Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

B & K PF-1 (488-094-9-001A)
Browning XM-888
Johnson Duo-Scan Low Range, High Range
Johnson 241-0340-001, 241-0340-002
Midland 13-915
Midland 13-925H/L/M
Pace Scan 108H/L/U, 208, 308
Pearce-Simpson Gladding Hi-Skan
Penneys 981-6065, 981-6066, 981-6067
Realistic Patrolman Pro-7 (20-5001)
Realistic Patrolman Pro-8 (20-162)
Realistic Patrolman Pro-9 (20-164)
Sonar FR-104, FR-105
Sonar FR-2516, FR-2517
Sonar FR-2525, FR-2526, FR-2528
Teaberry Scan "T"

A Howard W. Sams PUBLICATION

$4.95
$5.95 IN CANADA
Cat. No. SD-1

Sams

Scanner-Monitor Servicing Data

SD-1

REPRODUCED THROUGH THE COURTESY OF THE MANUFACTURER

HOWARD W. SAMS & CO., INC.
INDIANAPOLIS, INDIANA

First Edition

First Printing—December, 1972
Second Printing—September, 1973
Third Printing— October, 1974
Fourth Printing— September, 1975

Sams

Scanner-Monitor Servicing Data

SD-1

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

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SEMICONDUCTORS

ITEM	PART NO.	TYPE
D-1	150-005-9-001	1S73
D-2	150-006-9-001	1N60P
D-3	150-006-9-001	1N60P
D-4	150-006-9-001	1N60P
D-5	150-004-9-001	1S-188FM
D-6	150-004-9-001	1S-188FM
D-7	152-021-9-001	Zener, ZB-1
D-8	151-025-9-001	FR-2
D-9	151-025-9-001	FR-2
D10	151-025-9-001	FR-2
ICI	307-005-9-001	
Q-7	176-026-9-001	2SC784
Q-8	176-026-9-001	2SC784
Q-9	176-024-9-001	2SC371
Q-10	176-024-9-001	2SC371
Q-11	176-024-9-001	2SC371
Q-12	176-025-9-001	2SC373
Q-13	176-025-9-001	2SC373
Q-14	176-025-9-001	2SC373
Q-15	176-025-9-001	2SC373
Q-16	171-016-9-001	2SB367
Q-17	171-016-9-001	2SB367

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE	
C11	022-063-9-001	10mfd	16V
C14	022-063-9-001	10mfd	16V
C16	022-062-9-001	4.7mfd	25V
C21	022-063-9-001	10mfd	16V
C39	022-063-9-001	10mfd	16V
C40	022-061-9-001	1mfd	50V
C41	022-061-9-001	1mfd	50V
C42	022-064-9-001	33mfd	16V
C43	022-065-9-001	47mfd	16V
C45	022-061-9-001	1mfd	50V
C46	022-064-9-001	33mfd	16V
C47	022-067-9-001	220mfd	16V
C49	022-066-9-001	100mfd	16V
C50	022-068-9-001	470mfd	16V
C51	022-069-9-001	3300mfd	25V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R-63	006-102-5-059	0.5 ohm 1/2W
R-64	006-102-5-059	0.5 ohm 1/2W
R-65	006-102-5-059	0.5 ohm 1/2W
TH-1	004-097-9-001	Thermistor, D-1E
TH-2	004-097-9-001	Thermistor, D-1E
VR-1	008-142-9-001	50K Trim
VR-2	008-140-9-001	3000 ohms Squelch
VR-3	008-141-9-001	50K Volume

COILS/TRANSFORMERS

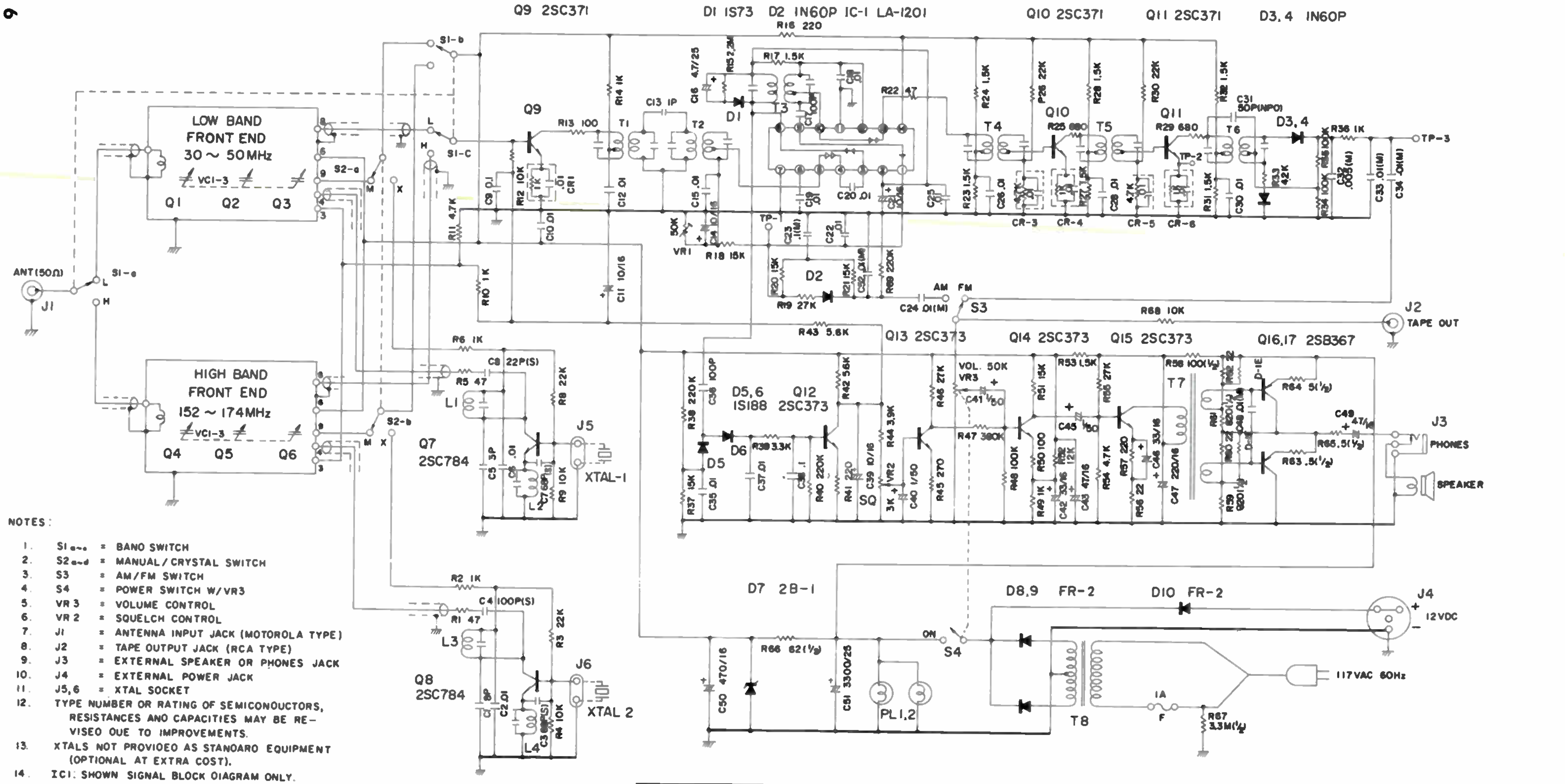
ITEM	PART NO.
L-1	046-010-9-001
L-2	046-009-9-001
L-3	046-010-9-001
T-1	060-009-9-001
T-2	060-009-9-001
T-3	060-012-9-001
T-4	060-010-9-001
T-5	060-010-9-001
T-6	060-011-9-001
T-7	068-003-9-001
T-8	065-065-9-001

MISCELLANEOUS

ITEM	NAME	PART
CR1	Component Combination	033-009-9-001
CR2	Component Combination	033-008-9-001
CR3	Component Combination	033-010-9-001
CR4	Component Combination	033-009-9-001
CR5	Component Combination	033-010-9-001
CR6	Component Combination	033-009-9-001
S1	Switch, Band	083-104-9-001
S2	Switch, Manual/Crystal	093-007-9-001
S3	Switch, AM/FM	093-007-9-001
SP1	Speaker	580-006-9-001
	Lamp	400-019-9-001
	Socket, Crystal (6V Type)	749-061-9-001

CABINET PARTS

NAME	PART NO.
Cabinet	272-073-9-001
Plate, Bottom	253-020-9-001
Bracket, Handle	250-036-9-001
Bracket, Antenna	251-076-9-001
Knob, Tuning	751-070-9-001
Knob, Control	751-071-9-001



NOTES:

1. $S1_{a-e}$ = BAND SWITCH
2. $S2_{a-d}$ = MANUAL/CRYSTAL SWITCH
3. S3 = AM/FM SWITCH
4. S4 = POWER SWITCH W/VR3
5. VR 3 = VOLUME CONTROL
6. VR 2 = SQUELCH CONTROL
7. J1 = ANTENNA INPUT JACK (MOTOROLA TYPE)
8. J2 = TAPE OUTPUT JACK (RCA TYPE)
9. J3 = EXTERNAL SPEAKER OR PHONES JACK
10. J4 = EXTERNAL POWER JACK
11. J5,6 = XTAL SOCKET
12. TYPE NUMBER OR RATING OF SEMICONDUCTORS, RESISTANCES AND CAPACITIES MAY BE REVISED DUE TO IMPROVEMENTS.
13. XTALS NOT PROVIDED AS STANDARD EQUIPMENT (OPTIONAL AT EXTRA COST).
14. IC1: SHOWN SIGNAL BLOCK DIAGRAM ONLY.

VHF MONITOR
RECEIVER
488-094-9-001 A

Pages 7-8 Courtesy of BROWNING LABORATORIES, INC.

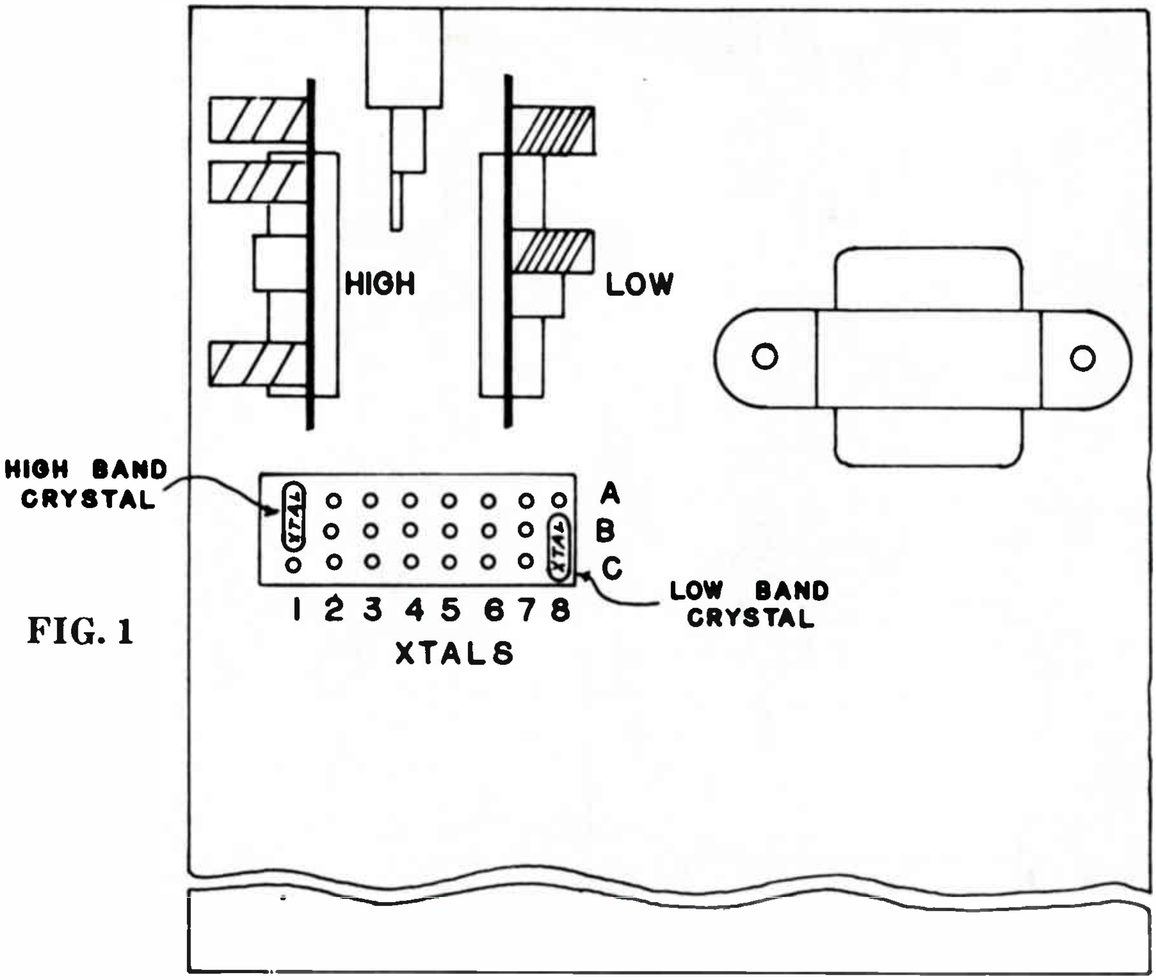


FIG. 1

FRONT

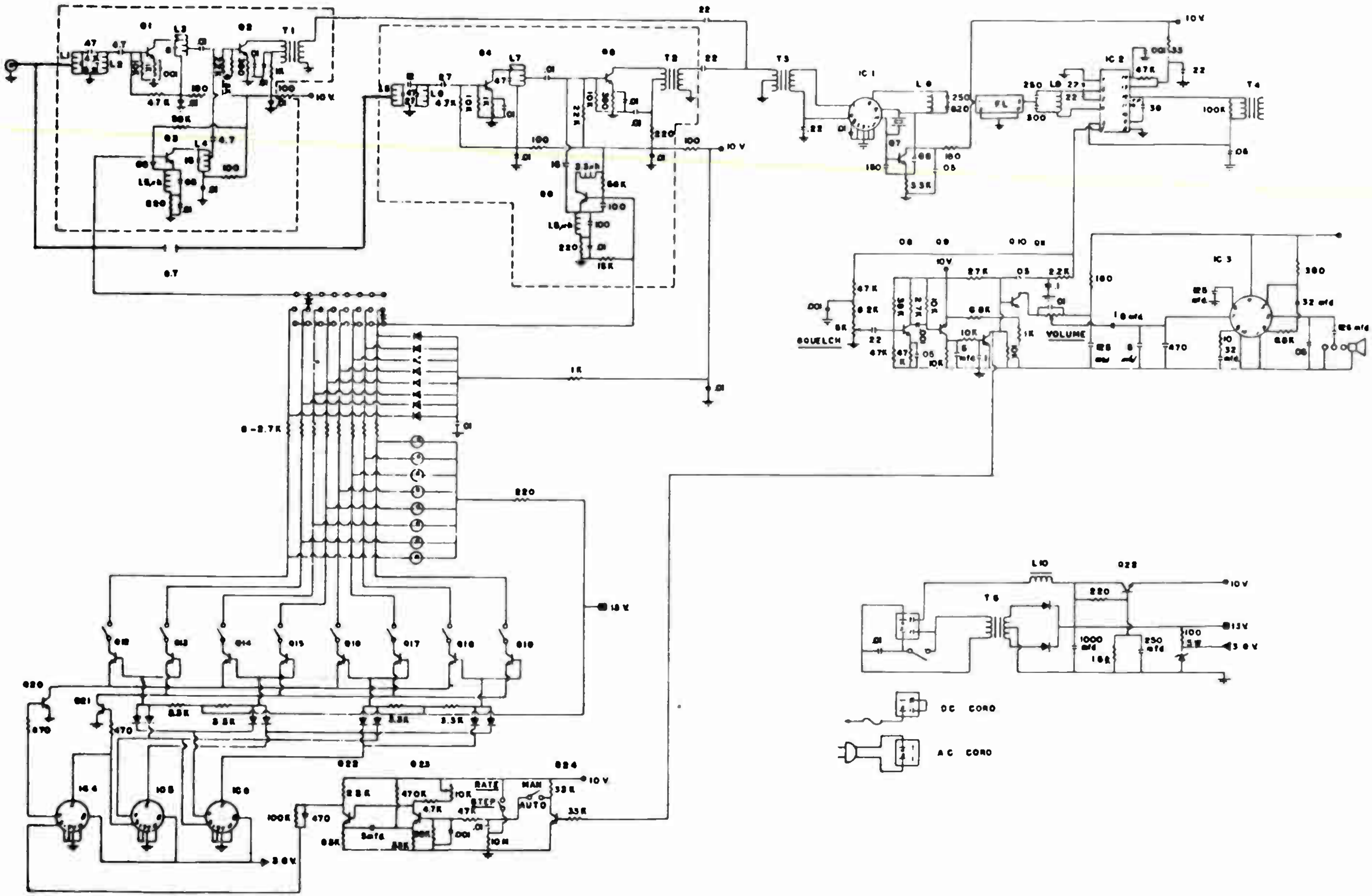
TOP VIEW

CRYSTAL ORDERING INFORMATION

HIGH BAND—CRYSTAL FREQ.—$\dfrac{\textbf{Receive Freq.} - \textbf{10.7 MHz.}}{3}$

LOW BAND—CRYSTAL FREQ.—Receive Freq.—10.7 MHz.

HC 25/u HOLDER SERIES RESONATE 50 OHMS MAX. INP.


SQUELCH
VOLUME
RATE
STEP
MAN
AUTO
DC CORD
AC CORD
IC 1
IC 2
IC 3
10 V
13 V

Crystal Installation and Programming

To add or change crystals in your receiver:

1. Remove the two screws which secure the cabinet locking brackets to the rear panel. Remove the whip antenna.

2. Carefully slide the chassis out of the cabinet. It should slide out easily; do not force it.

3. The crystal sockets are marked with letters corresponding to the front panel nomenclature. Insert the crystal(s) to be added in the position(s) you prefer.

4. Program the receiver by inserting the programming wire for each channel into the appropriate jack. Use the jacks toward the front of the receiver for 30-50 MHz crystals, jacks toward the rear for 150-174 MHz crystals. The wire and jack directly behind each crystal are for that crystal.

5. DO NOT TAMPER WITH ANY INTERNAL ADJUSTMENTS. DOING SO WILL DEGRADE THE SET'S PERFORMANCE.

6. Carefully reinstall the receiver in its cabinet. Press the speaker towards the bottom of the printed circuit board so that it will enter the cabinet. Replace the locking brackets, then insert and tighten the two screws at the rear of the cabinet. Connect the antenna and power lead. Install the transceiver in its mounting bracket.

7. Check unit operation to be sure you have installed the crystals and programming wires properly.

8. Crystal Specifications
30-50 MHz. Third overtone crystal with injection 10.7 MHz above signal frequency (crystal frequency = channel frequency +10.7 MHz). Maximum impedance, 35 Ω. HC-18/u holder with plug-in pin leads; ±0.002% frequency tolerance.

150-174 MHz. Third harmonic of third overtone crystal with injection 10.7 MHz below signal frequency (crystal frequencies 46.43 to 54.10 MHz; crystal freq. = $\frac{\text{channel freq.} - 10.7\ \text{MHz})}{3}$

Maximum impedance, 35 Ω. HC-18/u holder with plug-in pin leads; ±0.0015 tolerance.

RF AMPLIFIER

The RF signal input is coupled from the external or whip antenna to high band RF amplifier Q1, and low band RF amplifier Q4.

LOW BAND RF SIGNAL

After amplification, the low band RF signal is coupled to low band 10.7 MHz mixer Q5. This signal is mixed with the low band oscillator signal which is coupled from Q6 by C32 to the base of Q5. The 10.7 MHz difference frequency from the mixer is coupled through T10 to the 10.7 MHz ceramic filter, Z1.

HIGH BAND RF SIGNAL

After amplification, the high band RF signal is coupled to high band 10.7 MHz mixer Q2. This signal is mixed with the high band oscillator signal which is coupled from Q3 by C13 to the base of Q2. The 10.7 MHz difference frequency from the mixer is coupled through T10 to the 10.7 MHz ceramic filter, Z1. Notice that transformer T10 is shared by both high band and low band mixer.

455 kHz SIGNAL

The 10.7 MHz ceramic filter (Z1) output and the 11.155 MHz oscillator (Q8) output are mixed together by the 455 kHz mixer, Q7. A 455 kHz difference frequency output is filtered by the 455 kHz filter (Z2) and coupled to integrated circuit U1, where it is amplified. After amplification, the signal is coupled to integrated circuit U2, where it is again amplified and detected.

DETECTOR

The detected audio output signal from U2 is the difference of two peak-detected signals. Therefore, this detector is called a "differential peak detector". Since only one tuned coil is required, alignment is simplified.

AUDIO

Detected audio is amplified by audio preamplifier Q9, audio driver Q10, and single-ended Class B audio output stage Q11 and Q12. The resultant audio is coupled to speaker U7.

SQUELCH

High frequency noise (absence of input signal) is amplified by noise amplifier Q13 and Q14. The amplified noise is rectified and doubled by CR9, CR10 and associated components. This DC voltage level is coupled to the base of Q9 and Q10. With squelch control R61 set full clockwise, Q9 and Q10 are reverse biased, resulting in no audio output.

When a desired signal input is received, high frequency noise is absent and audio amplifiers Q9 and Q10 are forward biased, allowing audio output.

AC/DC POWER SUPPLY

The AC voltage input is rectified by a bridge rectifier consisting of CR11, CR12, CR13 and CR14. The DC output voltage (DC input voltage if battery supply is used) is coupled through on/off switch S10 to the audio output stage, Q11 and Q12, and voltage regulator Q29. The voltage regulator supplies approximately 9.6 VDC to the remaining stages.

SCANNING LOGIC

The scanning logic works in conjunction with the noise operated squelch circuit and functions as follows:

In the squelched condition (absence of a signal input) high frequency noise is amplified by noise amplifiers Q13 and Q14, and rectified and doubled by CR9, CR10 and associated components. Squelch switch Q15 conducts and the negative going collector voltage is coupled to the base of multivibrator switch Q18. Q18 conducts and the positive going collector voltage allows multivibrator Q16 and Q17 to conduct (scan and manual position).

With the scan switch engaged, B+ voltage is applied to the logic circuitry. Example of crystal 1 and 2 scanning; Q27 and Q28 conduct due to the positive going voltage (logical 1) from pin 3 of U5. The logic symbol shown for U5 is a "Nor gate" (no inputs produce a logical 1 output).

With reference to the timing chart, it is noted that when pin 9 and 13 of U4 are in the reset condition (logical 0 state), the desired output is produced.

In the unsquelched condition (presence of a signal input), the absence of high frequency noise allows squelch switch Q15, multivibrator switch Q18 and multivibrator Q16 and Q17 to cut off, enabling audio output. The crystal with the same frequency as the input signal will then be locked-in until the message is completed.

The AC ground path for crystal oscillator activation is as follows:

When Q28 and Q19 turn on in scan position (no channels locked out) the junction of R86 and DS6 is effectively shorted to ground. DS6 turns on, CR6 conducts and the AC ground path is through C82.

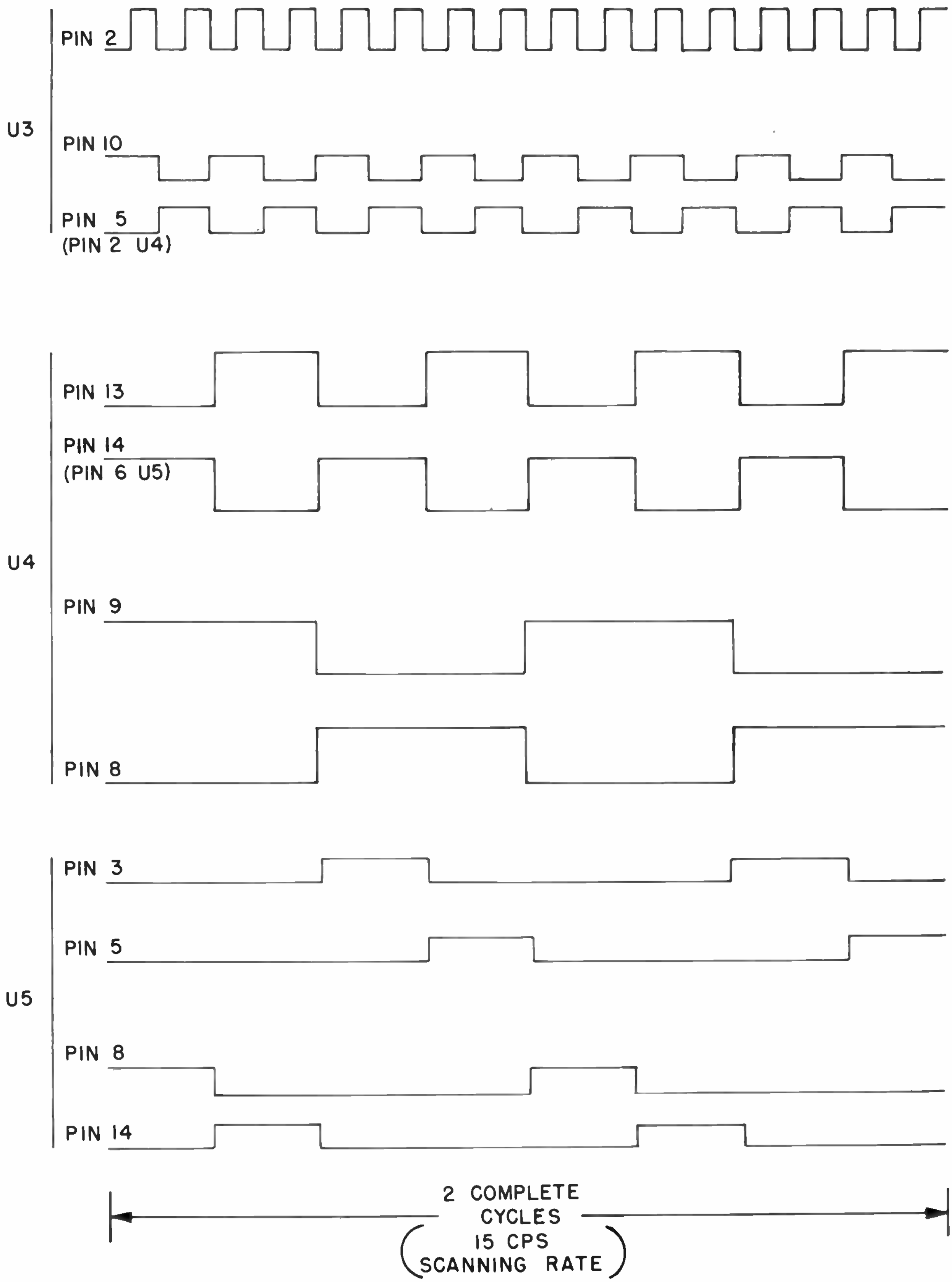
SCANNING LOGIC CIRCUITRY SERVICE TIPS

1. The scanning rate is designed for optimum performance. If desired, the scanning rate can be increased or decreased by increasing or decreasing C76 value.

2. When troubleshooting the scanning logic circuitry, the frequency of multivibrators Q16 and Q17 should be increased for ease of viewing the oscilloscope signal trace (change C76 value to 0.1 or 0.01 μF).

3. If "Nor Gate" output is not a logical 1, unsolder the gate output lead and remeasure output level. This is necessary because, if one of the transistor switches (Q21-Q28) is shorted, the associated "Nor Gate" will not give the proper output.

4. If either Q19 or Q20 becomes defective, the four channels associated with each stage will not scan.



LOGIC CIRCUIT TIMING CHART

ALIGNMENT HIGH RANGE

The standard UHF/VHF Duo-Scan Monitor Receiver is factory aligned on 460.000 MHz and 157.000 MHz.

To obtain peak receiver performance, selected crystal frequencies should be within ±3.5 MHz of 157.000 MHz and ±4.0 MHz of 460.000 MHz.

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the monitor receiver be realigned on the required "center frequency" by a QUALIFIED TECHNICIAN.

Align the monitor receiver on the available frequency which is close to the center of the frequencies installed in the individual customer's receiver. This frequency will be termed "center frequency" in the alignment procedure.

AUTOMATIC FREQUENCY CONTROL (AFC)

a. Connect the DC VTVM to the collector of Q103.

b. With no signal input (scan mode), adjust AFC set control R105 for a 3.5 VDC reading.

UHF/VHF OSCILLATOR

a. Manually select the UHF or VHF center frequency crystal.

b. Connect an RF voltmeter probe to the base of Q2.

c. Adjust L101 for a maximum RF voltmeter reading. A typical reading between 85 and 500 mV should be indicated.

VHF RF AMPLIFIER AND IF AMPLIFIER

a. Connect an RF signal generator to the antenna connector.

   1. Set the generator output to the VHF band "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

   1. Adjust T1, T2, T3, T4 and T103 for a minimum AC voltmeter reading (maximum quieting sensitivity).

   2. With an RF voltmeter connected to pin 1 of integrated circuit U1, a typical reading of approximately 90 mV should be indicated with a 0.5 μV signal input connected to the antenna connector.

c. Connect the RF voltmeter probe to pin 4 of IC U2.

   1. Adjust T11 for a maximum RF voltmeter reading.

   2. A typical reading is approximately 750 mV with a 0.5 μV signal input at the antenna connector.

UHF RF AMPLIFIER AND UHF MIXER

a. Connect an RF signal generator to the antenna connector.

   1. Set the generator output to the UHF "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

   1. Adjust C125, C118 and C112 for minimum AC voltmeter reading (maximum quieting sensitivity).

   2. With an RF voltmeter connected to pin 1 of IC U1, a typical reading is approximately 40 mV with 0.5 μV at the antenna connector.

DISCRIMINATOR

a. Externally modulate the RF signal generator with a 1 kHz audio signal at a deviation level of 3.5 kHz.

b. Set the RF signal generator to UHF or VHF "center frequency" and connect it to the antenna connector.

c. Adjust T12 for maximum undistorted audio output.

CERAMIC FILTER

The 455 kHz ceramic filter is factory adjusted and will not normally require realignment. However, if the ceramic filter or associated components are replaced, proceed as follows:

a. Connect an oscilloscope across external speaker jack J1.

b. Connect the RF signal generator to the antenna connector. Set the generator output level for 5 μV and externally modulate with a 1 kHz audio signal at a 7 to 8 kHz deviation level.

c. Adjust the ceramic filter for clean audio waveform.

QUIETING SENSITIVITY CHECK

a. Adjust the receiver volume control for a 0 dB audio output reference level.

b. Set the RF signal generator to the "center frequency" with 0.5 μV at the antenna connector.

   1. The 0 dB audio output level should drop a minimum of 20 dB for both the UHF and VHF "center frequency".

c. Repeat steps a. and b. on the remaining crystals with the signal generator set to each specific crystal frequency and the output level set to 1.0 μV.

ALIGNMENT LOW RANGE

The standard Duo-Scan® Monitor receiver is factory aligned on a low band frequency of 42.000 MHz and on a high band frequency of 156.500 MHz.

To obtain peak receiver performance, selected crystal frequencies should be within ±2.5 MHz of 42.000 MHz and ±3.5 MHz of 156.000 MHz. The receiver will operate outside these limits, but with reduced sensitivity.

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the monitor receiver be realigned on the required center frequency by a qualified technician.

Align the monitor receiver on the available frequency which is close to the center of the frequencies installed in the individual customer's receiver. This frequency will be termed "center frequency" in the alignment procedure.

NOTE

If the receiver is required to operate on a "center frequency" below 35 MHz, change capacitors C23 and C26 to 22 pF and 15 pF respectively, before realignment is started.

OSCILLATOR ADJUST (HIGH BAND)

a. Connect an RF voltmeter probe to the base of Q2.

b. Adjust T6 for a maximum RF voltmeter reading.

   1. A typical reading is 100 to 200 mV.

RF AND IF AMPLIFIER ADJUST (HIGH BAND)

a. Connect an RF signal generator to the receiver antenna connector.

   1. Set the generator output to the high band "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

   1. Adjust T1, T2, T3, T4 and T10 for a minimum AC voltmeter reading (maximum quieting sensitivity).
   2. With an RF voltmeter connected to pin 1 of integrated circuit U1, a typical reading of approximately 90 mV should be indicated with a 0.5 μV signal input connected to the antenna connector.

c. Connect the RF voltmeter probe to pin 4 of IC U2.

   1. Adjust T11 for a maximum RF voltmeter reading.
   2. A typical reading is approximately 750 mV with a 0.5 μV signal input at the antenna connector.

RF AMPLIFIER ADJUST (LOW BAND)

a. Connect an RF signal generator to the receiver antenna connector.

   1. Set the generator output to the low band "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

   1. Adjust T7, T8 and T9 for minimum AC voltmeter reading (maximum quieting sensitivity).
   2. With an RF voltmeter connected to pin 1 of IC U1, a typical reading is approximately 40 mV with 0.5 μV at the antenna connector.

DISCRIMINATOR ADJUST

a. Externally modulate the RF signal generator with a 1 kHz audio signal at a deviation level of 3.5 kHz.

b. Set the signal generator to "center frequency" and connect it to the receiver antenna connector.

c. Connect the RF voltmeter to the negative side of C60.

   1. Adjust T12 for a maximum RF voltmeter reading.

455 kHz CERAMIC FILTER ADJUST

The 455 kHz ceramic filter is factory adjusted and will not normally require realignment. However, if the ceramic filter is replaced, we recommend that you check the receiver frequency response curve and adjust the filter using a standard sweep alignment method.

QUIETING SENSITIVITY CHECK

a. Adjust the receiver volume control for a 0 dB audio output reference level.

b. Set the RF signal generator to the "center frequency" with 0.5 μV at the receive antenna terminal.

   1. The 0 dB audio output level should drop a minimum of 20 dB for both the low and high band center frequency.

c. Repeat steps a and b on the remaining crystals with the signal generator set to each specific crystal frequency and the output level set to 1.0 μV.

SEMICONDUCTORS

ITEM	PART NO.
CR1	523-006-002
CR2	523-006-002
CR3	523-006-002
CR4	523-006-002
CR5	523-006-002
CR6	523-006-002
CR7	523-006-002
CR8	523-006-002
CR9	523-1000-067
CR10	523-1000-067
CR11	523-0001-002
CR12	523-0001-002
CR13	523-0001-002
CR14	523-0001-002
CR15	523-2003-100
Q1	576-0003-004
Q2	576-0003-005
Q3	576-0003-006
Q4	576-0003-004
Q5	576-0003-005
Q6	576-0003-006
Q7	576-0003-007
Q8	576-0003-028
Q9	576-0003-011
Q10	576-0002-006
Q11	576-0002-001
Q12	576-0002-001
Q13	576-0003-011
Q14	576-0003-011
Q15	576-0003-011
Q16	576-0003-028
Q17	576-0003-028
Q18	576-0003-017
Q19	576-0003-028
Q20	576-0003-028
Q21	576-0003-028
Q22	576-0003-028
Q23	576-0003-028
Q24	576-0003-028
Q25	576-0003-028
Q26	576-0003-028
Q27	576-0003-028
Q28	576-0003-028
Q29	576-0002-001
U1	544-2002-004
U2	544-2003-002
U3	544-3001-002
U4	544-3001-003
U5	544-3001-001

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE	
C60	510-2045-109	1mfd	35V
C63	510-2005-568	.56mfd	35V
C65	510-2005-568	.57mfd	35V
C66	510-4003-007	330mfd	10V
C71	510-2045-229	2.2mfd	35V
C74	510-2045-229	2.2mfd	35V
C75	510-2045-229	2.2mfd	35V
C76	510-2045-229	2.2mfd	35V
C79	510-4006-005	1000mfd	16V
C80	510-4006-005	1000mfd	16V
C84	510-4006-005	1000mfd	16V

CONTROLS

ITEM	PART NO.	DESCRIPTION
R45	562-0018-008	10K Volume
R61	562-0018-007	5000 ohms Squelch

COILS/TRANSFORMERS

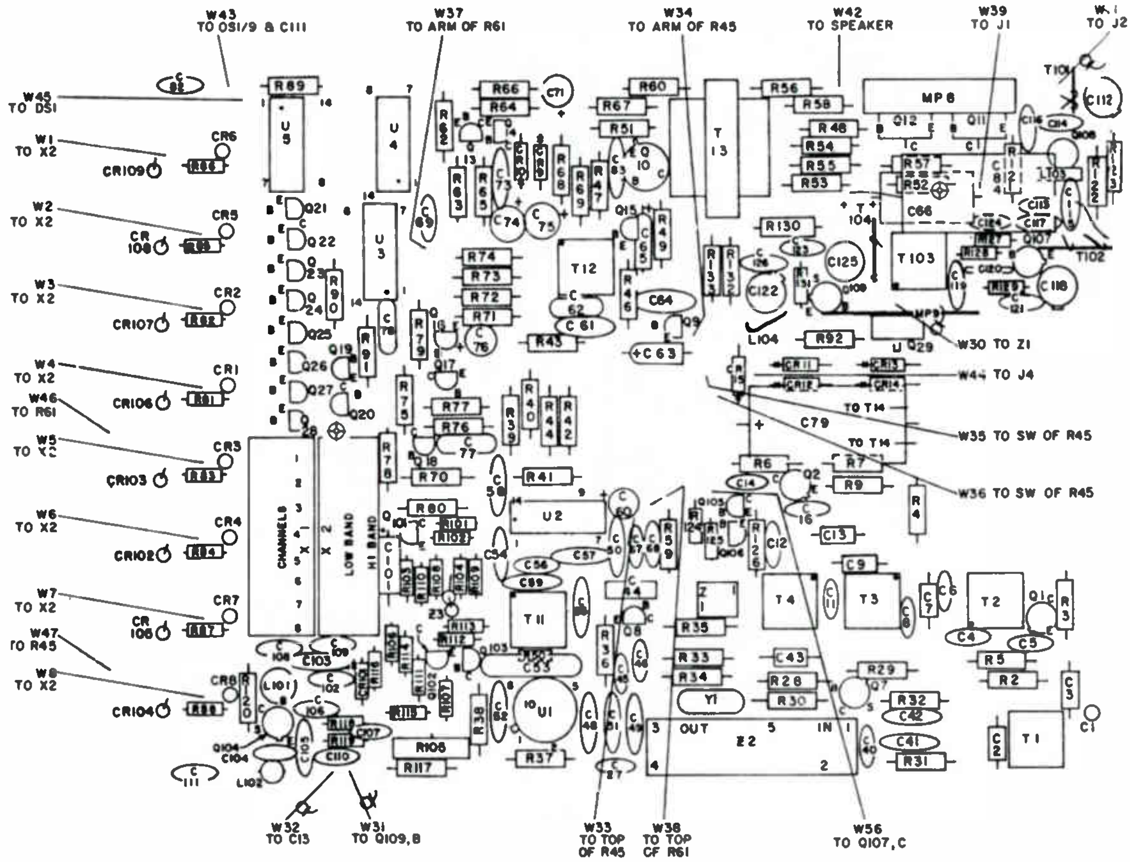
ITEM	PART NO.
L1	542-3002-001
L2	542-3002-001
T1	592-5009-016
T2	592-5009-016
T3	592-5009-016
T4	592-5009-016
T6	592-5030-021
T7	592-5030-021
T8	592-5009-011
T9	592-5009-011
T10	592-5009-011
T11	592-5006-006
T12	592-5006-008
T13	592-1015-001
T14	592-3001-008

MISCELLANEOUS

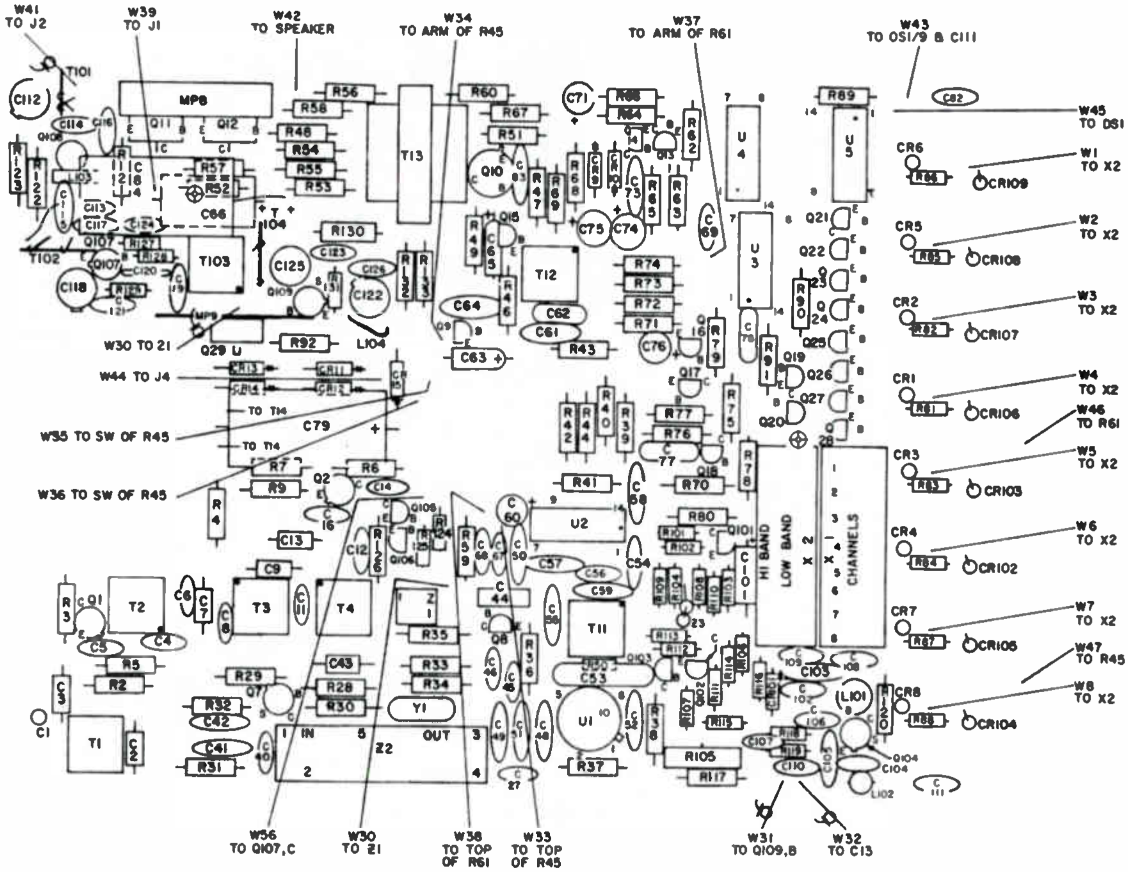
ITEM	NAME	PART NO.
S1-9	Switch, Push Button	583-4008-014
U7	Speaker Assembly	023-2927-001
Y1	Crystal, 11.155MC	519-0009-001
Z1	IF Filter, 10.7MC	532-2001-011
Z2	IF Filter, 455KC	532-2002-011
	Antenna, Telescopic	501-0010-001

CABINET PARTS

NAME	PART NO.
Cabinet Assembly	023-2920-002
Rear Panel Assembly	023-2965-001
Front Panel	032-0307-001
Knob, Volume	013-1086-008
Knob, Squelch	013-1086-008
Push Button "M"	032-0306-001
Push Button "1"	032-0306-002
Push Button "2"	032-0306-003
Push Button "3"	032-0306-004
Push Button "4"	032-0306-005
Push Button "5"	032-0306-006
Push Button "6"	032-0306-007
Push Button "7"	032-0306-008
Push Button "8"	032-0306-009

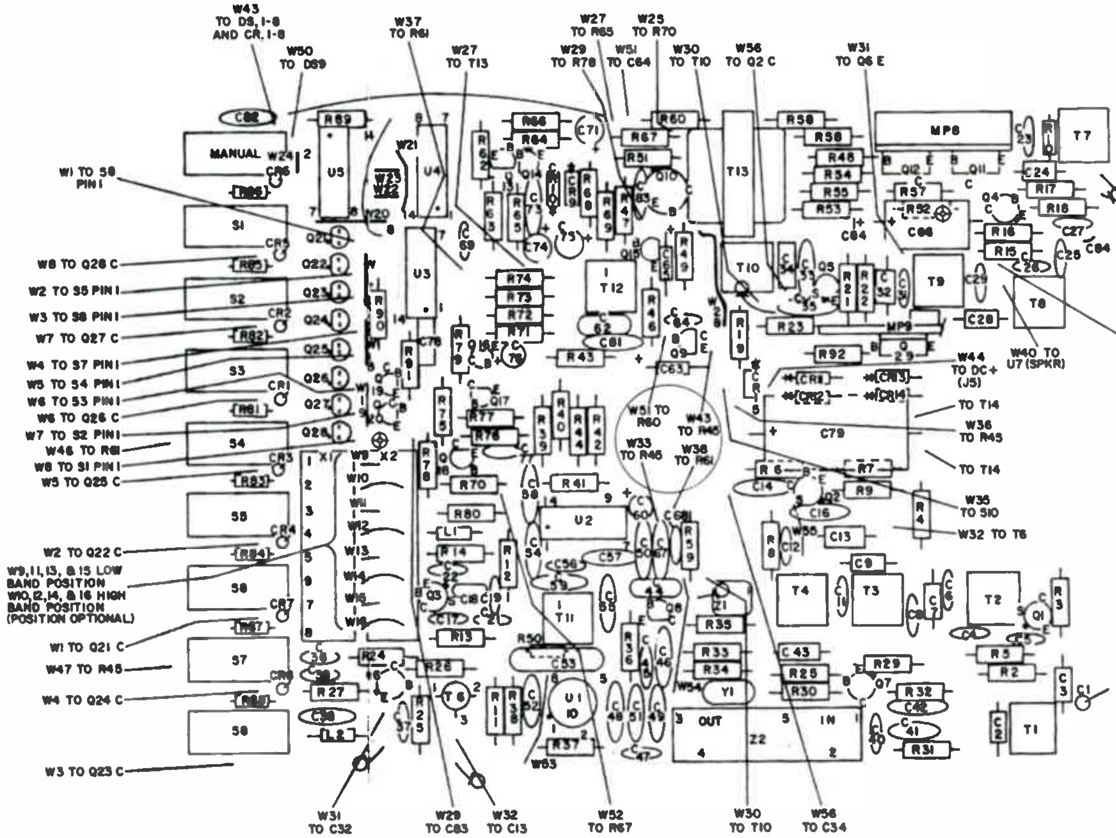


COMPONENT SIDE
(TOP VIEW)

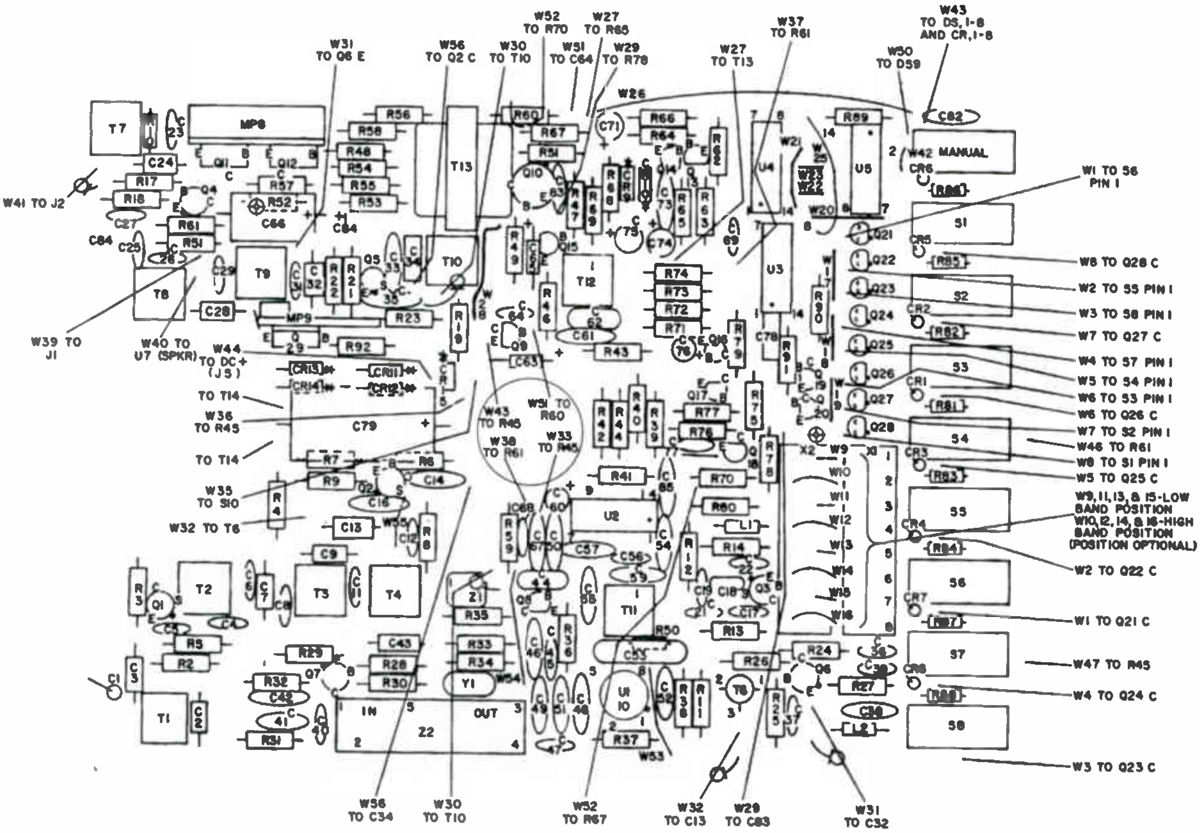


SOLDER SIDE
(BOTTOM VIEW)

HIGH RANGE

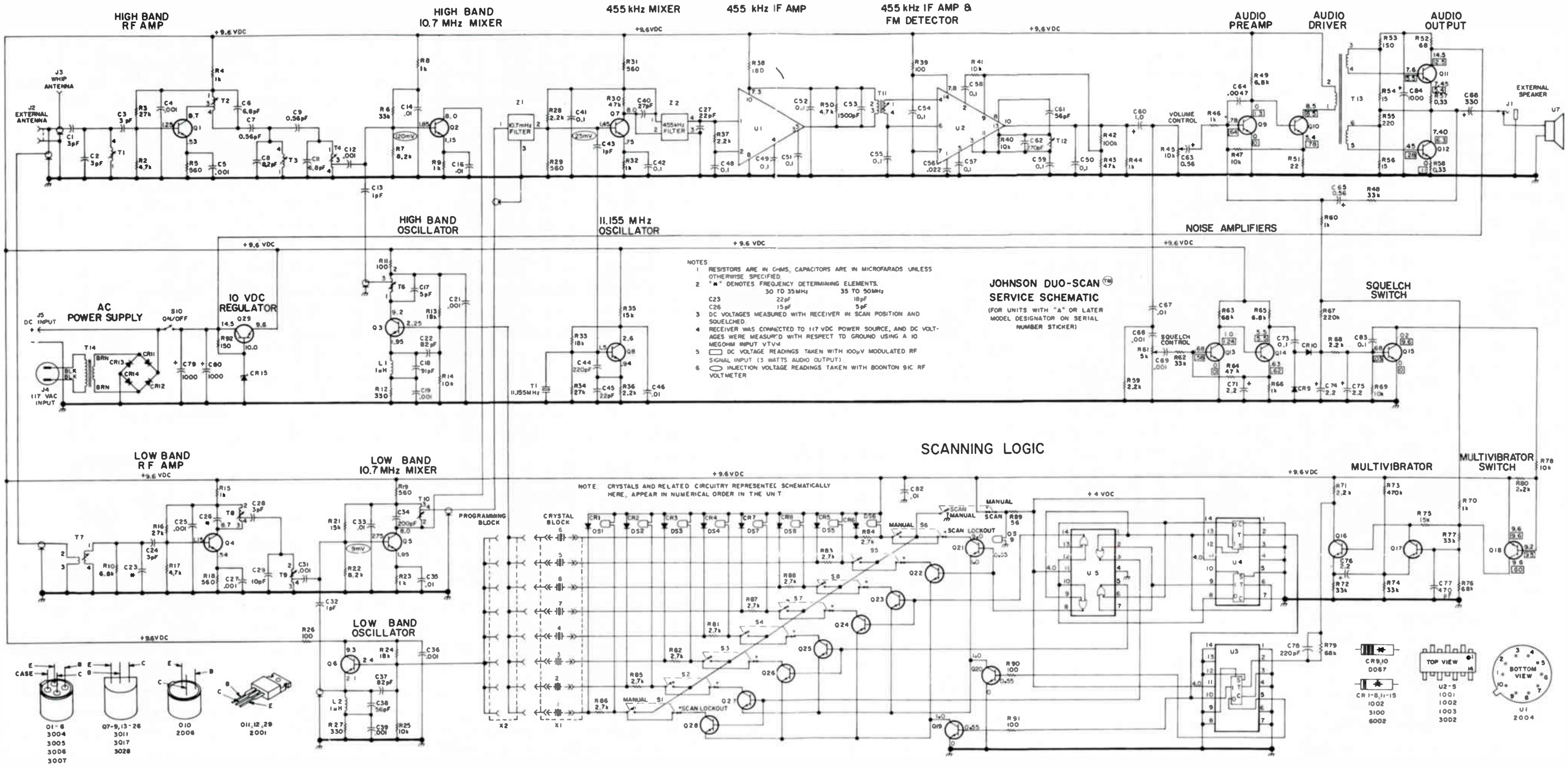


COMPONENT SIDE
(Top View)

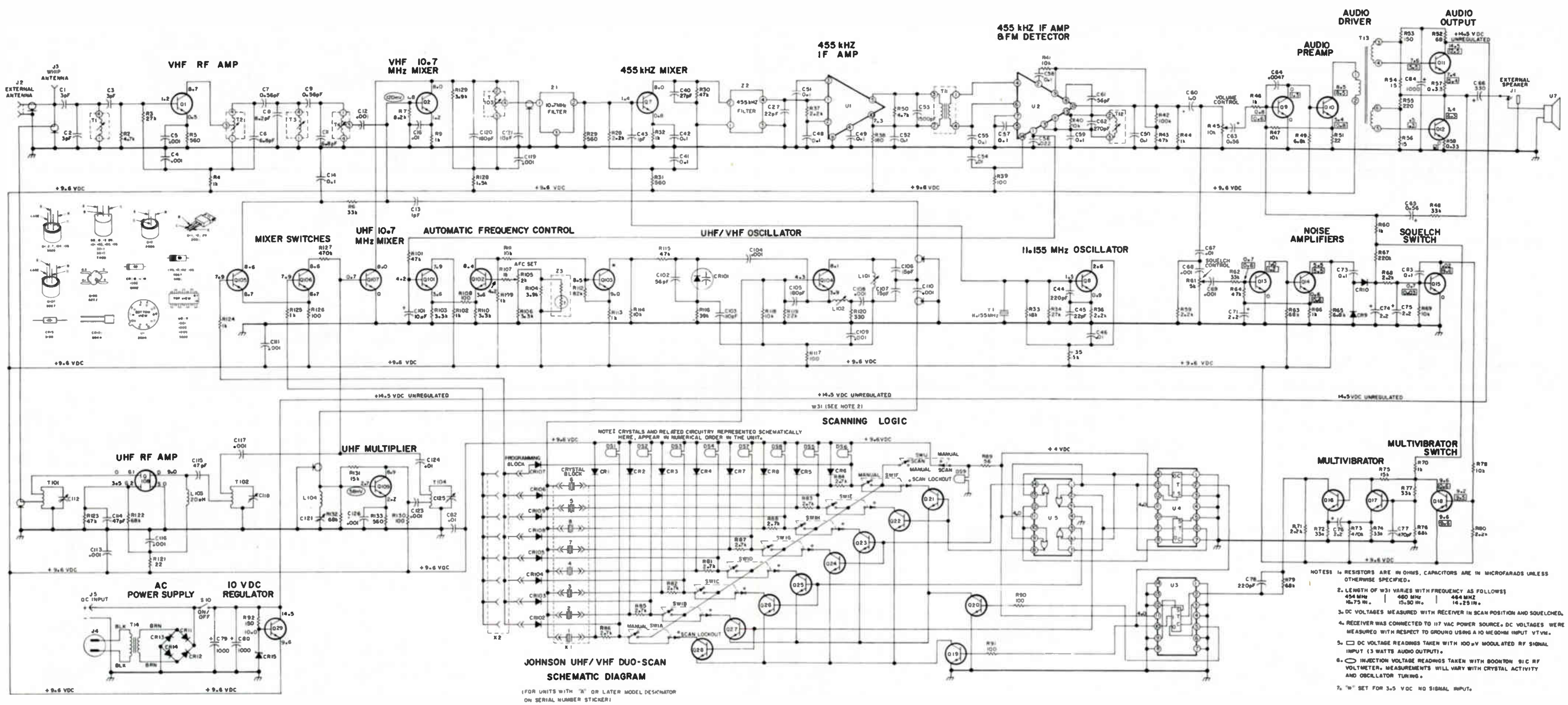


SOLDER SIDE
(Bottom View)

LOW RANGE

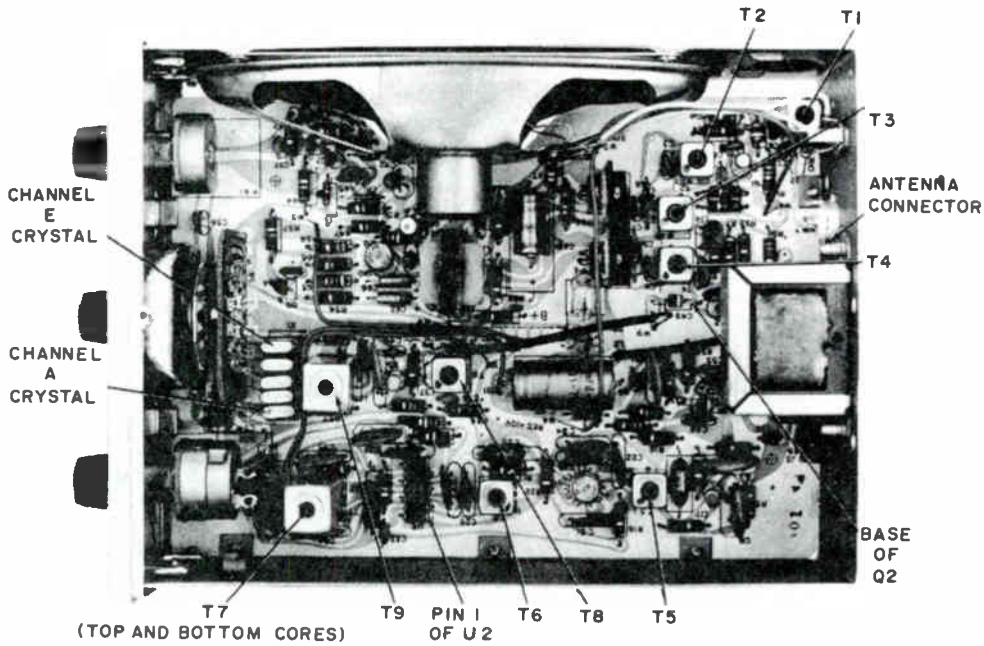

HIGH BAND RF AMP
HIGH BAND 10.7 MHz MIXER
455 kHz MIXER
455 kHz IF AMP
455 kHz IF AMP & FM DETECTOR
AUDIO PREAMP
AUDIO DRIVER
AUDIO OUTPUT
HIGH BAND OSCILLATOR
11.155 MHz OSCILLATOR
NOISE AMPLIFIERS
AC POWER SUPPLY
10 VDC REGULATOR
SQUELCH SWITCH
JOHNSON DUO-SCAN ™
SERVICE SCHEMATIC
(FOR UNITS WITH "A" OR LATER MODEL DESIGNATOR ON SERIAL NUMBER STICKER)
NOTES
1 RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2 "*" DENOTES FREQUENCY DETERMINING ELEMENTS.
30 TO 35MHz 35 TO 50MHz
C23 22pF 18pF
C26 15pF 5pF
3 DC VOLTAGES MEASURED WITH RECEIVER IN SCAN POSITION AND SQUELCHED
4 RECEIVER WAS CONNECTED TO 117 VDC POWER SOURCE, AND DC VOLTAGES WERE MEASURED WITH RESPECT TO GROUND USING A 10 MEGOHM INPUT VTVM
5 DC VOLTAGE READINGS TAKEN WITH 100μV MODULATED RF SIGNAL INPUT (3 WATTS AUDIO OUTPUT)
6 INJECTION VOLTAGE READINGS TAKEN WITH BOONTON 91C RF VOLTMETER
SCANNING LOGIC
LOW BAND RF AMP
LOW BAND 10.7 MHz MIXER
LOW BAND OSCILLATOR
PROGRAMMING BLOCK
CRYSTAL BLOCK
NOTE CRYSTALS AND RELATED CIRCUITRY REPRESENTED SCHEMATICALLY HERE, APPEAR IN NUMERICAL ORDER IN THE UNIT
MULTIVIBRATOR
MULTIVIBRATOR SWITCH
EXTERNAL SPEAKER
117 VAC INPUT
DC INPUT
WHIP ANTENNA
EXTERNAL ANTENNA

LOW RANGE


VHF RF AMP
VHF 10.7 MHz MIXER
455 kHZ MIXER
455 kHZ IF AMP
455 kHZ IF AMP & FM DETECTOR
AUDIO PREAMP
AUDIO DRIVER
AUDIO OUTPUT
EXTERNAL SPEAKER
MIXER SWITCHES
UHF 10.7 MHz MIXER
AUTOMATIC FREQUENCY CONTROL
UHF/VHF OSCILLATOR
11.155 MHz OSCILLATOR
NOISE AMPLIFIERS
SQUELCH SWITCH
SCANNING LOGIC
UHF RF AMP
UHF MULTIPLIER
MULTIVIBRATOR
MULTIVIBRATOR SWITCH
AC POWER SUPPLY
10 VDC REGULATOR
JOHNSON UHF/VHF DUO-SCAN
SCHEMATIC DIAGRAM
(FOR UNITS WITH "A" OR LATER MODEL DESIGNATOR ON SERIAL NUMBER STICKER)
NOTES: 1. RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. LENGTH OF W31 VARIES WITH FREQUENCY AS FOLLOWS:
454 MHz 16.75 IN. | 460 MHz 15.50 IN. | 464 MHZ 14.25 IN.
3. DC VOLTAGES MEASURED WITH RECEIVER IN SCAN POSITION AND SQUELCHED.
4. RECEIVER WAS CONNECTED TO 117 VAC POWER SOURCE. DC VOLTAGES WERE MEASURED WITH RESPECT TO GROUND USING A 10 MEGOHM INPUT VTVM.
5. DC VOLTAGE READINGS TAKEN WITH 100 µV MODULATED RF SIGNAL INPUT (3 WATTS AUDIO OUTPUT).
6. INJECTION VOLTAGE READINGS TAKEN WITH BOONTON 91C RF VOLTMETER. MEASUREMENTS WILL VARY WITH CRYSTAL ACTIVITY AND OSCILLATOR TUNING.
7. "*" SET FOR 3.5 VDC NO SIGNAL INPUT.

HIGH RANGE

Pages 21-26 Courtesy of E.F. JOHNSON COMPANY



ALIGNMENT POINTS AND CRYSTAL LOCATION
FIGURE 5

Crystal Installation

To add or change crystals in your receiver:

Remove the two screws at the rear sides of the cabinet which hold it to the chassis.

Remove the two screws at the top and bottom front of the cabinet which hold it to the front panel.

Carefully slide the chassis out of the cabinet. It should slide out easily; do not force it.

The crystal sockets are marked with letters corresponding to the front panel nomenclature. Insert the crystal(s) to be added to the position(s) you prefer.

DO NOT TAMPER WITH ANY INTERNAL ADJUSTMENTS. DOING SO WILL DEGRADE THE SET'S PERFORMANCE AND WILL VOID YOUR WARRANTY.

Carefully reinstall the chassis in its cabinet. Insert and tighten the two screws at the rear and at the front top and bottom sides of the cabinet. Connect the antenna and power lead. Install the transceiver in its mounting bracket or on its power supply.

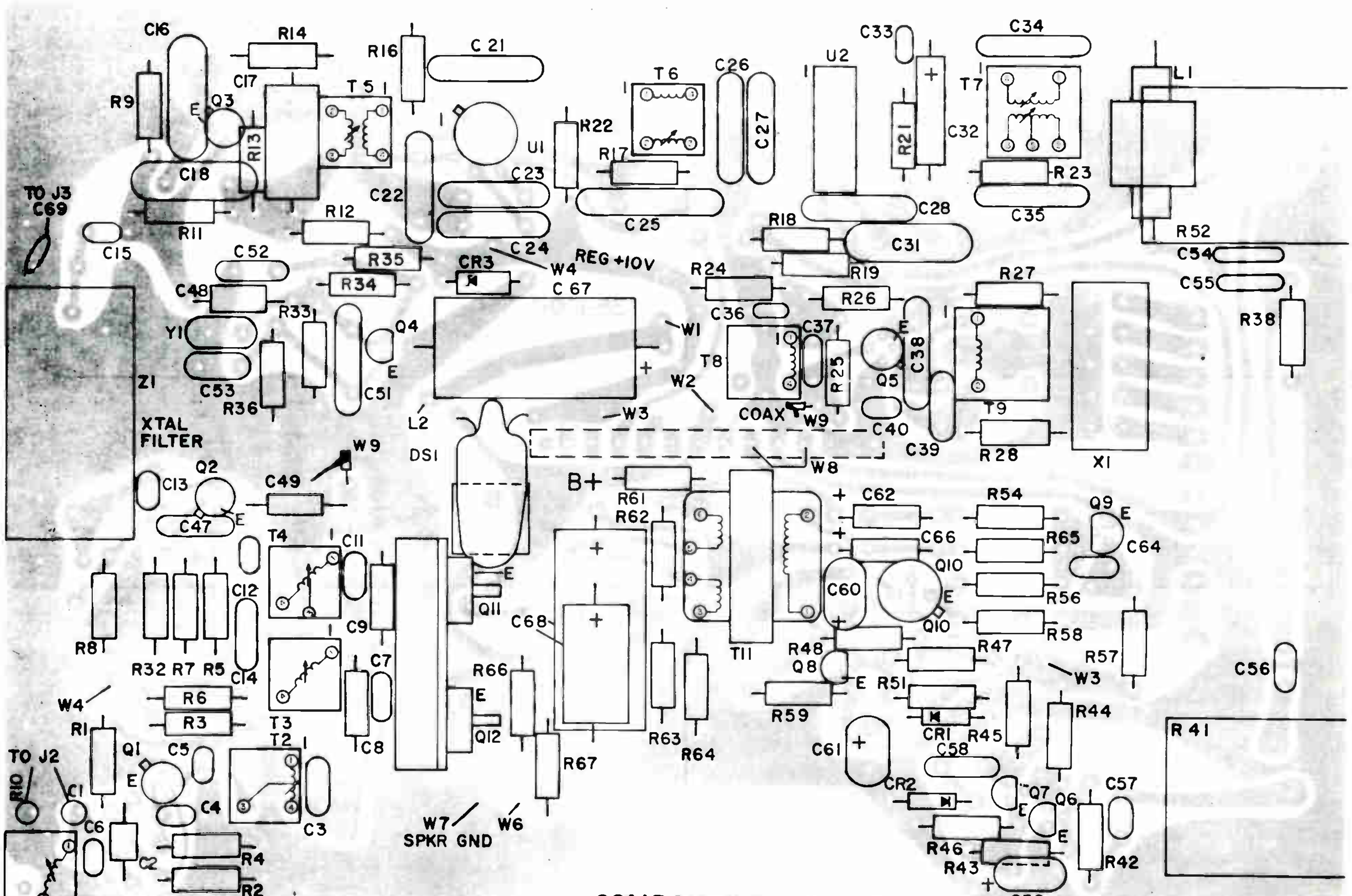
Check unit operation to be sure you have installed the crystals properly.

Crystal Specifications

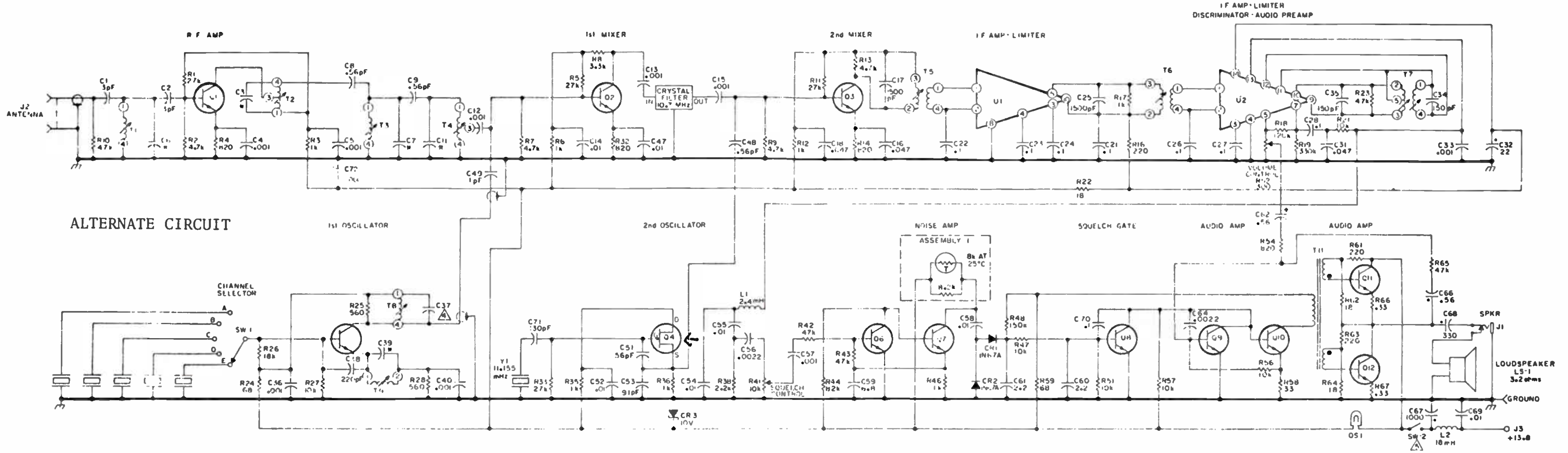
148-150 MHz. Third harmonic of third overtone crystal with injection 10.7 MHz above signal frequency (crystal frequencies 52.9 to 53.56 MHz).

150-174 MHz. Third harmonic of third overtone crystal with injection 10.7 MHz below signal frequency (crystal frequencies 46.43 to 54.43 MHz).

NOTE: When two or more channels are installed which are on either side of the 150 MHz frequency where the injection switches sides of the incoming signal, low side injection crystals should be used for the frequencies below 150 MHz (crystal frequencies 45.76 to 46.43 MHz).



COMPONENTS LAYOUT

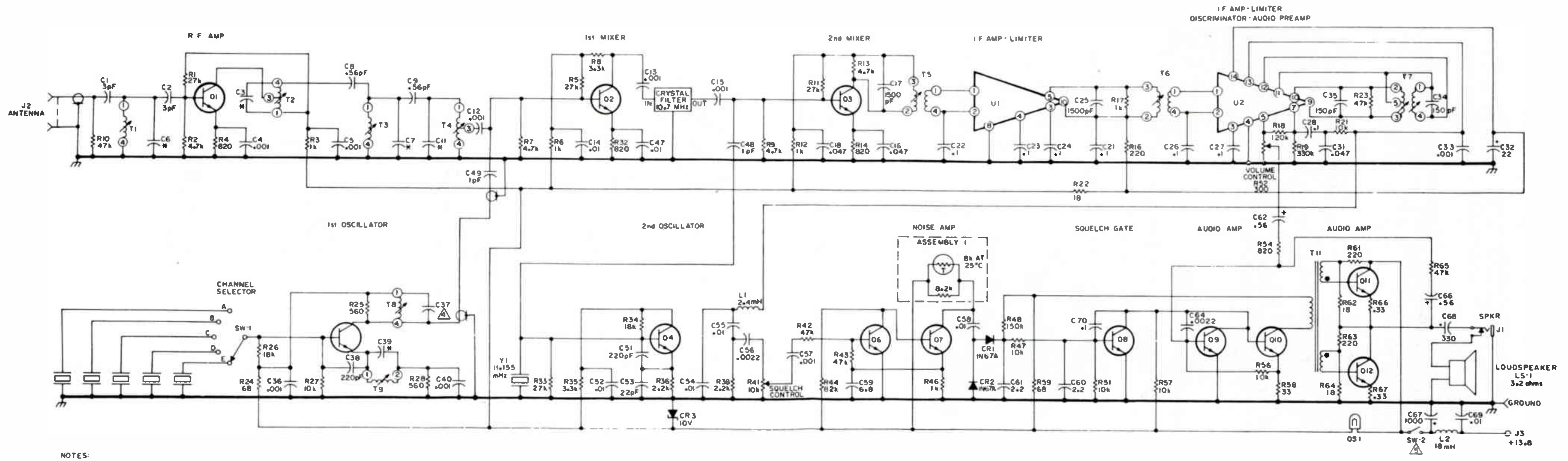


ALTERNATE CIRCUIT

NOTES

1. RESISTANCE VALUES GIVEN IN OHMS UNLESS OTHERWISE SPECIFIED.
2. CAPACITANCE VALUES GIVEN IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. * INDICATES COMPONENT VALUES SELECTED AT FACTORY.
4. C37 PROVIDED BY WIRE CAPACITY.
5. SW-2 IS LOCATED ON VOLUME CONTROL R52.

F M MONITOR RECEIVER



NOTES:

1. RESISTANCE VALUES GIVEN IN OHMS UNLESS OTHERWISE SPECIFIED.
2. CAPACITANCE VALUES GIVEN IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. * INDICATES COMPONENT VALUES SELECTED AT FACTORY.
4. C37 PROVIDED BY WIRE CAPACITY.
5. SW-2 IS LOCATED ON VOLUME CONTROL R52.

F M MONITOR RECEIVER
025-0802-001
241-0340-001/002

The Receivers are aligned at the factory on 154.550 MHz for -001 units which operate on frequencies 148 to 160 MHz, and on 167.920 MHz for -002 units which operate on frequencies 160 to 174 MHz.

To obtain peak receiver performance, crystal frequencies should be selected to be within ±3 to 4 MHz of 154.550 MHz for -001 units and within ±3 to 4 MHz of 167.920 MHz for -002 units. The receiver will operate outside these limits, but with reduced sensitivity.

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the monitor receiver be realigned on the required center frequency by a qualified technician. Refer to the following alignment procedure.

Align the monitor receiver on the channel frequency which is close to the center frequency of individual customer bandwidth. This frequency will be termed "center frequency" in the following alignment procedure.

FIRST OSCILLATOR ADJUST

a. Connect an RF voltmeter probe to the base of Q2.

b. Adjust T8 and T9 for a maximum RF voltage reading.

   1. A typical reading of approximately 0.03 to 0.05 VRF should be indicated.

RF AND IF AMPLIFIER ADJUST

a. Set an RF signal generator to "center frequency" and connect to the monitor receiver antenna connector.

b. Connect the RF voltmeter probe to pin 1 of integrated circuit U2.

c. Adjust T1, T2, T3, T4, T5 and T6 for a maximum RF voltage reading.

   1. A typical reading of approximately 0.045 VRF should be indicated with a 0.5 μV RF signal input.

DISCRIMINATOR ADJUST

a. Externally modulate the RF signal generator with a 1 kHz audio signal at a deviation level of ±9 kHz.

b. Set the RF signal generator to "center frequency" and connect to the monitor receiver antenna connector.

c. Adjust T7 top and bottom cores for maximum audio output with minimum distortion.

   1. The bottom core of T7 is adjusted from the top with TRW alignment tool, A-0634.

QUIETING SENSITIVITY CHECK

a. Adjust the receiver volume control for a 0 dB audio output reference level.

b. Set the unmodulated RF signal generator output level to 0.5 μV ("center frequency").

   1. The 0 dB audio output level should drop a minimum of 20 dB.

c. Repeat steps a and b on the remaining channels with the signal generator set to each specific channel frequency and the output level set to 1.0 μV.

   1. An RF signal input of 1.0 μV should produce an approximate drop of 20 dB on each remaining channel checked.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
CR1	523-1000-067	1N67A
CR2	523-1000-067	1N67A
CR3	523-2003-100	Zener, 10V, 1W, 5%
Q1	576-0003-004	
Q2	576-0003-005	
Q3	576-0003-007	
Q4	576-0006-011 (1)	
Q5	576-0003-007	
Q6	576-0003-011	
Q7	576-0003-011	
Q8	576-0001-004	
Q9	576-0003-011	
Q10	576-0002-006	
Q11	576-0002-001	
Q12	576-0002-001	
U1	544-2002-004	IC
U2	544-2002-005	IC

(1) Some versions may use FET.

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE
C32	510-2003-220	22mfd 15V
C59	510-2045-689	6.8mfd 35V
C60	510-2045-229	2.2mfd 35V
C61	510-2045-229	2.2mfd 35V
C62	510-2005-568	.56mfd 35V
C66	510-2005-568	.56mfd 35V
C67	510-4006-005	1000mfd 16V
C68	510-4003-007	330mfd 10V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R41	562-0007-025	10K Squelch
R52	562-0010-007	300 ohms Volume

COILS/TRANSFORMERS

ITEM	PART NO.
L1	022-1193-001
L2	542-5007-001
T1	592-5009-016
T2	592-5009-016
T3	592-5009-016
T4	592-5009-016
T5	592-5006-006
T6	592-5006-006
T7	592-5006-009
T8	592-5009-016
T9	592-5016-003
T11	592-1015-001

MISCELLANEOUS

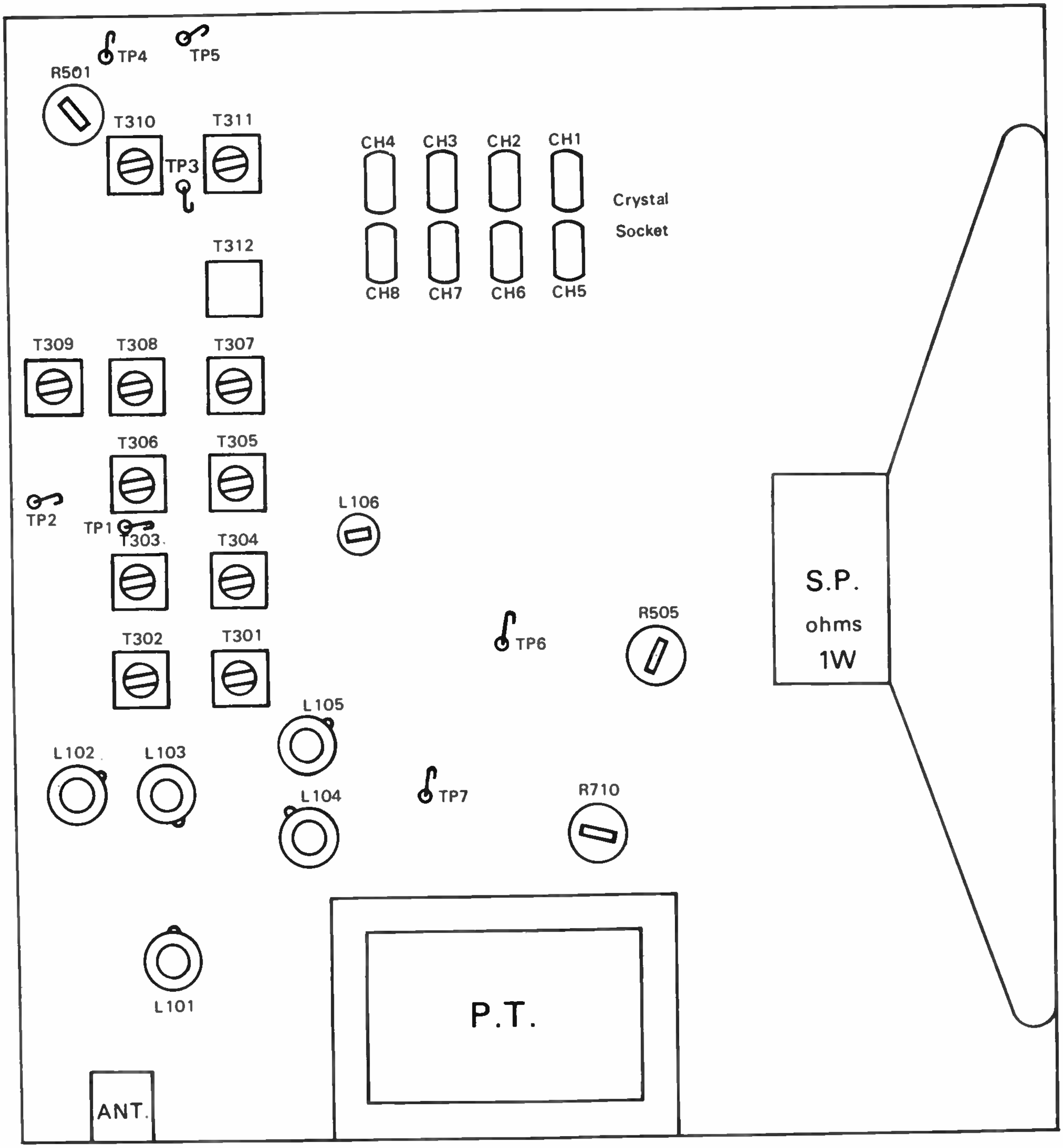
ITEM	NAME	PART NO.
ASY1	Component Combination	023-2042-002
I1	Bulb, Incandescent	549-3001-007
LS1	Speaker	589-1002-002
SW1	Switch, Crystal	583-2008-003
XY1	Block, Crystal	126-0110-011
Y1	Crystal 11.155 MHz	519-0009-001
Z1	Filter, Crystal, 10.7 MHz	532-0003-003
	Fuse, 2A	534-0003-024

CABINET PARTS

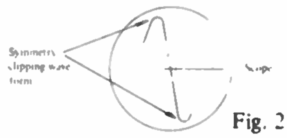
NAME	PART NO.
Cabinet	023-2201-003
Panel, Front	015-0756-002
Overlay	559-2042-002
Knob, Control	547-0001-004

Pages 27-34 Courtesy of MIDLAND COMMUNICATIONS CO.

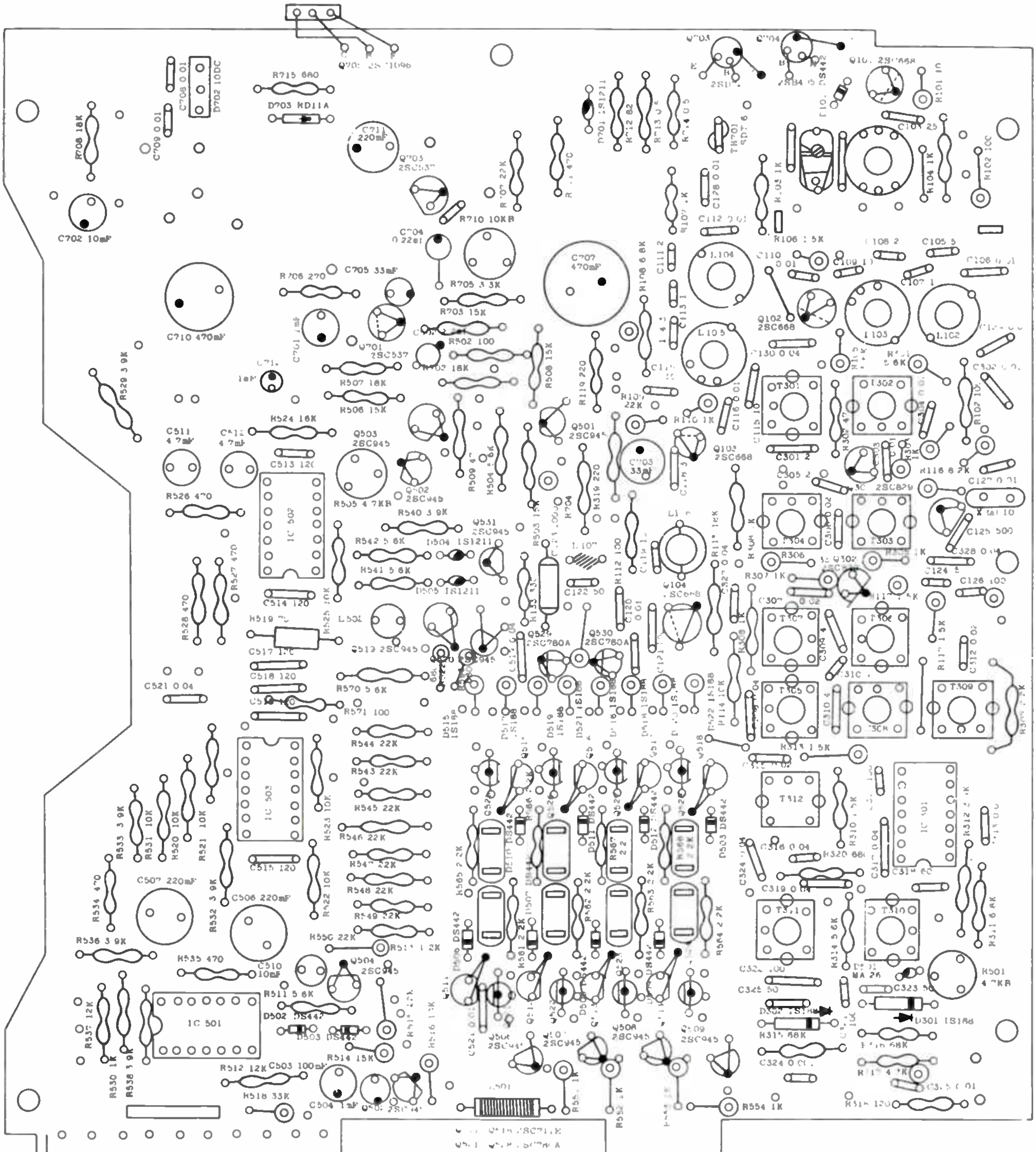
Parts Location Layout of Alignment Procedure



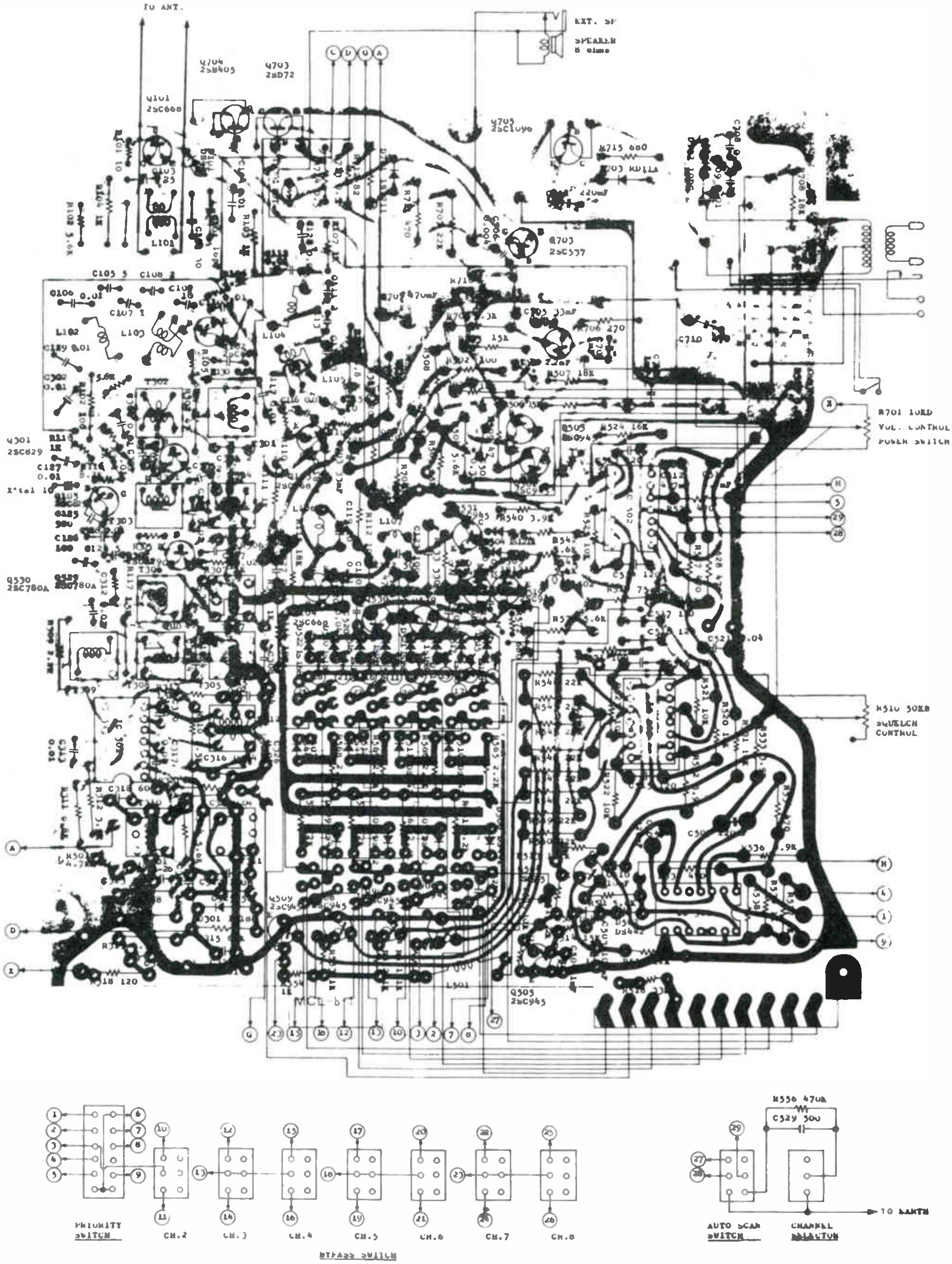
L101	ANT. Coil
L102 ~ L105	RF Coil
T301 ~ T304	10.7MHz, IFT
T305 ~ T309	455KHz, IFT
T310, T311	Detector Coil
T312	455KHz, IFT (No Adjustment)
L106	Oscillator Coil
R501, R505, R710	Semi fixed Volume Control

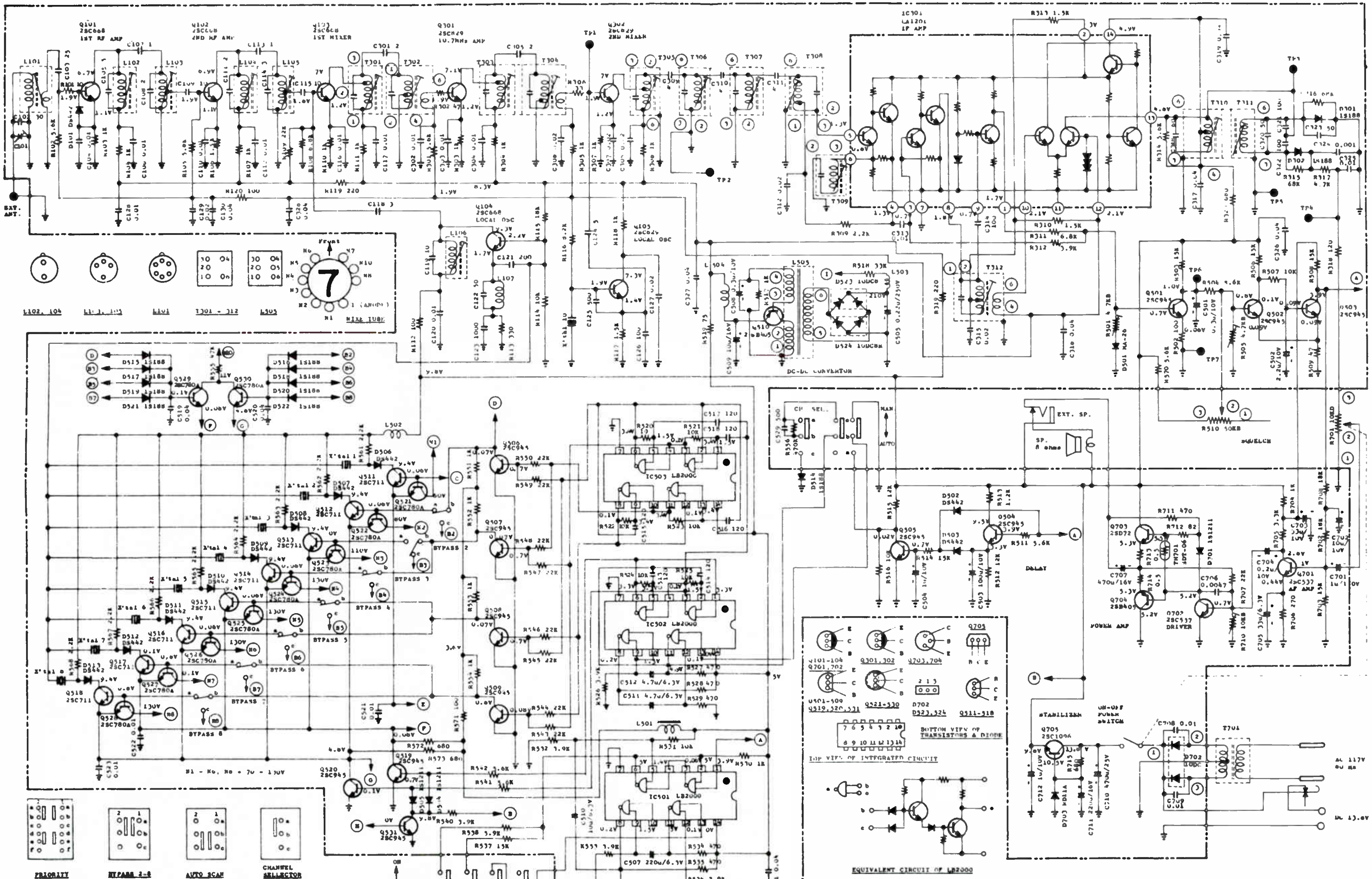
Step	Test Equipment	Meter point	Alignment Procedure
1. IF Stage	455KHz Sweep Generator	TP1, TP2, TP4, TP5	1) Preset VR cont. for a min. 2) Adjust IFT, from T305 to T309 for S curve characteristics. 3) Adjust 455KHz marker signal to center position in the S curve by adjustment of T310 and T311 4) Adjust T305 ~ T311 to symmetry on S curve characteristics and ±5KHz marker signal in the scope.  S curve Fig. 1
2. Audio stage	FM SSG 156MHz Mod. Freq. 1KHz Deviation ± 5KHz 8 ohms dummy load V.T.V.M. Oscilloscope SSG output 10KμV	Ant. Terminal EXT. Speaker socket 8 ohms load Terminal Same as above	1) Preset a) Priority switch off b) Bypass switch off all channel c) Scanning switch off d) Squelch control volume min. e) Insert crystal (Receiving Freq. 156MHz) to channel 8 f) Select for channel 8 by channel selector 2) Adjust volume control for a little clipping audio output wave form. 3) Adjust semi fixed volume control R710 to symmetry clipping of audio wave form in the oscilloscope.  Fig. 2
3. Antenna and RF stage	Same as above After sensitivity increase SSG output decrease. SSG 156MHz Mod. off Add. Mod. freq. 1KHz Deviation ±5KHz. Adjust SSG output voltage for a small level in the item (4) and (5). Field strength meter preset 183MHz and max. sensitivity.	Same as above Same as above Same as above Same as above Ant. Terminal	1) Adjust T301 ~ T304 for a max. output 2) Adjust L106 for a max. output 3) Adjust L101 ~ L105 and C101 for a max. output. Repeat above item (1) (2) and (3) adjustment 4) Adjust R311 for a min. noise output 5) Adjust T305 ~ T309 for a max output Adjust L102 – L105 and T301 T304 for a max. output 6) Adjust frequency dial for max. output in the field strength meter Adjust L106 for a max. dip indication of field strength meter
4. Squelch Adjustment	DC Voltmeter SSG 156MHz Mod. Freq. 1KHz Deviation ± 5KHz Load 8 ohms V.T.V.M. Oscilloscope	TP6, TP7 Ant. terminal Ext. speaker Socket Ext. speaker Socket Ext. speaker Socket	1) Preset semi fixed volume control R710 and R505 to mechanical center position. 2) Preset volume and squelch volume control for a max. (clock-wise, position) 3) Adjust semi fixed volume control R501 to obtain 0.4 volt between TP6 and TP7 4) Adjust semi fixed volume control R505 to obtain just audio output at 3.2μV output of signal generator 5) Repeat item (3) and (4)
5. Battery Drain	DC current meter (300mA full scall) DC power supply 13.8V	Series connection to power supply	Indication of current meter is under 150mA at squelched.

PARTS LAYOUT DIAGRAM



PARTS LAYOUT DIAGRAM (BOTTOM VIEW)





NOTE: 1. All resistance values are in ohm. K=1,000 ohms.
2. All capacitance values less than 1.0 are in MFD and greater than 1.0 are in PFD unless otherwise specified.
3. All voltage are measured from the common negative ground (-) to respective terminals of transistors and integrated circuit (IC) with V.T.V.M. under no signal condition.

FREQUENCIES AND CRYSTALS

Being a crystal controlled receiver, this unit requires 1 crystal for each frequency you want to monitor.
Generally speaking, frequencies for the various radio services such as police, fire, business, etc. vary from area to area and it is suggested that you contact your local authorities for frequency information for your area. You should also verify that the area in which you will use this monitor does not have laws or regulations prohibiting its use. Once you have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.
The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

$$\text{CRYSTAL 3RD OVERTONE FREQUENCY} = \frac{\text{DESIRED CHANNEL FREQUENCY} - 10.7\ \text{MHz}}{\text{Divided by 3}}$$

Crystal Type	:	HC-25U Third overtone
Frequency Tolerance	:	±0.001% (+25°C)
	:	±0.005% (-55°C ~ +105°C)
Load Capacity	:	20 pF
Max. Series Resistance	:	40 ohms
Maximum Drive	:	2 milliwatts

CRYSTAL INSTALLATION

To install crystals, open the crystal access door on the top of the cabinet and carefully and gently plug in the crystals in whatever order you desire.

AC-DC OPERATION

The 13-915 may be installed in mobile service, (13.8 volts DC) or used for base station operation by selecting either of the two power cords supplied.

MOBILE INSTALLATION

Safety and operating convenience are the primary factors to consider when mounting any piece of equipment in an automobile. Be sure that the controls may be easily reached by the operator. Also be sure that connecting cables do not interfere with the operation of the brake, accelerator, etc..

POWER CONNECTION

When used in mobile operation, the vehicle's battery supplies the power.
The red wire from the 13-915 is positive and may be connected directly to the positive or (+) battery terminal or to a fuse block or ignition switch or other convenient point.
The black wire is negative or ground and should be connected to be metal part of the vehicle body or frame or (–) battery terminal.
To insure proper operation, care should also be taken in attaching the unit and Mounting bracket to the vehicle in such a way as to obtain good ground connection at this point.

ANTENNAS

1) Mobile antenna
The mobile antenna represents an electrical quarter-wave length at the operation frequency, or physically represents about 19" at 150 MHz. Shorter equivalents are the "loaded" type of antenna, and are usually placed in the center of the roof for maximum effectiveness.
2) Base antenna
To install this receiver in a base installation, simply connect the AC power cord to the rear panel connector and plug the cord into a 110- 120 volt AC 60 Hz power source. For best operation, a permanent type antenna is recommended.
Wire the antenna coax lead-in to a RCA type Phono Plug and insert this in the antenna jack on the rear panel.
The base antenna should be as high as possible and can be of the ground-plane variety.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D101	09-306222	DS442
D301	09-306010	1S188
D302	09-306010	1S188
D501	09-306223	MA-26
D502	09-306222	DS442
D503	09-306222	DS442
D504	09-306224	1S1211
D505	09-306224	1S1211
D506	09-306222	DS442
D507	09-306222	DS442
D508	09-306222	DS442
D509	09-306222	DS442
D510	09-306222	DS442
D511	09-306222	DS442
D512	09-306222	DS442
D513	09-306222	DS442
D514	09-306010	1S188
D515	09-306010	1S188
D516	09-306010	1S188
D517	09-306010	1S188
D518	09-306010	1S188
D519	09-306010	1S188
D520	09-306010	1S188
D521	09-306010	1S188
D522	09-306010	1S188
D523	09-306225	10DC8
D524	09-306226	10DC8 (R)
D701	09-206224	1S1211
D702	09-306227	10DC1
D703	09-306228	RD11AM
IC301	09-308008	LA1201
IC501	09-308021	LB2000
IC502	09-308021	LB2000
IC503	09-308022	MC53200
Q101	09-302009	2SC668
Q102	09-302009	2SC668
Q103	09-302009	2SC668
Q104	09-302009	2SC668
Q105	09-302033	2SC829
Q301	09-302033	2SC829
Q302	09-302033	2SC829
Q501	09-302125	2SC945
Q502	09-302125	2SC945
Q503	09-302125	2SC945
Q504	09-302125	2SC945
Q505	09-302125	2SC945
Q506	09-302125	2SC945
Q507	09-302125	2SC945
Q508	09-302125	2SC945
Q509	09-302125	2SC945
Q510	09-301014	2SB405
Q511	09-302107	2SC711
Q512	09-302107	2SC711
Q513	09-302107	2SC711
Q514	09-302107	2SC711
Q515	09-302107	2SC711
Q516	09-302107	2SC711
Q517	09-302107	2SC711
Q518	09-302107	2SC711
Q519	09-302125	2SC945
Q520	09-302125	2SC945
Q521	09-302125	2SC945
Q522	09-302150	2SC780
Q523	09-302150	2SC780
Q524	09-302150	2SC780
Q525	09-302150	2SC780
Q526	09-302150	2SC780
Q527	09-302150	2SC780
Q528	09-302150	2SC780
Q529	09-302150	2SC780
Q530	09-302150	2SC780
Q701	09-302007	2SC537
Q702	09-302007	2SC537
Q703	09-303012	2SD72
Q704	09-301014	2SB405
Q705	09-302126	2SC1096

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C101	13-123029	Trimmer	
C501	77-336304	.3mfd	10V
C502	77-336225	2.2mfd	10V
C503	77-336107	100mfd	10V
C504	77-336105	1mfd	10V
C506	77-332227	220mfd	6.3V
C507	77-332227	220mfd	6.3V
C508	77-336304	.3mfd	10V
C509	77-337106	10mfd	16V
C511	77-332475	4.7mfd	6.3V
C512	77-332475	4.7mfd	6.3V
C701	77-336105	1mfd	10V
C702	77-336106	10mfd	10V
C703	77-336336	33mfd	10V
C704	77-336204	.2mfd	10V
C705	77-332336	33mfd	6.3V
C707	77-337477	470mfd	16V
C710	77-339477	470mfd	25V
C711	77-337227	220mfd	16V
C712	77-336105	1mfd	10V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R501	13-164067	4700 ohms Sensitivity
R505	13-164067	4700 ohms Sensitivity
R701	13-160079	10K Volume/Switch
R710	13-164068	10K Sensitivity
TH701	09-307005	Thermistor SDT-06

COILS/TRANSFORMERS

ITEM	PART NO.		
L101	13-176329	L503	13-178120
L102	13-176330	L504	13-178121
L103	13-176331	L505	13-170179
L104	13-176332	T301	13-090234
L105	13-176331	T304	13-090234
L106	13-170178	T305	13-090235
L107	13-176333	T311	13-090235
L501	13-178119	T312	13-090236
L502	13-178120	T701	13-098013

MISCELLANEOUS

ITEM	NAME	PART NO.
NT501	Tube, Nixe	13-201028
SP	Speaker	13-060074
XTAL10	Crystal 10.245 MHz	13-128248
	Switch, Channel Selector	13-183141
	Switch, Auto Scan	13-183142
	Switch, Priority	13-183143
	Switch, Channel	13-183144

CABINET PARTS

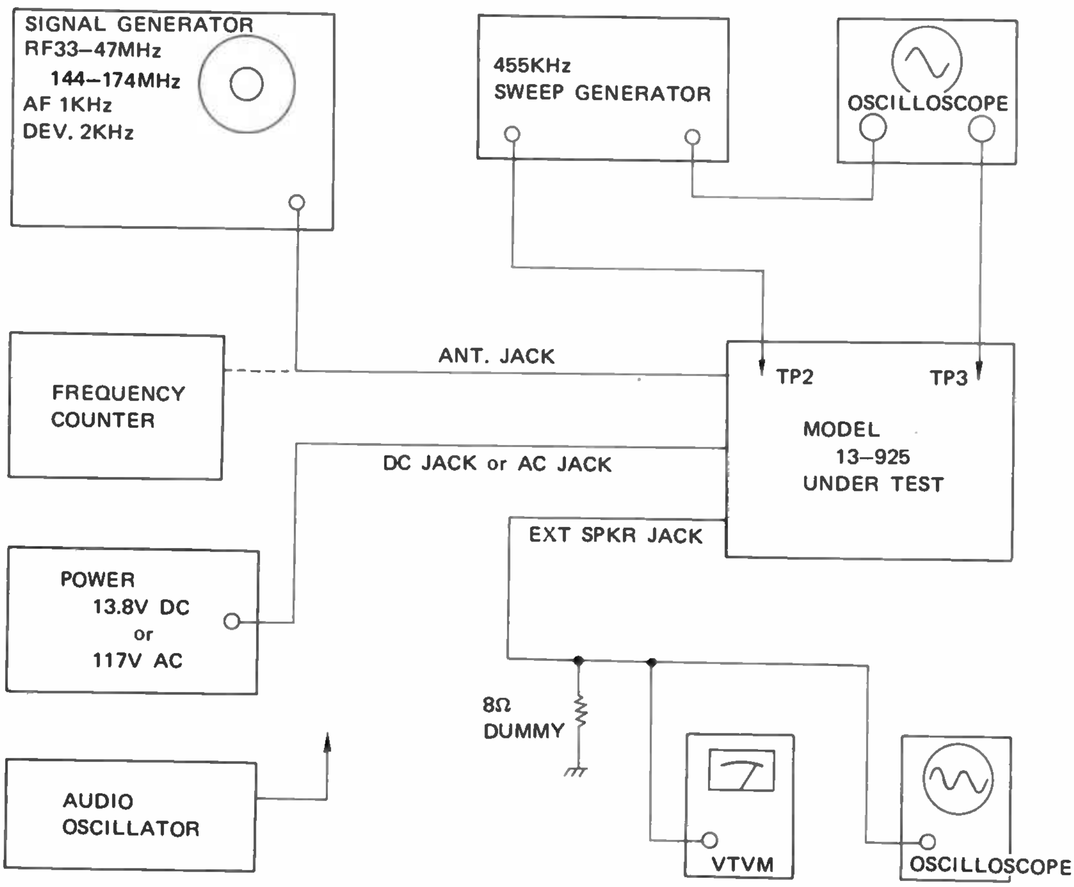
NAME	PART NO.
Cabinet, Main	13-010159
Panel, Front Trim	13-010160
Plate, Function	13-024038
Lens, Channel Indicator	13-020440
Lid, Crystal Compartment	13-018011
Knob, Volume/Squelch	13-110127
Knob, Channel Select (Red)	13-115055
Knob, Auto Scan	13-115056
Knob, Channel	13-115057

Pages 35-42 Courtesy of MIDLAND COMMUNICATIONS CO.

TEST EQUIPMENTS REQUIRED

1. POWER SOURCE of 13.8 V DC capable of 1 amp. regulated. (Hewlett-Packard model 6201B or equivalent)
2. AUDIO GENERATOR usable for frequency range of 200Hz to 5KHz or more. (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER, operatable for up to 200MHz or more. (Hewlett-Packard model 5246L with convertor model 5253B)
4. OSCILLOSCOPE, 450KHz bandwidth (Hewlett-Packard model 120B or equivalent)
5. VACUUM TUBE VOLTMETER, 1mV to 50V, 1MHz (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR, capable of tuning 455KHz, 10.7MHz 33–47MHz, 144–174MHz and for narrow band receiver.
7. SWEEP GENERATOR, capable of tuning 450KHz, 455KHz and 460KHz.

TEST CONNECTION



SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	09-306111	CD8457
D2	09-306111	CD8457
D3	09-306111	CD8457
D4	09-306111	CD8457
D5	09-306111	CD8457
D6	09-306111	CD8457
D7	09-306111	CD8457
D8	09-306111	CD8457
D9	09-306020	1N34A
D10	09-306020	1N34A
D11	09-306024	1S990
D12	09-306024	1S990
D13	09-306149	10D4
D14	09-306149	10D4
D15	09-306149	10D4
D16	09-306191	1S330
D17	09-306020	1N34A
D18	09-306020	1N34A
D19	09-306020	1N34A
D20	09-306020	1N34A
D21	09-306020	1N34A
D22	09-306020	1N34A
D23	09-306020	1N34A
D24	09-306020	1N34A
D25	09-306020	1N34A
D26	09-306020	1N34A
D27	09-306020	1N34A
D28	09-306020	1N34A
D29	09-306180	BZ090
D30	09-306020	1N34A
IC1	09-308015	M5340P
IC2	09-308015	M5340P
Q1	09-302095	2SC784
Q2	09-302095	2SC784
Q3	09-302095	2SC784
Q4	09-302095	2SC784
Q5	09-302124	2SC839
Q6	09-302124	2SC839
Q7	09-302124	2SC839
Q8	09-302124	2SC839
Q9	09-302124	2SC839
Q10	09-302124	2SC839
Q11	09-302124	2SC839
Q12	09-302124	2SC839
Q13	09-302125	2SC945
Q14	09-302125	2SC945
Q15	09-303019	2SD261
Q16	09-303019	2SD261
Q17	09-302125	2SC945
Q18	09-302125	2SC945
Q19	09-302125	2SC945
Q20	09-302125	2SC945
Q21	09-303019	2SD261
Q22	09-302125	2SC945
Q23	09-302125	2SC945
Q24	09-302125	2SC945
Q25	09-302125	2SC945
Q26	09-302125	2SC945
Q27	09-302125	2SC945
Q28	09-302125	2SC945
Q29	09-302125	2SC945
Q30	09-302125	2SC945
Q31	09-302125	2SC945

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE	
C225	77-337475	4.7mfd	16V
C227	77-337475	4.7mfd	16V
C229	77-337475	4.7mfd	16V
C232	77-337227	220mfd	16V
C239	77-337227	220mfd	16V
C244	77-337475	4.7mfd	16V
C245	77-337108	1000mfd	16V
C246	77-337476	47mfd	16V
C247	77-337476	47mfd	16V
C254	77-337476	47mfd	16V
C258	77-337476	47mfd	16V
C259	77-337227	220mfd	16V
C303	77-337106	10mfd	16V
C304	77-337106	10mfd	16V
C313	77-337106	10mfd	16V
C314	77-337227	220mfd	16V
C315	77-337476	47mfd	16V

CONTROLS

ITEM	PART NO.	DESCRIPTION
VR1	13-160074	10K Volume
VR3	13-166031	10K Squelch

COILS/TRANSFORMERS

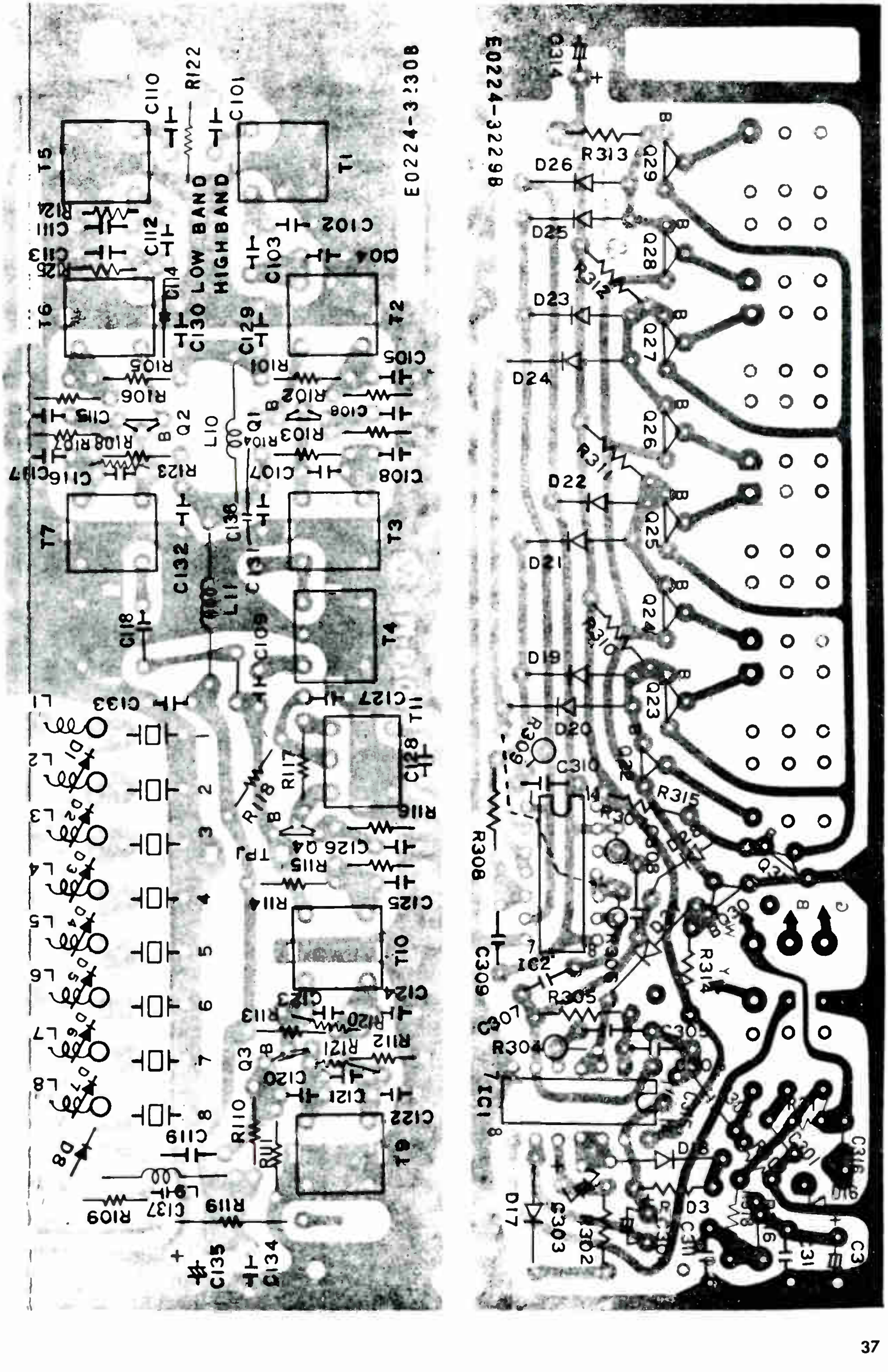
ITEM	PART NO.		
L1	13-178060	T2	13-094004
L2	13-178060	T3	13-094004
L3	13-178060	T4	13-094005
L4	13-178060	T5	13-094006
L5	13-178060	T6	13-094007
L6	13-178060	T7	13-094006
L7	13-178060	T8	13-094008
L8	13-178060	T9	13-094009
L9	13-178060	T10	13-094004
L10	13-178060	T11	13-090202
L11	13-178060	T12	13-090202
L12	13-178060	T13	13-090202
L13	13-178060	T14	13-090203
L14	13-178060	T15	13-090203
L15	13-178060	T16	13-093175
L16	13-178060	T17	13-093176
L17	13-178060	T19	13-098011
L18	13-178103	Driver	13-096121
T1	13-094004		

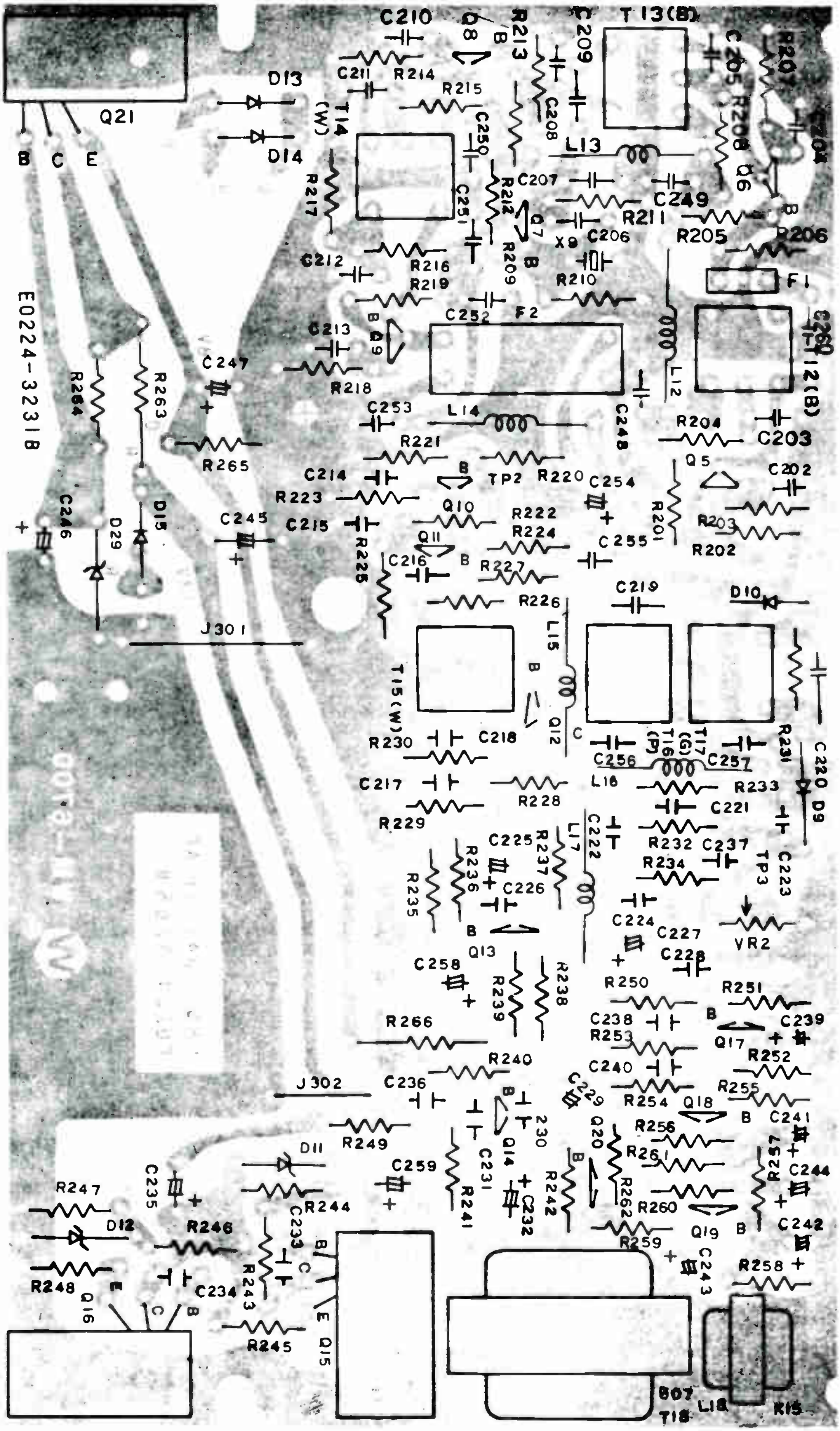
MISCELLANEOUS

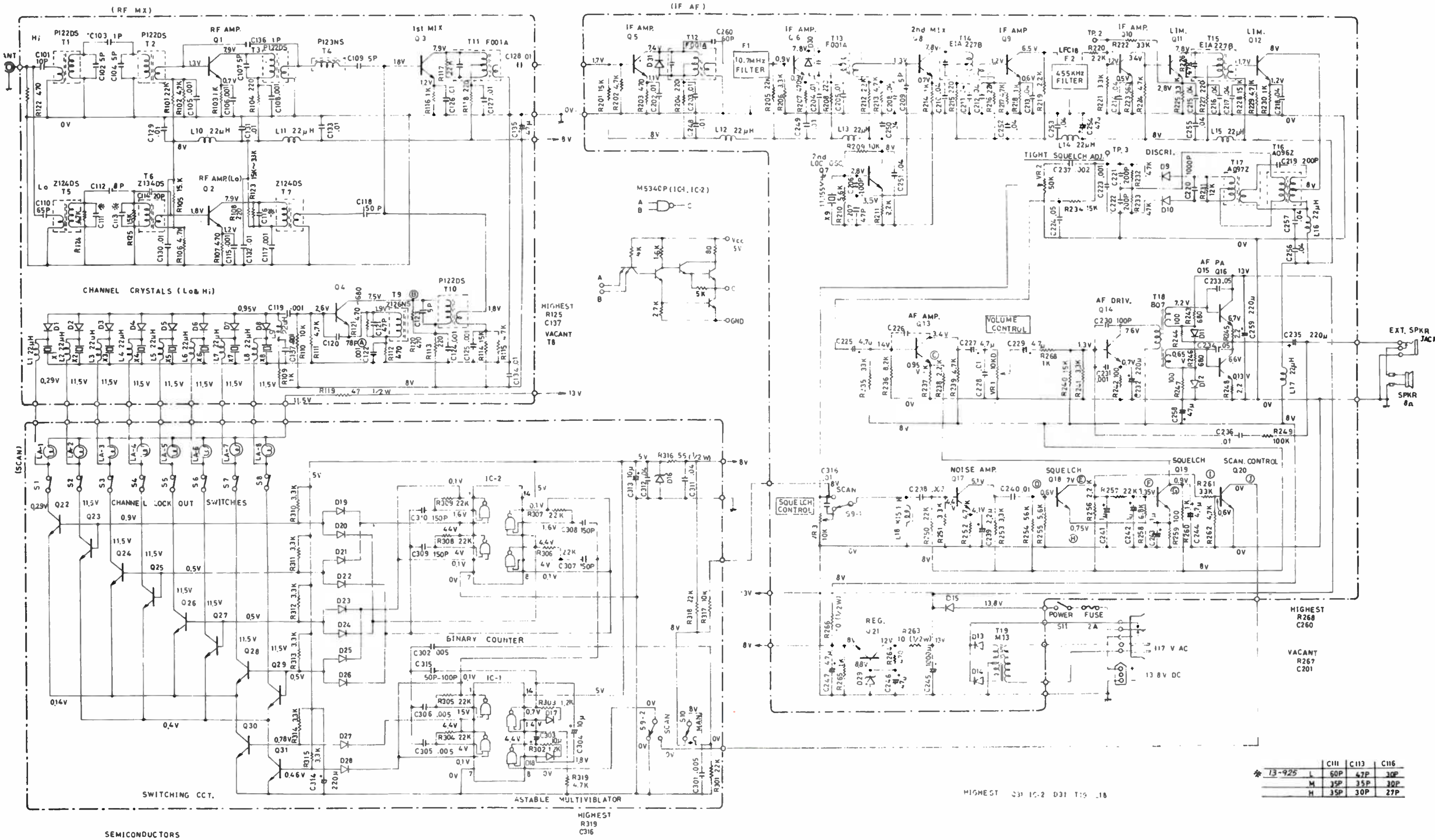
ITEM	NAME	PART NO.
F1	Filter, Ceramic 10.7 MHz	13-179021
F2	Filter, Ceramic 455 KHz	13-179022
	Assembly, Push Switch	13-188001
	Holder, Fuse	13-159099
	Socket, Crystal	13-159050
	Speaker, 8 ohm	13-060057
	Fuse, 2A	13-204004
	P.C. Board, Switch	13-070090

CABINET PARTS

NAME	PART NO.
Top, Case	13-010142
Bottom, Case	13-010143
Panel, Side	13-010144
Grille, Front	13-020412
Glass, Channel Indicator	13-020414
Knob, Volume/Squelch	13-110118




E0224-3231B
Q21
B C E
D13
D14
C210
C211
R214
R215
R213
C209
T13(B)
C205
R207
R208
T14 (W)
C250
C208
L13
R217
C251
R212
C207
C249
Q6
Q7
R211
R205
R206
X9
C206
C212
R216
R209
R210
R219
F1
C252
F2
C213
D9
C260
T12(B)
C247
R218
L12
R264
R263
C253
L14
C248
R204
C203
R265
R221
Q5
C202
C214
TP2
R220
C254
R223
R201
C246
D29
D15
C245
Q10
R222
R203
C215
R224
R202
R225
Q11
C255
C216
R227
C219
D10
R226
J301
L15
T15(W)
Q12
T16 (P)
T17 (G)
R231
C220
R230
C218
C256
C257
L16
C217
R228
R233
D9
R229
C221
C225
R237
C222
L17
R232
C237
C223
R235
R236
C226
R234
TP3
C224
Q13
C227
VR2
C258
C228
R239
R238
R250
R251
R266
C238
R253
C239
Q17
R252
R240
C240
J302
C236
C229
R254
Q18
R255
C241
Q14
Q20
R249
R256
D11
R261
R257
C259
C231
R242
C244
R247
C235
R241
C232
R262
R260
R244
Q19
C242
D12
R246
C233
R259
C243
R258
R248
R243
C234
Q16
E C B
R245
Q15
807
T18
L18
K15



		C111	C113	C116
* 13-925	L	60P	47P	30P
	M	35P	35P	30P
	H	35P	30P	27P

SEMICONDUCTORS

Q1 ~ Q4	2SC784 · 2SC535 2SC763	D1 ~ D8	1S2472
		D9, D10, D30, D31	1N34A 1N60P
Q5 ~ Q12	2SC839, 2SC460, 2SC710	D11, D12	1S990S
Q13, Q14 Q17 ~ Q20 Q22 ~ Q31	2SC945, 2SC458, 2SC619	D13 ~ D15	10D-4
		D29	BZ090 1N757A
		D16	1S330 1N751A
Q15, Q16, Q21	2SD261	D17 ~ D28	1N34A 1N60P
IC-1 IC-2	M5340P		

ALL CIRCUIT VOLTAGES MEASURED WITH A 20KΩ/V DC VOLTMETER THROUGH A 20μH INDUCTOR, WHEN SWITCHING DIODE D1 IS ON.

UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS. ALL CAPACITORS ARE IN μF.

	Ⓐ	Ⓑ
CRYSTAL	1.9V	7.5V
NO CRYSTAL	1.85V	7.6V

	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ	Ⓘ
UN SQUELCHED	0.95V	0.58V	7V	1.35V	0.9V	0.75V	0.6V
SQUELCH	1.85V	0.54V	1V	0.2V	6V	0.35V	0.1V

	Ⓙ
NOT SCAN.	0.04V
SCAN.	0.9V

ALIGNMENT

1. Connect the model 13-925 and all test equipments as illustrated on TEST CONNECTIONS figure.
2. Check the voltages of all points of the 13-925 in reviewing schematic diagram.

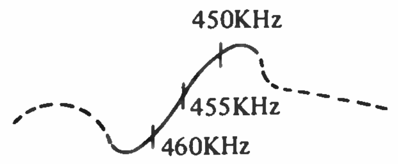
3. AF SECTION

3-1 Apply a 1KHz audio signal to TP3, and check the audio power, the wave form and the control of the VOLUME. (Audio clipping level is about 3V at 8Ω load)

4. DESCRIMINATOR

4-1 Connect the output of sweep generator to TP2 and oscilloscope to TP3.

4-2 Adjust T16 and T17 for the maximum output and best symmetry.



4-3 Seal T16 and T17 not to be toutched after this adjustment.

5. CRYSTAL OSCILLATION

5-1 SECOND LOCAL OSCILLATOR
Check the emitter voltage of Q7, the second local oscillator. When it is 3.5V, the oscillator is good and if stopped, it is about 2V.

5-2 FIRST LOCAL OSCILLATION
When a channel crystal is installed the emitter voltage of Q4, the first local emitter slightly increases. If not, the oscillator is no good.

6. SECOND IF SECTION

6-1 Turn SQUELCH control fully clockwise.

6-2 Turn VOLUME control clockwise to obtain 0db noise level.

6-3 Apply a 455KHz unmodulated signal to the base of Q8 the second mixer through a 0.01μF capacitor.

6-4 Adjust T14 and T15 for the maximum quieting while generator output decrease.

7. FIRST IF SECTION

7-1 Apply a 10.7MHz unmodulated signal to the base of Q3, the first mixer through a 0.01μF capacitor.

8. RF SECTION

8-1 Apply a high band channel frequency signal modulated at 1KHz with 2KHz deviation to ANT jack.

8-2 Adjust T1, T2, T3, T4, T9 and T10 for best audio output wave while generator output decrease.

8-3 Change the frequency of generator to a low band channel frequency.

8-4 Adjust T5, T6, T7 and T8 for high band RF section alignment.

8-5 Adjust T11, T12, T13, T14 and T15 again to obtain best audio output wave while generator output decrease.

8-6 Check the difference of the noise level and the signal level at voltmeter. If it is less than 3db, your adjustment is good.

9. TIGHT SQUELCH

9-1 Apply the main channel frequency signal modulated at 1KHz with 2KHz deviation to ANT jack.

9-2 Tune generator frequency carefully.

9-3 Turn SQUELCH control fully clockwise.

9-4 Decrease generator output until the audio output signal is silenced.

9-5 Increase generator output very slowly until you can watch the audio signal wave again on the oscilloscope, and check this opening level of generator output. 1 to 1.5μV is adequate.

9-6 You can adjust this tight squelch sensitivity with VR2, the preset type variable resistor.

FREQUENCIES AND CRYSTALS

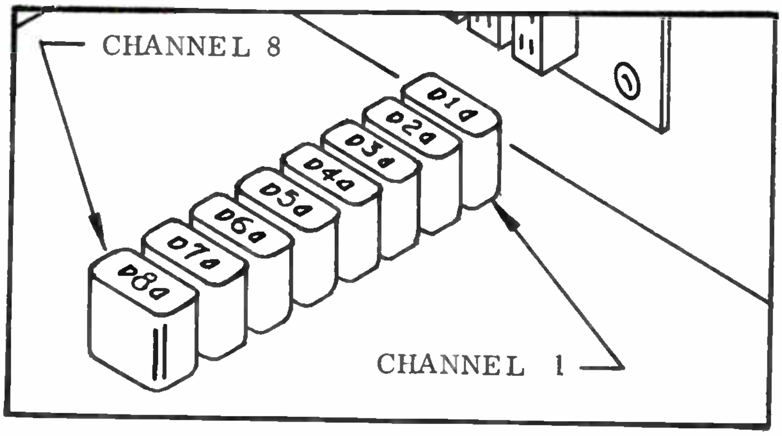
Once you have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

For VHF High Band, the fundamental crystal frequency	$= \dfrac{\text{Desired Frequency} - 10.7\text{ MHz}}{3}$
For VHF Low Band, the fundamental crystal frequency	= Desired Frequency + 10.7 MHz
Crystal Type	: HC – 25U Third overtone (Should meet MIL-C-3098E)
Frequency Tolerance	: 0.002% (-20°C -+40°C)
Resonance	: Series
Load Capacitance	: 32pF + 0.0005%
Drive Level	: 2.0 mW
Resistance (Rs)	: Less than 35 ohm
Shunt Capacitance	: Less than 6 PF

Pages 43-52 Courtesy of PATHCOM INC.

SCAN MONITOR CRYSTAL INSTALLATION



CRYSTAL FREQUENCY

LOW BAND CRYSTALS (25-50 MHz)

Crystal frequency=	Channel frequency + 10.7 MHz
Frequency tolerance =	$\pm$ .001% @ 25 °c
	$\pm$ .005% @ -55 °c to +105 °c
Mode =	Series resonance -450 Hz 3rd overtone
Impedance =	35 ohms maximum
Holder =	HC - 25/u

HIGH BAND CRYSTALS (140-174 MHz)

Crystal frequency = $\frac{\text{Channel frequency} - 10.7\ \text{MHz}}{3}$

Other specifications same as above.

UHF CRYSTALS (450-470 MHz)

Crystal frequency =	$\frac{\text{Channel frequency} - 10.7\ \text{MHz}}{9}$
Frequency tolerance =	$\pm$ .001% @ 25 ° c
	$\pm$ .005% @ -55 °c to +105 ° c
Mode =	Parallel 3rd overtone
Load Capacity =	27 pf
Drive level =	2 mW
Impedance =	35 ohms maximum
Holder =	HC - 25/u

NOTE: In certain areas it may be necessary to change the 2nd local Osc. crystal from 10.245 MHz to 11.155 MHz to reduce interference.

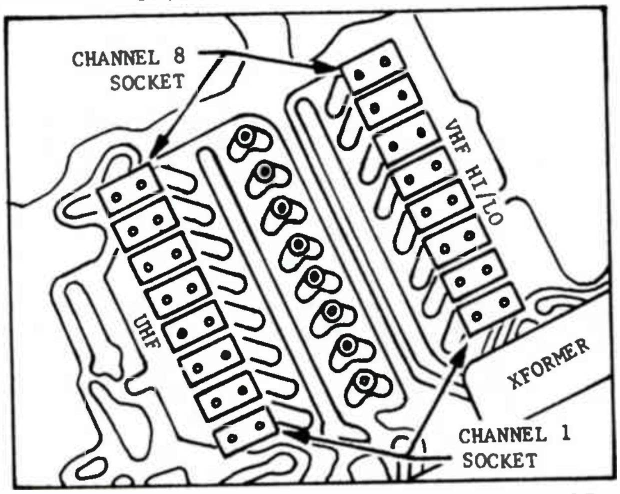
Special instructions for the 162.55 weather channel.-With few exceptions all licensed transmitters in these bands operate with 5 KHz deviation. However, some weather transmitters on 162.55 are still operating at 15 KHz. Until the weather channels transmit with 5 KHz deviation, it is necessary to monitor the channel with the squelch open.

The SCAN 308 monitors all three bands of frequencies at one time. There are special features designed into the SCAN 308 to provide 16 channel capability with an 8 channel readout.

CRYSTAL INSTALLATION

Up to 16 different crystals may be installed at one time as shown in the drawing, to the right. Eight crystals may be UHF and eight crystals may be any combination of Hi or Lo VHF.

CRYSTAL SOCKET LOCATION



LOOKING DOWN ON P.C. BD, FRONT TO REAR

The 3 position program switch on the rear will select the particular crystal and band being heard in any one of the eight channel readout positions. For instance, if in the two sockets for channel 1 -

a. there is a 456.5 MHz crystal in the UHF # # 1 socket -
b. and a 156.5 MHz crystal in the VHF Hi/Lo # 1 socket -

the operator would have the option of;

a. listening to 456.5 MHz on # 1 by putting the back panel Switch to "UHF" (full up)
b. or . . listening to 156.5 MHz on # 1 by putting the back panel Switch to "Hi" (middle position)
c. With the back panel Switch # 1 on "Lo" (full down) - - nothing will be heard on # 1 - - unless the Hi VHF crystal in socket # 1 were changed to a Lo VHF crystal.

This unique design technique provides 16 channel monitor capability in a more compact case with capability of mobile mounting as well as base operating features.

ANTENNAS

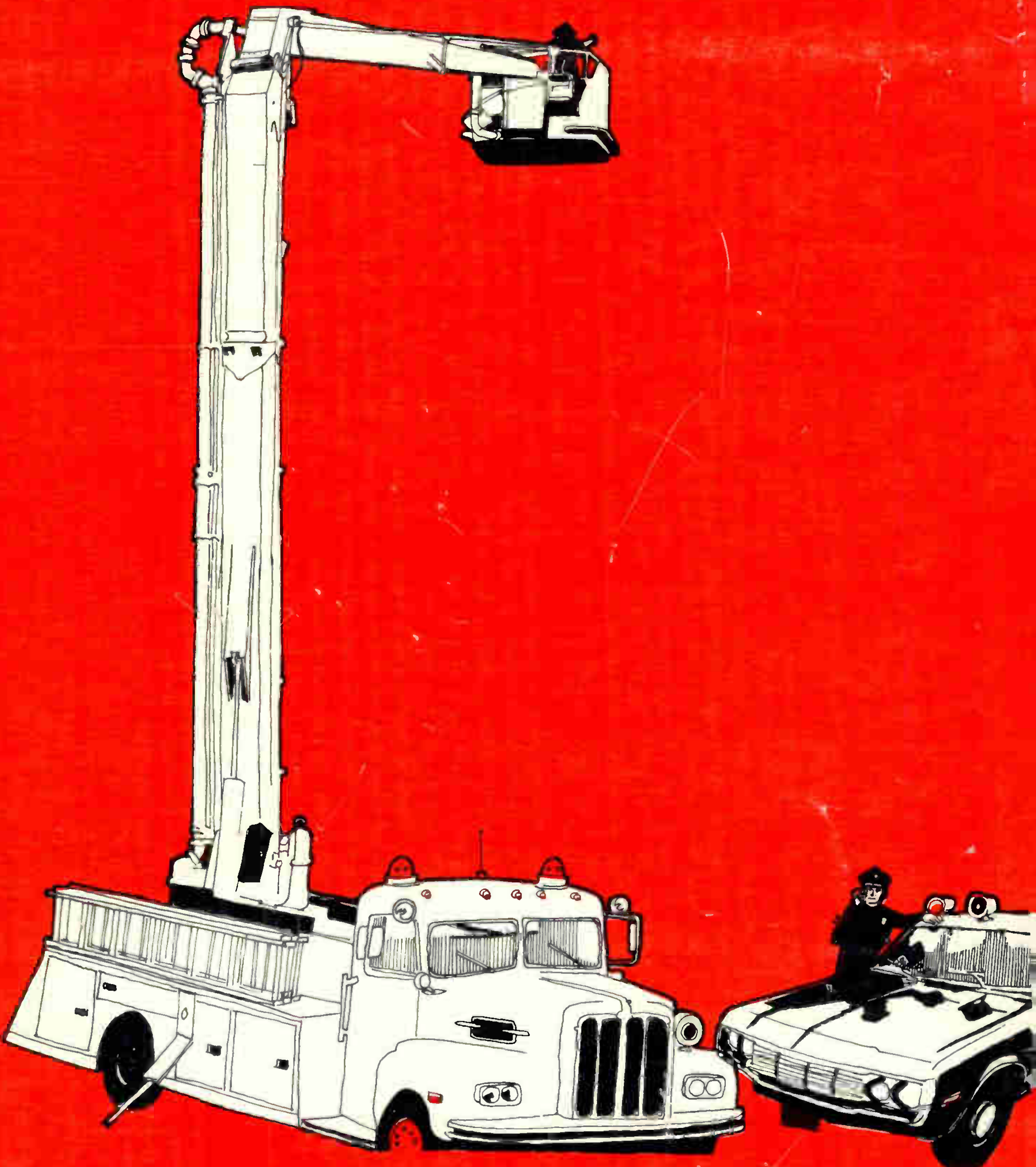
Two Antennas are provided with the SCAN 308.

A. The telescopic with a threaded base fits into the antenna opening in the top case and is adjusted for best reception of both Lo and Hi VHF signals. Turn gently clockwise to tighten after locating over the threaded stud mounted on the PC board.

There is also a rear jack for connecting a Hi/Lo VHF external antenna (PACE # SCAN-8H/L or similar) for picking up weaker signals in the VHF band. The telescopic antenna must be removed when using an external antenna.

B. The short antenna with a pin plug is for UHF reception. This antenna plugs into the recepticle on the rear panel marked "UHF ANT". For receiving weak UHF signals an external UHF type antenna (PACE # SCAN-8U or similar) should be plugged in place of the antenna furnished.

NOTE: External antennas should be installed with the highest possible elevation for the greatest reception range.



$4.95
$5.95 IN CANADA
SD-1
06557

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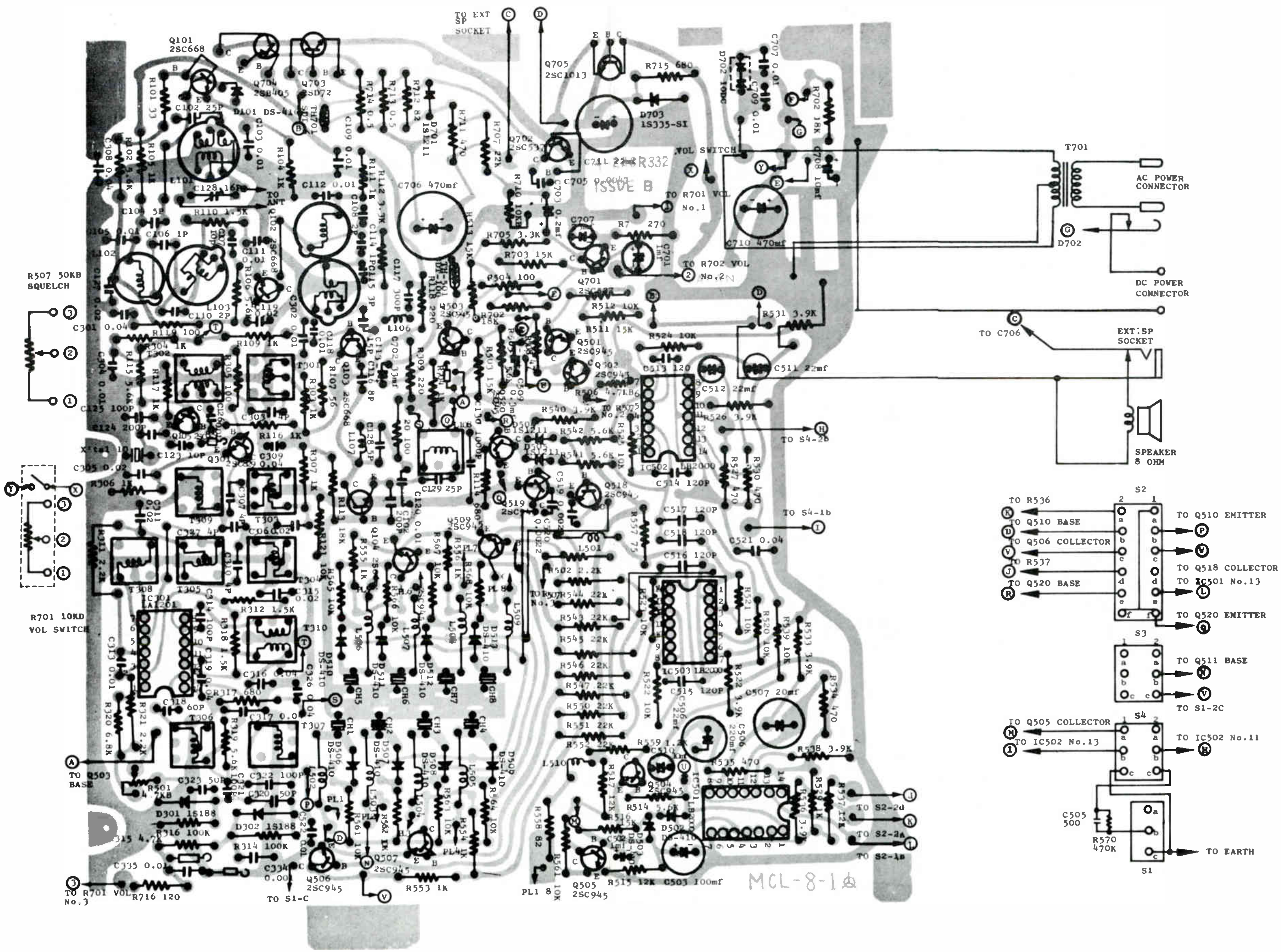
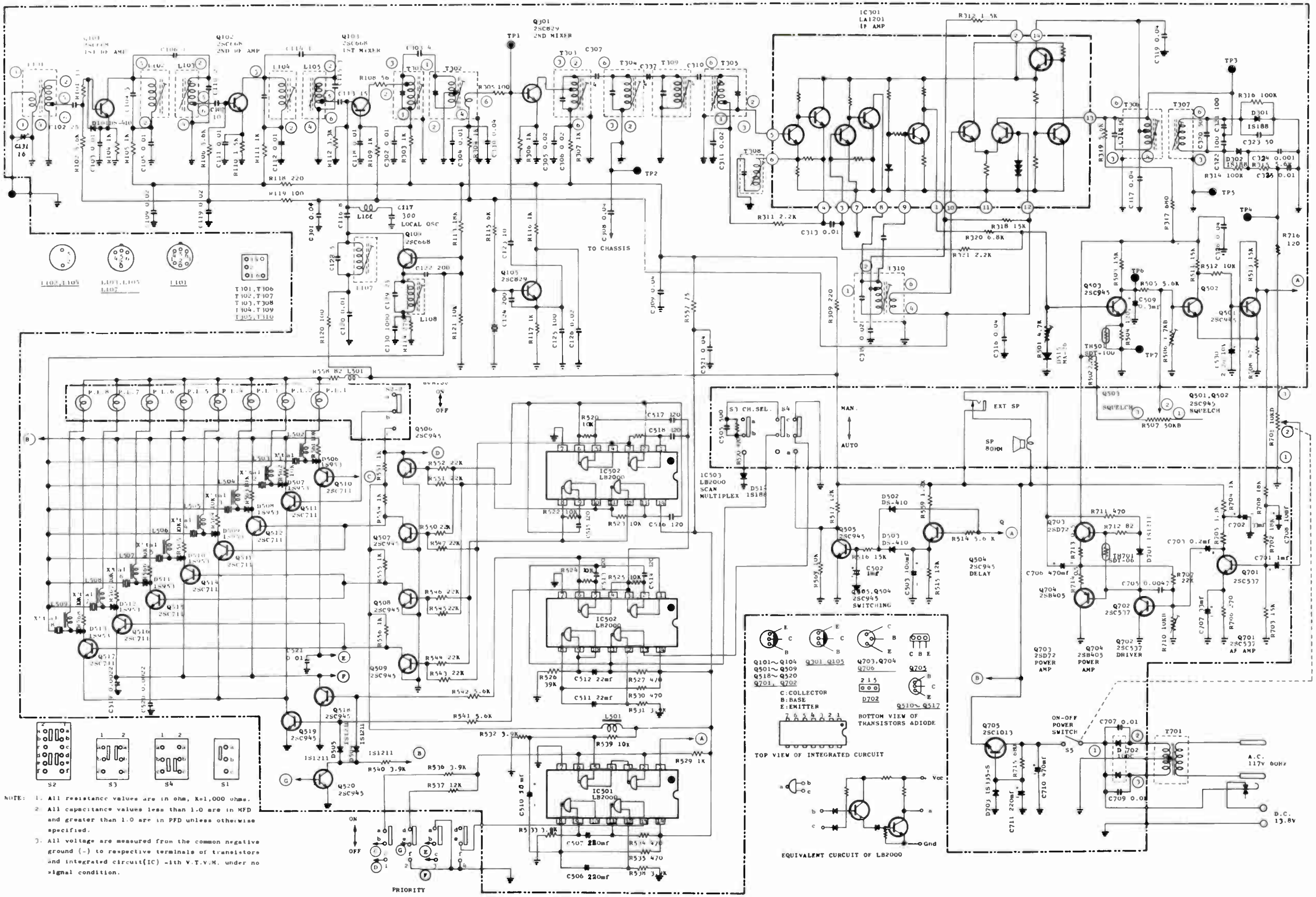

TO EXT SP SOCKET
Q101 2SC668
Q704 2SB405
Q703 2SD72
Q705 2SC1013
R715 680
D703 1S335-SI
VOL SWITCH
T701
AC POWER CONNECTOR
D702
DC POWER CONNECTOR
TO C706
EXT SP SOCKET
SPEAKER 8 OHM
C706 470mf
C710 470mf
TO R701 VOL No.1
TO R702 VOL No.2
R507 50KB SQUELCH
R701 10KD VOL SWITCH
TO Q503 BASE
TO R701 VOL No.3
R716 120
TO S1-C
TO S4-2b
TO S4-1b
TO S2-2d
TO S2-2a
TO S2-1a
TO R536
TO Q510 BASE
TO Q506 COLLECTOR
TO R537
TO Q520 BASE
S2
TO Q510 EMITTER
TO Q518 COLLECTOR
TO IC501 No.13
TO Q520 EMITTER
S3
TO Q511 BASE
TO S1-2C
S4
TO Q505 COLLECTOR
TO IC502 No.13
TO IC502 No.11
C505 500
R570 470K
TO EARTH
S1
Q505 2SC945
Q506 2SC945
Q507 2SC945
C503 100mf
C507 20mf
IC501
IC502
IC503
IC301 LA1201
MCL-8-1



NOTE:
1. All resistance values are in ohm, K=1,000 ohms.
2. All capacitance values less than 1.0 are in MFD and greater than 1.0 are in PFD unless otherwise specified.
3. All voltage are measured from the common negative ground (-) to respective terminals of transistors and integrated circuit(IC) with V.T.V.M. under no signal condition.

SEMICONDUCTORS

ITEM	PART NO./TYPE
D101	DS-410
D301	1S188
D302	1S188
D502	DS-410
D503	DS-410
D504	1S1211
D505	1S1211
D506	1S953
D507	1S953
D508	1S953
D509	1S953
D510	1S953
D511	1S953
D512	1S953
D513	1S953
D515	MA-26
D701	1S1211
D702	10DC
D703	1S335-S
IC301	LA-1201T
IC501	LB2000
IC502	LB2000
IC503	LB2000
Q101	2SC668D
Q102	2SC668D
Q103	2SC668D
Q104	2SC668D
Q105	2SC829C
Q301	2SC829C
Q501	2SC945R
Q502	2SC945R
Q503	2SC945R
Q504	2SC945R
Q505	2SC945R
Q506	2SC945R
Q507	2SC945R
Q508	2SC945R
Q509	2SC945R
Q510	2SC711D
Q511	2SC711D
Q512	2SC711D
Q513	2SC711D
Q514	2SC711D
Q515	2SC711D
Q516	2SC711D
Q517	2SC711D
Q518	2SC945R
Q519	2SC945R
Q520	2SC945R
Q701	2SC537F
Q702	2SC537E
Q703	2SD72
Q704	2SB405
Q705	2SC1013D (2SC1013C)

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE	
C128	4-224R016	16pf Trimmer	
C503	R-C9200 (1)	100mfd	10V
C506	6.3-CE-161-R012	160mfd	6.3V
C507	6.3-CE-161-R012	160mfd	6.3V
C509	R-C9140	.3mfd	10V
C510	6.3-CE-4R7-R022	4.7mfd	6.3V
C511	10-CE-220-R012	22mfd	10V
C512	10-CE-220-R012	22mfd	10V
C701	R-C9115	1mfd	10V
C702	R-C9881 (1)	33mfd	6.3V
C703	R-C9120	.2mfd	10V
C704	R-C9881 (1)	33mfd	6.3V
C706	R-C9874 (1)	470mfd	16V
C708	R-C9224	10mfd	10V
C710	R-C9844 (1)	470mfd	25V
C712	R-C9877 (1)	220mfd	16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R501	4-222T15501	4700 ohms Squelch Level
R506	4-222T15501	4700 ohms Squelch Level
R507		50K Squelch
R701		10K Volume
R710	4-222T155	10K Bias
TH701	SDT-06	Thermistor

COILS/TRANSFORMERS

ITEM	PART NO.
L101	4-257R229
L102	4-259R118
L103	4-259R117
L104	4-259R119
L105	4-2592117
L106	4-265R050A
L107	4-251R13591
L501	4-253R127
L502	4-253R127
L503	4-253R127
L504	4-253R127
L505	4-253R127
L506	4-253R127
L507	4-253R127
L508	4-253R127
L509	4-253R127
L510	4-253R129
T301	4-256R031
T302	4-256R031
T303	4-256R224
T304	4-256R224
T305	4-256R224
T306	4-256R224
T307	4-256R224
T310	4-256R228
T701	4-253R129

MISCELLANEOUS

ITEM	NAME	PART NO.
S1	Switch, Priority	4-231R128
S2	Switch, Bypass	4-231R115
S3	Switch, Channel Select	4-231R115
S4	Switch, Scan Select	4-231R130
SP	Speaker, 8 ohm	4-151R138
XTAL10	Crystal, 11.155MHz	121-037-0006
	Socket, Crystal	4-235R131

Pages 123-128 Courtesy of TEABERRY ELECTRONICS CORP.

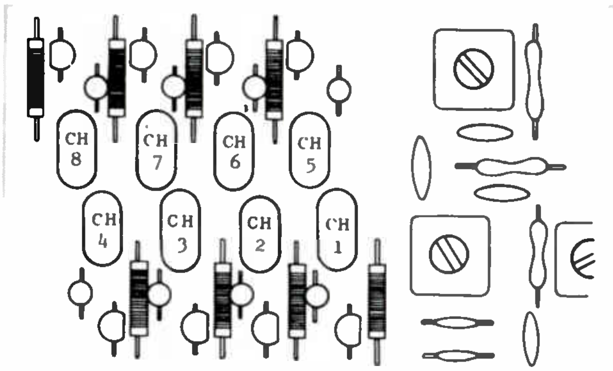
TO INSTALL CRYSTALS

1. An access door is provided so that crystals can be inserted without removing the entire cabinet.
2. Figure 1 shows the location of the crystal sockets.
3. Insert the crystals into the sockets, and then using the label provided, write in the respective frequencies. Affix label to top of cabinet for easy reference.

Every police, fire and other municipal, civilian defense or federal department, etc. broadcast on specific frequencies. These frequencies, will differ in each town or city. Your local dealer or town hall can tell you the frequencies being used in your area.

In order to obtain the correct crystal to monitor a specific channel, the following formula must be followed to obtain the crystal frequency.

CRYSTAL 3RD OVERTONE FREQUENCY = $\dfrac{\text{DESIRED CHANNEL FREQUENCY 10.7 MHz}}{\text{Divided by 3}}$



CRYSTAL SOCKET LAYOUT

Figure 1

CRYSTAL CORRELATION:

Resonance:	Parallel
Overtone:	3rd
Load Capacity:	20 pf
Max. Series Resistance:	40 Ohms
Maximum Drive:	2 milliwatts
Frequency Tolerance:	
At 25°C	± .001%
From −55°C to +105°C	± .005%

In special cases where interference is encountered from strong adjacent stations, the formula is changed by substituting a positive sign (+) for the negative sign (−) or vice versa. These crystals are available on special order.

LOW FREQUENCY
MODEL FR-2528
PRINTED CIRCUIT BOARD
(MIXER, RF & INJECTION AMPLIFIER)

PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)

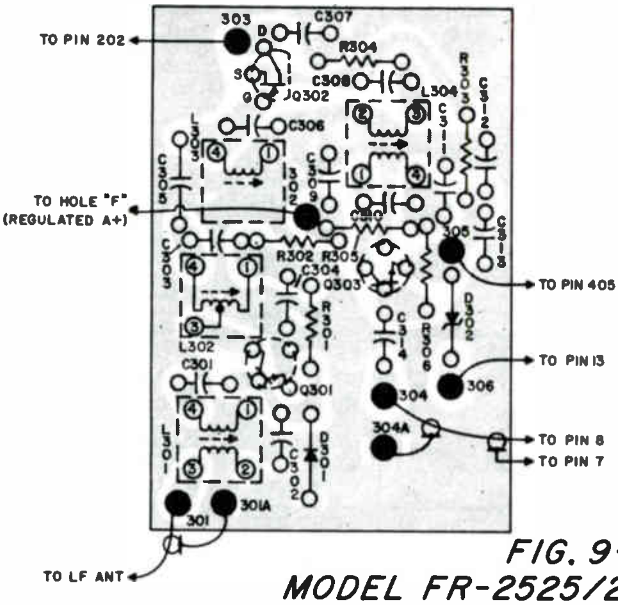
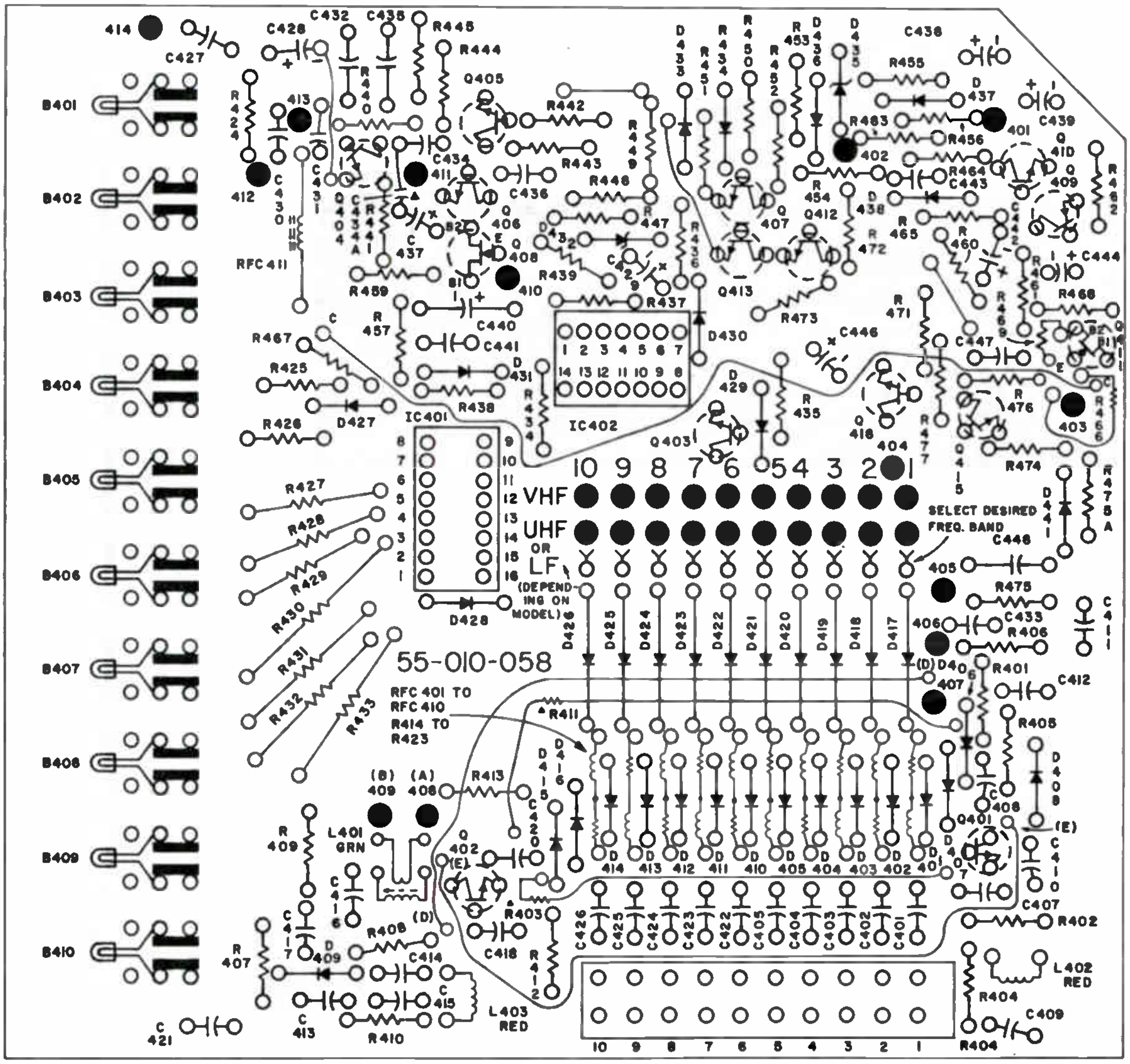


FIG. 9 - SCANNER
MODEL FR-2525/2526/2528 P.C. BOARD

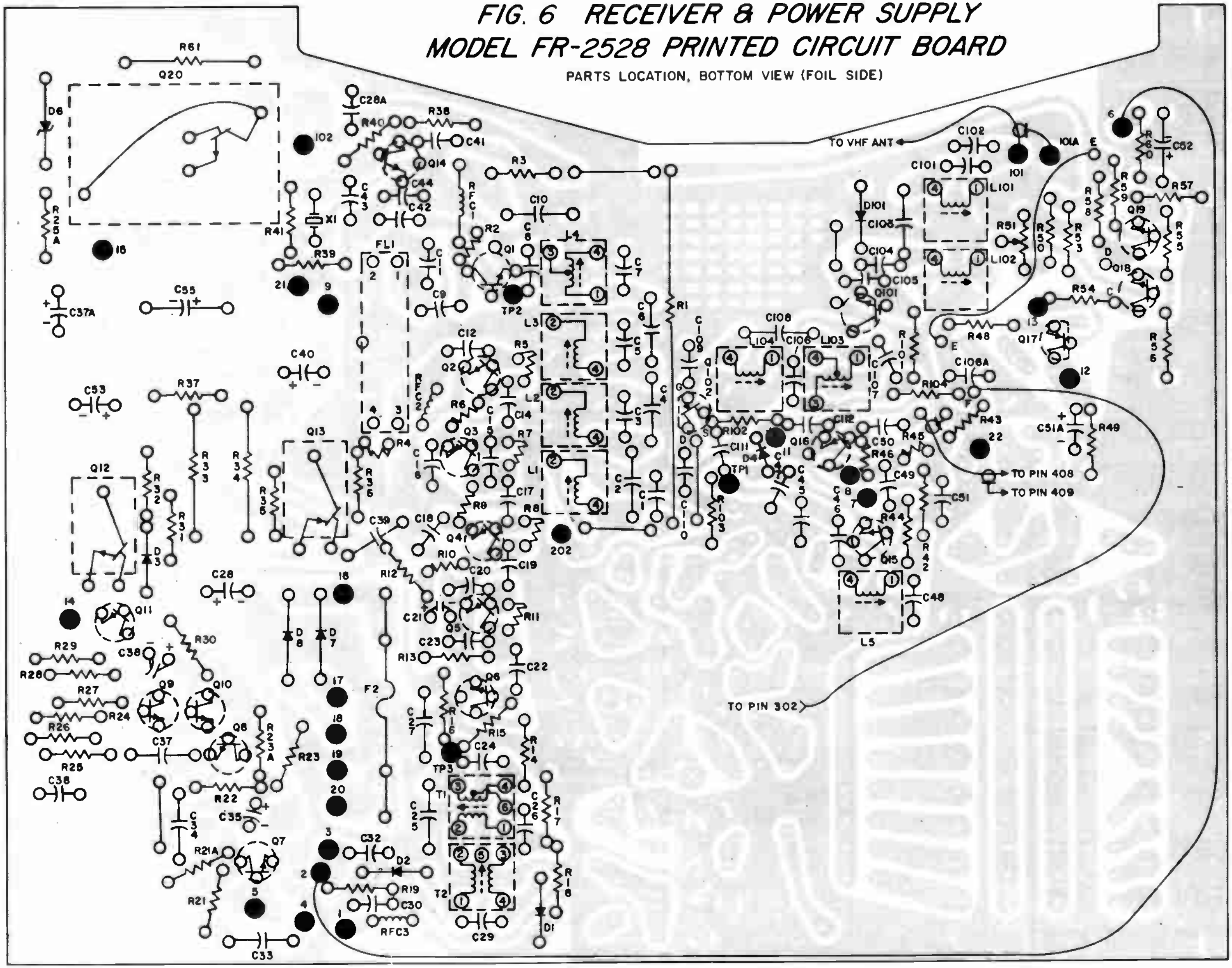
PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)

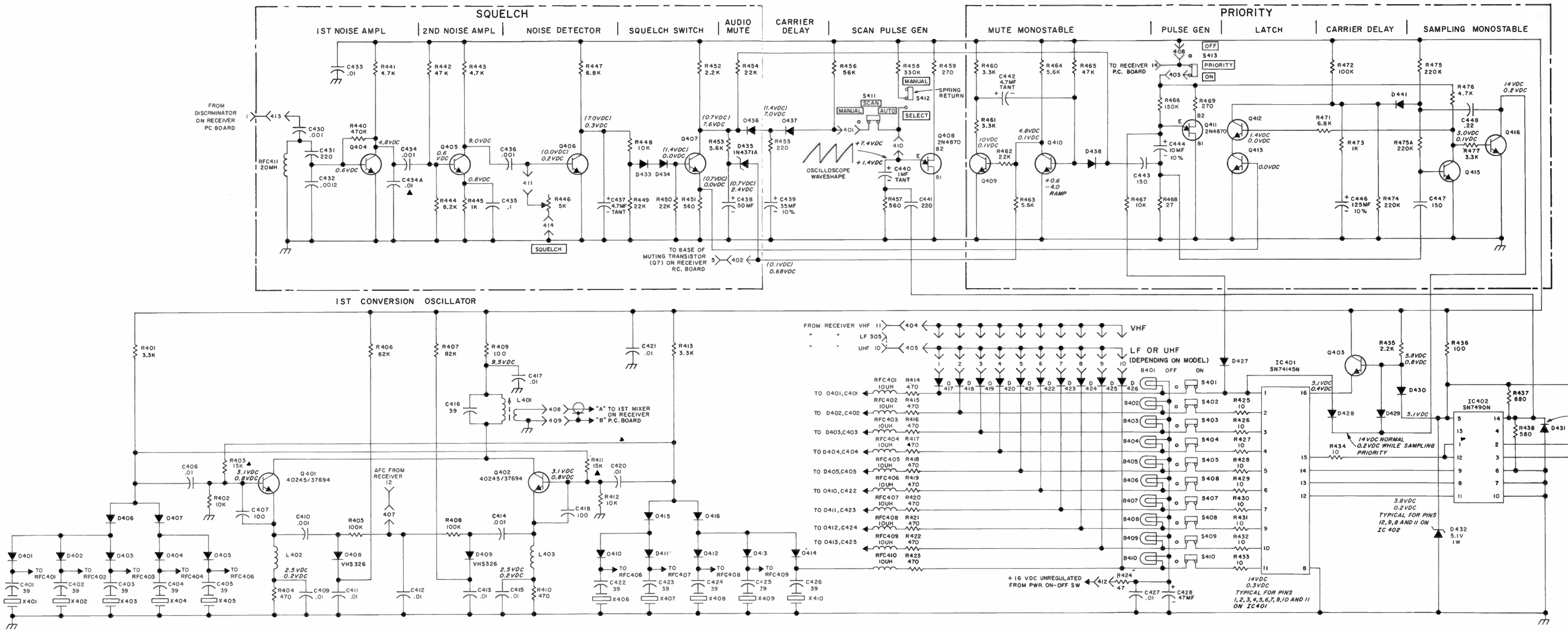


▲ LOCATED ON FOIL SIDE

FIG. 6 RECEIVER & POWER SUPPLY MODEL FR-2528 PRINTED CIRCUIT BOARD

PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)





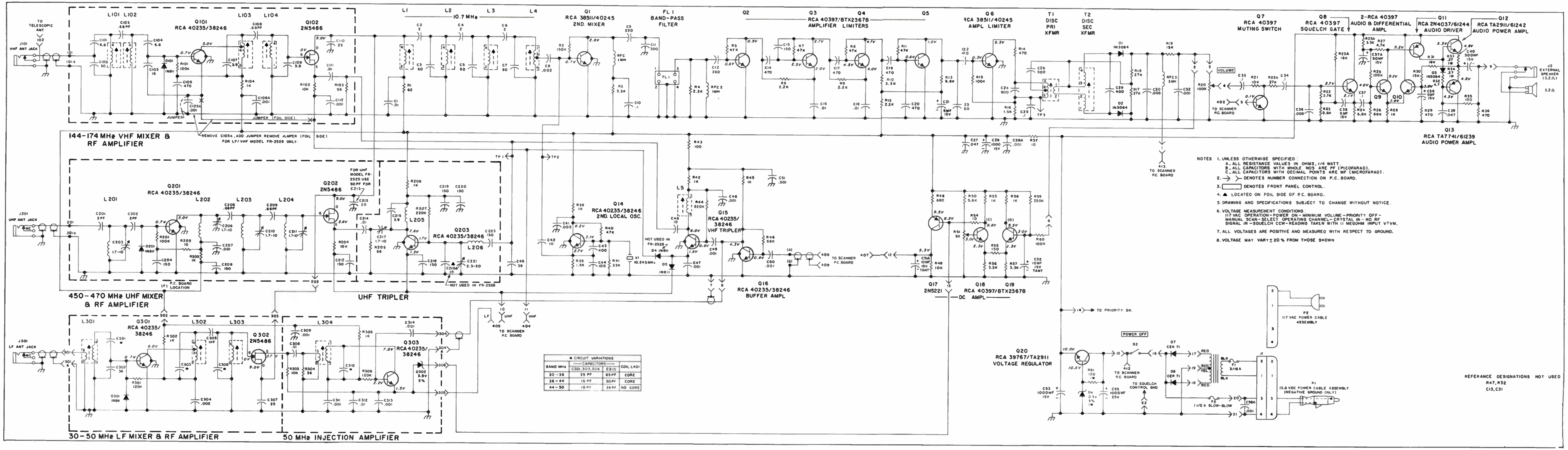
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS 1/4 WATT.
   ALL CAPACITANCE VALUES EXPRESSED AS WHOLE NUMBERS ARE IN PICOFARADS AND THOSE EXPRESSED AS DECIMAL NUMBERS ARE IN MICROFARADS.
2. INDICATES FRONT PANEL MARKING.
3. VOLTAGE MEASUREMENTS:
   A) 117 VAC OPERATION WITH NO SIGNAL INPUT.
   B) ALL MEASUREMENTS MADE WITH DC OSCILLOSCOPE EXCEPT SQUELCH SECTION WHERE VTVM WAS USED
   C) ALL READINGS MAY VARY ± 20%.
   D) WHEN TWO READINGS ARE GIVEN, THIS INDICATES THE TWO POSSIBLE STATES (HIGH OR LOW).
   E) CONTROL SETTINGS FOR ALL MEASUREMENTS (EXCEPT PRIORITY SECTION): "PWR"-ON, MINIMUM VOLUME, "SQUELCH"- FULLY CW,
   F) CONTROL SETTINGS FOR PRIORTY SECTION: SAME AS (E) EXCEPT "PRIORTY"-ON "SCAN"-MANUAL, SELECT ANY CHANNEL FROM 2 THRU 10.
   G) READINGS INSIDE ( ) TAKEN WITH "SQUELCH CONTROL"-CCW.
4. UNLESS OTHERWISE INDICATED:
   ALL TRANSISTORS ARE RCA 40397/BTX-2367B
   ALL DIODES ARE IN811
5. ▲ LOCATED ON FOIL SIDE OF P.C.BOARD.
6. BASE OF 2N4870, Q408, Q411

B1 E B2

(AS VIEWED FROM FOIL SIDE)

REFERANCE DESIGNATIONS NOT USED:
Q414, D439, D440, C408, C419, C445, R470, D443,



NOTES
1. UNLESS OTHERWISE SPECIFIED:
A. ALL RESISTANCE VALUES IN OHMS, 1/4 WATT.
B. ALL CAPACITORS WITH WHOLE NOS ARE PF (PICOFARAD).
C. ALL CAPACITORS WITH DECIMAL POINTS ARE MF (MICROFARAD).
2. → ≻ DENOTES NUMBER CONNECTION ON P.C. BOARD.
3. ▭ DENOTES FRONT PANEL CONTROL.
4. ▲ LOCATED ON FOIL SIDE OF P.C. BOARD.
5. DRAWING AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
6. VOLTAGE MEASUREMENT CONDITIONS:
117 VAC OPERATION-POWER ON-MINIMUM VOLUME-PRIORITY OFF-MANUAL SCAN-SELECT OPERATING CHANNEL-CRYSTAL IN-NO RF SIGNAL IN-SQUELCH CCW-READING TAKEN WITH 11 MEGOHM INPUT VTVM.
7. ALL VOLTAGES ARE POSITIVE AND MEASURED WITH RESPECT TO GROUND.
8. VOLTAGE MAY VARY ± 20 % FROM THOSE SHOWN

* CIRCUIT VARIATIONS

BAND MHz	CAPACITORS C301,303,306	CAPACITORS C310	COIL L401
30 - 36	25 PF	85 PF	CORE
36 - 44	15 PF	30 PF	CORE
44 - 50	10 PF	39 PF	NO CORE

FIG. 4 RECEIVER & POWER SUPPLY MODEL FR-2525 PRINTED CIRCUIT BOARD

PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)

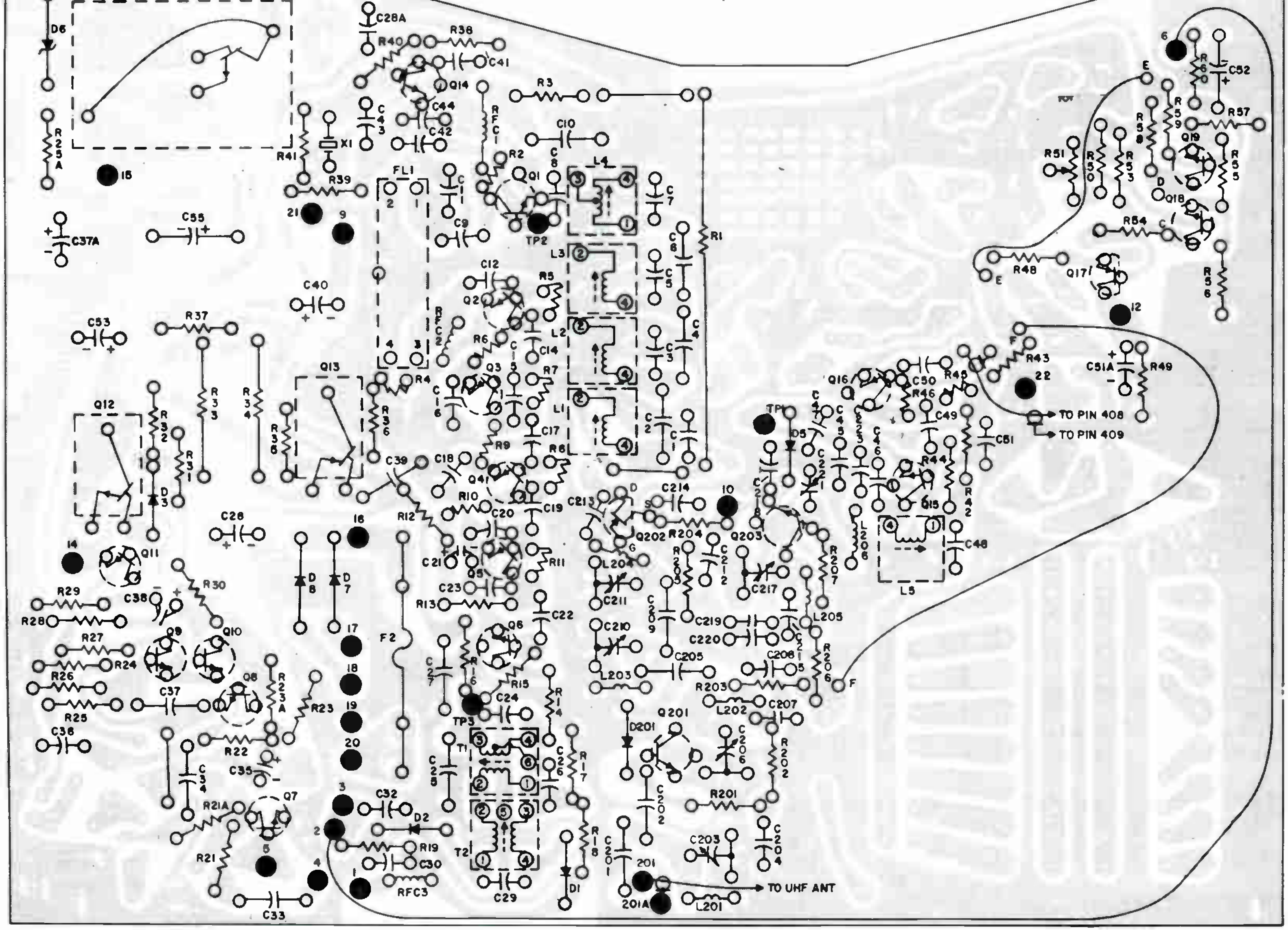
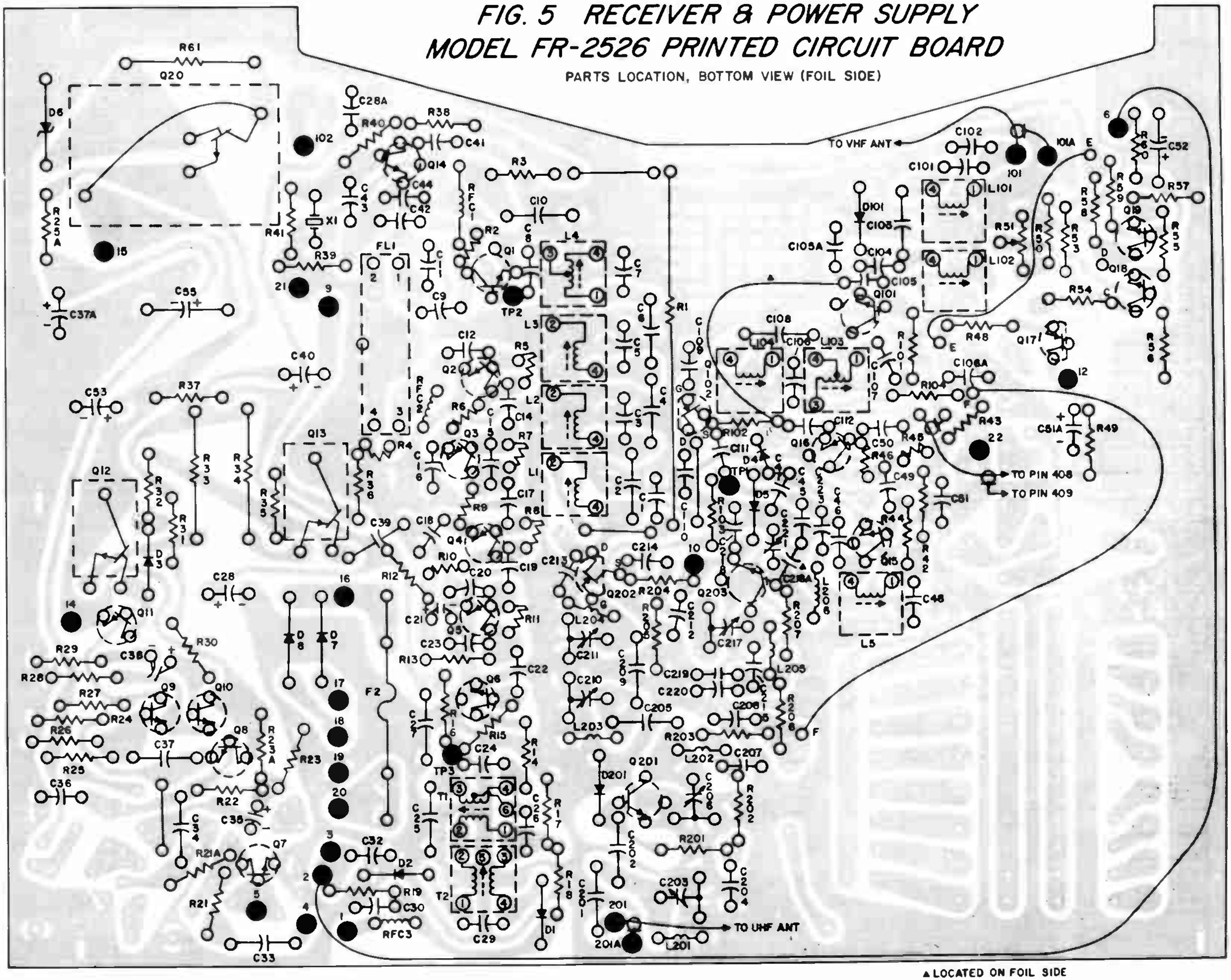


FIG. 5 RECEIVER & POWER SUPPLY MODEL FR-2526 PRINTED CIRCUIT BOARD

PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)



▲ LOCATED ON FOIL SIDE

Pages 109-122 Courtesy of SONAR RADIO CORP.

CRYSTAL FREQUENCY

LF, 30-50 MHz: Crystal Freq. = Chan. Freq. + 10.7 MHz

VHF, 144-174 MHz: Crystal Freq. = $\dfrac{\text{Chan. Freq.} - 10.7\text{ MHz}}{3}$

UHF, 450-470 MHz: Crystal Freq. = $\dfrac{\text{Chan. Freq.} - 10.7\text{ MHz}}{9}$

CRYSTAL CORRELATION

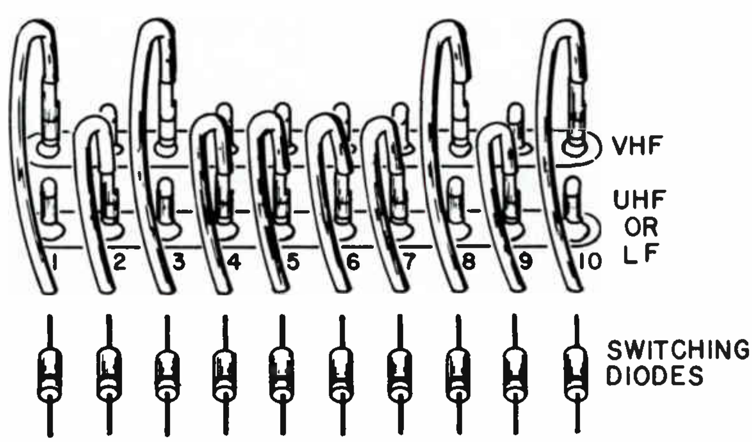
The following information is a guide for the manufacturer of crystals. Final frequency should be checked in the Sonar-Scan.

Resonance	Parallel
Overtone	3rd
Load Capacity	20 pf
Max. Series Resistance	30 ohms
Maximum Drive Level	2 milliwatts
Frequency Tolerance (25°C)	±.001%

DUAL BAND RECEIVER PROGRAMMING

In order that the Sonar-Scan can function as a dual band receiver, the oscillator on the scanning Printed Circuit Board must be programmed to switch between two bands. This is done by plugging in the correct connector pin next to the switching diodes.

Example: We want positions 1, 3, 8 and 10 to receive VHF and the rest UHF (or LF depending on model).



DUAL BAND PROGRAMMING

ALIGNMENT PROCEDURE

A. 455 KHz CIRCUITS (Use insulated alignment tool.)

(1) Disable the AFC by connecting Pin 6 (near Q19) to ground. •
(2) Connect a coaxial cable through 0.01 MF capacitor to the base of Q1 on the foil side. Leads should be short to avoid picking up interference. Be sure the 11.155 MHz crystal is out of its socket. Feed a 455 KHz cw signal into base of Q1.
(3) Connect a VTVM (+15 V scale) between Discriminator Driver TP3 (near the DC fuse) and chassis. Tune T1 for maximum reading.
(4) Connect a VTVM (-1.5 V scale, zero center) between cathode of detector D1 (near T2) and tune T2 for zero center reading.
(5) Take out the grounding wire from Pin 6. Connect the VTVM between collector of the AFC transistor Q17, Pin 2 and chassis. Adjust the AFC "mini-pot" R51 for +5.5 V reading.
(6) The 455 KHz sensitivity should be about 0.6 microvolts for 20 db quieting. Now the 455 KHz alignment is completed.
(7) Insert the 11.155 MHz crystal.
(8) Feed in a 10.7 MHz cw signal as in "A(2)". Check the 10.7 MHz sensitivity. It should be about 1.5 microvolts for 20 db quieting.
(9) Remove the alignment connections.

B. 10.7 MHz FILTER ALIGNMENT

(1) Switch to the VHF band and feed a 10.7 MHz cw signal to the VHF mixer TP1 by using clip connection; or switch to UHF band and feed a 10.7 MHz cw signal to the UHF mixer at the "hot" side of R205 (56 OHM). Be sure the high frequency crystals are not in the sockets or are disabled.
(2) Connect the VTVM (+15 V scale) between Discriminator Driver TP3 and chassis.
(3) Tune the cores of L1, L2, L3 and L4 for maximum reading. The reading increases from +5 V (no signal) to +7 V (full limiter), but may vary ±20%. Reduce input and readjust L1, L2, L3 and L4 until no further increase is noted. All cores except L4 are nearly flush with top of coil. The core of L4 is located at the bottom of the coil.
(4) The 10.7 MHz sensitivity at this point should be about 3 microvolts for 20 db quieting (1.4 microvolts direct at source termination of mixer).

C. R.F. CIRCUITS - ALIGNMENT

(1) For purposes of this section, it is assumed that all crystals are good.

(2) Before tuning, be sure that trimmers are placed with the moving white solder dot at the 4 l'clock position from the fixed brown dot at the top and that the cores of all inductors are flush with the top of the coil forms.

(3) Insert all high frequency crystals. For a dual band receiver, first tune the higher frequency range. Once the common components are tuned at the higher frequency band, do NOT retune them at the lower frequency range. Remember to reduce R.F. input and readjust the tuning components until the nominal sensitivity is reached.

(4a) FR-2525 UHF SCANNER RECEIVER.

Switch to center frequency. Feed an R. F. cw signal to the UHF antenna jack. Tune C203, C206, C210, C211, L401, L5, C221 and C217 for minimum noise output. Check sensitivity of other frequencies.

(4b) FR-2526 VHF/UHF SCANNER RECEIVER

First, follow (4a) to tune for the UHF band. Second, switch to center frequency of the VHF band. Feed an R. F. cw signal to the VHF antenna jack. Tune L101, L102, L103 and L104 for minimum noise output. Check sensitivity of other frequencies.

(4c) FR-2528 LF/VHF SCANNER RECEIVER

First, switch to center frequency of the VHF band. Feed an R. F. cw signal to VHF antenna jack. Tune L101, L102, L103, L104, L401 and L5 for minimum noise output. Check sensitivity of other frequencies. Second, switch to center frequency of the LF band. Feed an R. F. cw signal to LF antenna jack. Tune L301, L302, L303 and L304 for minimum noise output. Check the sensitivity of other frequencies.

(5) A variation of R.F. signal frequency at UHF should give a voltage variation at the collector of Q17, Pin 2, from +8.5 V to zero. The AFC range is ±11 KHz for both VHF and UHF. AFC is disabled for LF. (Use the "INCR." position of a Boonton #800 Signal Generator and Deviation Control to center of channel frequency.)

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	19-080-001	1N3064
D2	19-080-001	1N3064
D3	19-080-001	1N3064
D4	19-080-008	1N811
D5	19-080-008	1N811
D6	19-090-008A	Zener, 10.5V, 5%
D7	19-040-002	CER-71CA
D8	19-040-002	CER-71CA
D101	19-080-008	1N811
D201	19-080-008	1N811
D301	19-080-008	1N811
D302	19-090-015	Zener, 3.5V, 5%
D401	19-080-008	1N811
D402	19-080-008	1N811
D403	19-080-008	1N811
D404	19-080-008	1N811
D405	19-080-008	1N811
D406	19-080-008	1N811
D407	19-080-008	1N811
D408	19-120-001	VHS326
D409	19-120-001	VHS326
D410	19-080-008	1N811
D411	19-080-008	1N811
D412	19-080-008	1N811
D413	19-080-008	1N811
D414	19-080-008	1N811
D415	19-080-008	1N811
D416	19-080-008	1N811
D417	19-080-008	1N811
D418	19-080-008	1N811
D419	19-080-008	1N811
D420	19-080-008	1N811
D421	19-080-008	1N811
D422	19-080-008	1N811
D423	19-080-008	1N811
D424	19-080-008	1N811
D425	19-080-008	1N811
D426	19-080-008	1N811
D427	19-080-008	1N811
D428	19-080-008	1N811
D429	19-080-008	1N811
D430	19-080-008	1N811
D431	19-080-008	1N811
D432	19-090-014	Zener 5.1V, 5%
D433	19-080-008	1N811
D434	19-080-008	1N811
D435	19-090-007	1N4371A
D436	19-080-008	1N811
D437	19-080-008	1N811
D438	19-080-008	1N811
D441	19-080-008	1N811
IC401	19-130-004	SN74145
IC402	19-130-005	SN7490N
Q1	19-020-052	RCA 38511/40245
Q2	19-020-043A	RCA 40397/BTX2367B
Q3	19-020-043A	RCA 40397/BTX2367B
Q4	19-020-043A	RCA 40397/BTX2367B
Q5	19-020-043A	RCA 40397/BTX23678
Q6	19-020-052	RCA 38511/40245
Q7	19-020-043A	RCA 40397/8TX23678
Q8	19-020-043A	RCA 40397/BTX2367B
Q9	19-020-043A	RCA 40397/BTX23678
Q10	19-020-043A	RCA 40397/BTX23678
Q11	19-020-100	RCA 61244/2N4037
Q12	19-020-101	RCA 61242/TA2911/2N5298
Q13	19-020-102	RCA 61239/TA7741
Q14	19-020-048	RCA 40235/38246
Q15	19-020-048	RCA 40235/38246
Q16	19-020-048	RCA 40235/38246
Q17	19-020-114	2N5221
Q18	19-020-043A	RCA 40397/8TX2367B
Q19	19-020-043A	RCA 40397/BTX2367B
Q20	19-020-066	RCA 39767/TA2911
Q101	19-020-048	RCA 40235/38246
Q102	19-020-115	2N5486
Q201	19-020-048	RCA 40235/38246
Q202	19-020-115	2N5486
Q203	19-020-048	RCA 40235/38246
Q301	19-020-048	RCA 40235/38246
Q302	19-020-115	2N5486
Q303	19-020-048	RCA 40235/38246
Q401	19-020-044	RCA 40245/37694
Q402	19-020-044	RCA 40245/37694
Q403	19-020-043A	RCA 40397/BTX23678
Q404	19-020-043A	RCA 40397/BTX2367B
Q405	19-020-043A	RCA 40397/BTX2367B
Q406	19-020-043A	RCA 40397/BTX2367B
Q407	19-020-043A	RCA 40397/8TX23678
Q408	19-020-081	2N4870
Q409	19-020-043A	RCA 40397/BTX23678
Q410	19-020-043A	RCA 40397/BTX23678
Q411	19-020-081	2N4870
Q412	19-020-043A	RCA 40397/BTX23678
Q413	19-020-043A	RCA 40397/8TX23678
Q415	19-020-043A	RCA 40397/BTX23678
Q416	19-020-043A	RCA 40397/BTX2367B

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C21	06-530-062	5mfd	15V
C28	06-530-119	1000mfd	16V
C35	06-530-062	5mfd	15V
C37A	06-530-064	50mfd	15V
C38	06-530-062	5mfd	15V
C40	06-530-073	500mfd	15V
C51A	06-170-077	10mfd	15V
C52	06-170-077	10mfd	15V
C53	06-530-119	1000mfd	16V
C55	06-530-102	1000mfd	25V
C203	09-310-033	1.7-10pf	Trimmer
C206	09-310-033	1.7-10pf	Trimmer
C210	09-310-033	1.7-10pf	Trimmer
C211	09-310-033	1.7-10pf	Trimmer
C217	09-310-033	1.7-10pf	Trimmer
C221	09-310-040	2.3-20pf	Trimmer
C428	06-530-111	47mfd	25V
C429	06-570-103	10mfd	16V
C437	06-470-120	4.7mfd	15V
C438	06-530-064	50mfd	15V
C440	06-170-079	1mfd	15V
C442	06-570-120	4.7mfd	15V
C444	06-530-113	10mfd	25V
C446	06-530-115	125mfd	15V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R20	03-104-088	100K Volume/Switch
R32	01-477-331	4.7 ohms, 10%, 1/4W
R33	02-278-221	.27 ohms, 10% 1W WW
R34	02-278-221	.27 ohms, 10% 1W WW
R51	03-502-068	5000 ohms Bias
R446	03-502-089	5000 ohms Squelch

COILS/TRANSFORMERS

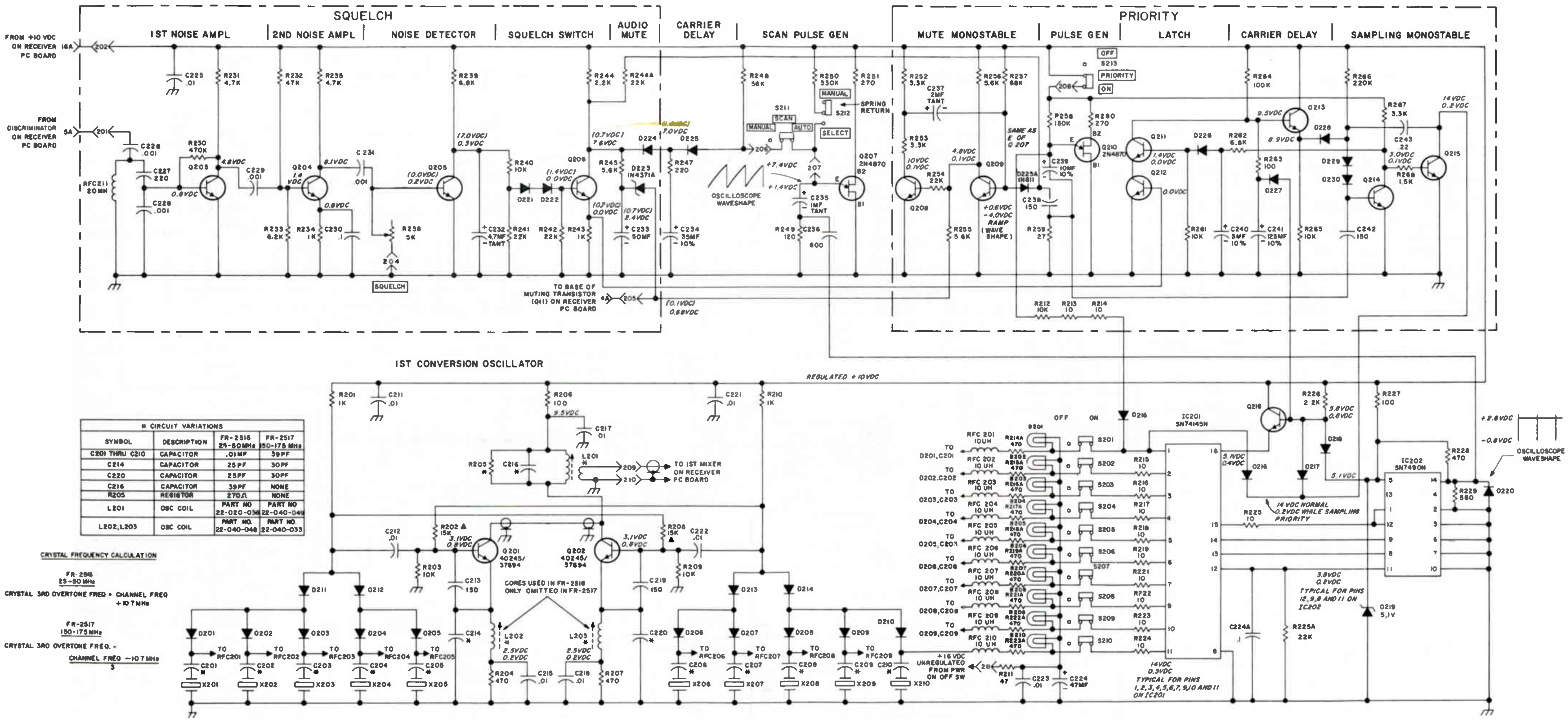
ITEM	PART NO.	ITEM	PART NO.
L1	22-010-066	L401	22-040-051
L2	22-010-066	L402	22-040-033
L3	22-010-066	L403	22-040-033
L4	22-010-067	RFC1	22-060-048
L5	22-040-050	RFC2	22-060-048
L101	22-020-075	RFC3	22-060-007
L102	22-020-075	RFC401	22-060-008
L103	22-020-076	RFC403	22-060-008
L104	22-020-075	RFC404	22-060-008
L201	22-090-020	RFC405	22-060-008
L202	22-090-020	RFC406	22-060-008
L203	22-090-020	RFC407	22-060-008
L204	22-090-020	RFC408	22-060-008
L205	22-090-020	RFC409	22-060-008
L206	22-090-021	RFC410	22-060-008
L301	22-020-082	RFC411	22-060-046
L302	22-020-083	T1	22-130-008
L303	22-020-084	T2	22-130-009
L304	22-020-085	T3	14-010-049

MISCELLANEOUS

ITEM	NAME	PART NO.
F1	Fuse, AC, 3/16A	42-010-027
F2	Fuse, DC, 1A	42-010-016
FL1	Filter, Ceramic	50-030-003
S401 S402 S403 S404 S405 S406 S407 S408 S409 S410	Switch, Channel Lockout	10-050-011
S411 S412 S413	Switch, Function Selector	10-050-012
X1	Crystal, 10.245MHz	40-010-023
	Speaker, 3.2 ohms	36-042-521

CABINET PARTS

NAME	PART NO.
Cabinet	28-010-030
Panel, Bezel	11-011-009
Knob, Control	33-010-023
Mount, Mobile	28-070-020
Knob, Mobile Mount	34-060-007



* CIRCUIT VARIATIONS			
SYMBOL	DESCRIPTION	FR-2516 25-50 MHz	FR-2517 150-175 MHz
C201 THRU C210	CAPACITOR	.01MF	39PF
C214	CAPACITOR	25PF	30PF
C220	CAPACITOR	25PF	30PF
C216	CAPACITOR	39PF	NONE
R205	RESISTOR	270Ω	NONE
L201	OSC COIL	PART NO 22-020-036	PART NO 22-040-049
L202, L203	OSC COIL	PART NO. 22-040-048	PART NO 22-040-033

CRYSTAL FREQUENCY CALCULATION

FR-2516
25-50 MHz

CRYSTAL 3RD OVERTONE FREQ = CHANNEL FREQ + 10.7 MHz

FR-2517
150-175 MHz

$$\text{CRYSTAL 3RD OVERTONE FREQ.} = \frac{\text{CHANNEL FREQ} - 10.7\ \text{MHz}}{3}$$

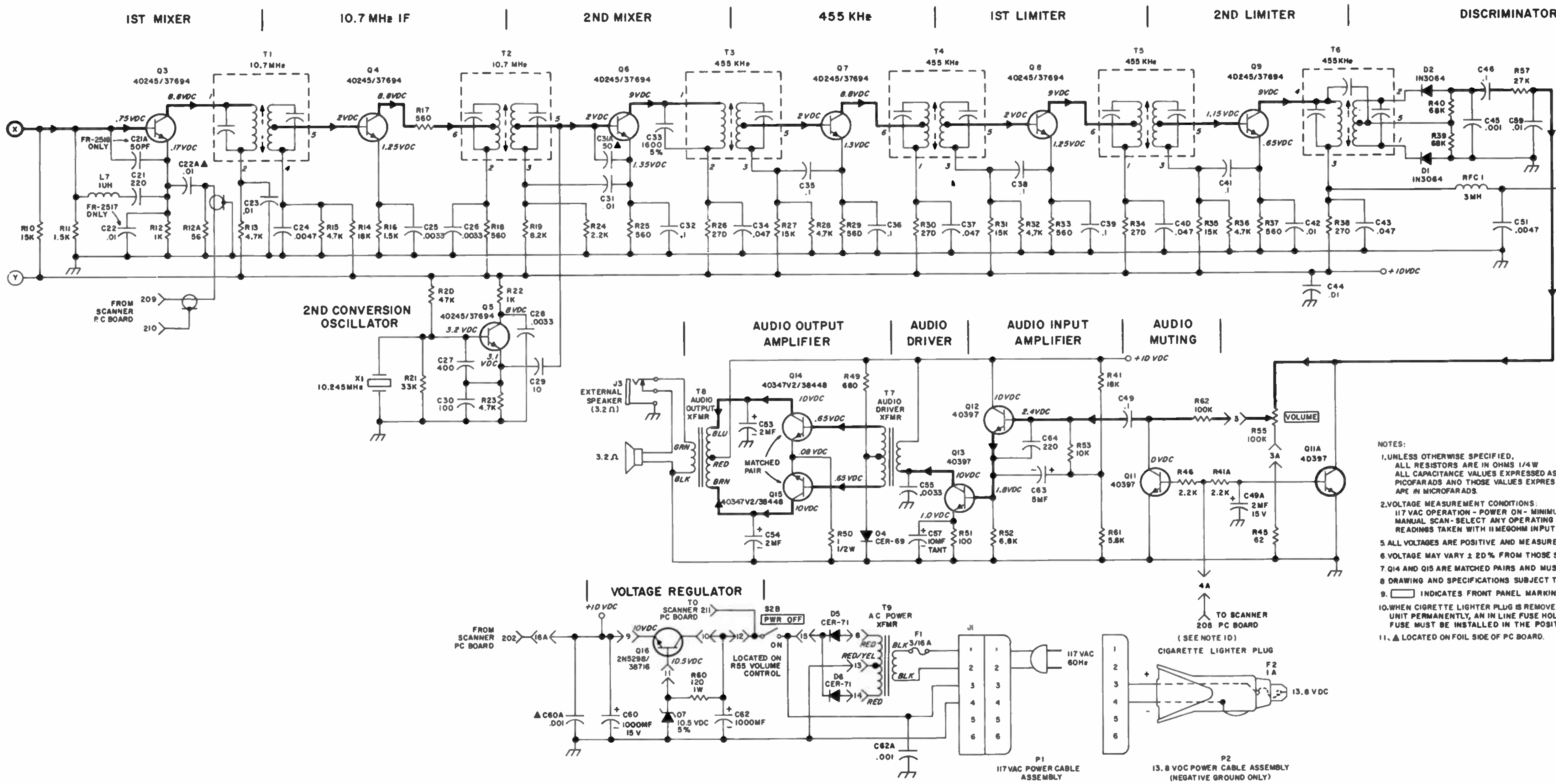
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS 1/4 WATT.
   ALL CAPACITANCE VALUES EXPRESSED AS WHOLE NUMBERS ARE IN PICOFARADS AND THOSE EXPRESSED AS DECIMAL NUMBERS ARE IN MICROFARADS.
2. ▭ INDICATES FRONT PANEL MARKING.
3. VOLTAGE MEASUREMENTS:
   A) 117 VAC OPERATION WITH NO SIGNAL INPUT.
   B) ALL MEASUREMENTS MADE WITH DC OSCILLOSCOPE EXCEPT SQUELCH SECTION WHERE VTVM WAS USED.
   C) ALL READINGS MAY VARY ± 20%.
   D) WHEN TWO READINGS ARE GIVEN, THIS INDICATES THE TWO POSSIBLE STATES (HIGH OR LOW)
   E) CONTROL SETTINGS FOR ALL MEASUREMENTS (EXCEPT PRIORITY SECTION): "PWR"-ON, MINIMUM VOLUME, "SQUELCH"-FULLY CW, "PRIORITY"-OFF, "SCAN"—AUTO
   F) CONTROL SETTINGS FOR PRIORTY SECTION: SAME AS (E) EXCEPT. "PRIORTY"-ON, "SCAN"-MANUAL, SELECT ANY CHANNEL FROM 2 THRU 10.
   G) READINGS INSIDE ( ) TAKEN WITH "SQUELCH CONTROL"-CCW.
4. UNLESS OTHERWISE INDICATED ALL TRANSISTORS ARE RCA 40397/BTX-2367 ALL DIODES ARE IN811.
5. BASE OF 2N4870, Q207, Q210

B1 E B2

(AS VIEWED FROM FOIL SIDE)

6. ▲ LOCATED ON FOIL SIDE OF PC BOARD

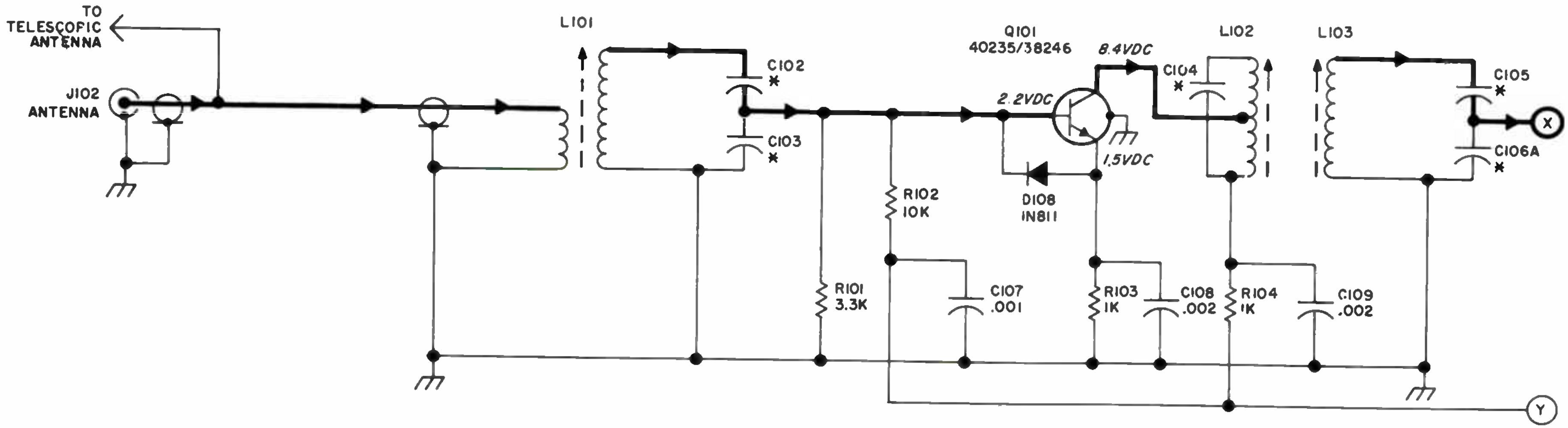


NOTES:

1. UNLESS OTHERWISE SPECIFIED,
   ALL RESISTORS ARE IN OHMS 1/4 W
   ALL CAPACITANCE VALUES EXPRESSED AS WHOLE NUMBERS ARE IN PICOFARADS AND THOSE VALUES EXPRESSED AS DECIMAL NUMBERS ARE IN MICROFARADS.
2. VOLTAGE MEASUREMENT CONDITIONS:
   117 VAC OPERATION - POWER ON - MINIMUM VOLUME - PRIORITY OFF - MANUAL SCAN - SELECT ANY OPERATING CHANNEL - SQUELCH CCW - READINGS TAKEN WITH 11 MEGOHM INPUT VTVM.

5. ALL VOLTAGES ARE POSITIVE AND MEASURED WITH RESPECT TO GROUND
6. VOLTAGE MAY VARY ± 20% FROM THOSE SHOWN
7. Q14 AND Q15 ARE MATCHED PAIRS AND MUST BE REPLACED TOGETHER.
8. DRAWING AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
9. ☐ INDICATES FRONT PANEL MARKINGS.
10. WHEN CIGRETTE LIGHTER PLUG IS REMOVED IN ORDER TO INSTALL THE UNIT PERMANENTLY, AN IN LINE FUSE HOLDER AND 1 AMP QUICK ACTING FUSE MUST BE INSTALLED IN THE POSITIVE LEAD.
11. ▲ LOCATED ON FOIL SIDE OF PC BOARD.

25–50 MHz RF AMPLIFIER

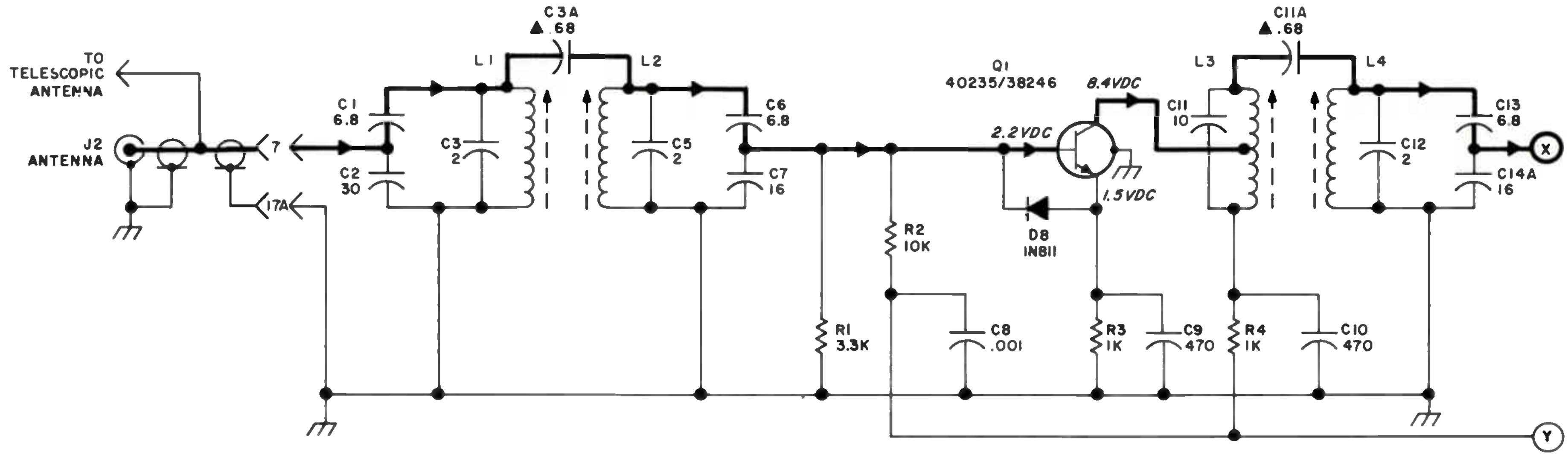


* CIRCUIT VARIATIONS

CAPACITOR	25-32.5 MHz	32.5-41 MHz	41-50 MHz
C102,105	30 PF	18 PF	12 PF
C103,106A	100 PF	50 PF	36 PF
C104	23 PF	13.5 PF	8.5 PF

FR-2516 FRONT END

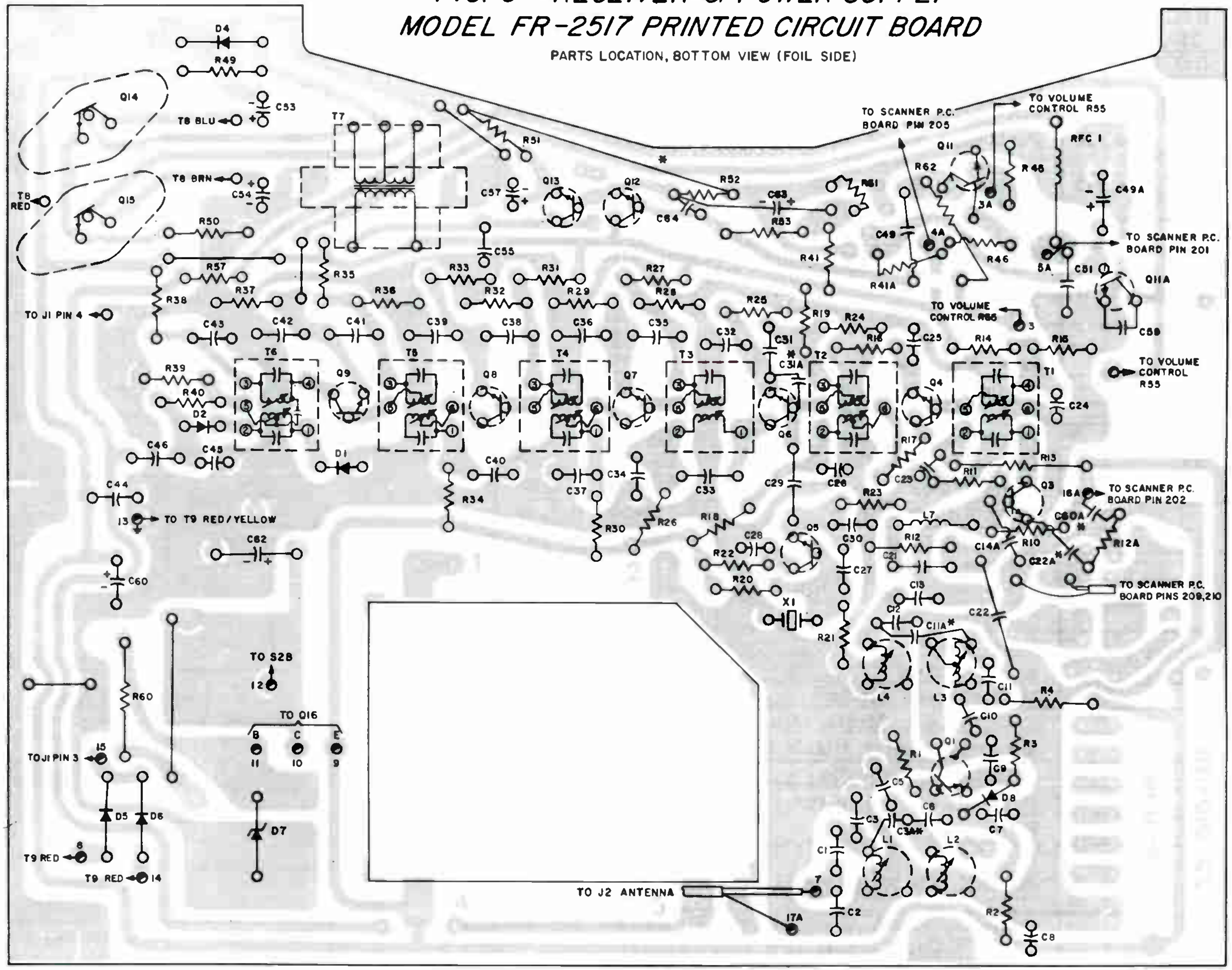
150-175 MHz RF AMPLIFIER



FR-2517 FRONT END

FIG. 3 — RECEIVER & POWER SUPPLY MODEL FR-2517 PRINTED CIRCUIT BOARD

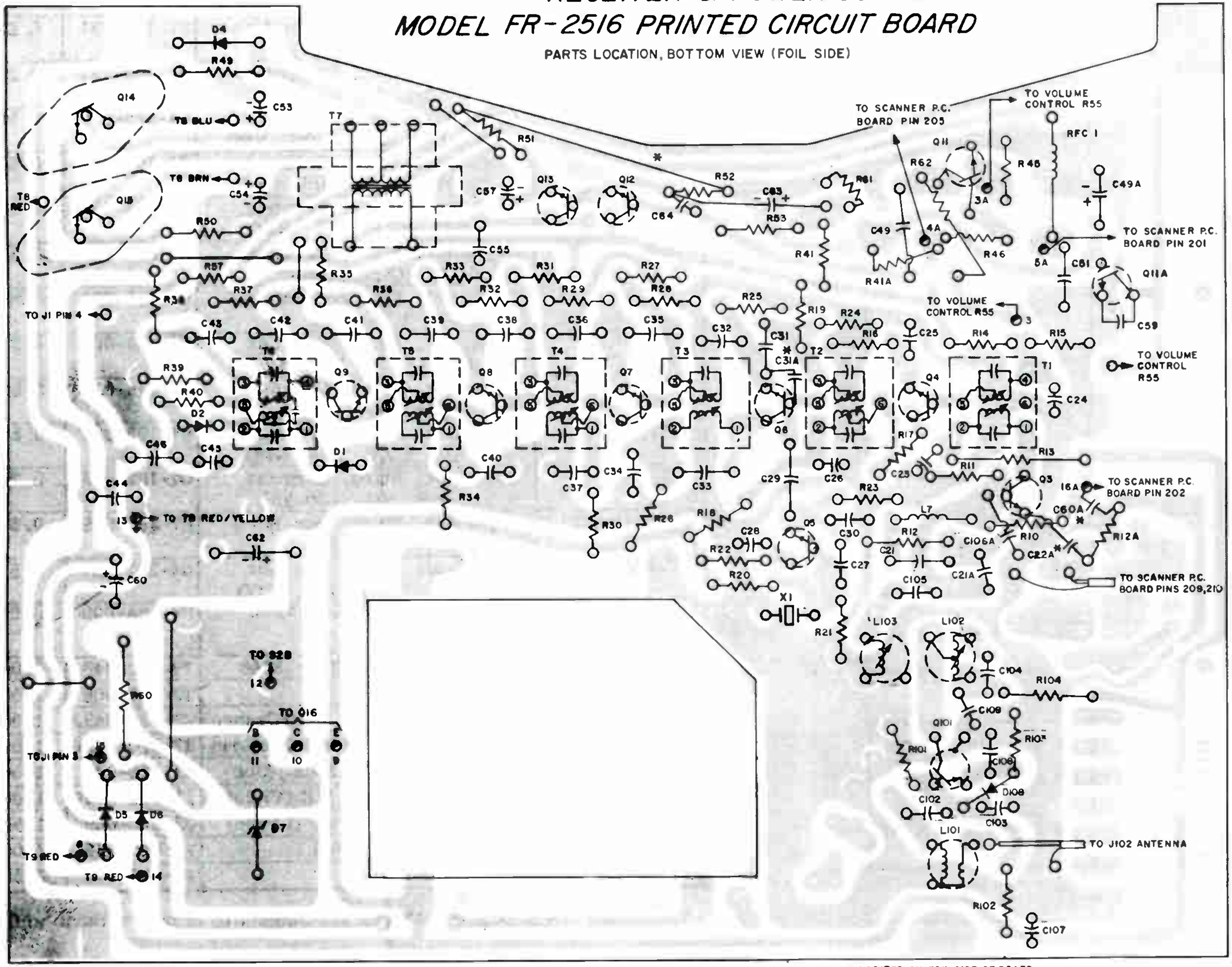
PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)



* LOCATED ON FOIL SIDE OF BOARD

RECEIVER & POWER SUPPLY
MODEL FR-2516 PRINTED CIRCUIT BOARD

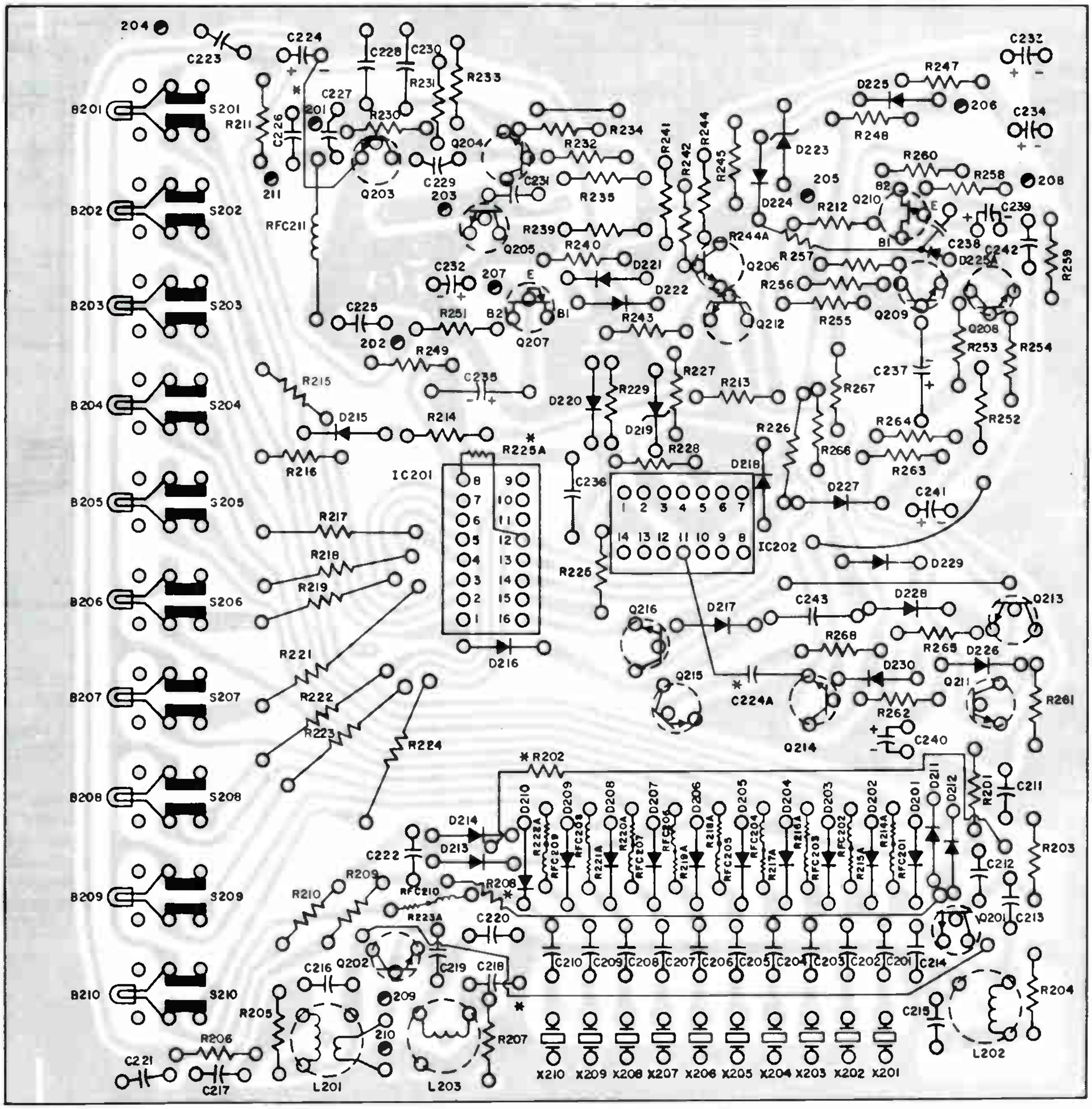
PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)



* LOCATED ON FOIL SIDE OF BOARD

SCANNER
MODEL FR-2516/2517 P.C. BOARD

PARTS LOCATION (FOIL SIDE)



✱ INDICATES LOCATED ON FOIL SIDE.
● INDICATES PIN CONNECTION:

PIN 201 TO PIN 5A DISCRIMINATOR RECEIVER P.C. BOARD.
PIN 202 TO PIN 16A REGULATED +10VDC RECEIVER P.C. BOARD.
PIN 203 TO R236 } SQUELCH CONTROL.
PIN 204 TO R236 }
PIN 205 TO PIN 4A BASE OF Q11 RECEIVER P.C. BOARD.

PIN 206 TO S211 } SCAN SWITCH.
PIN 207 TO S211 }
PIN 208 TO S213 PRIORITY SWITCH.
PIN 209 } TO 1ST MIXER RECEIVER P.C. BOARD.
PIN 210 (SHIELD) }
PIN 211 TO S28 POWER ON OFF SWITCH.

SEMICONDUCTORS

(1) Model FR-2516 (2) Model RF-2517

ITEM	PART NO.	TYPE
D1	19-080-001	1N3064
D2	19-080-001	1N3064
D4	19-040-003	CER-69
D5	19-040-002	CER-71CA
D6	19-040-002	CER-71CA
D7	19-090-008A	Zener 10.5V, 5%
D8	19-080-008	1N811 (2)
D108	19-080-008	1N811 (1)
D201	19-080-008	1N811
D202	19-080-008	1N811
D203	19-080-008	1N811
D204	19-080-008	1N811
D205	19-080-008	1N811
D206	19-080-008	1N811
D207	19-080-008	1N811
D208	19-080-008	1N811
D209	19-080-008	1N811
D210	19-080-008	1N811
D211	19-080-008	1N811
D212	19-080-008	1N811
D213	19-080-008	1N811
D214	19-080-008	1N811
D215	19-080-008	1N811
D216	19-080-008	1N811
D217	19-080-008	1N811
D218	19-080-008	1N811
D219	19-080-014	Zener, 5.1V, 5%
D220	19-080-008	1N811
D221	19-080-008	1N811
D222	19-080-008	1N811
D223	19-090-007	1N4371A
D224	19-080-008	1N811
D225A	19-080-008	1N811
D226	19-080-008	1N811
D227	19-080-008	1N811
D228	19-080-008	1N811
D229	19-080-008	1N811
D230	19-080-008	1N811
IC101	19-130-004	SN74145N
IC102	19-130-005	SN7490N
Q1	19-020-048	RCA 40235/38246 (2)
Q3	19-020-044	RCA 40245/37694
Q4	19-020-044	RCA 40245/37694
Q5	19-020-044	RCA 40245/37694
Q6	19-020-044	RCA 40245/37694
Q7	19-020-044	RCA 40245/37694
Q8	19-020-044	RCA 40245/37694
Q9	19-020-044	RCA 40245/37694
Q11	19-020-043A	RCA 40397/BTX-2367B
Q12	19-020-043A	RCA 40397/BTX-2367B
Q13	19-020-043A	RCA 40397/BTX-2367B
Q14	19-020-050	RCA 40347V2/38448
Q15	19-020-050	RCA 40347V2/38448
Q16	19-020-056	2N5298 (RCA TA2911/38716)
Q101	19-020-048	RCA 40235/38246 (1)
Q201	19-020-044	RCA 40245/37694
Q202	19-020-044	RCA 40245/37694
Q203	19-020-043A	RCA 40397/BTX-2367B
Q204	19-020-043A	RCA 40397/BTX-2367B
Q205	19-020-043A	RCA 40397/BTX-2367B
Q206	19-020-043A	RCA 40397/BTX-2367B
Q207	19-020-081	2N4870
Q208	19-020-043A	RCA 40397/BTX-2367B
Q209	19-020-043A	RCA 40397/BTX-2367B
Q210	19-020-081	2N4870
Q211	19-020-043A	RCA 40397/BTX-2367B
Q211A	19-020-043A	RCA 40397/BTX-2367B
Q212	19-020-043A	RCA 40397/BTX-2367B
Q213	19-020-043A	RCA 40397/BTX-2367B
Q214	19-020-043A	RCA 40397/BTX-2367B
Q215	19-020-043A	RCA 40397/BTX-2367B
Q216	19-020-043A	RCA 40397/BTX-2367B

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE	
C53	06-530-065	2mfd	24V
C54	06-530-065	2mfd	24V
C57	06-570-103	10mfd	16V
C60	06-530-119	1000mfd	16V
C62	06-530-102	1000mfd	25V
C63	06-130-116	5mfd	15V
C224	06-530-111	47mfd	25V
C232	06-570-082	4.7mfd	15V
C233	06-530-064	50mfd	15V
C234	06-530-114	35mfd	20V
C235	06-170-079	1mfd	15V
C237	06-170-089	2mfd	15V
C239	06-530-113	10mfd	25V
C240	06-530-112	3mfd	75V
C241	06-530-115	125mfd	15V

CONTROLS

ITEM	PART NO.	DESCRIPTION
R55/S2B	03-104-088	100K Volume/Switch

COILS/TRANSFORMERS

ITEM	PART NO.
L1	22-020-043A (2)
L2	22-020-043B (2)
L3	22-020-042 (2)
L4	22-020-043C (2)
L7	22-060-023
L101	22-020-041 (1)
L102	22-020-040 (1)
L103	22-040-032 (1)
L201	22-020-036 (1)
L201	22-040-049 (2)
L202	22-040-048 (1)
L202	22-040-033 (2)
L203	22-040-048 (1)
L203	22-040-033 (2)
RFC1	22-060-007
RFC201	22-060-008
RFC202	22-060-008
RFC203	22-060-008
RFC204	22-060-008
RFC205	22-060-008
RFC206	22-060-008
RFC207	22-060-008
RFC208	22-060-008
RFC209	22-060-008
RFC210	22-060-008
RFC211	22-060-046
T1	22-010-046
T2	22-010-047
T3	22-010-048
T4	22-010-049
T5	22-010-050
T6	22-130-004
T7	14-020-012
T8	14-030-009
T9	14-010-049

MISCELLANEOUS

ITEM	NAME	PART NO.
F1	Fuse, 3/16A	42-010-027
F2	Fuse, 1A	42-010-016
S201		
S202		
S203		
S204		
S205	Switch, Channel Lockout	10-050-011
S206		
S207		
S208		
S209		
S210		
S211		
S212	Switch, Function Selector	10-050-012
S213		
X1	Crystal, 10.245MHz	40-10-023
	Speaker, 3.2 ohms	36-042-521

CABINET PARTS

NAME	PART NO.
Cabinet	28-010-030
Panel, Bezel	11-011-009
Knob, Control	33-010-023
Panel, Front (Model RF-2516)	11-020-118
Panel, Front (Model RF-2517)	11-020-119

(8) Connect a V. T. V. M. to the emitter of Q8. Connect a signal generator through an isolation capacitor to the base of Q3. With no signal input, the voltage at the emitter of Q8 will be about +1.4 VDC. Tune the signal generator to 10.7 MHz and vary the output level to obtain approximately 0.1 VDC voltage drop. Adjust the top and bottom slugs of T1 and T2 for minimum voltage reading, gradually reducing generator output to maintain the 0.1 VDC voltage drop. After adjustment, approximately 10 uv. input will reduce the Q8 emitter voltage by 0.1 VDC.

(9) Connect a signal generator to the antenna input. The receiver will quiet when the generator is on frequency. Reduce the generator output until the voltage reading at the emitter of Q8 is reduced by 0.1 VDC. Adjust L1, L2, L3 and L4 (L101, L102 and L103) for minimum voltage reading while continuing to reduce the signal generator output to maintain approximately 0.1 VDC at the Q8 emitter. Continue to adjust the coils until no further decrease can be obtained. After adjustment, 0.7 uv signal input will produce about 0.1 VDC drop at the Q8 emitter.

CRYSTALS

CRYSTAL FREQUENCY DETERMINATION & CORRELATION

Crystal frequencies are determined as follows:

FR-2516 .... 25 - 50 MHz (Channel Frequency)

Crystal 3rd overtone frequency = Channel Freq. + 10.7 MHz

FR-2517 .... 150 - 175 MHz

Crystal 3rd overtone frequency = $\frac{\text{Channel Freq. - 10.7 MHz}}{3}$

CRYSTAL CORRELATION:

Resonance	Parallel
Overtone	3rd
Load Capacity	20 pf
Max. Series Resistance	40 Ohms
Maximum Drive	2 milliwatts
Frequency Tolerance:	
At 25^{o} C	$\pm$.001%
From -55^{o}C to $+105^{o}$C	$\pm$.005%

A special case occurs where it is necessary to change the 2nd local oscillator frequency from 10.245 MHz to 11.155 MHz.

Pages 97-108 Courtesy of SONAR RADIO CORP.

MAINTENANCE

TEST EQUIPMENT

(1) FM Signal Generator 24-175 MHz with adjustable attenuator calibrated to 0.1 uv. For example, Measurements 560.

(2) AM or CW Signal Generator 455 KHz - 10.7 MHz. For example, Hewlett-Packard 606A.

(3) V.T.V.M. Heath IM-11, etc.

ALIGNMENT PROCEDURE

A. RECEIVER SECTION

(1) Set Controls as follows:

a. Priority ... Off
b. Scan ...... Manual
c. Manual .... Select channel to desired frequency for alignment.

(2) Connect signal generator through a .01 MFD capacitor to the base of Q9. Adjust generator frequency to precisely 455 KHz. Connect Q8 Base to Emitter with short jumper.

(3) Connect a V.T.V.M. through a 1 megohm isolation resistor to the junction of R40 + R39.

(4) With 1000 microvolts @ 455 KHz it should be possible to get some indication on the 1.5 VDC range of the V.T.V.M. Adjust the bottom slug of T6 for maximum reading.

(5) Disconnect the V.T.V.M. and set it for zero center. Connect the V.T.V.M. to the junction of R40, D2 and C45. Adjust the top slug of T6 for zero center indication. Rotate the slug slightly CW and CCW of this point to establish if this reading is in fact zero center. Return adjustment to zero center.

(6) Repeat Steps 4 and 5 (ending with 5) until no further adjustment is necessary. Step 4 should result in about 0.6 VDC meter reading.

(7) Connect a V.T.V.M. to the emitter of Q9. Remove jumper from Q8. Connect the signal generator through the isolation capacitor to the base of Q6. With no signal input, the voltage at the emitter of Q9 will be approximately 1.3 - 1.4 VDC. Gradually increase signal input until the voltage at Q9 decreases about 0.1 VDC. Adjust the top and bottom slugs of T3, T4 and T5 for a minimum reading, at the same time reducing the signal generator output to maintain the 0.1 VDC drop. After adjustment, about 5 microvolts signal input will reduce the emitter voltage by 0.1 VDC.

CRYSTALS

CRYSTAL FREQUENCY DETERMINATION & CORRELATION

Crystal frequencies are normally determined as follows:

FR-104 .... 25-35 MHz

Crystal 3rd overtone frequency = Channel Freq. ± 10.7 MHz

FR-104 .... 35-50 MHz

Crystal 3rd overtone frequency = Channel Freq. - 10.7 MHz

FR-105 .... 150-175 MHz

Crystal 3rd overtone frequency = $\frac{\text{Channel Freq. - 10.7 MHz}}{3}$

CRYSTAL CORRELATION:

Resonance .... Parallel
Overtone 3rd
Load Capacity................. 20 pf
Max. Series Resistance .... 40 Ohms
Maximum Drive................ 2 milliwatts
Frequency Tolerance:
At 25° C .... ±.001%
From -55°C to +105°C ..... ±.005%

In special cases where interference is encountered from strong adjacent stations, the formula is changed by substituting a positive sign (+) for the negative sign (-) or vice versa. These crystals are available on special order.

Another special case occurs where it is necessary to change the 2nd local oscillator frequency from 10.245 MHz to 11.155 MHz.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	19-080-001	1N3064
D2	19-080-001	1N3064
D4	19-040-003	CER-69
D5	19-040-002	CER-71
D6	19-040-002	CER-71
D7	19-090-008	Zener
D8	19-080-008	1N811
D9	19-080-008	1N811
D108	19-080-008	1N811
D109	19-080-008	1N811
Q1	19-020-048	
Q2	19-020-044	
Q3	19-020-044	
Q4	19-020-044	
Q5	19-020-044	
Q6	19-020-044	
Q7	19-020-044	
Q8	19-020-044	
Q9	19-020-044	
Q10	19-020-058	
Q11	19-020-058	
Q12	19-020-043	
Q13	19-020-043	
Q14	19-020-050	
Q15	19-020-050	
Q16	19-020-056	
Q101	19-020-048	
Q102	19-020-044	

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE	
C47	06-570-081	10mfd	15V
C50	06-570-081	10mfd	15V
C53	06-530-065	2mfd	24V
C54	06-530-065	2mfd	24V
C57	06-570-081	10mfd	15V
C60	06-530-073	500mfd	15V
C62	06-530-072	1000mfd	35V

CONTROLS

ITEM	PART NO.	DESCRIPTION
R42	03-502-060	5000 ohms Squelch
R43	03-203-064	20K Limit Set
R55	03-104-059A	100K Volume/Switch

COILS/TRANSFORMERS

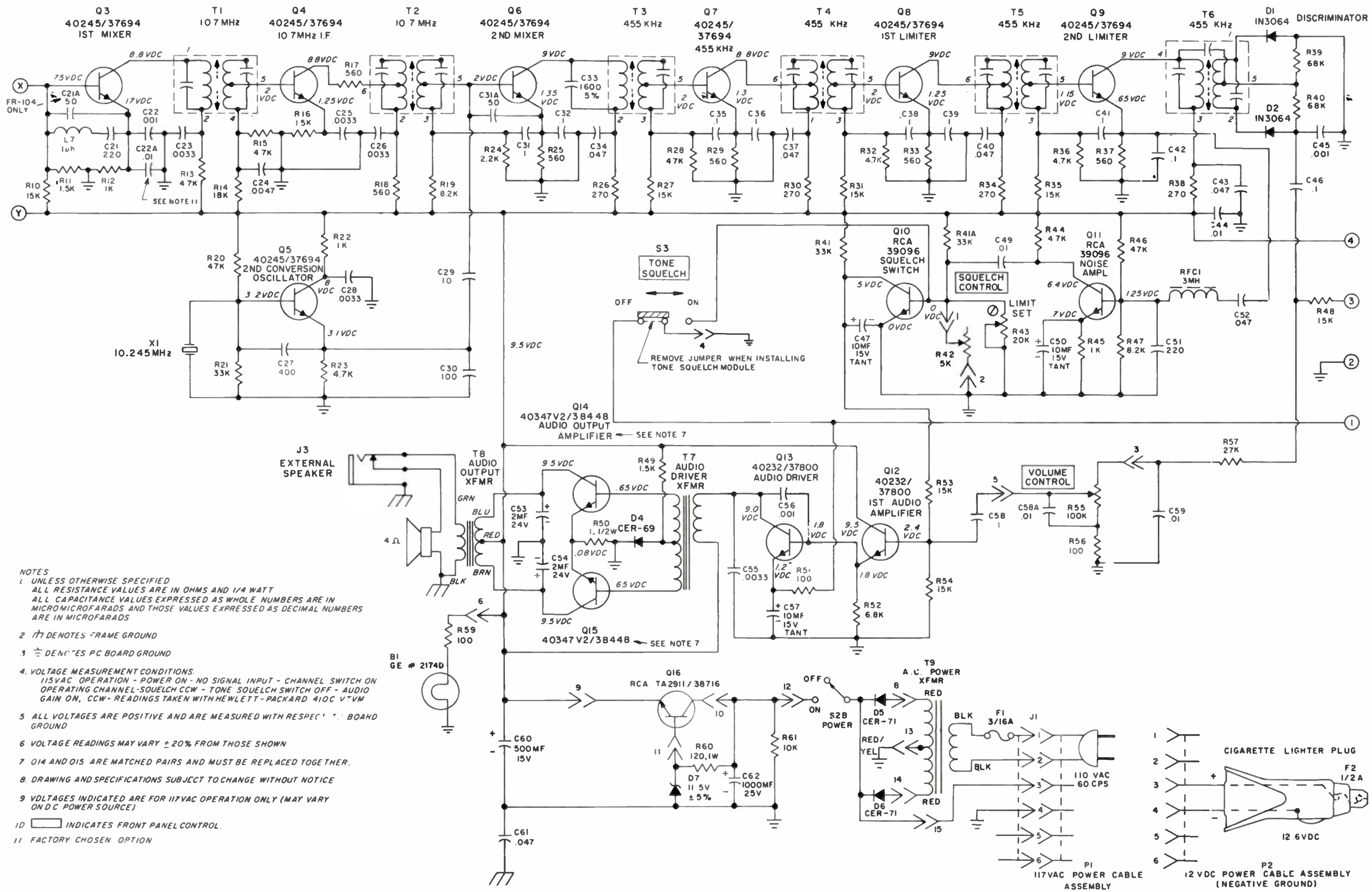
ITEM	PART NO.
L1	22-020-043A
L2	22-020-043B
L3	22-020-042
L4	22-020-043C
L5	22-040-034
L6	22-040-033
L7	22-060-023
L101	22-020-041
L102	22-020-040
L103	22-040-032
L104	22-040-031
L105	22-040-031
RFC1	22-060-007
T1	22-010-046
T2	22-010-047
T3	22-010-048
T4	22-010-049
T5	22-010-050
T6	22-130-004
T7	14-020-012
T8	14-030-009
T9	14-010-046

MISCELLANEOUS

ITEM	NAME	PART NO.
F1	Fuse, 1/2A	42-010-026
F2	Fuse, 3/16A	42-010-027
S1	Switch, Selector	10-030-019
S3	Switch, Tone Squelch	10-020-012
S101	Switch, Selector	10-030-019
X1	Crystal, 10.245MC	40-010-023
	Cigarette Lighter Plug	38-150-019
	Fuse Holder	42-020-003
	Speaker, 2" x 6"	36-042-616

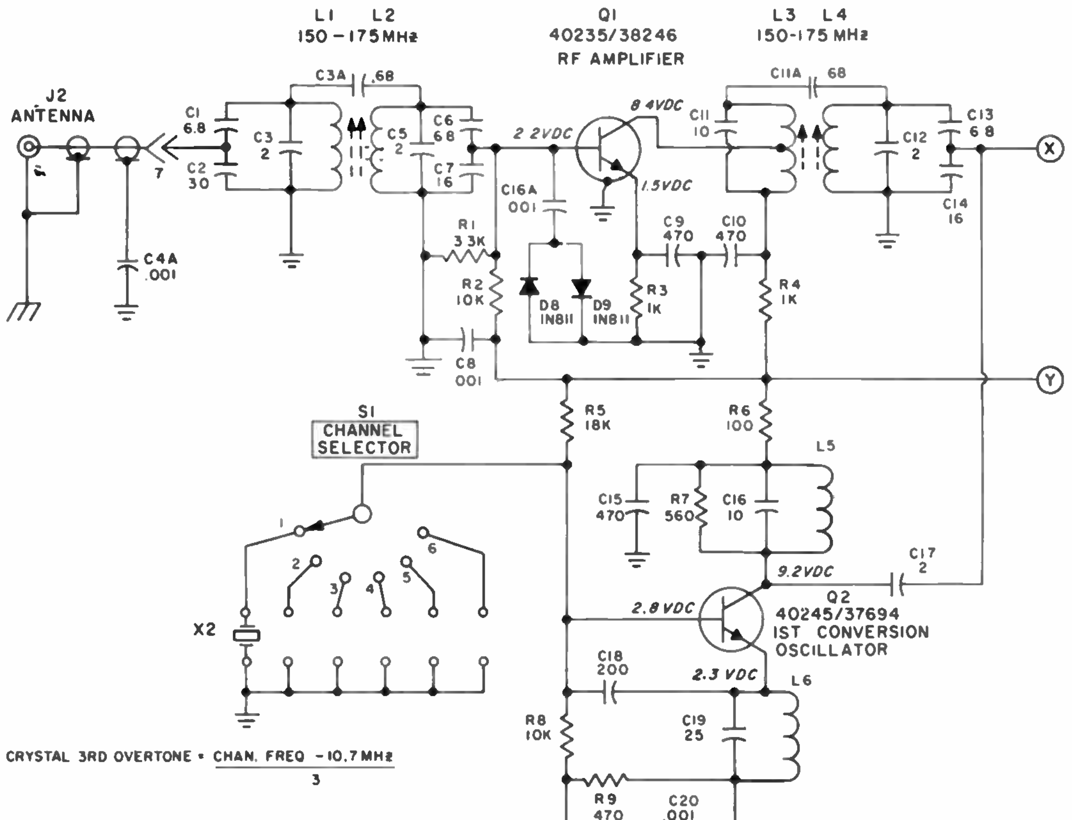
CABINET PARTS

NAME	PART NO.
Cabinet	28-010-021
Front Panel, Model FR-104	11-020-089
Front Panel, Model RF-105	11-020-088
Knob, Squelch/Volume	33-020-009
Knob, Channel Selector	33-010-019



NOTES

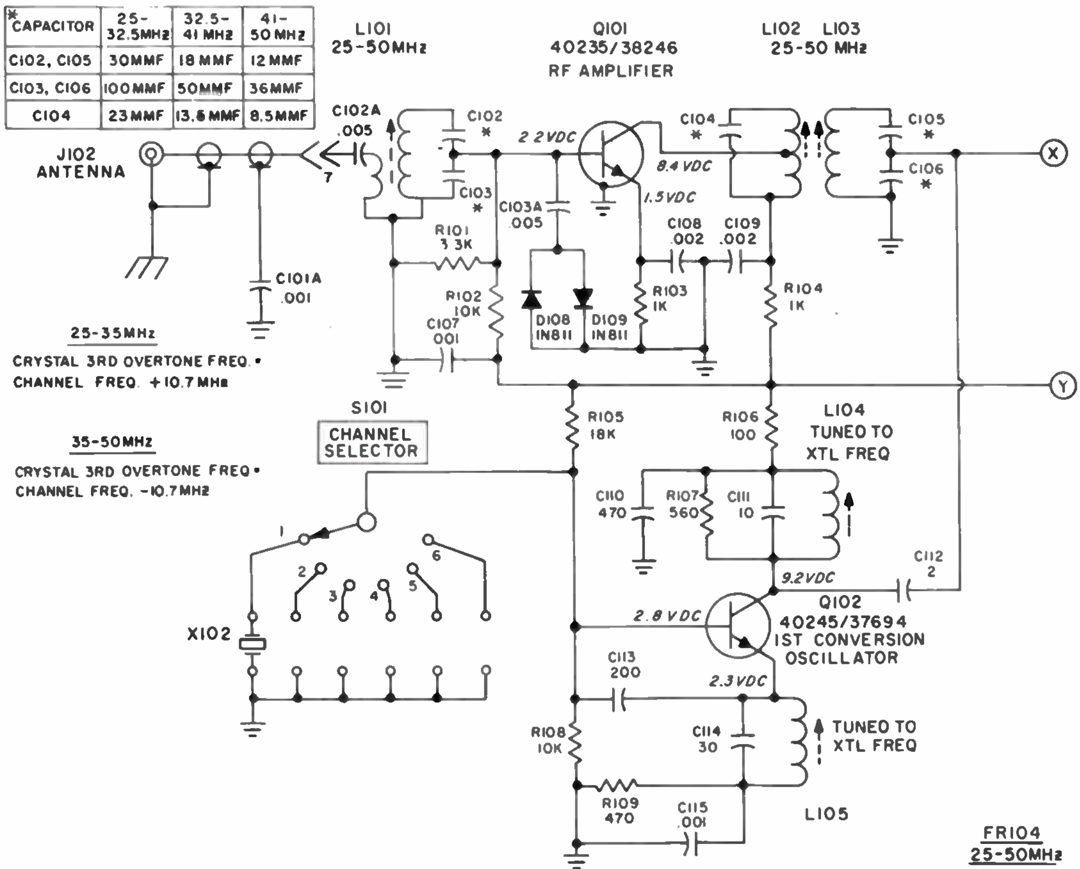
1. UNLESS OTHERWISE SPECIFIED
   ALL RESISTANCE VALUES ARE IN OHMS AND 1/4 WATT
   ALL CAPACITANCE VALUES EXPRESSED AS WHOLE NUMBERS ARE IN MICROMICROFARADS AND THOSE VALUES EXPRESSED AS DECIMAL NUMBERS ARE IN MICROFARADS
2. ⏚ DENOTES FRAME GROUND
3. ⏚ DENOTES PC BOARD GROUND
4. VOLTAGE MEASUREMENT CONDITIONS.
   115VAC OPERATION - POWER ON - NO SIGNAL INPUT - CHANNEL SWITCH ON OPERATING CHANNEL - SQUELCH CCW - TONE SQUELCH SWITCH OFF - AUDIO GAIN ON, CCW - READINGS TAKEN WITH HEWLETT-PACKARD 410C VTVM
5. ALL VOLTAGES ARE POSITIVE AND ARE MEASURED WITH RESPECT TO BOARD GROUND
6. VOLTAGE READINGS MAY VARY ±20% FROM THOSE SHOWN
7. Q14 AND Q15 ARE MATCHED PAIRS AND MUST BE REPLACED TOGETHER.
8. DRAWING AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE
9. VOLTAGES INDICATED ARE FOR 117VAC OPERATION ONLY (MAY VARY ON DC POWER SOURCE)
10. ▭ INDICATES FRONT PANEL CONTROL.
11. FACTORY CHOSEN OPTION



CRYSTAL 3RD OVERTONE = $\frac{\text{CHAN. FREQ} - 10.7\text{ MHz}}{3}$

FR105
150-175 MHz
FRONT END

*CAPACITOR	25-32.5 MHz	32.5-41 MHz	41-50 MHz
C102, C105	30 MMF	18 MMF	12 MMF
C103, C106	100 MMF	50 MMF	36 MMF
C104	23 MMF	13.5 MMF	8.5 MMF



25-35 MHz

CRYSTAL 3RD OVERTONE FREQ. = CHANNEL FREQ. +10.7 MHz

35-50 MHz

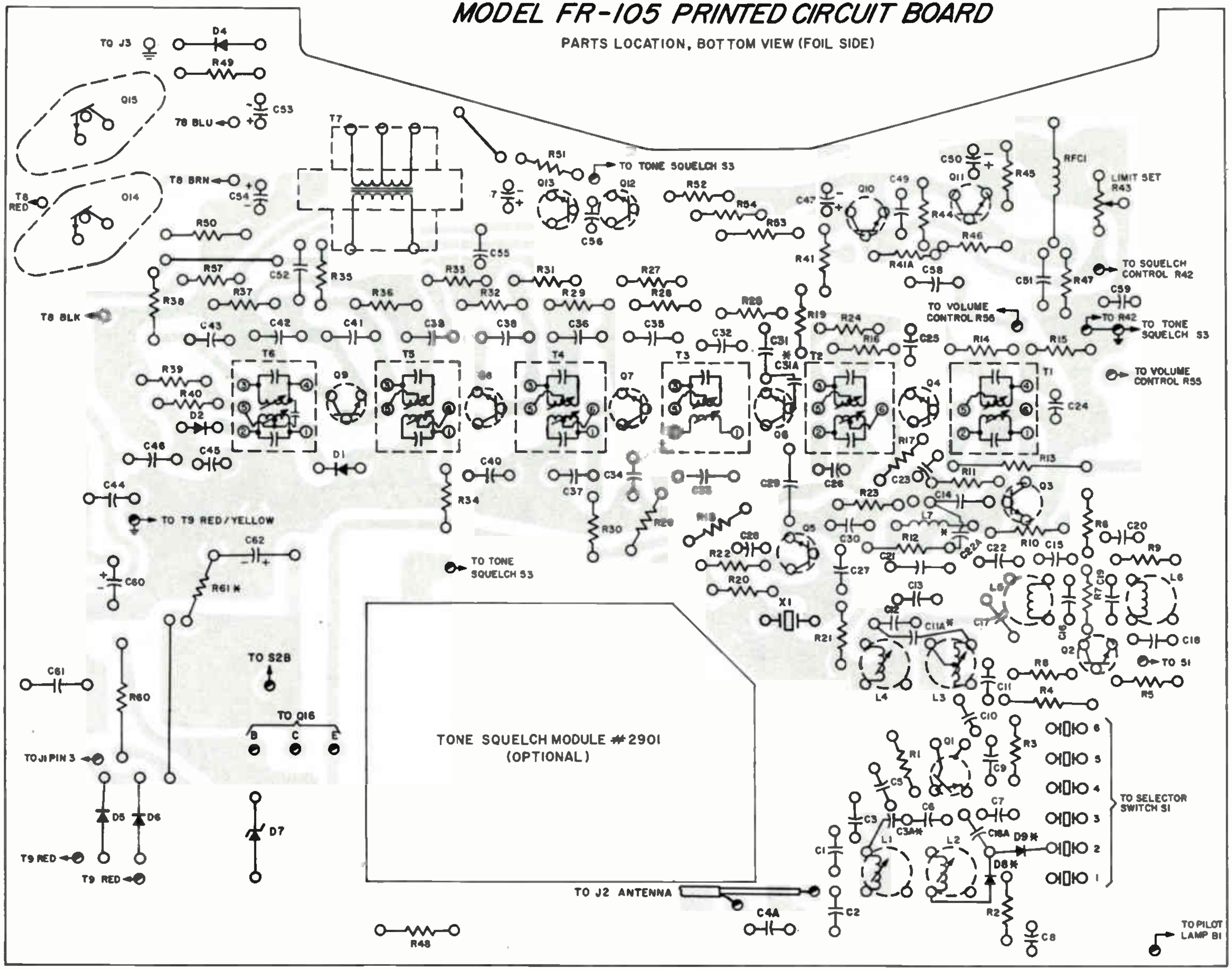
CRYSTAL 3RD OVERTONE FREQ = CHANNEL FREQ. -10.7 MHz

FR104
25-50 MHz
FRONT END

*SEE TABLE FOR VALUES

FIG. 2 – RECEIVER & POWER SUPPLY MODEL FR-105 PRINTED CIRCUIT BOARD

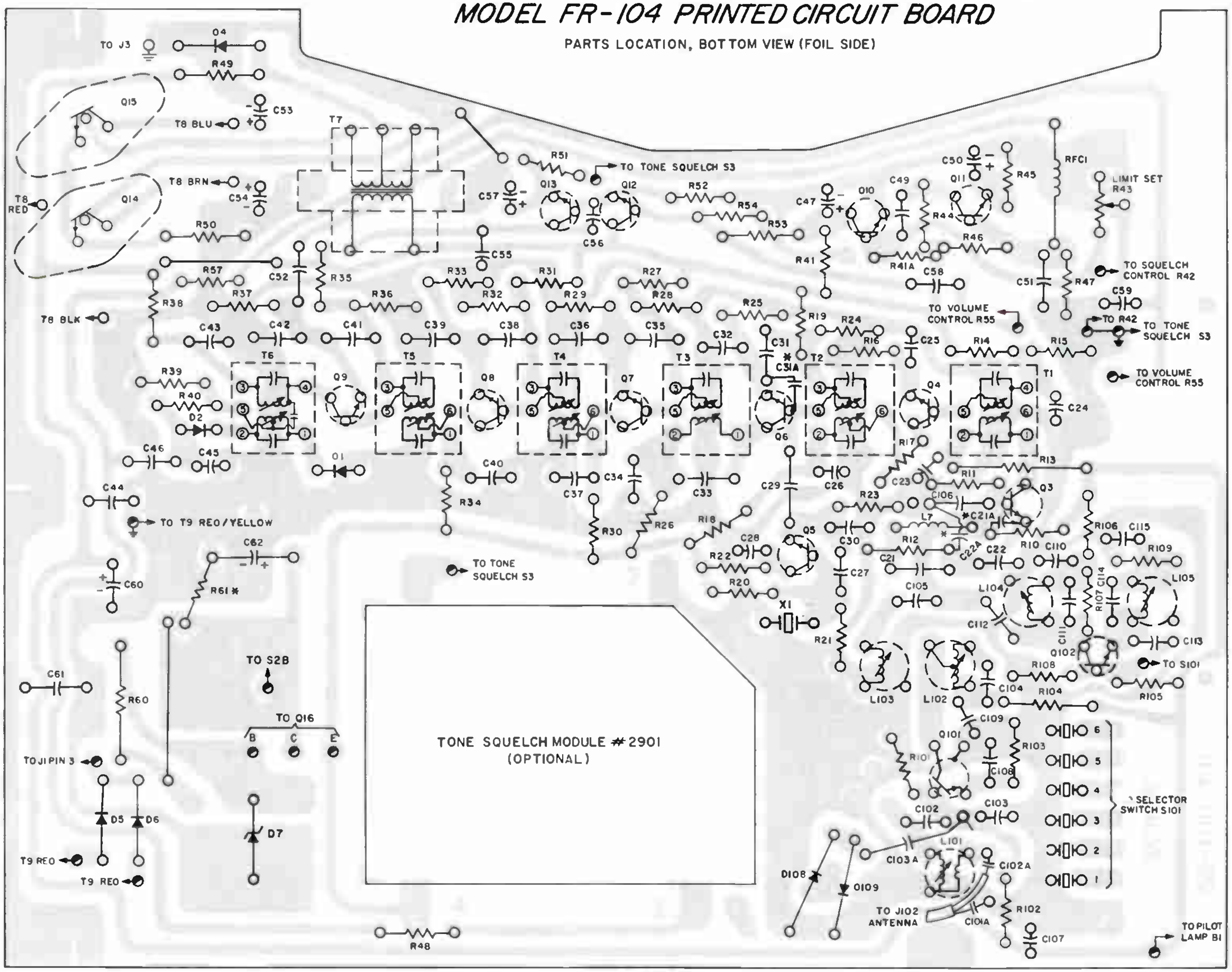
PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)



* LOCATED ON FOIL SIDE OF BOARD

FIG. 1 – RECEIVER & POWER SUPPLY MODEL FR-104 PRINTED CIRCUIT BOARD

PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)



* LOCATED ON FOIL SIDE OF BOARD

Pages 89-96 Courtesy of SONAR RADIO CORP.

MAINTENANCE

TEST EQUIPMENT

(1) FM Signal Generator 25-175 MHz with adjustable attenuator calibrated to 0.1 uv. Measurements 560 etc.

(2) AM or CW Signal Generator 455 KHz-10.7 MHz. Hewlett-Packard 606A, etc.

(3) V.T.V.M. Heath IM-11, etc.

ALIGNMENT PROCEDURE

(1) Connect signal generator through a .01 MFD capacitor to the base of Q9. Adjust generator frequency to precisely 455 KHz. Connect Q8 Base to Emitter with short jumper.

(2) Connect a V.T.V.M. through a 1 megohm isolation resistor to the junction of R40 + R39.

(3) With 1000 microvolts @ 455 KHz it should be possible to get some indication on the 1.5 VDC range of the V.T.V.M. Adjust the bottom slug of T6 for maximum reading.

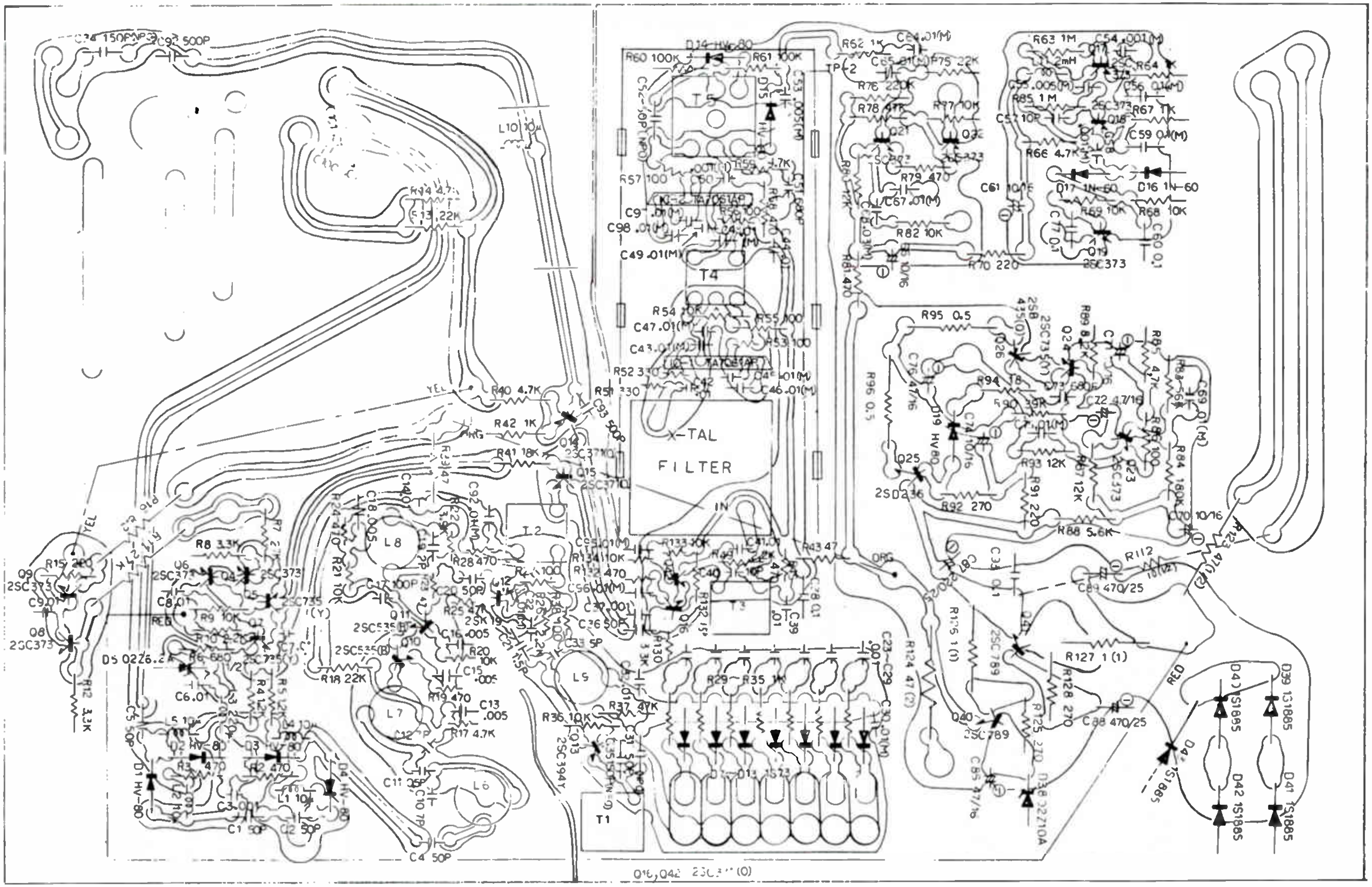
(4) Disconnect the V.T.V.M. and set it for zero center. Connect the V.T.V.M. to the junction of R40, D2 and C45. Adjust the top slug of T6 for zero center indication. Rotate the slug slightly CW and CCW of this point to establish if this reading is in fact zero center. Return adjustment to zero center.

(5) Repeat Steps 3 and 4 (ending with 4) until no further adjustment is necessary. Step 3 should result in about 0.6 VDC meter reading.

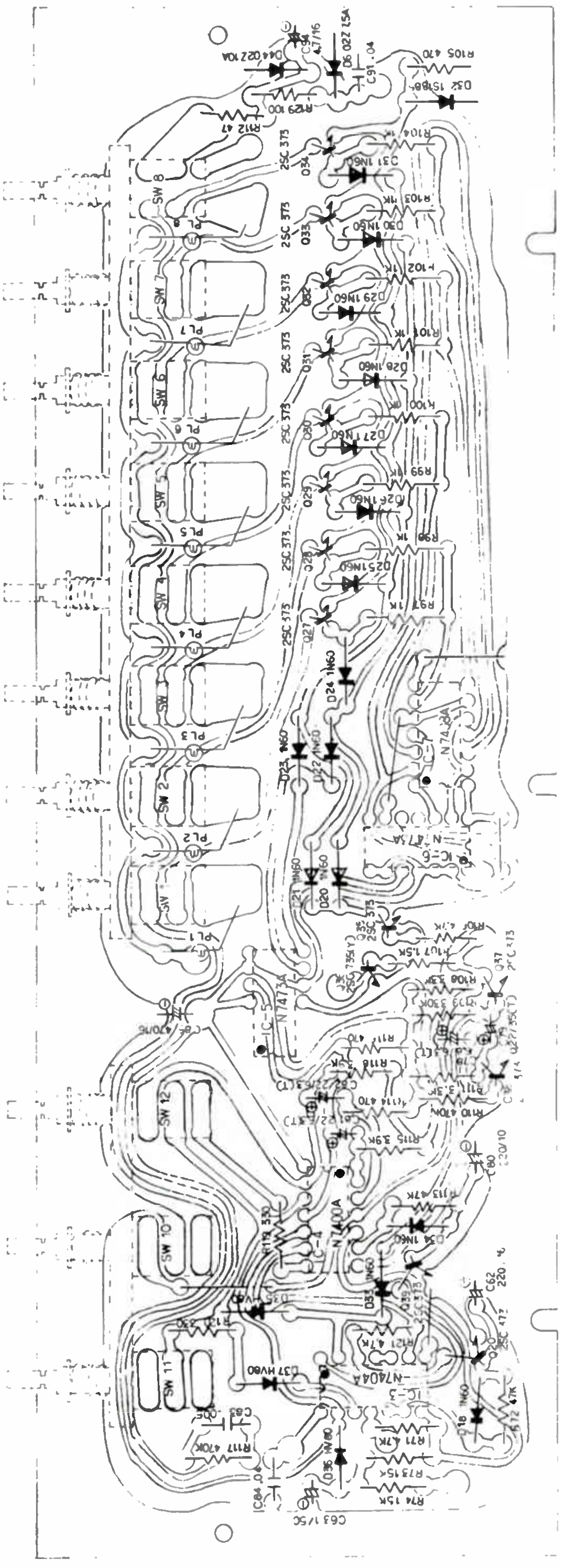
(6) Connect a V.T.V.M. to the emitter of Q9. Remove jumper from Q8. Connect the signal generator through the isolation capacitor to the base of Q6. With no signal input, the voltage at the emitter of Q9 will be approximately 1.3 - 1.4 VDC. Gradually increase signal input until the voltage at Q9 decreases about 0.1 VDC. Adjust the top and bottom slugs of T3, T4 and T5 for a minimum reading, at the same time reducing the signal generator output to maintain the 0.1 VDC drop. After adjustment, about 5 microvolts signal input will reduce the emitter voltage by 0.1 VDC.

(7) Connect a V.T.V.M. to the emitter of Q8. Connect a signal generator through an isolation capacitor to the base of Q3. With no signal input, the voltage at the emitter of Q8 will be about +1.4 VDC. Tune the signal generator to 10.7 MHz and vary the output level to obtain approximately 0.1 VDC voltage drop. Adjust the top and bottom slugs of T1 and T2 for minimum voltage reading, gradually reducing generator output to maintain the 0.1 VDC voltage drop. After adjustment, approximately 10 uv. input will reduce the Q8 emitter voltage by 0.1 VDC.

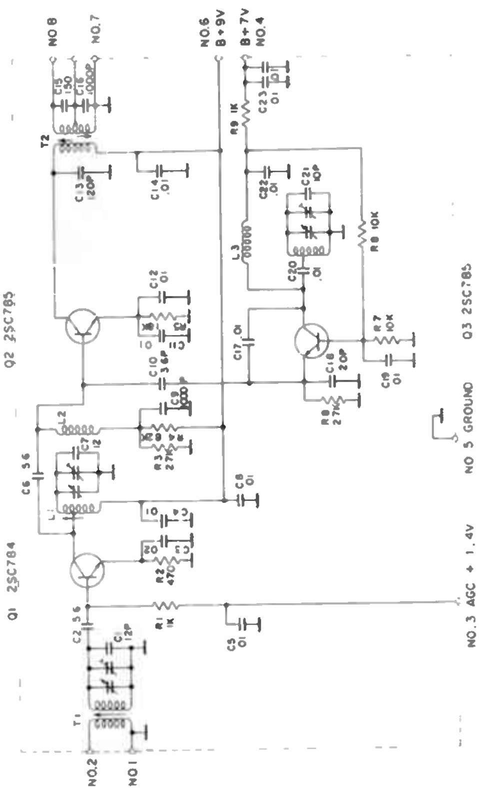
(8) Connect a signal generator to the antenna input. The receiver will quiet when the generator is on frequency. Reduce the generator output until the voltage reading at the emitter of Q8 is reduced by 0.1 VDC. Adjust L1, L2, L3 and L4 (L101, L102 and L103) for minimum voltage reading while continuing to reduce the signal generator output to maintain approximately 0.1 VDC at the Q8 emitter. Continue to adjust the coils until no further decrease can be obtained. After adjustment, 0.7 uv signal input will produce about 0.1 VDC drop at the Q8 emitter.



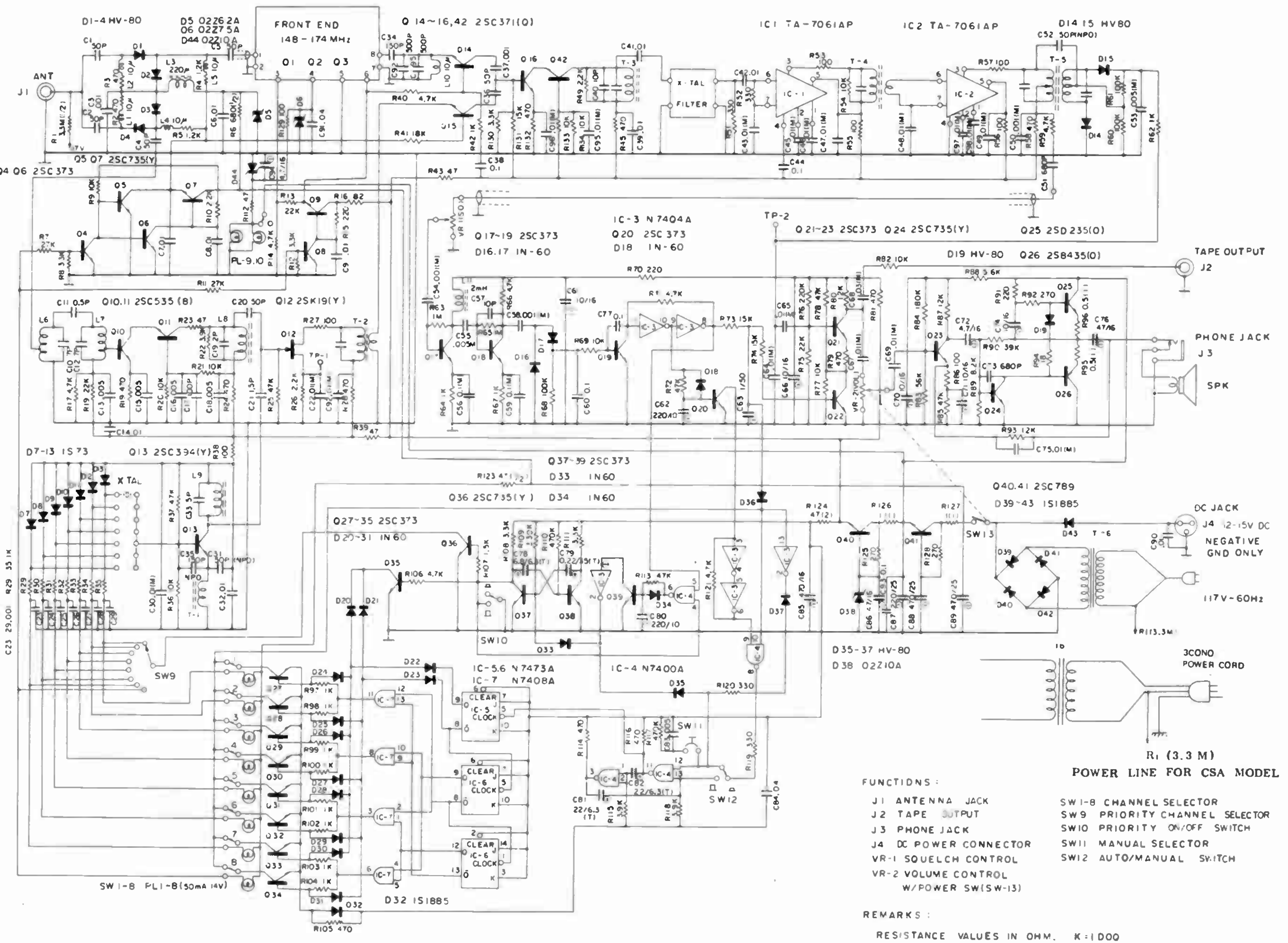
IF P.C.B. parts location



Switching P.C.B. parts location foil side



Front End Diagram



FUNCTIONS:

J1 ANTENNA JACK	SW1-8 CHANNEL SELECTOR
J2 TAPE OUTPUT	SW9 PRIORITY CHANNEL SELECTOR
J3 PHONE JACK	SW10 PRIORITY ON/OFF SWITCH
J4 DC POWER CONNECTOR	SW11 MANUAL SELECTOR
VR-1 SQUELCH CONTROL	SW12 AUTO/MANUAL SWITCH
VR-2 VOLUME CONTROL W/POWER SW(SW-13)	

REMARKS:

RESISTANCE VALUES IN OHM. K=1 000
CAPACITANCE VALUES IN MF. P= MMF
ALL VALUES AND RATING ARE SUBJCT TO CHANGE FOR IMPRDVEMENT WITHOUT NOTICE.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	R-7092	HV-80
D2	R-7092	HV-80
D3	R-7092	HV-80
D4	R-7092	HV-80
D5	R-7093	02Z6.2A
D6	R-7094	02Z7.5A
D7	R-7051	1S73
D8	R-7051	1S73
D9	R-7051	1S73
D10	R-7051	1S73
D11	R-7051	1S73
D12	R-7051	1S73
D13	R-7051	1S73
D14	R-7092	HV-80
D15	R-7092	HV-80
D16	R-7092	1N60
D17		1N60
D18		1N60
D19	R-7092	HV-80
D20		1N60
D21		1N60
D22		1N60
D23		1N60
D24		1N60
D25		1N60
D26		1N60
D27		1N60
D28		1N60
D29		1N60
D30		1N60
D31		1N60
D32	R-7096	1S1885
D33		1N60
D34		1N60
D35	R-7092	HV-80
D36	R-7092	HV-80
D37	R-7092	HV-80
D38	R-7097	02Z10A
D39	R-7096	1S1885
D40	R-7096	1S1885
D41	R-7096	1S1885
D42	R-7096	1S1885
D43	R-7096	1S1885
D44	R-7097	02Z10A
IC1		TA-7061AP
IC2		TA-7061AP
IC3		N-7404A
IC4		N-7400A
IC5		N-7473A
IC6		N-7473A
IC7		N-7408A
Q1		2SC784
Q2		2SC785
Q3		2SC785
Q4		2SC373
Q5		2SC735-Y
Q6		2SC373
Q7		2SC735-Y
Q8		2SC373
Q9		2SC373
Q10		2SC535-B
Q11		2SC535-B
Q12		2SK19-Y
Q13		2SC394-Y
Q14		2SC371-0
Q15		2SC371-0
Q16		2SC371-0
Q17		2SC373
Q18		2SC373
Q19		2SC373
Q20		2SC373
Q21		2SC373
Q22		2SC373
Q23		2SC373
Q24		2SC735-Y
Q25		2SD235-0
Q26		2SB435-0
Q27		2SC373
Q28		2SC373
Q29		2SC373
Q30		2SC373
Q31		2SC373
Q32		2SC373
Q33		2SC373
Q34		2SC373
Q35		2SC373
Q36		2SC735-Y
Q37		2SC373
Q38		2SC373
Q39		2SC373
Q40		2SC789-0
Q41		2SC789-0
Q42		2SC371-0

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C7	CE04WIC4R7	4.7mfd	16V
C61	CE04WIC100C	10mfd	16V
C62	CE04WIA221E	220mfd	10V
C63	CE04WIH010	1mfd	50V
C66	CE04WIC100C	10mfd	16V
C70	CE04WIC100C	10mfd	16V
C71	CE04WIC100C	10mfd	16V
C74	CE04WIC100C	10mfd	16V
C76	CE04WIC470B	47mfd	16V
C80	CE04WIA221E	220mfd	10V
C85	CE04WIC471B	470mfd	16V
C86	CE04WIC470B	47mfd	16V
C87	CE04WIC221	220mfd	25V
C88	CE04WIC471A	470mfd	25V
C89	CE04WIC471A	470mfd	25V
C94	CE04WIC4R7	4.7mfd	16V

CONTROLS

ITEM	DESCRIPTION
VR1	50K Squelch
VR2	50K Volume

COILS/TRANSFORMERS

ITEM	PART NO.	ITEM	PART NO.
L1	CB-2102	L9	CA-4257
L2	CB-2102	L10	CB-2102
L3	CB-2103	L11	CB-2104
L4	CB-2102	T1	CB-2105
L5	CB-2102	T2	CA-6977
L6	CA-4256	T3	CA-6978
L7	CA-4256	T4	CA-6977
L8	CA-4256	T5	CA-6685
		T6	TA-0258

MISCELLANEOUS

NAME	PART NO.
Crystal Filter	CA-2420
FM Tuner (Front End)	C-4238
P.C. Board, S.W.	GE-16B-2974
P.C. Board, IF	GE-16B-2972
Speaker	S-4037
Switch, Rotary	S-1038

TUNABLE FRONT END ALIGNMENT

STEP-1

STEP	RF GENERATOR		CONNECT VTVM & SPK	TUNER TUNED TO TRANS.	ADJUST-MENT COIL & TRANS.	REMARKS
1	ANT Terminal	154 MHz	J3	154 MHz	15 on FRONT END	To get 154 MHz signal.
2	"	"	"	"	L1,2 on FRONT END	Max reading on VTVM.
3	"	172 MHz	"	172 MHz	TR3 on FRONT END	To get 172 MHz signal
4	"		"		TR 1,2 on FRONT END	
5	Repeat step 1 to 4 until no further improvement can be obtain.					

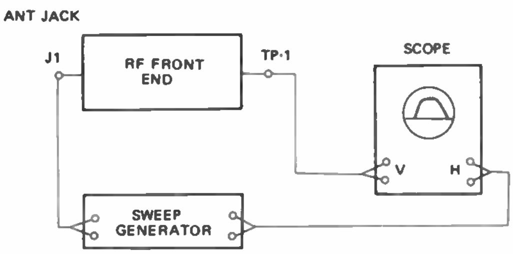


Fig. 3

STEP-1 Connect RF sweep generator to ANT JACK

STEP-2 Connect Oscilloscope to TP-1 of RF SECTION

STEP-3 Adjust L6, L7, L8 and L9 of RF SECTION for maximum output and best symmetry curve. See Fig. 4

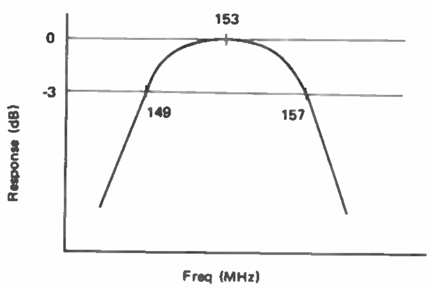


Fig. 4

LOCAL OSCILLATOR ALIGNMENT

STEP-1 Put the All CRYSTAL in sockets.

STEP-2 Couple FREQUENCY COUNTER thru pick-up coil to OSC COIL L9 of RF SECTION See Fig. 5

STEP-3 Adjust T1 of RF SECTION for best oscillating point of both side of CRYSTAL frequencies.

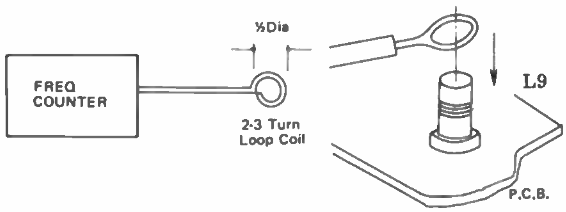


Fig. 5

2.2-3 SENSITIVITY MEASUREMENT

STEP-1 Connect RF S.S.G to ANT JACK

STEP-2 Connect AC-VTVM to speaker terminals

STEP-3 Turn SQUELCH control full counter-clockwise

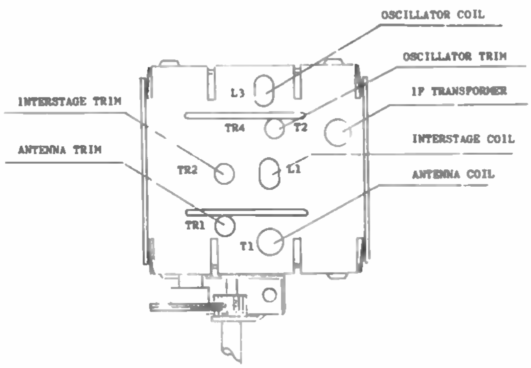
STEP-4 Turn VOLUME control full clockwise to obtain full scale meter reading at 0.1 VOLT range (Noise).

STEP-5 Adjust S.S.G frequency to channel frequency

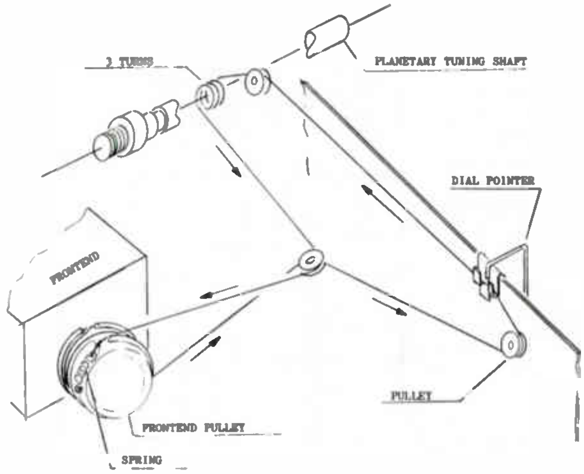
NOTE: Receiver should be now have sensitivity of 1 microvolt or better for 20 dB noise quieting.

STEP-6 Apply 1 microvolt RF signal to ANT JACK for Full power (Approx move than 2V on VTVM)

Pages 83-88 Courtesy of RADIO SHACK



Front End Layout



Dial Stringing

GENERAL ALIGNMENT INSTRUCTIONS

Note: The non-metallic alignment tool are required for complete alignment.
: The receiver should be warmed up at least 10 minutes before proceeding to the complete alignment.
: Input signal from generator should be kept as low as possible.

IF ALIGNMENT (Refer to Fig-1, Fig-2 & Fig-)

Test Equipment Needed:

-1 Oscilloscope

-2 Slow sweep generator with variable marker

STEP-1 Connect sweep generator to TP-1 (TEST POINT) of RF SECTION see Fig-1

STEP-2 Connect Oscilloscope to TP-2 of IF AMPLIFIER

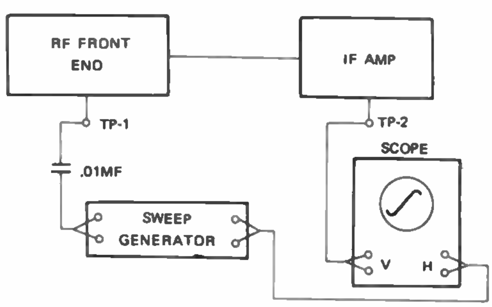


Fig. 1

STEP-3 Maintain output of sweep generator at a low level to prevent saturation from overloading

STEP-4 Adjust T2 of RF SECTION T3, T4 and T5 (Top and Bottom) of IF amplifier so that 10.7 MHz is in center of discriminator curve and for best linearity. (Refer to Fig-2)

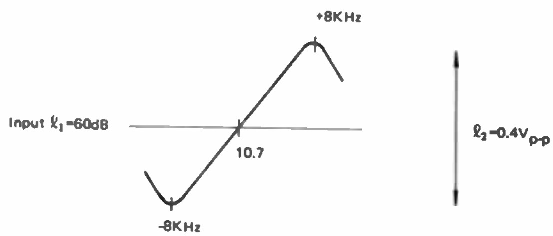


Fig. 2

STEP-5 Reference input	VS.	output Voltage
70 dB	....	= 0.55 V p-p
80 dB	....	= 0.7 V p-p

2.2 RF SECTION ALIGNMENT (Refer to Fig-3 and Fig-4)

Test Equipment Needed:

-1 RF STANDARD SIGNAL GENERATOR

-2 AC - VTVM

-3 DC - VTVM

-4 FREQUENCY COUNTER

-5 RF SWEEP GENERATOR WITH VARIABLE MARKER (130 MHz - 170 MHz)

SEMICONDUCTORS

ITEM	PART NO./TYPE
D1	1S73
D2	1S73
D3	1S73
D4	1S73
D5	1S73
D6	1S73
D7	1S73
D8	1S73
D9	HV80
D10	HV80
D11	M8489
D12	M8489
D13	HV80
D14	M8489
D15	M8489
D16	M8489
D17	M8489
D18	M8489
D19	M8489
D20	M8489
D21	M8489
D22	M8489
D23	M8489
D24	M8489
D25	M8489
D26	M8489
D27	M8489
D28	M8489
D29	M8489
D30	M8489
D31	M8489
D32	M8489
D33	M8489
D34	M8489
D35	M8489
D36	M8489
D37	M8489
D38	HV80
D39	ZB-1-9.5V
D40	FR-2P
D41	FR-2P
D42	FR-2P
IC1	TA-7061P
IC2	TA-7061P
IC3	GL-1001
IC4	GL-1001
IC5	GL-1001
IC6	GL-1002
IC7	GL-1003
IC8	GL-1002
Q1	2SC787 (2SC398)
Q2	2SC787 (2SC398)
Q3	2SK19Y
Q4	2SC380Y
Q5	2SK19Y
Q6	2SC373
Q7	2SC373
Q8	3SC373
Q9	2SC373
Q10	2SC373
Q11	2SC373
Q12	2SC373
Q13	2SC373
Q14	2SB367
Q15	2SB367
Q16	2SC373
Q17	2SC373
Q18	2SC373
Q19	2SC373
Q20	2SC373
Q21	2SC373
Q22	2SC373
Q23	2SC373
Q24	2SC735
Q25	2SC373
Q26	2SC971
Q27	2SC373
Q28	2SC373

ELECTROLYTIC CAPS

ITEM	VALUE		ITEM	VALUE	
C28	47mfd	16V	C53	33mfd	16V
C29	1mfd	50V	C54	68mfd	6.3V
C30	1mfd	50V	C55	33mfd	16V
C33	10mfd	16V	C56	100mfd	16V
C37	47mfd	16V	C57	100mfd	16V
C38	47mfd	16V	C58	47mfd	16V
C39	220mfd	16V	C60	4700mfd	16V
C41	47mfd	16V	C61	1mfd	50V
C48	2.2mfd	16V	C64	470mfd	16V

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION
R53	0.5 ohms WW
R54	0.5 ohms WW
TH1	Thermistor, D-1E
TH2	Thermistor, D-1E
VR1	50K Squelch
VR2	50K Volume/Switch

COILS/TRANSFORMERS

ITEM	PART NO.		
(RF FRONT END)		(AMP)	
L1	M-20001	L1	(2 mh)
L2	M-20001	L2	OB-002
L3	M-20001	T1	R-12 2851
L4	M-20000	T2	R-12 2875
T1	R-12 2851	T3	R1787
T2	TKEN-20777	T4	E-2294C
		T5	K-0305B

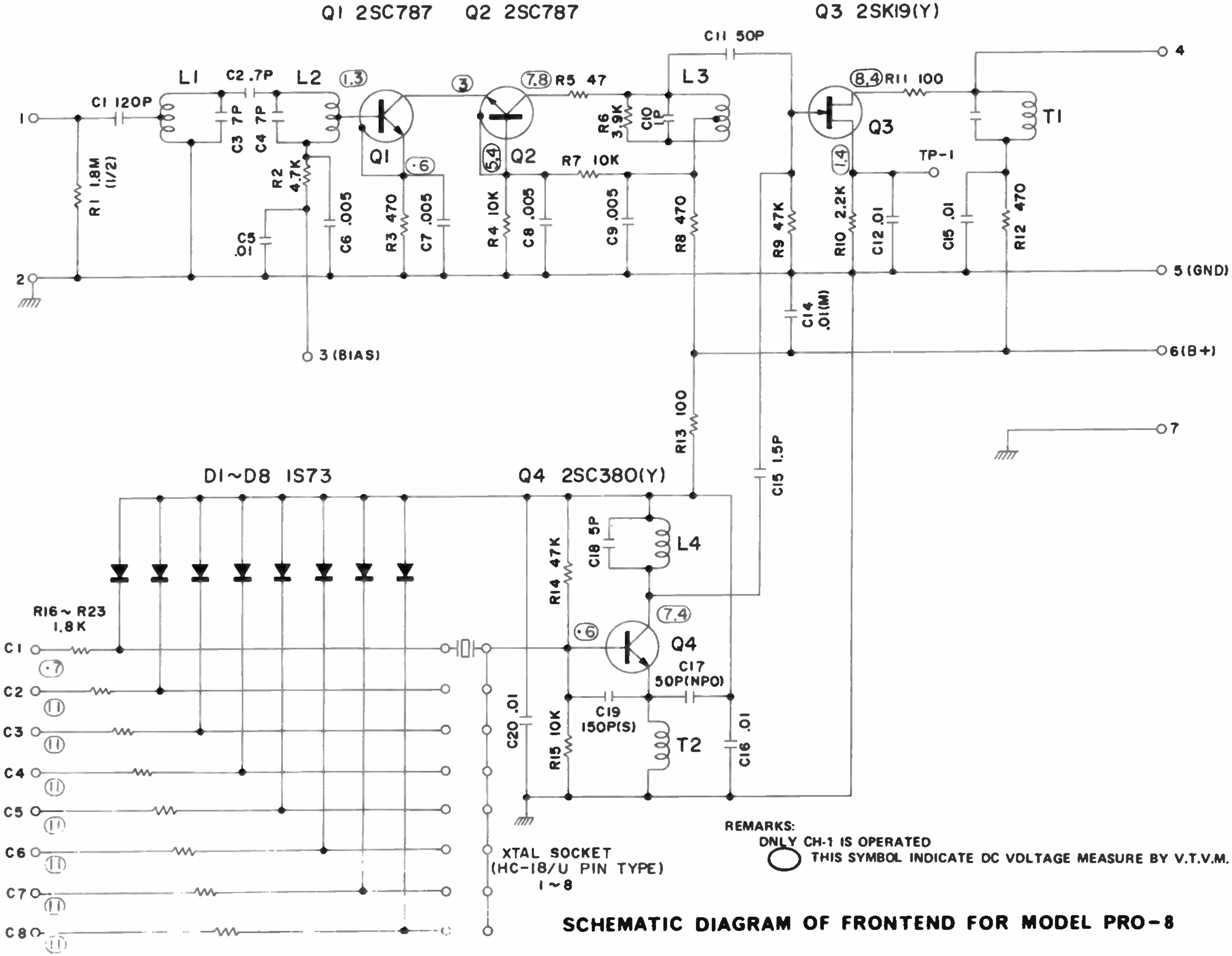
MISCELLANEOUS

ITEM	NAME	PART NO.
SW1	Switch, Priority, Channel	F-1-18
	Filter, Crystal	FHA-103-4
	P.C. Board, RF Front End	GE-15C-1861
	Socket, Crystal	HC-25/4
	Speaker	163-01

CABINET PARTS

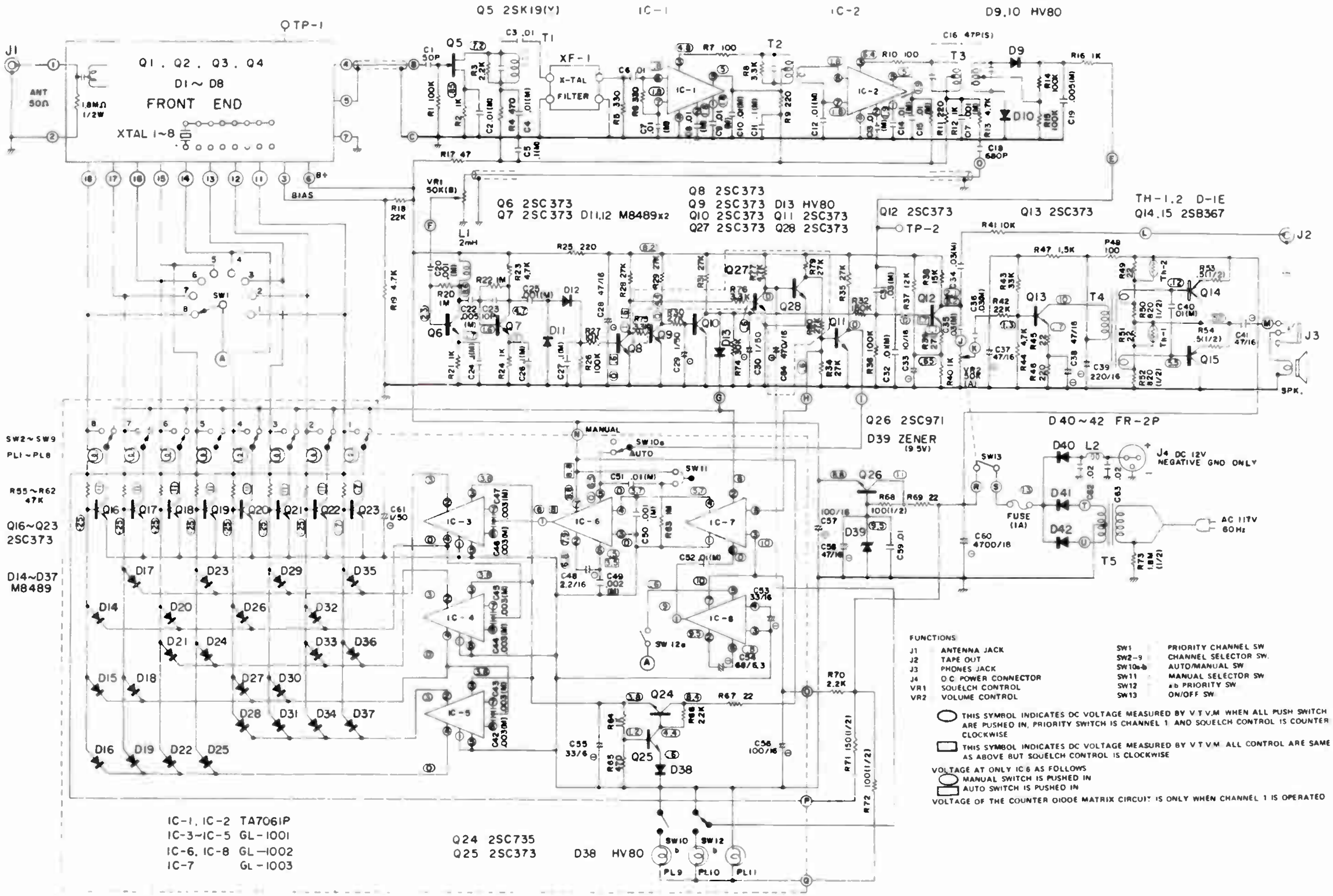
NAME	PART NO.
Cabinet	GE-15B-1851
Handle	GE-15B-1854
Plate, Bottom	GE-150-1868
Cover, Crystal	GE-150-1866
Escutcheon, Front	GE-158-2033
Panel, Front	GE-15C-1855
Knob, Metal	GE-150-1849

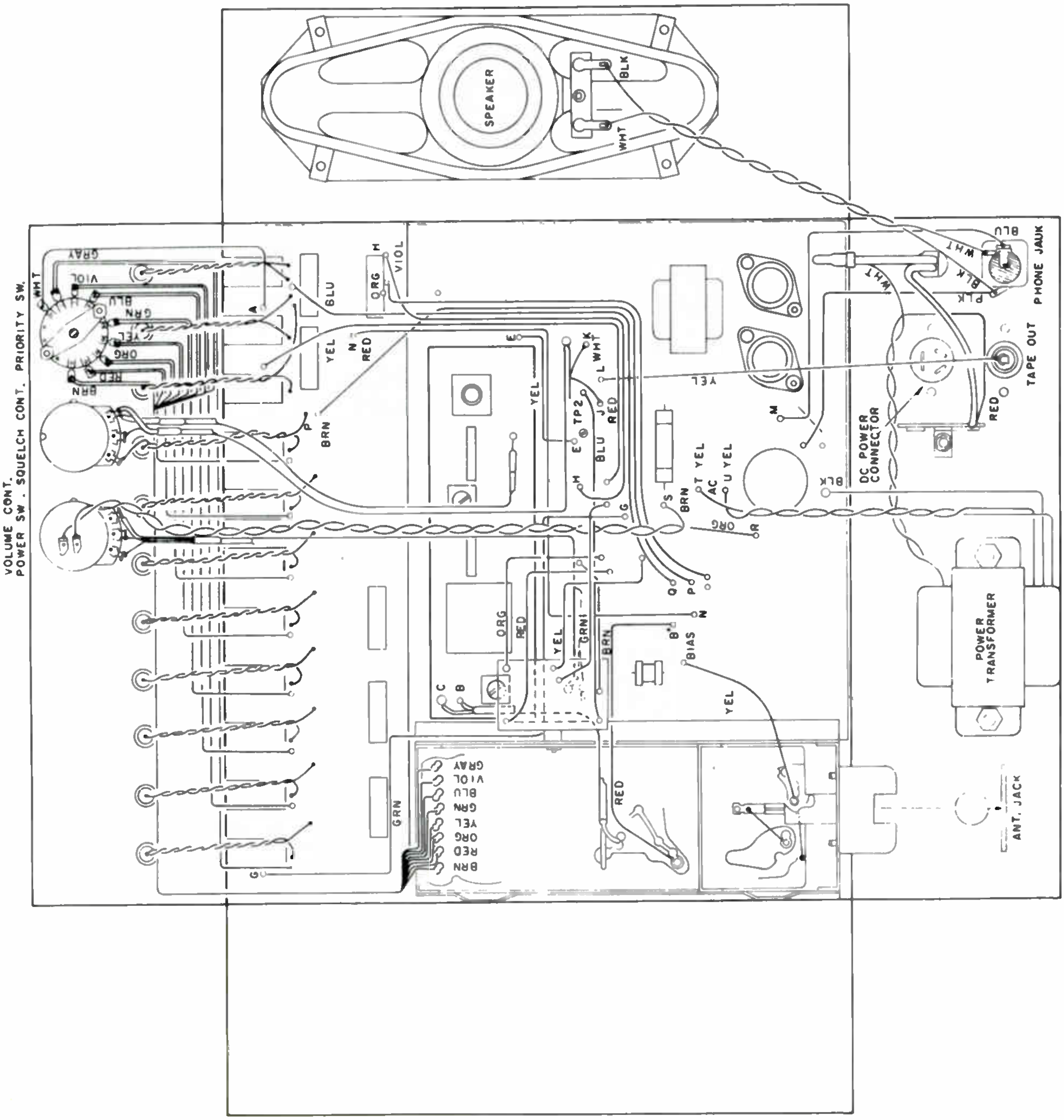
RF FRONTEND SCHEMATIC DIAGRAM



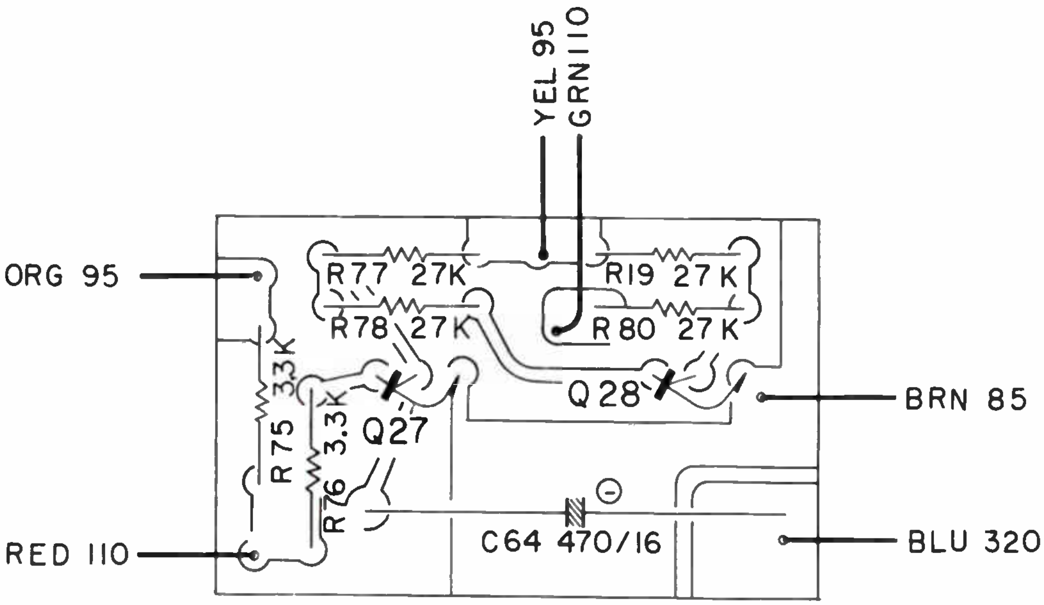
SCHEMATIC DIAGRAM OF FRONTEND FOR MODEL PRO-8

GENERAL SCHEMATIC DIAGRAM



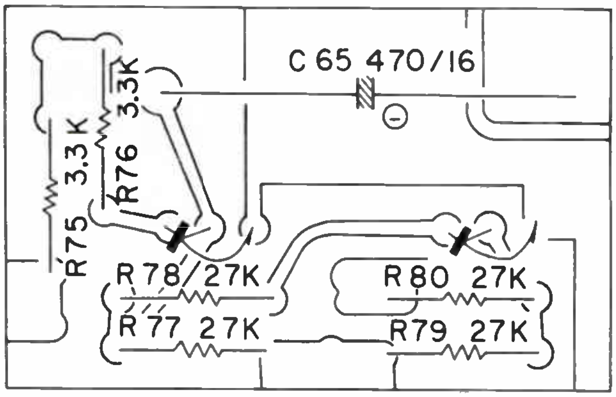


WIRING DIAGRAM



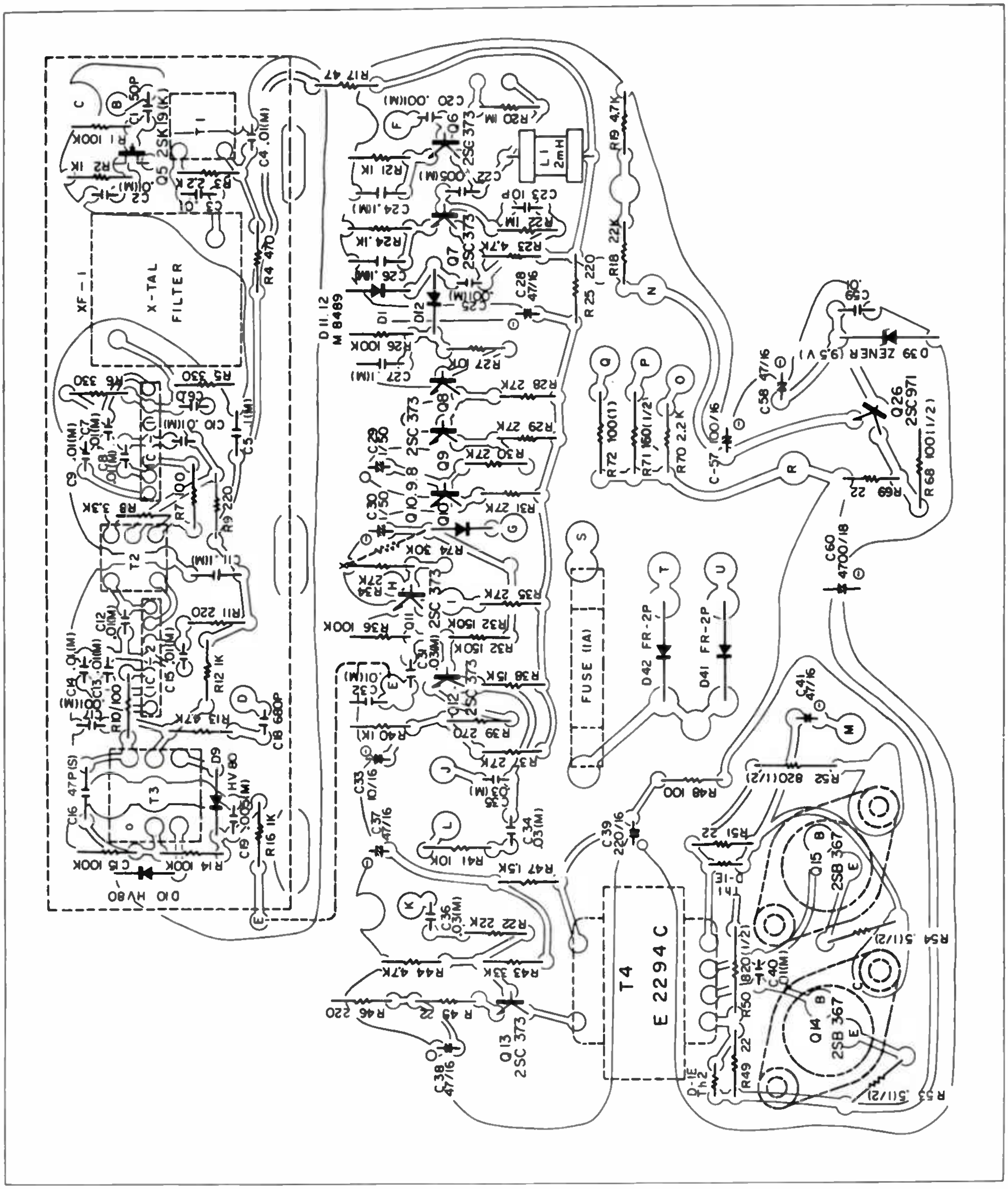
TOP VIEW

Fig. 15 DELAY CIRCUIT P.C.B. PARTS LOCATION



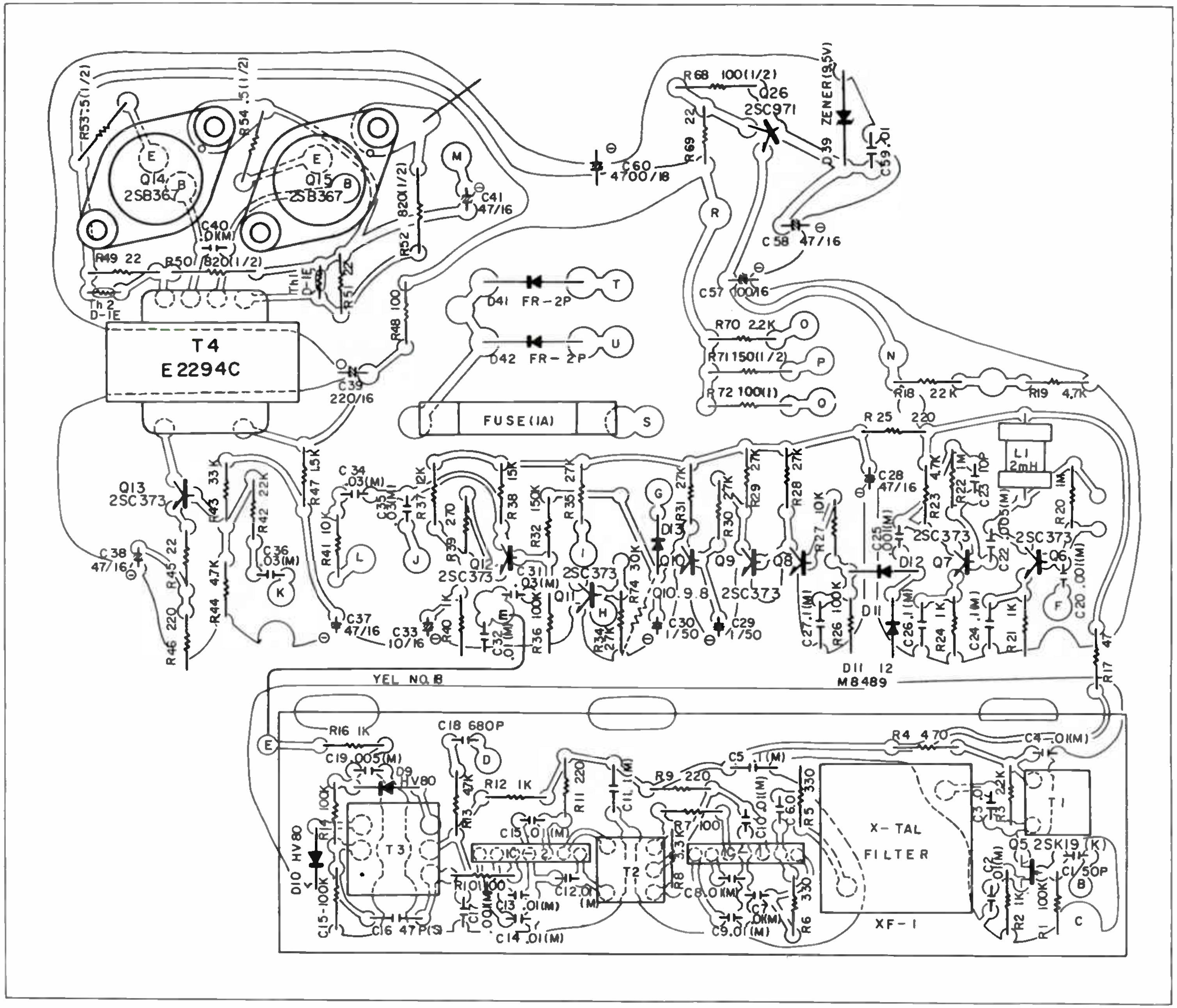
REAR VIEW

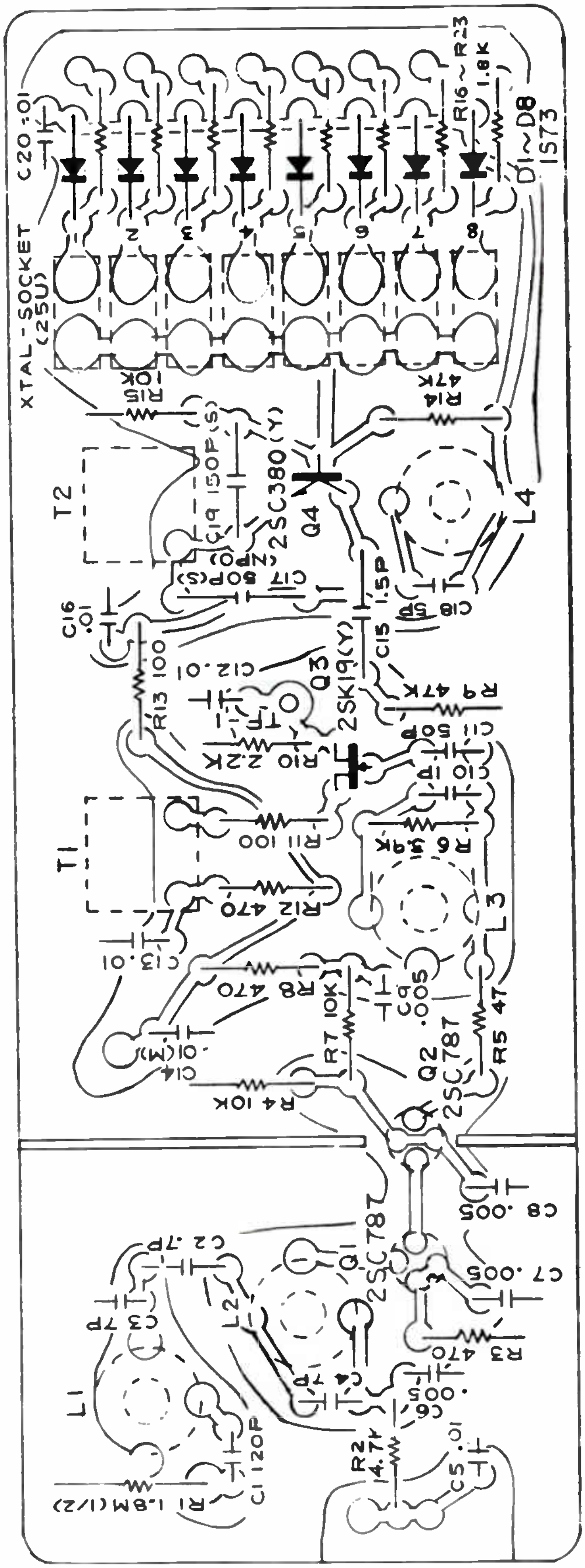
DELAY CIRCUIT P.C.B. PARTS LOCATION FOIL SIDE



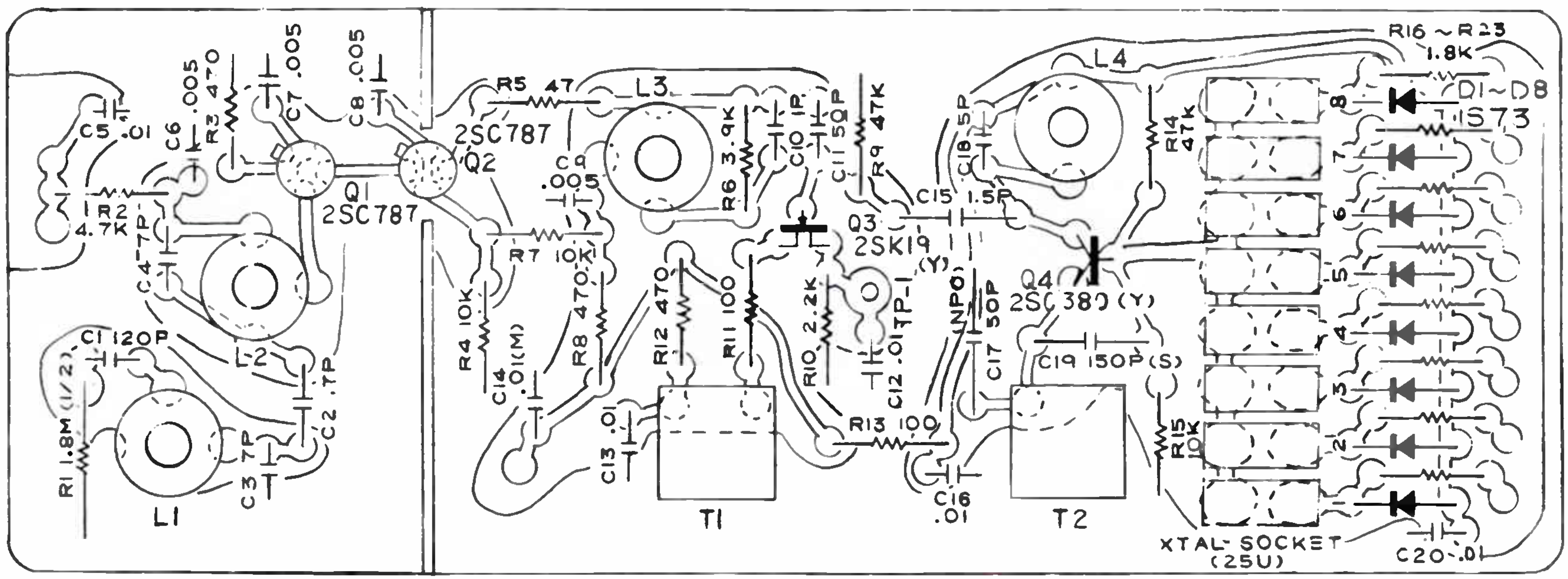
IF AND AF P.C.B. PARTS LOCATION FOIL SIDE

IF AND AF P.C.B. PARTS LOCATION

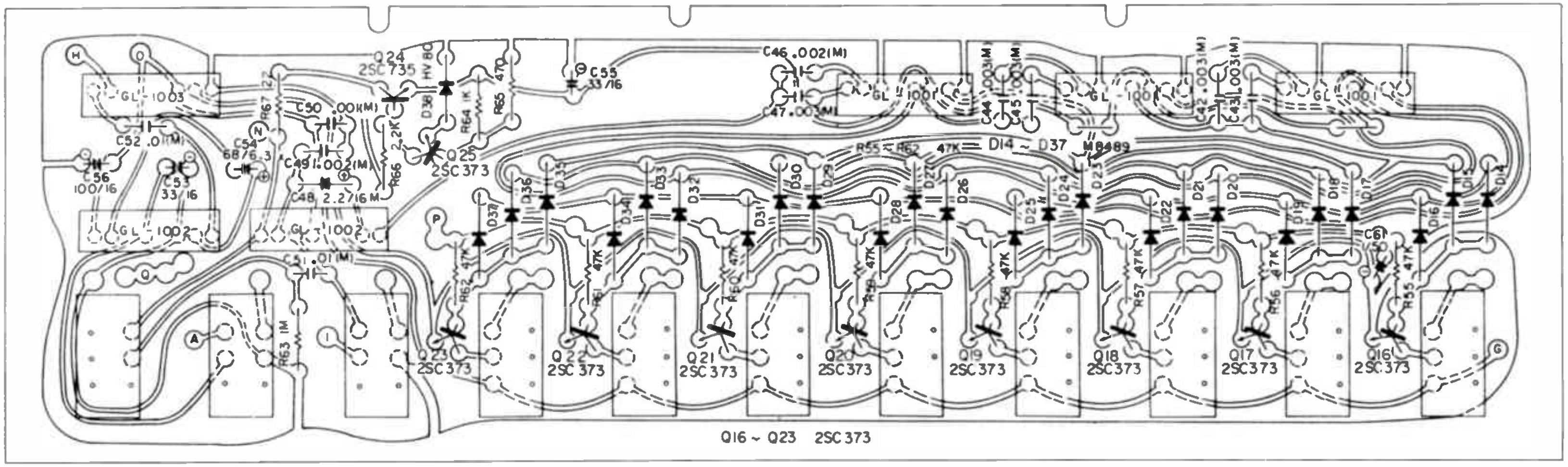




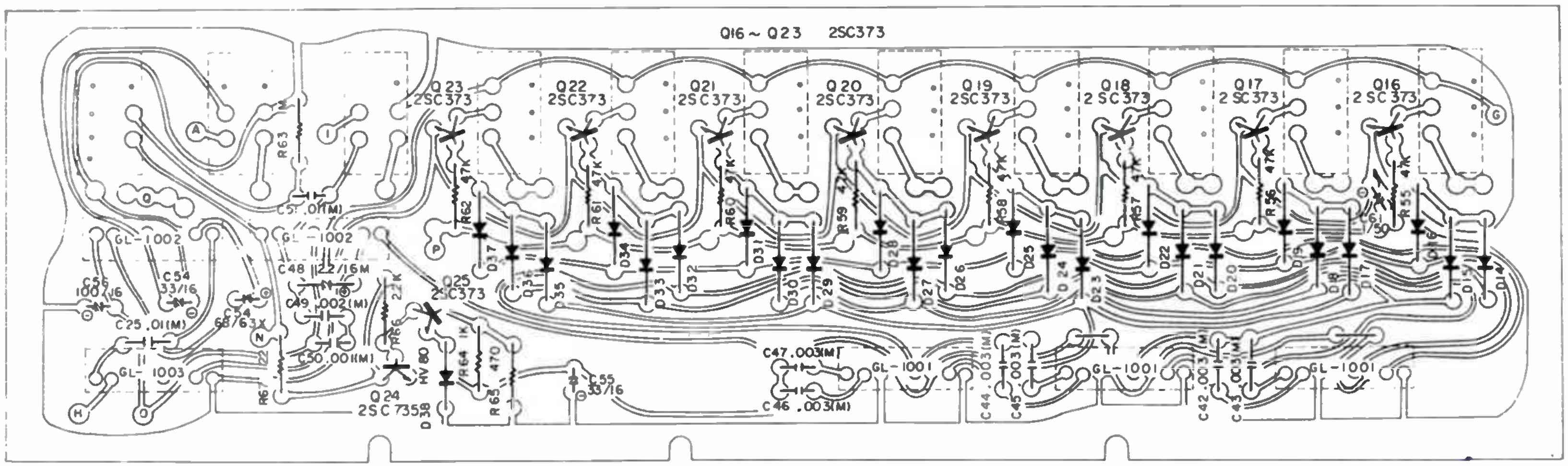
RF FRONTEND P.C.B. PARTS LOCATION FOIL SIDE



RF FRONTEND P.C.B. PARTS LOCATION



DIODE MATRIX P.C.B. PARTS LOCATION



DIODE MATRIX P.C.B. PARTS LOCATION FOIL SIDE

LOCAL OSCILLATOR ALIGNMENT

STEP-1 Put the All X'TAL in sockets.

STEP-2 Couple FREQUENCY COUNTER thru pick-up coil to OSC COIL T2 of FRONT END See Fig. 5

STEP-3 Adjust T2 of FRONT END for best oscillating point of both side of X'TALfrequencies.

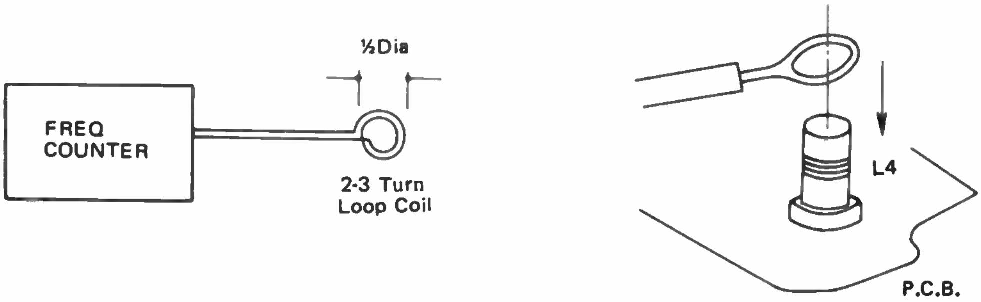


Fig. 5

SENSITIVITY MEASUREMENT

STEP-1 Connect RF S.S.G to ANT JACK

STEP-2 Connect AC-VTVM to speaker terminals

STEP-3 Turn SQUELCH control full counter-clockwise

STEP-4 Turn VOLUME control full clockwise to obtain full scale meter reading at 0.1 VOLT range (Noise).

STEP-5 Adjust S.S.G frequency to channel frequency

NOTE: Receiver should be now have sensitivity of 1 microvolt or better for 20dB noise quieting.

STEP-6 Apply 1 microvolt RF signal to ANT JACK for Full power (Approx move than 3V on VTVM)

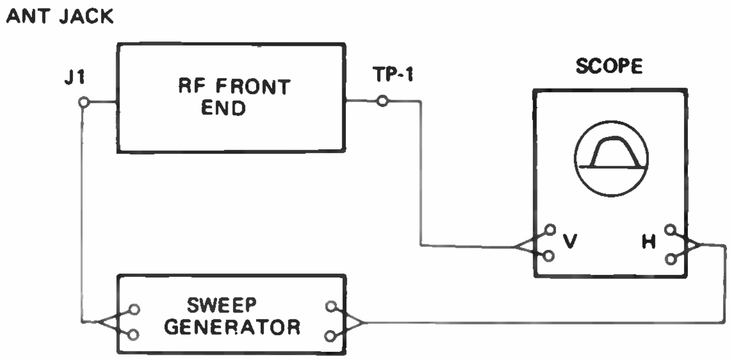


Fig. 3

STEP-1 Connect RF sweep generator to ANT JACK

STEP-2 Connect Oscilloscope to TP-1 of RF FRONT END

STEP-3 Adjust L1, L2, L3 and L4 of RF FRONT END for maximum output and best symmetry curve.
See Fig. 4

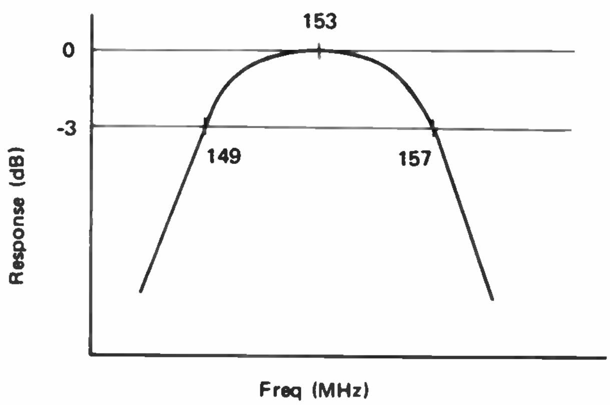


Fig. 4

STEP-3 Maintain output of sweep generator at a low level to prevent saturation from overloading

STEP-4 Adjust T1 of FRONT END T1, T2 and T3 (Top and Bottom) of IF amplifier so that 10.7MHz is in center of discriminator curve and for best linearity. (Refer to Fig-2)

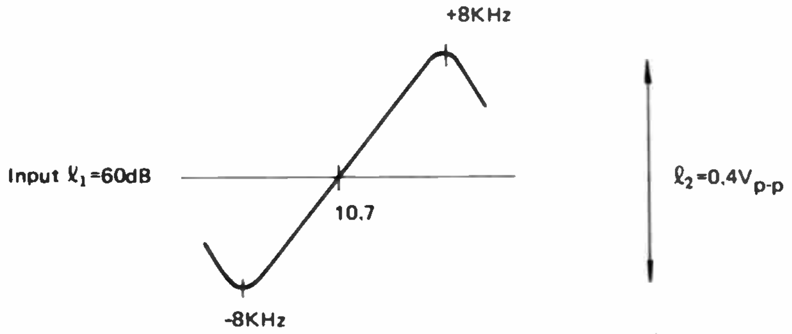


Fig. 2

STEP-5 Reference input ℓ_1 VS. ℓ_2 output Voltage

ℓ_1 70 dB .... ℓ_2 = 0.55 V p-p

ℓ_1 80 dB .... ℓ_2 = 0.7V p-p

2.2 RF FRONT END ALIGNMENT (Refer to Fig-3 and Fig-4)

Test Equipment Needed:

-1 RF STANDARD SIGNAL GENERATOR

-2 AC - VTVM

-3 DC - VTVM

-4 FREQUENCY COUNTER

-5 RF SWEEP GENERATOR WITH VARIABLE MARKER (130MHz - 170MHz)

IC

IC-1, IC-2	TA7061	IF Amp. and Limiter
IC-3, IC-4, IC-5	GL-1001	Flip-Flop
IC-6	GL-1002	Scanning Generator
IC-7	GL-1003	Priority and Lock-out
IC-8	GL-1002	Priority

GENERAL ALIGNMENT INSTRUCTIONS

Note: The non-metallic alignment tool are required for complete alignment.

: The receiver should be warm up at least 10 minutes before proceed to the complete alignment.

: Input signal from generator should be kept as low as possible.

IF ALIGNMENT (Refer to Fig-1, Fig-2 & Fig-9)

Test Equipment Needed:

-1 Oscilloscope

-2 Slow sweep generator with variable meter

STEP-1 Connect sweep generator to TP-1 (TEST POINT) of RF FRONT END see Fig-1

STEP-2 Connect Oscilloscope to TP-2 of IF AMPLIFIER

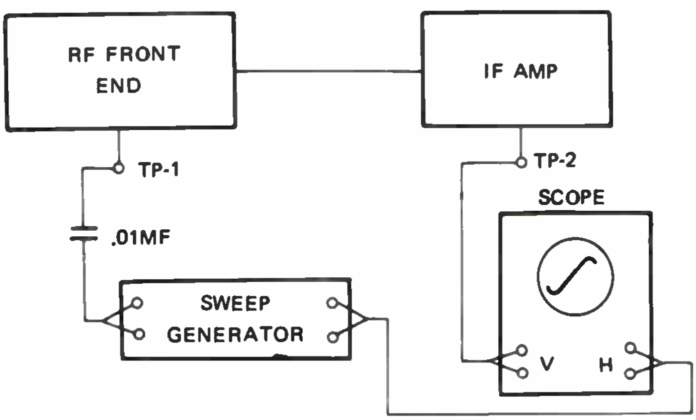


Fig. 1

SEMICONDUCTORS

ITEM	TYPE
D1	HV-80
D2	HV-80
D3	1S73
D4	1S73
D5	1S73
D6	1S73
D7	1S73
D8	1S73
D9	1S73
D10	1S73
D11	M-8489A
D12	M-8489A
D13	M-8489A
D14	HV-80
D15	HV-80
D16	AW01-09
D17	1S1885
D18	1S1885
D19	1S1885
D20	1S1885
D21	1S1885
D22	M8489A
D23	M8489A
D24	M8489A
D25	M8489A
D26	M8489A
D27	M8489A
D28	M8489A
D29	M8489A
IC1	TA-7061B
IC2	TA-7060
IC3	N7404A
IC4	N7400A
IC5	N7400A
IC6	N7408A
Q1	2SC535
Q2	2SC535
Q3	2SK19
Q4	2SC394
Q5	2SK19
Q6	2SC373
Q7	2SC373
Q8	2SC373
Q9	2SC373
Q10	2SC373
Q11	2SC373
Q12	2SC735
Q13	2SD235
Q14	2SB435
Q15	2SC373
Q16	2SC373
Q17	2SC373
Q18	2SC373
Q19	2SC373
Q20	2SC373
Q21	2SC373
Q22	2SC373
Q23	2SC1162

ELECTROLYTIC CAPS

ITEM	VALUE	
C43	1mfd	50V
C44	10mfd	16V
C45	220mfd	16V
C46	1mfd	50V
C49	10mfd	16V
C50	10mfd	16V
C53	10mfd	16V
C54	47mfd	16V
C55	4.7mfd	16V
C57	10mfd	16V
C58	47mfd	16V
C60	220mfd	16V
C67	22mfd	6.3V
C68	22mfd	6.3V
C72	470mfd	16V
C73	220mfd	16V
C74	470mfd	25V
C75	470mfd	25V

CONTROLS

ITEM	PART NO.	DESCRIPTION
VR1	VM10A-50KB	50K Squelch
VR2	VM11A-5M1111	5meg Volume

COILS/TRANSFORMERS

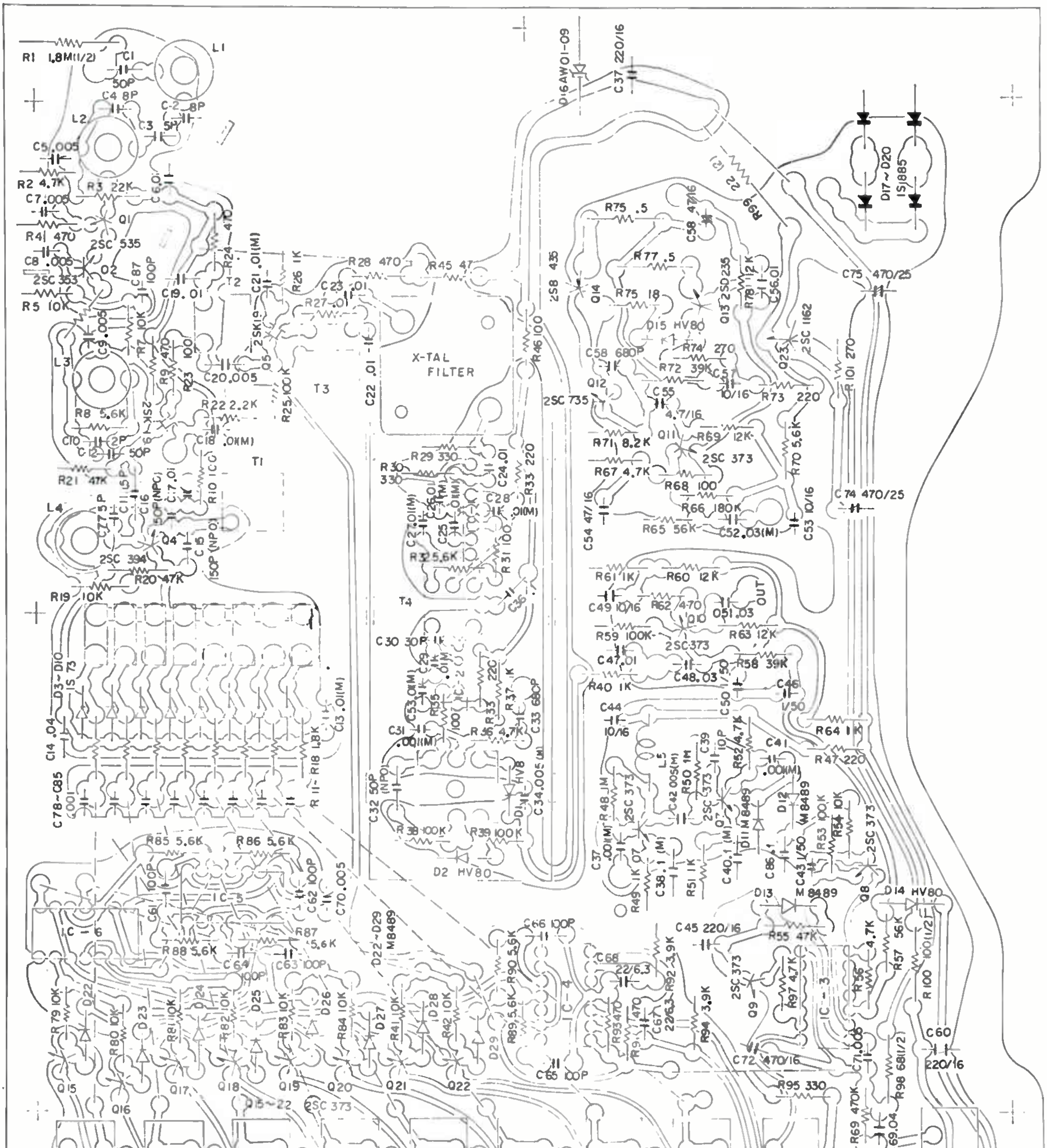
ITEM	PART NO.
L1	M-20001
L2	M-20001
L3	M-20001
L4	M-20001
T1	TKEN-21738NK
T2	R12-2851
T3	R12-2851
T4	R12-2875
T5	R-1787
T6	K-0888

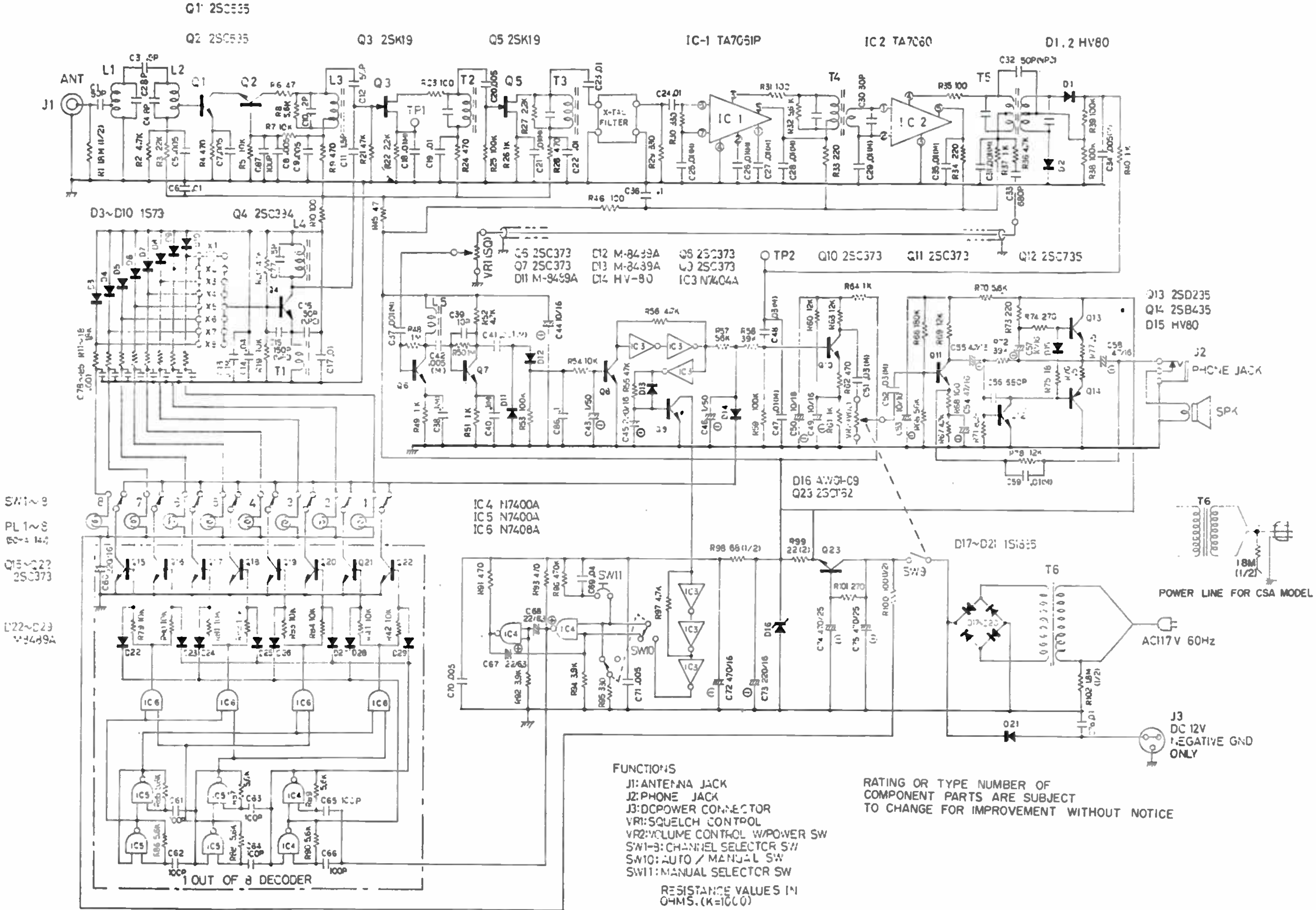
MISCELLANEOUS

NAME	PART NO.
Crystal Filter	FHA-103-4
Speaker	163-01
P.C. Board	GE-16B-2779

CABINET PARTS

NAME	PART NO.
Cabinet	GE-16B-2765
Panel, Front	GE-16C-2792
Escutcheon, Front	GE-16B-2786
Knob, Volume	GE-16D-2793
Knob, Squelch	GE-16D-2793

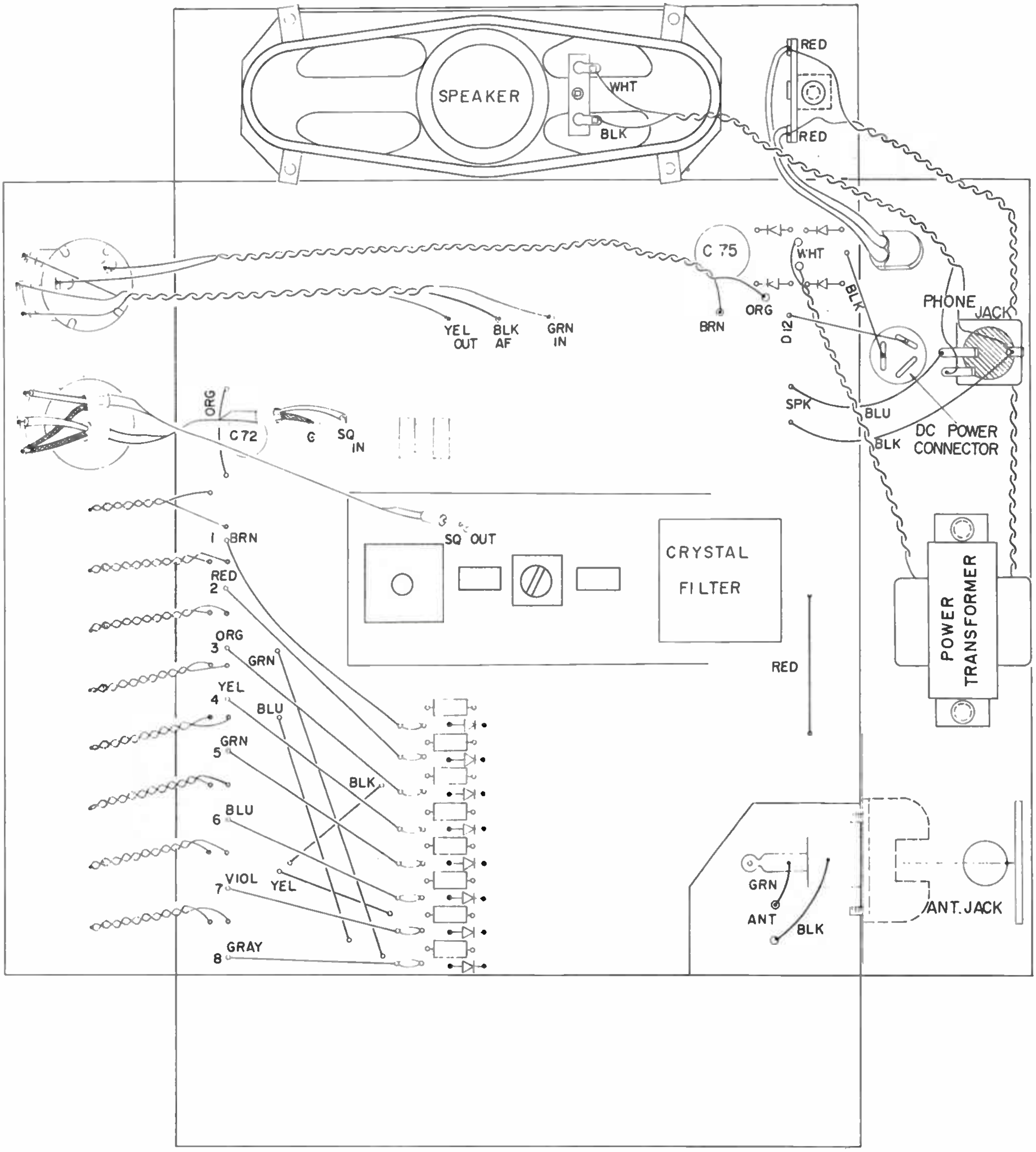

X-TAL
FILTER
L1
L2
L3
L4
T1
T2
T3
T4
IC-2
IC-3
IC-4
IC-5
IC-6
D3~D10
IS 73
D17~D20
IS1885
D22~D29
M8489
D16AW01-09
Q15~22
2SC 373
2SC 535
2SC 353
2SC 394
2SK19
2SC 735
2SB 435
2SD235
2SC 1162
R11~R18 1.8K
C78~C85
.001
C37 220/16
C74 470/25
C75 470/25
C60
220/16
C72 470/16
C45 220/16
C54 47/16
C53 10/16
OUT



FUNCTIONS
J1: ANTENNA JACK
J2: PHONE JACK
J3: DC POWER CONNECTOR
VR1: SQUELCH CONTROL
VR2: VOLUME CONTROL W/POWER SW
SW1-8: CHANNEL SELECTOR SW
SW10: AUTO / MANUAL SW
SW11: MANUAL SELECTOR SW

RESISTANCE VALUES IN OHMS. (K=1000)
CAPACITANCE VALUES IN MF. (P=MMF)

RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE


SPEAKER
WHT
BLK
RED
RED
C 75
WHT
BLK
ORG
BRN
D12
PHONE JACK
YEL OUT
BLK AF
GRN IN
ORG
C72
SQ IN
SPK
BLU
BLK
DC POWER CONNECTOR
3
SQ OUT
CRYSTAL FILTER
POWER TRANSFORMER
RED
1 BRN
RED 2
ORG 3
GRN
YEL 4
BLU
GRN 5
BLK
BLU 6
VIOL 7
YEL
GRAY 8
GRN
ANT
BLK
ANT. JACK

2.1 IF ALIGNMENT (Refer to Fig-1, Fig-2 & Fig-9)

Test Equipment Needed:

-1 Oscilloscope

-2 Slow sweep generator with variable marker

STEP-1 Connect sweep generator to TP-1 (TEST POINT) of RF section see Fig-1

STEP-2 Connect Oscilloscope to TP-2 of IF AMPLIFIER

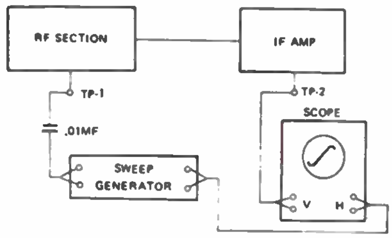


Fig. 1

STEP-3 Maintain output of sweep generator at a low level to prevent saturation from overloading

STEP-4 Adjust T2 of RF SECTION T3, T4 and T5 (Top and Bottom) of IF amplifier so that 10.7MHz is in center of discriminator curve and for best linearity. (Refer to Fig-2)

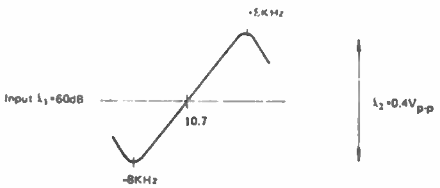


Fig. 2

STEP-5 Reference input ℓ_1 VS. ℓ_2 output Voltage

ℓ_1 70 dB .... ℓ_2 = 0.55 V p-p

ℓ_1 80 dB .... ℓ_2 = 0.7V p-p

2.2 RF SECTION ALIGNMENT (Refer to Fig-3 and Fig-4)

Test Equipment Needed:

-1 RF STANDARD SIGNAL GENERATOR

-2 AC - VTVM

-3 DC - VTVM

-4 FREQUENCY COUNTER

-5 RF SWEEP GENERATOR WITH VARIABLE MARKER (130MHz - 170MHz)

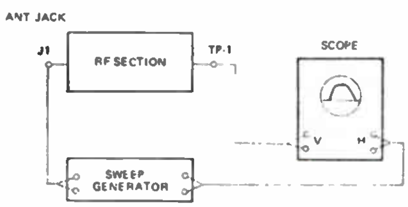


Fig. 3

STEP-1 Connect RF sweep generator to ANT JACK

STEP-2 Connect Oscilloscope to TP-1 of RF SECTION

STEP-3 Adjust L1, L2, L3 and L4 of RF SECTION for maximum output and best symmetry curve. See Fig. 4

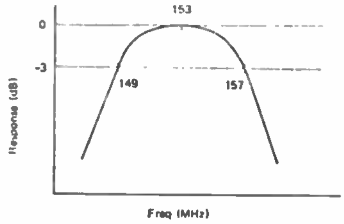


Fig. 4

LOCAL OSCILLATOR ALIGNMENT

STEP-1 Put the All CRYSTAL in sockets.

STEP-2 Couple FREQUENCY COUNTER thru pick-up coil to OSC COIL L4 of FRONT SECTION See Fig. 5

STEP-3 Adjust T1 of FRONT SECTION for best oscillating point of both side of CRYSTAL frequencies.

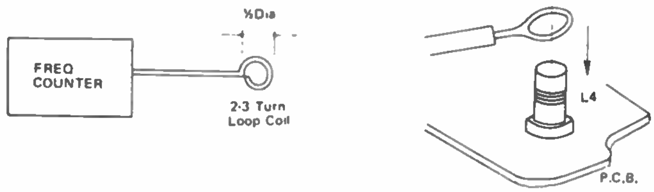


Fig. 5

SENSITIVITY MEASUREMENT

STEP-1 Connect RF S.S.G to ANT JACK

STEP-2 Connect AC-VTVM to speaker terminals

STEP-3 Turn SQUELCH control full counter-clockwise

STEP-4 Turn VOLUME control full clockwise to obtain full scale meter reading at 0.1 VOLT range (Noise).

STEP-5 Adjust S.S.G frequency to channel frequency

NOTE: Receiver should be now have sensitivity of 1 microvolt or better for 20dB noise quieting.

STEP-5 Apply 1 microvolt RF signal to ANT JACK for Full power (Approx move than 2V on VTVM)

SEMICONDUCTORS

ITEM	PART NO./TYPE
Q1	MFE-3008 (554C) (RCA 40601)
Q2	MFE-3008 (554C) (RCA 40601)
Q3	RCA 40600 (RCA 40601)
Q4	RCA 40600 (RCA 40601)
Q5	Fairchild 2N3563
Q6	MFE-3008 (554C) (RCA 40601)
Q7	MFE-3008 (554C) (RCA 40601)
Q8	Fairchild 2N3563
Q9	Fairchild 2N3563
Q10	Motorola MPS-3705
Q11	Fairchild 2N3563
Q12	Motorola MPS-3393
Q13	Motorola MPS-3393
Q14	Motorola MPS-3393
Q15	Motorola MPS-3393
Q16	Motorola MPS-3393
Q17	Motorola MPS-3393
Q18	Motorola MPS-3393
Q19	Motorola MPS-3393
Q20	Motorola MPS-3393
Q21	Motorola MPS-3393
Q22	Motorola MPS-3393
Q23	Motorola MPS-3702
Q24	Motorola MPS-U51
Q25	Motorola MPS-U01
Q26	Motorola MPS-3393
Q27	Motorola MPS-3393
Q28	Motorola MPS-3393
Q29	Motorola MPS-3393
Q30	RCA 40323

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C12	Arco 402	1.5-20pf Trimmer
C13	Centralab 829-6	1-6pf Trimmer
C20	Centralab 829-6	1-6pf Trimmer
C21	Centralab 829-6	1-6pf Trimmer
C54	Kemet K6R8E6	6.8mfd
C58		2mfd NP
C59		200mfd 10V
C63		1000mfd 20V

CONTROLS

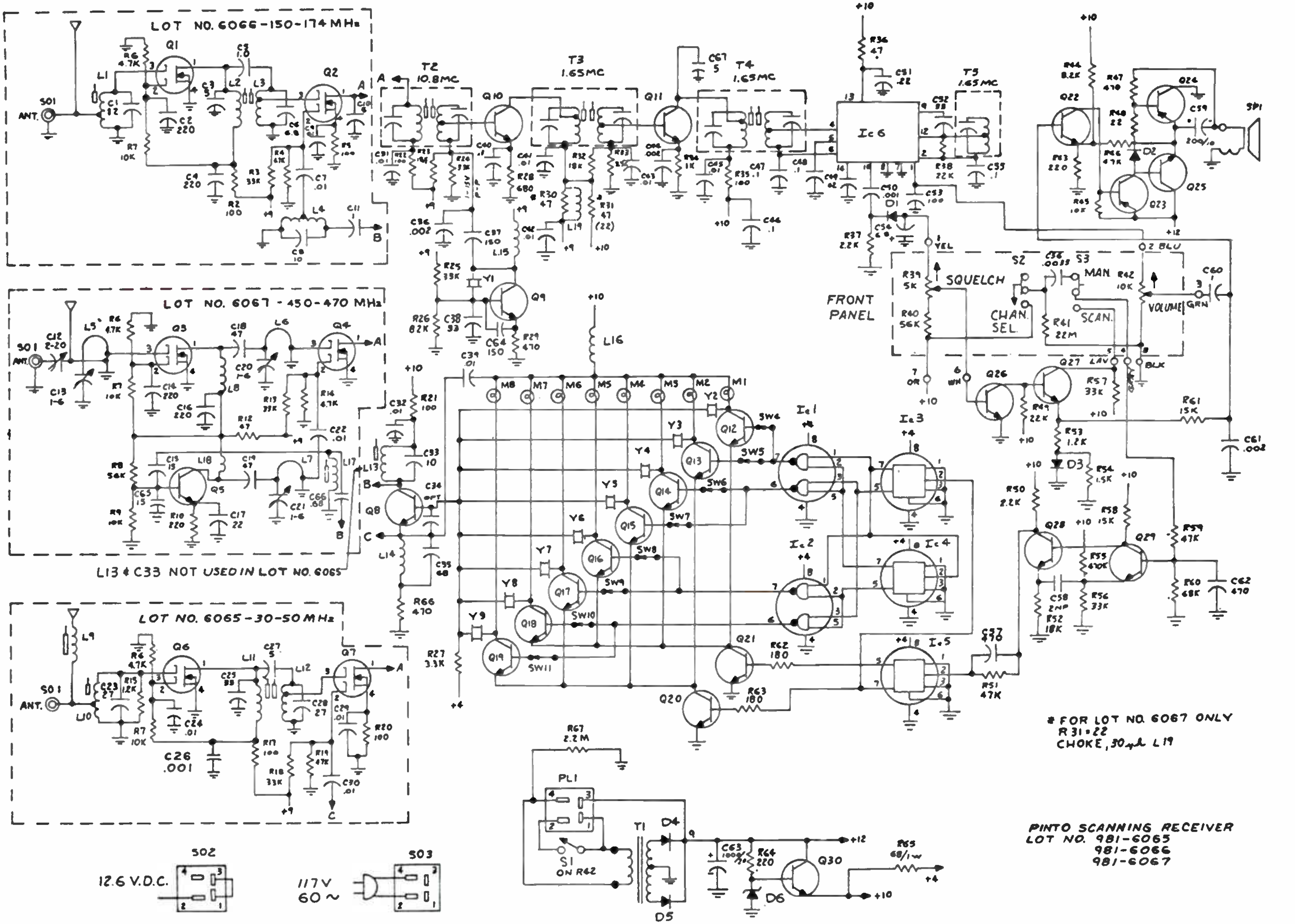
ITEM	DESCRIPTION
R39	5K Squelch
R42	10K Volume/Switch

COILS/TRANSFORMERS

ITEM	PART NO.
L1	B-146-1
L2	B-146-2
L3	B-146-3
L4	B-146-3
L5	A-158-2
L6	A-158-1
L7	A-158-2
L8	A-110
L9	A-136-3
L10	B-146-4
L11	B-146-5
L12	B-146-6
L13	B-146-2
L14	A-110
L15	A-149-1
L16	A-149-1
L17	B-146-2
L18	A-148
T1	B-129-1
T2	B-128-1
T3	B-127-1
T4	B-127-1
T5	B-126-1

MISCELLANEOUS

ITEM	NAME	PART NO.
SP	Speaker, 8 ohm	B-153-1
Y1	Crystal, 12.45000 MC	A-101-2


LOT NO. 6066-150-174 MHz
LOT NO. 6067 - 450-470 MHz
LOT NO. 6065-30-50 MHz
L13 & C33 NOT USED IN LOT NO. 6065
T2 10.8MC
T3 1.65MC
T4 1.65MC
T5 1.65MC
FRONT PANEL
SQUELCH
CHAN. SEL.
MAN
SCAN.
VOLUME
FOR LOT NO. 6067 ONLY
R 31 = 22
CHOKE, 30µh L19
12.6 V.D.C.
117V 60 ~
S1 ON R42
PINTO SCANNING RECEIVER
LOT NO. 981-6065
981-6066
981-6067

Pages 61-63 Courtesy of J.C. PENNEY CO., INC.

Unless ordered otherwise the 6067 alignment spread is 450 MHz to 470 MHz; the 6066, 151 MHz to 163 MHz; and the 6065 is aligned with a 7 MHz spread to include the frequencies ordered and factory installed. New frequencies may be added within these spreads; if they are outside, performance may be reduced or realignment may be required.

CRYSTAL FORMULAS

6066 - $\dfrac{\text{Received frequency} - 10.80\text{ MHz}}{3}$ = crystal frequency

Example: $\dfrac{155.01\text{ MHz} - 10.80\text{ MHz}}{3} = 48.07000\text{ MHz}$

6065 - Received frequency ± 10.80 MHz = crystal frequency.
30-40 MHz, use high side conversion.
40-50 MHz, use low side conversion.

Example: 35.80 MHz + 10.80 MHz = 46.60000 MHz
44.70 MHz - 10.80 MHz = 33.90000 MHz

(Exception: 46.4 MHz thru 46.6 MHz -- use high side conversion)

6067 - For even multiples of 25 kHz (XXX.X00 or XXX.X50 use low side conversion.

$\dfrac{\text{Received frequency} - 10.80\text{ MHz}}{9}$ = crystal frequency

Example: $\dfrac{453.250\text{ MHz} - 10.80\text{ MHz}}{9} = 49.16111\text{ MHz}$

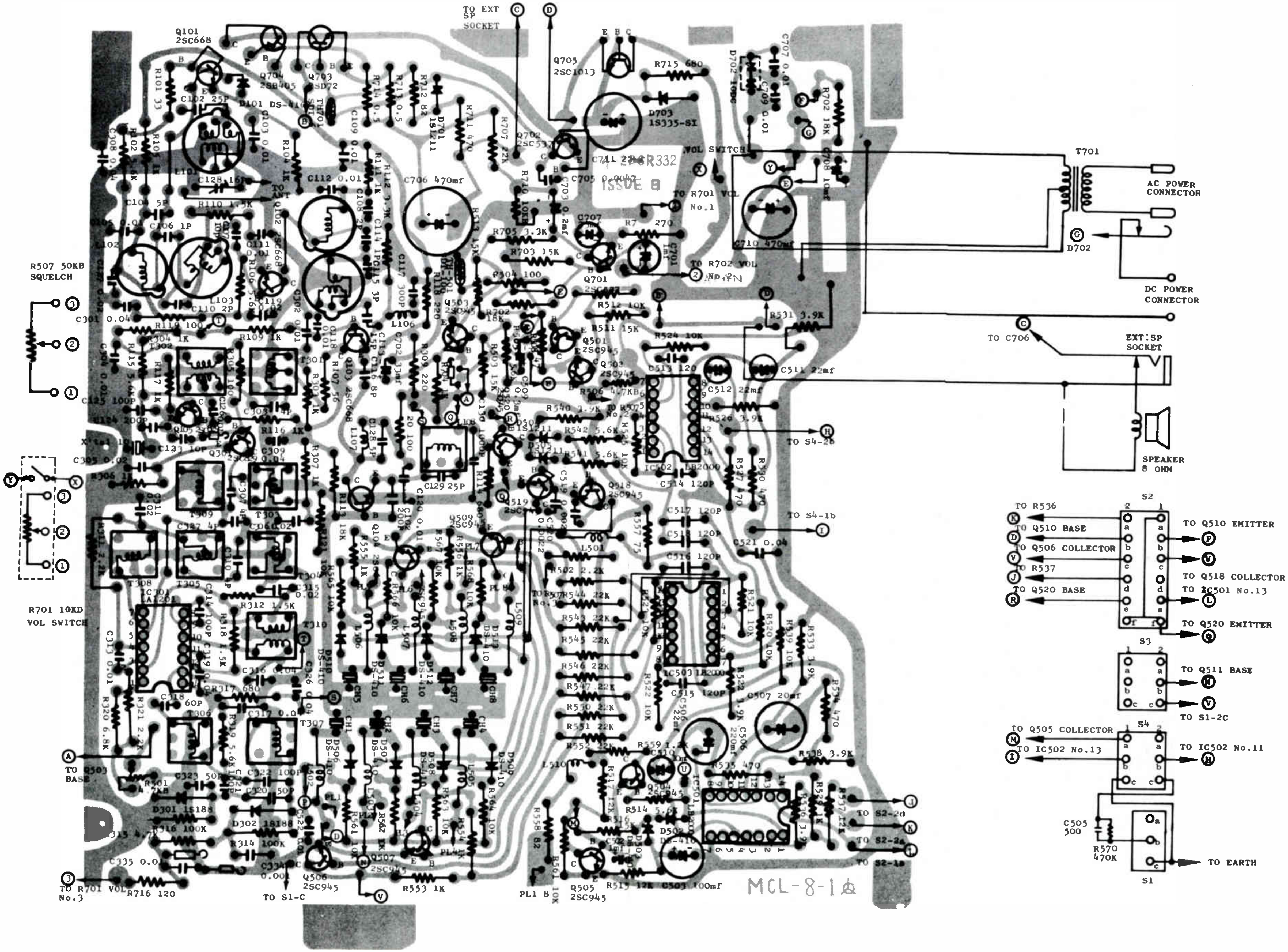
For odd multiples of 25 kHz (XXX.X25 or XXX.X75) use high side conversion.

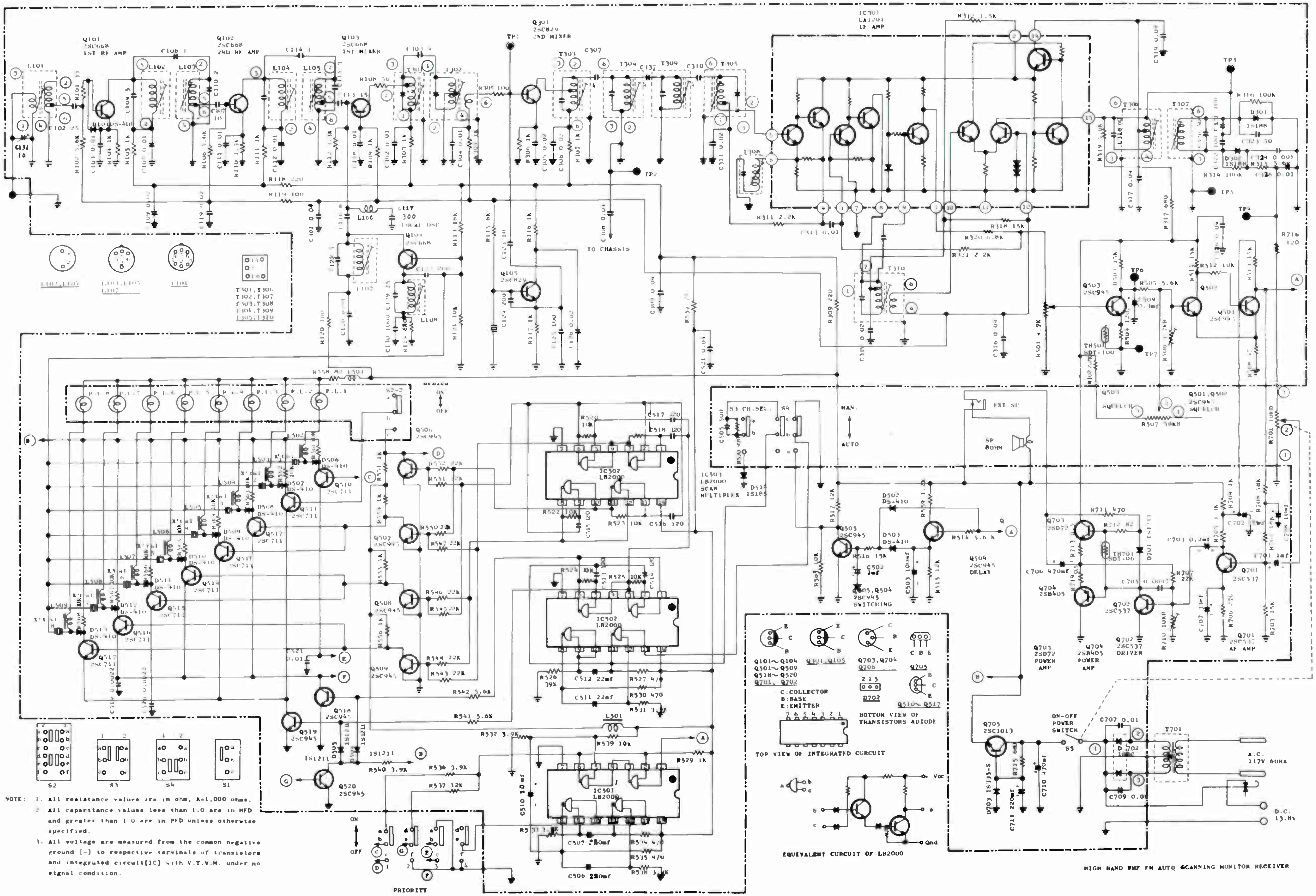
$\dfrac{\text{Receive frequency} + 10.80\text{ MHz}}{9}$ = crystal frequency

Example: $\dfrac{453.225\text{ MHz} + 10.80\text{ MHz}}{9} = 51.55833$

Pearce-Simpson Gladding Hi-Skan

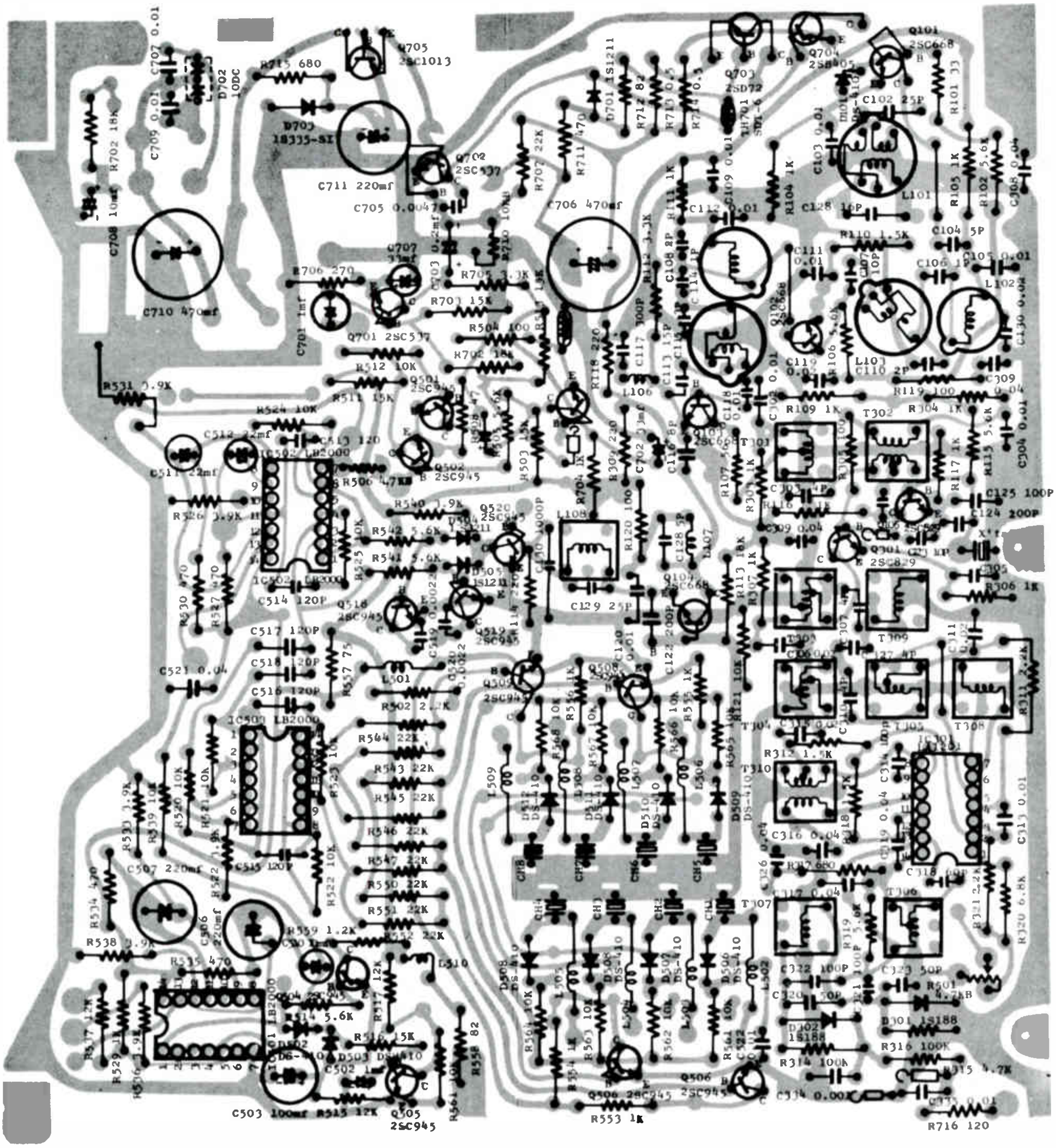
P.C. BOARD LAYOUT





NOTE: 1. All resistance values are in ohms, K=1,000 ohms.
2. All capacitance values less than 1.0 are in MFD and greater than 1.0 are in PFD unless otherwise specified.
3. All voltage are measured from the common negative ground (-) to respective terminals of transistors and integrated circuit(IC) with V.T.V.M. under no signal condition.
Q101 2SC668 1ST RF AMP
Q102 2SC668 2ND RF AMP
Q103 2SC668 1ST MIXER
Q301 2SC829 2ND MIXER
IC301 LA1201 IF AMP
IC503 LB2000 SCAN MULTIPLEX
IC502 LB2000
IC501 LB2000
Q504 2SC945 DELAY
Q505,Q504 2SC945 SWITCHING
Q703 2SD72 POWER AMP
Q704 2SB405 POWER AMP
Q702 2SC537 DRIVER
Q701 2SC537 AF AMP
Q705 2SC1013
ON-OFF POWER SWITCH
A.C. 117V 60Hz
D.C. 13.8V
C:COLLECTOR
B:BASE
E:EMITTER
BOTTOM VIEW OF TRANSISTORS & DIODE
TOP VIEW OF INTEGRATED CIRCUIT
EQUIVALENT CIRCUIT OF LB2000
PRIORITY
HIGH BAND VHF FM AUTO SCANNING MONITOR RECEIVER

COMPONENT LAYOUT



SEMICONDUCTORS

ITEM	PART NO./TYPE
D101	DS-410
D301	1S188
D302	1S188
D502	DS-410
D503	DS-410
D504	1S1211
D505	1S1211
D506	1S1211
D507	1S1211
D508	1S1211
D509	1S1211
D510	1S1211
D511	1S1211
D512	1S1211
D513	1S1211
D701	1S1211
D702	10DC
D703	1S335-S
IC301	LA-1201T
IC501	LB-2000
IC502	LB-2000
IC503	LB-2000
Q101	2SC668D
Q102	2SC668D
Q103	2SC668D
Q104	2SC668D
Q105	2SC829C
Q301	2SC829C
Q501	2SC945R
Q502	2SC945R
Q503	2SC945R
Q504	2SC945R
Q505	2SC945R
Q506	2SC945R
Q507	2SC945R
Q508	2SC945R
Q509	2SC945R
Q510	2SC711D
Q511	2SC711D
Q512	2SC711D
Q513	2SC711D
Q514	2SC711D
Q515	2SC711D
Q516	2SC711D
Q517	2SC711D
Q518	2SC945R
Q519	2SC945R
Q520	2SC945R
Q701	2SC537F
Q702	2SC537E
Q703	2SD72
Q704	2SB405
Q705	2SC1013D (2SC1013C)

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE	
C128	4-224R016	16pf Trimmer	
C503	R-C9200 (1)	100mfd	10V
C506	6.3-CE-161-R012	160mfd	6.3V
C507	6.3-CE-161-R012	160mfd	6.3V
C509	R-C9140	.3mfd	10V
C510	6.3-CE-4R7-R022	4.7mfd	6.3V
C511	10-CE-220-R012	22mfd	10V
C512	10-CE-220-R012	22mfd	10V
C701	R-C9115	1mfd	10V
C702	R-C9881 (1)	33mfd	6.3V
C703	R-C9120	.2mfd	10V
C704	R-C9881 (1)	33mfd	6.3V
C706	R-C9874 (1)	470mfd	16V
C708	R-C9224	10mfd	10V
C710	R-C9844 (1)	470mfd	25V
C712	R-C9877 (1)	220mfd	16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R501	4-222T15501	4700 ohms Squelch Level
R506	4-222T15501	4700 ohms Squelch Level
R507		50K Squelch
R701		10K Volume
R710	4-222T155	10K Bias
TH501	SDT-100	Thermistor
TH701	SDT-06	Thermistor

COILS/TRANSFORMERS

ITEM	PART NO.
L101	4-257R229
L102	4-259R118
L103	4-259R117
L104	4-259R119
L105	4-2592117
L106	4-265R050A
L107	4-251R13591
L501	4-253R127
L502	4-253R127
L503	4-253R127
L504	4-253R127
L505	4-253R127
L506	4-253R127
L507	4-253R127
L508	4-253R127
L509	4-253R127
L510	4-253R129
T301	4-256R031
T302	4-256R031
T303	4-256R224
T304	4-256R224
T305	4-256R224
T306	4-256R224
T307	4-256R224
T310	4-256R228
T701	4-253R129

MISCELLANEOUS

ITEM	NAME	PART NO.
S1	Switch, Priority	4-231R128
S2	Switch, Bypass	4-231R115
S3	Switch, Channel Select	4-231R115
S4	Switch, Scan Select	4-231R130
SP	Speaker, 8 ohm	4-151R138
XTAL10	Crystal, 11.155MHz	121-037-0006
	Socket, Crystal	4-235R131

CRYSTAL CORRELATION:

Resonance: .... Parallel

Overtone: 3rd

Load Capacity: .... 20 pf

Max. Series Resistance: .... 40 Ohms

Maximum Drive: .... 2 milliwatts

Frequency Tolerance:

At 25°C .... ± .001%

From −55°C to +105°C .... ± .005%

In special cases where interference is encountered from strong adjacent stations, the formula is changed by substituting a positive sign (+) for the negative sign (−) or vice versa. These crystals are available on special order.

TROUBLE-SHOOTING HINTS

No power in radio.

* AC power supply cord not connected.
* Jumper lead to On-Off switch not connected.
* Defective Fuse

No reception.

* Antenna not connected correctly.
* Crystal is not firmly seated in its socket.
* Radio is oversquelched.

No sound.

* Power plug not connected.
* Over squelched.
* Jumper leads to speaker not connected.
* Jumper leads to volume control not connected.

Can not select a channel.

* "Scanning" is not set in MANUAL position, but in AUTO position.
* "Priority" is in operation.
* Any one of jumper leads to channel select switch is disconnected.

Can not adjust squelch operation.

* Readjust mini-pots, R501 and R506.
* Pilot lamp not lighted.
* Jumper lead to pilot lamp disconnected.
* Defective Transistor or diode in digital circuit.

Abnormal scanning

* Defective IC, transistor or diode in digital circuit.

Pages 53-60 Courtesy of PEARCE-SIMPSON INC.

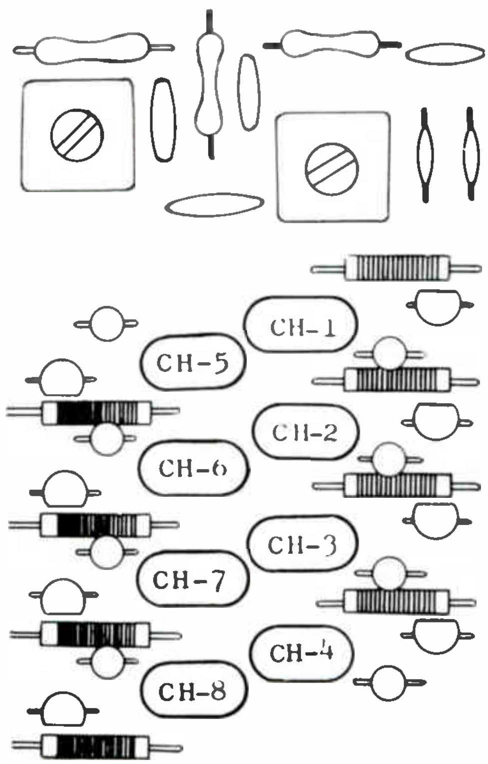
TO INSTALL CRYSTALS

1. An access door is provided so that crystals can be inserted without removing the entire cabinet.
2. Figure 1 shows the location of the crystal sockets.
3. Insert the crystals into the sockets.

Every police, fire and other municipal department, civilian defense or federal department, etc., broadcasts on specific frequencies. These frequencies will differ in each town or city. Your local dealer or town-hall can tell you the frequencies being used in your area.

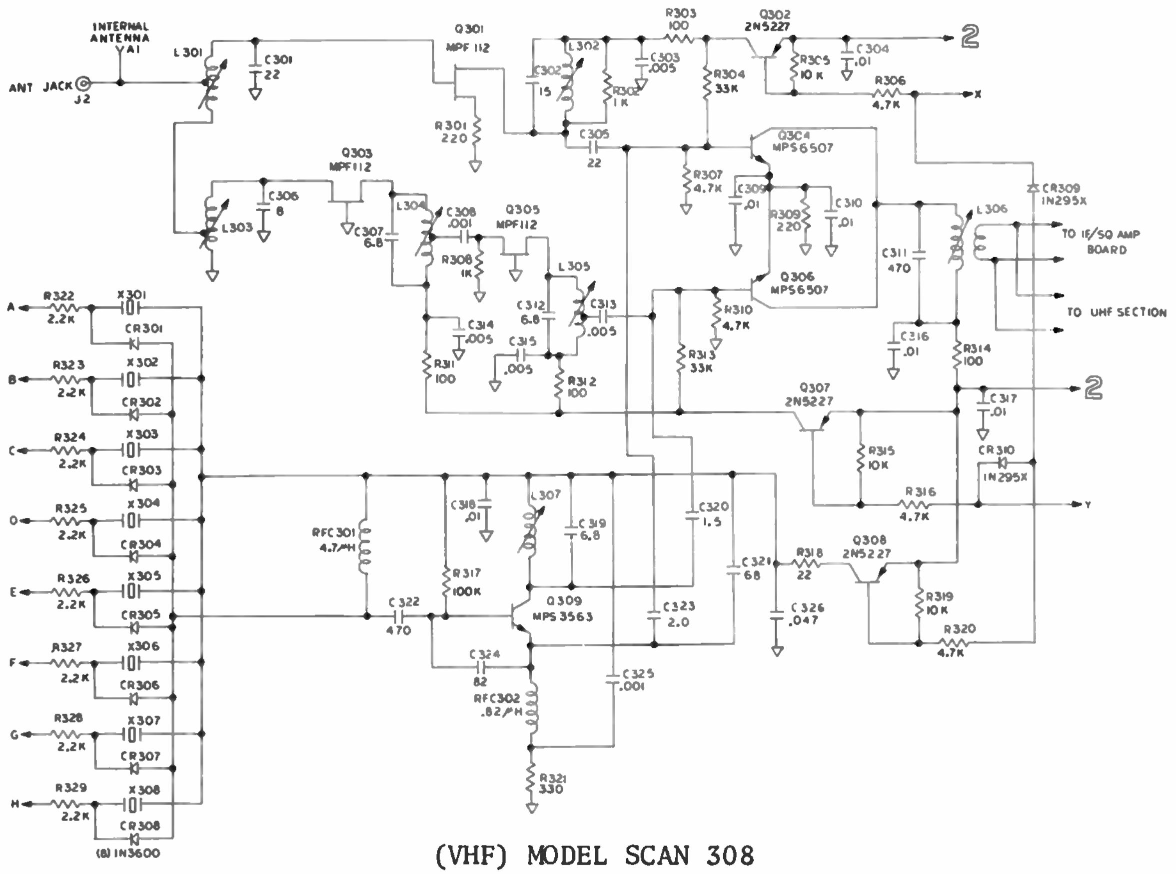
In order to obtain the correct crystal to monitor a specific channel the following formula must be followed to obtain the crystal frequency.

CRYSTAL 3RD OVERTONE FREQUENCY DESIRED CHANNEL FREQUENCY 10.7 MHz
Divided by 3

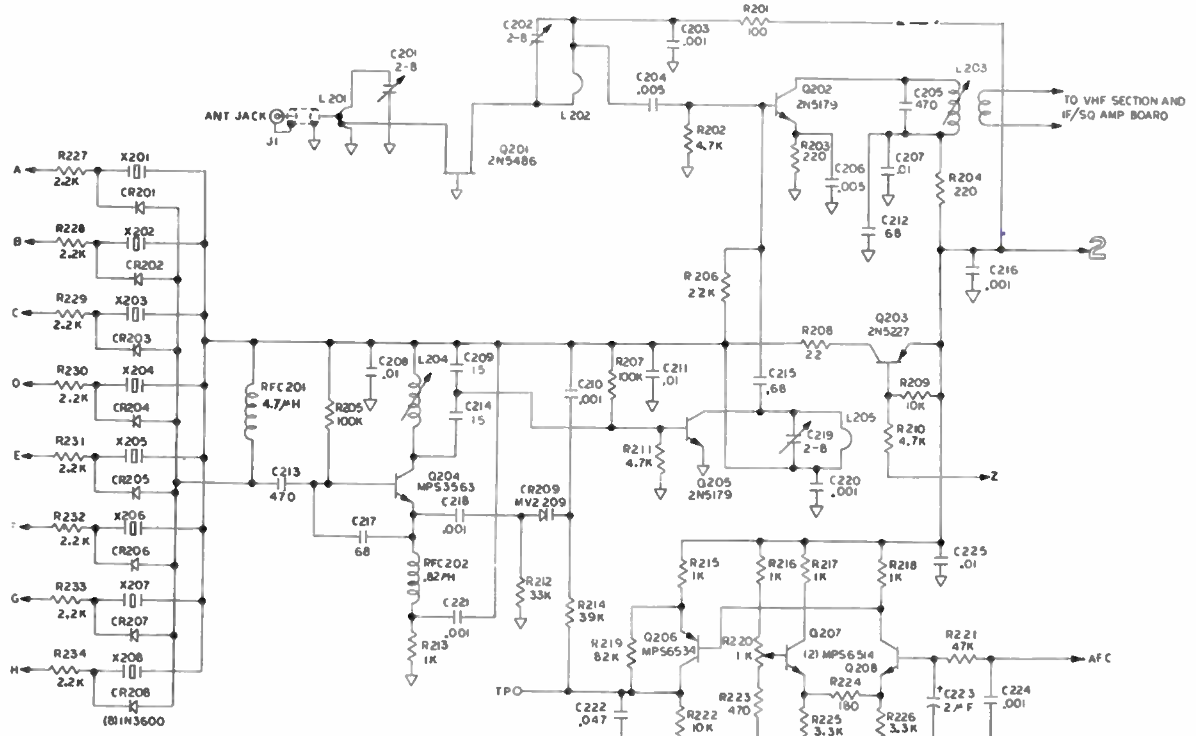


CRYSTAL SOCKET LAYOUT

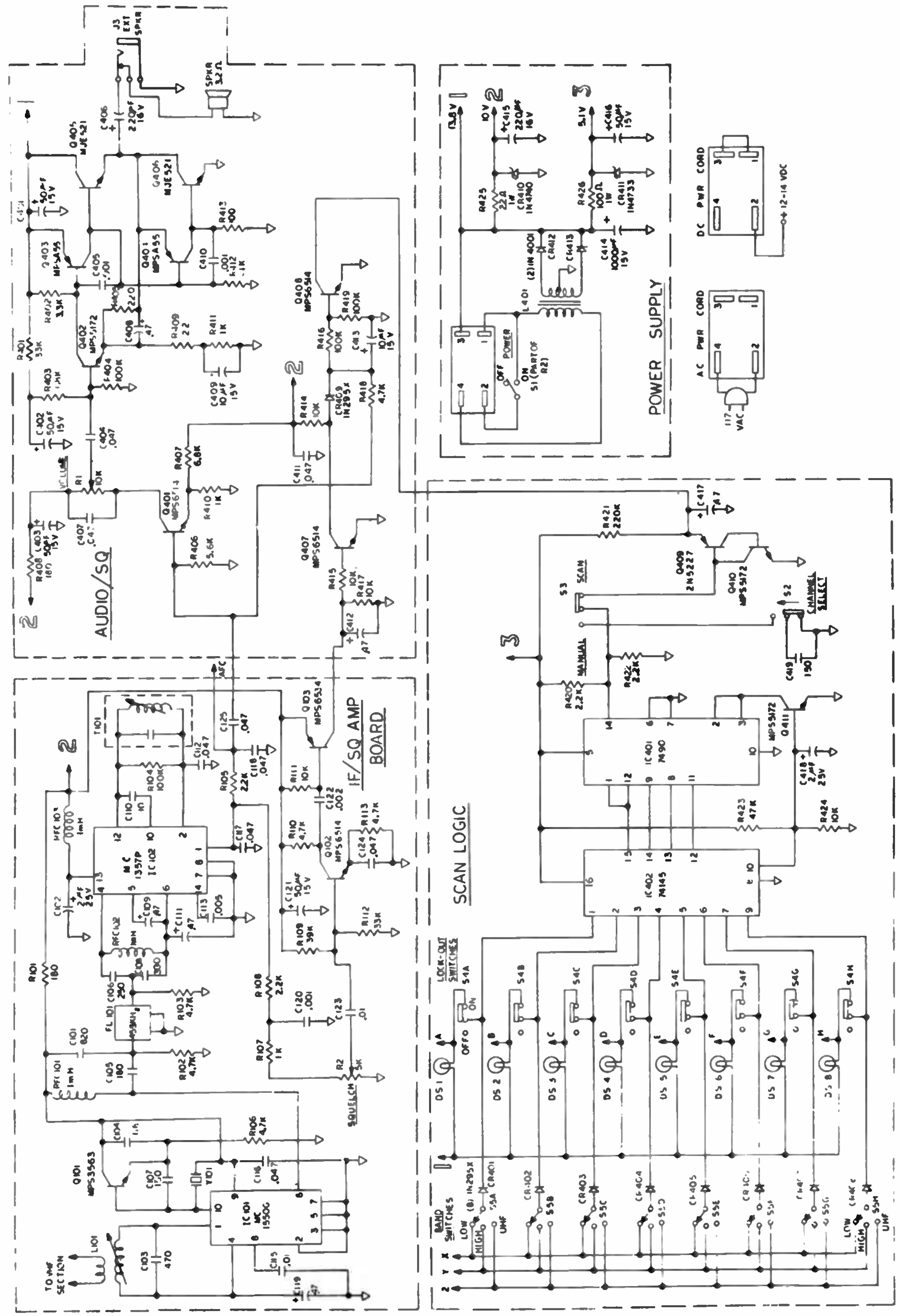
Figure 1

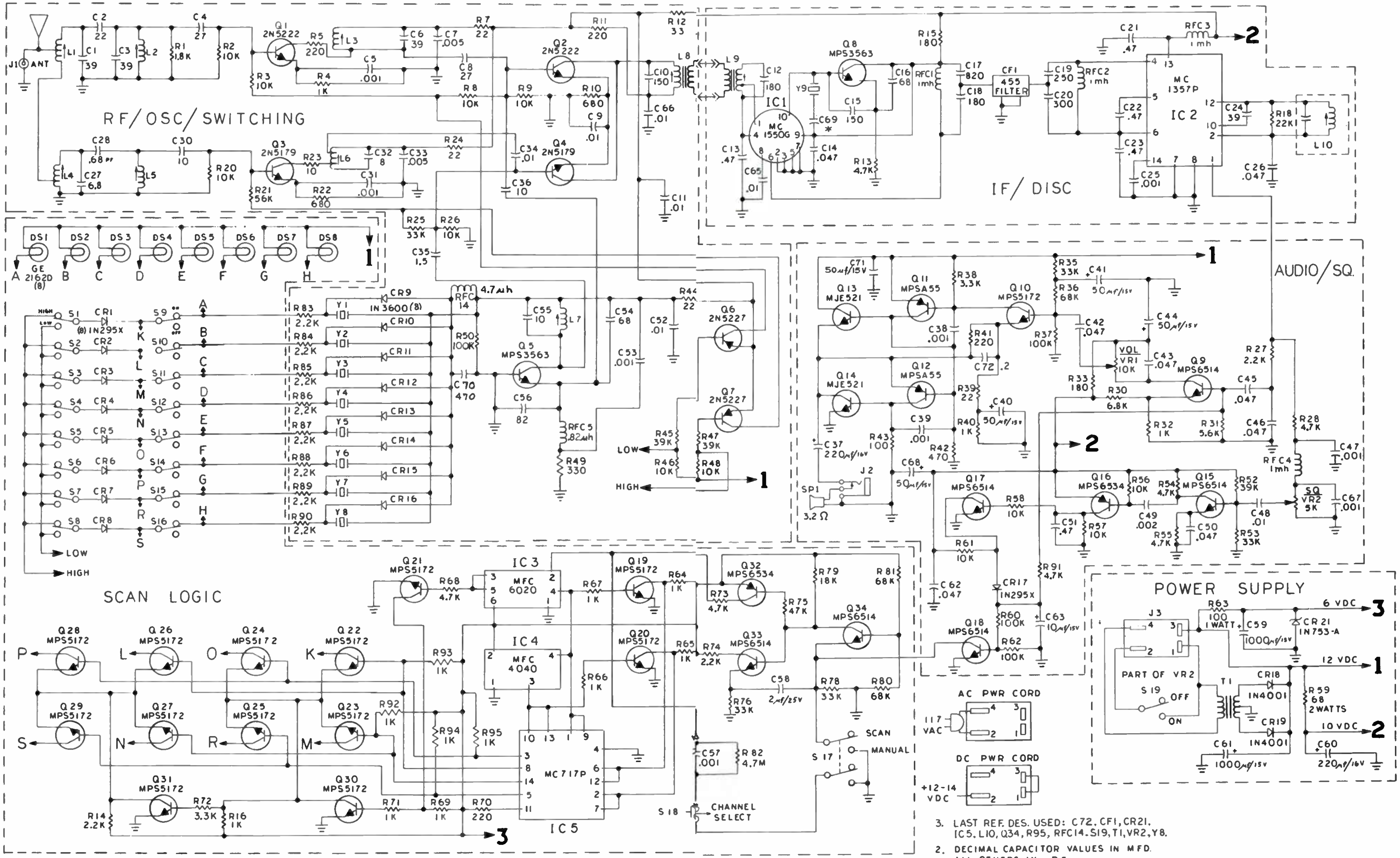


(VHF) MODEL SCAN 308



(UHF) MODEL SCAN 308





3. LAST REF. DES. USED: C72, CF1, CR21, IC5, L10, Q34, R95, RFC14, S19, T1, VR2, Y8.

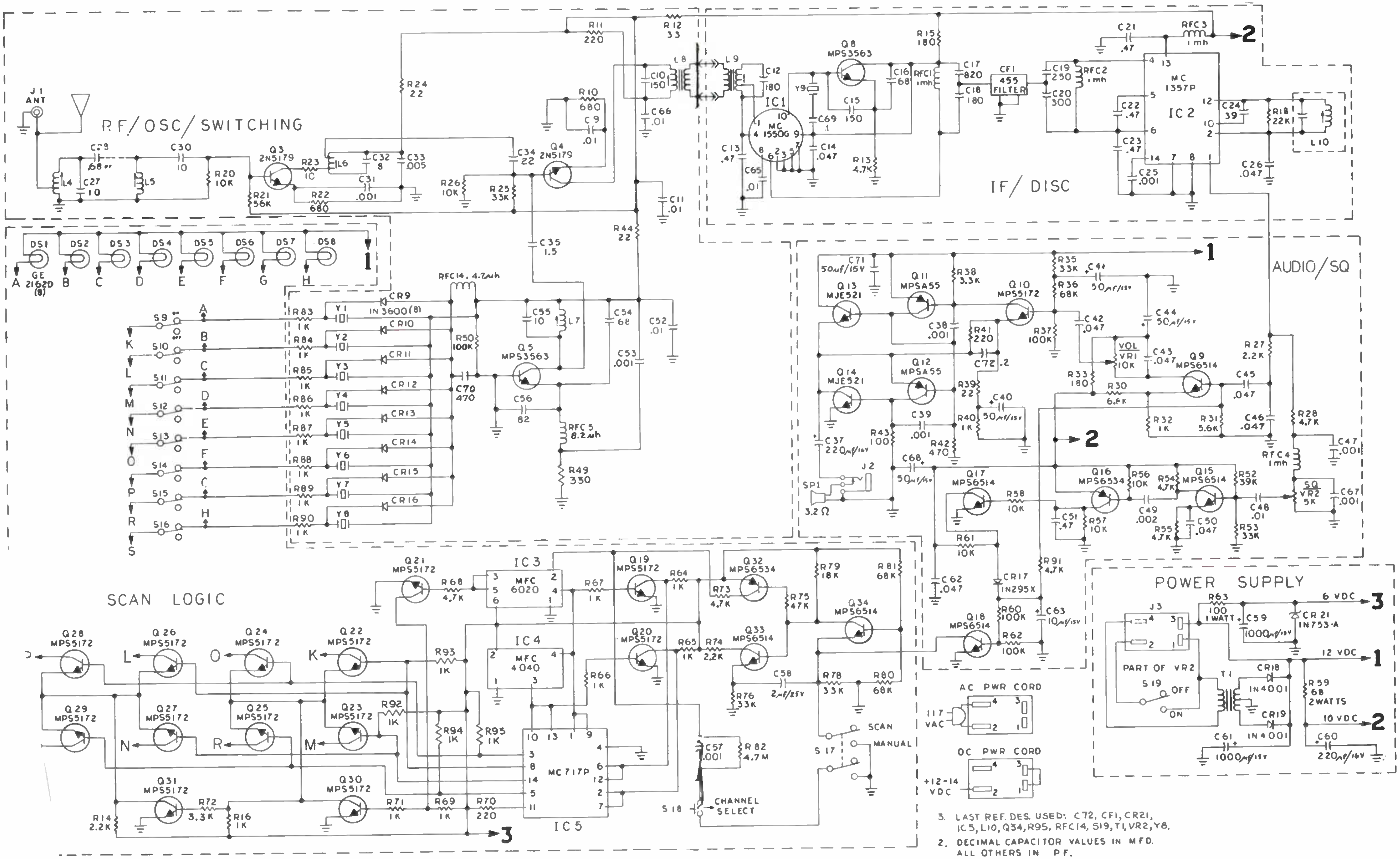
2. DECIMAL CAPACITOR VALUES IN MFD. ALL OTHERS IN PF.

1. ALL RESISTOR VALUES IN OHMS.

NOTES: UNLESS OTHERWISE SPECIFIED.

4. * DENOTES FACTORY SELECTED VALUES. (MAY BE DELETED ON SOME MODELS.)

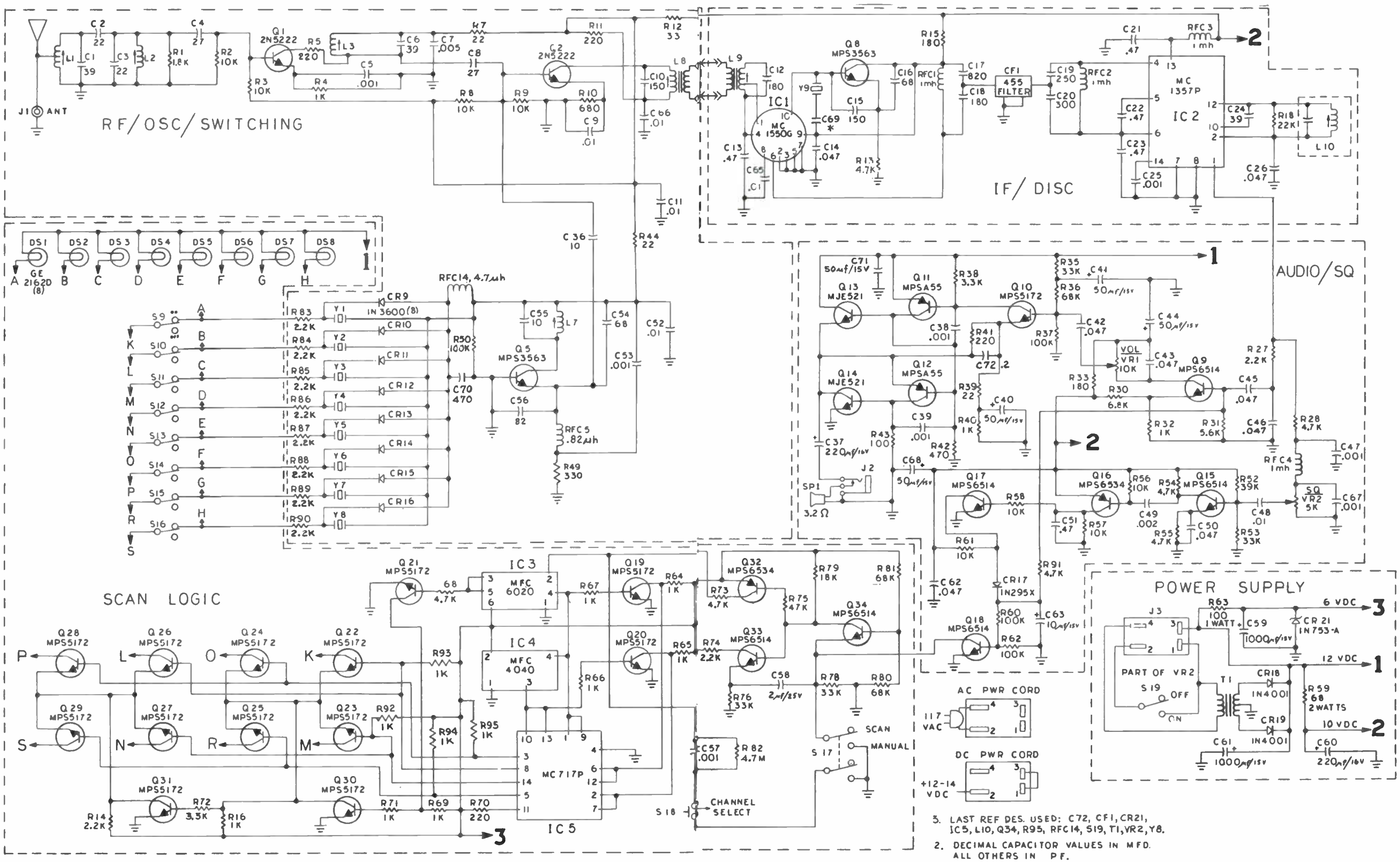
MODEL SCAN 208



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTOR VALUES IN OHMS.
2. DECIMAL CAPACITOR VALUES IN MFD. ALL OTHERS IN PF.
3. LAST REF. DES. USED: C72, CF1, CR21, IC5, L10, Q34, R95, RFC14, S19, T1, VR2, Y8.
4. * DENOTES FACTORY SELECTED VALUES (MAY BE DELETED ON SOME MODELS.)

MODEL SCAN 108H



3. LAST REF DES. USED: C72, CF1, CR21, IC5, L10, Q34, R95, RFC14, S19, T1, VR2, Y8.
2. DECIMAL CAPACITOR VALUES IN MFD. ALL OTHERS IN PF.
1. ALL RESISTOR VALUES IN OHMS.
NOTES: UNLESS OTHERWISE SPECIFIED.

4. * DENOTES FACTORY SELECTED VALUES. (MAY BE DELETED ON SOME MODELS.)

MODEL SCAN 108L

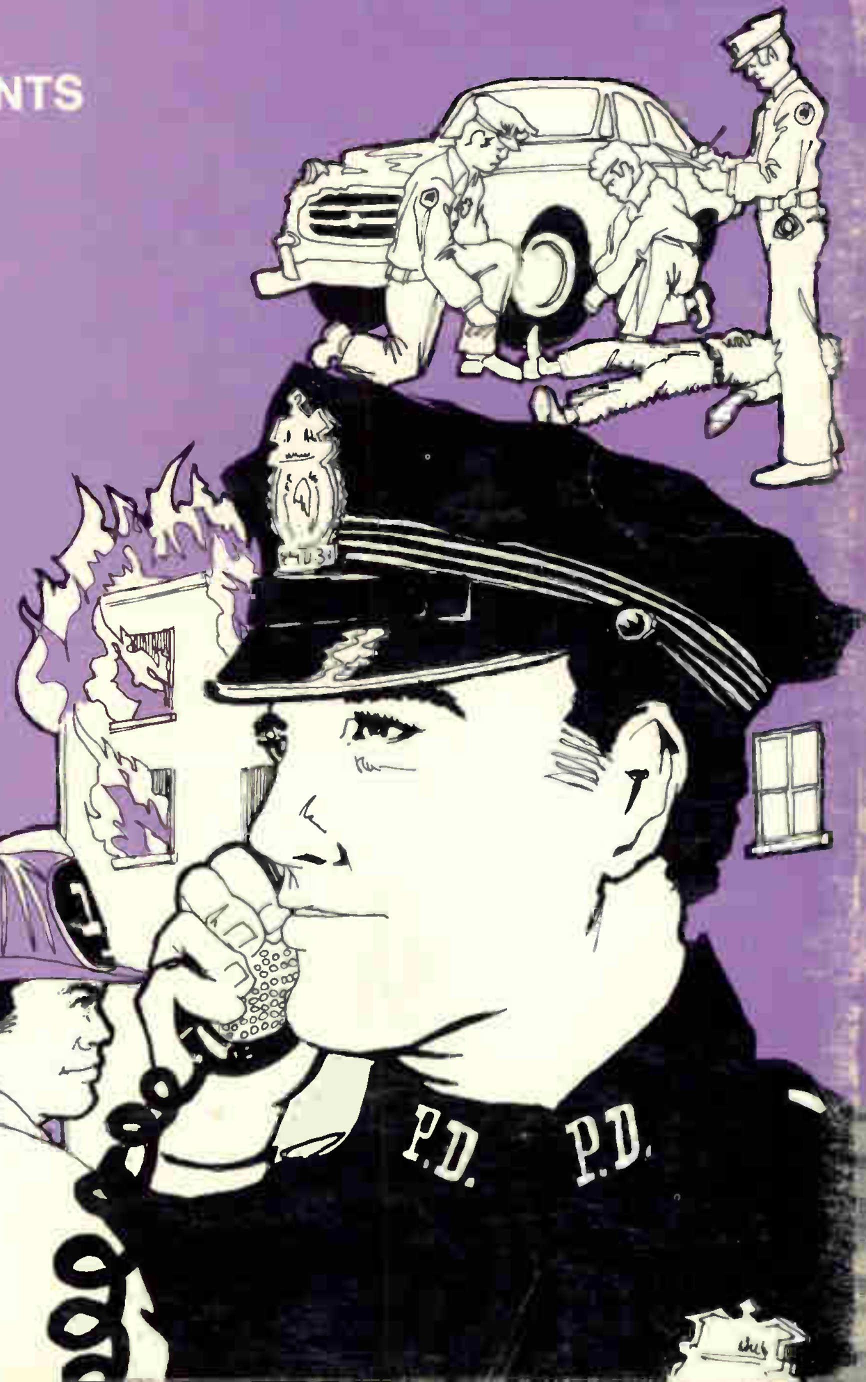
Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

***General Electric** 7-2995A*
***Midland** 13-908*
***Midland** 13-919*
***Pace Scan** 108/208A/216/308*
***Pace Scan** 150*
***Realistic** PRO-12 (20-156)*
***Realistic** PRO-16 (20-165)*
***Regency** Act-E10H/L/U*
***Regency** Act-P1HT/LT*
***SBE** SBE-5SM/-6SM*
***Sonar** FR-101/-102*



PUBLICATION

$4.95
$5.95 IN CANADA
Cat. No. SD-7

Sams

Scanner-Monitor Servicing Data

SD-7

REPRODUCED THROUGH THE COURTESY OF THE MANUFACTURER

HOWARD W. SAMS & CO., INC.
INDIANAPOLIS, INDIANA

First Edition
First Printing-February, 1976

Sams

Scanner-Monitor Servicing Data

SD-7

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

TABLE OF CONTENTS

Pages 5-14 Courtesy of GENERAL ELECTRIC

ALIGNMENT PROCEDURE

AM ALIGNMENT - FUNCTION SWITCH IN AM POSITION

AM Generator - RF Radiated Signal Modulated 30% at 400Hz

	GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1.	455kHz	Open	Output Meter Across Speaker	T6, T7, T8	Adjust for maximum. Repeat until no further improvement is noted.
2.	1630kHz	Open		C101G	Adjust for maximum.
3.	580kHz	Tune to Signal		L9	Adjust for maximum while rocking gang.
4.	1400kHz	Tune to Signal		C101E	Adjust for maximum. Repeat Steps 2, 3, & 4 until no further improvement is noted.

FM ALIGNMENT - FUNCTION SWITCH IN FM POSITION

High Side of FM Sweep Generator Thru 1K resistor in series with a 5pf capacitor to TP1. Use only enough marker signal for indication.

	GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1.	10.7MHz	Open	Scope at TP2 Thru Pad (See Figure 1)	T1, T2, T3	Adjust for maximum gain and symmetry. Repeat as necessary.
2.	10.7MHz	Open	Scope at TP3 Thru a 56K Resistor	T4, T5	Adjust for maximum gain and symmetrical S-Curve. Repeat Steps 1 & 2.
	FM Generator - Modulated RF Radiated Signal				
3.	109.9MHz	Open	Output Meter Across Speaker	C101C	Adjust for maximum
4.	87.5MHz	Closed		L2	Spread or compress coil windings slightly to raise or lower frequency. Repeat Steps 3 & 4.
5.	108.0MHz	Tune to Signal		C101A	Adjust for maximum
6.	88MHz	Tune to Signal		L1	Spread or compress coil windings slightly to obtain optimum alignment. Repeat Steps 5 & 6.

VHF IF ALIGNMENT - FUNCTION SWITCH IN VHF POSITION

High Side of FM Sweep Generator Thru 1K resistor in series with a 5pf capacitor to TP4. Use only enough marker signal for indication.

	GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1.	10.7MHz		Scope at TP2 Thru Pad (See Figure 1)	T9, T10	Adjust for maximum gain and symmetry. Repeat as necessary.

VHF RF ALIGNMENT

- Function Switch in PS Scan Position
- Squelch Control at Minimum
- Scan/Manual Switch in Manual Position
- Channel Switches (1 thru 4) in ON Position

Connect Hewlett Packard Model 3469A Multimeter or equivalent high impedance multimeter between TP5 and ground. Accuracy of all voltage readings should be better than ± 1%.

1. Depress manual advance switch until Channel 1 LED is lit.
2. Pre-adjust R85 (Trim Pot) for approximately half range.
3. Adjust Channel 1 tuning control (R55) for 7.10 volts DC on voltmeter and adjust R85 (Trim Pot) to calibration mark on tuning meter scale.
4. Depress manual advance switch until Channel 2 LED is lit.
5. Adjust Channel 2 tuning control (R54) for 1.50 volts DC on voltmeter. (Low band end).
6. Depress manual advance switch until Channel 3 LED is lit.
7. Adjust Channel 3 tuning control (R53) for 12.0 volts DC on voltmeter. (High band end).
8. Disconnect voltmeter from TP5 to ground.
9. Pre-adjust trimmer capacitors C78, C79 and C80 to approximately half range.
10. Depress manual advance switch until Channel 2 LED is lit.
11. Connect output of Sweep Generator thru antenna pad network (Figure 2) to antenna clip. Adjust output of Sweep Generator to 150.0MHz modulated at 400Hz. Connect output meter across speaker terminals.
12. Align low band end to 150.0MHz with L7 oscillator coil. Spread or compress coil windings slightly to raise or lower frequency.
13. Adjust L5 RF coil and L4 antenna coil for maximum. Spread or compress coil windings slightly to obtain optimum alignment.
14. Depress manual advance switch until Channel 3 LED is lit.
15. Adjust output of Signal Generator to 174.0MHz.
16. Align high band end to 174.0MHz with C79 oscillator trimmer.
17. Adjust C78 RF trimmer and C80 antenna trimmer for maximum.
18. Repeat Steps 10 thru 17 as necessary.
19. After low band end and high band end frequency alignment is complete, reconnect high impedance multimeter between TP5 and ground and recheck Steps 3 thru 7. If any voltage change has occurred, Steps 10 thru 18 must be repeated.

BATTERY CHECK ALIGNMENT

- Function Switch in PS Scan Position
- Power Switch in ON Position
- R101 Trim Pot Pre-Adjusted to Half Range

1. Lower B+ battery input to radio to 6.0 volts D.C.
2. Depress battery check switch, S8 and hold.
3. Adjust R101 to calibration mark on meter M1.

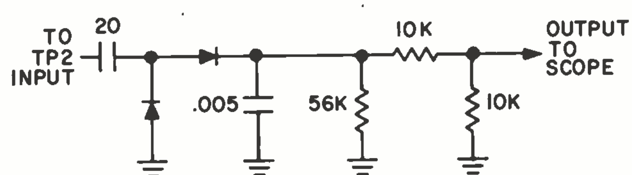


FIGURE 1

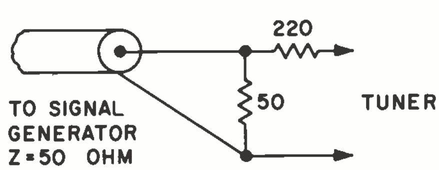
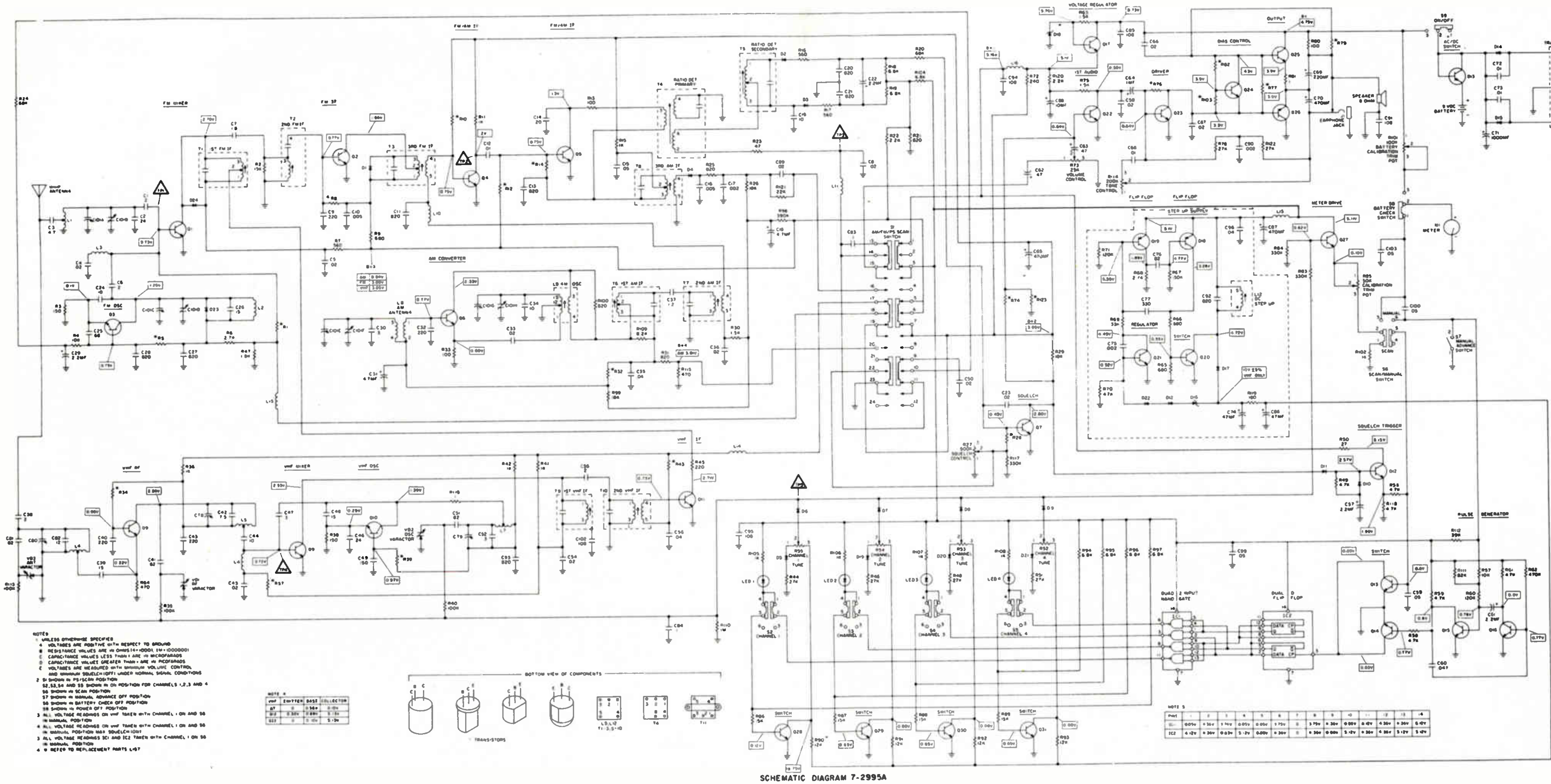
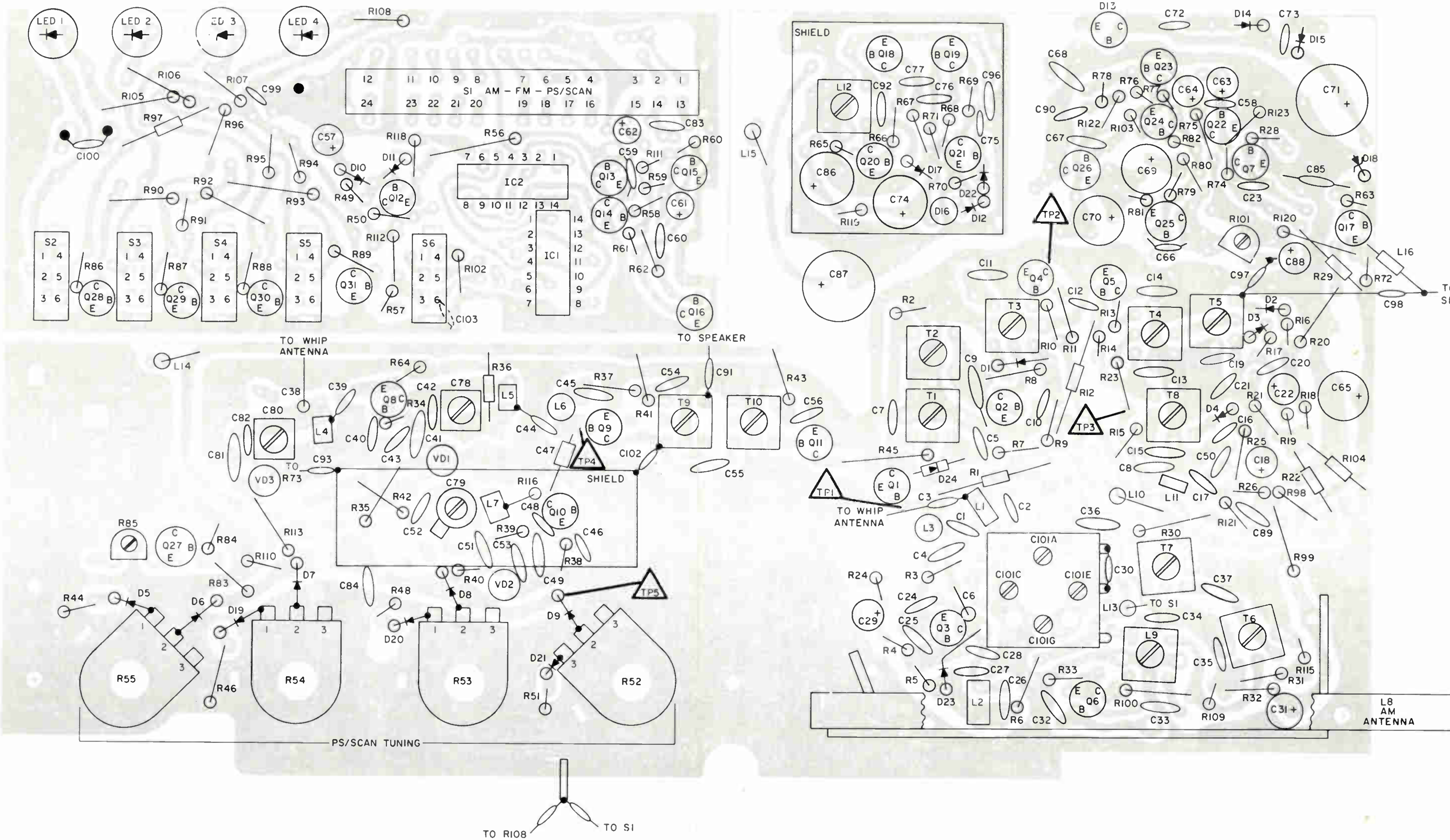


FIGURE 2


NOTES
1 UNLESS OTHERWISE SPECIFIED
A VOLTAGES ARE POSITIVE WITH RESPECT TO GROUND
B RESISTANCE VALUES ARE IN OHMS (K=1000, M=1000000)
C CAPACITANCE VALUES LESS THAN 1 ARE IN MICROFARADS
D CAPACITANCE VALUES GREATER THAN 1 ARE IN PICOFARADS
E VOLTAGES ARE MEASURED WITH MINIMUM VOLUME CONTROL AND MINIMUM SQUELCH (OFF) UNDER NORMAL SIGNAL CONDITIONS
2 S1 SHOWN IN PS/SCAN POSITION
S2, S3, S4 AND S5 SHOWN IN ON POSITION FOR CHANNELS 1, 2, 3 AND 4
S6 SHOWN IN SCAN POSITION
S7 SHOWN IN MANUAL ADVANCE OFF POSITION
S8 SHOWN IN BATTERY CHECK OFF POSITION
S9 SHOWN IN POWER OFF POSITION
SCHEMATIC DIAGRAM 7-2995A



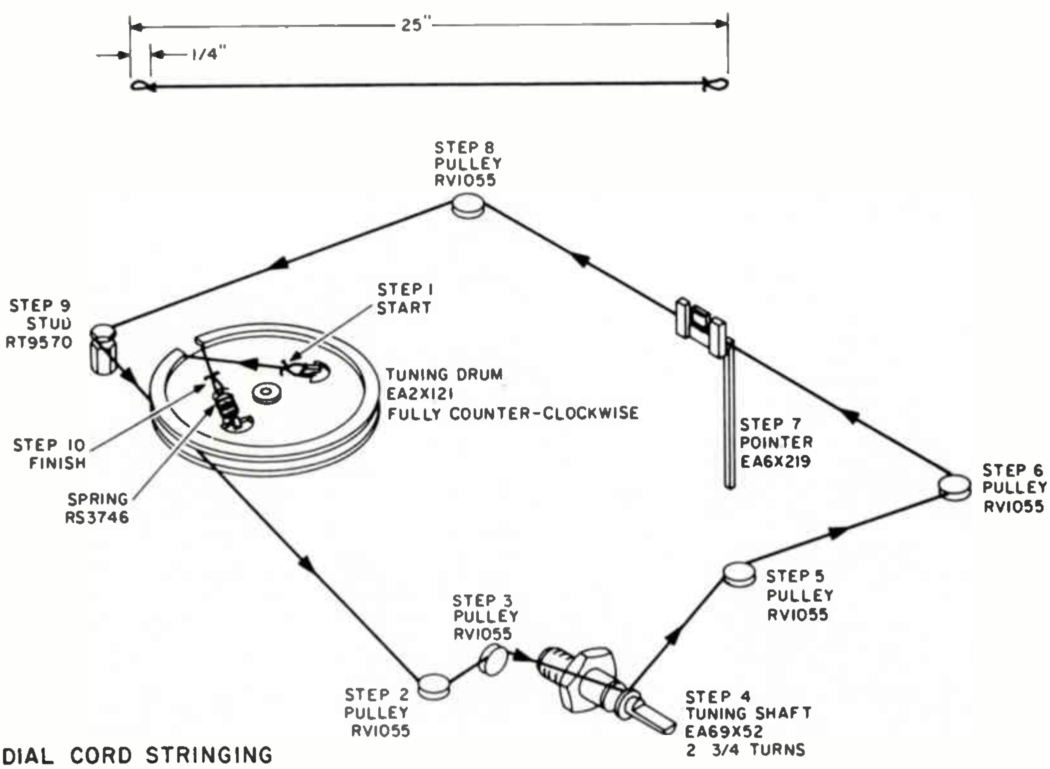
COMPONENT LAYOUT (TOP VIEW)
7-2995A

DIAL CORD STRINGING INSTRUCTIONS

To simplify servicing, troubleshoot the tuner board from the component side of the circuit board whenever possible, using the component layout top view. The scanning circuit board can be troubleshot from the conductor side. To remove defective components from either circuit board, it may be necessary to remove the circuit boards from cabinet bottom. Refer to chassis removal instructions and Figure 3 for disassembly.

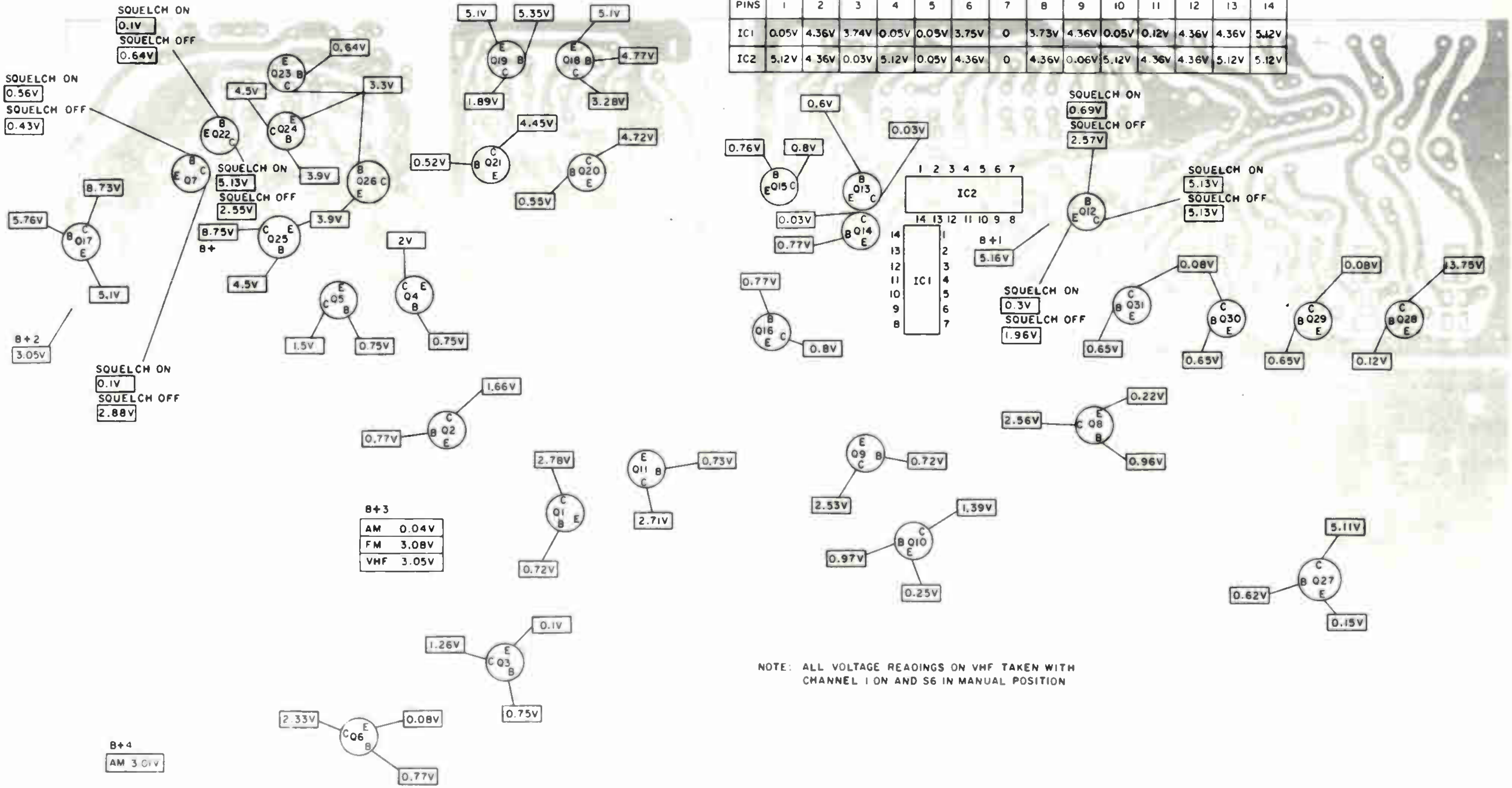
NOTES:

1. Dial cord length (25 inches)
2. Set tuning drum fully counterclockwise
3. Steps (1-10) indicate correct order and direction of dial cord installation
4. Cement dial cord ends



DIAL CORD STRINGING

PINS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC1	0.05V	4.36V	3.74V	0.05V	0.05V	3.75V	0	3.73V	4.36V	0.05V	0.12V	4.36V	4.36V	5.12V
IC2	5.12V	4 36V	0.03V	5.12V	0.05V	4.36V	0	4.36V	0.06V	5.12V	4.36V	4.36V	5.12V	5.12V



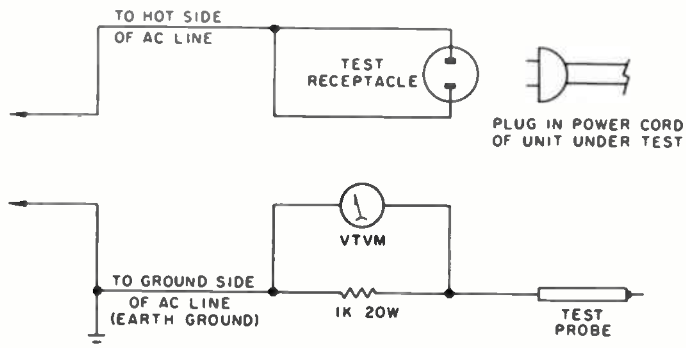
NOTE: ALL VOLTAGE READINGS ON VHF TAKEN WITH CHANNEL 1 ON AND S6 IN MANUAL POSITION

VOLTAGE CHECK POINTS (BOTTOM VIEW)
7-2995A

PERFORM THE FOLLOWING SAFETY CHECKS AFTER SERVICING THIS UNIT:

1. Remove all externally connected test equipment and wires before safety testing this unit.

2. Use RT6440 Safety Test Box or construct circuit as shown.



3. Plug power cord of unit to be tested into Test Receptacle.

4. Switch unit being tested to ON position.

5. Connect VTVM across 1K resistor in test circuit. Set meter on high (150VAC) scale to avoid meter damage and touch the following points with Test Probe.

   a) Three (3) battery contacts
   b) Screw in cord storage compartment
   c) Earphone jack

   If reading indicates less than 3 volts on all test points, proceed to a low (3VAC) scale and repeat test.

6. Any reading greater than two tenths (.2) volts indicates a potential shock hazard. If this occurs, further troubleshooting must be performed to determine the source of leakage.

SEMICONDUCTORS

ITEM	PART NO.
D1	EA2607
D2	RT5379
D3	RT5379
D4	EA2607
D5	EA16X94
D6	EA16X95
D7	EA16X95
D8	EA16X95
D9	EA16X95
D10	RT1689
D11	RT1689
D12	EA16X95
D13	RT5637
D14	EA57X14
D15	EA57X14
D16	EA16X96
D17	EA16X95
D18	RT1306
D19	EA16X94
D20	EA16X94
D21	EA16X94
D22	EA16X95
D23	RT2451
D24	EA2607
IC1	EA33X8343
IC2	EA33X8344
LED 1	EA16X200
LED 2	EA16X200
LED 3	EA16X200
LED 4	EA16X200
Q1	EA15X7243
Q2	EA15X7243
Q3	EA15X7243
Q4	EA15X7243
Q5	EA15X7243
Q6	EA15X7243
Q7	EA15X7513
Q8	EA15X7242
Q9	EA15X7242
Q10	EA15X7242
Q11	EA15X7242
Q12	EA15X7517
Q13	EA15X7517
Q14	EA15X7517
Q15	EA15X7517
Q16	EA15X7517
Q17	EA15X7642
Q18	EA15X4634
Q19	EA15X4632
Q20	EA15X4532
Q21	EA15X7517
Q22	EA15X7517
Q23	EA15X7639
Q24	EA15X7638
Q25	EA15X4532
Q26	EA15X4632
VD1	EA16X79
VD2	EA16X79
VD3	EA16X79

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C22	2.2uF 10V	EA31X234
C29	2.2uF 25V	EA31X213
C57	2.2uF 10V	EA31X234
C61	2.2uF 10V	EA31X234
C62	.47uF 25V	RT4933
C63	.47uF 25V	RT4933
C64	1uF 25V	RT5044
C65	470uF 16V	RT5273
C69	220uF 10V	RT5047
C70	470uF 16V	RT5273
C71	1000uF 16V	EA31X222
C74	47uF 25V	EA31X211
C78	Trimmer	EA30X26
C79	Trimmer	RS6172
C80	Trimmer	EA30X26
C86	47uF 16V	EA31X214
C87	470uF 16V	RT5273
C88	10uF 16V	EA31X213
C101	Tuning	RT1644

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R27	500K Squelch	EA49X233
R52	300K Channel Tun.	EA49X286
R73	25K Volume	EA49X285
R85	50K Trimmer	RT3357
R101	100K Trimmer	RT3519
R114	200K Tone	EA49X287

COILS/TRANSFORMERS

ITEM	PART NO.
L1	EA36X144
L2	RT4886
L3	EA36X145
L4	EA36X112
L5	EA36X62
L6	EA36X145
L7	EA35X67
L8	EA83X72
L9	EA35X24
L10	EA36X71
L11	RT4741
L12	EA56X18
L13	EA36X71
L14	EA36X71
L15	EA36X71
L16	EA36X71
T1	EA2625
T2	EA61X134
T3	EA61X135
T4	EA56X8
T5	EA56X9
T6	RS3424
T7	RT3575
T8	EA61X109
T9	EA61X108
T10	EA61X108
T11	EA88X91

MISCELLANEOUS

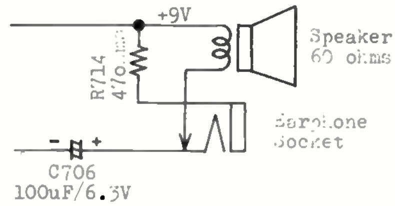
ITEM	NAME	PART NO.
M1	Meter	EA62X115
S1	Switch, Band	EA39X149
S2	Switch, Bypass	EA39X150
S3	Switch, Bypass	EA39X150
S4	Switch, Bypass	EA39X150
S5	Switch, Bypass	EA39X150
S6	Switch, Man./Scan.	EA39X150
S7	Switch, Man. Advance	EA39X151
S8	Switch, Battery Check	RV1811
S9	Switch, Power	RV1683
	Earphone	RT1546
	Speaker, 8 ohm	EA95X100
	PC Board	EA93X232
	Antenna	EA82X13

CABINET PARTS

NAME	PART NO.
Cabinet Bottom	EA98X349
Cabinet Top	EA98X350
Cabinet Front	EA98X351
Battery Door	EA9X167
Tuning Control Door	EA9X168
Handle Assy.	EA78X44
Knob, Vol. or Tone	EA43X498
Knob, Chan. Bypass	EA43X499
Knob, Battery Check	EA43X492
Knob, Chan. Tune	EA43X493
Knob, Tuning	EA43X494
Knob, Power	EA43X495
Knob, Band Switch	EA43X496
Knob, Squelch	EA43X497

Pages 15-18 Courtesy of Model 13-908 Alignment Procedure
MIDLAND CONSUMER PRODUCTS

OUTPUT BLOCK DIAGRAM (*1)



1. BC Band

Alignment Conditions

* Select BC band with the Band Selector Switch.
* Standard modulation is 400Hz at 30% amplitude.
* The position of ON-OFF Volume Control is at maximum position.
* The position of Squelch Control is at minimum position.
* DC 9 volts. Standard output power 50mW

Step	Connection of Signal Gen.	Input Signal Frequency	Dial Setting of Radio	Connection of Output Meter(*1)	Adjust	Remarks
1	Loop Antenna	455KHz	Lowest End	Across Speaker	IFT T301, T302 and T303	Adjust for Maximum
2	Same	523KHz	Lowest End	Same	OSC Coil L106	Same
3	Same	1750KHz	Highest End	Same	OSC Trim. CT-2	Same
4	Same	600KHz	600KHz	Same	ANT. Coil L105	Same
5	Same	1400KHz	1400KHz	Same	ANT. Trim. CT-1	Same
6	Repeat steps 2 through 5 to obtain maximum sensitivity.					

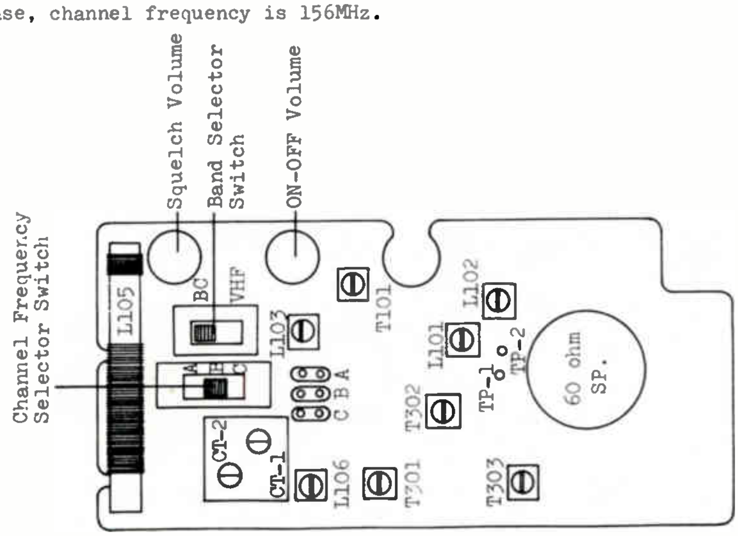
2. VHF Band

Alignment Conditions

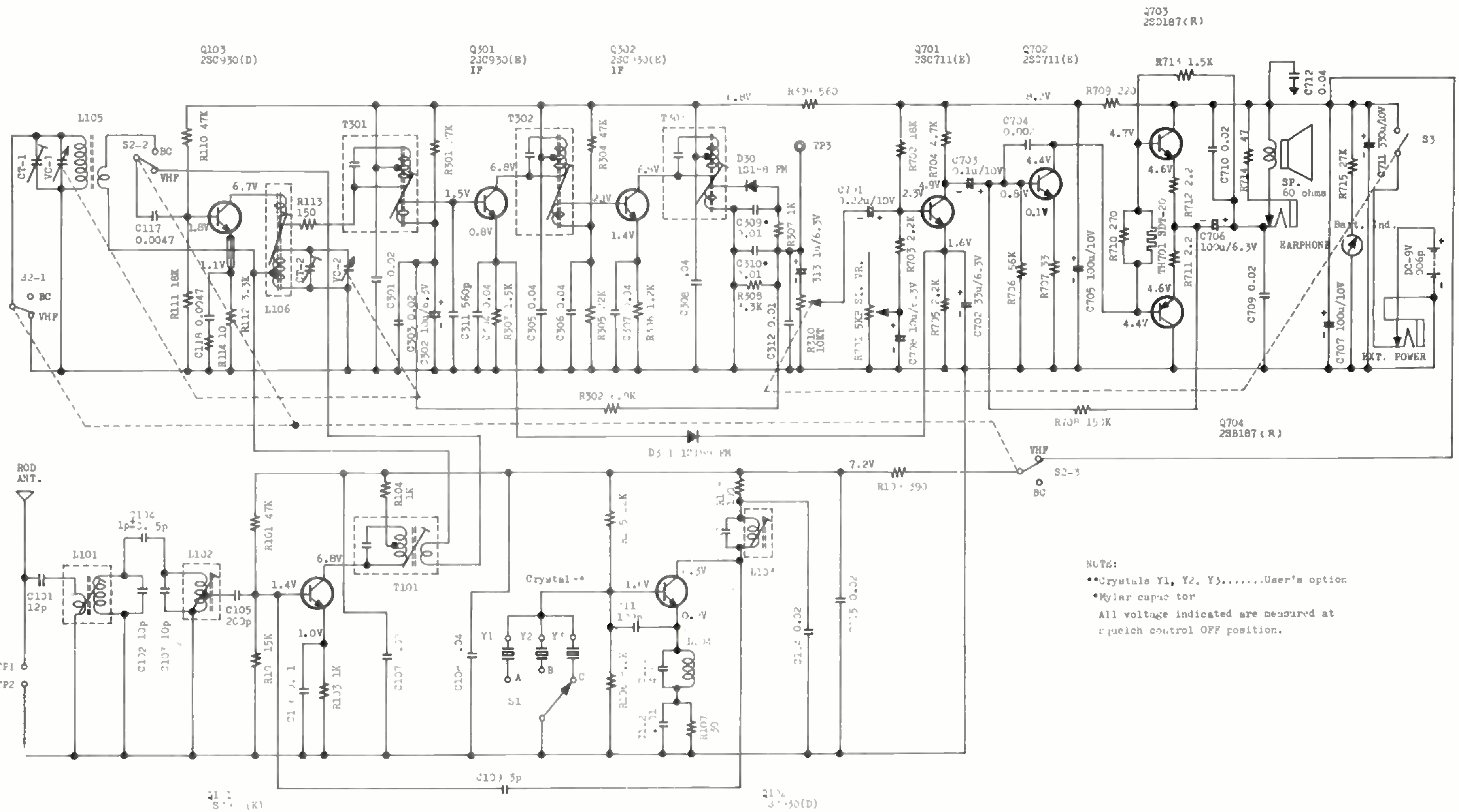
* Standard modulation is 400Hz at 30% amplitude for AM.
* Standard Frequency deviation is 5KHz. Modulation Frequency is 1KHz.
* Choose lower side Frequency FM SSG from two signal.
* Insert crystal(Receiving Frequency 156MHz) to channel A, B or C.

Step	Band Selector Switch position	Connection of Signal Gen.	Input Signal Freq.	Dial Setting of Radio	Connection of Meter or Oscilloscope	Adjust	Remarks
7	BC	Loop Antenna	560KHz	560KHz	Across Speaker	——	Tune in Maximum
8	VHF	TP1, TP2 (Earth)	156MHz(FM) (**)	Same	Same	T101, L103 L101, L102	Adjust for Maximum
9	Repeat steps 8 obtain maximum sensitivity.						

NOTE:
** Only in this case, channel frequency is 156MHz.



SCHEMATIC DIAGRAM Model 13-908

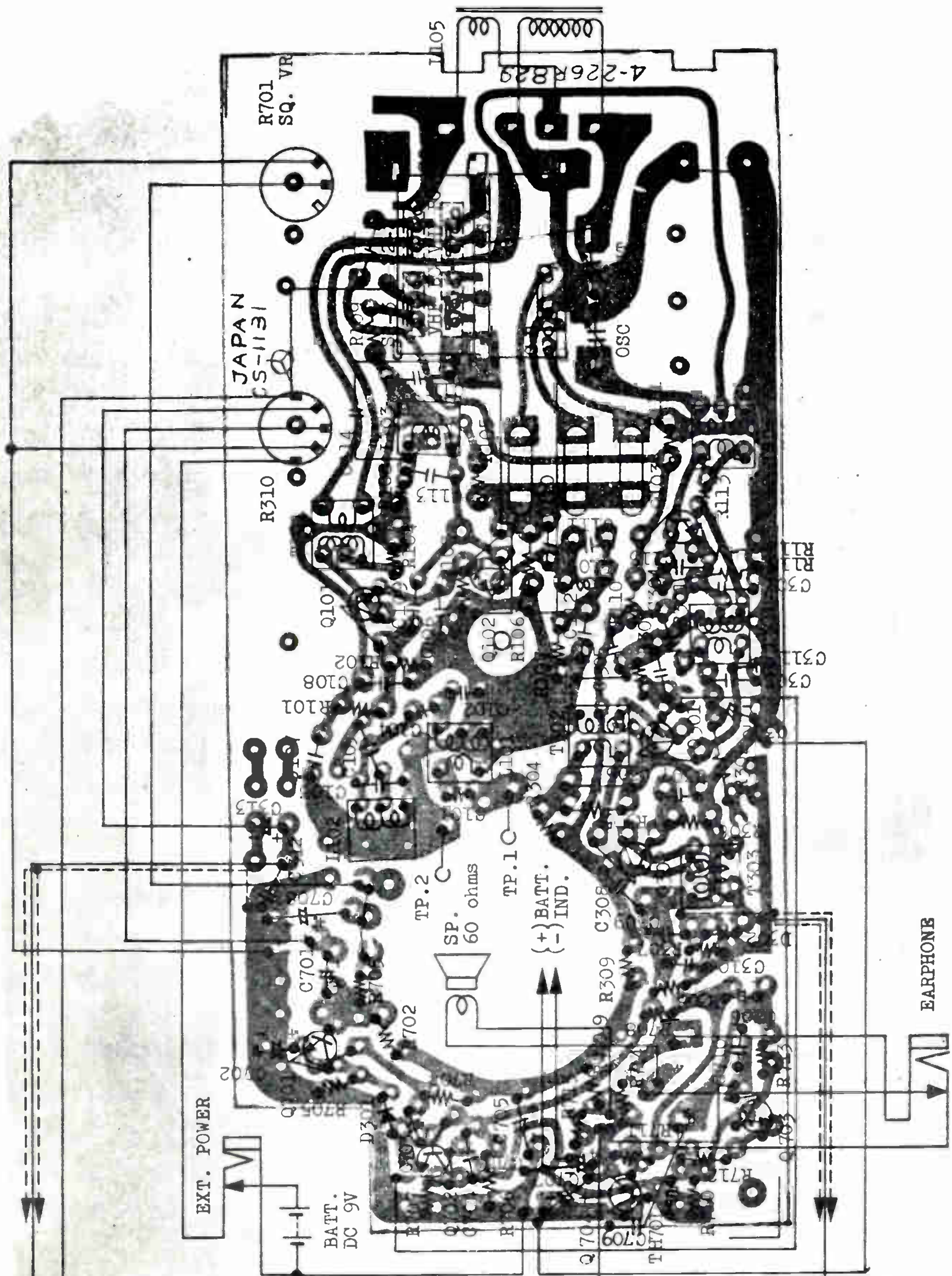


NOTE:

**Crystals Y1, Y2, Y3.......User's option

*Mylar capacitor

All voltage indicated are measured at squelch control OFF position.


R701
SQ. VR
JAPAN
CS-1131
R310
Q101
R101
C108
R102
Q102
R106
OSC
C313
TP.2
SP.
60 ohms
TP.1
(+)BATT.
(-)IND.
C308
R309
C310
C701
702
R705
D3
EXT. POWER
BATT.
DC 9V
C709
EARPHONE
4-226R829
L105

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D301	IS 188	09-306331
D302	IS 188	09-306331
Q101	2SC 922	09-309072
Q102	2SC930	09-305051
Q103	2SC930	09-305051
Q301	2SC930	09-305051
Q302	2SC930	09-305051
Q701	2SC 711	09-305048
Q702	2SC 711	09-305048
Q703	2SD 187	09-303030
Q704	2 SB 187	09-305131

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C302	10uF 6.3V	77-332106
C313	1uF 10V	77-336105
C702	33uF 6.3V	77-332336
C705	100uF 10V	77-336107
C706	100uF 6.3V	77-332107
C707	100uF 10V	77-336107
C708	10uF 6.3V	77-332106
C711	330uF 10V	77-336337
VC1	Tuning	13-120006
VC2	Tuning	13-120006

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R310	10K Volume	13-160105
R701	5K Squelch	13-166055
TH701	SDT-20	09-307042

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-094160
L102	13-094161
L103	13-094162
L104	13-090317
L105	13-176426
L106	13-170199
T101	13-090318
T301	13-090319
T302	13-090320
T303	13-090321

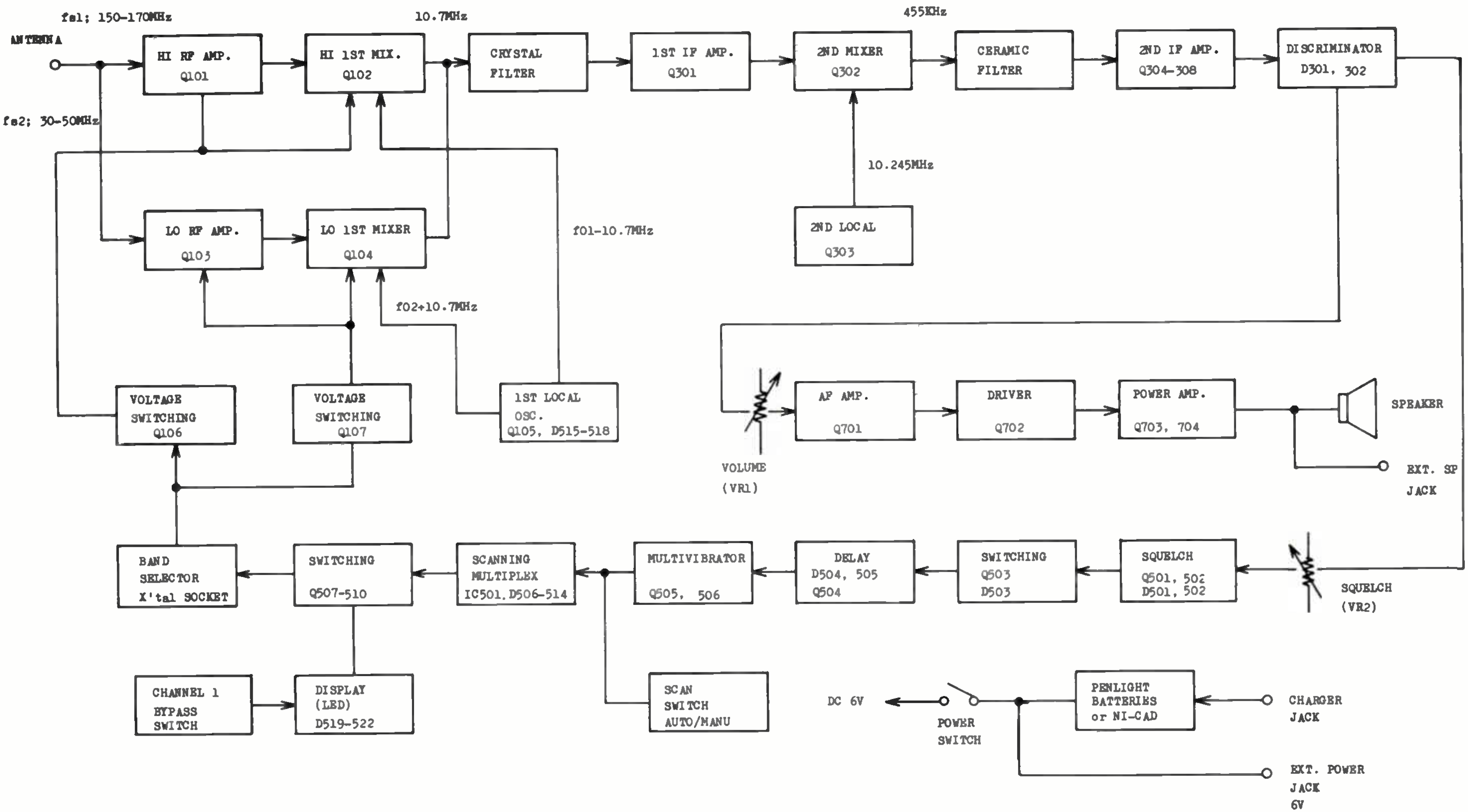
MISCELLANEOUS

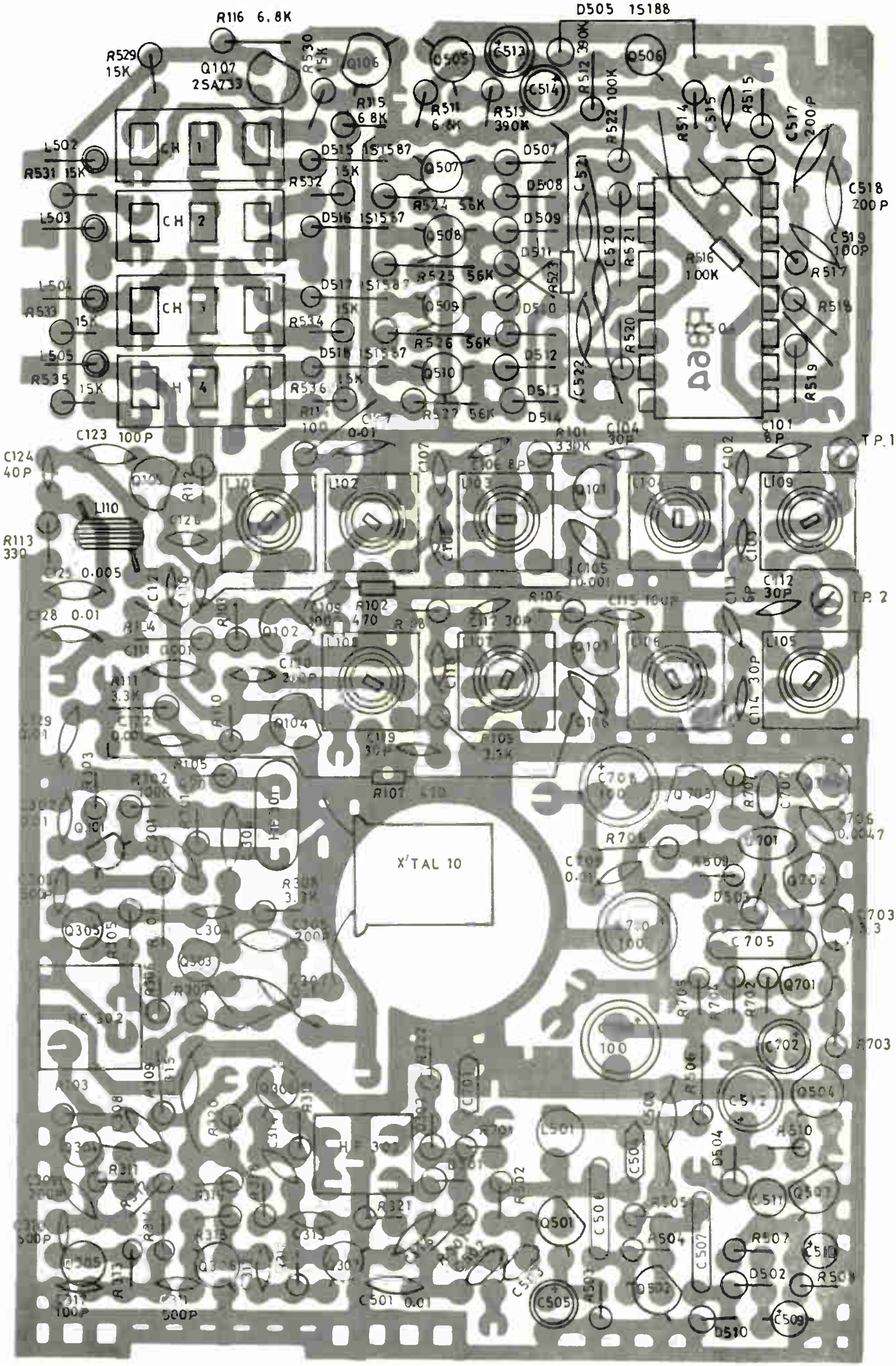
ITEM	NAME	PART NO.
	PC Board	13-070114
SP	Speaker, 60 ohm	13-068002
	Antenna	13-040078
	Switch, Band	13-183191
	Switch, Channel	13-183192

CABINET PARTS

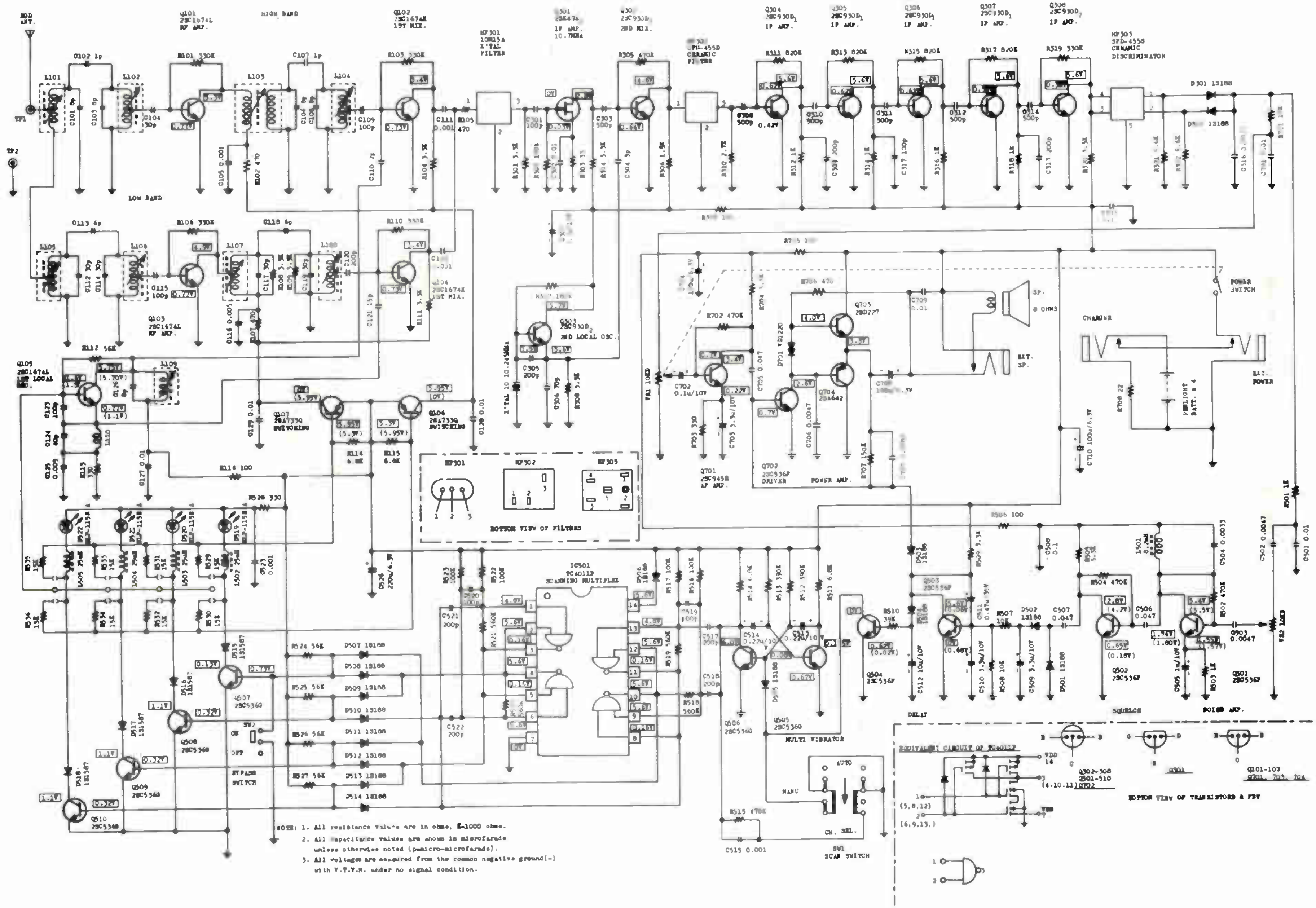
NAME	PART NO.
Cabinet	13-010241
Rear Cover	13-013107
Battery Lid	13-018020
Knob, Tuning	13-110162
Knob, Vol. or Squelch	13-110163

BLOCK DIAGRAM 13-919





D505 1S188
R116 6.8K
R529 15K
Q107 2SA733
R530 15K
Q106
Q505
C513
C514
Q506
R512 390K
R522 100K
R514
C515
R515
C517 200P
R115 6.8K
R511 6.8K
R513 390K
L502
R531 15K
CH 1
CH 2
L503
L504
R533 15K
L505
R535 15K
D515 1S1587
R532 15K
D516 1S1587
D517 1S1587
R534 15K
R536 15K
Q507
Q508
Q509
Q510
R524 56K
R525 56K
R526 56K
R527 56K
D507
D508
D509
D511
D510
D512
D513
D514
C521
C520
R521
C522
R520
R523
R516 100K
C518 200P
C519 100P
R517
R518
R519
C123 100P
C124 40P
L110
R113 330
C125 0.005
C128 0.01
L101
L102
L103
L104
L109
L105
L106
L107
C101 8P
T.P.1
T.P.2
C104 30P
R101 330K
C106 8P
C107
C112 30P
C115 100P
C114 30P
R102 470
Q101
Q102
Q104
Q105
R111 3.3K
R105 3.3K
C119 30P
R107
X'TAL 10
C708 100
Q703
R707
C707
C706 0.0047
R706
Q701
Q702
C703 3.3
C705
C709 0.01
R509
R703
C702
C710 100
Q504
C511
R510
D504
Q503
Q501
C506
C504
L501
R502
R505
R504
C507
R507
D502
R508
C510
C509
D510
C501 0.01
C505
Q502
R503
Q301
Q303
Q304
Q305
Q306
R321
C311 500P
C312 100P
C310 500P
C305 200P
R308 3.3K



NOTES: 1. All resistance values are in ohms, K=1000 ohms.
2. All capacitance values are shown in microfarads unless otherwise noted (p=micro-microfarads).
3. All voltages are measured from the common negative ground(-) with V.T.V.M. under no signal condition.

Midland 13-919

ALIGNMENT PROCEDURE

1. TEST EQUIPMENT REQUIRED
   - FM Signal Generator (183.03 MHz)
   - Sweep Generator (30 - 50 MHz)
   - Sweep Generator (150 - 170 MHz)
   - Oscilloscope
   - V.T.V.M.
   - Power Supply DC 6V 200 mA
   - Crystal for test 156 MHz
   - 8 ohm Dummy Load or Speaker
   - Sweep Oscilloscope 2 units
   - Screw Driver for alignment
2. TEST EQUIPMENT SET-UP DIAGRAM

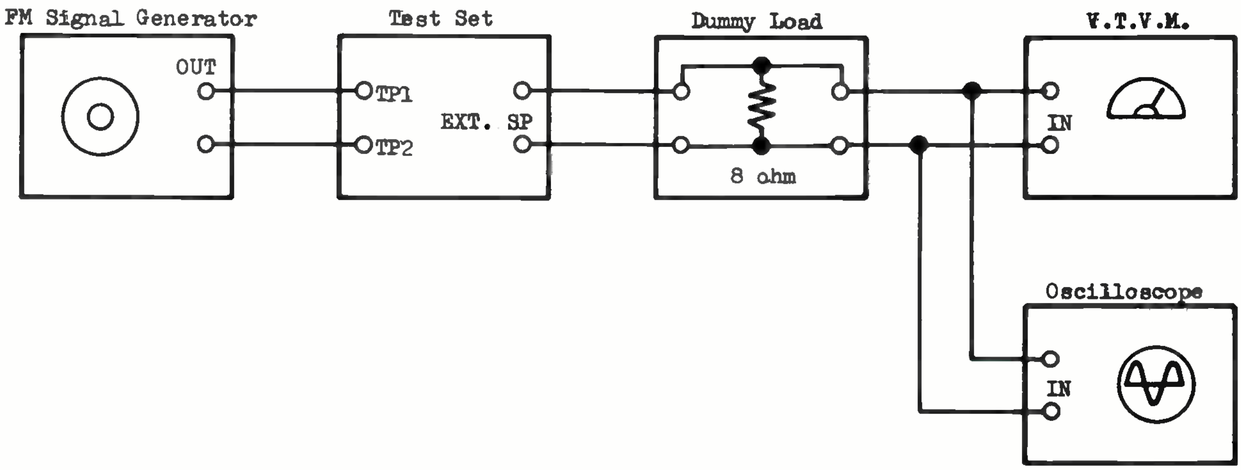
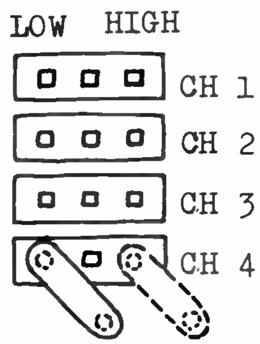


Figure 1

3. PROCEDURE

   (1) RF ALIGNMENT

   1. Connect the DC Power Supply to the Test Set.
   2. Turn the VOLUME and SQUELCH controls fully counterclockwise.
   3. Activate CH 4 in manual scanning operation. (Light CH 4 Indicator Light.)
   4. Plug only one pin of a HC-25U type crystal (Any frequency can be used) for activating the RF and Mixer circuits into CH 4 crystal socket on the High Band side. See Figure 2.



5. Connect the Sweep Generator to TP 1 and TP 2 of the Test Set as shown in Figure 1.
6. Connect the Sweep Oscilloscope to R103 and the wire between L108 and HF301 (ground) as shown in Figure 1 and 4.
7. Set the Sweep Generator to 158 MHz and keep its output level medium.
8. Adjust L101, L102, L103 and L104 for the waveform shown in Figure 3 on the Oscilloscope.

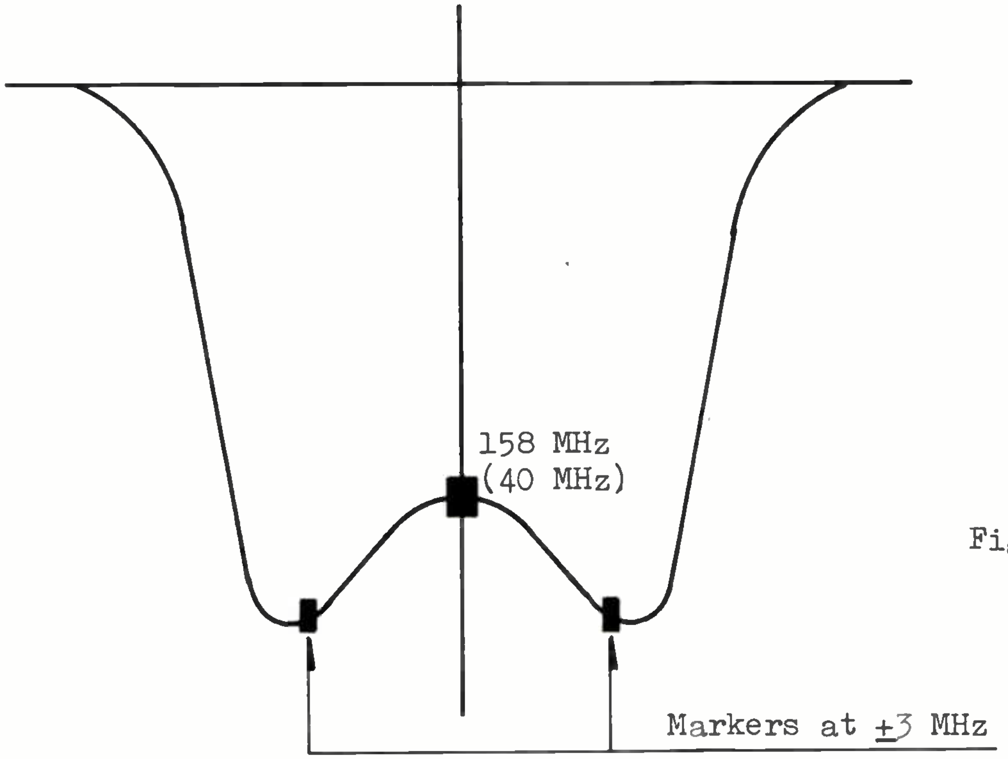
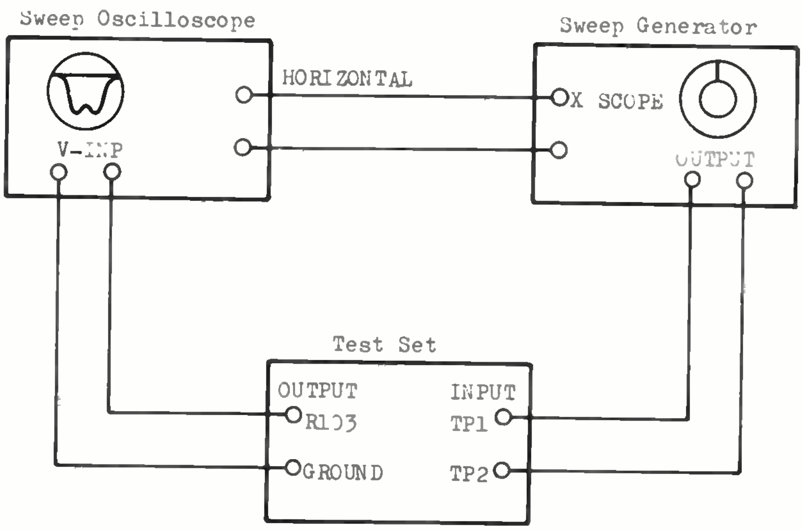


Figure 3

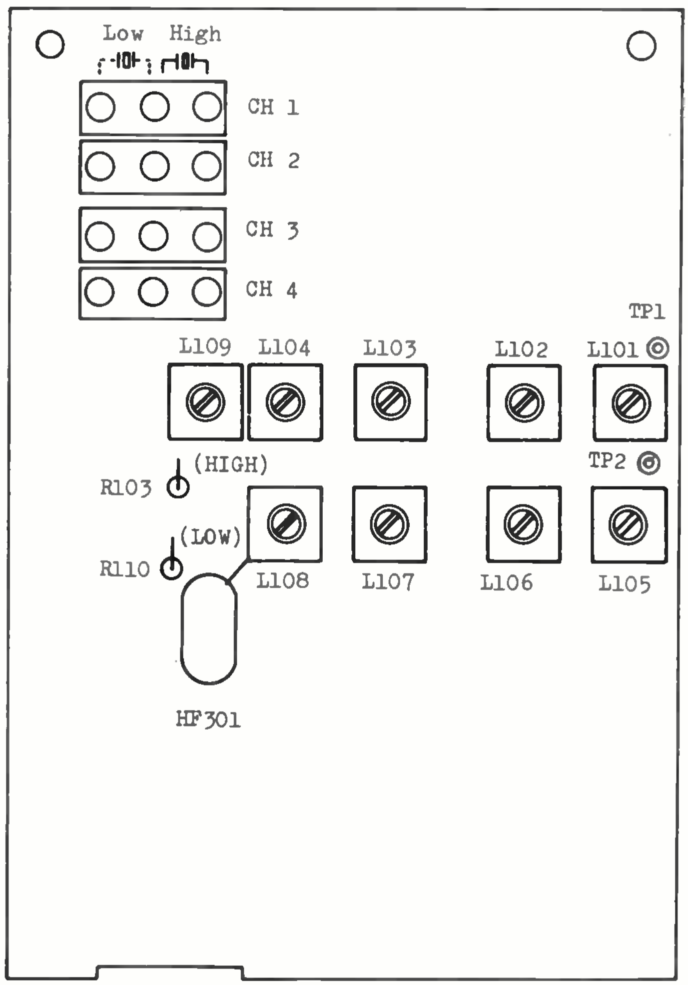
9. Remove the crystal from CH 4 crystal socket on the High Band side.
10. Plug the same crystal into CH 4 crystal socket on the Low BAnd side in the same way. See Figure 2.
11. Connect the Sweep Oscilloscope to R110 and the wire between L108 and HF301 (ground) as shown in Figure 1 and 4.
12. Set the Sweep Generator to 40 MHz and keep its output level medium.
13. Adjust L105, L106, L107 and L108 for the waveform shown in Figure 3 on the Oscilloscope.

(2) ALIGNMENT FOR MINIMIZING SPURIOUS RADIATION

1. Connect the DC Power Supply to the Test Set.
2. Activate CH 4 in manual scanning operation.
3. Plug the Test Crystal (156 MHz) into CH 4 crystal socket on the High Band side.
4. Connect the FM Signal Generator to TP 1 and TP 2 as shown in Figure 1.
5. Set the FM Signal Generator to 183.03 MHz.
6. Keep output level from the FM Signal Generator about 1 mV and adjust L109 for minimum spurious output level.



ALIGNMENT POINTS



SEMICONDUCTORS

ITEM	TYPE NO.
D301	IS188
D302	IS188
D501	IS188
D502	IS188
D503	IS188
D504	IS188
D505	IS188
D506	IS1588
D507	IS188
D508	IS188
D509	IS188
D510	IS188
D511	IS188
D512	IS188
D513	IS188
D514	IS188
D515	IS1587
D516	IS1587
D517	IS1587
D518	IS1587
D519	SLP-115RA
D520	SLP-115RA
D521	SLP-115RA
D522	SLP-115RA
D701	VD-1220
IC501 or	CMOS TC4011P
IC501	CM03 MC14011CP
Q101	2SC 1674
Q102	2SC 1674
Q103	2SC 1674
Q104	2SC 1674
Q105	2SC 1674
Q106	2SA 733
Q107	2SA 733
Q301	2SK 49
Q302	2SC 930
Q303	2SC 930
Q304	2SC 930
Q305	2SC 930
Q306	2SC 930
Q307	2SC 930
Q308	2SC 930
Q501	2SC 945
Q502	2SC 945
Q503	2SC 945
Q504	2SC 945
Q505	2SC 536
Q506	2SC 536
Q507	2SC 536
Q508	2SC 945
Q509	2SC 945
Q510	2SC 945
Q702	2SC 945
Q703	2SD 227
Q704	2SA 642

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C505	1uF 10V
C509	3.3uF 10V
C510	3.3uF 10V
C511	.47uF 35V
C512	10uF 6.3V
C513	.22uF 10V
C514	.22uF 10V
C702	1uF 10V
C703	3.3uF 10V
C704	100uF 6.3V
C708	100uF 6.3V
C710	100uF 6.3V

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	Volume	13-160126
VR2	Squelch	13-166065

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-094161
L102	13-094161
L103	13-176429
L104	13-094161
L105	13-176498
L106	13-176498
L107	13-176498
L108	13-176498
L109	13-094162
L110	13-176333
L501	13-178183
L502	13-178122
L503	13-178122
L504	13-178122
L505	13-178122

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	10M15A Crystal	13-179042
	10F15AG Crystal	13-179058
HF302	CFU-455D Filter	13-179041
HF303	Filter	13-179047
SW1	Switch, Scan	13-180085
SW2	Switch, Bypass	13-180084
	Antenna	13-040083
	10.245MHz Crystal	13-128364
	Speaker, 8 ohm	13-060108

CABINET PARTS

NAME	PART NO.
Top Panel Assy.	13-010283
Top Plate	13-020646
Case Front	13-010284
Crystal Door	13-018025
Rear Case Assy.	13-013126
Knob, Vol. or Squelch	13-110190
Knob, Scan./Chan.	13-115123
Push Button	13-030133

Pages 26-50 Courtesy of PATHCOM, INC.

Table 4-4
IF, Squelch Amplifier Board Voltage Chart

Transistors			
Reference Number	DC Voltage		
	E	B	C
Q101	4.2	3.6	8.6
Q102	3.8	4.4	5.8
Q103	10.0	10.0	SQ 9.5 UNSQ 0.0

Integrated Circuits					
Pin No.	DC Voltage		Pin No.	DC Voltage	
	IC 101	IC 102		IC 101	IC 102
1	0.7	3.8	8	4.4	0.0
2	0.0	3.6	9	8.6	-
3	0.0	-	10	3.6	1.5
4	0.7	1.5	11	-	-
5	0.0	1.5	12	-	-
6	8.6	1.5	13	-	9.6
7	0.0	0.0	14	-	4.2

Table 4-5
UHF RF Section* Voltage Chart

Transistors			
Reference No.	DC Voltage		
	E	B	C
Q202	0.8	1.5	9.0
Q203**	10.0	9.4	10.0
Q204	3.4	4.2	9.2
Q205	0.0	0.4	9.6
Q206	9.4	9.2	3.5
Q207	2.4	3.0	9.2
Q208	2.4	3.2	9.2
	D	S	G
Q201	9.0	0.0	0.0

* Switches in UHF positions (Models 308 and 216 only).
** Not used in Model 108U.

Table 4-6
VHF RF Section* Voltage Chart

Transistors				
Reference No.		DC Voltage		
		E	B	C
Q302	High	10.0	9.4	0.0
	Low	10.0	9.0	10.0
Q304	High	0.4	0.0	9.6
	Low	0.4	1.0	9.6
Q306	High	0.4	1.0	9.6
	Low	0.4	0.0	9.6
Q307	High	10.0	9.0	10.0
	Low	10.0	9.4	0.0
Q308	High	10.0	9.8	9.0
	Low	10.0	9.8	9.0
Q309	High	2.7	3.5	9.5
	Low	2.7	3.5	9.5
		D	S	G
Q301		9.6	0.5	0.0
Q303		8.4	0.0	0.0
Q305		9.8	1.6	0.0

* Switches in VHF High or Low positions as indicated (Models 308 and 208A only).

Table 4-7
Audio/Squelch Circuit* Voltage Chart

Transistors				
Reference No.	Condition	DC Voltage		
		E	B	C
Q401	SQ	1.2	0.0	10.0
	UNSQ	2.0	2.5	4.5
Q402		6.0	6.6	12.8
Q403		13.8	12.8	7.8
Q404		7.2	7.8	0.6
Q405		7.2	7.8	13.8
Q406		0.0	0.6	7.2
Q407	SQ	0.0	0.8	0.0
	UNSQ	0.0	0.0	6.0
Q408	SQ	0.0	0.0	2.0
	UNSQ	0.0	0.5	0.0

* Signals squelched or unsquelched as indicated. Where not indicated, either condition prevails.

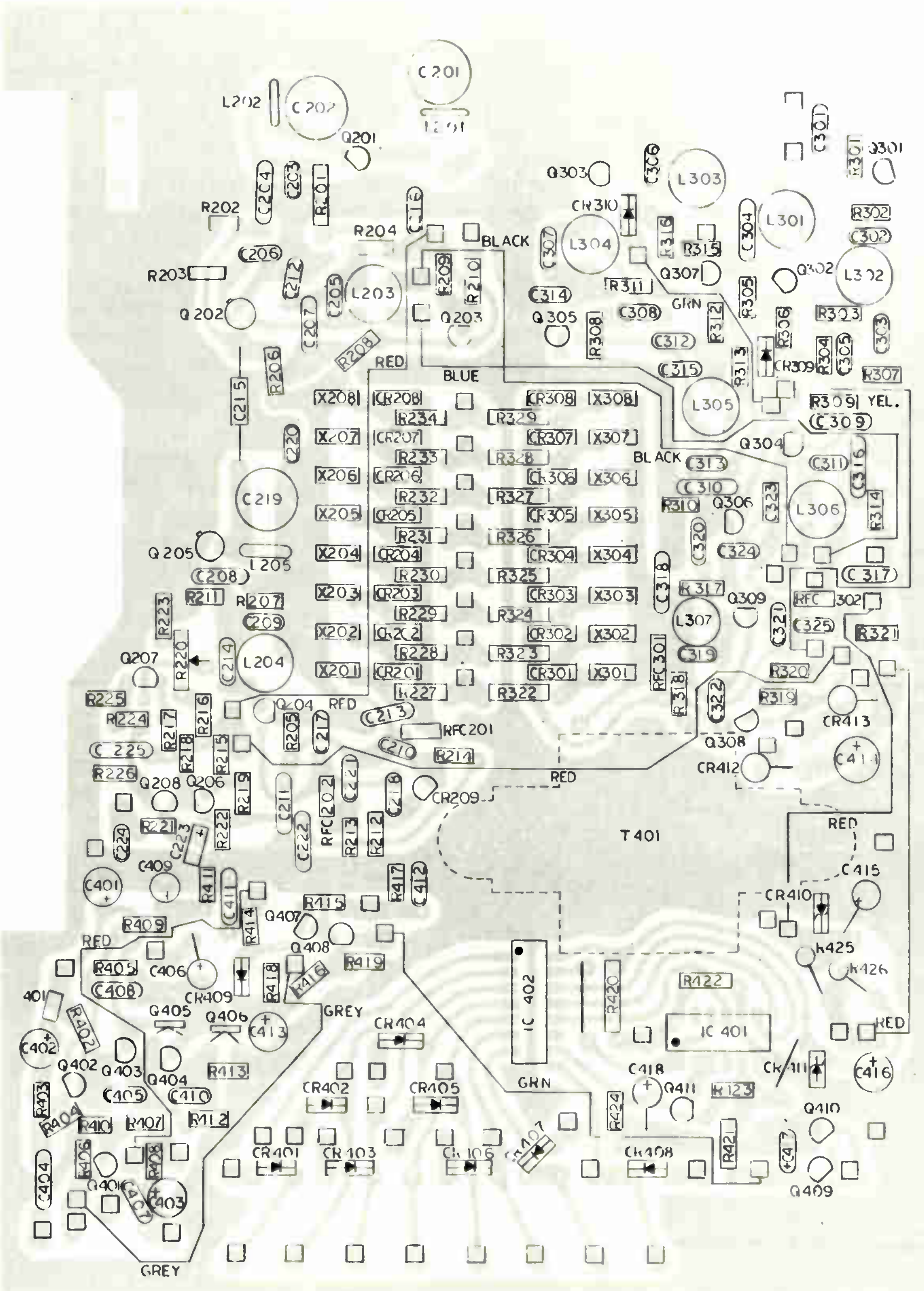
Table 4-8
SCAN Logic* Voltage Chart

Transistors				
Reference No.	Condition	DC Voltage		
		E	B	C
Q409	SQ/SCAN	1.8	2.5	0.6
	SQ/MAN	0.5	0.0	0.6
	UNSQ	0.0	same as above	0.6
Q410	SQ/SCAN	0.0	0.6	2.5
	SQ/MAN	0.0	0.6	0.0
	UNSQ	0.0	0.6	same as above
Q411		0.0	0.6	0.2

* Signals squelched in SCAN or MAN position as indicated. Where not indicated, either condition or SCAN switch position prevails.

Table 4-8 (continued)

Integrated Circuits									
Reference No.	Pin No.	CHANNEL							
		1	2	3	4	5	6	7	8
IC401	1	0.0	2.8	0.0	2.8	0.0	2.8	0.0	2.8
	2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	5	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0	0.0	0.0	0.0	3.4	3.4	3.4	3.4
	9	3.4	3.4	3.4	3.4	0.0	0.0	0.0	0.0
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	12	0.0	2.8	0.0	2.8	0.0	2.8	0.0	2.8
	14	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
IC402	1	1.0	13.8	13.8	13.8	13.8	13.8	13.8	13.8
	2	13.8	1.0	13.8	13.8	13.8	13.8	13.8	13.8
	3	13.8	13.8	1.0	13.8	13.8	13.8	13.8	13.8
	4	13.8	13.8	13.8	1.0	13.8	13.8	13.8	13.8
	5	13.8	13.8	13.8	13.8	1.0	13.8	13.8	13.8
	6	13.8	13.8	13.8	13.8	13.8	1.0	13.8	13.8
	7	13.8	13.8	13.8	13.8	13.8	13.8	1.0	13.8
	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	9	13.8	13.8	13.8	13.8	13.8	13.8	13.8	1.0
	10	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	13	0.0	0.0	0.0	0.0	3.4	3.4	3.4	3.4
	14	3.4	3.4	3.4	3.4	0.0	0.0	0.0	0.0
	15	0.0	2.8	0.0	2.8	0.0	2.8	0.0	2.8
	16	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1



C201
L201
C202
L202
Q201
R201
C203
C204
R202
R204
R203
C206
C212
C205
L203
C207
Q202
R208
R206
R209
R210
Q203
BLACK
RED
BLUE
C215
C220
C219
Q205
L205
C208
R211
R207
C209
R223
R220
C214
L204
Q207
R225
R224
R217
R216
C225
R218
R215
R226
Q208
Q206
R219
R221
C224
C223
R222
C211
RFC202
C222
R213
R212
C218
C221
C217
R205
Q204
C213
RFC201
C210
R214
CR209
X208
X207
X206
X205
X204
X203
X202
X201
CR208
CR207
CR206
CR205
CR204
CR203
CR201
R234
R233
R232
R231
R230
R229
R228
R227
R329
R328
R327
R326
R325
R324
R323
R322
CR308
CR307
CR306
CR305
CR304
CR303
CR302
CR301
X308
X307
X306
X305
X304
X303
X302
X301
Q303
C306
L303
CR310
C301
R301
Q301
L301
C304
R302
C302
Q302
L302
C307
L304
R316
R315
Q307
C314
R311
GRN
Q305
C308
R308
R312
R305
R306
R323
C303
C312
R313
CR309
R304
C305
C315
L305
R307
R309 YEL.
C309
Q304
C313
C311
C316
C310
R310
Q306
C323
L306
R314
C320
C324
C317
C318
R317
Q309
RFC 302
C321
C325
R321
L307
RFC301
C319
R320
R318
C322
R319
Q308
CR413
C414
CR412
T 401
C415
CR410
R425
R426
C401
C409
R411
C411
R414
Q407
R415
R417
C412
R409
R405
C406
CR409
R418
R416
R419
Q408
C408
R402
Q405
Q406
C413
GREY
CR404
IC 402
R420
R422
IC 401
C402
Q402
Q403
Q404
R413
C405
C410
R412
R410
R407
R403
R404
CR402
CR405
C418
Q411
R423
R424
CR411
C416
Q410
CR401
CR403
CR406
CR407
CR408
R421
C417
Q409
C404
R406
R408
C407
C403
Q401
GREY

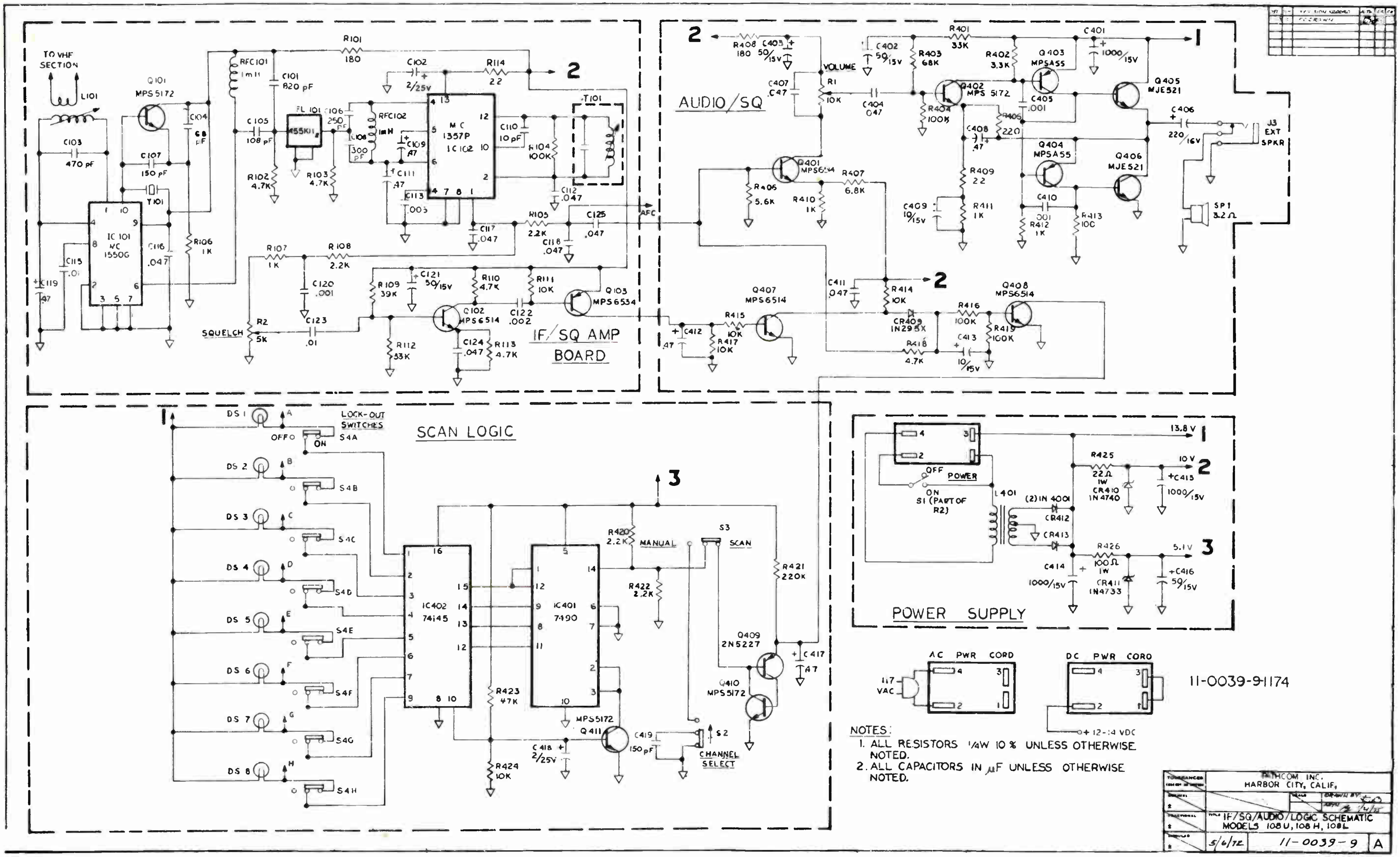


Figure 6-6. IF, Squelch, Audio and Logic Circuits for SCAN 108 Series

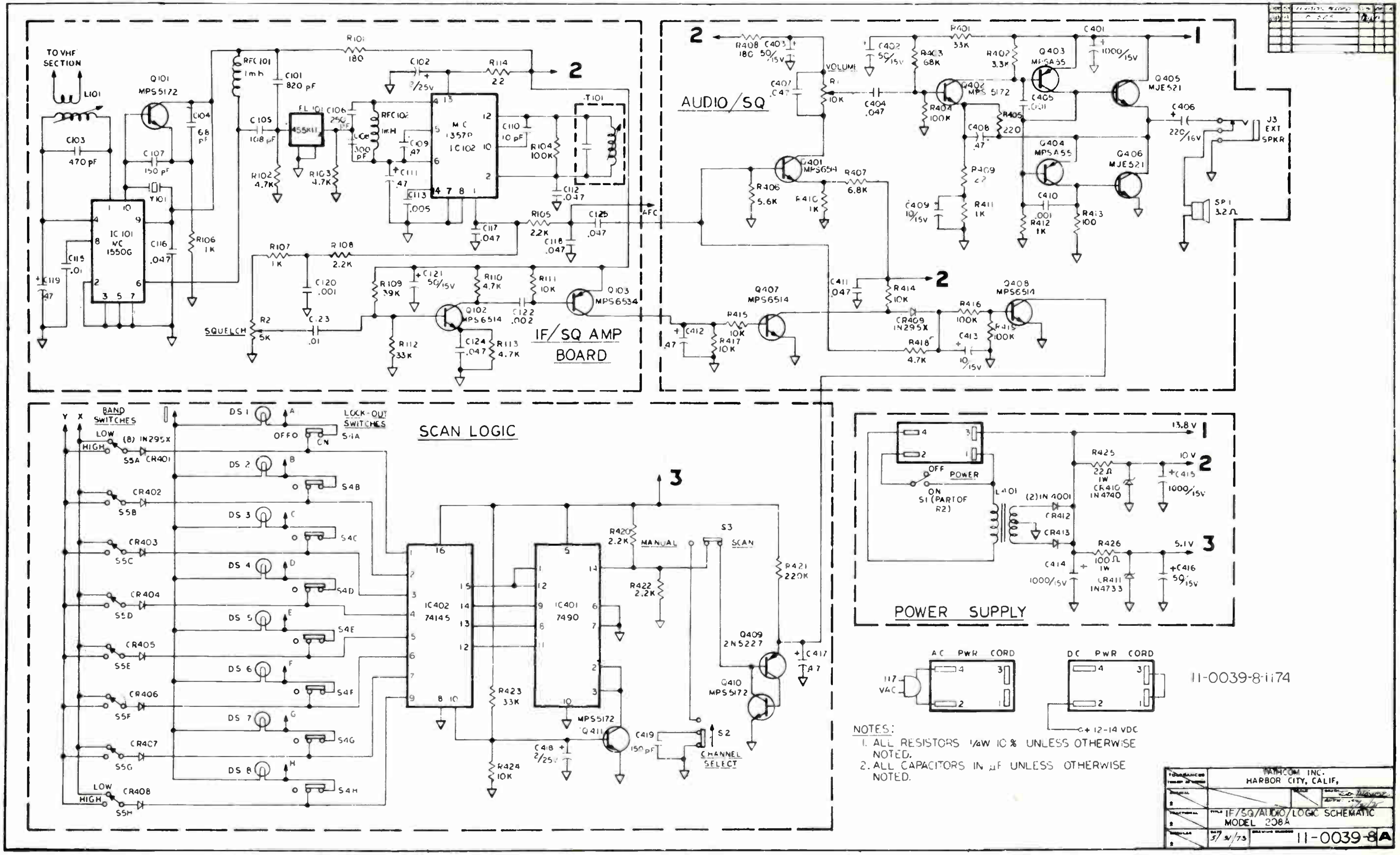


Figure 6-5. IF, Squelch, Audio and Logic Circuits for SCAN 208A

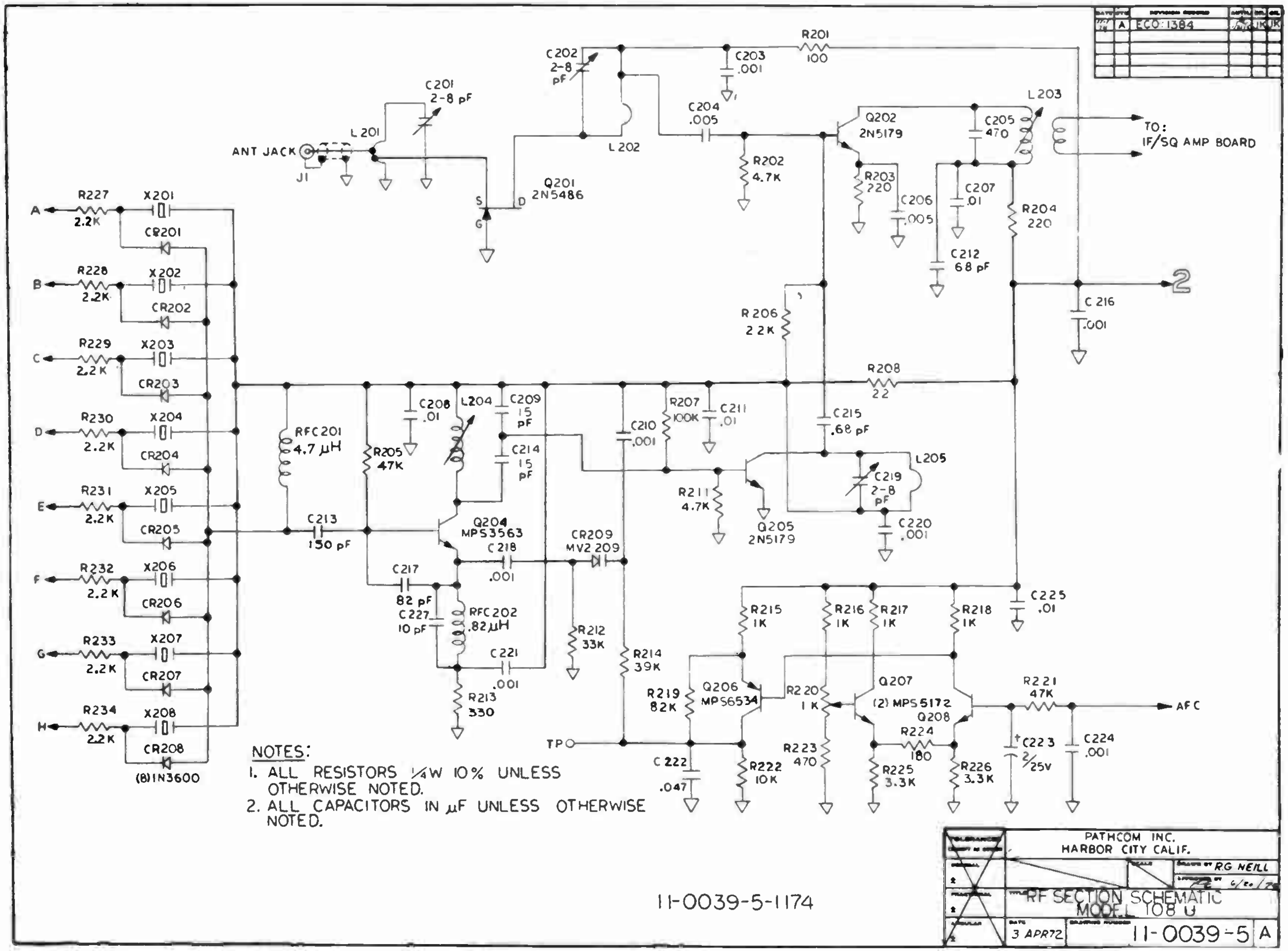


Figure 6-13. UHF/RF Circuit for SCAN 108U

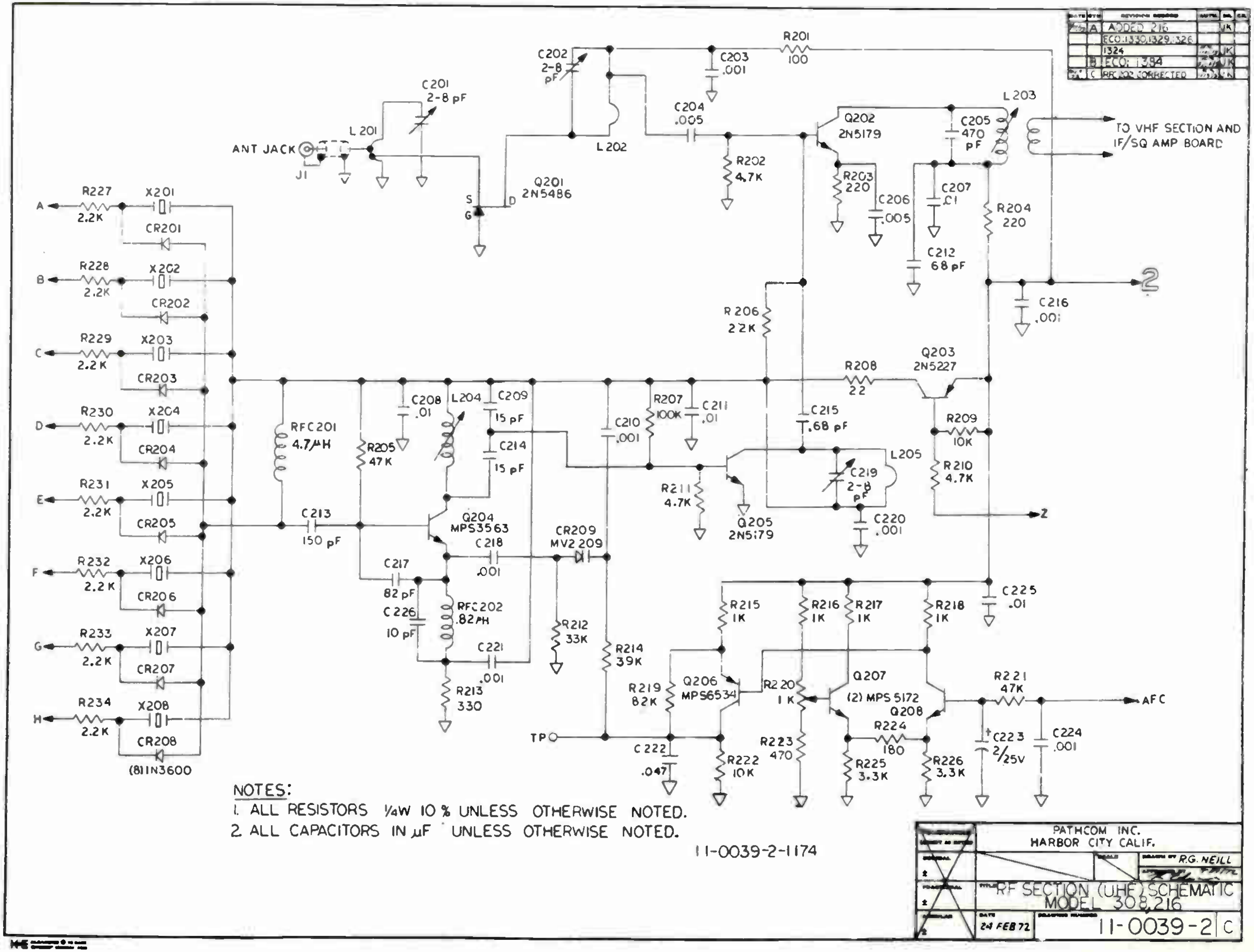


Figure 6-12. UHF/RF Circuit for SCAN 308 and 216

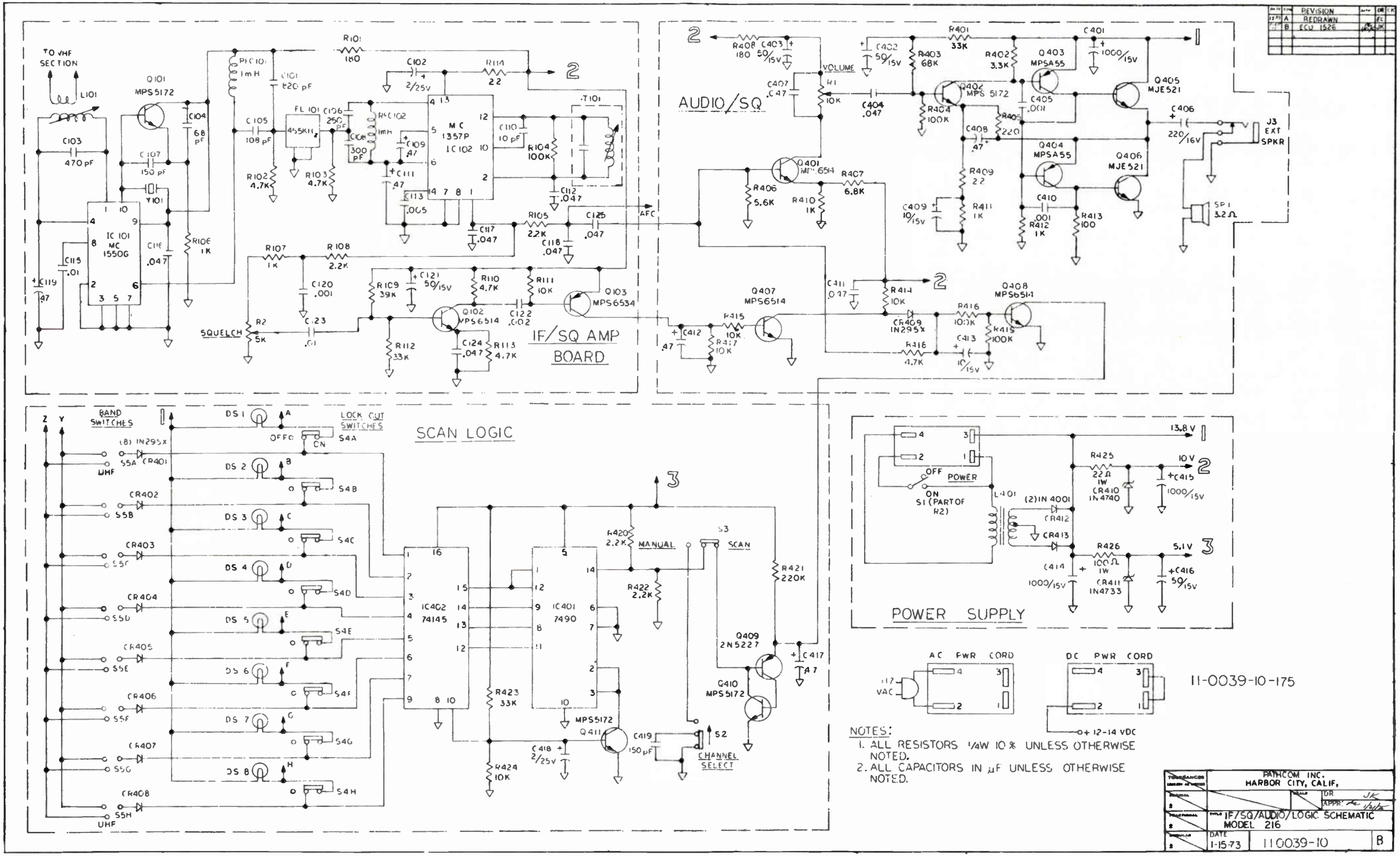


Figure 6-4. IF, Squelch, Audio and Logic Circuits for SCAN 216

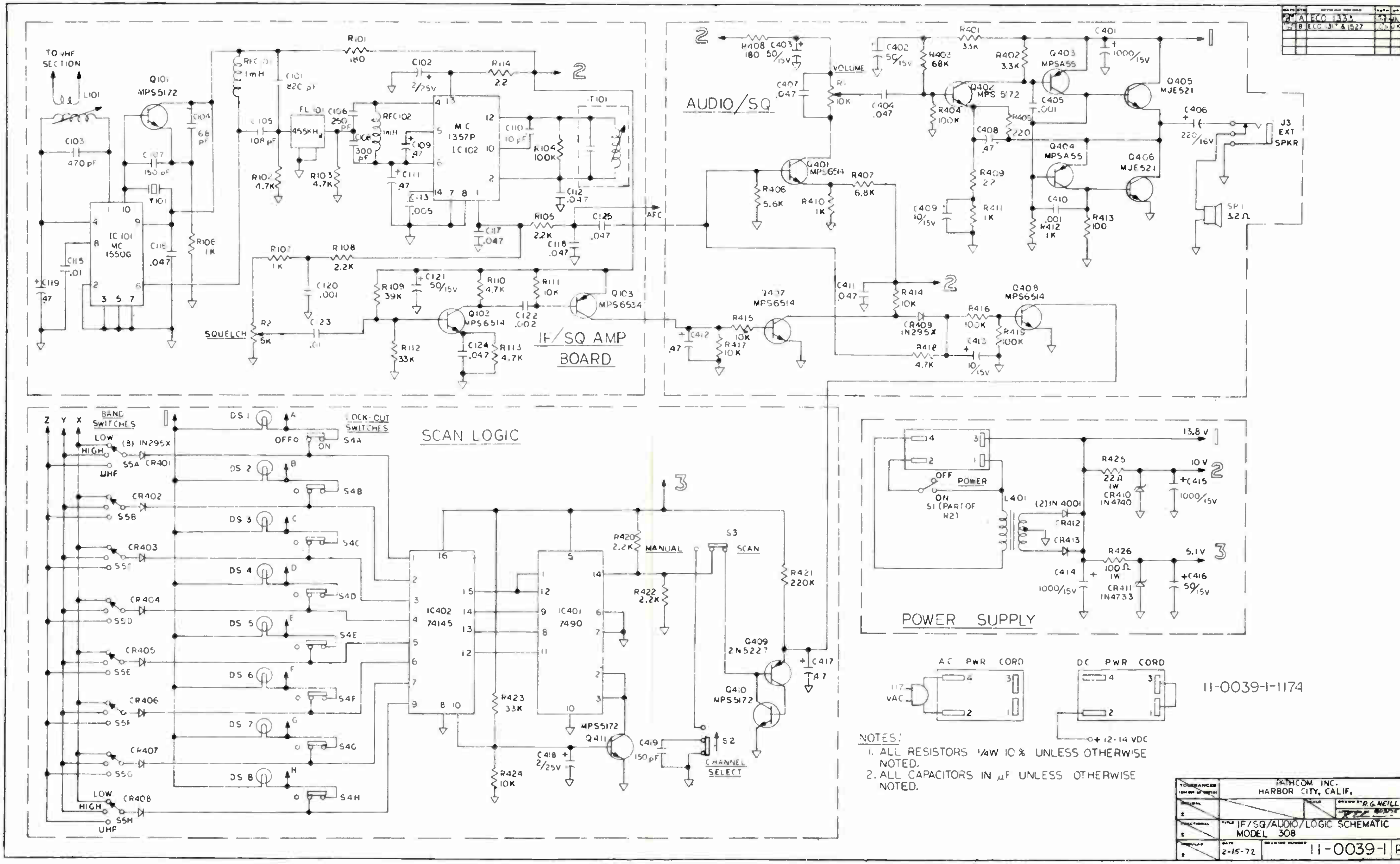


Figure 6-3. IF, Squelch, Audio and Logic Circuits for SCAN 308

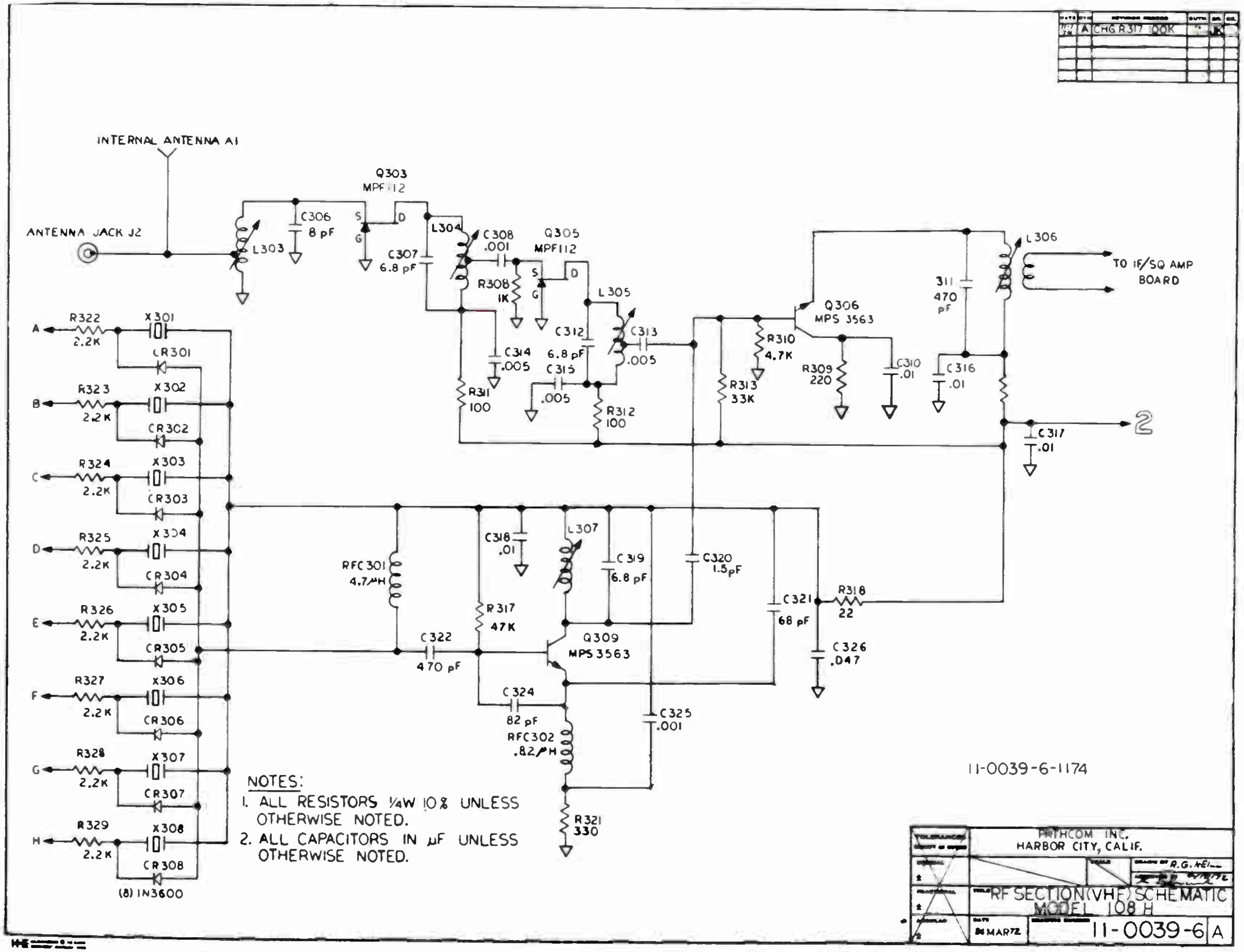


Figure 6-10. VHF/RF Circuit for SCAN 108H

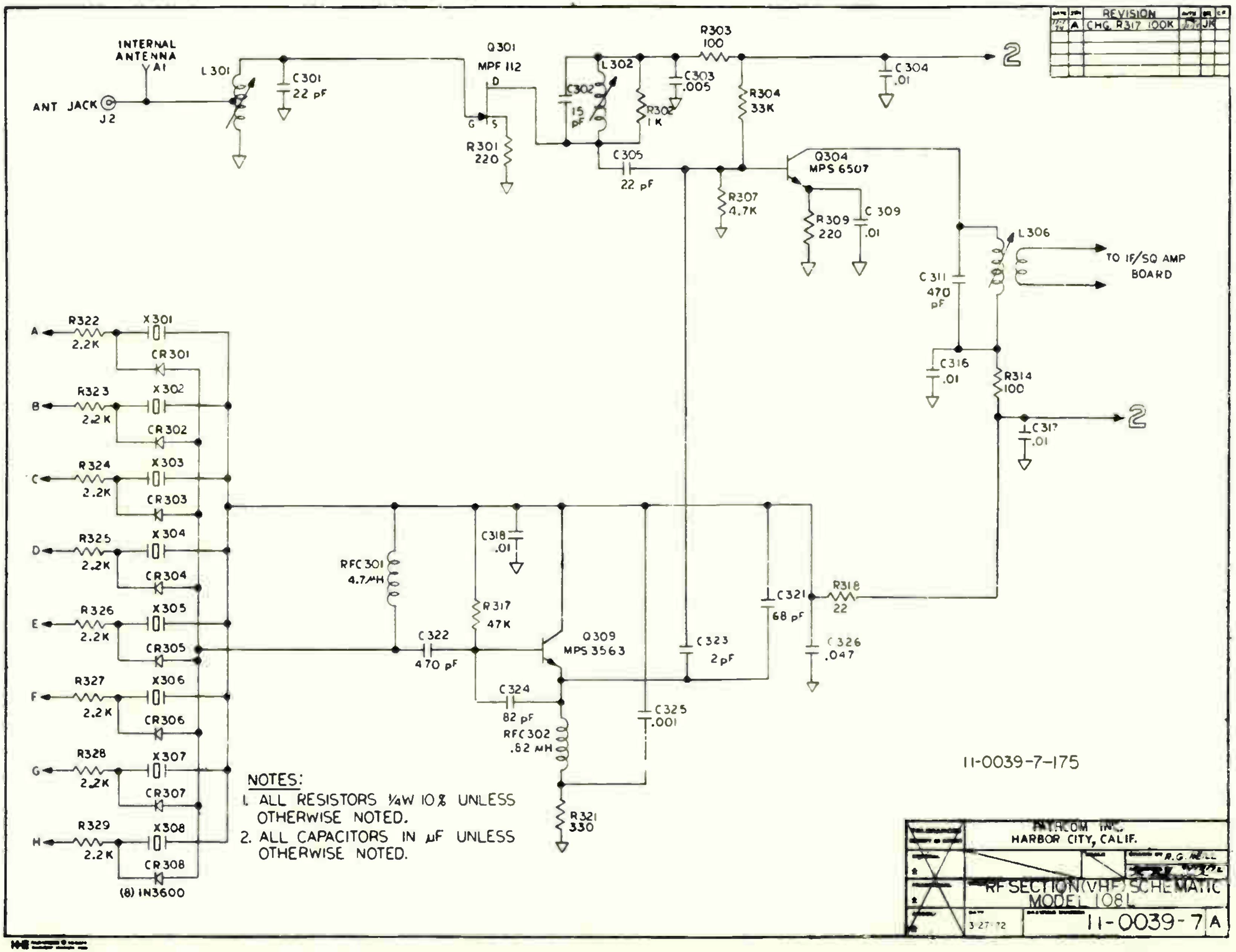


Figure 6-11. VHF/RF Circuit for SCAN 108L

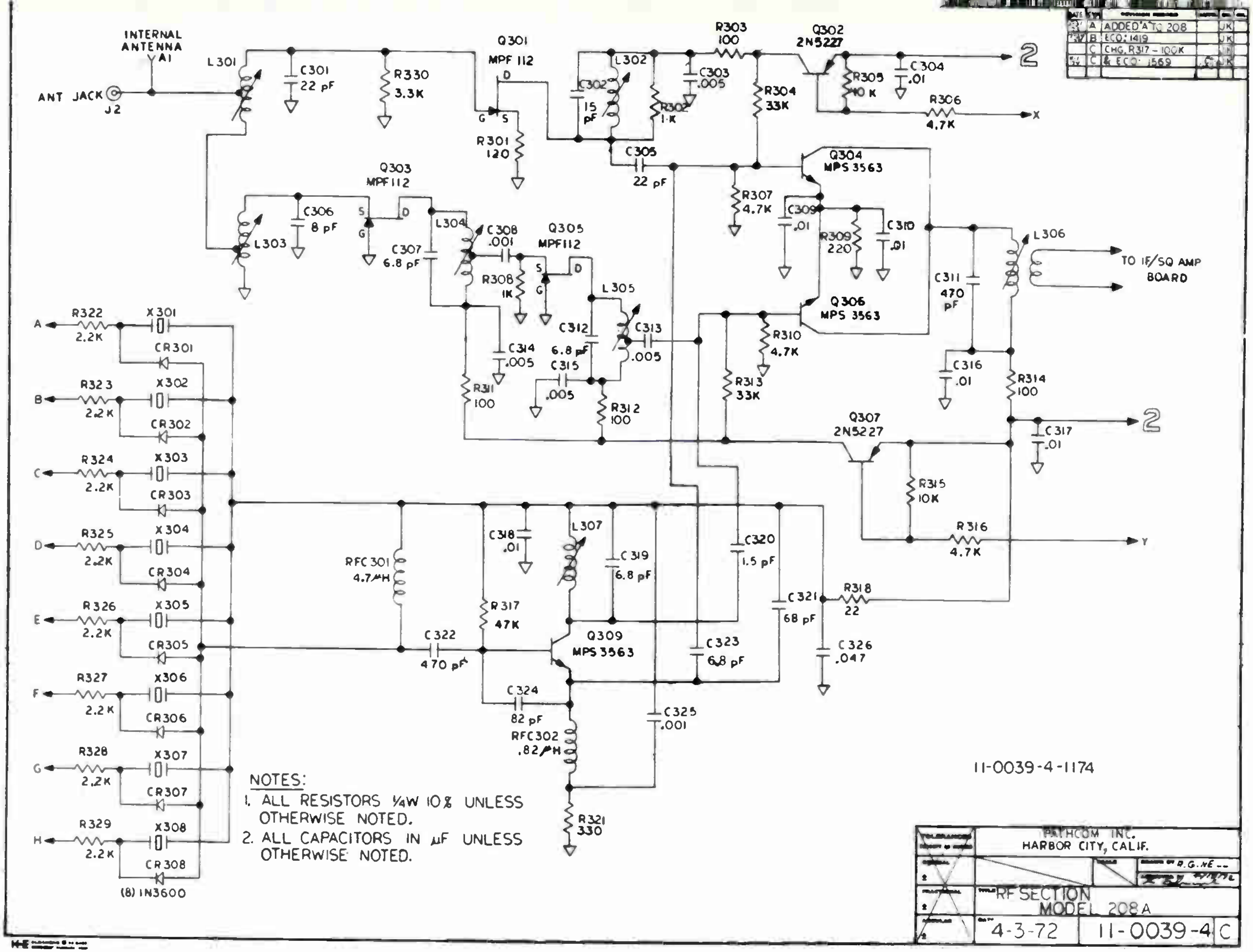


Figure 6-9. VHF/RF Circuit for SCAN 208A

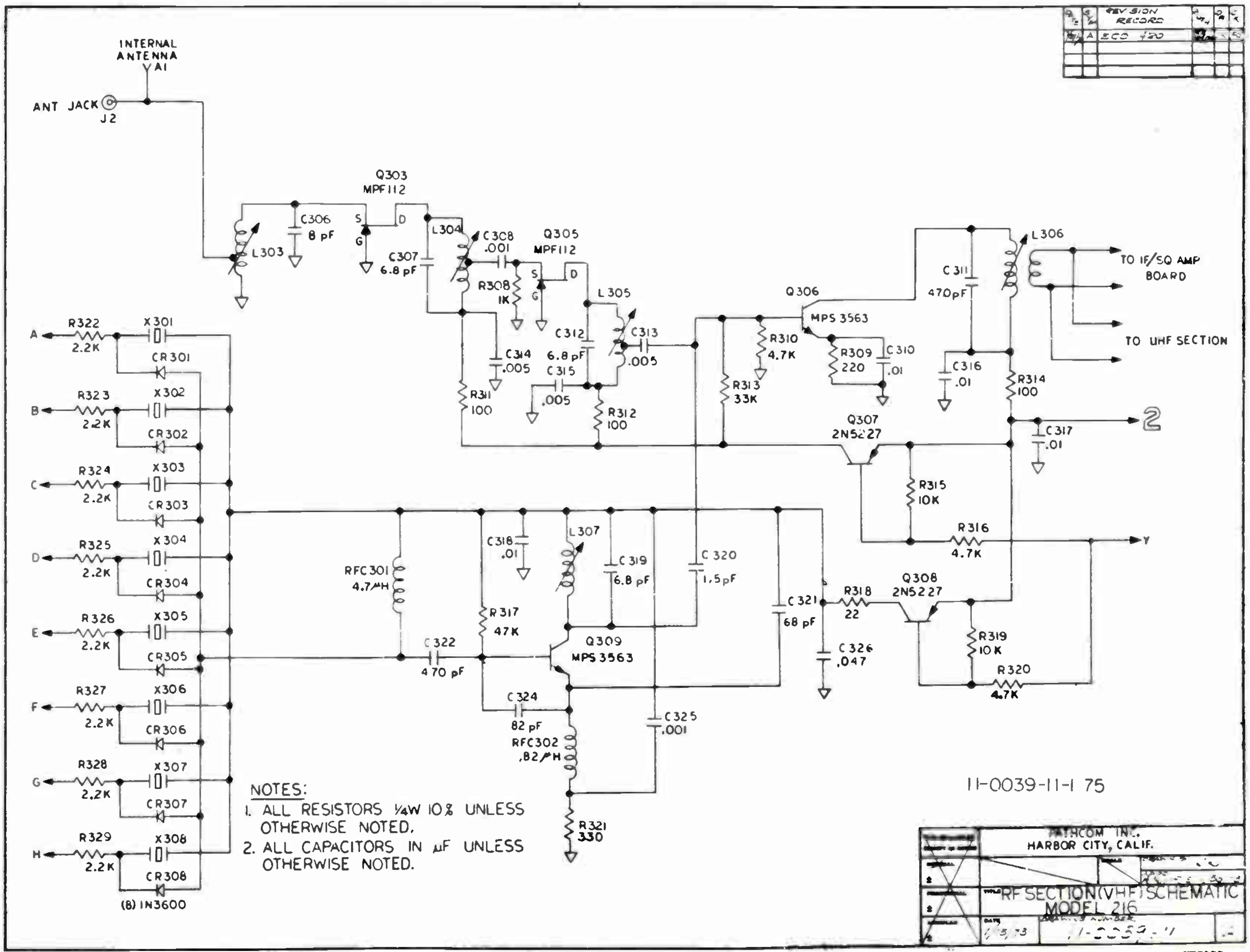


Figure 6-8. VHF/RF Circuit for SCAN 216

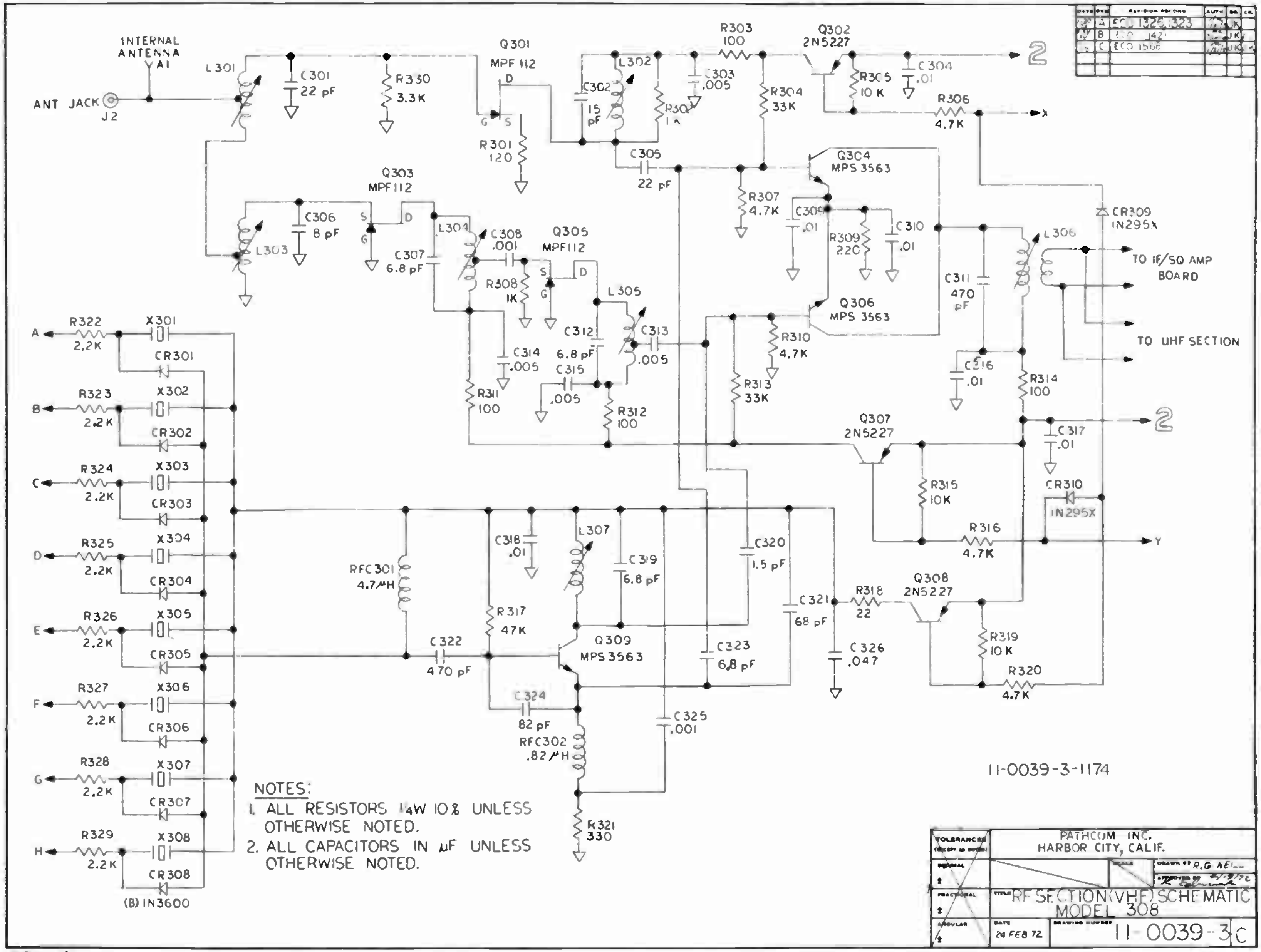


Figure 6-7. VHF/RF Circuit for SCAN 308

SECTION V
ADJUSTMENT AND ALIGNMENT

5.1 GENERAL

Every effort has been made to keep the required instruments necessary to align and service as simple as possible. It must be realized that the degree of accuracy attained in measurement is directly related to the quality of instruments used. Where a lower quality instrument than the one suggested is used, allowance must be made for possible error in readings. Refer to Table 4-1 for a list of recommended test equipment.

5.2 ALIGNMENT PROCEDURE

The main PC board is capable of accommodating three separate receiver front ends.

1. UHF Section can be tuned to cover 450-470 MHz. If it is necessary to retune to cover up to 512 MHz, certain component values must be changed. Unless specified otherwise, the UHF section is peak tuned at the factory to 460 MHz with broad band tuning to adequately receive signals from 454 MHz through 466 MHz.

2. **HIGH VHF** Section can be tuned to cover 140-174 MHz without component changes. Unless specified otherwise, the High VHF section is peak tuned at the factory to 156.5 MHz with broad band tuning to adequately receive signals from 151 MHz through 163 MHz.

3. **LOW VHF** Section can be tuned to cover 30-50 MHz without component changes. Unless specified otherwise, the Low VHF section is peak tuned to 42 MHz with broad band tuning to adequately receive signals from 37 MHz through 47 MHz.

Whenever it becomes necessary to change the factory tuning to a different frequency, try to tune at the center of the new frequency and then check the sensitivity of the extreme frequencies for adequate reception. (For each of the "center frequency" crystals, select the crystal frequency nearest the desired center band for your peak tuning procedure.)

Alignment procedures are referenced to the SCAN 308, because that model embodies all three receiver sections mentioned above. The SCAN 216 utilizes the UHF and High VHF sections. SCAN 208A utilizes the High VHF and Low VHF sections. Receivers in the 108 Series utilize only one section for each designation; L for Low VHF, H for High VHF, and U for UHF. Some component values change, and circuit jumpers are used, when omitting a receiver section from the main board. However, all component designations and alignment procedures are the same for all models.

5.2.1 IF/Discriminator Alignment (All Models)

1. Disconnect twisted pair leads from IF/SQ board (Figure 5-1) to main board at the main board end. Connect these leads to the signal generator grounding one lead to the chassis (either lead may be grounded).

2. Set the SQUELCH control to its maximum counterclockwise position.

3. Set signal generator to 10.7 MHz with 500 µV output and 1 kHz modulation frequency with 3.3 kHz deviation.

4. Connect RF voltmeter to pin 4 of IC102 and ground. Tune L101 for maximum indication on voltmeter. Voltmeter reading should be typically 0.25 to 0.35 volts.

5. Connect AC VTVM across the speaker terminals and adjust the volume control for a reading of approximately 0.3 volts. Adjust T101 for maximum indication on AC VTVM.

6. Reconnect twisted pair leads to main board.

7. Adjust L203 (Figure 5-2) and L306 (Figure 5-3) for maximum indication on AC VTVM.

5.2.2 UHF Alignment (Models 308, 216, and 108U)

1. Install desired channel crystal in Channel 1 position (see Figure 5-2) and set Channel 1 band switch (on rear panel) to UHF position.

2. Connect signal generator to UHF antenna jack.

3. Set AFC trimmer (R220) to middle of range.

4. Turn on power and be sure that the Channel 1 light is on.

5. Connect RF voltmeter to pin 4 of IC102 and ground on IF/SQ board. See Figure 5-1.

6. Set signal generator output level to approximately 1000 µV and tune for maximum indication on RF voltmeter. Adjustment of L204 and C219 (Figure 5-2) may be necessary to obtain an indication on the RF voltmeter. Reduce the signal generator output level as required to maintain an RF voltmeter reading of approximately 0.3 volts.

7. Tune C201, C202, L204, and C219 (Figure 5-2) for maximum indication on RF voltmeter. Reduce signal level to maintain approximately 0.3 volts on RF voltmeter.

8. Reduce signal generator output level to zero and remove UHF crystal from socket.

9. Connect VTVM to AFC test point (junction of R214 and R219, as shown in Figure 5-2) and ground. Set AFC control for a reading of 2.0 to 4.0 volts.

10. Reinstall crystal and measure sensitivity. Sensitivity should be 0.5 to 1.0 mV for 20 dB quieting. Some retuning may be necessary for maximum sensitivity.

NOTE

When more than one crystal is being installed, and the frequency spread is greater than 3 MHz, the unit should be tuned on one frequency and then the other with slight adjustment to maintain equal sensitivities.

11. Set MAN/SCAN switch to SCAN (outer) position and rotate SQUELCH control fully clockwise. The unit should be scanning all channels.

12. Increase signal generator output level until scanning stops on Channel 1. Signal generator output level should be less than 5.0 µV.

5.2.3 High VHF Band Alignment (Models 308, 216, 208A, and 108H)

1. Install desired channel crystal in Channel 1 position (Figure 5-3) and set Channel 1 band switch (on rear panel) to HIGH position.

2. Connect signal generator to High-Low antenna jack.

3. Turn on power and be sure that the Channel 1 light is on.

4. Connect RF voltmeter to pin 4 of IC102 (Figure 5-1) and ground on IF/SQ board.

5. Set signal generator output level to approximately 1000 µV and tune for maximum indication on RF voltmeter.

6. Tune L307, L305, L304, and L303 (Figure 5-3) for maximum indication on RF voltmeter. Reduce signal generator level as required to maintain approximately 0.3 volts on RF voltmeter during tuning.

7. Measure sensitivity (0.5-0.7 µV) for 20 dB quieting.

NOTE

When more than one crystal is being installed, and the frequency spread is greater than 1 MHz, the unit should be tuned on one frequency and then the other with slight readjustment to maintain equal sensitivities.

8. Reduce signal generator output to zero. Set MAN/SCAN switch to SCAN (outer) position and rotate SQUELCH control fully clockwise. Unit should be scanning all channels.

9. Increase signal generator output level until scanning stops on Channel 1. Signal generator output level should be less than 5.0 μV.

5.2.4 Low VHF Band Alignment (Models 308, 208A, and 108L)

1. Install desired channel crystal in Channel 1 position (Figure 5-3) and set Channel 1 band switch (on rear panel) to LOW position.

2. Connect signal generator to High-Low antenna jack.

3. Turn on power and be sure that the channel light is on.

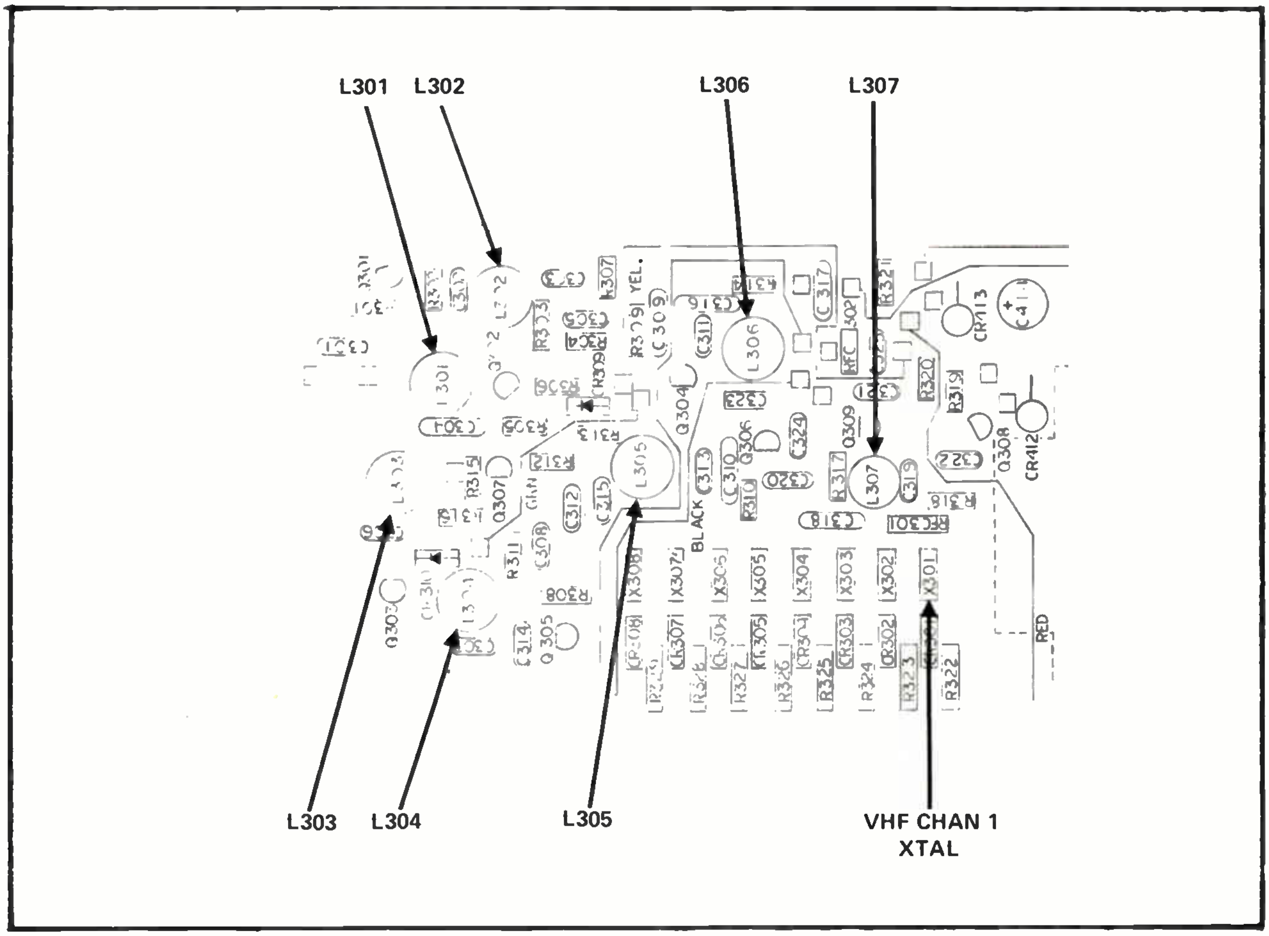


Figure 5-3. Main Board Tuning and Connecting Points for High and Low VHF Band Alignment

4. Connect RF voltmeter to pin 4 of IC102 (Figure 5-1) and ground in IF/SQ board.

5. Set signal generator output level to approximately 1000 µV and tune for maximum indication on RF voltmeter.

6. Tune L301 and L302 (Figure 5-3) for maximum indication on RF voltmeter. Reduce signal generator output level as required to maintain approximately 0.3 volts on RF voltmeter during tuning.

7. Measure sensitivity (0.5-0.7 µV) for 20 dB quieting.

NOTE

When more than one crystal is being installed and the frequency spread is greater than 5 MHz, the unit should be tuned on one frequency and then the other with slight readjustment to maintain approximately equal sensitivities.

8. Reduce signal generator output to zero. Set MAN/SCAN switch to SCAN (outer) position and rotate SQUELCH control fully clockwise. Unit should be scanning all channels.

9. Increase the signal generator output level until scanning stops on Channel 1. Signal generator output level should be less than 5.0 µV.

5.3 DELAY AND SCAN RATE MODIFICATION

Delay and Scan Rate Modification may be made by making the following simple component changes.

5.3.1 Scan Delay

The scan delay (or time to start scanning after the signal disappears) may be increased by changing the value of C413. With the 10 µF/15 V installed at the factory, this time delay is approximately 0.3 seconds. Installation of a 30 µF/15 V capacitor increases the delay to approximately one second.

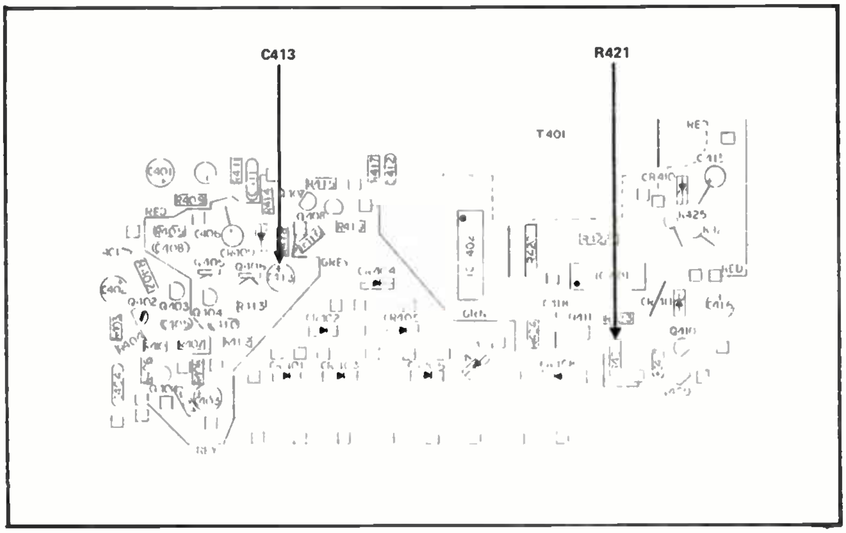


Figure 5-4. Main Board Component Location for SCAN Delay and SCAN Rate Modifications

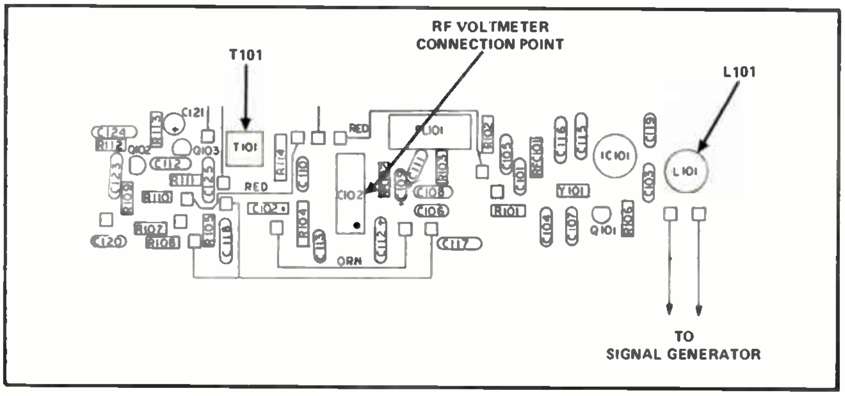


Figure 5-1. IF/Squelch Amplifier Tuning and Connecting Points

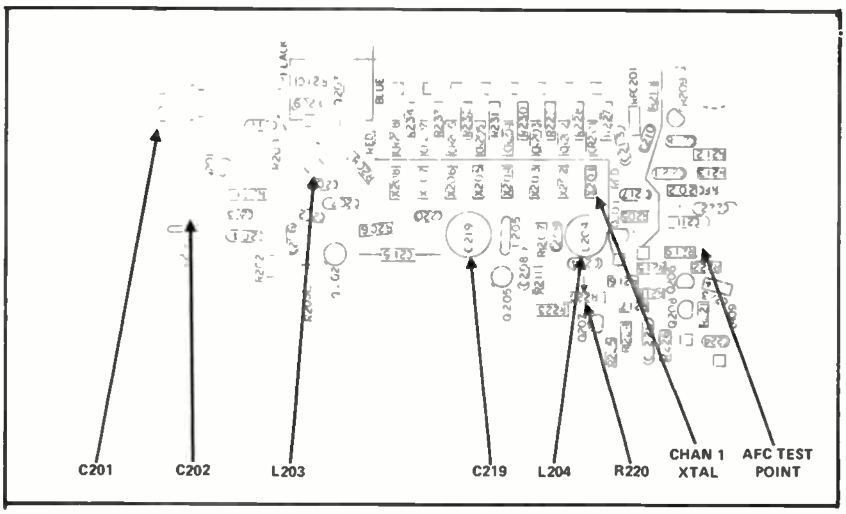


Figure 5-2. Main Board Tuning and Connecting Points for UHF Alignment

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
CR201	1N3600	13-0003
CR202	1N3600	13-0003
CR203	1N3600	13-0003
CR204	1N3600	13-0003
CR205	1N3600	13-0003
CR206	1N3600	13-0003
CR207	1N3600	13-0003
CR208	1N3600	13-0003
CR209	MV2209	13-0105
CR301	1N3600	13-0003
CR302	1N3600	13-0003
CR303	1N3600	13-0003
CR304	1N3600	13-0003
CR305	1N3600	13-0003
CR306	1N3600	13-0003
CR307	1N3600	13-0003
CR308	1N3600	13-0003
CR309	1N295	13-0004
CR310	1N295	13-0004
CR401	1N295	13-0004
CR402	1N295	13-0004
CR403	1N295	13-0004
CR404	1N295	13-0004
CR405	1N295	13-0004
CR406	1N295	13-0004
CR407	1N295	13-0004
CR408	1N295	13-0004
CR409	1N295	13-0004
CR410	1N4740	13-0002
CR411	1N4733	13-0100
CR412	1N4001	13-0050
CR413	1N4001	13-0050
IC101	MC1550G	13-0091
IC102	MC1357P	13-0089
IC401	MC7490P	13-0103
IC402	MC74145P	13-0104
Q101	MPS5172	13-0092
Q102	MPS6514	13-0022
Q103	MPS6534	13-0061
Q201	2N5486	13-0101
Q202	2N5179	13-0095
Q203	2N5227	13-0084
Q204	MPS3563	13-0082
Q205	2N5179	13-0095
Q206	MPS6534	13-0061
Q207	MPS5172	13-0092
Q208	MPS5172	13-0092
Q301	MPF112	13-0102
Q302	2N5227	13-0084
Q303	MPF112	13-0102
Q304	MPS3563	13-0082
Q305	MPF112	13-0102
Q306	MPS3563	13-0082
Q307	2N5227	13-0084
Q308	2N5227	13-0084
Q309	MPS3563	13-0082
Q401	MPS6514	13-0022
Q402	MPS5172	13-0092
Q403	MPSA55	13-0093
Q404	MPSA55	13-0093
Q405	MJE521	13-0094
Q406	MJE521	13-0094
Q407	MPS6514	13-0022
Q408	MPS6514	13-0022
Q409	2N5227	13-0084
Q410	MPS5172	13-0092
Q411	MPS5172	13-0092

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C102	2uF 25V	19-0049
C109	.47uF 35V	19-0116
C111	.47uF 35V	19-0116
C119	.47uF 35V	19-0116
C121	50uF 15V	19-0129
C201	2-8pF Trimmer	19-0136
C202	2-8pF Trimmer	19-0136
C219	2-8pF Trimmer	19-0136
C223	2uF 25V	19-0049
C401	1000uF 15V	19-0052
C402	50uF 15V	19-0129
C403	50uF 15V	19-0129
C406	220uF 16V	19-0132
C408	.47uF 35V	19-0116
C409	10uF 15V	19-0127
C412	.47uF 35V	19-0116
C413	10uF 15V	19-0127
C414	1000uF 15V	19-0052
C415	1000uF 15V	19-0052
C416	50uF 15V	19-0129
C417	.47uF 35V	19-0116
C418	2uF 25V	19-0049

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R1	Volume	15-0066
R2	Squelch	15-0067
R220	1K Trimmer	14-0007-2

COILS/TRANSFORMERS

ITEM	PART NO.
L101	17-0028
L201	17-0063
L202	17-0063
L203	17-0028
L204	17-0057
L205	17-0064
L301	17-0025
L302	17-0025
L303	17-0050
L304	17-0050
L305	17-0053
L306	17-0028
L307	17-0057
L401	16-0003
RFC101	17-0060
RFC102	17-0060
RFC201	17-0041
RFC202	17-0062
RFC301	17-0041
RFC302	17-0062
T101	16-0003

MISCELLANEOUS

ITEM	NAME	PART NO.
FL101	Filter, Ceramic	16-0031
S2	Switch, Chan.	15-0064
S3	Switch, Man./Scan.	15-0063
S4	Switch, Chan. Lock.	15-0062
S5 (SCAN 308)	Switch, 3-Position	15-0068
S5 (SCAN 216, SCAN 208A)	Switch, 2-Position	15-0065
SP1	Speaker, 3.2 ohm	22-0007
Y101	Crystal, 10.245MHz	20-0016
	Antenna, UHF	26-0009
	Antenna, VHF	26-0008
	Cord, AC	SCAN 10AC
	Cord, DC	SCAN 10DC

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SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D1	1N60P	IP 20-0016
D2	1N60P	IP 20-0016
D3	1S1588	IP 20-0061
D4	1S1588	IP 20-0061
D5	1S1588	IP 20-0061
D6	1S1588	IP 20-0061
D7	1S1588	IP 20-0061
D8	1S1588	IP 20-0061
D9	1S1588	IP 20-0061
D10	M117	IP 28-0007
D11	M117	IP 28-0007
D12	M117	IP 28-0007
D13	M117	IP 28-0007
D14	1S330	IP 20-0086
D15	1S1588	IP 20-0061
IC1	M53273P	IP 20-0068
IC2	M53201P	IP 20-0097
Q1	2SC1047	IP 20-0065
Q2	2SC1047	IP 20-0065
Q3	2SC372	IP 20-0039
Q4	2SC372	IP 20-0039
Q5	2SC372	IP 20-0039
Q6	2SC372	IP 20-0039
Q7	2SC372	IP 20-0039
Q8	2SC372	IP 20-0039
Q9	2SC372	IP 20-0039
Q10	2SC388A	IP 20-0088
Q11	2SC372	IP 20-0039
Q12	2SC372	IP 20-0039
Q13	2SC372	IP 20-0039
Q14	2SC372	IP 20-0039
Q15	2SC372	IP 20-0039
Q16	2SC372	IP 20-0039
Q17	2SC372	IP 20-0039
Q18	2SC373	IP 20-0105
Q19	2SC735	IP 20-0041
Q20	2SA562	IP 20-0046
Q21	2SC372	IP 20-0039
Q22	2SC372	IP 20-0039
Q23	2SC372	IP 20-0039

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C44	47uF	IP 22-0006
C50	1uF	IP 22-0001
C51	1uF	IP 22-0001
C52	100uF	IP 22-0008
C53	1uF	IP 22-0001
C54	1uF	IP 22-0001
C56	1uF	IP 22-0001
C58	4.7uF	IP 22-0003
C59	47uF	IP 22-0001
C62	4.7uF	IP 22-0003
C63	4.7uF	IP 22-0003
C65	100uF	IP 22-0008
PC1	30pF Trimmer	IP 22-0032
PC2	30pF Trimmer	IP 22-0032
PC3	30pF Trimmer	IP 22-0032
PC4	30pF Trimmer	IP 22-0032

CONTROLS/SPECIAL RESISTORS

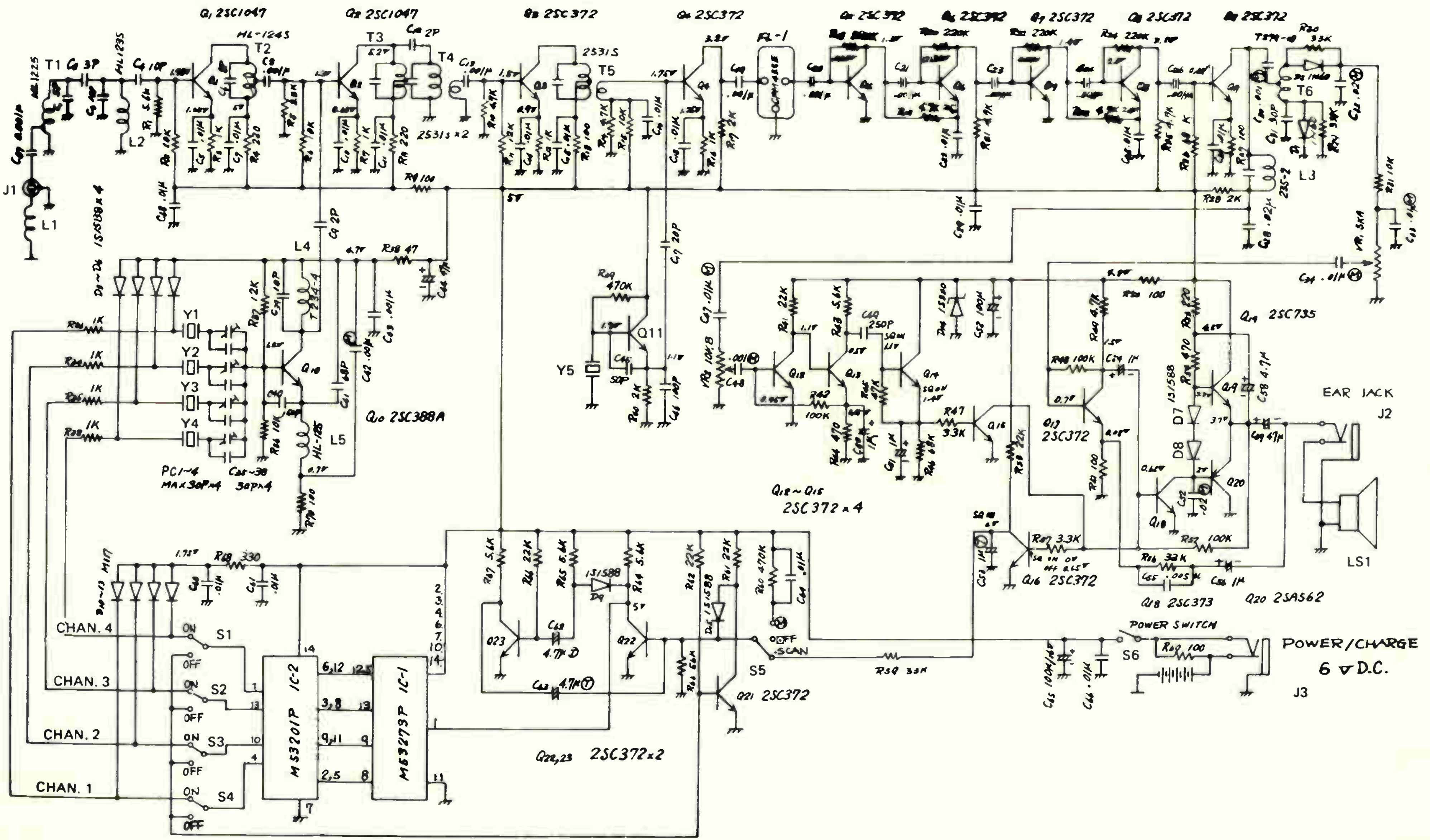
ITEM	DESCRIPTION	PART NO.
VR1	5K Variable	IP 24-0029
VR2	10K Variable	IP 24-0030

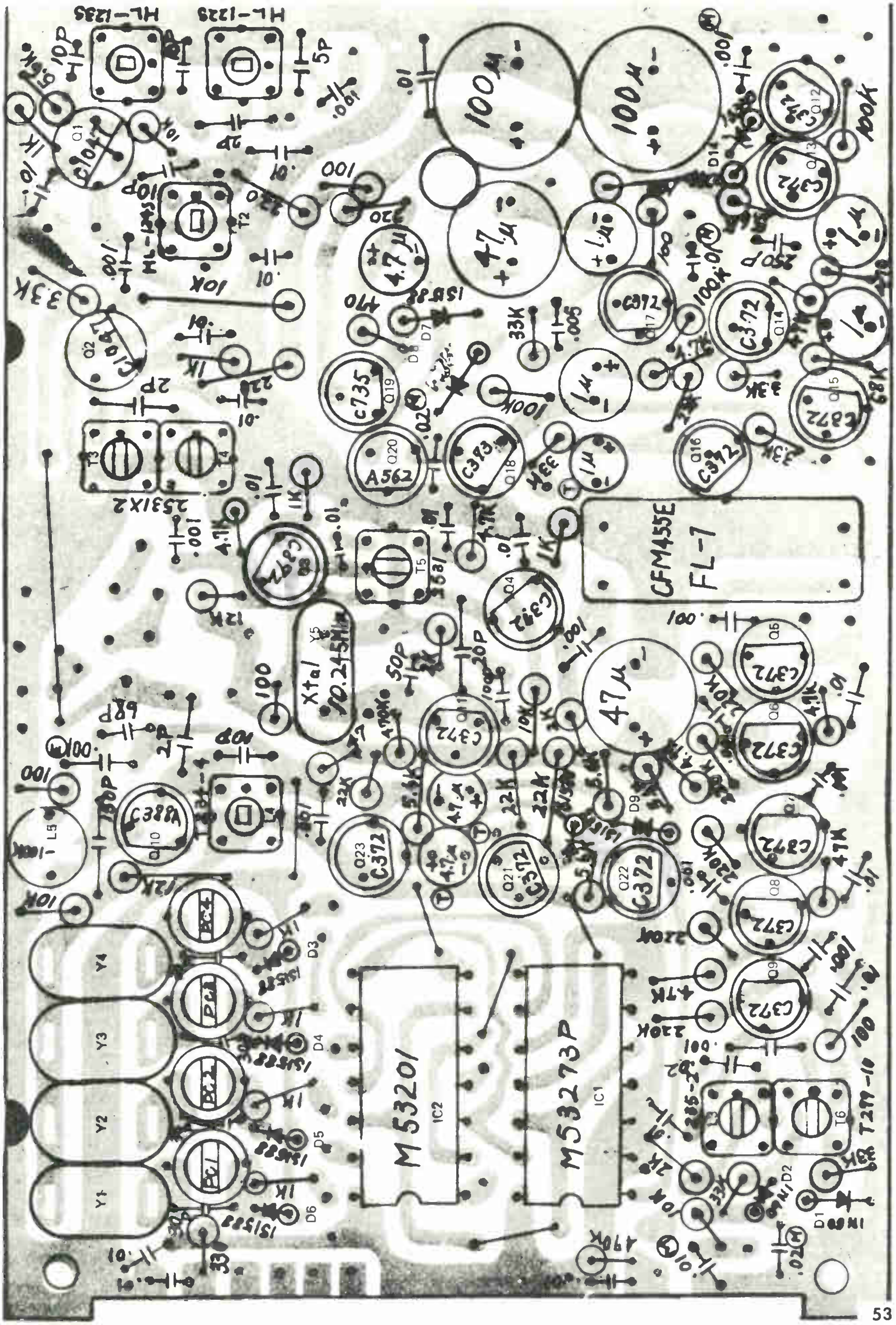
COILS/TRANSFORMERS

ITEM	PART NO.
L1	
L2	IP 21-0156
L3	IP 21-0159
L4	IP 21-0161
L5	IP 21-0107
T1	IP 21-0155
T2	IP 21-0157
T3	IP 21-0158
T4	IP 21-0158
T5	IP 21-0158
T6	IP 21-0160

MISCELLANEOUS

ITEM	NAME	PART NO.
FL1	Filter	IP 31-0052
LS1	Speaker	IP 29
S1	Switch	IP 25-0024
S2	Switch	IP 25-0024
S3	Switch	IP 25-0024
S4	Switch	IP 25-0024
S5	Switch	IP 25-0025
S6	Switch	IP 25-0024
Y5	10.245MHz Crystal	IP 31-0043


Q1 2SC1047
Q2 2SC1047
Q3 2SC372
Q4 2SC372
Q7 2SC372
Q8 2SC372
Q9 2SC372
HL-124S
T1
T2
T3
T4
T5
T6
FL-1
J1
L1
L2
L3
L4
L5
HL-125
2531S
2531S x 2
Y1
Y2
Y3
Y4
Y5
Q11
Q10 2SC388A
PC1~4
MAX 30P x 4
C35~38
30P x 4
Q12~Q15
2SC372 x 4
Q14 2SC735
Q17
2SC372
D7
D8
Q20
Q18
Q16 2SC372
Q18 2SC373
Q20 2SA562
EAR JACK
J2
LS1
POWER SWITCH
S6
POWER/CHARGE
6 V D.C.
J3
CHAN. 4
CHAN. 3
CHAN. 2
CHAN. 1
S1
S2
S3
S4
S5
ON
OFF
SCAN
M53201P IC-2
M53279P IC-1
Q23
Q22
Q21 2SC372
Q22,23 2SC372 x 2
D9
1S1588


HL-123S
HL-122S
L2
T1
CFM455E
FL-7
M53273P
IC1
M53201
IC2
Xtal
10.245MHz
Y5
Y1
Y2
Y3
Y4
C372
C373
A562
C735
C388
C1047
2531X2
T279-10
285-2
100μ
47μ
4.7μ
1μ

Pages 54-61 Courtesy of RADIO SHACK

GENERAL ALIGNMENT

Test equipment required:

1. VHF signal generator (120–200 MHz)
2. VHF signal generator (20–50 MHz)
3. RF frequency counter (10–60 MHz)
4. V.T.V.M.
5. Oscilloscope
6. 8 ohm dummy load

NOTE: Use a non-metallic tool.
The test equipment should be warmed up at least 1 hour before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable input.
Refer to PCB illustrations for alignment components and location.

RF AND IF ALIGNMENT

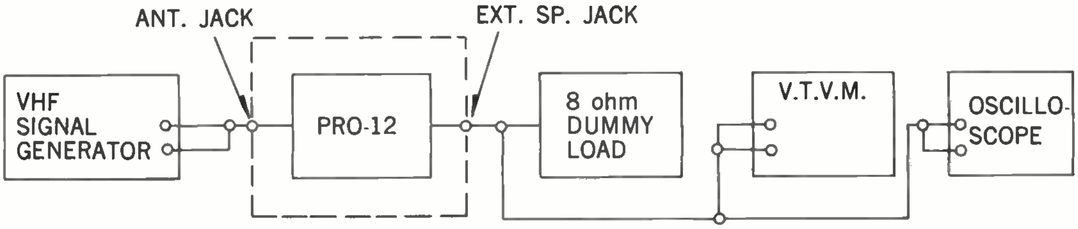


Figure 3. RF ALIGNMENT CONNECTION DIAGRAM

High Band

STEP 1. Connect the instruments as shown in Figure 3.
STEP 2. Insert a crystal for 156 MHz (or close to it – for center-of-the-band alignment) in the High Band side of CH. 1 socket.
STEP 3. Set Signal Generator to 156 MHz
STEP 4. Adjust L101, L102, L103, L104, L110 and T101 for maximum output and best signal-to-noise ratio.
STEP 5. Confirm that the unit is peak-tuned for 156 MHz.
STEP 6. Adjust VR532 for squelch open with 1.5μV input. (Squelch control set maximum clockwise)

Low Band

STEP 7. Insert a crystal of 40 MHz in the Low Band side of CH. 1 socket.
STEP 8. Set Signal Generator to 40 MHz.
STEP 9. Adjust L106, L107, L108 and L109 for maximum output and best signal-to-noise ratio.

SENSITIVITY MEASUREMENT

STEP 1. Connect the instruments as shown in Figure 3.

High Band

STEP 2. Insert a crystal for 156 MHz in Ch. 1 Hi socket.
Depress the channel select switch to activate CH. 1.
STEP 3. Turn the SQUELCH control fully counterclockwise, and adjust the signal generator to 156 MHz (1 kHz modulation, 3.3 kHz deviation).
STEP 4. Increase the output of the signal generator and adjust the VOLUME control to obtain reading 0.774 (0 dB) on the V.T.V.M.
STEP 5. Turn off the modulation of the signal generator, and adjust signal generator output to obtain a reading of –20 dB on the V.T.V.M.
The generator output now equals the sensitivity at the 20 dB signal-to-noise ratio point.

Low Band

STEP 6. Insert a crystal for 40 MHz in the Low Band side of CH. 1 socket.
Depress the channel select switch to activate CH. 1.
STEP 7. Measure sensitivity as noted in step 3 to step 5 (at a Receiving frequency of 40 MHz)

LOCAL OSCILLATOR CHECKING

STEP 1. Insert all crystals in sockets.
STEP 2. Couple the frequency counter thru a pickup coil to oscillator coil L111. Refer to Figure 4.

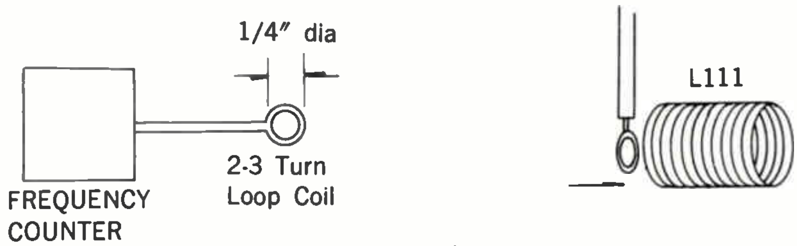


Figure 4. 1st LOCAL OSCILLATOR

CHECK FREQUENCY OF THE SECOND LOCAL OSCILLATOR

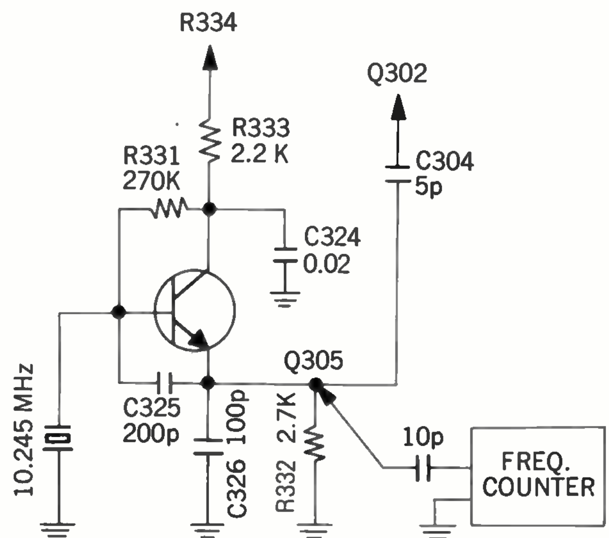
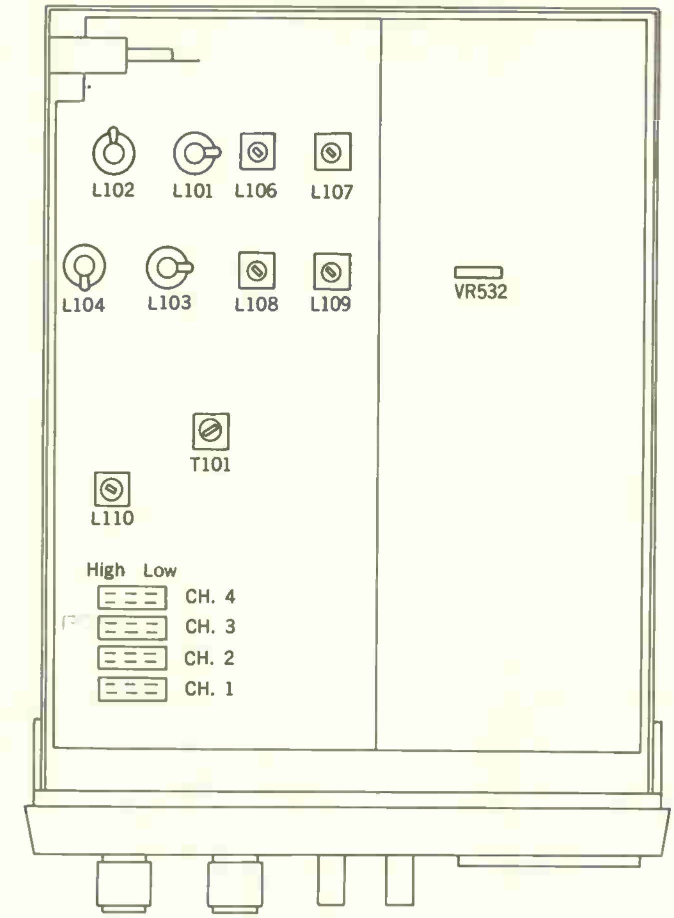


Figure 5. 2ND LOCAL OSCILLATOR

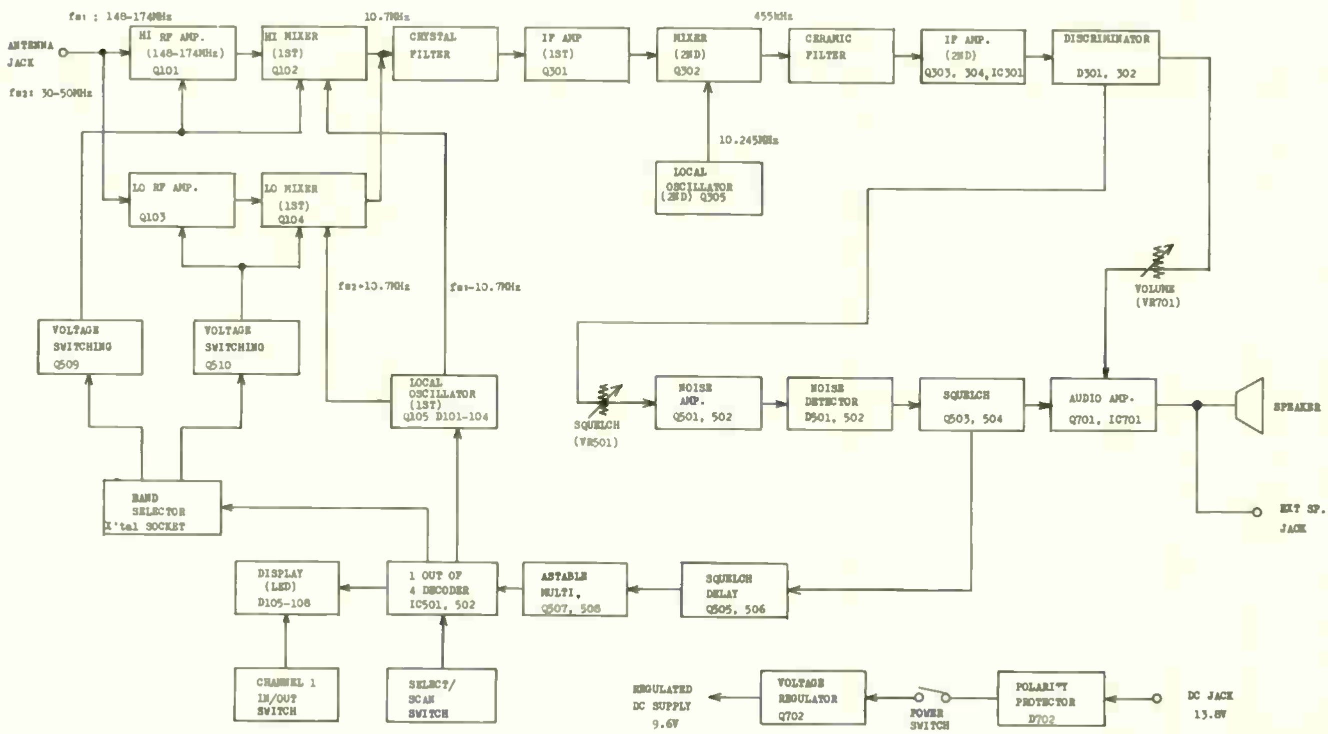
STEP 1. Connect Frequency Counter thru a 10 pf capacitor to Q305 emitter.
STEP 2. Read frequency on the Frequency Counter.
Normal: 10.245 MHz ±0.7 kHz

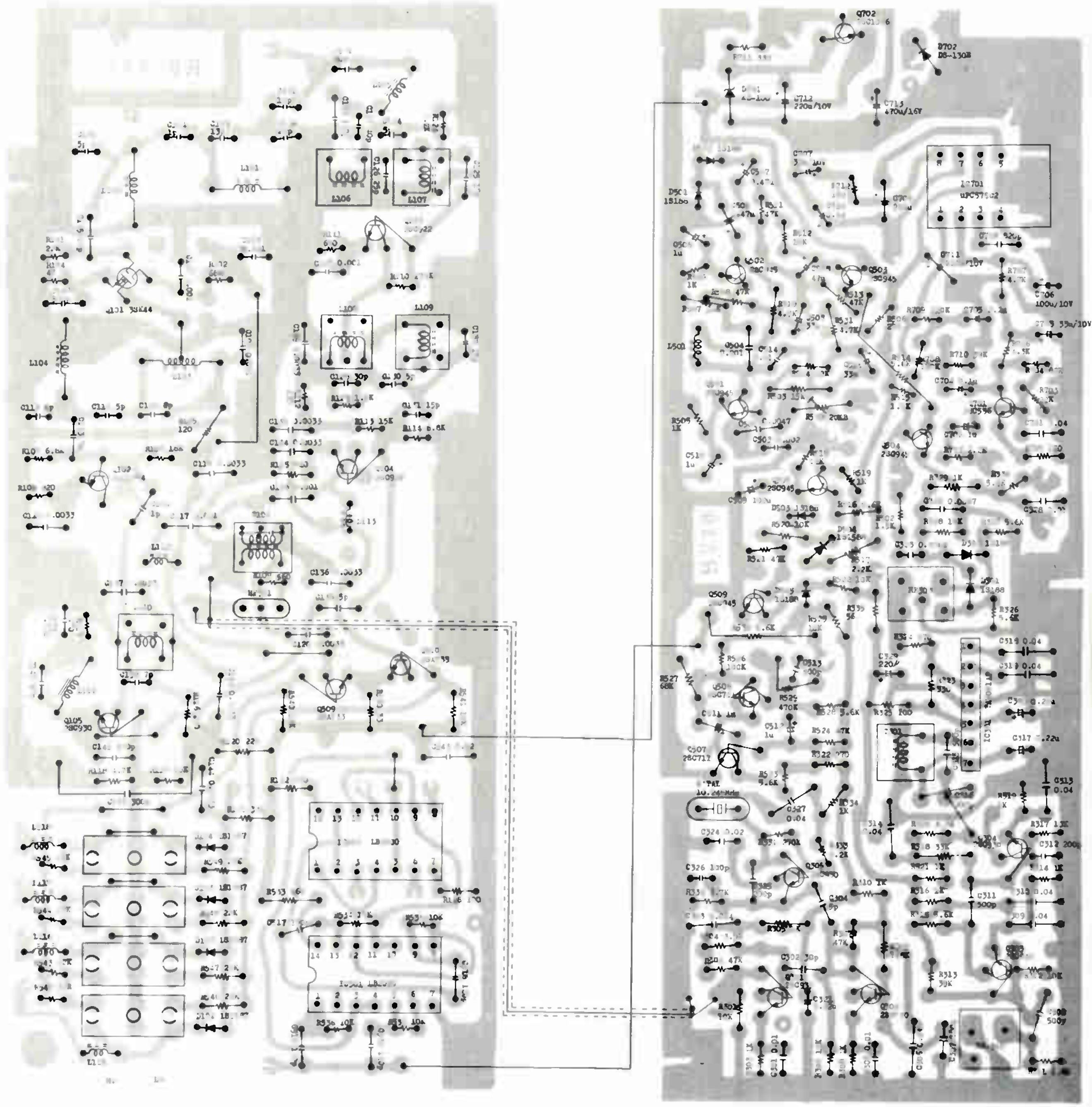
NOTE: Crystal Frequency Calculation
The crystal frequencies are obtained by the following formulas.
Frequency (MHz) = (Fr−10.7 MHz) / 3 High Band
Frequency (MHz) = Fr+10.7 MHz Low Band
Where Fr is the desired receive frequency, in MHz

ALIGNMENT POINTS (CHASSIS LAYOUT)



BLOCK DIAGRAM

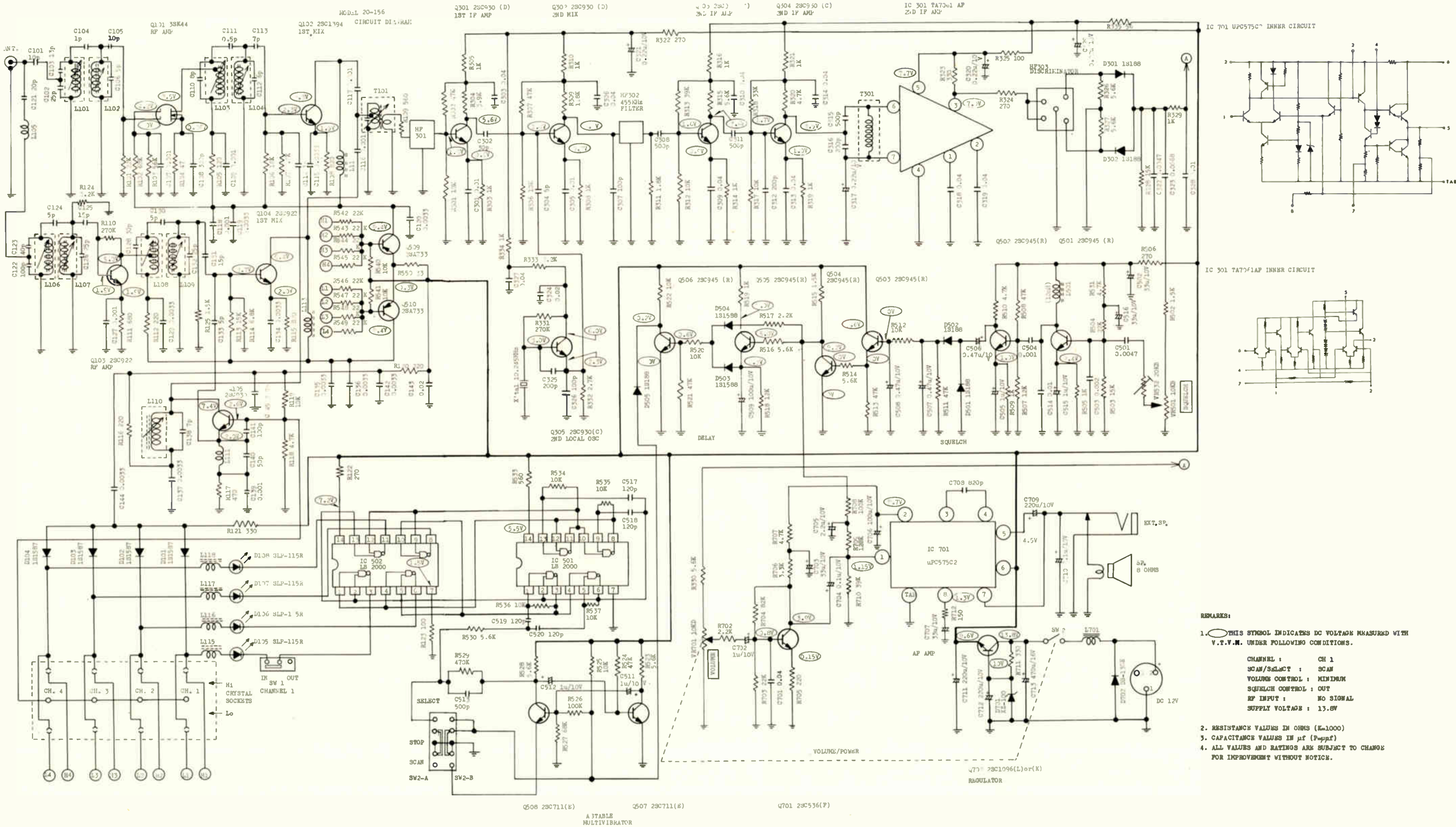




TROUBLE SHOOTING

Symptom	Possible Cause
1) LED (Light Emitting Diode, D105 to D108) doesn't light and no sound. VOLUME : MAX. CHANNEL 1 : IN SQUELCH : OFF (non squelch)	A) Blown Fuse B) Defective ON-OFF switch in VOLUME control C) Regulator Q702 circuit broken or shorted
2) LED lights but no sound. VOLUME : MAX. SQUELCH : OFF (non squelch)	A) Defective EXT. Speaker socket or speaker B) Faulty component part in Audio amp. or IF amp. circuit
3) Noise sound but can't receive desired signal and LED does not light. VOLUME : MAX. SQUELCH : OFF (non squelch) CHANNEL 1 : IN	A) Faulty LED and/or defect in LED PC Board B) Faulty IC 502 C) Short or open in L115-L118 D) Defective D101-D104
4) No sound through EXT. SP. Socket	A) Defective EXT. SP. socket
5) Doesn't scan and SQUELCH doesn't operate. SCAN/SELECT : SCAN SQUELCH : ON (tight)	A) Defective VR501(SQ), VR532 (VOLUME) B) Faulty component part in Noise amp. or Noise Detector circuit C) Faulty Transistor Q503, Q504 D) Faulty component part in IF amp. circuit
6) Doesn't scan but SQUELCH operates normally. SCAN/SELECT : SCAN CHANNEL 1 : IN SQUELCH : ON (tight)	A) Faulty Transistor Q505, Q506 B) Either Transistor Q507, or Q508 defective C) Defective SCAN/SELECT switch D) Faulty IC IC501
7) Manual selector doesn't operate. SCAN/SELECT : SELECT	A) Defective SCAN/SELECT selector switch
8) Delay doesn't operate.	A) Faulty Transistor Q505 or capacitor C509
9) Only scans channel 1, 2 or channel 3, 4. SCAN/SELECT : SCAN CHANNEL 1 : IN SQUELCH : ON (tight)	A) Faulty IC IC501
10) Noise sound can be heard and LED lights but can't receive desired signal.	A) Defective X'tal socket B) Faulty component part in the appropriate RF amp. or 1st MIXER circuit C) Faulty component part in 1st, 2nd local OSC. or 2nd MIXER circuit D) Faulty Transistor Q509, Q510
11) Low sensitivity	A) Faulty component part in RF amp. or IF amp. circuit B) X'tal Frequency not covering the correct channel
12) Mixed reception	A) X'tal not set to proper receiving frequency

NOTE: For optimum sensitivity, use crystal frequencies within the specified band coverage.
For reception outside of the optimum frequency coverage, you can realign for best reception either above or below the optimum frequency range noted. For max sensitivity at any one frequency, align for that one frequency.



REMARKS:

1. THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH V.T.V.M. UNDER FOLLOWING CONDITIONS.

CHANNEL :	CH 1
SCAN/SELECT :	SCAN
VOLUME CONTROL :	MINIMUM
SQUELCH CONTROL :	OUT
RF INPUT :	NO SIGNAL
SUPPLY VOLTAGE :	13.8V

2. RESISTANCE VALUES IN OHMS (K=1000)
3. CAPACITANCE VALUES IN µf (P=µµf)
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

SEMICONDUCTORS

ITEM	TYPE NO.
D101	1S1587
D102	1S1587
D103	1S1587
D104	1S1587
D105	SLP115RA
D106	SLP115RA
D107	SLP115RA
D108	SLP115RA
D301	1S188
D302	1S188
D501	1S188
D502	1S188
D503	1S1588
D504	1S1588
D505	1S188
D701	XZ-100
D702	DS-130
IC301	TA7061
IC501	LB2000
IC502	LB2000
IC701	uPC575C2
Q101	3SK44 W
Q102	2SC1394 L
Q103	2SC922 L
Q104	2SC922 L
Q105	2SC930 D
Q301	2SC930 D
Q302	2SC930 D
Q303	2SC930 C
Q304	2SC930 C
Q305	2SC930 C
Q501	2SC945 R
Q502	2SC945 R
Q503	2SC945 R
Q504	2SC945 R
Q505	2SC945 R
Q506	2SC945 R
Q507	2SC711 E
Q508	2SC711 E
Q509	2SA733 Q
Q510	2SA733 Q
Q701	2SC536 F
Q702	2SC1096 K or L

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C317	0.2uF 10V
C320	0.2uF 10V
C321	0.2uF 10V
C329	0.22uF 10V
C502	33uF 10V
C505	1uF 10V
C506	0.47uF 10V
C507	0.47uF 10V
C508	0.47uF 10V
C509	100uF 10V
C510	0.47uF 10V
C511	1uF 10V
C512	1uF 10V
C515	1uF 10V
C516	33uF 10V
C702	1uF 10V
C703	33uF 10V
C704	0.1uF 10V
C705	2.2uF 10V
C706	100uF 10V
C707	33uF 10V
C709	220uF 10V
C710	0.1uF 10V
C711	220uF 10V
C712	220uF 10V
C713	470uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR501	10K Squelch	P-6250
VR532	20K Trimmer	P-6251
VR701	10K Volume	P-6252

COILS/TRANSFORMERS

ITEM	PART NO.
L101	CA-3258
L102	CA-3258
L103	CA-4556
L104	CA-3258
L105	CA-3269
L106	CA-4568
L107	CA-4568
L108	CA-4569
L109	CA-4568
L110	CA-4557
L111	CA-3259
L112	CB-2239
L113	CB-2239
L115	CB-2237
L116	CB-2237
L117	CB-2237
L118	CB-2237
L501	CB-2236
L701	CB-2240
T101	CA-7420
T301	CA-7421

MISCELLANEOUS

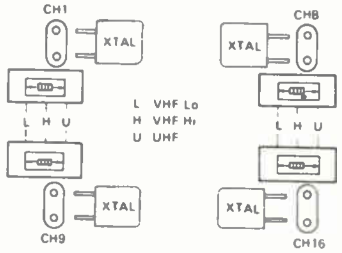
ITEM	NAME	PART NO.
HF301	10.7MHz Filter	C-0589
HF302	455kHz Filter	C-0591
HF303	455kHz Filter	C-0590
	10.245MHz Crystal	CX-0051
SW-1	Switch	S-2253
SW-2	Switch	S-0640
	Speaker	S-4537
	Fuse	HF-1086

CABINET PARTS

NAME	PART NO.
Cabinet	Z-3020
Back Lid	Z-3021
Front Panel	Z-3022
Cover/Lever Knob	Z-3024
Knob, Rotary	K-1795
Knob, Lever	K-1796
Compartment Lid	DA-0134

Pages 62-78 Courtesy of RADIO SHACK

CRYSTAL INSTALLATION



CHYSTAL AND SWITCH ILLUSTRATION

FIGURE 2. CRYSTAL INSTALLATION

ALIGNMENT PREPARATION

Test equipment required

1. Oscilloscope
2. Slow sweep generator with variable marker (10.7 MHz)
3. VHF sweep generator with variable marker (30 – 50 MHz, 148 – 174 MHz)
4. UHF sweep generator with variable marker (450 – 490 MHz)
5. RF frequency counter
6. AC V.T.V.M.
7. DC V.T.V.M.
8. 8 ohm dummy load

Note: Use a non-metallic tool.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 3.

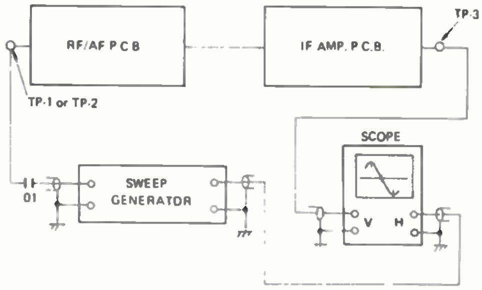


FIGURE 3. IF SECTION ALIGNMENT TEST EQPT. HOOK UP

Step 2: Maintain sweep generator output at a low level to prevent overloading.

Step 3: Adjust T1, T2 of IF amplifier section so that the 455 kHz marker is in the center of the discriminator curve and further adjust T8 of RF/AF section for best linearity.

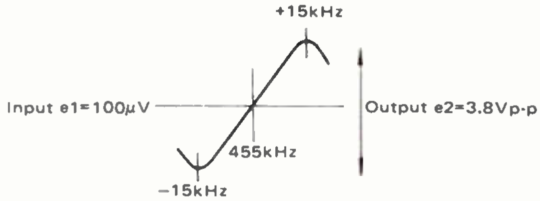


FIGURE 4. IF DISCRIMINATOR CURVE

Note: Input signal level from the sweep generator should be kept as low as possible.

VHF LOW/HIGH BAND RF ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.

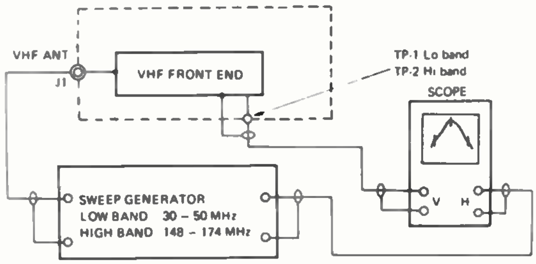


FIGURE 5. VHF LOW/HIGH BAND RF TEST EQPT. HOOK UP

LOW BAND RF ALIGNMENT

Step 1: Set at least one crystal band selector switch to "L" position.

Step 2: Adjust Frequency of sweep generator at 40 MHz and connect Scope to TP-1.

Step 3: Adjust T1, T2, T3 of RF section for maximum output and best curve symmetry as shown in Figure 6-1.

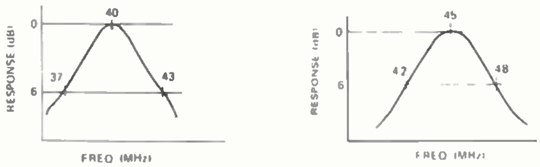


Fig. 6-1 **Fig. 6-2**

FIGURE 6. VHF Lo RF CHARACTERISTIC CURVE

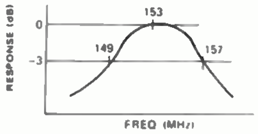
Step 4: Figure 6-2 shows a typical example of when the center peak frequency is adjust to 45 MHz.

Step 5: When the Low band is adjusted per Figure 6-2 the adjustable frequency range will be about ±3 MHz band width from 30 MHz to 50 MHz.

HIGH BAND RF ALIGNMENT

Step 1; Set at least one crystal switch to "H" position. Connect Scope to TP-2.

Step 2: Adjust T4, T5 and T6 in RF section for maximum output and best curve symmetry as shown in Figure 7-1.



Fgi. 7-1

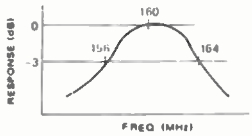


Fig. 7-2

FIGURE 7. VHF Hi RF CHARACTERISTIC CURVE

Step 3: Figure 7-2 shows a typical example of when the center peak frequency is adjust to 160 MHz.

Step 4: When the High band is adjusted per Figure 7-2 the adjustable frequency range will be about ±4 MHz band width from 148 MHz to 174 MHz.

UHF FRONT END ALIGNMENT

Step 1: Connect the instruments as shown in Figure 8.

Step 2: Set at least one crystal band selector switch to "U" position.

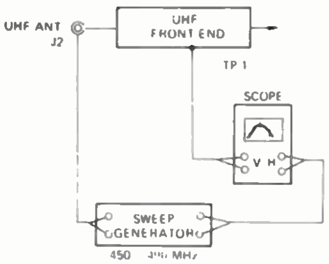


FIGURE 8. UHF FRONT END EQPT: HOOK UP

Step 3: Adjust TC1, TC2 and TC3 for maximum output and best curve symmetry as shown in Figure 9-1.

Step 4: Figure 9-2 shows a typical example of when the tuner as originally aligned.

Step 5: Figure 9-2 the acceptable sensitivity the center peak frequnecy is adjust to 470 MHz.

Step 6: When the Front-End is adjusted per Figure 9-2 the acceptable sensitivity frequency range will be about from 450MHz to 490MHz.

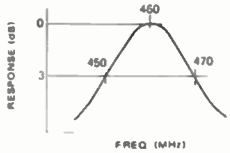


FIGURE 9-1

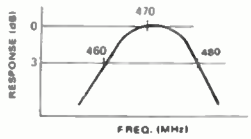


FIGURE 9-2

FIGURE 9. UHF RF CHARACTERISTIC CURVE

VHF LOW/HIGH, UHF LOCAL OSCILLATOR CHECK

Step 1: Insert all crystals in sockets.

Step 2: Couple the frequency counter thru a pickup coil to oscillator coil. Refer to Figure 10.

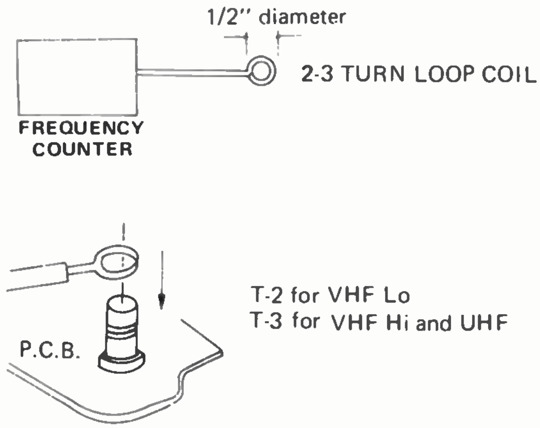


FIGURE 10. LOCAL OSCILLATOR COUPLING

Step 3: Check the frequencies of the appropriate oscillators as shown in the following chart. Do not make adjustments until or unless you perform the "Overall Alignment and Sensitivity" procedures noted on page 4.

	Fr	CRYSTAL SWITCH POSITION	f osc	ALIGNMENT COIL
VHF LOW	30–50 MHz	L	Fr +10.7 MHz	T2 (OSC. P.C.B.)
VHF HIGH	148–174 MHz	H	(Fr–10.7 MHz)/3	T1, T3 (OSC. P.C.B.)
UHF	450–485 MHz	U	(Fr–44 MHz)/9	T3, T4 (OSC. P.C.B.)

Note: Crystal Frequency Calculation.
The crystal frequencies are obtained by the following formula;
VHF LOW Crystal frequency (MHz)
= Fr + 10.7
VHF HIGH Crystal frequency (MHz)
= (Fr – 10.7)/3
UHF Crystal frequency (MHz) = (Fr – 44)/9
Where Fr is the desired receive frequency, in MHz.

LOCAL OSCILLATOR FREQUENCY CHECK (10.245MHz)

Step 1: Connect Frequency Counter through a 10 pF capacitor to Q2 Emitter circuit of IF AMP. P.C. Board.

Step 2: Read frequency on the Frequency Counter Normal: 10.245 MHz ±1 kHz.

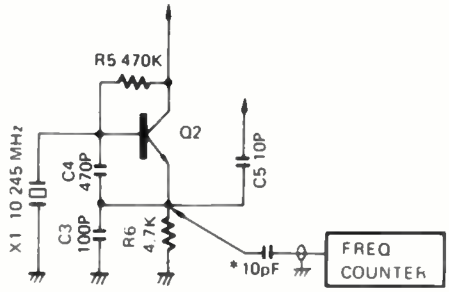


FIGURE 11. DIAGRAM

***Note:** Frequency Counter coupling capacitor should be as small a value as possible. Frequency Counter should be High Impedance Type.

UHF LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Connect Frequency counter through a 1 pF capacitor to Q9 emitter circuit on RF/AF P.C. Board.

Step 2: Read frequency on the frequency counter. Normal: 54.7 MHz ±1 kHz

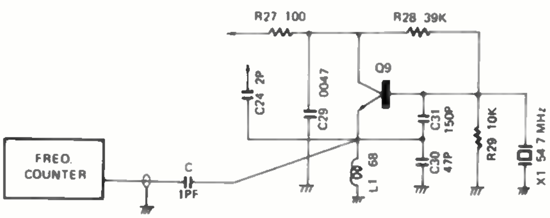


FIGURE 12. DIAGRAM

AFC ALIGNMENT

Step 1: Put a crystal in UHF position and crystal band selector switch to "U" position.

Step 2: Connect a DC V.T.V.M. to Drain of Transistor Q10 on RF/AF P.C. Board.

Step 3: Ground TP4 and adjust VR1 to 4 volts on the V.T.V.M.

Step 4: Remove ground from TP4 and continue to monitor voltage if it remains at 4 volts. If not, re-adjust T2 slightly to obtain precisely 4.0 volts. Recheck steps 3 and 4 if necessary.

UHF OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to UHF input and A.C. V.T.V.M. to speaker terminals.

Step 2: Turn the SQUELCH control fully counter-clockwise and set the frequency to receive band center 460 MHz.

Step 3: Adjust TC4 and T4 on the UHF front-end T3, T4 on the OSC Board and T7 on the RF/AF board to maximum sensitivity.

Step 4: Adjust the output of the generator to minimum and with no modulation and set VOLUME control for 0 dB reading on the VTVM.

Step 5: Increase output of the generator to obtain reading of −20 dB on the A.C. V.T.V.M. The generator output now equals the 20 dB noise quieting sensitivity.

VHF LOW/HIGH OVERALL ALIGNMENT AND SENSITVITY MEASUREMENT

Step 1: Connect signal generator to VHF input and A.C.V.T.V.M. to speaker terminals.

Step 2: Turn the SQUELCH control fully counter-clockwise, and with the generator at minimum output and with no modulation, adjust the VOLUME control on the set for a 0 dB (0.775 volts) reading on the A.C.V.T.V.M.

Step 3: Adjust T1 (Hi) and T2 (Lo) on the OSC. P.C. Board to maximum sensitivity.

Step 4: Increase the output of the signal generator to obtain a reading of −20 dB on the A.C. V.T.V.M. The generator output now equals the 20 dB quieting sensitivity.

Step 5: Tune the PRO-16 to the frequency of the signal generator (or vice versa).

Step 6: Turn VOLUME control fully clockwise. Set the signal generator for no modulation and minimum output.

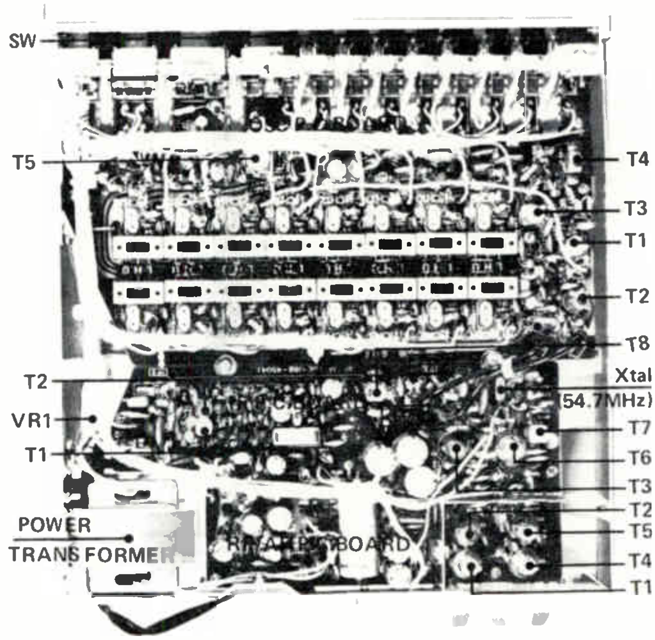
Step 7: Adjust VOLUME control so that the output noise level shows 0 dB = 0.775 volt on the A.C.V.T.V.M.

Step 8: Increase the output level of signal generator so that the signal output is 20 dB below the noise output level. The S.G. output is now equal to the 20 dB noise quieting figure of the set.

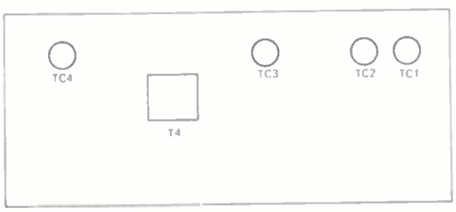
NOTE 1: As supplied by the factory, this unit is set up to provide maximum sensitivity in ranges of 37–43 MHz for VHF Lo, 149–157 MHz for VHF Hi and 455–475 MHz for UHF. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 30 MHz up to about 50 MHz for VHF Lo, 150 MHz to 170 MHz for VHF Hi and 450 to 485 for UHF. (Some UHF front-ends can be adjusted for reception even up to 490 MHz—don't promise a customer such coverage, but you can try). To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a bandwidth "window" of about 3/8/10 MHz total—adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). Of course, be sure to use correct crystals.

NOTE 2: Alignment of T5 on OSC P.C. Board is not required. It happens to be adjustable only because of ease of parts procurement and does not need any adjustment.

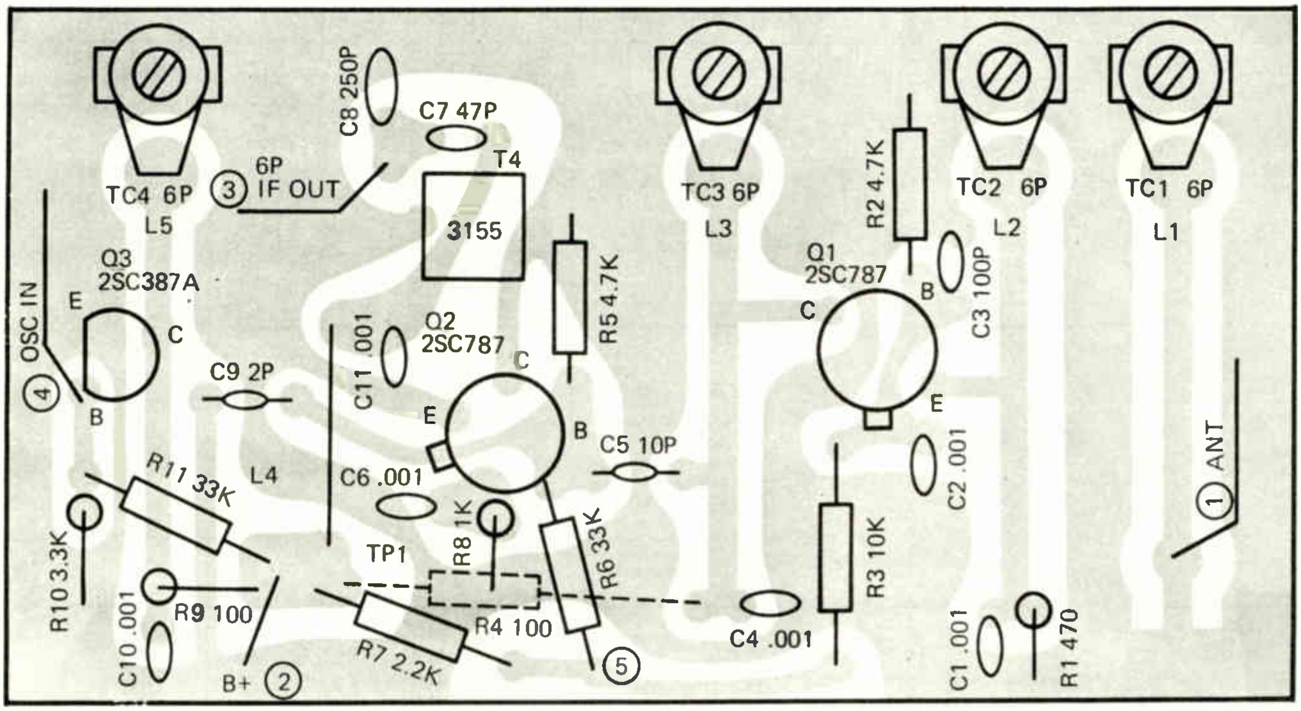
ALIGNMENT POSITION



UHF FRONT-END

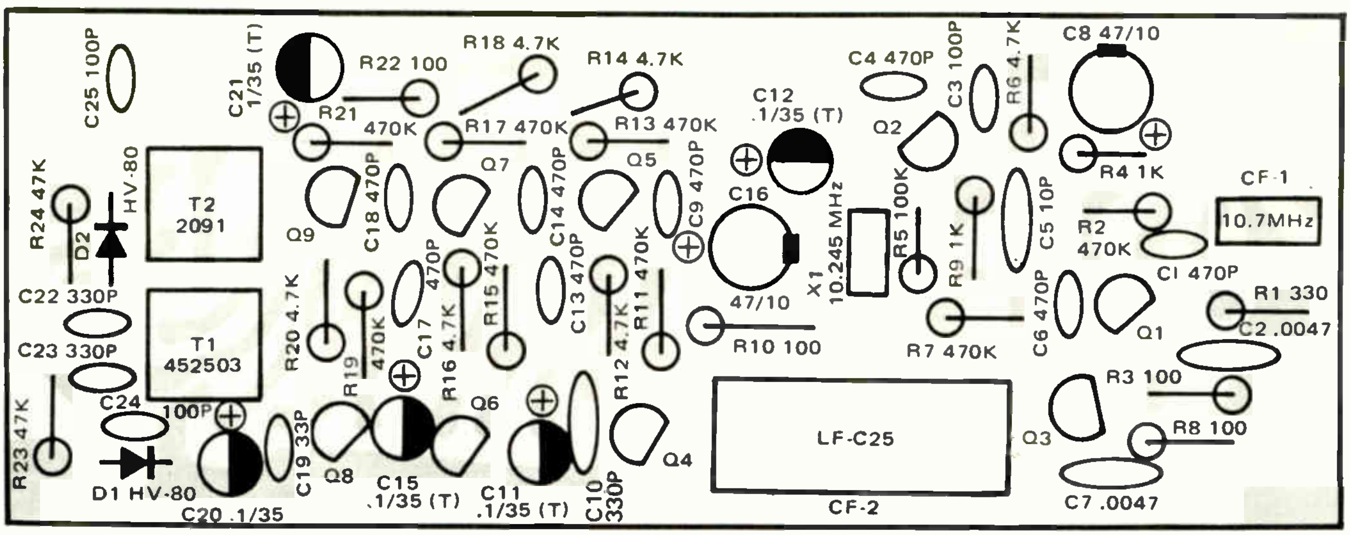


UHF FRONT END P.C. BOARD (TOP VIEW)

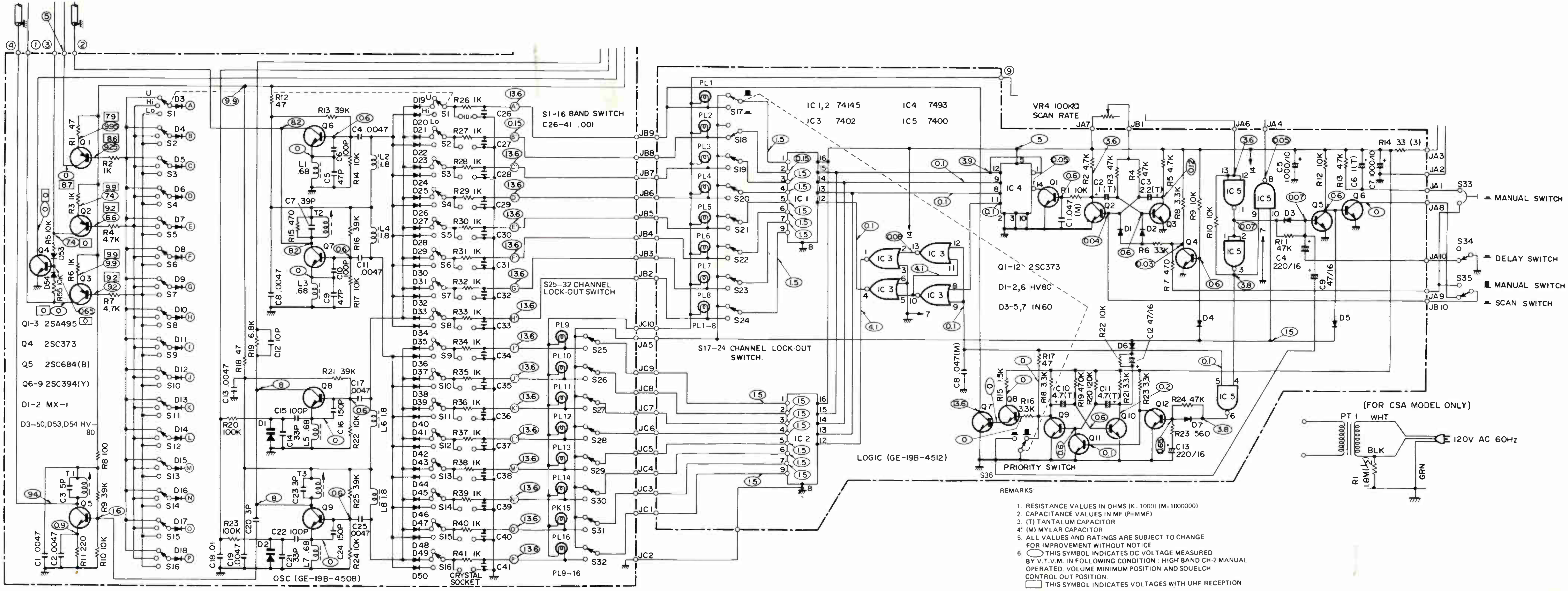


IF
P.C. BOARD (TOP VIEW)

Q9 2SC372 Q7 2SC372 Q5 2SC372 Q2 2SC372

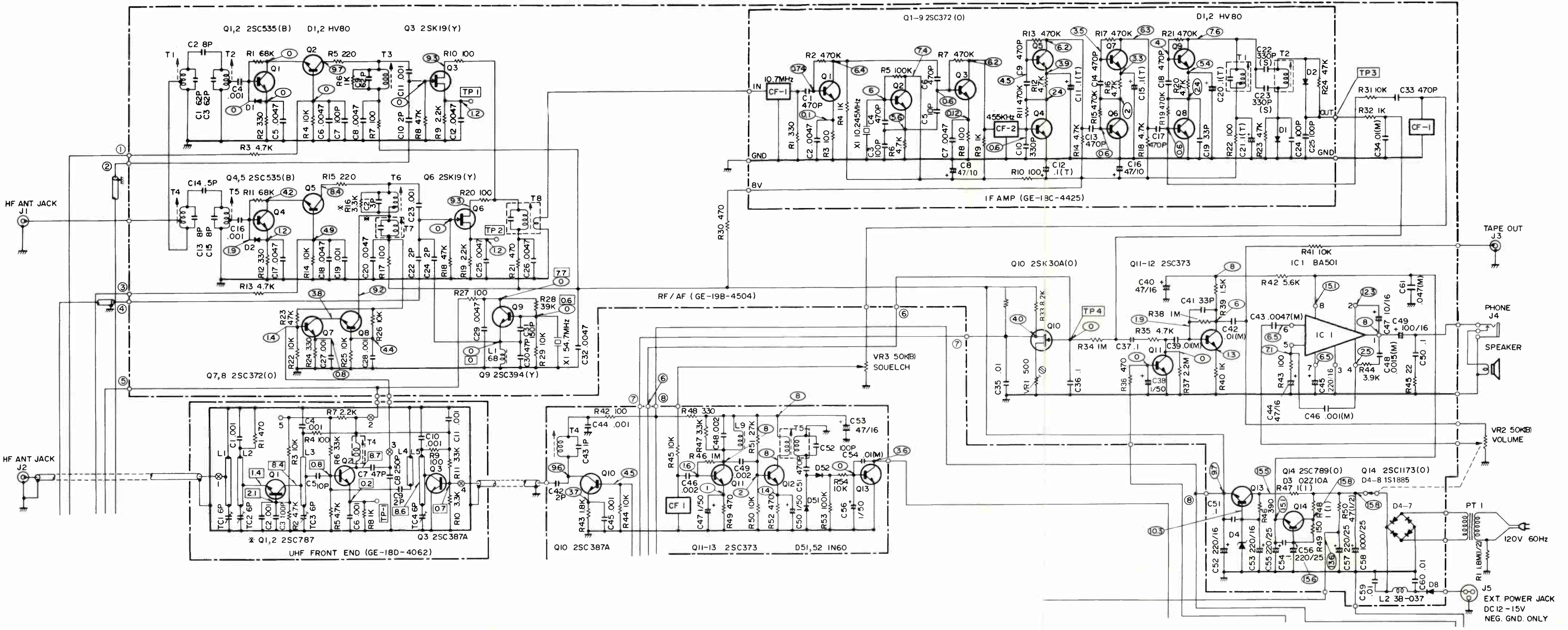


Q8 2SC372 Q6 2SC372 Q4 2SC372 Q3 2SC372 Q1 2SC372

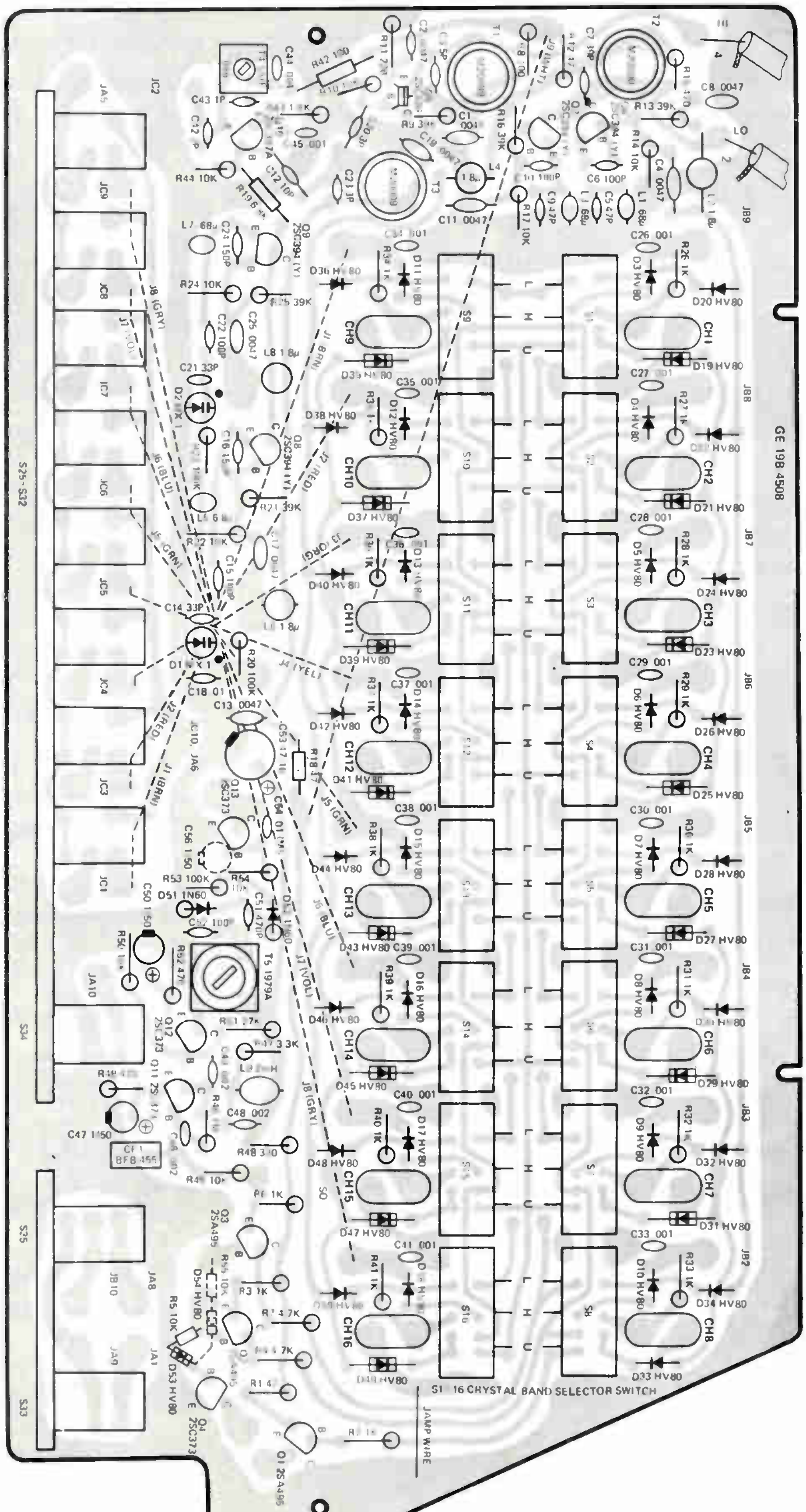


REMARKS:

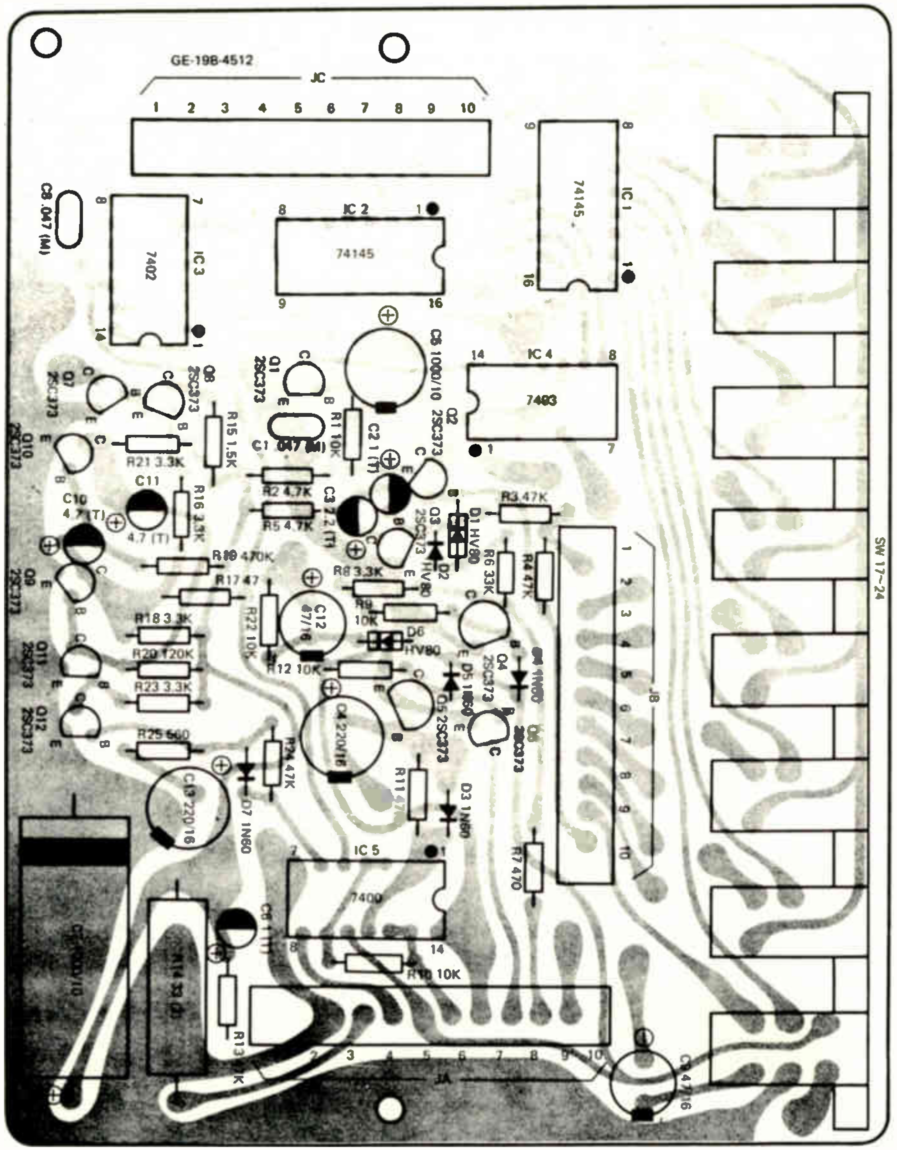
1. RESISTANCE VALUES IN OHMS (K=1000) (M=1000000)
2. CAPACITANCE VALUES IN MF (P=MMF)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE
6. THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. IN FOLLOWING CONDITION : HIGH BAND CH-2 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SOUELCH CONTROL OUT POSITION.
THIS SYMBOL INDICATES VOLTAGES WITH UHF RECEPTION


HF ANT JACK J1
HF ANT JACK J2
IF AMP (GE-18C-4425)
RF/AF (GE-19B-4504)
UHF FRONT END (GE-18D-4062)
Q1-9 2SC372 (O)
Q1,2 2SC535(B)
D1,2 HV80
Q3 2SK19(Y)
Q4,5 2SC535(B)
Q6 2SK19(Y)
Q7,8 2SC372(O)
Q9 2SC394(Y)
Q10 2SK30A(O)
Q11-12 2SC373
IC1 BA501
Q1,2 2SC787
Q3 2SC387A
Q10 2SC387A
Q11-13 2SC373
D51,52 1N60
Q14 2SC789(O)
Q14 2SC1173(O)
D3 02Z10A
D4-8 1S1885
VR3 50K(B) SQUELCH
VR2 50K(B) VOLUME
TAPE OUT J3
PHONE J4
SPEAKER
120V 60Hz
J5 EXT. POWER JACK DC 12-15V NEG. GND. ONLY

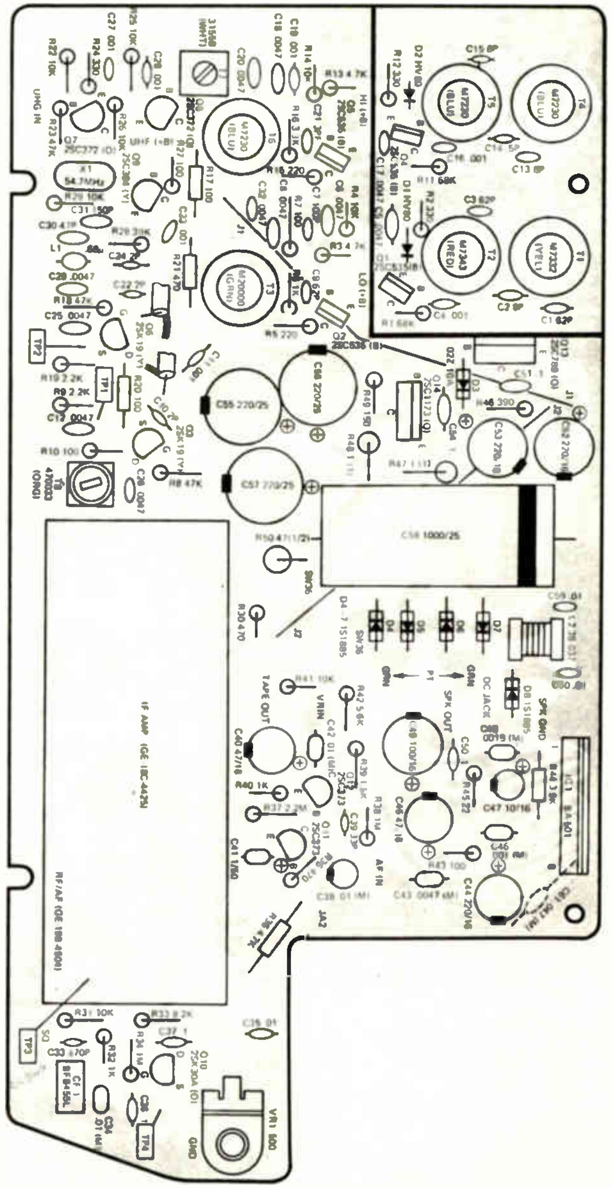
OSCILLATOR P.C. BOARD (TOP VIEW)



LOGIC P.C. BOARD (TOP VIEW)



RF/AF P.C. BOARD (TOP VIEW)



TROUBLE SHOOTING

Symptom	Possible cause
1) Pilot Lamp does not light and no sound output. Power Switch : ON Channel Switch : ON Volume Control : MAX.	A) Faulty line power cord. B) Defective power transformer. C) Defective power switch. D) Defective diodes D4 to D7 of RF/AF section and/or defective associated circuit component. E) Defective fuse. (DC only) F) Faulty DC jack. (DC only) G) Defective diode D8. (DC only)
2) Channel lamp lights but no sound. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective speaker. B) Defective speaker jack. C) Faulty transistors Q11 to Q14 on RF/AF section and/or integrated circuit IC-1 and/or faulty associated circuit component. D) Faulty IF amplifier circuit component.
3) Sound but channel lamp does not light. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective channel switch or defective channel lamp. B) Defective connector (JA, JB, JC). C) Defective R50 on RF/AF P.C. Board. D) Problem with integrated circuit IC-1 to IC-3 of LOGIC section. E) Faulty transistors Q7, Q8 of LOGIC section.
4) Does not scan and Squelch does not operate.	A) Defective Squelch control and/or connector. B) Defective IF amplifier circuit. C) Defective noise amplifier or noise detector and/or defective circuit component parts. D) Defective integrated circuit IC-5 of LOGIC section.
5) Does not scan but Squelch operates.	A) Defective AUTO/MANUAL switch or connector. B) Problem with integrated circuit IC-1 to IC-4 and/or transistors Q1 to Q6 of LOGIC section and/or defective circuit component parts.
6) Priority channel does not operate.	A) Faulty priority switch or connector. B) Problem with integrated circuits IC-1 to IC-5 and/or transistors Q7 to Q12 of LOGIC section defective and/or circuit component parts.
7) Manual selector does not operate.	A) Faulty manual selector switch, AUTO/MANUAL switch and/or connector.
8) Skipper does not operate.	A) Defective transistor Q4, diode D4 of LOGIC section and/or defective circuit component parts.
9) Delay does not operate.	A) Faulty delay switch or connector. B) Defective Q5, Q6 of LOGIC section and/or defective circuit component parts.

Symptom	Possible cause
10) VHF (Lo) band does not operate but VHF (Hi), UHF band operate. Noise is audible.	A) Defective crystal. B) Check up crystal band selector switch adjust at L position. C) Weak crystal and/or one of transistors Q6 to Q7 of OSC. section defective or defective circuit component parts. D) Defective RF amplifier, MIXER of AF/RF section and/or defective circuit component parts.
11) VHF (Hi) band does not operate but VHF (Lo), UHF band operate. Noise is audible.	A) Defective crystal. B) Check crystal switch and/or position (H). C) Defective BUFFER amplifier or OSC. section and/or defective circuit component parts.
12) UHF band does not operate but VHF Lo/Hi band operate.	A) Defective crystal. B) Check crystal switch and/or position (U). C) Defective UHF Front end. D) Defective UHF IF amplifier, LOCAL OSC. and TRIPLER of RF/AF, OSC. section and/or defective circuit component parts.
13) VHF Lo, Hi and UHF band do not operate.	A) RF/AF circuit defective. B) Defective OSC. circuit. C) Defective IF amplifier circuit.
14) VHF Lo, Hi and UHF sound distorted.	A) Defective crystal. B) Defective amplifier circuit. C) Defective AUDIO amplifier circuit.
15) VHF Lo, Hi and UHF, low sensitivity.	A) Check alignment (frequency range). B) Defective RF AMP. and IF AMP.
16) VHF Lo, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.
17) VHF High, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.
18) UHF low sensitivity.	A) Weak crystal. B) Faulty adjustment of UHF Front end and/or faulty circuit component parts.
19) UHF band AFC does not operate.	A) Faulty DC amplifier. B) Varicap diodes D1 and D2 of OSC. section defective and/or defective circuit component parts.

SEMICONDUCTORS

ITEM	TYPE NO.
UHF BOARD	
Q1	2SC787(BL)
Q2	2SC787(BL)
Q3	2SC387(A)
IF BOARD	
D1	HV-80
D2	HV-80
Q1	2SC372(O)
Q2	2SC372(O)
Q2	2SC372(O)
Q3	2SC372(O)
Q4	2SC372(O)
Q6	2SC372(O)
Q7	2SC372(O)
Q8	2SC372(O)
Q9	2SC372(O)
OSC BOARD	
D1	MX-1
D2	MX-1
D3	HV-80
D4	HV-80
D5	HV-80
D6	HV-80
D7	HV-80
D8	HV-80
D9	HV-80
D10	HV-80
D11	HV-80
D12	HV-80
D13	HV-80
D14	HV-80
D15	HV-80
D16	HV-80
D17	HV-80
D18	HV-80
D19	HV-80
D20	HV-80
D21	HV-80
D22	HV-80
D23	HV-80
D24	HV-80
D25	HV-80
D26	HV-80
D27	HV-80
D28	HV-80
D29	HV-80
D30	HV-80
D31	HV-80
D32	HV-80
D33	HV-80
D34	HV-80
D35	HV-80
D36	HV-80
D37	HV-80
D38	HV-80
D39	HV-80
D40	HV-80
D41	HV-80
D42	HV-80
D43	HV-80
D44	HV-80
D45	HV-80
D46	HV-80
D47	HV-80
D48	HV-80
D49	HV-80
D50	HV-80
D51	1N60
D52	1N60
D53	HV-80
D54	HV-80
Q1	2SA495(O)
Q2	2SA495(O)
Q3	2SA495(O)
Q4	2SC373
Q5	2SC684(B)
Q6	2SC394(Y)
Q7	2SC394(Y)
Q8	2SC394(Y)
Q9	2SC394(Y)
Q10	2SC387(A)
Q11	2SC373
Q12	2SC373
Q13	2SC373
RF/AF BOARD	
D1	HV-80
D2	HV-80
D3	02Z10A
D4	1S1885
D5	1S1885
D6	1S1885
D7	1S1885
D8	1S1885
IC1	BA501
Q1	2SC535(B)
Q2	2SC535(B)
Q3	2SK19(Y)
Q4	2SC535(B)
Q5	2SC535(B)
Q6	2SK19(Y)
Q7	2SC372(O)
Q8	2SC372(O)
Q9	2SC394(Y)
Q10	2SK30A(O)
Q11	2SC373
Q12	2SC373
Q13	2SC789(O)
Q14	2SC1173(O)
LOGIC BOARD	
D1	HV-80
D2	HV-80
D3	1N60
D4	1N60
D5	1N60
D6	HV-80
D7	1N60
IC1	N74145N
IC2	N74145N
IC3	N7402
IC4	N7493
IC5	N7400A
Q1	2SC373
Q2	2SC373
Q2	2SC373
Q4	2SC373
Q5	2SC373
Q6	2SC373
Q7	2SC373
Q8	2SC373
Q9	2SC373
Q10	2SC373
Q11	2SC373
Q12	2SC373

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
UHF BOARD		
TC1	6pF Trimmer	C-0583
TC2	6pF Trimmer	C-0583
TC3	6pF Trimmer	C-0583
TC4	6pF Trimmer	C-0583
IF BOARD		
C8	47uF 10V	
C11	0.1uF 35V	
C12	0.1uF 35V	
C15	0.1uF 35V	
C16	47uF 10V	
C20	0.1uF 35V	
C21	0.1uF 35V	
OSC BOARD		
C47	1uF 50V	
C50	1uF 50V	
C53	47uF 16V	
C56	1uF 50V	
RF/AF BOARD		
C40	47uF 16V	
C41	1uF 50V	
C44	47uF 16V	
C45	220uF 16V	
C47	10uF 16V	
C49	100uF 16V	
C52	220uF 16V	
C53	220uF 16V	
C55	220uF 25V	
C56	220uF 25V	
C57	220uF 25V	
C58	1000uF 25V	
LOGIC BOARD		
C2	1uF 25V	
C3	2.2uF 25V	
C4	220uF 16V	
C5	1000uF 10V	
C6	1uF 25V	
C7	1000uF 10V	
C9	47uF 16V	
C10	4.7uF 25V	
C11	4.7uF 25V	
C12	47uF 16V	
C13	220uF 16V	

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR2	Volume	P-1472
VR3	Squelch	P-1471
VR4	Scan Rate	P-0756

COILS/TRANSFORMERS

ITEM	PART NO.
UHF BOARD	
T4	CA-7150
IF BOARD	
T1	CA-2996
T2	CA-2997
OSC BOARD	
L1	CB-2190
L2 (1.8uH)	
L3	CB-2190
L4 (1.8uH)	
L5	CB-2190
L6 (1.8uH)	
L7	CB-2190
L8 (1.8uH)	
L9	CB-2104
T1	CA-4305
T2	CA-6827
T3	CA-4305
T4	CA-3211
T5	CA-2998
RF/AF BOARD	
L1	CB-2190
L2	CA-3182
T1	CA-7173
T2	CA-3174
T3	CA-6827
T4	CA-2511
T5	CA-2511
T6	CA-2511
T7	CA-7150
T8	CA-7246
CHASSIS	
PT1	TA-0448

CABINET PARTS

NAME	PART NO.
Escutcheon	Z-2149
Front Panel	Z-2150
Knob, Volume	K-1027
Knob, Push Switch	K-1709

MISCELLANEOUS

ITEM	NAME	PART NO.
UHF BOARD		
	PC Board	C-4500
IF BOARD		
	PC Board	Y-4802
	Crystal, 10.245MHz	CX-0049
CF-1	Filter, 10.7MHz	CA-3221
CF-2	Filter, 455kHz	C-0577
OSC BOARD		
	PC Board	X-4808
CF-1	Filter, 455kHz	C-0578
S1	Switch, Band	S-2246
S2	Switch, Band	S-2246
S3	Switch, Band	S-2246
S4	Switch, Band	S-2246
S5	Switch, Band	S-2246
S6	Switch, Band	S-2246
S7	Switch, Band	S-2246
S8	Switch, Band	S-2246
S9	Switch, Band	S-2246
S10	Switch, Band	S-2246
S11	Switch, Band	S-2246
S12	Switch, Band	S-2246
S13	Switch, Band	S-2246
S14	Switch, Band	S-2246
S15	Switch, Band	S-2246
S16	Switch, Band	S-2246
S17	Switch, Channel	S-7195
S18	Switch, Channel	S-7195
S19	Switch, Channel	S-7195
S20	Switch, Channel	S-7195
S21	Switch, Channel	S-7195
S22	Switch, Channel	S-7195
S23	Switch, Channel	S-7195
S24	Switch, Channel	S-7195
S25	Switch, Channel	S-7195
S26	Switch, Channel	S-7195
S27	Switch, Channel	S-7195
S28	Switch, Channel	S-7195
S29	Switch, Channel	S-7195
S30	Switch, Channel	S-7195
S31	Switch, Channel	S-7195
S32	Switch, Channel	S-7195
S33	Switch, Manual	S-7194
S34	Switch, Delay	S-7195
S35	Switch, Auto	S-7194
RF/AF BOARD		
	PC Board	X-4809
CF-1	Filter, 455kHz	C-0578
X1	Crystal, 54.7MHz	CX-0050
LOGIC BOARD		
	PC Board	X-4810
S36	Switch, Priority	S-7196
MISCELLANEOUS		
	Speaker	S-4529

Pages 79-88 Courtesy of REGENCY ELECTRONICS, INC.

SECTION 2 ALIGNMENT AND TUNING PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receiver RF sections, (Low, High and UHF) should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

2-2 QUADRATURE DETECTOR

2-2-1 Connect the FM Signal Generator to the H/L antenna input jack. Accurately set the frequency to the center of the channel being used for alignment. Modulate Signal Generator Generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to Junction of C162, C163 and R172.

2-2-3 Adjust Signal Generator's output until all of the noise in the scope pattern just disappears.

2-2-4 Adjust L128 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal. When L128 is properly aligned, signal at above Junction should be approximately 0.2 volts RMS with test signal input as noted in 2-2-1.

2-3 IF ALIGNMENT

2-3-1 Pre-Set the cores of L122, L123 and L124 9 turns in from the outer end of the coil form. This step is usually necessary only if the IF appears to be badly misaligned.

2-3-2 Connect AC voltmeter to the Junction of R167 and the collector of Q116.

2-3-3 Set AC voltmeter to the 300 millivolts (or 1 volt) scale.

2-3-4 With generator accurately set to the frequency of the center of the channel being used for alignment, increase Signal Generator's output until AC voltmeter reading is mid-range.

2-3-5 Adjust L122, L123 and L124 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvement can be made.

2-4 RF ALIGNMENT

LOW BAND SECTION

2-4-1 Pre-Set the cores of L102 and L103 one turn from the outer ends of the coil form. (NOTE: Due to the broadness of the Low Band Section, presetting the above cores will give you optimum performance over the entire band).

HIGH BAND SECTION

2-4-2 Connect AC voltmeter to the Junction of R167 and the collector of Q116.

2-4-3 Set AC voltmeter to the 300 millivolts scale.

2-4-4 Activate High Band channel nearest to center of High Band frequencies being used.

2-4-5 With Signal Generator accurately set to the frequency of the center of the channel being used for alignment and connected to H/L antenna input jack, increase Signal Generator's output until AC voltmeter reading is mid-range.

2-4-6 Adjust L129, L104, L105 and L106 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

UHF BAND SECTION

2-4-7 Connect AC voltmeter across the speaker terminals; connect Signal Generator to the UHF antenna input jack.

2-4-8 With Signal Generator output reduced to zero, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

2-4-9 Activate UHF channel nearest to center of UHF frequencies being used.

2-4-10 Set Signal Generator accurately to the channel being used and adjust output of Signal Generator until AC voltmeter reads approximately 0.2 volts.

2-4-11 Pre-Set trimmer capacitor C139 for minimum capacitance. The movable half-moon section (gold color) should be turned toward the front of the unit.

2-4-12 Adjust trimmer capacitors C121 and C122 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a voltmeter reading between 0.1 and 0.2 volts. Repeat adjustments until no further improvement can be made.

NOTE: Use a non-metallic tool for all trimmer capacitor adjustments. Peaks are very sharp, so tune with care.

2-4-13 Adjust the core of L119 for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a reading between 0.1 and 0.2 volts.

2-4-14 Adjust trimmer capacitor C139 for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a reading between 0.1 and 0.2 volts.

2-4-15 Readjust trimmer capacitors C121, C122 and C139 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a voltmeter reading between 0.1 and 0.2 volts. Repeat these adjustments until no further improvement can be made.

2-5 AFC ALIGNMENT

NOTE: This adjustment requires an accurate 10.7 MHz ±1 KHz oscillator or 455 KHz ±500 Hz oscillator to be used as a reference signal. If none are available, proceed to Step 2-5-4.

2-5-1 With a coupling loop, inject "Reference" signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R147 for reading of 3.8 to 4.0 volts at the collector of Q109.

2-5-2 Remove the "Reference" signal and have the unit squelched and receiving no signal. The voltage on the collector of Q109 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 2-5-3. If voltage is between 3.2 and 4.6 volts, AFC alignment is complete.

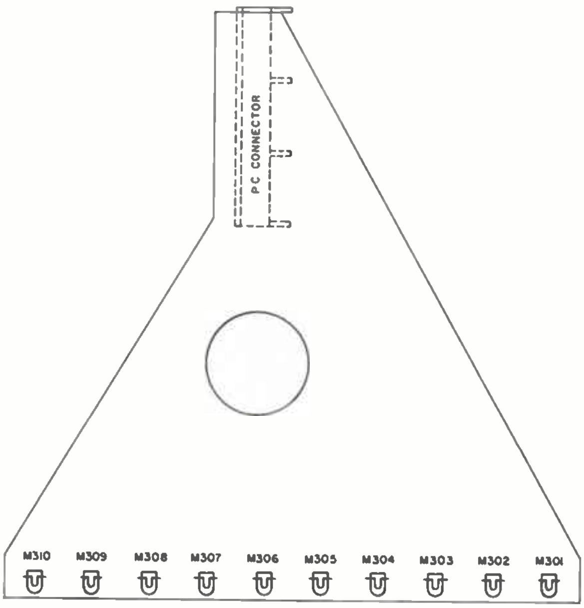
NOTE: Any further adjustment made to L128 and R147 will require AFC to be re-adjusted.

2-5-3 Inject "Reference" signal and monitor voltage on collector of Q109. Adjust L128 for same voltage as noted in Step 3. Re-adjust R147 for a voltmeter reading of 3.8 to 4.0 volts. Repeat Step 2-5-2.

NOTE: Do not adjust L128 more than 1/4 turn at a time.

2-5-4 If an accurate I.F. signal source is not available, an approximate AFC alignment can be made by adjusting L128 on a High Band or Low Band crystal as specified in Quadrature Detector Alignment (Section 2-2), and with the unit squelched and receiving no signal, adjust R147 for voltmeter reading of 3.2 to 4.6 on the collector of Q109.

NOTE: Units equipped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q109 and collector of Q111. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q109 and the collector of Q110. If the crystal is changed from one frequency to the other, the jumper MUST be also changed. If the UHF, first L.O. crystals are made for high side injection (to eliminate a primary image problem in certain areas of the country), the jumper must be changed.



3-5 LIGHT BOARD BOTTOM VIEW

VOLTAGE DATA (CONTINUED)

INTEGRATED CIRCUITS

NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M301 is lighted).

IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
IC101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–	–	–	
IC102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0	–	–	
IC103	7.1	.01	0	0	0	.01	0	6.9	0	0	0	0	0	13.8	–	–	
IC104	5.1	0	0	0	5.1	5.1	5.1	.1	.1	0	.1	.1	0	.1	–	–	Manual
	4.9	0	0	0	5.1	5.1	5.1	1P	2P	0	2P	1P	0	2P	–	–	SCAN
IC105	.5	11.2	11.2	11.2	11.2	11.2	11.2	0	11.2	11.2	11.2	.1	.1	.1	.1	5.1	Manual
	9P	9P	9P	9P	9P	9P	9P	0	9P	9P	9P	1P	2P	1P	2P	5.1	SCAN

3-6 VOLTAGE DATA

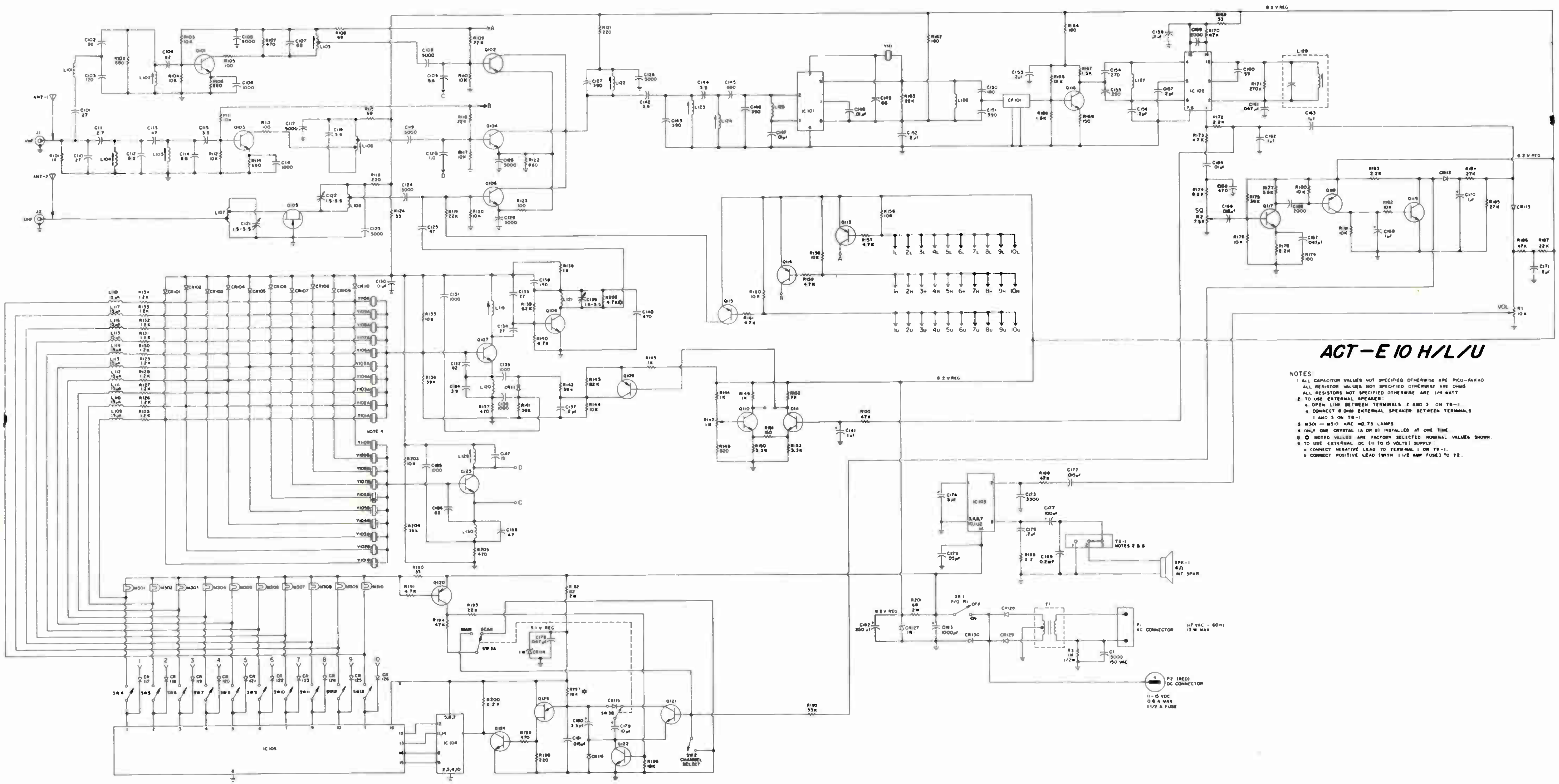
NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – SEMICONDUCTORS:

TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
Q101	3.1	3.8	7.0	Low Band Activated
	0	0	0	High Band Activated
	0	0	0	UHF Band Activated
Q102	1.6	2.3	7.7	Low Band Activated
	1.6	0	7.7	High Band Activated
	1.4	0	7.7	UHF Band Activated
Q103	0	0	8.2	Low Band Activated
	3.1	3.8	7.9	High Band Activated
	0	0	8.2	UHF Band Activated
Q104	1.6	0	7.7	Low Band Activated
	1.6	2.3	7.7	High Band Activated
	1.4	0	7.7	UHF Band Activated
Q105 (FET)	0	0	6.0	
Q106	1.6	0	7.7	Low Band Activated
	1.6	0	7.7	High Band Activated
	1.6	2.3	7.7	UHF Band Activated
Q107	3.7	4.4	7.3	No Crystal
	3.4	4.0	7.3	With Crystal
Q108	0	.4	7.3	UHF Band (No Crystal)
	0	.1	4.0	UHF Band (With Crystal)
Q109 (PNP)	7.9	7.2	3-5	
Q110	2.9	3.6	7.2	
Q111	2.9	3.6	7.4	
Q113 (PNP)	8.2	7.5	8.1	Low Band Activated
	8.2	8.2	0	High Band Activated
	8.2	8.2	0	UHF Band Activated
Q114 (PNP)	8.2	8.2	0	Low Band Activated
	8.2	7.5	8.1	High Band Activated
	8.2	8.2	0	UHF Band Activated
Q115 (PNP)	8.2	8.2	0	Low Band Activated
	8.2	8.2	0	High Band Activated
	8.2	7.5	8.1	UHF Band Activated
Q116	0.4	1.1	4.5	
Q117	1.0	1.7	5.0	
Q118	8.2	8.2	0	(Unsquelched)
	8.2	8.2	1.0	(Squelched)
	8.2	8.2	1.5	Min. (Tight Squelched)
Q119	0	0	7.2	(Unsquelched)
	0	0.8	0.2	(Squelched)
	0	0.8	0.1	(Tight Squelched)
Q120	13.8	13.1	13.6	(SCAN)
	13.8	13.1	13.6	(MAN)
	13.8	13.8	0	(No Lights)
Q121	0	0	4.0	(SCAN)
	0	0.8	0.1	(MAN)
Q122	0	0.8	0.1	
Q124	0	.2	4.9	(SCAN)
	0	.2	5.1	(MAN)
Q125	3.7	4.4	7.3	No Crystal
	3.4	4.0	7.3	With Crystal

	BASE 1	EMITTER	BASE 2	
Q123	0.2	3.8	5.1	(SCAN)
(Unijunction)	0.2	0.5	5.1	(MAN)

	CATHODE	ANODE	
CR113	1.8	2.4	(Unsquelched)
	1.0	0	(Squelched)

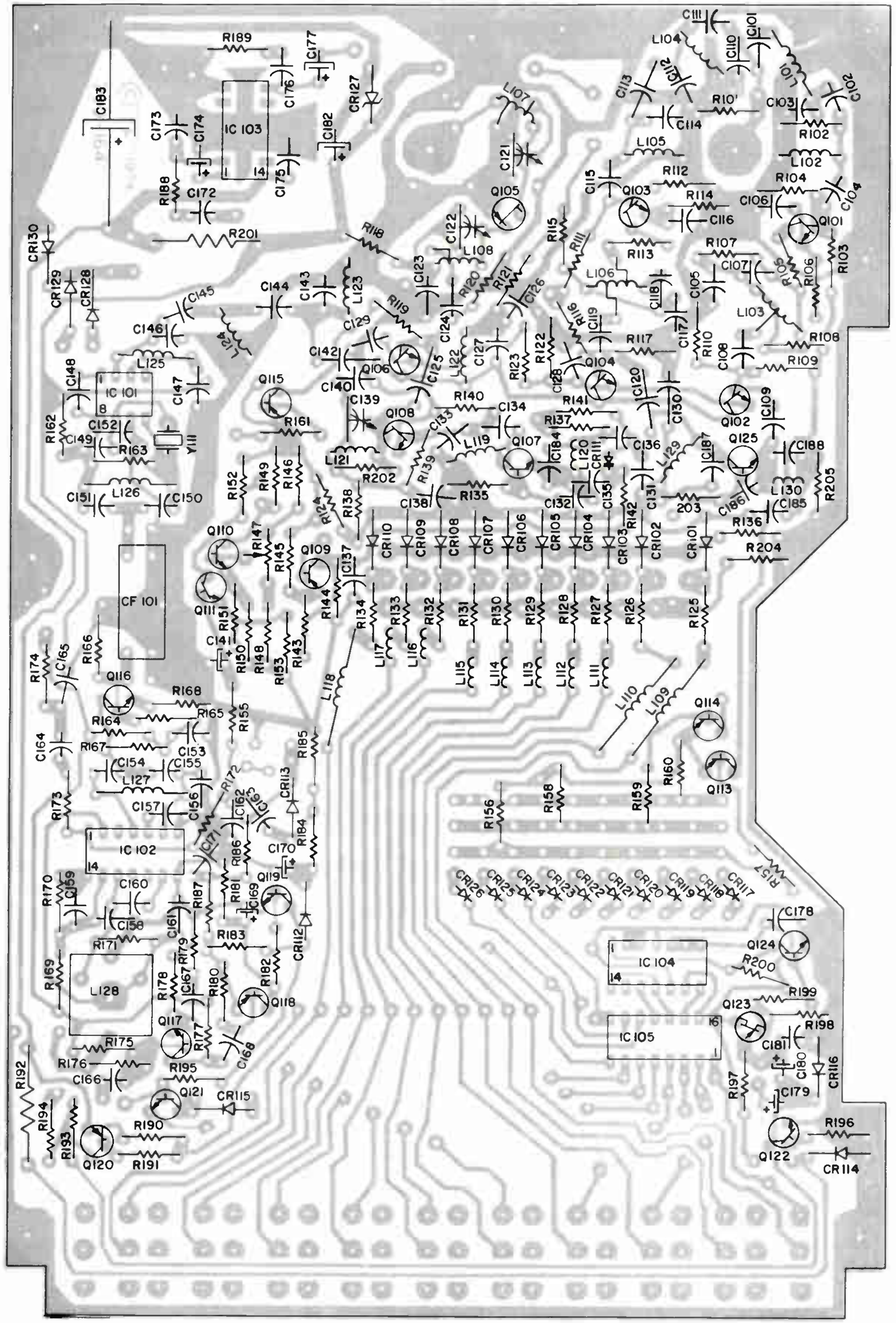


ACT—E 10 H/L/U

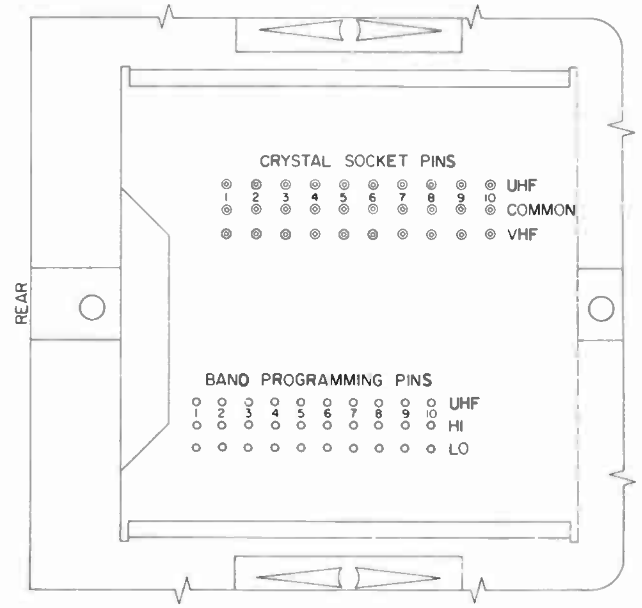
NOTES

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS
   ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT
2. TO USE EXTERNAL SPEAKER:
   a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1
   b. CONNECT 8 OHM EXTERNAL SPEAKER BETWEEN TERMINALS 1 AND 3 ON TB-1.
3. M301 — M310 ARE NO. 73 LAMPS
4. ONLY ONE CRYSTAL (A OR B) INSTALLED AT ONE TIME
5. ✡ NOTED VALUES ARE FACTORY SELECTED NOMINAL VALUES SHOWN.
6. TO USE EXTERNAL DC (11 TO 15 VOLTS) SUPPLY:
   a. CONNECT NEGATIVE LEAD TO TERMINAL 1 ON TB-1.
   b. CONNECT POSITIVE LEAD (WITH 1 1/2 AMP FUSE) TO T2.

MAIN BOARD 700-164



3-2 MAIN BOARD BOTTOM VIEW



High Band Crystal: (148-174 MHz)

a. Crystal frequency, determined as follows:

$$\text{Crystal frequency} = \frac{\text{Channel frequency} - 10.7\ \text{MHz}}{3}$$

EXAMPLE:

Crystal frequency =

$$\frac{155.55\ \text{MHz} - 10.7\ \text{MHz}}{3} = \frac{144.85\ \text{MHz}}{3} = 48.28333\ \text{MHz}$$

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 Ohms
f. Drive Level of 2 MW
g. Holder: HC-25/U

Low Band Crystal: (30-50 MHz)

a. Crystal frequency, determined as follows:
Crystal frequency = Channel frequency +10.7 MHz

EXAMPLE:

Crystal frequency = 39.50 MHz +10.7 MHz = 50.20 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 Ohms
f. Drive Level of 2 MW
g. Holder: HC-25/U

UHF Band Crystal (450-470 MHz)

a. $\text{Crystal frequency} = \frac{\text{Receive frequency} - 10.7\ \text{MHz}}{9}$

EXAMPLE:

$$\text{Crystal frequency} = \frac{458.00\ \text{MHz} - 10.700\ \text{MHz}}{9}$$

Crystal frequency = 49.70000 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Parallel resonance - 18 PF load capacitance
e. Maximum equivalent series resistance of 35 Ohms
f. Drive Level of 2 MW
g. Holder: HC-25/U

SEMICONDUCTORS

ITEM	PART NO.
CR101	4807-1233-900
CR102	4807-1233-900
CR103	4807-1233-900
CR104	4807-1233-900
CR105	4807-1233-900
CR106	4807-1233-900
CR107	4807-1233-900
CR108	4807-1233-900
CR109	4807-1233-900
CR110	4807-1233-900
CR111	4809-0000-001
CR112	4805-1241-200
CR113	4805-1241-200
CR114	4808-0000-007
CR115	4805-1241-200
CR116	4805-1241-200
CR117	4805-1241-200
CR118	4805-1241-200
CR119	4805-1241-200
CR120	4805-1241-200
CR121	4805-1241-200
CR122	4805-1241-200
CR123	4805-1241-200
CR124	4805-1241-200
CR125	4805-1241-200
CR126	4805-1241-200
CR127	4808-0000-009
CR128	4806-0000-004
CR129	4806-0000-004
CR130	4806-0000-004
IC101	3130-3167-901
IC102	3130-3157-603
IC103	3130-3157-614
IC104	3130-3157-608
IC105	3130-3193-501
Q101	4801-0000-035
Q102	4801-0000-035
Q103	4801-0000-035
Q104	4801-0000-035
Q105	4811-0000-015
Q106	4801-0000-035
Q107	4801-0000-100
Q108	4801-0000-035
Q109	4801-0000-060
Q110	4801-0000-010
Q111	4801-0000-010
Q113	4801-0000-060
Q114	4801-0000-060
Q115	4801-0000-060
Q116	4801-0000-010
Q117	4801-0000-010
Q118	4801-0000-060
Q119	4801-0000-010
Q120	4801-0000-060
Q121	4801-0000-010
Q122	4801-0000-010
Q123	4813-0000-001
Q124	4801-0000-010
Q125	4801-0000-100

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C121	1.5-5.5pF Trimmer	1517-0000-011
C122	1.5-5.5pF Trimmer	1517-0000-011
C139	1.5-5.5pF Trimmer	1517-0000-011
C141	1uF 16V	1513-0010-002
C169	1uF 16V	1513-0010-002
C170	1uF 16V	1513-0010-002
C174	5uF 10V	1513-0050-001
C177	100uF 16V	1513-0101-002
C179	10uF 10V	1513-0100-001
C180	3.3uF 20% 10V	1513-0339-005
C182	250uF 10V	1513-0251-001
C183	1000uF 16V	1513-0102-002

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R1	10K Volume	4750-3212-101
R2	7.5K Squelch	4750-3212-102
R147	1K Vert. Trimmer	4751-0102-005

COILS/TRANSFORMERS

ITEM	PART NO.
ANT-1	1201-5108-802
ANT-2	1201-5108-803
L101	1802-0688-003
L102	1800-3152-005
L103	1800-3152-004
L104	1800-3152-002
L105	1800-3152-002
L106	1800-3152-003
L107	1800-3160-001
L108	1800-3160-002
L109	1802-0152-004
L110	1802-0152-004
L111	1802-0152-004
L112	1802-0152-004
L113	1802-0152-004
L114	1802-0152-004
L115	1802-0152-004
L116	1802-0152-004
L117	1802-0152-004
L118	1802-0152-004
L119	1800-3152-009
L120	1801-1236-900
L121	1800-3160-003
L122	1800-3191-401
L123	1800-3191-401
L124	1800-3191-402
L125	1802-0689-003
L126	1802-0000-002
L127	1802-0000-002
L128	1800-3151-700
L129	1800-3152-009
T1	5604-5100-600

MISCELLANEOUS

ITEM	NAME	PART NO.
CF101	Ceramic Filter	2700-0000-007
Y100	30-50MHz Crystal	2303-0000-000
	148-174MHz Crystal	2302-0000-000
	450-470MHz Crystal	2304-0000-000
	470-500MHz Crystal	2320-0000-000
Y111	10.245MHz Crystal	2301-3151-601
	11.155MHz Crystal	2301-3151-602
SPK-1	Speaker	1301-3236-000
SW2	Switch, 2 Station	5112-6035-820
SW3	Switch, 2 Station	5112-6035-820
SW4	Switch, 10 Station	5112-6038-401
SW5	Switch, 10 Station	5112-6038-401
SW6	Switch, 10 Station	5112-6038-401
SW7	Switch, 10 Station	5112-6038-401
SW8	Switch, 10 Station	5112-6038-401
SW9	Switch, 10 Station	5112-6038-401
SW10	Switch, 10 Station	5112-6038-401
SW11	Switch, 10 Station	5112-6038-401
SW12	Switch, 10 Station	5112-6038-401
SW13	Switch, 10 Station	5112-6038-401
	AC Cord, MA-16	6041-3215-900
	AC Cord, MA-17	7011-1047-800

CABINET PARTS

NAME	PART NO.
Cabinet	1408-7017-400
Rear Panel	1405-3167-503
Crystal Door	1413-1293-900
Knob	2402-1276-202

Pages 89-100 Courtesy of REGENCY ELECTRONICS, INC.

SECTION 3 ALIGNMENT AND TUNING PROCEDURES

3-1 RECEIVER ALIGNMENT (LOW BAND, HIGH BAND)

NOTE: During all steps of receiver alignment, the squelch control should be in the maximum clockwise position (minimum squelch action). Set power supply source to maintain a constant voltage of 8.75 VDC.

EQUIPMENT REQUIRED:

FM Signal Generator
AC VTVM
DC VTVM

PROCEDURE:

1. Connect an AC VTVM to the audio output at the speaker. Adjust Volume Control, R139, for a readable output level (use 1 volt scale).

2. Adjust T101 for MAXIMUM audio noise output. The DC voltage at pin 1 of IC102 should be approximately 2.6 VDC when T101 is set properly.

3. Connect FM Signal Generator to the receiver. This is accomplished by:

   1. Remove the telescopic antenna, or the flexible antenna and adapter.
   2. Solder small alligator clips to the coaxial cable from the Signal Generator, one to the center conductor and one to the shield.
   3. Connect the center conductor clip to the antenna mounting bracket and the shield clip to a ground near the antenna mounting bracket.

4. Tune the FM Signal Generator accurately to the receive frequency, and adjust RF level until audio output decreases noticeably (about 3 or 4 DB).

5. Adjust L108, L101, L102 and L103 (in that order) for MINIMUM AC VTVM reading. Adjust RF level or Volume Control (R139) to keep reading on 1 volt scale.

6. Remove FM Signal Generator and adjust Volume Control (R139) for full scale reading on AC VTVM.

7. Reconnect FM Signal Generator and tune generator to the Image Frequency (910 KHz below the frequency being used). Adjust the RF Signal level for approximately 18-20 DB quieting (point where noise is at minimum).

NOTE: Some receivers may have the second oscillator at 11.155 MHz, if this is the case, the image frequency is 910 KHz ABOVE the channel frequency. Check the frequency marked on top of the crystal (10.245 MHz for BELOW and 11.155 MHz for ABOVE).

8. Adjust L104 for MAXIMUM reading on AC VTVM.

9. Remove FM Signal Generator and adjust Volume Control (R139) for full scale reading on AC VTVM.

10. Reconnect FM Signal Generator and tune generator to the receive frequency and adjust RF Signal level for 18-20 DB quieting.

11. Readjust L101, L102 and L103 for MINIMUM reading on AC VTVM. Do Not readjust L104 as its proper adjustment should be as in Step 7.

12. Apply a 1 KHz signal modulated at approximately ±3.3 KHz deviation to antenna input.

13. Adjust T101 for MAXIMUM undistorted audio output (approximately 2.7 Vrms at full volume).

3-2 TONE DECODER TEST

EQUIPMENT REQUIRED:

AC VTVM
RF Signal Generator
Sequential Tone Generator

1. Switch receiver to Monitor position.

2. Connect an AC VTVM to audio output (speaker). Adjust Volume Control (R139) for 1 volt noise reading.

3. Apply RF Signal at RX frequency. Adjust RF level to a value greater than 20 DB quieting.

4. Connect tone generator to RF Signal Generator and adjust modulated tone signal to a deviation greater than ±1 KHz and less than ±5 KHz.

5. Set tone generator to proper frequencies and timing.

6. Place receiver in Tone position.

7. Apply tone sequence. The receiver's audio should be turned on and the Alert light should flash on and off.

8. Slide the switch to Monitor/Reset position. The Alert light should stop flashing.

4-7 VOLTAGE DATA

VOLTAGE DATA - TRANSISTORS

NOTE: All voltages are nominal and are measured with a DVM. Supply voltage is 8.75v

Receiver Board No. 501-098	Transistor	Emitter (Source)	Base (Gate)
	Q101	4.9v	4.2v
	Q102	1.8v	2.6v
	Q103	0v	0.7v
	Q104	1.2v	1.8v
	Q105	0.6v	1.2v
	Q106	5.9v	5.9v
	Q107	0.1v	0.7v
	Q108	0v	0v (N)
			0.6v (S)
			0.7v (T)
	Q109	3.5v	4.0v (N)
			4.0v (S)
			0v (T)
	Q110	8.75v	8.0v
	Q111	3.7v	3.4v
	Q112	3.7v	4.0v
	Q113	0v	0.3v
	Q114	0v	0.7v
	Q115	8.75v	7.9v
	Q116	5.9v	6.7v
	Q117	0v	0.7v
Decoder Board No. 501-097	Q201	0	0
	Q202	0	0v
	Q203	0	0.7v
	Q204	0	0.7v
	Q205	0	0.7v
	Q206	0	0.3v
	Q207	0	0v

VOLTAGE DATA – INTEGRATED CIRCUITS

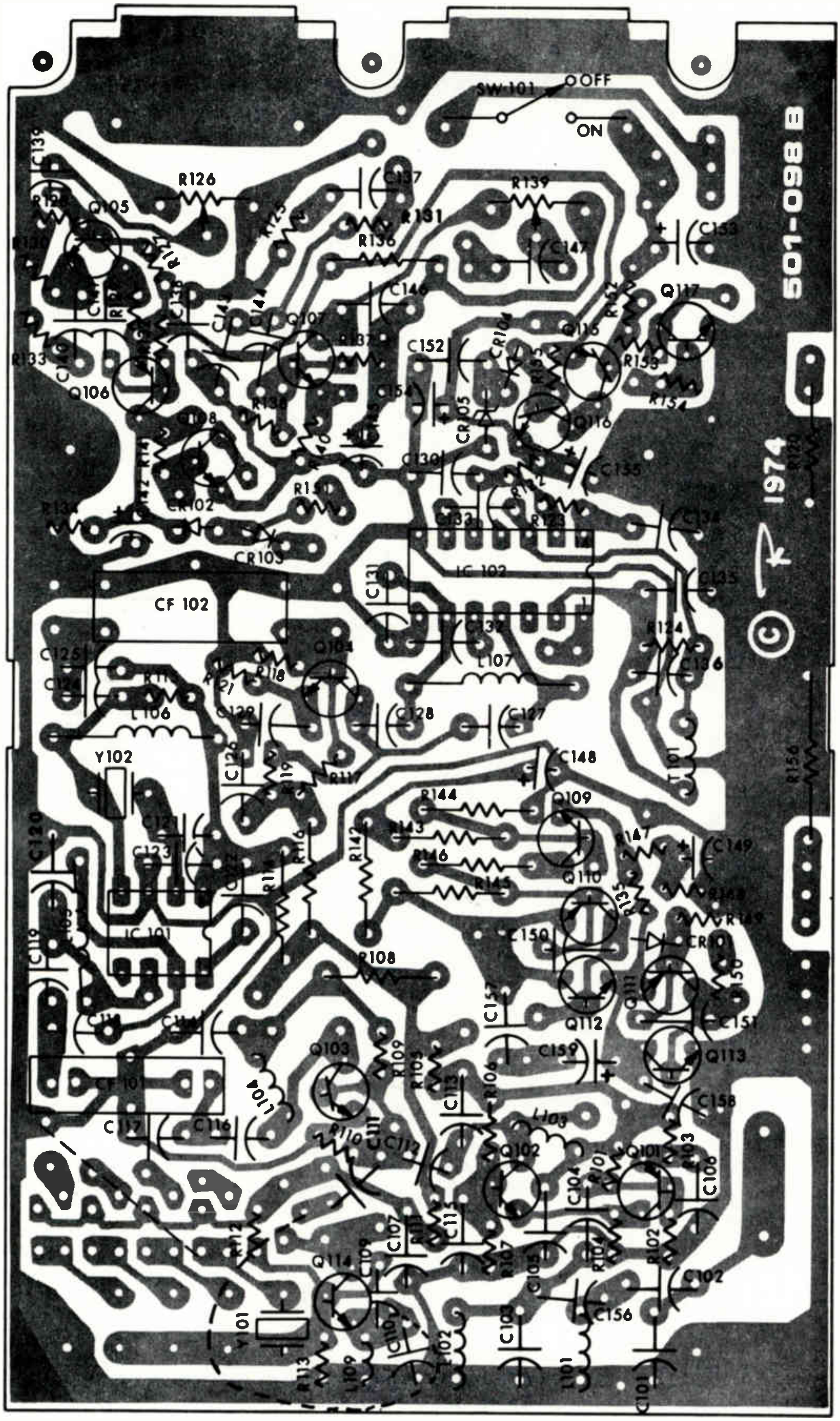
Pin No.	1	2	3	4	5	6	7	8
IC101	3.2 v	0.7 v	0.7 v	3.2 v	5.6 v	–	3.2 v	5.6v

Pin No.	1	2	4	6	9	10	11	12	13	14
IC102	2.7 v	3.5 v	1.4 v	1.4 v	0.2 v		2.8 v	3.5 v	5.5 v	3.7 v

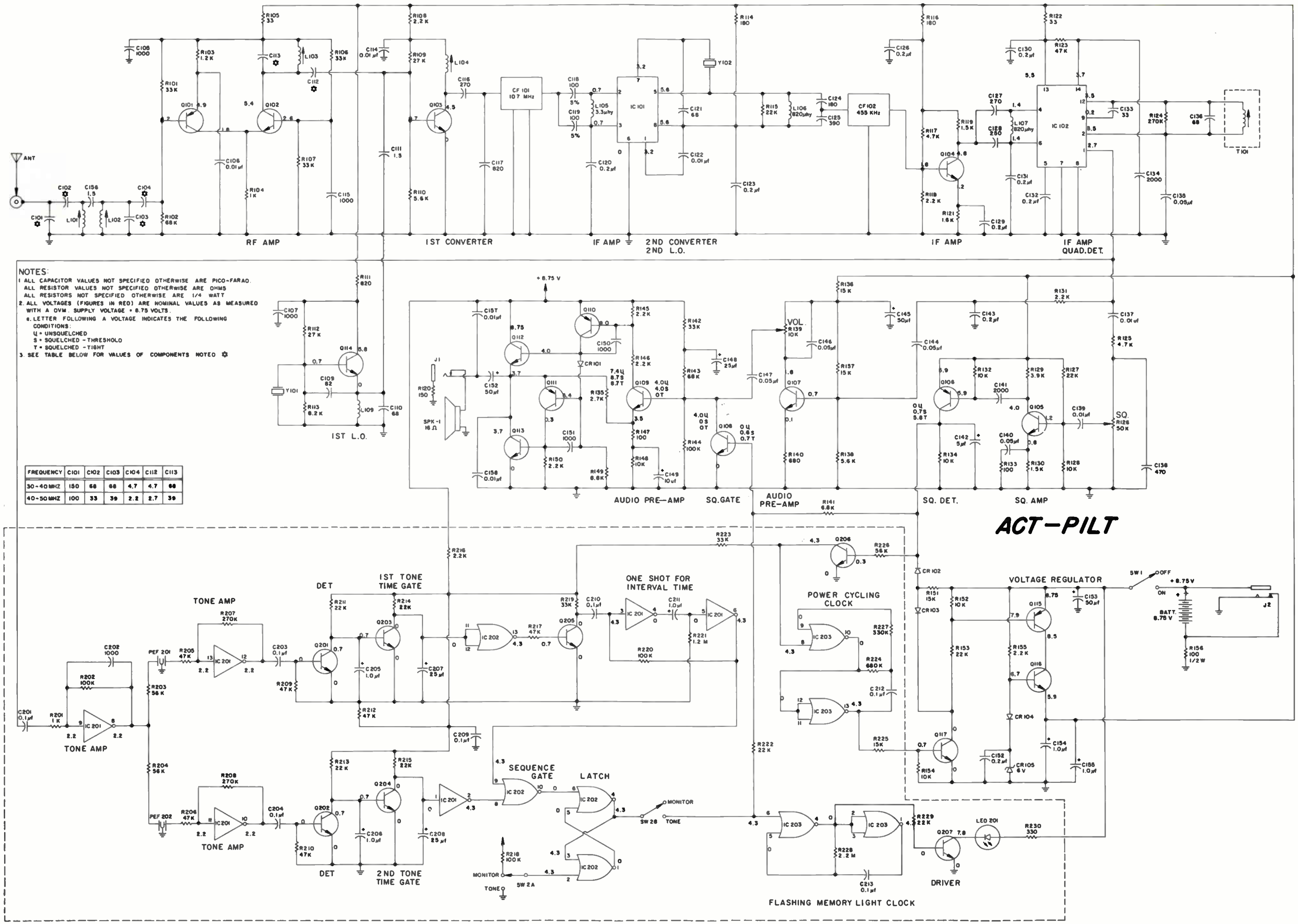
VOLTAGE DATA - INTEGRATED CIRCUITS

Pin No.	IC201	IC202	IC203
1	0v	0	4.3
2	4.3v	4.3v	0
3	4.3v	4.3v	0
4	0v	4.3v	0
5	0v	0v	0
6	4.3v	0v	4.3
7	Ground	0v(Ground)	Ground
8	2.2v	4.3v	4.3
9	2.2v	4.3v	0
10	2.2v	0v	0
11	2.2v	0v	0
12	2.2v	0v	0
13	2.2v	4.3v	4.3
14	4.4v	4.4v	4.4

RECEIVER BOARD 501-098



4-2 LOW-BAND RECEIVER BOARD BOTTOM VIEW

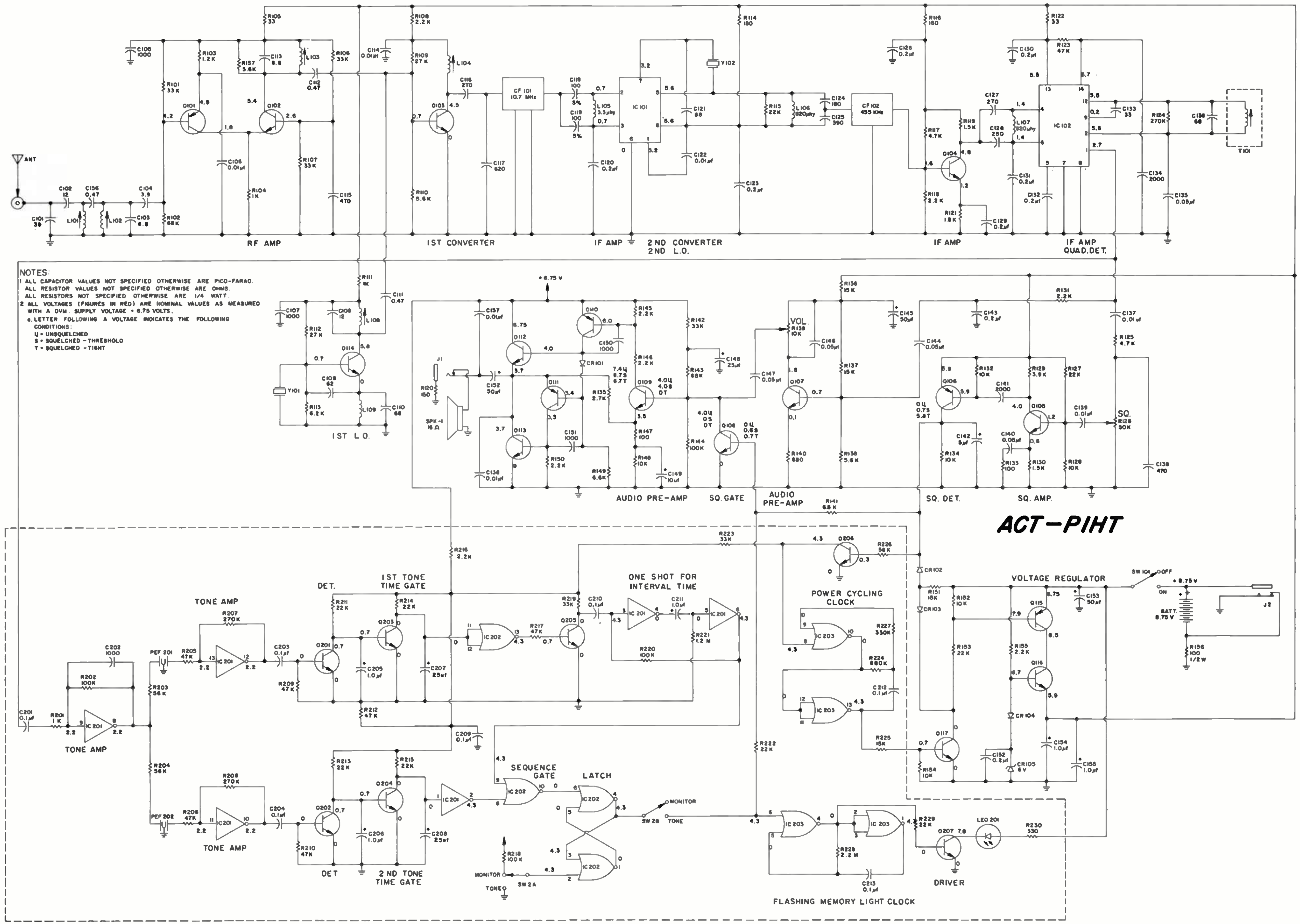


NOTES:
1 ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD.
ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS
ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT
2. ALL VOLTAGES (FIGURES IN RED) ARE NOMINAL VALUES AS MEASURED WITH A DVM. SUPPLY VOLTAGE = 8.75 VOLTS.
a. LETTER FOLLOWING A VOLTAGE INDICATES THE FOLLOWING CONDITIONS:
U = UNSQUELCHED
S = SQUELCHED - THRESHOLD
T = SQUELCHED - TIGHT
3. SEE TABLE BELOW FOR VALUES OF COMPONENTS NOTED ✿

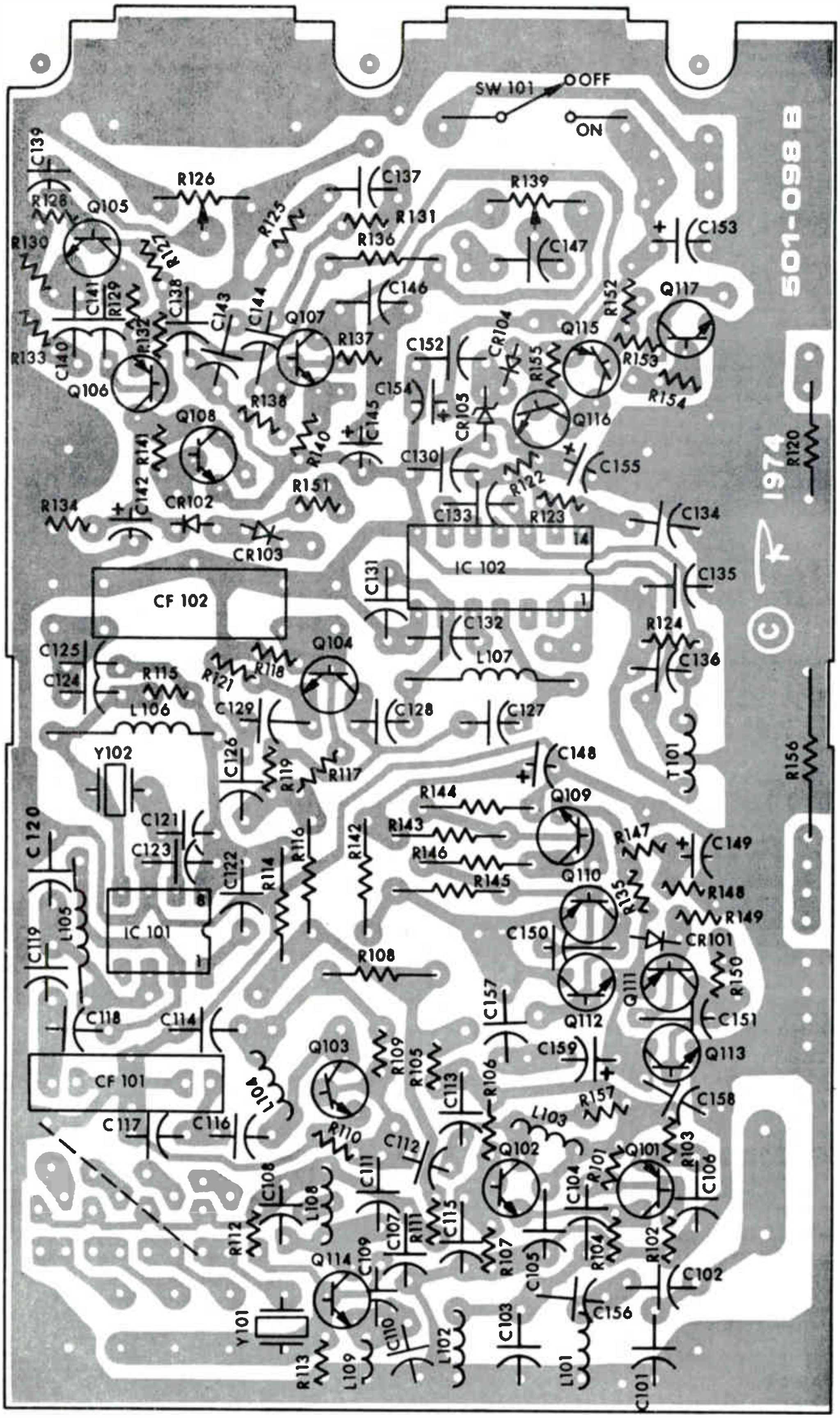
FREQUENCY	C101	C102	C103	C104	C112	C113
30-40 MHZ	150	68	68	4.7	4.7	68
40-50 MHZ	100	33	39	2.2	2.7	39

ACT-PILT

Regency Act-P1HT/LT

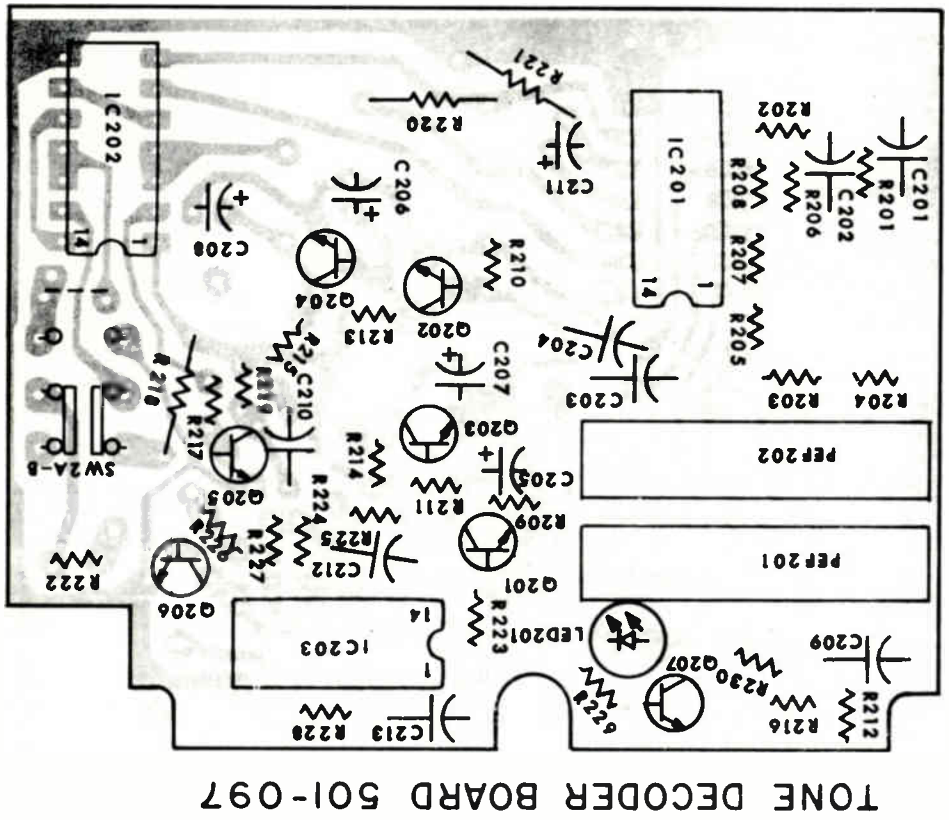


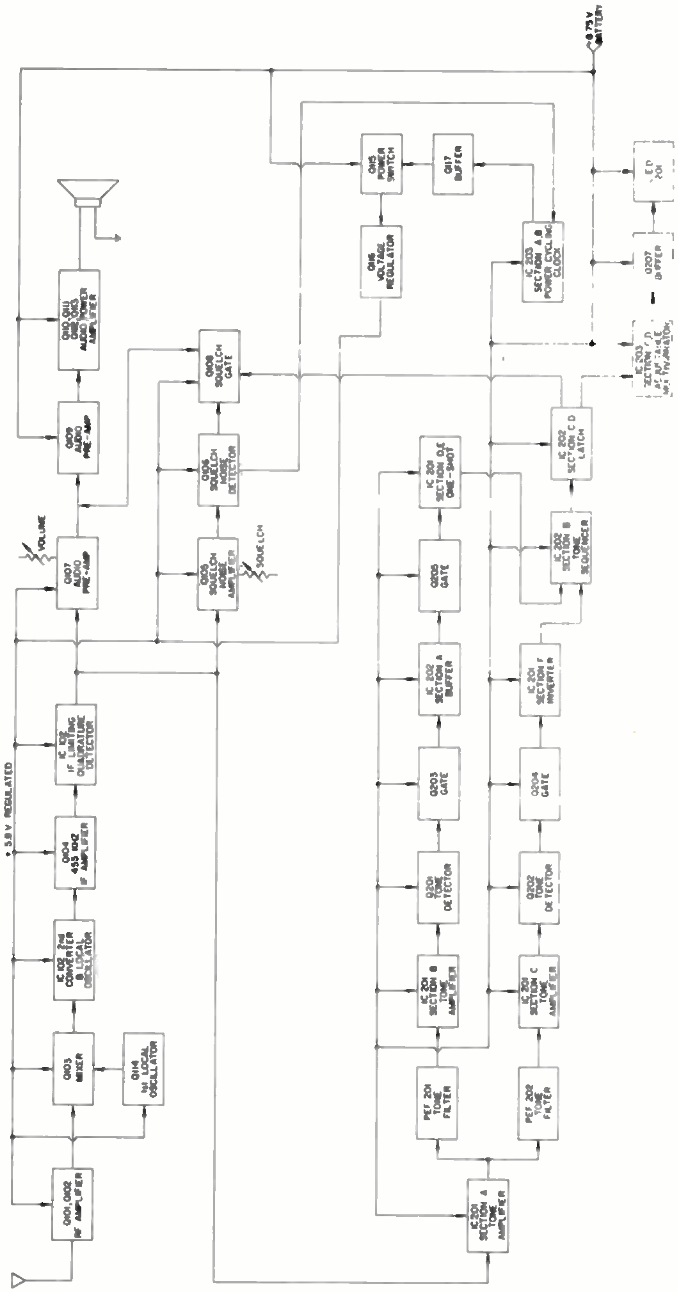
RECEIVER BOARD 501-098



4-4 HIGH-BAND RECEIVER BOARD BOTTOM VIEW

4-6 TONE DECODER BOARD BOTTOM VIEW





2-3 TONE DECODER BLOCK DIAGRAM

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
LOW-BAND ASSY.		
CR101	102-412	4805-1241-200
CR102	102-412	4805-1241-200
CR103	102-412	4805-1241-200
CR104	102-412	4805-1241-200
CR105	6V Zener	4808-0000-012
IC101	IC 301-679-1	3130-3167-901
IC102	IC 301-576-3	3130-3157-603
Q101	2N-4258 102-842	4801-1284-200
Q102	2N-5130	4801-0000-095
Q103	2N-5130	4801-0000-095
Q104	SPS-952	4801-0000-010
Q105	SPS-952	4801-0000-010
Q106	SPS-1539	4801-0000-060
Q107	SPS-952	4801-0000-010
Q108	SPS-952	4801-0000-010
Q109	SPS-952	4801-0000-010
Q110	SPS-1539	4801-0000-060
Q111	SPS-1539	4801-0000-060
Q112	SPS-952	4801-0000-010
Q113	SPS-952	4801-0000-010
Q114	SPS-1473	4801-0000-035
Q115	SPS-1539	4801-0000-060
Q116	SPS-952	4801-0000-010
Q117	SPS-952	4801-0000-010
HIGH-BAND ASSY.		
CR101	102-412	4805-1241-200
CR102	102-412	4805-1241-200
CR103	102-412	4805-1241-200
CR104	102-412	4805-1241-200
CR105	6V Zener	4808-0000-012
IC101	IC 301-679-1	3130-3167-901
IC102	IC 301-576-3	3130-3157-603
Q101	2N-4258	4801-1284-200
Q102	2N-5130	4801-0000-095
Q103	2N-5130	4801-0000-095
Q104	SPS-952	4801-0000-010
Q105	SPS-952	4801-0000-010
Q106	SPS-1539	4801-0000-060
Q107	SPS-952	4801-0000-010
Q108	SPS-952	4801-0000-010
Q109	SPS-952	4801-0000-010
Q110	SPS-1539	4801-0000-060
Q111	SPS-1539	4801-0000-060
Q112	SPS-952	4801-0000-010
Q113	SPS-952	4801-0000-010
Q114	SPS-1473	4801-0000-035
Q115	SPS-1539	4801-0000-060
Q116	SPS-952	4801-0000-010
Q117	SPS-952	4801-0000-010
TONE DECODER ASSY.		
IC201	IC 301-576-17	3130-3157-617
IC202	IC 301-576-21	3130-3157-621
IC203	IC 301-576-21	3130-3157-621
LED-201	102-829	4810-1282-900
Q201	SPS-952	4801-0000-010
Q202	SPS-952	4801-0000-010
Q203	SPS-952	4801-0000-010
Q204	SPS-952	4801-0000-010
Q205	SPS-952	4801-0000-010
Q206	SPS-952	4801-0000-010
Q207	SPS-952	4801-0000-010

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
LOW-BAND ASSY.		
C142	5uF 10V	1513-0050-001
C145	50uF 16V	1513-0500-002
C148	25uF 10V	1513-0250-001
C149	10uF 10V	1513-0100-001
C152	50uF 16V	1513-0500-002
C153	50uF 16V	1513-0500-002
C154	1uF 50V	1513-0010-004
C155	1uF 50V	1513-0010-004
HIGH-BAND ASSY.		
C142	5uF 10V	1513-0050-001
C145	50uF 16V	1513-0500-002
C148	25uF 10V	1513-0250-001
C149	10uF 10V	1513-0100-001
C153	50uF 16V	1513-0500-002
C154	1uF 50V	1513-0010-004
C155	1uF 50V	1513-0010-004
TONE DECODER ASSY.		
C205	1uF 50V	1513-0010-004
C206	1uF 50V	1513-0010-004
C207	25uF 10V	1513-0250-001
C208	25uF 10V	1513-0250-001
C211	1uF 50V	1513-0010-004

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R139 (1)	10K Variable	4750-3220-101
R126 (2)	50K Variable	4750-3220-102
R139 (2)	10K Variable	4750-3220-101

(1) Low-Band Assy.
(2) High-Band Assy.

COILS/TRANSFORMERS

ITEM	PART NO.
LOW-BAND ASSY.	
L101	1800-5100-518
L102	1800-5100-518
L103	1800-5100-518
L104	1800-5100-402
L105	1802-0339-007
L106	1803-3238-600
L107	1803-3238-600
L109	1801-1236-900
T101	1800-3218-800
HIGH-BAND ASSY.	
L101	1800-5100-503
L102	1800-5100-503
L103	1800-5100-503
L104	1800-5100-402
L105	1802-0339-007
L106	1803-3238-600
L107	1803-3238-600
L108	1800-5100-503
L109	1801-1236-900
T101	1800-3218-800

MISCELLANEOUS

ITEM	NAME	PART NO.
CF101 (1)	Ceramic Filter	2700-3209-600
CF101 (2)	Ceramic Filter	2700-3209-600
CF102 (1)	Ceramic Filter	2700-0000-006
CF102 (2)	Ceramic Filter	2700-0000-006
	Antenna	1201-5108-801
	Speaker	1301-3213-402
	Battery	4000-3213-100

(1) Low-Band Assy.
(2) High-Band Assy.

CABINET PARTS

NAME	PART NO.
Case	1411-7010-000
Battery Door	1411-6038-700

Pages 101-114 Courtesy of LINEAR SYSTEMS, INC.

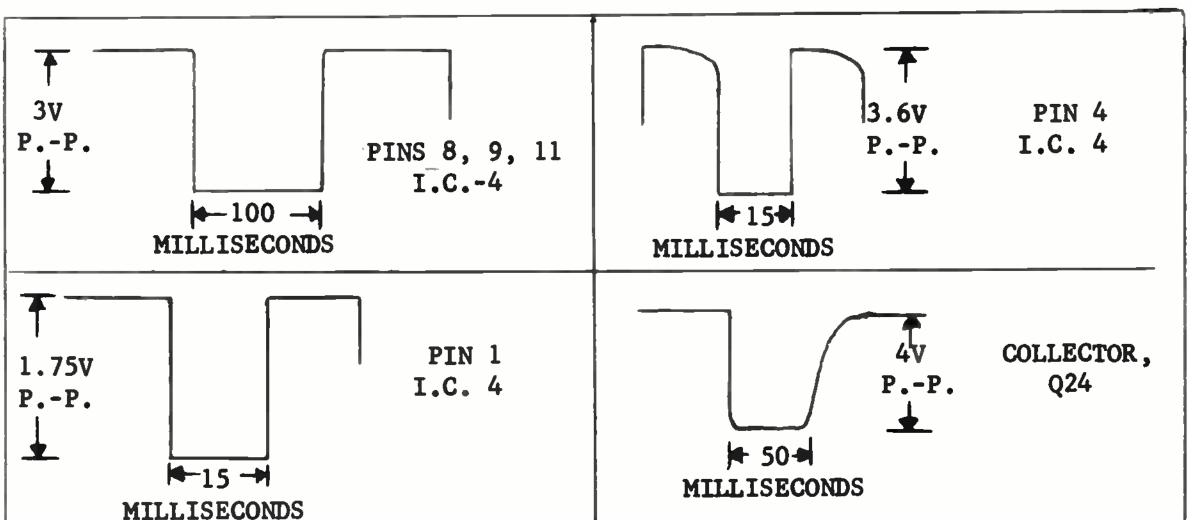
TROUBLE CHART
SQUELCH, SCANNING CIRCUITS

SYMPTOM	NOTES	PROBABLE CAUSE
SCAN STOPS WITH SQUELCH CONTROL FULLY COUNTER-CLOCKWISE, BUT RADIO REMAINS SQUELCHED		Q16, Q30 ASSOCIATED CIRCUITRY
SQUELCH WILL NOT OPEN WITH SQUELCH POT FULLY COUNTER-CLOCKWISE (SCANS CONTINUOUSLY)	IF VOLTAGE AT THE BASE OF Q14 IS ZERO, WITH SQUELCH CONTROL COUNTER-CLOCKWISE, PROBLEM IS IN SCHMIDT TRIGGER OR LOCKOUT-SKIPPER (SW1-8, INV. 13-12)	VR1, C67, Q14, C96 INV's 9-8, 5-6, 13-12, D19, D26, SW1-8
RADIO SQUELCHES, BUT WILL NOT SCAN.	CHECK FOR SQUARE WAVE AT PIN 4 OF MULTIVIBRATOR, (WHILE SQUELCHED) IF PRESENT, PROBLEM IN Q27, IC4, IC5. IF SQUARE-WAVE IS NOT PRESENT, SUSPECT INV'S 1-2, 3-4, 11-10, D23, C70, Q15	Q27, IC4, IC5, INVER-TERS 1-2, 3-4, 11-10, D18, D23, C70, Q15
UNSQUELCHES MOMENTARILY, WHEN SCANNING THROUGH SIGNAL, BUT WILL NOT "LOCK-ON".	IF D18 IS DEFECTIVE, (OPEN) SCAN WILL STOP APPROX' 2 SECONDS AFTER RADIO IS SQUELCHED. (BY ROTATING SQUELCH CONTROL FULL COUNTER-CLOCKWISE.)	D18, D23, Q15, D25 INVERTER 11-10
NO SCAN DELAY AFTER RADIO SQUELCHES		D18, C70, R66
PRIORITY SEARCH CONTINUES WITH PRIORITY SWITCH "OFF"	FAIRLY LOW CONTACT RESIS-TANCE IS REQUIRED OF THIS SWITCH, (LESS THAN TWO OHMS), TO STOP PRIORITY	SW9
NO PRIORITY SEARCH, SW9 ON, (RADIO LOCKED ON CHANNEL OTHER THAN ONE)		SW9, Q23, Q24, Q25, Q28, Q22, D21, D22 ASSOCIATED CIRCUITRY

SYMPTOM	NOTES	PROBABLE CAUSE
FAILS TO "LOCK-ON" CHANNEL ONE SIGNAL AFTER PRIORITY SEARCH (SCAN OTHERWISE NORMAL)		D21, D22, Q22, Q25 ASSOCIATED CIRCUITRY
FAILS TO SQUELCH AT MOMENT OF PRIORITY SEARCH. (BURST OF NOISE FROM SPEAKER.)		D32, C101, R108
SCAN RATE VARIES WITH TEMPERATURE	SUSPECT LEAKY DIODES (USUALLY, SCAN RATE INCREASES WITH WARM-UP)	D23, D24, D25
NO MANUAL SCAN ACTION (SW11 IN MANUAL POSITION) (AUTO-SCAN NORMAL)		SW10, C90, R99, SW11
ONE CHANNEL DEAD, LAMP FAILS TO LIGHT AND DIODE SWITCHING DOES NOT OPERATE	THE PILOT LAMP ASSOCIATED WITH THE CHANNEL MAY BE SHORTED OR DECODER OR LOCKOUT SWITCH DEFECTIVE	IC5, PL1-8, SW1-8
ONE CHANNEL IS OPERATIVE, EVEN WHEN ANOTHER IS LOCKED IN BY MANUAL SCAN.	CAPACITOR OR DIODE ASSOCIATED WITH THE CHANNEL IS SHORTED	D6-D13, C29-C38
A GROUP OF CHANNELS IS INOPERATIVE (FAIL TO SCAN)	CONSULT TRUTH TABLES TO DETERMINE WHICH IC IS AT FAULT	IC4, IC5

SYMPTOM	NOTES	PROBABLE CAUSE
EXCESSIVELY HIGH SCAN RATE	CHECK SUPPLY VOLTAGE, (5-5.5V) OF IC3, IF HIGH, SUSPECT R102 AND REGULATOR. BAD TIMING COMPONENTS WILL USUALLY CAUSE AN ASYMETRICAL SQUARE-WAVE AT PIN 4	C88, C89, R96, R98, D24
INTERMITTANT SCAN, FALSE LOCKING	OCCASIONALLY THE TRACE TO THIS CAP WILL BREAK	C91
RADIO WILL NOT SQUELCH WITH VR1 FULLY CLOCK-WISE	CHECK NOISE AT INPUT TO DETEC-TOR (SHOULD BE ONE VOLT OR GREATER WITH NO SIGNAL AND VR1 FULLY CLOCKWISE	VR-1, Q12, Q13, Q14, INV'S 9-8, 5-6

SCANNING CIRCUIT WAVEFORMS



WAVEFORMS 1-3 TAKEN WHILE RADIO IS SQUELCHED AND SCANNING.

WAVEFORM 4 TAKEN WHILE RADIO IS LOCKED ONTO CHANNEL OTHER THAN NUMBER ONE, AND CHANNEL ONE HAS NO SIGNAL (PRIORITY SWITCH ON).

SIGNAL INJECTION POINTS

INJECTION POINT		SIGNAL PICK-UP POINT	
BASE Q11	5uV AT 10.7MHz THROUGH .01uF CAP' MODULATED (1KHz, AT 5KHz DEVIATION)	TP-3	.2V P.-P. CLEAN SINE WAVE. FULL LIMITING SHOULD BE EVIDENT. (I.F. MAY OSCILLATE WITH THIS INJECTION METHOD.)
ANT. JACK	HIGH-LEVEL SIGNAL (5uV) (MODULATED 1KHz AT 5KHZ DEVIATION)	TP-3	.2V P.-P. CLEAN SINE WAVE. FULL LIMITING SHOULD BE EVIDENT.
	NO SIGNAL INPUT	TP-3	.25V P.-P. NOISE (TYPICAL)
INPUT' XTAL FILTER	350uV 10.7MHz (MODULATED 1KHz AT 5KHz DEVIATION)	TP-3	.2V P.-P. CLEAN SINE WAVE. SHOULD QUIET NOISE BY APPROX' 20 D.B.
NOTE: I.F. BECOMES EXTREMELY UNSTABLE WITH ANY EXTERNAL DEVICES CONNECTED. IF OSCILLATION IS FOUND TO BE A PROBLEM -- POSSIBLE CAUSE IS A DEFECTIVE CRYSTAL FILTER, UNSOLDERED BYPASS CAPS OR DAMAGED FOIL GROUND ON PC BOARD UNDER I.F. SHIELD. IT MAY BE NECESSARY TO USE .5-2 pfd CAPS FOR DEGENERATIVE FEED BACK IN IC1 AND IC2 (PINS 3 TO 6) IN EXTREME CASES.			

ALIGNMENT NOTES

CAUTION

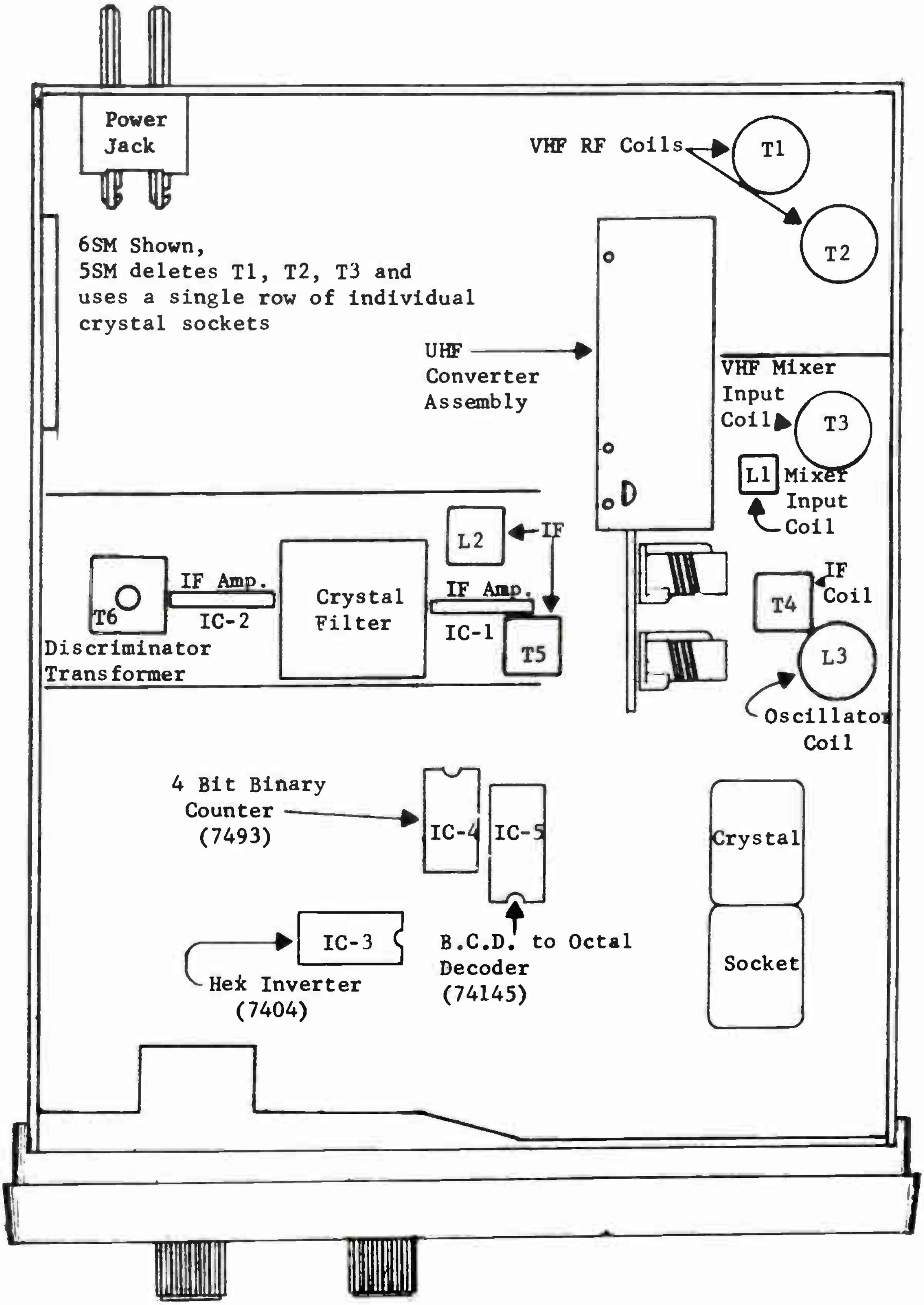
All Sentinel receivers are carefully prealigned at the factory. It is recommended that alignment not be attempted, unless a generator of the capabilities described below, is available. This is especially critical in the U.H.F. models.

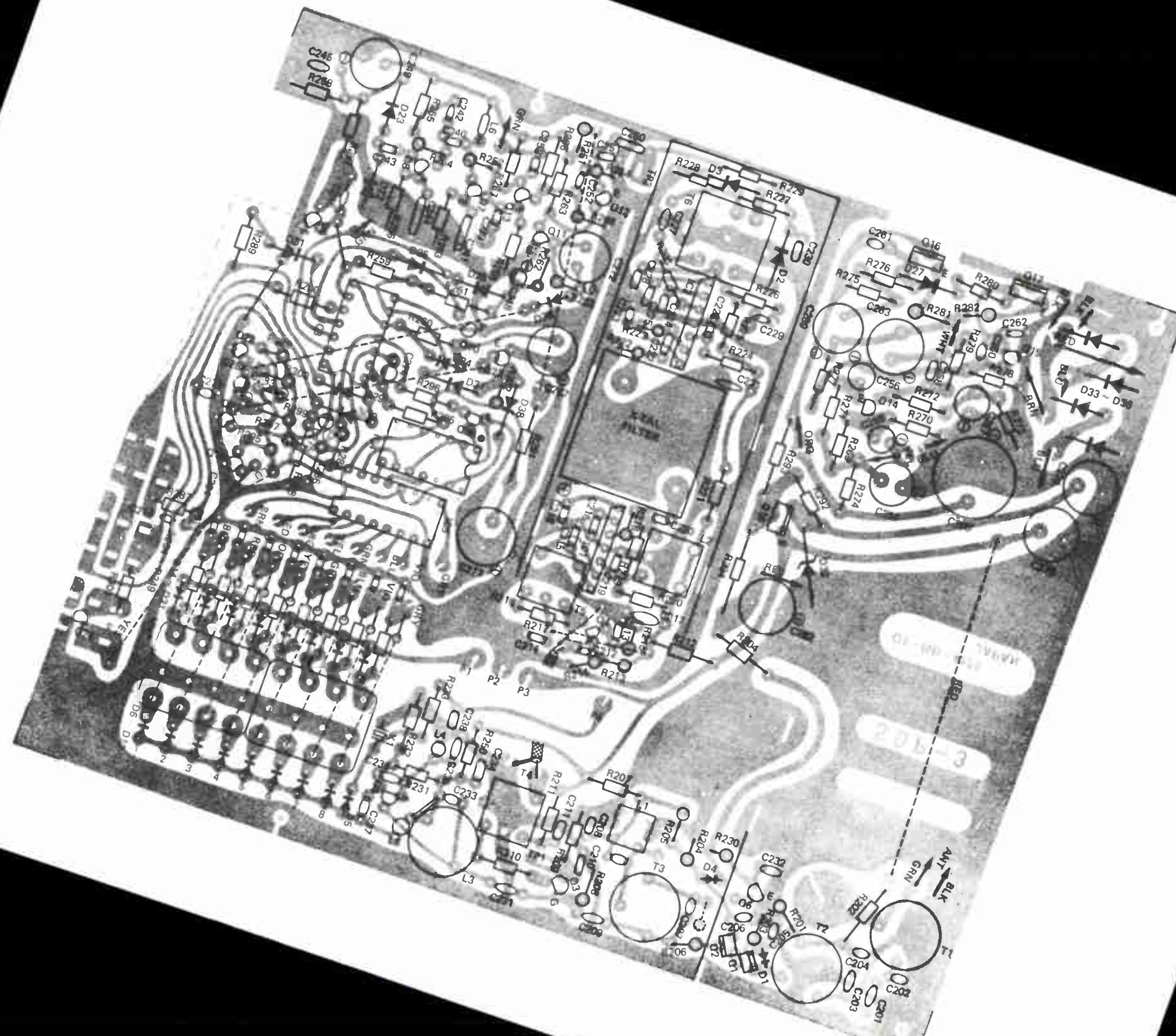
Due to the fact that the main source of selectivity in the Sentinel receivers is the fix-tuned crystal filter, alignment is quite simple and straightforward. The entire receiver alignment may be accomplished, by injection of a signal at the antenna jack, and peaking for maximum signal-to-noise ratio, using the ear as indicator.

Generator requirements are fairly severe for use in alignment. Controllable, calibrated, output at sub-microvolt levels is required. Frequency output must be "crystal" accurate. Calibrated F.M. deviation capability is required.

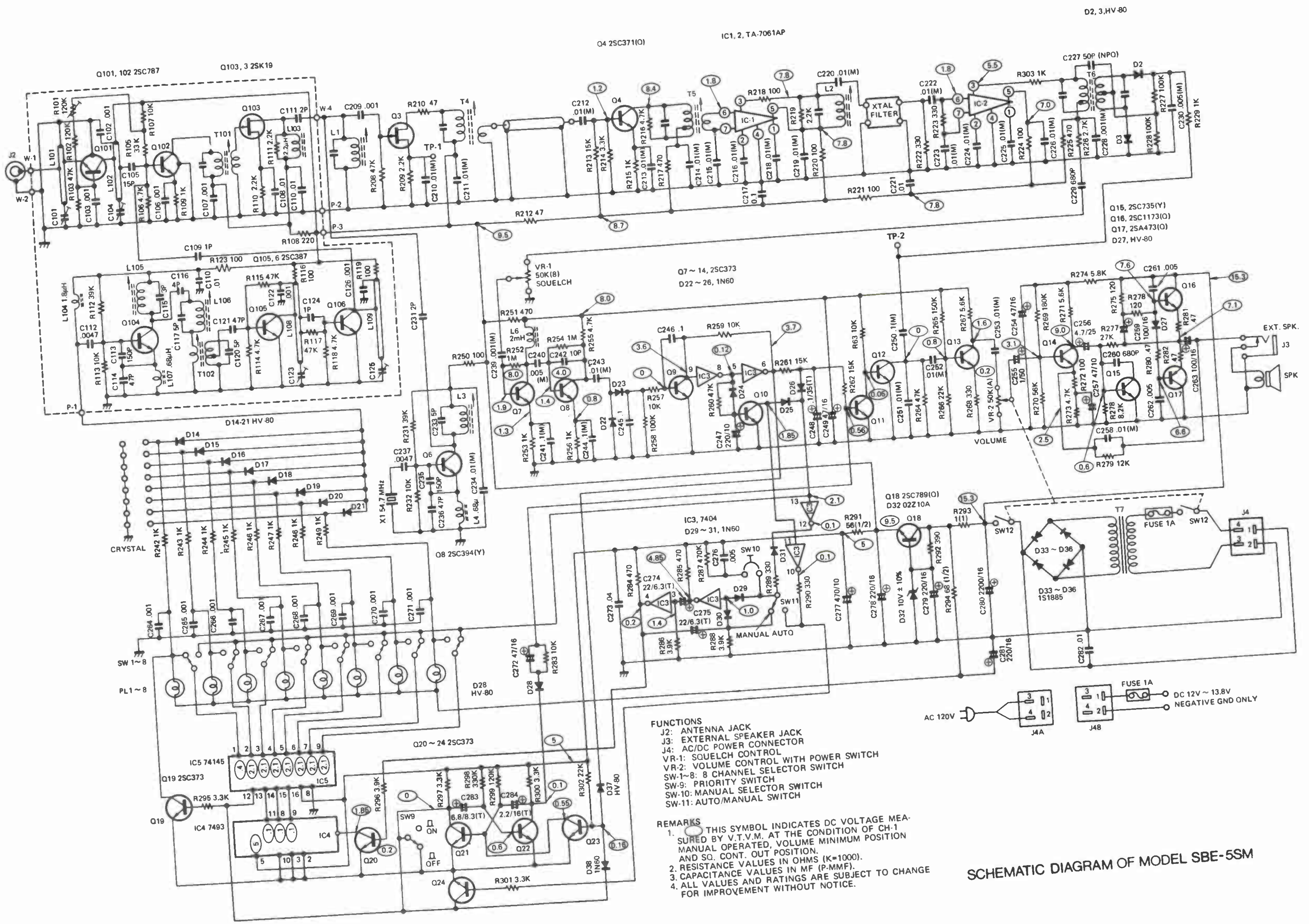
It must be remembered during alignment, that a number of frequencies, often several megahertz apart must be received, so "compromise" tuning of the front end is required, (stagger tuning of the antenna coils) for uniform operation on all channels.

ALIGNMENT CHART SBE-5SM & 6SM





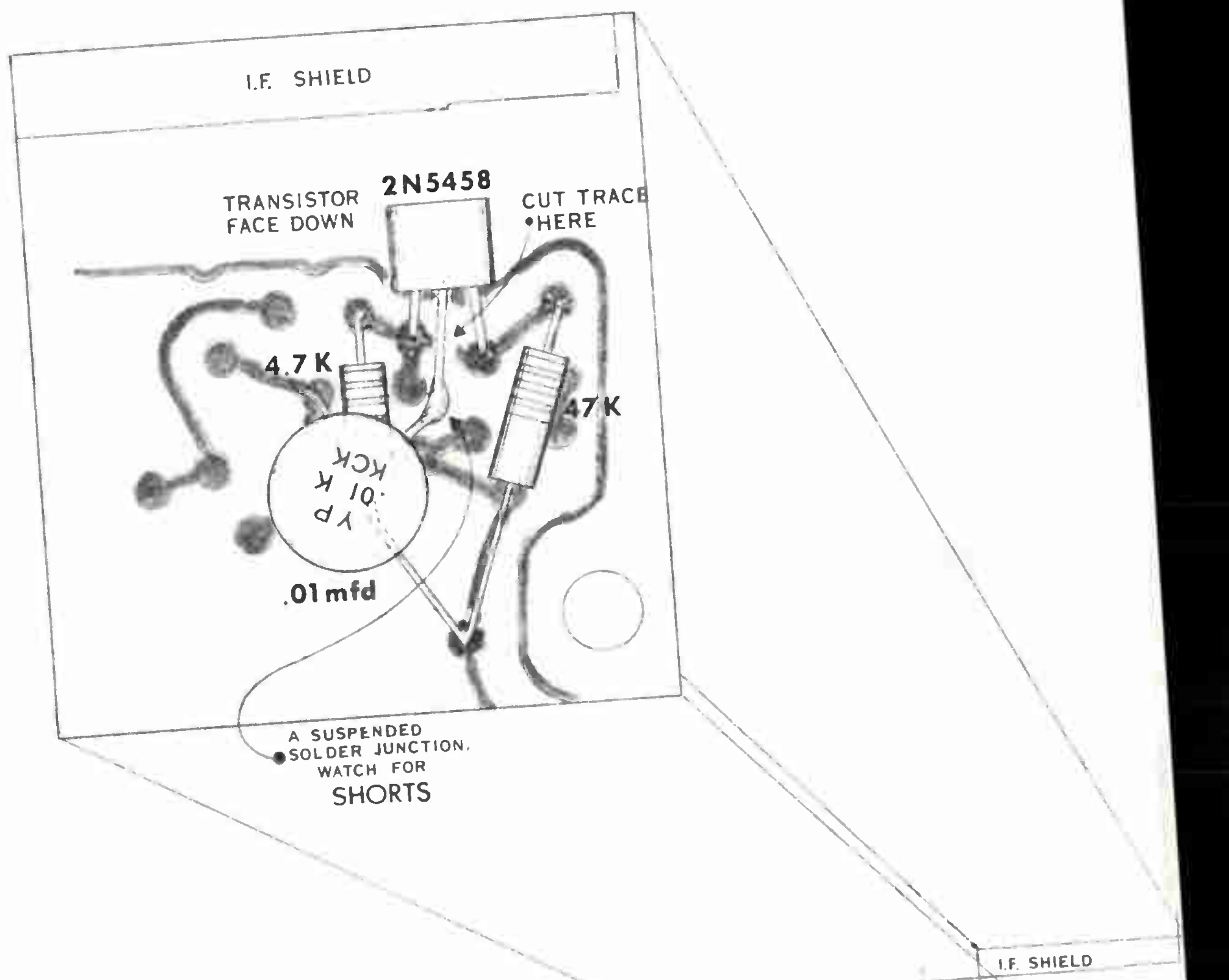
PCB
ASSEMBLY
SBE-5SM, 6SM

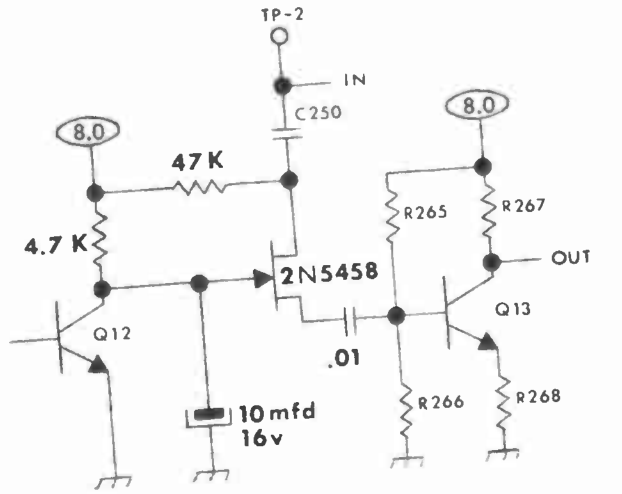


FUNCTIONS
J2: ANTENNA JACK
J3: EXTERNAL SPEAKER JACK
J4: AC/DC POWER CONNECTOR
VR-1: SQUELCH CONTROL
VR-2: VOLUME CONTROL WITH POWER SWITCH
SW-1~8: 8 CHANNEL SELECTOR SWITCH
SW-9: PRIORITY SWITCH
SW-10: MANUAL SELECTOR SWITCH
SW-11: AUTO/MANUAL SWITCH

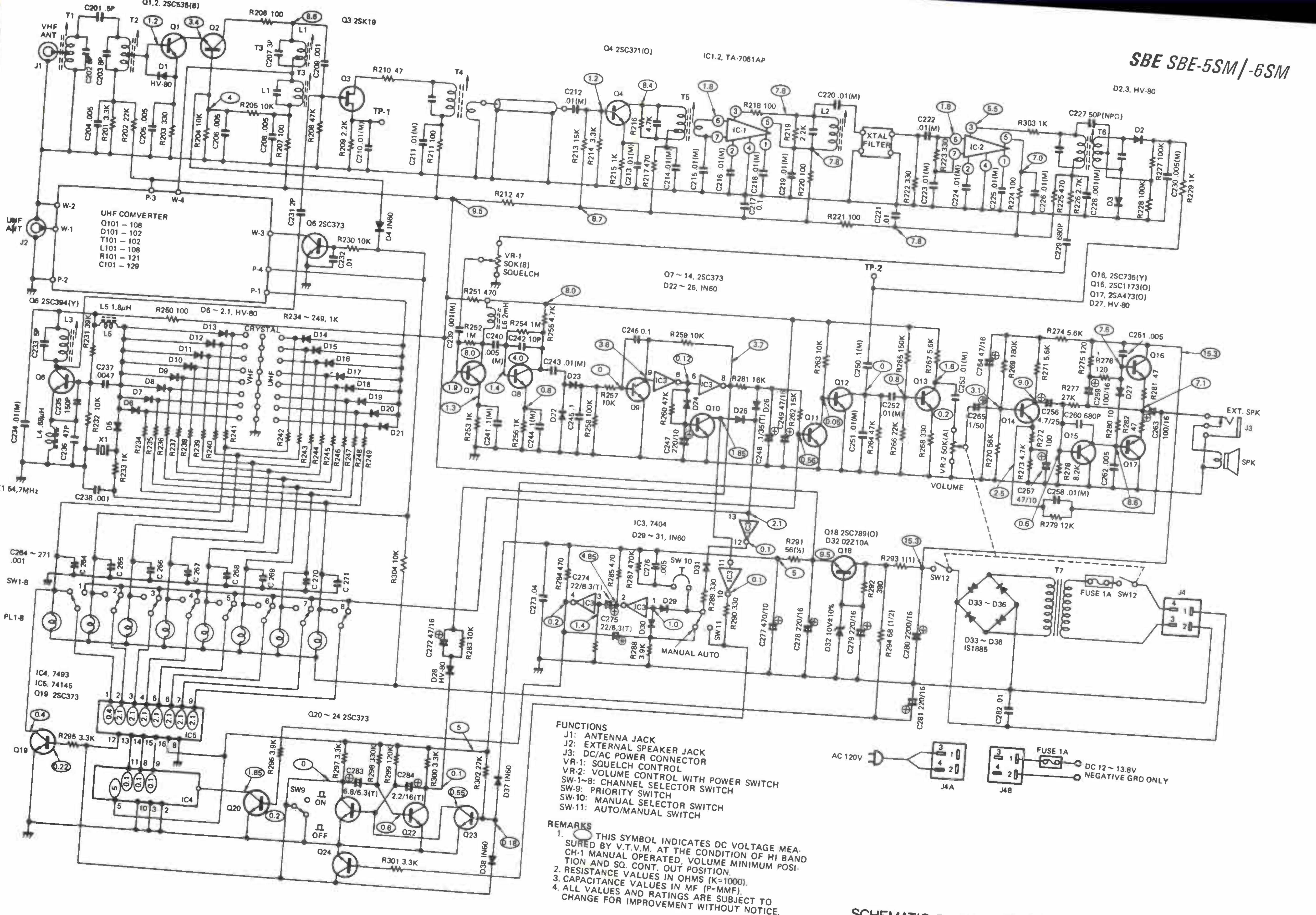
REMARKS
1. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQ. CONT. OUT POSITION.
2. RESISTANCE VALUES IN OHMS (K=1000).
3. CAPACITANCE VALUES IN MF (P-MMF).
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

SCHEMATIC DIAGRAM OF MODEL SBE-5SM





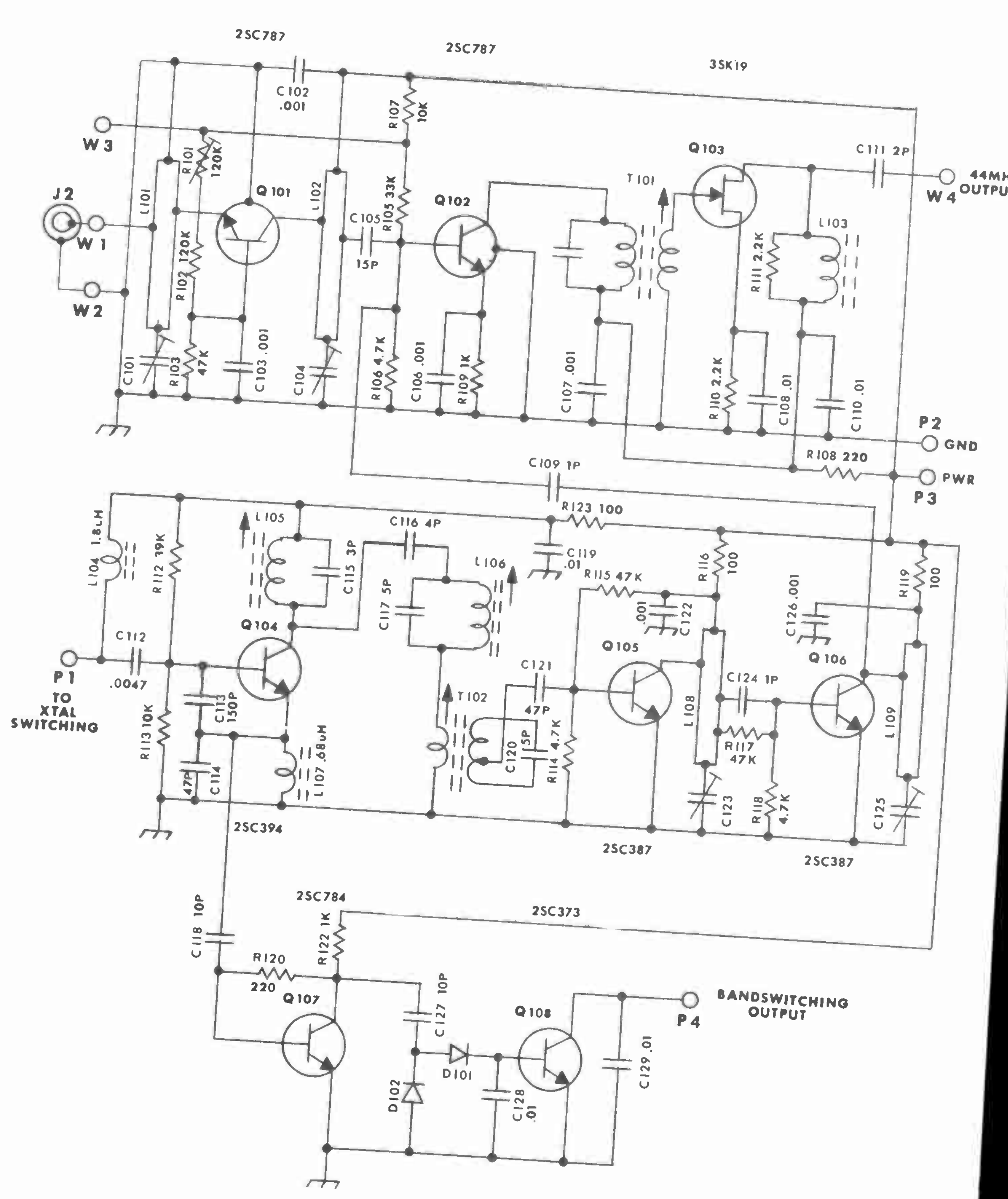
SBE SBE-5SM/-6SM



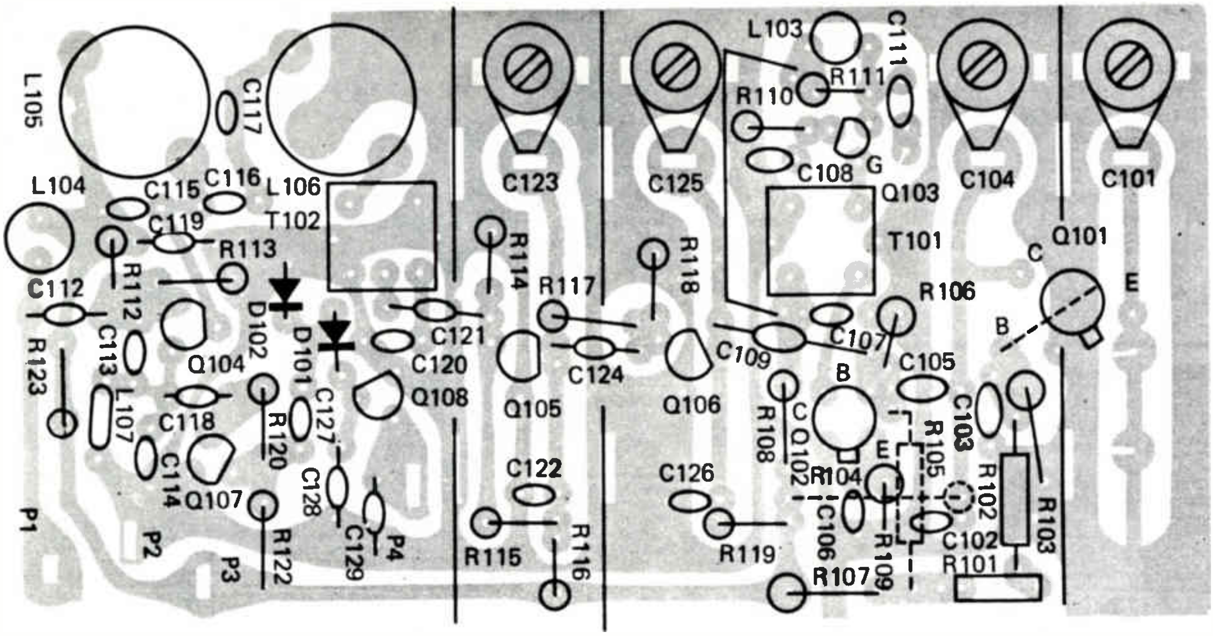
FUNCTIONS
J1: ANTENNA JACK
J2: EXTERNAL SPEAKER JACK
J3: DC/AC POWER CONNECTOR
VR-1: SQUELCH CONTROL
VR-2: VOLUME CONTROL WITH POWER SWITCH
SW-1~8: CHANNEL SELECTOR SWITCH
SW-9: PRIORITY SWITCH
SW-10: MANUAL SELECTOR SWITCH
SW-11: AUTO/MANUAL SWITCH

REMARKS
1. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF HI BAND CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQ. CONT. OUT POSITION.
2. RESISTANCE VALUES IN OHMS (K=1000).
3. CAPACITANCE VALUES IN MF (P=MMF).
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

SCHEMATIC DIAGRAM OF MODEL SBE-6SM



UHF Converter SBE-6SM



P.C.B. ASSEMBLY
UHF CONVERTER
SBE-5SM & 6SM

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D1	HV-80	8000-00028-045
D2	HV-80	8000-00028-045
D3	HV-80	8000-00028-045
D4 (1)	1N60	8000-00004-063
D5 (1)	HV-80	8000-00028-045
D6 (1)	HV-80	8000-00028-045
D7 (1)	HV-80	8000-00028-045
D8 (1)	HV-80	8000-00028-045
D9 (1)	HV-80	8000-00028-045
D10 (1)	HV-80	8000-00028-045
D11 (1)	HV-80	8000-00028-045
D12 (1)	HV-80	8000-00028-045
D13	HV-80	8000-00028-045
D14	HV-80	8000-00028-045
D15	HV-80	8000-00028-045
D16	HV-80	8000-00028-045
D17	HV-80	8000-00028-045
D18	HV-80	8000-00028-045
D19	HV-80	8000-00028-045
D20	HV-80	8000-00028-045
D21	HV-80	8000-00028-045
D22	1N60	8000-00004-063
D23	1N60	8000-00004-063
D24	1N60	8000-00004-063
D25	1N60	8000-00004-063
D26	1N60	8000-00004-063
D27	HV-80	8000-00028-045
D28	HV-80	8000-00028-045
D29	1N60	8000-00004-063
D30	1N60	8000-00004-063
D31	1N60	8000-00004-063
D32	02Z10A	8000-00028-047
D33	1S1885	8000-00028-048
D34	1S1885	8000-00028-048
D35	1S1885	8000-00028-048
D36	1S1885	8000-00028-048
D37	1N60	8000-00004-063
D38	1N60	8000-00004-063
D101	1N60	8000-00004-063
D102	1N60	8000-00004-063
IC1	TA-7061AP	8000-00016-127
IC2	TA-7061AP	8000-00016-127
IC3	SN7404A	8000-00028-042
IC4	SN7493A	8000-00028-043
Q1	2SC535(B)	8000-00009-177
Q2	2SC535(B)	8000-00009-177
Q3	2SK19(Y)	8000-00009-178
Q4	2SC371(O)	8000-00009-174
Q5	2SC373	8000-00009-089
Q6	2SC394(Y)	8000-00028-034
Q7	2SC373	8000-00009-089
Q8	2SC373	8000-00009-089
Q9	2SC373	8000-00009-089
Q10	2SC373	8000-00009-089
Q11	2SC373	8000-00009-089
Q12	2SC373	8000-00009-089
Q13	2SC373	8000-00009-089
Q14	2SC373	8000-00009-089
Q15	2SC735(Y)	8000-00009-038
Q16	2SC1173(O)	8000-00028-039
Q17	2SA473(O)	8000-00028-040
Q18	2SC789(O)	8000-00028-041
Q19	2SC373	8000-00009-089
Q20	2SC373	8000-00009-089
Q21	2SC373	8000-00009-089
Q22	2SC373	8000-00009-089
Q23	2SC373	8000-00009-089
Q24	2SC373	8000-00009-089
Q101	2SC787	8000-00028-150
Q102	2SC787	8000-00028-150
Q103	2SK19(Y)	8000-00009-178
Q104	2SC394(Y)	8000-00028-037
Q105	2SC387(A)	8000-00028-151
Q106	2SC387(A)	8000-00028-151
Q107 (1)	2SC784(O)	8000-00004-298
Q108 (2)	2SC373	8000-00009-089

(1) Used in Model SBE-6SM only.
(2) Used in Model SBE-5SM only.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C101	Variable	8000-00028-152
C104	Variable	8000-00028-152
C123	Variable	8000-00028-156
C125	Variable	8000-00028-152
C247	220uF 10V	8000-00028-165
C248	.1uF 35V	8000-00028-034
C249	47uF 16V	8000-00028-023
C254	47uF 16V	8000-00028-023
C255	1uF 50V	8000-00028-166
C256	4.7uF 25V	8000-00028-025
C257	47uF 10V	8000-00028-023
C259	100uF 16V	8000-00028-027
C263	100uF 16V	8000-00028-027
C272	47uF 16V	8000-00028-023
C274	4.7uF 6.3V	8000-00028-168
C275	4.7uF 6.3V	8000-00028-168
C277	470uF 10V	8000-00028-031
C278	220uF 16V	8000-00028-032
C279	220uF 16V	8000-00028-032
C280	2200uF 16V	8000-00028-033
C281	220uF 16V	8000-00028-032
C283	6.8uF 6.3V	8000-00028-028
C284	2.2uF 16V	8000-00028-029

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR-1	50K Variable	8000-00028-060
VR-2	50K Variable	8000-00028-061

COILS/TRANSFORMERS

ITEM	PART NO.
L1	8000-00028-170
L2	8000-00028-055
L3	8000-00028-053
L4	8000-00028-171
L5	8000-00028-172
L6	8000-00028-173
L103	8000-00028-143
L104	8000-00028-144
L105	8000-00028-145
L106	8000-00028-146
L107	8000-00028-147
T1	8000-00028-049
T2	8000-00028-049
T3	8000-00028-049
T4	8000-00028-055
T5	8000-00028-055
T6	8000-00028-057
T7	8000-00028-058
T101	8000-00028-148
T102	8000-00028-149

MISCELLANEOUS

ITEM	NAME	PART NO.
	UHF Antenna	8000-00028-124
	VHF Antenna	8000-00028-090
	Fuse, 1A	8000-00028-081
	PC Board	8000-00028-128
FIL	Crystal Filter	8000-00028-059
SW1	Switch, Push	8000-00028-065
SW2	Switch, Push	8000-00028-065
SW3	Switch, Push	8000-00028-065
SW4	Switch, Push	8000-00028-065
SW5	Switch, Push	8000-00028-065
SW6	Switch, Push	8000-00028-065
SW7	Switch, Push	8000-00028-065
SW8	Switch, Push	8000-00028-065
SW9	Switch, Push	8000-00028-065
SW10	Switch, Push	8000-00028-065
SW11	Switch, Push	8000-00028-065

CABINET PARTS

NAME	PART NO.
Bezel (Alone)	8000-00028-070
Cabinet (1)	8000-00028-085
Cabinet (2)	8000-00028-186
Bezel (Assy.) (1)	8000-00028-127
Bezel (Assy.) (2)	8000-00028-130
Knob, Vol. or Squelch	8000-00028-082
Knob, Push Button	8000-00028-072

(1) Model SBE-6SM.
(2) Model SBE-5SM.

Pages 115-127 Courtesy of SONAR RADIO CORP.

SECTION 5 - MAINTENANCE

5 - 1. TEST EQUIPMENT

The following equipment is necessary to perform the alignment:

(1) VTVM 11 Meg. input

(2) AM or FM GENERATOR 10 MHz to either 50 or 175 MHz, depending on model

(3) PROPER ALIGNMENT TOOLS

(4) AUDIO OUTPUT METER

5 - 2. I. F. ALIGNMENT

(1) Turn set "ON." Allow 10 minutes for warm-up and stabilization.

(2) Set generator to 10.7 MHz, modulation "OFF" and connect it through a .01 mfd capacitor to Pin 2 of V2-A (V202-A).

(3) Connect the VTVM through a 1 Meg. resistor to the junction of R19, R32 and C28 at V5 (Test Point 1*). Set the VTVM to the -1.5 VDC range.

(4) Increase or decrease the generator output until a reading of at least -0.2 VDC but not greater than -0.5 VDC occurs at a metering point.

(5) Starting with T3 and working towards T1, slowly adjust both primary and secondary of each can for maximum indication at the VTVM. ALWAYS keep readjusting the generator output to keep the voltage metered within the limits set in Step 4.

(6) Repeat adjustments in (5).

5 - 3. OSCILLATOR - R. F. ALIGNMENT

BAND	OSC. DIAL SET		R. F. DIAL SET	
	LOW END	HIGH END	LOW END	HIGH END
25 - 50 MHz	28 MHz	47 MHz	28 MHz	
150 - 175 MHz	153 MHz	172 MHz	155 MHz	170 MHz

(1) Remove the generator from Pin 2 of V2-A (V202-A) and connect to the antenna terminals. Modulation "OFF"

(2) See above chart for proper oscillator alignment points.

(3) Set generator and the receiver dial to the low end of the oscillator set point and adjust L3 (L103) for maximum indication on the VTVM. NOTE: The VTVM reading should not exceed -0.6 VDC at TP1.

* Shown as TP1

(4) Set generator and dial to high end set point and adjust C14 (C108) for maximum indication.

(5) Repeat the procedure of Steps (3) and (4) until the dial calibration requires no further adjustment.

(6) The procedure for the R. F. section is the same, but use L1 (L101) and L2 (L102) for the low end. The FR-102 R. F. stage is aligned at the high end by adjusting C102 and C111 at 170 MHz. There is no high end trimmer capacitor adjustment for the FR-101 R. F. stage.

(7) Set the dial to some frequency in the center of the band and adjust the generator to the frequency of the receiver. Increase the output of the generator until a voltage of -0.5 VDC is monitored. Turn the modulation "ON" and set it to approximately ±5 KHz deviation. Adjust L4 for maximum undistorted audio.

(8) If a modulated FM generator is not available, tune in a strong station and adjust L4 for maximum undistorted audio.

5 - 4. CRYSTAL OSCILLATOR ALIGNMENT (in Models FR-101(102)X or DX only)

The crystal oscillator is completely pre-aligned and tested when shipped from the factory. Should realignment be necessary, the procedures listed below are to be followed:

A. GENERATOR and/or STATION PROCEDURE

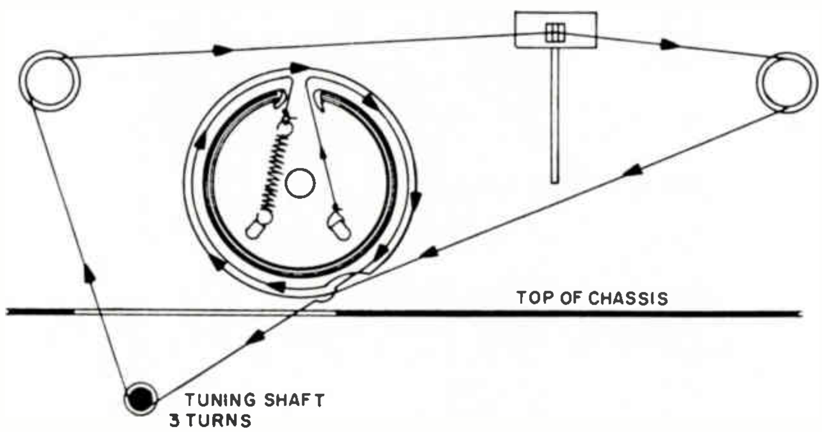
Set the generator to the frequency of the crystal oscillator and tune the unit to the approximate frequency as previously discussed under Section 4-4. Make sure the Frequency switch is in the "Fixed" position. Adjust the output of the generator to maximum and tune L301 (25 - 50 MHz) or L401 and C408 (150 - 175 MHz) for maximum audio response while gradually reducing the output of the generator. If a generator is not available, a station that is broadcasting on the fixed channel may be used for tuning the appropriate coils and capacitor.

NOTE: IF UNIT IS WAY OUT OF ALIGNMENT OR SIGNAL STRENGTH IS INSUFFICIENT TO GIVE PROPER INDICATION, VTVM PROCEDURE MUST BE FOLLOWED.

B. VTVM PROCEDURE

Make sure that the Frequency switch is in the "Fixed" position and connect a VTVM (150 VDC range) to TP301 or TP401. Adjust the coil L301 or L401 until the voltage rises sharply and then drops. When that point is reached, slowly reverse the direction of adjustment until there is a sharp increase in voltage. Procedure "A" can then be used for the final alignment, if necessary.

NOTE: Two peaks may occur. The innermost peak will be another overtone frequency. The correct peak is the uppermost peak when the slug is turned counter-clockwise.



REAR VIEW

SEMICONDUCTORS/TUBES

ITEM	TYPE NO.	PART NO.
D1 (1) (2)	CER-71	19-040-002
D2 (2)	CER-71	19-080-001
D3 (2)	CER-71	19-040-002
D202 (1)	CER-71	19-040-002
D203 (1)	CER-71	19-040-002
Q1 (2)	MSP1893	19-020-030
Q2 (2)	MSP1893	19-020-030
V1 (1)	6DC6	19-010-060
V2 (1)	6KE8	19-010-054
V3 (1) (2)	12AU6	19-010-009
V4 (1) (2)	12AU6	19-010-009
V5 (1) (2)	6DT6	19-010-055
V6 (1) (2)	12AX7	19-010-006
V7 (1) (2)	6EB8	19-010-031
V101 (2)	6FV6	19-010-061
V102 (2) (3)	6KE8	19-010-054
V301 (1)	13CW4	19-010-047
V401 (2)	13CW4	
(Crystal) (4)		40-050-001

(1) Model FR-101.
(2) Model FR-102.
(3) May be V202 in some versions.
(4) Specify frequency.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C46	30uF 300V	06-950-050
C47	30uF 300V	06-950-050
C48	500uF 15V	06-950-050
C101	Variable	08-360-018
C102	.9-12pF Trimmer	09-410-027
C108	.9-12pF Trimmer	09-410-027
C111	.9-12pF Trimmer	09-410-027
C246	30uF 300V	06-950-050
C247	30uF 300V	06-950-050

COILS/TRANSFORMERS

ITEM	PART NO.
L1	22-030-015
L2	22-070-015
L3	22-040-022
L4	22-130-003
L101	22-030-017
L102	22-070-017
L103	22-040-025
L301	22-050-001
RFC1	22-060-023
RFC2	22-060-028
RFC3	22-060-022
RFC4	22-060-022
RFC5	22-060-022
RFC6	22-060-023
RFC7	22-060-023
RFC8	22-060-023
RFC9	22-060-023
RFC10	22-060-023
RFC101	22-060-023
RFC102	22-060-029
RFC103	22-060-022
RFC104	22-060-022
T1	22-010-029
T2	22-010-029
T3	22-010-029
T4	14-030-006
T5	14-010-038

MISCELLANEOUS

ITEM	NAME	PART NO.
	Speaker	36-044-014
F1	Fuse, 7/10A	42-010-018
F2	Fuse, 7.5A	42-010-014
F101	Fuse, 7/10A	42-010-018
S1	Switch	10-020-008
S3	Switch	10-020-008

CABINET PARTS

NAME	PART NO.
Front Panel	11-020-068
Top Cover	28-020-022
Bottom Cover	28-020-006
Mounting Knob	34-060-006

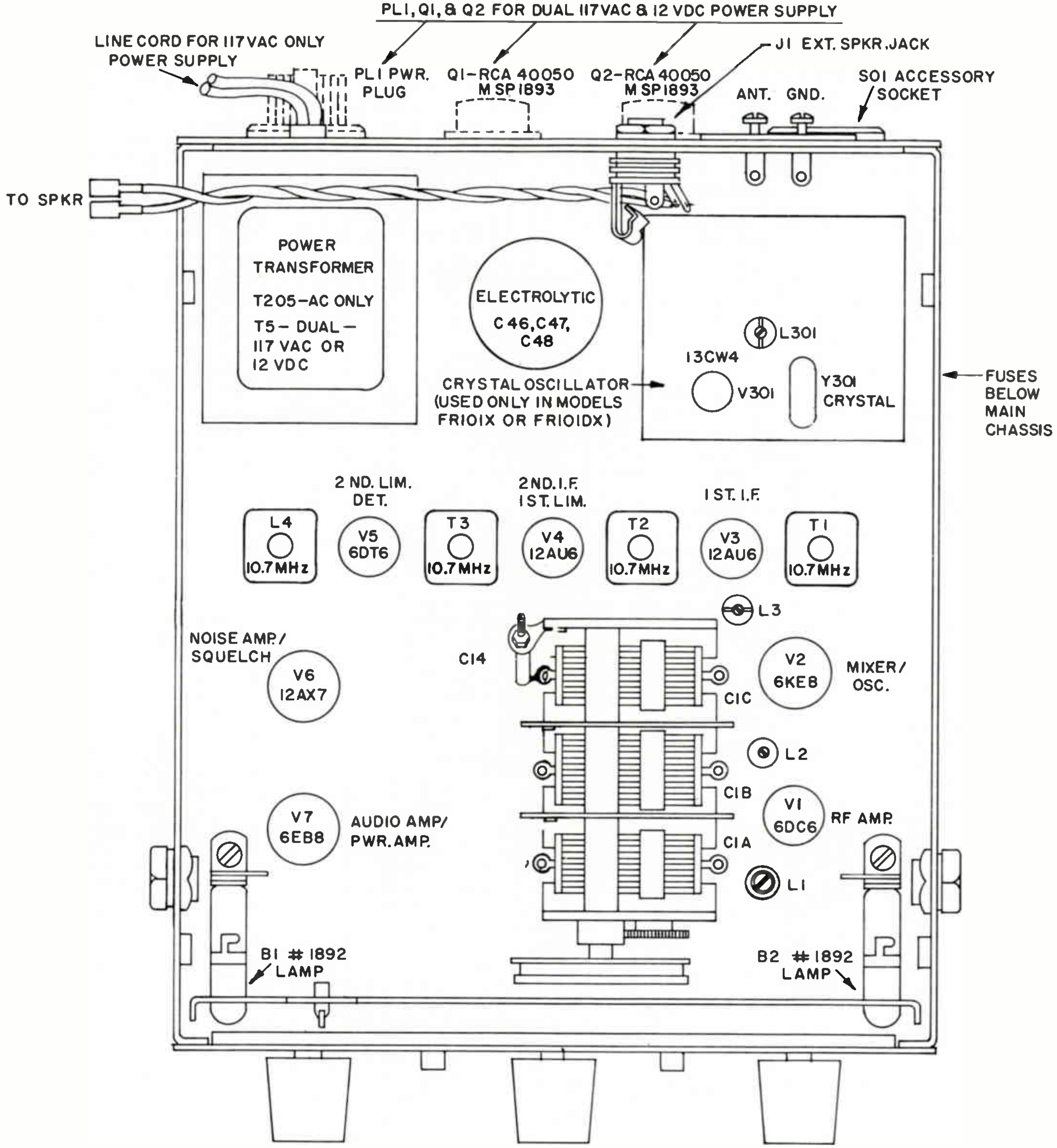


FIG. 3 MODEL FR-101 PARTS IDENTIFICATION

TOP VIEW

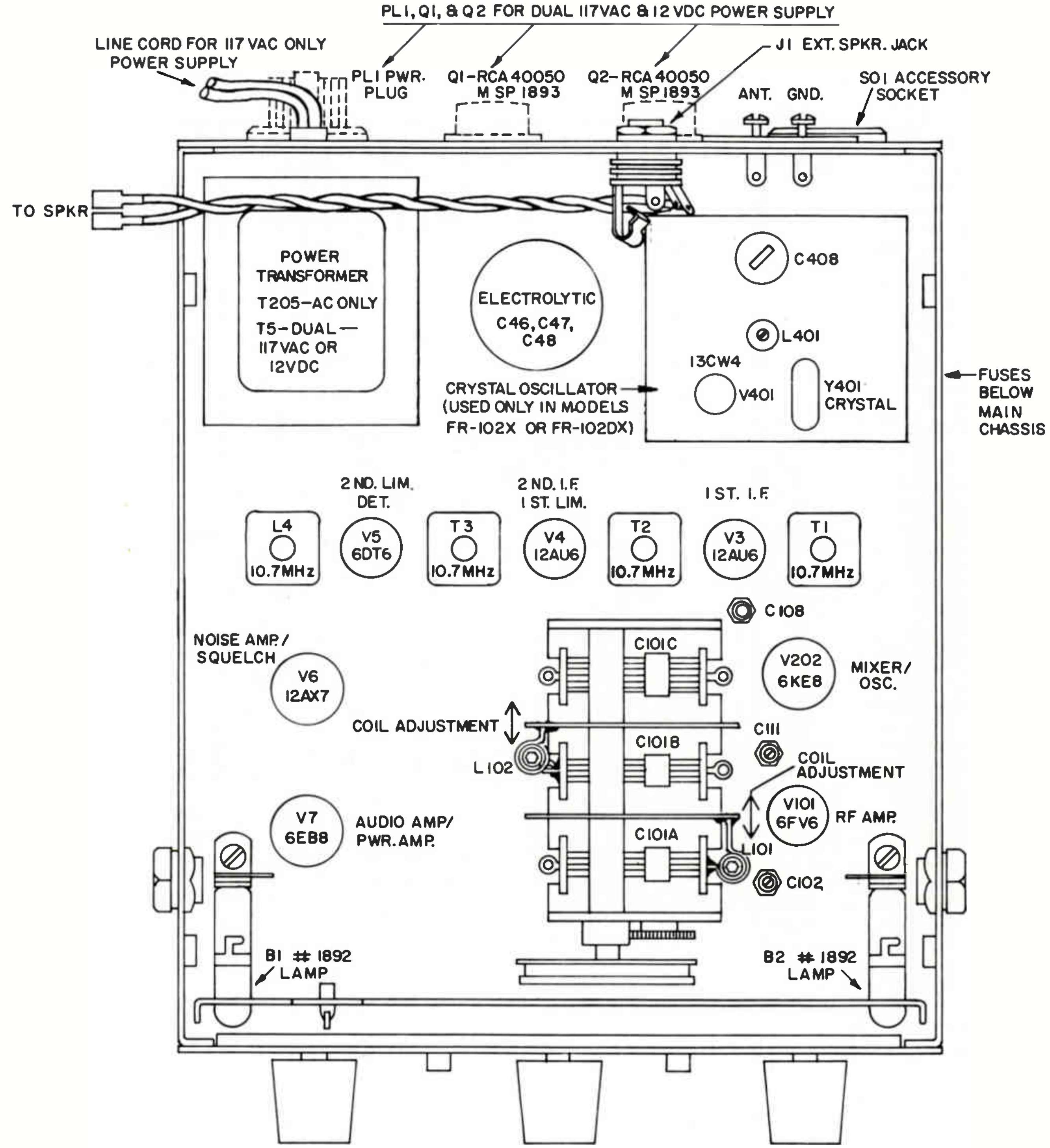
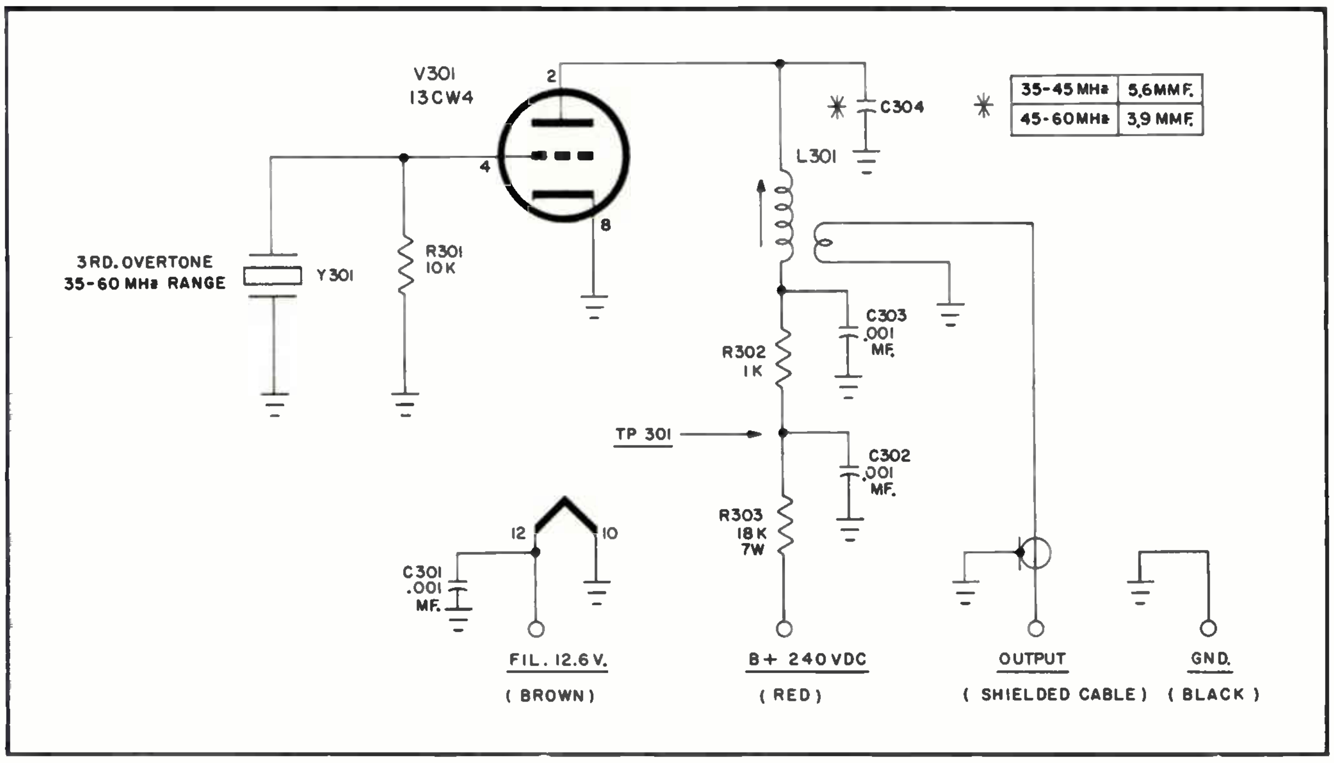


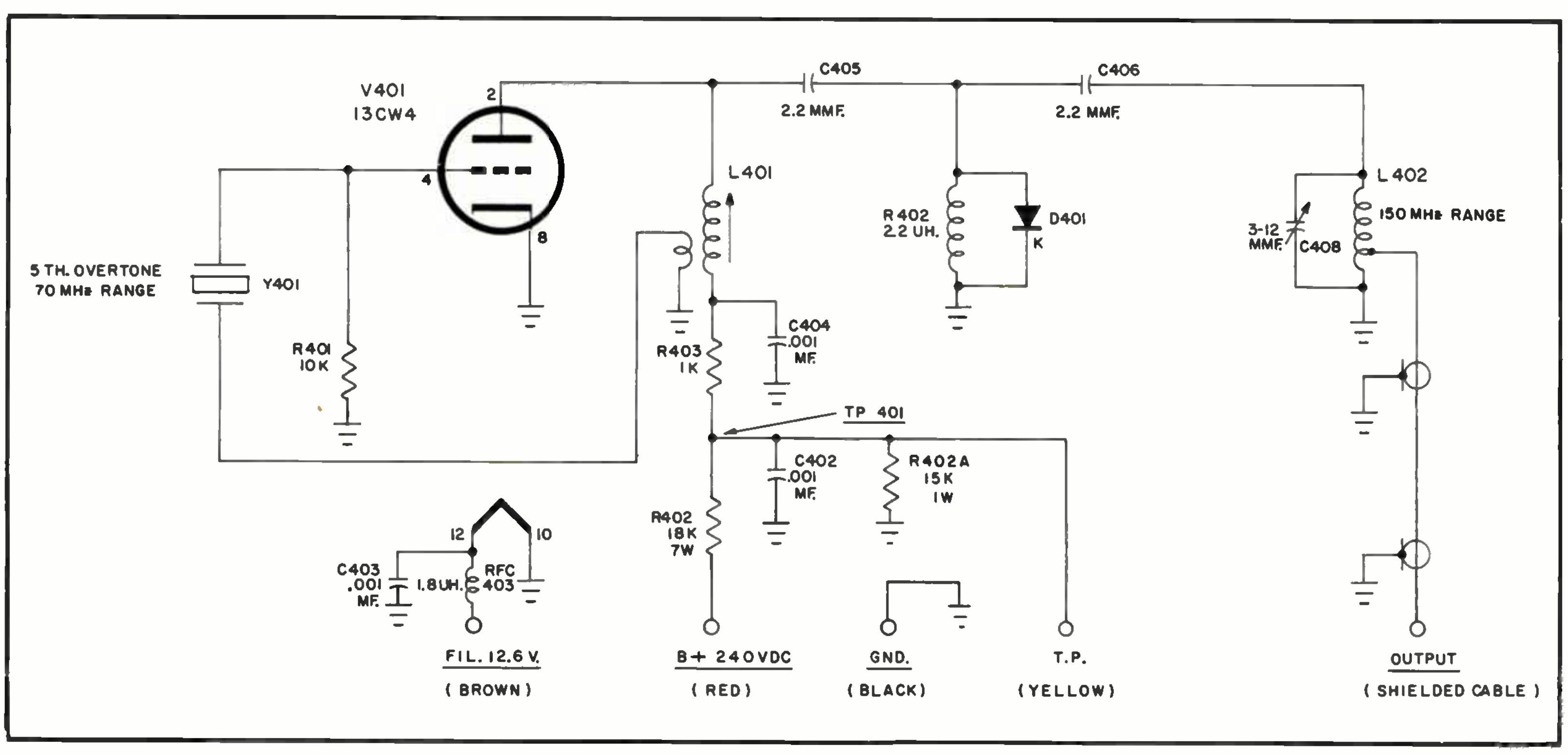
FIG. 4 MODEL FR-102 PARTS IDENTIFICATION

TOP VIEW

25-50 MHz CRYSTAL OSCILLATOR



150-175 MHz CRYSTAL OSCILLATOR



MODELS	FR-101 FR-101X FR-101D FR-101DX	25 - 50 MHz FREQUENCY RANGE
MODELS	FR-102 FR-102X FR-102D FR-102DX	150 - 175 MHz FREQUENCY RANGE

MODELS FR-101, FR-102 VOLTAGE CHART

NO.	TUBE	MODEL	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	6DC6	FR-101	0	+2.8	FIL	0	+190	+140	0		
V2	6KE8		+125	−1.3	+60	0	FIL	+215	+1.0	0	−5.0
V101	6FV6	FR-102	−1.7	0	FIL	0	+235	+78	0		
V202	6KE8		+75	−1.1	+73	0	FIL	+245	+1.3	0	−3.0
V3	12AU6	FR-101 OR FR-102	0	0	FIL	0	+210	+140	+1.4		
V4	12AU6		−0.4	0	FIL	0	+60	+45	0		
V5	6DT6		0	+1.6	FIL	0	+125	+95	−2.0 ◢		
V6	12AX7		+68	0	+0.55	FIL	0	+46	+0.6	+11.5	FIL
V7	6EB8		+50	+25	+120	FIL	FIL	+2.3	0	+140	+240

NOTES

1. INPUT LINE VOLTAGES EITHER 120 VAC OR 12.6 VDC DEPENDING ON MODEL.
2. SQUELCH CONTROL AT FULL CCW ROTATION.
3. RCVR FREQ. SLIDE SWITCH SET TO TUNABLE POSITION.
4. ALL VOLTAGE MEASUREMENTS MADE WITH A VTVM (11 MEGOHM INPUT)
5. ALL VOLTAGE MEASUREMENTS MADE FROM SOCKET PIN TO GROUND (CHASSIS)
6. ALL VOLTAGES D.C. UNLESS OTHERWISE INDICATED.
7. VOLTAGES ARE FOR GUIDANCE. VALUES MAY VARY ±10% FROM THOSE SHOWN DUE TO: A) VARIATION OF LINE VOLTAGE, B) DIFFERANCES BETWEEN INSTRUMENTS.
8. ◢ MEASURED AT LUG 2 − L4

MODELS FR-101, FR-102 RESISTANCE CHART

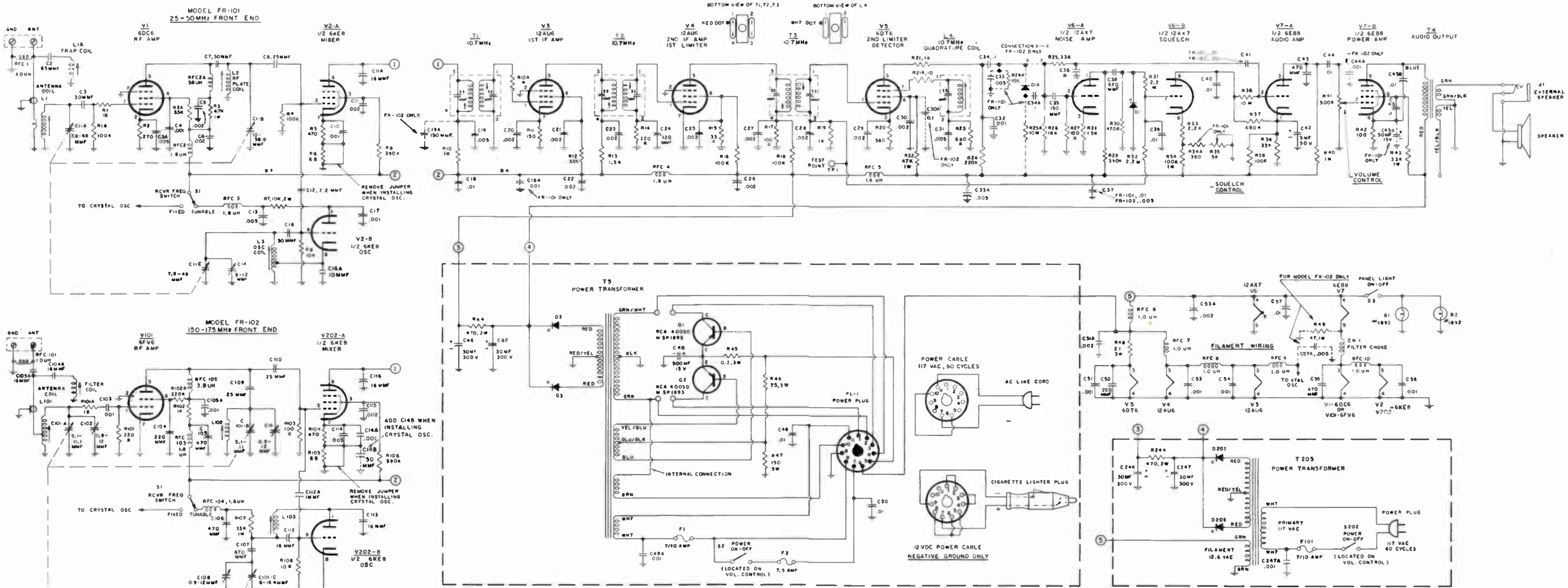
NO.	TUBE	MODEL	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	6DC6	FR-101	100 K	270	FIL	0	35 K *	70 K *	0		
V2	6KE8		40 K *	100 K	500 K *	0	FIL	30 K *	470	0	10 K
V101	6FV6	FR-102	220 K	0	FIL	0	70 K *	300 K *	0		
V202	6KE8		70 K *	100 K	500 K *	0	FIL	30 K *	470	0	10 K
V3	12AU6	FR-101 OR FR-102	0	0	FIL	0	37 K *	70 K *	150		
V4	12AU6		220 K	0	FIL	0	60 K *	26 K *	0		
V5	6DT6		1 K	560	FIL	0	300 K *	80 K *	680 K		
V6	12AX7		400 K *	100 K	1.5 K	FIL	0	680 K *	1.4 M	7 K *	FIL
V7	6EB8		26 K *	10 M *	1 M *	FIL	FIL	390	0	70 K *	30 K *

LEGEND

* ALLOW METER READING TO STABILIZE DUE TO ELECTROLYTIC CHARGING IN CIRCUIT.

NOTES

1. POWER SWITCH (VOL. CONT.) "OFF"
2. SQUELCH CONTROL AT FULL CCW ROTATION.
3. RCVR FREQ. SLIDE SWITCH SET TO TUNABLE POSITION.
4. ALL RESISTANCE MEASUREMENTS MADE WITH A VTVM.
5. ALL RESISTANCE MEASUREMENTS MADE FROM SOCKET PIN TO GROUND (CHASSIS)
6. ALL RESISTANCE VALUES ARE IN OHMS. K = 1000, M = 1,000,000
7. RESISTANCE MAY VARY ± 10%.



DUAL POWER SUPPLY
117 VAC OR 12 VDC

A.C. POWER SUPPLY
117 VAC, 60 CYCLES

CIRCUIT VARIATIONS

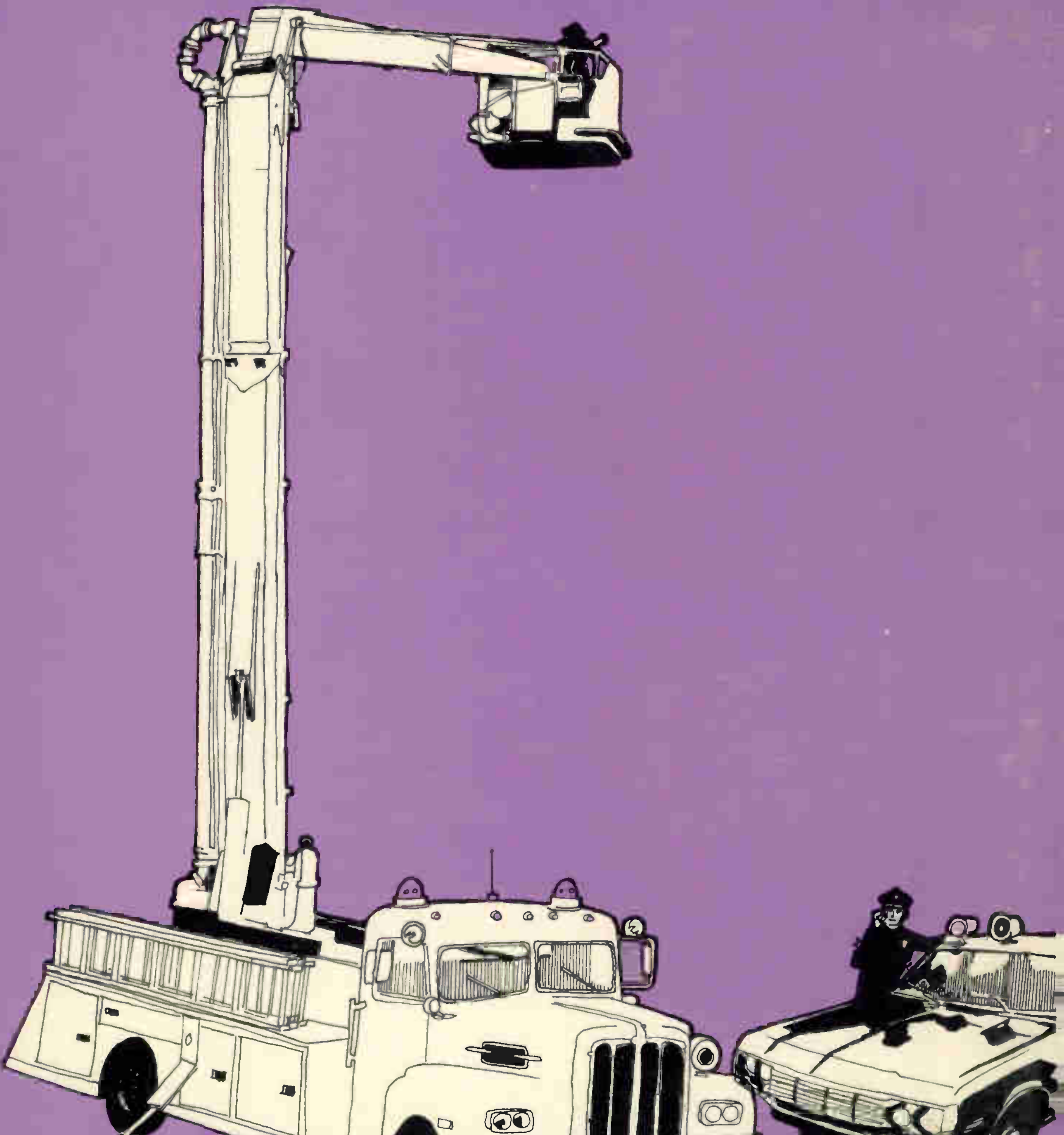
DIAG NO	FR-101	FR-102
R10A	15	10
C36	.005	.002

NOTES

1. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS AND ALL CAPACITANCE VALUES ARE IN MICROFARADS.
2. THIS DRAWING IS SUBJECT TO CHANGE WITHOUT NOTICE

INDEX

THIS INDEX LISTS ALL SCANNERS AND MONITORS IN "SAMS SCANNER-MONITOR SERVICING DATA" VOLUMES.



$4.95
$5.95 IN CANADA
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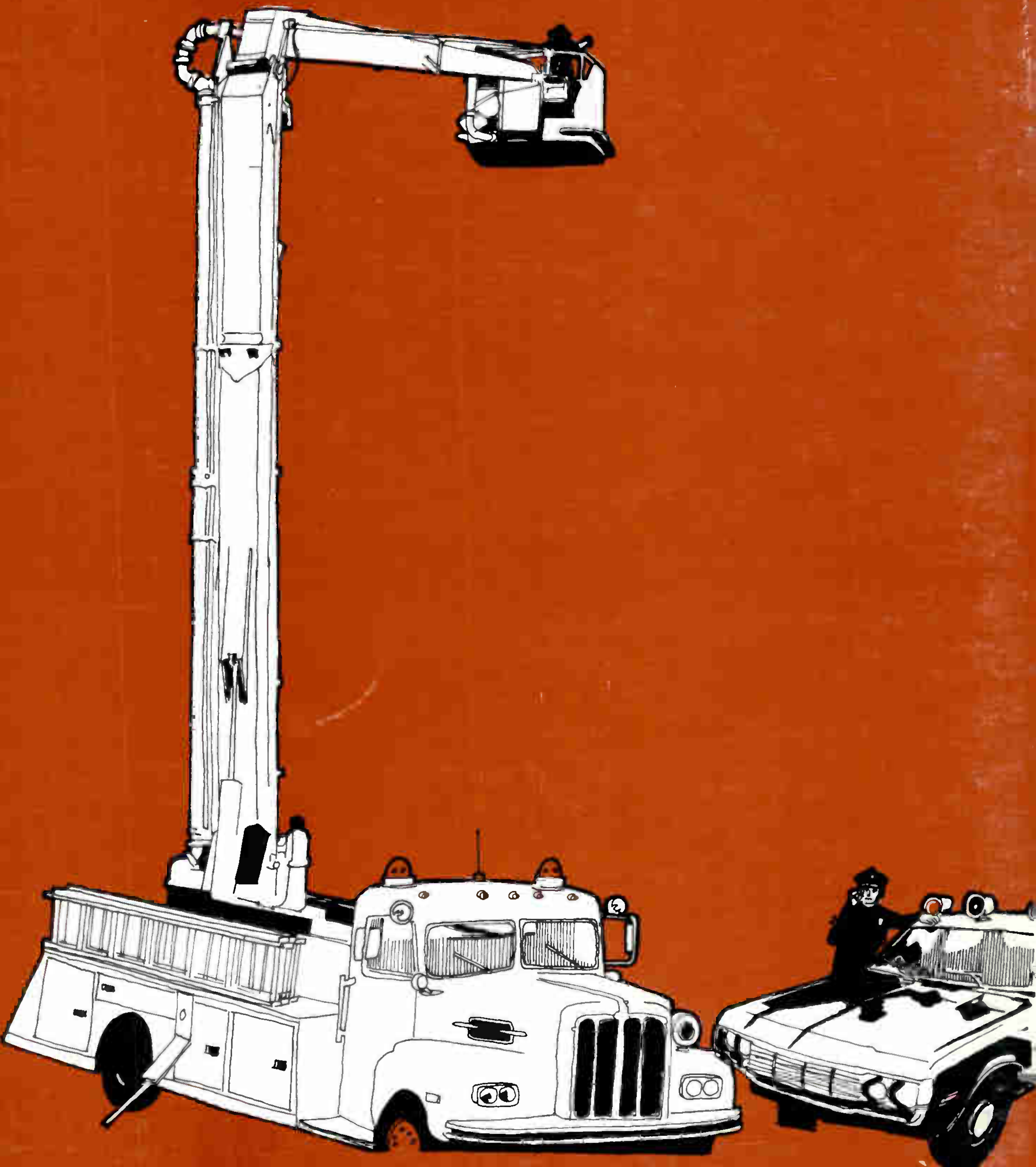

$4.95
$5.95 IN CANADA
SD-6
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INDEX

THIS INDEX LISTS ALL SCANNERS AND MONITORS
IN "SAMS SCANNER-MONITOR SERVICING DATA" VOLUMES.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C306	10uF 10V	
C309	.1uF 10V	
C312	.1uF 10V	
C314	.1uF 10V	
C504	1uF 10V	
C507	1uF 10V	
C509	3.3uF 10V	
C510	3.3uF 10V	
C511	.47uF 10V	
C512	100uF 6.3V	R-C9880
C513	.47uF 10V	
C514	.47uF 10V	
C701	.22uF 10V	
C702	.22uF 10V	
C703	33uF 6.3V	R-C9881
C705	100uF 6.3V	R-C9880
C706	100uF 6.3V	R-C9880

COILS/TRANSFORMERS

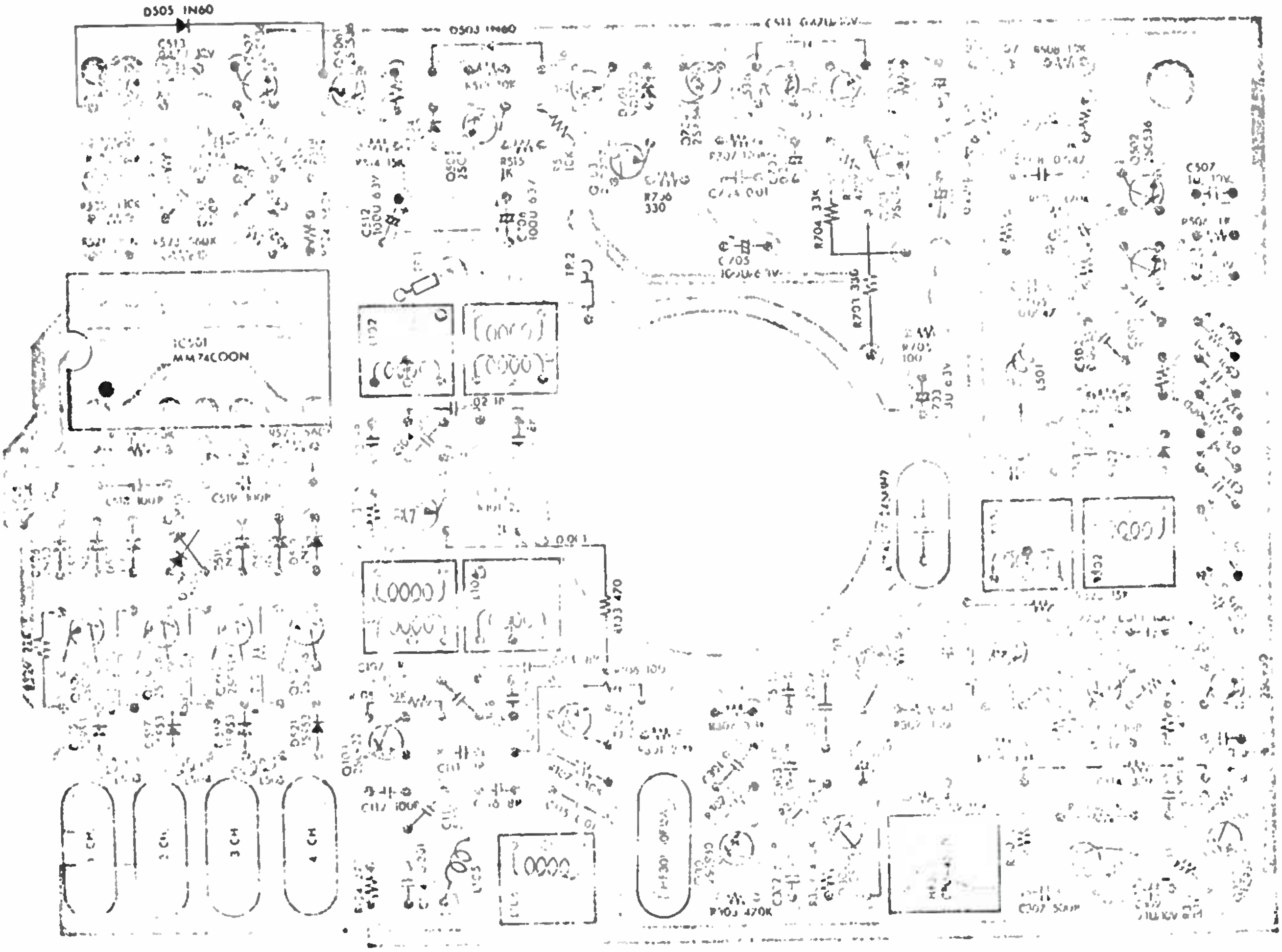
ITEM	PART NO.
L101	4-259R818
L102	4-259R819
L103	4-259R818
L104	4-259R819
L105	4-265R127
L106	4-259R820
L501	4-253R702
L502	4-253R701
L503	4-253R701
L504	4-253R701
L505	4-253R701
T301	4-256R706
T302	4-256R718

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R502	10K, Squelch	4-222R514
R701	10K, Volume	4-222R513

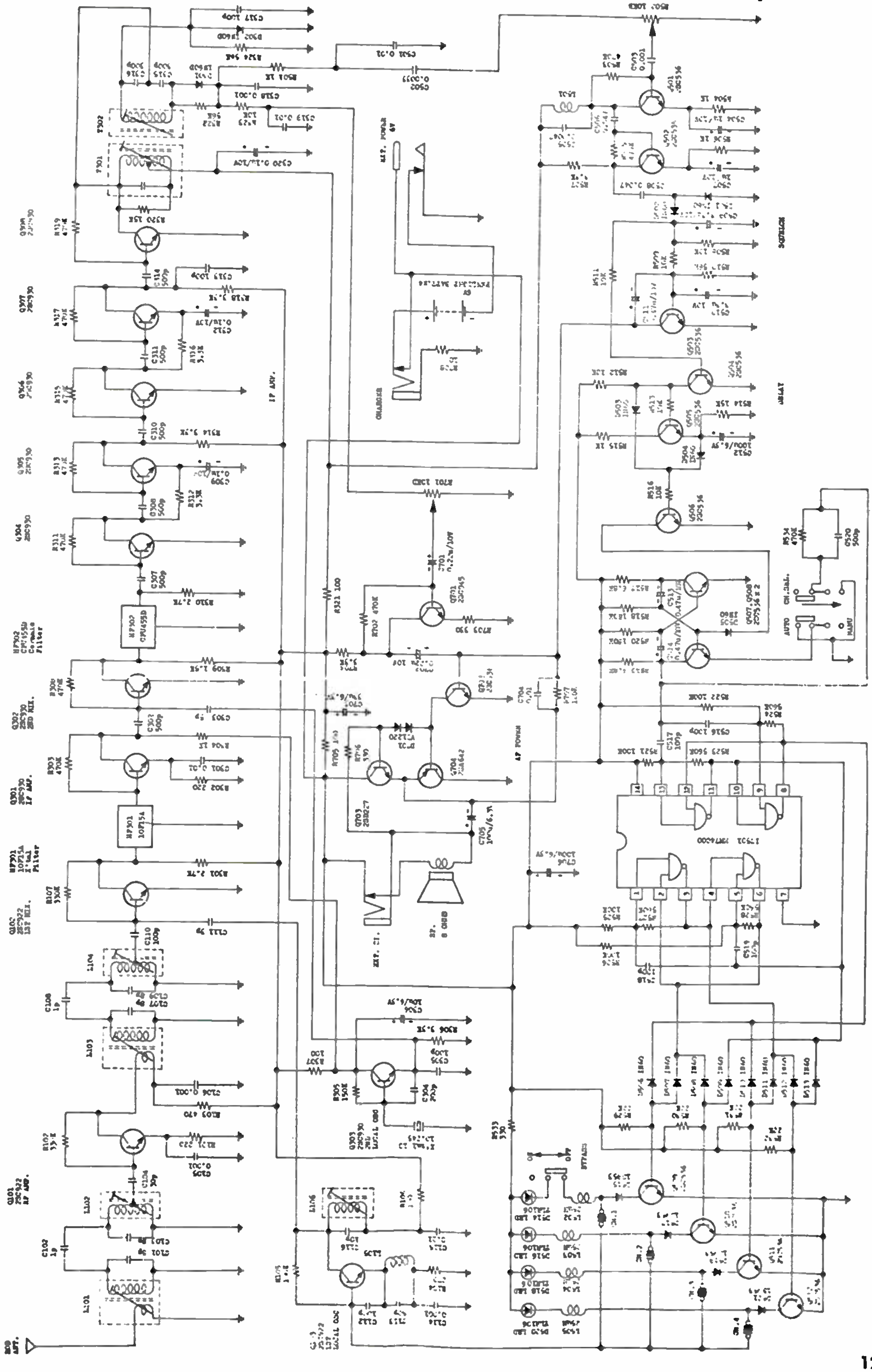
MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	Crystal Filter	10F75A/4-253R903
HF302	Ceramic Filter	CFU-455D/4-253R906
SP	Speaker, 8 ohm .3W	4-151R803
	Crystal, 10.245MHz	HC-18-U/4-225R802
	Switch, Scan/Channel Selector	4-231R953
	Switch, Bypass	4-231R165
	Crystal Socket	4-235R131
	Charger Socket	4-235R804
	Antenna	4-244R129(b)

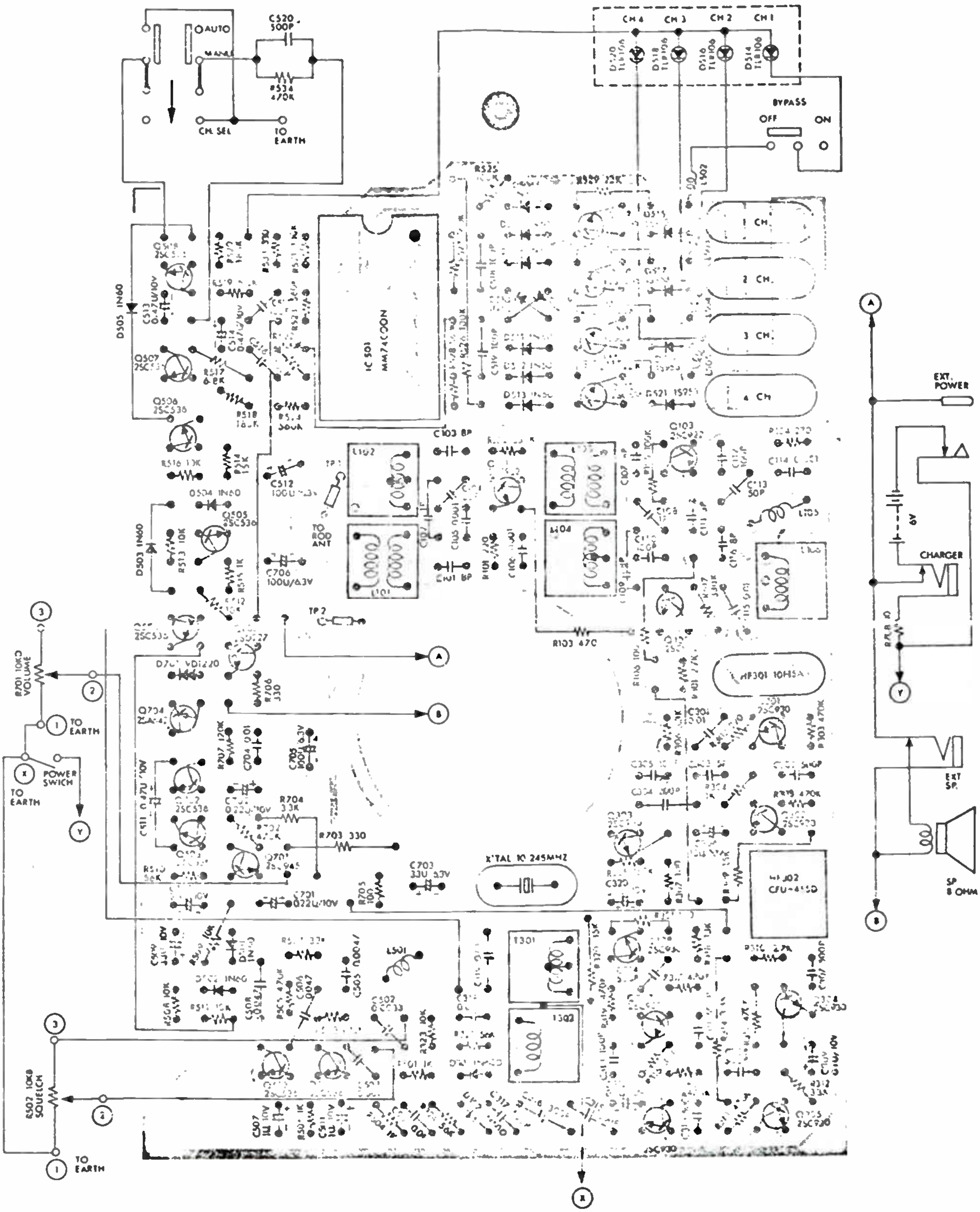


SEMICONDUCTORS

ITEM	TYPE NO.
D301	1N60D
D302	1N60D
D501	1N60
D502	1N60
D503	1N60
D504	1N60
D505	1N60
D506	1N60
D507	1N60
D508	1N60
D509	1N60
D510	1N60
D511	1N60
D512	1N60
D513	1N60
D514	TLR106
D516	TLR106
D518	TLR105
D520	TLR105
D515	1S953
D517	1S953
D519	1S953
D521	1S953
D701	VD1220
IC501	MM74C00N
Q101	2SC922K
Q102	2SC922K
Q103	2SC922K
Q301	2SC930D
Q302	2SC930D
Q303	2SC930D
Q304	2SC930C
Q305	2SC930C
Q306	2SC930C
Q307	2SC930C
Q308	2SC930D
Q501	2SC945Q
	2SC536F
Q502	2SC945Q
	2SC536F
Q503	2SC945Q
	2SC536F
Q504	2SC945Q
	2SC536F
Q505	2SC945R
	2SC536E
Q506	2SC945R
	2SC536E
Q507	2SC945R
	2SC536E
Q508	2SC945R
	2SC536E
Q509	2SC945R
	2SC536E
Q510	2SC945R
	2SC536E
Q511	2SC945R
	2SC536E
Q512	2SC945R
	2SC536E
Q701	2SC945R
Q702	2SC945Q
	2SC536F
Q703	2SD227
Q704	2SA642



Pages 124-127 Courtesy of TEABERRY ELECTRONICS CORP.



SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D1	1N3064	19-080-001
D2	1N3064	19-080-001
D4	CER-69	19-040-003
D5	CER-71	19-040-002
D6	CER-71	19-040-002
D7	11.5V Zener	19-090-008
D8	1N811 (1)	19-080-008
D9	1N811 (1)	19-080-008
D108	1N811 (2)	19-080-008
D109	1N811 (2)	19-080-008
Q1	(1)	19-020-048
Q2	(1)	19-020-044
Q3		19-020-044
Q4		19-020-044
Q5		19-020-044
Q6		19-020-044
Q7		19-020-044
Q8		19-020-044
Q9		19-020-044
Q10		19-020-058
Q11		19-020-058
Q12		19-020-043
Q13		19-020-043
Q14		19-020-050
Q15		19-020-050
Q16		19-020-056
Q101	(2)	19-020-048
Q102	(2)	19-020-044

(1) Used in Model FR-2513 only.
(2) Used in Model FR-2512 only.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C47	10uF 15V	06-570-081
C50	10uF 15V	06-570-081
C53	2uF 24V	06-530-065
C54	2uF 24V	06-530-065
C57	10uF 15V	06-570-081
C60	500uF 15V	06-530-073
C62	1000 35V	06-530-072

CONTROLS/SPECIAL RESISTORS

ITEM	DEXCRIPTION	PART NO.
R42	5K, Squelch	03-502-060
R43	20K, Limit Set	03-203-064
R55	100K, Volume/ Power Switch	03-104-059A

COILS/TRANSFORMERS

ITEM	PART NO.
L1	22-020-043A (1)
L2	22-020-0438 (1)
L3	22-020-042 (1)
L4	22-020-043C (1)
L5	22-040-034 (1)
L6	22-040-033 (1)
L7	22-090-014
L101	22-020-041 (2)
L102	22-020-040 (2)
L103	22-040-032 (2)
L104	22-040-031 (2)
L105	22-040-031 (2)
T1	22-010-046
T2	22-010-047
T3	22-010-048
T4	22-010-049
T5	22-010-050
T6	22-130-004
T7	14-020-012
T8	14-030-009
T9	14-010-046

(1) Used in Model FR-2513 only.
(2) Used in Model FR-2512 only.

MISCELLANEOUS

ITEM	NAME	PART NO.
B1	Lamp	19-060-009
F1	Fuse, 3/16 A	42-010-027
F2	Fuse, 1/2 A	42-010-026
P1	Power Cord, 117VAC	59-010-026
P2	Power Cord, 12VAC	59-010-027
S1	Channel Selector (1)	51-010-040
S101	Channel Selector (2)	51-010-040
X1	Crystal	40-010-023
	Speaker, 4 ohm	36-042-521
	Crystal Socket	13-100-006
	Power Socket	15-090-009
	Power Plug	15-100-008

(1) Used in Model FR-2513 only.
(2) Used in Model FR-2512 only.

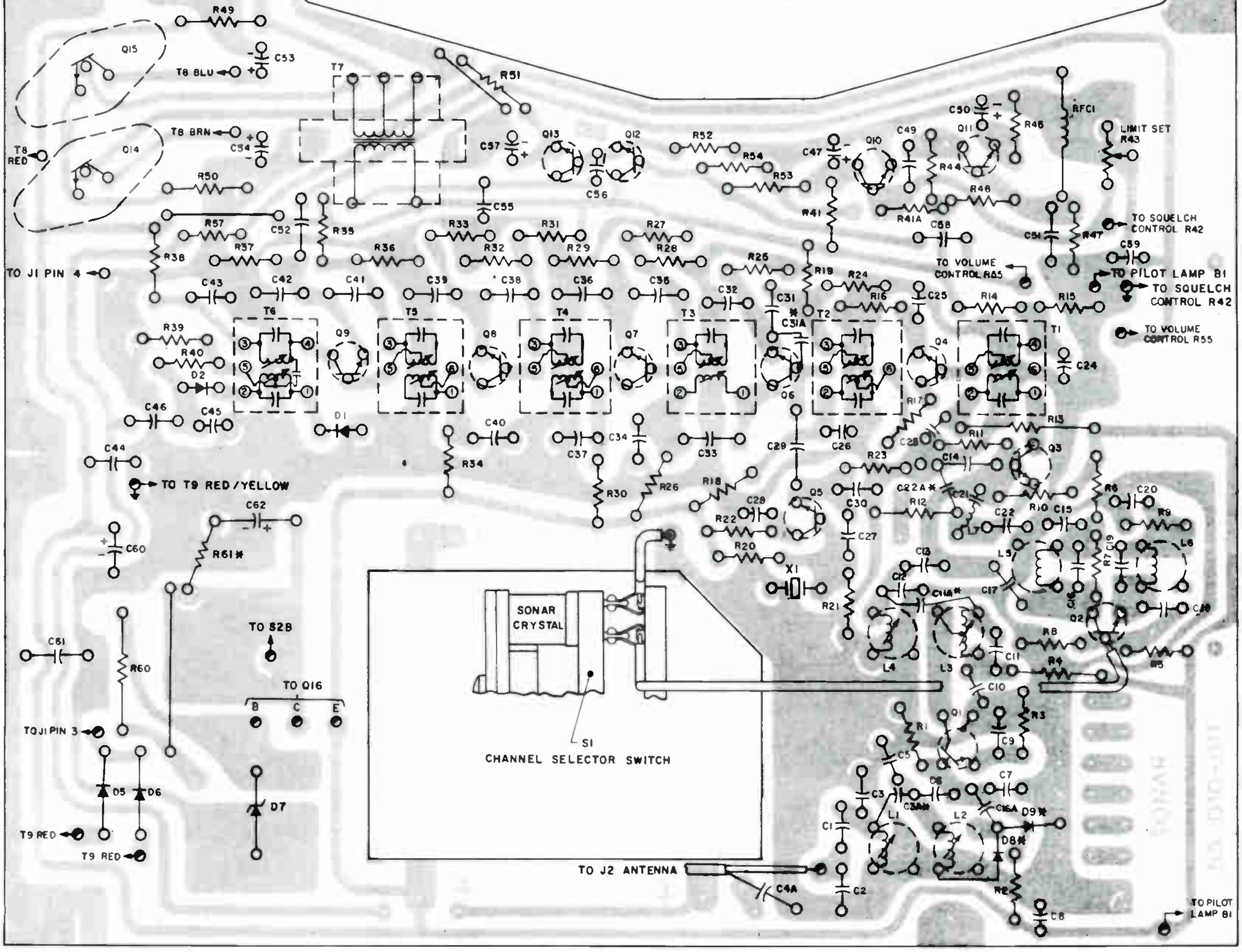
CABINET PARTS

NAME	PART NO.
Cabinet 2	28-010-021
Front Panel	11-020-104 (2)
Front Panel	11-020-105 (1)
Panel Bezel	11-011-007
Knob, Channel Selector	51-010-041
Knob, Squelch/Volume	33-020-009

(1) Used in Model FR-2513 only.
(2) Used in Model FR-2512 only.

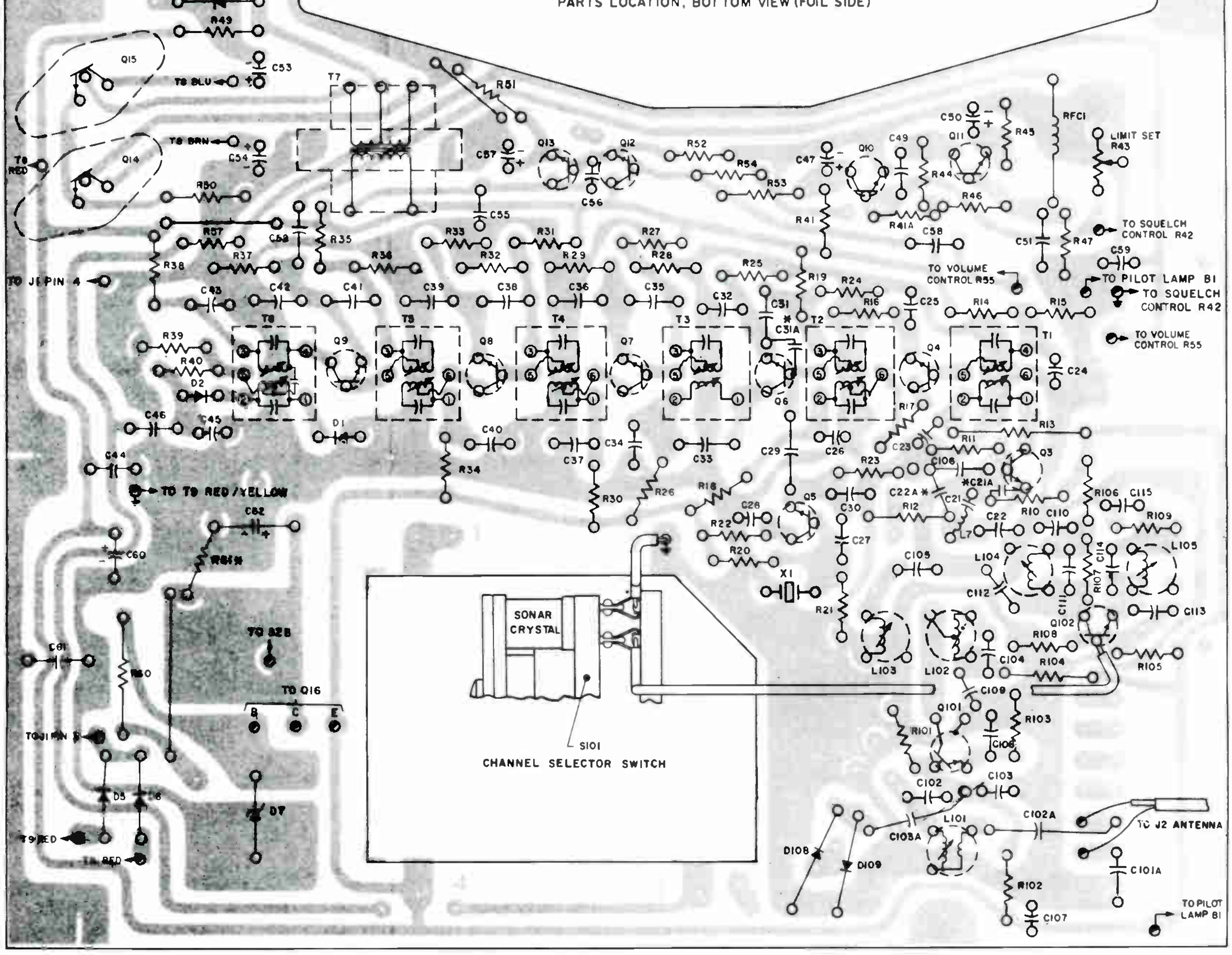
MODEL FR-2513 PRINTED CIRCUIT BOARD

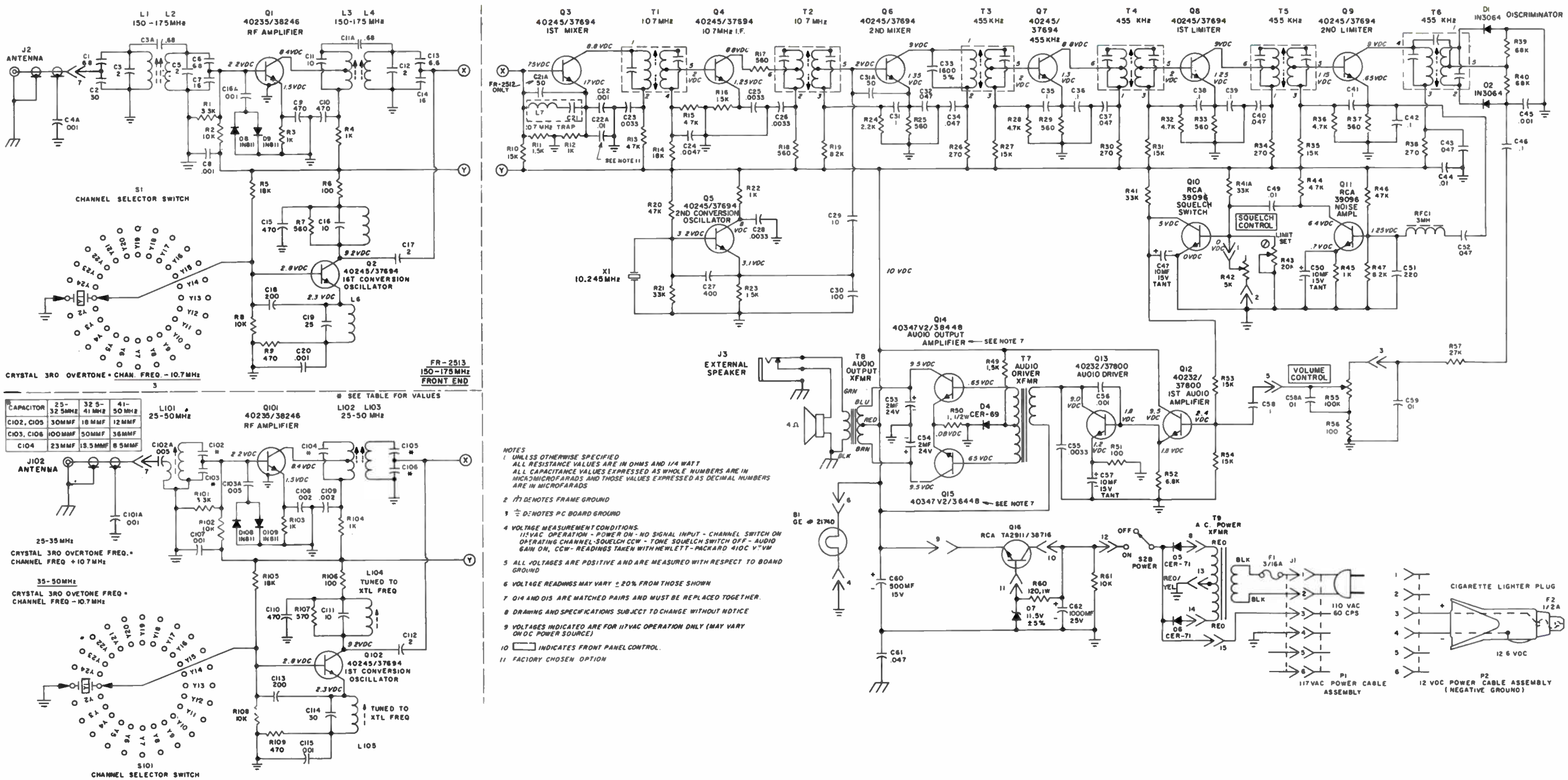
PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)



MODEL FR-2512 PRINTED CIRCUIT BOARD

PARTS LOCATION, BOTTOM VIEW (FOIL SIDE)




J2 ANTENNA
L1 L2 150-175MHz
Q1 40235/38246 RF AMPLIFIER
L3 L4 150-175MHz
S1 CHANNEL SELECTOR SWITCH
Q2 40245/37694 1ST CONVERSION OSCILLATOR
CRYSTAL 3RD OVERTONE = CHAN. FREQ. - 10.7MHz / 3
FR-2513 150-175MHz FRONT END
* SEE TABLE FOR VALUES
CAPACITOR | 25-32.5MHz | 32.5-41MHz | 41-50MHz
C102, C105 | 30MMF | 18MMF | 12MMF
C103, C106 | 100MMF | 50MMF | 36MMF
C104 | 23MMF | 13.5MMF | 8.5MMF
J102 ANTENNA
L101 25-50MHz
Q101 40235/38246 RF AMPLIFIER
L102 L103 25-50MHz
L104 TUNED TO XTL FREQ
Q102 40245/37694 1ST CONVERSION OSCILLATOR
L105 TUNED TO XTL FREQ
25-35MHz
CRYSTAL 3RD OVERTONE FREQ. = CHANNEL FREQ + 10.7MHz
35-50MHz
CRYSTAL 3RD OVERTONE FREQ = CHANNEL FREQ - 10.7MHz
S101 CHANNEL SELECTOR SWITCH
FR-2512 ONLY
10.7MHz TRAP
SEE NOTE 11
Q3 40245/37694 1ST MIXER
T1 10.7MHz
Q4 40245/37694 10.7MHz I.F.
T2 10.7MHz
Q5 40245/37694 2ND CONVERSION OSCILLATOR
X1 10.245MHz
Q6 40245/37694 2ND MIXER
T3 455KHz
Q7 40245/37694 455KHz
T4 455KHz
Q8 40245/37694 1ST LIMITER
T5 455KHz
Q9 40245/37694 2ND LIMITER
T6 455KHz
D1 IN3064 DISCRIMINATOR
D2 IN3064
Q10 RCA 39096 SQUELCH SWITCH
SQUELCH CONTROL
LIMIT SET
Q11 RCA 39096 NOISE AMPL
RFC1 3MH
10 VDC
J3 EXTERNAL SPEAKER
4 Ω
T8 AUDIO OUTPUT XFMR
Q14 40347V2/38448 AUDIO OUTPUT AMPLIFIER — SEE NOTE 7
T7 AUDIO DRIVER XFMR
Q13 40232/37800 AUDIO DRIVER
Q12 40232/37800 1ST AUDIO AMPLIFIER
VOLUME CONTROL
Q15 40347V2/38448 — SEE NOTE 7
D4 CER-69
B1 GE # 21740
Q16 RCA TA2911/38716
D7 11.5V ±5%
S2B POWER
OFF ON
T9 A.C. POWER XFMR
D5 CER-71
D6 CER-71
F1 3/16A
J1
110 VAC 60 CPS
P1 117VAC POWER CABLE ASSEMBLY
CIGARETTE LIGHTER PLUG
F2 1/2A
12.6 VDC
P2 12 VDC POWER CABLE ASSEMBLY (NEGATIVE GROUND)
NOTES
1 UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS AND 1/4 WATT
ALL CAPACITANCE VALUES EXPRESSED AS WHOLE NUMBERS ARE IN MICROMICROFARADS AND THOSE VALUES EXPRESSED AS DECIMAL NUMBERS ARE IN MICROFARADS
2 DENOTES FRAME GROUND
3 DENOTES PC BOARD GROUND
4 VOLTAGE MEASUREMENT CONDITIONS.
117VAC OPERATION - POWER ON - NO SIGNAL INPUT - CHANNEL SWITCH ON OPERATING CHANNEL-SQUELCH CCW - TONE SQUELCH SWITCH OFF - AUDIO GAIN ON, CCW - READINGS TAKEN WITH HEWLETT-PACKARD 410C VTVM
5 ALL VOLTAGES ARE POSITIVE AND ARE MEASURED WITH RESPECT TO BOARD GROUND
6 VOLTAGE READINGS MAY VARY ± 20% FROM THOSE SHOWN
7 Q14 AND Q15 ARE MATCHED PAIRS AND MUST BE REPLACED TOGETHER.
8 DRAWING AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE
9 VOLTAGES INDICATED ARE FOR 117VAC OPERATION ONLY (MAY VARY ON DC POWER SOURCE)
10 INDICATES FRONT PANEL CONTROL.
11 FACTORY CHOSEN OPTION

Pages 118-123 Courtesy of SONAR RADIO CORP.

5 - 1. TEST EQUIPMENT

(1) FM Signal Generator 25-175 MHz with adjustable attenuator calibrated to 0.1 uv. Measurements 560 etc.

(2) AM or CW Signal Generator 455 KHz-10.7 MHz. Hewlett-Packard 606A, etc.

(3) V.T.V.M. Heath IM-11, etc.

5 - 2. ALIGNMENT PROCEDURE

(1) Connect signal generator through a .01 MFD capacitor to the base of Q9. Adjust generator frequency to precisely 455 KHz. Connect Q8 Base to Emitter with short jumper.

(2) Connect a V.T.V.M. through a 1 megohm isolation resistor to the junction of R40 + R39.

(3) With 1000 microvolts @ 455 KHz it should be possible to get some indication on the 1.5 VDC range of the V.T.V.M. Adjust the bottom slug of T6 for maximum reading.

(4) Disconnect the V.T.V.M. and set it for zero center. Connect the V.T.V.M. to the junction of R40, D2 and C45. Adjust the top slug of T6 for zero center indication. Rotate the slug slightly CW and CCW of this point to establish if this reading is in fact zero center. Return adjustment to zero center.

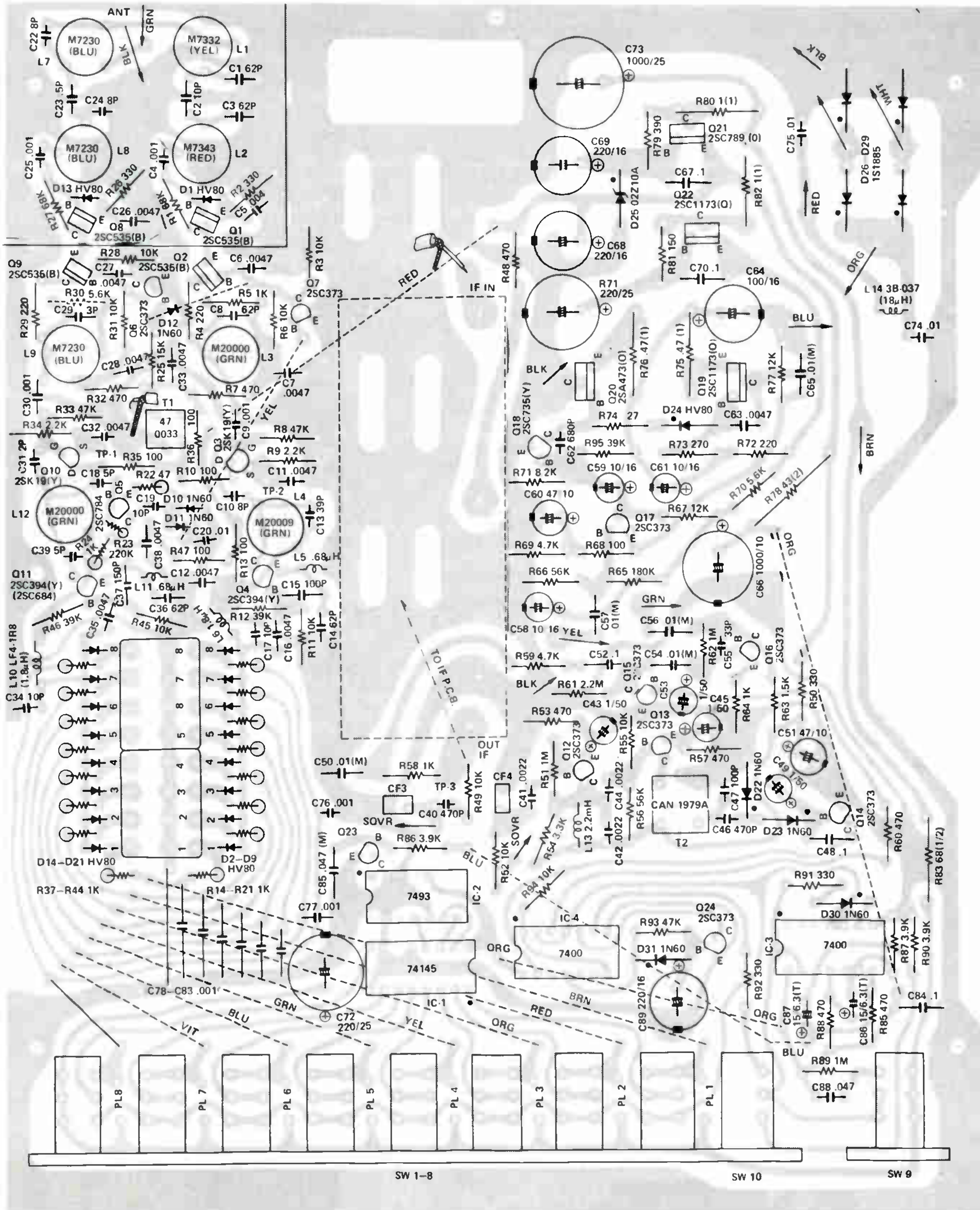
(5) Repeat Steps 3 and 4 (ending with 4) until no further adjustment is necessary. Step 3 should result in about 0.6 VDC meter reading.

(6) Connect a V.T.V.M. to the emitter of Q9. Remove jumper from Q8. Connect the signal generator through the isolation capacitor to the base of Q6. With no signal input, the voltage at the emitter of Q9 will be approximately 1.3 - 1.4 VDC. Gradually increase signal input until the voltage at Q9 decreases about 0.1 VDC. Adjust the top and bottom slugs of T3, T4 and T5 for a minimum reading, at the same time reducing the signal generator output to maintain the 0.1 VDC drop. After adjustment, about 5 microvolts signal input will reduce the emitter voltage by 0.1 VDC.

(7) Connect a V.T.V.M. to the emitter of Q8. Connect a signal generator through an isolation capacitor to the base of Q3. With no signal input, the voltage at the emitter of Q8 will be about +1.4 VDC. Tune the signal generator to 10.7 MHz and vary the output level to obtain approximately 0.1 VDC voltage drop. Adjust the top and bottom slugs of T1 and T2 for minimum voltage reading, gradually reducing generator output to maintain the 0.1 VDC voltage drop. After adjustment, approximately 10 uv. input will reduce the Q8 emitter voltage by 0.1 VDC.

(8) Connect a signal generator to the antenna input. The receiver will quiet when the generator is on frequency. Reduce the generator output until the voltage reading at the emitter of Q8 is reduced by 0.1 VDC. Adjust L1, L2, L3 and L4 (L101, L102 and L103) for minimum voltage reading while continuing to reduce the signal generator output to maintain approximately 0.1 VDC at the Q8 emitter. Continue to adjust the coils until no further decrease can be obtained. After adjustment, 0.7 uv signal input will produce about 0.1 VDC drop at the Q8 emitter.

MAIN P.C. BOARD (BOTTOM VIEW)



SEMICONDUCTORS

ITEM	PART NO.
(IF BOARD)	
D1	HV-80
D2	HV-80
Q1	2SC372(O)
Q2	2SC372(O)
Q3	2SC372(O)
Q4	2SC372(O)
Q5	2SC372(O)
Q6	2SC372(O)
Q7	2SC372(O)
Q8	2SC372(O)
Q9	2SC372(O)
(MAIN BOARD)	
D1	HV-80
D2	HV-80
D3	HV-80
D4	HV-80
D5	HV-80
D6	HV-80
D7	HV-80
D8	HV-80
D9	HV-80
D10	1N60
D11	1N60
D12	1N60
D13	HV-80
D14	HV-80
D15	HV-80
D16	HV-80
D17	HV-80
D18	HV-80
D19	HV-80
D20	HV-80
D21	HV-80
D22	1N60
D23	1N60
D24	HV-80
D25	02Z10A
D26	1S1885
D27	1S1885
D28	1S1885
D29	1S1885
D30	1N60
D31	1N60
IC1	N74145
IC2	N7493A
IC3	N7400A
IC4	N7400A
Q1	2SC535B
Q2	2SC535B
Q3	2SK19(Y)
Q4	2SC394(Y)
	2SC684
Q5	2SC784(O)
Q6	2SC373
Q7	2SC373
Q8	2SC535(B)
Q9	2SC535(B)
Q10	2SK19(Y)
Q11	2SC394(Y)
Q12	2SC373
Q13	2SC373
Q14	2SC373
Q15	2SC373
Q16	2SC373
Q17	2SC373
Q18	2SC735(Y)
Q19	2SC1173(O)
Q20	2SA473(O)
Q21	2SC789(O)
Q22	2SC1173(O)
Q23	2SC373
Q24	2SC373

LYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
(IF BOARD)		
C8	CE04W1C470	4.7uF 16V
C11	CS15E1VOR1-M	.1uF 35V
C12	CS15E1VOR1-M	.1uF 35V
C15	CS15E1VOR1-M	.1uF 35V
C16	CE041VOR1-M	47uF 16V
C20	CS15E1VOR1-M	.1uF 35V
C21	CS15E1VOR1-M	.1uF 35V
(MAIN BOARD)		
C43	CE04W1H010	1uF 50V
C45	CE04W1H010	1uF 50V
C49	CE04W1H010	1uF 50V
C51	CE04W1A470	47uF 10V
C53	CE04W1H010	1uF 50V
C58	CE94W1C110	10uF 16V
C59	CE04W1C110	10uF 16V
C60	CE04W1A470	47uF 10V
C61	CE04W1C100	10uF 16V
C64	CE04W1C101	100uF 16V
C66		220uF 16V
C68	CE04W1C221	220uF 16V
C69	CE04W1C221	220uF 16V
C71	CE04W1E221	220uF 25V
C72	CE04W1E221	220uF 25V
C73	CE04W1E102	1000uF 25V
C86		15uF 6.3V
C87		15uF 6.3V
C89	CE04W1C221	220uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
(MAIN BOARD)		
VR1	P-1472	50K, Squelch
VR2	P-1471	50K, Volume

COILS/TRANSFORMERS

ITEM	PART NO.
(IF BOARD)	
T1	CA-3171
T2	CA-3170
(MAIN BOARD)	
L1	CA-3173
L2	CA-3174
L3	CA-3175
L4	CA-3176
L5	CA-3180
L6	CA-3181
L7	CA-3172
L8	CA-3172
L9	CA-3172
L10	CA-3181
L11	CA-3180
L12	CA-3175
L13	CA-3179
L14	CA-3182
T1	CA-3177
T2	CA-3178
T3	CA-0452

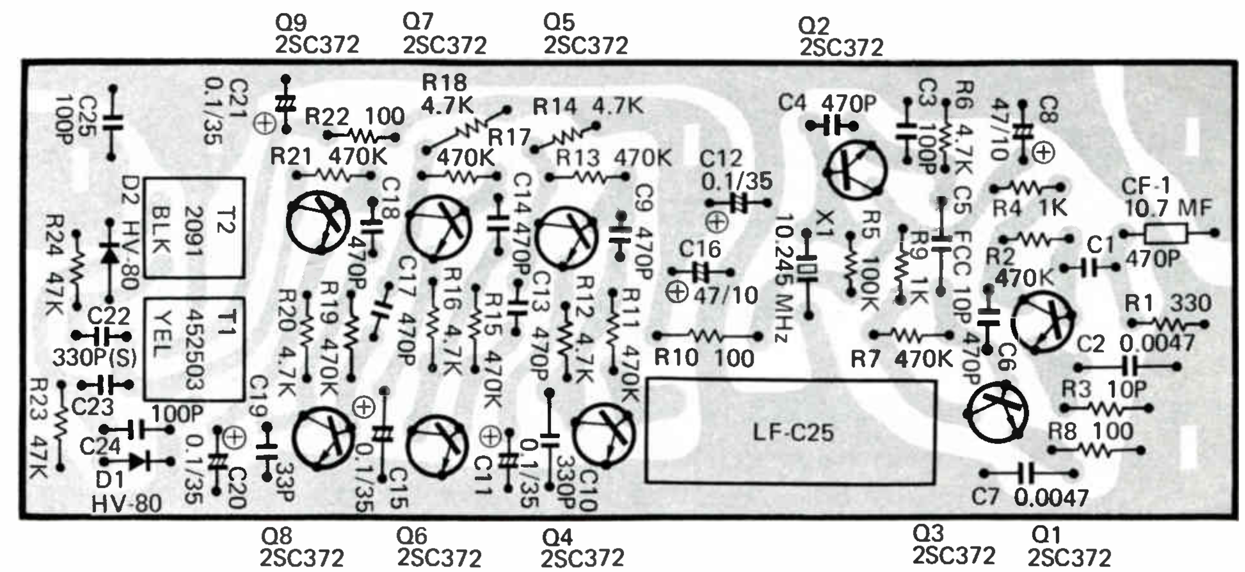
MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	Ceramic Filter	C-0576
CF2	Ceramic Filter	C-0577
CF3	Ceramic Filter(455kHz)	CA-0578
CF4	Ceramic Filter(455kHz)	CA-0578
SW1	Switch, Push	S-7187
SW2	Switch, Push	S-7187
SW3	Switch, Push	S-7187
SW4	Switch, Push	S-7187
SW5	Switch, Push	S-7187
SW6	Switch, Push	S-7187
SW7	Switch, Push	S-7187
SW8	Switch, Push	S-7187
SW9	Switch, Push	S-7188
SW10	Switch, Push	S-7187
X1	Crystal (10.245MHz)	
	Cord, AC Power	W-1001
	Crystal Socket	J-6232
	Lamp (14V/50mA)	L-0536
	Speaker	S-4516

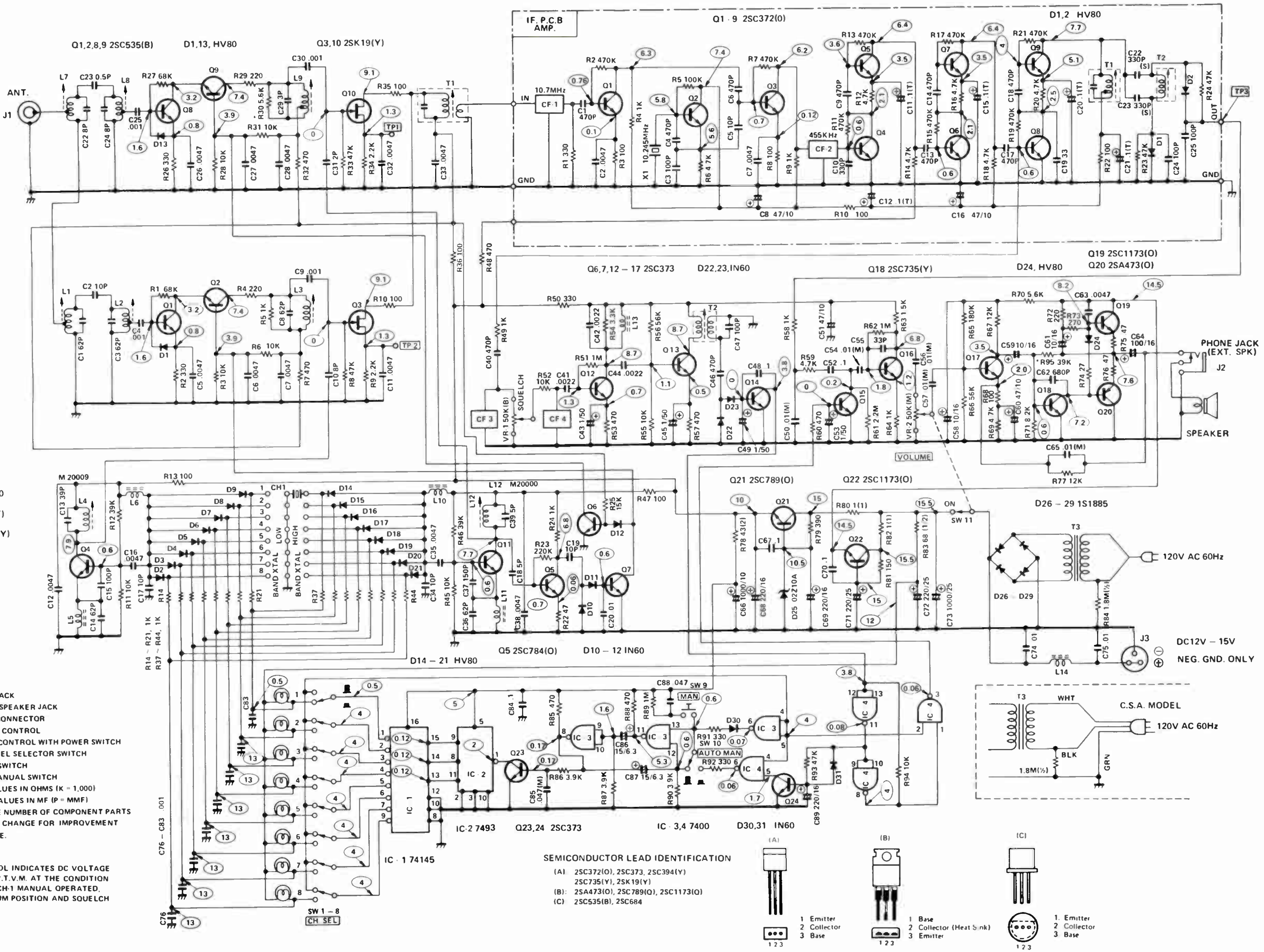
CABINET PARTS

NAME	PART NO.
Cabinet	Z-2100
Crystal Cover	HB-1511
Front Panel	HB-1512
Escutcheon	Z-2101
Jewel, Lamp	HB-1514
Knob, Push-button(Gry)	K-1677
Knob, Push-button(Orn)	K-1668
Knob, Squelch	K-1676
Knob, Volume	K-1676

IF AMP P.C. BOARD (BOTTOM VIEW)



SCHEMATIC DIAGRAM



FUNCTION

J1: ANTENNA JACK
J2: EXTERNAL SPEAKER JACK
J3: DC POWER CONNECTOR
VR-1: SQUELCH CONTROL
VR-2: VOLUME CONTROL WITH POWER SWITCH
SW 1 - 8: CHANNEL SELECTOR SWITCH
SW-9: MANUAL SWITCH
SW-10: AUTO/MANUAL SWITCH
RESISTANCE VALUES IN OHMS (K = 1,000)
CAPACITANCE VALUES IN MF (P = MMF)
RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

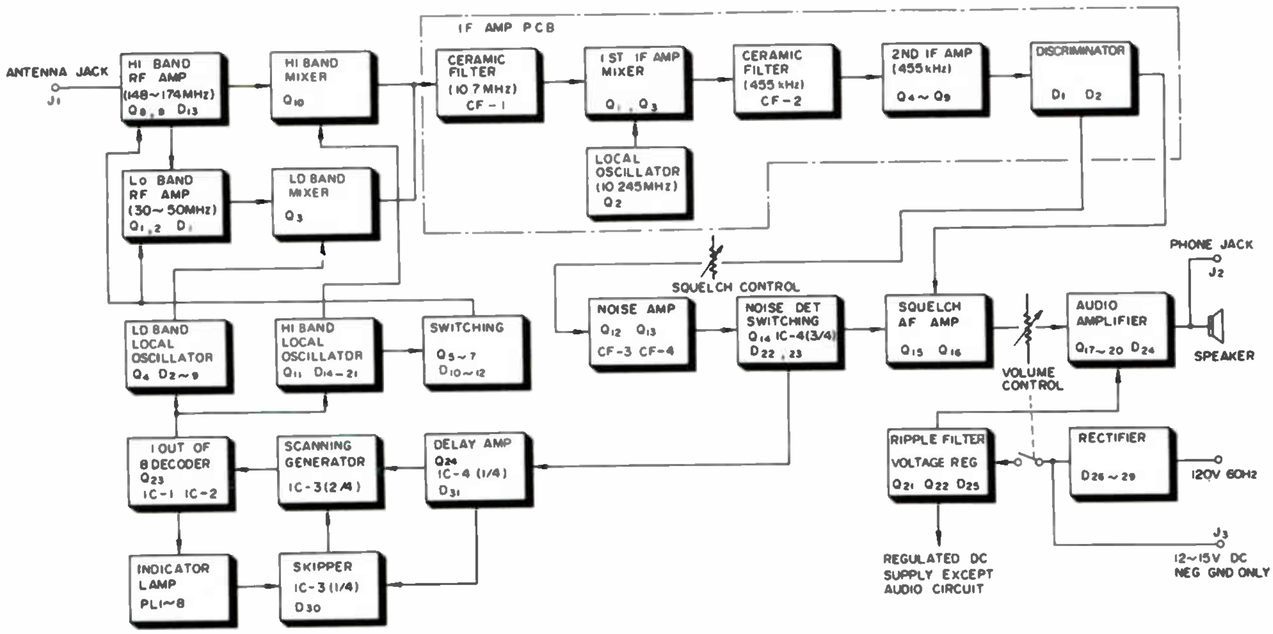
REMARKS

THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF HIGH BAND CH-1 MANUAL OPERATED. VOLUME MINIMUM POSITION AND SQUELCH OUT POSITION.

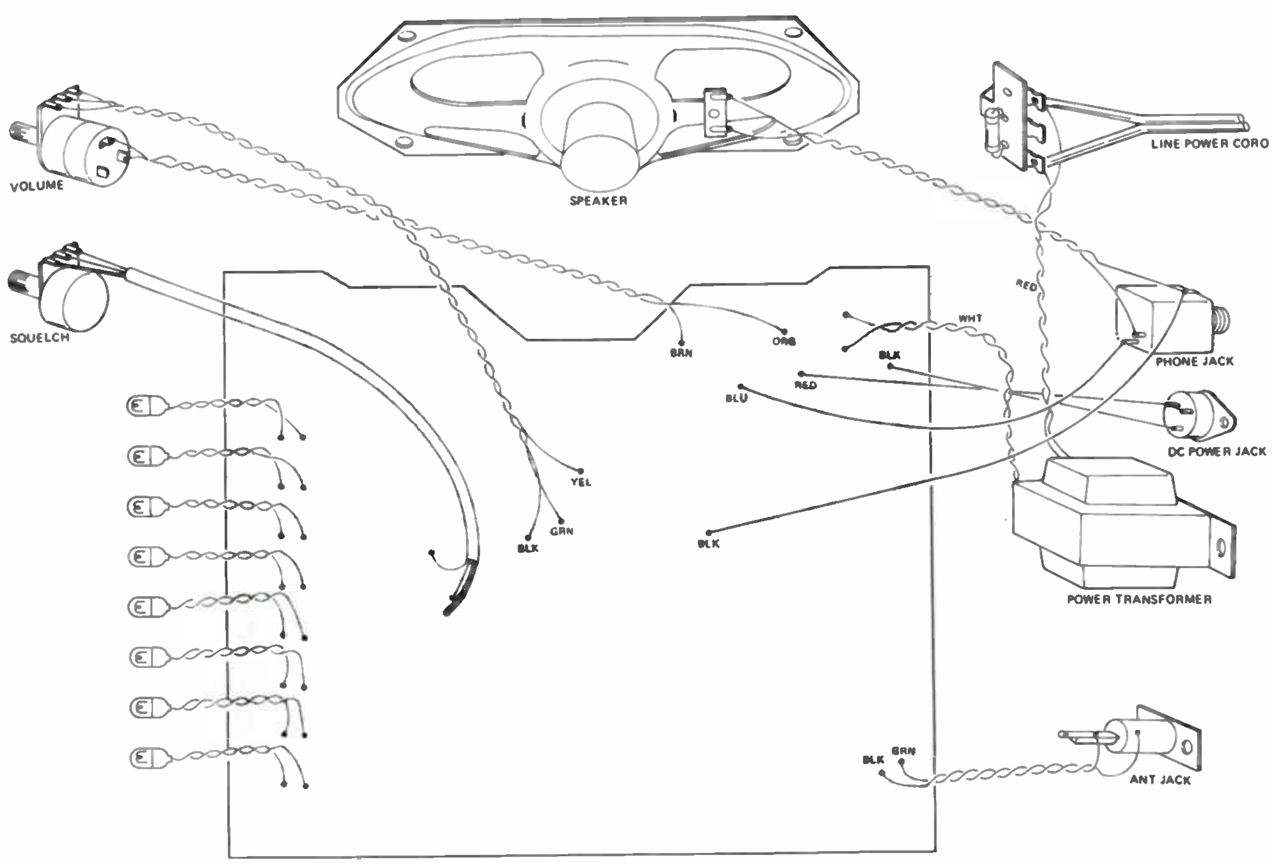
TROUBLE SHOOTING

Symptom	Possible cause
1) Pilot lamp does not light and set does not operate.	A) Faulty line power cord. B) Defective power transformer. C) Defective power rectifiers. D) Defective power switch. E) Defective Q21, 22 and/or associated circuit component.
2) One or two of channel lamps not on when channel switch is on.	A) Defective pilot lamp. B) Faulty channel switch contact. C) Defective IC1, 2. D) Skipper circuit IC3.
3) Skipper circuit does not work.	A) IC3 or D30 defective.
4) Only scans CH1, 2 or CH5, 6.	A) Defective IC1. B) Defective IC2.
5) Only scans CH1, 2, 3, 4 or CH5, 6, 7, 8.	A) Defective IC1. B) Defective IC2.
6) Squelch control does not operate.	A) One of transistors Q12, 13, 14, 15 or 16 is defective. B) Defective IC3 or IC4. C) Faulty VR1. D) Defective diodes D22, 23.
7) No sound in VHF Hi or Lo.	A) Faulty Audio amplifier circuit component. B) Faulty IF amplifier circuit component including crystal X1.
8) No sound in VHF Hi.	A) Faulty VHF front-end or local oscillator circuit component. B) Weak crystal. C) Faulty Q8, 9 of VHF RF or Q10 MIX circuit component.
9) No sound in VHF Lo.	A) Faulty VHF front-end or local oscillator circuit component. B) Weak crystal. C) Faulty Q1, 2 of VHF RF, or Q3 MIX circuit component.

BLOCK DIAGRAM



WIRING DIAGRAM



LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Put all crystals in sockets. Refer to Figure 2.

Step 2: Couple the frequency counter thru a pick-up coil to oscillator coil L4 (Lo Band) or L12 (Hi Band) in the tuner front end section. Refer to Figure 7.

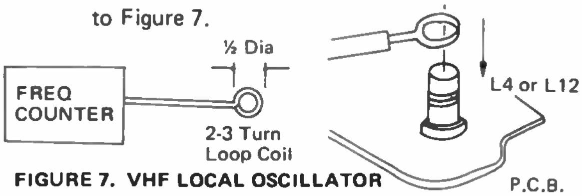


FIGURE 7. VHF LOCAL OSCILLATOR

Step 3: Check if these crystals are oscillating.

SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to antenna input and AC voltmeter to speaker terminals.

Step 2: Turn the **SQUELCH** control fully counterclockwise, and with the generator at minimum output and with no modulation, adjust the **VOLUME** control on the set for a 0 dB (0.775 volts) recording on the AC voltmeter.

Step 3: Adjust L4 (Lo band) and L12 (Hi band) on the Main P.C. Board for amximum sensitivity.

Step 4: Increase the output of the signal generator to obtain a reading of –20 dB on the AC voltmeter. The generator output to achieve this is the 20 dB quieting sensitivity.

Step 5: The set should be tuned in conformity with the frequency of signal generator.

Step 6: Turn **VOLUME** control fully clockwise, signal generator should be set for carrier wave (no modulation) and attenuator at minimum output level.

Step 7: Adjust **VOLUME** control so that the output noise level shows 0 dB = 0.775 volt on the AC-V.T.V.M.

Step 8: Increase the output level of signal generator so that signal level is 20 dB down from noise level. The S.G output is the 20 dB noise quieting level.
*Alignment of T2 on Main P.C. Board is not necessary.

Note:

As supplied by the factory, this unit is set up to provide maximum sensitivity in a range of 149-157 MHz for Hi and 37-43 for Lo. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 150 MHz up to about 170 MHz for Hi and 33/35 to 45/47 for Lo. To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a bandwidth "window" of about 8 MHz total for Hi and 6 MHz for Lo—adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). **Of course, be sure to use correct crystals.**

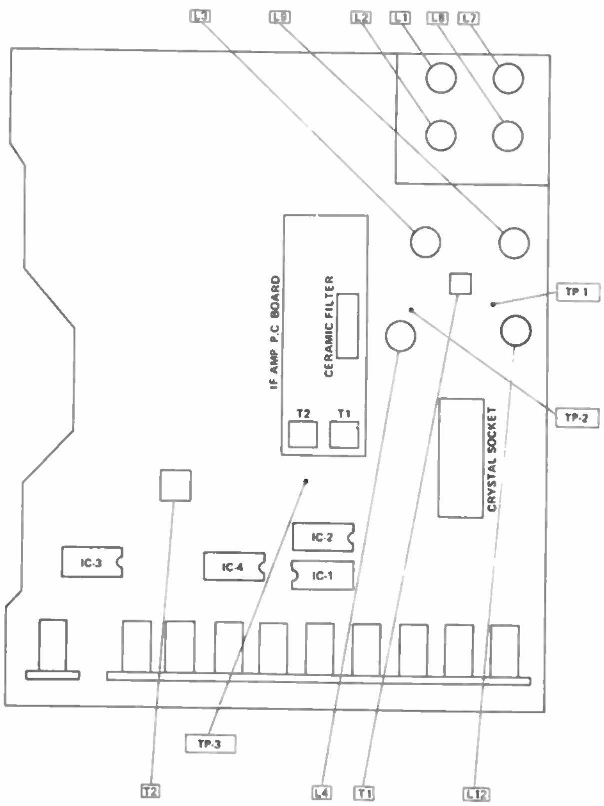
CRYSTAL FREQUENCY CALCULATION

The crystal frequencies required are found by the following formulas. Fr is the desired frequency to be received in MHz.

VHF Hi Crystal Frequency = (Fr – 10.7)/3

VHF Lo Crystal Frequency = Fr + 10.7

ALIGNMENT LOCATIONS



Pages 109-117 Courtesy of RADIO SHACK

CRYSTAL INSTALLATION

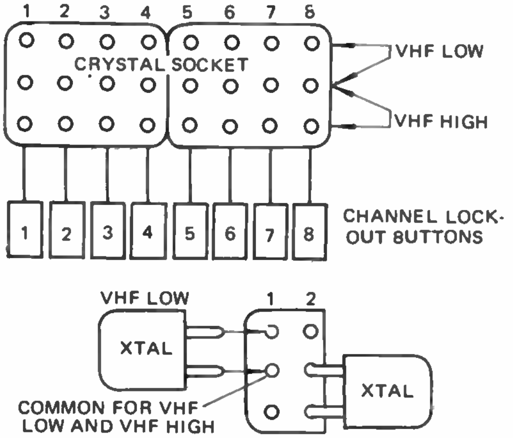


FIGURE 2. CRYSTAL INSTALLATIONS

ALIGNMENT PREPARATION

Test equipment required:

1. Oscilloscope
2. Slow sweep generator with variable marker (10.7MHz)
3. RF standard signal generator
4. RF sweep generator with variable marker (30-50 MHz, 148-174 MHz)
5. AC V.T.V.M.
6. DC V.T.V.M.
7. Frequency counter

Note: A non-metallic alignment tool is required for complete alignment.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding to the complete alignment.
Input signal from generator should be kept as low as possible.

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 3.

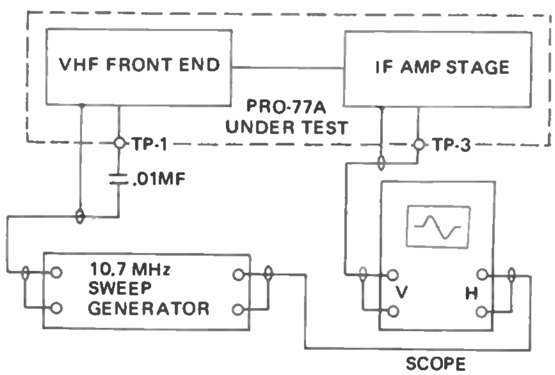


FIGURE 3. IF SECTION ALIGNMENT INSTRUCTIONS

Step 2: Maintain output of sweep generator at a low level to prevent overloading.

Step 3: Adjust T1 of RF Section and T1 and T2 of IF amplifier so that the 455 kHz marker is in the center of the discriminator curve, and for best linearity. Refer to Figure 4.

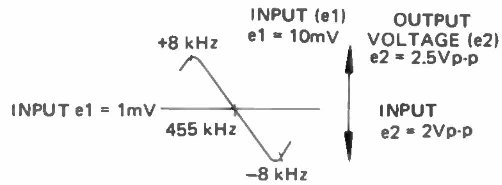


FIGURE 4. IF DISCRIMINATOR CURVE

RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.

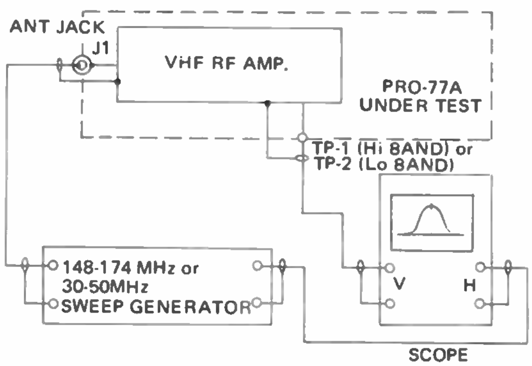


FIGURE 5. VHF RF ALIGNMENT

Step 2: Adjust L1, L2 and L3 of RF section (for Lo Band) for maximum output and best curve symmetry as shown in Figure 6. For Hi Band, adjust L7, L8 and L9.

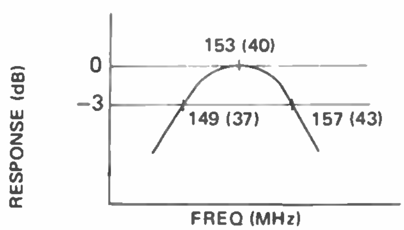


FIGURE 6. VHF RF CHARACTERISTIC CURVE

SEMICONDUCTORS

AMP BOARD

ITEM	TYPE NO.
D1	HV80
D2	HV80
Q1	2SC372(0)
Q2	2SC372(0)
Q3	2SC372(0)
Q4	2SC372(0)
Q5	2SC372(0)
Q6	2SC372(0)
Q7	2SC372(0)
Q8	2SC372(0)
Q9	2SC372(0)

MAIN BOARD

D13	HV80
D14	HV80
D15	HV80
D16	HV80
D17	HV80
D18	HV80
D19	HV80
D20	HV80
D21	HV80
D22	1N60
D23	1N60
D24	HV80
D25	02Z10A
D26	1S1885
D27	1S1885
D28	1S1885
D29	1S1885
D30	1N60
D31	1N60
IC1	N74145B
IC2	N7493A
IC3	N7400A
Q8	2SC535(B)
Q9	2SC535(B)
Q10	2SK19(Y) FET
Q11	2SC394(Y)
	2SC684
Q12	2SC373
Q13	2SC373
Q14	2SC373
Q15	2SC373
Q16	2SC373
Q17	2SC373
Q18	2SC735(Y)
Q19	2SC1173(0)
Q20	2SA473(0)
Q21	2SC789(0)
Q22	2SC1173(0)
Q23	2SC373
Q24	2SC373

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	50K, Squelch	P-1472
VR2	50K, Volume	P-1471

COILS/TRANSFORMERS

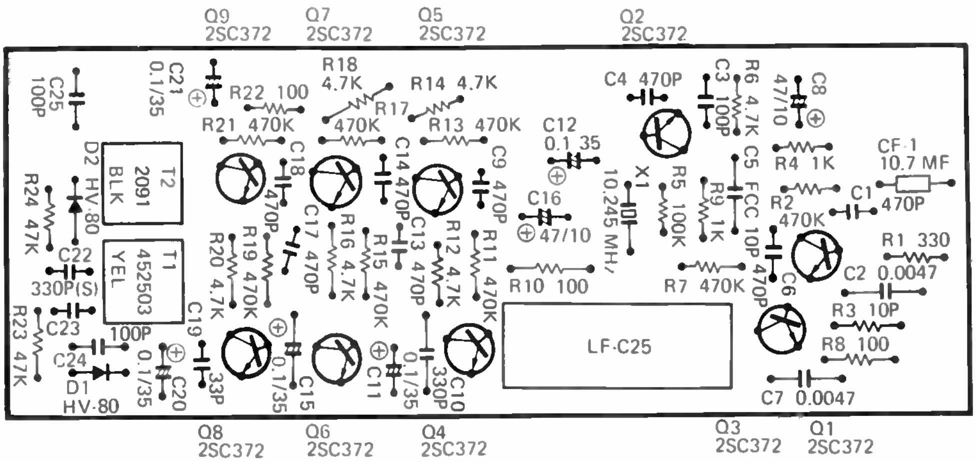
ITEM	PART NO.
AMP BOARD	
T1	CA-3171
T2	CA-3170
MAIN BOARD	
L7	CA-3172
L8	CA-3172
L9	CA-3172
L10	CA-3181
L11	CA-3180
L12	CA-6827
L13	CA-3179
L14	CA-3182
T1	CA-3183
T2	CA-3178
T3	TA-0452

MISCELLANEOUS

ITEM	NAME	PART NO.
AMP BOARD		
CF1	Ceramic Filter	C-0576
CF2	Ceramic Filter	C-0577
MAIN BOARD		
CF3	Ceramic Filter	CA-0578
CF4	Ceramic Filter	CA-0578
SW1	Push Switch	S-7187
SW2	Push Switch	S-7187
SW3	Push Switch	S-7187
SW4	Push Switch	S-7187
SW5	Push Switch	S-7187
SW6	Push Switch	S-7187
SW7	Push Switch	S-7187
SW8	Push Switch	S-7187
SW9	Push Switch	S-7188
SW10	Push Switch	S-7187
	Socket, Crystal	J-6213
	Speaker	S-4516
	DC Cable with Fuse Holder	W-1747
	Fuse, 1A	HF-0018
	Lamp Jewel	HB-1514

CABINET PARTS

NAME	PART NO.
Cabinet	Z-1694
Front Panel	HB-1512
Knob, Gray	K-1677
Knob, Black	K-1679
KNob, Volume/Squelch	K-1676



TROUBLE SHOOTING

Symptom	Possible cause
1) Lamp does not light and set does not operate.	A) Faulty line power cord. B) Defective power transformer. C) Defective power rectifiers. D) Defective power switch. E) Defective Q21, 22 and/or associated circuit components.
2) Channel lamps not on when channel switch is on.	A) Defective pilot lamp. B) Faulty channel switch contact. C) Defective IC1, 2. D) Skipper circuit IC3.
3) Skipper circuit does not work.	A) IC3 or D30 defective.
4) Only scans CH1, 2 or CH5, 6.	A) Defective IC1. B) Defective IC2.
5) Only scans CH1, 2, 3, 4 or CH5, 6, 7, 8.	A) Defective IC1. B) Defective IC2.
6) Squelch control does not operate.	A) One of transistors Q12, 13, 14, 15 or 16 is defective. B) Defective IC3 or IC4. C) Faulty VR1. D) Defective diodes D22, 23.
7) No sound.	A) Faulty Audio amplifier circuit component. B) Faulty IF amplifier circuit component. C) Faulty front-end or local oscillator circuit component. D) Weak crystal. E) Faulty Q8, 9 of RF or Q10 MIX circuit component.

CRYSTAL INSTALLATION

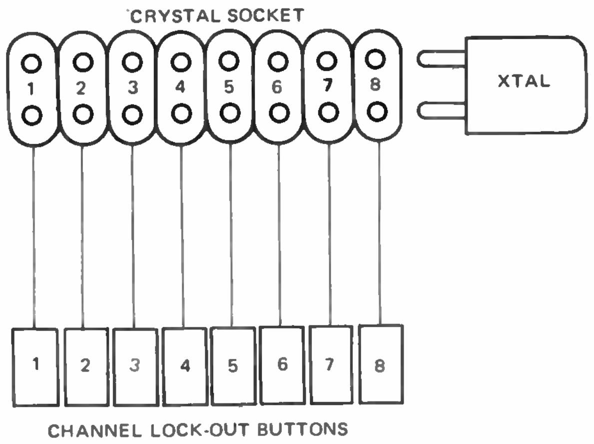


FIGURE 2. CRYSTAL INSTALLATION

ALIGNMENT PREPARATION

Test equipment required:

1. Oscilloscope
2. Slow sweep generator with variable marker
3. RF standard signal generator
4. RF sweep generator with variable marker (130-170 MHz).
5. AC V.T.V.M.
6. DC V.T.V.M.
7. Frequency counter

Note: A non-metallic alignment tool is required for complete alignment.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding to the complete alignment.
Input signal from generator should be kept as low as possible.

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 3.

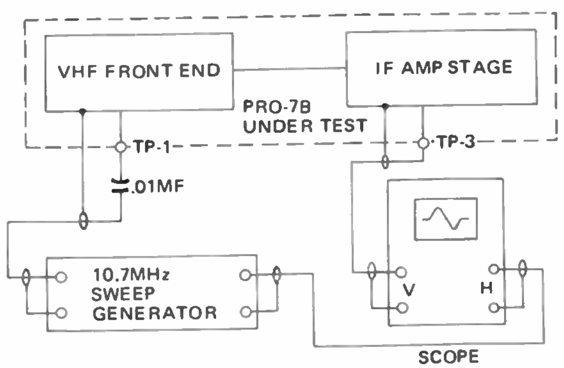


FIGURE 3. IF SECTION ALIGNMENT INSTRUCTIONS

Step 2: Maintain output of sweep generator at a low level to prevent overloading.

Step 3: Adjust T1 of RF Section and T1, T2 of IF amplifier so that the 455 kHz marker is in the center of the discriminator curve, and for best linearity. Refer to Figure 4.

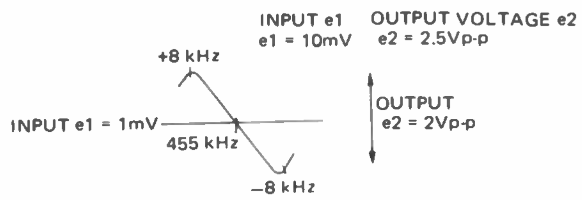


FIGURE 4. IF DISCRIMINATOR CURVE

RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.

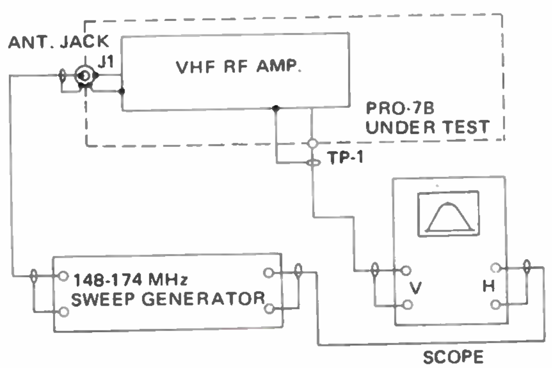


FIGURE 5. VHF RF ALIGNMENT

Step 2: Adjust L7, L8 and L9 of RF section for maximum output and best curve symmetry as shown in Figure 6.

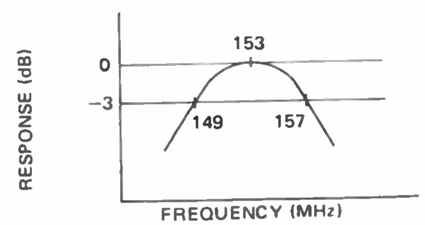
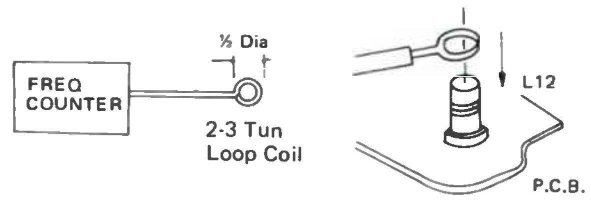


FIGURE 6. VHF RF CHARACTERISTIC CURVE

LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Put all crystals in sockets. Refer to Figure 2.

Step 2: Couple the frequency counter thru a pick-up coil to oscillator coil L12 in the tuner front end section. Refer to Figure 7.



SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to antenna input and AC voltmeter to speaker terminals.

Step 2: Turn the **SQUELCH** control fully counterclockwise, and with the generator at minimum output and with no modulation, adjust the **VOLUME** control on the set for a 0 dB (0.775 volts) recording on the AC voltmeter.

Step 3: Adjust L12 on the main P.C. Board for maximum sensitivity.

Step 4: Increase the output of the signal generator to obtain a reading of −20 dB on the AC voltmeter. The generator output to achieve this is the 20 dB quieting sensitivity.

Step 5: The set should be tuned in conformity with the frequency of signal generator.

Step 6: Turn **VOLUME** control fully clockwise, signal generator should be set for carrier wave (no modulation) and attenuator at minimum output level.

Step 7: Adjust **VOLUME** control so that the output noise level shows 0 dB = 0.775 volt on the AC-V.T.V.M.

Step 8: Increase the output level of signal generator so that signal level is 20 dB down from noise level. The S.G. output is the 20 dB noise quieting level.

*Alignment of T2 on Main P.C. Board is not necessary.

Note:

As supplied by the factory, this unit is set up to provide maximum sensitivity in a range of 149-157 MHz. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 150 MHz up to about 170 MHz.

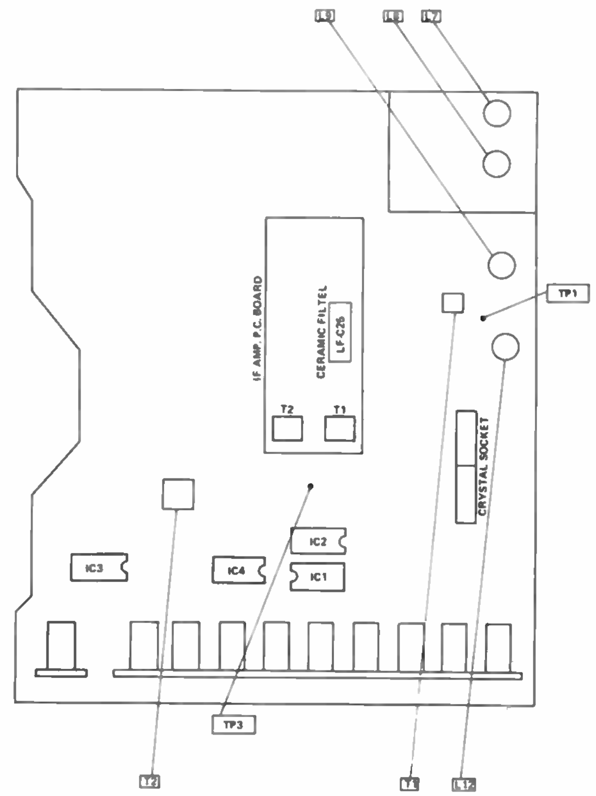
To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a bandwidth "window" of about 8 MHz total—adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). Of course, be sure to **use correct crystals.**

CRYSTAL FREQUENCY CALCULATION

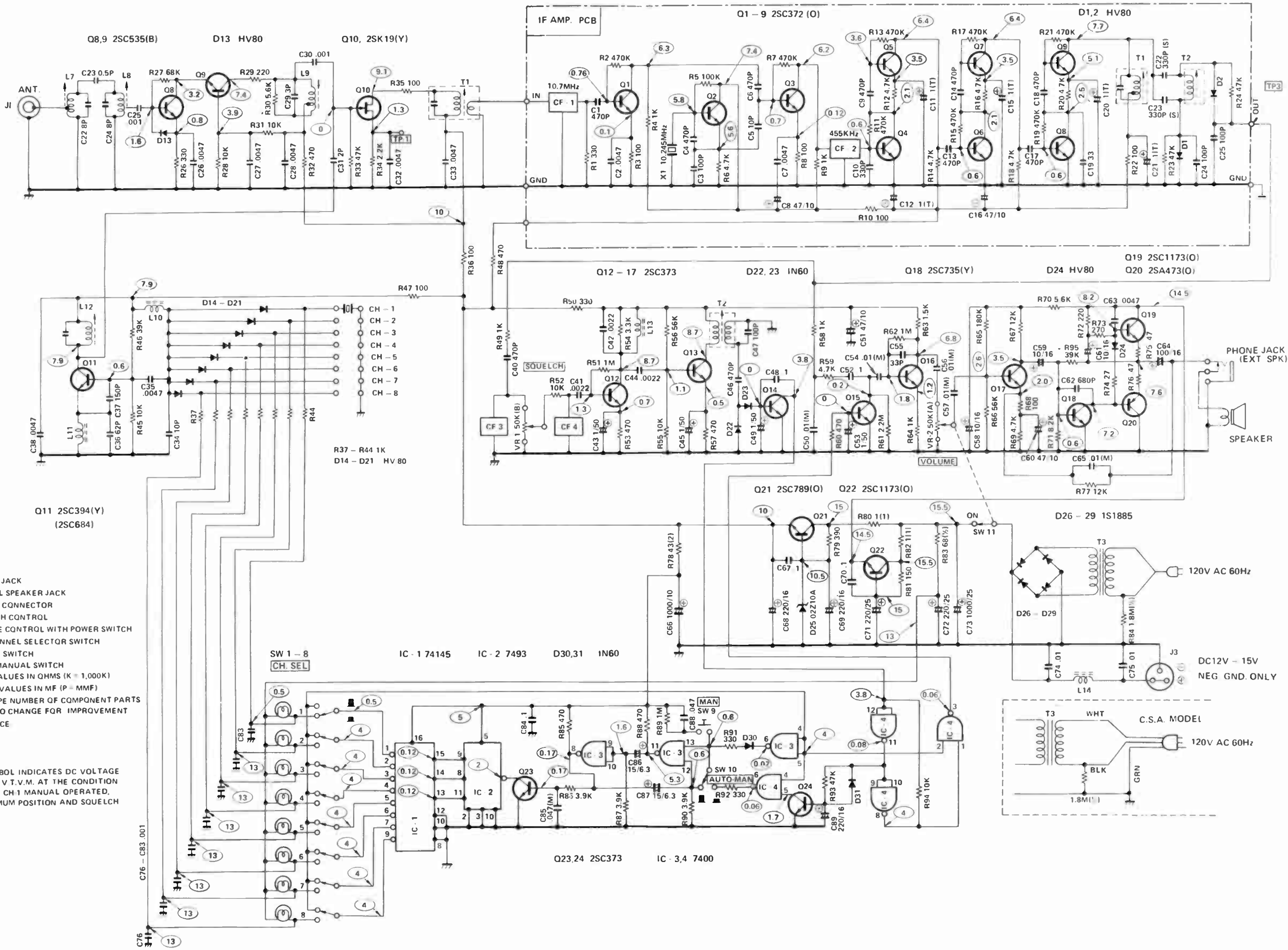
The crystal frequencies required are found by the following formula. Fr is the desired frequency to be received in MHz.

Crystal Frequency = (Fr − 10.7)/3

ALIGNMENT LOCATIONS



SCHEMATIC DIAGRAM



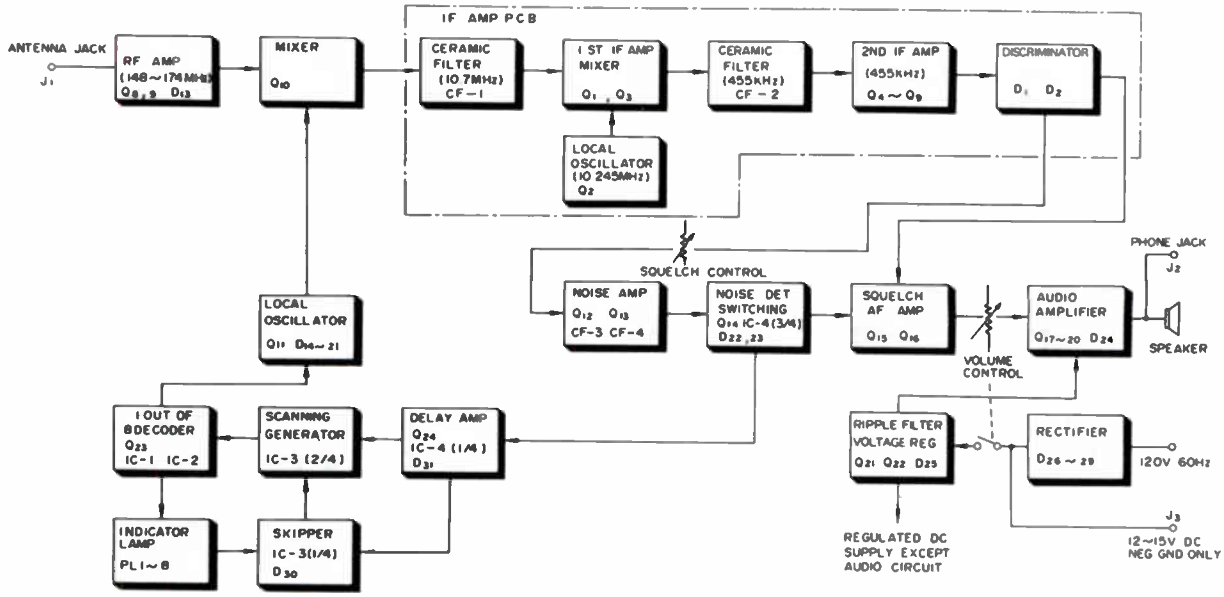
FUNCTION

J1 ANTENNA JACK
J2 EXTERNAL SPEAKER JACK
J3 DC POWER CONNECTOR
VR 1 SQUELCH CONTROL
VR 2 VOLUME CONTROL WITH POWER SWITCH
SW 1 – 8 CHANNEL SELECTOR SWITCH
SW 9 MANUAL SWITCH
SW 10 AUTO/MANUAL SWITCH
RESISTANCE VALUES IN OHMS (K = 1,000K)
CAPACITANCE VALUES IN MF (P = MMF)
RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

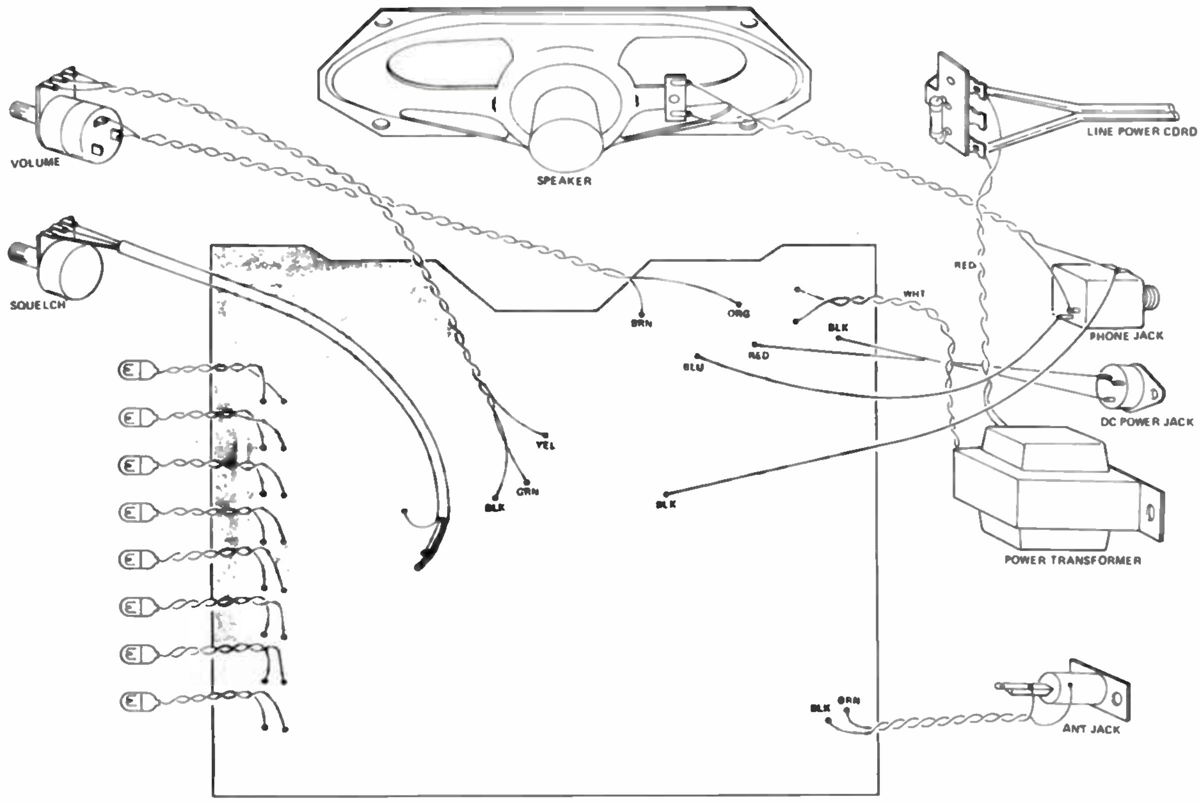
REMARKS

THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF HIGH BAND CH 1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQUELCH OUT POSITION.

BLOCK DIAGRAM



WIRING DIAGRAM



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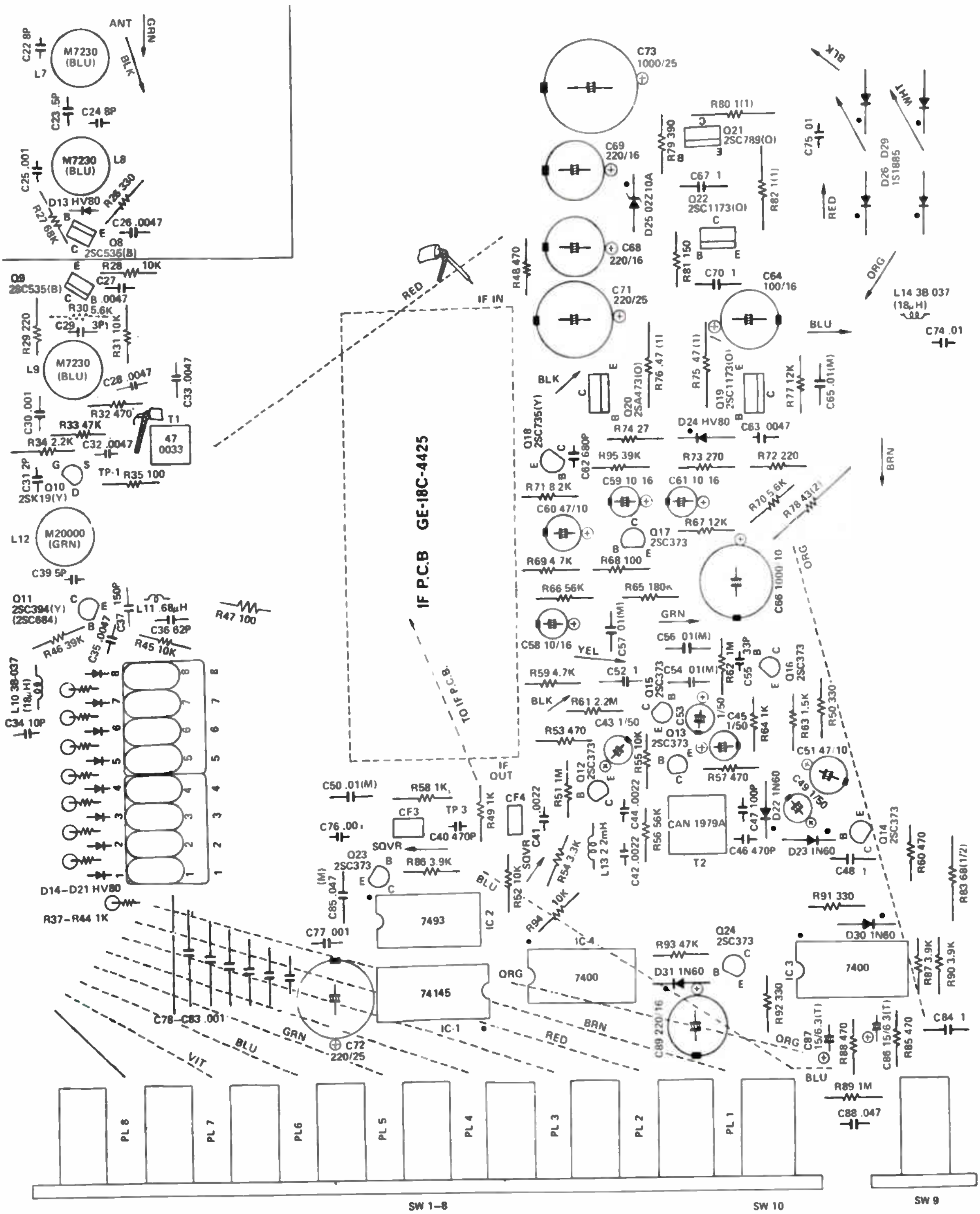
MAIN P.C. BOARD (BOTTOM VIEW)



CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	Squelch	VM10A-50KB-20B

ITEM	DESCRIPTION	PART NO.
VR1	Squelch	VM10A-50KB-20B/P-1109
VR2	Volume	VM11A-50KA-20B/P-1108

MISCELLANEOUS

ITEM	NAME	PART NO.
S1	Switch, VHF Low/ VHF High/UHF	518-2122/S-0463
S2	Switch, Selectivity	518-283/S-0464
S3	Switch, AF Filter	S-J0607/S-0211
S4	Switch, Power	(1)
CR1	Component Combination	C-0271
CR2	Component Combination	C-0271
	Tuner, Front End Lo Band	3SN3-351P/C-4245
	Tuner, Front End Hi Band	3SN3-352P/C-4246
	UHF Converter	C-4247
	Crystal Filter	FGC-103-1/CA-2583
	Printed Circuit Board	59B-S-3401
	AC Cord	W1311 (2)
	3P AC Cord	CSAPOT-64 (3)
	DC Cable with Fuse Holder	W-1312
	Pilot Lamp	L-0295
	Pilot Lamp	L-0296
	Speaker	163-01/S-4215

(1) Part of VT2.
(2) UL Listed
(3) CSA Listed

COILS/TRANSFORMERS

ITEM	PART NO.
L1	EL0610-202K/CB-2090
L2	CB-2107
L3	6LNC-53/CB-2090
T1	R-8822A/CA-6981
T2	R-8822A/CA-6981
T3	R-12-2851/CA-6920
T4	R-12-2875-CA-6921
T5	R-1787/CA-6685
T6	K-0869E/TA-0269 (1)
	K-2064 (2)

(1) UL Listed
(2) CSA Listed.

CABINET PARTS

NAME	PART NO.
Cabinet	GE-16B-3135/Z-0458
Front Panel	GE-16C-3042/Z-0459
Dial Window	GE-16C-3162/G-0083
Dial Back Plate	GE-16B-2886/D-5033
Dial Pointer Red for Lo	GE-12A-794(A)/D-1031
Dial Pointer Blue for Hi	GE-12A-794(B)/D-1032
Knob, Tuning	GE-16D-2863/K-0912
Knob, Volume/Squelch	GE-16D-286/K-0913
Knob, Band/Selectivity	GE-16D-2863/K-0913

TRANSISTOR VOLTAGE CHART

1. Power Supply Voltage = 120 VAC
2. All voltage readings are with no input signal

		VOL. CONT. MAX. SQ. CONT. MIN.	SQ. CONT. MAX.	VOL. CONT. MAX. SQ. CONT. MIN.		
Q10	B	1.47 V DC		Q21	B	8.65 V DC
	E	0.83			E	8.2
	C	8.2			C	15.9
Q11	B	1.5		Q22	B	7.75
	E	0.88			E	8
	C	8.1			C	0
Q13	B	1.66		Q23	B	1.68
	E	1.05			E	1.0
	C	6.85			C	3.1
Q14	B	1.3		Q24	B	3.8
	E	0.53			E	3.1
	C	4.3			C	7.85
Q15	B	0	0.63	Q25	B	10
	E	0	0		E	9.5
	C	0.63	0		C	14.6
Q16	B	0.63	0	Q26	B	16.5
	E	0	0		E	15.9
	C	0	0.06		C	16.9
Q17	B	0	0.06	IC1	3	6.6
	E	0	0		5	6.9
	C	5.3	0		6	1.9
Q18	B	1.5	0	IC2	3	4.8
	E	0.8			5	7.0
	C	4.1			6	1.9
Q19	B	2.95				
	E	2.3				
	C	3.9				
Q20	B	0.66				
	E	0				
	C	7.75				

Remarks: DC Voltages Measured with V.T.V.M. (±5%)

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D2	HV80	
D3	HV80	
D4	1N60	
D5	1N60	
D6	HV80	
D7	HV80	
D8	ZB-1	R07105
D9	1S1885	
D10	1S1885	
D11	1S1885	
D12	1S1885	
S13	1S1885	
IC1	TA7061AP	
IC2	TA7061AP	
Q10	2SC371-0	
Q11	2SC371-0	
Q13	2SC373	
Q14	2SC373	
Q15	2SC373	
Q16	2SC373	
Q17	2SC373	
Q18	2SC373	
Q19	2SC373	
Q20	2SC735-Y	
Q21	2SD235-0	
Q22	2SB435-0	
Q23	2SC394-0	
Q24	2SC394-0	
Q25	2SC1173-0	
Q26	2SC1173-0	

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C28	1uF 50V	CE04WIH010
C29	1uF 50V	CE04WIH010
C32	10uF 16V	CE04WIC100C
C33	10uF 16V	CE04WIC100C
C37	10uF 16V	CE04WIC100C
C38	10uF 16V	CE04WIC100C
C39	4.7uF 16V	CE04WIC4R7
C41	10uF 16V	CE04WIC100C
C42	47uF 16V	CE04WIC470B
C52	100uF 16V	CE04WIC1018
C53	100uF 16V	CE04WIC1018
C54	220uF 25V	CE04WIC221
C55	470uF 25V	CE04WIC471A
C56	470uF 25V	CE04WIC471A

GENERAL ALIGNMENT

Test equipment required:

–1. Oscilloscope
–2. Slow sweep generator with variable marker (10.7MHz)
–3. UHF sweep generator with variable marker (450 ~ 470MHz)
–4. VHF sweep generator with variable marker (30 ~ 50MHz , 152 ~ 174MHz)
–5. AC V.T.V.M.
–6. DC V.T.V.M.
–7. 8 ohm dummy load

NOTE: Use a non-metallic alignment tool.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible.

IF SECTION ALIGNMENT

Maintain output of sweep generator at a low level to prevent saturation resulting from overloading. Adjust either of the VHF Front end L4 Coils, then the IF Section T1, T2, T4 and T5 for best linearity (using the 15 kHz selectivity switch position) so that the 10.7 MHz marker is in the center of the discriminator curve as shown in Figure 4.

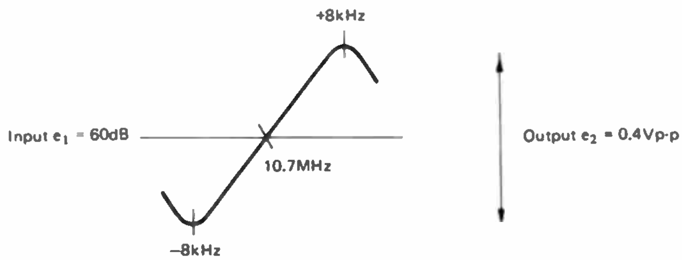


Figure 4.

Adjust VHF Lo Front end L4, IF Section T3, T4 and T5 for best linearity (using the 5kHz selectivity switch position) so that the 10.7MHz marker is in the center of the discriminator curve.
Adjust VHF Hi Front end L4 and repeat steps 3 and 4 until no further improvement can be made.

VHF FRONT END ALIGNMENT

Set the frequency at 32MHz (or 154MHz) and adjust L5 to 32MHz (or 154MHz) for maximum reading on the V.T.V.M.
Next adjust L1 (Antenna coil) and L2 (RF coil) for maximum reading on the V.T.V.M.
Set the frequency at 48MHz (or 172MHz) and adjust TR3 on the Lo (or Hi Front end) for maximum reading on the V.T.V.M.
Next adjust TR1 and TR2 for maximum reading on the V.T.V.M.
Repeat above steps until no further improvement can be made.
Repeat for the other band (Hi or Lo as required).

UHF CONVERTER ALIGNMENT

Adjust CT1, CT2, L2 and L3 of UHF converter section for maximum output with an output wave form as shown in Figure 8.

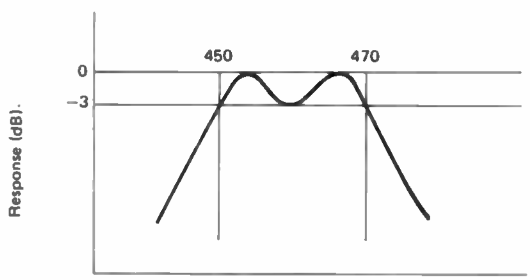


Figure 8.

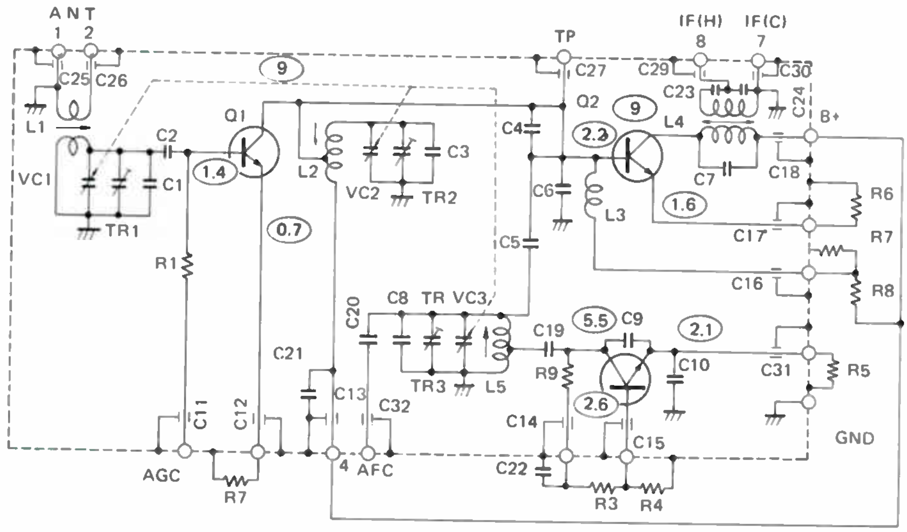
A 50-ohm coaxial cable should be used on these all connections; Keep its leads as short as possible. If it becomes necessary to move or replace parts on this UHF sub-assembly, be sure to position the parts exactly as originally, or replace the entire sub-assembly.

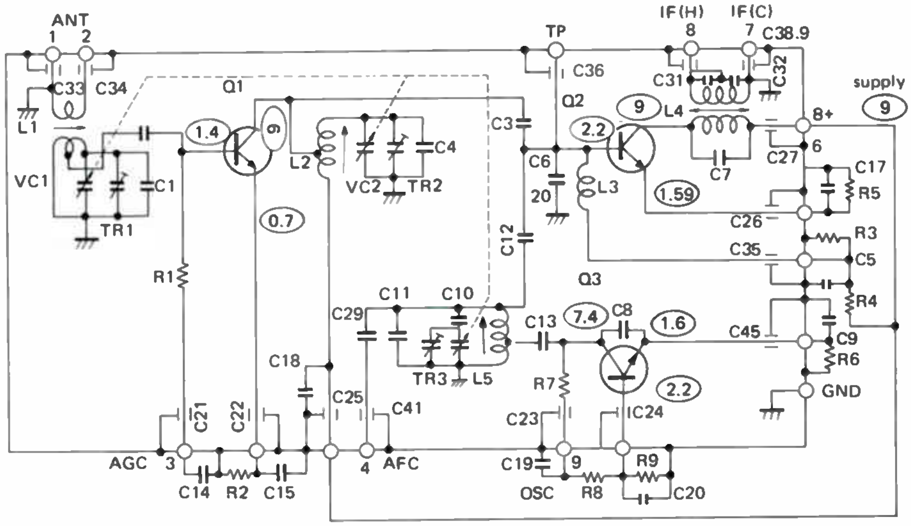
UHF LOCAL OSCILLATOR ADJUSTMENT

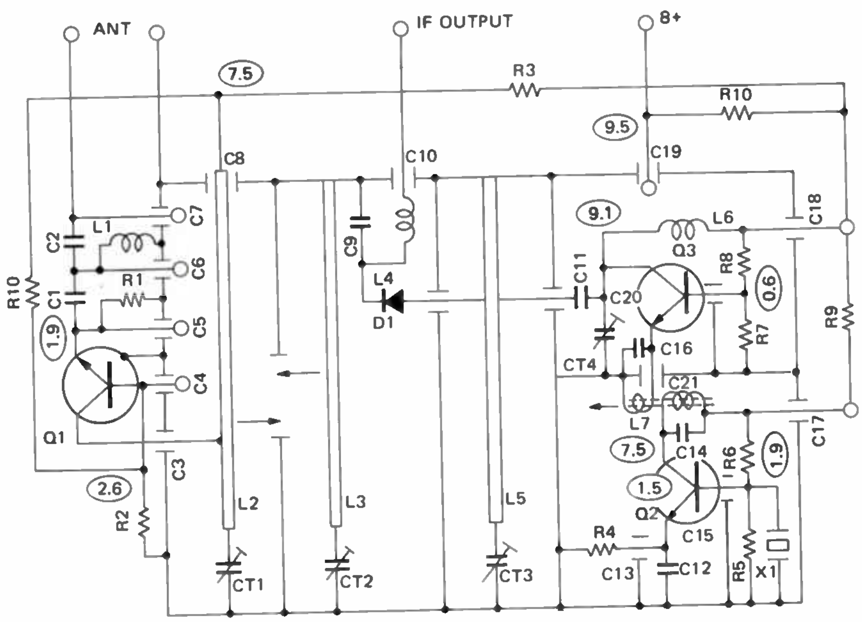
NOTE: Crystal frequency 105MHz.

Adjust L7 to obtain 105MHz oscillation.
Adjust CT4 to 210MHz.
Adjust CT3 to 420MHz.

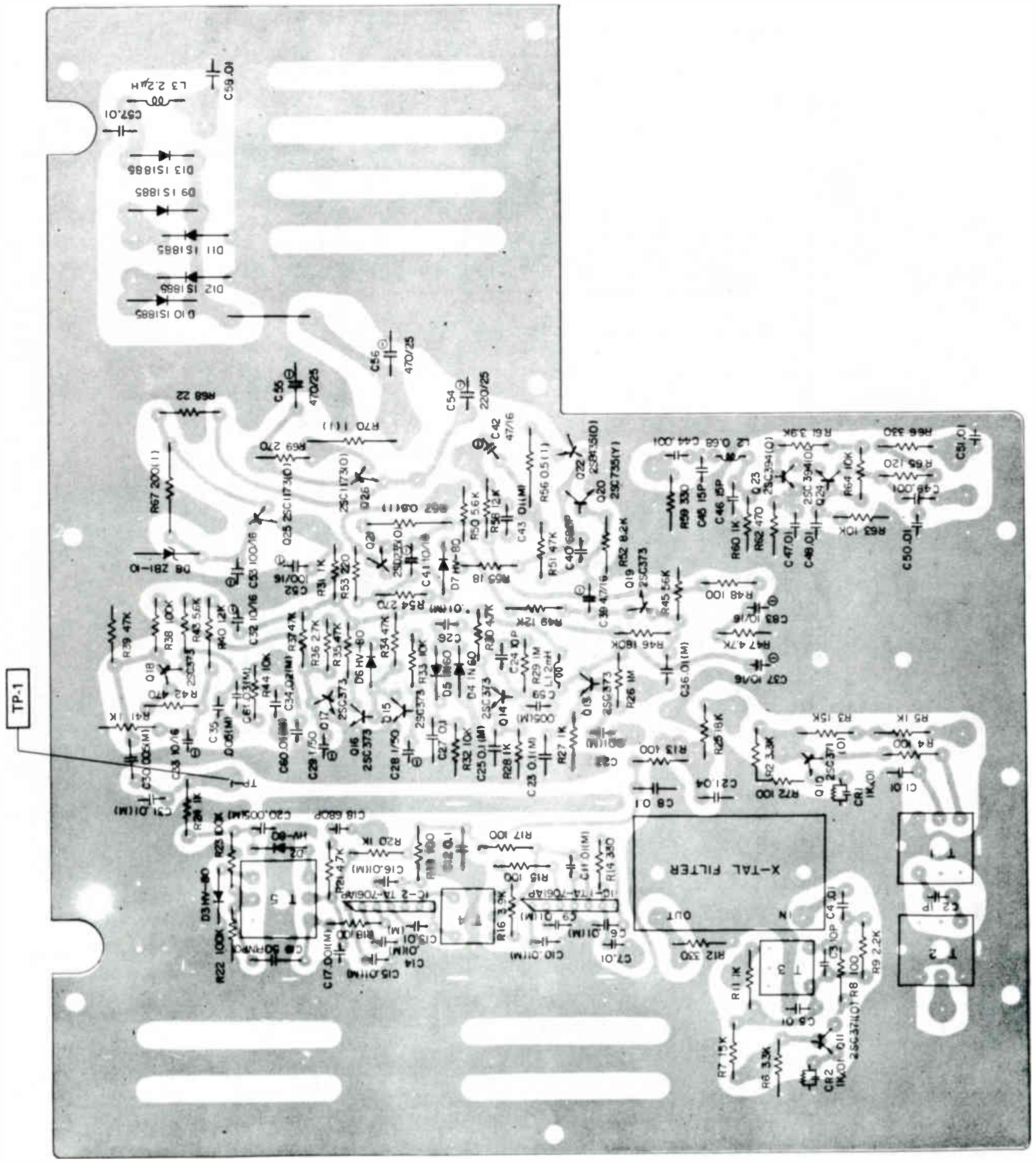
12. VHF LOW BAND FRONT END SCHEMATIC DIAGRAM





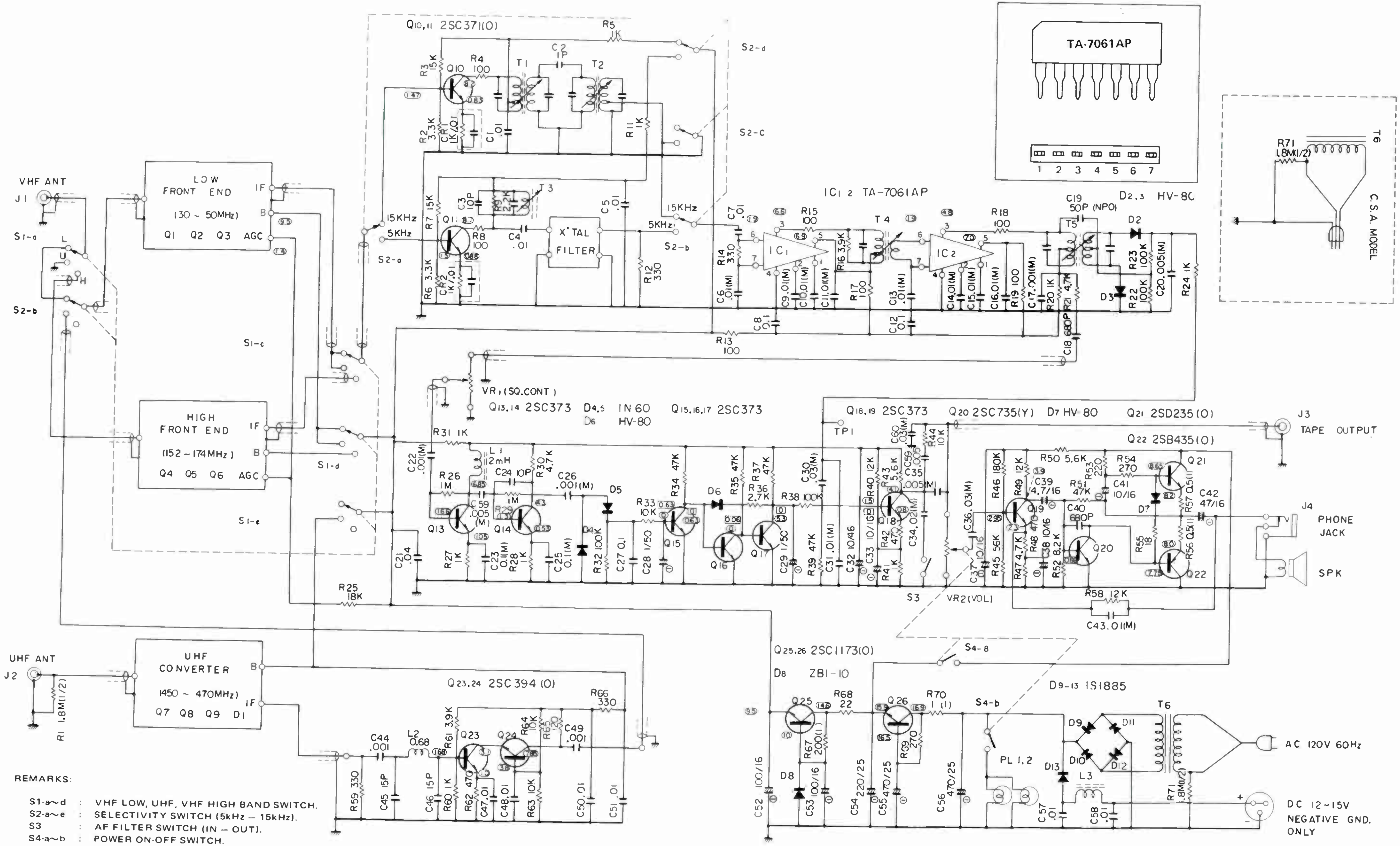


PRINTED CIRCUIT BOARD (TOP VIEW)



TROUBLE SHOOTING CHART

Symptom	Possible Cause
1) Pilot lamp does not light and/or set fails to operate when power is on.	A) Faulty line power cord. B) Defective power transformer. C) Defective power rectifier. D) Defective power switch. E) Defective Q25, 26 and/or associated circuit components. F) Defective pilot lamp
2) Squelch control does not function.	A) Q13, 14 or Q15, 16, 17 defective. B) D4, 5 or D6 defective. C) Faulty VR1.
3) No sound on either VHF or UHF.	A) Faulty Audio amplifier circuit component. B) Faulty IF amplifier circuit component. C) Defective phone jack. D) Defective zener diode D8.
4) No sound on VHF only.	A) Faulty VHF front end Hi or Lo local oscillator circuit component. B) Defective Band selector switch S1-a-d. C) Faulty VHF RF or MIX. circuit component.
5) No sound on UHF only.	A) Faulty UHF front end local oscillator circuit component. B) Defective Band selector switch S1-a-d. C) Faulty UHF RF or MIX. circuit component.
6) Does not operate on DC.	A) Defective D13. B) Defective C57, 58. C) Faulty DC cable.



REMARKS:

S1-a~d	:	VHF LOW, UHF, VHF HIGH BAND SWITCH.
S2-a~e	:	SELECTIVITY SWITCH (5kHz – 15kHz).
S3	:	AF FILTER SWITCH (IN – OUT).
S4-a~b	:	POWER ON-OFF SWITCH.
VR1	:	SQUELCH CONTROL.
VR2	:	VOLUME CONTROL, w/POWER SWITCH.
	:	RESISTANCE VALUES IN OHMS (k = 1000).
	:	CAPACITANCE VALUES IN MF (P = MMF).
	:	DC VOLTAGE (MEASURED BY V.T.V.M.).
	:	DC VOLTAGE (SQUELCH CONTROL AT MAXIMUM CONDITION).

ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

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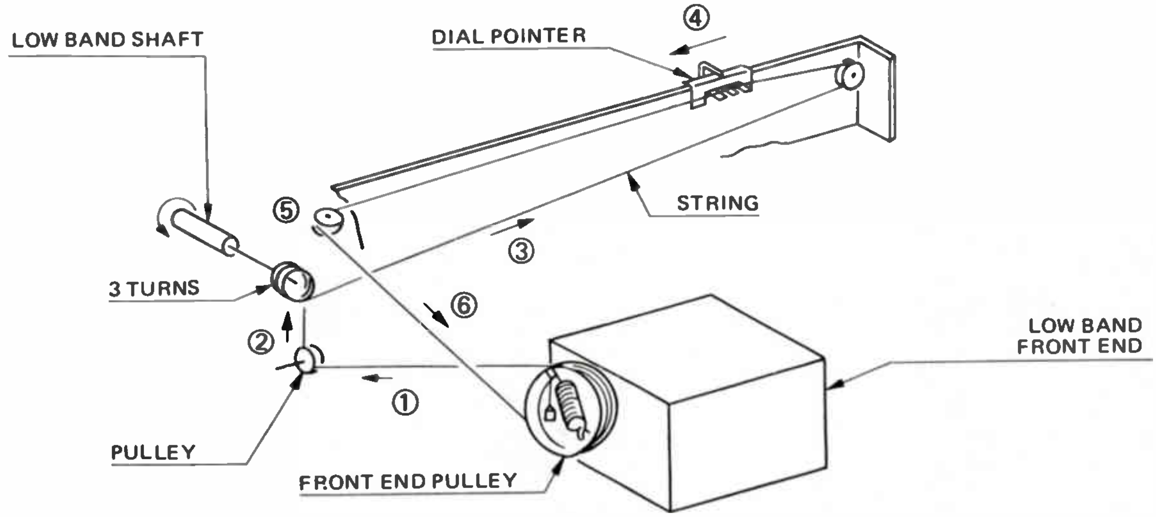
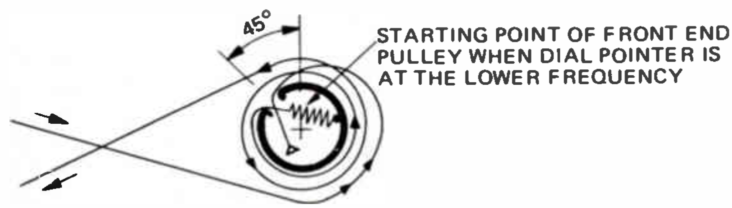
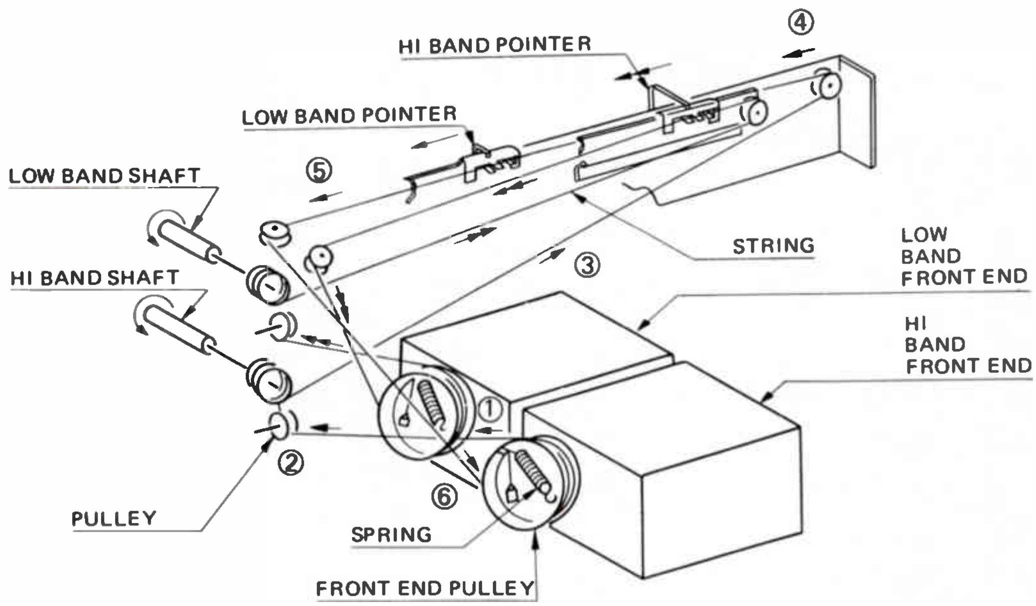
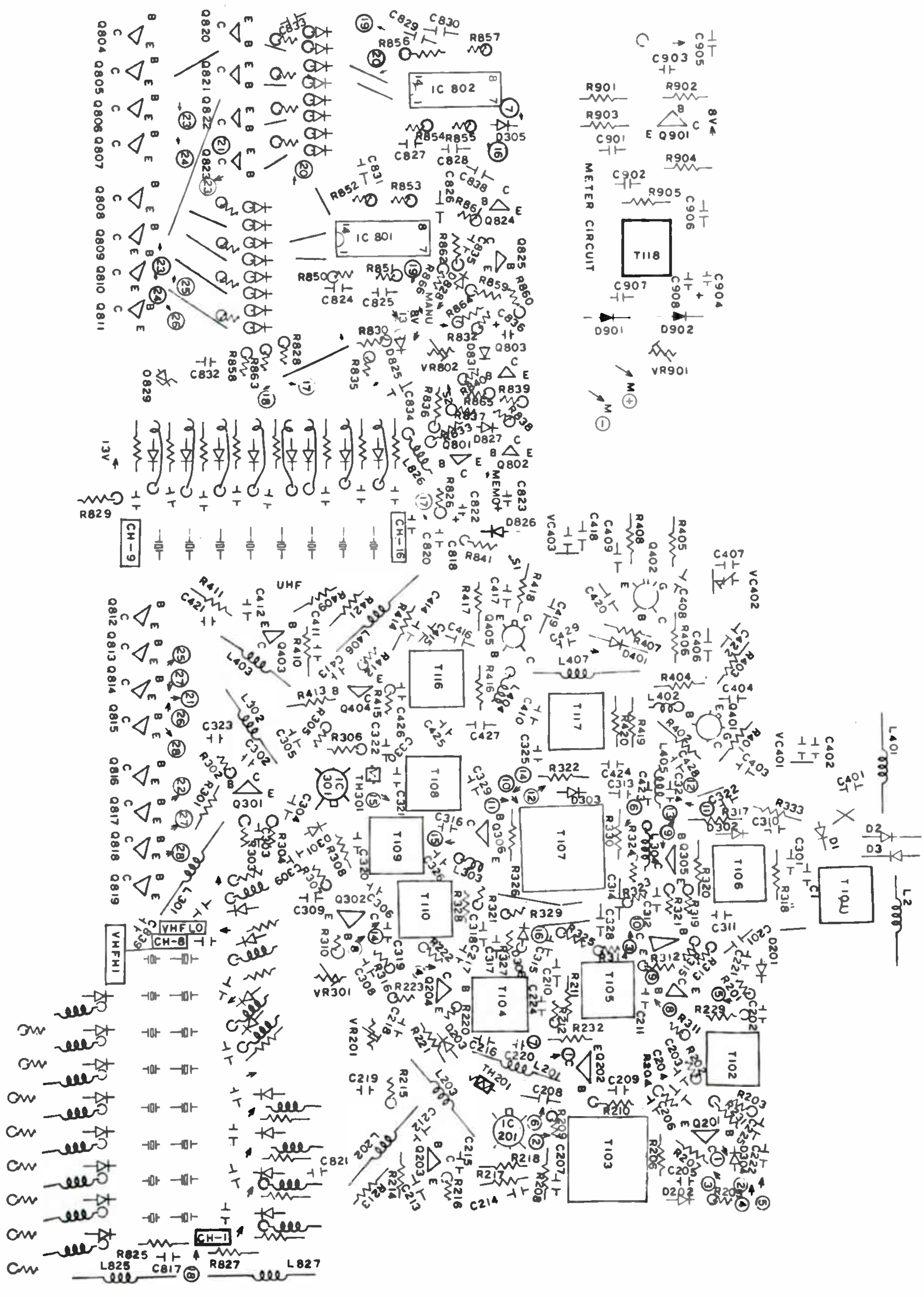
DIAL STRING ASSEMBLY



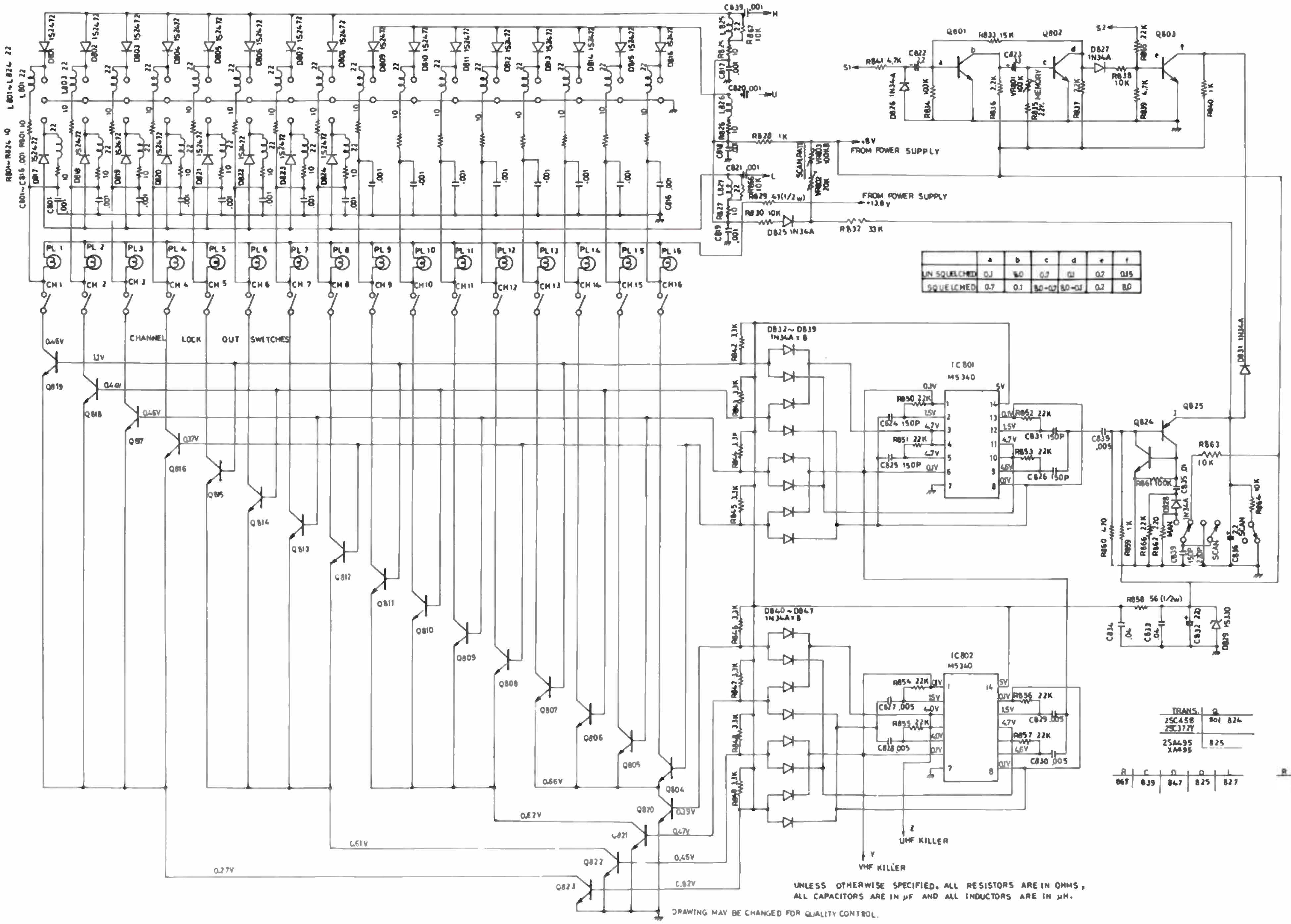


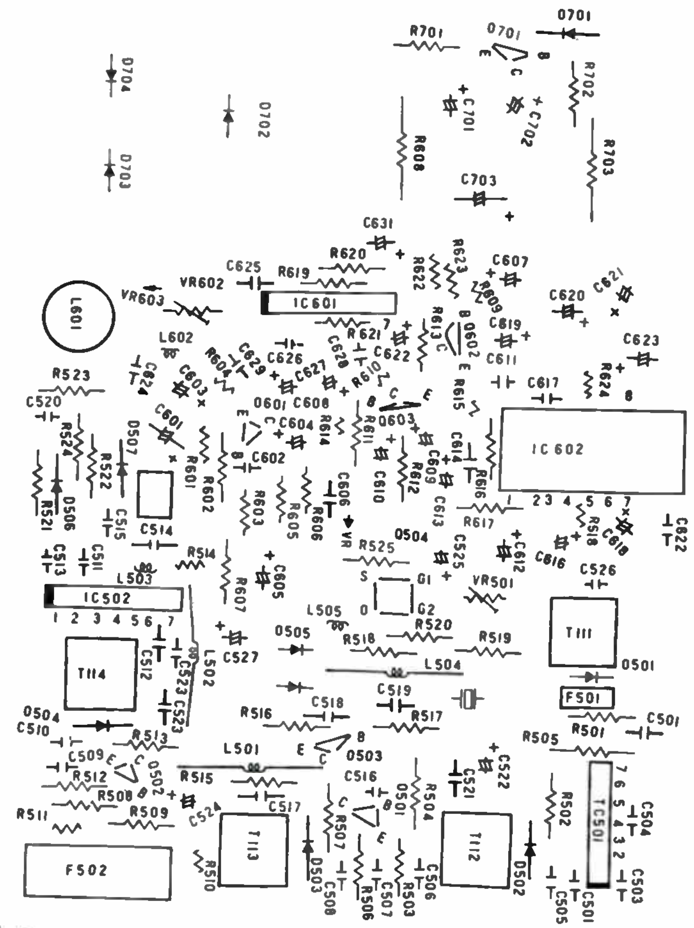


NOTE: Numbers show the sequence of the stringing procedures.



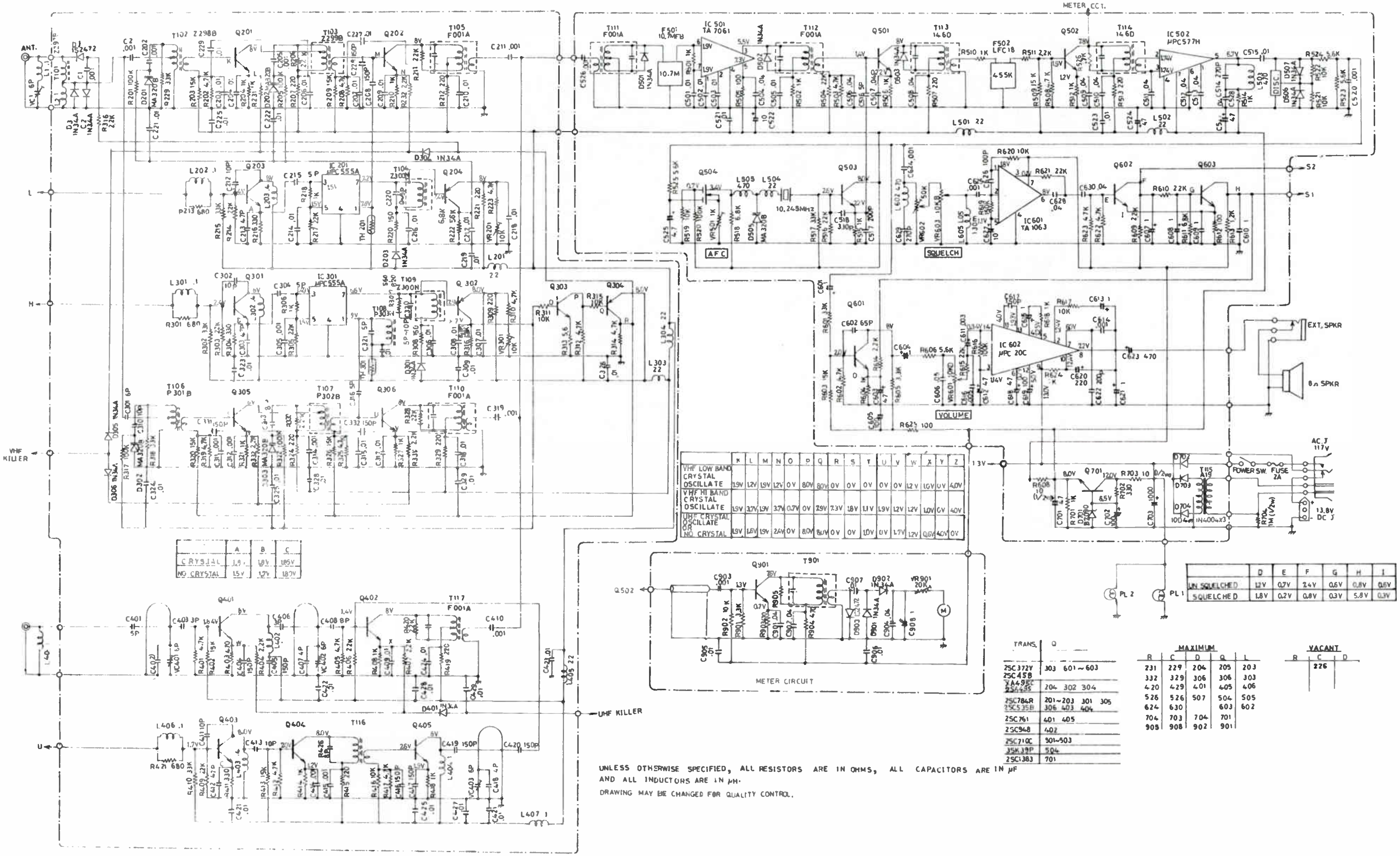
Midland 13-950





COILS/TRANSFORMERS

ITEM	PART NO.
L1	13-178154
L2	13-178155
L201	13-178151
L202	13-178154
L203	13-178153
L301	13-178154
L302	13-178153
L303	13-178151
L304	13-178151
L401	13-178155
L402	13-178155
L404	13-178155
L405	13-178151
L406	13-178154
L407	13-178155
L501	13-178151
L502	13-178151
L503	13-178152
L504	13-178151
L505	13-178152
L602	13-178152
L605	13-178110
L801	13-178151
L802	13-178151
L803	13-178151
L804	13-178151
L805	13-178151
L806	13-178151
L807	13-178151
L808	13-178151
L809	13-178151
L810	13-178151
L811	13-178151
L812	13-178151
L813	13-178151
L814	13-178151
L815	13-178151
L816	13-178151
L817	13-178151
L818	13-178151
L819	13-178151
L820	13-178151
L821	13-178151
L822	13-178151
L823	13-178151
L824	13-178151
L825	13-178151
L826	13-178151
L827	13-178151
T101	13-094072
T102	13-094073
T103	13-094074
T104	13-094071
T105	13-094047
T106	13-094068
T107	13-094069
T108	13-094070
T109	13-094071
T110	13-094047
T111	13-094047
T112	13-094047
T113	13-090282
T114	13-090282
T116	13-094004
T117	13-094047



	A	B	C
CRYSTAL	1.9	1.8V	18.5V
NO CRYSTAL	1.5V	1.7V	18.0V

	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
VHF LOW BAND CRYSTAL OSCILLATE	1.9V	1.2V	1.9V	1.2V	0V	8.0V	8.0V	0V	0V	0V	0V	0V	1.2V	1.0V	0V	4.0V
VHF HI BAND CRYSTAL OSCILLATE	1.9V	3.7V	1.9V	3.7V	0.7V	0V	7.9V	7.3V	1.8V	1.1V	1.9V	1.2V	1.2V	1.0V	0V	4.0V
UHF CRYSTAL OSCILLATE OR NO CRYSTAL	1.9V	1.6V	1.9V	2.4V	0V	8.0V	8.0V	0V	0V	1.0V	0V	1.7V	1.2V	0.6V	4.0V	0V

	D	E	F	G	H	I
UN SQUELCHED	1.2V	0.7V	2.4V	0.6V	0.8V	0.6V
SQUELCHED	1.8V	0.2V	0.8V	0.3V	5.8V	0.3V

TRANS.	Q
2SC372Y 2SC458	303 601~603
YA495C 2SA495	204 302 304
2SC784R 2SC535B	201~203 301 305 306 403 404
2SC761	401 405
2SC948	402
2SC710C	501~503
3SK39P	504
2SC1383	701

MAXIMUM

R	C	D	Q	L
231	229	204	205	203
332	329	306	306	303
420	429	401	405	406
526	526	507	504	505
624	630		603	602
704	703	704	701	
905	908	902	901	

VACANT

R	C	D
	226	

UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS, ALL CAPACITORS ARE IN μF AND ALL INDUCTORS ARE IN μH.

DRAWING MAY BE CHANGED FOR QUALITY CONTROL.

IC801	09-808015	M5340P
IC802	09-308015	M5340P
Q201	09-302095	2SC784R
	09-302095	2SC535B
Q202	09-302095	2SC784R
	09-302095	2SC535B
Q203	09-302095	2SC784R
	09-302095	2SC535B
Q204	09-304012	XA495C
Q301	09-302095	2SC784R
	09-302095	2SC535B
Q302	09-304012	XA495C
Q303	09-302039	2SC372Y
	09-302039	2SC403C
Q304	09-304012	XA495C
Q305	09-302095	2SC784R
	09-302095	2SC535B
Q306	09-302095	2SC784R
	09-302095	2SC535B
Q401	09-302149	2SC761
Q402	09-302148	2SC948
Q403	09-302095	2SC784R
	09-302095	2SC535B
Q404	09-302095	2SC784R
	09-302095	2SC535B
Q405	09-302149	2SC761
Q501	09-302012	2SC710C
Q502	09-302012	2SC710C
Q503	09-302012	2SC710C
Q504	09-305040	3SK39P(FET)
Q601	09-302039	2SC372Y
	09-302039	2SC403C
Q602	09-302039	2SC372Y
	09-302039	2SC403C
Q603	09-302039	2SC372Y
	09-302039	2SC403C
Q701	09-302155	2SC1383
Q801	09-302039	2SC372Y
	09-302039	2SC403C
Q802	09-302039	2SC372Y
	09-302039	2SC403C
Q803	09-302039	2SC372Y
	09-302039	2SC403C
Q804	09-302039	2SC372Y
	09-302039	2SC403C
Q805	09-302039	2SC372Y
	09-302039	2SC403C
Q806	09-302039	2SC372Y
	09-302039	2SC403C
Q807	09-302039	2SC372Y
	09-302039	2SC403C
Q808	09-302039	2SC372Y
	09-302039	2SC403C
Q809	09-302039	2SC372Y
	09-302039	2SC403C
Q810	09-302039	2SC372Y
	09-302039	2SC403C
Q811	09-302039	2SC372Y
	09-302039	2SC403C
Q812	09-302039	2SC372Y
	09-302039	2SC403C
Q813	09-302039	2SC372Y
	09-302039	2SC403C
Q814	09-302039	2SC372Y
	09-302039	2SC403C
Q815	09-302039	2SC372Y
	09-302039	2SC403C
Q816	09-302039	2SC372Y
	09-302039	2SC403C
Q817	09-302039	2SC372Y
	09-302039	2SC403C
Q818	09-302039	2SC372Y
	09-302039	2SC403C
Q819	09-302039	2SC372Y
	09-302039	2SC403C
Q820	09-302039	2SC372Y
	09-302039	2SC403C
Q821	09-302039	2SC372Y
	09-302039	2SC403C
Q822	09-302039	2SC372Y
	09-302039	2SC403C
Q823	09-302039	2SC372Y
	09-302039	2SC403C
Q824	09-302039	2SC372Y
	09-302039	2SC403C
Q825	09-304012	XA495C
		2SC403C

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C110	77-337227	220uF 16V
C121	77-337107	10uF 16V
C522	77-337107	10uF 16V
C524	77-337476	47uF 16V
C525	77-337475	4.7uF 16V
C527	77-337476	47uF 16V
C603	77-337476	47uF 16V
C612	77-337476	47uF 16V
C618	77-337476	47uF 16V
C619	77-337107	100uF 16V
C620	77-338227	220uF 16V
C623	77-337477	470uF 16V
C631	77-337107	100uF 16V
C701	77-337476	47uF 16V
C702	77-337107	100uF 16V
C703	77-337108	1000uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R608	77-202100	10 ohms 1/2W
R703	77-202100	10 ohms 1/2W
R829	77-202470	47 ohms 1/2W
VR601	13-160087	Volume
VR602	13-166048	Squelch
VR801	13-166039	Memory
VR803	13-166039	Scan Rate

MISCELLANEOUS

ITEM	NAME	PART NO.
F501	10.7MHz Filter	13-179021
F502	455kHz Filter	13-179022
	AC Power Cord	13-034049
	DC Power Cord	13-034062
	Meter	13-200047
	Speaker, 8 ohms	13-060073
	Switch, 16 Section	13-188005
	Switch, 2 Section	13-183164

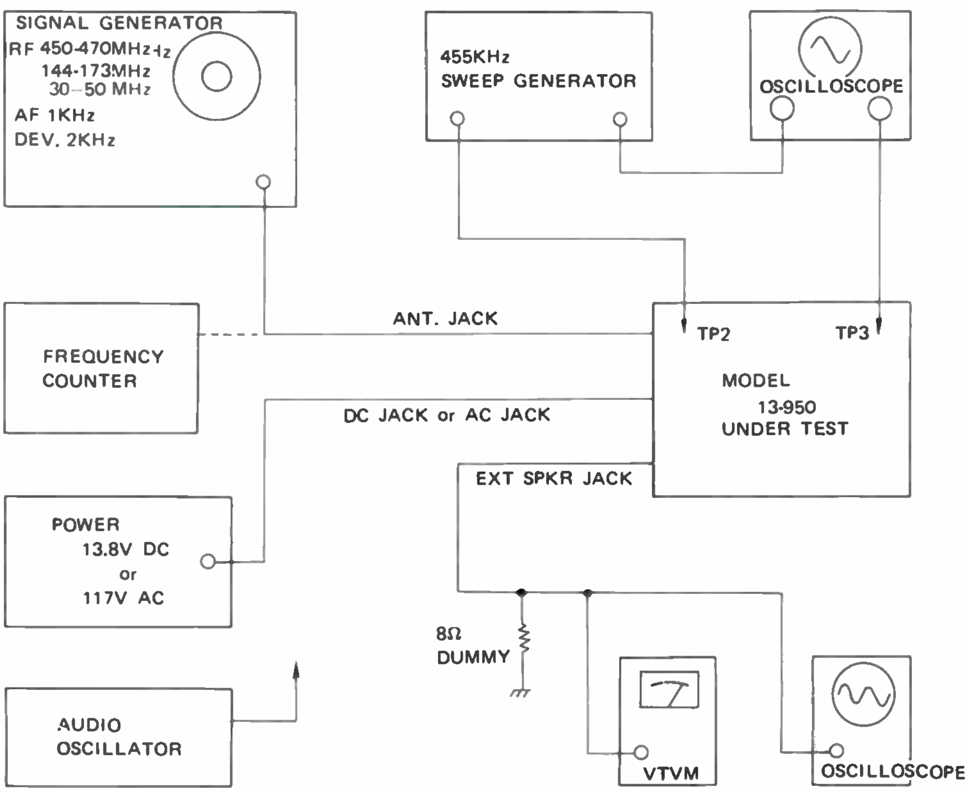
CABINET PARTS

NAME	PART NO.
Case, Bottom	13-010209
Case, Top	13-010208
Inside Cover	13-158285
Knob, 4 Used	13-110149

TEST EQUIPMENTS REQUIRED

1. POWER SOURCE: of 13.8 V DC capable of 1 amp. regulated (Hewlett-Packard model 6201B or equivalent)
2. AUDIO GENERATOR: frequency range of 200Hz to 5KHz or more. (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER: capable of counting up to 200MHz or more (Hewlett-Packard model 5246L with convertor model 5253B or equivalent)
4. OSICLLOSCOPE: 450KHz bandwidth. (Hewlett-Packard model 120B or equivalent)
5. VACUUM TUBE VOLT METER: 1mV to 50V, 1MHz (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR: capable of tuning 455KHz, 10.7MHz, 33-48MHz, 144-173MHz, 450-470MHz for narrow
7. SWEEP GENERATOR: capable of tuning 450, 455 and 460KHz.

TEST CONNECTION



SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	09-306219	1S2472
D2	09-306020	1N34A
D3	09-306020	1N34A
D201	09-306240	MA320B
D202	09-306240	MA320B
D203	09-306020	1N34A
D302	09-306040	MA320B
D303	09-306240	MA320B
D304	09-306020	1N34A
D305	09-306020	1N34A
D306	09-306020	1N34A
D505	09-306240	MA320B
D701	09-306180	BZ090
D702	09-306149	10D4
	09-306149	1N4004
D703	09-306149	10D4
	09-306149	1N4004
D704	09-306149	10D4
	09-306149	1N4004
D801	09-306219	1S2472
D802	09-306219	1S2472
D803	09-306219	1S2472
D804	09-306219	1S2472
D805	09-306219	1S2472
D806	09-306219	1S2472
D807	09-306219	1S2472
D808	09-306219	1S2472
D809	09-306219	1S2472
D810	09-306219	1S2472
D811	09-306219	1S2472
D812	09-306219	1S2472
D813	09-306219	1S2472
D814	09-306219	1S2472
D815	09-306219	1S2472
D816	09-306219	1S2472
D817	09-306219	1S2472
D818	09-306219	1S2472
D819	09-306219	1S2472
D820	09-306219	1S2472
D821	09-306219	1S2472
D822	09-306219	1S2472
D823	09-306219	1S2472
D824	09-306219	1S2472
D825	09-306020	1N34A
D826	09-306020	1N34A
D827	09-306020	1N34A
D828	09-306020	1N34A
D829	09-306191	1S330
D831	09-306020	1N34A
D832	09-306020	1N34A
D833	09-306020	1N34A
D834	09-306020	1N34A
D835	09-306020	1N34A
D836	09-306020	1N34A
D837	09-306020	1N34A
D838	09-306020	1N34A
D839	09-306020	1N34A
D840	09-306020	1N34A
D841	09-306020	1N34A
D842	09-306020	1N34A
D843	09-306020	1N34A
D844	09-306020	1N34A
D845	09-306020	1N34A
D846	09-306020	1N34A
D847	09-306020	1N34A
IC201	09-308013	uPC555A
IC301	09-308013	uPC555A
IC501	09-308041	TA7061
IC502	09-308052	uPC577H
IC601	09-308043	TA7063
IC602	09-308053	uPC20C

6-2 First IF Section

6-2-1 Apply a 10.7MHz unmodulated signal to the base of Q202 or Q306 through 0.001μF capacitor.

6-2-2 Adjust T105, (110), 111 and 112 for maximum noise quieting while decreasing the output of the signal generator. 100μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-3 RF Section

6-3-1 Short out T101

6-3-2 Apply a channel frequency in High Band from signal generator to antenna connector of the unit. Modulation of signal generator should be 1KHz with 2KHz deviation.

6-3-3 Adjust T106, 107, 108 and 110 on High Band for best audio wave form (in terms of sine wave form), while decreasing output of signal generator.

6-3-4 Change the frequency of signal generator to Low Band channel frequency.

6-3-5 Adjust T102, 103 and 105 for Low Band RF section alignment.

6-3-6 Change the frequency of signal generator to UHF Band channel frequency.

6-3-7 Adjust VC401, 402, 403, T116 and T117 for UHF Band RF section alignment.

6-3-8 Adjust T110 (T105), T111 and 112 to obtain best audio wave in terms of sine wave on oscilloscope while decreasing the output of signal generator.

6-3-9 Check the difference between noise level and signal level on VTVM. If it is less than 3db your adjustment is correct.

6-3-10 T 101 should be replaced in the circuit.

7. TIGHT SQUELCH

7-1 From signal generator apply any freuqency modulated at 1KHz with 2KHz devaition to antenna connector.

7-2 Turn squelch control fully clockwise.

7-3 Increase the signal generator output until the audio output is silenced.

7-4 Slowly decrease the generator output until audio is heard or seen on the oscilloscope. Generator output level should be 1 to 0.5μV to open squelch.

7-5 By adjusting V 602 the tight squelch level can be varied.

FREQUENCY AND CRYSTAL

Once your have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

Low Band (30-50MHz)

Crystal Frequency	:	Channel Frequency+10.7MHz
Frequency Tolerance	:	+2,000, -1,500Hz
Crystal Type	:	HC-25/U (Plug-in Type)
Series Resonance	:	-450Hz ; Third Overtone
maximum Impedance	:	35Ω
Drive Level	:	2mW
Shunt Capacitancw	:	Less than 6pF

High Band (144-173MHz)

Crystal Frequency	:	(Channel Frequency -10.7MHz)/3
Frequency Tolerance	:	+1,000, -800Hz
Crystal Type	:	HC-25/U (Plug-in Type)
Series Resonance	:	-450Hz ; Third Overtone
Maximum Impedance	:	35Ω
Drive Level	:	2mW
Shunt Capacitance	:	Less than 6pF

HOW AND WHERE TO ORDER REPLACEMENT PARTS

NOTE: To eliminate error and speed delivery of replacement parts, always include the following information on your order:

1. Complete identification of merchandise for which the part is wanted.
   A. Name Item
   B. Model Number
   C. Serial Number

2. Best possible identification of the part itself.
   A. Part Number
   B. Part Name
   C. Quantity
   D. If necessary, return old part as sample.

3. Customer should use address listed below when ordering replacement parts.
   MIDLAND ELECTRONICS COMPANY
   Parts Department
   110 West 12th Street
   North Kansas City, Missouri 64116

Pages 83-91 Courtesy of MIDLAND CONSUMER PRODUCTS DIV.

ALIGNMENT

1. Connect all test equipment as illustrated in Fig. 1.
2. Check all voltage readings as shown on schematic diagram.
3. AF SECTION

3-1 Apply a 1KHz audio signal to VR 601.
On the oscilloscope check the wave form of the audio power and volume control. (Audio clipping level is near 3V at 8 ohms load.)

4. DISCRIMINATOR
Due to a ceramic discriminator being employed in this model, alignment of the discriminator is not necessary.

5. CRYSTAL OSCILLATOR

5-1 Second Local Oscillator and A.F.C.

5-1-1 Check for specified frequency of second local oscillator (10.245MHz) at the base of Q 501.

5-1-2 Short out resistor R 523.

5-1-3 Adjust VR 501 to obtain the second local oscillator frequency of 10.245MHz±1KHz.

5-1-4 Adjust T 112, 113 and 114 for maximum noise level on the oscilloscope or volt-meter at speaker.

5-1-5 Re-check the frequency of the second local oscillator. If the frequency is 10.245MHz±2KHz, the oscillator is functioning properly. Repeat alignment steps 5-1-1 through 5-1-4 if the oscillator frequency is below or above the specified frequency

5-2-1 The emitter voltage of Q301 (High Band) or Q203 (Low Band) or Q403 (UHF Band) should increase slightly when a crystal is placed in an operative channel. No increase in voltage indicates either a defective crystal or the oscillator is malfunctioning.

5-2-2 Automatic Self Tuning Control for RF Stages. The check point on High Band is the collector of Q302, Low Band Q204 collector.

5-2-3 Place a 144MHz crystal in an operative channel. Adjust VR301 to obtain a 1 volt or less indication at the collector of Q302. Place a 33MHz crystal in an operative channel. Adjust VR201 to obtain a 1 volt or less indication at the collector of Q203. Place a 162.55MHz crystal in an operative channel. Adjust T 109 for 5 volts at the collector of Q302. Place a 44MHz crystal in an operative channel. Adjust T104 for 5 volts at the collector of Q204.

Caution:
1. Adjust High Band first.
2. Do not try to obtain peak point in voltage at 162.55MHz on High Band and at 44MHz on Low Band on multimeter for ohm/volt.

For reference, the list below shows approximate voltage at certain frequencies.

frequency	voltage at collector of Q302 and Q204 on High and Low, respectively
144.0MHz	1.0±0.2V
150.0MHz	2.0±0.5V
155.16MHz	3.0±0.5V
162.55MHz	5.0±0.5V
173.0MHz	6.0 or over
33MHz	1.0±0.2V
36MHz	1.5±0.5V
39MHz	2.0±0.5V
41MHz	3.0±0.5V
44MHz	5.0±0.5V
47MHz	6.0 or over

6. IF STAGES

6-1 Second IF Section

6-1-1 Turn volume control to obtain proper audio level (around 0.5W).

6-1-2 Turn squelch control fully counter-clockwise.

6-1-3 Apply a 455KHz, unmodulated signal to the base of Q501 (Second Mixer) through a 0.001μF capacitor.

6-1-4 Adjust T113 and 114 for maximum quieting (minimum noise) while decreasing the output of the signal generator. With the output of the signal generator at about 300μV quieting sensitivity should be around 20db which can be monitored at speaker.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D101	09-306326	1S1587
D102	09-306326	1S1587
D103	09-306326	1S1587
D104	09-306326	1S1587
D105	09-306369	MV201
D106	09-306369	MV201
D301	09-306010	1S188
D302	09-306010	1S188
D501	09-306135	1S1588
D502	09-306135	1S1588
D503	09-306010	1S188
D504	09-306010	1S188
D507	09-306010	1S188
D508	09-306010	1S188
D509	09-306010	1S188
D510	09-306010	1S188
D511	09-306010	1S188
D512	09-306010	1S188
D513	09-306010	1S188
D514	09-306010	1S188
D701	09-306327	XZ-092
IC301	09-308063	LA1201
IC501	09-308021	LB200
IC701	09-308061	M5106P
LED501	09-306371	TLR-104
LED502	09-306371	TLR-104
LED503	09-306371	TLR-104
LED504	09-306371	TLR-104
Q101	09-305135	2N5486
Q102	09-305132	2SC787
Q103	09-305051	2SC930
Q104	09-302061	2SC387A
Q301	09-305051	2SC930
Q302	09-305051	2SC930
Q303	09-305051	2SC930
Q304	09-305051	2SC930
Q501	09-305063	2SC372
Q502	09-305063	2SC372
Q503	09-305063	2SC372
Q504	09-305063	2SC372
Q505	09-305063	2SC372
Q506	09-305063	2SC372
Q507	09-305063	2SC372
Q508	09-302125	2SC945
Q509	09-302125	2SC945
Q510	09-302125	2SC945
Q511	09-302125	2SC945
Q512	09-302125	2SC945
Q513	09-300080	2SA733
Q701	09-302126	2SC1096

LYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C101	13-123057	Trimmer
C103	13-123057	Trimmer
C115	13-123057	Trimmer
C330	77-336105	1uF 10V
C501	77-377107	100uF 16V
C502	77-336224	.22uF 10V
C507	77-336105	1uF 10V
C509	77-336105	1uF 10V
C510	77-336474	.47uF 10V
C511	77-336474	.47uF 10V
C512	77-336474	.47uF 10V
C513	77-336106	10uF 10V
C519	77-336106	10uF 10V
C520	77-336106	10uF 10V
C522	77-336224	.22uF 10V
C701	77-336274	.47uF 10V
C702	77-336106	10uF 10V
C703	77-336474	.47uF 10V
C704	77-336106	10uF 10V
C706	77-336336	33uF 10V
C707	77-336106	10uF 10V
C708	77-336476	47uF 10V
C710	77-337477	470uF 16V
C711	77-336225	2.2uF 10V
C712	77-337107	100uF 16V
C713	77-337227	220uF 16V
C714	77-337477	470uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R509	13-161009	10K, Squelch
R512	13-161007	1000 ohms, Squelch Level
R544	13-161002	5000 ohms, RF Level
R701	13-161008	10K, Volume

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-094165
L102	13-094165
L103	13-094166
L104	13-094162
L105	13-094165
L106	13-176366
L107	13-178122
L108	13-178122
L109	13-178122
L110	13-178122
L301	13-094166
L501	13-178175
T301	13-090290
T302	13-090291

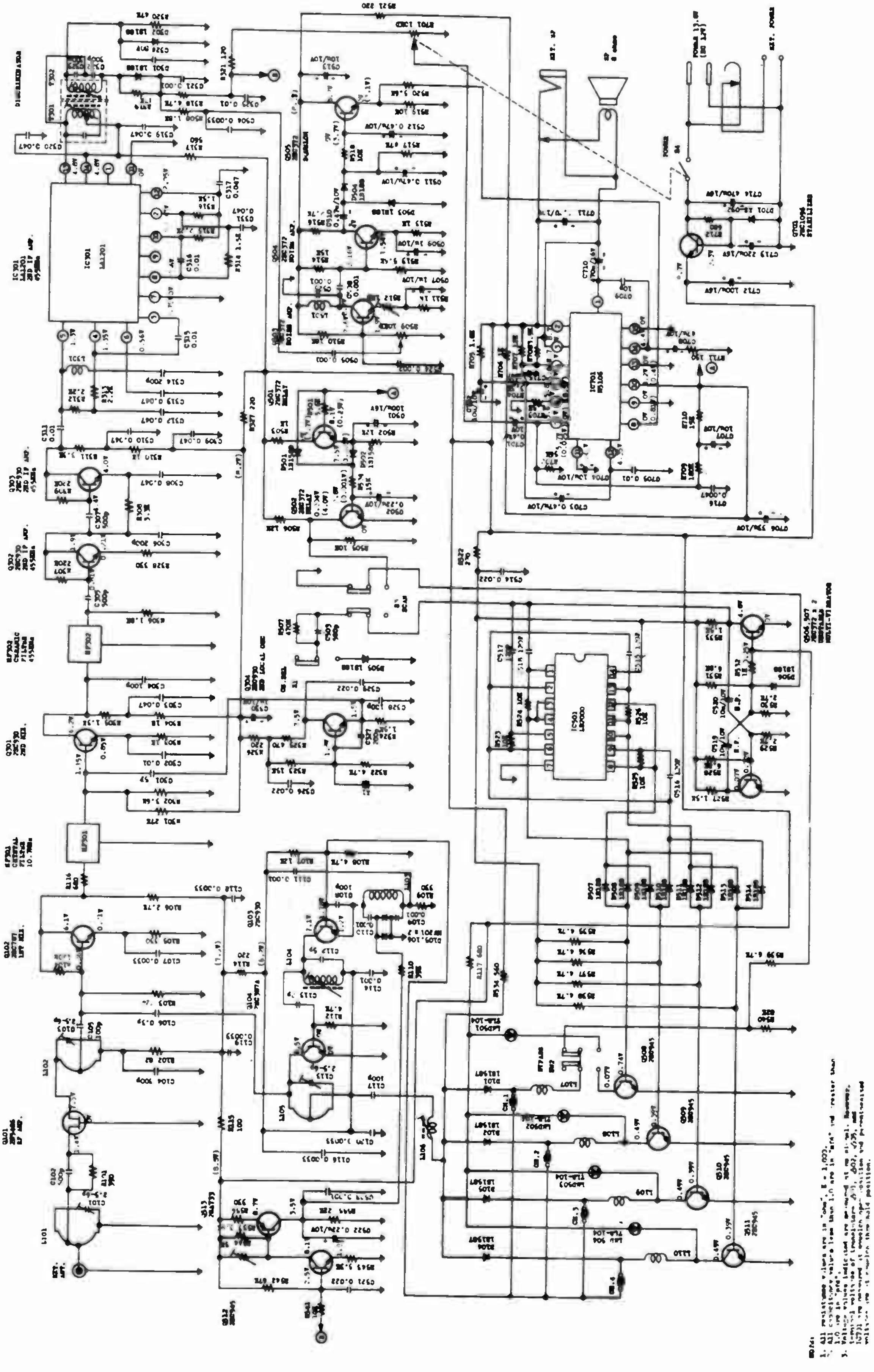
MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	Ceramic Filter	13-179042
HF302	Ceramic Filter	13-179046
SP	Speaker	13-060093
X1	Crystal(10.245MHz)	13-138316 (HC/18u)
	Antenna, Telescopic	13-040080
	Cord, Power	13-034072
	Heat Sink	13-089100 13-089101
	Socket, Crystal	13-159119
	Switch, Mode	13-180088

CABINET PARTS

NAME	PART NO.
Cabinet	13-010227
Cabinet, Front Panel	13-010226
Cabinet, Rear	13-013109
Knob, Push-buttons	13-115103
Knob, Squelch	13-110169
Knob, Volume	13-110169

SCHEMATIC DIAGRAM



$$\text{CRYSTAL FREQUENCY} = \frac{\text{DESIRED CHANNEL FREQUENCY} - 10.7\ \text{MHz}}{9}$$

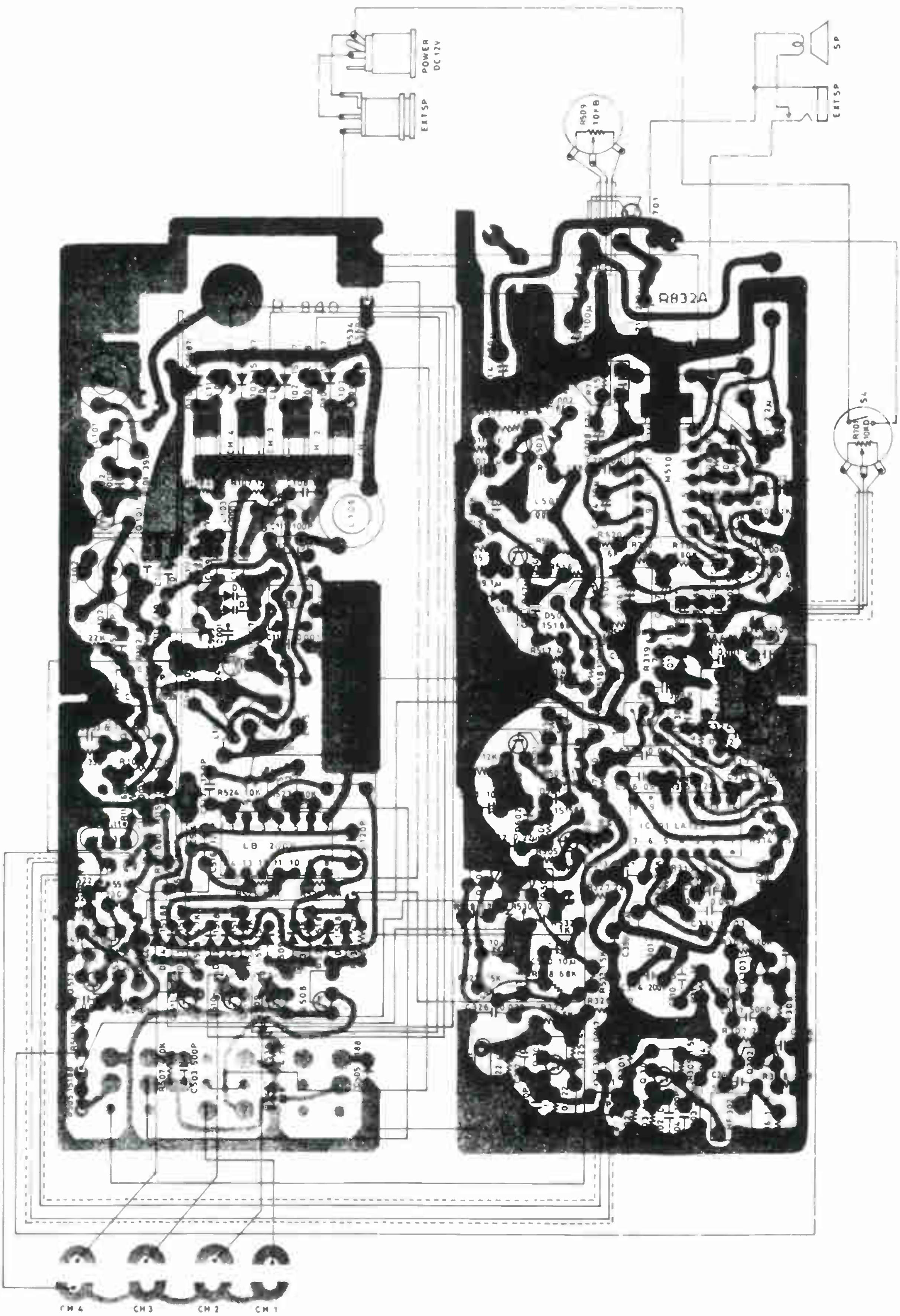
Crystal Holder Type:	HC-25U
Mode of Oscillation:	Third Overtone
Frequency tolelance:	±0.001% (+25°C)
Load Capacity:	18pF
Max. Series Resistance:	35 ohms
Rated Drive Level:	2 milliwatts
Capacitance Shunt:	6pF Max.

MODEL 13-918 ALIGNMENT PROCEDURE

STEP	TEST EQUIPMENT	METER POINT	ALIGNMENT PROCEDURE
1. Antenna stage RF Stage IF Stage and AFC Alignment	FM SSG 458MHz Mod. Freq. 1KHz Deviation ± 5KHz 8 ohms dummy load V.T.V.M. Oscilloscope	Ant. Terminal Ext. Speaker socket 8 ohms Resistive load	1. Preset a. Bypass switch OFF b. Scan switch MANU c. Squelch control volume min. d. Insert crystal to channel 1 2. Preset the core of L106 at the same height as the top of L106 case. 3. Preset semi fixed volume control R544 to mechanical center position. 4. Adjust T301 and T302 for a max output 5. Adjust L104 for a max output 6. Adjust C101, C103 and C115 for a max output 7. Adjust semi fixed volume R544 to obtain 3.7V between R554 hot end and ground 8. Repeat item 4,5,6 and 7
2. Squelch Adjustment	FM SSG 458MHz Mod. Freq. 1KHz Deviation ± 5KHz Load 8 ohms V.T.V.M.	Ant. Terminal Ext. Speaker socket	1. Preset volume and squelch control for a max. (clockwise position) 2. Adjust semi fixed volume control R512 to obtain just audio output at 2uV output of signal generator

Pages 79-82 Courtesy of MIDLAND CONSUMER PRODUCTS DIV.

BOTTOM VIEW



SBE SBE-1SM, -2SM, -3SM, -7SM (Sentinel I, II, III, VII)

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D1	HV80 (2)	8000-00028-045
D2	1N60 (1)(2)	8000-00004-063
D3	HV80 (1)	8000-00028-045
D4	1N60 (1)(2)	8000-00004-063
D5	1N60 (1)(2)	8000-00004-063
D6	1S73	8000-00028-046
D7	1S73	8000-00028-046
D8	1S73	8000-00028-046
D9	1S73	8000-00028-046
D10	1S73	8000-00028-046
D11	1S73	8000-00028-046
D12	1S73	8000-00028-046
D13	1S73	8000-00028-046
D14	HV80	8000-00028-045
D15	HV80	8000-00028-045
D16	1N60	8000-00004-063
D17	1N60	8000-00004-063
D18	1N60	8000-00004-063
D19	1N60	8000-00004-063
D20	1N60	8000-00004-063
D21	1N60	8000-00004-063
D22	1N60	8000-00004-063
D23	1N60	8000-00004-063
D24	1N60	8000-00004-063
D25	1N60	8000-00004-063
D26	1N60	8000-00004-063
D27	02Z10A	8000-00028-047
D28	1S1885	8000-00028-048
D29	1S1885	8000-00028-048
D30	1S1885	8000-00028-048
D31	1S1885	8000-00028-048
D32	1N60	8000-00004-063
IC1	TA7061AP	8000-00016-127
IC2	TA7061AP	8000-00016-127
IC3	SN7404N	8000-00028-042
IC4	SN7493N	8000-00028-043
IC5	SN7415N	8000-00028-044
Q1	2SC535(B)(2)	8000-00009-177
Q2	2SC535(B)(2)	8000-00009-177
Q3	2SK19(Y)(2)	8000-00009-178
Q4	2SC535(B)(1)	8000-00009-177
Q5	2SC535(B)(1)	8000-00009-177
Q6	2SK19(Y)(1)	8000-00009-178
Q7	2SC373(1)(2)	8000-00009-089
Q8	2SC373(1)(2)	8000-00009-089
Q9	2SC394(Y)(1)	8000-00028-037
Q10	2SC394(Y)(2)	8000-00028-037
Q11	2SC371(0)	8000-00009-174
Q12	2SC373	8000-00009-089
Q13	2SC373	8000-00009-089
Q14	2SC373	8000-00009-089
Q15	2SC373	8000-00009-089
Q16	2SC373	8000-00009-089
Q17	2SC373	8000-00009-089
Q18	2SC373	8000-00009-089
Q19	2SC735(Y)	8000-00028-038
Q20	2SC1173(0)	8000-00028-039
Q21	2SA473(0)	8000-00028-040
Q22	2SC373	8000-00009-089
Q23	2SC373	8000-00009-089
Q24	2SC373	8000-00009-089
Q25	2SC373	8000-00009-089
Q26	2SC789(0)	8000-00028-041
Q27	2SC373	8000-00009-089
Q28	2SC373	8000-00009-089
Q29	2SC784(0)(2)	8000-00004-298
Q30	2SC373	8000-00009-089

(1) Not used in 2SM and 7SM.
(2) Not used in 3SM.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C70	220uF 10V	8000-00028-022
C73	47uF 16V	8000-00028-023
C75	1uF 50V	8000-00028-024
C76	47uF 16V	8000-00028-023
C77	47uF 16V	8000-00028-023
C78	4.7uF 25V	8000-00028-025
C79	10uF 16V	8000-00028-026
C83	100uF 16V	8000-00028-027
C85	6.8uF 6.3V	8000-00028-028
C86	2.2uF 16V	8000-00028-029
C88	22uF 6.3V	8000-00028-030
C89	22uF 6.3V	8000-00028-030
C91	470uF 10V	8000-00028-031
C92	220uF 16V	8000-00028-032
C93	220uF 16V	8000-00028-032
C94	2200uF 16V	8000-00028-033
C97	220uF 16V	8000-00028-032
C98	.1uF 35V	8000-00028-034
C101	47uF 16V	8000-00028-023

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	50K, Squelch	8000-00028-060
VR2	50K, Volume	8000-00028-061

COILS/TRANSFORMERS

ITEM	PART NO.
L1	8000-00028-049 (2)
L2	8000-00028-049 (2)
L3	8000-00028-049 (2)
L4	8000-00028-050 (1)
L5	8000-00028-051 (1)
L6	8000-00028-052 (1)
L7	8000-00028-053 (1)
L8	8000-00028-053
L9	8000-00028-054
T1	8000-00028-055
T2	8000-00028-056 (1)
T3	8000-00028-056 (1)
T4	8000-00028-055
T5	8000-00028-005
T6	8000-00028-057
T7	8000-00028-058

(1) Not used in 2SM and 7SM.
(2) Note used in 3SM.

MISCELLANEOUS

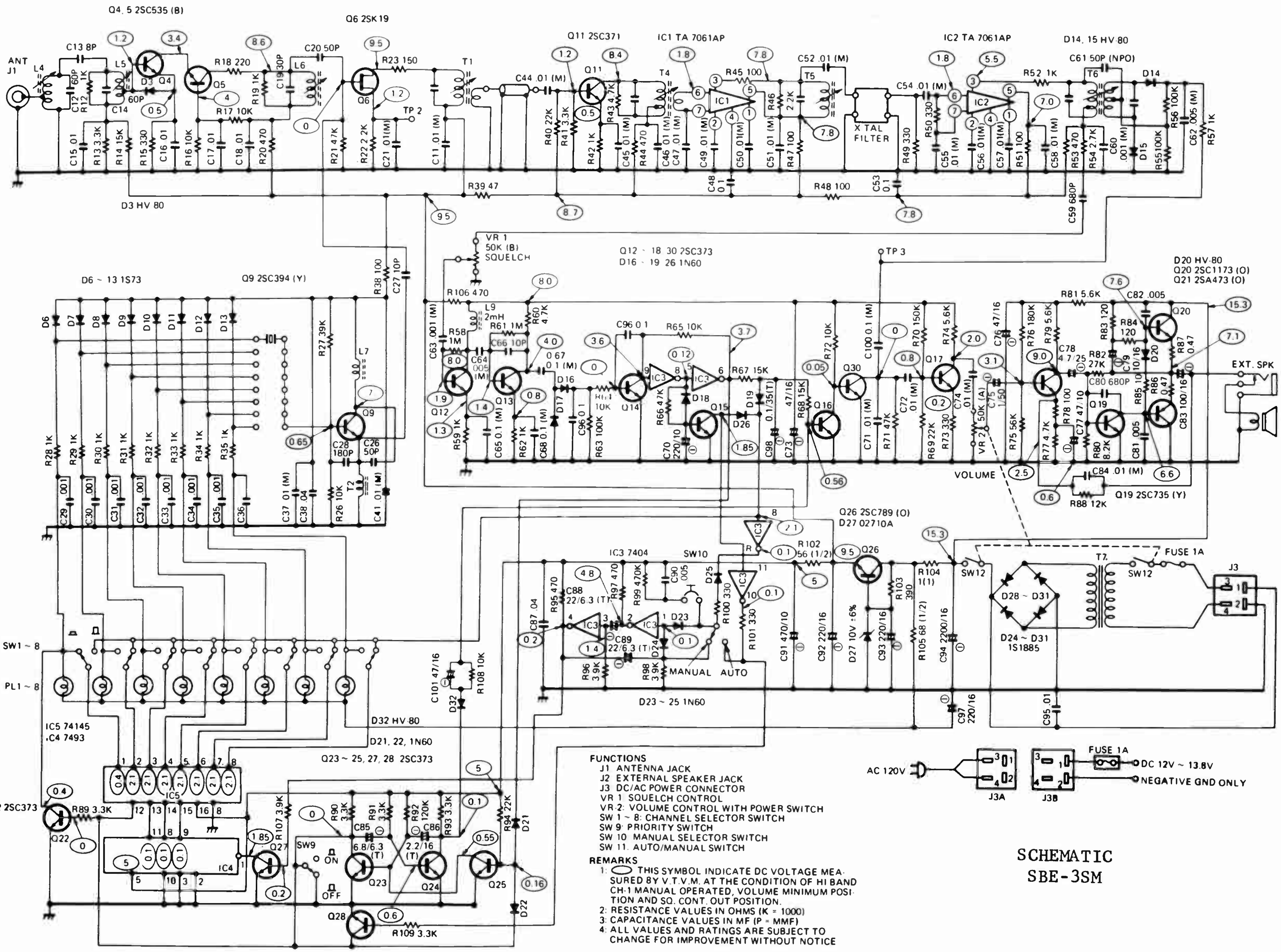
ITEM	NAME	PART NO.
PL1	Lamp, Indicator	8000-00028-067
PL2	Lamp, Indicator	8000-00028-067
PL3	Lamp, Indicator	8000-00028-067
PL4	Lamp, Indicator	8000-00028-067
PL5	Lamp, Indicator	8000-00028-067
PL6	Lamp, Indicator	8000-00028-067
PL7	Lamp, Indicator	8000-00028-067
PL8	Lamp, Indicator	8000-00028-067
SW1	Switch, Channel Select	8000-00028-065
SW2	Switch, Channel Select	8000-00028-065
SW3	Switch, Channel Select	8000-00028-065
SW4	Switch, Channel Select	8000-00028-065
SW5	Switch, Channel Select	8000-00028-065
SW6	Switch, Channel Select	8000-00028-065
SW7	Switch, Channel Select	8000-00028-065
SW8	Switch, Channel Select	8000-00028-065
SW9	Switch, Priority	8000-00028-066
SW10	Switch, Manual Select	8000-00028-066
SW11	Switch, Auto/Manual	8000-00028-066
SW12	Switch, Power	(1)
	Filter, Crystal	8000-00028-059
	Socket, Crystal	8000-00028-076 (2)
	Socket, Crystal	8000-00028-100 (3)
	Lamp, Jewel	8000-00028-069
	AC Power Cord	8000-00028-078
	DC Power Cord	8000-00028-079
	Fuse, 1A	8000-00028-081
	Fuse, 1A with Pigtails	8000-00028-080
	Speaker	8000-00028-089
	Antenna	8000-00028-090

(1) Part of VR2.
(2) Used in 1SM only.
(3) Used in 2SM, 3SM and 7SM only.

CABINET PARTS

NAME	PART NO.
Cabinet	8000-00028-085
Bezel	8000-00028-070
Bezel with Front Panel	8000-00028-114 (1)
Bezel, with Front Panel	8000-00028-185 (2)
Knob, Volume/Squelch	8000-00028-082
Knob, Push	8000-00028-072

(1) Used in 3SM only.
(2) Used in 7SM only.

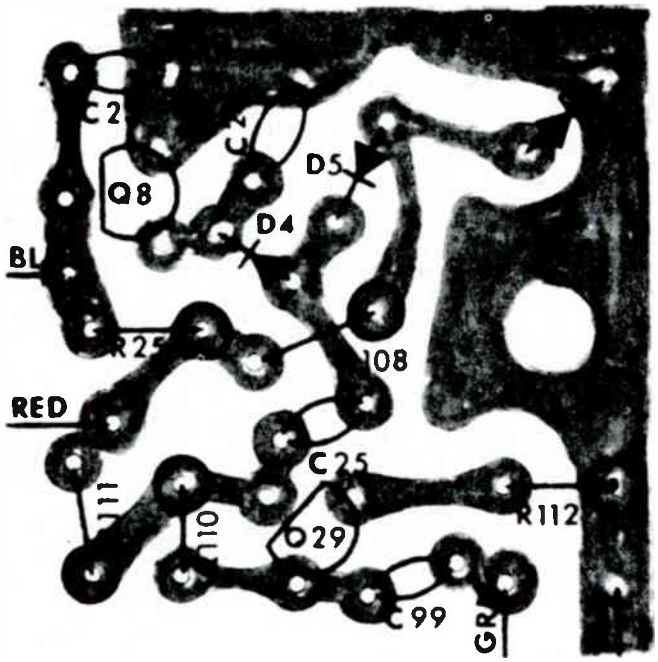


FUNCTIONS
J1 ANTENNA JACK
J2 EXTERNAL SPEAKER JACK
J3 DC/AC POWER CONNECTOR
VR 1 SQUELCH CONTROL
VR 2: VOLUME CONTROL WITH POWER SWITCH
SW 1 ~ 8: CHANNEL SELECTOR SWITCH
SW 9: PRIORITY SWITCH
SW 10: MANUAL SELECTOR SWITCH
SW 11: AUTO/MANUAL SWITCH

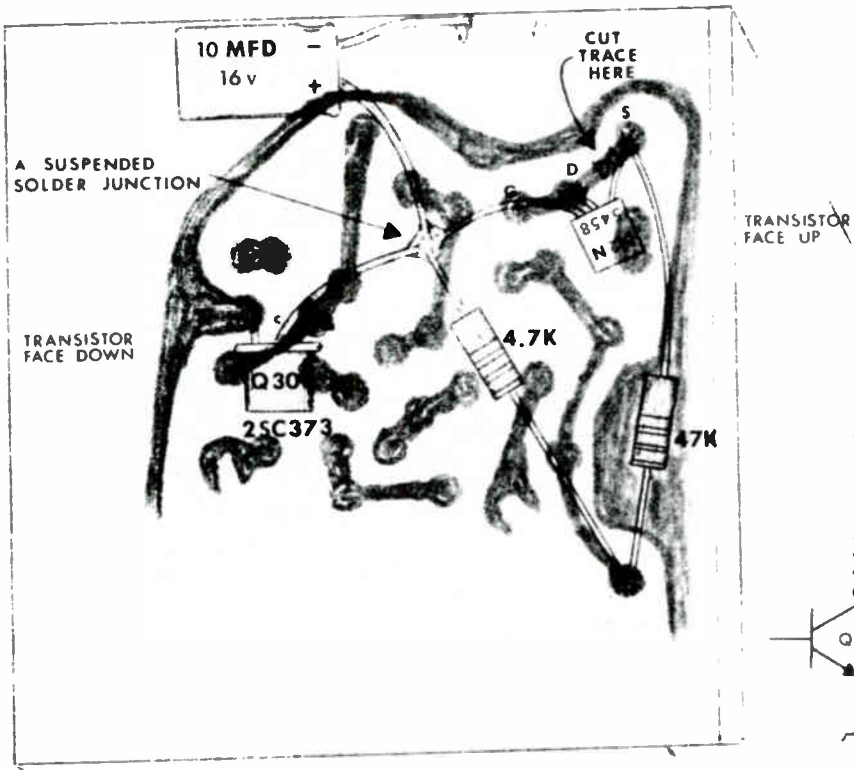
REMARKS
1: THIS SYMBOL INDICATE DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF HI BAND CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQ. CONT. OUT POSITION.
2: RESISTANCE VALUES IN OHMS (K = 1000)
3: CAPACITANCE VALUES IN MF (P = MMF)
4: ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

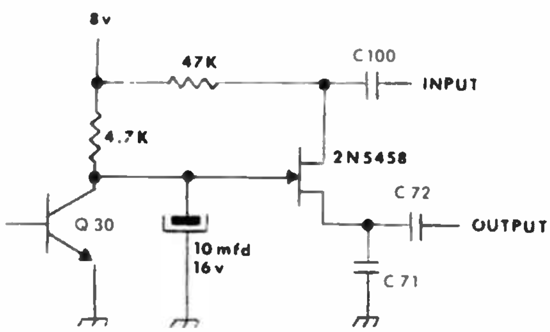
SCHEMATIC
SBE-3SM

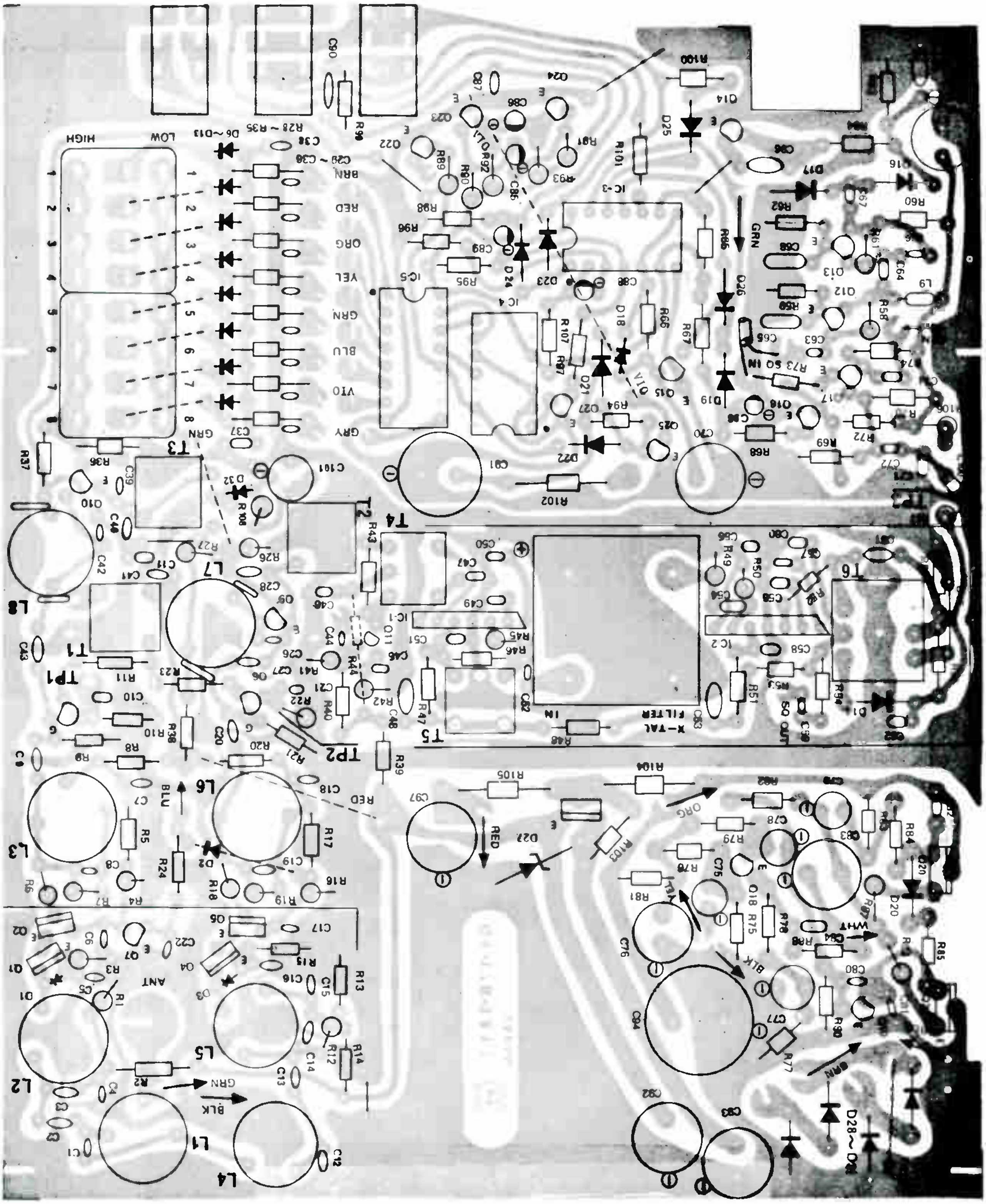
SBE-1SM BANDSWITCHING P.C. BOARD



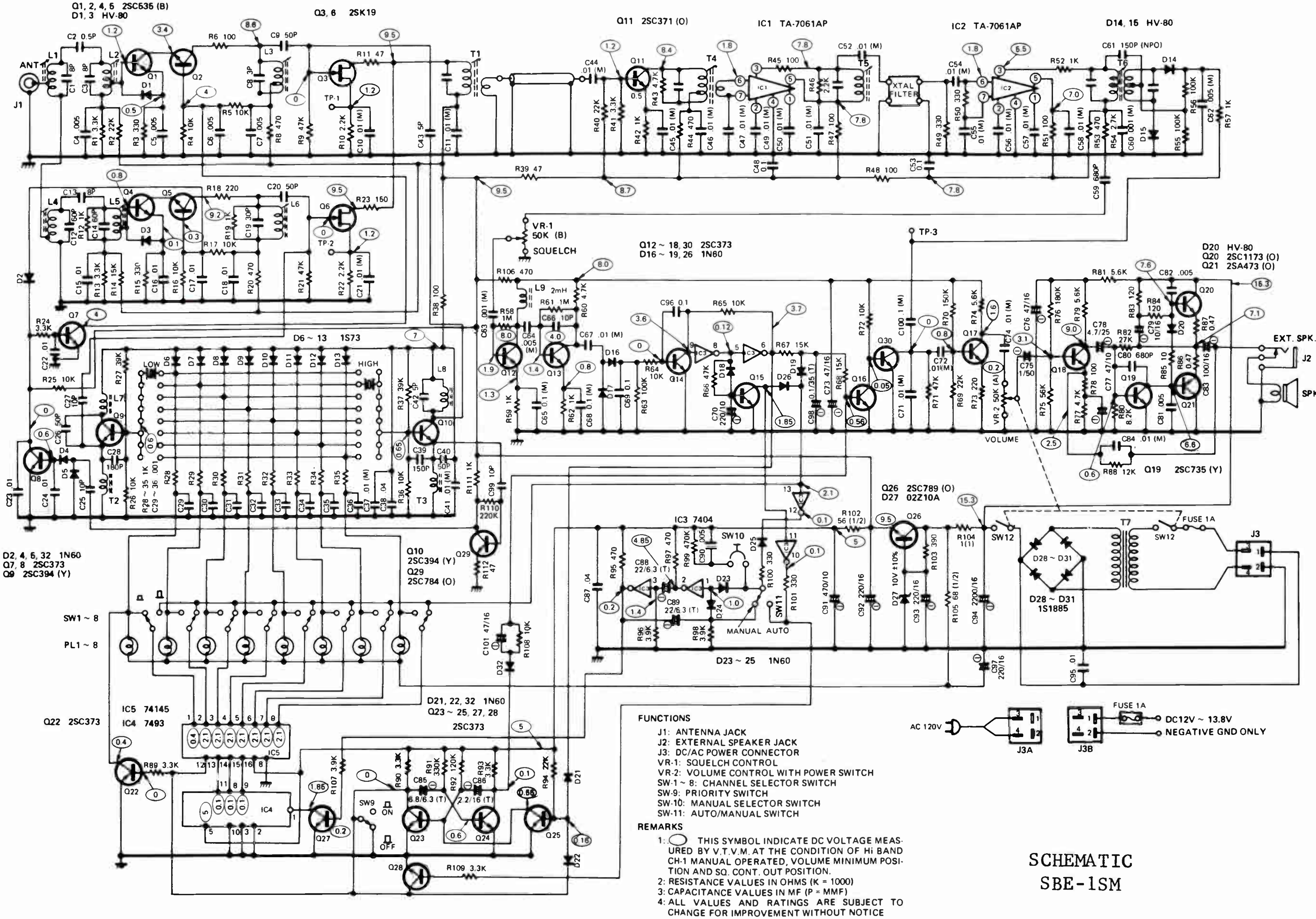
SBE-1SM, 2SM, 3SM & 7SM SQUELCH MODIFICATION







P.C.B. ASSEMBLY
SBE-1SM, 2SM, 3SM, 7SM



FUNCTIONS

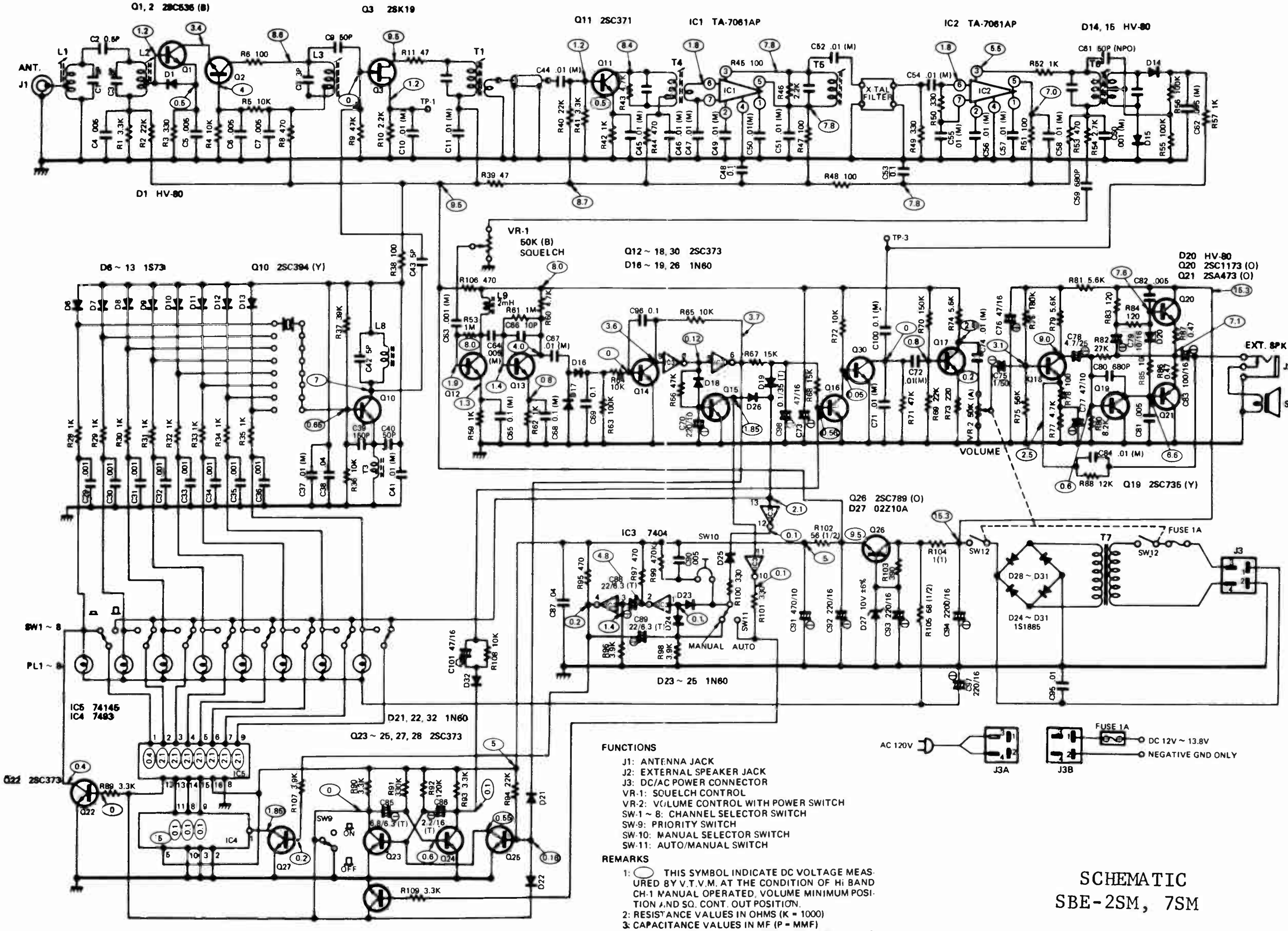
J1: ANTENNA JACK
J2: EXTERNAL SPEAKER JACK
J3: DC/AC POWER CONNECTOR
VR-1: SQUELCH CONTROL
VR-2: VOLUME CONTROL WITH POWER SWITCH
SW-1 ~ 8: CHANNEL SELECTOR SWITCH
SW-9: PRIORITY SWITCH
SW-10: MANUAL SELECTOR SWITCH
SW-11: AUTO/MANUAL SWITCH

REMARKS

1: ◯ THIS SYMBOL INDICATE DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF Hi BAND CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQ. CONT. OUT POSITION.
2: RESISTANCE VALUES IN OHMS (K = 1000)
3: CAPACITANCE VALUES IN MF (P = MMF)
4: ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

SCHEMATIC
SBE-1SM

SBE SBE-1SM, -2SM, -3SM, -7SM
(Sentinel I, II, III, VII)



FUNCTIONS

- J1: ANTENNA JACK
- J2: EXTERNAL SPEAKER JACK
- J3: DC/AC POWER CONNECTOR
- VR-1: SQUELCH CONTROL
- VR-2: VOLUME CONTROL WITH POWER SWITCH
- SW-1 ~ 8: CHANNEL SELECTOR SWITCH
- SW-9: PRIORITY SWITCH
- SW-10: MANUAL SELECTOR SWITCH
- SW-11: AUTO/MANUAL SWITCH

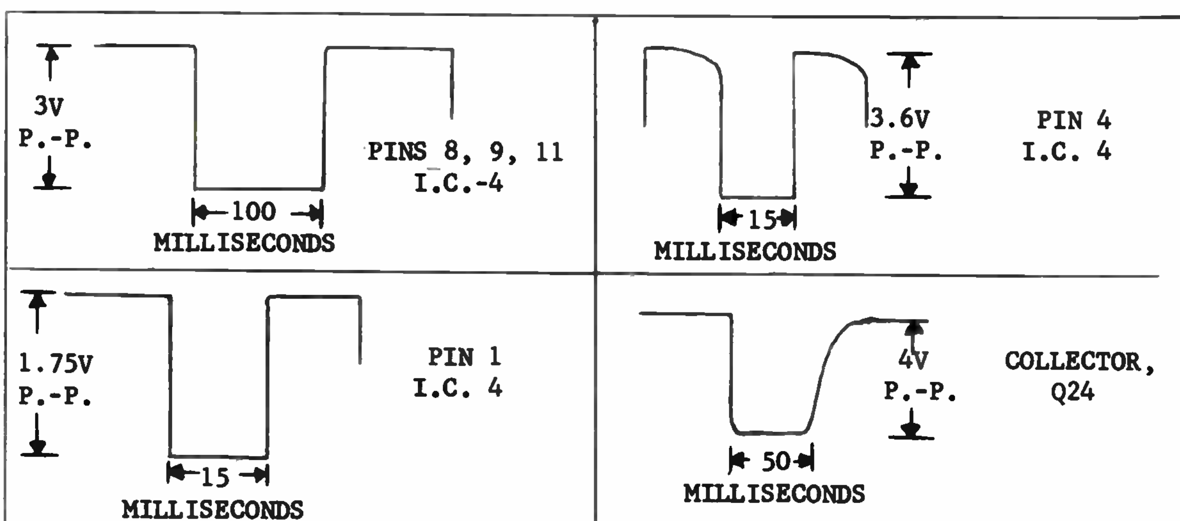
REMARKS

1: ◯ THIS SYMBOL INDICATE DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF Hi BAND CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQ. CONT. OUT POSITION.
2: RESISTANCE VALUES IN OHMS (K = 1000)
3: CAPACITANCE VALUES IN MF (P = MMF)
4: ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

SCHEMATIC
SBE-2SM, 7SM

SYMPTOM	NOTES	PROBABLE CAUSE
EXCESSIVELY HIGH SCAN RATE	CHECK SUPPLY VOLTAGE, (5-5.5V) OF IC3, IF HIGH, SUSPECT R102 AND REGULATOR. BAD TIMING COMPONENTS WILL USUALLY CAUSE AN ASYMETRICAL SQUARE-WAVE AT PIN 4	C88, C89, R96, R98, D24
INTERMITTANT SCAN, FALSE LOCKING	OCCASIONALLY THE TRACE TO THIS CAP WILL BREAK	C91
RADIO WILL NOT SQUELCH WITH VR1 FULLY CLOCK-WISE	CHECK NOISE AT INPUT TO DETEC-TOR (SHOULD BE ONE VOLT OR GREATER WITH NO SIGNAL AND VR1 FULLY CLOCKWISE	VR-1, Q12, Q13, Q14, INV'S 9-8, 5-6

SCANNING CIRCUIT WAVEFORMS



WAVEFORMS 1-3 TAKEN WHILE RADIO IS SQUELCHED AND SCANNING.

WAVEFORM 4 TAKEN WHILE RADIO IS LOCKED ONTO CHANNEL OTHER THAN NUMBER ONE, AND CHANNEL ONE HAS NO SIGNAL (PRIORITY SWITCH ON).

SYMPTOM	NOTES	PROBABLE CAUSE
FAILS TO "LOCK-ON" CHANNEL ONE SIGNAL AFTER PRIORITY SEARCH (SCAN OTHERWISE NORMAL)		D21, D22, Q22, Q25 ASSOCIATED CIRCUITRY
FAILS TO SQUELCH AT MOMENT OF PRIORITY SEARCH. (BURST OF NOISE FROM SPEAKER.)		D32, C101, R108
SCAN RATE VARIES WITH TEMPERATURE	SUSPECT LEAKY DIODES (USUALLY, SCAN RATE INCREASES WITH WARM-UP)	D23, D24, D25
NO MANUAL SCAN ACTION (SW11 IN MANUAL POSITION) (AUTO-SCAN NORMAL)		SW10, C90, R99, SW11
ONE CHANNEL DEAD, LAMP FAILS TO LIGHT AND DIODE SWITCHING DOES NOT OPERATE	THE PILOT LAMP ASSOCIATED WITH THE CHANNEL MAY BE SHORTED OR DECODER OR LOCKOUT SWITCH DEFECTIVE	IC5, PL1-8, SW1-8
ONE CHANNEL IS OPERATIVE, EVEN WHEN ANOTHER IS LOCKED IN BY MANUAL SCAN.	CAPACITOR OR DIODE ASSOCIATED WITH THE CHANNEL IS SHORTED	D6-D13, C29-C38
A GROUP OF CHANNELS IS INOPERATIVE (FAIL TO SCAN)	CONSULT TRUTH TABLES TO DETERMINE WHICH IC IS AT FAULT	IC4, IC5

TROUBLE CHART
SQUELCH, SCANNING CIRCUITS

SYMPTOM	NOTES	PROBABLE CAUSE
SCAN STOPS WITH SQUELCH CONTROL FULLY COUNTER-CLOCKWISE, BUT RADIO REMAINS SQUELCHED		Q16, Q30 ASSOCIATED CIRCUITRY
SQUELCH WILL NOT OPEN WITH SQUELCH POT FULLY COUNTER-CLOCKWISE (SCANS CONTINUOUSLY)	IF VOLTAGE AT THE BASE OF Q14 IS ZERO, WITH SQUELCH CONTROL COUNTER-CLOCKWISE, PROBLEM IS IN SCHMIDT TRIGGER OR LOCKOUT-SKIPPER (SW1-8, INV. 13-12)	VR1, C67, Q14, C96 INV's 9-8, 5-6, 13-12, D19, D26, SW1-8
RADIO SQUELCHES, BUT WILL NOT SCAN.	CHECK FOR SQUARE WAVE AT PIN 4 OF MULTIVIBRATOR, (WHILE SQUELCHED) IF PRESENT, PROBLEM IN Q27, IC4, IC5. IF SQUARE-WAVE IS NOT PRESENT, SUSPECT INV'S 1-2, 3-4, 11-10, D23, C70, Q15	Q27, IC4, IC5, INVERTERS 1-2, 3-4, 11-10, D18, D23, C70, Q15
UNSQUELCHES MOMENTARILY, WHEN SCANNING THROUGH SIGNAL, BUT WILL NOT "LOCK-ON".	IF D18 IS DEFECTIVE, (OPEN) SCAN WILL STOP APPROX' 2 SECONDS AFTER RADIO IS SQUELCHED. (BY ROTATING SQUELCH CONTROL FULL COUNTER-CLOCKWISE.)	D18, D23, Q15, D25 INVERTER 11-10
NO SCAN DELAY AFTER RADIO SQUELCHES		D18, C70, R66
PRIORITY SEARCH CONTINUES WITH PRIORITY SWITCH "OFF"	FAIRLY LOW CONTACT RESISTANCE IS REQUIRED OF THIS SWITCH, (LESS THAN TWO OHMS), TO STOP PRIORITY	SW9
NO PRIORITY SEARCH, SW9 ON, (RADIO LOCKED ON CHANNEL OTHER THAN ONE)		SW9, Q23, Q24, Q25, Q28, Q22, D21, D22 ASSOCIATED CIRCUITRY

SIGNAL INJECTION POINTS

INJECTION POINT		SIGNAL PICK-UP POINT	
BASE Q11	5uV AT 10.7MHz THROUGH .01uF CAP' MODULATED (1KHz, AT 5KHz DEVIATION)	TP-3	.2V P.-P. CLEAN SINE WAVE. FULL LIMITING SHOULD BE EVIDENT. (I.F. MAY OSCILLATE WITH THIS INJECTION METHOD.)
ANT. JACK	HIGH-LEVEL SIGNAL (5uV) (MODULATED 1KHz AT 5KHZ DEVIATION)	TP-3	.2V P.-P. CLEAN SINE WAVE. FULL LIMITING SHOULD BE EVIDENT.
	NO SIGNAL INPUT	TP-3	.25V P.-P. NOISE (TYPICAL)
INPUT' XTAL FILTER	350uV 10.7MHz (MODULATED 1KHz AT 5KHz DEVIATION)	TP-3	.2V P.-P. CLEAN SINE WAVE. SHOULD QUIET NOISE BY APPROX' 20 D.B.

NOTE: I.F. BECOMES EXTREMELY UNSTABLE WITH ANY EXTERNAL DEVICES CONNECTED. IF OSCILLATION IS FOUND TO BE A PROBLEM -- POSSIBLE CAUSE IS A DEFECTIVE CRYSTAL FILTER, UNSOLDERED BYPASS CAPS OR DAMAGED FOIL GROUND ON PC BOARD UNDER I.F. SHIELD. IT MAY BE NECESSARY TO USE .5-2 pfd CAPS FOR DEGENERATIVE FEED BACK IN IC1 AND IC2 (PINS 3 TO 6) IN EXTREME CASES.

ALIGNMENT NOTES

CAUTION

All Sentinel receivers are carefully prealigned at the factory. It is recommended that alignment not be attempted, unless a generator of the capabilities described below, is available. This is especially critical in the U.H.F. models.

Due to the fact that the main source of selectivity in the Sentinel receivers is the fix-tuned crystal filter, alignment is quite simple and straightforward. The entire receiver alignment may be accomplished, by injection of a signal at the antenna jack, and peaking for maximum signal-to-noise ratio, using the ear as indicator.

Generator requirements are fairly severe for use in alignment. Controllable, calibrated, output at sub-microvolt levels is required. Frequency output must be "crystal" accurate. Calibrated F.M. deviation capability is required.

It must be remembered during alignment, that a number of frequencies, often several megahertz apart must be received, so "compromise" tuning of the front end is required, (stagger tuning of the antenna coils) for uniform operation on all channels.

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	10K, Volume	2004-46
VR2	10K, Squelch	2004-47

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2004-38
L102	2004-38
L103	2004-37
L104	2004-38
L105	2018-02
L106	2018-02
L107	2018-02
L108	2018-02
L109	2004-39
L110	2004-45
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43

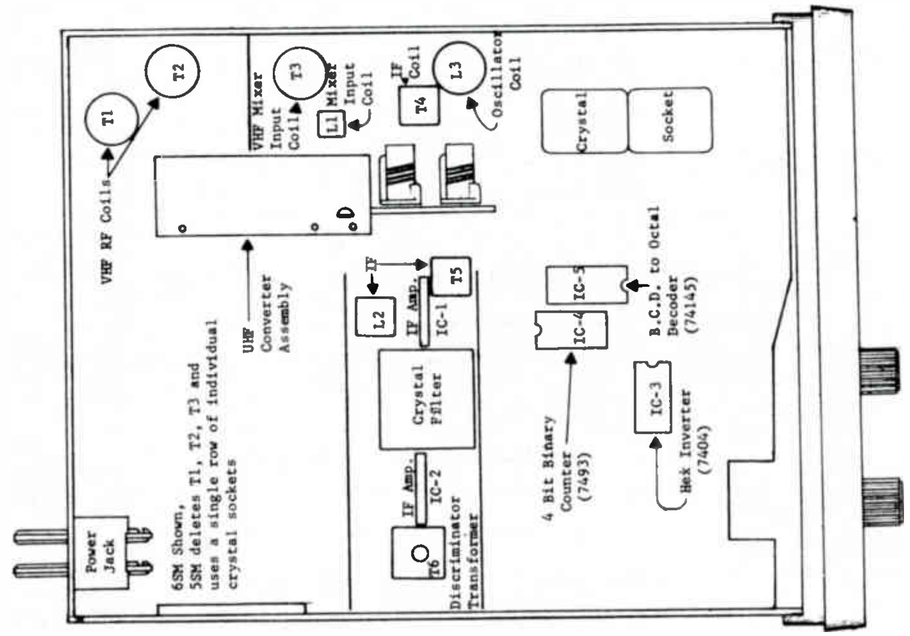
MISCELLANEOUS

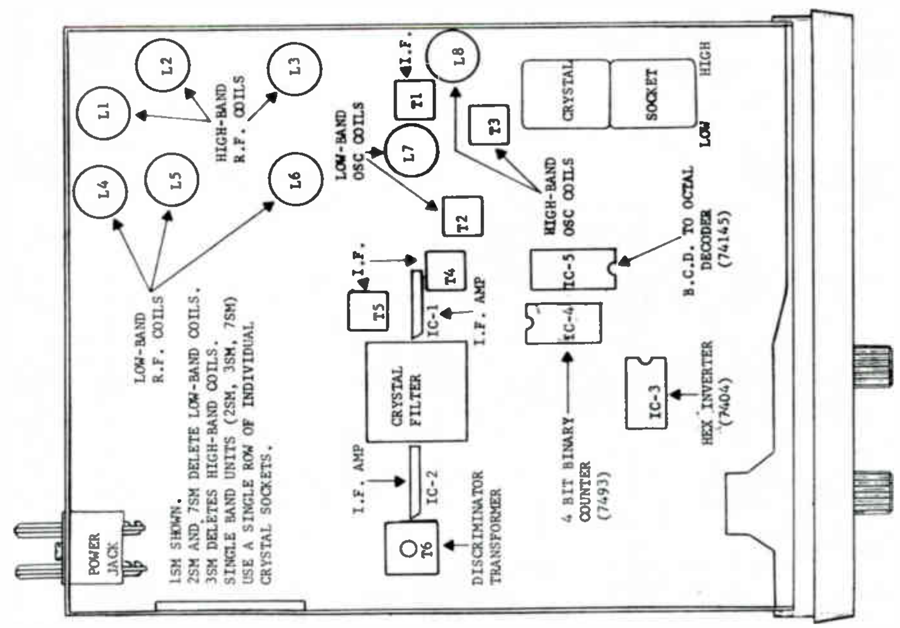
ITEM	NAME	PART NO.
HF301	HF Filter	10M15A/2004-49
	HF Filter	10M15AG/2032-18
HF302	HF Filter	CFU-455D/2004-50
HF303	HF Filter	2032-19
	Crystal, 10.24MHz	HC-18U/2004-65
	Switch, Bypass	2004-57
	Switch, Auto/Manual/ Channel Select	2004-56
	Socket, Ext. Antenna	2004-62
	Socket, Crystal	2032-15
	Socket, Ext. Speaker	2004-59
	Socket, DC	2004-58

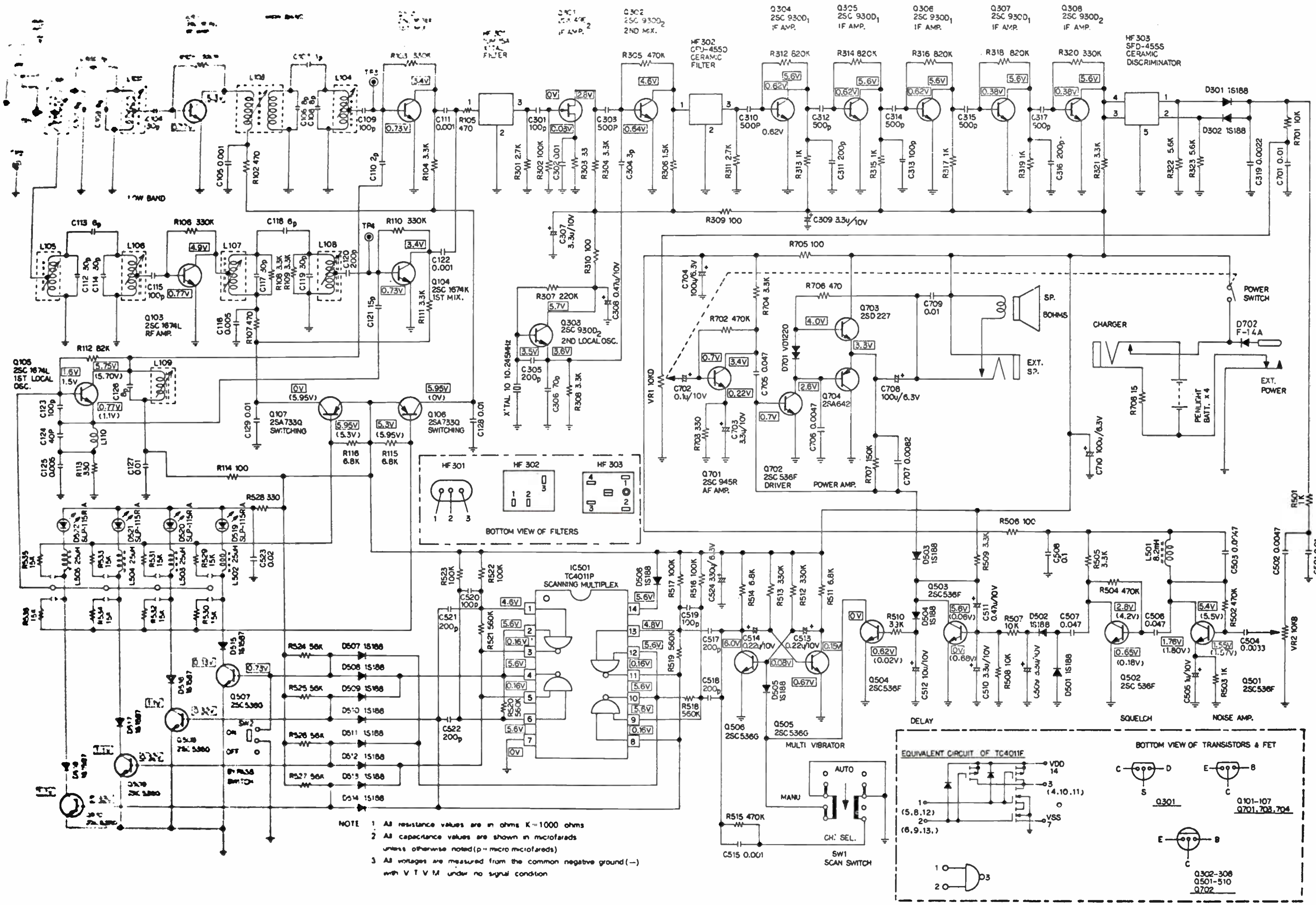
CABINET PARTS

NAME	PART NO.
Cabinet	2032-01
Panel, Front	2004-09
Lid, Back	2032-02
Lid, Bottom	2004-10
Lid, Battery	2004-11
Lid, Crystal	2032-03
Knob, Volume/Squelch	2004-26
Knob, Assembly- Auto/ Manual/Channel Select	2004-29

Pages 64-78 Courtesy of LINEAR SYSTEMS INC.







NOTE
1. All resistance values are in ohms K=1000 ohms
2. All capacitance values are shown in microfarads unless otherwise noted (p= micro microfarads)
3. All voltages are measured from the common negative ground (−) with V T V M under no signal condition

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D301	1S188FM	1010-145
D302	1S188FM	1010-145
D501	1S188FM	1010-145
D502	1S188FM	1010-145
D503	1S188FM	1010-145
D504	1S188FM	1010-145
D505	1S188FM	1010-145
D506	1S188FM	1010-145
D507	1S188FM	1010-145
D508	1S188FM	1010-145
D509	1S188FM	1010-145
D510	1S188FM	1010-145
D511	1S188FM	1010-,45
D512	1S188FM	1010-145
D513	1S188FM	1010-145
D515	1S1587	2004-67
D516	1S1587	2004-67
D517	1S1587	2004-67
D518	1S1587	2004-67
D519	SLP-115R	2018-12
D520	SLP-115R	2018-12
D521	SLP-115R	2018-12
D522	SLP-115R	2018-12
D701	VD1220	2004-68
D702	F-14A	2022-08
IC501	MC-14011CP	3023-38
Q101	2SC1674(L)	2032-34
Q102	2SC1674(K)	2032-33
Q103	2SC1674(L)	2032-34
Q104	2SC1674(K)	2032-33
Q105	2SC1674(L)	2032-34
Q106	2SA733	2032-35
Q107	2SA733	2032-35
Q301	2SK49E2	2032-36
Q304	2SC930(D)	1013-15
Q305	2SC930(D)	1013-15
Q306	2SC930(D)	1013-15
Q307	2SC930(D)	1013-15
Q501	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q502	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q503	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q504	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q505	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q506	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q507	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q508	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q509	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q510	2SC536(G)	2020-05
	2SC945(P)	2032-37
Q701	2SC945(R)	1080-21
Q703	2SD227(W)	2020-06
	2SD227(R)	2032-40
Q704	2SA642	2004-06

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO
C307	3.3uF 10V	2004-55
C308	.47uF 10V	2004-52
C309	3.3uF 10V	2004-55
C505	1uF 10V	1014-107
C509	3.3uF 10V	2004-55
C510	3.3uF 10V	2004-55
C511	.47uF 10V	2004-52
C512	10uF 6.3V	2017-86
C513	.22uF 10V	2004-53
C514	.22uF 10V	2004-53
C524	330uF 6.3V	2032-25
C702	.1uF 10V	2004-54
C703	3.3uF 10V	2004-55
C704	100uF 6.3V	1003-102
C708	100uF 6.3V	1003-102
C710	100uF 6.3V	1003-102

Q702	2SC945	1043-07
	2SC945(Q)	2004-04
	2SC536(F)	2018-01
Q703	2SD227	2004-05
Q704	2SA642	2004-06

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C306	10uF 10V	170-66-9
C309	.1uF 10V	2004-54
C312	.1uF 10V	2004-54
C320	.01uF 10V	2018-05
C504	1uF 10V	1014-107
C509	3.3uF 10V	2004-55
C510	3.3uF 10V	2004-55
C511	.47uF 10V	2004-52
C512	100uF 6.3V	1003-102
C513	.47uF 10V	2004-52
C514	.47uF 10V	2004-52
C701	.22uF 10V	2004-53
C703	100uF 6.3V	1003-102
C705	100uF 6.3V	1003-102
C706	100uF 6.3V	1003-102
C708	2.2uF 10V	2004-51

CONTROLS/SPECIAL RESISTORS

ITEM	DEXCRIPTION	PART NO.
R502	10K, Trimmer	2004-47
R701	10K, Trimmer	2004-46

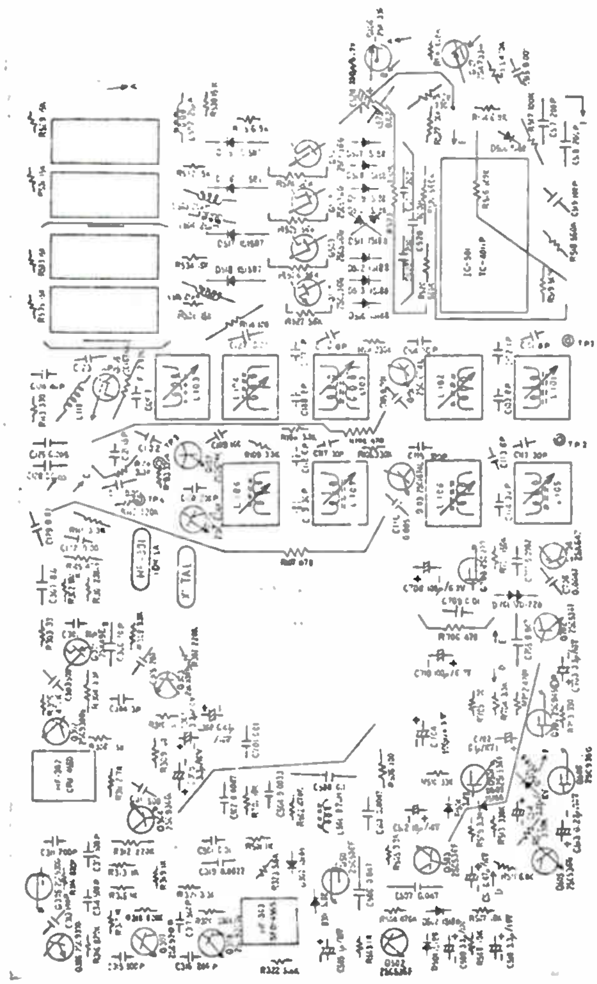
COILS/TRANSFORMERS

ITEM	PART NO.
L101	2018-02
L102	2018-02
L103	2018-02
L104	2018-02
L105	2018-03
L106	1041-49
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43
L505	2004-43
T301	2004-40
T302	2004-41

MISCELLANEOUS

ITEM	NAME	PART NO
HF301	Crystal Filter	2004-49
HF302	Ceramic Filter	2004-50
	Switch, Bypass	2004-57
	Switch, Auto-Manual/ Channel Select	2004-56
	Speaker, 8 ohms .3W	2004-48
	Earphone Assembly	1012-26
	Socket, Crystal	1002-28
	Socket, Ext. Power	2004-58
	Socket, Ext. Ant	2004-62
	Socket Assembly, Charger and Ext. Speaker	2004-59
	Crystal (10.245mHz)	HC-18-U
	Antenna	AN-13

Pages 59-63 Courtesy of FANON/COURIER CORP.



Q305	2SC930(C)	2004-02
Q306	2SC930(C)	2004-02
Q307	2SC930(D)	1013-15
Q308	2SC930(D)	1013-15
Q501	2SK44(D)	2020-04
Q502	2SK536(F)	2018-01
Q503	2SK536(F)	2018-01
Q504	2SK536(F)	2018-01
Q505	2SC536(G)	2020-05
Q506	2SC536(G)	2020-05
Q507	2SC536(G)	2020-05
Q508	2SC536(F)	2018-01
Q509	2SC536(G)	2020-05
Q510	2SC536(G)	2020-05
Q515	2SC945(R)	1080-21
Q516	2SC934(R)	1080-21
Q517	2SC945(R(	1080-21
Q518	2SC945(R)	1080-21
Q701	2SC536(F)	2018-01
Q702	2SC536(F)	2018-01
Q703	2SD227 W)	2020-06
Q704	2SA642(R)	2020-07

FANON SCANFARE

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C101	Trimmer	2020-22
C102	Trimmer	2020-22
C112	Trimmer	2020-22
C503	10uF 10V	170-66-9
C509	.47uF 10V	2004-52
C510	.47uF 10V	2004-52
C511	.47uF 10V	2004-52
C512	1uF 10V	1014-107
C513	100uF 10V	1012-18
C514	.47uF 10V	2004-52
C515	.47uF 10V	2004-52
C520	220uF 10V	1012-19
C523	.47uF 10V	2004-52
C701	.1uF 10V	2004-54
C702	.1uF 10V	2004-54
C703	100uF 10V	1012-18
C704	100uF 10V	1012-18
C707	10uF 10V	170-66-9

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R501	10K, Trimmer	2004-47
R503	5K, Trimmer	1002-24
R504	10K, Trimmer	2020-10
R702	10K, Trimmer	2004-46

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2020-21
L102	2020-21
L103	2018-03
L104	2004-39
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43
L505	2004-43

VHFL

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D301	1S188(FM)	1010-145
D302	1S188(FM)	1010-145
D501	1S188(FM)	1010-145
D502	1S188(FM)	1010-145
D503	1S188(FM)	1010-145
D504	1S188(FM)	1010-145
D505	1S188(FM)	1010-145
D506	1S188(FM)	1010-145
D507	1S188(FM)	1010-145
D508	1S188(FM)	1010-145
D509	1S188(FM)	1010-145
D510	1S188(FM)	1010-145
D511	1S188(FM)	1010-145
D512	1S188(FM)	1010-145
D513	1S188(FM)	1010-145
D514	SLP-115R	2018-12
D515	1S1587	2004-67
D516	SLP-115R	2018-12
D517	1S1587	2004-67
D518	SLP-115R	2018-12
D519	1S1587	2004-67
D520	SLP-115R	2018-12
D521	1S1587	2004-67
D701	VD1220	2004-68
D702	DS-130(E)	291-20
IC501	CMOS MM6400N	2004-70
Q101	2SC922(K)	2004-03
Q102	2SC922(K)	2004-03
Q103	2SC922(L)	2004-01
Q301	2SC930(D)	1013-15
Q302	2SC930(D)	1013-15
Q303	2SC930(D)	1013-15
Q304	2SC930(C)	2004-02
Q305	2SC930(C)	2004-02
Q306	2SC930(C)	2004-02
Q307	2SC930(C)	2004-02
Q308	2SC930(D)	1013-15
	2SC945	1043-07
	2SC945(Q)	2004-04
Q501	2SC536(F)	2018-01
	2SC945	1043-07
	2SC945(Q)	2004-04
Q502	2SC536(F)	2018-01
	2SC945	1043-07
	2SC945(Q)	2004-04
Q503	2SC536(F)	2018-01
	2SC945	1043-07
	2SC945(Q)	2004-04
Q504	2SC536(F)	2018-01
	2SC945	1043-07
	2SC945(Q)	2004-04
Q505	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q506	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q507	2SC536(E)	296-55-9
Q508	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q509	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q510	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q511	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q512	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q701	2SC945(R)	1080-21

VHF

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D301	1S188	1010-145
D302	1S188	1010-145
D501	1S188	1010-145
D502	1S188	1010-145
D503	1S188	1010-145
D504	1S188	1010-145
D505	1S188	1010-145
D506	1S188	1010-145
D513	1S188	1010-145
D514	TLR104	2004-69
D515	1S1487	2004-67
D516	TLR104	2004-69
D517	1S1587	2004-67
D518	TLR104	2004-69
D519	1S1587	2004-67
D520	TLR104	2004-69
D701	VD1220	2004-68
C501	CMOS-MM64C00N	2004-70
Q101	2SC922(K)	2004-03
Q102	2SC922(K)	2004-03
Q103	2SC922(L)	2004-01
Q301	2SC930(D)	1013-15
Q302	2SC930(D)	1013-15
Q303	2SC930(D)	1013-15
Q304	2SC930(C)	2004-02
Q305	2SC930(C)	2004-02
Q306	2SC930(C)	2004-02
Q307	2SC930(C)	2004-02
Q308	2SC930(D)	1013-15
Q501	2SC934(O)	2004-14
	2SC536(F)	2018-01
Q502	2SC945(O)	2004-14
	2SC536(F)	2018-01
Q503	2SC945(O)	2004-14
	2SC536(F)	2018-01
Q504	2SC945(O)	2004-14
	2SC536(F)	2018-01
Q505	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q506	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q507	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q508	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q509	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q701	2SC945(R)	1080-21
Q703	2SD227	2004-05
Q704	2SA642	2004-06

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C306	10uF 10V	170-66-9
C309	.1uF 10V	2004-54
C312	.1uF 10V	2004-54
C320	.1uF 10V	2004-54
C504	1uF 10V	1014-107
C507	1uF 10V	1014-107
C509	3.3uF 10V	2004-55
C510	3.3uF 10V	2004-55
C511	.47uF 10V	2004-52
C512	100uF 6.3V	1003-102
C513	.47uF 10V	2004-52
C514	.47uF 10V	2004-52
C701	.22uF 10V	2004-53
C703	100uF 6.3V	L003-102
C705	100uF 6.3V	1003-102
C706	100uF 6.3V	L003-102
C708	2.2uF 10V	2004-51

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R502	10K, Trimmer	2004-47
R701	10K, Trimmer	2004-46

COILS/TRANSFORMERS

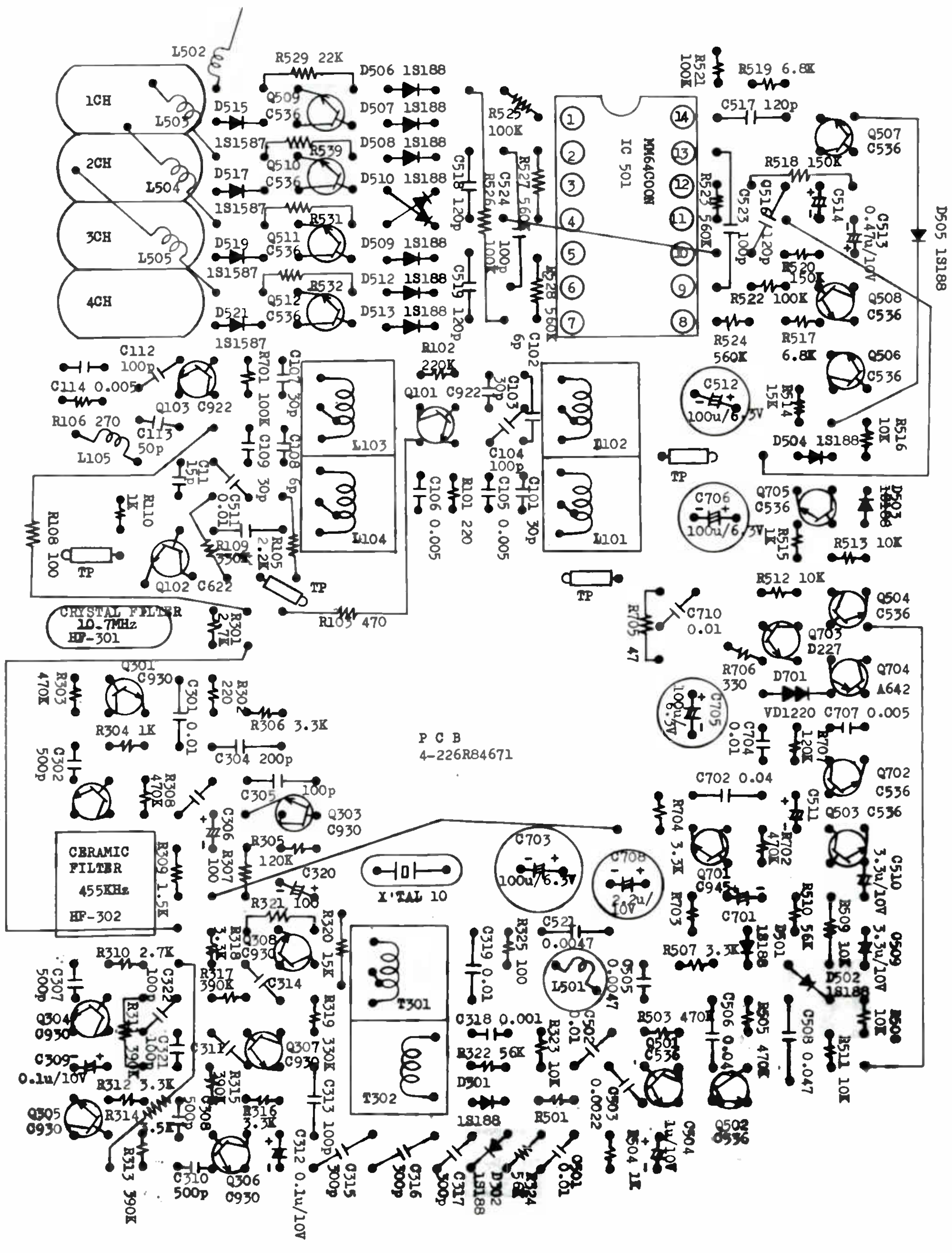
Item	PART NO.
L101	2004-37
L102	2004-38
L103	2004-37
L104	2004-38
L105	2004-45
L106	2004-39
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43
L505	2004-43
T301	2004-40
T302	2004-41

UHF/UHFH

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D101	MV201	2020-08
D102	MV201	2020-08
D301	1S188(FM)	1010-145
D302	1S188(FM)	1010-145
D501	1S188(FM)	1010-145
D502	1S188(FM)	1010-145
D503	1S188(FM)	1010-145
D504	1S188(FM)	1010-145
D505	1S188(FM)	1010-145
D506	1S188(FM)	1010-145
D507	1S188(FM)	1010-145
D508	1S188(FM)	1010-145
D509	1S188(FM)	1010-145
D510	1S188(FM)	1010-145
D511	1S188(FM)	1010-145
D512	1S188(FM)	1010-145
D513	1S188(FM)	1010-145
D514	1S1587	2004-67
D515	1S1587	2004-67
D516	1S1587	2004-67
D517	1S1587	2004-67
D518	SLP115(R)	2018-12
D519	SLP115(R)	2018-12
D520	SLP115(R)	2018-12
D521	SLP115(R)	2018-12
D701	VD1220	2004-68
D702	DS-130(E)	291-20
IC501		2004-70
Q101	2N5485-1	2020-01
Q102	2SC787	2020-02
Q103	2SC930(D)	1013-15
Q104	2SC387(A)	2020-03
Q301	2SC930(D)	1013-15
Q302	2SC930(D)	1013-15
Q303	2SC930(C)	2004-02
Q304	2SC930(C)	2004-02

Fanon Scanfare



MODEL VHFL

TABLE 2, MODEL VHF AND VHFL VOLTAGE CHART

Measure all voltages with a DC-VTVM with no signal at the antenna. Set the monitor controls as follows: Volume Control 1/4 turn CW; Squelch Control full CCW; Bypass switch OFF. Manual/Scan switch, center position. Adjust the external power supply to 6, ±0.5 volts. Voltage reading may vary ±10%.

Transistor	Base	Emitter	Collector	Transistor	Base	Emitter	Collector
Q101	1.02	0.27	4.42	Q504	0.08	0	3.15
Q102	0.68	0	2.92	Q505	3.13	2.55	5.30
Q103	1.33	0.65	4.75	Q506	0.62	0	0.02
Q301	0.82	0.15	4.17	Q507	0.12	2.29	5.43
Q302	0.63	0	3.82	Q508	0.62	0	0.10
Q303	3.58	3.43	4.80	Q509	0.69	0	0.12
Q304	0.63	0	1.90	Q510	0.69	0	0.12
Q305	2.92	2.35	4.37	Q511	0.69	0	0.12
Q306	0.27	0	1.75	Q512	0.69	0	0.12
Q307	2.25	2.59	4.18	Q701	0.77	0.17	3.28
Q308	0.33	0	4.61	Q702	0.66	0	2.33
Q501	1.88	1.28	4.42	Q703	3.62	3.00	5.45
Q502	0.61	0	2.45	Q704	2.33	2.99	0
Q503	0.06	0	0.66				

TABLE 3, MODEL UHF AND UHFH VOLTAGE CHART

(All Conditions Same As Table 2)

Transistor	Base	Emitter	Collector	Transistor	Base	Emitter	Collector
Q101 (FET)	0 (Drain)	0 (Gate)	3.42 (Source)	Q504	0.01	0	5.41
Q102	0.68	0	2.82	Q505	0	0	2.15
Q103	1.10	0.44	4.04	Q506	2.14	1.59	5.31
Q104	0.50	0	3.86	Q507	0.60	0	0.01
Q301	0.65	0	3.12	Q508	0	0	0.62
Q302	0.63	0	3.17	Q509	0.59	0	0.07
Q303	0.72	0.05	4.04	Q510	0.10	1.20	5.41
Q304	0.66	0	3.97	Q515	0.68	0	0.07
Q305	0.64	0	3.94	Q516	0.68	0	0.07
Q306	0.32	0	3.71	Q517	0.68	0	0.07
Q307	0.30	0	2.45	Q518	0.68	0	0.07
Q308	2.38	1.98	3.95	Q701	0.65	0.05	2.59
Q501	0.03	0	2.45	Q702	0.63	0	1.94
Q502	2.07	1.51	5.01	Q703	3.22	2.59	5.41
Q503	0.61	0	2.58	Q704	1.94	2.59	0

TABLE 4, INTEGRATED CIRCUIT IC 501 VOLTAGE CHART

The Channel scanning circuit is common to all Models of the FM monitors. Set the monitor control as follows: Volume and Squelch controls to FULL CW positions; Bypass switch to OFF; Manual/Scan selector to center position. Adjust the external power supply to 6 ±.5 volts. Measure the voltages with a VTVM from the back side of the printed circuit board. MANUALLY SELECT EACH CHANNEL BEFORE MAKING A MEASUREMENT. Terminal 7 is common ground and terminal 14 is +6 volts. Refer to Figure 5 for terminal locations.

IC 501 TERMINAL

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4.50	5.45	0.08	0.08	5.40	5.45	0	5.45	5.40	0.08	0.08	5.45	4.50	5.45
2	5.40	5.45	0.08	0.08	5.45	5.45	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45
3	5.40	0.08	5.45	5.45	4.52	0.08	0	5.45	5.40	0.08	0.08	5.45	5.40	5.45
4	5.40	0.08	5.45	5.45	4.52	0.08	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45

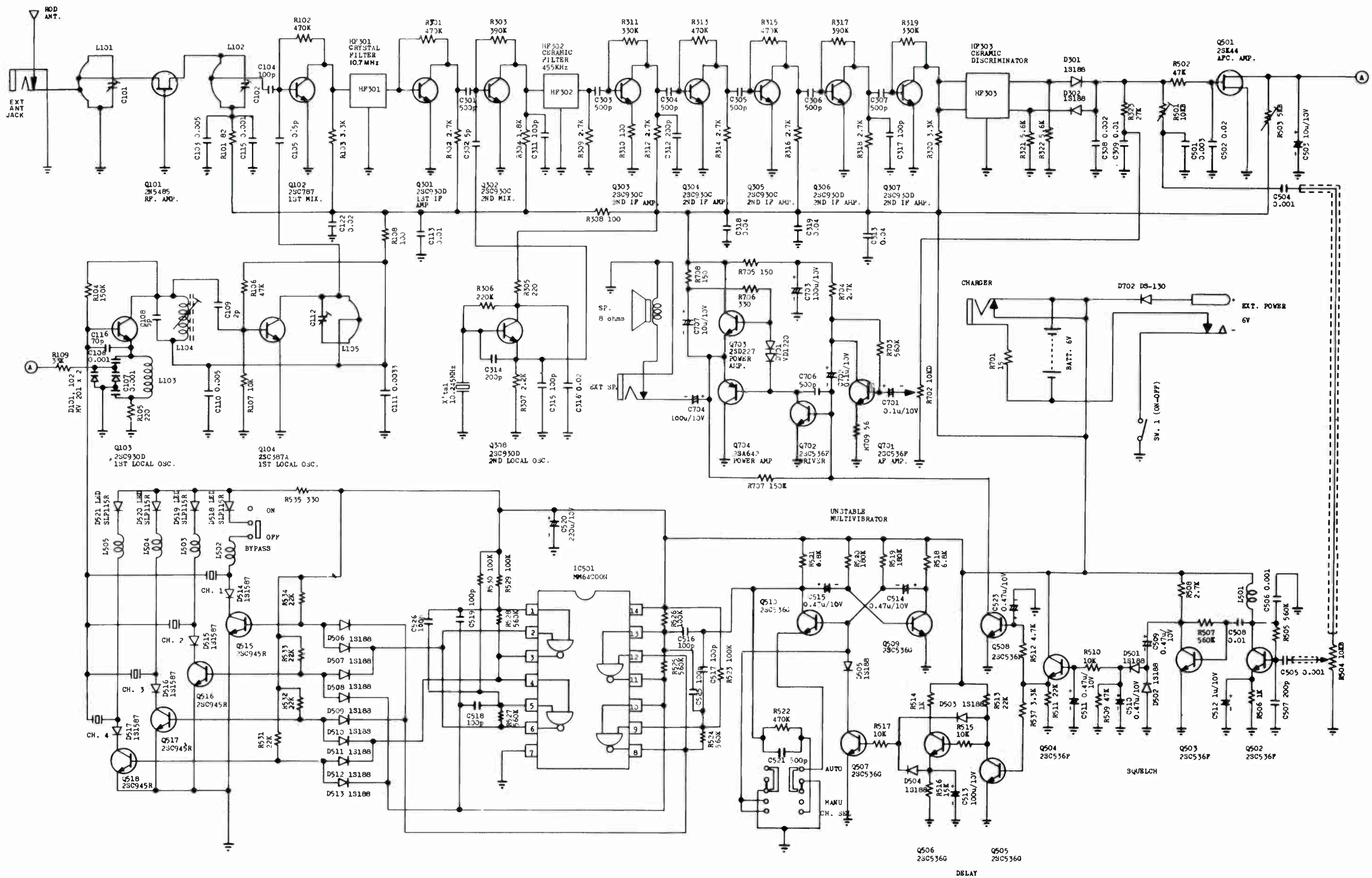
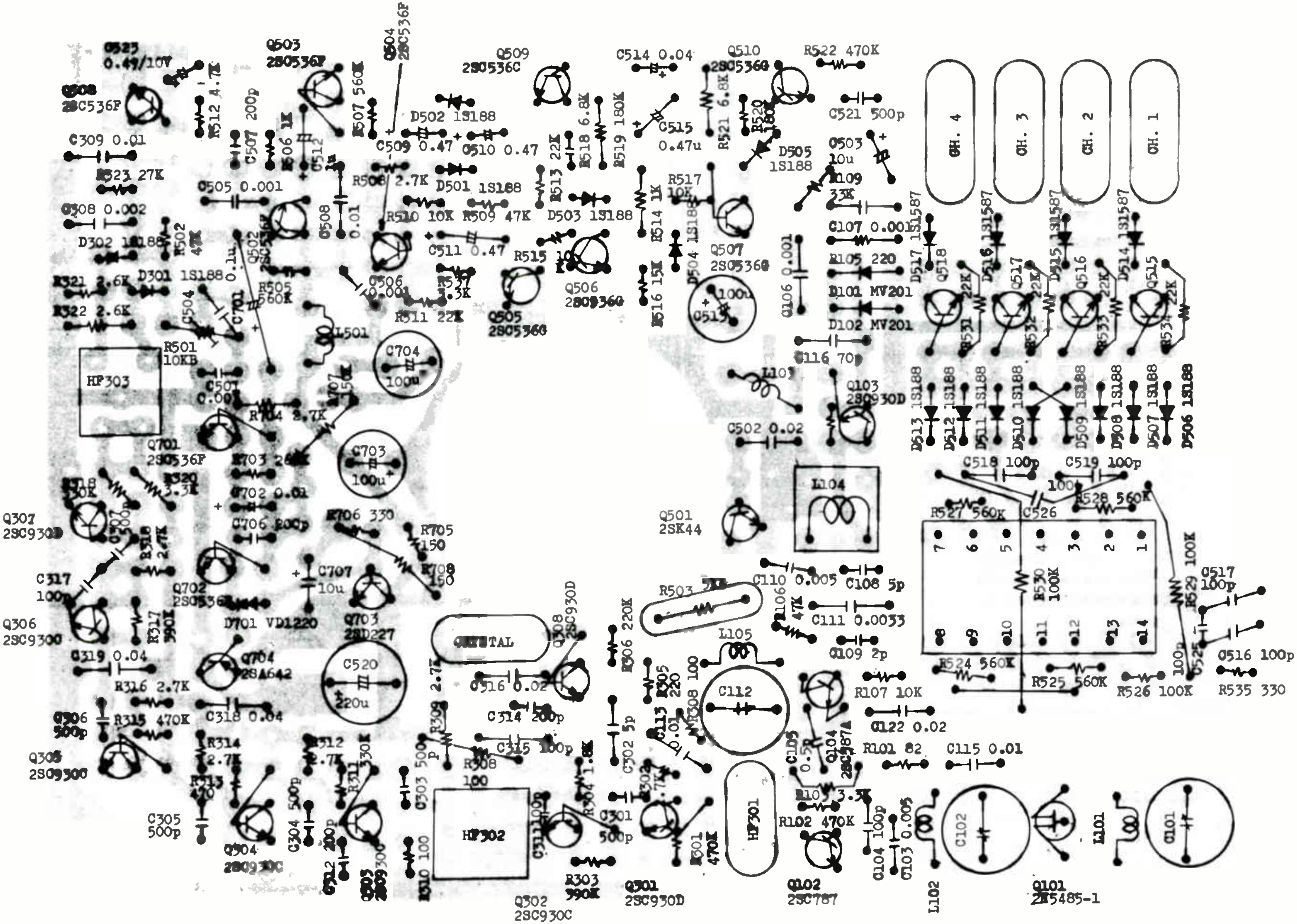
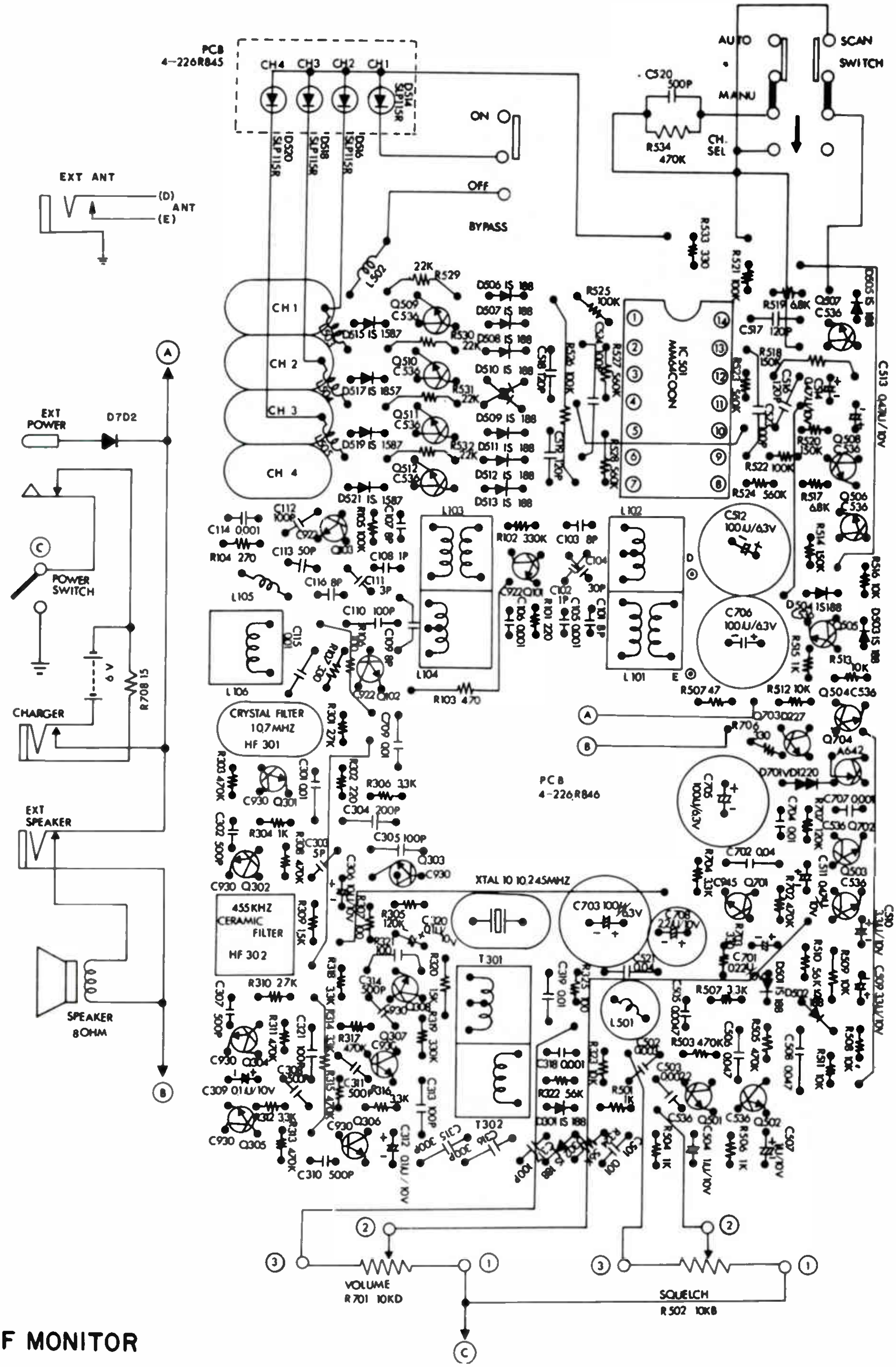


FIGURE 11, MODEL UHF AND UHFH MONITORS, SCHEMATIC DIAGRAM

UHF AND UHFH MONITORS




PCB 4-226R845
CH4 CH3 CH2 CH1
EXT ANT
ANT
ON
OFF
BYPASS
AUTO
MANU
SCAN SWITCH
CH. SEL
C520 500P
R534 470K
R533 330
R521 100K
IC 501 MM64COON
EXT POWER
D7D2
POWER SWITCH
CHARGER
R708 15
6V
EXT SPEAKER
SPEAKER 8OHM
CRYSTAL FILTER 10.7MHZ HF 301
455KHZ CERAMIC FILTER HF 302
XTAL 10 10.245MHZ
PCB 4-226R846
L101
L102
L103
L104
L105
L106
L501
T301
T302
VOLUME R701 10KD
SQUELCH R502 10KB

VHF MONITOR

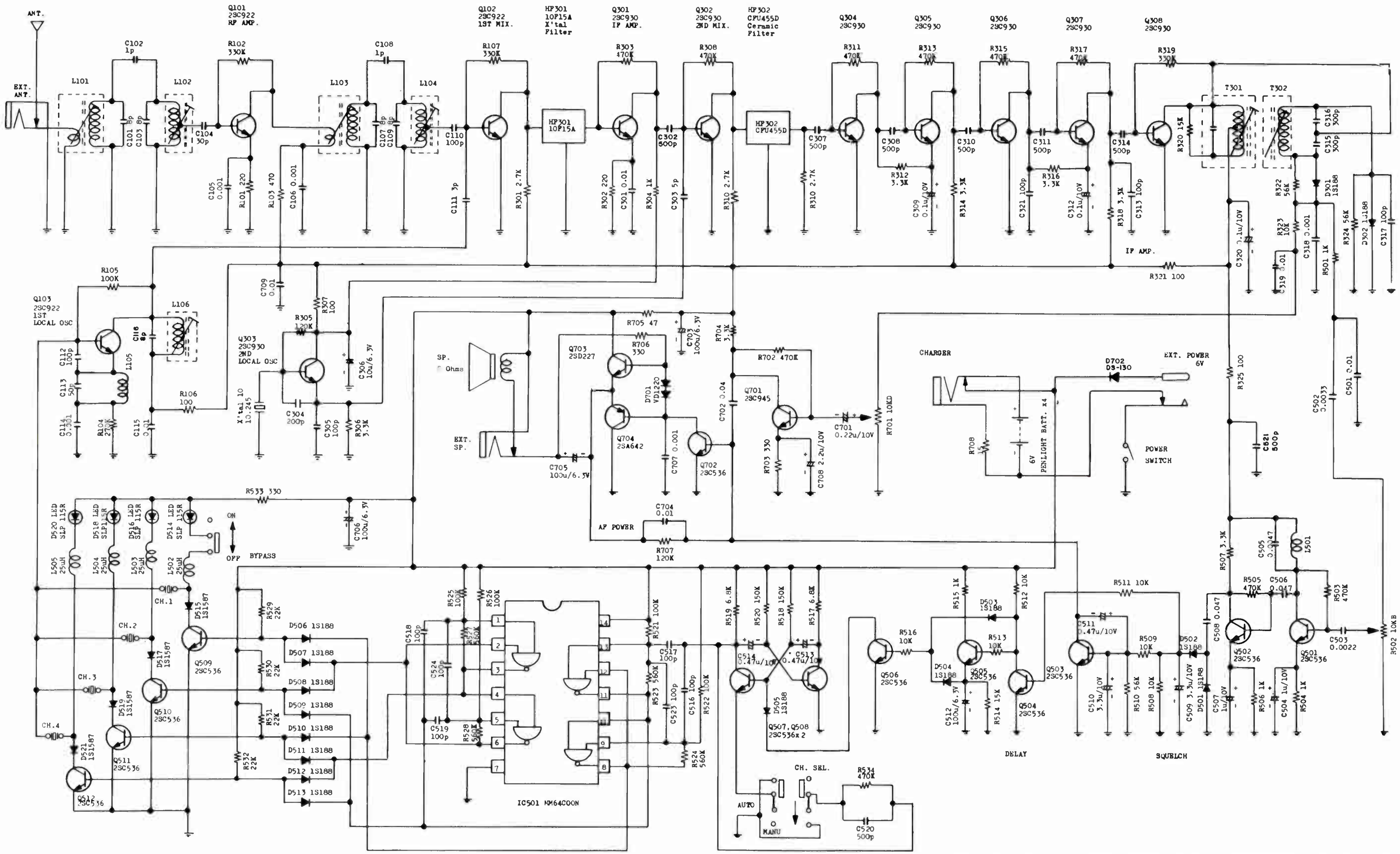


FIGURE 8, MODEL VHF MONITOR, SCHEMATIC DIAGRAM

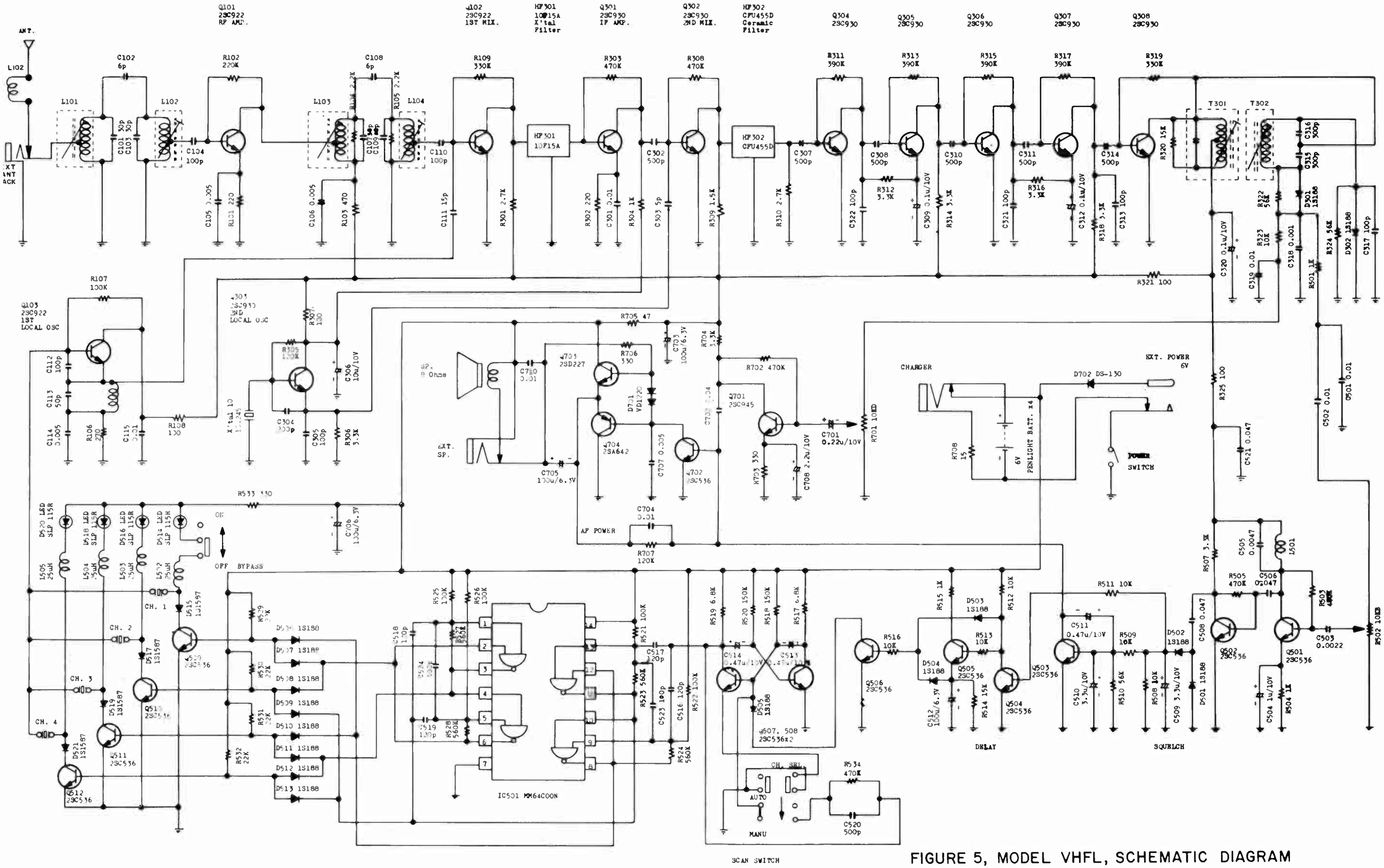


FIGURE 5, MODEL VHFL, SCHEMATIC DIAGRAM

TABLE 1, TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE
1. Monitor will not operate. -No sound from speaker. -Channel indicators do not light.	a. Battery voltage low, less than 4 volts. b. Defective power On/Off switch. c. Defective EXT PWR jack. d. Defective CHG jack.
2. No sound from speaker. -Channel lights glow. -Manual scan functions normal.	a. Defective speaker. b. Defective EXT and SPK jack. c. Squelch Control (shorted to ground). d. D501,shorted. e. Q508 defective. f. Defective Audio Amplifier Component, (Q701,Q702, or Q704).
3. No automatic scanning. -Audio and Squelch functions, operates normally.	a. Defective component in IC501 driving circuit (Q505,506, D504,D503,Q508 or Q510) b. Defective IC501.
4. No Manual scanning. -All other functions operate normally.	a. Manual/Scan switch defective. b. C520 open. c. Battery voltage low. (less than 4 volts)
5. Irregular scanning. -Channels 1 and 2 only scan. -Channels scan in pairs.	a. IC500 defective. b. C523, D510 or D506 shorted. c. Defective diodes. d. D506 through D513 shorted. e. See Table 4.
6. Squelch functions inoperative. -Background noise very low. -No squelch control. -Receiver will not awaken.	a. C521 and C501 shorted. b. C502, C503 and R502 open.
7. Poor Sensitivity.	a. Defective Crystal. b. Poor alignment. c. Defective antenna.

UHF and UHFH Monitor Alignment and Tests

All tests and observations performed on the VHF/VHFL monitors are applicable to the UHF/UHFH models except for the RF coil alignment.

A. Disassemble the cabinet and install an applicable crystal in channel 1 position. Connect the monitor to the test equipment as shown in the diagram and adjust the external power supply to 6 ±0.5 volts.

B. Connect the RMS Volt/DB meter across the 8 ohm load and adjust the signal generator frequency of the crystal installed.

C. Set the monitor control as follows:

Volume Control	to	Full CW position
Squelch Control	to	Full CCW position
Bypass Switch	to	OFF position
Manual/Scan switch	to	Center position (select Ch. 1)

D. RF Coil Adjustment

1) Set the Signal Generator Modulation to OFF and adjust the RF output to obtain a drop of 10 db on the RMS Volt/DB meter.

2) Adjust C101, C102, L104 and C112 for minimum reading of the db meter. Repeat these adjustments to assure maximum quieting.

3) Disconnect the signal generator and install an antenna. Repeat test for VHFL/VHF steps 3 D4 through 7.

E. AFC Voltage Adjustment

1) Connect the VTVM to the arm of R503, (Q501 drain) and adjust R503 to obtain +3.0 VDC.

F. Sensitivity Measurement (maximum quieting)

1) Without receiving a signal (noise only) adjust the volume control to obtain zero db reference. Reconnect the signal generator (without modulation) and adjust the RF to obtain (-)20db on the voltmeter.

2) Signal generator output should be 3uV or less (8 to 16db). Read just C101 and C102, if necessary, to obtain at least (-)20db quieting.

G. Scanning Observations and Tests

Perform scanning tests outlined in step 3I, Pg. 10 for VHFL and VHF monitors.

H. Channel Tests

Insert the crystal used for the above tests in the other 3 channel sockets and observe that each channel functions as channel one.

I. Reassemble the monitor cabinet, install good batteries and check the monitor for normal operation.

G. Audio Output Measurement

1) Adjust the volume control full CW and the squelch control full CCW. Modulate the signal generator +5KHz at 1KHz.

2) Adjust the signal generator RF output to 5 uV. The RMS Volt/DB meter should indicate 250 mW to 300 mW.

H. Squelch Sensitivity Measurements

1) Disconnect the signal generator from the EXT ANT jack. Set the monitor volume control full CW position. Remove the phone plug from the EXT SPK jack.

2) Adjust the squelch control from full CCW position to a point where the noise just stops. Control should be approximately 1/4 rotation from CCW.

3) Adjust the signal generator RF output to zero and reconnect to the EXT ANT jack. Slowly increase the RF output until audio is heard in the speaker.

4) The RF output should be approximately 0.25 uV (-6db).

5) Adjust the squelch control full CW position. Increase the signal generator RF output until the audio is heard in the speaker.

6) The RF output reading should be between 2 and 10 uV (12 to 26 db)

I. Scanning Observations and Tests

1) Set the monitor controls as follows:

Volume Control	to	1/2 rotation
Squelch Control	to	Full CW
Manual/Scan Switch	to	Scan position

2) Scan Time Measurement

a. Cover up channel lights 2, 3 and 4 with masking tape or finger. Count the number of scans of channel 1 for 30 seconds.

$$\frac{\text{No. Scan X 4 channels}}{\text{30 seconds}} = \text{4 to 10 channels per second.}$$

3) Delay time (after carrier is OFF)

a. Set the signal generator frequency to the frequency of the crystal installed. Adjust the RF output to zero. Slowly increase the RF output and observe that the scanning stops (upon the receipt of a signal), on the channel in which the crystal is installed.

b. Measure the time scanning starts again after the carrier is removed; delay should be approximately 2 seconds. Delay time may be increased or decreased by changing the value of C512 (higher the capacity, longer the delay).

NOTE: IF SCANNING DELAY FEATURE IS NOT REQUIRED REMOVE CAPACITOR C512 FROM CIRCUIT.

Pages 43-58 Courtesy of FANON/COURIER CORP.

VHFL and VHF Monitor Alignment Procedure

A. Disassemble the cabinet, top half only. Connect the monitor to the test equipment as shown in the diagram. Connect the RMS Volt/Wattmeter across the EXT SPK 8 ohm load.

B. Select a crystal with the desired frequency and install in channel 1 position. Adjust the external power supply to 6 ± 0.5 volts. Adjust the monitor controls as follows:

Volume Control	to	0.25 VRMS (0db) of noise across load
Squelch Control	to	Full CCW position
Bypass Switch	to	OFF
Manual/Scan Switch	to	Center position

C. Operate the Manual/Scan switch to select channel 1 and set in the center position.

D. RF Coil Adjustments

1) Adjust the FM signal generator to the same frequency as the channel frequency of the crystal installed (observe on the frequency counter).

2) Set signal generator modulation to the OFF position. Adjust the RF output to obtain a drop of 10db (0.1 volts) on the RMS Volt/DB meter.

3) Adjust the following coils for minimum reading on the db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10db quieting.

Adjust: L101,L102,L103,L104,L105,L106 and T301 for maximum quieting.

4) Disconnect the external antenna adapter and install its antenna. Adjust the monitor volume control to obtain zero db reference on the RMS voltmeter, without receiving a signal.

5) Connect a short length of copper wire to the signal generator output and position vertically. Place the monitor approximately 24 inches from the signal generator.

6) Adjust the signal generator output (without modulation) to obtain 10db drop in the reading on the RMS voltmeter.

7) Adjust L101 or C101 (as applicable) to obtain maximum quieting.

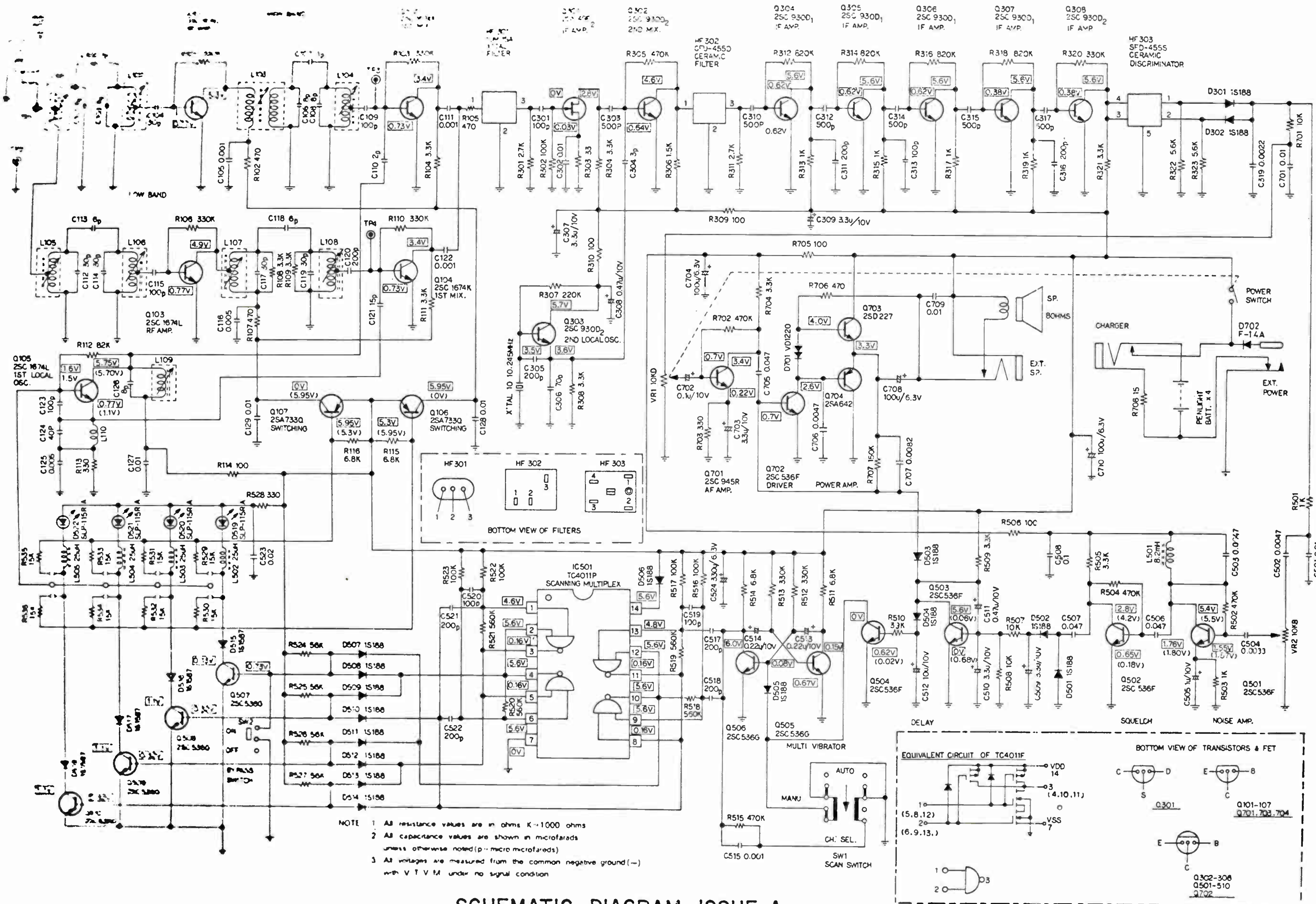
E. Discriminator Adjustment

1) Connect a VTVM to the junction of R501, C501 and C502. Test point may be reached from the component side of the circuit board, top end of R501. Adjust T302 for zero reading on the VTVM.

F. Sensitivity Measurement

1) Set the squelch control full CCW and adjust the volume control to obtain a zero db (0.25 VRMS) reading on the RMS. Volt/DB meter (no signal should be received).

2) Without changing the adjustments of the monitor, reconnect the signal generator to the EXT ANT jack and adjust the RF output to obtain a noise drop of 20 db on the RMS Volt/DB meter. The signal generator RF output should be 1.0 uV(6db) or less.



SCHEMATIC DIAGRAM, ISSUE A

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D301	1S188FM	1010-145
D302	1S188FM	1010-145
D501	1S188FM	1010-145
D502	1S188FM	1010-145
D503	1S188FM	1010-145
D504	1S188FM	1010-145
D505	1S188FM	1010-145
D506	1S188FM	1010-145
D507	1S188FM	1010-145
D508	1S188FM	1010-145
D509	1S188FM	1010-145
D510	1S188FM	1010-145
D511	1S188FM	1010-145
D512	1S188FM	1010-145
D513	1S188FM	1010-145
D515	1S1587	2004-67
D516	1S1587	2004-67
D517	1S1587	2004-67
D518	1S1587	2004-67
D519	SLP-115R	2018-12
D520	SLP-115R	2018-12
D521	SLP-115R	2018-12
D522	SLP-115R	2018-12
D701	VD1220	2004-68
D702	F-14A	2022-08
IC501	MC-14011CP	2032-38
Q101	2SC1674(L)	2032-34
Q102	2SC1674(K)	2032-33
Q103	2SC1674(L)	2032-34
Q104	2SC1674(K)	2032-33
Q105	2SC1674(L)	2032-34
Q106	2SA733	2032-35
Q107	2SA733	2032-35
Q301	2SK49E2	2032-36
Q304	2SC930(D)	1013-15
Q305	2SC930(D)	1013-15
Q306	2SC930(D)	1013-15
Q307	2SC930(D)	1013-15
Q501	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q502	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q503	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q504	2SC536(F)	2018-01
	2SC945(Q)	2004-04
Q505	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q506	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q507	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q508	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q509	2SC536(F)	2018-01
	2SC945(P)	2032-37
Q510	2SC536(G)	2020-05
	2SC945(P)	2032-37
Q701	2SC945(R)	1080-21
Q703	2SD227(W)	2020-06
	2SD227(R)	2032-40
Q704	2SA642	2004-06

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C307	3.3uF 10V	2004-55
C308	.37uF 10V	2004-52
C309	3.3uF 10V	2004-55
C505	1uF 10V	1014-107
C509	3.3uF 10V	2004-55
C510	3.3uF 10V	2004-55
C511	.47uF 10V	2004-52
C512	10uF 6.3V	2017-86
C513	.22uF 10V	2004-53
C514	.22uF 10V	2004-53
C524	330uF 6.3V	2032-25
C702	.1uF 10V	2004-54
C703	3.3uF 10V	2004-55
C704	100uF 6.3V	1003-102
C708	100uF 6.3V	L003-102
C710	100uF 6.3V	1003-102

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	10K, Volume	2004-46
VR2	10K, Squelch	2004-47

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2004-38
L102	2004-38
L103	2004-37
L104	2004-38
L105	2018-02
L106	2018-02
L107	2018-02
L108	2018-02
L109	2004-39
L110	2004-45
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	HF Filter	10M15A/2004-49
	HF Filter	10M15AG/2032-18
HF302	HF Filter	CFU-455D/2004-50
HF303	HF Filter	2032-19
	Crystal, 1024MHz	HC-18U/2004-65
	Switch, Bypass	2004-57
	Switch, Auto/Manual/ Channel Select	2004-56
	Socket, Ext. Antenna	2004-62
	Socket, Crystal	2032-15
	Socket, Ext. Speaker	2004-59
	Socket, DC	2004-58

CABINET PARTS

NAME	PART NO.
Cabinet	2032-01
Panel, Front	2004-09
Lid, Back	2032-02
Lid, Bottom	2004-10
Lid, Battery	2004-11
Lid, Crystal	2032-03
Knob, Volume/Squelch	2004-26
Knob, Assembly-Auto/ Manual/Channel Select	2004-29

Pages 38-42 Courtesy of FANON/COURIER CORP.

Q701	2SC945(R)	1080-21
Q702	2SC945	1043-07
	2SC945(Q)	2004-04
	2SC536(F)	2018-01
Q703	2SD227	2004-05
Q704	2SA642	2004-06

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C306	10uF 10V	170-66-9
C309	.1uF 10V	2004-54
C312	.1uF 10V	2004-54
C320	.01uF 10V	2018-05
C504	1uF 10V	1014-107
C509	3.3uF 10V	2004-55
C510	3.3uF 10V	2004-55
C511	.47uF 10V	2004-52
C512	100uF 6.3V	L003-102
C513	.47uF 10V	2004-52
C514	.47uF 10V	2004-52
C701	.22uF 10V	2004-53
C703	100uF 6.3V	L003-102
C705	100uF 6.3V	1003-102
C706	100uF 6.3V	L003-102
C708	2.2uF 10V	2004-51

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R502	10K, Trimmer	2004-47
R701	10K, Trimmer	2004-46

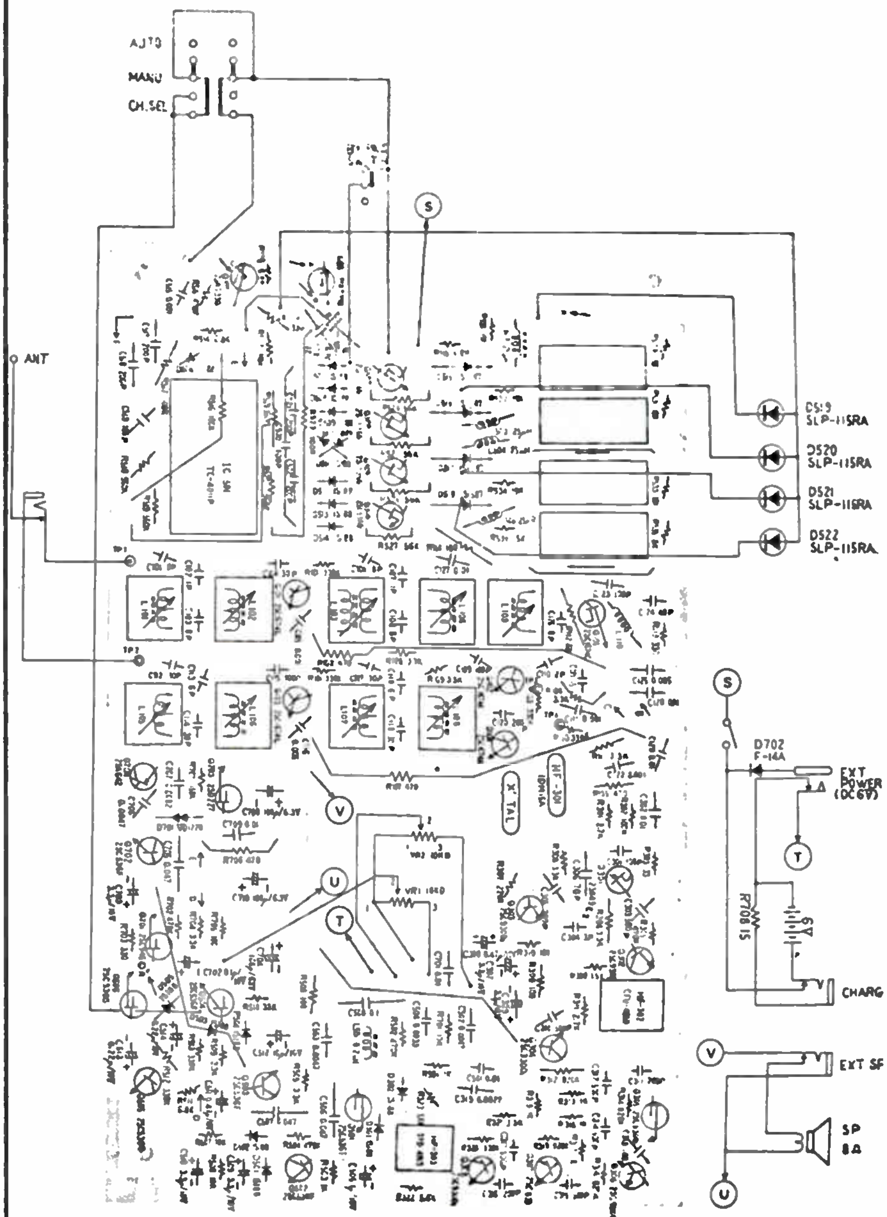
ITEM	PART NO.
L101	2018-02
L102	2018-02
L103	2018-02
L104	2018-02
L105	2018-03
L106	1041-49
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43
L505	2004-43
T301	2004-40
T302	2004-41

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	HF Filter	2004-49
HF302	HF Filter	CFU455D
	Switch, Bypass	2004-57
	Switch, Auto/Manual/ Channel Select	2004-56
	Speaker, 8 ohms .3W	2004-48
	Earphone Assembly	1012-26
	Socket, Crystal	1002-28
	Socket, Ext. Power	2004-58
	Socket, Ext. Antenna	2004-62
	Socket, Assembly Charger and Ext. Speaker	2004-59
	Crystal 10.245MHz	HC-18U

CABINET PARTS

NAME	PART NO.
Cabinet, Front	2004-07
Cabinet, Back	2004-08
Panel, Front	2004-09
Bottom	2004-10
Battery Compartment	2004-11
Crystal Compartment	2004-12



Q308	2SC930(D)	1013-15
Q501	2SK44(D)	2020-04
Q502	2SK536(F)	2018-01
Q503	2SK536(F)	2018-01
Q503	2SK536(F)	2018-01
Q504	2SK536(F)	2018-01
Q505	2SC536(G)	2020-05
Q506	2SC536(G)	2020-05
Q507	2SC536(G)	2020-05
Q508	2SC536(F)	2018-01
Q509	2SC536(G)	2020-05
Q510	2SC536(G)	2020-05
Q515	2SC945(R)	1080-21
Q516	2SC945(R)	1080-21
Q517	2SC945(R)	1080-21
Q518	2SC945(R)	1080-21
Q701	2SC536(F)	2018-01
Q702	2SC536(F)	2018-01
Q703	2SD227(W)	2020-06
Q704	2SA642(R)	2020-07

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C101	Trimmer	2020-22
C102	Trimmer	2020-22
C112	Trimmer	2020-22
C503	10uF 10V	170-66-9
C509	.47uF 10V	2004-52
C510	.47uF 10V	2004-52
C511	.47uF 10V	2004-52
C512	1uF 10V	1014-107
C513	100uF 10V	1012-18
C514	.47uF 10V	2004-52
C515	.47uF 10V	2004-52
C520	220uF 10V	1012-19
C523	.47uF 10V	2004-52
C701	.1uF 10V	2004-54
C702	.1uF 10V	2004-54
C703	100uF 10V	1012-18
C704	100uF 10V	1012-18
C707	10uF 10V	170-66-9

CONTROLS/SPECIAL RESISTORS

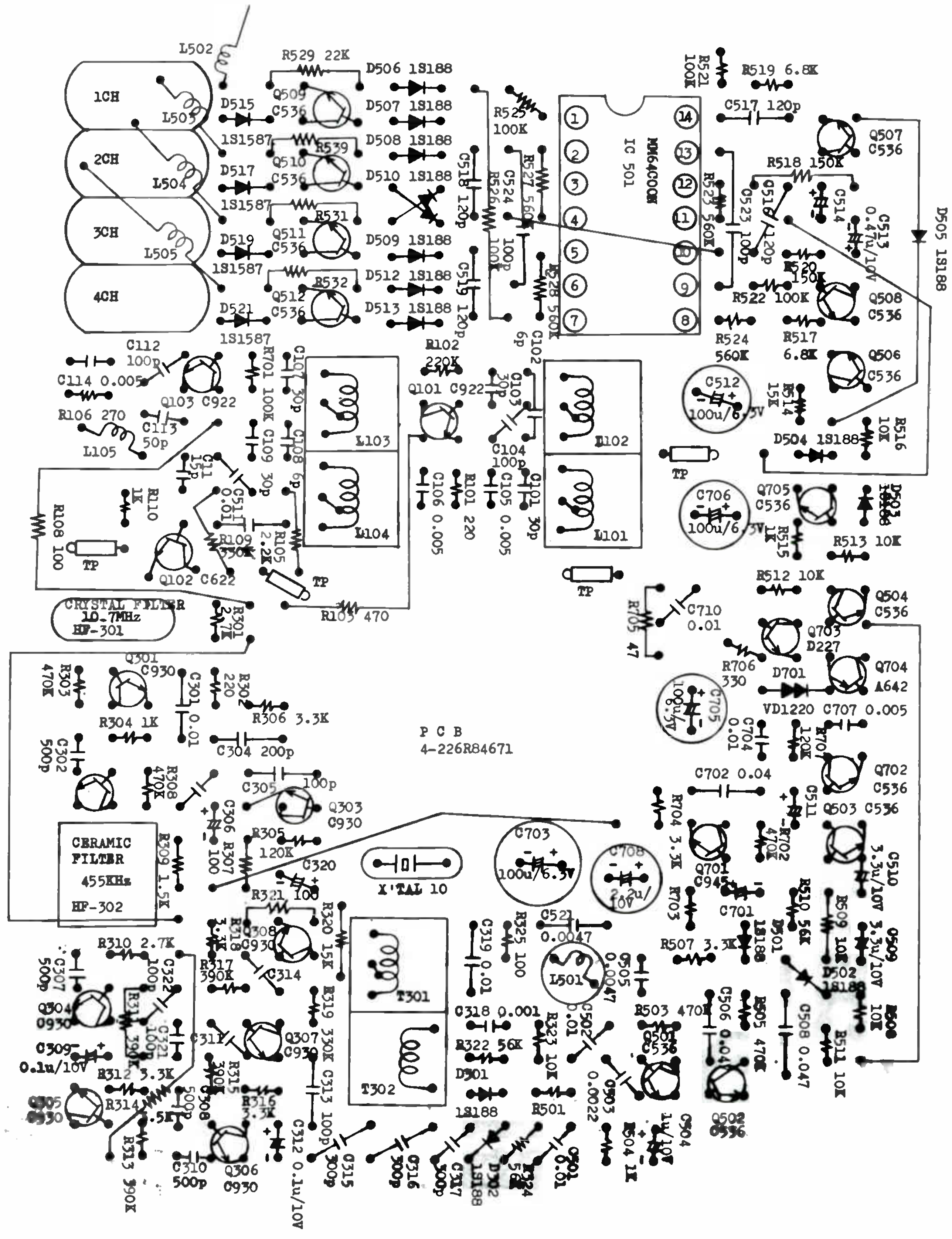
ITEM	DESCRIPTION	PART NO.
R501	10K, Trimmer	2004-47
R503	5K, Trimmer	1002-24
R504	10K, Trimmer	2020-10
R702	10K, Trimmer	2004-46

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2020-21
L102	2020-21
L103	2018-03
L104	2004-39
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43
L505	2004-43

VHFL SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D301	1S188(FM)	1010-145
D302	1S188(FM)	1010-145
D501	1S188(FM)	1010-145
D502	1S188(FM)	1010-145
D503	1S188(FM)	1010-145
D504	1S188(FM)	1010-145
D505	1S188(FM)	1010-145
D506	1S188(FM)	1010-145
D507	1S188(FM)	1010-145
D508	1S188(FM)	1010-145
D509	1S188(FM)	1010-145
D510	1S188(FM)	1010-145
D511	1S188(FM)	1010-145
D512	1S188(FM)	1010-145
D513	1S188(FM)	1010-145
D514	SLP-115R	2018-12
D515	1S1587	2004-67
D516	SLP-115R	2018-12
D517	1S1587	2004-67
D518	SLP-115R	2018-12
D519	1S1587	2004-67
D520	SLP-115R	2018-12
D521	1S1587	2004-67
D701	VD1220	2004-68
D702	DS-130(E)	291-20
IC501	CM05 MM6400N	2004-70
Q101	2SC922(K)	2004-03
Q102	2SC922(K)	2004-03
Q103	2SC922(L)	2004-01
Q301	2SC930(D)	1013-15
Q302	2SC930(D)	1013-15
Q303	2SC930(D)	1013-15
Q304	2SC930(C)	2004-02
Q305	2SC390(C)	2004-02
Q306	2SC930(C)	2004-02
Q307	2SC930(C)	2004-02
Q308	2SC930(D)	1013-15
	2SC945	1043-07
	2SC945(Q)	2004-04
Q501	2SC536(F)	2018-01
	2SC945	1043-07
	2SC945(Q)	2004-04
Q502	2SC536(F)	2018-01
	2SC945	1043-07
	2SC945(Q)	2004-04
Q503	2SC536(F)	2018-01
	2SC934	1043-07
	2SC934)Q)	2004-04
Q504	2SC536(F)	2018-01
	2SC945	1043-07
	2SC945(Q)	2004-04
Q505	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC934(R)	1080-21
Q506	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC934(R)	1080-21
Q507	2SC536(E)	296-55-9
Q508	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q509	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q510	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q511	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21
Q512	2SC536(E)	296-55-9
	2SC945	1043-07
	2SC945(R)	1080-21



MODEL VHFL

VHF SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D301	1S188	1010-145
D302	1S188	1010-145
D501	1S188	1010-145
D502	1S188	1010-145
D503	1S188	1010-145
D504	1S188	1010-145
D505	1S188	1010-145
D506	1S188	1010-145
D513	1S188	1010-145
D514	TLR104	2004-69
D515	1S1587	2004-67
D516	TLR104	2004-69
D517	1S1587	2004-67
D518	TLR104	2004-69
D519	1S1587	2004-67
D520	TLR104	2004-69
D701	VD1220	2004-68
IC501	CM05-MM64COON	2004-70
Q101	2SC922(K)	2004-03
Q102	2SC922(K)	2004-03
Q103	2SC922(L)	2004-01
Q301	2SC930(D)	1013-15
Q302	2SC930(D)	1013-15
Q303	2SC930(D)	1013-15
Q304	2SC930(C)	2004-02
Q305	2SC930(C)	2004-02
Q306	2SC930(C)	2004-02
Q307	2SC930(C)	2004-02
Q308	2SC930(D)	1013-15
Q501	2SC945(O)	2004-14
	2SC536(F)	2018-01
Q502	2SC945(O)	2004-14
	2SC536(F)	2018-01
Q503	2SC945(O)	2004-14
	2SC536(F)	2018-01
Q504	2SC945(O)	2004-14
	2SC536(F)	2018-01
Q505	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q506	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q507	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q508	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q509	2SC945(O)	2004-14
	2SC536(F)	2018-01
	2SC945(R)	1080-21
	2SC536(E)	296-55-9
Q701	2SC945(R)	1080-21
Q703	2SD227	2004-05
Q704	2SA642	2004-06

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C306	10uF 10V	170-66-9
C309	.1uF 10V	2004-54
C312	.1uF 10V	2004-54
C320	.1uF 10V	2004-54
C504	1uF 10V	1014-107
C507	1uF 10V	1014-107
C509	3.3uF 10V	2004-55
C510	3.3uF 10V	2004-55
C511	.47uF 10V	2004-52
C512	100uF 6.3V	1003-102
C513	.47uF 10V	2004-52
C514	.478F 10V	2004-52
C701	.22uF 10V	2004-53
C703	100uF 6.3V	1003-102
C705	100uF 6.3V	1003-102
C706	100uF 6.3V	1003-102
C708	2.2uF 10V	2004-51

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R502	10K, Trimmer	2004-47
R701	10K, Trimmer	2004-46

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2004-37
L102	2004-38
L103	2004-37
L104	2004-38
L105	2004-45
L106	2004-39
L501	2004-44
L502	2004-43
L503	2004-43
L504	2004-43
L505	2004-43
T301	2004-40
T302	2004-41

UHF/UHFH SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D101	MV201	2020-08
D102	MV201	2020-08
D301	1S188(FM)	1010-145
D302	1S188(FM)	1010-145
D501	1S188(FM)	1010-145
D502	1S188(FM)	1010-145
D503	1S188(FM)	1010-145
D504	1S188(FM)	1010-145
D505	1S188(FM)	1010-145
D506	1S188(FM)	1010-145
D507	1S188(FM)	1010-145
D508	1S188(FM)	1010-145
D509	1S188(FM)	1010-145
D510	1S188(FM)	1010-145
D511	1S188(FM)	1010-145
D512	1S188(FM)	1010-145
D513	1S188(FM)	1010-145
D514	1S1587	2004-67
D515	1S1587	2004-67
D516	1S1587	2004-67
D517	1S1587	2004-67
D518	SLP115(R)	2018-12
D519	SLP115(R)	2018-12
D520	SLP115(R)	2018-12
D521	SLP115(R)	2018-12
D701	VD1220	2004-68
D702	DS-130(E)	291-20
IC501		2004-70
Q101	2N5485-1	2020-01
Q102	2SC787	2020-02
Q103	2SC930(D)	1013-15
Q104	2SC387(A)	2020-03
Q301	2SC930(D)	1013-15
Q302	2SC930(D)	1013-15
Q303	2SC930(C)	2004-02
Q304	2SC930(C)	2004-02
Q305	2SC930(C)	2004-02
Q306	2SC930(C)	2004-02
Q307	2SC930(D)	1013-15

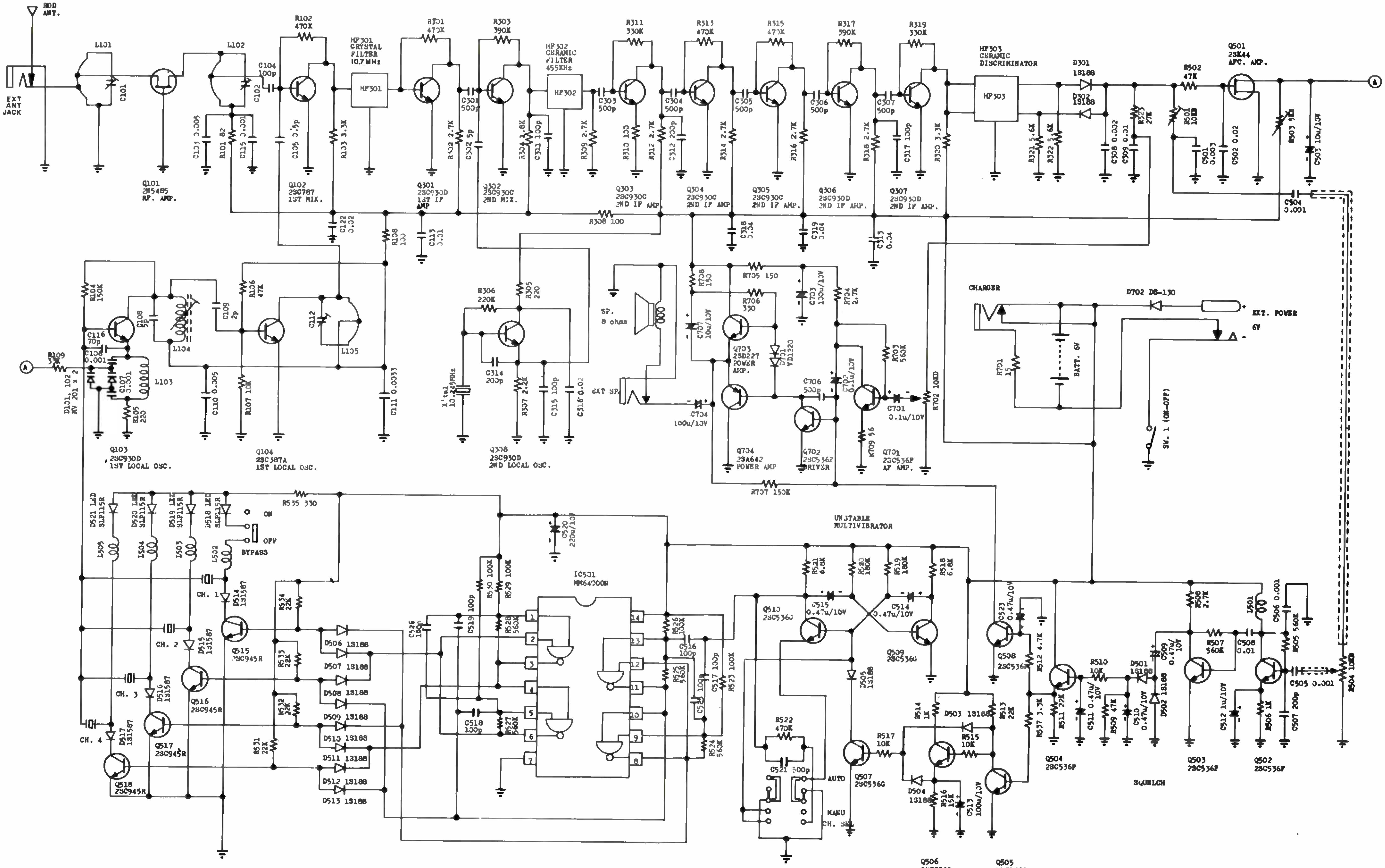
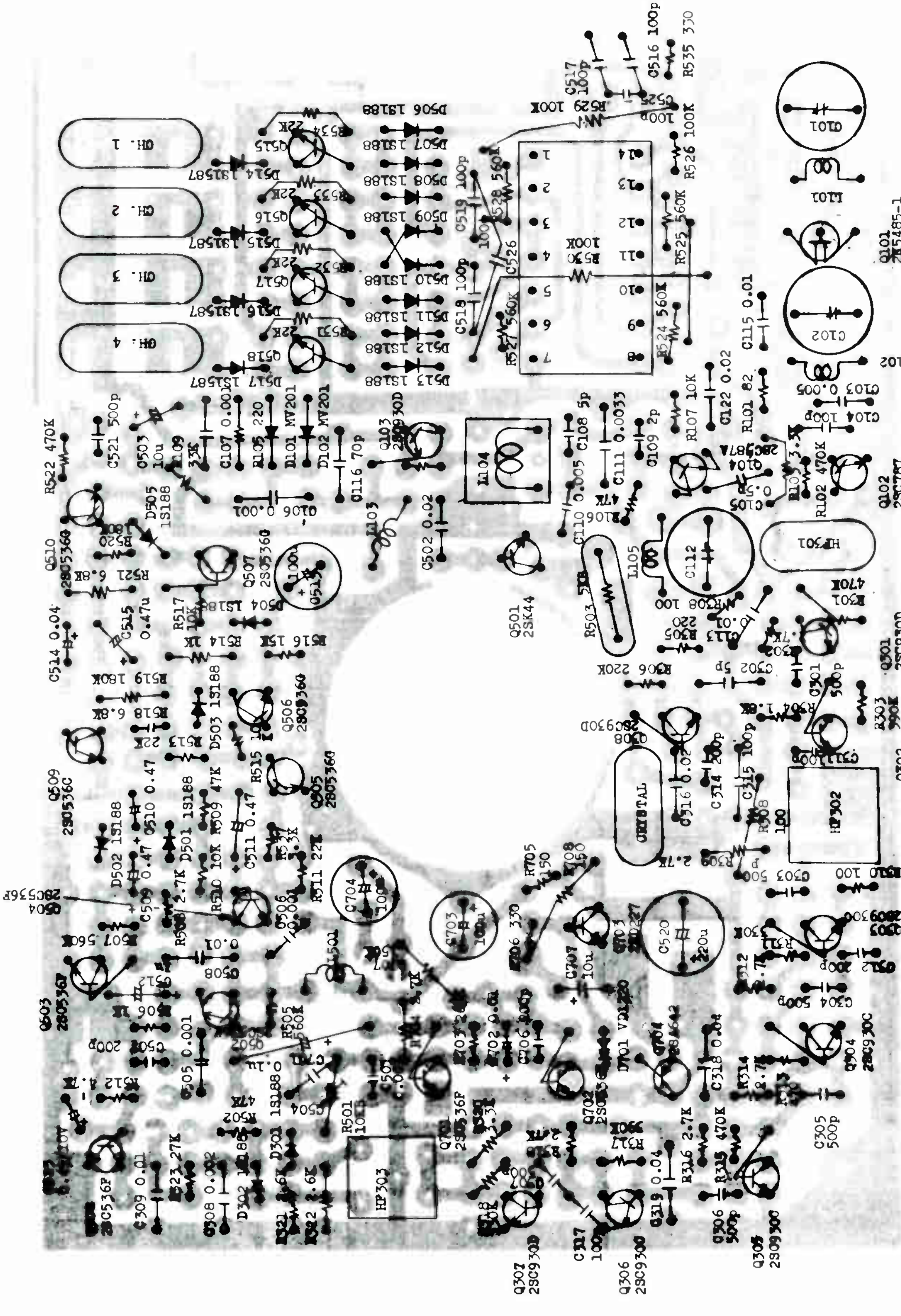
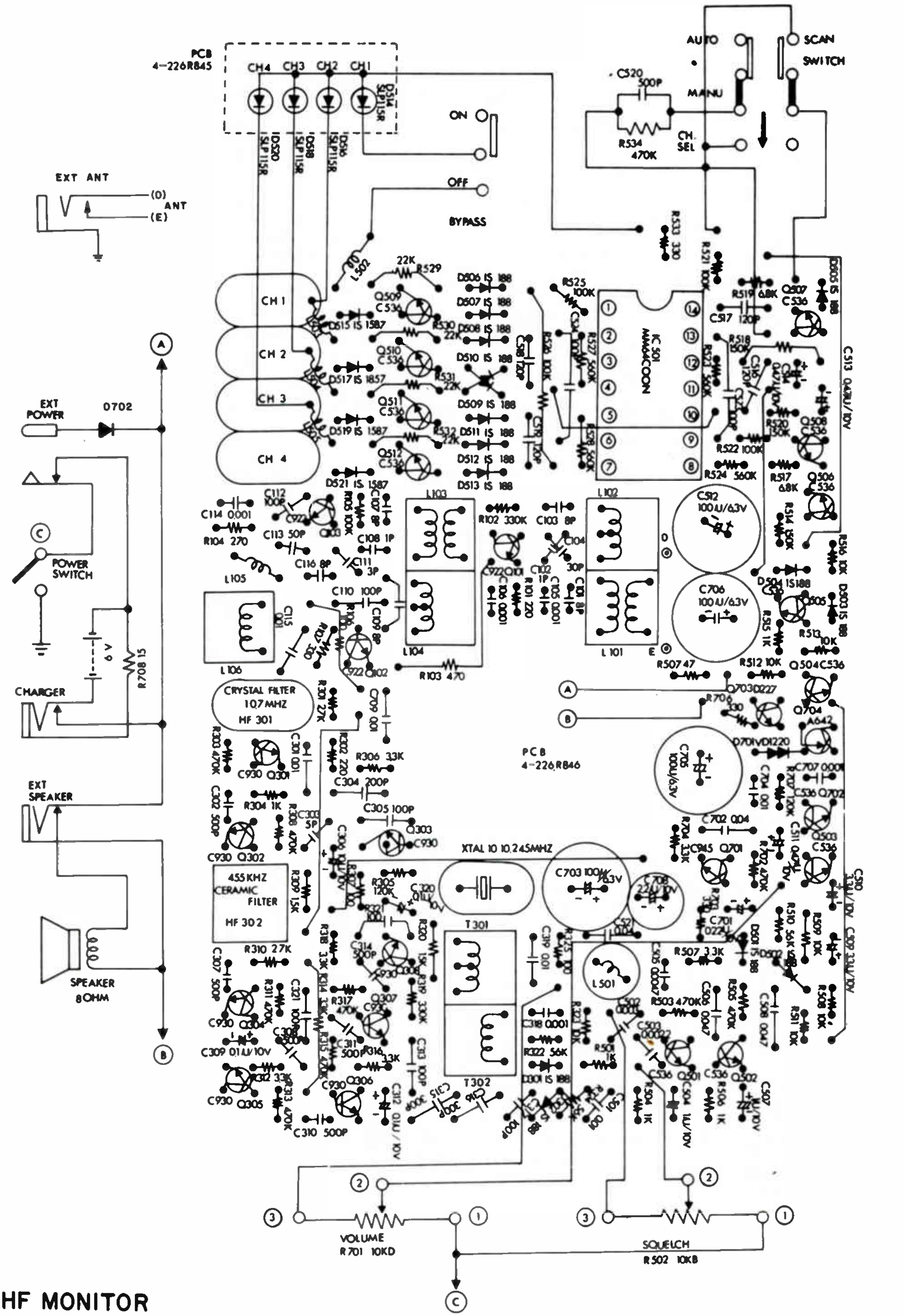


FIGURE 11, MODEL UHF AND UHFH MONITORS, SCHEMATIC DIAGRAM



UHF AND UHFH MONITORS



VHF MONITOR

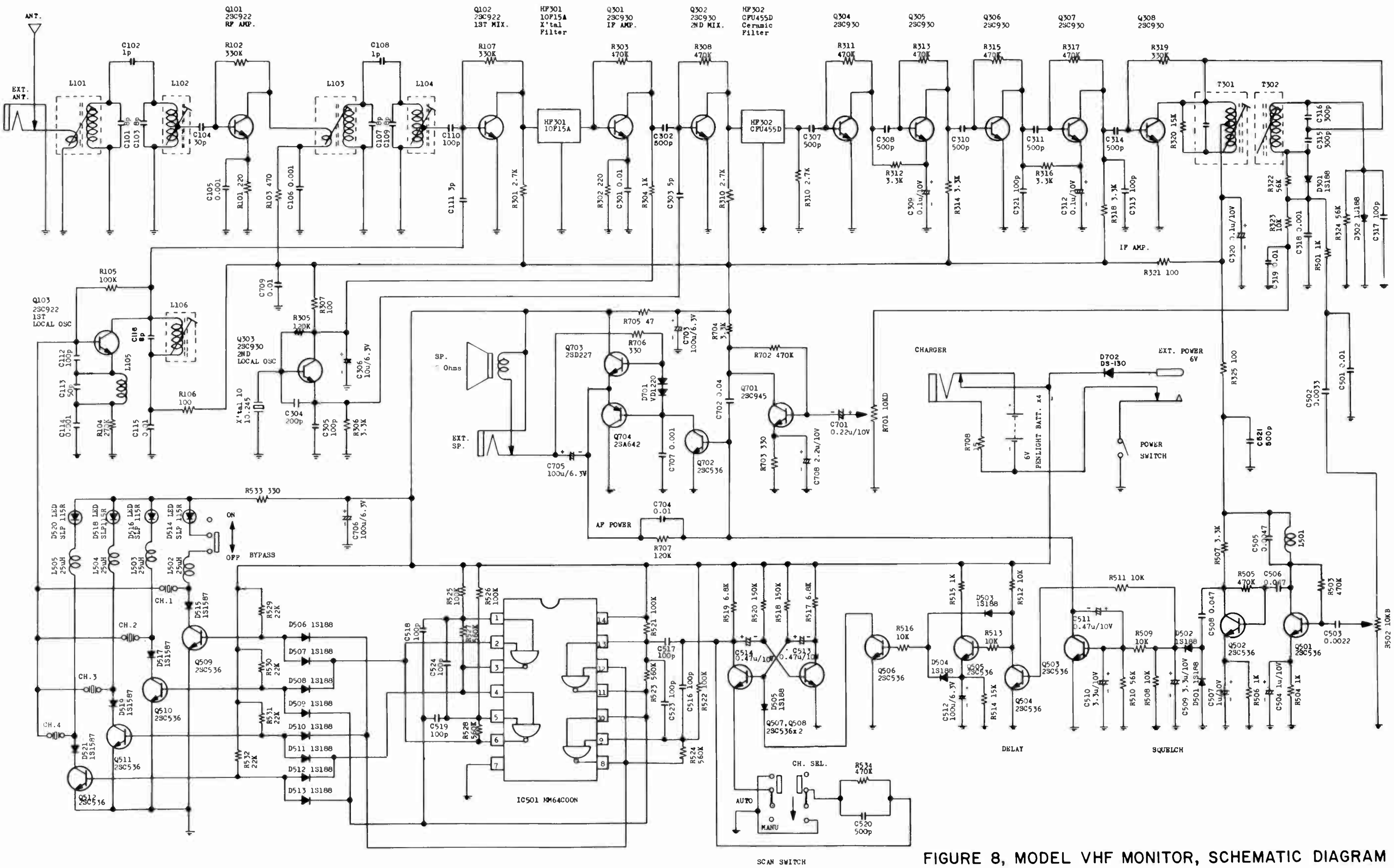


FIGURE 8, MODEL VHF MONITOR, SCHEMATIC DIAGRAM

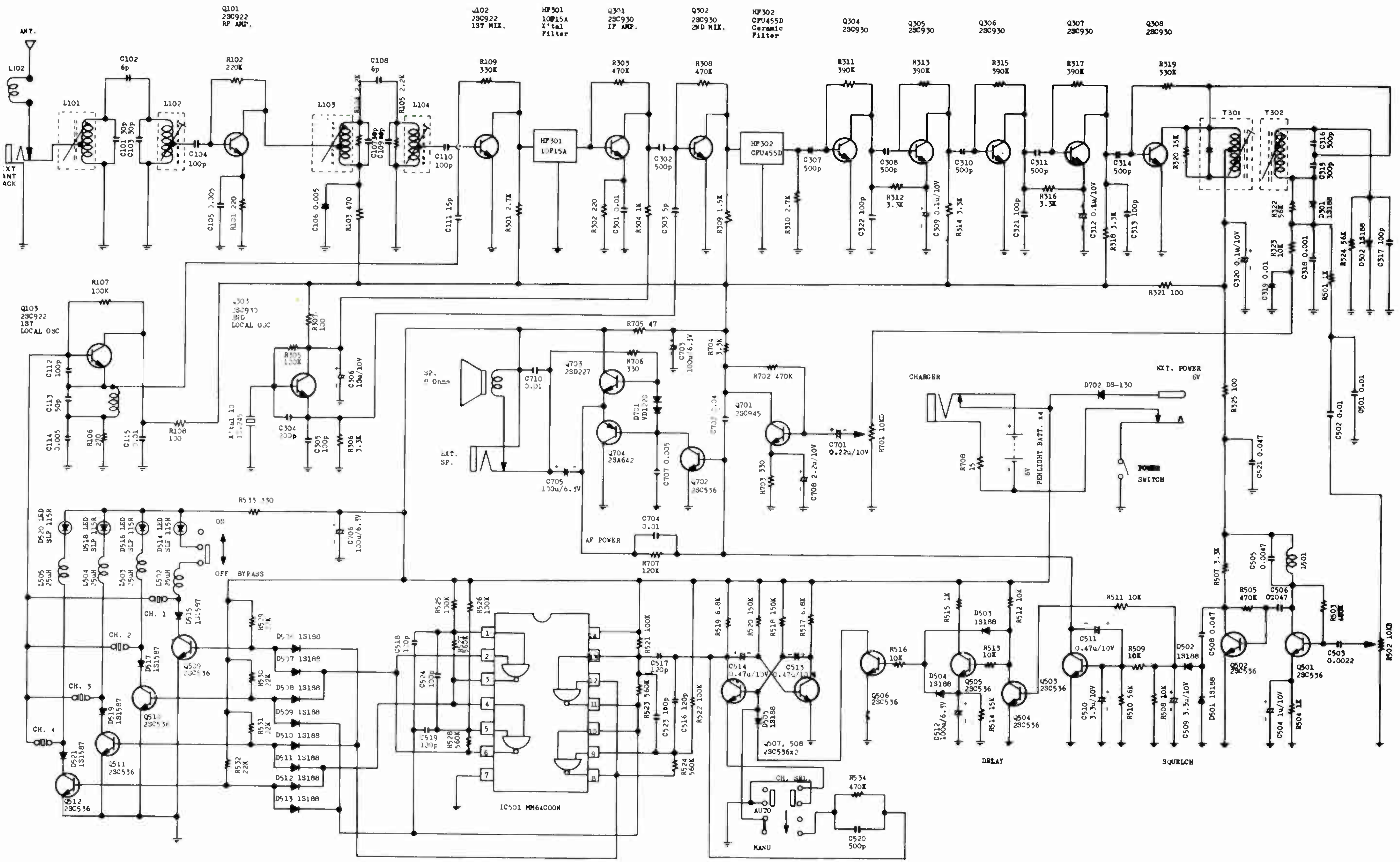

Q101 2SC922 RF AMP.
Q102 2SC922 1ST MIX.
HF301 10F15A X'tal Filter
Q301 2SC930 IF AMP.
Q302 2SC930 2ND MIX.
HF302 CFU455D Ceramic Filter
Q103 2SC922 1ST LOCAL OSC
Q303 2SC930 2ND LOCAL OSC
IC501 MM64C00N
AF POWER
CHARGER
EXT. POWER 6V
PENLIGHT BATT. x4
DELAY
SQUELCH

TABLE 2, MODEL VHF AND VHFL VOLTAGE CHART

Measure all voltages with a DC-VTVM with no signal at the antenna. Set the monitor controls as follows: Volume Control 1/4 turn CW; Squelch Control full CCW; Bypass switch OFF. Manual/Scan switch, center position. Adjust the external power supply to 6, ±0.5 volts. Voltage reading may vary ±10%.

Transistor	Base	Emitter	Collector	Transistor	Base	Emitter	Collector
Q101	1.02	0.27	4.42	Q504	0.08	0	3.15
Q102	0.68	0	2.92	Q505	3.13	2.55	5.30
Q103	1.33	0.65	4.75	Q506	0.62	0	0.02
Q301	0.82	0.15	4.17	Q507	0.12	2.29	5.43
Q302	0.63	0	3.82	Q508	0.62	0	0.10
Q303	3.58	3.43	4.80	Q509	0.69	0	0.12
Q304	0.63	0	1.90	Q510	0.69	0	0.12
Q305	2.92	2.35	4.37	Q511	0.69	0	0.12
Q306	0.27	0	1.75	Q512	0.69	0	0.12
Q307	2.25	2.59	4.18	Q701	0.77	0.17	3.28
Q308	0.33	0	4.61	Q702	0.66	0	2.33
Q501	1.88	1.28	4.42	Q703	3.62	3.00	5.45
Q502	0.61	0	2.45	Q704	2.33	2.99	0
Q503	0.06	0	0.66				

TABLE 3, MODEL UHF AND UHFH VOLTAGE CHART

(All Conditions Same As Table 2)

Transistor	Base	Emitter	Collector	Transistor	Base	Emitter	Collector
Q101 (FET)	0 (Drain)	0 (Gate)	3.42 (Source)	Q504	0.01	0	5.41
Q102	0.68	0	2.82	Q505	0	0	2.15
Q103	1.10	0.44	4.04	Q506	2.14	1.59	5.31
Q104	0.50	0	3.86	Q507	0.60	0	0.01
Q301	0.65	0	3.12	Q508	0	0	0.62
Q302	0.63	0	3.17	Q509	0.59	0	0.07
Q303	0.72	0.05	4.04	Q510	0.10	1.20	5.41
Q304	0.66	0	3.97	Q515	0.68	0	0.07
Q305	0.64	0	3.94	Q516	0.68	0	0.07
Q306	0.32	0	3.71	Q517	0.68	0	0.07
Q307	0.30	0	2.45	Q518	0.68	0	0.07
Q308	2.38	1.98	3.95	Q701	0.65	0.05	2.59
Q501	0.03	0	2.45	Q702	0.63	0	1.94
Q502	2.07	1.51	5.01	Q703	3.22	2.59	5.41
Q503	0.61	0	2.58	Q704	1.94	2.59	0

TABLE 4, INTEGRATED CIRCUIT IC 501 VOLTAGE CHART

The Channel scanning circuit is common to all Models of the FM monitors. Set the monitor control as follows: Volume and Squelch controls to FULL CW positions; Bypass switch to OFF; Manual/Scan selector to center position. Adjust the external power supply to 6 ±.5 volts. Measure the voltages with a VTVM from the back side of the printed circuit board. MANUALLY SELECT EACH CHANNEL BEFORE MAKING A MEASUREMENT. Terminal 7 is common ground and terminal 14 is +6 volts. Refer to Figure 5 for terminal locations.

IC 501 TERMINAL

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4.50	5.45	0.08	0.08	5.40	5.45	0	5.45	5.40	0.08	0.08	5.45	4.50	5.45
2	5.40	5.45	0.08	0.08	5.45	5.45	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45
3	5.40	0.08	5.45	5.45	4.52	0.08	0	5.45	5.40	0.08	0.08	5.45	5.40	5.45
4	5.40	0.08	5.45	5.45	4.52	0.08	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45

TABLE 1, TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE
1. Monitor will not operate. -No sound from speaker. -Channel indicators do not light.	a. Battery voltage low, less than 4 volts. b. Defective power On/Off switch. c. Defective EXT PWR jack. d. Defective CHG jack.
2. No sound from speaker. -Channel lights glow. -Manual scan functions normal.	a. Defective speaker. b. Defective EXT and SPK jack. c. Squelch Control (shorted to ground). d. D501,shorted. e. Q508 defective. f. Defective Audio Amplifier Component, (Q701,Q702, or Q704).
3. No automatic scanning. -Audio and Squelch functions, operates normally.	a. Defective component in IC501 driving circuit (Q505,506, D504,D503,Q508 or Q510) b. Defective IC501.
4. No Manual scanning. -All other functions operate normally.	a. Manual/Scan switch defective. b. C520 open. c. Battery voltage low. (less than 4 volts)
5. Irregular scanning. -Channels 1 and 2 only scan. -Channels scan in pairs.	a. IC500 defective. b. C523, D510 or D506 shorted. c. Defective diodes. d. D506 through D513 shorted. e. See Table 4.
6. Squelch functions inoperative. -Background noise very low. -No squelch control. -Receiver will not awaken.	a. C521 and C501 shorted. b. C502, C503 and R502 open.
7. Poor Sensitivity.	a. Defective Crystal. b. Poor alignment. c. Defective antenna.

UHF and UHFH Monitor Alignment and Tests

All tests and observations performed on the VHF/VHFL monitors are applicable to the UHF/UHFH models except for the RF coil alignment.

A. Disassemble the cabinet and install an applicable crystal in channel 1 position. Connect the monitor to the test equipment as shown in the diagram and adjust the external power supply to 6 ±0.5 volts.

B. Connect the RMS Volt/DB meter across the 8 ohm load and adjust the signal generator frequency of the crystal installed.

C. Set the monitor control as follows:

Volume Control	to	Full CW position
Squelch Control	to	Full CCW position
Bypass Switch	to	OFF position
Manual/Scan switch	to	Center position (select Ch. 1)

D. RF Coil Adjustment

1) Set the Signal Generator Modulation to OFF and adjust the RF output to obtain a drop of 10 db on the RMS Volt/DB meter.

2) Adjust C101, C102, L104 and C112 for minimum reading of the db meter. Repeat these adjustments to assure maximum quieting.

3) Disconnect the signal generator and install an antenna. Repeat test for VHFL/VHF steps 3 D4 through 7.

E. AFC Voltage Adjustment

1) Connect the VTVM to the arm of R503, (Q501 drain) and adjust R503 to obtain +3.0 VDC.

F. Sensitivity Measurement (maximum quieting)

1) Without receiving a signal (noise only) adjust the volume control to obtain zero db reference. Reconnect the signal generator (without modulation) and adjust the RF to obtain (-)20db on the voltmeter.

2) Signal generator output should be 3uV or less (8 to 16db). Read just C101 and C102, if necessary, to obtain at least (-)20db quieting.

G. Scanning Observations and Tests

Perform scanning tests outlined in step 3I, Pg. 10 for VHFL and VHF monitors.

H. Channel Tests

Insert the crystal used for the above tests in the other 3 channel sockets and observe that each channel functions as channel one.

I. Reassemble the monitor cabinet, install good batteries and check the monitor for normal operation.

G. Audio Output Measurement

1) Adjust the volume control full CW and the squelch control full CCW. Modulate the signal generator +5KHz at 1KHz.

2) Adjust the signal generator RF output to 5 uV. The RMS Volt/DB meter should indicate 250 mW to 300 mW.

H. Squelch Sensitivity Measurements

1) Disconnect the signal generator from the EXT ANT jack. Set the monitor volume control full CW position. Remove the phone plug from the EXT SPK jack.

2) Adjust the squelch control from full CCW position to a point where the noise just stops. Control should be approximately 1/4 rotation from CCW.

3) Adjust the signal generator RF output to zero and reconnect to the EXT ANT jack. Slowly increase the RF output until audio is heard in the speaker.

4) The RF output should be approximately 0.25 uV (-6db).

5) Adjust the squelch control full CW position. Increase the signal generator RF output until the audio is heard in the speaker.

6) The RF output reading should be between 2 and 10 uV (12 to 26 db)

I. Scanning Observations and Tests

1) Set the monitor controls as follows:

Volume Control	to	1/2 rotation
Squelch Control	to	Full CW
Manual/Scan Switch	to	Scan position

2) Scan Time Measurement

a. Cover up channel lights 2, 3 and 4 with masking tape or finger. Count the number of scans of channel 1 for 30 seconds.

$$\frac{\text{No. Scan X 4 channels}}{\text{30 seconds}} = \text{4 to 10 channels per second.}$$

3) Delay time (after carrier is OFF)

a. Set the signal generator frequency to the frequency of the crystal installed. Adjust the RF output to zero. Slowly increase the RF output and observe that the scanning stops (upon the receipt of a signal), on the channel in which the crystal is installed.

b. Measure the time scanning starts again after the carrier is removed; delay should be approximately 2 seconds. Delay time may be increased or decreased by changing the value of C512 (higher the capacity, longer the delay).

NOTE: IF SCANNING DELAY FEATURE IS NOT REQUIRED REMOVE CAPACITOR C512 FROM CIRCUIT.

Pages 22-37 Courtesy of FANON/COURIER CORP.

VHFL and VHF Monitor Alignment Procedure

A. Disassemble the cabinet, top half only. Connect the monitor to the test equipment as shown in the diagram. Connect the RMS Volt/Wattmeter across the EXT SPK 8 ohm load.

B. Select a crystal with the desired frequency and install in channel 1 position. Adjust the external power supply to 6 ± 0.5 volts. Adjust the monitor controls as follows:

Volume Control	to	0.25 VRMS (0db) of noise across load
Squelch Control	to	Full CCW position
Bypass Switch	to	OFF
Manual/Scan Switch	to	Center position

C. Operate the Manual/Scan switch to select channel 1 and set in the center position.

D. RF Coil Adjustments

1) Adjust the FM signal generator to the same frequency as the channel frequency of the crystal installed (observe on the frequency counter).

2) Set signal generator modulation to the OFF position. Adjust the RF output to obtain a drop of 10db (0.1 volts) on the RMS Volt/DB meter.

3) Adjust the following coils for minimum reading on the db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10db quieting.

Adjust: L101,L102,L103,L104,L105,L106 and T301 for maximum quieting.

4) Disconnect the external antenna adapter and install its antenna. Adjust the monitor volume control to obtain zero db reference on the RMS voltmeter, without receiving a signal.

5) Connect a short length of copper wire to the signal generator output and position vertically. Place the monitor approximately 24 inches from the signal generator.

6) Adjust the signal generator output (without modulation) to obtain 10db drop in the reading on the RMS voltmeter.

7) Adjust L101 or C101 (as applicable) to obtain maximum quieting.

E. Discriminator Adjustment

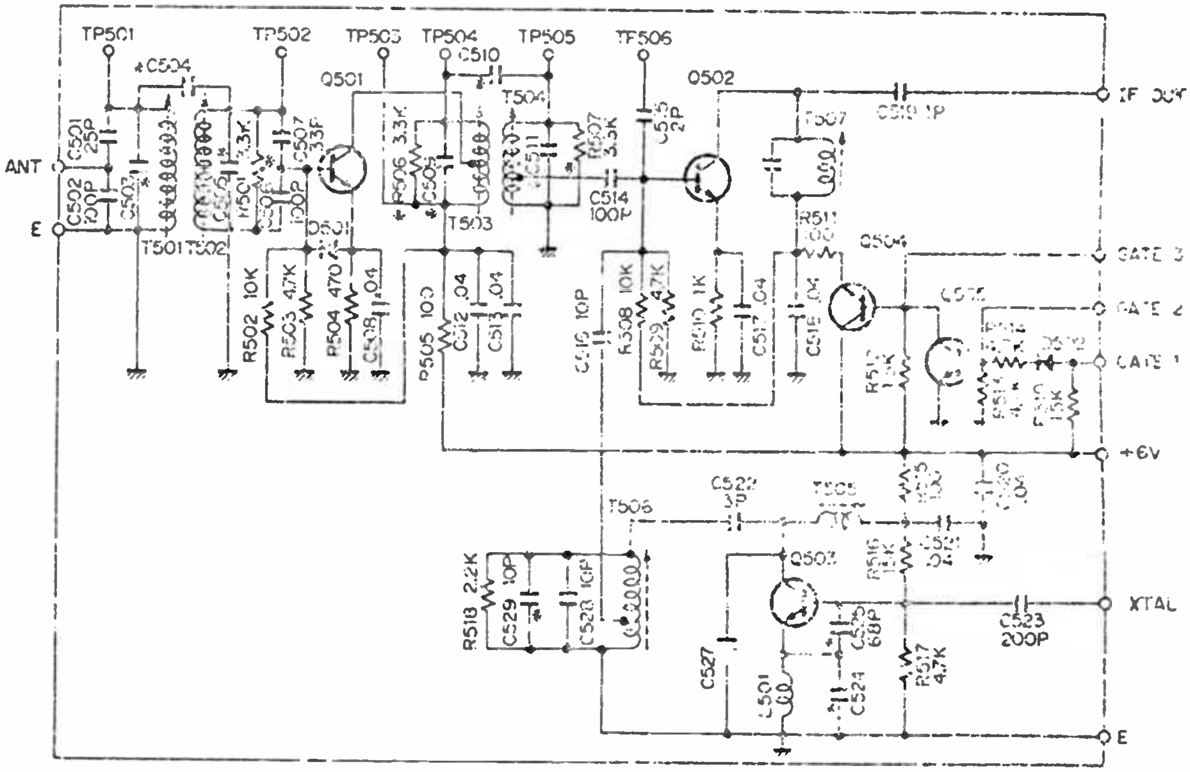
1) Connect a VTVM to the junction of R501, C501 and C502. Test point may be reached from the component side of the circuit board, top end of R501. Adjust T302 for zero reading on the VTVM.

F. Sensitivity Measurement

1) Set the squelch control full CCW and adjust the volume control to obtain a zero db (0.25 VRMS) reading on the RMS. Volt/DB meter (no signal should be received).

2) Without changing the adjustments of the monitor, reconnect the signal generator to the EXT ANT jack and adjust the RF output to obtain a noise drop of 20 db on the RMS Volt/DB meter. The signal generator RF output should be 1.0 uV(6db) or less.

Lo VHF



NOTE: In Hi VHF and Lo VHF Front End, to change frequency range for usable sensitivity, it is not enough to adjust coils and trimmer condensers.
Accordingly the change of capacities of capacitors is necessary as follows.*

Lo VHF

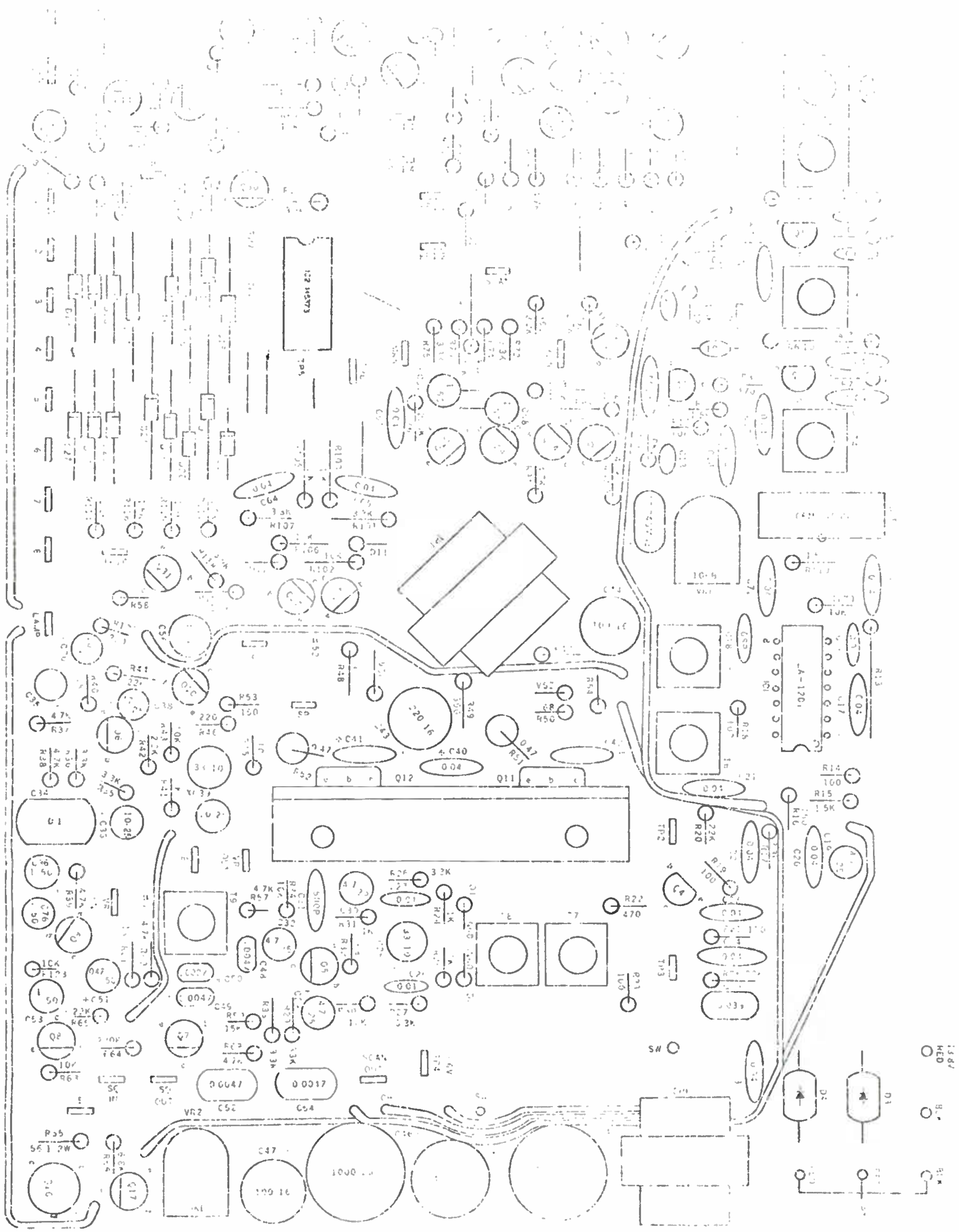
TYPE	FREQUENCY RANGE	C503	C504	C505	C509	C510	C511	C524	C527
LL	31~37 MHz	25P	9P	18P	50P	15P	50P	150P	15P
LM	37~43 MHz	12P	6P	8P	39P	9P	39P	120P	5P
LH	43~49 MHz	5P	4P	--	25P	5P	25P	100P	—

Hi VHF

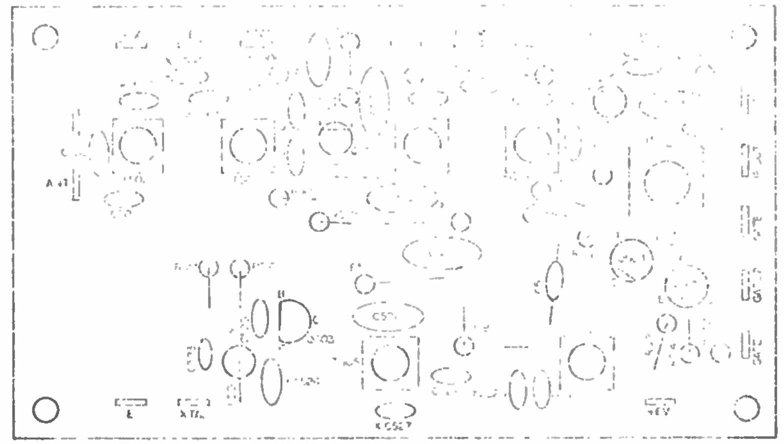
TYPE	FREQUENCY RANGE	C320	C304	C308	C313	C321
HL	150~158MHz	5P	5P	8P	8P	2P
HM	156~164MHz	3P	3P	8P	8P	–
HH	166~174MHz	2P	2P	5P	5P	–

UHF : NO CHANGE

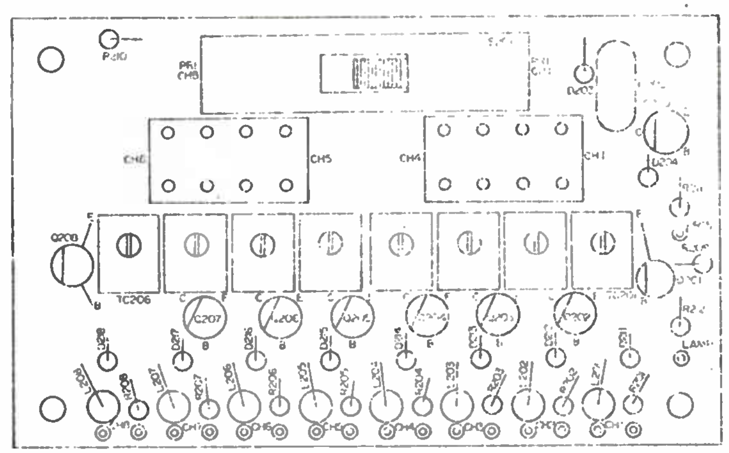
Claricon Sky-Scanner (37500)



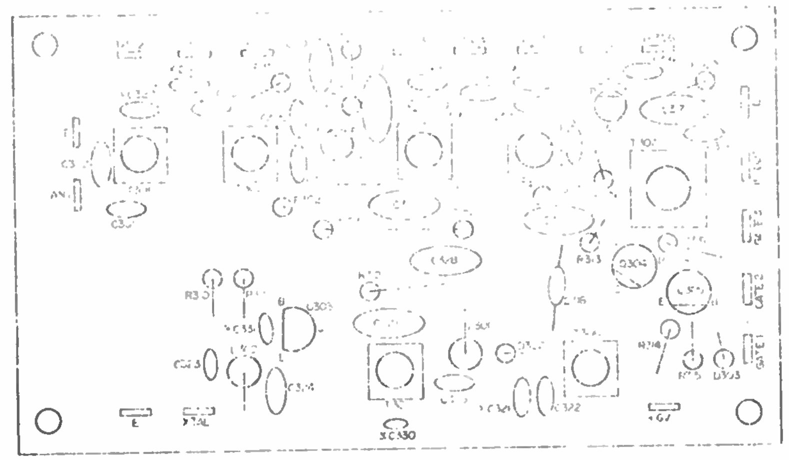
Lo VHF



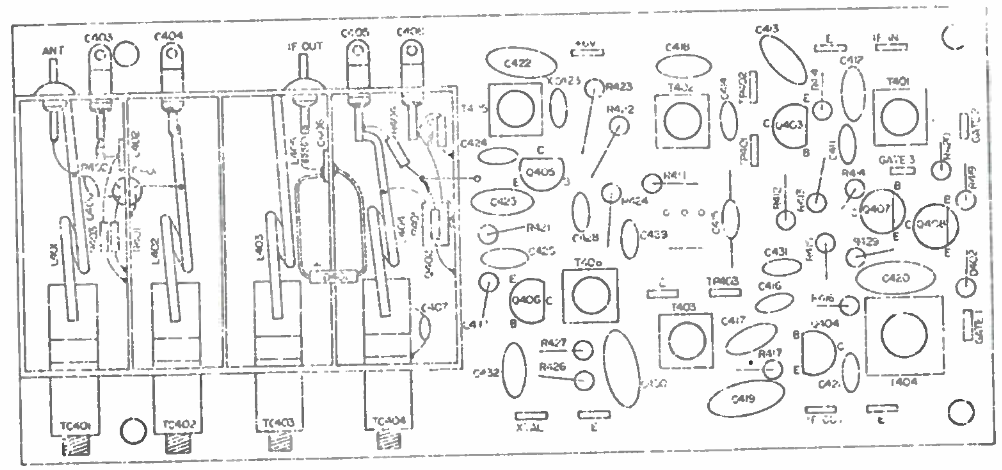
XTAL P.C.B

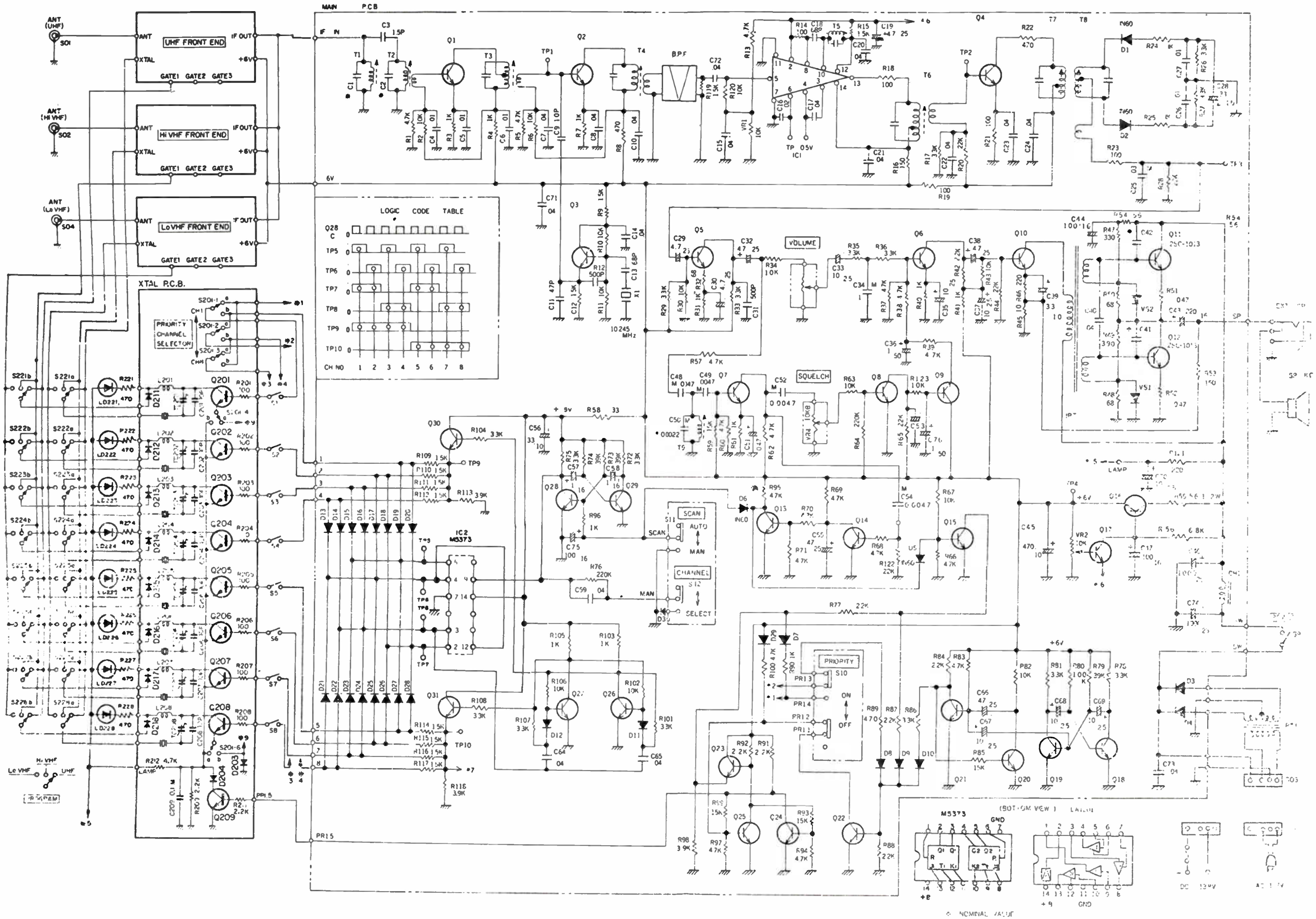


Hi VHF

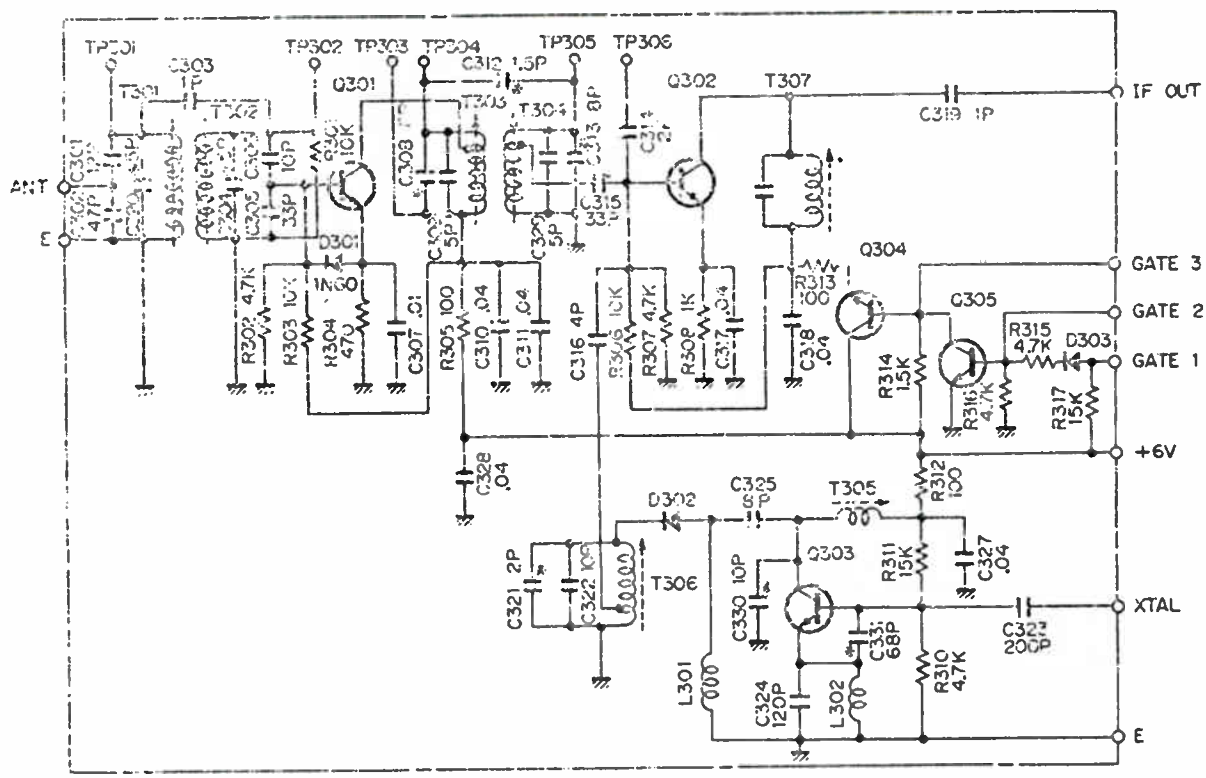


UHF



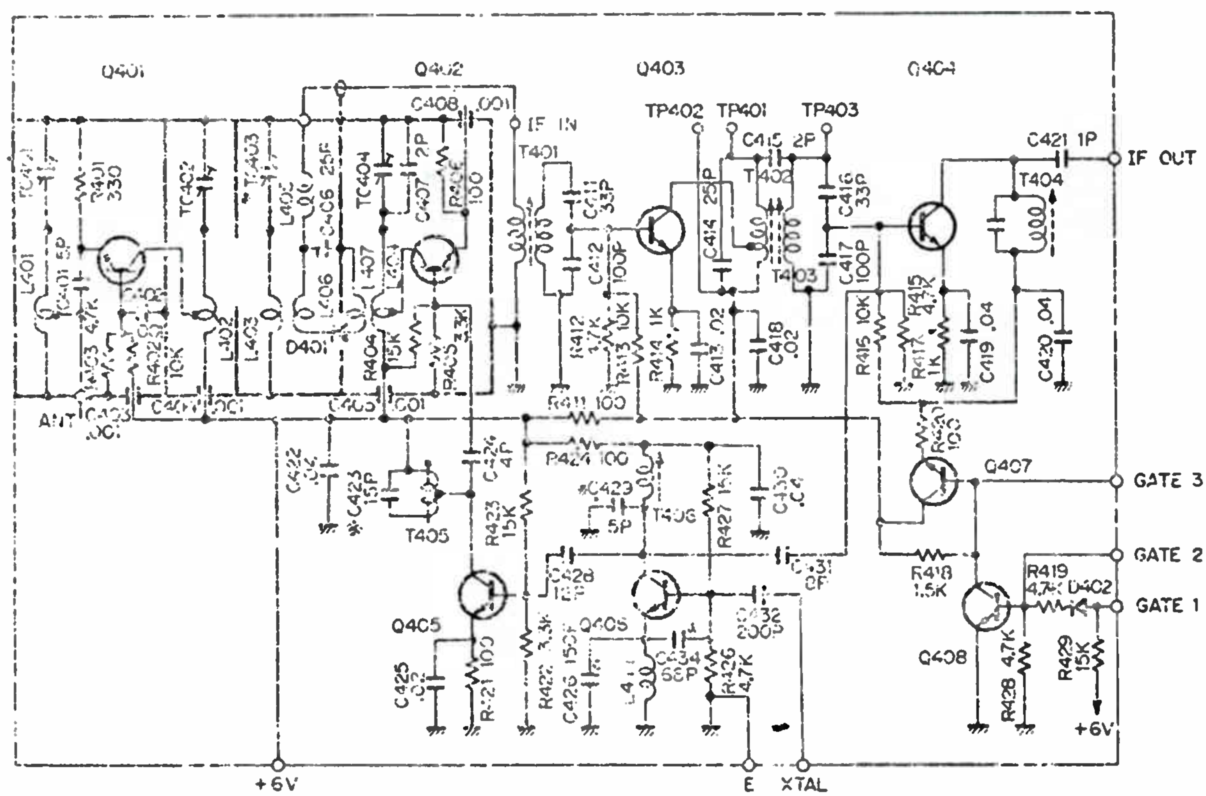

MAIN P.C.B
ANT (UHF) S01
UHF FRONT END
ANT (Hi VHF) S02
Hi VHF FRONT END
ANT (Lo VHF) S04
Lo VHF FRONT END
ANT XTAL GATE1 GATE2 GATE3 IF OUT +6V
XTAL P.C.B.
PRIORITY CHANNEL SELECTOR
LOGIC CODE TABLE
CH NO 1 2 3 4 5 6 7 8
BPF
VOLUME
SQUELCH
SCAN AUTO MAN
CHANNEL SELECT
PRIORITY S10 ON OFF
IC2 M5373
LAMP
SP
(BOTTOM VIEW) LAYOUT
M5373
GND
DC 13.8V
NOMINAL VALUE

Hi VHF



ANT
E
TP301
TP302 TP303 TP304
TP305 TP306
Q301
Q302
Q303
Q304
Q305
T307
IF OUT
GATE 3
GATE 2
GATE 1
+6V
XTAL
E

UHF



Q401
Q402
Q403
Q404
Q405
Q406
Q407
Q408
IF IN
TP402 TP401 TP403
IF OUT
ANT
GATE 3
GATE 2
GATE 1
+6V
E
XTAL

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C19	3.7uF 25V
C28	33uF 10V
C29	4.7uF 25V
C30	3.7uF 25V
C32	4.7uF 25V
C33	10uF 25V
C35	10uF 25V
C36	1uF 50V
C37	10uF 25V
C38	4.7uF 25V
C39	33uF 10V
C43	220 uF 16V
C44	100uF 16V
C45	470uF 10V
C46	1000uF 25V
C47	100uF 16V
C51	.47uF 50V
C53	1uF 50V
C55	4.7uF 25V
C56	33uF 10V
C57	1uF 50V
C58	1uF 50V
C66	4.7uF 25V
C67	10uF 25V
C68	10uF 25V
C69	10uF 25V
C70	10uF 25V
C74	1000uF 25V
C75	100uF 16V
C76	1uF 50V
TC201	16pF
TC202	16pF
TC203	16pF
TC204	16pF
TC205	16pF
TC206	16pF
TC207	16pF
TC208	16pF
TC401	5pF
TC402	5pF
TC403	5pF
TC404	5pF

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	10K, Trimmer	
VR2	10K, Trimmer	
VR3	10K, Volume	
VR4	10K, Squelch	

MISCELLANEOUS

ITEM	NAME
BPF	Ceramic Filter
S1	Switch, Bypass Channel
S2	Switch, Bypass Channel
S3	Switch, Bypass Channel
S4	Switch, Bypass Channel
S5	Switch, Bypass Channel
S6	Switch, Bypass Channel
S7	Switch, Bypass Channel
S8	Switch, Bypass Channel
S9	Switch, Power
S10	Switch, Priority
S11	Switch, Scan
S12	Switch, Channel Select
S201	Switch, Priority Channel Selector
S211	Switch, 2 Band
S212	Switch, 2 Band
S213	Switch, 2 Band
S214	Switch, 2 Band
S215	Switch, 2 Band
S216	Switch, 2 Band
S217	Switch, 2 Band
S218	Switch, 2 Band
S221	Switch, 3 Band
S222	Switch, 3 Band
S223	Switch, 3 Band
S224	Switch, 3 Band
S225	Switch, 3 Band
S226	Switch, 3 Band
S227	Switch, 3 Band
S228	Switch, 3 Band
S01	Socket, Ant
S02	Socket, Ant
S03	Socket, Power Supply
S04	Socket, Ant
Sp	Speaker, 8 ohms
X1	Crystal

Pages 14-21 Courtesy of CLARICON

SEMICONDUCTORS

ITEM	TYPE NO.
D1	1N60
D2	1N60
D3	FR2-02
	RA1Z
D4	FR2-02
	RA1Z
D5	1N60
D6	1N60
D7	1S1588
D8	1S1588
D9	1S1588
D10	1S1588
D11	1S1588
D12	1S1588
D13	1S1588
D14	1S1588
D15	1S1588
D16	1S1588
D17	1S1588
D18	1S1588
D19	1S1588
D20	1S1588
D21	1S1588
D22	1S1588
D23	1S1588
D24	1S1588
D25	1S1588
D26	1S1588
D27	1S1588
D28	1S1588
D29	1S1588
D30	1N60
D203	1S1588
D204	1S1588
D211	1N60
D212	1N60
D213	1N60
D214	1N60
D215	1N60
D216	1N60
D217	1N60
D218	1N60
D301	1N60
D302	1S1588
D303	1S1588
D401	SD82A
	1SS16
D402	1S1588
D501	1N60
D502	1S1588
IC1	LA1201
IC2	M5373
LD221	ME116
LD222	ME116
LD223	ME116
L224	ME116
LD225	ME116
LD226	ME116
LD227	ME116
LD228	ME116
Q1	2SC839J
Q2	2SC839J
Q3	2SC839J
Q4	2SC839J
Q5	2SC372Y
	2SC380
	2SC735
Q6	2SC372Y
	2SC380
	2SC735
Q7	2SC372Y
	2SC380
	2SC735
Q8	2SC372Y
	2SC380
	2SC735
Q9	2SC372Y
	2SC380
	2SC735
Q10	2SC372Y
	2SC380
	2SC735
Q11	2SC1013
Q12	2SC1013
Q13	2SC372Y
	2SC380
	2SC735
Q14	2SC372Y
	2SC380
	2SC735
Q15	2SC372Y
	2SC380
	2SC735
Q16	2SC971
	2SC1173
Q17	2SC372Y
	2SC380
	2SC735
Q18	2SC372Y
	2SC380
	2SC735
Q19	2SC372Y
	2SC380
	2SC735
Q20	2SC372Y
	2SC380
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Q21	2SC372Y
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	2SC735
Q22	2SC372Y
	2SC380
	2SC735
Q23	2SC372Y
	2SC380
	2SC735
Q24	2SC372Y
	2SC380
	2SC735
Q25	2SC372Y
	2SC380
	2SC735
Q26	2SC372Y
	2SC380
	2SC735
Q27	2SC372Y
	2SC380
	2SC735
Q28	2SC372Y
	2SC380
	2SC735
Q29	2SC372Y
	2SC380
	2SC735
Q30	2SC372Y
	2SC380
	2SC735
Q31	2SC372Y
	2SC380
	2SC735
Q201	2SC372Y
	2SC380
	2SC735
Q202	2SC372Y
	2SC380
	2SC735
Q203	2SC372Y
	2SC380
	2SC735
Q204	2SC372Y
	2SC380
	3SC735
Q205	2SC372Y
	2SC380
	2SC735
Q206	2SC372Y
	2SC380
	2SC735
Q207	2SC372Y
	2SC380
	3SC735
Q208	2SC372Y
	2SC380
	2SC735
Q209	2SC372Y
	2SC380
	2SC735
Q301	2SC668
Q302	2SC668
Q303	2SC710
Q304	2SC372Y
	2SC380
	2SC735
Q305	2SC372Y
	2SC380
	2SC735
Q401	2SC1035
	2SC1180
Q402	2SC1035
	2SC1180
Q403	2SC710
Q404	2SC710
Q405	2SC710
Q406	2SC710
Q407	2SC372Y
	2SC380
	2SC735
Q408	2WC372Y
	2SC380
	2SC735
Q501	2SC922
Q502	2SC922
Q503	2SC710
Q504	2SC372Y
	2SC380
	2SC735
Q505	2SC372Y
	2SC380
	2SC735
V51	1S1209
V52	1S1209

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	Crystal Filter	10F15A/4-253R903
HF302	Crystal Filter	CFU-455D/4-253R906
SP	Speaker, 8 ohms	4-151R803
	Crystal-10.245MHz	HC-18-U/4-225R802
	Rod Antenna	4-244R129B
	Socket	4-235R131
	Socket, Charger	4-235R807
	Switch, Slide	4-231R165
	Switch, Auto-Manu/ Channel Select	4-231R953
	PCB	4-226R835
	PCB	4-226R
	PCB	4-2262838

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R402	10K, Trimmer	4-222R514
R701	10K, Trimmer	4-222R513

COILS/TRANSFORMERS

ITEM	PART NO.
L101	4-259R818
L102	4-259R819
L103	4-259R818
L104	4-259R819
L105	4-265R127
L106	4-259R820
L501	4-253R702
L502	4-253R701
L503	4-253R701
L504	4-253R701
L505	4-253R701
T301	4-256R706
T302	4-256R718A

CABINET PARTS

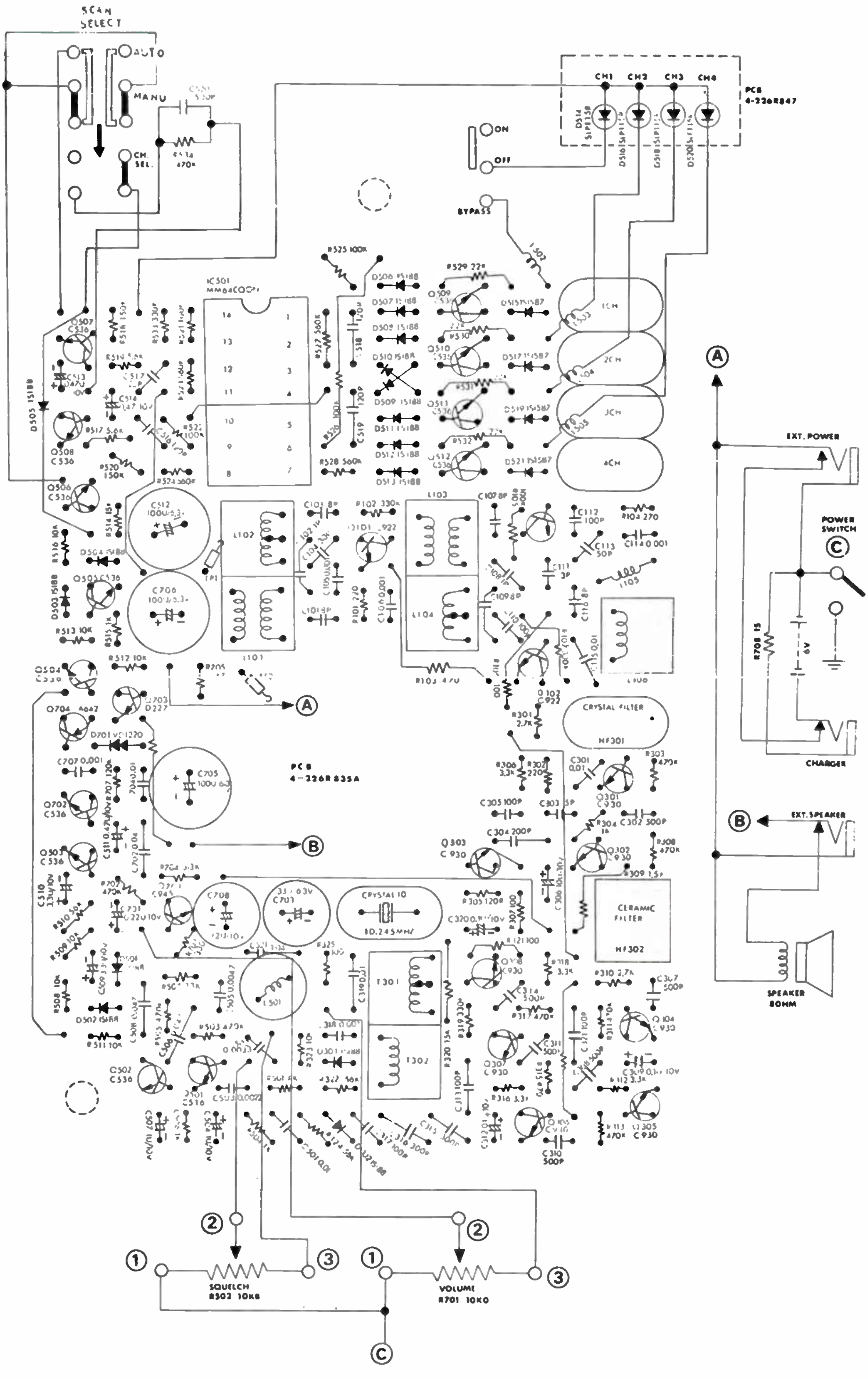
NAME	PART NO.
Cabinet	176-2-111R129
Back Lid	176-2-126R126
Compartment Lid	176-2-133R104
Rotary Knob, Assembly	176-0-163R114
Lever Knob, Assembly	176-0-162R101

SEMICONDUCTORS

ITEM	TYPE NO.
D301	1S188
D302	1S188
D501	1S1587
D502	1S1587
D503	1S1587
D504	1S1587
D505	1S1587
D506	1S188
D507	1S188
D508	1S188
D509	1S188
D510	1S188
D511	1S188
D512	1S188
D513	1S188
D514	SLP-115R
D515	1S1587
D516	SLP-115R
D517	1S1587
D518	SLP-115R
D519	1S1587
D520	SLP-115R
D521	1S1587
D701	VD1220
IC501	CM05 MM64C00
	MM74C00
Q101	2SC922K
Q102	2SC922K
Q103	2SC922L
	2SC922K
Q301	2SC930D
Q302	2SC930D
Q303	2SC930D
Q304	2SC930C
Q305	2SC930C
Q306	2SC930C
Q307	2SC930C
Q308	2SC930D
Q501	2SC945Q
	2SC536F
Q502	2SC945Q
	2SC536F
Q503	2SC945Q
	2SC536F
Q504	2SC945Q
	2SC536F
Q505	2SC945R
	2SC536E
Q506	2SC945R
	2SC536E
Q507	2SC945R
	2SC536E
Q508	2SC945R
	2SC536E
Q509	2SC945R
	2SC536E
Q510	2SC945R
	2SC536E
Q511	2SC945R
	2SC536E
Q512	2SC945R
	2SC536E
Q701	2SC945R
Q702	2SC945Q
	2SC536F
Q703	2SD227
Q704	2SA642

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C306	10uF 10V	
C309	.1uF 10V	
C312	.1uF 10V	
C320	.1uF 10V	
C504	1uF 10V	
C507	1uF 10V	
C509	3.3uF 10V	
C510	3.3uF 10V	
C511	.47uF 10V	
C512	100uF 6.3V	R-C9880
C513	.47uF 10V	
C514	.47uF 10V	
C701	.22uF 10V	
C703	33uF 6.3V	R-C9881
C705	100uF 6.3V	R-C9880
C706	100uF 6.3V	R-C9880
C708	2.2uF 10V	


SCAN SELECT
AUTO
MANU
CH. SEL.
ON
OFF
BYPASS
CH1
CH2
CH3
CH4
PCB 4-226R847
IC501
CRYSTAL FILTER
HF301
CERAMIC FILTER
HF302
PCB 4-226R835A
EXT. POWER
POWER SWITCH
CHARGER
EXT. SPEAKER
SPEAKER 8OHM
SQUELCH R502 10KB
VOLUME R701 10KΩ

TROUBLE SHOOTING

1) LED (Light Emitting Diode, D514, D516, D518, D520) doesn't light and no sound.

VOLUME : MAX

BYPASS : OFF

SQUELCH : OFF (non squelch)

A) Defective ON-OFF switch in VOLUME control.

B) Broken or shorted at EXT. POWER SOCKET.

C) Check battery installation.

2) LED lights but no sound.

VOLUME : MAX

SQUELCH : OFF (non squelch)

A) Defective EXT. SPEAKER SOCKET or speaker.

B) Faulty component part in Audio amp. or IF amp. circuit.

3) Noise sound but can't receive desired signal and LED doesn't light.

VOLUME : MAX

SQUELCH : OFF (non squelch)

BYPASS : OFF

A) Faulty LED and/or defect in LED PC Board.

B) Open in L502 - L505.

C) Defective D515, D517, D519, D521.

D) Defective Q509 - Q512.

E) R529 - R532 disconnected.

4) No sound through EXT. SP. SOCKET.

A) Defective EXT. SP. SOCKET.

5) Doesn't scan and SQUELCH doesn't operate.

AUTO/MANU/CH-SEL : AUTO

SQUELCH : ON (tight)

A) Defective SQUELCH VOLUME.

B) Faulty component part in Noise amp. or Noise Detector circuit.

C) Faulty component part in IF amp. circuit.

6) Doesn't scan but SQUELCH operates normally.

AUTO/MANU/CH-SEL : AUTO

BYPASS : OFF

SQUELCH : ON (tight)

A) Faulty Q503 - Q508.

B) Broken wire at AUTO/MANU/CH-SEL switch.

C) Faulty IC501.

7) Manual selector doesn't operate.

AUTO/MANU/CH-SEL : MANU

A) Defective AUTO/MANU/CH-SEL switch.

B) Check if R534 and C520 are normal.

8) Delay doesn't operate.

A) Check Q505 circuit.

9) Only scans channel 1, 2 or channel 3, 4.

AUTO/MANU/CH-SEL : AUTO

BYPASS : OFF

SQUELCH : ON (tight)

A) Faulty IC501.

10) Noise sound can be heard and LED lights but can't receive desired signal.

A) Defective X'tal socket.

B) Faulty component part in the appropriate RF amp. or 1st MIXER circuit.

C) Check 1st local oscillator circuit.

11) Low sensitivity.

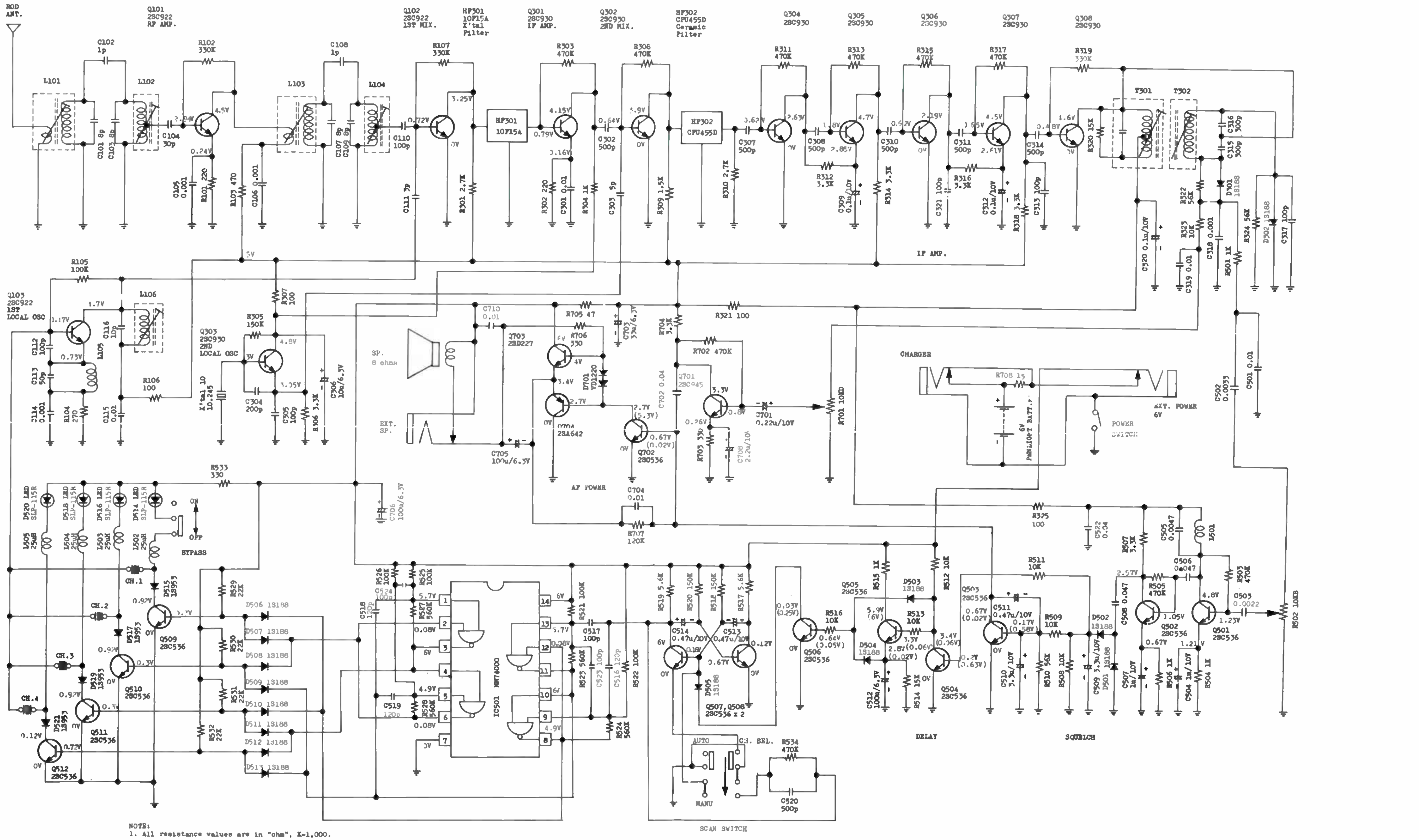
A) Faulty component part in RF amp. circuit.

B) X'tal frequency not covering the correct channel.

C) Rod Antenna lead is grounded.

12) Mixed reception.

A) X'tal not set to proper receiving frequency.



NOTE:
1. All resistance values are in "ohm", K=1,000.
2. All capacitance values less than 1.0 are in "mfd" and greater than 1.0 are in "pfd".
3. Voltage values indicated are measured at no signal. However, terminal voltages of Q503, 504, 505, 506 and Q702 are measured at squelch open position and parenthesized voltages are at squelch threshold position.

ALIGNMENT PROCEDURE

Test equipment required

1. VHF Signal Generator (150-170 MHz, Mod. Freq. 1 kHz, Dev. 5 kHz)
2. Oscilloscope
3. V.T.V.M.
4. DC Power Supply (6 V, 200 mA)
5. 8 ohm Dummy Load

NOTE: Use a non-metallic tool.

The test equipment should be warmed up at least 1 hour before proceeding with alignment.

Input signal from the generator should be kept as low as possible and still obtain usable output.

See ALIGNMENT POINTS (CHASSIS LAYOUT).

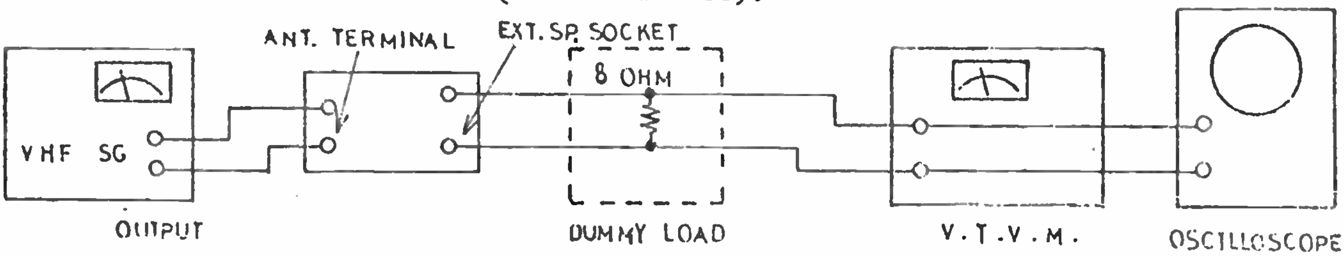


Figure ALIGNMENT CONNECTION

STEP 1 Connect the instruments as shown Figure

The output terminals of SG should be connected to the Antenna Terminals on the PCB directly. (Do not use the Rod Antenna.)

STEP 2 Set the unit to CH 4 by Ch. Sel. Switch.

STEP 3 Insert a crystal of 156 MHz in CH 4 socket.

STEP 4 Set SG to 156 MHz.

STEP 5 Set output of SG to around 30 db.

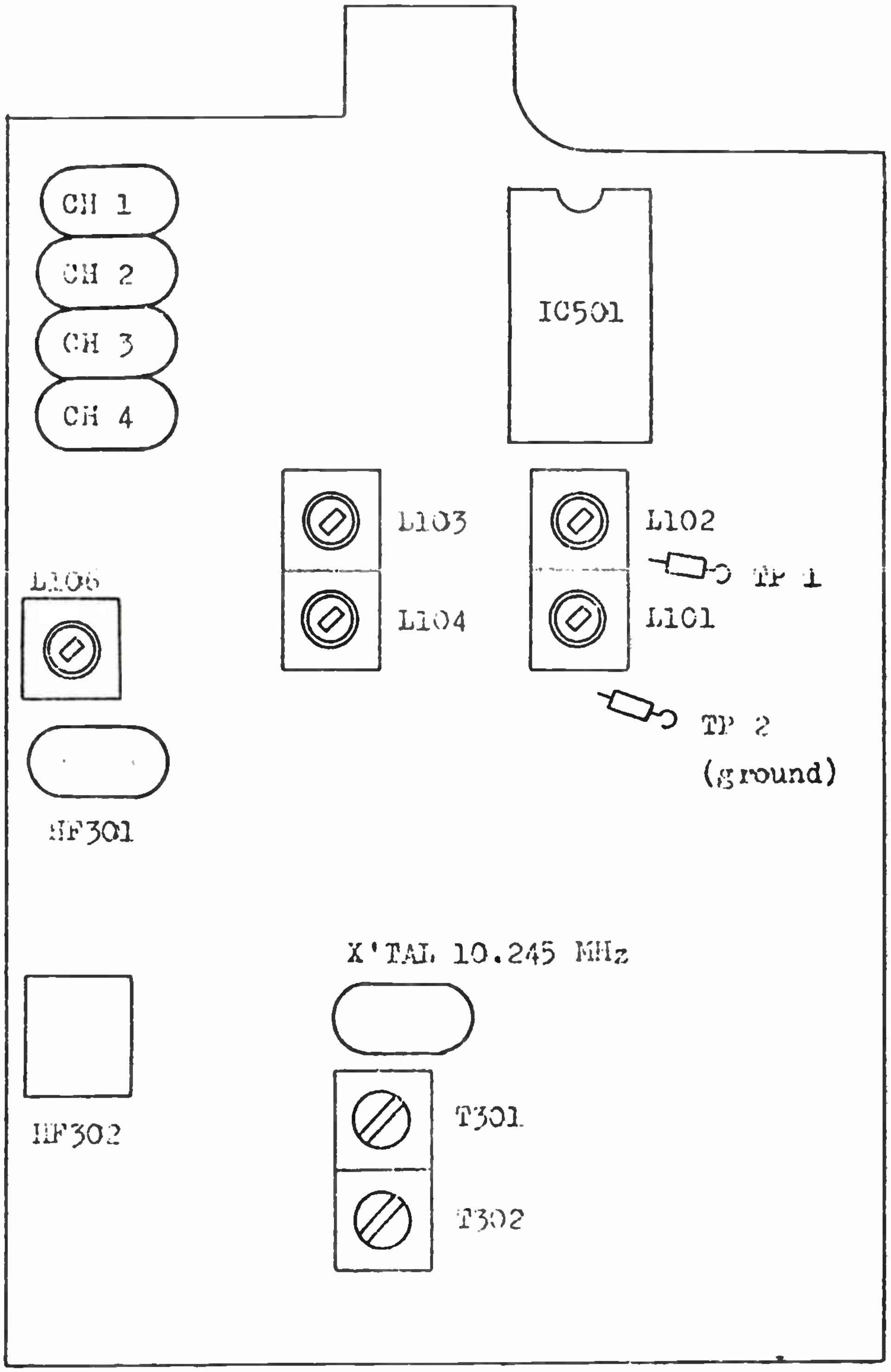
STEP 6 Adjust T301 and T302 for maximum output.

STEP 7 Adjust L101 - L102 - L103 - L104 - L106 for maximum output.

Repeat this process.

STEP 8 After obtaining proper sensitivity, re-adjust T301 and T302 for best usable sensitivity (20 db noise quieting).

Pages 5-13 Courtesy of CHANNEL MASTER CORP.



Scanner-Monitor Servicing Data

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First Edition
First Printing-November, 1975

Sams

Scanner-Monitor Servicing Data

SD-6

Library of Congress Catalog Card Number 72-92711

$4.95
$5.95 IN CANADA
Cat. No. SD-6

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Scanner-Monitor Servicing Data

SD-6

REPRODUCED THROUGH THE COURTESY OF THE MANUFACTURER

HOWARD W. SAMS & CO., INC.
INDIANAPOLIS, INDIANA

Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

***Channel Master** 6258*
***Claricon** Sky-Scanner (37500)*
***Courier** Cop-Scan*
***Courier** Cop-Scan VHFHL*
***Fanon** Scanfare*
***Fanon** Scanfare VHFHL*
***Midland** 13-918*
***Midland** 13-950*
***Realistic** PRO-3A (20-452)*
***Realistic** PRO-7B (20-173)*
***Realistic** PRO-77B (20-172)*
***SBE** SBE-1SM, -2SM, -3SM-7SM (Sentinel I, II, III, VII)*
***Sonar** FR-2512, FR-2513*
***Tesberry** "T" Scan*

Howard W. Sams PUBLICATION

Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

Bearcat IV
Craig 4350, 4350A
Johnson Mini-Scan
Kris Tri-Band, Hand-Scan
Lafayette Porta-Scan 4, 99-26213W, 99-26221W
Midland 13-903, 13-904, 13-916, 13-934, 13-940, 13-944
Realistic PRO-4 (20-168), PRO-7A (20-167), PRO-10 (20-170), PRO-77 (20-166), PRO-88 (20-163)
Robyn 100-B (HI-Bander), HL-8 + 8 (HI-LOW Bander)

Howard W. Sams PUBLICATION

$4.95
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SD-5

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HOWARD W. SAMS & CO., INC.
INDIANAPOLIS, INDIANA

First Edition
First Printing—May, 1975

Sams

Scanner-Monitor Servicing Data

SD-5

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

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Pages 5 - 12 Courtesy of ELECTRA CO.

ALIGNMENT

I–F SECTION

Alignment of the I–F system consists of optimizing the input and output networks and balancing the detector output. The bandpass and center frequency are established by quartz crystal filters and "peaking" the coils can result in bandpass ripple or poor sensitivity. Field alignment should not be necessary but the procedure is given for general information.

EQUIPMENT NEEDED

Oscilloscope

Sweep generator with 10.79, 10.80 and 10.81mHz markers

1. Connect sweep generator to TP-1 through a 1pf capacitator.
2. Connect oscilloscope to TP-3.
3. Maintain output of 10.80mHz sweep generator at a low level to prevent distortion from overloading.
4. Detune T5 for maximum IF output display. See Figure 2.
5. Adjust T3 for maximum output, and T4 for minimum ripple.
6. Adjust T5 so that 10.80 mHz is in center of discriminator curve and for best linearity. See Figure 3.

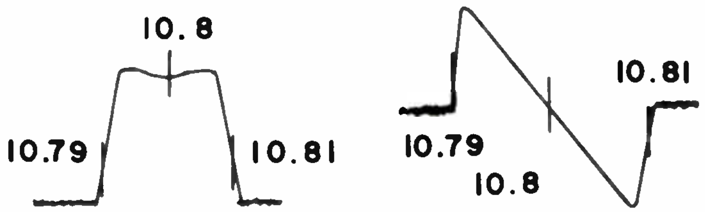


Figure 2 Figure 3

ALTERNATE METHOD: I–F alignment may be checked using a Measurements Model 800 Generator or equivalent tuned to an operating frequency and swept ±25kc. Markers are not essential since center frequency is determined by the filter.

R–F SECTION

DO NOT ATTEMPT ALIGNMENT OR "PEAKING" OF R–F SECTION.

The R–F alignment points are adjusted and sealed at the factory and should not be disturbed. Factory alignment involves multi-frequency signal generation systems, add-on test modules, output indicators and training beyond the scope of normal service activities.

The unique R–F system includes electronic tracking of R–F and oscillator circuits for maximum performance over a wide range of frequencies. THIS PERFORMANCE CAN BE DESTROYED BY AN ATTEMPT TO "PEAK UP" OR "TWEAK" OR "OPTIMIZE", ETC.

CRYSTAL INSTALLATION

DISCONNECT POWER BEFORE REMOVING CABINET
LEAVE POWER OFF WHILE INSTALLING CRYSTALS

To remove the cabinet, first remove the screw at the bottom rear edge. Push the rear panel forward through the cabinet. The components and crystal sockets are in full view and easily accessible.

Up to eight crystals may be installed in any combination of L, H, or U/T bands. Each crystal is installed in the sockets corresponding to its channel. (Channel 1 is nearest the side of the radio)

The eight three-position slide switches select the desired band for each crystal. To select "Lo" Band (30-50mHz) for a particular channel, place the corresponding switch in the "L" position. (Nearest the front of the radio). The center or "H" position of the switch selects "Hi" Band (150-174mHz) and the third or "U/T" position is used for both "U" (450-470 mHz) and "T" (470-512mHz) bands.

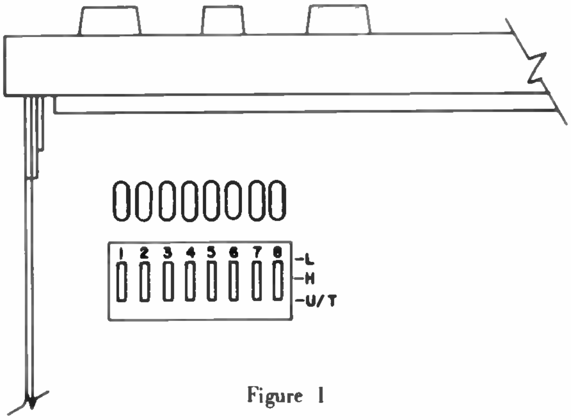


Figure 1

Remove the crystal by a gentle pull upward. Insert the crystal by aligning the pins with the sockets and pushing straight down. DO NOT BEND THE SOCKETS. THESE MINIATURE SOCKETS ARE MADE OF SPRING BRONZE AND WILL BREAK OFF IF BENT EXCESSIVELY.

NOTE: Do not install two crystals of the same frequency.

Rigid quality standards are applied to crystals furnished by Electra Company to assure full performance, therefore our warranty does not include correcting poor operation caused by crystals from other sources.

The "U/T" alignment spread is 450mHz to 512mHz, the "H" 150mHz to 174mHz, and the "L" 33mHz to 48mHz. New frequencies may be added within these spreads.

CRYSTAL FORMULAS

"L" – Received frequency + 10.80 mHz = crystal frequency
Example: 35.80 mHz + 10.80 mHz = 46.60000 mHz

"H" – $\frac{\text{Received frequency} - 10.80\text{ mHz}}{3}$ = crystal frequency

$\frac{\text{Example: } 155.01\text{ mHz} - 10.80\text{ mHz}}{3}$ = 48.07000

"U/T" $\frac{\text{Received frequency} - 10.80\text{ mHz}}{9}$ = crystal frequency

$\frac{\text{Example: } 453.250\text{ mHz} - 10.80\text{ mHz}}{9}$ = 49.16111 mHz

USER HINTS

Radio equipment usually operates in an environment of man-made electro-magnetic noise which radiates from power lines, fluorescent lights, motors, appliances, ignition systems, etc. Modern radios are designed to minimize interference from such sources but operation may be affected under conditions of unusually strong noise.

Distant weak, "skip" or noise signals may be received by this receiver because of its high sensitivity. Whenever such conditions interrupt scanning or whenever a very busy channel prevents reception of other desired signals, the affected channel may be bypassed by means of its individual panel switch.

In cases of strong interfering noise or signals it may be desirable to reduce the length of the antenna to reduce noise pickup below a critical level. This may be very effective in medium and strong signal areas.

Single-channel operation may be obtained as described under Operating Instructions. It may also be accomplished with the "MANUAL-SCAN" switch in either position by locking out all but the desired channel. This assures that the radio will always be on that channel even when turned OFF and ON. Continuous-carrier signals such as the ESSA weather broadcasts on 162.55 mHz, which are available in many areas, may be received when desired by use of the individual channel switches. This unit was designed for use with more than one crystal installed. The unit may be very weak or not work at all with only one crystal installed.

In mobile service the commonly encountered poor reception conditions are signal fading, nearby faulty ignition systems, power lines and proximity to strong signals. Careful setting of the squelch control will minimize these conditions.

When moving or shipping the radio, remove the telescoping antenna to avoid damage to it or to the internal circuit assemblies.

RADIO SERVICES

Local Government	Special Emergency	Police
Highway Maintenance	–Hospitals	Fire
Forestry-Conservation	–Ambulances	Press
Motion Pictures	–Physicians	Business
Special Industrial	–Disaster Relief	Railroad
Telephone Maintenance	–School Busses	Taxicab
Automobile Emergency	Power	Marine
Public Mobile Radio	Petroleum	Manufacturers
Mobile Telephones	Forest Products	Motor Carrier
		Rural Radio

SERVICING

GENERAL

It is recommended that servicing of this receiver be done by the factory service center. Special equipment and skills are maintained at the factory to give fast and efficient service on all of our products.

When returning radio receivers to the factory for service, include crystals, ac and dc power cables and telescoping antenna. Disconnect cables and antenna, pack carefully and include a brief. detailed description of the difficulty you are having.

The receiver circuitry is designed to utilize the best features of four types of semiconductors: rectifier diodes, conventional bi-polar transistors, insulated-gate field-effect transistors and integrated circuits. Servicing should not be attempted by anyone who is not familiar with the manufacturer's recommendations and cautions relating to each of these devices. The use of ohmmeters is particularly hazardous since they can deliver voltages and currents large enough to damage semiconductors.

Unusual circuitry in this receiver includes the automatic tuning system. I.C. No.1 and the associated circuits generate tuning voltages to track the antenna, r-f and oscillator circuits as channels are scanned. Also, when the receiver is operating in the "L" band, loading coil L-1 is switched into the telescoping antenna circuit.

Audio output power is measured with bursts of modulation or by measuring the maximum excursion on voice modulation as shown on an oscilloscope. When a continuous tone is received, the output will start at full power and then decrease to approximately half power to protect the output integrated circuit from overload. It will then return to full power for voice communications.

The LED indicators have a forward voltage drop of about 1.6v at 20ma. The current should not exceed 50ma. They are polarized and may be damaged by a high reverse voltage. When a channel lamp does not light, the failure may be either the lamp or the switching I.C. If the channel works, check the lamp; if not, check the I.C. When groups of lamps are out, refer to the logic chart.

TRACKED TUNING SYSTEM

All tuned circuits in the RF sections are tuned by voltage-variable capacitators which optimize the radio for each crystal individually regardless of where it falls in any band. This tuning is done automatically and allows the Bearcat IV to tune all parts of any band without compromise.

Tracked tuning is accomplished by means of a DC voltage applied to VVC1, 2, 3, 4, 5, 6. This voltage varies with crystal frequency and is higher for higher frequency crystals. It is adjusted by T1, T2, R17 and R52.

Factory alignment of the RF and tracked tuning system involves highly specialized equipment and training not available to normal service activities.

Because this unique feature is outside the experience of even the most highly trained technicians, these adjustments should only be made by Electra.

BANDSWITCHING

Switches SW11-18 are used to select the proper band for each channel. These switches, the channel scanning logic (IC6, 7, 8, 9) and transistor switches Q8, Q11, and Q13 generate three 12V bandswitch signals– $\bar{U}$, U, and H. These signals select the proper RF section (VHF or UHF) and switch inductors in the VHF section to select L or H band. For any selected channel, the logic diagram is as follows:

Band Selected	$\bar{U}$	U	H
L	1	0	0
H	1	0	1
U/T	0	1	0

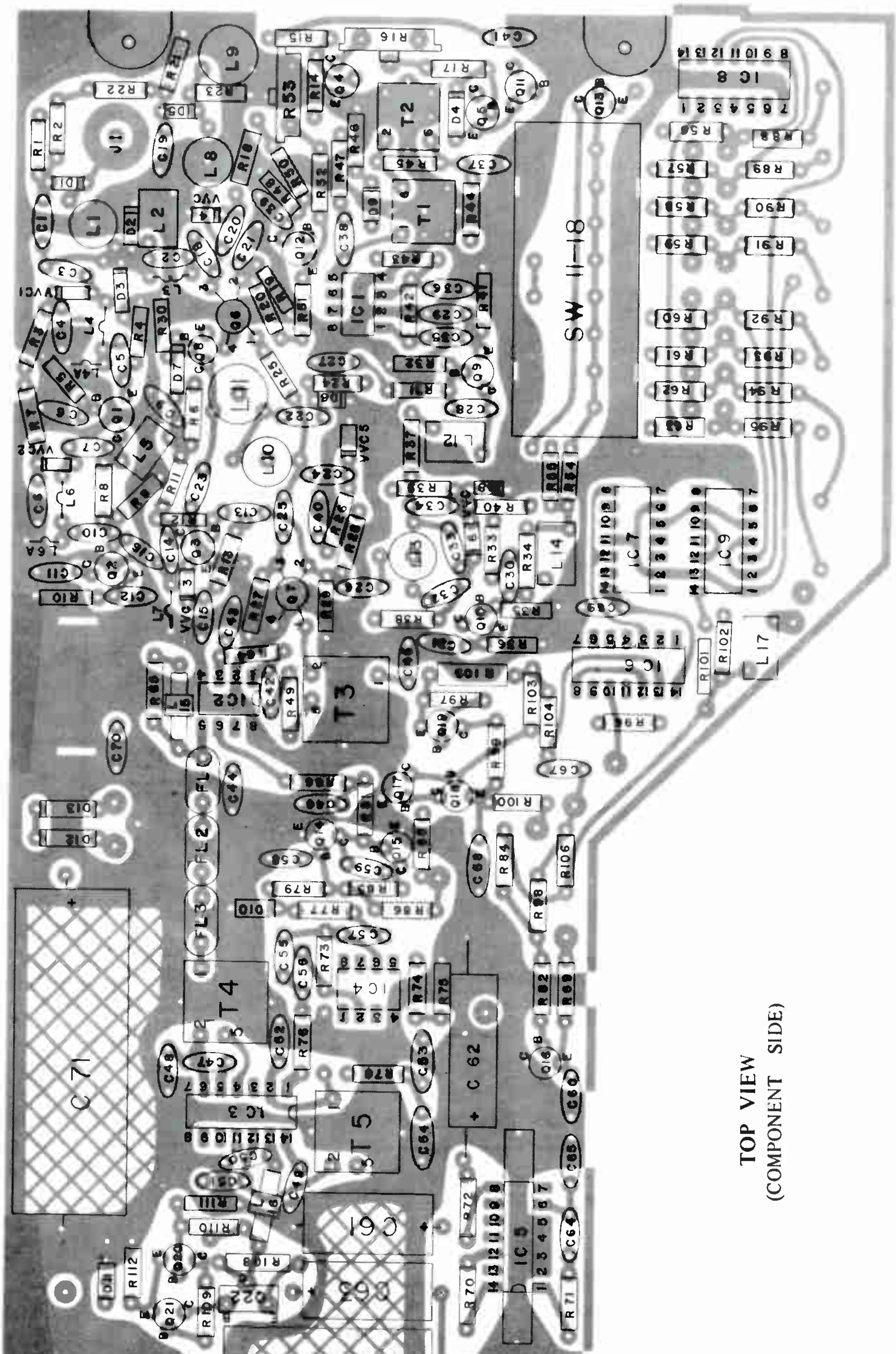
0 = 0VDC
1 = 12VDC

BANDSWITCHING FUNCTIONS

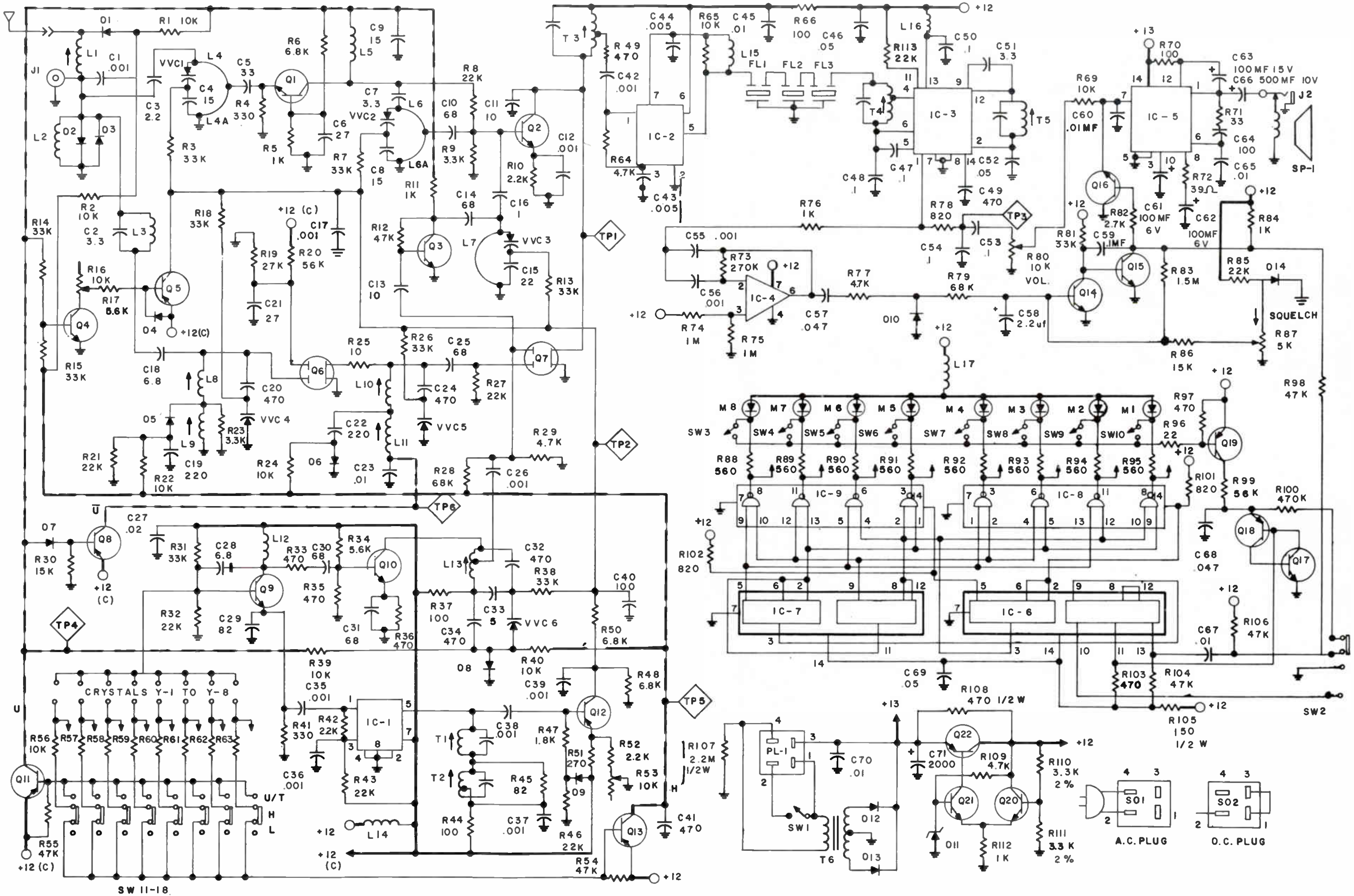
U (Q11) on for U/T band only
1. Switches D8 on (Grounds Tripler Tank)
2. Switches Q8 off
3. Switches Q4 on (Shifts tuning voltage upward)
4. Switches D1 on (Shorts antenna-loading coil)
5. Supplies bias voltages to Q1, Q2, Q3 (UHF Section)

$\bar{U}$ (Q8) on for L or H band
Supplies drain voltage to Q6 (VHF amplifier)

H (Q13) on for H band only
1. Switches D8 on (Grounds Tripler Tank)
2. Supplies Gate 2 bias to Q7 (UHF Mixer)
3. Switches D5 and D6 on (Shorts out low band coils L9 and L11)
4. Switches Q4 on (Shifts tuning voltage upward)



TOP VIEW
(COMPONENT SIDE)



RESISTOR VALUES IN OHMS

CAPACITOR VALUES BELOW 1 IN MFD
ABOVE 1 IN pf

UNLESS OTHERWISE SPECIFIED

BEARCAT IV SCHEMATIC

VOLTAGE CHART

The Voltage Chart may be used as an approximate guide in following circuit operation or locating a defective stage. You should be familiar with the entire manual before attempting measurements.

INTEGRATED CIRCUIT VOLTAGES

IC No.	1	2	3	4	5	6	7	8	9
PIN 1	1.4	1.4	5.6	0	8	NC	NC	.1	5
2	GND	GND	3.4	6	NC	5.2	5	.1	5
3	1.45	1.45	0	6	GND	5	.1	12	12
4	GND	0	1.4	GND	NC	NC	NC	.1	5
5	11.6	10.5	1.4	NC	GND	.2	.1	5	.1
6	12	11	1.4	6	.6	5.2	5	12	12
7	12	10.2	GND	12	0	GND	GND	GND	GND
8	GND	0	GND	NC	1.3	5	5	.2	12
9	x	x	.15	x	NC	.1	.1	5	.1
10	x	x	1.5	x	6.4	1.6	NC	5	.1
11	x	x	NC	x	NC	6	5	12	12
12	x	x	3.4	x	15.2	5	5	5	.1
13	x	x	12	x	NC	6	NC	.1	5
14	x	x	6.2	x	15.6	6.2	6.2	5.2	.2

Channel No. 1 selected.

LOGIC CHART

The logic sequence for counting is shown by "0" under .5v and "1" over 4v. I.C.-6 pins 8 and 9 (*) change state on each movement, up or down, of the "Manual-Scan" Switch.

		COUNT							
I. C. No.	PIN	1	2	3	4	5	6	7	8
6	5	0	0	0	0	1	1	1	1
	6	1	1	1	1	0	0	0	0
	8*	1	1	1	1	1	1	1	1
	9*	0	0	0	0	0	0	0	0
7	5	0	1	0	1	0	1	0	1
	6	1	0	1	0	1	0	1	0
	8	1	1	0	0	1	1	0	0
	9	0	0	1	1	0	0	1	1
9	8	0	1	1	1	1	1	1	1
	11	1	0	1	1	1	1	1	1
	6	1	1	0	1	1	1	1	1
	3	1	1	1	0	1	1	1	1
8	3	1	1	1	1	0	1	1	1
	6	1	1	1	1	1	0	1	1
	11	1	1	1	1	1	1	0	1
	8	1	1	1	1	1	1	1	0

TRANSISTOR VOLTAGES

TEST CONDITION	Q No.	E	B	C	
	Q1	2.3	3	12.0	
	2	.8	1.5	11.0	
	3	GND	.7	6.0	
L/(HUT)	4	GND	0/07	12/0	
	5	12.0	11.4	*	
LH/UT	8	12.0	11.3/11.6	12.0/0	
	9	3.4	3.8	12	
NO XTAL/XTAL..	10	.25/1.2	.9	12/11.8	
LH/UT	11	12	11.9/11.3	0/12	
	12	11.7	*	*	
LUT/H	13	12	12/11.3	0/12	
SQUELCH CW/CCW	14	GND	.4/.7	.7/.04	
SQUELCH CW/CCW	15	GND	.7/.04	.08/10.5	
SQUELCH CW/CCW	16	.007/.0003	.08/.7	GND	
	17	GND	0	6	
MAN/SCAN	18	0/4	6	0	
MAN/SCAN	19	12	12	.05/4.0	
	20	5.4	6	12	
	21	5.4	6	15	
	22	15.6	15	12	
		D	S	G_1	G_2
LH/UT	Q6	11.8/0	GND	0	4
LUT/H	Q7	11	GND	0	0/.7

*Tuning Voltage – varies with crystal frequency.

SEMICONDUCTORS

ITEM	TYPE
D1	MPN-3401
D2	1N914
D3	1N914
D4	1N914
D5	MPN-3401
D6	MPN-3401
D7	1N34A
D8	MPN-3401
D9	1N914
D10	1N914
D11	(6V Zener)
D12	1N4001
D13	1N4001
D14	1N914
IC1	LM-703LN
IC2	LM-703LN
IC3	MC-1357P
IC4	UA741
IC5	UA706
IC6	SN7474
IC7	SN7474
IC8	SN7426
IC9	SN7426
Q1	2N5179
Q2	2N5179
Q3	2N5179
Q4	MPS-3393
Q5	2N4126
Q6	3N201
Q7	3N201
Q8	2N4126
Q9	2SC684
Q10	2SC684
Q11	2N4126
Q12	MPS-3640
Q13	2N4126
Q14	MPS-3393
Q15	MPS-3393
Q16	MPS-3393
Q17	MPS-3393
Q18	2N4126
Q19	2N4126
Q20	MPS-3393
Q21	MPS-3393
Q22	TIP-30
VVC1	BB-105A (Matched)
VVC2	BB-105A (Matched)
VVC3	BB-105A (Matched)
VVC4	BB-209 (Matched)
VVC5	BB-209 (Matched)
VVC6	BB-209 (Matched)

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C58	2.2uF 6V
C61	100uF 15V
C62	100uF 15V
C63	100uF 15V
C66	500uF 10V
C71	2000uF 20V

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION
R80	10K Volume
R87	5K Squelch

COILS/TRANSFORMERS

ITEM	PART NO.
L1	A-219-1
L2	A-218-1
L3	A-509
L4	A-508-1
L4A	A-508-2
L5	A-218-4
L6	A-508-1
L6A	A-508-2
L7	A-508-1
L8	B-501-2
L9	B-511
L10	B-501-2
L11	B-511
L12	A-218-3
L13	B-501-1
L14	A-218-1
L15	A-205
L16	A-205
L17	A-218-2
T1	B-502-2
T2	B-502-1
T3	B-217-2
T4	B-217-2
T5	B-217-2
T6	B-507

MISCELLANEOUS

ITEM	NAME	PART NO.
FL-1	Crystal Filter	A-226-1
FL-2	Crystal Filter	A-226-2
FL-3	Crystal Filter	A-226-1
SP-1	Speaker, 3" x 5"	B-248-2
SW-2	Switch, Man-Scan	B-254-1
SW-3-10	Switch, C.W.	GF-124
SW11	Switch, C.W.	(1)
SW18	Switch, C.W.	(1)
Y1	Crystal	A-135
Y8	Crystal	A-135

(1) Frame, A-503-1;
Contact, A-504-1;
Handle, A-5051.

Pages 13 - 19 Courtesy of CRAIG CORP.

CRYSTALS

The Federal Communications Commission has assigned three different bands of frequencies for use as Public Safety two-way radio communications channels. The Low VHF band covers from 30.0 to 50.0 MHz (megahertz), the High VHF band from 150.0 to 174.0 MHz, and the UHF band from 450.0 to 520.0 MHz. Both public and private agencies, such as police, ambulance, fire, lifeguard, Red Cross, and Forest Service, are assigned specific frequencies within these bands. The frequencies will differ in each town or city. Your local dealer or town hall can tell you the frequencies being used in your area.

For greatest sensitivity, your 4350A is supplied from the factory prealigned for best performance in the most active portions of the three bands. Signals in other portions of the bands may still be received with slightly less sensitivity. If desired, your dealer can modify the tuning to optimize performance for other frequencies. The bands and the parts changes required are as follows.

Lo VHF

Covers from 30.0 to 50.0 MHz without any changes.

Hi VHF

	TYPE	FREQUENCY RANGE	C320	C304	C308	C313	C321
•	H1	150~158 MHz	5pF	5pF	8pF	8pF	2pF
	H2	156~164 MHz	3pF	3pF	8pF	8pF	–
	H3	166~174 MHz	2pF	.2pF	5pF	5pF	–

UHF

	TYPE	FREQUENCY RANGE	1st IF BANO	C411	C414	C416	C423	C426
•	U1	450~470 MHz	54.63~56.63 MHz	33pF	25pF	33pF	15pF	150pF
	U2	470~490 MHz	56.63~58.63 MHz	33pF	25pF	33pF	15pF	150pF
	U3	490~510 MHz	58.63~60.63 MHz	27pF	20pF	27pF	12pF	120pF
	U4	500~520 MHz	59.63~61 63 MHz	27pF	20pF	27pF	12pF	120pF

• Supplied from the factory pretuned for this range.

Crystals may normally be ordered by simply giving the channel frequency. In order to determine the crystal frequency, the following formulas should be used:

LOW VHF

CRYSTAL 3RD OVERTONE FREQUENCY = CHANNEL FREQUENCY + 10.7 MHz

HIGH VHF

CRYSTAL 3RD OVERTONE FREQUENCY = (CHANNEL FREQUENCY – 10.7 MHz)/3

UHF

CRYSTAL 3RD OVERTONE FREQUENCY = (CHANNEL FREQUENCY – 10.7 MHz)/

In special cases where interference is encountered from strong adjacent stations, the formula should be changed by substituting a positive sign (+) for the negative sign (–), or vice versa. These crystals are available on special order.

REMEMBER: When ordering crystals from your dealer always give Craig Model Number 4350A, the channel frequency, and the crystal frequency, and specify crystal holder CR 25/U.

INSTALLING CRYSTALS

1. Remove the cover of the crystal compartment.
2. Install the crystals in the sockets according to the desired channel assignments. Using the label provided, write in the respective frequencies.
3. If desired, the frequency, call letters, or identification of the station may be written on the front panel in the space provided.

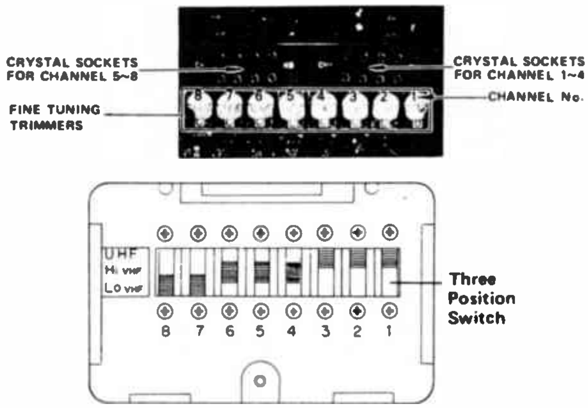


Figure shows channel 1~3 for UHF
channel 4~6 for Hi VHF
channel 7, 8 for Lo VHF

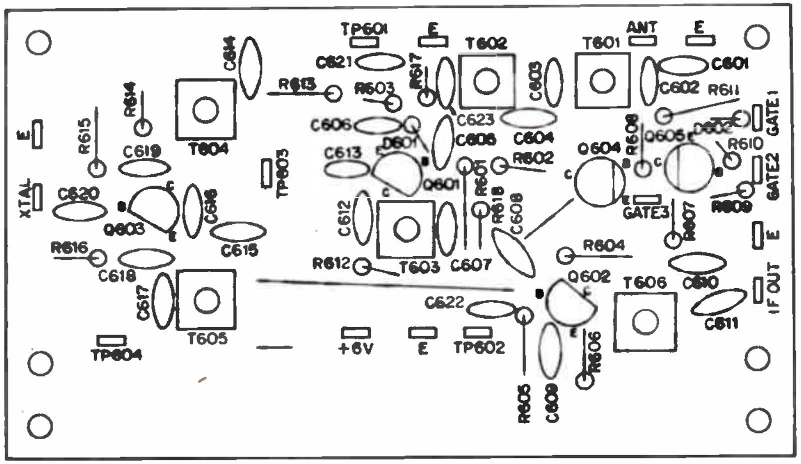
4. Set the three-position switches to the proper band according to the frequency of each channel: 30 – 50 MHz, Lo VHF; 150 – 174 MHz, Hi VHF; 450 – 520 MHz, UHF.
5. With the Scan switch in the MANUAL position, select the first channel. Adjust the fine tuning trimmer for channel 1 for minimum noise and best sound. Repeat for the other channels.

CRYSTAL CORRELATION

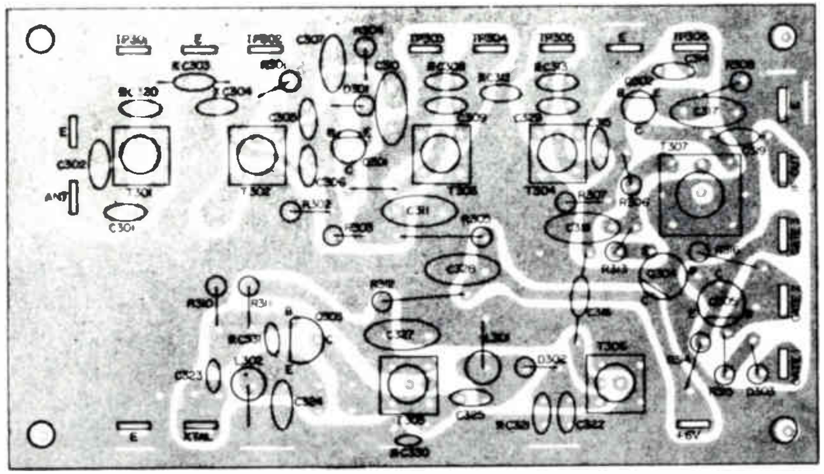
Resonance	Parallel
Overtone	3rd
Load Capacity	20 pF
Maximum Series Resistance	35Ω
Maximum Drive	2 mW
Frequency Tolerance:	
VHF (25°C)	±0.001%
(–30°C to + 80°C)	±0.005%
UHF (25°C)	±0.0007%
(–30°C to +80°C)	±0.001%

PARTS LOCATION of FRONT ENDS

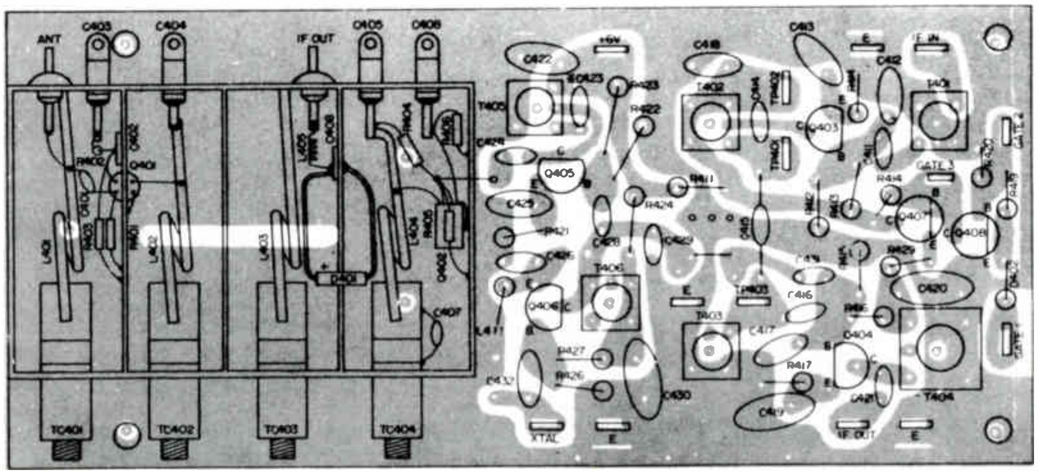
Lo VHF



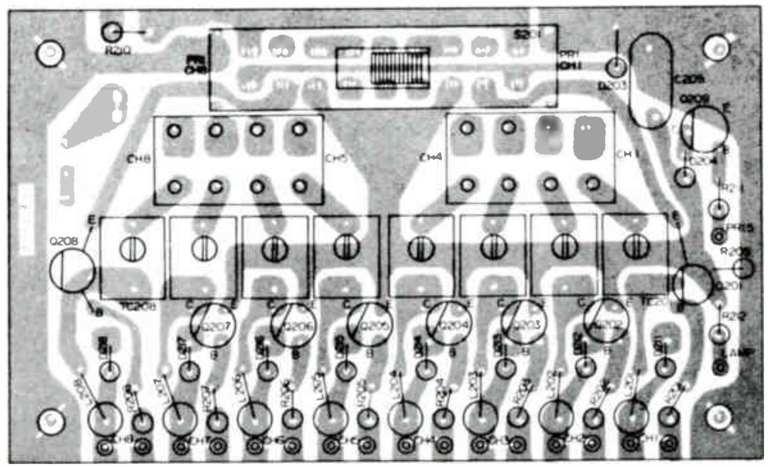
Hi VHF



UHF

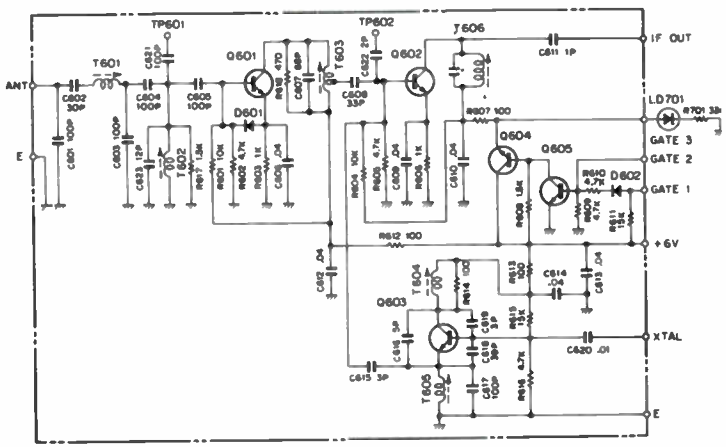


XTAL P.C.B

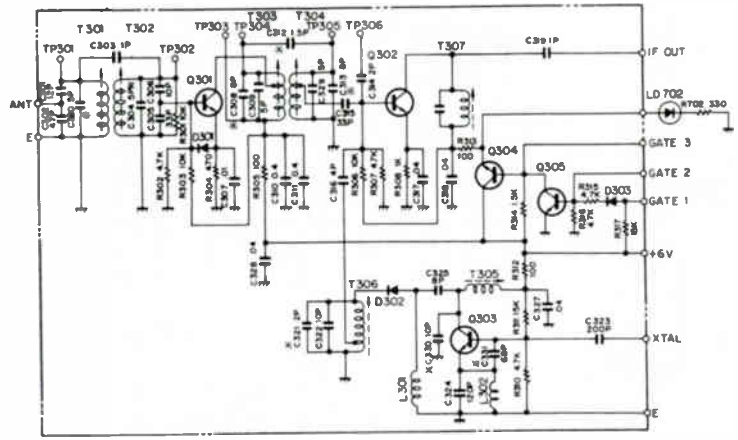


FRONT END SCHEMATIC DIAGRAM

Lo VHF



Hi VHF

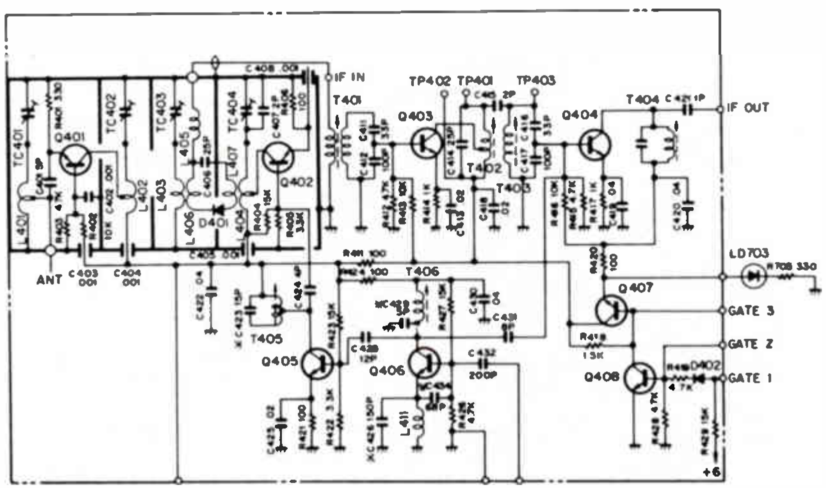


NOTE: To change frequency range for usable sensitivity. It is not enough to adjust coils and brimmer condensers. Accordingly the change of capacities of capacitors is necessary as follows.

Lo VHF

Covers from 30.0 to 50.0 MHz without any parts change and adjustment.

UHF



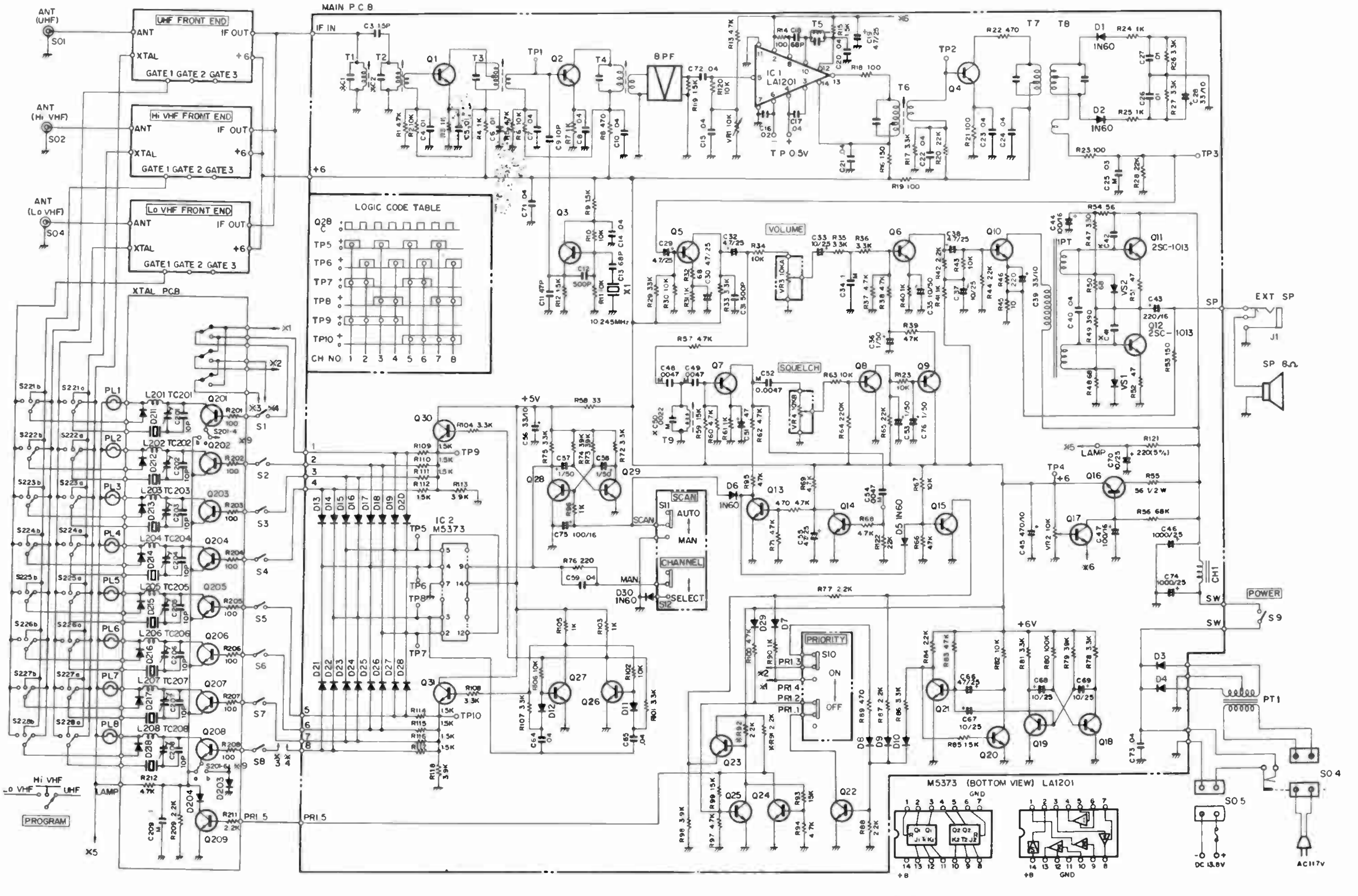
Hi VHF

TYPE	FREQUENCY RANGE	C320	C304	C308	C313	C321
H1	150~158 MHz	5pF	5pF	8pF	8pF	2pF
H2	156~164 MHz	3pF	3pF	8pF	8pF	–
H3	166~174 MHz	2pF	2pF	5pF	5pF	–

UHF

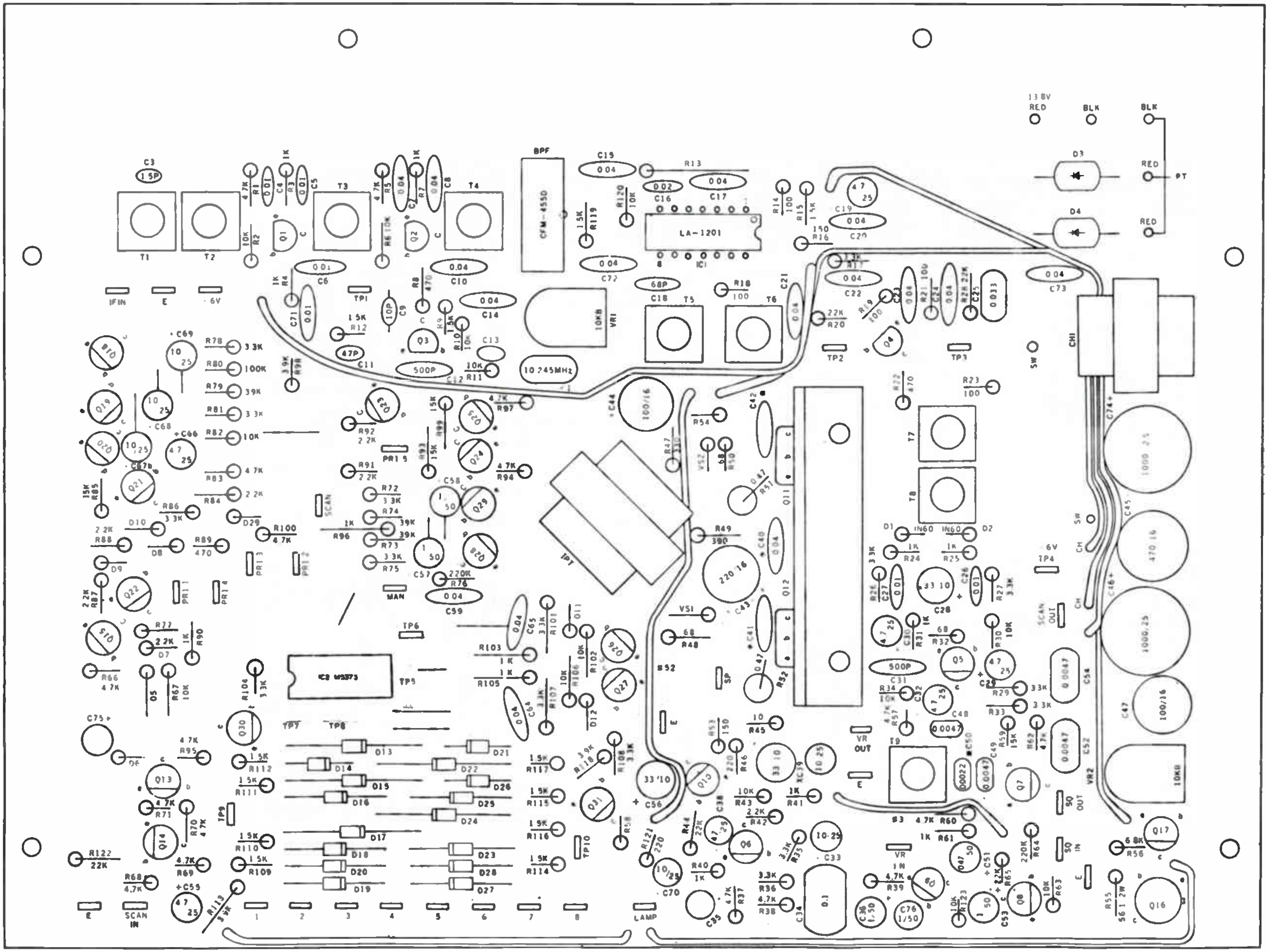
TYPE	FREQUENCY RANGE	1st IF BAND	C411	C414	C416	C423	C426
U1	450~470 MHz	54.63~56.63 MHz	33pF	25pF	33pF	15pF	150pF
U2	470~490 MHz	56.63~58.63 MHz	33pF	25pF	33pF	15pF	150pF
U3	490~510 MHz	58.63~60.63 MHz	27pF	20pF	27pF	12pF	120pF
U4	500~520 MHz	59.63~61.63 MHz	27pF	20pF	27pF	12pF	120pF

MODEL 4350A CIRCUIT DIAGRAM

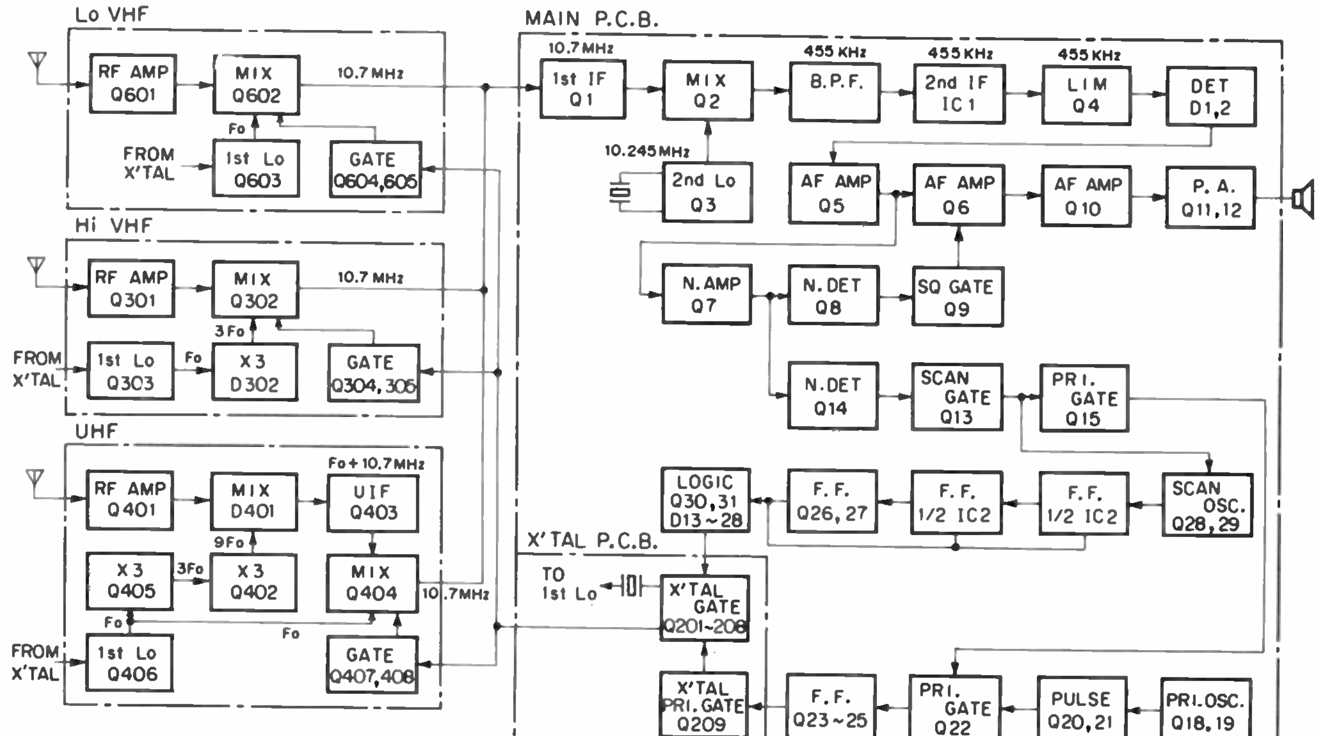


※NOMINAL VALUE

PARTS LOCATION of MAIN P.C.B



Craig 4350, 4350A



Fo: X'TAL OSCILLATER FREQUENCY

Lo VHF : RF + 10.7 MHz

Hi VHF : $\frac{RF - 10.7}{3}$ MHz

UHF $\frac{RF - 10.7}{10}$ MHz

U IF : 1st IF for UHF

Fo + 10.7 MHz

SEMICONDUCTORS

		D27	1S1588	Q3	2SC839	Q201	2SC372, 2SC735
ITEM	TYPE	D28	1S1588	Q4	2SC839	Q202	2SC372, 2SC735
		D29	1S1588	Q5	2SC372, 2SC735	Q203	2SC372, 2SC735
D1	1N60	D30	1N60	Q6	2SC372, 2SC735	Q204	2SC372, 2SC735
D2	1N60	D203	1S1588	Q7	2SC372, 2SC735	Q205	2SC372, 2SC735
D3	RA1Z	D204	1S1588	Q8	2SC372, 2SC735	Q206	2SC372, 2SC735
D4	RA1Z	D211	1N60	Q9	2SC372, 2SC735	Q207	2SC372, 2SC735
D5	1N60	D212	1N60	Q10	2SC372, 2SC735	Q208	2SC372, 2SC735
D6	1N60	D213	1N60	Q11	2SC1013	Q209	2SC372, 2SC735
D7	1S1588	D214	1N60	Q12	2SC1013	Q301	2SC668
D8	1S1588	D215	1N60	Q13	2SC372, 2SC735	Q302	2SC668
D9	1S1588	D216	1N60	Q14	2SC372, 2SC735	Q303	2SC710
D10	1S1588	D217	1N60	Q15	2SC372, 2SC735	Q304	2SC372, 2SC735
D11	1S1588	D218	1N60	Q16	2SC1173	Q305	2SC372, 2SC735
D12	1S1588	D301	1N60	Q17	2SC372, 2SC735	Q401	2SC1035, 2SC1180
D13	1S1588	D302	1S1588	Q18	2SC372, 2SC735	Q402	2SC1035, 2SC1180
D14	1S1588	D303	1S1588	Q19	2SC372, 2SC735	Q403	2SC710
D15	1S1588	D401	SD82A	Q20	2SC372, 2SC735	Q404	2SC710
D16	1S1588		1SS16	Q21	2SC372, 2SC735	Q405	2SC710
D17	1S1588	D402	1S1588	Q22	2SC372, 2SC735	Q406	2SC710
D18	1S1588	D601	1N60	Q23	2SC372, 2SC735	Q407	2SC372, 2SC735
D19	1S1588	D602	1S1588	Q24	2SC372, 2SC735	Q408	2SC372, 2SC735
D20	1S1588	IC1	LA1201	Q25	2SC372, 2SC735	Q601	2SC922
D21	1S1588	IC2	M5373	Q26	2SC372, 2SC735	Q602	2SC922
D22	1S1588	LD701	ME-116	Q27	2SC372, 2SC735	Q603	2SC710
D23	1S1588	LD702	ME-116	Q28	2SC372, 2SC735	Q604	2SC372
D24	1S1588	LD703	ME-116	Q29	2SC372, 2SC735	Q605	2SC372
D25	1S1588	Q1	2SC839	Q30	2SC372, 2SC735	VS1	1S1209
D26	1S1588	Q2	2SC839	Q31	2SC372, 2SC735	VS2	1S1209

SEMICONDUCTORS

ITEM	TYPE
D1	1N60
D2	1N60
D3	RA1Z
D4	RA1Z
D5	1N60
D6	1N60
D7	1S1588
D8	1S1588
D9	1S1588
D10	1S1588
D11	1S1588
D12	1S1588
D13	1S1588
D14	1S1588
D15	1S1588
D16	1S1588
D17	1S1588
D18	1S1588
D19	1S1588
D20	1S1588
D21	1S1588
D22	1S1588
D23	1S1588
D24	1S1588
D25	1S1588
D26	1S1588
D27	1S1588
D28	1S1588
D29	1S1588
D30	1N60
D203	1S1588
D204	1S1588
D211	1N60
D212	1N60
D213	1N60
D214	1N60
D215	1N60
D216	1N60
D217	1N60
D218	1N60
D301	1N60
D302	1S1588
D303	1S1588
D401	SD82A
	1SS16
D402	1S1588
D601	1N60
D602	1S1588
IC1	LA1201
IC2	M5373
LD701	ME-116
LD702	ME-116
LD703	ME-116
Q1	2SC839
Q2	2SC839
Q3	2SC839
Q4	2SC839
Q5	2SC372, 2SC735
Q6	2SC372, 2SC735
Q7	2SC372, 2SC735
Q8	2SC372, 2SC735
Q9	2SC372, 2SC735
Q10	2SC372, 2SC735
Q11	2SC1013
Q12	2SC1013
Q13	2SC372, 2SC735
Q14	2SC372, 2SC735
Q15	2SC372, 2SC735
Q16	2SC1173
Q17	2SC372, 2SC735
Q18	2SC372, 2SC735
Q19	2SC372, 2SC735
Q20	2SC372, 2SC735
Q21	2SC372, 2SC735
Q22	2SC372, 2SC735
Q23	2SC372, 2SC735
Q24	2SC372, 2SC735
Q25	2SC372, 2SC735
Q26	2SC372, 2SC735
Q27	2SC372, 2SC735
Q28	2SC372, 2SC735
Q29	2SC372, 2SC735
Q30	2SC372, 2SC735
Q31	2SC372, 2SC735
Q201	2SC372, 2SC735
Q202	2SC372, 2SC735
Q203	2SC372, 2SC735
Q204	2SC372, 2SC735
Q205	2SC372, 2SC735
Q206	2SC372, 2SC735
Q207	2SC372, 2SC735
Q208	2SC372, 2SC735
Q209	2SC372, 2SC735
Q301	2SC668
Q302	2SC668
Q303	2SC710
Q304	2SC372, 2SC735
Q305	2SC372, 2SC735
Q401	2SC1035, 2SC1180
Q402	2SC1035, 2SC1180
Q403	2SC710
Q404	2SC710
Q405	2SC710
Q406	2SC710
Q407	2SC372, 2SC735
Q408	2SC372, 2SC735
Q601	2SC922
Q602	2SC922
Q603	2SC710
Q604	2SC372
Q605	2SC372
VS1	1S1209
VS2	1S1209

ELECTROLYTICS/ VARIABLE CAPS

ITEM	VALUE		
C19	4.7uF 25V		
C28	33uF 10V		
C29	4.7uF 25V		
C30	4.7uF 25V		
C32	4.7uF 25V		
C33	10uF 25V		
C35	10uF 25V		
C36	1uF 50V		
C37	10uF 25V		
C38	4.7uF 25V		
C39	33uF 10V		
C43	220uF 16V		
C44	100uF 16V		
C45	470uF 10V		
C46	1000uF 25V		
C47	100uF 16V		
C51	.47uF 50V		
C53	1uF 50V		
C55	4.7uF 25V		
C56	33uF 10V		
C57	1uF 50V		
C58	1uF 50V		
C66	4.7uF 25V		
C67	10uF 25V		
C69	10uF 25V		
C70	10uF 25V		
C74	1000uF 25V		
C75	100uF 16V		
C76			1uF 50V
TC201		4350013	Trimmer
TC202		4350013	Trimmer
TC203		4350013	Trimmer
TC204		4350013	Trimmer
TC205		4350013	Trimmer
TC206		4350013	Trimmer
TC207		4350013	Trimmer
TC208		4350013	Trimmer
TC401		4350019	Trimmer
TC402		4350019	Trimmer
TC403		4350019	Trimmer
TC404		4350019	Trimmer

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
VR1	4350007	10K
VR2	4350007	10K
VR3	4350002	10K, Volume Switch.
VR4	4350008	10K, Squelch

CABINET PARTS

NAME	PART NO.
Cabinet, Bottom	4350061
Cabinet, Tops	4350060
Crystal, Cover	4350057
Crystal, Socket	4350051
Escutcheon	4350053
Feet, Rubber	4350049
Knob, Squelch	4350047
Knob, Volume	4350047
Panel, Acryl.	4350052

MISCELLANEOUS

ITEM	NAME	PART NO.
BPF	Ceramic Filter	4350009
PL1	Lamp, Indicator	4350011
PL2	Lamp, Indicator	4350011
PL3	Lamp, Indicator	4350011
PL4	Lamp, Indicator	4350011
PL5	Lamp, Indicator	4350011
PL6	Lamp, Indicator	4350011
PL7	Lamp, Indicator	4350011
PL8	Lamp, Indicator	4350011
S1	Switch, Bypass Channel	4350001
S2	Switch, Bypass Channel	4350001
S3	Switch, Bypass Channel	4350001
S4	Switch, Bypass Channel	4350001
S5	Switch, Bypass Channel	4350001
S6	Switch, Bypass Channel	4350001
S7	Switch, Bypass Channel	4350001
S8	Switch, Bypass Channel	4350001
S9	Switch, Power (on Volume)	4350002
S10	Switch, Priority	4350003
S11	Switch, Scam	4350003
S12	Switch, Channel Selector	4350004
S221	Switch, Program	4350006
S222	Switch, Program	4350006
S223	Switch, Program	4350006
S224	Switch, Program	4350006
S225	Switch, Program	4350006
S226	Switch, Program	4350006
S227	Switch, Program	4350006
S228	Switch, Program	4350006
SP	Speaker, 8 ohms	4350015
X1	Crystal (10.245MHz)	4350014
	Cord, AC Power	4350080
	Cord, DC Power	4350081
	Antenna, High UHF/VHF	4350054
	Antenna, Low VHF	4350055

COILS/ TRANSFORMERS

ITEM	PART NO.
CH1	4350010
IP1	4350016
L201	4350034
L202	4350034
L203	4350034
L204	4350034
L205	4350034
L206	4350034
L207	4350034
L208	4350034
L301	4350034
L302	4350035
L401	4350027
L402	4350027
L403	4350027
L404	4350029
L405	4350036
PT1	4350083
T1	4350038
T2	4350039
T3	4350040
T4	4350041
T5	4350041
T6	4350042
T7	4350043
T8	4350044
T9	4350045
T301	4350023
T302	4350023
T303	4350024
T304	4350026
T305	4350020
T306	4350025
T307	4350037
T401	4350021
T402	4350022
T403	4350020
T404	4350037
T405	4350028
T406	4350020
T601	4350075
T602	4350020
T603	4350077
T604	4350020
T605	4350076
T606	4350037

Pages 20 - 24 Courtesy of E. F. JOHNSON COMPANY

ALIGNMENT

The standard Johnson Mini-Scan Monitor Receiver, Part No. 241-0352-102, is factory aligned on a "center frequency" of 156.500 MHz.

To obtain peak receiver performance, selected crystal frequencies should be within +5.5 MHz and -4.5 MHz of 156.500 MHz. The receiver will operate outside these limits, but with reduced sensitivity.

NOTE

Part No. 241-0352-101 is factory aligned on a "center frequency" of 150.250 MHz. (Selected monitor frequency crystals should be within +3.75 MHz and -4.25 MHz from this frequency.)

Part No. 241-0352-103 is factory aligned on a "center frequency" of 167.250 MHz. (Selected monitor frequency crystals should be within +4.75 MHz and -5.25 MHz from this frequency.)

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the receiver be realigned on the required "center frequency" by a QUALIFIED TECHNICIAN.

Align the receiver on the available frequency which is close to the center of the frequencies installed in the customer's receiver. This frequency will be termed "center frequency" in the following alignment procedure.

PRELIMINARY

a. Connect an RF signal generator to the antenna connector and an AC VTVM across the speaker.

b. Select the "center frequency" channel and apply 5.0 VDC to the receiver.

FIRST OSCILLATOR ADJUSTMENT

a. Connect an RF voltmeter probe to the base of Q2.

b. Adjust L3 for a maximum RF voltmeter reading (a typical reading is 25 to 40 mV.)

RF AMPLIFIER, IF AMPLIFIER AND DISCRIMINATOR ADJUSTMENT

a. With no RF signal input, adjust L2 for maximum audio noise.

b. With the RF signal generator output connected to the antenna connector, adjust in order C1, L1, L3, T1, and L2 for maximum quieting sensitivity.

c. Remove the RF signal and adjust T2 for maximum audio noise.

d. Repeat step b., then adjust L2 and C1 last for best quieting sensitivity.

QUIETING SENSITIVITY TEST

a. Set the receiver volume control for a 0 dB audio output reference level.

b. Set the RF signal generator to the "center frequency" with 1 μV level at the receiver antenna connector.

The 0 dB audio output level should drop a minimum of 20 dB.

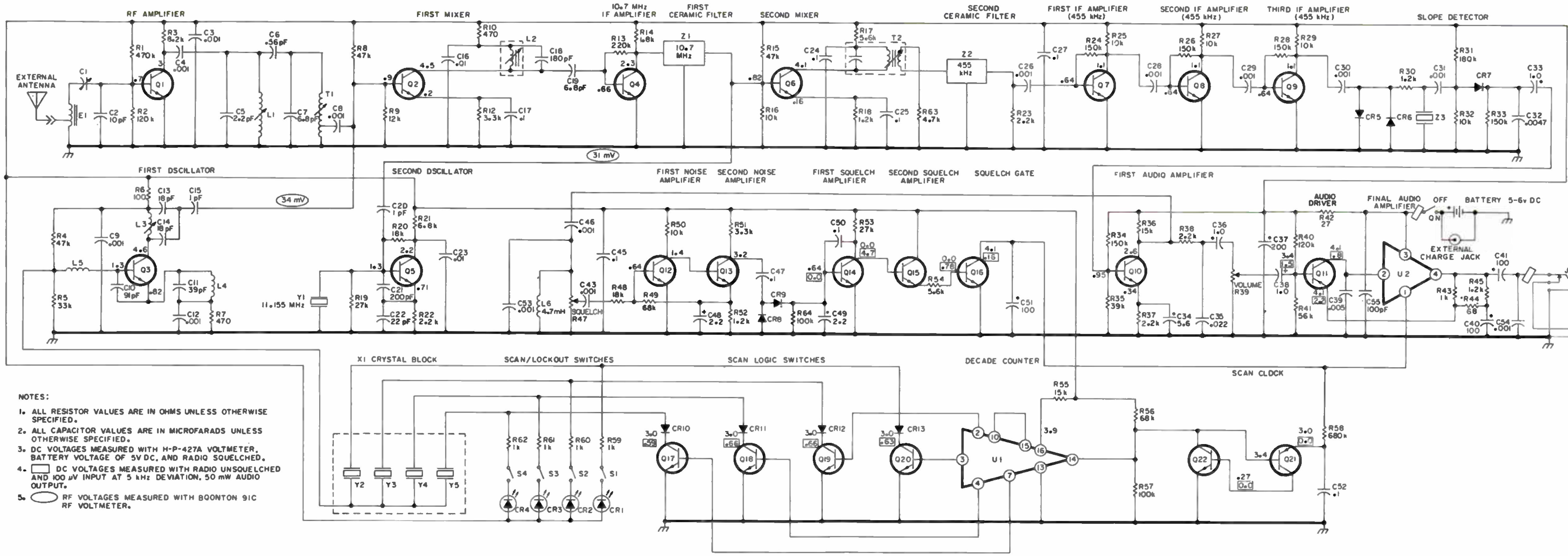
c. Repeat steps a. and b. on the remaining crystals.

The worst case frequency should produce at least 20 dB quieting sensitivity with a 5.5 μV input signal.

AUDIO TEST

a. Set the on frequency RF signal generator output level for 1.0 mV with ±3.0 kHz deviation.

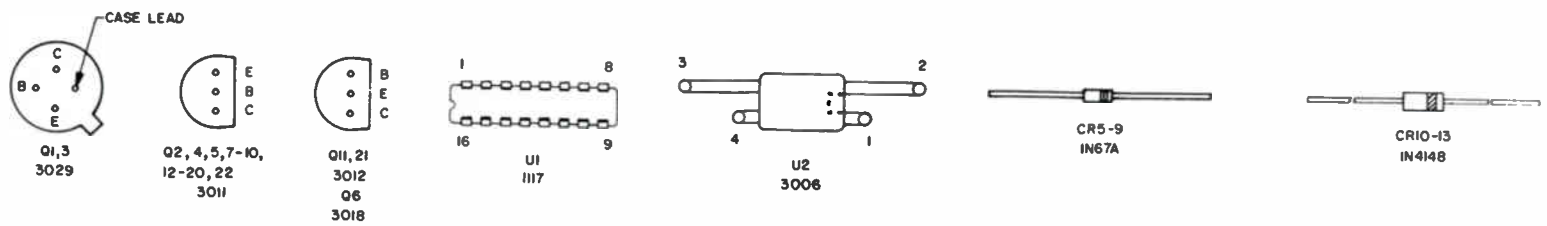
b. The minimum acceptable audio output with the volume control at maximum is 0.7 V across an 8 ohm load.

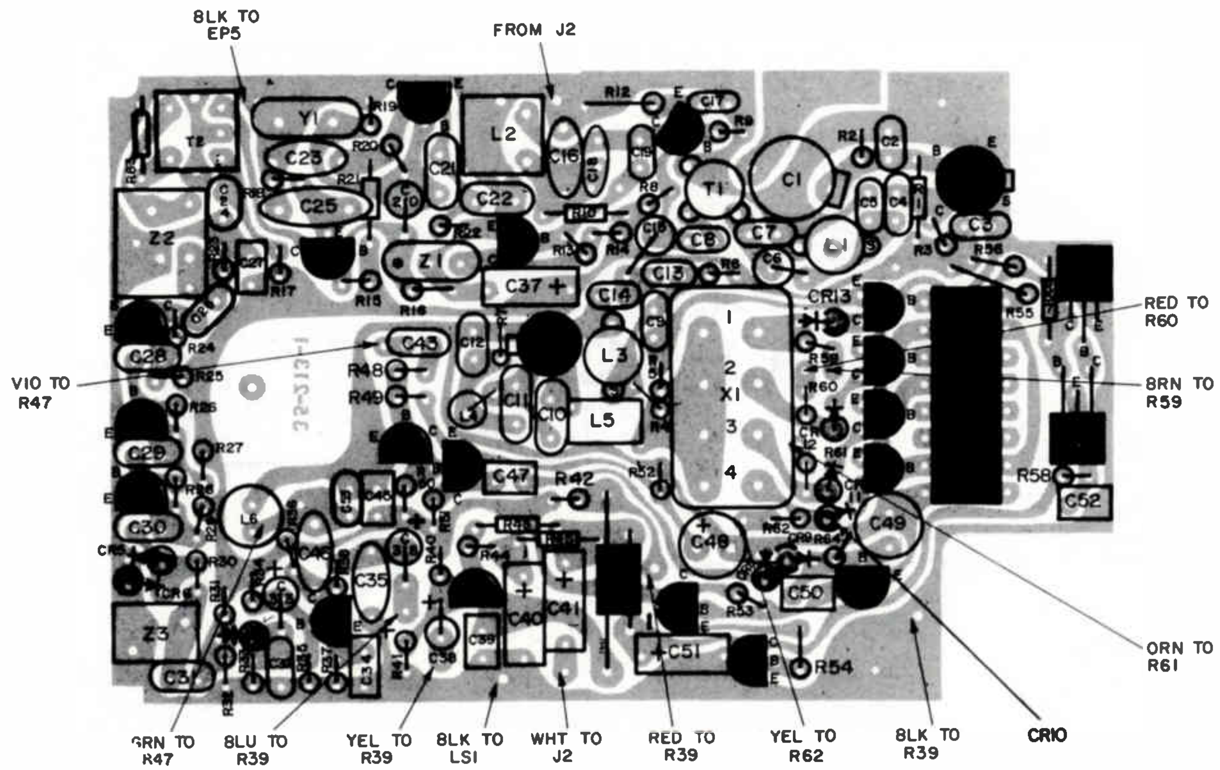


NOTES:

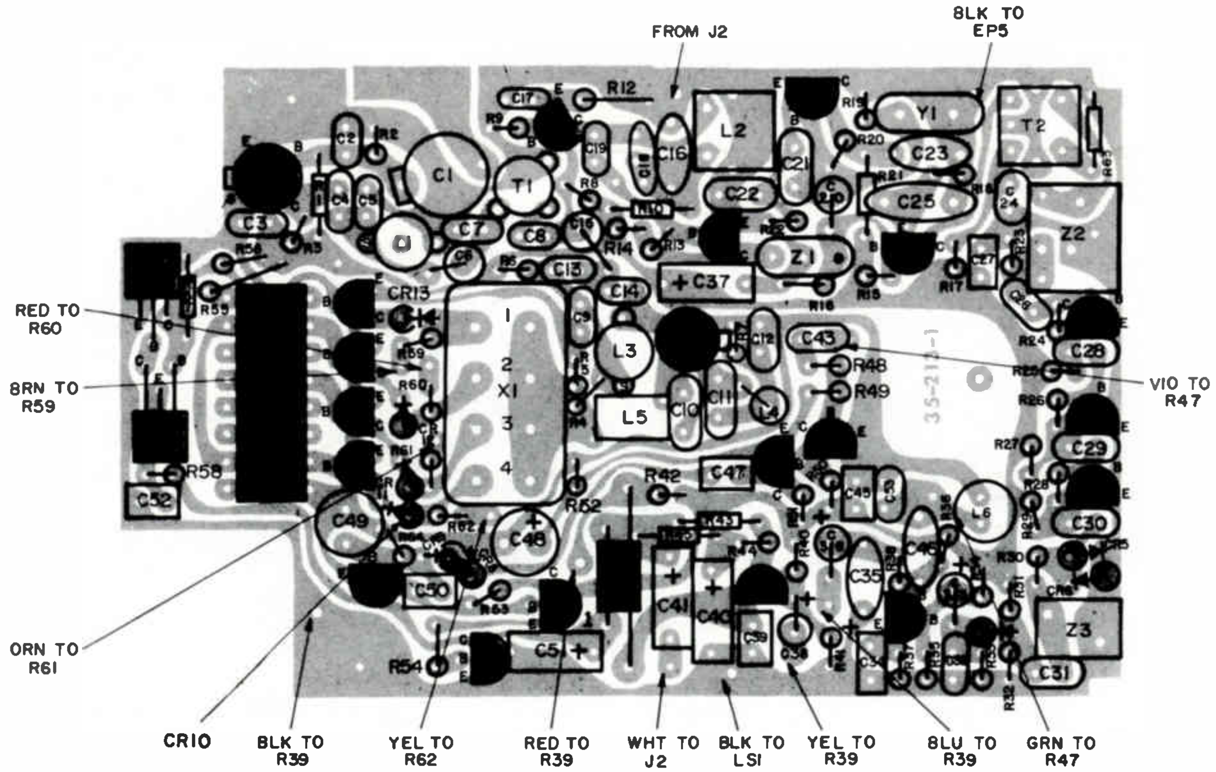
1. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. DC VOLTAGES MEASURED WITH H-P-427A VOLTMETER, BATTERY VOLTAGE OF 5V DC, AND RADIO SQUELCHED.
4. ▭ DC VOLTAGES MEASURED WITH RADIO UNSQUELCHED AND 100 µV INPUT AT 5 kHz DEVIATION, 50 mW AUDIO OUTPUT.
5. ⬭ RF VOLTAGES MEASURED WITH BOONTON 91C RF VOLTMETER.

NOTE:
SEMICONDUCTOR BASING IS BOTTOM VIEW UNLESS OTHERWISE INDICATED.





MINI-SCAN COMPONENTS LAYOUT
(COMPONENT SIDE VIEW)
FIGURE 1



MINI-SCAN COMPONENTS LAYOUT
(SOLDER SIDE VIEW)
FIGURE 2

SEMICONDUCTORS

ITEM	PART NO.	TYPE
CR1	549-4001-002	
CR2	549-4001-002	
CR3	549-4001-002	
CR4	549-4001-002	
CR5	523-1000-067	1N67A
CR7	523-1000-067	1N67A
CR8	523-1000-067	1N67A
CR9	523-1000-067	1N67A
CR10	523-1500-883	1N4148
CR11	523-1500-883	1N4148
CR12	523-1500-883	1N4148
CR13	523-1500-883	1N4148
Q1	576-0003-029	
Q2	576-0003-011	
Q3	576-0003-029	
Q4	576-0003-011	
Q5	576-0003-011	
Q6	576-0003-018	
Q7	576-0003-011	
Q8	576-0003-011	
Q9	576-0003-011	
Q10	576-0003-011	
Q11	576-0003-012	
Q12	576-0003-011	
Q13	576-0003-011	
Q14	576-0003-011	
Q15	576-0003-011	
Q16	576-0003-011	
Q17	576-0003-011	
Q18	576-0003-011	
Q19	576-0003-011	
Q20	576-0003-011	
Q21	576-0003-012	
Q22	576-0003-011	
U1	544-3001-117	CD4017AE
U2	544-2003-006	MFC40008

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C1	187-0103-005	Trimmer
C33	510-2075-109	1uF 35V
C36	510-2075-109	1uF 35V
C37	510-2055-107	100uF 10V
C38	510-2075-109	1uF 35V
C40	510-2055-107	100uF 10V
C41	510-2055-107	100uF 10V
C48	510-2045-229	2.2uF 35V
C49	510-2045-229	2.2uF 35V
C51	510-2055-107	100uF 10V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R39	562-0018-017	50K, 1/4W Volume (with Switch)
R47	562-0018-016	5000 ohms, 1/4W Squelch
HV-80		

COILS/TRANSFORMERS

ITEM	PART NO.
L1	542-1012-011
L2	542-1012-002
L3	542-1006-013
L4	542-3002-001
L5	542-0001-135
L6	542-5022-008
T1	592-5022-008
T2	592-5020-003
U3	023-2694-002

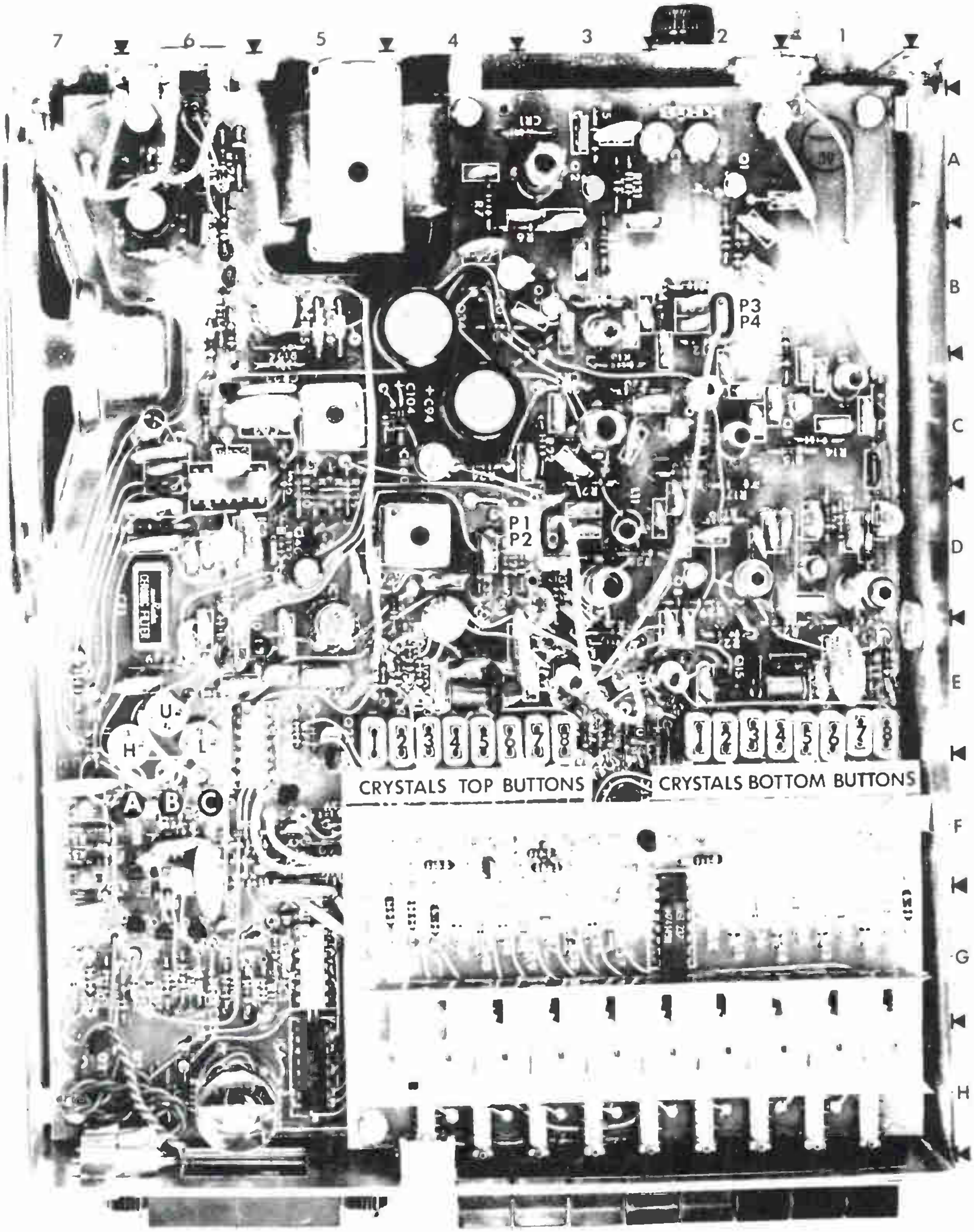
MISCELLANEOUS

ITEM	NAME	PART NO.
LSI	Speaker, 8.2 ohms	589-1012-02
S1	Switch, Scan Lockout	583-3001-201
S2	Switch, Scan Lockout	583-3001-201
S3	Switch, Scan Lockout	583-3001-201
S4	Switch, Scan Lockout	583-3001-201
U4	PCB	035-0213-001
X1	Crystal Socket	126-0110-110
Y1	Crystal (11.155MHz)	519-009-001
Z1	Ceramic Filter	532-2001-011
Z2	Ceramic Filter	532-2004-001
Z3	Ceramic Resonator (455kHz)	532-2005-001

CABINET PARTS

NAME	PART NO.
Case	032-0364-001
Knob, Squelch	547-0011-001
Knob, Volume	547-0011-001
Speaker Cover	032-0365-001

Pages 25 - 29 Courtesy of KRIS, INC.



CRYSTALS

The Kris Tri-Band was shipped without crystals because of the many hundreds of authorized frequencies in the three monitoring bands. Crystals are available from Kris and also available from your local Kris Dealer. Be sure to specify Kris Tri-Band crystals.

Kris Tri-Band crystal specifications are as follows:

1. Frequency tolerance — .001%
2. 3rd overtone; series resonance is 450 Hz lower than operating frequency.
3. Maximum impedance of 35 ohms
4. Type HC-25/u holder
5. Crystal frequency:
   Low Band: Crystal Frequency = Channel Frequency + 10.7 mHz

   $$\text{High Band: Crystal Frequency} = \frac{\text{Channel Frequency} - 10.7\text{ mHz}}{3}$$

   $$\text{UHF Band: Crystal Frequency} = \frac{\text{Channel frequency} - 10.7\text{ mHz}}{9}$$

Placement of the crystals for each channel is noted in the illustration showing the interior of the radio.

INSTALLATION

Antenna

For most satisfactory performance you should use a 50 ohm monitor antenna designed to operate on the 30-50 MHz, 150-174 MHz and 450-470 MHz bands. If you intend to operate your receiver on only one or two bands, you can install an antenna for those frequencies only. A variety of monitor antennas is available.

The selection of an antenna — whether it is a collapsible whip to be used on the Tri-Band, an outdoor antenna mounted high in the air, or a mobile antenna — depends on your own situation. For best reception of weak or distant stations an outdoor antenna mounted clear of surrounding objects will naturally give the best results. In areas where signals are strong and nearby, an indoor whip antenna will nearly always suffice. For mobile operation a roof or fender mounted whip will give good results. Refer to the instructions supplied with the antenna for proper installation and operation.

Base Station Installation

Plug the AC power cable into 117 VAC outlet. Connect the antenna to the Tri-Band antenna jack on the back of the receiver. The Tri-Band antenna jack accepts a PL-239 coax connector. Most monitor antennas have the proper plug to fit this jack — however, in the event that your antenna does not, adapters are readily available. An external speaker can be connected by opening the link between the screw terminals on the back of the set. The two wires which go to the external speaker are then connected to the two screws located on opposite ends of the terminal strip. The screw connector furthest from the center of the set is connected to chassis ground. If the external speaker has a "grounded" lead, make sure it is connected to this ground screw. An 8 ohm speaker is recommended for best operation.

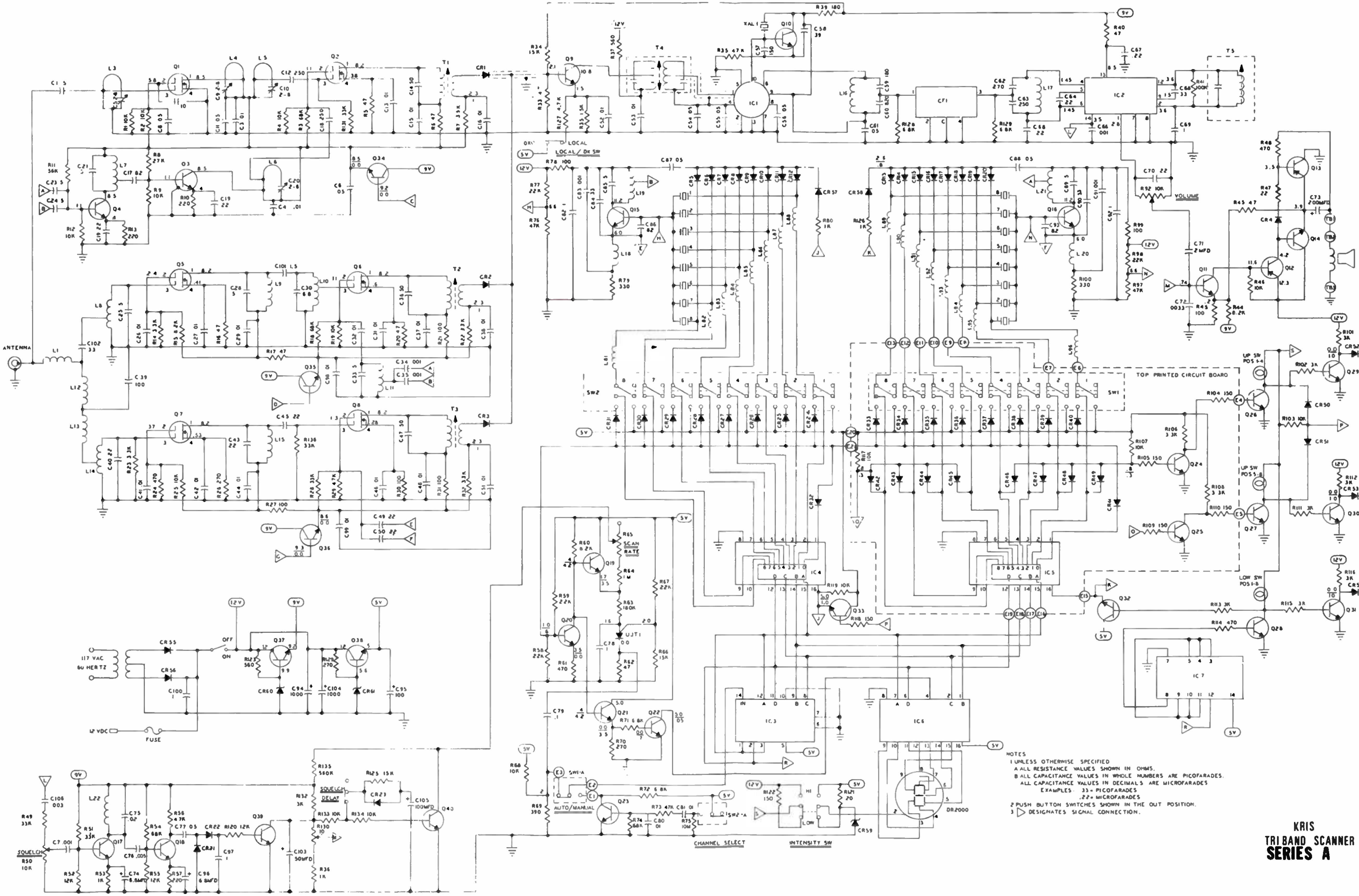
Mobile Installation

The Kris Tri-Band can be used in any car, truck, boat, etc. that has a 12 volt DC *negative* ground system. The receiver should be positioned in a convenient operating position in the vehicle. Mount the bracket which is provided. By using the two #10-32 thumb screws, position the receiver in the bracket and tighten securely.

The power lead is terminated at one end with a connector which fits into the DC power jack at the back of the Tri-Band. Insert this connector into the jack. Connect the other end to any convenient positive 12 volt source such as the fuse block, cigarette lighter, positive battery terminal, etc.

To complete the circuit, the mounting bracket may be sufficient if it is securely fastened to a metal electrical ground portion of the vehicle. If not, or if you are in doubt, connect a wire from the back panel of the Tri-Band to any metal portion of the vehicle frame.

NOTICE: Mobile reception of a police frequency by unauthorized personnel is illegal in vehicles in some areas. Check your local laws. Kris, Inc. cannot be held responsible for unauthorized receiver installation or use.



ANTENNA
117 VAC
60 HERTZ
12 VDC
FUSE
OFF
ON
SQUELCH
SQUELCH DELAY
AUTO/MANUAL
CHANNEL SELECT
INTENSITY SW
SCAN RATE
VOLUME
LOCAL/DX SW
TOP PRINTED CIRCUIT BOARD
NOTES
1 UNLESS OTHERWISE SPECIFIED
A ALL RESISTANCE VALUES SHOWN IN OHMS.
B ALL CAPACITANCE VALUES IN WHOLE NUMBERS ARE PICOFARADES.
ALL CAPACITANCE VALUES IN DECIMALS ARE MICROFARADES
EXAMPLES: 33 = PICOFARADES
.22 = MICROFARADES
2 PUSH BUTTON SWITCHES SHOWN IN THE OUT POSITION.
3 ▷ DESIGNATES SIGNAL CONNECTION.
KRIS
TRI BAND SCANNER
SERIES A

OPERATION

Automatic Scan
Turn the unit "on". Put the Scan/Manual switch in the scan position (out). Rotate the Squelch Control in a clockwise direction until the unit starts to scan. The best position for the Squelch Control is at scan threshold (where unit begins to scan). Adjust the Scan Rate control to desired speed. Switch the Intensity control to the desired intensity.

In the event that you do not want to listen to signals from one or more stations, merely push in the lock-out switches for those channels you wish to skip. The scan operation will then skip those channels.

Manual Operation
To operate the Tri-Band in a manual mode, push in Scan/Manual switch. Then pulse the Channel Select switch until the proper channel is indicated in the panel display.

Your Tri-Band Scanner may be programmed in many different ways. This allows you a great deal of flexibility as your monitoring needs change. The table below shows how to go about changing the scanners' "program" to fit your requirements.

TRI-BAND PROGRAMMING TABLE

	Buttons 1-4 Top Row	Buttons 5-8 Top Row	Buttons 1-8 Bottom Row
LOW BAND	Wire A to Socket L	Wire C to Socket L	Wire B to Socket L
HIGH BAND	Wire A to Socket H Red Wire to P-1 or P-2	Wire C to Socket H Red Wire to P-1 or P-2	Wire B to Socket H White Wire to P-1 or P-2
UHF BAND	Wire A to Socket U Red Wire to P-3 or P-4	Wire C to Socket U Red Wire to P-3 or P-4	Wire B to Socket U White Wire to P-3 or P-4

NOTE: There are three holes in each of the H,L, and U sockets — it makes no difference which of these holes are used.

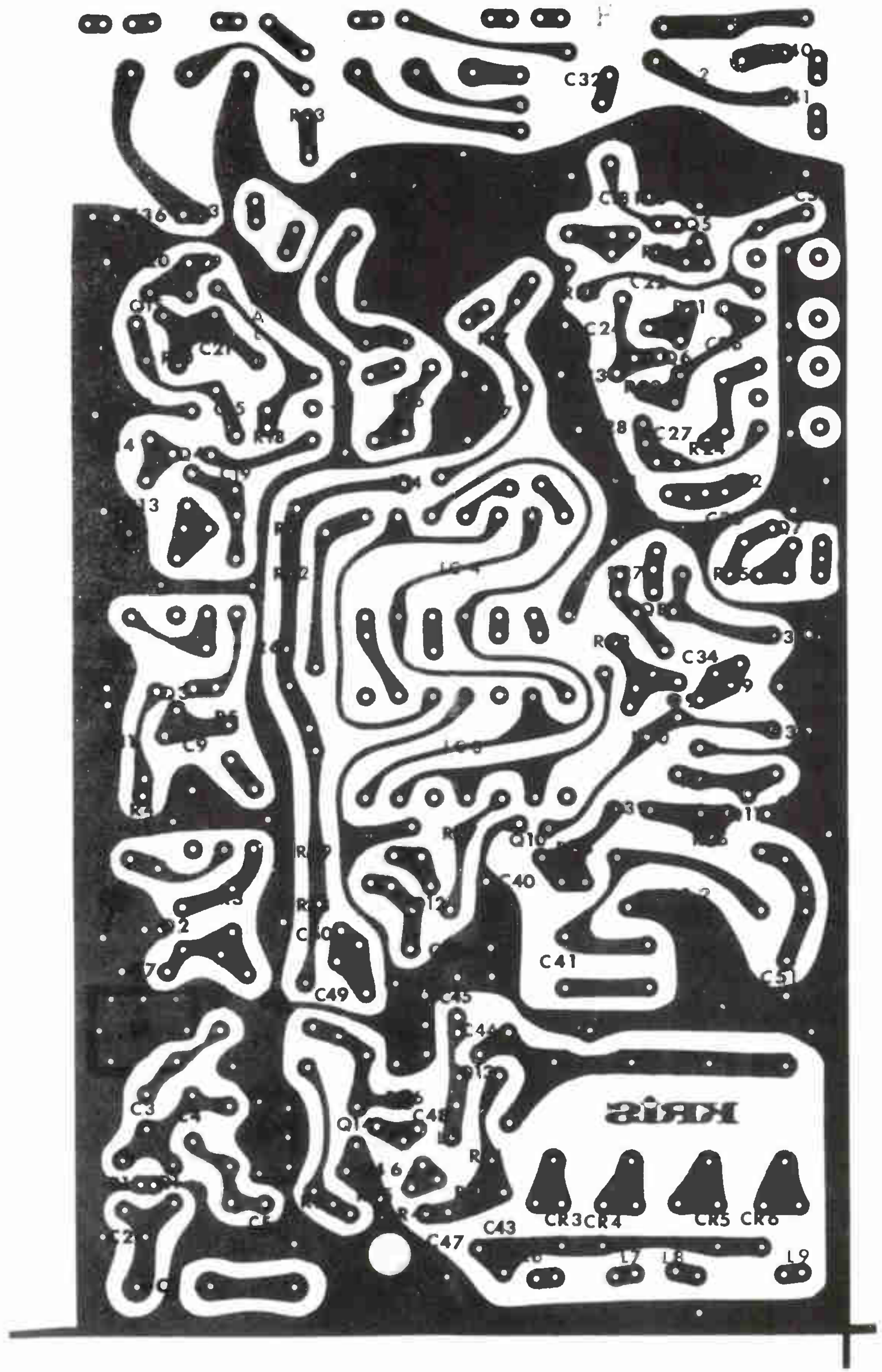
NOTE: If you desire to program the set so that both High Band and UHF are to be received using the top deck switches*, it will be necessary to add an additional short piece of wire from either P-1 or P-2 to either P-3 or P-4.

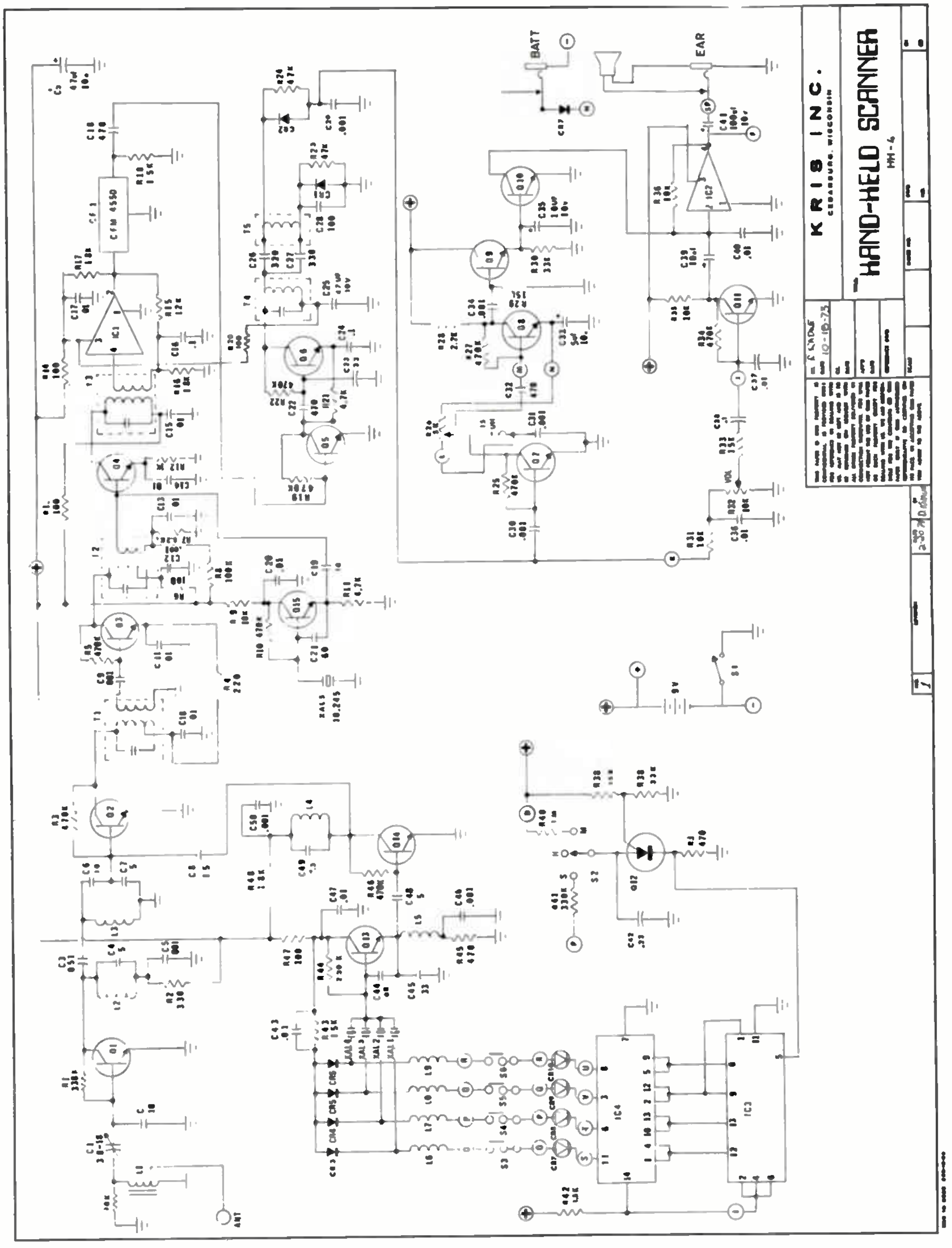
* For example, UHF on buttons 1-4 and Hi Band on buttons 5-8 or vice versa.

OPERATOR TROUBLE-SHOOTING HINTS

No power in radio (Lights do not light and no noise from speaker)	Check to see that power cord is connected to rear of set (Mobile operation) Check to see that set is properly grounded to vehicle frame and that power cord is properly connected to 12 volts Check fuse
No reception (Lights light but do not receive any signals)	Check antenna connection. Check to see that crystal is in proper socket and that radio is correctly programmed
No sound	Check to see it squelch control is properly adjusted If using external speaker, check for proper connection of speaker wires
Does not scan	Check to see that "scan/manual" button is in the out position Check setting of squelch control
Signals distorted or weak	Check antenna connections. Are stations too distant for your antenna. If so, try a better antenna. Check to see that crystals were ordered for use in Kris Tri-Band

Pages 30 - 31 Courtesy of KRIS, INC.





CRYSTAL INSTALLATION

The Hand-Skan requires a crystal for each of the four high band frequencies (146-174 MHz) you wish to monitor. It is not essential that all four crystals be used.

The Hand-Skan uses TMR type crystals, which is also known as a "10.7 IF" crystal. Local frequency crystals are normally available at your Kris dealer. When specific frequencies are not available, you usually can purchase a Crystal Certificate which enables you to order these frequencies directly from the crystal manufacturer.

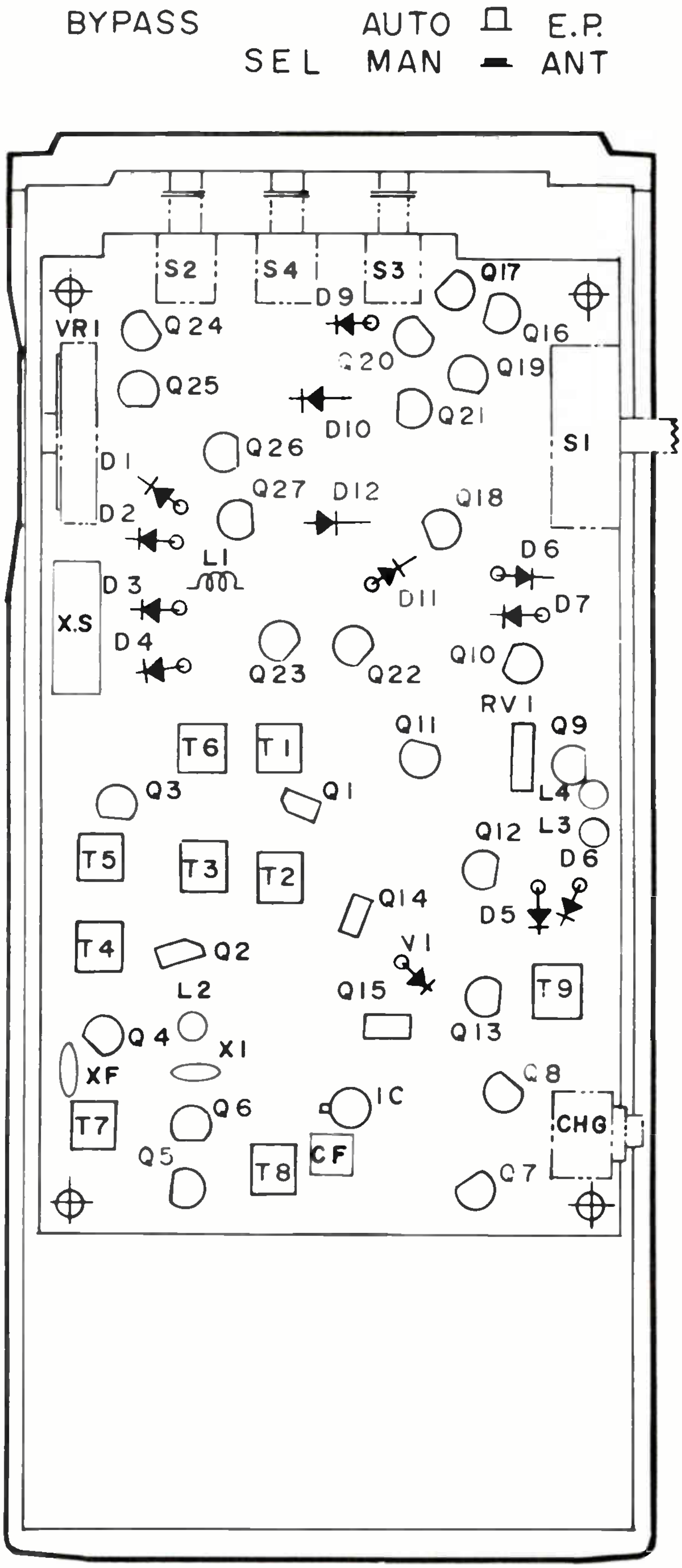
Hand-Skan crystal specifications are as follows:

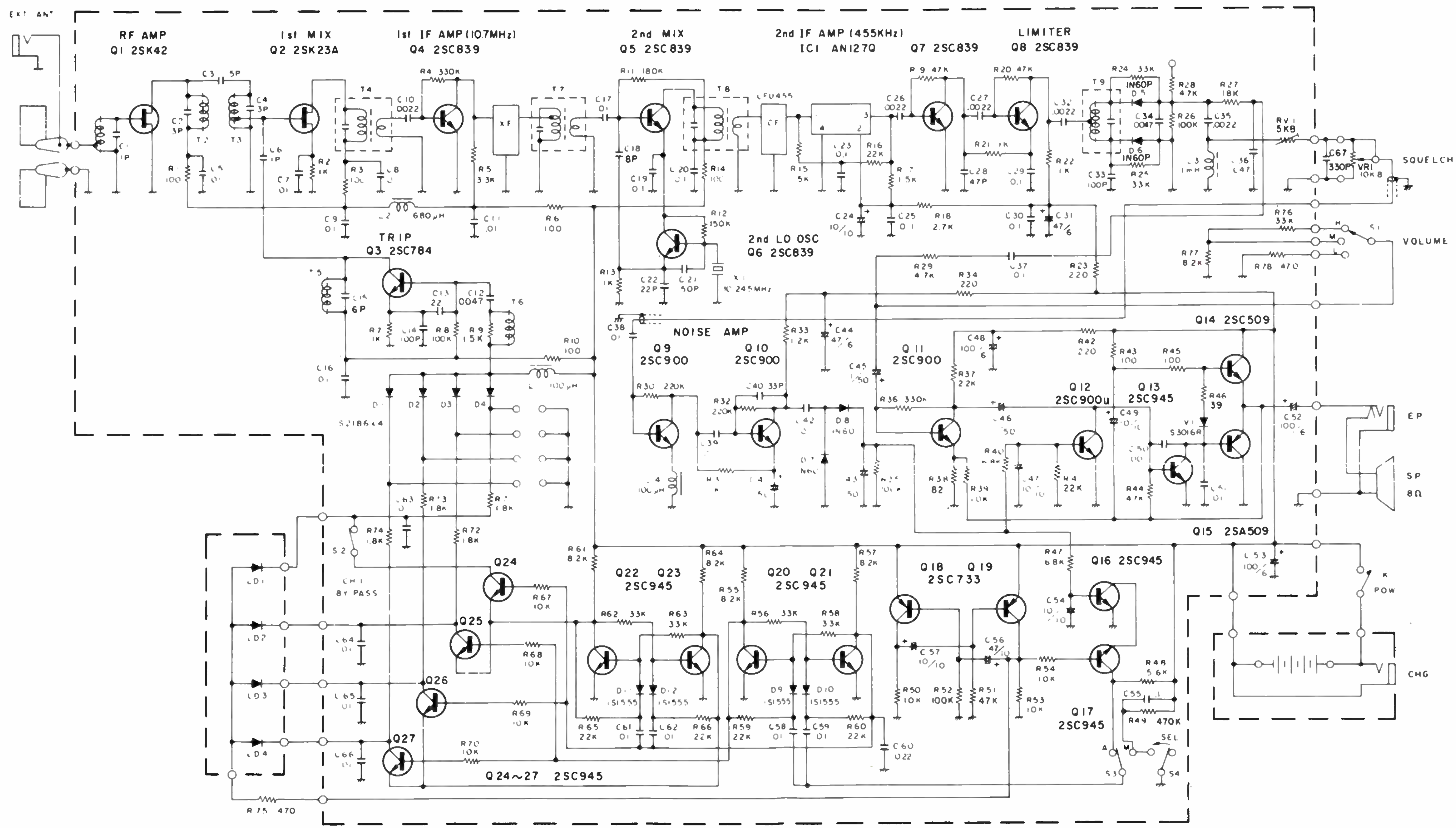
Frequency Tolerance:	.001%
Holder:	type HC-25/U
Overtone:	3rd overtone
Resonance:	series
Maximum Impedance:	35 ohms

$$\text{Crystal Frequency: } \frac{\text{channel freq.} - 10.7\text{ MHz}}{3}$$

Pages 32 - 36 Courtesy of LAFAYETTE RADIO & ELECTRONICS

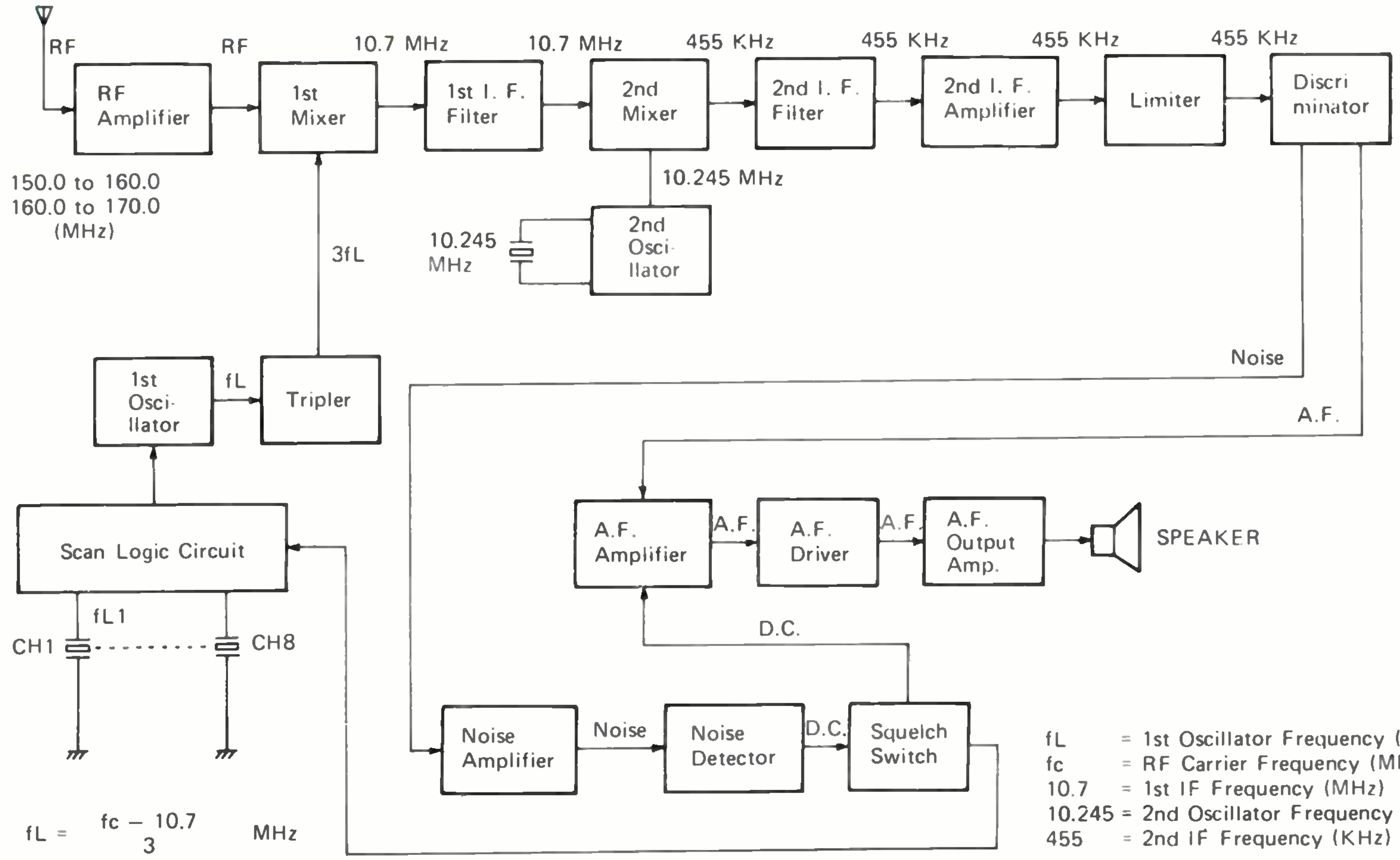
INTERIOR PARTS LOCATION




RF AMP
Q1 2SK42
1st MIX
Q2 2SK23A
1st IF AMP (10.7MHz)
Q4 2SC839
2nd MIX
Q5 2SC839
2nd IF AMP (455KHz)
IC1 AN127Q
Q7 2SC839
LIMITER
Q8 2SC839
TRIP
Q3 2SC784
2nd LO OSC
Q6 2SC839
NOISE AMP
Q9
2SC900
Q10
2SC900
Q11
2SC900
Q12
2SC900u
Q13
2SC945
Q14 2SC509
Q15 2SA509
Q16 2SC945
Q17
2SC945
Q18 Q19
2SC733
Q20 Q21
2SC945
Q22 Q23
2SC945
Q24
Q25
Q26
Q27
Q24~27 2SC945
SQUELCH
VOLUME
EP
SP
8Ω
POW
CHG
SEL
CH1
BY PASS

Lafayette Porta-Scan-4

FUNCTIONAL BLOCK DIAGRAM



$$f_L = \frac{f_c - 10.7}{3} \text{ MHz}$$

fL = 1st Oscillator Frequency (MHz)
fc = RF Carrier Frequency (MHz)
10.7 = 1st IF Frequency (MHz)
10.245 = 2nd Oscillator Frequency (MHz)
455 = 2nd IF Frequency (KHz)

TABLE 1. BATTERY REPLACEMENT

MFR'S NO.	STANDARD DRY CELL	ALKALINE CELL	MERCURY CELL	NICKEL CADMIUM CELL
LAFAYETTE STOCK NO.	99-63703*	99-63828	32-46857**	32-47400

*Extra Long-Life type.
**Package of 2.

RECHARGEABLE BATTERIES: Six (6) rechargeable AA cells, such as the Mallory SA-15AA, can be used to power the Hand-Skan. These cells can be recharged without removing them from the unit. To recharge, plug the recharger into the "Batt" jack, and then connect the charger to the 110 volt AC current. Remember you must use 1.5 volt rechargeable batteries. NI-CAD'S with 1.4 volts may not work.

To charge the batteries, use the Nicad Battery charger [Lafayette Stock No. 99-31007] especially designed for this purpose. Plug the charger into the "CHG" socket on the side of the Pocket Scanner and insert the AC power plug [from the battery charger into any convenient 117V AC outlet. Leave on charge for at least 15 hours, if possible.

CRYSTAL INSTALLATION

Crystals are not normally installed at the factory, but by the purchaser of the receiver. Due to the accuracy required [0.001%], we recommend that you purchase a crystal certificate from Lafayette Radio Electronics for each crystal desired [see following section titled "ORDERING CRYSTALS"].

1. Remove the front case by loosening a large center screw at the rear of the unit. Remove the front cover with care.

NOTE: To locate the crystal socket is for each channel, see Figure 2 for means of identification.

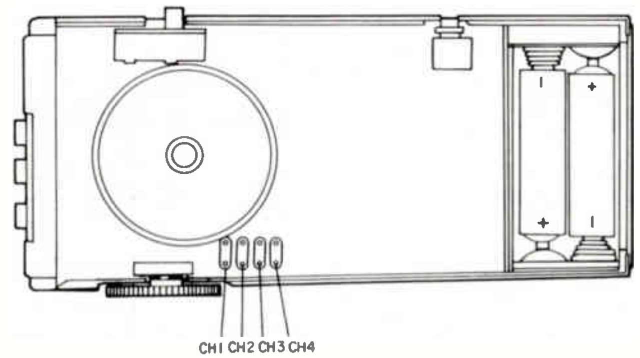


Figure 2.

2. Insert as many crystals as desired [up to 4 crystals] into the crystal sockets on the printed circuit board. Make sure each crystal is firmly seated into each socket. Then, make a chart showing the crystal receiving frequency and the channel number in which it has been inserted.

PLEASE READ THE FOLLOWING BEFORE ORDERING CRYSTALS

Each Lafayette PORTASCAN-4 is normally available from the factory tuned to the following standard center frequency.

1. Lafayette Stock No. 99-26247L - "150-160 MHz". Standard center frequency 155 MHz.
2. Lafayette Stock No. 99-26254L - "160-170 MHz". Standard center frequency 165 MHz.

ORDERING CRYSTALS

To order crystals, send for a crystal certificate from Lafayette Radio Electronics under Stock No. 40-82145Y.

Pages 37 - 43 Courtesy of LAFAYETTE RADIO & ELECTRONICS

IGNITION INTERFERENCES

Reception of FM signals is usually not affected by automobile ignition noises, and therefore should not be a problem in most cases. However, sufficient noise may be generated by some vehicles to make it necessary to install additional suppression. Ignition radiation suppression requires the use of resistor spark plugs, feed-thru capacitors and distributor suppressors. Of prime importance is a properly adjusted ignition system. The following steps will serve as a guide.

1) SPARK PLUGS -- Install resistor spark plugs or Belden IRS cable.
2) DISTRIBUTOR CAP -- Install suppressor resistor IRS cable between distributor cap and ignition coil
3) GENERATOR -- Install 0.5mfd coaxial capacitor (Sprague #48P18 or equivalent) at the "A" terminal of generator.
4) ALTERNATORS -- Require no attention except when the diodes become defective or when the slip-rings are dirty.
5) IGNITION COIL PRIMARY -- Install 0.1mfd coaxial capacitor (Sprague #48P9 or equivalent) in the lead from ignition switch to coil. Keep capacitor close to coil terminal. Brighten the metal acround the coil mounting bracket to engine block, apply grease and retighten mounting screws.
6) REGULATOR FIELD TERMINAL -- Connect a 39 ohm resistor in series with 0.01mfd ceramic capacitor between the field terminal and ground.
7) ARMATURE TERMINAL -- Insert 0.2mfd coaxial capacitor (Sprague #48P18 or equivalent).
8) GAUGES -- Install 0.5mfd, 200 volts capacitors from terminals to ground.
9) WHEELS AND TIRES -- Inject special graphite powder (available at automotive parts supplier) into the tires.

CRYSTAL INSTALLATION

NOTE: Due to the numerous frequencies (channels) involved and the accuracy required (0.001%), it is recommended that the proper crystal for the desired channel frequency be purchased directly from LAFAYETTE CORP. The crystal is not normally installed by the factory, but by the seller or owner of the unit. Crystals are available on special order only. When ordering crystals, specify desired receiving frequency.

PLEASE READ THE FOLLOWING BEFORE ORDERING CRYSTALS

Each 99-26213W and 99-26221W is normally available from the factory tuned to this standard center frequency.

Model 99-26213W (150-160MHz): Standard Center Frequency 155MHz

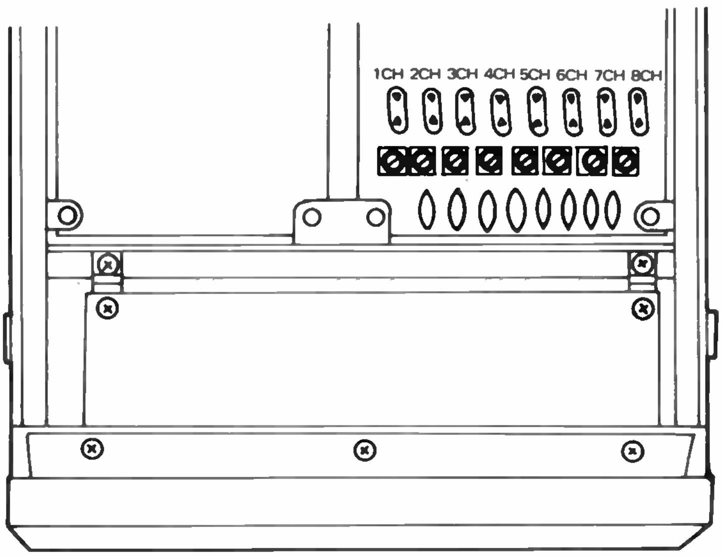
Model 99-26221W (160-170MHz): Standard Center Frequency 165MHz

These are center frequencies, of course. The circuits are so designed as to permit operation of up to 8 channels over a band of frequencies without retuning.

When ordering additional crystals for a receiver tuned to a standard center frequency, make sure the monitoring frequencies requested fall within the specific spread indicated above. If the monitoring frequencies requested with the original order of the receiver fall outside of the frequency spread provided by a standard center frequency, the receiver must be retuned to a new center frequency before being shipped to accommodate the requested monitoring frequency (s). When ordering additional crystals for such a receiver, be sure the requested monitoring frequencies fall within the total spread provided by the new center frequency.

INSERTING CRYSTALS

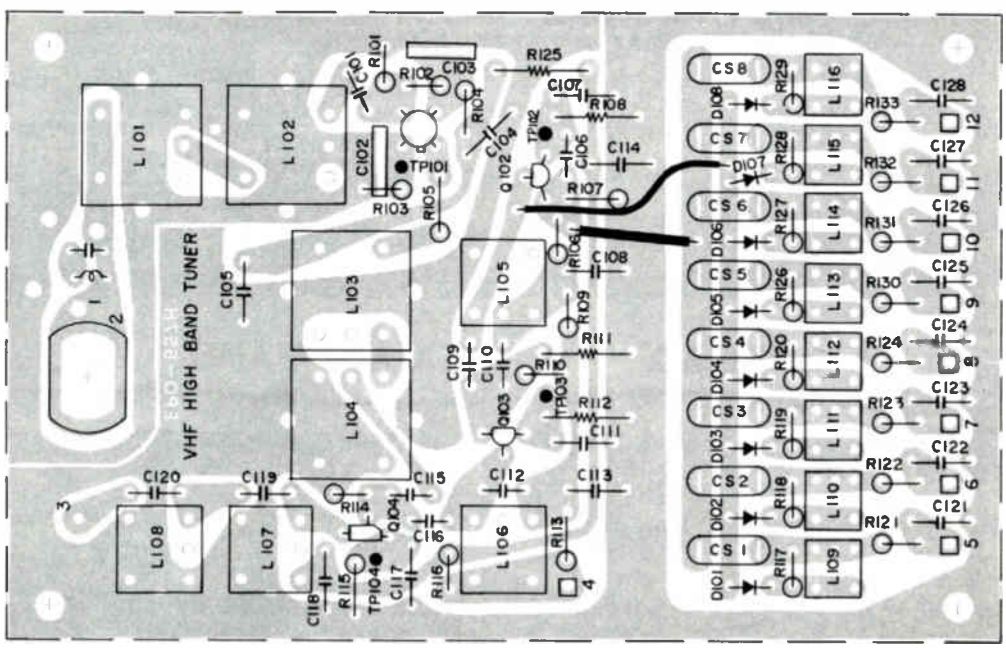
To install new crystal, remove the cage, removing 4 screws on the cabinet bottom. Refer to Figure 5 and insert the crystals desired. For convenience, a record should be kept of the monitoring frequencies and the channels in which they appear.



FRONT SIDE

LOCATION OF CRYSTAL SOCKETS

Each channel number in the illustration corresponds to the number of digital indicator on the front panel.



EPO-557H VHF HI-BAND TUNER

CRYSTAL FREQUENCY DETERMINATION AND CORRELATION

Crystals used are type HC-25/U
Crystal frequencies are normally determined as follows.

Frequency for High Band VHF 150-174MHz:

$$\text{Crystal 3rd overtone frequency} = \frac{\text{Channel frequency F} - 10.7\text{MHz}}{3}$$

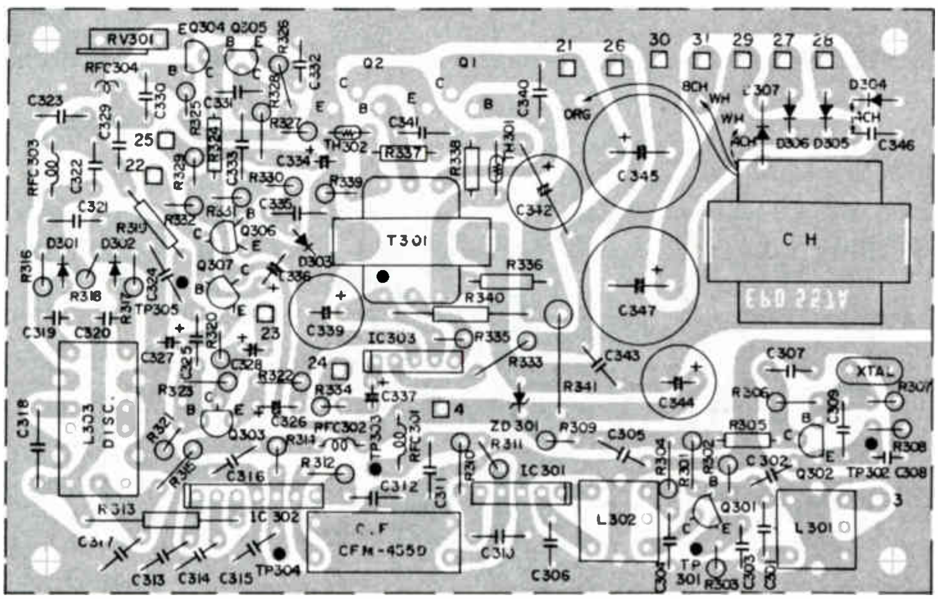
Frequency deviation is less than 2/100,000 in high VHF band 150-174MHz.

CRYSTAL CORRELATION:

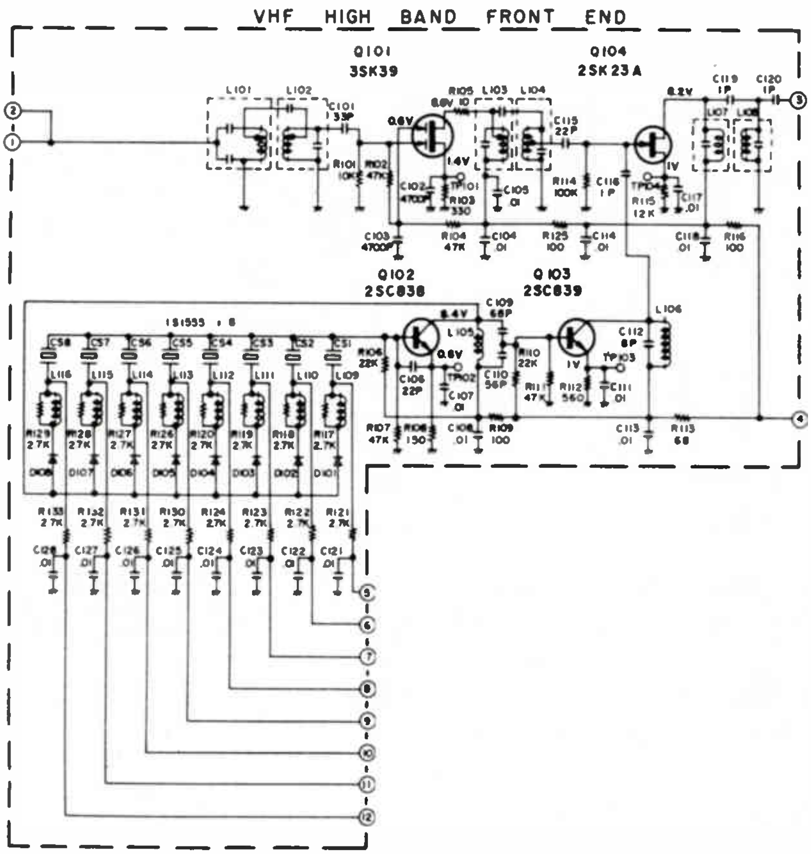
Resonance	Parallel
Overtone	Fundamental, 3rd, 9th
*Load Capacity	32pF
Max. Series Resistance	Less than 40 ohms
Frequency Tolerance	±0.001% (at 25°C)

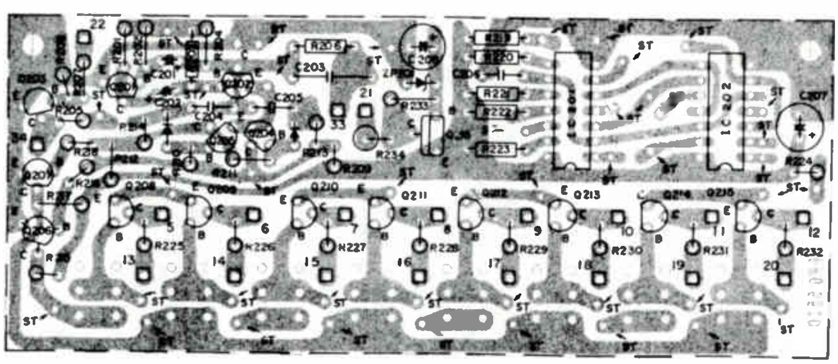
* This particular number could vary depending upon crystal manufacturer, but crystal trimmer will take care of any error. UHF LOAD CAPACITY: 22pF.

For convenience, a record should be kept of the frequencies as they are added, and the positions in which they have been inserted.

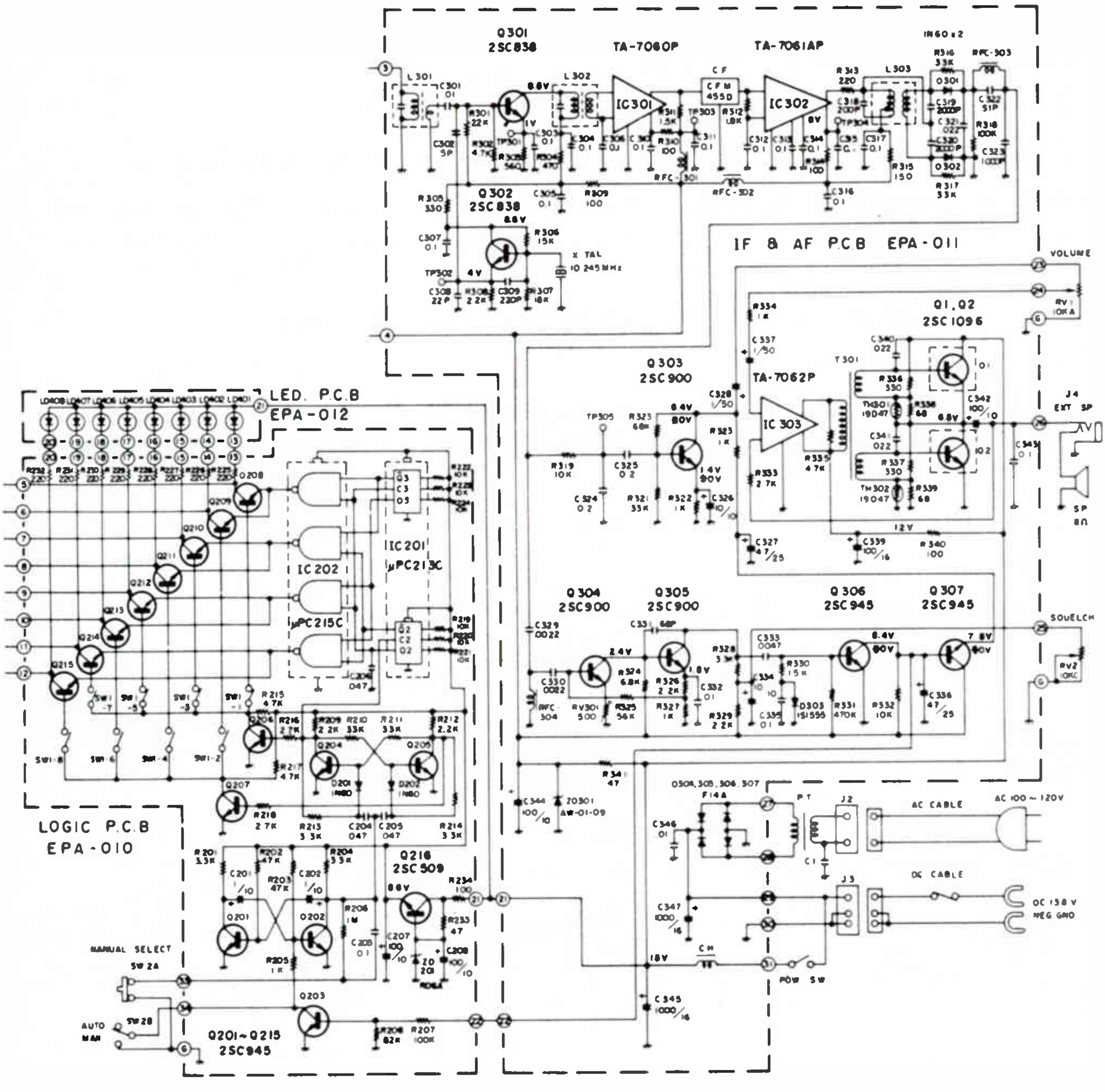


EPO-557A/2 IF AMP. & AUDIO AMP.





EPO-557D LOGIC CIRCUIT



NOTE: ALL VOLTAGES MEASURED FROM COMMON NEGATIVE GROUND WITH VTVM AT NO SIGNAL.

* AT SQUELCH ON

HIGH BAND TUNER ALIGNMENT

a. Oscillator Circuit Alignment

Connect a frequency counter to the base of Q103 through a capacitor of 1pF.

Turn the core of L105 clockwise until oscillator stops its oscillation, then turn the core again 3/4 turn in the counter clockwise direction from the position at which the oscillation starts.

Adjust L106 for the frequency multiplied in three times the frequency.

b. Tracking Alignment

Set SG output (with no modulation) to provide about the level which will give 20dB noise quieting sensitivity. Adjust L102 and L104 for maximum 20dB noise quieting sensitivity at low end of the band.

Adjust L101 and L103 for maximum 20dB noise quieting sensitivity at high end of the band.

Repeat the above steps until no further improvement is obtained.

c. Crystal Frequency Alignment

The crystal frequency for each channel will be slightly adjusted by turning the core of L109 (1CH), L110 (2CH) , L111 (3CH), L112 (4CH), L113 (5CH), L114 (6CH), L115 (7CH) and L116 (8CH), respectively to set the correct frequency.

d. Alignment for Moving Center Frequency

Adjust for new center frequency as stated above procedures, a), b) and c).

No stray capacitors will be necessary to remove.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(VHF HIGH BANO TUNER)		
0101	100-125	1S1555
0102	100-125	1S1555
0103	100-125	1S1555
0104	100-125	1S1555
0105	100-125	1S1555
D106	100-125	1S1555
D107	100-125	1S1555
D108	100-125	1S1555
Q101	90-58	3SK39
Q102	90-56	2SC838
Q103	90-57	2SC839
Q104	90-55	2SK23A
(AF/IF/LOGIC)		
D301	100-136	1N60
D302	100-136	1N60
D303	100-137	1S1555
0304	100-138	F14A
D305	100-138	F14A
0306	100-138	F14A
D307	100-138	F14A
IC201	90-67	uPC213C
IC202	90-68	uPC215C
IC301	90-74	TA-7060P
IC302	90-73	TA-7061P
IC303	90-72	TA-7062P
LD401	100-140	
LD402	100-140	
LD403	100-140	
LD404	100-140	
LD405	100-140	
LD406	100-140	
LD407	100-140	
LD408	100-140	
Q1	90-75	2SC1096
Q2	90-75	2SC1096
Q201	90-65	2SC945
Q202	90-65	2SC945
Q203	90-65	2SC945
Q204	90-65	2SC945
Q205	90-65	2SC945
Q206	90-65	2SC945
Q207	90-65	2SC945
Q208	90-65	2SC945
Q209	90-65	2SC945
Q210	90-65	2SC945
Q211	90-65	2SC945
Q212	90-65	2SC945
Q213	90-65	2SC945
Q214	90-65	2SC945
Q215	90-65	2SC945
Q216	90-66	2SC509
Q301	90-71	2SC838
Q302	90-71	2SC838
Q303	90-70	2SC900
Q304	90-70	2SC900
Q305	90-70	2SC900
Q306	90-69	2SC945
Q307	90-69	2SC945
Z0201	100-135	RD6A
ZD301	100-139	AW-01-09

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C201	80-146	1 uF	10 V
C202	80-146	1 uF	10 V
C207	80-147	100 uF	10 V
C208	89-147	100 uF	10 V
C326	80-157	10 uF	10 V
C327	80-161	4.7 uF	25 V
C328	80-162	1 uF	50 V
C334	80-157	10 uF	10 V
C336	80-161	4.7 uF	25 V
C337	80-162	1 uF	50 V
C339	80-159	100 uF	16 V
C342	80-158	100 uF	10 V
C344	80-158	100 uF	10 V
C345	80-160	1000 uF	16 V
C346	80-160	1000 uF	16 V
TC101-104	80-118	Trimmer	

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
RV1	70-199	10 K Volume
RV2	70-200	10 K Squelch
RV301	70-173	500 ohm Bias
TH301	70-172	Thermistor, 1904:
TH302	70-172	Thermistor, 19D4:

COILS/TRANSFORMERS

ITEM	PART NO.
(VHF HIGH BANO TUNER)	
L101	50-65
L102	50-66
L103	50-67
L104	50-68
L105	50-69
L106	50-71
L107	50-72
L108	50-72
L109	50-70
L110	50-70
L111	50-70
L112	50-70

MISCELLANEOUS

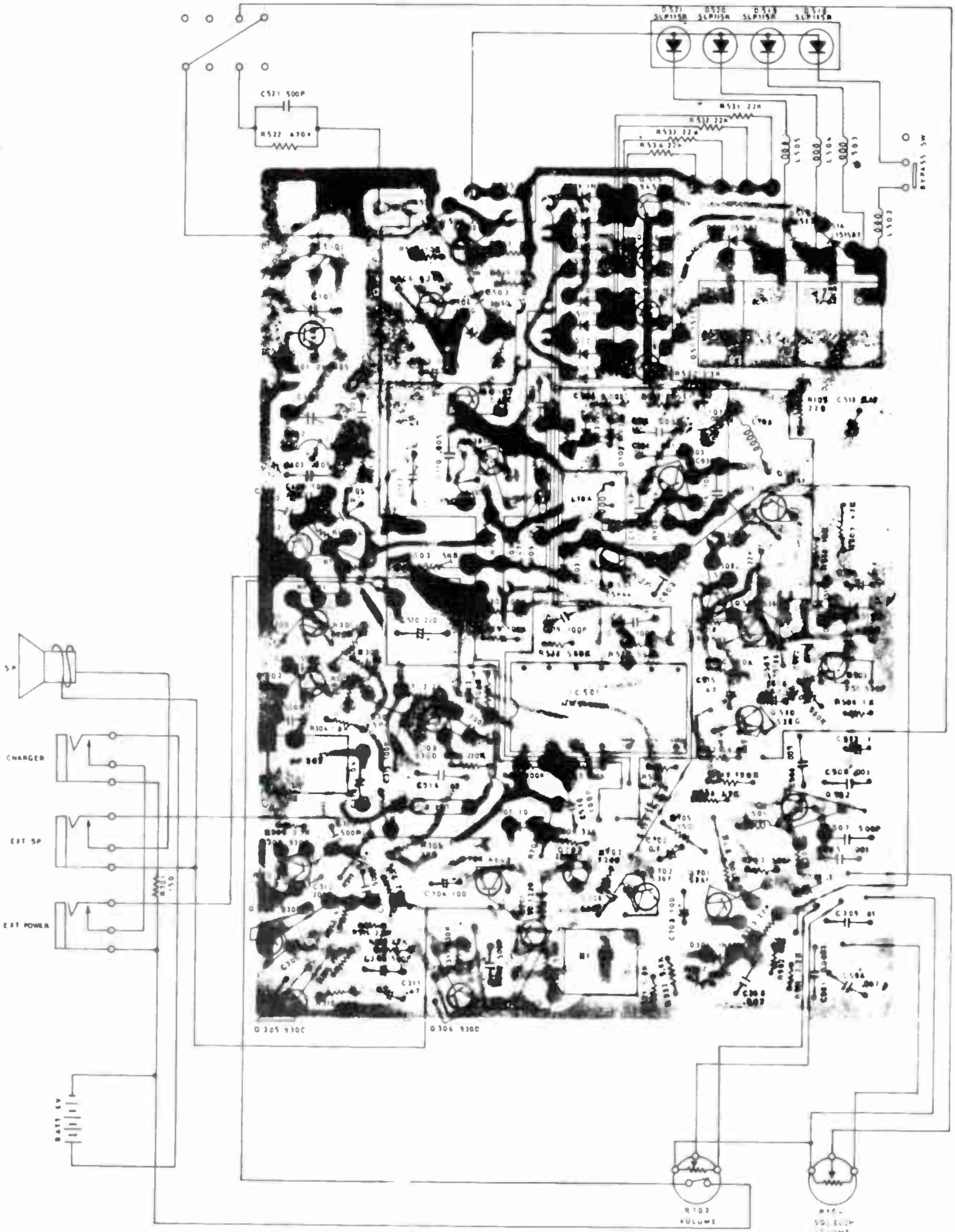
ITEM	NAME	PART NO.
C1	Component Combination	60-124
CF	Filter, Ceramic	60-117
SP	Speaker	60-133
SW1	Assembly, Bypass Switches	60-127
SW2	Assembly, Auto/Manual Switches	60-128
XTAL	Oscillator, Crystal	60-118

CABINET PARTS

NAME	PART NO.
Assembly, Escutcheon	60-134
Panel, Front	60-136
Panel, Rear	60-137

Pages 44 - 48 Courtesy of MIDLAND CONSUMER PRODUCTS

COMPONENT SYMBOLS LAYOUT




R535
R108
C112
L103
L102
Q102
C510
C509
C512
C520
IC501
XTAL
C316
C301
Q301
Q302
Q303
R301
R305
R306
R309
R703
C701
C703
C309
C505
C507
C506
C504
C501
D301
D701
Q701
Q702
Q704
C307
C305
C319
Q306
Q502
Q503
L501
R505
R506
R501
R316
R320
R314
R318
C301
MF303
MF301

Step	Measuring Equipment	Measuring Equipment Connection Point	Alignment Procedure
1 Antenna stage RF stage and AFC Alignment	FM SSG 458MHz Mod. Freq. 1KHz Deviation ±3.5KHz 8 ohm dummy load V.T.V.M. Oscilloscope	Ant. Terminal Ext. Speaker socket 8 ohm dummy load	1. Preset a. Bypass switch OFF b. Scan switch MANU. c. Squelch control volume min d. Insert crystal to channel 2 2. Adjust semi fixed volume R503 to obtain 3.0V between TP2 and ground. 3. Adjust L104 for a max output 4. Adjust C101, C102 and C112 for a max output 5. Repeat item 3 and 4

BATTERY OPERATION

Slide the battery compartment lock in the direction shown by the arrow and remove the battery compartment lid. Install 4 penlight batteries in the battery lid as indicated. Insert batteries carefully observing polarity. Insert the battery compartment lid back in place. When the receiver is not to be used for an extended period of time or if the batteries are exhausted, remove the batteries to prevent damage to the receiver that could result from battery leakage.

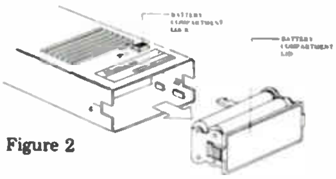


Figure 2

AC POWER OPERATION

This receiver can be operated on household current with an AC adaptor (optional), of 6 volt DC output, such as model 18-106. Connect the adaptor plug to EXT. POWER jack located on the left side of the receiver.

CRYSTAL INSTALLATION

Insert a small coin into the opening provided at the left side of the unit and twist the coin carefully to open the crystal compartment lid. Figure 3 shows the location of the crystal sockets. Insert the crystals into the sockets.

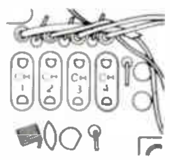


Figure 3

Crystal Socket Layout

FREQUENCIES AND CRYSTALS

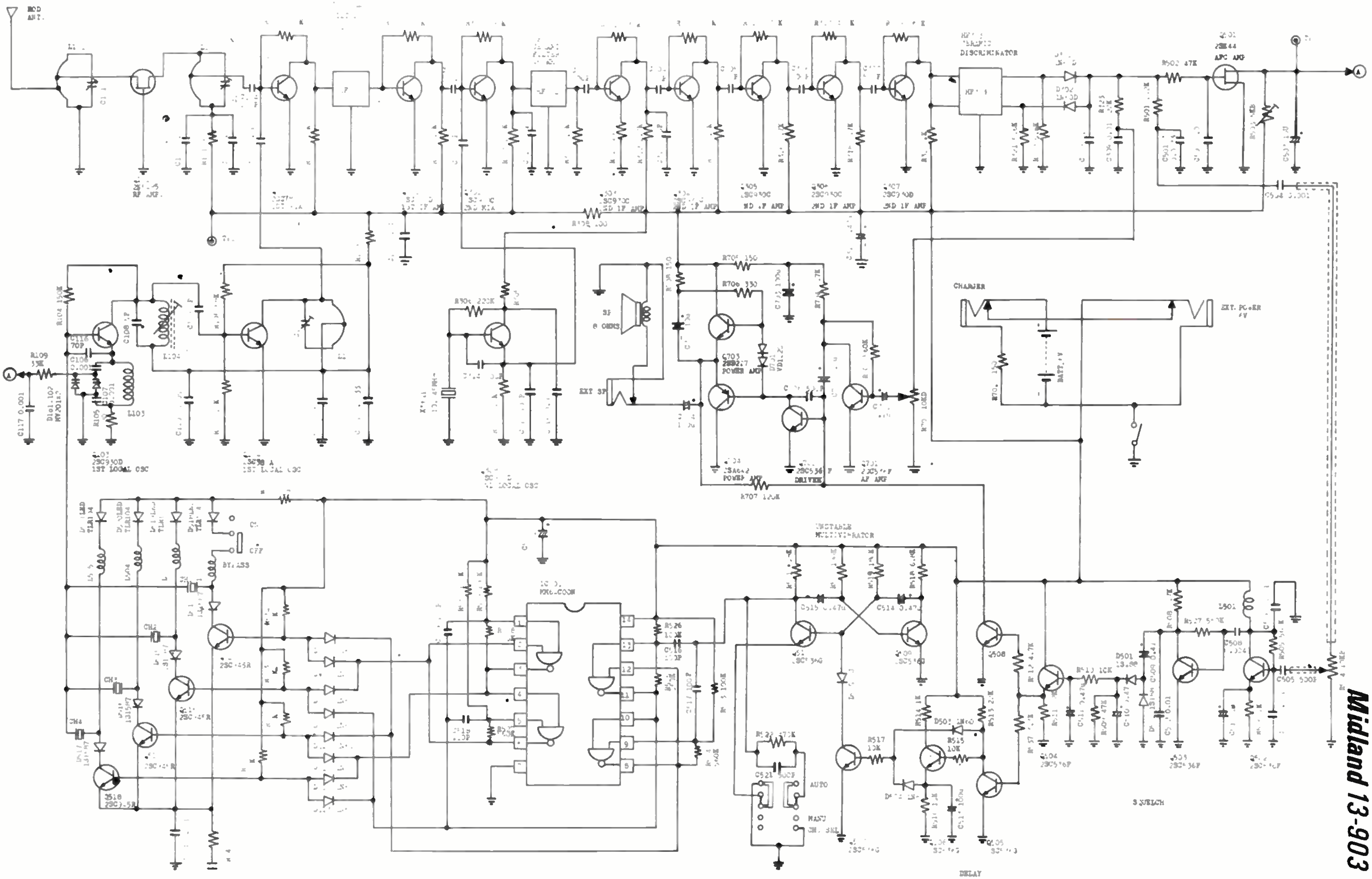
Being a crystal controlled receiver, this unit requires one crystal for each frequency you want to monitor. Generally speaking, frequencies for the various radio services such as police, fire, business, etc. vary from area to area and it is suggested that you contact your local authorities for frequency information for your area. You should also verify that the area in which you will use this monitor does not have laws or regulations prohibiting its use. Once you have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

$$\text{CRYSTAL FREQUENCY} = \frac{\text{DESIRED CHANNEL FREQUENCY} - 10.7\text{MHz}}{9}$$

Crystal Holder Type:	HC-25U
Mode of Oscillation:	Third Overtone
Frequency Tolerance:	±0.001%(+25°C)
Load Capacity:	18pF
Max. Series Resistance:	35 ohms
Rated Drive Level:	2 milliwatts
Capacitance Shunt:	6pF Max.

SCHEMATIC DIAGRAM



Midland 13-903

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D101	09-306369	MV201
D102	09-306369	MV201
D301	09-306336	1N60
D302	09-306336	1N60
D501	09-306370	IS188
D502	09-306370	IS188
D503	09-306336	1N60
D504	09-306336	1N60
D505	09-306330	IS188FM
D506	09-306336	1N60
D507	09-306336	1N60
D508	09-306336	1N60
D509	09-306336	1N60
D510	09-306336	1N60
D511	09-306336	1N60
D512	09-306336	1N60
D513	09-306336	1N60
D514	09-306326	IS1587
D515	09-306326	IS1587
D516	09-306326	IS1587
D517	09-306326	IS1587
D518	09-306371	TLR104LED
D519	09-306371	TLR104LED
S520	09-306371	TLR104LED
D521	09-306371	TLR104LED
D721	09-306372	VD1220
Q101	09-304017	2N5485
Q102	09-305132	2SC787
Q103	09-302037	2SC930
Q104	09-302061	2SC387A
Q301	09-302037	2SC930
Q302	09-302037	2SC930
Q303	09-302037	2SC930
Q304	09-302037	2SC930
Q305	09-302037	2SC930
Q306	09-302037	2SC930
Q307	09-302037	2SC930
Q308	09-302037	2SC930
Q501	09-305133	2SK44-
Q502	09-302053	2SC536
Q503	09-302053	2SC536
Q504	09-302053	2SC536
Q505	09-302053	2SC536
Q506	09-302053	2SC536
Q507	09-302053	2SC536
Q508	09-302053	2SC536
Q509	09-302053	2SC536
Q510	09-302053	2SC536
Q515	09-302125	2SC945
Q516	09-302125	2SC945
Q517	09-302125	2SC945
Q518	09-302125	2SC945
Q701	09-302053	2SC536
Q702	09-302053	2SC536
Q703	09-303025	2SD227
Q704	09-305134	2SA642-

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-176427
L102	13-176427
L103	13-090322
L104	13-176428
L105	13-176427
L501	13-178183
L502	13-178127
L503	13-178127
L504	13-178127
L505	13-178127

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C101	13-123055	Trimmer
C102	13-123055	Trimmer
C112	13-123055	Trimmer
C313	77-336474	.47uF 10V
C503	77-336106	10uF 10V
C509	77-336474	.47uF 10V
C510	77-336474	.47uF 10V
C511	77-336105	1uF 10V
C512	77-336105	1uF 10V
C513	77-336107	100uF 10V
C514	77-336474	.47uF 10V
C515	77-336474	.47uF 10V
C520	77-336227	220uF 10V
C523	77-336105	1uF 10V
C534	77-336474	.47uF 10V
C701	77-336104	.1uF 10V
C702	77-336104	.1uF 10V
C703	77-336107	100uF 10V
C704	77-336107	100uF 10V
C707	77-336106	10uF 10V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R503	13-161002	5K AFC
R504	13-161003	10K Squelch
R523	77-100104	100K 1/8W
R524	77-100564	560K 1/8W
R525	77-100564	560K 1/8W
R526	77-100104	100K 1/8W
R527	77-100564	560K 1/8W
R528	77-100564	560K 1/8W
R529	77-100104	100K 1/8W
R530	77-100104	100K 1/8W
R701	77-102155	150K 1/2W
R702	13-161004	10K Volume

MISCELLANEOUS

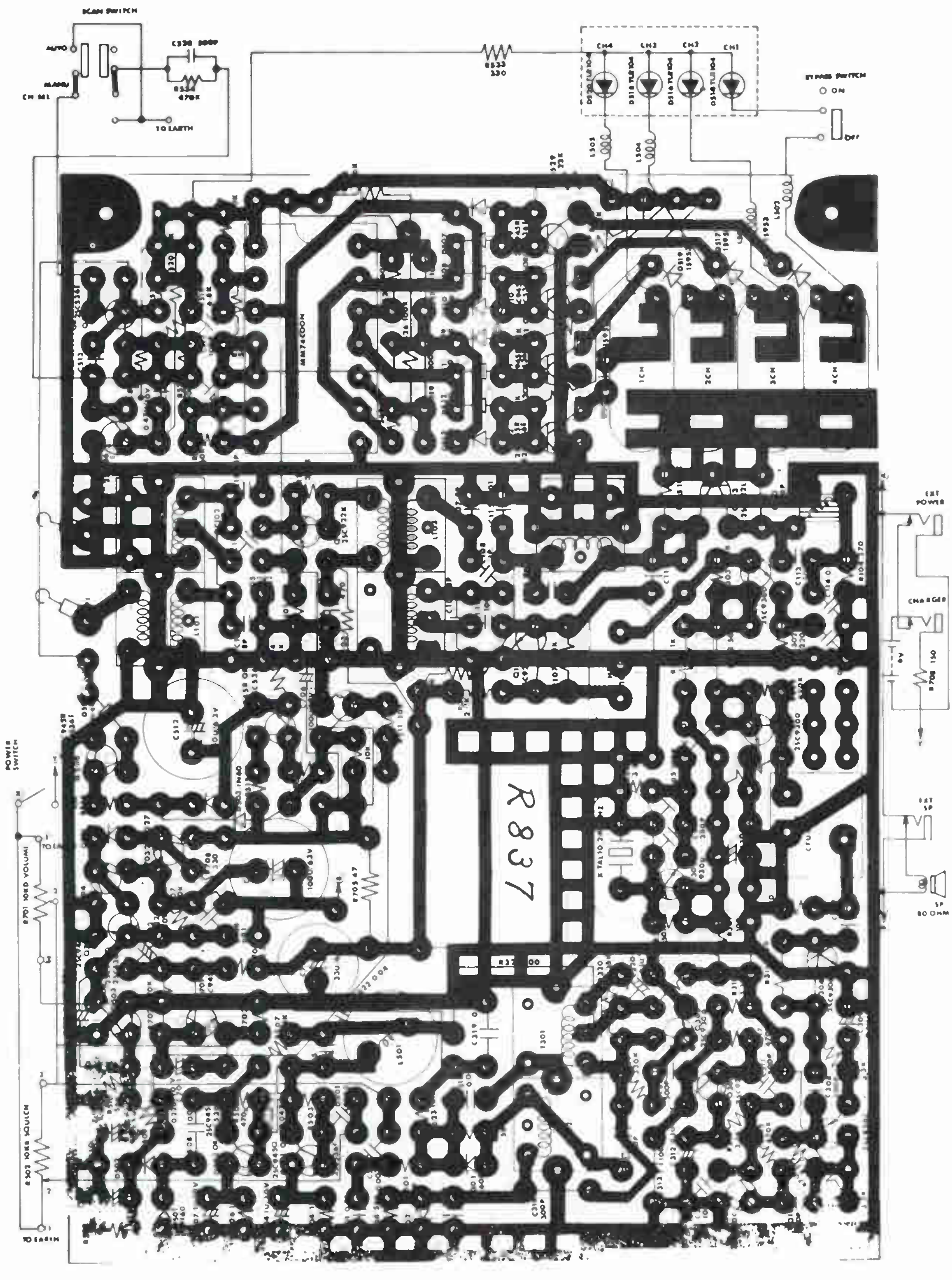
ITEM	NAME	PART NO.
HF301	HF Filter	13-179042
HF302	HF Filter	13-179046
HF303	HF Filter	13-179047
SP	Speaker	13-068003
	Antenna	13-040079
	Crystal	13-128316
	Printed Board	13-070115
	Printed Board LED	13-070116
	Switch, Slide	13-180084
	Switch,Auto/Man.	13-180085

CABINET PARTS

NAME	PART NO.
Battery Holder	13-030120
Cabinet	13-010244
Case	13-010242
Cover, Rear	13-013108
Knob,Volume/Squelch	13-110164
Knob, Cap	13-110165
Knob, Lever	13-155007
Lid, Compartment	13-018021
Panel, Front	13-010243

Pages 49 - 52 Courtesy of MIDLAND CONSUMER PRODUCTS

COMPONENT SYMBOLS LAYOUT



Step	Test Equipment	Meter Point	Alignment Procedure
1. Antenna and RF Stage IF Stage	FM SSG 156MHz Mod. Freq. 1KHz Deviation ±5KHz 8 ohms dummy load V.T.V.M. Oscilloscope After sensitivity increase SSG output decrease	Ant. Terminal Ext. Speaker socket 8 ohms load Terminal	1. Preset a. Bypass switch OFF b. Scan switch MANU c. Squelch control volume min. d. Insert crystal (Receiving Freq. 156MHz) to channel 3 2. Adjust L101 - L104 for a max. output 3. Adjust L106 for a max. output 4. Adjust T301 and T302 for a max. output Repeat above item 2,3 and 4 adjustment
2. Battery Drain	DC Current meter (100mA full scale) DC power supply 6V	Series connection to power supply	Indication of current meter is under 35mA at squelched

AC POWER OPERATION

This receiver can be operated on household current with an AC adaptor (optional) of 6 volt DC output, such as model 18-106. Connect the adaptor plug to EXT. POWER jack located on the left side of the receiver.

CRYSTAL INSTALLATION

Insert a small coin into the opening provided at the left side of the unit and twist the coin carefully to open the crystal compartment lid. Figure 3 shows the location of the crystal sockets. Insert the crystals into the sockets.

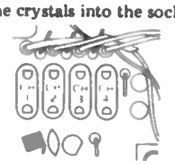


Figure 3

Crystal Socket Layout

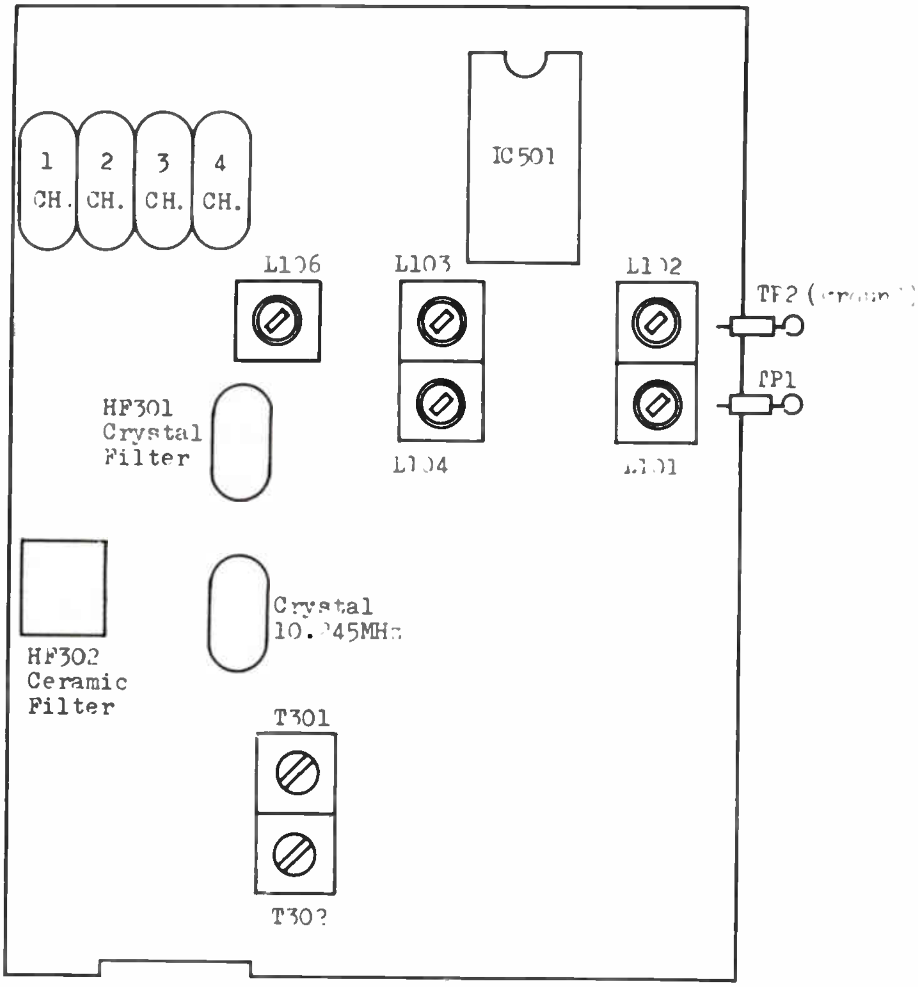
FREQUENCIES AND CRYSTALS

Being a crystal controlled receiver, this unit requires a crystal for each frequency you want to monitor. Generally speaking, frequencies for the various radio services such as police, fire, business, etc. vary from area to area and it is suggested that you contact your local authorities for frequency information for your area. You should also verify that the area in which you will use this monitor does not have laws or regulations prohibiting its use. Once you have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals:

$$\text{CRYSTAL FREQUENCY} = \frac{\text{DESIRED CHANNEL FREQUENCY} - 10.7\,\text{MHz}}{3}$$

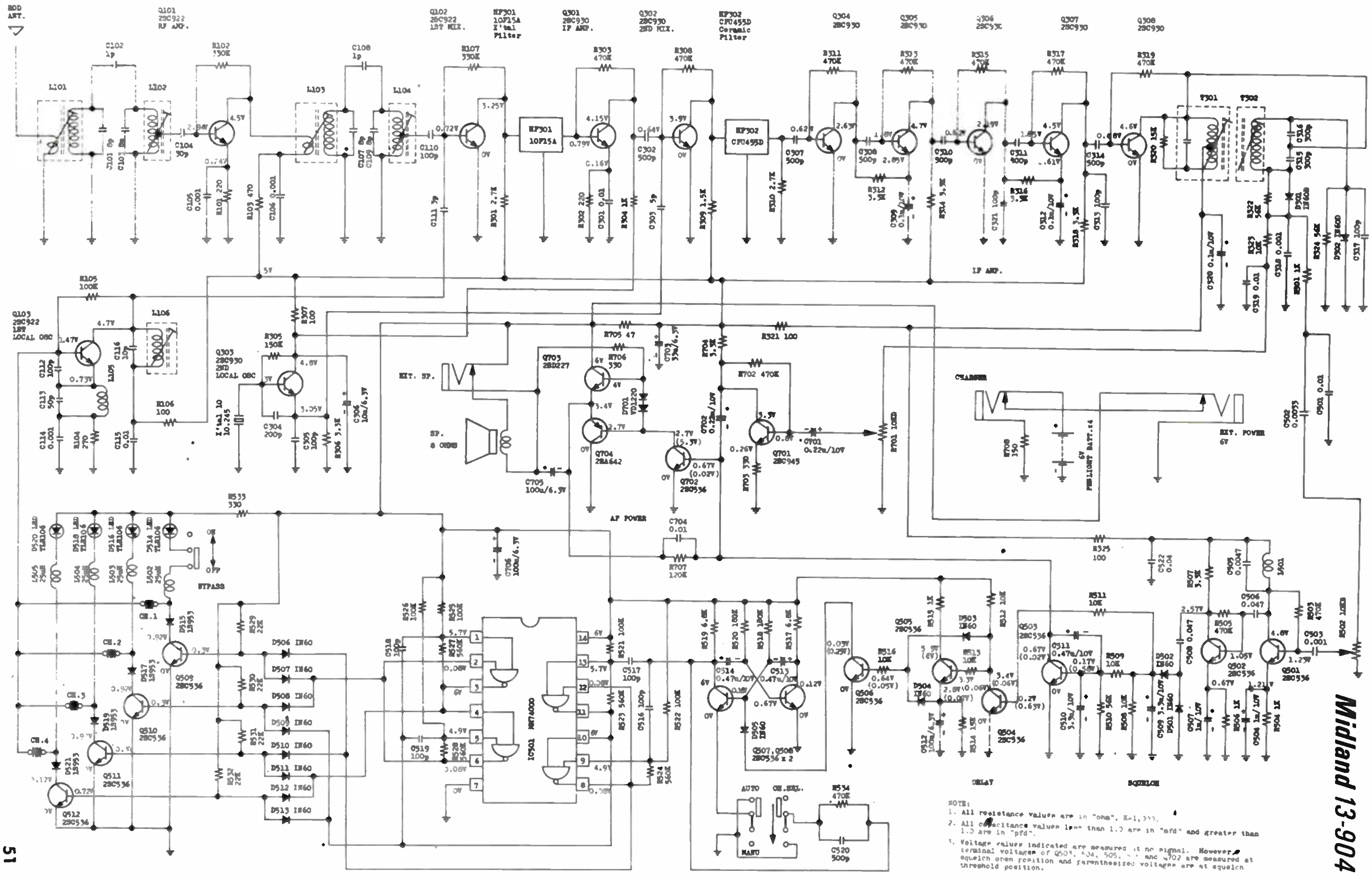
Crystal Holder Type:	HC-25U
Mode of Oscillation:	Third Overtone
Frequency Tolerance:	±0.001% (+25°C)
Load Capacity:	Series Resonance -450Hz
Max. Series Resistance:	35 ohms
Rated Drive Level:	2 milliwatts
Capacitance Shunt:	6 pF Max.



TP1, TP2 .... ANT. Terminal
L101, L102 .... ANT. Coil
L103, L104 .... RF Coil
L106 .... OSC Coil
T301, T302 .... Detector Coil

Part Location Layout

SCHEMATIC DIAGRAM



NOTE:
1. All resistance values are in "ohm", K=1,000.
2. All capacitance values less than 1.0 are in "mfd" and greater than 1.0 are in "pfd".
3. Voltage values indicated are measured at no signal. However, terminal voltages of Q503, 504, 505, 5.. and Q702 are measured at squelch open position and parenthesized voltages are at squelch threshold position.

Midland 13-904

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D301		1N60D
D302		1N60D
D501	09-306336	1N60
D513	09-306336	1N60
D514	09-306371	TRL104LED
D515	09-306313	IS953
D516	09-306371	TRL104LED
D517	09-306313	IS953
D518	09-306371	TRL104LED
D519	09-306313	IS953
D520	09-306371	TRL104LED
D521	09-306313	IS953
D701	09-306372	VD-1220
IC501	09-308074	CMOSMM74COON
Q101	09-309072	2SC922
Q102	09-309072	2SC922
Q103	09-309072	2SC922
Q301	09-302037	2SC930
Q302	09-302037	2SC930
Q303	09-302037	2SC930
Q304	09-302037	2SC930
Q305	09-302037	2SC930
Q306	09-302037	2SC930
Q307	09-302037	2SC930
Q308	09-302037	2SC930
Q501	09-302125	2SC945
Q502	09-302125	2SC945
Q503	09-302125	2SC945
Q504	09-302125	2SC945
Q505	09-302125	2SC945
Q506	09-302125	2SC945
Q507	09-302125	2SC945
Q508	09-302125	2SC945
Q509	09-302125	2SC945
Q510	09-302125	2SC945
Q511	09-302125	2SC945
Q512	09-302125	2SC945
Q701	09-302125	2SC945
Q702	09-302125	2SC945
Q703	09-303025	2SD227
Q704	09-305134	2SA642

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C306	77-336106	10uF 10V
C309	77-336104	.1uF 10V
C312	77-336104	.1uF 10V
C320	77-336104	.1uF 10V
C504	77-336105	1uF 10V
C507	77-336105	1uF 10V
C509	77-336335	3.3uF 10V
C510	77-336335	3.3uF 10V
C511	77-336474	.47uF 10V
C512	77-332107	100uF 6.3V
C513	77-336474	.47uF 10V
C514	77-336474	.47uF 10V
C701	77-336224	.22uF 10V
C702	77-336224	.22uF 10V
C703	77-332336	33uF 6.3V
C705	77-332107	100uF 6.3V
C706	77-332107	100uF 6.3V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R502	13-161003	10K, Squelch
R701	13-161004	10K, Volume

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-176429
L102	13-176430
L103	13-176429
L104	13-176430
L105	13-090317
L106	13-176428
L501	13-178183
L502	13-178127
L503	13-178127
L504	13-178127
L505	13-178127
T301	13-090320
T302	13-090323

MISCELLANEOUS

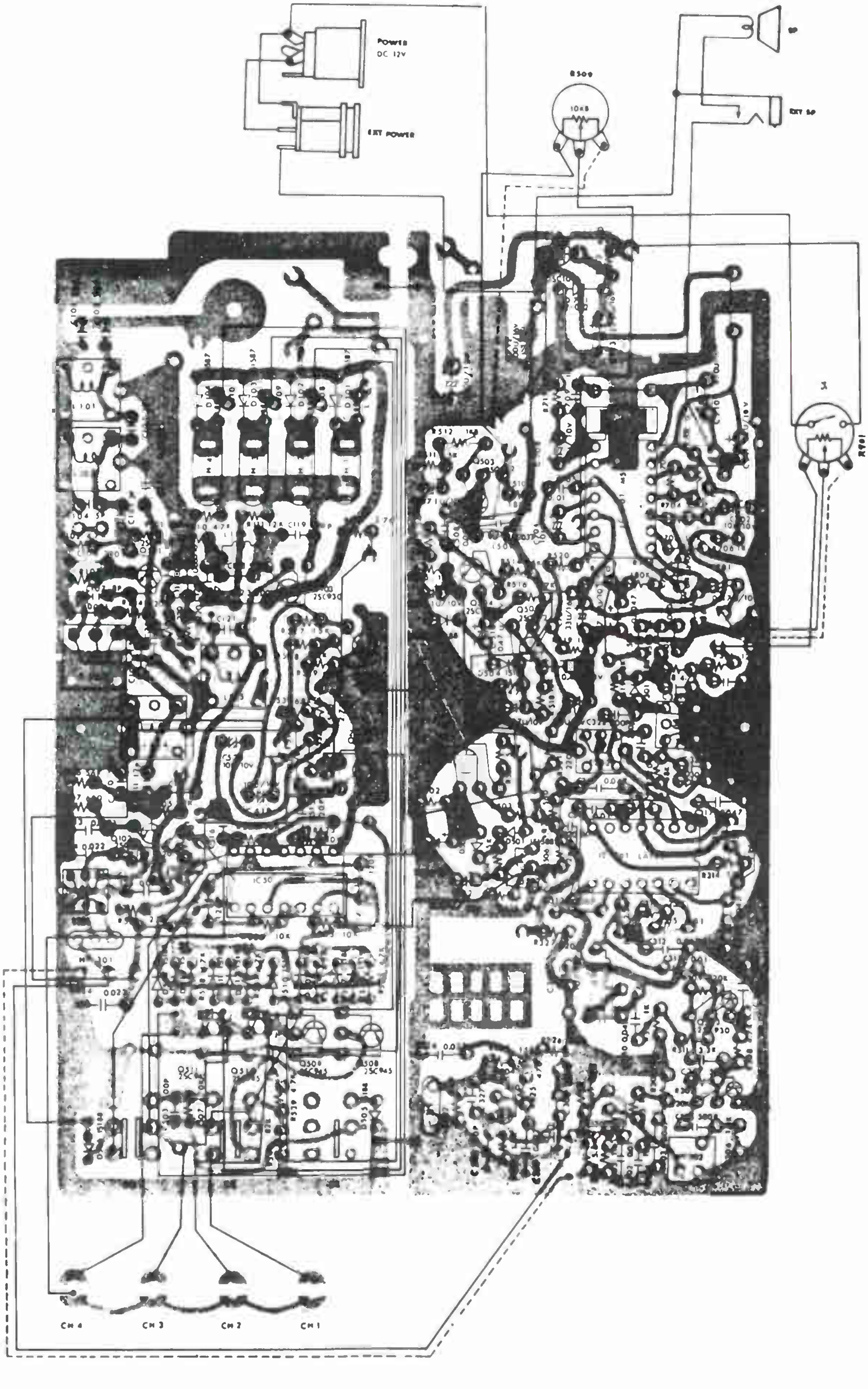
ITEM	NAME	PART NO.
HF301	Crystal Filter	13-179042(10F15A)
HF302	Ceramic Filter	13-179041(CFU-455D)
SP	Speaker, 8 ohms, .3W	13-068003
	Antenna, Telescopic	13-040078
	Crystal (10.245MHz)	13-128317(HC-18/u)
	Crystal Socket	13-159119
	PCB, LED	13-070116
	PCB	13-070117
	Switch, Slide	13-180084
	Switch, Channel Select	13-180085

CABINET PARTS

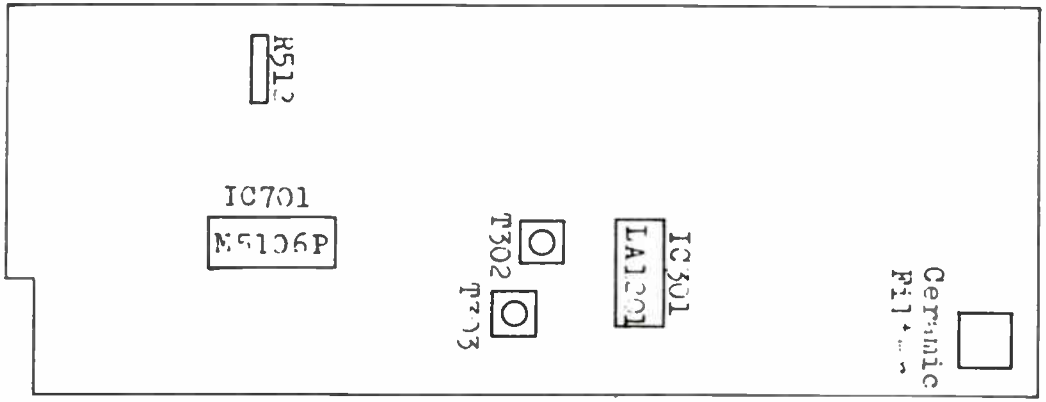
NAME	PART NO.
Battery, Holder Assembly	13-030120
Cabinet	13-010245
Cabinet, Front	13-010243
Cover	13-022001
Lid, Crystal	13-018021
Lid, Rear	13-013108
Knob, Lever	13-155007
Knob, Push-button	13-115101
Knob, Squelch	13-110166
Knob, Volume	13-110166

Pages 53 - 56 Courtesy of MIDLAND CONSUMER PRODUCTS

COMPONENT SYMBOL & WIRING DIAGRAM

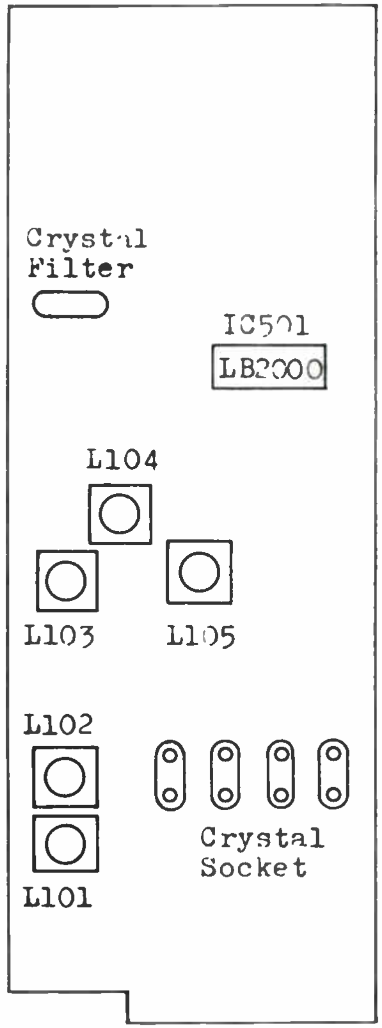


COMPONENT LAYOUT

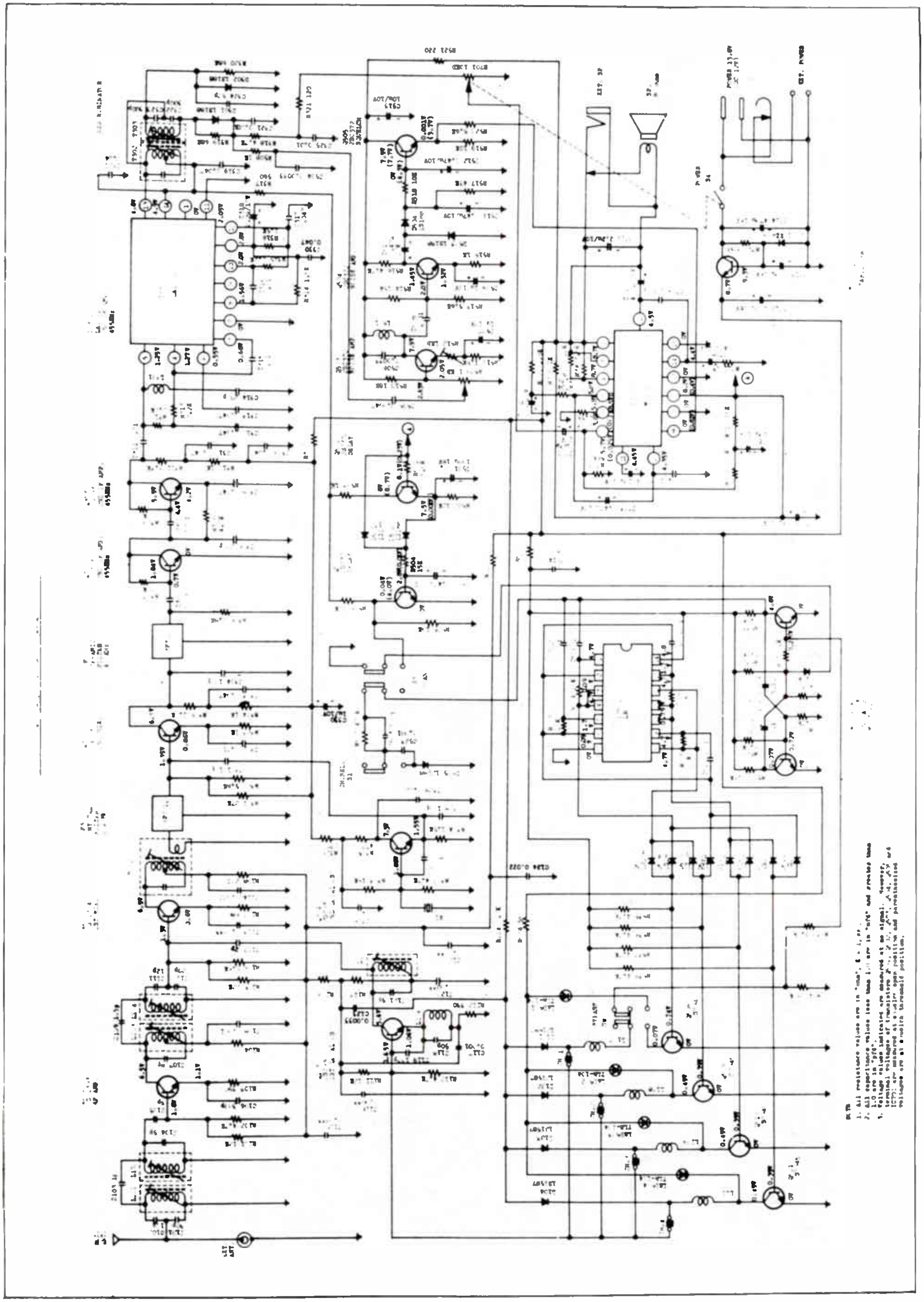


Model 13-916 Alignment Procedure

Step	Test Equipment	Meter Point	Alignment Procedure
1. Antenna and RF Stage	FM SSG 156MHz Mod. Freq. 1kHz Deviation ±5KHz 8 ohms dummy load V.T.V.M. Oscilloscope After sensitivity increase SSG output decrease	Ant. Terminal Ext. Speaker socket 8 ohms load Terminal	1. Preset a. Bypass switch OFF b. Scan switch MANU c. Squelch control volume min. d. Insert crystal (Receiving Freq. 156MHz) to channel 3 2. Adjust L101 - L104 for a max. output 3. Adjust L105 for a max. output 4. Adjust T302 and T303 for a max. output Repeat above item 2,3 and 4 adjustment
2. Squelch Adjustment	FM SSG 156MHz Mod. Freq. 1KHz Deviation ±5KHz Load 8 ohms V.T.V.M.	Ant. Terminal Ext. Speaker socket	1. Preset volume and squelch volume control for a max. (clockwise position) 2. Adjust semi fixed volume control R512 to obtain just audio output at 2uV output of signal generator
3. Battery Drain	DC Current meter (500mA full scale) DC power supply 13.8V	Series connection to power supply	Indication of current meter is under 100mA at squelched



SCHEMATIC DIAGRAM



SEMICONDUCTORS

ITEM	PART NO.	TYPE
D101	09-306326	1S1587
D102	09-306326	1S1587
D103	09-306326	1S1587
D104	09-306326	1S1587
D301	09-306037	1S188
D302	09-306037	1S188
D501	09-306135	1S1588
D502	09-306135	1S1588
D503	09-306037	1S188
D504	09-306037	1S188
D701	09-306327	XZ-092
IC301	09-308008	LA1201
IC501	09-308021	LB2000
IC701	09-308061	M5106P
Q101	09-302215	2SC1393
Q102	09-302216	2SC1394
Q103	09-302037	2SC930
Q301	09-302037	2SC930
Q302	09-302037	2SC930
Q303	09-302037	2SC930
Q304	09-302037	2SC930
Q501	09-302039	2SC372
Q502	09-302039	2SC372
Q503	09-302039	2SC372
Q504	09-302039	2SC372
Q505	09-302039	2SC372
Q506	09-302039	2SC372
Q507	09-302039	2SC372
Q508	09-302145	2SC945
Q509	09-302145	2SC945
Q510	09-302145	2SC945
Q511	09-302145	2SC945
Q701	09-302126	2SC1096

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C318	77-336225	2.2uF 10V
C330	77-336225	2.2uF 10V
C501	77-337107	100uF 16V
C502	77-336474	.47uF 10V
C507	77-337105	1uF 16V
C509	77-337105	1uF 16V
C510	77-336474	.47uF 10V
C511	77-336474	.47uF 10V
C512	77-336474	.47uF 10V
C513	77-336106	10uF 10V
C519	13-135016	10uF 10V (Non Pol)
C520	13-135016	10uF 10V (Non Pol)
C701	77-336474	.47uF 10V
C702	77-336106	10uF 10V
C703	77-336474	.47uF 10V
C704	77-336106	10uF 10V
C706	77-336336	33uF 10V
C707	77-336106	10uF 10V
C708	77-336476	47uF 10V
C710	77-337477	470uF 16V
C711	77-337105	1uF 16V
C712	77-337107	100uF 16V
C713	77-337227	220uF 16V
C714	77-337477	470uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R509	13-166052	10K, Squelch
R512	13-164108	1000 ohms, Sensitivity
R701	13-160098	10K, Volume with S4.

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-176400
L102	13-176400
L103	13-176401
L104	13-176400
L105	13-176400
L106	13-176333
L107	13-178127
L108	13-178127
L109	13-178127
L110	13-178127
L301	13-176333
L501	13-178175
T301	13-090289
T302	13-090290
T303	13-090291

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	Ceramic Filter	13-179042
HF302	Ceramic Filter	13-179043
S1	Switch, Selector	13-183176
S2	Switch, Bypass	13-183176
S3	Switch, Scan	13-183176
X1	Crystal (10.245MHz)	12-128295
	Antenna, Telescopic	13-040074
	Fuse, 1.5A	
	Fuse Holder	13-159116
	Speaker	13-060093
	PBC, Channel Lamp	13-070104

CABINET PARTS

NAME	PART NO.
Cabinet, Bottom	13-010228
Cabinet, Front	13-010226
Cabinet, Top	13-010227
Knob, Push-button (3 used)	13-115095
Knob, Squelch	13-110155
Knob, Volume	13-110155

Pages 57 - 64 Courtesy of MIDLAND CONSUMER PRODUCTS

ALIGNMENT

1. Connect all test equipment as illustrated in Fig. 1.

2. Check all voltage readings as shown on schematic diagram.

3. AF SECTION

3-1 Apply a 1KHz audio signal to VR 601.
On the oscilloscope check the wave form of the audio power and volume control. (Audio clipping level is near 3V at 8 ohms load.)

4. DISCRIMINATOR
Due to a ceramic discriminator being employed in this model, alignment of the discriminator is not necessary.

5. CRYSTAL OSCILLATOR

5-1 Second Local Oscillator and A.F.C.

5-1-1 Check for specified frequency of second local oscillator (10.245MHz) at the base of Q 501.

5-1-2 Short out resistor R 523.

5-1-3 Adjust VR 501 to obtain the second local oscillator frequency of 10.245MHz±1KHz.

5-1-4 Adjust T 112, 113 and 114 for maximum noise level on the oscilloscope or volt-meter at speaker.

5-1-5 Re-check the frequency of the second local oscillator. If the frequency is 10.245MHz±2KHz, the oscillator is functioning properly. Repeat alignment steps 5-1-1 through 5-1-4 if the oscillator frequency is below or above the specified frequency

5-2-1 The emitter voltage of Q301 (High Band) or Q403 (UHF Band) should increase slightly when a crystal is placed in an operative channel. No increase in voltage indicates either a defective crystal or the oscillator is malfunctioning.

5-2-2 Automatic Self Tuning Control for RF Stages. The check point on High Band is the collector of Q302.

5-2-3 Place a 144MHz crystal in an operative channel. Adjust VR301 to obtain a 1 volt or less indication at the collector of Q302. Place a 162.55MHz crystal in an operative channel. Adjust T 109 for 5 volts at the collector of Q302.
Caution: Do not try to obtain peak point in voltage at 162.55MHz on High Band.
For reference, the list below shows approximate voltage at certain frequencies.

frequency	voltage at collector of Q302 on VHF High.
144.0MHz	1.0±0.2V
150.0MHz	2.0±0.5V
155.16MHz	3.0±0.5V
162.55MHz	5.0±0.5V
173.0MHz	6.0 or over

6. IF STAGES

6-1 Second IF Section

6-1-1 Turn volume control to obtain proper audio level (around 0.5W).

6-1-2 Turn squelch control fully counter-clockwise.

6-1-3 Apply a 455KHz, unmodulated signal to the base of Q501 (Second Mixer) through a 0.001μF capacitor.

6-1-4 Adjust T113 and 114 for maximum quieting (minimum noise) while decreasing the output of the signal generator. With the output of the signal generator at about 300μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-2 First IF Section

6-2-1 Apply a 10.7MHz unmodulated signal to the base of Q402 or Q306 through 0.001μF capacitor.

6-2-2 Adjust T105, (110), 111 and 112 for maximum noise quieting while decreasing the output of the signal generator. 100μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-3 RF Section

6-3-1 Apply a channel frequency in High Band from signal generator to antenna connector of the unit. Modulation of signal generator should be 1KHz with 2KHz deviation.

6-3-2 Adjust T106, 107, 108 and 110 on High Band for best audio wave form (in terms of sine wave form), while decreasing output of signal generator.

6-3-3 Change the frequency of signal generator to UHF Band channel frequency.

6-3-4 Adjust VC401, 402, 403, T116 and T117 for UHF Band RF section alignment.

6-3-5 Adjust T110 (T117), T111 and 112 to obtain best audio wave in terms of sine wave on oscilloscope while decreasing the output of signal generator.

6-3-6 Check the difference between noise level and signal level on VTVM. If it is less than 3db your adjustment is correct.

7. TIGHT SQUELCH

7-1 From signal generator apply any freuqency modulated at 1KHz with 2KHz devaition to antenna connector.

7-2 Turn squelch control fully clockwise.

7-3 Increase the signal generator output until the audio output is silenced.

7-4 Slowly decrease the generator output until audio is heard or seen on the oscilloscope. Generator output level should be 1 to 0.5μV to open squelch.

7-5 By adjusting V 602 the tight squelch level can be varied.

FREQUENCY AND CRYSTAL

Once your have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

UHF Band (450-470MHz)

Crystal Frequency	:	(Channel Frequency – 10.7MHz)/9
Frequency Tolerance	:	+800, -600Hz
Crystal Type	:	HC-25/U (Plug-in Type)
Series Resonance	:	Third Overtone ; load capacity of 18 pf
maximum Impedance	:	35Ω
Drive Level	:	2mW

High Band (144-173MHz)

Crystal Frequency	:	(Channel Frequency -10.7MHz)/3
Frequency Tolerance	:	+1,000, -800Hz
Crystal Type	:	HC-25/U (Plug-in Type)
Series Resonance	:	-450Hz ; Third Overtone
Maximum Impedance	:	35Ω
Drive Level	:	2mW
Shunt Capacitance	:	Less than 6pF

HOW AND WHERE TO ORDER REPLACEMENT PARTS

NOTE: To eliminate error and speed delivery of replacement parts, always include the following information on your order:

1. Complete identification of merchandise for which the part is wanted.
   A. Name Item
   B. Model Number
   C. Serial Number

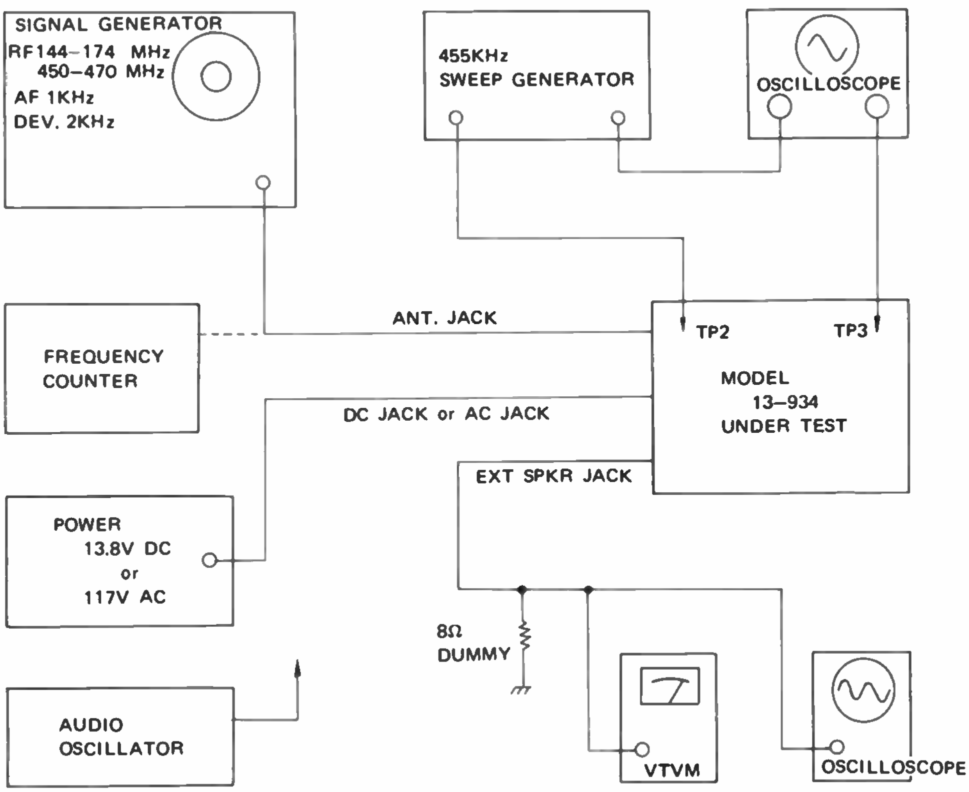
2. Best possible identification of the part itself.
   A. Part Number
   B. Part Name
   C. Quantity
   D. If necessary, return old part as sample.

3. Customer should use address listed below when ordering replacement parts.
   MIDLAND ELECTRONICS COMPANY
   Parts Department
   110 West 12th Street
   North Kansas City, Missouri 64116

TEST EQUIPMENTS REQUIRED

1. POWER SOURCE: of 13.8 V DC capable of 1 amp. regulated
   (Hewlett-Packard model 6201B or equivalent)
2. AUDIO GENERATOR: frequency range of 200Hz to 5KHz or more.
   (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER: capable of counting up to 200MHz or more
   (Hewlett-Packard model 5246L with convertor model 5253B or equivalent)
4. OSICLLOSCOPE: 450KHz bandwidth.
   (Hewlett-Packard model 120B or equivalent)
5. VACUUM TUBE VOLT METER: 1mV to 50V, 1MHz
   (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR: capable of tuning 455KHz, 10.7MHz, 144-173MHz, 450-470MHz, for narrow band receiver.
7. SWEEP GENERATOR: capable of tuning 450, 455 and 460KHz.

TEST CONNECTION



SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	09-306191	1S330
D2	09-306191	1S330
D101	09-306219	1S2479
D102	09-306219	1S2479
D103	09-306219	1S2479
D104	09-306219	1S2479
D105	09-306219	1S2479
D106	09-306219	1S2479
D107	09-306219	1S2479
D108	09-306219	1S2479
D109	09-306219	1S2479
D110	09-306219	1S2479
D111	09-306219	1S2479
D112	09-306219	1S2479
D113	09-306219	1S2479
D114	09-306219	1S2479
D115	09-306219	1S2479
D116	09-306219	1S2479
D117	09-306020	1N34A
D118	09-306020	1N34A
D119	09-306020	1N34A
D120	09-306020	1N34A
D121	09-306020	1N34A
D122	09-306020	1N34A
D123	09-306020	1N34A
D124	09-306020	1N34A
D125	09-306020	1N34A
D126	09-306020	1N34A
D127	09-306020	1N34A
D218	09-306020	1N34A
D129	09-306020	1N34A
D131	09-306191	1S330
D132	09-306020	1N34A
D301	09-306020	1N34A
D302	09-306240	MA320B
D303	09-306240	MA320B
D501	09-306191	1S330
D502	09-306191	1S330
D503	09-306191	1S330
D504	09-306191	1S330
D505	09-306240	MA320B
D506	09-306191	1S330
D507	09-306191	1S330
D701	09-306180	BZ090
D702	09-306149	10D4(1N4004)
D703	09-306149	10D4(1N4004)
D704	09-306149	10D4(1N4004)
IC101	09-308015	M5340
IC102	09-308015	M5340
IC301	09-308013	uPC555A
IC501	09-308041	TA7061
IC502	09-308052	uPC577H
IC601	09-308043	TA7063
IC602	09-308053	uPC20C
Q101	09-302039	2SC372(2SC403)
Q102	09-302039	2SC372(2SC403)
Q103	09-302039	2SC372(2SC403)
Q104	09-302039	2SC372(2SC403)
Q105	09-302039	2SC372(2SC403)
Q106	09-302039	2SC372(2SC403)
Q107	09-302039	2SC372(2SC403)
Q108	09-302039	2SC372(2SC403)
Q109	09-302039	2SC372(2SC403)
Q110	09-302039	2SC372(2SC403)
Q111	09-304012	XA495
Q112	09-302039	2SC372(2SC403)
Q301	09-302095	2SC784R(2SC535B)
Q302	09-304012	XA495
Q303	09-302039	2SC372(2SC403)
Q304	09-304012	XA495
Q305	09-302095	2SC784R(2SC535B)
Q306	09-302095	2SC784R(2SC535B)
Q401	09-302149	2SC761
Q402	09-302148	2SC948
Q403	09-302095	2SC784R(2SC535B)
Q404	09-302095	2SC784R(2SC535B)
Q501	09-302012	2SC710C
Q502	09-302012	2SC710C
Q503	09-302012	2SC710C
Q504	09-305040	3SK39
Q601	09-302039	2SC372(2SC403)
Q602	09-302039	2SC372(2SC403)
Q701	09-302155	2SC1383

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C110	77-337227	220uF 16V
C121	77-337106	10uF 16V
C522	77-337106	10uF 16V
C524	77-337476	47uF 16V
C525	77-337475	4.7uF 16V
C527	77-337476	47uF 16V
C603	77-337476	47uF 16V
C612	77-337476	47uF 16V
C618	77-337476	47uF 16V
C619	77-337477	100uF 16V
C620	77-337227	220uF 16V
C623	77-337477	470uF 16V
C631	77-337477	100uF 16V
C701	77-337476	47uF 16V
C702	77-337477	100uF 16V
C703	77-337108	1000uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R608	77-202100	10 ohms, 1/2W
R703	77-202100	10 ohms, 1/2W
TH301	09-307072	Thermistor
VR102	13-166039	Scan Rate Adjust
VR601	13-160087	Volume with Switch
VR602	13-166048	Squelch

COILS/TRANSFORMERS

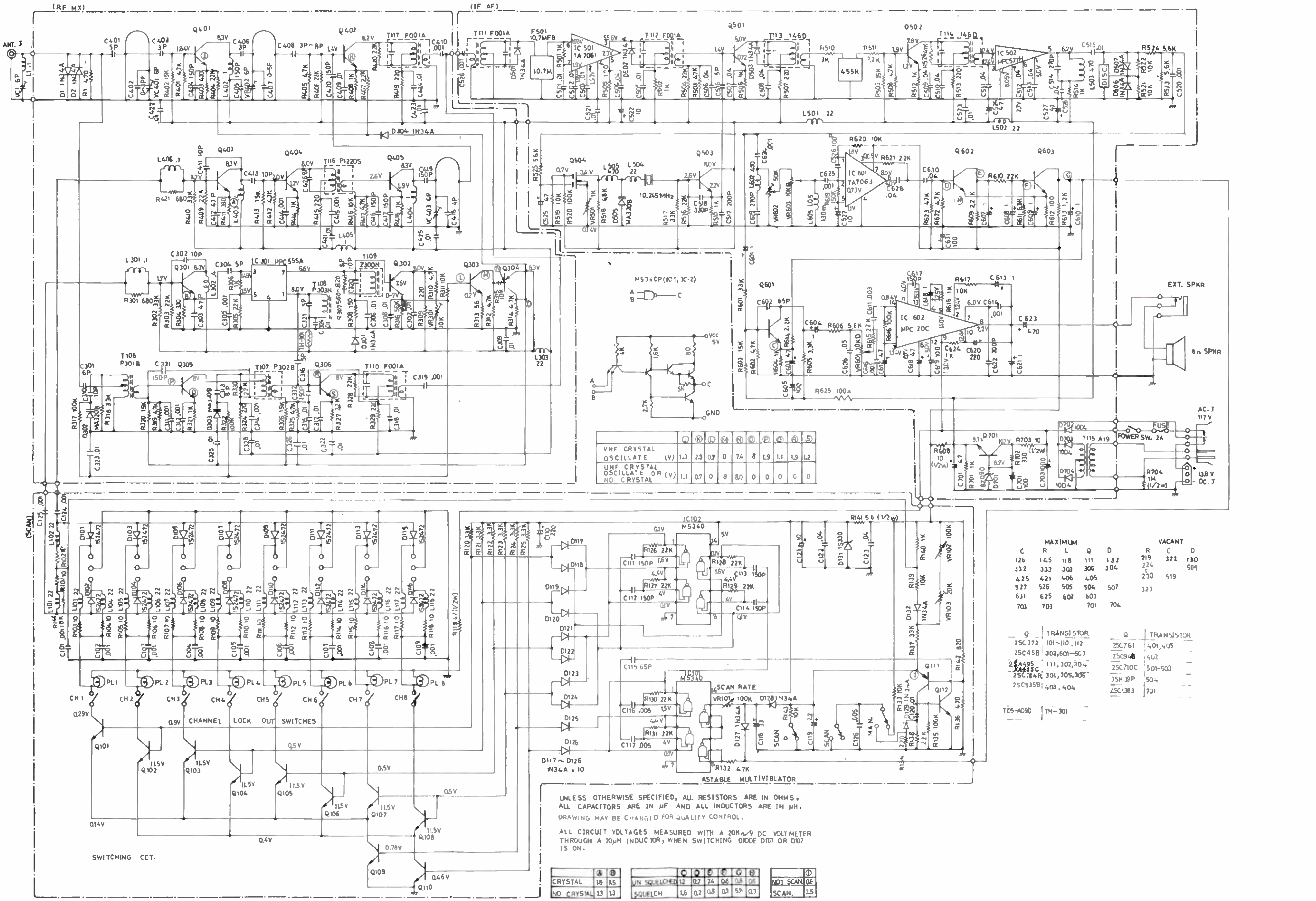
ITEM	PART NO.
L1	13-178154
L101	13-178151
L102	13-178151
L103	13-178151
L104	13-178151
L105	13-178151
L106	13-178151
L107	13-178151
L108	13-178151
L109	13-178151
L110	13-178151
L111	13-178151
L112	13-178151
L113	13-178151
L114	13-178151
L115	13-178151
L116	13-178151
L117	13-178151
L118	13-178151
L301	13-178154
L303	13-178153
	13-178151
L402	13-178153
L404	13-178129
L405	13-178129
L406	13-178154
L501	13-178151
L502	13-178151
L503	13-178099
L504	13-178151
L505	13-178099
L602	13-178099
L605	13-178161
T106	13-094068
T107	13-094069
T108	13-094070
T109	13-094071
T110	13-094047
T111	03-094047
T112	03-094047
T113	13-090282
T114	13-090282
T117	13-094047

MISCELLANEOUS

ITEM	NAME	PART NO.
F501	Ceramic Filter(10.7MHz)	13-179021
F502	Ceramic Filter(455kHz)	13-179022
	Antenna, Telescopic	13-040067
	Cord, AC Power	13-034049
	Cord, DC Power	13-034062
	Fuse, 2A	
	Fuse, 1A	
	Fuse Holder	13-159154
	Lamp, Channel	13-201038
	Speaker, 8 ohms .5W	13-060073
	Switch, Channel	13-188005
	Switch, Scan	13-188164

CABINET PARTS

NAME	PART NO.
Cabinet, Bottom	13-010204
Cabinet, Top	13-010203
Door, Crystal Accessory	13-018015
Front Grille	13-020507
Front Plate	13-020508
Knob, Scan Rate	13-110147
Knob, Squelch	13-110147
Knob, Volume	13-110147



	J	K	L	M	N	O	P	Q	R	S
VHF CRYSTAL OSCILLATE (V)	1.3	2.3	0.7	0	7.4	8	1.9	1.1	1.9	1.2
UHF CRYSTAL OSCILLATE OR NO CRYSTAL (V)	1.1	0.7	0	8	8.0	0	0	0	0	0

MAXIMUM

C	R	L	Q	D
126	145	118	111	132
332	333	303	306	304
425	421	406	405	
527	526	505	504	507
631	625	602	603	
703	703		701	704

VACANT

R	C	D
219	372	130
224 ~ 230	519	504
323		

Q	TRANSISTOR
2SC372	101~110, 112
2SC458	303, 601~603
2SA495 XA495C	111, 302, 304
2SC784R	301, 305, 306
2SC535B	403, 404

Q	TRANSISTOR
2SC761	401, 405
2SC94[illegible]	402
2SC710C	501~503
3SK39P	504
2SC1383	701

TD5-A090	TH-301

UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS. ALL CAPACITORS ARE IN μF AND ALL INDUCTORS ARE IN μH.

DRAWING MAY BE CHANGED FOR QUALITY CONTROL.

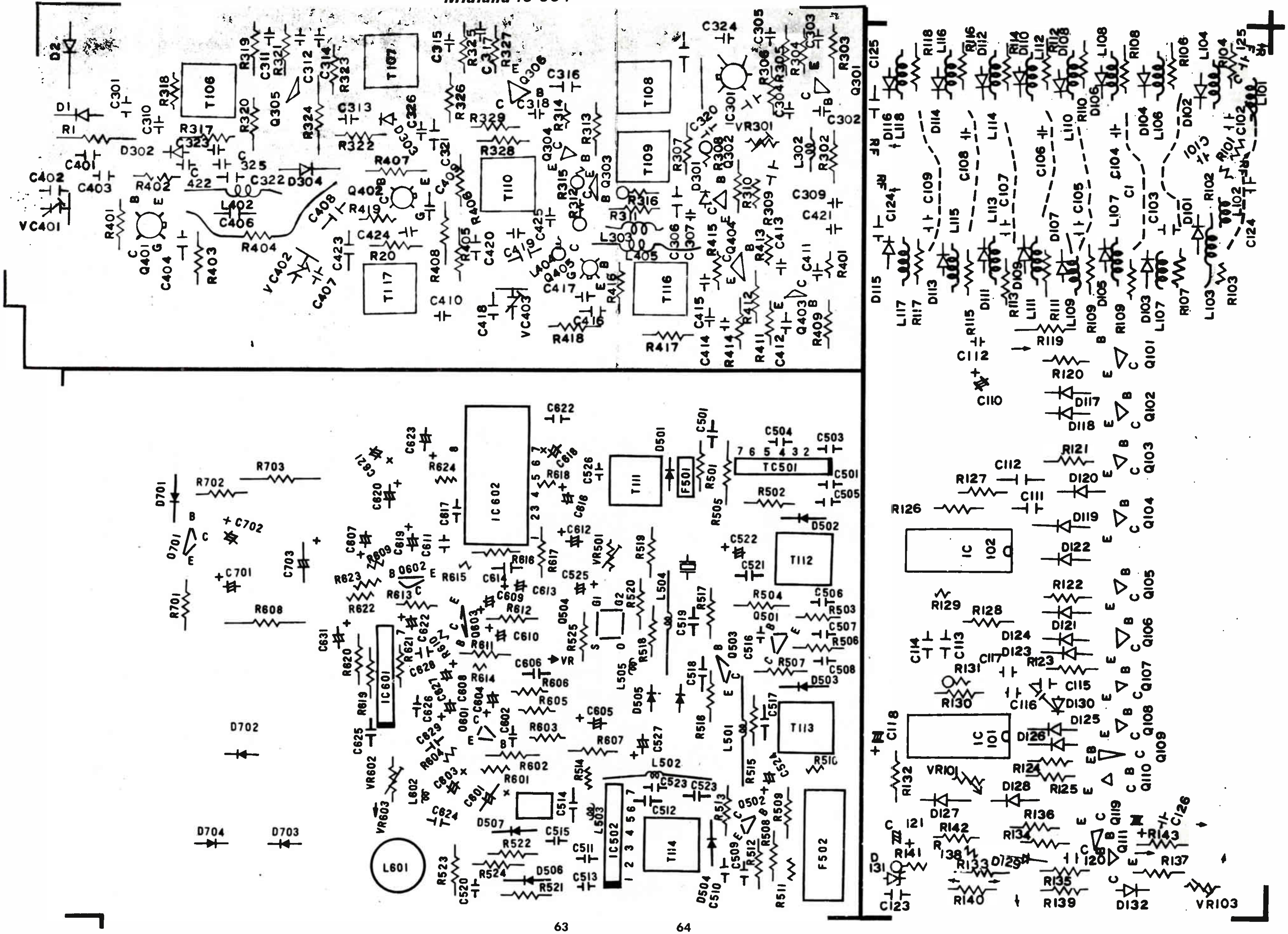
ALL CIRCUIT VOLTAGES MEASURED WITH A 20KΩ/V DC VOLTMETER THROUGH A 20μH INDUCTOR, WHEN SWITCHING DIODE D101 OR D102 IS ON.

	A	B
CRYSTAL	1.5	1.5
NO CRYSTAL	1.3	1.3

	C	D	E	F	G	H
UN SQUELCHED	1.2	0.7	2.4	0.6	0.8	0.6
SQUELCH	1.8	0.2	0.8	0.3	5.8	0.3

	I
NOT SCAN	0.6
SCAN.	2.5

Midland 13-934



Pages 65 - 72 Courtesy of MIDLAND CONSUMER PRODUCTS

ALIGNMENT

1. Connect all test equipment as illustrated in Fig. 1.

2. Check all voltage readings as shown on schematic diagram.

3. AF SECTION

3-1 Apply a 1KHz audio signal to VR 601.
On the oscilloscope check the wave form of the audio power and volume control. (Audio clipping level is near 3V at B ohms load.)

4. DISCRIMINATOR
Due to a ceramic discriminator being employed in this model, alignment of the discriminator is not necessary.

5. CRYSTAL OSCILLATOR

5-1 Second Local Oscillator and A.F.C.

5-1-1 Check for specified frequency of second local oscillator (10.245MHz) at the base of Q 501.

5-1-2 Short out resistor R 523.

5-1-3 Adjust VR 501 to obtain the second local oscillator frequency of 10.245MHz±1KHz.

5-1-4 Adjust T 112, 113 and 114 for maximum noise level on the oscilloscope or volt-meter at speaker.

5-1-5 Re-check the frequency of the second local oscillator. If the frequency is 10.245MHz±2KHz, the oscillator is functioning properly. Repeat alignment steps 5-1-1 through 5-1-4 if the oscillator frequency is below or above the specified frequency

5-2-1 The emitter voltage of Q301 (High Band) or Q203 (Low Band) should increase slightly when a crystal is placed in an operative channel. No increase in voltage indicates either a defective crystal or the oscillator is malfunctioning.

5-2-2 Automatic Self Tuning Control for RF Stages. The check point on High Band is the collector of Q302, Low Band Q204 collector.

5-2-3 Place a 144MHz crystal in an operative channel. Adjust VR301 to obtain a 1 volt or less indication at the collector of Q302. Place a 33MHz crystal in an operative channel. Adjust VR201 to obtain a 1 volt or less indication at the collector of Q203. Place a 162.55MHz crystal in an operative channel. Adjust T 109 for 5 volts at the collector of Q302. Place a 44MHz crystal in an operative channel. Adjust T104 for 5 volts at the collector of Q204.

Caution: 1. Adjust High Band first.
2. Do not try to obtain peak point in voltage at 162.55MHz on High Band and at 44MHz on Low Band on multimeter for ohm/volt.

For reference, the list below shows approximate voltage at certain frequencies.

frequency	voltage at collector of Q302 and Q204 on High and Low, respectively		
144.0MHz	1.0±0.2V	33MHz	1.0±0.2V
150.0MHz	2.0±0.5V	36MHz	1.5±0.5V
155.16MHz	3.0±0.5V	39MHz	2.0±0.5V
162.55MHz	5.0±0.5V	41MHz	3.0±0.5V
173.0MHz	6.0 or over	44MHz	5.0±0.5V
		47MHz	6.0 or over

6. IF STAGES

6-1 Second IF Section

6-1-1 Turn volume control to obtain proper audio level (around 0.5W).

6-1-2 Turn squelch control fully counter-clockwise.

6-1-3 Apply a 455KHz, unmodulated signal to the base of Q501 (Second Mixer) through a 0.001μF capacitor.

6-1-4 Adjust T113 and 114 for maximum quieting (minimum noise) while decreasing the output of the signal generator. With the output of the signal generator at about 300μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-2 First IF Section

6-2-1 Apply a 10.7MHz unmodulated signal to the base of Q202 or Q306 through 0.001μF capacitor.

6-2-2 Adjust T105, (110), 111 and 112 for maximum noise quieting while decreasing the output of the signal generator. 100μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-3 RF Section

6-3-1 Short out T101

6-3-2 Apply a channel frequency in High Band from signal generator to antenna connector of the unit. Modulation of signal generator should be 1KHz with 2KHz deviation.

6-3-3 Adjust T106, 107, 108 and 110 on High Band for best audio wave form (in terms of sine wave form), while decreasing output of signal generator.

6-3-4 Change the frequency of signal generator to Low Band channel frequency.

6-3-5 Adjust T102, 103 and 105 for Low Band RF section alignment.

6-3-6 Adjust T110 (T105), T111 and 112 to obtain best audio wave in terms of sine wave on oscilloscope while decreasing the output of signal generator.

6-3-7 Check the difference between noise level and signal level on VTVM. If it is less than 3db your adjustment is correct.

6-3-8 T 101 should be replaced in the circuit.

7. TIGHT SQUELCH

7-1 From signal generator apply any freuqency modulated at 1KHz with 2KHz devaition to antenna connector.

7-2 Turn squelch control fully clockwise.

7-3 Increase the signal generator output until the audio output is silenced.

7-4 Slowly decrease the generator output until audio is heard or seen on the oscilloscope. Generator output level should be 1 to 0.5μV to open squelch.

7-5 By adjusting V 602 the tight squelch level can be varied.

FREQUENCY AND CRYSTAL

Once your have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufactuıer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

Low Band (30-50MHz)

Crystal Frequency	:	Channel Frequency+10.7MHz
Frequency Tolerance	:	+2,000, -1,500Hz
Crystal Type	:	HC-25/U (Plug-in Type)
Series Resonance	:	-450Hz ; Third Overtone
maximum Impedance	:	35Ω
Drive Level	:	2mW
Shunt Capacitancw	:	Less than 6pF

High Band (144-173MHz)

Crystal Frequency	:	(Channel Frequency -10.7MHz)/3
Frequency Tolerance	:	+1,000, -800Hz
Crystal Type	:	HC-25/U (Plug-in Type)
Series Resonance	:	-450Hz ; Third Overtone
Maximum Impedance	:	35Ω
Drive Level	:	2mW
Shunt Capacitance	:	Less than 6pF

HOW AND WHERE TO ORDER REPLACEMENT PARTS

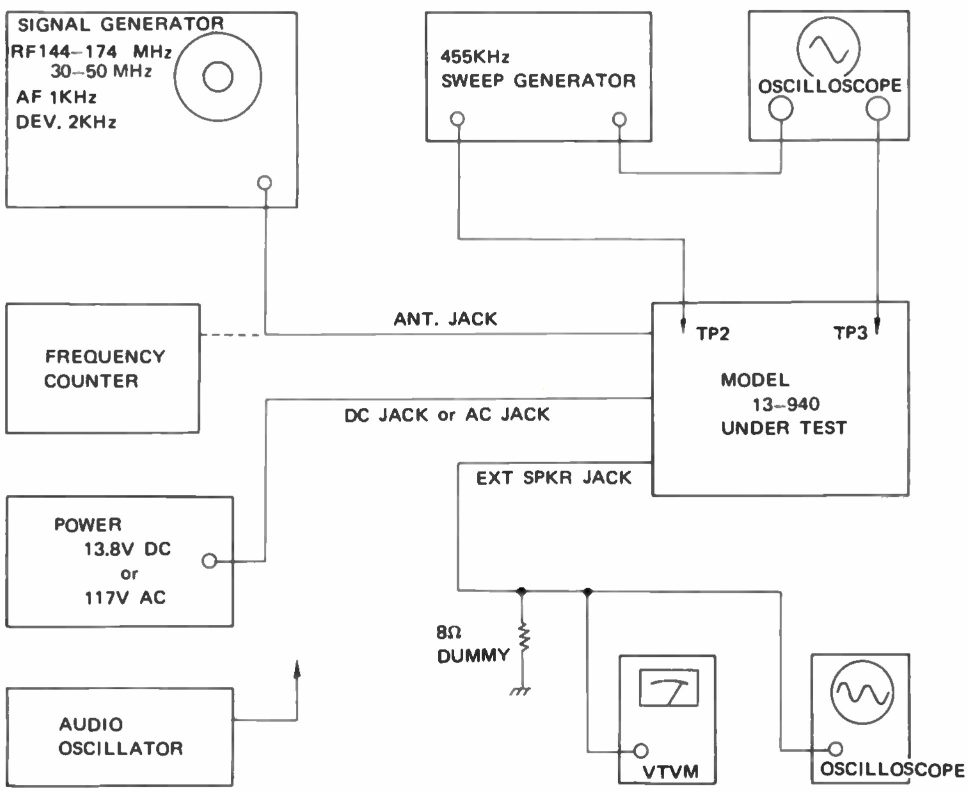
NOTE: To eliminate error and speed delivery of replacement parts, always include the following information on your order:

1. Complete identification of merchandise for which the part is wanted.
   A. Name Item
   B. Model Number
   C. Serial Number
2. Best possible identification of the part itself.
   A. Part Number
   B. Part Name
   C. Quantity
   D. If necessary, return old part as sample.
3. Customer should use address listed below when ordering replacement parts.
   MIDLAND ELECTRONICS COMPANY
   Parts Department
   110 West 12th Street
   North Kansas City, Missouri 64116

TEST EQUIPMENTS REQUIRED

1. POWER SOURCE: of 13.8 V DC capable of 1 amp. regulated
   (Hewlett-Packard model 6201B or equivalent)
2. AUDIO GENERATOR: frequency range of 200Hz to 5KHz or more.
   (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER: capable of counting up to 200MHz or more
   (Hewlett-Packard model 5246L with convertor model 5253B or equivalent)
4. OSICLLOSCOPE: 450KHz bandwidth.
   (Hewlett-Packard model 120B or equivalent)
5. VACUUM TUBE VOLT METER: 1mV to 50V, 1MHz
   (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR: capable of tuning 455KHz, 10.7MHz, 33-48MHz, 144-173MHz, for narrow band receiver.
7. SWEEP GENERATOR: capable of tuning 450, 455 and 460KHz.

TEST CONNECTION



SEMICONDUCTORS

ITEM	PART NO.	TYPE
D101	09-306219	1S2472
D102	09-306219	1S2472
D103	09-306219	1S2472
D104	09-306219	1S2472
D105	09-306219	1S2472
D106	09-306219	1S2472
D117	09-306020	1N34A
D118	09-306020	1N34A
D119	09-306020	1N34A
D120	09-306020	1N34A
D121	09-306020	1N34A
D122	09-306020	1N34A
D123	09-306020	1N34A
D124	09-306020	1N34A
D125	09-306020	1N34A
D126	09-306020	1N34A
D127	09-306020	1N34A
D128	09-306020	1N34A
D129	09-306020	1N34A
D131	09-306191	1S330
D132	09-306020	1S34A
D201	09-306240	MA320B
D202	09-306240	MA320B
D203	09-306020	1N34A
D213	09-306020	1N34A
D301	09-306020	1N34A
D302	09-306240	MA320B
D303	09-306240	MA320B
D501	09-306020	1N34A
D502	09-306020	1N34A
D503	09-306020	1N34A
D503	09-306020	1N34A
D504	09-306020	1N34A
D505	09-306020	MA320B
D506	09-306020	1N34A
D507	09-306020	1N34A
D701	09-306180	BZ090
D702	09-306149	10D4
	09-306149	1N4004
D703	09-306149	10D4
	09-306149	1N4004
D704	09-306149	10D4
	09-306149	1N4004
IC101	09-308015	M5340P
IC102	09-308015	M5340P
IC201	09-308013	uPC555A
IC301	09-308013	uPC555A
IC501	09-308041	TA7061
IC502	09-308052	uPC577H
IC601	09-308043	TA7063
IC602	09-308053	uPC20C
Q101	09-302039	2SC372
	09-302039	2SC403
Q102	09-302039	2SC372
	09-302039	2SC403
Q103	09-302039	2SC372
	09-302039	2SC403
Q104	09-302039	2SC372
	09-302039	2SC403
Q105	09-302039	2SC372
	09-302039	2SC403
Q106	09-302039	2SC372
	09-302039	2SC403
Q107	09-302039	2SC372
	09-302039	2SC403
Q108	09-302039	2SC372
	09-302039	2SC403
Q109	09-302039	2SC372
	09-302039	2SC403
Q110	09-302039	2SC372
	09-302039	2SC403
Q111	09-304012	XA495
Q112	09-302039	2SC372
	09-302039	2SC403
Q201	09-302095	2SC784R
	09-302095	2SC535B
Q202	09-302095	2SC784R
	09-302095	2SC535B
Q203	09-302095	2SC784R
	09-302095	2SC535B
Q204	09-304012	XA495
	09-302039	2SC372
	09-302039	2SC403
Q301	09-302095	2SC784R
	09-302095	2SC535B
Q302	09-304012	XA495
Q303	09-302039	2SC372
	09-302039	2SC403
Q304	09-30412	XA495
Q306	09-302095	2SC784R
	09-302095	2SC535B
Q501	09-302012	2SC710
Q502	09-302012	2SC710
Q503	09-302012	2SC710
Q504	09-305040	FET3SK39P
Q601	09-302039	2SC372
	09-302039	2SC372
Q602	09-302039	2SC372
	09-302039	2SC403
Q603	09-302039	2SC372
	09-302039	2SC403
Q701	09-302155	2SC1383

ELECTROLYTICS/ VARIABLE CAPS

ITEM	PART NO.	VALUE
C110	77-337227	220uF 16V
C121	77-337106	10uF 16V
C522	77-337106	10uF 16V
C524	77-337476	47uF 16V
C525	77-337474	4.7uF 16V
C527	77-337476	47uF 16V
C603	77-337476	47uF 16V
C612	77-337476	47uF 16V
C618	77-337476	47uF 16V
C619	77-337107	100uF 16V
C620	77-337227	220uF 16V
C623	77-337477	470uF 16V
C631	77-337107	100uF 16V
C701	77-337476	47uF 16V
C702	77-337107	100uF 16V
C703	77-337108	1000uF 16V

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-178151
L102	13-178151
L103	13-178151
L104	13-178151
L105	13-178151
L106	13-178151
L107	13-178151
L108	13-178151
L109	13-178151
L110	13-178151
L111	13-178151
L112	13-178151
L113	13-178151
L114	13-178151
L115	13-178151
L116	13-178151
L117	13-178151
L118	13-178151
L301	13-178154
L303	13-178151
L503	13-178099
L504	130178151
L505	13-178099
L602	13-178099
L605	13-178156
T101	13-094043
T102	13-094044
T103	13-094045
T104	13-094046
T105	13-094047
T106	13-094048
T107	13-094049
T108	13-094045
T109	13-094046
T110	13-094047
T111	13-094047
T112	13-094047
T113	13-094051
T114	13-094051

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R119	77-202470	470 ohms 1/2W
R608	77-202100	10 ohms 1/2W
R703	77-202100	10 ohms 1/2W
TH201	09-307072	TD5-A090
TH301	09-307072	TD5-A090
VR102	13-166039	Scan Rate
VR601	13-160087	Volume
VR602	13-166048	Squelch

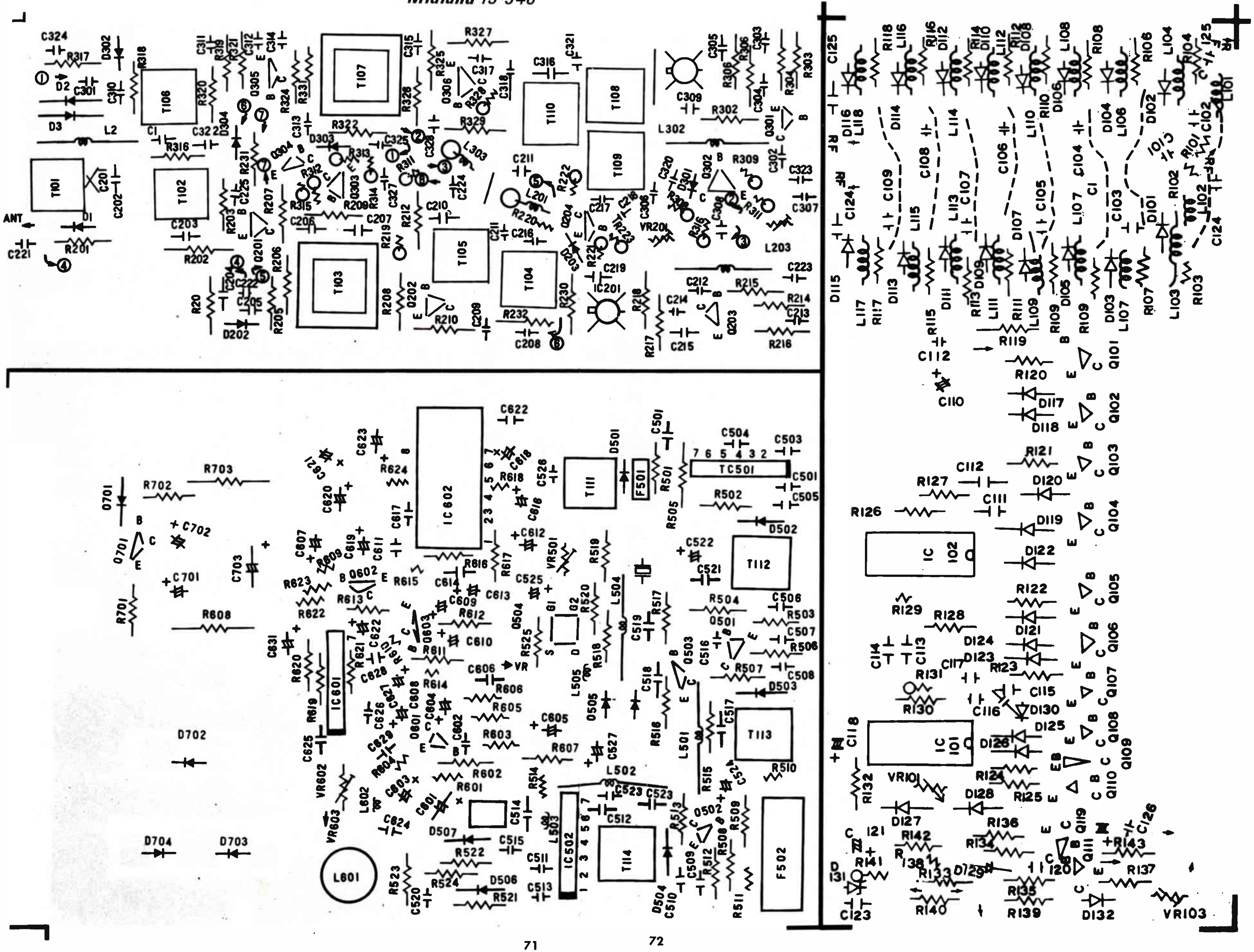
MISCELLANEOUS

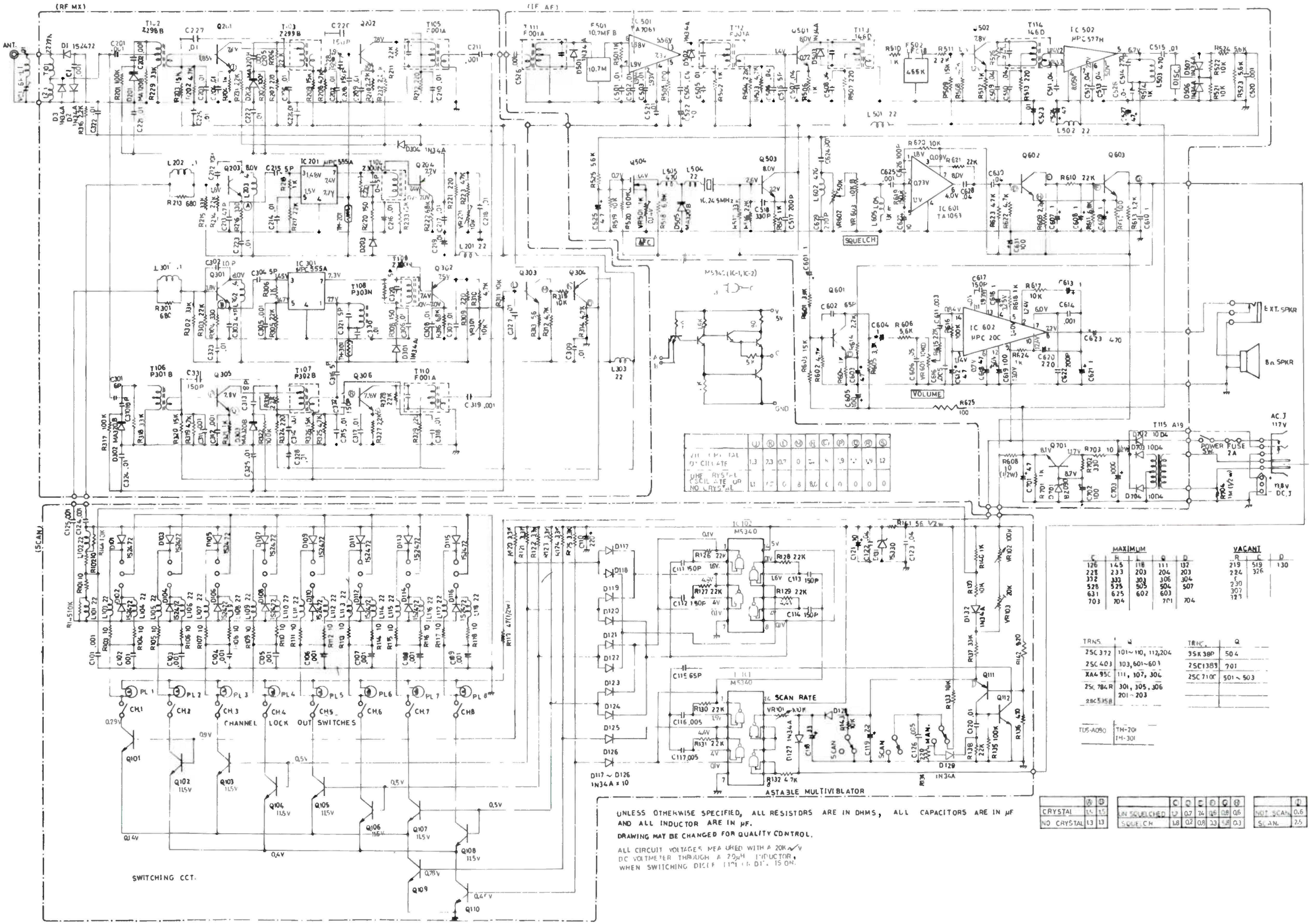
ITEM	NAME	PART NO.
F501	10.7MHz Filter	13-179021
F502	455kHz Filter	13-179022
	AC Power Cord	13-034049
	DC Power Cord	13-034062
	Speaker, 8 ohms	13-060073
	Switch, 8 Section	13-188005
	Switch, 2 Section	13-183614

CABINET PARTS

NAME	PART NO.
Case, Bottom	13-010209
Case, Top	13-010208
Front Plate	13-020517
Inside Cover	13-158285
Knob, 3 Used	13-110149

Midland 13-940





UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS, ALL CAPACITORS ARE IN μF AND ALL INDUCTOR ARE IN μF.

DRAWING MAY BE CHANGED FOR QUALITY CONTROL.

ALL CIRCUIT VOLTAGES MEASURED WITH A 20KΩ/V DC VOLTMETER THROUGH A 20μH INDUCTOR, WHEN SWITCHING DIODE [illegible] IS ON.

MAXIMUM

C	R	L	Q	D
126	145	118	111	132
228	233	203	204	203
332	333	303	306	304
528	525	505	504	507
631	625	602	603	
703	704		701	704

VACANT

R	C	D
219	519	130
224	326	
~		
230		
307		
323		

TRNS.	Q
2SC372	101~110, 112, 204
2SC403	303, 601~603
XA495C	111, 302, 304
2SC784R	301, 305, 306
2SC535B	201~203

TRNS.	Q
3SK38P	504
2SC1383	701
2SC710C	501~503

TU5-A090	TH-201 TH-301

	Ⓐ	Ⓑ
CRYSTAL	1.5	1.5
NO CRYSTAL	1.3	1.3

	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ
UN SQUELCHED	1.2	0.7	2.4	0.6	0.8	0.6
SQUELCH	1.8	0.2	0.8	2.3	5.8	0.3

	Ⓘ
NOT SCAN	0.6
SCAN.	2.5

Pages 73 - 80 Courtesy of MIDLAND CONSUMER PRODUCTS

ALIGNMENT

1. Connect all test equipment as illustrated in Fig. 1.

2. Check all voltage readings as shown on schematic diagram.

3. AF SECTION

3-1 Apply a 1KHz audio signal to VR 601.
On the oscilloscope check the wave form of the audio power and volume control. (Audio clipping level is near 3V at 8 ohms load.)

4. DISCRIMINATOR
Due to a ceramic discriminator being employed in this model, alignment of the discriminator is not necessary.

5. CRYSTAL OSCILLATOR

5-1 Second Local Oscillator and A.F.C.

5-1-1 Check for specified frequency of second local oscillator (10.245MHz) at the base of Q 501.

5-1-2 Short out resistor R 523.

5-1-3 Adjust VR 501 to obtain the second local oscillator frequency of 10.245MHz±1KHz.

5-1-4 Adjust T 112, 113 and 114 for maximum noise level on the oscilloscope or volt-meter at speaker.

5-1-5 Re-check the frequency of the second local oscillator. If the frequency is 10.245MHz±2KHz, the oscillator is functioning properly. Repeat alignment steps 5-1-1 through 5-1-4 if the oscillator frequency is below or above the specified frequency

5-2-1 The emitter voltage of Q301 (High Band) or Q403 (UHF Band) should increase slightly when a crystal is placed in an operative channel. No increase in voltage indicates either a defective crystal or the oscillator is malfunctioning.

5-2-2 Automatic Self Tuning Control for RF Stages. The check point on High Band is the collector of Q302.

5-2-3 Place a 144MHz crystal in an operative channel. Adjust VR301 to obtain a 1 volt or less indication at the collector of Q302. Place a 162.55MHz crystal in an operative channel. Adjust T 109 for 5 volts at the collector of Q302.
Caution: Do not try to obtain peak point in voltage at 162.55MHz on High Band.

For reference, the list below shows approximate voltage at certain frequencies.

frequency	voltage at collector of Q302 on VHF High.
144.0MHz	1.0±0.2V
150.0MHz	2.0±0.5V
155.16MHz	3.0±0.5V
162.55MHz	5.0±0.5V
173.0MHz	6.0 or over

6. IF STAGES

6-1 Second IF Section

6-1-1 Turn volume control to obtain proper audio level (around 0.5W).

6-1-2 Turn squelch control fully counter-clockwise.

6-1-3 Apply a 455KHz, unmodulated signal to the base of Q501 (Second Mixer) through a 0.001μF capacitor.

6-1-4 Adjust T113 and 114 for maximum quieting (minimum noise) while decreasing the output of the signal generator. With the output of the signal generator at about 300μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-2 First IF Section

6-2-1 Apply a 10.7MHz unmodulated signal to the base of Q402 or Q306 through 0.001μF capacitor.

6-2-2 Adjust T105, (110), 111 and 112 for maximum noise quieting while decreasing the output of the signal generator. 100μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-3 RF Section

6-3-1 Apply a channel frequency in High Band from signal generator to antenna connector of the unit. Modulation of signal generator should be 1KHz with 2KHz deviation.

6-3-2 Adjust T106, 107, 108 and 110 on High Band for best audio wave form (in terms of sine wave form), while decreasing output of signal generator.

6-3-3 Change the frequency of signal generator to UHF Band channel frequency.

6-3-4 Adjust VC401, 402, 403, T116 and T117 for UHF Band RF section alignment.

6-3-5 Adjust T110 (T117), T111 and 112 to obtain best audio wave in terms of sine wave on oscilloscope while decreasing the output of signal generator.

6-3-6 Check the difference between noise level and signal level on VTVM. If it is less than 3db your adjustment is correct.

7. TIGHT SQUELCH

7-1 From signal generator apply any freuqency modulated at 1KHz with 2KHz devaition to antenna connector.

7-2 Turn squelch control fully clockwise.

7-3 Increase the signal generator output until the audio output is silenced.

7-4 Slowly decrease the generator output until audio is heard or seen on the oscilloscope. Generator output level should be 1 to 0.5μV to open squelch.

7-5 By adjusting V 602 the tight squelch level can be varied.

FREQUENCY AND CRYSTAL

Once your have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

UHF Band (450-470MHz)

Crystal Frequency	: (Channel Frequency – 10.7MHz)/9
Frequency Tolerance	: +800, -600Hz
Crystal Type	: HC-25/U (Plug-in Type)
Series Resonance	: Third Overtone ; load capacity of 18 pf
maximum Impedance	: 35Ω
Drive Level	: 2mW

High Band (144-173MHz)

Crystal Frequency	: (Channel Frequency -10.7MHz)/3
Frequency Tolerance	: +1,000, -800Hz
Crystal Type	: HC-25/U (Plug-in Type)
Series Resonance	: -450Hz ; Third Overtone
Maximum Impedance	: 35Ω
Drive Level	: 2mW
Shunt Capacitance	: Less than 6pF

HOW AND WHERE TO ORDER REPLACEMENT PARTS

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   B. Part Name
   C. Quantity
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   Parts Department
   110 West 12th Street
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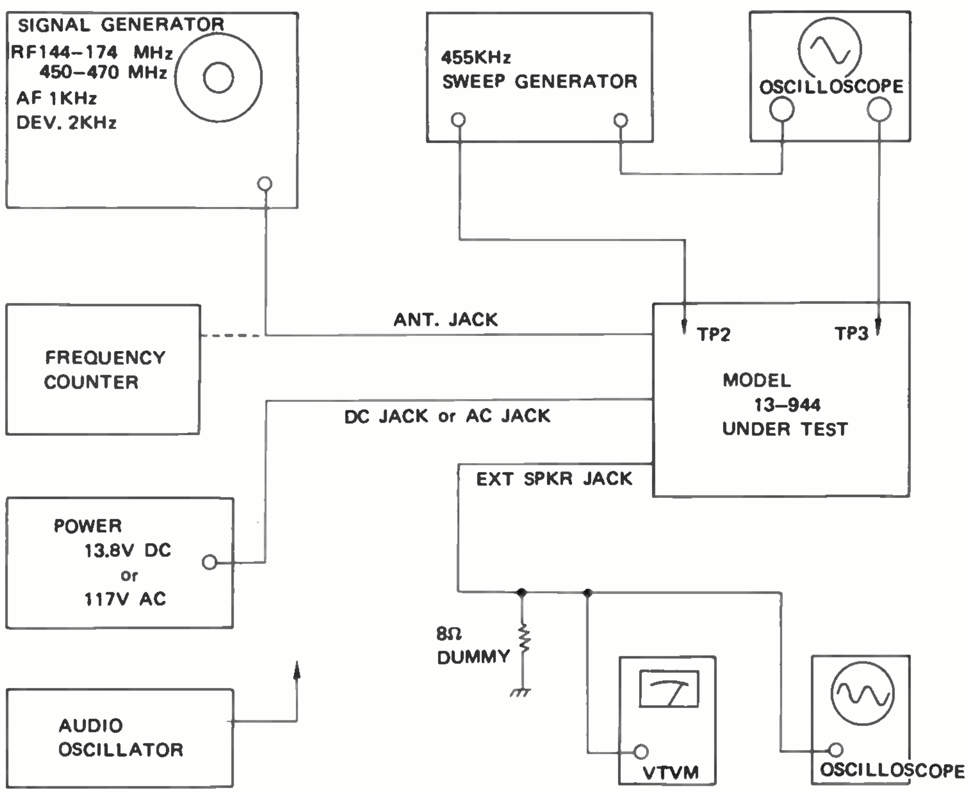
   (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER: capable of counting up to 200MHz or more
   (Hewlett-Packard model 5246L with convertor model 5253B or equivalent)
4. OSICLLOSCOPE: 450KHz bandwidth.
   (Hewlett-Packard model 120B or equivalent)
5. VACUUM TUBE VOLT METER: 1mV to 50V, 1MHz
   (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR: capable of tuning 455KHz, 10.7MHz, 144-173MHz, 450-470MHz, for narrow band receiver.
7. SWEEP GENERATOR: capable of tuning 450, 455 and 460KHz.

TEST CONNECTION



SEMICONDUCTORS

ITEM	PART NO.	TYPE
D101	09-306219	1S2472
D102	09-306219	1S2472
D103	09-306219	1S2472
D104	09-306219	1S2472
D105	09-306219	1S2472
D117	09-306020	1N34A
D118	09-306020	1N34A
D119	09-306020	1N34A
D120	09-306020	1N34A
D121	09-306020	1N34A
D122	09-306020	1N34A
D123	09-306020	1N34A
D124	09-306020	1N34A
D125	09-306020	1N34A
D126	09-306020	1N34A
D127	09-306020	1N34A
D128	09-306020	1N34A
D129	09-306020	1N34A
D131	09-306191	1S330
D132	09-306020	1N34A
D201	09-306240	MA320B
D202	09-306240	MA320B
D203	09-306020	1N34A
D213	09-306020	1N34A
D301	09-306020	1N34A
D302	09-306240	MA320B
D303	09-306240	MA320B
D501	09-306020	1N34A
D502	09-306020	1N34A
D503	09-306020	1N34A
D504	09-306020	1N34A
D505	09-306240	MA320B
D506	09-306020	1N34A
D507	09-306020	1N34A
D701	09-306180	BZ090
D702	09-306149	10D4
	09-306149	1N4004
D703	09-306149	10D4
	09-306149	1N4004
D704	09-306149	10D4
	09-306149	1N4004
IC101	09-308015	M5340P
IC102	09-308015	M5340P
IC201	09-308013	uPC555A
IC301	09-308013	uPC555A
IC501	09-308041	TA7061
IC502	09-308052	uPC577H
IC601	09-308043	TA7063
IC602	09-308053	uPC20C
Q101	09-302039	2SC372
	09-302039	2SC403
Q102	09-302039	2SC372
	09-302039	2SC403
Q103	09-302039	2SC372
	09-302039	2SC403
Q104	09-302039	2SC372
	09-302039	2SC403
Q105	09-302039	2SC372
	09-302039	2SC403
Q106	09-302039	2SC372
	09-302039	2SC403
Q107	09-302039	2SC372
	09-302039	2SC403
Q108	09-302039	2SC372
	09-302039	2SC403
Q109	09-302039	2SC372
	09-302039	2SC403
Q110	09-302039	2SC372
	09-302039	2SC403
Q111	09-304012	XA495
Q112	09-302039	2SC372
	09-302039	2SC403
Q201	09-302095	2SC784R
	09-302095	2SC535B
Q202	09-302095	2SC784R
	09-302095	2SC535B
Q203	09-302095	2SC784R
	09-302095	2SC535B
	09-302039	2SC372
	09-302039	2SC403
Q204	09-302095	2SC784R
	09-302095	2SC535B
	09-302039	2SC372
	09-302039	2SC403
Q301	09-302095	2SC784R
	09-302095	2SC535B
Q302	09-304012	XA495
Q304	09-304012	XA495
Q305	09-302095	2SC784R
	09-302095	2SC535B
Q306	09-302095	2SC784R
	09-302095	2SC535B
Q501	09-302012	2SC710
Q502	09-302012	2SC710
Q503	09-302012	2SC710
Q504	09-305040	FET3SK39P
Q601	09-302039	2SC372
	09-302039	2SC403
Q602	09-302039	2SC372
	09-302039	2SC403
Q603	09-302039	2SC372
	09-302039	2SC403
Q701	09-302155	2SC1383

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C110	77-337227	220uF 16V
C121	77-337106	10uF 16V
C522	77-337106	10uF 16V
C524	77-337476	47uF 16V
C525	77-337475	4.7uF 16V
C527	77-337476	47uF 16V
C603	77-337476	47uF 16V
C612	77-337476	47uF 16V
C618	77-337476	47uF 16V
C619	77-337107	100uF 16V
C620	77-337227	220uF 16V
C623	77-337477	470uF 16V
C631	77-337107	100uF 16V
C701	77-337476	47uF 16V
C702	77-337107	100uF 16V
C703	77-337108	1000uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R119	77-202470	470 ohms 1/2W
R608	77-202100	10 ohms 1/2W
R703	77-202100	10 ohms 1/2W
TH201	09-307072	TD5-A090
TH301	09-307072	TD5-A090
VR102	13-166039	Scan Rate
VR601	13-160087	Volume
VR602	13-166048	Squelch

COILS/TRANSFORMERS

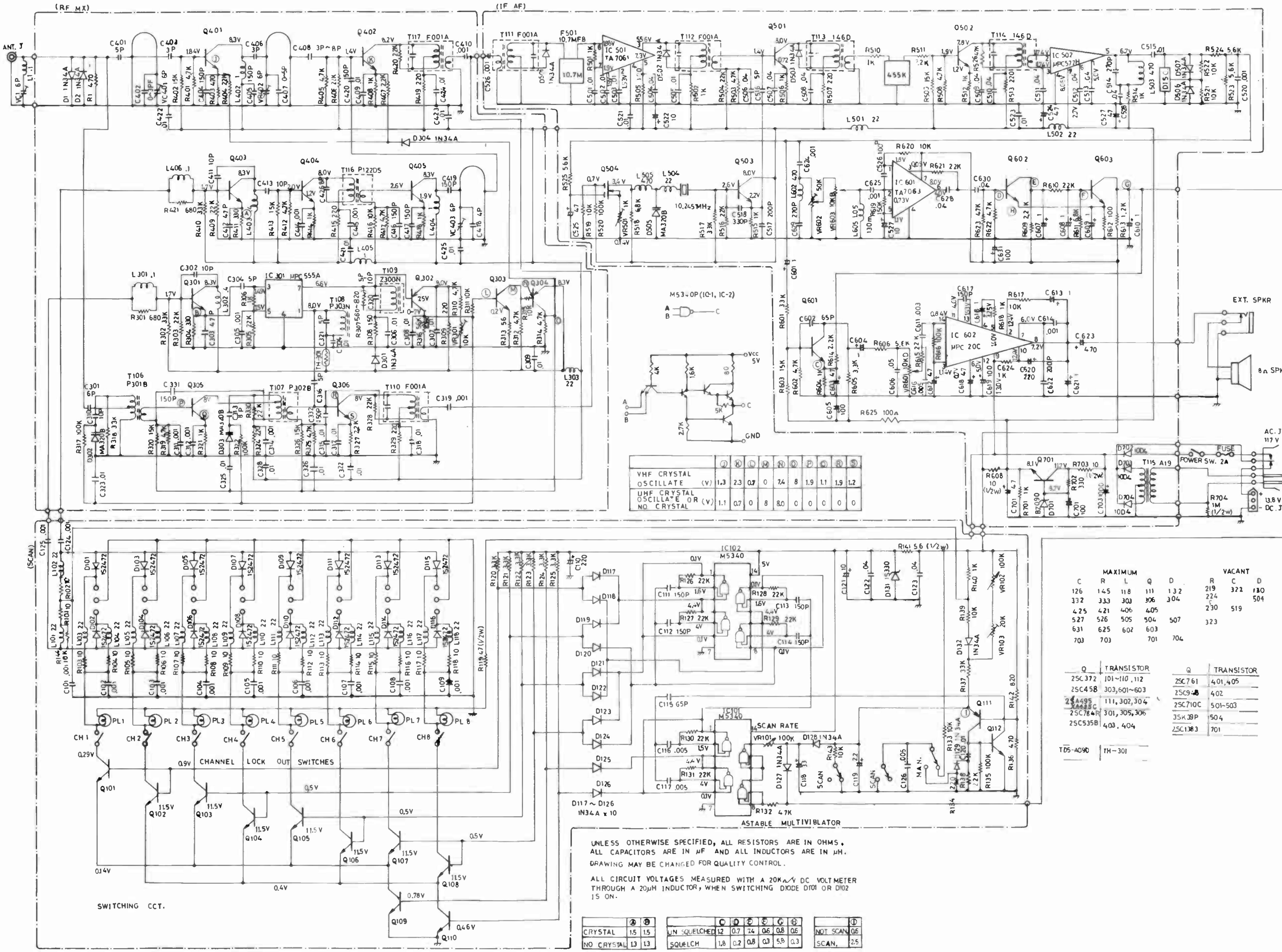
ITEM	PART NO.
L101	13-178151
L102	13-178151
L103	13-178151
L104	13-178151
L105	13-178151
L106	13-178151
L107	13-178151
L108	13-178151
L109	13-178151
L110	13-178151
L111	13-178151
L112	13-178151
L113	13-178151
L114	13-178151
L115	13-178151
L116	13-178151
L117	13-178151
L118	13-178151
L301	13-178154
L303	13-178153
	13-178151
L403	13-178153
L404	13-178129
L405	13-178129
L406	13-178154
L501	13-178151
L502	13-178151
L503	13-178099
L504	13-178151
L505	13-178099
L602	13-178099
L605	13-178161
T106	13-094068
T107	13-094069
T108	13-094070
T109	13-094071
T110	13-094047
T111	13-094047
T112	13-094047
T113	13-090282
T114	13-090282
T116	13-094004
T117	13-094047

MISCELLANEOUS

NAME	PART NO.
10.7MHz Filter	13-179021
455kHz Filter	13-179022
AC Power Cord	13-034049
DC Power Cord	13-034062
Speaker, 8 ohms	13-060073
Switch, 8 Section	13-188005
Switch, 2 Section	13-183164

CABINET PARTS

NAME	PART NO.
Case, Bottom	13-010209
Case, Top	13-010208
Front Plate	13-020520
Inside Cover	13-158285
Knob, 3 Used	13-110149



	Ⓙ	Ⓚ	Ⓛ	Ⓜ	Ⓝ	Ⓞ	Ⓟ	Ⓠ	Ⓡ	Ⓢ
VHF CRYSTAL OSCILLATE (V)	1.3	2.3	0.7	0	7.4	8	1.9	1.1	1.9	1.2
UHF CRYSTAL OSCILLATE OR NO CRYSTAL (V)	1.1	0.7	0	8	8.0	0	0	0	0	0

MAXIMUM

C	R	L	Q	D
126	145	118	111	132
332	333	303	306	304
425	421	406	405	
527	526	505	504	507
631	625	602	603	
703	703		701	704

VACANT

R	C	D
219	322	130
224		504
230	519	
323		

Q	TRANSISTOR
2SC372	101~110, 112
2SC458	303, 601~603
2SA495	111, 302, 304
2SC784R	301, 305, 306
2SC535B	403, 404

Q	TRANSISTOR
2SC761	401, 405
2SC948	402
2SC710C	501~503
3SK39P	504
2SC1383	701

TDS-A090	TH-301

UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS. ALL CAPACITORS ARE IN μF AND ALL INDUCTORS ARE IN μH.

DRAWING MAY BE CHANGED FOR QUALITY CONTROL.

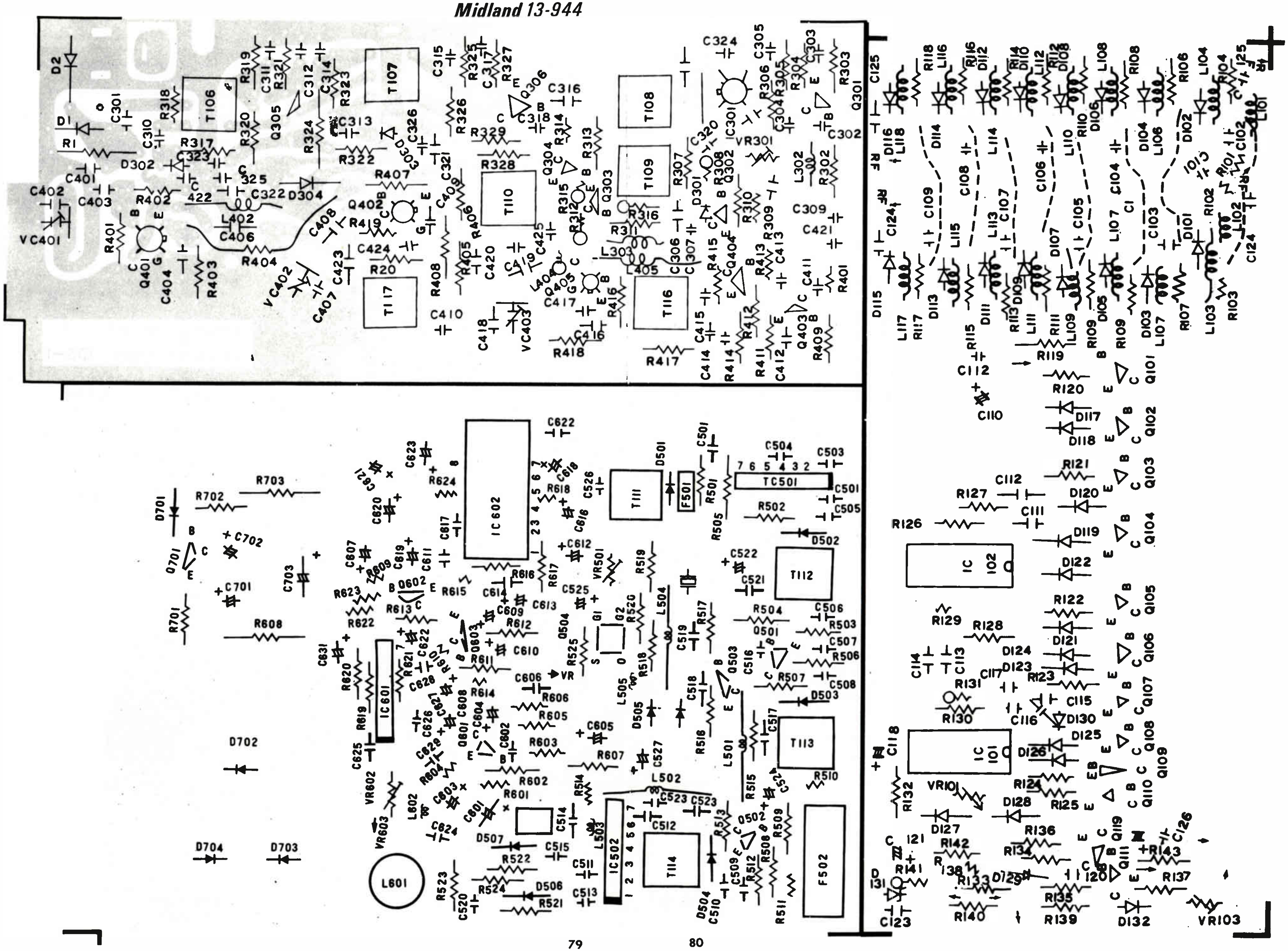
ALL CIRCUIT VOLTAGES MEASURED WITH A 20KΩ/V DC VOLTMETER THROUGH A 20μH INDUCTOR, WHEN SWITCHING DIODE D101 OR D102 IS ON.

	Ⓐ	Ⓑ
CRYSTAL	1.5	1.5
NO CRYSTAL	1.3	1.3

	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ
UN SQUELCHED	1.2	0.7	7.4	0.6	0.8	0.6
SQUELCH	1.8	0.2	0.8	0.3	5.8	0.3

	Ⓘ
NOT SCAN	0.6
SCAN.	2.5

Midland 13-944



79 80

Pages 81 - 89 Courtesy of RADIO SHACK

GENERAL ALIGNMENT

Test equipment required:

1. Oscilloscope
2. Slow sweep generator with variable marker (10.7 MHz)
3. VHF sweep generator with variable marker (140 ~ 180 MHz)
4. RF frequency counter (10 ~ 60 MHz)
5. AC V.T.V.M.
6. DC V.T.V.M.
7. 16 ohm dummy load

NOTE: *Use a non-metallic tool.*
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

IF SECTION ALIGNMENT

Step 1 : Connect the instruments as shown in Figure 2.

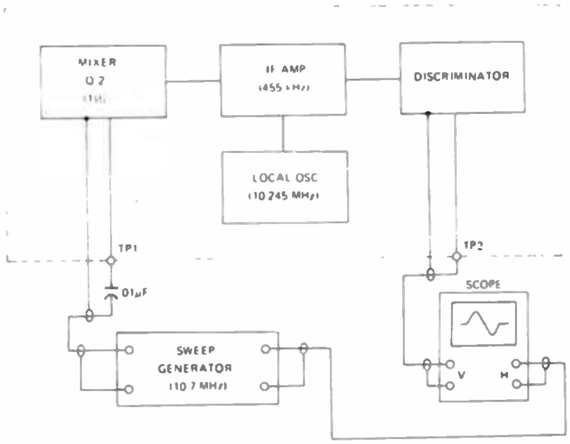


Figure 2. IF SECTION ALIGNMENT BLOCK DIAGRAM

Step 2 : Maintain sweep generator output at a low level to prevent overloading.

Step 3 : For best linearity, adjust IF Section T6, T7 so that the 455 kHz marker is in the center of the discriminator curve as shown in Figure 3.

Step 4 : Adjust T4 for maximum reading on the V.T.V.M.

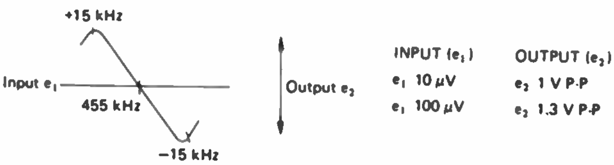


Figure 3. IF DISCRIMINATOR CURVE

NOTE: *Check to be sure 2nd Local Oscillator (10.245MHz) is operating.*

RF SECTION ALIGNMENT

Step 1 : Connect the instruments as shown in Figure 4.

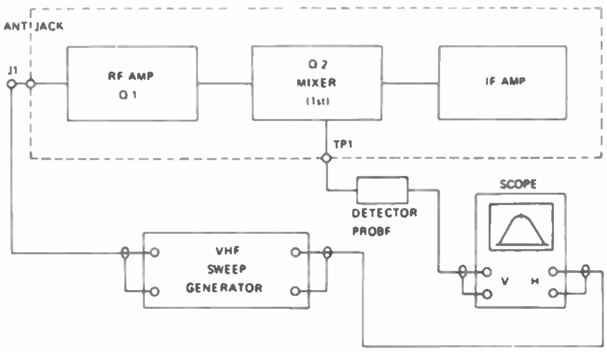


Figure 4. RF ALIGNMENT BLOCK DIAGRAM

RF CHARACTERISTIC

Step 2 : Adjust T1, T2, T3 and T5 of RF Section for maximum output and best curve symmetry as shown in Figure 5.

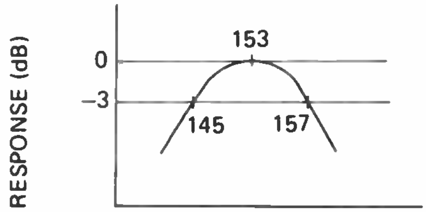


Figure 5

LOCAL OSCILLATOR ALIGNMENT

Step 1 : Insert all crystals in sockets.

Step 2 : Couple the frequency counter thru a pick-up coil to oscillator coil T5. Refer to Figure 6.

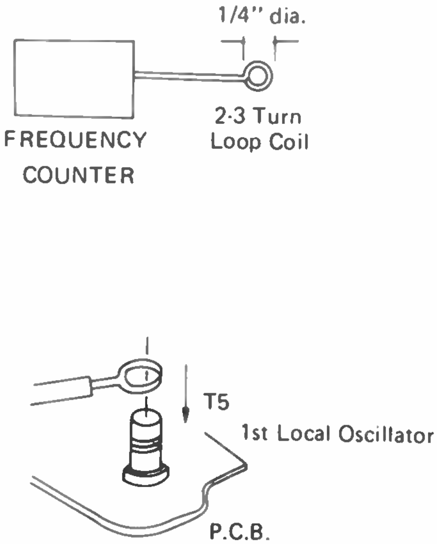


Figure 6. 1ST LOCAL OSCILLATOR

NOTE: *Crystal Frequency Calculation.*
The crystal frequencies are obtained by the following formula; Frequency (MHz) = (Fr – 10.7)/3.
Where Fr is the desired receive frequency, in MHz.

CHECK FREQUENCY OF THE SECOND LOCAL OSCILLATOR

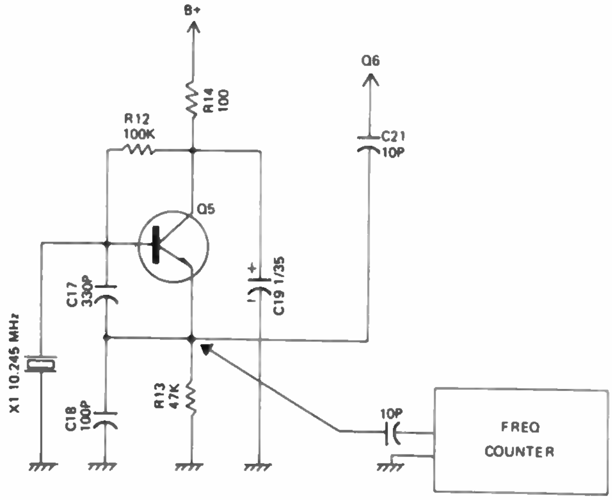


Figure 7. DIAGRAM

Step 1: Connect Frequency Counter through a 10 pf capacitor to Q5 emitter circuit.

Step 2: Read frequency on the Frequency Counter.
Normal: 10.245MHz ± 1kHz.

SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to antenna input and AC voltmeter to speaker terminals.

Step 2: Turn the SQUELCH control fully counterclockwise, and with the generator at minimum output and with no modulation, adjust the VOLUME control on the set for a 0 dB (0.755 volts) recording on the AC voltmeter.

Step 3: Increase the output of the signal generator to obtain a reading of +20 dB on the AC voltmeter. The generator output now equals the 20 dB quieting sensitivity.

Step 4: Tune the PRO-4 to the frequency of the signal generator (or vice versa).

Step 5: Turn VOLUME control fully clockwise. Set the signal generator for no modulation and minimum output.

Step 6: Adjust VOLUME control so that the output noise level shows 0 dB = 0.775 volt on the AC-V.T.V.M.

Step 7: Increase the output level of signal generator so that the signal output is 20 dB above the noise output level. The S.G. output is now equal to the 20 dB noise quieting figure of the PRO-4.

FREQ RANGE	CAPACITOR VALUE	SYMBOL
145 ~ 160 MHz	9 PF	C2, C3
150 ~ 165 MHz	8 PF	C2, C3
160 ~ 175 MHz	6 PF	C2, C3

FREQ RANGE	CAPACITOR VALUE	SYMBOL
145 ~ 160 MHz	5 PF	C6
150 ~ 165 MHz	4 PF	C6
160 ~ 175 MHz	3 PF	C6

Chart of frequency range vs. capacitor value

Figure 8

Step 1 : LOWER SIDE
If a frequency range of 145 ~ 160 MHz is desired, C2 and C3 capacitors should be changed from 8 pf to 9 pf and C6 from 4 pf to 5 pf.
UPPER SIDE
If a frequency range of 160 ~ 175 MHz is desired, C2 and C3 capacitors should be changed from 8 pf to 6 pf and C6 from 4 pf to 3 pf.

Step 2 : Go back and check RF Section Alignment.

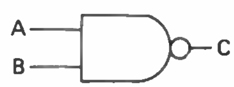
LOGIC CIRCUIT TRUTH TABLE

IC NO.	IC-2				IC-1			
PIN NO.	9	8	12	13	6	8	3	11
1	L	H	L	H	•L	H	H	H
2	H	L	L	H	H	•L	H	H
3	L	H	H	L	H	H	•L	H
4	H	L	H	L	H	H	H	•L

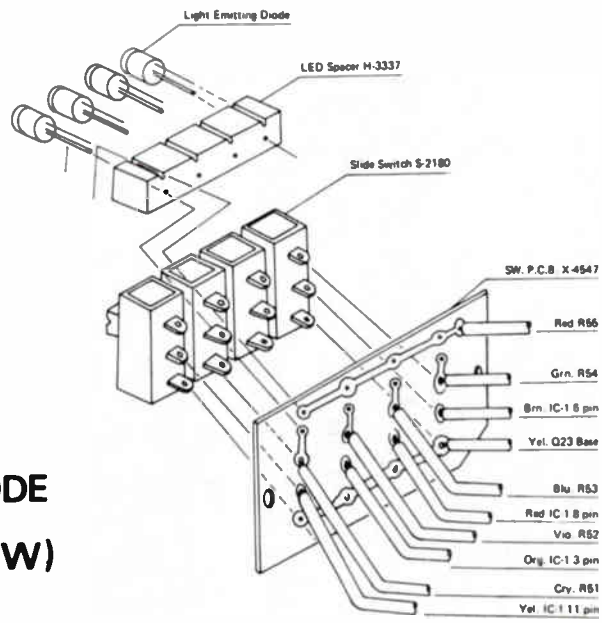
NOTE: *H=High level, L=Low level, •=L.E.D. "ON".*

TTL IC TRUTH TABLE

NAND CIRCUIT



A	B	C
H	H	L
H	L	H
L	H	H
L	L	H



LIGHT EMITTING DIODE PC BOARD (TOP VIEW)

SEMICONDUCTORS

ITEM	TYPE
D1	HV-80
D2	HV-80
D3	HV-80
D4	HV-80
D5	HV-80
D6	HV-80
D7	HV-80
D8	TLR102
D9	TLR102
D10	TLR102
D11	TLR102
D12	1N60
D13	HV-80
D14	HV-80
D15	1N60
IC1	SN74L03
IC2	SN74173N
Q1	2SC784(O)
Q2	2SC784(O)
Q3	2SC394(Y),(GR)
Q4	2SC371(O)
Q5	2SC371(O)
Q6	2SC371(O)
Q7	2SC371(O)
Q8	2SC371(O)
Q9	2SC371(O)
Q10	2SC371(O)
Q11	2SC371(O)
Q12	2SC373
Q13	2SC373
Q14	2SC373
Q15	2SC373
Q16	2SC373
Q17	2SC373
Q18	2SC735(Y)
Q19	2SA562(Y)
Q20	2SC373
Q21	2SC373
Q22	2SC373
Q23	2SC373

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C19		.1uF 35V
C23		.1uF 25V
C24		4.7uF 6.3V
C28		.1uF 35V
C32		.uF 35V
C44		.47uF 35V
C45		.47uF 10V
C46		.1uF 35V
C47		.1uF 35V
C48		47uF 10V
C50		47uF 10V
C51		47uF 10V
C55		47uF 10V
C56		6.8uF 6.3V
C57		6.8uF 6.3V
C59		47uF 10V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
VR1	P-1339	10K, Volume with Switch
VR2	P-1338	10K, Squelch

COILS/TRANSFORMERS

ITEM	PART NO.
L1	CA-2908
L2	CA-2909
T1	CA-4433
T2	CA-4434
T3	CA-4433
T4	CA-7246
T5	CA-4435
T6	CA-7247
T7	CA-7248

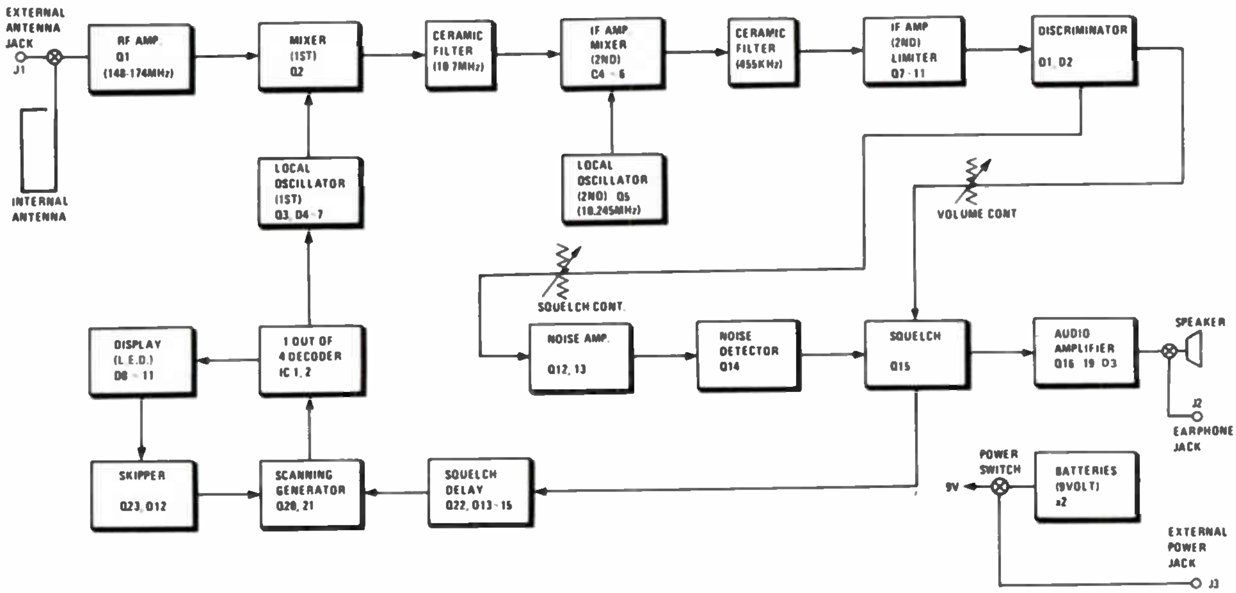
MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	Ceramic Filter (10.7MHz)	CA-2910
CF2	Ceramic Filter (455kHz)	CA-2910
SW1	Switch, Slide	S-2180
SW2	Switch, Slide	S-2180
SW3	Switch, Slide	S-2180
SW4	Switch, Slide	S-2180
SW5	Switch, Scan	2-2019
X1	Crystal (10.245MHz)	HC-18/u
	Crystal Socket	J-6213
	PCB, Main	X-4546

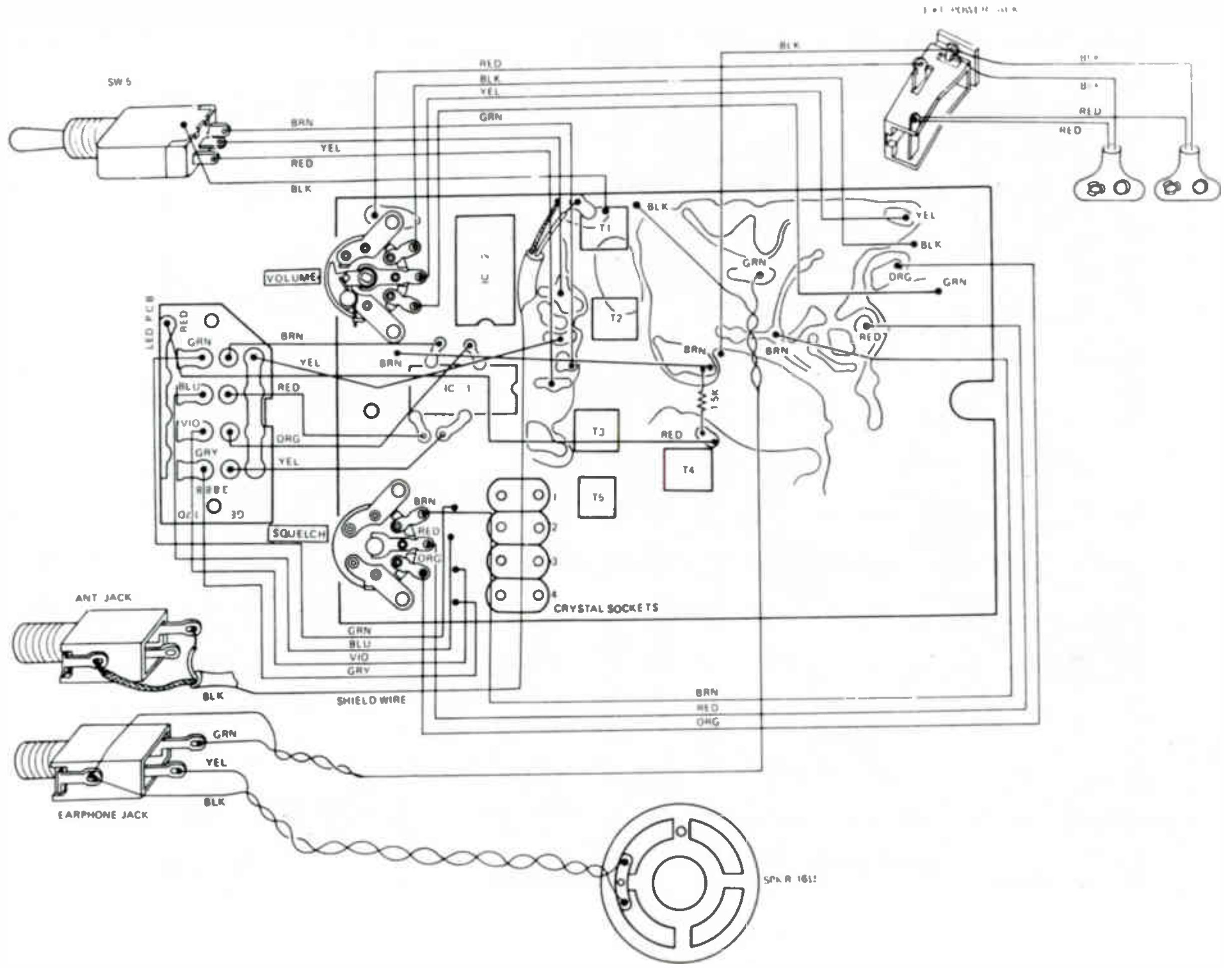
CABINET PARTS

NAME	PART NO.
Cabinet, Bottom	Z-1419
Cabinet, Top	Z-1418
Cover, Bottom	DB-0084
Cover, Crystal	DA-0097
Front, Panel	Z-1420
Knob, Squelch	K-1385
Knob, Volume	K-1385

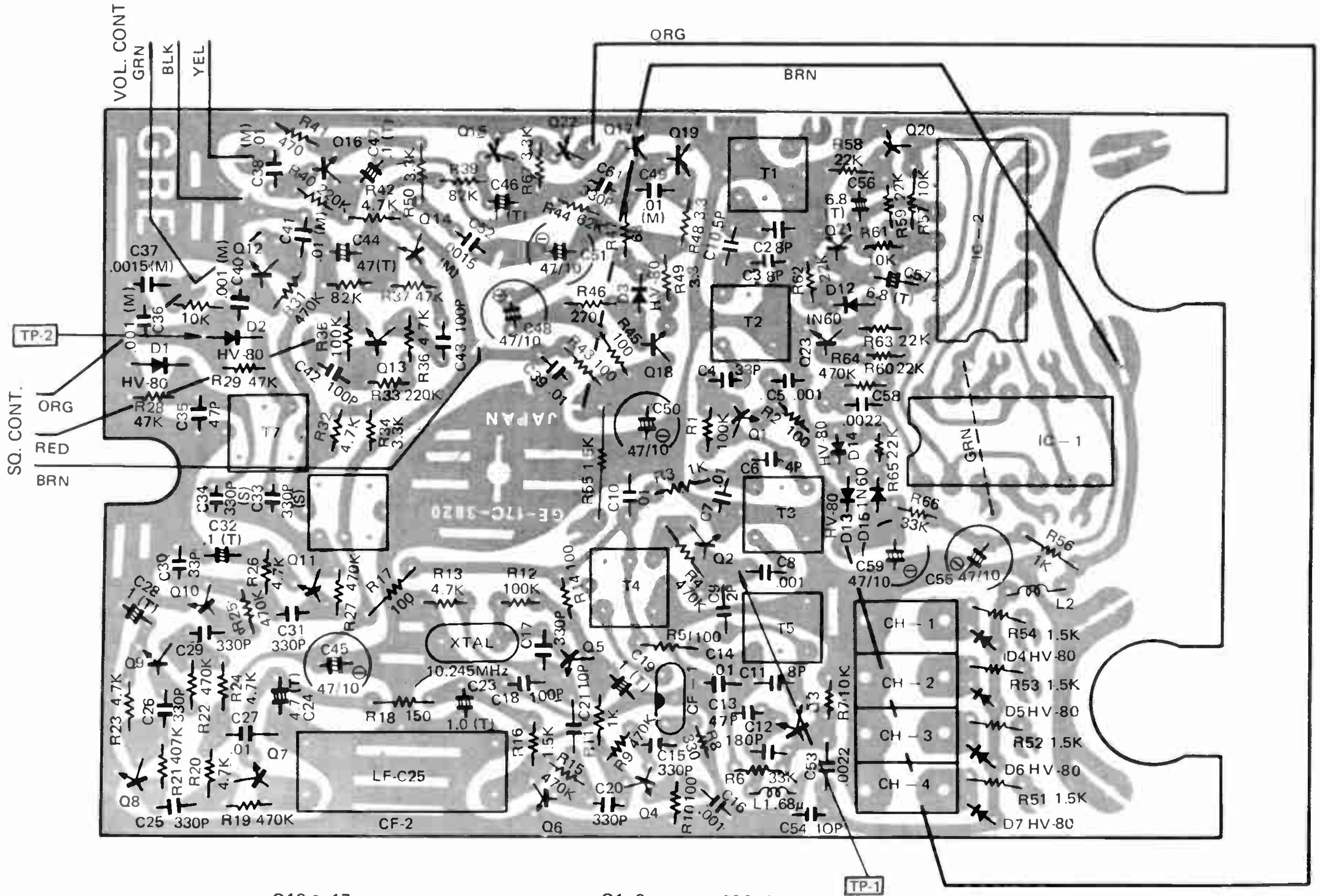
BLOCK DIAGRAM



WIRING DIAGRAM

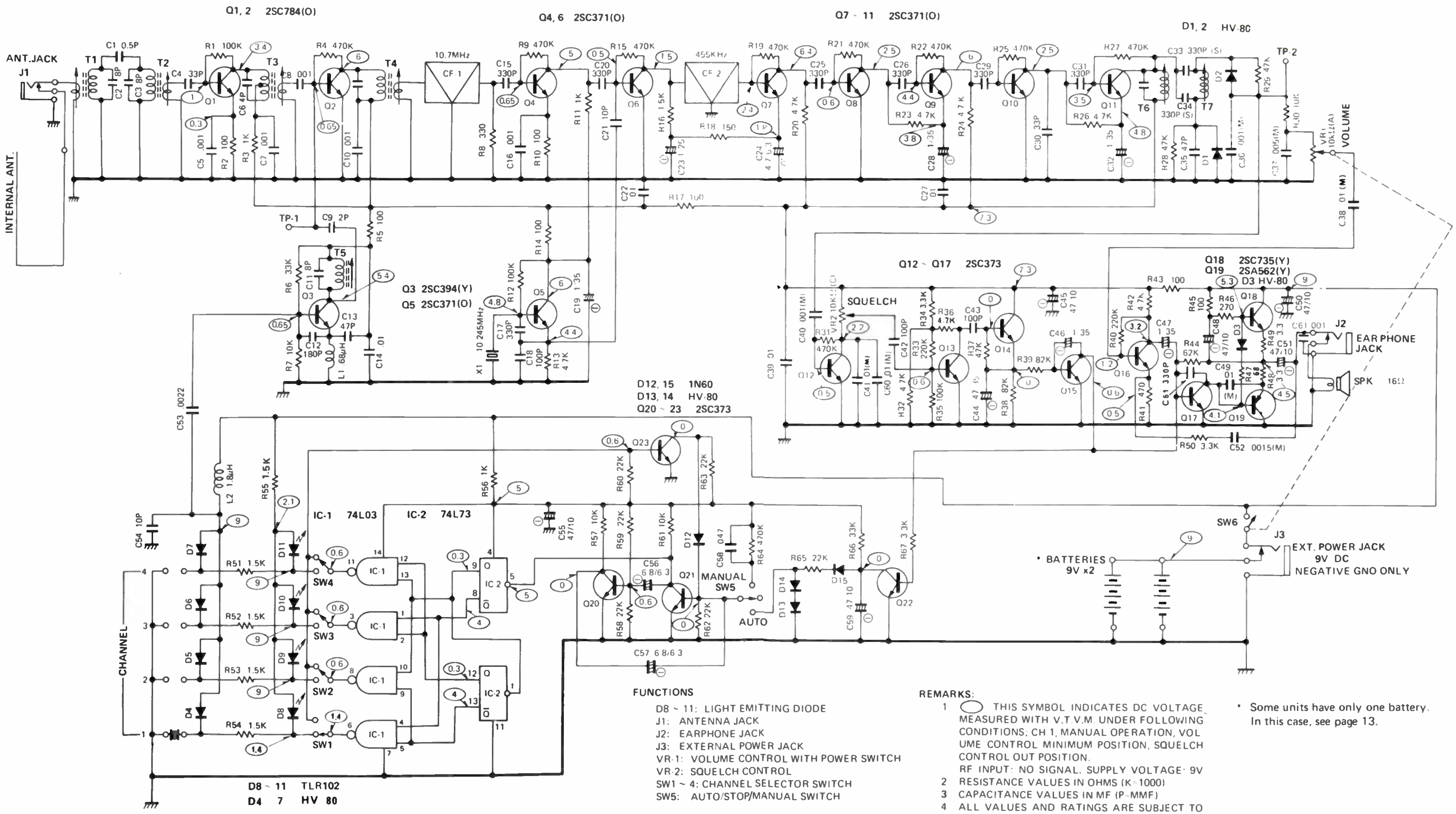


MAIN PC BOARD (BOTTOM VIEW)



Q12 ~ 17 Q20 ~ 23	2SC373	Q1, 2	2SC784 (O)
Q18	2SC735 (Y)	Q3	2SC394 (Y) or (GR)
Q19	2SA562 (Y)	Q4 ~ 11	2SC371 (O)

SCHEMATIC DIAGRAM



FUNCTIONS

D8 ~ 11: LIGHT EMITTING DIODE
J1: ANTENNA JACK
J2: EARPHONE JACK
J3: EXTERNAL POWER JACK
VR-1: VOLUME CONTROL WITH POWER SWITCH
VR-2: SQUELCH CONTROL
SW1 ~ 4: CHANNEL SELECTOR SWITCH
SW5: AUTO/STOP/MANUAL SWITCH

REMARKS:

1. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH V.T.V.M. UNDER FOLLOWING CONDITIONS: CH 1, MANUAL OPERATION, VOLUME CONTROL MINIMUM POSITION, SQUELCH CONTROL OUT POSITION.
   RF INPUT: NO SIGNAL. SUPPLY VOLTAGE: 9V
2. RESISTANCE VALUES IN OHMS (K=1000)
3. CAPACITANCE VALUES IN MF (P=MMF)
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

• Some units have only one battery. In this case, see page 13.

TROUBLE SHOOTING

Symptom	Possible Cause
1) When Light Emitting Diode (L.E.D.) does not light and no sound is audible. Power SW. : On VOLUME : Maximum Channel SW. : On	A) Defective/Low/Weak Battery. B) Defective On-Off Switch on VOLUME Control. C) Power Circuit disconnected or Short Circuit.
2) L.E.D. Lights but no sound. Channel SW. : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Defective Earphone Jack. B) Defective Speaker. C) Faulty Q16, 17, 18 and Q19 or Faulty Q16, 17, 18, 19 Circuit Component.
3) Sound but L.E.D. does not light. Channel SW. : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Faulty L.E.D. P.C. Board Assembly + B supply. B) Defective L.E.D. C) Faulty Channel Switch. D) Defective IC-1.
4) No Sound through Earphone.	A) Defective Earphone Jack. B) Defective Earphone.
5) Does not scan and SQUELCH does not operate.	A) Faulty Noise Amplifier or Faulty Noise Detector Circuit Component. B) Defective RF or IF Amplifier. C) Defective Low/Weak Battery.
6) Does not scan but SQUELCH operates normally.	A) Defective Auto/Manual Switch. B) One of Transistors Q20 to Q22 defective. C) Either IC-1 or IC-2 defective. D) One of Circuit component parts faulty.
7) Manual Selector does not operate.	A) Defective Auto/Manual Selector Switch. B) Either Q20 or Q21 defective. C) Either IC-1 or IC-2 defective. D) One of Circuit component parts faulty.
8) Skipper Circuit does not operate.	A) Faulty Transistor Q23 or Faulty Circuit component part.
9) Only scans channel 1,2 or channel 3,4.	A) Defective IC-2.
10) L.E.D. of one or two channels does not light when channel switch is on.	A) Defective IC-1. B) Defective Channel Switch. C) Defective L.E.D.
11) Noise can be heard but does not receive.	A) Wrong Crystal Channel or Faulty Crystal. B) Defective RF Amplifier Circuit. C) Defective IF Amplifier Circuit. D) Defective 1st or 2nd Local Oscillator Circuit. E) Weak Battery.
12) Mixed reception.	A) Crystal not set to proper receiving frequency.
13) Low sensitivity.	A) Weak Battery. B) Crystal frequency not covering the correct channel. C) Defective RF and IF Amplifiers. D) Retune front end higher or lower to obtain optimum sensitivity for the frequency change desired.

Pages 90 - 93 Courtesy of RADIO SHACK

MOBILE NOISE SUPPRESSION

Noise:

This receiver is very sensitive, and will pick up signals that are extremely weak. With this extreme sensitivity, you will find that the receiver will amplify weak signals, along with any noise that may be present.

When operating a receiver in a vehicle, you will find that the vehicle generates noise, and this noise can become very objectionable. Mobile operation will not be as quiet as base station operation, but steps can be taken that will greatly improve the noise situation.

Electrical System:

Generally speaking, noise can be generated by any device or connection that carries electrical current. Any device that generates a spark should also be suspected. Bypass any suspected wire to ground with a high quality coaxial capacitor.

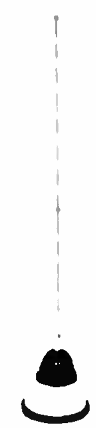
Probably the next most common source of noise is the generator, or alternator. This type of noise will sound like a musical whine, and will also vary with speed of the engine. Generator and alternator noise can usually be reduced by connecting a coaxial-type capacitor between the armature terminal and the metal case.

Ignition System:

The ignition system is the most common source of noise. This noise can be identified by the fact that its speed varies with the engine speed. Ignition noise will sounds like a series of "popping" sounds, while that engine is idling, and will speed up to a buzzing sound as engine speed is increased.

There are a number of things that can be done for this type of noise.

1. Use radio suppression type ignition wire, and resistor spark plugs.
2. Check high-tension leads etc. for leakage, cracks, etc. Replace any old wiring.
3. In extreme cases, kits may be purchased, that will completely shield all ignition wiring. This will provide maximum noise suppression.

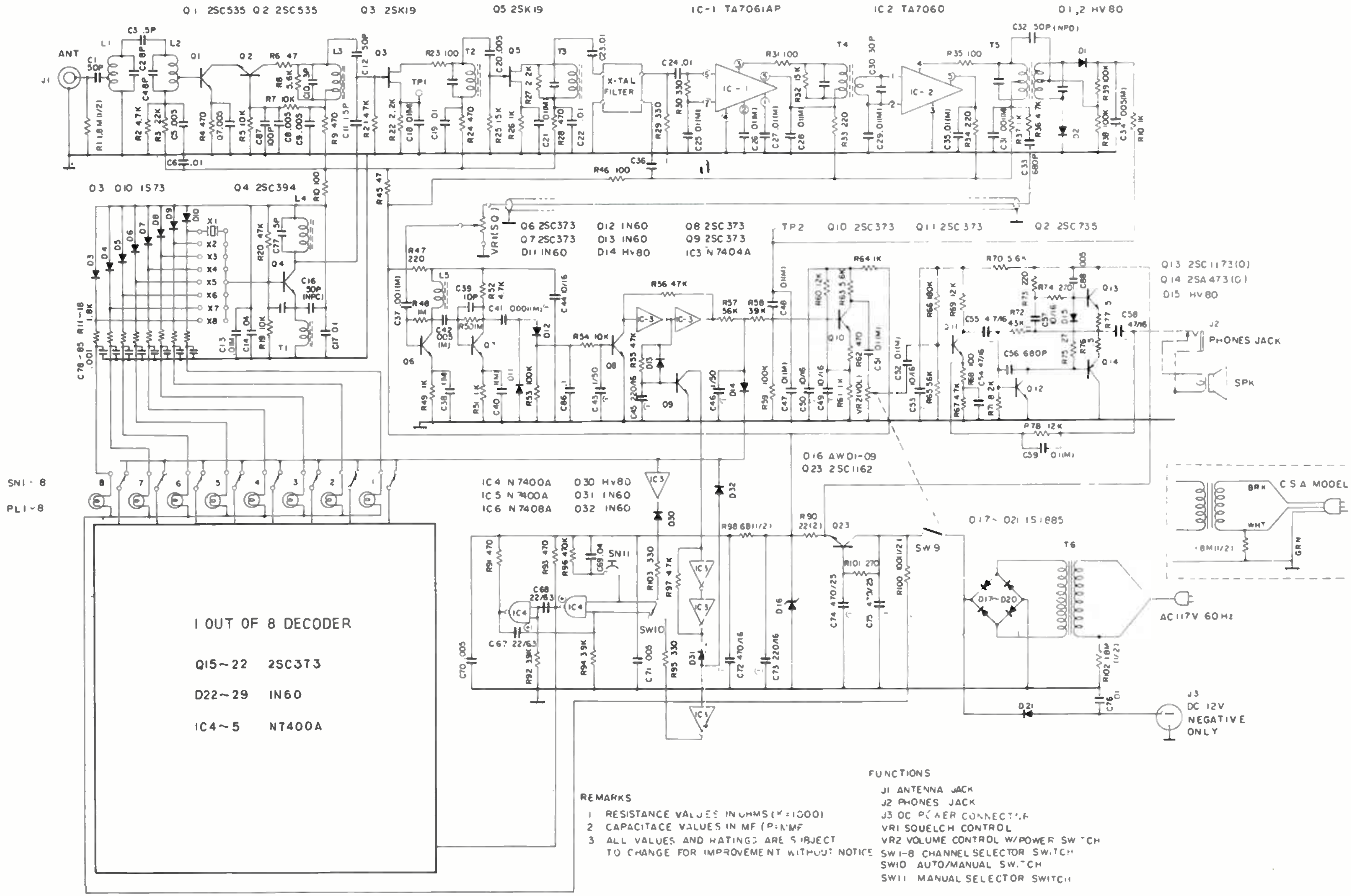


VHF Mobile Mount

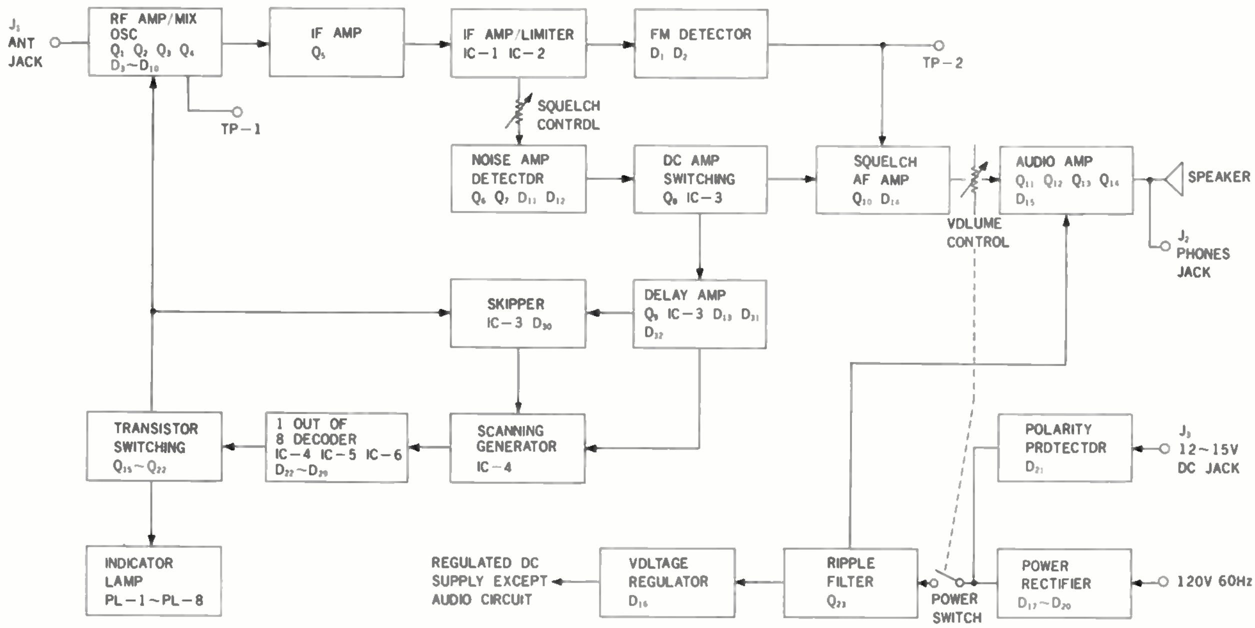
Complete with cutting chart. Cover 130-174 MHz. Snap grip mounting. Fits top or side of trunk lid. Omni-directional capability avoids fading as vehicle changes direction. Waterproof. Specific frequency adjustment. 17-7PH stainless steel whip.
17' cable.
20-177

CB/VHF Cowl-Mount

For mobile use. Chrome telescopic whip (50" extended, 28" collapsed), mounted on swivel base. Loaded weatherproof coil. 22' RG-58/U cable. Terminates with PL-259 and pin-type plug connectors.
21-930



SCHEMATIC DIAGRAM



BLOCK DIAGRAM

SEMICONDUCTOR COMPLEMENT

Q1, Q2	2SC535	Cascode RF Amp.
Q3	2SK19	Mixer (FET)
Q4	2SC394	Local OSC.
Q5	2SK19	IF Amp. (FET)
Q6, Q7	2SC373	Noise Amp.
Q8, Q9	2SC373	DC Amp. for Squelch
Q10, Q11	2SC373	Audio Amp.
Q12	2SC735	Audio Amp.
Q13	2SC1173	Audio Power Amp.
Q14	2SA473	Audio Power Amp.
Q15-Q22	2SC373	Switching
Q23	2SC1162	Ripple Filter
IC-1	TA7061AP	IF Amp.
IC-2	TA7060	IF Amp. and Limiter
IC-3	7404A	DC Amp.
IC-4 (½)	7400A	Scanning Generator
IC-4 (½)	7400A	Flip Flop
IC-5	7400A	Flip Flop
IC-6	7408A	MATRIX

Crystal Installation:

Due to the numerous frequencies or channels available, crystals are not installed by the factory, but by the seller or owner of the unit. Because of the accuracy required it is recommended that the crystals be ordered from Radio Shack Stores, specifying the model number of the set and the frequency you wish to receive. Allow 3 to 4 weeks delivery. Order crystals under Catalog No. 20-002. Crystal sockets are provided inside the front end of the unit.

Unscrew the plate at the top of the cabinet to insert the crystals. To receive a signal on a specific channel, insert proper crystal into the proper socket (Channel 1 = socket marked 1 on the circuit board, and so on). Refer to Figure 3.

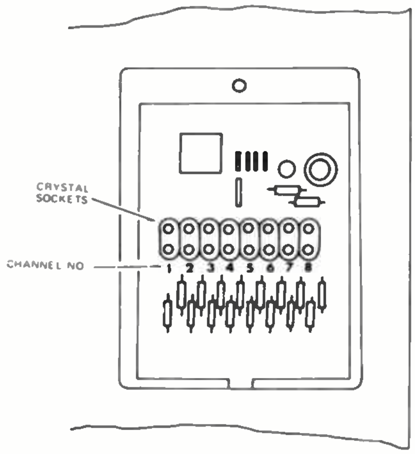


Figure 3

Crystals should be ordered from Radio Shack stating channel frequency and model number.

Radio Shack is not responsible for poor operation when crystals of another manufacturer are used.

Frequency Coverage: (IMPORTANT)

For maximum sensitivity, the channel frequencies specified should be within plus or minus 4 MHz of 153 MHz. However, for channel frequencies outside of this range, the unit will still operate, but with some loss in sensitivity. This 8 MHz range can be moved up, or down, in the band, in which case the RF section (Front End) of the receiver would have to be realigned.

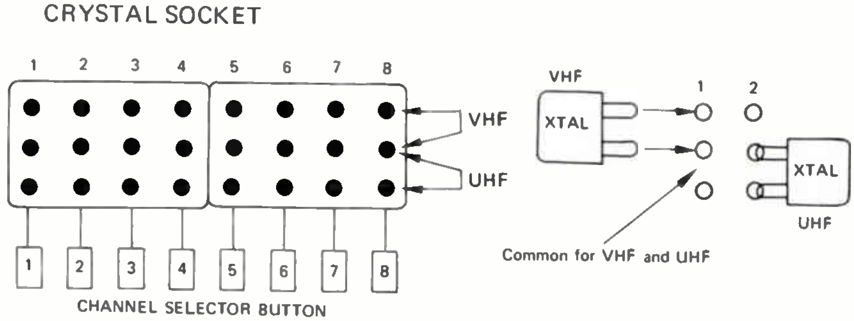
Special Instructions for 162.55 and 162.40 MHz Weather Channels:

The weather channel broadcasts a continuous 24 hour carrier signal. When set for automatic scan, your PRO-7A will stop and remain on weather channel until manually "stepped" to another frequency. To prevent automatic locking on the weather channel, deactivate the channel by releasing the push button control for the channel to the "out" position. Then, when you want the weather report, reactivate the channel with the push button control.

Note: In some areas more than one transmitter is operating and because they are so close, an alternate frequency, 162.40 MHz, may be used for weather. Check with your local Weather Bureau or local FCC office.

Pages 94 - 105 Courtesy of RADIO SHACK

CRYSTAL INSTALLATION



ALIGNMENT PREPARATION

See Figure 12 for Alignment Locations.

Test equipment required:

1. Oscilloscope
2. Slow sweep generator with variable marker (10.7 MHz)
3. VHF sweep generator with variable marker (140 ~ 180 MHz)
4. UHF sweep generator with variable marker (450 ~ 500 MHz)
5. RF frequency counter (10 ~ 60 MHz)
6. AC V.T.V.M.
7. DC V.T.V.M.
8. 8 ohm dummy load

NOTE: Use a non-metallic tool.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 3.

Step 2: Maintain sweep generator output at a low level to prevent overloading.

Step 3 Adjust IF Section T5, T6, T7 for best curve linearity and so the marker is in the center of the discriminator curve as shown in Figure 4.

Step 4: Adjust T5 for maximum reading on the V.T.V.M.

Step 5: Repeat steps 3 and 4.

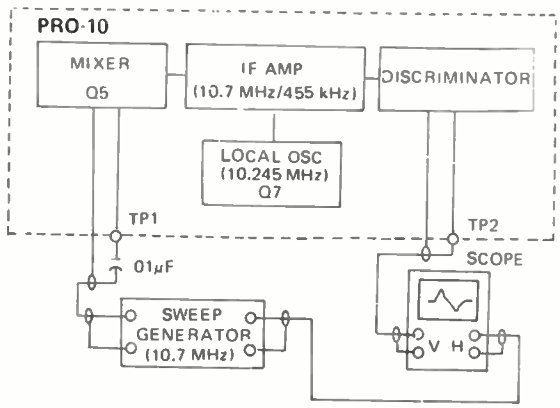


FIGURE 3. IF SECTION ALIGNMENT TEST EQPT. HOOK-UP

NOTE: Check to be sure Local Oscillator Q7 is operating (10.245MHz)

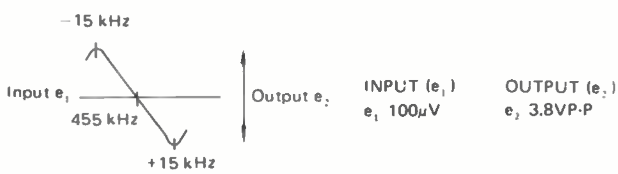


FIGURE 4. IF DISCRIMINATOR CURVE

VHF RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.

Step 2: Adjust T1, T2 and T3 of RF Section for maximum output and best curve symmetry as shown in Figure 6.

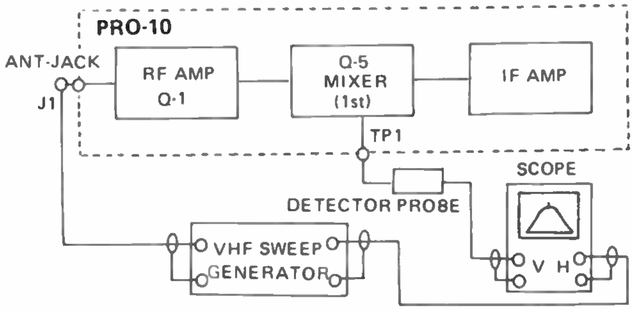


FIGURE 5. VHF RF ALIGNMENT TEST EQPT. HOOK-UP

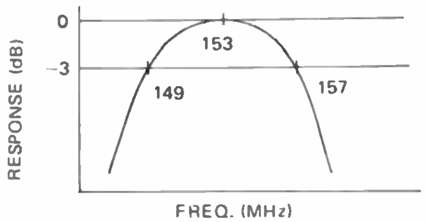


FIGURE 6. VHF RF CHARACTERISTIC CURVE

UHF FRONT-END SECTION ALIGNMENT

Step 1: Connect the UHF Sweep Generator and the Oscilloscope per Figure 7.

Step 2: Figure 8 shows a typical response curve of the tuner as originally aligned.

Step 3: Adjust TC1, TC2 and TC3 of UHF Front-End section, so that the 460 MHz marker is in the center peak of a symmetrical curve as shown in Figure 8.

Step 4: Figure 9 shows a typical example when the center peak frequency is adjusted to 470 MHz.

Step 5: When the Front-End is adjusted to per Figure 9, the acceptable sensitivity frequency range will be from about 450 MHz to 490 MHz.

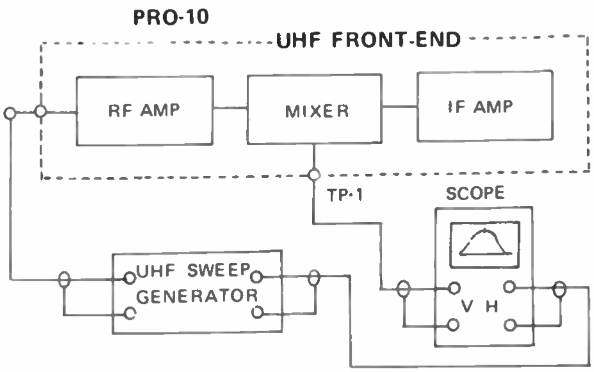


FIGURE 7.
UHF FRONT-END ALIGNMENT TEST EQPT. HOOK-UP

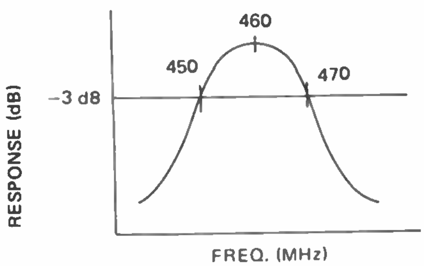


FIGURE 8.

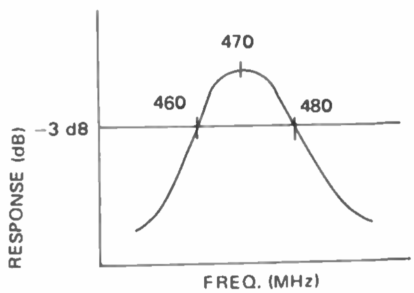


FIGURE 9.

NOTE: Keep output level from the Sweep Generator as low as possible (and still obtain usable output); then, use highest sensitivity setting of your scope to obtain the response curves shown above. It is very easy to swamp these circuits, so it is vital that your levels be kept at a minimum.

LOCAL OSCILLATOR FREQUENCY CHECK (Q7)

Step 1: Connect Frequency Counter through a 10 pf capacitor to Q7 emitter circuit.

Step 2: Read frequency on the Frequency Counter.
Normal: 10.245 MHz ± 1 kHz.

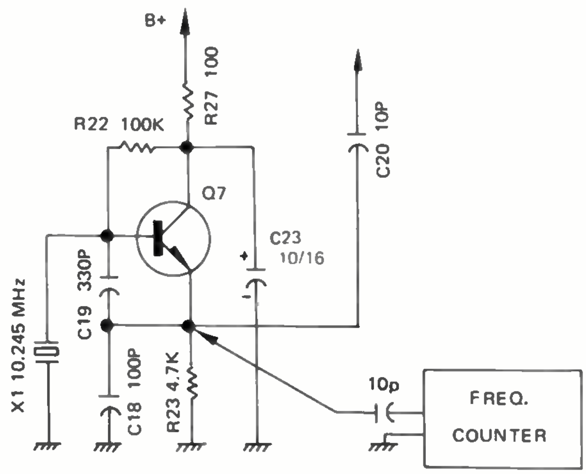


FIGURE 11. FREQUENCY CHECK DIAGRAM

LOCAL OSCILLATOR FREQUENCY CHECK (Q24 and Q25)

Step 1: Put all crystals in sockets. Refer to Figure 2.

Step 2: Couple the frequency counter thru a pick-up coil to oscillator coil T9 (VHF and UHF 2nd local oscillator 54.7MHz) or T10 (UHF) on the tuner front-end section. Refer to Figure 10.

Note: UHF 2nd local oscillator 54.7MHz is automatically works only when UHF local oscillator (Q25) is operating.

Step 3: Check that both circuits are oscillating properly.

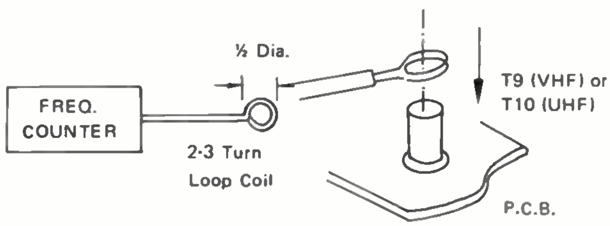


FIGURE 10. VHF/UHF LOCAL OSCILLATOR

AFC ALIGNMENT

Step 1: Plug in a UHF crystal.

Step 2: Connect a DC V.T.V.M. to pin 6 of IC 1(LM307N) and couple the frequency counter to T10 as shown Fig. 10.

Step 3: Connect a 1.5V battery in series with 10KΩ resistor between TP2 and ground. Minus side of battery must be grounded.

Step 4: Turn VR3 (1KΩ) fully clockwise. Voltage at pin 6 should rise to about 8 – 9 volts.

Step 5: Adjust TC1 (in emitter circuit of Q25) so that the oscillating frequency will change about 700 – 800 Hz.

Step 6: Remove the battery and 10KΩ resistor, then ground TP2 and adjust VR4 for 4 volts on the V.T.V.M.

Step 7: Remove ground from TP2 and continue to monitor if voltage remains at 4 volts. If not, re-adjust T7 slightly to obtain precisely 4 volts.
Recheck step 3 to 7 if necessary.

CRYSTAL FREQUENCY CALCULATION

The crystal frequencies are obtained by the following formula:

VHF Frequency (MHz) = (Fr - 10.7)/3
UHF Frequency (MHz) = (Fr - 44)/9

Where Fr is the desired receive frequency, in MHz.

VHF OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to antenna input and AC V.T.V.M. to speaker terminals.

Step 2: Turn the SQUELCH control fully counterclockwise, and with no modulation, adjust the VOLUME control on the set for a 0 dB (0.775 volts) reading on the AC voltmeter.

Step 3: Adjust T9 for maximum sensitivity.

Step 4: Adjust output of the generator to minimum and with no modulation, and set the VOLUME control to 0 dB (0.775 volts) reading on the AC voltmeter.

Step 5: Increase the output of the signal generator to obtain a reading of −20 dB on the AC V.T.V.M. The generator output now equals the 20 dB noise quieting sensitivity.

Step 6: Tune the PRO-10 to the frequency of the signal generator (or vice versa).

Step 7: Turn VOLUME control fully clockwise. Set the signal generator for no modulation and minimum output.

Step 8: Adjust VOLUME control so that the output noise level shows 0 dB = 0.775 volts on the AC-V.T.V.M.

Step 9: Increase the output level of signal generator so that the signal output is 20 dB below the noise output level. The S.G. output is now equal to the 20 dB noise quieting figure of the set.

UHF OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to UHF antenna input and AC V.T.V.M. to speaker terminals.

Step 2: Turn SQUELCH control fully counterclockwise and set up for reception at the band center, 460 MHz.

Step 3: Adjust TC4 and T4 on the UHF front-end and TC2, T4 and T10 on the main P.C.B. for maximum sensitivity.

Step 4: Adjust the output of the generator to minimum, with no modulation and set the VOLUME control for 0 dB on the V.T.V.M.

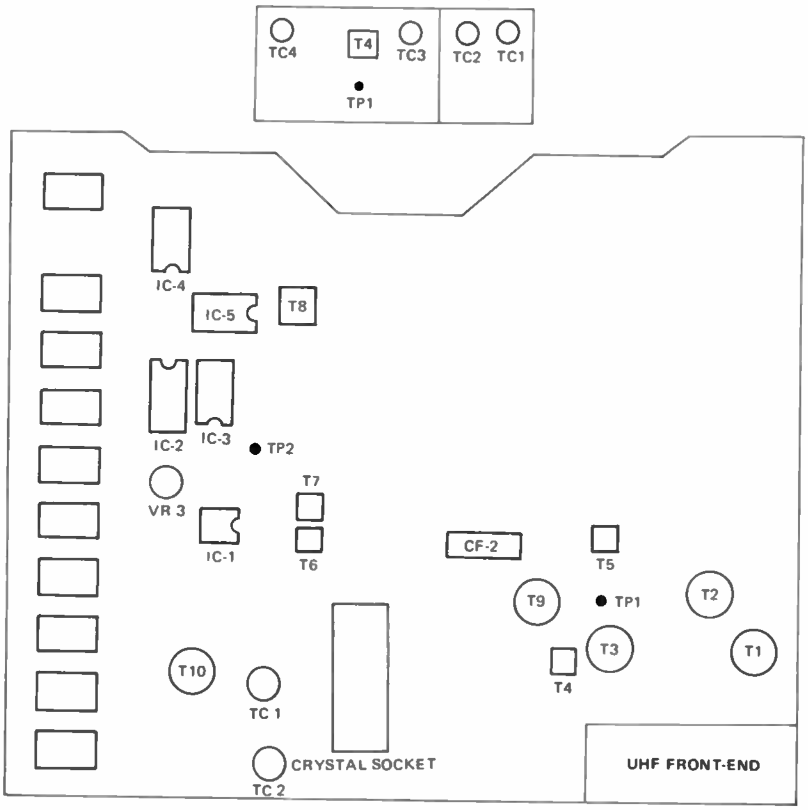
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC V.T.V.M. The generator output now equals the 20 dB noise quieting sensitivity.

NOTE 1:

As supplied by the factory, this unit is set up to provide maximum sensitivity in a range of 149–157 MHz for VHF and 455–465 MHz for UHF. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 150 MHz up to about 170 MHz for VHF and 450 to 470 for UHF. (Some UHF front-ends can be adjusted for reception even up to 500 MHz—don't promise a customer such coverage, but you can try). To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a bandwidth "window" of about 8/10 MHz total—adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). **Of course, be sure to use correct crystals.**

NOTE 2:

Alignment of T8 on Main P.C. Board is not required. It happens to be adjustable only because of ease of parts precurement and does not need any adjustment.



ALIGNMENT LOCATIONS

LOGIC CIRCUIT TRUTH TABLES

NOTE: H=High level, L=Low level, Marked • =Pilot lamp "on".

CH. NO. \ IC. NO. / PIN NO.	IC–1								IC–2		
	1	2	3	4	5	6	7	9	11	8	9
CHANNEL 1	•L	H	H	H	H	H	H	H	L	L	L
CHANNEL 2	H	•L	H	H	H	H	H	H	L	L	H
CHANNEL 3	H	H	•L	H	H	H	H	H	L	H	L
CHANNEL 4	H	H	H	•L	H	H	H	H	L	H	H
CHANNEL 5	H	H	H	H	•L	H	H	H	H	L	L
CHANNEL 6	H	H	H	H	H	•L	H	H	H	L	H
CHANNEL 7	H	H	H	H	H	H	•L	H	H	H	L
CHANNEL 8	H	H	H	H	H	H	H	•L	H	H	H

TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSE
1) When pilot lamp does not light and no sound is audible. Power SW : On Volume : Maximum Channel SW : On	A) Faulty line power cord. B) Defective power transformer. C) Defective power switch with volume control. D) Defective Q31, 32 and / or associated circuit components. E) Defective rectifier D30~33.
2) Channel lamp lights but no sound. Channel SW : On Volume : Maximum Squelch : Off (Minimum)	A) Defective speaker. B) Defective phone jack. C) Faulty Q18–23 or faulty Q18–23 circuit components. D) Defective crystal.
3) Sound but Channel lamp does not light.	A) Defective Channel switch or defective Channel lamp. B) Either IC-2 or IC-3 Defective. C) +B line for R114 defective.
4) Does not scan and Squelch does not operate.	A) Faulty noise Amplifier or faulty Noise Defector circuit component. B) Defective IC-5. C) Defective RF or IF Amplifier.
5) Does not scan but Squelch operates normally.	A) Defective Auto/Manual Swtich. B) One of IC's IC-2 to IC-5 defective. C) Defective Transistor Q33. D) One of circuit component parts faulty.
6) Skipper does not operate.	A) One of IC's IC-4 to IC-5 defective or circuit component parts faulty.
7) Manual selector does not operate.	A) Auto/Manual selector switch defective or poor contact. B) Defective Manual selector switch. C) One of IC's IC-2 to IC-5 defective. D) Defective Transistor Q33. E) One of Q13 Circuit component parts faulty.
8) No sound on VHF only but noise is audible.	A) Defective VHF RF Amplifier. B) Weak crystal. C) Faulty VHF front-end local oscillator circuit component.
9) No sound on VHF nor UHF	A) Defective IF Amplifier, mixer, or crystal filter. B) Defective Local oscillator (10.245 MHz) C) Faulty Transistor Q24 or faulty circuit component.

SEMICONDUCTORS

ITEM	TYPE NO.
(UHF FRONT END)	
Q1	2SC787A
Q2	2SC787A
Q3	2SC387A
(MAIN BOARD)	
D1	1N60
D2	1N60
D3	HV-80
D4	HV-80
D5	1N60
D6	1N60
D7	HV-80
D8	1S73
D9	HV-80
D10	HV-80
D11	HV-80
D12	HV-80
D13	HV-80
D14	HV-80
D15	HV-80
D16	HV-80
D17	HV-80
D18	HV-80
D19	HV-80
D20	HV-80
D21	HV-80
D22	HV-80
D23	HV-80
D24	HV-80
D25	MX-1
D26	1N60
D27	1N60
D28	1N60
D29	02Z10A
D30	1S1885
D31	1S1885
D32	1S1885
D33	1S1885
D34	1N60
D35	1N60
IC1	LM307N
IC2	SM47145N
IC3	N7493N
IC4	N7400N
IC5	N7400N
Q1	2SC535(B)
Q2	2SC535(B)
Q3	2SC372(0)
Q4	2SC372(0)
Q5	2SK19(Y)
Q6	2SC372(0)
Q7	2SC372(0)
Q8	2SC372(0)
Q9	2SC372(0)
Q10	2SC372(0)
Q11	2SC372(0)
Q12	2SC372(0)
Q13	2SC372(0)
Q14	2SC372(0)
Q15	2SC373, 2SC735
Q16	2SC373, 2SC735
Q17	2SC373, 2SC735
Q18	2SC373, 2SC735
Q19	2SC373, 2SC735
Q20	2SC373, 2SC735
Q21	2SC735(Y)
Q22	2SC1173(0)
Q23	2SA473(0)
Q24	2SC394, 2SC684
Q25	2SC394, 2SC684
Q26	2SC387A
Q27	2SC784(0)
Q28	2SC373, 2SC733
Q29	2SC373, 2SC733
Q30	2SK30A(0)
Q31	2SC789(0)
Q32	2SC1173(0)
Q33	2SC373, 2SC733
Q34	2SC373, 2SC733

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
(UHF FRONT END)		
TC1	ECV-1ZW06	Trimmer
TC2	ECV-1ZW06	Trimmer
TC3	ECV-1ZW06	Trimmer
TC4	ECV-1ZW06	Trimmer
(MAIN BOARD)		
C23		10uF 16V
C26		.1uF
C27		.1uF
C30		47uF 16V
C34		.1uF
C35		.1uF
C44		1uF 50V
C46		1uF 50V
C50		1uF 50V
C53		47uF 16V
C57		10uF 16V
C58		47uF 16V
C59		4.7uF 16V
C60		10uF 16V
C63		100uF 16V
C96		1000uF 10V
C97		220uF 16V
C98		220uF 16V
C100		220uF 25V
C101		220uF 25V
C102		1000uF 25V
C107		15uF 6.3V
C108		15uF 6.3V
C110		220uF 16V
TC1	P-1404	Trimmer
TC2	P-1405	Trimmer

COILS/TRANSFORMERS

ITEM	PART NO.
(UHF FRONT END)	
T4	R123155B
(MAIN BOARD)	
L2	CB-2190
L3	CB-2191
L4	CB-2191
L5	CB-2190
L7	CB-2189
T1	CA-4256
T2	CA-4256
T3	CA-4256
T5	CA-2999
T6	CA-2996
T7	CA-2997
T8	CA-2998
T9	CA-6827
T11	TA0416

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
(MAIN BOARD)		
VR1	P-1109	50K, Squelch
VR2	P-1070	50K, Volume
VR3	P-1043	1000 ohms, Gain

MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	Ceramic Filter(10.7MHz)	CA-3001
CF2	Ceramic Filter(455kHz)	CA-3000
CF3	Ceramic Filter(455kHz)	CA-3002
CF4	Ceramic Filter(455kHz)	CA-3002
SW1	Switch, Push	S-7153
SW2	Switch, Push	S-7153
SW3	Switch, Push	S-7153
SW4	Switch, Push	S-7153
SW5	Switch, Push	S-7153
SW6	Switch, Push	S-7153
SW7	Switch, Push	S-7153
SW8	Switch, Push	S-7153
SW9	Switch, Push	S-7152
SW10	Switch, Push	S-7153
X1	Crystal(10.245MHz)	
X2	Crystal(5.4MHz)	
	Cord, AC Power	W-1667
	Cord, DC Power with Fuseholder	W-1668
	Lamp	L-0263
	PCB, Main	X-4679
	UHF Front End	C-4466

CABINET PARTS

NAME	PART NO.
Cabinet	Z-1694
Crystal Compartment	DA-0110
Escutcheon	Z-1695
Front Panel	Z-1696
Jewel, Lamp (8 used)	H-2250
Knob, Push-button (Gry)	K-1495
Knob, Push-button (Red)	K-1496

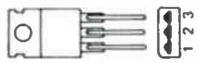
SEMICONDUCTOR LEAD IDENTIFICATION

(A): 2SC372 (O), 2SC373, 2SC387A, 2SC394 (Y), 2SC733
2SC735 (Y), 2SC784 (O), 2SK19 (Y)
(B): 2SA473 (O), 2SC1173
(C): 2SC535 (B), 2SC684
(D): 2SC787A
(E): 2SK30A (O)

(A)

(A)
1. Emitter
2. Collector
3. Base

(B)

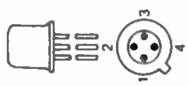


(B)
1. Base
2. Collector (Heat Sink)
3. Emitter

(C)

(C)
1. Emitter
2. Collector
3. Base

(D)

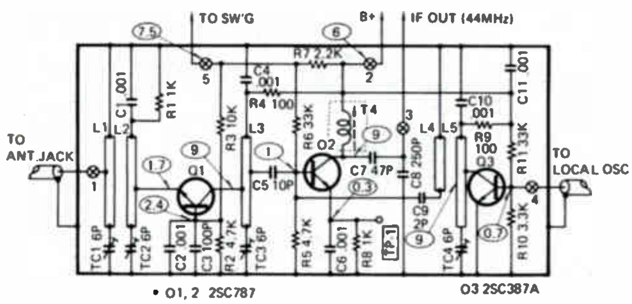


(D)
1. Emitter
2. Base
3. Collector
4. Case

(E)

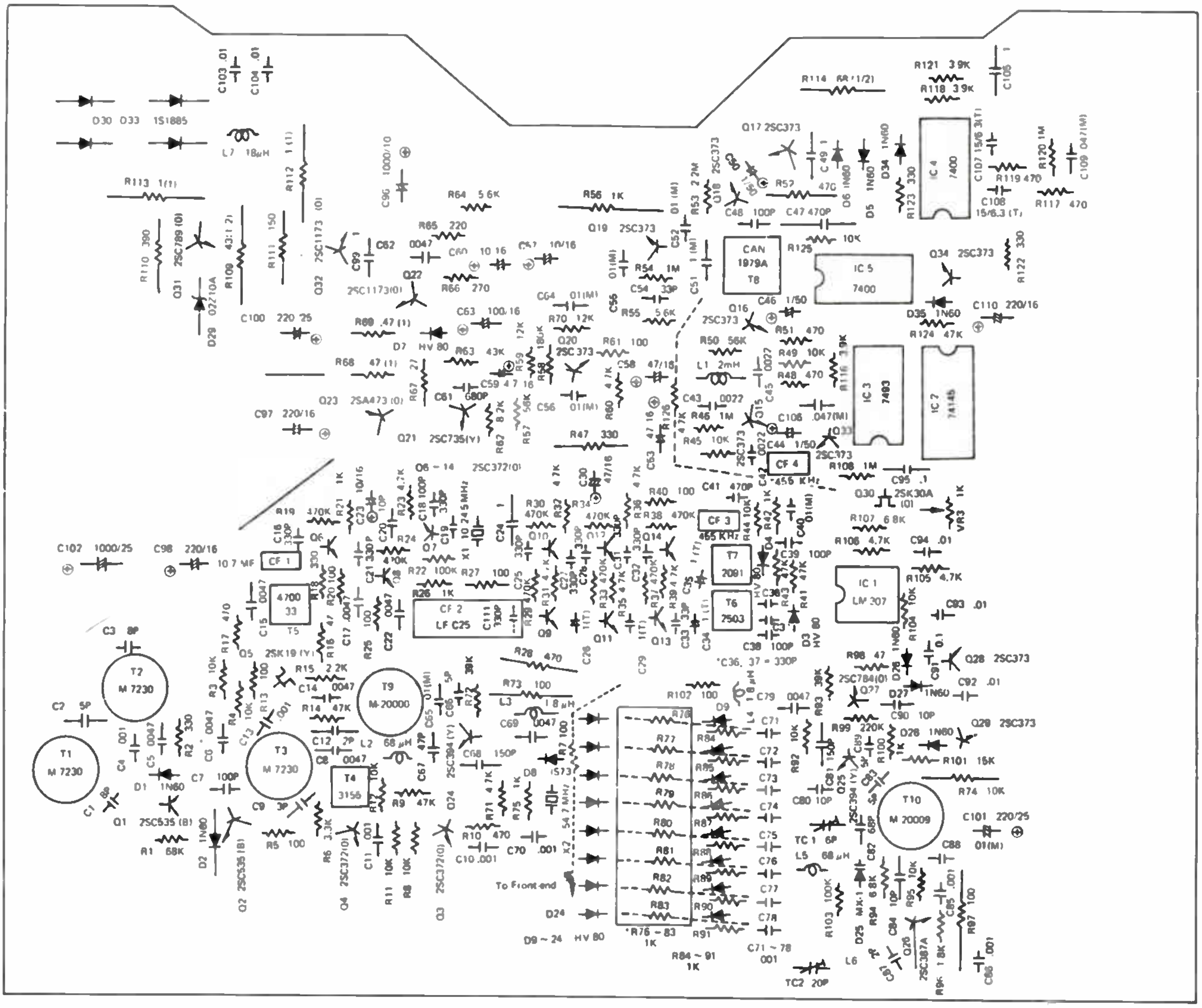
(E)
1. Source
2. Gate
3. Drain

SCHEMATIC DIAGRAM FOR UHF FRONT-END

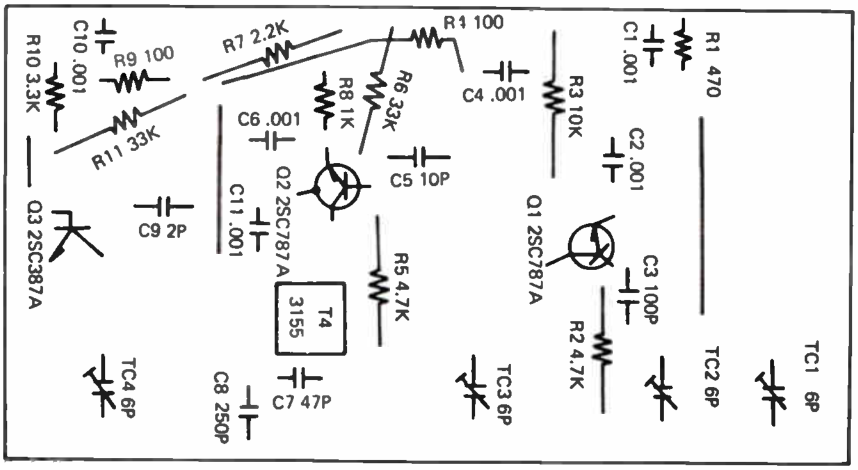


REMARKS
1. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF UHF OPERATED.
2. RESISTANCE VALUES IN OHMS (K=1000).
3. CAPACITANCE VALUES IN MF (P=MMF).
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

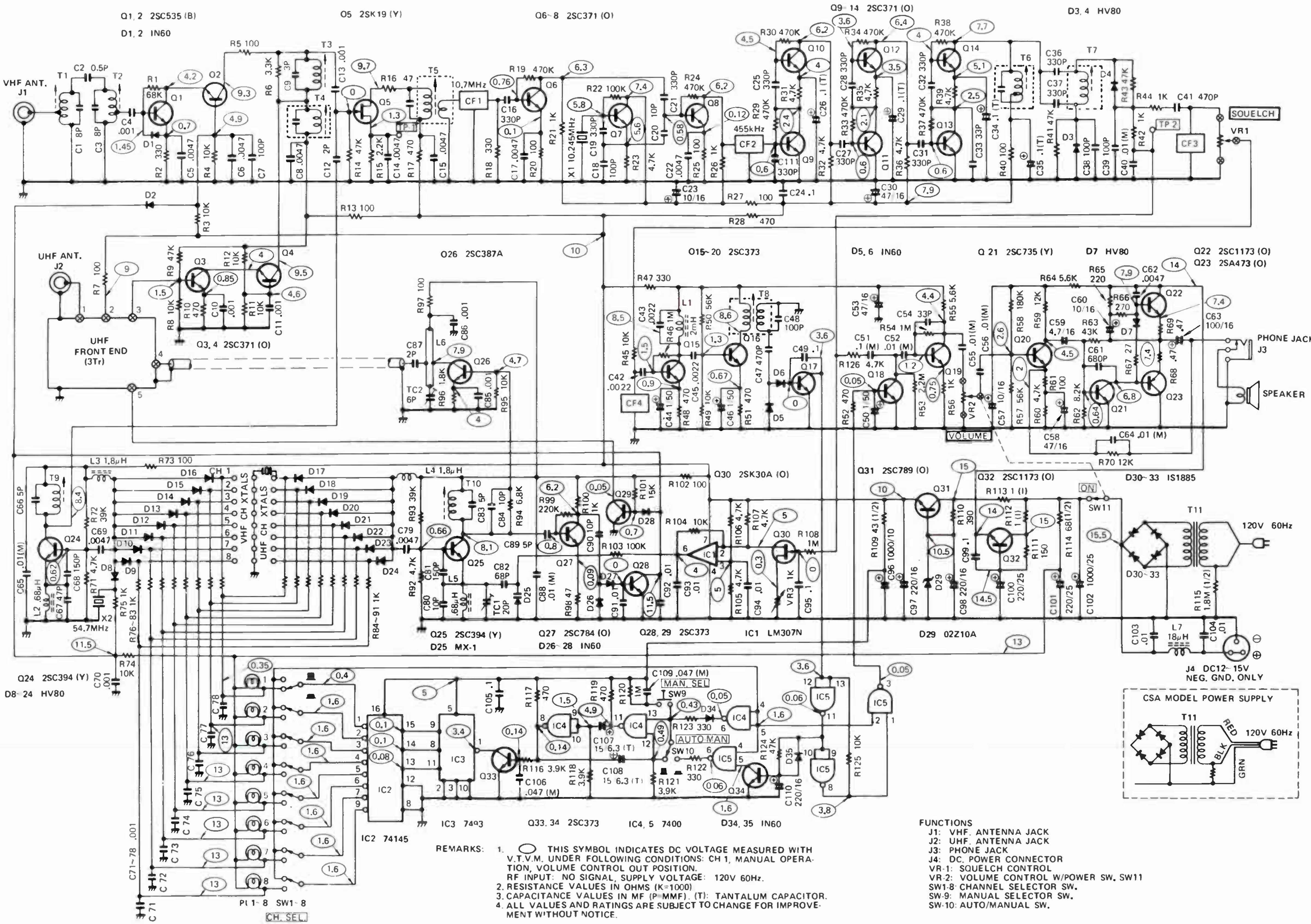
MAIN P.C. BOARD (BOTTOM VIEW)



UHF FRONT-END P.C. BOARD (BOTTOM VIEW)



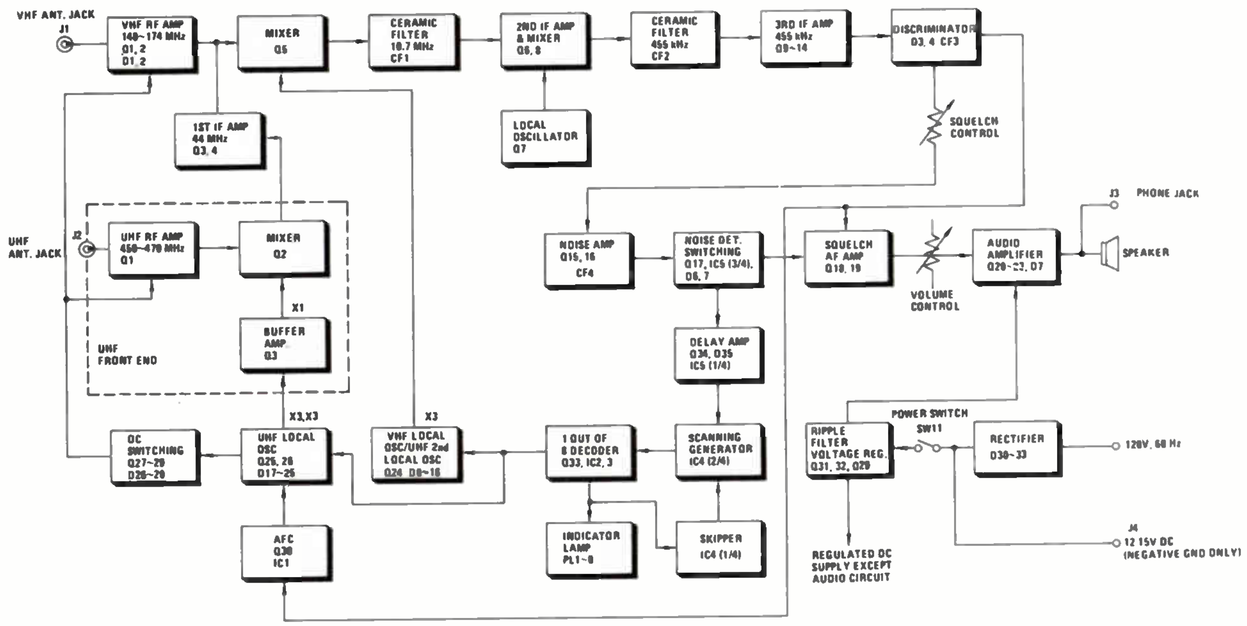
SCHEMATIC DIAGRAM



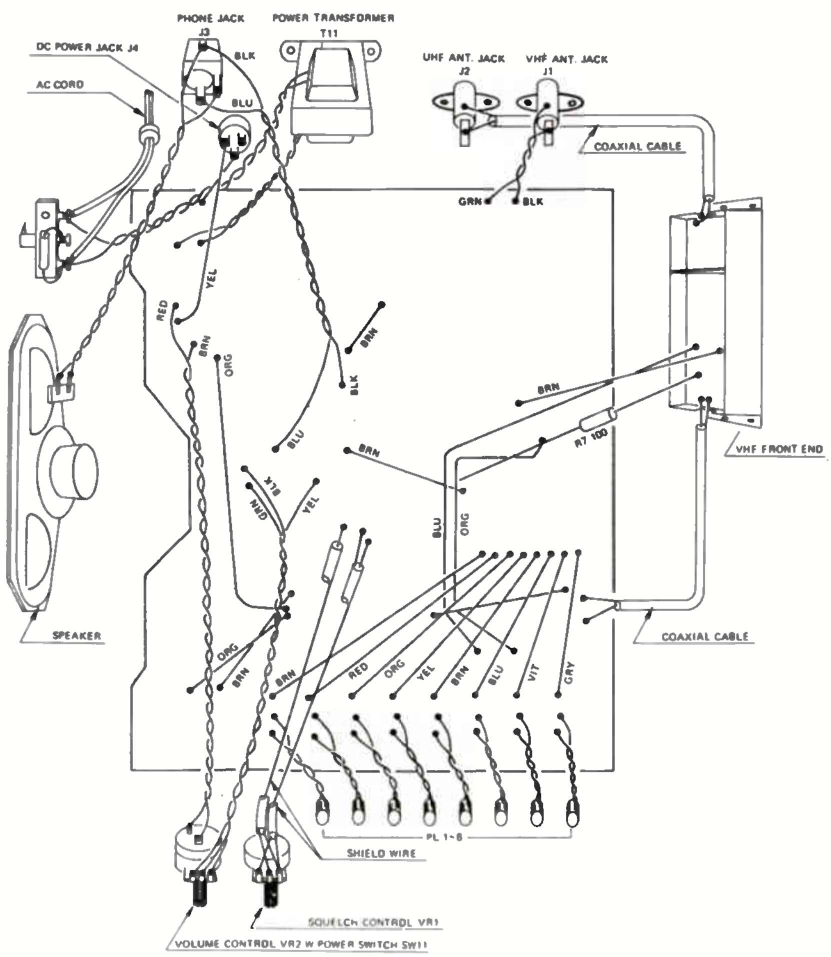
REMARKS: 1. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH V.T.V.M. UNDER FOLLOWING CONDITIONS: CH 1, MANUAL OPERATION, VOLUME CONTROL OUT POSITION.
RF INPUT: NO SIGNAL, SUPPLY VOLTAGE: 120V 60Hz.
2. RESISTANCE VALUES IN OHMS (K=1000)
3. CAPACITANCE VALUES IN MF (P=MMF). (T): TANTALUM CAPACITOR.
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

FUNCTIONS
J1: VHF. ANTENNA JACK
J2: UHF. ANTENNA JACK
J3: PHONE JACK
J4: DC. POWER CONNECTOR
VR-1: SQUELCH CONTROL
VR-2: VOLUME CONTROL W/POWER SW. SW11
SW1-8: CHANNEL SELECTOR SW.
SW-9: MANUAL SELECTOR SW.
SW-10: AUTO/MANUAL SW.

BLOCK DIAGRAM



WIRING DIAGRAM



Pages 106 - 109 Courtesy of RADIO SHACK

MOBILE NOISE SUPPRESSION

Noise:

This receiver is very sensitive, and will pick up signals that are extremely weak. With this extreme sensitivity, you will find that the receiver will amplify weak signals, along with any noise that may be present.

When operating a receiver in a vehicle, you will find that the vehicle generates noise, and this noise can become very objectionable. Mobile operation will not be as quiet as base station operation, but steps can be taken that will greatly improve the noise situation.

Electrical System:

Generally speaking, noise can be generated by any device or connection that carries electrical current. Any device that generates a spark should also be suspected. Bypass any suspected wire to ground with a high quality coaxial capacitor.

Probably the next most common source of noise is the generator, or alternator. This type of noise will sound like a musical whine, and will also vary with speed of the engine. Generator and alternator noise can usually be reduced by connecting a coaxial-type capacitor between the armature terminal and the metal case.

Ignition System:

The ignition system is the most common source of noise. This noise can be identified by the fact that its speed varies with the engine speed. Ignition noise will sound like a series of "popping" sounds, while that engine is idling, and will speed up to a buzzing sound as engine speed is increased.

There are a number of things that can be done for this type of noise.

1. Use radio suppression type ignition wire, and resistor spark plugs.
2. Check high-tension leads etc. for leakage, cracks, etc. Replace any old wiring.
3. In extreme cases, kits may be purchased, that will completely shield all ignition wiring. This will provide maximum noise suppression.

DUAL—BAND Cowl Mount

For mobile use. Chrome telescopic whip (55" extended, 36" collapsed), mounted on swivel base. Centerloaded weatherproof coil. With 5' RG-58/U coax cable. Terminates with pin-type plug.
20-016

Due to the numerous frequencies or channels available, crystals are not installed by the factory, but by the seller or owner of the unit. Because of the accuracy required it is recommended that the crystals be ordered from Radio Shack Stores, specifying the model number of the set and the frequency you wish to receive. Allow 3 to 4 weeks delivery. Order crystals under Catalog No. 20-002. Crystal sockets are provided inside the front end of the unit. To instal crystals remove the crystal access door on the top of the receiver. Each of the eight channels may be used for either the VHF Lo or VHF Hi band as desired.

For example, if channel 1 is to be used for VHF Hi and channel 2 for VHF Lo, insert the VHF Hi crystal (for the desired frequency in the VHF Hi band) into the crystal socket 1 as sketch (A) and the VHF Lo crystal (for the desired frequency in the VHF Lo band) into the crystal socket 2 as sketch (B) (See Figure 3)

Your scanner can cover a total of 8 channels in each of VHF Hi and Lo. However the maximum combination that can be active is eight since only 8 of the 16 crystals can be connected at one time.

Sketch

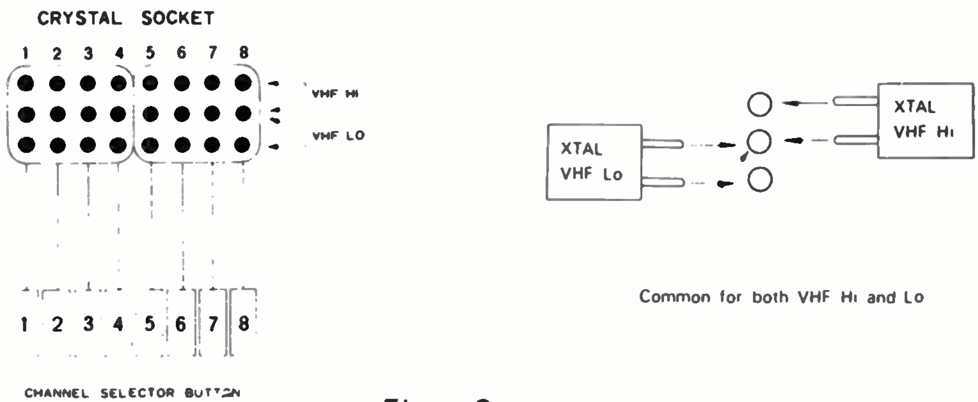


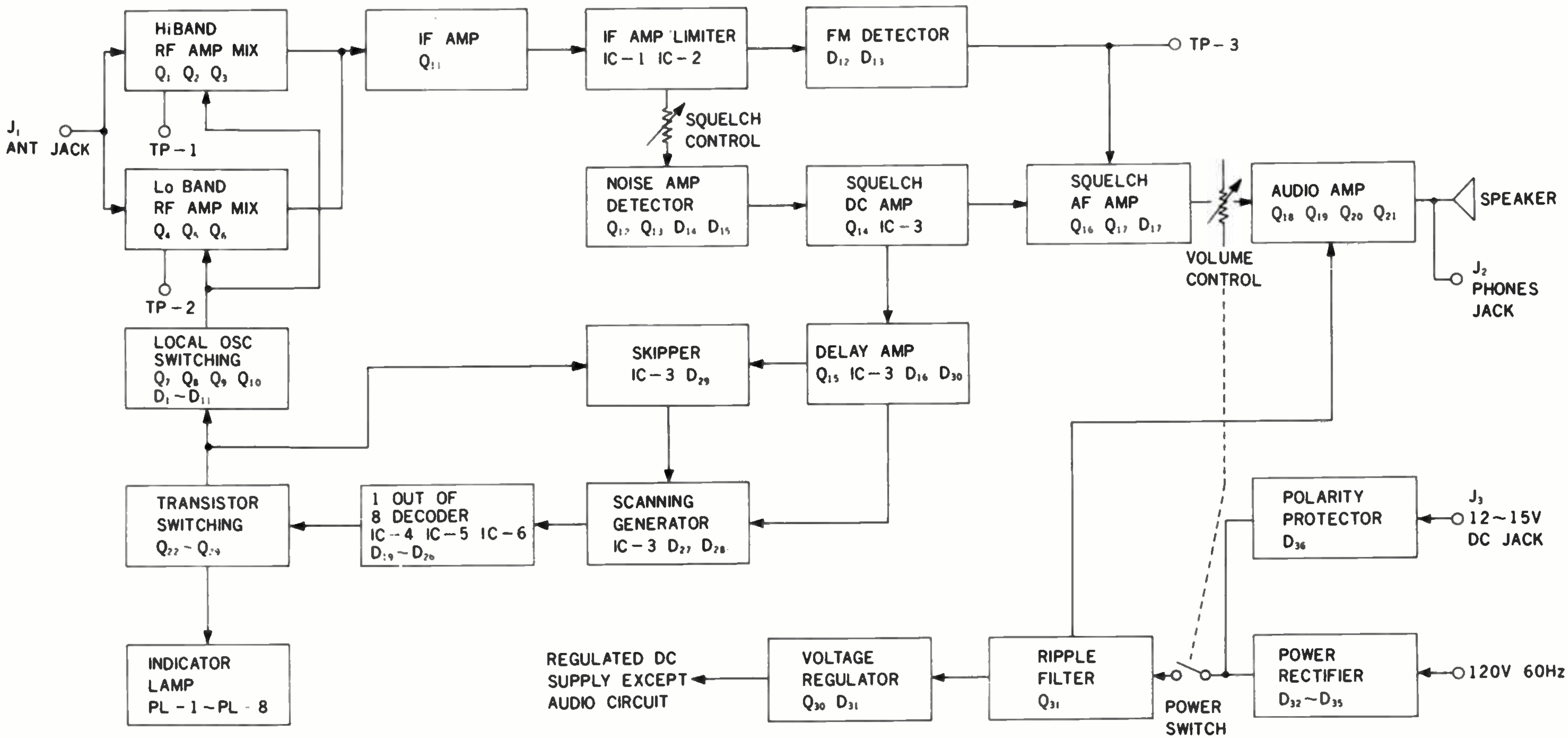
Figure 3

Crystals should be ordered from Radio Shack stating channel frequency and model number.

Radio Shack is not responsible for poor operation when crystals of another manufacturer are used.

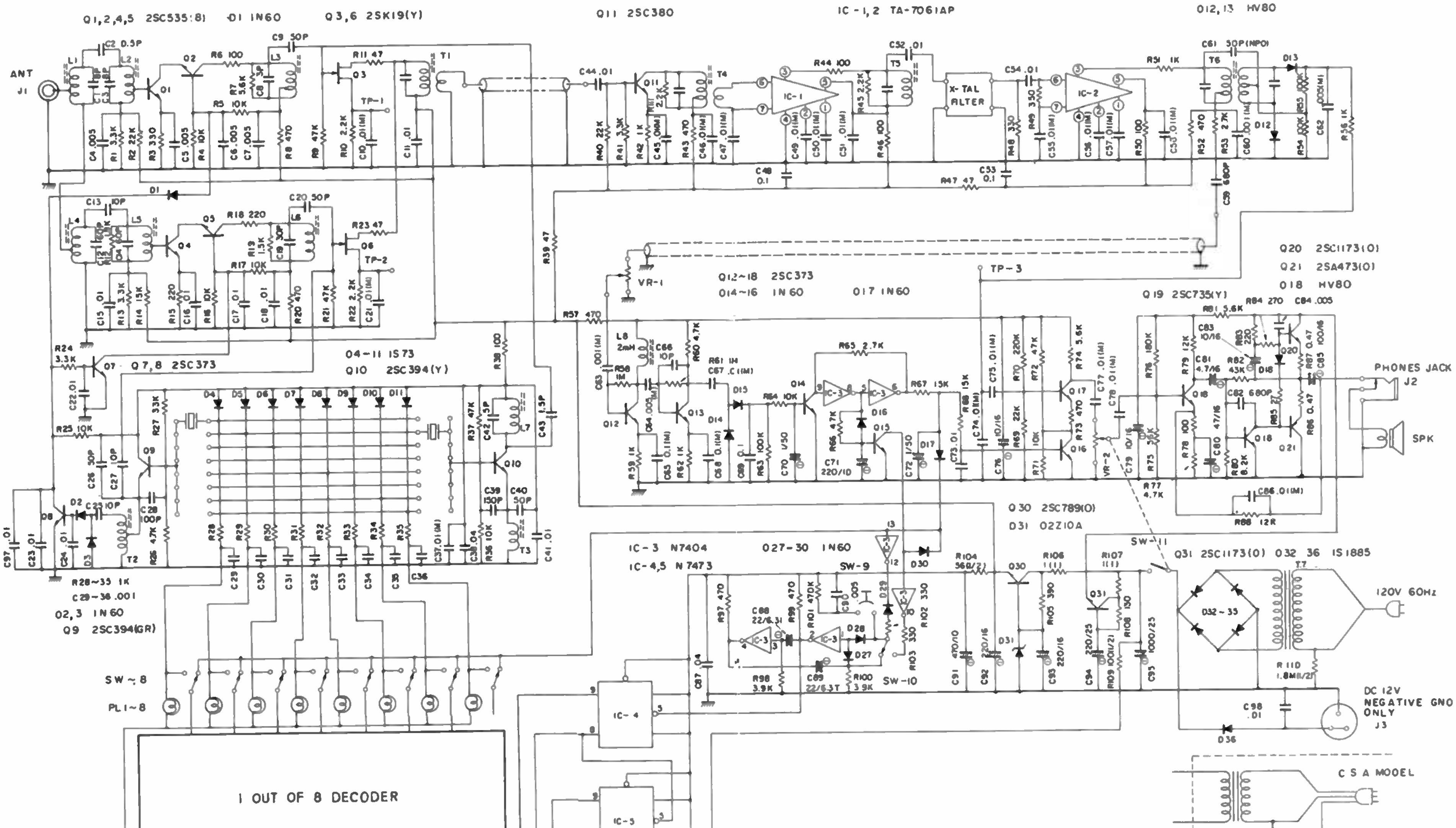
SEMICONDUCTOR COMPLEMENT

Q1, 2	2SC535	Cascode RF Amplifier
Q3	2SK19	Mixer (FET)
Q4, 5	2SC535	Cascode RF Amplifier
Q6	2SK19	Mixer (FET)
Q7, 8	2SC373	Switching
Q9	2SC394	Local Oscillator (Lo Band)
Q10	2SC394	Local Cscillator (Hi Band)
Q11	2SC380	IF Amplifier
Q12, 13	2SC373	Noise Amplifier
Q14, 15, 16	2SC373	DC Amplifier & Squelch
Q17, 18	2SC 373	Audio Amplifier
Q19	2SC735	Audio Amplifier
Q20	2SC1173	Audio Power Amplifier
Q21	2SA473	Audio Power Amplifier
Q22-29	2SC373	Switching
Q30	2SC789	DC Regulator
Q31	2SC1173	Ripple Filter
IC1, 2	TA7061AP	IF Amplifier & Limiter
IC3	N7404A	DC Amplifier & Scanning Generator
IC4, 5	N7473A	Flip Flop
IC6	N7408A	Matrix



HiBAND RF AMP MIX Q_1 Q_2 Q_3
IF AMP Q_{11}
IF AMP LIMITER IC-1 IC-2
FM DETECTOR D_{12} D_{13}
TP-3
J_1 ANT JACK
TP-1
SQUELCH CONTROL
Lo BAND RF AMP MIX Q_4 Q_5 Q_6
NOISE AMP DETECTOR Q_{12} Q_{13} D_{14} D_{15}
SQUELCH DC AMP Q_{14} IC-3
SQUELCH AF AMP Q_{16} Q_{17} D_{17}
AUDIO AMP Q_{18} Q_{19} Q_{20} Q_{21}
SPEAKER
VOLUME CONTROL
J_2 PHONES JACK
TP-2
LOCAL OSC SWITCHING Q_7 Q_8 Q_9 Q_{10} $D_1 \sim D_{11}$
SKIPPER IC-3 D_{29}
DELAY AMP Q_{15} IC-3 D_{16} D_{30}
TRANSISTOR SWITCHING $Q_{22} \sim Q_{29}$
1 OUT OF 8 DECODER IC-4 IC-5 IC-6 $D_{19} \sim D_{26}$
SCANNING GENERATOR IC-3 D_{27} D_{28}
POLARITY PROTECTOR D_{36}
J_3 12~15V DC JACK
INDICATOR LAMP PL-1~PL-8
REGULATED DC SUPPLY EXCEPT AUDIO CIRCUIT
VOLTAGE REGULATOR Q_{30} D_{31}
RIPPLE FILTER Q_{31}
POWER SWITCH
POWER RECTIFIER $D_{32} \sim D_{35}$
120V 60Hz

Realistic PRO-77 (20-166)



FUNCTIONS

- J1 ANTENNA JACK
- J2 PHONES JACK
- J3 DC POWER CONNECTOR
- VR-1 SQUELCH CONTROL
- VR-2 VOLUME CONTROL W/POWER SWITCH
- SW1-8 CHANNEL SELECTOR SWITCH
- SW-9 MANUAL SELECTOR SWITCH
- SW-10 AUTO/MANUAL SWITCH

REMARKS

1. RESISTANCE VALUES IN OHMS (K=1000)
2. CAPACITANCE VALUES IN MF (P=MMF)
3. RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

Pages 110 - 123 Courtesy of RADIO SHACK

MOBILE INSTALLATION:

Safety and operating convenience are the primary factors to consider when mounting any piece of equipment in an automobile. Be sure that the Receiver controls may be easily reached by the operator. Also be sure that connecting cables do not interfere with the operation of the brake, accelerator, etc.

The Receiver may be mounted to the underside of the instrument panel or dashboard of a car, truck, boat, etc., by means of the special bracket that is supplied with the Receiver.

Mobile Station: CAUTION: **BE AWARE OF THE BATTERY POLARITY.**
For a vehicle with a 12-15V DC negative ground system, use the DC power cable supplied with the unit. Simply connect the cable into the cigarette lighter receptacle (Cat. No.274-331) or directly to the DC power supply source, red lead to the positive terminal, black lead to ground.

IMPORTANT: If your car has been burning out headlamps and other bulbs at a rapid rate, have the voltage regulator checked for proper output. Excessive voltage (more than 16 volts) may cause serious damage to your Receiver.

MOBILE ANTENNA

Keep the following points in mind when installing your mobile antenna.

1. Mount the antenna as high as possible, mounting in the center of the roof is the best possible location.
2. Mount it rigidly, so it will remain vertical while in motion.
3. Mount as far as possible from the engine compartment; mounting on the rear of the car is preferable to mounting in place of the AM antenna.

MOBILE NOISE SUPPRESSION

Noise:

This receiver is very sensitive, and will pick up signals that are extremely weak. With this extreme sensitivity, you will find that the receiver will amplify weak signals, along with any noise that may be present.

When operating a receiver in a vehicle, you will find that the vehicle generates noise, and this noise can become very objectionable. Mobile operation will not be as quiet as base station operation, but steps can be taken that will greatly improve the noise situation.

Electrical System:

Generally speaking, noise can be generated by any device or connection that carries electrical current. Any device that generates a spark should also be suspected. Bypass any suspected wire to ground with a high quality 1μf coaxial capacitor.

Probably the next most common source of noise is the generator, or alternator. This type of noise will sound like a musical whine, and will also vary with speed of the engine. Generator and alternator noise can usually be reduced by placing a coaxial-type capacitor from the armature terminal to the metal case.

Ignition System:

The ignition system is the most common source of noise. This noise can be identified by the fact that its speed varies with the engine speed. Ignition noise will sound like a series of "popping" sounds, while that engine is idling, and will speed up to a buzzing sounds as engine speed is increased.

There are a number of things that can be done for this type of noise.

1. Use radio suppression-type ignition wire, and resistor spark plugs.
2. Check high-tension leads etc. for leakage, cracks, etc.
   Replace any old wiring.
3. In extreme cases, kits may be purchased, that will completely shield all ignition wiring. This will provide maximum noise suppression.

Cutting instructions for UHF and VHF Antennas

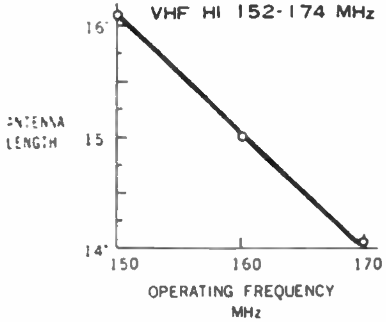
The Radio Shack No. 20-177 antenna is a one quarter (152-174 MHz) or five-eighths (450-470 MHz) wave vertical designed for automotive trunk lid mounting. A special clamp in the antenna base fits into the space between lid and car body so that no hole cutting is required. Complete installation instructions are supplied with the antenna.

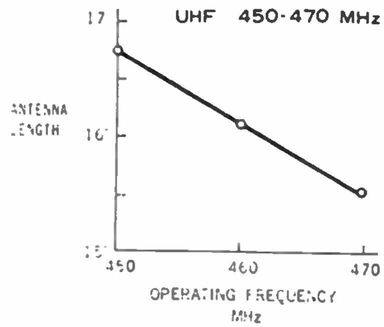
Minimum distance from antenna to edge of the metal mounting surface is preferably five or more antenna lengths. The two charts at the right indicate most efficient lengths, as measured from the tip of the antenna to the top of the set screw fitting.

The antenna length is adjusted to 5/8 wavelength at 450-470 MHz to improve its horizontal gain at a slight cost in high-angle gain. Its practical effect is about equal to a doubling of the transmitter power.

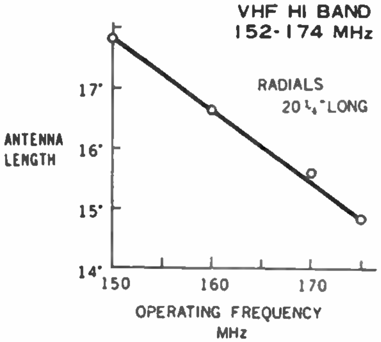
Antenna reliability will be improved if at assembly all contacting metal surfaces are cleaned and then coated with a thin layer of water pump grease or equivalent. The base fitting should be dismantled, cleaned, and checked about once per year.

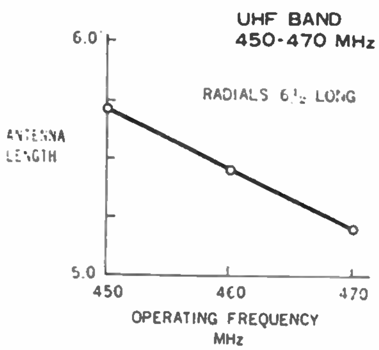
CUTTING 20-177 ANTENNA





CUTTING 20-176 ANTENNA



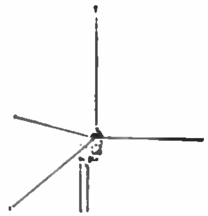


The Radio Shack No. 20-176 antenna is a wideband quarter-wave gound-plane antenna for 152-174 MHz or 450-470 MHz. It is designed to be used at fixed or portable stations. For best performance at a given frequency its whip and radials should be cut as follows.

During installation all four radials are cut to 20 1/4" (152-174 MHz) or 6 1/2" (450-470 MHz). They are removed from the assembly, the four end balls pulled off, and each radial is cut to the correct over-all length. Then the balls are tapped back on.

Next, the vertical radiator top plug is removed, and the radiator overall length trimmed to the value given in the cutting chart. After cutting, the antenna is ready for assembly and installation.

For best performance this antenna should be installed ten or more vertical radiator lengths away from any large metal objects. Wires, lightning protection systems, metal roofs, and large vehicles moving or stored nearby may influence quality of the received signal. If performance of the receiver system seems poor compared with that of other similar installations, the antenna should be moved.



Indoor UHF and VHF Antennas

Indoor Hi-Lo VHF Antenna

Indoor Hi-Lo Antenna

Plug-in type. For indoor use. Rugged construction, center loaded coil. Telescoping whip, 40" extended, 16" collapsed. Terminates with pin-type plug. 21-161, 2 lbs.

Omnidirectional Indoor UHF Antenna

Omnidirectional Indoor Antenna

For indoor or portable use. Plugs directly in to back of PRO-88 receiver. 22" overall. Decoupling skirt improves efficiency. Chrome-plated. 20-451, 1 1/2 lbs.

Crystal Installation:

Due to the numerous frequencies or channels available, crystals are not installed by the factory, but by the seller or owner of the unit. Because of the accuracy required, it is recommended that the crystals be ordered from Radio Shack Stores, specifying the model number of the set and the frequency you wish to receive. Allow 3 to 4 weeks delivery. Order crystals under Catalog No.20-002. Crystal sockets are provided inside the front end of the unit.

To install crystals remove the crystal access door on the bottom of the receiver. Each of the eight channels may be used for either the VHF or UHF band as desired. Insert the crystal into the desired channel socket—in the UHF compartment if the crystal is for the UHF band or in the VHF compartment if the crystal is for the VHF band. Then push the color coded Band Selector Plug for that channel onto the Band Selector Pin under the installed crystal. (See Fig.-3)

For example, if Channel 1 is to be used for UHF and Channel 2 for VHF, insert the UHF crystal (for the desired frequency in the UHF band) into crystal socket 1 in the UHF compartment. Then push the brown wire Band Selector Plug onto the Band Selector Pin 1 under the UHF crystal socket for Channel 1. Insert the VHF crystal (for the desired frequency in the VHF band) into crystal socket 2 in the VHF compartment. Then push the red wire Band Selector Plug onto the Band Selector Pin under VHF crystal socket 2.

It is important that the band selector plugs for unused channels not be left free. Connect an unused channel plug to either the VHF or UHF band selector pin for that channel. This is necessary for correct functioning of the scanner.

The actual crystal frequencies required are found by the following formulas:

$$\text{UHF XTAL FREQ} = \frac{FR - 44}{9} \text{ MHz}$$

$$\text{VHF XTAL FREQ} = \frac{FR - 10.7}{3} \text{ MHz}$$

where FR is the desired frequency to be received in MHz.

Your scanner will hold up to 16 crystals, 8 VHF and 8 UHF. However the maximum combination that may be active is eight. If you install more than eight crystals in your unit, you may change the programing by simply changing the band selector pins. (See Fig.-3)

Radio Shack is not responsible for poor operation when crystals of another manufacturer are used.

Crystal Frequency Trimmers

While crystal frequencies are extremely accurate, at the high frequencies in the UHF band, even a small error in the receiver or transmitter frequency may produce distortion or loss of signal. To compensate for this your receiver has a trimmer capacitor located near each of the eight UHF crystal sockets. (See Fig.-3) These allow the receiver frequency to be varied a small amount from the crystal frequency. Should an incoming signal appear distorted adjust the trimmer near that channel crystal for maximum clarity. Since both the transmitter and receiver crystals may change slightly with age it may occasionally be necessary to repeat this adjustment after prolonged use.

Replace the crystal access door after installing crystals or making trimmer adjustments.

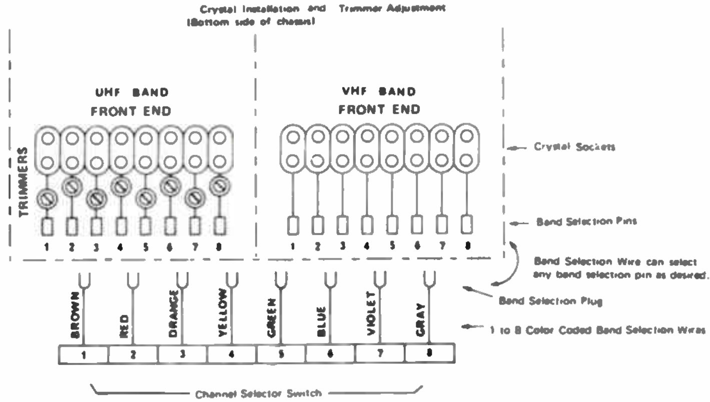


FIG-3

Frequency Coverage: (IMPORTANT)

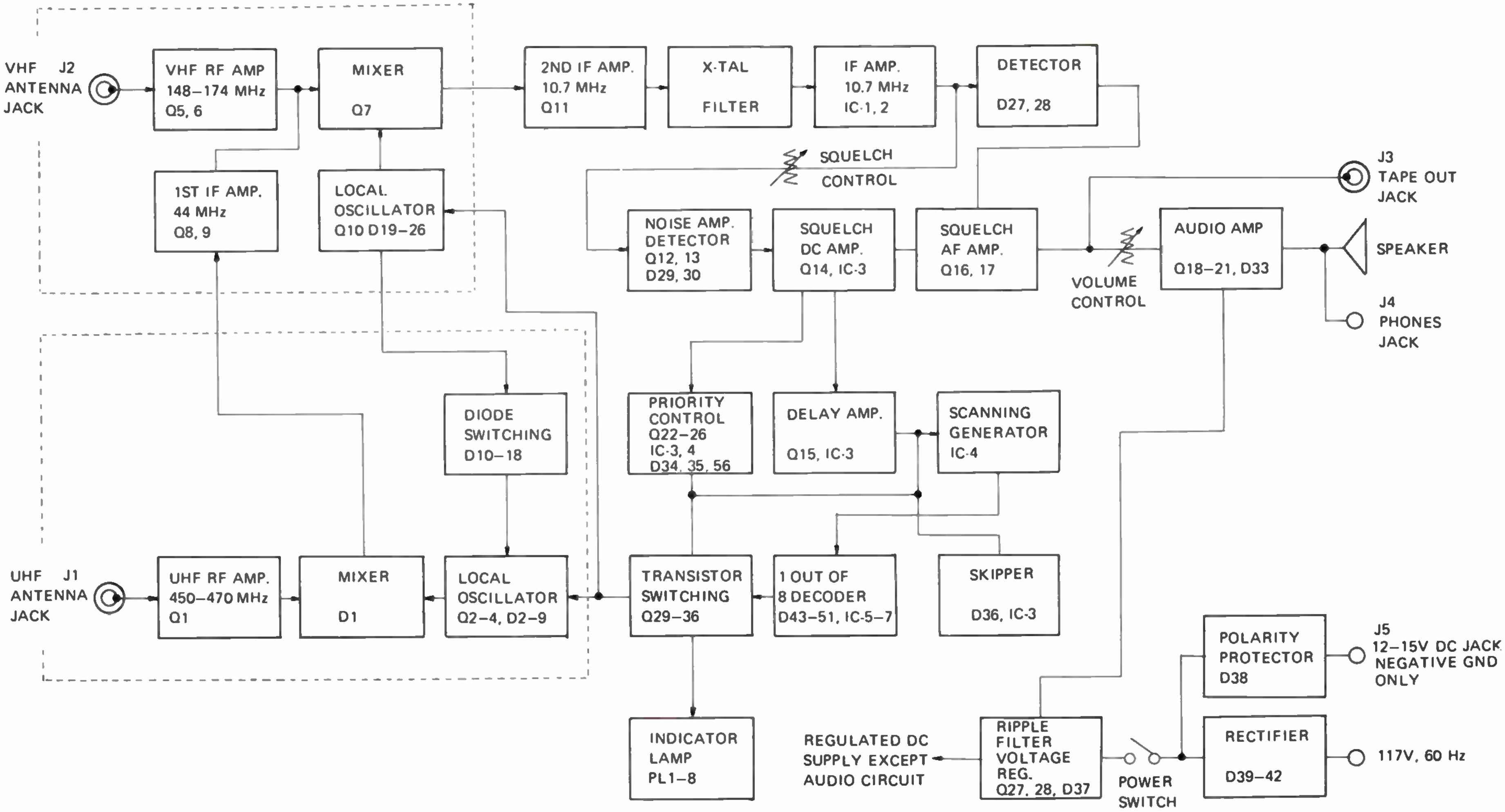
For maximum sensitivity, the channel frequencies specified should be within plus or minus 4 MHz of 153 MHz in the VHF band and within plus or minus 4 MHz of 460 MHz in the UHF band. However, for channel frequencies outside of this range, the unit will still operate, but with some loss in sensitivity. This 8 MHz range can be moved up, or down, in the band, in which case the RF section (Front End) of the receiver would have to be realigned by a qualified technician.

Special Instructions for 162.55 and 162.40 MHz Weather Channels:

The weather channel broadcasts a continuous 24 hour carrier signal. When set for automatic scan, your PRO-88 will stop and remain on weather channel until manually "stepped" to another frequency. To prevent automatic locking on the weather channel, deactivate the channel by releasing the push button control for the channel to the "out" position. Then, when you want the weather report, reactivate the channel with the push button control.

Note: In some areas more than one transmitter is operating and because they are so close an alternate frequency 162.40 MHz may be used for weather. Check with your local Weather Bureau or local FCC office.

Model PRO-88 Block Diagram



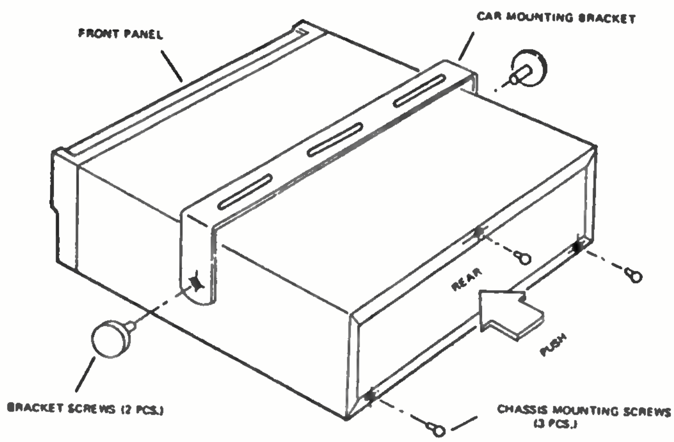


FIGURE 1. CHASSIS DISASSEMBLY

3. GENERAL ALIGNMENT

Test equipment required:

–1 Oscilloscope

–2 Slow sweep generator with variable marker (10.7 MHz.)

–3 RF Sweep generator with variable marker (148 – 174 MHz)

–4 RF Sweep generator with variable marker (450 – 470 MHz)

–5 AC V. T. V. M.

–6 DC V. T. V. M.

–7 8 ohms dummy load

Note: A non-metallic alignment tool is required for complete alignment.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding to the complete alignment.
Input signal from generator should be kept as low as possible.

Step 2: Maintain output of sweep-generator at a low level to prevent overloading.

Step 3: Adjust VHF Front-end T2, IF section T3, T4 and T5, so that 10.7 MHz is at center of discriminator curve and for best linearity as shown in Figure 3.

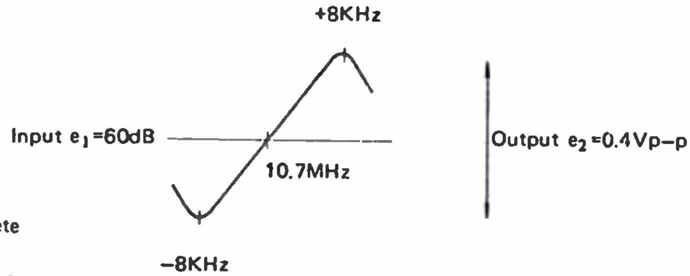


FIGURE 3. IF DISCRIMINATOR CURVE

4. IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 2.

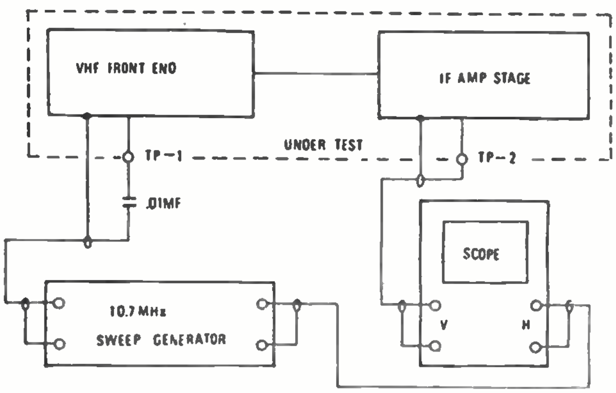


FIGURE 2. IF SECTION ALIGNMENT

5. VHF RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 4.

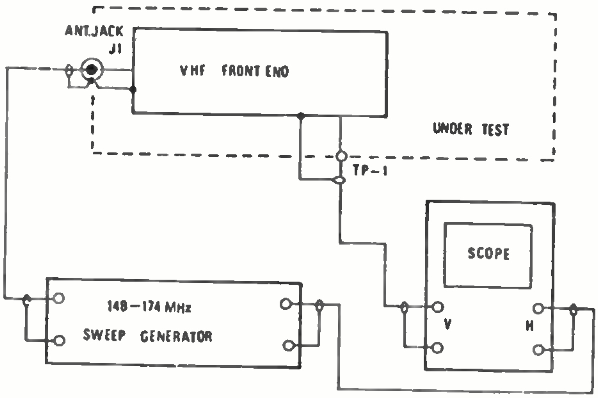


FIGURE 4. VHF RF ALIGNMENT

Step 2: Adjust L11 and L12(Antenna coil) for maximum output and best symmetry curve as shown in Figure 5.

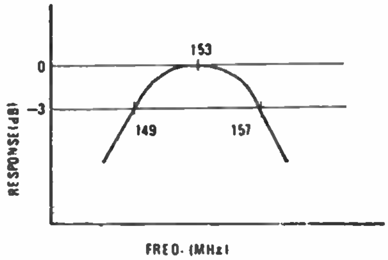


FIGURE 5. VHF RF CHARACTERISTIC

6. VHF LOCAL OSCILLATOR ALIGNMENT

Step 1: Put all crystals in sockets.

Step 2: Couple the frequency counter thru a pick-up coil to oscillator coil L14 as shown in Figure 6.

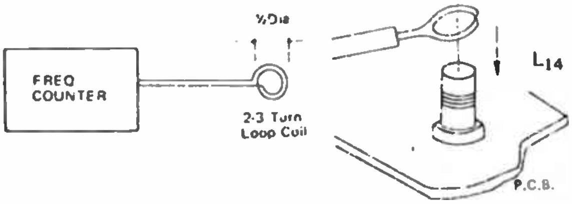


FIGURE 6. VHF LOCAL OSCILLATOR ALIGNMENT

Step 3: Adjust T8 for best oscillating point on both sides of the crystal frequency.

7. UHF RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 7.

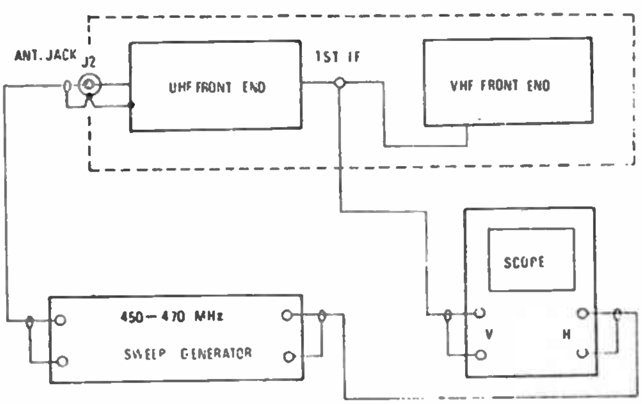


FIGURE 7. UHF RF ALIGNMENT

Step 2: Adjust trimmer capacitor TC3, TC2 and TC1 for maximum output and best symmetry curve as shown in Figure 8.

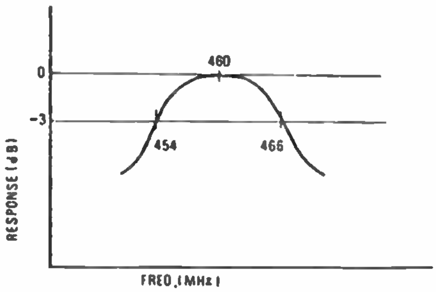


FIGURE 8. UHF RF CHARACTERISTIC

8. UHF LOCAL OSCILLATOR ALIGNMENT

Step 1: Put all crystals in sockets

Step 2: Couple the frequency counter thru a pick-up coil to oscillator coil T2 as shown in Figure 6.

Step 3: Adjust trimmer capacitors TC5 to TC12 for best oscillating point on each crystal frequency.

9. UHF 1ST IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 9.

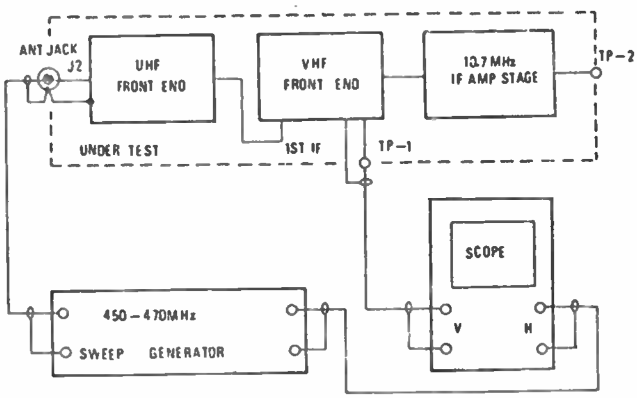


FIGURE 9. UHF 1ST IF ALIGNMENT

Step 2: Adjust the coils T3, T2 and trimmer capacitor TC4 on the UHF Front-end. Also adjust the coils T6 and T7 on the VHF Front-end for maximum output of center receiving frequency.

10. CRYSTAL FREQUENCY CALCULATION

The crystal frequencies required are found by the following formulas:
UHF Crystal Frequency = (Fr - 44)/9 MHz
VHF Crystal Frequency = (Fr - 10.7)/3 MHz
where FR is the desired frequency to be received in MHz.

11. SENSITIVITY MEASUREMENT

Step 1: Connect signal generators to antenna input and AC voltmeter to speaker terminals.

Step 2: Turn the squelch control fully counter clockwise, and with the generator at minimum output and with no modulation, adjust the volume control on the set for a 0 dB(0.775 volts) recording on the AC voltmeter.

Step 3: Increase the output of the signal generator to obtain a reading of +20 dB on the AC voltmeter. The generator output to achieve this is the 20 dB quieting sensitivity.

Step 4: The set should be tuned in conformity with the frequency of signal generator.

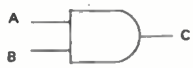
Step 5: Turn VOLUME control fully clockwise, signal generator should be set on carrier wave (NO MODULATION) range and attenuator be minimum output level.

Step 6: Adjust volume control so that the output noise level shows 0 dB=0.775 volt on the AC-V.T.V.M.

Step 7: Increase the output level of signal generator so that signal level set on 20 dB down from noise level. The value of S.G. attenuator shows sensitivity voltage at the condition of 20 dB noise quieting.

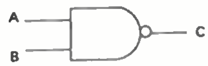
TTL IC TRUTH TABLE

AND CIRCUIT



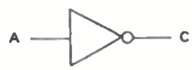
A	B	C
H	H	H
H	L	L
L	H	L
L	L	L

NAND CIRCUIT



A	B	C
H	H	L
H	L	H
L	H	H
L	L	H

NOT (INVERTER) CIRCUIT



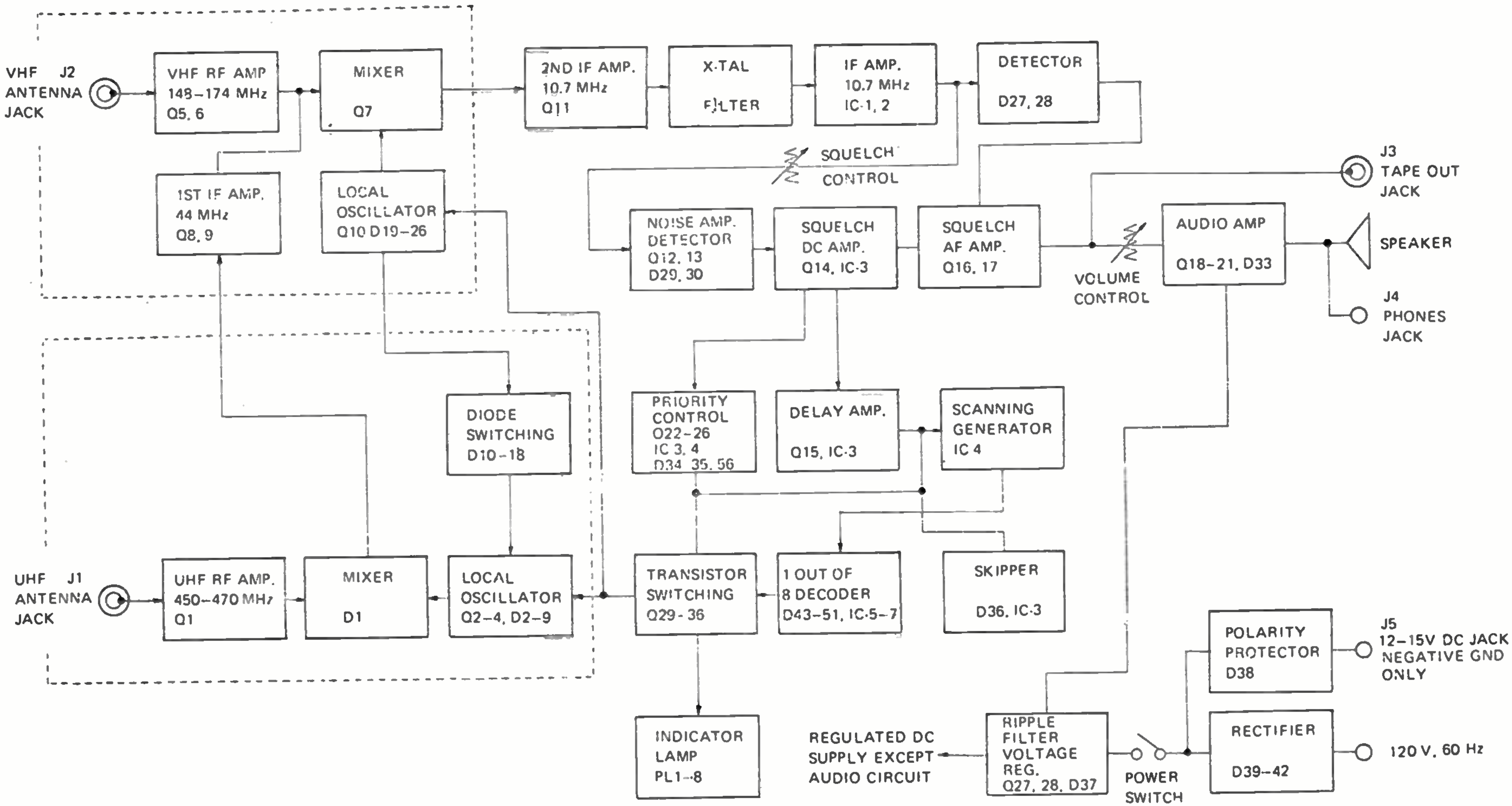
A	C
H	L
L	H

12. LOGIC CIRCUIT TRUTH TABLE

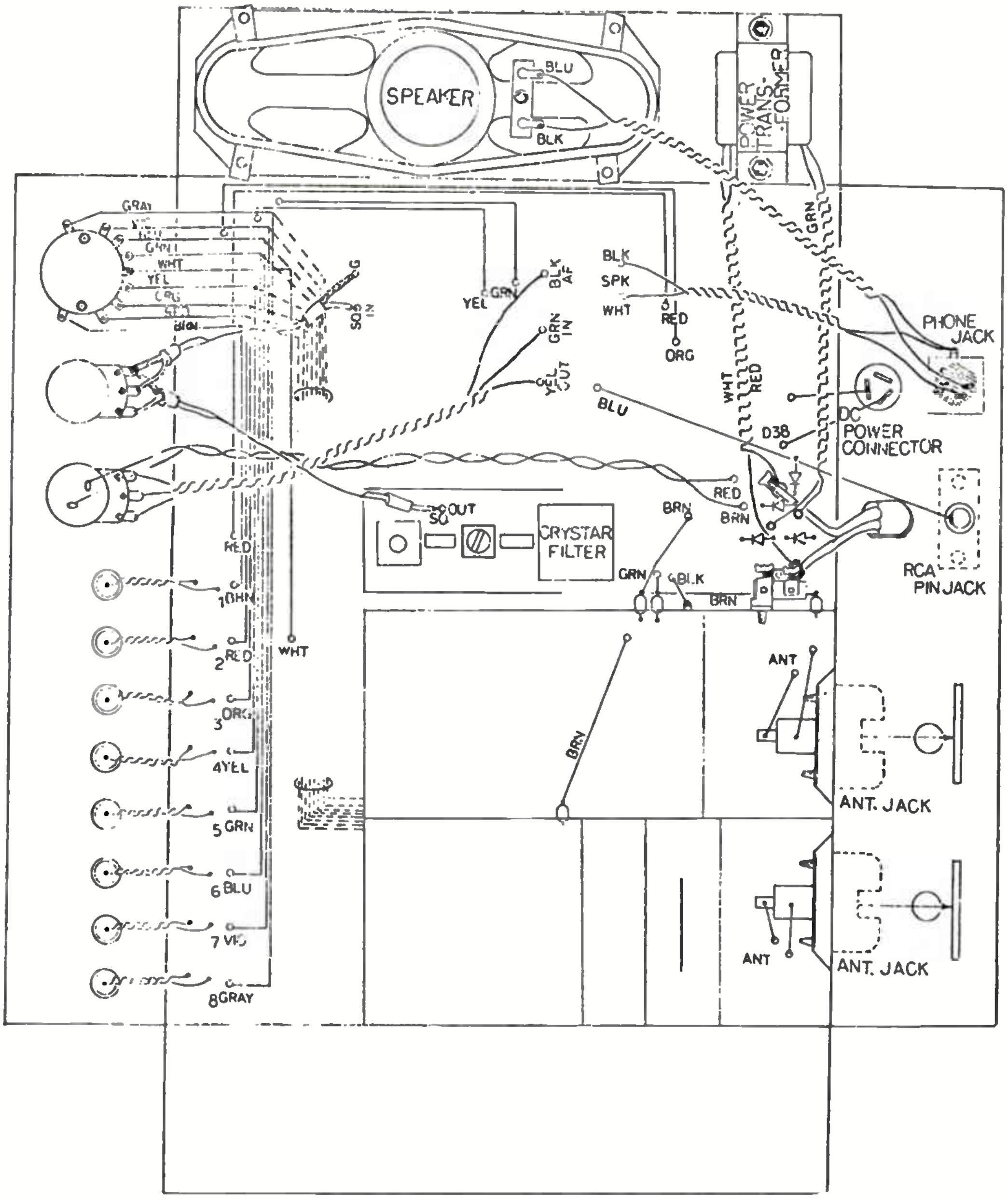
NOTE: H=High level, L=Low level, B=Base, C=Collector   Marked •=Lighting in pilot lamp

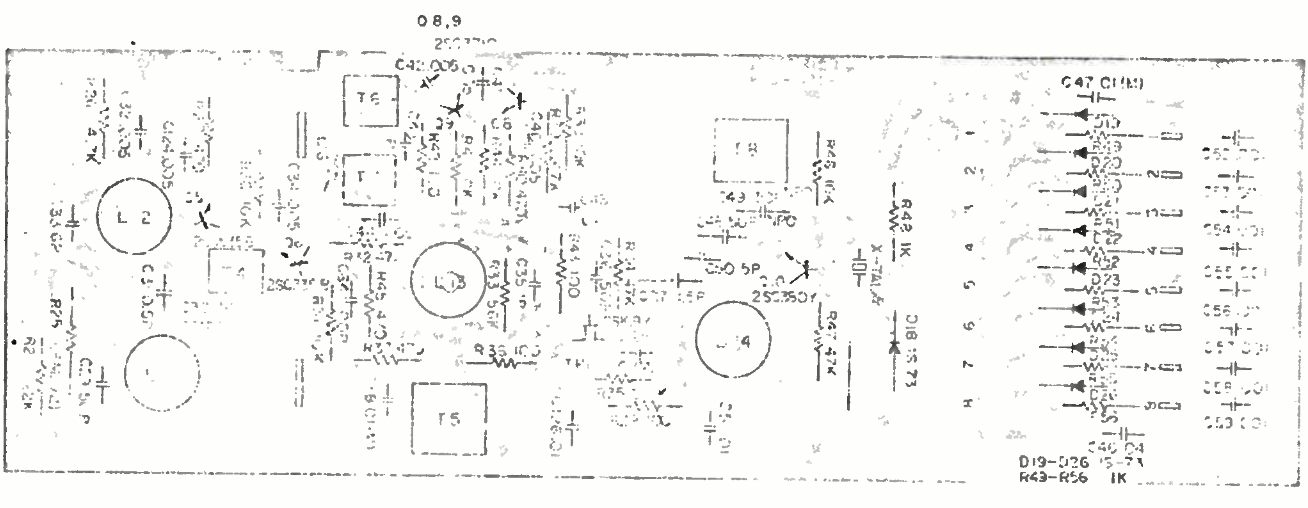
IC, TR NO.	IC – 4		IC – 5				IC – 6				Q22	Q21	Q20	Q19	Q18	Q17	Q16	Q15
PIN NO.	6	3	6	3	11	8	11	8	3	6	B/C	B/C	B/C	B/C	B/C	B/C	B/C	B/C
CH. NO.																		
1	H	L	L	H	L	H	H	L	L	L	•H/L	L/H	L/H	L/H	L/H	L/H	L/H	L/H
2	L	H	L	H	L	H	H	L	L	L	L/H	•H/L	L/H	L/H	L/H	L/H	L/H	L/H
3	H	L	H	L	L	H	L	H	L	L	L/H	L/H	•H/L	L/H	L/H	L/H	L/H	L/H
4	L	H	H	L	L	H	L	H	L	L	L/H	L/H	L/H	•H/L	L/H	L/H	L/H	L/H
5	H	L	L	H	H	L	L	L	H	L	L/H	L/H	L/H	L/H	•H/L	L/H	L/H	L/H
6	L	H	L	H	H	L	L	L	H	L	L/H	L/H	L/H	L/H	L/H	•H/L	L/H	L/H
7	H	L	H	L	H	L	L	L	L	H	L/H	L/H	L/H	L/H	L/H	L/H	•H/L	L/H
8	L	H	H	L	H	L	L	L	L	H	L/H	L/H	L/H	L/H	L/H	L/H	L/H	•H/L

15. BLOCK DIAGRAM

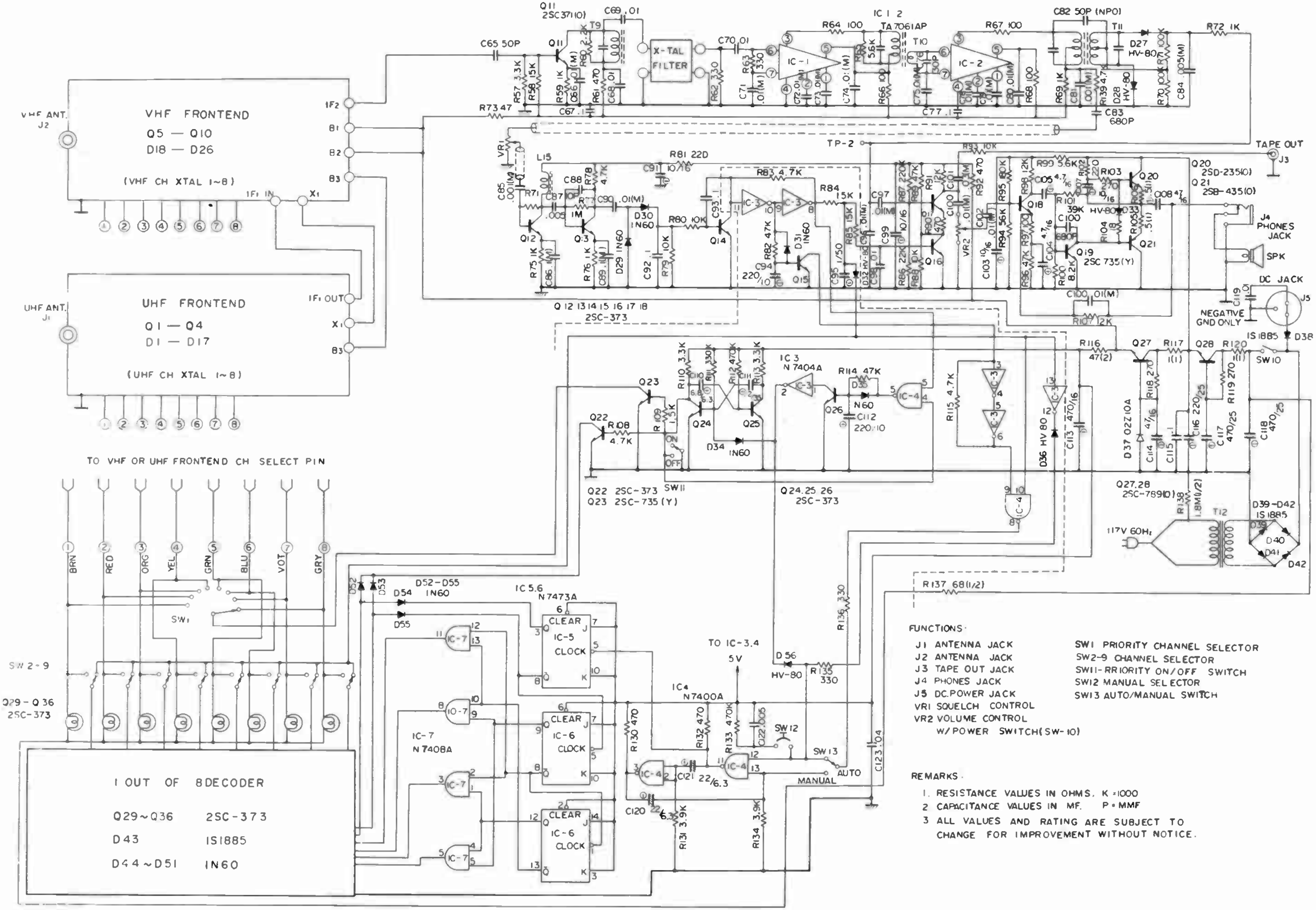


WIRING DIAGRAM

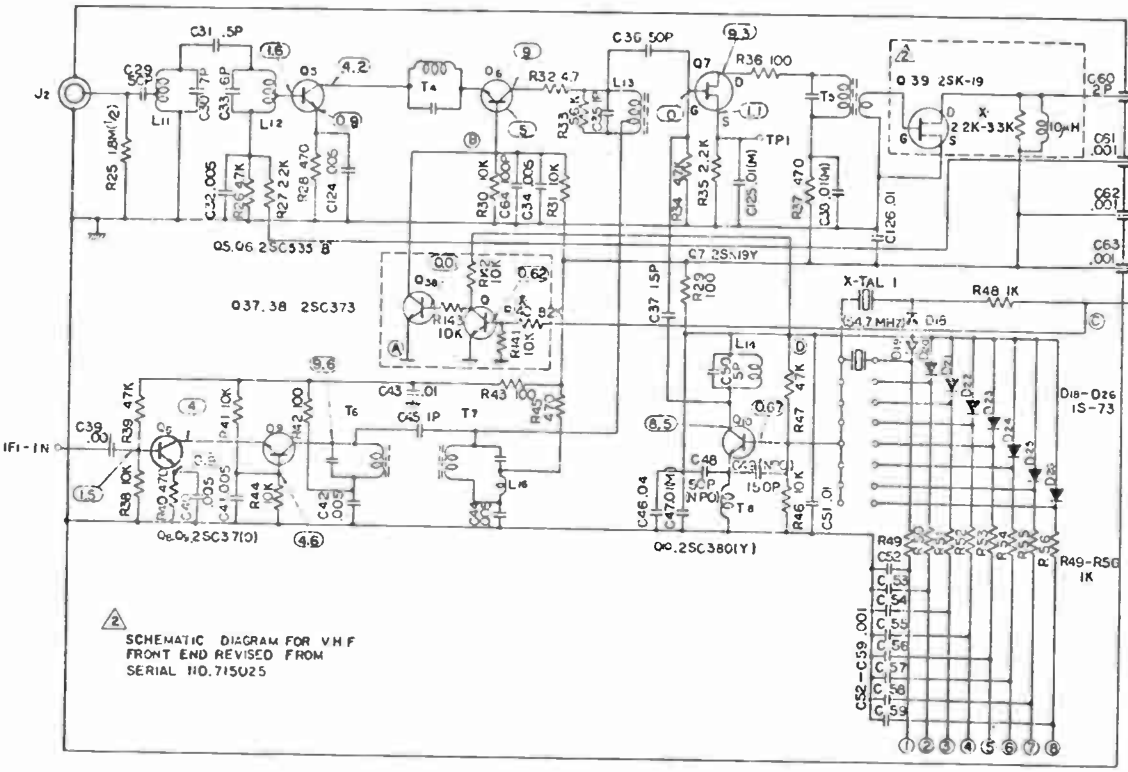




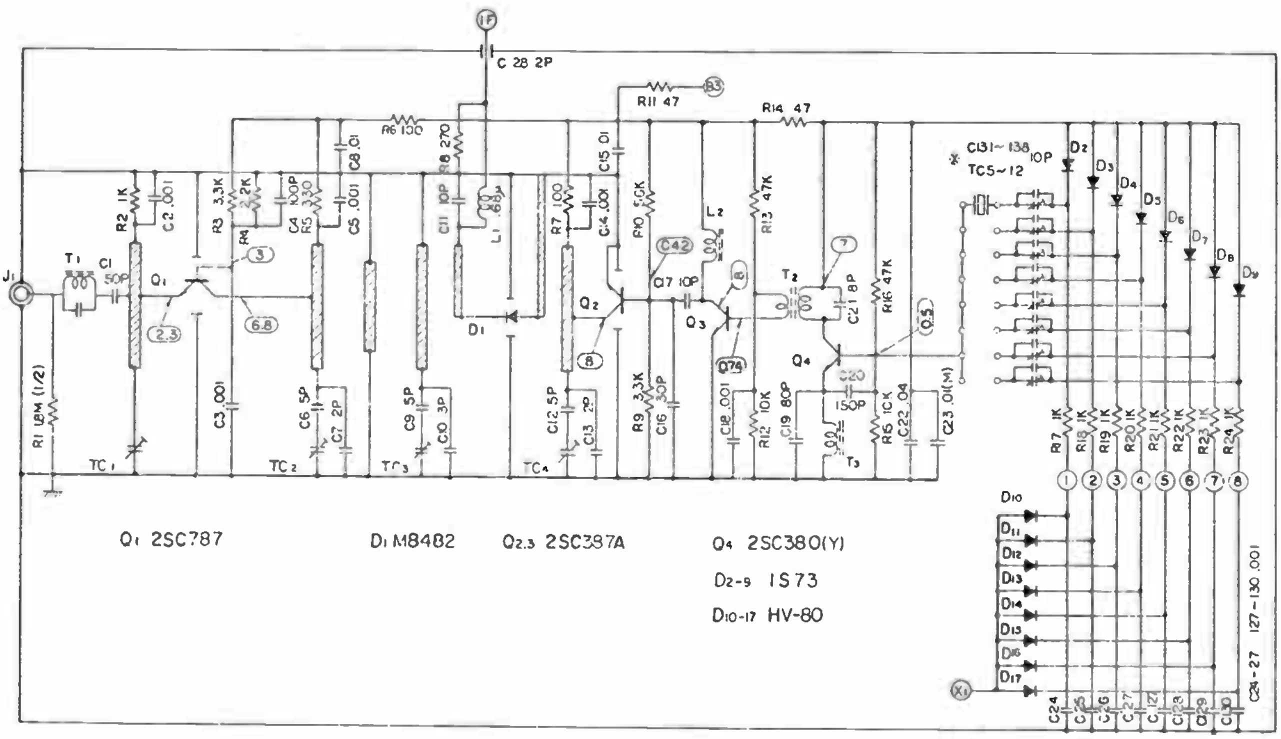
(FOIL VIEW)

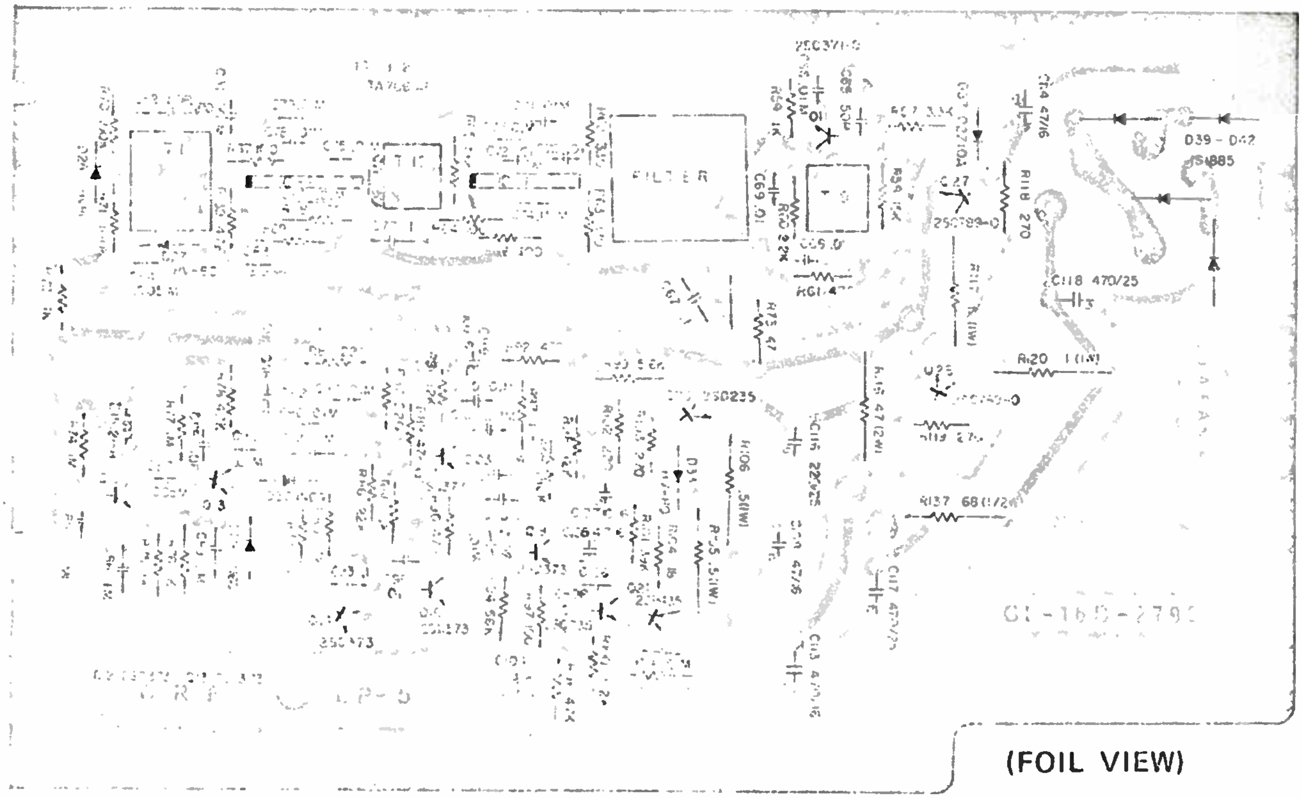

VHF ANT. J2
VHF FRONTEND
Q5 — Q10
D18 — D26
(VHF CH XTAL 1~8)
UHF ANT. J1
UHF FRONTEND
Q1 — Q4
D1 — D17
(UHF CH XTAL 1~8)
X-TAL FILTER
IC-1
IC-2
IC 1 2 TA7061AP
TAPE OUT J3
J4 PHONES JACK
SPK
DC JACK J5
NEGATIVE GND ONLY
Q 12 13 14 15 16 17 18 2SC-373
Q20 2SD-235(O)
Q21 2SB-435(O)
Q22 2SC-373
Q23 2SC-735(Y)
Q24,25 26 2SC-373
Q27,28 2SC-789(O)
IC 3 N7404A
IC 5,6 N7473A
IC-7 N7408A
IC4 N7400A
117V 60Hz
D39-D42 1S1885
TO VHF OR UHF FRONTEND CH SELECT PIN
BRN
RED
ORG
YEL
GRN
BLU
VOT
GRY
SW1
SW 2-9
Q29 - Q36 2SC-373
1 OUT OF 8 DECODER
Q29~Q36 2SC-373
D43 1S1885
D44~D51 1N60
D52-D55 1N60
TO IC-3,4 5V
SW12
SW13
AUTO
MANUAL
FUNCTIONS
J1 ANTENNA JACK
J2 ANTENNA JACK
J3 TAPE OUT JACK
J4 PHONES JACK
J5 DC.POWER JACK
VR1 SQUELCH CONTROL
VR2 VOLUME CONTROL W/POWER SWITCH(SW-10)
SW1 PRIORITY CHANNEL SELECTOR
SW2-9 CHANNEL SELECTOR
SW11-PRIORITY ON/OFF SWITCH
SW12 MANUAL SELECTOR
SW13 AUTO/MANUAL SWITCH
REMARKS
1. RESISTANCE VALUES IN OHMS. K = 1000
2. CAPACITANCE VALUES IN MF. P = MMF
3. ALL VALUES AND RATING ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

17. VHF FRONT END SCHEMATIC DIAGRAM



18. UHF FRONT END SCHEMATIC DIAGRAM

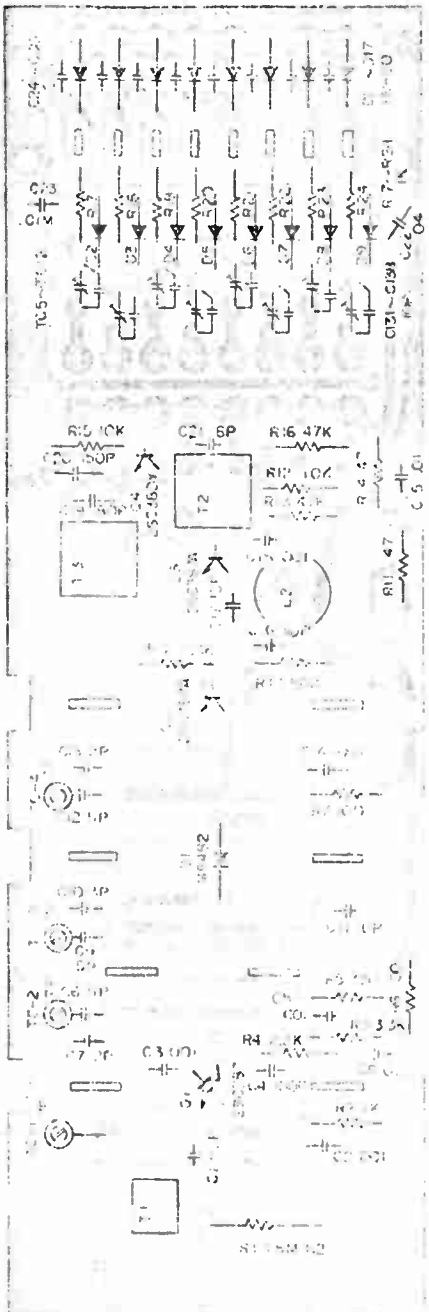




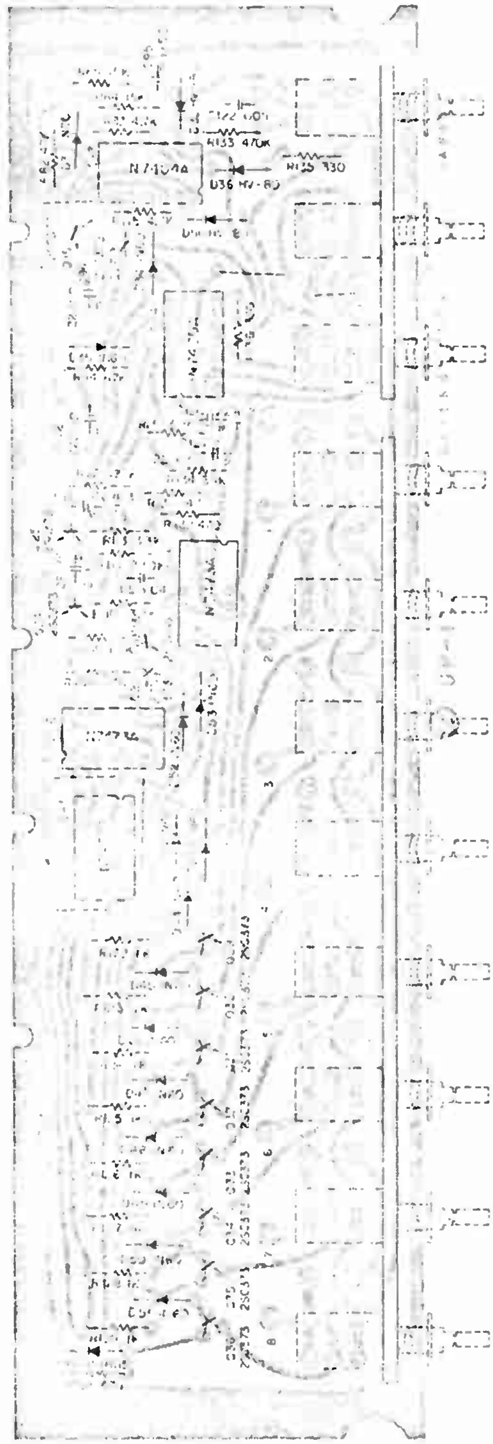
(FOIL VIEW)

24. TROUBLESHOOTING CHART

Symptom	Possible cause test
1) Pilot lamp does not light and set does not operate when power is on.	A) Faulty line power cord. B) Defective power transformer. C) Defective power rectifier. D) Defective power switch E) Defective Q27, 28 and/or associated circuit components.
2) One or two scanning lamps not on when channel switch is on.	A) Defective pilot lamp. B) Faulty channel switch contact. C) One of transistors, Q29 to Q36 is defective. D) One of diodes D44 to D51 is defective.
3) Priority circuit does not work.	A) One of transistors, Q22 to Q26 is defective. B) IC3 or IC4 is defective. C) Faulty priority switch.
4, Only scans CH 1,3,5,7 or CH 2,4,6,8.	A) Defective IC5.
5) Only scans CH 1,2,5,6 or CH 3,4,7,8.	A) Defective IC6.
6) Only scans CH 1,2,3,4 or CH 5,6,7,8.	A) Defective IC6.
7) Light on both CH 1 and CH 3 when scanning.	A) Defective IC7.
8) Light on both CH 1 and CH 5 when scanning.	A) Defective IC7.
9) Light on both CH 1 and CH 7 when scanning.	A) Defective IC7.
10) Squelch control does not operate.	A) Q12,13,14,16 or 17 is defective. B) Defective IC3. C) Faulty VR.
11) No sound in either VHF or UHF.	A) Faulty Audio amplifier circuit component. B) Faulty IF amplifier circuit component
12) No sound in VHF only.	A) Faulty VHF front-end local oscillator circuit component. B) Weak crystal. C) Faulty VHF RF or MIX circuit component.
13) No sound in UHF only.	A) Faulty UHF front-end local oscillator circuit component. B) Weak crystal. C) Faulty UHF RF, MIX or VHF 1st IF amplifier circuit. component.



(FOIL VIEW)



(FOIL VIEW)

SEMICONDUCTORS

ITEM	TYPE
D1	M8452
D2	1S73
D3	1S73
D4	1S73
D5	1S73
D6	1S73
D7	1S73
D8	1S73
D9	1S73
D10	HV-80
D11	HV-80
D12	HV-80
D13	HV-80
D14	HV-80
D15	HV-80
D16	HV-80
D17	HV-80
D18	1S73
D19	1S73
D20	1S73
D21	1S73
D22	1S73
D23	1S73
D24	1S73
D25	1S73
D26	1S73
D27	HV-80
D28	HV-80
D29	1N60
D30	1N60
D31	1N60
D32	HV-80
D33	HV-80
D34	1N60
D35	1N60
D36	HV-80
D37	01Z10A
D38	1S1885
D39	1S1885
D40	1S1885
D41	1S1885
D42	1S1885
D43	1S1885
D44	1N60
D45	1N60
D46	1N60
D47	1N60
D48	1N60
D49	1N60
D50	1N60
D51	1N60
D52	1N60
D53	1N60
D54	1N60
D55	1N60
D56	HV-80
IC1	TA-7061AP
IC2	TA-7061AP
IC3	N7404A
IC4	N7404A
IC5	N7473A
IC6	N7473A
IC7	N7408A
Q1	2SC787
Q2	2SC378A
Q4	2SC394(Y)
Q5	2SC535
Q6	2SC535
Q7	2SK19(Y)
Q8	2SC371(O)
Q9	2SC371(O)
Q10	2SC394(GR)
Q11	2SC371(O)
Q12	2SC373
Q13	2SC373
Q14	2SC373
Q15	2SC373
Q16	2SC373
Q17	2SC373
Q18	2SC373
Q19	2SC735(Y)
Q20	2SD235
Q21	2SB435
Q22	2SC373
Q23	2SC735(Y)
Q24	2SC735(Y)
Q25	2SC735(Y)
Q26	2SC735(Y)
Q27	2SC789
Q28	2SC789
Q29	2SC373
Q30	2SC373
Q31	2SC373
Q32	2SC373
Q33	2SC373
Q34	2SC373
Q35	2SC373
Q36	2SC373
Q37	2SC373
Q38	2SC373

ELECTROLYTICS/VARIABLE CAPS

ITEM	PART NO.	VALUE
C28		Trimmer
C60		Trimmer
C61		Trimmer
C62		Trimmer
C63		Trimmer
C91		10uF 16V
C94		220uF 10V
C95		1uF 50V
C99		10uF 16V
C103		10uF 16V
C104		4.7uF 16V
C105		4.7uF 16V
C107		10uF 16V
C108		47uF 16V
C110		6.8uF 6.3V
C111		.22uF 35V
C112		220uF 10V
C113		470uF 16V
C114		47uF 16V
C116		220uF 25V
C117		470uF 25V
C118		470uF 25V
C120		22uF 6.3V
C121		22uF 6.3V
TC1	C-4272	Trimmer
TC2	C-4272	Trimmer
TC3	C-4272	Trimmer
TC4	C-4272	Trimmer
TC5	C-4273	Trimmer
TC6	C-4273	Trimmer
TC7	C-4273	Trimmer
TC8	C-4273	Trimmer
TC9	C-4273	Trimmer
TC10	C-4273	Trimmer
TC11	C-4273	Trimmer
TC12	C-4273	Trimmer

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R105		.5 ohms, 1W 10%
R106		.5 ohms, 1W 10%
R117		1 ohm, 1W 10%
R120		1 ohm, 1W 10%
VR1	P-1097	50K, Squelch
VR2	P-1098	50K, Volume

COILS/TRANSFORMERS

ITEM	PART NO.
L1	CB-2116
L2	CA-4305
L11	CA-4304
L12	CA-4304
L13	CA-4304
L14	CA-4303
L15	CB-2117
L16	CB-2118
T1	CA-7049
T2	CA-7052
T3	CA-4306
T4	CA-7049
T5	CA-7051
T6	CA-7050
T7	CA-7050
T8	CA-4306
T9	CA-7052
T10	CA-7051
T11	CA-2672
T12	TA-0308

MISCELLANEOUS

ITEM	NAME	PART NO.
SW1	Switch, Rotary	S-1064
	Switch, Push	S-7052
	Switch, Push	S-7117
	Cord, AC Power	W-1391
	Cord, DC Power with Fuse Holder	W-1304
	Crystal	CX-0045
	Crystal Filter	CA-2420
	PCB, IF/AF	X-4438
	PCB, Switching	X-4439
	PCB, UHF Front End	X-4441
	PCB, VHF Front End	X-4440
	Speaker	S-4215
	UHF/VHF Front End	CA-4307

CABINET PARTS

NAME	PART NO.
Cabinet	Z-0728
Cabinet Front Panel	Z-0445
Escutcheon	Z-0729
Jewel, Lamp (8 used)	H-1424
Knobs, (3 used)	K-1027

CRYSTAL INSTALLATION

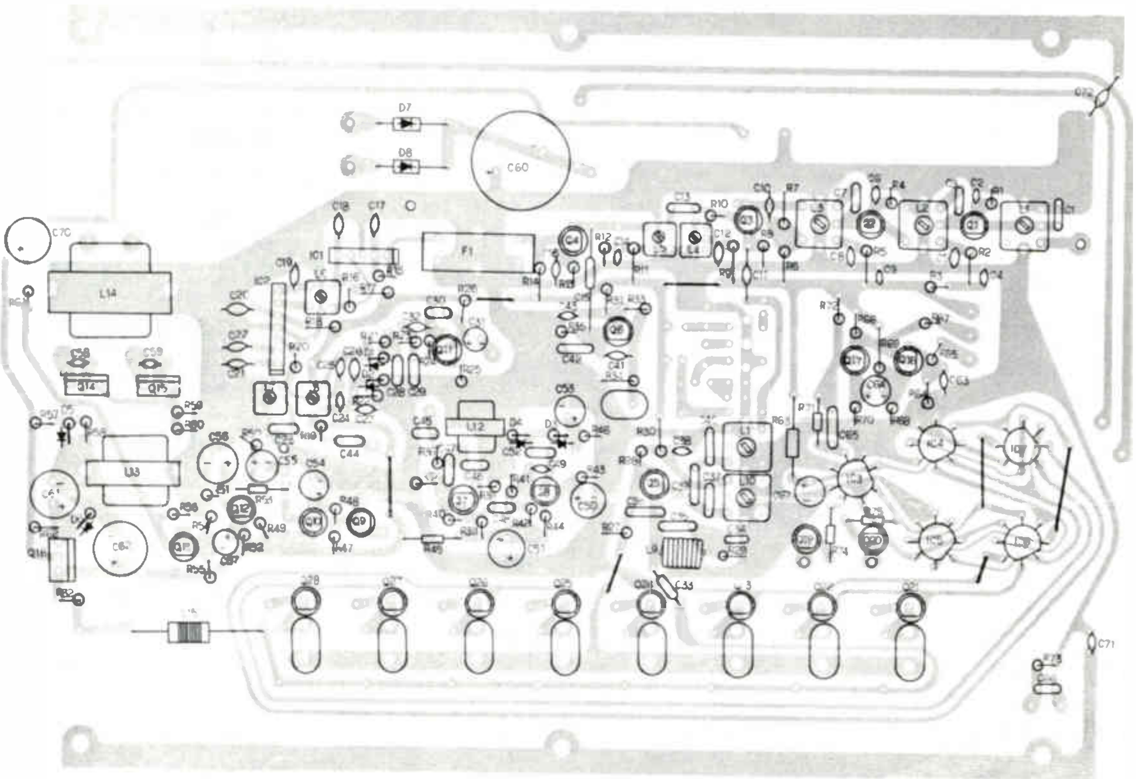
Suitable Crystals must be installed before operation.
To install Crystals:

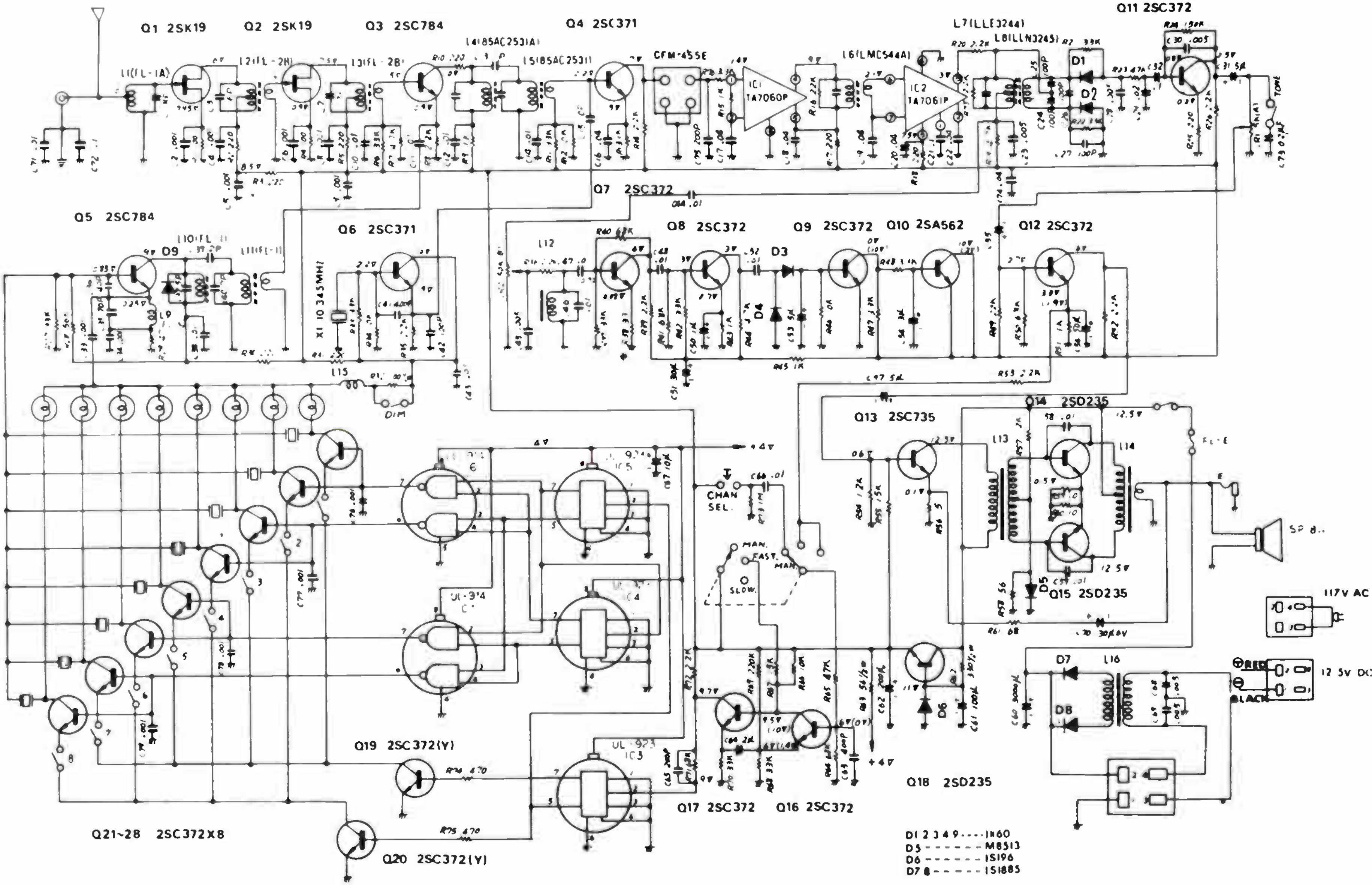
1. Remove four Lock Screws of the bottom.
2. Take off the back cover. You see the crystal sockets in one line.
3. Install crystals in the sockets according to the channel number. Be careful in this work! Crystal Pins and Sockets are quite easy to break, if you handle roughly.

IMPORTANT: CRYSTALS HAVE TO BE SELECTED CAREFULLY IN ACCORDANCE WITH THE BASIC RECEIVING FREQUENCY INDICATED AT THE BACK OF THE RECEIVER.
CRYSTAL FREQUENCY: (Receiving Frequency – 10.7MHz) x 1/3

** It is recommended you will have your dealer install or replace Crystals.
Your Robyn Hi-Bander!is shipped without crystals. Your dealer should have stock covering the standard frequencies for your area. If there is no dealer in your area and you wish to purchase ccrystal certificates covering any channel in the 144 to 174 MHz band please write us direct. Your cost will be 5.00 pre/paid direct from the factory. Approximately 10 day delivery.

TOP VIEW





Robyn 100-B (HI-Bander)

Pages 126 - 127 Courtesy of ROBYN INTERNATIONAL

CRYSTAL INSTALLATION

Suitable crystals must be installed before operation.
To install crystals:

1. Remove two lock screws. Each side bottom cabinet.
2. Install crystals in the sockets according to the channel numbers. Be careful not to bend crystal pins.

IMPORTANT: CRYSTALS HAVE TO BE SELECTED CAREFULLY IN ACCORDANCE WITH THE BASIC RECEIVING FREQUENCY:

Receiving Frequency –

Low Band

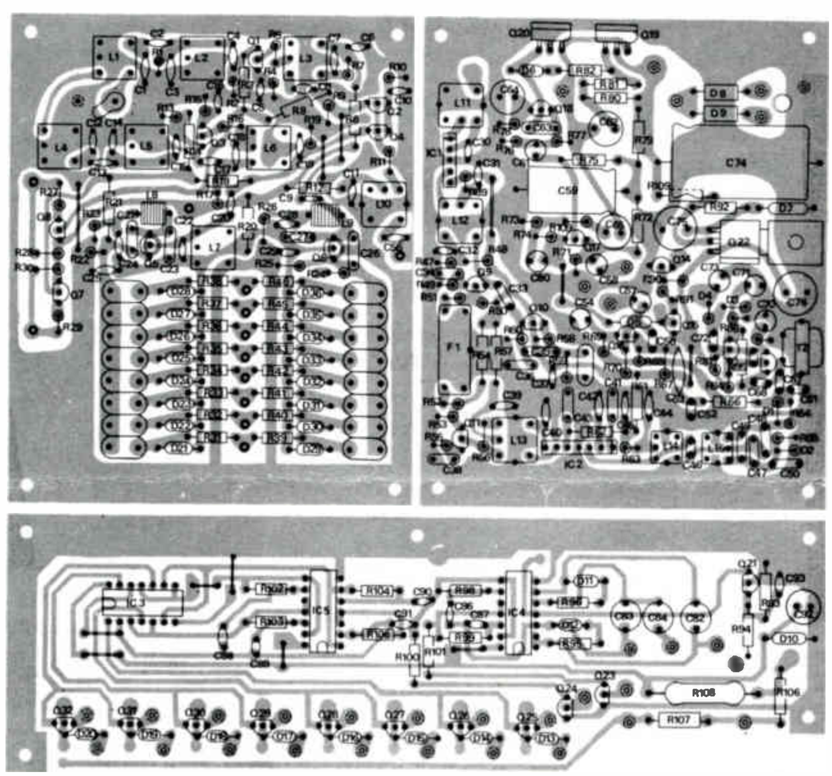
Crystal frequency = channel frequency + 10.7 MHz

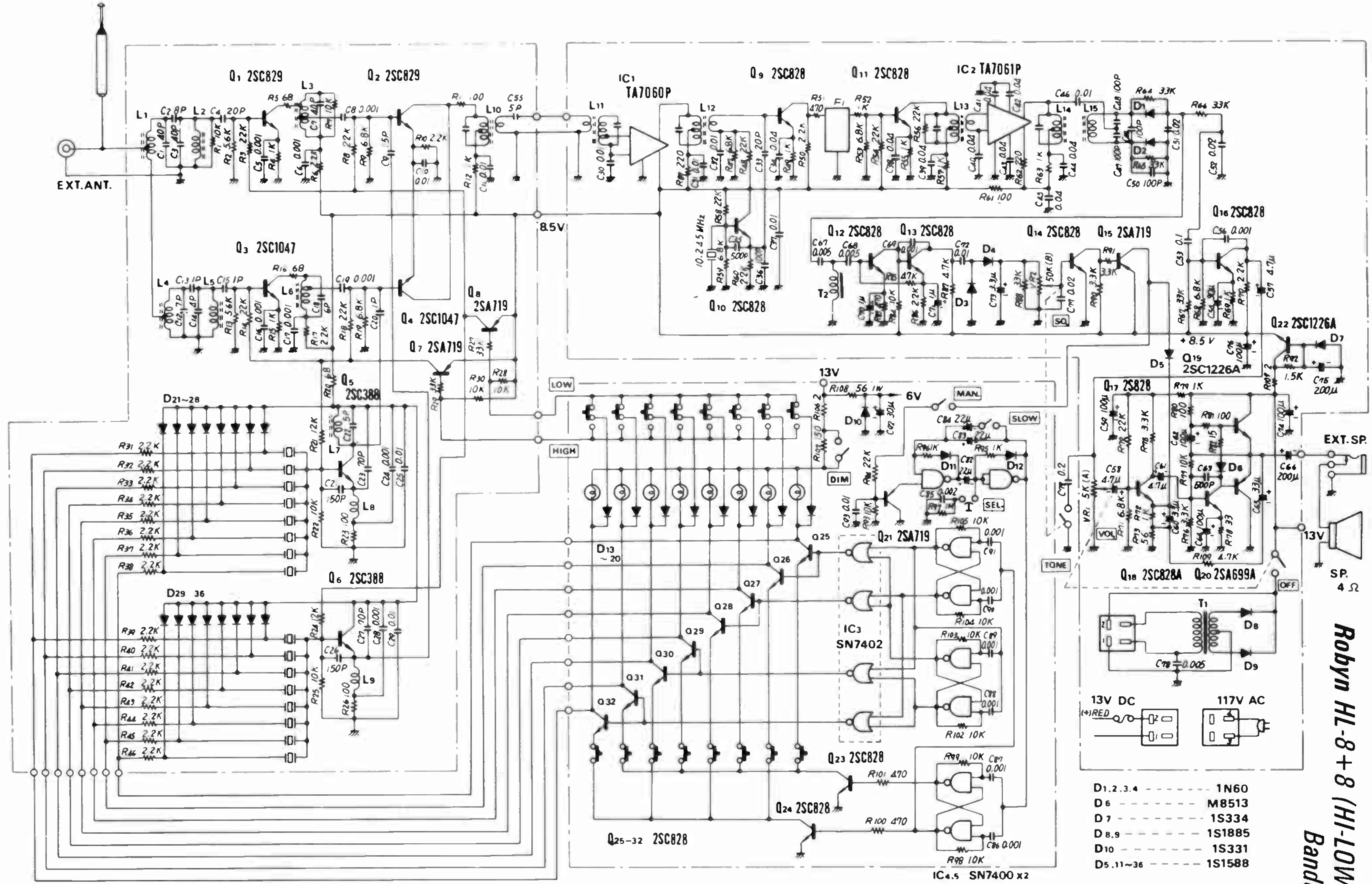
High Band

$$\text{Crystal frequency} = \frac{\text{channel frequency} - 10.7\ \text{MHz}}{3}$$

** It is recommended that you will have your dealer install or replace crystals.
Your Robyn Hi-Low Bander is shipped without crystals. Your dealer should have stock covering the standard frequencies for your area. If there is no dealer in your area and you wish to purchase crystals covering any channel in the 144 MHz–174 MHz band or 25 MHz–55 MHz band, please write us direct. Your cost will be US$5.00 pre-paid direct from the factory. Approximately 10 days delivery.

TOP VIEW





Robyn HL-8+8 (HI-LOW Bander)

INDEX

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Library of Congress Catalog Card Number 72-92711

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TABLE OF CONTENTS

I-F SECTION

Alignment of the 1-F system consists of optimizing the input and output networks and balancing the detector output. The bandpass and center frequency are established by quartz crystal filters and "peaking" the coils can result in bandpass ripple or poor sensitivity. Field alignment should not be necessary but the procedure is given for general information.

EQUIPMENT NEEDED

Oscilloscope
Sweep generator with 10.79, 10.80 and 10.81mHz markers

1. Connect sweep generator to TP-1 through a lpf capacitor.
2. Connect oscilloscope to TP-3.
3. Maintain output of 10.80mHz sweep generator at a low level to prevent distortion from overloading.
4. Detune T5 for maximum IF output display. See Fig 2.
5. Adjust T3 for maximum output, and T4 for minimum ripple.
6. Adjust T5 so that 10.80mHz is in center of discriminator curve and for best linearity. See Figure 3.

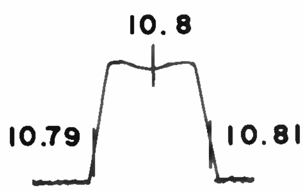


Figure 2

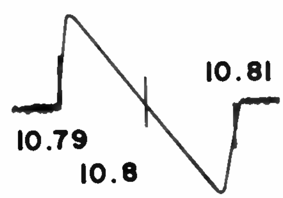


Figure 3

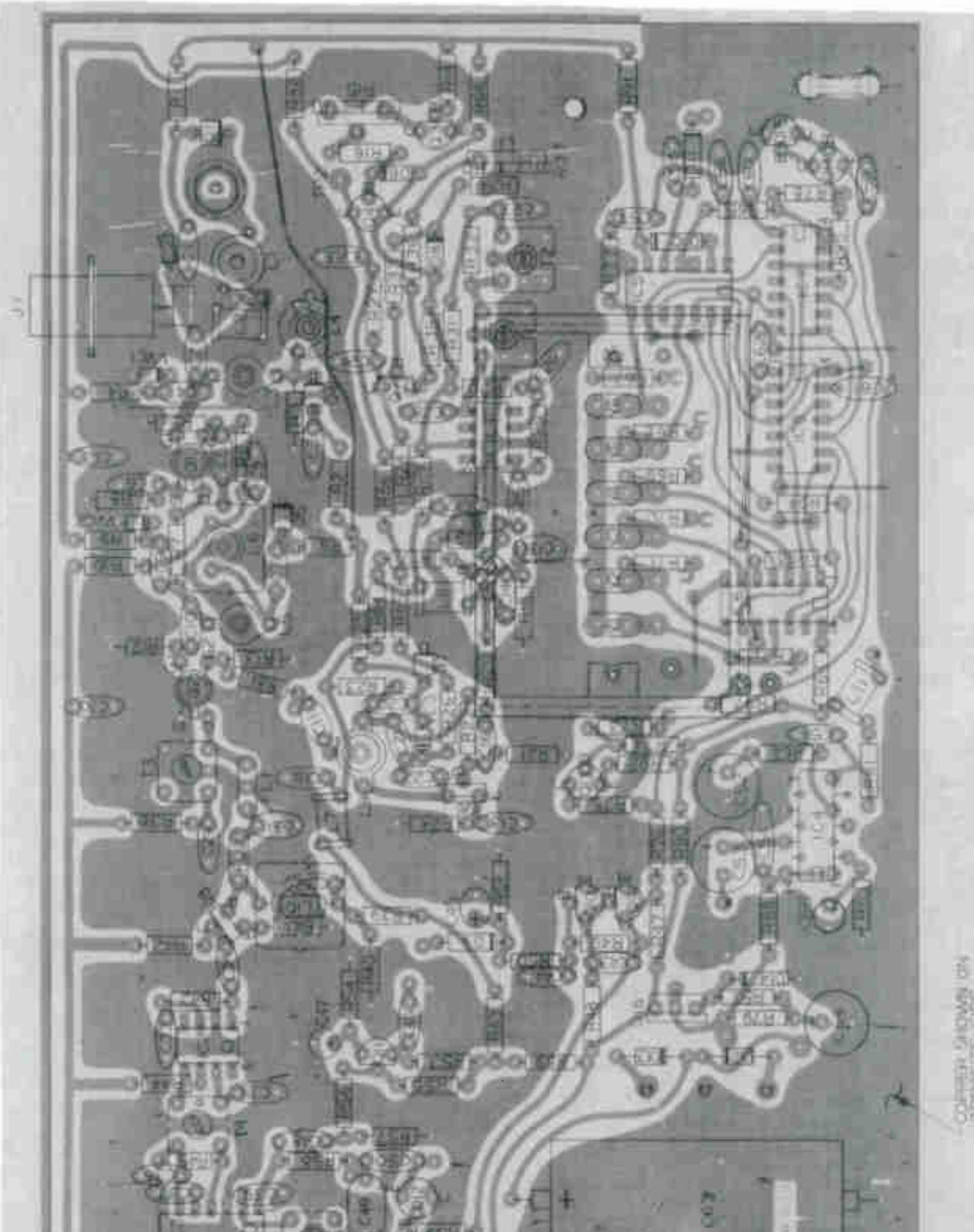
ALTERNATE METHOD: I-F alignment may be checked using a Measurements Model 800 Generator or equivalent tuned to an operating frequency and swept ±25kc. Markers are not essential since center frequency is determined by the filter.

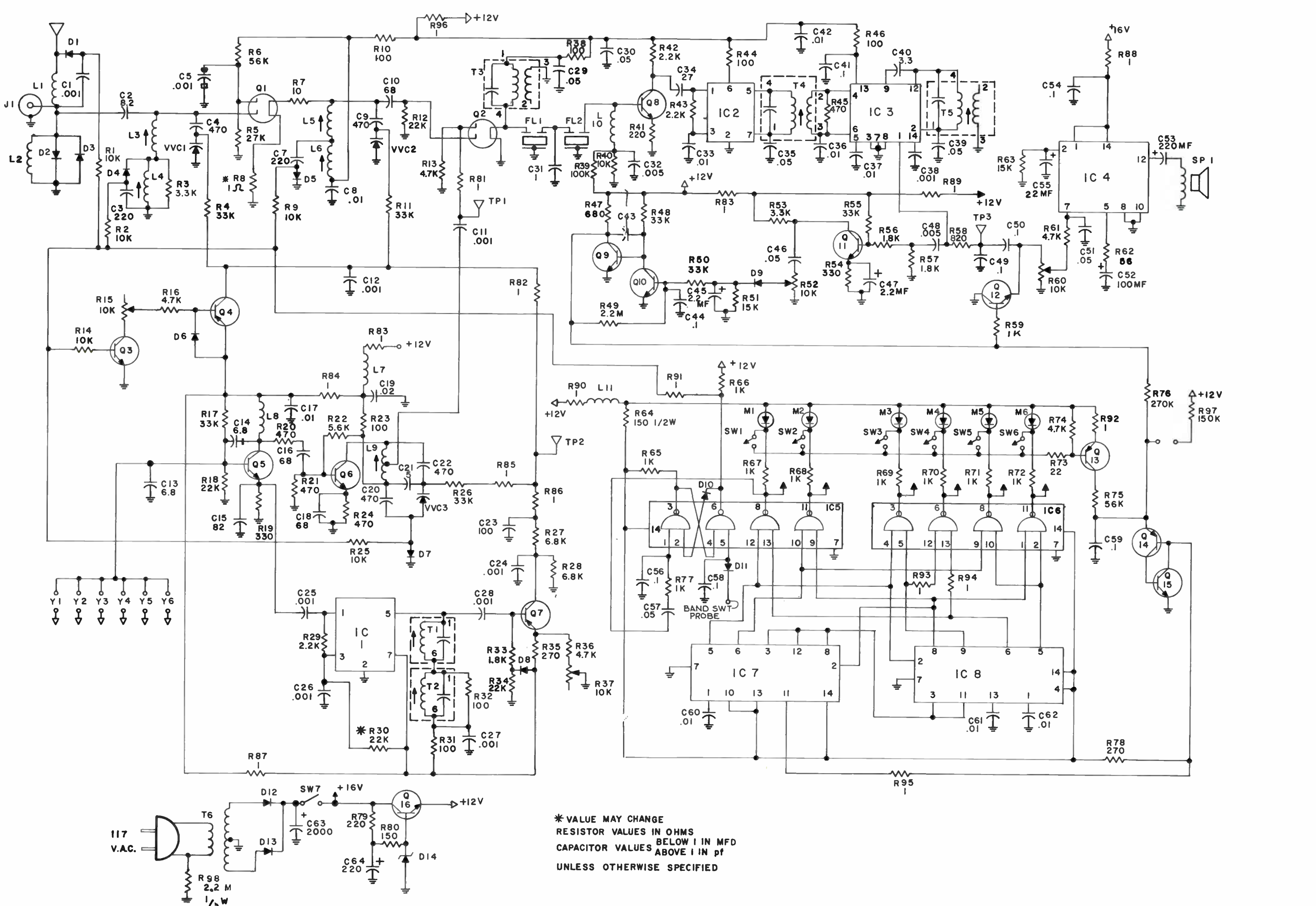
R–F SECTION

DO NOT ATTEMPT ALIGNMENT OR "PEAKING" OF R–F SECTION

The R-F alignment points are adjusted and sealed at the factory and should not be disturbed. Factory alignment involves multi-frequency signal generation systems, add-on test modules, output indicators and training beyond the scope of normal service activities.

The unique R-F system includes electronic tracking of R-F and oscillator circuits for maximum performance over a wide range of frequencies. THIS PERFORMANCE CAN BE DESTROYED BY AN ATTEMPT TO "PEAK UP" OR "TWEAK" OR "OPTIMIZE," ETC.





* VALUE MAY CHANGE
RESISTOR VALUES IN OHMS
CAPACITOR VALUES BELOW 1 IN MFD, ABOVE 1 IN pf
UNLESS OTHERWISE SPECIFIED

I.C. VOLTAGE CHART

The Voltage Chart may be used as an approximate guide in following circuit operation or locating a defective stage. You should be familiar with the entire manual before attempting measurements.

INTEGRATED CIRCUIT VOLTAGES

IC NO.	1	2	3	4	5	6	7	8
Pin 1	1.4	1.4	4.2	16	.5	4	1	1
2	GND	GND	3.7	8.5	.6/6	.2	4	.1
3	1.5	1.5	GND	x	5/.2	12.6	4	4
4	x	x	1.5	x	5.4/.2	.1	2	5
5	12	11	1.5	.6	.2/.3	.1	.1	.2
6	12.5	12	1.5	x	.3/9	12.6	4	4
7	12.5	11	GND	0	GND	GND	GND	GND
8	x	x	GND	GND	.3	12.6	4	4
9	x	x	.2	x	4	.3	.1	.1
10	x	x	1.5	GND	4	4	5	5.4
11	x	x	3.1	x	12.6	12.6	5	4
12	x	x	3.7	6.8	.1	.1	4	.2
13	x	x	10.9	x	14	4	5	1
14	x	x	4.8	16	5	5	5	5

Channel No. 1 Selected

LOGIC CHART

The logic sequence for counting is shown by "0" under .5V and "1" over 4V.

IC NO.	PIN	COUNT 1	2	3	4	5	6
	5	0	1	1	1	0	0
7	6	1	0	0	0	1	1
	8	1	1	1	1	1	1
	9	0	0	0	0	0	0
8	5	0	0	1	1	1	0
	6	1	1	0	0	0	1
	8	1	1	1	0	0	0
	9	0	0	0	1	1	1
5	8	0	1	1	1	1	1
	11	1	0	1	1	1	1
6	3	1	1	0	1	1	1
	6	1	1	1	0	1	1
	8	1	1	1	1	0	1
	11	1	1	1	1	1	0

TRANSISTOR VOLTAGE CHART

TEST CONDITION	Q No.	D	S	G_1	G_2
	1	11.6	.2	0	4
	2	12	GND	0	0
			E	B	C
	3		GND	.3/.8	12/0
	4		12.6	12.4/12	*
	5		3.4	4	13
No Xtal/Xtal	6		.3/1	1	12
No Xtal/Xtal	7		12.2/11.9	12	*
	8		.3	1	10
Squelch CW/CCW	9		0	.8/.1	.1/8
Squelch CW/CCW	10		0	0/.7	.8/.1
	11		.6	1.3	6.6
Squelch CW/CCW	12		0	0/.8	0
Squelch CW/CCW	13		12.6	12.6/12.4	.1/5.5
Squelch CW/CCW	14		.1/4	5.4/5.3	0
Squelch CW/CCW	15		GND	0	5.4/5.3
	16		12.6	13.2	16

***Tuning voltage — varies with crystal frequency.**

SEMICONDUCTORS

ITEM	PART NO.
D1	MPN3401
D2	1N4148
D3	1N4148
D4	MPN3401
D5	MPN3401
D6	1N4148
D7	MPN3401
D8	1N4148
D9	1N34A
D10	1N34A
D11	1N34A
D12	1N4002
D13	1N4002
D14	13V Zener
IC1	LM703
IC2	LM703
IC3	LM2111
IC4	TBA820
IC5	SN7426
IC6	SN7426
IC7	SN7474
IC8	SN7474
Q1	3N201
Q2	3N201
Q3	MPS3393
Q4	2N4126
Q5	2SC684
Q6	2SC684
Q7	MPS3640
Q8	2SC684
Q9	MPS3393
Q10	MPS3393
Q11	MPS3393
Q12	MPS3393
Q13	2N4126
Q14	2N4126
Q15	MPS3393
Q16	TIP29
VVC1	BB109
VVC2	BB109
VVC3	BB109

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R15	10K, Trimmer	
R37	10K, Trimmer	
R52	10K, Squelch	
R60	10K, Volume	

COILS/TRANSFORMERS

ITEM	PART NO.
L1	A-219-1
L2	A-218-1
L3	B-501-2
L4	B-511-2
L5	B-501-2
L6	B-511-2
L7	A-218-1
L8	A-218-3
L9	B-501-1
L10	A-205
T1	B502-2
T2	B502-2
T3	B520-2
T4	B520-2
T5	B520-2
T6	B267

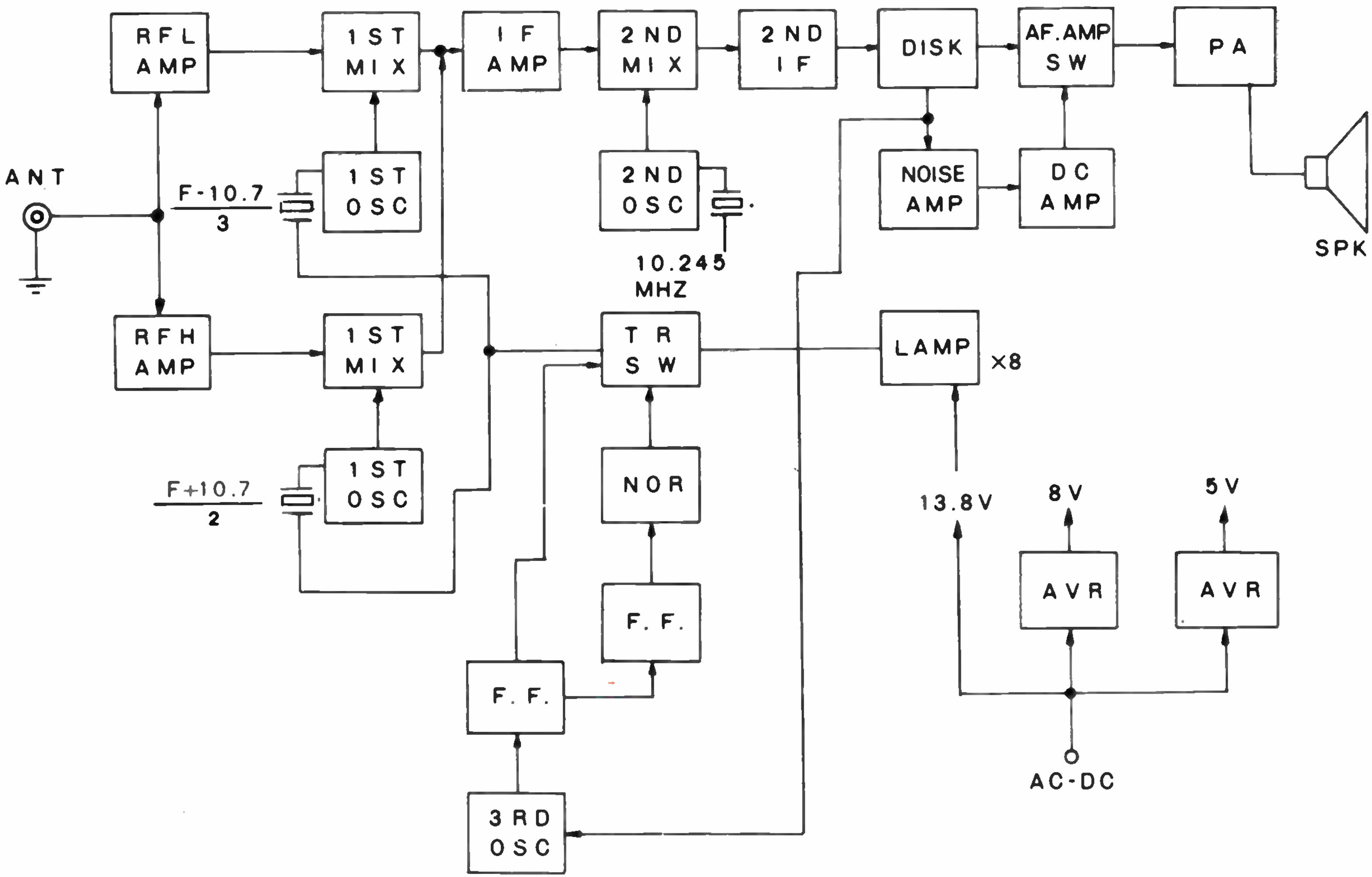
MISCELLANEOUS

ITEM	NAME	PART NO.
FL1	Filter	A226-1
FL2	Filter	A226-1
Y1	Crystal	A-135
Y2	Crystal	A-135
Y3	Crystal	A-135
Y4	Crystal	A-135
Y5	Crystal	A-135
Y6	Crystal	A-135
	LED	A287

CABINET PARTS

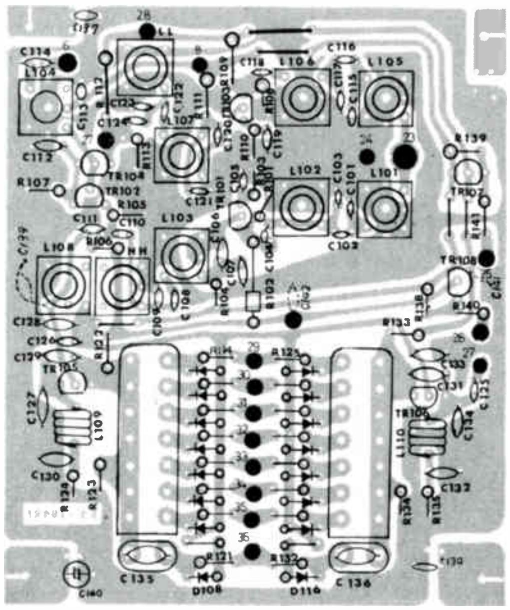
NAME	PART NO.
Cabinet	D101
Knob	A454

BLOCK DIAGRAM

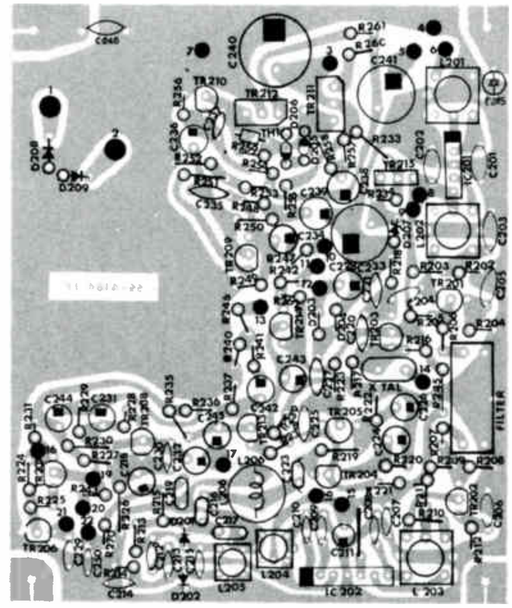


LAYOUTS

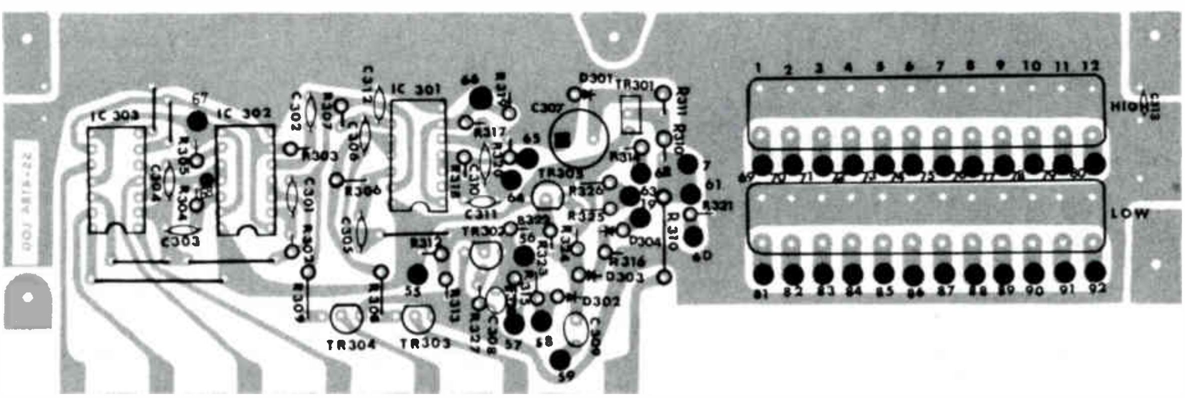
RF



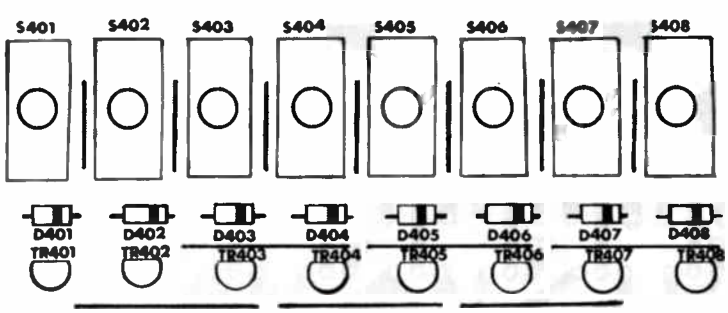
IF



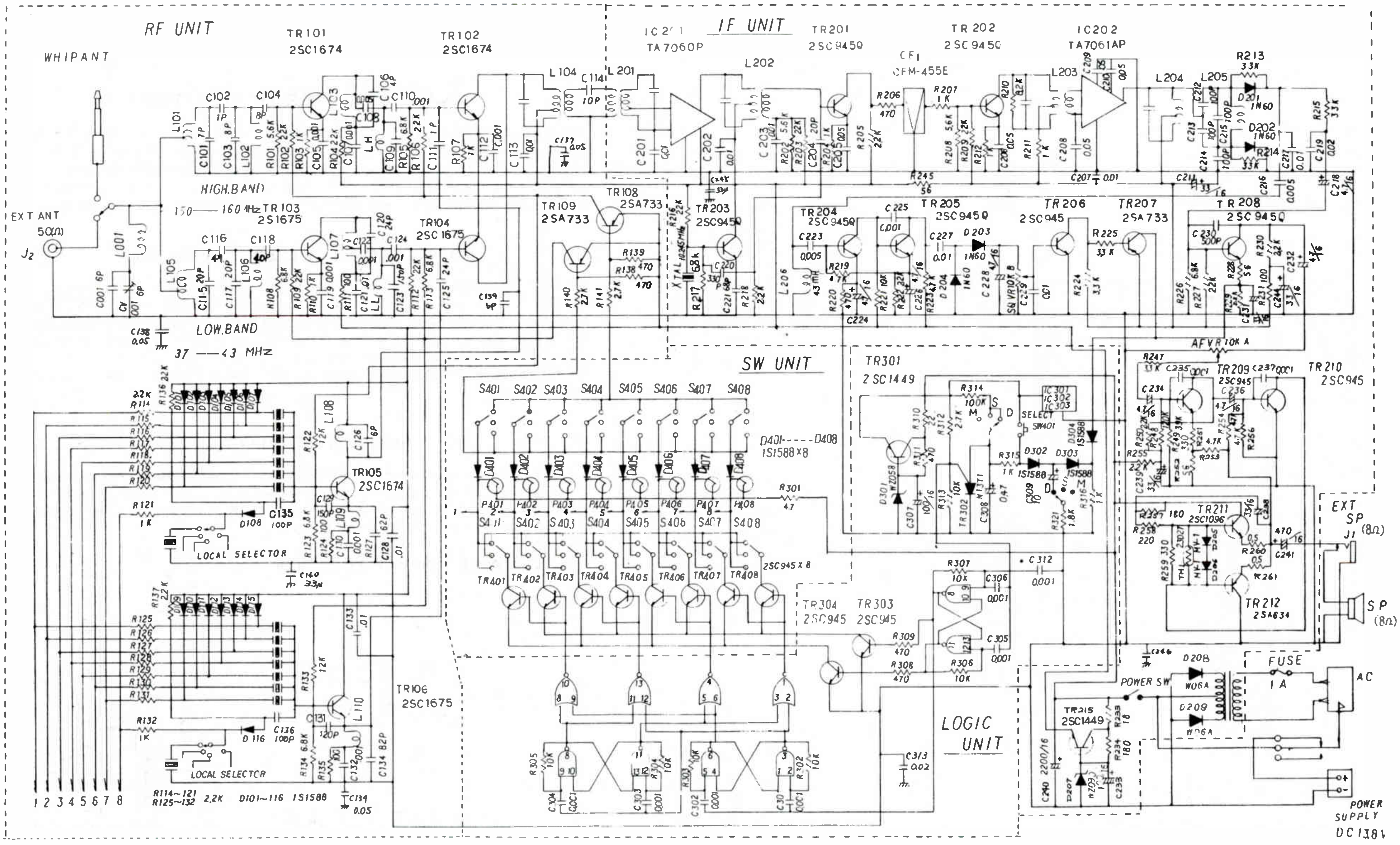
LOGIC



SW



SCHEMATIC DIAGRAM



Subject to change the above circuit diagram and componenents without notice for improvements.

SEMICONDUCTORS

ITEM	TYPE NO.
D001	W06A
D101	1S1588
D102	1S1588
D103	1S1588
D104	1S1588
D105	1S1588
D106	1S1588
D107	1S1588
D108	1S1588
D109	1S1588
D110	1S1588
D111	1S1588
D112	1S1588
D113	1S1588
D114	1S1588
D115	1S1588
D116	1S1588
D201	1N6D
D202	1N60
D203	1N60
D204	1N60
D207	WZ-090
D208	W06A
D209	W06A
D301	WZ-058
D302	1S1588
D303	1S1588
D304	1S1588
D401	1S1588
D402	1S1588
D403	1S1588
D404	1S1588
D405	1S1588
D406	1S1588
D407	1S1588
D408	1S1588
IC201	TA7060P
IC202	TA6061AP
IC301	TD4200P
IC302	TD4200P
IC303	TD4202P
TR101	2SC1674
TR102	2SC1674
TR103	2SC1675
TR104	2SC1675
TR105	2SC1674
TR106	2SC1675
TR1D7	2SA733
TR108	2SA733
TR2D1	2SC945Q
TR202	2SC945Q
TR203	2SC945Q
TR204	2SC945Q
TR205	2SC945Q
TR2D6	2SC945Q
TR207	2SA733
TR208	2SC945Q
TR209	2SC945Q
TR210	2SC945Q
TR211	2SC1096
TR212	2SA634
TR302	PUTN13T1
TR303	2SC945Q
TR304	2SC945Q
TR401	2SC945Q
TR4D2	2SC945Q
TR403	2SC945Q
TR404	2SC945Q
TR405	2SC945Q
TR406	2SC945Q
TR407	2SC945Q
TR408	2SC945Q

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C140	33uF 16V
C211	33uF 16V
C218	4.7uF 16V
C224	4.7uF 16V
C226	4.7uF 16V
C228	4.7uF 16V
C231	33uF 16V
C232	4.7uF 16V
C233	100uF 16V
C234	4.7uF 16V
C236	4.7uF 16V
C238	33uF 16V
C239	33uF 16V
C240	2200uF 16V
C241	470uF 16V
C244	33uF 16V
C245	33uF 16V
C307	100uF 16V
C308	0.47uF 35V
C309	10uF 16V
C313	0.02uF

CRYSTAL INSTALLATION

Crystal are not supplied with the unit. Before using this unit, install crystals into the crystal sockets according to the channel numbers. Crystal should be selected carefully in accordance with the crystal specifications. Ask your dealer for crystal installation or replacement.

INSTALLATION FOR AC OPERATION

To use this unit at house current (117 volt 60 Hz AC), connect AC power cord to the Power Socket at the back of the unit, and then plug it into the house current outlet. This unit has swivel antenna at the back of the unit, and pull out the built-in antenna to its full length and set the antenna in best direction. When you use this unit in areas of low signal strength, use a Ground Plane Antenna or ask your dealer what type of antenna is the best for best reception.

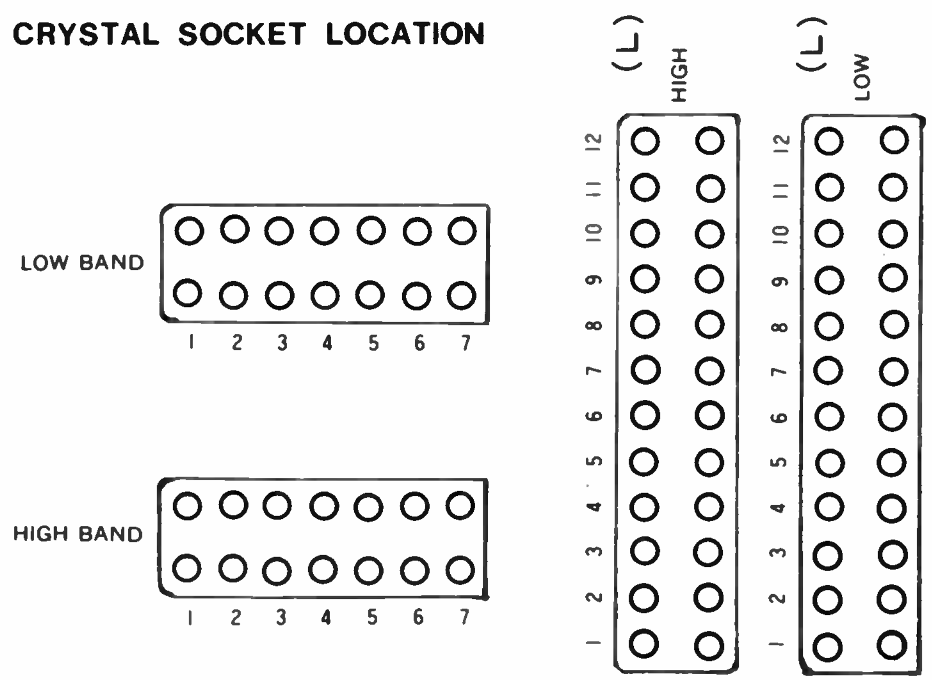
INSTALLATION FOR MOBILE OPERATION

This may be operated in any car or truck with the use of a mobile antenna. Plug the DC power cord into the power socket on the rear pannel. Connect the red (+) cord to the positive terminal of the battery, and the black (−) cord to the negative terminal. Incorrect power cable installation (reverse polarity) may cause damage to the unit. Check carefully before connection to make sure that correct polarity is observed.
THIS SCANNER WORKS ON EITHER NEGATIVE OR POSITIVE GROUND if the above instruction are followed.

ANTENNA INSTALLATION

A VHF antenna is provided with this unit. This telescopic antenna is adjusted for best reception of both low and high VHF signals. Pull out the antenna to its full length, then swivel it for best reception. There is also a rear jack for connecting a VHF Hi / Lo external antenna for picking up weaker signals in the VHF high or low band.

CRYSTAL SOCKET LOCATION



Pages 17-24 Courtesy of GEMTRONICS

CRYSTAL SOCKETS and PROGRAM SWITCHES

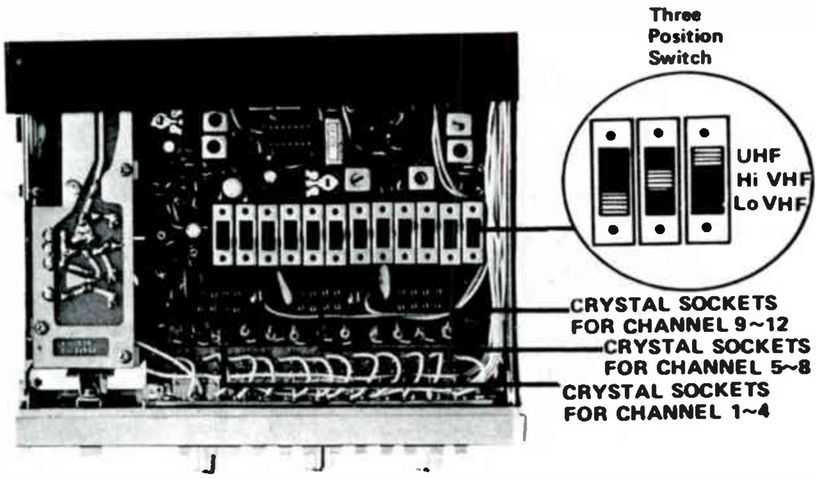
Take off the cover by removing the side screws.

A. CRYSTAL SOCKETS

Install crystals into the socket. (See Fig. 1)

B. PROGRAM SWITCHES

Put each switch in the proper position according to the crystal that is installed for each channel (See Fig. 1)



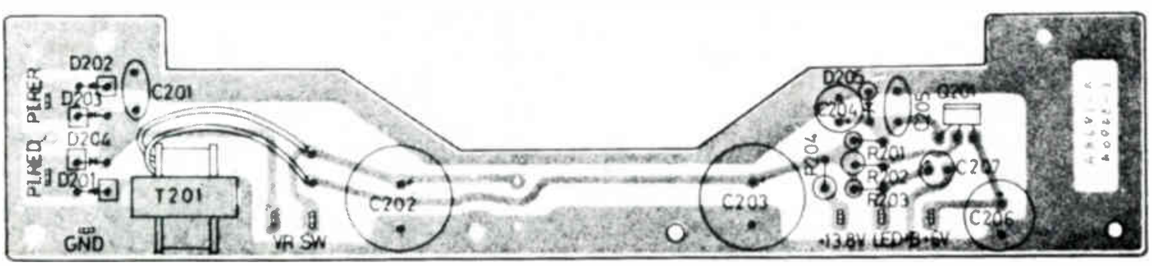
NOTE: In Hi VHF and UHF Front End, to change frequency range for usable sensitivity, it is not enough to adjust coils and trimmer condensers. Accordingly the change of capacities of capacitors is necessary as follows.

Hi VHF

TYPE	Frequency Range	C320	C304	C308	C313	C321
HL	150 ~ 158 MHz	5 pF	5 pF	8 pF	8 pF	2 pF
HM	156 ~ 164 MHz	3 pF	3 pF	8 pF	8 pF	–
HH	166 ~ 174 MHz	2 pF	2 pF	5 pF	5 pF	–

UHF

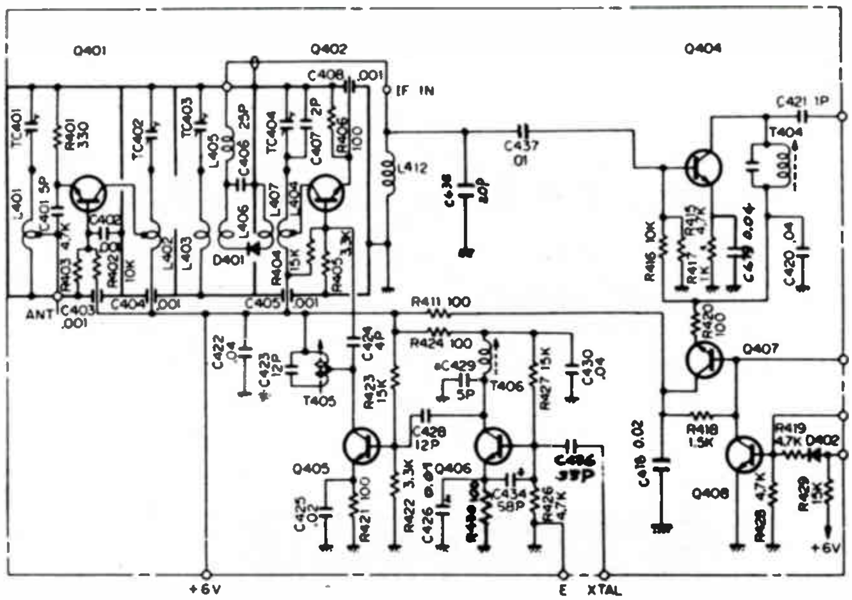
TYPE	Frequency Range	IF Frequency	C423
U1	450 ~ 470 MHz	54.63 ~ 56.63 MHz	15 pF
U2	470 ~ 490 MHz	56.63 ~ 58.63 MHz	15 pF
U3	490 ~ 510 MHz	58.63 ~ 60.63 MHz	12 pF
U4	500 ~ 520 MHz	59.63 ~ 61.63 MHz	12 pF



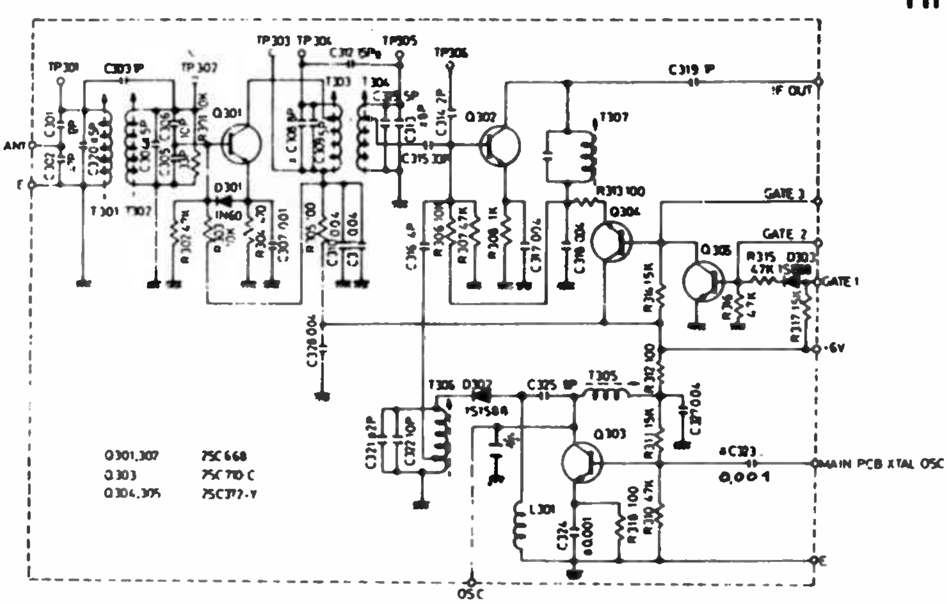
POWER P.C.B

FRONT END SCHEMATIC

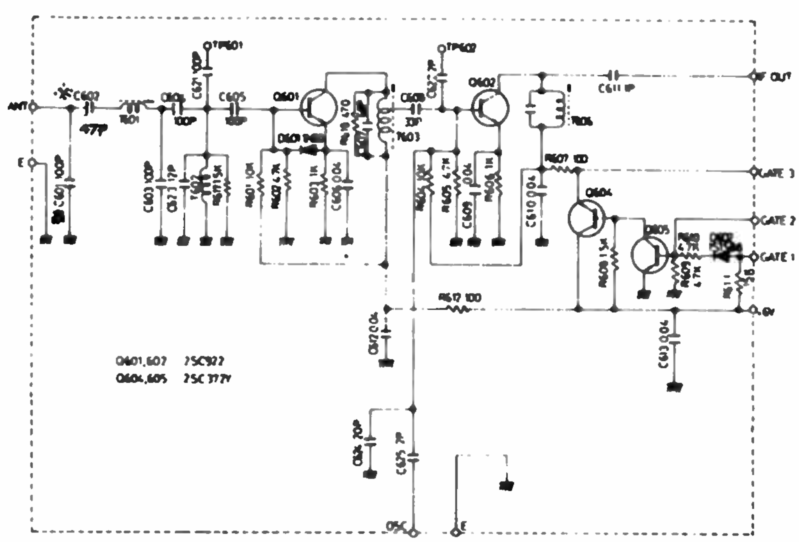
UHF



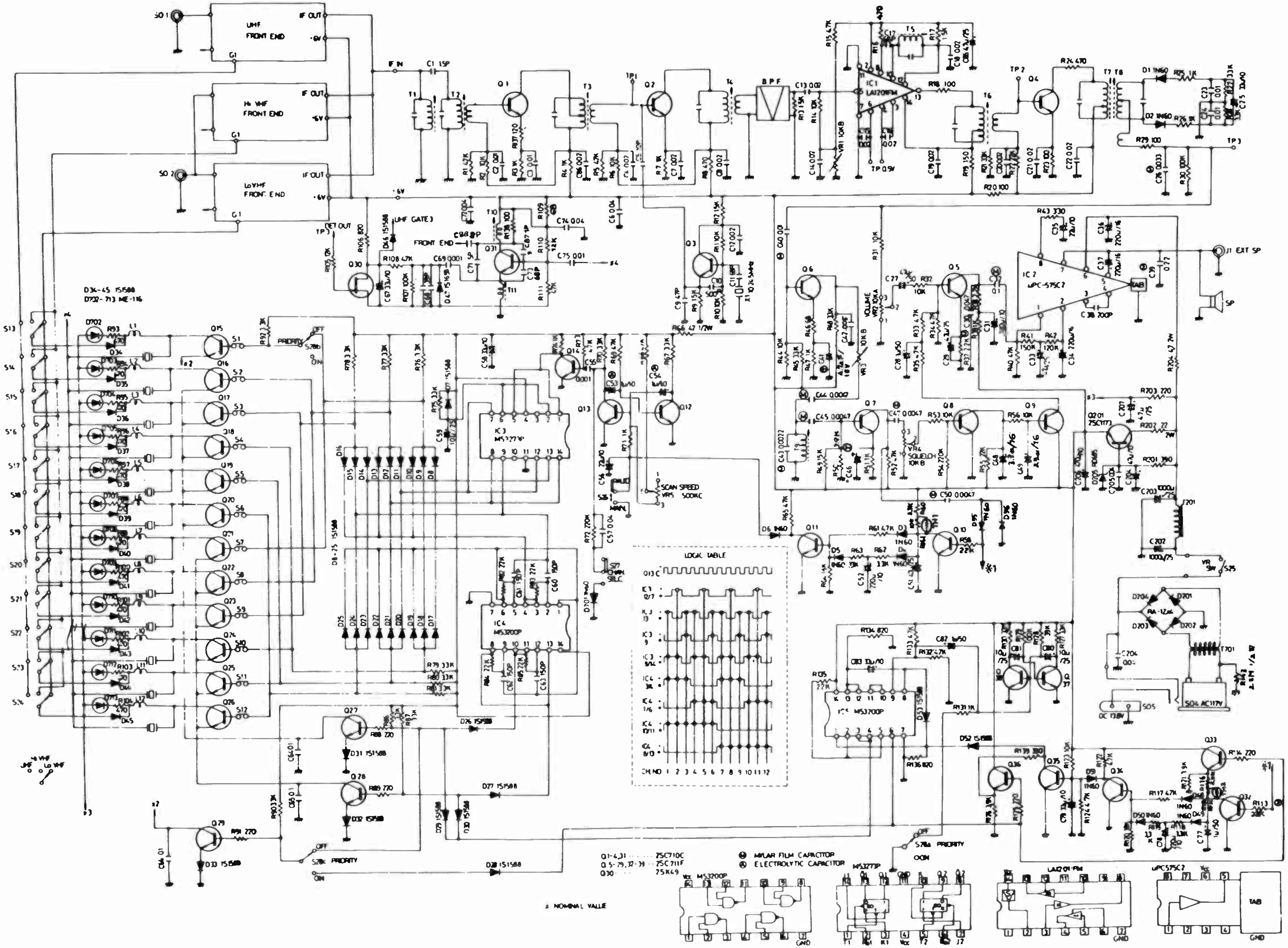
Hi VHF

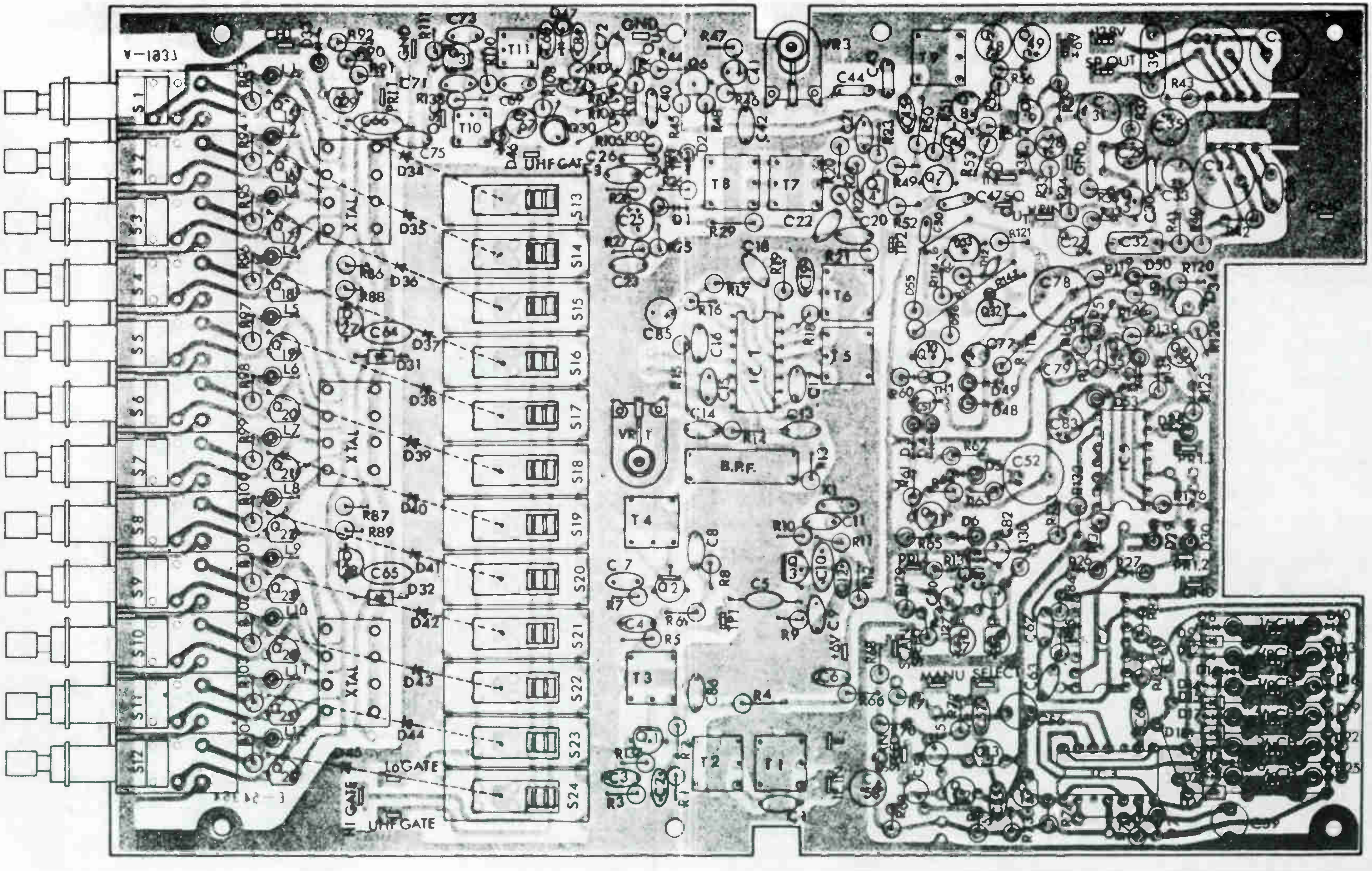


Lo VHF



SCHEMATIC DIAGRAM




S13
S14
S15
S16
S17
S18
S19
S20
S21
S22
S23
S24
XTAL
XTAL
XTAL
B.P.F.
IC 1
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
VR 1
VR3
C44
C52
C78
C65
C32
UHF GATE
LO GATE
HI GATE
SP OUT
GND
MANU SELECT

RECHARGEABLE BATTERIES: Six (6) rechargeable AA cells, such as the Mallory SA-15AA, can be used to power the Hand-Skan. These cells can be recharged without removing them from the unit. To recharge, plug the recharger into the "Batt" jack, and then connect the charger to the 110 volt AC current. Remember you must use 1.5 volt rechargeable batteries. NI-CAD'S with 1.4 volts may not work.

EXTERNAL AC/DC SUPPLY: The Hand-Skan will operate with a 9 volt powered battery eliminator, such as the Kris 416-912. Make certain that you have 6 AA cells in the unit when using an external power supply.

EXTERNAL DC SUPPLY: The Hand-Skan will operate with a 9 volt DC supply--such as an adapter for a car's cigarette lighter. Make certain that the DC adapter reduces the vehicle's voltage to 9 volt. Make certain that you have 6 AA cells in the unit when using an external power supply.

INSTALLATION OF BATTERIES: Remove the two, screws on the back of the Hand-Skan case. Turn the unit over so that the speaker is on top. Remove the front cabinet piece. Insert 6 AA cells into the battery holder. Be certain you position the batteries with their proper polarity. Make certain that the battery holder connector is properly attached. Replace the screws.

CRYSTAL INSTALLATION

The Hand-Skan requires a crystal for each of the four high band frequencies (146-174 MHz) you wish to monitor. It is not essential that all four crystals be used.

The Hand-Skan uses TMR type crystals, which is also known as a "10.7 IF" crystal. Local frequency crystals are normally available at your Kris dealer. When specific frequencies are not available, you usually can purchase a Crystal Certificate which enables you to order these frequencies directly from the crystal manufacturer.

Hand-Skan crystal specifications are as follows:

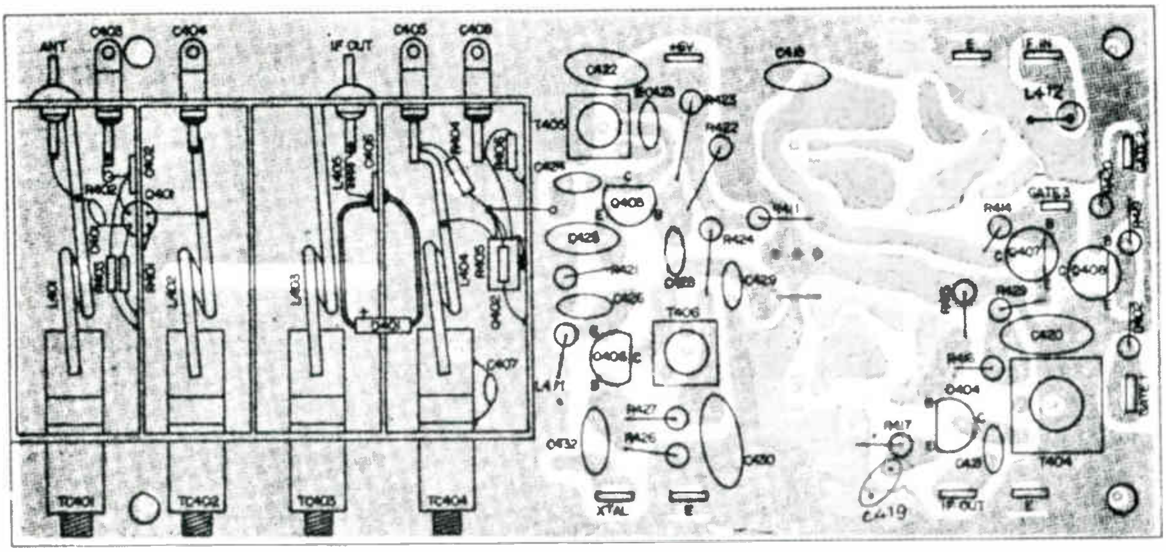
Frequency Tolerance:	.001%
Holder:	type HC-25/U
Overtone:	3rd overtone
Resonance:	series
Maximum Impedance:	35 ohms

Crystal Frequency: $\frac{\text{channel freq.} - 10.7\text{ MHz}}{3}$

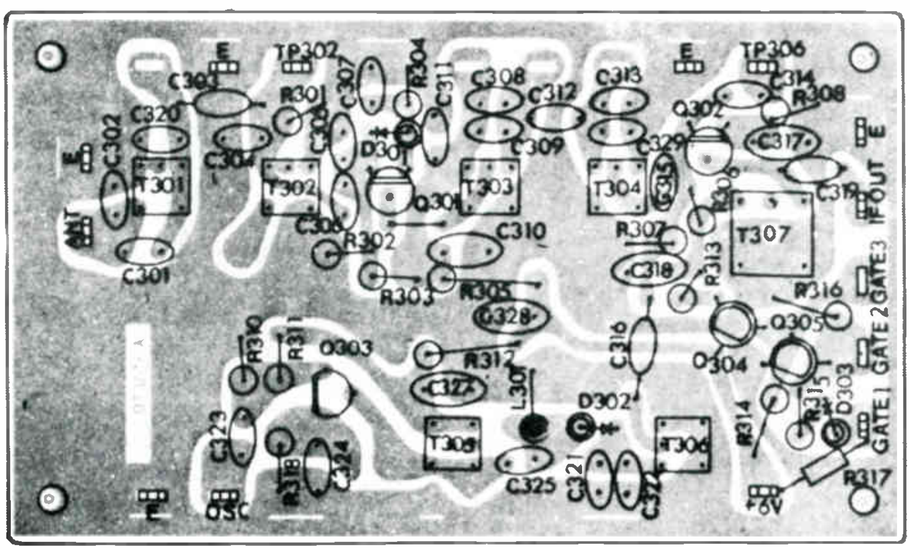
To insert crystals into the Hand-Skan, remove the cover. Place crystal (s) in the socket(s) per the following diagram. (Either pin can go in either socket.)

PARTS LOCATION of FRONT END

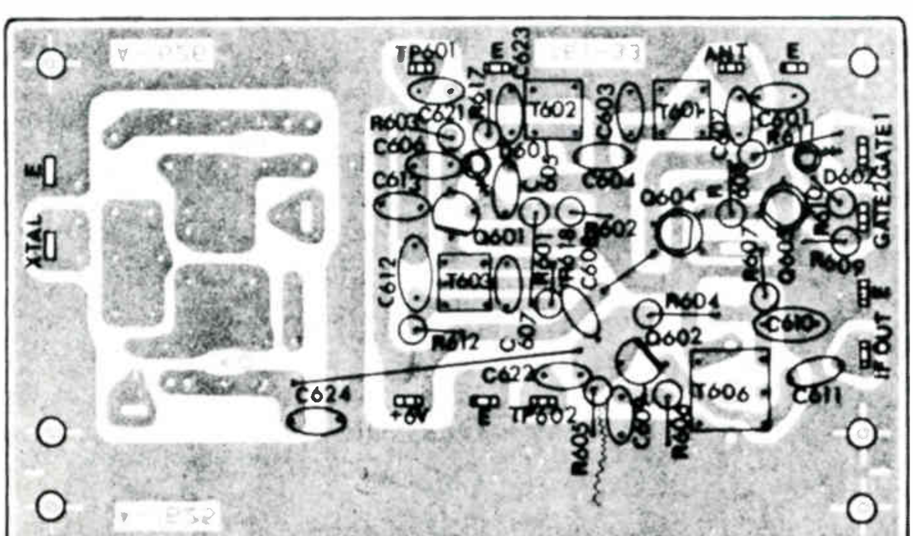
UHF



Hi VHF



Lo VHF



SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D1	1N60	30-1,011
D2	1N60	30-1,011
D3	1N60	30-1,011
D3	1N60	30-1,011
D4	1N60	30-1,011
D5	1N60	30-1,011
D6	1N60	30-1,011
D7	1S1588	30-1,010
D8	1S1588	30-1,010
D9	1S1588	30-1,010
D10	1S1588	30-1,010
D11	1S1588	30-1,010
D12	1S1588	30-1,010
D13	1S1588	30-1,010
D14	1S1588	30-1,010
D15	1S1588	30-1,010
D16	1S1588	30-1,010
D17	1S1588	30-1,010
D18	1S1588	30-1,010
D19	1S1588	30-1,010
D20	1S1588	30-1,010
D21	1S1588	30-1,010
D22	1S1588	30-1,010
D23	1S1588	30-1,010
D24	1S1588	30-1,010
D25	1S1588	30-1,010
D26	1S1588	30-1,010
D27	1S1588	30-1,010
D28	1S1588	30-1,010
D29	1S1588	30-1,010
D30	1S1588	30-1,010
D31	1S1588	30-1,010
D32	1S1588	30-1,010
D33	1S1588	30-1,010
D34	1S1588	30-1,010
D35	1S1588	30-1,010
D36	1S1588	30-1,010
D37	1S1588	30-1,010
D38	1S1588	30-1,010
D39	1S1588	30-1,010
D40	1S1588	30-1,010
D41	1S1588	30-1,010
D42	1S1588	30-1,010
D43	1S1588	30-1,010
044	1S1588	30-1,010
D45	1S1588	30-1,010
D46	1S1588	30-1,010
D47	1S1658	30-1,022
D48	1N60	30-1,011
D49	1N60	30-1,011
D50	1N60	30-1,011
D51	1N60	30-1,011
D52	1S1588	30-1,010
D53	1S1588	30-1,010
D55	1N60	30-1,011
D56	1N60	30-1,011
D201	RA-1Z	30-1,013
D202	RA-1Z	30-1,013
D203	RA-1Z	30-1,013
D204	RA-1Z	30-1,013
D205	RD-6.8E	30-1,021
D301	1N60	30-1,011
D302	1S1588	30-1,010
D303	1S1588	30-1,010
D401	1SS-16	30-1,012
D402	1S1588	30-1,010
D601	1N60	30-1,011
D602	1S1588	30-1,010
D701	1N60	30-1,011
D702	ME-116	30-1,024
D703	ME-116	30-1,024
D704	ME-116	30-1,024
D705	ME-116	30-1,024
D706	ME-116	30-1,024
D707	ME-116	30-1,024
D708	ME-116	30-1,024
D709	ME-116	30-1,024
D710	ME-116	30-1,024
D711	ME-116	30-1,024
D712	ME-116	30-1,024
D713	ME-116	30-1,024
IC1	LA-1201	30-1,008
IC2	uPC-575	30-1,017
IC3	M-53273	30-1,019
IC4	M-53200	30-1,018
IC5	M-53200	30-1,018
Q1	2SC1675	30-1,025
Q2	2SC1675	30-1,025
Q3	2SC710	30-1,002
Q4	2SC1675	30-1,025
Q5	2SC711	30-1,016
Q6	2SC711	30-1,016
Q7	2SC711	30-1,016
Q8	2SC711	30-1,016
Q9	2SC711	30-1,016
Q10	2SC711	30-1,016
011	2SC711	30-1,016
Q12	2SC711	30-1,016
Q13	2SC711	30-1,016
Q14	2SC711	30-1,016
Q15	2SC711	30-1,016
Q16	2SC711	30-1,016
Q17	2SC711	30-1,016
Q18	2SC711	30-1,016
Q19	2SC711	30-1,016
Q20	2SC711	30-1,016
Q21	2SC711	30-1,016
Q22	2SC711	30-1,016
Q23	2SC711	30-1,016
Q24	2SC711	30-1,016
Q25	2SC711	30-1,016
Q26	2SC711	30-1,016
Q27	2SC711	30-1,016
Q28	2SC711	30-1,016
Q29	2SC711	30-1,016
Q30	2SK-49	30-1,023
Q31	2SC710	30-1,002
Q32	2SC711	30-1,016
Q33	2SC711	30-1,016
Q34	2SC711	30-1,016
Q35	2SC711	30-1,016
Q36	2SC711	30-1,016
Q37	2SC711	30-1,016
Q38	2SC711	30-1,016
Q201	2SC1173	30-1,007
Q301	2SC668	30-1,001
Q302	2SC668	30-1,001
Q303	2SC710	30-1,002
Q304	2SC372	30-1,003
Q305	2SC372	30-1,003
Q401	2SC1180	30-1,004
Q402	2SC1180	30-1,004
Q404	2SC710	30-1,002
Q405	2SC710	30-1,002
Q406	2SC710	30-1,002
Q407	2SC372	30-1,003
Q408	2SC372	30-1,003
Q601	2SC922	30-1,015
Q602	2SC922	30-1,015
Q604	2SC372	30-1,003
Q605	2SC372	30-1,003

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO
C25	33uF 10V	10-1,026
C27	0.47uF 50V	10-1,033
C28	1uF 50V	10-1,034
C29	4.7uF 25V	10-1,030
C31	100uF 10V	10-1,054
C33	4.7uF 25V	10-1,030
C34	220uF 16V	10-1,029
C35	22uF 10V	10-1,052
C36	220uF 16V	10-1,029
C37	220uF 16V	10-1,029
C41	4.7uF 16V	10-1,057
C46	4.7uF 16V	10-1,057
C48	3.3uF 25V	10-1,058
C49	3.3uF 25V	10-1,058
C51	4.7uF 25V	10-1,030
C52	220uF 10V	10-1,055
C53	1uF 10V	10-1,056
C54	1uF 10V	10-1,056
C56	22uF 10V	10-1,052
C58	33uF 10V	10-1,026
C59	10uF 25V	10-1,031
C67	33uF 10V	10-1,026
C77	1uF 50V	10-1,034
C78	220uF 10V	10-1,055
C79	33uF 10V	10-1,026
C80	10uF 25V	10-1,031
C81	10uF 25V	10-1,031
C82	1uF 50V	10-1,034
C83	33uF 10V	10-1,026
C85	4.7uF 25V	10-1,030
C202	1000uF 25V	10-1,032
C203	1000uF 25V	10-1,032
C204	47uF 10V	10-1,053
C206	470uF 10V	10-1,027
C207	4.7uF 25V	10-1,030
TC401	5pF Trimmer	50-1,016
TC402	5pF Trimmer	50-1,016
TC403	5pF Trimmer	50-1,016
TC404	5pF Trimmer	50-1,016

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
TH1	Thermistor,TD5-C225	30-1,026
TH2	Thermistor,TD5-C225	30-1,026
VR1	10K, Trimmer	20-1,028
VR2	10K, Volume	21-1,001
VR3	10K, Trimmer	20-1,028
VR4	10K, Squelch	21-1,002
VR5	500K, Scan	21-1,003

COILS/TRANSFORMERS

ITEM	PART NO.
L1	40-1,010
L2	40-1,010
L3	40-1,010
L4	40-1,010
L5	40-1,010
L6	40-1,010
L7	40-1,010
L8	40-1,010
L9	40-1,010
L10	40-1,010
L11	40-1,010
L12	40-1,010
L301	40-1,010
L401	40-1,008
L402	40-1,008
L403	40-1,008
L404	40-1,022
L405	40-1,012
L412	40-1,010
T1	40-1,014
T2	40-1,015
T3	40-1,016
T4	40-1,017
T5	40-1,017
T6	40-1,018
T7	40-1,019
T8	40-1,020
T9	40-1,021
T10	40-1,031
T11	40-1,028
T201	50-1,002
T301	40-1,004
T302	40-1,004
T303	40-1,005
T304	40-1,007
T305	40-1,001
T306	40-1,006
T307	40-1,013
T404	40-1,013
T405	40-1,009
T406	40-1,001
T601	40-1,027
T602	40-1,001
T603	40-1,029
T606	40-1,013
T701	40-1030

MISCELLANEOUS

ITEM	NAME	PART NO.
BPF	Ceramic Filter	50-1,001
S1	Switch, Bypass	51-1,006
S2	Switch, Bypass	51-1,006
S3	Switch, Bypass	51-1,006
S4	Switch, Bypass	51-1,006
S5	Switch, Bypass	51-1,006
S6	Switch, Bypass	51-1,006
S7	Switch, Bypass	51-1,006
S8	Switch, Bypass	51-1,006
S9	Switch, Bypass	51-1,006
S10	Switch, Bypass	51-1,006
S11	Switch, Bypass	51-1,006
S12	Switch, Bypass	51-1,006
S13	Switch, Program	51-1,007
S14	Switch, Program	51-1,007
S15	Switch, Program	51-1,007
S16	Switch, Program	51-1,007
S17	Switch, Program	51-1,007
S18	Switch, Program	51-1,007
S19	Switch, Program	51-1,007
S20	Switch, Program	51-1,007
S21	Switch, Program	51-1,007
S22	Switch, Program	51-1,007
S23	Switch, Program	51-1,007
S24	Switch, Program	51-1,007
S25	Switch, Volume	21-1,001
S26	Switch, Priority	51-1,008
S27	Switch, Scan	51-1,008
S28	Switch, Channel Select	51-1,008
X1	10.245MHz Crystal	50-1,017
	AC Power Cord	51-1,009
	DC Power Cord	51-1,010

CABINET PARTS

NAME	PART NO.
Knob, Bypass Switches	51-1,019
Knob, Priority Switch	51-1,020
Knob, Scan Switch	51-1,020
Knob, Select Switch	51-1,020
Knob, Control	51-1,021

TO INSTALL CRYSTALS

1. Remove the cover.
2. Figure 1 shows the location of the crystal sockets.

3. Insert the crystals into the sockets where channel number is designated, and then using the label provided, write in the respective frequencies. Affix label to cover for easy reference.
4. Put the program switches to the proper position according to the crystal frequency of each channel.

Every police, fire and other municipal, civilian defense or federal department, etc. broadcast on specific frequencies *These frequencies, will differ in each town or city. Your local dealer or town hall can tell you the frequencies being used in your area.

In order to obtain the correct crystal to monitor a specific channel, the following formula must be followed to obtain the crystal frequency.

FOR Lo VHF:

CRYSTAL 3RD OVERTONE FREQUENCY=DESIRED CHANNEL FREQUENCY +10.7MHz

FOR Hi VHF:

$$\text{CRYSTAL 3RD OVERTONE FREQUENCY}=\frac{\text{DESIRED CHANNEL FREQUENCY} - 10.7\text{MHz}}{\text{Divided by 3}}$$

FOR UHF:

$$\text{CRYSTAL 3RD OVERTONE FREQUENCY}=\frac{\text{DESIRED CHANNEL FREQUENCY} - 10.7\text{MHz}}{\text{Divided by 9}}$$

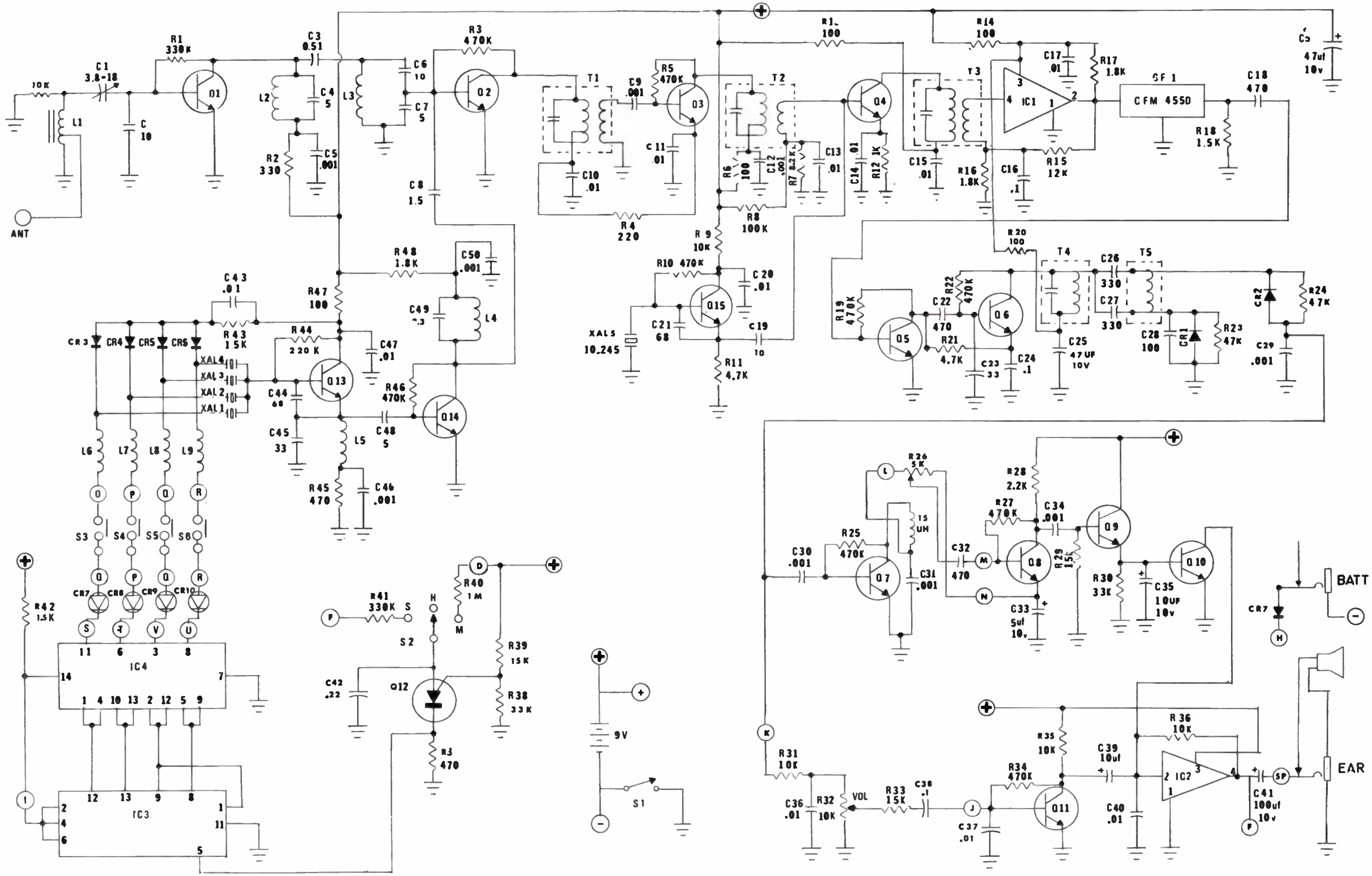
CRYSTAL CORRELATION:

Resonance:		Parallel
Overtone:		3rd
Load Capacity:		20 pf
Max. Series Resistance		35 ohm
Maximum Drive:		2 milliwatts
Frequency Tolerance:		
V.HF:	At 25°C	±0.001%
	From −30°C to +80°C	±0.005%
UHF:	At 25°C	±0.0007%
	From −30°C to +80°C	±0.001%

In special cases where interference is encountered from strong adjacent stations, the formula is changed by substituting a positive sign (+) for the negative sign (−) or vice versa. There crystals are available on special order.

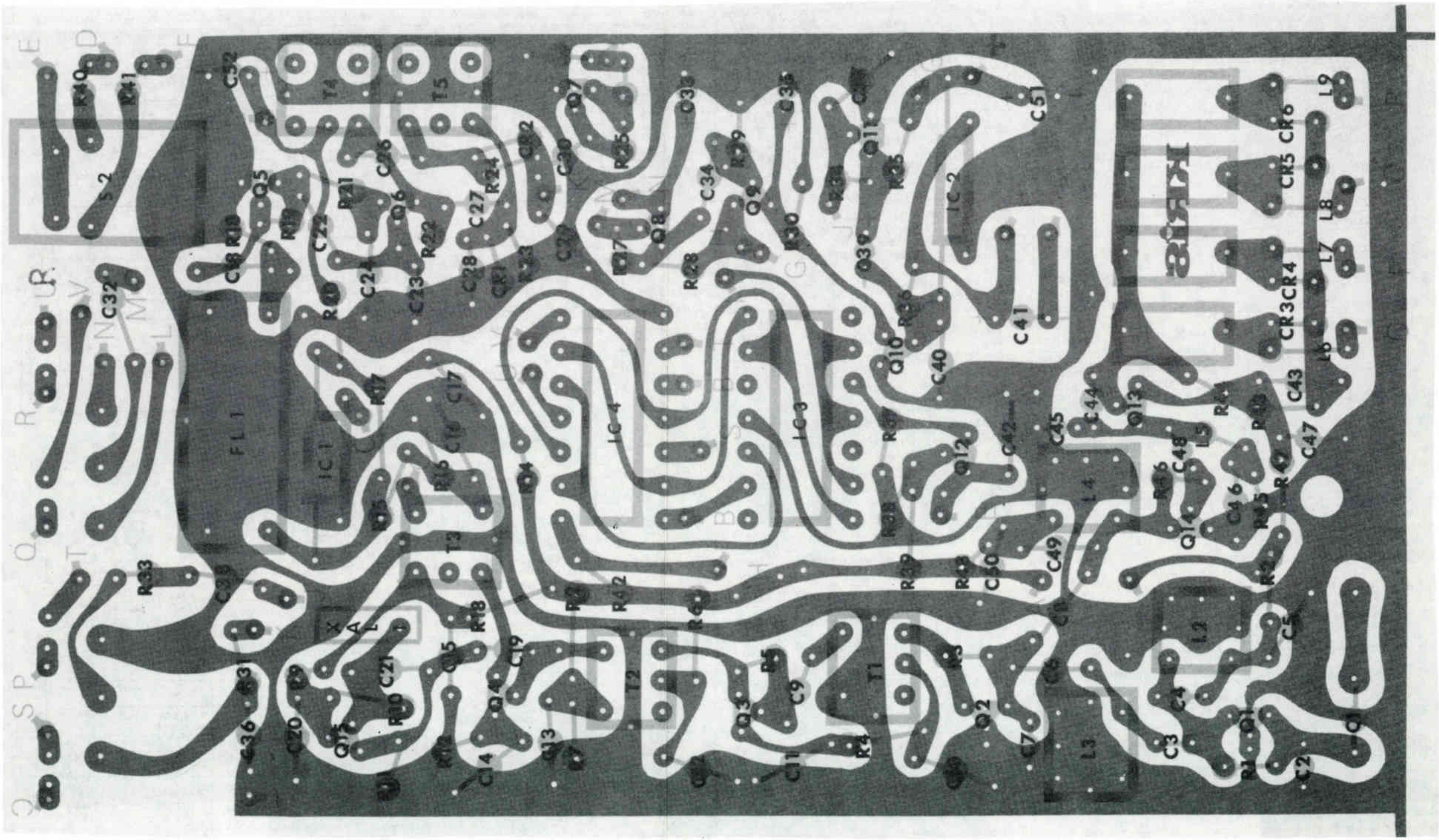
REMEMBER: When ordering crystals from your dealer always give the model number of the unit, crystal frequency and specify crystal holder CR 25/U.

ALL CRYSTALS ARE 3RD OVERTONE AND 20PF LOAD CAPACITY.



ANT
10K
C1 3.8-18
R1 330K
C 10
L1
Q1
C3 0.51
L2
C4 5
R2 330
C5 .001
L3
C6 10
C7 5
R3 470K
Q2
C8 1.5
T1
C9 .001
R5 470K
Q3
C10 .01
C11 .01
R4 220
T2
R6 100
C12 .001
R7 8.2K
C13 .01
C14 .01
R12 1K
Q4
R8 100K
R9 10K
R10 470K
Q15
C20 .01
C21 68
C19 10
R11 4.7K
XALS 10.245
R14 100
C17 .01
R17 1.8K
T3
IC1
C15 .01
R16 1.8K
C16 .1
R15 12K
SF1
CFM 455D
R18 1.5K
C18 470
47uf 10v
R20 100
T4
C26 330
T5
C27 330
R19 470K
R22 470K
C22 470
Q5
Q6
R21 4.7K
C23 33
C24 .1
C25 47UF 10V
C28 100
CR1
R23 47K
CR2
R24 47K
C29 .001
R48 1.8K
C50 .001
C43 .01
R47 100
R43 15K
C49
L4
R44 220K
C47 .01
CR3
CR4
CR5
CR6
XAL4
XAL3
XAL2
XAL1
Q13
C44 68
R46 470K
Q14
C45 33
L5
C48 5
R45 470
C46 .001
L6
L7
L8
L9
S3
S4
S5
S6
CR7
CR8
CR9
CR10
R42 1.5K
IC4
IC3
R41 330K
S2
R40 1M
Q12
C42 .22
R39 15K
R38 33K
R3 470
9V
S1
R26 5K
R28 2.2K
R27 470K
C34 .001
Q9
R25 470K
15 UH
C30 .001
Q7
C31 .001
C32 470
Q8
R29 15K
R30 33K
C35 10UF 10V
Q10
C33 5uf 10v
BATT
CR7
EAR
R35 10K
R36 10K
C39 10uf
R34 470K
IC2
R31 10K
C36 .01
R32 10K
VOL
R33 15K
C38 .1
C37 .01
Q11
C40 .01
C41 100uf 10v

***Kris** Hand Scan VHF (416-155)*



Pages 31-35 Courtesy of KRIS, INC.

Your Tri-Band Scanner may be programmed in many different ways. This allows you a great deal of flexibility as your monitoring needs change. The table below shows how to go about changing the scanners' "program" to fit your requirements.

TRI-BAND PROGRAMMING TABLE

	Buttons 1-4 Top Row	Buttons 5-8 Top Row	Buttons 1-8 Bottom Row
LOW BAND	Wire A to Socket L	Wire C to Socket L	Wire B to Socket L
HIGH BAND	Wire A to Socket H Red Wire to P-1 or P-2	Wire C to Socket H Red Wire to P-1 or P-2	Wire B to Socket H White Wire to P-1 or P-2
UHF BAND	Wire A to Socket U Red Wire to P-3 or P-4	Wire C to Socket U Red Wire to P-3 or P-4	Wire B to Socket U White Wire to P-3 or P-4

NOTE: There are three holes in each of the H,L, and U sockets — it makes no difference which of these holes are used.

NOTE: If you desire to program the set so that both High Band and UHF are to be received using the top deck switches*, it will be necessary to add an additional short piece of wire from either P-1 or P-2 to either P-3 or P-4.

* For example, UHF on buttons 1-4 and Hi Band on buttons 5-8 or vice versa.

PROGRAMMING EXAMPLE

The set in the illustration is programmed for Low Band on buttons 1-4 of the top buttons, UHF on buttons 5-8 of the top buttons, and High Band on the bottom buttons 1-8. This is the way your Tri-Band was programmed at the factory.

From the programming table we find that:

To get Low Band on buttons 1-4 of the top row, wire A is inserted into socket L.

To get UHF on buttons 5-8 of the top row, wire C is inserted into socket U and the red wire is plugged into either P-3 or P-4.

To get High Band on the bottom eight buttons, wire B is inserted into socket H and the white wire is inserted into either P-1 or P-2.

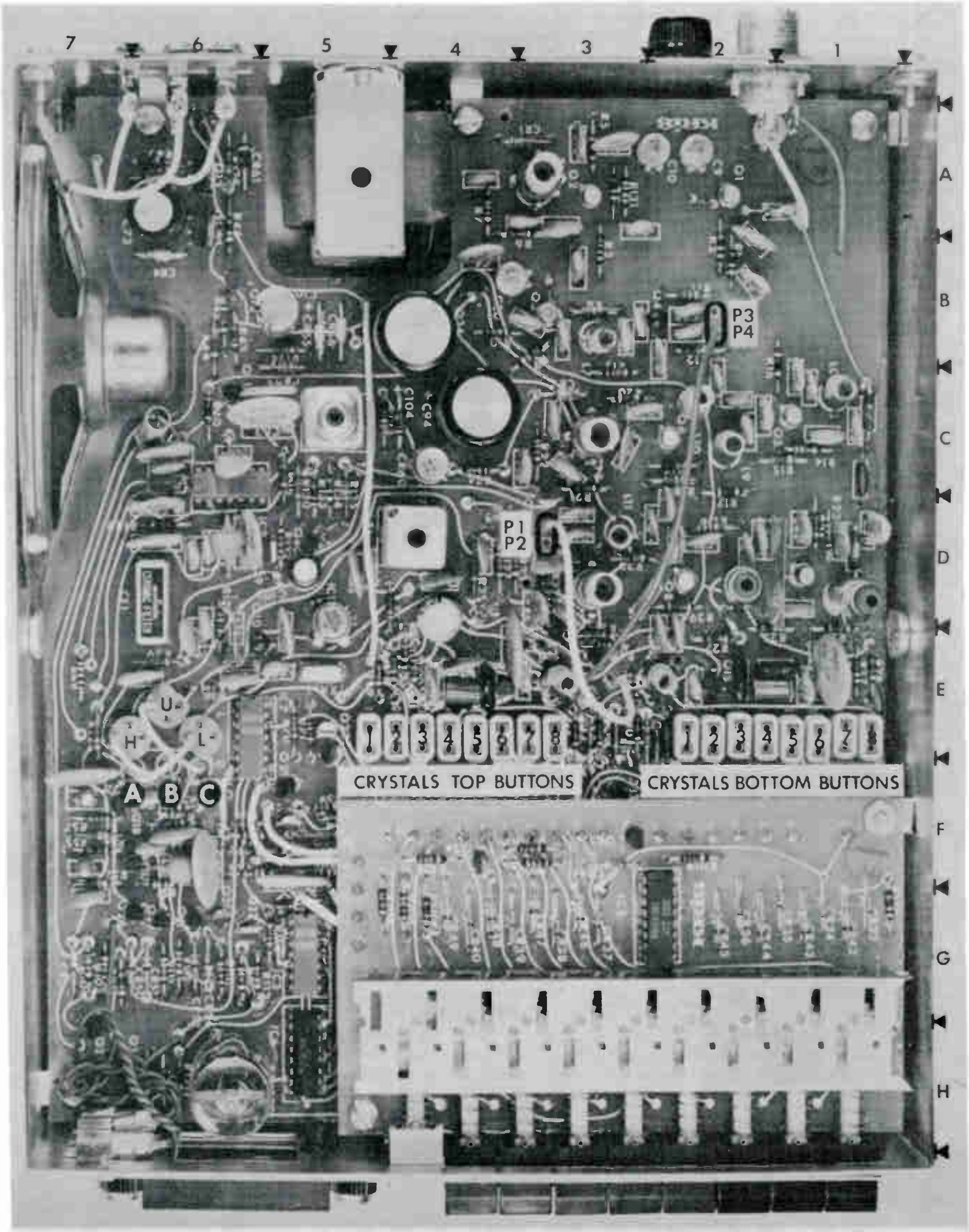
By consulting the table and illustration you will find that there are many ways of programming the scanner — one will undoubtedly fit your special requirements.

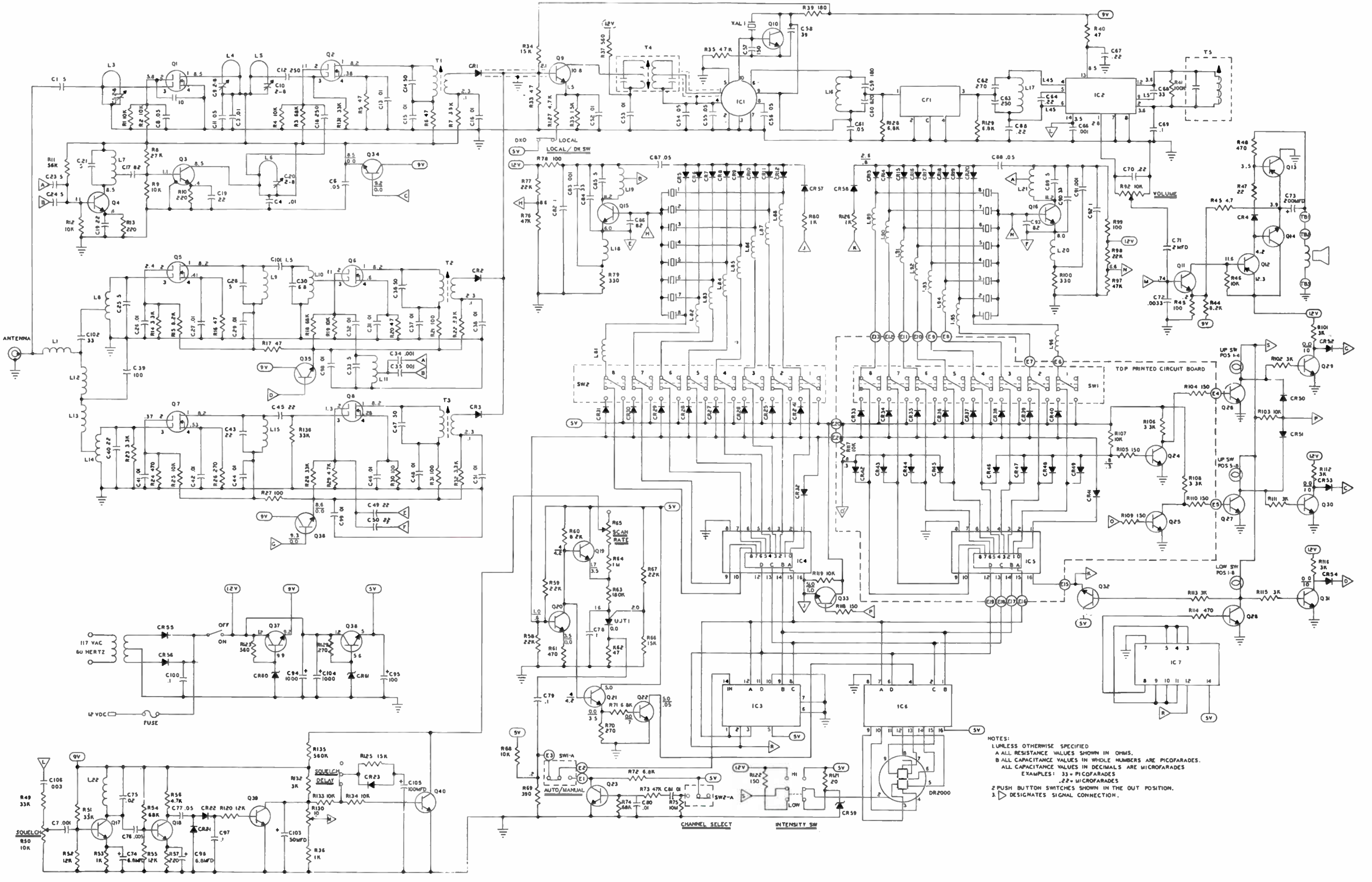
CRYSTALS

The Kris Tri-Band was shipped without crystals because of the many hundreds of authorized frequencies in the three monitoring bands. Crystals are available from Kris and also available from your local Kris Dealer. Be sure to specify Kris Tri-Band crystals.

Kris Tri-Band crystal specifications are as follows:

1. Frequency tolerance — .001%
2. 3rd overtone; series resonance is 450 Hz lower than operating frequency
3. Maximum impedance of 35 ohms
4. Type HC-25/u holder
5. Crystal frequency:
   Low Band: Crystal Frequency = Channel Frequency + 10.7 mHz
   High Band: Crystal Frequency = $\dfrac{\text{Channel Frequency - 10.7 mHz}}{3}$
   UHF Band: Crystal Frequency = $\dfrac{\text{Channel frequency - 10.7 mHz}}{9}$


7
6
5
4
3
2
1
A
B
C
D
E
F
G
H
P3
P4
P1
P2
C94
C104
1 2 3 4 5 6 7 8
CRYSTALS TOP BUTTONS
1 2 3 4 5 6 7 8
CRYSTALS BOTTOM BUTTONS
U
H
L
A B C



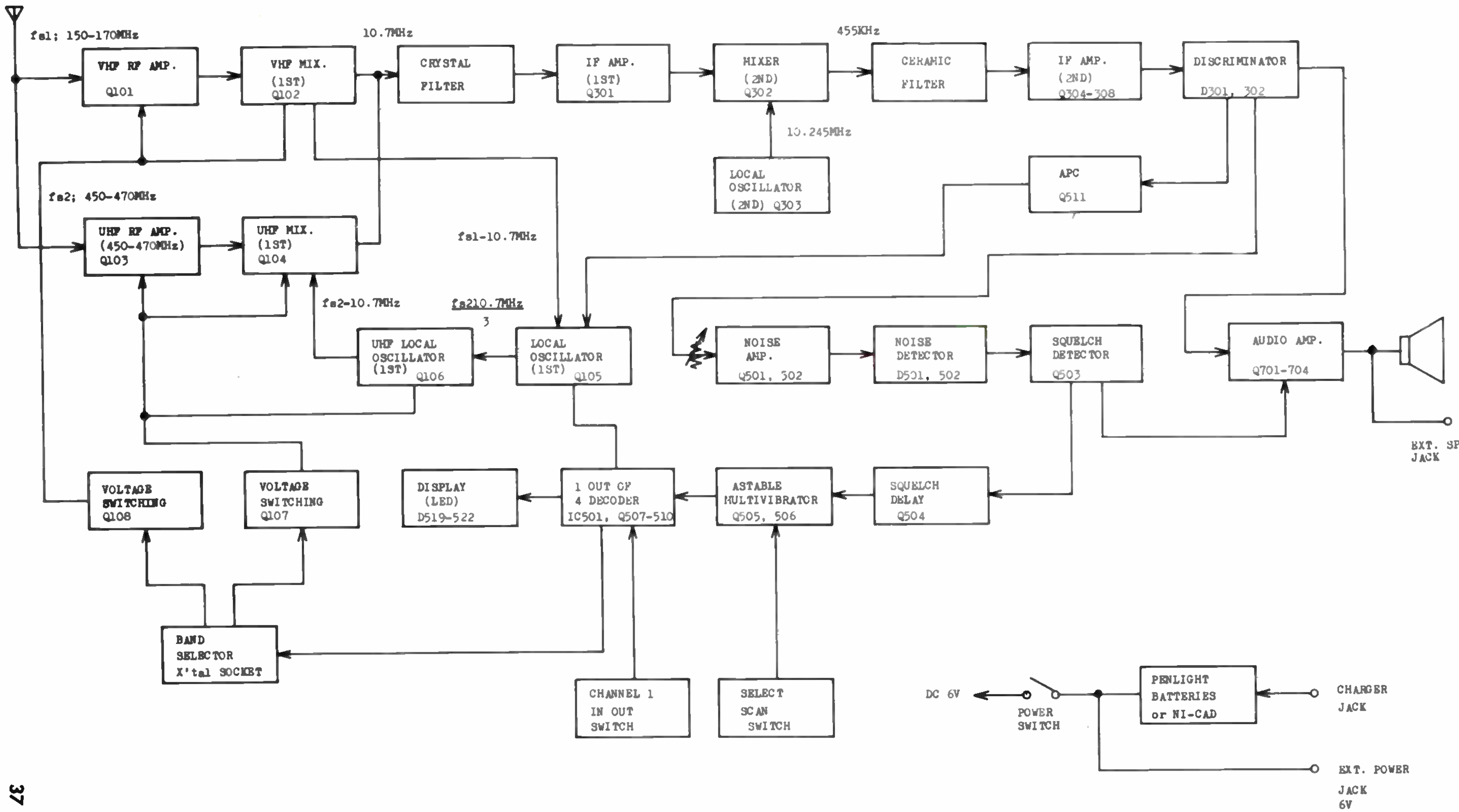
NOTES:
1. UNLESS OTHERWISE SPECIFIED
A. ALL RESISTANCE VALUES SHOWN IN OHMS.
B. ALL CAPACITANCE VALUES IN WHOLE NUMBERS ARE PICOFARADS.
ALL CAPACITANCE VALUES IN DECIMALS ARE MICROFARADS
EXAMPLES: 33 = PICOFARADS
.22 = MICROFARADS
2. PUSH BUTTON SWITCHES SHOWN IN THE OUT POSITION.
3. ▷ DESIGNATES SIGNAL CONNECTION.

OPERATOR TROUBLE-SHOOTING HINTS

No power in radio (Lights do not light and no noise from speaker)	Check to see that power cord is connected to rear of set. (Mobile operation) Check to see that set is properly grounded to vehicle frame and that power cord is properly connected to 12 volts. Check fuse.
No reception (Lights light but do not receive any signals)	Check antenna connection. Check to see that crystal is in proper socket and that radio is correctly programmed.
No sound	Check to see if squelch control is properly adjusted If using external speaker, check for proper connection of speaker wires.
Does not scan	Check to see that "scan/manual" button is in the out position. Check setting of squelch control.
Signals distorted or weak	Check antenna connections. Are stations too distant for your antenna. If so, try a better antenna. Check to see that crystals were ordered for use in Kris Tri-Band.

BLOCK DIAGRAM

MODEL 13-921



Sams — Scanner-Monitor —
Pages 37-44 Courtesy of MIDLAND INTERNATIONAL

ALIGNMENT PROCEDURE

1. TEST EQUIPMENT REQUIRED
   FM Signal Generator VHF Hi: 100 - 200 MHz
   UHF : 400 - 500 MHz
   Oscilloscope
   V.T.V.M.
   DC Power Supply 6V - 500 mA
   DC Volt Meter 5V
   Screw Driver for alignment
   Crystals for test VHF Hi: 156 MHz
   UHF : 458 MHz
   Dummy Load 8 ohms - 500 mW
2. TEST EQUIPMENT SET-UP DIAGRAM

TEST EQUIPMENT SET-UP DIAGRAM

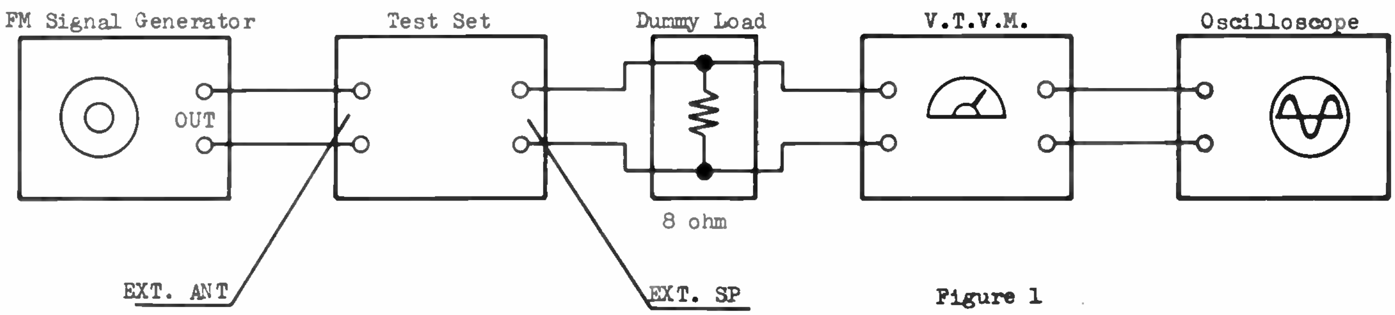


Figure 1

3. PROCEDURE

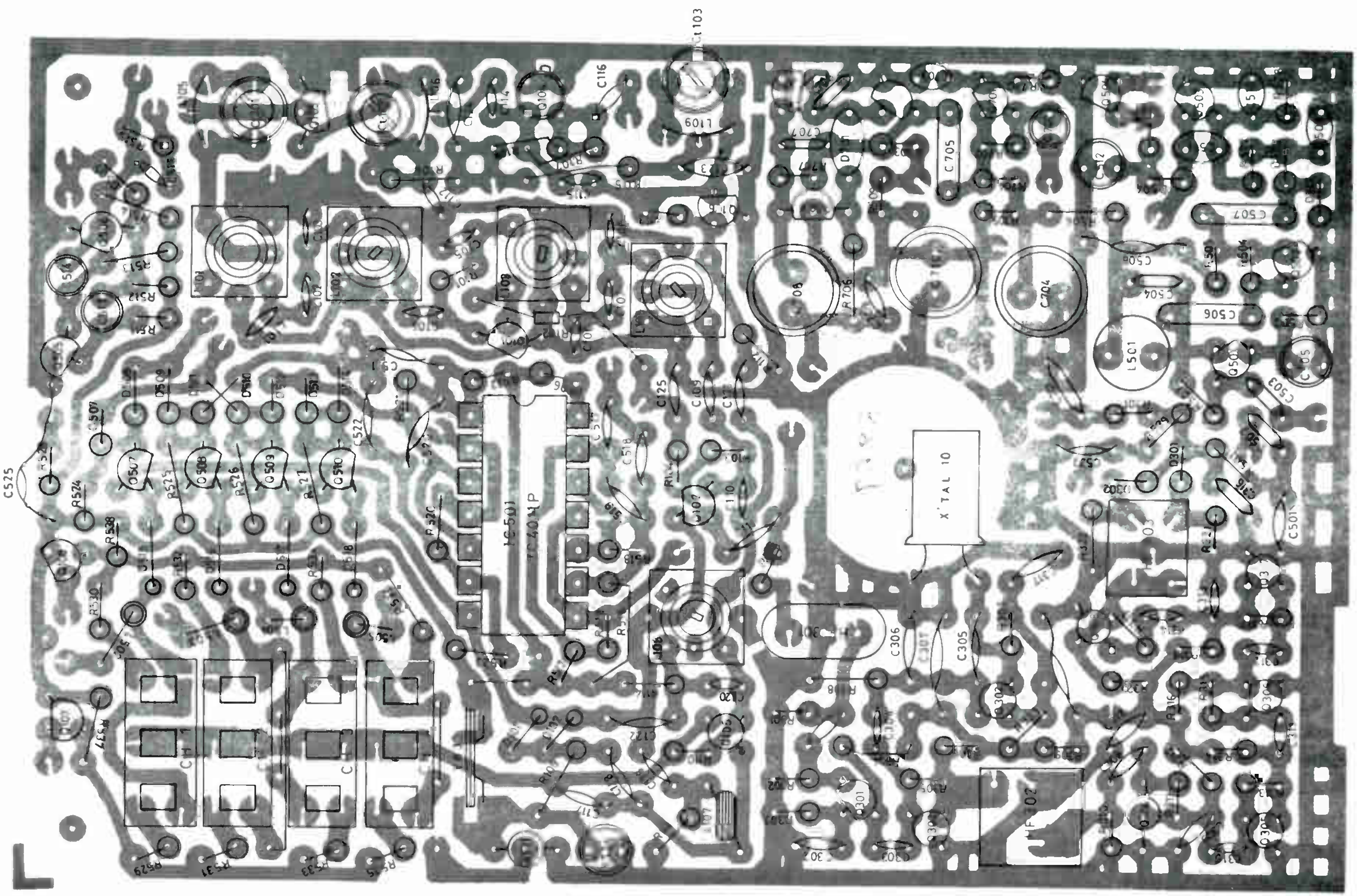
(VHF Hi Band)

1. Connect the DC Power Supply to the Test Set.
2. Activate CH 4 in manual scanning operation. (Light CH 4 Indicator Light.)
3. Turn the SQUELCH control fully counterclockwise.
4. Keep noise level about 0.5V reading on the V.T.V.M. by rotating the VOLUME control.
5. Plug 156 MHz crystal into the CH4 crystal socket on the High Band side.
6. Connect the DC Volt Meter to R109 and the ⊖ terminal of the DC Power Supply.
7. Adjust VR502 for 3 volts reading on the DC Volt Meter.
8. Connect the FM Signal Generator to EXT. ANT. socket.
9. Set the FM Signal Generator to 156 MHz.
10. Adjust L101, L102, L103, L104 and L108 for maximum output.
    Repeat this step two or three times.

(UHF Band)

1. Plug 458 MHz crystal into the CH 4 crystal socket on the UHF Band side.
2. Set the FM Signal Generator to 458 MHz.
3. Adjust CT101, CT102, CT103 and L107 for maximum output.
   Repeat this step two or three times.

COMPONENT LAYOUT



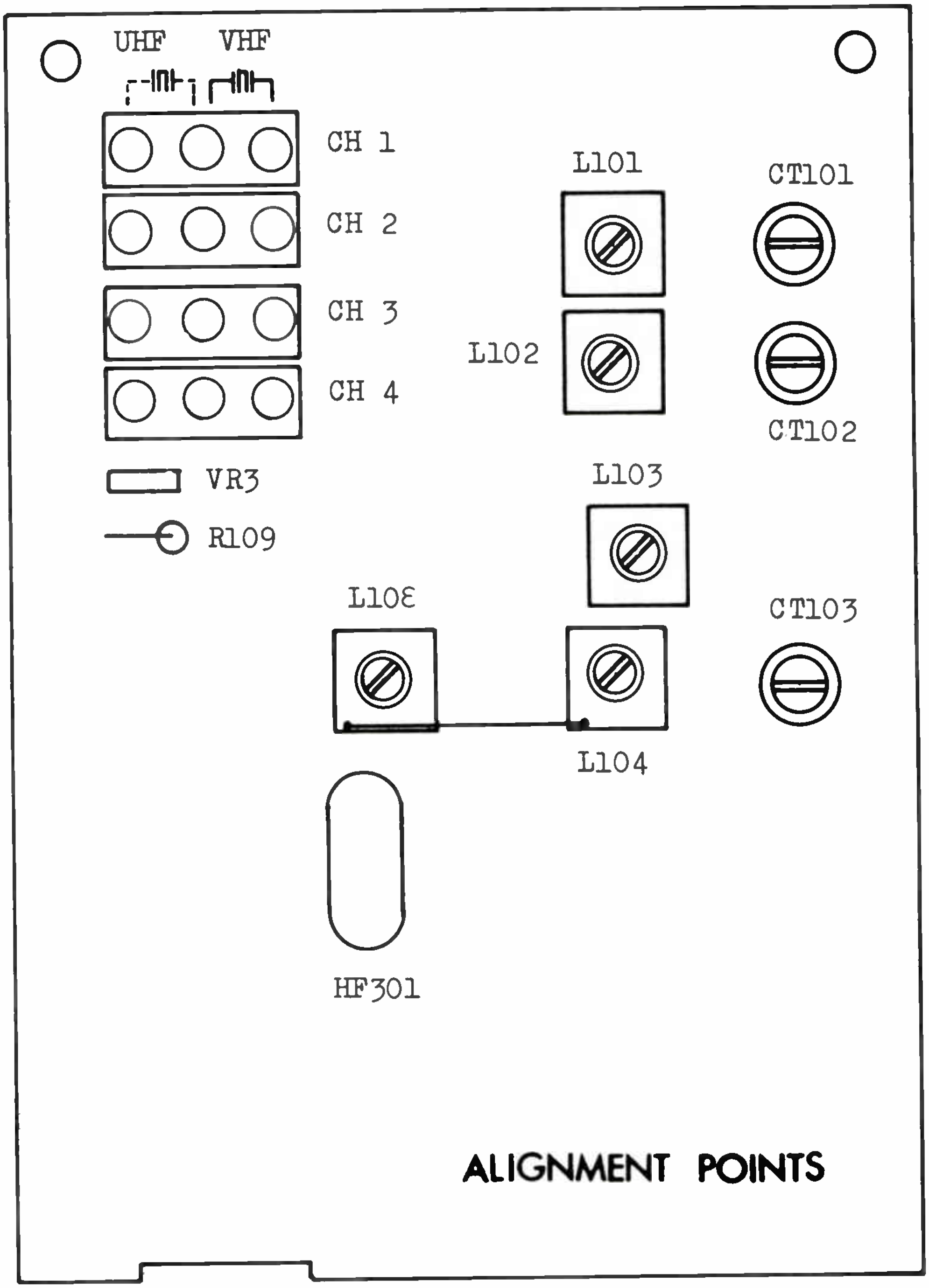


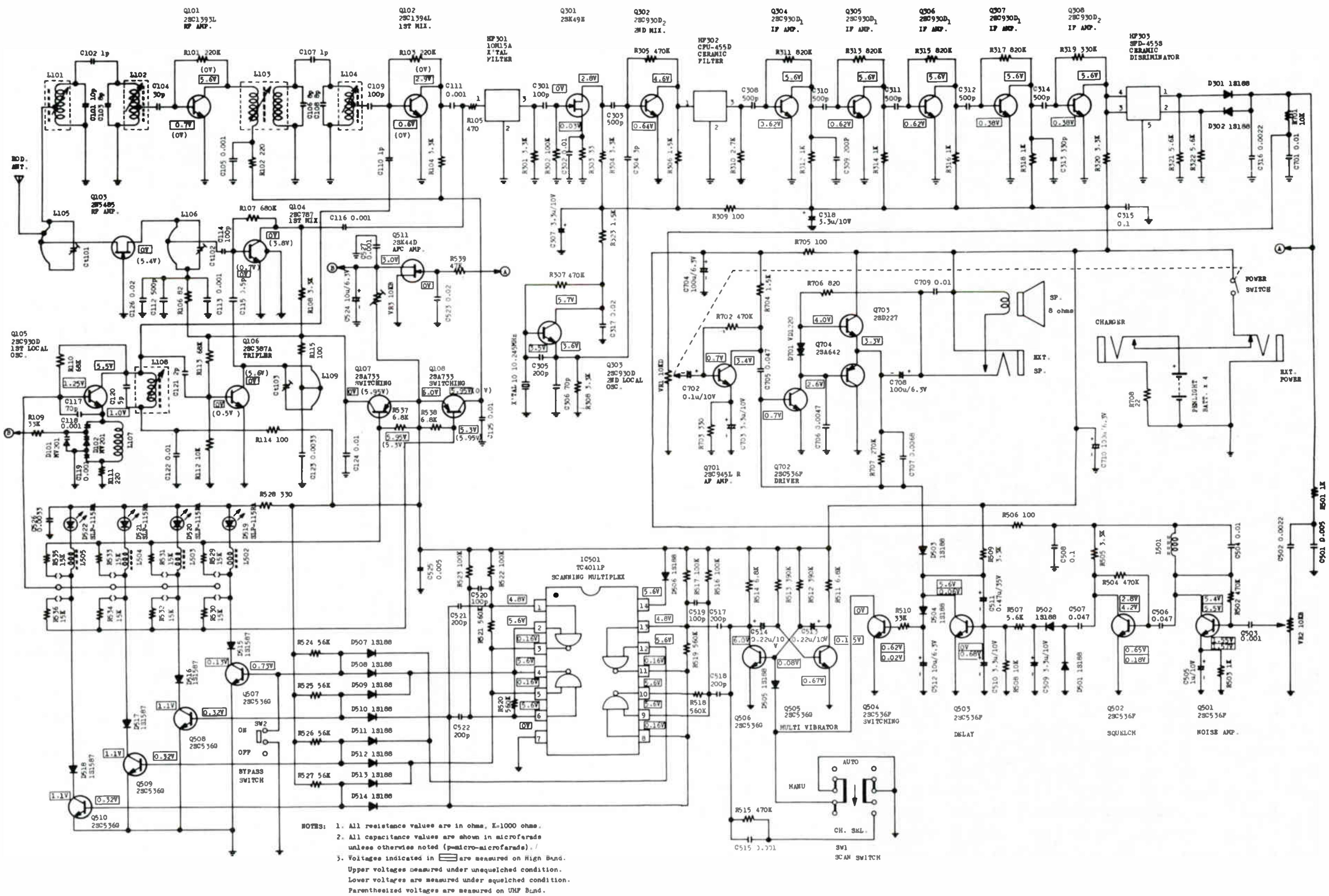
Figure 2

All reasonable efforts have been made to assure that this reference information is as complete and accurate as practical, but no representation of total accuracy is expressed or implied.

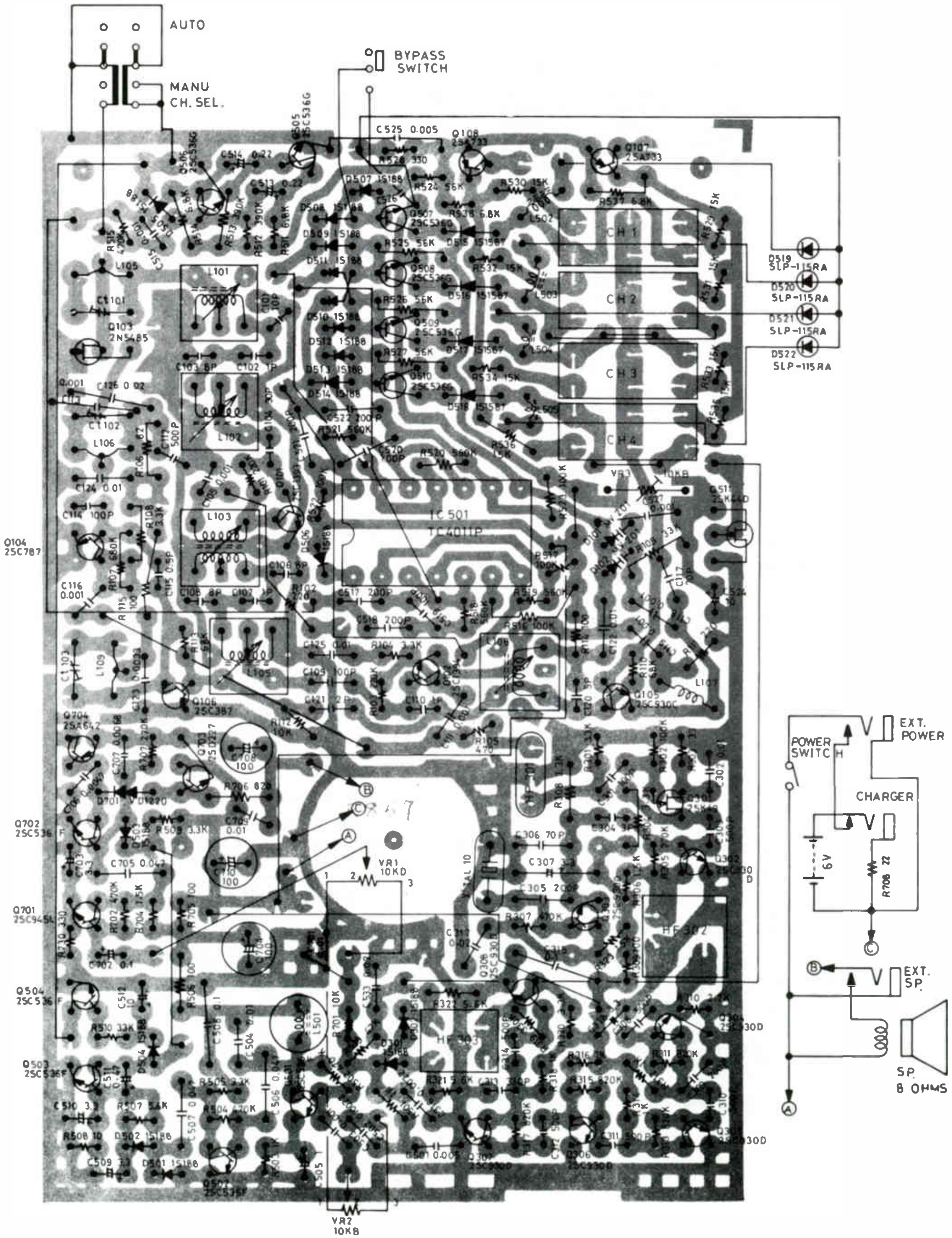
If the information listed is believed to be in error or needs to be revised, please direct your comments in writing to:

MIDLAND INTERNATIONAL
Technical Publications
Dept. 54
P. O. Box 1903
Kansas City, Missouri 64141

SCHEMATIC DIAGRAM



COMPONENT SYMBOLS LAYOUT



SEMICONDUCTORS

ITEM	TYPE NO.
D101	MV201
0102	MV201
0301	1S188
0302	1S188
0501	1S188
0502	1S188
0503	1S188
0504	1S188
0505	1S188
0506	1S188
0507	1S188
0508	1S188
0509	1S188
0510	1S188
0511	1S188
0512	1S188
0513	1S188
0514	1S188
0515	1S1587
0516	1S1587
0517	1S1587
0518	1S1587
0519	SLP-115RA
0520	SLP-115RA
0521	SLP-115RA
0522	SLP-115RA
0701	V01220
IC501	CMOSTC4011P
	CM03MC14011CP (1)
Q101	2SC1393
Q102	2SC1394
Q103	2N5485-1
Q104	2SC787
Q105	2SC930
Q106	2SC387
Q107	2SA733
Q108	2SA733
Q301	2SK49
Q302	2SC930
Q303	2SC930
Q304	2SC930
Q305	2SC930
Q306	2SC930
Q307	2SC930
Q308	2SC930
Q501	2SC536
	2SC945 (1)
Q502	2SC536
	2SC945 (1)
Q503	2SC536
	2SC945 (1)
Q504	2SC536
	2SC945 (1)
Q505	2SC536G
Q506	2SC536G
Q507	2SC536G
Q508	2SC536G
Q509	2SC536G
Q510	2SC536G
Q511	2SK44
Q701	2SC945
Q702	2SC536
	2SC945 (1)
Q703	2S0227
Q704	2SA642

(1) Alternate.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C505	1uF 10V	
C509	3.3uF 10V	
C510	3.3uF 10V	
C511	0.47uF 35V	
C512	10uF 6.3V	
C513	0.22uF 10V	
C514	0.22uF 10V	
C524	10uF 6.3V	
C702	0.1uF 10V	
C703	3.3uF 10V	
C704	100uF 6.3V	
C708	100uF 6.3V	
C710	100uF 6.3V	
Ct101	Trimmer	13-123061
Ct102	Trimmer	13-123061
Ct103	Trimmer	13-123061

CONTROLS/SPECIAL RESISTORS

ITEM	OESCRIPTION	PART NO.
VR1	10K, Volume	13-161004
VR2	10K, Squelch	13-166065
VR3	10K, AFC	13-161033

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-094161
L102	13-094161
L103	13-176429
L104	13-094161
L105	13-176427
L106	13-176427
L107	13-094166
L108	13-094162
L109	13-176427
L501	13-178183
L502	13-178122
L503	13-178122
L504	13-178122
L505	13-178122

MISCELLANEOUS

ITEM	NAME	PART NO.
SW1	Switch, Scan	13-180085
SW2	Switch, Bypass	13-180084
	10.245MHz Crystal	13-128364

CABINET PARTS

NAME	PART NO.
Panel, Top Assy.	13-010283
Case, Front	13-010284
Case, Rear	13-013127
Ooor, Crystal Access	13-018025
Knob, Volume/Squelch	13-110190
Knob, Scan	13-115123

Pages 45-58 Courtesy of PACE COMMUNICATIONS

SECTION V
ADJUSTMENTS AND ALIGNMENT

5.1 GENERAL

Every effort has been made to keep the required instruments necessary to align and service as simple as possible. It must be realized that the degree of accuracy attained in measurement is directly related to the quality of instruments used. Where a lower quality instrument than the one suggested is used, allowance must be made for possible error in readings. Refer to Table 4-1 for a list of recommended test equipment.

5.2 ALIGNMENT PROCEDURE

5.2.1 IF Alignment

1. Connect a DC voltmeter, through an RF probe (Figure 4-1) to terminal 2 of IC2.

2. Connect an FM signal generator to the antenna jack. Set the frequency to the RF carrier frequency of the crystal installed in Channel 1 position. Check to see that the Channel 1 indicator lamp remains lit.

3. With no modulation of the signal, adjust the generator output control for an indication on the meter of approximately 0.5 volts.

4. Tune T1, T2, and T3 for maximum indication on the meter. Reduce the signal generator level to maintain approximately 0.5 volts on the meter. This procedure is common to all models. Refer to Figure 5-1.

5.2.2 RF Amplifier Alignment

NOTE

Adjustable components in this circuit have been precisely set at the factory. They should not be readjusted unless one of the critical tuning components associated with them has been replaced or the seals on the coils broken.

A. Models 10-4H and 10-4L (Figure 5-1)

1. Repeat steps 1 through 3 of Section 5.2.1.

2. Tune L101 through L103 for maximum indication on the meter. Reduce the signal generator level to maintain approximately 0.5 volts on the meter.

B. Model 10-4U (Figure 5-2)

1. Repeat steps 1 through 3 of Section 5.2.1.

2. Adjust PC1 and PC2 for maximum indication on the meter. Reduce the signal generator level to maintain approximately 0.5 volts on the meter.

5.2.3 Oscillator Alignment

NOTE

Adjustable components in this circuit have been precision set at the factory. Only the trimmer capacitors associated with the crystals should need adjustment when a new crystal is installed. All other adjustable components should not be readjusted unless one of the critical tuning components associated with them have been replaced, or the seals on the coils broken.

A. Models 10-4H and 10-4L (Figure 5-1)

1. Repeat steps 1 through 3 of Section 5.2.1.

2. Tune L4 for maximum indication on the meter. Reduce the signal generator level to maintain approximately 0.5 volts on the meter.

3. Adjust PC1 for maximum indication on the meter.

4. Set the signal generator frequency to that of the RF carrier frequency of the crystal installed in the Channel 2 position. Check to see that the Channel 2 indicator lamp remains lit.

5. Adjust PC2 for maximum indication on the meter.

6. Repeat steps 4 and 5 for crystals in Channels 3 and 4, adjusting PC3 and PC4.

B. Model 10-4U (Figure 5-2)

1. Repeat steps 1 through 3 of Section 5.2.1.

2. Tune L3 and PC3 for maximum indication on the meter. Reduce the signal generator level to maintain approximately 0.5 volts on the meter.

3. Adjust PC7 for maximum indication on the meter.

4. Repeat steps 4 through 6 of part A, adjusting PC6 for Channel 2, PC5 for Channel 3, and PC4 for Channel 4.

5.2.4 FM Detector Coil Alignment (Figure 5-1)

1. Connect an AC VTVM, on its 3 volt scale across the speaker terminals.

2. Connect an FM signal generator to the antenna jack. Set the frequency to the RF carrier frequency of the crystal installed in the Channel 1 position. Frequency modulate the signal at 1 kHz with 3 to 5 kHz deviation.

3. Tune T4 for maximum indication on the voltmeter.

5.3 VOLUME LIMIT POTENTIOMETER ADJUSTMENT (Figure 5-1)

1. Repeat steps 1 and 2 of Section 5.2.3.

2. Set the volume control to its maximum clockwise position.

3. Adjust trimming potentiometer, VR3, for 2.9 volts on the meter.

NOTE

In some units, this potentiometer is wired to the volume control.

5.4 QUIETING SENSITIVITY CHECK

After the receiver has been completely aligned, check the quieting sensitivity as follows:

1. Lock the scanner in on one of the channels.

2. Connect an AC VTVM, on its 3 volt scale across the speaker terminals.

3. Turn the receiver squelch control fully counterclockwise (squelch off).

4. Adjust the volume control for a zero dB reference level on the AC VTVM.

5. Connect an unmodulated FM signal generator to the antenna jack. The generator frequency should be set to the frequency of the locked-in channel.

6. Adjust the generator output level for a –20 dB indication on the AC VTVM. The level should be 0.6 microvolts or less. If greater than 0.6 microvolts, repeat Section 5.2.2.

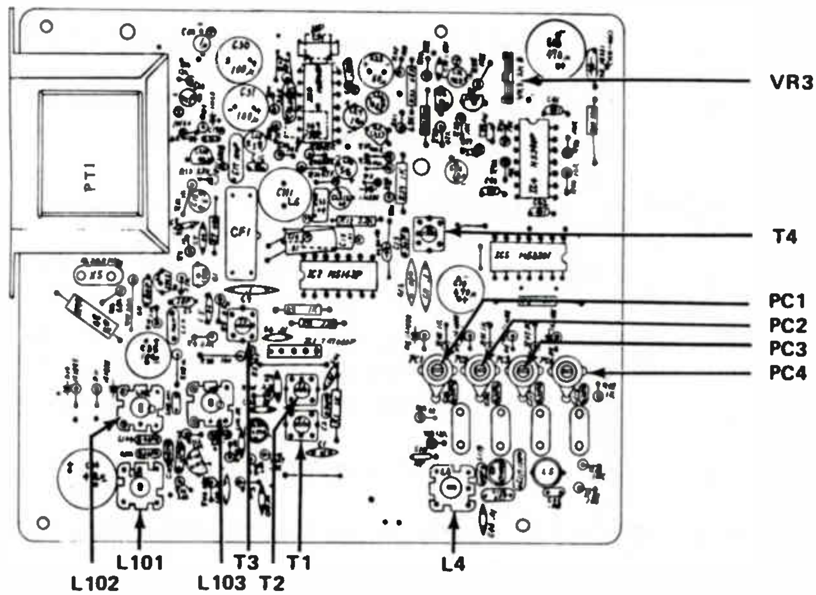
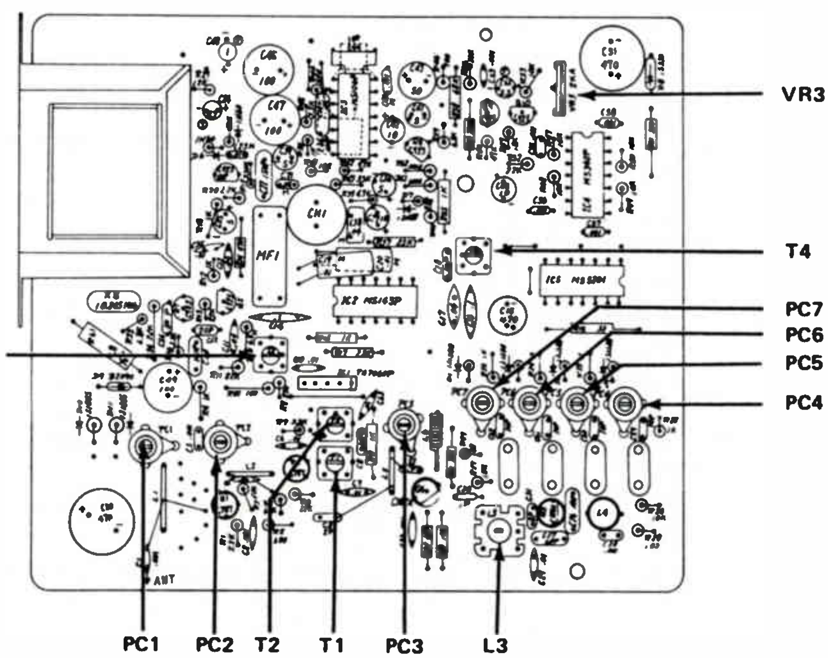


Figure 5-1 Adjustment Locations for SCAN 10-4H and 10-4L



Adjustment Locations for SCAN 10-4U

TABLE 4-3
IF AND AUDIO CIRCUIT DC VOLTAGE CHART

TRANSISTORS				
10-4U	10-4H & L	E	B	C
Q5	Q1	1.4	2.0	5.5
Q6	Q2	0	0.5	3.0

INTEGRATED CIRCUITS			
Pin No.	IC1	IC2	IC3
1	1.4	1.5	6.0
2	1.4	1.5	12.5
3	0	0	12.0
4	6.5	0	7.5
5	7.0	11.0	SQ 7.0 UNSQ 6.0
6	-	0	SQ 1.5 UNSQ 2.5
7	-	6.5	SQ 0 UNSQ 3.5
8	-	5.5	SQ 0.6 UNSQ 0
9	-	4.0	0
10	-	4.0	SQ 0 UNSQ 4.0
11	-	-	6.0
12	-	5.0	6.0
13	-	-	0
14	-	1.5	6.0

TABLE 4-4
OSCILLATOR CIRCUIT DC VOLTAGE CHART

TRANSISTORS				
10-4U	10-4H & L	E	B	C
Q3*	Q3*	0.9	1.5	6.5
Q7	Q4	2.6	2.0	9.0

* Measured with all channels locked out.

TABLE 4-5
SCANNING LOGIC CIRCUITS DC VOLTAGE CHART

TRANSISTORS

10-4U	10-4H & L		E	B	C
Q8	Q5	SQ	0	0	4.0
		UNSQ	0	0.6	0
Q9	Q6	SQ	4.5*	4.0	6.0*
		UNSQ	1.0	0	7.0
Q10	Q7	SQ	5.8*	6.0*	7.0*
		UNSQ	7.0	7.0	6.7

INTEGRATED CIRCUITS

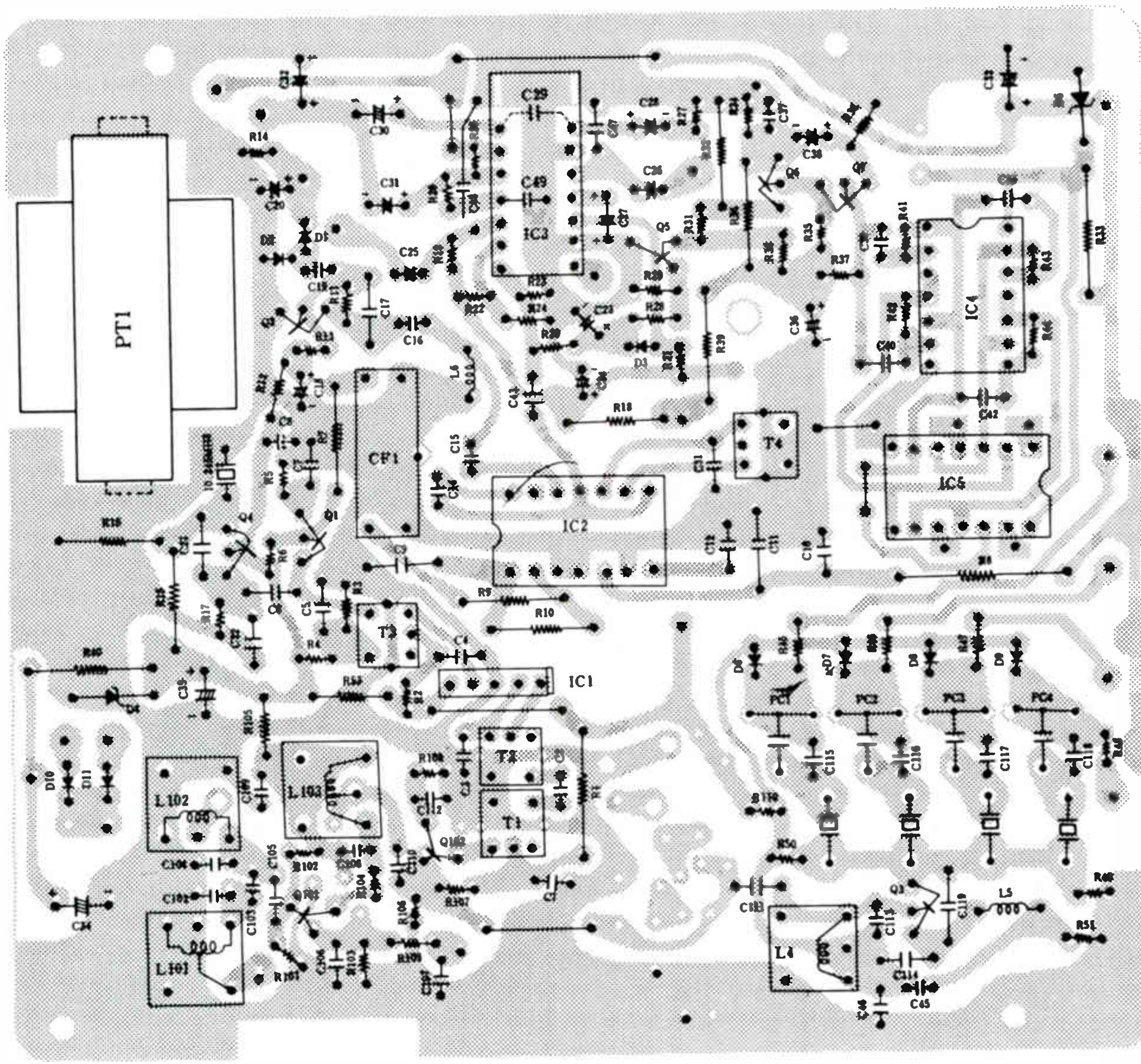
Pin Number	IC4 CHANNEL ON				IC5 CHANNEL ON			
	1	2	3	4	1	2	3	4
1	0.3	4.5	0.3	4.5	0.5	12	12	12
2	1.5	4.5	1.5	4.5	4.5	0.3	4.5	0.3
3	4.5	0.3	4.5	0.3	4.5	4.5	0.3	0.3
4	4.5	0.3	4.5	0.3	12	0.5	12	12
5	0.3	4.5	0.3	4.5	4.5	4.5	0.3	0.3
6	4.5	1.5	4.5	1.5	0.3	4.5	0.3	4.5
8	1.5	1.5	4.5	4.5	4.5	0.3	4.5	0.3
9	4.5	4.5	0.3	0.3	0.3	0.3	4.5	4.5
10	0.3	0.3	4.5	4.5	12	12	0.5	12
11	0.3	0.3	4.5	4.5	0.3	0.3	4.5	4.5
12	4.5	4.5	1.5	1.5	0.3	4.5	0.3	4.5
13	4.5	4.5	0.3	0.3	12	12	12	0.5

*Pulsating DC.

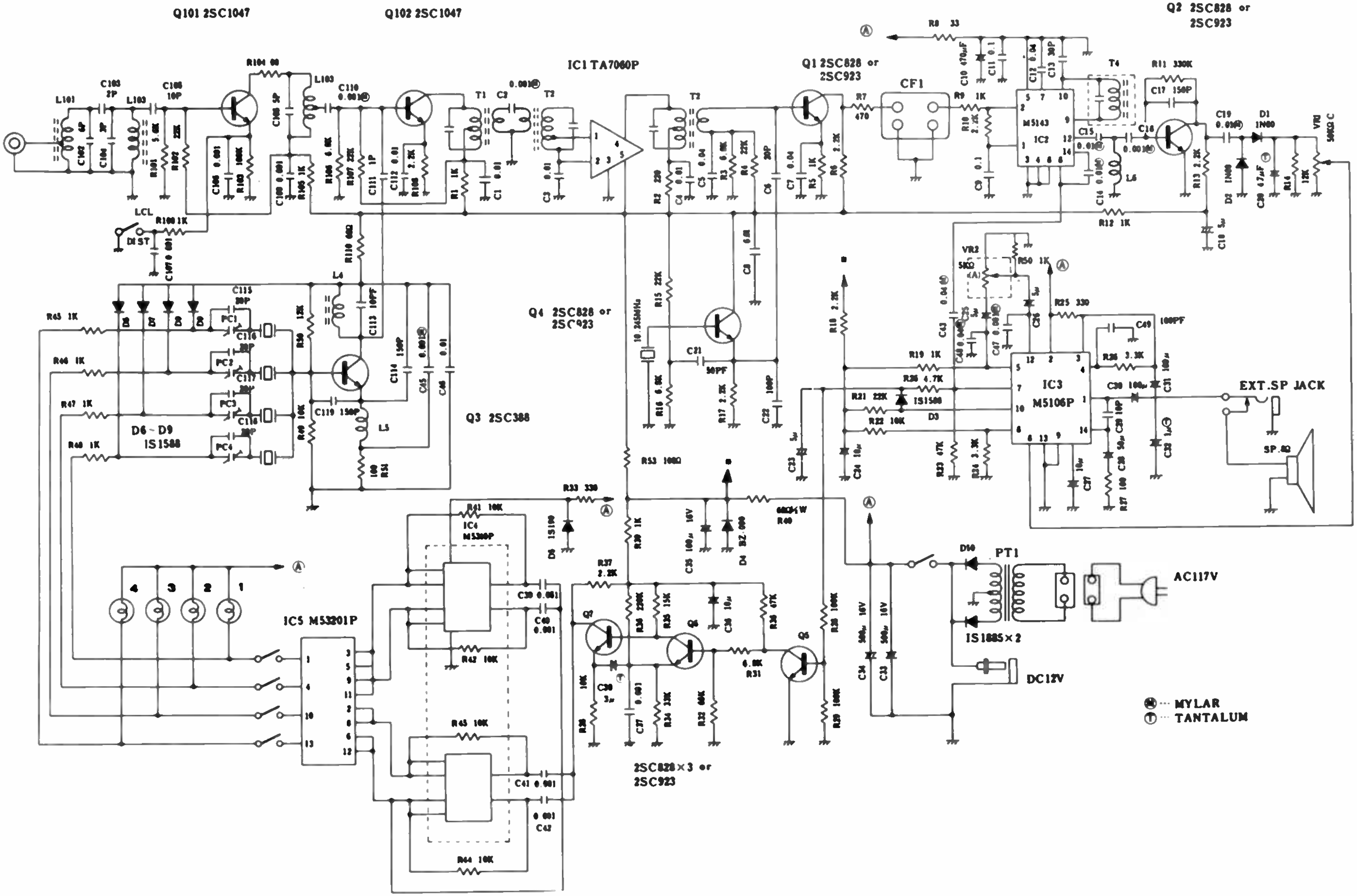
4.5 NOISE SUPPRESSION

When installed in a vehicle whose ignition system proves to be unusually noisy, local measures can be taken on the vehicle to reduce such noise. Usually simple suppression of spark plugs may suffice. However, more difficult cases may require special techniques. Sometimes generator and voltage regulator "hash" may be troublesome. Special capacitors and/or complete kits are available depending upon requirements.

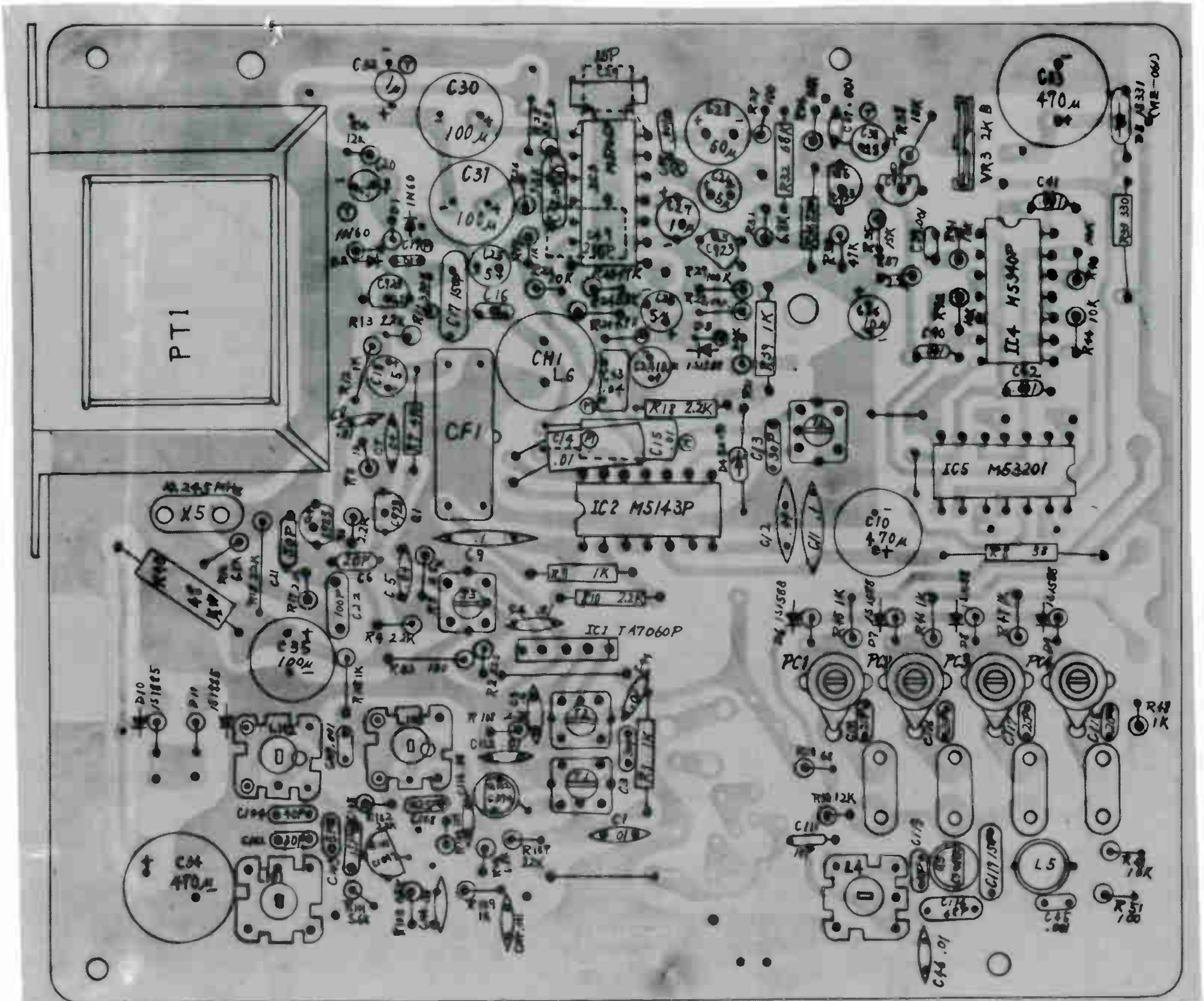
Little can be done to reduce noise interference from other mobile sources. The PACE SCAN 10-4 has the finest noise suppression circuitry available today regardless of cost. Only special and expensive noise blankers can improve upon its noise rejection. "Outboard" noise suppressors available from $20 to $50 on the market cannot improve PACE as noise is already suppressed beyond the capability of such devices. If noise is experienced in base station operation from fluorescent lamps, motors, etc., suppression devices are available from radio distributors specifically designed for radio noise suppression of these appliances.



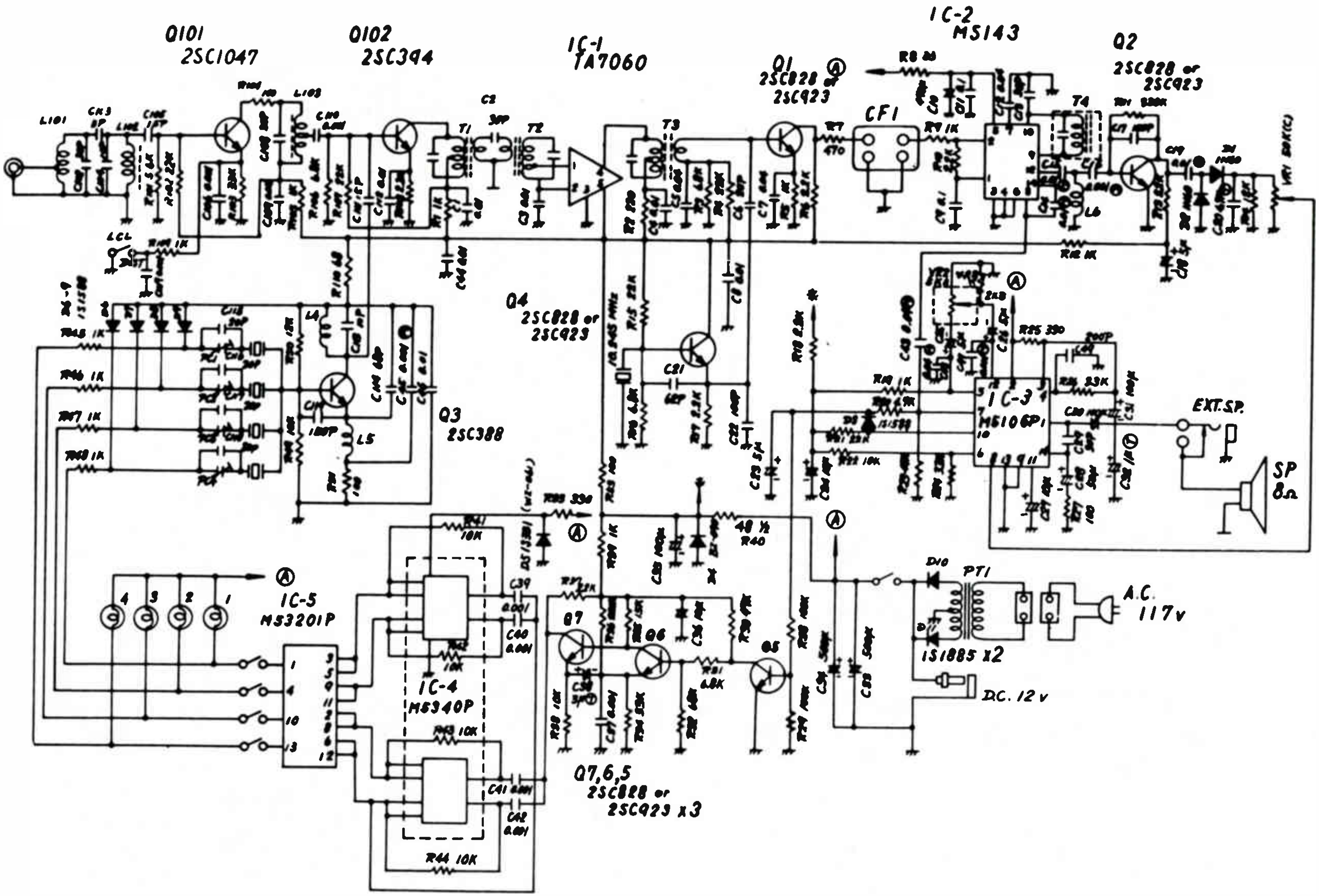
10-4H Schematic and Parts Locator (Top View)

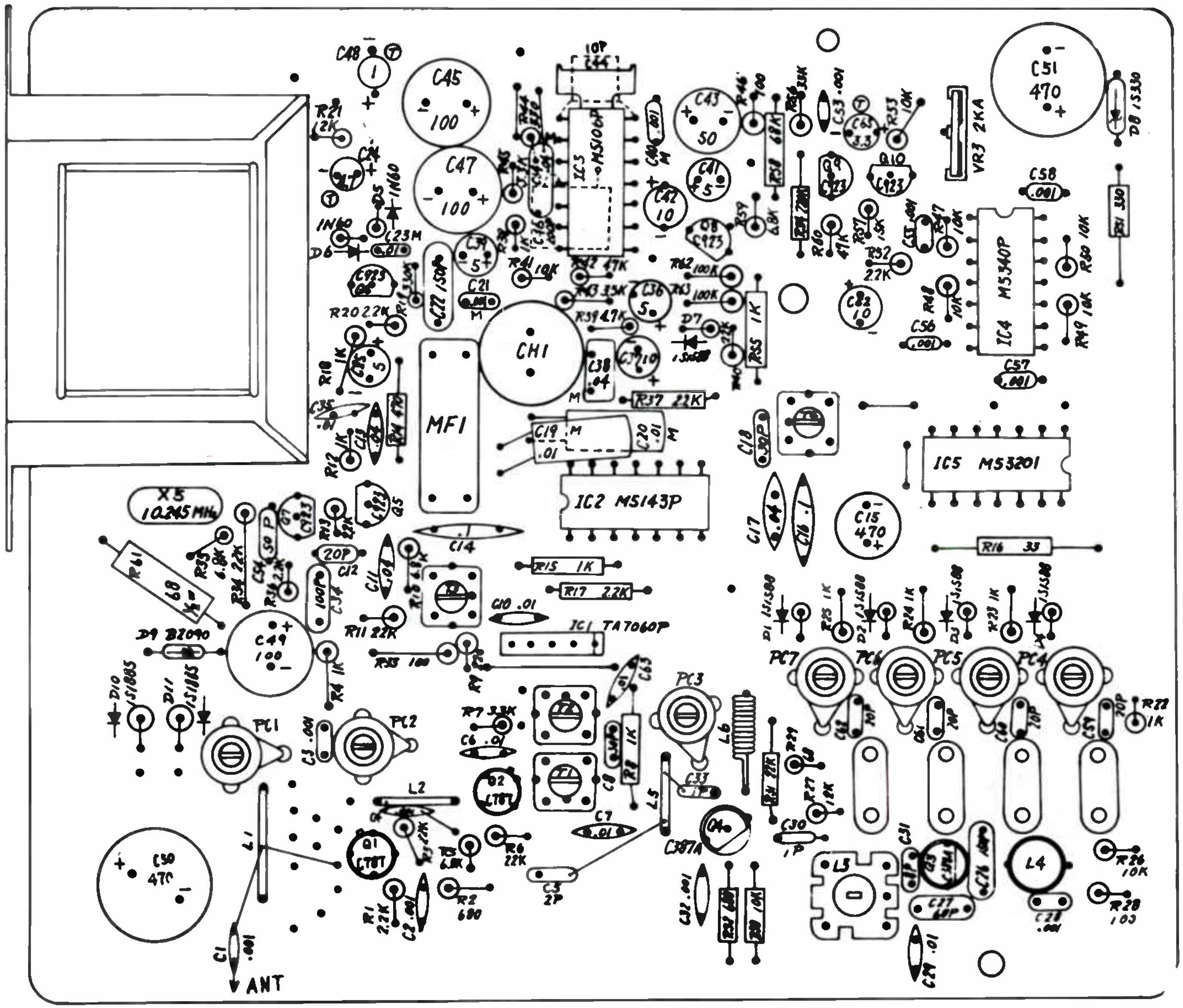


Q101 2SC1047
Q102 2SC1047
IC1 TA7060P
Q1 2SC828 or 2SC923
Q2 2SC828 or 2SC923
CF1
T1
T2
T4
M5143
IC2
Q4 2SC828 or 2SC923
Q3 2SC388
D6 ~ D9 IS1588
LCL
DIST
IC3
M5106P
EXT.SP JACK
SP. 8Ω
IC4 M5380P
IC5 M53201P
2SC828×3 or 2SC923
PT1
AC117V
IS1885×2
DC12V
MYLAR
TANTALUM

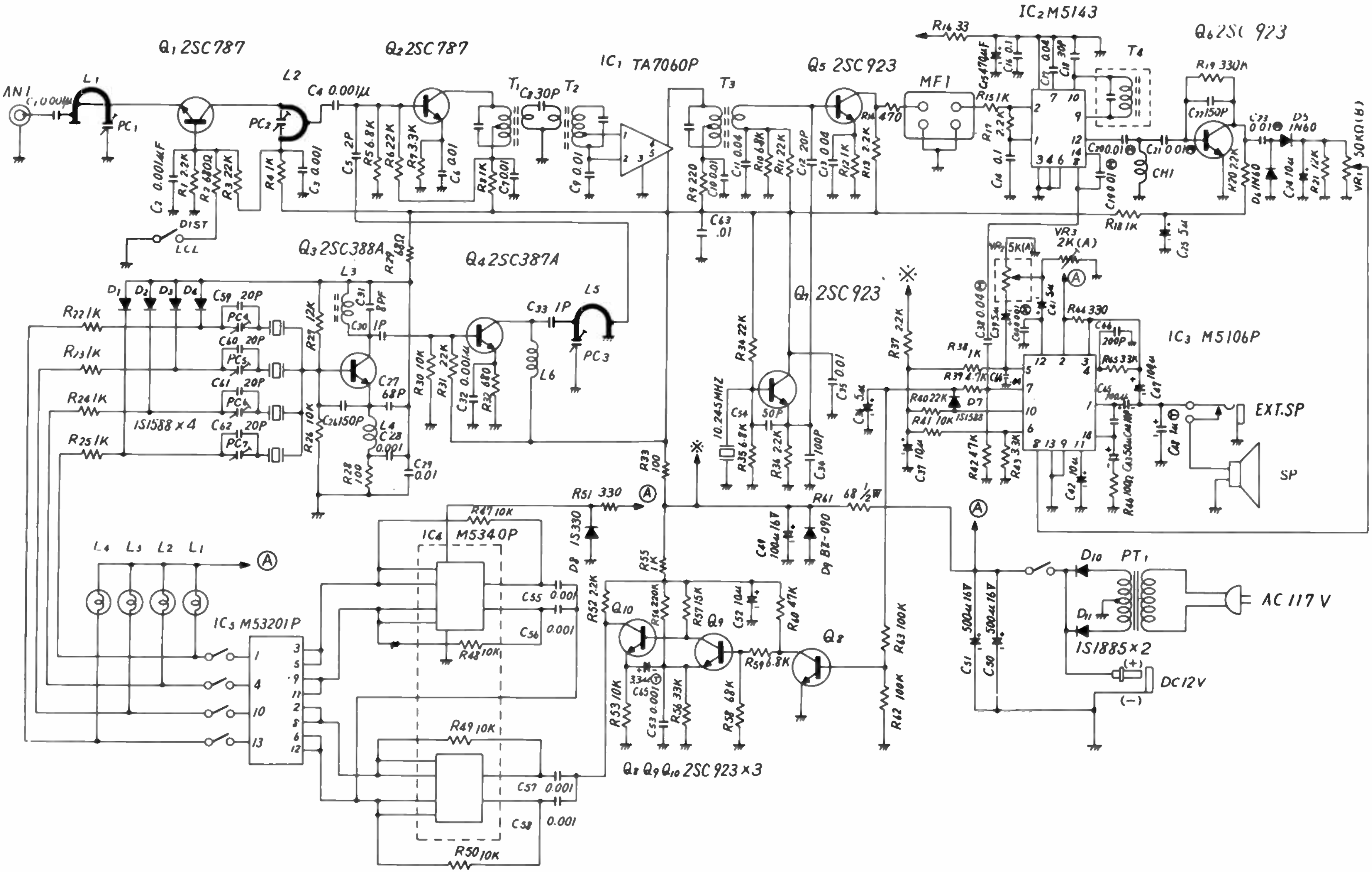


10-4L Schematic and Parts Locator (Top View)


Q101
2SC1047
Q102
2SC394
IC-1
TA7060
Q1
2SC828 or
2SC923
IC-2
M5143
Q2
2SC828 or
2SC923
CF1
T1
T2
T3
T4
L101
L102
L103
LCL
Q4
2SC828 or
2SC923
Q3
2SC388
L4
L5
IC-3
M5106P1
EXT.SP.
SP
8Ω
IC-5
M53201P
IC-4
M5340P
Q7
Q6
Q5
Q7,6,5
2SC828 or
2SC923 x3
D10
PT1
A.C.
117V
1S1885 x2
DC. 12 V
R44 10K
R43 10K
R42 10K
R41 10K
R40
C39 0.001
C40 0.001
C41 0.001
C42 0.001



10-4U Schematic and Parts Locator (Top View)


Q1 2SC787
Q2 2SC787
IC1 TA7060P
Q5 2SC923
IC2 M5143
Q6 2SC923
MF1
T1
T2
T3
T4
L1
L2
L5
L6
PC1
PC2
PC3
ANT
DIST
LCL
Q3 2SC388A
Q4 2SC387A
Q7 2SC923
10.245MHZ
IC3 M5106P
EXT.SP
SP
CH1
D5 1N60
D6 1N60
D7 1S1588
1S1588×4
IC4 M5340P
IC5 M53201P
L4 L3 L2 L1
D8 1S330
D9 BZ-090
Q8 Q9 Q10 2SC923×3
D10
D11
PT1
1S1885×2
AC 117 V
DC12V
(+)
(−)

4.2.1 Voltage Check

DC power supply output voltages should be checked periodically to verify that the voltages are within specified limits. Output voltage levels should be as noted in Table 4-2. These voltages are based upon an input voltage of 13.8 volts DC ± 5%.

TABLE 4-2
POWER SUPPLY VOLTAGE CHECKS

Test Point	DC Voltage
Point A	+12 V
Cathode of D4	+9 V
Cathode of D5	+4.5 V

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D1	1N60	IP20-0060
D2	1N60	IP20-0060
D3	1S1588	IP20-0061
D4	BZ090	IP20-0019
D5	1S331	IP20-0062
	WZ-061 (3)	IP20-0062
D6	1S1588	IP20-0061
D7	1S1588	IP20-0061
D8	1S1588	IP20-0061
D9	1S1588	IP20-0061
D10	1S1885	IP20-0054
D11	1S1885	IP20-0054
IC1	TA7060P	IP20-0093
IC2	M5143P	IP20-0094
IC3	M5106P	IP20-0095
IC4	M5340P	IP20-0096
IC5	M53201P	IP20-0097
Q1	2SC828	IP20-0091
Q2	2SC828	IP20-0091
Q3	2SC388A	IP20-0088
Q4	2SC828	IP20-0091
Q5	2SC828	IP20-0091
Q6	2SC828	IP20-0091
Q7	2SC828	IP20-0091
Q101	2SC1014	IP20-0033
Q102(1)	2SC1014	IP20-0033
Q102(2)	2SC394	IP20-0038

(1) In 10-4H only
(2) In 10-4L only
(3) Alternate

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C10	470uF 16V	IP22-0010
C18	4.7uF 16V	IP22-0003
C20	4.7uF 16V	IP22-0003
C23	4.7uF 16V	IP22-0003
C24	10uF 16V	IP22-0004
C25	4.7uF 16V	IP22-0003
C26	4.7uF 16V	IP22-0003
C27	10uF 16V	IP22-0004
C28	47uF 16V	IP22-0006
C30	100uF 16V	IP22-0008
C31	100uF 16V	IP22-0008
C32	1uF 16V	IP22-0001
C33	470uF 16V	IP22-0010
C34	470uF 16V	IP22-0010
C35	100uF 16V	IP22-0008
C36	10uF 16V	IP22-0004
C38	3.3uF 16V	IP22-0002
PC1	30pF Trimmer	IP22-0018
PC2	30pF Trimmer	IP22-0018
PC3	30pF Trimmer	IP22-0018
PC4	30pF Trimmer	IP22-0018

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	50K, Squelch	IP24-0010
VR2	5K, Volume	IP24-0009
VR3	2K, Trimmer	IP24-0011

COILS/TRANSFORMERS

ITEM	PART NO.
L4	IP21-0106
L5	IP21-0107
L6	IP21-0108
L101	IP21-0109
L102	IP21-0110
L103	IP21-0111
PT1	IP21-0115
T1	IP21-0038
T2	IP21-0038
T3	IP21-0038
T4	IP21-0033

MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	Ceramic Filter (1)	IP31-0052
	Ceramic Filter (2)	IP31-0045
	Power Cord, DC	IP35-0001
	Switch	IP25-0001

CHECK FREQUENCY OF THE SECOND LOCAL OSCILLATOR

Step 1: Connect Frequency Counter through a 10pF capacitor to Q2 (2nd Local Osc) emitter circuit.
Step 2: Read frequency on the Frequency Counter.
Normal: 10.245 MHz ±1 kHz

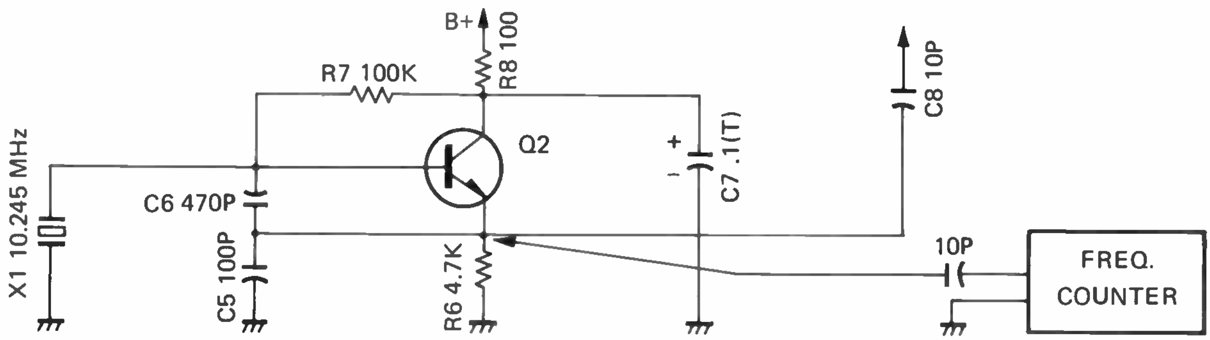


Figure 2. DIAGRAM

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 3.

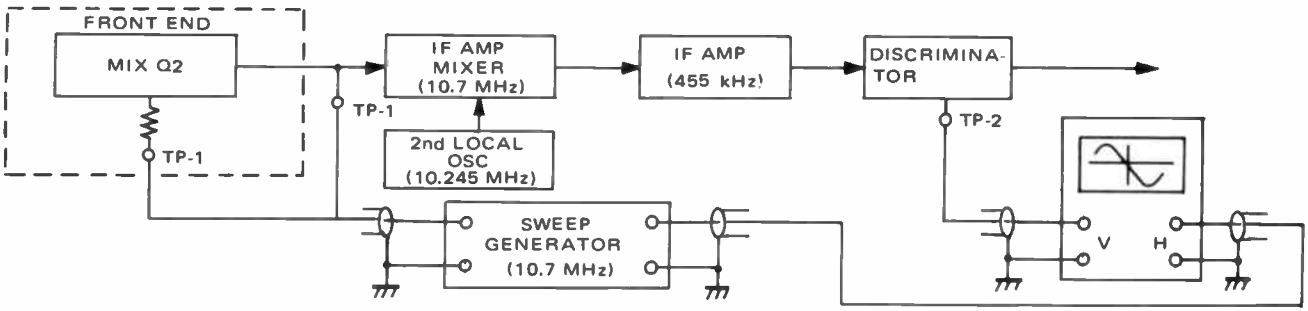


Figure 3. IF TEST SETUP

Step 2: Maintain sweep generator output at a low level to prevent overloading.
Step 3: For optimum linearity, adjust IF Section T1, T2, T3 so that the 455 kHz marker is in the center of the discriminator curve as shown in Figure 4.

Input (e1)		Output (e2)	
e1	10μV	e2	2Vp-p
e1	100μV	e2	2.3Vp-p

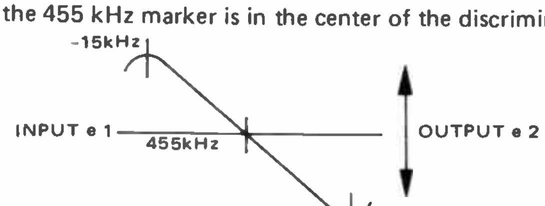


Figure 4. IF DISCRIMINATOR CURVE

RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.

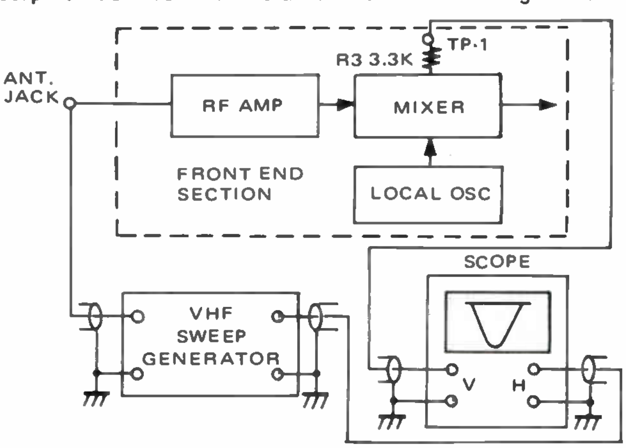


Figure 5. RF TEST SETUP

Step 2: Adjust T1, T2 and T3 of RF section for maximum output and best curve symmetry as shown in Figure 6.

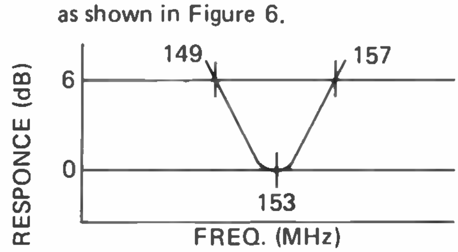


Figure 6. RF CHARACTERISTIC

LOCAL OSCILLATOR CHECK

Step 1: Insert all crystals in sockets.
Step 2: Couple the frequency counter thru a pick up coil to oscillator coil T5. Refer to Figure 7.
Step 3: Check to be sure these crystals are oscillating.
If oscillation is poor or intermittent, adjust T-5 to assure proper oscillation. As you adjust T-5, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

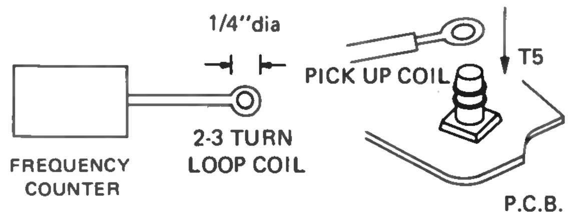
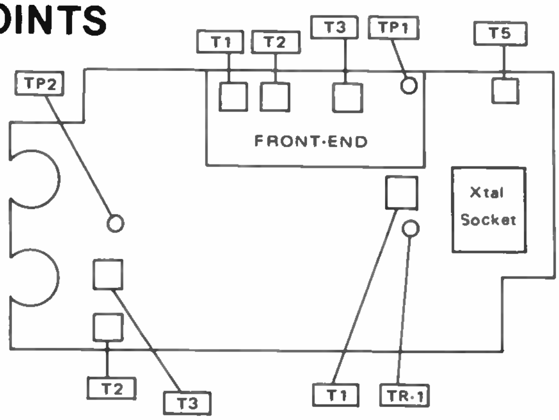


Figure 7. 1st LOCAL OSCILLATOR

NOTE: Crystal frequency calculation.
The crystal frequencies are obtained by the following formula; Frequency (MHz) = (Fr – 10.7)/3.
Where Fr is the desired receive frequency, in MHz.

ALIGNMENT POINTS

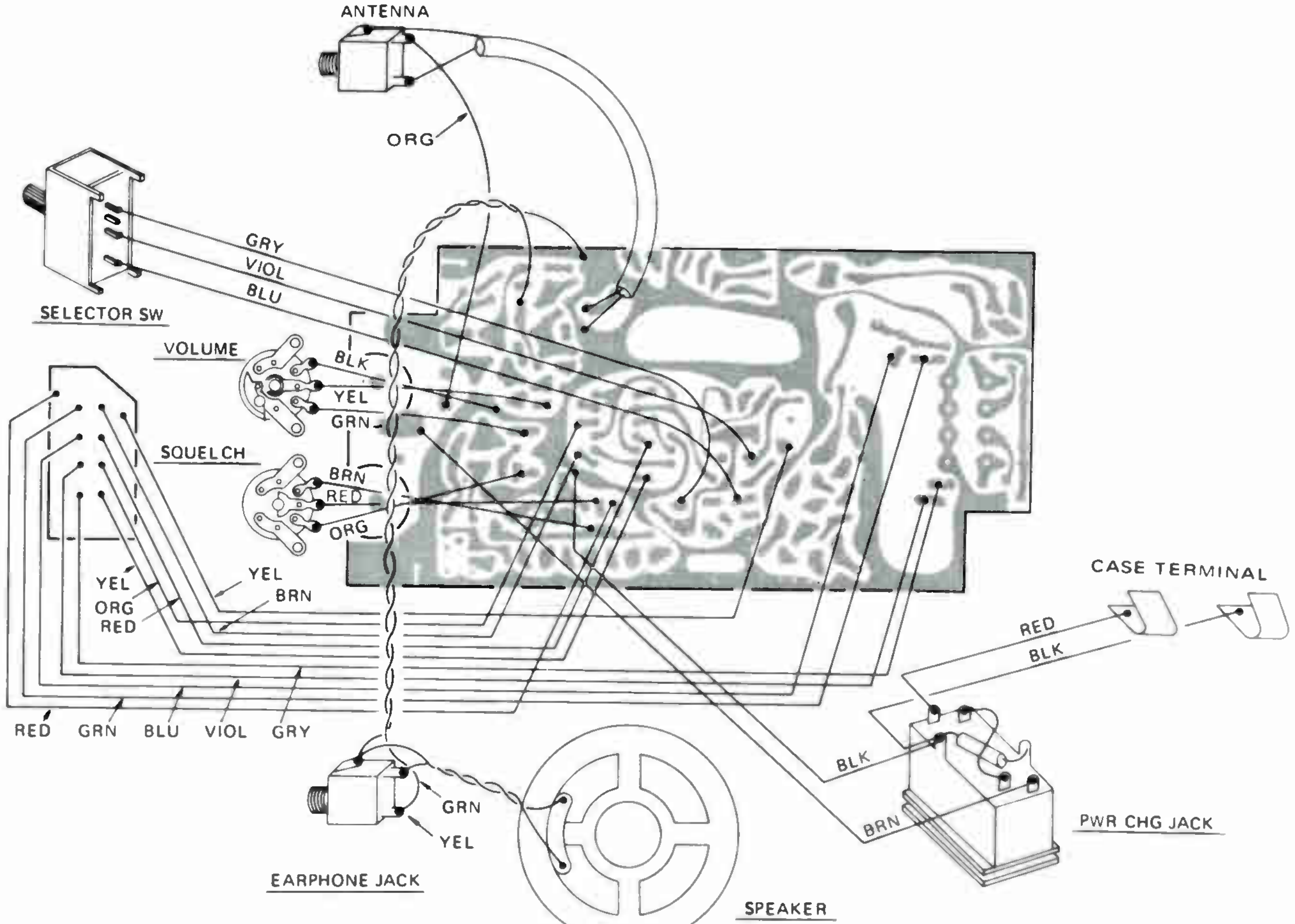


SENSITIVITY MEASUREMENT

Step 1: Connect the signal generator to the antenna input and the AC voltmeter to the speaker terminals.
Step 2; Turn the SQUELCH control fully counter clockwise.
With the generator at minimum output and with no modulation, adjust the VOLUME control on the set for a 0 dB (0.775 volts) reading on the AC voltmeter.
Step 3: Increase the output of the signal generator to obtain a reading of –20 dB on the AC voltmeter. The generator output now equals the 20 dB quieting sensitivity.
Step 4: Tune the PRO-4A to the frequency of the signal generator (or vice versa).
Step 5: Turn the VOLUME control fully clockwise. Set the signal generator for no modulation and minimum output.
Step 6: Adjust the VOLUME control so that the output noise level shows 0 dB (0.775 volts) on the AC V.T.V.M.
Step 7: Increase the output level of the signal generator so that the signal output is 20 dB below the noise output level. The S.S.G. output is now equal to the 20 dB noise quieting figure of the set.

NOTE: As supplied by the factory, this unit is set up to provide maximum sensitivity in a range of 149-157 MHz. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 150 MHz up to about 170 MHz.
To achieve optimum sensitivity, realign the RF section and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a bandwidth "window" of about 8 MHz total—adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). **Of course, be sure to use correct crystals.**

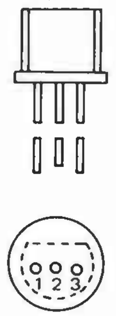
WIRING DIAGRAM



SEMICONDUCTOR LEAD IDENTIFICATION

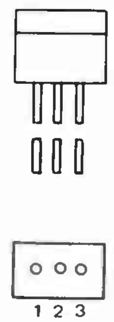
(A) 2SC372(O), 2SC373, 2SC394(Y), 2SC735(Y), 2SC784(O), 2SA562(Y)
(B) 2SC535B

(A)



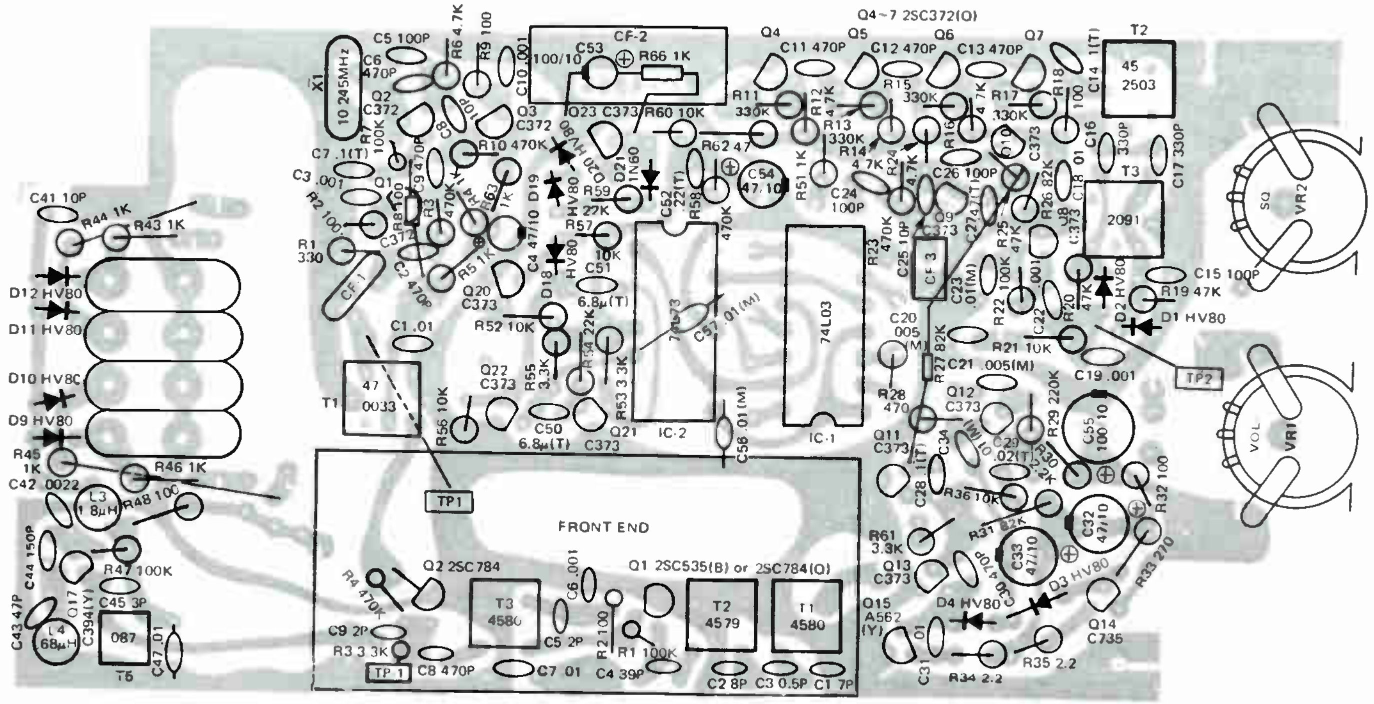
1. Emitter
2. Collector
3. Base

(B)

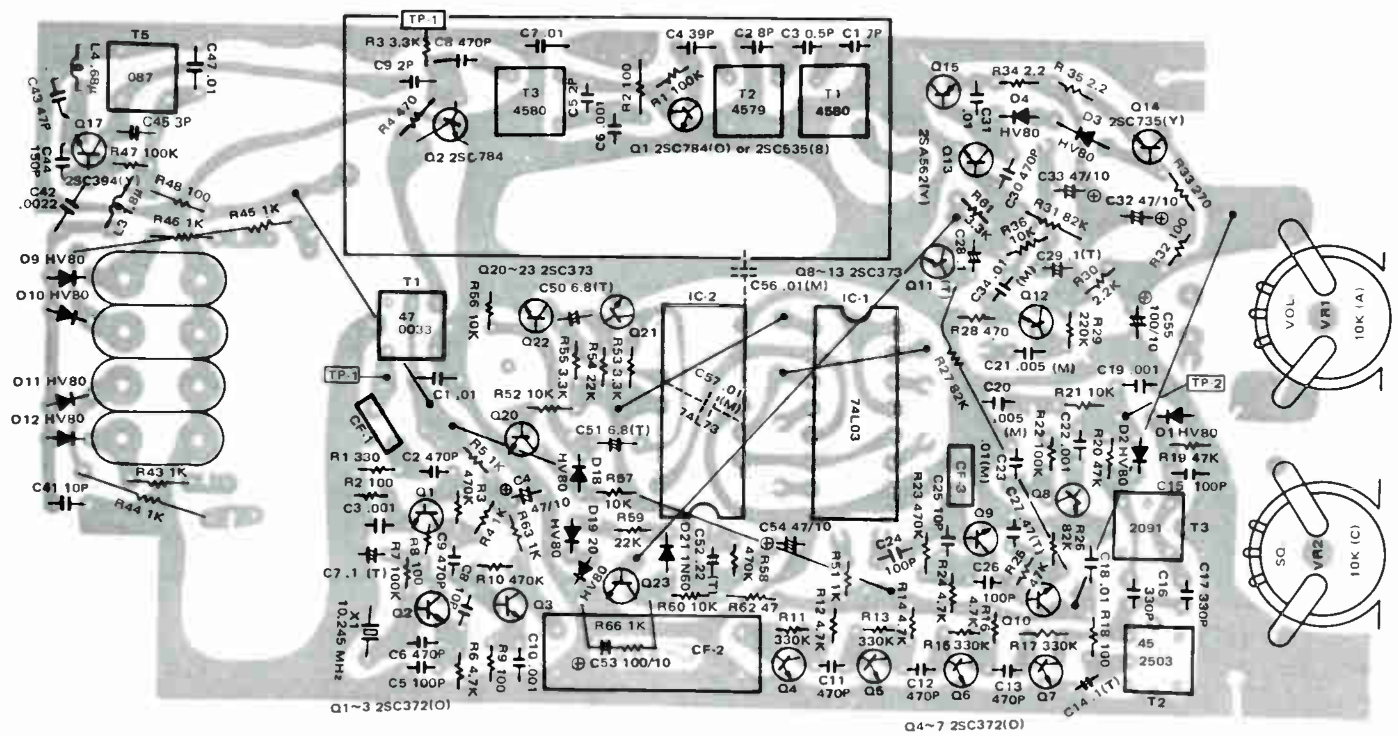


1. Emitter
2. Collector
3. Base

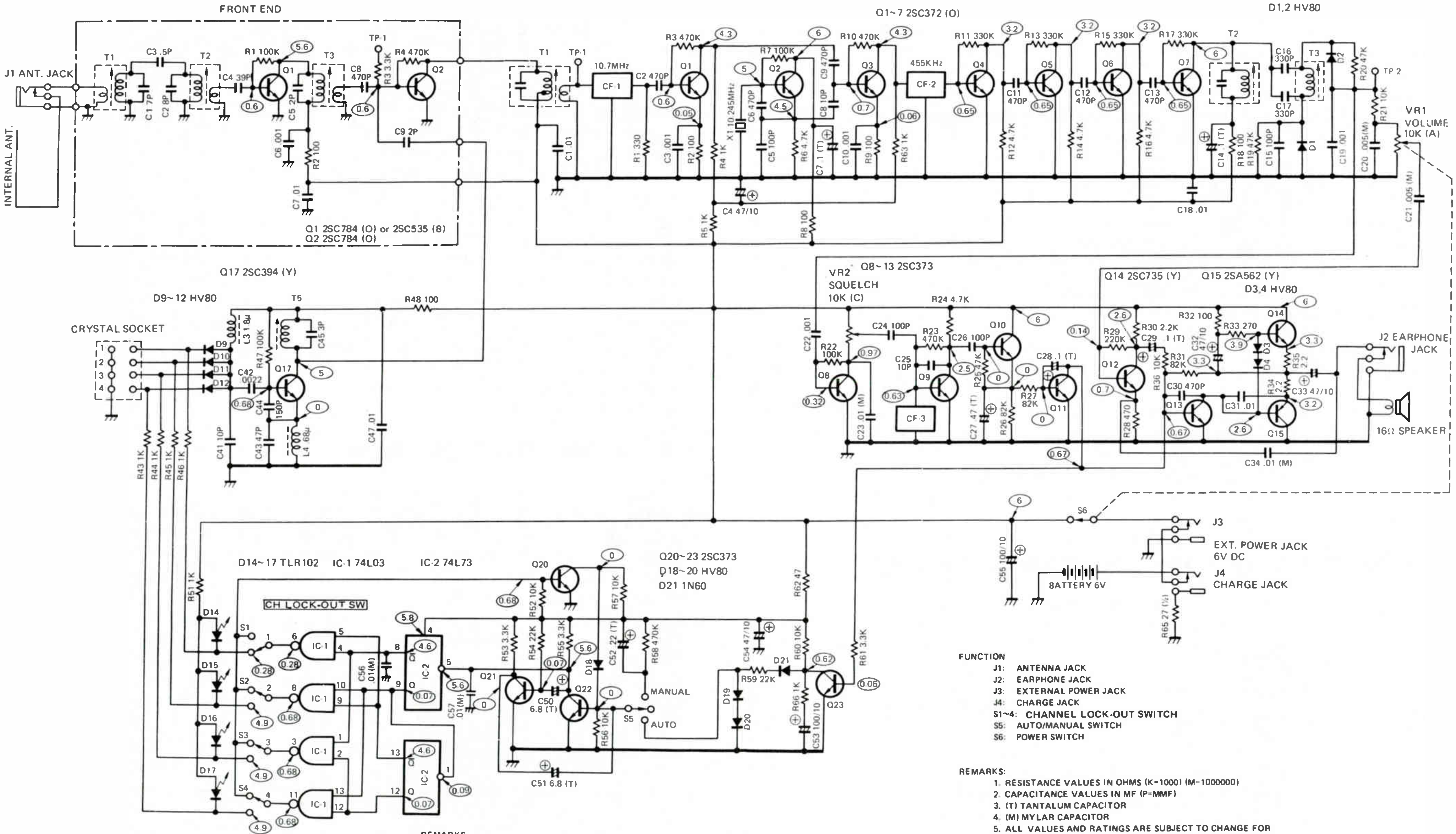
P.C. BOARD (TOP VIEW)



P.C. BOARD (BOTTOM VIEW)



SCHEMATIC DIAGRAM



FUNCTION

- J1: ANTENNA JACK
- J2: EARPHONE JACK
- J3: EXTERNAL POWER JACK
- J4: CHARGE JACK
- S1~4: CHANNEL LOCK-OUT SWITCH
- S5: AUTO/MANUAL SWITCH
- S6: POWER SWITCH

REMARKS:

1. RESISTANCE VALUES IN OHMS (K=1000) (M=1000000)
2. CAPACITANCE VALUES IN MF (P=MMF)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

REMARKS

THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF CH-1 MANUAL OPERATED: VOLUME MINIMUM POSITION AND SQ. CONT. OUT POSITION.

TROUBLE SHOOTING

Symptom	Possible Cause
1) Light Emitting Diode (L.E.D.) does not light and no sound is audible. Power SW : On VOLUME : Maximum Channel SW : On	A) Defective Battery. B) Defective On-Off Switch on VOLUME Control. C) Power Circuit disconnected or shorted.
2) L.E.D. Lights but no sound. Channel SW : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Defective Earphone jack. B) Defective Speaker. C) Faulty Q8 thru Q15 or faulty component in these stages.
3) Sound but L.E.D. does not light. Channel SW : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Faulty L.E.D. P.C. Board Assembly +B supply. B) Defective L.E.D. C) Faulty Channel Switch. D) Defective IC-1.
4) No Sound through Earphone.	A) Defective Earphone jack. B) Defective Earphone.
5) Does not scan and SQUELCH does not operate but only noise can be heard.	A) Faulty Noise Amplifier or faulty Noise Detector Circuit component. B) Defective IF Amplifier. C) Defective Battery.
6) Does not scan but SQUELCH operates normally.	A) Defective Auto/Manual Switch. B) One of Transistors Q21 to Q23 defective. C) Either IC-1 or IC-2 defective. D) One of Circuit component parts faulty.
7) Manual Selector does not operate.	A) Defective Auto/Manual Selector Switch. B) Either Q21 or Q22 defective. C) One of Circuit component parts faulty.
8) Skipper Circuit does not operate.	A) Faulty Transistor Q20 or faulty Circuit component part. B) Defective channel switch.
9) Only scan channels 1 and 2 or channel 3 and 4.	A) Defective IC-2.
10) L.E.D. of one or two channels does not light when channel switch is on.	A) Defective IC-1 or IC-2. B) Defective Channel Switch. C) Defective L.E.D.
11) Noise can be heard but does not receive.	A) Wrong Channel Crystal or faulty Crystal. B) Defective RF Amplifier Circuit. C) Defective IF Amplifier Circuit. D) Defective 1st or 2nd Local Oscillator Circuit. E) Weak Battery.
12) Low sensitivity.	A) Weak Battery. B) Crystal frequency not covering the correct channel. C) Defective RF and IF Amplifiers.

SEMICONDUCTORS

ITEM	PART NO.
FRONT END BOARD	
Q1	2SC784(O)
	2SC535(B) (1)
Q2	2SC784(O)
MAIN BOARD	
D1	HV-80
D2	HV-80
D3	HV-80
D4	HV-80
D9	HV-80
D10	HV-80
D11	HV-80
D12	HV-80
D14	TLR102
D15	TLR102
D16	TLR102
D17	TLR102
D18	HV-80
D19	HV-80
D20	HV-80
D21	1N60
IC1	74L03
IC2	74L03
Q1	2SC372(O)
Q2	2SC372(O)
Q3	2SC372(O)
Q4	2SC372(O)
Q5	2SC372(O)
Q6	2SC372(O)
Q7	2SC372(O)
Q8	2SC373
Q9	2SC373
Q10	2SC373
Q11	2SC373
Q12	2SC373
Q13	2SC373
Q14	2SC735(Y)
Q15	2SA562(Y)
Q17	2SC394(Y)
Q20	2SC373
Q21	2SC373
Q22	2SC373
Q23	2SC373

(1) Alternate.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C4	47uF 10V	RCE-A10V47L
C7	0.1uF 35V	
C14	0.1uF 35V	
C27	0.47uF 35V	
C28	0.1uF 35V	
C29	0.1uF 35V	
C32	47uF 10V	ECE-A10V47L
C33	47uF 10V	ECE-A10V47L
C50	6.8uF 6.3V	
C51	6.8uF 6.3V	
C52	0.22uF 35V	
C53	100uF 10V	ECE-A10V100L
C54	47uF 10V	ECE-A10V47L
C55	100uF 10V	ECE-A10V100L

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	10K, Volume	P-1493
VR2	10K, Squelch	P-1492

COILS/TRANSFORMERS

ITEM	PART NO.
FRONT END BOARD	
T1	CA-4597
T2	CA-4596
T3	CA-4597
MAIN BOARD	
L3	CA-2909
L4	CB-2190
T1	CA-7246
T2	CA-7247
T3	CA-2997
T5	CA-4595

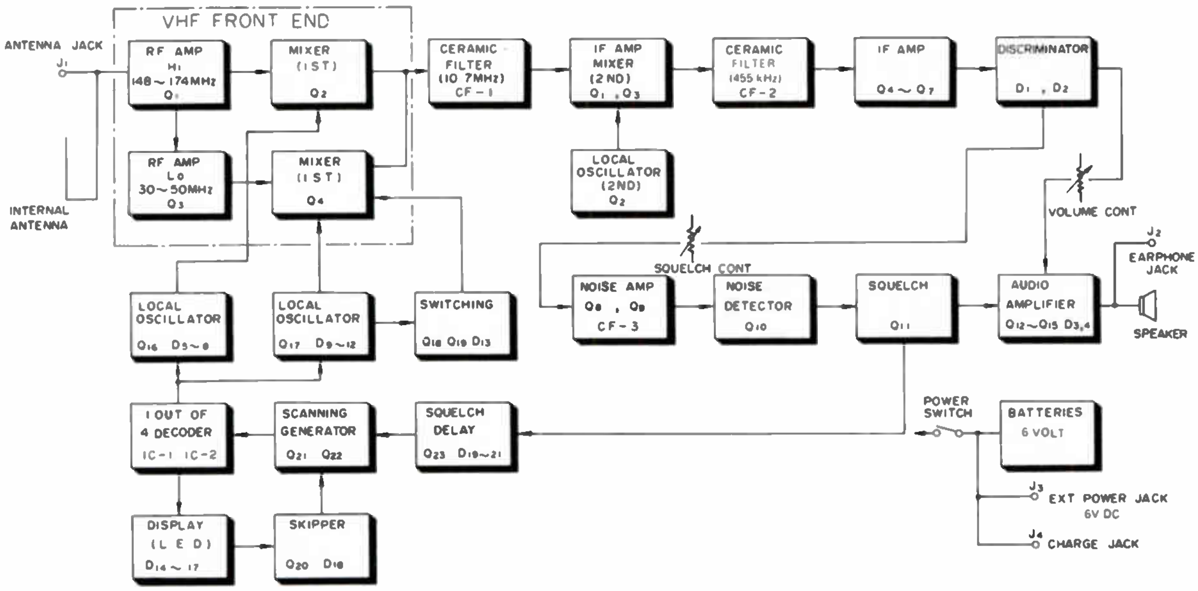
MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	10.7MHz Filter	CA-0607
CF2	455kHz Filter	C-0577
CF3	455kHz Filter	C-0578
X1	10.245MHz Crystal	CX-0049
S1	Switch	S-2180
S2	Switch	S-2180
S3	Switch	S-2180
S4	Switch	S-2180
S5	Switch	S-5027
	Earphone	E-0069
	P.C. Board	X-4830

CABINET PARTS

NAME	PART NO.
Front Escutcheon	Z-2182
Front Panel	Z-2185
Cabinet (Upper)	Z-2183
Cabinet (Bottom)	Z-2184
Knob, Control	K-1385

BLOCK DIAGRAM



GENERAL ALIGNMENT

Test equipments required.

1. Oscilloscope
2. IF sweep generator with variable marker (10.7 MHz)
3. VHF sweep generator with variable marker (30 – 50, 148 – 174 MHz)
4. RF frequency counter (10 – 60 MHz)
5. AC V.T.V.M.
6. DC V.T.V.M.
7. 16 ohm dummy load

NOTE: Use non-metallic tuning tools.
The test equipment and receiver should be warmed up for at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 2.
Step 2: Maintain sweep generator output at a low level to prevent overloading.
Step 3: For best linearity, adjust T2 and T3 in the IF Section so that the 455 kHz marker is at the center of the discriminator curve as shown in Figure 3.
Step 4: Adjust T1 for maximum after adjusting IF sections.
NOTE: Check to be sure 2nd Local Oscillator (10.245 MHz) is operating.

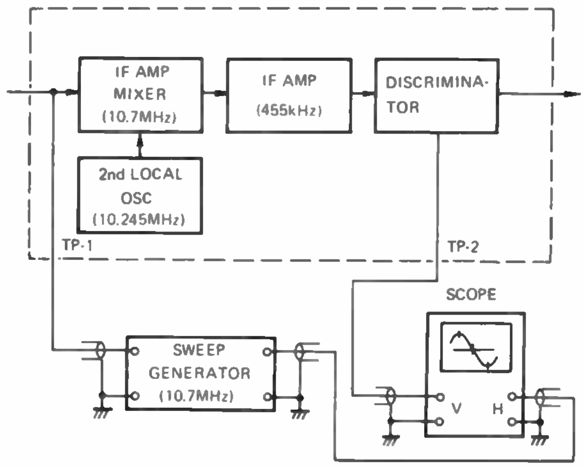


Figure 2. IF SECTION ALIGNMENT BLOCK DIAGRAM

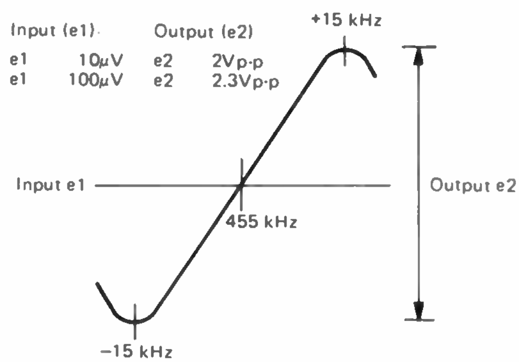


Figure 3. VHF LOW IF CHARACTERISTIC

RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 4.
Step 2: (VHF HIGH) Adjust T1, T2 and T3 of RF Section for maximum output and best curve symmetry as shown in Figure 5.
Step 3: (VHF LOW) Adjust T4, T5 and T6 of RF Section for maximum output and best curve symmetry as shown in Figure 6.

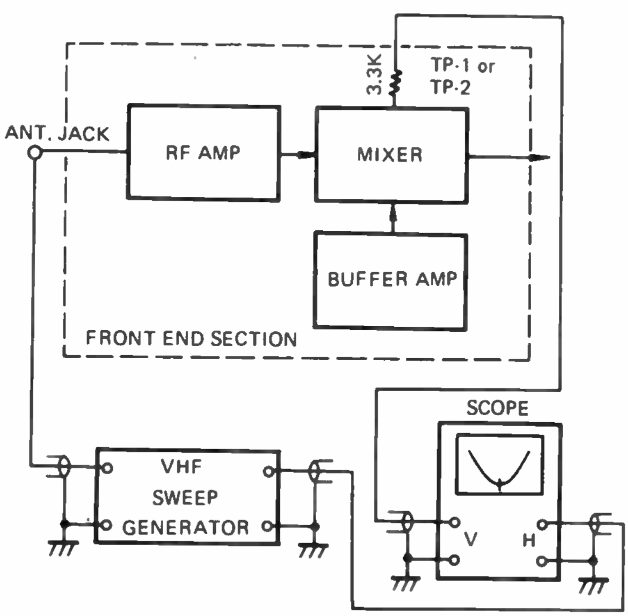


Figure 4. RF SECTION ALIGNMENT BLOCK DIAGRAM

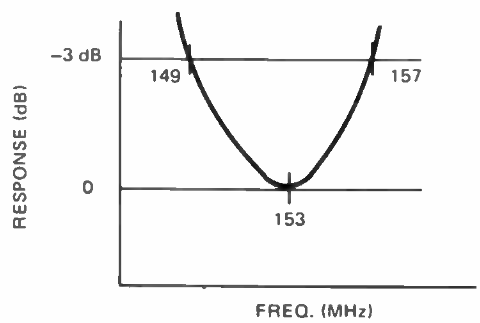


Figure 5. VHF HIGH RF CHARACTERISTIC

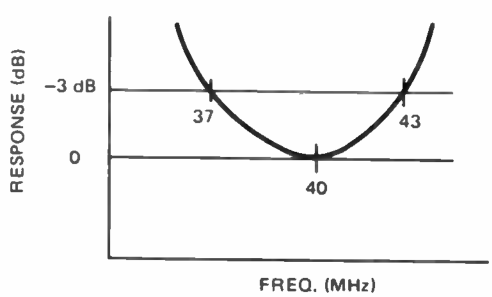


Figure 6. VHF LOW RF CHARACTERISTIC

CHECKING THE FIRST LOACL OSCILLATOR ALIGNMENT

Step 1: Insert all crystals into the sockets.

Step 2: Couple the frequency counter thru a pickup coil to oscillator coil T5 (Low), T4 (High) on the main PCB section. Refer to Figure 7.

Step 3: Check if these crystals are oscillating. If necessary, make the following adjustments.
As you adjust these coils, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

NOTE: Crystal Frequency Calculation
The crystal frequencies are obtained by the following
Formula; VHF LOW Frequency (MHz) = Fr + 10.7
VHF HIGH Frequency (MHz) = (Fr – 10.7)/3
Fr = Receiving frequency

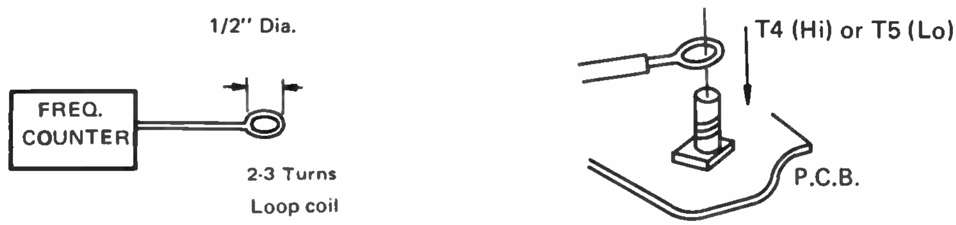


Figure 7. COUPLING OF FREQUENCY COUNTER

CHECKING THE SECOND LOCAL OSCILLATOR FREQUENCY

Step 1: Connect Frequency Counter through a 10pF capacitor to Q2 emitter circuit as shown in Figure 8. **(10.245 MHz)**

Step 2: Read frequency on the Frequency Counter
Normal: 10.245MHz ±1kHz.

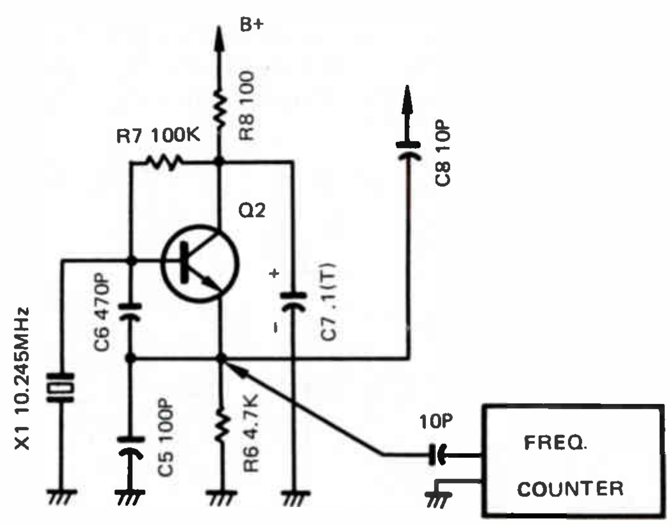


Figure 8. CONNECTION POINT

ALIGNMENT POINTS

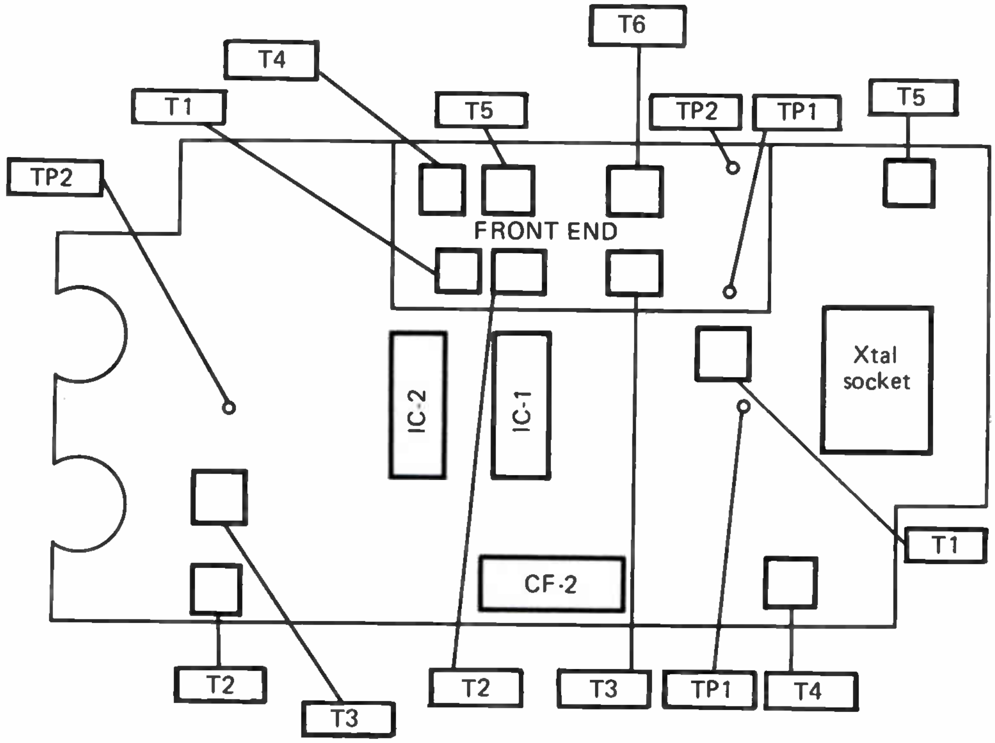


Figure 9.

SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to antenna input and connect AC voltmeter to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise. With the generator at minimum output and with no modulation, adjust the VOLUME control on the set for a 0 dB (0.775 volts) reading on the AC voltmeter.
Step 3: Increase the output of the signal generator to obtain a reading of –20 dB on the AC voltmeter. The generator output now equals the 20 dB quieting sensitivity.
Step 4: Tune the PRO-6 to the frequency of the signal generator (or vice versa).
Step 5: Turn VOLUME control fully clockwise. Set the signal generator for no modulation and minimum output.
Step 6: Adjust VOLUME control so that the output noise level shows 0 dB (0.775 volts) on the AC voltmeter.
Step 7: Increase the output level of signal generator so that the signal output is 20 dB below the noise output level. The S.G. output is now equal to the 20 dB noise quieting figure of the set.

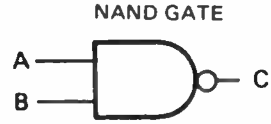
LOGIC CIRCUIT TRUTH TABLE

IC NO.	IC-2				IC-1			
PIN NO. / CH NO.	9	8	12	13	6	8	3	11
CH 1	L	H	L	H	*L	H	H	H
CH 2	H	L	L	H	H	*L	H	H
CH 3	L	H	H	L	H	H	*L	H
CH 4	H	L	H	L	H	H	H	*L

NOTE: H=High level, L=Low level, *=L.E.D. "ON".

TTL IC TRUTH TABLE

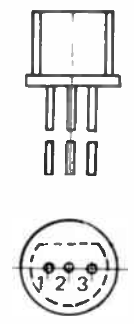
NAND GATE



A	B	C
H	H	L
H	L	H
L	H	H
L	L	H

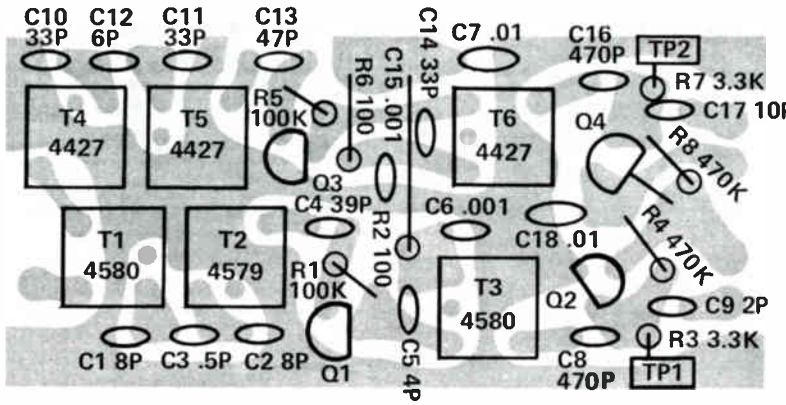
SEMICONDUCTOR LEAD IDENTIFICATION

2SA562(Y), 2SC372(O), 2SC373, 2SC394(Y), 2SC735(Y), 2SC784(O)



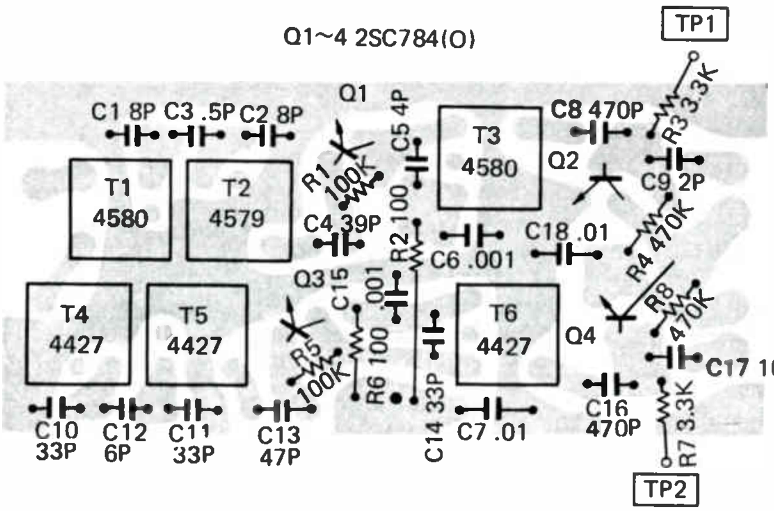
1: EMITTER
2: COLLECTOR
3: BASE

VHF FRONT END P.C. BOARD (TOP VIEW)

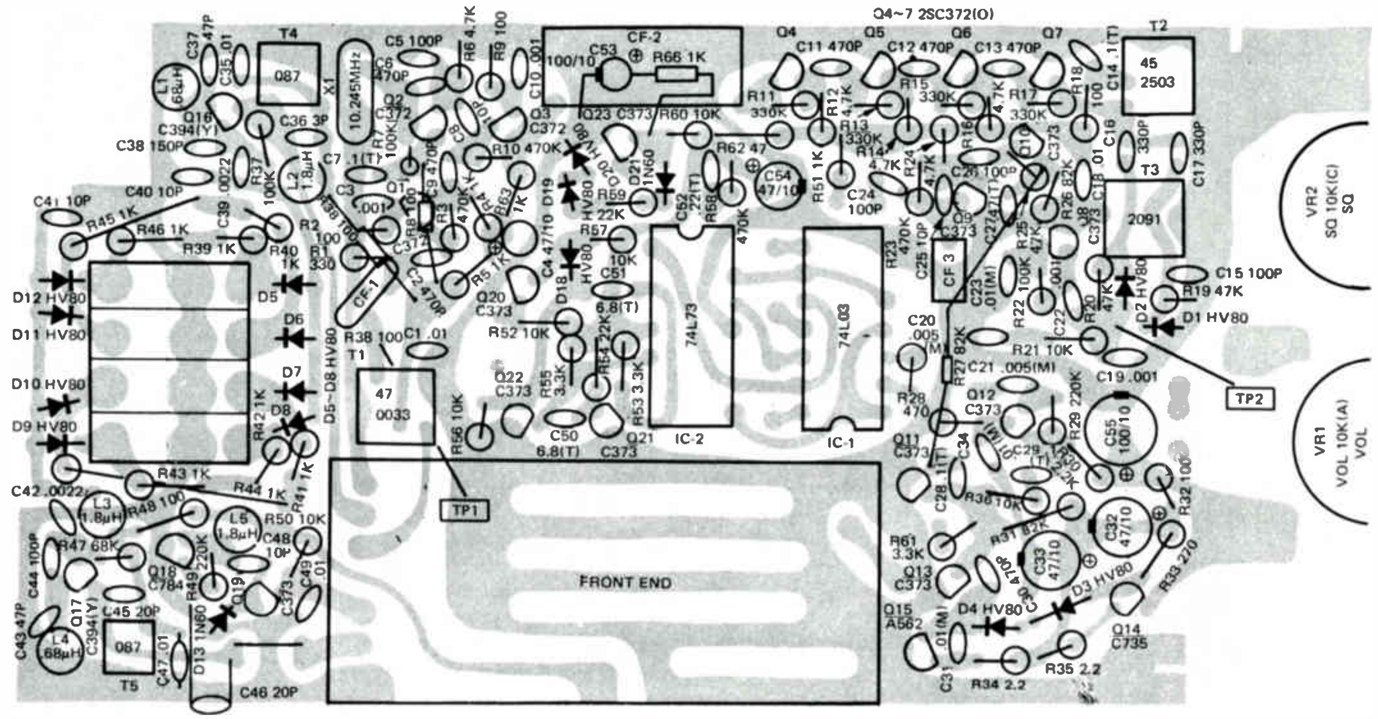


Q1~4 2SC784(O)

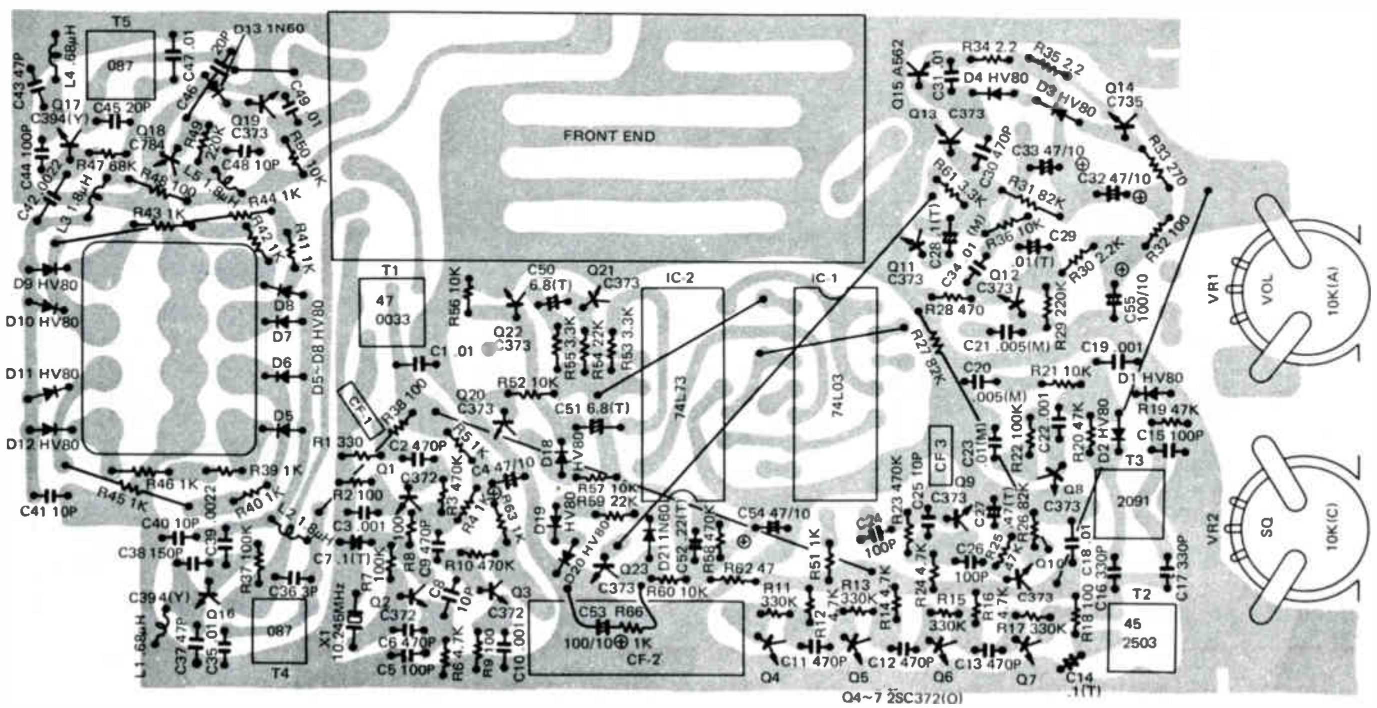
VHF FRONT END P.C. BOARD (BOTTOM VIEW)



MAIN P.C. BOARD (TOP VIEW)

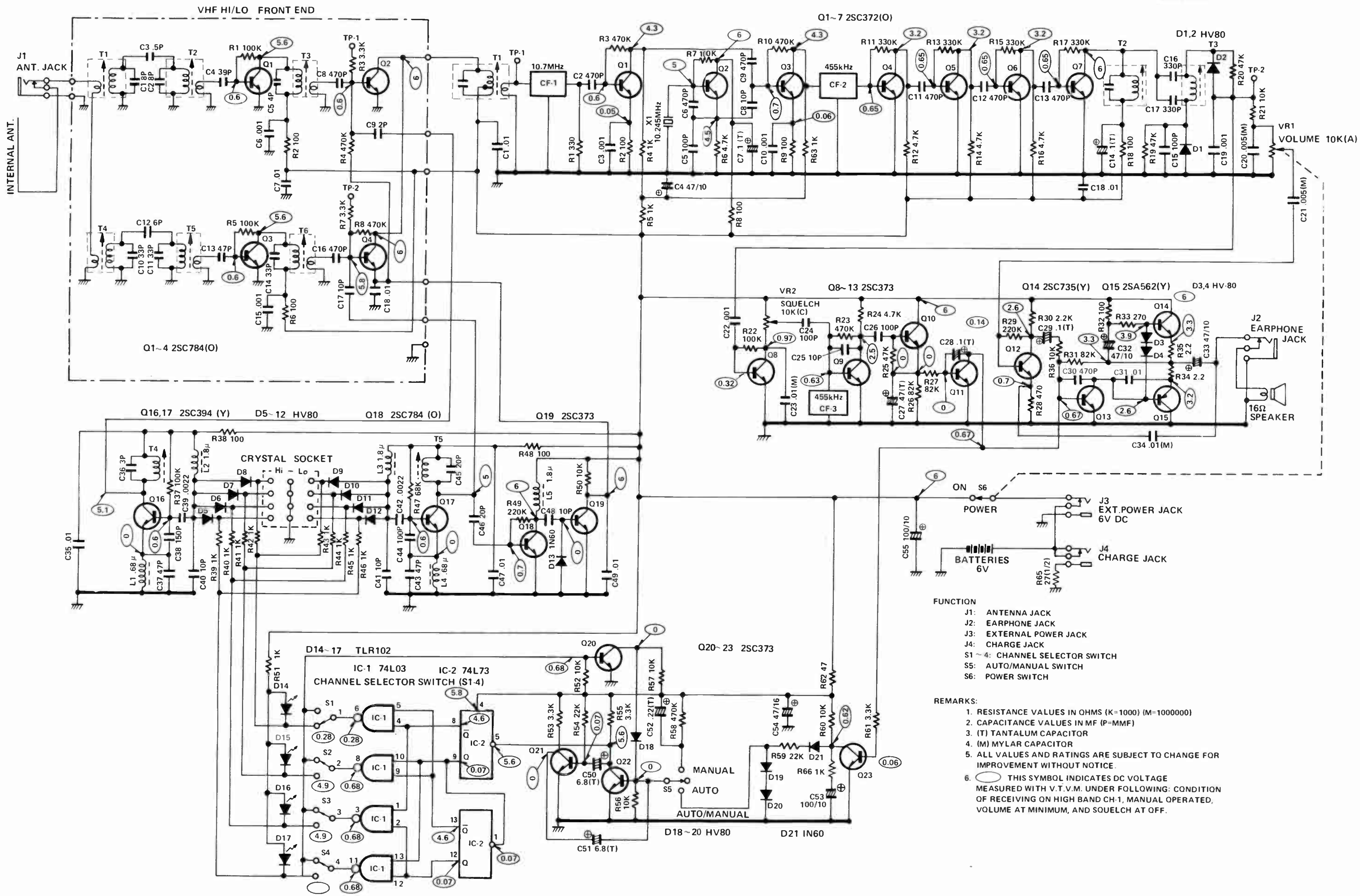


MAIN P.C. BOARD(BOTTOM VIEW)



SCHEMATIC DIAGRAM

***Realistic** Patrolman PRO-6*



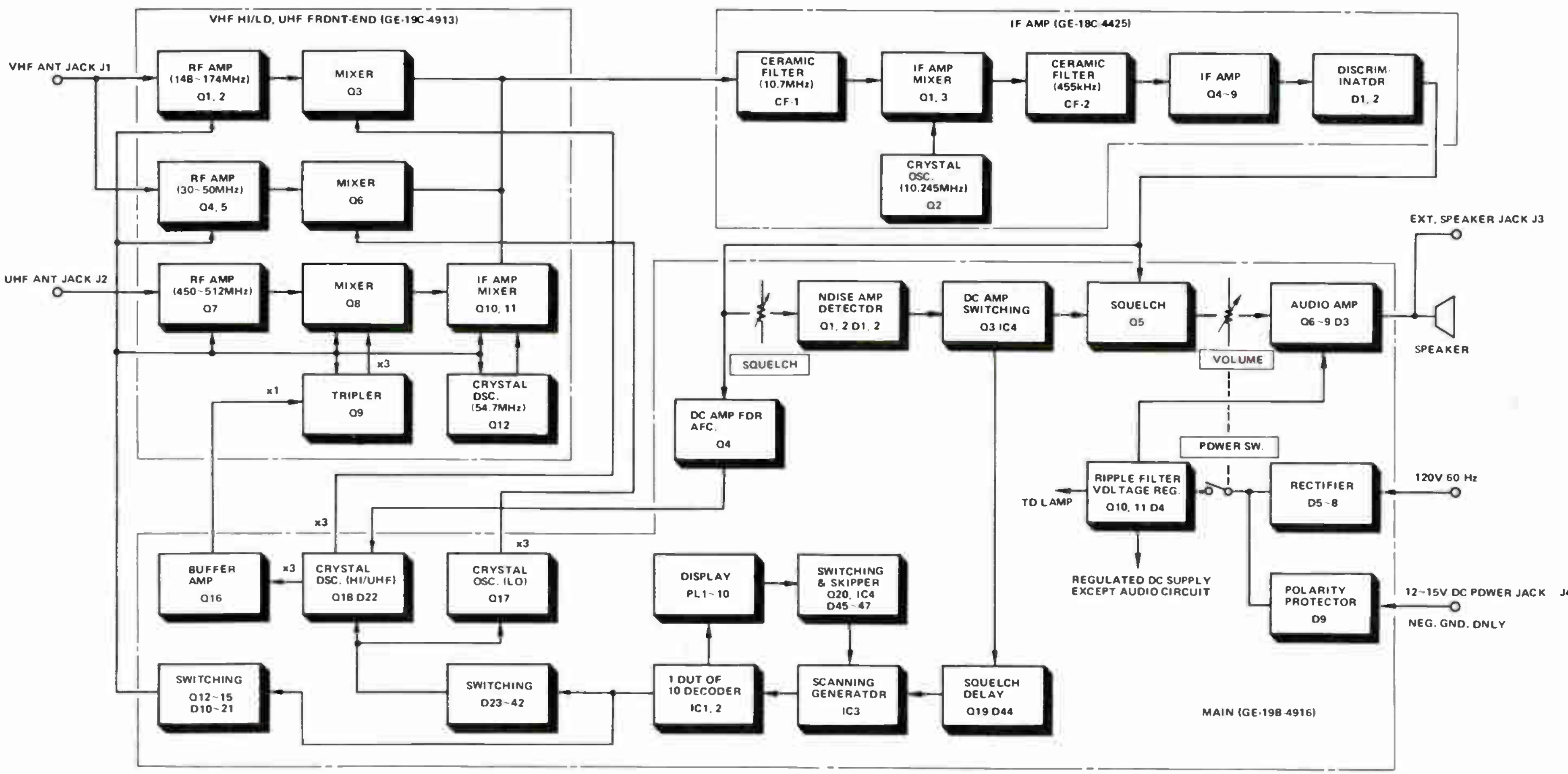
FUNCTION

- J1: ANTENNA JACK
- J2: EARPHONE JACK
- J3: EXTERNAL POWER JACK
- J4: CHARGE JACK
- S1 ~ 4: CHANNEL SELECTOR SWITCH
- S5: AUTO/MANUAL SWITCH
- S6: POWER SWITCH

REMARKS:

1. RESISTANCE VALUES IN OHMS (K=1000) (M=1000000)
2. CAPACITANCE VALUES IN MF (P=MMF)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.
6. ( ) THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH V.T.V.M. UNDER FOLLOWING: CONDITION OF RECEIVING ON HIGH BAND CH-1, MANUAL OPERATED, VOLUME AT MINIMUM, AND SQUELCH AT OFF.

BLOCK DIAGRAM



Symptom	Possible cause
10) UHF (Hi) band does not operate but VHF (Lo), UHF band operate. Noise is audible.	A) Defective crystal. B) Check crystal switch and/or position (H). C) Defective Q18 of OSC. section and/or defective circuit component parts.
11) UHF band does not operate but Lo/Hi band operate.	A) Defective crystal. B) Check crystal switch and/or position (U). C) Defective UHF section. D) Defective UHF IF amplifier, LOCAL OSC. and TRIPLER of UHF Front-end, OSC. section and/or defective circuit component parts.
12) VHF Lo, Hi and UHF band do not operate.	A) RF/AF circuit defective. B) Defective OSC. circuit. C) Defective IF amplifier circuit.
13) VHF Lo, Hi and UHF sound distorted.	A) Defective crystal. B) Defective amplifier circuit. C) Defective AUDIO amplifier circuit.
14) VHF Lo, Hi and UHF, low sensitivity.	A) Check alignment (frequency range). B) Defective RF AMP and IF AMP.
15) VHF Lo, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.
16) VHF High, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.
17) UHF low sensitivity.	A) Weak crystal. B) Faulty adjustment of UHF Front-end and/or faulty circuit component parts.
18) UHF band AFC does not operate.	A) Faulty DC amplifier. B) Varicap diode D22 of OSC. section defective and/or defective circuit component parts.

TROUBLE SHOOTING

Symptom	Possible cause
1) Pilot Lamp does not light and no sound output. Power Switch : ON Channel Switch : ON Volume Control : MAX.	A) Faulty line power cord. B) Defective power transformer. C) Defective power switch. D) Defective diodes D5 to D8 of MAIN section and/or defective associated circuit component. E) Defective fuse (DC only). F) Faulty DC jack (DC only). G) Defective diode D9 (DC only).
2) Channel lamp lights but no sound. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective speaker. B) Defective speaker jack. C) Faulty transistors Q5 to Q11 on MAIN section and/or faulty associated circuit component. D) Faulty IF amplifier circuit component.
3) Sound but channel lamp does not light. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective channel switch or defective channel lamp. B) Defective R39 on MAIN Board. C) Problem with integrated circuit IC-1 to IC-3 of MAIN section.
4) Does not scan and Squelch does not operate.	A) Defective Squelch control. B) Defective IF amplifier circuit. C) Defective noise amplifier or noise detector and/or defective circuit component parts. D) Defective integrated circuit IC-1 to IC-4 of MAIN section.
5) Does not scan but Squelch operates.	A) Defective AUTO/MANUAL switch. B) Problem with integrated circuit IC-1 to IC-4 and/or transistors Q19 MAIN section and/or defective circuit component parts.
6) Manual selector does not operate.	A) Faulty manual selector switch, AUTO/MANUAL switch.
7) Skipper does not operate.	A) Defective IC-4 MAIN section and/or defective circuit component parts.
8) Delay does not operate.	A) Defective Q19 of MAIN section and/or defective circuit component parts.
9) VHF (Lo) band does not operate but VHF (Hi), UHF band operate. Noise audible.	A) Defective crystal. B) Check crystal band selector switch, set to L position. C) Weak crystal and/or one of transistors Q17 of OSC. section defective and/or defective circuit component parts. D) Defective RF amplifier, MIXER of VHF Hi/Lo UHF Front End P.C.B. section and/or defective circuit component parts.

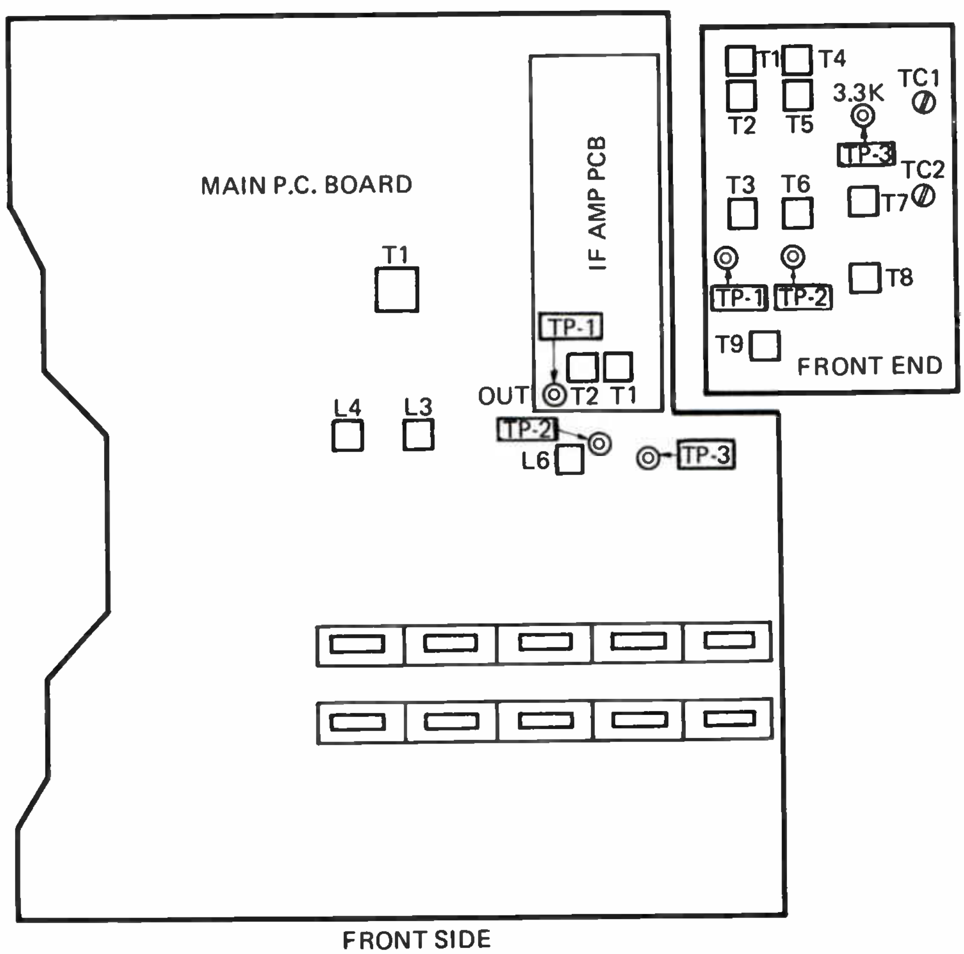
VHF LOW/HIGH OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to VHF input and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receive band center (153 MHz for High Band, 40 MHz for Low Band).
Step 3: Adjust L6(Hi) and L4(Lo) on the main PCB for maximum sensitivity.
Step 4: Set the signal generator for no modulation and minimum output, and set VOLUME control for 0 dB (0.775V) reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting.

NOTE 1: *As supplied by the factory, this unit is set up to provide maximum sensitivity in ranges of 37 – 43 MHz for VHF Lo, 149 – 157 MHz for VHF Hi and 465 – 495 MHz for UHF. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 30 MHz up to about 50 MHz for VHF Lo, 148 MHz to 174 MHz for VHF Hi and 450 MHz to 512 MHz for UHF. To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a band width "window" of about 6/8/30 MHz total -- adjust the sensitivity accordingly (compromise of frequency coverage may be necessary).* **Of course, be sure to use correct crystals.**

NOTE 2: *Alignment of T1 on main P.C. Board is not required. It happens to be adjustable only because of ease of parts procurement and does not need any adjustment.*

ALIGNMENT POSITIONS



UHF LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Set at least one crystal band selector switch to "U" position.
Step 2: Connect frequency counter thru a 1 pF capacitor to Q12 emitter circuit on the front-end P.C. Board.
Step 3: Read frequency on the frequency counter.
Normal: 54.7 MHz ±1 kHz

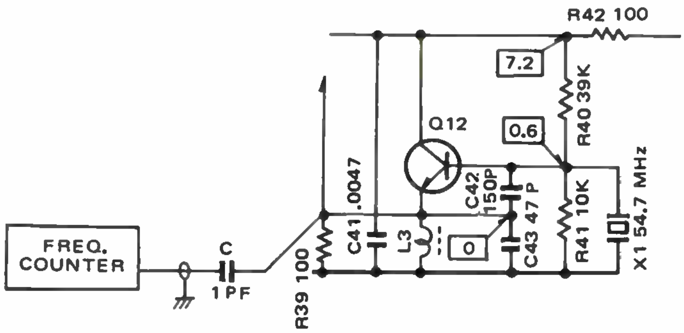


FIGURE 12. DIAGRAM

AFC ALIGNMENT

METHOD 1 USING A STANDARD CRYSTAL

*Standard crystal: One which has been manufactured to precise RS standards and for which you have a precise frequency correlation as to exactly how far off it is in frequency (IE. how far off actual is from required, in a standard, known circuit).

Step 1: Put the "standard" crystal in a UHF position and that crystal band selector switch to "U" position.
Step 2: With no antenna or signal generator connected, ground TP-3 (on Main PCB) and couple the frequency counter thru a pickup coil to oscillator coil L6. Refer to Figure 11.
Step 3: Adjust VR1 (on Main PCB) to the standard crystal frequency on the frequency counter.
Step 4: Remove ground from TP-3 and continue to monitor frequency; it should remain within ±500 Hz. If not, re-adjust T2 on the IF PCB slightly to obtain ±500 Hz. Recheck steps 2 to 4 if necessary.

METHOD 2 WITHOUT USING A STANDARD CRYSTAL

Step 1: Put a crystal in a UHF position and that crystal band selector switch to "U" position.
Step 2: With no antenna or signal generator connected, connect a DC VTVM to TP-2 of transistor Q4 on the main PCB.
Step 3: Ground TP-3 (on Main PCB) and adjust VR1 for 4 volts on the VTVM.
If you can not obtain 4 volts, change the value of R15 from 8.2K to 10K.
Step 4: Remove ground from TP-3 and continue to monitor voltage; it should remain at 4 volts. If not, re-adjust T2 slightly to obtain precisely 4.0 volts.
Step 5: If necessary, re-adjust VR1 to 4V ± 0.5V by rechecking steps 3 and 4.

UHF OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to UHF input and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receiver band center (480 MHz).
Step 3: Adjust TC-2, T7, T8 and T9 on the front-end PCB, L3 and L6 on the main PCB for maximum sensitivity.
Step 4: Set the signal generator for no modulation and minimum output, and set VOLUME control for 0 dB (0.775V) reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting sensitivity.

VHF LOW/HIGH, UHF LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Insert crystals in sockets.

Step 2: Couple the frequency counter thru a pickup coil to oscillator coil. Refer to Figure 10.

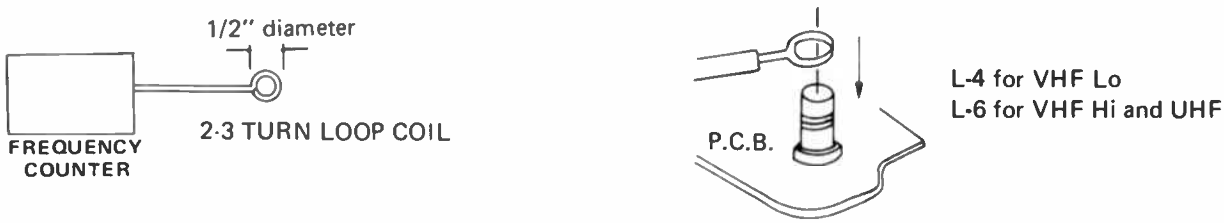


FIGURE 11. LOCAL OSCILLATOR COUPLING

Step 3: Check the frequencies of the appropriate oscillators as shown in the following chart. Do not make adjustments until or unless you perform the "Overall Alignment and Sensitivity" procedures noted on Page 5 and 6.

If necessary, adjust L-4 and L-6 as follows:

As you adjust these coil, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

Fr		CRYSTAL SWITCH POSITION	f osc	OSCILLATOR COIL	REMARKS
VHF LOW	30 ~ 50 MHz	L	Fr +10.7 MHz	L4 (MAIN P.C.B.)	
VHF HIGH	148 ~ 174 MHz	H	(Fr −10.7 MHz)/3	L6 (MAIN P.C.B.)	
UHF	450 ~ 512 MHz	U	(Fr −44 MHz)/9	L6 (MAIN P.C.B.)	GROUND TP-3 ON MAIN P.C.B.

NOTE 1: *Oscillating frequency, which is read on the frequency counter, should be ±750 Hz of the calculated crystal frequency.*

EXAMPLE RECEIVING FREQ.	CRYSTAL FREQ.	COUNTER FREQ.
40 MHz	50.7 MHz	50.699250 ~ 50.700750 MHz
150 MHz	47.433333 MHz	47.432583 ~ 47.434083 MHz
480 MHz	48.444444 MHz	48.443694 ~ 48.445194 MHz

2: *Crystal Frequency Calculation.*
The crystal frequencies are obtained by the following formula.
VHF LOW Crystal frequency (MHz) = Fr + 10.7
VHF HIGH Crystal frequency (MHz) = (Fr − 10.7)/3
UHF Crystal frequency (MHz) = (Fr − 44)/9
Where Fr is the desired receive frequency, in MHz.

VHF FRONT-END ALIGNMENT

LOW BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Set at least one crystal band selector switch to "L" position.
Step 3: Adjust Frequency of sweep generator to 40 MHz and connect Scope to TP-2.
Step 4: Adjust T4, T5, T6 of RF section for maximum output and best curve symmetry as shown in Figure 6.

HIGH BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Set at least one crystal switch to "H" position. Connect Scope to TP-1.
Step 3: Adjust T1, T2 and T3 in RF section for maximum output and best curve symmetry as shown in Figure 7.

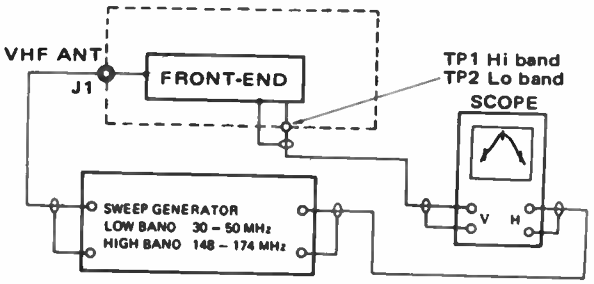


FIGURE 5. VHF LOW/HIGH BAND RF TEST EQPT. HOOK UP

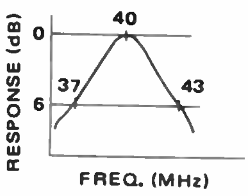


FIGURE 6. VHF Lo

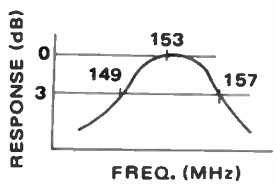


FIGURE 7. VHF Hi

UHF FRONT-END ALIGNMENT

Step 1: Connect the instruments as shown in Figure 8.
Step 2: Set at least one crystal band selector switch to "U" position.
Step 3: Set TC-2 to minimum capacitance.
Step 4: Adjust TC-1 for maximum output and best curve symmetry as shown in Figure 9.

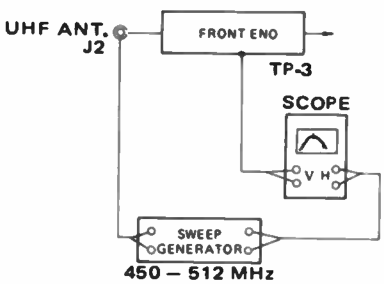


FIGURE 8. UHF FRONT END EQPT. HOOK UP

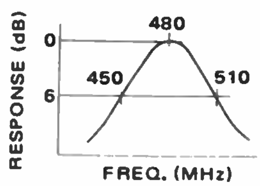
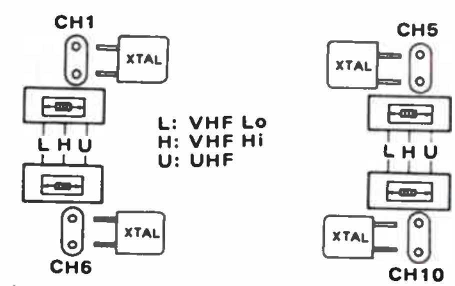


FIGURE 9. UHF RF CHARACTERISTIC CURVE

CRYSTAL INSTALLATION



CRYSTAL AND SWITCH ILLUSTRATION

FIGURE 10. CRYSTAL INSTALLATION

ALIGNMENT PREPARATION

Test equipment required

1. Oscilloscope
2. AC VTVM
3. DC VTVM
4. Frequency counter (60 MHz)
5. 8 ohm dummy load
6. Slow sweep generator with variable marker (10.7 MHz)
7. VHF sweep generator with variable marker (30 – 50 MHz, 148 – 174 MHz)
8. UHF sweep generator with variable marker (450 – 512 MHz)

NOTE: *Use non-metallic tuning tools.*
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

LOCAL OSCILLATOR FREQUENCY CHECK (10.245 MHz)

Step 1: Connect Frequency Counter through a 10 pF capacitor to Q2 Emitter circuit of IF AMP. PCB.

Step 2: Read frequency on the Frequency Counter. Normal: 10.245 MHz ±1 kHz.

NOTE: *Frequency Counter coupling capacitor should be as small a value as possible. Frequency Counter should be high impedance type.*

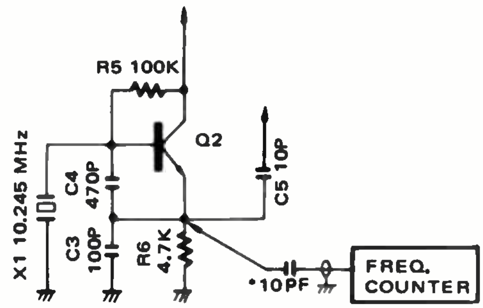


FIGURE 2.

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 3.

Step 2: Maintain sweep generator output at a low level to prevent overloading.

Step 3: Adjust T1, T2 of IF amplifier section so that the 455 kHz marker is in the center of the discriminator curve and for best linearity.

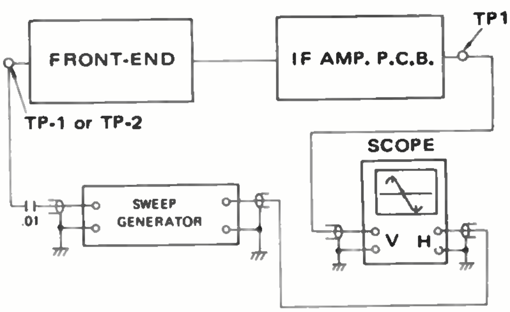


FIGURE 3. IF SECTION ALIGNMENT TEST EQPT. HOOK UP

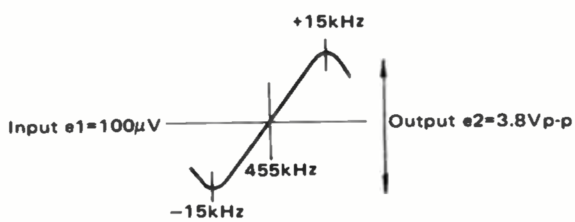


FIGURE 4. IF DISCRIMINATOR CURVE

SEMICONDUCTORS

ITEM	PART NO.
FRONT-END BOARD	
Q1	2SC784(0)
Q2	2SC784(0)
Q3	2SC784(0)
Q4	2SC784(0)
MAIN BOARD	
D1	HV-80
D2	HV-80
D3	HV-80
D4	HV-80
D5	HV-80
D6	HV-80
D7	HV-80
D8	HV-80
D9	HV-80
D10	HV-80
D11	HV-80
D12	HV-80
D13	1N60
D14	TLR102
D15	TLR102
D16	TLR102
D17	TLR102
D18	HV-80
D19	HV-80
D20	HV-80
D21	1N60
IC1	SN74L03N
IC2	SN74L73
Q1	2SC372(0)
Q2	2SC372(0)
Q3	2SC372(0)
Q4	2SC372(0)
Q5	2SC372(0)
Q6	2SC372(0)
Q7	2SC372(0)
Q8	2SC373
Q9	2SC373
Q10	2SC373
Q11	2SC373
Q12	2SC373
Q13	2SC373
Q14	2SC735(Y)
Q15	2SA562(Y)
Q16	2SC394(Y)
Q17	2SC394(Y)
Q18	2SC784(0)
Q19	2SC373
Q20	2SC373
Q21	2SC373
Q22	2SC373
Q23	2SC373

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C4	47uF 10V	CE04W1A470
C7	0.1uF 35V	
C14	0.1uF 35V	
C27	0.47uF 35V	
C28	0.1uF 35V	
C29	0.1uF 35V	
C32	47uF 10V	CE04W1A470
C33	47uF 10V	CE04W1A470
~~C50~~	6.8uF 6.3V	
C51	6.8uF 6.3V	
C52	0.22uF 35V	
C53	100uF 10V	CE04W1A101
C54	47uF 10V	CE04W1A470
C55	100uF 10V	CE04W1A101

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	10K, Volume	P-1493
VR2	10K, Squelch	P-1492

COILS/TRANSFORMERS

ITEM	PART NO.
FRONT-END BOARD	
T1	CA-4547
T2	CA-4548
T3	CA-4547
T4	CA-4549
T5	CA-4549
T6	CA-4549
MAIN BOARD	
L1	CA-3180
L2	CA-2909
L3	CA-2909
L4	CA-3180
L5	CA-2909
T1	CA-7246
T2	CA-7247
T3	CA-2997
T4	CA-4546
T5	CA-4546

MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	10.7MHz Filter	CA-2911
CF2	455kHz Filter	C-0577
CF3	455kHz Filter	C-0578
X1	10.245MHz Crystal	HC-18/u
	Switch, Slide	S-2180
	Switch, Lever	S-5027
	PC Board, Front End	GE-19D-4604
	PC Board, Main	GE-18B-4462
	Earphone	E-0069

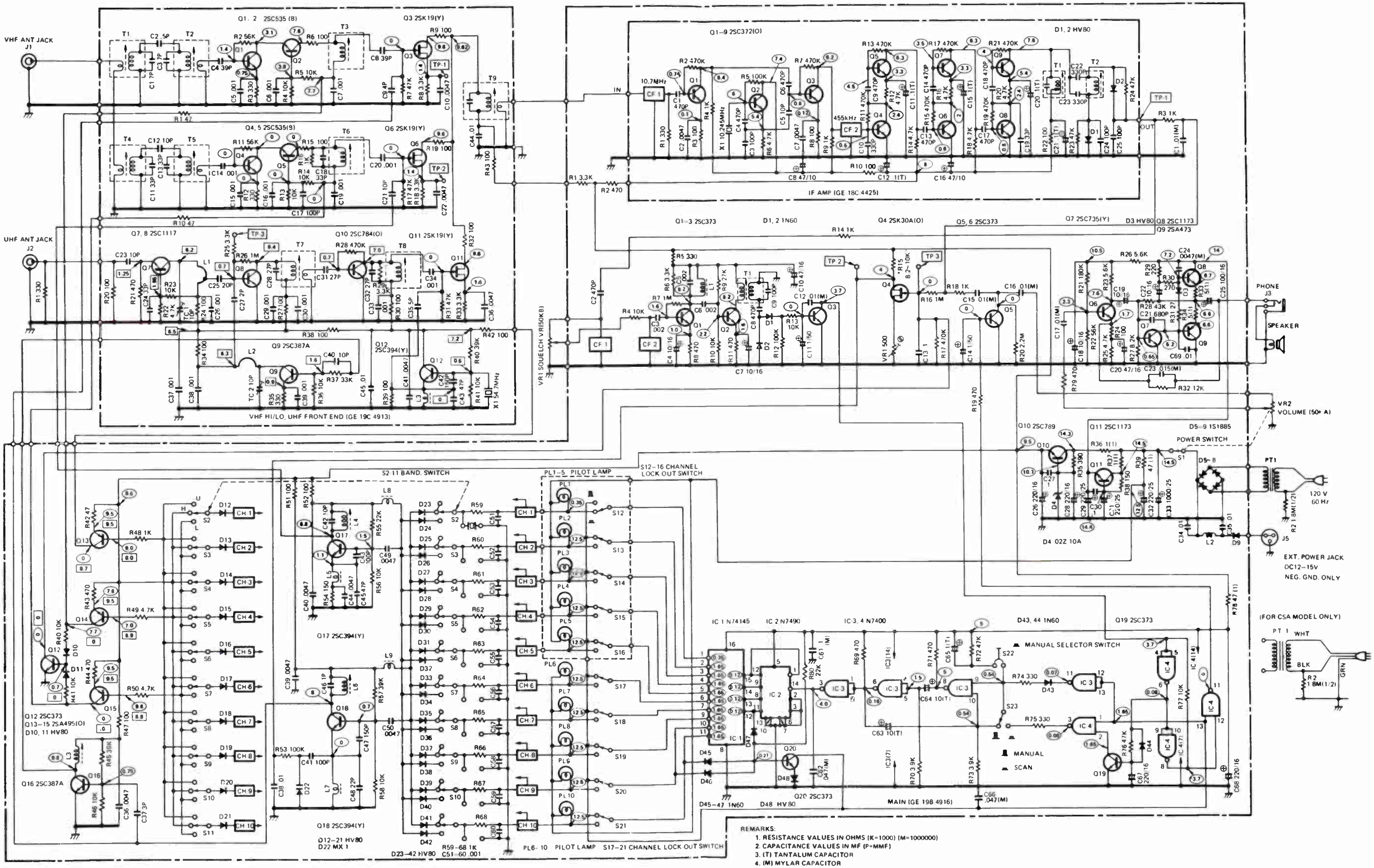
CABINET PARTS

NAME	PART NO.
Front Escutcheon	Z-2182
Case (Spkr side)	Z-2183
Case (Battery side)	Z-2184
Front Panel	Z-2185
Knob, Volume	K-1385

TROUBLE SHOOTING

Symptom	Possible cause
1) Light Emitting Diode (L.E.D.) does not light and no sound is audible. Power Switch : On VOLUME Control : Maximum Channel Switch : On	A) Defective, low or weak battery. B) Defective On-Off switch on VOLUME control. C) Power circuit disconnected or short circuit.
2) L.E.D. Lights but no sound. Channel Switch : On SQUELCH Control : Off (Minimum) VOLUME Control : Maximum	A) Defective earphone jack. B) Defective speaker. C) Faulty transistor Q12, 13, 14 or Q15 or associated circuit component(s).
3) Sound, but L.E.D. does not light. Channel Switch : On SQUELCH Control : Off (Minimum) VOLUME Control : Maximum	A) Faulty L.E.D. P.C. Board assembly +B supply. B) Defective L.E.D. C) Faulty channel switch. D) Defective IC-1.
4) No Sound through Earphone.	A) Defective earphone jack. B) Defective earphone.
5) Does not scan and SQUELCH does not operate.	A) Faulty noise amplifier or faulty noise detector circuit component. B) Defective RF or IF amplifier. C) Defective, low or weak battery.
6) Does not scan but SQUELCH operates normally.	A) Defective Auto/Manual switch. B) One of transistors Q21 to Q23 defective. C) Either IC-1 or IC-2 defective. D) One of circuit components faulty.
7) Manual Selector does not operate.	A) Defective Auto/Manual selector switch. B) Either Q21 or Q22 defective. C) Either IC-1 or IC-2 defective. D) One of circuit components faulty.
8) Skipper Circuit does not operate.	A) Faulty transistor Q20 or faulty circuit component part.
9) Only scans channel 1, 2 or channel 3, 4.	A) Defective IC-1.
10) L.E.D. of one or two channels does not light when channel switch is on.	A) Defective IC-1. B) Defective channel switch. C) Defective L.E.D.
11) Noise can be heard but does not receive.	A) Wrong crystal channel or faulty crystal. B) Defective RF amplifier circuit. C) Defective IF amplifier circuit. D) Defective 1st or 2nd local oscillator circuit. E) Weak battery. F) One of transistors Q18, Q19 defective and/or defective associated circuit component(s).
12) Mixed reception.	A) Crystal not set to proper receiving frequency.
13) Low sensitivity.	A) Weak battery. B) Crystal frequency not covering the correct channel. C) Defective RF and/or IF amplifiers. D) Retune front end higher or lower for optimum sensitivity. E) One of transistors Q18, Q19 defective and/or defective associated circuit component.

SCHEMATIC DIAGRAM



REMARKS:
1. RESISTANCE VALUES IN OHMS (K=1000) (M=1000000)
2. CAPACITANCE VALUES IN MF (P=MMF)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE
6. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF HIGH BAND CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQUELCH CONTROL OUT POSITION.
▭ THIS SYMBOL INDICATES UHF BAND OPERATED.

SEMICONDUCTOR LEAD IDENTIFICATION

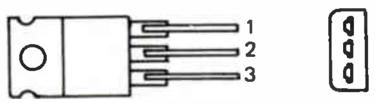
(A): 2SA495(O), 2SC372(O), 2SC373, 2SC387A, 2SC394(Y), 2SC735(Y), 2SC784(O)
(B): 2SK19(Y)
(C): 2SC789(O), 2SC1173, 2SA473(O)
(D): 2SC535(B)
(E): 2SC1117
(F): 2SK30A(O)

(A)
(B)

(A)
1. Emitter
2. Collector
3. Base

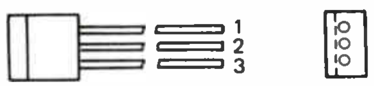
(B)
1. Drain
2. Source
3. Gate

(C)



(C)
1. Base
2. Collector (Heat Sink)
3. Emitter

(D)



(D)
1. Emitter
2. Collector
3. Base

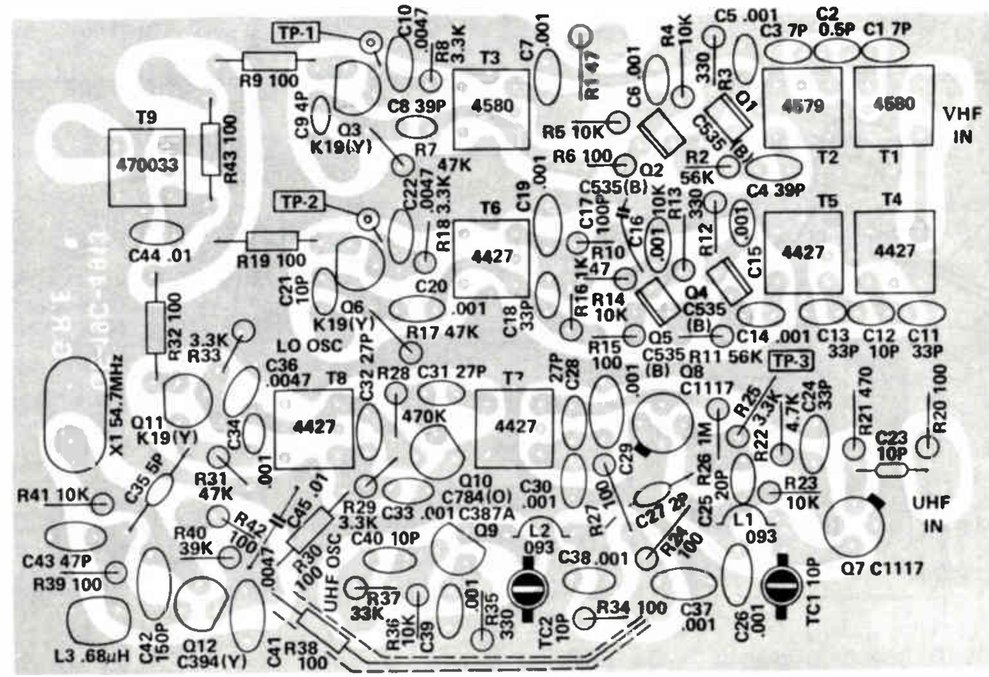
(E)

(E)
1. Emitter
2. Base
3. Collector
4. Case

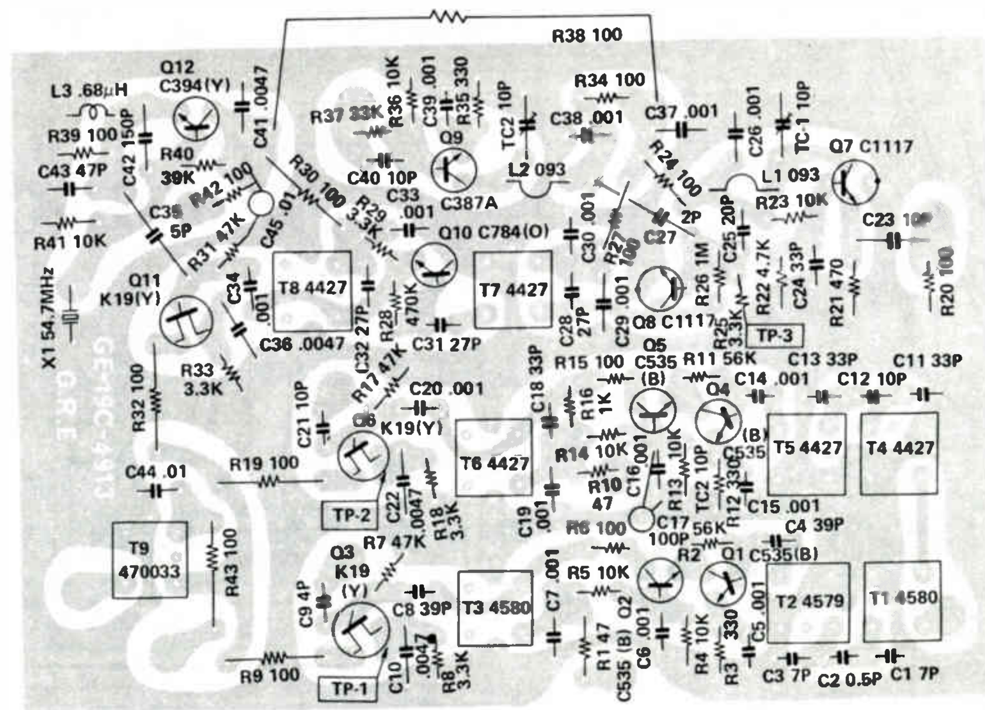
(F)

(F)
1. Source
2. Gate
3. Drain

FRONT END P.C. BOARD (TOP VIEW)



FRONT END P.C. BOARD (BOTTOM VIEW)



3-10 VOLTAGE DATA

VOLTAGE DATA – TRANSISTORS:

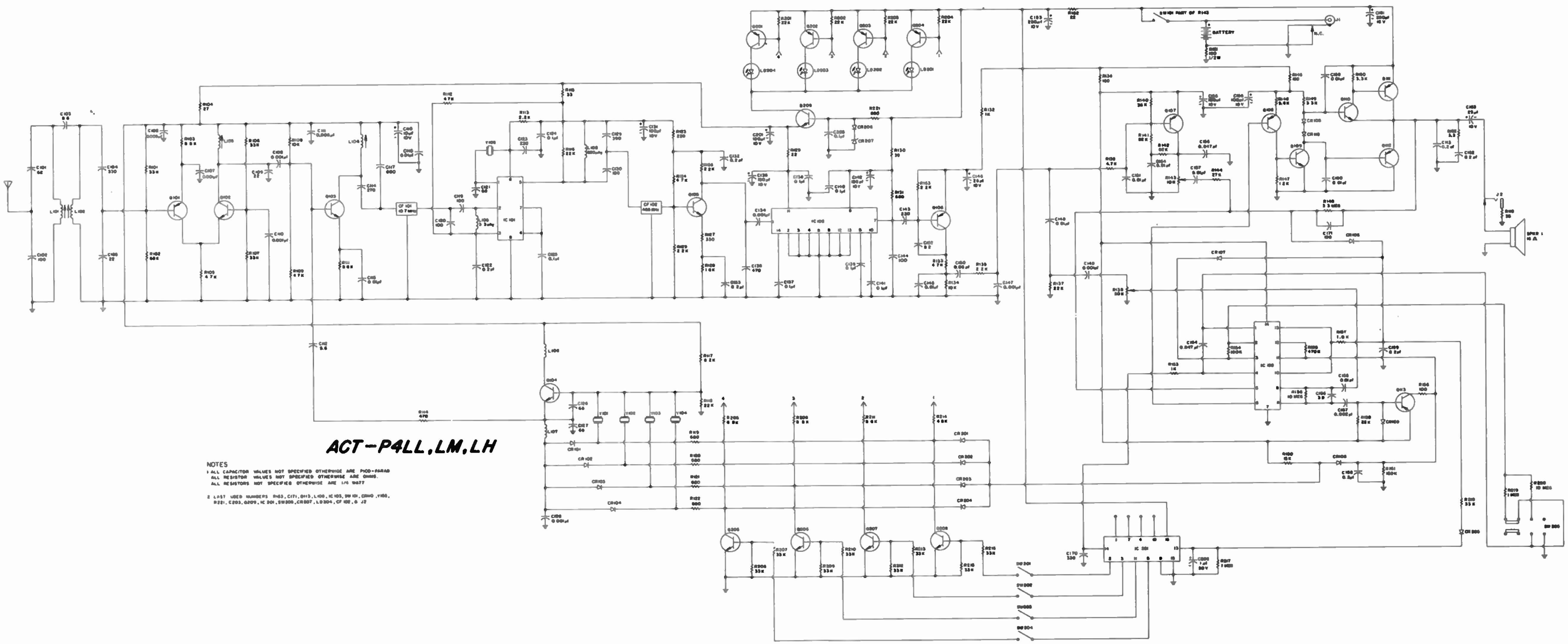
NOTES: 1. All voltages are nominal and are measured with a VTVM.
1. For transistors Q101 through Q113 "SCAN" indicates that the receiver is scanning all four channels in the "FAST" scan mode.
3. "STOP" indicates that the receiver is stopped on oen of the channels 1-4.
4. For transistors Q201 through Q209 "SCAN" indicates that the receiver is scanning in the "SLOW" scan mode. "STOP" indicates that the scanner is stopped ON THE INDICATED CHANNEL.

	Transistor	Emitter (Source)	Base (Gate)	Collector (Drain)
Main Bd. No. 501-055	Q101			
	Scan	4.2P	3.6P	1.5P
	Stop	4.8	4.1	2.0
	Q102			
	Scan	1.5P	2.2P	4.9P
	Stop	2.0	2.7	5.8
	Q103			
	Scan	0.9P	1.6P	4.8P
	Stop	1.2	1.9	5.8
	Q104			
	Scan			
	Stop	3.8	3.8	5.8
	Q105			
	Scan	0.8	1.4	3.8
	Stop	1.2	1.8	4.5
	Q106	8.3	8.3	5.5
	Q107	7.8	7.8	3.9
	Q108			
	Squelch Tight	8.2	8.0	0
	Squelch Open	6.3	5.8	0.6
	Q109			
	Squelch Tight	0	0	8.0
	Squelch Open	0	0.6	3.9
	Q110			
	Squelch Tight	8.3	8.7	9.3
	Squelch Open	4.0	4.3	8.6
	Q111	9.0	9.0	
	Squelch Tight	9.0	9.0	8.[illegible]
	Squelch Open	9.0	8.9	4.0
	Q112			
	Squelch Tight	8.2	8.0	0
	Squelch Open	4.0	3.8	0
	Q113			
	Squelch Tight	8.3	8.3	7.5
	Squelch Threshold	8.3	8.3	7.0
	Squelch Open	7.8	7.8	0.3

VOLTAGE DATA – INTEGRATED CIRCUITS

NOTES. 1. All voltages are nominal and are measured with a VTVM.
2. For IC's 101, 102 and 103, "SCAN" indicates that the receiver is in the "FAST" scan mode.
3. For IC201. "SCAN" indicates that the receiver is in the "SLOW" scan mode.
4. A "P" beside a reading indicates that the meter is pulsating (fluctuating) because the scanner section is operating.
5. For IC201. "STOP" indicates that the receiver is stopped ON THE INDICATED CHANNEL.

	IC101																
Main Bd.	pin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
No. 501-055	Scan	1.8P	0.8 P	0.8 P	1.8 P	4.7 P	0	1.8 P	2.8 P								
	Stop	2.0	0.8	0.8	1.9	5.8	0	1.9	3.3								
	IC102																
	Scan	2.3	0	0	0	2.4 P	0	6.3 P	7.8	0	2.4 P	4.5P	0	0	2.4 P		
	Stop	2.9	0	0	0	2.9	0	6.0	7.7	0	3.0	5.7	0	0	3.0		
	IC103																
	Scan (slow)	4.2 P	4.5 P	4.5 P	4.0 P	0.3	8.2	0	4.5 P	4.0	0	7.5	8.3	0	8.3		
	Stop (squelched)	0	8.1	8.0	0	0.3	8.0	0	4.5	4.0	0	7.2	8.0	0	8.0		
	Unsquelched	0	7.8	7.6	0	4.3	5.9	0	4.4	4.0	7.8	0.2	0	7.8	7.8		
Scan Bd.	IC201																
No. 501-056	Scan (slow)	0/9 P	0/7.5 P	0/9 P	0/9 P	0/7.5 P	0	0/9 P	0	0	0/9 P	0/7.5 P	0/9 P	0	0/9 P	0	9
	Stop (squelched)	0	0/7.5 (CH 1)	0/7.5 (CH 2)	0	0/7.5 (CH 4)	0	0	0	0	0	0/7.5 (CH 3)	0/9	0	0/9	0	9
	Unsquelched	0	0/7	0/7	0	0/7	0	0	0	0	0	0/7	7.0	7.0	0	0	8.4



ACT-P4LL, LM, LH

NOTES

1 ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS.
ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT

2 LAST USED NUMBERS R163, C171, Q113, L108, IC103, SW101, CR110, Y105,
R221, C203, Q209, IC201, SW205, CR207, LD204, CF102, & J2

2-2-8 Adjust the slugs in L101 and L102 (starting with L101) for minimum noise reducing the Signal Generator level to maintain the noise reading near 0.1 volt RMS. Repeat several times until no further improvement is noted.

This completes the alignment of the receiver.

NOTE: The ACT-P4LL is normally tuned-up at 36 MHz, the ACT-P4LM is tuned at 41 MHz and the ACT-P4LH is normally tuned-up at 46 MHz. Either model may however, be retuned to cover any 10 MHz segment of the 30-50 MHz band. For example, if it is desired that the range of 35-45 MHz be covered, the above tune-up procedure would be performed near 40 MHz. In general, best performance can be obtained if the receiver is tuned at the center of the desired range of coverage. For example, if it is necessary to cover 41-45 MHz, a slight improvement in sensitivity could be obtained at the low end of the range by retuning near 43 MHz.

3-10 VOLTAGE DATA

Scan Bd. No. 501-056	Q201			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 4)	8.2	7.2	8.1
	Q202			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 3)	8.2	7.2	8.1
	Q203			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 2)	8.2	7.2	8.1
	Q204			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 1)	8.2	7.2	8.1
	Q205			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 4)	0	0.7	0
	Q206			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 3)	0	0.7	0
	Q207			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 2)	0	0.7	0
	Q208			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 1)	0	0.7	0
	Q209			
	Stop (Any Channel)	5.8	6.4	6.8

SECTION 2 ALIGNMENT PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator

2-1-2 A.C. Vacuum Tube Voltmeter

NOTE: During all steps of the alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range over which they will operate.

Figure 3-1 shows the location of all coils which are to be adjusted.

2-2 ALIGNMENT

2-2-1 Remove the antenna from the receiver.

2-2-2 Using the slow scan mode, set the receiver to the channel nearest the frequency range to be covered. Set the "Scan" Switch to "Stop" and rotate the squelch control to the maximum clockwise position (minimum squelch action), opening the audio circuits.

2-2-3 Connect the A.C. VTVM across the speaker terminals (Note Polarity).

2-2-4 Connect the FM Signal Generator between the antenna post and ground.

2-2-5 Adjust the receiver volume control for 0.3 volt RMS noise reading on AC Voltmeter.

2-2-6 Increase Signal Generator level and tune L104 for minimum noise (maximum quieting), reducing the Signal Generator level as necessary to maintain a noise reading near 0.1 volt RMS.

NOTE: This and following steps should be performed with an <u>unmodulated</u> signal.

2-2-7 Adjust the slugs in L103 for minimum noise, reducing the Signal Generator level to maintain the noise level near 0.1 volt RMS.

SEMICONDUCTORS

ITEM	PART NO.
FRONT-END BOARD	
Q1	2SC535(B)
Q2	2SC535(B)
Q3	2SK19(Y)
Q4	2SC535(B)
Q5	2SC535(B)
Q6	2SK19(Y)
Q7	2SC1117
Q8	2SC1117
Q9	2SC387A
Q10	2SC784(0)
Q11	2SK19(Y)
Q12	2SC394(Y)
IF BOARD	
D1	HV80
D2	HV80
Q1	2SC372(0)
Q2	2SC372(0)
Q3	2SC372(0)
Q4	2SC372(0)
Q5	2SC372(0)
Q6	2SC372(0)
Q7	2SC372(0)
Q8	2SC372(0)
Q9	2SC372(0)
SWITCH BOARD	
D45	1N60
D46	1N60
D47	1N60
D48	HV80
Q20	2SC373
MAIN BOARD	
D1	1N60
D2	1N60
D3	HV80
D4	02Z10A
D5	1S1885
D6	1S1885
D7	1S1885
D8	1S1885
D9	1S1885
D10	HV80
D11	HV80
D12	HV80
D13	HV80
D14	HV80
D15	HV80
D16	HV80
D17	HV80
D18	HV80
D19	HV80
D20	HV80
D21	HV80
D22	MX1
D23	HV80
D24	HV80
D25	HV80
D26	HV80
D27	HV80
D28	HV80
D29	HV80
D30	HV80
D31	HV80
D32	HV80
D33	HV80
D34	HV80
D35	HV80
D36	HV80
D37	HV80
D38	HV80
D39	HV80
D40	HV80
D41	HV80
D42	HV80
D43	1N60
D44	1N60
IC1	N74145B
IC2	N7490A
IC3	N7400A
IC4	N7400A
Q1	2SC373
Q2	2SC373
Q3	2SC373
Q4	2SK30(0)
Q5	2SC373
Q6	2SC373
Q7	2SC735(Y)
Q8	2SC1173(0)
Q9	2SA473(0)
Q10	2SC789(0)
Q11	2SC1173(0)
Q12	2SC373
Q13	2SA495(0)
Q14	2SA495(0)
Q15	2SA495(0)
Q16	2SC387(A)
Q17	2SC394(Y)
Q18	2SC394(Y)
Q19	2SC373
Q20	2SC373

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
FRONT-END BOARD		
TC1	10pF Trimmer	ECV-1ZW10P51
TC2	10pF Trimmer	ECV-1ZW10P51
IF BOARD		
C8	47uF 10V	CE04W1A470
C11	0.1uF 35V	
C12	0.1uF 35V	
C15	0.1uF 35V	
C16	47uF 10V	CE04W1A470
C20	0.1uF 35V	
C21	0.1uF 35V	
MAIN BOARD		
C4	10uF 16V	CE04W1C100F
C7	10uF 16V	CE04W1C100F
C10	47uF 16V	CE04W1C470B
C11	1uF 50V	CE04W1H010
C14	1uF 50V	CE04W1H010
C18	10uF 16V	CE04W1C100F
C19	10uF 16V	CE04W1C100F
C20	47uF 16V	CE04W1C470B
C22	10uF 16V	CE04W1C100F
C25	100uF 16V	CE04W1C101F
C26	220uF 16V	CE04W1C221E
C28	220uF 16V	CE04W1C221E
C29	220uF 25V	CE04W1E221C
C31	220uF 25V	CE04W1E221C
C32	220uF 25V	CE04W1E221C
C33	1000uF 25V	CE04W1E102
C63	10uF 6.3V	CS15E0J100M
C64	10uF 6.3V	CS15E0J100M
C65	1uF 50V	CS15E1E010M
C67	220uF 16V	CE04W1C221C
C68	220uF 16V	CE04W1C221C

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
MAIN BOARD		
VR1	500 ohms, Semi Fixed	TR11R500(ohm)
CHASSIS		
VR1	50K, Squelch	VM10A-50KB-40-A
VR2	50K, Volume	VM11A-5M1111-50KA-40-A

COILS/TRANSFORMERS

ITEM	PART NO.
FRONT-END BOARD	
L1	8LNR-093
L2	8LNR-093
L3	EL0610-R68M
T1	113SN-4580X
T2	113SN-4579X
T3	113SN-4580X
T4	113SN-4427X
T5	113SN-4427X
T6	113SN-4427X
T7	113SN-4427X
T8	113SN-4427X
T9	119LC-470033N3
IF BOARD	
T1	7MC-452503N
T2	7MC-2091N
MAIN BOARD	
L1	EL0610-202K
L2	38-037
L3	6.5SNO-086
L4	6.5SNO-087
L5	EL0606-R68M
L6	6.5SNO-087
L7	EL0606-R68M
L8	LF4-1R8K
L9	LF4-1R8k
T1	CAN-1979A
Power Transformer(UL type)	K088F
Power Transformer(CSA type)	K2065

MISCELLANEOUS

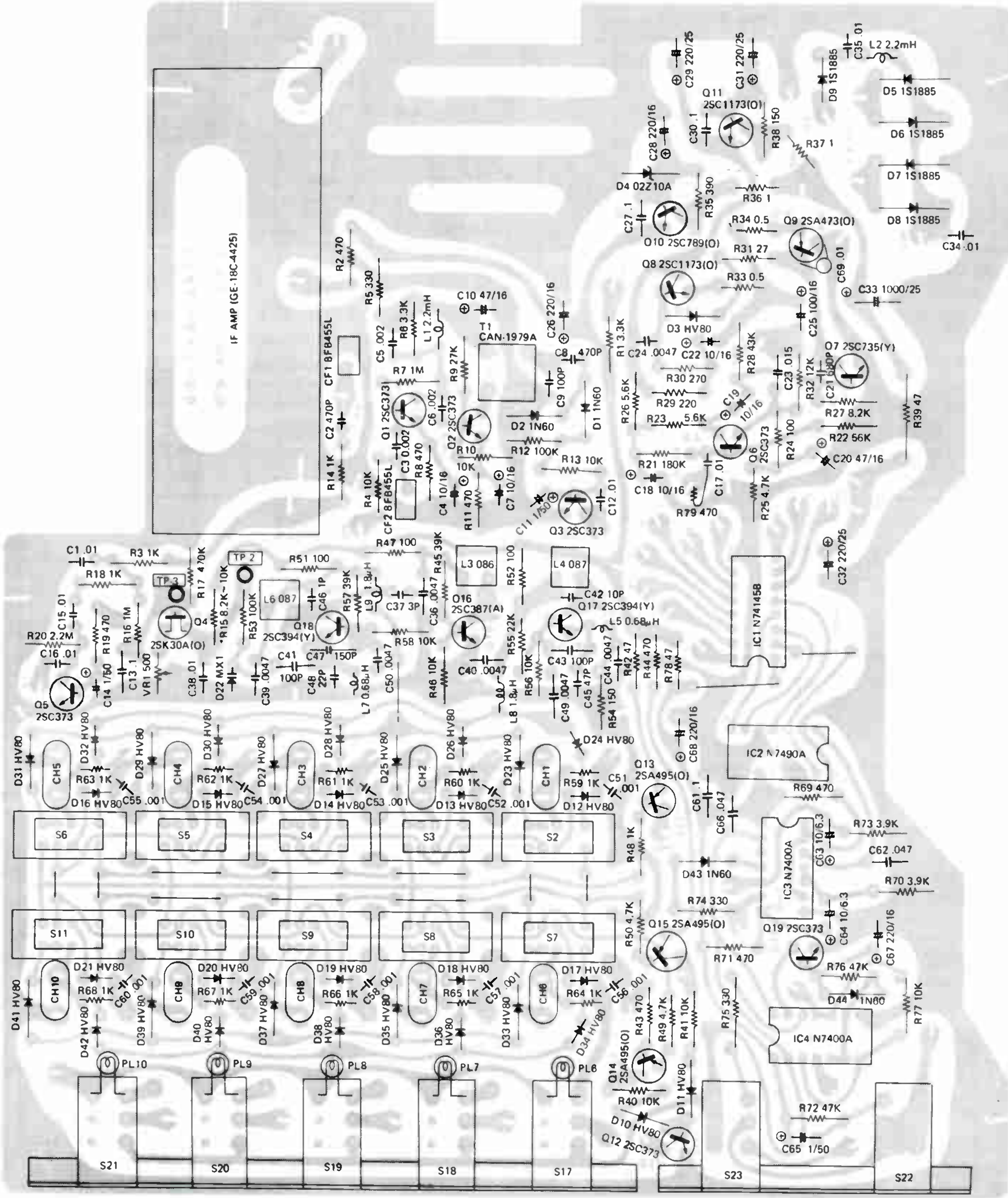
ITEM	NAME	PART NO.
FRONT-END BOARD		
	PC Board (UL Type)	GE-19C-4913
IF BOARD		
CF1	10.7MHz Filter	10.7MF-B
CF2	455kHz Filter	LF-C25
	PC Board (UL Type)	GE-18C-4425
SWITCH BOARD		
	PC Board (UL Type)	GE-20D-5272
MAIN BOARD		
CF1	455kHz Filter	BFB455L EF-A8 (1)
CF2	455kHz Filter	BFB455L EF-A8 (1)
S2-11	Switch,Board Selector	S223063
S17-21	Switch,Program	5F-0013FF2020
S22	Switch,Auto-Manual Selector	2F-0016DF2020
S23	Switch,Auto-Manual Selector	2F-0016DF2020
	PC Board (UL Type)	GE-19C-4916
CHASSIS		
S12-16	Switch,Program	5F-0013FF2020

(1) Alternate

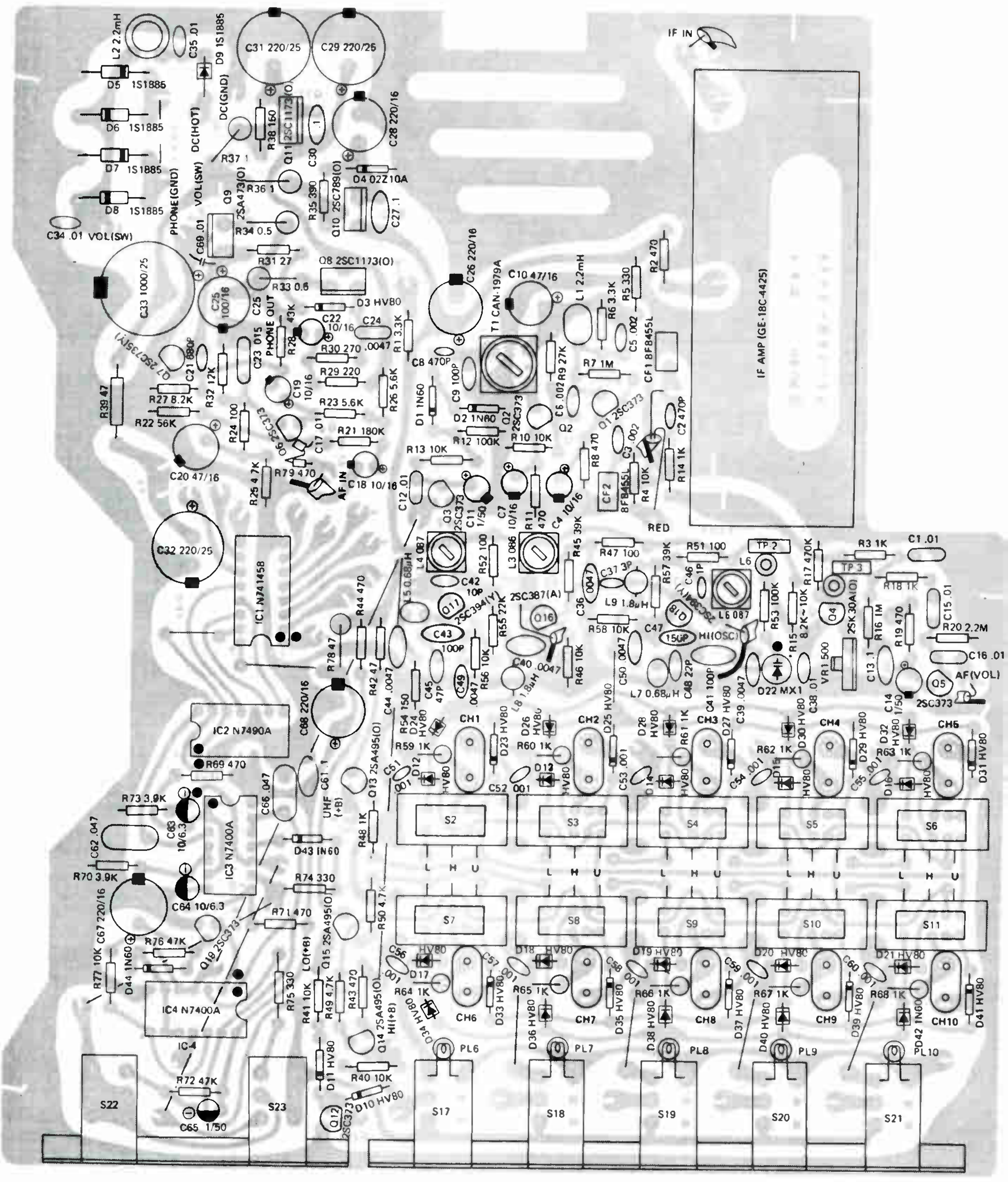
CABINET PARTS

NAME	PART NO.
Case	GE-19B-4963
Front Escutcheon	GE-19B-4965
Front Panel	GE-19C-4966
Knob, Volume	GE-16D-3007
Knob, Switch (Amber	GE-19C-4548A
Knob, Switch (Black)	GE-19C-4548B

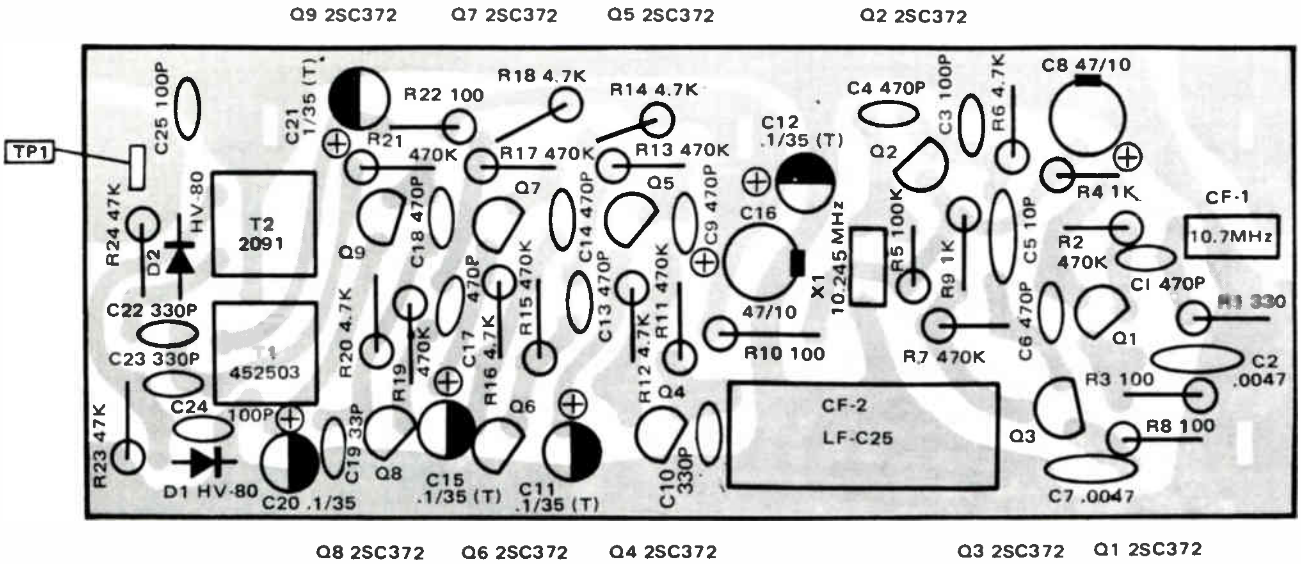
MAIN P.C. BOARD (BOTTOM VIEW)



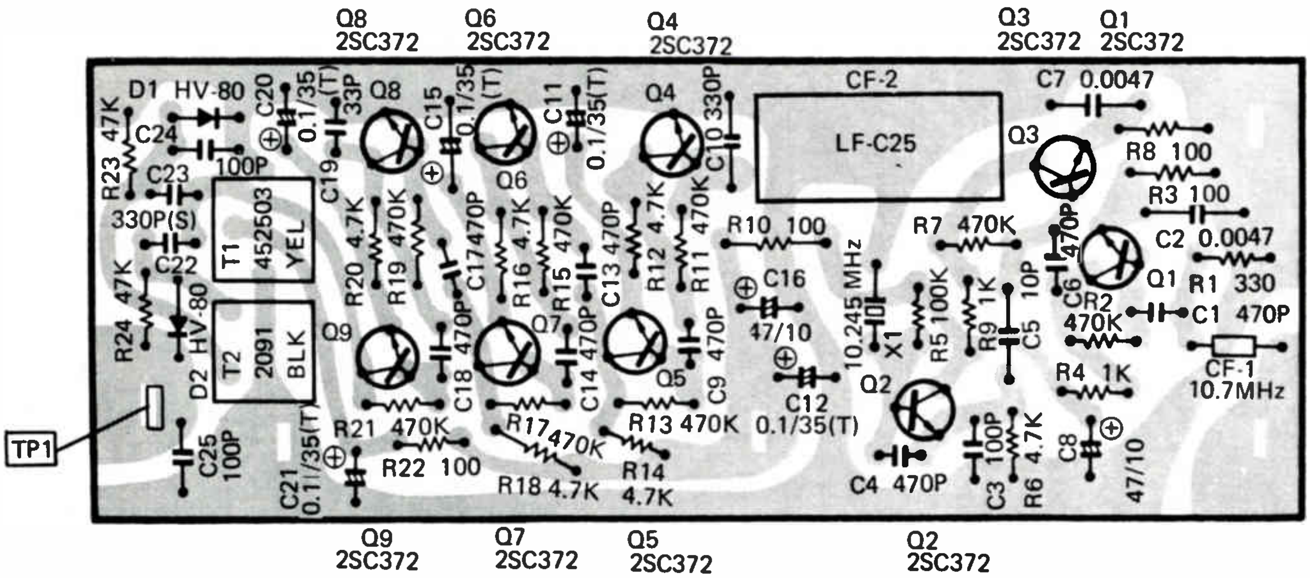
MAIN P.C. BOARD (TOP VIEW)



IF P.C. BOARD (TOP VIEW)

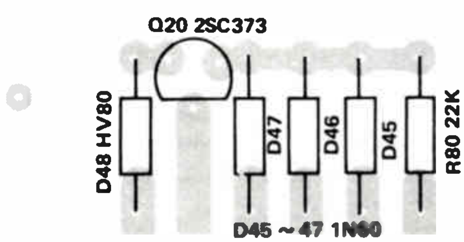


IF P.C. BOARD (BOTTOM VIEW)



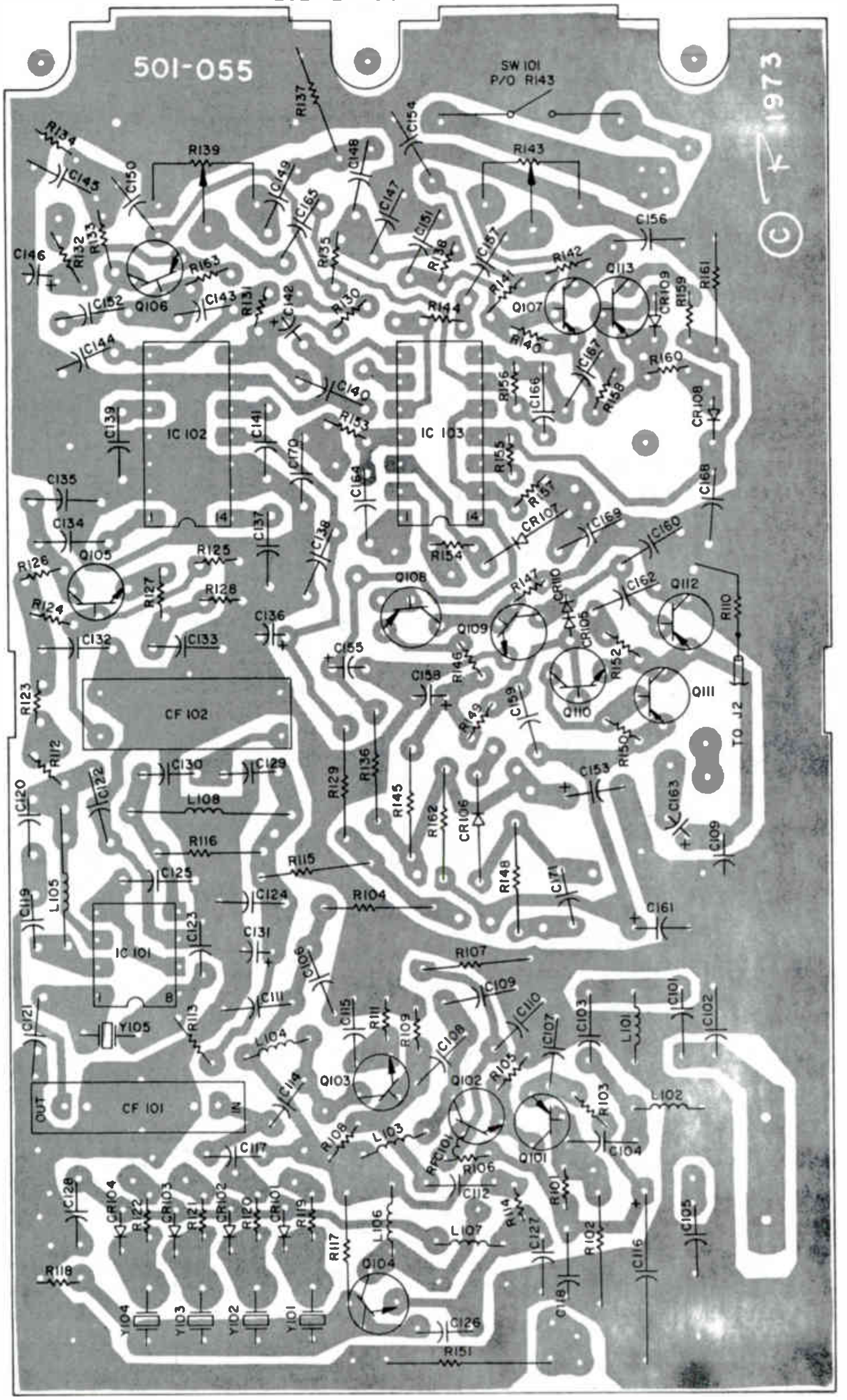
SWITCHING P.C. BOARD

(TOP VIEW)



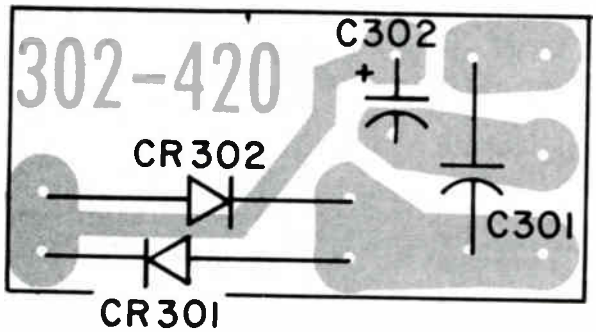
(BOTTOM VIEW)

RECEIVER BOARD 501-055

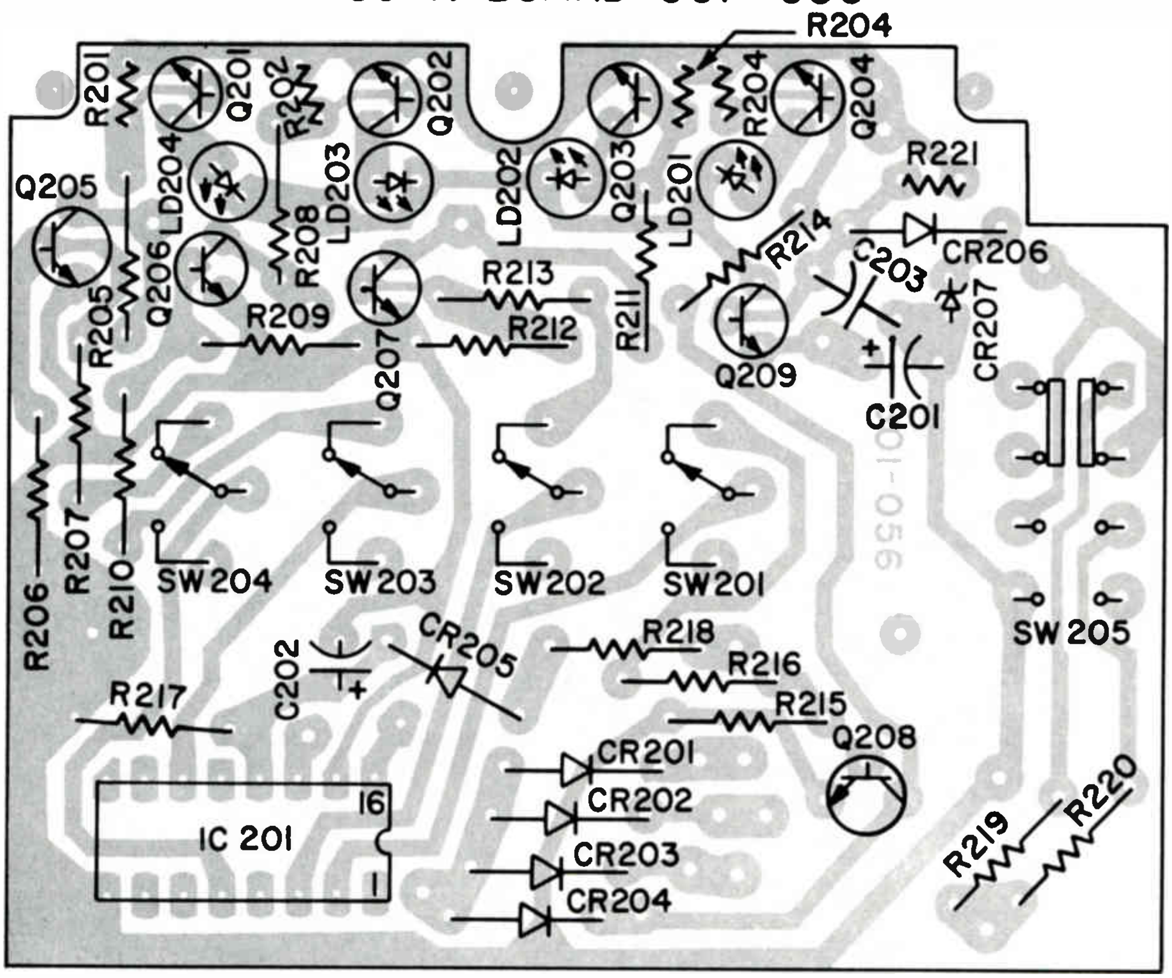


3-2 RECEIVER BOARD BOTTOM VIEW

NOISE LIMITER BOARD 302-420

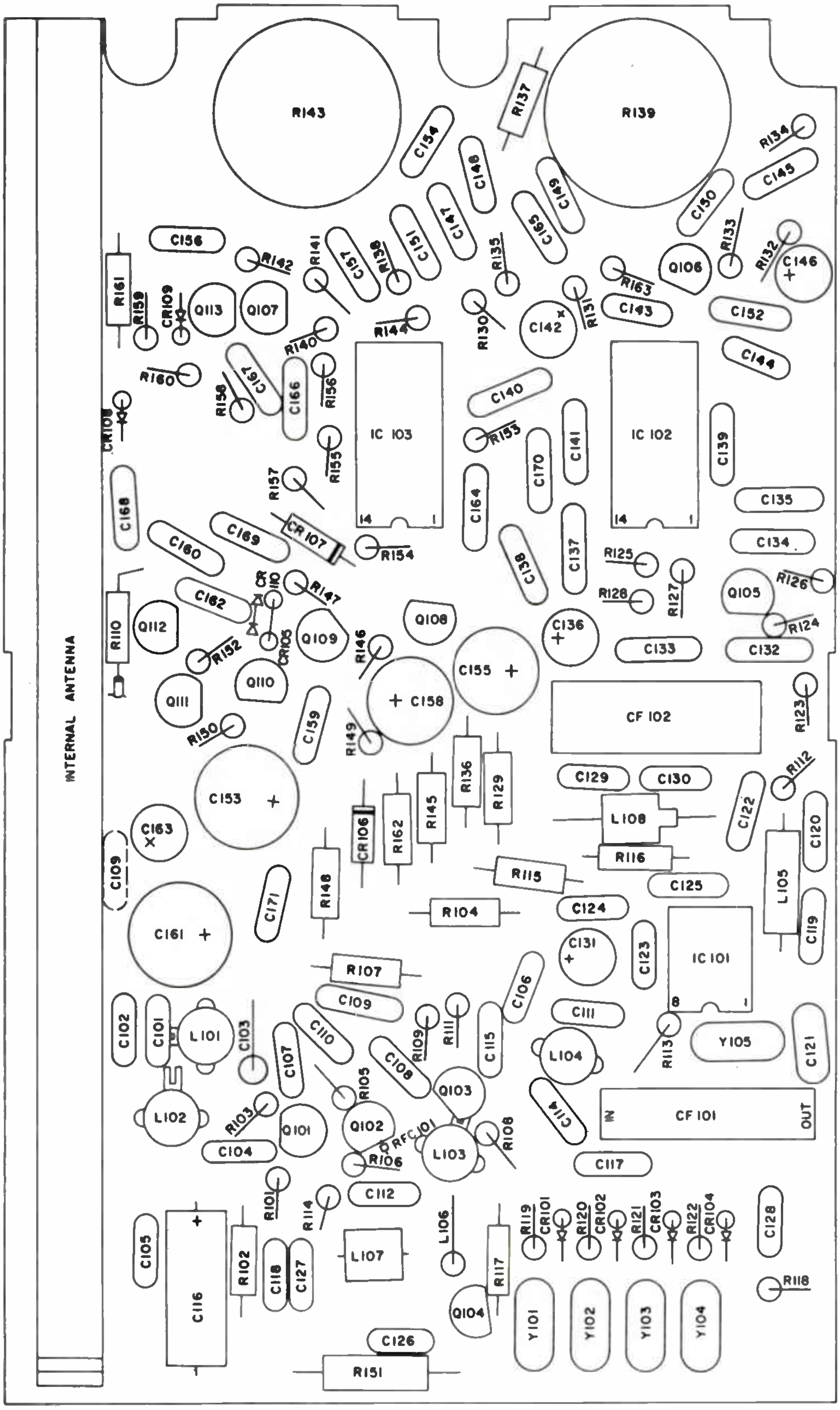


SCAN BOARD 501-056



3-5 SCANNER BOARD BOTTOM VIEW

RECEIVER BOARD 501-055



RECEIVER BOARD PARTS PLACEMENT DIAGRAM

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
CR101	102-339	4807-1233-900
CR102	102-339	4807-1233-900
CR103	102-339	4807-1233-900
CR104	102-339	4807-1233-900
CR105	1N4148	4805-1241-200
CR106	1N4148	4805-1241-200
CR107	1N4148	4805-1241-200
CR108	1N4148	4805-1241-200
CR109	1N4148	4805-1241-200
CR110	102-339	4807-1233-900
CR201	1N4148	4805-1241-200
CR202	1N4148	4805-1241-200
CR203	1N4148	4805-1241-200
CR204	1N4148	4805-1241-200
CR205	1N4148	4805-1241-200
CR206	1N4148	4805-1241-200
CR207	1N4148	4805-1241-200
CR208	1N4148	4805-1241-200
CR209	MZ92-6.08	4808-0000-012
CR301		4805-1241-200
CR302		4805-1241-200
IC101		3130-3167-901
IC102		3130-3157-618
IC103		3130-3157-617
IC201		3130-3193-502
LD201		4810-1282-900
LD202		4810-1282-900
LD203		4810-1282-900
LD204		4810-1282-900
Q101	2N4258	4801-1284-200
Q102	2N3563/2N5130	4801-0000-018
Q103	2N3563/2N5130	4801-0000-018
Q104		4801-0000-035
Q105	MPS5172	4801-0000-100
Q106		4801-0000-060
Q107		4801-0000-060
Q108		4801-0000-060
Q109	MPS5172	4801-0000-100
Q110	MPS5172	4801-0000-100
Q111		4801-0000-060
Q112		4801-0000-060
Q113		4801-0000-060
Q201		4801-0000-060
Q202		4801-0000-060
Q203		4801-0000-060
Q204		4801-0000-060
Q205	MPS5172	4801-0000-100
Q206	MPS5172	4801-0000-100
Q207	MPS5172	4801-0000-100
Q208	MPS5172	4801-0000-100
Q209	MPS5172	4801-0000-100

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C116	10uF 10V	1511-0100-001
C131	100uF 10V	1513-0101-001
C136	100uF 10V	1513-0101-001
C142	100uF 10V	1513-0101-001
C146	25uF 10V	1513-0250-001
C153	220uF 10V	1513-0101-001
C155	100uF 10V	1513-0101-001
C158	100uF 10V	1513-0101-001
C161	250uF 16V	1513-0251-002
C163	25uF 10V	1513-0250-001
C201	100uF 10V	1513-0101-001
C202	1uF 16V	1513-0010-002
C302	25uF 10V	1513-0250-001

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R139	50K, Squelch	4750-3220-102
R143	10K, Volume	4750-3220-101

COILS/TRANSFORMERS

ITEM	PART NO.
L101	1800-5100-403
L102	1800-5100-404
L103	1800-5100-405
L104	1800-5100-402
L105	1802-0339-007
L106	1802-0688-003
L107	1801-1236-900
L108	1800-0000-002

MISCELLANEOUS

ITEM	NAME	PART NO.
CF101	Ceramic Filter	2700-3209-600
CF102	Ceramic Filter	2700-0000-007
S201	Switch	5113-3221-001
S202	Switch	5113-3221-001
S203	Switch	5113-3221-001
S204	Switch	5113-3221-001
S205	Switch	5113-3221-001
Y101	Crystal,Low Band	2303-0000-000
Y102	Crystal,Low Band	2303-0000-000
Y103	Crystal,Low Band	2303-0000-000
Y104	Crystal,Low Band	2303-0000-000
Y105	Crystal,10.245MHz	2301-3216-400

Pages 103-114 Courtesy of REGENCY ELECTRONICS INC.

SECTION 2 ALIGNMENT AND TUNING PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM
2-1-4 Noise Generator (To Be Used In 2-5 Only)

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

Diagrams 3-1 and 3-3 show the location of all coils to be adjusted.

2-2 QUADRATURE DETECTOR ALIGNMENT

2-2-1 Connect the FM Signal Generator to the antenna input jack. Accurately set frequency to the center of the channel being used for alignment. Modulate Signal Generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to test point A, (Junction of C126, C128, R113). See diagram 3-4.

2-2-3 Adjust output of Signal Generator until all noise in scope pattern just disappears.

2-2-4 Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal. When L103 is properly aligned, signal should be approximately 0.2 volts RMS with test signal input as noted in 3-2-1.

2-3 IF ALIGNMENT

2-3-1 Disconnect RF Signal Generator from antenna input.

2-3-2 Connect AC voltmeter across speaker terminals.

2-3-3 Adjust volume control for .5 volt noise reading on AC voltmeter.

2-3-4 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

NOTE: Coils will have two peaks; adjust core to peak away from the center of the coil form.

2-3-5 Adjust volume control for 1.0 volts noise reading on AC voltmeter.

2-3-6 Connect the R.F. Signal Generator to the antenna input jack. Turn modulation off. Set the generator to the High Band crystal frequency that will be used for High Band section alignment.

2-3-7 Adjust the Signal Generator output until the voltmeter reads 0.2 volts.

2-3-8 Adjust T101 and T201, (in that order), for maximum quieting (lowest meter reading). Adjust Signal Generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts. If two peaks occur, use the one away from the center of the coil form.

2-3-9 Set the generator frequency to the secondary Image frequency. This is 910 KHz below the channel frequency.

NOTE: Some receivers may have the second oscillator at 11.155 MHz, if this is the case, the Image frequency is 910 KHz ABOVE the channel frequency. Check the frequency marked on top of the crystal (10.245 MHz for below and 11.155 MHz for above). The reverse is true for Low Band channels due to high side injection.

2-3-10 Adjust the Signal Generator output until voltmeter reads .2 volts.

2-3-11 Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order), for maximum quieting degradation (highest meter reading). Adjust Signal Generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the slugs should be within two turns of the position in Step No. 4 and 8.

2-4 RF ALIGNMENT

2-4-1 Preset the cores L204, L206, L207 and L208 flush with the outer ends of the coil form.

2-4-2 Connect AC voltmeter across speaker terminals.

2-4-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

HIGH BAND SECTION

2-4-4 Activate High Band channel nearest to center of High Band frequencies being used.

2-4-5 Connect Signal Generator to antenna input jack. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-4-6 Adjust output Signal Generator until AC voltmeter reads .2 volts.

2-4-7 Adjust L206, L207, L208 and L204, in that order, for maximum quieting (lowest meter reading). Adjust Signal Generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

LOW BAND SECTION

2-4-8 Preset the cores of L102 and L103 one turn from the outer ends of the coil form. (NOTE: Due to the broadness of the Low Band Section, presetting the above cores will give you optimum performance over the entire band).

2-5 NOISE BALANCE ADJUSTMENT

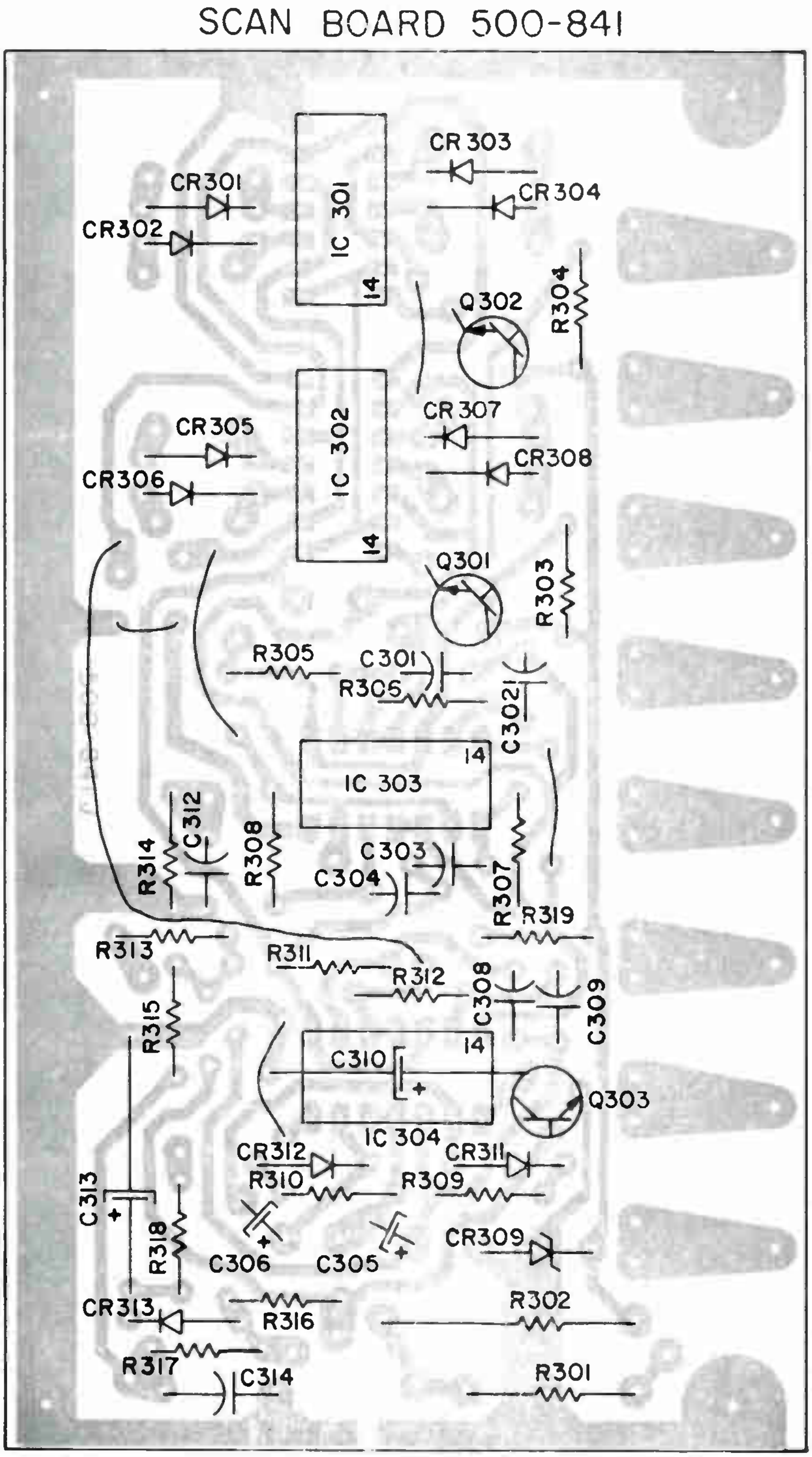
NOTE: This adjustment may be required only if excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper or inadequate noise suppression of the vehicle's ignition system.

2-5-1 Using a "T" connector, connect the FM Signal Generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L206.

2-5-2 Connect the oscilloscope to the junction of Q109's emitter and Q110's collector, or to the speaker terminals.

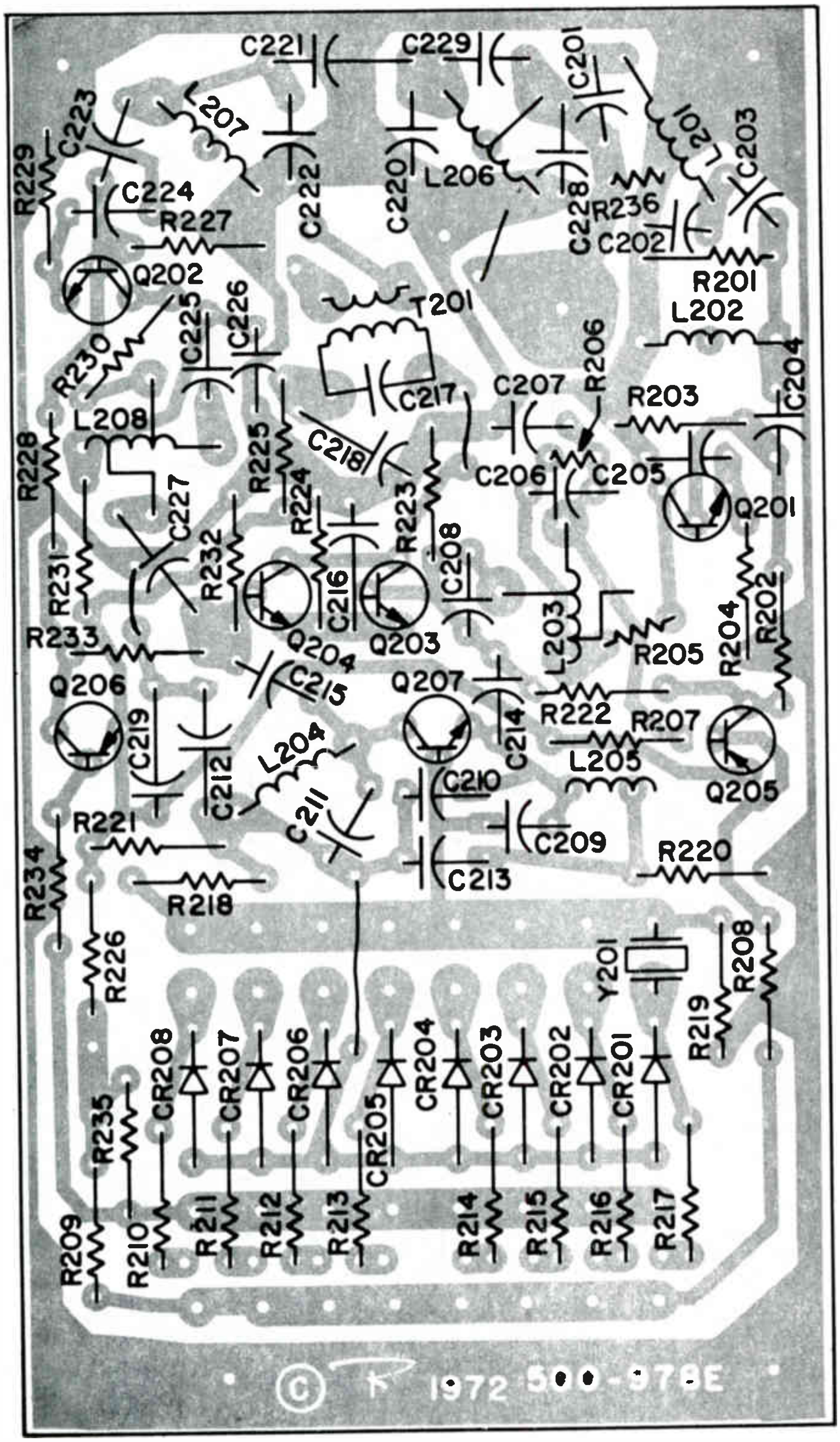
2-5-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the noise generator until spikes are clearly seen in the audio output as viewed on the oscilloscope. The noise spikes will be either mostly positive or negative if an unbalanced condition exists.

2-5-4 Turn L102 (Quadrature Detector Coil) until the noise spikes are equally positive or negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.



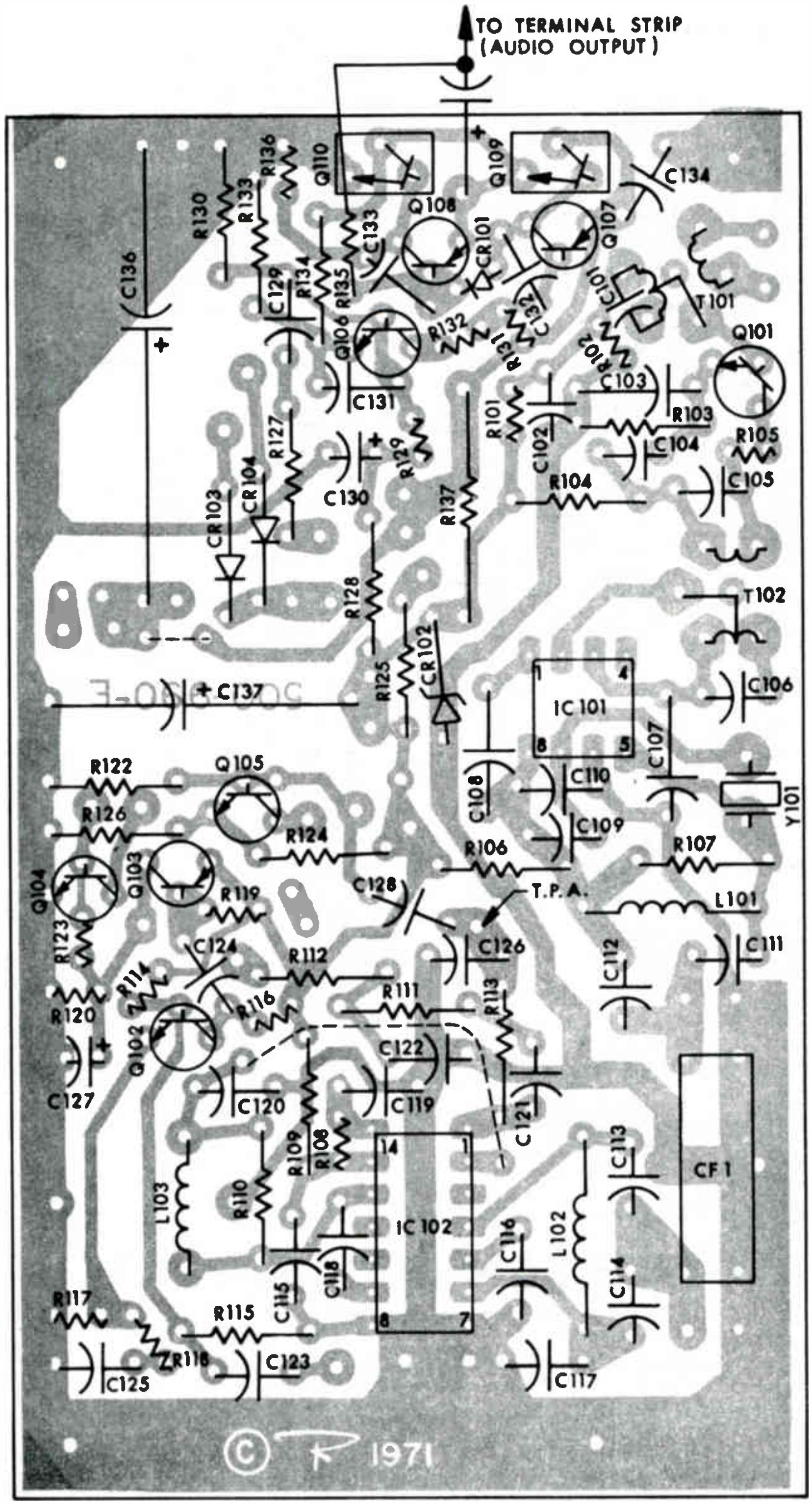
3 - 6 SCANNER BOARD BOTTOM VIEW

RF BOARD 500-978



3 - 2 RF BOARD BOTTOM VIEW

IF BOARD 500-990



3 - 4 IF - AUDIO BOARD BOTTOM VIEW

VOLTAGE DATA

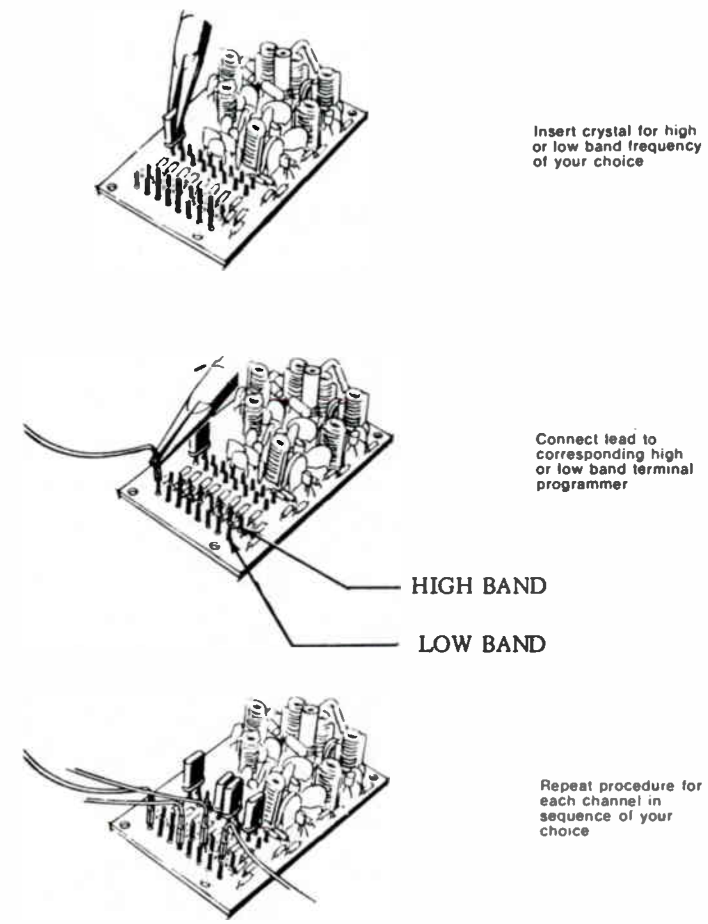
NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – TRANSISTORS:

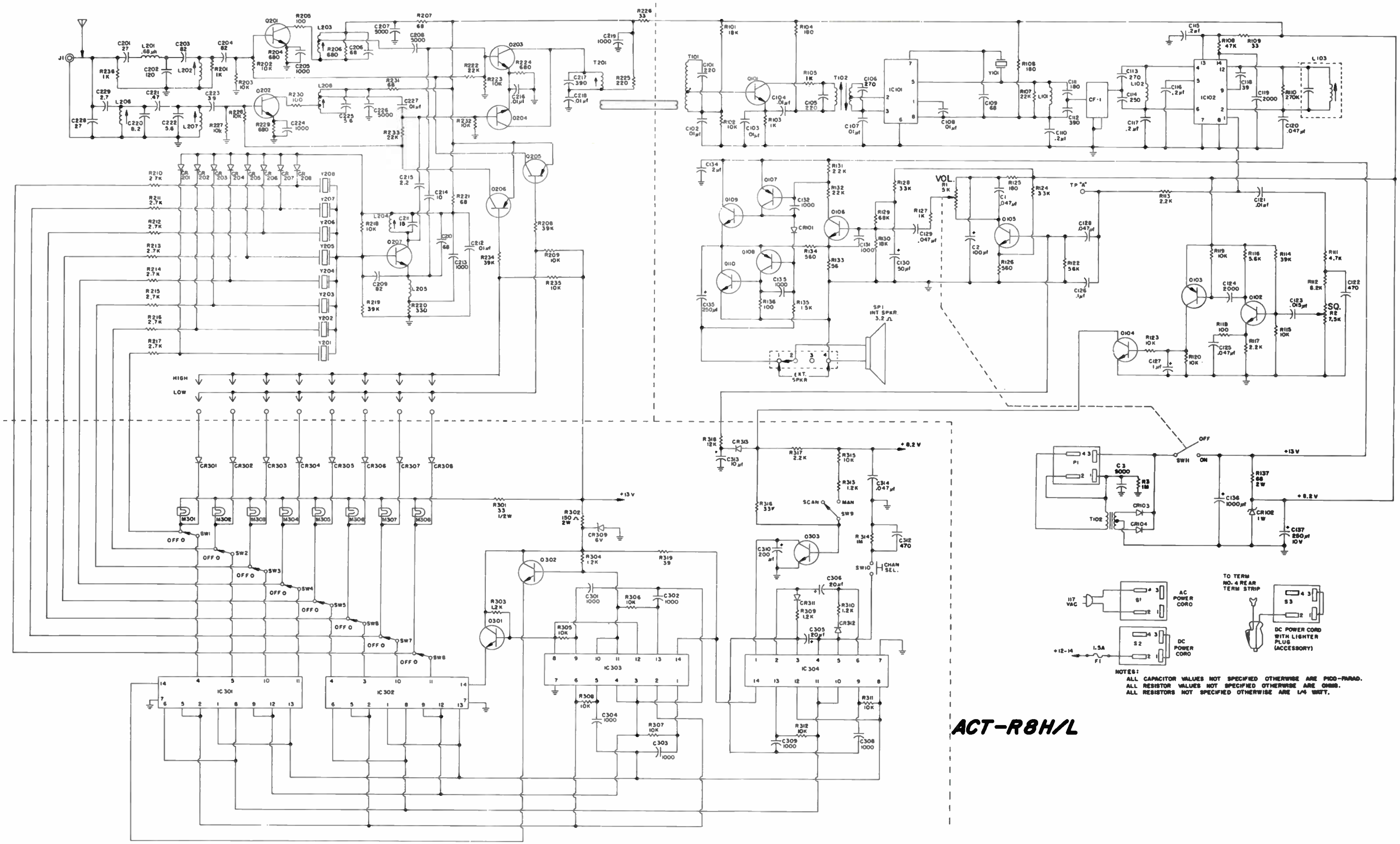
	TRANSISTOR	EMITTER	BASE	COLLECTOR
RF Board No. 500-978	Q201	3.1	3.8	7.0 Low Band Activated
		0	0	7.6 High Band Activated
	Q202	0	0	7.6 Low Band Activated
		3.1	3.8	7.0 High Band Activated
	Q203	1.6	2.3	7.1 Low Band Activated
		1.6	0	7.1 High Band Activated
	Q204	1.6	0	7.1 Low Band Activated
		1.6	2.3	7.1 High Band Activated
	Q205	7.8	7.4	7.6 Low Band Activated
		7.8	11.0	0^{V} High Band Activated
	Q206	7.8	11.0	0 Low Band Activated
		7.8	7.0	7.6 High Band Activated
	Q207	3.4	4.1	7.0
IF Board No. 500-990	Q101	2.3	3.0	5.8
	Q102	1.0	1.7	4.8
	Q103 (PNP)	8.2	8.2	0 (unsquelched)
		8.2	8.2	1.0 (squelched)
		8.2	8.2	1.5 Min. (tight squelch)
	Q104	0	0	7.2 (unsquelched)
		0	.80	.30 (squelched)
		0	.80	.10 (tight squelch)
	Q105	1.4	1.9	5.1 (unsquelched)
		1.1	.10	8.2 (tight squelch)
	Q106	0.7	1.3	12.4
	Q107 (PNP)	13.8	13.1	7.2
	Q108 (PNP)	6.9	6.6	.10
	Q109	6.9	7.2	13.8
	Q110	0	.10	6.9
Scan Board No. 500-841	Q301	.2	.2	6.0 Manual
		3P	3P	6.0 Scan
	Q302	5.2	5.9	6.0 Manual
		3P	3P	6.0 Scan
	Q303	0	.7	.1 Manual
		0	.1	1.6 Scan

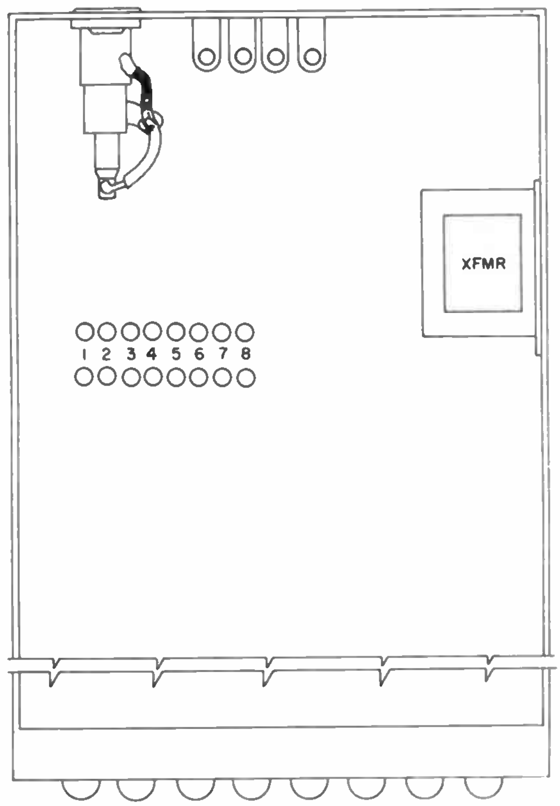
VOLTAGE DATA – INTEGRATED CIRCUITS

	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
IF Board	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	-	-	-	-	-		
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0	
Scan Board	IC 301	2.0P	2.0P	9.P	9.P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
		.2	3.6	11	.7	3.6	3.6	0	3.6	.2	11	11	.2	.2	5.2	(MAN)
	IC302	2.0P	2.0P	9P	9P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
		.2	3.6	11	11	3.6	3.6	0	3.6	.2	11	11	.2	.2	0	(MAN)
	IC 303	2.7P	2.0P	2.0P	2.0P	2.7P	2.0P	0	3P	4P	3P	3P	3P	4P	4.8	(SCAN)
		1.5	3.6	.2	.2	3.6	3.6	0	.2	1.5	5.9	5.9	.2	5.9	4.8	(MAN)
	IC 304	1.6	1.3P	1.8P	1.3P	1.3P	1.3P	0	2P	2.7P	2.0P	2.0P	2.0P	2.0	4.8	(SCAN)
		.1	.2	3.8	3.8	1.5	1.5	0	.2	1.5	3.6	3.6	.2	3.6	4.8	(MAN)



BAND PROGRAMMING DIAGRAM


NOTES:
ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD.
ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS.
ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT.
ACT-R8H/L
VOL.
SQ.
SCAN
MAN
CHAN SEL.
SP1 INT SPKR 3.2 Ω
EXT. SPKR
117 VAC
AC POWER CORD
DC POWER CORD
TO TERM NO. 4 REAR TERM STRIP
DC POWER CORD WITH LIGHTER PLUG (ACCESSORY)
HIGH
LOW
OFF
ON
+13V
+8.2V



CRYSTAL LOCATION DIAGRAM

CRYSTAL INSTALLATION AND BAND PROGRAMMING

Prior to installing a crystal, the cover will have to be removed. To remove this cover, unscrew the two large bolts located at the sides of the unit. The cover may then be slipped off by sliding it toward the rear of the unit.

Next, the speaker should be removed. Unscrew the two small metal screws (one located on each side) holding the speaker mounting brackets in place. Then carefully place the speaker assembly along side of the unit.

Insert the crystal, or crystals, in the proper socket pins as indicated on the Crystal Location Drawing 3-8.

The number by each pair of sockets matches the channel number on the front panel.

If the crystal inserted is for the High Band (148-174 MHz), place the proper color-coded wire and socket onto the proper High Band pin; if the crystal is for the Low Band (30-50 MHz), place the proper wire and socket onto the proper Low Band pin. Pictorial B illustrates how the band selection wires are properly connected. Pictorial C shows an example of a partially programmed board. See Diagram 3-9.

NOTE: If a particular channel is not used (in other words, there is no crystal installed for that channel), the band selection wire must still be connected to either a High Band pin or to a Low Band pin. Thus, for proper scanner operation, all of the band selection wires MUST be connected, even though not all channels are used.

After the crystals are installed and any necessary band programming changes are completed, reinstall the speaker assembly. Then carefully reinstall the cover and its hardware.

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
CR101	1N4148	4805-1241-200
CR102		4808-0000-009
CR103		4806-0000-004
CR104		4806-0000-004
CR201		4807-1233-900
CR202		4807-1233-900
CR203		4807-1233-900
CR204		4807-1233-900
CR205		4807-1233-900
CR206		4807-1233-900
CR207		4807-1233-900
CR208		4807-1233-900
CR301	1N4148	4805-1241-200
CR302	1N4148	4805-1241-200
CR303	1N4148	4805-1241-200
CR304	1N4148	4805-1241-200
CR305	1N4148	4805-1241-200
CR306	1N4148	4805-1241-200
CR307	1N4148	4805-1241-200
CR308	1N4148	4805-1241-200
CR309		4808-0000-012
CR311	1N4148	4805-1241-200
CR312	1N4148	4805-1241-200
CR313	1N4148	4805-1241-200
IC101		3130-3167-901
IC102	MC-1357P	3130-3157-603
IC301		3130-3157-602
IC302		3130-3157-602
IC303		3130-3157-604
IC304		3130-3157-604
Q101	MPS5172	4801-0000-010
Q102	MPS5172	4801-0000-010
Q103	2N5227	4801-0000-060
Q104	MPS5172	4801-0000-010
Q105	MPS5172	4801-0000-010
Q106	MPS5172	4801-0000-010
Q107		4801-0000-135
Q108		4801-0000-135
Q109		4802-0000-001
Q110		4802-0000-001
Q201	2N5222	4801-0000-035
Q202	2N5222	4801-0000-035
Q203	2N5222	4801-0000-035
Q204	2N5222	4801-0000-035
Q205	2N5227	4801-0000-060
Q206	2N5227	4801-0000-060
Q207	2N5230	4801-0000-100
Q301	MPS5172	4801-0000-010
Q302	MPS5172	4801-0000-010
Q303	MPS5172	4801-0000-010

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C2	100uF 10V	1511-0101-001
C127	1uF 50V	1513-0010-004
C130	50uF 10V	1511-0500-001
C135	250uF 16V	1511-0251-002
C136	1000uF 16V	1511-0102-002
C137	250uF 10V	1511-0251-001
C305	18uF 10V	1513-0180-005
C306	18uF 10V	1513-0180-005
C310	250uF 10V	1511-0251-001
C313	10uF 10V	1511-0100-003

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R1	5K, Volume	4750-1247-903
R2	2.5K, Squelch	4750-1247-902

COILS/TRANSFORMERS

ITEM	PART NO.
L101	1802-0000-002
L102	1802-0000-002
L103	1800-3151-700
L201	1802-0688-003
L202	1800-3152-005
L203	1800-3152-004
L204	1800-3152-009
L205	1801-1236-900
L206	1800-3152-002
L207	1800-3152-002
L208	1800-3152-003
T1	5604-3151-500
T101	1800-1250-700
T102	1800-3173-000
T201	1800-1240-500

MISCELLANEOUS

ITEM	NAME	PART NO.
ANT-1	Telescoping Antenna	1201-0000-002
CF-1	Ceramic Filter	2700-0000-006
F1	Fuse, 1.5A	5106-0000-005
SW1	Switch	5112-6035-803
SW2	Switch	5112-6035-803
SW3	Switch	5112-6035-803
SW4	Switch	5112-6035-803
SW5	Switch	5112-6035-803
SW6	Switch	5112-6035-803
SW7	Switch	5112-6035-803
SW8	Switch	5112-6035-803
SW9	Switch	5112-6035-801
SW10	Switch	5112-6035-801
Y200	Crystal, High Band	2302-0000-000
Y200	Crystal, Low Band	2303-0000-000
Y101	Crystal, 10.245MHz	2301-3151-601
	Crystal, 11.155MHz	2301-3151-602

CABINET PARTS

NAME	PART NO.
Front Panel	1405-5081-302
Cabinet/Wrap Ass'y.	1408-6025-901
Knob, Volume	2402-3214-802
Knob, Squelch	2402-3214-802

Pages 115-126 Courtesy of REGENCY ELECTRONICS INC.

5 - 3 SPECIAL NOTE ON AFC OPERATION

The second L.O. frequency is normally 10.245 MHz. In cases where interference is encountered from a signal approximately 910 KHz below the desired frequency, the second L.O. may be changed to 11.155 MHz. If the second L.O. is 10.245 MHz, the error voltage is taken from the collector of Q111. If the second L.O. has been changed to 11.155 MHz, the error voltage is taken from the collector of Q110. Also, if the 450 MHz RF crystals are changed to high side injection and the IF crystal is still 10.245 MHz, the error voltage is taken from the collector of Q110.

5 - 4 ALIGNMENT AND TUNING PROCEDURE

5 - 4-1 EQUIPMENT REQUIRED

5-4-1-1 FM Signal Generator
5-4-1-2 Oscilloscope
5-4-1-3 AC VTVM

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receiver RF sections (Low, High and UHF) should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

5 - 4-2 QUADRATURE DETECTOR

5-4-2-1 Connect the FM Signal Generator to the H/L antenna input jack. Accurately set the frequency to the center of the channel being used for alignment. Modulate Signal Generator with 1000 Hz, 3 KHz deviation.

5-4-2-2 Connect the oscilloscope to Junction of C162, C163 and R172.

5-4-2-3 Adjust Signal Generator's output until all of the noise in the scope pattern just disappears.

5-4-2-4 Adjust L128 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal. When L128 is properly aligned, signal at above Junction should be approximately 0.2 volts RMS with test signal input as noted in 5-4-2-1.

5 - 4-3 IF ALIGNMENT

5-4-3-1 Pre-Set the cores of L122, L123 and L124 9 turns in from the outer end of the coil form. This step is usually necessary only if the IF appears to be badly misaligned.

5-4-3-2 Connect AC voltmeter to the Junction of R 167 and the collector of Q116.

5-4-3-3 Set AC voltmeter to the 300 millivolts scale.

5-4-3-4 With generator accurately set to the frequency of the center of the channel being used for alignment, increase Signal Generator's output until AC voltmeter reading is mid-range.

5-4-3-5 Adjust L122, L123, and L124 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

5-4-4 RF ALIGNMENT

LOW BAND SECTION

5-4-4-1 Pre-Set the cores of L102 and L103 one turn from the outer ends of the coil form. (NOTE: Due to the broadness of the Low Band Section, presetting the above cores will give you optimum performance over the entire band).

HIGH BAND SECTION

5-4-4-2 Connect AC voltmeter to the Junction of R 167 and the collector of Q116.

5-4-4-3 Set AC voltmeter to the 300 millivolts scale.

5-4-4-4 Activate High Band channel nearest to center of High Band frequencies being used.

5-4-4-5 With the Signal Generator accurately set to the frequency of the channel being used for alignment and connected to H/L antenna input jack, increase Signal Generator's output until AC voltmeter reading is mid-range.

5-4-4-6 Adjust L109, L104, L105 and L106 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

UHF BAND SECTION

5-4-4-7 Connect AC voltmeter across the speaker terminals.

3-6 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

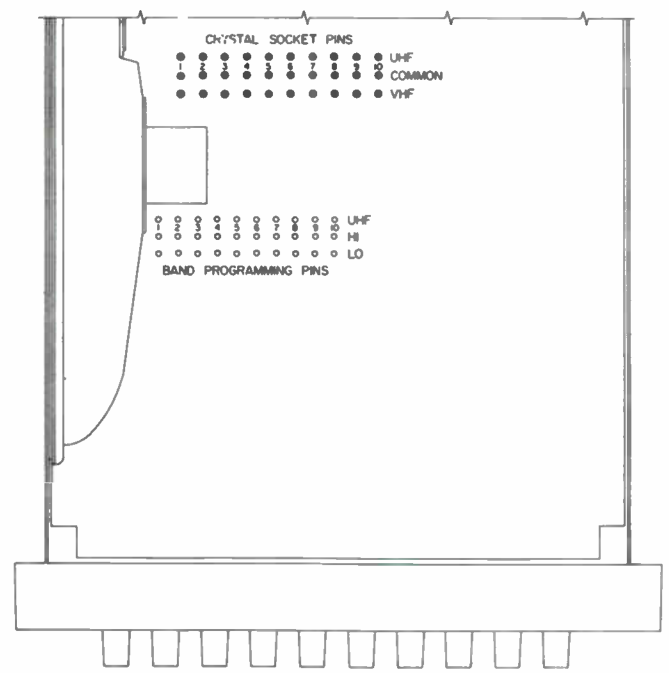
VOLTAGE DATA – SEMICONDUCTORS:

TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
Q101	3.1	3.8	7.0	Low Band Activated
	0	0	0	High Band Activated
	0	0	0	UHF Band Activated
Q102	1.6	2.3	7.7	Low Band Activated
	1.6	0	7.7	High Band Activated
	1.4	0	7.7	UHF Band Activated
Q103	0	0	8.2	Low Band Activated
	3.1	3.8	7.9	High Band Activated
	0	0	8.2	UHF Band Activated
Q104	1.6	0	7.7	Low Band Activated
	1.6	2.3	7.7	High Band Activated
	1.4	0	7.7	UHF Band Activated
Q105 (FET)	0	0	6.0	
Q106	1.6	0	7.7	Low Band Activated
	1.6	0	7.7	High Band Activated
	1.6	2.3	7.7	UHF Band Activated
Q107	3.7	4.4	7.4	No Crystal
	3.4	4.0	7.4	With Crystal
Q108	0	0	0	Low High Band Activated
	0	.4	8.1	UHF Band Activated (No Crystal)
	0	.1	4.0	UHF Band Activated (With Crystal)
Q109 (PNP)	8.1	8.1	.8	Low Band Activated
	8.1	8.1	.8	High Band Activated
	7.9	7.2	3-5	UHF Band Activated
Q110	8.2	8.2	8.2	Low Band Activated
	8.2	8.2	8.2	High Band Activated
	2.9	3.6	7.2	UHF Band Activated
Q111	8.2	8.2	4.0	Low Band Activated
	8.2	8.2	4.0	High Band Activated
	2.9	3.6	7.4	UHF Band Activated
Q112	0	0	8.2	Low Band Activated
	0	0	8.2	High Band Activated
	0	.7	.1	UHF Band Activated
Q113 (PNP)	8.2	7.5	8.1	Low Band Activated
	8.2	8.2	0	High Band Activated
	8.2	8.2	0	UHF Band Activated
Q114 (PNP)	8.2	8.2	0	Low Band Activated
	8.2	7.5	8.1	High Band Activated
	8.2	8.2	0	UHF Band Activated
Q115 (PNP)	8.2	8.2	0	Low Band Activated
	8.2	8.2	0	High Band Activated
	8.2	7.5	8.1	UHF Band Activated
Q116	0.4	1.1	4.5	

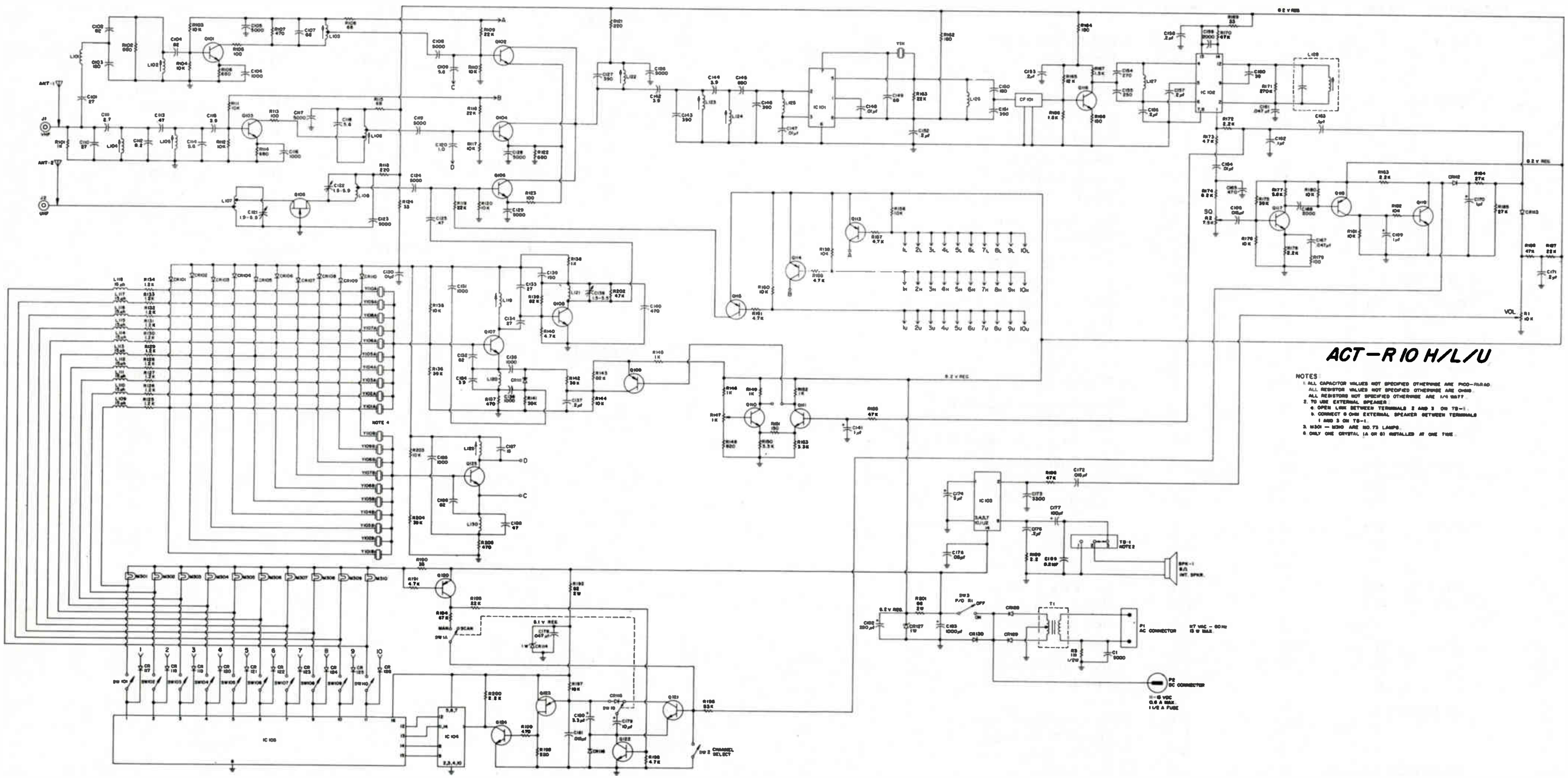
TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
Q117	1.0	1.7	5.0	
Q118	8.2	8.2	0	(Unsquelched)
	8.2	8.2	1.0	(Squelched)
	8.2	8.2	1.5	Min. (Tight Squelched)
Q119	0	0	7.2	(Unsquelched)
	0	0.8	0.2	(Squelched)
	0	0.8	0.1	(Tight Squelched)
Q120	13.8	13.1	13.6	(SCAN)
	13.8	13.1	13.6	(MAN)
	13.8	13.8	0	(No Lights)
Q121	0	0	4.0	(SCAN)
	0	0.8	0.1	(MAN)
Q122	0	0.8	0.1	
Q124	0	.2	4.9	(SCAN)
	0	.2	5.1	(MAN)
Q125	3.7	4.4	7.3	No Crystal
	3.4	4.0	7.3	With Crystal

	BASE 1	EMITTER	BASE 2	
Q123	0.2	3.8	5.1	(SCAN)
Unijunction	o.2	0.5	5.1	(MAN)

	CATHODE	ANODE	
CR113	1.8	2.4	(Unsquelched)
	1.0	0	(Squelched)



5-5.5 CRYSTAL LOCATION DIAGRAM



ACT-R 10 H/L/U

NOTES:

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS. ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT.
2. TO USE EXTERNAL SPEAKER:
   a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1.
   b. CONNECT 8 OHM EXTERNAL SPEAKER BETWEEN TERMINALS 1 AND 3 ON TB-1.
3. M301 — M310 ARE NO. 73 LAMPS.
4. ONLY ONE CRYSTAL (A OR B) INSTALLED AT ONE TIME.

5-4-5-2 Remove the "Reference" Signal and have the unit squelched and receiving no signal. The voltage on the collector of Q109 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 5-4-5-3. If voltage is between 3.2 and 4.6 volts, AFC alignment is complete.

NOTE: Any further adjustments made to L128 and R 147 will require AFC to be re-adjusted.

5-4-5-3 Inject "Reference" Signal and monitor voltage on collector of Q109. Adjust L128 for same voltage as noted in step 5-4-5-2. Readjust R 147 for a voltmeter reading of 3.8 to 4.0 volts. Repeat step 5-4-5-2.

NOTE: Do Not adjust L128 more than 1/4 turn at a time.

5-4-5-4 If an accurate I.F. signal source is not available, an appropriate AFC alignment can be made by adjusting L128 on a High Band or Low Band crystal as specified in Quadrature Detector Alignment (Section 5-4-2, and with the unit squelched and receiving no signal, adjust R 147 for voltmeter reading of 3.2 to 4.6 on the collector of Q109.

NOTE: Units equipped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q109 and collector of Q111. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q109 and the collector of Q110. If the crystal is changed from one frequency to the other, the jumper must be also changed. If the UHF first L.O. crystals are made for high side injection (to eliminate a primary image problem in certain areas of the country), the jumper must be changed.

5-4-4-8 With Signal Generator output reduced to zero, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

5-4-4-9 Activate UHF channel nearest to center of UHF frequencies being used.

5-4-4-10 Set Signal Generator accurately to the channel being used and adjust output of Signal Generator until AC voltmeter reads .2 volts.

5-4-4-11 Pre-Set trimmer capacitor C139 for minimum capacitance. The movable half-moon section (gold color) should be turned toward the right side of the unit, as viewed from the front.

5-4-4-12 Adjust trimmer capacitor C121 and C122 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator output to maintain a voltmeter reading between 0.1 and 0.2 volts. Repeat adjustments until no further improvement can be made.

NOTE: Use a non-metallic tool for all trimmer capacitor adjustments. Peaks are very sharp, so tune with care.

5-4-4-13 Adjust the core of L119 for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a reading between 0.1 and 0.2 volts.

5-4-4-14 Adjust trimmer capacitor C139 for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a reading between 0.1 and 0.2 volts.

5-4-4-15 Readjust trimmer capacitors C121, C122 and C139 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a voltmeter reading between 0.1 and 0.2 volts. Repeat these adjustments until no further improvement can be made.

5-4-5 AFC ALIGNMENT

NOTE: This adjustment requires an accurate 10.7 MHz ±1 KHz oscillator or 455 KHz ±500 Hz oscillator to be used as a reference signal. If none are available, proceed to Step 5-4-5-4.

5-4-5-1 With a coupling loop, inject "Reference" Signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R 147 for reading of 3.8 to 4.0 volts at the collector of Q109.

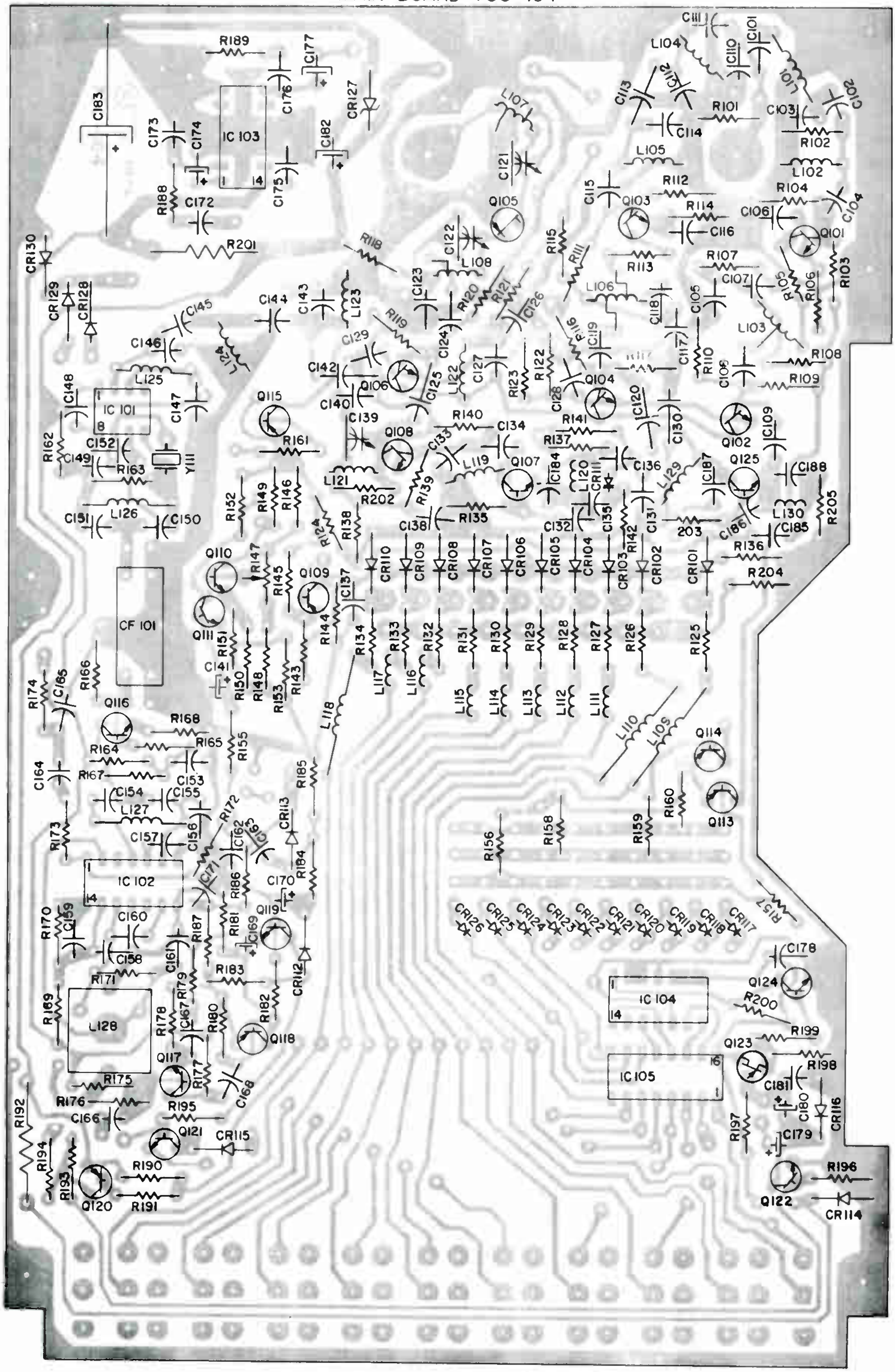
VOLTAGE DATA

INTEGRATED CIRCUITS

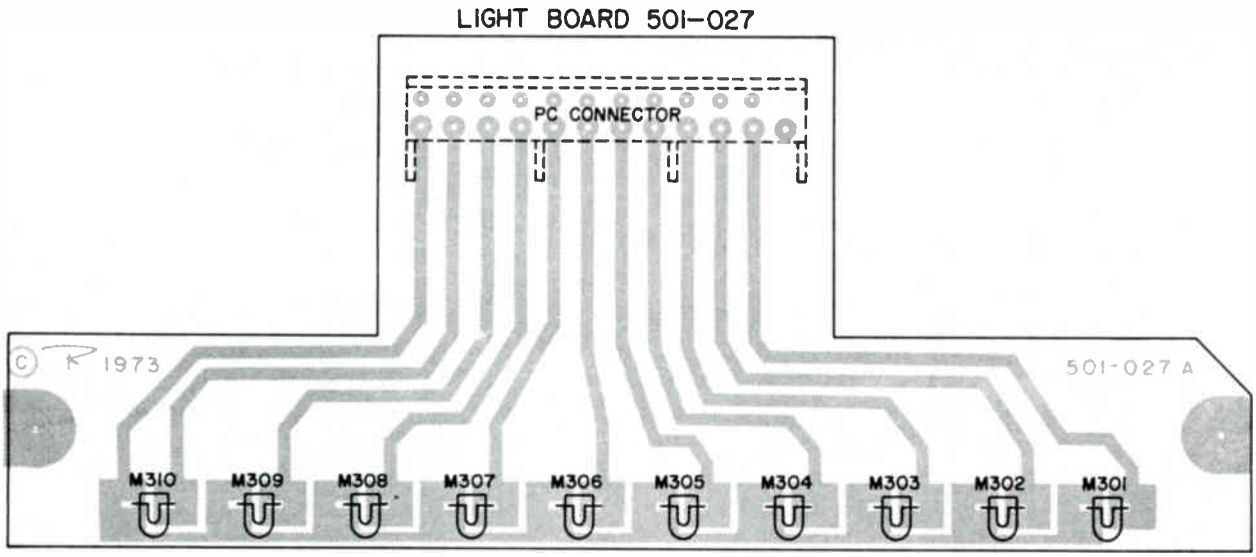
NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M301 is lighted).

IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
IC101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–	–	–	
IC102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0	–	–	
IC103	7.1	.01	0	0	0	.01	0	6.9	0	0	0	0	0	13.8	–	–	
IC104	5.1	0	0	0	5.1	5.1	5.1	.1	.1	0	.1	.1	0	.1	–	–	Manual
	4.9	0	0	0	5.1	5.1	5.1	1P	2P	0	2P	1P	0	2P	–	–	SCAN
IC105	.5	11.2	11.2	11.2	11.2	11.2	11.2	0	11.2	11.2	11.2	.1	.1	.1	.1	5.1	Manual
	9P	9P	9P	9P	9P	9P	9P	0	9P	9P	9P	1P	2P	1P	2P	5.1	SCAN

MAIN BOARD 700-164



5 - 5-2 MAIN BOARD BOTTOM VIEW 700 - 164



3-5 LIGHT BOARD BOTTOM VIEW

5 - 2 CRYSTAL INSTALLATION

Due to the numerous frequencies involved, the crystal is not normally installed by the factory, but by the seller or owner of the unit. Miniature, plug-in crystals are installed by inserting them in receptacles mounted on the printed circuit board.

Prior to installing a crystal, the receiver's cover will have to be removed. To remove the cover, first remove telescopic antennas if they are installed. Second, unscrew the two large bolts located at the sides of the unit. The cover may then be slipped off by sliding it toward the rear of the unit.

Carefully install the crystal in the proper pair of socket pins as indicated in the Crystal Location Drawing 5-5-5. The crystal MUST be installed in the proper row for correct operation. The numbers located between two of the rows of pins indicate which group of pins correspond to the channel number on the front panel.

If the crystal is for the UHF band (450 to 500 MHz), it should be installed with one lead in a center row pin (labeled COMMON) and its other lead in the corresponding pin in the row labeled UHF (row of pins near the rear of unit). If the crystal is for one of the VHF bands (either High or Low), it should be installed with one lead in a center row pin and its other lead in the corresponding pin in the row labeled VHF (row of pins near the fron of unit). Thus, one of the crystal's leads must always be inserted in a center row socket pin while its other lead is inserted in the proper corresponding outer row socket pin.

Band programming and crystal specifications are the same as stated in the original ACT-R 10 Service and Instruction Manual.

SEMICONDUCTORS

ITEM	PART NO.
CR101	4807-1233-900
CR102	4807-1233-900
CR103	4807-1233-900
CR104	4807-1233-900
CR105	4807-1233-900
CR106	4807-1233-900
CR107	4807-1233-900
CR108	4807-1233-900
CR109	4807-1233-900
CR110	4807-1233-900
CR111	4809-0000-001
CR112	4805-1241-200
CR113	4805-1241-200
CR114	4808-0000-007
CR115	4805-1241-200
CR116	4805-1241-200
CR117	4805-1241-200
CR118	4805-1241-200
CR119	4805-1241-200
CR120	4805-1241-200
CR121	4805-1241-200
CR122	4805-1241-200
CR123	4805-1241-200
CR124	4805-1241-200
CR125	4805-1241-200
CR126	4805-1241-200
CR127	4808-0000-009
CR128	4806-0000-004
CR129	4806-0000-004
CR130	4806-0000-004
IC101	3130-3167-901
IC102	3130-3157-603
IC103	3130-3157-614
IC104	3130-3157-608
IC105	3130-3193-501
Q101	4801-0000-035
Q102	4801-0000-035
Q103	4801-0000-035
Q104	4801-0000-035
Q105	4811-0000-015
Q106	4801-0000-035
Q107	4801-0000-100
Q108	4801-0000-035
Q109	4801-0000-060
Q110	4801-0000-010
Q111	4801-0000-010
Q113	4801-0000-060
Q114	4801-0000-060
Q115	4801-0000-060
Q116	4801-0000-010
Q117	4801-0000-010
Q118	4801-0000-060
Q119	4801-0000-010
Q120	4801-0000-060
Q121	4801-0000-010
Q122	4801-0000-010
Q123	4813-0000-001
Q124	4801-0000-010
Q125	4801-0000-100

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C121	1.5-5.5pF Trimmer	1517-0000-011
C122	1.5-5.5pF Trimmer	1517-0000-011
C139	1.5-5.5pF Trimmer	1517-0000-011
C141	1uF 16V	1513-0010-002
C169	1uF 16V	1513-0010-002
C170	1uF 16V	1513-0010-002
C174	5uF 10V	1513-0050-001
C177	100uF 16V	1513-0101-002
C179	10uF 10V	1513-0100-001
C180	3.3uF 10V	1513-0339-005
C182	250uF 10V	1513-0251-001
C183	1000uF 16V	1513-0102-002

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R1	10K,Volume	4750-3212-101
R2	7.5K,Squelch	4750-3212-102
R147	1K,Trimmer	4751-0102-005

COILS/TRANSFORMERS

ITEM	PART NO.
L101	1802-0688-003
L102	1800-3152-005
L103	1800-3152-004
L104	1800-3152-002
L105	1800-3152-002
L106	1800-3152-003
L107	1800-3160-001
L108	1800-3160-002
L109	1802-0152-004
L110	1802-0152-004
L111	1802-0152-004
L112	1802-0152-004
L113	1802-0152-004
L114	1802-0152-004
L115	1802-0152-004
L116	1802-0152-004
L117	1802-0152-004
L118	1802-0152-004
L119	1800-3152-009
L120	1801-1236-900
L121	1800-3160-003
L122	1800-3191-401
L123	1800-3191-401
L124	1800-3191-402
L125	1802-0689-003
L126	1802-0000-002
L127	1802-0000-002
L128	1800-3151-700
L129	1800-3152-009
T1	5604-5100-600

MISCELLANEOUS

ITEM	NAME	PART NO.
ANT-1	Antenna,H/L Telescoping	1201-0000-002
ANT-2	Antenna,UHF Telescoping	1201-0000-003
CF101	Ceramic Filter	2700-0000-007
MA16	AC Power Cord	6041-3215-900
MA17	DC Power Cord Assembly	5112-6035-820
	Switch, Selector	5112-6038-401

CABINET PARTS

NAME	PART NO.
Front Panel	1405-6034-302
Cabinet, Wrap Assembly	1408-6038-500
Knob, Volume	2402-1276-202
Knob, Squelch	2402-1276-202

INDEX

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First Edition
First Printing—May, 1973
Second Printing—May, 1974
Third Printing—January, 1975

Sams

Scanner-Monitor Servicing Data

SD-2

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

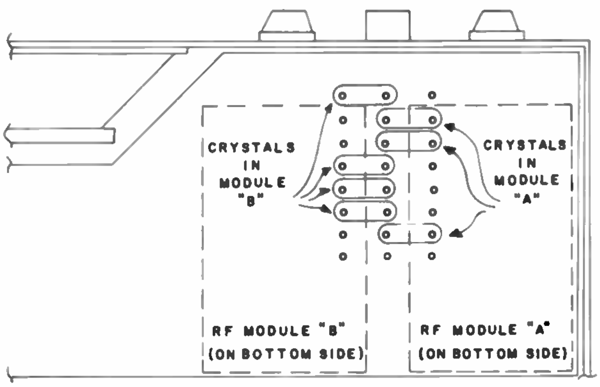
TABLE OF CONTENTS

CRYSTAL INSTALLATION

DISCONNECT POWER BEFORE REMOVING CABINET

To remove the cabinet, first remove the screw at the bottom rear edge. Push the rear panel forward through the cabinet. The components and crystal sockets are in full view and easily accessible.

The three crystal pin sockets at the front are for channel No. 1. The second row of 3 is for channel 2 etc. Each crystal will be installed between the center row and one outside row. The outside rows connect to the r-f module nearest them on the opposite side of the board. Only one outside row will be used when only one r-f module is used. A total of eight crystals may be used. They may be installed in any order and in either band as long as each crystal frequency is proper for the particular module to which it is connected.



L, H or U modules may be in either position.

Figure 1

Remove the crystal by a gentle pull upward. Insert the crystal by aligning the pins with the sockets and pushing straight down. DO NOT BEND THE SOCKETS. THESE MINIATURE SOCKETS ARE MADE OF SPRING BRONZE AND WILL BREAK OFF IF BENT EXCESSIVELY.

NOTE: Do not install two crystals of the same frequency.

Rigid quality standards are applied to crystals furnished by Electra Corporation to assure full performance, therefore our warranty does not include correcting poor operation caused by crystals from other sources.

Unless ordered otherwise the "U" alignment spread is 450mHz to 470mHz, the "H" 150mHz to 174mHz, and the "L" 33mHz to 48mHz. New frequencies may be added within these spreads.

CRYSTAL FORMULAS

"H" – $\frac{\text{Received frequency} - 10.80 \text{ mHz}}{3}$ = crystal frequency.

Example: $\frac{155.01 \text{ mHz} - 10.80 \text{ mHz}}{3} = 48.07000$ mHz

"L" – Received frequency + 10.80 mHz = crystal frequency.

Example: 35.80 mHz + 10.80 mHz = 46.60000 mHz

"U" – $\frac{\text{Received frequency} \pm 10.80 \text{ mHz}}{9}$ = crystal frequency.

Example: $\frac{453.250 \text{ mHz} - 10.80 \text{ mHz}}{9} = 49.16111$ mHz

Example: $\frac{453.225 \text{ mHz} + 10.80 \text{ mHz}}{9} = 51.55833$ mHz

USER HINTS

Radio equipment usually operates in an environment of man-made electro-magnetic noise which radiates from power lines, fluorescent lights, motors, appliances, ignition systems, etc. Modern radios are designed to minimize interference from such sources but operation may be affected under conditions of unusually strong noise.

Distant weak, "skip" or noise signals may be received by this receiver because of its high sensitivity. Whenever such conditions interrupt scanning or whenever a very busy channel prevents reception of other desired signals, the affected channel may be bypassed by means of its individual panel switch.

The squelch control functions in the normal manner and, in addition, as it is rotated counterclockwise farther, it becomes a sensitivity control. By careful setting, it can accept weak signals or can be adjusted to receive only medium or strong signals. Interference from weak signals on the same channel may be reduced in this manner.

In cases of strong interfering noise or signals it may be desirable to reduce the length of the antenna to reduce noise pickup below a critical level. This may be very effective in medium and strong signal areas.

In mobile service the commonly encountered poor reception conditions are signal fading, nearby faulty ignition systems, power lines and proximity to strong signals. Careful setting of the squelch control will minimize these conditions.

When moving or shipping the radio, remove the telescoping antenna to avoid damage to it or to the internal circuit assemblies.

VOLTAGE CHART

The Voltage Chart may be used as an approximate guide in following circuit operation or locating a defective stage. You should be familiar with the entire manual before attempting measurements.

TRANSISTOR VOLTAGES

Q#	E	B	C	
1	0	0/.03	0	
2	0	0/.02	0	
3	GND	.4/.6	.7/0	
4	GND	.7/0	.01/9	
5	GND	.01/.7	0	
6	11.0	11.0	.5/0	
7	.5/0	6.1	0	
8	GND	0	6.1	
9	11.0	11.5	16.0	
103	3.0	3.6	10.3	
104	7.4	10.0	9.6	
203	2.9	3.6	10.2	
204	.6	9.9	9.6	
303	9.6	10.3	10.3	
304	2.9	3.4	10.3	
305	6.9	5.5	10.2	
306	.15	-.25	9.0	
...	1	2	3	4
101	8.2	3.8	0	.08
102	10.2	.16	0	.05
201	10.2	4.3	0	.2
202	10.2	.7	0	.24
301	10.3	4.2	0	.14
302	9.6	.65	0	.13

INTEGRATED CIRCUIT VOLTAGES

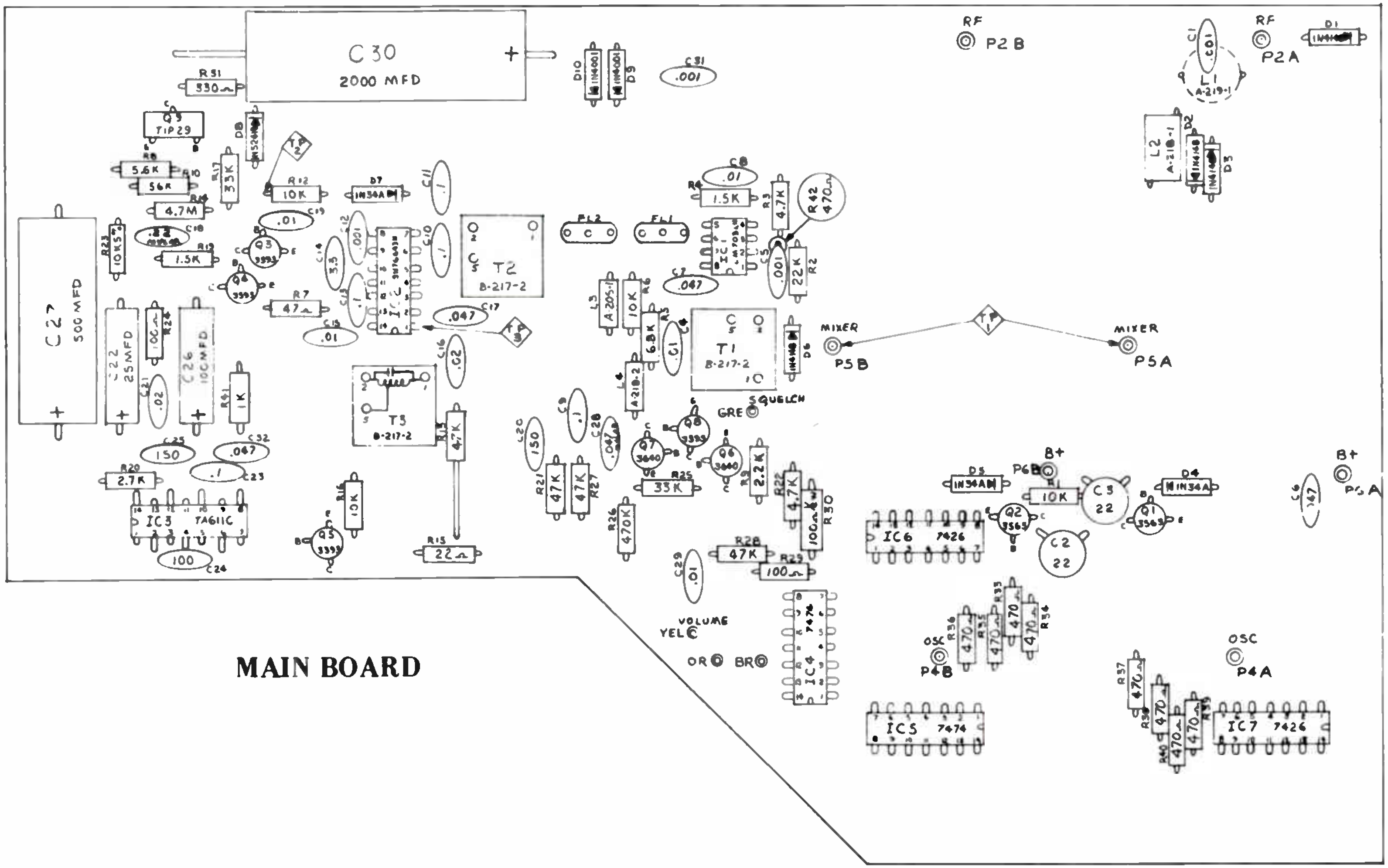
PIN NO.	I.C. NUMBER 1	2	3	4	5	6	7
1	1.3	4.9	11	NC	NC	5.0	.13
2	GND	3.5	NC	4.4	5.0	5.0	.13
3	1.4	NC	7.8	5.0	.13	9.0	9.0
4	NC	1.4	.7	1.5	NC	5.0	.13
5	10	1.4	.5	.1	.13	.1	5.0
6	NC	1.4	NC	4.4	5.0	9.0	9.0
7	2.1	GND	0	GND	GND	GND	GND
8	NC	GND	GND	5.0	5.0	9.0	.2
9		.14	NC	.1	.13	.1	5.0
10		1.4	GND	NC	1.4	.1	5.0
11		NC	.5	6.2	5.0	9.0	9.0
12		3.5	6.5	5.0	5.0	.1	5.0
13		10	0	NC	1.0	5.0	.13
14		5.3	12	6.2	6.2	.1	1.4

Voltages are measured with "Manual-Scan" switch in manual position, "Volume" control counterclockwise and "Squelch" counterclockwise or, for some measurements, CW/CCW.

		COUNT							
I.C. No.	PIN	1	2	3	4	5	6	7	8
4	5	0	0	0	0	1	1	1	1
	6	1	1	1	1	0	0	0	0
	8*	1	1	1	1	1	1	1	1
	9*	0	0	0	0	0	0	0	0
5	5	0	1	0	1	0	1	0	1
	6	1	0	1	0	1	0	1	0
	8	1	1	0	0	1	1	0	0
	9	0	0	1	1	0	0	1	1
7	8	0	1	1	1	1	1	1	1
	11	1	0	1	1	1	1	1	1
	6	1	1	0	1	1	1	1	1
	3	1	1	1	0	1	1	1	1
6	3	1	1	1	1	0	1	1	1
	6	1	1	1	1	1	0	1	1
	11	1	1	1	1	1	1	0	1
	8	1	1	1	1	1	1	1	0

LOGIC CHART

The logic sequence for counting is shown by "0" under .5v and "1" over 4v. I.C.-4, pins 8 & 9 (*) change state on each movement, up or down, of the "Manual-Scan" Switch.


C30
2000 MFD
C27
500 MFD
C22
25 MFD
C26
100 MFD
T2
B-217-2
T1
B-217-2
T5
B-217-2
IC3 TA611C
IC6 7426
IC5 7474
IC4 7474
IC7 7426
RF
P2B
P2A
MIXER
P5B
P5A
SQUELCH
GRE
B+
P6B
OSC
P4B
P4A
VOLUME
YEL
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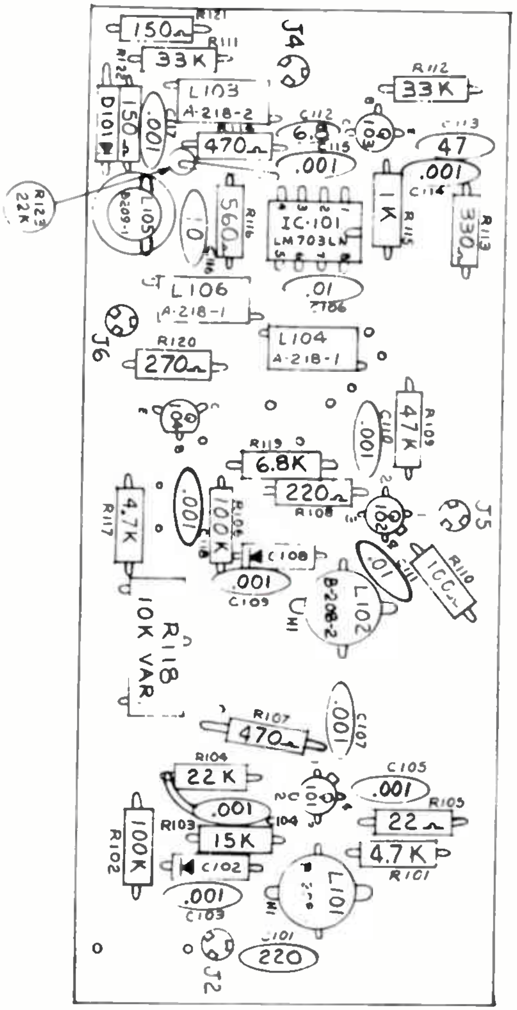
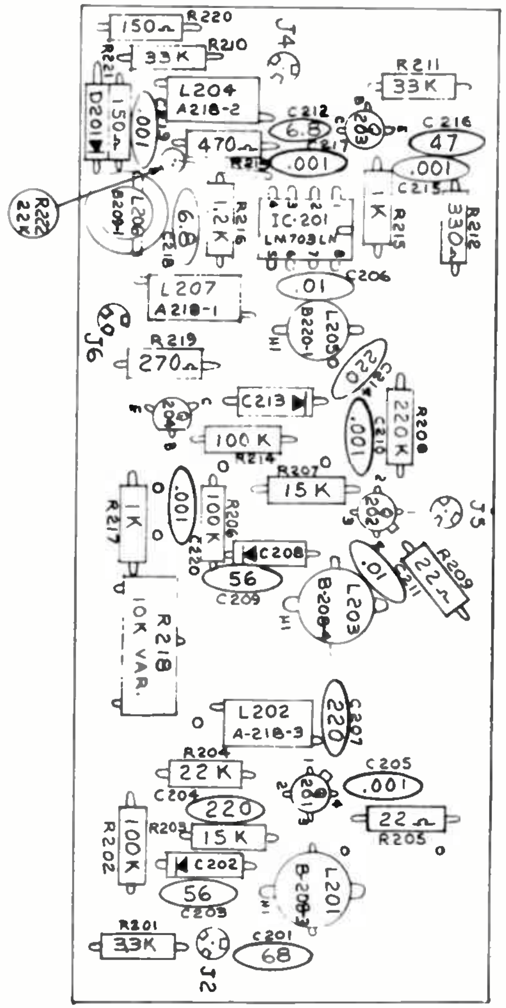
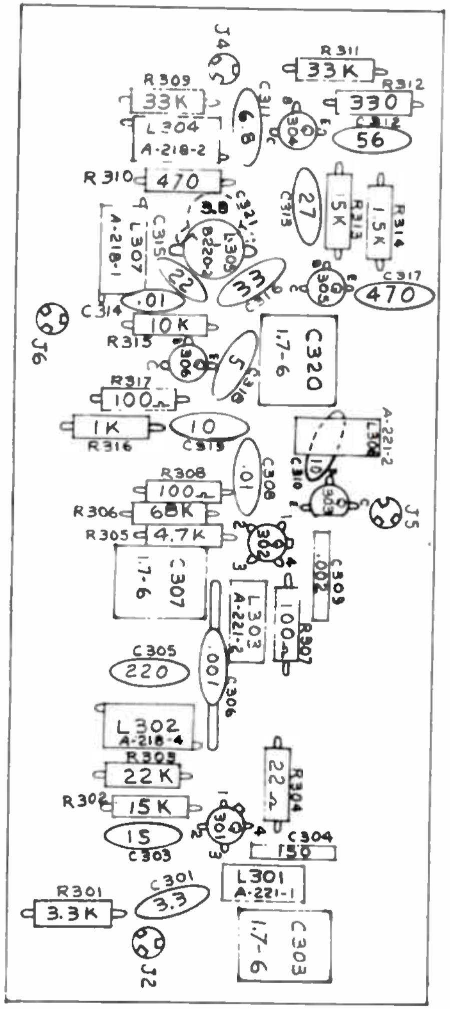
MAIN BOARD



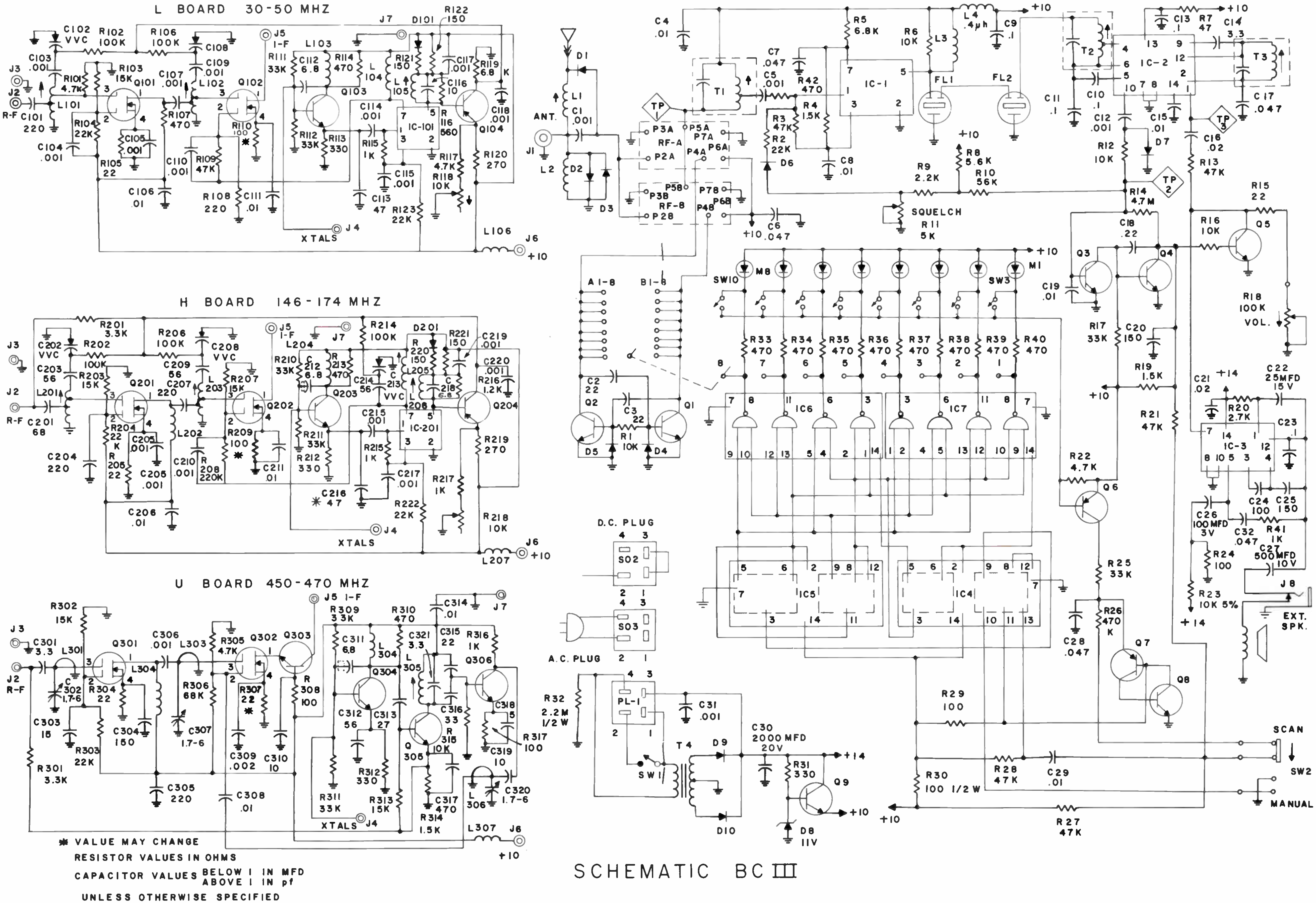
3 L MODULE



3 H MODULE



3 U MODULE



SCHEMATIC BC III

ALIGNMENT

I–F SECTION

Alignment of the I–F system consists of optimizing the input and output networks and balancing the detector output. The bandpass and center frequency are established by quartz crystal filters and "peaking" the coils can result in bandpass ripple or poor sensitivity. Field alignment should not be necessary but the procedure is given for general information.

EQUIPMENT NEEDED

Oscilloscope

Sweep generator with 10.79, 10.80 and 10.81mHz markers

1. Connect sweep generator to TP–1 through a lpf capacitor.
2. Connect oscilloscope to TP–2.
3. Maintain output of 10.8mHz sweep generator at a low level to prevent distortion from overloading.
4. Adjust T1 and T2 for maximum output, and minimum ripple. See Figure 2.

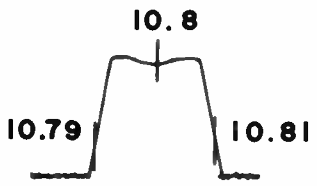


Figure 2

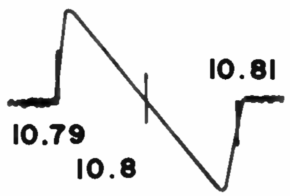


Figure 3

5. Connect scope to pin TP–2 and adjust T3 so that 10.8mHz is in center of discriminator curve and for best linearity. See Figure 3.

ALTERNATE METHOD: I–F alignment may be checked using a Measurements Model 800 Generator or equivalent tuned to an operating frequency and swept ±25kc. Markers are not essential since center frequency is determined by the filter.

R–F SECTION

DO NOT ATTEMPT ALIGNMENT OR "PEAKING" OF R–F MODULES.

The R–F alignment points are adjusted and sealed at the factory and should not be disturbed. Factory alignment involves multi-frequency signal generation systems, add-on test modules, output indicators and training beyond the scope of normal service activities.

The unique R–F system includes electronic tracking of R–F and oscillator circuits for maximum performance over a wide range of frequencies. THIS PERFORMANCE CAN BE DESTROYED BY AN ATTEMPT TO "PEAK UP" OR "TWEAK" OR "OPTIMIZE", ETC.

NOTE: WHEN ORDERING REPLACEMENT PARTS NOT OTHERWISE LISTED, ORDER FROM MANUFACTURER BY ITEM NUMBER AND DESCRIPTION.

SEMICONDUCTORS

ITEM	PART NO./TYPE
(Main Board)	
D1	1N4148
D2	1N4148
D3	1N4148
D4	1N34A
D5	1N34A
D6	1N4148
D7	1N34A
D8	1N5241B (11V, 5%)
D9	1N4001
D10	1N4001
IC1	LM703LnNat
IC2	SN76653N (ULN2111A)
IC3	TA-611CS.G.S
IC4	SN-7474
IC5	SN-7474
IC6	SN-7426
IC7	SN-7426
M1-8	A-259
Q1	2N3563F.C.
Q2	2N3563F.C.
Q3	MPS3393Mot.
Q4	MPS3393Mot.
Q5	MPS3393Mot.
Q6	2N3640
Q7	2N3640
Q8	MPS3393Mot.
Q9	TIP-29T.I.
("L" Module)	
C102	A-225-1
C108	A-225-1
D101	1N34A
IC101	LM703LNNat.
Q101	3N201T.I.
Q102	3N201T.I.
Q103	2N3563F.C.
Q104	2N3640
("H" Module)	
C202	A-258-1
C208	A-258-1
C213	A-258-1
D201	1N34A
IC201	LM703LNNat.
Q201	3N201T.I.
Q202	3N201T.I.
Q203	2N3563F.C.
Q204	2N3640
("U" Module)	
Q301	3N201T.I.
Q302	3N201T.I.
Q303	2N3562F.C.
Q304	2N3562F.C.
Q305	2N3562F.C.
Q306	2N3562F.C.

ELECTROLYTIC/VARIABLE CAPS

ITEM	VALUE
(Main Board)	
C22	25mfd 10V
C26	100mfd 3V
C27	500mfd 10V
C30	2000mfd 20V
("U" Module)	
C302	1.7-6pf Trimmer
C307	1.7-6pf Trimmer
C320	1.7-6pf Trimmer

CONTROLS

ITEM	DESCRIPTION
(Main Board)	
R11	5000 ohms Squelch
R18	100K Volume/Switch
("L" Module)	
R118	10K Bias
("H" Module)	
R218	10K Bias

COILS/TRANSFORMERS

ITEM	PART NO.
(Main Board)	
L1	A-219-1
L2	A-218-1
L3	A-205-1
L4	A-218-2
T1	B-217-2
T2	B-217-2
T3	B-217-2
T4	13-202
("H" Module)	
L201	B-208-3
L202	A-218-3
L203	B-208-4
L204	A-218-2
L205	B-220-1
L206	B-209-1
L207	A-218-1
("L" Module)	
L101	B-208-1
L102	B-208-2
L103	A-218-2
L104	A-218-1
L105	B-209-1
L106	A-218-1
("U" Module)	
L301	A-221-1
L302	A-218-4
L303	A-221-2
L304	A-218-2
L305	B-220-2
L306	A-221-2
L307	A-218-1

MISCELLANEOUS

ITEM	NAME	PART NO.
FL1	Filter, Crystal	A-226
FL2	Filter, Crystal	A-226
SP1	Speaker, 3" x 5", 3.2 ohms	B-248
SW2	Switch, Manual/Scan	B-254

CABINET PARTS

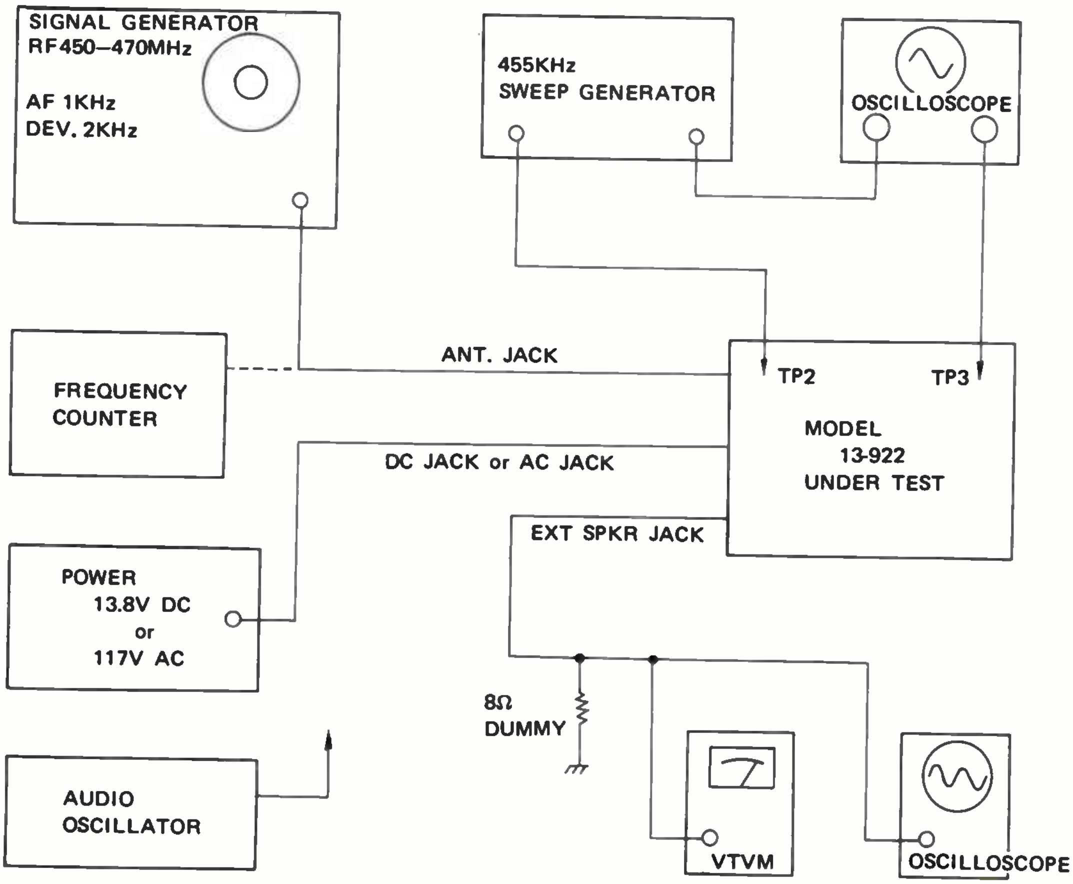
NAME	PART NO.
Panel, Front	B-228
Trim, Cabinet	C-233
Knob, Control	RB-155-840

Pages 13-20 Courtesy of MIDLAND COMMUNICATIONS CO.

TEST EQUIPMENT REQUIRED

1. POWER SOURCE of 13.8 V DC capable of 1 amp. regulated.
   (Hewlett-Packard model 6201B or equivalent)
2. AUDIO GENERATOR usable for frequency range of 200Hz to 5KHz or more.
   (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER, operatable for up to 500MHz or more.
   (Hewlett-Packard model 5246L with convertor model 5253B)
4. OSCILLOSCOPE, 450KHz bandwidth
   (Hewlett-Packard model 120B or equivalent)
5. VACUUME TUBE VOLTMETER, 1mV to 50V, 1MHz
   (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR, capable of tuning 455KHz, 10.7MHz 450~470MHz and for narrow band receiver.
7. SWEEP GENERATOR, capable of tuning 450KHz, 455KHz and 460KHz.

TEST CONNECTION



ALIGNMENT

1. Connect model 13-922 and all test equipment as illustrated on TEST CONNECTIONS figure.
2. Check voltages at all points, as shown on schematic diagram.

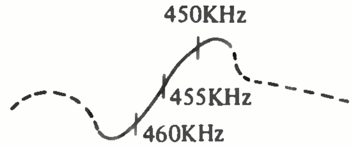
3. AF SECTION

3-1 Apply a 1KHz audio signal to TP3, and check the audio power, the wave form on the oscilloscope and the control of the VOLUME. (Audio clipping level is about 3V at 8Ω load)

4. DISCRIMINATOR

4-1 Connect the output of sweep generator to TP2 and oscilloscope to TP3.

4-2 Adjust T16 and T17 for maximum output and best symmetry.



4-3 Seal T16 and T17. No further adjustments will be made.

5. CRYSTAL OSCILLATION

5-1 **SECOND LOCAL OSCILLATOR**
Check the emitter voltage of Q7, the second local oscillator. A 3.5V reading indicates the oscillator is functioning properly. A 2V reading indicates a defective oscillator.

5-2 **FIRST LOCAL OSCILLATOR**
When a crystal is installed the emitter voltage of Q3, the first local oscillator, increases slightly. No increase in voltage will indicate a defective oscillator.

6. SECOND IF SECTION

6-1 Turn SQUELCH control fully clockwise.

6-2 Turn VOLUME control clockwise to obtain 0db noise level.

6-3 Apply a 455KHz unmodulated signal to the base of Q8, the second mixer, through a 0.01μF capacitor.

6-4 Adjust T14 and T15 for maximum quieting while generator output is decreased.

7. FIRST IF SECTION

7-1 Apply a 10.7MHz unmodulated signal to the base of Q2, the first mixer, through a 0.01μF capacitor.

7-2 Adjust T11, T12 and T13 for maximum quieting while generator output is decreased

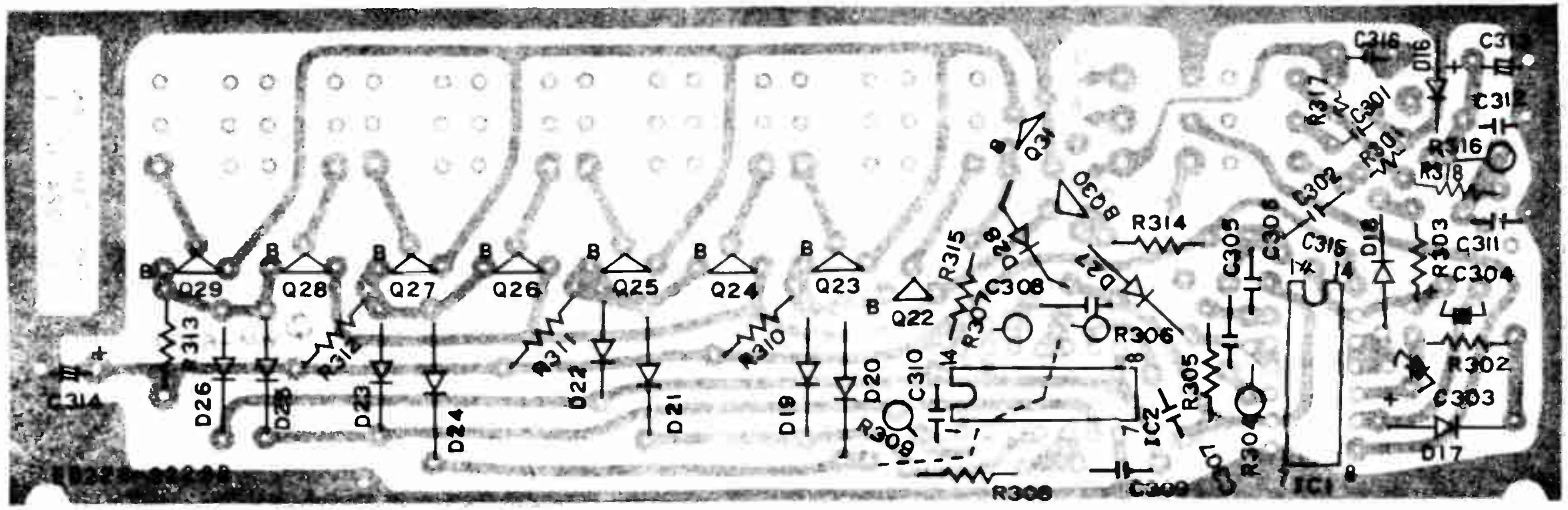
8. RF SECTION

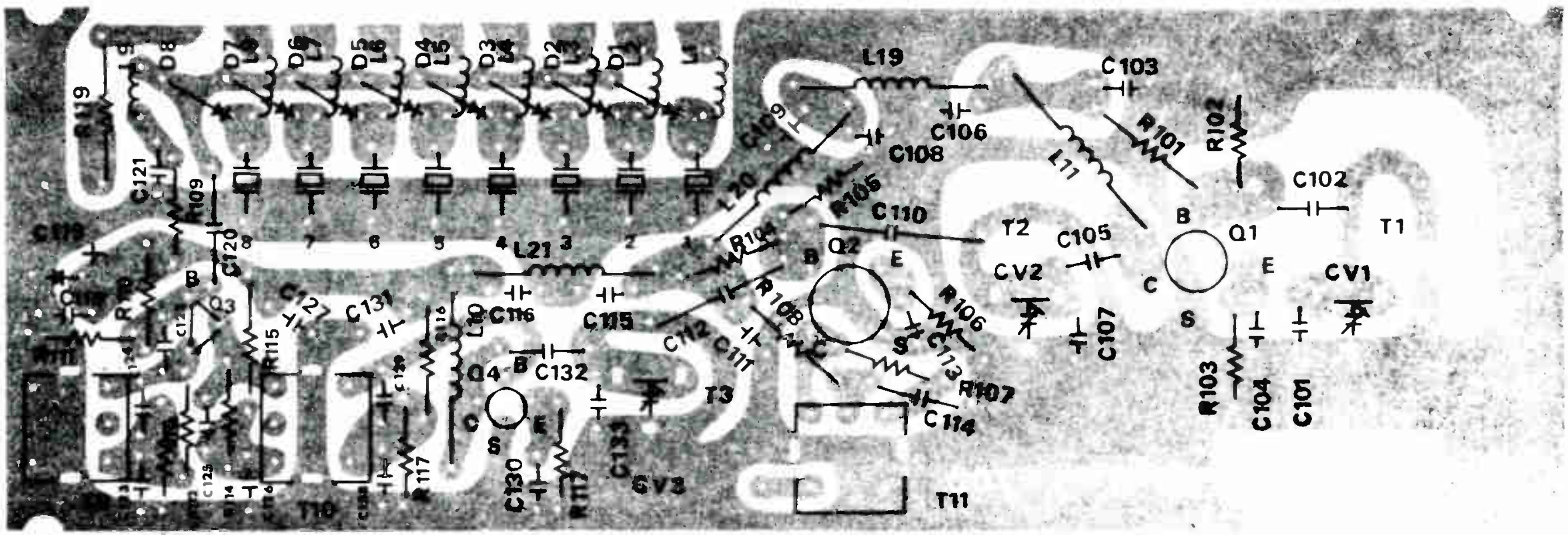
8-1 Apply a UHF band channel frequency signal modulated at 1KHz with 2KHz deviation to ANT jack.

8-2 Adjust T1, T2, T3, T9 and T10 for best audio output wave while generator output is decreased.

8-4 Adjust T11, T12, T13, T14 and T15 again to obtain best audio output wave while generator output is decreased.

8-5 Check difference of noise level and signal level on voltmeter. If less than 3 db, adjustment is good.


Q29
Q28
Q27
Q26
Q25
Q24
Q23
Q22
Q31
B
R313
R312
R311
R310
R315
R314
R306
R307
R305
R304
R309
R308
R302
R303
R316
R317
R318
R301
C314
C308
C310
C309
C305
C306
C302
C301
C315
C311
C304
C303
C312
C313
C316
D26
D25
D23
D24
D22
D21
D19
D20
D28
D27
D18
D17
D16
BD30
IC1
IC2
14
8


L19
C103
C106
C108
C109
R101
R102
L11
C102
L20
R105
C110
T2
T1
C105
Q1
B
C
E
S
CV2
CV1
C107
R103
C104
C101
R104
Q2
R106
R107
C113
C114
R108
C111
C112
T11
T3
CV3
C133
C130
R113
Q4
C132
C115
C116
L21
L10
R116
R117
C131
C127
R115
Q3
C120
R109
C121
R119
C119
T10
D8
D7
D6
D5
D4
D3
D2
D1
L9
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L6
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L4
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L2
L1
8
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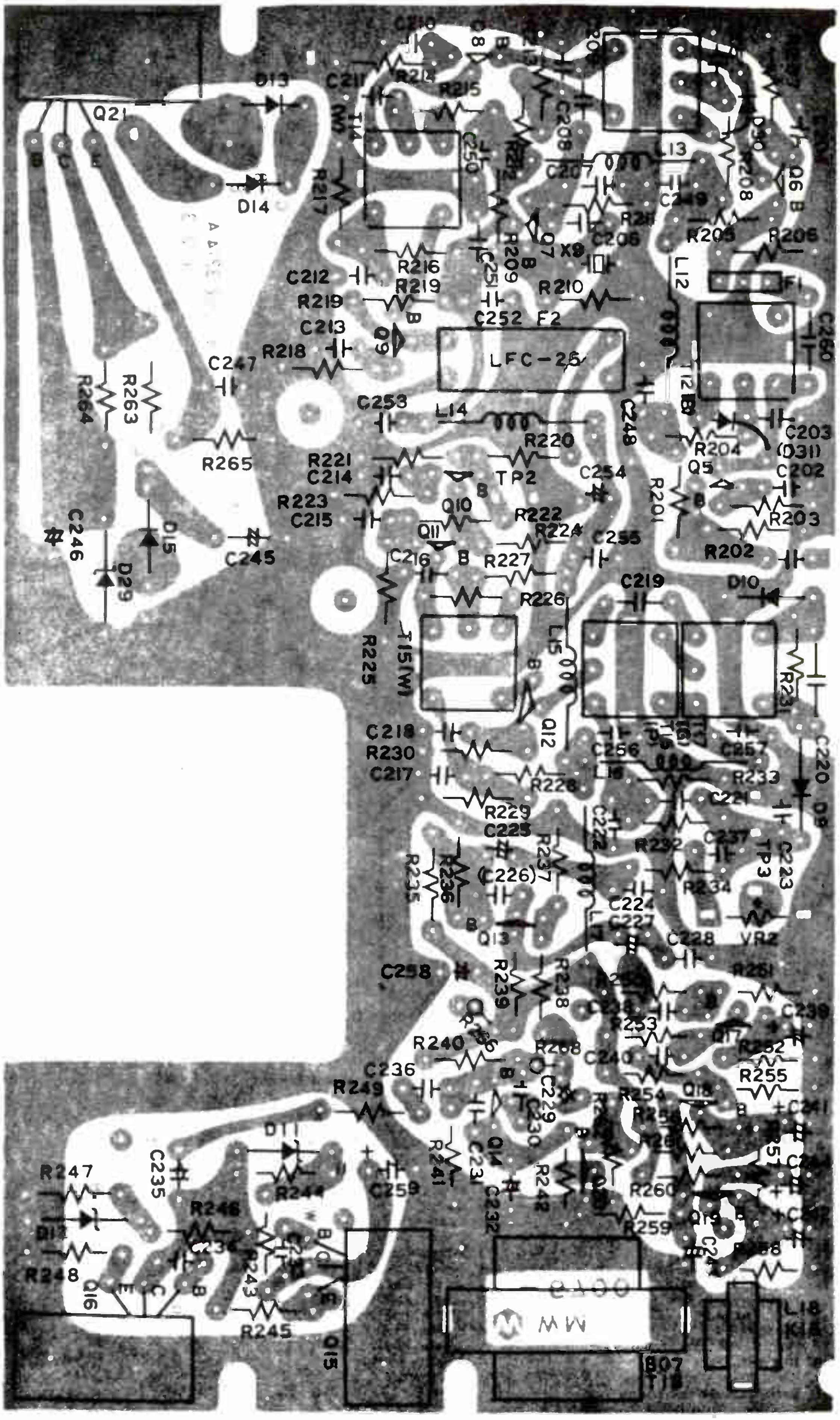
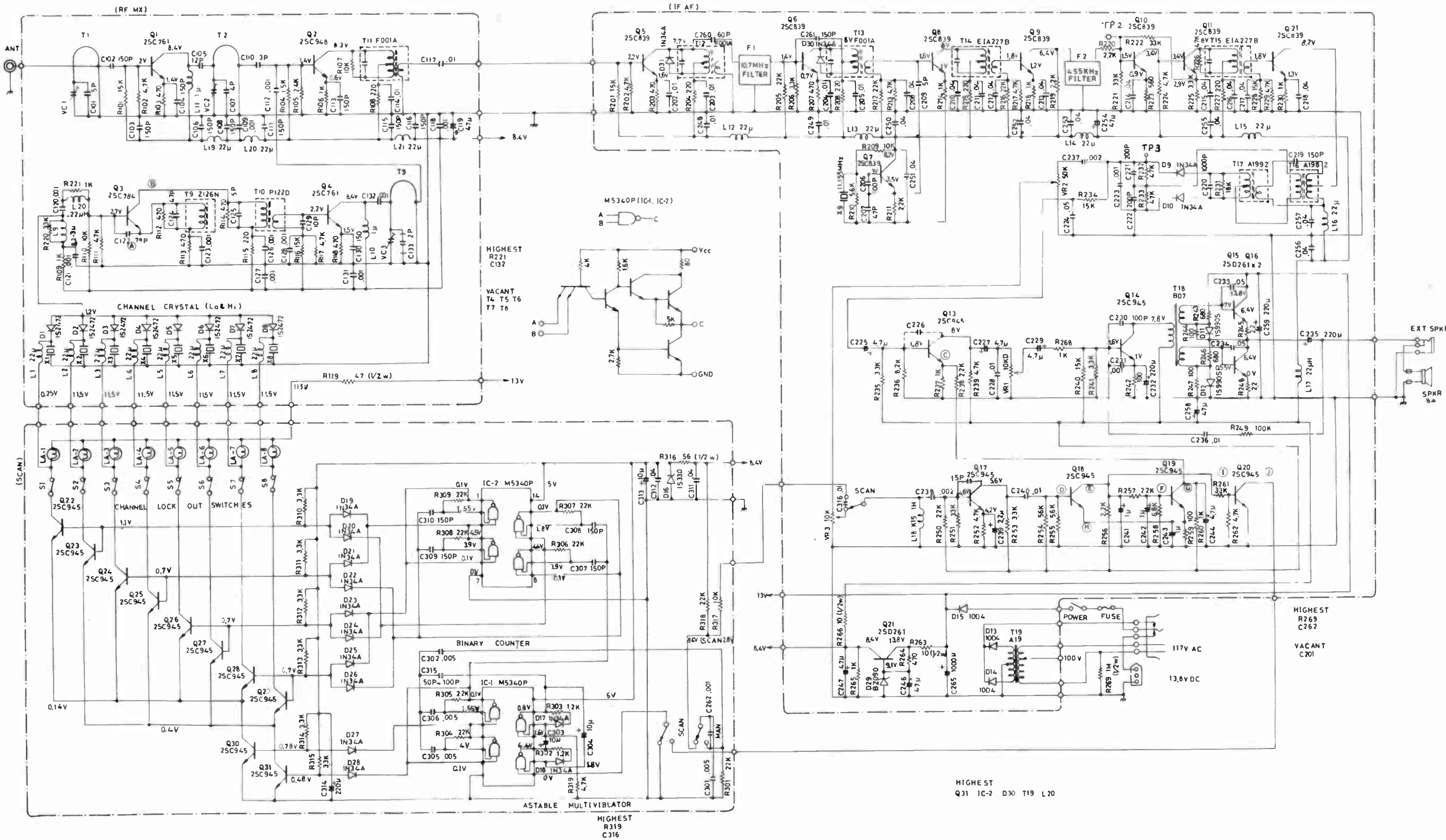
5
4
3
2
1



Q21
D13
D14
C211
R214
R215
C210
T14
R217
C250
R212
C208
C207
L13
C249
R208
Q6
R211
C206
R205
R206
R216
R219
C212
C251
R209
Q7
X9
R210
L12
F1
C252
F2
C213
R218
Q9
LFC-25
C260
C247
R264
R263
R265
C253
L14
R220
C248
T12
C203
(D31)
R204
Q5
C202
R221
C214
TP2
C254
R201
R223
C215
Q10
R222
R224
R203
C246
D15
Q11
C255
R202
C245
D29
C216
R227
C219
D10
R226
R225
T15
L15
R231
Q12
C218
R230
C217
R228
C256
C257
C220
L16
R233
C221
R229
C225
R237
C222
R232
C237
TP3
C223
D9
R235
R236
(C226)
R234
C224
C227
Q13
C228
VR2
C258
R239
R238
R251
C239
R253
Q17
R240
R268
C240
R252
C236
C229
R255
R249
R254
Q18
C241
D11
C230
R241
C231
Q14
C235
R244
C259
R242
R260
R247
C232
R259
R246
D12
R243
R248
Q16
R245
Q15
MW
807
T18
L18


(RF MX)
(IF AF)
(SCAN)
ANT
10.7MHz FILTER
455KHz FILTER
CHANNEL CRYSTAL (Lo & Hi)
M5340P (IC-1, IC-2)
HIGHEST
R221
C132
VACANT
T4 T5 T6
T7 T8
CHANNEL LOCK OUT SWITCHES
BINARY COUNTER
ASTABLE MULTIVIBLATOR
HIGHEST
R319
C316
SCAN
MAN
EXT SPKR
SPKR
POWER
FUSE
117V AC
13.8V DC
HIGHEST
R269
C262
VACANT
C201
HIGHEST
Q31 IC-2 D30 T19 L20

9. TIGHT SQUELCH

9-1 Apply the main channel frequency signal modulated at 1KHz with 2KHz deviation to ANT jack.

9-2 Tune generator frequency carefully.

9-3 Turn SQUELCH control fully clockwise.

9-4 Decrease generator output until the audio output signal is silenced.

9-5 Increase generator output very slowly until you can watch the audio signal wave again on the oscilloscope, and check this opening level of generator output. 1 to 1.5μV is adequate.

9-6 You can adjust this tight squelch sensitivity with VR2, the preset type variable resistor.

FREQUENCIES AND CRYSTALS

Once you have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

The fundamental crystal frequency	=	$\dfrac{\text{Desired Frequency} - 10.7\text{ MHz}}{9}$
Crystal Type	:	HC – 25U Third overtone (Should meet MIL-C-3098E)
Frequency Tolerance	:	0.002% (-20°C -+40°C)
Resonance	:	Series
Load Capacitance	:	32pF + 0.0005%
Drive Level	:	2.0 mW
Resistance (Rs)	:	Less than 35 ohm
Shunt Capacitance	:	Less than 6 PF

HOW AND WHERE TO ORDER REPLACEMENT PARTS

NOTE: TO ELIMINATE ERROR AND SPEED DELIVERY OF REPLACEMENT PARTS, ALWAYS INCLUDE THE FOLLOWING INFORMATION ON YOUR ORDER:

1. Complete identification of merchandise for which the part is wanted.
   - A. Name item
   - B. Model number
   - C. Serial number
2. Best possible identification of the part itself.
   - A. Part Number
   - B. Part Name
   - C. Quantity
   - D. If necessary return old part as sample.
3. Customer should use address listed below when ordering replacement parts.

   MIDLAND ELECTRONICS COMPANY
   PARTS DEPARTMENT
   P.O.BOX 19032
   KANSAS CITY, MISSOURI 64141

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	09-306219	1S2472
D2	09-306219	1S2472
D3	09-306219	1S2472
D4	09-306219	1S2472
D5	09-306219	1S2472
D6	09-306219	1S2472
D7	09-306219	1S2472
D8	09-306219	1S2472
D9	09-306020	1N34A
D10	09-306020	1N34A
D11	09-306220	1S990S
D12	09-306220	1S990S
D13	09-306149	10D4
D14	09-306149	10D4
D15	09-306149	10D4
D16	09-306191	1S330
D17	09-306020	1N34A
D18	09-306020	1N34A
D19	09-306020	1N34A
D20	09-306020	1N34A
D21	09-306020	1N34A
D22	09-306020	1N34A
D23	09-306020	1N34A
D24	09-306020	1N34A
D25	09-306020	1N34A
D26	09-306020	1N34A
D27	09-306020	1N34A
D28	09-306020	1N34A
D29	09-306180	BZ090
D30	09-306020	1N34A
IC1	09-308015	M5340P
IC2	09-308015	M5340P
Q1	09-302149	2SC761
Q2	09-302148	2SC948
Q3	09-302095	2SC784
Q4	09-302149	2SC761
Q5	09-302124	2SC839
Q6	09-302124	2SC839
Q7	09-302124	2SC839
Q8	09-302124	2SC839
Q9	09-302124	2SC839
Q10	09-302124	2SC839
Q11	09-302124	2SC839
Q12	09-302124	2SC839
Q13	09-302125	2SC945
Q14	09-302125	2SC945
Q15	09-303019	2SD261
Q16	09-303019	2SD261
Q17	09-302125	2SC945
Q18	09-302125	2SC945
Q19	09-302125	2SC945
Q20	09-302125	2SC945
Q21	09-303019	2SD261
Q22	09-302125	2SC945
Q23	09-302125	2SC945
Q24	09-302125	2SC945
Q25	09-302125	2SC945
Q26	09-302125	2SC945
Q27	09-302125	2SC945
Q28	09-302125	2SC945
Q29	09-302125	2SC945
Q30	09-302125	2SC945
Q31	09-302125	2SC945

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C119	77-337476	47mfd 16V
C225	77-337475	4.7mfd 16V
C227	77-337475	4.7mfd 16V
C229	77-337475	4.7mfd 16V
C232	77-337227	220mfd 16V
C239	15-135003	2.2mfd 16V
C241	15-135002	1mfd 16V
C242	15-135002	1mfd 16V
C243	15-135002	1mfd 16V
C244	77-337475	4.7mfd 16V
C245	77-337108	1000mfd 16V
C246	77-337476	47mfd 16V
C247	77-337476	47mfd 16V
C254	77-337476	47mfd 16V
C258	77-337476	47mfd 16V
C259	77-337227	220mfd 16V
C303	77-337106	10mfd 16V
C304	77-337106	10mfd 16V
C313	77-337106	10mfd 16V
C314	77-337227	220mfd 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
VR1	13-160074	10K Volume/Switch
VR2	13-164066	50K Sensitivity
VR3	13-166031	10K Squelch

COILS/TRANSFORMERS

ITEM	PART NO.		
L1	13-178106	L16	13-178118
L2	13-178106	L17	13-178118
L3	13-178106	L19	13-178118
L4	13-178106	L20	13-178118
L5	13-178106	L21	13-178118
L6	13-178106	T9	13-094009
L7	13-178106	T10	13-094004
L8	13-178106	T11	13-090202
L9	13-178106	T12	13-090202
L10	13-178094	T13	13-090202
L11	13-178094	T14	13-090203
L12	13-178118	T15	13-090203
L13	13-178118	T16	13-093177
L14	13-178118	T17	13-093178
L15	13-178118	T18	13-096121
		T19	13-098011

MISCELLANEOUS

ITEM	NAME	PART NO.
F1	Filter, 10.7MHz	13-179021
F2	Filter, 455KHz	13-179022
S1	Assembly, Push Switch	13-188001
X9	Crystal, Second Local	13-128247
	Antenna, Rod	13-040066
	Holder, Fuse	13-159099
	Socket, Crystal (8 used)	13-159109
	Speaker, 8 ohm	13-060073

CABINET PARTS

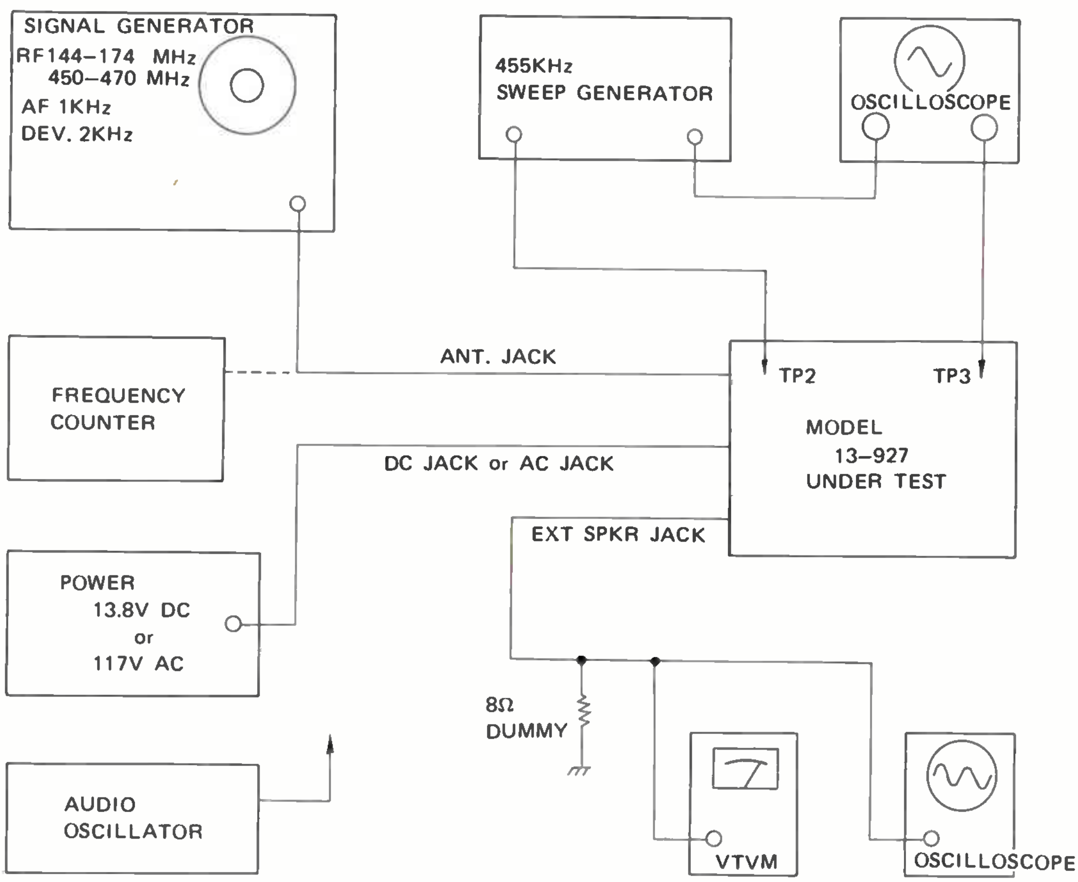
NAME	PART NO.
Case, Top	13-010142
Case, Bottom	13-010143
Panel, Front	13-020413
Plate, Function	13-020436
Knob, Function	13-110118
Panel, Case Side	13-010144

Pages 21-28 Courtesy of MIDLAND COMMUNICATIONS CO.

TEST EQUIPMENTS REQUIRED

1. POWER SOURCE of 13.8 V DC capable of 1 amp. regulated.
   (Hewlett-Packard model 6201B or equivalent)
2. AUDIO GENERATOR usable for frequency range of 200Hz to 5KHz or more.
   (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER, operatable for up to 500MHz or more.
   (Hewlett-Packard model 5246L with convertor model 5253B)
4. OSCILLOSCOPE, 450KHz bandwidth
   (Hewlett-Packard model 120B or equivalent)
5. VACUUM TUBE VOLTMETER, 1mV to 50V, 1MHz
   (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR, capable of tuning 455KHz, 10.7MHz 144–174MHz, 450–470 MHz and for narrow band receiver.
7. SWEEP GENERATOR, capable of tuning 450KHz, 455KHz and 460KHz.

TEST CONNECTION



ALIGNMENT

1. Connect model 13-927 and all test equipment as illustrated on TEST CONNECTIONS figures.
2. Check voltages at all points, as shown on 13-927 schematic diagram.

3. AF SECTION

3-1 Apply a 1KHz audio signal to TP-3, check the audio power wave form on the oscilloscope and the control of the VOLUME. (Audio clipping level is about 3V at 8Ω load)

4. DISCRIMINATOR

4-1 Connect the output of sweep generator to TP2 and oscilloscope to TP3.

4-2 Adjust T16 and T17 for maximum output and best symmetry.

4-3 Seal T16 and T17. No further adjustments will be made.

5. CRYSTAL OSCILLATION

5-1 **SECOND LOCAL OSCILLATOR**
Check the emitter voltage of Q7, the second local oscillator. A 3.5V reading indicates the oscillator is functioning properly. A 2V reading indicates a defective oscillator.

5-2 **FIRST LOCAL OSCILLATOR**
UHF. BAND when a crystal is installed the emitter voltage of Q4, the first oscillator, increases slightly. No increases in voltage will indicate a defective oscillator.

VHF BAND when a crystal is installed the emitter voltage of Q34, the first oscillator increases slightly. No increase in voltage will indicate a defective oscillator.

6. SECOND IF SECTION

6-1 Turn SQUELCH control fully clockwise.

6-2 Turn VOLUME control clockwise to obtain 0db noise level.

6-3 Apply a 455KHz unmodulated signal to the base of Q8, the second mixer, through a 0.01 μF capacitor.

6-4 Adjust T14 and T15 for maximum quieting while generator output is decreased.

7. FIRST IF SECTION

7-1 Apply 10.7 MHz unmodulated signal to the base of Q2, the first UHF mixer through a 0.01μF capacitor.

7-2 Adjust T3, T12 and T13 for maximum quieting while generator output is decreased.

7-3 Apply a 10.7 MHz unmodulated signal to the base of Q33, the first VHF mixer, through a 0.01μF capacitor.

7-4 Adjust T10 for maximum quieting while generator output is decreased.

8. RF SECTION

8-1 Apply a UHF band channel frequency signal modulated at 1KHz with 2KHz deviation to ANT jack.

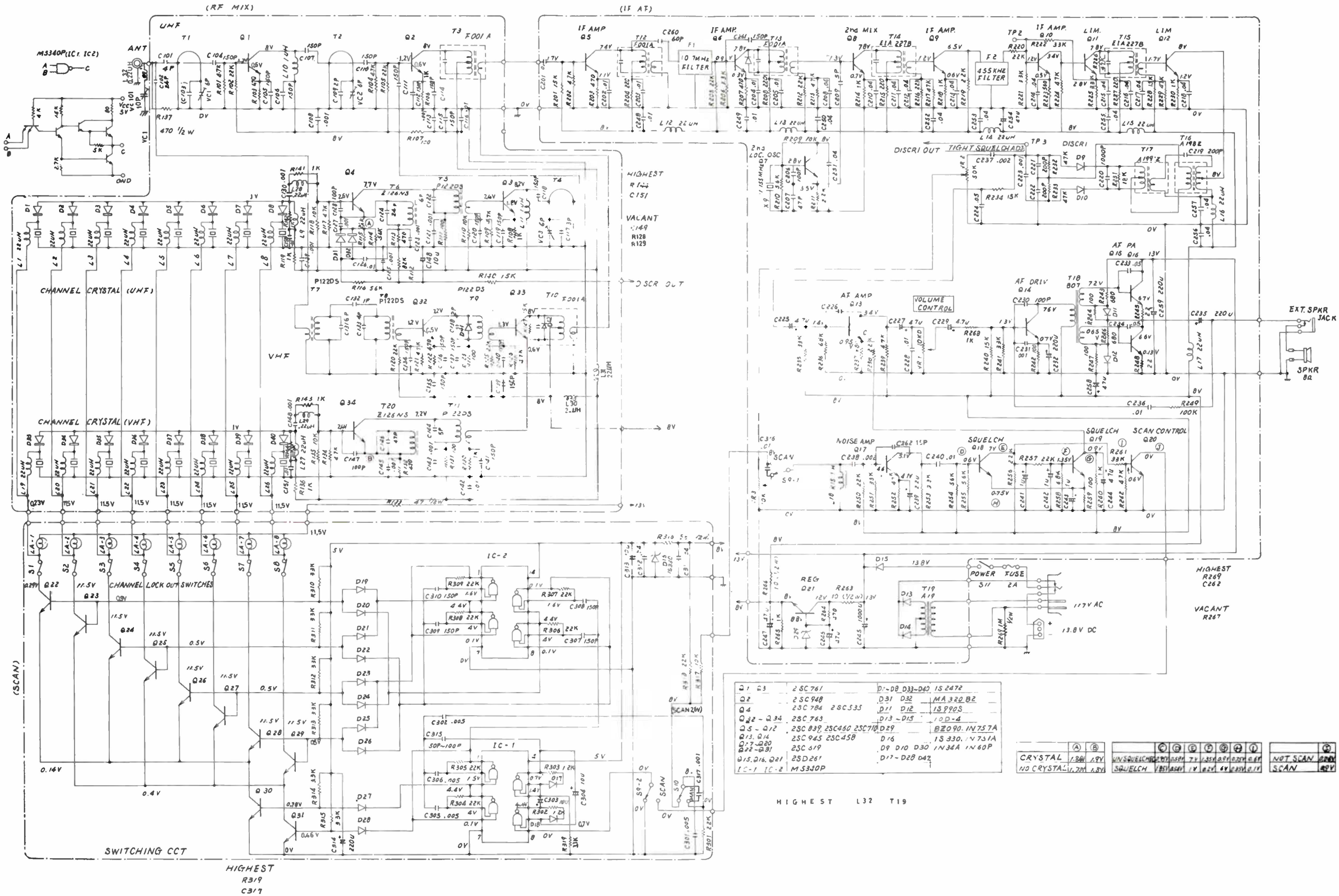
8-2 Adjust VC1, VC2, VC3, T3, T5 and T6 for best audio output wave while generator output is decreased.

8-3 Change the frequency of generator to a VHF band channel frequency.

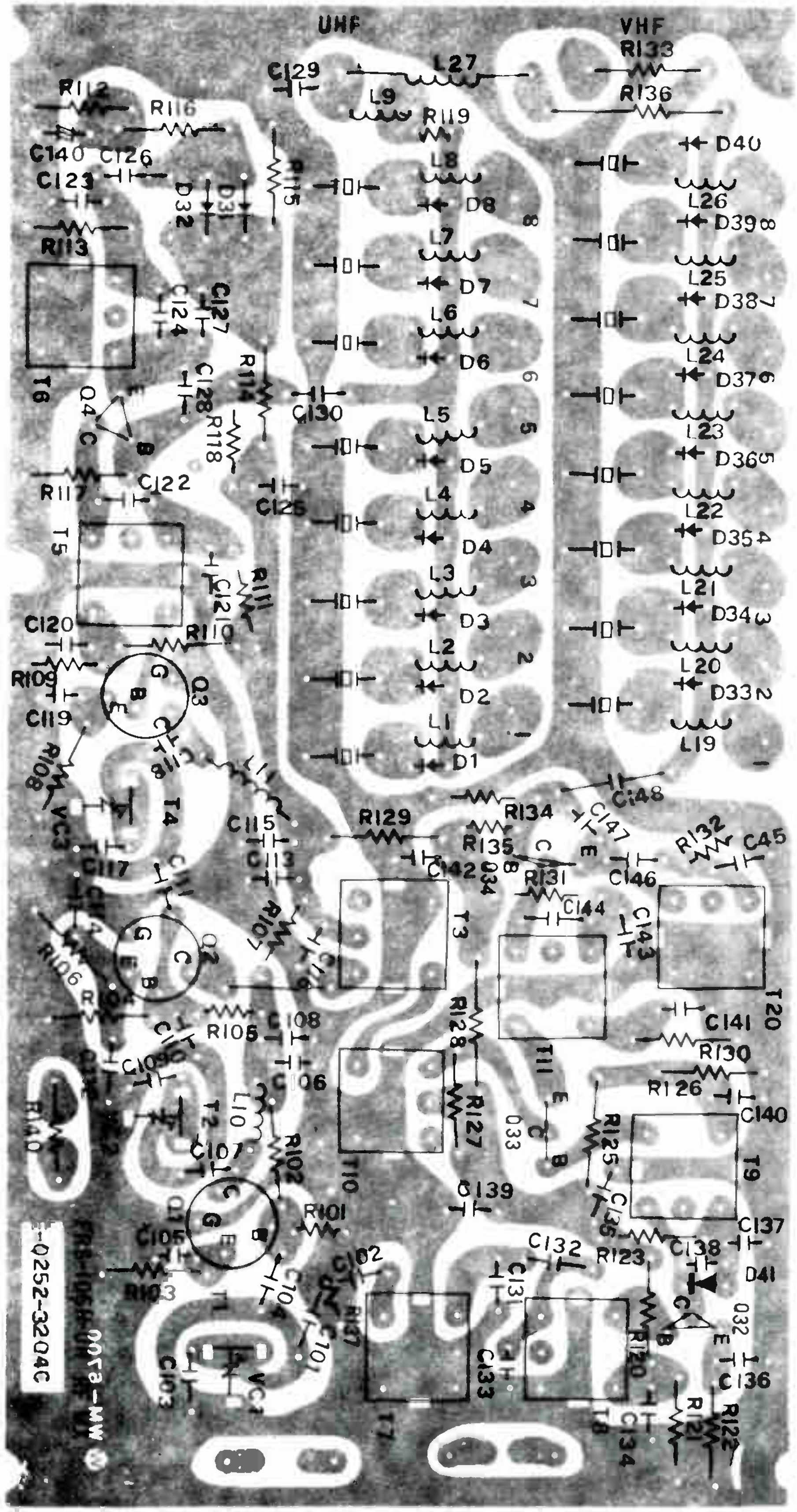
8-4 Adjust T7, T8, T9, T11 and T20 for VHF band RF section alignment.

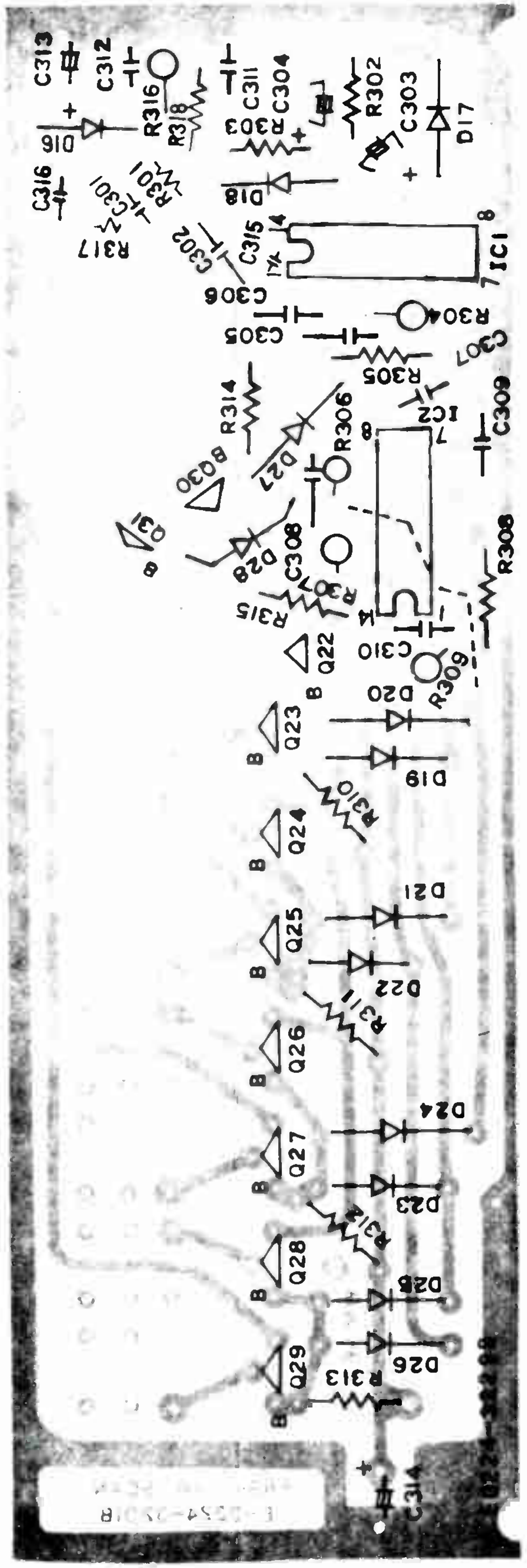
8-5 Adjust T10, T12, T13, T14 and T15 to obtain the best audio output wave while generator output is decreased.

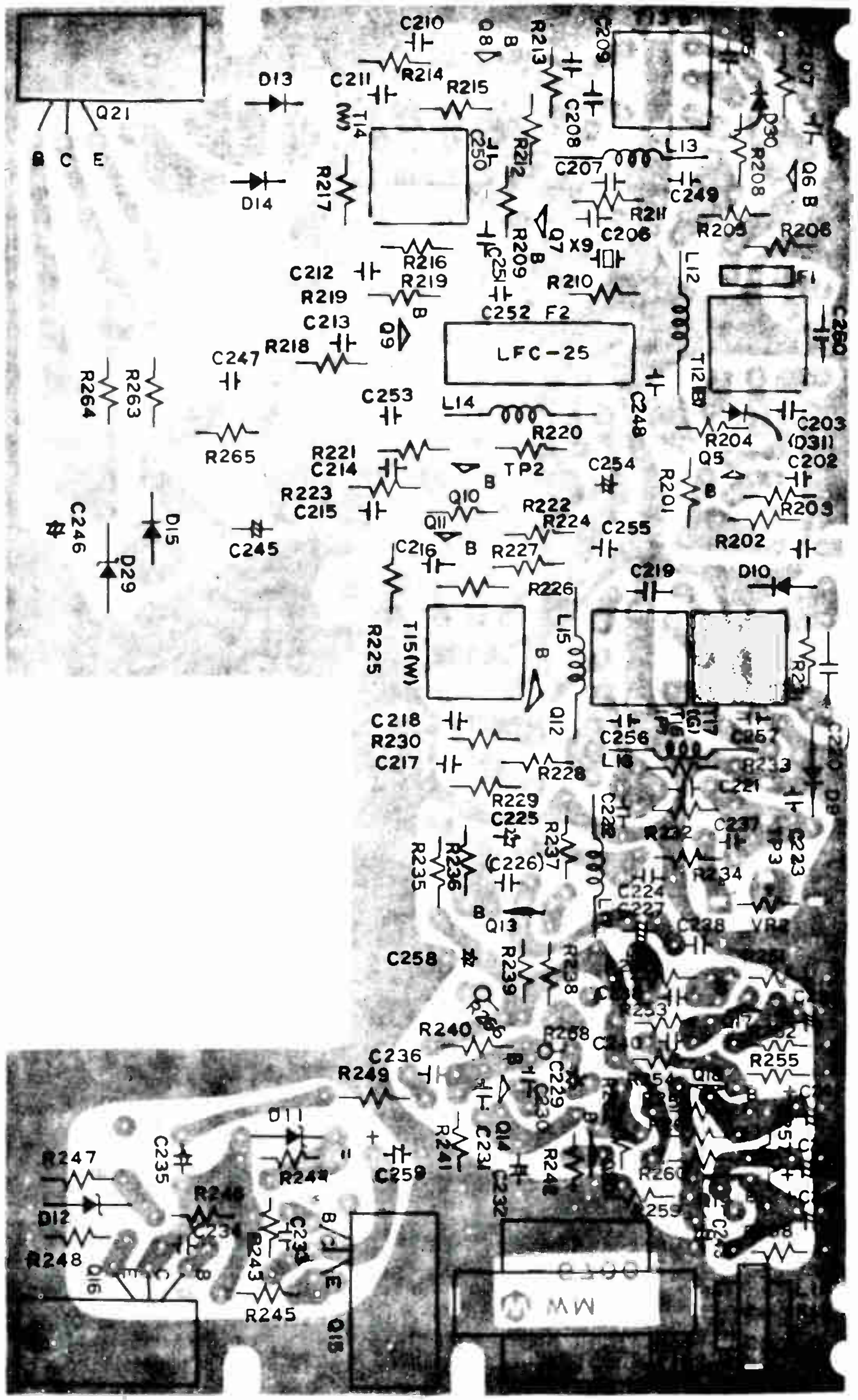
8-6 Check the difference of noise level and the signal level on voltmeter. A 3 db reading indicates your 13-927 is working properly.



(RF MIX)
(IF AF)
UHF
VHF
CHANNEL CRYSTAL (UHF)
CHANNEL CRYSTAL (VHF)
CHANNEL LOCK OUT SWITCHES
SWITCHING CCT
(SCAN)
DISCRI OUT
TIGHT SQUELCH ADJ.
VOLUME CONTROL
AF AMP
AF DRIV
AF PA
NOISE AMP
SQUELCH
SCAN CONTROL
EXT. SPKR JACK
SPKR 8Ω
POWER FUSE
117 V AC
13.8 V DC
HIGHEST R319 C317
HIGHEST L32 T19
HIGHEST R269 C262
VACANT R267


UHF
VHF




LFC-25

9. TIGHT SQUELCH

9-1 Apply the main channel frequency signal modulated at 1KHz with 2KHz deviation to ANT jack.

9-2 Tune generator frequency carefully.

9-3 Turn SQUELCH control fully clockwise.

9-4 Decrease generator output until the audio output signal is silenced.

9-5 Increase generator output very slowly until you can observe the audio signal wave on the oscilloscope, check the opening level of generator output. 1 to 1.5μV is adequate.

9-6 You can adjust the tight squelch sensitivity with VR2, the preset type variable resistor.

FREQUENCIES AND CRYSTALS

Once you have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

For VHF High Band, The fundamental crystal frequency	=	$\dfrac{\text{Desired Frequency} - 10.7\text{ MHz}}{3}$
For UHF Band, The fundamental crystal frequency	=	$\dfrac{\text{Desired Frequency} - 10.7\text{ MHz}}{9}$
Crystal Type	:	HC – 25U Third overtone (Should meet MIL-C-3098E)
Frequency Tolerance	:	0.001% (-20°C -+40°C)
Load Capacitance	:	18pF + 0.0003%
Drive Level	:	2.0 mW
Resistance (Rs)	:	Less than 35 ohm
Shunt Capacitance	:	Less than 6 PF

HOW AND WHERE TO ORDER REPLACEMENT PARTS

NOTE: TO ELIMINATE ERROR AND SPEED DELIVERY OF REPLACEMENT PARTS, ALWAYS INCLUDE THE FOLLOWING INFORMATION ON YOUR ORDER:

1. Complete identification of merchandise for which the part is wanted.
   - A. Name item
   - B. Model number
   - C. Serial number
2. Best possible identification of the part itself.
   - A. Part Number
   - B. Part Name
   - C. Quantity
   - D. If necessary return old part as sample.
3. Customer should use address listed below when ordering replacement parts.

   MIDLAND ELECTRONICS COMPANY
   PARTS DEPARTMENT
   P.O.BOX 19032
   KANSAS CITY, MISSOURI 64141

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	09-306219	1S2472
D2	09-306219	1S2472
D3	09-306219	1S2472
D4	09-306219	1S2472
D5	09-306219	1S2472
D6	09-306219	1S2472
D7	09-306219	1S2472
D8	09-306219	1S2472
D9	09-306020	1N34A
D10	09-306020	1N34A
D11	09-306220	1S990S
D12	09-306220	1S990S
D13	09-306149	10D4
D14	09-306149	10D4
D15	09-306149	10D4
D16	09-306191	1S330
D17	09-306020	1N34A
D18	09-306020	1N34A
D19	09-306020	1N34A
D20	09-306020	1N34A
D21	09-306020	1N34A
D22	09-306020	1N34A
D23	09-306020	1N34A
D24	09-306020	1N34A
D25	09-306020	1N34A
D26	09-306020	1N34A
D27	09-306020	1N34A
D28	09-306020	1N34A
D29	09-306180	BZ090
D30	09-306020	1N34A
D31	09-306240	MA320B2
D32	09-306240	MA320B2
D33	09-306219	1S2472
D34	09-306219	1S2472
D35	09-306219	1S2472
D36	09-306219	1S2472
D37	09-306219	1S2472
D38	09-306219	1S2472
D39	09-306219	1S2472
D40	09-306219	1S2472
D41	09-306020	1N34A
D42	09-306020	1N34A
IC1	09-308015	M5340P
IC2	09-308015	M5340P
Q1	09-302149	2SC761
Q2	09-302148	2SC948
Q3	09-302149	2SC761
Q4	09-302162	2SC763
Q5	09-302124	2SC839
Q6	09-302124	2SC839
Q7	09-302124	2SC839
Q8	09-302124	2SC839
Q9	09-302124	2SC839
Q10	09-302124	2SC839
Q11	09-302124	2SC839
Q12	09-302124	2SC839
Q13	09-302125	2SC945
Q14	09-302125	2SC945
Q15	09-303019	2SD261
Q16	09-303019	2SD261
Q17	09-302125	2SC945
Q18	09-302125	2SC945
Q19	09-302125	2SC945
Q20	09-302125	2SC945
Q21	09-303019	2SC261
Q22	09-302125	2SC945
Q23	09-302125	2SC945
Q24	09-302125	2SC945
Q25	09-302125	2SC945
Q26	09-302125	2SC945
Q27	09-302125	2SC945
Q28	09-302125	2SC945
Q29	09-302125	2SC945
Q30	09-302125	2SC945
Q31	09-302125	2SC945
Q32	09-302095	2SC784
Q33	09-302095	2SC784
Q34	09-302095	2SC784

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C119	77-337476	47mfd 16V
C150	77-337106	10mfd 16V
C225	77-337475	4.7mfd 16V
C227	77-337475	4.7mfd 16V
C229	77-337475	4.7mfd 16V
C232	77-337227	220mfd 16V
C239	15-135003	2.2mfd 16V
C241	15-135002	1mfd 16V
C242	15-135002	1mfd 16V
C243	15-135002	1mfd 16V
C244	77-337475	4.7mfd 16V
C245	77-337108	1000mfd 16V
C246	77-337476	47mfd 16V
C247	77-337476	47mfd 16V
C254	77-337476	47mfd 16V
C258	77-337476	47mfd 16V
C259	77-337227	220mfd 16V
C303	77-337106	10mfd 16V
C304	77-337106	10mfd 16V
C313	77-337106	10mfd 16V
C314	77-337227	220mfd 16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
VR1	13-160074	10K Volume/Switch
VR2	13-164066	50K Sensitivity
VR3	13-166031	10K Squelch

COILS/TRANSFOPMERS

ITEM	PART NO.		
L1	13-178118	L23	13-178118
L2	13-178118	L24	13-178118
L3	13-178118	L25	13-178118
L4	13-178118	L26	13-178118
L5	13-178118	L27	13-178118
L6	13-178118	T3	13-090202
L7	13-178118	T5	13-094004
L8	13-178118	T6	13-094009
L9	13-178118	T7	13-094004
L10	13-178094	T8	13-094004
L11	13-178094	T9	13-094004
L12	13-178118	T10	13-090202
L13	13-178118	T11	13-094004
L14	13-178118	T12	13-090202
L15	13-178118	T13	13-090202
L16	13-178118	T14	13-090203
L17	13-178118	T15	13-090203
L18	13-178123	T16	13-093177
L19	13-178118	T17	13-093178
L20	13-178118	T19	13-098014
L21	13-178118	T20	13-094009
L22	13-178118	Driver	13-096121

MISCELLANEOUS

ITEM	NAME	PART NO.
F1	Filter, 10.7MHz	13-179021
F2	Filter, 455KHz	13-179022
S1	Assembly, Push Switch	13-118001
X9	Crystal, Second Local	13-128247
	Antenna, Rod	13-040067
	Holder, Crystal	13-159109
	Holder, Fuse	13-159099
	Speaker, 8 ohm	13-060073

CABINET PARTS

NAME	PART NO.
Case, Top	13-010163
Case, Bottom	13-010164
Panel, Front	13-020413
Plate, Function	13-020449
Knob, Function	13-110118
Panel, Side	13-010144

CRYSTAL SPECIFICATIONS

Due to the numerous frequencies or channels involved, the crystal is not normally installed by the factory, but by the seller or owner of the unit. Because of the accuracy required, it is recommended that the crystals be ordered from Shepherd Industries, Inc., 8106 Santa Fe Drive, Overland Park, Kansas 66202. Specify the channel frequency and part No.301-532 for high band crystals, part no. 301-542 for low band crystals, and part no. 301-603 for Uhf crystals.

For maximum sensitivity, the channel frequencies specified should be in;

±3 megahertz of;	39.5 MHz	Low Band
±4 megahertz of;	155.55 MHz	High Band
±4 megahertz of;	458.00 MHz	UHF Band

However, for channel frequencies outside of this range, the unit will still operate, but with some loss of sensitivity. This 8 MHz range (6 MHz on Low Band) can be moved up or down, in the band, in which case the RF section of the receiver would have to be realigned.

If desired, the crystal may be purchased from other manufacturers. The following information must be included in the order.

1. Crystal frequency, determined as follows:

Low Band; Crystal frequency=channel frequency+10.7 MHz

Example:
Crystal frequency=39.5 MHz+10.7 MHz=50.2 MHz

High Band; Crystal frequency$=\frac{\text{channel frequency}-10.7\text{ MHz}}{3}$

Example:

Crystal frequency$=\frac{155.55\text{ MHz}-10.7\text{ MHz}}{3}=\frac{144.85\text{ MHz}}{3}=$
48.2833 MHz

UHF Band; Crystal frequency$=\frac{\text{channel frequency}-10.7\text{ MHz}}{9}$

Example:
Crystal frequency$=\frac{458.0\text{ MHz}-10.7\text{ MHz}}{9}=\frac{447.30\text{ MHz}}{9}=$
49.70000 MHz

2. Frequency tolerance of 0.001% on High band and UHF band, 0.002% on low band.

3. UHF Band-3rd overtone, load capacity of 18pf; drive level of 2 milliwatts.

4. VHF Bands-3rd overtone, series resonance minus 450 Hz.

5. Maximum impedance of 35 ohms.

6. Holder is an HC-25/U with pin leads (plug-in type).

CRYSTAL/FILTER INSTALLATION

Prior to installing a crystal, the receiver's cover will have to be removed. To remove the cover, first remove the telescopic antenna if it is installed. Second, remove the four rubber feet by carefully twisting and pulling on each one. Third, unscrew the two large bolts located at the side of the unit. The cover may then be slipped off by sliding it toward the rear of the unit.

Also, to lessen the possibility of causing damage to the unit, the speaker should be removed. Unscrew the two small metal screws (one located on each side) holding the speaker brackets in place. Then carefully place the speaker assembly along side of the unit.

Insert the crystal in the proper socket pins as indicated on the crystal location drawing. See page 8.

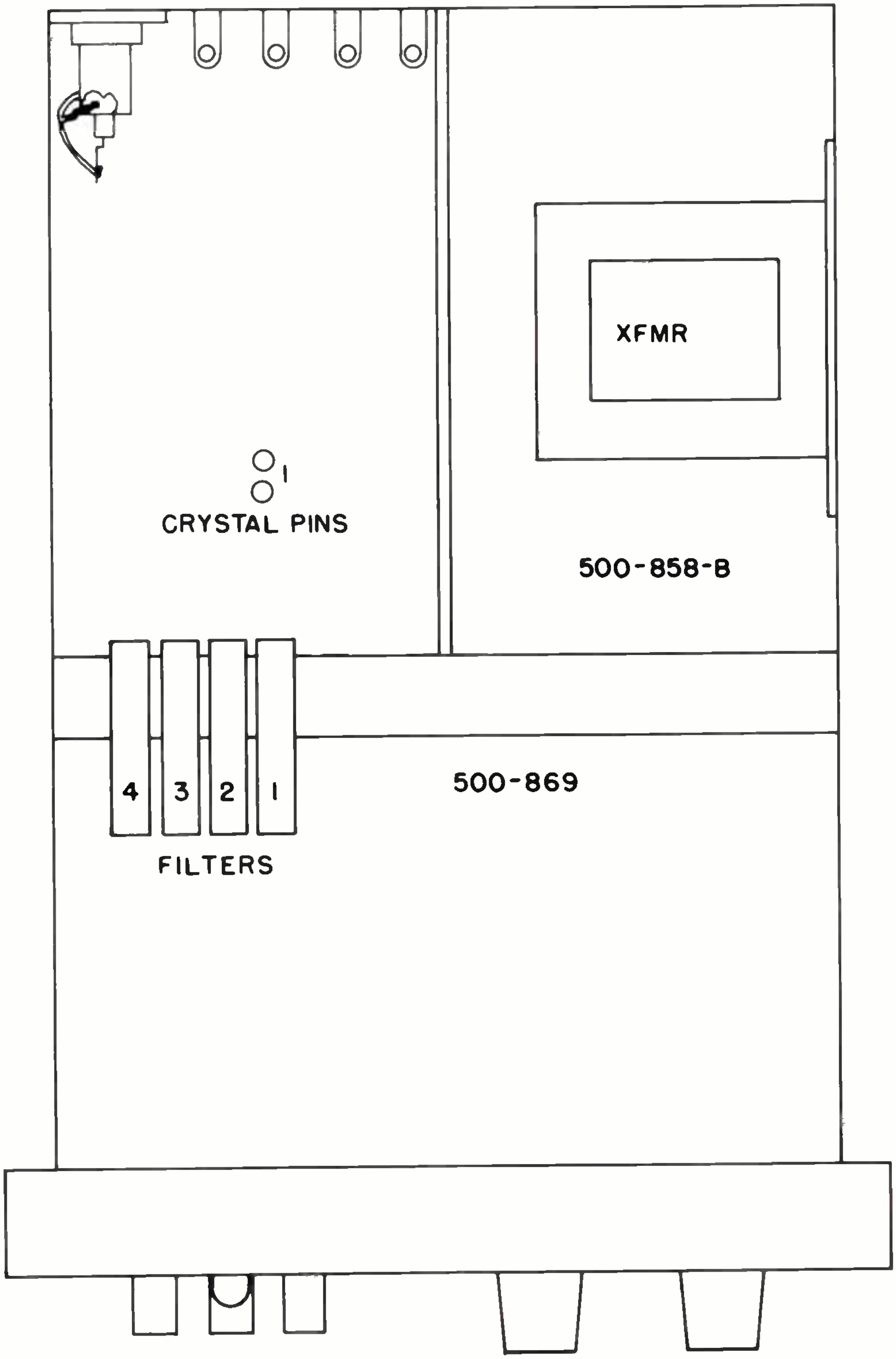
Reinstall the speaker assembly and the cover.

WARNING: USE 1/4-20 BOLTS NOT TO EXCEED 5/8" IN LENGTH.

Prior to installing the filters, the receiver's cover will have to be removed. To remove the cover, first remove the telescopic antenna if it is installed. Second, unscrew the two large bolts located at the side of the unit. The cover may then be slipped off by sliding it toward the rear or the unit. See Figure 1 for proper filter sequencing.

		SINGLE DUTY RECEIVER	
FILTER	FREQUENCY	TWO DUTY CALL-1	TWO DUTY CALL-2
NO. 1		FIRST TONE	SECOND TONE
NO. 2		SECOND TONE	FIRST TONE
NO. 3		FIRST TONE ALL/CALL	FIRST TONE ALL/CALL
NO. 4		SECOND TONE ALL/CALL	SECOND TONE ALL/CALL

FIGURE 1



CRYSTAL/FILTER INSTALLATION DIAGRAM

ALIGNMENT AND TUNING PROCEDURES

EQUIPMENT REQUIRED FOR RECEIVER ALIGNMENT AND TESTING

a. FM Signal Generator with the frequency band corresponding with the band of the receiver to be tested.
b. Oscilloscope
c. AC Voltmeter
d. Tone Generator with time divisions up to and including 1.0 second on the first tone, interval, and second tone.
e. Frequency Counter such as the Regency EC-175

QUADRATURE DETECTOR ALIGNMENT

1. Turn receiver on and set Alert-Monitor switch to "Monitor" position.
2. Connect the FM signal generator to the antenna input jack. Accurately set the frequency of the signal generator to the channel frequency being used for alignment. Modulate the signal generator with a 1000 Hz tone at 3 KHz deviation.
3. Connect the oscilloscope to point A,(Junction of R113 and C126 on IF/Audio Board).
4. Adjust the output of the signal generator until all noise in the oscilloscope pattern just disappears.
5. Adjust L103 for maximum peak to peak amplitude (of oscilloscope pattern); while maintaining symmetry of the detected signal.

IF ALIGNMENT

1. Connect an AC voltmeter across the speaker terminals.

2. Adjust volume control for 0.5 volt reading on AC voltmeter.

3. Peak T102 (Bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

   NOTE: Coils will have two peaks; adjust core to peak away from the center of form.

4. Pre-align quadrature detector by tuning L103 for maximum noise (AC voltmeter reading).

5. Adjust the volume control for 1 volt noise reading on the AC voltmeter.

6. Connect the R.F. signal generator to the antenna input jack. Turn modulation off. Set the generator to the operating crystal frequency.

7. Adjust the signal generator output until the voltmeter reads 0.2 volts.

8. Adjust T101 and T201 (in that order) for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts.

   NOTE: Coils will have two peaks; adjust core of T101 and T201 to peak away from center of the coil form.

9. Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency. NOTE: Some receivers have the second oscillator at 11.155 MHz, in this case the image frequency is 910 above the channel frequency, for the High Band, and 910 KHz below the channel frequency for the Low Band. Check the frequency marked on top of the crystal.

10. Adjust the signal generator output until voltmeter reads .2 volts.

11. Adjust R102 (bottom core), T102(top core), T101 and T202 (in that order for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the slugs should be within two turns of the position in step No. 3 and 8.

3-4 LOW-BAND RF (RECEIVER) ALIGNMENT

1. Switch the receiver to "Monitor" position.

2. Preset the slugs of L201, L202 and L203 out of the outer end of the coil form three turns.

3. Connect an AC voltmeter across the speaker terminals.

4. With nothing connected to the antenna input, adjust the volume control until the AC voltmeter reads 1 volt of noise.

5. Connect the signal generator to the antenna input of the receiver.

6. Set the signal generator accurately to the frequency of the channel being used for alignment. TURN MODULATION OFF.

7. Adjust the output of the signal generator until the AC voltmeter reads 0.2 volts.

8. Adjust coils L201, L202 and L203 (in that order) for maximum quieting (lowest AC voltmeter reading). Adjust the signal generator output to maintain an AC voltmeter reading between 0.1 volts and 0.2 volts. Repeat adjustments until no further improvement can be made.

HIGH-BAND RF (RECEIVER) ALIGNMENT

1. Switch the receiver to "Monitor" position.
2. Preset the slugs of L201, L202 and L203 out of the outer end of the coil form three turns.
3. Connect an AC voltmeter across the speaker terminals.
4. With nothing connected to the antenna input, adjust the volume control until the AC voltmeter reads 1 volt of noise.
5. Connect the signal generator to the antenna input of the receiver.
6. Set the signal generator accurately to the frequency of the channel being used for alignment. TURN MODULATION OFF.
7. Adjust the output of the signal generator until the AC voltmeter reads 0.2 volts.
8. Adjust coils L201, L202 and L203 (in that order), for maximum quieting (lowest AC voltmeter reading). Adjust the signal generator output to maintain an AC voltmeter reading between 0.1 volts and 0.2 volts. Repeat adjustment until no further improvement can be made.

UHF-BAND RF (RECEIVER) ALIGNMENT

1. Switch the receiver to "Monitor" Position.
2. Pre-adjust Trimmer Capacitor (C217) so that the silvered half moon section is nearest to the rear of the receiver.
3. Connect AC voltmeter across the speaker terminals.
4. With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1 volt of noise.
5. Connect signal generator to antenna input jack. Set generator accurately to the frequency being used for alignment. This should be nearest to the center of all frequencies being used in set.
6. Adjust output of signal generator until AC voltmeter reads 0.2 volts.
7. Adjust C201 and C202 (trimmer capacitors) in that order for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made.

NOTE: Use non-metallic screwdriver for trimmer adjustments. Peaks are very sharp, tune with care. Two peaks can be observed, tune to peak with silver moon section away from I.F. Board.

8. Adjust the core of L-203 for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts.

NOTE: To properly adjust L203, C217 must be pre-adjusted as in Step #1.

9. Adjust C217 counter-clockwise with non-metallic screwdriver for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Do Not re-adjust L203 after C217 is adjusted.

AUTOMATIC FREQUENCY CONTROL (AFC) ALIGNMENT

NOTE: This adjustment requires an accurate 10.7 MHz ± 1 KHz oscillator or 455 KHz ± 500 Hz oscillator. If none are available, proceed to Step 5.

1. Pre-align Quadrature Detector by tuning L103 for maximum noise (AC voltmeter reading) at the speaker terminals.

2. With coupling loop, inject "reference" signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R226 for a reading of 3.8 to 4.0 volts at the collector of Q204.

3. Remove "reference" signal, with unit squelched and receiving no signal. The voltage on the collector of Q204, shall be between 3.2 to 4.6 volts. Of not note voltage and proceed to Step 4. If voltage is between 3.2 to 4.6 volts AFC Alignment is complete.

4. Inject "Reference" voltage and monitor voltage on collector of Q204, adjust L103 for same voltage as in step 3. Re-adjust R226 for a voltmeter reading of 3.8 to 4.0 volts. Repeat Step 3.

NOTE: Do not adjust L103 more than 1/4 turn at a time.

5. If no accurate I.F. signal source is available, an approximate AFC alignment is to adjust L103 for maximum noise (AC voltmeter reading) at the speaker terminals, and with unit squelched and receiveng no signal, adjust R226 for a voltmeter reading of 3.2 to 4.6 on the collector of Q204.

NOTE: Units equipped with 10.245 MHz I.F. crystals have jumper in AFC circuit connected between the base of Q204 and collector of Q206. When 11.155 MHz crystal is used, jumper is connected between base of Q204 and collector of Q205. If crystal is changed from one frequency to the other, jumper must be changed.

NOISE BALANCE ADJUSTMENT

1. Using a 'T' connector, connect the FM signal generator and the Noise generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the Noise signal by means of a 3 or 4 turn loop coupled to the input coil, L201.

2. Connect the oscilloscope to the junction of Q109's emitter and Q110's collector or to the speaker terminals.

3. Apply a 3 to 10μv signal on channel frequency, as accurately as can be set, (carrier only, on modulation) and adjust the output of the noise generator until noise spikes are clearly seen in the audio output as viewed on the oscilloscope. The noise spikes may be either mostly positive or negative if an unbalanced condition exists.

4. Tune L103 (quadrature detector coil) until the noise spikes are equally positive and negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignment and then try the noise balance adjustment again.

TONE DECODER TEST

1. Apply power to the receiver and switch to monitor position.

2. Connect an AC voltmeter across the speaker terminals.

3. Adjust the volume control for 1 volt noise reading on the AC voltmeter.

4. Connect the R.F. signal generator to the antenna input jack. Apply a signal to the receiver.

5. Set the R.F. signal generator to the operating crystal frequency (lowest AC voltmeter reading or maximum quieting).

6. Connect the sequential tone generator to the R.F. signal generator.

7. Install the proper frequency piezoelectric filters (frequency of filters in the unit), in the correct sequence, in the tone generator. Refer to the Crystal/Filters Installation drawing for proper sequencing. Adjust the output of the tones from the tone generator to 0.2 volt P-P (from oscilloscope pattern).

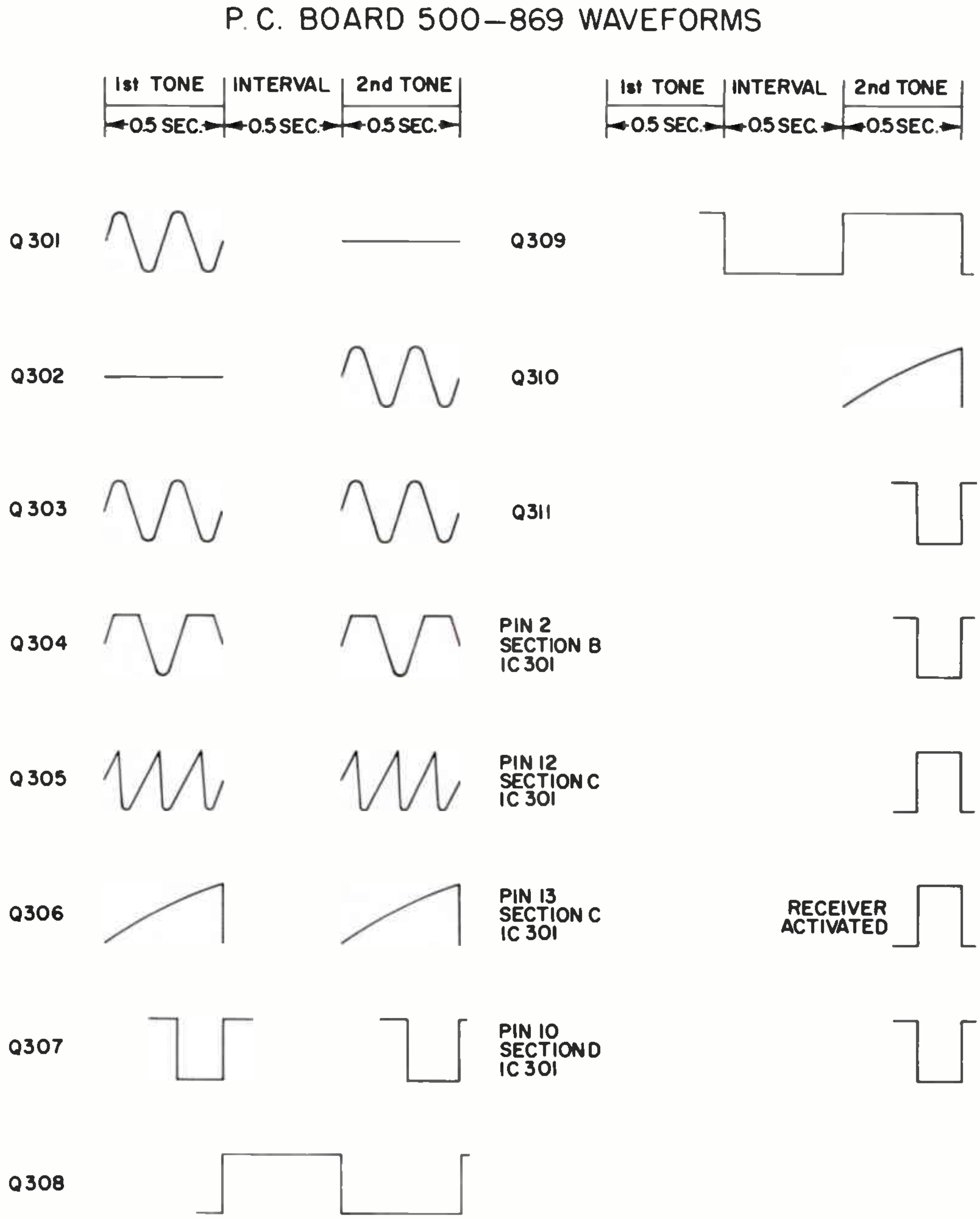
8. Set the time divisions on the tone generator for 0.5 second on the first tone, interval and second tone.

9. Set the R.F. generator for FM modulation. Trigger the tone generator

and set the deviation to 3 KHz for both tones. With this adjustment, check to see is the receiver audio is operating. If it is, you will hear the sequence of tones.

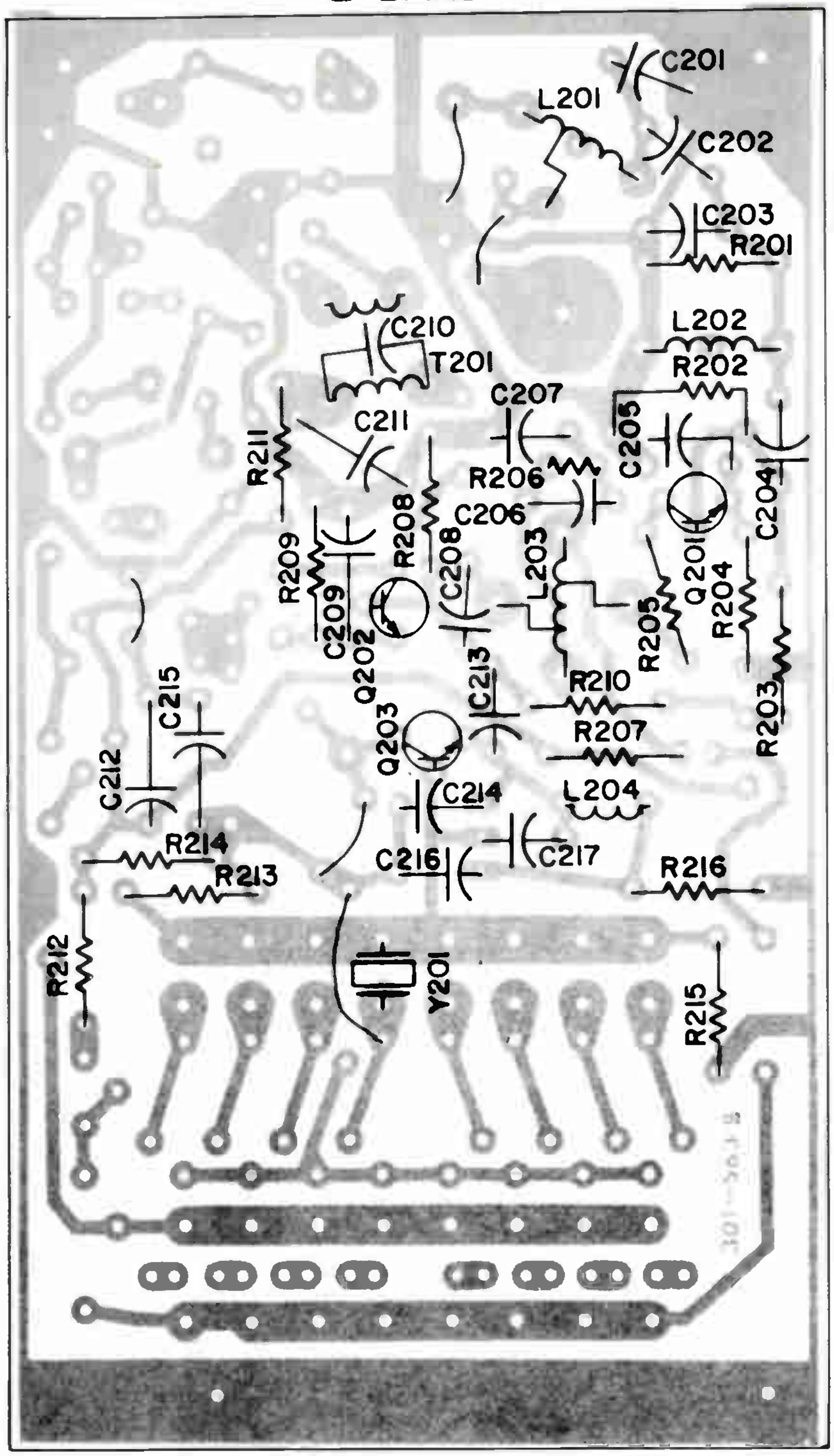
10. Switch the Alert receiver to the Alert position.

11. Trigger the tone generator to activate the receiver.



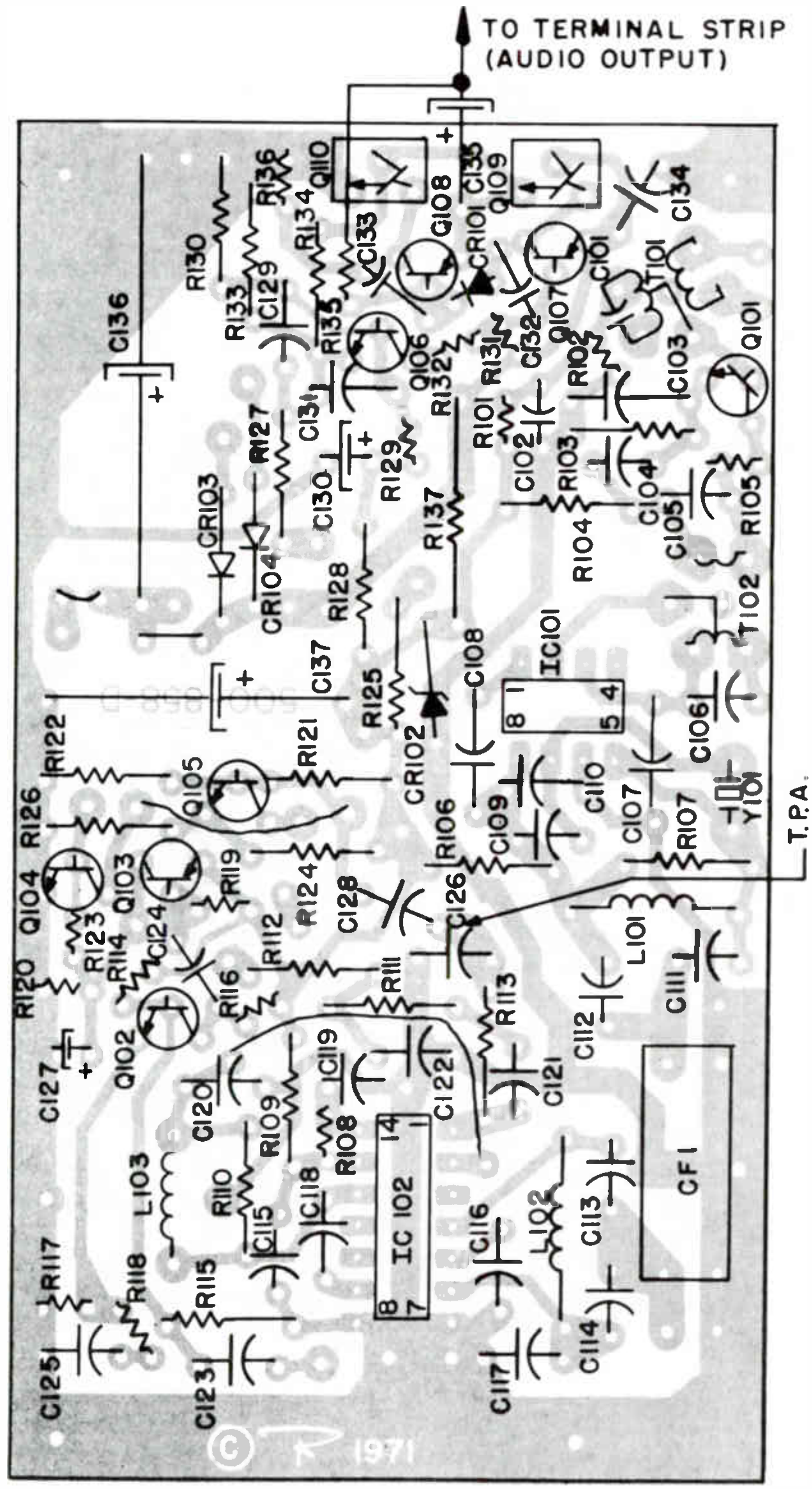
WAVEFORMS DECODER BOARD

RF BOARD 301-563-B
L BAND



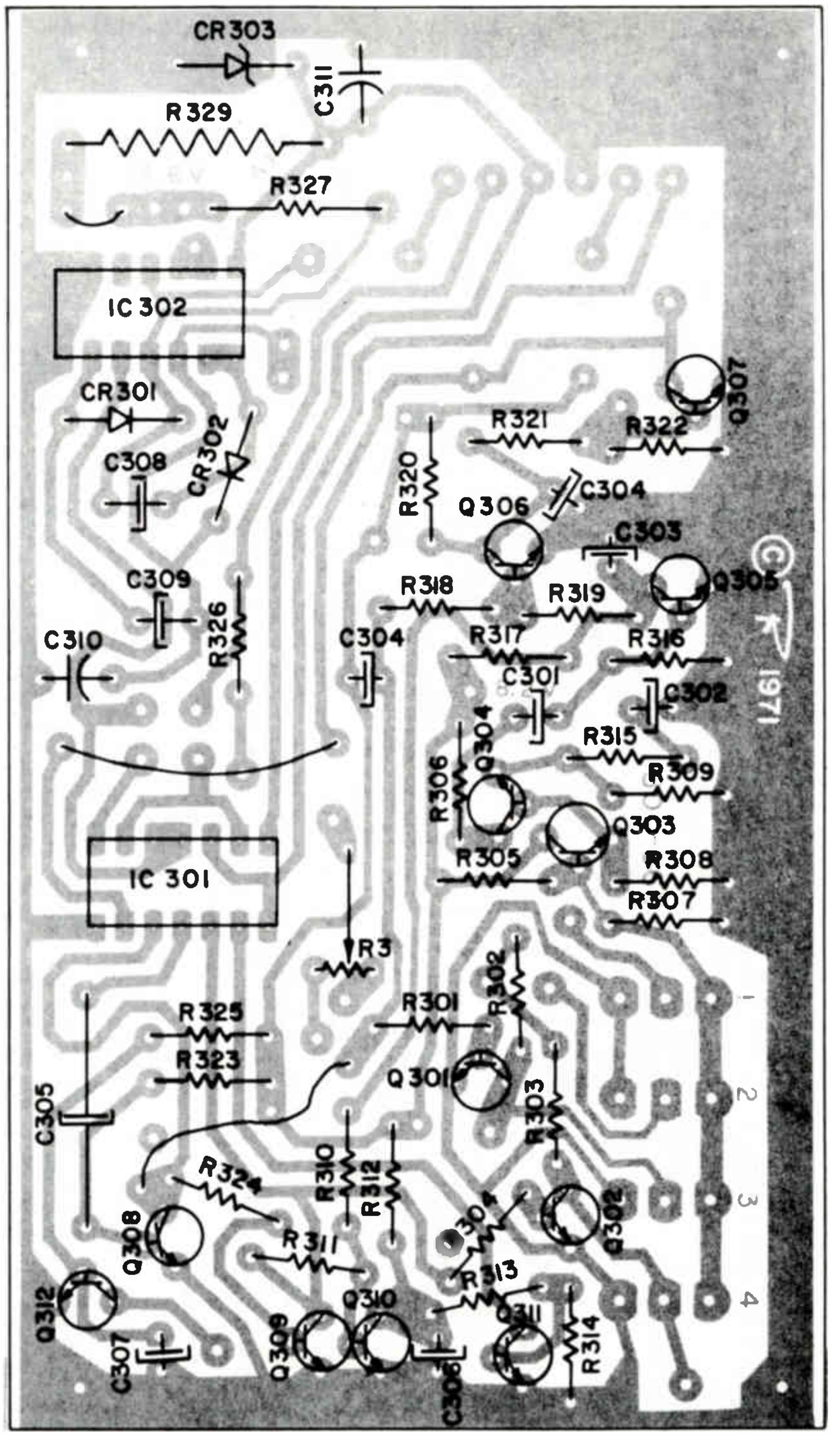
LOW-BAND RF BOARD BOTTOM VIEW

IF BOARD 500-858

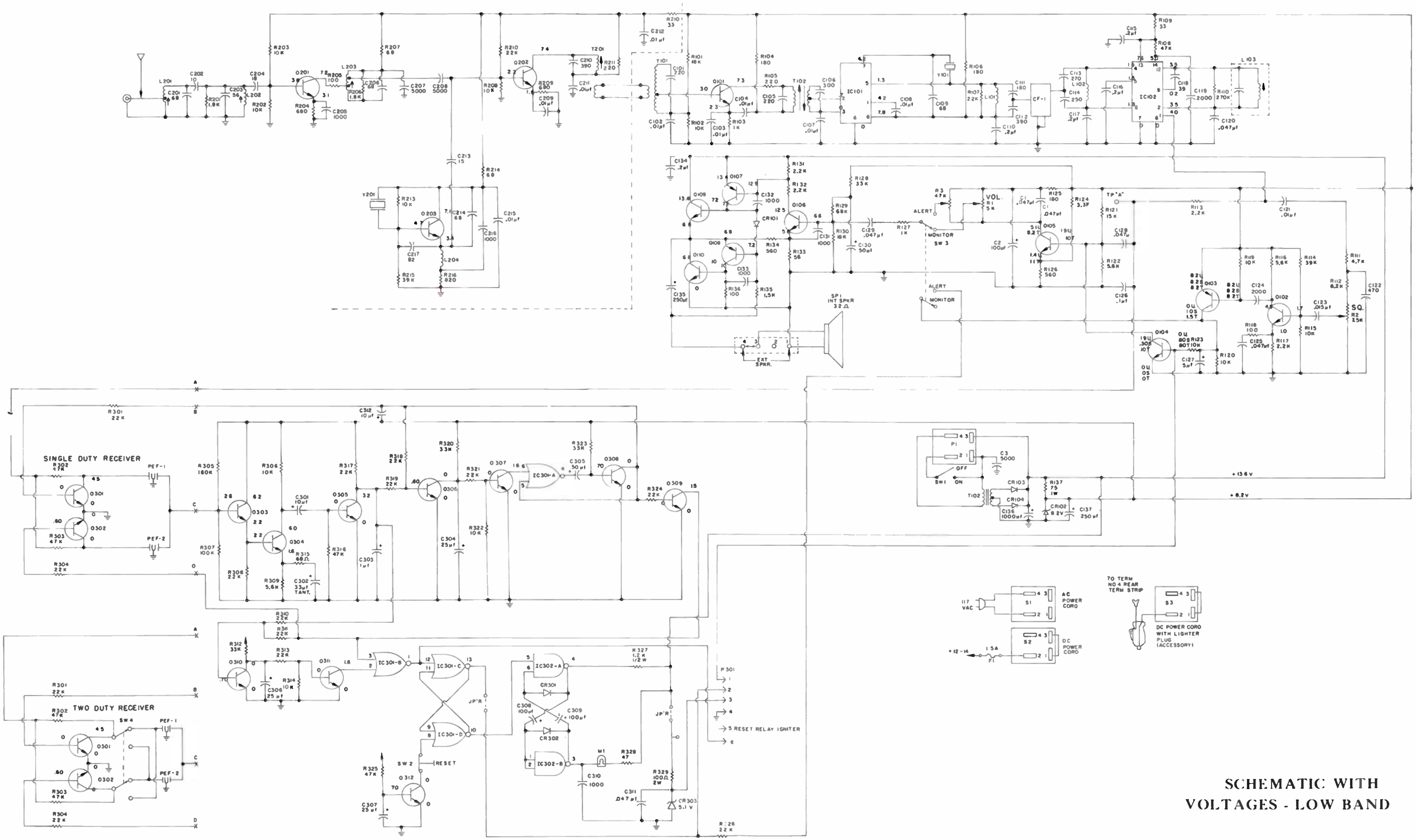


IF/AUDIO BOARD BOTTOM VIEW

TONE DECODER BOARD
500-869

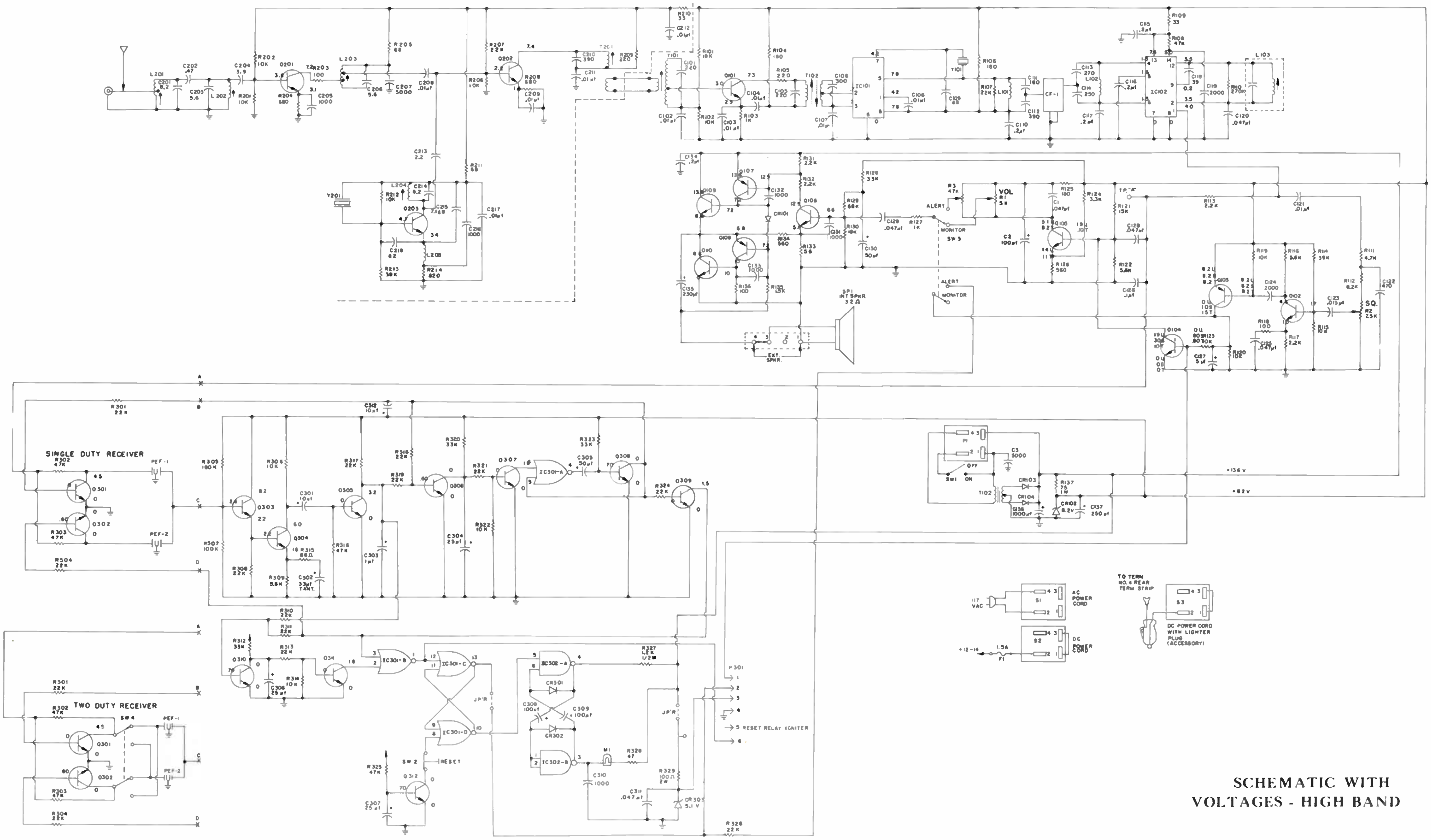


TONE DECODER BOARD BOTTOM VIEW



SCHEMATIC WITH VOLTAGES - LOW BAND

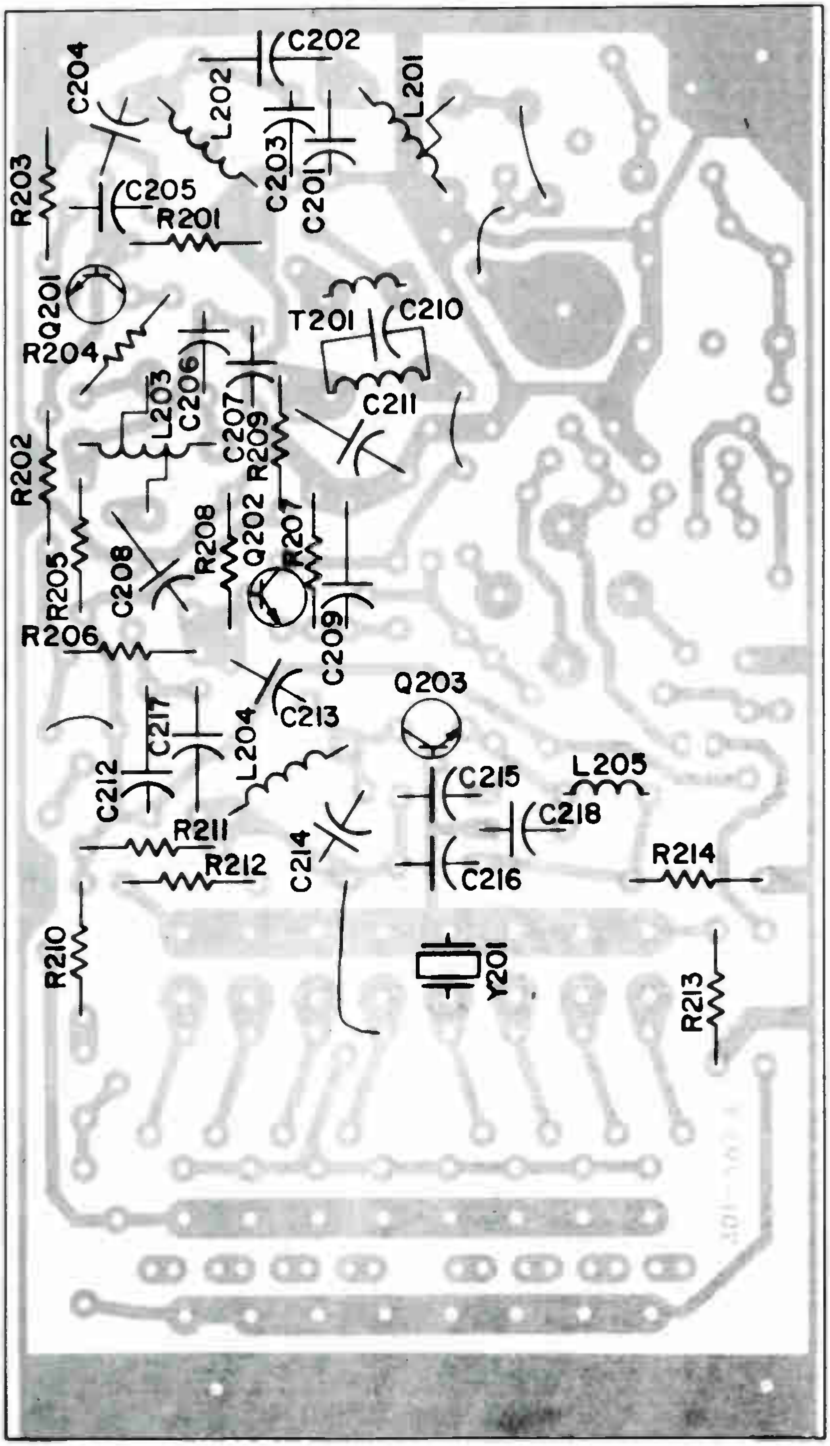
MODELS R1LT1-1, R2LT1-1



SCHEMATIC WITH VOLTAGES - HIGH BAND

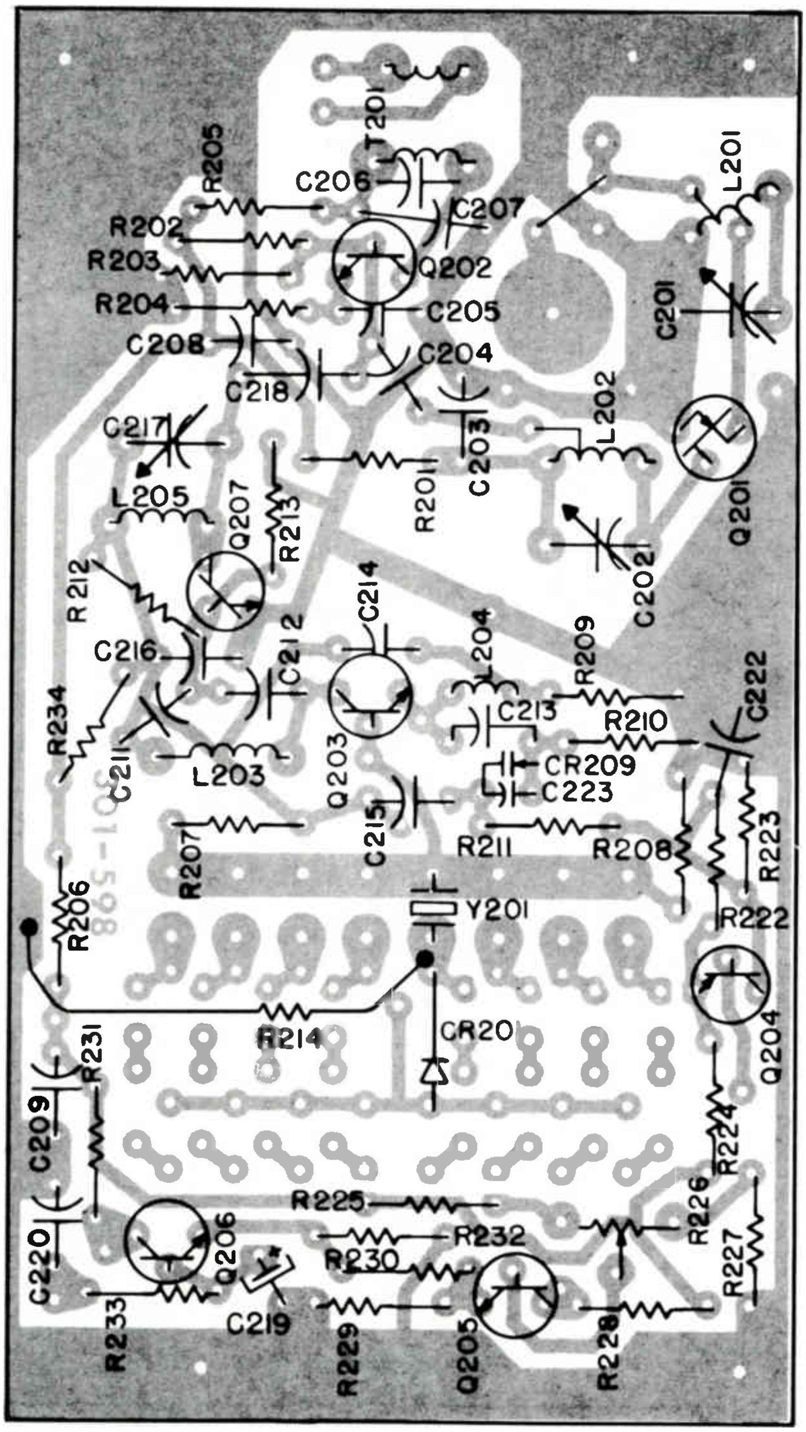
MODELS R1HT1-1, R2HT1-1

RF BOARD 301-563-B
H BAND



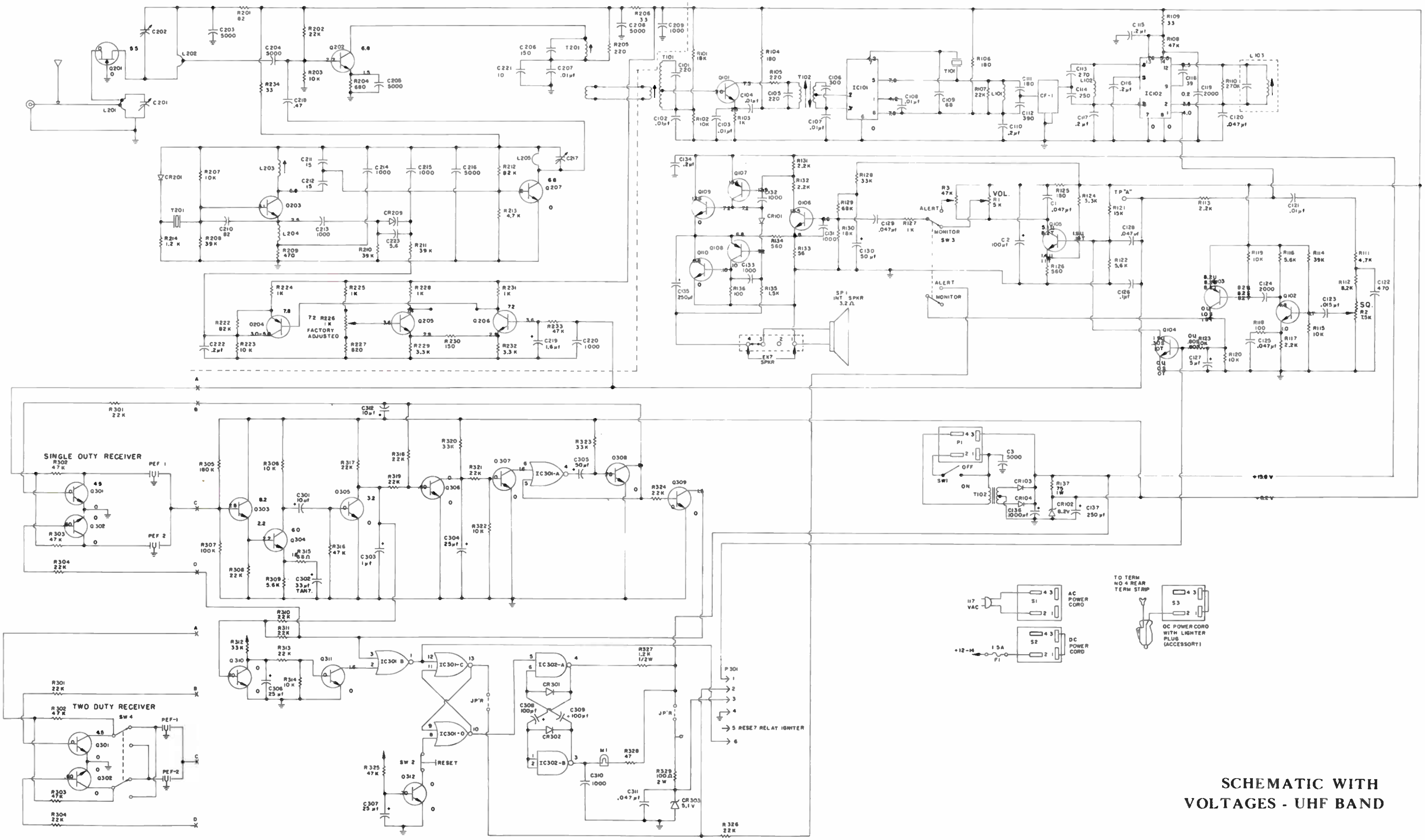
HIGH-BAND RF BOARD BOTTOM VIEW

RF BOARD 301-598



C223 & R214 ON BOTTOM OF BOARD

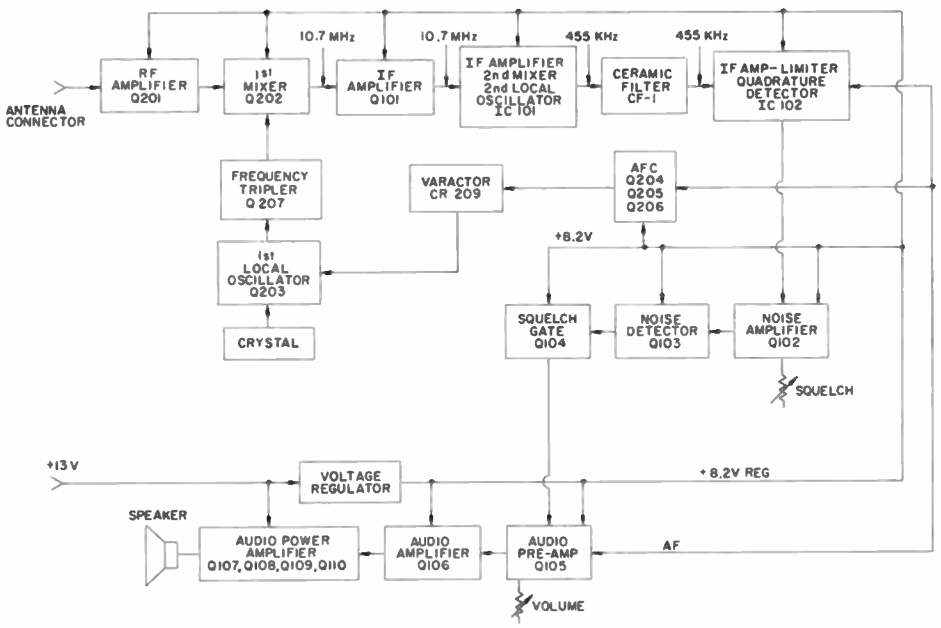
UHF-BAND RF BOARD BOTTOM VIEW



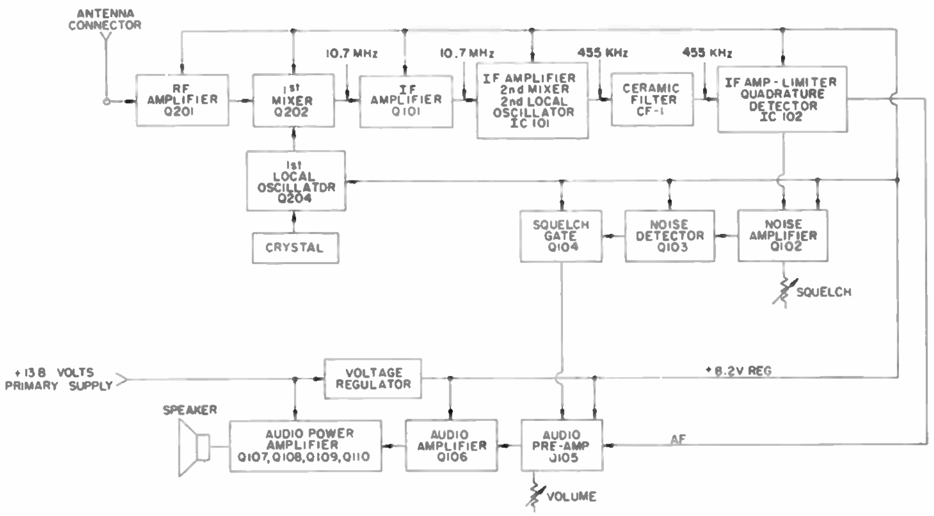
SCHEMATIC WITH VOLTAGES - UHF BAND

MODELS R1UT1-1, R2UT1-1

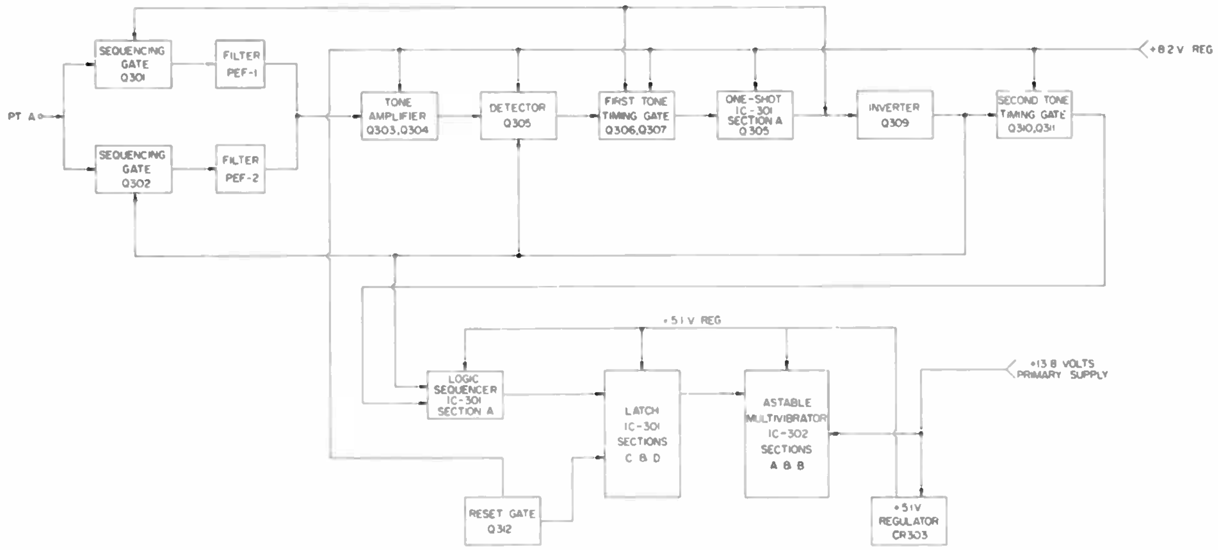
Regency R1HT1-1, R1LT1-1, R1UT1-1, R2HT1-1, R2LT1-1, R2UT1-1



UHF BAND RECEIVER BLOCK DIAGRAM



HIGH BAND OR LOW BAND RECEIVER BLOCK DIAGRAM



TONE DECODER BLOCK DIAGRAM

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(Low & High Band)		
Q201	SPS-1473	
Q202	SPS-1473	
Q203	SM-4304-S	2N5130
(UHF Band)		
CR209	MV2209 (Motorola)	
Q201	2N5245	2N5245
Q202	SPS-1473(RT)	
Q203	SM-4304-S	2N5130
Q204	SPS-1539(WT)	2N5227
Q205	SPS-952	MPS5172
Q206	SPS-952	MPS5172
Q207	SPS-1473(RT)	2N5222

Note: RT (Red Top), WT (White Top)

ITEM	PART NO.	TYPE
(All Bands)		
IC101	301-679-1	MC-1550P
IC102	301-576-3	MC-1375P
IC301		MC-7402
IC302	301-576-2	MC-858
CR101	102-412	1N4148
CR102		1N4738A
CR301	102-412	1N4148
CR302	102-412	1N4148
CR303		1N4733
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539(WT)	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107		MPS-A55
Q108		MPS-A55
Q109		MJE-521
Q110		MJE-521
Q301	SPS-952	MPS5172
Q302	SPS-952	MPS5172
Q303	SPS-952	MPS5172
Q304	SPS-952	MPS5172
Q305	SPS-952	MPS5172
Q306	SPS-952	MPS5172
Q307	SPS-952	MPS5172
Q308	SPS-952	MPS5172
Q309	SPS-952	MPS5172
Q310	SPS-952	MPS5172
Q311	SPS-952	MPS5172
Q312	SPS-952	MPS5172

Note: RT (Red Top), WT (White Top)

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
(UHF Band)		
C201	10S-Triko 22	2-8pf
C202	10S-Triko 22	2-8pf
C217	10S-Triko 22	2-8pf
C219		1mfd 50V
(All Bands)		
C2		100mfd 10V
C127		5mfd 25V
C130		10mfd 10V
C135		250mfd 16V
C136		1000mfd 16V
C137		250mfd 10V
C301		10mfd 10V
C302		33mfd 10V
C303		1mfd 50V
C304		25mfd 10V
C305		50mfd 16V
C306		25mfd 10V
C307		25mfd 10V
C308		100mfd 16V
C309		100mfd 16V
C312		10mfd 10V

CONTROLS

ITEM	PART NO.	DESCRIPTION
(UHF Band)		
R226	X201R102C	1000 ohms Bias
(All Bands)		
R1	102-479-3	5000 ohms Volume/Switch
	102-479*	5000 ohms Volume/Switch
R2	102-479-2	7.5K Squelch
R3	E086TYPE	47K Alert Volume
	2322-410-033-09	47K Alert Volume

* Single Duty Receiver

COILS/TRANSFORMERS

ITEM	PART NO.	ITEM	PART NO.
(Low Band)		(UHF Band)	
L201	301-520-4	L201	301-600-1
L202	301-520-5	L202	301-600-2
L203	301-520-6	L203	301-520-2
L204	102-369	L205	301-600-3
T201	102-405	T201	301-619
(High Band)		(All Bands)	
L201	301-520-1	L101	ES-2502
L202	301-520-2	L102	ES-2228
L203	301-520-3	L103	301-517
L204	301-520-2	T101	102-507
L205	102-369	T102(I.F.)	301-683
T201	102-405	T102 (P.T.)	301-515

MISCELLANEOUS

ITEM	NAME	PART NO.
CF-1	455KC Filter	301-723
F1	Fuse, 1-1/2 Amp.	3AG
PEF-1	Tuning Fork	Specify Frequency
PEF-2	Tuning Fork	Specify Frequency
SP1	Speaker (3.2 ohms, 4")	301-537-1
SW1	Switch, On-Off	301-551-4
SW2	Switch, Reset	301-551-4
SW3	Switch, Monitor - Alert	301-551-4
SW4	Switch, Two Duty	301-551-4
Y101	Crystal, 10.245MC	301-516-1
	Crystal, 11.155MC	301-516-2
Y201	Crystal, Low Band	301-542
	Crystal, High Band	301-532
	Crystal, UHF Band	301-603
	Antenna, Telescopic (Low Band)	TAD39245-0-A0
	Antenna, Telescopic (High Band)	P-6-125/102
	Antenna, Telescopic (UHF Band)	REG-1

CABINET PARTS

NAME	PART NO.
Cabinet/Wrap Ass'y	600-259-1
Rear Panel	300-079-14
Knob, Volume	27500
Knob, Squelch	27500

Pages 51-66 Courtesy of REGENCY ELECTRONICS, INC.

1-2 CRYSTAL SPECIFICATIONS

Minature plug-in crystals are utilized in the receiver. Because of the high accuracy (close tolerances) required, Shepherd Industries' crystals are recommended. If the crystals are ordered from Regency, it is only necessary to specify the part No. 301-603 and the desired receive frequency.

If desired, the crystals may be purchased from other manufacturers. The following specifications must be included in the order:

a. $\text{Crystal Frequency} = \dfrac{\text{Receive Frequency} - 10.7\ \text{MHz}}{9}$

EXAMPLE

$\text{Crystal Frequency} = \dfrac{458.000\ \text{MHz} - 10.700\ \text{MHz}}{9}$

Crystal Frequency = 49.70000 MHz

b. Frequency Tolerance of .001%

c. 3rd overtone

d. Parallel resonance - 18pf load capacity

e. Maximum equivalent series resistance of 35 ohms

f. Drive level of 2 MW

g. Holder: HC-25/U

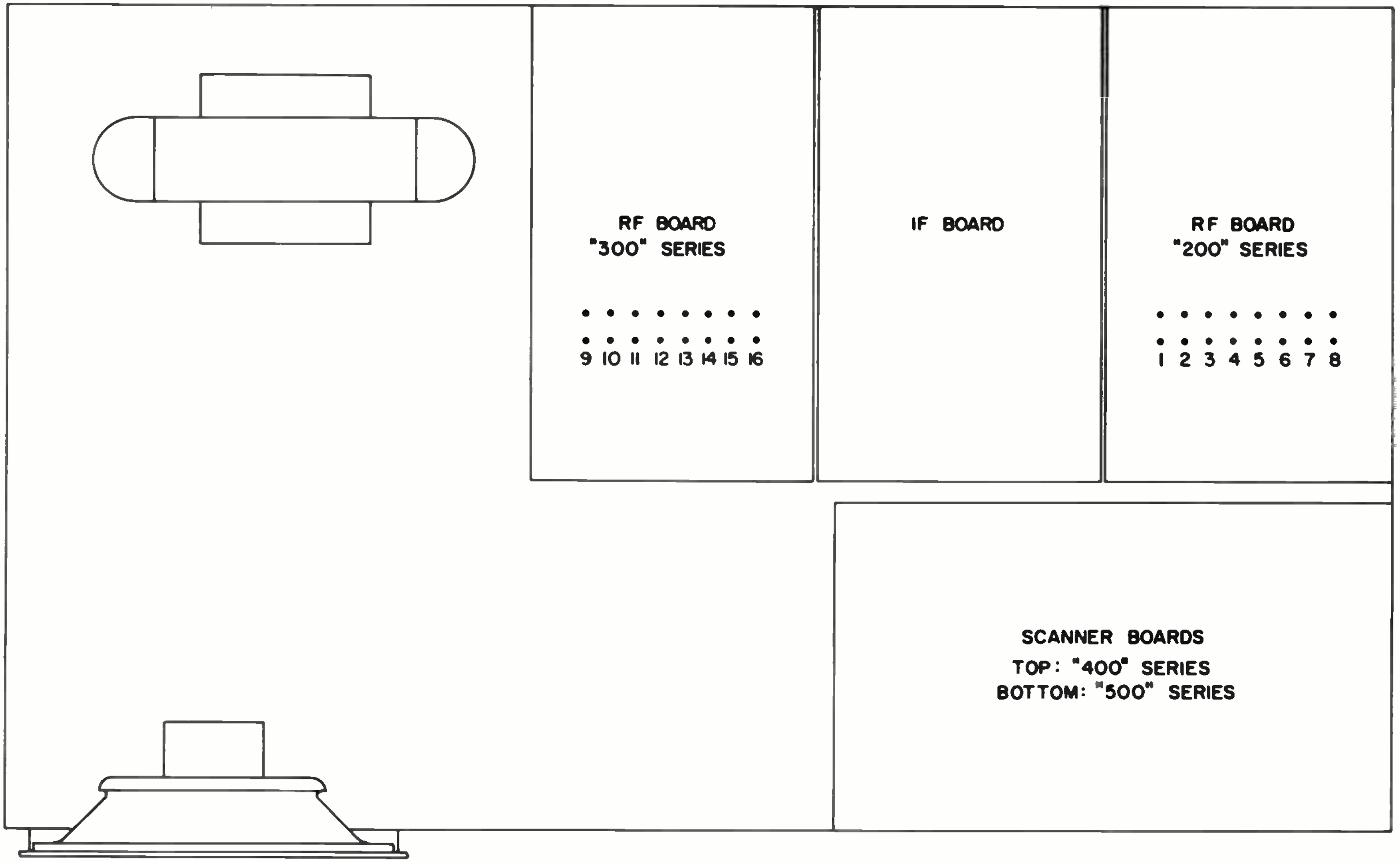
1-3 CRYSTAL INSTALLATION

Prior to installing a crystal, the receiver will have to be partially pulled out of its cabinet. First, remove the telescopic antennas if they are installed. Second, remove the two knobs (volume and squelch). Third, remove the rear panel (cover) by removing the four mounting screws. Fourth, remove the four rubber feet by unscrewing each one. The receiver may then be slid rearward from the cabinet until the crystal socket pins are accessible.

Insert the crystal in the proper socket pins as indicated on the Crystal Location Diagram 3-10. The sockets are numbered, in pairs, from left to right, corresponding to the channel number on the front panel.

After the crystals are installed, carefully slide the unit back into the cabinet. Screw the four feet back into place and replace the rear panel. Push the volume and squelch knobs back on their shafts and the unit is again ready for operation.

3-10 CRYSTAL LOCATION DIAGRAM



SECTION 2 ALIGNMENT AND TUNING PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM

NOTE: During all steps of alignment, the squelch control should be set fully to the right (minimum squelch action).

All receiver RF boards should be aligned to the channel nearest the center of the frequency range over which they will operate.

2-2 IF ALIGNMENT

2-2-1 Connect AC voltmeter across speaker terminals.

2-2-2 Adjust volume control for 0.5 volt reading on AC voltmeter.

2-2-3 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

NOTE: Coils will have two peaks; adjust core to peak away from the center of form.

2-2-4 Pre-align quadrature detector by tuning L103 for maximum noise (AC voltmeter).

2-2-5 Adjust volume control for 1 volt noise reading on AC voltmeter

2-2-6 Connect the R.F. signal generator to the antenna input jack of "200" series board. Turn modulation off. Set the genenerator to the operating crystal frequency.

2-2-7 Adjust the signal generator output until the voltmeter reads 0.2 volts.

2-2-8 Adjust T101 and T201 (in that order) for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts.

NOTE: Coils will have two peaks; adjust core of T101 to peak away from center of the coil form, and adjust core of T201 to peak nearest the center of the coil form.

Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency. NOTE: some receivers have the second oscillator at 11.155 MHz, in this case the image frequency is 910 KHz above the channel frequency. Check the frequency marked on top of the crystal.

NOTE: The AFC circuit action will be reversed when tuning to the 910 KHz image frequency. This means that the Image will be sharp, or narrow, with respect to tuning the RF signal generator.

Adjust the signal generator output until voltmeter reads .2 volts.

Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order) for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the cores should be withing two turns of the position in step No. 3 and 8.

RF ALIGNMENT

Pre-Adjust Trimmer Capacitor (C217) so that the silvered half-moon section is nearest to the rear of the receiver.

Connect AC voltmeter across the speaker terminals.

With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1-volt of noise.

Connect signal generator to antenna input jack. Set generator accurately to the frequency being used for alignment. This should be nearest to the center of all frequencies being used in set.

Adjust output of signal generator unitl AC voltmeter reads 0.2 volts.

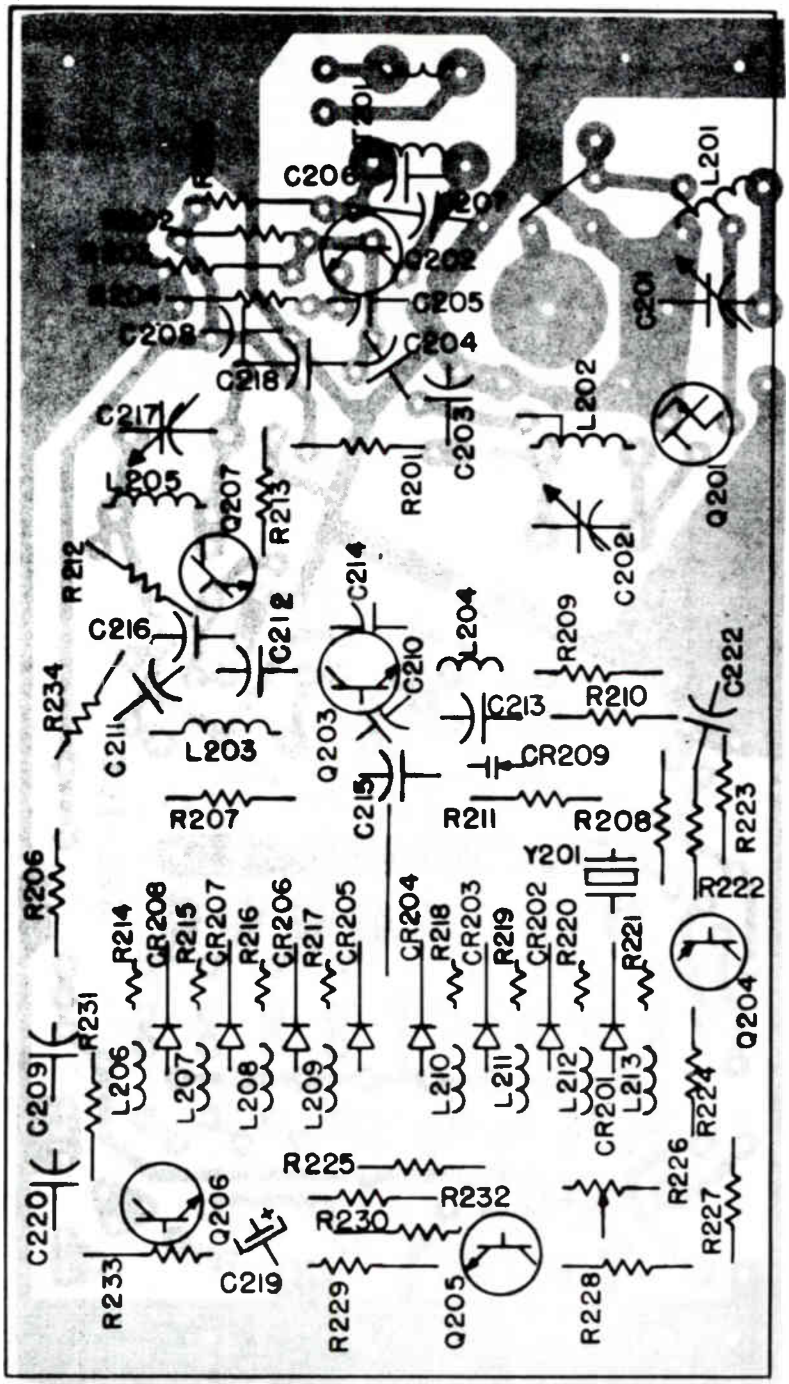
Adjust C201 and C202 (trimmer capacitors), in that order, for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts.

NOTE: Use non-metallic screwdriver for trimmer adjustments.

Peaks are very sharp, tune with care. Two peaks can be observed, tune to peak with silver half-moon section towards I.F. Board.

Adjust the core of L203 for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts.

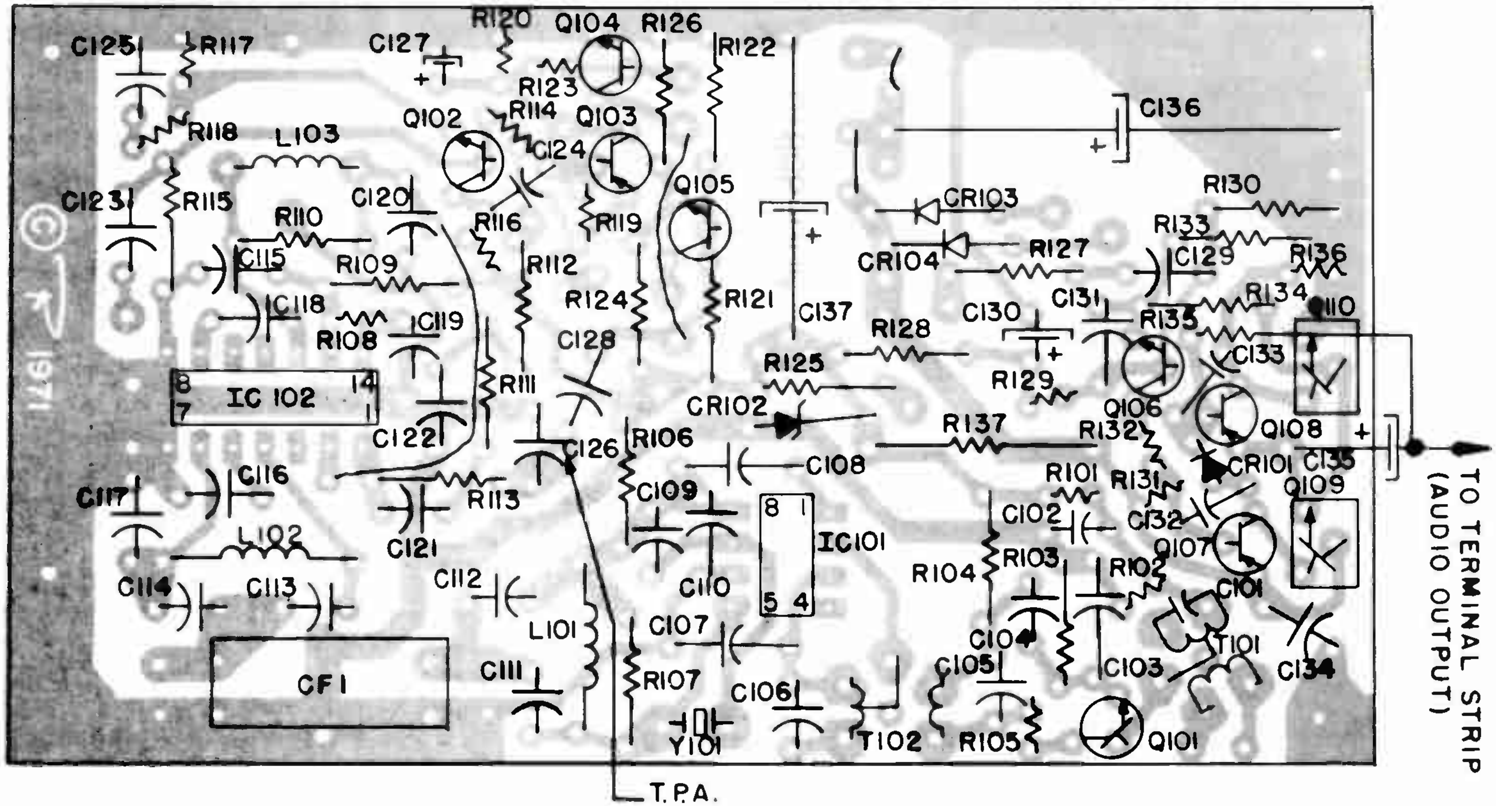
RF BOARD 301-598



BOTH UHF RF BOARDS ARE IDENTICAL EXCEPT FOR ONE BEING A "200" SERIES BOARD AND THE OTHER A "300" SERIES BOARD.

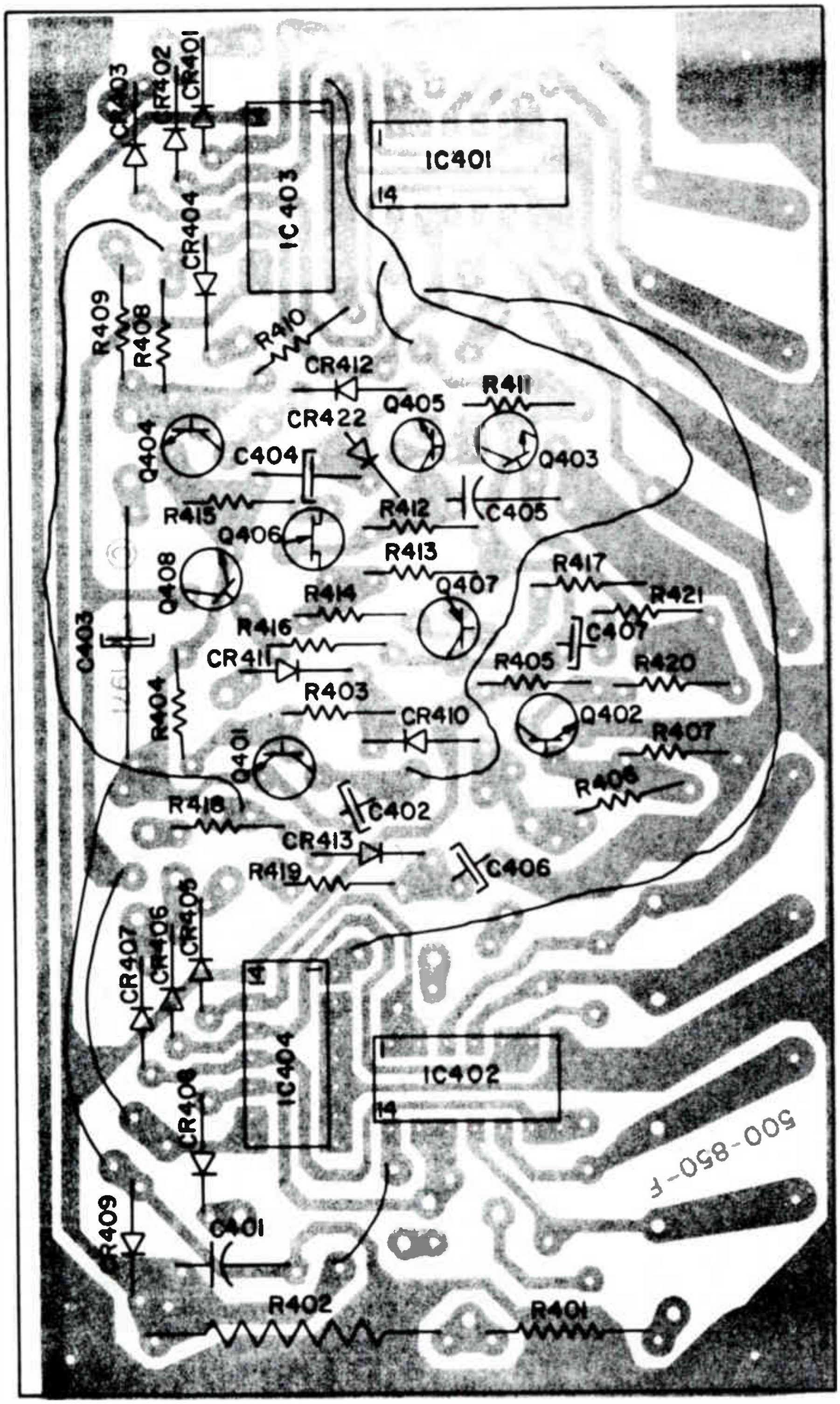
RF BOARD BOTTOM VIEW

IF/AUDIO BOARD BOTTOM VIEW



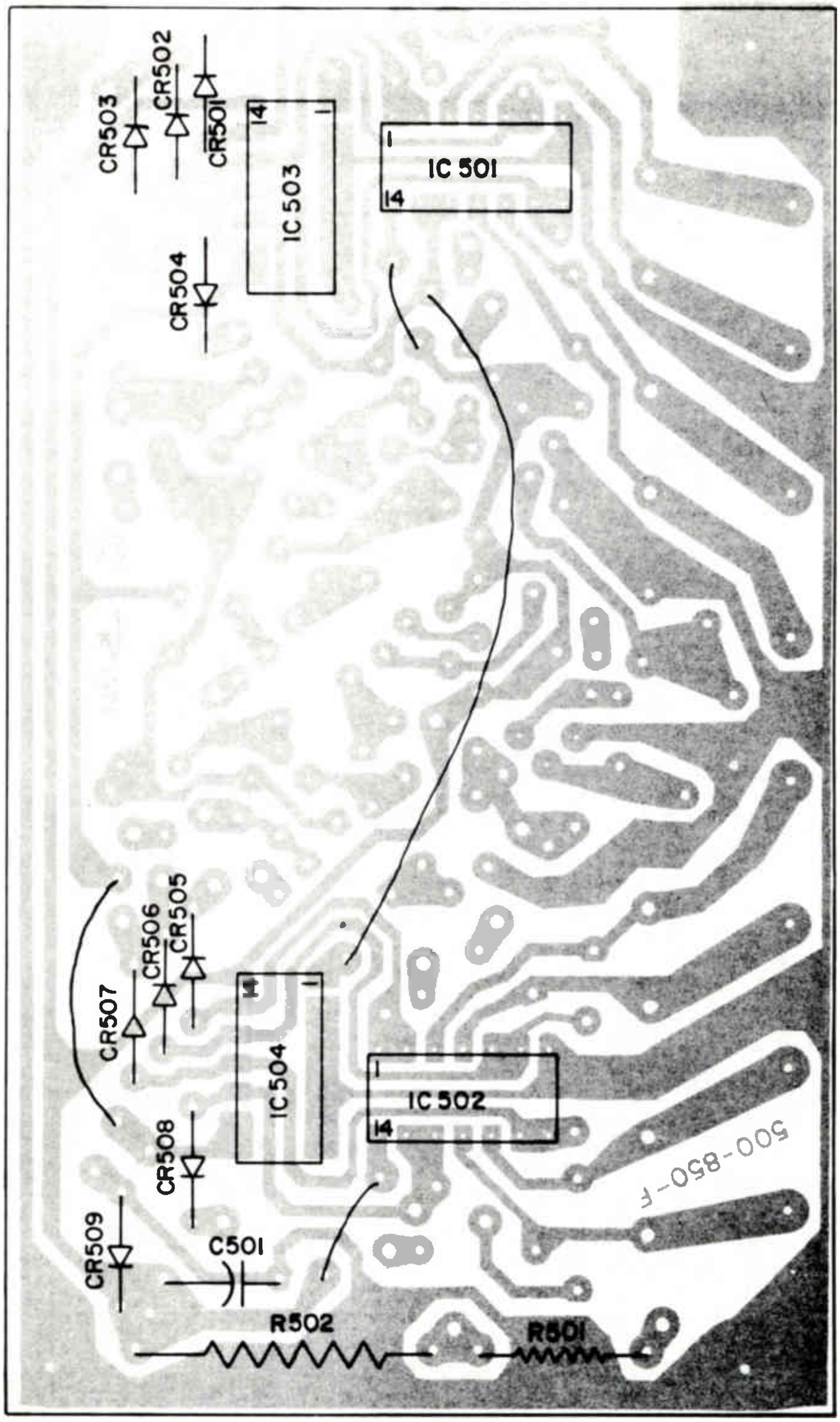
IF BOARD 500-858

SCAN BOARD 500-850



SCANNER BOARD BOTTOM VIEW

SCAN BOARD 500-850



SCANNER BOARD (SECONDARY) BOTTOM VIEW

3-9 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

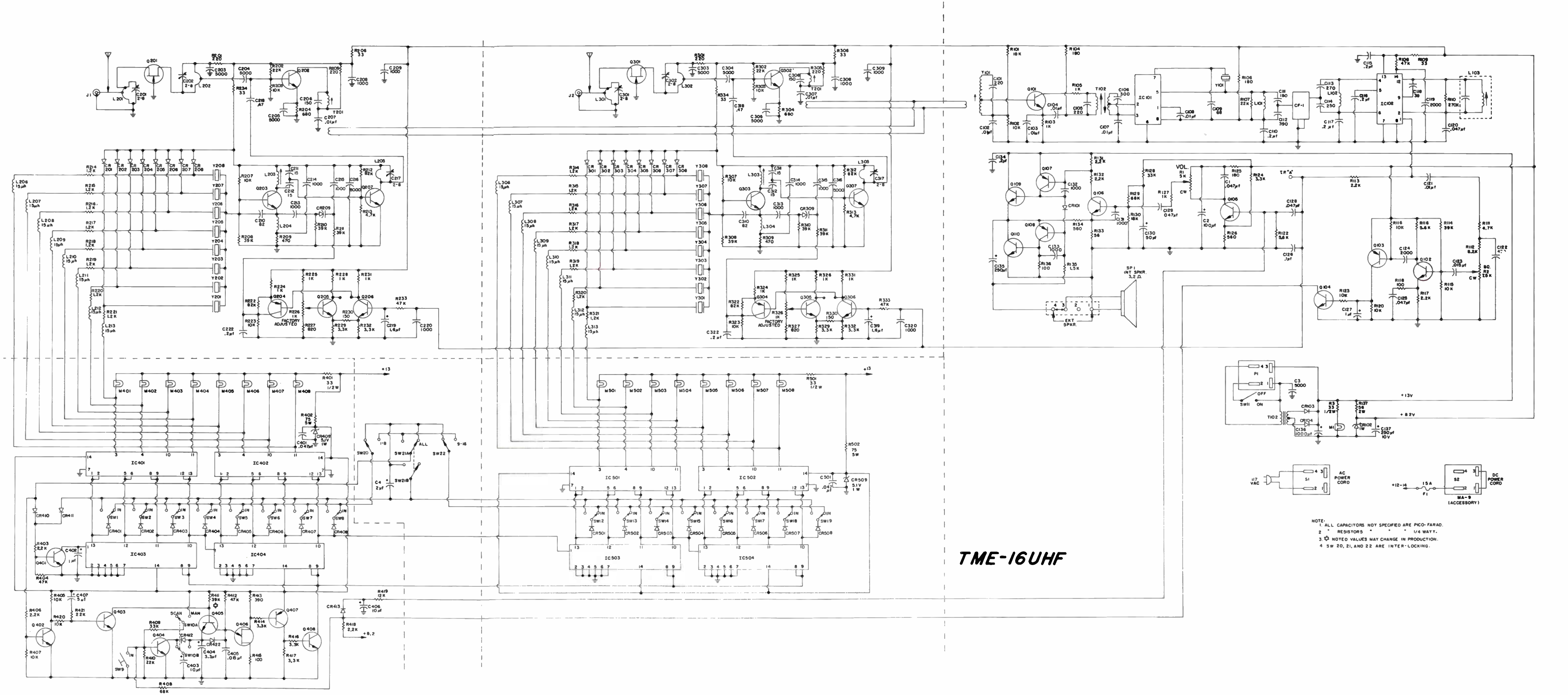
VOLTAGE DATA – TRANSISTORS:

	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
RF Board No. 301-598	Q201 (FET)	0	0	5.5	
	Q202	1.5	2.2	6.8	
NOTE: "300" Series RF Board voltages identical to "200" Series RF Board voltages	Q203	2.5	3.1	6.8	
	Q204	7.8	7.2	3.0-5.0	
	Q205	2.9	3.6	7.4	
	Q206	2.9	3.6	7.2	
	Q207	0	.2	6.8	
IF Board No. 500-858	Q101	2.3	3.0	5.8	
	Q102	1.0	1.7	4.8	
	Q103 (PNP)	8.2	8.2	0	(unsquelched)
		8.2	8.2	1.0	(squelched)
		8.2	8.2	1.5	Min. (tight squelch)
	Q104	0	0	7.2	(unsquelched)
		0	.80	.30	(squelched)
		0	.80	.10	(tight squelch)
	Q105	1.4	1.9	5.1	(unsquelched)
		1.1	.10	8.2	(tight squelch)
	Q106	0.7	1.3	12.4	
	Q107 (PNP)	13.8	13.1	7.2	
	Q108 (PNP)	6.9	6.6	.10	
	Q109	6.9	7.2	13.8	
	Q110	0	.10	6.9	
Scan Board	Q401	0	.70	.10	(SCAN)
		0	.70	0	(MAN)
	Q402	0	.70	.10	
	Q403	0	.10	3.6	(SCAN)
		0	.10	1.2	(MAN)
	Q404	0	.10	2.8	(SCAN)
		0	.70	0.2	(MAN)
	Q405	3.1	3.6	3.2	(SCAN)
		0.7	1.2	0.7	(MAN)
	Q407 (PNP)	5.1	4.5	.20	(SCAN)
		5.1	4.6	.10	(MAN)
	Q408	0	.10	1.5	
		Base 1	Emitter	Base 2	
	Q406 (unijunction)	.20	3.2	4.6	(SCAN)
		.20	0.7	4.6	(MAN)

Voltage Data – Integrated Circuits

NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M401 is lighted).

	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IF Board 500-858	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	—	—	—	—	—	—
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0
Scan Board 500-850	IC 401	.7P 3.3	.7P 3.3	9P 0.5	9P 10.8	.7P 0.2	.7P 0.2	0 0	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
	IC 402	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	0 0	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
	IC 403	0.1 0	0 0	0 0	0 0	0 0	0 0	0 0	1.5 1.5	1.5 1.5	.7P 0.2	.7P 0.2	.7P 0.2	.7P 3.3	5.1 (Scan) 5.1 (Man)
	IC 404	.7P 0.2	0 0	0 0	0 0	0 0	0 0	0 0	1.5 1.5	1.5 1.5	.7P 0.2	.7P 0.2	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
Scan Board Secondary 500-850	IC 501	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	0 0	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
	IC 502	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	0 0	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
	IC 503	.7P 0.2	0 0	0 0	0 0	0 0	0 0	0 0	1.5 1.5	1.5 1.5	.7P 0.2	.7P 0.2	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
	IC 504	.7P 0.2	0 0	0 0	0 0	0 0	0 0	0 0	1.5 1.5	1.5 1.5	.7P 0.2	.7P 0.2	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)



TME-16UHF
NOTE-
1. ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD.
2. " RESISTORS " " " 1/4 WATT.
3. NOTED VALUES MAY CHANGE IN PRODUCTION.
4. SW 20, 21, AND 22 ARE INTER-LOCKING.

NOTE: To properly adjust L203, C217 must be pre-adjusted as in Step 2-3-1.

Adjust C217 counter clockwise with non-metallic screwdriver for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Do NOT re-adjust L203 after C217 is adjusted.

Re-adjust C201, C202 and C217 (only) for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

Connect the R.F. signal generator to the antenna input jack of the "300" series board. Set the generator to the operating crystal frequency.

Adjust output of signal generator until AC voltmeter reads 0.2 volts.

Pre-Adjust Trimmer Capacitor (C317) so that the silvered half-moon section is nearest to the rear of the receiver.

Adjust T301 for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 voltmeter.

Adjust C301 and C302 (trimmer capacitors) in that order, for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

NOTE: Use non-metallic screwdriver for trimmer adjustments.

Peaks are very sharp, tune with care. Two peaks can be observed, tune to peak with silver moon section away from I.F. Board.

Adjust the core of L303 for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts.

NOTE: To properly adjust L303, C317 must be pre-adjusted as in Step 2-3-11.

Adjust C317 counter clockwise with non-metallic screwdriver for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and

.2 volts. Do NOT re-adjust L303 after C317 is adjusted.

Re-adjust C301, C302 and C317 (only) for maximum quieting (lowest meter reading). Adjust signal generator output to maintain .1 and .2 volts. Repeat adjustments until no further improvements can be made.

2-4 AFC ALIGNMENT

NOTE: This adjustment requires an accurate 10.7 MHz ± 1 KHz oscillator or 455 KHz ± 500 Hz oscillator to be used as a reference signal. If none are available, proceed to Step 2-4-6.

Pre-align Quadrature Detector by tuning L103 for maximum noise (AC voltmeter reading) at the speaker terminals.

With a coupling loop, inject "reference" signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R226 for a reading of 3.8 to 4.0 volts at the collector of Q204.

Remove the "reference" signal and have the unit squelched and receiving no signal. The voltage on the collector of Q204 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 2-4-4. If voltage is between 3.2 and 4.6 volts, AFC Alignment is complete for "200" series RF board. Proceed to Step 2-4-5.

NOTE: Any further adjustments made to L103 and R226 will require AFC to be re-adjusted.

Inject "Reference" signal and monitor voltage on collector of Q204, adjust L103 for same voltage as noted in Step 3. Re-adjust R226 for a voltmeter reading of 3.8 to 4.0 volts. Repeat Step 2-4-3.

NOTE: Do not adjust L103 more than 1/4 turn at a time.

Inject reference signal and adjust R326 for a reading of 3.8 to 4.0 volts at the collector of Q304. AFC alignment is complete for the TME-16U.

If an accurate I.F. signal source is not available, an approximate AFC alignment can be made by adjusting L103 for maximum noise (AC voltmeter reading) at the speaker terminals, and with unit squelched and receiving no signal, adjust R226 for a voltmeter reading of 3.2 to 4.6 on the collector of Q204 and adjust R326 for a voltmeter reading of 3.2 to 4.6 on the collector of Q304.

NOTE: Units equiped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q204 and collector of Q206. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q204 and the collector of Q205. If crystal is changed from one frequency to the other, the jumper must be changed. This also must be done to the "300" series RF board.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
CR101	102-412	1N4148
CR102	1N4738A	1N4738A
CR103	1N4002	1N4002
CR104	1N4002	1N4002
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
CR209	MV2209	
CR401	102-412	1N4148
CR402	102-412	1N4148
CR403	102-412	1N4148
CR404	102-412	1N4148
CR406	102-412	1N4148
CR407	102-412	1N4148
CR409	1N4733A	1N4733A
CR410	102-412	1N4148
CR411	102-412	1N4148
CR413	102-412	1N4148
CR422	102-412	1N4148
CR501	102-412	1N4148
CR502	102-412	1N4148
CR503	102-412	1N4148
CR504	102-412	1N4148
CR505	102-412	1N4148
CR506	102-412	1N4148
CR507	102-412	1N4148
CR508	102-412	1N4148
CR509	1N4733A	1N4733A
IC101	301-679-1	
IC102	301-576-3	MC-1357P
IC401	301-576-2	
IC402	301-576-2	
IC403	301-576-6	
IC404	301-576-6	
IC501	301-576-2	
IC502	301-576-2	
IC503	301-576-6	
IC504	301-576-6	
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539(WT)	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107	MPS-A55	MPS-A55
Q108	MPS-A55	MPS-A55
Q109	MJE-521	
Q110	MJE-521	
Q201	2N5245	2N5245
Q202	SPS-1473(RT)	2N5222
Q203	SM-4304-S	2N5130
Q204	SPS-1539(WT)	2N5227
Q205	SPS-952	MPS-5172
Q206	SPS-952	MPS-5172
Q207	SPS-1473(RT)	2N5222
Q401	SPS-952	MPS5172
Q402	SPS-952	MPS5172
Q403	SPS-952	MPS5172
Q404	SPS-952	MPS5172
Q405	SPS-952	MPS5172
Q406	2N4871	2N4871
Q407	SPS-1539(WT)	2N227
Q408	SPS-952	MPS5172

Note: (WT) White Top,
(RT) Red Top

VARIABLE CAPS

ITEM	PART NO.	VALUE
C201	10S-Triko 22	2-8pf
C202	10S-Triko 22	2-8pf
C217	10S-Triko 22	2-8pf

CONTROLS

ITEM	PART NO.	DESCRIPTION
R1	R72-00691	5000-ohm Volume
R2	R72-00692	7.5K Squelch
R226	X201R102B	1000 ohms

COILS/TRANSFORMERS

ITEM	PART NO.		
L101	ES-2228	L204	102-369
L102	ES-2228	L205	301-600-3
L103	301-517	T1	301-699
L201	301-600-1	T101	102-507
L202	301-600-2	T102	301-730
L203	301-520-2	T201	301-619

MISCELLANEOUS

ITEM	NAME	PART NO.
CF-1	Ceramic Filter	301-724
SW1-8	Switch, Assembly	UID500-874-3
SW9-10	Switch	UID500-874-19
SW11	Switch, Push	UID500-874-6
SW12-19	Switch, Assembly	UID500-874-3
SW20-22	Switch	UID500-874-13
Spk	Speaker (3.2 ohms 3-1/2")	301-793
Y101	Crystal (10.245MC)	301-516-1
	Crystal (11.155MC)	301-516-2
Y200	Crystal (Specify Frequency)	301-603
Y300	Crystal (Specify Frequency)	301-603
	Antenna, Telescopic	Reg.-1

CABINET PARTS

NAME	PART NO.
Cabinet/Wrap Ass'y	600-311
Front Panel	600-339
Rear Panel	301-674
Knob, Volume	301-670
Knob, Squelch	301-670

RECEIVER ALIGNMENT AND TUNING PROCEDURE

2-1 EQUIPMENT REQUIRED

FM Signal Generator
Oscilloscope
AC VTVM

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receiver should be aligned to the channel nearest the center of the frequency range over which they will operate.

2-2 IF ALIGNMENT

Connect AC voltmeter across speaker terminals.

Adjust volume control for 0.5 volt reading on AC voltmeter.

Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

NOTE: Coils will have two peaks; adjust core to peak away from the center of form.

Pre-align quadrature detector by tuning L103 for maximum noise (AC voltmeter).

Adjust volume control for 1 volt noise reading on AC voltmeter

Connect the R.F. signal generator to the antenna input jack. Turn modulation off. Set the generator to the operating crystal frequency.

Adjust the signal generator output until the voltmeter reads 0.2 volts.

Adjust T101 and T201 (in that order) for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts.

NOTE: Coils will have two peaks; adjust core of T101 to peak away from center of the coil form, and adjust core of T201 to peak nearest the center of the coil form.

Set the generator frequency to the secondary image frequency. This 910 KHz below the channel frequency. NOTE: some receivers have the second oscillator at 11.155 MHz, in this case the image frequency is 910 KHz above the channel frequency. Check the frequency marked on top of the crystal.

NOTE: The AFC circuit action will be reversed when tuning to the 910 KHz image frequency. This means that the Image will be sharp, or narrow, with respect to tuning the RF signal generator.

Adjust the signal generator output until voltmeter reads .2 volts.

Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order) for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the slugs should be within two turns of the position in step No. 3 and 8.

2-3 RF ALIGNMENT

Pre-Adjust Trimmer Capacitor (C217) so that the silvered half moon section is nearest to the rear of the receiver.

Connect AC voltmeter across the speaker terminals.

With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1 volt of noise.

Connect signal generator to antenna input jack. Set generator accurately to the frequency being used for alignment. This should be nearest to the center of all frequencies being used in set.

Adjust output of signal generator until AC voltmeter reads 0.2 volts.

Adjust C201 and C202 (trimmer capacitors) in that order, for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

NOTE: Use non-metallic screwdriver for trimmer adjustments.

Peaks are very sharp, tune with care. Two peaks can be observed, tune to peak with silver moon section away from I. F. Board.

Adjust the core of L203 for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts.

NOTE: To properly adjust L203, C217 must be pre-adjusted as in Step 2-3-1.

Adjust C217 counter clockwise with non-metallic screwdriver for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Do NOT re-adjust L203 after C217 is adjusted.

2-4 AFC ALIGNMENT

NOTE: This adjustment requires an accurate 10.7 MHz ± 1 KHz oscillator or 455 KHz. ± 500 Hz oscillator to be used as a reference signal. If none are available, proceed to step 2-4-5.

Pre-align Quadrature Detector by tuning L103 for maximum noise (AC voltmeter reading) at the speaker terminals.

With a coupling loop, inject "reference" signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R226 for a reading of 3.8 to 4.0 volts at the collector of Q204.

Remove the "reference" signal and have the unit squelched and receiving no signal. The voltage on the collector of Q204 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 2-4-4. If voltage is between 3.2 and 4.6 volts, AFC Alignment is complete.

NOTE: Any further adjustments made to L103 and R226 will require AFC to be re-adjusted.

Inject "Reference" signal and monitor voltage on collector of Q204, adjust L103 for same voltage as noted in Step 3. Re-adjust R226 for a voltmeter reading of 3.8 to 4.0 volts. Repeat Step 2-4-3.

NOTE: Do not adjust L103 more than ¼ turn at a time.

If an accurate I. F. signal source is not available, an approximate AFC alignment can be made by adjusting L103 for maximum noise (AC voltmeter reading) at the speaker terminals, and with unit squelched and receiving no signal, adjust R226 for a voltmeter reading of 3.2 to 4.6 on the collector of Q204.

NOTE: Units equipped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q204 and collector of Q206. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q204 and the collector of Q205. If crystal is changed from one frequency to the other, the jumper must be changed.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
CR101	102-412	1N4148
CR102	1N4738A	8.2V, 5%, 1W
CR103	1N4002	1N4002
CR104	1N4002	1N4002
CR201	102-339	
CR202	102-339	(1)
CR203	102-339	(1)
CR204	102-339	(1)
CR205	102-339	(1)
CR206	102-339	(1)
CR207	102-339	(1)
CR208	102-339	(1)
CR209	Motorola MV2209 (1)	
CR309	MZ92-6.0B	6.0V, 5%, 1/2W
CR311	102-412	1N4148 (1)
CR312	102-412	1N4148 (1)
CR313	102-412	1N4148 (1)
IC101	301-679-1	
IC102	301-576-3	MC-1357P
IC301	301-576-2	(1)
IC302	301-576-2	(1)
IC303	301-576-4	(1)
IC304	301-576-4	(1)
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539 (WT)	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107	MPS-A55	
Q108	MPS-A55	
Q109	MJE-521	
Q111	MJE-521	
Q201	2N5245	
Q202	SPS-1473(RT)	2N5222
Q203	SM-4304-S	2N5130
Q204	SPS-1539(WT)	2N5227
Q205	SPS-952	MPS5172
Q206	SPS-952	MPS5172
Q207	SPS-1473(RT)	2N5222
Q301	SPS-952	MPS5172 (1)
Q302	SPS-952	MPS5172 (1)
Q303	SPS-952	MPS5172 (1)

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C2		100mfd 10V
C127		1mfd 50V (1)
C127		10mfd 10V (2)
C130		50mfd 10V
C135		250mfd 16V
C136		1000mfd 16V
C137		250mfd 10V
C201	10S-Triko 22	2-8pf NPO Trimmer
C202	10S-Triko 22	2-8pf NPO Trimmer
C207	10S-Triko 22	2-8pf NPO Trimmer
C219		1mfd 50V
C305		20mfd 16V (1)
C306		20mfd 16V (1)
C310		200mfd 10V (1)
C313		10mfd 10V (1)

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R1	102-479-3	5000 ohms Volume/Switch (1)
R1	102-303-5	5000 ohms Volume/Switch (2)
R2	102-479-2	7500 ohms Squelch (1)
R2	102-303-6	7500 ohms Squelch (2)
R226	X201R102B	1000 ohms Bias

COILS/TRANSFORMERS

ITEM	PART NO.
L101	ES-2228
L102	ES-2228
L103	301-517
L201	301-600-1
L202	301-600-2
L203	301-520-2
L204	102-369
L205	301-600-3
T1	301-515
T101	102-507
T102	301-730
T201	301-619

MISCELLANEOUS

ITEM	NAME	PART NO.
Ant-1	Antenna, Telescopic	Reg.-1
CF-1	Filter, Ceramic, 455KHz	301-724
Spk-1	Speaker, 3.2 ohm	301-573-1
SW1-8	Assembly, Switch	UID500-874-3 (1)
SW9	Switch, Pushbutton	UID500-874-1 (1)
SW10	Switch, Momentary	UID500-874-1 (1)
Y101	Crystal Oscillator (10.245MHz)	301-516-1
	Crystal, Oscillator (11.155MHz)	301-516-2
Y200	Crystal, Receive (Specify Freq.)	301-603

CABINET PARTS

NAME	PART NO.
Panel, Front	500-813
Plate, Face (Model TMR-8U)	301-513
Plate, Face (Model TMR-1U)	301-535
Knob, Volume/Squelch (Model TMR-8U)	Plasticware 27500
Knob, Volume/Squelch (Model TMR-1U)	Phillips 3-9
Bracket, Mobile Mount	301-431

(1) Model TMR-8U
(2) Model TMR-1U

1-2 CRYSTAL SPECIFICATIONS

Minature plug-in crystals are utilized in the receiver. Because of the high accuracy (close tolerances) required, Shepherd Industries' crystals are recommended. If the crystals are ordered from Regency, it is only necessary to specify the part No. 301-603 and the desired receive frequency.

If desired, the cyrstals may be purchased from other manufacturers. The following specifications must be included in the order:

a. Crystal Frequency $= \dfrac{\text{Receive Frequency} - 10.7\ \text{MHz}}{9}$

EXAMPLE:

Crystal Frequency $= \dfrac{458.000\ \text{MHz} - 10.700\ \text{MHz}}{9}$

Crystal Frequency = 49.70000 MHz

b. Frequency Tolerance of .001%

c. 3rd overtone

d. Parallel resonance – 18pf load capacity

e. Maximum equivalent series resistance of 35 ohms.

f. Drive level of 2 MW.

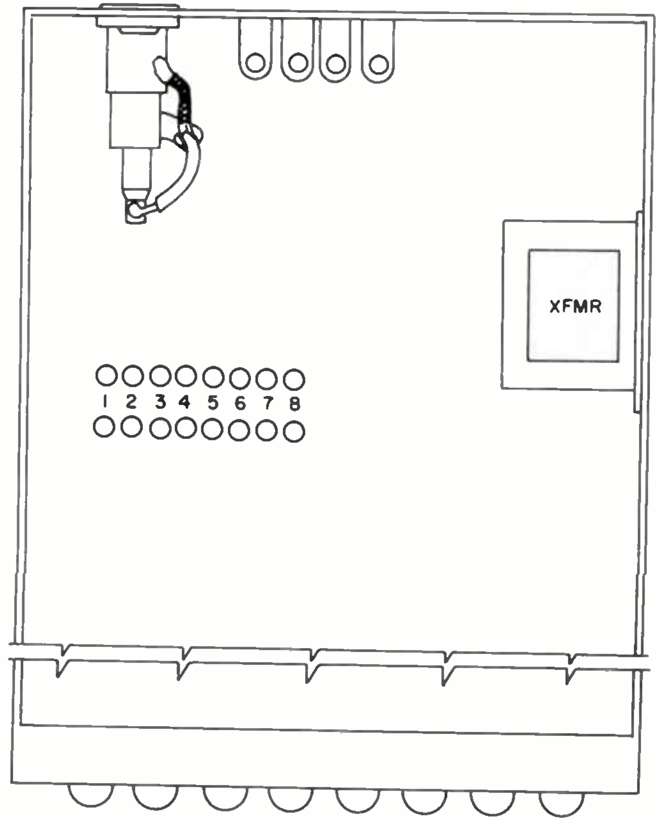
g. Holder: HC-25/u

1-3 CRYSTAL INSTALLATION

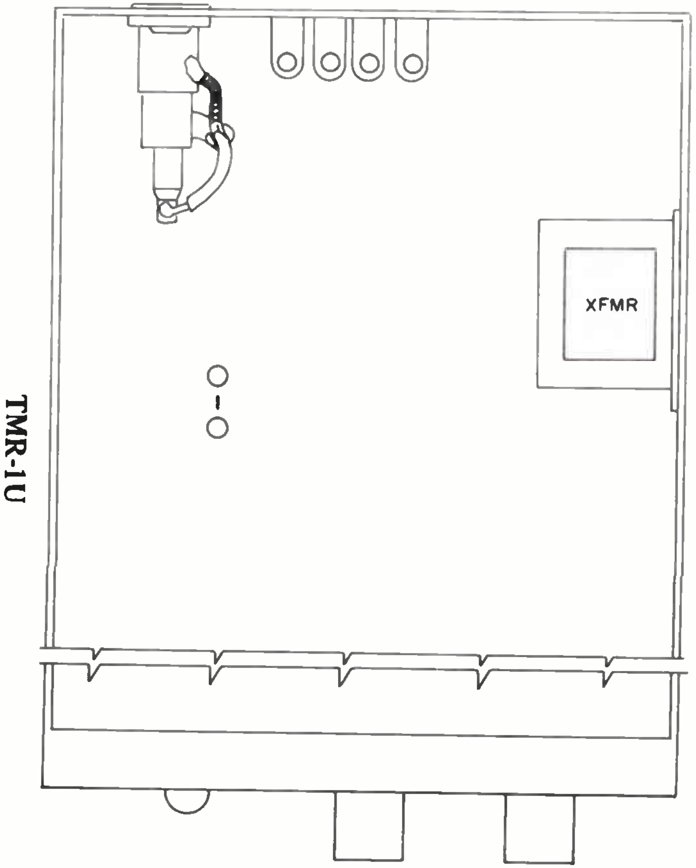
Prior to installing a crystal, the TMR cover will have to be removed. To remove this cover, unscrew the two large bolts located at the sides of the unit. The cover may then be slipped off by sliding it toward the rear of the unit.

CRYSTAL LOCATION DIAGRAMS

TMR-8U



TMR-1U



VOLTAGE DATA – INTEGRATED CIRCUITS

	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
IF Board	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	-	-	-	-	-	-	
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0	
	IC 301	2.0P	2.0P	9.P	9.P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
		.2	3.6	11	.7	3.6	3.6	0	3.6	.2	11	11	.2	.2	5.2	(MAN)
	IC302	2.0P	2.0P	9P	9P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
		.2	3.6	11	11	3.6	3.6	0	3.6	.2	11	11	.2	.2	0	(MAN)
	IC 303	2.7P	2.0P	2.0P	2.0P	2.7P	2.0P	0	3P	4P	3P	3P	3P	4P	4.8	(SCAN)
		1.5	3.6	.2	.2	3.6	3.6	0	.2	1.5	5.9	5.9	.2	5.9	4.8	(MAN)
	IC 304	1.6	1.3P	1.8P	1.3P	1.3P	1.3P	0	2P	2.7P	2.0P	2.0P	2.0P	2.0	4.8	(SCAN)
		.1	.2	3.8	3.8	1.5	1.5	0	.2	1.5	3.6	3.6	.2	3.6	4.8	(MAN)

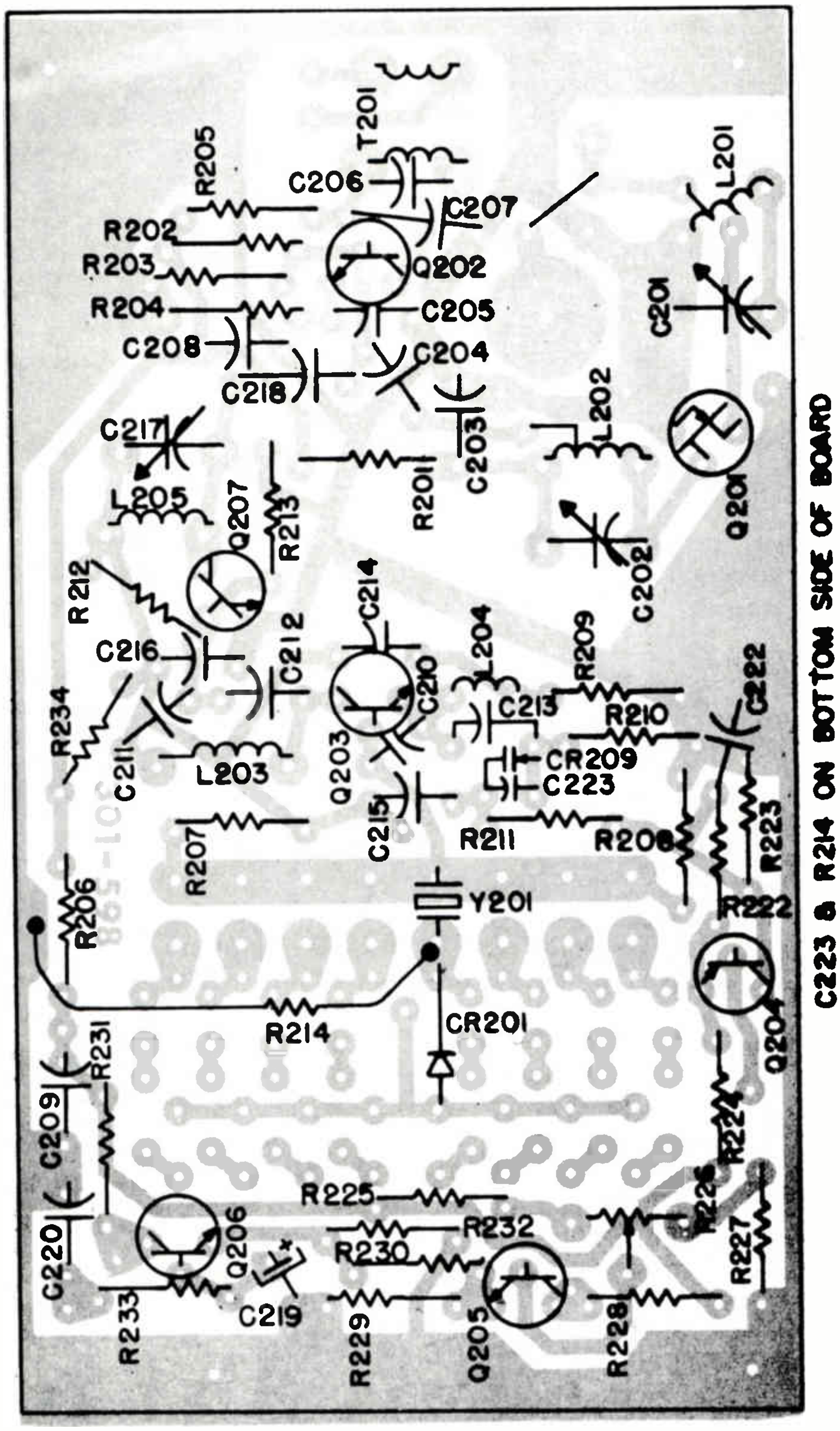
3-11 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – TRANSISTORS:

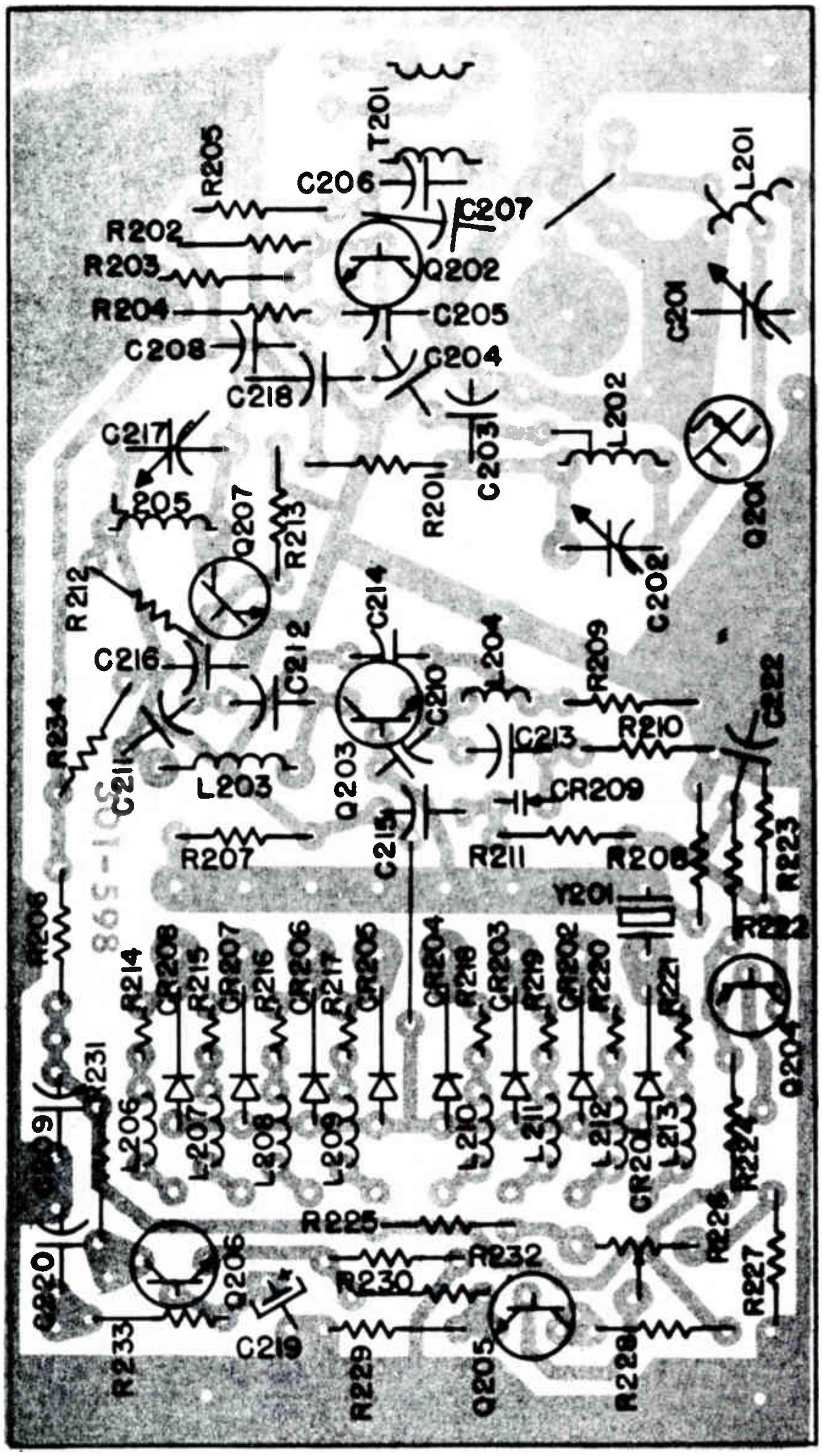
	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)
RF Board No. 301-598	Q201 (FET)	0	0	5.5
	Q202	1.5	2.2	6.8
	Q203	2.5	3.1	6.8
	Q204	7.8	7.2	3.0–5.0
	Q205	2.9	3.6	7.4
	Q206	2.9	3.6	7.2
	Q207	0	.2	6.8
IF Board No. 500-858	Q101	2.3	3.0	5.8
	Q102	1.0	1.7	4.8
	Q103 (PNP)	8.2	8.2	0 (unsquelched)
		8.2	8.2	1.0 (squelched)
		8.2	8.2	1.5 Min. (tight squelch)
	Q104	0	0	7.2 (unsquelched) (TMR-8U)
		0	0	1.9 (unsquelched) (TMR-1U)
		0	.80	.30 (squelched)
		0	.80	.10 (tight squelch)
	Q105	1.4	1.9	5.1 (unsquelched)
		1.1	.10	8.2 (tight squelch)
	Q106	0.7	1.3	12.4
	Q107 (PNP)	13.8	13.1	7.2
	Q108 (PNP)	6.9	6.6	.10
	Q109	6.9	7.2	13.8
	Q110	0	.10	6.9
Scan Board No. 500-841	Q301	.2	.2	6.0 Manual
		3P	3P	6.0 Scan
	Q302	5.2	5.9	6.0 Manual
		3P	3P	6.0 Scan
	Q303	0	.7	.1 Manual
		0	.1	1.6 Scan

RF BOARD 301-598



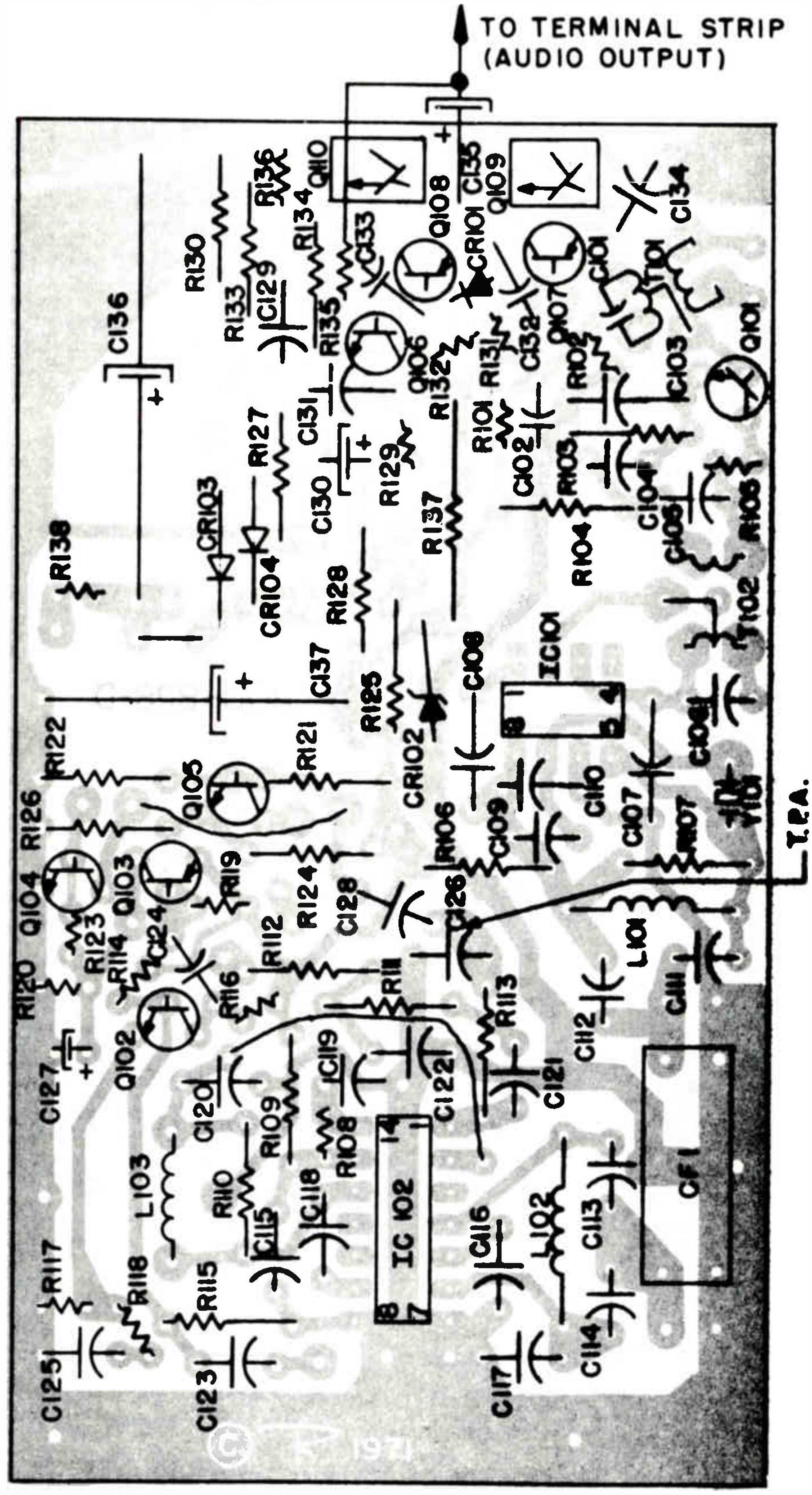
RF BOARD BOTTOM VIEW (TMR-1U)

RF BOARD 301-598



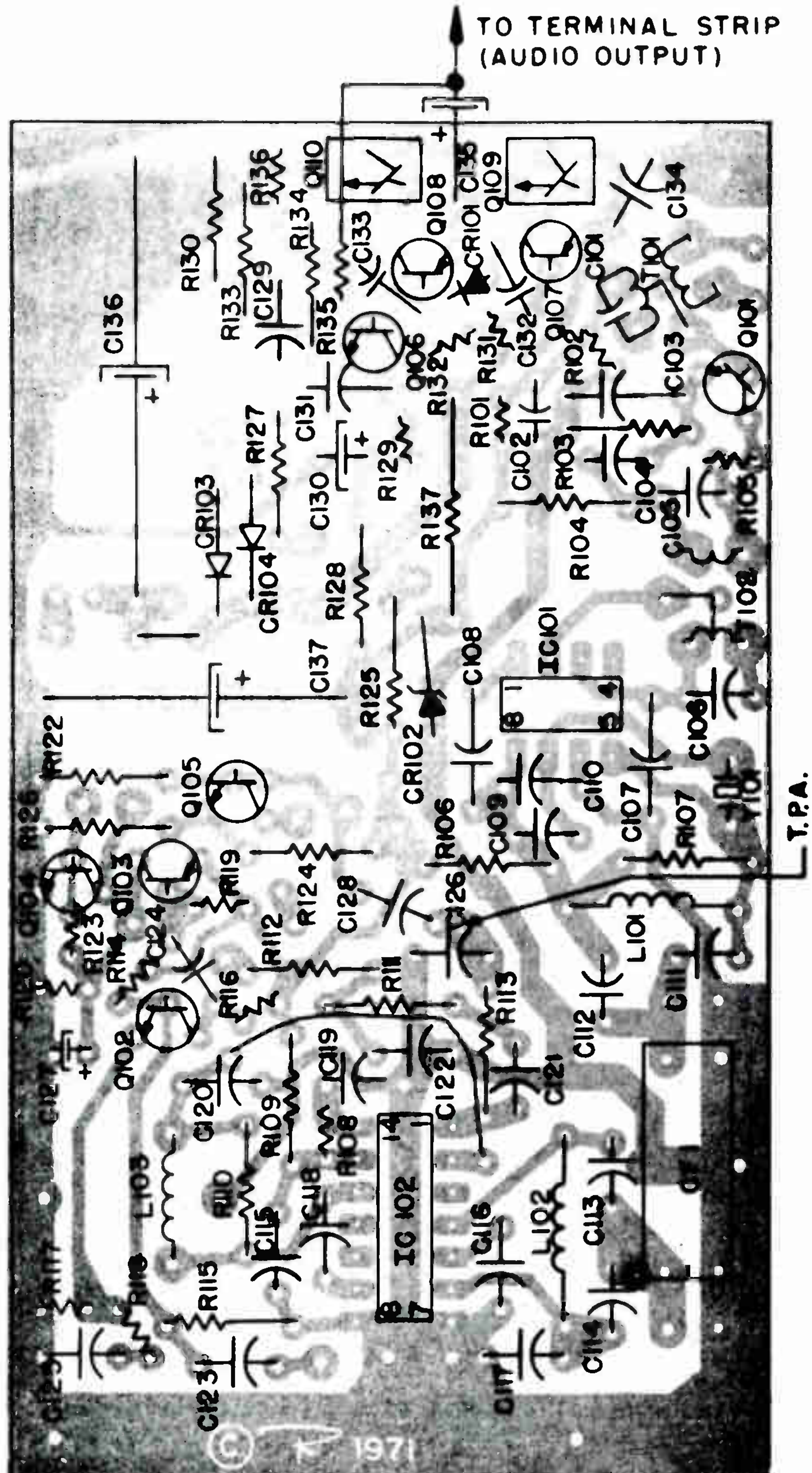
RF BOARD BOTTOM VIEW (TMR-8U)

IF BOARD 500-858



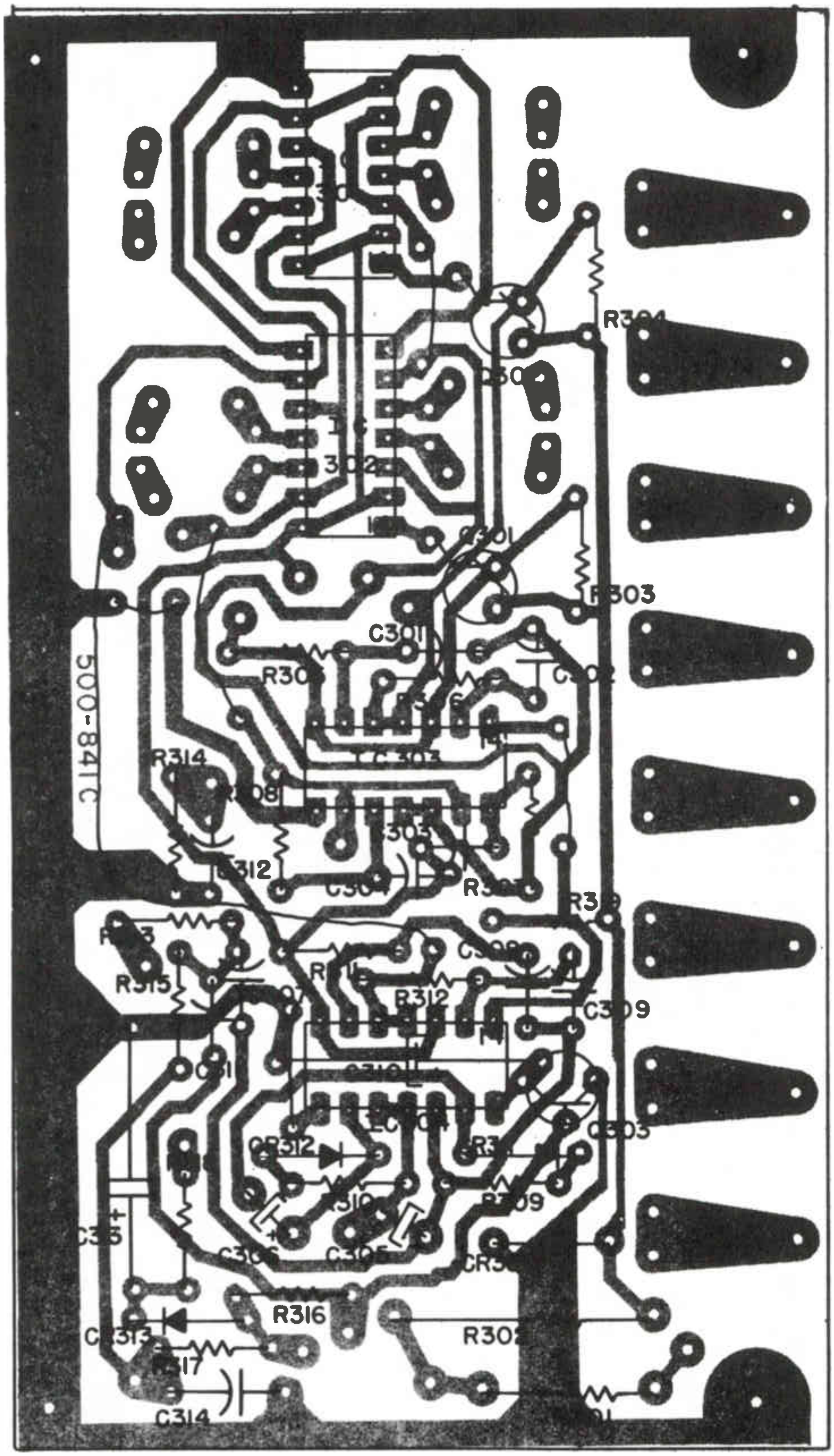
IF–AUDIO BOARD BOTTOM VIEW (TMR-1U)

IF BOARD 500-858

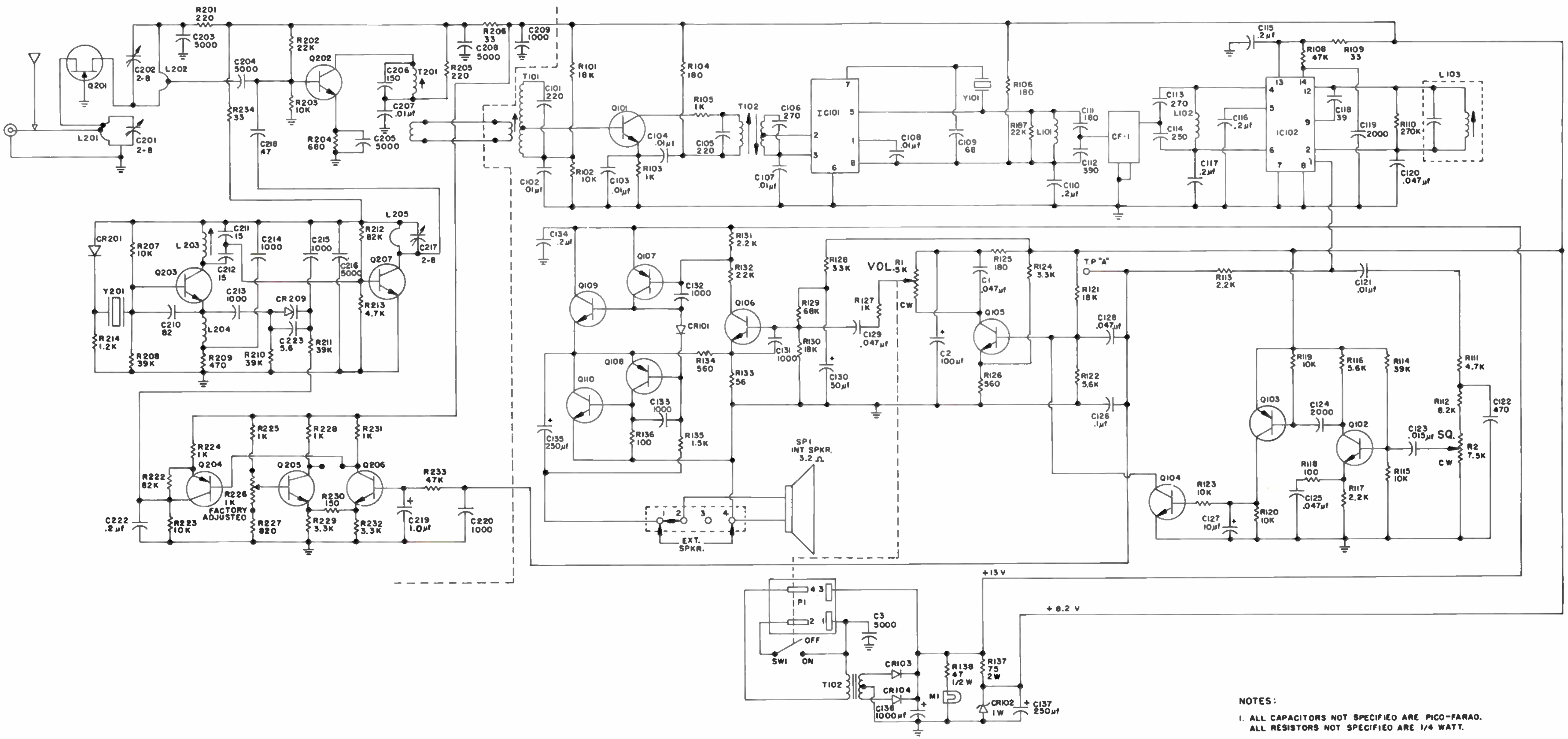


IF–AUDIO BOARD BOTTOM VIEW (TMR-8U)

SCAN BOARD 500-841

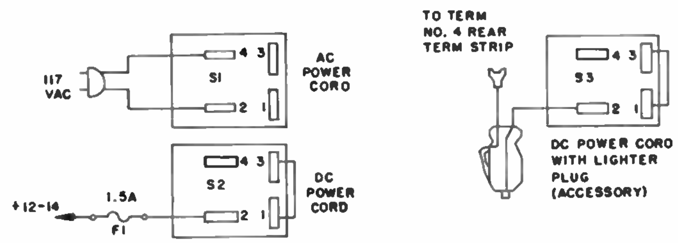


SCANNER BOARD BOTTOM VIEW



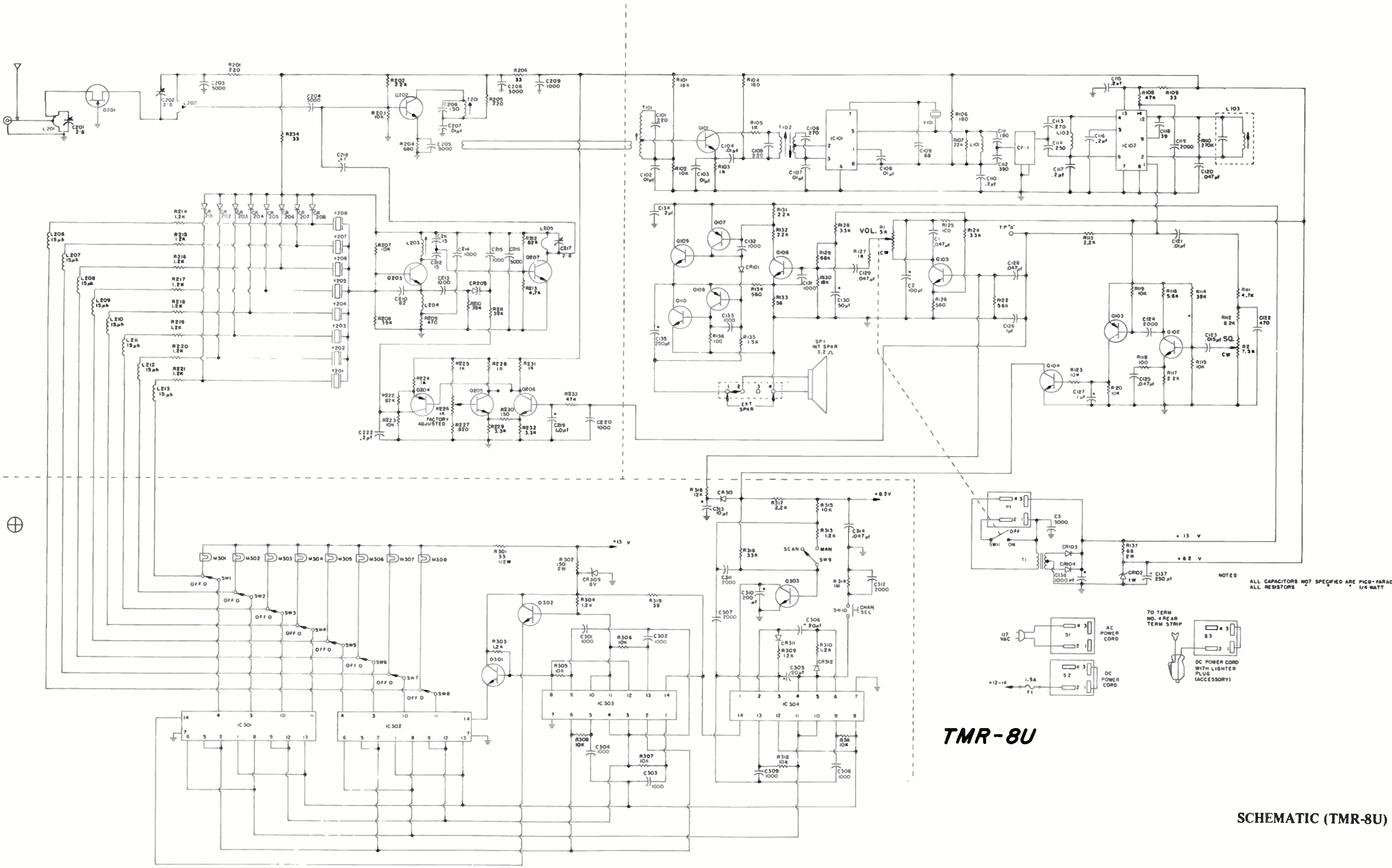
NOTES:

1. ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD. ALL RESISTORS NOT SPECIFIED ARE 1/4 WATT.



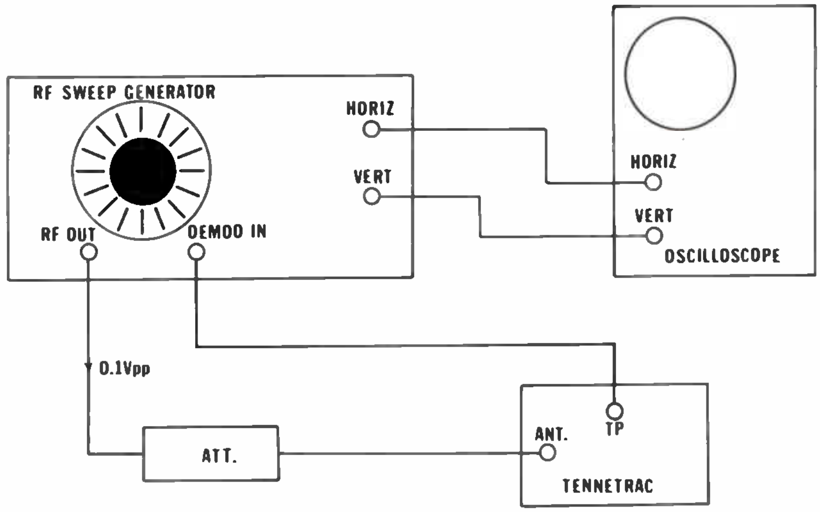
TMR-1U

SCHEMATIC (TMR-1U)



SCHEMATIC (TMR-8U)

Pages 83-90 Courtesy of TENNELEC, INC.



TEST SETUP FOR RF ALIGNMENT

IF ALIGNMENT

Program Channel 1 for UHF: Plug in AC line cord and turn on radio. Depress scan manual switch and push channel select until Channel 1 light comes on. Inject 33mVpp of 10.7 MHz into the base of Q6 (TP 1). This 10.7 MHz must be ±1 KHz. Place scope probe on Pin 4 of IC2 (TP 2). You should see a 455 KHz signal. Tune L11, L14 and L13 for maximum signal on scope; it should be approximately 2Vpp. Move scope probe to Pin 11 of IC2 (TP 3). Tune L12 to move blip to top of sinewave.

RF ALIGNMENT

UHF

Program Channel 1 for UHF. Connect output of sweep generator to UHF antenna receptacle and demodulation input to emitter of Q6 (TP 4). No additional detector is needed. Connect 12V dc supply to terminal strip on back panel. Depress scan manual switch and push channel select until Channel 1 light comes on. Tune C30 and C33 to peak trace at 457 MHz.

VHF HIGH

Move output of sweep generator to HI-LO antenna receptacle and demodulation input to emitter of Q4 (TP 5). Move programming wire to HIGH. Center trace at 160 MHz and tune L5, L6, L8 and L9 to peak trace. Two peaks should be seen.

VHF LOW

Move demodulation input of signal generator to emitter of Q2 (TP 6). Move programming wire to LOW. Center trace at 40 MHz. Tune L1, L2, L3 and L4 to peak trace so 33 MHz and 40 MHz are approximately the same height.

SENSITIVITY

UHF

Program Channel 1 for UHF and place UHF crystal in Channel 1 crystal socket. Connect output of UHF signal generator to UHF antenna receptacle. Turn output to minimum. Connect AC voltmeter between the speaker terminal and ground, Terminals 1 and 4 on back panel. Disconnect wire from Q14 emitter. Plug line cord into 115V ac. Turn squelch control fully clockwise. Push Channel Select switch until Channel 1 light comes on. Turn volume control until voltmeter reads –10 dBm. Set signal generator for 100μV and tune until the noise at the speaker quiets. The frequency that occurs is determined by the crystal being used. Decrease signal level until voltmeter reads –30 dBm. Retune signal generator for minimum reading on voltmeter and again decrease the signal level until the voltmeter reads –30 dBm. Continue this action until tuning generator will no longer lower voltage. Tune L15 and C55 for minimum reading on voltmeter. Retune signal generator for minimum reading on voltmeter. Decrease signal until voltmeter reads –30 dBm. This is the 20 dB quieting sensitivity

for UHF. It should be below .9μV. Connect wire back to Q14 emitter. AFC adjustment should be made at this time.

AFC ADJUSTMENT

With no signal input, place dc voltmeter on base of Q13 (TP 14). Adjust R63 for 1.3V dc. Set output of signal generator for 30μV and shift frequency with fine tuning while monitoring voltage on collector of Q13 (TP 7). One should see a voltage swing of 0.6 to 2V dc with the frequency shift.

VHF HIGH

Should be done only after UHF. Program Channel 1 for High and place a high band crystal in Channel 1 crystal socket. Connect output of VHF signal generator to HI-LO antenna receptacle and turn output to minimum. Connect ac voltmeter between speaker terminals and ground, Terminals 1 and 4 on back panel. Plug line cord into 115V ac. Turn squelch control fully clockwise. Push channel select switch until Channel 1 light comes on. Turn volume control until voltmeter reads –10 dBm. Set signal generator for 100μV and tune until noise at speaker quiets. The frequency this occurs is determined by the crystal being used. Decrease signal level until voltmeter reads –30 dBm. Retune signal generator for minimum reading on voltmeter. Again decrease signal level until voltmeter reads –30 dBm. Continue this action until tuning generator will no longer lower voltages. DO NOT RETUNE L15 OR C55. This is your 20 dB quieting sensitivity for High Band. It should be below .5μV.

VHF LOW

Program Channel 1 for low and place a low band crystal in Channel 1 crystal socket. Follow procedures for VHF High. 20 dB quieting sensitivity for low band should be less than .4μV.

SERVICING

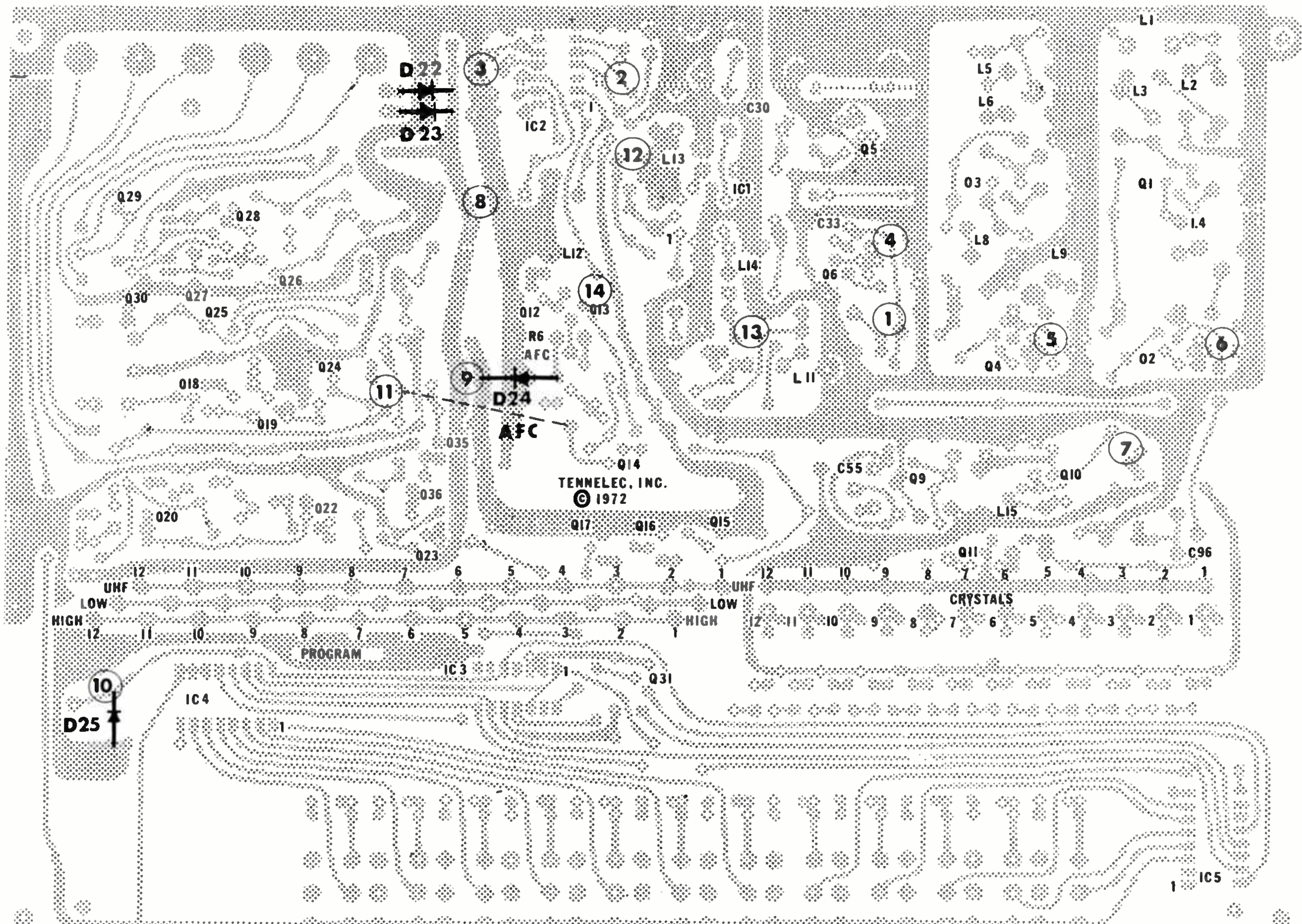
When servicing the TENNETRAC, the first step should be to check the power supply.

TEST POINT	Vdc	CHECK
8	17 ± 1	D22 & D23
9	9 ± .5	D24
10	5 ± .5	D25

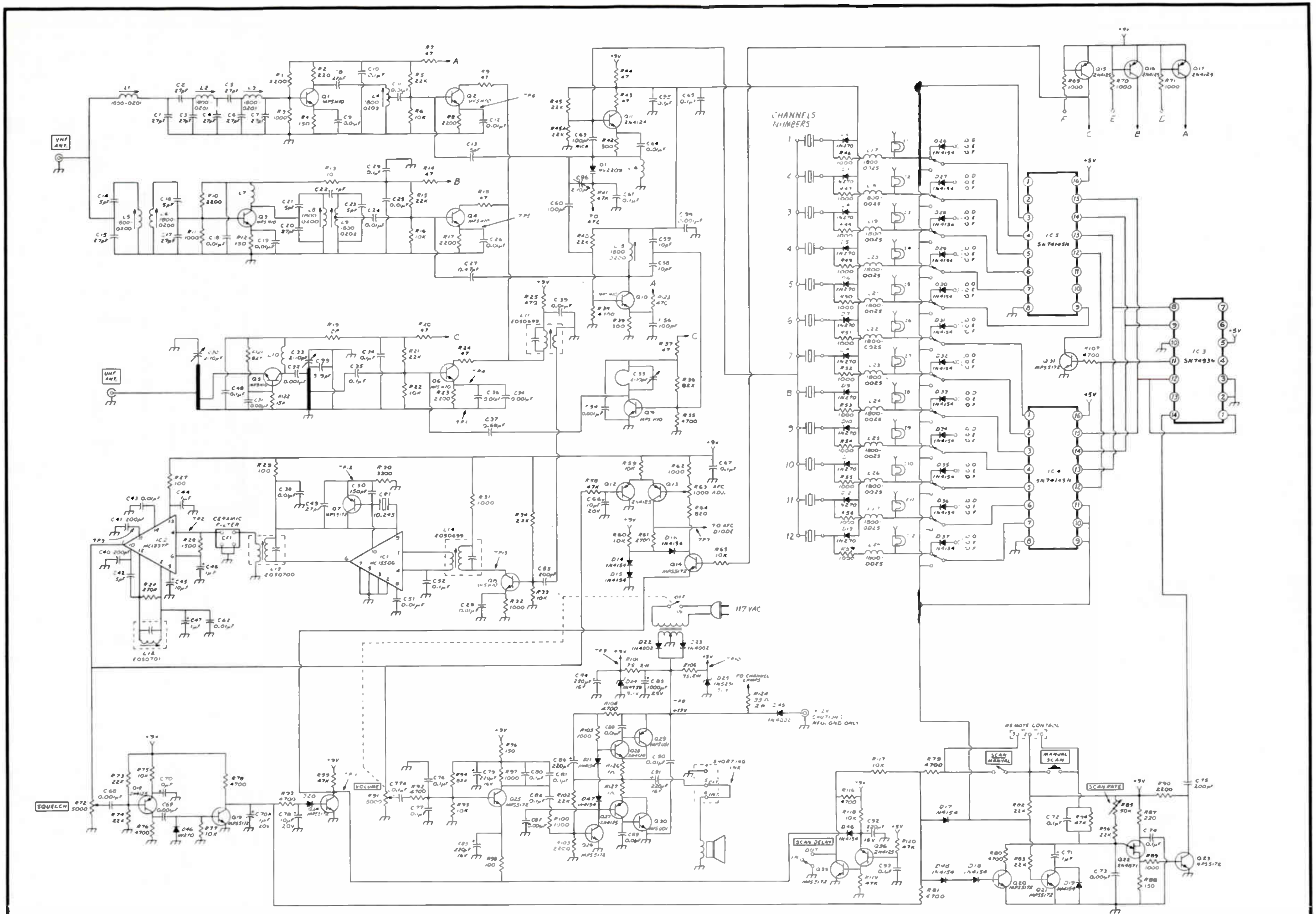
If any component changes are to be made, the case is easily removed by removing the two screws on each side panel.

TYPICAL DC VOLTAGES

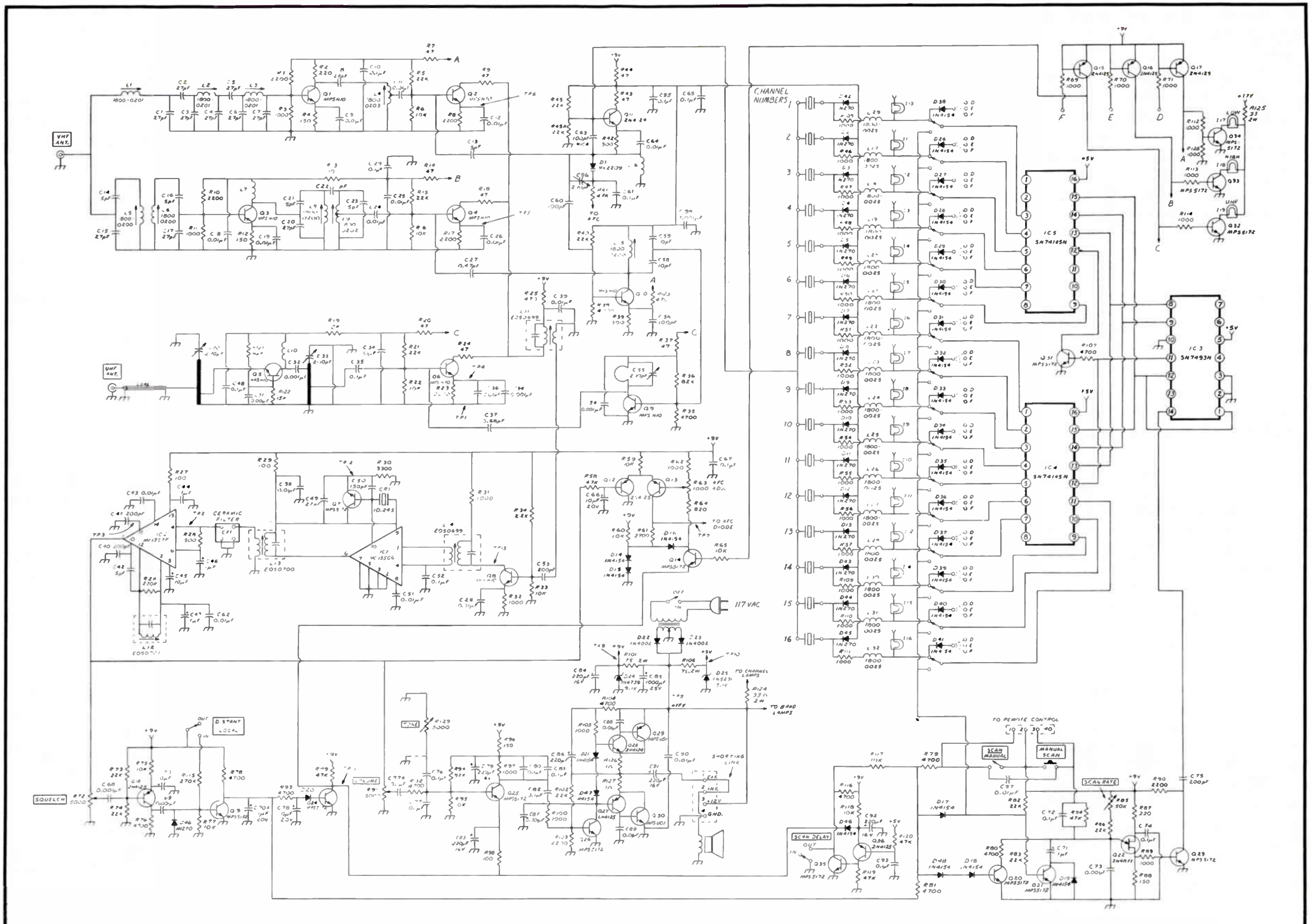
	B	E	C	
Q1	2.7	2.0	6.0	
Q2	2.7	2.0	9.2	
Q3	2.7	2.0	8.8	
Q4	2.7	2.0	9.2	
Q5	0.7	0	4.8	
Q6	3.0	2.3	9.2	
Q7	4.0	3.3	9.2	
Q8	2.7	2.0	7.5	
Q9	0.7	0	9.8	
Q10	0.7	1.4	8.8	
Q11	3.7	3.0	8.3	
Q12	3.7	4.4	0	
Q13	3.7	4.4	1.3	
Q14	0.7 (8.9)	0 (8.2)	9.2	(SQUELCHED)
Q18	4.7	5.4	1.9	
Q19	0 (0.7)	0	4.4 (0.26)	(SQUELCHED)
Q20	0.7 (0.2)	0	0 (6.0)	(SCANNING)
Q21	0.65	0	0	
Q23	0.23	0	9.8	
Q24	0.7 (0.26)	0	0 (8.25)	(SQUELCHED)
Q25	0.9 (1.3)	0.2 (8.3)	7.3 (9.66)	(SQUELCHED)
Q26	0.6	0	6.5	
Q27	6.5	7.2	0.7	
Q28	8.0	7.3	17.0	
Q29	17.0	17.7	7.3	
Q30	0.7	0	7.2	



PC BOARD LAYOUT WITH TEST POINTS



TENNETRAC I&II



TENNETRAC IV

CRYSTAL FREQUENCY DETERMINATION AND CORRELATION

Crystals used in DIGI SCAN 4+4 are type HC-25/U.
Crystal frequencies are normally determined as follows.

FREQUENCY FOR LOW BAND VHF 30 – 50 MHz:
Crystal 3rd overtone frequency = Channel frequency F + 10.7 MHz

FREQUENCY FOR HIGH BAND VHF 150 – 174 MHz:
Crystal 3rd overtone frequency = Channel frequency $\frac{F - 10.7\ \text{MHz}}{3}$

FREQUENCY FOR UHF BAND 450 – 470 MHz:
Crystal 3rd overtone frequency = Channel frequency $\frac{F - 10.7\ \text{MHz}}{10}$

Frequency deviation is less than 2/100,000 in low VHF band 30 – 50 MHz and high VHF band 150 – 174 MHz.
Frequency deviation is less than 1/100,000 in UHF band 450 – 470 MHz.

CRYSTAL CORRELATION:
Resonance .... Parallel
Overtone 3rd
Load Capacity .... 32 pF ※
Max. Series Resistance .... Less than 40 ohms
Frequency Tolerance .... ±.001 % (at 25 ℃)

※ This particular number could vary depending upon crystal manufacturer, but crystal trimmer will take care of any error.
For convenience, a record should be kept of the frequencies as they are added, and the positions in which they have been inserted.

ALIGNMENT INSTRUCTION

ALIGNMENT OF STABILIZED POWER VOLTAGE:

Alignment Point	Align for	Measuring Equipment Connection point	Measuring Equipment	Condition
RV-2 10K ohm (Semi-fixed V.R.)	6 V	+ side, TR5 2SC1226A Emitter (TP 9). – side, Ground.	0 to 10 V DC Volt Meter	AC 117 V 60 Hz

ALIGNMENT OF IC-1:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
RV-1 10K ohm (Semi-fixed V.R.)	0.5 V	+ side, TP6 (IC-1 LA1201 Pin 4). – side, TP5 (IC-1 LA1201 Pin 6).	0 – 1.5 V DC Volt Meter (50K ohm/V)	Alignment to be made after alignment of stabilized power voltage.

ALIGNMENT OF IF CIRCUIT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T4, T5, T6, T7 (455KHz IF Trans.)	455KHz	Input TP3 (TR2 2SC829 // 2SC1032 Base). Output TP7 (TR3 2SC829 // 2SC1032 Base).	Sweep Generator 455KHz	Note 1−5 Fig. 7−9
T1, T2, T3 (10.7MHz IF Trans.)	10.7MHz	Input TP1 (P.C.B. "IF IN"). Output TP7 (TR3 2SC829 // 2SC1032 Base).	Sweep Generator 10.7MHz	Note 1−5 Fig. 8−9

Note 1 : Disconnect Front-end (VHF low, VHF hi, UHF) IF output leads from VHF low, VHF hi and UHF tuner (at Front-end).

Note 2 : Output impedance of the sweep generator to be 50 or 75 ohms.

Note 3 : Capacitor 0.001μF to be inserted in series when the sweep generator is connected to input TP1 or TP3.

Note 4 : Detector probe to be connected to the oscilloscope input.

455KHz ALIGNMENT:

Repeat alignment of T4, T5 and T7 to obtain wave shape shown in Fig. 7 which is symmetric to 455KHz center. Symmetric wave shape must be aligned for maximum. T6 to be aligned to obtain maximum level.

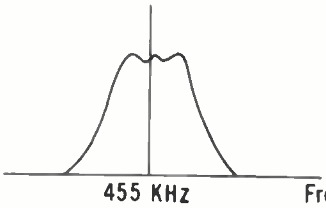


FIGURE 7

10.7MHz ALIGNMENT:

Repeat alignment of T1, T2 and T3 to obtain wave shape shown in Fig. 8 which is symmetric to 10.7MHz center. Symmetric wave shape must be aligned for maximum, however do not align T4, T5 and T6 while aligning T1, T2 and T3.

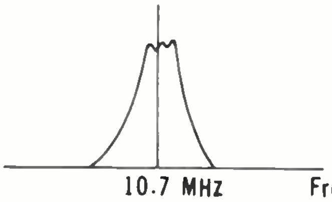


FIGURE 8

Note 5 : In the above-mentioned alignment procedure, the valley of wave shape to be aligned not to exceed 6 db as shown below.

DISCRIMINATOR COIL ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T8	S Curve Max.	Input TP7, TR3 2SC829 // 2SC1032 Base. Output TP8, IF Audio Output.	Sweep Generator (455KHz)	Note 6−8
T9	Zero Point at 455KHz	Same as above		Fig. 10

Note 6 : Disconnect Front-end (VHF low, VHF hi, UHF) IF output leads from VHF low, VHF hi and UHF tuner (at Front-end).

Note 7 : Output impedance of the sweep generator to be 50 or 75 ohms.

Note 8 : Capacitor 0.001 μF to be inserted in series when the sweep generator is connected to input TP 7.

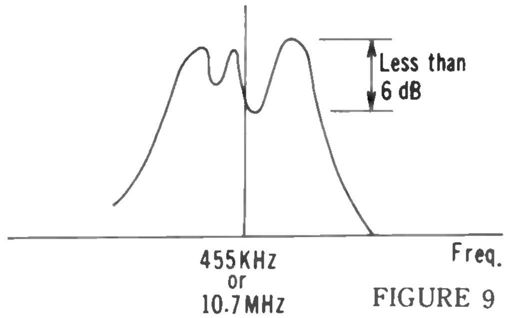


FIGURE 9

"S"CURVE ALIGNMENT:

Align T9 so that 455KHz marker on S curve may come across pedestal line (zero point).
Align T8 and T9 so that symmetric S curve (maximum linear portion) can be obtained.
Repeat the above-mentioned steps until proper S curve can be obtained.

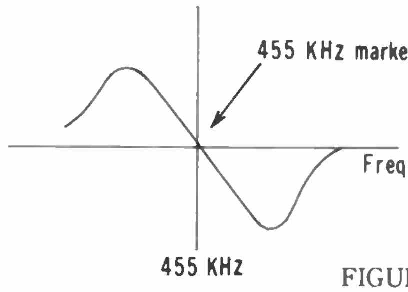


FIGURE 10

IF COIL ALIGNMENT IN FRONT-END

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
VHF low Band T304	10.7MHz	Input TP301, TR302 2SC722 Base. Output TP7, TR3 2SC829 // 2SC1032 Base.	Sweep Generator 10.7MHz	Note 1-5 Note 9-10 Fig. 8-9
VHF hi Band T405		Input TP401, TR402 2SC722 Base. Output TP7, TR3 2SC829 // 2SC1032 Base.		
UHF Band T504		Input TP502, TR504 2SC722 Base. Output TP7, TR3 2SC829 // 2SC1032 Base.		

Note 9 : Connect IF cable to Front-end (VHF low, VHF hi, UHF) IF output terminal.

Note 10: Disconnect crystal terminal lead (yellow) at Front-end.

ALIGNMENT:

Align Front-end IF coil to obtain maximum gain and wave shape shown in Fig. 8.

VHF – LOW FRONT-END ALIGNMENT:

Alignment point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T301 Ant. Coil T302 R.F. Coil T303 R.F. Coil	35MHz (Note 14)	Input Ant. Terminal. Ant. Coil Primary. Output TP301, TR302 2SC722 Base.	VHF Signal Generator (Freq. 30 – 50MHz). High Freq. Volt Meter (Range 30 – 50MHz).	Note 11 – 13 (Fig. 11)

Note 11 : Use the VHF signal generator (30 – 50MHz) provided with output 0.1μV to 100mV variable.

Note 12 : High freq. volt meter provided with freq. range 30 - 50MHz and input voltage range 1 - 10mV.

Note 13 : Preferably the receiver should be aligned with the range not to exceed 3mV.

Note 14 : Aligning frequency can be determined as follows :

A) Receiving band width 4MHz.
B) Aligning Freq. to be chosen to cover center of desired stations.
C) Use circuits without taking off star marked capacitors, in case of 30 - 40MHz.
D) Star marked capacitors to be eliminated when aligning frequencies are 40 - 50MHz range.

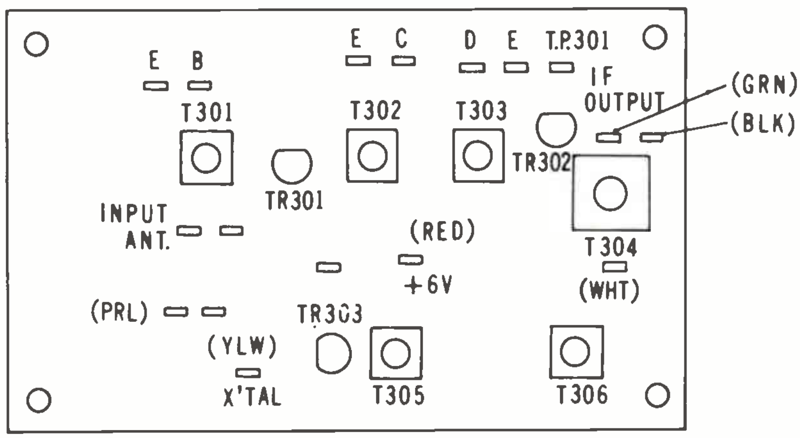


FIGURE 11 VHF-LOW FRONT END P.C.B.

ALIGNMENT:

Step 1 : Connect the signal generator output to antenna input terminals, then set the signal generator frequency to aligning frequency.

Step 2 : Connect the high frequency volt meter across TP301.

Step 3 : Align T301 to obtain maximum output.

Step 4 : Connect damping resistor (47 ohms) across terminal D-E, then align T302 to obtain maximum output.
Eliminate the resistor (47 ohms) after the alignment.

Step 5 : Connect damping resistor (47 ohms) across terminal C-E, then align T303 to obtain maximum output.
Eliminate the resistor (47 ohms) after the alignment.

Step 6 : Repeat step 3 thru step 5.

Note 15 : Connect all leads from main chassis to assigned terminals, IF output (green), +6V (red), crystal (yellow), ground (black), ground (purple), emitter (white) and antenna input (coaxial cable).

Note 16 : Provide 4 - 5 turns loop at end of frequency counter input cable as shown in Fig. 12, then close-couple to T305.

VHF – LOW OSCILLATOR ALIGNMENT:

Alignment Point	Adjust for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T305, Osc Coil T306	35MHz (Note 14)	Freq. Counter, Coupling Loop, T305. Input Ant. Terminal. Output Ext. Speaker Jack.	Signal Generator (Freq. 30 – 50MHz). Freq. Counter (Freq. 30 – 50MHz). Volt Meter (V.T.V.M.).	Note 15 – 16 (Fig. 12)

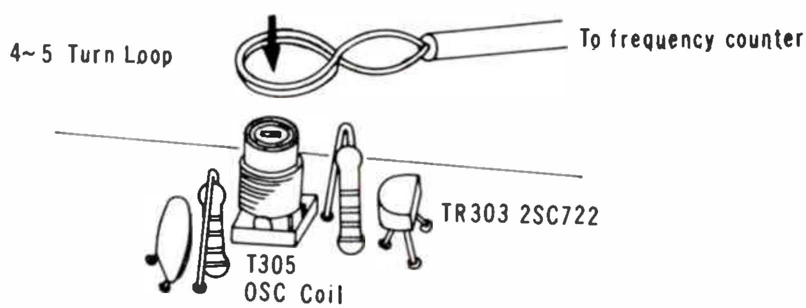


FIGURE 12 FREQUENCY COUNTER LOOP SET-UP

ALIGNMENT:

Step 1 : Turn T305 core fully clockwise until it reaches the bottom of the coil.

Step 2 : Confirm that on all channels (4 channels) the oscillator operates normally. If on any channels the oscillator is dead, align T305 core to obtain normal oscillation, then read out oscillator frequency by the frequency counter confirming that the frequency error is within 2/100,000.

Step 3 : Set the signal generator frequency to 35MHz.

Step 4 : Set channel to 35MHz crystal.

Step 5 : Align T306 to obtain maximum sensitivity thru step 3 to step 4.

VHF HI FRONT-END ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T401 Ant. Coil T402 Ant. Coil T403 R.F. Coil T404 R.F. Coil	155MHz (Note 20)	Input Ant. Terminal, Ant. Coil T401. Output TP401, TR402 2SC722 Base.	Signal Generator (Freq. 150–174MHz). Hi Freq. Volt Meter (Range 150–174MHz).	Note 17 – 19 (Fig. 13)

Note 17 : Use the VHF signal generator (150 – 174MHz) provided with output of 0.1 μV – 100mV variable.

Note 18 : High frequency volt meter should be provided with frequency range 150–174MHz and input voltage range 1 – 10mV.

Note 19 : Preferably the receiver to be aligned in range not to exceed 3mV.

Note 20 : Aligning frequency can be determined as follows:

A) Receiving band-width 7MHz.
B) Aligning frequency to be chosen to cover center of desired stations.
C) Use all capacitors with star mark indicated in the schematic diagram (in case of 150 - 162MHz).
D) However, star marked capacitors to be eliminated when aligning frequencies are 162 - 174MHz range.

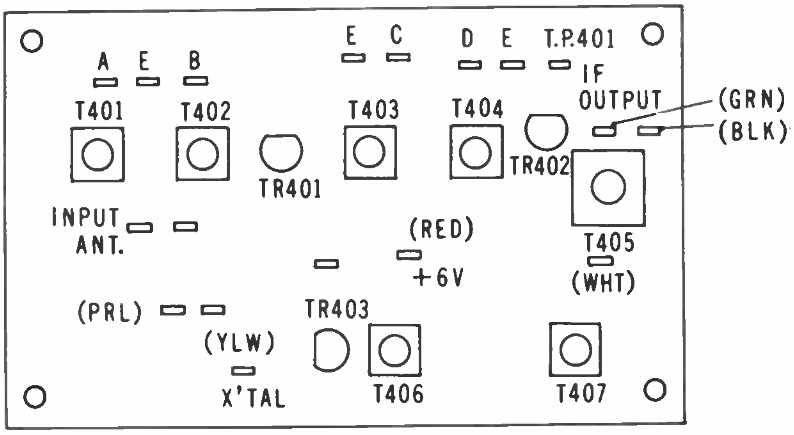


FIGURE 13 VHF-HI FRONT END P.C.B.

ALIGNMENT:

Step 1 : Connect the signal generator output to antenna input terminal, then set the signal generator frequency to aligning frequency.

Step 2 : Connect the high frequency volt meter across TP401 and chassis ground.

Step 3 : Connect the damping resistor (47 ohms) across terminal B-E, then align T401 to obtain maximum output. Remove the resistor (47 ohms) after the above alignment.

Step 4 : Connect the damping resistor (47 ohms) across terminal A-E, then align T402 to obtain maximum level. Remove the resistor (47 ohms) after the alignment.

Step 5 : Connect the damping resistor (47 ohms) across terminal D-E, then align T403 to obtain maximum level. Remove the resistor after the alignment.

Step 6 : Connect the damping resistor (47 ohms) across terminal C-E, then align T404 to obtain maximum level. Remove the resistor after the aligning.

Step 7 : Repeat Step 3-6 until the proper wave shape and output are obtained.

VHF HI OSCILLATOR ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T406 Osc Coil	155MHz (Note 20)	Freq. Counter. Loop T406.	Signal Generator (Freq. 150 - 174MHz). Frequency Counter (Freq. 40 - 60MHz). Volt Meter (V.T.V.M.).	Note 21 - 22
T407 Tripler Coil		Input Ant. Input Terminal. Output Ext. Speaker Jack.		

Note 21 : Connect all leads from main chassis to assigned terminals, IF output (green), +6V(red), crystal (yellow), grounding (black), ground (purple), emitter (white) and antenna input (co-axial cable).

Note 22 : Provide 4 – 5 turns loop at end of frequency counter input cable as shown in Fig. 11, then close-couple to T406, as shown.

ALIGNMENT:

Step 1 : Turn T406 core fully clockwise until it reaches the bottom of the coil.

Step 2 : Confirm that on all channels (8 channels) the oscillator operates normally. If on any channels the oscillator is dead, align T406 core to obtain normal oscillation, then read out oscillator frequency on the counter confirming that frequency error is within 2/100, 000.

Step 3 : Set the signal generator frequency to 155MHz.

Step 4 : Set channel to 155MHz crystal.

Step 5 : Align T407 to obtain maximum sensitivity thru step 3 - 4.

UHF FRONT-END ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T.C. 501 T.C. 502 T.C. 503	463MHz	Input Ant. Terminal. Output R.F. Output (IF).	Signal Generator (Freq. 450 - 470MHz). High Freq. Volt Meter (Range 450 - 470MHz).	Note 23 - 26 (Fig. 13)

Note 23 : Use the UHF signal generator (450-470MHz) provided with output of 0.1μV - 100mV variable.

Note 24 : Set the signal Generator frequency to 463MHz and the output to 100mV.

Note 25 : The high freq. volt meter to be provided with freq. range 450 - 470MHz, and 1 - 10mV in output range.

Note 26 : The high frequency volt meter to be connected to RF output of UHF Front-end which is terminated with 47 ohms.

ALIGNMENT:

Step 1 : Connect the capacitor of 500pF (damping capacitor) across trimmer capacitor T.C.503.

Step 2 : Align T.C.502 to obtain maximum deflection on the voltmeter.

Step 3 : Align T.C.501 (trimmer) to obtain maximum deflection on the voltmeter.

Step 4 : Eliminate 500pF capacitor from T.C.503, then connect it to T.C.502.

Step 5 : Align T503 trimmer capacitor to obtain maximum deflection on the voltmeter. Eliminate 500pF capacitor from T.C.502 after aligning.

Step 6 : Repeat step 1 thru step 5 until proper characteristics are obtained.

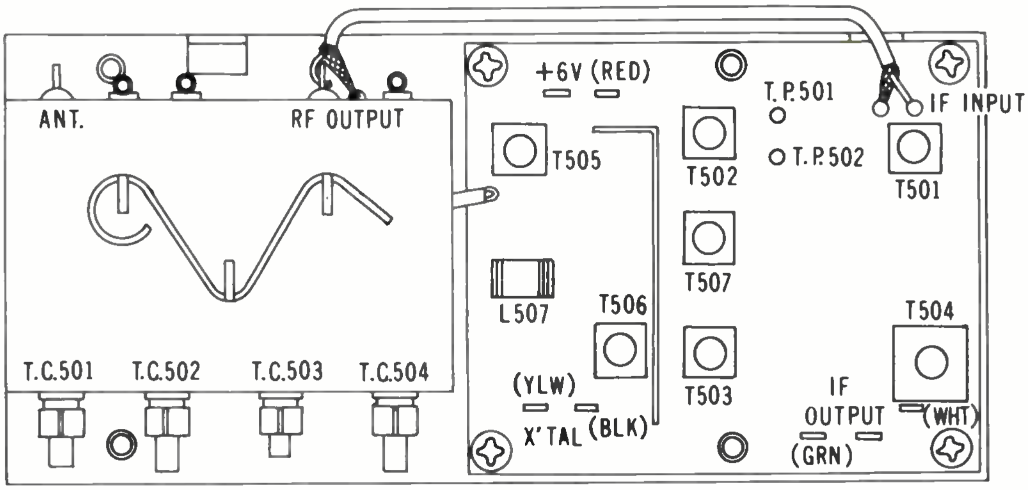


FIGURE 14 UHF FRONT-END

UHF IF ALIGNMENT :

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T507 Trap Coil	90.46MHz	Input X'tal Terminal Output T. P. 502	Signal Generator (Freq. 50 - 100MHz).	
T501 IF Coil	55.93MHz	Input IF-in	High Freq. Voltmeter (Range 50 - 100MHz).	Note 27 - 28
T502 IF Coil		Output TR504,2SC722 Base		
T503 IF Coil				

UHF LOCAL ALIGNMENT :

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T505 Tripler Coil	135.69MHz	Input X'tal terminal. Output C522, 2pF.	Signal Generator (Freq. 120 - 470MHz).	
T506 Osc. Coil		Freq. Counter, Loop T506	Freq. Counter (40 - 60MHz).	Note 29
TC504	463MHz	Input Ant. Terminal. Output Ext. Speaker Jack.	High Freq. Voltmeter (Range 120 - 470MHz).	

Note 27 : Use the VHF signal generator (50 - 100MHz) provided with 100mV output.

Note 28 : The high freq. voltmeter must be provided with freq. range 50-100MHz and input voltage range 1 - 10mV.

ALIGNMENT :

(A) Trap Coil (T507) Alignment

Step 1 : Connect the signal generator to crystal terminal (yellow).

Step 2 : Set the signal generator output level and its frequency to 100mV and 90.46MHz respectively.

Step 3 : Connect the high freq. voltmeter to TP502. Align T507 to obtain minimum reading on the voltmeter.

(B) IF Alignment (UHF)

Step 1 : Connect the signal generator to IF - IN(T501), and set the frequency and its output to 55.93MHz and 100mV respectively.

Step 2 : Connect the high freq. voltmeter to TR504 2SC722 base.

Step 3 : Connect the damping resistor (47 ohms) across TP502.

Step 4 : Align T501, T502 in step 3 to obtain maximum reading on the voltmeter.

Step 5 : Disconnect the damping resistor from TP502, then connect it to TP501.

Step 6 : Align T503 in step 5 to obtain maximum reading on the voltmeter. Disconnect the damping resistor after the alignment.

Step 7 : Repeat step 3 thru step 6 until proper characteristics are obtained.

(C) UHF Local Oscillator Alignment

Step 1 : Connect the signal generator to crystal terminal (yellow). Frequency and output (unmodulated signal) to be set to 135.69MHz and 100mV respectively.

Step 2 : Connect high freq. voltmeter to C522 2pF, then align T505 to obtain maximum reading on the voltmeter.

Step 3 : Turn T506 core clockwise until the core reaches the bottom of T506.

Step 4 : Confirm the local oscillation of all 8 channels by frequency-counter. If all channel oscillation fails, adjust the core to oscillate all channels. Oscillation frequency error must be within 1/100,000.

Step 5 : Set the signal generator frequency to 463MHz, then the receiver channel to 463MHz.

Step 6 : In step 3, align T.C. 504 to obtain maximum sensitivity.

Note 29 : Provide 4 − 5 turns loop at end of frequency counter input cable as shown in Fig. 11 and close-couple to T506.

ADJUSTMENT OF PRIORITY CIRCUIT:

Procedure for adjustment of priority circuit is as follows:

1. On receiving the signal at channel 1 by turning PRIORITY SWITCH to "OFF" position, adjust signal input level to be 0 db (1 μV), and adjust semi-fixed volume control, RV7 so as to get positive voltage at test point 21 (T.P. 21). At this time, confirm that the voltage becomes 0V at TP21, when signal level is below 0 db (1 μV) by controling RF signal input and that the voltage becomes positive at TP21, when signal level is more than 0 db (1 μV).

2. Turning PRIORITY SWITCH to "ON" position, receive signal by operating to select any channel among Ch. 2 thru Ch. 8, and then it makes possible to receive Ch. 1 as priorty Ch. by adding RF signal of Ch. 1 to ANT. A.

   As turning switch to "OFF" for RF signal of Ch. 1, this receiver operates Ch. 5 returned after some minutes.
   The time which to be returned to Ch. 5 is controlled with RV-80 semi-fixed volume.

Best adjustment for this time is done so as to receive Ch. 5 after 1.5 thru 2 seconds.

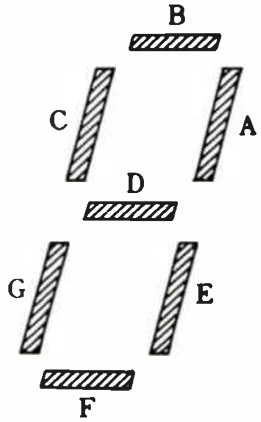
Non-modulation signal is used in procedure for adjustment 1, and modulation frequency 1 KHz, frequency deviation 5 KHz and use output level of signal generator at 20 db approx.

LOGIC CIRCUIT CHECK:

Refer the below-indicated table when logic circuit parts are replaced.

Channel No.	J TP.11	K TP.12	L TP.13	M TP.14	N TP.19	P TP.20	J+L TP.15	K+L TP.16	J+M TP.17	K+M TP.18
1	2.3V	0	2.5V	0	2.5V	0	2.2V	0.3V	0.4V	0.3V
2	0	2.3V	2.5V	0	2.5V	0	0.3V	2.0V	0.3V	0.3V
3	2.3V	0	0	2.5V	2.5V	0	0.3V	0.3V	2.0V	0.3V
4	0	2.3V	0	2.5V	2.5V	0	0.3V	0.3V	0.3V	2.0V
5	2.3V	0	2.5V	0	0	2.5V	2.2V	0.3V	0.5V	0.3V
6	0	2.3V	2.5V	0	0	2.5V	0.3V	2.2V	0.4V	0.3V
7	2.3V	0	0	2.5V	0	2.5V	0.3V	0.3V	2.2V	0.3V
8	0	2.3V	0	2.5V	0	2.5V	0.3V	0.3V	0.4V	2.2V

Channel No.	A	B	C	D	E	F	G
1	2.3V	0.4V	0.3V	2.0V	0.4V	2.1V	2.2V
2	2.3V	1.9V	0.3V	0.5V	0.9V	0.6V	0.3V
3	2.3V	1.9V	0.3V	0.5V	0.4V	0.6V	2.3V
4	2.3V	0.3V	1.9V	0.5V	0.4V	2.1V	2.1V
5	0	2.5V	2.5V	0.7V	0.1V	0.7V	2.2V
6	0	2.5V	2.5V	0.5V	0.1V	0.6V	0.2V
7	2.1V	2.5V	2.5V	1.7V	0.1V	1.7V	2.2V
8	2.1V	2.5V	2.5V	0.5V	0.1V	0.6V	0.2V



$A = M + N$

$B = (J + M) + (K + L) + P$

$C = P + (K + M)$

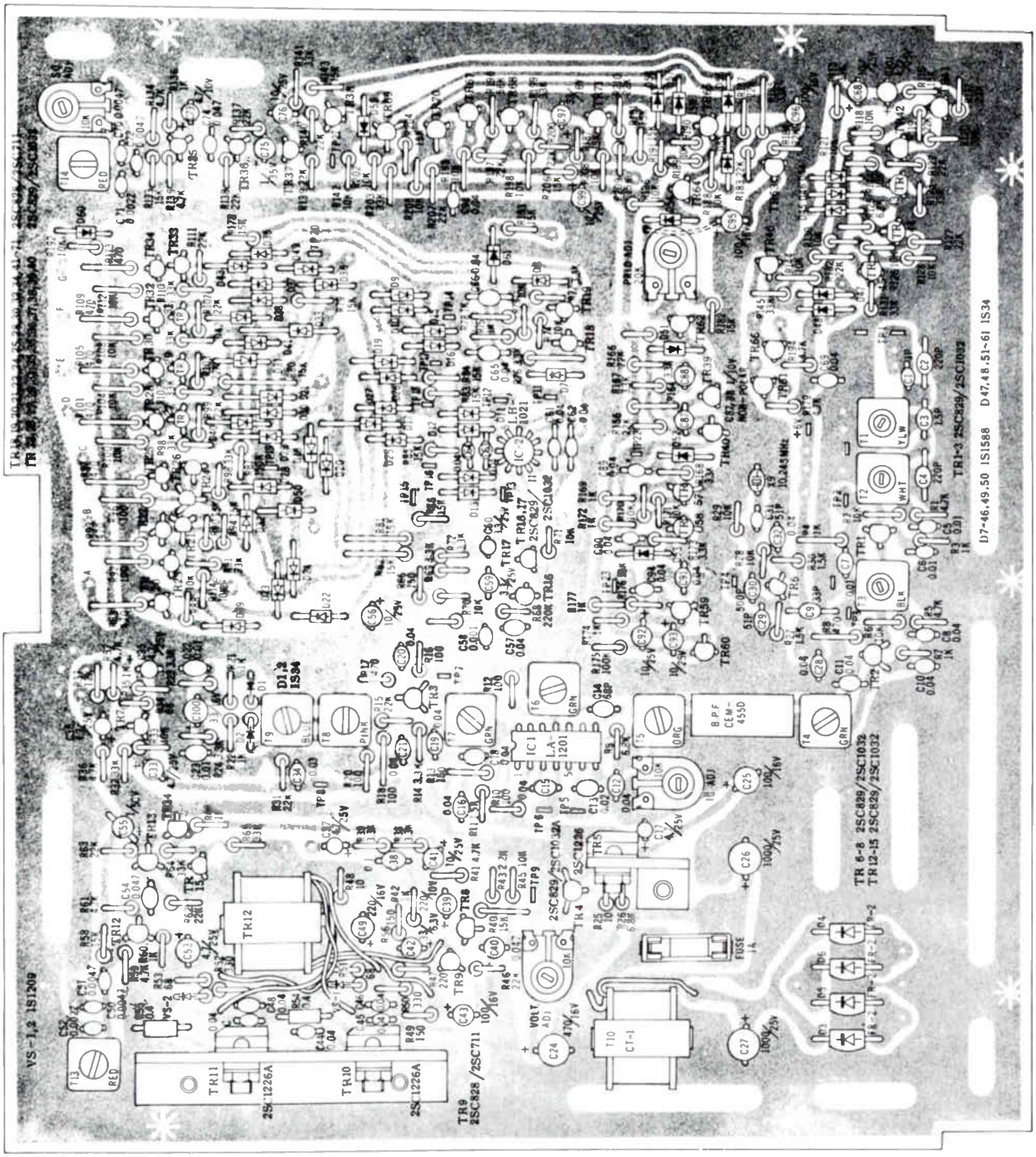
$D = [(J + L) - N] + [(J + M) - P]$

$E = (K + L) - N$

$F = [(J + M) + P] - K$

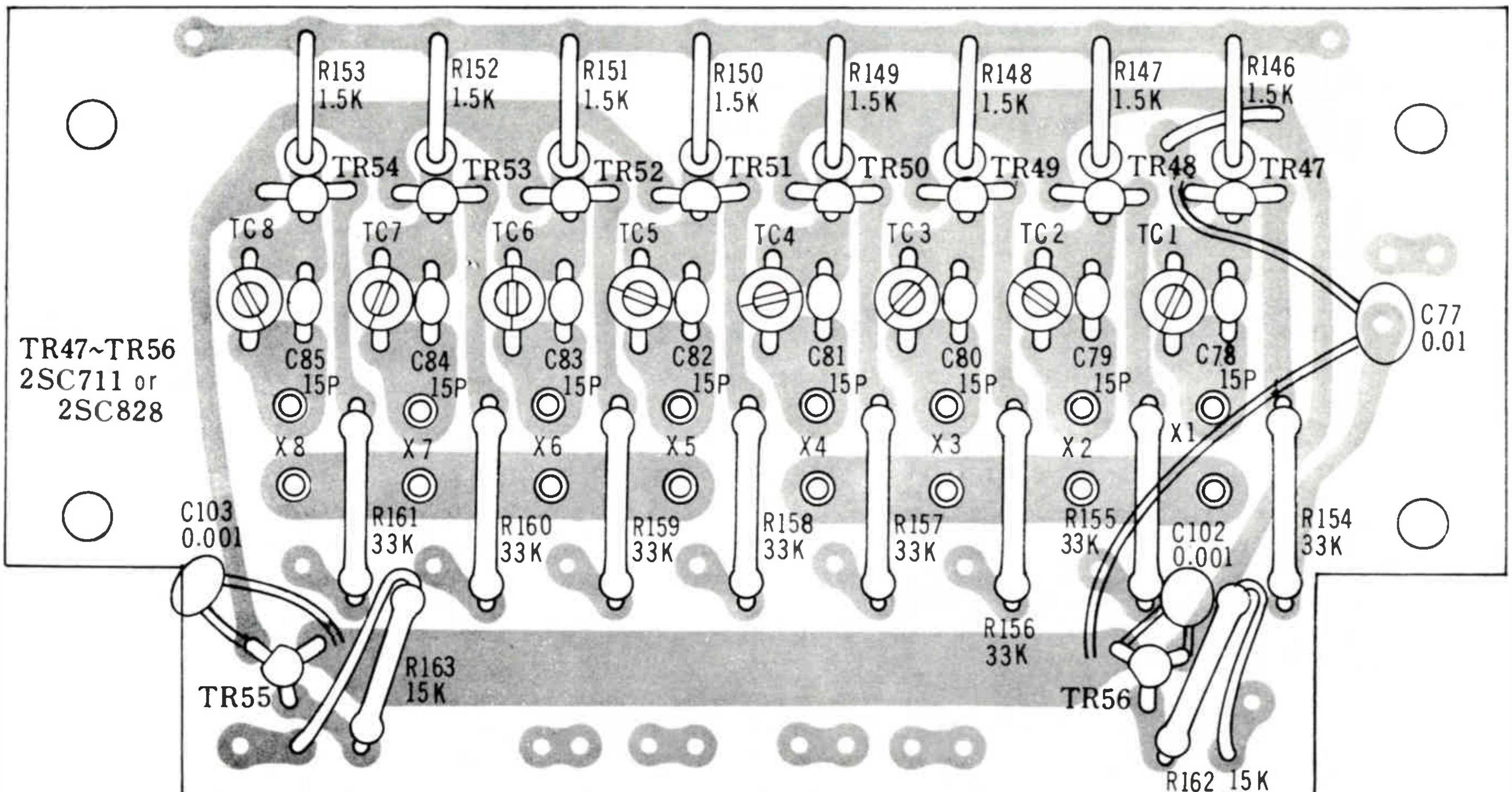
$G = (M + N) - J$

Remarks : Use the voltmeter (20K ohms/V) to check voltages in the circuits.

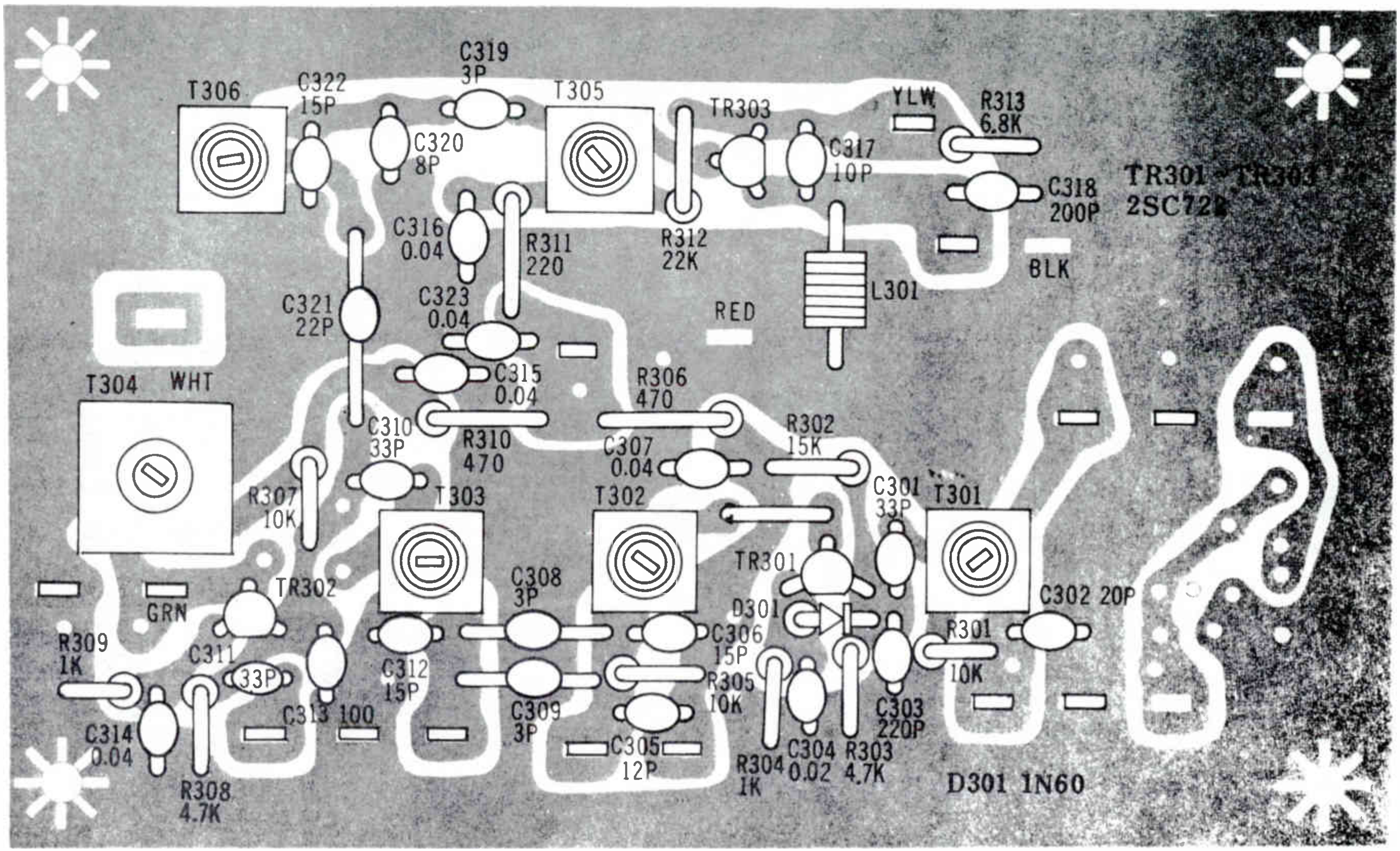


PARTS LOCATION

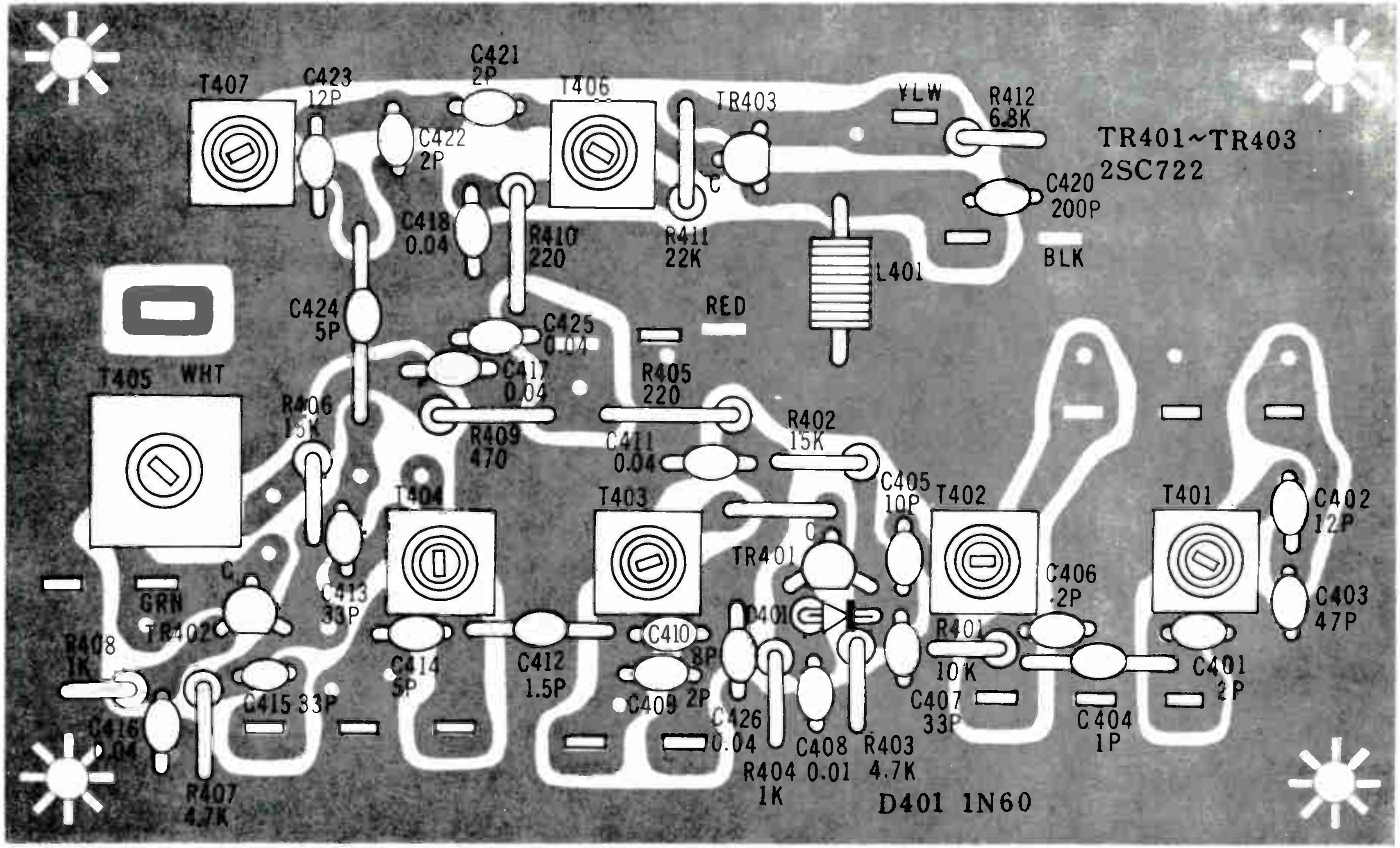
TRIMMER BOARD

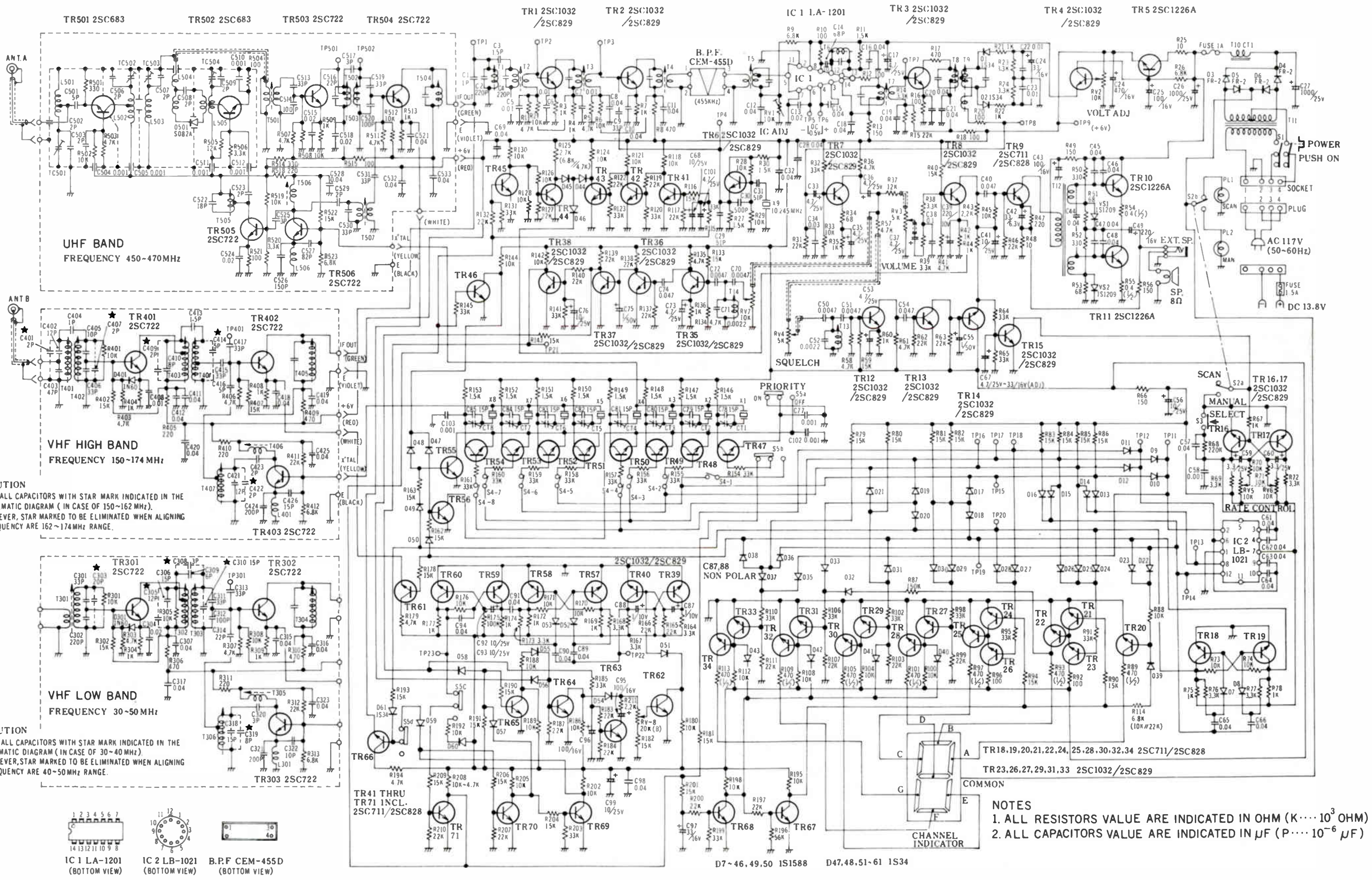


VHF LOW FRONT END BOARD



VHF HIGH FRONT END BOARD

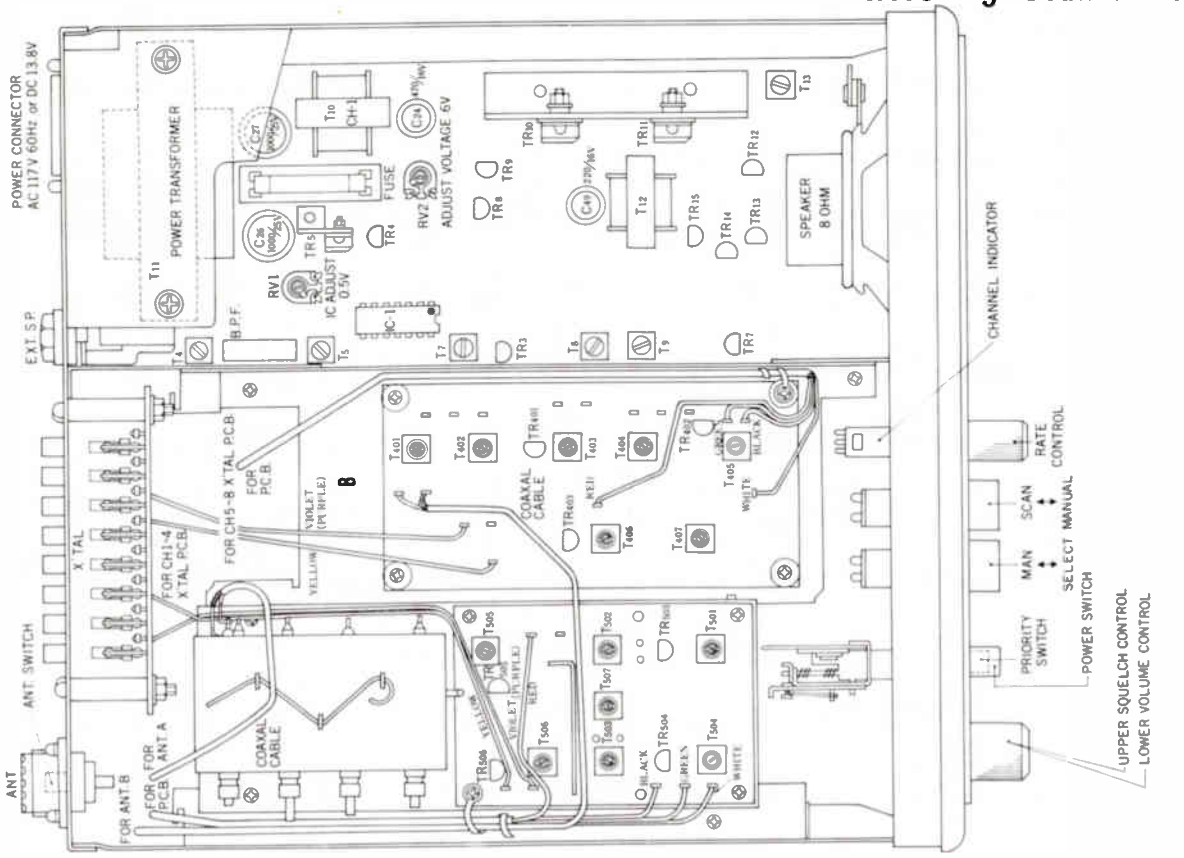




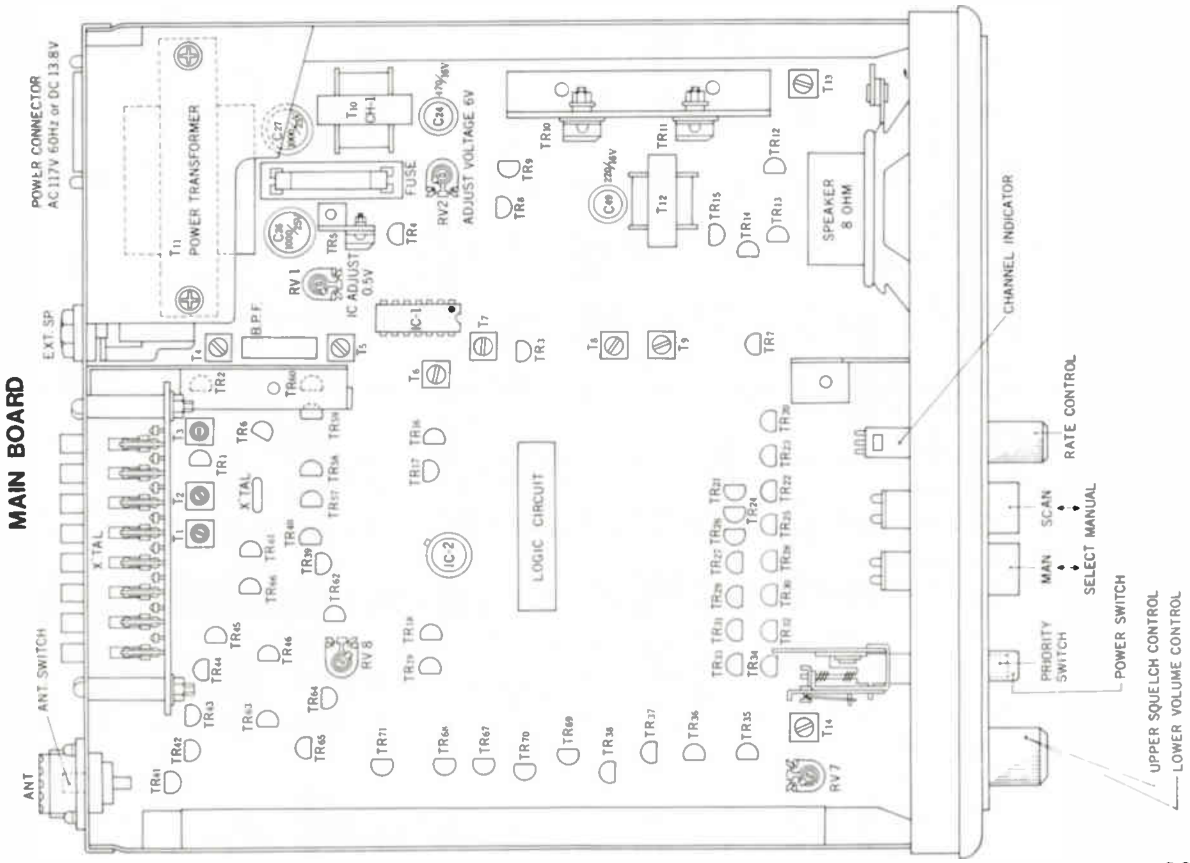
TR501 2SC683
TR502 2SC683
TR503 2SC722
TR504 2SC722
TR1 2SC1032 /2SC829
TR2 2SC1032 /2SC829
IC 1 LA-1201
TR3 2SC1032 /2SC829
TR4 2SC1032 /2SC829
TR5 2SC1226A
ANT.A
B.P.F. CEM-455D
UHF BAND
FREQUENCY 450~470MHz
TR505 2SC722
TR506 2SC722
IF OUT (GREEN)
E (VIOLET)
+6V (RED)
(WHITE)
X'TAL (YELLOW)
E (BLACK)
VOLT ADJ
IC ADJ
TR6 2SC1032 /2SC829
TR7 2SC1032 /2SC829
TR8 2SC1032 /2SC829
TR9 2SC711 /2SC828
TR10 2SC1226A
TR11 2SC1226A
POWER PUSH ON
SOCKET
PLUG
AC 117V (50~60Hz)
EXT. SP.
SP. 8Ω
DC 13.8V
FUSE 1.5A
SCAN
MAN
ANT.B
TR401 2SC722
TR402 2SC722
VHF HIGH BAND
FREQUENCY 150~174MHz
TR403 2SC722
CAUTION
USE ALL CAPACITORS WITH STAR MARK INDICATED IN THE SCHEMATIC DIAGRAM (IN CASE OF 150~162 MHz).
HOWEVER, STAR MARKED TO BE ELIMINATED WHEN ALIGNING FREQUENCY ARE 162~174MHz RANGE.
TR38 2SC1032 /2SC829
TR36 2SC1032 /2SC829
TR37 2SC1032/2SC829
TR35 2SC1032/2SC829
TR46
VOLUME
SQUELCH
TR12 2SC1032 /2SC829
TR13 2SC1032 /2SC829
TR14 2SC1032 /2SC829
TR15 2SC1032 /2SC829
PRIORITY
TR16,17 2SC1032 /2SC829
MANUAL SELECT
RATE CONTROL
IC2 LB-1021
TR301 2SC722
TR302 2SC722
VHF LOW BAND
FREQUENCY 30~50MHz
TR303 2SC722
CAUTION
USE ALL CAPACITORS WITH STAR MARK INDICATED IN THE SCEMATIC DIAGRAM (IN CASE OF 30~40 MHz).
HOWEVER, STAR MARKED TO BE ELIMINATED WHEN ALIGNING FREQUENCY ARE 40~50MHz RANGE.
2SC1032/2SC829
C87,88 NON POLAR
TR41 THRU TR71 INCL. 2SC711/2SC828
TR18,19,20,21,22,24,25,28,30,32,34 2SC711/2SC828
TR23,26,27,29,31,33 2SC1032/2SC829
COMMON
CHANNEL INDICATOR
D7~46,49,50 1S1588
D47,48,51~61 1S34
IC 1 LA-1201 (BOTTOM VIEW)
IC 2 LB-1021 (BOTTOM VIEW)
B.P.F CEM-455D (BOTTOM VIEW)
NOTES
1. ALL RESISTORS VALUE ARE INDICATED IN OHM (K···· 10^3 OHM)
2. ALL CAPACITORS VALUE ARE INDICATED IN μF (P···· 10^-6 μF)

Unimetrics Digi Scan 4+4

MAIN BOARD



MAIN BOARD



SEMICONDUCTORS

ITEM	PART NO/TYPE
D1	1S34
D2	1S34
D3	FR-2
D4	FR-2
D5	FR-2
D6	FR-2
D7	1S1588
D8	1S1588
D9	1S1588
D10	1S1588
D11	1S1588
D12	1S1588
D13	1S1588
D14	1S1588
D15	1S1588
D16	1S1588
D17	1S1588
D18	1S1588
D19	1S1588
D20	1S1588
D21	1S1588
D22	1S1588
D23	1S1588
D24	1S1588
D25	1S1588
D26	1S1588
D27	1S1588
D28	1S1588
D29	1S1588
D30	1S1588
D31	1S1588
D32	1S1588
D33	1S1588
D34	1S1588
D35	1S1588
D36	1S1588
D37	1S1588
D38	1S1588
D39	1S1588
D40	1S1588
D41	1S1588
D42	1S1588
D43	1S1588
D44	1S1588
D45	1S1588
D46	1S1588
D47	1S34
D48	1S34
D49	1S1588
D50	1S1588
D51	1S34
D52	1S34
D53	1S34
D54	1S34
D55	1S34
D56	1S34
D57	1S34
D58	1S34
D59	1S34
D60	1S34
D61	1S34
D301	1N60
D401	1N60
D501	SD82A
IC1	LA1201
IC2	LB1021
TR1	2SC1032 (2SC829)
TR2	2SC1032 (2SC829)
TR3	2SC1032 (2SC829)
TR4	2SC1032 (2SC829)
TR5	2SC1226A
TR6	2SC1032 (2SC829)
TR7	2SC1032 (2SC829)
TR8	2SC1032 (2SC829)
TR9	2SC1032 (2SC829)
TR10	2SC1226A
TR11	2SC1226A
TR12	2SC1032 (2SC829)
TR13	2SC1032 (2SC829)
TR14	2SC1032 (2SC829)
TR15	2SC1032 (2SC829)
TR16	2SC1032 (2SC829)
TR17	2SC1032 (2SC829)
TR18	2SC711 (2SC828)
TR19	2SC711 (2SC828)
TR35	2SC1032 (2SC829)
TR36	2SC1032 (2SC829)
TR37	2SC1032 (2SC829)
TR38	2SC1032 (2SC829)
TR39	2SC1032 (2SC829)
TR40	2SC1032 (2SC829)
TR41	2SC711 (2SC828)
TR42	2SC711 (2SC828)
TR43	2SC711 (2SC828)
TR44	2SC711 (2SC828)
TR45	2SC711 (2SC828)
TR46	2SC711 (2SC828)
TR47	2SC711 (2SC828)
TR48	2SC711 (2SC828)
TR49	2SC711 (2SC828)
TR50	2SC711 (2SC828)
TR51	2SC711 (2SC828)
TR52	2SC711 (2SC828)
TR53	2SC711 (2SC828)
TR54	2SC711 (2SC828)
TR55	2SC711 (2SC828)
TR56	2SC711 (2SC828)
TR57	2SC711 (2SC828)
TR58	2SC711 (2SC828)
TR59	2SC711 (2SC828)
TR60	2SC711 (2SC828)
TR61	2SC711 (2SC828)
TR62	2SC711 (2SC828)
TR63	2SC711 (2SC828)
TR64	2SC711 (2SC828)
TR65	2SC711 (2SC828)
TR66	2SC711 (2SC828)
TR67	2SC711 (2SC828)
TR68	2SC711 (2SC828)
TR69	2SC711 (2SC828)
TR70	2SC711 (2SC828)
TR71	2SC711 (2SC828)
TR301	2SC722
TR302	2SC722
TR303	2SC722
TR401	2SC722
TR402	2SC722
TR403	2SC722
TR501	2SC683
TR502	2SC683 (2SC722)
TR503	2SC683 (2SC722)
TR504	2SC683 (2SC722)
TR505	2SC683 (2SC722)
TR506	2SC722

ELECTROLYTIC/VARIABLE CAPS

ITEM	VALUE
C17	4.7mfd 25V
C24	470mfd 16V
C25	100mfd 16V
C26	1000mfd 25V
C27	1000mfd 25V
C33	4.7mfd 25V
C35	4.7mfd 25V
C36	4.7mfd 25V
C37	4.7mfd 25V
C38	220mfd 16V
C41	10mfd 25V
C42	33mfd 6.3V
C43	100mfd 16V
C49	220mfd 16V
C53	4.7mfd 25V
C55	1mfd 50V
C56	10mfd 25V
C59	3.3mfd 25V
C60	3.3mfd 25V
C68	10mfd 25V
C73	4.7mfd 16V
C75	1mfd 50V
C76	10mfd 25V
C87	1mfd 10V
C88	1mfd 10V
C92	10mfd 10V
C93	10mfd 10V
C95	100mfd 16V
C96	100mfd 16V
C97	33mfd 16V
C99	10mfd 25V
C100	33mfd 16V
C101	4.7mfd 25V
CT1	10pf Trimmer
CT2	10pf Trimmer
CT3	10pf Trimmer
CT4	10pf Trimmer
CT5	10pf Trimmer
CT6	10pf Trimmer
CT7	10pf Trimmer
CT8	10pf Trimmer

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R54		.4 ohm 1/2W WW
R55		.4 ohm 1/2W WW
VS1	1S1209	Thermistor
VS2	1S1209	Thermistor

COILS/TRANSFORMERS

ITEM	PART NO.
L301	20-58
L401	20-66
L501	20-73
L502	20-74
L503	20-75
L505	20-77
T1	20-44
T2	20-45
T3	20-46
T4	20-49
T6	20-50
T7	20-51
T8	20-47
T9	20-48
T13	20-52
T14	20-52
T301	20-53
T302	20-54
T303	20-55
T304	20-59
T305	20-56
T306	20-57
T401	20-60
T402	20-61
T403	20-62
T404	20-63
T405	20-67
T406	20-64
T407	20-65
T501	20-68
T502	20-69
T503	20-70
T504	20-76
T506	20-71
T507	20-72
INPUT	20-42
POWER	20-41
CHOKE,65Hz.	20-43

MISCELLANEOUS

NAME	PART NO.
Crystal, Oscillator	30-99
Filter, Ceramic 455KHz	30-97
Fuse, 1A	30-105
Fuse, 1.5A	30-106
P.C. Board, Main	30-85
P.C. Board, Crystal Switching	30-86
P.C. Board, UHF	30-124
Speaker	30-94
Switch, See-Saw	30-87
Switch, Push	30-88
Switch, Slide	30-90
Tuner, UHF	30-116

CABINET PARTS

NAME	PART NO.
Panel, Front	30-61
Cover, Bottom	30-65
Plate, Front Acrylic	30-71
Button, Push	30-73
Cover, Crystal Compartment	30-75
Knob, Volume/Squelch	30-72

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ALIGNMENT OF IC-1:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
RV-1 10K ohm (Semi-fixed V.R.)	0.5V	+ side, TP 6 (IC-1 LA1201 Pin 4). − side, TR 5 (IC-1 LA1201 Pin 6).	0 - 1.5V DC Volt Meter (50K ohm/V)	Alignment to be made after alignment of stabilized power voltage

ALIGNMENT OF IF CIRCUIT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T4, T5, T6, T7 (455KHz IF Trans.)	455KHz	Input TP 3 (TR2 2SC1032 Base). Output TP 7 (TR3 2SC1032 Base).	Sweep Generator 455KHz	Note 1 – 5 Fig. 6 – 8
T1, T2, T3 (10.7MHz IF Trans.)	10.7MHz	Input TP 1 (P.C.B. "IF IN"). Output TP 7 (TR3 2SC1032 Base).	Sweep Generator 10.7MHz	Note 1 – 5 Fig. 7 – 8

Note 1 : Disconnect Front-end (VHF low, VHF hi, UHF) IF output leads from VHF low, VHF hi and UHF tuner (at Front-end).

Note 2 : Output impedance of the sweep generator to be 50 or 75 ohms.

Note 3 : Capacitor 0.001μF to be inserted in series when the sweep generator is connected to input TP1 or TP3.

Note 4 : Detector probe to be connected to the oscilloscope input.

455KHz ALIGNMENT:

Repeat alignment of T4, T5 and T7 to obtain wave shape shown in Fig. 6 which is symmetric to 455KHz center. Symmetric wave shape must be aligned for maximum. T6 to be aligned to obtain maximum level.

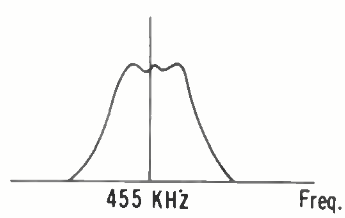


FIGURE 6

10.7MHz ALIGNMENT:

Repeat alignment of T1, T2 and T3 to obtain wave shape shown in Fig. 7 which is symmetric to 10.7MHz center. Symmetric wave shape must be aligned for maximum, however do not align T4, T5 and T6 while aligning T1, T2 and T3.

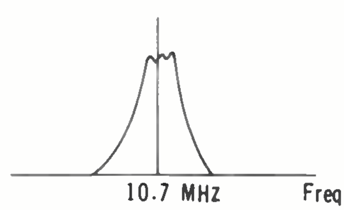


FIGURE 7

Note 5 : In the above-mentioned alignment procedure, the valley of wave shape to be aligned not to exceed 6 dB as shown below.

DISCRIMINATOR COIL ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T8	S Curve Max.	Input TP7, TR3 2SC1032 Base. Output TP8, IF Audio Output.	Sweep Generator (455KHz)	Note 6 - 8
T9	Zero Point at 455KHz	Same as above		Fig. 9

Note 6 : Disconnect Front-end (VHF low, VHF hi, UHF) IF output leads from VHF low, VHF hi and UHF tuner (at Front-end).

Note 7 : Output impedance of the sweep generator to be 50 or 75 ohms.

Note 8 : Capacitor 0.001 μF to be inserted in series when the sweep generator is connected to input TP 7.

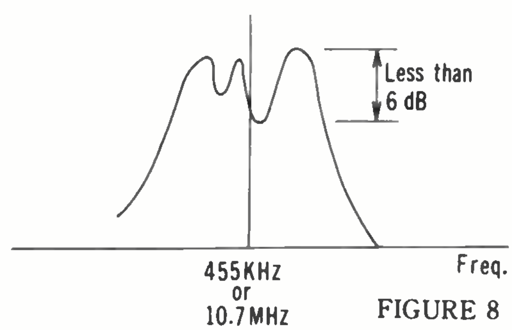


FIGURE 8

"S"CURVE ALIGNMENT:

Align T9 so that 455KHz marker on S curve may come across pedestal line (zero point).
Align T8 and T9 so that symmetric S curve (maximum linear portion) can be obtained.
Repeat the above-mentioned steps until proper S curve can be obtained.

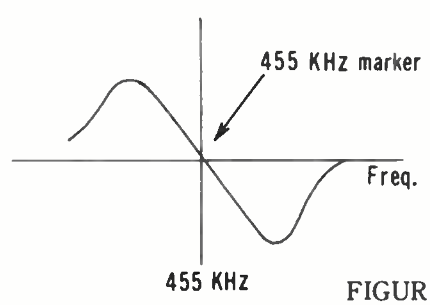


FIGURE 9

IF COIL ALIGNMENT IN FRONT-END:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
VHF low Band T304	10.7MHz	Input TP301, TR302 2SC722 Base. Output TP7, TR3 2SC1032 Base.	Sweep Generator 10.7MHz	Note 1-5 Note 9-10 Fig. 7-8
VHF hi Band T405		Input TP401, TR402 2SC722 Base. Output TP7, TR3 2SC1032 Base.		
UHF Band T504		Input TP502, TR504 2SC722 Base. Output TP7, TR3 2SC1032 Base.		

Note 9 : Connect IF cable to Front-end (VHF low, VHF hi, UHF) IF output terminal.

Note 10: Disconnect crystal terminal lead (yellow) at Front-end.

ALIGNMENT:

Align Front-end IF coil to obtain maximum gain and wave shape shown in Fig. 7.

VHF – LOW FRONT-END ALIGNMENT:

Alignment point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T301 Ant. Coil T302 R.F. Coil T303 R.F. Coil	35MHz (Note 14)	Input Ant. Terminal. Ant. Coil Primary. Output TP301, TR302 2SC722 Base.	VHF Signal Generator (Freq. 30 – 50MHz). High Freq. Volt Meter (Range 30 – 50MHz).	Note 11 – 13 (Fig. 10)

Note 11 : Use the VHF signal generator (30 – 50MHz) provided with output 0.1μV to 100mV variable.

Note 12 : High freq. volt meter provided with freq. range 30 – 50MHz and input voltage range 1 – 10mV.

Note 13 : Preferably the receiver should be aligned with the range not to exceed 3mV.

Note 14 : Aligning frequency can be determined as follows :

A) Receiving band width 4MHz.
B) Aligning Freq. to be chosen to cover center of desired stations.
C) Use circuits without taking off star marked capacitors, in case of 30 – 40MHz.
D) Star marked capacitors to be eliminated when aligning frequencies are 40 – 50MHz range.

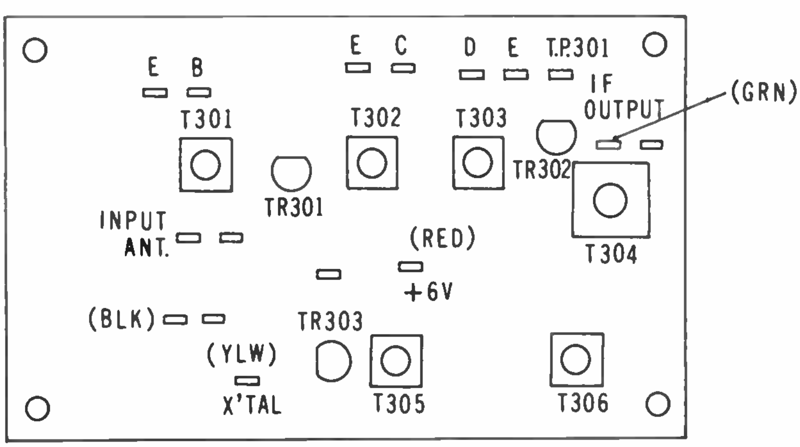


FIGURE 10 VHF–LOW FRONT END P.C.B.

ALIGNMENT:

Step 1 : Connect the signal generator output to antenna input terminals, then set the signal generator frequency to aligning frequency.

Step 2 : Connect the high frequency volt meter across TP301.

Step 3 : Align T301 to obtain maximum output.

Step 4 : Connect damping resistor (47 ohms) across terminal D-E, then align T302 to obtain maximum output.
Eliminate the resistor (47 ohms) after the alignment.

Step 5 : Connect damping resistor (47 ohms) across terminal C-E, then align T303 to obtain maximum output.
Eliminate the resistor (47 ohms) after the alignment.

Step 6 : Repeat step 3 thru step 5.

Note 15 : Connect all leads from main chassis to assigned terminals, IF output (green), + 6V (red), crystal (yellow), ground (black) and antenna input (coaxial cable).

Note 16 : Provide 4 - 5 turns loop at end of frequency counter input cable as shown in Fig.11, then close-couple to T305.

VHF - LOW OSCILLATOR ALIGNMENT:

Alignment Point	Adjust for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T305, Osc Coil	35MHz (Note 14)	Freq. Counter, Coupling Loop, T305.	Signal Generator (Freq. 30 - 50MHz). Freq. Counter (Freq. 30 - 50MHz). Volt Meter (VTVM).	Note 15 - 16 (Fig. 11)
T306		Input Ant. Terminal. Output Ext. Speaker Jack.		

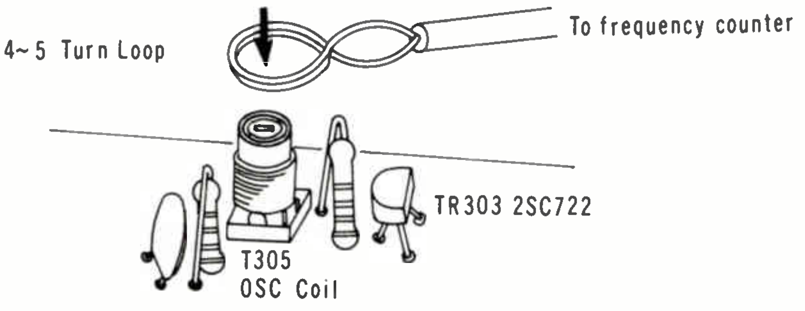


FIGURE 11 FREQUENCY COUNTER LOOP SET-UP

ALIGNMENT:

Step 1 : Turn T305 core fully-clockwise until it reaches the bottom of the coil.

Step 2 : Confirm that on all channels (8 channels) the oscillator operates normally. If on any channels the oscillator is dead, align T305 core to obtain normal oscillation, then read out oscillator frequency by the frequency counter confirming that the frequency error is within 2/100,000.

Step 3 : Set the signal generator frequency to 35MHz.

Step 4 : Set channel to 35MHz crystal.

Step 5 : Align T306 to obtain maximum sensitivity thru step 3 to step 4.

VHF HI FRONT-END ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T401 Ant. Coil T402 Ant. Coil T403 R.F. Coil T404 R.F. Coil	155MHz (Note 20)	Input Ant. Terminal, Ant. Coil T401. Output TP401, TR402 2SC722 Base.	Signal Generator (Freq. 150-174MHz). Hi Freq. Volt Meter (Range 150-174MHz).	Note 17 - 19 (Fig. 12)

Note 17 : Use the VHF signal generator (150 - 174MHz) provided with output of 0.1 μV - 100mV variable.

Note 18 : High frequency volt meter should be provided with frequency range 150-174MHz and input voltage range 1 - 10mV.

Note 19 : Preferably the receiver to be aligned in range not to exceed 3mV.

Note 20 : Aligning frequency can be determined as follows:

A) Receiving band width 7MHz.
B) Aligning frequency to be chosen to cover center of desired stations.
C) Use all capacitors with star mark indicated in the schematic diagram (in case of 150-162MHz).
D) However, star marked capacitors to be eliminated when aligning frequencies are 162-174MHz range.

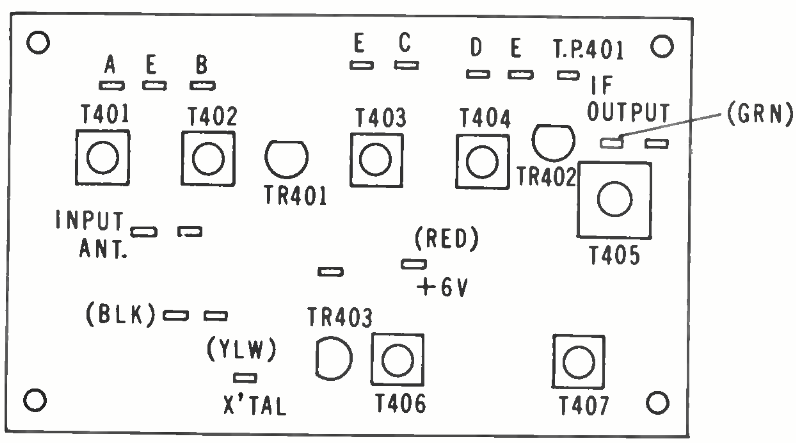


FIGURE 12 VHF—HI FRONT END P.C.B.

ALIGNMENT:

Step 1 : Connect the signal generator output to antenna input terminal, then set the signal generator frequency to aligning frequency.

Step 2 : Connect the high frequency volt meter across TP401 and chassis ground.

Step 3 : Connect the damping resistor (47 ohms) across terminal B-E, then align T401 to obtain maximum output. Remove the resistor (47 ohms) after the above alignment.

Step 4 : Connect the damping resistor (47 ohms) across terminal A-E, then align T402 to obtain maximum level. Remove the resistor (47 ohms) after the alignment.

Step 5 : Connect the damping resistor (47 ohms) across terminal D-E, then align T403 to obtain maximum level. Remove the resistor after the alignment.

Step 6 : Connect the damping resistor (47 ohms) across terminal C-E, then align T404 to obtain maximum level. Remove the resistor after the aligning.

Step 7 : Repeat Step 3-6 until the proper wave shape and output are obtained.

VHF HI OSCILLATOR ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T406 Osc Coil	155MHz (Note 20)	Freq. Counter. Loop T406.	Signal Generator (Freq. 150 - 174MHz). Frequency Counter (Freq. 40 - 60MHz). Volt Meter (VTVM).	Note 21 - 22
T407 Tripler Coil		Input Ant. Input Terminal. Output Ext. Speaker Jack.		

Note 21 : Connect all leads from main chassis to assigned terminals, IF output (green), + 6V (red), crystal (yellow), grounding (black) and antenna input (coaxial cable).

Note 22 : Provide 4-5 turns loop at end of frequency counter input cable as shown in Fig. 11, then close-couple to T406, as shown.

ALIGNMENT:

Step 1 : Turn T406 core fully clockwise until it reaches the bottom of the coil.

Step 2 : Confirm that on all channels (8 channels) the oscillator operates normally. If on any channels the oscillator is dead, align T406 core to obtain normal oscillation, then read out oscillator frequency on the counter confirming that frequency error is within 2/100,000.

Step 3 : Set the signal generator frequency to 155MHz.

Step 4 : Set channel to 155MHz crystal.

Step 5 : Align T407 to obtain maximum sensitivity thru step 3-4.

UHF FRONT-END ALIGNMENT:

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
TP501 TP502 TP503	463MHz	Input Ant. Terminal. Output R.F. Output (IF).	Signal Generator (Freq. 450 - 470MHz). High Freq. Volt Meter (Range 450 - 470MHz).	Note 23 - 26 (Fig. 13)

Note 23 : Use the UHF signal generator (450-470MHz) provided with output of 0.1μV - 100mV variable.

Note 24 : Set the signal Generator frequency to 463MHz and the output to 100mV.

Note 25 : The high freq. volt meter to be provided with freq. range 450 - 470MHz, and 1 - 10mV in output range.

Note 26 : The high frequency volt meter to be connected to RF output of UHF Front-end which is terminated with 47 ohms.

ALIGNMENT:

Step 1 : Connect the capacitor of 500pF (damping capacitor) across trimmer capacitor T.C.503.

Step 2 : Align T.C.502 to obtain maximum deflection on the voltmeter.

Step 3 : Align T.C.501 (trimmer) to obtain maximum deflection on the voltmeter.

Step 4 : Eliminate 500pF capacitor from T.C.503, then connect it to T.C.502.

Step 5 : Align T503 trimmer capacitor to obtain maximum deflection on the voltmeter. Eliminate 500pF capacitor from T.C.502 after aligning.

Step 6 : Repeat step 1 thru step 5 until proper characteristics are obtained.

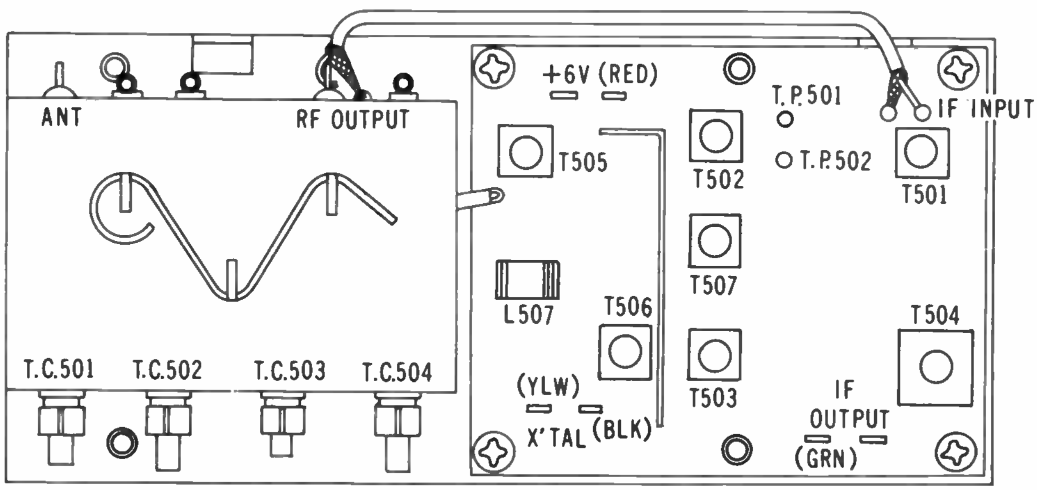


FIGURE 13 UHF FRONT—END

UHF IF ALIGNMENT :

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T507 Trap Coil	90.46MHz	Input X'tal Terminal Output T. P. 502	Signal Generator (Freq. 50 - 100MHz).	
T501 IF Coil	55.93MHz	Input IF—in	High Freq. Voltmeter (Range 50 - 100MHz).	Note 27 - 28
T502 IF Coil		Output TR504,2SC722 Base		
T503 IF Coil				

UHF LOCAL ALIGNMENT :

Alignment Point	Align for	Measuring Equipment Connection Point	Measuring Equipment	Condition
T505 Tripler Coil	135.69MHz	Input X'tal terminal. Output C522, 2pF.	Signal Generator (Freq. 120 - 470MHz).	Note 29
T506 Osc. Coil		Freq. Counter, Loop T506	Freq. Counter (40 - 60MHz).	
TC504	463MHz	Input Ant. Terminal. Output Ext. Speaker Jack.	High Freq. Voltmeter (Range 120 - 470MHz).	

Note 27 : Use the VHF signal generator (50 - 100MHz) provided with 100mV output.

Note 28 : The high freq. voltmeter must be provided with freq. range 50-100MHz and input voltage range 1 - 10mV.

ALIGNMENT :

(A) Trap Coil (T507) Alignment

Step 1 : Connect the signal generator to crystal terminal (yellow).

Step 2 : Set the signal generator output level and its frequency to 100mV and 90.46MHz respectively.

Step 3 : Connect the high freq. voltmeter to TP502. Align T507 to obtain minimum reading on the voltmeter.

(B) IF Alignment (UHF)

Step 1 : Connect the signal generator to IF - IN (T501), and set the frequency and its output to 55.93MHz and 100mV respectively.

Step 2 : Connect the high freq. voltmer to TR504 2SC722 base.

Step 3 : Connect the damping resistor (47 ohms) across TP502.

Step 4 : Align T501, T502 in step 3 to obtain maximum reading on the voltmeter.

Step 5 : Disconnect the damping resistor from TP502, then connect it to TP501.

Step 6 : Align T503 in step 5 to obtain maximum reading on the voltmeter. Disconnect the damping resistor after the alignment.

Step 7 : Repeat step 3 thru step 6 until proper characteristics are obtained.

(C) UHF Local Oscillator Alignment

Step 1 : Connect the signal generator to crystal terminal (yellow). Frequency and output (unmodulated signal) to be set to 135.69MHz and 100mV respectively.

Step 2 : Connect high freq. voltmeter to C522 2pF, then align T505 to obtain maximum reading on the voltmeter.

Step 3 : Turn T506 core clockwise until the core reaches the bottom of T506.

Step 4 : Confirm the local oscillation of all 8 channels by frequency-counter. If all channel oscillation fails, adjust the core to oscillate all channels. Oscillation frequency error must be within 1/100,000.

Step 5 : Set the signal generator frequency to 463MHz, then the receiver channel to 463MHz.

Step 6 : In step 3, align T.C.504 to obtain maximum sensitivity.

Note 29 : Provide 4 – 5 turns loop at end of frequency counter input cable as shown in Fig. 11 and close-couple to T506.

ALIGNMENT OF STABILIZED POWER VOLTAGE:

Alignment Point	Align for	Measuring Equipment Connection point	Measuring Equipment	Condition
RV-4 10K ohm (Semi-fixed V.R.)	6V	+ side, TR41 2SC971 Emitter (TP 9). – side, Ground.	0 to 10V DC Volt Meter	AC 117V 60Hz

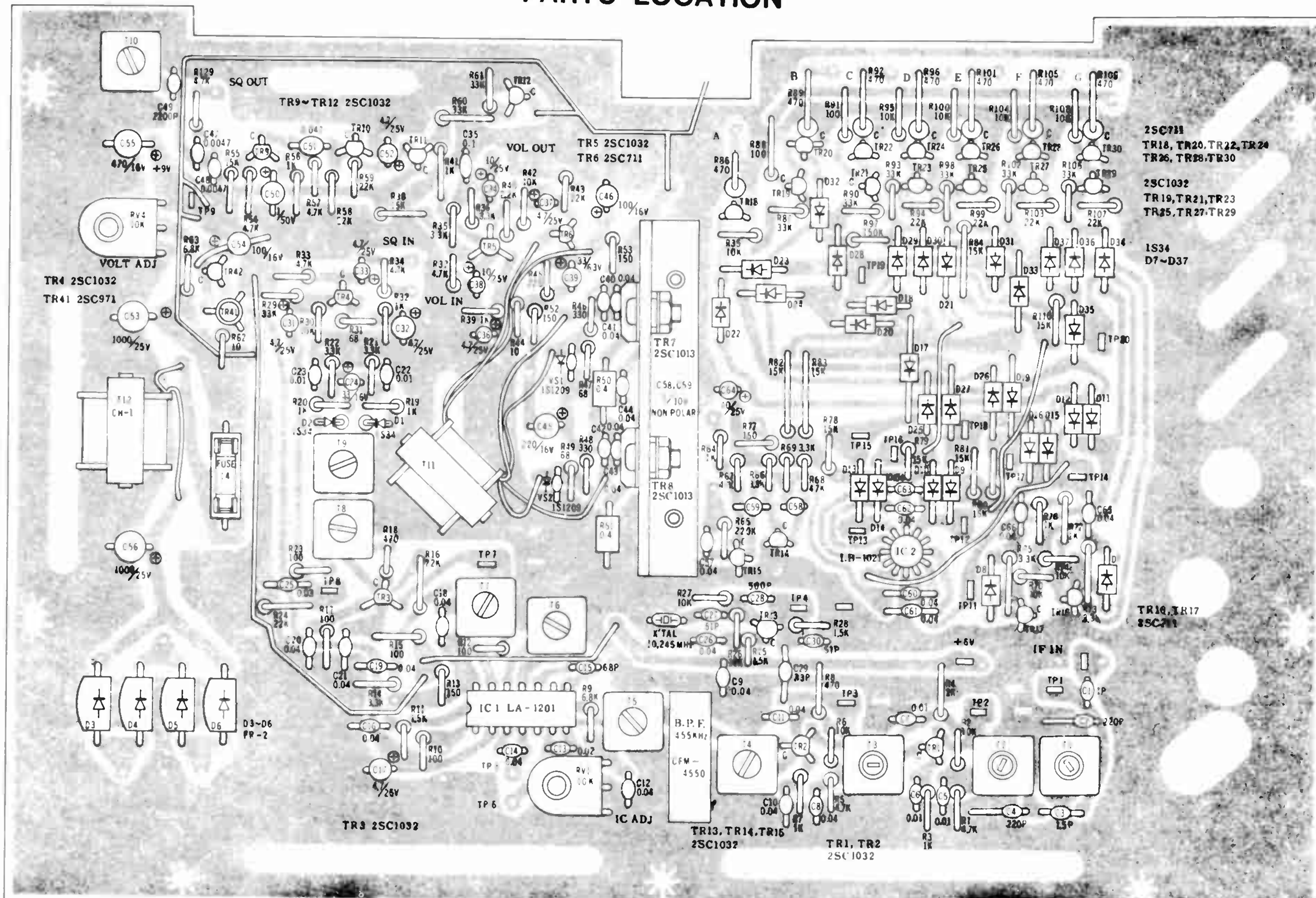
LOGIC CIRCUIT CHECK:

Refer the below-indicated table when logic circuit parts are replaced.

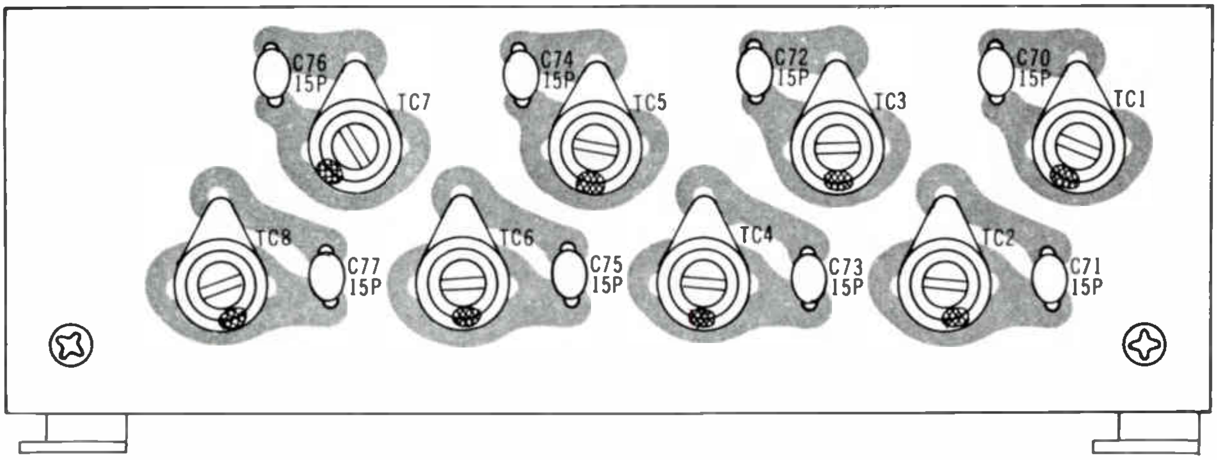
Channel No.	J TP.11	K TP.12	L TP.13	M TP.14	N TP.19	P TP.20	J+L TP.15	K+L TP.16	J+M TP.17	K+M TP.18
1	2.3V	0	2.5V	0	2.5V	0	2.2V	0.3V	0.4V	0.3V
2	0	2.3V	2.5V	0	2.5V	0	0.3V	2.0V	0.3V	0.3V
3	2.3V	0	0	2.5V	2.5V	0	0.3V	0.3V	2.0V	0.3V
4	0	2.3V	0	2.5V	2.5V	0	0.3V	0.3V	0.3V	2.0V
5	2.3V	0	2.5V	0	0	2.5V	2.2V	0.3V	0.5V	0.3V
6	0	2.3V	2.5V	0	0	2.5V	0.3V	2.2V	0.4V	0.3V
7	2.3V	0	0	2.5V	0	2.5V	0.3V	0.3V	2.2V	0.3V
8	0	2.3V	0	2.5V	0	2.5V	0.3V	0.3V	0.4V	2.2V

Channel No.	A	B	C	D	E	F	G
1	2.3V	0.4V	0.3V	2.0V	0.4V	2.1V	2.2V
2	2.3V	1.9V	0.3V	0.5V	0.9V	0.6V	0.3V
3	2.3V	1.9V	0.3V	0.5V	0.4V	0.6V	2.3V
4	2.3V	0.3V	1.9V	0.5V	0.4V	2.1V	2.1V
5	0	2.5V	2.5V	0.7V	0.1V	0.7V	2.2V
6	0	2.5V	2.5V	0.5V	0.1V	0.6V	0.2V
7	2.1V	2.5V	2.5V	1.7V	0.1V	1.7V	2.2V
8	2.1V	2.5V	2.5V	0.5V	0.1V	0.6V	0.2V

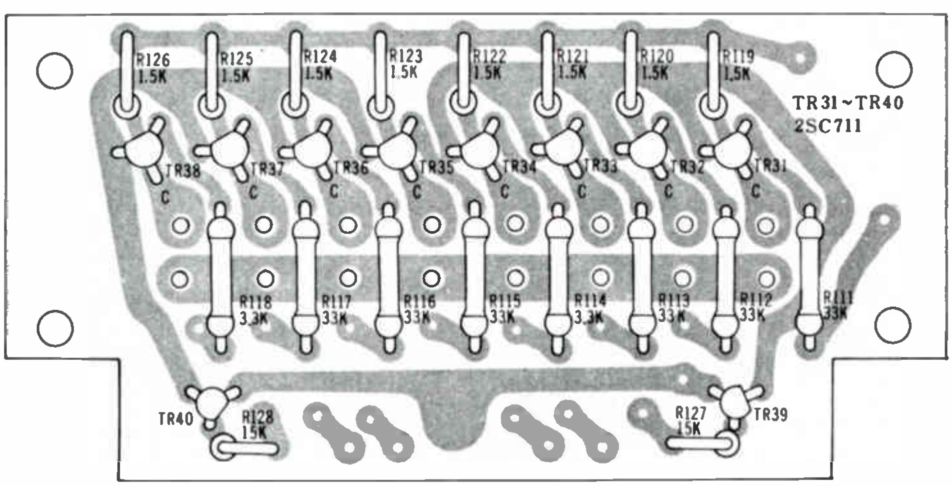
PARTS LOCATION



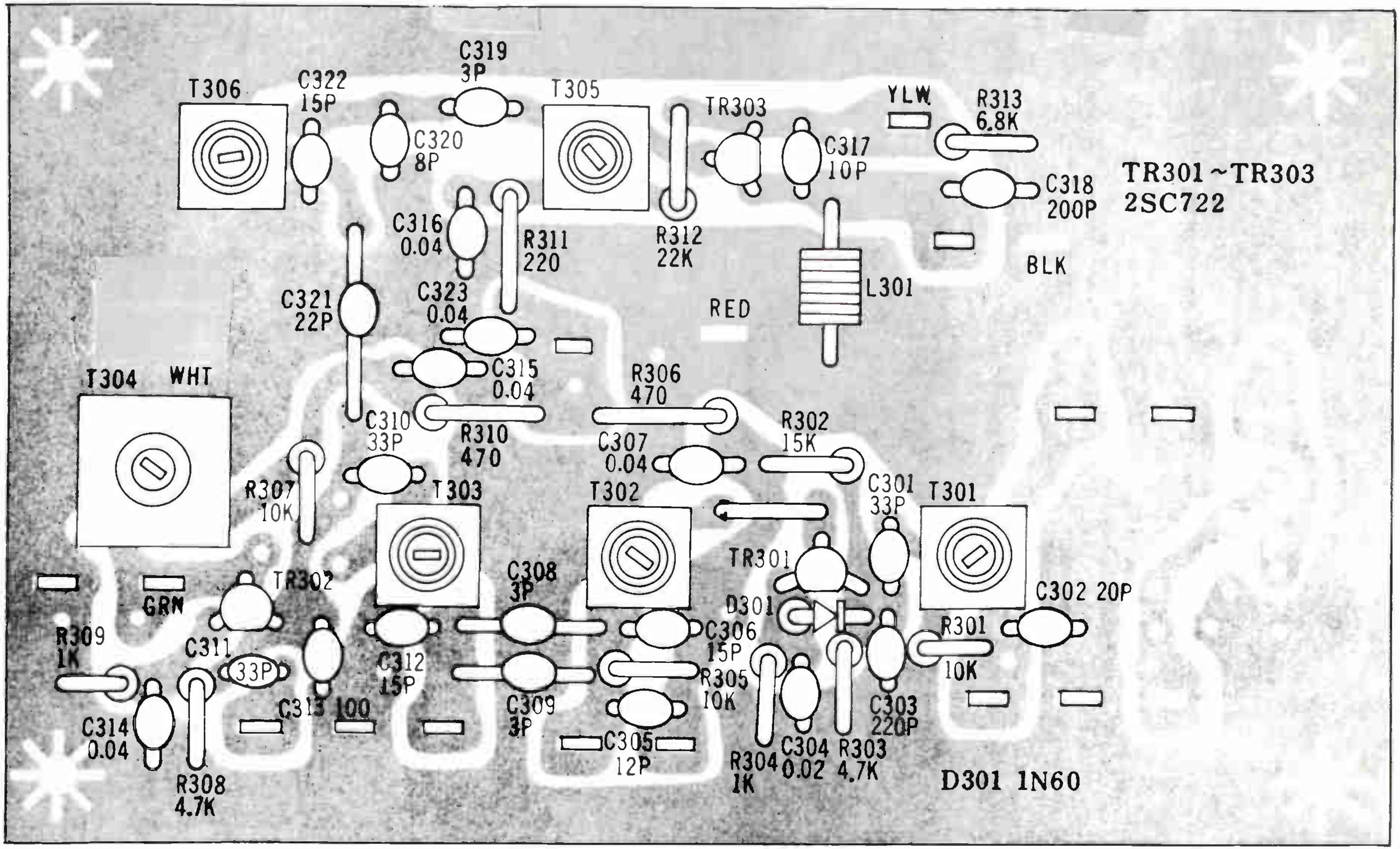
TRIMER BOARD



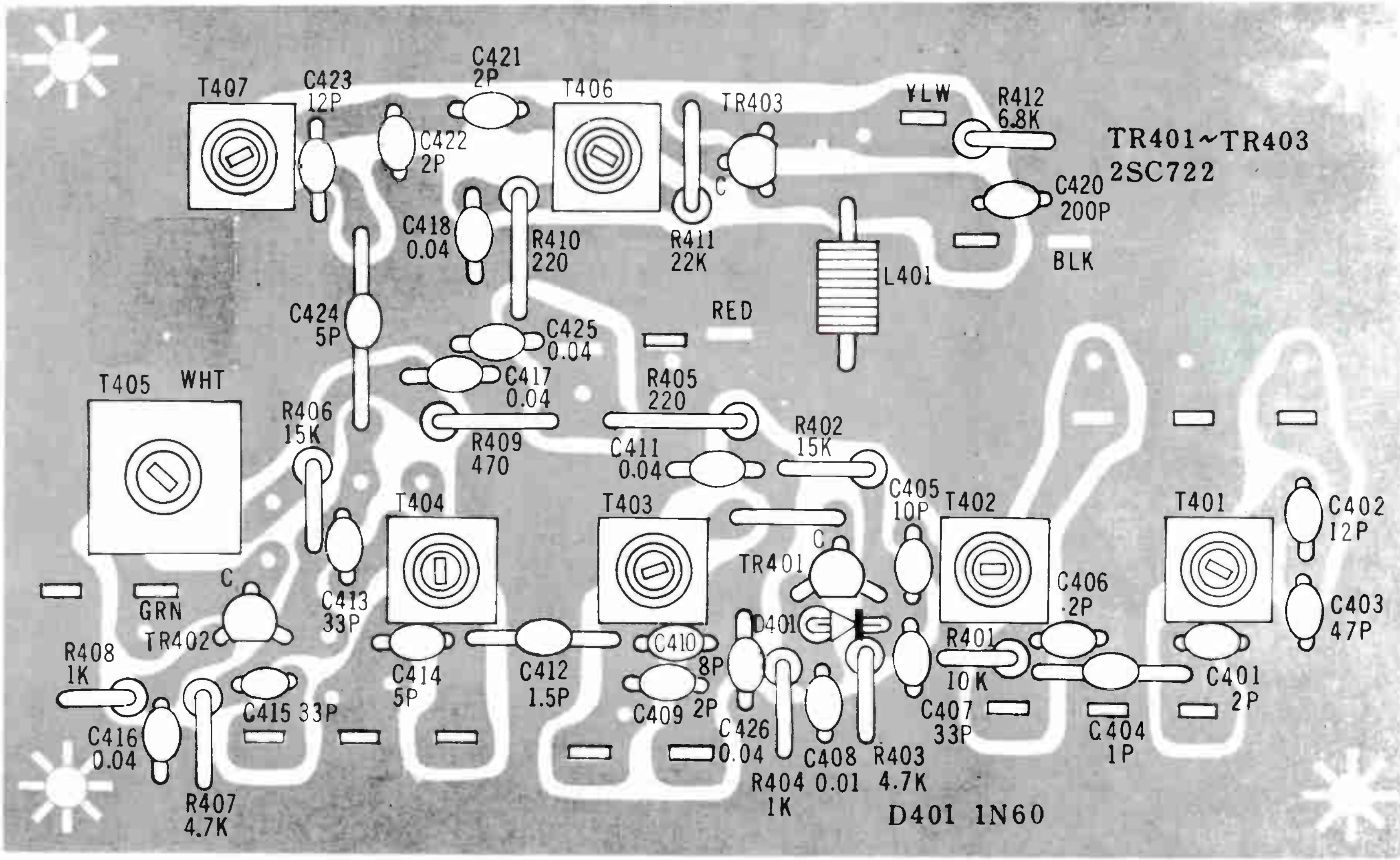
CRYSTAL SWITCHING BOARD



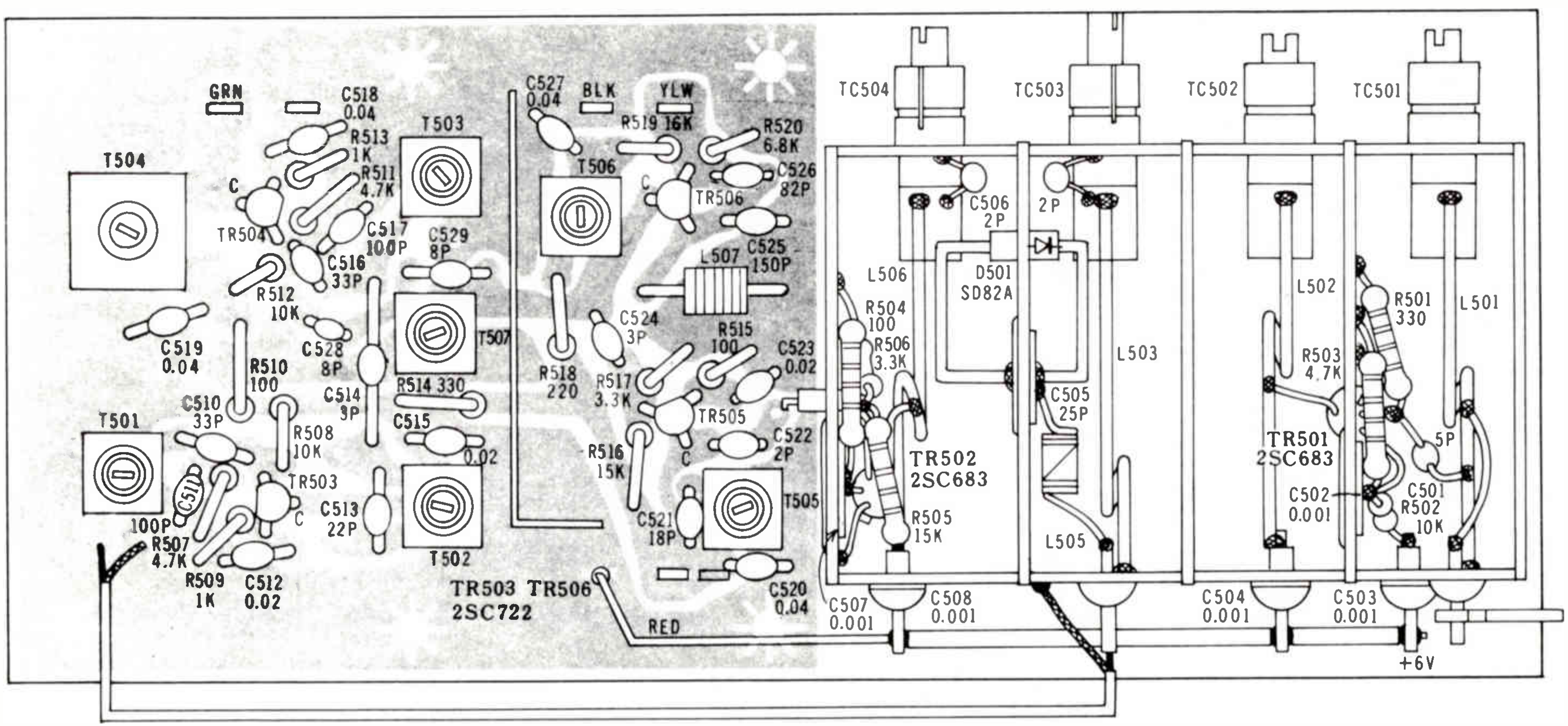
VHF LOW FRONT END BOARD

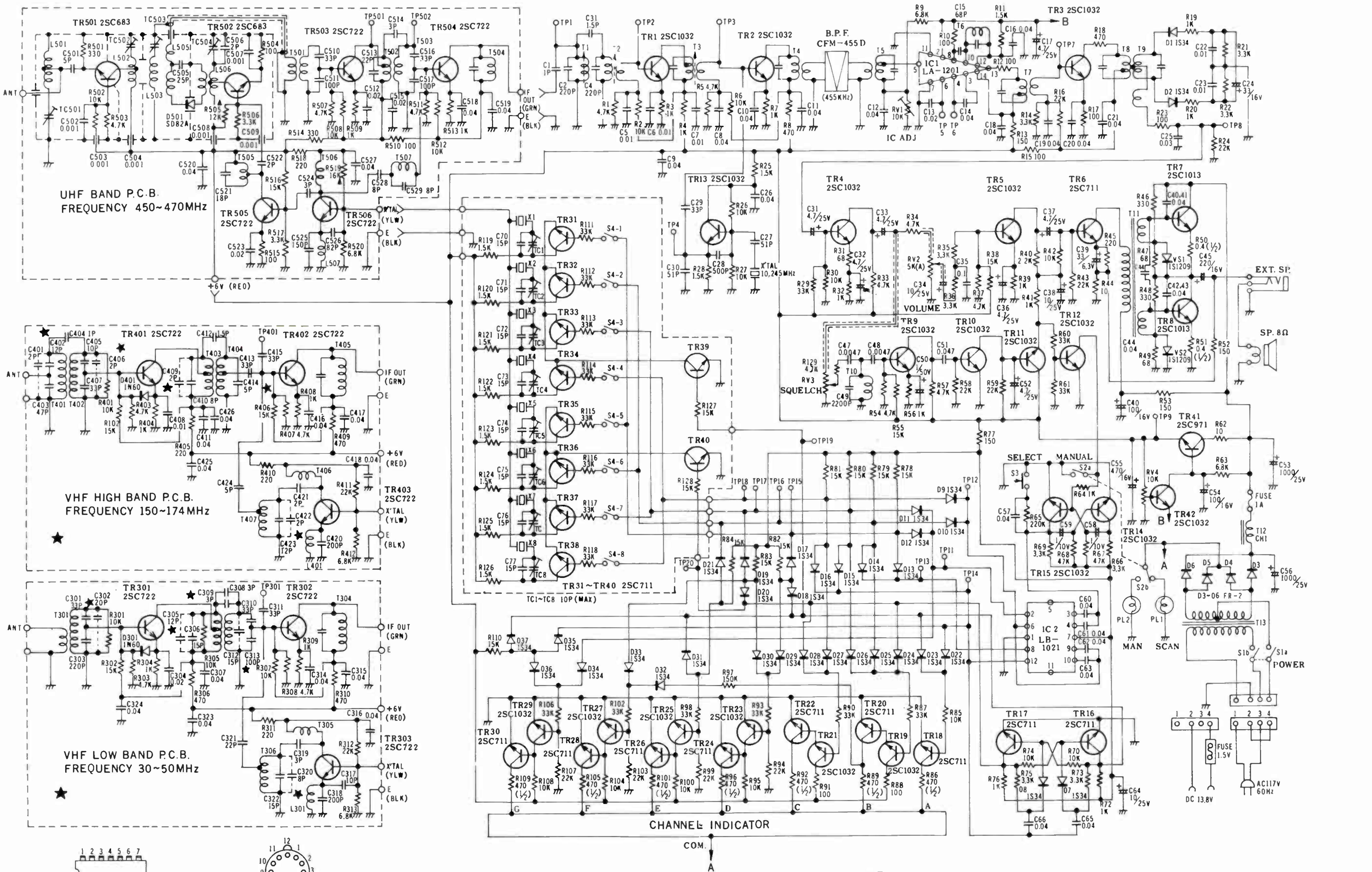


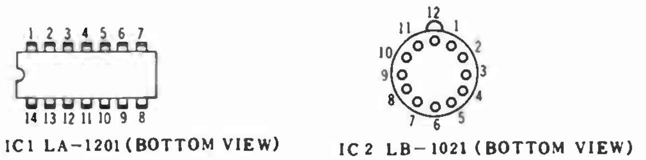
VHF HIGH FRONT END BOARD



UHF FRONT END BOARD



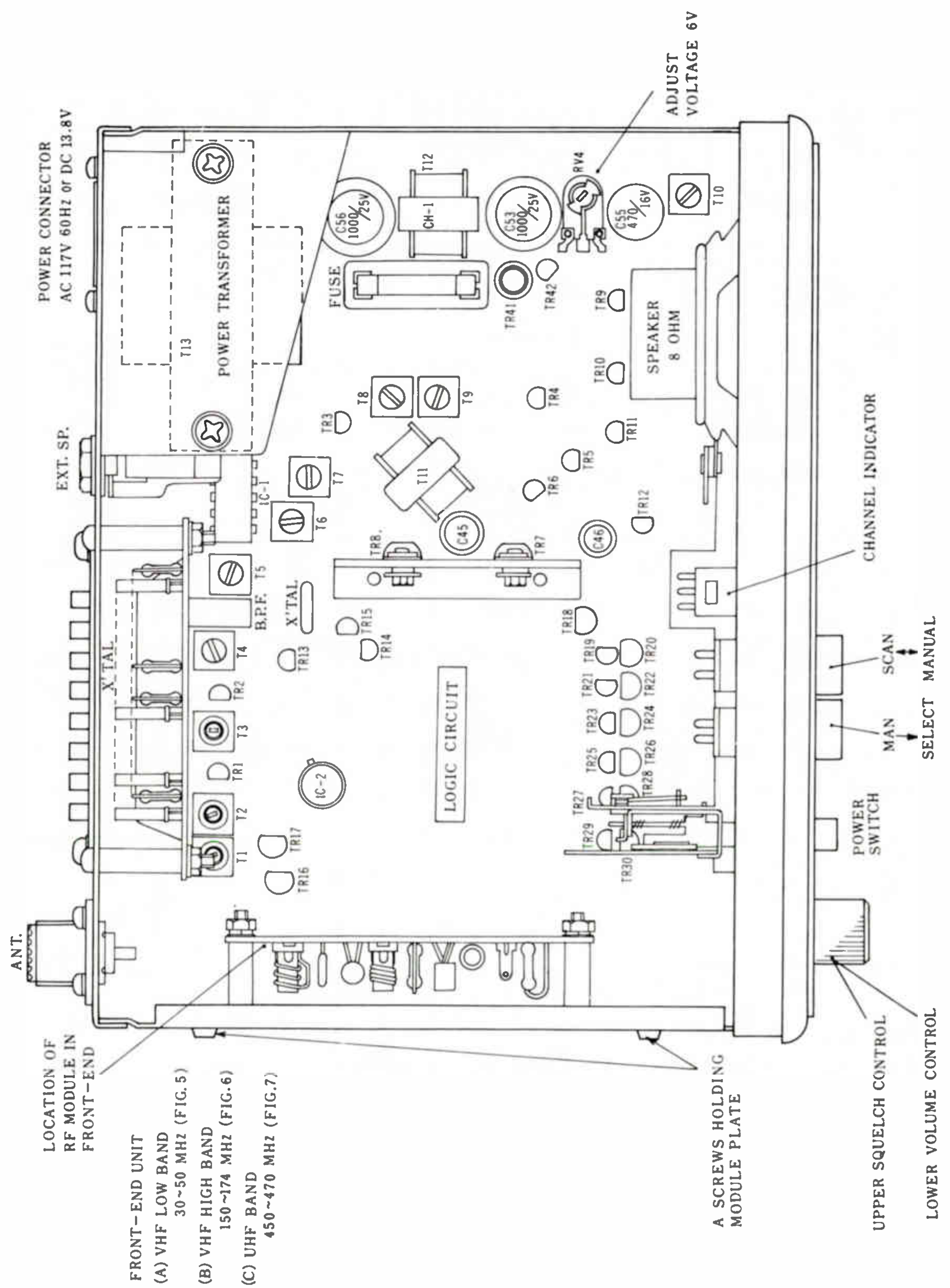




NOTES

1. ALL RESISTOR VALUE ARE INDICATED IN OHM ($K \cdots 10^3$ OHM).
2. ALL CAPACITOR VALUE ARE INDICATED IN μF ($P \cdots 10^{-6}$ μF).
3. UHF BAND. ▲ R505 12K····15K//47K, ▲ R519 16K····22K//47K.

MAIN BOARD



PLEASE READ THE FOLLOWING BEFORE ORDERING CRYSTALS

Each Digi Scan-8 is normally available from the factory tuned to the following standard center frequency.

[1] Low Band Receivers (30-50MHz): Standard Center Frequency 35MHz

[2] High Band Receivers (150-174MHz): Standard Center Frequency 155MHz

[3] UHF Receivers (450-470MHz): Standard Center Frequency 463MHz

These are center frequencies, of course. The circuits are so designed as to permit operation of up to 8 channels over a band of frequencies without retuning, as follows:

[1] Low Band: 33 – 37 MHz (※35 ± 2.0MHz). Total spread 4MHz. 33.0 35.0 37.0

[2] High Band: 151.5 – 158.5MHz (※155 ± 3.5MHz). Total spread 7MHz. 151.5 155.0 158.5

[3] UHF Band: 459.5 – 466.5 (※463 ± 3.5MHz). Total spread 7MHz. 459.5 463.0 466.5

※ Center frequency.

When ordering additional crystals for a receiver tuned to a standard center frequency, make sure the monitoring frequencies requested fall within the specific spread indicated above. If the monitoring frequencies requested with the original order of the receiver fall outside of the frequency spread provided by a standard center frequency, the receiver must be retuned to a new center frequency before being shipped to accommodate the requested monitoring frequency[s]. When ordering additional crystals for such a receiver, be sure the requested monitoring frequencies fall within the total spread provided by the new center frequency.

CRYSTAL FREQUENCY DETERMINATION AND CORRELATION

Crystals used in DIGI SCAN-8 are type HC-25/U
Crystal frequencies are normally determined as follows.

FREQUENCY FOR LOW BAND VHF 30 – 50 MHz:
Crystal fundamental frequency = Channel frequency F + 10.7 MHz

FREQUENCY FOR HIGH BAND VHF 150 – 174 MHz:
Crystal 3rd overtone frequency = Channel frequency $\frac{F - 10.7\ \text{MHz}}{3}$

FREQUENCY FOR UHF BAND 450 – 470 MHz:
Crystal 9th overtone frequency = Channel frequency $\frac{F - 10.7\ \text{MHz}}{10}$

Frequency deviation is less than 2/100,000 in low VHF band 30 – 50 MHz and high VHF band 150 – 174 MHz.
Frequency deviation is less than 1/100,000 in UHF band 450 – 470 MHz.

CRYSTAL CORRELATION:
Resonance .... Parallel

INDEX

THIS INDEX LISTS ALL SCANNERS AND MONITORS
IN "SAMS SCANNER-MONITOR SERVICING DATA" VOLUMES.

SEMICONDUCTORS

ITEM	PART NO/TYPE
D1	SD34
D2	SD34
D3	FR2
D4	FR2
D5	FR2
D6	FR2
D9	1S34
D10	1S34
D11	1S34
D12	1S34
D13	1S34
D14	1S34
D15	1S34
D16	1S34
D17	1S34
D18	1S34
D19	1S34
D20	1S34
D21	1S34
D22	1S34
D23	1S34
D24	1S34
D25	1S34
D26	1S34
D27	1S34
D28	1S34
D29	1S34
D30	1S34
D31	1S34
D32	1S34
D33	1S34
D34	1S34
D35	1S34
D36	1S34
D37	1S34
D301	1N60
D401	1N60
D501	SD82
IC1	LA1201
IC2	LB1021
TR1	2SC1032 (2SC829)
TR2	2SC1032 (2SC829)
TR3	2SC1032 (2SC829)
TR4	2SC1032 (2SC829)
TR5	2SC1032 (2SC829)
TR6	2SC711 (2SC828)
TR7	2SC1013
TR8	2SC1013
TR9	2SC1032 (2SC829)
TR10	2SC1032 (2SC829)
TR11	2SC1032 (2SC829)
TR12	2SC1032 (2SC829)
TR13	2SC1032 (2SC829)
TR14	2SC1032 (2SC829)
TR15	2SC1032 (2SC829)
TR16	2SC711 (2SC828)
TR17	2SC711 (2SC828)
TR18	2SC711 (2SC828)
TR19	2SC1032 (2SC829)
TR20	2SC711 (2SC828)
TR21	2SC1032 (2SC829)
TR22	2SC711 (2SC828)
TR23	2SC1032 (2SC829)
TR24	2SC711 (2SC828)
TR25	2SC1032 (2SC829)
TR26	2SC711 (2SC828)
TR27	2SC1032 (2SC829)
TR28	2SC711 (2SC828)
TR29	2SC1032 (2SC829)
TR30	2SC711 (2SC828)
TR31	2SC711 (2SC828)
TR32	2SC711 (2SC828)
TR33	2SC711 (2SC828)
TR34	2SC711 (2SC828)
TR35	2SC711 (2SC828)
TR36	2SC711 (2SC828)
TR37	2SC711 (2SC828)
TR38	2SC711 (2SC828)
TR39	2SC711 (2SC828)
TR40	2SC711 (2SC828)
TR41	2SC971
TR42	2SC1032 (2SC829)
TR301	2SC722
TR302	2SC722
TR303	2SC722
TR401	2SC722
TR402	2SC722
TR403	2SC722
TR501	2SC683
TR502	2SC683 (2SC722)
TR503	2SC683 (2SC722)
TR504	2SC683 (2SC722)
TR505	2SC683 (2SC722)
TR506	2SC722

ELECTROLYTIC/VARIABLE CAPS

ITEM	VALUE
C17	4.7mfd 25V
C24	33mfd 16V
C31	4.7mfd 25V
C32	4.7mfd 25V
C33	4.7mfd 25V
C34	10mfd 16V
C36	4.7mfd 25V
C37	4.7mfd 25V
C38	10mfd 16V
C39	33mfd 6.3V
C45	220mfd 16V
C46	100mfd 16V
C50	1mfd 50V
C52	4.7mfd 25V
C53	1000mfd 25V
C54	100mfd 16V
C55	470mfd 16V
C56	1000mfd 25V
C58	1mfd 10V
C59	1mfd 10V
C64	10mfd 16V
TC1	10pf Trimmer
TC2	10pf Trimmer
TC3	10pf Trimmer
TC4	10pf Trimmer
TC5	10pf Trimmer
TC6	10pf Trimmer
TC7	10pf Trimmer
TC8	10pf Trimmer

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO./TYPE
VS1	1S1209
VS2	1S1209

COILS/TRANSFORMERS

ITEM	PART NO.
L301	20-18
L401	20-26
L501	20-33
L502	20-34
L503	20-35
L505	20-37
T1	20-4
T2	20-5
T3	20-6
T4	20-9
T5	20-10
T7	20-11
T8	20-7
T9	20-8
T10	20-12
T301	20-13
T302	20-14
T303	20-15
T304	20-19
T305	20-16
T306	20-17
T401	20-20
T402	20-21
T403	20-22
T404	20-23
T405	20-27
T406	20-24
T407	20-25
T501	20-28
T502	20-29
T503	20-3
T504	20-36
T506	20-31
T507	20-32
POWER	20-1
INPUT	20-2
CHOKE,65Hz	20-3

MISCELLANEOUS

ITEM	NAME	PART NO.
BPF	Filter, Ceramic 455KHz	30-37
S1	Switch, Power	30-28
S2	Switch, Scan/Manual	30-27
S4	Switch, Crystal On/Off	30-30
SP	Speaker	30-34
	Crystal	30-39
	P.C. Board, Main	30-26
	P.C. Board, VHF Low	30-42
	P.C. Board, VHF High	30-43
	P.C. Board, UHF	30-55
	Assembly, UHF Tuner	30-44

CABINET PARTS

NAME	PART NO.
Panel, Front	30-1
Cover, Top	30-4
Cover, Bottom	30-5
Knob, Volume/Squelch	30-12
Button, Push	30-13
Cover, Crystal Compartment	30-15

$4.95
$5.95 IN CANADA
SD-2
06558

HOWARD W. SAMS & CO., INC.
4300 WEST 62nd ST. · INDIANAPOLIS, INDIANA 46268

Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

Craig 4354
Globe 3700
Handic 006
Handic 007
Lafayette 4B-10
Morse/Electrophonic SC600
Realistic Patrolman PRO-2B (20-160)
Realistic PRO-52
Realistic PRO-53
SBE Opti/Scan (SBE-12SM)
Wards Airline GEN-846A

PUBLICATION

Sams

Scanner-Monitor Servicing Data

SD-12

REPRODUCED THROUGH THE COURTESY OF THE MANUFACTURER

HOWARD W. SAMS & CO., INC.

INDIANAPOLIS, INDIANA

First Edition
First Printing-January, 1978

Sams

Scanner-Monitor Servicing Data

SD-12

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

TABLE OF CONTENTS

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ALIGNMENT PROCEDURES

Alignment is performed at factory with laboratory test equipment. Therefore, before alignment is attempted the unit should be thoroughly cheked for circuit troubles.

EQUIPMENT REQUIRED

1. Sweep Generator
2. FM Signal Generator
3. Oscilloscope
4. AC V.T.V.M.
5. Power Source - 12V, 0.4A DC or 120V, 50/60 Hz, 11W AC

STEP	FUCNTION	SIGNAL INPUT	FRQ'CY	OUTPUT	ADJUST	ADJUST FOR
1	IF	Connect sweep generator to base of Q4.	455kHz	Connect oscilloscope to C28.	T1,T2	Adj for sine-wave of maximum hight & best linearity. (See Fig. 1)
1	Lo VHF	Connect sweep generator to ANT. Connector	40MHz	Connect oscilloscope to base of Q302.	T301,T302, T303	Adj for wave in Fig. 2
1	Hi VHF	Connect sweep generator to ANT. Connector (NON-MODULATED SIGNAL)	156MHz	Connect oscilloscope to base of Q304.	T304,T305, T306,T307	Adj for wave in Fig. 3
2		Connect RF signal generator to ANT. Connector (NON-MODULATED SIGNAL)	156MHz	Connect AC V.T.V.M. across voice coil of speaker.	T308	Minimum noise level
1	UHF	Connect sweep generator to ANT. Connector (NON-MODUALTED SIGNAL)	460MHz	Connect oscilloscope to IF out terminal	TC401 TC402 TC403	Adj for wave in Fig. 4
2		Connect RF signal generator to ANT. Connector (NON-MODULATED SIGNAL)	460MHz	Connect AC V.T.V.M. across voice coil of speaker	TC404,T404, T405,T406	minimum noise level

CHANNEL LOCK

Channel lock gate Q16 is dependant on a noise signal of about 30 kHz at the output of the discriminator. The lock sensitivity will drop off as the 30 kHz noise level is reduced by a received signal.

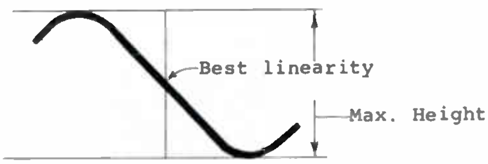


Fig. 1

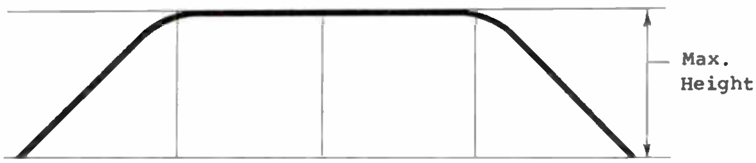


Fig. 2

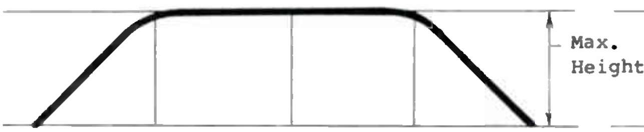


Fig. 3

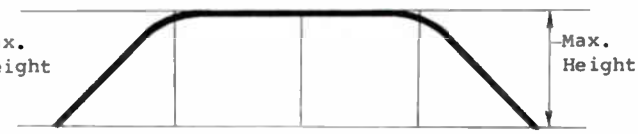


Fig. 4

PARTS PRICE LIST

SUBJECT TO CHANGE WITHOUT NOTICE. USE ALL AVAILABLE NUMBERS AND COMPLETE DESCRIPTION WHEN ORDERING, INCLUDING MODEL NUMBER

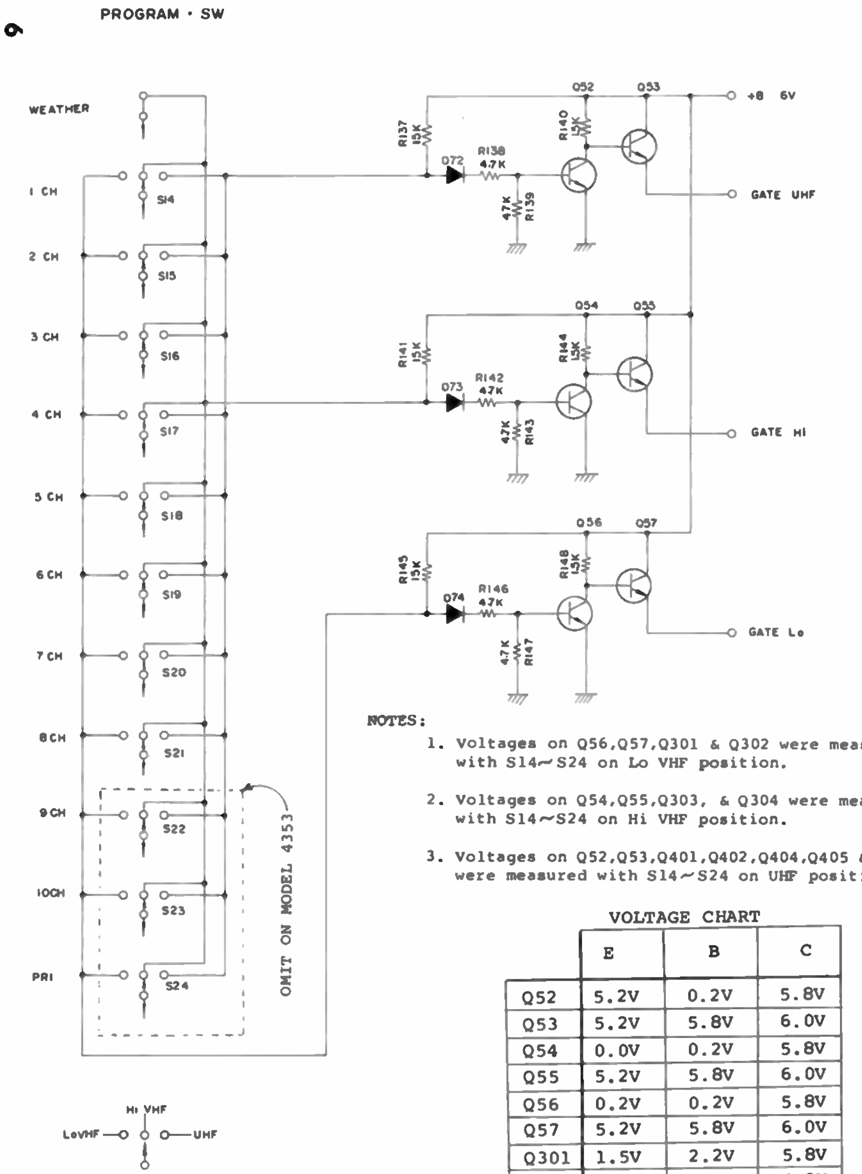
* * * "THESE NUMBERS HAVE BEEN REVISED AS OF 6-5-76" * * *

PACKAGING

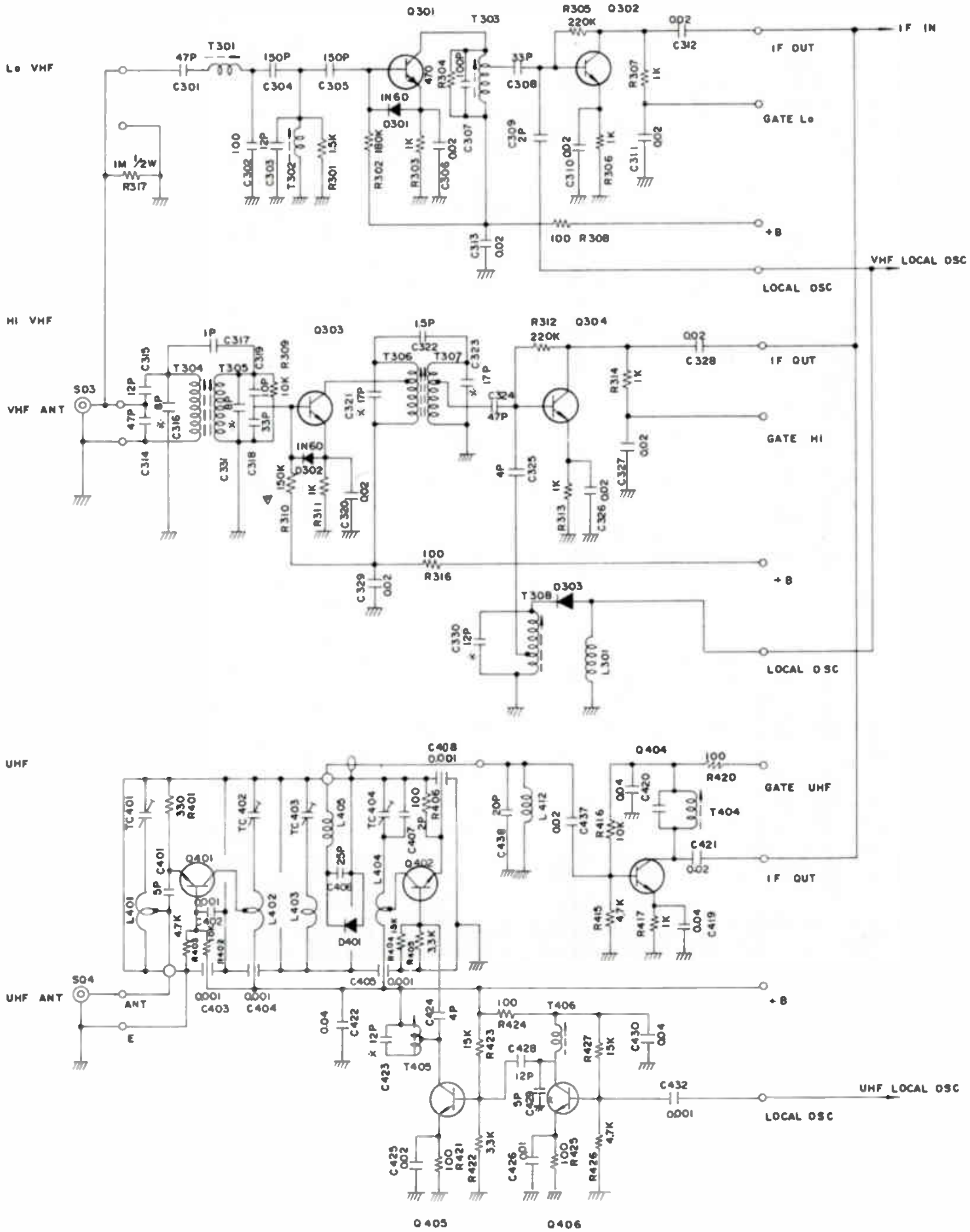
Ref. No.	Craig Key No.	Description	Mfr's Sugg Ret. Price
	4353001	Individual Carton	1.60
	4354001	Individual Carton	1.60
*	4353002	Styrofoam Set	.90
*	4353003	Mtg Bracket	1.85
*	4353004	Mtg Screw Kit	.95
*	4353005	Telescopic Antenna, VHF	4.95
*	4353006	Telescopic Antenna, UHF	2.95
*	4350080	AC Cord W/Plug	3.00
*	4350081	DC Cord Assembly	3.00

* SAME PART FOR BOTH MODELS

GATE CIRCUIT SCHEMATIC DIAGRAM



FRONT END SCHEMATIC DIAGRAM

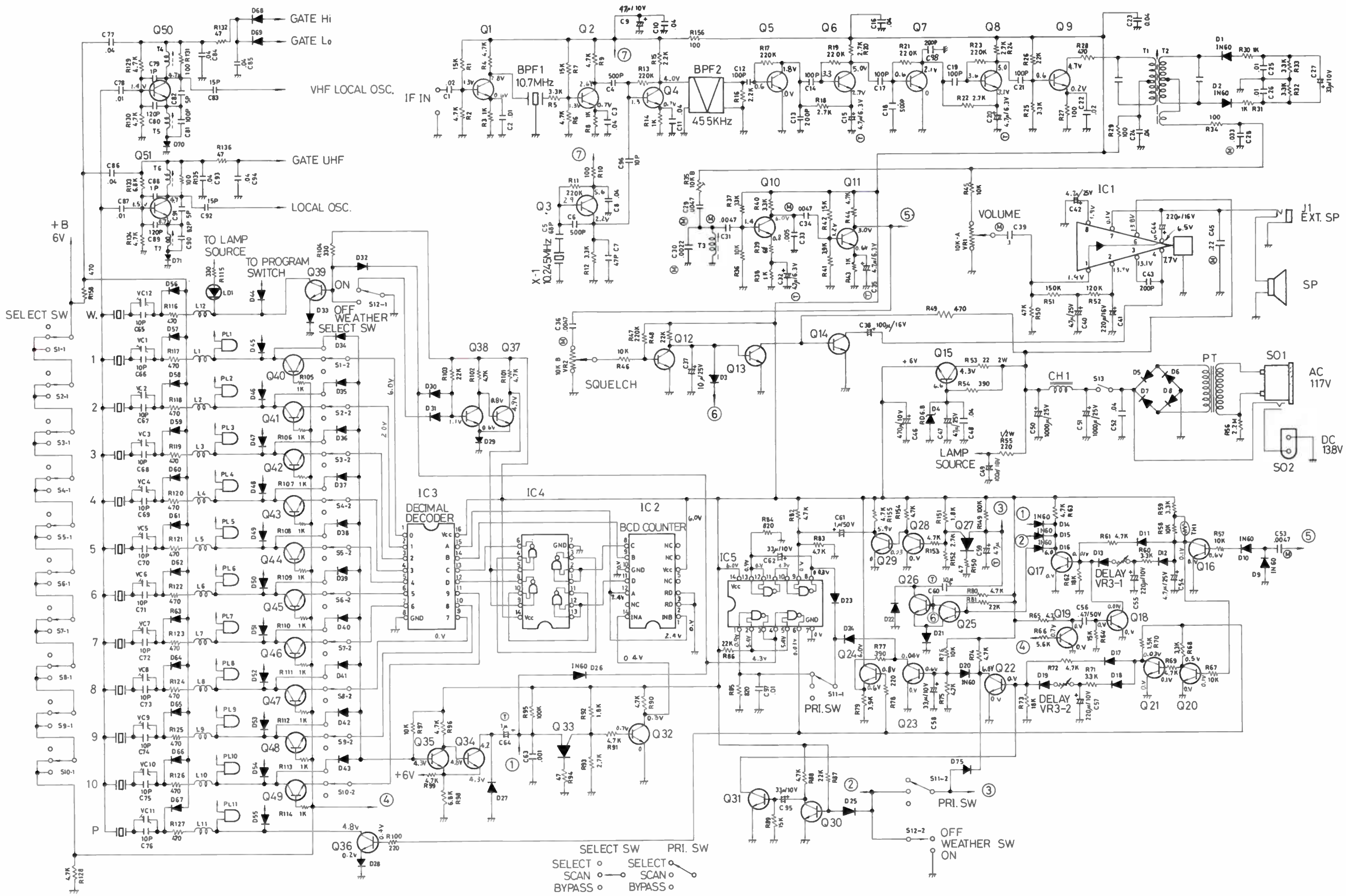


NOTES:

1. Voltages on Q56,Q57,Q301 & Q302 were measured with S14~S24 on Lo VHF position.
2. Voltages on Q54,Q55,Q303, & Q304 were measured with S14~S24 on Hi VHF position.
3. Voltages on Q52,Q53,Q401,Q402,Q404,Q405 & Q406 were measured with S14~S24 on UHF position.

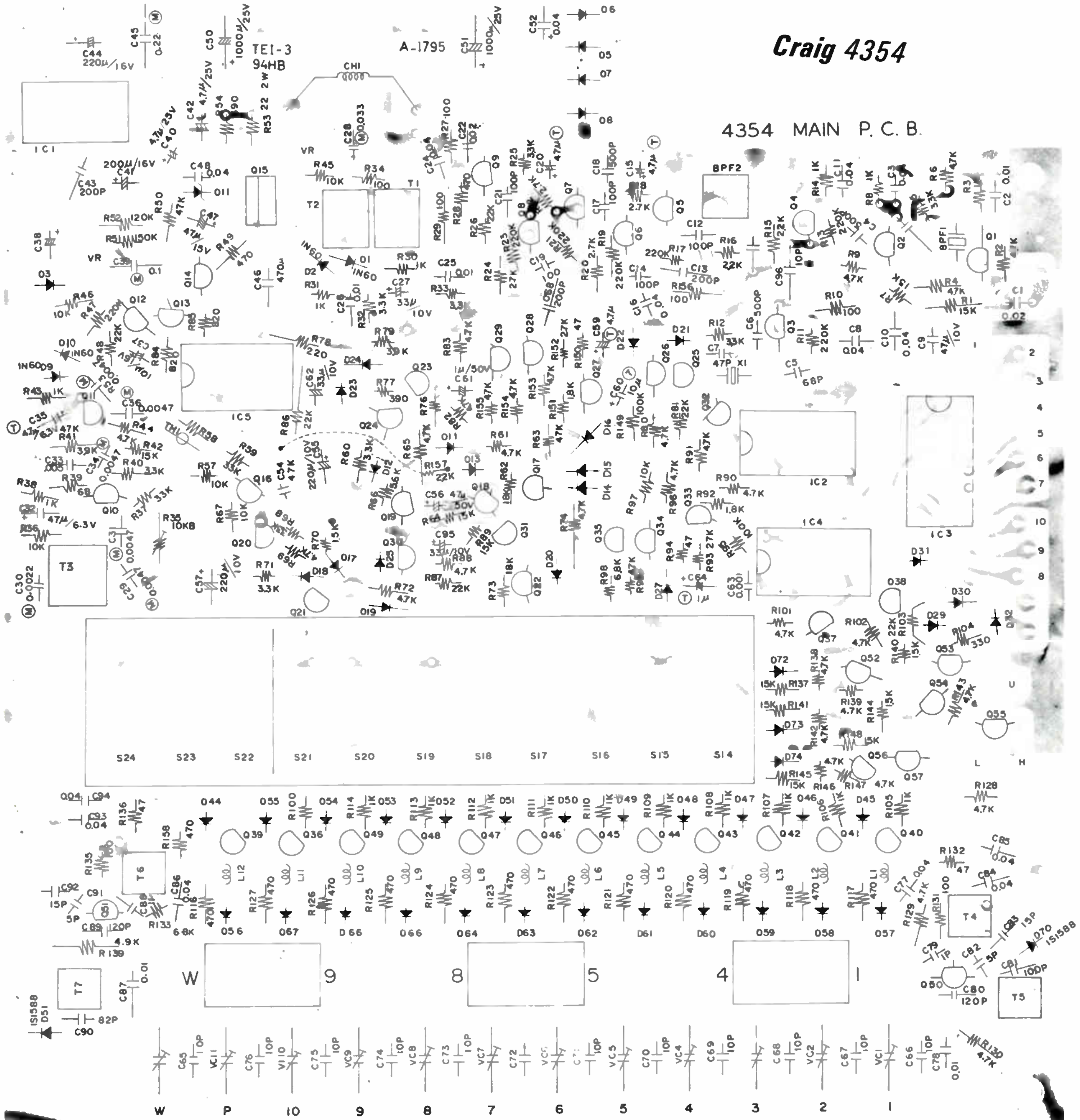
VOLTAGE CHART

	E	B	C
Q52	5.2V	0.2V	5.8V
Q53	5.2V	5.8V	6.0V
Q54	0.0V	0.2V	5.8V
Q55	5.2V	5.8V	6.0V
Q56	0.2V	0.2V	5.8V
Q57	5.2V	5.8V	6.0V
Q301	1.5V	2.2V	5.8V
Q302	1.0V	1.7V	4.2V
Q303	1.6V	2.4V	5.9V
Q304	1.0V	1.8V	4.2V
Q401	1.0V	1.8V	6.0V
Q402	6.0V	1.0V	0.2V
Q404	0.9V	1.6V	5.1V
Q405	0.3V	1.0V	6.0V
Q406	0.4V	1.1V	5.6V

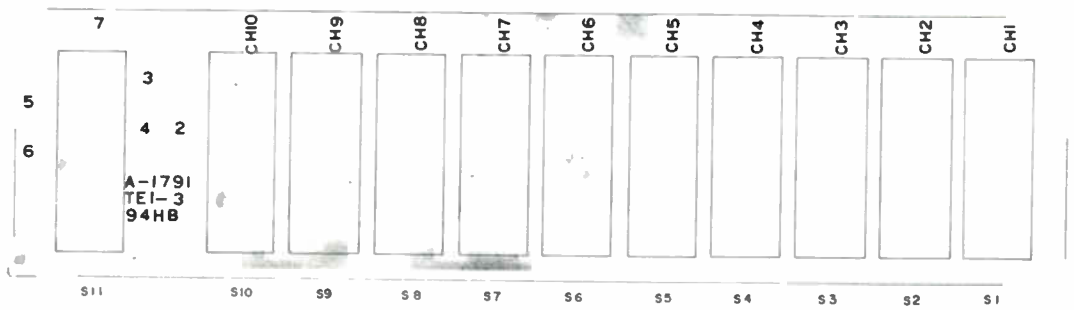

GATE Hi
GATE Lo
VHF LOCAL OSC.
GATE UHF
LOCAL OSC.
IF IN
BPF1
10.7MHz
BPF2
455KHz
X-1
10.245MHz
VOLUME
IC1
J1
EXT. SP
SP
SQUELCH
+B
6V
TO LAMP SOURCE
TO PROGRAM SWITCH
ON
OFF
WEATHER SELECT SW
SELECT SW
W.
1
2
3
4
5
6
7
8
9
10
P
IC3
DECIMAL DECODER
IC4
IC2
BCD COUNTER
IC5
CH1
PT
SO1
AC
117V
DC
13.8V
SO2
LAMP SOURCE
DELAY
VR3-1
DELAY
VR3-2
PRI. SW
OFF
WEATHER SW
ON
SELECT SW
PRI. SW
SELECT
SCAN
BYPASS
SELECT
SCAN
BYPASS

Craig 4354

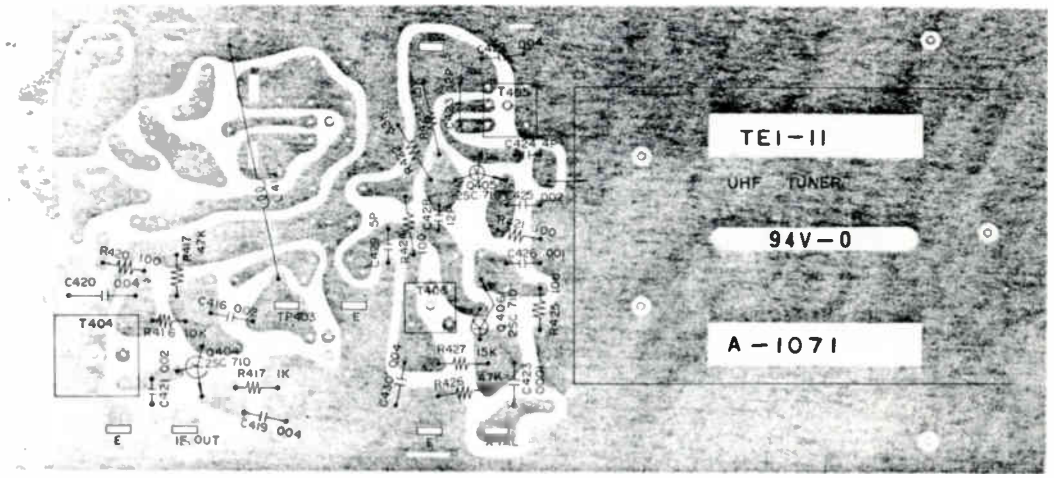
4354 MAIN P.C.B.



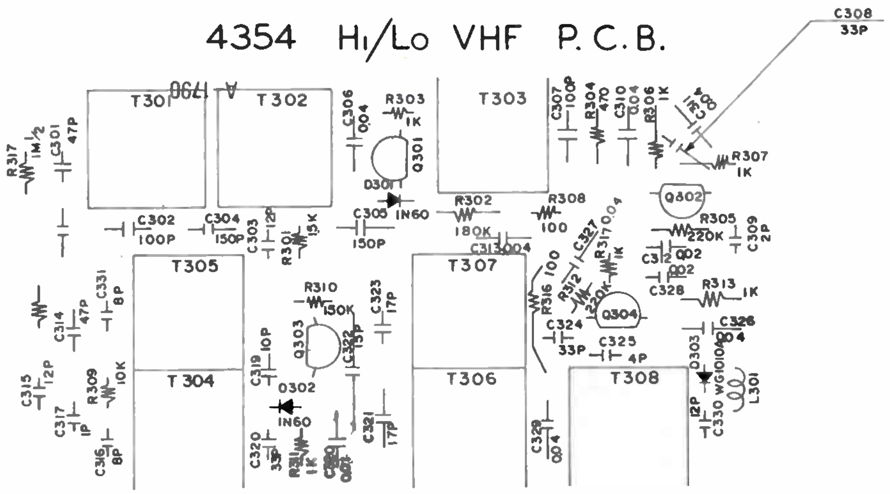
4354 PROGRAM SELECT SW P.C.B.



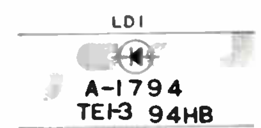
4354 UHF P.C.B.



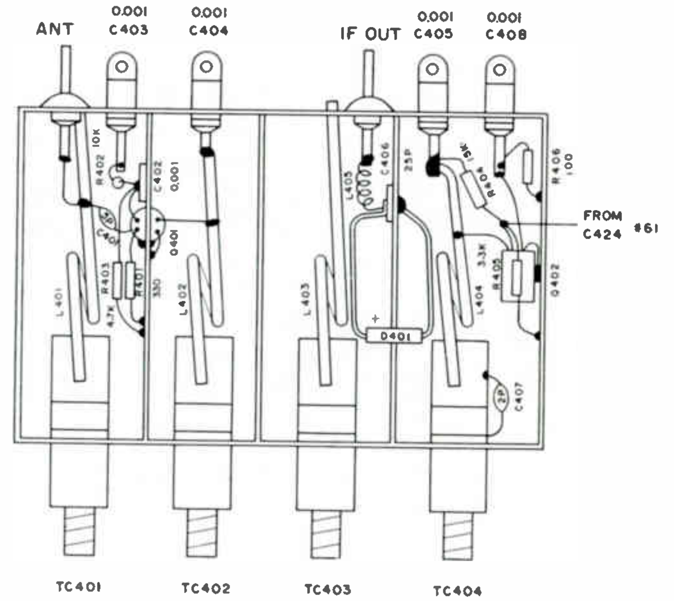
4354 Hi/Lo VHF P.C.B.

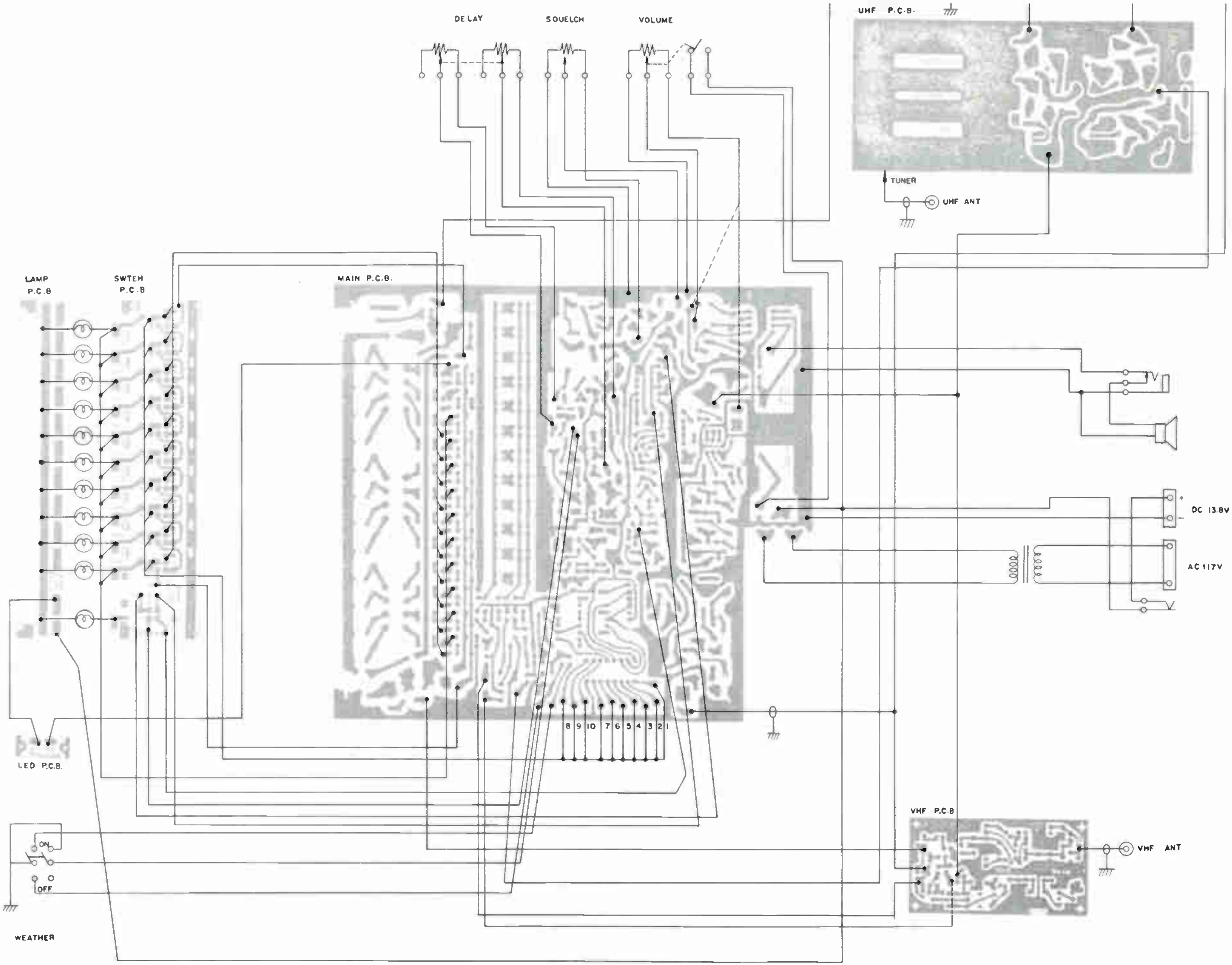


4354 WEATHER L.E.D. P.C.B.



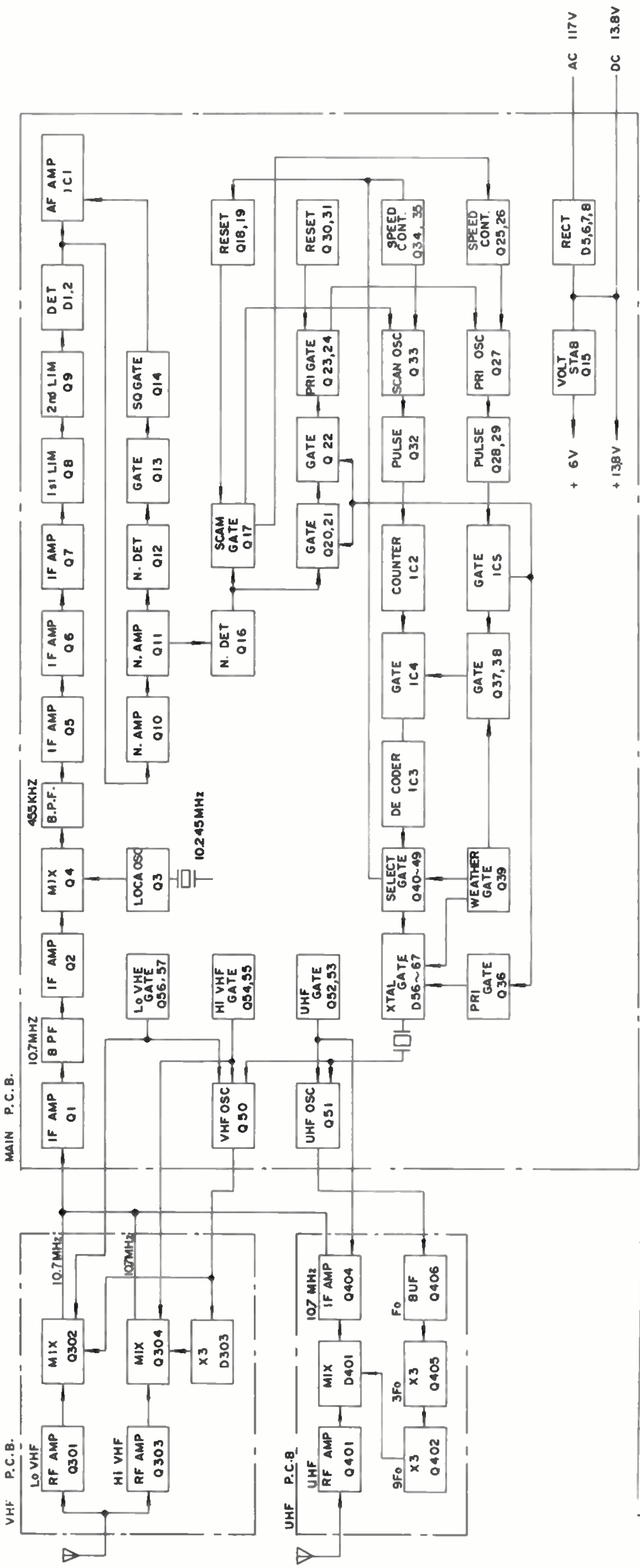
4354 UHF TUNER




DELAY
SQUELCH
VOLUME
UHF P.C.B.
TUNER
UHF ANT
LAMP P.C.B
SWTCH P.C.B
MAIN P.C.B.
DC 13.8V
AC 117V
8 9 10 7 6 5 4 3 2 1
LED P.C.B.
VHF P.C.B
VHF ANT
ON
OFF
WEATHER

Craig 4354

4354 BLOCK DIAGRAM



To change frequency range for usable sensitivity. It is not enough to adjust coils and trimmer condensers. Accordingly the change of capacities of capacitors is necessary as follows.

Lo VHF

Covers from 30.0 to 50.0 MHz without any parts change and adjustment.

Hi VHF

	TYPE	FREQUENCY RANGE	C316	C331	C321	C323	C33
•	H1	150~158MHz	10pF	10pF	17pF	17pF	12p
	H2	156~164MHz	8pF	8pF	15pF	15pF	12p
	H3	166~174MHz	5pF	5pF	12pF	12pF	10p

UHF

	TYPE	FREQUENCY RANGE	C423
•	U1	450~470MHz	12pF
	U2	470~490MHz	12pF
	U3	490~510MHz	10pF
	U4	500~520MHz	10pF

• Supplied from the factory pretuned for this range.

NOTES:

UNLESS OTHERWISE INDICATED,

1. ALL RESISTANCE VALUES ARE IN OHMS. $k=10^3$ $M=10^6$
2. ALL RESISTORS ARE ¼ WATT 10%.
3. ALL CAPACITANCE VALUES ARE IN uF. $p=10^6$ uF
4. ALL VOLTAGES MEASURED WITH A D.V.M. UNDER NO SIGNAL, UNSQUELCHED & SCAN POSITION
5. VOLTAGES ON Q50 MEASURED WITH S14~S24 ON HIGH VHF POSITION.
6. VOLTAGES ON Q51 MEASURED WITH S14~S24 ON UHF POSITION.

VOLTAGES AFFECTED BY SQUELCH

	BASE SQUELCHED	BASE UNSQUELCHED	COLLECTOR SQUELCHED	COLLECTOR UNSQUELCHED	EMITTER SQUELCHED	EMITTER UNSQUELCHED
Q12	0.4V	0.3V	0.1V	0.7V	0. V	0. V
Q13	0.1V	0.7V	0.8V	0.1V	0. V	0. V
Q14	0.8V	0.1V	0.03V	0. V	0. V	0. V
Q40 ~ Q49		5.6V		5.5V		5.0V

	BASE WEATHER SW ON	BASE WEATHER SW OFF	COLLECTOR WEATHER SW ON	COLLECTOR WEATHER SW OFF	EMITTER WEATHER SW ON	EMITTER WEATHER SW OFF
Q30	0.5V	0.7V	6.0V	0.04V	0. V	0. V
Q31	0.01V	0. V	0.5V	0. V	0. V	0. V
Q39	1.6V	0. V	0.8V	4.7V	0.8V	0. V

CABINET & CHASSIS

Ref. No.	Craig Key No.	Description	Mfr's Sugg Ret. Price	Ref. No.	Craig Key No.	Description
	4353010	Knob, Vol/SQ/Scan Delay	.70		NSP	Upper Chassis, PCB Mtg
	4350049	Rubber Feet	.25		NSP	Main Chassis
	4353011	Rubber Bushing, Lamps	.25		4353015	Cabinet Top
	NSP	Bkt, Lamp Mtg	**		4353016	Cabinet Bottom
	NSP	Bkt, Main PCB Mtg	**		4353017	Sponge CH Select Sw's(4353)
	4354010	Front Escutcheon (4354)	5.15		4354013	Sponge CH Select Sw's(4354)
	4353012	Front Escutcheon (4353)	5.15		4353018	Lid W/Scr, Crystal Access
	4353013	Acrylic Panel, Sw's(4353)	2.60		4353019	Craig Badge
	4354011	Acrylic Panel, Sw's(4354)	2.75		4353020	Label for Crystal Lid(4353)
	4353014	Vol & SQ Panel (4353)	.55		4354014	Label for Crystal Lid(4354)
	4354012	Vol, SQ, Scan Delay Panel(4354)	.55		4353021	Plastic Coupler, UHF ANT.
	NSP	Metal Plate, Dummy Hole Cover	**		4353022	Plastic Coupler, VHF ANT.
	4354018	Push Button Knob, Weather	.70		4353023	Felt, Vol/SQ/Scan Delay Knobs

MISCELLANEOUS ELECTRICAL PARTS

Ref. No.	Craig Key No.	Description	Mfr's Sugg Ret. Price	Ref. No.	Craig Key No.	Description
PL1~PL11	4350011	Lamp, CH Indicator	.85	S12	4353028	Push Sw, Weather
	4350051	Crystal Socket	1.20	VR1	4353029	Var Res 10k, Vol Cont W/Sw
SO1	4350078	AC Power Socket	1.60	VR2	4353030	Var Res 10k, Squelch Cont
SO2	4350079	DC Power Socket	1.55	VR3	4354017	Var Res 10k, Scan Delay(4354)
SO3, SO4	4353024	Antenna Socket	1.25	R35	4350007	Semi-Variable Resistor, 10k
J1	4353025	Extension Speaker Jack	.65		4354016	PCB, Weather LED Mtg W/O Comp
SP	4350015	Speaker	4.05		4353033	PCB, For Lamp Ground W/O Comp
S1~S11	4353026	Slide Sw, SELCT/SCAN/BYPASS	1.50		4353034	PCB, CH Select Sw Mtg(4353)
S14~S24	4353027	Slide Sw, Hi/Lo VHF/UHF	1.25		4354015	PCB, CH Select Sw Mtg(4354)
	4353048	Ass'y, UHF PCB W/Comp	****		4353049	Ass'y, Hi/Lo VHF PCB W/Comp

NOTE: Unless otherwise specefied all parts obove are used on both models.

CHOKES, COILS, TRIMMERS, CRYSTALS, & TRANSFORMERS

Ref. No.	Craig Key No.	Description	Mfr's Sugg Ret. Price	Ref. No.	Craig Key No.	Description
TC401,402	4350019	Trimmer Cap, 5pF (cylinder type)	1.15	T405	4350036	RF Coil, C
TC403,404	4350019	Trimmer Cap, 5pF "	1.15	L404	4350029	RF Coil, J
VC1~VC12	4350013	Trimmer Capacitor, 16pF	.45	T301	4353040	RF Coil, P
T404	4350037	IFT, 10.7 MHz (T101)	1.35	T5,7	4353041	RF Coil, Q
T1	4353035	IFT, Discriminator (T3166)	1.20	T303	4353042	RF Coil, R
T2	4353036	IFT, Discriminator (T3167)	1.20	L1~L12	4350034	RF Choke Coil, A
T3	4350045	IFT, 40 kHz (T301)	1.40	L301,412	4350034	RF Choke Coil, A
T4,6,406	4350020	RF Coil, A	1.10	L405	4353043	RF Choke Coil, C
T304,305	4353037	RF Coil, D	1.10	CH1	4350010	AF Choke Coil
T306	4353038	RF Coil, E	1.10	PT	4350083	Power Transformer
T308	4353032	RF Coil, F	1.10	T302	4353045	RF Coil
T307	4353039	RF Coil, G	1.10	BPF1	4353046	Band Pass Filter, 10.7 MHz
L401,402	4350027	RF Coil, H	1.10	BPF2	4353047	Ceramic Band Pass Filter 455kHz
L403	4350027	RF Coil, H	1.10	X1	4350014	Crystal, 10.245 MHz

SEMICONDUCTORS

Ref. No.	Craig Key No.	Description	Mfr's Sugg Ret. Price	Ref. No.	Craig Key No.	Description
Q301,302	2SC1674	Transistor	1.35	D11,12,	WG1010A	Diode
Q303,304	2SC1674	"	"	D13,17,	WG1010A	Diode
Q1~Q9	2SC1675	"	.95	D18,19,	WG1010A	"
Q50,51,	2SC710	"	1.15	D21,22,	WG1010A	"
Q404,405	2SC710	"	"	D23,24,	WG1010A	"
Q406	2SC710	"	"	D25	WG1010A	"
Q10~Q14	2SC711	"	"	D26~D55	WG1010A	"
Q16~Q26	2SC711	"	"	D68,69,	WG1010A	"
Q28,29,	2SC711	"	"	D72,73,	WG1010A	"
Q30,31	2SC711	"	"	D74,75	WG1010A	"
Q32	2SC711	"	"	D1,2,3,9	1N60	"
Q34~Q49	2SC711	"	"	D10,14,	1N60	"
Q52~Q57	2SC711	"	"	D15,16,	1N60	"
Q15	2SC1096	Transistor	3.40	D20,26,	1N60	"
Q401,402	2SC1180	"	2.30	D301,302	1N60	"
Q27,33	N13T1	P.U. Transistor	1.65	D401	1SS16	"
IC3	SN74145N	I.C.	6.50	D5~D8	S1B0102	"
IC1	UPC575C2	I.C.	3.75	D4	RD6.8	Zener Diode
IC4,5	M53200	I.C.	1.55	LD1	ME116	L.E.D.
IC2	M53293P	I.C.	5.25	TH1	TD5C225	Thermistor

CAPACITORS

Ref No.	Description			Mfr's Sugg Ret. Price	Ref. No.	Description		
C79	Ceramic,	1pF/25V	±0.5%	.45	C326,327,328,329	Ceramic,	0.02uF/25V	±20%
C322	"	1.5pF/25V	"	.45	C421,425,437	"	0.02uF/25V	"
C309,407	"	2pF/25V	"	.45	C3,8,10,11,16,23	"	0.04uF/25V	"
C325,424	"	4pF/25V	"	.45	C24,48,52,77,	"	0.04uF/25V	"
C82,91,401,429	"	5pF/25V	"	.45	C84,85,86,93,94	"	0.04uF/25V	"
C316,331	"	8pF/25V	"	.45	C419,420,422,430	"	0.04uF/25V	"
C65,66,67,68,69	"	10pF/25V	±10%	.45	C39	"	0.1uF/25V	"
C70,71,72,73,74,	"	10pF/25V	"	.45	C30	Mylar,	0.0022uF/50V	±10%
C75,76,96,319	"	10pF/25V	"	.45	C29,31,34,36,53	"	0.0047uF/50V	"
C303,315,330,	"	12pF/25V	"	.45	C28	"	0.033uF/50V	"
C423,428	"	12pF/25V	"	.45	C45	"	0.22uF/50V	±20%
C83,92	"	15pF/25V	"	.45	C27,58,62,95	Electrolytic,	33uF/10V	
C321,323	"	17pF/25V	"	.45	C9	"	47uF/10V	
C438	"	20pF/25V	"	.45	C55,57	"	220uF/10V	
C308,318	"	33pF/25V	"	.45	C46	"	470uF/10V	
C7,301,314,324	"	47pF/25V	"	.45	C49,38	"	100uF/16V	

(CAPACITOR LIST CONTINUED)

Ref. No.	Description			Mfr's Sugg Ret. Price	Ref. No.	Description		Mfr's Sugg Ret. Price
C5	Ceramic	68pF/25V	±10%	.45	C41,44	Ceramic	220uF/16V	1.85
C12,14,17,19,21	"	100pF/25V	"	.45	C37	"	10uF/16V	.60
C81,302,307	"	100pF/25V	"	.45	C40,42,54	"	4.7uF/25V	.75
C80,89	"	120pF/25V	"	.45	C50,51	"	1000uF/25V	2.50
C13,43,98	"	200pF/25V	"	.45	C47	"	47uF/25V	1.30
C90	"	82pF/25V	"	.45	C56	"	0.47uF/50V	1.10
C4,6,18	"	500pF/25V	"	.45	C61	"	1uF/50V	1.20
C304,305	"	150pF/25V	"	.45	C15,20,32,35	Tantalum,	4.7uF/6.3V	.85
C63,432	"	0.001uF/25V	±20%	.45	C60	"	10uF/10V	.85
C33	"	0.005uF/25V	"	.45	C59	"	4.7uF/10V	.85
C2,25,26,78,87,	"	0.01uF/25V	"	.45	C64	"	1uF/10V	.85
C97,426	"	0.01uF/25V	"	.45	C402	Gnd type Cap,	1000pF	.45
C1,22,305,310	"	0.02uF/25V	"	.45	C406	" " "	25pF	.45
C311,312,313,320	"	0.02uF/25V	"	.45	C403,404,405,408	Feed Thru,	1000pF	.45

R E S I S T O R S, CARBON, OHMS, ± 10%, ¼W, 0.25¢ OR NOTED

Ref. No.	Description	Ref. No.	Description	Ref. No.	Description	Ref. No.	Description
R94,132,	47 Ohms, ¼W	R111,112,	1k Ohms, ¼W	R142,143,	4.7k Ohms, ¼W	R21,23,	220k Ohms, ¼W
R436,150	47 " "	R113,114,	1k " "	R146,147,	4.7k " "	R47	220k Ohms, ¼ W
R39	68 " "	R417	1k " "	R153,154,	4.7k " "	R41,79	3.9k " " "
R10,27,	100 " "	R70,140,	1.5k " "	R155,415,	4.7k " "	R92,151	1.8k " " "
R29,34,	100 " "	R148,144	1.5k " "	R426	4.7k " "	R66	5.6k " " "
R131,135,	100 " "	R15,16	2.2k " "	R36,45,	10k " "	R159	1M " " "
R156,420,	100 " "	R18,20,	2.7k " "	R46,57,	10k " "	R98,133	6.8k " " "
R421,424,	100 " "	R22,24,	2.7k " "	R58,67,	10k " "	R308,316,	100 Ohms, 1/8W
R425	100 " "	R93,152	2.7k " "	R76,97,	10k " "	R406	100 Ohms, 1/8W
R78,100	220 " "	R5,12,25,	3.3k " "	R416	10k " "	R401	330 " " "
R104,115	330 " "	R32,33,	3.3k " "	R1,7,42,	15k " "	R405	3.3k " " "
R54,77	390 " "	R40,59,	3.3k " "	R64,89,	15k " "	R403	4.7k " " "
R28,49,	470 " "	R60,68,	3.3k " "	R137,141,	15k " "	R309,402	10k " " "
R116,117,	470 " "	R71,422	3.3k " "	R145,423,	15k " "	R404	15k " " "
R118,119,	470 " "	R2,4,6,	4.7k " "	R427	15k " "	R304	470 " " "
R120,121,	470 " "	R9,44,61,	4.7k " "	R62,73	18k " "	R303,306,	1k " " "
R122,123,	470 " "	R63,65,	4.7k " "	R26,48,	22k " "	R307,311,	1k " " "
R124,125,	470 " "	R69,72,	4.7k " "	R81,86,	22k " "	R313,314	1k " " "
R126,127,	470 " "	R74,75,	4.7k " "	R87,103	22k " "	R301	1.5k " " "
R158	470 " "	R80,82,	4.7k " "	R37	33k " "	R305,312	220k " " "
R84,85	820 " "	R83,88,	4.7k " "	R50	47k " "	R310	150k " " "
R3,8,14,	1k " "	R90,91,	4.7k " "	R95,149	100k " "	R302	180k " " "
R30,31,	1k " "	R96,99,	4.7k " "	R52	120k " "	R55	220 Ohms, ½ W
R38,43,	1k " "	R101,102,	4.7k " "	R51	150k " "	R53	22 Ohms, 2 W
R105,106,	1k " "	R128,129,	4.7k " "	R11,13,	220k " "	R317	1M Ohms, ½ W
R107,108,	1k " "	R130,134,	4.7k " "	R17,19	220k " "		(Solid Res.)
R109,110	1k " "	R138,139,	4.7k " "	R35	(See Misc. Elect.)	R56	2.2M Ohms, ½ W

NOTE:

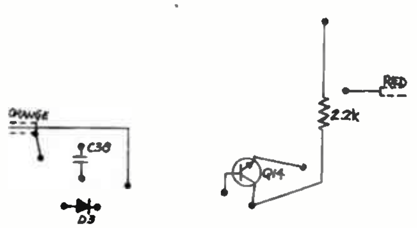
Modification for suppressing residual noise when unit is squelched and no signal is being received. Early production only.

MODIFY AS FOLLOWS:

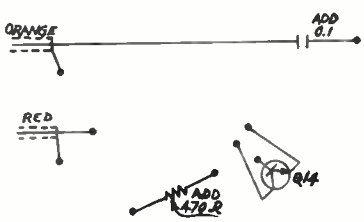
1. Move Q-14 emitter from 6V + line to ground. Hole is provided adjacent to Q-14 for emitter lead.
2. Remove capacitor C-38 and Diode D-3. Remove resistor R-49 (2.2k) from back side of P.C.B.
3. Add 470 ohm ¼W resistor from Q-14 base 6V + line.
4. Move red audio lead to Q-14 collector. Remove orange audio lead from P.C.B.
5. Add capacitor .1 mfd, 50V from orange lead to point on P.C.B. from which red lead was removed.

SEE DRAWINGS BELOW

BEFORE MODIFICATION



AFTER MODIFICATION



Pages 15-18 Courtesy of GC ELECTRONICS CORP.

LOCATION OF CONTROLS

CHANNEL SELECTION SWITCH

CHANNEL INDICATOR

SCANNING SWITCH

HI-LO AND SKIPPING SWITCH

ON-OFF SWITCH/VOLUME CONTROL

SQUELCH CONTROL

CRYSTAL INSTALLATION

Crystals are not included with this set as different frequencies are used throughout the country. Ask your dealer to help you in the selection of crystals for the stations you wish to monitor. Suitable crystals must be installed before use.

CRYSTAL INSTALLATION

1) Remove the four screws holding the half of the case containing the speaker.
2) Install crystals in the sockets carefully to avoid damaging the crystal pins. Be sure low band crystals (30–50 MHz) are installed in the section marked "LO" and high band crystals (144–174 MHz) in the section marked "HI".

IMPORTANT:
CRYSTALS HAVE TO BE SELECTED CAREFULLY IN ACCORDANCE WITH THE BASIC RECEIVING FREQUENCY.

Receiving Frequency	Crystal Frequency
Low Band	Channel Frequency + 10.7 MHz
High Band	Channel Frequency – 10.7 MHz

3

INSTALLATION

A. MOBILE USE

1. Select a convenient location for your unit. Be sure the unit wil not interfere with safe vehicle operation.
2. Attach the mounting bracket securely.
3. Hold the set in the mounting bracket and insert and tighten the two mounting screws provided.
4. To use your car antenna, insert the auto antenna plug into the EXTERNAL ANTENNA JACK on the back of the scanner.
5. Connect the power cord to the battery or at the fuse holder. The RED wire to plus (+) or positive and the BLACK wire to MINUS (–) or negative. Be sure to observe polarity or your scanner will be damaged.
6. Plug the power cord into your scanner and it is ready for operation.

B. HOME USE

1. Plug the telescoping antenna into the EXTERNAL ANTENNA JACK on the back of the set.
2. Connect the AC power cord to your set first and then into a standard 117 V.A.C. outlet.

NOTE: Reception may vary if the antenna or set are moved about (even a few inches). If reception seems to be poor, try changing the scanner location. For long distance reception, or reception of weak stations, an outdoor antenna may be desirable. In most cases, an outdoor antenna is unnecessary.

OPERATION

AUTOMATIC SCANNING

1. Turn the set ON and set the scanning switch to the "SCAN" position.
2. Set the Hi-Lo-skipping switches to the desired positions.
3. Turn the squelch control fully counterclockwise.
4. Turn the volume control clockwise until a rushing sound (background noise) is heard in the speaker.
5. Turn the squelch control clockwise until the unit begins scanning the channels. The LED lights will clearly indicate when the unit is scanning.
6. When a station is received, set the volume to a pleasant listening level. If the unit tends to stop scanning after a station has been received, advance the squelch control clockwise.

MANUAL SCANNING

1. Set the SCANNING switch to the "MANUAL" position.
2. Each time you push the "SELECTOR" switch the unit will advance one channel. The LED indicator light will indicate which channel you are monitoring.

DELAY

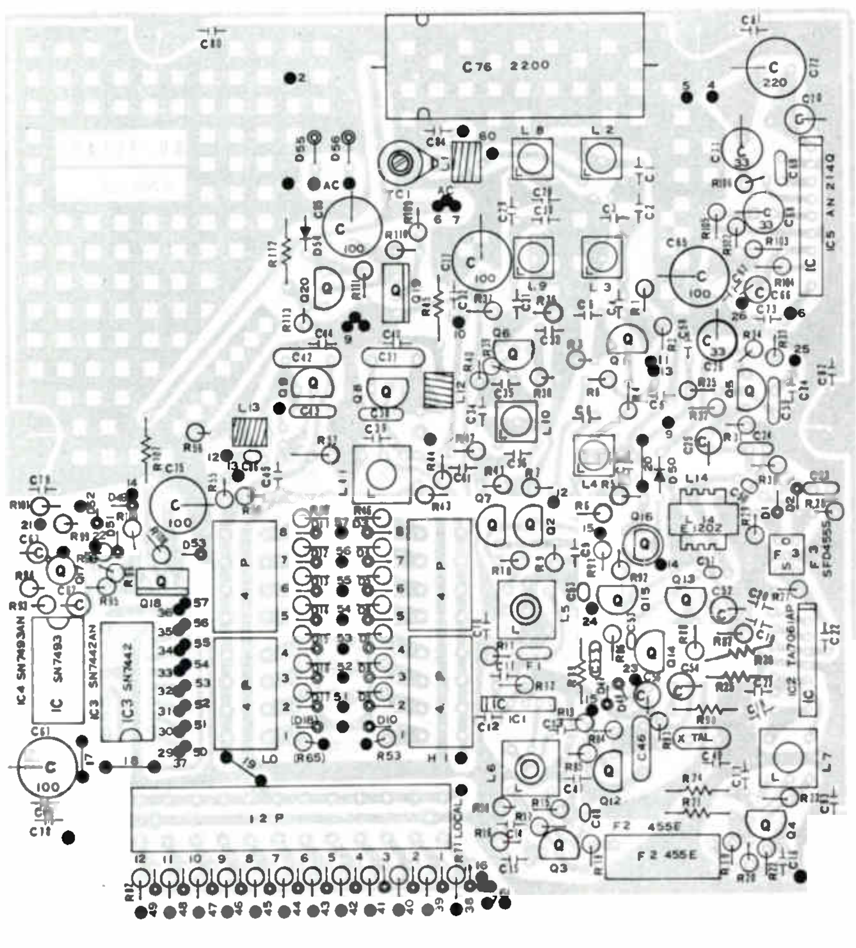
1. Set the scanning switch to the "DELAY" position.
2. Operation is the same as with automatic scanning. The DELAY holds the scanner on the same channel for about two seconds so that you do not miss both sides of a conversation. On occasion, you will note that one of two parties tends to be slow to answer and the scanner automatically resumes scanning. As a consequence you may miss half of a conversation, particularly if the scanner stops at another busy channel. The DELAY is most helpful in such cases. The SCAN position is adequate for normal transmissions. You may freely switch from SCAN to MANUAL or DELAY while the unit is operating without fear of damage.

SKIPPING

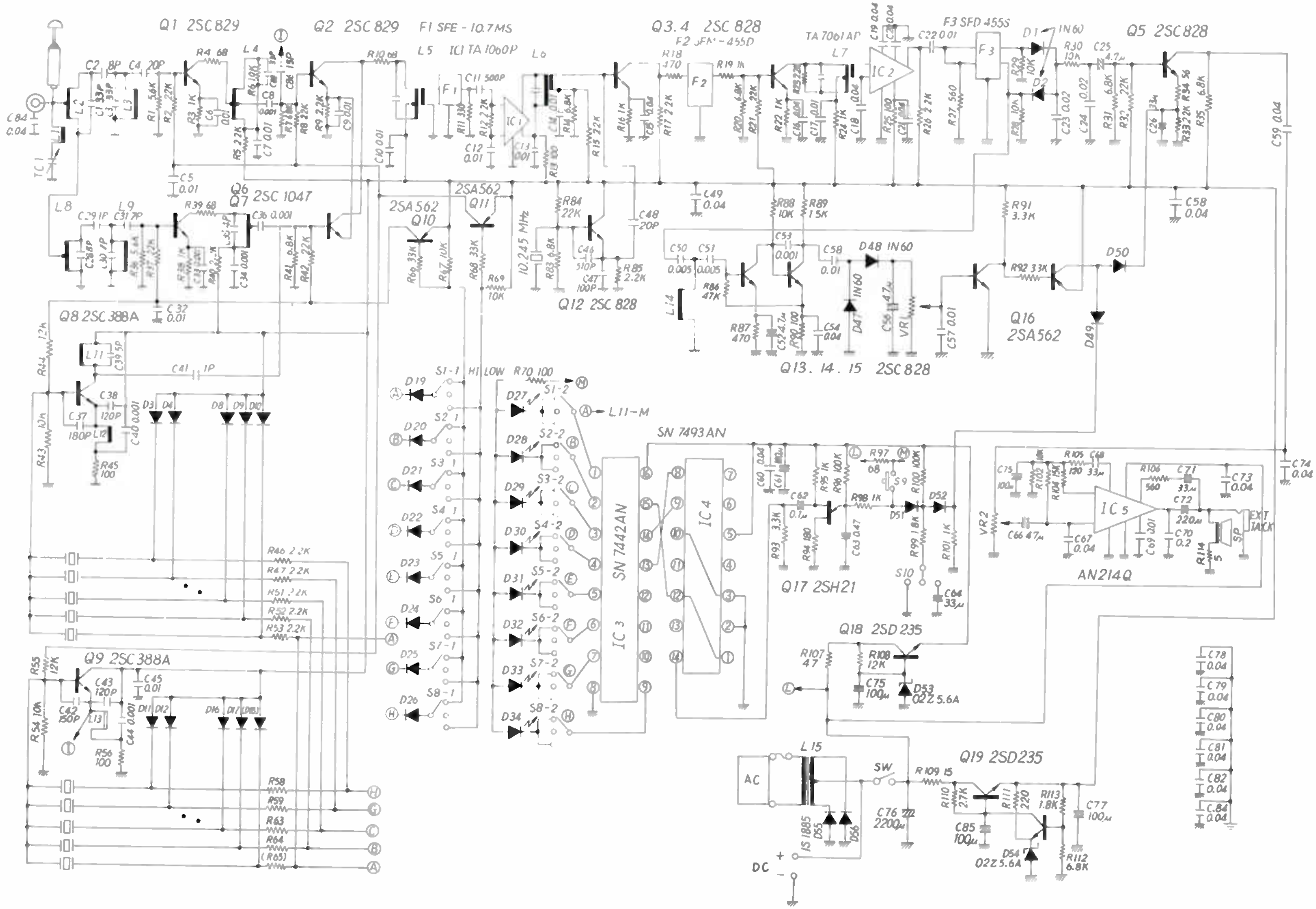
The hi-band lo-band switches may be set in the center position to lock-out or "skip" an unwanted channel entirely. Switching may be done while the GLOBE 9700 is in operation.

NOTE: Do not attempt any adjustments without proper equipment and knowledge. The GLOBE 9700 is factory aligned and sealed and should not need any adjustments for many years.

TOP VIEW



SCHEMATIC DIAGRAM



Pages 19-33 Courtesy of HANDIC U.S.A. INC.

GENERAL ALIGNMENT INSTRUCTIONS

Test equipment required:

1. Oscilloscope
2. Slow sweep generator with variable marker (10.7 MHz)
3. RF standard signal generator (75 – 174 MHz) (S.S.G.)
4. RF sweep generator with variable marker (75 - 174 MHz)
5. AC V.T.V.M.
6. DC V.T.V.M.
7. Frequency counter (0 – 50 MHz)

Note: A non-metallic alignment tool is required for complete alignment.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding to the complete alignment.
Input signal from generator should be kept as low as possible.

ALIGNMENT POSITIONS

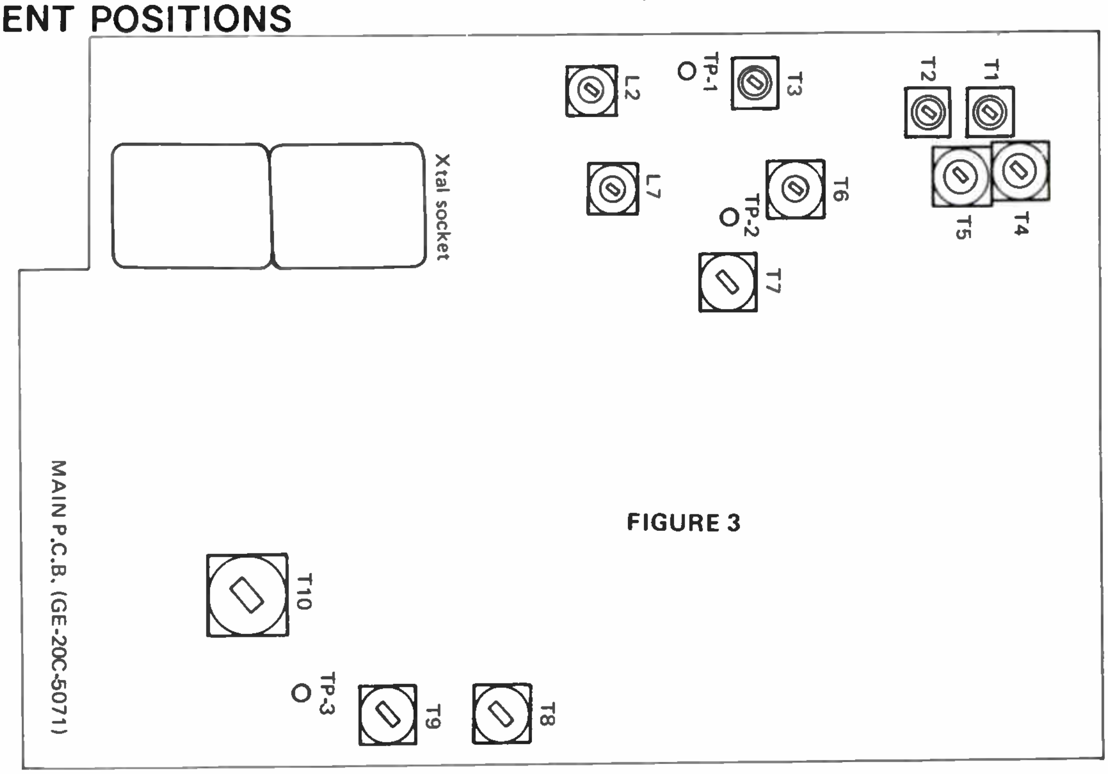


FIGURE 3

1ST LOCAL OSCILLATOR CHECK

Step 1: Connect the Frequency Counter to L7 (Mid) and L2(Hi) with a pick-up coil.

Step 2: Check the crystal frequency on the Frequency Counter.

Step 3: The crystal frequencies required are found by the following formulas:

Receiving Range	Required Frequency	Alignment coil
VHF Mid 74 – 85 MHz	$\frac{Fr + 10.7\ MHz}{2}$	L7
VHF Hi 148 – 174 MHz	$\frac{Fr - 10.7\ MHz}{3}$	L2

2ND LOCAL OSCILLATOR FREQUENCY CHECK (Q7)

Step 1: Connect Frequency Counter through a 10pF capacitor to Q7 emitter circuit.

Step 2: Read frequency on the Frequency Counter.
Normal: 10.245 MHz ±1 kHz.

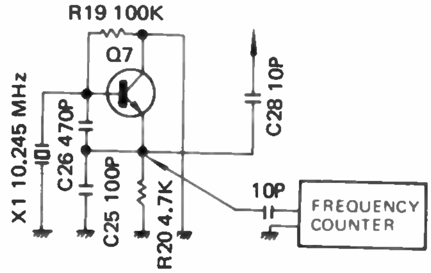


FIGURE 4

IF ALIGNMENT

Step 1: Connect instruments as shown in Fig. 5.

Step 2: Adjust T8 and T9 of IF amplifier so that 455 kHz marker is in the center of the discriminator curve as shown in Fig. 6.

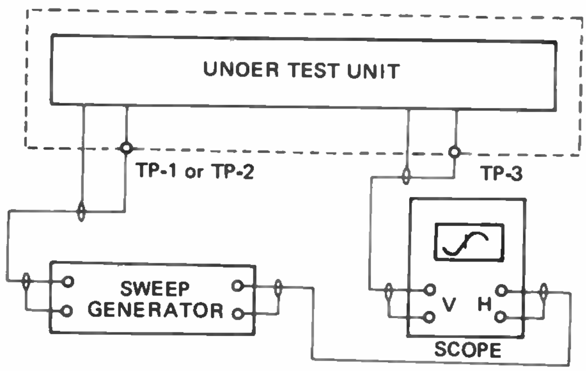


FIGURE 5

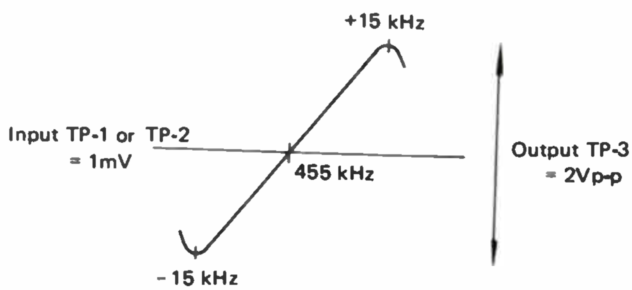
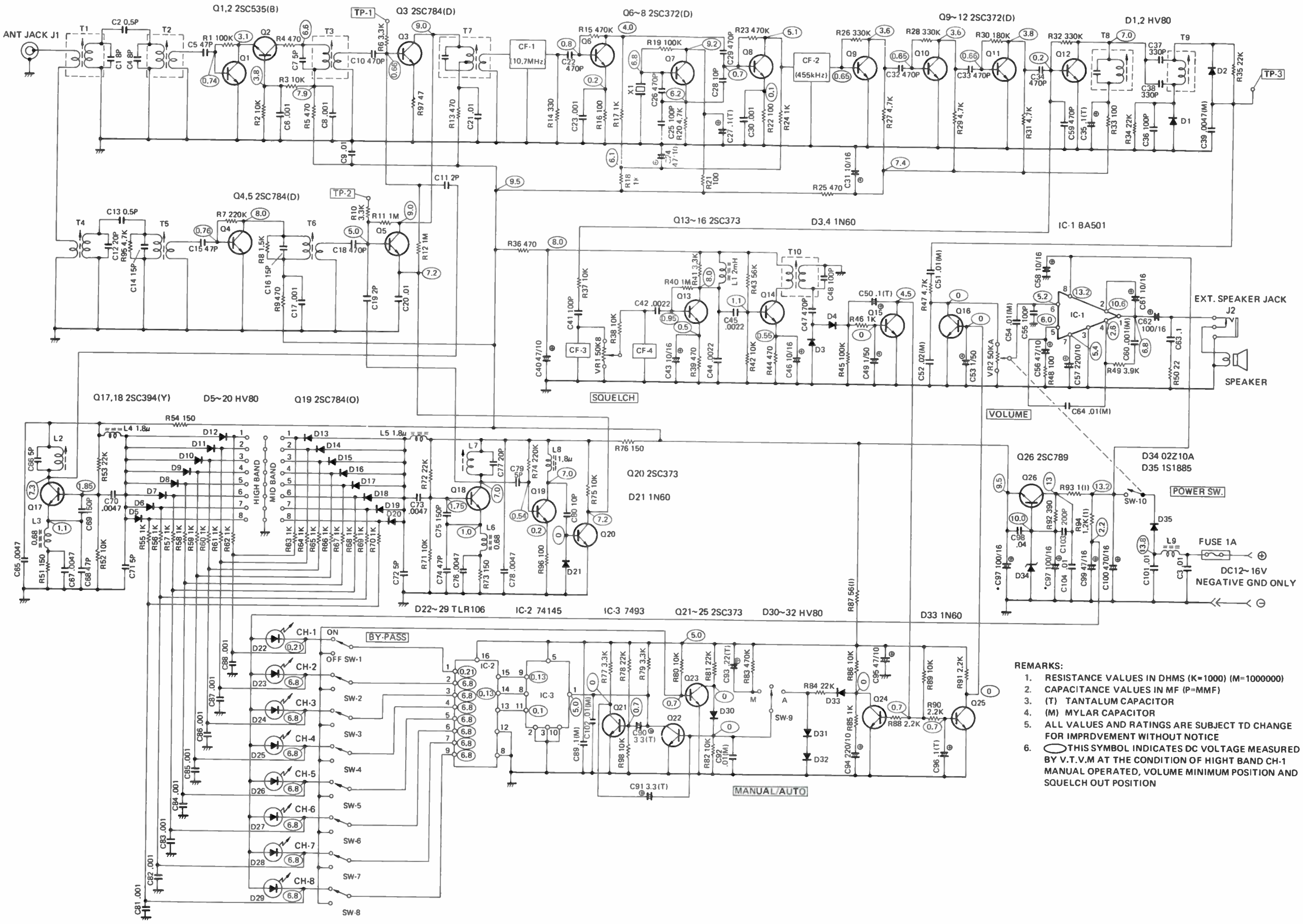


FIGURE 6

SCHEMATIC DIAGRAMS



REMARKS:

1. RESISTANCE VALUES IN OHMS (K=1000) (M=1000000)
2. CAPACITANCE VALUES IN MF (P=MMF)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE
6. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M AT THE CONDITION OF HIGHT BAND CH-1 MANUAL OPERATED, VOLUME MINIMUM POSITION AND SQUELCH OUT POSITION

RF ALIGNMENT

Step 1: Connect instruments as shown in Figure 7.

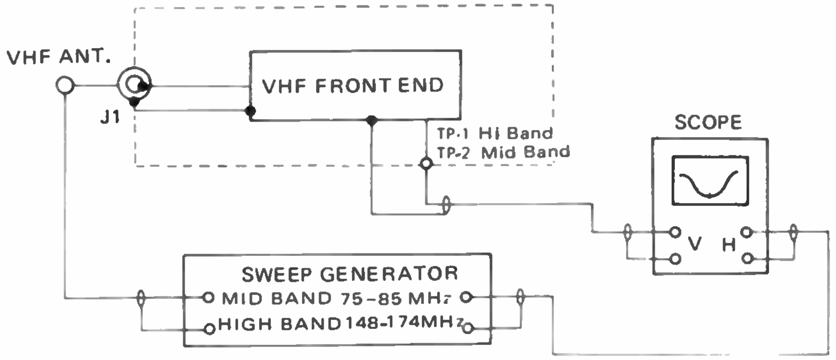


FIGURE 7

VHF MID RF ALIGNMENT

Step 1: Put crystal in socket.

Step 2: Tune sweep generator point on sweep center frequency at 79 MHz.

Step 3: Adjust T4, T5 and T6 for maximum output and best symmetry curve as shown in Figure 8.

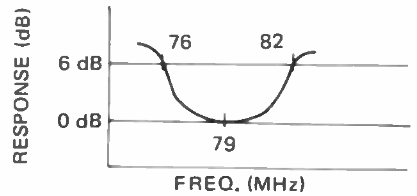


FIGURE 8

VHF HIGH RF ALIGNMENT

Step 1: Tune sweep generator point on sweep center frequency at 166 MHz (not necessary to put in crystal).

Step 2: Adjust T1, T2 and T3 for maximum output and best symmetry curve as shown in Figure 9.

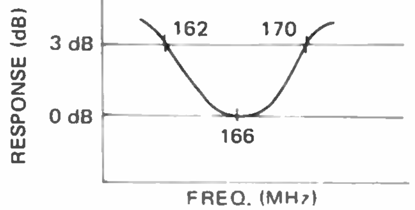
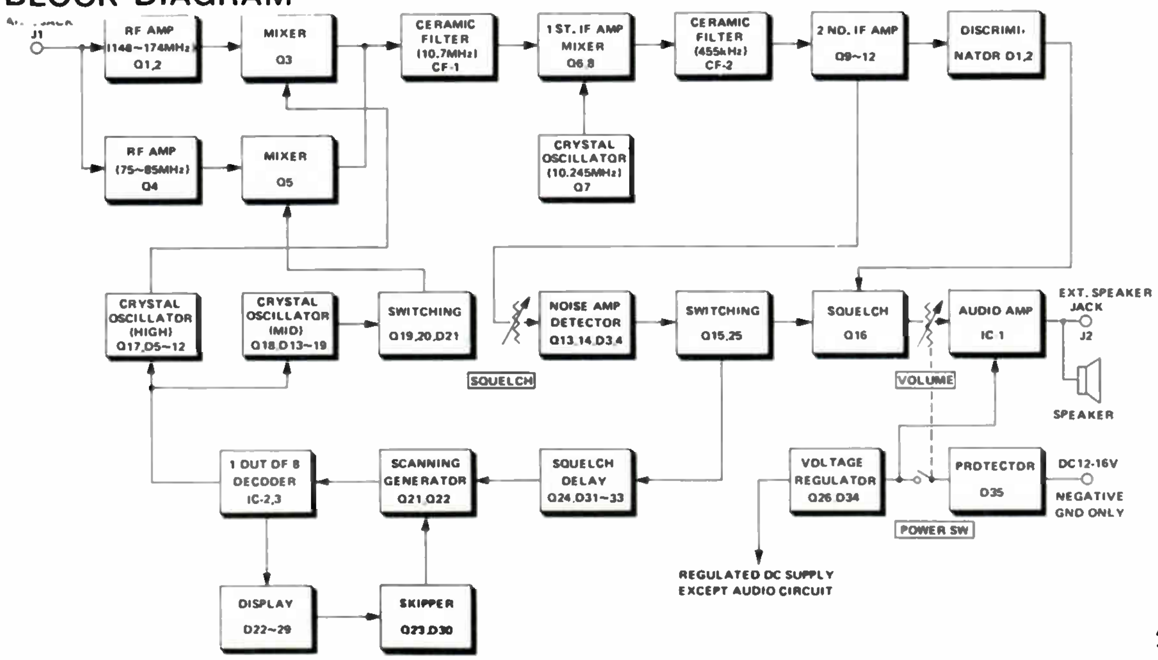


FIGURE 9

BLOCK DIAGRAM



TROUBLE SHOOTING

Symptom	Possible cause
1) Channel LED not on and no sound. Power switch: ON Channel switch: ON Volume control: Maximum	A) Reversed connection of Power Line. B) Faulty Power line cord. C) Defective Power switch. D) Defective one of D35, L9 or C3, C101. E) Defective Fuse.
2) Channel LED on but no sound. Channel switch: ON Volume control: Maximum Squelch control: Minimum	A) Defective Speaker or Ext. speaker jack J2. B) Defective one of Q26, Q25, Q16 and IC-1 and/or associated circuit components. C) Faulty IF amplifier Q6–Q12.
3) Channel LED not on but sound is OK. Channel switch: ON Volume control: Maximum Squelch control: Minimum	A) Defective channel switch or LED. B) Defective R94 or R87. C) Defective IC-2 and IC-3.
4) No scanning and Squelch control does not work.	A) Faulty IF amplifier Q6–Q12. B) Faulty Noise amplifier detector D3 or D4. C) Defective Q24, Q25 and/or associated circuit components. D) Defective VR1.
5) No scanning but Squelch is OK.	A) Defective Auto Manual switch SW9. B) Defective IC-2, IC-3 and/or associated circuit components.
6) Manual selector does not work.	A) Defective Auto/Manual switch SW9. B) Defective C93 or R83.
7) Skipper circuit does not work.	A) Defective Q23, D30 and/or associated circuit components.
8) Delay circuit does not work.	A) Defective Q24, D31, D32 and/or D33.

Symptom	Possible cause
9) VHF ~~Mid~~ Lo does not work but VHF Hi is OK. (Noise is heard.)	A) Correct crystal not put in the required channel. B) Weak crystal or defective Q18, Q19 and Q20 and/or associated circuit components. C) Defective Q4, Q5 and/or associated circuit components.
10) VHF Hi does not work but VHF ~~Mid~~ Lo is OK. (Noise is heard.)	A) Correct crystal not put in required channel. B) Weak crystal or defective Q1, Q2, Q3 and Q17 and/or associated circuit components.
11) Distortion voice.	A) Correct crystal not put in required channel. B) Faulty IF amplifier. C) Defective IC-1 and/or associated circuit components.
12) Low sensitivity on VHF	A) Poor Antenna. B) Does not receive signal on the covered Receiving range. C) Faulty IF amplifier. D) Weak crystal. E) Bad alignment of RF amplifier and/or associated circuit components.
13) Low sensitivity on VHF Hi.	A) Weak crystal. B) Bad alignment of RF amplifier and/or associated circuit components.

LED ASSEMBLY

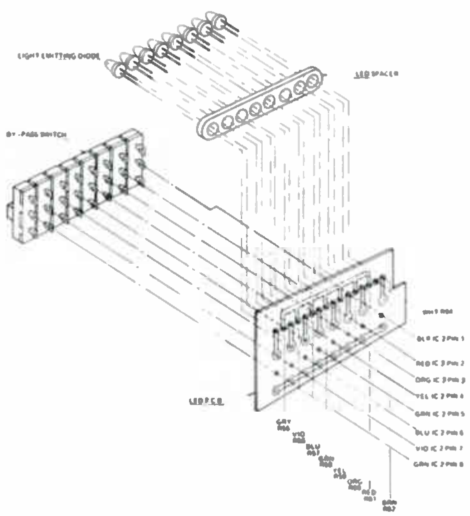
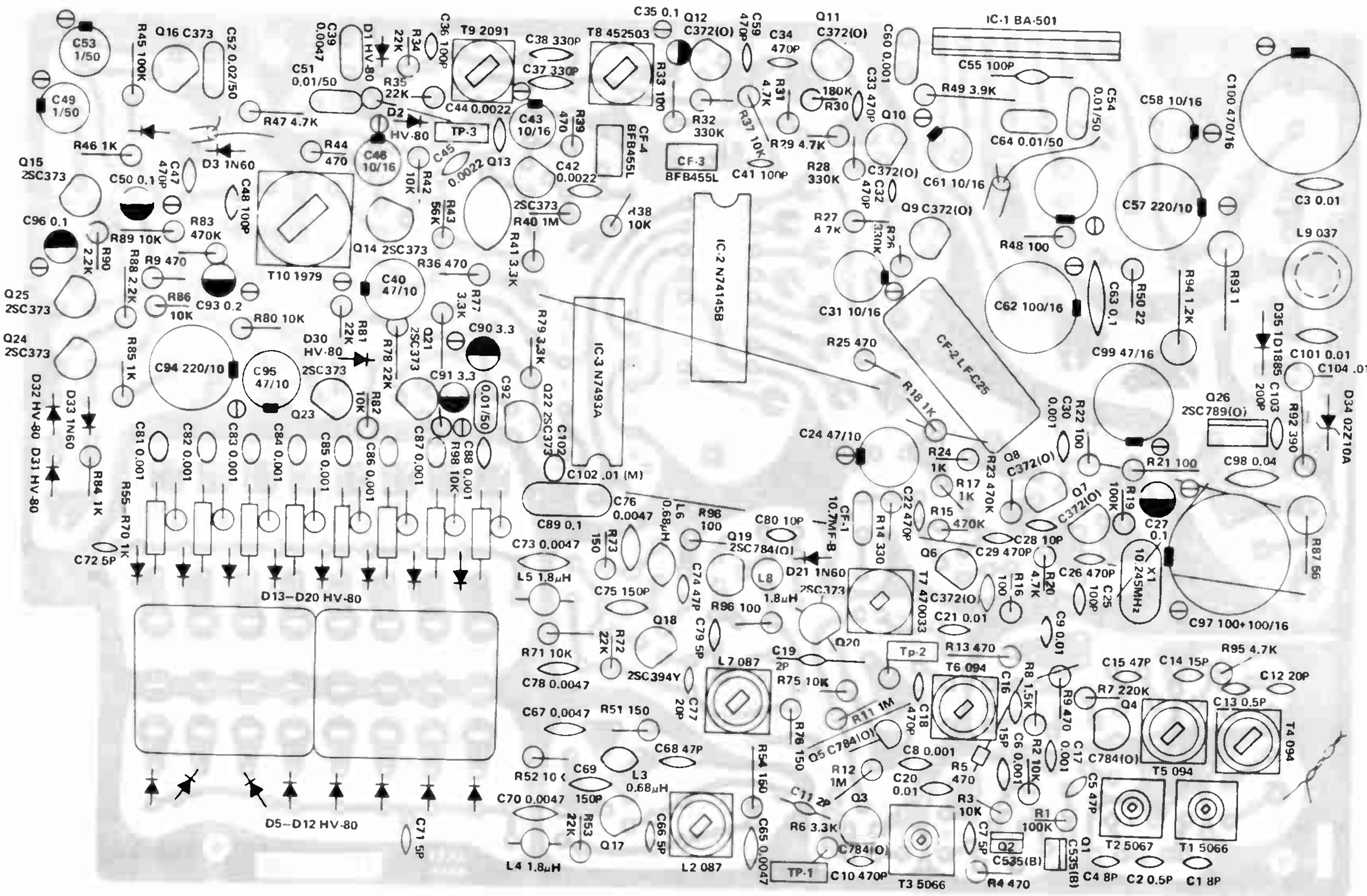


FIGURE 11

PRINTED CIRCUIT BOARD(BOTTOM VIEW)



ADDENDUM

If modification of the receiver is required for the purpose of covering the VHF low band 30~50 MHz, the following changes must be effected at the sacrifice of the VHF mid. band.

PARTS

Ref. No.	Description			handic Stock Number	MFR's Part Number
T4–6	RF coil				113SN-4427X
C7	Ceramic	7pF	±0.5pF		FC-50
C12	Ceramic	33pF	±5%		FC-50
C13	Ceramic	6pF	±0.5pF		FC-50
C14,16	Ceramic	33pF	±5%		FC-50
R95	Not used				

Test equipment required.

1. RF standard signal generator (30 – 174 MHz)
2. RF sweep generator with variable make (30 – 174 MHz)

ALIGNMENT

1st local oscillator check

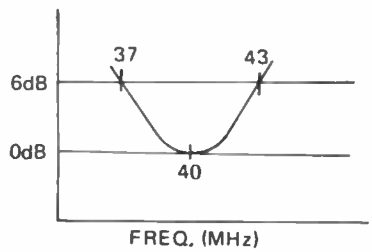
Receiving Range	Required Frequency	Alignment coil
VHF Lo 30 – 50 MHz	Fr + 10.7 MHz	L7

VHF LOW RF ALIGNMENT

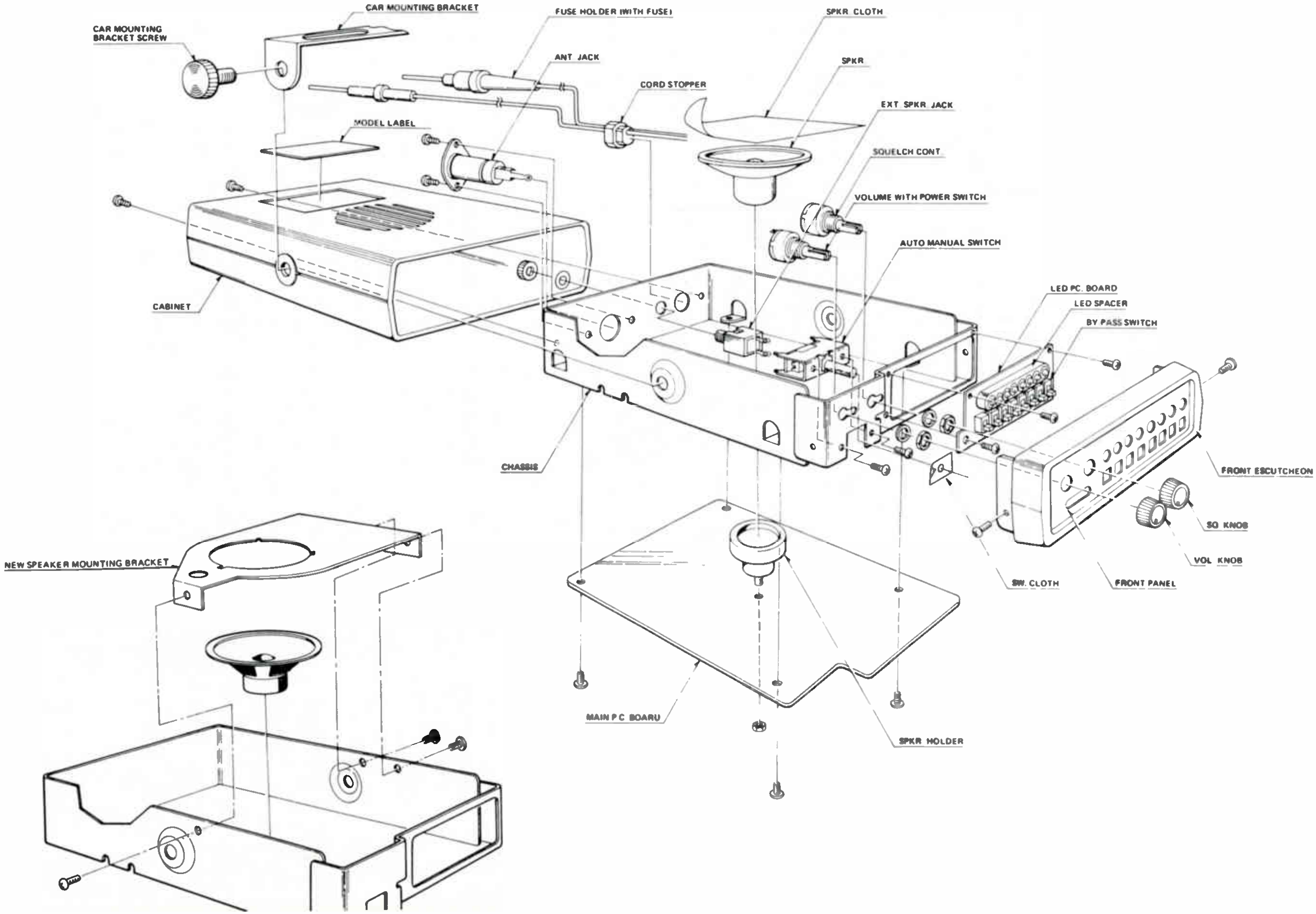
Step 1: Put crystal in socket.

Step 2: Tune sweep generator point on sweep center frequency at 40 MHz.

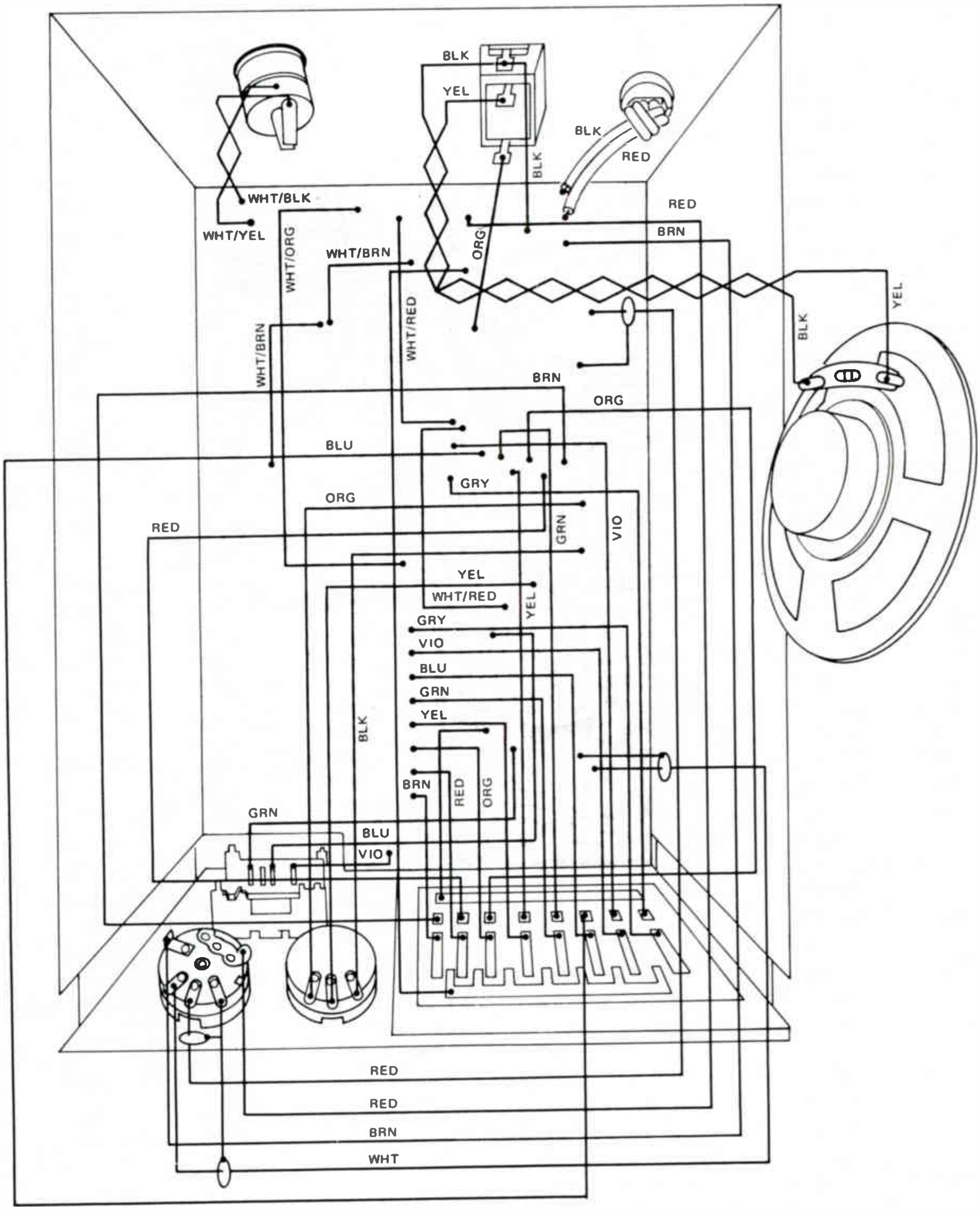
Step 3: Adjust T4, T5 and T6 for maximum output and best symmetry curve as shown follow.



DISASSEMBLY INSTRUCTIONS



WIRING DIAGRAM



PARTS LIST
MAIN P.C. BOARD

Ref. No.	Description				handic Stock Number	MFR'S Part Number
	CAPACITORS					
C1	Ceramic	8pF		±0.5pF	990232	FC-50
C2	Ceramic	0.5pF		±0.25pF	990547	AK-50
C3	Ceramic	0.01μF		−20 ~ +80%	990477	MC-70
C4	Ceramic	8pF		±0.5pF	990237	FC-50
C5	Ceramic	47pF		±5%	990274	FC-60
C6	Ceramic	0.001μF		±10%	990519	SCP-60
C7	Ceramic	5pF		±0.5pF	990218	FC-50
C8	Ceramic	0.001μF		±10%	990519	SCP-60
C9	Ceramic	0.01μF		−20 ~ +80%	990477	MC-70
C10	Ceramic	470pF		±10%	990512	SCP-50
C11	Ceramic	2pF		±0.5pF	990211	FC-50
C12	Ceramic	20pF		±5%	990631	FC-50
C13	Ceramic	0.5pF		±0.25pF	990547	AK-50
C14	Ceramic	15pF		±5%	990246	FC-50
C15	Ceramic	47pF		±5%	990274	FC-60
C16	Ceramic	15pF		±5%	990246	FC-50
C17	Ceramic	0.001μF		±10%	990519	SCP-60
C18	Ceramic	470pF		±10%	990512	SCP-50
C19	Ceramic	2pF		±0.5pF	990211	FC-50
C20,21	Ceramic	0.01μF		−20 ~ 80%	990477	MC-70
C22	Ceramic	470pF		±10%	990512	SCP-50
C23	Ceramic	0.001μF		±10%	990519	SCP-60
C24	Electrolytic	47μF	10WV		990617	CE04W
C25	Ceramic	100pF		±5%	990295	FC-70
C26	Ceramic	470pF		±10%	990512	SCP-50
C27	Tantalum	0.1μF			990582	CS15E1V0R1M
C28	Ceramic	10pF		±0.5pF	990239	FC-50
C29	Ceramic	470pF		±10%	990512	SCP-50
C30	Ceramic	0.001μF		±10%	990519	SCP-60
C31	Electrolytic	10μF	16WV		990036	CE04W 10/16
C32–34	Ceramic	470pF		±10%	990512	SCP-50
C35	Tantalum	0.1μF			990582	CS15E1V0R1M
C36	Ceramic	100pF		±5%	990295	FC-70
C37,38	Ceramic	330pF		±5%	990645	FCU-100
C39	Mylar	0.0047μF	50WV	±10%	990652	
C40	Electrolytic	47μF	10WV		990617	CE04W
C41	Ceramic	100pF		±5%	990295	FC-70
C42	Ceramic	0.0022μF		±20%	990533	SCP-80
C43	Electrolytic	10μF	16WV		990036	CE04W
C44,45	Ceramic	0.0022μF		±20%	990533	SCP-80
C46	Electrolytic	10μF	16WV		990036	CE04W
C47	Ceramic	470pF		±10%	990512	SCP-50
C48	Ceramic	100pF		±5%	990295	FC-70
C49	Electrolytic	1μF	50WV		990008	CE04W
C50	Tantalum	0.1μF			990582	CS15E1V0R1M
C51	Mylar	0.01μF	50WV	±10%	990099	
C52	Mylar	0.02μF	50WV	±10%	990106	
C53	Electrolytic	1μF	50WV		990008	CE04W
C54	Mylar	0.01μF	50WV	±10%	990099	
C55	Ceramic	100pF		±5%	990295	FC-70
C56	Electrolytic	47μF	10WV		990617	CE04W
C57	Electrolytic	220μF	10WV		990624	CE04W

Ref. No.	Description				handic Stock Number	MFR'S Part Number
C58	Electrolytic	10μF	16WV		990036	CE04W
C59	Ceramic	470pF		±10%	990512	SCP-50
C60	Mylar	0.001μF	50WV	±10%	990085	
C61	Electrolytic	10μF	16WV		990036	CE04W
C62	Electrolytic	100μF	16WV		990050	CE04W
C63	Ceramic	0.1μF		−20 ~ +80%	990498	MMC-135
C64	Mylar	0.01μF	50WV	±10%	990099	
C65	Ceramic	0.0047μF		−20 ~ +80%	990540	SCP-100
C66	Ceramic	5pF		±0.5pF	990218	FC-50
C67	Ceramic	0.0047μF		−20 ~ +80%	990540	SCP-100
C68	Ceramic	47pF		±5%	990274	FC-60
C69	Ceramic	150pF		±10%	990638	SCP-50
C70	Ceramic	0.0047μF		−20 ~ +80%	990540	SCP-100
C71,72	Ceramic	5pF		±0.5pF	990218	FC-50
C73	Ceramic	0.0047μF		−20 ~ +80%	990540	SCP-100
C74	Ceramic	47pF		±5%	990274	FC-60
C75	Ceramic	150pF		±10%	990638	SCP-50
C76	Ceramic	0.0047μF		−20 ~ +80%	990540	SCP-100
C77	Ceramic	20pF		±5%	990631	FC-50
C78	Ceramic	0.0047μF		−20 ~ +80%	990540	SCP-100
C79	Ceramic	5pF		±0.5pF	990218	FC-50
C80	Ceramic	10pF		±0.5pF	990239	FC-50
C80–88	Ceramic	0.001μF		±10%	990519	SCP-60
C89	Mylar	0.1μF	50WV	±10%	990134	
C90,91	Tantalum	3.3μF	16WV		990148	CS15E1C3R3M
C92	Mylar	0.01μF	50WV		990099	
C93	Tantalum	0.22μF		±10%	990659	CS15E1C0R22M
C94	Electrolytic	220μF	10WV		990624	CE04W
C95	Electrolytic	47μF	10WV		990617	CE04W
C96	Tantalum	0.1μF			990582	CS15E1V0R1M
C97	Electrolytic	100μF+100μF	16WV		990071	CE042W
C98	Ceramic	0.04μF			990491	MC-100
C99	Electrolytic	47μF	16WV	−20 ~ +80%	990043	CE04W
C100	Electrolytic	470μF	16WV		990064	CE04W
C101	Ceramic	0.01μF		−20 ~ +80%	990477	MC-70
C102	Mylar	0.01μF	50WV	±10%	990099	
C103	Ceramic	200pF	50WV	±10%	990589	FC-80
C104	Ceramic	0.01μF	50WV	−20 ~ +80%	990477	MC-70

SEMICONDUCTORS				
Q1,2	Transistor	silicon	992080	2SC535(B)
Q3–5	Transistor	silicon	992101	2SC784(O)
Q6–12	Transistor	silicon	992052	2SC372(O)
Q13–16	Transistor	silicon	992066	2SC373
Q17,18	Transistor	silicon	992073	2SC394Y
Q19	Transistor	silicon	992101	2SC784(O)
Q20–25	Transistor	silicon	992066	2SC373
Q26	Transistor	silicon	992115	2SC789(O)
D1,2	Diode	silicon	992164	HV-80
D3,4	Diode	germanium	992143	1N60
D5–20	Diode	silicon	992164	HV-80
D21	Diode	germanium	992143	1N60
D30–32	Diode	silicon	992164	HV-80
D33	Diode	germanium	992143	1N60
D34	Diode	zener	992178	02Z10A
D35	Diode	silicon	992157	1S1885
IC-1	Integrated circuit		992255	BA-501
IC-2	Integrated circuit		992269	N74145B
IC-3	Integrated circuit		992241	N7493A
COILS/TRANSFORMERS/FILTERS				
L1	Microinductor	2mH	995297	EL0610-202K
L2	OSC. coil		995276	6.5SN0-087
L3	Microinductor	0.68μH	995283	EL0606-R68M
L4,5	Microinductor	1.8μH	995290	LF4-1R8K
L6	Microinductor	0.68μH	995283	EL0606-R68M
L7	OSC. coil		995276	6.5SNO-087
L8	Microinductor	1.8μH	995290	LF4-1R8K
L9	Choke coil		995409	3B-037
T1	RF coil		995416	113SN-5066X
T2	RF coil		995423	113SN-5067X
T3	RF coil		995416	113SN-5066X

Ref. No.	Description		handic Stock Number	MFR'S Part Number
T4–6	RF coil		995430	7SSR-094
T7	IFT		995304	119LC-470033N3
T8	IFT		995234	7MC-452503N4
T9	IFT		995241	7MC-2091N
T10	Coil		995311	CAN-1979A
CF-1	Ceramic filter	10.7MHz	995325	10.7MF-B
CF-2	Ceramic filter	455kHz	995332	LF-C25
CF-3,4	Ceramic filter	455kHz	995339	BFB-455L
X1	Crystal	10.245MHz	452403	
	MISCELLANEOUS			
	Main P.C. Board		597001	GE-20C-5071
	Crystal socket		599950	GE-17D-3391
	Test pin		599449	C.T.P.

LED. P.C. BOARD

Ref. No.	Description	handic Stock Number	MFR'S Part Number
	MISCELLANEOUS		
D22–29	Light emitting diode	992283	TLR106
	By-pass switch	994081	S-112142
	LED. spacer	597008	GE-20D-5068
	LED. P.C. Board	597015	GE-20D-5072

CHASSIS ASSEMBLY PARTS

Ref. No.	Description		handic Stock Number	MFR'S Part Number
	VOLUME			
VR1	Squelch control	50KΩ(B)	984060	V12M4-1N 15FHB-50KΩ
VR2	Volume with power switch	50KΩ(A)	984067	V12M4-1S(SJ) 15FH15A-50KΩ

Pages 34-52 Courtesy of HANDIC U.S.A. INC.

FIGURE 2

DIAL STRING DIAGRAM

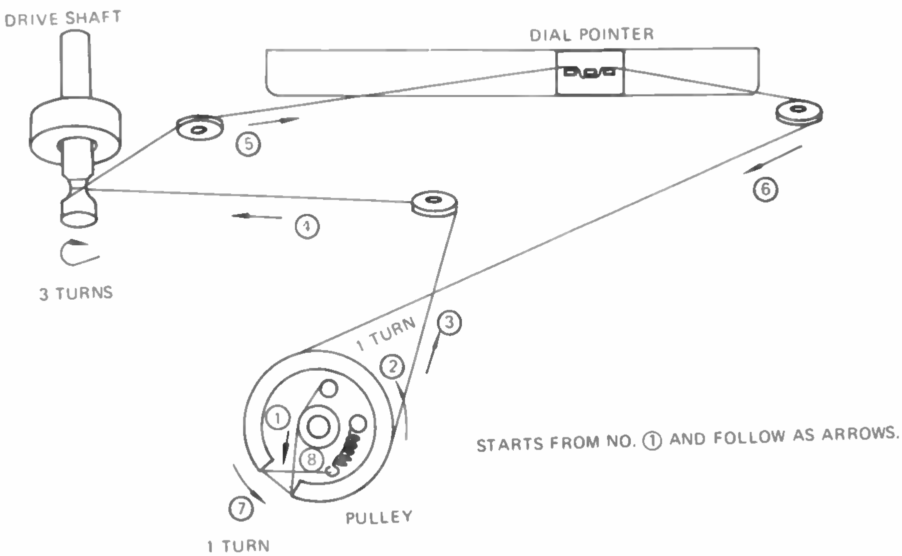


FIGURE 3

DISASSEMBLY INSTRUCTION

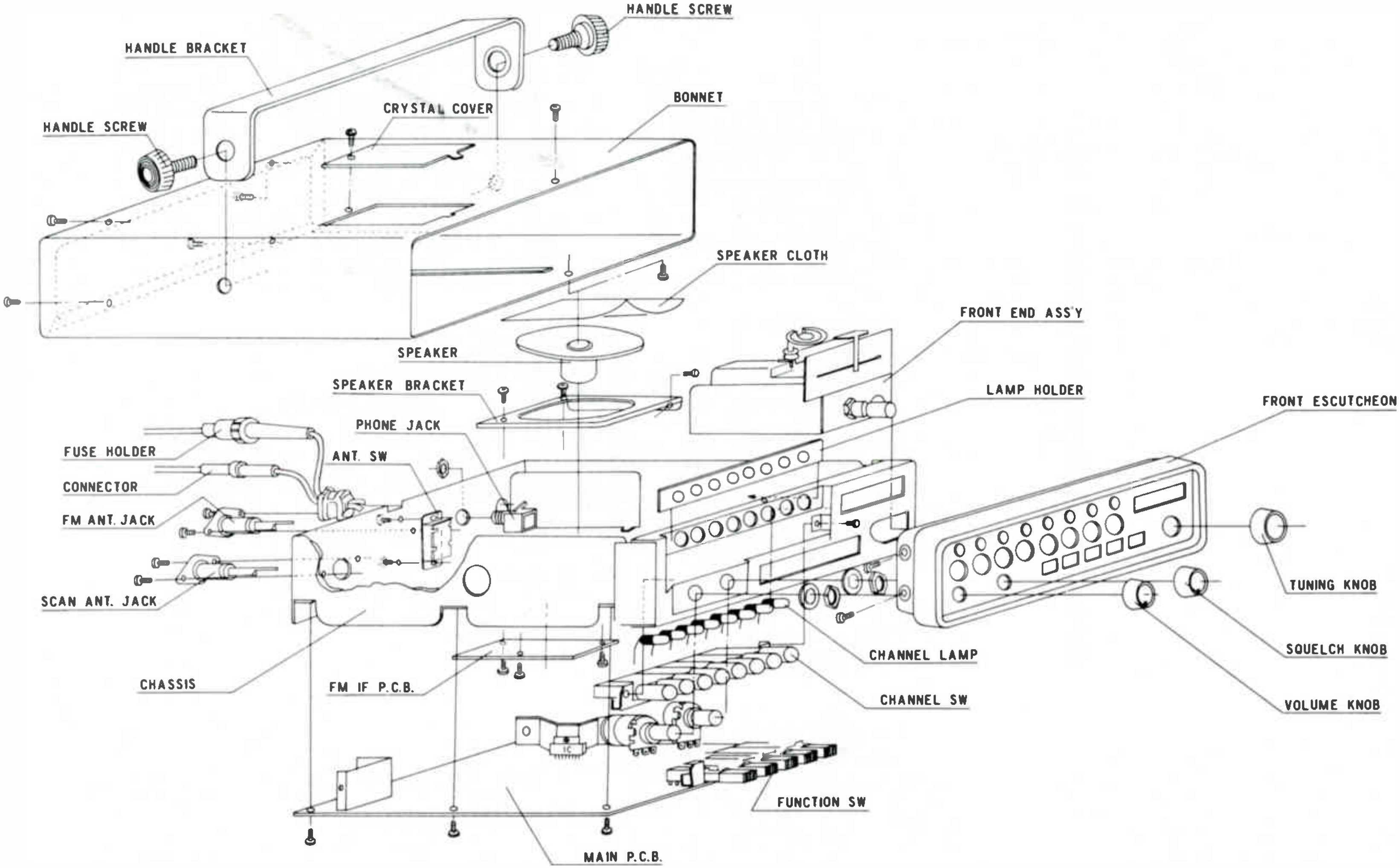


FIGURE 1

SCHEMATIC DIAGRAM FOR FM FRONT END

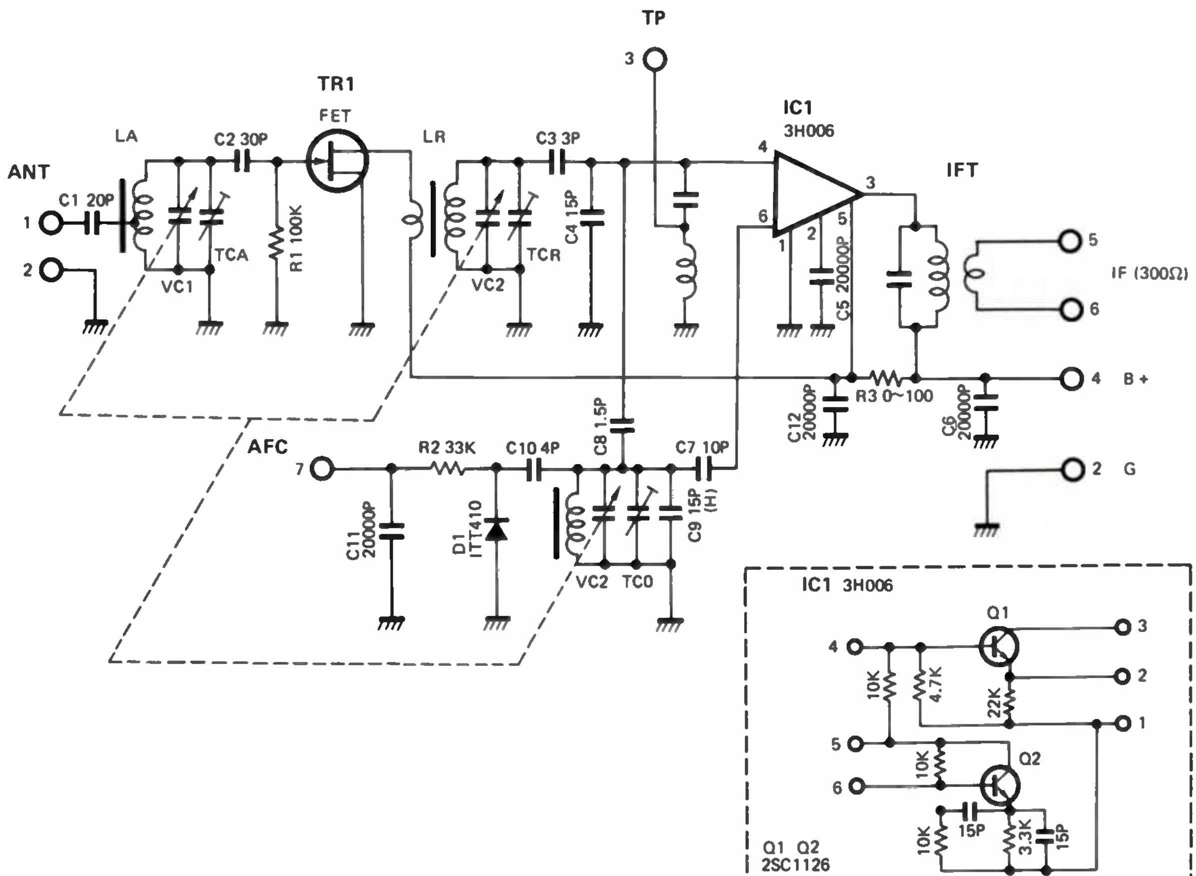
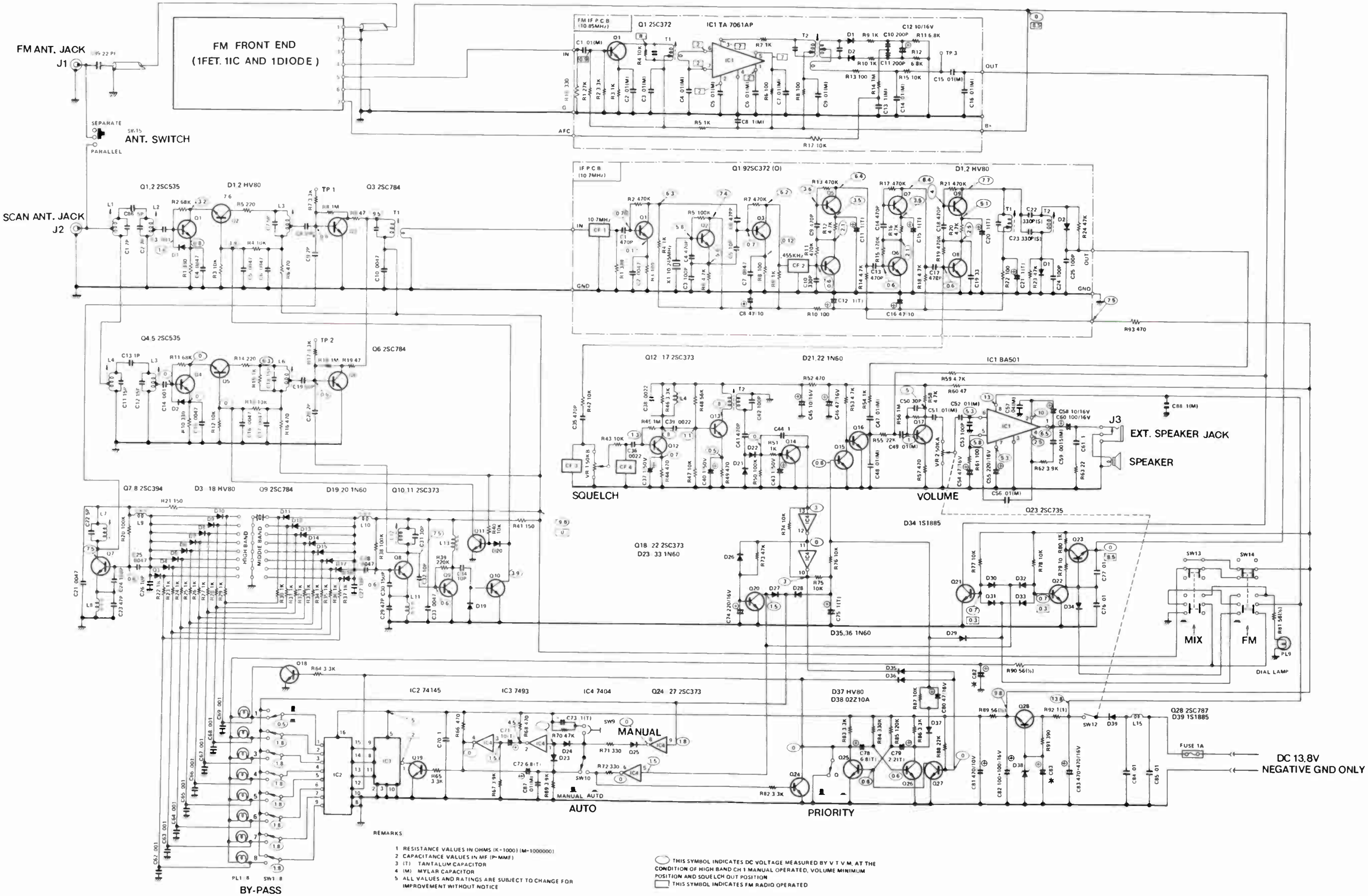
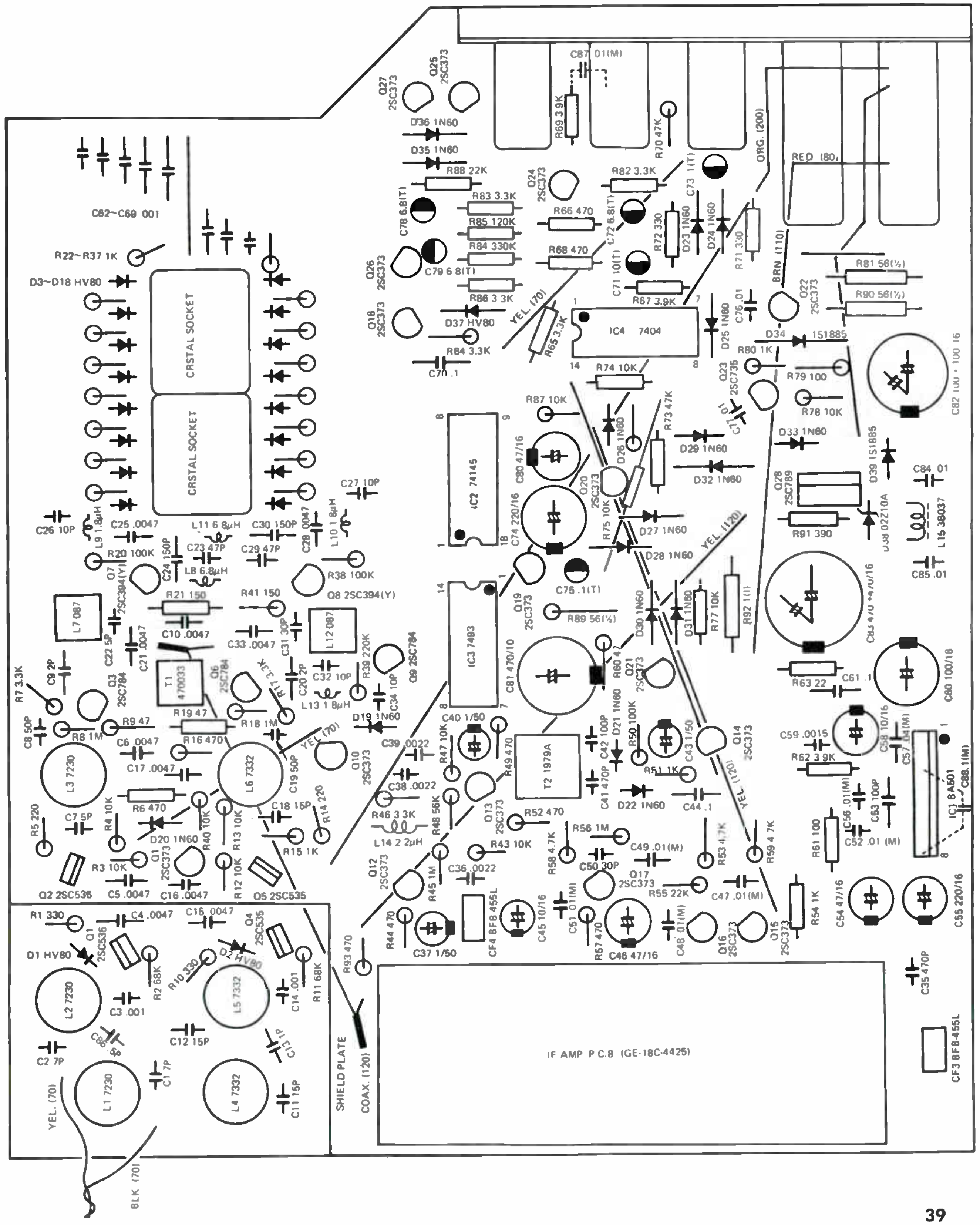


FIGURE 22

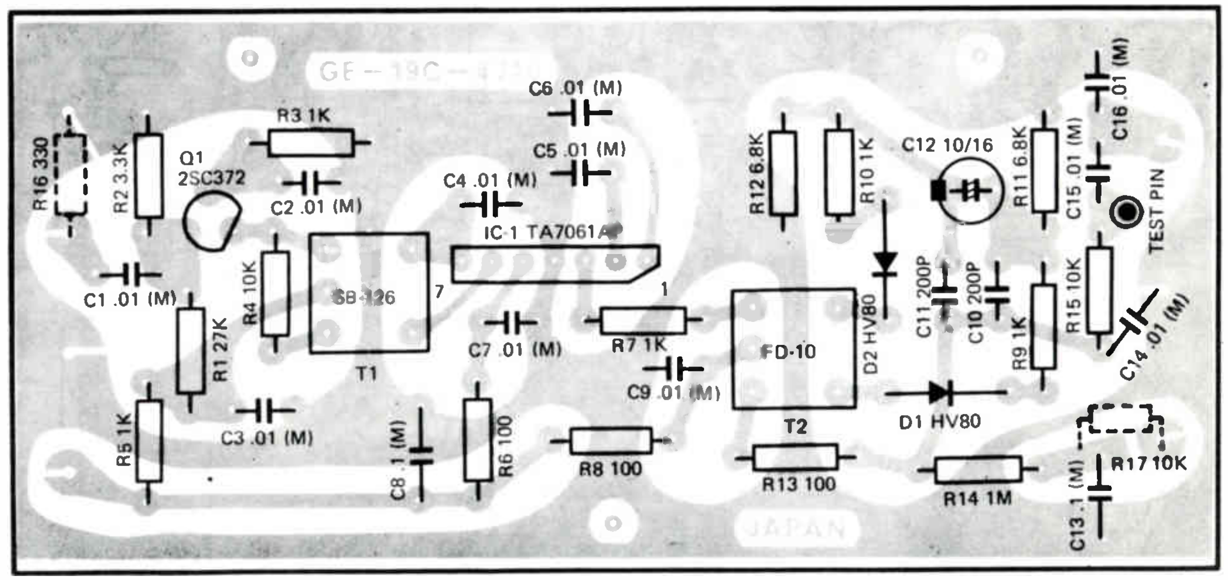
SCHEMATIC DIAGRAM



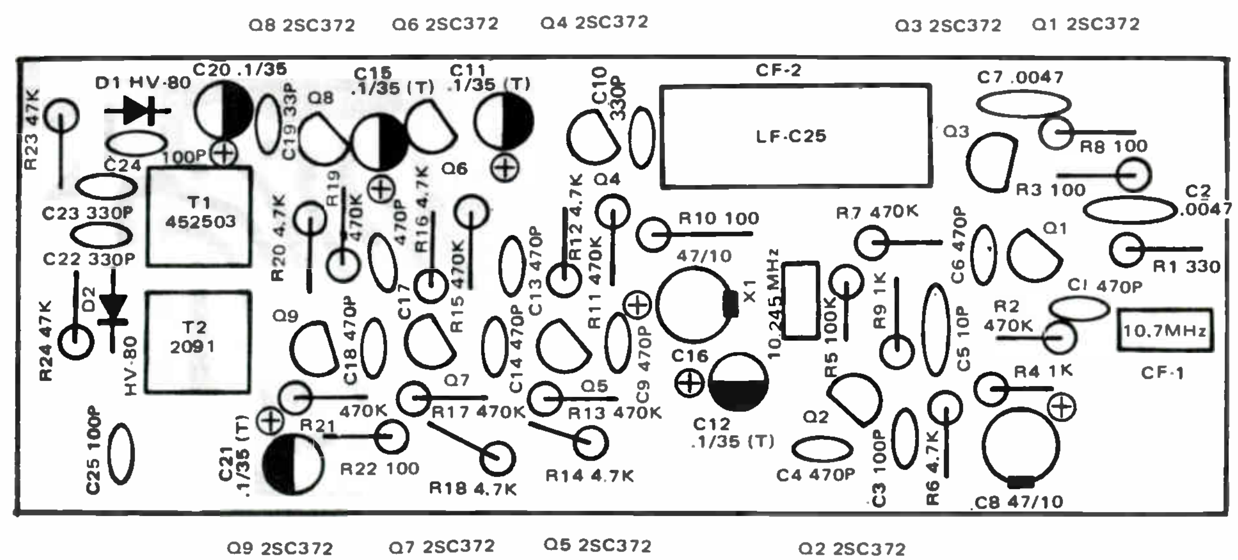
MAIN PRINTED CIRCUIT BOARD BOTTOM VIEW



FM IF AMP. PRINTED CIRCUIT BOARD BOTTOM VIEW



SCANNER IF AMP. PRINTED CIRCUIT BOARD BOTTOM VIEW



ALIGNMENT POSITIONS

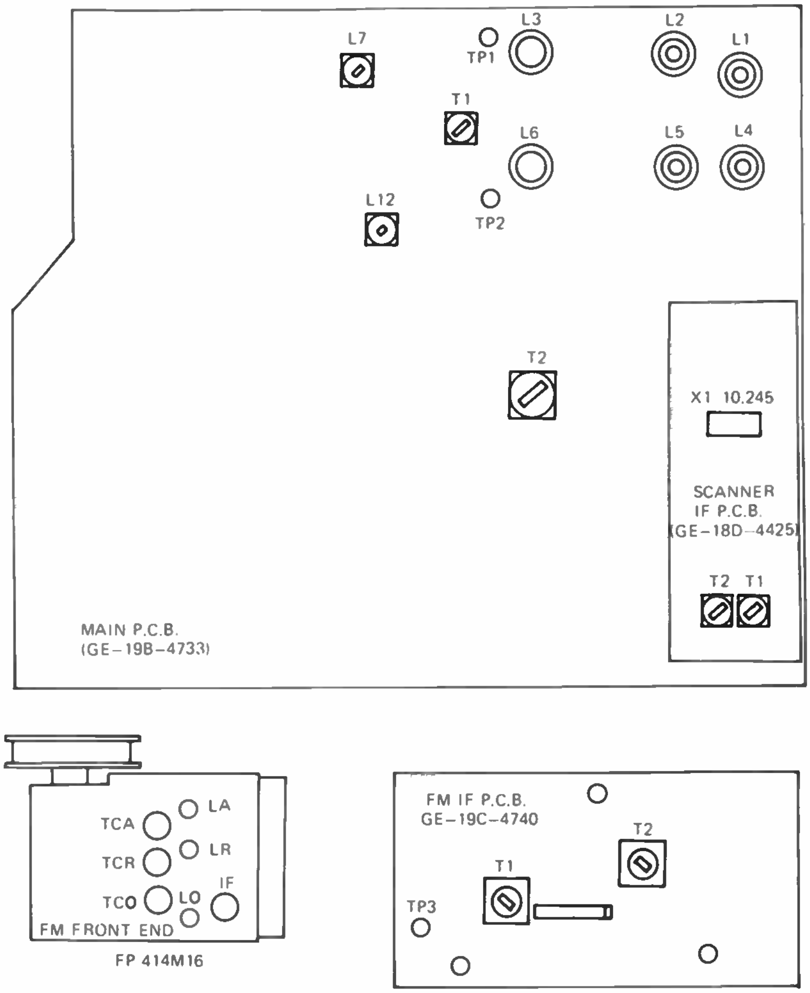


FIGURE 4

M SECTION ALIGNMENT

tep 1: FM IF SECTION (10.85 MHz)

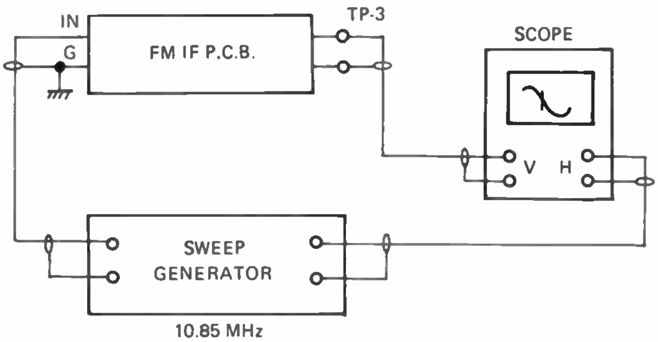


FIGURE 11

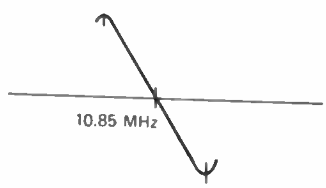


FIGURE 12

tep 1: Connect instruments as shown in Figure 11.

tep 2: Adjust T1 and T2 so that 10.85 MHz marker is in the center of the discriminator curve as shown in Figure 12.

SCANNER LOCAL OSCILLATOR CHECK

Step 1: Connect Frequency Counter to L12(Mid) and L7(Hi) with a pick-up coil.

Step 2: Check the crystal frequency on the Frequency Counter.

Step 3: The crystal frequencies required are found by the following formulas:

Receiving Range	Required Frequency	Alignment coil
VHF Mid 74 – 85 MHz	$\frac{Fr + 10.7\ MHz}{2}$	L7
VHF Hi 148 – 174 MHz	$\frac{Fr - 10.7\ MHz}{3}$	L12

LOCAL OSCILLATOR FREQUENCY CHECK (Q2)

Step 1: Connect Frequency Counter through a 10pF capacitor to Q2 emitter circuit.

Step 2: Read frequency on the Frequency Counter.
Normal: 10.245 MHz ± 1 kHz.

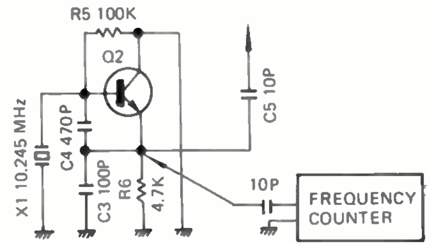


FIGURE 5

SCANNER IF ALIGNMENT

Step 1: Connect instruments as shown in Fig. 6.

Step 2: Adjust T1 and T2 of IF amplifier so that 455 kHz marker is in the center of the discriminator curve as shown in Fig. 7.

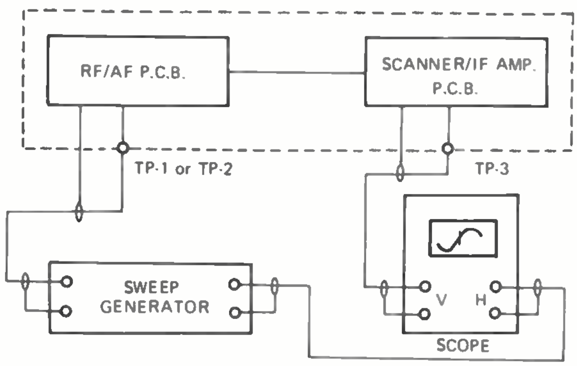


FIGURE 6

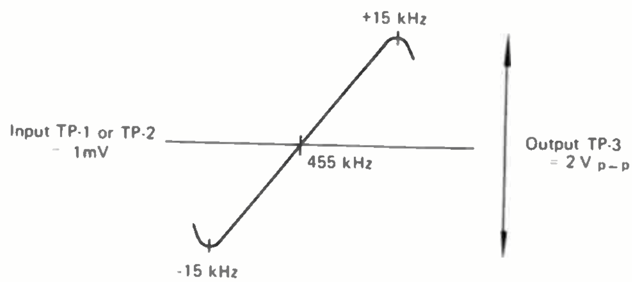


FIGURE 7

SCANNER RF ALIGNMENT

Step 1: Connect instruments as shown in Figure 8.

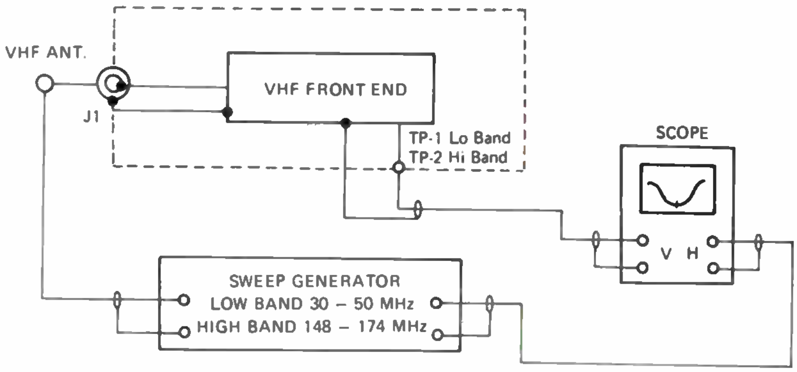


FIGURE 8

SCANNER VHF MID ALIGNMENT

Step 1: Put crystal in socket.

Step 2: Tune sweep generator point on sweep center frequency at 70 MHz.

Step 3: Adjust L4, L5 and L6 results at maximum output and best symmetry curve as shown in Figure 9.

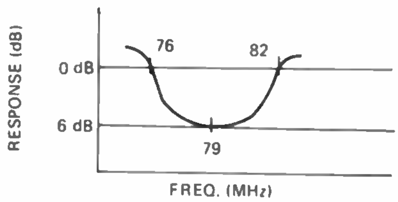


FIGURE 9

SCANNER VHF HIGH ALIGNMENT

Step 1: Tune sweep generator point on sweep center frequency at 166 MHz (not necessary put in crystal).

Step 2: Adjust L1, L2 and L3 results at maximum output and best symmetry curve as shown in Figure 10.

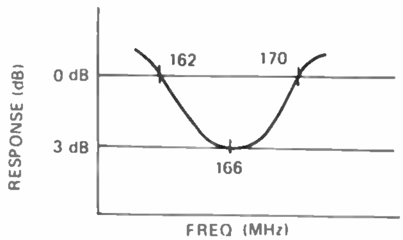


FIGURE 10

FM TRACKING ALIGNMENT

Step 1: Connect instruments as shown in Figure 13.

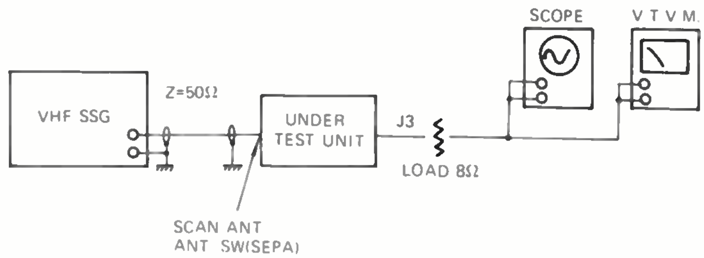


FIGURE 13

Step 2: Set receiver pointer at 88 MHz and SSG also set on 88 MHz.

Step 3: Adjust LO, LR and LA results at maximum putput wave form when SSG input at minimum as possibly.
Next set on 108 MHz and adjust trimmer condensers TCO, TCR and TCA at maximum sensitivity.

Step 4: Check the output level of SSG at 98 MHz and receiver pointer at 98 MHz.

Step 5: Repeat step 2 to 4 if necessary.

SCANNER SECTION ALIGNMENT

Step 1: Connect instruments shown in Figure 13. Install crystals in sockets of VHF Hi (166 MHz) and VHF Mid (79 MHz).

Step 2: Tune SSG for best output signal with the installed crystals. Keep SSG output signal at low as possible with modulation at 1 kHz and deviation at 5 kHz.

Step 3: Adjust T1 (Main P.C. Board) and oscillator coil L7(Hi) or L12(Mid) for maximum output.

Step 4: Adjust Volume control clockwise to set the output noise level to 0dB. (0dB=0.775 volts) with SSG output at minimum.
Increase input level of SSG (no modulation) so that output level of receiver goes 20dB down from 0dB.
Sensitivity means the value of SSG attenuator.
This value level is noise quieting=20dB.

SQUELCH ALIGNMENT

Step 1: Adjust T2 to maximum inductance. (Inductance of coil will be at the maximum when the core is fully inserted.

Step 2: Farther alignment is not required.

TROUBLE SHOOTING

Symptom	Possible cause
1) Channel lamp not on and no sound. Power switch: ON Channel switch: ON Volume control: Maximum	A) Reversed connection of Power line. B) Faulty Power line cord. C) Defective Power switch. D) Defective one of D39, L15 or C84, C85. E) Defective Fuse.
2) Channel lamp on but no sound. Channel switch: ON Volume control: Maximum Squelch control: Minimum	A) Defective Speaker or Ext. speaker jack J3. B) Defective one of Q28, Q21, Q22, Q23, Q17 and IC-1 and/or associated circuit components. C) Faulty IF P.C. Board. D) Defective FM Mix switch.
3) Channel lamps not on but sound is OK. Channel switch: ON Volume control: Maximum Squelch control: Minimum	A) Defective channel switch or lamp. B) Defective R89 or R90. C) Defective IC-2, IC-3 and IC-4. D) Defective Q24, Q25 and Q18. (Priority channel only).
4) No scanning and Squelch control does not work.	A) Faulty IF amplifier. B) Faulty Noise amplifier detector. C) Defective IC-4, Q15, Q16 and/or associated circuit components. D) Defective VR1.
5) No scanning but Squelch is OK.	A) Defective Auto Manual switch SW10. B) Defective IC-2, IC-3 and IC-4 and/or associated circuit components.
6) Priority channel does not work.	A) Defective Priority switch SW11. B) Defective IC-2, IC-3 and IC-4. C) Defective Q18, Q24, Q25, Q26 and Q27 and/or associated circuit components.
7) Manual selector does not work.	A) Defective Manual switch or Auto/Manual switch SW9 and SW10. B) Defective C73 or R70.
8) Skipper circuit does not work.	A) Defective IC-4, D25 and/or associated circuit components.
9) Delay circuit does not work.	A) Defective D26, C74 and R73.

Symptom	Possible cause
10) VHF Hi and VHF ~~Mid~~ Lo does not work.	A) Defective Mix/FM switch. B) Faulty IF amplifier P.C. Board. C) Defective Q7, Q8, Q9, Q10 and Q11 and/or associated circuit components.
11) VHF does not work and VHF Hi is OK. (Noise is heard.)	A) Correct crystal not put in the required channel. B) Weak crystal or defective Q8, Q9, Q10 and Q11 and/or associated circuit components. C) Defective Q4, Q5 and Q6 and/or associated circuit components.
12) VHF Hi does not work and VHF is OK. (Noise is heard.)	A) Correct crystal not put in required channel. B) Weak crystal or defective Q1, Q2, Q3 and Q7 and/or associated circuit components.
13) Distortion on VHF voice	A) Correct crystal not put in required channel. B) Faulty IF P.C. Board. C) Defective IC-1 and/or associated circuit components.
14) Low sensitivity VHF	A) Poor Antenna. B) Does not receive signal on the covered Receiving range. C) Faulty IF amplifier unit. D) Weak crystal. E) Bad alignment of RF amplifier and/or associated circuit components.
15) Low sensitivity on VHF Hi.	A) Weak crystal. B) Bad alignment RF amplifier and/or associated circuit components.
16) Poor operation on Mix.	A) Defective Mix switch. B) Defective Q21, Q22,and Q23 and/or associated circuit components.
17) FM does not work.	A) Faulty FM Front end. B) Faulty FM IF P.C. Board. C) Defective FM switch SW14. D) Defective Q21, Q22 and Q23 and/or associated circuit components.

Ref. No.	Description				handic Stock Number	MFR'S Parts Number
	CAPACITORS					
C1	Ceramic	470 pF		±10 %	990512	SCP-50
C2	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C3	Ceramic	100 pF		±10 %	990295	FC-70
C4	Ceramic	470 pF		±10 %	990512	SCP-50
C5	Ceramic	10 pF		±10 %	990377	FCC-50
C6	Ceramic	470 pF		±10%	990512	SCP-50
C7	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C8	Electrolytic	10 μF	16WV	−10 ~ +50 %	990036	CE04W1C100
C9	Ceramic	470 pF		±10 %	990512	SCP-50
C10	Ceramic	330 pF		±10 %	990505	SCP-50
C11,12	Tantalum	1 μF		±20 %	990141	CS15E1VOR1M
C13,14	Ceramic	470 pF		±10%	990512	SCP-50
C15	Tantalum	0.1 μF		±20 %	990582	CS15E1VOR1M
C16	Electrolytic	10 μF	16WV	−10 ~ + 50 %	990036	CE04W1C100
C17,18	Ceramic	470 pF		±10 %	990512	SCP-50
C19	Ceramic	33 pF		±5 %	990267	FC-50
C20,21	Tantalum	0.1 μF		±20 %	990582	CS15E1VOR1M
C22,23	Polystyrene	330 pF		±20 %	990183	SOC1H331J
C24,25	Ceramic	100 pF		±10 %	990295	FC-70
	SEMICONDUCTORS					
Q1–Q9	Transistor	silicon			992052	2SC372(0)
D1,2	Diode	silicon			992164	HV-80
	COILS/TRANSFORMERS/FILTERS/CRYSTAL					
T1	1FT				995234	7MC-452503N
T2	1FT				995241	7MC-2091N
CF1	Filter	10.7 MHz			995325	10.7MF-B
CF2	Filter	455 kHz			995332	LF-C25
X1	Crystal	10.235 MHz			452403	
	MISCELLANEOUS					
	P.C. Board				599929	GE-18C-4425

FM IF P.C. Board

	CAPACITORS					
C1–C7	Mylar	0.01 μF	50 WV	±20 %	990099	
C8	Mylar	0.1 μF	50 WV	±20 %	990134	
C9	Mylar	0.01 μF	50 WV	±20 %	990099	
C10,11	Ceramic	200 pF		±20 %	990589	FC-80
C12	Electrolytic	10 μF	16 WV	−10 ~ +50 %	990036	CE04W1C100
C13	Mylar	0.1 μF	50 WV	±20 %	990134	
C14–C16	Mylar	0.01 μF	50 WV	±20 %	990099	

SEMICONDUCTORS			
Q1	Transistor silicon	992052	2SC372(0)
D1,2	Diode silicon	992164	HV-80
IC1	Integrated circuit	992248	TA 7061AP
COILS			
T1	1FT	995248	SB-126
T2	1FT	995255	FD-10

Ref. No.	Description	handic Stock Number	MFR'S Parts Number
MISCELLANEOUS			
	P.C. Board	599936	GE-19C-4740
	Test Pin	599449	

MAIN P.C. BOARD

CAPACITORS						
C1,2	Ceramic	7 pF		±0.5 pF	990336	PC-50
C3	Ceramic	0.001 μF		±10 %	990519	SCP-60
C4–C6	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C7	Ceramic	5 pF		±0.25 pF	990218	PC-50
C8	Ceramic	50 pF		±10 %	990281	PC-60
C9	Ceramic	2 pF		±0.15 pF	990211	FC-50
C10	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C11,12	Ceramic	15 pF		±5 %	990246	FC-50
C13	Ceramic	1 pF		±0.1 pF	990204	RC-50
C14	Ceramic	0.001 μF		±10 %	990519	SCP-60
C15–17	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C18	Ceramic	15 pF		±5 %	990246	FC-50
C19	Ceramic	50 pF		±10 %	990281	FC-60
C20	Ceramic	2 pF		±0.15 pF	990211	FC-50
C21	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C22	Ceramic	5 pF		±0.25 pF	990218	FC-50
C23	Ceramic	47 pF		±10 %	990407	FCC-80
C24	Ceramic	150 pF		±10 %	990442	FCC-150
C25	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C26,27	Ceramic	10 pF		±0.5 pF	990239	FC-50
C28	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C29	Ceramic	47 pF		±10 %	990407	FCC-80
C30	Ceramic	150 pF		±10 %	990442	FCC-150
C31	Ceramic	30 pF		±5 %	990260	FC-50
C32	Ceramic	10 pF		±0.5 pF	990239	FC-50
C33	Ceramic	0.0047 μF		±10 %	990540	SCP-100
C34	Ceramic	10 pF		±0.5 pF	990239	FC-50
C35	Ceramic	470 pF		±10 %	990512	SCP-50
C36	Ceramic	0.0022 μF		±10 %	990533	SCP-80
C37	Electrolytic	1 μF	50 WV	−10 ~ +75 %	990008	CE04W1H010
C38,39	Ceramic	0.0022 μF		±10 %	990533	SCP-80
C40	Electrolytic	1 μF	50 WV	−10 ~ +75 %	990008	CE04W1H010
C41	Ceramic	470 μ F		±10 %	990512	SCP-50
C42	Ceramic	100 pF		±10 %	990295	FC-70
C43	Electrolytic	1 μF	50 WV	−10 ~ +75 %	990008	CE04W1H010
C44	Ceramic	0.1 μF		−20 ~ +80 %	990498	MMC-135
C45	Electrolytic	10 μF	16 WV	−10 ~ +50 %	990036	CE04W1C100
C46	Electrolytic	47 μF	16 WV	−10 ~ +50 %	990043	CE04W1C470
C47–C49	Mylar	0.01 μF		±20 %	990099	
C50	Ceramic	30 pF		±5 %	990260	FC-50
C51,52	Mylar	0.01 μF		±20 %	990099	FC-50
C53	Ceramic	100 pF		±10 %	990295	FC-70
C54	Electrolytid	47 μF	16 WV	−10 ~ +50 %	990043	CE04W1C470
C55	Electrolytic	220 μF	16 WV	±20 %	990057	
C56,57	Mylar	0.01 μF		±20 %	990099	
C58	Electrolytic	10 μF	16 WV	−10 ~ +50 %	990036	CE04W1C100

Ref. No.	Description				handic Stock Number	MFR'S Parts Number
C59	Mylar	0.0015 μF			990596	
C60	Electrolytic	100 μF	16 WV	−10 ~ +50 %	990050	CE04W1C101
C61	Ceramic	0.1 μF		−20 ~ +80 %	990498	MMC-135
C62−C69	Ceramic	0.001 μF		±10 %	990519	SCP-60
C70	Ceramic	0.1 μF		−20 ~ +80 %	990498	MMC-135
C71	Tantalum	10 μF	6.3 WV	±20 %	990162	CS15E0J100M
C72	Tantalum	6.8 μF	6.3 WV	±20 %	990155	CS15E0J6R8M
C73	Tantalum	1 μF	35 WV	±20 %	990141	CS15E1V0R1M
C74	Electrolytic	220 μF	16 WV	−10 ~ +50 %	990057	CE04W1C221
C75	Tantalum	1 μF	35 WV	±20 %	990141	CS15E1V0R1M
C76,77	Ceramic	0.01 μF		−20 ~ +80 %	990477	MC-70
C78	Tantalum	6.8 μF	6.3 WV	±20 %	990155	CS15E0J6R8M
C79	Tantalum	2.2 μF	16 WV	±20 %	990148	CS15E1C2R2M
C80	Electrolytic	47 μF	16 WV	−10 ~ +50 %	990043	CE04W1C470
C81	Electrolytic	470 μF	10 WV	−10 ~ +50 %	990064	CE04W1A471
C82	Electrolytic	100 μF + 100 μF	16 WV	−10 ~ +50 %	990071	CE042W1C101
C83	Electrolytic	470 μF + 470 μF	16 WV	−10 ~ +50 %	990078	CE042W1C471
C84,85	Ceramic	0.01 μF		−20 ~ +80 %	990477	MC-70
C86	Ceramic	0.5 pF			990547	AK-50
C87	Mylar	0.01 μF		±20 %	990099	
C88	Mylar	0.1 μF		±20 %	990134	

SEMICONDUCTORS

Q1,2	Transistor	silicon	992080	2SC535(B)
Q3	Transistor	silicon	992101	2SC784(O)
Q4,5	Transistor	silicon	992080	2SC535(B)
Q6	Transistor	silicon	992101	2SC784(O)
Q7,8	Transistor	silicon	992073	2SC394(Y)
Q9	Transistor	silicon	992101	2SC784(O)
Q10−Q22	Transistor	silicon	992066	2SC373
Q23	Transistor	silicon	992087	2SC735(Y)
Q24−Q27	Transistor	silicon	992066	2SC373
Q28	Transistor	silicon	992115	2SC789(O)
D1−D18	Diode	silicon	992164	HV-80
D19−33	Diode	germanium	992143	1N60
D34	Diode	silicon	992157	1S1885

Ref. No.	Description		handic Stock Number	MFR'S Parts Number
D35,36	Diode	germanium	992143	1N60
D37	Diode	silicon	992164	HV-80
D38	Diode	Zener	992178	02Z10A
D39	Diode	silicon	992157	1S1885
IC1	Intergrated circuit		992255	BA-501
IC2	Intergrated circuit		992269	N74145N
IC3	Intergrated circuit		992234	N7404N

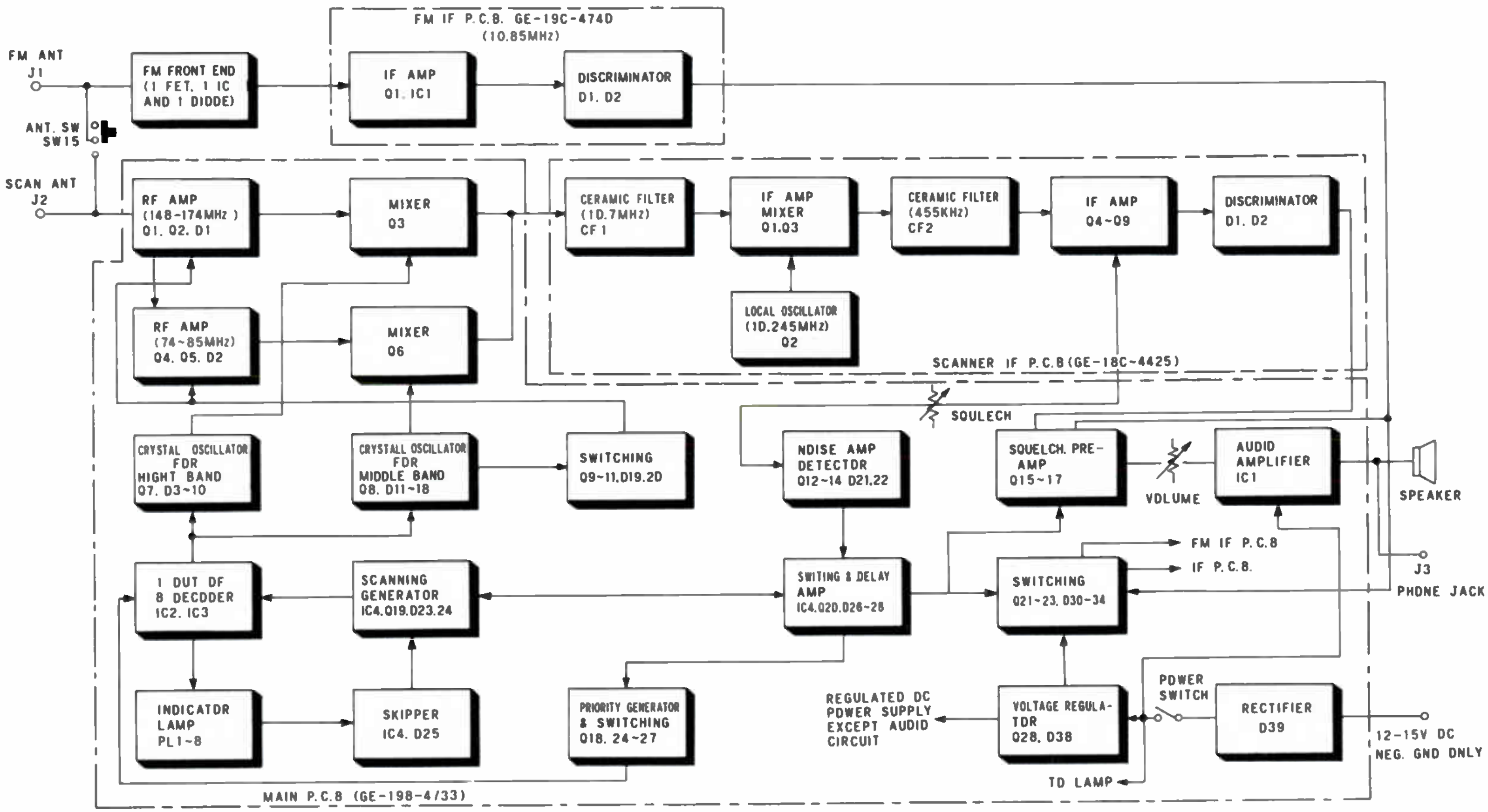
COILS/TRANSFORMERS/FILTERS			
L1–3	RF coil	995262	M-7230
L4–6	RF coil	995269	M-7332
L7	OSC. coil	995276	6.5SNO-087
L8	Microinductor 0.68 μH	995283	EL0606-R68M
L9,10	Microinductor 1.8 μH	995290	LF4-1R8K
L11	Microinductor 0.68 μH	995276	EL0606-R68M
L12	OSC. coil	995276	6.5SNO-087
L13	Microinductor 1.8 μH	995290	LF4-1R8K
L14	Microinductor	995297	EL061-202K
L15	Choke coil	995409	38-037
T1	IFT	995304	119LC470033N3
T2	Noise Amp. coil	995311	CAN-1979A
CF3,4	Ceramic filter 455 kHz	598196	

CHASSIS ASSEMBLY PARTS LIST

VOLUMES			
VR1	Squelch 50 K	994060	50KΩB-15A
VR2	Volume 50 K	984032	50KΩA-15A
SWITCHES			
SW1–8	Push switch	994060	SFS-00002DF2010
SW9–15	Push switch	994067	SF-0026DF2010
MISCELLANEOUS			
	Main P.C. Board	599943	GE-198-4733
	Crystal socket	599950	GE-17D-3391
	Pilot lamp 14 V/50 mA L=120 m/m	599957	
	RF shield	599964	GE-19D-4800
	Vinyle tube 3 ϕ L=100 m/m		
MISCELLANEOUS			
	FM front end	599971	FP414016
	Motorola jack	599978	JA-C-020
	Phone jack	599985	JA-C-011
	Push switch button	599992	ER10-01-00
	Push switch button	599999	10105
	Slide switch	598006	S222081

Ref. No.	Description	handic Stock Number	MFR'S Parts Number
	Pilot lamp 14 V 50 mA L=60 mm	599957	
	Volume knob	599554	GE-19D-4652
	Tuning knob	598013	GE-19D-4750
	Speaker	598020	PD-945ST
	Speaker cloth	598027	HN-6-7
	DC cable	598034	DX-106
	Fuse 1 A	598041	
	Cord stopper	599659	3P-4
	Lamp holder	598048	GE-16D-2794
	Lamp jewel	598055	GE-17D-3438
	Escutcheon	598062	GE-198-4802
	Front panel	598069	GE-19C-4803
	Chassis	598076	GE-19A-4796
	Sub chassis	598083	GE-19C-4797
	Crystal cover	598090	GE-16D-2766
	Handle bracket	598097	GE-19C-4799
	Heat sink	598104	GE-19D-4801
	Speaker bracket	598111	GE-17C-3851
	Bonnet	598118	GE-198-4798
	Dial pointer	598125	GE-19D-4810
	Dial window	598132	GE-19D-4804
	Dial plate	598139	GE-19D-4805
	Handle fiber	598146	
	Dial dram	598154	
	Dial pulley	598161	7002
	Pulley shaft	598168	2ϕ x 10t x 5
	Lamp grommet	598175	8U-687
	Handle screw	598182	
	Screw	598189	

BLOCK DIAGRAM



WIRING DIAGRAM

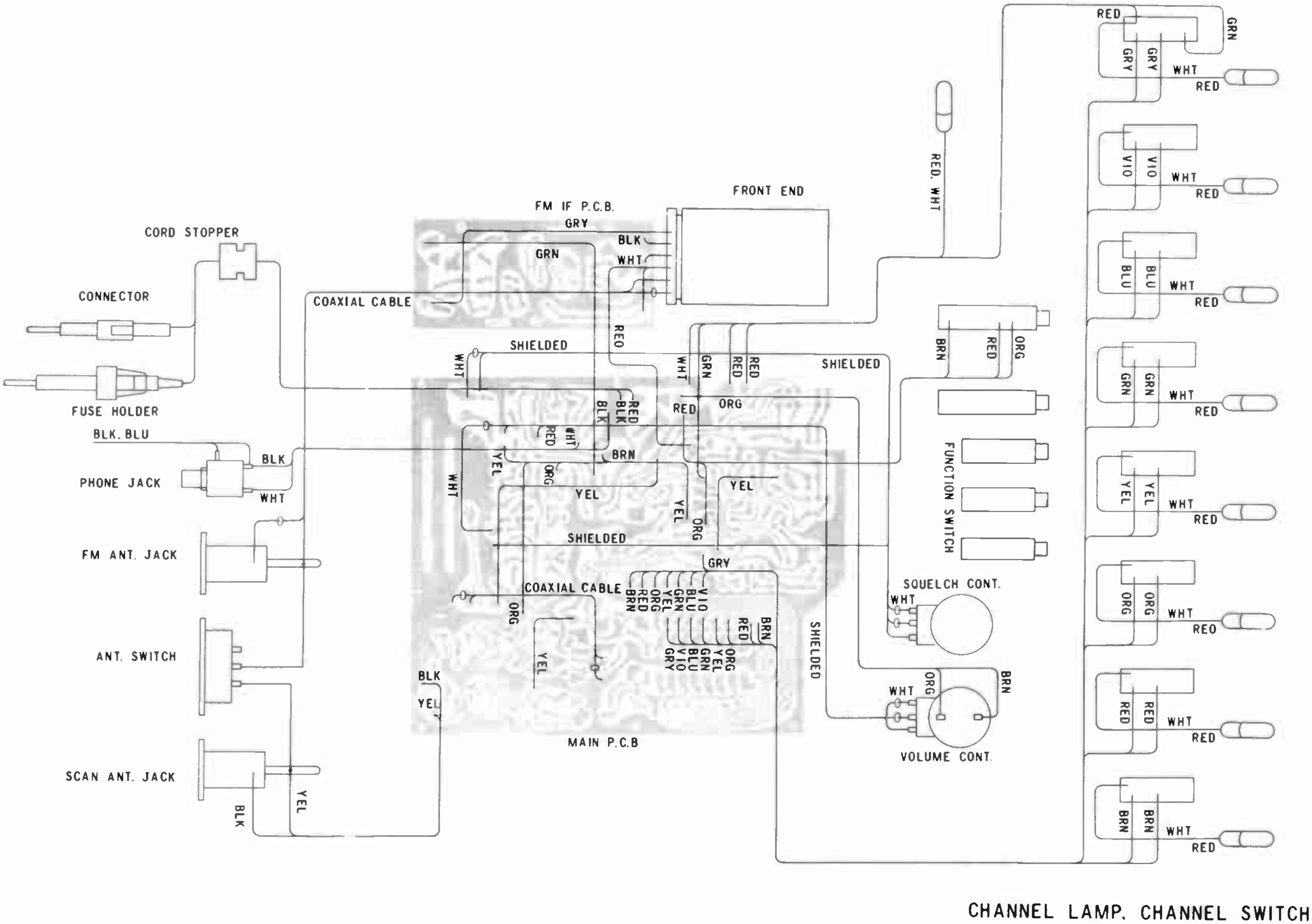
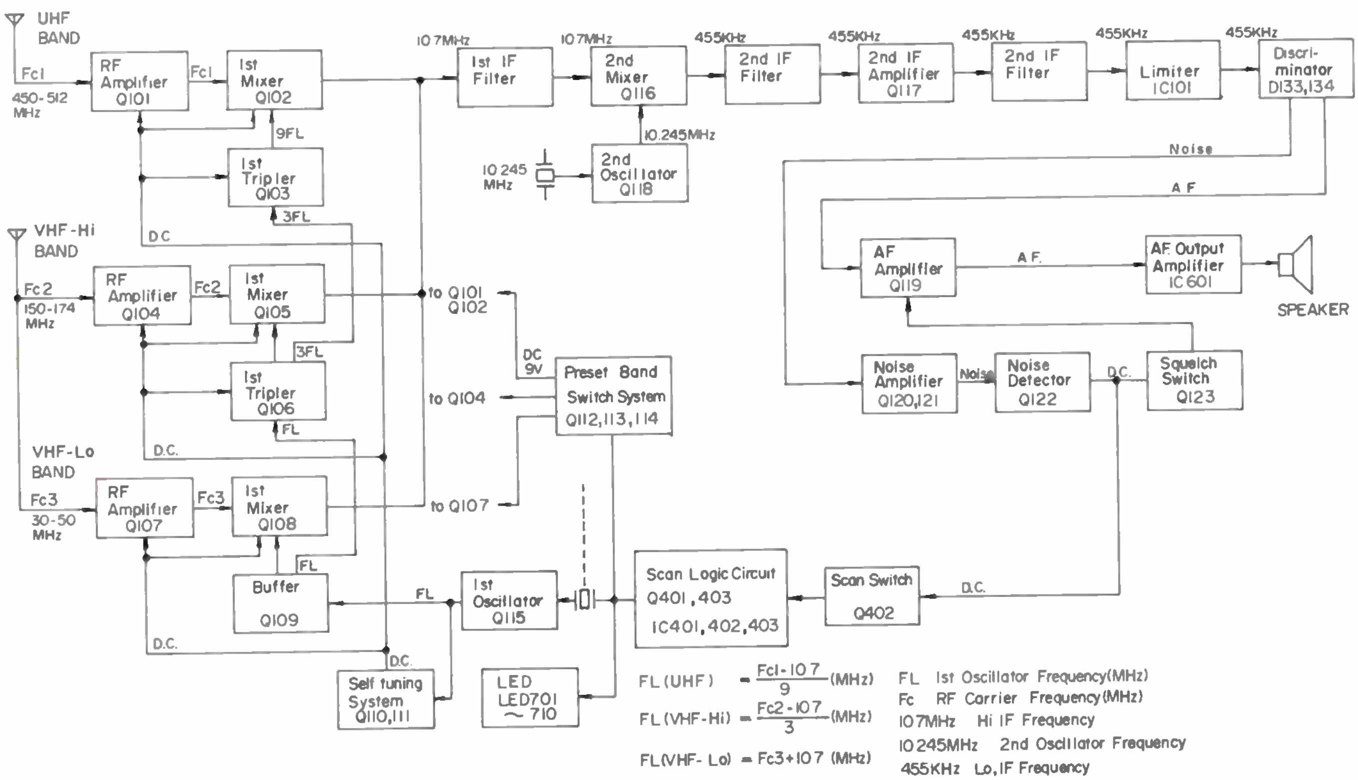


FIGURE 15

FUNCTIONAL BLOCK DIAGRAM



IGNITION INTERFERENCE

AUTO

The suppression carried out on vehicles equipped with a standard broadcast, radio will usually prevent any serious ignition interference from occurring. However, because of the high sensitivity of the receiver, sufficient noise may be picked up from your own vehicle to make reception of weaker stations difficult. In such a case, additional suppression is recommended. Several noise suppressor kits are available from Lafayette Radio Electronics, which include all necessary parts and instructions for effectively suppressing ignition noise. Alternatively, you can take the vehicle to a skilled auto radio technician who will be able to carry out the suppression for you.

SERVICING THE RECEIVER

The receiver has been fully aligned at the factory before shipment and will not usually require any further adjustments. Any unit requiring service should be returned to the Lafayette Store from which it was purchased or to any service organization qualified to make repairs or internal adjustments to the highly complex circuits in this unit.

NOTE: Only competent service personnel using factory-approved procedures should attempt adjustments to the circuits in this receiver. Failure to follow the proper alignment procedures may disturb the critically tuned circuits sufficiently to cause improper operation of the unit.

It should also be noted that under the terms of the Warranty, units which show evidence of having been serviced by unauthorized personnel will be ineligible for free service.

RECEIVER ALIGNMENT PROCEDURE

COVER REMOVAL

Place the receiver on a flat surface [speaker grille upward], and remove the uppermost chassis cover by removing two screws on each side of chassis. Remove cover with care -- the speaker is connected by two leads to the main chassis.

ALIGNMENT

a. Scanner Logic Circuit Alignment

1. Connect plus (+) circuit tester lead to the emitter of Q401 and minus lead to the ground.
2. Set the tester range to 12V.
3. Adjust VR401 to obtain the reading of 5 ± 0.1V on the circuit tester. Care should be given to this alignment, since inaccurate alignment may cause instability of scanning operation.

b. IF Alignment

1. Connect 8 ohm dummy load to the EXT. PS jack so that the built-in speaker disconnects.
2. Connect an oscilloscope and VTVM across the dummy load.
3. Connect 10.7 MHz (no modulation) signal generator to the source of Q108 through a coupling capacitor of 0.01 μF and the generator ground lead to the PC board ground.

4. Turn the power on and observe the LED channel indicator turned on.
5. Place the Bandselector Switch corresponding to the LED channel indicator being lit up in the VHF Low position.
6. Adjust T101, T102 and T103 for minimum noise output on the VTVM.

   NOTE: During this alignment, keep the generator output as low as necessary to avoid inaccurate alignment due to AGC operation.

c. Frequency-Voltage Conversion Alignment

1. Install 30 MHz, 35 MHz, 40 MHz, 45 MHz and 50 MHz crystal into the channel sockets 1, 2, 3, 4 and 5, respectively.
2. Place the Band Selector switches (1 — 5ch) on the PC board in the VHF Low position.
3. Depress the BY-PASS switches for channel 1 through 5.
4. Depress the AUTO/MAN switch for manual operation.
5. Turn the power on, and set the receiver to CH3.
6. Temporarily set the VR101 to its center position.
7. Connect a plus (+) tester lead to the collector of Q111 (Test Point TP1) and minus lead (—) to the chassis ground. Place the tester range to 12V.
8. Adjust L110 to obtain 2.5V on the circuit tester.
9. Set the receiver to CH5 and adjust VR101 so that the circuit tester reads 6.3V (6.2 — 6.5V).
10. Repeat the above alignments a few times until the voltage illustrated in Figure 6 is obtained.

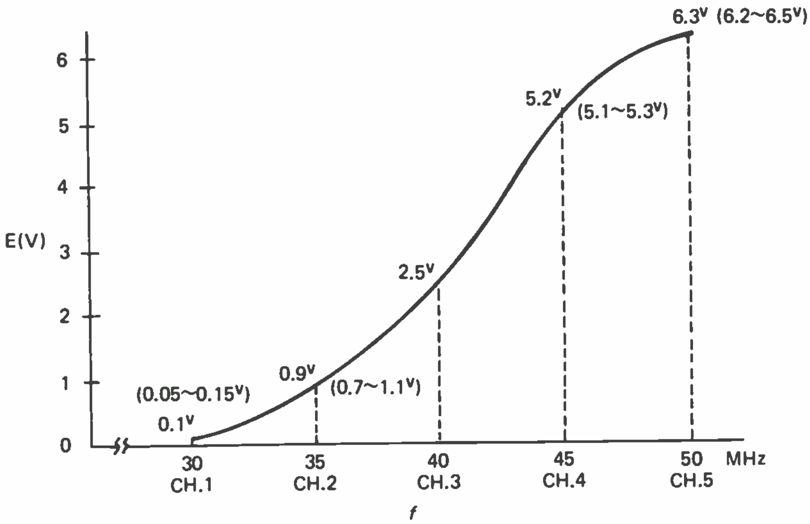


Figure 6

d. VHF Low Band Tuner Alignment

1. Install 30 MHz, 35 MHz, 40 MHz, 45 MHz and 50 MHz crystals into the CH1, 2, 3, 4 and 5 crystal sockets, respectively.
2. Connect the Signal generator output to the VHF antenna connector on the rear panel.
3. Place each Band Selector Switch (1 — 5CH) in the VHF Low position.
4. Turn the power on and set the receiver to CH3 and tune the Signal Generator to the CH3 (40 MHz) frequency.
5. Adjust L108 and L109 for minimum noise on the VTVM connected to the audio output circuit (EXT.SP Jack).
6. Check the sensitivity at both CH1 and CH5, they should be nearly the same. If excessive difference is occured, adjust L108 for nearly same sensitivity.

e. VHF High Band Tuner Alignment

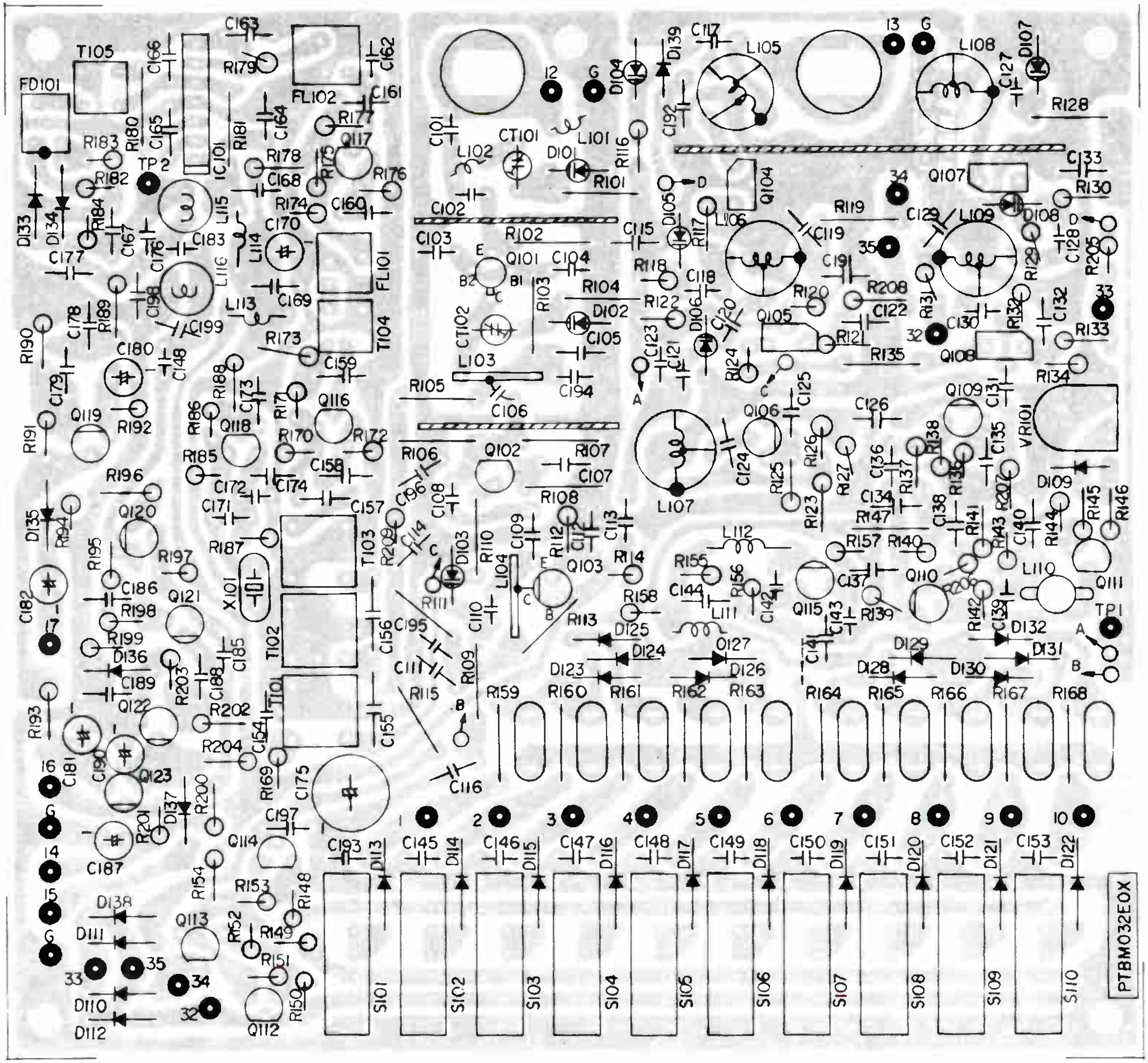
1. Temporarily install 150 MHz, 155 MHz, 160 MHz, 165 MHz, 170 MHz and 174 MHz crystals into the 1, 2, 3, 4, 5 and 6 channel crystal sockets, respectively.
2. Connect the signal generator output to the VHF antenna connector on the rear panel.
3. Place each Band Selector Switch (CH1 — 6) in the VHF High position.
4. Turn the power on and set the receiver to CH1 and tune the signal generator to the CH1 (150 MHz) frequency. Adjust L105 for minimum noise output.
5. Next, set the receiver to CH3 and CH5 and adjust L106 and L107 for minimum noise on the VTVM, respectively.
6. Repeat the steps 3 and 4 until no further improvement is obtained.

   NOTE: The alignment of L107 may affect the sensitivity of UHF band tuner, so do not tamper the L107 for the alignments other than CH5 (170 MHz).

f. UHF Band Tuner Alignment

1. Temporarily, insert 450 MHz, 460 MHz, 470 MHz, 480 MHz, 490 MHz, 500 MHz and 512 MHz crystals into the CH1, 2, 3, 4, 5, 6 and 7 crystal sockets, respectively.
2. Place the Band Selector Switches (1 — 7CH) in the UHF position.
3. Connect UHF Signal Generator to the UHF Antenna Connector on the rear panel.
4. Set the receiver to CH2 and tune the signal generator to CH2. Adjust CT101 for minimum noise on the VTVM.
5. Set the receiver to CH5 and tune the signal generator to the same channel (490 MHz). Adjust CT102 for minimum noise on the VTVM.

   NOTE: Special care should be given during the alignment, since the alignment is very critical due to extreme high frequency and a very small capacitance variation in the trimmer may cause considerable frequency shift.


PTBM032E0X
S101
S102
S103
S104
S105
S106
S107
S108
S109
S110
TP1
TP2
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FD101
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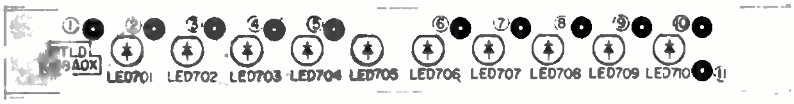
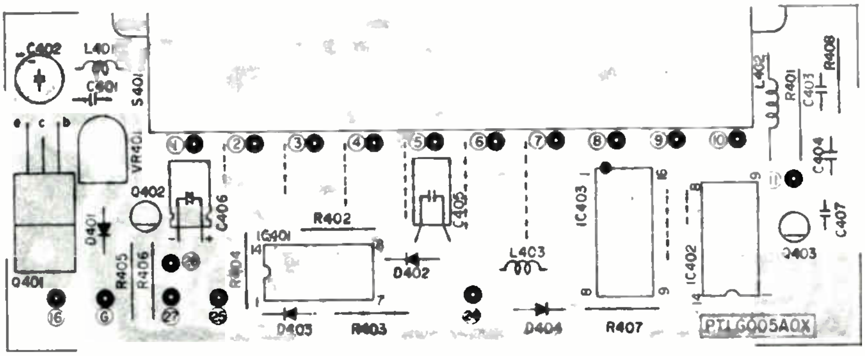
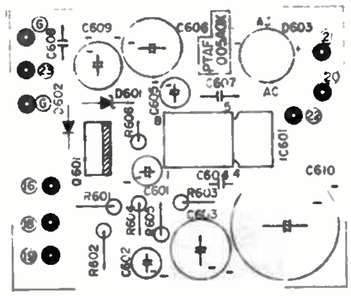
X101
IC101
CT101
CT102



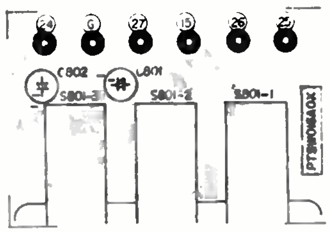
PTLD008A0X



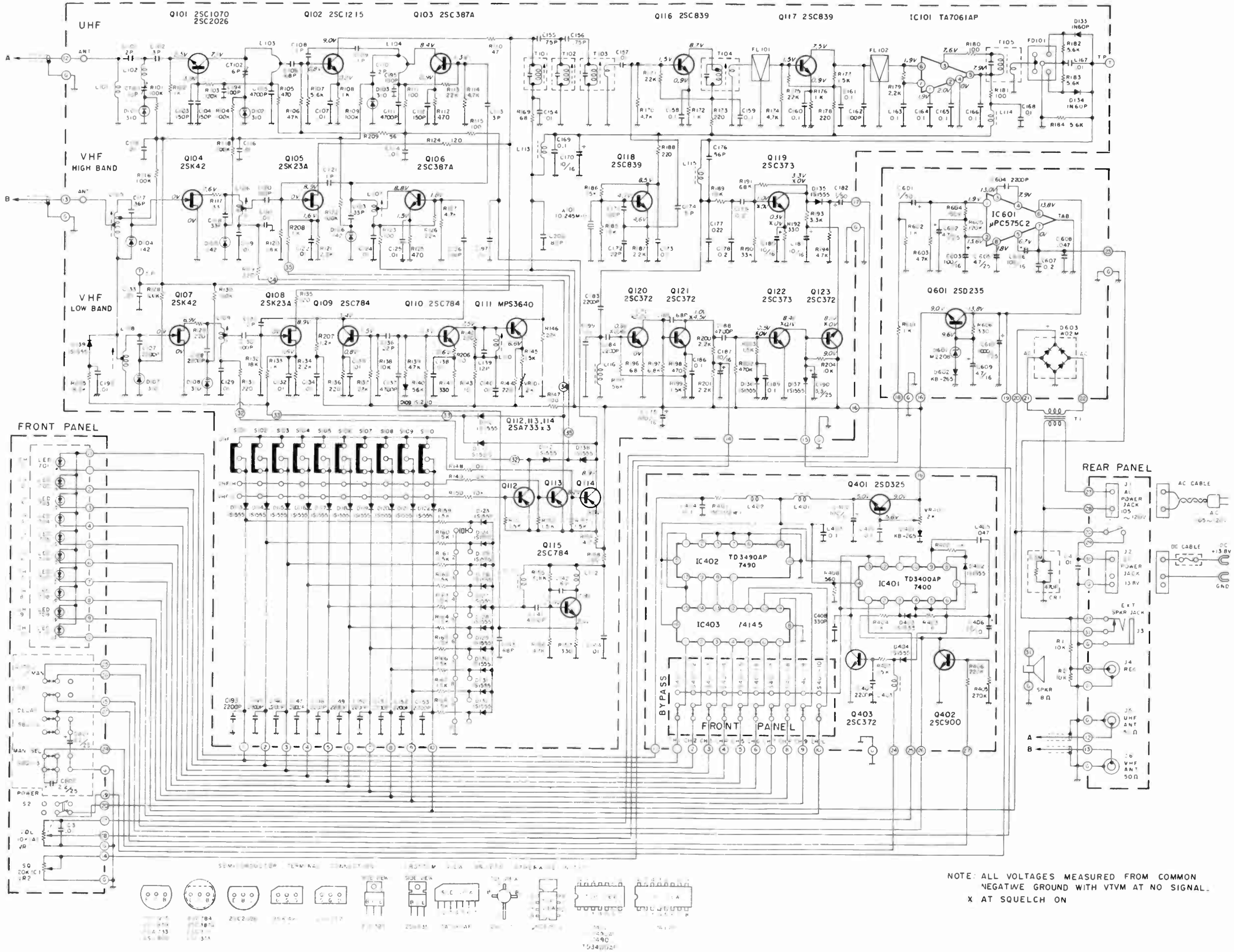
PTLG005A0X

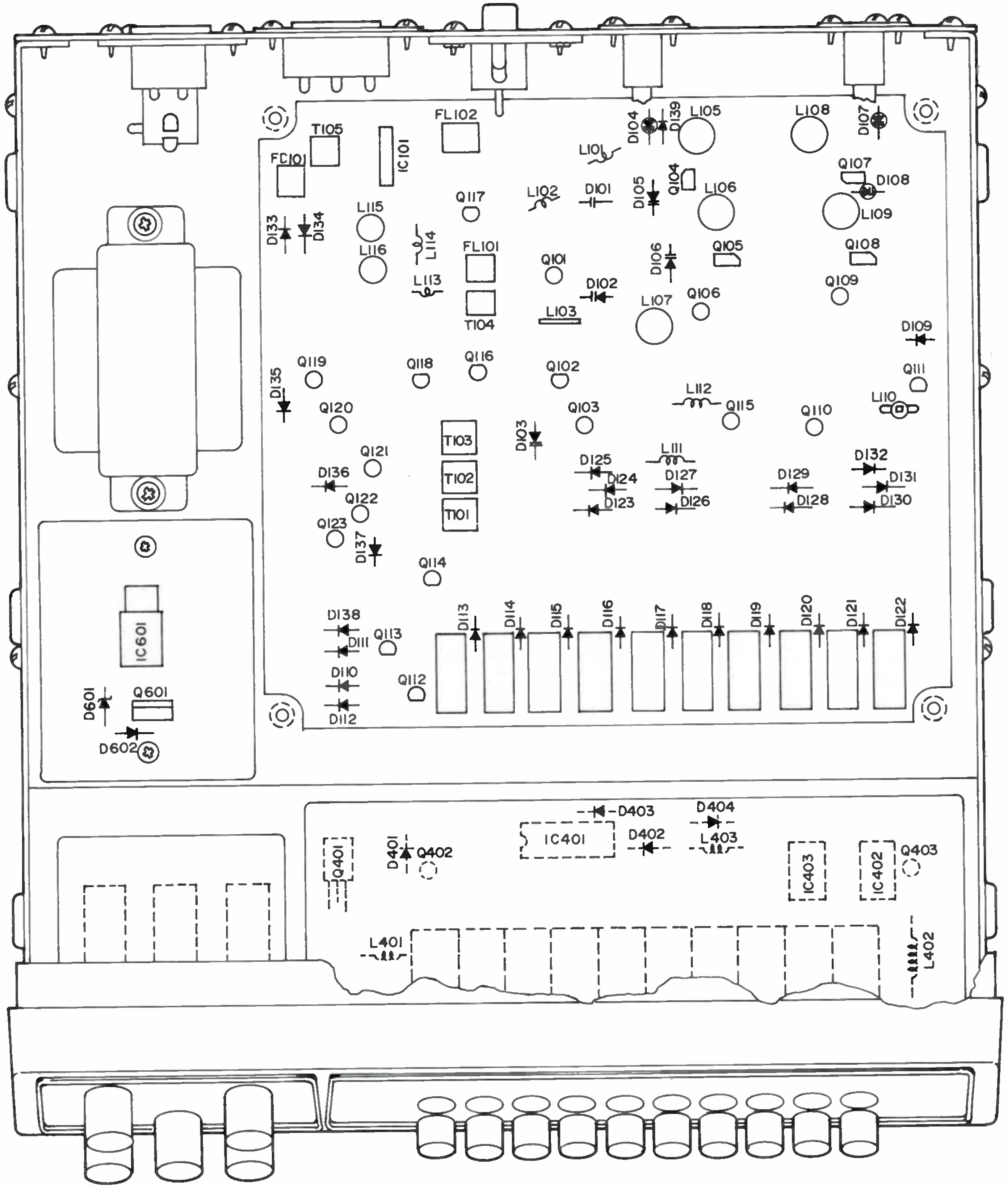


PTAF005A0X



PTSW016A0X


UHF
VHF HIGH BAND
VHF LOW BAND
FRONT PANEL
REAR PANEL
Q101 2SC1070 2SC2026
Q102 2SC1215
Q103 2SC387A
Q116 2SC839
Q117 2SC839
IC101 TA7061AP
Q104 2SK42
Q105 2SK23A
Q106 2SC387A
Q118 2SC839
Q119 2SC373
IC601 μPC575C2
Q107 2SK42
Q108 2SK23A
Q109 2SC784
Q110 2SC784
Q111 MPS3640
Q120 2SC372
Q121 2SC372
Q122 2SC373
Q123 2SC372
Q601 2SD235
Q112,113,114 2SA733 x 3
Q115 2SC784
Q401 2SD325
IC402 TD3490AP 7490
IC401 TD3400AP 7400
IC403 74145
Q403 2SC372
Q402 2SC900
BYPASS
AC CABLE
DC CABLE
NOTE: ALL VOLTAGES MEASURED FROM COMMON NEGATIVE GROUND WITH VTVM AT NO SIGNAL.
X AT SQUELCH ON



T105
FC101
IC101
FL102
FL101
T104
T103
T102
T101
L101
L102
L103
L105
L106
L107
L108
L109
L110
L111
L112
L113
L114
L115
L116
Q101
Q102
Q103
Q104
Q105
Q106
Q107
Q108
Q109
Q110
Q111
Q112
Q113
Q114
Q115
Q116
Q117
Q118
Q119
Q120
Q121
Q122
Q123
D101
D102
D103
D104
D105
D106
D107
D108
D109
D110
D111
D112
D113
D114
D115
D116
D117
D118
D119
D120
D121
D122
D123
D124
D125
D126
D127
D128
D129
D130
D131
D132
D133
D134
D135
D136
D137
D138
D139
IC601
Q601
D601
D602
IC401
IC402
IC403
Q401
Q402
Q403
D401
D402
D403
D404
L401
L402
L403

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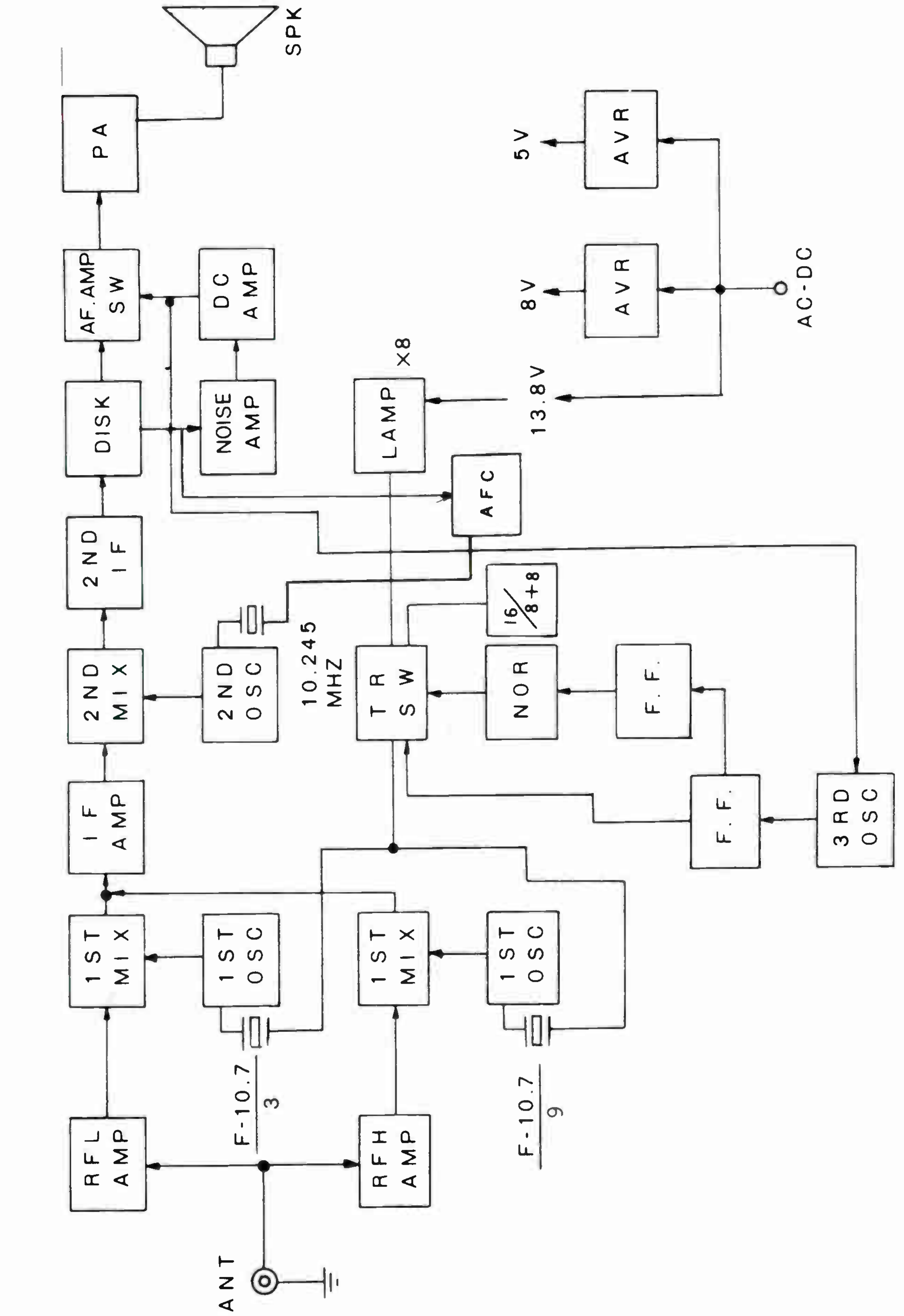
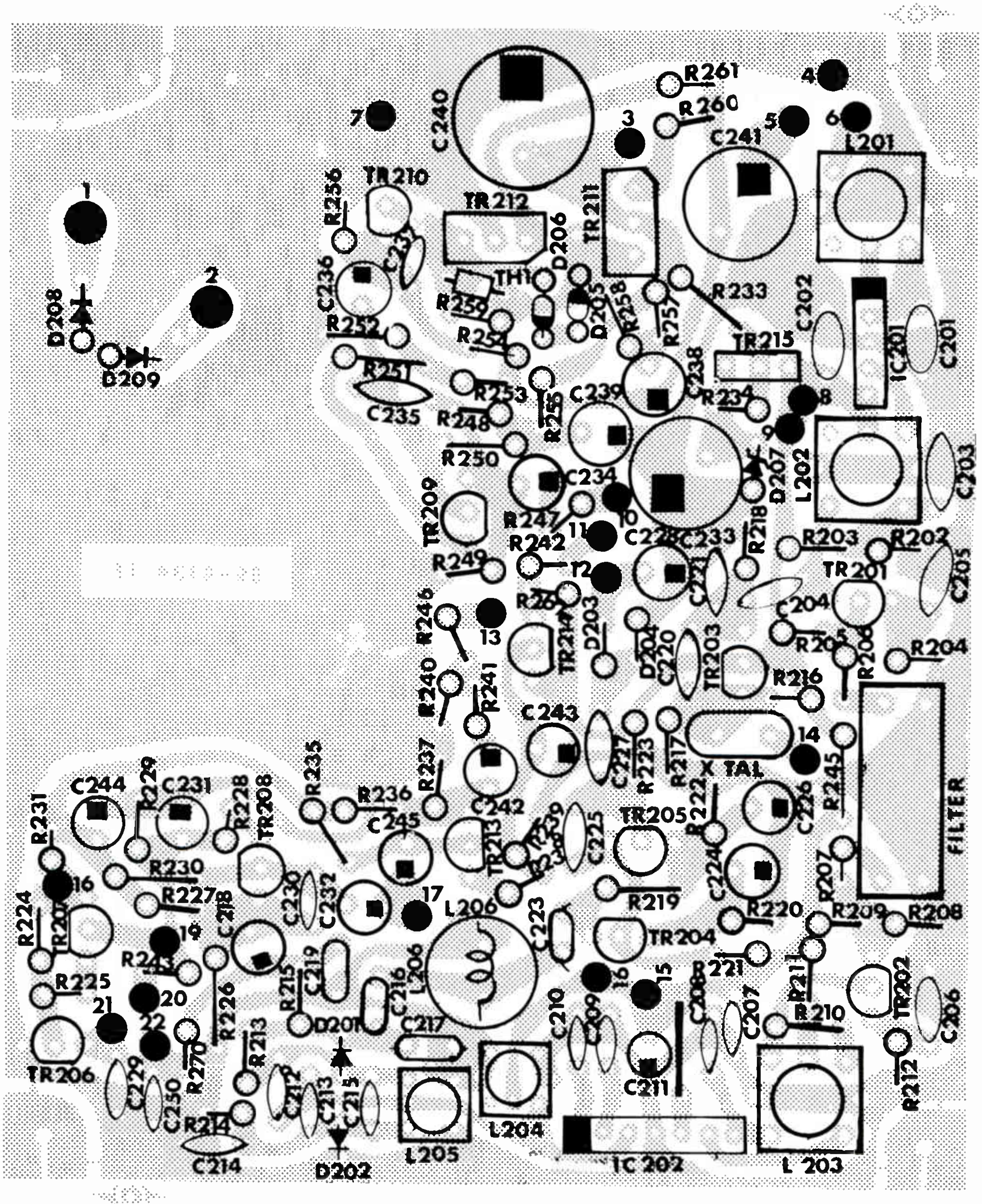


IF



R261
R260
C240
C241
L201
TR210
TR212
TR211
R256
C236
D206
TH1
R259
D205
R258
R257
R233
C202
TR215
IC201
C201
D208
D209
R252
R251
R254
R253
C235
R248
R255
C239
C238
R234
R250
C234
D207
L202
C203
TR209
R247
R242
R249
C228
C233
R218
R203
R202
TR201
C205
R246
R261
R240
R241
TR214
D203
D204
C220
TR203
C204
R205
R206
R204
R216
C243
C227
R223
R217
X TAL
R245
FILTER
R237
R235
R236
C244
R229
C231
R228
TR208
R231
C245
C242
TR213
R239
C225
TR205
R222
C226
R230
R227
C218
C230
C232
L206
C223
R219
C224
R207
R224
R220
R209
R208
TR207
R243
TR204
R226
R225
C219
C216
R215
R221
R211
TR202
D201
C217
C210
C209
C208
C207
R210
C206
R213
R270
TR206
C229
C250
C212
C213
C215
C211
R212
R214
C214
D202
L205
L204
IC 202
L 203
1
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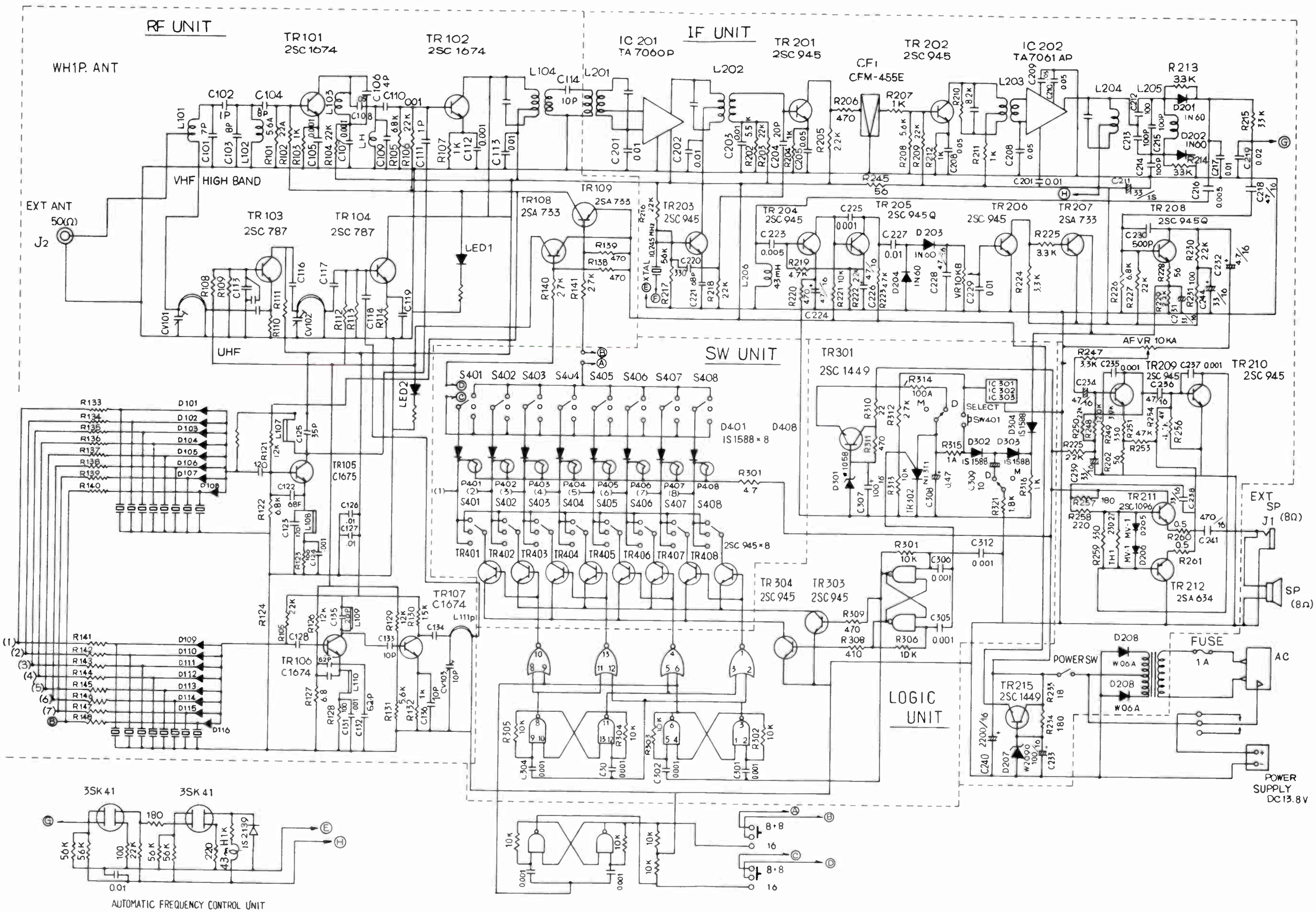
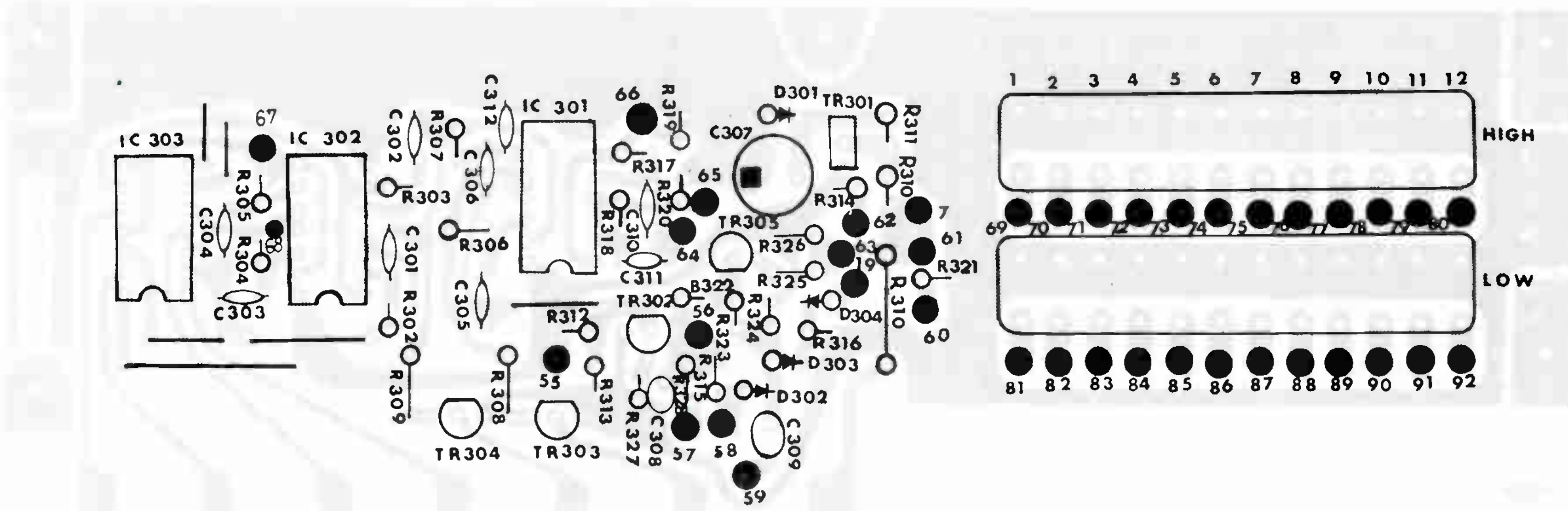
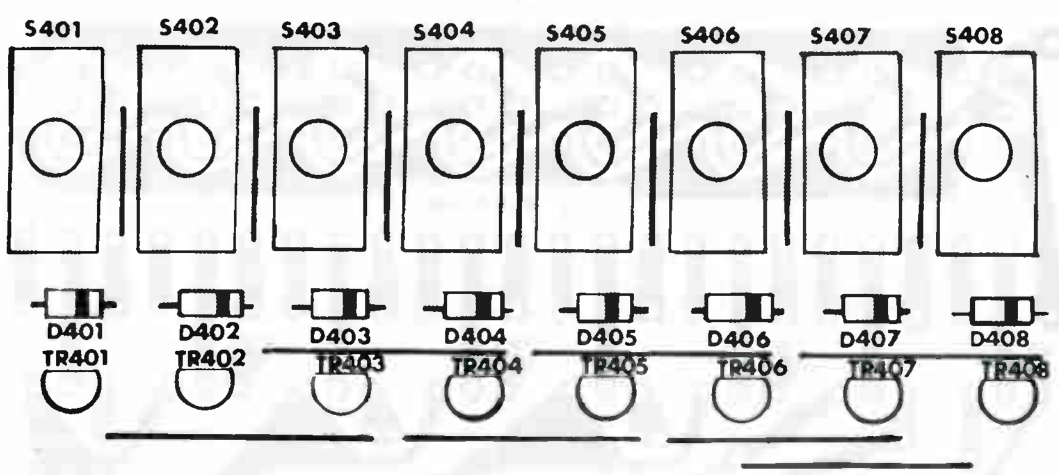
21
22


RF UNIT
IF UNIT
SW UNIT
LOGIC UNIT
WH1P. ANT
EXT ANT 50(Ω)
VHF HIGH BAND
UHF
TR101 2SC1674
TR102 2SC1674
TR103 2SC787
TR104 2SC787
TR105 C1675
TR106 C1674
TR107 C1674
TR108 2SA733
TR109 2SA733
IC201 TA7060P
IC202 TA7061AP
CF1 CFM-455E
TR201 2SC945
TR202 2SC945
TR203 2SC945
TR204 2SC945
TR205 2SC945Q
TR206 2SC945
TR207 2SA733
TR208 2SC945Q
TR209 2SC945
TR210 2SC945
TR211 2SC1096
TR212 2SA634
TR215 2SC1449
TR301 2SC1449
TR303 2SC945
TR304 2SC945
AF VR 10KA
D401 D408 1S1588×8
2SC945×8
EXT SP J1 (8Ω)
SP (8Ω)
POWER SW
FUSE
AC
POWER SUPPLY DC13.8V
3SK41
AUTOMATIC FREQUENCY CONTROL UNIT

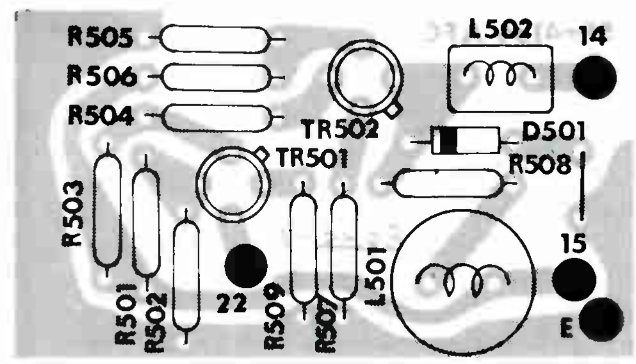
LOGIC



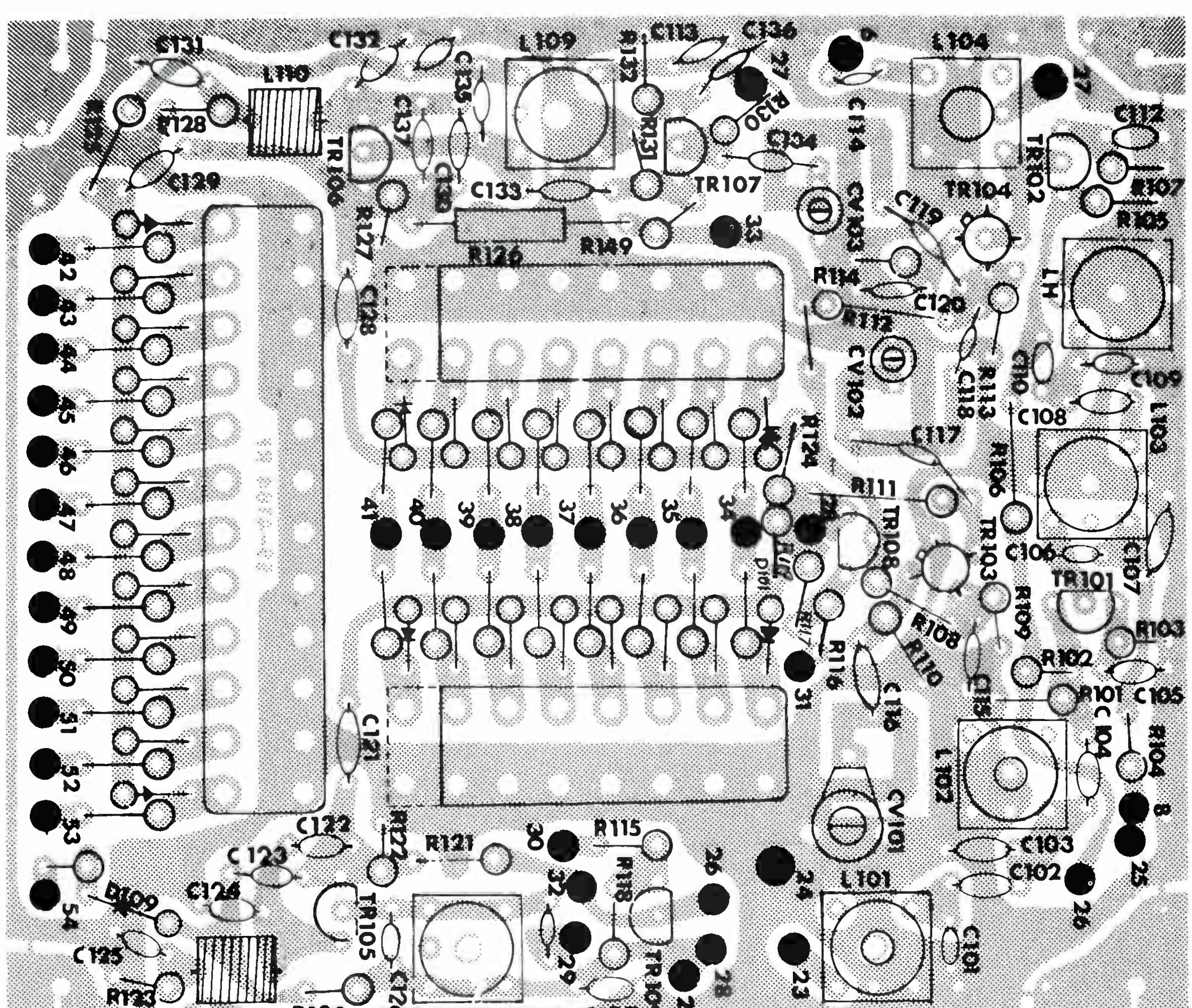
SW

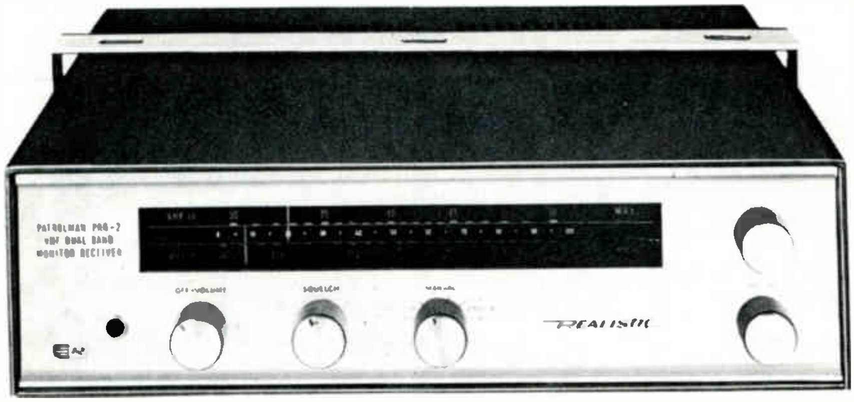


AFC



RF





2. GENERAL ALIGNMENT INSTRUCTIONS

2.1 Test equipments: The following equipment is necessary to perform the alignment.

-1 AM and FM signal generator 25 MHz - 175 MHz with adjustable attenuator.

-2 10.7 MHz signal generator or sweep generator.

-3 DC V.T.V. M.

-4 AC V.T.V.M. and dummy load 8 ohm

-5 Oscilloscope

2.2 General alignment conditions

-1 Before servicing this receiver, disconnect from the power source and remove all lead wires attached to terminal connections. Remove the four screws which fasten the chassis to the bottom of the cabinet. (Shown Fig. 1 Chassis disassembly)

Knob function and it nominal position

a) Tuning dial: On logical scale

b) Volume control: On position

c) Squelch control: Counter clockwise

Alignment procedure

Note: The non-metallic alignment tool are required for complete alignment. Unless otherwise specified a'l front panel controls shall be positioned as Item 2.2 -2 for complete alignment of the receiver. The receiver should be warmed up for a period of at least 10 minutes before proceeding with the complete alignment.

General alignment

IF alignment. Refer to Fig. 7 and Fig. 9 or Fig. 10

STEP	RF GENERATOR		VTVM	ADJUSTMENT	
	CONNECT TO	FREQUENCY OUTPUT	CONNECT TO	TUNE	VTVM READING
1	Test point on front end through a 0.01 MF.	10.7 MHz without MOD. Input signal from generator should be kept as low as possible.	TP1	VR-1	Just below peak of gradual drop off on the voltmeter.
2	"	"	"	L4,T1 T2,T3 T4,T5 Pri.	Peak on the VTVM.
3	"	"	TP2	T5 Sec.	Zero reading.

STEP	RF GENERATOR		VTVM	ADJUSTMENT	
	CONNECT TO	FREQUENCY OUTPUT	CONNECT TO	TUNE	VTVM READING
4	Repeat step 1 to 3 until no further improvement can be obtain.				

-2 Front end alignment. Refer to Fig. 9 or Fig. 10

STEP	RF GENERATOR		CONNECT VTVM & SPK	TUNER TUNED TO	ADJUST-MENT COIL & TRANS.	REMARKS
	CONNECT TO	FREQ.				
1	ANT Terminal	32 MHz (or 154 MHz)	J3	32 MHz (or 154 MHz)	L5 on Front end	To get 32 MHz (or 154 MHz) signal.
2	"	"	"	"	L1.2 on Front end	Max reading on VTVM.
3	"	48 MHz (or 172 MHz)	"	48 MHz (or 172 MHz)	TR3 on Front end	To get 48 MHz (or 172 MHz) signal.
4	ANT Terminal	48 MHz (or 172 MHz)	J3	48 MHz (or 172 MHz)	TR1.2 on Front end	
5	Repeat step 1 to 4 until no further improvement can be obtain.					

-3 Crystal oscillator alignment

The crystal oscillator is completely prealigned and tested when shipped from the factory. If realignment is necessary, the procedures is follow:

Adjust T6 for Lowend frequency (40.7 MHz)

Adjust T7 for Highend frequency (61.1 MHz)

-4 Crystal frequency is calculated as follow:

For Low Band $Fx = Fr + 10.7$ (MHz) ..... (40.7 - 60.7 MHz)

For High Band $Fx = \frac{Fr - 10.7}{3}$ (MHz) (47.1 - 54.4 MHz)

Fx : X'tal frequency

Fr : Receiving frequency

3 CHASSIS DISASSEMBLY AND DIAL STRING ASSEMBLY

3.1 Chassis disassembly shown in FIG. 1

3.2 Dial string assembly for Pro-1B shown in FIG. 2

3.3 Dial string assembly for Pro-2B shown in FIG. 4

FIG.2-4 DIAL STRING ASSEMBLY

FIG. 2

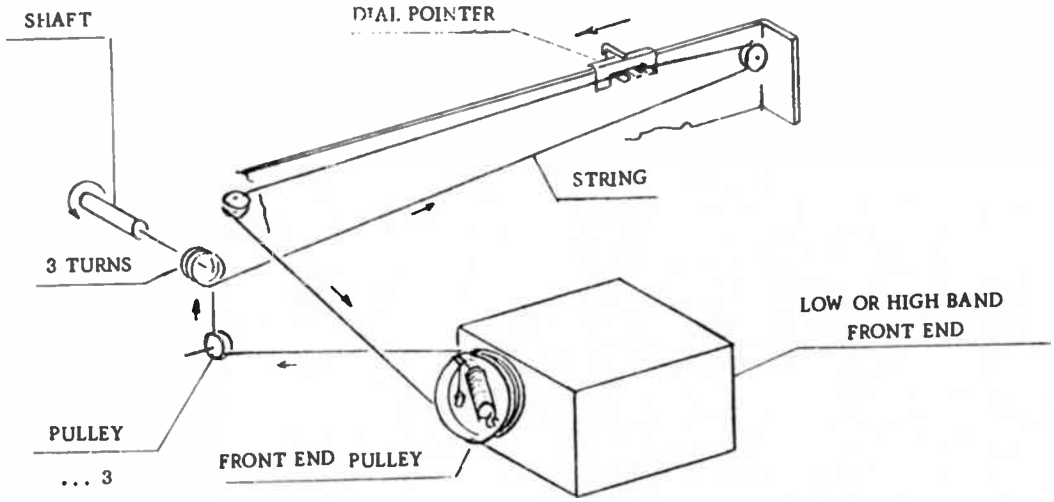


FIG. 3

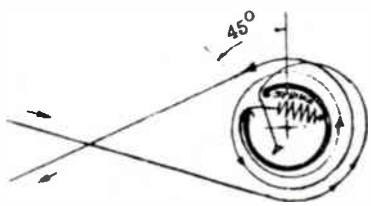
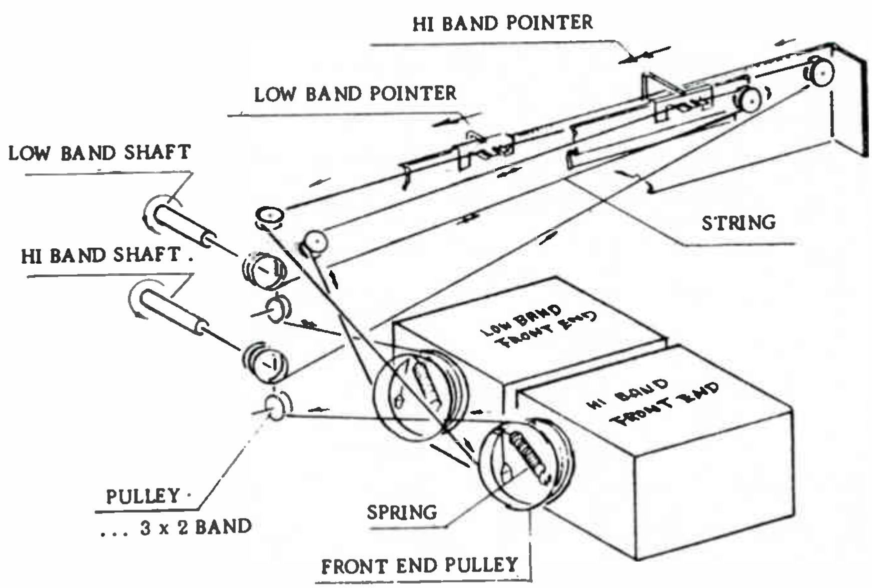


FIG. 3 SHOWN ANY OF HI/LOW BAND FRONT END PULLEY STARTING POINT WHEN DIAL POINTER IS ON THE LOWER FREQUENCY

FIG. 4



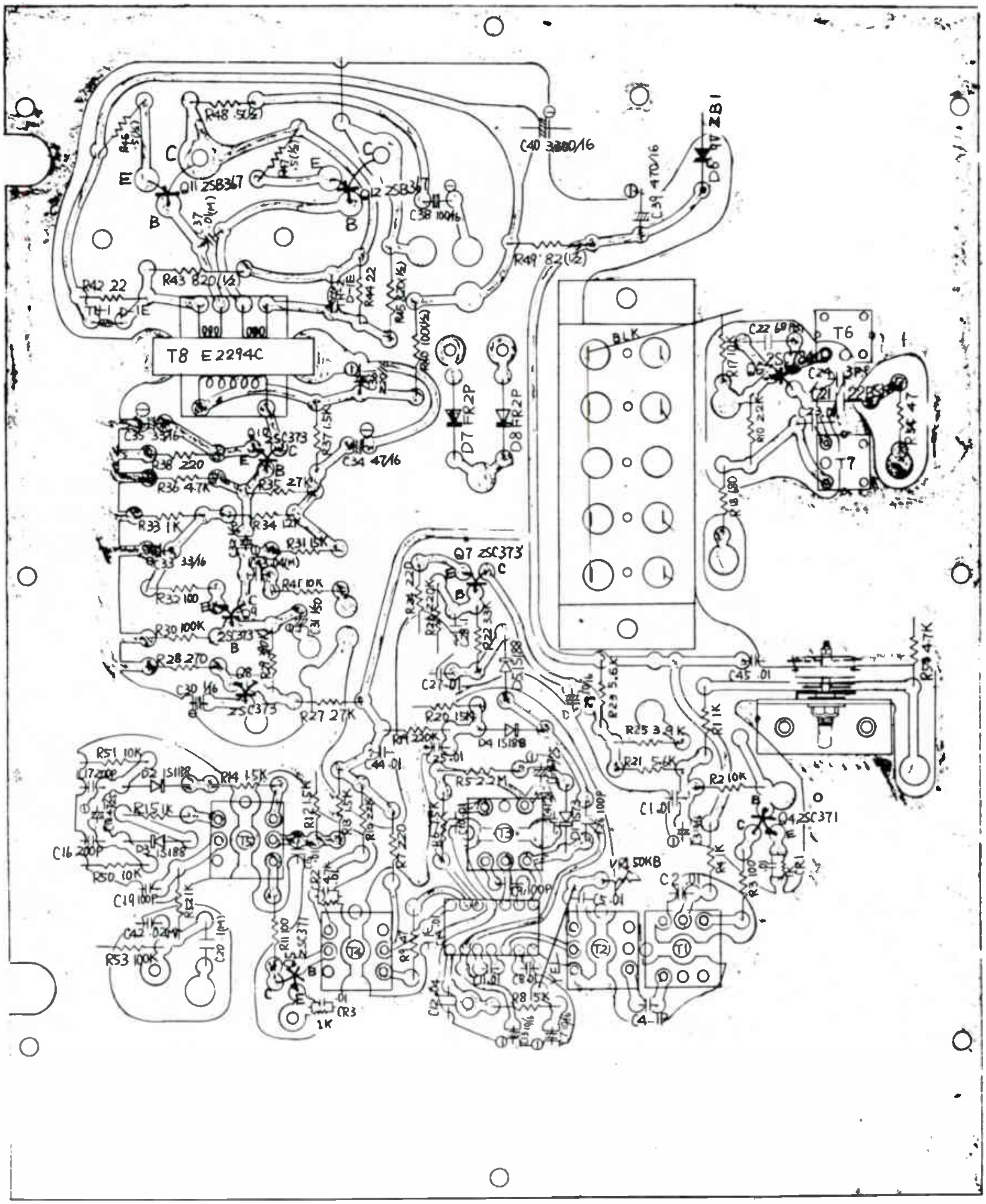


FIG. 7 PRINTED CIRCUIT BOARD TOP VIEW.

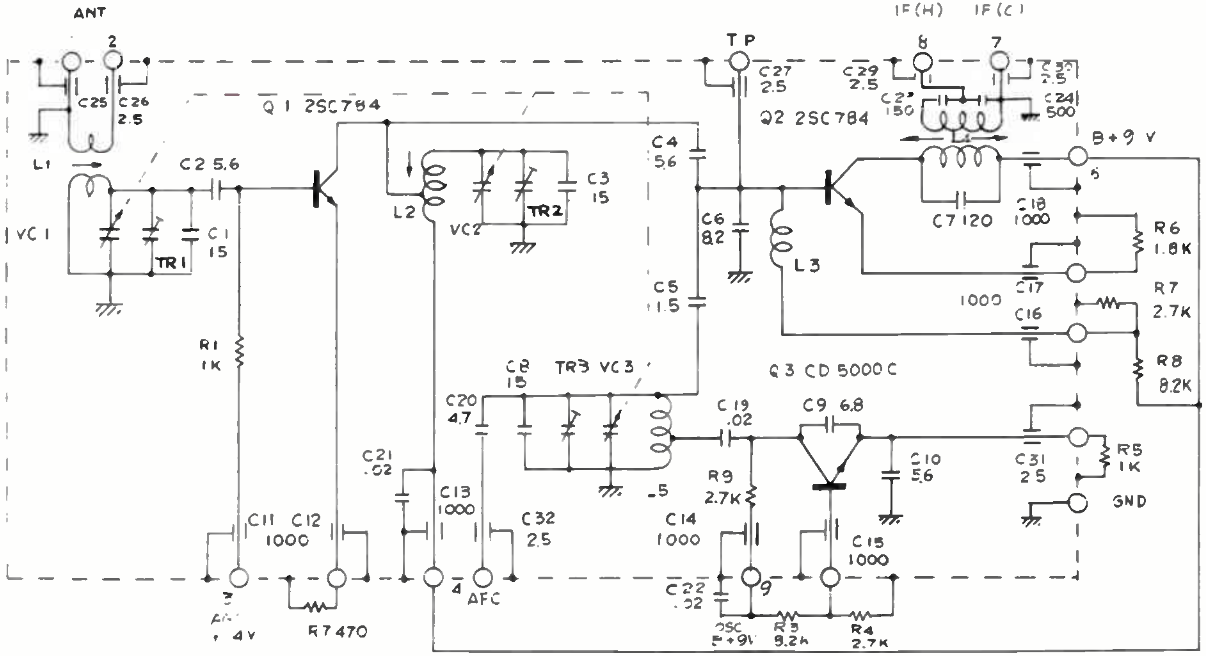


FIG. 9 SCHEMATIC DIAGRAM FOR HIGH BAND FRONT END

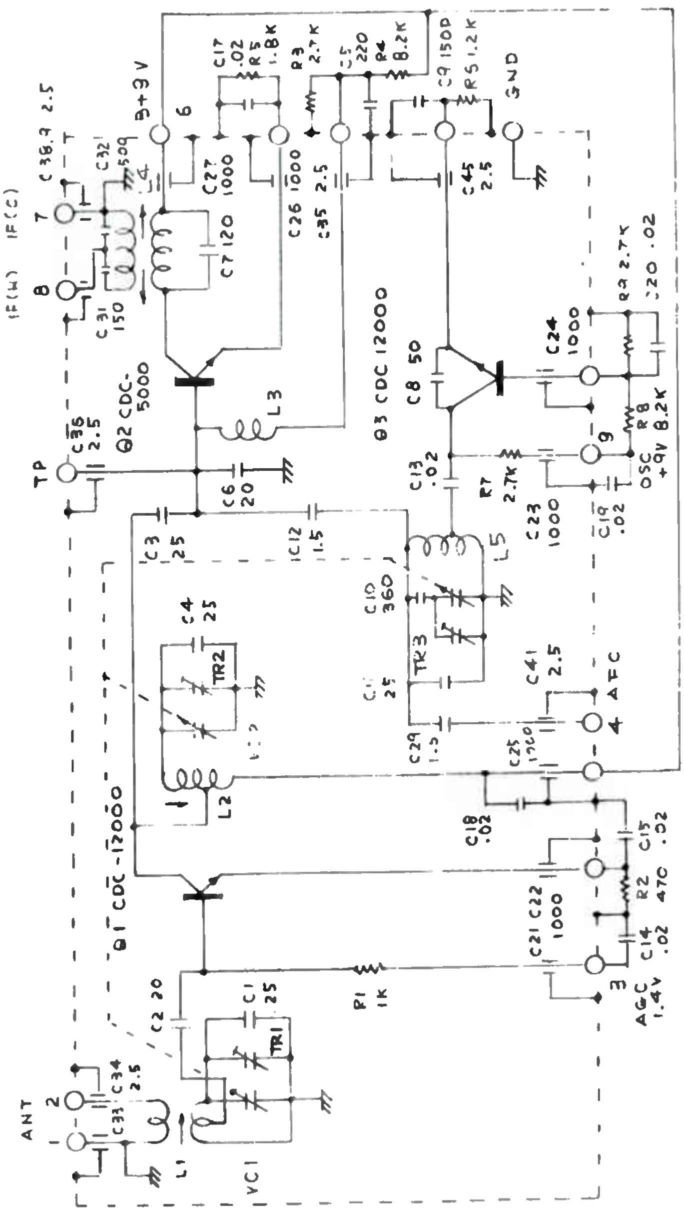
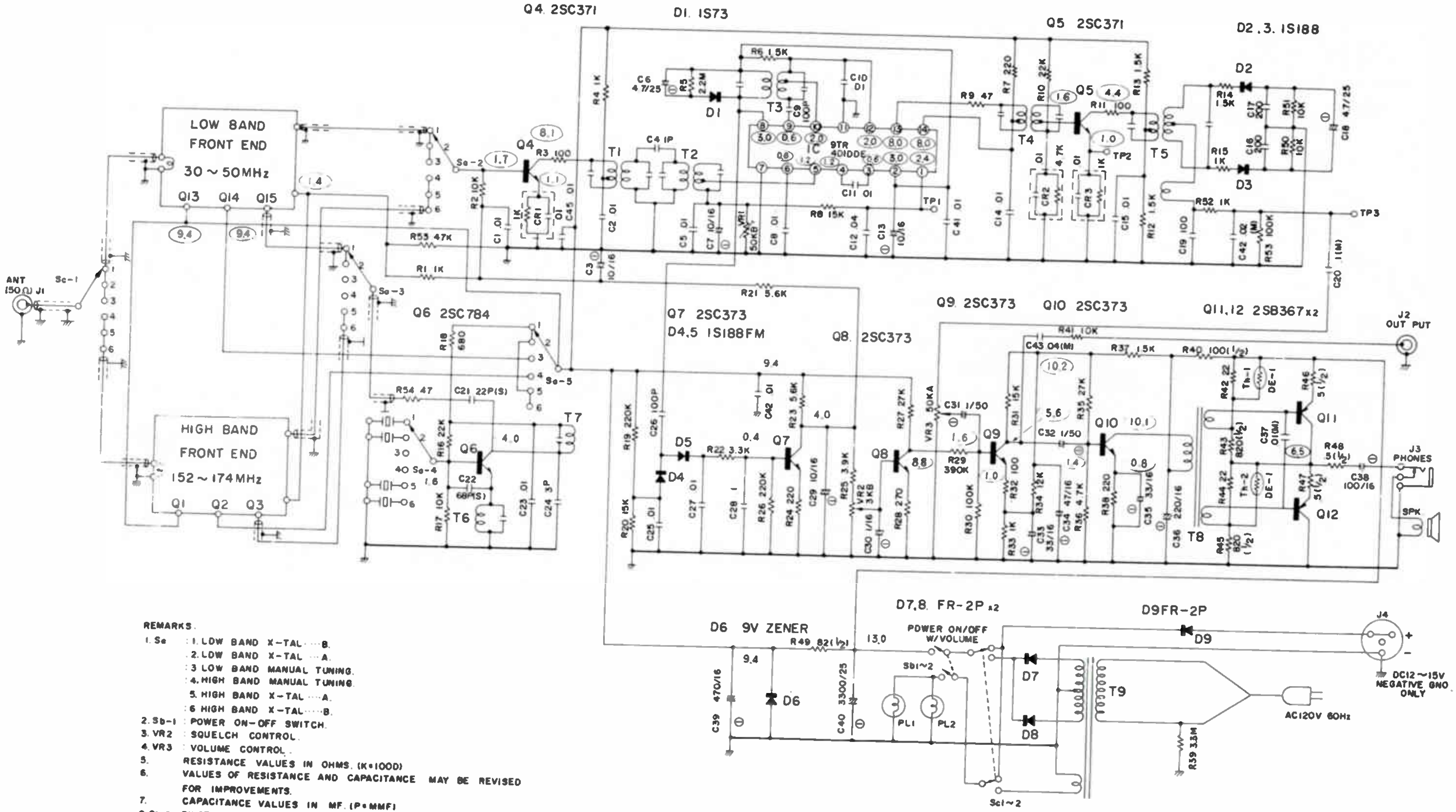


FIG.10 SCHEMATIC DIAGRAM FOR LOW BAND FRONT END



REMARKS.

1. Sa : 1. LOW BAND X-TAL ···B.
 : 2. LOW BAND X-TAL ···A.
 : 3 LOW BAND MANUAL TUNING.
 : 4. HIGH BAND MANUAL TUNING.
 5. HIGH BAND X-TAL ···A.
 : 6 HIGH BAND X-TAL ···B.
2. Sb-1 : POWER ON-OFF SWITCH.
3. VR2 : SQUELCH CONTROL.
4. VR3 : VOLUME CONTROL.
5. RESISTANCE VALUES IN OHMS. (K=1000)
6. VALUES OF RESISTANCE AND CAPACITANCE MAY BE REVISED FOR IMPROVEMENTS.
7. CAPACITANCE VALUES IN MF. (P=MMF)
8 Sb-2 PILOT LAMP ON-OFF SWITCH
9 Sc 1 POWER AC-DC SWITCH
 2 PILOT LAMP AC-DC SWITCH

SCHEMATIC DIAGRAM FOR PRO-2B

4. PARTS LIST AND DESCRIPTION

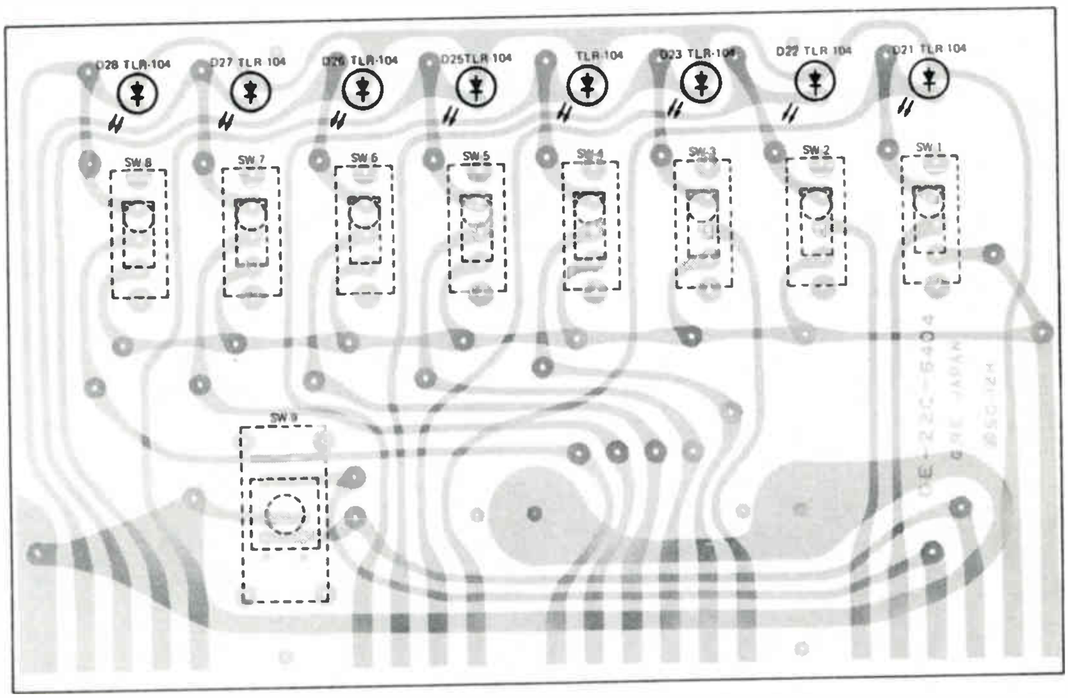
4.1 Parts list and description for Pro-1b High band and Pro-2b

SYMBOL NO.	DESCRIPTION	RATING OR STOCK NO.	REMARKS
Q1	Transistor		HIGH BAND FRONT END
Q2	"		"
Q3	"		"
Q4	"	2SC371	IF AMP
Q5	"	2SC371	IF AMP
Q6	"	2SC781	X'tal OSC
Q7	"	2SC373	AGC
Q8	"	2SC373	SQUELCH
Q9	"	2SC373	1st AF
Q10	"	2SC373	AF DRIVER
Q11	"	2SB367	POWER AMP
Q12	"	2SB367	POWER AMP
Q13	"		LOW BAND FRONT END(only Pro-2b)
Q14	"		"
Q15	"		"
IC-1	Integrated Circuit	LA-1201	IF AMP
D1	Diode	1S73	RF ANL
D2	"	1S188	Discriminate
D3	"	1S188	AM DET
D5	"	1S188	"
D6	"	ZB-1-9.5	Voltage Regulator
D7	"	FR-2	Rectifier
D8	"	"	"
D9	"	FR-2	Polarity Diode
TH-1.2	Thermistor	D-1E	
T1.2	IFT	R 8822A	
T3	"	R 1626	
T4	"	R 8822C	
T5	"	R 8822D	
T6	OSC Coil	KEN8587HMz	
T7	"	KEN8588HMz	
T8	Input Trans.	E 2291	
T9	Power Trans.	Y 0135B	
R1	Fixed Resistor	1K ohm	1/4W
R2	"	10K ohm	"
R3	"	100 ohm	"
R4	"	1K ohm	"
R5	"	2.2M ohm	"
R6	"	1.5K ohm	"
R7	"	220 ohm	"
R8	"	15K ohm	"
R9	"	47 ohm	"
R10	"	22K ohm	"
R11	"	100 ohm	1/4W
R12	"	1.5K ohm	"
R13	"	1.5K ohm	"
R14	"	1.5K ohm	"
R15	"	1K ohm	"
R16	"	22K ohm	"
R17	"	10K ohm	"
R18	"	680 ohm	"
R19	"	220K ohm	"
R20	"	15K ohm	"
R21	"	5.6K ohm	1/4W
R22	"	3.3K ohm	"
R23	"	5.6K ohm	"
R24	"	220K ohm	"
R25	"	3.9K ohm	"
R26	"	220K ohm	"
R27	"	27K ohm	"
R28	"	270K ohm	"
R29	"	390K ohm	"
R30	"	100K ohm	"
R31	"	15K ohm	1/4W
R32	"	100 ohm	"
R33	"	1K ohm	"
R34	"	12K ohm	"
R35	"	27K ohm	"
R36	"	4.7K ohm	"
R37	"	1.5K ohm	"
R38	"	220 ohm	1/4W
R39	"	3.3M ohm	1/2W
R40	"	100 ohm	"
R41	"	10K ohm	1/4W
R42	"	22 ohm	"
R43	"	820 ohm	1/2W
R44	Fixed Resistor	22 ohm	1/4W
R45	"	820 ohm	1/2W
R46	"	0.5 ohm	"
R47	"	0.5 ohm	"
R48	"	0.5 ohm	1/2W
R49	"	82 ohm	"
R50	"	10K ohm	1/4W
R51	"	10K ohm	"
R52	"	1K ohm	"
R53	"	4.7K ohm	"
R54	"	47 ohm	"

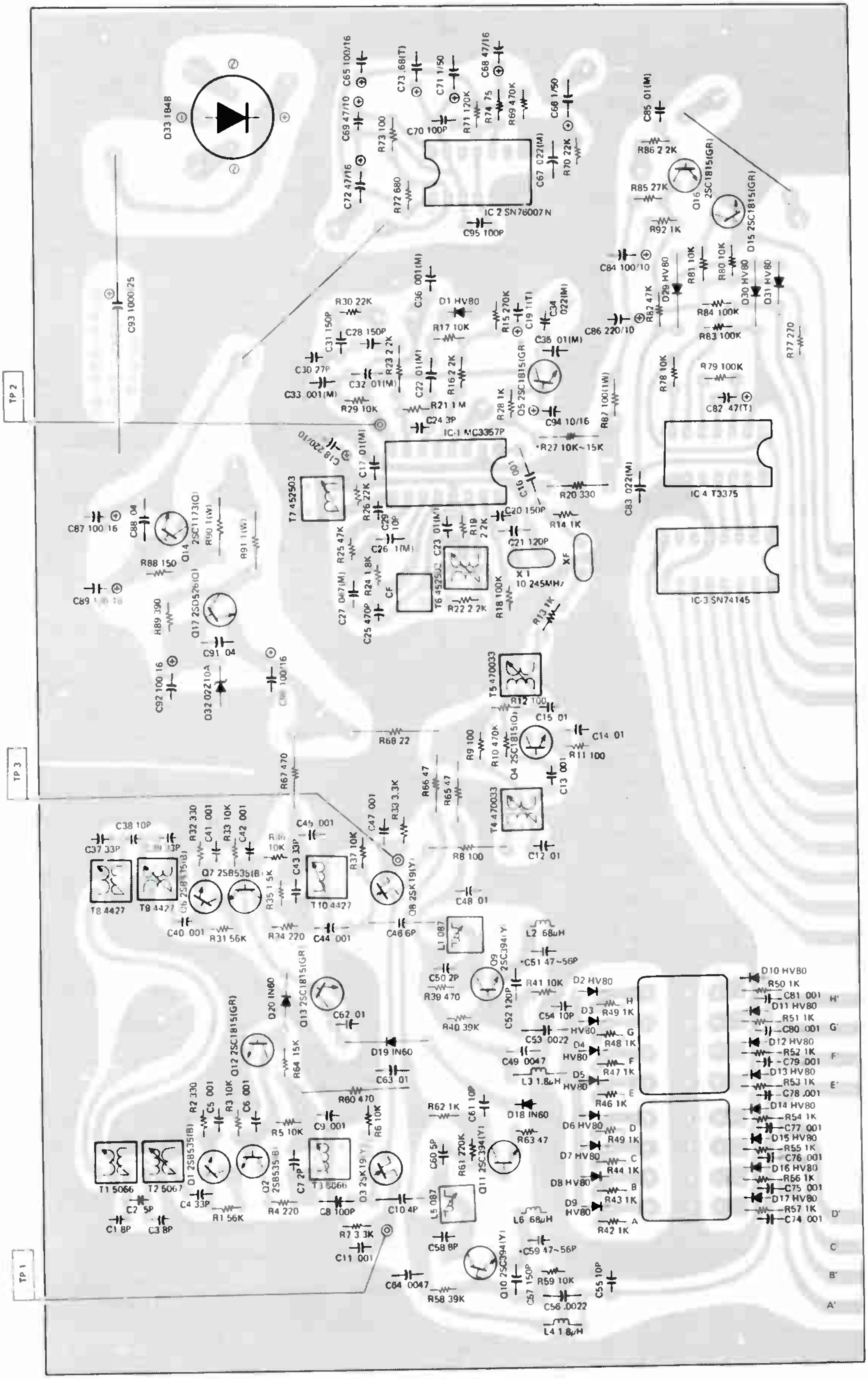
SYMBOL NO.	DESCRIPTION	RATING OR STOCK NO.	REMARKS
C1	Disc Ceramic	0.01MF 50WV	
C2	"	0.01MF 50WV	
C3	Electrolytic	10MF 16WV	
C4	Disc Ceramic	1PF 50WV	
C5	"	0.01MF 50WV	
C6	Electrolytic	4.7MF 25WV	
C7	"	10MF 16WV	
C8	Disc Ceramic	0.01MF 50WV	
C9	"	100PF 50WV	
C10	"	0.01MF 50WV	
C11	"	0.01MF 50WV	
C12	"	0.01MF 50WV	
C13	Electrolytic	10MF 16WV	
C14	Disc Ceramic	0.01MF 50WV	
C15	"	0.01MF 50WV	
C16	"	200PF 50WV	
C17	"	200PF 50WV	
C18	Electrolytic	4.7MF 25WV	
C19	Disc Ceramic	100PF 50WV	
C20	Mylor Capacitor	0.1MF 50WV	
C21	Styrol Capacitor	22PF 50WV	
C22	"	68PF 50WV	
C23	Disc Ceramic	0.01MF 50WV	
C24	"	3PF 50WV	
C25	"	0.01MF 50WV	
C26	"	100PF 50WV	
C27	"	0.01MF 50WV	
C28	"	0.1MF 50WV	
C29	Electrolytic	10MF 16WV	
C30	"	1MF 50WV	
C31	"	1MF 50WV	
C32	"	1MF 50WV	
C33	Electrolytic	33MF 16WV	
C34	"	47MF 16WV	
C35	"	33MF 16WV	
C36	"	220MF 16WV	
C37	Mylor Capacitor	0.01MF 50WV	
C38	Electrolytic	100MF 16WV	
C39	"	470MF 16WV	
C40	"	3300MF 25WV	
C41	Disc Ceramic	0.01MF 25WV	
C42	Mylor Capacitor	0.02MF 50WV	
C43	"	0.04MF 50WV	
C44	Disc Ceramic	0.01MF 50WV	
C45	"	0.01MF 50WV	
CR1	Composite Parts	1K ohm 0.01MF	
CR2	"	4.7K ohm 0.01MF	
CR3	"	1K ohm 0.01MF	
SPK	Speaker	163-01 8 ohm	
VR1	Semi Fixed VR	50KB	
VR2	Variable Resistor	3KB	SQ Control
VR3	Variable Resistor	50KA/SW	AF Control
J1	Antenna Jack	Motrola type YJ-20	
J2	Tape Output Jack	1P RCA type GE-15D-2066	
J3	Phones Jack	S-G3207	
J4	DC Power Jack	NO. 1476	
	Crystal Socket	HC-6 'U' type	
Sa	Manual X'tal SW	S18 1-2-6	FOR PRO-1b
	"	S18 3-3-6	FOR PRO-2b
Sb	Power SW	With VR3	
Sc	AC/DC SW	6P9L Slide SW	
	AC cord w plug	6 feet BLK	UL type
PL1 2	Pilot lamp	14V, 80mA	Lead type
	P.C.B.	GE-15B-1916	
	Chassis	GE-12A-789(1)	
	Bonnet	GE-12A-790	
	Front End Mount Bracket	GE-12A-789-B(5)	
	Back plate	GE-12A-793-(1)	
	Dial Pointer		
	VC Pulley	GE-12A-798	
	Mounting Bracket	GE-12A-791-(8)	
	Bottom Plate	GE-12A-791-(6)	
	X'tal Socket Holder	GE-15D-2040	
	Antenna Supporter	GE-13C-890	
	Manual X'tal SW Mount Bracket	GE-13D-935	
	Pully Shaft	GE-12A-801-(1)	
	"	GE-12A-801-(2)	
	Dial Shaft	GE-12A-800	
	Pully	10ǿ	
	Dial Plate		
	Front Panel		
	Line Cord Strain Relief	SR-3P-4	
	Knob	With mark	
		Without mark	
	SPK mount rubber		
	Foot	NO. 4850 #2	
	FRONT END	3SN3-S352	HIGH BAND
	"	3SN3-S351	LOW BAND

Pages 78-94 Courtesy of RADIO SHACK

SWITCH P.C.BOARD (BOTTOM VIEW)



MAIN P.C.BOARD (BOTTOM VIEW)



LOGIC CIRCUIT TRUTH TABLES

Channel No. / PIN NO.	IC4			IC-3							
	2	3	4	1	2	3	4	5	6	7	9
CH. 1	L	L	L	*L	H	H	H	H	H	H	H
CH. 2	H	L	L	H	*L	H	H	H	H	H	H
CH. 3	L	H	L	H	H	*L	H	H	H	H	H
CH. 4	H	H	L	H	H	H	*L	H	H	H	H
CH. 5	L	L	H	H	H	H	H	*L	H	H	H
CH. 6	H	L	H	H	H	H	H	H	*L	H	H
CH. 7	L	H	H	H	H	H	H	H	H	*L	H
CH. 8	H	H	H	H	H	H	H	H	H	H	*L

NOTE: *H = high level* *L = low level* *Marked * = channel indication "ON"*

2nd LOCAL OSCILLATOR FREQUENCY CHECK (10.245 MHz)

Step 1: Connect Frequency Counter through a 10pF capacitor to IC-1, Pin 2. (See Figure 2)
Step 2: Read frequency on the Frequency Counter. Normal: 10.245 MHz ±1 kHz.

NOTE: *Frequency Counter coupling, capacitor should be as small a value as possible. Frequency Counter should be high impedance type.*

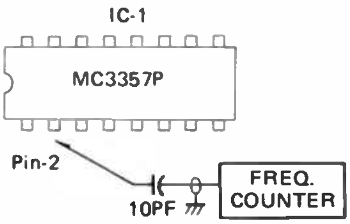


FIGURE 2.

IF SECTION ALIGNMENT

Step 1: Connect instruments as shown in Figure 3.
Step 2: Maintain Sweep Generator output at a low level to prevent overloading.
Step 3: Adjust T4, T5, T6, T7 of IF amplifier so that the 455 kHz marker is in the center of the discriminator curve and for best linearity as shown in Figure 4.

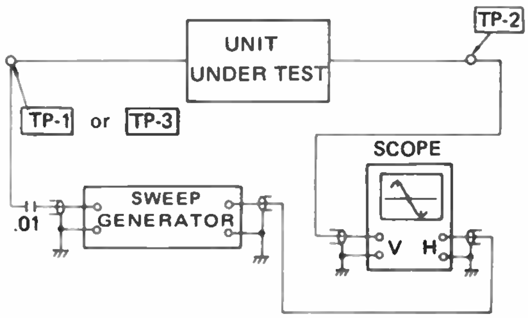


FIGURE 3. IF SECTION ALIGNMENT TEST EQPT. HOOK UP

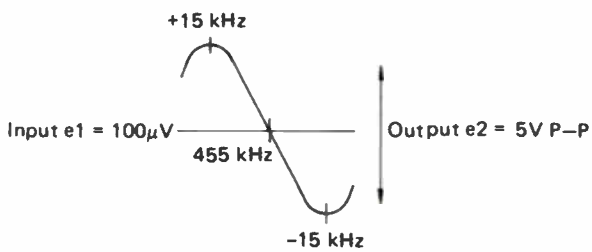


FIGURE 4. IF DISCRIMINATOR CURVE

VHF FRONT-END ALIGNMENT

LOW BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Adjust frequency of Sweep Generator to 40 MHz and connect Scope to TP-3.
Step 3: Adjust T8, T9 and T10 of RF section for maximum output and best curve symmetry as shown in Figure 6.

HIGH BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Set at least one crystal to HIGH position and connect Scope to TP-1.
Step 3: Set Sweep Generator to a center frequency of 153 MHz.
Step 4: Adjust T1, T2 and T3 in RF section for maximum output and best curve symmetry as shown in Figure 7.

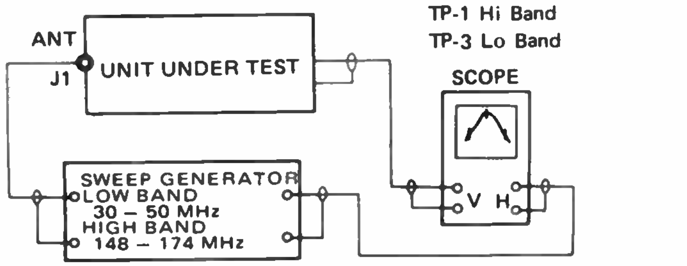


FIGURE 5. VHF LOW/HIGH BAND RF TEST EQPT. HOOK UP

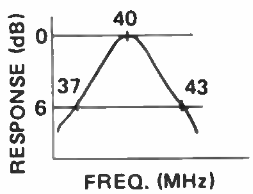


FIGURE 6. VHF Lo

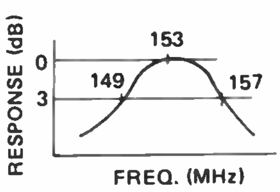


FIGURE 7. VHF Hi

CRYSTAL INSTALLATION

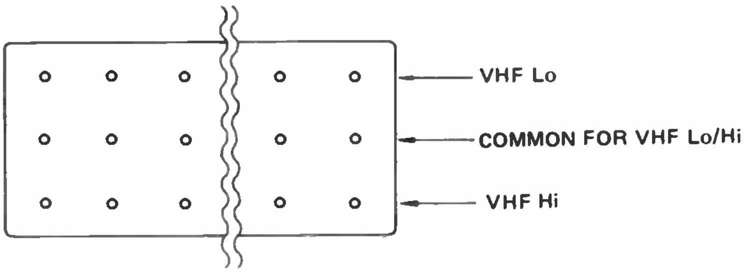
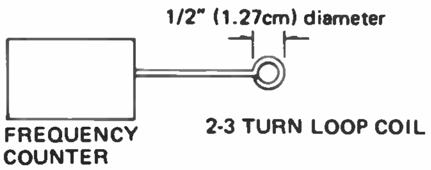


FIGURE 8. CRYSTAL INSTALLATION

VHF LOW/HIGH, LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Insert crystals in sockets.
Step 2: Couple the Frequency Counter thru a pickup coil to oscillator coil. Refer to Figure 9.



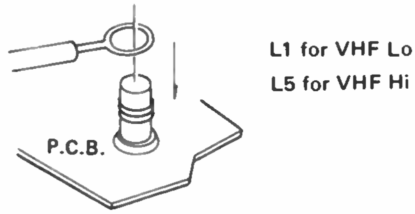


FIGURE 9. LOCAL OSCILLATOR COUPLING

Step 3: Check the frequencies of the appropriate oscillators as shown in the following chart. Do not make adjustments until or unless you perform the "Overall Alignment and Sensitivity Measurement" procedures noted on Page 5.

If necessary, adjust L1 and L5 as follows:
As you adjust these coils, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

Fr		CRYSTAL POSITION	f osc	OSCILLATOR COIL
VHF LOW	30~50 MHz	Lo	Fr +10.7 MHz	L1
VHF HIGH	148~174 MHz	Hi	(Fr −10.7 MHz)/3	L5

NOTE 1: *Oscillating frequency, which is read on the frequency counter, should be ±750Hz of the calculated crystal frequency.*

EXAMPLE RECEIVING FREQ.	CRYSTAL FREQ.	COUNTER FREQ.
40 MHz	50.7 MHz	50.699250~50.700750 MHz
150 MHz	47.433333 MHz	47.432583~47.434083 MHz

NOTE 2: *Crystal Frequency Calculation.*
The crystal frequencies are obtained by the following formula.
VHF LOW Crystal frequency (MHz) = Fr + 10.7

$$\text{VHF HIGH Crystal frequency (MHz)} = \frac{(Fr - 10.7)}{3}$$

Where Fr is the desired receive frequency, in MHz.

VHF LOW/HIGH OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect Signal Generator to Antenna input and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receive band center (153 MHz for High Band, 40 MHz for Low Band).
Step 3: Adjust L5 (Hi) and L1 (Lo) for maximum sensitivity.
Step 4: Set the Signal Generator for no modulation and minimum output, and set VOLUME control for 0 dB (0.775V) reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting.

NOTE 1: *R76 270Ω must be shorted if you connect the VTVM to the Headphone jack.*
NOTE 2: *As supplied by the factory, this unit is set up to provide maximum sensitivity in ranges of 37~43 MHz for VHF Lo and 149~157 MHz for VHF Hi. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 30 MHz up to about 50 MHz for VHF Lo and 148 MHz to 174 MHz for VHF Hi. To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a band width "window" of about 6/8 MHz total—adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). OF COURSE, BE SURE TO USE CORRECT CRYSTALS.*

ALIGNMENT POSITIONS

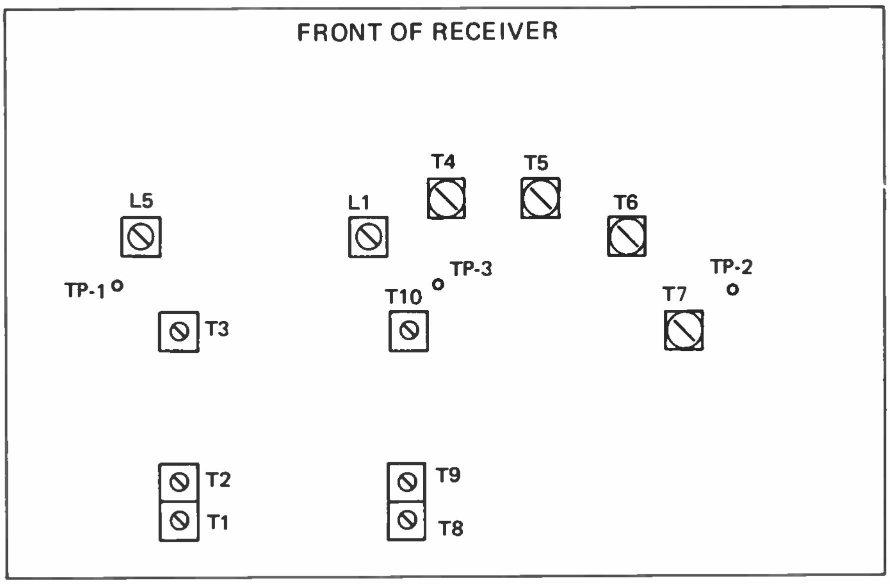
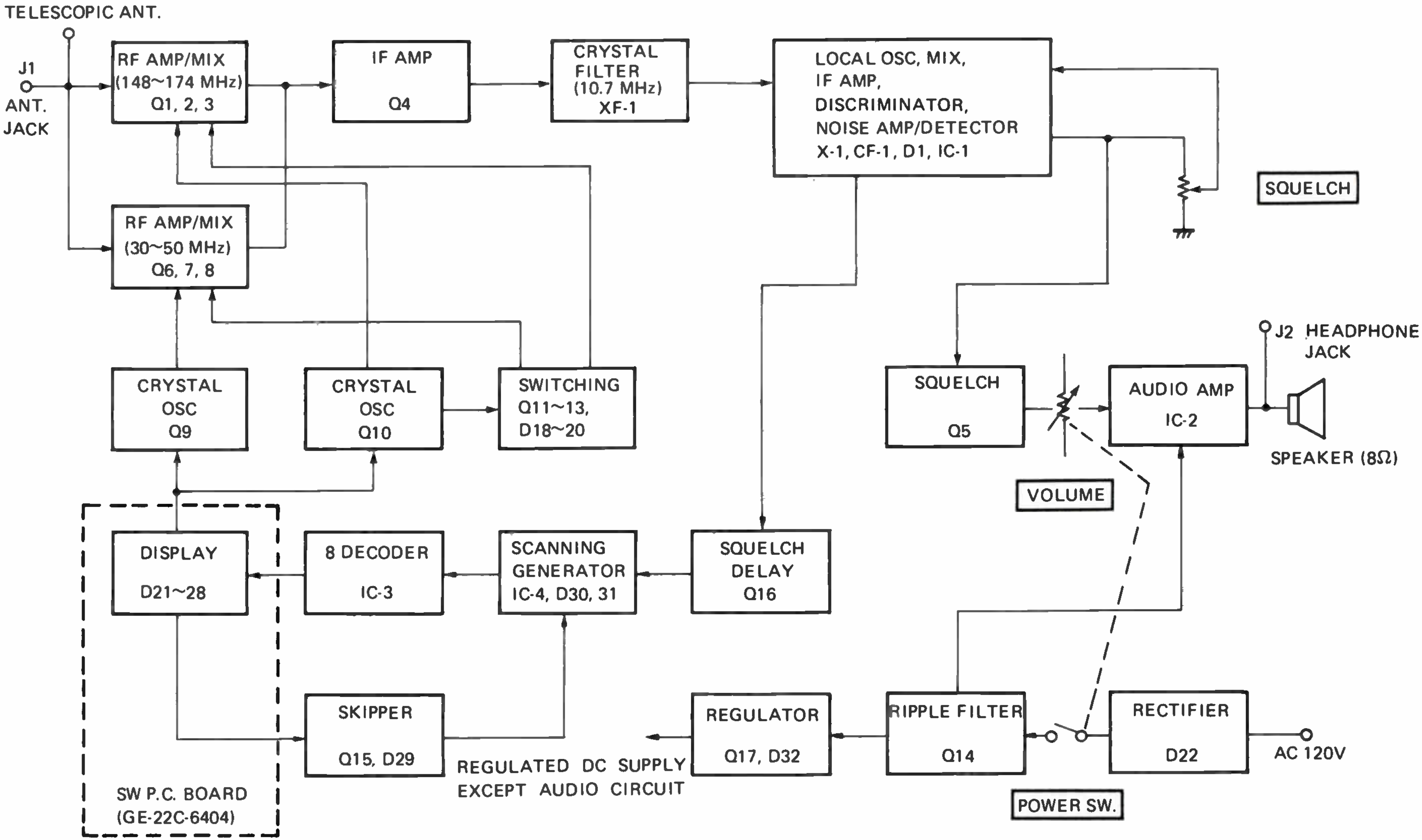


FIGURE 10.

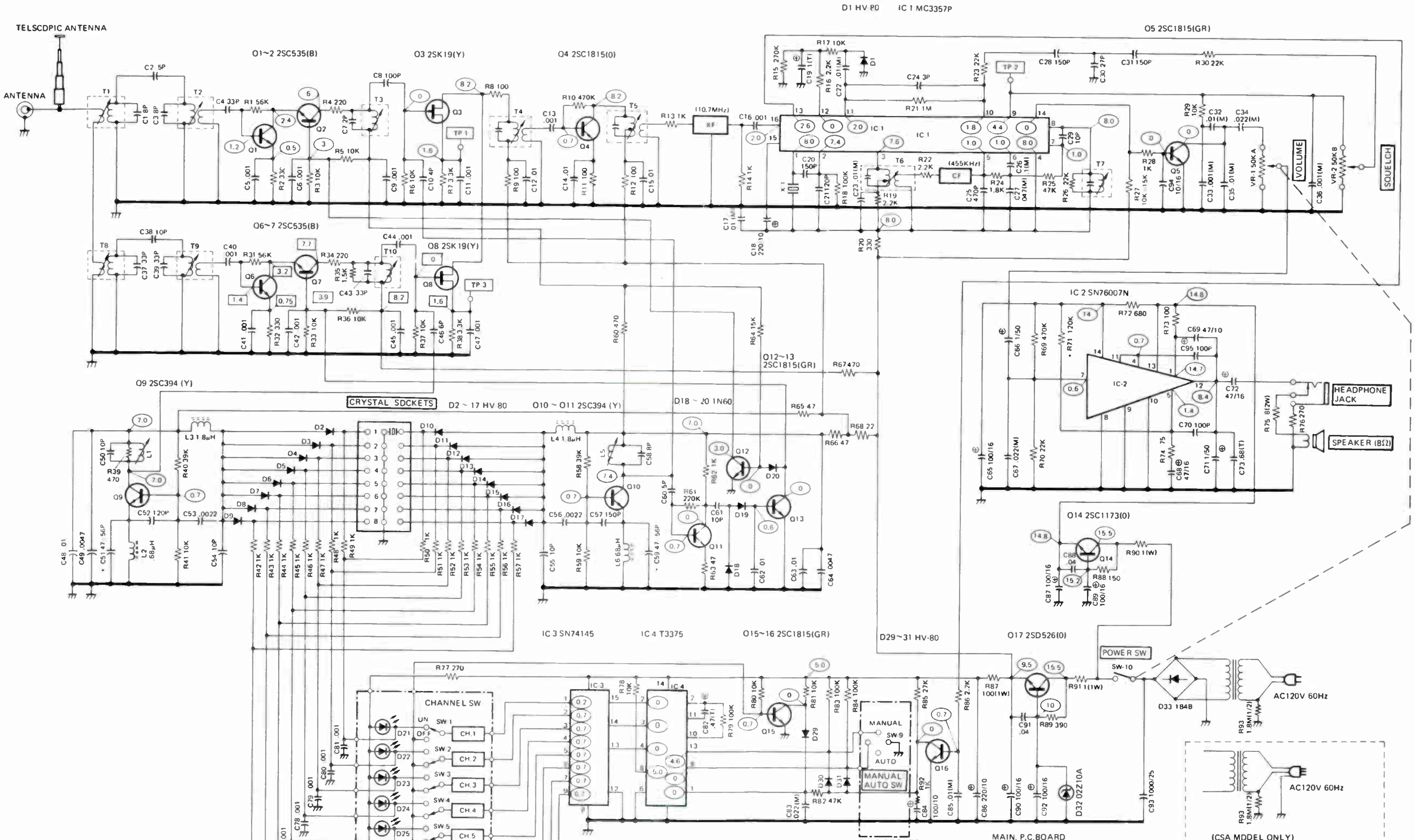
BLOCK DIAGRAM



TROUBLESHOOTING

Symptom	Possible cause
1) Channel LED does not light and no sound. Power Switch : ON Channel Switch : ON Volume Control: MAX.	A) Faulty line power cord. B) Defective power switch C) Defective Q17, IC-3 and/or associated circuit component. D) Defective diode D33
2) Channel LED lights but no sound. Channel Switch : ON Volume Control: MAX. Squelch Control: MIN.	A) Defective speaker. B) Defective speaker jack. C) Faulty Q14, IC-2 and/or faulty associated circuit component. D) Faulty IF amplifier circuit component.
3) Sound but channel LED does not light. Channel Switch : ON Volume Control: MAX. Squelch Control: MIN.	A) Defective channel switch or defective diode D21~D28 B) Defective R87 C) Problem with integrated circuit IC-3 and/or IC-4
4) Does not scan and Squelch does not operate.	A) Defective Squelch control. B) Defective IF amplifier circuit, IC-1 and/or component parts. C) Defective integrated circuit IC-3 and/or IC-4 D) Defective Q5, Q15 and/or Q16
5) Does not scan but Squelch operates.	A) Defective AUTO/MANUAL switch. B) Problem with integrated circuit IC-3 or IC-4 and/or transistors Q16 and/or defective circuit component parts.
6) Manual selector does not operate.	A) Faulty manual selector switch, AUTO/ MANUAL switch.
7) Skipper does not operate.	A) Defective Q15 and/or defective circuit component parts.
8) Delay does not operate.	A) Defective Q16 and/or circuit component parts.
9) VHF (Lo) band does not operate but VHF (Hi), band operates.	A) Defective crystal. B) Check setting of crystal switch (Low position) C) Weak crystal and/or Q9, D2~D9 and/or defective circuit component parts. D) Defective RF amplifier, MIXER and/or defective circuit component parts.

Symptom	Possible cause
10) VHF (Hi) band does not operate but (Lo) band operates.	A) Defective crystal. B) Defective Q10~13, D10~17 and/or defective circuit component parts. C) Defective RF Amplifier Q1, 2 or Mixer Q3 and/or defective associated part.
11) Neither VHF Lo nor Hi band operate.	A) Defective OSC circuit. B) Defective IF amplifier circuit.
12) VHF Lo and Hi, sound distorted.	A) Defective crystal. B) Defective amplifier circuit, IC-2 or circuit component parts.
13) VHF Lo and Hi, low sensitivity.	A) Check alignment (frequency coverage). B) Defective RF AMP and IF AMP.
14) VHF Lo, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.
15) VHF High, low sensitivity.	A) Weak crystal. B) Faulty adjustment of RF amplifier and/or faulty circuit component parts.



REMARKS

1 RESISTANCE VALUES IN OHMS (K = 1000), (M = 1000000)
2 CAPACITANCE VALUES IN μF (P = μμF)
3 (T) ... TANTALUM CAPACITOR
4 (M) ... MYLAR CAPACITOR
5 ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE
6. ⬭ THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH DC VOLT METER (100KΩ/V) UNDER FOLLOWING CONDITIONS : HIGH BAND, CH 1, MANUAL OPERATED, VOLUME MINIMUM, AND SQUELCH MAX C.W.
▭ THIS SYMBOL INDICATES LOW BAND VOLTAGE MEASUREMENTS.

P.C.BOARD PARTS LIST

Ref. No.	Description				RS Part Number	MFR's Part Number
CAPACITORS						
C1	Ceramic	8pF	50WV	±0.5pF		FC-50
C2	Ceramic	0.5pF	50WV	±0.25pF		AK-50
C3	Ceramic	8pF	50WV	±0.5pF		FC-50
C4	Ceramic	33pF	50WV	±5%		FC-50
C5	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C6	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C7	Ceramic	2pF	50WV	±0.5pF		FC-50
C8	Ceramic	100pF	50WV	±10%		FC-70
C9	Ceramic	0.001μF	50WV	±10%		E508JYB102K
C10	Ceramic	4pF	50WV	±0.5pF		FC-50
C11	Ceramic	0.001μF	50WV	±10%		E508JYB102K
C12	Ceramic	0.01μF	25WV	+80%~-20%		C70SJZF103Z
C13	Ceramic	0.001μF	50WV	±10%		E508JYB102K
C14	Ceramic	0.01μF	25WV	+80%~-20%		C70SJZF103Z
C15	Ceramic	0.01μF	25WV	+80%~-20%		C70SJZF103Z
C16	Ceramic	0.001μF	50WV	±10%		E508JYB102K
C17	Mylar	0.01μF	50WV	±10%		
C18	Electrolytic	220μF	10WV			CE04W1A221E
C19	Tantalum	1μF	15WV			CS15E1E010M1S
C20	Ceramic	150pF	50WV	±10%		FC-80
C21	Ceramic	120pF	50WV	±10%		FC-80
C22	Mylar	0.01μF	50WV	±10%		
C23	Mylar	0.01μF	25WV	±10%		
C24	Ceramic	3pF	50WV	±0.5%		FC-50
C25	Ceramic	470pF	50WV	±10%		E50SJYB471K
C26	Mylar	0.1μF	50WV	±10%		
C27	Mylar	0.047μF	50WV	±10%		
C28	Ceramic	150pF	50WV	±10%		FC-80
C29	Ceramic	10pF	50WV	±10%		FCC-100
C30	Ceramic	27pF	50WV	±5%		FC-50
C31	Ceramic	150pF	50WV	±10%		FC-80
C32	Mylar	0.01μF	50WV	±10%		
C33	Mylar	0.001μF	50WV	±10%		
C34	Mylar	0.022μF	50WV	±10%		
C35	Mylar	0.01μF	50WV	±10%		
C36	Mylar	0.001μF	50WV	±10%		
C37	Ceramic	33pF	50WV	±5%		FC-50
C38	Ceramic	10pF	50WV	±5%		FC-50
C39	Ceramic	33pF	50WV	±5%		FC-50
C40	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C41	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C42	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C43	Ceramic	33pF	50WV	±5%		FC-50
C44	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C45	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C46	Ceramic	6pF	50WV	±0.5pF		FC-50
C47	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C48	Ceramic	0.01μF	25WV	+80%~-20%		C70SJZF103Z

Ref. No.	Description				RS Part Number	MFR's Part Number
C49	Ceramic	0.0047μF	50WV	±10%		E90SJYB472K
C50	Ceramic	10pF	50WV	±5%		FC-50
C51	Ceramic	47~56pF	50WV	±10%		FCC-100
C52	Ceramic	120pF	50WV	±10%		FCC-100
C53	Ceramic	0.0022μF	50WV	±10%		E70SJYB222K
C54	Ceramic	10pF	50WV	±5%		FC-50
C55	Ceramic	10pF	50WV	±5%		FC-50
C56	Ceramic	0.0022μF	50WV	±10%		E70SJYB222K
C57	Ceramic	150pF	50WV	±10%		FCC-100
C58	Ceramic	8pF	50WV	±0.5pF		FC-50
C59	Ceramic	47~50pF	50WV	±10%		FCC-100
C60	Ceramic	5pF	50WV	±0.5pF		FC-50
C61	Ceramic	10pF	50WV	±5%		FC-50
C62	Ceramic	0.01μF	25WV	+80%~-20%		C70SJZF103Z
C63	Ceramic	0.01μF	25WV	+80%~-20%		C70SJZF103Z
C64	Ceramic	0.0047μF	50WV	±10%		E90SJYB472K
C65	Electrolytic	100μF	16WV			CE04W1C101F
C66	Electrolytic	1μF	50WV			CE04W1H010
C67	Mylar	0.022μF	50WV	±10%		
C68	Electrolytic	47μF	16WV			CE04W1C470B
C69	Electrolytic	47μF	10WV			CE04W1C470A
C70	Ceramic	100pF	50WV	±10%		FC-70
C71	Electrolytic	1μF	50WV			CE04W1H010
C72	Electrolytic	47μF	16WV			CE04W1C470B
C73	Tantalum	0.68μF	15WV			CS15E1VR68M1S
C74	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C75	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C76	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C77	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C78	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C79	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C80	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C81	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C82	Tantalum	0.47μF	15WV			CS15E1VR47MIS
C83	Mylar	0.022μF	50WV	±10%		
C84	Electrolytic	100μF	10WV			CE04W1A101A
C85	Mylar	0.01μF	50WV			
C86	Electrolytic	220μF	10WV			CE04W1A221E
C87	Electrolytic	100μF	16WV			CE04W1C101F
C88	Ceramic	0.04μF	25WV	+80%~-20%		C10SJZF403Z
C89	Electrolytic	100μF	16WV			CE04W1C101F
C90	Electrolytic	100μF	10WV			CE04W1C101F
C91	Ceramic	0.04μF	25WV	+80%~-20%		C10SJZF403Z
C92	Electrolytic	100μF	10WV			CE04W1C101F
C93	Electrolytic	1000μF	25WV			CE02W1E102F
C94	Electrolytic	10μF	16WV			CE04W011
C95	Ceramic	100pF	50WV	±10%		FC-70

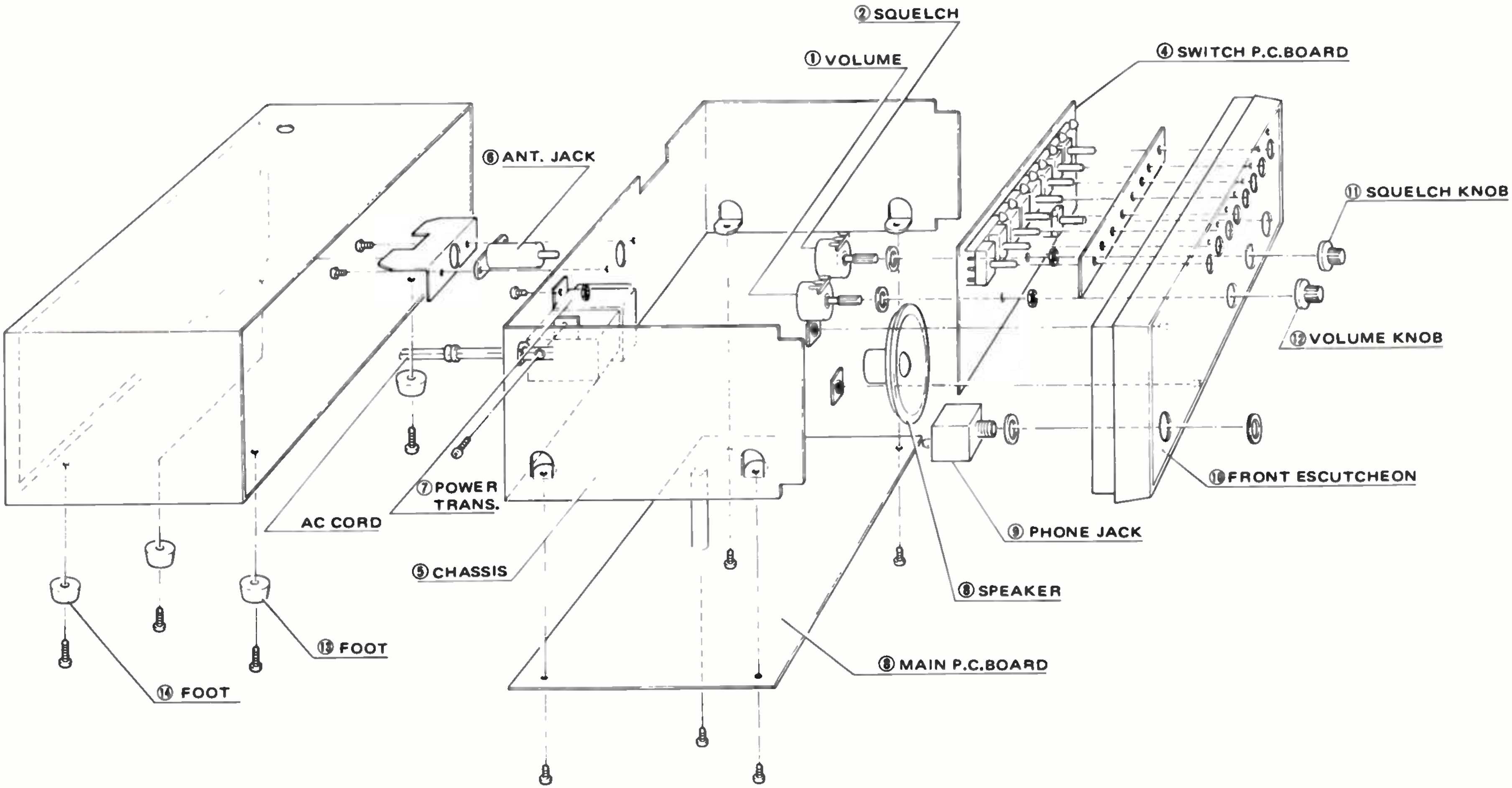
Ref. No.	Description	RS Part Number	MFR's Part Number
COILS/FILTERS/TRANS			
T1	RF coil	CA-4784	113SN-5066X
T2	RF coil	CA-4785	113SN-5067X
T3	RF coil		1135N-5066X
T4	IF coil (10.7MHz)	CA-7246	119LC-470033N3
T5	IF coil (10.7MHz)	CA-7246	119LC-470033N3
T6	IF coil (455kHz)	CA-7247	7MC-452503N4
T7	IF coil (455 kHz)	CA-7247	7MC-452503N4
T8	RF coil	CA-4549	113KN-4427X
T9	RF coil	CA-4549	113KN-4427X
T10	RF coil	CA-4549	113KN-4427X
L1	OSC coil	CA-4891	F153-6.5SNO-087
L2	Micro inductor	CB-2190	EL0606-R68M or FL3HR68M
L3	Micro inductor	CA-2909	LF4-1R8K
L4	Micro inductor	CA-2909	LF4-1R8K
L5	OSC coil		F153-6.5SNO-087
L6	Micro inductor		EL0606-R68M or FL3HR68M
XF-1	Crystal filter 10.7 MHz	C-0846	10M15A
CF-1	Ceramic filter 455 kHz	C-0847	LF-B20
X-1	Crystal (10.245 MHz)	MV-2049	
SWITCHES/CRYSTAL			
SW-1	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SW-2	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SW-3	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SW-4	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SW-5	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SW-6	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SW-7	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SW-8	Channel PROGRAM Switch	S-2424	SSFMB-1-2-14.5K
SOCKET			
	Crystal socket	J-6299	SF-101B-00
POTENTIOMETERS			
VR1 ①	VOLUME control	P-1831	VM11A-5M1411-50KA-30LK
VR2 ②	SQUELCH control	P-0810	VM10A-50KB-30LK

Q1	Transistor	silicon	2SC535(B)	2SC535(B)
Q2	Transistor	silicon	2SC535(B)	2SC535(B)
Q3	F.E.T.	silicon	2SK19(Y)	2SK19(Y)
Q4	Transistor	silicon	2SC1815(O) or 2SC372(O)	2SC1815(O) or 2SC372(O)
Q5	Transistor	silicon	2SC1815(GR) or 2SC373	2SC1815(GR) 2SC373
Q6	Transistor	silicon	2SC535(B)	2SC535(B)
Q7	Transistor	silicon	2SC535(B)	2SC535(B)
Q8	F.E.T.	silicon	2SK19(Y)	2SK19(Y)
Q9	Transistor	silicon	2SC394(Y)	2SC394(Y)
Q10	Transistor	silicon	2SC394(Y)	2SC394(Y)
Q11	Transistor	silicon	2SC394(Y)	2SC394(Y)
Q12	Transistor	silicon	2SC1815(GR) or 2SC373	2SC1815(GR) or 2SC373
Q13	Transistor	silicon	2SC1815(GR) or 2SC373	2SC1815(GR) or 2SC373
Q14	Transistor	silicon	2SC1173	2SC1173
Q15	Transistor	silicon	2SC1815(GR) or 2SC373	2SC1815(GR) or 2SC373
Q16	Transistor	silicon	2SC1815(GR) or 2SC373	2SC1815(GR) or 2SC373
Q17	Transistor	silicon	2SD526(O)	2SD526(O)
IC-1	Integrated circuit		MX-3439	MC3357P
IC-2	Integrated circuit		MX-3440	SN76007N
IC-3	Integrated circuit		MX-3309	SN74145
IC-4	Integrated circuit		MX-3345	T3375
D1	Diode	silicon	DX-0150	HV-80
D2	Diode	silicon	DX-0150	HV-80
D3	Diode	silicon	DX-0150	HV-80
D4	Diode	silicon	DX-0150	HV-80
D5	Diode	silicon	DX-0150	HV-80
D6	Diode	silicon	DX-0150	HV-80
D7	Diode	silicon	DX-0150	HV-80
D8	Diode	silicon	DX-0150	HV-80
D9	Diode	silicon	DX-0150	HV-80
D10	Diode	silicon	DX-0150	HV-80
D11	Diode	silicon	DX-0150	HV-80
D12	Diode	silicon	DX-0150	HV-80
D13	Diode	silicon	DX-0150	HV-80
D14	Diode	silicon	DX-0150	HV-80
D15	Diode	silicon	DX-0150	HV-80
D16	Diode	silicon	DX-0150	HV-80
D17	Diode	silicon	DX-0150	HV-80
D18	Diode	germanium	DX-0161	1N60
D19	Diode	germanium	DX-0161	1N60
D20	Diode	germanium	DX-0161	1N60
D21	LED		L-0744	TLR104
D22	LED		L-0744	TLR104
D23	LED		L-0744	TLR104
D24	LED		L-0744	TLR104
D25	LED		L-0744	TLR104
D26	LED		L-0744	TLR104
D27	LED		L-0744	TLR104
D28	LED		L-0744	TLR104
D29	Diode	silicon	DX-0150	HV-80
D30	Diode	silicon	DX-0150	HV-80
D31	Diode	silicon	DX-0150	HV-80
D32	Zener diode		DX-0994	02Z10A-U or 05Z10A-U
D33	Rectifier		DX-0995	1B4B

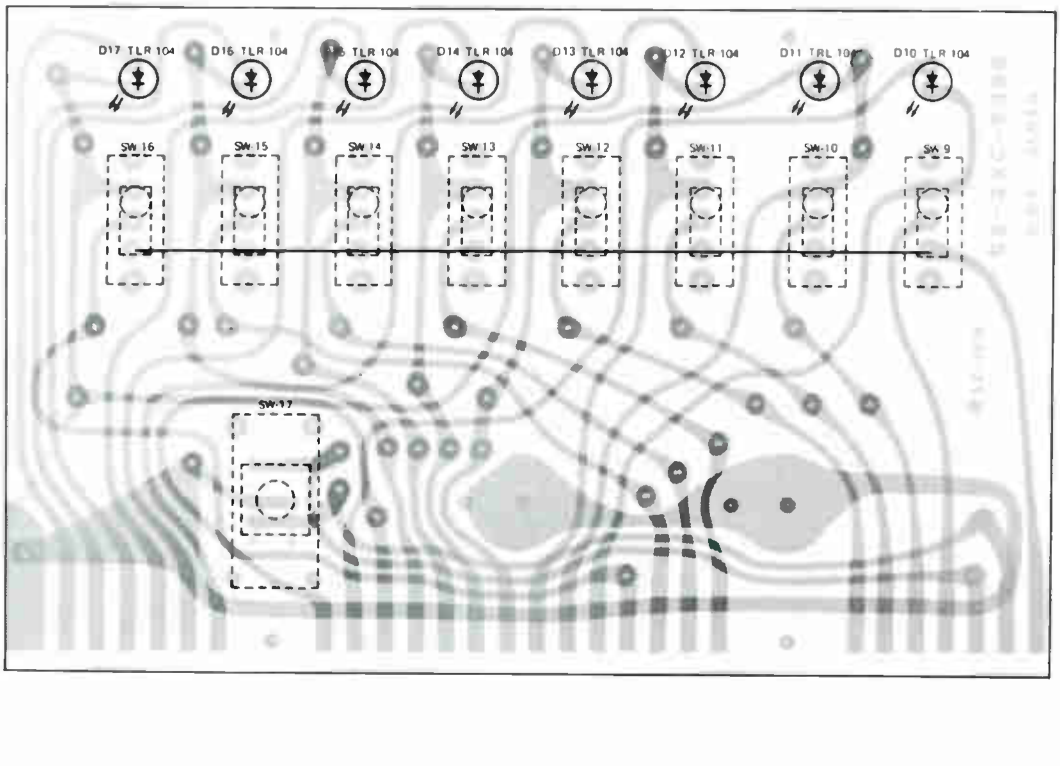
CHASSIS PARTS LIST

Ref. No.	Description	RS Part Number	MFR's Part Number
	ELECTRICAL PARTS		
3	Main P.C. Board		GE-22B-6400
	Switch P.C. Board		GE-22C-6404
6	ANTenna jack	J-0566	JA-C-020
7	Power transformer	TA-0643	TK1053
8	Speaker	S-4715	PD-734STB or C065A20N1312
9	Headphone jack	J-0907	SG-7615#02
	AC line cord	W-1670	BLK-6 feet
	AUTO-MANUAL switch	S-5040	MLS-D-2-3 (WHT)
	Wire terminal connector		1-SD
	Telescopic antenna	A-0307	F2007-113
	MECHANICAL PARTS		
	Cabinet		GE-22A-6599
5	Chassis		GE-22B-6382
10	Front panel assembly		GE-22B-6590
11 12	Volume knob	K-2733	GE-22D-6416
13	Foot (front)	F-0065	7101
14	Foot (rear)	F-0224	7109
	AUTO-MANUAL switch cloth		GE-20D-5070
	Line cord strain relief	HB-0705	SR-3P4
	Antenna guide sleeve		GE-22D-6428
	Live parts cover		GE-22D-6384
	Program switch sponge		GE-22D-6409
	Screws		
	Snap Bushing		SB-437-5

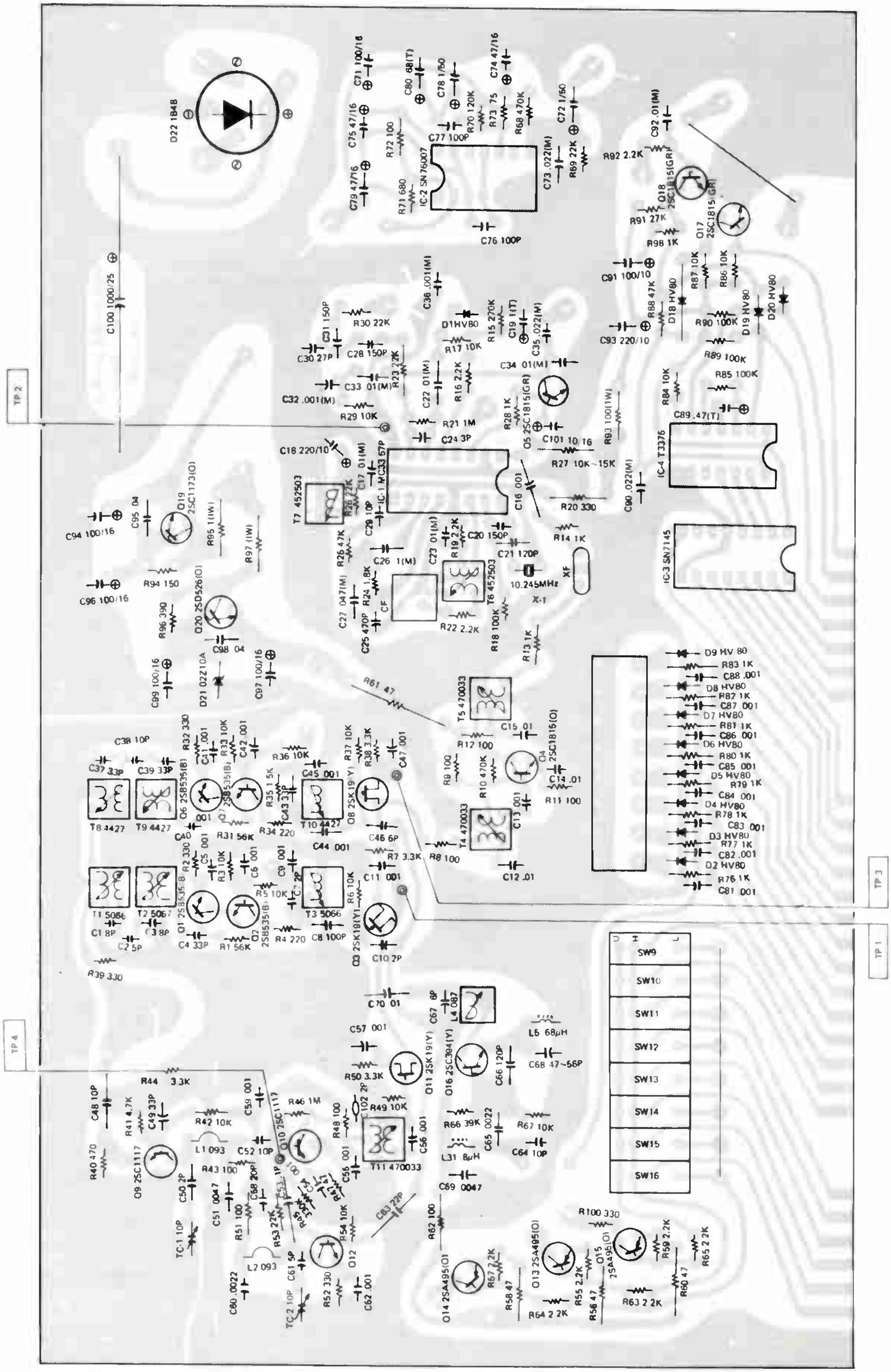
EXPLODED VIEW



SWITCH P.C.BOARD (BOTTOM VIEW)



MAIN P.C.BOARD (BOTTOM VIEW)



LOGIC CIRCUIT TRUTH TABLES

Channel No. \ PIN NO.	IC4			IC-3							
	2	3	4	1	2	3	4	5	6	7	9
CH. 1	L	L	L	*L	H	H	H	H	H	H	H
CH. 2	H	L	L	H	*L	H	H	H	H	H	H
CH. 3	L	H	L	H	H	*L	H	H	H	H	H
CH. 4	H	H	L	H	H	H	*L	H	H	H	H
CH. 5	L	L	H	H	H	H	H	*L	H	H	H
CH. 6	H	L	H	H	H	H	H	H	*L	H	H
CH. 7	L	H	H	H	H	H	H	H	H	*L	H
CH. 8	H	H	H	H	H	H	H	H	H	H	*L

NOTE: *H = high level* *L = low level* *Marked * = channel indication "ON"*

2nd LOCAL OSCILLATOR FREQUENCY CHECK (10.245 MHz)

Step 1: Connect Frequency Counter through a 10pF capacitor to IC-1, Pin 2. (See Figure 2)

Step 2: Read frequency on the Frequency Counter.
Normal: 10.245 MHz ±1 kHz.

NOTE: *Frequency Counter coupling, capacitor should be as small a value as possible. Frequency Counter should be high impedance type.*

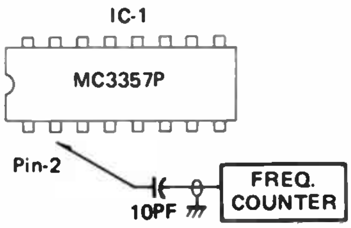


FIGURE 2.

IF SECTION ALIGNMENT

Step 1: Connect instruments as shown in Figure 3.

Step 2: Maintain Sweep Generator output at a low level to prevent overloading.

Step 3: Adjust T4, T5, T6, T7 of IF amplifier so that the 455 kHz marker is in the center of discriminator curve and for best linearity as shown in Figure 4.

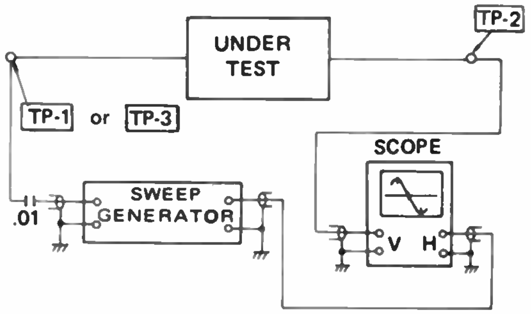


FIGURE 3. IF SECTION ALIGNMENT TEST EQPT. HOOK UP

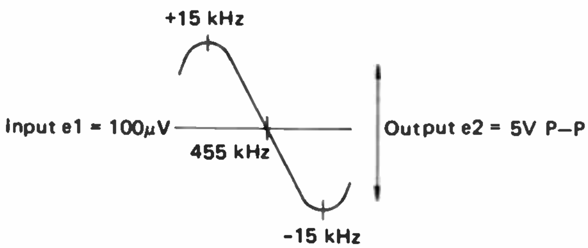


FIGURE 4. IF DISCRIMINATOR CURVE

VHF FRONT-END ALIGNMENT

LOW BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Set at least one crystal band selector switch to "L" position. Connect Scope to TP-3.
Step 3: Set Sweep Generator to a center frequency of 40 MHz.
Step 4: Adjust T8, T9 and T10 in RF section for maximum output and best curve symmetry as shown in Figure 6.

HIGH BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Set at least one crystal band selector switch to "H" position. Connect Scope to TP-1.
Step 3: Set Sweep Generator to a center frequency of 153 MHz.
Step 4: Adjust T1, T2 and T3 in RF section for maximum output and best curve symmetry as shown in Figure 7.

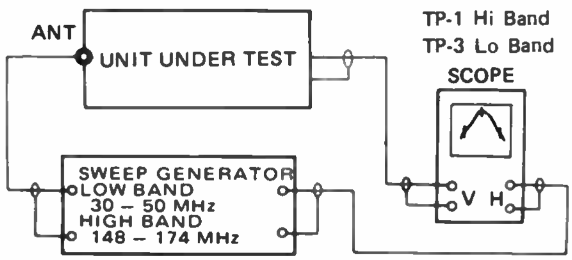


FIGURE 5. VHF LOW/HIGH BAND RF TEST EQPT. HOOK UP

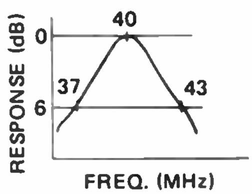


FIGURE 6. VHF Lo

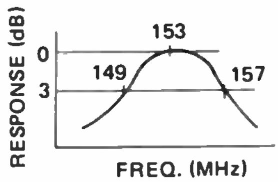


FIGURE 7. VHF Hi

UHF FRONT-END ALIGNMENT

Step 1: Connect the instruments as shown in Figure 8.
Step 2: Set at least one crystal band selector switch to "U" position and connect Scope to TP-4.
Step 3: Set TC-2 to minimum capacitance.
Step 4: Set Sweep Generator to a center frequency of 480 MHz.
Step 5: Adjust TC-1 for maximum output and best curve symmetry as shown in Figure 9.

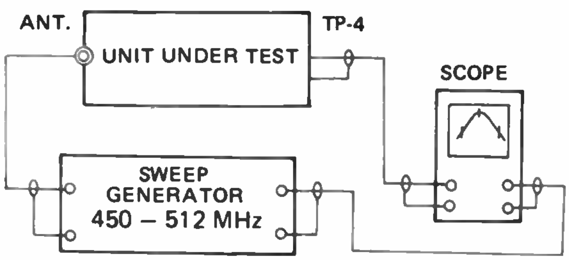


FIGURE 8. UHF BAND RF TEST EQPT. HOOK UP

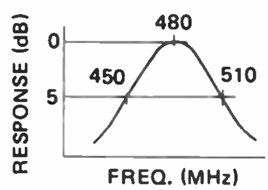


FIGURE 9. UHF CHARACTERISTIC CURVE

CRYSTAL INSTALLATION

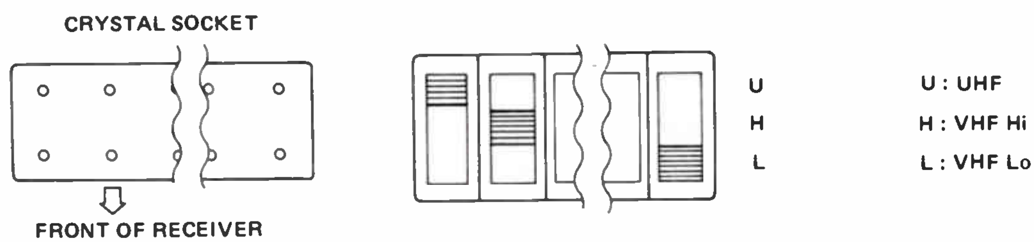
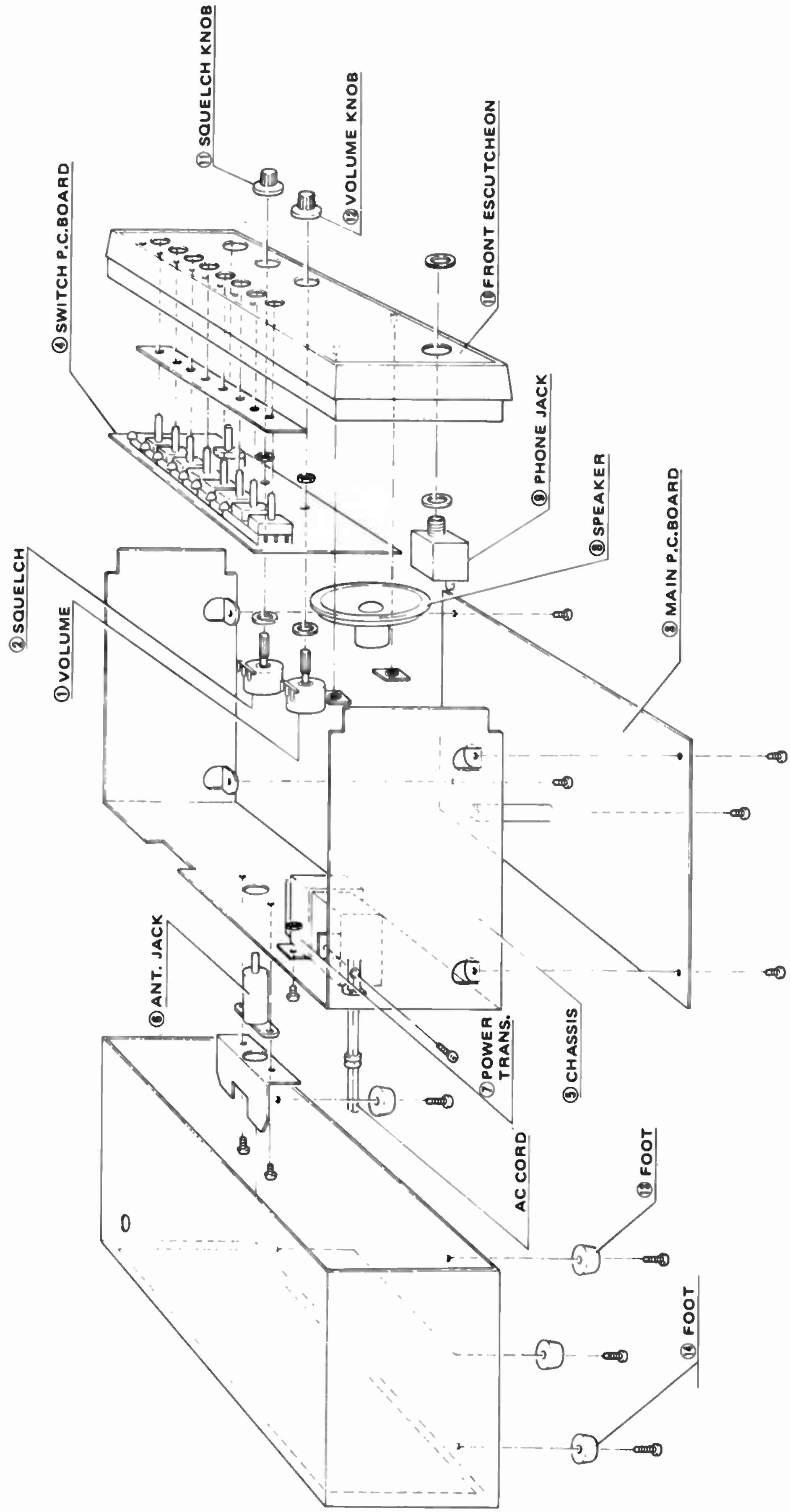


FIGURE 10. CRYSTAL INSTALLATION


1 VOLUME
2 SQUELCH
3 MAIN P.C.BOARD
4 SWITCH P.C.BOARD
5 CHASSIS
6 ANT. JACK
7 POWER TRANS.
8 SPEAKER
9 PHONE JACK
10 FRONT ESCUTCHEON
11 SQUELCH KNOB
12 VOLUME KNOB
13 FOOT
14 FOOT
AC CORD

UHF OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect Signal Generator to ANTENNA jack and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receiver band center (480 MHz).
Step 3: Adjust TC-2, T11, L4 for maximum sensitivity.
Step 4: Set the Signal Generator for no modulation and minimum output and set VOLUME control for 0 dB reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting sensitivity.

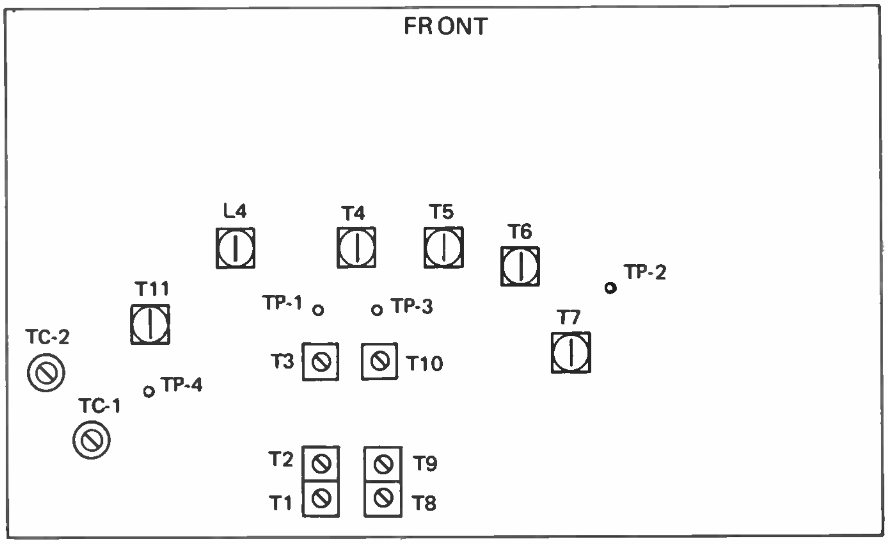
NOTE: *If you connect the VTVM to the headphone jack, you must short out R75 (270Ω).*

VHF LOW/HIGH OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect Signal Generator to ANTENNA jack and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receive band center (153 MHz for High Band; 40 MHz for Low Band).
Step 3: Adjust L4 for maximum sensitivity.
Step 4: Set the Signal Generator for no modulation and minimum output, and set VOLUME control for 0 dB (0.775V) reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting.

NOTE 1: *As supplied by the factory, this unit is set up to provide maximum sensitivity in ranges of 37 ~ 43 MHz for VHF Lo, 149 ~ 157 MHz for VHF Hi and 465 ~ 495 MHz for UHF. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 30 MHz up to about 50 MHz for VHF Lo, 148 MHz to 174 MHz for VHF Hi and 450 MHz to 512 MHz for UHF. To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a band width "window" of about 6/8/30 MHz total – adjust the sensitivity accordingly (compromise of frequency coverage may be necessary). Of course, be sure to use correct crystals.*

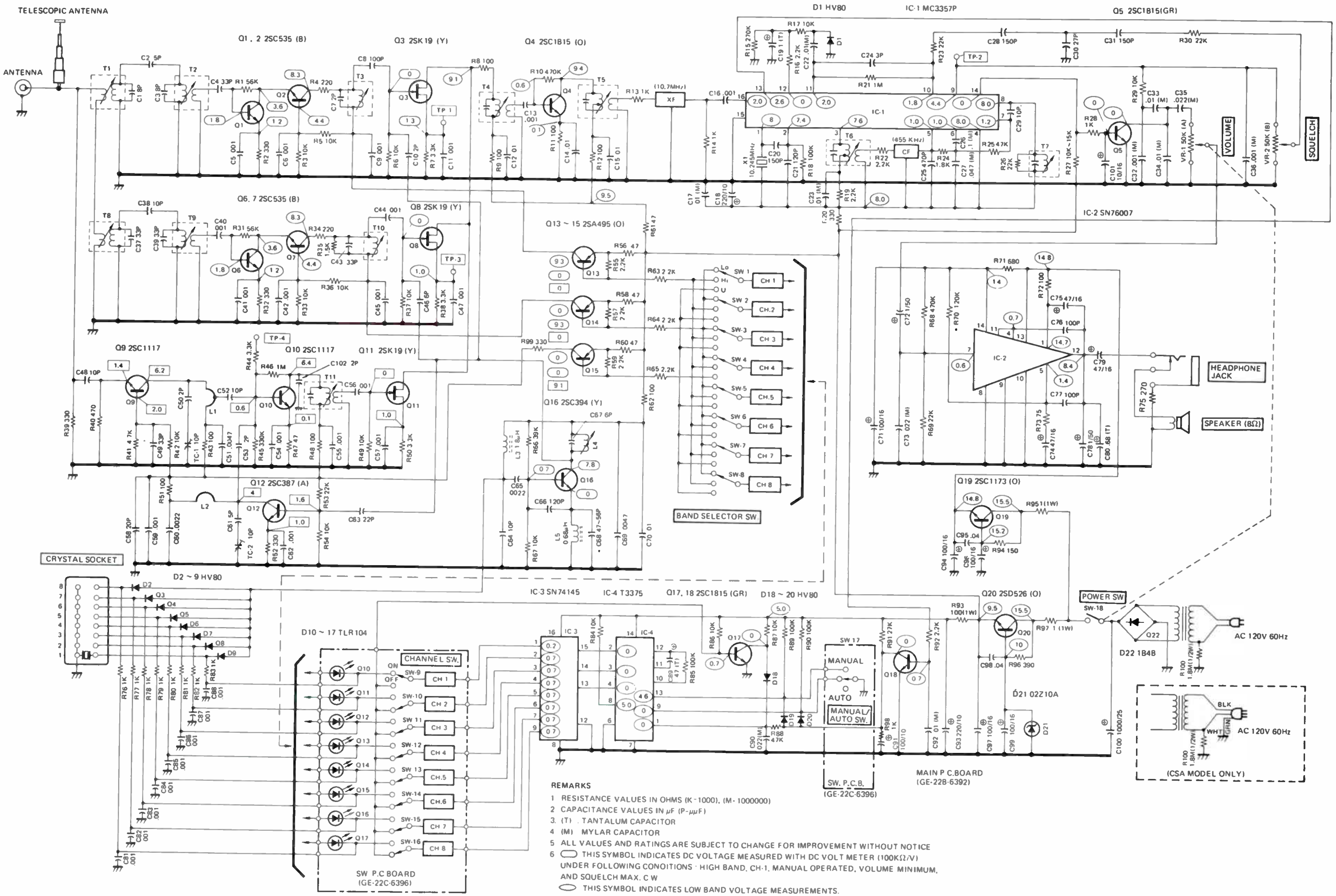
ALIGNMENT POSITIONS



TROUBLESHOOTING

Symptom	Possible cause
1) Channel LED does not light and no sound. Power Switch : ON Channel Switch : ON Volume Control : MAX.	A) Faulty line power cord B) Defective power switch C) Defective Q19, Q20 and/or defective associated circuit component D) Defective diode D21
2) Channel LED lights but no sound. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective speaker B) Defective speaker jack C) Faulty Q19, IC-2 and/or faulty associated circuit component D) Faulty IF amplifier circuit component
3) Sound but channel LED does not light. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective channel switch or defective diode D10 ~ D17 B) Defective R93 C) Problem with integrated circuit IC-3 and/or IC-4
4) Does not scan and Squelch does not operate.	A) Defective Squelch control B) IC-1 and/or defective circuit component parts C) Defective integrated circuit IC-3 and/or IC-4 D) Defective transistor Q5, Q17 and/or Q18
5) Does not scan but Squelch operates.	A) Defective AUTO/MANUAL switch B) Problem with integrated circuit IC-3 and/or IC-4 or Q18 and/or defective circuit component parts
6) Manual selector does not operate.	A) Faulty manual selector switch, AUTO/ MANUAL switch
7) Skipper does not operate.	A) Defective Q17 and/or defective circuit component parts
8) Delay does not operate.	A) Defective Q18 and/or defective circuit component parts
9) VHF (Lo) band does not operate but VHF (Hi), UHF bands operate.	A) Defective crystal B) Defective band selector switch C) Check setting of crystal band selector switch (L position) D) Defective RF Amplifier, Mixer and/or defective circuit E) Defective Q14 and/or Defective circuit component parts

Symptom	Possible cause
10) VHF (Hi) band does not operate but VHF (Lo), UHF bands operate.	A) Defective crystal B) Defective band selector switch C) Defective Q13 and/or defective circuit component parts
11) UHF band does not operate but VHF (Lo)/(Hi) bands operate.	A) Defective crystal B) Defective band selector switch C) Defective Q15 and/or circuit component parts D) Defective RF Amplifier mixer and/or tripler OSC, and/or defective circuit component parts
12) VHF (Lo), (Hi) and UHF bands do not operate.	A) Defective OSC circuit B) Defective IF amplifier circuit, IC-1 and/or circuit component parts
13) VHF (Lo), (Hi) and UHF sound distorted	A) Defective crystal B) Defective amplifier IC-2 or circuit component parts
14) VHF (Lo), (Hi) and UHF low sensitivity	A) Check alignment (frequency coverage) B) Defective RF AMP and IF AMP
15) VHF (Lo), low sensitivity	A) Weak crystal B) Faulty adjustment of RF amplifier and/or faulty circuit component parts
16) VHF (Hi), low sensitivity	A) Weak crystal B) Faulty adjustment of RF amplifier and/or faulty circuit component parts
17) UHF, low sensitivity	A) Weak crystal B) Faulty adjustment of UHF Front-end and/or faulty circuit component parts



REMARKS

1 RESISTANCE VALUES IN OHMS (K=1000), (M=1000000)
2 CAPACITANCE VALUES IN μF (P=μμF)
3 (T) TANTALUM CAPACITOR
4 (M) MYLAR CAPACITOR
5 ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE
6 THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH DC VOLT METER (100KΩ/V) UNDER FOLLOWING CONDITIONS: HIGH BAND, CH-1, MANUAL OPERATED, VOLUME MINIMUM, AND SQUELCH MAX. C W
THIS SYMBOL INDICATES LOW BAND VOLTAGE MEASUREMENTS.
THIS SYMBOL INDICATES UHF BAND VOLTAGE MEASUREMENTS.

P.C.BOARD PARTS LIST

Ref. No.	Description				RS Part Number	MFR's Part Number
	CAPACITORS					
C1	Ceramic	8pF	50WV	±0.5pF		FC-50
C2	Ceramic	0.5pF	50WV	±0.25pF		AK-50
C3	Ceramic	8pF	50WV	±0.5pF		FC-50
C4	Ceramic	33pF	50WV	±5%		FC-50
C5	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C6	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C7	Ceramic	2pF	50WV	±0.5pF		FC-50
C8	Ceramic	100pF	50WV	±10%		FC-70
C9	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C10	Ceramic	2pF	50WV	±0.5pF		FC-50
C11	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C12	Ceramic	0.01μF	25WV	+80 ~ −20%		C70SJZF103Z
C13	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C14	Ceramic	0.01μF	25WV	+80 ~ −20%		E70SJZF103Z
C15	Ceramic	0.01μF	25WV	+80 ~ −20%		C70SJZF103Z
C16	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C17	Mylar	0.01μF	50WV	±10%		
C18	Electrolytic	220μF	10WV			CE04W1A221E
C19	Tantalum	1μF	6.3WV			
C20	Ceramic	150pF	50WV	±10%		FC-80
C21	Ceramic	120pF	50WV	±10%		FC-80
C22	Mylar	0.01μF	50WV	±10%		
C23	Mylar	0.01μF	50WV	±10%		
C24	Ceramic	3pF	50WV	±0.5pF		FC-50
C25	Ceramic	470P	50WV	±10%		
C26	Mylar	0.1μF	50WV	±10%		
C27	Mylar	0.047μF	50WV	±10%		
C28	Ceramic	150pF	50WV	±10%		FC-80
C29	Ceramic	10pF	50WV	±5%		FCC-50
C30	Ceramic	27pF	50WV	±5%		FC-50
C31	Ceramic	150pF	50WV	±5%		FC-80
C32	Ceramic	0.001μF	50WV	±5%		E50SJYB102K
C33	Ceramic	0.01μF	25WV	±5%		C70SJZF103Z
C34	Ceramic	0.01μF	25WV	±5%		C70SJZF103Z
C35	Ceramic	0.022μF	25WV	±5%		C70SJZF223Z
C36	Ceramic	0.001μF	50WV	±5%		E50SJYB102K
C37	Ceramic	33pF	50WV	±5%		FC-50
C38	Ceramic	10pF	50WV	±5%		FC-50
C39	Ceramic	33pF	50WV	±5%		FC-50
C40	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C41	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C42	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C43	Ceramic	33pF	50WV	±5%		FC-50
C44	Ceramic	0.001μF	50WV	±10%		E50SJYB102K

Ref. No.	Description				RS Part Number	MFR's Part Number
C45	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C46	Ceramic	6pF	50WV	±0.5pF		FC-50
C47	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C48	Ceramic	10pF	50WV	±5%		FC-50
C49	Ceramic	33pF	50WV	±5%		FC-50
C50	Ceramic	2pF	50WV	±0.5pF		FC-50
C51	Ceramic	0.0047μF	50WV	±10%		E90SJYB472K
C52	Ceramic	10pF	50WV	±5%		FC-50
C53	Ceramic	2pF	50WV	±0.5pF		FC-50
C54	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C55	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C56	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C57	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C58	Ceramic	20pF	50WV	±10%		FC-50
C59	Ceramic	0.001μF	50WV	±10%		E50S1YB102K
C60	Ceramic	0.0022μF	50WV	±10%		E70SJYB222K
C61	Ceramic	5pF	50WV	±0.5pF		FC-50
C62	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C63	Ceramic	22pF	50WV	±5%		FC-50
C64	Ceramic	10pF	50WV	±5%		FC-50
C65	Ceramic	0.0022μF	50WV	±10%		E70SJYB22K
C66	Ceramic	120pF	50WV	±10%		FC80
C67	Ceramic	6pF	50WV	±0.5pF		FC-50
C68	Ceramic	47~56pF	50WV	±10%		FC-50
C69	Ceramic	0.0047μF	50WV	±10%		E90SJYB472K
C70	Ceramic	0.01μF	25WV	+80 ~ −20%		C70SJZF103Z
C71	Electrolytic	100μF	16WV			CE04W1C101F
C72	Electrolytic	1μF	50WV			CE04W1H010
C73	Mylar	0.022μF	50WV	±5%		
C74	Electrolytic	47μF	16WV			CE04W1C470B
C75	Electrolytic	47μF	16WV			CE04W1C470B
C76	Ceramic	100pF	50WV	±10%		FC-70
C77	Ceramic	100pF	50WV	±10%		FC-70
C78	Electrolytic	1μF	50WV			CE04W1H010
C79	Electrolytic	47μF	16WV			CE04W10470B
C80	Tantalum	0.68μF	50WV			CS15E1VR68MIS
C81	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C82	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C83	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C84	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C85	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C86	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C87	Ceramic	0.001μF	50WV	±10%		E50SJYB102K
C88	Ceramic	0.001μF	50WV	±10%		E50SJYB102K

Ref. No.	Description				RS Part Number	MFR's Part Number
C89	Tantalum	0.47μF	50WV			1S15E1VR47MIS
C90	Mylar	0.022μF	50WV	±10%		
C91	Electrolytic	100μF	10WV			CE04W1A101A
C92	Mylar	0.01μF	50WV	±10%		
C93	Electrolytic	220μF	10WV			CE04W1A221E
C94	Electrolytic	100μF	16WV			CE04W1C101F
C95	Ceramic	0.04μF	50WV	+80 ~ −20%		CI0SJZF403Z
C96	Electrolytic	100μF	16WV			CE04WIC101F
C97	Electrolytic	100μF	16WV			CE04WIC101F
C98	Ceramic	0.04μF	25WV	+80 ~ −20%		CI0SJZF403Z
C99	Electrolytic	100μF	16WV			CE04W1C101F
C100	Electrolytic	1000μF	25WV			CE02WIE102F
C101	Electrolytic	10μF	10WV			CE04W1C100F
C102	Ceramic	2pF	50WV	±0.5pF		FC-50
TC-1	Ceramic trimmer					ECV-1ZW10X52
TC-2	Ceramic trimmer					ECV-1ZW10X52
	COILS/TRANSFORMERS/FILTERS					
T1	RF coil					113SN-5066X
T2	RF coil					113SN-5067X
T3	RF coil					113SN-5066X
T4	IF coil				CA-7246	119LC470033N3
T5	IF coil				CA-7246	119LC470033N3
T6	IF coil				CA-7247	7MC452503N4
T7	IF coil				CA-7247	7MC452503N4
T8	RF coil					113KN-4427X
T9	RF coil					113KN-4427X
T10	RF coil					113KN-4427X
T11	IF coil					119LC470033N3
L1	Tank coil					8LNR-093
L2	Tank coil					8LNR-093
L3	Micro inductor					LF4-1R8K
L4	OSC coil					F153-6.5SN0-087
L5	Micro inductor					FL3HR68M or EL0606-R68M
XF-1	Crystal filter	10.7 MHz				10M15A
CF-1	Ceramic filter	455 kHz				LF-B20
X-1	Crystal	10.245 MHz				
	POTENTIOMETERS					
VR1	VOLUME control				P-1831	VM11A-5M1411-50KA-30LK
VR2	SQUELCH control				P-0810	VM10A-50KB-30LK

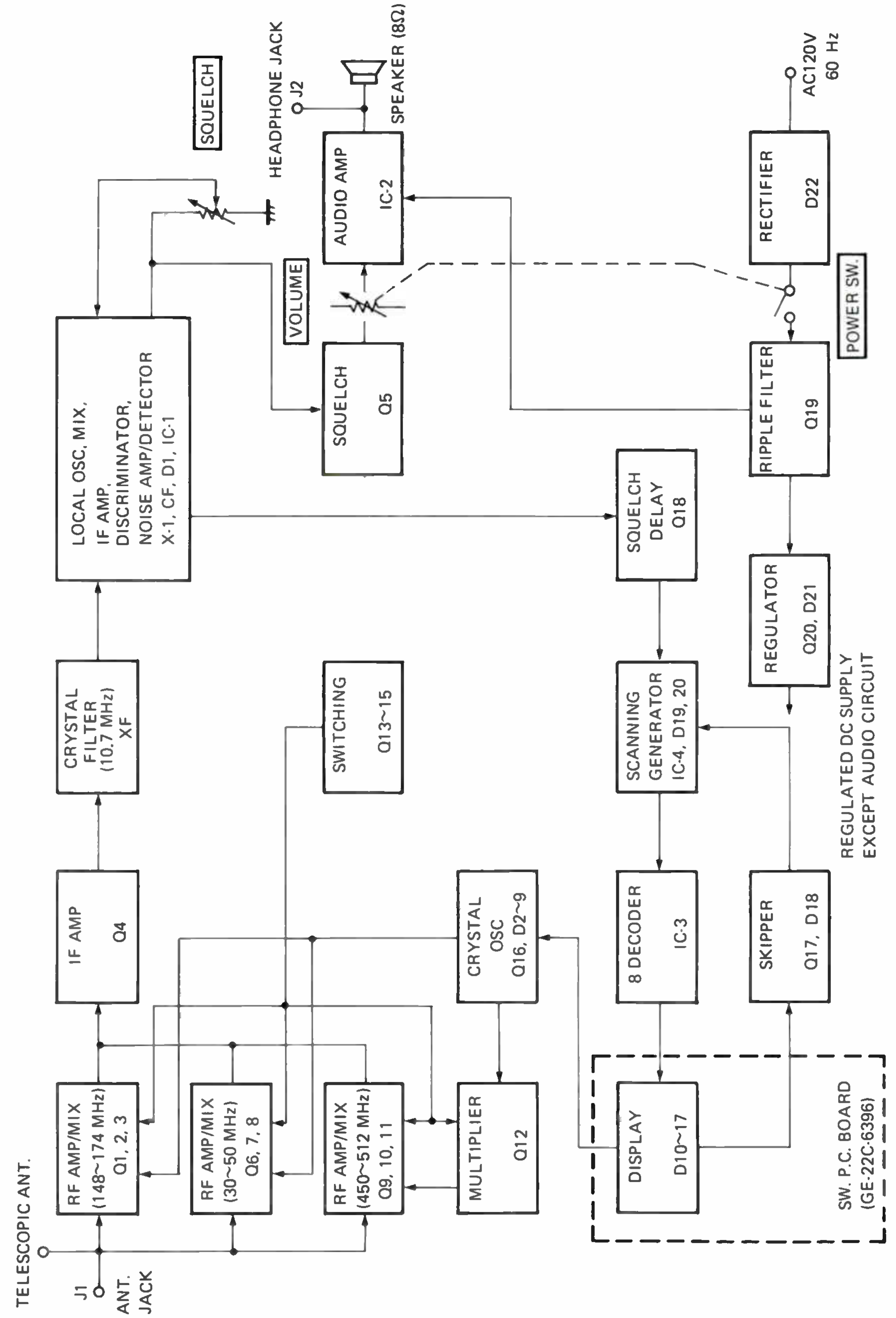
Ref. No.	Description		RS Part Number	MFR's Part Number
	SEMICONDUCTORS			
Q1	Transistor	silicon	2SC535(B)	2SC535(B)
Q2	Transistor	silicon	2SC535(B)	2SC535(B)
Q3	F.E.T.	silicon	2SK19(Y)	2SK19(Y)
Q4	Transistor	silicon	2SC1815(O)	2SC1815(O)
			or 2SC372(O)	or 2SC372(O)
Q5	Transistor	silicon	2SC1815(GR)	2SC1815(GR)
			or 2SC373	or 2SC373
Q6	Transistor	silicon	2SC535(B)	2SC535(B)
Q7	Transistor	silicon	2SC535(B)	2SC535(B)
Q8	F.E.T.	silicon	2SK19(Y)	2SK19(Y)
Q9	Transistor	silicon	2SC1117	2SC1117
Q10	Transistor	silicon	2SC1117	2SC1117
Q11	F.E.T.	silicon	2SK19(Y)	2SK19(Y)
Q12	Transistor	silicon	2SC387A	2SC387A
Q13	Transistor	silicon	2SA495(O)	2SA495(O)
Q14	Transistor	silicon	2SA495(O)	2SA495(O)
Q15	Transistor	silicon	2SA495(O)	2SA495(O)
Q16	Transistor	silicon	2SC394(Y)	2SC394(Y)
Q17	Transistor	silicon	2SC1815(O)	2SC1815(O)
			or 2SC372(O)	or 2SC372(O)
Q18	Transistor	silicon	2SC1815(GR)	2SC1815(GR)
			or 2SC373	or 2SC373
Q19	Transistor	silicon	2SC1173(O)	2SC1173(O)
Q20	Transistor	silicon	2SD526(O)	2SD526(O)
IC-1	Integrated circuit		MX-3439	MC3357P
IC-2	Integrated circuit		MX-3440	SN76007N
IC-3	Integrated circuit		MX-3309	SN74145
IC-4	Integrated circuit		MX-3345	T3375
D1	Diode	silicon	DX-0150	HV80 or 1S1588
D2	Diode	silicon	DX-0150	HV80
D3	Diode	silicon	DX-0150	HV80
D4	Diode	silicon	DX-0150	HV80
D5	Diode	silicon	DX-0150	HV80
D6	Diode	silicon	DX-0150	HV80
D7	Diode	silicon	DX-0150	HV80
D8	Diode	silicon	DX-0150	HV80
D9	Diode	silicon	DX-0150	HV80
D10	LED		L-0744	TLR104
D11	LED		L-0744	TLR104
D12	LED		L-0744	TLR104
D13	LED		L-0744	TLR104
D14	LED		L-0744	TLR104
D15	LED		L-0744	TLR104
D16	LED		L-0744	TLR104
D17	LED		L-0744	TLR104
D18	Diode	silicon	DX-0150	HV80
D19	Diode	silicon	DX-0150	HV80
D20	Diode	silicon	DX-0150	HV80
D21	Zener diode		DX-0994	02Z10A-U
			or 05Z10A-U	or 05Z10A-U
D22	Rectifier		1B4B	1B4B

Ref. No.	Description	RS Part Number	MFR's Part Number
	SOCKET		
	Crystal socket		SF-101B-00
	SWITCHES		
SW-1	Band selector switch		S-113146
SW-2	Band selector switch		S-113146
SW-3	Band selector switch		S-113146
SW-4	Band selector switch		S-113146
SW-5	Band selector switch		S-113146
SW-6	Band selector switch		S-113146
SW-7	Band selector switch		S-113146
SW-8	Band selector switch		S-113146
SW-9	Channel PROGRAM switch		SSFMB-1-2-14.5K
SW-10	Channel PROGRAM switch		SSFMB-1-2-14.5K
SW-11	Channel PROGRAM switch		SSFMB-1-2-14.5K
SW-12	Channel PROGRAM switch		SSFMB-1-2-14.5K
SW-13	Channel PROGRAM switch		SSFMB-1-2-14.5K
SW-14	Channel PROGRAM switch		SSFMB-1-2-14.5K
SW-15	Channel PROGRAM switch		SSFMB-1-2-14.5K
SW-16	Channel PROGRAM switch		SSFMB-1-2-14.5K

CHASSIS ASSEMBLY PARTS LIST

Ref. No.	Description	RS Part Number	MFR's Part Number
	ELECTRICAL PARTS		
(3)	Main P.C. Board		GE-22B-6392
	Switch P.C. Board		GE-22C-6396
(6)	ANTenna jack	J-0566	JA-C-020
(7)	Power transformer	TA-0643	TK1053
(8)	Speaker	S-4715	PD-734STB or C065A20N1312
(9)	Headphone jack	J-0907	SG-7615#02
	AC line cord	W-1670	BLK-6 feet
	AUTO-MANUAL switch	S-5040	MLS-D-2-3 (WHT)
	Wire terminal connector		1-SD
	Telescopic antenna	A-0307	F2007-113
	MECHANICAL PARTS		
	Cabinet		GE-22A-6599
(5)	Chassis		GE-22B-6382
(10)	Front panel assembly		GE-22B-6589
(11)(12)	Volume knob	K-2733	GE-22D-6416
(13)	Foot (front)	F-0065	7101
(14)	Foot (rear)	F-0224	7109
	AUTO-MANUAL switch cloth		GE-20D-5070
	Line cord strain relief	HB-0705	SR-3P4
	Antenna guide sleeve		GE-22D-6428
	Live parts cover		GE-22D-6384
	Program switch sponge		GE-22D-6409
	Screws		
	Snap Bushing		SB-437-5

BLOCK DIAGRAM



VHF LOW/HIGH, UHF LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Insert crystals in sockets.
Step 2: Couple the frequency counter thru a pickup coil to oscillator coil. Refer to Figure 11.

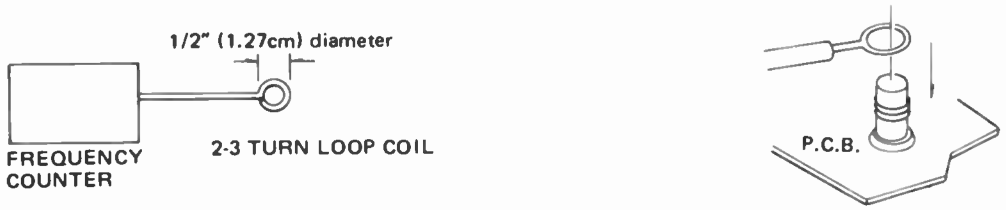


FIGURE 11. LOCAL OSCILLATOR COUPLING

Step 3: Check the frequencies of the oscillator as shown in the following chart. Do not make adjustments until or unless you perform the "Overall Alignment and Sensitivity" procedures noted on Page 5.

If necessary, adjust L4 as follows:
As you adjust this coil, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

Fr		CRYSTAL SWITCH POSITION	f osc	OSCILLATOR COIL
VHF LOW	30 ~ 50 MHz	L	Fr +10.7 MHz	L4
VHF HIGH	148 ~ 174 MHz	H	(Fr −10.7 MHz)/3	
UHF	450 ~ 512 MHz	U	(Fr −10.7 MHz)/9	

NOTE 1: *Oscillating frequency, which is read on the frequency counter, should be ±750 Hz of the calculated crystal frequency.*

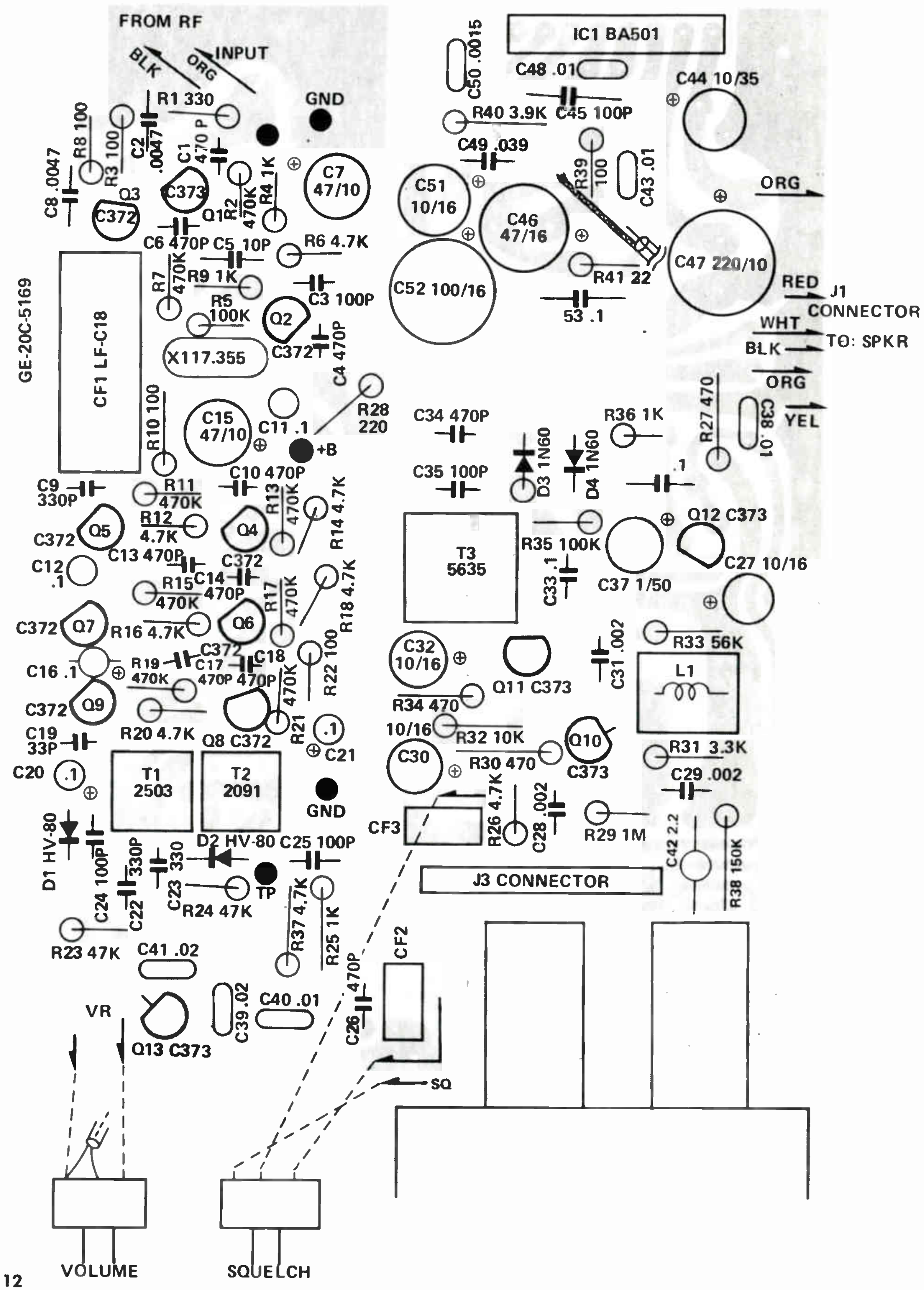
EXAMPLE RECEIVING FREQ.	CRYSTAL FREQ.	COUNTER FREQ.
40 MHz	50.7 MHz	50.699250 ~ 50.700750 MHz
150 MHz	47.433333 MHz	47.432583 ~ 47.434083 MHz
480 MHz	52.144444 MHz	52.143694 ~ 52.145194 MHz

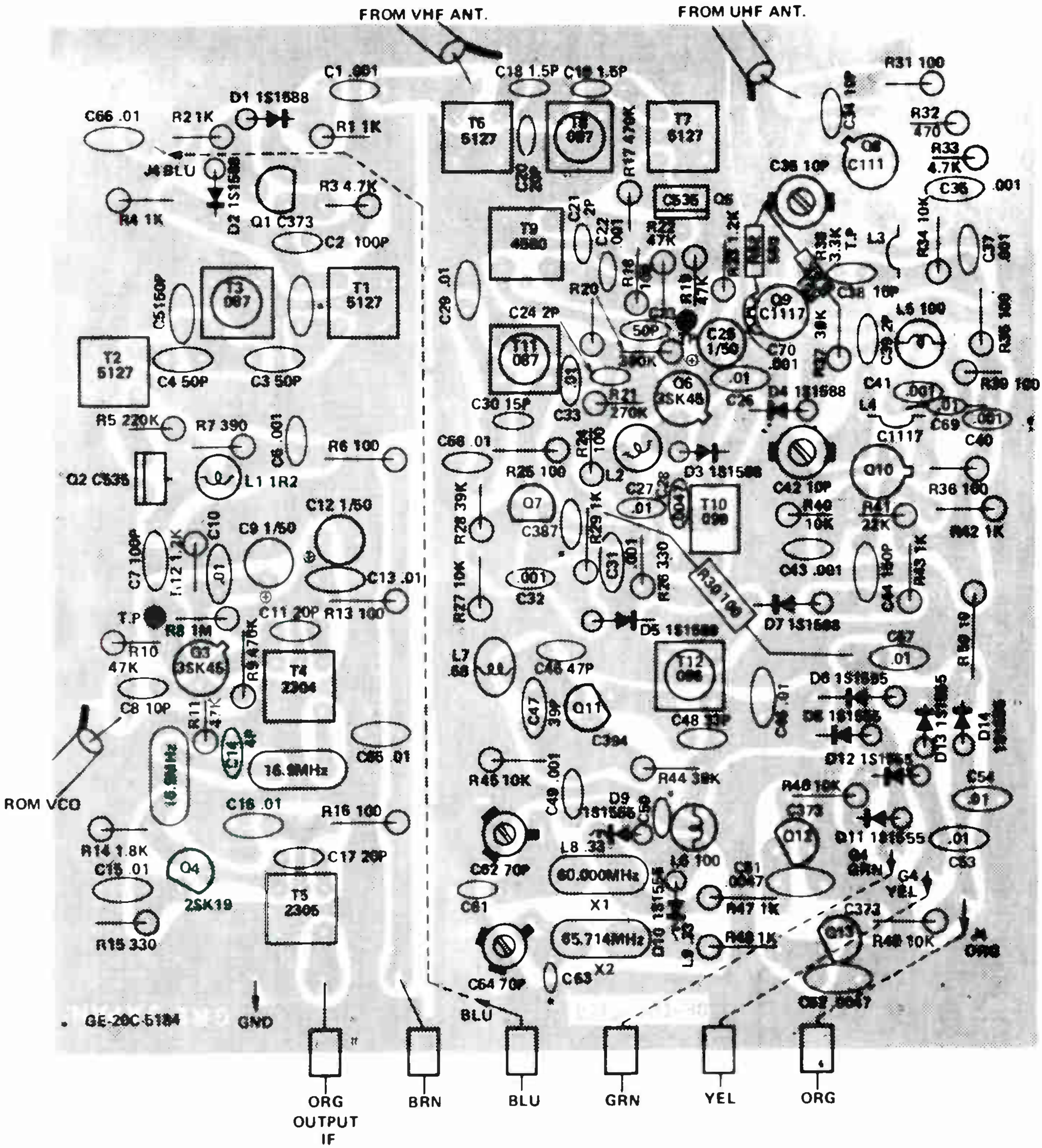
NOTE 2: *Crystal Frequency Calculation.*
The crystal frequencies are obtained by the following formula.
VHF LOW Crystal frequency (MHz) = Fr +10.7

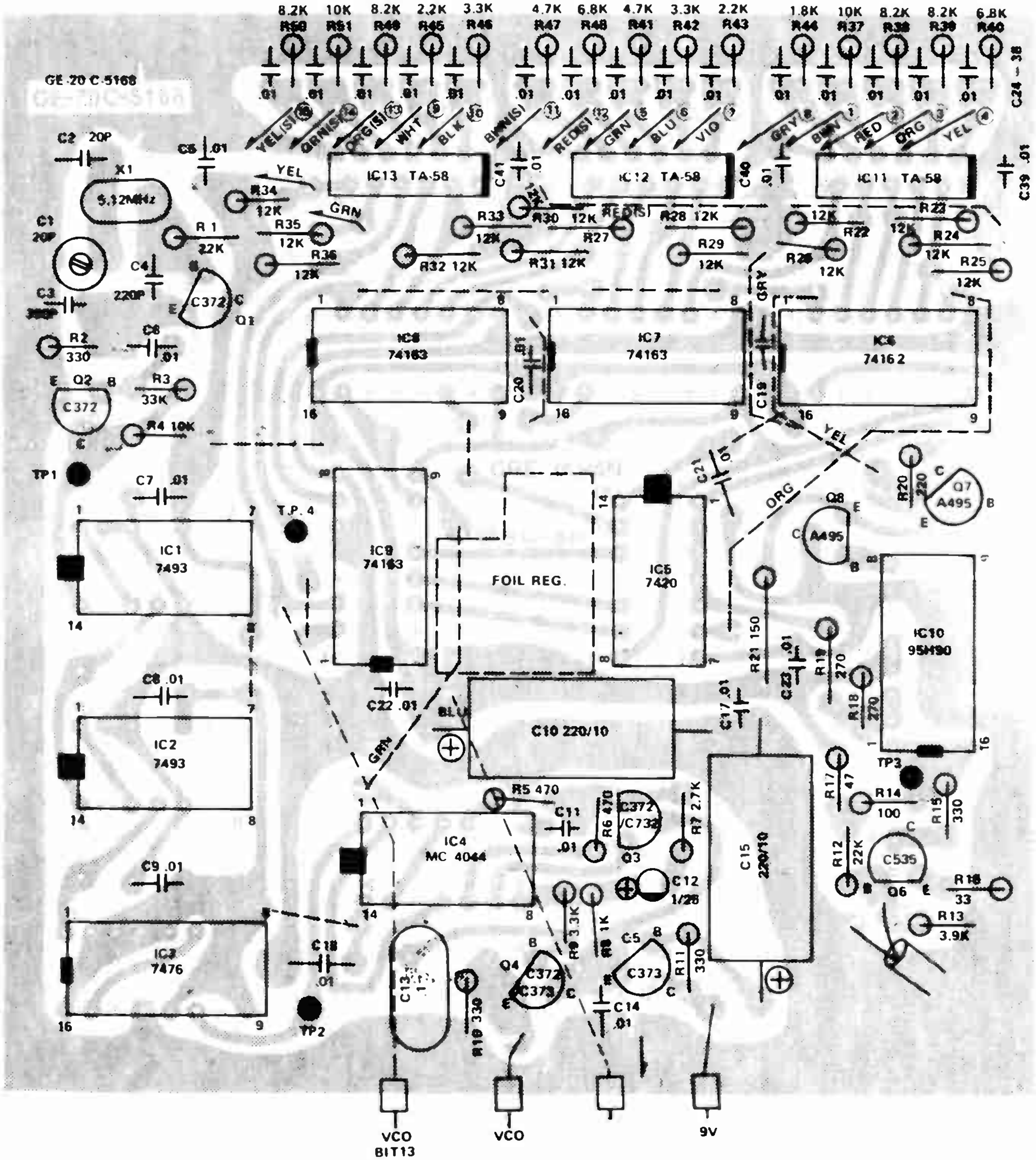
$$\text{VHF HIGH Crystal frequency (MHz)} = \frac{(Fr - 10.7)}{3}$$

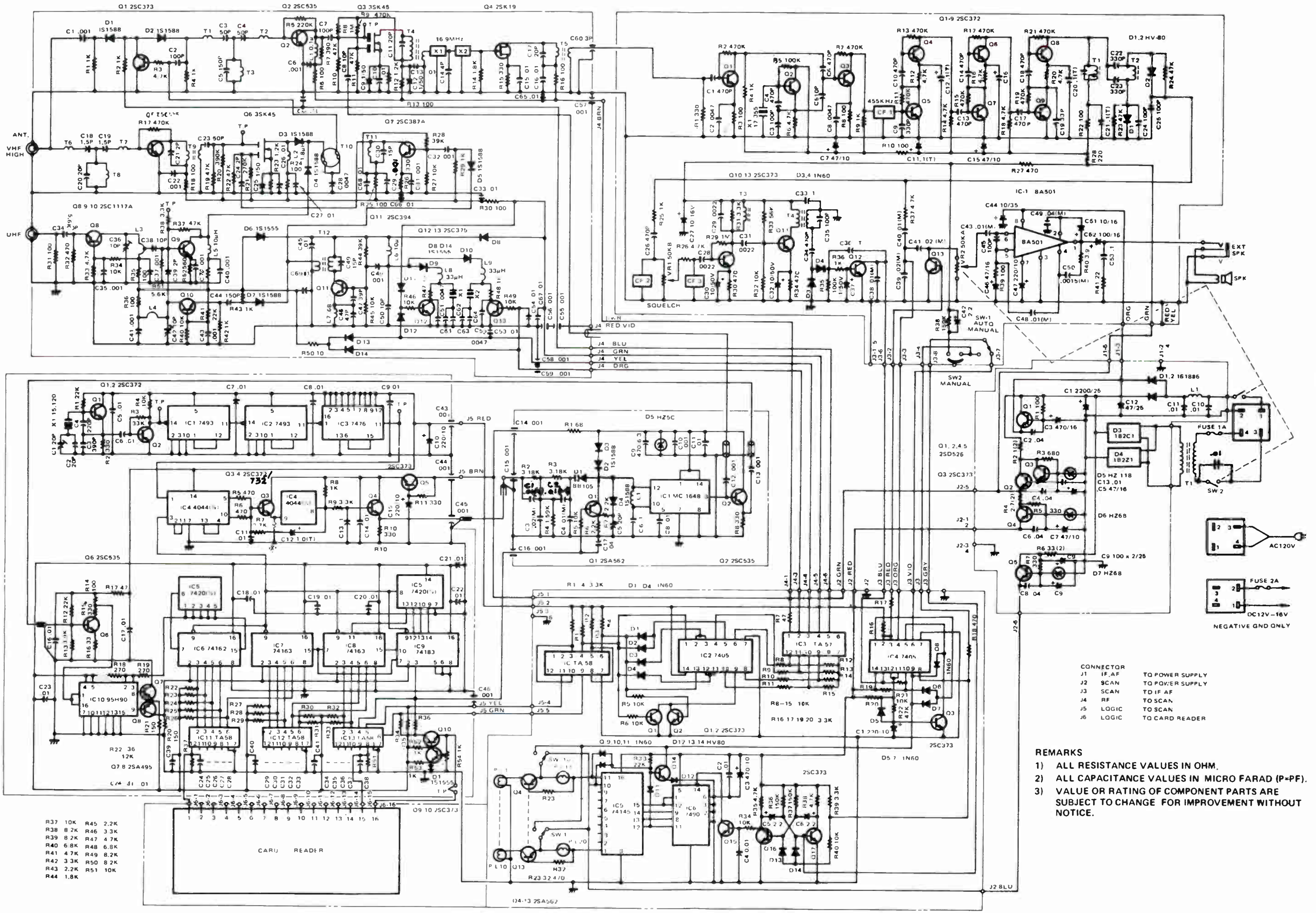
$$\text{UHF Crystal frequency (MHz)} = \frac{(Fr - 10.7)}{9}$$

Where Fr is the desired receive frequency, in MHz.



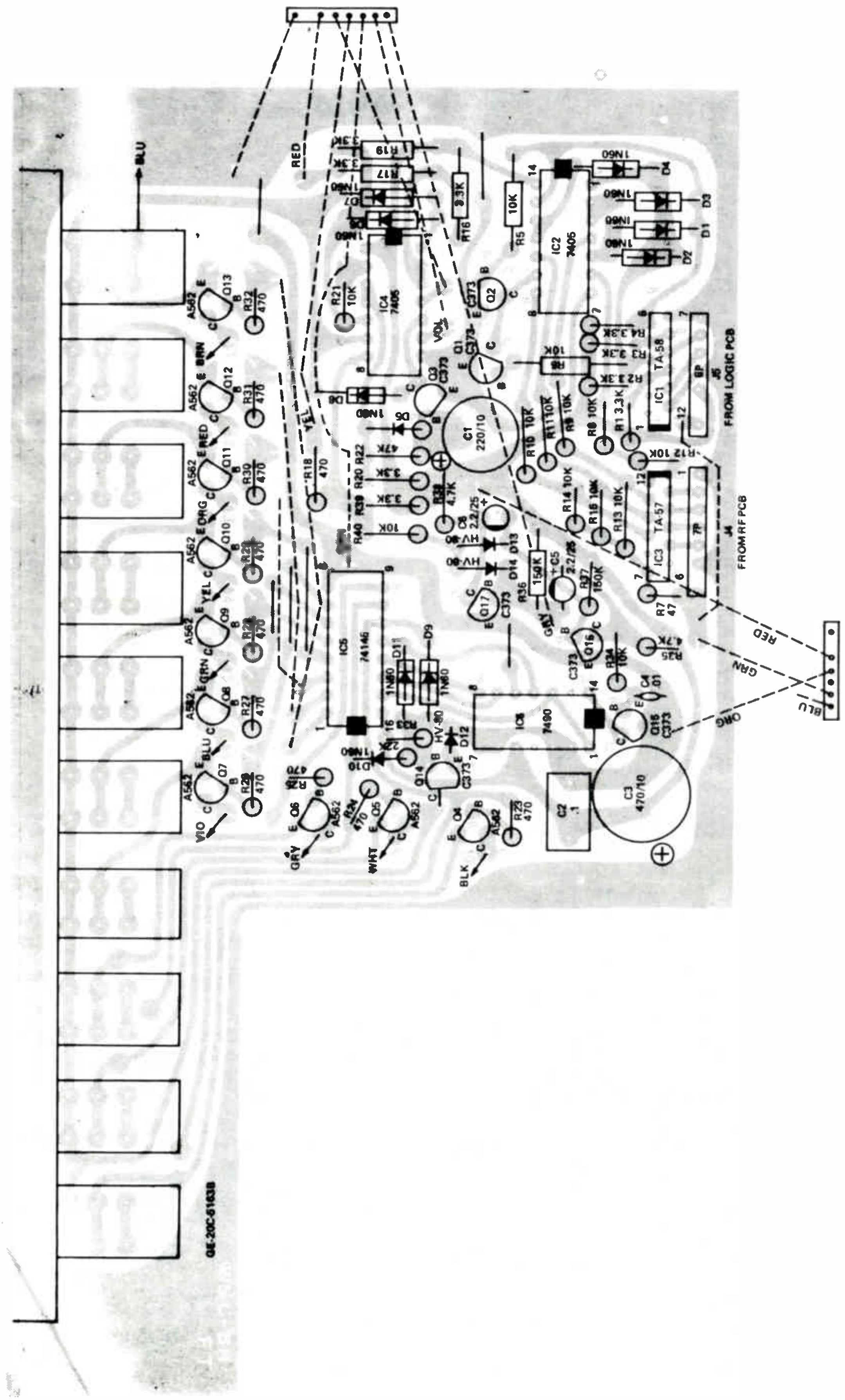

FROM VHF ANT.
FROM UHF ANT.
ROM VCO
GND
BLU
ORG
OUTPUT
IF
BRN
BLU
GRN
YEL
ORG


GE-20 C-5168
X1
5.12MHz
IC13 TA-58
IC12 TA-58
IC11 TA-58
IC8 74163
IC7 74163
IC6 74162
IC1 7493
IC2 7493
IC3 7476
IC9 74163
FOIL REG.
IC5 7420
IC10 95H90
C10 220/10
IC4 MC 4044
C15 220/10
TP1
T.P. 4
TP2
TP3
VCO BIT13
VCO
9V



REMARKS
1) ALL RESISTANCE VALUES IN OHM.
2) ALL CAPACITANCE VALUES IN MICRO FARAD (P=PF).
3) VALUE OR RATING OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

SBE Opti/Scan (SBE-12SM)



Power Supply P. C. Board

		Parts List
GE-20D-5201	Printed Circuit Board	8-40-121
2SD526	Transistor	8-40-001
2SC373	Transistor	8-9-089
1S1885	Diode	8-28-048
HZ-6B	Zener Diode	8-40-002
HZ-11B	Zener Diode	8-40-003
1B2C1	Rectification Stack	8-40-004
1B2Z1	Rectification Stack	8-40-005
47uF/10V	Electrolytic Capacitor	8-28-023
47uF/25V	Electrolytic Capacitor	8-7-008
100uFx2/25V	Electrolytic Capacitor	8-28-203
2200uF/25V	Electrolytic Capacitor	8-40-131
470uF/16V	Electrolytic Capacitor	8-11-143
SN-8D500	Choke Coil	8-40-009
Y1340G	Power Transformer	8-40-010

Scan P. C. Board

		Parts List
GE-20C-5163	Printed Circuit Board	8-40-122
2SC373	Transistor	8-9-089
2SA562(Y)	Transistor	8-28-217
7405	Integrated Circuit	8-28-187
7490	Integrated Circuit	8-40-011
74145	Integrated Circuit	8-28-044
TA-57	Integrated Circuit	8-40-012
1N60	Diode	8-6-007
HV-80	Diode	8-28-045
220uF/10V	Electrolytic Capacitor	8-28-022
470uF/10V	Electrolytic Capacitor	8-28-031
0.47uF/25V	Tantalum Capacitor	8-40-052
2.2uF/25V	Tantalum Capacitor	8-40-053
TA-58	Integrated Circuit	8-40-013

VCO P. C. Board

		Parts List
GE-19D-4994	Printed Circuit Board	8-40-124
2SA562	Transistor	8-28-217
2SC535(B)	Transistor	8-9-177
MC-1648L	Integrated Circuit	8-40-014
BB-105G	Diode	8-40-020
1S1588	Diode	8-28-267
1S1555	Diode	8-10-109
HZ5C	Zener Diode	8-40-021
47uF/10V	Electrolytic Capacitor	8-28-023
ECV-1ZW20X51	Trimmer Capacitor	8-40-056

Logic P. C. Board

		Parts List
GE-20C-5168	Printed Circuit Board	8-40-125
7493	Integrated Circuit	8-28-043
7476	Integrated Circuit	8-40-015
7420	Integrated Circuit	8-40-016
74163	Integrated Circuit	8-40-017
74162	Integrated Circuit	8-40-018
95H90	Integrated Circuit	8-40-019
MC-4044	Integrated Circuit	8-38-002
TA-58	Integrated Circuit	8-40-013
2SC372(O)	Transistor	8-28-206
2SC373	Transistor	8-9-089
2SC535(B)	Transistor	8-9-177
2SA495	Transistor	8-10-019
5.120MHz	Crystal	8-40-022
ECV-1ZW20X51	Trimmer Capacitor	8-40-056
1uF/25V	Tantalum Capacitor	8-40-134
220uF/10V	Electrolytic Capacitor	8-40-055

Logic P. C. Board (Foil Regulator)

		Parts List
GE-20D-5426	Printed Circuit Board	8-40-126
SR-19R 1K	Semi Fixed Resistor	8-40-040
2SC373	Transistor	8-9-089
1S1555	Diode	8-40-109

IF P. C. Board

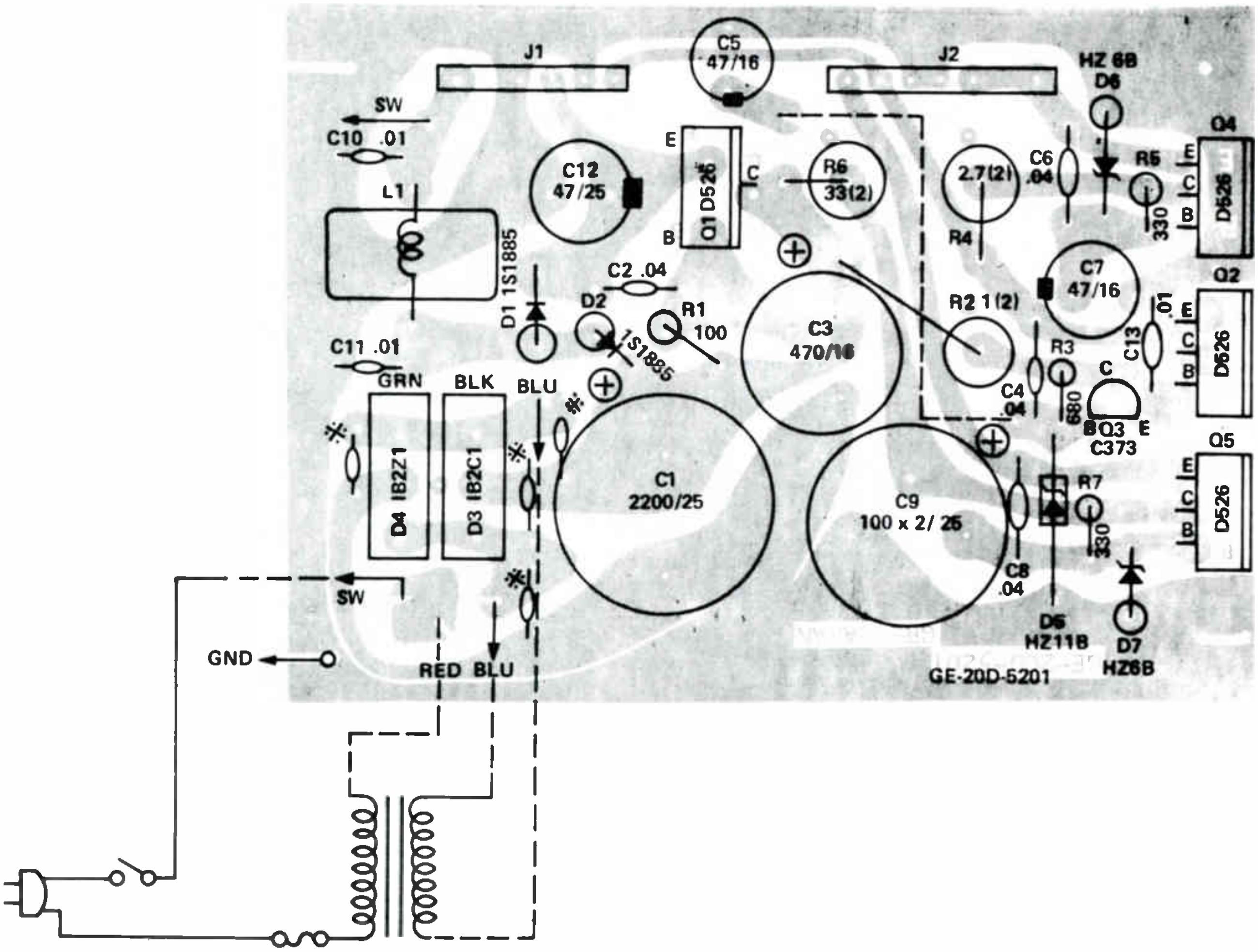
		Parts List
GE-20C-5169	Printed Circuit Board	8-40-127
BA-501	Integrated Circuit	8-28-188
2SC372(O)	Transistor	8-28-206
2SC373(Y)	Transistor	8-9-089
1N60	Diode	8-6-007
HV-80	Diode	8-28-045
17.355MHz	Crystal	8-40-023
7MC-452503N	Coil	8-28-207
7MC-2091N	Coil	8-28-208
CS15D1V0R1-M	Tantalum Capacitor	8-28-034
2.2uF/25V	Tantalum Capacitor	8-40-053
10uF/16V	Electrolytic Capacitor	8-28-026
1uF/50V	Electrolytic Capacitor	8-28-024
47uF/10V	Electrolytic Capacitor	8-5-077
47uF/16V	Electrolytic Capacitor	8-28-023
10uF/35V	Electrolytic Capacitor	8-40-054
100uF/16V	Electrolytic Capacitor	8-28-027
220uF/10V	Electrolytic Capacitor	8-28-022

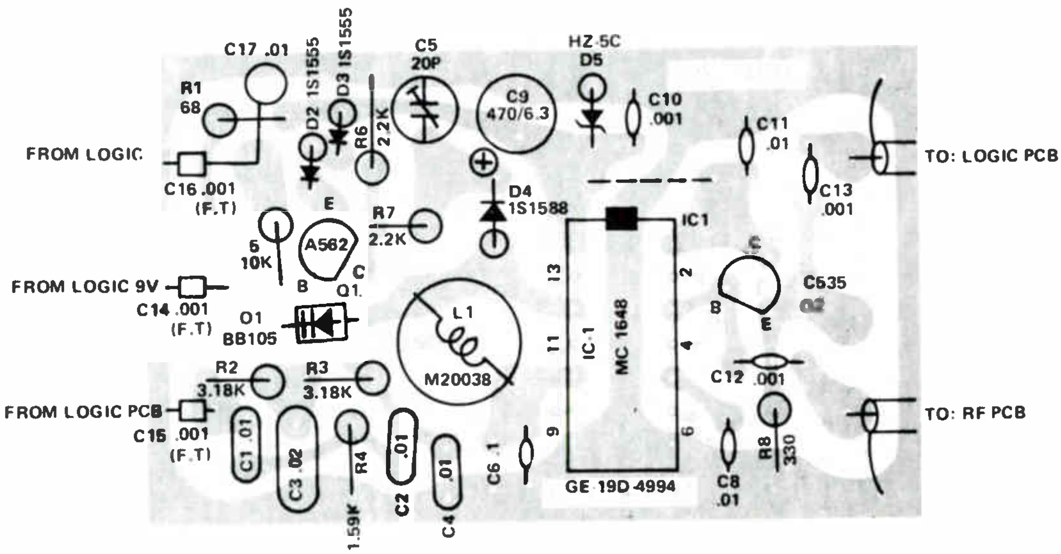
RF P. C. Board

		Parts List
GE-20C-5184	Printed Circuit Board	8-40-128
2SC1117	Transistor	8-28-254
2SC535	Transistor	8-9-177
2SC373	Transistor	8-9-089
2SC394(O)	Transistor	8-40-132
2SC387(A)	Transistor	8-40-027
2SK19	F.E.T.	8-4-081
3SK45	F.E.T.	8-11-053
16.9MHz	Crystal Filter	8-40-024
60.0MHz	Crystal	8-40-025
1S1588	Diode	8-28-267
1S1555	Diode	8-10-109
65SN0-097	Coil	8-40-031
65SN0-096	Coil	8-40-032
65SN0-087	Coil	8-40-033
113KN-5127Z	Coil	8-40-034
113SN-4580	Coil	8-40-035
119LN-12305N	Coil	8-40-036
119LN-12304N	Coil	8-40-037
1uF/50V	Electrolytic Capacitor	8-28-024

Final Parts

		Parts List
TAV-633250-0-A0	UHF Antenna	8-40-074
T2007-166	VHF Antenna	8-40-075
QS-4F	AC Cable Assembly	8-28-078
QS-4F	DC Cable Assembly	8-28-079

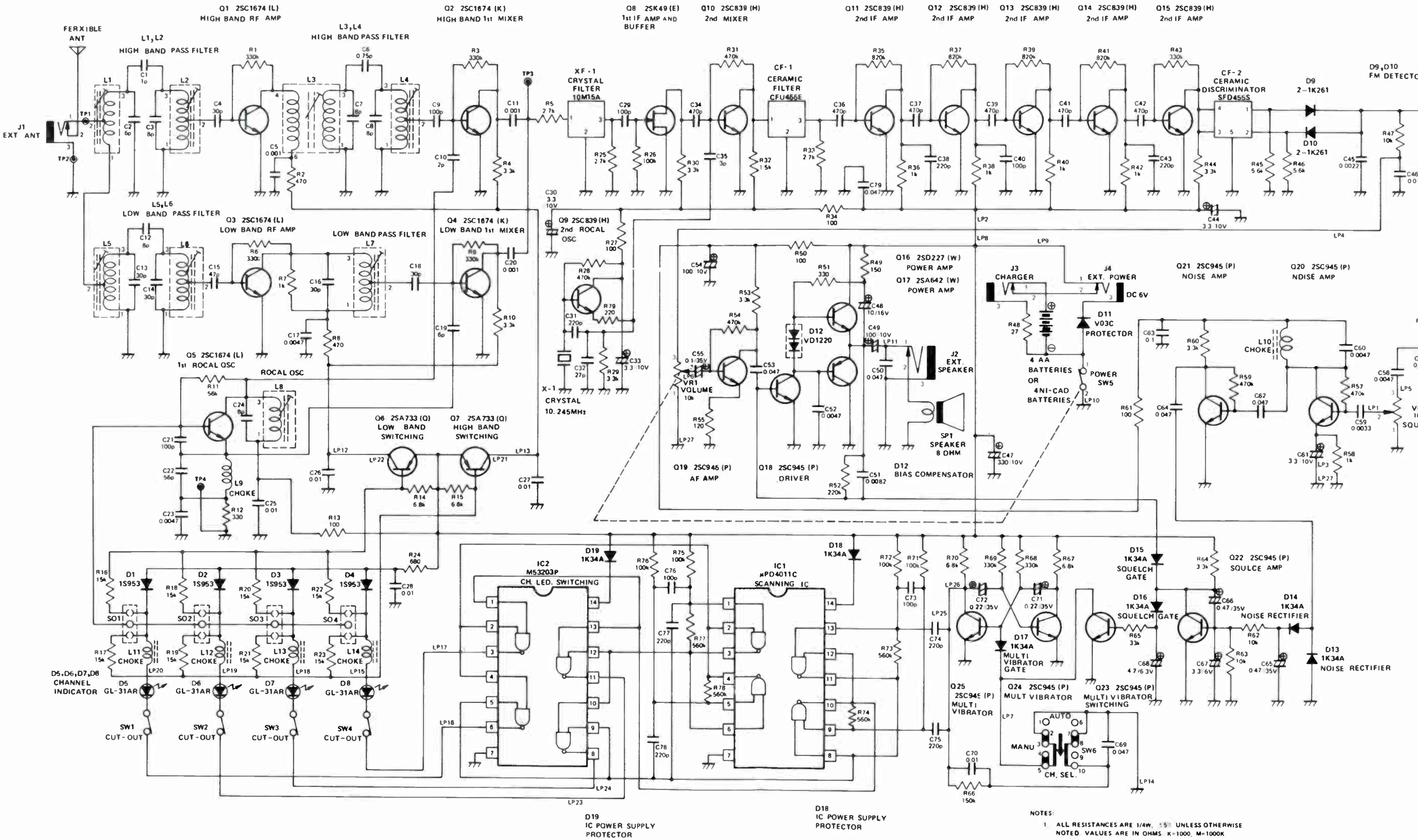

J1
C5
47/16
J2
HZ 6B
D6
SW
C10 .01
E
C12
47/25
Q1 D526
C
R6
33(2)
2.7(2)
C6
.04
R5
330
Q4
E
C
B
D526
L1
B
R4
D1 1S1885
C2 .04
D2
R1
100
C3
470/16
R2 1(2)
C7
47/16
Q2
E
C
B
D526
C11 .01
1S1885
R3
680
C13
.01
C
GRN
BLK
BLU
C4
.04
BQ3 E
C373
Q5
D4 1B2Z1
D3 1B2C1
C1
2200/25
C9
100 x 2/ 25
R7
330
E
C
B
D526
C8
.04
SW
D6
HZ11B
D7
HZ6B
GND
RED
BLU
GE-20D-5201


C17 .01
D2 1S1555
D3 1S1555
C5
20P
HZ-5C
D5
R1
68
R6
2.2K
C9
470/6.3
C10
.001
C11
.01
FROM LOGIC
TO: LOGIC PCB
C16 .001
(F.T)
E
R7
2.2K
D4
1S1588
IC1
C13
.001
6
10K
A562
B
C
Q1
13
2
C
C535
Q2
FROM LOGIC 9V
C14 .001
(F.T)
D1
BB105
L1
IC-1
MC 1648
11
4
B
E
R2
3.18K
R3
3.18K
M20038
C12 .001
FROM LOGIC PCB
C15 .001
(F.T)
TO: RF PCB
C1 .01
C3 .02
R4
1.59K
C2
.01
C4
.01
C6 .1
9
6
R8
330
C8
.01
GE 19D 4994

Pages 120-127 Courtesy of MONTGOMERY WARD & CO.

REF. NO.	PART NO.	DESCRIPTION
C1	CC 1P 50V .5P	1PF ±0.5PF 50V Ceramic
C2,19	CC 6P 50V .5P	6PF ±0.5PF 50V Ceramic
C3,7,8,12,24	CC 8P 50V .5P	8PF ±0.5PF 50V Ceramic
C4,13,14,16,18	CC 30P 50V 10	30PF ±10% 50V Ceramic
C5,11,20	CC .001U 50V 20	0.001MF ±20% 50V Ceramic
C6	CC .75P 50V .25P	0.75PF ±0.25PF 50V Ceramic
C9,21,29,40,73,76	CC 100P 50V 10	100PF ±10% 50V Ceramic
C10	CC 2P 50V .5P	2PF ±0.5PF 50V Ceramic
C15	CC 47P 50V 10	47PF ±10% 50V Ceramic
C17	CC .0047U 50V 10	0.0047MF +100%-0% 50V Ceramic
C22	CC 56P 50V 10	56PF ±10% 50V Ceramic
C23,52,58,60	CC .0047U 50V 20	0.0047MF ±20% 50V Ceramic
C25,28	CC .01U 50V 20	0.01MF ±20% 50V Ceramic
C26,27,70	CC .01U 50V 100-0	0.01MF +100%-0% 25V Ceramic
C30,33,44,61,67	CT 3.3U 10V 20	3.3MF ±20% 10V Tantalum Elect.
C31,38,43,74,75,77,78	CC 220P 50V 20	220PF ±20% 50V Ceramic
C32	CC 27P 50V 10	27PF ±10% 50V Ceramic
C34,36,37,39,41,42	CC 470P 50V 20	470PF ±20% 50V Ceramic
C35	CC 3P 50V 10	3PF ±10% 50V Ceramic
C45	CC 2200P 50V 20	0.0022MF ±20% 50V Ceramic
C46,57	CM .01U 50V 20	0.01MF ±20% 50V Mylar
C47	CE 330U 10V 100-10	330MF +100%-10% 10V Elect.
C48	CE 10U 16V 100-10	10MF +100%-10% 16V Elect.
C49,54	CE 100U 10V 100-10	100MF +100%-10% 10V Elect.
C50,69,79	CC .047U 50V 100-0	0.047MF +100%-0% 25V Ceramic
C51	CM .0082U 50V 10	0.0082MF ±20% 50V Mylar
C53,62,64	J331080	0.047MF +80%-20% 12V Ceramic Semiconductor 5369-473043
C55	CT .1U 35V 20	0.1MF ±20% 35V Tantalum Elect.
C59	CC 3300P 50V 20	0.0033MF ±20% 50V Ceramic
C63	J331071	0.1MF ±20% 12V Ceramic Semiconductor
C65,66	CT .47U 35V 20	0.47MF ±20% 35V Tantalum Elect.
C68	CT 4.7U 6.3V 20	4.7MF ±20% 6.3V Tantalum Elect.
C71,72	CT .22U 35V 20	0.22MF ±20% 35V Tantalum Elect.

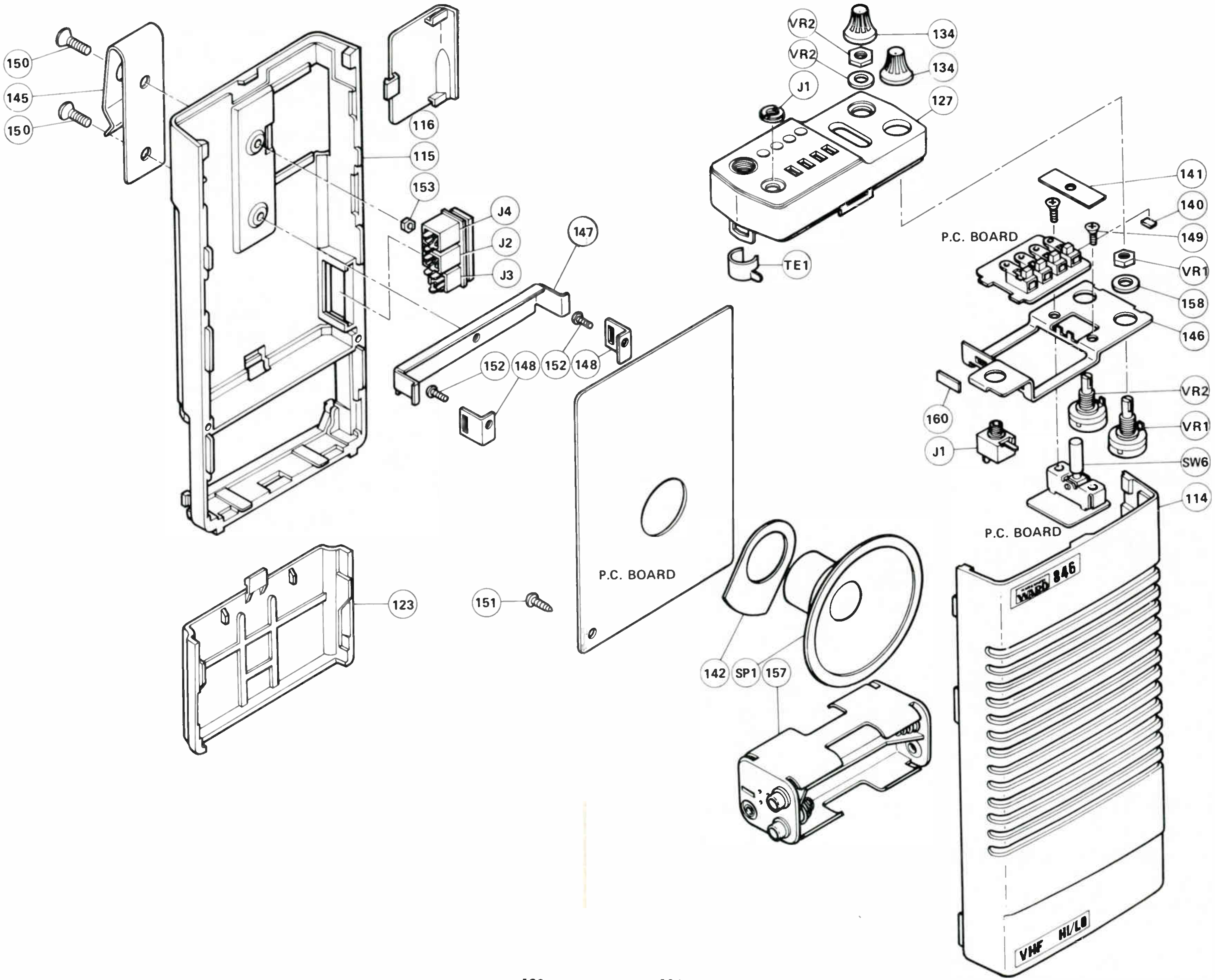
REF. NO.	PART NO.	DESCRIPTION	
VR1	J25769	Variable Resistor, 10 K ohm Volume Control (W/Power Switch SW 5)	5112-103017
VR2	J25770	Variable Resistor, 10 K ohm Squelch Control	5112-103018



NOTES:

1. ALL RESISTANCES ARE 1/4W, ±5% UNLESS OTHERWISE NOTED. VALUES ARE IN OHMS. K=1000, M=1000K
2. ALL CAPACITANCES VALUES ARE IN MF UNLESS OTHERWISE NOTED. P=MMF

Wards Airline GEN-846A



REF. NO.	PART NO.	DESCRIPTION	
101	J75141	Individual Carton Box	1221-01562
103	J75142	Packing Protector	1222-563
104	J75143	Packing Protector	1222-564
105	J75157	Polyethylene Bag, Owner's Guide, Guarantee Card	1241-C1230
106	J75158	Polyethylene Bag, Set	1241-C1216
107	J75144	Polyethylene Bag, Flexible Antenna	1241-C12121
108	J75159	Polyethylene Bag, Wire Antenna	1241-C1214
109	J60301	Wire Antenna	4161-0177
110	63MW221	Magnetic Earphone	5821-F16019
111	J75160	Polyethylene Bag, Earphone	1241-C1270
112	J59224	Owner's Guide	1111-F103
113	E591955	Guarantee Card	1116-0127
114	J98855	Cabinet Front Assembly	A311-846
115	J98856	Back Cover Assembly	A312-846
116	J70716	Crystal Compartment Cover Assembly	A314-846
123	J18551	Battery Component Cover	1313-01116
127	J70717	Top Panel	1339-01320
134	J501102	Knob, Volume/ON-OFF, Squelch	1352-01490
137	J60300	Flexible Antenna	1396-011
140	J381085	Spacer, Ch. Cutout Switch/LED P.C. Board	2132-237
141	J381016	Spacer, Auto/Manual Scan Switch	2132-230
142	J381017	Spacer, Speaker (SP 1)	2132-231
145	J381019	Bracket, Back Cover	2219-870
146	J381020	Bracket, Top Panel	2219-871
147	J381086	Bracket, Back Cover Mounting	2219-889
148	J381087	Bracket, Back Cover Holding (x2)	2219-890
149	J471492	Screw (2.6 x 4 mm) (x2)*	2323-260429
150	J471493	Screw (3 x 8 mm) (x2)	2323-300859
151	J471494	Self Tapping Screw (+) (2.6 x 8 mm)	2347-260821
152	J471480	Screw (2.6 x 4 mm) (x2).	2327-260429
153	J471502	Hexagon Nut	2446-30109
157	J18550	Battery Case	1321-471
158	J42962	Metal Washer	2401-0612
160	J381089	Tape, Bracket (146)	CL-EIE24ND13
TE 1	J19641	Terminal, Flexible Antenna	2652-00172

*NOTE: The notation "(2.6 x 4 mm) (x2)" means the screw diameter is 2.6 mm, its length is 4 mm, it is used in 2 places.

REF. NO.	PART NO.	DESCRIPTION	
Q1,3,5	2SC1674	Transistor, RF AMP. (High and Low Band) 1st Local Osc.	5613-1674 (L)
Q2,4	2SC1674	Transistor, 1st Mixer (High and Low Band)	5613-1674 (K)
Q6,7	2SA733	Transistor, Switching 1st IF AMP. and BUFFER	5611-733 (Q)
Q8	2SK49	Fild Effect Transistor	5616-2SK49 (E)
Q9,10	2SC839	Transistor, 2nd Local Osc., 2nd Mixer	5613-839 (H)
Q11,12,13, 14,15	2SC839	Transistor, 2nd IF Amp.	5613-839 (H)
Q16*	2SA642 (W) 2SD227 (MP)	Transistor, Power Amp.	5614-227 (W)
Q17*		Transistor, Power Amp.	5611-642 (W)
Q18,19	2SC945	Transistor, Driver, AF Amp.	5613-945 (P)
Q20,21	2SC945	Transistor, Noise Amp.	5613-945 (P)
Q22	2SC945	Transistor, Squelch Amp.	5613-945 (P)
Q23	2SC945	Transistor, Multi Vibrator Switching	5613-945 (P)
Q24,25	2SC945	Transistor, Multi Vibrator	5613-945 (P)
D1,2,3,4	1S953	Diode, Switching	5636-1S953
D5,6,7,8	GL31AR	Light Emitting Diode, Channel Indicator	5637-GL31AR
D9,10	2-1K261	Diode, FM Detector	5631-2-1K261
D11	V03C	Diode, Polarity Protector	5632-V03C
D12	VD1220	Varistor, Power Transistor Bias Compensation	5641-VD1220
D13,14	1K34A	Diode, Noise Rectifier	5631-1K34A
D15,16	1K34A	Diode, Squelch Gate	5631-1K34A
D17	1K34A	Diode, Multi Vibrator Switcning	5631-1K34A
D18,19	1K34A	Diode, IC Power Supply Protector	5631-1K34A
IC 1	uPD4011C	Integrated Circuit, Scanning Multiplex	5654-uPD4011C
IC 2	M53203P	Integrated Circuit, Channel Switching	5654-M53203P

*Replace only with matched pairs.

REF. NO.	PART NO.	DESCRIPTION	
L1,2,4	J611295	Coil,High Band Pass Filter	5932-0015
L3	J611296	Coil,High Band Pass Filter	5932-0025
L5,6,7	J611297	Coil,Low Band Pass Filter	5932-0035
L8	J611295	Coil, OSC Coil	5932-0015
L9	J611300	Coil,Line Choke	5991-0013
L10	J611298	Coil,Line Choke	5995-0116
L11,12,13, 14	J611299	Coil,Line Choke	5995-220233
XF-1	J305	Crystal Filter,10.7 MHz Band Pass Filter	5678-011A
CF-1	J303	Ceramic Filter,455KHz Band Pass Filter	5671-0111E
CF-2	J304	Ceramic Discriminator,FM Discriminator	5671-0112

MISCELLANEOUS

SW1,2,3,4	J12604	Slido Switch, Channel Cutout	4421-011017
SW6	J12603	Lever Switch,Auto/Manual/CH Selector	4462-023012
SP	J10172	Dynamic Speaker,2" (50mm) 8 ohm	5811-C050016
J1	J63351	Jack,Wire Antenna	4451-0023
J2,3,4	J63350	3-Pin Jack,Ext. Speaker/Charger/ Ext. Power	4453-012
S01,2,3,4	J26850	Socket,Crystals	4473-2
TP1,2,3,4	J26851	Terminal.Test Point	4214-7015
X-1	J241288	Crystal,10.245 MHz Osc.	5691-01024515
	J56474	P.C. Board Assembly,Main	D551-846-A
	J56475	P.C. Board Assembly,Auto/Manual/ CH Selector	D551-846-B
	J56476	P.C. Board Assembly,Channel Cutout Switch	D551-846-C
	J381088	Shield Plate	2216-182
	J381018	Holder,Indicator LED	2132-232

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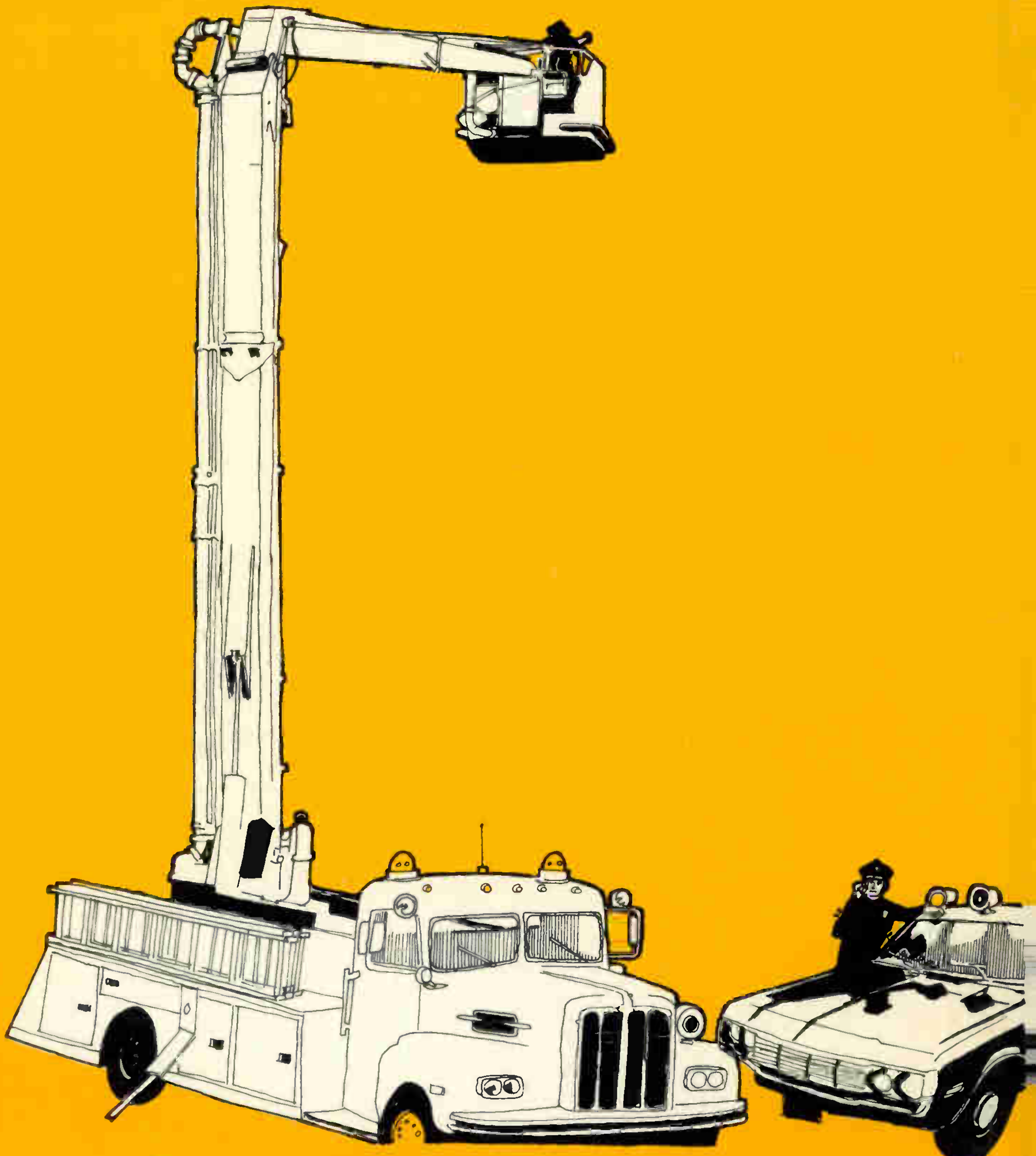
Listing all models/chassis covered in

SAMS SD (Scanner Data) Series volumes



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SD-12
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Courier Cop-Scan M8-HU
Courier Cop-Scan M8-HUH
Craig 4351
Craig 4353
Electra Bearcat 101
Fanon Scanfare M8-HL
Fanon Scanfare M8-HU
Fanon Scanfare M8-HUH
RCA 16S100
RCA 16S400
Realistic PRO-5A (20-169)
Realistic PRO-40 (20-140)
Surveyor 4 UHF
Surveyor 4 VHF
Surveyor 10 HLP

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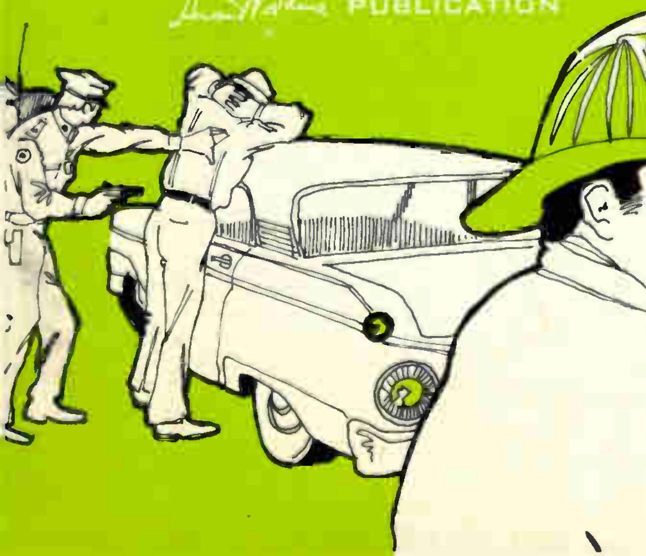

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SD-10

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First Edition
First Printing-April, 1977

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Scanner-Monitor Servicing Data

SD-10

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

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1. TEST EQUIPMENT REQUIRED

(1) Sweep Generator (30 - 50 MHz)
(2) Sweep Generator (150 - 170 MHz)
(3) Sweep Oscilloscope 2 units
(4) FM Signal Generator (10.7 MHz)
(5) FM Signal Generator (450 - 512 MHz)
(6) FM Signal Generator (150 - 170 MHz)
(7) Power Supply (DC 13.8 V/1 A)
(8) V.T.V.M.
(9) Oscilloscope
(10) Dummy Load (4 ohm/3 W)
(11) Volt Meter (DC 10 V)

2. NOTES

(1) Use a non-metallic tool.
(2) The test equipment should be wamed up at least 1 hour before proceeding with alignment.
(3) Input signal from the generator should be kept as low as possible and still obtain usable input.
(4) Refer to ALIGNMENT POINTS (CHASSIS LAYOUT) for alignment components and location.

3. TEST EQUIPMENT SET-UP DIAGRAM

(1) IF, AFC, SQUELCH and UHF SENSITIVITY ALIGNMENTS

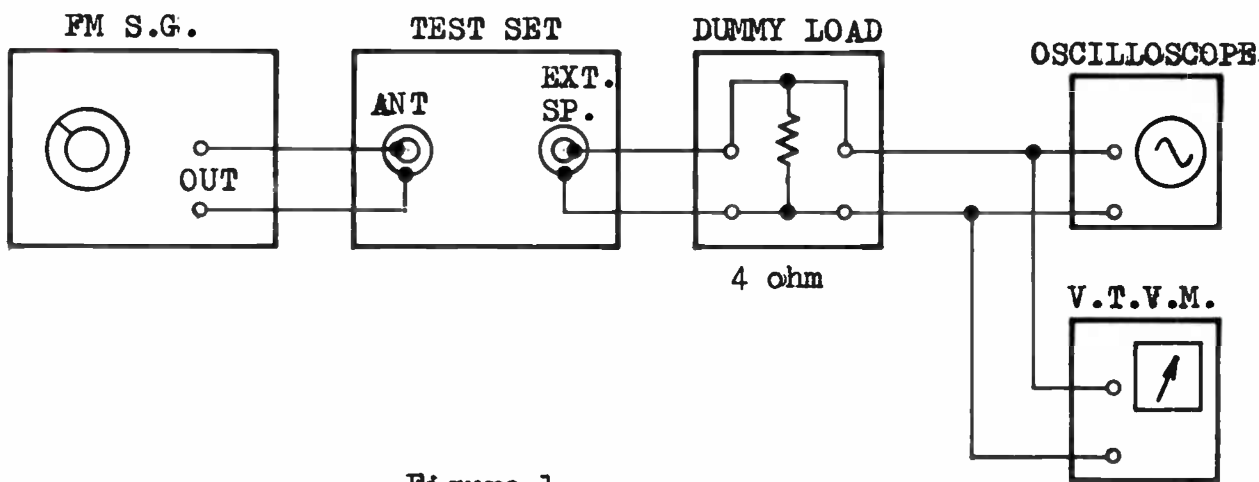
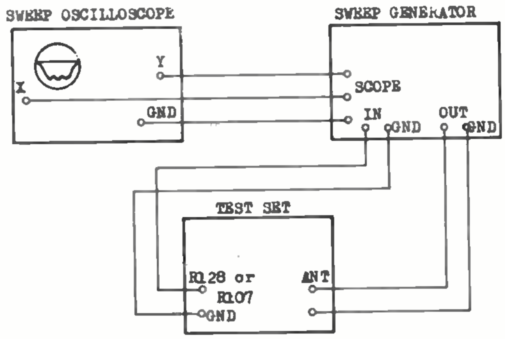


Figure 1

.2) RF ALIGNMENT (Hi-VHF and Lo-VHF BANDS)



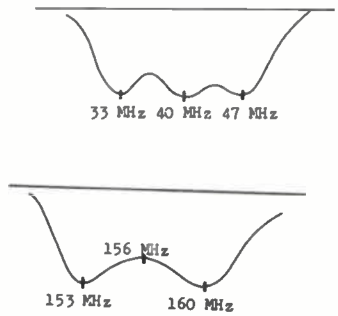
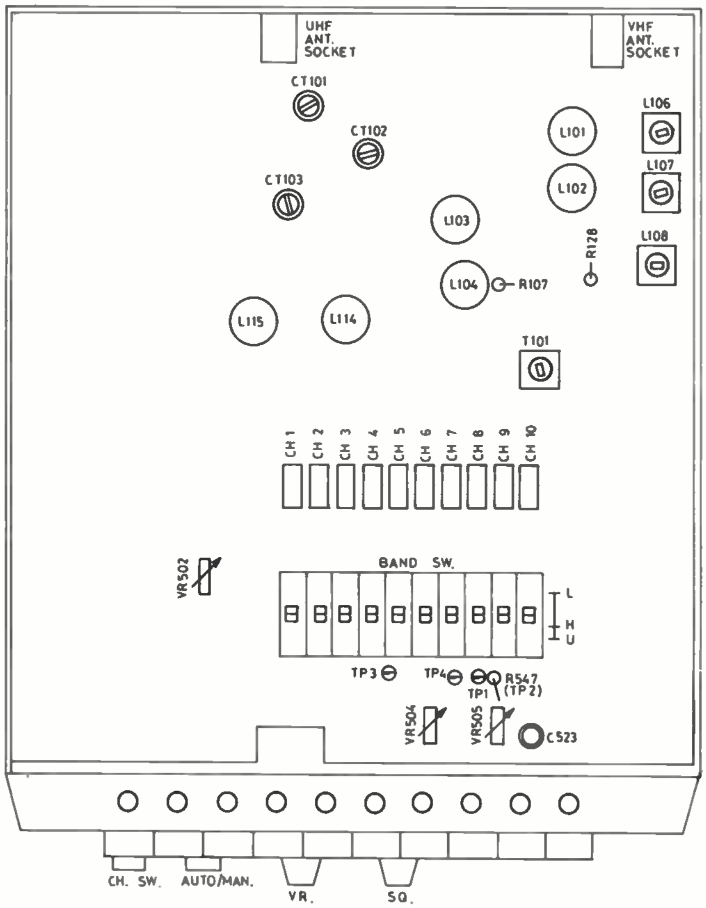
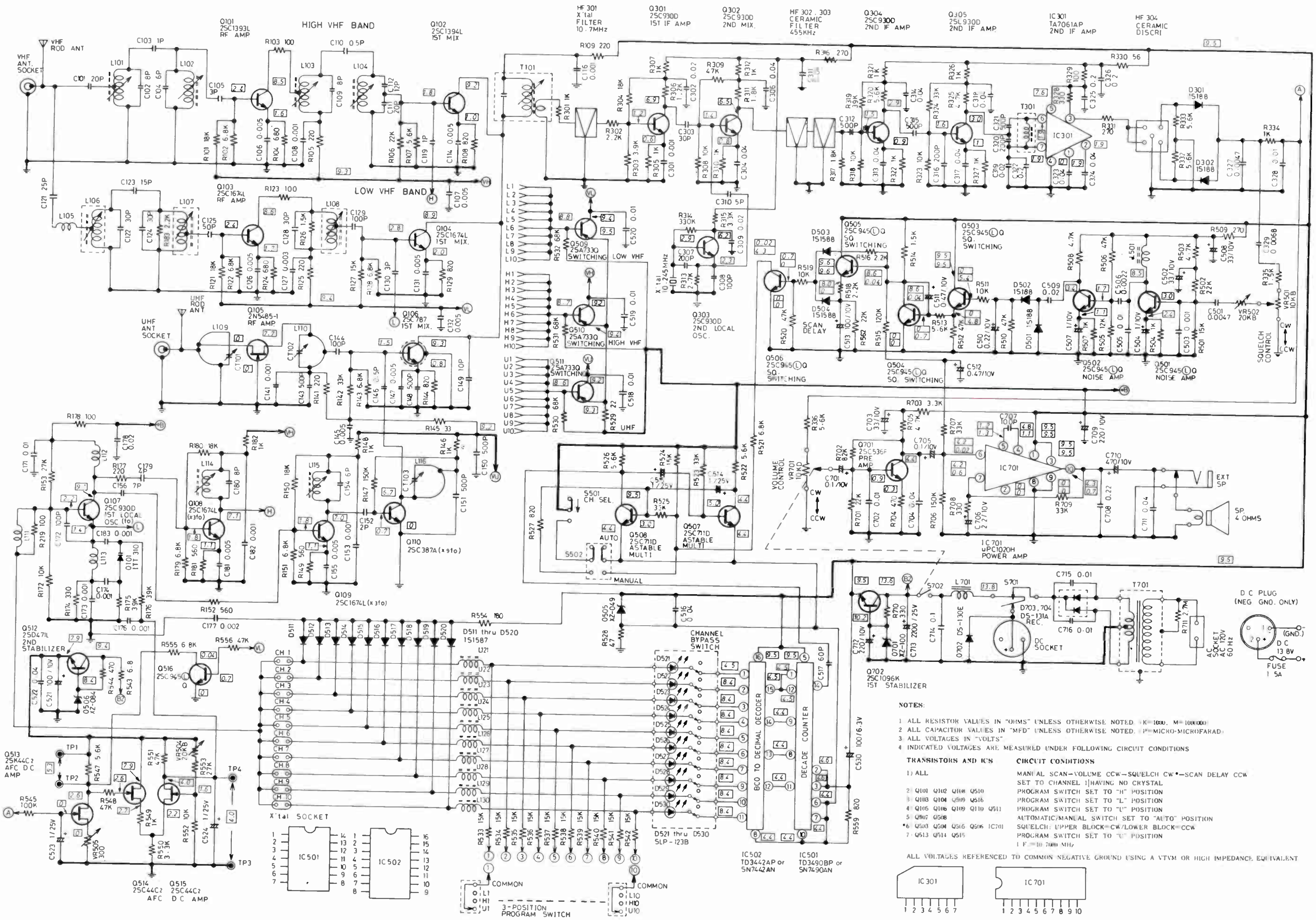


Figure 2

ALIGNMENT POINTS (CHASSIS LAYOUT)





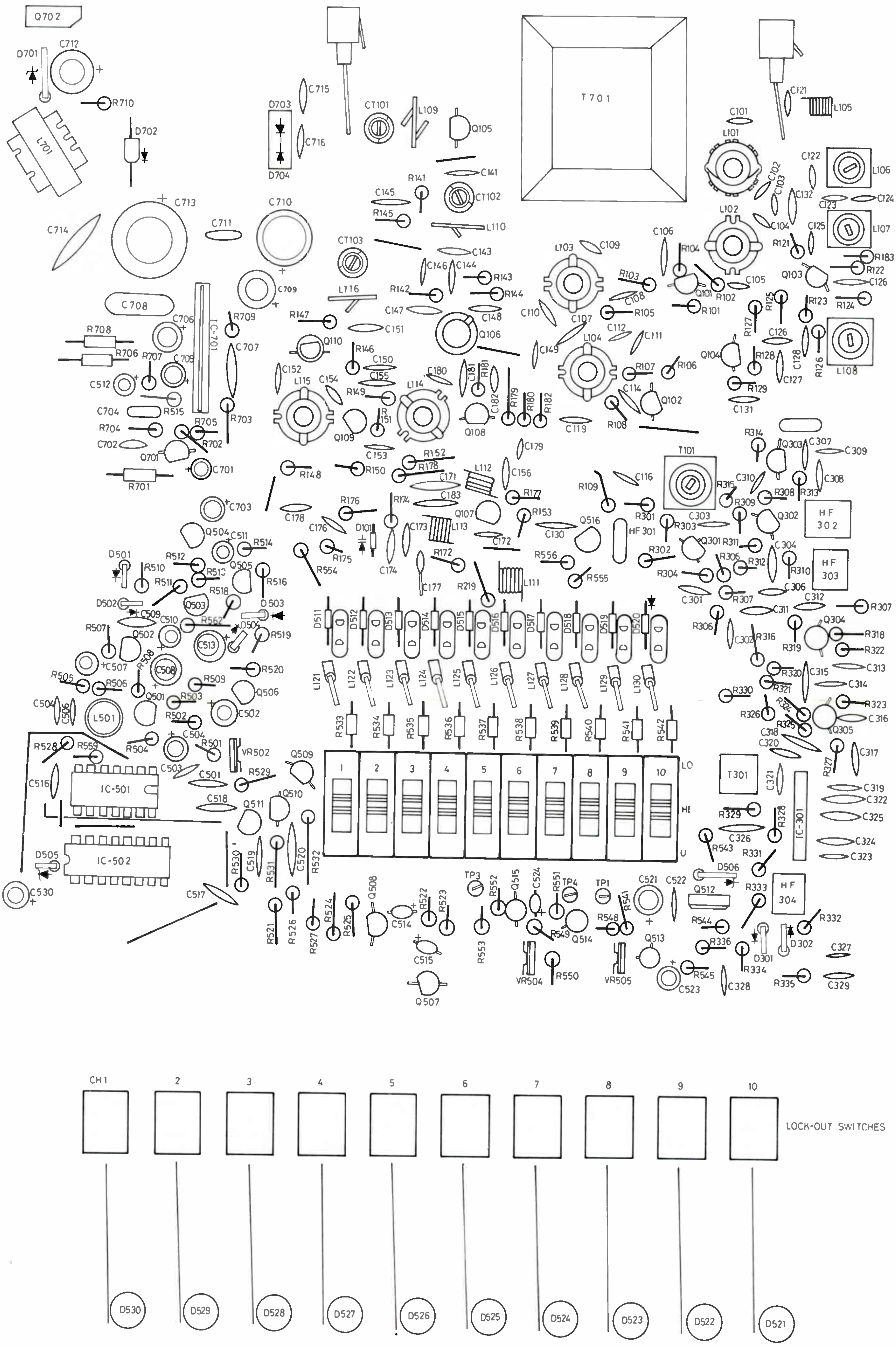
NOTES:

1. ALL RESISTOR VALUES IN "OHMS" UNLESS OTHERWISE NOTED. (K=1000, M=1000000)
2. ALL CAPACITOR VALUES IN "MFD" UNLESS OTHERWISE NOTED. (P=MICRO-MICROFARAD)
3. ALL VOLTAGES IN "VOLTS"
4. INDICATED VOLTAGES ARE MEASURED UNDER FOLLOWING CIRCUIT CONDITIONS

TRANSISTORS AND ICS	CIRCUIT CONDITIONS
1) ALL	MANUAL SCAN—VOLUME CCW—SQUELCH CW*—SCAN DELAY CCW SET TO CHANNEL 1 HAVING NO CRYSTAL
2) Q101 Q102 Q108 Q510	PROGRAM SWITCH SET TO "H" POSITION
3) Q103 Q104 Q509 Q516	PROGRAM SWITCH SET TO "L" POSITION
4) Q105 Q106 Q109 Q110 Q511	PROGRAM SWITCH SET TO "U" POSITION
5) Q507 Q508	AUTOMATIC/MANUAL SWITCH SET TO "AUTO" POSITION
*6) Q503 Q504 Q505 Q506 IC701	SQUELCH: UPPER BLOCK=CW/LOWER BLOCK=CCW
7) Q513 Q514 Q515	PROGRAM SWITCH SET TO "U" POSITION
	I.F.=10.7000 MHz

ALL VOLTAGES REFERENCED TO COMMON NEGATIVE GROUND USING A VTVM OR HIGH IMPEDANCE EQUIVALENT

Channel Master CS6794



(b) RF ALIGNMENT ON VHF BAND

STEP	CONNECT SIGNAL SOURCE TO	SET CONDITION	CONNECT OUTPUT INDICATOR TO	ADJUST	ADJUST FOR
1		VOLUME: Fully CCW SQUELCH: Fully CCW			

(Lo-VHF ALIGNMENT)

STEP	CONNECT SIGNAL SOURCE TO	SET CONDITION	CONNECT OUTPUT INDICATOR TO	ADJUST	ADJUST FOR
2	Output terminals of Sweep Generator connected to VHF ANT. JACK Input terminals of Sweep Generator connected bet. R128 and ground Note: Output level from Sweep Generator should be kept as low as possible.	Same as STEP 1 Channel: Activate CH. 1 PROGRAM SWITCH: Set CH. 1 to "LO" position	Sweep Oscilloscope connected to Sweep Generator as shown in Fig. 2	L106	Maximum 47 MHz waveform
				L107	Maximum 33 MHz waveform
				L108	Maximum 40 MHz waveform
					For optimum waveform, see Fig. 2.

3. ALIGNMENT PROCEDURE

(a) IF AND AFC ALIGNMENTS

STEP	SET SIGNAL SOURCE TO	SET CONDITION	CONNECT OUTPUT INDICATOR TO	ADJUST	ADJUST FOR
1	FM Signal Generator connected to UHF ANT. JACK Freq.: 10.7 MHz Mod.: 1000 Hz Deviation: 3.5 kHz	PROGRAM SWITCHES: All "U" position CHANNEL: Activate CH. 1 SQUELCH: Fully CCW	Oscilloscope and V.T.V.M. connected to EXT. SP JACK	T101	Best signal-to-noise ratio
2	Same as STEP 1	Same as STEP 1 Short C523	Volt Meter connected bet. TP-1(positive side) and TP-2(negative side)	VR505	5.32 V reading
3	Same as STEP 1	Same as STEP 1 Release C523 from shorted condition.	Volt Meter connected bet. TP-3(negative side) and TP-4(positive side)	VR504	4.0 V reading Note: Under STEP 2 and STEP 3, keep IF frequency exactly 10.7 MHz

(Hi-VHF ALIGNMENT)

3	Output terminals of Sweep Generator connected to VHF ANT. JACK Input terminals of Sweep Generator connected bet. R107 and ground Center Frequency: 156 MHz	Same as STEP 1 Channel: Activate CH. 1 PROGRAM SWITCH: Set CH. 1 to "HI" position.	Same as STEP 2	L101 L102 L103 L104	Waveform as shown in Fig. 2

(c) UHF AND SQUELCH ALIGNMENTS

(UHF ALIGNMENT)

STEP	CONNECT SIGNAL SOURCE TO	SET CONDITION	CONNECT OUTPUT INDICATOR TO	ADJUST	ADJUST FOR
1	Signal Generator connected to UHF ANT. JACK Freq.: 458 MHz(UHF) or the frequency of the crystal installed(UHF-T)	Channel: Activate CH. 1 PROGRAM SWITCH: Set CH. 1 to "U" position SQUELCH: Fully CCW Insert 458 MHz crystal (UHF) or any one crystal within 470-512 MHz (UHF-T) in CH. 1 crystal socket.	Oscilloscope and V.T.V.M. connected to EXT. SP JACK	CT101 CT102 CT103 L115	Maximum audio output

(SQUELCH ALIGNMENT)

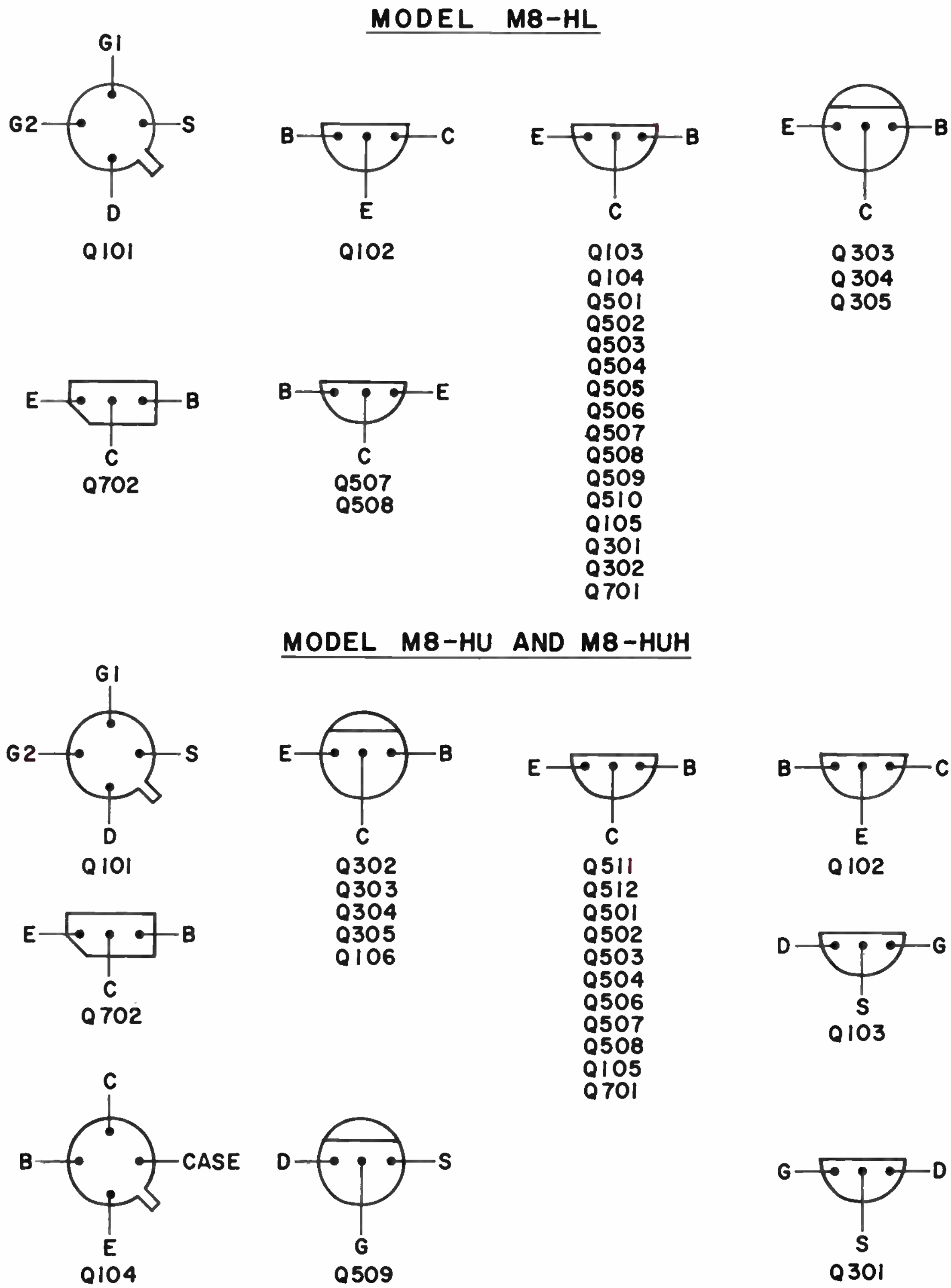
2	Signal Generator connected to VHF ANT. JACK Freq.: 156 MHz Output level: 2 μV	Channel: Activate CH. 1 PROGRAM SWITCH: Set CH. 1 to "HI" position SQUELCH: Fully CW Insert 156 MHz crystal in CH. 1 crystal socket.	Same as STEP 1	L114	Preset the top of L114 core to the top of L114 bobbin.
				VR502	Squelch open with 2 μV signal input

Q101	2SC1393	Transistor
Q102	2SC1394	Transistor
Q103,104,108,109	2SC1674	Transistor
Q106	2SC787	Transistor
Q110	2SC387	Transistor
Q107,30,302,303,304,305	2SC930	Transistor
Q501,502,503, 504,506,516	2SC945	Transistor
Q507	2SC945 or	Transistor
Q508	2SC711	Transistor
Q701	2SC536	Transistor
Q509,510,511	2SA733	Transistor
Q702	2SC1096	Transistor
Q105	2N5485-1	Transistor
Q513,514,515	2SK44	Transistor
Q512	2SD471	Transistor
D101	ITT310 or MV3102	Diode
D511,512,513,514,515,516 517,518,519,520	1S1587	Diode
D503,504	1S1588	Diode
D301,302,501,502	1S188	Diode
D703	DS131	Diode
D702	DS130	Diode
D505	XZ-049	Diode
D506	XZ-084	Diode
D701	XZ-100	Diode
D521,522,523,524,525,256 527,528,529,530 "21"	SLP-123	LED
IC502	TD3442or SN7442	Integrated Circuit
IC301	TA-7061	Integrated Circuit
IC701	uPC1020	Integrated Circuit
IC501	TD3490or SN7490	Integrated Circuit
CT101,102,103	Trimmer	
VR501	Variable Resistor,10KB	
VR701	Variable Resistor, 10KD	
VR502	Variable REsistor, 20KB	
VR504	Variable Resistor, 20KB	
VR505	Variable Resistor, 300 ohm	

L101	Antenna Coil
L102,104,114,115	Antenna Coil
L103	RF Coil
L109, 110,116	RF Coil
L106,107,108	RF Coil
L113	VHF Coil
L112	VHF Coil
L111	VHF Coil
L105	VHF Coil
L501	Choke Coil, 10mH
L701	Choke Coil
L121,122,123,124,125,126, 127,128,129,130	RF Choke, 25,uH RF Choke
T101	IFT, 10.7MHz
T301	IFT, 455KHz
T701	Power Trans.
HF301	HF Filter, 10.7MHz
	HF Filter, 10.7MHz
Hf302	HF Filter, 455 KHz
HF304	HF Filter,

C701,705	0.1 mfd	10V
C510	0.22 mfd	10V
C511,512	0.47 mfd	10V
C504	1 mfd	10V
C706	2.2 mfd	10V
C514,515,523,524	1 mfd	25V
C502,508,703	33 mfd	10V
C530	100 mfd	6.3V
C521,513	100 mfd	10V
C709,712	220 mfd	10V
C710	470 mfd	10V
C713	2200 mfd	25V

Pages 15-28 Courtesy of FANON/COURIER CORP.



NOTE:
TRANSISTORS ARE VIEWED FROM THE LEAD SIDE.

FIGURE 7, TRANSISTOR TERMINAL DIAGRAM

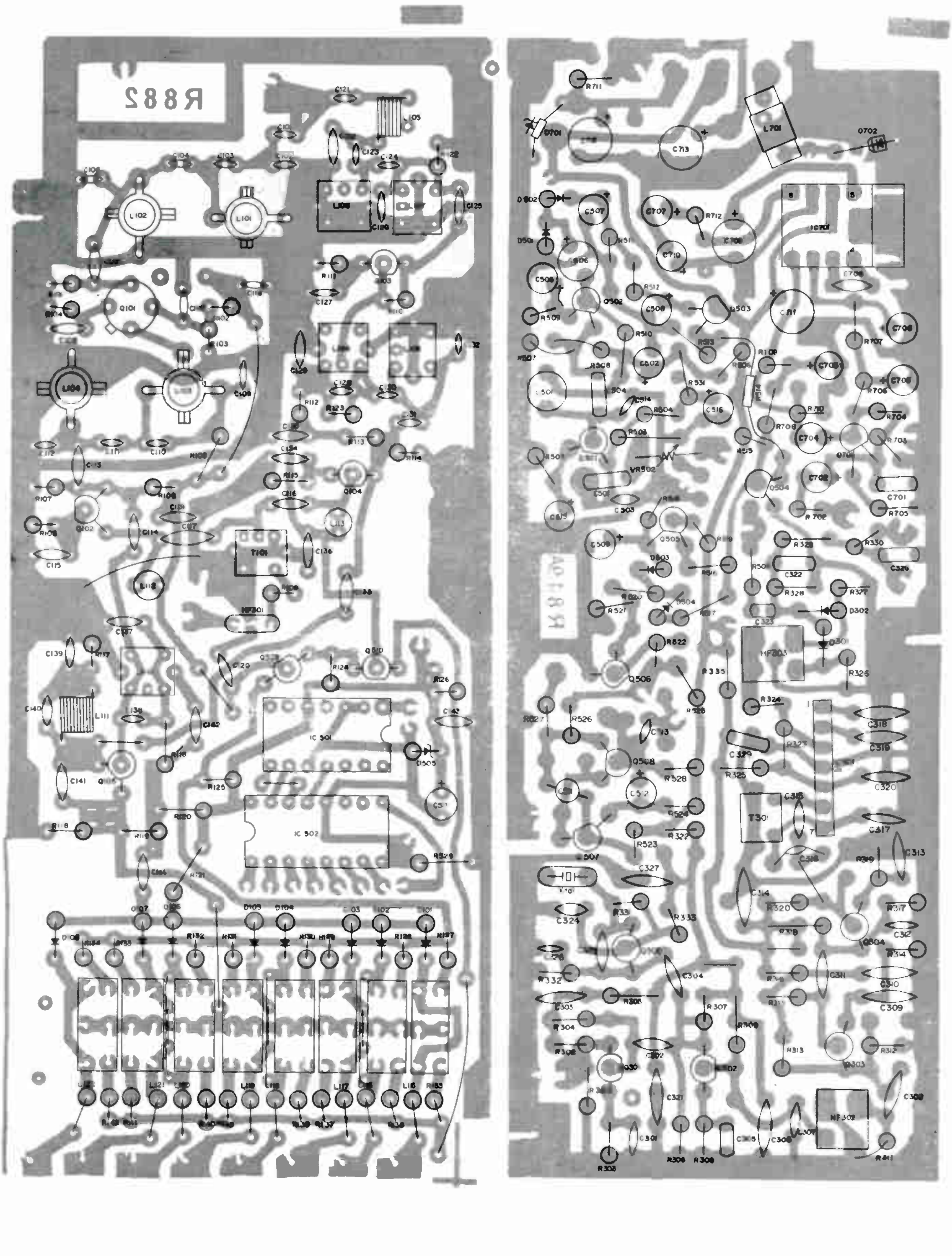


FIGURE 8, MODEL M8-HL, P.C. BOARD, COMPONENT SIDE

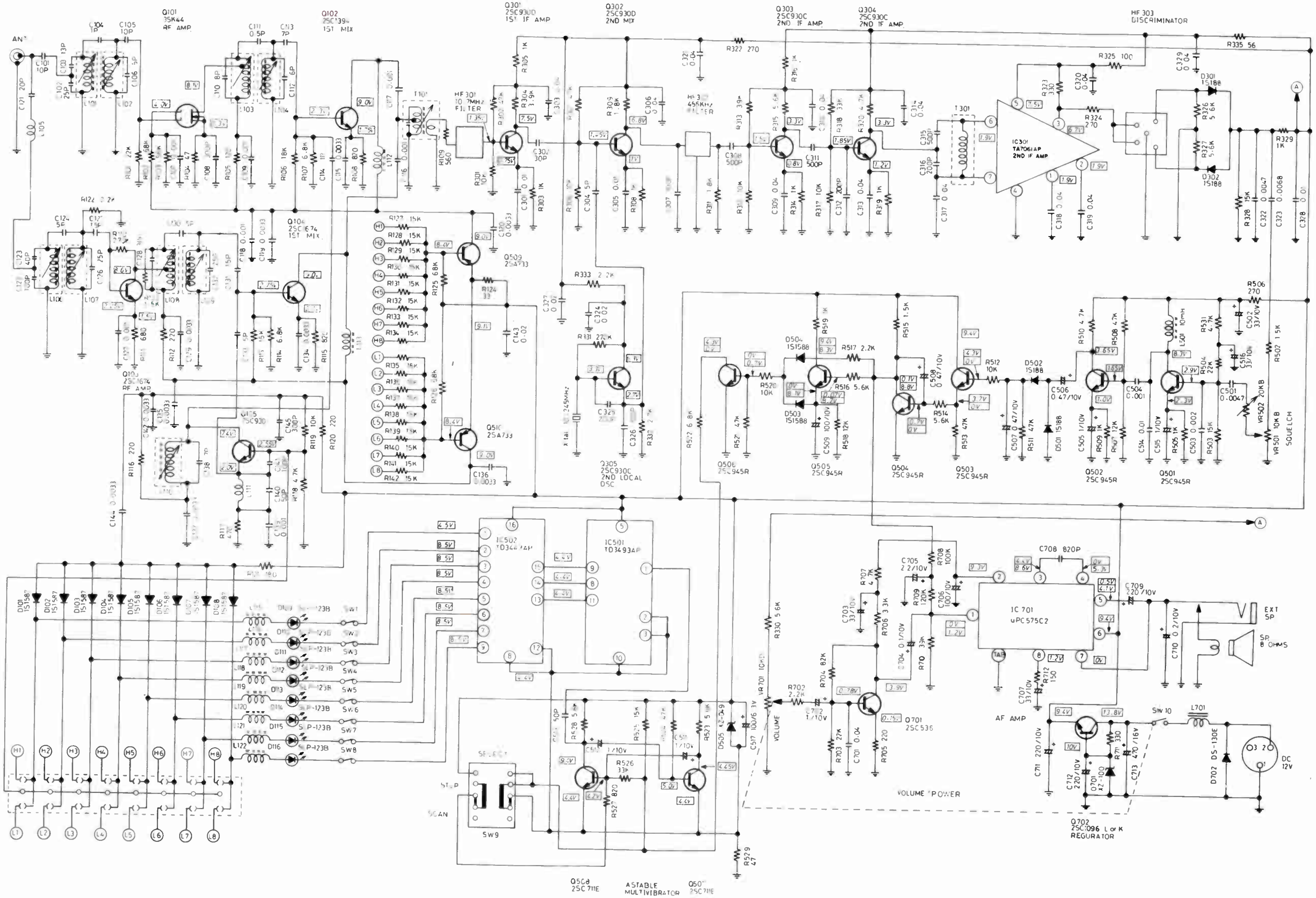


FIGURE 10, MODEL M8-HL, SCHEMATIC DIAGRAM

TABLE 2, TRANSISTOR VOLTAGES (MODEL M8—HL)

TRANSISTOR	S	D	G1	G2	SPECIAL CONDITION
Q101	0.3	8.1	0	4.0	Crystal Installed - VHF-HB

TRANSISTOR	B	E	C	SPECIAL CONDITION
Q102	2.2	1.8	9.0	Crystal Installed - VHF-HB
Q103	2.3	1.5	8.6	Crystal Installed - VHF-LB
Q104	2.8	2.1	9.0	Crystal Installed - VHF-LB
Q105	2.6	2.0	7.4	
Q301	1.4	0.8	7.5	
Q302	1.5	1.0	6.8	
Q303	1.5	0.8	3.3	
Q304	1.9	1.2	3.3	
Q305	3.3	2.7	6.3	
Q501	2.9	2.3	8.3	
Q502	1.7	1.0	3.7	
Q503	4.3	3.7	9.4	Squelch CW
	0	0	9.4	Squelch CCW
Q504	0.7	0	0.1	Squelch CW
	0	0	8.8	Squelch CCW
Q505	0.1	0	9.4	Squelch CW
	8.7	8.1	8.3	Squelch CCW
Q506	0	0	4.3	Squelch CW
	0.7	0	0	Squelch CCW
Q507	5.0	4.4	4.5	
Q508	4.2	4.4	9.4	
Q509	8.4	9.1	9.0	Crystal Installed - VHF-HB
Q510	8.5	9.1	9.0	Crystal Installed - VHF-LB
Q701	0.8	0.1	3.9	
Q702	10.0	9.4	13.8	

TABLE 4, INTEGRATED CIRCUIT VOLTAGES (ALL MODELS)

IC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	CONDITION
IC301	1.9	1.9	6.7	0	7.5	1.9	1.9	---	---	---	---	---	---	---	---	---	Squelch CCW
IC701	0	9.3	9.3	0	0.5	9.4	0	1.2	---	---	---	---	---	---	---	---	Squelch CW
	1.2	9.3	8.6	5.3	4.1	9.4	0	1.2	---	---	---	---	---	---	---	---	Squelch CCW
IC501	6.5	4.4	4.4	---	9.4	---	---	4.4	4.4	4.4	4.4	---	---	---	---	---	Channel 1
	6.5	4.4	4.4	---	9.4	---	---	4.4	8.5	4.4	4.4	---	---	---	---	---	Channel 2
	6.5	4.4	4.4	---	9.4	---	---	8.5	4.4	4.4	4.4	---	---	---	---	---	Channel 3
	6.5	4.4	4.4	---	9.4	---	---	8.5	8.5	4.4	4.4	---	---	---	---	---	Channel 4
	6.5	4.4	4.4	---	9.4	---	---	4.4	4.4	4.4	8.5	---	---	---	---	---	Channel 5
	6.5	4.4	4.4	---	9.4	---	---	4.4	8.5	4.4	8.5	---	---	---	---	---	Channel 6
	6.5	4.4	4.4	---	9.4	---	---	8.5	4.4	4.4	8.5	---	---	---	---	---	Channel 7
	6.5	4.4	4.4	---	9.4	---	---	8.5	8.5	4.4	8.5	---	---	---	---	---	Channel 8
IC502	4.4	8.5	8.5	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	4.4	4.4	9.4	Channel 1
	8.5	4.4	8.5	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	4.4	8.5	9.4	Channel 2
	8.5	8.5	4.4	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	8.5	4.4	9.4	Channel 3
	8.5	8.5	8.5	4.4	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	8.5	8.5	9.4	Channel 4
	8.5	8.5	8.5	8.5	4.4	8.5	8.5	4.4	8.5	---	---	4.4	8.5	4.4	4.4	9.4	Channel 5
	8.5	8.5	8.5	8.5	8.5	4.4	8.5	4.4	8.5	---	---	4.4	8.5	4.4	8.5	9.4	Channel 6
	8.5	8.5	8.5	8.5	8.5	8.5	4.4	4.4	8.5	---	---	4.4	8.5	8.5	4.4	9.4	Channel 7
	8.5	8.5	8.5	8.5	8.5	8.5	8.5	4.4	4.4	---	---	4.4	8.5	8.5	8.5	9.4	Channel 8

CHANNEL FREQUENCY	CRYSTAL FREQUENCY FORMULA	LOAD CAPACITY
30 to 45 MHz:	(Desired Frequency) plus (10.7 MHz)	Series resonance (-) 450 Hz (62pF)
45 to 50 MHz:	(Desired Frequency) minus (10.7 MHz)	Series resonance (-) 450 Hz (62pF)
146 to 175 MHz:	(Desired Frequency) minus (10.7 MHz) / Divided by 3	Series resonance (-) 450 Hz (62pF)
450 to 512 MHz:	(Desired Frequency) minus (10.7 MHz) / Divided by 9	18pF

For all models, install lowest band crystals in socket pins A & B and install highest band crystals in socket pins B & C.

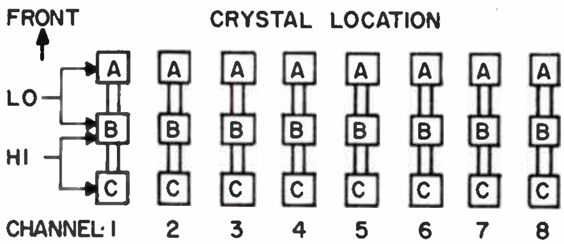


FIGURE 2, CRYSTAL INSTALLATION DIAGRAM

TEST EQUIPMENT REQUIRED
(Or Equivalent)

* Regulated Power Supply, 12 VDC 500 Ma.
* FM Signal Generator, Measurements Model 560 FM.
* Frequency Counter, Systron/Donner Model 7015.
* DC Voltmeter, Hewlett Packard Model 410B.
* Wattmeter/DB Meter, EICO Model 261.
* Load, 8 ohms Non-Inductive.
* Antenna Connector, Cinch #13B or AVA Electronics #M-20-59.
* Distortion Analyzer, Hewlett Packard Model 330B.

3. Test and Alignment Setup

Test equipment should be warmed up before proceeding with alignment. Use only a non-metallic tool at adjustment points. Input signal from the generator should always be kept as low as possible and still obtain a usable input.

A. Connect test equipment to unit under test as shown in Figure 4.

B. Set Mobile Scanner switches and controls as follows:

Volume Control to obtain 0.77 VRMS (0 db) of noise across load.
Squelch Control to full CCW position.
Bypass Switches to "up" position.
Manual/Scan Switch to center position.

C. Operate the Manual/Scan switch to select channel 1 and set in the center position.

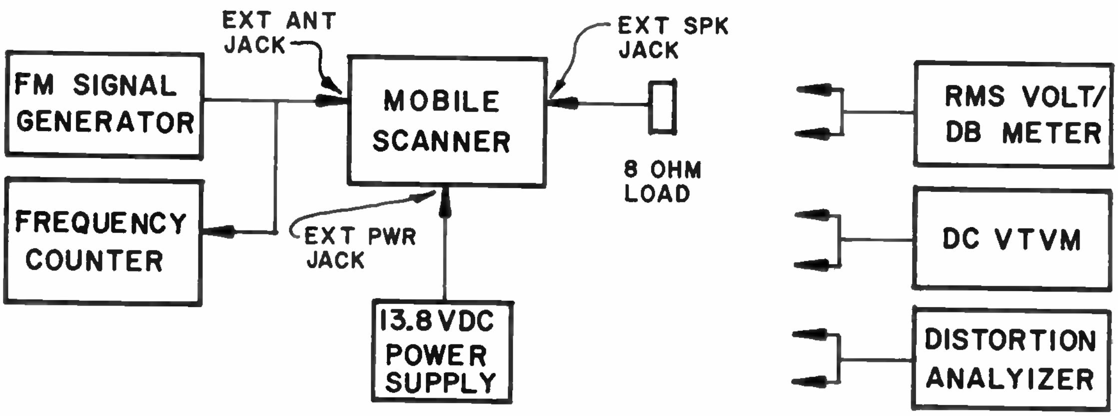


FIGURE 4, TEST SETUP DIAGRAM

4. RF Alignment, Model M8-HL (Figure 5)

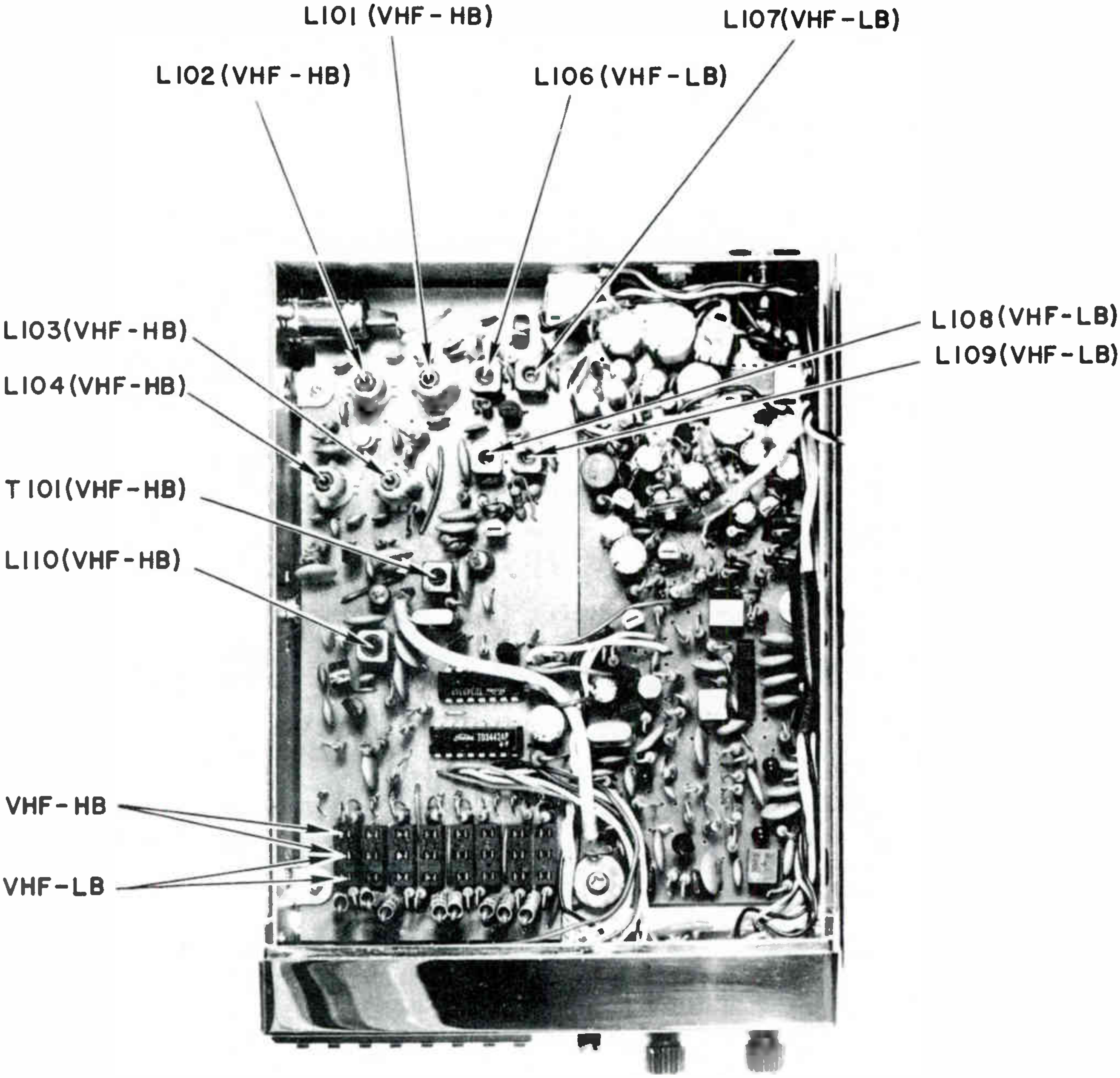
A. Insert a crystal for center-of-the-band alignment in the VHF-HB side of the channel 1 socket. For a center-of-the-band of 156 MHz, the actual crystal oscillating frequency should be 48.433 MHz.

B. Adjust FM signal generator to the center-of-the-band frequency as observed on frequency counter. Adjust the signal generator output (without modulation) to obtain a drop of 10 db on RMS volt/db meter. Vary signal generator slightly above and below the tuned frequency to verify that actual crystal frequency is correct for center-of-the-band alignment.

C. Adjust L101, L102, L103, L104, L110, and T101 for minimum reading on RMS volt/db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10 db quieting. Refer to Figure 5 for location of adjustments.

D. Remove VHF-HB crystal and insert crystal for center-of-the-band alignment in the VHF-LB side of channel 1 socket. For a center-of-the-band of 39 MHz, the actual crystal oscillating frequency should be 49.7 MHz.

E. Repeat Step B.



NOTE:
HB - HIGH BAND (146-174 MHZ)
LB - LOW BAND (30-50 MHZ)

FIGURE 5, LOCATION OF FREQUENCY ADJUSTMENTS (M8-HL)

F. Adjust L106, L107, L108, and L109 for minimum reading on RMS volt/db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10 db quieting.

MODEL	CENTER-OF-THE-BAND FREQUENCY	ACTUAL CRYSTAL FREQUENCY
M8-HU	460 MHz	49.922 MHz
M8-HUH	493 MHz	53.588 MHz

G. Repeat step D.

H. Adjust CT1, CT2, CT3, and L110 for minimum reading on RMS volt/db meter. Reduce the signal generator output as the circuit is peaked to maintain approximately 10 db quieting.

6. Sensitivity Measurement (All Models)

A. Insert a crystal in the channel 1 socket (VHF-LB side for Model M8-HL and VHF-HB side for Model M8-HU or M8-HUH).

B. With no input signal applied, adjust volume control to obtain 0 db (0.77 VRMS) on RMS volt/db meter. Be sure that squelch control is fully counterclockwise.

C. Adjust frequency of FM signal generator to correspond to channel frequency.

D. Without changing the adjustments of the scanner, adjust the RF output of the signal generator to obtain a noise drop of 20 db on RMS volt/db meter.

E. Measure output level of FM signal generator. Indication should be equal to or less than 0.5 microvolts.

F. Remove crystal from channel 1 socket and insert new crystal for remaining band (VHF-HB side for Model M8-HL and UHF side for Model M8-HU or M8-HUH).

G. Repeat steps B through E.

H. Measure output level of FM signal generator. Indication should be equal to or less than the following:

MODEL	
M8-HL	0.5 microvolts
M8-HU	1.0 microvolt
M8-HUH	1.0 microvolt

7. Audio Output and Distortion Measurement (All Models)

A. Insert a crystal in the channel 1 socket (VHF-LB side for Model M8-HL and VHF-HB side for Model M8-HU or M8-HUH).

B. Adjust scanner volume control fully CW and squelch control full CCW.

C. Adjust frequency of FM signal generator to correspond to channel frequency with 1 kHz modulation at 5 kHz deviation.

D. Adjust RF output of the FM signal generator to 1.5 microvolts. The RMS volt/db meter should indicate 2.53 to 3.09 volts RMS (800 to 1200 milliwatts).

E. Reduce RF output of the FM signal generator until audio output of the scanner is 2.37 volts RMS (700 milliwatts).

F. Connect distortion analyzer across 8-ohm load in place of RMS volt/db meter. Measure output distortion. Indication should not be greater than 10%.

G. Remove crystal from channel 1 socket and insert new crystal for remaining band (VHF-HB side for Model M8-HL and UHF side for Model M8-HU or M8-HUH).

H. Repeat steps B through F.

8. Squelch Open Adjustment (All Models)

A. Remove the phone plug from the external speaker jack.

B. Insert a crystal with a frequency near the center-of-the-band in the channel 1 socket for the VHF-HB side.

C. Adjust frequency of FM signal generator to correspond to channel frequency, with 1 kHz modulation at 5 kHz deviation.

D. Adjust scanner squelch control fully CW.

E. Adjust RF output of FM signal generator to 1.5 microvolts.

F. On scanner, adjust VR502 so that squelch circuit just opens with 1.5 microvolts input.

9. Scan Time Measurement (All Models)

A. Position channel bypass switches 2 through 8 to "down", bypass position.

B. With no RF signal applied to scanner, count the number of scans of channel 1 for 30 seconds. Channel 1 LED lamp flash rate should be between 37 and 60 for 30 seconds.

C. Position all channel bypass switches to "up" position and verify that all channel "LED" lamps flash during each complete scan.

10. Special Crystal Frequency Alignment (All Models)

A. Any channel frequency within the specified frequency range may be used for the center-of-the-band frequency. Both frequency bands can be realigned to produce maximum sensitivity for any desired channel frequency within the specified range.

B. To realign the scanner for special crystal frequencies, insert the desired crystal in the proper frequency band and perform the factory RF alignment procedure in this manual substituting the desired center-of-the-band frequency.

TABLE I, TROUBLESHOOTING GUIDE

Listed in the troubleshooting guide are possible symptoms of trouble, with the probable causes for use in fault isolation. The table is intended as a brief guide in troubleshooting. It is best used in conjunction with the transistor voltage tables, particularly when the more obvious causes of malfunction have been eliminated and the fault is presumed to be a detailed circuit defect.

TROUBLE	PROBABLE CAUSE
1. Scanner will not operate. No sound from speaker. Channel indicators do not light.	a. Defective voltage connector or defective power switch. b. Regulator Q702 defective.
2. No sound from speaker. Channel LED lamps light. Scan functions normally.	a. Defective speaker or wiring. b. IC701 or Q701 defective. c. Squelch circuit won't open (Q501 or Q502). d. Q503, 504, 505 or 506 defective.
3. No scanning (manual or automatic). Audio and squelch functions operate normally.	a. IC501 or IC502 defective. b. Defective scan select switch or multivibrator (Q507 & Q508).
4. No automatic scanning. Manual scan only. Noise on speaker.	a. Q506, Q505, Q504, or Q503 defective. b. D503 or D504 defective. c. Astable MV defective.
5. Irregular scanning. Only some channels scan. Channels scan in pairs.	a. Defective LED (D109-D116). b. Defective switch (SW1-SW8). c. Defective diode (D101-D108).
6. Squelch function inoperative. Audio will not turn off.	a. Q501 or Q502 defective. b. Defective control VR501.
7. No signals on any channel. Noise heard on speaker.	a. Q301, 302, 303, or 304 defective b. IC301 defective. c. HF303 defective.
8. No signals on some channels. Other channels operate normally.	a. Improper crystals installed. b. Crystal socket connection loose. c. Resistor open (R127-R142).
9. Poor sensitivity.	a. Poor alignment. b. Defective antenna or antenna connection. c. Improper crystal or defective crystal.

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D101	IS1587	2004-67
D102	IS1587	2004-67
D103	IS1587	2004-67
D104	IS1587	2004-67
D105	IS1587	2004-67
D106	IS1587	2004-67
D107	IS1587	2004-67
D108	IS1587	2004-67
D109	SLP-123B02	2037-29
D110	SLP-123B02	2037-29
D111	SLP-123B02	2037-29
D112	SLP-123B02	2037-29
D113	SLP-123B02	2037-29
D114	SLP-123B02	2037-29
D115	SLP-123B02	2037-29
D116	SLP-123B02	2037-29
D301	IS188FMIA	1010-145
D302	IS188FMIA	1010-145
D501	IS188FMIA	1010-145
D502	IS188FMIA	1010-145
D503	IS158B	2010-01
D504	IS158B	2010-01
D505	XZ-049	2037-26
D701	XZ-100	2037-28
D702	DS-130E	291-20
IC301	TA7061AP	2037-26
IC501	TD3493AP	2037-24
IC502	TD3442AP	2037-25
IC701	UPC575C2	2037-27
Q101	3SK44W	2037-22
Q102	2SC1394L	2037-23
Q103	2SC1675L	2032-34
Q104	2SC1675L	2032-34
Q105	2SC930D	1013-15
Q301	2SC930D	1013-15
Q302	2SC930D	1013-15
Q303	2SC930	2004-02
Q304	2SC930	2004-02
Q305	2SC930	2004-02
Q501	2SC945R	1080-21
Q502	2SC945R	1080-21
Q503	2SC945R	1080-21
Q504	2SC945R	1080-21
Q505	2SC945R	1080-21
Q506	2SC945R	1080-21
Q507	2SC711E	1076-02
Q508	2SC711E	1076-02
Q509	2SA733Q	1079-85
Q510	2SA733Q	1079-85
Q701	2SC536	2004-04
Q702	2SC1096L	1074-116

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C502	33uF 10V	2017-87
C505	1uF 10V	1014-107
C506	0.47uF 10V	2004-52
C507	0.47uF 10V	2004-52
C508	0.47uF 10V	2004-52
C509	100uF 10V	1012-18
C511	1uF 10V	1014-107
C512	1uF 10V	1014-107
C515	1uF 10V	1014-107
C516	33uF 10V	2017-87
C702	1uF 10V	1014-107
C703	33uF 10V	2017-87
C704	0.1uF 10V	2004-54
C705	2.2uF 10V	2004-51
C706	100uF 10V	1012-18
C707	33uF 10V	2017-87
C709	220uF 10V	1012-19
C710	0.22uF 10V	2004-53
C711	220uF 10V	1012-19
C712	220uF 10V	1012-19
C713	470uF 16V	170-47-9

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR501	Squelch Control, 10K	2037-44
VR502	Semi-fixed, 20K	2037-45
VR701	Volume Control, 10K	2037-43

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2037-56
L102	2037-56
L103	2037-57
L104	2037-56
L105	2004-45
L106	2037-60
L107	2037-60
L108	2037-61
L109	2037-60
L110	2004-39
L111	2018-03
L112	2037-62
L113	2037-62
L115	2004-43
	2032-16 (1)
L116	2004-43
	2032-16 (1)
L117	2004-43
	2032-16 (1)
L118	2004-43
	2032-16 (1)
L119	2004-43
	2032-16 (1)
L120	2004-43
	2032-16 (1)
L121	2004-43
	2032-16 (1)
L122	2004-43
	2032-16 (1)
L501	2037-46
L701	2037-47
T101	2037-63
T301	2037-48

(1) Alternate.

MISCELLANEOUS

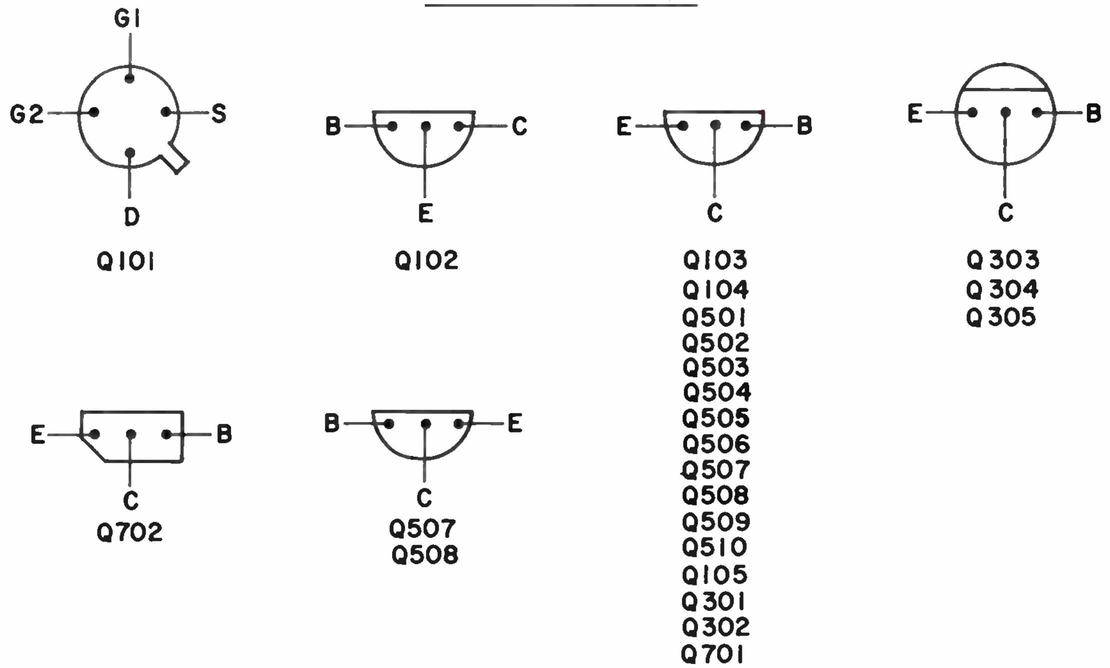
ITEM	NAME	PART NO.
HF301	HF Filter	2004-49
HF302	Ceramic Filter	2004-50
HF303	Ceramic Filter	2037-42
	Switch, Scan/Manual	2004-56
	Switch, Bypass	2037-39
	PC Board, Main	2037-16
	PC Board, Sub	2037-17
	PC Board, Switch	2037-19
	Power Cord	2037-05
	Crystal	2004-65

CABINET PARTS

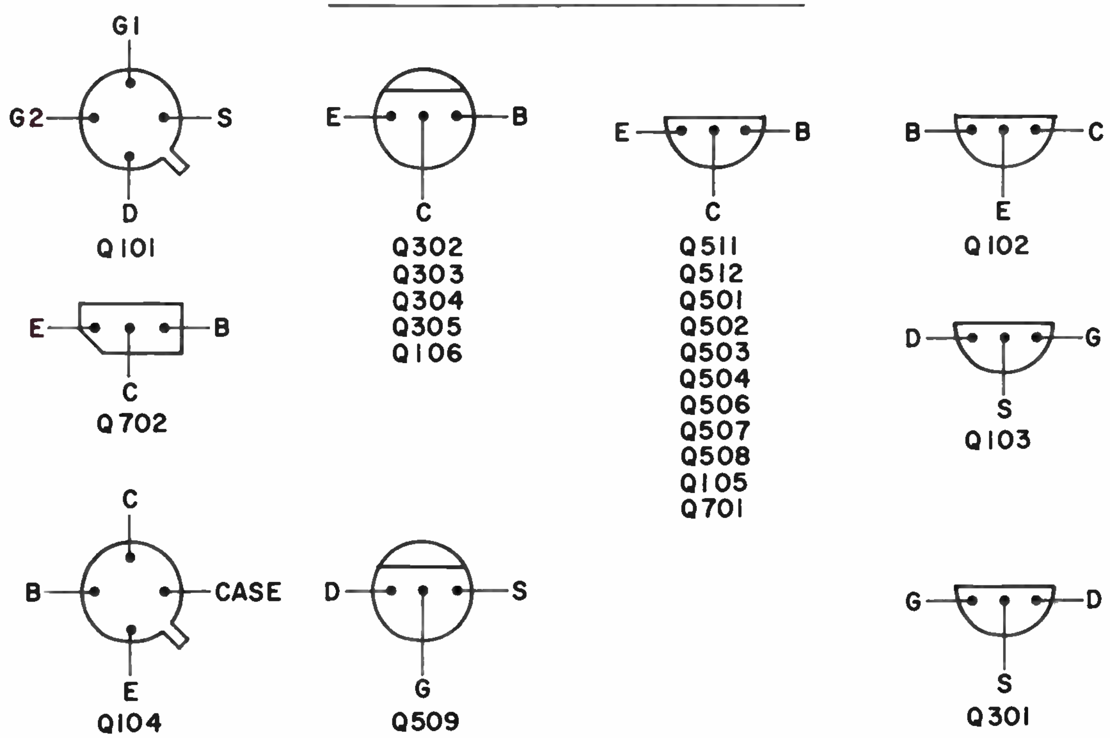
NAME	PART NO.
Cabinet	2037-01
Panel, Front	2037-03
Lid, Back	2037-02
Knob, Rotary	2037-09
Knob, Lever	2004-30
Knob, Switch	2004-31

Pages 29-42 Courtesy of FANON/COURIER CORP.

MODEL M8-HL



MODEL M8-HU AND M8-HUH



NOTE:
TRANSISTORS ARE VIEWED FROM THE LEAD SIDE.

FIGURE 7, TRANSISTOR TERMINAL DIAGRAM

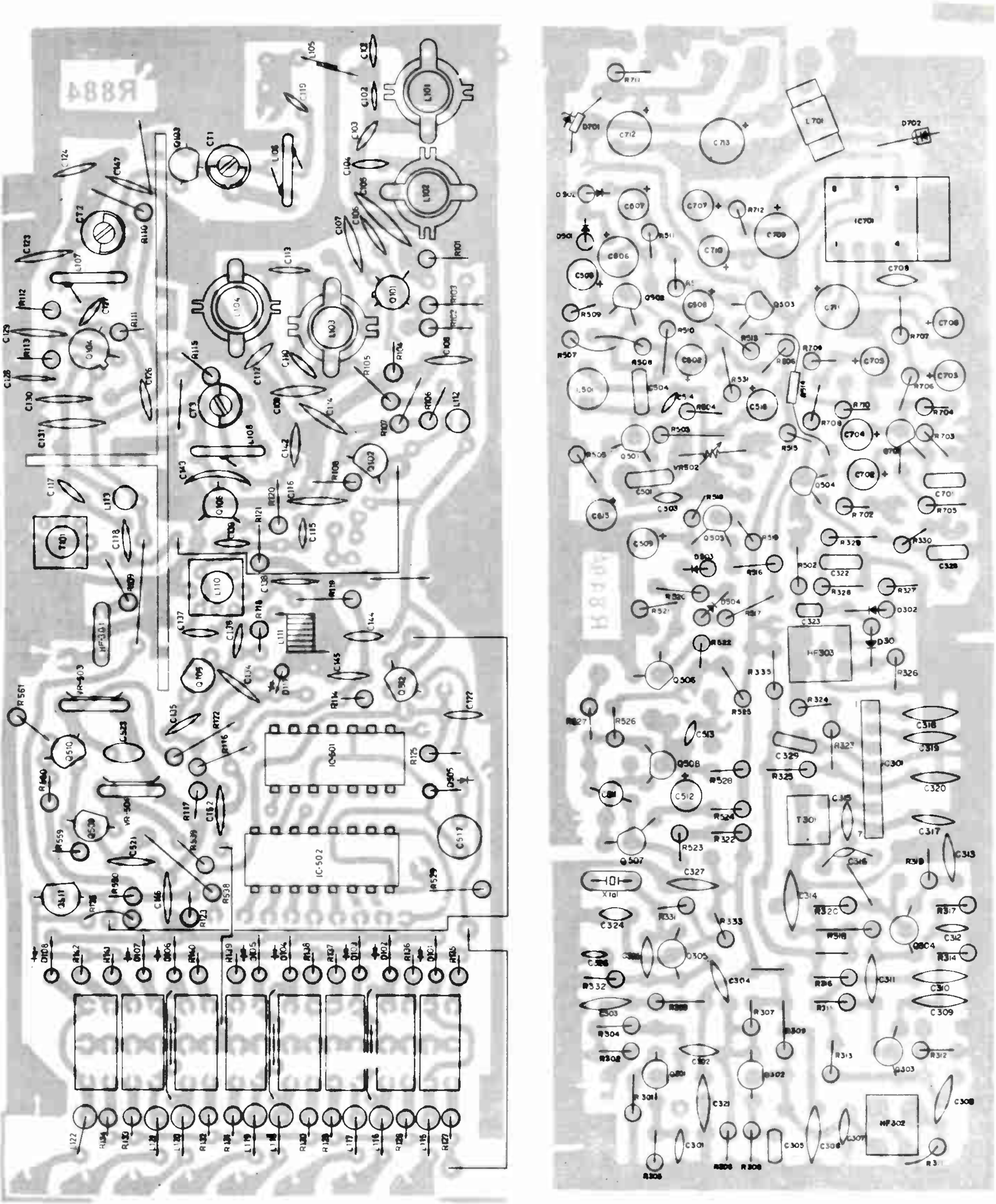


FIGURE 11, MODEL M8-HU, P.C. BOARD, COMPONENT SIDE, ISSUE A

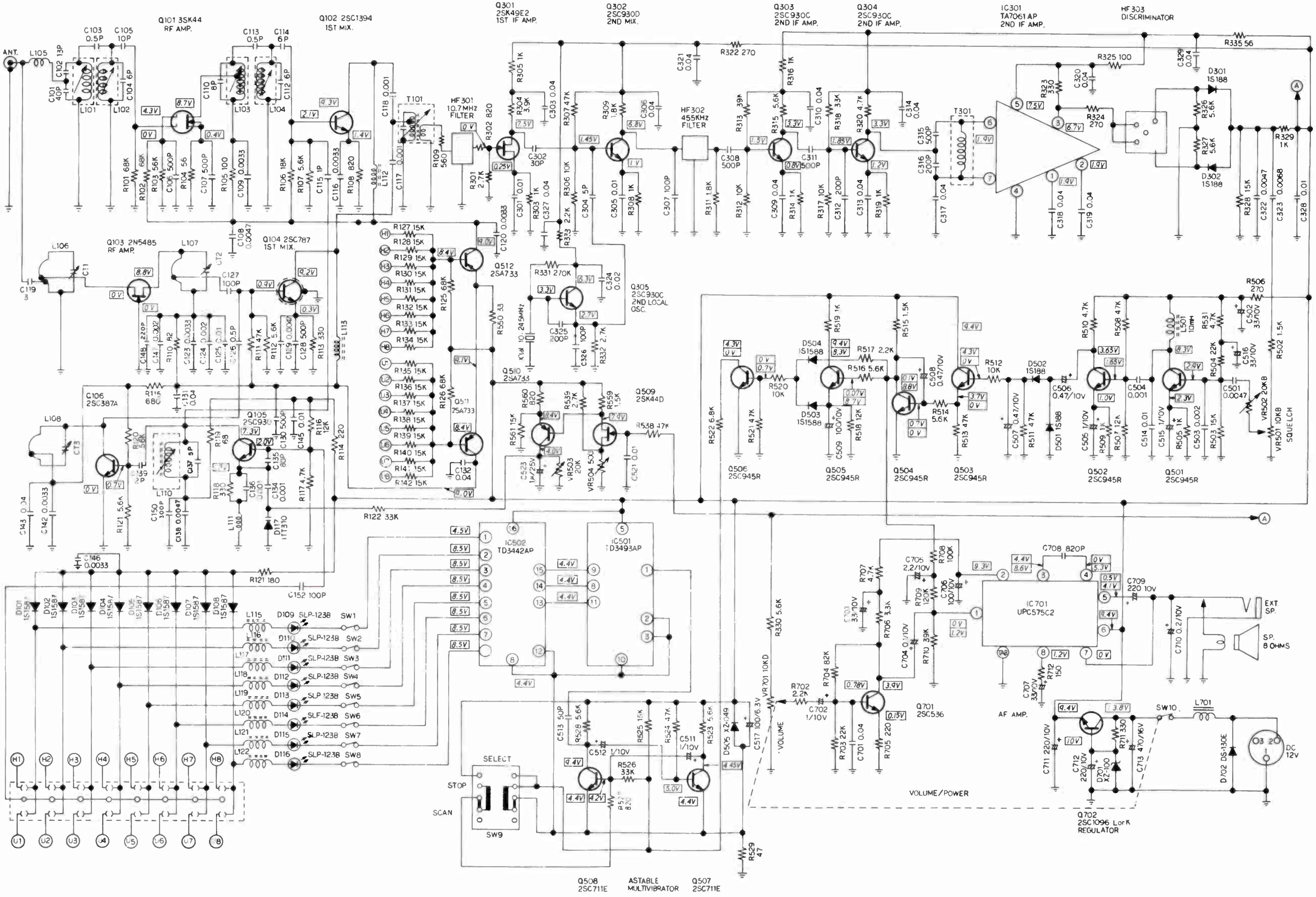

Q101 3SK44
RF AMP.
Q102 2SC1394
1ST MIX.
Q301
2SK49E2
1ST IF AMP.
Q302
2SC930C
2ND MIX.
Q303
2SC930C
2ND IF AMP.
Q304
2SC930C
2ND IF AMP.
IC301
TA7061AP
2ND IF AMP.
HF303
DISCRIMINATOR
HF301
10.7MHz
FILTER
HF302
455KHz
FILTER
Q103 2N5485
RF AMP.
Q104 2SC787
1ST MIX.
Q105
2SC930
Q106
2SC387A
Q305
2SC930C
2ND LOCAL
OSC.
Q512
2SA733
Q511
2SA733
Q510
2SA733
Q509
2SK44D
Q506
2SC945R
Q505
2SC945R
Q504
2SC945R
Q503
2SC945R
Q502
2SC945R
Q501
2SC945R
SQUELCH
IC502
TD3442AP
IC501
TD3493AP
IC701
UPC575C2
AF AMP.
Q701
2SC536
VOLUME
VOLUME/POWER
Q702
2SC1096 L or K
REGULATOR
EXT
SP.
SP.
8 OHMS
DC
12V
SELECT
STOP
SCAN
SW9
Q508
2SC711E
ASTABLE
MULTIVIBRATOR
Q507
2SC711E

TABLE 3, TRANSISTOR VOLTAGES (MODEL M8-HU AND M8-HUH)

TRANSISTOR	S	D	G1	G2	SPECIAL CONDITION
Q101	0.4	8.7	0	4.3	Crystal Installed - VHF-HB

TRANSISTOR	S	D	G	SPECIAL CONDITION
Q103	8.8	0	0	Crystal Installed - UHF
Q301	7.4	0.2	0	
Q509	7.4	0.2	0	

TRANSISTOR	B	E	C	SPECIAL CONDITION
Q102	2.1	1.4	9.3	Crystal Installed - VHF-HB
Q104	0.9	0.3	9.2	Crystal Installed - UHF
Q105	2.0	1.3	7.3	
Q106	0.7	0	8.0	Crystal Installed - UHF
Q302	1.5	1.0	6.8	
Q303	1.5	0.8	3.3	
Q304	1.9	1.2	3.3	
Q305	3.3	2.7	6.3	
Q501	2.9	2.3	8.3	
Q502	1.7	1.0	3.6	
Q503	4.3	3.7	9.4	Squelch CW
	0	0	9.4	Squelch CCW
Q504	0.7	0	0.1	Squelch CW
	0	0	8.8	Squelch CCW
Q505	0.1	0	9.4	Squelch CW
	8.7	8.1	8.3	Squelch CCW
Q506	0	0	4.3	Squelch CW
	0.7	0	0	Squelch CCW
Q507	5.0	4.4	4.5	
Q508	4.2	4.4	9.4	
Q510	7.4	8.4	4.0	
Q511	8.4	9.1	9.0	Crystal Installed - UHF
Q512	8.4	9.1	9.0	Crystal Installed - VHF-HB
Q701	0.1	0.2	3.9	
Q702	10.0	9.4	13.8	

TABLE 4, INTEGRATED CIRCUIT VOLTAGES (ALL MODELS)

IC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	CONDITION
IC301	1.9	1.9	6.7	0	7.5	1.9	1.9	---	---	---	---	---	---	---	---	---	Squelch CCW
IC701	0	9.3	9.3	0	0.5	9.4	0	1.2	---	---	---	---	---	---	---	---	Squelch CW
	1.2	9.3	8.6	5.3	4.1	9.4	0	1.2	---	---	---	---	---	---	---	---	Squelch CCW
IC501	6.5	4.4	4.4	---	9.4	---	---	4.4	4.4	4.4	4.4	---	---	---	---	---	Channel 1
	6.5	4.4	4.4	---	9.4	---	---	4.4	8.5	4.4	4.4	---	---	---	---	---	Channel 2
	6.5	4.4	4.4	---	9.4	---	---	8.5	4.4	4.4	4.4	---	---	---	---	---	Channel 3
	6.5	4.4	4.4	---	9.4	---	---	8.5	8.5	4.4	4.4	---	---	---	---	---	Channel 4
	6.5	4.4	4.4	---	9.4	---	---	4.4	4.4	4.4	8.5	---	---	---	---	---	Channel 5
	6.5	4.4	4.4	---	9.4	---	---	4.4	8.5	4.4	8.5	---	---	---	---	---	Channel 6
	6.5	4.4	4.4	---	9.4	---	---	8.5	4.4	4.4	8.5	---	---	---	---	---	Channel 7
	6.5	4.4	4.4	---	9.4	---	---	8.5	8.5	4.4	8.5	---	---	---	---	---	Channel 8
IC502	4.4	8.5	8.5	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	4.4	4.4	9.4	Channel 1
	8.5	4.4	8.5	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	4.4	8.5	9.4	Channel 2
	8.5	8.5	4.4	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	8.5	4.4	9.4	Channel 3
	8.5	8.5	8.5	4.4	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	8.5	8.5	9.4	Channel 4
	8.5	8.5	8.5	8.5	4.4	8.5	8.5	4.4	8.5	---	---	4.4	8.5	4.4	4.4	9.4	Channel 5
	8.5	8.5	8.5	8.5	8.5	4.4	8.5	4.4	8.5	---	---	4.4	8.5	4.4	8.5	9.4	Channel 6
	8.5	8.5	8.5	8.5	8.5	8.5	4.4	4.4	8.5	---	---	4.4	8.5	8.5	4.4	9.4	Channel 7
	8.5	8.5	8.5	8.5	8.5	8.5	8.5	4.4	4.4	---	---	4.4	8.5	8.5	8.5	9.4	Channel 8

Crystal Correlation Data

CHANNEL FREQUENCY	CRYSTAL FREQUENCY FORMULA	LOAD CAPACITY
30 to 45 MHz:	(Desired Frequency) plus (10.7 MHz)	Series resonance (-) 450 Hz (62pF)
45 to 50 MHz:	(Desired Frequency) minus (10.7 MHz)	Series resonance (-) 450 Hz (62pF)
146 to 175 MHz:	(Desired Frequency) minus (10.7 MHz) / Divided by 3	Series resonance (-) 450 Hz (62pF)
450 to 512 MHz:	(Desired Frequency) minus (10.7 MHz) / Divided by 9	18pF

For all models, install lowest band crystals in socket pins A & B and install highest band crystals in socket pins B & C.

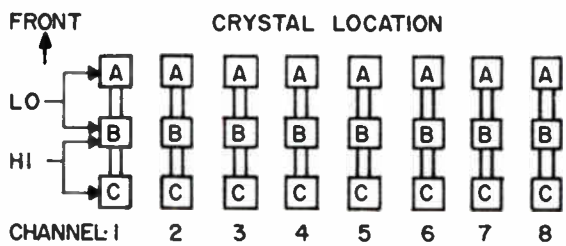


FIGURE 2, CRYSTAL INSTALLATION DIAGRAM

TEST EQUIPMENT REQUIRED
(Or Equivalent)

* Regulated Power Supply, 12 VDC 500 Ma.
* FM Signal Generator, Measurements Model 560 FM.
* Frequency Counter, Systron/Donner Model 7015.
* DC Voltmeter, Hewlett Packard Model 410B.
* Wattmeter/DB Meter, EICO Model 261.
* Load, 8 ohms Non-Inductive.
* Antenna Connector, Cinch #13B or AVA Electronics #M-20-59.
* Distortion Analyzer, Hewlett Packard Model 330B.

3. Test and Alignment Setup

Test equipment should be warmed up before proceeding with alignment. Use only a non-metallic tool at adjustment points. Input signal from the generator should always be kept as low as possible and still obtain a usable input.

A. Connect test equipment to unit under test as shown in Figure 4.

B. Set Mobile Scanner switches and controls as follows:

Volume Control to obtain 0.77 VRMS (0 db) of noise across load.
Squelch Control to full CCW position.
Bypass Switches to "up" position.
Manual/Scan Switch to center position.

C. Operate the Manual/Scan switch to select channel 1 and set in the center position.

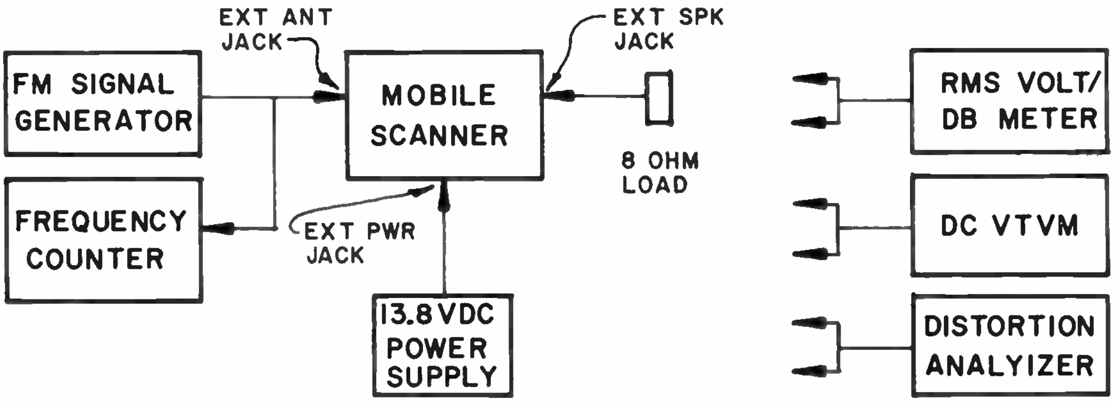


FIGURE 4, TEST SETUP DIAGRAM

5. RF Alignment, Model M8-HU and M8-HUH (Figure 6)

A. With no crystals installed, connect VTVM across R599 and adjust VR504 for an indication of 1.5 ±0.1 volts DC on VTVM. Refer to Figure 6 for location of adjustments.

B. Connect VTVM between collector of Q510 and ground and adjust VR503 for an indication of 4.0 ±0.1 volts DC on VTVM.

C. Insert a crystal for center-of-the-band alignment in the VHF-HB side of the channel 1 socket. For a center-of-the-band of 156 MHz, the actual crystal frequency should be 48.433 MHz.

D. Adjust FM signal generator to the center-of-the-band frequency as observed on frequency counter. Adjust the signal generator output (without modulation) to obtain a drop of 10 db on RMS volt/db meter. Vary signal generator slightly above and below the tuned frequency to verify that actual crystal frequency is correct for center-of-the-band alignment.

E. Adjust L101, L102, L103, L104 and T101 for minimum reading on RMS volt/db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10 db quieting.

F. Remove VHF-HB crystal and insert crystal for center-of-the-band alignment in the UHF side of channel 1 socket. For center alignment, crystal frequency should be as follows:

MODEL	CENTER-OF-THE-BAND FREQUENCY	ACTUAL CRYSTAL FREQUENCY
M8-HU	460 MHz	49.922 MHz
M8-HUH	493 MHz	53.588 MHz

G. Repeat step D.

H. Adjust CT1, CT2, CT3, and L110 for minimum reading on RMS volt/db meter. Reduce the signal generator output as the circuit is peaked to maintain approximately 10 db quieting.

6. Sensitivity Measurement (All Models)

A. Insert a crystal in the channel 1 socket (VHF-LB side for Model M8-HL and VHF-HB side for Model M8-HU or M8-HUH).

B. With no input signal applied, adjust volume control to obtain 0 db (0.77 VRMS) on RMS volt/db meter. Be sure that squelch control is fully counterclockwise.

C. Adjust frequency of FM signal generator to correspond to channel frequency.

D. Without changing the adjustments of the scanner, adjust the RF output of the signal generator to obtain a noise drop of 20 db on RMS volt/db meter.

E. Measure output level of FM signal generator. Indication should be equal to or less than 0.5 microvolts.

F. Remove crystal from channel 1 socket and insert new crystal for remaining band (VHF-HB side for Model M8-HL and UHF side for Model M8-HU or M8-HUH).

G. Repeat steps B through E.

H. Measure output level of FM signal generator. Indication should be equal to or less than the following:

MODEL	
M8-HL	0.5 microvolts
M8-HU	1.0 microvolt
M8-HUH	1.0 microvolt

7. Audio Output and Distortion Measurement (All Models)

A. Insert a crystal in the channel 1 socket (VHF-LB side for Model M8-HL and VHF-HB side for Model M8-HU or M8-HUH).

B. Adjust scanner volume control fully CW and squelch control full CCW.

C. Adjust frequency of FM signal generator to correspond to channel frequency with 1 kHz modulation at 5 kHz deviation.

D. Adjust RF output of the FM signal generator to 1.5 microvolts. The RMS volt/db meter should indicate 2.53 to 3.09 volts RMS (800 to 1200 milliwatts).

E. Reduce RF output of the FM signal generator until audio output of the scanner is 2.37 volts RMS (700 milliwatts).

F. Connect distortion analyzer across 8-ohm load in place of RMS volt/db meter. Measure output distortion. Indication should not be greater than 10%.

G. Remove crystal from channel 1 socket and insert new crystal for remaining band (VHF-HB side for Model M8-HL and UHF side for Model M8-HU or M8-HUH).

H. Repeat steps B through F.

8. Squelch Open Adjustment (All Models)

A. Remove the phone plug from the external speaker jack.

B. Insert a crystal with a frequency near the center-of-the-band in the channel 1 socket for the VHF-HB side.

C. Adjust frequency of FM signal generator to correspond to channel frequency, with 1 kHz modulation at 5 kHz deviation.

D. Adjust scanner squelch control fully CW.

E. Adjust RF output of FM signal generator to 1.5 microvolts.

F. On scanner, adjust VR502 so that squelch circuit just opens with 1.5 microvolts input.

9. Scan Time Measurement (All Models)

A. Position channel bypass switches 2 through 8 to "down", bypass position.

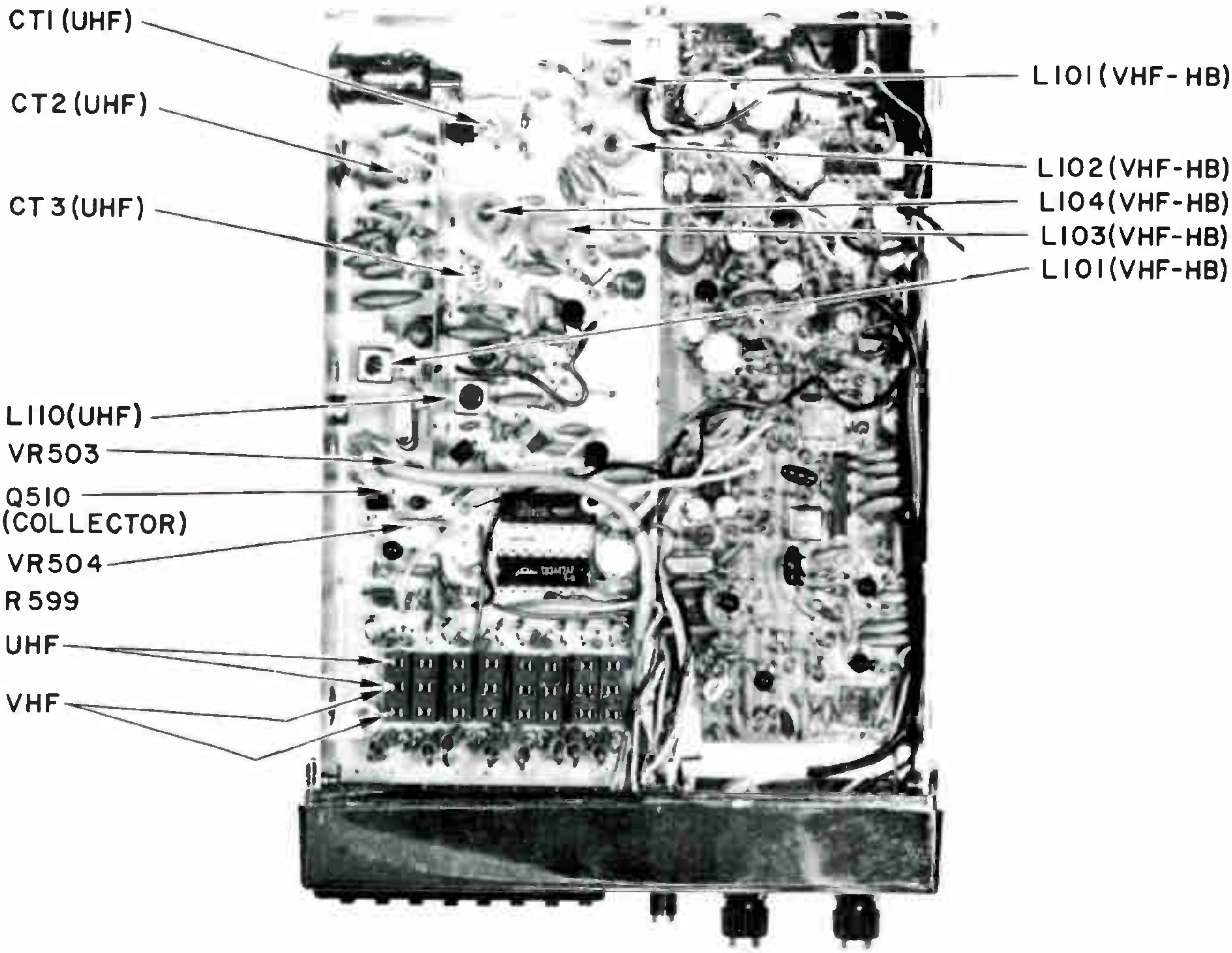
B. With no RF signal applied to scanner, count the number of scans of channel 1 for 30 seconds. Channel 1 LED lamp flash rate should be between 37 and 60 for 30 seconds.

C. Position all channel bypass switches to "up" position and verify that all channel "LED" lamps flash during each complete scan.

10. Special Crystal Frequency Alignment (All Models)

A. Any channel frequency within the specified frequency range may be used for the center-of-the-band frequency. Both frequency bands can be realigned to produce maximum sensitivity for any desired channel frequency within the specified range.

B. To realign the scanner for special crystal frequencies, insert the desired crystal in the proper frequency band and perform the factory RF alignment procedure in this manual substituting the desired center-of-the-band frequency.



NOTE:
VHF-HB (144 - 175 MHZ)
UHF (450 - 475 MHZ)
UHFH (425 - 512 MHZ)

FIGURE 6, LOCATION OF FREQUENCY ADJUSTMENTS (MODEL M8—HU AND M8—HUH)

TABLE I, TROUBLESHOOTING GUIDE

Listed in the troubleshooting guide are possible symptoms of trouble, with the probable causes for use in fault isolation. The table is intended as a brief guide in troubleshooting. It is best used in conjunction with the transistor voltage tables, particularly when the more obvious causes of malfunction have been eliminated and the fault is presumed to be a detailed circuit defect.

TROUBLE	PROBABLE CAUSE
1. Scanner will not operate. No sound from speaker. Channel indicators do not light.	a. Defective voltage connector or defective power switch. b. Regulator Q702 defective.
2. No sound from speaker. Channel LED lamps light. Scan functions normally.	a. Defective speaker or wiring. b. IC701 or Q701 defective. c. Squelch circuit won't open (Q50 or Q502). d. Q503, 504, 505 or 506 defective
3. No scanning (manual or automatic). Audio and squelch functions operate normally.	a. IC501 or IC502 defective. b. Defective scan select switch or multivibrator (Q507 & Q508).
4. No automatic scanning. Manual scan only. Noise on speaker.	a. Q506, Q505, Q504, or Q503 defective. b. D503 or D504 defective. c. Astable MV defective.
5. Irregular scanning. Only some channels scan. Channels scan in pairs.	a. Defective LED (D109-D116). b. Defective switch (SW1-SW8). c. Defective diode (D101-D108).
6. Squelch function inoperative. Audio will not turn off.	a. Q501 or Q502 defective. b. Defective control VR501.
7. No signals on any channel. Noise heard on speaker.	a. Q301, 302, 303, or 304 defective b. IC301 defective. c. HF303 defective.
8. No signals on some channels. Other channels operate normally.	a. Improper crystals installed. b. Crystal socket connection loose. c. Resistor open (R127-R142).
9. Poor sensitivity.	a. Poor alignment. b. Defective antenna or antenna connection. c. Improper crystal or defective crystal.

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D101	IS1587	2004-67
D102	IS1587	2004-67
D103	IS1587	2004-67
D104	IS1587	2004-67
D105	IS1587	2004-67
D106	IS1587	2004-67
D107	IS1587	2004-67
D108	IS1587	2004-67
D109	SLP-123B02	2037-29
D110	SLP-123B02	2037-29
D111	SLP-123B02	2037-29
D112	SLP-123B02	2037-29
D113	SLP-123B02	2037-29
D114	SLP-123B02	2037-29
D115	SLP-123B02	2037-29
D116	SLP-123B02	2037-29
D117	ITT-310	2039-10
D301	IS188FMIA	1010-145
D302	IS188FMIA	1010-145
D501	IS188FMIA	1010-145
D502	IS188FMIA	1010-145
D503	IS1588	2010-01
D504	IS1588	2010-01
D505	XZ-049	2037-26
D701	XZ-100	2037-28
D702	DS-130E	291-20
IC301	TA7061AP	2037-26
IC501	TD3493AP	2037-24
IC502	TD3442AP	2037-25
IC701	UPC575C2	2037-27
Q101	3SK44W	2037-22
Q102	2SC1394L	2037-23
Q103	2N485-1	2020-01
Q104	2SC787	2020-02
Q105	2SC930D	1013-15
Q106	2SC387A	2020-03
Q301	2SK49E2	2032-36
Q302	2SC930D	1013-15
Q303	2SC930	2004-02
Q304	2SC930	2004-02
Q305	2SC930	2004-02
Q501	2SC945R	1080-21
Q502	2SC945R	1080-21
Q503	2SC945R	1080-21
Q504	2SC945R	1080-21
Q505	2SC945R	1080-21
Q506	2SC945R	1080-21
Q507	2SC711E	1076-02
Q508	2SC711E	1076-02
Q509	2SK44D	2020-04
Q510	2SA733Q	1079-85
Q511	2SA733Q	1079-85
Q512	2SA733Q	1079-85
Q701	2SC536	2004-04
Q702	2SC1096L	1074-116

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C502	33uF 10V	2017-87
C505	1uF 10V	1014-107
C506	0.47uF 10V	2004-52
C507	0.47uF 10V	2004-52
C508	0.47uF 10V	2004-52
C509	100uF 10V	1012-18
C511	1uF 10V	1014-107
C512	1uF 10V	1014-107
C515	1uF 10V	1014-107
C516	33uF 10V	2017-87
C517	100uF 6.3V	1003-102
C523	1uF 25V	2039-22
C702	1uF 10V	1014-107
C703	33uF 10V	2017-87
C704	0.1uF 10V	2004-54
C705	2.2uF 10V	2004-51
C706	100uF 10V	1012-18
C707	33uF 10V	2017-87
C710	0.22uF	2004-53
C711	220uF 10V	1012-19
C712	220uF 10V	1012-19
C713	470uF 16V	170-47-9
CT1	Trimmer	2020-22
CT2	Trimmer	2020-22
CT3	Trimmer	2020-22

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR501	Squelch Control, 10K	2037-44
VR502	Semi-fixed, 20K	2037-45
VR503	Semi-fixed, 20K	2039-13
VR504	Semi-fixed, 500	2039-13
VR701	Volume Control, 10K	2037-43

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2037-56
L102	2037-56
L103	2037-57
L104	2037-56
L105	2039-12
L106	2039-11
L107	2039-11
L108	2039-11
L110	2004-39
L111	2018-03
L112	2037-62
L113	2037-62
L115	2004-43
	2032-16 (1)
L116	2004-43
	2032-16 (1)
L117	2004-43
	2032-16 (1)
L118	2004-43
	2032-16 (1)
L119	2004-43
	2032-16 (1)
L120	2004-43
	2032-16 (1)
L121	2004-43
	2032-16 (1)
L122	2004-43
	2032-16 (1)
L501	2039-02
L701	2037-47
T101	2037-63
T301	2037-48

(1) Alternate.

MISCELLANEOUS

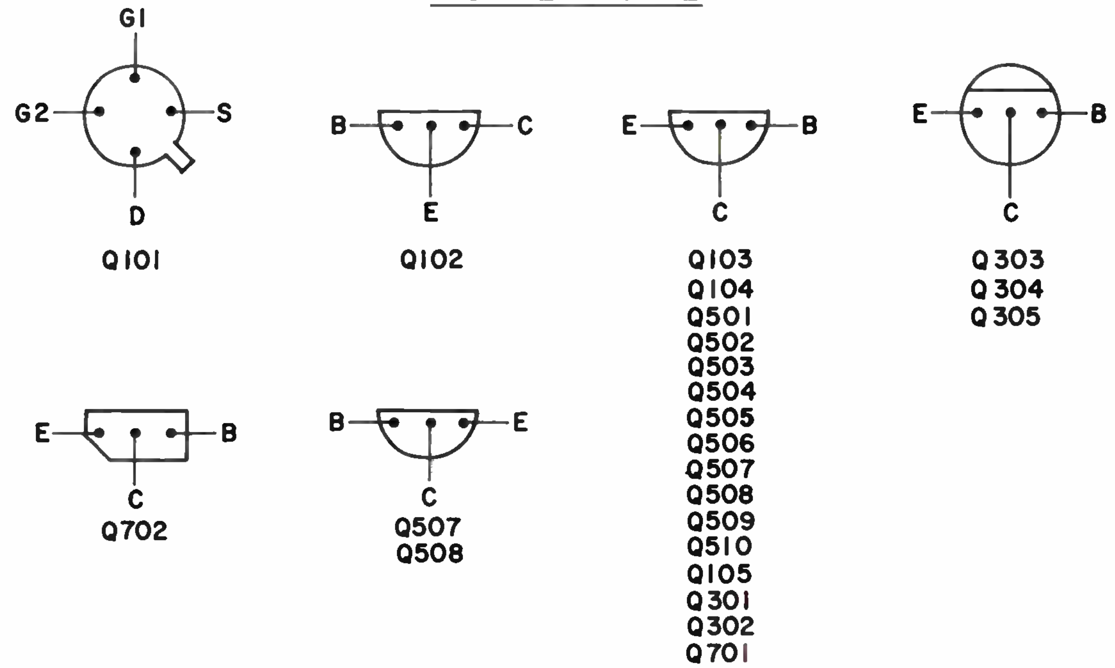
ITEM	NAME	PART NO.
HF301	HF Filter	2004-49
HF302	Ceramic Filter	2004-50
HF303	Ceramic Filter	2037-42
	Switch, Scan/Manual	2004-56
	Switch, Bypass	2037-39
	Crystal	2004-65
	PC Board, Main	2037-16
	PC Board, Sub	2039-08
	PC Board, Switch	2037-19
	Power Cord	2037-05

CABINET PARTS

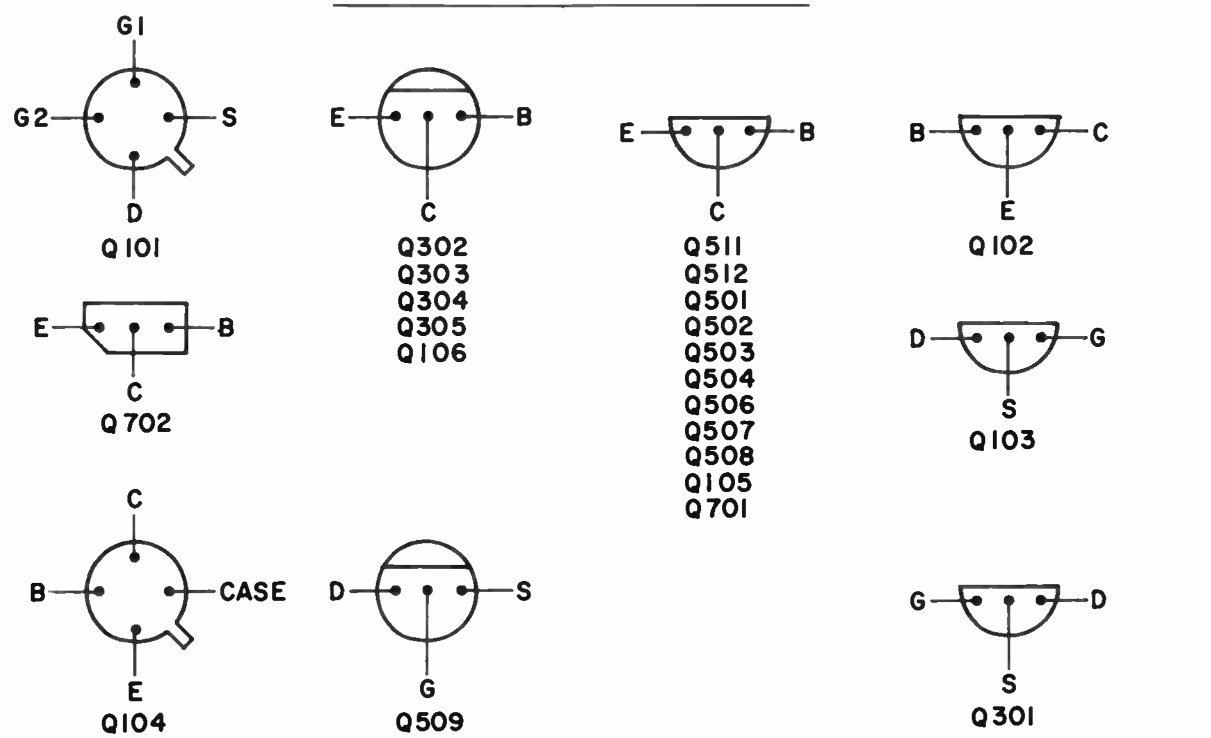
NAME	PART NO.
Cabinet	2037-01
Panel Front	2037-03
Lid, Back	2037-02
Knob, Rotary	2037-09
Knob, Lever	2004-30
Knob, Switch	2004-31

Pages 43-56 Courtesy of FANON/COURIER CORP.

MODEL M8-HL



MODEL M8-HU AND M8-HUH



NOTE:
TRANSISTORS ARE VIEWED FROM THE LEAD SIDE.

FIGURE 7, TRANSISTOR TERMINAL DIAGRAM

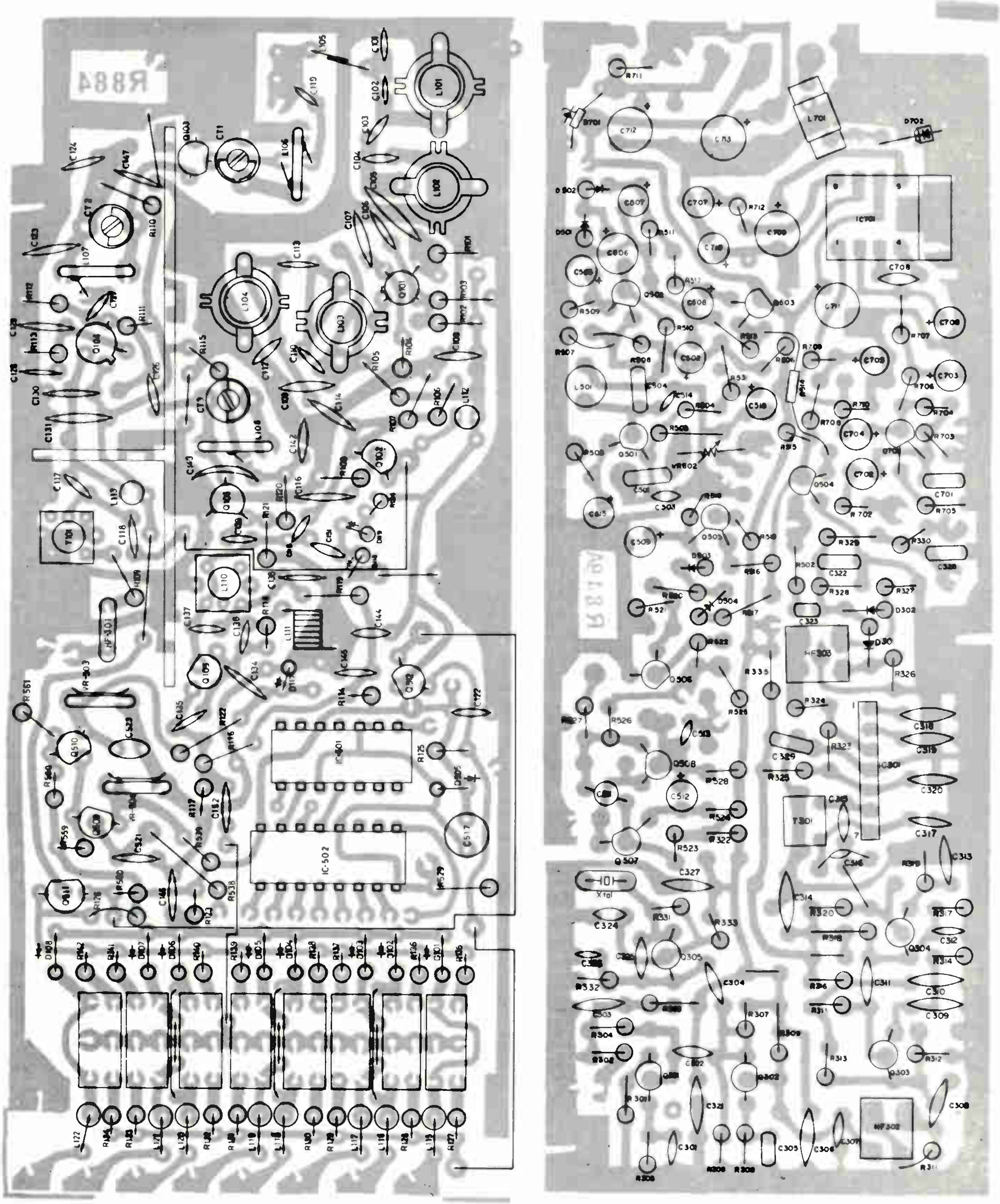


FIGURE 14, MODEL HUH, P.C. BOARD, COMPONENT SIDE, ISSUE A

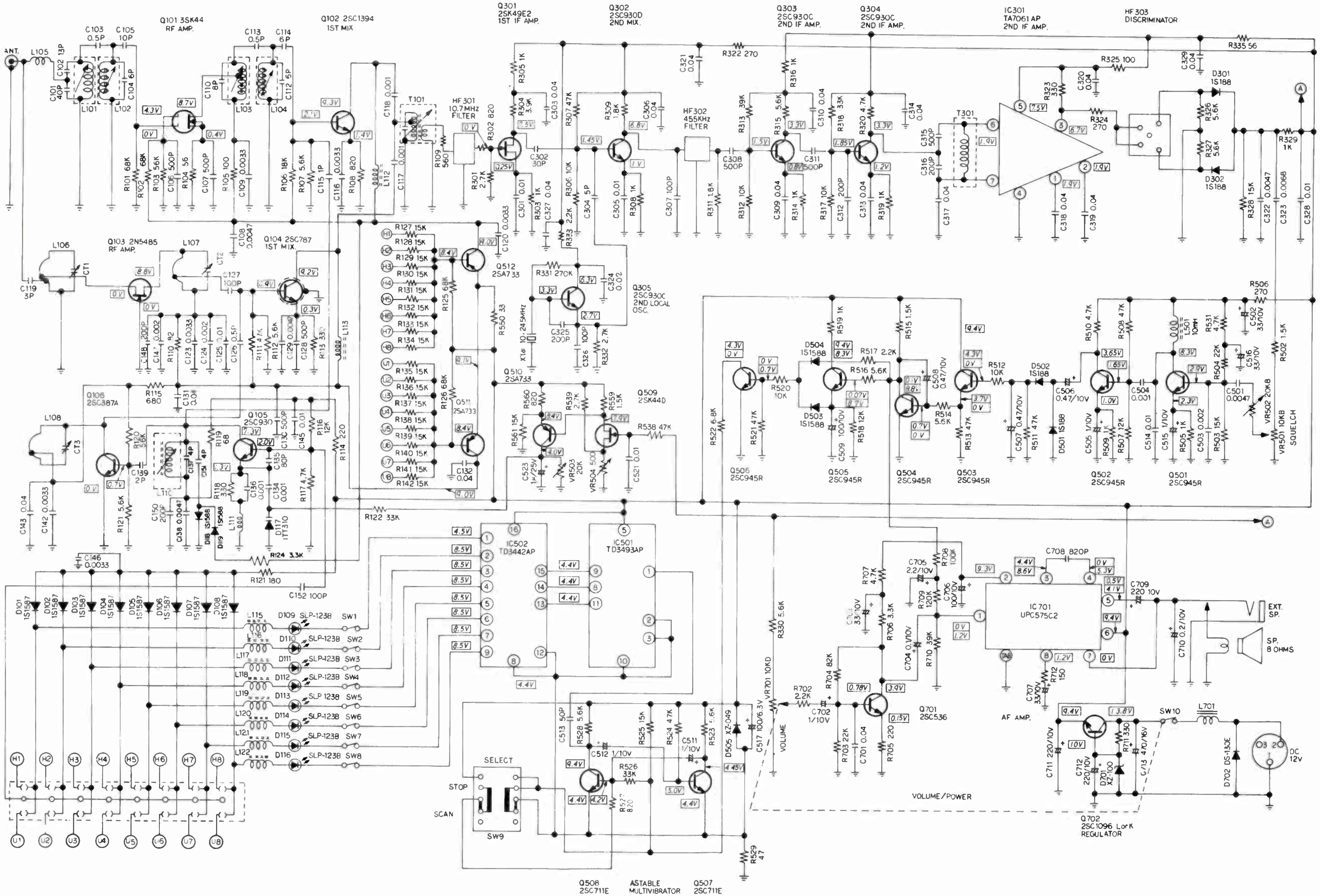


FIGURE 16, MODEL M8-HUH, SCHEMATIC DIAGRAM, ISSUE A

TABLE 3, TRANSISTOR VOLTAGES (MODEL M8-HU AND M8-HUH)

TRANSISTOR	S	D	G1	G2	SPECIAL CONDITION
Q101	0.4	8.7	0	4.3	Crystal Installed - VHF-HB

TRANSISTOR	S	D	G	SPECIAL CONDITION
Q103	8.8	0	0	Crystal Installed - UHF
Q301	7.4	0.2	0	
Q509	7.4	0.2	0	

TRANSISTOR	B	E	C	SPECIAL CONDITION
Q102	2.1	1.4	9.3	
Q104	0.9	0.3	9.2	Crystal Installed - VHF-HB
Q105	2.0	1.3	7.3	Crystal Installed - UHF
Q106	0.7	0	8.0	
Q302	1.5	1.0	6.8	Crystal Installed - UHF
Q303	1.5	0.8	3.3	
Q304	1.9	1.2	3.3	
Q305	3.3	2.7	6.3	
Q501	2.9	2.3	8.3	
Q502	1.7	1.0	3.6	
Q503	4.3	3.7	9.4	Squelch CW
	0	0	9.4	Squelch CCW
Q504	0.7	0	0.1	Squelch CW
	0	0	8.8	Squelch CCW
Q505	0.1	0	9.4	Squelch CW
	8.7	8.1	8.3	Squelch CCW
Q506	0	0	4.3	Squelch CW
	0.7	0	0	Squelch CCW
Q507	5.0	4.4	4.5	
Q508	4.2	4.4	9.4	
Q510	7.4	8.4	4.0	
Q511	8.4	9.1	9.0	Crystal Installed - UHF
Q512	8.4	9.1	9.0	Crystal Installed - VHF-HB
Q701	0.1	0.2	3.9	
Q702	10.0	9.4	13.8	

TABLE 4, INTEGRATED CIRCUIT VOLTAGES (ALL MODELS)

IC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	CONDITION
IC301	1.9	1.9	6.7	0	7.5	1.9	1.9	---	---	---	---	---	---	---	---	---	Squelch CCW
IC701	0	9.3	9.3	0	0.5	9.4	0	1.2	---	---	---	---	---	---	---	---	Squelch CW
	1.2	9.3	8.6	5.3	4.1	9.4	0	1.2	---	---	---	---	---	---	---	---	Squelch CCW
IC501	6.5	4.4	4.4	---	9.4	---	---	4.4	4.4	4.4	4.4	---	---	---	---	---	Channel 1
	6.5	4.4	4.4	---	9.4	---	---	4.4	8.5	4.4	4.4	---	---	---	---	---	Channel 2
	6.5	4.4	4.4	---	9.4	---	---	8.5	4.4	4.4	4.4	---	---	---	---	---	Channel 3
	6.5	4.4	4.4	---	9.4	---	---	8.5	8.5	4.4	4.4	---	---	---	---	---	Channel 4
	6.5	4.4	4.4	---	9.4	---	---	4.4	4.4	4.4	8.5	---	---	---	---	---	Channel 5
	6.5	4.4	4.4	---	9.4	---	---	4.4	8.5	4.4	8.5	---	---	---	---	---	Channel 6
	6.5	4.4	4.4	---	9.4	---	---	8.5	4.4	4.4	8.5	---	---	---	---	---	Channel 7
	6.5	4.4	4.4	---	9.4	---	---	8.5	8.5	4.4	8.5	---	---	---	---	---	Channel 8
IC502	4.4	8.5	8.5	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	4.4	4.4	9.4	Channel 1
	8.5	4.4	8.5	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	4.4	8.5	9.4	Channel 2
	8.5	8.5	4.4	8.5	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	8.5	4.4	9.4	Channel 3
	8.5	8.5	8.5	4.4	8.5	8.5	8.5	4.4	8.5	---	---	4.4	4.4	8.5	8.5	9.4	Channel 4
	8.5	8.5	8.5	8.5	4.4	8.5	8.5	4.4	8.5	---	---	4.4	8.5	4.4	4.4	9.4	Channel 5
	8.5	8.5	8.5	8.5	8.5	4.4	8.5	4.4	8.5	---	---	4.4	8.5	4.4	8.5	9.4	Channel 6
	8.5	8.5	8.5	8.5	8.5	8.5	4.4	4.4	8.5	---	---	4.4	8.5	8.5	4.4	9.4	Channel 7
	8.5	8.5	8.5	8.5	8.5	8.5	8.5	4.4	4.4	---	---	4.4	8.5	8.5	8.5	9.4	Channel 8

Crystal Correlation Data

CHANNEL FREQUENCY	CRYSTAL FREQUENCY FORMULA	LOAD CAPACITY
30 to 45 MHz:	(Desired Frequency) plus (10.7 MHz)	Series resonance (-) 450 Hz (62pF)
45 to 50 MHz:	(Desired Frequency) minus (10.7 MHz)	Series resonance (-) 450 Hz (62pF)
146 to 175 MHz:	(Desired Frequency) minus (10.7 MHz) / Divided by 3	Series resonance (-) 450 Hz (62pF)
450 to 512 MHz:	(Desired Frequency) minus (10.7 MHz) / Divided by 9	18pF

For all models, install lowest band crystals in socket pins A & B and install highest band crystals in socket pins B & C.

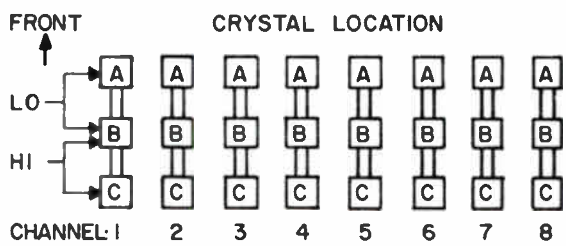


FIGURE 2, CRYSTAL INSTALLATION DIAGRAM

TEST EQUIPMENT REQUIRED (Or Equivalent)

* Regulated Power Supply, 12 VDC 500 Ma.
* FM Signal Generator, Measurements Model 560 FM.
* Frequency Counter, Systron/Donner Model 7015.
* DC Voltmeter, Hewlett Packard Model 410B.
* Wattmeter/DB Meter, EICO Model 261.
* Load, 8 ohms Non-Inductive.
* Antenna Connector, Cinch #13B or AVA Electronics #M-20-59.
* Distortion Analyzer, Hewlett Packard Model 330B.

3. Test and Alignment Setup

Test equipment should be warmed up before proceeding with alignment. Use only non-metallic tool at adjustment points. Input signal from the generator shoul always be kept as low as possible and still obtain a usable input.

A. Connect test equipment to unit under test as shown in Figure 4.

B. Set Mobile Scanner switches and controls as follows:

Volume Control to obtain 0.77 VRMS (0 db) of noise across load.
Squelch Control to full CCW position.
Bypass Switches to "up" position.
Manual/Scan Switch to center position.

C. Operate the Manual/Scan switch to select channel 1 and set in the cente position.

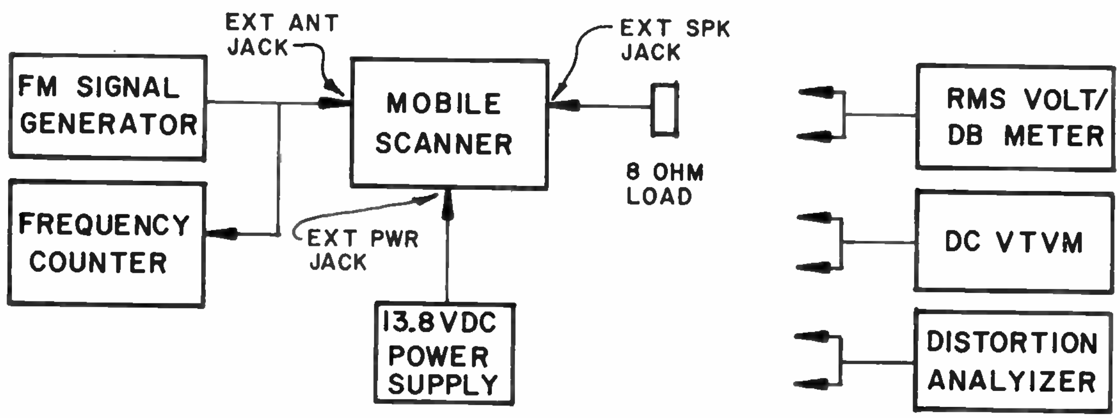


FIGURE 4, TEST SETUP DIAGRAM

5. RF Alignment, Model M8-HU and M8-HUH (Figure 6)

A. With no crystals installed, connect VTVM across R599 and adjust VR504 fo an indication of 1.5 ±0.1 volts DC on VTVM. Refer to Figure 6 for location of adjustments.

B. Connect VTVM between collector of Q510 and ground and adjust VR503 for an indication of 4.0 ±0.1 volts DC on VTVM.

C. Insert a crystal for center-of-the-band alignment in the VHF-HB side of the channel 1 socket. For a center-of-the-band of 156 MHz, the actual crystal frequency should be 48.433 MHz.

D. Adjust FM signal generator to the center-of-the-band frequency as observe on frequency counter. Adjust the signal generator output (without modula tion) to obtain a drop of 10 db on RMS volt/db meter. Vary signal genera tor slightly above and below the tuned frequency to verify that actual crystal frequency is correct for center-of-the-band alignment.

E. Adjust L101, L102, L103, L104 and T101 for minimum reading on RMS volt/db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10 db quieting.

F. Remove VHF-HB crystal and insert crystal for center-of-the-band alignment in the UHF side of channel 1 socket. For center alignment, crystal frequency should be as follows:

MODEL	CENTER-OF-THE-BAND FREQUENCY	ACTUAL CRYSTAL FREQUENCY
M8-HU	460 MHz	49.922 MHz
M8-HUH	493 MHz	53.588 MHz

G. Repeat step D.

H. Adjust CT1, CT2, CT3, and L110 for minimum reading on RMS volt/db meter. Reduce the signal generator output as the circuit is peaked to maintain approximately 10 db quieting.

6. Sensitivity Measurement (All Models)

A. Insert a crystal in the channel 1 socket (VHF-LB side for Model M8-HL and VHF-HB side for Model M8-HU or M8-HUH).

B. With no input signal applied, adjust volume control to obtain 0 db (0.77 VRMS) on RMS volt/db meter. Be sure that squelch control is fully counterclockwise.

C. Adjust frequency of FM signal generator to correspond to channel frequency.

D. Without changing the adjustments of the scanner, adjust the RF output of the signal generator to obtain a noise drop of 20 db on RMS volt/db meter.

E. Measure output level of FM signal generator. Indication should be equal to or less than 0.5 microvolts.

F. Remove crystal from channel 1 socket and insert new crystal for remaining band (VHF-HB side for Model M8-HL and UHF side for Model M8-HU or M8-HUH).

G. Repeat steps B through E.

H. Measure output level of FM signal generator. Indication should be equal to or less than the following:

MODEL	
M8-HL	0.5 microvolts
M8-HU	1.0 microvolt
M8-HUH	1.0 microvolt

7. Audio Output and Distortion Measurement (All Models)

A. Insert a crystal in the channel 1 socket (VHF-LB side for Model M8-HL and VHF-HB side for Model M8-HU or M8-HUH).

B. Adjust scanner volume control fully CW and squelch control full CCW.

C. Adjust frequency of FM signal generator to correspond to channel frequency with 1 kHz modulation at 5 kHz deviation.

D. Adjust RF output of the FM signal generator to 1.5 microvolts. The RMS volt/db meter should indicate 2.53 to 3.09 volts RMS (800 to 1200 milliwatts).

E. Reduce RF output of the FM signal generator until audio output of the scanner is 2.37 volts RMS (700 milliwatts).

F. Connect distortion analyzer across 8-ohm load in place of RMS volt/db meter. Measure output distortion. Indication should not be greater than 10%.

G. Remove crystal from channel 1 socket and insert new crystal for remaining band (VHF-HB side for Model M8-HL and UHF side for Model M8-HU or M8-HUH).

H. Repeat steps B through F.

8. Squelch Open Adjustment (All Models)

A. Remove the phone plug from the external speaker jack.

B. Insert a crystal with a frequency near the center-of-the-band in the channel 1 socket for the VHF-HB side.

C. Adjust frequency of FM signal generator to correspond to channel frequency, with 1 kHz modulation at 5 kHz deviation.

D. Adjust scanner squelch control fully CW.

E. Adjust RF output of FM signal generator to 1.5 microvolts.

F. On scanner, adjust VR502 so that squelch circuit just opens with 1.5 microvolts input.

9. Scan Time Measurement (All Models)

A. Position channel bypass switches 2 through 8 to "down", bypass position.

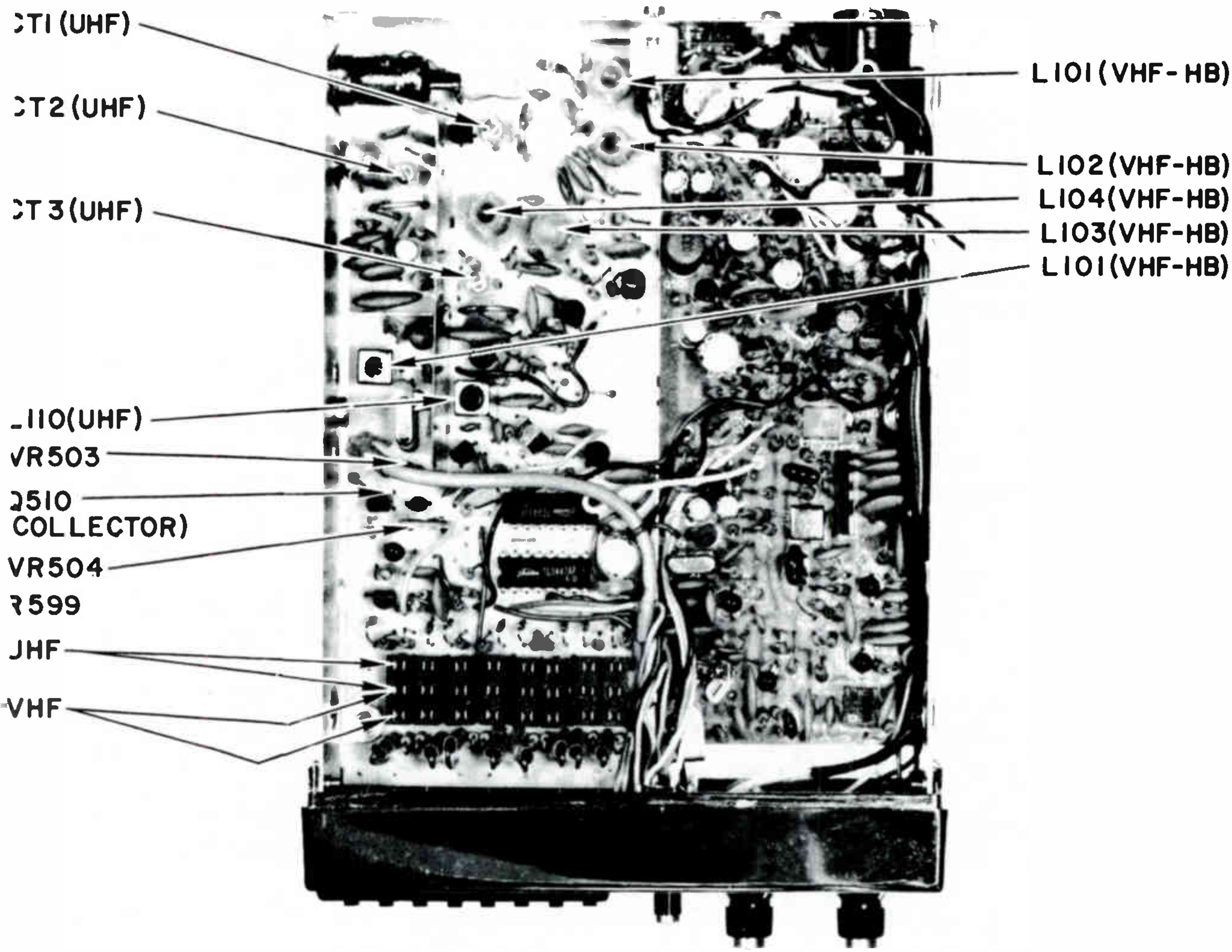
B. With no RF signal applied to scanner, count the number of scans of channel 1 for 30 seconds. Channel 1 LED lamp flash rate should be between 37 and 60 for 30 seconds.

C. Position all channel bypass switches to "up" position and verify that all channel "LED" lamps flash during each complete scan.

10. Special Crystal Frequency Alignment (All Models)

A. Any channel frequency within the specified frequency range may be used for the center-of-the-band frequency. Both frequency bands can be realigned to produce maximum sensitivity for any desired channel frequency within the specified range.

B. To realign the scanner for special crystal frequencies, insert the desired crystal in the proper frequency band and perform the factory RF alignment procedure in this manual substituting the desired center-of-the-band frequency.



NOTE:
VHF-HB (144-175 MHZ)
UHF (450-475 MHZ)
UHFH (425-512 MHZ)

FIGURE 6, LOCATION OF FREQUENCY ADJUSTMENTS (MODEL M8-HU AND M8-HUH)

TABLE I, TROUBLESHOOTING GUIDE

Listed in the troubleshooting guide are possible symptoms of trouble, with the probable causes for use in fault isolation. The table is intended as a brief guide in troubleshooting. It is best used in conjunction with the transistor voltage tables, particularly when the more obvious causes of malfunction have been eliminated and the fault is presumed to be a detailed circuit defect.

TROUBLE	PROBABLE CAUSE
1. Scanner will not operate. No sound from speaker. Channel indicators do not light.	a. Defective voltage connector or defective power switch. b. Regulator Q702 defective.
2. No sound from speaker. Channel LED lamps light. Scan functions normally.	a. Defective speaker or wiring. b. IC701 or Q701 defective. c. Squelch circuit won't open (Q50 or Q502). d. Q503, 504, 505 or 506 defective
3. No scanning (manual or automatic). Audio and squelch functions operate normally.	a. IC501 or IC502 defective. b. Defective scan select switch or multivibrator (Q507 & Q508).
4. No automatic scanning. Manual scan only. Noise on speaker.	a. Q506, Q505, Q504, or Q503 defective. b. D503 or D504 defective. c. Astable MV defective.
5. Irregular scanning. Only some channels scan. Channels scan in pairs.	a. Defective LED (D109-D116). b. Defective switch (SW1-SW8). c. Defective diode (D101-D108).
6. Squelch function inoperative. Audio will not turn off.	a. Q501 or Q502 defective. b. Defective control VR501.
7. No signals on any channel. Noise heard on speaker.	a. Q301, 302, 303, or 304 defectiv b. IC301 defective. c. HF303 defective.
8. No signals on some channels. Other channels operate normally.	a. Improper crystals installed. b. Crystal socket connection loose c. Resistor open (R127-R142).
9. Poor sensitivity.	a. Poor alignment. b. Defective antenna or antenna connection. c. Improper crystal or defective crystal.

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D101	IS1587	2004-67
D102	IS1587	2004-67
D103	IS1587	2004-67
D104	IS1587	2004-67
D105	IS1587	2004-67
D106	IS1587	2004-67
D107	IS1587	2004-67
D108	IS1587	2004-67
D109	SLP-123B02	2037-29
D110	SLP-123B02	2037-29
D111	SLP-123B02	2037-29
D112	SLP-123B02	2037-29
D113	SLP-123B02	2037-29
D114	SLP-123B02	2037-29
D115	SLP-123B02	2037-29
D116	SLP-123B02	2037-29
D117	ITT-310	2039-10
D118	IS1588	2010-01
D119	IS1588	2010-01
D301	IS188FMIA	1010-145
D302	IS188FMIA	1010-145
D501	IS188FMIA	1010-145
D502	IS188FMIA	1010-145
D503	IS1588	2010-01
D504	IS1588	2010-01
D505	XZ-049	2037-26
D701	XZ-100	2037-28
D702	DS-130E	291-20
IC301	TA7061AP	2037-26
IC501	TD3493AP	2037-24
IC502	TD3442AP	2037-25
IC701	UPC575C2	2037-27
Q101	3SK44W	2037-22
Q102	2SC1394L	2037-23
Q103	2N485-1	2020-01
Q104	2SC787	2020-02
Q105	2SC930D	1013-15
Q106	2SC387A	2020-03
Q301	2SK49E2	2032-36
Q302	2SC930D	1013-15
Q303	2SC930	2004-02
Q304	2SC930	2004-02
Q305	2SC930	2004-02
Q501	2SC945R	1080-21
Q502	2SC945R	1080-21
Q503	2SC945R	1080-21
Q504	2SC945R	1080-21
Q505	2SC945R	1080-21
Q506	2SC945R	1080-21
Q507	2SC711E	1076-02
Q508	2SC711E	1076-02
Q509	2SK44D	2020-04
Q510	2SA733Q	1079-85
Q511	2SA733Q	1079-85
Q512	2SA733Q	1079-85
Q701	2SC536	2004-04
Q702	2SC1096L	1074-116

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C502	33uF 10V	2017-87
C505	1uF 10V	1014-107
C506	0.47uF 10V	2004-52
C507	0.47uF 10V	2004-52
C508	0.47uF 10V	2004-52
C509	100uF 10V	1012-18
C511	1uF 10V	1014-107
C512	1uF 10V	1014-107
C515	1uF 10V	1014-107
C516	33uF 10V	2017-87
C517	100uF 6.3V	1003-102
C523	1uF 25V	2039-22
C702	1uF 10V	1014-107
C703	33uF 10V	2017-87
C704	0.1uF 10V	2004-54
C705	2.2uF 10V	2004-51
C706	100uF 10V	1012-18
C707	33uF 10V	2017-87
C710	0.22uF 10V	2004-53
C711	220uF 10V	1012-19
C712	220uF 10V	1012-19
C713	470uF 16V	170-47-9
CT1	Trimmer	2020-22
CT2	Trimmer	2020-22
CT3	Trimmer	2020-22

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR501	Squelch Control, 10K	2037-44
VR502	Semi-fixed, 20K	2037-45
VR503	Semi-fixed, 20K	2039-13
VR504	Semi-fixed, 500	2039-14
VR701	Volume Control, 10K	2037-43

COILS/TRANSFORMERS

ITEM	PART NO.
L101	2037-56
L102	2037-56
L103	2037-57
L104	2037-56
L105	2039-12
L106	2039-11
L107	2039-11
L108	2039-11
L110	2004-39
L111	2018-03
L112	2037-62
L113	2037-62
L115	2004-43
	2032-16 (1)
L116	2004-43
	2032-16 (1)
L117	2004-43
	2032-16 (1)
L118	2004-43
	2032-16 (1)
L119	2004-43
	2032-16 (1)
L120	2004-43
	2032-16 (1)
L121	2004-43
	2032-16 (1)
L122	2004-43
	2032-16 (1)
L501	2039-02
L701	2037-47
T101	2037-63
T301	2037-48

(1) Alternate.

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	HF Filter	2004-49
HF302	Ceramic Filter	2004-50
HF303	Ceramic Filter	2037-42
	Crystal	2004-65
	Switch, Scan/Manual	2004-56
	Switch, Bypass	2037-39
	PC Board, Main	2037-16
	PC Board, Sub	2039-08
	PC Board, Switch	2037-19
	Power Cord	2037-05

CABINET PARTS

NAME	PART NO.
Cabinet	2037-01
Panel, Front	2037-03
Lid, Back	2037-02
Knob, Rotary	2037-09
Knob, Lever	2004-30
Knob, Switch	2004-31

Pages 57-60 Courtesy of CRAIG CORP.

4351 Hi/Lo VHF

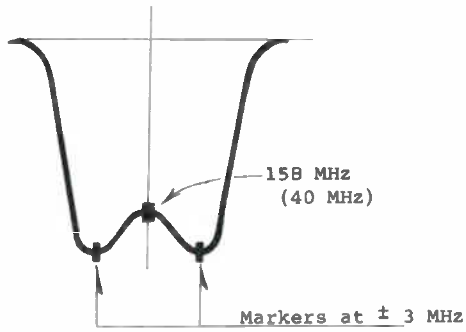


Fig. 4

ALIGNMENT PROCEDURES

Alignment is performed at factory with laboratory test equipment. Therefore, before alignment is attempted the unit should be thoroughly checked for circuit troubles.

EQUIPMENT REQUIERED

1.) FM SIGNAL GENERATOR - 30 to 190 MHz (VHF Band)
2.) FM SIGNAL GENERATOR - 450 to 512 MHz (UHF Band)
3.) SWEEP GENERATOR - 30 to 170 MHz
4.) OSCILLOSCOPE
5.) POWER SUPPLY - 6V DC 200 mA
6.) CRYSTALS - 156 MHz, 450 MHz, 470 MHz & 480 MHz
7.) DUMMY LOAD - 8 Ohms
8.) V.T.V.M.

4351

Turn volume and squelch control fully counterclockwise. Set unit to MANUAL scanning and activate CH-4, plug ONE pin only of a crystal type HC-25U (any frequency can be used) into CH-4 crystal socket on the HIGH Band side to activate the RF and mixer circuits.

FUNCTION	BAND	SIGNAL INPUT	FREQ'CY	OUTPUT	ADJUSTMENT	ADJ. FOR
RF	Hi VHF (4351 only)	Connect sweep generator to TP1 & TP2 (SIGNAL LEVEL MEDIUM)	158 MHz	Connect oscilloscope to R103 & ground to R302	L101, L102, L103, L104	Wave form on Fig. 4

Remove crystal from High Band side and plug ONE pin only of the same crystal on CH-4 crystal socket on Low Band side

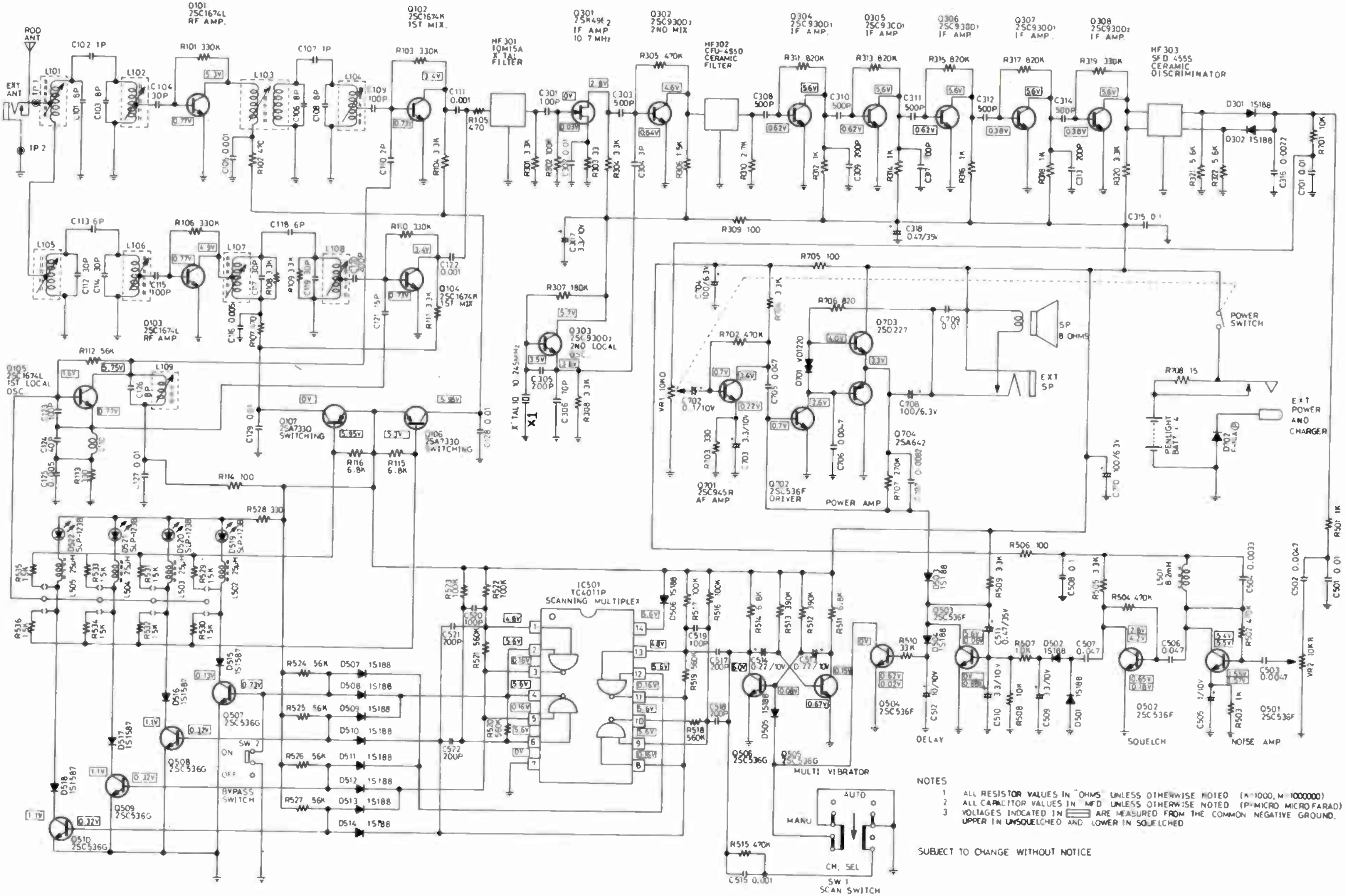
RF	Lo VHF	Connect sweep generator to TP1 & TP2 (SIGNAL LEVEL MEDIUM)	40 MHz	Connect oscilloscope to R110 & Gnd to R302	L105, L106, L107, L108	Wave form on Fig. 4

ALIGNMENT FOR MINIMIZING SPURIOUS

Set unit to MANUAL scanning and activate CH-4, plug a 156 MHz crystal into CH-4 crystal socket on High Band side.

MINIMIZING SPURIOUS	VHF (4351 only)	Connect FM signal generator to TP1 & TP2 (SIGNAL LEVEL APROX. 1mV)	183.03 MHz	Connect oscilloscope, V.T.V.M. to 8 Ohm dummy load across EXT. speaker jack.	L109	minimum spurious output level

4351 SCHEMATIC DRAWING

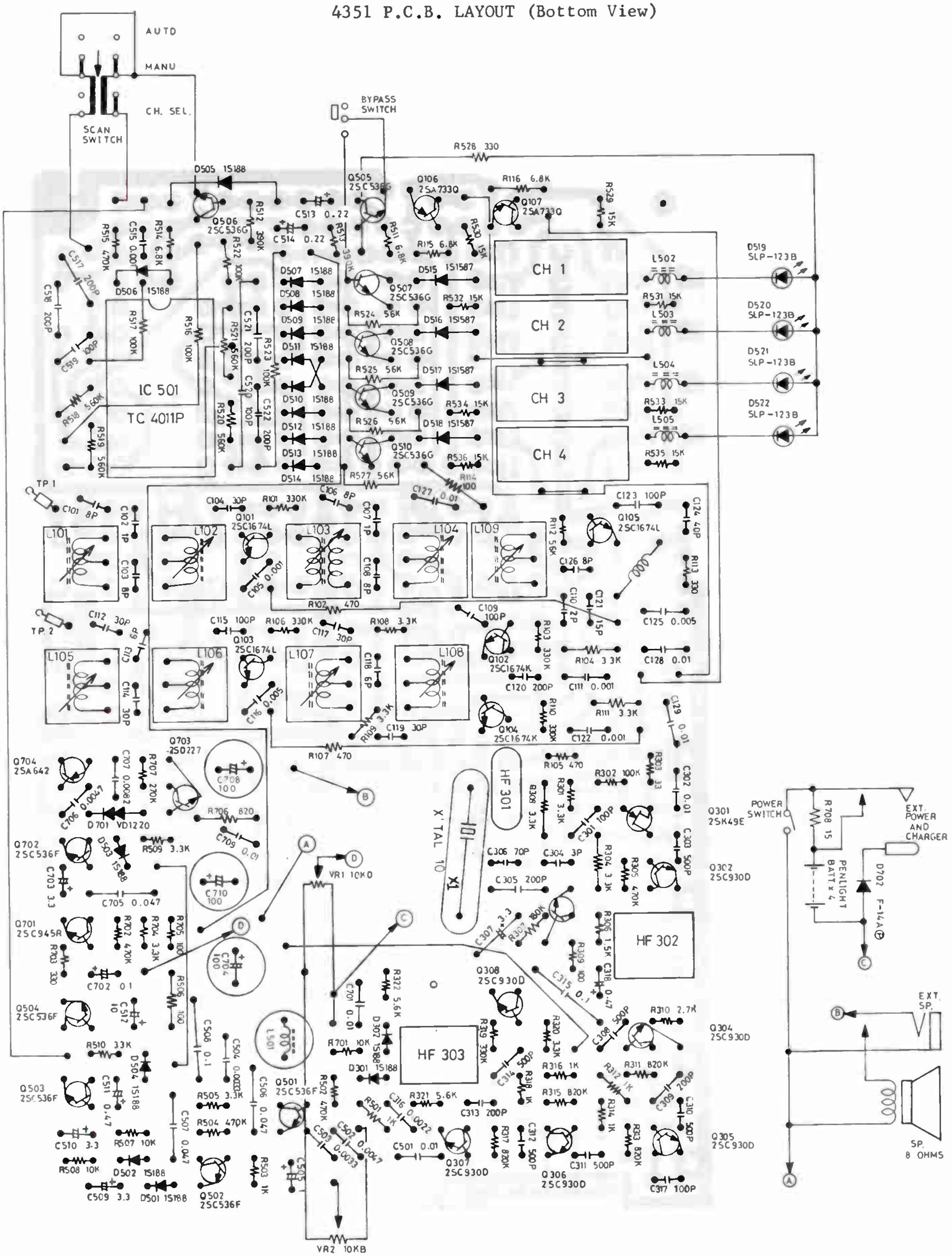


NOTES

1. ALL RESISTOR VALUES IN "OHMS" UNLESS OTHERWISE NOTED (K=1000, M=1000000)
2. ALL CAPACITOR VALUES IN MFD UNLESS OTHERWISE NOTED (P=MICRO MICRO FARAD)
3. VOLTAGES INDICATED IN ▭ ARE MEASURED FROM THE COMMON NEGATIVE GROUND. UPPER IN UNSQUELCHED AND LOWER IN SQUELCHED

SUBJECT TO CHANGE WITHOUT NOTICE

4351 P.C.B. LAYOUT (Bottom View)



C105,111,122,515	Ceramic,	0.001uF/50V	$\pm$ 20%
C116,125	"	0.005uF/50V	"
C127,128,129,302,	"	0.01uF/50V	"
501,709	"	" " "	"
C316	Mylar,	0.0022uF/50V	"
C504	Mylar,	0.0033uF/50V	"
C502,503,706	"	0.0047uF/50V	"
C707	"	0.0082uF/50V	"
C701	"	0.01uF/50V	"
C506,507,705	"	0.047uF/50V	"
C315,508	"	0.1uF/50V	"
C704,708,710	Electrolytic,	100uF/6.3V	
C512	"	10uF/10V	
C505	"	1uF/10V	
C513,514	"	0.022uF/10V	
C702	"	0.1uF/10V	
C307,309,510,703	"	3.3uF/10V	
C511,318	"	0.47uF/35V	

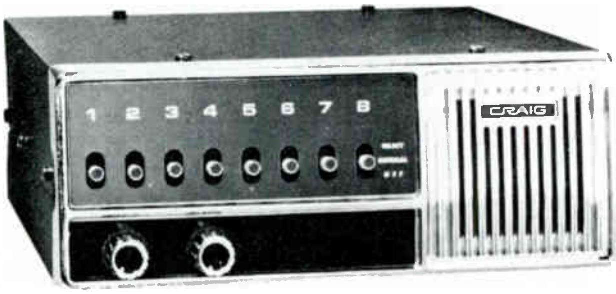
Q101,102,103	2SC1674	Transistor
Q104,105	"	"
Q106,107	2SA733	"
Q301	2SK49	"
Q302,303,304	2SC930	"
Q305,306,307	"	"
Q308	"	"
Q501,502,503	2SC536	"
Q505,506,507	"	"
Q508,509,510	2SC945	"
Q504,702,701	"	"
Q703	2SD227	Transistor
Q704	2SA642	Transistor
IC501	TC4011P	I.C.
D301,302,501	1S188	Diode
D502,503,504,	"	"
D505,506,507,	"	"
D508,509,510,	"	"
D511,512,513,	"	"
D514	"	"
D515,516,517,	1S1587	"
D518	"	"
D519,520,521,	SLP123B	L.E.D.
D522	SLP123B	L.E.D.

L103	4351045	RF Coil
L101,102,	4351046	" "
L104	4351046	" "
L109	4351047	" "
L105,106,	4351048	" "
L107,108	4351048	RF Coil
L502,503,	4351049	RF Choke, 25 uH
L504,505	4351049	" " " "
L501	4351050	RF Choke, 8.2 mH
L110	4351051	VHF Coil
HF301	4351052	Crystal Filter (10M15A)
HF302	4351053	Ceramic Filter (CFU455D)
HF303	4351054	Ceramic Discriminator
X1	4351055	Crystal, 10.245 MHz(HC-18U)

VR1	4351 ONLY	4351038	Var Res 10k,Vol Cont W/Sw
VR2		4351039	Var Res 10k, Squelch

1	4351056	Front Cabinet
2	4351057	Plate, Decoration
3	4351058	Net, Speaker Grille
4	4351059	Back Cabinet
5	4351060	Plate, Decoration
6	4351061	Craig Model Bedge
7	4351017	Lid, Crystal Access
8	4351018	Label, Crystal Layout
9	4351019	Top Panel
10	4351020	Face Plate, Top Panel
11	4351021	Plastic Bkt, LED & Cont Mtg
12	4351022	Dust Cover, Switch
13	4351023	Bkt (L), Main PCB Mtg
14	4351024	Bkt (R), Main PCB Mtg
15	4351025	Bkt, Slide Sw Mtg
16	4351026	Knob, Select Sw
17	4351027	Battery Case
18	4351028	Ass'y, Batt Terminal
19	4351029	Knob, Vol Cont
20	4351030	Knob, Squelch Cont
21	4351031	Felt Cushion, Speaker Mtg
22	4351032	Spr, Ant. Extension Jack
23	*******	Main P.C.B.

Pages 61-66 Courtesy of CRAIG CORP.



4353 8-CHANNEL
ALIGNMENT PROCEDURES

Alignment is performed at factory with laboratory test equipment. Therefore, before alignment is attempted the unit should be thoroughly cheked for circuit troubles.

EQUIPMENT REQUIRED

1. Sweep Generator
2. FM Signal Generator
3. Oscilloscope
4. AC V.T.V.M.
5. Power Source - 12V, 0.4A DC or 120V, 50/60 Hz, 11W AC

STEP	FUCNTION	SIGNAL INPUT	FRQ'CY	OUTPUT	ADJUST	ADJUST FOR
1	IF	Connect sweep generator to base of Q4.	455kHz	Connect oscilloscope to C28.	T1,T2	Adj for sine-wave of maximum hight & best linearity. (See Fig. 1)
1	Lo VHF	Connect sweep generator to ANT. Connector	40MHz	Connect oscilloscope to base of Q302.	T301,T302, T303	Adj for wave in Fig. 2
1	Hi VHF	Connect sweep generator to ANT. Connector (NON-MODULATED SIGNAL)	156MHz	Connect oscilloscope to base of Q304.	T304,T305, T306,T307	Adj for wave in Fig. 3
2		Connect RF signal generator to ANT. Connector (NON-MODULATED SIGNAL)	156MHz	Connect AC V.T.V.M. across voice coil of speaker.	T308	Minimum noise level
1	UHF	Connect sweep generator to ANT. Connector (NON-MODUALTED SIGNAL)	460MHz	Connect oscilloscope to IF out terminal	TC401 TC402 TC403	Adj for wave in Fig. 4
2		Connect RF signal generator to ANT. Connector (NON-MODULATED SIGNAL)	460MHz	Connect AC V.T.V.M. across voice coil of speaker	TC404,T404, T405,T406	minimum noise level

CHANNEL LOCK

Channel lock gate Q16 is dependant on a noise signal of about 30 kHz at the output of the discriminator. The lock sensitivity will drop off as the 30 kHz noise level is reduced by a received signal.

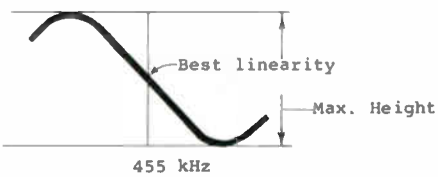


Fig. 1

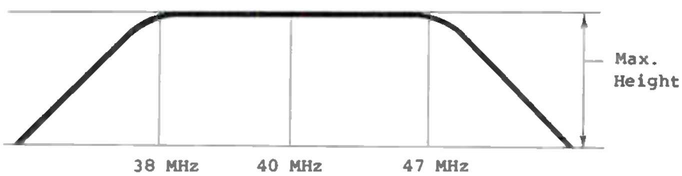


Fig. 2

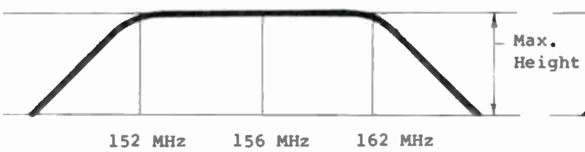
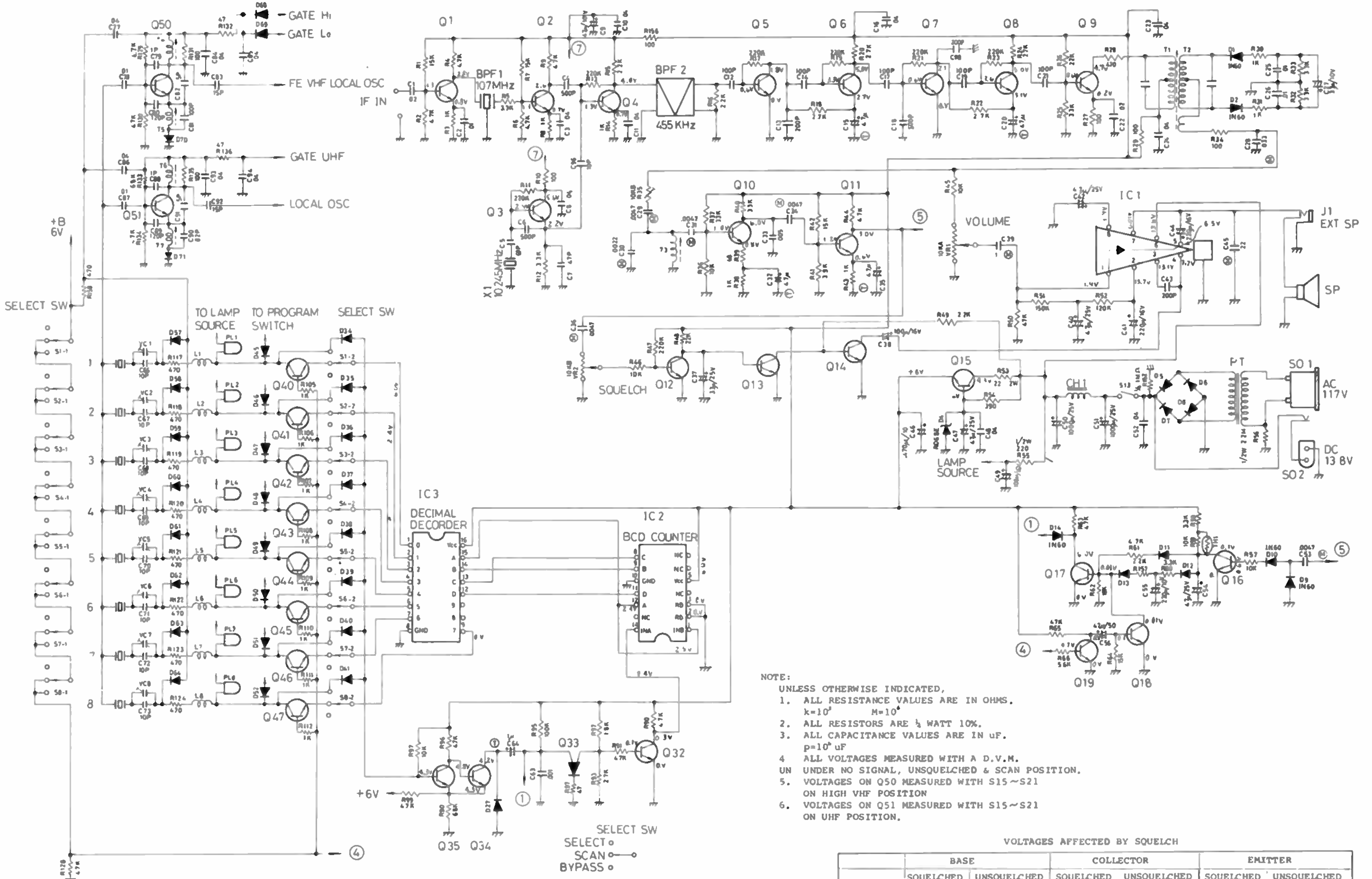


Fig. 3

Fig. 4

4353 SCHEMATIC DIAGRAM



NOTE:

UNLESS OTHERWISE INDICATED,

1. ALL RESISTANCE VALUES ARE IN OHMS. $k=10^3$ $M=10^6$
2. ALL RESISTORS ARE ½ WATT 10%.
3. ALL CAPACITANCE VALUES ARE IN uF. $p=10^{-6}$ uF
4. ALL VOLTAGES MEASURED WITH A D.V.M.

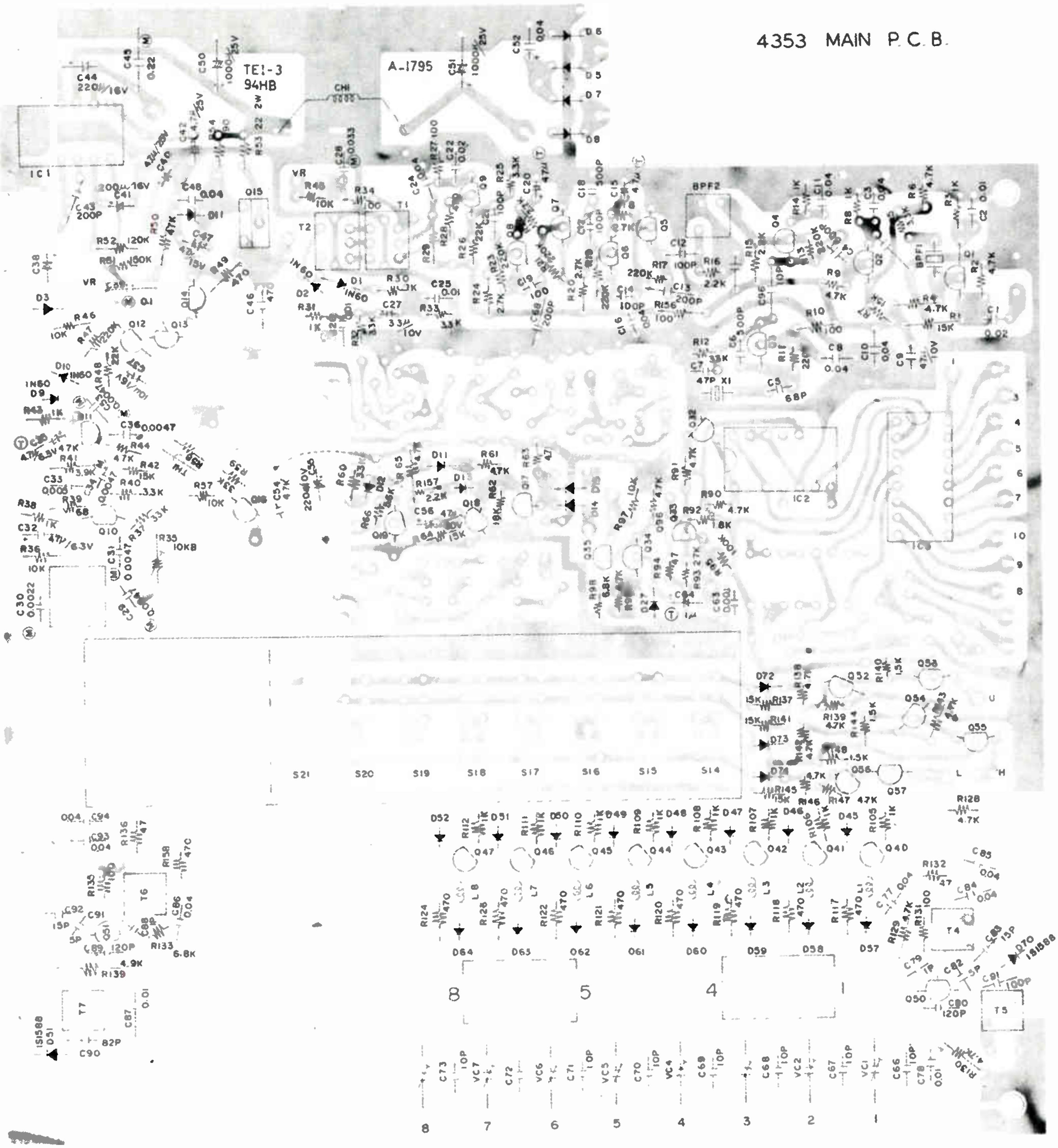
UN UNDER NO SIGNAL, UNSQUELCHED & SCAN POSITION.

5. VOLTAGES ON Q50 MEASURED WITH S15~S21 ON HIGH VHF POSITION
6. VOLTAGES ON Q51 MEASURED WITH S15~S21 ON UHF POSITION.

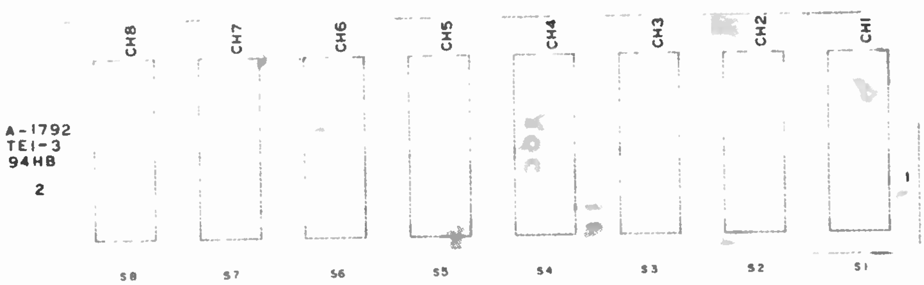
VOLTAGES AFFECTED BY SQUELCH

	BASE		COLLECTOR		EMITTER	
	SQUELCHED	UNSQUELCHED	SQUELCHED	UNSQUELCHED	SQUELCHED	UNSQUELCHED
Q12	0.4V	0.3V	0.1V	0.7V	0.V	0.V
Q13	0.1V	0.7V	0.8V	0.1V	0.V	0.V
Q14	0.8V	0.1V	0.03V	0.V	0.V	0.V
Q40~Q47		5.6V		5.5V		5.0V

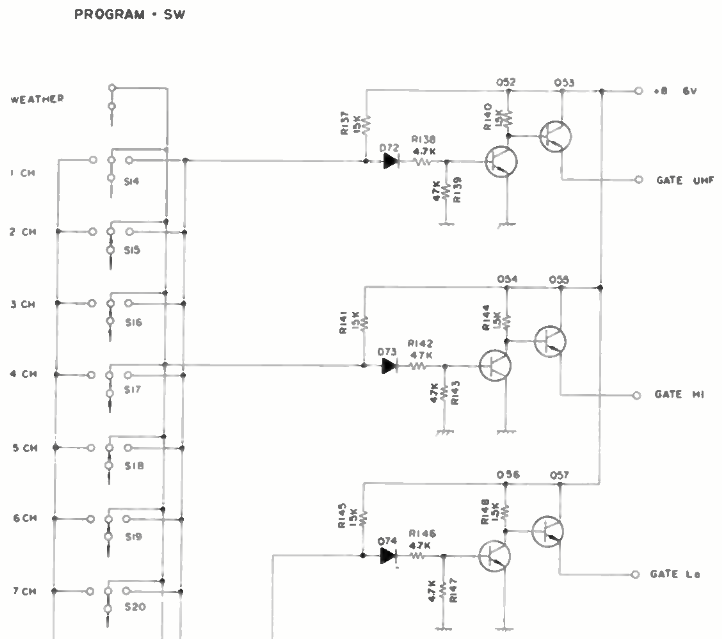
4353 MAIN P.C.B.

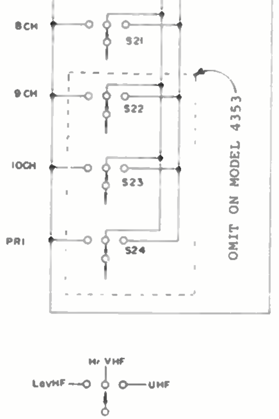


4353 PROGRAM SELECT SW P.C.B.



GATE CIRCUIT SCHEMATIC DIAGRAM





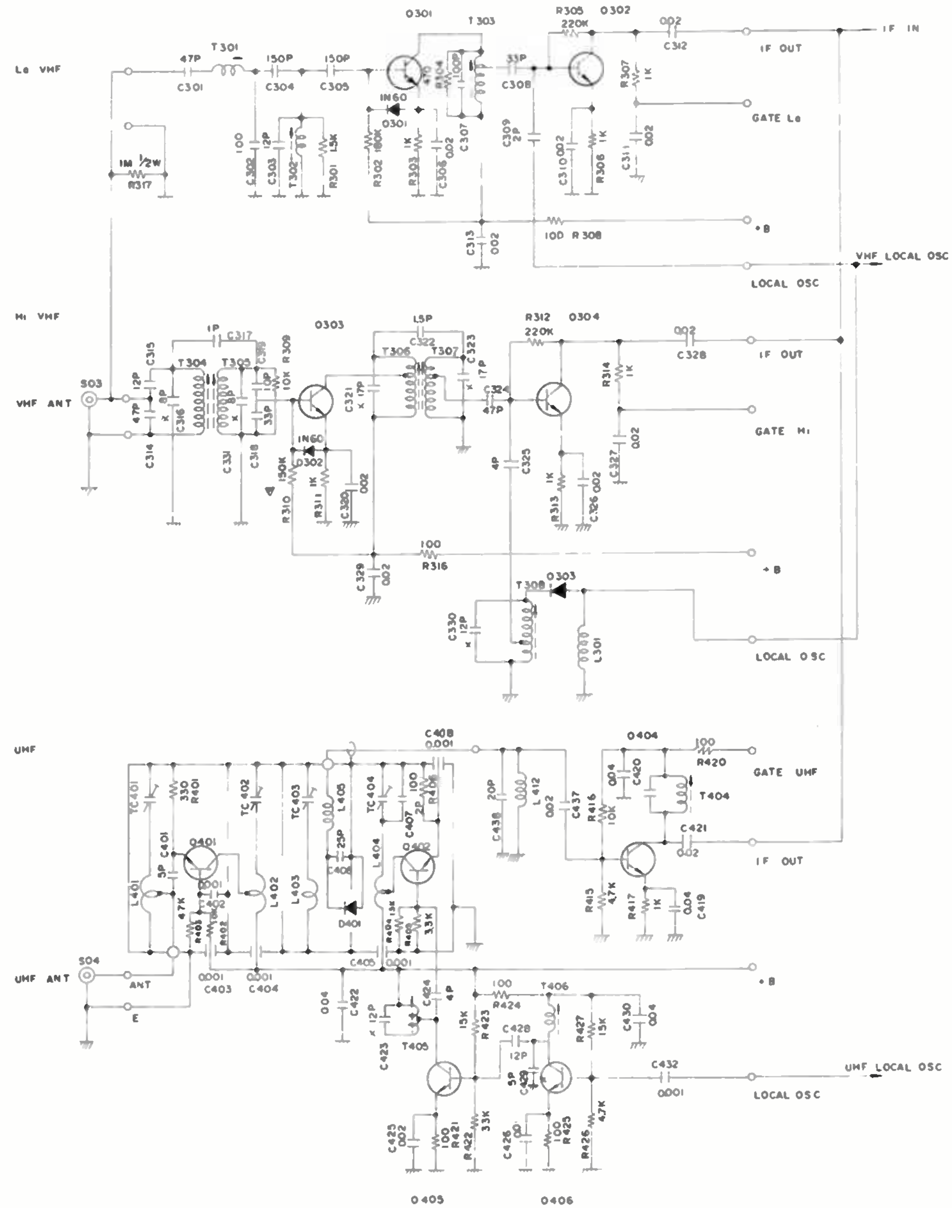
NOTES:

1. Voltages on Q56,Q57,Q301 & Q302 were measured with S14~S24 on Lo VHF position.
2. Voltages on Q54,Q55,Q303, & Q304 were measured with S14~S24 on Hi VHF position.
3. Voltages on Q52,Q53,Q401,Q402,Q404,Q405 & Q406 were measured with S14~S24 on UHF position.

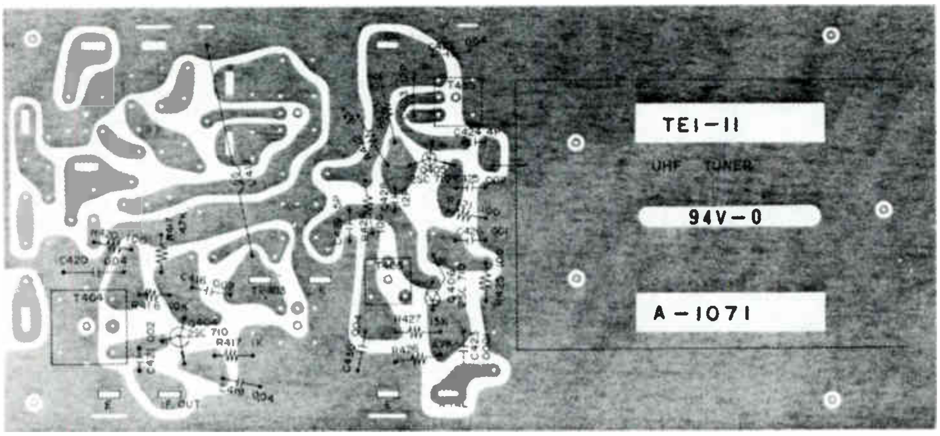
VOLTAGE CHART

	E	B	C
Q52	5.2V	0.2V	5.8V
Q53	5.2V	5.8V	6.0V
Q54	0.0V	0.2V	5.8V
Q55	5.2V	5.8V	6.0V
Q56	0.2V	0.2V	5.8V
Q57	5.2V	5.8V	6.0V
Q301	1.5V	2.2V	5.8V
Q302	1.0V	1.7V	4.2V
Q303	1.6V	2.4V	5.9V
Q304	1.0V	1.8V	4.2V
Q401	1.0V	1.8V	6.0V
Q402	6.0V	1.0V	0.2V
Q404	0.9V	1.6V	5.1V
Q405	0.3V	1.0V	6.0V
Q406	0.4V	1.1V	5.6V

FRONT END SCHEMATIC DIAGRAM



4353 UHF P.C.B.



D11,12,	WG1010A	Diode
D13,17,	WG1010A	Diode
D18,19,	WG1010A	"
D21,22,	WG1010A	"
D23,24,	WG1010A	"
D25	WG1010A	"
D26~D55	WG1010A	"
D68,69,	WG1010A	"
D72,73,	WG1010A	"
D74,75	WG1010A	"
D1,2,3,9	1N60	"
D10,14,	1N60	"
D15,16,	1N60	"
D20,26,	1N60	"
D301,302	1N60	"
D401	1SS16	"
D5~D8	S1B0102	"
D4	RD6.8	Zener Diode
LD1	ME116	L.E.D.
TH1	TD5C225	Thermistor

Q301,302	2SC1674	Transistor
Q303,304	2SC1674	"
Q1~Q9	2SC1675	"
Q50,51,	2SC710	"
Q404,405	2SC710	"
Q406	2SC710	"
Q10~Q14	2SC711	"
Q16~Q26	2SC711	"
Q28,29,	2SC711	"
Q30,31	2SC711	"
Q32	2SC711	"
Q34~Q49	2SC711	"
Q52~Q57	2SC711	"
Q15	2SC1096	Transistor
Q401,402	2SC1180	"
Q27,33	N13T1	P.U. Transistor
IC3	SN74145N	I.C.
IC1	UPC575C2	I.C.
IC4,5	M53200	I.C.
IC2	M53293P	I.C.

TC401,402	4350019	Trimmer Cap, 5pF (cylinder type)
TC403,404	4350019	Trimmer Cap, 5pF "
VC1~VC12	4350013	Trimmer Capacitor, 16pF
T404	4350037	IFT, 10.7 MHz (T101)
T1	4353035	IFT, Discriminator (T3166)
T2	4353036	IFT, Discriminator (T3167)
T3	4350045	IFT, 40 kHz (T301)
T4,6,406	4350020	RF Coil, A
T304,305	4353037	RF Coil, D
T306	4353038	RF Coil, E
T308	4353032	RF Coil, F
T307	4353039	RF Coil, G
L401,402	4350027	RF Coil, H
L403	4350027	RF Coil, H

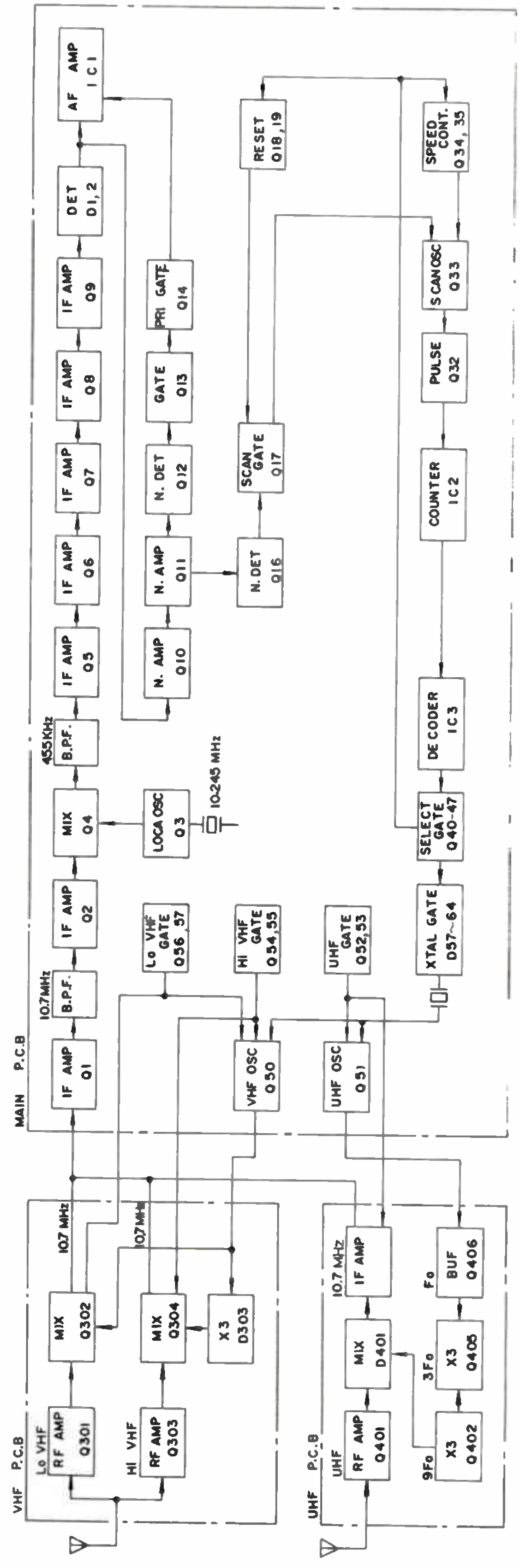
T405	4350036	RF Coil, C
L404	4350029	RF Coil, J
T301	4353040	RF Coil, P
T5,7	4353041	RF Coil, Q
T303	4353042	RF Coil, R
L1~L12	4350034	RF Choke Coil, A
L301,412	4350034	RF Choke Coil, A
L405	4353043	RF Choke Coil, C
CH1	4350010	AF Choke Coil
PT	4350083	Power Transformer
T302	4353045	RF Coil
BPF1	4353046	Band Pass Filter, 10.7 MHz
BPF2	4353047	Ceramic Band Pass Filter 455kHz
X1	4350014	Crystal, 10.245 MHz

S12	4353028	Push Sw, Weather
VR1	4353029	Var Res 10k, Vol Cont W/Sw
VR2	4353030	Var Res 10k, Squelch Cont
VR3	4354017	Var Res 10k, Scan Delay(4354)
R35	4350007	Semi-Variable Resistor, 10k
	4354016	PCB, Weather LED Mtg W/O Comp
	4353033	PCB, For Lamp Ground W/O Comp
	4353034	PCB, CH Select Sw Mtg(4353)
	4354015	PCB, CH Select Sw Mtg(4354)
	4353049	Ass'y, Hi/Lo VHF PCB W/Comp

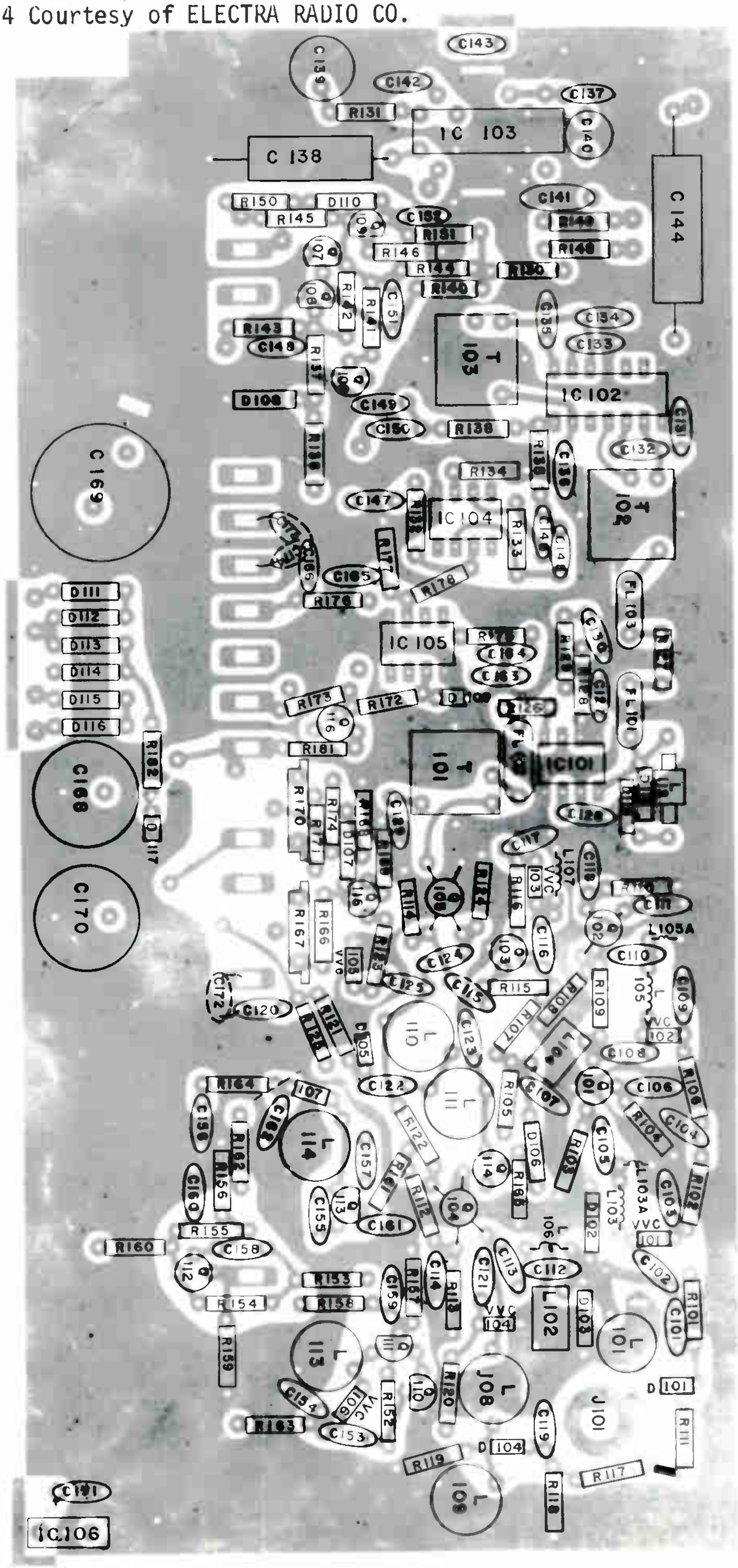
PL1~PL11	4350011	Lamp, CH Indicator
	4350051	Crystal Socket
SO1	4350078	AC Power Socket
SO2	4350079	DC Power Socket
SO3, SO4	4353024	Antenna Socket
J1	4353025	Extension Speaker Jack
SP	4350015	Speaker
S1~S11	4353026	Slide Sw, SELCT/SCAN/BYPASS
S14~S24	4353027	Slide Sw, Hi/Lo VHF/UHF
	4353048	Ass'y, UHF PCB W/Comp

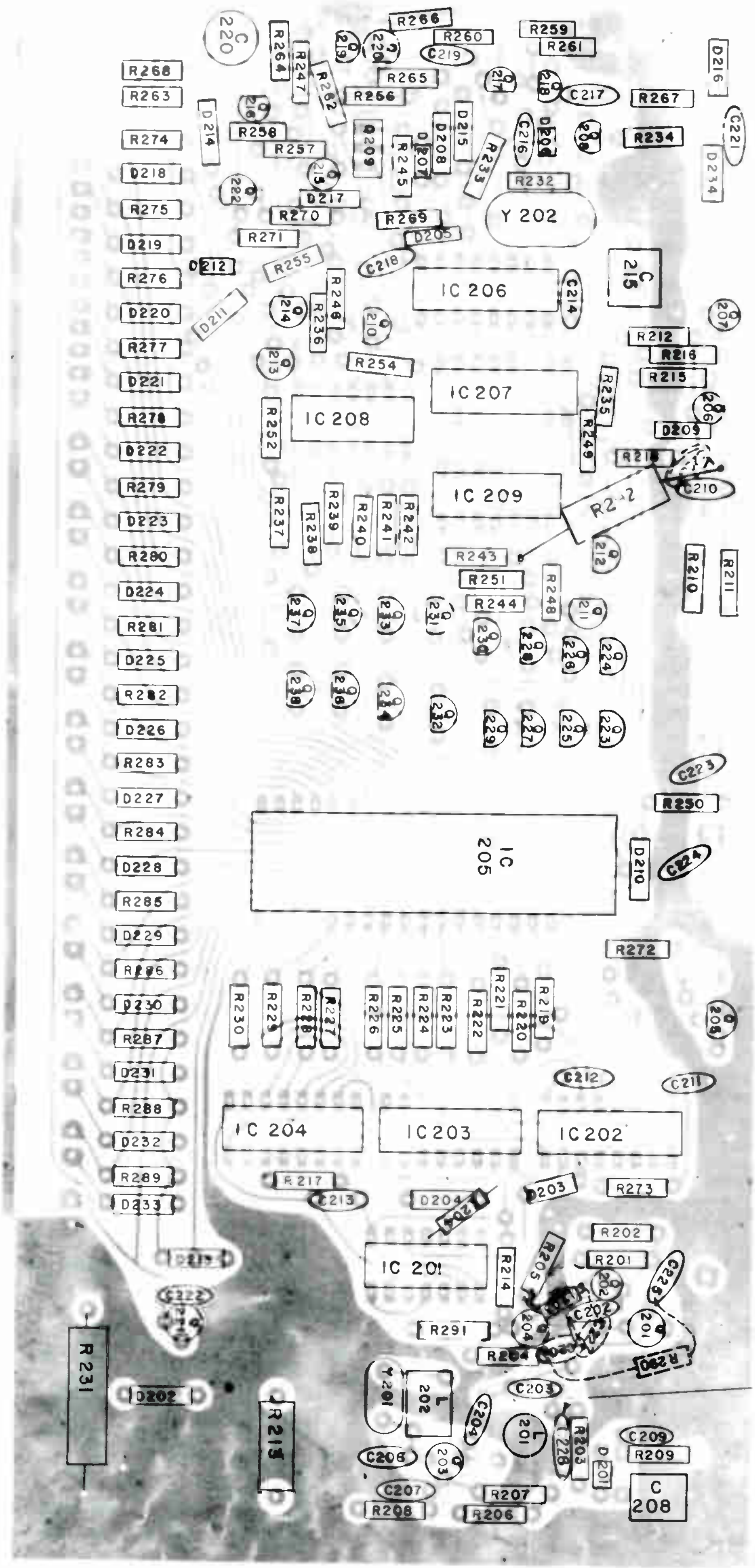
C27,58,62,95	Electrolytic,	33uF/10V
C9	"	47uF/10V
C55,57	"	220uF/10V
C46	"	470uF/10V
C49,38	"	100uF/16V

4353 BLOCK DIAGRAM



Pages 67-74 Courtesy of ELECTRA RADIO CO.




R266
R260
R259
R261
C220
R264
R247
R262
C219
R265
R256
R268
R263
C217
R267
D216
D214
R258
R257
R274
D218
Q209
R245
D208
D215
C216
R233
R234
C221
D234
R232
R275
D217
R270
D219
R269
D205
R271
Y 202
R276
D212
R255
C218
IC 206
C214
C 215
R246
D220
D211
R236
R277
R254
R212
R216
R215
D221
IC 207
R235
R278
IC 208
R252
R249
D209
D222
R279
IC 209
R237
R239
R240
R241
R242
C210
D223
R238
R280
R243
R251
R210
R211
D224
R244
R248
R281
D225
R282
D226
R283
C223
D227
R250
R284
IC 205
D210
C224
D228
R285
D229
R272
R286
D230
R230
R229
R228
R227
R226
R225
R224
R223
R222
R221
R220
R219
R287
D231
C212
C211
R288
IC 204
IC 203
IC 202
D232
R289
R217
D233
C213
D204
D203
R273
R202
IC 201
R214
R201
R205
C202
R291
R231
R204
C203
D202
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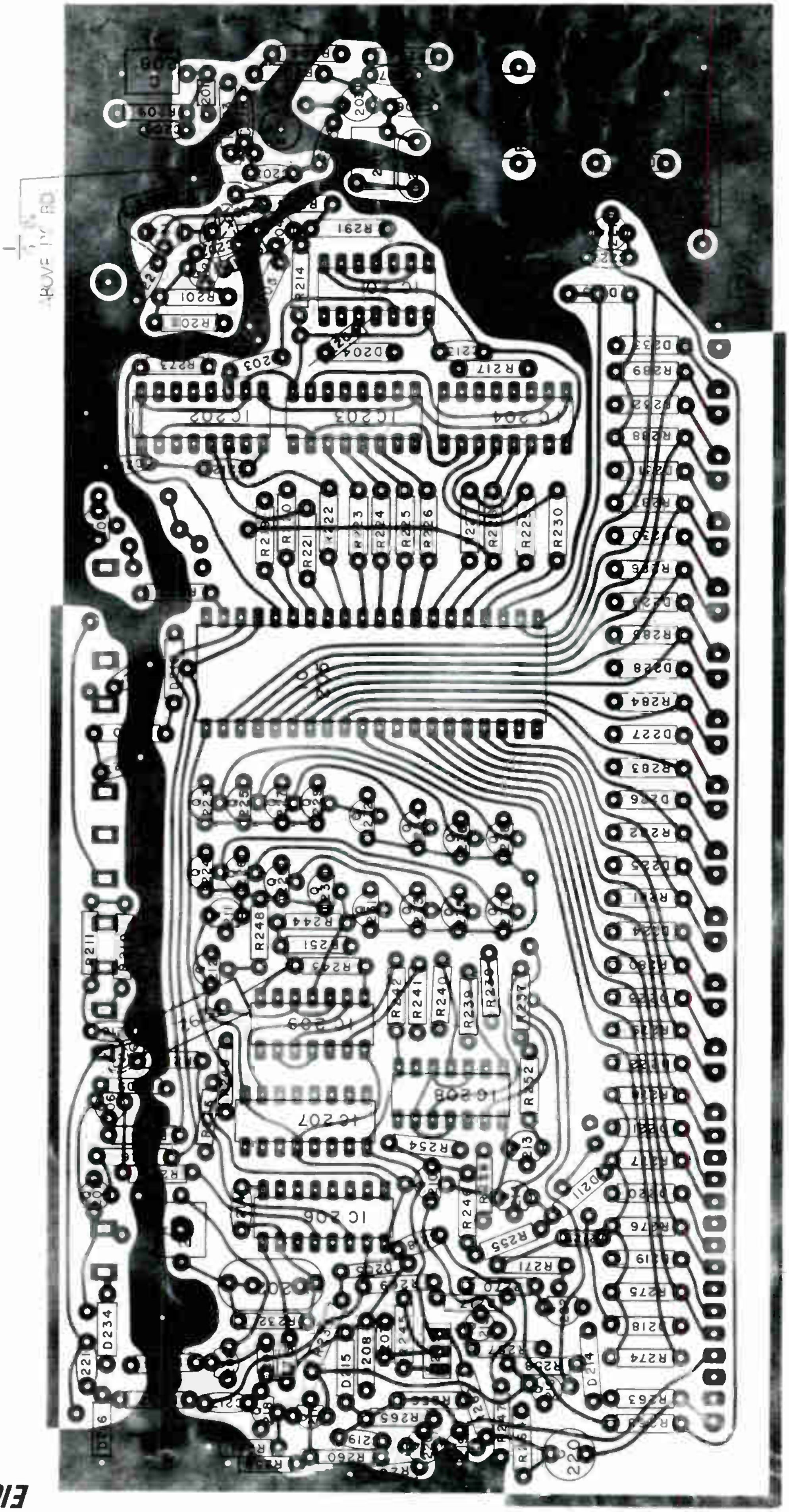
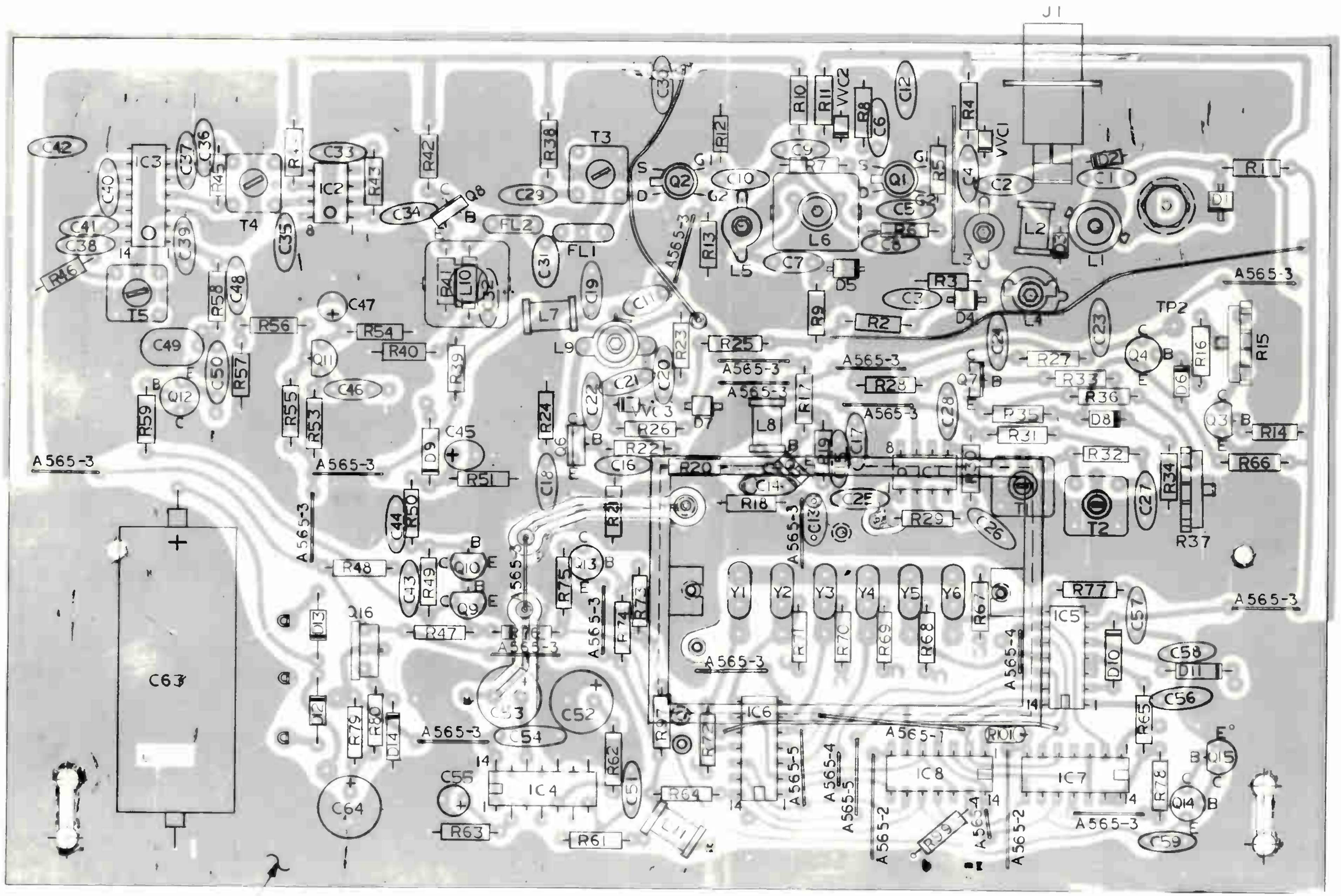
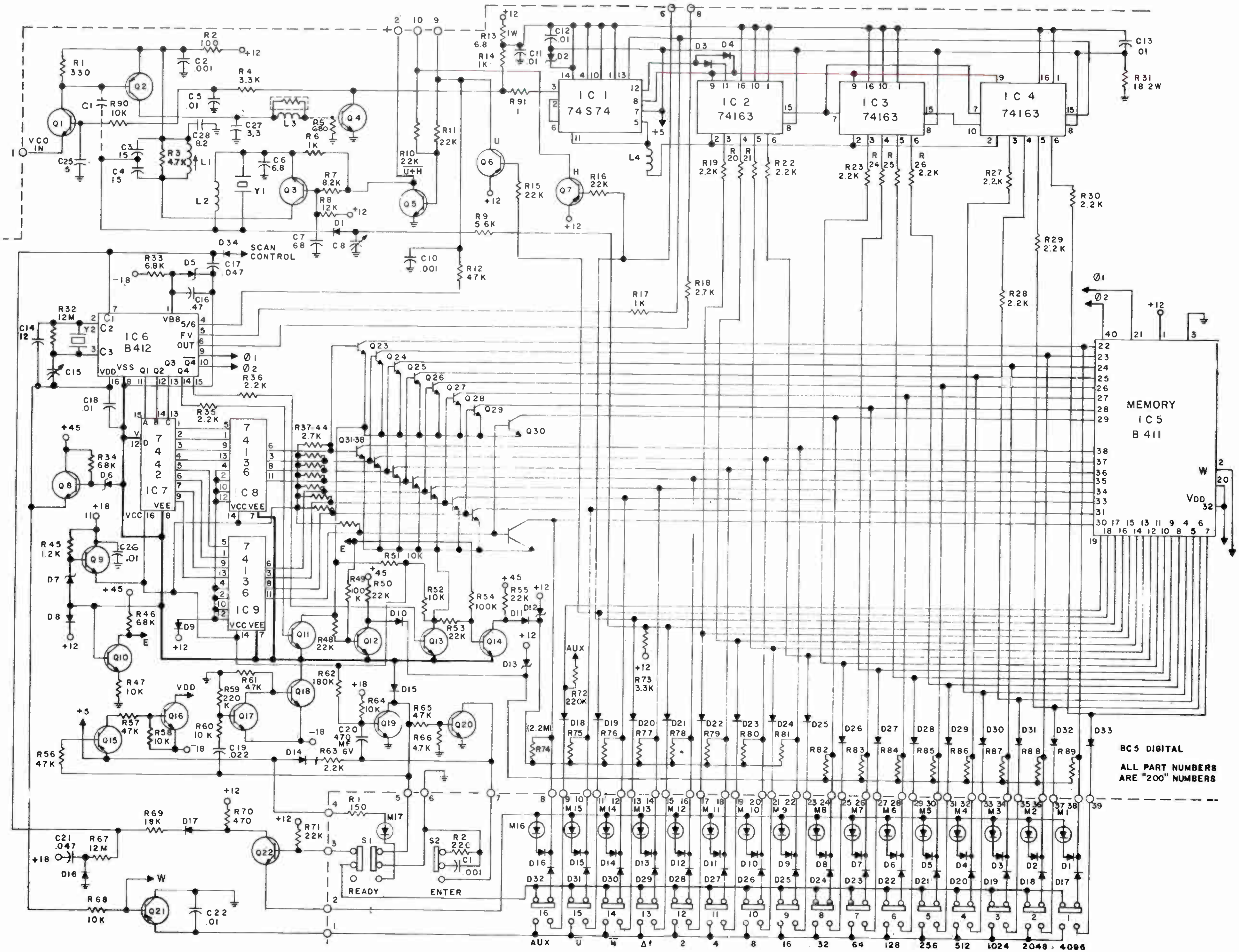
C209
C206
R209
D201
C207
R207
C 208
R208
R206



Electra Bearcat 101

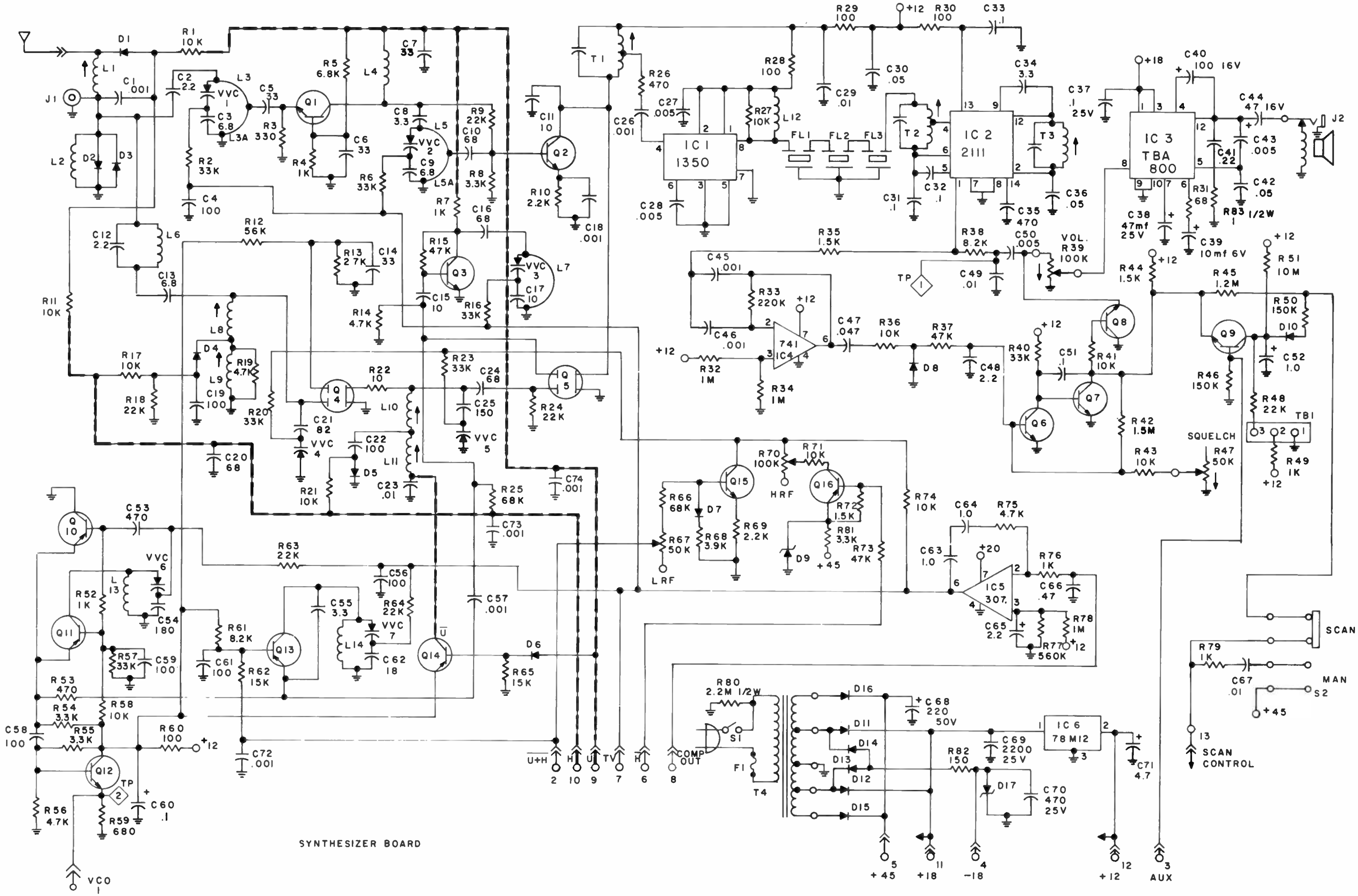


COPPER SHOWN ON OPPOSITE SIDE



VCO IN
SCAN CONTROL
IC 1 74S74
IC 2 74163
IC 3 74163
IC 4 74163
IC 6 B412
IC 7 74442
IC 8 74136
IC 9 74136
MEMORY IC 5 B 411
READY
ENTER
AUX
BC5 DIGITAL
ALL PART NUMBERS ARE "200" NUMBERS

Electra Bearcat 101



ALL PART NUMBERS ARE "100" NUMBERS

Pages 75-84 Courtesy of RCA ELECTRONICS COMPONENTS & DEVICES

Troubleshooting

General

If any of the operational checks indicate that the receiver is not performing normally, standard troubleshooting techniques should be used to locate the defective part of the receiver.

The RF and audio circuits are straightforward designs and should not present any servicing difficulty. Before attempting to troubleshoot the squelch, scanning or switching circuits, study the circuit description and schematic diagram to obtain a thorough understanding of these circuits.

Service Hints

1. The dc voltages shown on the schematic are approximate and will vary slightly from unit to unit. Refer to the circuit condition notes on the schematic.
2. All first local oscillator crystals should be removed from the crystal sockets before making dc voltage measurements.

NOTE:

The voltages applied to Q101, Q102, Q103 and Q104 are turned "off" when all crystals are removed from their sockets. To apply voltage to these circuits (without inserting a crystal), the proper "socket switch", described in the Circuit Description section, must be "closed". This can easily be done by inserting a small wire (such as the end of a straightened paper clip) into the proper crystal socket to close the socket contacts.

3. Oscillator Q105 may oscillate at some parasitic frequency when all crystals are removed. To measure the dc voltages on Q105, a small capacitor (approximately 0.047 μF) should be temporarily connected from the base of Q105 to ground to "kill" these oscillations. A convenient connection can be made between a center contact of the crystal socket and TP2.

NOTE:
The dc voltages for 2nd local oscillator Q303 are shown with Q303 in its oscillating mode. These voltages change only slightly when the crystal is shorted out with a 0.047 μF capacitor.

4. RF alignment should be made using a signal level just high enough to give a useful oscilloscope waveform. Excessive signal input can result in front-end overload and distortion which may appear to be a receiver problem. A high sensitivity RF probe and an oscilloscope having 1 mV vertical sensitivity are recommended.
5. The front and back covers of the scanner cabinet are held together by six "snap-in" tabs —three on each side of the case. One pair of tabs is located in the center; the other two pairs are located respectively about one inch from the top and one inch from the bottom ends of the case.

To remove the back cover, first remove the battery and crystal compartment lids. Tightly squeeze the sides of the back cover about one inch below the top of the unit. While holding the front cover firmly, pull back hard on the back cover. To obtain a better grip on the back cover while pulling, insert your index finger into the crystal compartment opening.

Measurement Procedures

Crystal Frequency Measurement

Test Equipment Required
- Frequency Counter (Hewlett Packard Model 5381A or equivalent)
- Counter Preamplifier (If required)

Procedure:
1. Insert the crystals to be measured into the appropriate sockets.
2. Turn the scanner on and adjust the squelch and volume controls fully counter-clockwise.
3. Manually set the scanner to the channel position of the crystal to be tested.
4. Connect the test equipment as shown in Fig. 2.

NOTE:
Signal pick-up from the crystal's metal case is recommended because it has negligible loading effect on the oscillator circuit. In most cases, the signal pick-up from the crystal case will be sufficient to provide an accurate and steady count. If no count is displayed, or if the count is erratic, a counter preamplifier having a minimum gain of 15 dB between 40 MHz and 60 MHz should be used.

5. Record the frequency displayed on the counter.

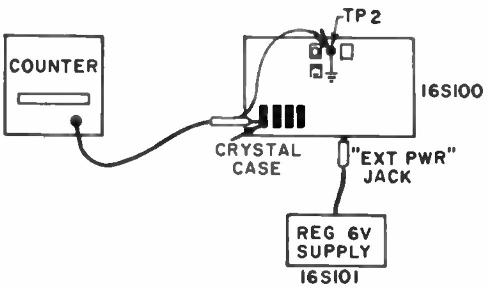


Figure 2—Test setup for crystal frequency measurement

The following examples will illustrate how to calculate the frequency range that is acceptable if the crystal is oscillating within the specified tolerance.

Example No. 1: Low VHF Band

Channel frequency = 33.860
Crystal frequency = Ch. Freq. + 10.700 MHz
= 33.860 + 10.700 MHz
= 44.560 Mhz

The accuracy specified for low VHF band crystals is .003%.

Upper Frequency Limit = 1.00003 x 44.560 MHz = 44.561336 MHz
Lower Frequency Limit = .99997 x 44.560 MHz = 44.558663 MHz

Example No. 2: High VHF Band

Channel Frequency = 158.970

$$\text{Crystal Frequency} = \frac{\text{Ch. Freq.} - 10.700\ \text{MHz}}{3} = \frac{158.970 - 10.700\ \text{MHz}}{3} = 49.423333$$

The accuracy specified for the high VHF band crystals is .002%.

Upper Frequency Limit = 1.00002 x 49.423333 MHz = 49.424321 MHz
Lower Frequency Limit = 0.99998 x 49.423333 MHz = 49.422344 MHz

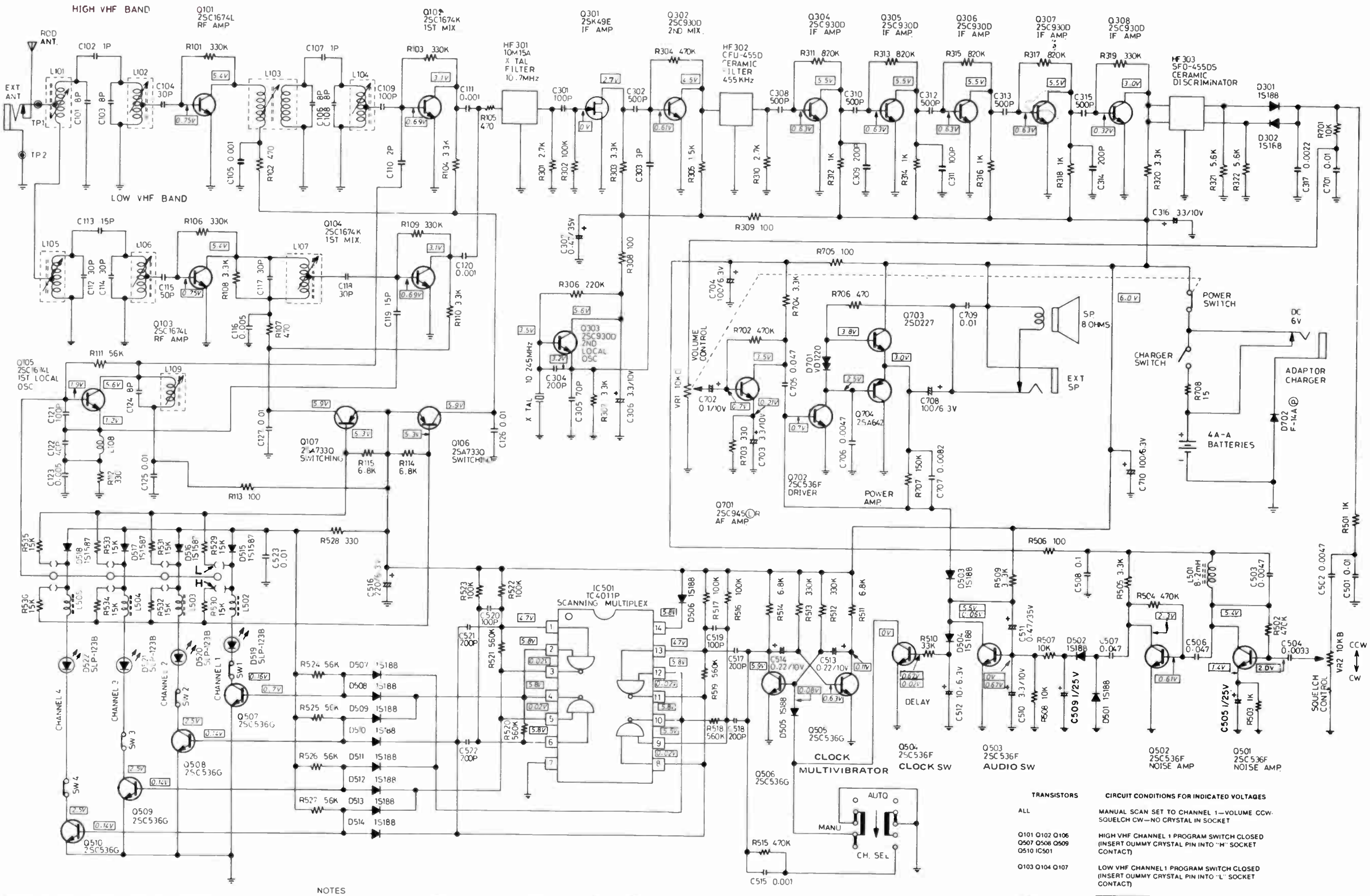


Figure 3—Schematic diagram—16S100

NOTES
1. ALL RESISTOR VALUES IN "OHMS" UNLESS OTHERWISE NOTED (K=1000 M=1000000)
2. ALL CAPACITOR VALUES IN "MFD" UNLESS OTHERWISE NOTED (P=MICRO MICROFARAD)

TRANSISTORS	CIRCUIT CONDITIONS FOR INDICATED VOLTAGES
ALL	MANUAL SCAN SET TO CHANNEL 1—VOLUME CCW. SQUELCH CW—NO CRYSTAL IN SOCKET
Q101 Q102 Q106 Q507 Q508 Q509 Q510 IC501	HIGH VHF CHANNEL 1 PROGRAM SWITCH CLOSED (INSERT DUMMY CRYSTAL PIN INTO "H" SOCKET CONTACT)
Q103 Q104 Q107	LOW VHF CHANNEL 1 PROGRAM SWITCH CLOSED (INSERT DUMMY CRYSTAL PIN INTO "L" SOCKET CONTACT)
Q503 Q504	SQUELCH CW / SQUELCH CCW

NOTE: ALL VOLTAGES MEASURED TO COMMON NEGATIVE GROUND USING A VTVM OR HIGH IMPEDANCE EQUIVALENT.

Measurement Procedure continued

Sensitivity Measurement (20 dB Noise Quieting)

Test Equipment Required
- RF Signal Generator (Wavetek Model 3000 or equivalent).
- AC Voltmeter (Ballantine Model 314 or equivalent).
- Audio Dummy-Load Resistor (8 Ohms — ½ Watt)

Procedure:
1. Connect the test equipment as shown in Fig. 4.
2. Insert the crystal for the channel frequency to be measured into the appropriate socket.

NOTE:
If a general overall sensitivity performance check is being made, the test crystals recommended on page 7 should be used. Additional crystals having frequencies of particular interest may also be included.

3. Turn the scanner on and manually set it to the channel position corresponding to the frequency to be measured.
4. Set the generator for cw operation. Adjust the RF output level to zero.
5. Turn the scanner's squelch control fully clockwise.
6. Adjust the scanner's volume control until the audio output noise indicated on the ac voltmeter is 0.5 volt.
7. Increase the generator's RF output to approximately 10 microvolts.
8. Adjust the generator's output frequency to the exact center of the channel being measured. This frequency must remain stable within ± 500 Hz during Step 9.

NOTE:
At this point, the noise level indicated on the ac voltmeter should drop to a low level (less than 0.05 volt).

9. Decrease the generator's RF output level until the audio noise level indicated on the AC voltmeter increases to 0.05 volt. This RF output level is the 20 dB noise quieting sensitivity for the channel frequency being measured.
10. Repeat steps 1 through 9 for each channel frequency to be measured.

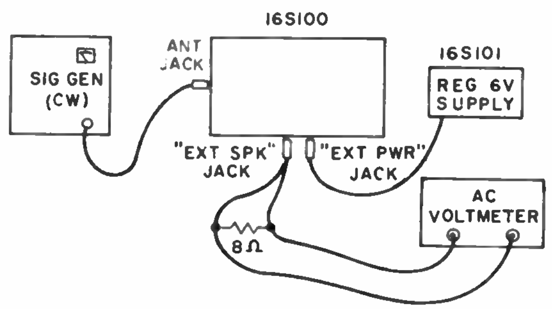


Figure 4—Test setup for Sensitivity measurement

RF Alignment

Test Equipment Required
- RF Sweep Generator (Wavetek Model 2000 with 1, 10, 50 MHz Harmonic Markers—or equivalent).
- Oscilloscope (Wavetek Model 1901A or equivalent).
- RF oscilloscope probe (RCA WG-400A Direct/Low Cap. Probe with slip-on RF Probe WG-302B or equivalents).

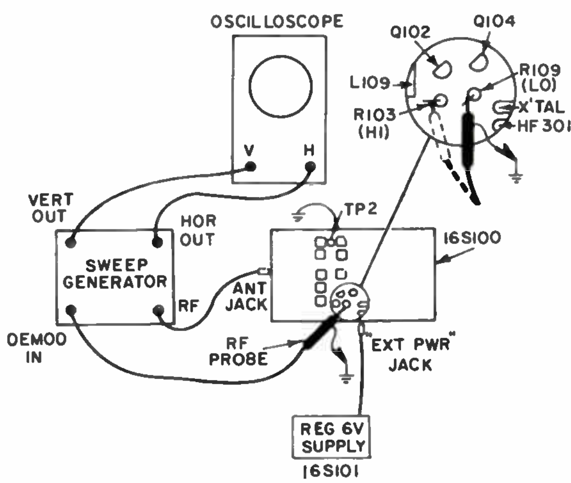


Figure 5—Test setup for RF alignment

Procedure:

Step	Signal Source	Output Indicator	* Set Input Signal To	Manually Set Channel To	Adjust	Adjust For
1. High-VHF RF Alignment	Connect Sweep Generator to antenna input jack. See Fig. 5 Use lowest output producing usable waveform.	Connect scope's RF probe to base of mixer Q102 (R103).	150 MHz to 170 MHz Sweep Markers at 153, 158, 163 MHz	Channel 1 Remove crystals. Insert end of paper clip wire into channel 1 socket (H) to turn High-VHF circuits "on".	L101, L102, L103, L104	Waveform shown in Fig. 6, with maximum flatness between 153-163 MHz.
2. Oscillator Alignment					L109—Set one turn down from the top surface of the transformer can.	
3. Low-VHF RF Alignment	Connect Sweep Generator to antenna input jack. See Fig. 5 Use lowest output producing usable waveform.	Connect scope RF probe to base of mixer Q104 (R109).	30 MHz to 50 MHz Sweep Markers at 33, 40, 47 MHz.	Channel 1. Remove crystals. Insert end of paper clip wire into channel 1 socket (L) to turn Low-VHF circuits "on".	L105, L106, L107	Waveform shown in Fig. 7, with maximum flatness between 33-47 MHz.

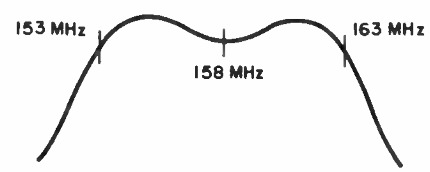


Figure 6—High-VHF RF waveform

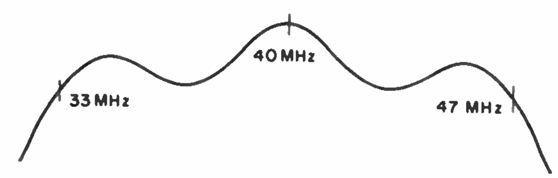


Figure 7—Low-VHF RF waveform

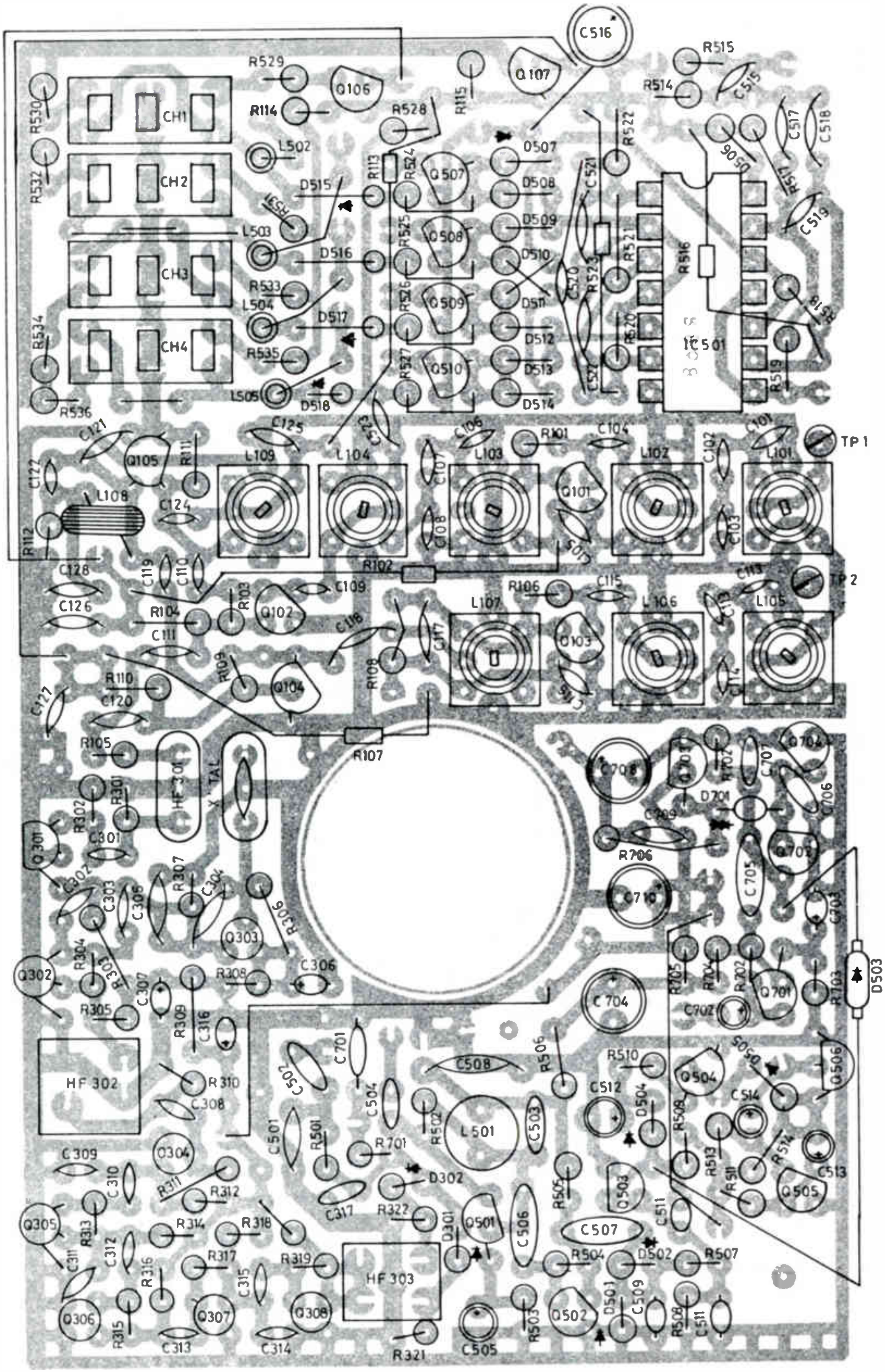


Figure 8—Top View: Location of components

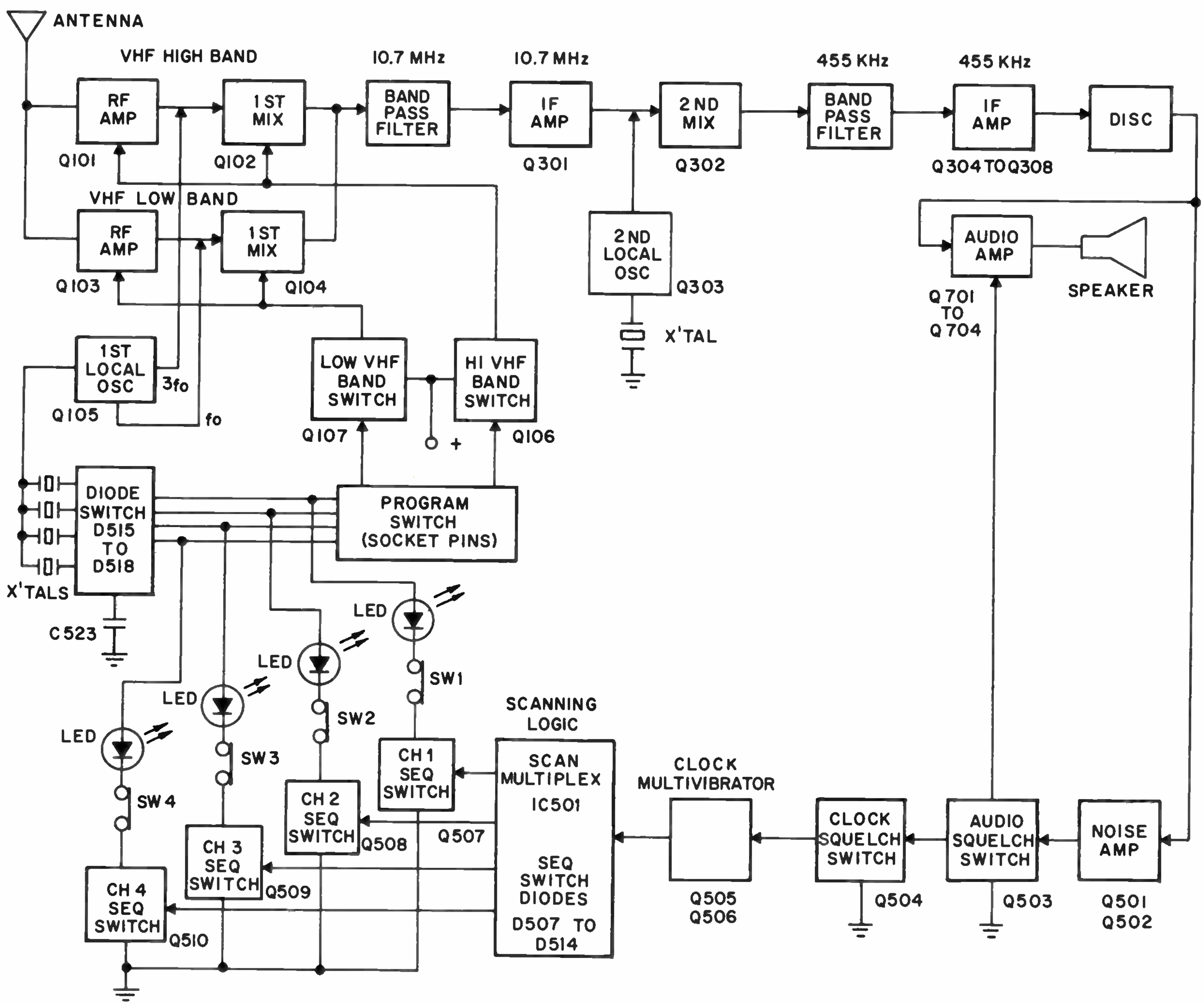


Figure 10—Block diagram—16S100

Symbol	Stock No.	Description
C101	741069	8 pF, 50V, ceramic
C102	134437	1 pF, ± 0.25 pF, 50V, ceramic
C103	741069	8 pF, 50V, ceramic
C104	426404	30 pF, 50V, ceramic
C105	426408	0.001 uF, 50V, ceramic
C106	741069	8 pF, 50V, ceramic
C107	134437	1 pF, ± 0.25 pF, 50V, ceramic
C108	741069	8 pF, 50V, ceramic
C109	741081	100 pF, 50V, ceramic
C110	741070	2 pF, ± 0.25 pF, 50V, ceramic
C111	426408	0.001 uF, 50V, ceramic
C112	426404	30 pF, 50V, ceramic
C113	426403	15 pF, 50V, ceramic
C114	426404	30 pF, 50V, ceramic
C115	741232	50 pF, 50V, ceramic
C116	741222	0.005 uF, +80 −20%, 50V, ceramic
C117	426404	30 pF, 50V, ceramic
C118	426404	30 pF, 50V, ceramic
C119	426403	15 pF, 50V, ceramic
C120	426408	0.001 uF, 50V, ceramic
C121	741081	100 pF, 50V, ceramic
C122	741079	40 pF, 50V, ceramic
C123	741222	0.005 uF, +80 −20%, 50V, ceramic
C124	741069	8 pF, 50V, ceramic
C125, 126, 127	227756	0.01 uF, +80 −20%, 25V, ceramic
C301	741081	100 pF, 50V, ceramic
C302	741231	500 pF, 50V, ceramic
C303	741075	3 pF, ± 0.25 pF, 50V, ceramic
C304	741237	200 pF, 50V, ceramic
C305	741080	70 pF, 50V, ceramic
C306	741227	3.3 uF, 10V, electrolytic
C307	141654	0.47 uF, 35V, electrolytic
C308	741231	500 pF, 50V, ceramic
C309	741237	200 pF, 50V, ceramic
C310	741231	500 pF, 50V, ceramic
C311	741081	100 pF, 50V, ceramic
C312	741231	500 pF, 50V, ceramic
C313	741231	500 pF, 50V, ceramic
C314	741237	200 pF, 50V, ceramic
C315	741231	500 pF, 50V, ceramic
C316	741227	3.3 uF, 10V, electrolytic
C317	419849	0.0022 uF, 50V, Mylar
C501	227756	0.01 uF, +80 −20%, 25V, ceramic
C502	241793	0.0047 uF, 50V, Mylar
C503	241793	0.0047 uF, 50V, Mylar
C504	240560	0.0033 uF, 50V, Mylar
C505	221890	1 uF, 25V, electrolytic
C506	418198	0.047 uF, 50V, Mylar
C507	418198	0.047 uF, 50V, Mylar
C508	741221	0.1 uF, +80 −20%, 12V
C509	221890	1 uF, 25V, electrolytic
C510	741227	3.3 uF, 10V, electrolytic
C511	141654	0.47 uF, 35V, electrolytic
C512	423359	10 uF, 6.3V, electrolytic
C513	741239	0.22 uF, 10V, electrolytic
C514	741239	0.22 uF, 10V, electrolytic
C515	426408	0.001 uF, 50V, ceramic
C516	432066	220 uF, 6.3V, electrolytic
C517	741237	200 pF, 50V, ceramic
C518	741237	200 pF, 50V, ceramic
C519	741081	100 pF, 50V, ceramic
C520	741081	100 pF, 50V, ceramic
C521	741237	200 pF, 50V, ceramic
C522	741237	200 pF, 50V, ceramic
C523	227756	0.01 uF, +80 −20%, 25V, ceramic
C701	429696	0.01 uF, 50V, Mylar
C702	741223	0.1 uF, 10V, electrolytic
C703	741227	3.3 uF, 10V, electrolytic
C704	431269	100 uF, 6.3V, electrolytic
C705	418198	0.047 uF, 50V, Mylar
C706	241793	0.0047 uF, 50V, Mylar
C707	741229	0.0082 uF, 50V, Mylar
C708	431269	100 uF, 6.3V, electrolytic
C709	227756	0.01 uF, +80 −20%, 25V, ceramic
C710	431269	100 uF, 6.3V, electrolytic

Symbol	Stock No.	Description
D301	119919	Diode-1S188
D302	119919	Diode-1S188
D501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514	119919	Diode-1S188
D515, 516, 517, 518	741171	Diode-1S1587
D519, 520, 521, 522	741167	Diode, Light Emitting
D701	741170	Diode-VD 1220
D702	741169	Diode-F-14A
HF301	741191	Filter, crystal—10M15A or 10M15AG
HF302	741192	Filter, ceramic—CFU-455D
HF303	741198	Discriminator ceramic
IC501	741168	Integrated circuit—TC4011P
L101	741165	Coil, RF
L102	741165	Coil, RF
L103	741164	Coil, RF
L104	741165	Coil, RF
L105	741190	Coil, RF
L106	741190	Coil, RF
L107	741422	Coil, RF
L108	741166	Coil, RF
L109	741193	Coil, RF
L501	741196	Choke, RF-8.2 mH
L502, 503, 504, 505	741197	Choke, RF-25 H
Q101, 102, 103, 104, 105	741173	Transistor—2SC1674
Q301	741176	Transistor—2SK49
Q302, 303, 304, 305, 306, 307, 308	170794	Transistor—2SC930
Q501, 502, 503, 504, 505, 506, 507, 508, 509, 510	741172	Transistor—2SC945
Q701	741172	Transistor—2SC945
Q702	741172	Transistor—2SC945
Q703 *	741427	Transistor—2SD227-R
Q703 *	741426	Transistor—2SD227-W
Q704 *	741425	Transistor—2SA642-R
Q704 *	741174	Transistor—2SA642-W
R101	259309	330,000 ohm, ¼W
R102	240580	470 ohm, ¼W
R103	259309	330,000 ohm, ¼W
R104	107972	3,300 ohm, ¼W
R105	240580	470 ohm, ¼W
R106	259309	330,000 ohm, ¼W
R107	240580	470 ohm, ¼W
R108	107972	3,300 ohm, ¼W
R109	259309	300,000 ohm, ¼W
R110	107972	3,300 ohm, ¼W
R111	426199	56,000 ohm, ¼W
R112	245958	330 ohm, ¼W
R113	239450	100 ohm, ¼W
R114	108867	6,800 ohm, ¼W
R115	108867	6,800 ohm, ¼W
R301	113524	2,700 ohm, ¼W
R302	223769	100,000 ohm, ¼W
R303	107927	3,300 ohm, ¼W

* Both Audio Output Transistors must have the same suffix letter. Order the stock number corresponding to the R or W suffix on the transistor.

VR1	741200	10,000 ohm, variable—with switch
VR2	741199	10,000 ohm, variable

Mechanical Parts

Symbol	Stock No.	Description
1	741177	Case, Front—with grill
2		Case, front
3		Grill
4	741160	Case, back—with nameplate
5		Case, back
6		Plate, name
7	741178	Case, top
8	741194	Case, bottom
9	741179	Cover, battery
10	741161	Escutcheon
11	741195	Cover, crystal compartment
12		Label, crystal layout
13	741180	Terminal, battery
14	741181	Terminal, battery
15		Bracket, channel lock-out switch; antenna jack
16		Ribbon, battery compartment
17	741182	Cover, mode switch
18	741423	Spring, case assembly
19	741183	Knob-Squelch
	741183	Knob-volume
20	741184	Knob-mode switch
21	741185	Battery holder
22		PC Board, main
23	741217	PC Board, mode switch
24	741218	PC Board, LED
25	741424	Screws, mode switch assembly-pair
26	741186	Switch, mode-AUTO-MANU-CH. SEL —with mounting screws
27	741188	Switch, lock-out
28	741187	Jack, antenna—with nut
29	741200	Control, volume—with switch and nut
30	741199	Control, squelch—with nut
31	741167	LED (D519-D522) — each

Miscellaneous

	741159	Antenna, telescoping
	741189	Crystal—10.25 MHz
	741187	Socket, crystal
	741163	Jack, ext. power—ext. speaker
	741219	Speaker, 8 ohm, 0.3W
	741428	Spring, antenna connector

Pages 85-95 Courtesy of RCA ELECTRONICS COMPONENTS & DEVICES

Troubleshooting

General

If any of the operational checks indicate that the receiver is not performing normally, standard trouble-shooting techniques should be used to locate the defective part of the receiver.

The RF and audio circuits are straight forward designs and should not present any servicing difficulty. Before attempting to troubleshoot the squelch, scanning or switching circuits, study the circuit description, the schematic, and the block diagram to obtain a thorough understanding of these circuits.

Service Hints

1. The dc voltages shown on the schematic are approximate and will vary slightly from unit to unit. Refer to the circuit condition notes on the schematic.
2. All first local oscillator crystals should be re-moved from the crystal sockets before making dc voltage measurements.
3. Oscillator Q107 may oscillate at some parasitic frequency when all crystals are removed. To measure the dc voltages on Q107, a small capacitor (approximately 0.047 μF) should be temporarily connected from the base of Q107 to ground to "kill" these oscillations.

NOTE:

The dc voltages for 2nd local oscillator Q303 are shown with Q303 in its oscillating mode. These voltages change only slightly when the crystal is shorted out with a 0.047 μF capacitor.

4. RF alignment should be made using a signal level just high enough to give a useful output. Excessive signal input can result in front-end overload and distortion which may appear to be a receiver problem.

Adjustment Procedure

The following adjustments should be made in the order given to assure proper scanner performance.

IF Adjustment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8-ohms—½ watt)
- DC Power Supply (13.8 volts—1 ampere)

Procedure:

1. Connect the test equipment as shown in Figure 2.
2. Remove crystals from the crystal sockets and set the program switches to the UHF (U) position. Manually set the scanner to channel 1 and the squelch control fully CW.
3. Set the generator to 10.700 MHz and adjust the output level to zero. Adjust the scanner's volume control for a noise voltage of 0.5 volt on the ac voltmeter.
4. Increase the generator's 10.700 MHz output voltage until the reading on the ac voltmeter decreases to 0.05 volt.
5. Adjust T101 for minimum noise output (0.05 volt or less).

AFC Adjustment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- High Impedance DC Voltmeter
- Audio Dummy-Load Resistor (8-ohms—½ watt)
- DC Power Supply (13.8 volts—1 ampere)

Procedure:

1. Complete the IF adjustment.
2. Connect the RF Generator and AC Voltmeter as shown in Figure 2.
3. Connect the DC Voltmeter between TP1(+) and TP2(−).
4. Short TP5 and TP3.
5. Increase the 10.700 MHz signal generator output to 40 dB above the 20 dB noise-quieting level obtained during the IF adjustment.

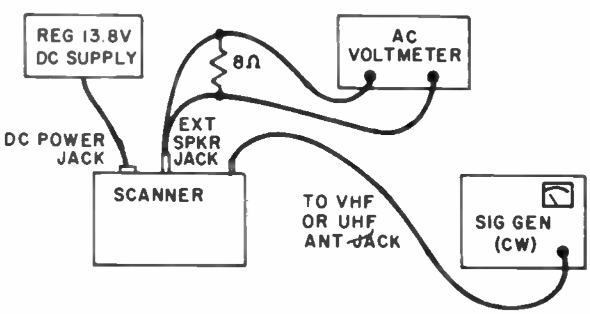


Figure 2—Test Setup for IF, AFC, and High VHF Oscillator Adjustment.

6. Adjust VR505 for a reading of 5.3 Vdc.
7. Remove the short between TP5 and TP3.
8. Connect the DC Voltmeter between TP4(+) and TP3(−).
9. Adjust VR504 for a reading of 4.5 Vdc.

RF Alignment—VHF

Test Equipment Required

- RF Sweep Generator (Wavetek Model 2000 with 1, 10, 50 MHz Harmonic Markers—or equivalent).
- Oscilloscope (Wavetek Model 1901A or equivalent).
- RF Oscilloscope Probe (RCA WG-400A Direct/Low Cap. Probe with slip-on RF Detector Probe WG-302B or equivalents).
- DC Power Supply (13.8 volts—1 ampere).

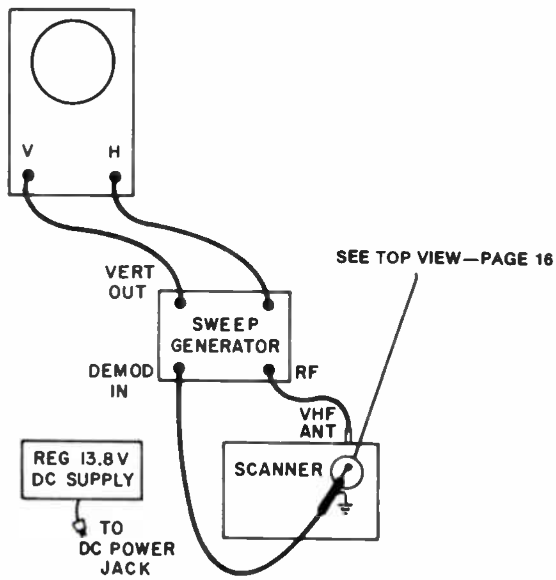


Figure 3—Test Setup for VHF RF Alignment.

Low VHF Alignment

Procedure:

1. Connect the test equipment as shown in Figure 3.
2. Manually set the scanner to channel 1.
3. Set the squelch control CW, the volume control CCW, and the program switch to low (L).
4. Connect the RF Detector Probe between the base of mixer Q104 (top of R128) and ground.
5. Set the generator to sweep between 30 MHz and 50 MHz.
6. Adjust: L106 for maximum output at 47 MHz
   L107 for maximum output at 33 MHz
   L108 for maximum output at 40 MHz

Figure 4 shows the low VHF RF waveform.

Figure 4—Low-VHF RF Waveform.

High VHF Alignment

Procedure:

1. Connect the test equipment as shown in Figure 3.
2. Manually set the scanner to channel 1.
3. Set the squelch control CW, the volume control CCW and the program switch to high (H).
4. Connect the RF Detector Probe between the base of mixer Q102 (top of R107) and ground.
5. Set the generator to sweep between 150 MHz and 170 MHz.
6. Adjust: L101 for maximum output at 160 MHz.
   L102 for maximum output at 153 MHz.
   L103 and L104 for best balance between 153 MHz peak and 160 MHz peak.

   Figure 5 shows the high-VHF RF waveform.

High VHF Oscillator Alignment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8-ohms—½ watt)
- DC Power Supply (13.8 volts—1 ampere)

Procedure:

1. Connect the test equipment as shown in Figure 2.
2. Insert a 158 MHz test crystal into the channel 1 socket.
3. Set the program switch to high (H).
4. Set the generator to 158 MHz.
5. Adjust the generator output to the 20 dB quieting level. (See Sensitivity Measurement Procedure).
6. Adjust L114 for maximum noise quieting (minimum output).

Tight Squelch Adjustment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8 ohms—½ watt)

Procedure:

1. Complete the high VHF RF and oscillator alignment.
2. Set the squelch control fully CCW and the volume control to mid-range.
3. Set the signal generator output to 1.8 μV at 158 MHz.
4. Adjust VR502 to the point at which squelch just opens ("rushing" sound is heard).

Figure 5—High-VHF RF Waveform.

Frequency/Voltage Converter Adjustment

Test Equipment Required

- High Impedance DC Voltmeter
- Test Crystals—450 MHz, 460 MHz, 470 MHz, 480 MHz, 490 MHz, 500 MHz and 508 MHz.
- DC Power Supply (13.8 volts—1 ampere)

Procedure:

1. Set the volume and squelch controls fully CCW, all program switches to the UHF (U) position, all bypass switches to the "on" position, and the AUTO/MAN switch to the "MAN" position.
2. Insert the 450 MHz crystal into the channel 1 socket, and the 490 MHz crystal into the channel 2 socket.
3. Adjust L136 so that the top of the core is three turns down from the top surface of the transformer can.
4. Connect the dc voltmeter between TP7 (+) and TP6 (−).
5. Manually set the scanner to channel 1.
6. Adjust VR101 for a meter reading of 0.8 ±0.1 volt.
7. Manually set the scanner to channel 2.
8. Adjust L138 for a meter reading of 4.0 ±0.1 volts.
9. Repeat the adjustment of VR101 (450 MHz) and L138 (490 MHz) until the voltages indicated in steps 6 and 8 are obtained.
10. Insert the other test crystals into the crystal sockets and confirm that the following VVC voltage readings are obtained across TP7 and TP6 at the specified crystal frequencies.

Channel Frequency (MHz)	VVC Voltage
450	0.8 ±0.1
460	1.4 ±0.2
470	2.0 ±0.2
480	3.0 +0.1, −0.3
490	4.0 ±0.1
500	5.5 +0.5, −0.4
508	6.3 +1.1, −0.5

NOTE

If the voltages measured with the 500 MHz and 508 MHz crystal do not meet the limits given above, check the sensitivity (see Measurement Procedures) at these frequencies. If the sensitivity at 500 and 508 MHz is 1.5 μV or less, the adjustment of the F/V converter is acceptable.

Adjustment Procedure Continued on Page 14

Adjustment Procedure Continued

UHF/UHF-T RF Alignment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8 ohms—½ watt)
- Test Crystals—450 MHz, 480 MHz and 508 MHz.
- DC Power Supply (13.8 volts—1 ampere)

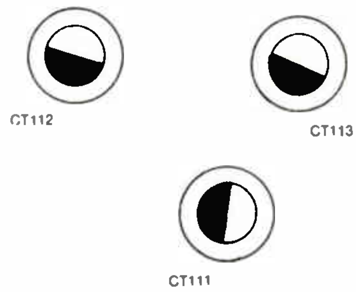
Procedure:

1. Connect the test equipment as shown in Figure 8 with the RF generator output connected to the UHF antenna jack.
2. Set the program switches to the UHF (U) position, the bypass switches to the "on" position and the AUTO/MAN switch to the "MAN" position.
3. Insert the 480 MHz crystal into the Channel 1 socket.
4. Manually set the scanner to channel 1.
5. Measure the sensitivity as described in the Measurements Procedures section.
6. Adjust CT111. CT112 and CT113 for maximum sensitivity (minimum output). Repeat these adjustments until the lowest noise measurement is obtained. The 20 dB noise quieting specifications are:

   Limit 0.7 μV
   Nominal 0.4 μV

CAUTION

CT111, CT112 and CT113 have two tuning points. The correct tuning positions are approximately those shown in the illustration.



7. With the 480 MHz crystal still in the crystal socket, set the RF generator frequency to 427.855 MHz.
8. Adjust L136 for minimum noise quieting (maximum output). The 20 dB noise quieting specifications are:

   Limit 20 μV
   Nominal 40 μV
9. Check the sensitivity at 450, 480 and 508 MHz. The following readings should be obtained at the specified frequencies.

Frequency	Limit	Nominal
450 MHz	1.5 μV	1 μV
480 MHz	0.7 μV	0.4 μV
508 MHz	1.5 μV	0.6 μV

If the sensitivity at 450 MHz is worse than 1.5 μV, readjust CT112. Check the sensitivity at 508 MHz to make sure it remains within specifications.

Measurement Procedures

Crystal Frequency Measurement

Test Equipment Required

- Frequency Counter (Hewlett Packard Model 5381A or equivalent)
- Counter Preamplifier (If required)

Procedure:

1. Insert the crystals to be measured into the appropriate sockets.
2. Turn the scanner on and adjust the squelch and volume controls fully counterclockwise.
3. Manually set the scanner to the channel position of the crystal to be tested.
4. Connect the test equipment as shown in Figure 7.

NOTE:

Signal pick-up from the crystal's metal case is recommended because it has negligible loading effect on the oscillator circuit. In most cases, the signal pick-up from the crystal case will be sufficient to provide an accurate and steady count. If no count is displayed, or if the count is erratic, a counter preamplifier having a minimum gain of 15 dB between 40 MHz and 60 MHz should be used.

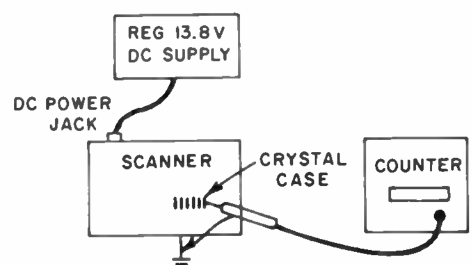


Figure 7—Test Setup for Crystal Frequency Measurement.

5. Record the frequency displayed on the counter.

The following examples will illustrate how to calculate the frequency range that is acceptable if the crystal is oscillating within the specified tolerance.

Example No. 1: Low VHF Band

Channel frequency = 33.860 MHz
Crystal frequency = Ch. Freq. + 10.700 MHz
= 33.860 MHz + 10.700 MHz
= 44.560 MHz

The accuracy specified for low VHF band crystals is 0.003%.

Upper Frequency Limit = 1.00003 x 44.560 MHz
= 44.561336 MHz
Lower Frequency Limit = .99997 x 44.560 MHz
= 44.558663 MHz

Example No. 2: High VHF Band

Channel frequency = 158.970 MHz

$$\text{Crystal frequency} = \frac{\text{Ch. Freq.} - 10.700\text{ MHz}}{3} = \frac{158.970\text{ MHz} - 10.700\text{ MHz}}{3} = 49.423333\text{ MHz}$$

The accuracy specified for high VHF crystals is 0.002%.

Upper Frequency Limit = 1.00002 x 49.423333 MHz
= 49.424321 MHz
Lower Frequency Limit = 0.99998 x 49.423333 MHz
= 49.422344 MHz

Example No. 3: Middle of UHF Band

The measured crystal frequency is determined by the accuracy of the crystal and the AFC correction voltage. This frequency should remain within 225 Hz of the crystal frequency calculated from the formula:

$$\text{Crystal Frequency} = \frac{\text{Channel Freq.} - 10.700\text{ MHz}}{9}$$

The following example will illustrate how to calculate the frequency range that is acceptable if the crystal is oscillating within the specified tolerance.

Channel frequency = 465.400

$$\text{Crystal Frequency} = \frac{\text{Ch. Freq.} - 10.700\text{ MHz}}{9} = \frac{465.400\text{ MHz} - 10.700\text{ MHz}}{9} = 50.522222\text{ MHz}$$

Upper Frequency Limit = 50.522222 MHz + 225 Hz
= 50.522447 MHz
Lower Frequency Limit = 50.522222 MHz − 225 Hz
= 50.521997 MHz

Sensitivity Measurement (20 dB Noise Quieting)

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8 ohms—½ watt)

Procedure:

1. Connect the test equipment as shown in Figure 8.
2. Insert the crystal for the channel frequency to be measured into the appropriate socket.

NOTE:
If a general overall sensitivity performance check is being made, the test crystals recommended on page 8 should be used. Additional crystals having frequencies of particular interest may also be included.

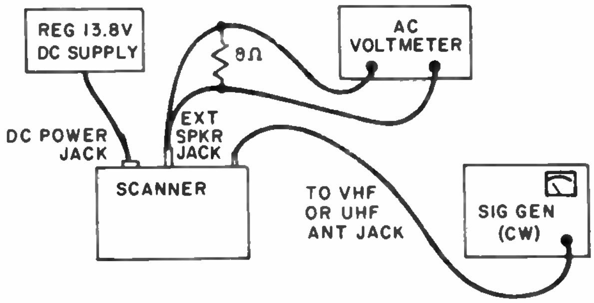


Figure 8—Test Setup for UHF RF Alignment and Sensitivity Measurement.

3. Turn the scanner on and manually set it to the channel position corresponding to the frequency to be measured.
4. Set the generator for CW operation. Adjust the RF output level to zero.
5. Turn the scanner's squelch control fully clockwise.
6. Adjust the scanner's volume control until the audio output noise indicated on the ac voltmeter is 0.5 volt.
7. Increase the generator's RF output to approximately 10 microvolts.
8. Adjust the generator's output frequency to the exact center of the channel being measured. This frequency must remain stable within ±500 Hz during Step 9.

NOTE:
At this point, the noise level indicated on the AC voltmeter should drop to a low level (less than 0.05 volt).

9. Decrease the generator's RF output level until the audio noise level indicated on the ac voltmeter increases to 0.05 volt. This RF output level is the 20 dB noise quieting sensitivity for the channel frequency being measured.
10. Repeat steps 1 through 9 for each channel frequency to be measured.

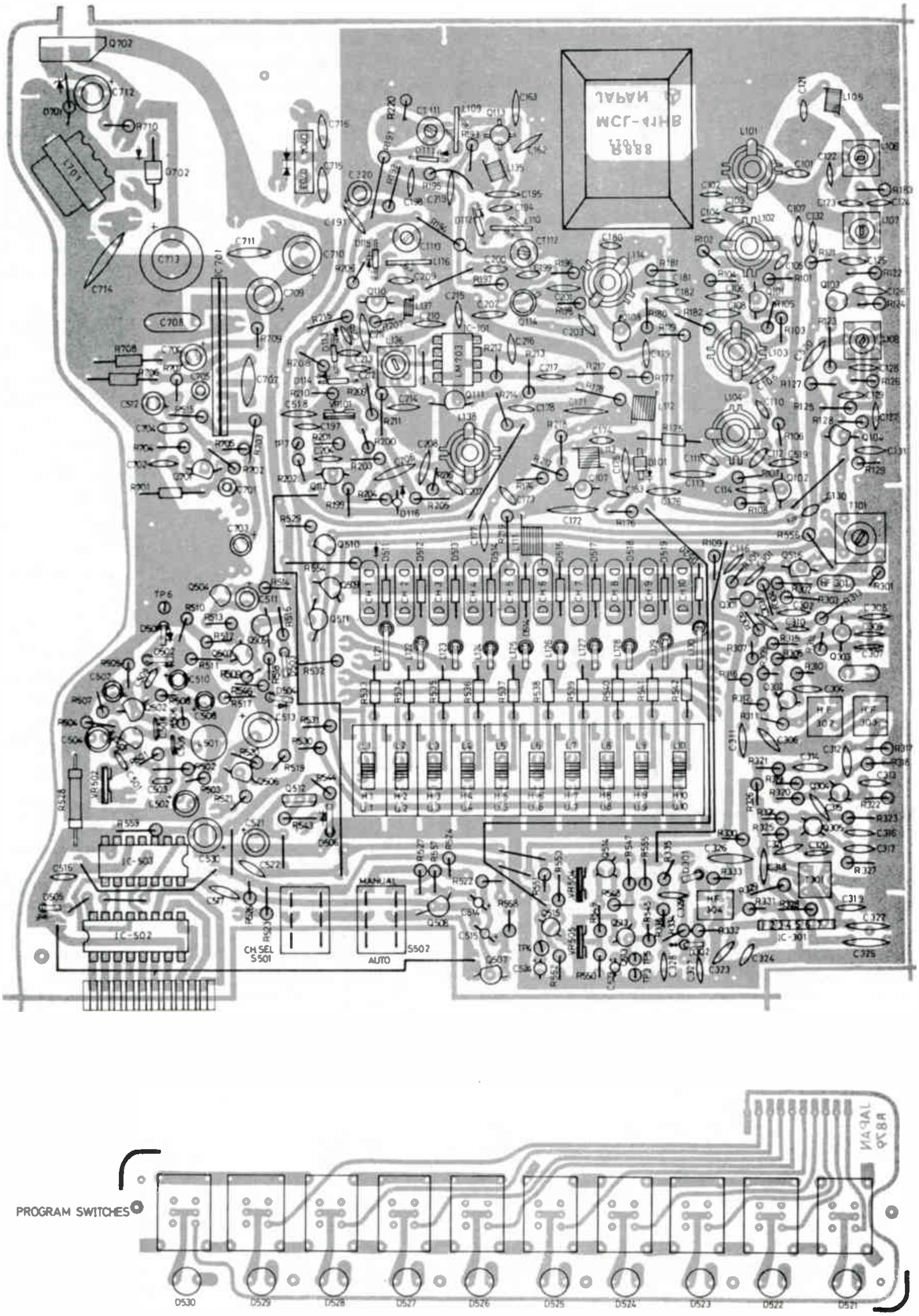
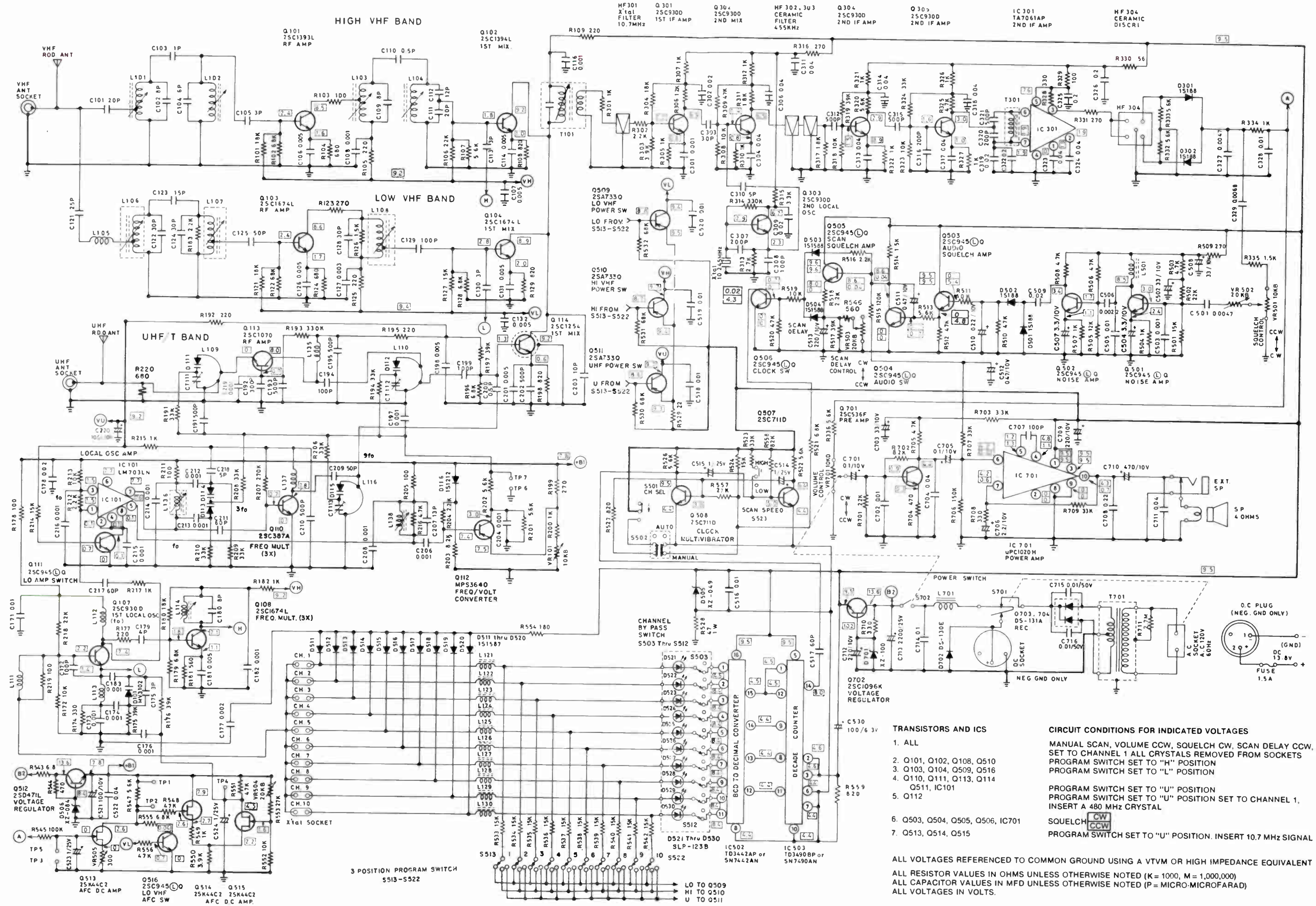


Figure 9—Top View: Location of Components.



TRANSISTORS AND ICS / **CIRCUIT CONDITIONS FOR INDICATED VOLTAGES**

TRANSISTORS AND ICS	CIRCUIT CONDITIONS FOR INDICATED VOLTAGES
1. ALL	MANUAL SCAN, VOLUME CCW, SQUELCH CW, SCAN DELAY CCW, SET TO CHANNEL 1 ALL CRYSTALS REMOVED FROM SOCKETS
2. Q101, Q102, Q108, Q510	PROGRAM SWITCH SET TO "H" POSITION
3. Q103, Q104, Q509, Q516	PROGRAM SWITCH SET TO "L" POSITION
4. Q110, Q111, Q113, Q114 Q511, IC101	PROGRAM SWITCH SET TO "U" POSITION
5. Q112	PROGRAM SWITCH SET TO "U" POSITION SET TO CHANNEL 1, INSERT A 480 MHz CRYSTAL
6. Q503, Q504, Q505, Q506, IC701	SQUELCH $\frac{\boxed{CW}}{\boxed{CCW}}$
7. Q513, Q514, Q515	PROGRAM SWITCH SET TO "U" POSITION. INSERT 10.7 MHz SIGNAL

ALL VOLTAGES REFERENCED TO COMMON GROUND USING A VTVM OR HIGH IMPEDANCE EQUIVALENT

ALL RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED (K = 1000, M = 1,000,000)
ALL CAPACITOR VALUES IN MFD UNLESS OTHERWISE NOTED (P = MICRO-MICROFARAD)
ALL VOLTAGES IN VOLTS.

Figure 6—Schematic Diagram—16S400.

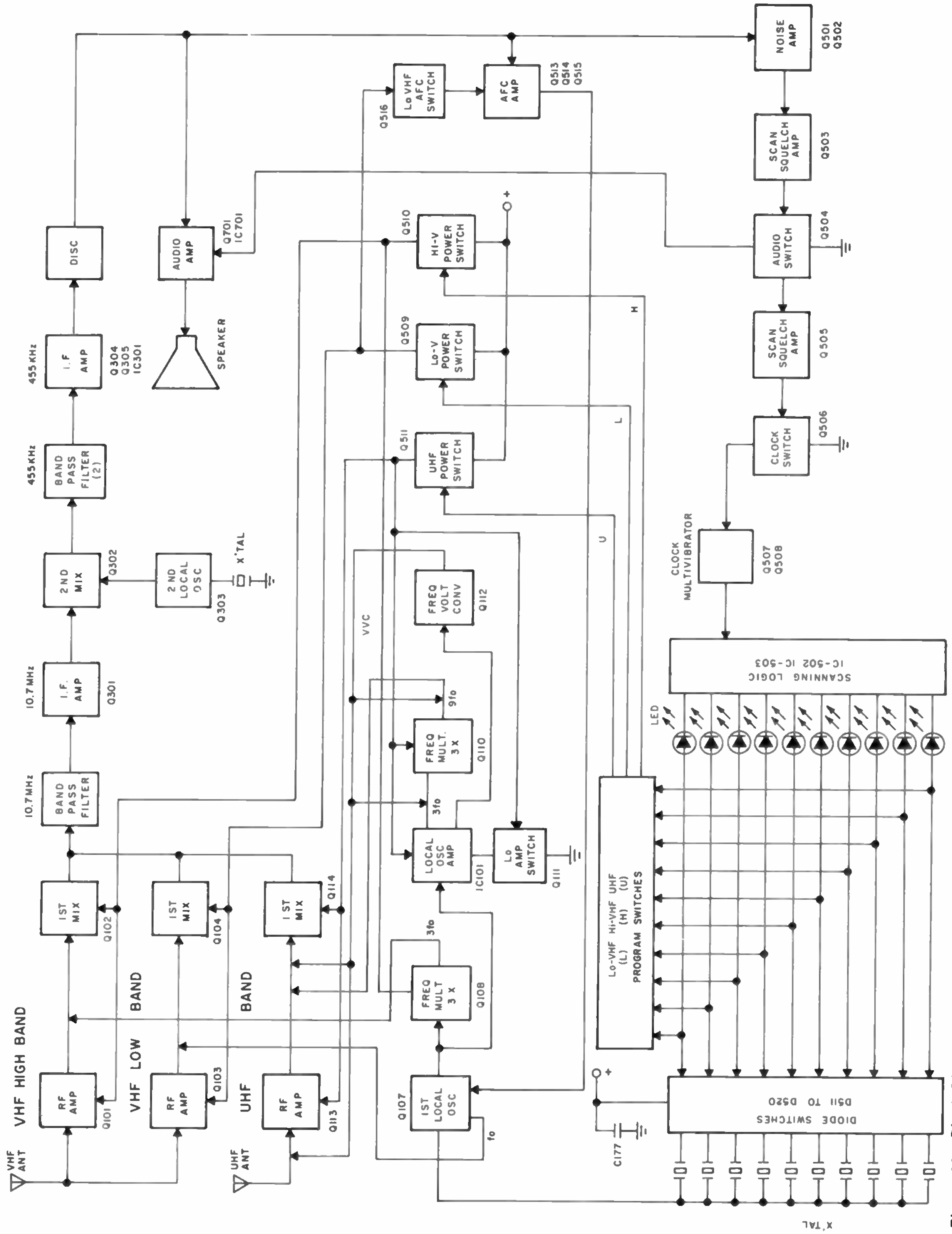


Figure 11—Block Diagram 16S400.

Symbol	Stock No.	Description
C101	741350	20 pF, 10%, 50V, ceramic
C102	741069	8 pF, ± .5 pF, 50V, ceramic
C103	741268	1 pF, ± .5 pF, 50V, ceramic
C104	111838	6 pF, ± .5 pF, 50V, ceramic
C105	169499	3 pF, ± 0.25 pF, 50V, ceramic
C106, 107	741279	5000 pF, 10%, 50V, ceramic
C108	741276	1000 pF, 10%, 50V, ceramic
C109	741069	8 pF, ± .5 pF, 50V, ceramic
C110	741236	0.5 pF, ± .25 pF, 50V, ceramic
C111	741350	20 pF, 10%, 50V, ceramic
C112	741270	12 pF, 10%, 50V, ceramic
C113	169499	3 pF, ± .25 pF, 50V, ceramic
C114	741279	5000 pF, 10%, 50V, ceramic
C116	741276	1000 pF, 10%, 50V, ceramic
C121	741235	25 pF, 10%, 50V, ceramic
C122	741351	30 pF, 10%, 50V, ceramic
C123	117907	15 pF, 10%, 50V, ceramic
C124	741351	30 pF, 10%, 50V, ceramic
C125	741232	50 pF, 10%, 50V, ceramic
C126	741279	5000 pF, 10%, 50V, ceramic
C127	741278	0.003 uF, 10%, 50V, ceramic
C128	741351	30 pF, 10%, 50V, ceramic
C129	741353	100 pF, 10%, 50V, ceramic
C130	169499	3 pF, ± 0.25 pF, 50V, ceramic
C131, 132	741279	5000 pF, 10%, 50V, ceramic
C171	426027	.01 uF, 20%, 50V, ceramic
C172	741081	100 pF, 5%, 50V, ceramic
C173, 174	741276	1000 pF, 10%, 50V, ceramic
C175	169499	3 pF, ± 0.25 pF, 50V, ceramic
C176	741276	1000 pF, 10%, 50V, ceramic
C177	741277	0.002 uF, 10%, 50V, ceramic
C178	117706	0.02 uF, + 80 − 20%, 50V, ceramic
C179	741269	4 pF, ± .5 pF, 50V, ceramic
C180	741069	8 pF, ± .5 pF, 50V, ceramic
C181	741279	5000 pF, 10%, 50V, ceramic
C182, 183	741276	1000 pF, 10%, 50V, ceramic
C191	741355	500 pF, 10%, 50V, ceramic
C192	741354	300 pF, 10%, 50V, ceramic
C193	741355	500 pF, 10%, 50V, ceramic
C194	741353	100 pF, 10%, 50V, ceramic
C195	741355	500 pF, 10%, 50V, ceramic
C197	741276	1000 pF, 10%, 50V, ceramic
C198	741279	5000 pF, 10%, 50V, ceramic
C199	741353	100 pF, 10%, 50V, ceramic
C200	741236	0.5 pF, ± .25 pF, 50 V, ceramic
C201	741279	5000 pF, 10%, 50V, ceramic
C202	741355	500 pF, 10%, 50V, ceramic
C203	116214	10 pF, 10%, 50V, ceramic
C204	741276	1000 pF, 10%, 50V, ceramic
C206	741276	1000 pF, 10%, 50V, ceramic
C207	741271	13 pF, 10%, 50V, ceramic
C208	741276	1000 pF, 10%, 50V, ceramic
C209	741232	50 pF, 10%, 50V, ceramic
C210	741255	500 pF, 10%, 50V, ceramic
C211	741352	60 pF, 10%, 50V, ceramic
C212	741276	1000 pF, 10%, 50V, ceramic
C213, 214 215, 216	741276	.001 uF, 10%, 50V, ceramic
C217	741352	60 pF, 10%, 50V, ceramic
C218	169252	5 pF, ± 0.5 pF, 50 V, ceramic disc
C219	741276	.001 uF, 10%, 50V, ceramic
C220	741364	100 uF, 10V, electrolytic
C301	741276	.001 uF, 10%, 50V, ceramic
C302	117706	0.02 uF, + 80 − 20%, 50V, ceramic
C303	741351	30 pF, 10%, 50V, ceramic
C304	741280	40,000 pF, 10%, 25V, ceramic
C306	741280	0.04 uF, + 80 − 20%, 25V, ceramic
C308	741353	100 pF, 10%, 50V, ceramic
C309	117706	0.02 uF, + 80 − 20%, 50V, ceramic
C310	169252	5 pF, ± 0.5 pF, 50V, ceramic disc
C311	741280	40,000 pF, 10%, 25V, ceramic
C312	741355	500 pF, 10%, 50V, ceramic
C313, 314	741280	40,000 pF, 10%, 25V, ceramic
C315	741355	500 pF, 10%, 50V, ceramic
C316	741237	200 pF, 10%, 50V, ceramic
C317, 318	741280	40,000 pF, 10%, 25V, ceramic
C319	117706	0.02 uF, + 80 − 20%, 50V, ceramic

Symbol	Stock No.	Description
C320	741237	200 pF, 10%, 50V, ceramic
C321	741355	500 pF, 10%, 50V, ceramic
C322	741275	0.2 uF, + 80 − 20%, 12V, BC
C323, 324	741280	40,000 pF, 10%, 25V, ceramic
C325, 326	741275	0.2 uF, + 80 − 20%, 12V, BC
C328	741282	0.01 uF, 20%, 50V, Mylar
C329	741274	0.0068 uF, 20%, 50V, Mylar
C501	741064	0.0047 uF, 20%, 50V, Mylar
C502	741362	33 uF, 10V, electrolytic
C503	120535	0.001 uF, 20%, 50V, Mylar
C504	741359	1 uF, 10V, electrolytic
C505	741282	0.01 uF, 20%, 50V, Mylar
C506	741281	0.0022 uF, 20%, 50V, Mylar
C507	741359	1 uF, 10V, electrolytic
C508	741362	33 uF, 10V, electrolytic
C509	741272	0.02 uF, 20%, 50V, Mylar
C510	741239	0.22 uF, 10V, electrolytic
C511, 512	741358	0.47 uF, 10V, electrolytic
C513	741365	220 uF, 10V, electrolytic
C514, 515	741361	1 uF, 25V, electrolytic
C516	117706	0.02 uF, 50V, + 80 − 20%, ceramic
C517	741352	60 pF, 5%, 50V, ceramic
C518, 519 520	422975	0.01 uF, + 80 − 20%, 25V, ceramic
C521	741364	100 uF, 10V, electrolytic
C522	741280	40,000 pF, 10%, 25V, ceramic
C523, 524	741361	1 uF, 25V, electrolytic
C530	741363	100 uF, 6.3V, electrolytic
C701	741357	0.1 uF, 10V, electrolytic
C702	741282	0.01 uF, 20%, 50V, Mylar
C703	741362	33 uF, 10V, electrolytic
C704	740614	0.04 uF, 20%, 50V, Mylar
C705	741357	0.1 uF, 10V, electrolytic
C706	741360	2.2 uF, 10V, electrolytic
C707	741081	100 pF, 5%, 50V, ceramic
C708	741273	0.22 uF, 20%, 50V, Mylar
C709	741365	220 uF, 10V, electrolytic
C710	741366	470 uF, 10V, electrolytic
C711	740614	0.04 uF, 20%, 50V, Mylar
C712	741365	220 uF, 10V, electrolytic
C713	741367	2200 uF, 25V, electrolytic
C714	741221	0.1 uF, + 80 − 20%, 12V, BC
C715, 716	426027	.01 uF, + 80 − 20%, 50V, ceramic
CT111, 112 113	741321	Trimmer
D101	741331	Diode-Type MV3102
D111, 112 113, 114 115	741339	Diode-Type 1TT141
D116	741338	Diode-Type 1S1212
D301, 302	119919	Diode-Type 1S188
D501, 502	119919	Diode-Type 1S188
D503, 504	741051	Diode-Type 1S1588
D505	741334	Diode-Type XZ-049
D506	741335	Diode-Type OZ-084
D511, 512 513, 514 515, 516 517, 518 519, 520	741171	Diode-Type 1S1587
D521, 522 523, 524 525, 526 527, 528 529, 530	741337	LED-Type SLP-123
D701	741336	Diode-Type XZ-100
D702	741333	Diode-Type DS130
D703	741332	Diode-Type DS131
HF301	741191	HF Filter
HF302	741192	Ceramic filter-Type CFU-455D
HF303	741192	Ceramic filter-Type CFU-455D
HF304	741320	Filter HF

	Case
741288	Panel, front
	Plate, upper—for channel indicators and lock-out switches
	Plate, lower—for controls
741289	Door, crystal compartment
	Screw—crystal compartment door
741291	Foot
	Pushbutton
	Bracket, mounting
741292	Screw, thumb
741293	Knob for volume, squelch, scan delay control—each
	Cover, switch
741295	Holder, UHF antenna
	Grill, speaker
741297	Holder, VHF antenna
	Heat sink—power transformer
	Label, for program switches
	Connector, flexible
	Rivet, special
	PC board, LED
	Bracket, mounting
	Bracket, front panel
	Main chassis
	PC board, main
741296	Socket, external speaker
741204	Socket, crystal
741298	Socket, antenna—VHF or UHF
741299	Socket, DC power
741368	Socket, AC power
741301	Switch, lock-out (S503-S512)
741302	Switch, scan speed (S 523)
741305	Switch, program (S513-S522)
741306	Switch, Ch Sel or A/M (S501, S502)
741303	Antenna, telescoping-UHF
741304	Antenna, telescoping-VHF
741300	Power cord assem.-AC
741307	Power cord-DC
741372	Speaker, 4 ohm

Symbol	Stock No.	Description
VR101	741215	10,000 ohm, variable
VR501	741323	10,000 ohm, variable
VR502	741324	20,000 ohm, variable
VR503	741322	20,000 ohm, variable
VR504	741324	20,000 ohm, variable
VR505	741326	300 ohm, variable
VR701	741325	10,000 ohm, variable
T101	741317	IF transformer, 10.7 MHz
T301	741318	IF transformer 455 kHz
T701	741319	Transformer, power (Ref. No. 22)
IC101	741342	IC-Type LM703
IC301	741340	IC-Type TA-7061
IC502	741533	IC-Type SN7442 or TD3442
IC503	741343	IC-Type TD3490
IC701	741341	IC-Type UPC1020
L101	741308	Coil antenna
L102	741309	Coil antenna
L103	741310	Coil RF
L104	741309	Coil antenna
L105	741202	VHF coil
L106, 107 108	741190	Coil, RF
L109, 110	741311	Coil RF
L111	741356	Coil VHF
L112	741312	Coil VHF
L113	741166	VHF coil
L114	741309	Coil antenna
L116	741311	Coil RF
L121, 122 123, 124 125, 126 127, 128 129, 130	741315	Choke, RF
L135	741312	Coil, VHF
L136	741193	Coil, RF
L137	170846	Coil, VHF
L138	741316	Coil RF
L501	741313	Coil choke
L701	741314	Coil choke
Q101	741327	Transistor-Type 2SC1393
Q102	741328	Transistor-Type 2SC1394
Q103, 104	741173	Transistor-Type 2SC1674
Q107	170794	Transistor-Type 2SC930
Q108	741173	Transistor-Type 2SC1674
Q110	741209	Transistor-Type 2SC387
Q111	741172	Transistor-Type 2SC945
Q112	741420	Transistor-Type MPS3640
Q113	741220	Transistor-Type 2SC1070
Q114	740728	Transistor-Type 2SC1254
Q301, 302 303, 304 305	741172	Transistor-Type 2SC945
Q501, 502 503, 504 505, 506 507	741172	Transistor-Type 2SC945
Q508	741114	Transistor-Type 2SC711
Q509, 510 511	741175	Transistor-Type 2SA733
Q512	741330	Transistor-Type 2SD471
Q513, 514 515	741329	Transistor-Type 2SK44
Q516	741172	Transistor-Type 2SC945
Q701	169792	Transistor-Type 2SC536
Q702	741115	Transistor-Type 2SC1096

Pages 96-104 Courtesy of RADIO SHACK

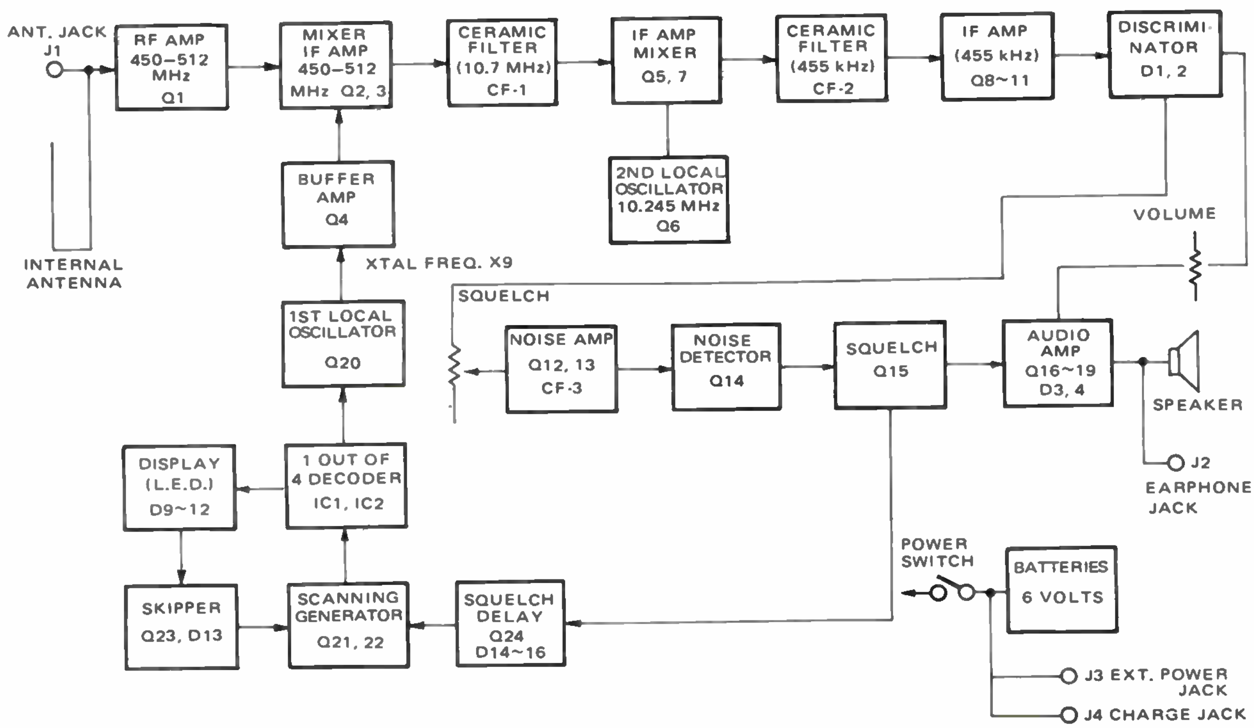
GENERAL ALIGNMENT

Test equipment required.

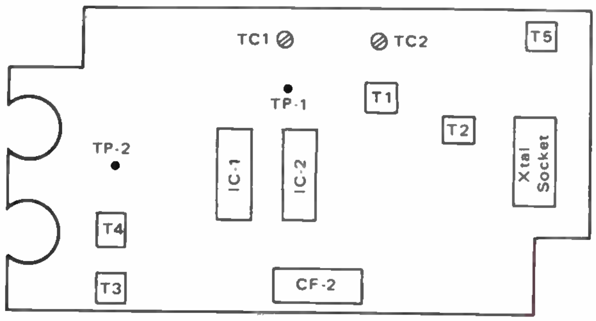
1. Oscilloscope
2. IF sweep generator with variable marker (10.7 MHz)
3. UHF sweep generator with variable marker (450 – 512 MHz)
4. RF frequency counter (10 – 60 MHz)
5. UHF standard signal generator (450 – 512 MHz)
6. AC V.T.V.M.
7. DC V.T.V.M.
8. 16 ohm dummy load
9. Load the unit with appropriate crystals.

NOTE: Use non-metallic tuning tools.
The test equipment and receiver should be warmed up for at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

BLOCK DIAGRAM



ALIGNMENT LOCATION POINTS



IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 2.
Step 2: Maintain sweep generator output at a low level to prevent overloading.
Step 3: Adjust IF Section T2, T3 and T4 for best linearity and so that the 455 kHz marker is in the center of the discriminator curve as shown in Figure 3.
NOTE: Adjust T1 for maximum sensitivity after adjustment of IF and RF sections.

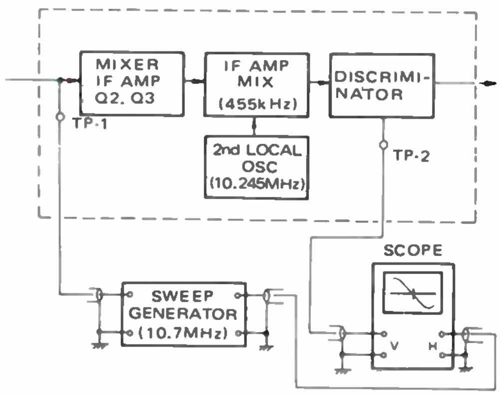


Figure 2. IF TEST SETUP

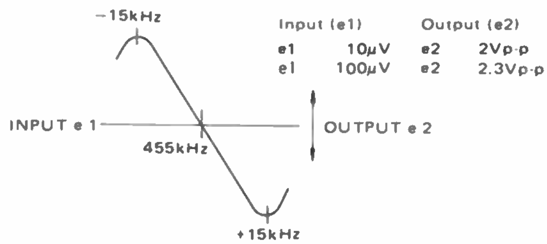


Figure 3. IF DISCRIMINATOR CURVE

NOTE: Check to be sure 2nd Local Oscillator (10.245 MHz) is operating.

RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 4.
Step 2: Set trimmer TC2 to minimum capacitance.
Step 3: Adjust TC1 of RF Section for maximum output and best curve symmetry as shown in Figure 5.

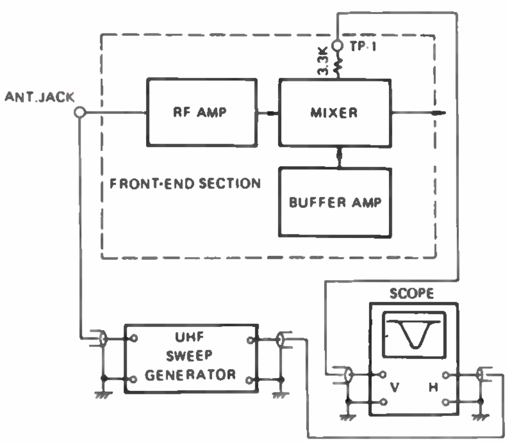


Figure 4. RF TEST SETUP

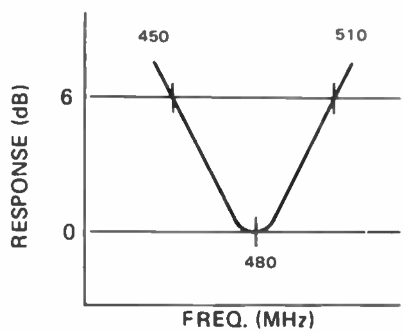


Figure 5. RF CHARACTERISTIC CURVE

CHECKING THE FIRST LOCAL OSCILLATOR FREQUENCY

Step 1: Insert all crystals into the sockets.
Step 2: Couple the frequency counter thru a pickup coil to oscillator coil T5. Refer to Figure 6.
Step 3: Check if these crystals are oscillating. If necessary, adjust T5 as follows:
As you adjust this coil, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

NOTE 1: Oscillating frequency, which is read on the frequency counter, should be ±500 Hz of the crystal frequency.
For example when receiving frequency is at 480 MHz, the frequency counter reading should be 52.144444 MHz ±500 = 52.144944 ~ 52.143944 MHz.

2: Crystal Frequency Calculation
The crystal frequencies are obtained by the following formula:
Frequency (MHz) = (Fr – 10.7)/9
Fr = Receiving frequency

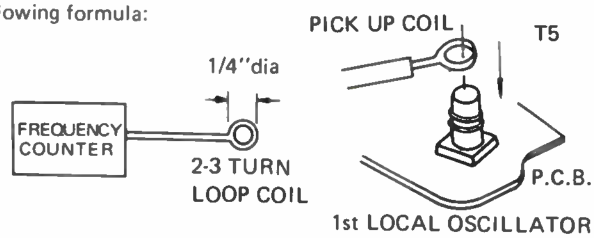


Figure 6. 1ST LOCAL OSCILLATOR

CHECKING THE SECOND LOCAL OSCILLATOR FREQUENCY

Step 1: Connect Frequency Counter through a 10pF capacitor to Q6 emitter circuit as shown in Figure 7. (10.245 MHz)
Step2: Read frequency on the Frequency Counter.
Normal: 10.245 MHz ±1 kHz.

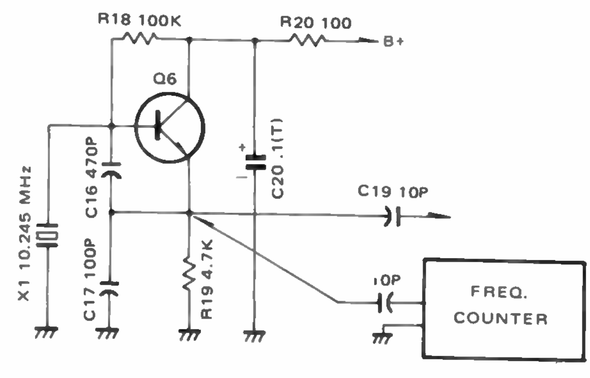


Figure 7. CONNECTION POINT

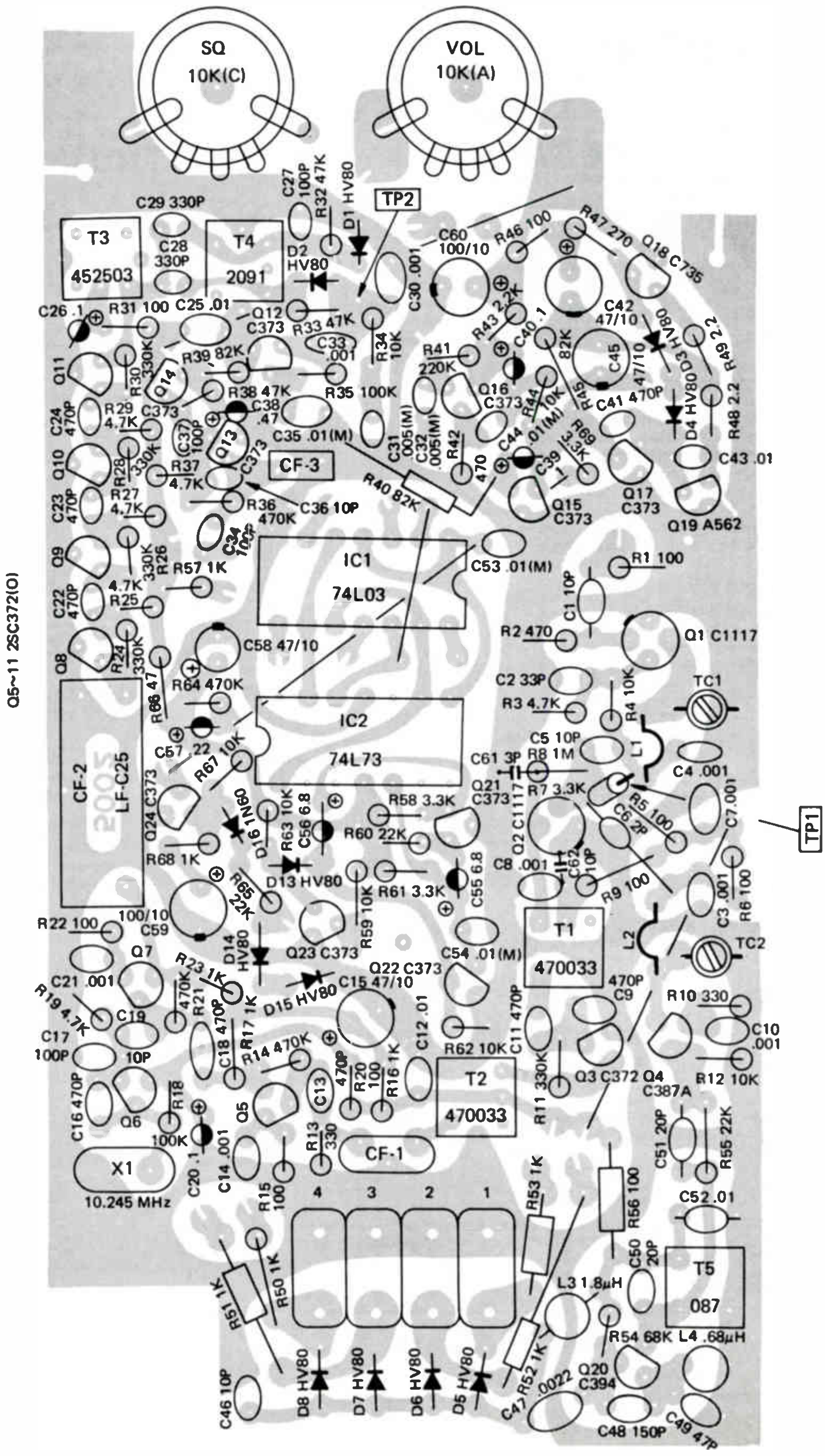
SENSITIVITY ALIGNMENT AND MEASUREMENT

Step 1: Connect the signal generator to antenna input and connect AC voltmeter to the speaker terminals.
Step 2: Adjust TC2, T1 and T5 for maximum output on the AC voltmeter.
Step 3: Turn the SQUELCH control fully counterclockwise. With the generator at minimum output and with no modulation, adjust the VOLUME control on the set for a 0 dB (0.775 volts) reading on the AC voltmeter.
Step 4: Increase the output of the signal generator to obtain a reading of –20 dB on the AC voltmeter. The generator output now equals the 20 dB quieting sensitivity.
Step 5: Tune the PRO 5A to the frequency of the signal generator (or vice versa).
Step 6: Turn VOLUME control fully clockwise. Set the signal generator for no modulation and minimum output.
Step 7: Adjust VOLUME control so that the output noise level shows 0 dB (0.775 volts) on the AC voltmeter.
Step 8: Increase the output level of the signal generator so that the signal output is 20 dB below the noise output level. The S.G. output is now equals to the 20 dB noise quieting figure of the set.

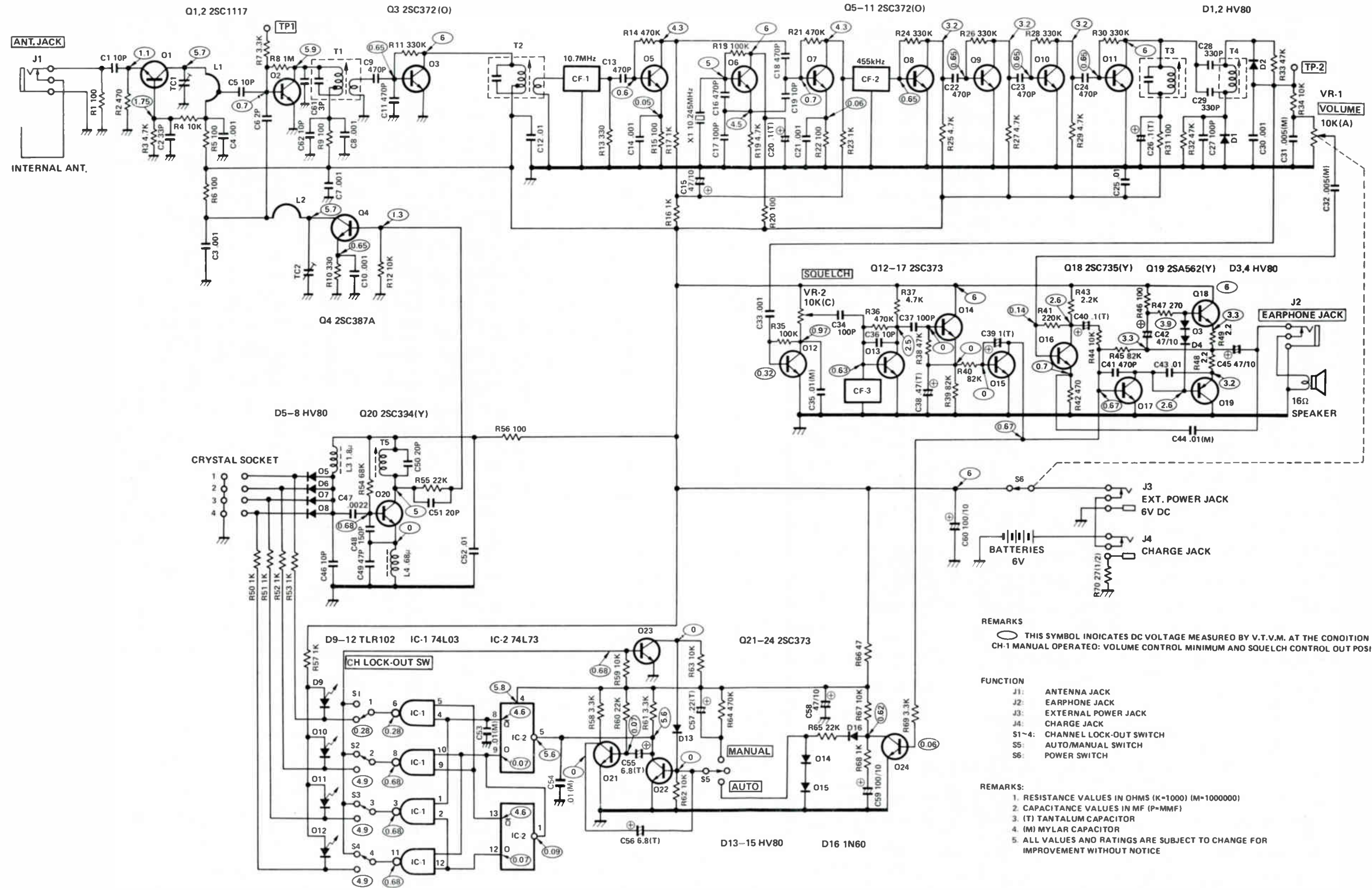
TROUBLESHOOTING

Symptom	Possible Cause
1) Light Emitting Diode (L.E.D.) does not light and no sound. Power SW : On VOLUME : Maximum Channel SW : On	A) Defective Battery. B) Defective On-Off Switch on VOLUME Control. C) Power Circuit Disconnected or Shorted.
2) L.E.D. Lights but no sound. Channel SW : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Defective Earphone jack. B) Defective Speaker. C) Faulty Q12, 13, 14, 15, 16, 17, 18 and/or Q19 Faulty Component in these stages.
3) Sounds but L.E.D. does not light. Channel SW : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Faulty L.E.D. P.C. Board Assembly + B supply. B) Defective L.E.D. C) Faulty Channel Switch. D) Defective IC-1.
4) No Sound through Earphone.	A) Defective Earphone jack. B) Defective Earphone.
5) Does not scan and SQUELCH does not operate but only noise con be heard.	A) Faulty Noise Amplifier or Faulty Noise Detector Circuit Component. B) Defective IF Amplifier. C) Defective Battery.
6) Does not scan but SQUELCH operates normally.	A) Defective Auto/Manual Switch B) One of Transistors Q21, 22 and 24 defective. C) Either IC-1 or IC-2 defective. D) One of Circuit component parts faulty.
7) Manual Selector does not operate.	A) Defective Auto/Manual Selector Switch. B) Either Q21 or Q22 defective. C) Either IC-1 or IC-2 defective. D) One of Circuit component parts faulty.
8) Skipper Circuit does not operate.	A) Faulty Transistor Q23 or Faulty Circuit component part. B) Defective channel Lock-out Switch.
9) Only scan channels 1 and 2 or channel 3 and 4.	A) Defective IC-2.
10) L.E.D. of one or two channels does not light when channel switch is on.	A) Defective IC-1 or IC-2. B) Defective Channel Switch. C) Defective L.E.D.
11) Noise can be heard but does not receive.	A) Wrong Channel Crystal or faulty Crystal. B) Defective RF Amplifier Circuit. C) Defective IF Amplifier Circuit. D) Defective 1st or 2nd Local Oscillator Circuit and/or Q4. E) Weak Battery.
12) Low sensitivity.	A) Weak Battery. B) Crystal frequency not covering the correct channel. C) Defective RF and IF Amplfiers.

P.C.BOARD (TOP VIEW)



SCHEMATIC DIAGRAM



REMARKS

THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY V.T.V.M. AT THE CONDITION OF CH-1 MANUAL OPERATED: VOLUME CONTROL MINIMUM AND SQUELCH CONTROL OUT POSITIONS.

FUNCTION

J1:	ANTENNA JACK
J2:	EARPHONE JACK
J3:	EXTERNAL POWER JACK
J4:	CHARGE JACK
S1~4:	CHANNEL LOCK-OUT SWITCH
S5:	AUTO/MANUAL SWITCH
S6:	POWER SWITCH

REMARKS:

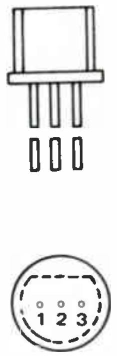
1. RESISTANCE VALUES IN OHMS (K=1000) (M=1000000)
2. CAPACITANCE VALUES IN MF (P=MMF)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE

SEMICONDUCTOR LEAD IDENTIFICATION

(A): 2SA562(Y)
2SC372(O)
2SC373
2SC387(A)
2SC394(Y)
2SC735(Y)

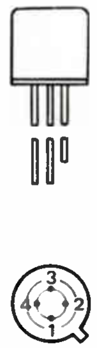
(B): 2SC1117

(A)



1. Emitter
2. Collector
3. Base

(B)



1. Emitter
2. Base
3. Collector
4. Shield

Ref. No.	Description	RS Parts Number	MFR's Parts Number
R60	Carbon film 22KΩ 1/8W ±5%		ERD-18VJ-223
R61	Carbon film 3.3KΩ 1/8W ±5%		ERD-18VJ-332
R62, 63	Carbon film 10KΩ 1/8W ±5%		ERD-18VJ-103
R64	Carbon film 470KΩ 1/8W ±5%		ERD-18VJ-474
R65	Carbon film 22KΩ 1/8W ±5%		ERD-18VJ-223
R66	Carbon film 47Ω 1/8W ±5%		ERD-18VJ-470
R67	Carbon film 10KΩ 1/8W ±5%		ERD-18VJ-103
R68	Carbon film 1KΩ 1/8W ±5%		ERD-18TJ-102
R69	Carbon film 3.3KΩ 1/8W ±5%		ERD-18VJ-332
R70	Solid 27Ω 1/2W ±10%		ERC-12GK-270
	SEMICONDUCTORS		
Q1, 2	Transistor silicon Hitachi	2SC1117	2SC1117
Q3	Transistor silicon Toshiba	2SC372(O)	2SC372(O)
Q4	Transistor silicon Toshiba	2SC387A	2SC387A
Q5–11	Transistor silicon Toshiba	2SC372(O)	2SC372(O)
Q12–17	Transistor silicon Toshiba	2SC373	2SC373
Q18	Transistor silicon Toshiba	2SC735(Y)	2SC735(Y)
Q19	Transistor silicon Toshiba	2SA562(Y)	2SA562(Y)
Q20	Transistor silicon Toshiba	2SC394(Y)	2SC394(Y)
Q21–24	Transistor silicon Toshiba	2SC373	2SC373
D1–8	Diode silicon	HV-80	HV-80
D9–12	Diode L.E.D.	TLR102	TLR102
D13–15	Diode slicon	HV-80	HV-80
IC-1	Integrated circuit	SN74L03N	74L03
IC-2	Integrated circuit	SN74L73	74L73
	COILS/TRANSFORMERS/FILTERS/CRYSTAL		
T1–2	IFT	CA-7246	119LC-470033N3
T3	IFT	CA-7247	7MC452503N4
T4	IFT	CA-2997	7MC2091N
T5	OSC. coil	CA-4546	6.5SN0-087
L1–2	UHF coil		8LNR-093
L3	Microinductor 1.8μH	CA-2909	LF4-1R8K
L4	Microinductor 0.68μH		EL0606-R68M
CF-1	Filter 10.7 MHz	CA-2911	10.7MFB
CF-2	Ceramic filter 455 kHz	C-0577	LF-C25
CF-3	Ceramic filter 455 kHz	C-0578	BFB-455L
X1	Crystal 10.245 MHz HC-18/μ		

Ref. No.	Description	RS Parts Number	MFR's Parts Number
	CAPACITORS		
C1	Ceramic 10pF ±0.5pF		FC50
C2	Ceramic 33pF ±5%		FC50
C3, 4	Ceramic 0.001μF ±10%		SCP60
C5	Ceramic 10pF ±0.5pF		FC50
C6	Ceramic 2pF ±0.25pF		FC50
C7, 8	Ceramic 0.001μF ±10%		SCP60
C9	Ceramic 470pF ±10%		SCP50
C10	Ceramic 0.001μF ±10%		SCP60
C11	Ceramic 470pF ±10%		SCP50
C12	Ceramic 0.01μF −20 +80%		MC70
C13	Ceramic 470pF ±10%		SCP50
C14	Ceramic 0.001μF ±10%		SCP60
C15	Electrolytic 47μF 10WV −10 +50%		CE04W1A470
C16	Ceramic 470pF ±10%		SCP50
C17	Ceramic 100pF ±10%		SCP50
C18	Ceramic 470pF ±10%		SCP50
C19	Ceramic 10pF ±0.5pF		FC50
C20	Tantalum 0.1μF 35WV ±20%		CS15E1V0R1-M
C21	Ceramic 0.001μF ±10%		SCP60
C22–24	Ceramic 470pF ±10%		SCP50
C25	Ceramic 0.01μF −20 +80%		MC70
C26	Tantalum 0.1μF 35WV ±20%		CS15E1V0R1-M
C27	Ceramic 100pF ±10%		SCP50
C28, 29	Ceramic 330pF ±10%		SCP50
C30	Ceramic 0.001μF ±10%		SCP60
C31, 32	Mylar 0.005μF ±20%		
C33	Ceramic 0.001μF ±10%		SCP60
C34	Ceramic 100pF ±10%		SCP50
C35	Mylar 0.01μF ±20%		
C36	Ceramic 10pF ±0.5pF		FC50
C37	Ceramic 100pF ±10%		SCP50
C38	Tantalum 0.47μF 35WV ±20%		CS15E1V0R1-M
C39, 40	Tantalum 0.1μF 35WV ±20%		CS15E1V0R1-M
C41	Ceramic 470pF ±10%		SCP50
C42	Electrolytic 47μF 10WV −10 +50%		CE04W1A470
C43	Ceramic 0.01μF −20 +80%		MC70
C44	Mylar 0.01μF ±20%		
C45	Electrolytic 47μF 10WV −10 +50%		CE04W1A470
C46	Ceramic 10pF ±0.5pF		FC50
C47	Ceramic 0.0022μF ±10%		SCP70
C48	Ceramic 150pF ±10%		SCP50
C49	Ceramic 47pF ±5%		FC60
C50, 51	Ceramic 20pF ±5%		FC50
C52	Ceramic 0.01μF −20 +80%		MC70
C53, 54	Mylar 0.01μF ±20%		
C55, 56	Tantalum 6.8μF 6.3WV ±20%		CS15E0J6R8
C57	Tantalum 0.22μF 35WV ±20%		CS15E1VR22-M
C58	Electrolytic 47μF 10WV −10 +50%		CE04W1A470
C59, 60	Electrolytic 100μF 10WV −10 +50%		CE04W1A101
C61	Ceramic 3pF ±0.25		FC50
C62	Ceramic 10pF ±10%		FC50
TC-1	Trimmer 10pF		ECV-1ZW10X51
TC-2	Trimmer 10pF		ECV-1ZW10X51

Pages 105-116 Courtesy of RADIO SHACK

ALIGNMENT PREPARATION

Test equipment required

1. Oscilloscope
2. AC VTVM
3. DC VTVM
4. Frequency counter (60 MHz)
5. 8 ohm dummy load
6. Slow sweep generator with variable marker (10.7 MHz)
7. VHF sweep generator with variable marker (30 – 50 MHz, 148 – 174 MHz)
8. UHF sweep generator with variable marker(450 – 512 MHz)
9. FM signal generator (30 – 50 MHz, 150 – 172 MHz, 450 – 512 MHz).

NOTES: *Use non-metallic tuning tools.*
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.
See PCB and Alignment Positions Illustrations for Test Points and Adjustable Components.

2nd LOCAL OSCILLATOR FREQUENCY CHECK (10.245 MHz)

Step 1: Connect Frequency Counter through a 10pF capacitor to Q12 Emitter circuit. (See Figure 2)
Step 2: Read frequency on the Frequency Counter.
Normal: 10.245 MHz ±1 kHz.

NOTE: *Frequency Counter coupling capacitor should be as small a value as possible. Frequency Counter should be high impedance type.*

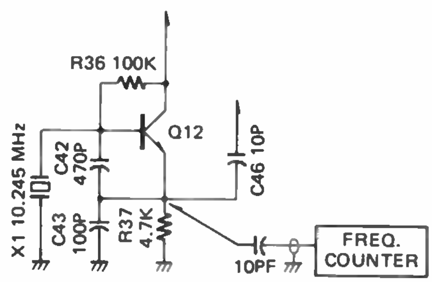


FIGURE 2.

IF SECTION ALIGNMENT

Step 1: Connect instruments as shown in Figure 3.
Step 2: Maintain sweep generator output at a low level to prevent overloading.
Step 3: Adjust T9, T10 of IF amplifier so that the 455 kHz marker is in the center of the discriminator curve and for best linearity as shown in Figure 4.

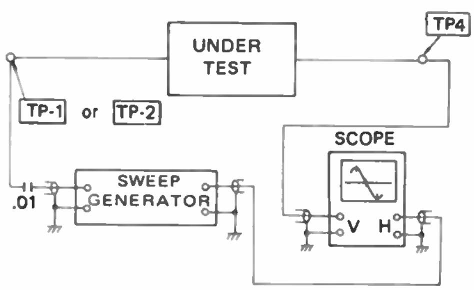


FIGURE 3. IF SECTION ALIGNMENT TEST EQPT. HOOK UP

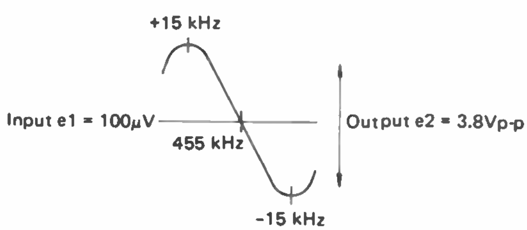


FIGURE 4. IF DISCRIMINATOR CURVE

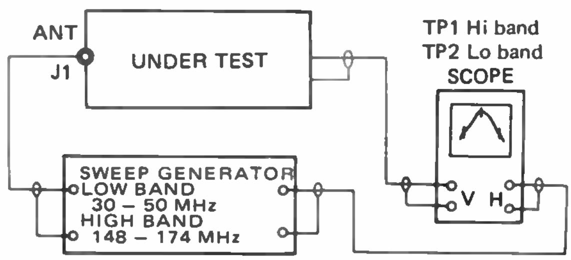
VHF FRONT-END ALIGNMENT

LOW BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Set at least one crystal band selector switch to "L" position.
Step 3: Adjust Frequency of sweep generator to 40 MHz. Connect Scope to TP-2.
Step 4: Adjust T4, T5 and T6 of RF section for maximum output and best curve symmetry as shown in Figure 6.

HIGH BAND ALIGNMENT

Step 1: Connect the instruments as shown in Figure 5.
Step 2: Set at least one crystal switch to "H" position. Connect Scope to TP-1.
Step 3: Adjust frequency of sweep generator to 153 MHz.
Step 4: Adjust T1, T2 and T3 in RF section for maximum output and best curve symmetry as shown in Figure 7.



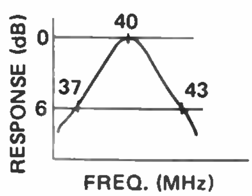


FIGURE 6. VHF Lo

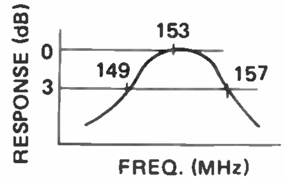


FIGURE 7. VHF Hi

FIGURE 5. VHF LOW/HIGH BAND RF TEST EQPT. HOOK UP

UHF FRONT-END ALIGNMENT

Step 1: Connect the instruments as shown in Figure 8.
Step 2: Set at least one crystal band selector switch to "U" position and connect Scope to TP-3.
Step 3: Set TC-2 to minimum capacitance.
Step 4: Adjust frequency of sweep generator to 480 MHz.
Step 5: Adjust TC-1 for maximumoooutput and best curve symmetry as shown in Figure 9.

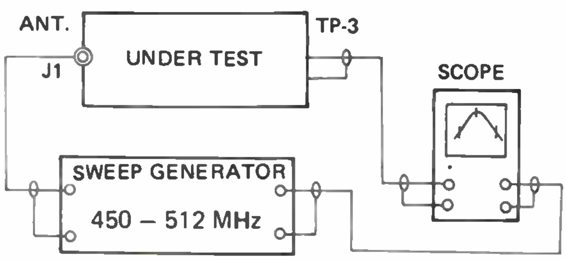


FIGURE 8. UHF BAND RF TEST EQPT. HOOK UP

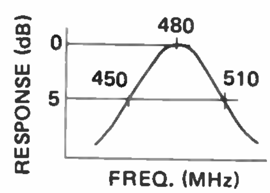


FIGURE 9. UHF RF CHARACTERISTIC CURVE

CRYSTAL INSTALLATION

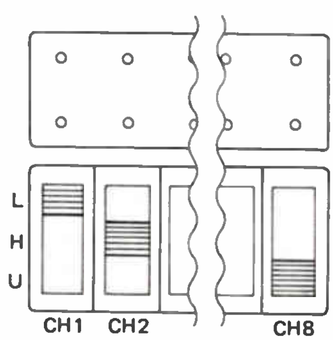


FIGURE 10. CRYSTAL INSTALLATION

VHF LOW/HIGH, UHF LOCAL OSCILLATOR FREQUENCY CHECK

Step 1: Insert crystals in sockets.
Step 2: Couple the frequency counter thru a pickup coil to oscillator coil. Refer to Figure 11.

FIGURE 11. LOCAL OSCILLATOR COUPLING

Step 3: Check the frequencies of the appropriate oscillators as shown in the following chart. Do not make adjustments until or unless you perform the "Overall Alignment and Sensitivity" procedures noted on Page 5.

If necessary, adjust L5 and L8 as follows:
As you adjust these coils, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

Fr		CRYSTAL SWITCH POSITION	f osc	OSCILLATOR COIL
VHF LOW	30 ~ 50 MHz	L	Fr +10.7 MHz	L8
VHF HIGH	148~174MHz	H	(Fr −10.7 MHz)/3	L5
UHF	450~512MHz	U	(Fr −10.7 MHz)/9	L5

NOTE 1: *Oscillating frequency, which is read on the frequency counter, should be ±750 Hz of the calculated crystal frequency.*

EXAMPLE RECEIVING FREQ.	CRYSTAL FREQ.	COUNTER FREQ.
40 MHz	50.7 MHz	50.699250 ~ 50.700750 MHz
150 MHz	47.433333 MHz	47.432583 ~ 47.434083 MHz
480 MHz	52.144444 MHz	52.143694 ~ 52.145194 MHz

NOTE 2: *Crystal Frequency Calculation.*
The crystal frequencies are obtained by the following formula.
VHF LOW Crystal frequency (MHz) = Fr +10.7
VHF HIGH Crystal frequency (MHz) = (Fr − 10.7)/3
UHF Crystal frequency (MHz) = (Fr − 10.7)/9
Where Fr is the desired receive frequency, in MHz.

UHF OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to ANTENNA jack and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receiver band center (480 MHz).
Step 3: Adjust TC-2, T7, T8 and L5 for maximum sensitivity.
Step 4: Set the signal generator for no modulation and minimum output, and set VOLUME control for 0 dB (0.775V) reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting sensitivity.

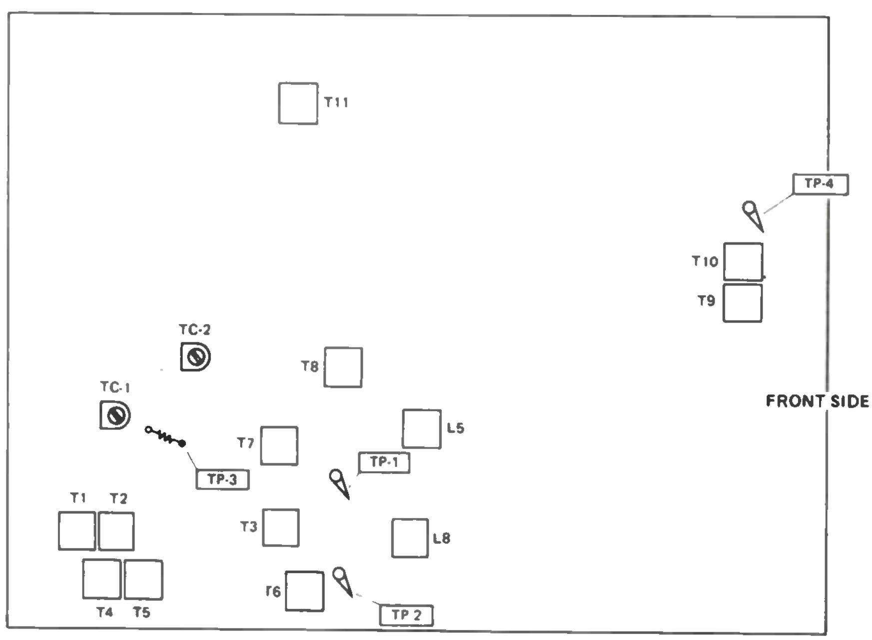
VHF LOW/HIGH OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect signal generator to ANTENNA jack and AC VTVM to speaker terminals.
Step 2: Turn the SQUELCH control fully counterclockwise and set up the frequency to receive band center (153 MHz for High Band, 40 MHz for Low Band).
Step 3: Adjust L5 (Hi) and L8 (Lo) for maximum sensitivity.
Step 4: Set the signal generator for no modulation and minimum output, and set VOLUME control for 0 dB (0.775V) reading on the VTVM.
Step 5: Increase output of the generator to obtain reading of −20 dB on the AC VTVM. The generator output now equals the 20 dB noise quieting.

NOTE 1: *As supplied by the factory, this unit is set up to provide maximum sensitivity in ranges of 37 – 43 MHz for VHF Lo, 149 – 157 MHz for VHF Hi and 465 – 495 MHz for UHF. If a customer desires optimum performance for a frequency range other than this, you can realign for maximum sensitivity at a center frequency anywhere from about 30 MHz up to about 50 MHz for VHF Lo, 148 MHz to 174 MHz for VHF Hi and 450 MHz to 512 MHz for UHF. To achieve optimum sensitivity, realign the RF and Local Oscillator for the desired center frequency. Keep in mind that best sensitivity will cover only a band width "window" of about 6/8/30 MHz total -- adjust the sensitivity accordingly (compromise of frequency coverage may be necessary).* Of course, be sure to use correct crystals.

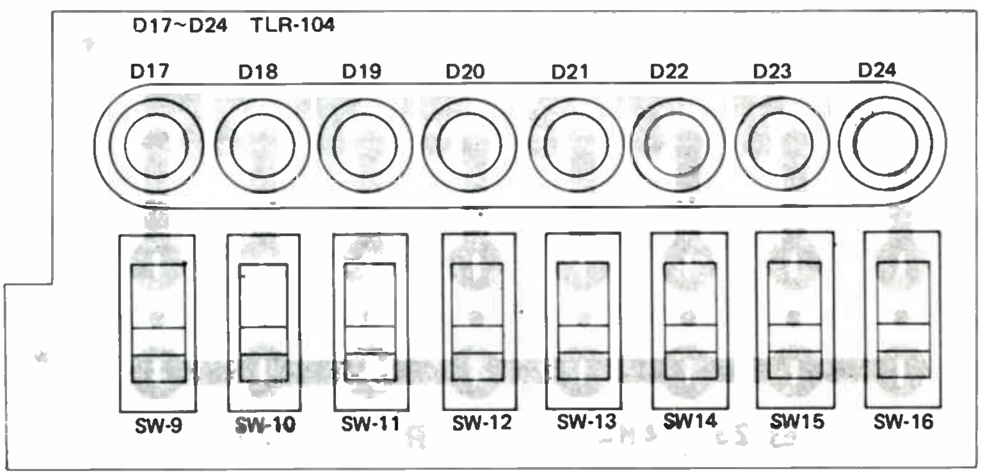
NOTE 2: *Alignment of T11 is not required. It happens to be adjustable only because of ease of parts procurement and does not need any adjustment.*

ALIGNMENT POSITIONS



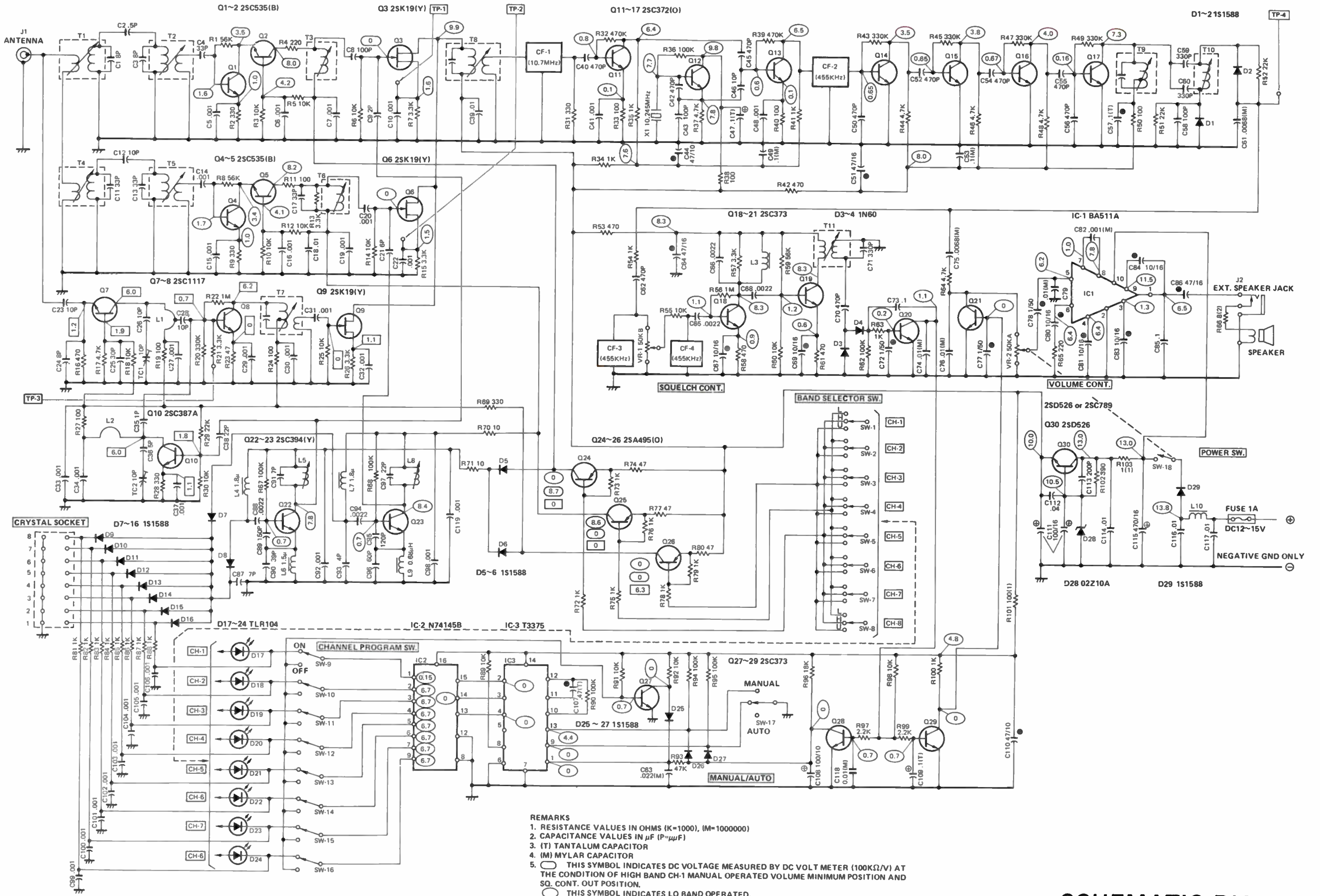
Symptom	Possible cause
11) UHF band does not operate but Lo/Hi band operate.	A) Defective crystal B) Check crystal switch and/or position (U). C) UHF section D) Defective RF AMPLIFIER mixer and tripler OSC. and/or defective circuit component parts
12) VHF Lo, Hi and UHF band do not operate.	A) Defective OSC circuit B) Defective IF amplifier circuit
13) VHF Lo, Hi and UHF sound distorted.	A) Defective crystal B) Defective amplifier circuit C) Defective AUDIO amplifier circuit
14) VHF Lo, Hi and UHF, low sensitivity	A) Check alignment (frequency range). B) Defective RF AMP and IF AMP
15) VHF Lo, low sensitivity	A) Weak crystal B) Faulty adjustment of RF amplifier and/or faulty circuit component parts
16) VHF High, low sensitivity	A) Weak crystal B) Faulty adjustment of RF amplifier and/or faulty circuit component parts
17) UHF low sensitivity	A) Weak crystal B) Faulty adjustment of UHF Front-end and/or faulty circuit component parts

SWITCH P.C. BOARD (TOP VIEW)



TROUBLE SHOOTING

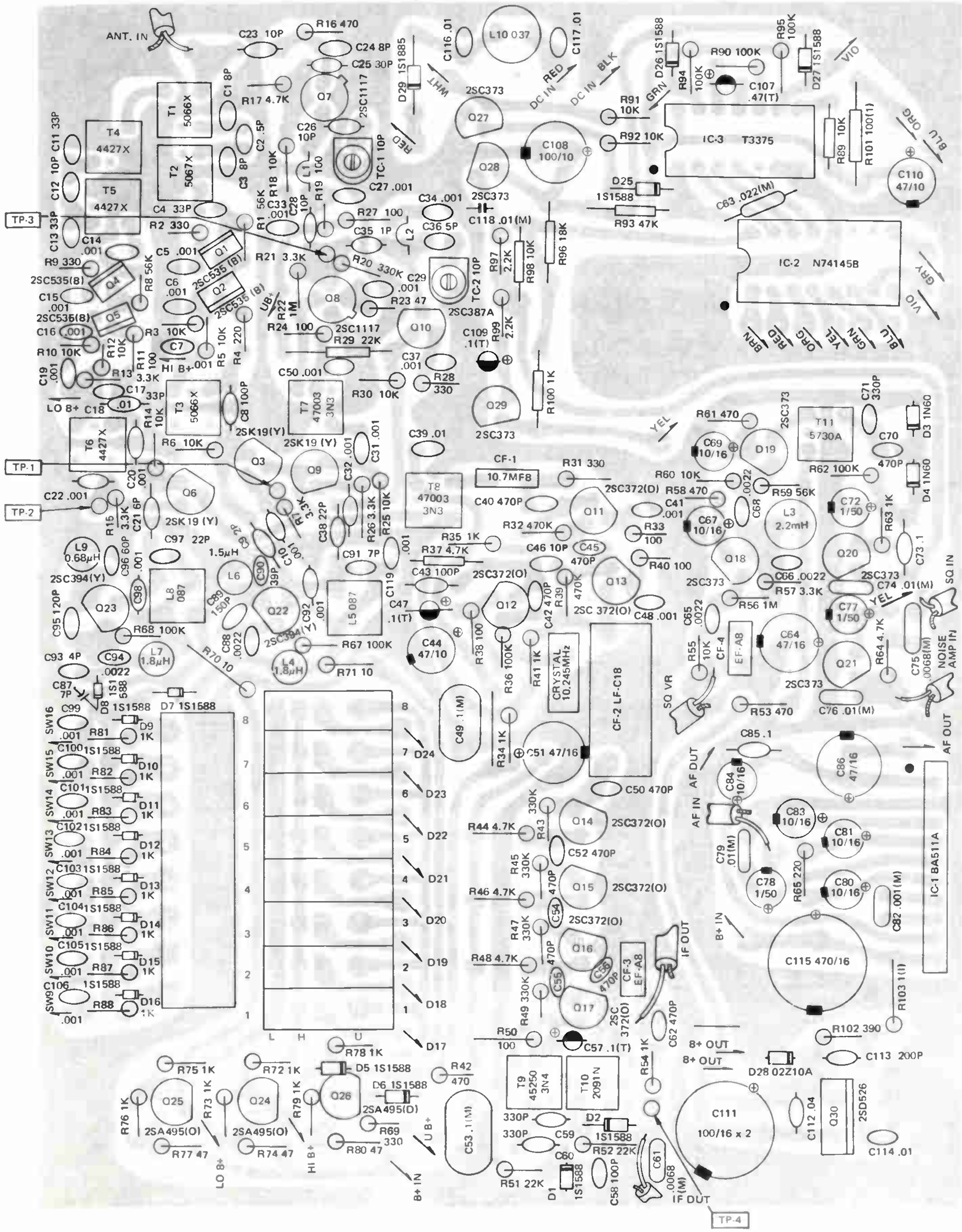
Symptom	Possible cause
1) Pilot Lamp does not light and no sound output. Power Switch : ON Channel Switch : ON Volume Control : MAX.	A) Faulty line power cord B) Defective power switch C) Defective Transistor Q30 or defective associated circuit component D) Defective fuse E) Defective diode D29
2) Channel lamp lights but no sound. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective speaker B) Defective speaker jack C) Faulty transistors Q21 and IC IC-1 and/or faulty associated circuit component D) Faulty IF amplifier circuit component
3) Sound but channel lamp does not light. Channel Switch : ON Volume Control : MAX. Squelch Control : MIN.	A) Defective channel switch or defective diode D17 – D24 B) Defective R101 C) Problem with integrated circuit IC-2 to IC-3
4) Does not scan and Squelch does not operate.	A) Defective Squelch control B) Defective IF amplifier circuit C) Defective noise amplifier or noise detector and/or defective circuit component parts D) Defective integrated circuit IC-2 to IC-3 E) Defective transistor Q21, Q28 and Q29
5) Does not scan but Squelch operates.	A) Defective AUTO/MANUAL switch B) Problem with integrated circuit IC-2 to IC-3 and/or transistors Q28 and/or defective circuit component parts
6) Manual selector does not operate.	A) Faulty manual selector switch, AUTO/MANUAL switch.
7) Skipper does not operate.	A) Defective transistor Q27 and/or defective circuit component parts
8) Delay does not operate.	A) Defective Q28 and/or defective circuit component parts
9) VHF (Lo) band does not operate but VHF (Hi), UHF band operate.	A) Defective crystal B) Check crystal band selector switch, set to L position C) Weak crystal and/or one of transistors Q23 defective and/or defective circuit component parts D) Defective RF amplifier, MIXER and/or defective circuit component parts
10) VHF (Hi) band does not operate but VHF (Lo), UHF band operate.	A) Defective crystal B) Check crystal switch and/or position (H) C) Defective Q22 and/or defective circuit component parts D) Defective RF AMPLIFIER Q1, 2 and mixer Q3 and/or defective circuit component Parts



REMARKS
1. RESISTANCE VALUES IN OHMS (K=1000), (M=1000000)
2. CAPACITANCE VALUES IN μF (P=$\mu\mu$F)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ⬭ THIS SYMBOL INDICATES DC VOLTAGE MEASURED BY DC VOLT METER (100KΩ/V) AT THE CONDITION OF HIGH BAND CH-1 MANUAL OPERATED VOLUME MINIMUM POSITION AND SQ. CONT. OUT POSITION.
◯ THIS SYMBOL INDICATES LO BAND OPERATED.
▭ THIS SYMBOL INDICATES UHF BAND OPERATED.

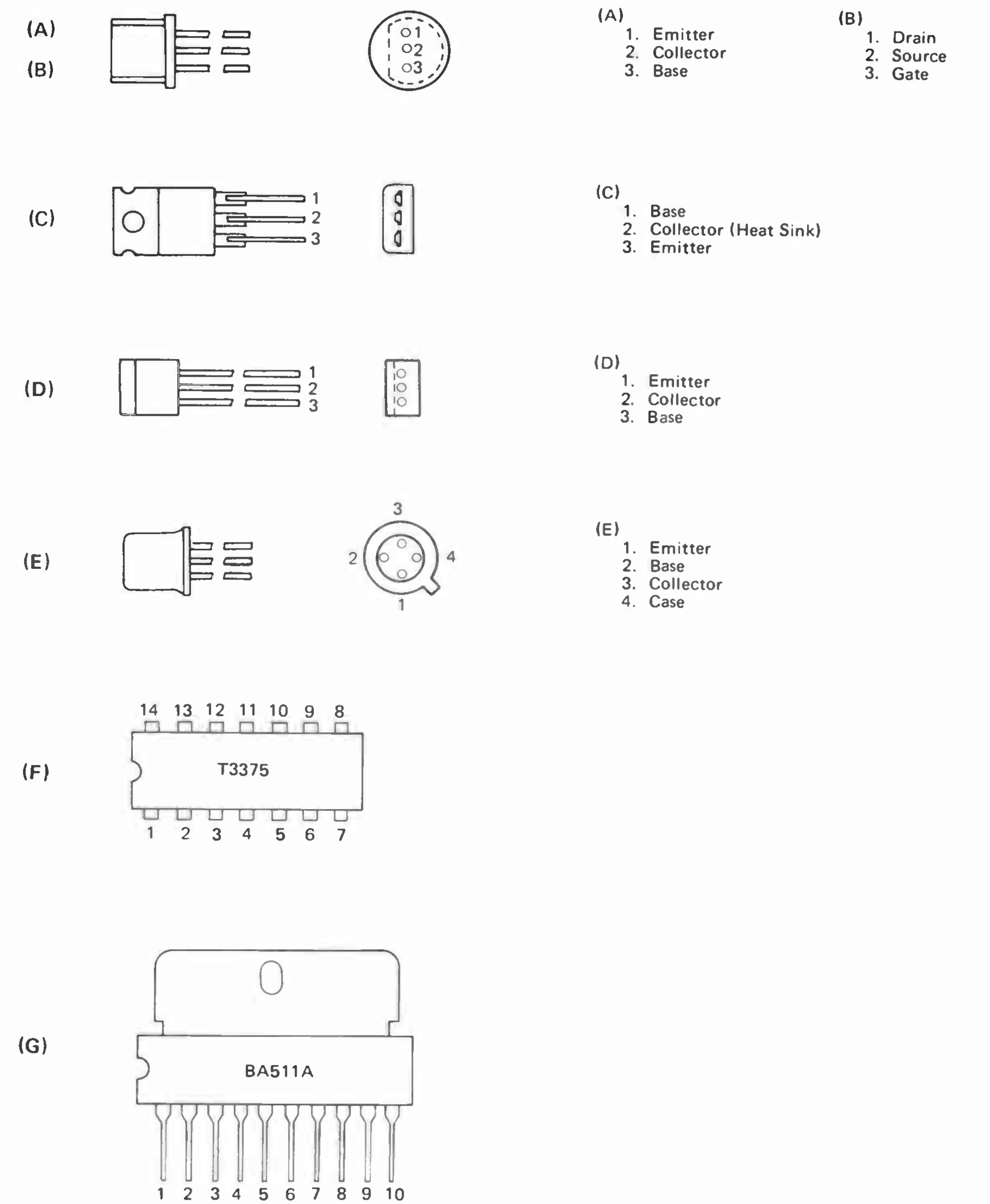
SCHEMATIC DIAGRAM

MAIN P.C. BOARD (TOP VIEW)



SEMICONDUCTOR LEAD IDENTIFICATION

(A): 2SA495(O), 2SC372(O), 2SC373, 2SC387A, 2SC394(Y).
(B): 2SK19(Y)
(C): 2SD526
(D): 2SC535(B)
(E): 2SC1117
(F): T3375
(G): BA511A
(H): N7415B



Ref. No.		Description			RS Part Number	MFR's Part Number
		SEMICONDUCTORS				
Q1		Transistor	Silicon	Hitachi	2SC535(B)	2SC535(B)
Q2		Transistor	Silicon	Hitachi	2SC535(B)	2SC535(B)
Q3		FET	Silicon	Toshiba	2SK19(Y)	2SK19(Y)
Q4		Transistor	Silicon	Hitachi	2SC535(B)	2SC535(B)
Q5		Transistor	Silicon	Hitachi	2SC535(B)	2SC535(B)
Q6		FET	Silicon	Toshiba	2SK19(Y)	2SK19(Y)
Q7		Transistor	Silicon	Hitachi	2SC1117	2SC1117
Q8		Transistor	Silicon	Hitachi	2SC1117	2SC1117
Q9		FET	Silicon	Toshiba	2SK19(Y)	2SK19(Y)
Q10		Transistor	Silicon	Toshiba	2SC387A	2SC387A
Q11		Transistor	Silicon	Toshiba	2SC372(O)	2SC372(O)
Q12		Transistor	Silicon	Toshiba	2SC372(O)	2SC372(O)
Q13		Transistor	Silicon	Toshiba	2SC372(O)	2SC372(O)
Q14		Transistor	Silicon	Toshiba	2SC372(O)	2SC372(O)
Q15		Transistor	Silicon	Toshiba	2SC372(O)	2SC372(O)
Q16		Transistor	Silicon	Toshiba	2SC372(D)	2SC372(O)
Q17		Transistor	Silicon	Toshiba	2SC372(O)	2SC372(O)
Q18		Transistor	Silicon	Toshiba	2SC373	2SC373
Q19		Transistor	Silicon	Toshiba	2SC373	2SC373
Q20		Transistor	Silicon	Toshiba	2SC373	2SC373
Q21		Transistor	Silicon	Toshiba	2SC373	2SC373
Q22		Transistor	Silicon	Toshiba	2SC394(Y)	2SC394(Y)
Q23		Transistor	Silicon	Toshiba	2SC394(Y)	2SC394(Y)
Q24		Transistor	Silicon	Toshiba	2SA495(O)	2SA495(O)
Q25		Transistor	Silicon	Toshiba	2SA495(O)	2SA495(O)
Q26		Transistor	Silicon	Toshiba	2SA495(O)	2SA495(O)
Q27		Transistor	Silicon	Toshiba	2SC373	2SC373
Q28		Transistor	Silicon	Toshiba	2SC373	2SC373
Q29		Transistor	Silicon	Toshiba	2SC373	2SC373
Q30		Transistor	Silicon	Toshiba	2SD526(O)	2SD526(O)
IC1		Integrated circuit		Toyo Dengu	BA511A	BA511A
IC2		Integrated circuit			N741458	N741458
IC3		Integrated circuit		Toshiba	T3375	T3375
D1		Diode	Silicon	Toshiba	1S1588	1S1588
D2		Diode	Silicon	Toshiba	1S1588	1S1588
D3		Diode	Germanium	Toshiba	1N60	1N60
D4		Diode	Germanium	Toshiba	1N60	1N60
D5		Diode	Silicon	Toshiba	1S1588	1S1588
D6		Diode	Silicon	Toshiba	1S1588	1S1588
D7		Diode	Silicon	Toshiba	1S1588	1S1588
D8		Diode	Silicon	Toshiba	1S1588	1S1588
D9		Diode	Silicon	Toshiba	1S1588	1S1588
D10		Diode	Silicon	Toshiba	1S1588	1S1588
D11		Diode	Silicon	Toshiba	1S1588	1S1588
D12		Diode	Silicon	Toshiba	1S1588	1S1588
D13		Diode	Silicon	Toshiba	1S1588	1S1588
D14		Diode	Silicon	Toshiba	1S1588	1S1588
D15		Diode	Silicon	Toshiba	1S1588	1S1588
D16		Diode	Silicon	Toshiba	1S1588	1S1588
D17		Diode	LED	Toshiba	L-0744	TLR104
D18		Diode	LED	Toshiba	L-0744	TLR104
D19		Diode	LED	Toshiba	L-0744	TLR104
D20		Diode	LED	Toshiba	L-0744	TLR104
D21		Diode	LED	Toshiba	L-0744	TLR104
D22		Diode	LED	Toshiba	L-0744	TLR104
D23		Diode	LED	Toshiba	L-0744	TLR104
D24		Diode	LED	Toshiba	L-0744	TLR104
D25		Diode	Silicon	Toshiba	1S1588	1S1588
D26		Diode	Silicon	Toshiba	1S1588	1S1588
D27		Diode	Silicon	Toshiba	1S1588	1S1588
D28		Diode	Zener	Toshiba	02Z10A	02Z10A
D29		Diode	Silicon	Toshiba	1S1885	1S1885
		SWITCHES				
SW1-8		Band selector switch			S-2356	S-113146
SW9-16	5	Channel program switch			S-2355	S-112142
SW17	1	Manual/Auto lever switch			S-5040	MLS-D-2-3
SW18		Power switch with VOLUME				

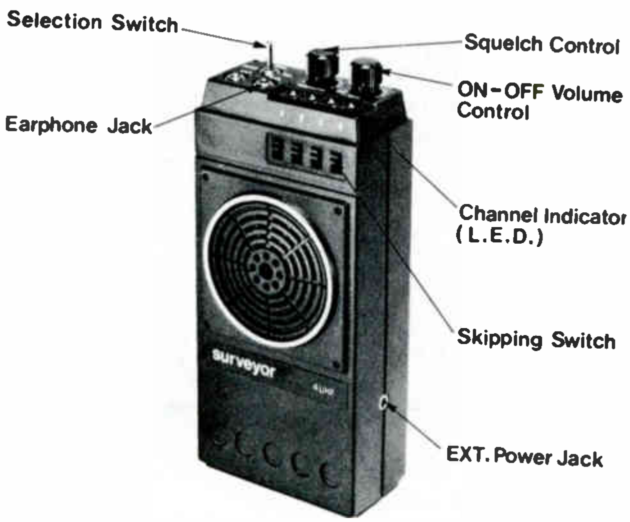
J1	7	ANTenna jack	J-0566	JA-C-020
		Crystal socket	J-6464	SF-1018-00
		DC cable with fuse holder	W-1909	DX-104
J2	8	EXT. SPeaKeR jack	J-0408	JA-C-011
		Fuse	HF-0018	1A
	4	Main P.C. Board		GE-218-5758
	10	SW P.C. Board		GE-21D-5769
	9	Speaker	S-4668	C080A20N1311

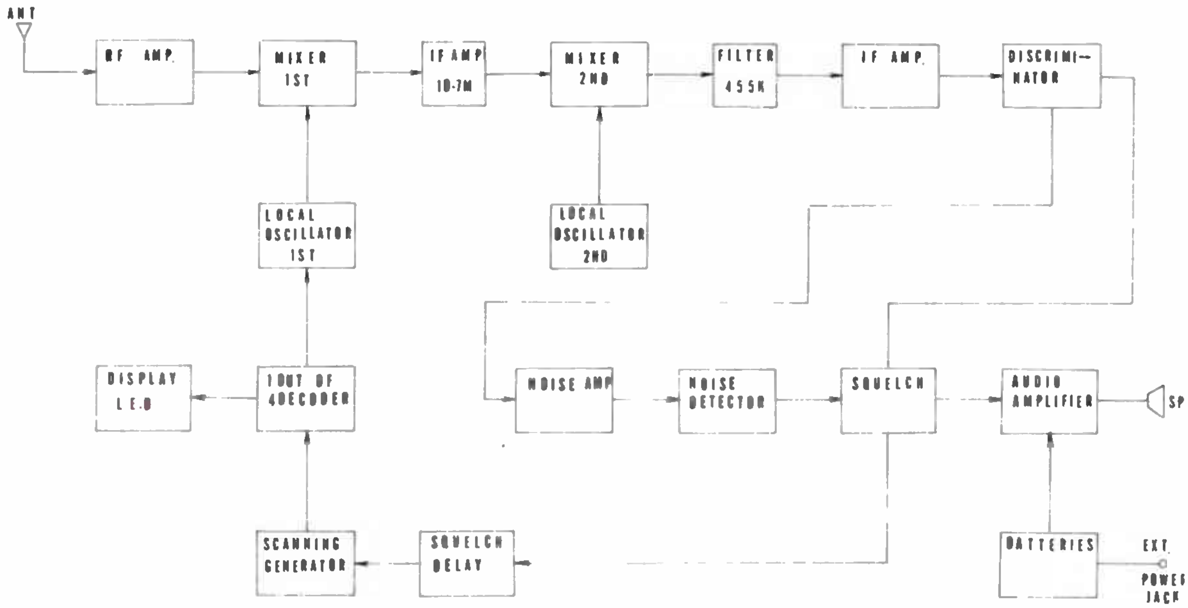
POTENTIOMETERS

VR1	3	SQUELCH control	P-1718	V12M4-1S(SJ) 15FH15A-50KΩ
VR2	2	VOLUME control	P-1717	V1Z4-1S(SJ)15FH15A-50KΩ

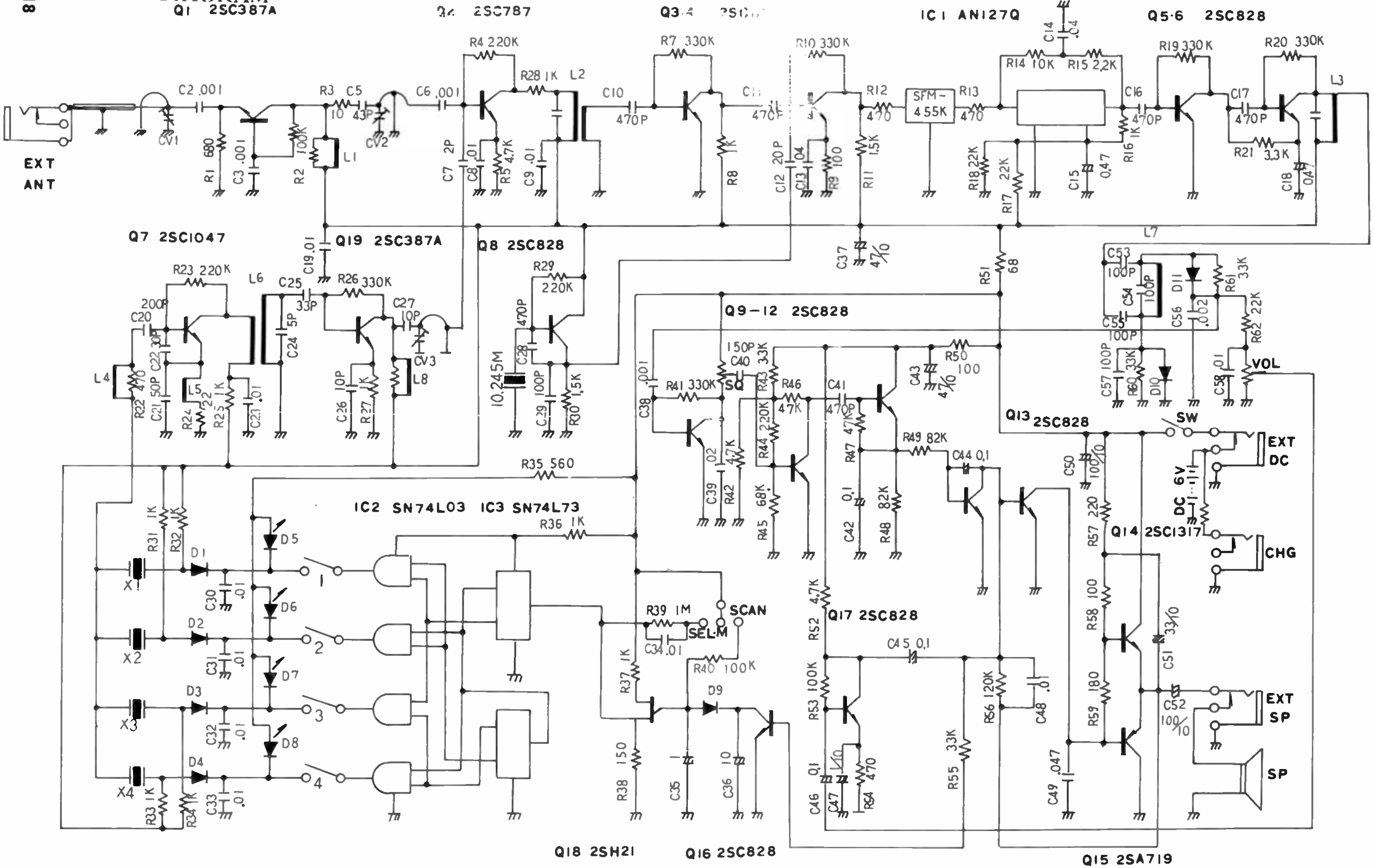
Ref. No.	Description				RS Part Number	MFR's Part Number
C51	Electrolytic	47μF	16WV			CE04W1C470B
C52	Ceramic	470pF		±10%		SCP-50
C53	Mylar	0.1μF	50WV	±10%		
C54	Ceramic	470pF		±10%		SCP-50
C55	Ceramic	470pF		±10%		SCP-50
C56	Ceramic	470pF		±10%		SCP-50
C57	Tantalum	0.1μF	35WV	±20%		CS15E1VOR1M
C58	Ceramic	100pF		±5%		FC-70
C59	Ceramic	330pF		±5%		SCU-100
C60	Ceramic	330pF		±5%		SCU-100
C61	Mylar	0.0068μF	50WV	±10%		
C62	Ceramic	470pF		±10%		SCP-50
C63	Mylar	0.022μF	50WV	±10%		
C64	Electrolytic	47μF	16WV			CE04W1C4708
C65	Ceramic	0.0022μF		±20%		SCP-100
C66	Ceramic	0.0022μF		±20%		SCP-100
C67	Electrolytic	10μF	16WV			CE04W1C100F
C68	Ceramic	0.0022μF		±20%		SCP-100
C69	Electrolytic	10μF	16WV			CE04W1C100F
C70	Ceramic	470pF		±10%		SCP-50
C71	Ceramic	330pF		±10%		SCP-50
C72	Electrolytic	1μF	50WV			CE04W1H010
C73	Ceramic	0.1μF		+80 ~ 20%		MC-135
C74	Mylar	0.01μF	50WV	±10%		
C75	Mylar	0.0068μF	50WV	±10%		
C76	Mylar	0.01μF	50WV	±10%		
C77	Electrolytic	1μF	50WV			CE04W1H010
C78	Electrolytic	1μF	50WV			CE04W1H010
C79	Mylar	0.01μF	50WV	±10%		
C80	Electrolytic	10μF	16WV			CE04W1C100F
C81	Electrolytic	10μF	16WV			VE04W1C100F
C82	Mylar	0.001μF	50WV	±10%		
C83	Electrolytic	10μF	16WV			CE04W1C100F
C84	Electrolytic	10μF	16WV			CE04W1C100F
C85	Ceramic	0.1μF		+80 ~ 20%		MC-135
C86	Electrolytic	47μF	16WV			CE04W1C4708
C87	Ceramic	7pF		±0.5pF		FC-50
C88	Ceramic	0.0022μF		±20%		SCP-100
C89	Ceramic	150pF		±10%		FC-80
C90	Ceramic	39pF		±5%		FC-50
C91	Ceramic	7pF		±0.5pF		FC-50
C92	Ceramic	0.001μF		±10%		SCP-60
C93	Ceramic	4pF		±0.5pF		FC-50
C94	Ceramic	0.0022μF		±20%		SCP-100
C95	Ceramic	120pF		±10%		FC-80
C96	Ceramic	60pF		±5%		FC-60
C97	Ceramic	22pF		±5%		FC-50
C98	Ceramic	0.001μF		±10%		SCP-60
C99	Ceramic	0.001μF		±10%		SCP-60
C100	Ceramic	0.001μF		±10%		SCP-60
C101	Ceramic	0.001μF		±10%		SCP-60
C102	Ceramic	0.001μF		±10%		SCP-60
C103	Ceramic	0.001μF		±10%		SCP-60
C104	Ceramic	0.001μF		±10%		SCP-60
C105	Ceramic	0.001μF		±10%		SCP-60
C106	Ceramic	0.001μF		±10%		SCP-60
C107	Tantalum	0.47μF	35WV	±20%		CS15E1VOR47M
C108	Electrolytic	100μF	10WV			CE04W1A101A
C109	Tantalum	0.1μF	35WV	±20%		CS15E1VOR1M
C110	Electrolytic	47μF	10WV			CE04W1A4708
C111	Electrolytic	100μF	16WV			CE042W1C101F
C112	Ceramic	0.04μF		+80 ~ 20%		MC-100
C113	Ceramic	200pF		±10%		FC-80
C114	Ceramic	0.01μF		+80 ~ 20%		MC-70
C115	Electrolytic	470μF	16WV			CE04W1C471E
C116	Ceramic	0.01μF		+80 ~ 20%		MC-70
C117	Ceramic	0.01μF		+80 ~ 20%		MC-70
C118	Mylar	0.01μF	50WV	±10%		
C119	Ceramic	0.001μF		±10%		SCP-60
TC1	Trimmer	10pF				ECV-1ZW10X53
TC2	Trimmer	10pF				ECV-1ZW10X53
	COILS/TRANSFORMERS/FILTERS					
T1	VHF Hi Ant coil				CA-4786	113SN-5066X
T2	VHF Hi RF coil				CA-4785	113SN-5067X
T3	VHF Hi RF coil				CA-4786	113SN-5066X
T4	VHF Lo Ant coil				CA-4549	113KN-4427X
T5	VHF Lo RF coil				CA-4549	113KN-4427X
T6	VHF Lo RF coil				CA-4549	113KN-4427X
T7	IFT 10.7 MHz				CA-7246	119LC-470033N3
T8	IFT 10.7 MHz				CA-7246	119LC-470033N3
T9	IFT 455 kHz				CA-7217	7MC-452503N
T10	Discriminator coil 455 kHz				CA-2997	7MC-2091N
T11	Noise AMP coil				CA-3489	126LN-5730A
L1	UHF tank coil				CA-4654	8LNR-093
L2	UHF tank coil				CA-4654	8LNR 093
L3	RFC 2.2mH				C-0735	FL7H-222J
L4	RFC 1.8μF					LF4-1R8K
L5	OSC coil				CA-4546	6.5SNO-087
L6	RFC 1.5μH				C-0734	LF4-1R5K
L7	RFC 1.8μH				CA-2909	LF4-1R8K
L8	OSC coil				CA-4546	6.5SNO-087
L9	RFC 0.68μH				CA-4546	LF4-R68K
L10	Choke coil				CA-3182	38-037
CF1	Filter 10.7 MHz				C-0607	10.7MF8
CF2	Filter 455 kHz				C-0733	LF-C18
CF3	Filter 455 kHz				C-0671	EF-A8 or 8F8455L
CF4	Filter 455 kHz				C-0671	EF-A8 or 8F8455L
X1	Crystal 10.245 MHz					

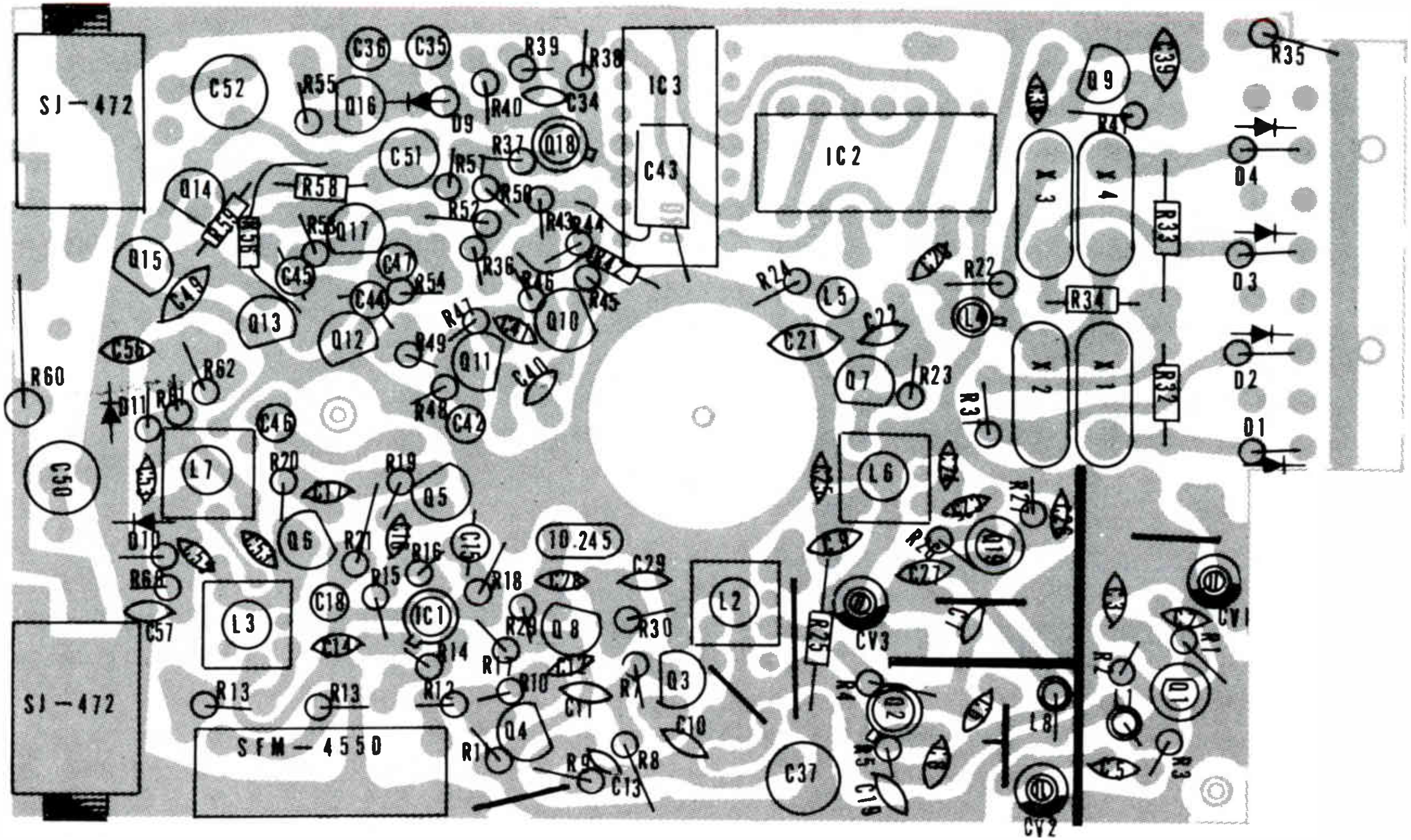
Pages 117-119 Courtesy of SURVEYOR MANUFACTURING CORP.





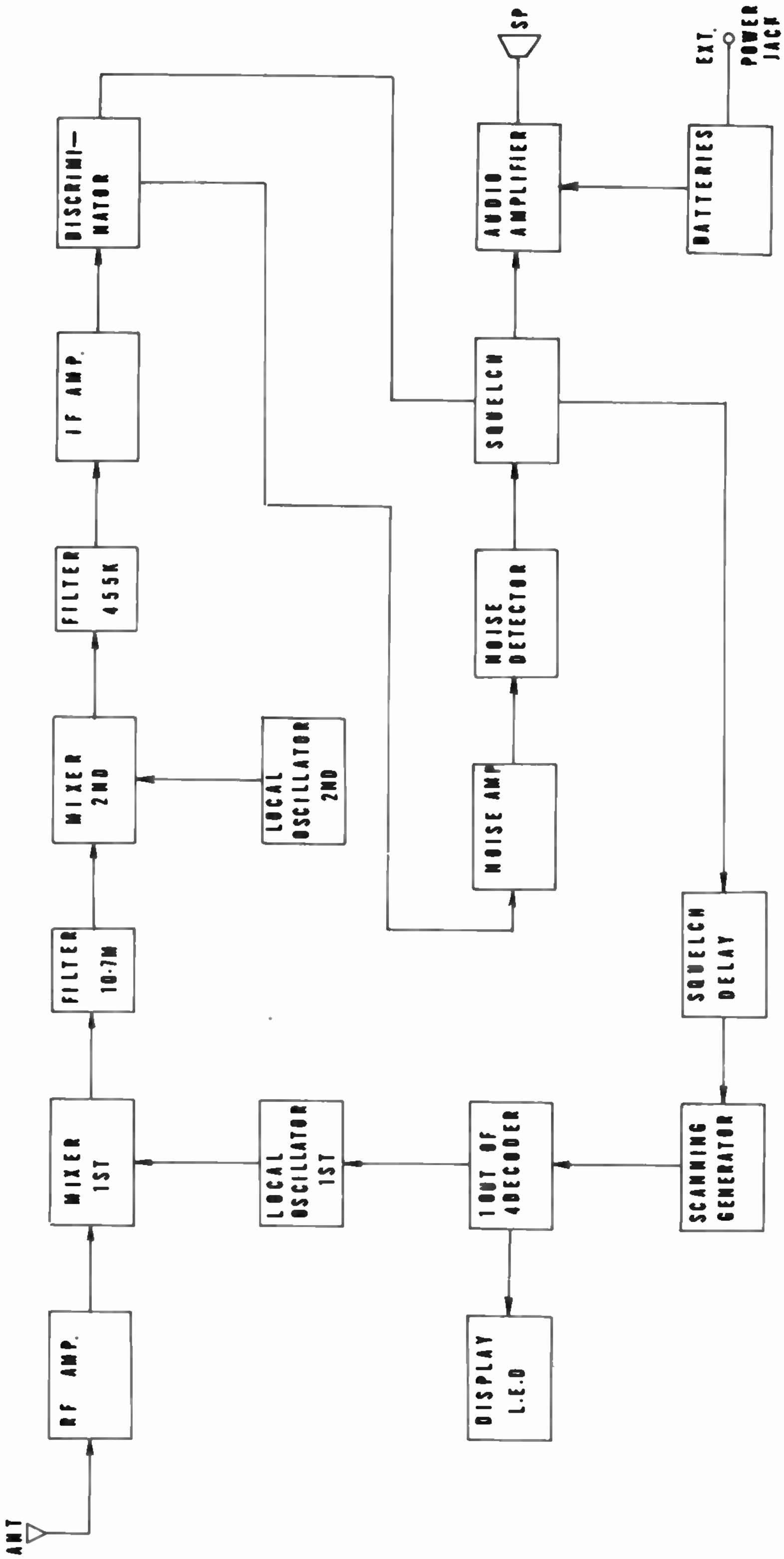
CIRCUIT DIAGRAM



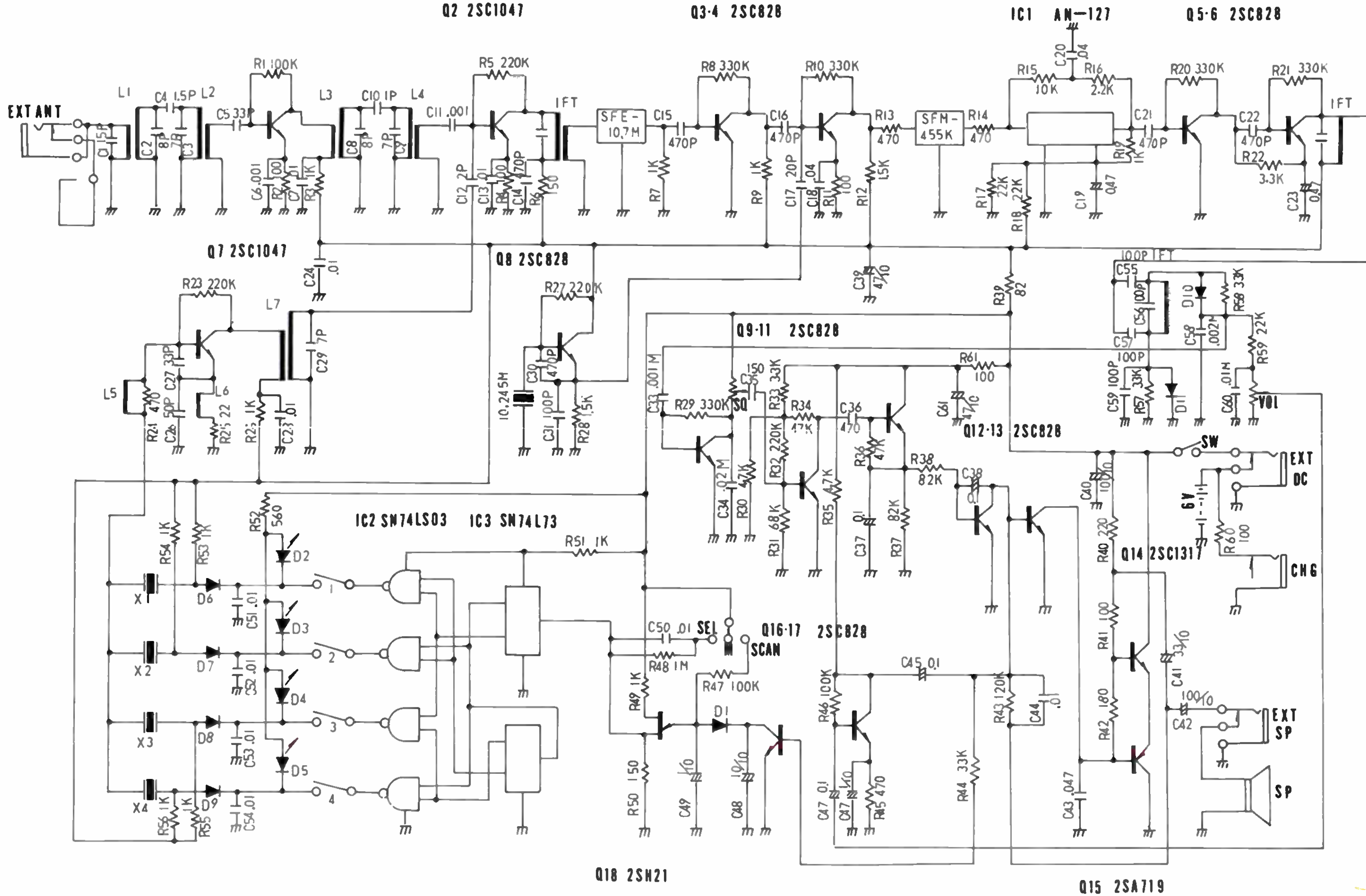


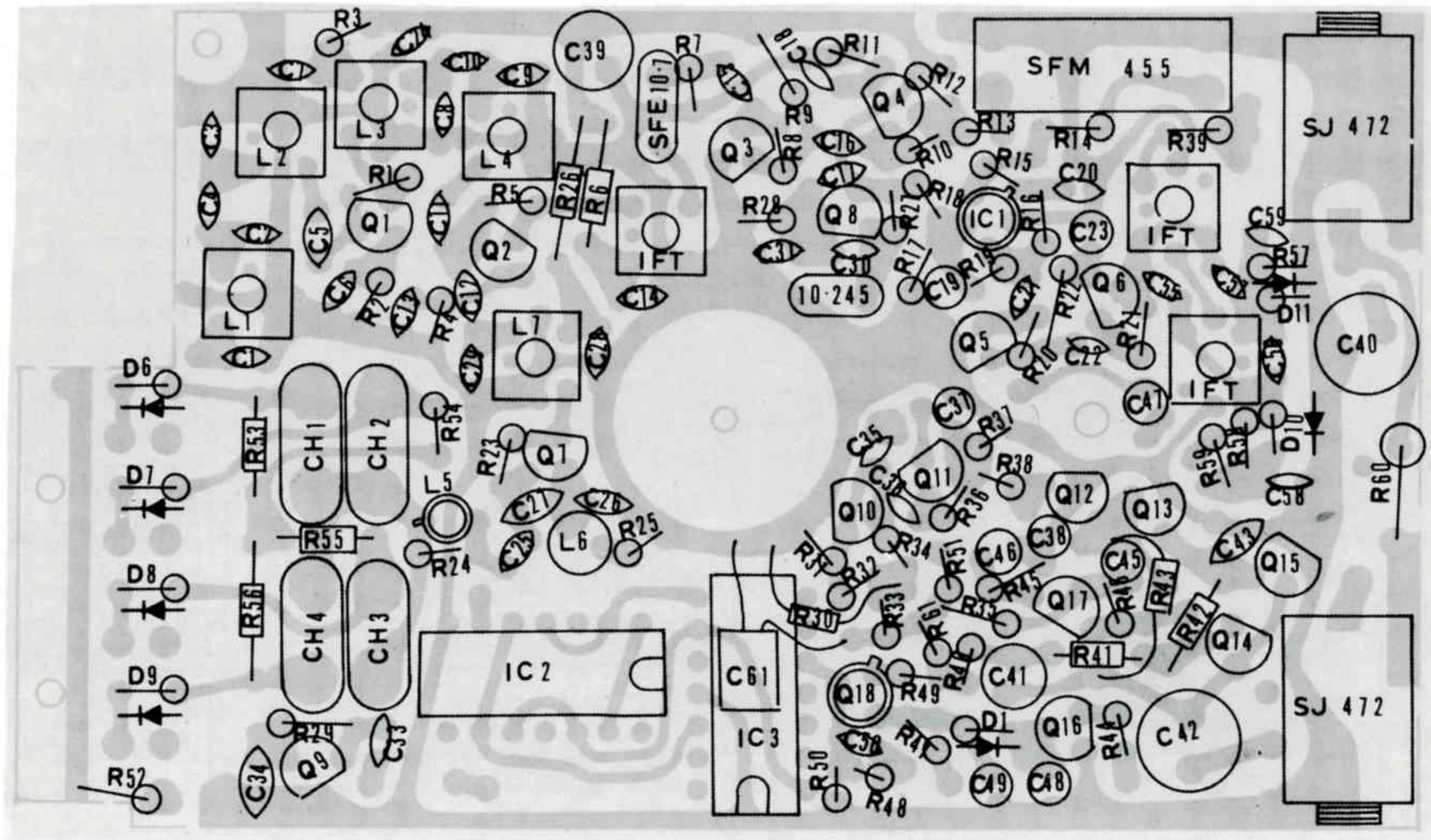
Surveyor 4 UHF

Pages 120-122 Courtesy of SURVEYOR MANUFACTURING CORP.



CIRCUIT DIAGRAM




SFM 455
SJ 472
SJ 472
SFE 10.7
10.245
C39
C40
C41
C42
C61
IC1
IC2
IC3
IFT
IFT
IFT
L1
L2
L3
L4
L5
L6
L7
CH1
CH2
CH3
CH4
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
D1
D6
D7
D8
D9
D10
D11
R52
R53
R55
R56
R60

Pages 123-127 Courtesy of SURVEYOR MANUFACTURING CORP.

This receiver is dispatched from factory being tuned at the center frequency of each band – 40 MHz (VHF-Lo) 155 MHz (VHF-Hi). Therefore, it may be necessary to re-tune it according to the frequencies which you would choose because of the limit of usable bandwidth as described in SPECIFICATIONS and effect of bandwidth upon sensitivity. Have a well-trained service technician equipped with proper equipment for re-tuning. Do not try adjustment for yourself unless you are familiar with tuning procedure and have proper equipment.

Re-tuning is performed by adjusting coils mentioned below. (See Fig.3).

VHF-Lo .... L1, L3 and L4 (Coils)
VHF-Hi .... L50, L51, L52 and L53 (Coils)

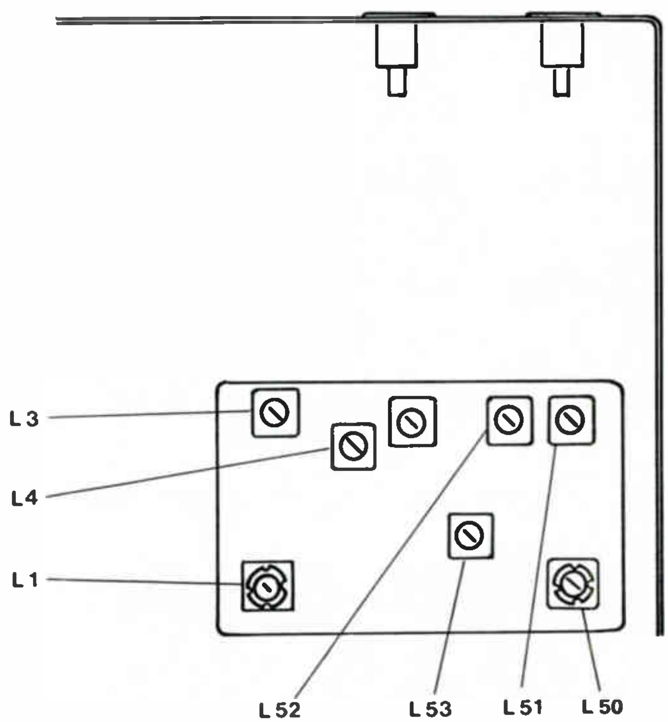
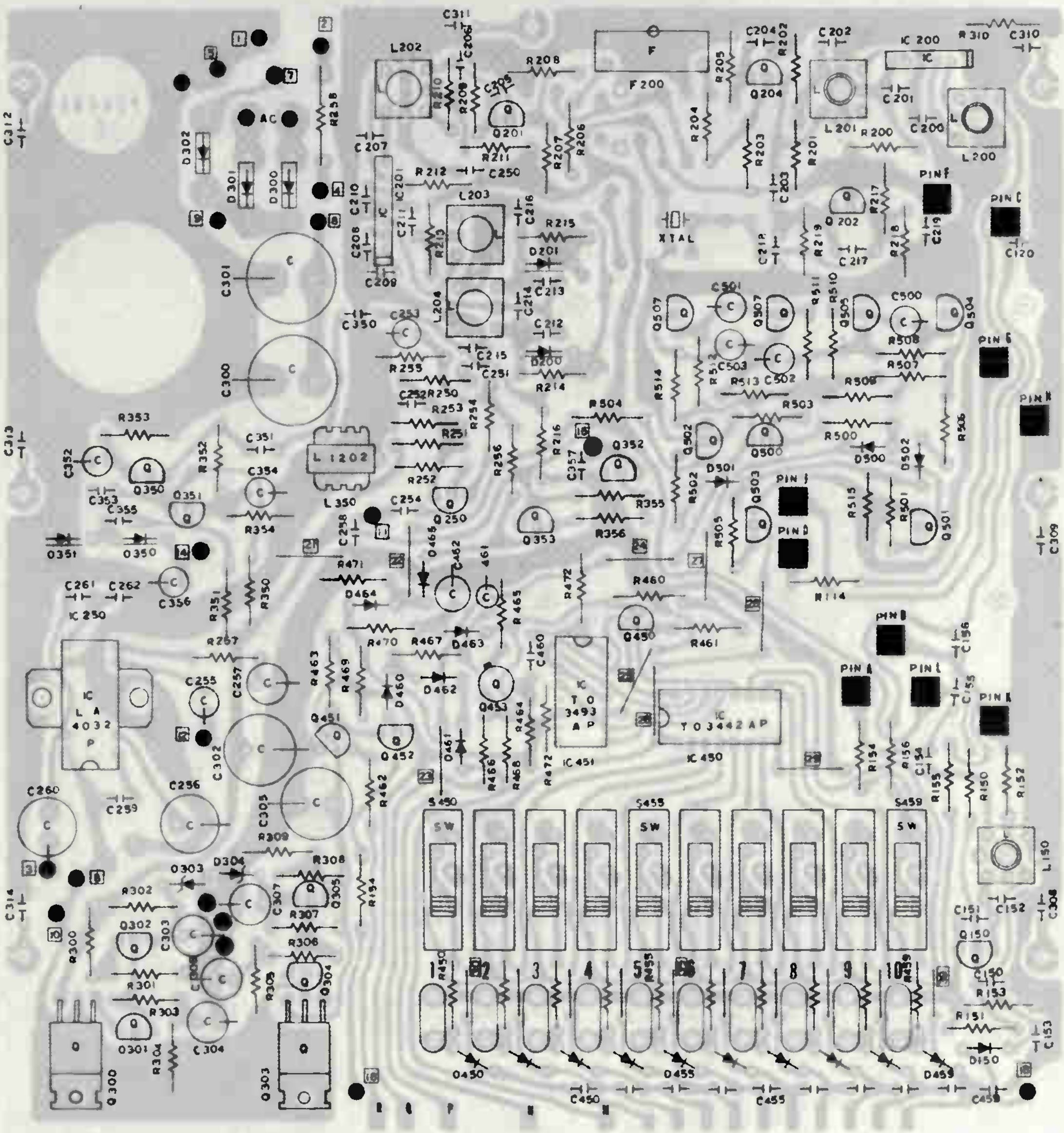


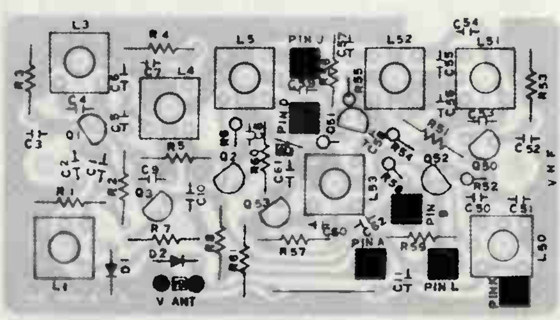
Fig. (3)

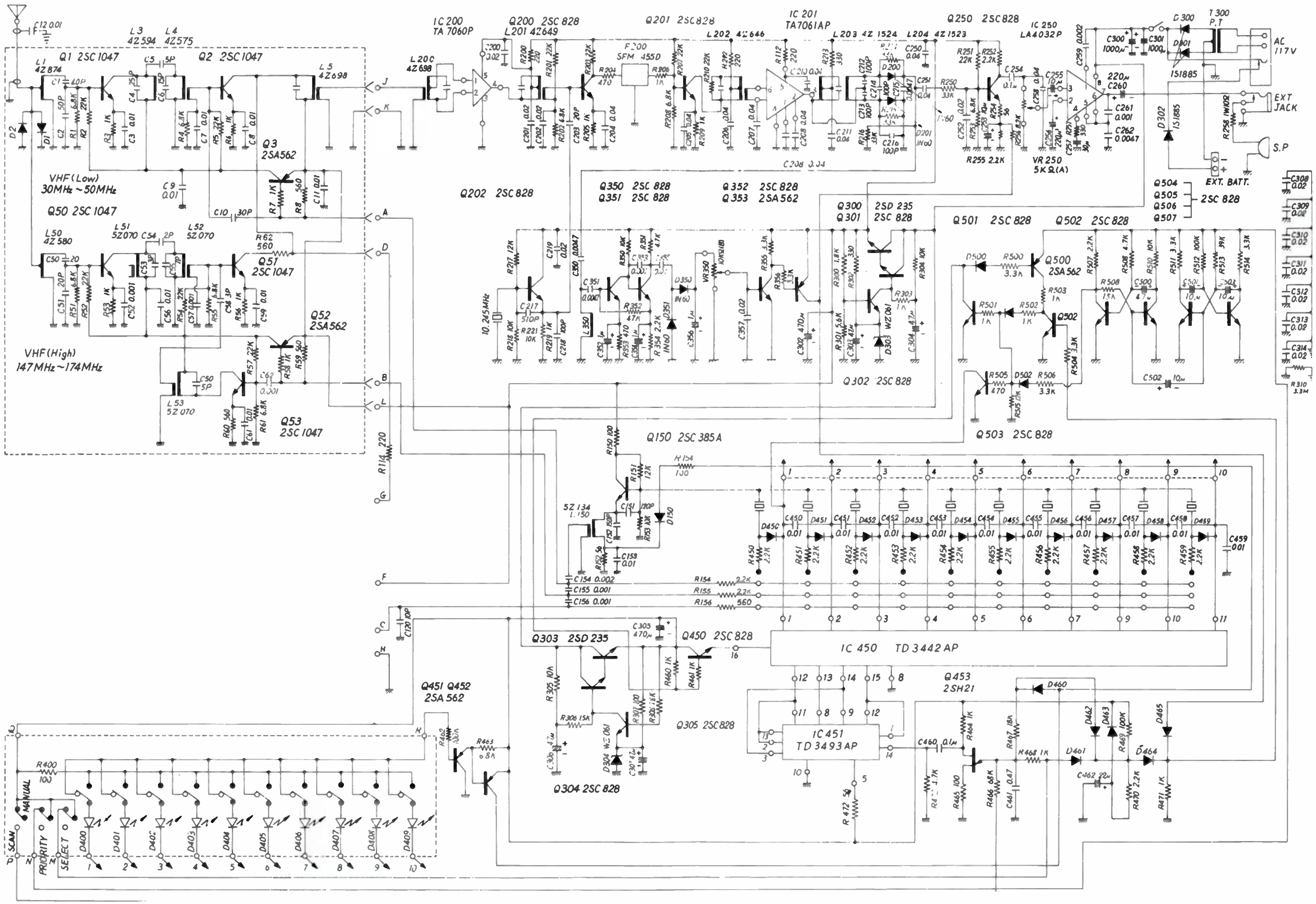
TOP VIEW

MAIN PRINTED CIRCUIT BOARD



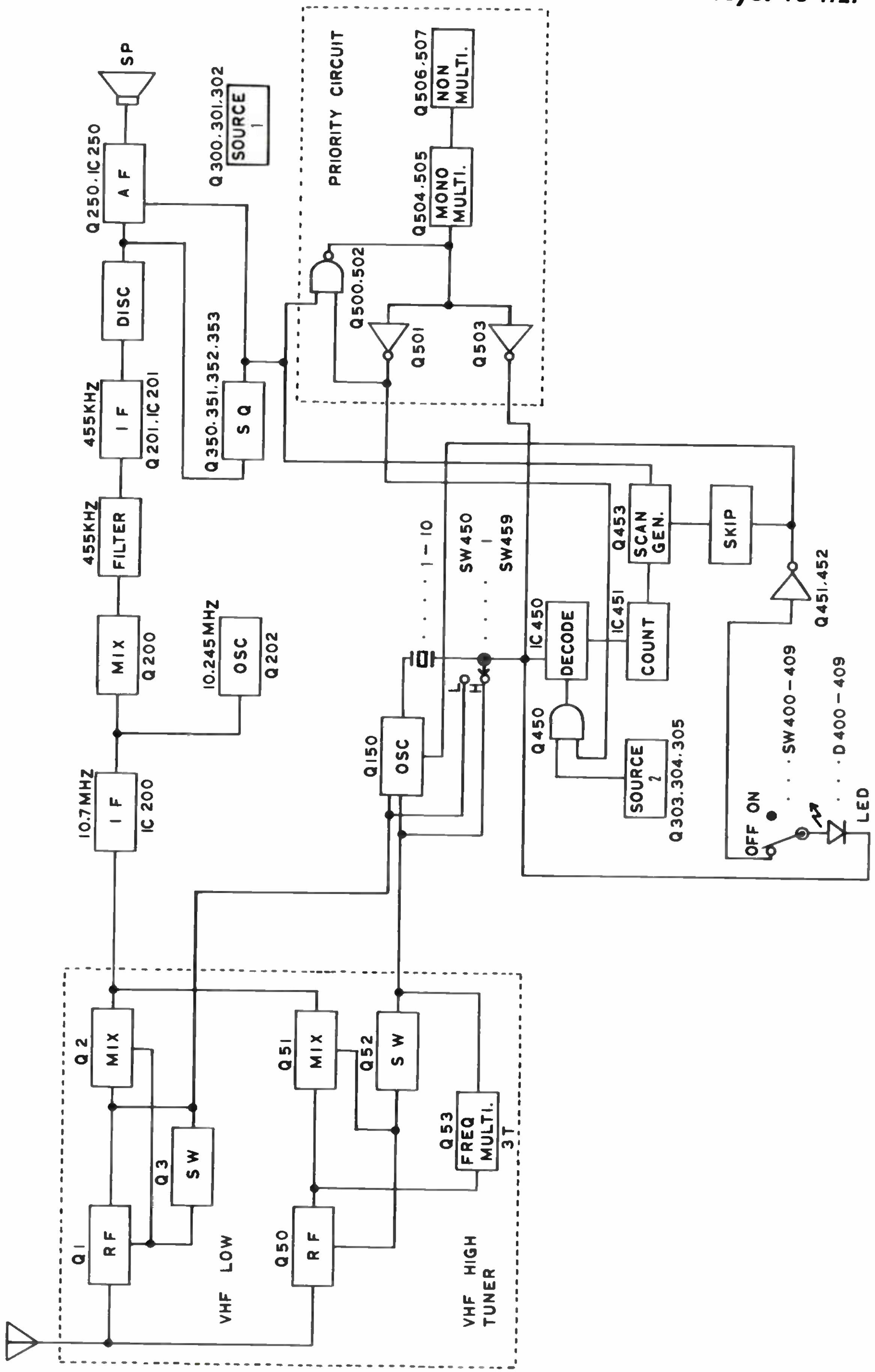
VHF TUNER





Q1 2SC1047
Q2 2SC1047
L1 4Z874
L3 4Z594
L4 4Z575
L5 4Z698
Q3 2SA562
VHF(Low) 30MHz~50MHz
Q50 2SC1047
L50 4Z580
L51 5Z070
L52 5Z070
Q51 2SC1047
Q52 2SA562
Q53 2SC1047
L53 5Z070
VHF(High) 147MHz~174MHz
IC200 TA7060P
L200 4Z698
Q200 2SC828
L201 4Z649
Q201 2SC828
F200 SFM 455D
L202 4Z646
IC201 TA7061AP
L203 4Z1524
L204 4Z1523
Q202 2SC828
Q250 2SC828
IC250 LA4032P
VR250 5KΩ(A)
D300
D301
1S1885
T300 P.T
AC 117V
EXT JACK
S.P
D302 1S1885
EXT. BATT.
Q350 2SC828
Q351 2SC828
Q352 2SC828
Q353 2SA562
Q300 2SD235
Q301 2SC828
Q302 2SC828
Q501 2SC828
Q502 2SC828
Q500 2SA562
Q503 2SC828
Q504
Q505
Q506
Q507
2SC828
10.245MHz
Q150 2SC385A
5Z134 L150
IC450 TD3442AP
Q303 2SD235
Q450 2SC828
Q304 2SC828
Q305 2SC828
Q451 Q452 2SA562
Q453 2SH21
IC451 TD3493AP
SCAN
MANUAL
PRIORITY
SELECT
D400
D401
D402
D403
D404
D405
D406
D407
D408
D409

BLOCK DIAGRAM



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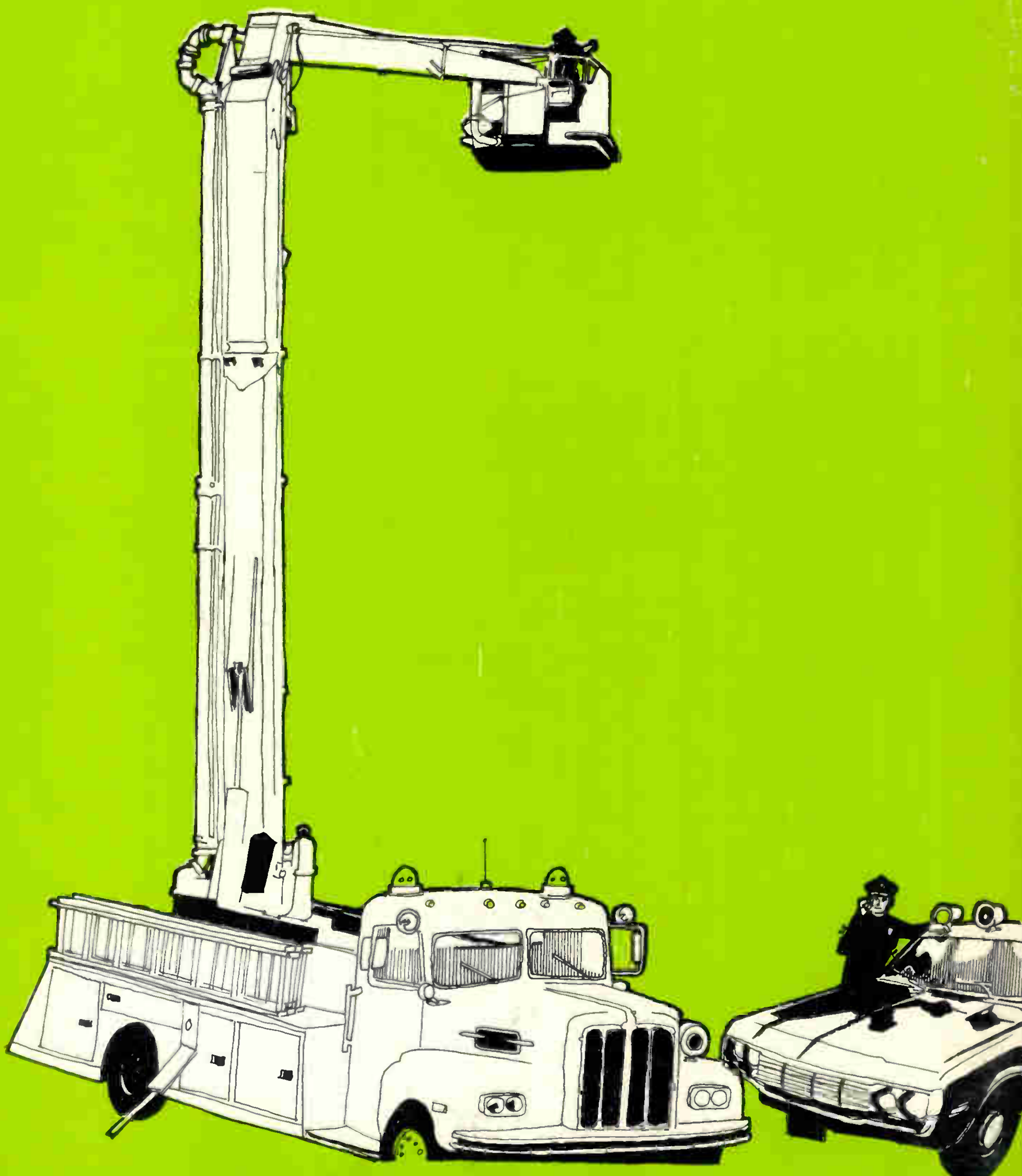
Listing all models/chassis covered in SAMS SD (Scanner Data) Series volumes



$4.95
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SD-10
006827

HOWARD W. SAMS & CO., INC.
4300 WEST 62nd ST. · INDIANAPOLIS, INDIANA 46268

Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

Alaron *B-8002*
Channel Master *CS6790*
General Electric *7-2985A*
Hy-Gain *618H, 618L*
Hy-Gain *618L/H/U*
Realistic *Patrolman PRO-1 (20-175), PRO-2 (20-160)*
Realistic *Patrolman PRO-5 (20-169)*
Realistic *Patrolman PRO-11 (20-155)*
Realistic *Patrolman PRO-13 (20-157)*
Regency *ACT-M8H, ACT-M8L, ACT-M8H/L*
Regency *ACT-P4H*
Truetone *MCC4777A-77*
Truetone *MCC4778A-77*

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Scanner-Monitor Servicing Data

SD-9

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HOWARD W. SAMS & CO., INC.
INDIANAPOLIS, INDIANA

First Edition
First Printing-November, 1976

Sams

Scanner-Monitor Servicing Data

SD-9

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

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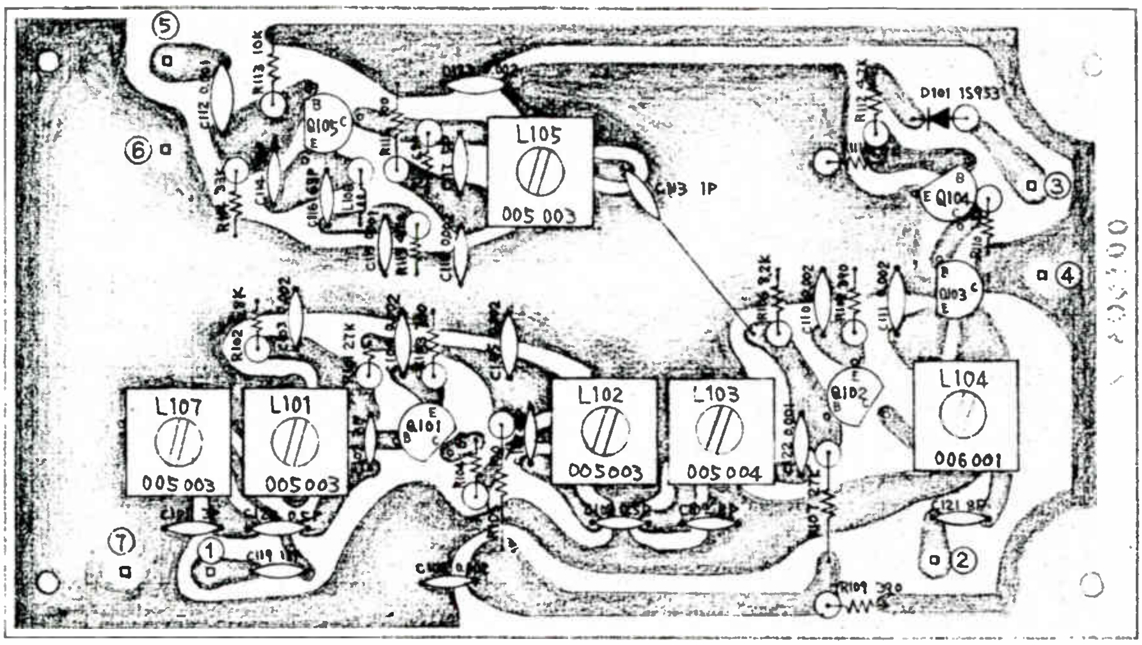
VHF PCB (UFE-001) TOP VIEW



SEMICONDUCTORS

ITEM	TYPE NO.
D101	MA150
D201	1S953
D202	MA150
D203	MA150
D204	MA150
D205	MA150
D206	MA150
D207	MA150
D208	MA150
D209	MA150
D210	MA150
D211	MA150
D212	MA150
D213	MA150
D214	MA150
D215	MA150
D216	MA150
D217	MA150
D218	MA150
D219	MA150
D220	MA150
D221	MA150
D222	MA150
D223	MA150
D224	MA150
D225	MA150
D226	MA150
D227	MA150
D228	MA150
D301	1S188
D302	1S188
D303	1N4002
D304	1N4002
D305	1N4002
0401	1SS16
D402	1S953
IC201	M53273P
IC301	LA1201
IC302	UPC575
Q101	2SC763
Q102	2SC763
Q103	2SC711
Q104	2SC711
Q105	2SC763
Q201	2SC711
Q202	2SC711
Q203	2SC711
Q204	2SC711
Q205	2SC711
Q206	2SC711
Q207	2SC711
Q208	2SC711
Q209	2SC711
Q210	2SC711
Q211	2SC711
Q212	2SC711
Q213	2SC711
Q214	2SC711
Q301	2SC710
Q302	2SC710
Q303	2SC710
Q304	2SC711
Q305	2SC711
Q306	2SC711
Q307	2SC711
Q308	2SC711
Q309	2SC711
Q310	2SC1096
Q311	2SC711
Q312	2SC711
Q313	2SC711
Q401	2SC1070
Q402	2SC288A
Q403	2SC1674
Q404	2SC1674
Q405	2SC1674
Q406	2SC1675
Q407	2SC1675
Q408	2SC1675

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR301	Volume Control, 10K	004001
VR302	Squelch Control, 10K	004002

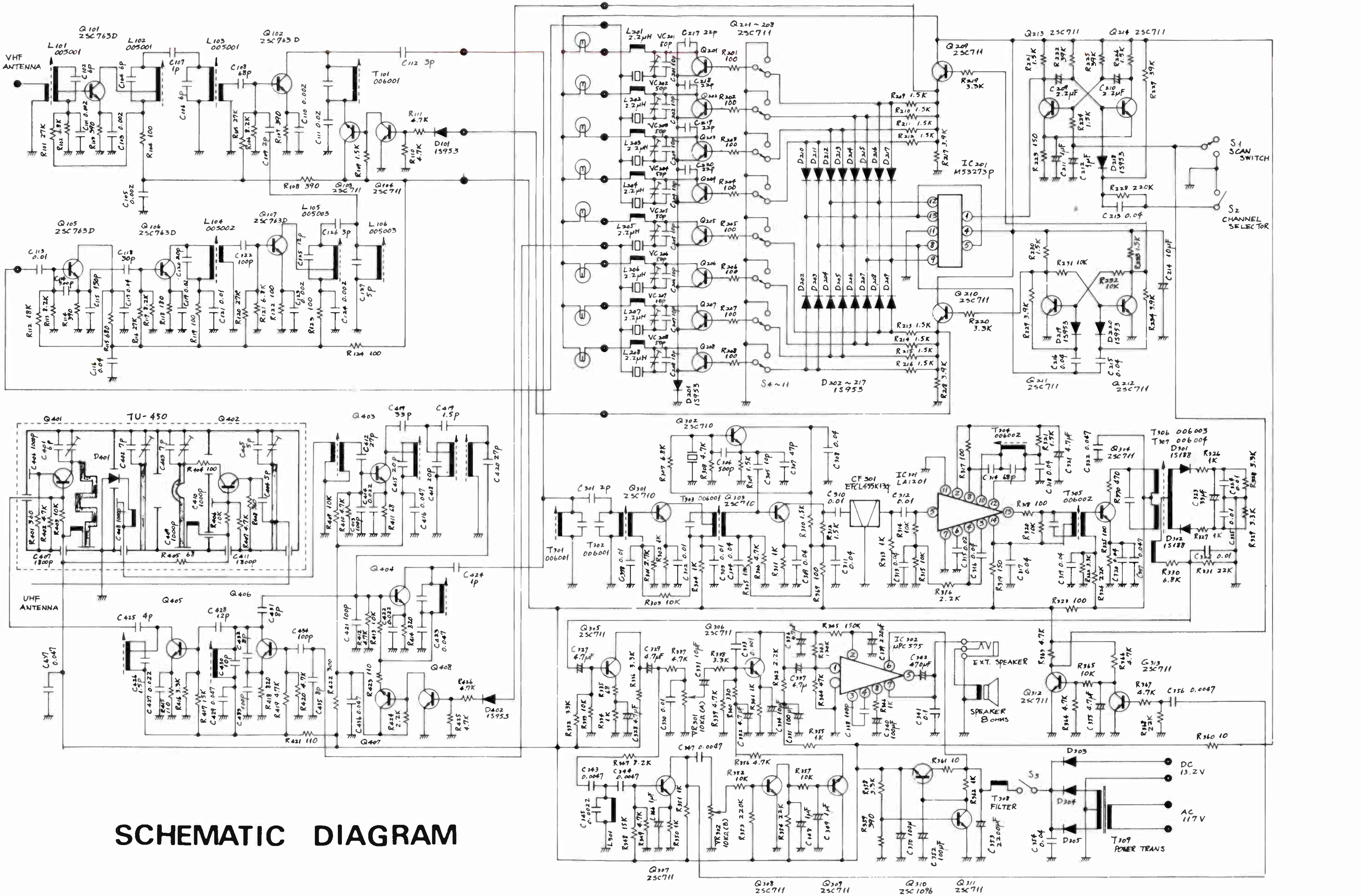
COILS/TRANSFORMERS

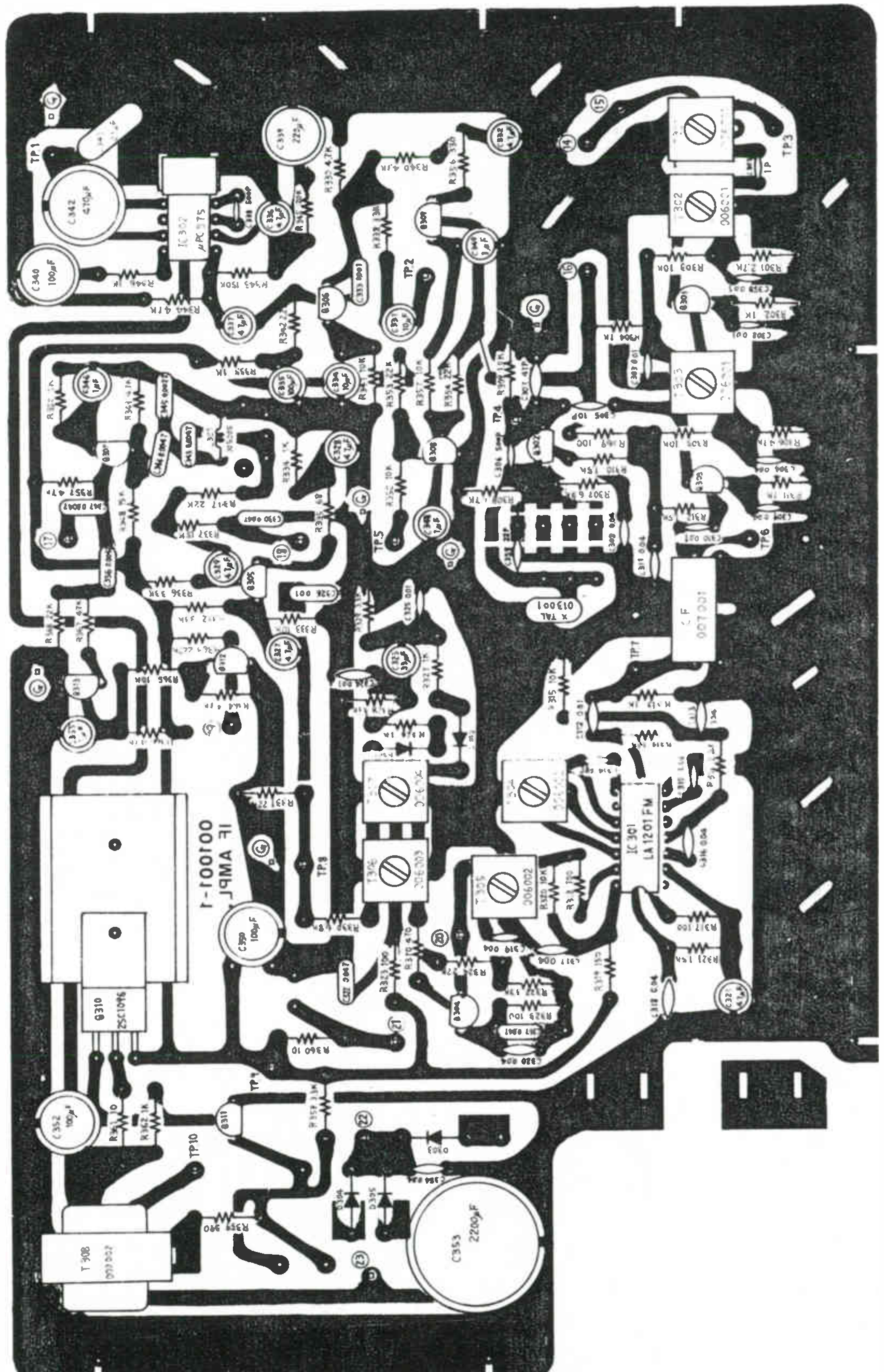
ITEM	PART NO.
L101	005003
L102	005003
L103	005004
L104	006001
L105	005003
L106	005007
L201	005005
L202	005005
L203	005008
L204	005008
L205	005008
L206	005008
L207	005008
L208	005008
L209	005008
L210	005008
L301	005005
T301	006001
T302	006001
T303	006001
T304	006002
T305	006002
T306	006003
T307	006004
T308	002002
T309	002001

MISCELLANEOUS

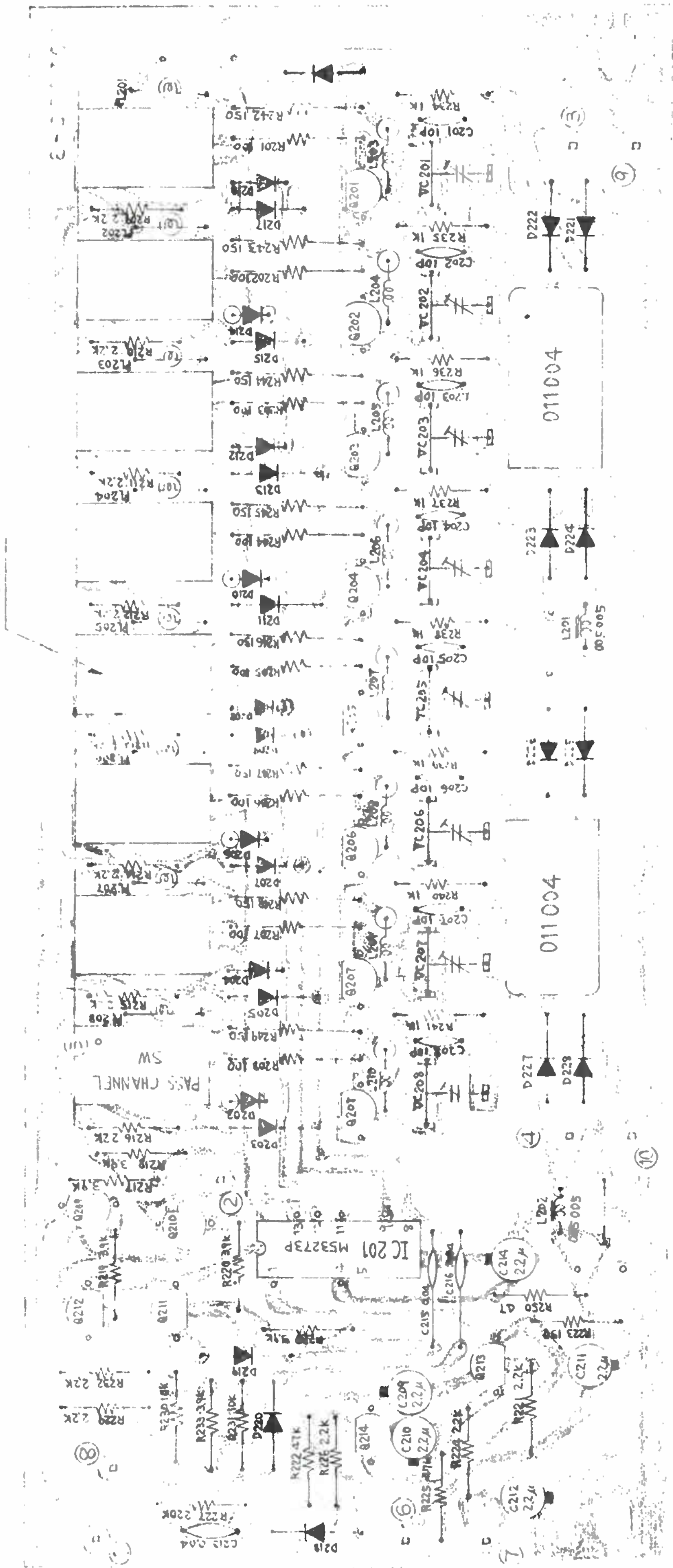
ITEM	NAME	PART NO.
CF301	Ceramic Filter	EFCL455K13Q
SW201	Switch, Scan	003002
SW202	Switch, Channel Selector	003003

SCHEMATIC DIAGRAM





IF PCB(UFF-002) TOP VIEW



PCB(UFS-001) TOP VIEW

Pages 11-18 Courtesy of CHANNEL MASTER CORP.

ALIGNMENT PROCEDURE

(1) TEST EQUIPMENT REQUIRED

(1) FM Signal Generator (183.03 MHz)
(2) Sweep Generator (30-50 MHz)
(3) Sweep Generator (150-170 MHz)
(4) Sweep Oscilloscope
(5) Oscilloscope
(6) V.T.V.M.
(7) Power Supply (6VDC/200mA)
(8) Test Crystal (156 MHz)
(9) 8 ohm Dummy Load.

Notes:

* Use a non-metallic tool.
* The test equipment should be warmed up at least 1 hour before proceeding with alignment.
* Input signal from the generator should be kept as low as possible and still obtain usable output.
* For proceeding the alignment, see ALIGNMENT POINTS.

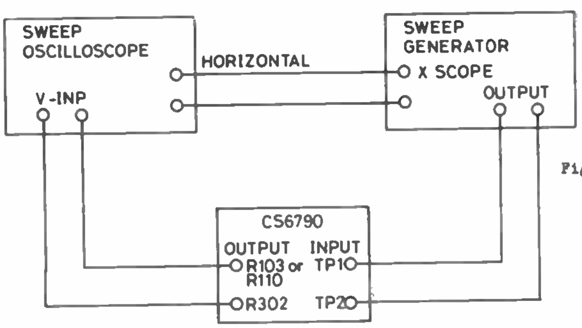


Figure 1

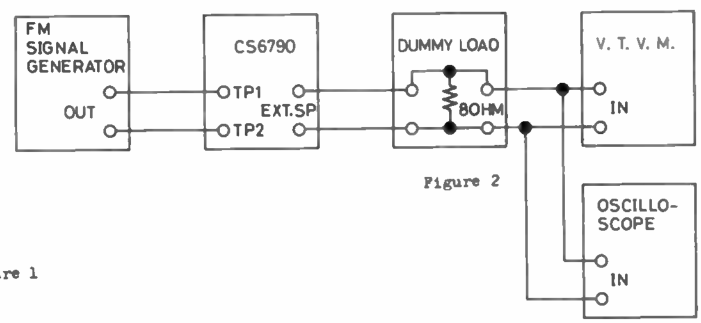


Figure 2

(2) RF ALIGNMENT

1. Connect the DC Power Supply to the Test Set.
2. Turn the VOLUME and SQUELCH controls fully counterclockwise.
3. Activate CH 4 in manual scanning operation.(Light CH 4 indicator light.)
4. Plug only one pin of a HC-25U type crystal (Any frequency can be used.) into CH 4 crystal socket on the High Band side. It activates the RF and Mixer circuits. See Figure 3.

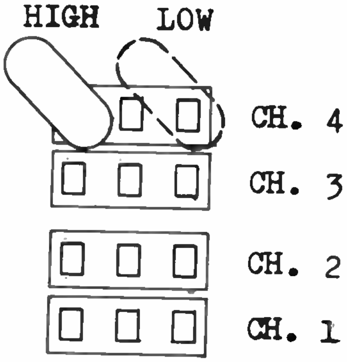


Figure 3

5. Connect the Sweep Generator to TP 1 and TP 2 (ground) of the Test Set as shown in Figure 1.
6. Connect the Sweep Oscilloscope to R103 and R302(ground) as shown in Figure 1.
7. Set the Sweep Generator to 158 MHz and keep its output level medium.
8. Adjust L101, L102, L103 and L104 for the waveform as shown in Figure 4 on the Sweep Oscilloscope.

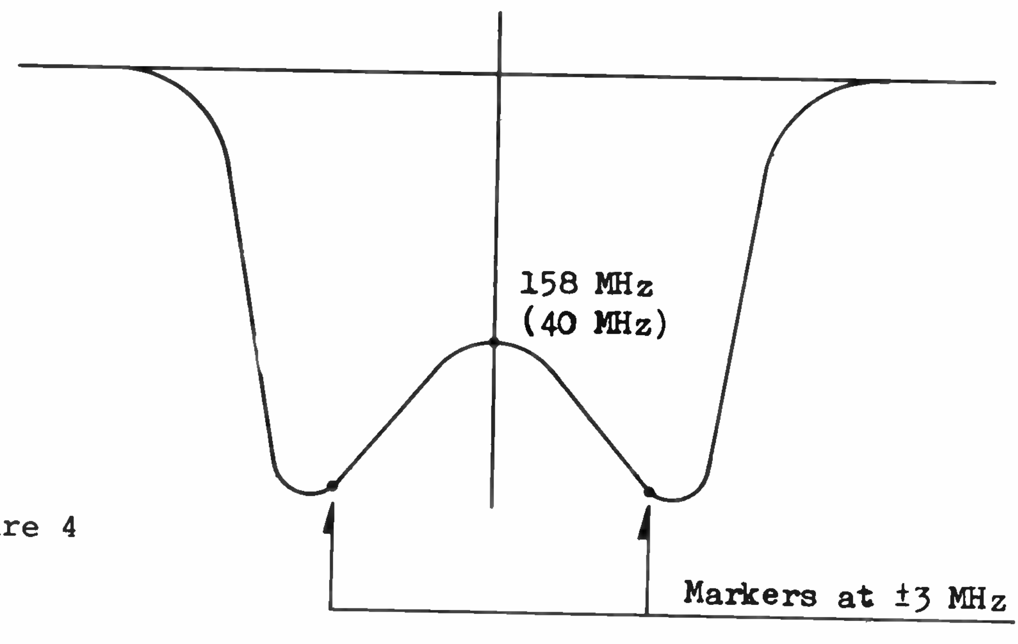
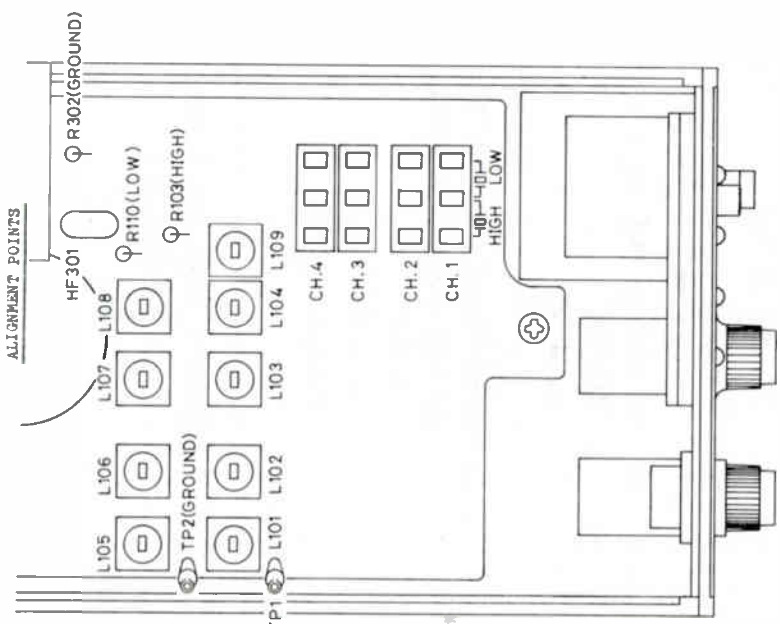


Figure 4

9. Remove the crystal from CH 4 crystal socket on the High Band side.
10. Plug the same crystal into CH 4 crystal socket on the Low Band side in the same way. For crystal installation, see Figure 3.
11. Connect the Sweep Oscilloscope to R110 and R302(ground) as shown in Figure 1.
12. Set the Sweep Generator to 40 MHz and keep its output level medium.
13. Adjust L105, L106, L107 and L108 for the waveform as shown in Figure 4 on the Sweep Oscilloscope.

(3) ALIGNMENT FOR MINIMIZING SPURIOUS

1. Connect the DC Power Supply to the Test Set.
2. Turn the SQUELCH control fully counterclockwise.
3. Activate CH 4 in manual scanning operation.(Light CH 4 indicator light.)
4. Plug the crystal(156 MHz) into CH 4 crystal socket on the High Band side.
5. Connect the FM Signal Generator to TP 1 and TP 2 (ground) as shown in Figure 2.
6. Set the FM Signal Generator to 183.03 MHz.
7. Keep output level from the FM Signal Generator approx. 1 mV and adjust L109 for minimum spurious output level.

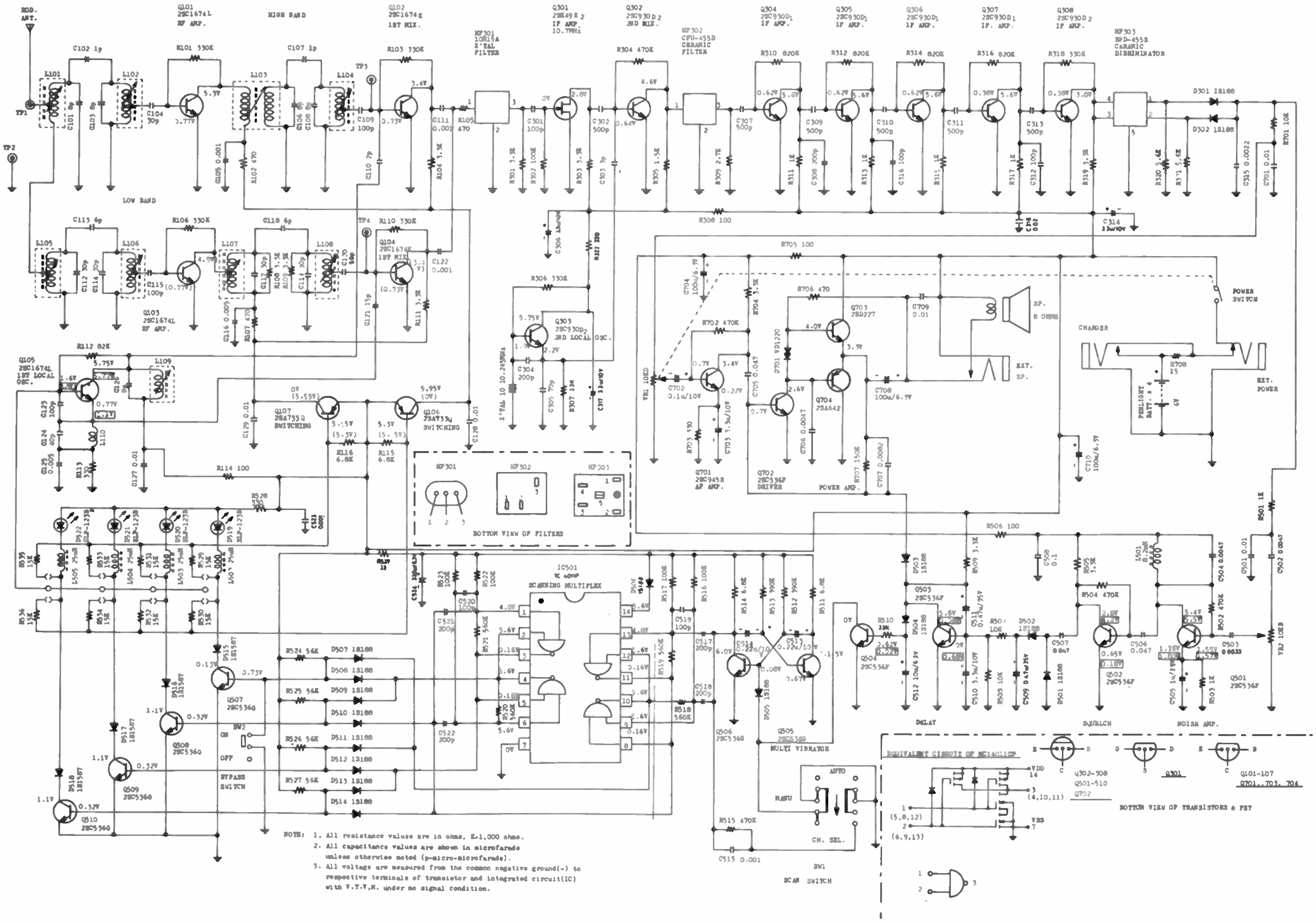


TROUBLE SHOOTING

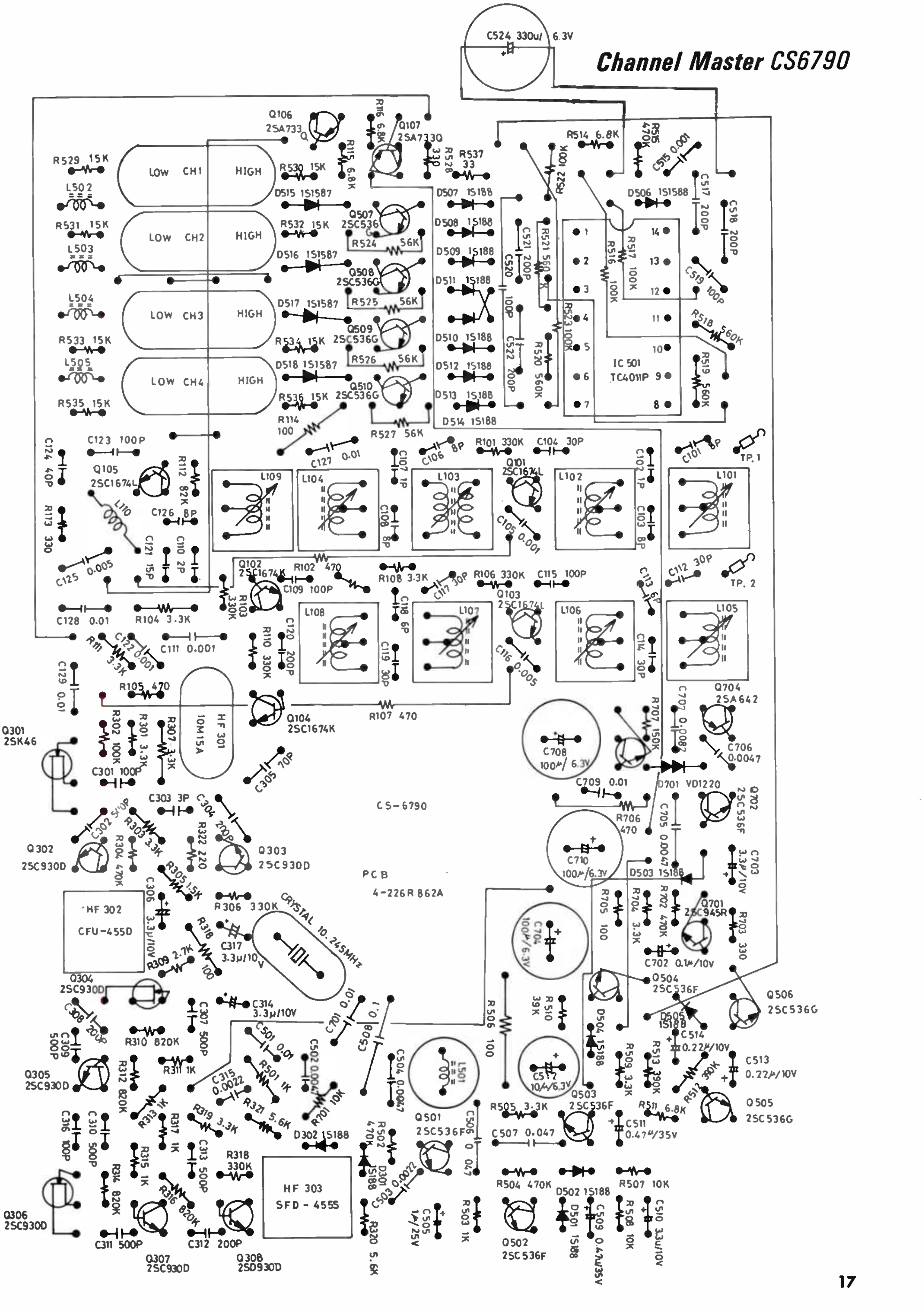
Symptom	Possible Cause
1) LED (Light Emitting Diode, D519 to D522) doesn't light and no sound. VOLUME : MAX. BYPASS SWITCH : OFF SQUELCH : OFF (non squelch)	A) Defective ON-OFF switch in VOLUME control B) Audio amp. circuit is broken or shorted.
2) LED lights but no sound. VOLUME : MAX. SQUELCH : OFF (non squelch)	A) Defective EXT. speaker socket or speaker B) Faulty component part in Audio amp. or IF amp. circuit
3) Noise sound but can't receive desired signal and LED doesn't light. VOLUME : MAX. SQUELCH : OFF (non squelch) BYPASS SWITCH : OFF	A) Faulty LED and/or defect in LED PC Board B) Faulty IC501 C) Short or open in L502-L505 D) Defective D507-D514 E) Defective LEDs D519-D522 F) Defective X'tal socket
4) Doesn't scan and SQUELCH doesn't operate. AUTO/MANU/CH-SEL : AUTO SQUELCH : ON (tight)	A) Defective VR2 (SQ) B) Faulty component part in Noise amp. or Noise Detector circuit C) Faulty component part in IF amp. circuit
5) Doesn't scan but SQUELCH operates normally. AUTO/MANU/CH-SEL : AUTO BYPASS SWITCH : OFF	A) Faulty Transistor Q503, Q504 B) Either Transistor Q505 or Q506 defective C) Defective AUTO/MANU/CH-SEL switch D) Faulty IC501

6) Manual selector doesn't operate. AUTO/MANU/CH-SEL : MANU	A) Defective AUTO/MANU/CH-SEL switch B) Faulty IC501
7) Delay doesn't operate. AUTO/MANU/CH-SEL : AUTO SQUELCH : Clockwise rotation	A) Faulty C512, R510 and D504
8) Only scans channel 1, 2 or channel 3, 4. AUTO/MANU/CH-SEL : AUTO BYPASS SWITCH : OFF SQUELCH : ON (tight)	A) Faulty IC501
9) Noise sound can be heard and LED lights but can't receive desired signal.	A) Defective X'tal socket B) Faulty component part in RF amp. or 1st MIXER circuit C) Faulty component part in 1st, 2nd local OSC. or 2nd MIXER circuit
10) Low sensitivity	A) Faulty component part in RF amp. or IF amp. circuit B) X'tal Frequency not covering the correct channel

NOTE: For optimum sensitivity, use crystal frequencies within the specified band coverage.
For reception outside of the optimum frequency range, you can realign for best reception either above or below the specified optimum range. For best sensitivity at any one frequency, align for that one frequengy.


HIGH BAND
LOW BAND
BOTTOM VIEW OF FILTERS
SCANNING MULTIPLEX
BYPASS SWITCH
CH. SEL.
SCAN SWITCH
MULTI VIBRATOR
DELAY
SQUELCH
NOISE AMP.
POWER AMP.
CHARGER
POWER SWITCH
EQUIVALENT CIRCUIT OF MC14011CP
BOTTOM VIEW OF TRANSISTORS & FET
NOTE: 1. All resistance values are in ohms, K=1,000 ohms.
2. All capacitance values are shown in microfarads unless otherwise noted (p=micro-microfarads).
3. All voltage are measured from the common negative ground(-) to respective terminals of transistor and integrated circuit(IC) with V.T.V.M. under no signal condition.

Channel Master CS6790



SEMICONDUCTORS

ITEM	TYPE NO.
D301	1S188
D302	1S188
D501	1S188
D502	1S188
D503	1S188
D504	1S188
D505	1S188
D506	1S188
D507	1S188
D508	1S188
D509	1S188
D510	1S188
D511	1S188
D512	1S188
D513	1S188
D514	1S188
D515	1S1587
D516	1S1587
D517	1S1587
D518	1S1587
D519	SLP-123B
D520	SLP-123B
D521	SLP-123B
D522	SLP-123B
D701	VD1220
IC501	CMSTC4011P
Q101	2SC1674L
Q102	2SC1674K
Q103	2SC1674L
Q104	2SC1674K
Q105	2SC1674L
Q302	2SC930D
Q303	2SC930D
Q304	2SC930D
Q305	2SC930D
Q306	2SC930D
Q307	2SC930D
Q308	2SC930D
Q501	2SC536F
Q502	2SC536F
Q503	2SC536F
Q504	2SC536F
Q505	2SC536G
Q506	2SC536G
Q507	2SC536G
Q508	2SC536G
Q509	2SC945P
Q510	2SC945P
Q701	2SC945R
Q702	2SC945Q
Q703	2SD227W
Q704	2SA642R

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C304	10uF 10V
C306	10uF 10V
C317	10uF 10V
C505	1uF 25V
C509	0.47uF 35V
C510	10uF 10V
C511	0.47uF 35V
C512	10uF 6.3V
C513	0.22uF 10V
C514	0.22uF 10V
C702	0.1uF 10V
C703	10uF 10V
C704	100uF 6.3V
C708	100uF 6.3V
C710	100uF 6.3V

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	Ceramic Filter	10M15A
HF302	Ceramic Filter	CFU-455D
HF303	Ceramic Filter	SFD-455S
	PC Board, Main	4-226R862A

Pages 19-25 Courtesy of GENERAL ELECTRIC COMPANY

IF ALIGNMENT

- Squelch Control Minimum
- Manual/Scan Switch to Manual Position
- Advance Channels until Channel 1 LED is Lit

1. Connect high side of FM Sweep Generator thru 1K resistor in series with a 5pf capacitor to TP1. Use only enough marker signal for indication. Generator frequency set at 10.7MHz.

2. Connect scope to TP2.

3. Adjust T1, T2 and T3 for maximum gain and symmetry. Repeat as necessary. (Figure 1)

4. Connect scope to TP3.

5. Adjust T4 and T5 for maximum gain and symmetrical S-Curve. Repeat as necessary. (Figure 2)

RF ALIGNMENT

- Squelch Control Minimum
- Manual/Scan Switch to Manual Position
- Channel 4 OFF Switch to ON Position
- Channel 1 Tuning Control to 150MHz Mark
- Channel 4 Tuning Control to 174MHz Mark

FIGURE 1

6. Pre-adjust trimmer capacitors C3 and C8 to approximately half range.

7. Advance channels with manual advance switch until channel 1 LED is lit.

8. Connect high impedance multimeter to Pin 1 of tuning control R39 and ground.

9. Adjust R75 trim pot to .8 volts DC on multimeter.

10. Advance channel until channel 4 LED is lit.

11. With RF signal generator set at 174.0MHz, radiate signal to whip antenna.

12. Adjust C3 and C8 for maximum amplitude.

13. Advance channel until channel 1 LED is lit.

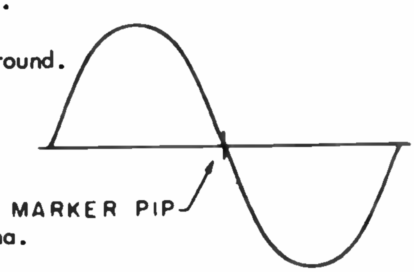
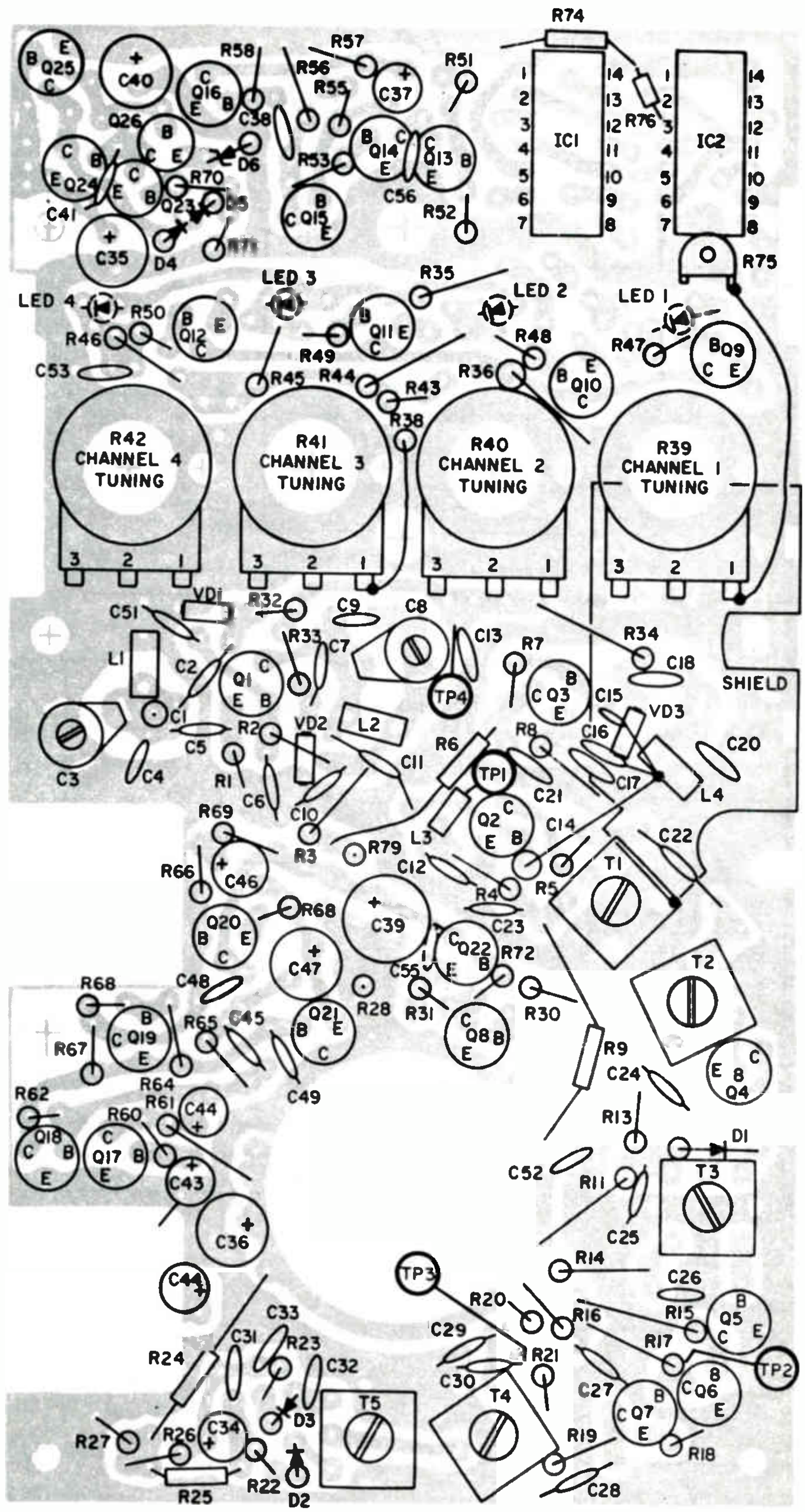


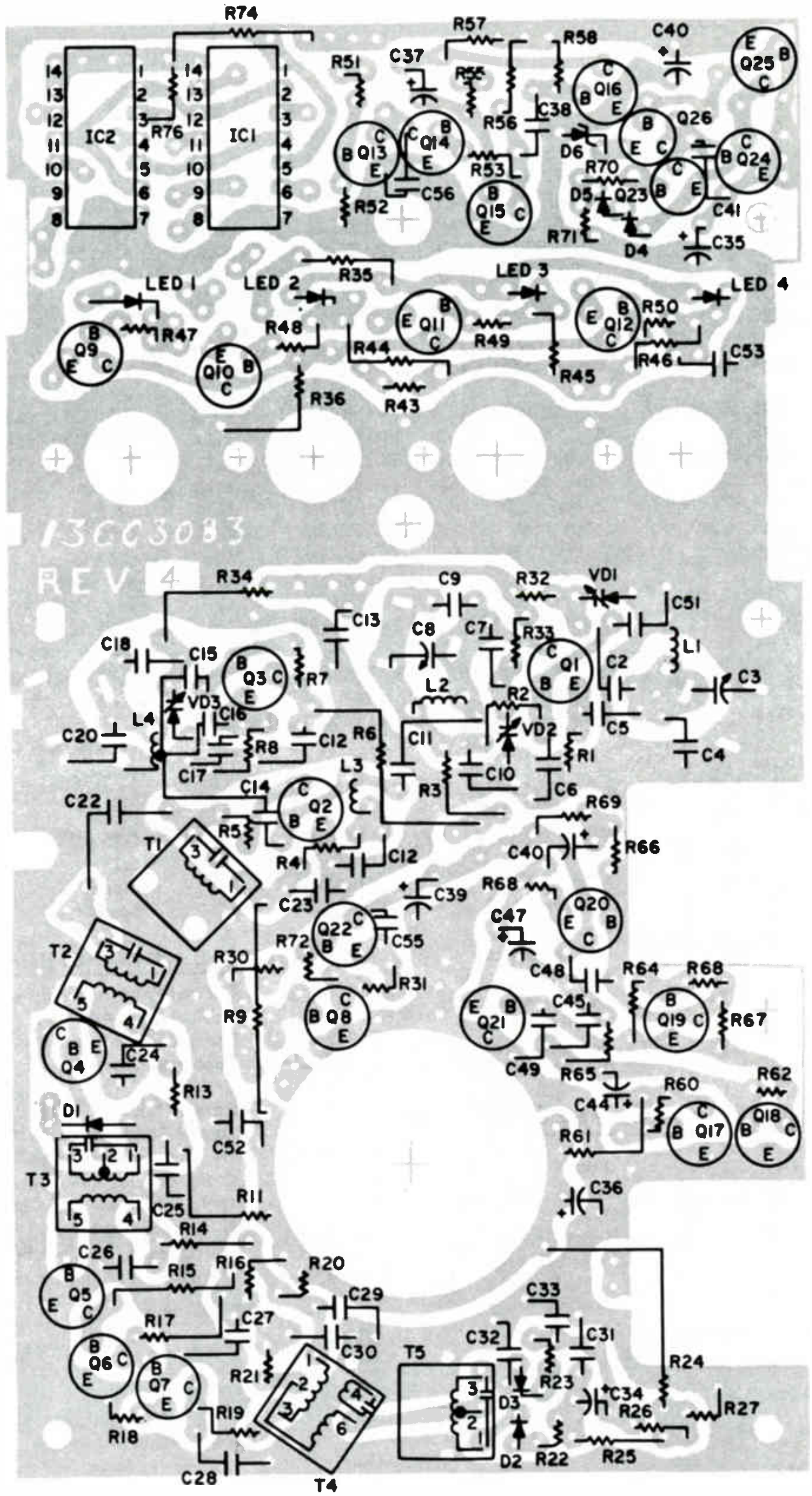
FIGURE 2

14. With RF signal generator set at 150.0MHz, readjust R75 to 150MHz signal and then adjust L1 and L2 for maximum amplitude. To adjust coils spread or compress coil winding slightly.

15. Repeat steps 11 thru 14 as necessary to obtain optimum alignment.



COMPONENT LAYOUT (TOP VIEW) 7-2985A



WIRING DIAGRAM (BOTTOM VIEW) 7-2985A

SEMICONDUCTORS

ITEM	TYPE NO.
D1	EA16X94
D2	RT5379
D3	RT5379
D4	RT1689
D5	RT1689
D6	EA16X114
IC-1	EA33X8343
IC-2	EA33X8344
LED1	EA16X206
LED2	EA16X206
LED3	EA16X206
LED4	EA16X206
Q1	EA15X7243
Q2	EA15X7243
Q3	EA15X7243
Q4	EA15X7243
Q5	EA15X7115
Q6	EA15X7243
Q7	EA15X7243
Q8	EA15X7520
Q9	EA15X8524
Q10	EA15X8524
Q11	EA15X8524
Q12	EA15X8524
Q13	EA15X7516
Q14	EA15X7516
Q15	EA15X7516
Q16	EA15X7516
Q17	EA15X7517
Q18	EA15X7639
Q19	EA15X7638
Q20	EA15X4533
Q21	EA15X4633
Q22	EA15X4633
Q23	EA15X8524
Q24	EA15X8441
Q25	EA15X7637
Q26	EA15X7637

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C34	2.2uF 25V	EA31X234
C35	47uF 16V	EA31X214
C36	47uF 16V	EA31X214
C37	2.2uF 25V	EA31X234
C39	100uF 16V	EA2215
C40	47uF 16V	EA31X214
C42	.47uF 25V	RT4933
C43	.47uF 25V	RT4933
C44	.47uF 25V	RT4933
C46	10uF 16V	EA31X221
C47	47uF 16V	EA31X214
C50	220uF 16V	RT4634

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
LED1	Varactor	EA16X113
LED2	Varactor	EA16X113
LED3	Varactor	EA16X113
R29	Squelch Control, 200K	EA49X303
R39	CH1 Tuning Control, 300K	EA49X305
R40	CH2 Tuning Control, 300K	EA49X305
R41	CH3 Tuning Control, 300K	EA49X305
R42	CH4 Tuning Control, 300K	EA49X305
R59	Volume Control, 25K	EA49X304
R75	Semi-Fixed, 50K	RT3357

COILS/TRANSFORMERS

ITEM	PART NO.
L1	EA35X78
L2	EA36X181
L3	EA36X182
L4	EA35X79
T1	EA61X108
T2	EA61X108
T3	EA61X135
T4	EA56X8
T5	RT5792

MISCELLANEOUS

ITEM	NAME	PART NO.
S1	Switch, CH4 ON/OFF	EA39X180
S2	Switch, Manual/Scan	EA39X180
S3	Switch, Manual Advance	EA39X181

CABINET PARTS

NAME	PART NO.
Cabinet Front	EA98X395
Cabinet Back	EA98X396
Door, Control Compartment	EA9X209
Knob, Volume/Squelch	EA43X555
Knob, Manual Advance	EA43X556
Knob, Man/Scan & CH4	EA43X557
Knob, Channel Tuning	EA43X558

Pages 26-37 Courtesy of HY-GAIN ELECTRONICS CORP.

Use the following procedures to align the Hy-Scan 618L and 618H. Alignment should be performed by a qualified service technician only.

Always align the scanner using the procedures in the order given. It is assumed that a signal is present at all points and the scanner is functioning throughout. If not, refer to Testing and Troubleshooting, to correct the difficulty before proceeding with the alignment.

The following test equipment is needed to align a 618L or 618H scanner:

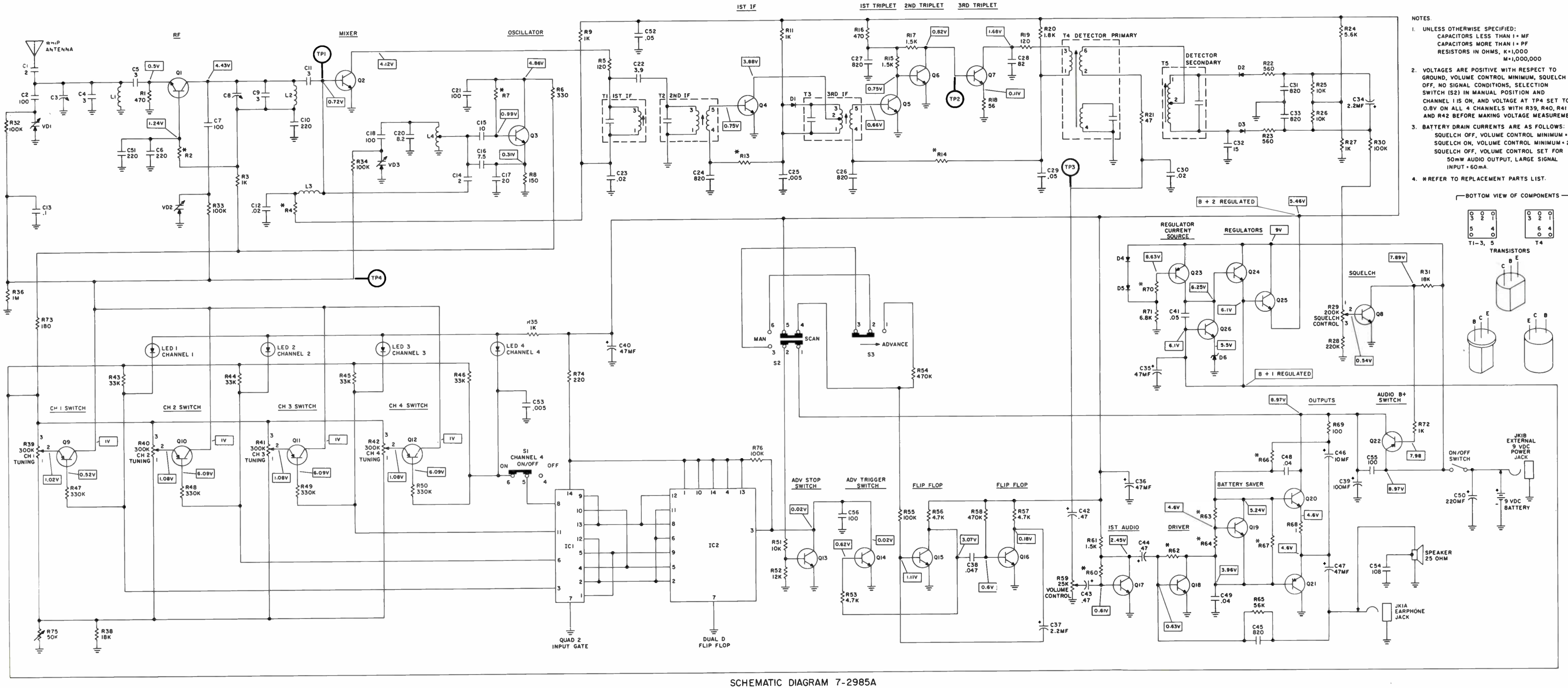
> power supply -- regulated 12.5 VDC, 1 amp
>
> AC VTVM (rms reading)
>
> RF FM signal generator -- 50-ohm calibrated output, capable of tuning 30 - 50 MHz and 150 - 170 MHz.

I Equipment Set-up

1. Turn the scanner off.
2. Remove any channel crystals that may be in the scanner.
3. Adjust the power supply for 12.5 VDC. Then plug the lead from the power supply into the scanner's external power jack.
4. If you have an early production unit with the external antenna switch, switch to external antenna (out).
5. Connect the AC voltmeter across the scanner's internal speaker.

II Discriminator Calibration Adjustment

1. Set up per "Equipment Set-up" first.
2. Turn the SQUELCH control fully counterclockwise. Turn the scanner on.
3. Set the signal generator frequency at 10.7 MHz. Adjust the attenuator control for an RF level of at least 10 mV.



NOTES.

1. UNLESS OTHERWISE SPECIFIED:
   CAPACITORS LESS THAN 1 = MF
   CAPACITORS MORE THAN 1 = PF
   RESISTORS IN OHMS, K=1,000
   M=1,000,000
2. VOLTAGES ARE POSITIVE WITH RESPECT TO GROUND, VOLUME CONTROL MINIMUM, SQUELCH OFF, NO SIGNAL CONDITIONS, SELECTION SWITCH (S2) IN MANUAL POSITION AND CHANNEL 1 IS ON, AND VOLTAGE AT TP4 SET TO 0.8V ON ALL 4 CHANNELS WITH R39, R40, R41 AND R42 BEFORE MAKING VOLTAGE MEASUREMENTS.
3. BATTERY DRAIN CURRENTS ARE AS FOLLOWS:
   SQUELCH OFF, VOLUME CONTROL MINIMUM = 36mA.
   SQUELCH ON, VOLUME CONTROL MINIMUM = 25mA.
   SQUELCH OFF, VOLUME CONTROL SET FOR 50mW AUDIO OUTPUT, LARGE SIGNAL INPUT = 60mA.
4. *REFER TO REPLACEMENT PARTS LIST.

SCHEMATIC DIAGRAM 7-2985A

Set the internal frequency modulation for 1000 Hz and adjust the deviation to ±3 kHz.

4. Connect a jumper lead with aligator clips from the center conductor of the signal generator's RF cable plug to the transistor case of the 1st 10.7 Amp, Q201.

5. Adjust the discriminator inductor, L201, for a maximum reading on the AC voltmeter.

III Receive Sensitivity Adjustment

1. Set up per "Equipment Set-up" and adjust the Discriminator calibration first.

2. Adjust RF attenuator control of the Signal generator to minimum output.

3. Adjust the volume control for a 1.5 volt reading on the AC voltmeter.

4. Match the signal generator frequency with the frequency of the test crystal to be used (the test crystal frequency should be the center of the desired 8 MHz band). Turn the signal generator internal modulation switch off.

5. Plug the test crystal into the channel 1 sockets of the scanner. The channel 1 sockets are the pair nearest the rear of the scanner.

6. Increase the signal generator RF level until the noise is reduced 20 dB (AC VTVM reading of Ø.15V). The RF level reading at this point should be 0.5 uV or less.

7. If the RF level is greater than 0.5 uV, adjust ("tweak") the front end until 20 dB quieting can be obtained with a 0.5 uV RF level or less.

   a. 618L -- Adjust L301 and L302, then repeat until satisfactory level can be obtained.

   b. 618H -- Adjust T401, T402, L401, and L402, then repeat until satisfactory level can be obtained.

8. Turn off the scanner and test equipment. Disconnect the test equipment and test crystal and re-install any crystals removed at the beginning of the alignment procedure.

TESTING AND TROUBLESHOOTING

VISUAL INSPECTION

A. Check the front panel controls to be sure they are set properly for desired operation.
B. Inspect the cables and connectors on the rear of and within the scanner to be sure they are securely in place.
C. Inspect the p.c. boards for shorts, broken wires, and broken or burned parts.

FUNCTION TESTS

Test Equipment needed:

Power Source -- Regulated 12.5 VDC, 1 amp
RF signal generator -- 50-ohm, calibrated output
Haromonic Distortion Meter
Test Crystal -- any channel crystal of known accuracy

Test Equipment Set-up:

1. Connect the power supply to the scanner power jack and the RF signal generator to the external antenna jack. (Antenna Switch, if any, to Ext. Position.)
2. Remove all channel crystals. (Re-install them after completing tests and needed repair.)
3. Turn the scanner on.

<u>Channel Lock-up</u>

1. Set the signal generator for the same frequency as the test crystal, with an output level of zero.
2. Set the scanner controls as follows:
   VOLUME -- for comfortable listening
   SQUELCH -- to where the noise is just quieted
   AUTO-MAN -- AUTO-scan (up)
3. Raise the signal generator RF level to 0.5 uV.
4. Place the test crystal in the channel one sockets. Then jump the crystal through each set of channel sockets.
5. To pass, each channel must lock-up when the crystal is placed in its sockets. The appropriate LED for that channel must also light up.
6. If the radio does not pass this test, troubleshoot the Crystal Switch, LED, and Logic circuitry.

<u>Tight Squelch.</u>

1. Set the signal generator for the same frequency as the test crystal with an output level of zero.
2. Place the test crystal in the channel one sockets.
3. Set the scanner control as follows:
   VOLUME -- for comfortable listening
   SQUELCH -- fully on (CW)
   AUTO-MAN -- AUTO-scan (up)
4. Raise the generator output level until the squelch opens (unit locks on channel and constant noise is heard).
5. To pass, the generator output level must be less than 2.5 uV.
6. If the radio does not pass this test, troubleshoot the Squelch circuitry.

Audio Output.

1. Set the signal generator for the same frequency as the test crystal with the output level at maximum, not to exceed 1000 uV. Turn the internal modulation on and set it for 3.5 kHz deviation. Set the modulation frequency at 1 kHz.
2. Place the test crystal in the channel one sockets.
3. Connect a distortion meter to either the phone jack or the speaker terminals. Set the distortion meter sensitivity level at 3 V.
4. Set the scanner controls as follows:
   SQUELCH -- fully off (CCW)
   VOLUME -- fully on (CW)
   AUTO-MAN -- AUTO--scan (up)
5. To pass, audio output must be 2.2 V rms or more. Distortion must not exceed 15% at 2.2 V rms.
6. If the radio does not pass this test, troubleshoot the Audio circuitry.

CIRCUIT TESTS

Test Equipment Needed:

Power Source -- Regulated 12.5 VDC, 1 amp
VTVM (voltage readings measured to ground, except as noted)
RF signal generator -- 50-ohm, calibrated output
Oscilloscope -- 10 MHz; 7 pF, x10 test probe

Test Equipment Set-up:

1. Connect the power supply to the scanner power jack and the RF signal generator to the external antenna jack. (Antenna Switch, if any, to Ext. Position.)
2. Turn the scanner on; then lock it on any channel that has a crystal installed.
3. Set the scanner power controls as follows:
   VOLUME -- for comfortable listening
   SQUELCH -- to where the noise is just quieted
   AUTO-MAN -- MANual-scan (down)

First RF amplifier.

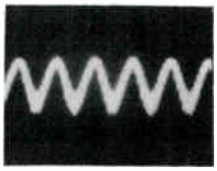
Measure the voltage drop across the 100 ohm B+ resistor. There should be a drop of 0.2 V at its junction with the RF coil versus the other end of resistor.

First Oscillator.

1. Measure the voltage across the 100 ohm emitter resistor. It should read 0.4 V.
2. Remove the channel crystal corresponding to the locked-up channel. There should now be a reading of 0.5 V for a difference of .1 V.
3. Re-install the crystal removed in step 2.

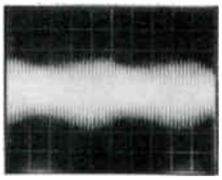
First Mixer.

1. Connect the oscilloscope probe (x10) to the collector.
2. Raise the signal generator RF level to 0.5 mV.
3. Set the oscilloscope controls as follows:
   vertical gain -- .05 V/cm
   time base -- .1uS/cm
4. There should be a .2 V waveform like this:



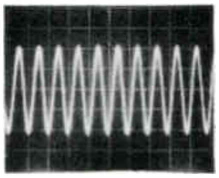
10.7 MHz Monolithic Filter.

1. Connect the oscilloscope probe (x10) to the junction of the filter and the 18 pF capacitor.
2. Raise the signal generator RF level to 0.5 mV.
3. Set the oscilloscope controls as follows:
   vertical gain -- .05 V/cm
   time base -- .5 uS/cm
4. There should be a waveform like this:



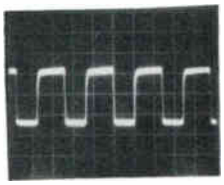
Mixer, 10.245 MHz.

1. Connect the oscilloscope probe (x10) to the base.
2. Raise the signal generator RF level to 0.5 mV.
3. Set the oscilloscope controls as follows:
   vertical gain -- 0.1 V/cm
   time base -- 0.1 uS/cM
4. There should be a 0.5 V waveform like this:



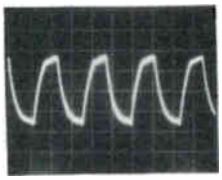
First Limiter

1. Connect the oscilloscope probe (x10) to pin three.
2. Set the oscilloscope controls as follows:
   vertical gain -- 0.5 V/cm
   time base -- 1 uS/cm
3. There should be a 1.5 V waveform like this:



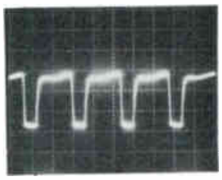
Second Limiter

1. Connect the oscilloscope probe to the collector.
2. Set the oscilloscope controls as follows:
   vertical gain -- 1V/cm
   time base -- 1 uS/cm
3. There should be a 4 V waveform like this:



Third Limiter or Discriminator Driver

1. Connect the oscilloscope probe to the collector.
2. Set the oscilloscope controls as follows:
   vertical gain -- 2 V/cm
   time base -- 1 uS/cm
3. There should be a 5.6 V waveform like this:



Discriminator.

1. Connect the oscilloscope probe to the anode of the IN60 that junctions with the 15K resistor.
2. Set the oscilloscope controls as follows:
   vertical gain -- 0.2 V/cm
   time base -- 1 mS/cm
3. There should be a noise waveform of 0.8 V

Squelch B+ Check

Measure the voltage drop across the B+ Coil off the collector of the 1st Squelch Amp. There should be a drop of 0.1 V (5.4 V - 5.3 V) between the B+ end and the collector end.

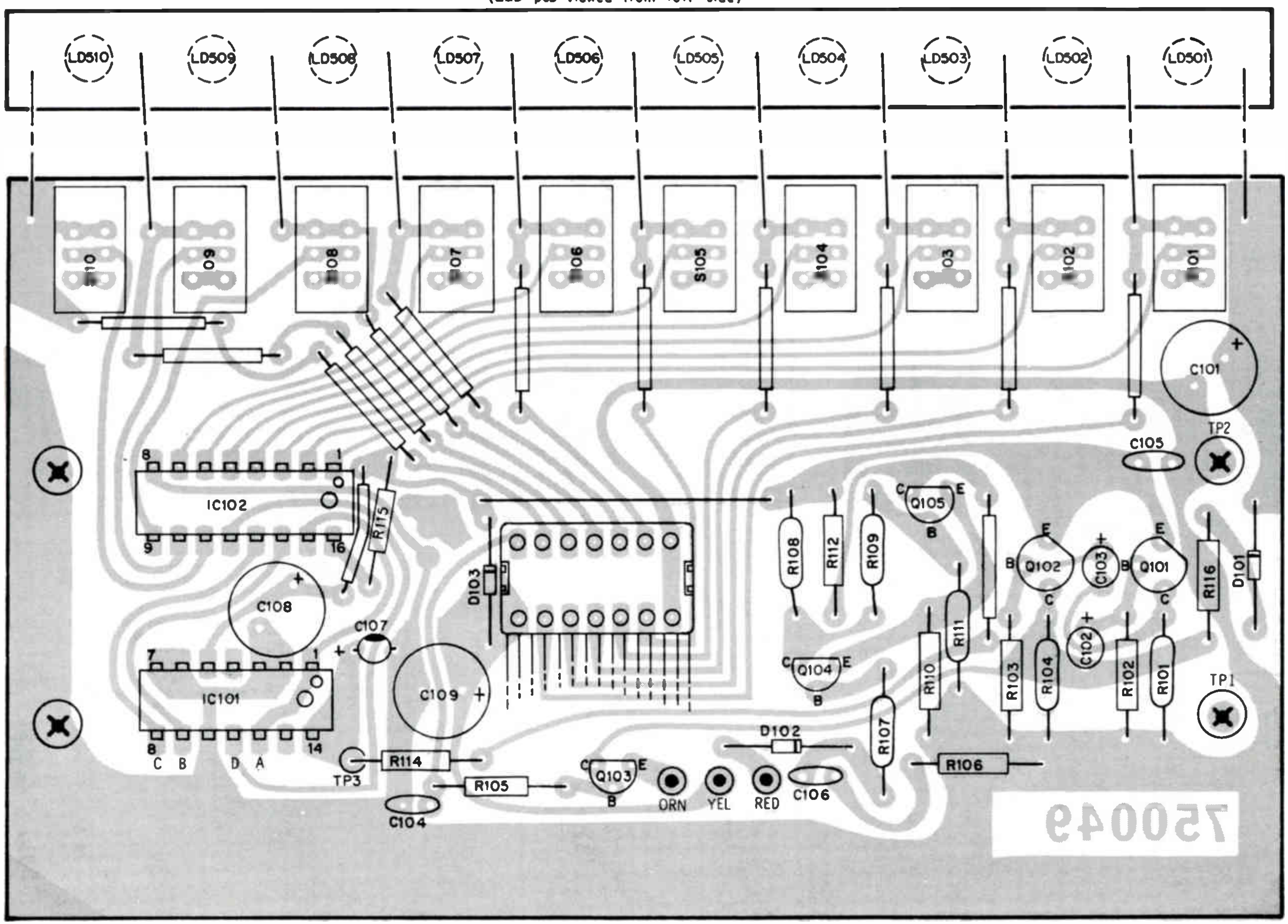
Squelch and Scan Stop.

Measure the lead voltages of all the transistors in the squelched and unsquelched conditions. Refer to the schematic diagram or voltage chart for the correct readings.

Power Supply.

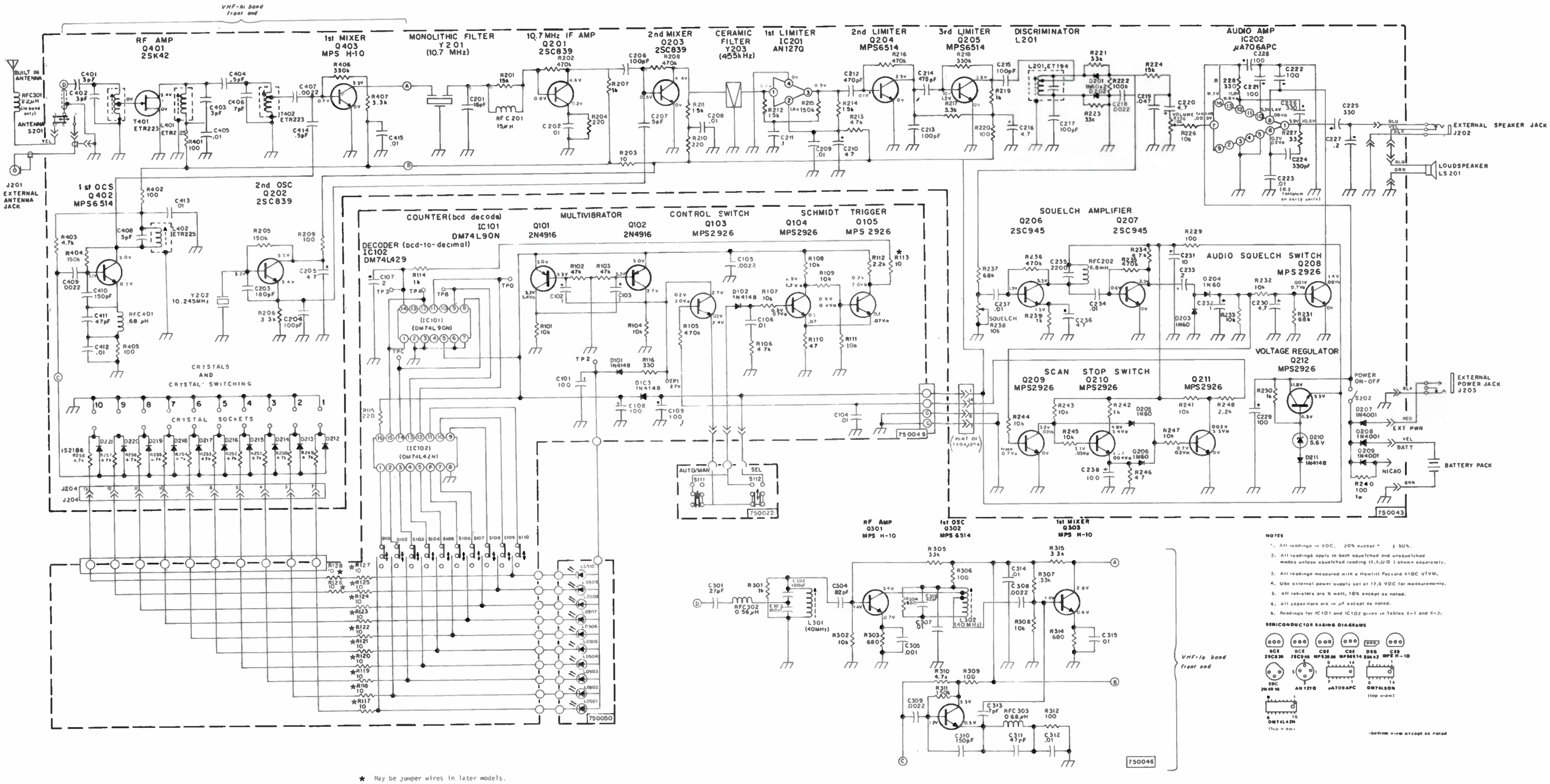
Measure the voltage of the emitter of the voltage regulator. There should be a reading of 5.5 V.

(LED pcb viewed from foil side)

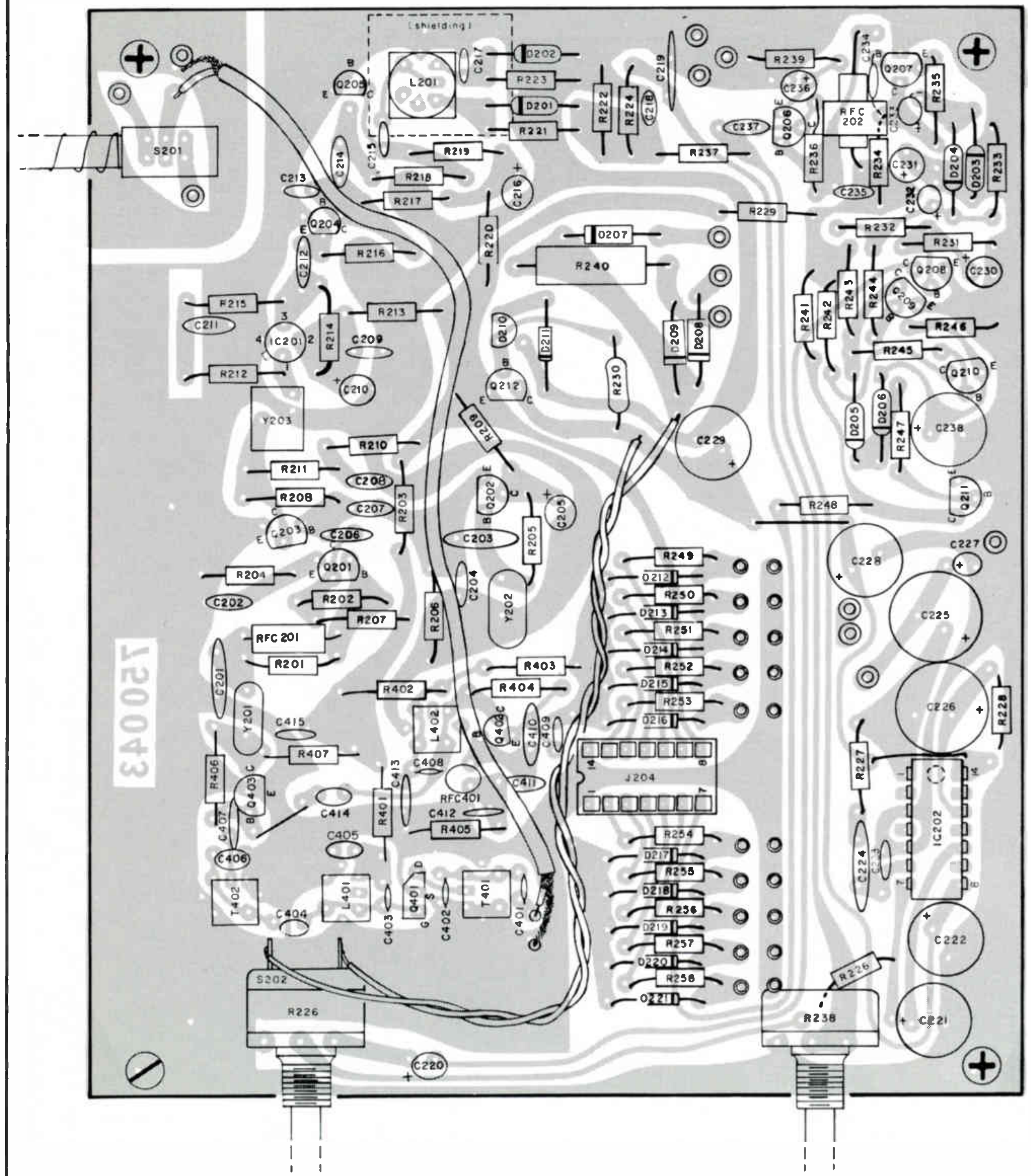


(logic pcb veiwed from component side)

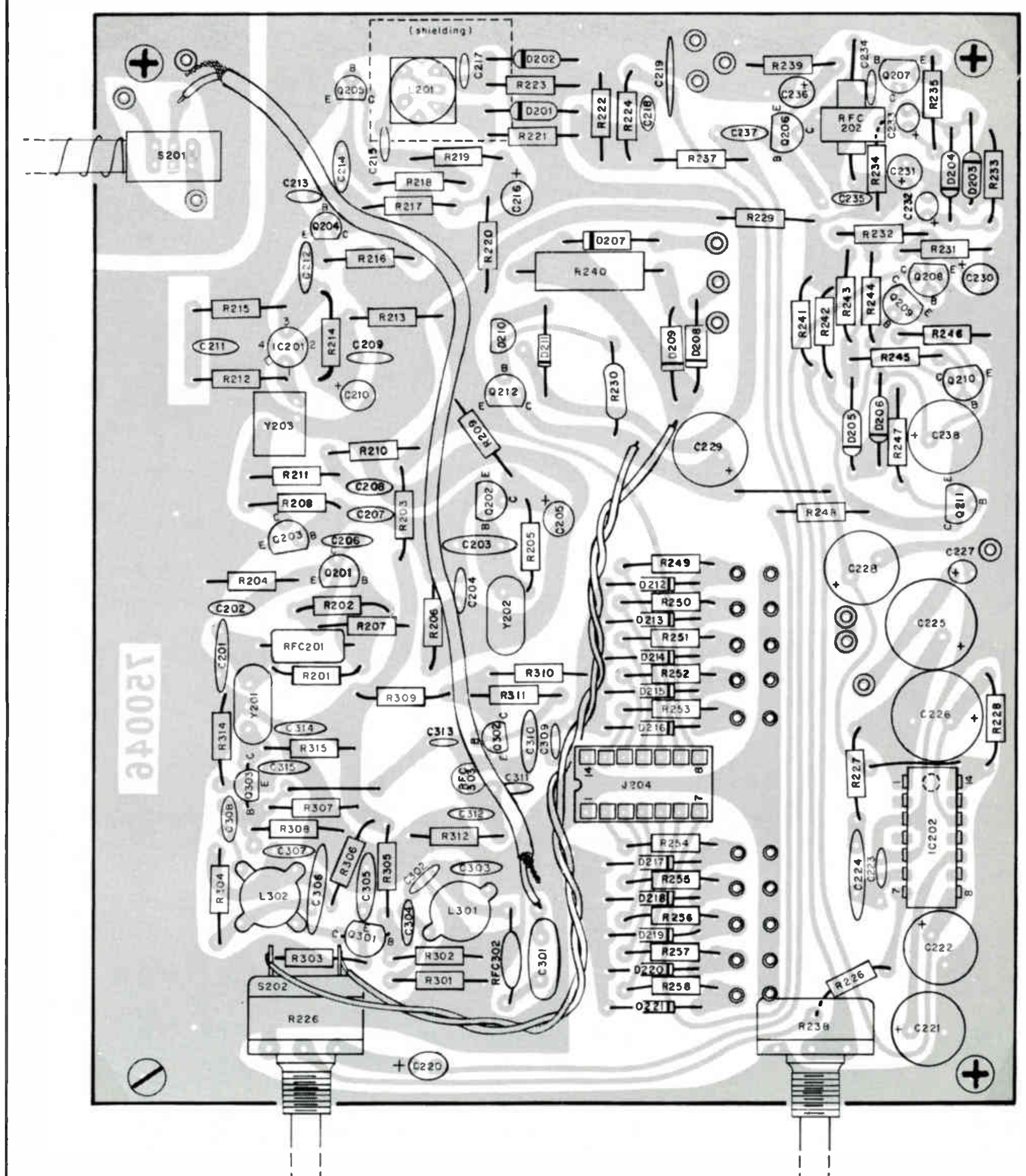
618L and 618H SCHEMATIC



618L MAIN BOARD



618H MAIN BOARD



SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
D101	1N4148	760037
D102	1N4148	760037
D103	1N4148	760037
D201	1N60(P)	760057
D202	1N60(P)	760057
D203	1N60(P)	760057
D204	1N60(P)	760057
D205	1N60(P)	760057
D206	1N60(P)	760057
D207	1N4001	760076
D208	1N4001	760076
D209	1N4001	760076
D210	(5.6V Zener)	760088
D211	1N4148	760037
D212	1S2186	760043
D213	1S2186	760043
D214	1S2186	760043
D215	1S2186	760043
D216	1S2186	760043
D217	1S2186	760043
D218	1S2186	760043
D219	1S2186	760043
D220	1S2186	760043
D221	1S2186	760043
IC101	DM74L90N	760075
IC102	DM74L42N	760074
IC201	AN127Q	760056
IC202	uA706APC	760028
LD501	MLED650	760030
LD502	MLED650	760030
LD503	MLED650	760030
LD504	MLED650	760030
LD505	MLED650	760030
LD506	MLED650	760030
LD507	MLED650	760030
LD508	MLED650	760030
LD509	MLED650	760030
LD510	MLED650	760030
Q101	2N4916	760040
Q102	2N4916	760040
Q103	MPS2926	760038
Q104	MPS2926	760038
Q105	MPS2926	760038
Q201	2SC839(H)	760066
Q202	2SC839(H)	760066
Q203	2SC839(H)	760066
Q204	2N6514	760039
Q205	2N6514	760039
Q206	2SC945	760068
Q207	2SC945	760068
Q208	MPS2926	760038
Q209	MPS2926	760038
Q210	MPS2926	760038
Q211	MPS2926	760038
Q212	MPS2926	760038
Q301	MPSH-10	760053
Q302	MPS6514	760039
Q303	MPSH-10	760053
Q401	2SK42	760051
Q402	MPS6514	760039
Q403	MPSH-10	760053

RESISTORS

ITEM	VALUE	PART NO.
R101	1/4W, 10%, car.	720114
R102	47K, 1/4W, 10%, car.	720135
R103	47K, 1/4W, 10%, car.	720135
R104	10K, 1/4W, 10%, car.	720114
R105	470K, 1/4W, 10%, car.	720119
R106	4.7K, 1/4W, 10%, car.	720155
R107	10K, 1/4W, 10%, car.	720114
R108	10K, 1/4W, 10%, car.	720114
R109	10K, 1/4W, 10%, car.	720114
R110	47 ohm, 1/4W, 10%, car.	720123
R111	10K, 1/4W, 10%, car.	720114
R112	2.2K, 1/4W, 10%, car.	721116
R113	10 ohm, 1/4W, 10%, car.	720136
R114	1K, 1/4W, 10%, car.	720111
R115	220 ohm, 1/4W, 10%, car.	720082
R116	330 ohm, 1/4W, 10%, car.	720086
R117 thru R128	10 ohm, 1/4W, 10%, car.	720136
R201	15K, 1/4W, 10%, car.	720175
R202	470K, 1/4W, 10%, car.	720119
R203	10 ohm, 1/4W, 10%, car.	720136
R204	220 ohm, 1/4W, 10%, car.	720082
R205	150K, 1/4W, 10%, car.	720176
R206	3.3K, 1/4W, 10%, car.	720109
R207	1K, 1/4W, 10%, car.	720111
R208	470K, 1/4W, 10%, car.	720119
R209	100 ohm, 1/4W, 10%, car.	720130
R210	220 ohm, 1/4W, 10%, car.	720082
R211	1.5K, 1/4W, 10%, car.	720132
R212	1.5K, 1/4W, 10%, car.	720132
R213	4.7K, 1/4W, 10%, car.	720155
R214	1.5K, 1/4W, 10%, car.	720132
R215	150K, 1/4W, 10%, car.	720176
R216	470K, 1/4W, 10%, car.	720119
R217	3.3K, 1/4W, 10%, car.	720109
R218	330K, 1/4W, 10%, car.	720131
R219	1K, 1/4W, 10%, car.	720111
R220	100 ohm, 1/4W, 10%, car.	720130
R221	33K, 1/4W, 10%, car.	720167
R222	100K, 1/4W, 10%, car.	720081
R223	33K, 1/4W, 10%, car.	720167
R224	15K, 1/4W, 10%, car.	720175
R226	10K, 1/4W, 10%, car.	720114
R227	33 ohm, 1/4W, 10%, car.	721103
R228	330 ohm, 1/4W, 10%, car.	720086
R229	100 ohm, 1/4W, 10%, car.	720130
R230	1K, 1/4W, 10%, car.	720111
R231	68K, 1/4W, 10%, car.	720127
R232	10K, 1/4W, 10%, car.	720114
R233	10K, 1/4W, 10%, car.	720114
R234	4.7K, 1/4W, 10%, car.	720155
R235	470K, 1/4W, 10%, car.	720119
R236	470K, 1/4W, 10%, car.	720119
R237	68K, 1/4W, 10%, car.	720127
R239	1K, 1/4W, 10%, car.	720111
R240	100 ohm, 1 watt, 10%	721379
R241	10K, 1/4W, 10%, car.	720114
R242	1K, 1/4W, 10%, car.	720111
R243	10K, 1/4W, 10%, car.	720114
R244	10K, 1/4W, 10%, car.	720114
R245	10K, 1/4W, 10%, car.	720114
R246	4.7K, 1/4W, 10%, car.	720155
R247	10K, 1/4W, 10%, car.	720114
R248	2.2K, 1/4W, 10%, car.	720116
R249 thru R258	4.7K, 1/4W, 10%, car.	720155
R301	1K, 1/4W, 10%, car.	720111
R302	10K, 1/4W, 10%, car.	720114
R303	680, 1/4W, 10%, car.	720166
R304	680, 1/4W, 10%, car.	720166
R305	33K, 1/4W, 10%, car.	720167
R306	100, 1/4W, 10%, car.	720130
R307	33K, 1/4W, 10%, car.	720167
R308	10K, 1/4W, 10%, car.	720114
R309	100, 1/4W, 10%, car.	720130
R310	4.7K, 1/4W, 10%, car.	720155
R311	150K, 1/4W, 10%, car.	720176
R312	100, 1/4W, 10%, car.	720130
R313	3.3K, 1/4W, 10%, car.	720109
R314	680, 1/4W, 10%, car.	720166
R401	100, 1/4W, 10%, car.	720130
R402	100, 1/4W, 10%, car.	720130
R403	4.7K, 1/4W, 10%, car.	720155
R404	150K, 1/4W, 10%, car.	720176
R405	100, 1/4W, 10%, car.	720130
R406	330K, 1/4W, 10%, car.	720131
R407	3.3K, 1/4W, 10%, car.	720109

ELECTROSTATIC CAPS

ITEM	VALUE	PART NO.
C104	.01uF, disc cer.	720162
C105	.0022uF, disc cer.	720147
C106	.01uF, disc cer.	720162
C201	18pF, NPO, 5% disc	721633
C202	.01uF, disc cer.	720162
C203	180pF, disc cer.	720164
C204	100pF, disc cer.	720195
C206	100pF, disc cer.	720195
C207	5pF, disc cer.	720152
C208	.01uF, disc cer.	720162
C209	.01uF, disc cer.	720162
C211	.1uF, disc cer.	720146
C212	470pF, disc cer.	720148
C213	100pF, disc cer.	720195
C214	470pF, disc cer.	720148
C215	100pF, disc cer.	720195
C217	100pF, disc cer.	720195
C218	.0022uF, disc cer.	720147
C219	.047uF, disc cer.	720194
C223	.01uF, disc cer.	720162
C224	330pF, disc cer.	720163
C234	.01uF, disc cer.	720162
C235	.0022uF, disc cer.	720147
C237	.01uF, disc cer.	720162
C301	27pF, disc cer.	720105
C302	100pF, disc cer.	720195
C303	150pF, disc cer.	720149
C304	82pF, disc cer.	720150
C305	.001uF, disc cer. 500VDC	721560
C306	62pF, NPO, 5% disc	721643
C307	.01uF, disc cer.	720162
C308	.0022uF, disc cer.	720147
C309	.0022uF, disc cer.	720147
C310	150pF, disc cer.	720149
C311	47pF, disc cer.	720152
C312	.01uF, disc cer.	720162
C313	7pF, disc cer.	720165
C314	.01uF, disc cer.	720162
C315	.01uF, disc cer.	720162
C401	3pF, disc cer.	720187
C402	3pF, disc cer.	720187
C403	3pF, disc cer.	720187
C404	0.5pF, disc cer.	720188
C405	.01uF, disc cer.	720162
C406	7pF, disc cer.	720165
C407	.0022uF disc cer.	720147
C408	3pF, disc cer.	720187
C409	.0022uF, disc cer.	720147
C410	150pF, disc cer.	720149
C411	47pF, disc cer.	720152
C412	.01uF, disc cer.	720162
C413	.01uF, disc cer.	720162
C414	0.5pF, disc cer.	720188
C415	.01uF, disc cer.	720162

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C101	100uF 16V	720143
C102	1uF 35V	722226
C103	1uF 35V	722226
C107	.2uF 35V	720145
C108	100uF 16V	720143
C109	100uF 16V	720143
C205	4.7uF 20V	720080
C210	4.7uF 20V	720080
C216	4.7uF 20V	720080
C220	4.7uF 20V	720080
C221	100uF 16V	720143
C222	100uF 16V	720143
C225	330uF 16V	720142
C226	330uF 16V	720142
C227	.2uF 35V	720145
C228	100uF 16V	720143
C229	100uF 16V	720143
C230	4.7uF 20V	720080
C231	10uF 16V	720144
C232	1uF 16V	722226
C233	.2uF 35V	720145
C236	4.7uF 20V	720080
C238	100uF 16V	720143

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R226	Volume, 10K	720138
R238	Squelch, 10K	720139

COILS/TRANSFORMERS

ITEM	PART NO.	NAME
L201	720170	Variable
L301	722266	40 MHz Variable
L302	722265	40 MHz Variable
L401	720159	150 MHz Variable
L402	720159	150 MHz Variable
RFC201	721929	15 uH
RFC202	720191	6.8mH
RFC301	725679	.56 uH
RFC302	720161	.68 uH
RFC303	720161	.68 uH
RFC401	720161	.68 uH
T401	730021	Variable
T402	730021	Variable

MISCELLANEOUS

ITEM	NAME	PART NO.
	PC Board,Main(Only)	750057
	PC Board,Main(Assy.)	878823
	PC Board,Logic/Osc(Only)	750056
	PC Board,Logic/Osc(Assy.)	878822
S101	Switch,Channel 1	700023
S102	Switch,Channel 2	700023
S103	Switch,Channel 3	700023
S104	Switch,Channel 4	700023
S105	Switch,Channel 5	700023
S106	Switch,Channel 6	700023
S107	Switch,Channel 7	700023
S108	Switch,Channel 8	700023
S109	Switch,Channel 9	700023
S110	Switch,Channel 10	700023
S111	Switch,Auto/Manual	700023
S112	Switch,Select	700025
Y201	Ceramic Filter,10.7MHz	780062
Y202	Crystal,10.245MHz	780060
Y203	Ceramic Filter,455kHz	780061
	Speaker	730010

CABINET PARTS

NAME	PART NO.
Case Top	460085
Case Bottom	460086
Knob,Squelchor Volume	460070
Bottom,Slotted Switch	460083
Collapsable VHF Antenna	250047
Face Panel, Moulded	460054
Handle	460061

Pages 38-50 Courtesy of HY-GAIN ELECTRONICS CORP.

618 L/H/U Final Test Procedure

(Using Pretested Logic and Main PCB)

Required Test Equipment

1. RF narrow-band FM signal generator - 50 ohm calibrated output, capable of tuning 30 - 50 MHz, 150 - 170 MHz, and 450 - 470 MHz.

2. VTVM, Heath IM18

3. AC VTVM or Audio Analyzer, Heath IM48 or Heath IM12

4. Power Supply, Heath IP27

Alignment Procedure:

1. Install crystals

   a. Channel 1, 40 MHz
   b. Channel 4, 156 MHz
   c. Channel 7, 458 MHz

   NOTE: The 618 LHU has been adjusted at the factory for best sensitivity on these frequencies. If the channels desired do not fall in the bandwidth of the frequencies, retune the scanner for maximum sensitivity on the new frequencies.

2. Rotate squelch and volume controls full CW.

3. Connect:

   a. RF generator to RF input jack, J301
   b. DC power supply to DC power jack, J303 (black to receiver common neg. red to positive.)
   c. AC VTVM across speaker
   d. VTVM negative to power supply negative. (All voltage readings are referenced to receiver common negative.)

4. Apply power. Adjust power supply to 12 VDC with a 300 mA maximum current limit.

5. Note current drain, should be 35 to 56 mA.

6. Switch to auto scan, unit should scan, open squelch (rotate squelch control full CCW). Unit should stop scanning and speaker should sound with noise.

7. Measure regulated voltage at TP8, should be 5.3 to 6 V.

8. Switch scanner to Channel 7, tune T4 (VHF Multiplier) for minimum volatage at TP4; should be less than 4 V.

9. Tune discriminator.

   a. Switch scanner to Channel 1.
   b. Switch generator frequency to 40 MHz and -60 dBm.
   c. Tune T5 for peak (approz. +1.5 V) measured at TP6 using VTVM.

d. Tune T6 for zero measured at TP7.
e. T5 and T6 interact, therefore repeat steps C and D until no change is noted.

10. Measure VHF low, 20 dB noise quieting sensitivity.

a. Switch scanner to Channel 1. **
b. Switch RF generator to 40 MHz and minimum output.
c. Switch AC VTVM to 1 V range.
d. Rotate squelch control full CCW.
e. Adjust volume control for 0.78 V (0 db) on AC VTVM, this is the OdB noise reference.
f. Switch AC VTVM to 0.1 V range (20 dBm).
g. Increase RF generator output unitl audio meter reads approximately -20 dBm (0 dB on the meter scale).
h. Tune L3, L4 and L5 for minimum audio meter deflection. (Best noise quieting), because there is interaction between L3, L4 and L5. Consecutively tune through each until no improvement is noted in minimum meter reading.
i. Adjust the RF generator output for -20 dB on the AC VTVM (OdB on the meter). The RF generator output level is the receiver 20 dB quieting sensitivity. The 20 dB quieting sensitivity should be -113 dBm or less.

11. Test Squelch Sensitivity

a. Squelch Threshold

1. Switch scanner to Channel 1, auto scan.
2. Switch generator to 40 MHz, minimum output. **
3. Rotate squelch control full CCW. **
4. Switch AC VTVM to 1 V range. **
5. Adjust volume control for 0.78 V (OdB) on AC VTVM, this is the 0 dB noise reference. **
6. Switch AC VTVM to 0.1 V range (-20 dBm). **
7. Increase RF generator output until AC VTVM reads approximately -20 dBm (OdB on the meter scale.) **
8. Rotate squelch control CW until audio noise quiets. Then slowly rotate squelch control CCW until squelch is just released. CONSTANT audio is heard and scan stops.
9. Reduce RF output to minimum. Audio should completely quiet.

b. Test Tight Squelch Sensitivity

1. Rotate squelch control full CW.
2. Slowly increase RF generator output until the squelch is just released, constant audio is heard and scan stops. RF generator output should be between -104 and -95 dBm.

12. Measure Maximum Audio Output

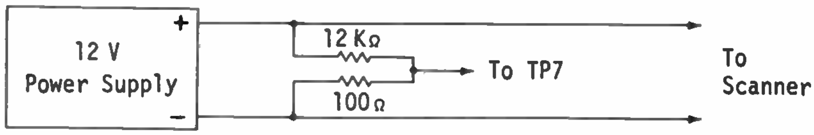
a. Switch scanner to Channel 1, rotate volume control full CW.
b. Switch RF generator to 40 MHz, maximum output and ±3KHz deviation.
c. Switch AC VTVM to 3 V range.
d. Meter should indicate 3 VRMS minimum.

13. Measure VHF high, 20 dB noise quieting sensitivity.

618L/H/U ALIGNMENT CONT.

a. Switch scanner to Channel 4.
b. Switch RF generator to 156 MHz and minimum output.
c. Switch AC VTVM to 1 V range.
d. Rotate squelch control full CCW.
e. Adjust volume control for 0.78 V (0dB) on AC VTVM, this is the 0 dB noise reference.
f. Switch AC VTVM to 0.1 V range (-20 dB).
g. Increase RF generator output until the audio meter reads approximately -20 dB (0dB on the meter scale).
h. Tune T2, L2 and T3 for minimum audio meter deflection. (Best noise quieting), because there is interaction between T2, L2 and T3, consecutively tune through each until no improvement is noted in minimum meter reading.
i. Increase RF generator output until the AC VTVM reads -20 dB (0 dB on the meter scale). The RF generator output level is the receiver 20 dB quieting sensitivity. The 20 dB quieting sensitivity should be -113 dBm or less.

14. Calibrate AFC
   a. Switch to Channel 7.
   b. Connect a low impedance 0.1 V source to TP7 as shown, select resistors for 0.1 V ±.005 V with 12 V ±0.5 V DC input.



   c. Set R129 for 4 V measured with the VTVM at TP12.

15. Measure UHF 20 dB quieting sensitivity.
   a. Switch scanner to Channel 7. **
   b. Switch RF generator to 458 MHz and minimum output.
   c. Switch AC VTVM to 1 V range.
   d. Rotate squelch control full CCW.
   e. Adjust volume control for 0.78 V (0 dBm) on AC VTVM, this is the 0dB noise reference.
   f. Switch AC VTVM to 0.1 V range (-20 dB).
   g. Increase RF generator output until the audio meter reads -20 dB (0 dB on the meter scale).
   h. Tune L1, C9 and L6 for minimum audio meter deflection. (Best noise quieting), because there is interaction between these circuits, consecutively tune through each until no improvement is noted in minimum meter reading.
   i. Adjust RF generator output for -20 dB (0 dB on the meter scale). The RF generator output level is the receiver 20 dB quieting sensitivity. The 20 dB quieting sensitivity should be -107 dBm or less.

** This step established on previous test.

618L/H/U PARTS LIST

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
CR1	MPN3401	760007
CR2	MPN3401	760007
CR3	MPN3401	760007
CR4	MPN3401	760007
CR5	MPN3401	760007
CR6	MPN3401	760007
CR7	1N4148	760037
CR8	1N4148	760037
CR9	1N60P	760057
CR10	1N60P	760057
CR11	1N60P	760057
CR12	1N60P	760057
CR13	1N60P	760057
CR14	1N60P	760057
CR15	(5.6V, 1mA Zener)	760088
CR16	1N4148	760037
CR17	1N4001	760076
CR18	1N4001	760076
CR19	1N4001	760076
CR20	1N4001	760076
CR101	MPN3401	760007
CR102	MPN3401	760007
CR103	MPN3401	760007
CR104	MPN3401	760007
CR105	MPN3401	760007
CR106	MPN3401	760007
CR107	MPN3401	760007
CR108	MPN3401	760007
CR109	MPN3401	760007
CR110	MPN3401	760007
CR111	1N4148	760037
CR112	1N4148	760037
CR113	1N4148	760037
CR114	1N4148	760037
CR115	1N4148	760037
CR116	1N4148	760037
CR117	1N4148	760037
CR118	1N4148	760037
CR119	1N4148	760037
CR120	1N4148	760037
CR121	MLED650	760030
CR122	MLED650	760030
CR123	MLED650	760030
CR124	MLED650	760030
CR125	MLED650	760030
CR126	MLED650	760030
CR127	MLED650	760030
CR128	MLED650	760030
CR129	MLED650	760030
CR130	MLED650	760030
CR131	1N4148	760037
CR132	1N4148	760037
CR133	1N4148	760037
U1	AN127Q	760056
U2	uA706	760028
U101	74L42	760074
U102	74L90	760075
Q1	2SC1070	760093
Q2	2SK42	760051
Q3	2SK42	760051
Q4	MPSH10	760053
Q5	MPSH10	760053
Q6	MPSH10	760053
Q7	2SA733	760069
Q8	2SA733	760069
Q9	2SA733	760069
Q10	2SC839H	760066
Q11	2SC839H	760066
Q12	2SC839H	760066
Q13	2SC945	760068
Q14	MPS6514	760039
Q15	MPS6514	760039
Q16	2SC945	760068
Q17	MPS2926	760038
Q18	MPS2926	760038
Q19	MPS2926	760038
Q20	MPS2926	760038
Q21	MPS2926	760038
Q101	2SA733	760069
Q102	2SA733	760069
Q103	2N5770	760042
Q104	2SA733	760069
Q105	2SC945	760068
Q106	2SA733	760069
Q107	MPS2926	760038
Q108	MPS2926	760038
Q109	MPS2926	760038

CONTINUED ON PAGE 45

TESTING AND TROUBLESHOOTING

VISUAL INSPECTION

A. Check the front panel controls to be sure they are set properly for desired operation.

B. Inspect the cables and connectors on the rear of and within the scanner to be sure they are securely in place.

C. Inspect the p.c. boards for shorts, broken wires, and broken or burned parts.

FUNCTION TESTS

Test Equipment needed:

Power Source -- Regulated 12.5 VDC, 1 amp
RF signal generator -- 50-ohm, calibrated output
Haromonic Distortion Meter
Test Crystal -- any channel crystal of known accuracy

Test Equipment Set-up:

1. Connect the power supply to the scanner power jack and the RF signal generator to the external antenna jack. (Antenna Switch, if any, to Ext. Position.)
2. Remove all channel crystals. (Re-install them after completing tests and needed repair.)
3. Turn the scanner on.

<u>Channel Lock-up</u>

1. Set the signal generator for the same frequency as the test crystal, with an output level of zero.
2. Set the scanner controls as follows:
   VOLUME -- for comfortable listening
   SQUELCH -- to where the noise is just quieted
   AUTO-MAN -- AUTO-scan (up)
3. Raise the signal generator RF level to 0.5 uV.
4. Place the test crystal in the channel one sockets. Then jump the crystal through each set of channel sockets.
5. To pass, each channel must lock-up when the crystal is placed in its sockets. The appropriate LED for that channel must also light up.
6. If the radio does not pass this test, troubleshoot the Crystal Switch, LED, and Logic circuitry.

<u>Tight Squelch.</u>

1. Set the signal generator for the same frequency as the test crystal with an output level of zero.
2. Place the test crystal in the channel one sockets.
3. Set the scanner control as follows:
   VOLUME -- for comfortable listening
   SQUELCH -- fully on (CW)
   AUTO-MAN -- AUTO-scan (up)
4. Raise the generator output level until the squelch opens (unit locks on channel and constant noise is heard).
5. To pass, the generator output level must be less than 2.5 uV.
6. If the radio does not pass this test, troubleshoot the Squelch circuitry.

Audio Output.

1. Set the signal generator for the same frequency as the test crystal with the output level at maximum, not to exceed 1000 uV. Turn the internal modulation on and set it for 3.5 kHz deviation. Set the modulation frequency at 1 kHz.
2. Place the test crystal in the channel one sockets.
3. Connect a distortion meter to either the phone jack or the speaker terminals. Set the distortion meter sensitivity level at 3 V.
4. Set the scanner controls as follows:

SQUELCH -- fully off (CCW)
VOLUME -- fully on (CW)
AUTO-MAN -- AUTO--scan (up)

5. To pass, audio output must be 2.2 V rms or more. Distortion must not exceed 15% at 2.2 V rms.
6. If the radio does not pass this test, troubleshoot the Audio circuitry.

CIRCUIT TESTS

Test Equipment Needed:

Power Source -- Regulated 12.5 VDC, 1 amp
VTVM (voltage readings measured to ground, except as noted)
RF signal generator -- 50-ohm, calibrated output
Oscilloscope -- 10 MHz; 7 pF, x10 test probe

Test Equipment Set-up:

1. Connect the power supply to the scanner power jack and the RF signal generator to the external antenna jack. (Antenna Switch, if any, to Ext. Position.)
2. Turn the scanner on; then lock it on any channel that has a crystal installed.
3. Set the scanner power controls as follows:

VOLUME -- for comfortable listening
SQUELCH -- to where the noise is just quieted
AUTO-MAN -- MANual-scan (down)

First RF amplifier.

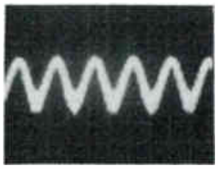
Measure the voltage drop across the 100 ohm B+ resistor. There should be a drop of 0.2 V at its junction with the RF coil versus the other end of resistor.

First Oscillator.

1. Measure the voltage across the 100 ohm emitter resistor. It should read 0.4 V.
2. Remove the channel crystal corresponding to the locked-up channel. There should now be a reading of 0.5 V for a difference of .1 V.
3. Re-install the crystal removed in step 2.

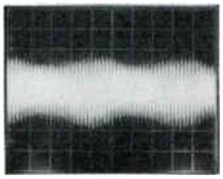
First Mixer.

1. Connect the oscilloscope probe (x10) to the collector.
2. Raise the signal generator RF level to 0.5 mV.
3. Set the oscilloscope controls as follows:
   vertical gain -- .05 V/cm
   time base -- .1uS/cm
4. There should be a .2 V waveform like this:



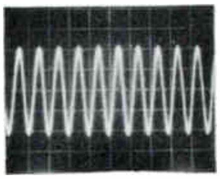
10.7 MHz Monolithic Filter.

1. Connect the oscilloscope probe (x10) to the junction of the filter and the 18 pF capacitor.
2. Raise the signal generator RF level to 0.5 mV.
3. Set the oscilloscope controls as follows:
   vertical gain -- .05 V/cm
   time base -- .5 uS/cm
4. There should be a waveform like this:



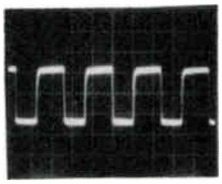
Mixer, 10.245 MHz.

1. Connect the oscilloscope probe (x10) to the base.
2. Raise the signal generator RF level to 0.5 mV.
3. Set the oscilloscope controls as follows:
   vertical gain -- 0.1 V/cm
   time base -- 0.1 uS/cM
4. There should be a 0.5 V waveform like this:



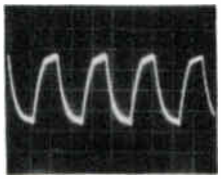
First Limiter

1. Connect the oscilloscope probe (x10) to pin three.
2. Set the oscilloscope controls as follows:
   vertical gain -- 0.5 V/cm
   time base -- 1 uS/cm
3. There should be a 1.5 V waveform like this:



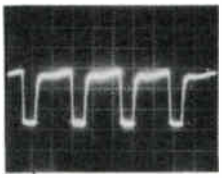
Second Limiter

1. Connect the oscilloscope probe to the collector.
2. Set the oscilloscope controls as follows:
   vertical gain -- 1V/cm
   time base -- 1 uS/cm
3. There should be a 4 V waveform like this:



Third Limiter or Discriminator Driver

1. Connect the oscilloscope probe to the collector.
2. Set the oscilloscope controls as follows:
   vertical gain -- 2 V/cm
   time base -- 1 uS/cm
3. There should be a 5.6 V waveform like this:



Discriminator.

1. Connect the oscilloscope probe to the anode of the IN60 that junctions with the 15K resistor.
2. Set the oscilloscope controls as follows:
   vertical gain -- 0.2 V/cm
   time base -- 1 mS/cm
3. There should be a noise waveform of 0.8 V

Squelch B+ Check

Measure the voltage drop across the B+ Coil off the collector of the 1st Squelch Amp. There should be a drop of 0.1 V (5.4 V - 5.3 V) between the B+ end and the collector end.

Squelch and Scan Stop.

Measure the lead voltages of all the transistors in the squelched and unsquelched conditions. Refer to the schematic diagram or voltage chart for the correct readings.

Power Supply.

Measure the voltage of the emitter of the voltage regulator. There should be a reading of 5.5 V.

RESISTORS

ITEM	VALUE	PART NO.
1	1K, 1/4W, 10%, car.	720111
2	470 ohm, 1/4W, 10%, car.	720110
3	4.7K, 1/4W, 10%, car.	720155
4	8.2K, 1/4W, 10%, car.	722258
5	47 ohm, 1/4W, 10%, car.	720023
6	47 ohm, 1/4W, 10%, car.	720023
7	1K, 1/4W, 10%, car.	720111
8	47 ohm, 1/4W, 10%, car.	720023
9	47 ohm, 1/4W, 10%, car.	720023
10	4.7K, 1/4W, 10%, car.	720155
11	1K, 1/4W, 10%, car.	720111
12	820 ohm, 1/4W, 10%, car.	720156
13	100 ohm, 1/4W, 10%, car.	720130
14	3.3K, 1/4W, 10%, car.	720109
15	10K, 1/4W, 10%, car.	720114
16	3.3K, 1/4W, 10%, car.	720109
17	680 ohm,1/4W, 10%, car.	720166
18	330 ohm, 1/4W, 10%, car.	720086
19	10K, 1/4W, 10%, car.	720114
20	330 ohm, 1/4W, 10%, car.	720086
21	15K, 1/4W, 10%, car.	720175
22	10K, 1/4W, 10%, car.	720114
23	100 ohm, 1/4W, 10%, car.	720130
24	3.3K, 1/4W, 10%, car.	720109
25	60K, 1/4W, 10%, car.	720127
26	33 ohm, 1/4W, 10%, car.	720103
27	15K, 1/4W, 10%, car.	720175
28	10K, 1/4W, 10%, car.	720114
29	15K, 1/4W, 10%, car.	720175
30	4.7K, 1/4W, 10%, car.	720155
31	15K, 1/4W, 10%, car.	720175
32	10K, 1/4W, 10%, car.	720114
33	100 ohm, 1/4W, 10%, car.	721379
34	1K, 1/4W, 10%, car.	720111
R35	470K, 1/4W, 10%, car.	720119
R36	220 ohm, 1/4W, 10%, car.	720082
R37	100 ohm, 1/4W, 10%, car.	721379
R38	150K, 1/4W, 10%, car.(1)	720146
R39	220 ohm, 1/4W, 10%, car.	720082
R40	1.5K, 1/4W, 10%, car.	720132
R41	470K, 1/4W, 10%, car.	720119
R42	68K, 1/4W, 10%, car.	720127
R43	100K, 1/4W, 10%, car.	720081
R45	1.5K, 1/4W, 10%, car.	720132
R46	470K, 1/4W, 10%, car.	720119
R47	1K, 1/4W, 10%, car.	720111
R48	150K, 1/4W, 10%, car.	720146
R49	1.5K, 1/4W, 10%, car.	720132
R50	4.7K, 1/4W, 10%, car.	720155
R52	4.7K, 1/4W, 10%, car.	720155
R53	470 ohm, 1/4W, 10%, car.	720119
R54	10K, 1/4W, 10%, car.	720114
R55	10K, 1/4W, 10%, car.	720114
R56	3.3K, 1/4W, 10%, car.	720109
R57	470K, 1/4W, 10%, car.	720119
R58	3.3K, 1/4W, 10%, car.	720109
R59	330K, 1/4W, 10%, car.	720131
R60	100 ohm, 1/4W, 10%, car.	720130
R61	10K, 1/4W, 10%, car.	720114
R62	1K, 1/4W, 10%, car.	720111
R63	10K, 1/4W, 10%, car.	720114
R64	15K, 1/4W, 10%, car.	720175
R65	100 ohm, 1/4W, 10%, car.	720130
R66	10K, 1/4W, 10%, car.	720114
R67	4.7K, 1/4W, 10%, car.	720155
R68	33K, 1/4W, 10%, car.	720167
R69	33K, 1/4W, 10%, car.	720167
R71	10K, 1/4W, 10%, car.	720114
R72	68K, 1/4W, 10%, car.	720127
R73	10K, 1/4W, 10%, car.	720114
R74	10K, 1/4W, 10%, car.	720114
R75	2.2K, 1/4W, 10%, car.	721116
R76	33 ohm, 1/4W, 10%, car.	721103
R77	330 ohm, 1/4W, 10%, car.	720086
R78	1K, 1/4W, 10%, car.	720111
R79	100 ohm, 1/4W, 10%, car.	721379
R80	1K, 1/4W, 10%, car.	720111
R91	33 ohm, 1/4W, 10%, car.	721103
R82	330 ohm, 1/4W, 10%, car.	720086
R101	10K, 1/4W, 10%, car.	720114
R102	10K, 1/4W, 10%, car.	720114
R103	10K, 1/4W, 10%, car.	720114
R104	10K, 1/4W, 10%, car.	720114
R105	10K, 1/4W, 10%, car.	720114
R106	10K, 1/4W, 10%, car.	720114
R107	10K, 1/4W, 10%, car.	720114
R108	10K, 1/4W, 10%, car.	720114
R109	10K, 1/4W, 10%, car.	720114
R110	10K, 1/4W, 10%, car.	720114
R111	39K, 1/4W, 10%, car.	720172
R112	220 ohm, 1/4W, 10%, car.	720082
R113	4.7K, 1/4W, 10%, car.	720155
R114	10K, 1/4W, 10%, car.	720114
R115	470 ohm, 1/4W, 10%, car.	720110
R116	10K, 1/4W, 10%, car.	720114
R117	47K, 1/4W, 10%, car.	720135
R118	68K, 1/4W, 10%, car.	720127
R119	10K, 1/4W, 10%, car.	720114
R120	330 ohm, 1/4W, 10%, car.	720086
R121	470K, 1/4W, 10%, car.	720119
R122	39K, 1/4W, 10%, car.	720172
R124	39K, 1/4W, 10%, car.	720172
R125	68K, 1/4W, 10%, car.	720127
R126	2.7K, 1/4W, 10%, car.	720134
R127	100K, 1/4W, 10%, car.	720081
R128	22K, 1/4W, 10%, car.	720129
R130	1K, 1/4W, 10%, car.	720111
R131	47K, 1/4W, 10%, car.	720135
R132	4.7K, 1/4W, 10%, car.	720155
R133	10K, 1/4W, 10%, car.	720114
R134	10K, 1/4W, 10%, car.	720114
R135	10K, 1/4W, 10%, car.	720114
R136	47 ohm, 1/4W, 10%, car.	720023
R137	10K, 1/4W, 10%, car.	720114
R138	2.2K, 1/4W, 10%, car.	720116
R139	1K, 1/4W, 10%, car.	720111
R140	680K	

(1) Not used in some versions.

ELECTROSTATIC CAPS

ITEM	VALUE	PART NO.
C1	1pF, 500V cer.	722324
C2	2.7pF, 50V cer.	722326
C3	7pF, 50V cer.	720165
C4	7pF, 50V cer.	720165
C5	7pF, 50V cer.	720165
C6	.01, 50V cer.	720162
C7	.01, 50V cer.	720162
C8	.01, 50V cer.	720162
C9	Trimmer, 2-9pF	722319
C10	.01, 50V cer.	720162
C11	3pF, 50V cer.	720187
C12	2.2pF, 50V cer.	721609
C13	3pF, 50V cer.	720187
C14	.01, 50V cer.	720162
C15	.5pF, 50V cer.	720188
C16	.01, 50V cer.	720162
C17	5pF, 50V cer.	720154
C18	.47pF, 10% comp.	722318
C19	25pF, 50V cer.	721632
C20	8pF, 50V cer.	721625
C21	27pF, 50V cer.	722382
C22	.01, 50V cer.	720162
C23	4.7pF, 5% comp.	722315
C24	20pF, 5% cer.	721604
C25	27pF, 50V cer.	722382
C26	10pF, 50V cer.	721624
C27	7pF, 50V cer.	720165
C30	3pF, 50V cer.	720187
C31	2200pF, 50V cer.	720147
C32	8pF, 5% cer.	721625
C33	1pF, 500V cer.	722324
C34	.01, 50V cer.	720163
C35	3pF, 50V cer.	720187
C36	.01, 50V cer.	720163
C37	.01, 50V cer.	720163
C38	27pF, 50V cer.	720153
C39	18pF, 5% cer.	721633
C40	.01 50V cer.	720162
	(.001)	
C41	150pf, 50V cer.	720149
C42	4.7pf, 5% comp.	722315
C43	.01, 50V cer.	720162
C44	.01, 50V cer.	720162
C45	100pf, 50V cer.	720195
C47	.01, 50V cer.	720162
C48	.01, 50V cer.	720162
	(.001)	
C49	.0033, 50V cer.	720147
C50	.01, 50V cer.	720162
C52	2200pF, 50V cer.	720147
C54	.01, 50V cer.	720162
C55	.01, 50V cer.	720162
C56	470pF, 50V cer.	720148
C59	100pF, 50V cer.	720195
C60	470pF, 50V cer.	720148
C61	.01, 50V cer.	720162
C62	47pF, 50V cer.	720152
C66	2200pF, 50V cer.	720147
C68	.05	720080
C72	.01, 50V cer.	720162
C73	330pF, 50V cer.	720163
C78	.01, 50V cer.	720162
C79	.47pF, 10% comp.	722318
C80	3pF, 50V cer.	720187
C81	.01, 50V cer.	720162
C82	.01, 50V cer.	720162
C103	.01, 50V cer.	720162
C104	100pF, 50V cer.	720195
C105	.001, 50V cer.	720158
C106	.001, 50V cer.	720158
C107	.001, 50V cer.	720158
C108	.001, 50V cer.	720158
C109	.001, 50V cer.	720158
C110	.001, 50V cer.	720158
C112	.01, 50V cer.	720162
C113	.01, 50V cer.	720162

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C9	Trimmer, 2-9pF	722319
C46	4.7uF 20V	720080
C51	4.7uF 20V	720080
C53	4.7uF 20V	720080
C57	.2uF 35V	720145
C58	4.7uF 20V	720080
C63	10uF 16V	720144
C65	100uF 16V	720143
C67	4.7uF 20V	720080
C69	4.7uF 20V	720080
C70	100uF	720143
C71	20uF	722337
C74	330uF 16V	720142
C75	330uF 16V	720142
C76	.2uF 35V	720145
C77	330uF 16V	720142
C101	1uF 35V	722226
C102	1uF 35V	722226
C111	1uF 35V	722226
C114	.2uF 35V	720145
C116	100uF 16V	720143
C117	100uF 16V	720143

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R44	Squelch, 10K	720114
R70	Volume, 10K	720138
R129	Variable, 10K	722331

COILS/TRANSFORMERS

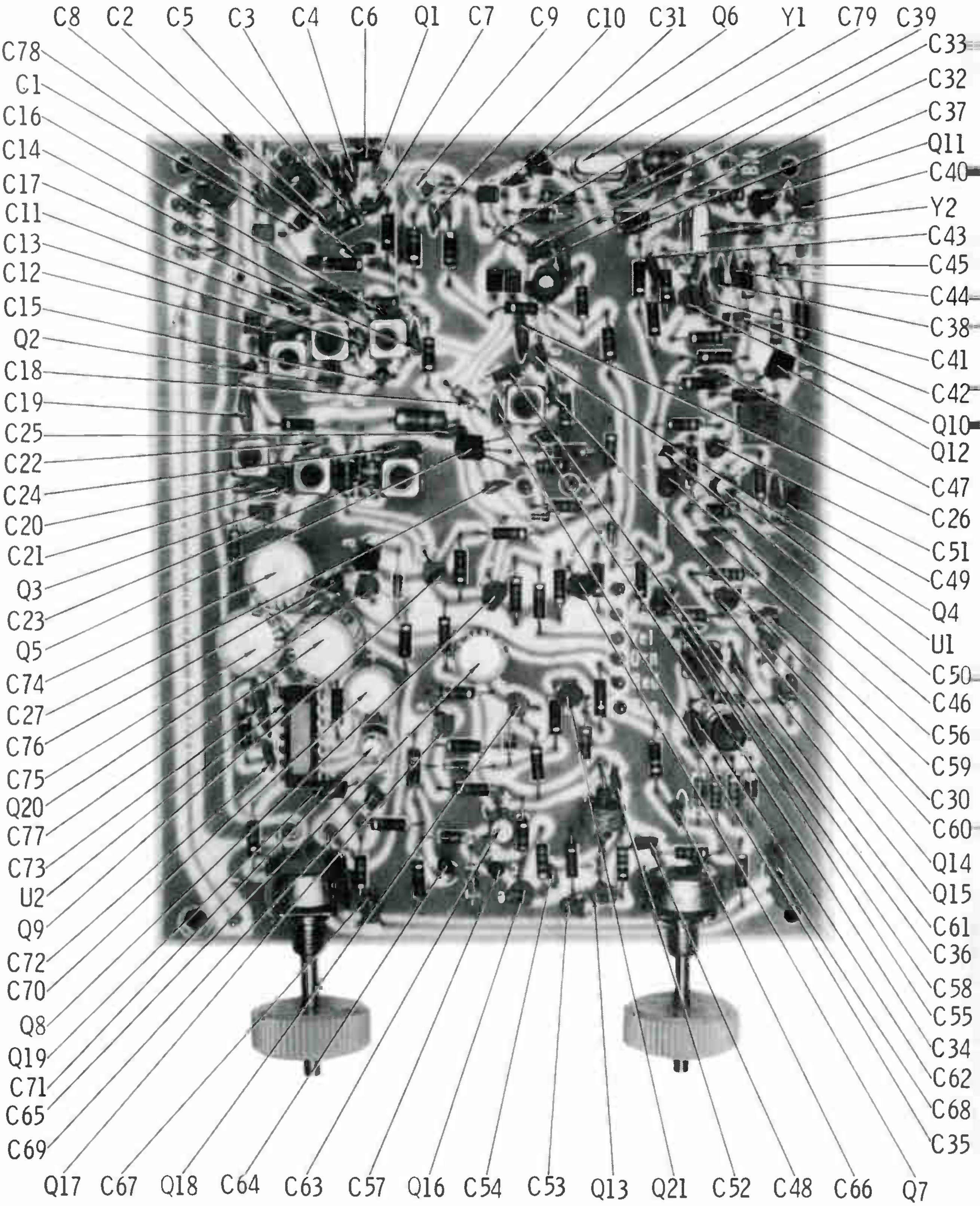
ITEM	PART NO.	NAME
L1	722317	Variable
L2	730021	Variable
L3	720161	.68uH
L4	720185	40 MHz Variable
L5	720185	40 MHz Variable
L6	722317	Variable
L7	721929	15 uH
L8	720191	6.8mH
L10	721929	15uH
L101	721929	15 uH
L102	721929	15 uH
L103	721929	15 uH
L104	721929	15 uH
L105	721929	15 UH
L106	721929	15 uH
L107	721929	15 uH
L108	721929	15 uH
L109	721929	15 uH
L110	721929	15 uH
L111	721922	.33uH
L112	720161	.68 uH
T1	722322	RF
T2	720159	150 MHz Variable
T3	720159	150 MHz Variable
T4	730021	Variable
T5	720140	Variable
T6	720170	Variable
T7	722329	40mHz Variable

MISCELLANEOUS

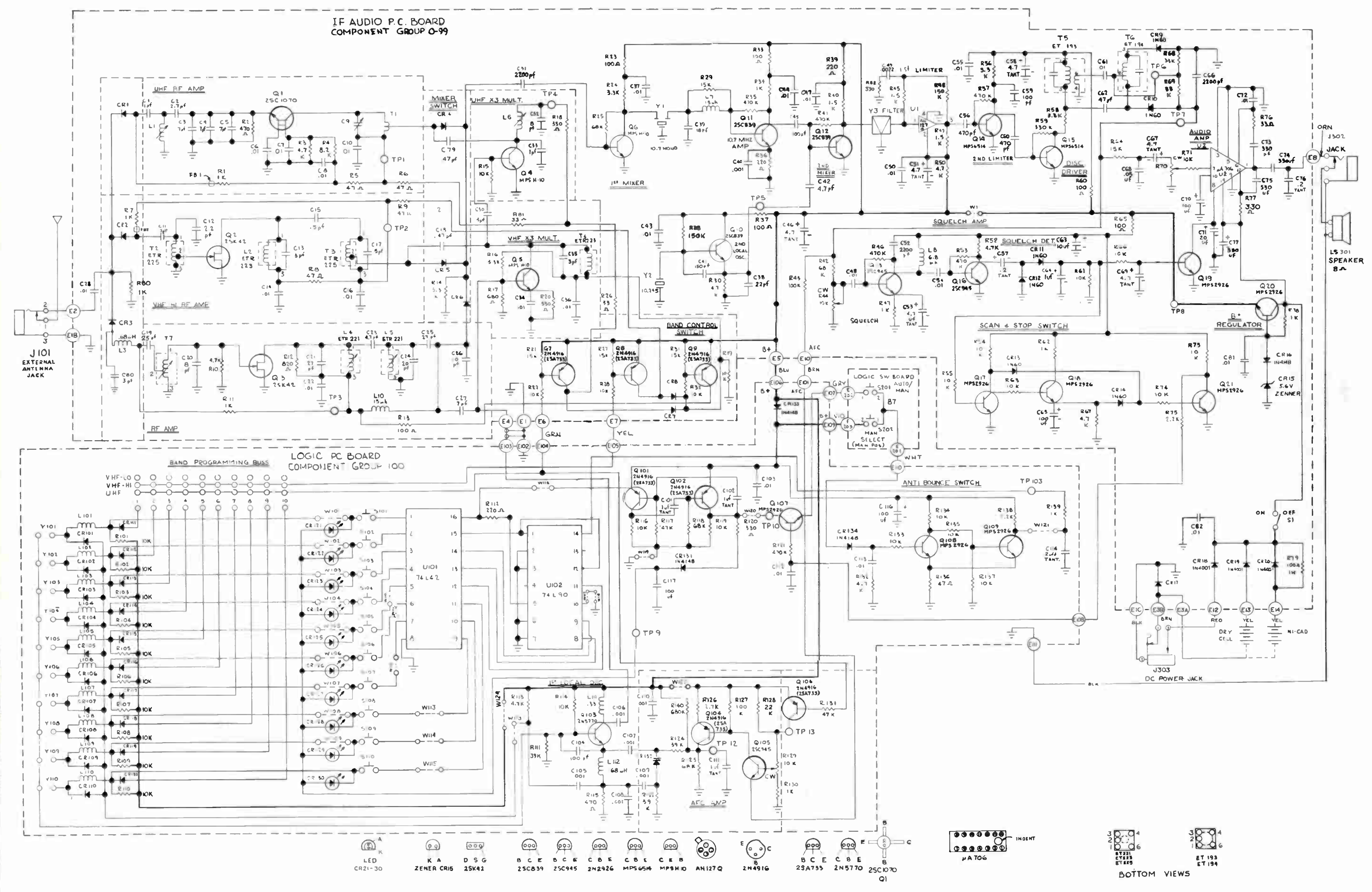
ITEM	NAME	PART NO.
	PC Board, Main Complete	878823
	PC Board, Main, Only	750057
	PC Board, Logic-Osc., Complete	878822
	PC Board, Logic-Osc., Only	750056
LS301	Speaker	730010
S1	Switch, Power	(Part of Volume)
S101	Switch, DPDT Pushbutton	700023
S102	Switch, DPDT Pushbutton	700023
S103	Switch, DPDT Pushbutton	700023
S104	Switch, DPDT Pushbutton	700023
S105	Switch, DPDT Pushbutton	700023
S106	Switch, DPDT Pushbutton	700023
S107	Switch, DPDT Pushbutton	700023
S108	Switch, DPDT Pushbutton	700023
S109	Switch, DPDT Pushbutton	700023
S110	Switch, DPDT Pushbutton	700023
Y1	10.7MHz Crystal Filter	780062
Y2	10.245MHz Crystal Filter	780060
Y3	455kHz Crystal Filter	780061

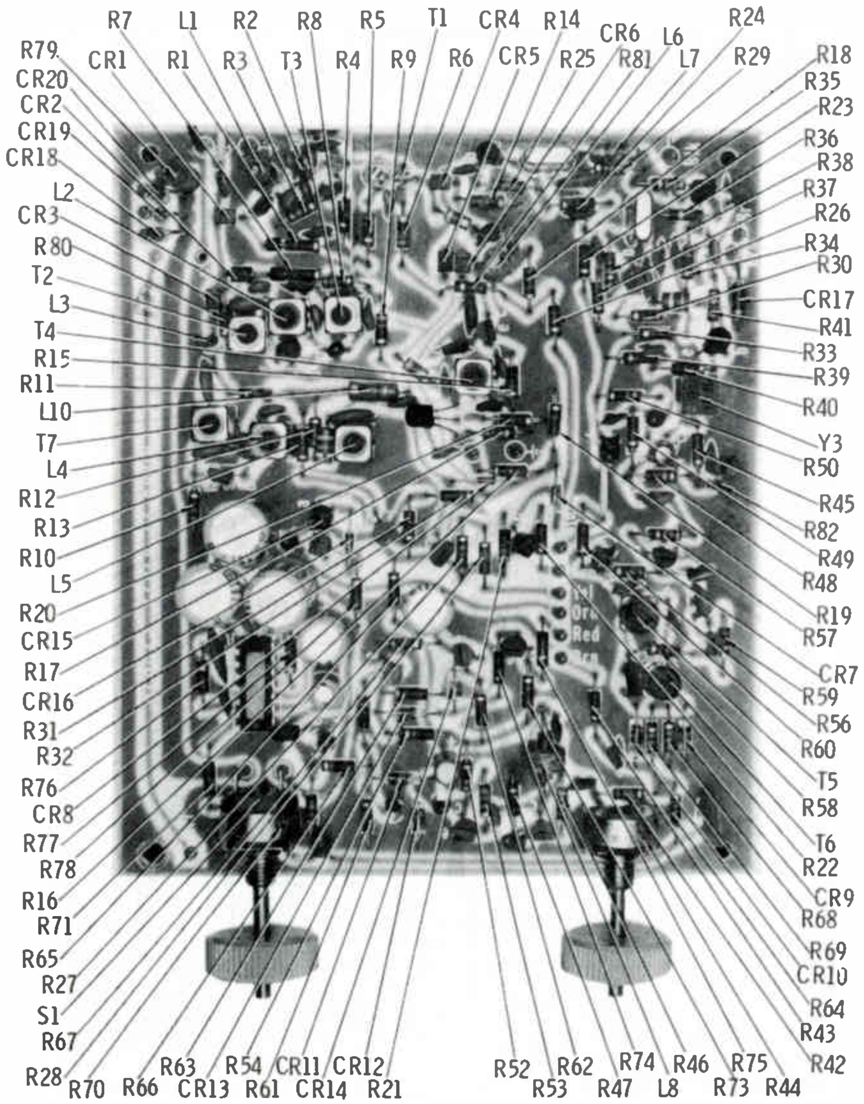
CABINET PARTS

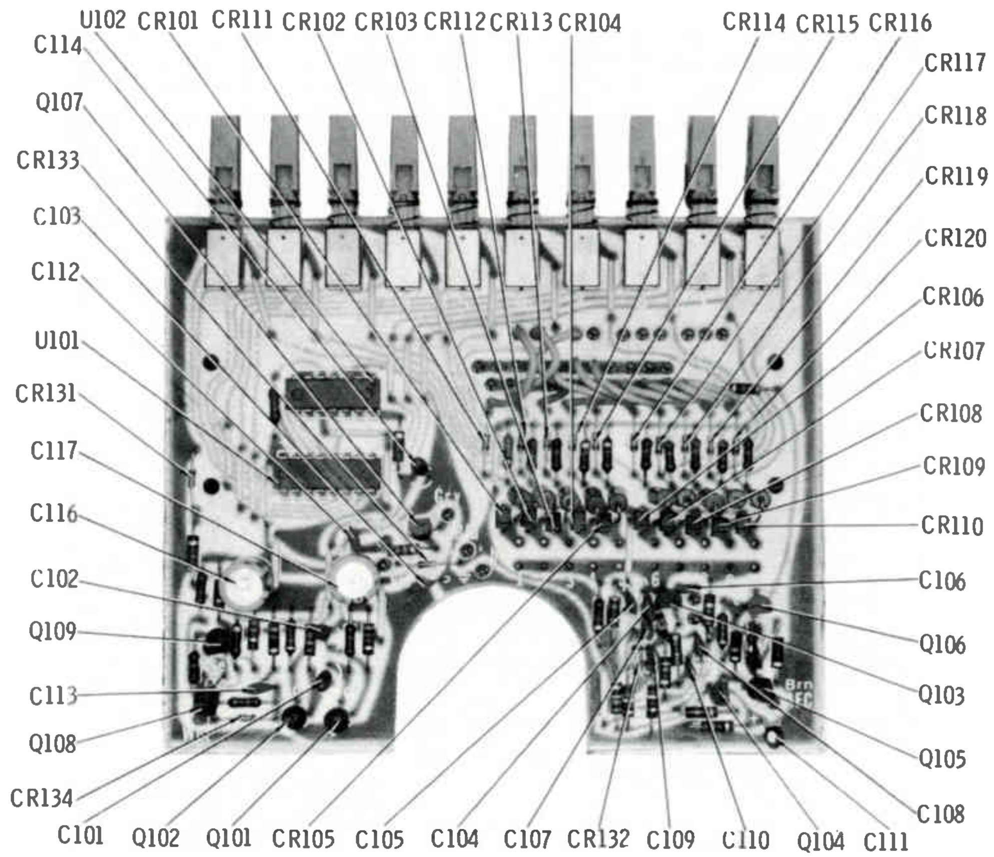
NAME	PART NO.
Push Button, Switch	460083
Handle	460061
Case Top	460085
Case Bottom	460086
Collapsible Antenna	250047

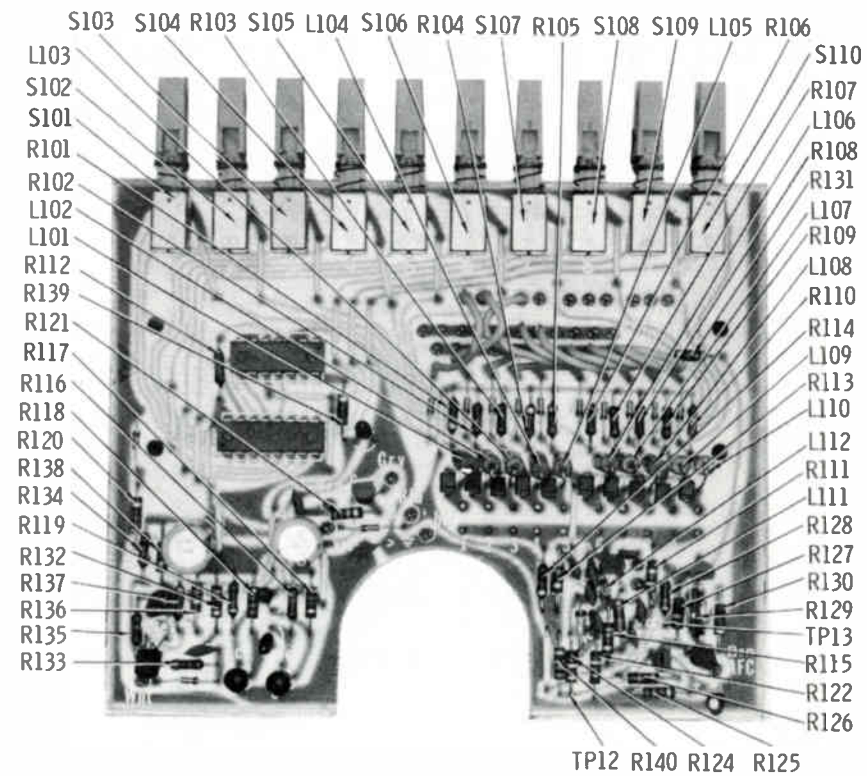

C8
C2
C5
C3
C4
C6
Q1
C7
C9
C10
C31
Q6
Y1
C79
C39
C78
C1
C16
C14
C17
C11
C13
C12
C15
Q2
C18
C19
C25
C22
C24
C20
C21
Q3
C23
Q5
C74
C27
C76
C75
Q20
C77
C73
U2
Q9
C72
C70
Q8
Q19
C71
C65
C69
C33
C32
C37
Q11
C40
Y2
C43
C45
C44
C38
C41
C42
Q10
Q12
C47
C26
C51
C49
Q4
U1
C50
C46
C56
C59
C30
C60
Q14
Q15
C61
C36
C58
C55
C34
C62
C68
C35
Q17
C67
Q18
C64
C63
C57
Q16
C54
C53
Q13
Q21
C52
C48
C66
Q7

618L/H/U SCHEMATIC




R7 L1 R2 R8 R5 T1 CR4 R14 CR6 L6 R24
R79 CR1 R1 R3 T3 R4 R9 R6 CR5 R25 R81 L7 R29 R18
CR20 CR2 CR19 CR18 L2 CR3 R80 T2 L3 T4 R15 R11 L10 T7 L4 R12 R13 R10 L5 R20 CR15 R17 CR16 R31 R32 R76 CR8 R77 R78 R16 R71 R65 R27 S1 R67 R28
R35 R23 R36 R38 R37 R26 R34 R30 CR17 R41 R33 R39 R40 Y3 R50 R45 R82 R49 R48 R19 R57 CR7 R59 R56 R60 T5 R58 T6 R22 CR9 R68 R69 CR10 R64 R43 R42
R63 R54 CR11 CR12 R52 R62 R74 R46 R75
R70 R66 CR13 R61 CR14 R21 R53 R47 L8 R73 R44


U102 CR101 CR111 CR102 CR103 CR112 CR113 CR104 CR114 CR115 CR116
C114 Q107 CR133 C103 C112 U101 CR131 C117 C116 C102 Q109 C113 Q108 CR134
CR117 CR118 CR119 CR120 CR106 CR107 CR108 CR109 CR110 C106 Q106 Q103 Q105 C108
C101 Q102 Q101 CR105 C105 C104 C107 CR132 C109 C110 Q104 C111


S103 S104 R103 S105 L104 S106 R104 S107 R105 S108 S109 L105 R106
L103 S102 S101 R101 R102 L102 L101 R112 R139 R121 R117 R116 R118 R120 R138 R134 R119 R132 R137 R136 R135 R133
S110 R107 L106 R108 R131 L107 R109 L108 R110 R114 L109 R113 L110 L112 R111 L111 R128 R127 R130 R129 TP13 R115 R122 R126
TP12 R140 R124 R125

2. GENERAL ALIGNMENT INSTRUCTIONS

2.1 Test equipments: The following equipment is necessary to perform the alignment.

-1 FM signal generator 25 MHz - 175 MHz with adjustable attenuator calibrated to 0.3 μV.

-2 AM or FM signal generator 10.7 MHz for IF alignment.

-3 Sweep generator 10.7 MHz.

-4 DC V.T.V.M.

-5 AF V.T.V.M. and dummy load 8 ohm

-6 Oscilloscope

2.2 General alignment conditions

-1 Before servicing this receiver, disconnect from the power source and remove all lead wires attached to terminal connections. Remove the four screws which fasten the chassis to the bottom of the cabinet. (Shown Fig. 1 Chassis dis-assembly)

-2 Knob function and it nominal position

a) Tuning dial: On logical scale

b) Volume control: On position

c) Squelch control: Counter clockwise

-3 Alignment procedure

Note: The non-metallic alignment tool are required for complete alignment. Unless otherwise specified all front panel controls shall be positioned as Item 2.2 -2 for complete alignment of the receiver. The receiver should be warmed up for a period of at least 10 minutes before proceeding with the complete alignment.

2.3 General alignment

-1 IF alignment, Refer to Fig. 6 and Fig. 9 or Fig. 11 and Fig. 14.

STEP	RF GENERATOR NO MOD.		VTVM	ADJUSTMENT	
	CONNECT TO	FREQUENCY OUTPUT	CONNECT TO	TUNE	VTVM READING
1	Test point on front end through a 0.01 MF	10.7 MHz without MOD. Input signal from generator should be kept as low as possible.	TP1	VR-1	Just below peak of gradual drop off on the voltmeter.
2	"	"	"	L4, T1 T2, T3 T4 PRI.	Peak on the VTVM.
3	"	"	TP2	T4 SEC.	Zero reading.
4	Repeat step 1 to 3 until no further improvement can be obtain.				

-2 Front end alignment, Refer to Fig. 9 or Fig. 14.

STEP	RF GENERATOR		CONNECT VTVM & SPK	TUNER TUNED TO	ADJUST-MENT COIL & TRANS.	REMARKS
	CONNECT TO	FREQ.				
1	ANT Ter-minal	32 MHz (or 154 MHz)	J3	32 MHz (or 154 MHz)	L5 on front end	To get 32 MHz (or 154 MHz) signal.
2	"	"	"	"	L1, 2 on front end	Max reading on VTVM.
3	"	48 MHz (or 172 MHz)	"	48 MHz (or 172 MHz)	TR3 on front end	To get 48 MHz (or 172 MHz) signal.
4	"	"	"	"	TR1, 2 on front end	
5	Repeat step 1 to 4 until no further improvement can be obtain.					

-3 Crystal oscillator alignment

The crystal oscillator is completely prealigned and tested when shipped from the factory. Should realignment be necessary, the procedures listed below are to be followed:

LOW END T6 or T9, High End T5 or T10

FIG. 2

FIG. 2-4 DIAL STRING ASSEMBLY

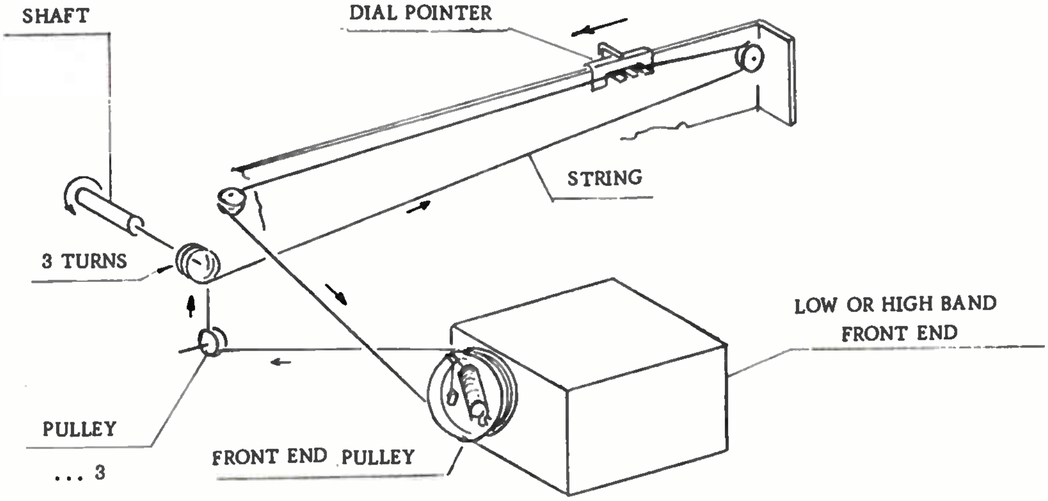


FIG. 3

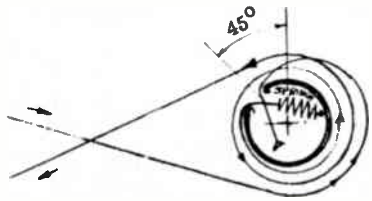
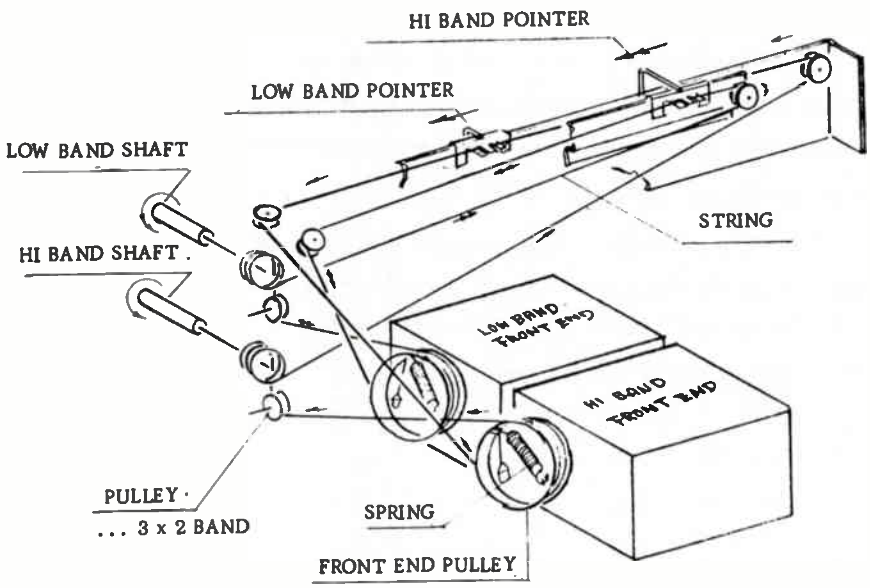


FIG. 3 SHOWN ENY OF HI/LOW BAND FRONT END PULLEY STARTING POINT WHEN DIAL POINTER IS ON THE LOWER FREQUENCY

FIG. 4



SEMICONDUCTORS

ITEM	TYPE NO.
D1	1S73
D2	1N34
	1S188 (1)
D3	1N34
	1S188 (1)
D4	1N34
	1S188 (1)
D5	1N34
	1S188 (1)
D6	ZB-9.5
D7	FR-1P
	FR-2P (1)
D8	FR-1P
	FR-2P (1)
Q1	2SC784
Q2	2SC784
Q3	CDC-5000C
Q4	2SC784
Q5	2SC371
Q6	2SC373
Q7	2SC373
Q8	2SC373
Q9	2SC373
Q10	2SB367
Q11	2SB367

(1) Used in some versions.

ELECTROLYTICS/VARIABLE CAPS

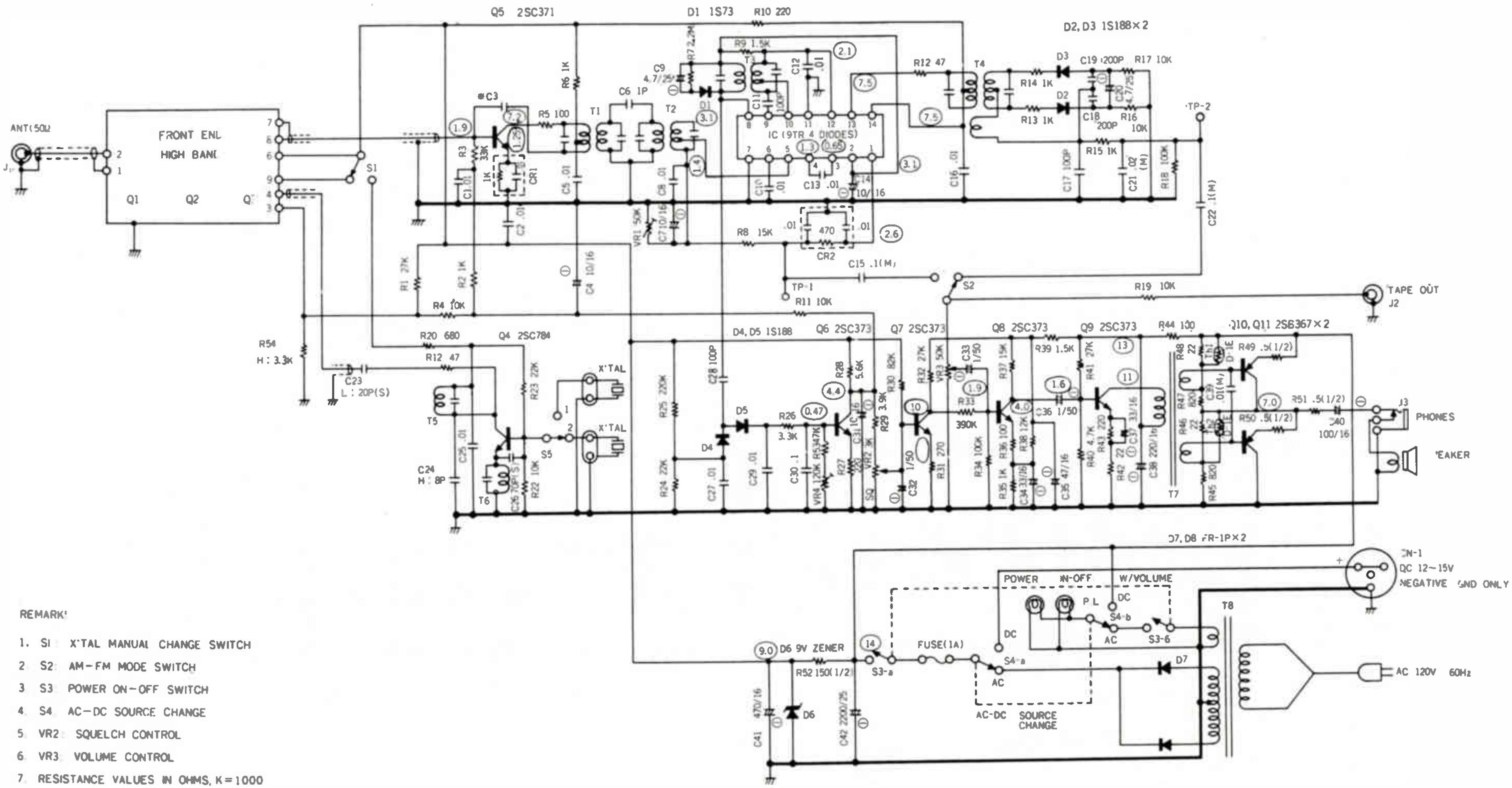
ITEM	VALUE	PART NO.
C4	10uF 16V	
C7	10uF 16V	
C9	4.7uF 25V	
C14	10uF 16V	
C20	4.7uF 25V	
C31	10uF 16V	
C32	1uF 50V	
C33	1uF 50V	
C34	33uF 16V	
C35	47uF 16V	
C36	1uF 50V	
C37	33uF 16V	
C38	220uF 16V	
C40	100uF 16V	
C41	470uF 16V	
C42	2200uF 25V	

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
TH1	Thermistor	D-1E
TH2	Thermistor	D-1E

COILS/TRANSFORMERS

ITEM	PART NO.
T1	R8822A
T2	R8822A
T3	R1626
T4	R8822D
T5	KEN8588HM2
T6	KXC8588HM2
T7	E2294
T8	R5219E



REMARK:

1. S1 X'TAL MANUAL CHANGE SWITCH
2. S2 AM-FM MODE SWITCH
3. S3 POWER ON-OFF SWITCH
4. S4 AC-DC SOURCE CHANGE
5. VR2 SQUELCH CONTROL
6. VR3 VOLUME CONTROL
7. RESISTANCE VALUES IN OHMS, K=1000
8. CAPACITANCE VALUES IN MF, P=MMF
9. RATING WILL REVISED FOR IMPROVEMENT.

FIG. 5 SCHEMATIC DIAGRAM FOR PRO-1

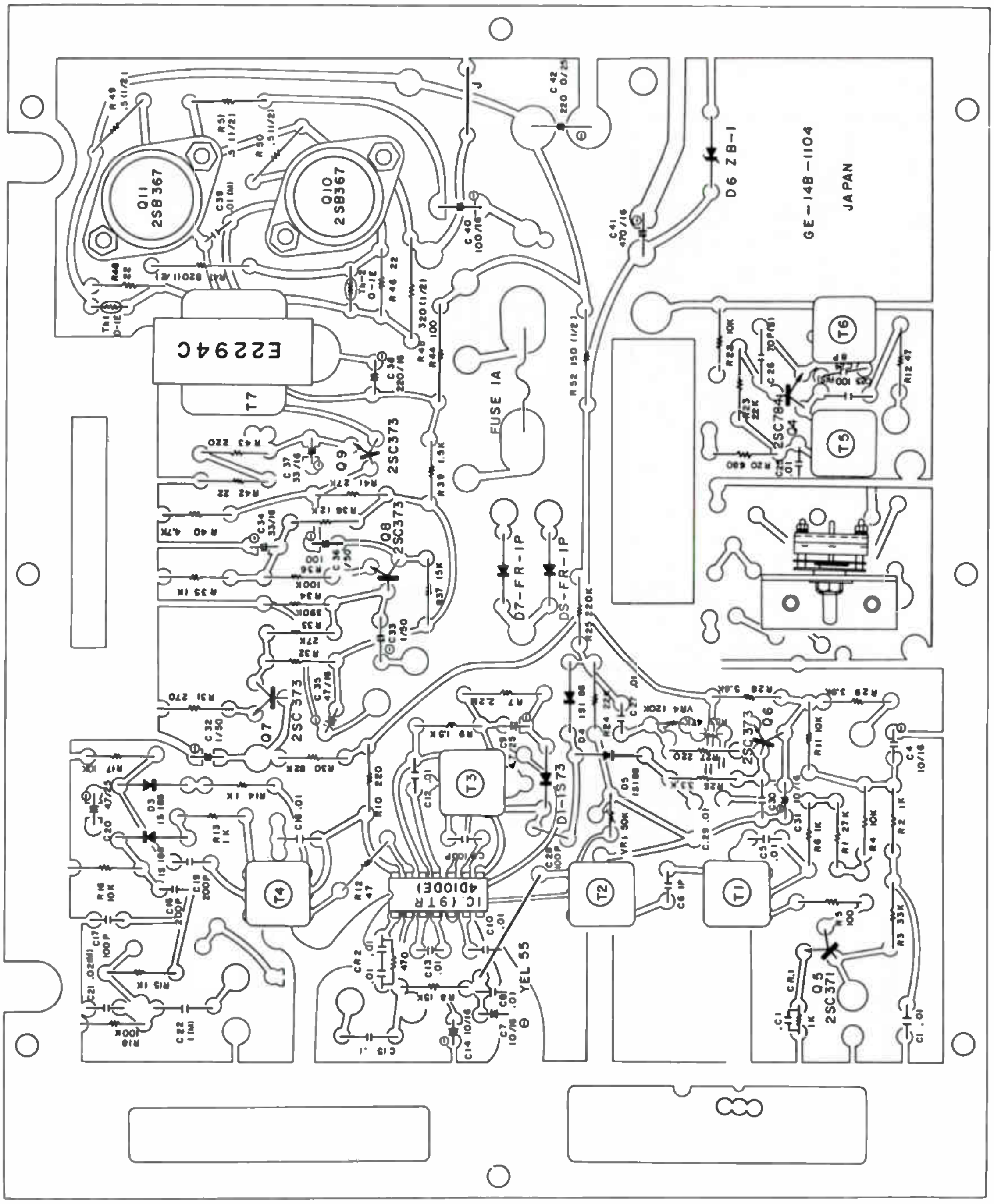


FIG. 6 PRINTED CIRCUIT BOARD TOP VIEW FOR PRO-1

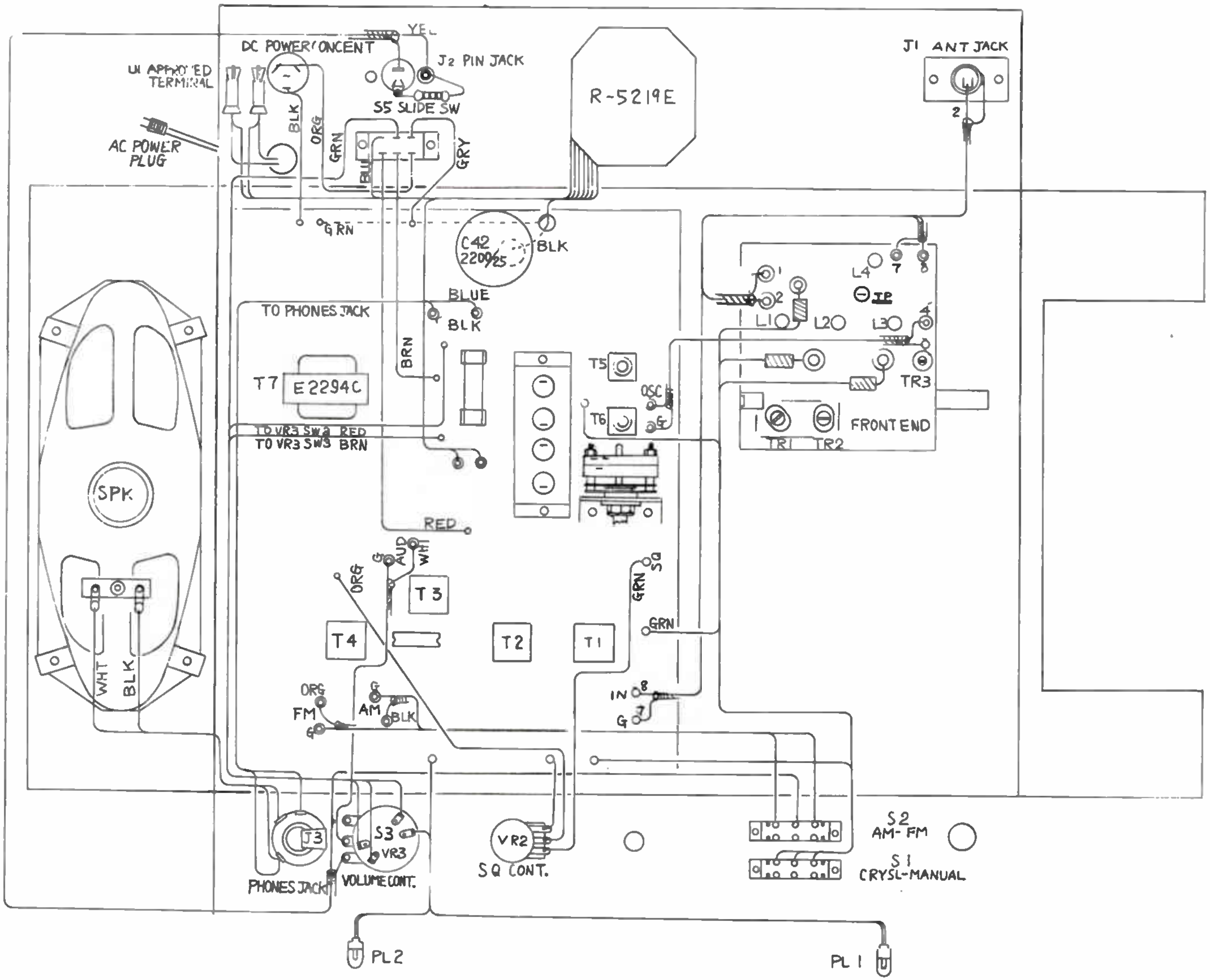


FIG. 9 WIRING DIAGRAM FOR PRO-1

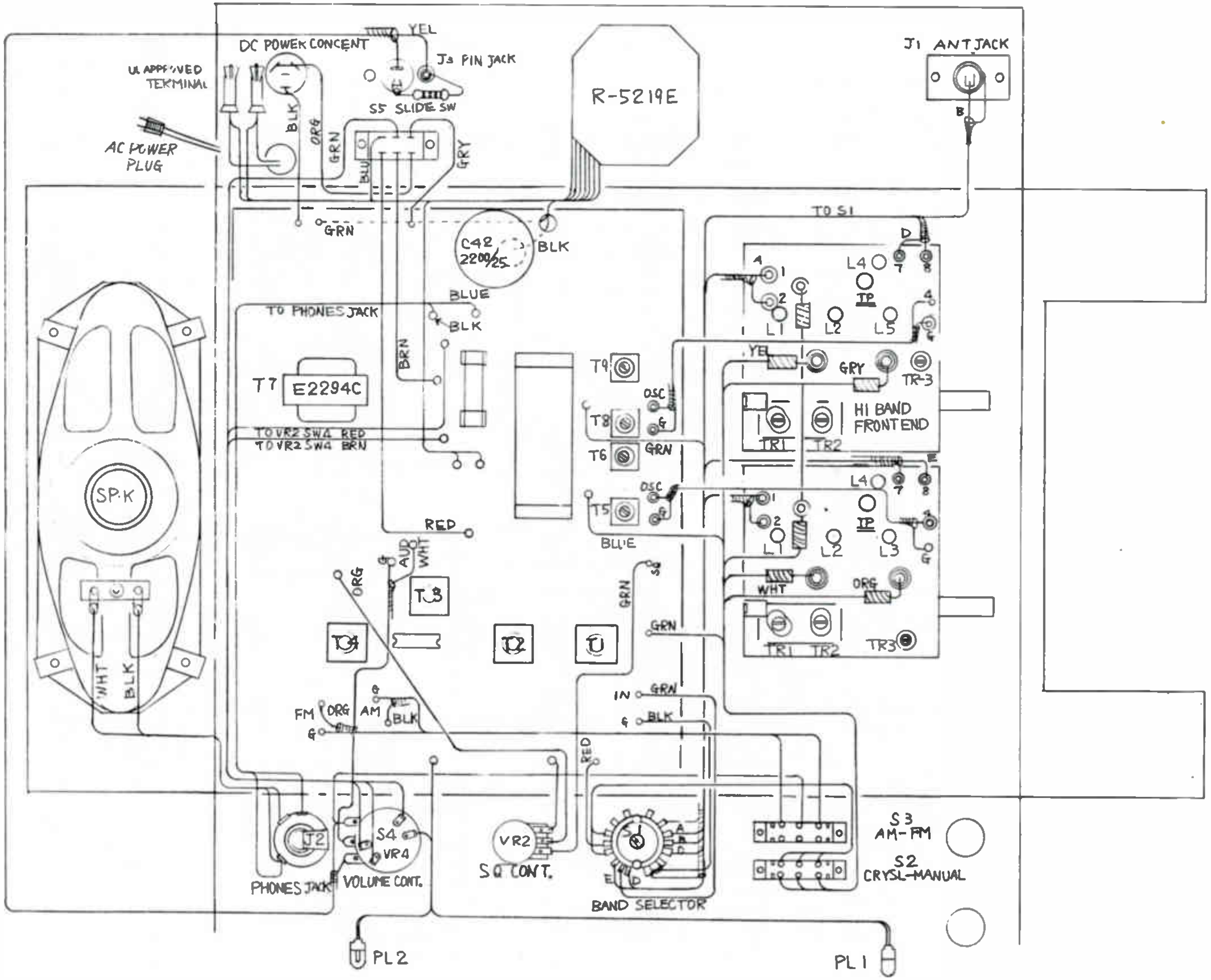
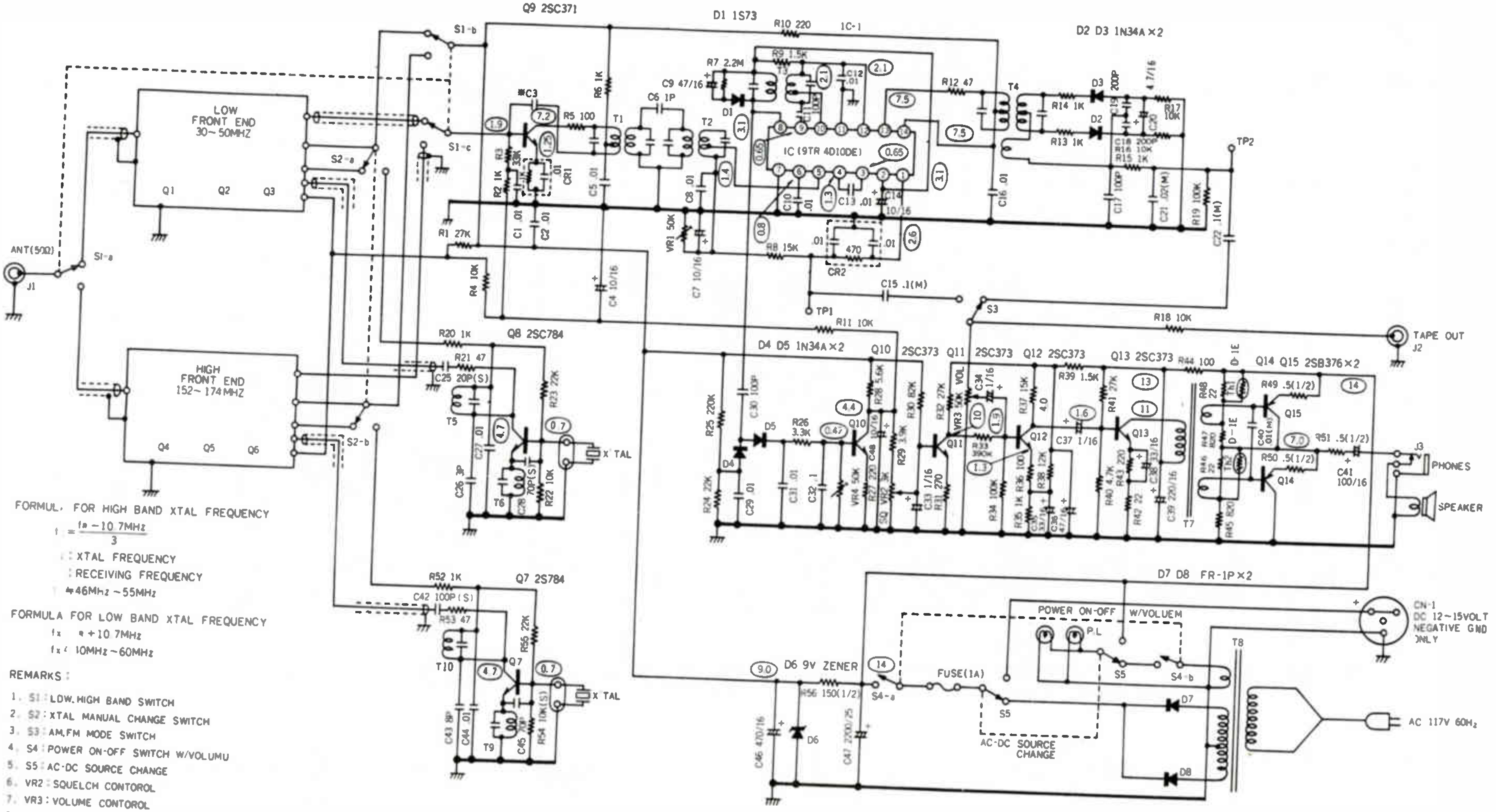


FIG. 14 WIRING DIAGRAM FOR PRO-2

FIG. 10 SCHEMATIC DIAGRAM FOR PRO-2



FORMUL. FOR HIGH BAND XTAL FREQUENCY

f : = (fe − 10 7MHz) / 3

: XTAL FREQUENCY

: RECEIVING FREQUENCY

≒46MHz ~ 55MHz

FORMULA FOR LOW BAND XTAL FREQUENCY

fx e + 10 7MHz

fx ≤ 10MHz ~ 60MHz

REMARKS :

1. S1 : LOW, HIGH BAND SWITCH
2. S2 : XTAL MANUAL CHANGE SWITCH
3. S3 : AM, FM MODE SWITCH
4. S4 : POWER ON-OFF SWITCH W/VOLUMU
5. S5 : AC-DC SOURCE CHANGE
6. VR2 : SQUELCH CONTOROL
7. VR3 : VOLUME CONTOROL
8. RESISTANCE VALUES IN OHMS K = 1000
9. CAPACITANCE VALUES IN MF P = MMF
10. VALUES OF RESISTANCE AND CAPACITANCE MAY BE REVISED FOR IMPROVEMENTS

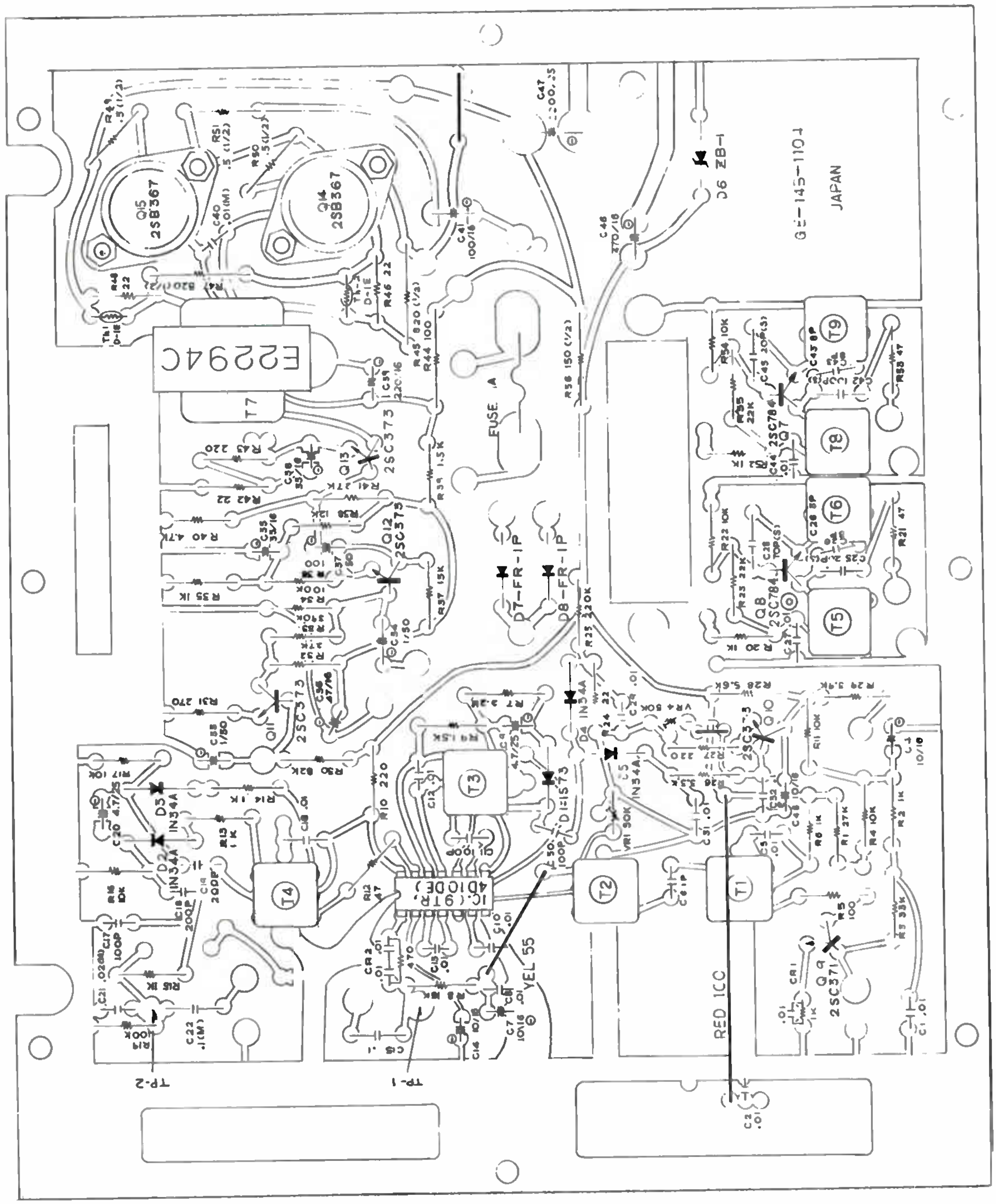


FIG. 11 PRINTED CIRCUIT BOARD TOP VIEW FOR PRO-2

SEMICONDUCTORS

ITEM	TYPE NO.
D1	1S73
D2	1N34
	1S188 (1)
D3	1N34
	1S188 (1)
D4	1N34
	1S188 (1)
D5	1N34
	1S188 (1)
D6	Z8-9.5
D7	FR-1P
	FR-2P (1)
D8	FR-1P
	FR-2P (1)
Q1	CDC-12000
Q2	CDC-5000
Q3	CDC-12000
Q4	2SC784
Q5	2SC784
Q6	CDC-5000C
Q7	2SC784
Q8	2SC784
Q9	2SC371
Q10	2SC373
Q11	2SC373
Q12	2SC373
Q13	2SC373
Q14	2SB367
Q15	2SB367

(1) Used in some versions.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C4	10uF 16V
C7	10uF 16V
C9	4.7uF 25V
C14	10uF 16V
C20	4.7uF 25V
C33	1uF 50V
C34	1uF 50V
C35	33uF 16V
C36	47uF 16V
C37	1uF 50V
C38	33uF 16V
C39	220uF 16V
C41	100uF 16V
C46	470uF 16V
C47	2200uF 25V
C48	10uF 16V

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
TH1	Thermistor	D-1E
TH2	Thermistor	D-1E

COILS/TRANSFORMERS

ITEM	PART NO.
T1	R8822A
T2	R8822A
T3	R1626
T4	R8822D
T5	KEN8588HM2
T6	KXC8588HM2
T7	E2294
T8	R5219E
T9	KXC8588HM2
T10	KEN8588HM2

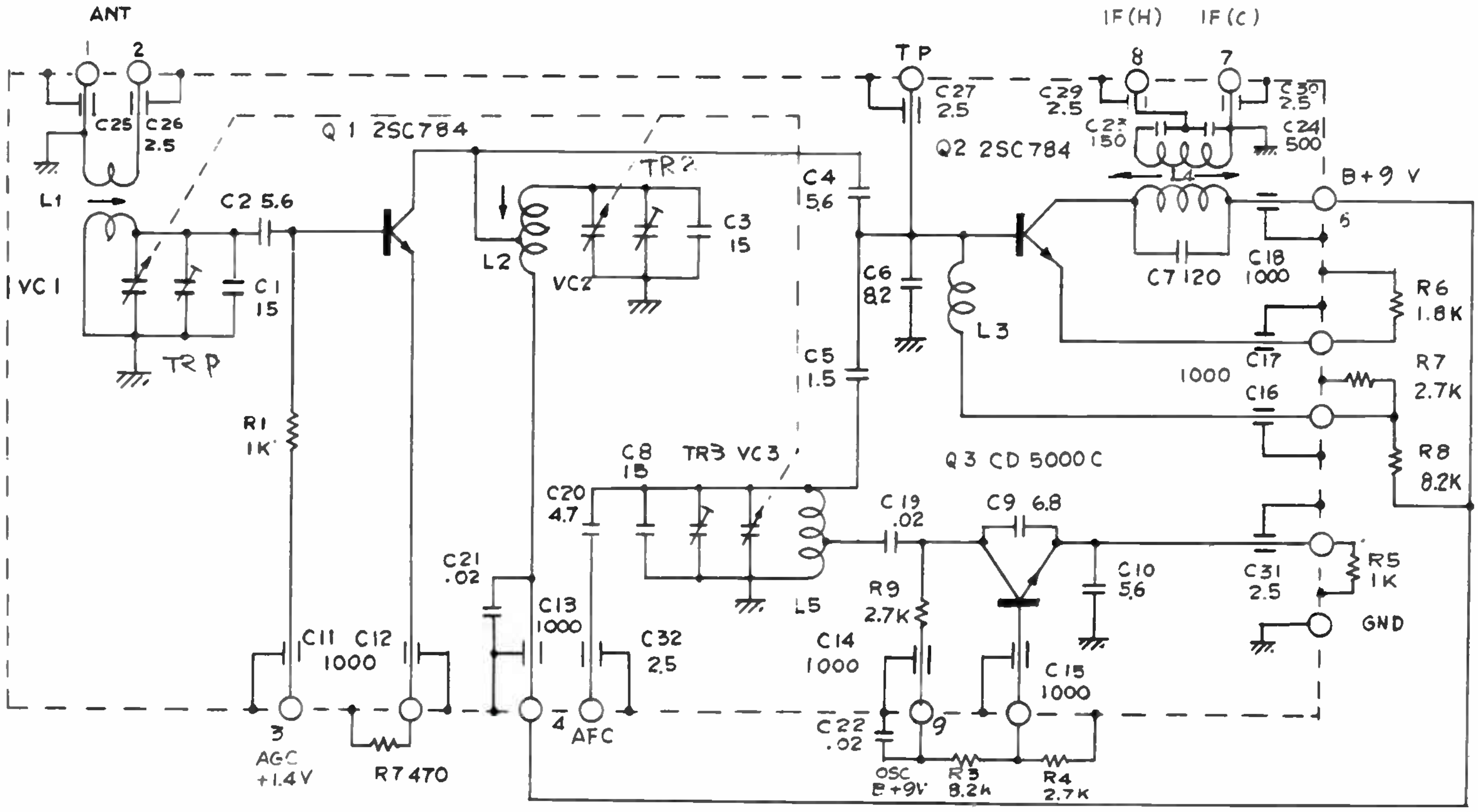


FIG. 15 SCHEMATIC DIAGRAM FOR HIGH BAND FRONT END

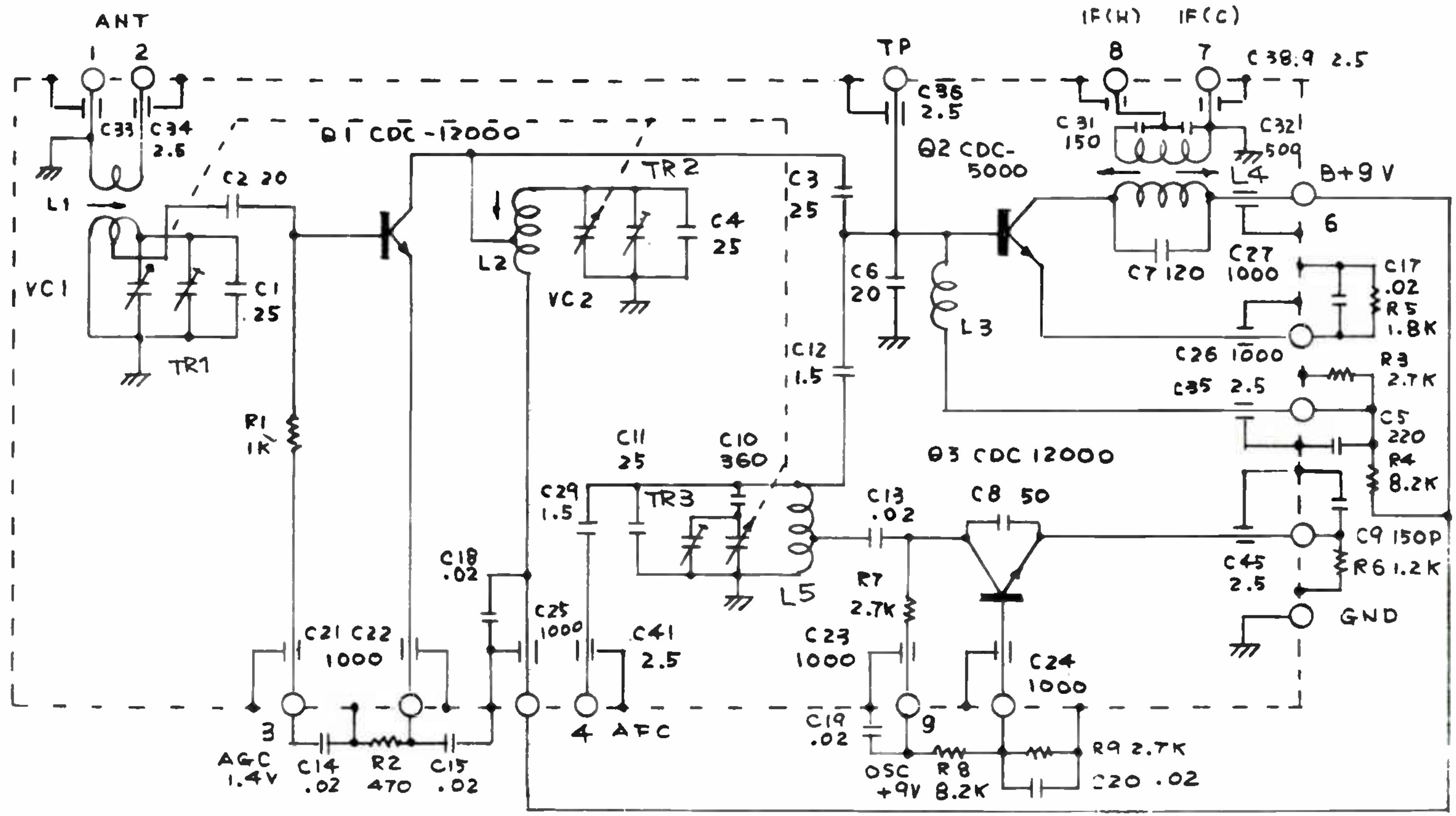


FIG.16 SCHEMATIC DIAGRAM FOR LOW BAND FRONT END

Pages 65-72 Courtesy of RADIO SHACK

HECK FREQUENCY OF THE ECOND LOCAL OSCILLATOR

Step 1: Connect Frequency Counter through a 10 pF capacitor to Q2 emitter circuit.

Step 2: Read frequency on the Frequency Counter. Normal: 10.245MHz ± 1 kHz.

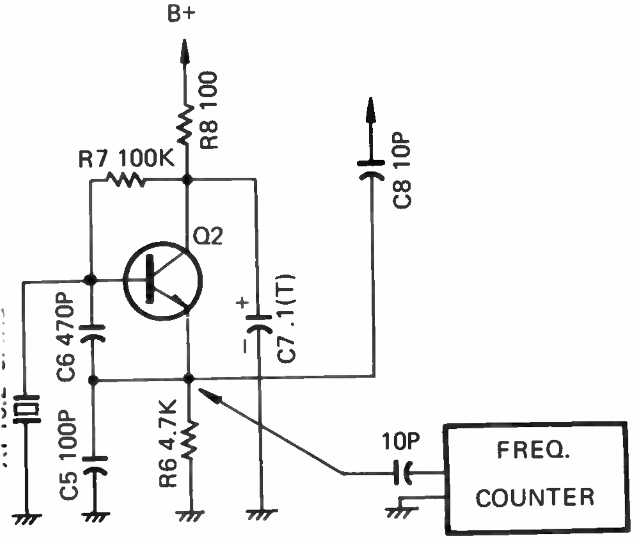


Figure 7. DIAGRAM

SENSITIVITY MEASUREMENT

Step 1: Connect the signal generator to the antenna input and the AC voltmeter to the speaker terminals.

Step 2: Turn the SQUELCH control fully counter-clockwise. With the generator at minimum output and with no modulation, adjust the VOLUME control on the set for a 0 dB (0.775 volts) reading on the AC voltmeter.

Step 3: Increase the output of the signal generator to obtain a reading of −20 dB on the AC voltmeter. The generator output now equals the 20 dB quieting sensitivity.

Step 4: Tune the PRO-5 to the frequency of the signal generator (or vice versa).

Step 5: Turn the VOLUME control fully clockwise. Set the signal generator for no modulation and minimum output.

Step 6: Adjust the VOLUME control so that the output noise level shows 0 dB (0.775 volt) on the AC-V.T.V.M.

Step 7: Increase the output level of the signal generator so that the signal output is 20 dB below the noise output level. The S.G. output is now equal to the 20 dB noise quieting figure of the set.

GENERAL ALIGNMENT

Test equipment required:

1. Oscilloscope
2. Slow sweep generator with variable marker (10.7 MHz)
3. UHF sweep generator with variable marker (450 – 470 MHz)
4. RF frequency counter (10 – 60 MHz)
5. AC V.T.V.M.
6. DC V.T.V.M.
7. 16 ohm dummy load

NOTE: Use a non-metallic tool.
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

IF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 2.

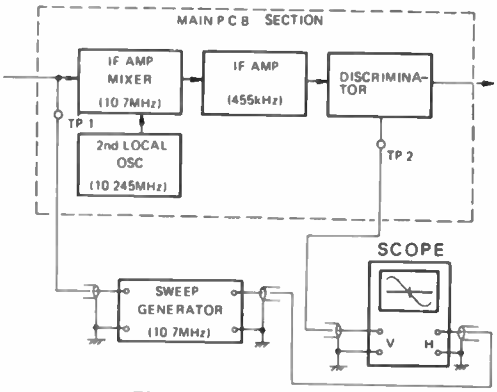


Figure 2. IF TEST SETUP

Step 2: Maintain sweep generator output at a low level to prevent overloading.

Step 3: For best linearity, adjust IF Section T2, T3 so that the 455 kHz marker is in the center of the discriminator curve as shown in Figure 3.

NOTE: Adjust T1 for maximum sensitivity after adjustment of IF and RF sections.

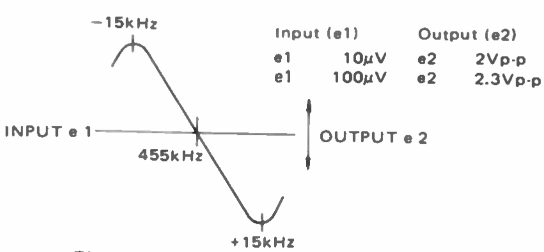


Figure 3. IF DISCRIMINATOR CURVE

NOTE: Check to be sure 2nd Local Oscillator (10.245 MHz) is operating.

RF SECTION ALIGNMENT

Step 1: Connect the instruments as shown in Figure 4.

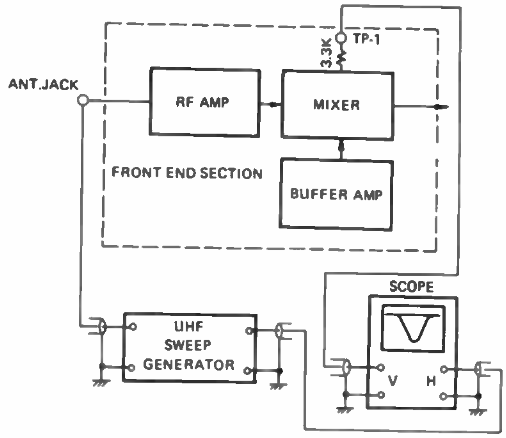


Figure 4. RF TEST SETUP

Step 2: Adjust TC1, TC2 and TC3 of RF Section for maximum output and best curve symmetry as shown in Figure 5.

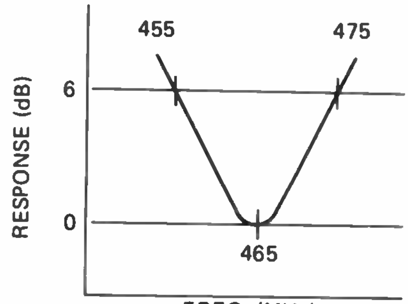


Figure 5. RF CHARACTERISTIC CURVE

LOCAL OSCILLATOR CHECK

Step 1: Insert all crystals in sockets.

Step 2: Couple the frequency counter thru a pick-up coil to oscillator coil T5. Refer to Figure 6.

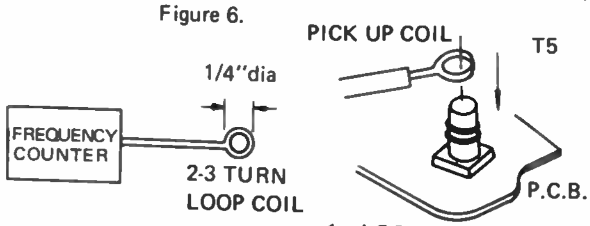


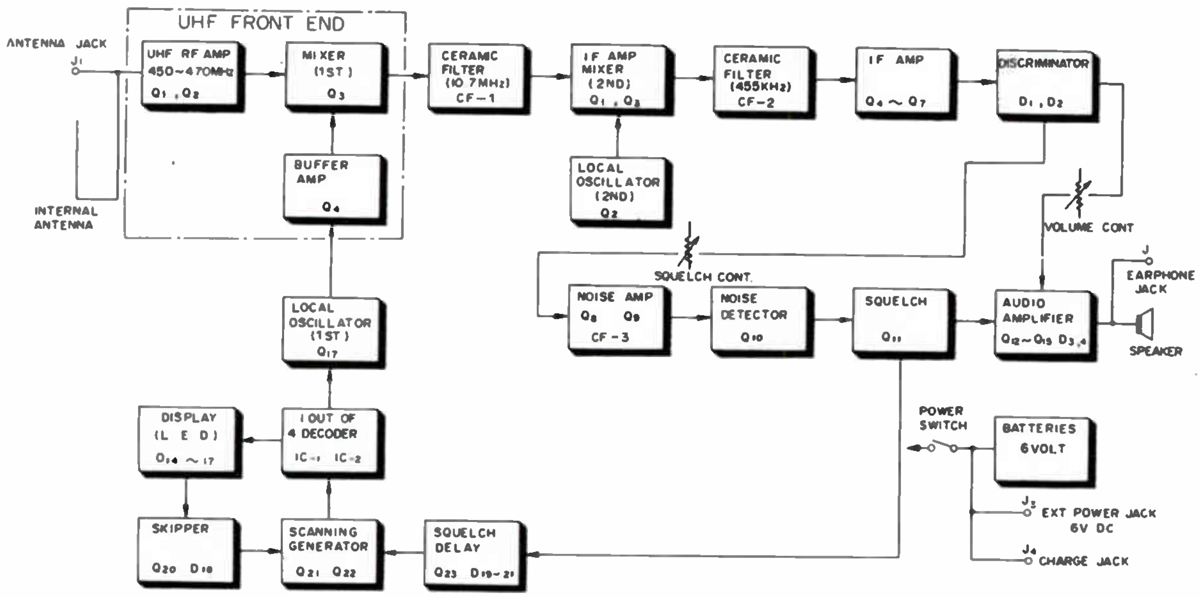
Figure 6. 1ST LOCAL OSCILLATOR

Step 3: Check if this crystal is oscillating.

NOTE: Crystal Frequency Calculation.
The crystal frequencies are obtained by the following formula; Frequency (MHz) = (Fr – 10.7)/9.
Where Fr is the desired receive frequency, in MHz.

BLOCK DIAGRAM

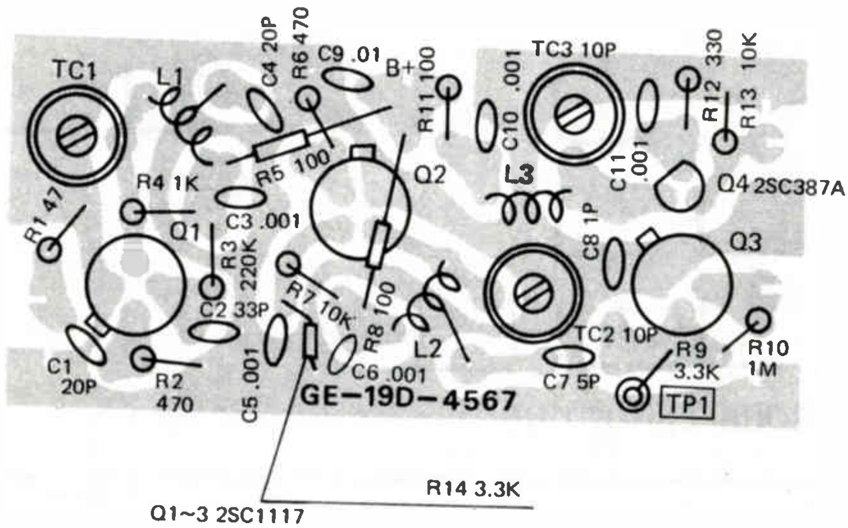
Realistic Patrolman PRO-5 (20-169)



TROUBLESHOOTING

Symptom	Possible Cause
1) Light Emitting Diode (L.E.D.) does not light and no sound is audible. Power SW : On VOLUME : Maximum Channel SW : On	A) Defective Battery. B) Defective On-Off Switch on VOLUME Control. C) Power Circuit Disconnected or Shorted.
2) L.E.D. Lights but no sound. Channel SW : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Defective Earphone jack. B) Defective Speaker. C) Faulty Q12, 13, 14 and Q15 or Faulty Component in these stages.
3) Sounds but L.E.D. does not light. Channel SW : On SQUELCH : Off (Minimum) VOLUME : Maximum	A) Faulty L.E.D. P.C. Board Assembly + B supply. B) Defective L.E.D. C) Faulty Channel Switch. D) Defective IC-1.
4) No Sound through Earphone.	A) Defective Earphone jack. B) Defective Earphone.
5) Does not scan and SQUELCH does not operate.	A) Faulty Noise Amplifier or Faulty Noise Detector Circuit Component. B) Defective RF or IF Amplifier. C) Defective Battery.
6) Does not scan but SQUELCH operates normally.	A) Defective Auto/Manual Switch. B) One of Transistors Q21 to Q23 defective. C) Either IC-1 or IC-2 defective. D) One of Circuit component parts faulty.
7) Manual Selector does not operate.	A) Defective Auto/Manual Selector Switch. B) Either Q21 or Q22 defective. C) Either IC-1 or IC-2 defective. D) One of Circuit component parts faulty.
8) Skipper Circuit does not operate.	A) Faulty Transistor Q20 or Faulty Circuit component part.
9) Only scan channels 1 and 2 or channel 3 and 4.	A) Defective IC-2.
10) L.E.D. of one or two channels does not light when channel switch is on.	A) Defective IC-1. B) Defective Channel Switch. C) Defective L.E.D.
11) Noise can be heard but does not receive.	A) Wrong Channel Crystal or faulty Crystal. B) Defective RF Amplifier Circuit. C) Defective IF Amplifier Circuit. D) Defective 1st or 2nd Local Oscillator Circuit. E) Weak Battery.
12) Low sensitivity.	A) Weak Battery. B) Crystal frequency not covering the correct channel. C) Defective RF and IF Amplifiers. D) Retune front end higher or lower to obtain optimum.

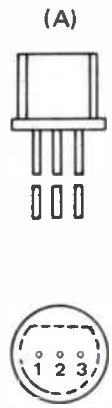
UHF FRONT END P.C. BOARD (TOP VIEW)



SEMICONDUCTOR LEAD IDENTIFICATION

(A): 2SA562(Y)
2SC372(O)
2SC373
2SC387(A)
2SC394(Y)
2SC735(Y)

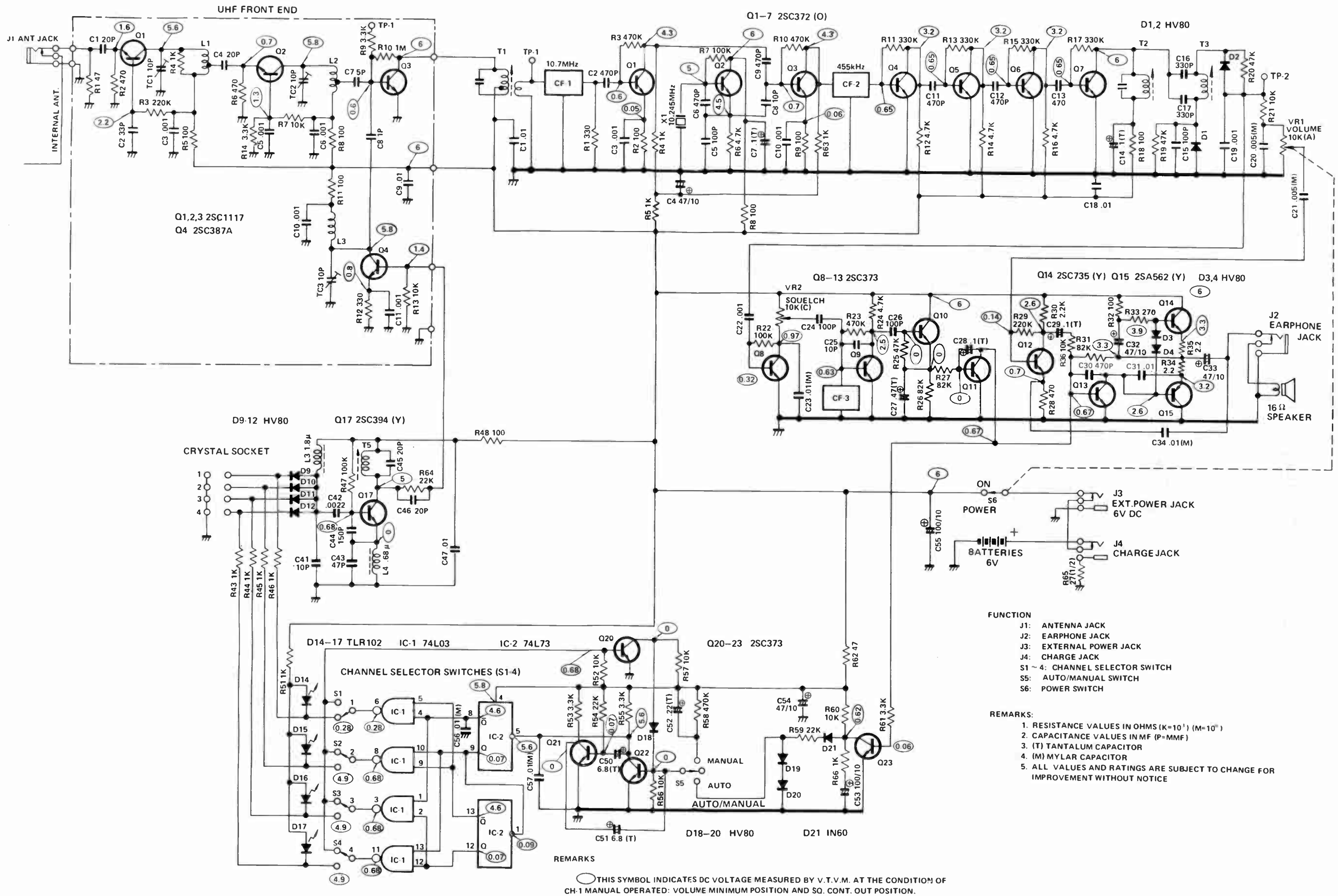
(B): 2SC1117

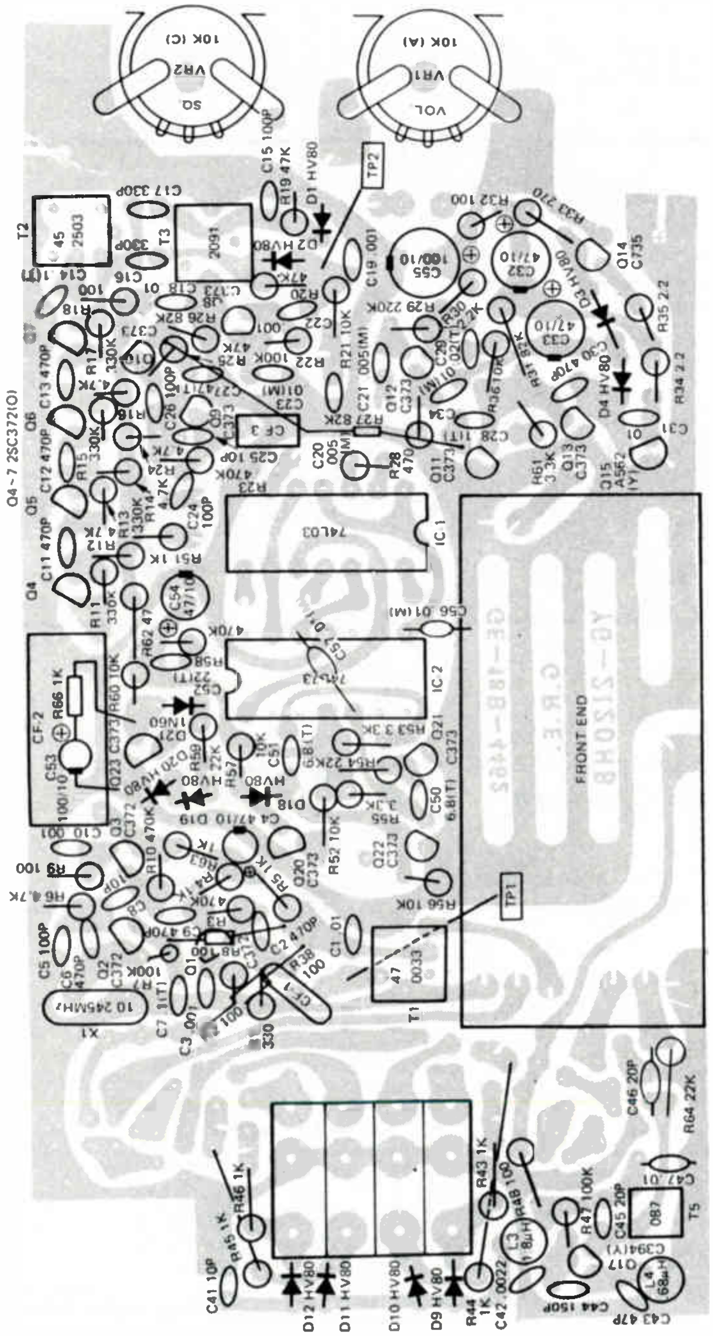


1.Emitter
2.Collector
3.Base

1.Emitter
2.Base
3.Collector
4.Shield

SCHEMATIC DIAGRAM





MAIN P.C. BOARD (TOP VIEW)

SEMICONDUCTORS

ITEM	TYPE NO.
MAIN BOARD	
D1	HV-80
D2	HV-80
D3	HV-80
D4	HV-80
D9	HV-80
D10	HV-80
D11	HV-80
D12	HV-80
D14	TLR102
D15	TLR102
D16	TLR102
D17	TLR102
D18	HV-80
D19	HV-80
D20	HV-80
D21	1N60
IC1	SN74L03N
IC2	SN74L73N
Q1	2SC372(O)
Q2	2SC372(O)
Q3	2SC372(O)
Q4	2SC372(O)
Q5	2SC372(O)
Q6	2SC372(O)
Q7	2SC372(O)
Q8	2SC373
Q9	2SC373
Q10	2SC373
Q11	2SC373
Q12	2SC373
Q13	2SC373
Q14	2SC735(Y)
Q15	2SA562(Y)
Q17	2SC394(Y)
Q20	2SC373
Q21	2SC373
Q22	2SC373
Q23	2SC373
UHF FRONT END	
Q1	2SC1117
Q2	2SC1117
Q3	2SC1117
Q4	2SC387A

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C4	47uF 10V	CE04W1A470
C7	0.1uF 35V	CS15E1VOR1-M
C14	0.1uF 35V	CS15E1VOR1-M
C27	0.47uF 35V	
C28	0.1uF 35V	CS15E1VOR1-M
C29	0.1uF 35V	CS15E1VOR1-M
C32	47uF 10V	CE04W1A470
C33	47uF 10V	CE04W1A470
C50	6.8uF 6.3V	CS15E0J6R8
C51	6.8uF 6.3V	CS15E0J6R8
C52	0.22uF 35V	
C53	100uF 10V	CE04W1A101
C54	47uF 10V	CE04W1A470
C55	100uF 10V	CE04W1A101
TC1	Trimmer	ECV-1ZW10X51
TC2	Trimmer	ECV-1ZW10X51
TC3	Trimmer	ECV-1ZW10X51

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	Volume Control, 10K	P-1493
VR2	Squelch Control, 10K	P-1492

COILS/TRANSFORMERS

ITEM	PART NO.
MAIN BOARD	
L3	LF4-1R8K
L4	EL0606-R68M
T1	119LC-470033N3
T2	7MC452503N4
T3	7MC2091N
UHF FRONT END	
L1	4LNE-088
L2	4LNE-088
L3	4LNE-088

MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	Filter	CA-2911
CF2	Ceramic Filter	C-0577
CF3	Ceramic Filter	C-0578
X1	Crystal, 10.245MHz	HC-18/U
	PC Board, Main	GE-188-4462

CABINET PARTS

NAME	PART NO.
Case, Upper	Z-2183
Case, Bottom	Z-2184
Escutcheon	Z-2182
Front Panel	Z-2185

Pages 73-82 Courtesy of RADIO SHACK

GENERAL ALIGNMENT

Test equipment required:

1. VHF signal generator (120-200 MHz)
2. RF frequency counter (10-60 MHz)
3. V.T.V.M.
4. Oscilloscope
5. 8 ohm dummy load.

NOTE: Use a non-metallic tool.
The test equipment should be warmed up at least 1 hour before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.
See PCB Illustrations for Alignment points.

RF AND IF ALIGNMENT

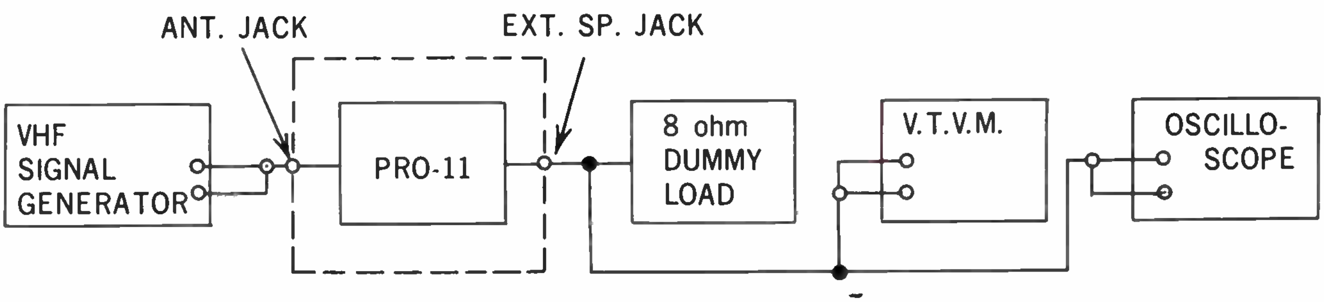


Figure 3 RF ALIGNMENT CONNECTION DIAGRAM

STEP 1. Connect the instruments as shown in Figure 3.
STEP 2. Insert a crystal for 156 MHz in CH. 1 socket.
STEP 3. Set Signal Generator to 156 MHz.
STEP 4. Adjust L101, L102, L103, L104, L110 and T101 for maximum output and best signal-to-noise ratio.
STEP 5. Confirm that the unit has been peaked for maximum at 156 MHz.
STEP 6. Adjust R532 for squelch open with 1.5μV input.

SENSITIVITY MEASUREMENT

STEP 1. Connect the instruments as shown in Figure 3.

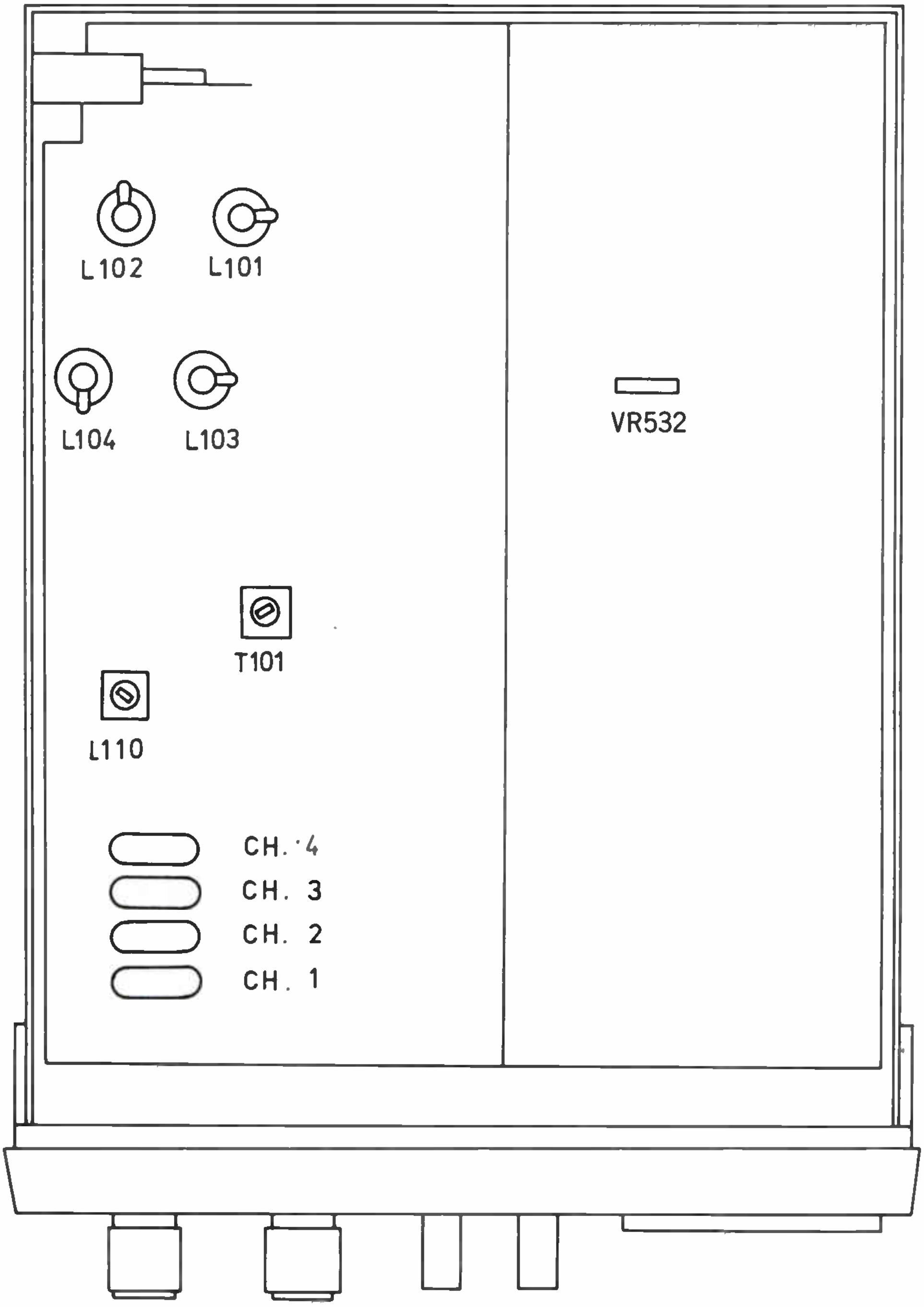
STEP 2. Insert a crystal for 156 MHz in CH. 1 socket.
Depress the channel select switch to activate CH. 1.

STEP 3. Turn the SQUELCH control fully counterclockwise, and set the signal generator to 156 MHz (1 kHz modulation, 3.5 kHz deviation).

STEP 4. Increase the output of the signal generator and adjust the VOLUME control to obtain a reading of 0.774 volts (0 dB) on the V.T.V.M.

STEP 5. Turn off the modulation of the signal generator, and adjust signal generator output to obtain a reading of –20dB on the V.T.V.M.
The generator output now equals the sensitivity at the 20 dB signal-to-noise ratio point.

ALIGNMENT POINT (CHASSIS LAYOUT)



CHECKING LOCAL OSCILLATOR

STEP 1. Insert all crystal in sockets.
STEP 2. Couple the frequency counter thru a pickup coil to oscillator coil L111. Refer to Figure 4

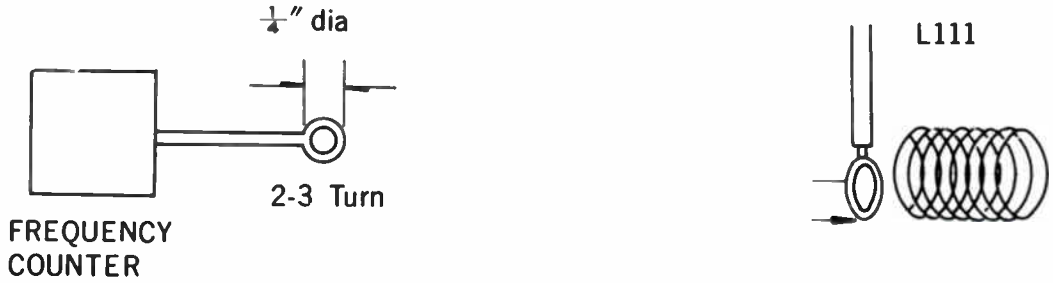


Figure 4 1st LOCAL OSCILLATOR

CHECK FREQUENCY OF THE SECOND LOCAL OSCILLATOR

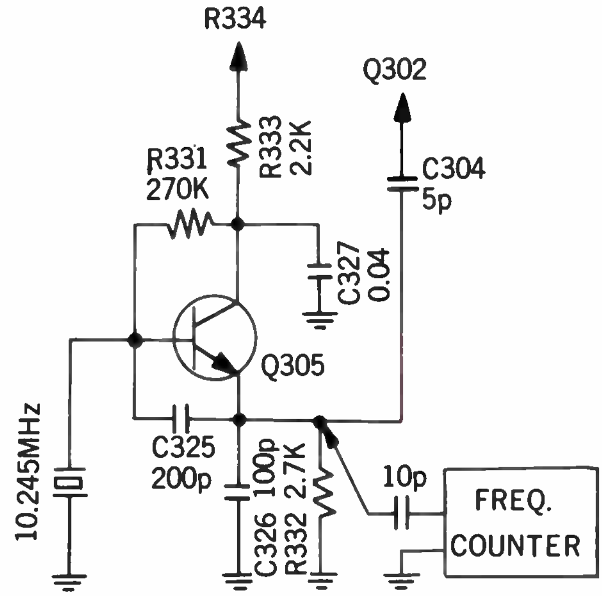


Figure 5 2ND LOCAL OSCILLATOR

STEP 1. Connect Frequency Counter through a 10 pf capacitor to Q305 emitter.
STEP 2. Read frequency on the Frequency Counter.
Normal: 10.245 MHz ±0.7 kHz

NOTE: Crystal Frequency Calculation
The Crystal frequencies are obtained by the following formula: Frequency(MHz) = (Fr-10.7)/3.
Where Fr is the desired receive frequency, in MHz.

TROUBLE SHOOTING

Symptom	Possible Cause
1) LED (Light Emitting Diode, D105 to D108) doesn't light and no sound. VOLUME : MAX. CHANNEL 1 : IN SQUELCH : OFF (non squelch)	A) Blown FUSE B) Defective ON-OFF switch in VOLUME control C) Regulator Q702 circuit broken or shorted
2) LED lights but no sound. VOLUME : MAX. SQUELCH : OFF (non squelch)	A) Defective EXT. speaker socket or speaker B) Faulty component part in Audio amp. or IF amp. circuit
3) Noise sound but can't receive desired signal and LED does not light. VOLUME : MAX. SQUELCH : OFF (non squelch) CHANNEL 1 : IN	A) Faulty LED and/ or defect in LED PC Board B) Faulty IC502 C) Short or open in L115–L118 D) Defective D101–D104 E) Defective X'tal socket
4) No sound through EXT. SP. socket	A) Defective EXT. SP. Socket
5) Doesn't scan and SQUELCH doesn't operate. SCAN/SELECT : SCAN SQUELCH : ON (tight)	A) Defective VR501 (SQ), VR532 B) Faulty component part in Noise amp. or Noise Detector circuit C) Faulty Transistor Q503, Q504. D) Faulty component part in IF amp. circuit.
6) Doesn't scan but SQUELCH operates normally. SCAN/SELECT : SCAN CHANNEL 1 : IN SQUELCH : ON (tight)	A) Faulty Transistor Q505, Q506 B) Either Transistor Q507 or Q508 defective C) Defective SCAN/SELECT switch D) Faulty IC 501
7) Manual selector doesn't operate. SCAN/SELECT : SELECT	A) Defective SCAN/SELECT selector switch
8) Delay doesn't operate.	A) Faulty Transistor Q505 or capacitor C509
9) Only scans channel 1, 2 or channel 3, 4. SCAN/SELECT : SCAN CHANNEL 1 : IN SQUELCH : ON (tight)	A) Faulty IC 501
10) Noise sound can be heard and LED lights but can't receive desired signal.	A) Defective X'tal socket B) Faulty component part in RF amp. or 1st MIXER circuit C) Faulty component part in 1st, 2nd local OSC. or 2nd MIXER circuit
11) Low sensitivity	A) Faulty component part in RF amp. or IF amp. circuit B) X'tal Frequency not covering the correct channel
12) Mixed reception	A) X'tal not set to proper receiving frequency

NOTE: For optimum sensitivity, use crystal frequencies within the specified band coverage.
For reception outside of the optimum frequency range, you can realign for best reception either above or below the specified optimum range. For best sensitivity at any one frequency, align for that one frequency.

SEMICONDUCTORS

ITEM	TYPE NO.
D101	1S1587
D102	1S1587
D103	1S1587
D104	1S1587
D105	SLP115RA
D106	SLP115RA
D107	SLP115RA
D108	SLP115RA
D301	1S188
D302	1S188
D501	1S188
D502	1S188
D503	1S1588
D504	1S1588
D505	1S188
D701	XZ-100
D702	DS-130
IC301	TA7061
IC501	LB2000
IC502	LB2000
IC701	uPC575C2
Q101	3SK44W
Q102	2SC1394L
Q105	2SC930D
Q301	2SC930D
Q302	2SC930D
Q303	2SC930C
Q304	2SC930C
Q305	2SC930C
Q501	2SC945R
Q502	2SC945R
Q503	2SC945R
Q504	2SC945R
Q505	2SC945R
Q506	2SC945R
Q507	2SC711E
Q508	2SC711E
Q701	2SC536F
Q702	2SC1096K,L

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C317	0.22uF 10V	
C320	0.22uF 10V	
C321	0.22uF 10V	
C329	0.22uF 10V	
C502	33uF 10V	
C505	1uF 10V	
C506	0.47uF 10V	
C507	0.47uF 10V	
C508	0.47uF 10V	
C509	100uF 10V	
C511	1uF 10V	
C512	1uF 10V	
C515	1uF 10V	
C516	33uF 10V	
C702	1uF 10V	
C703	33uF 10V	
C704	0.1uF 10V	
C705	2.2uF 10V	
C706	100uF 10V	
C707	33uF 10V	
C709	220uF 10V	
C710	0.1uF 10V	
C711	220uF 10V	
C712	220uF 10V	
C713	470uF 16V	

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR501	Squelch Control, 10K	4-222T328
VR532	Semi-Fixed, 20K	4-222R757
VR701	Volume Control, 10K	4-222R040A

COILS/TRANSFORMERS

ITEM	PART NO.
L101	4-257R803
L102	4-257R803
L103	4-257R812
L104	4-257R803
L110	4-259R820
L111	4-265R106
L115	4-253R701
L116	4-253R701
L117	4-253R701
L118	4-253R701
L501	R-W1862
L701	4-255R806
T101	4-256R725
T301	4-256R724

MISCELLANEOUS

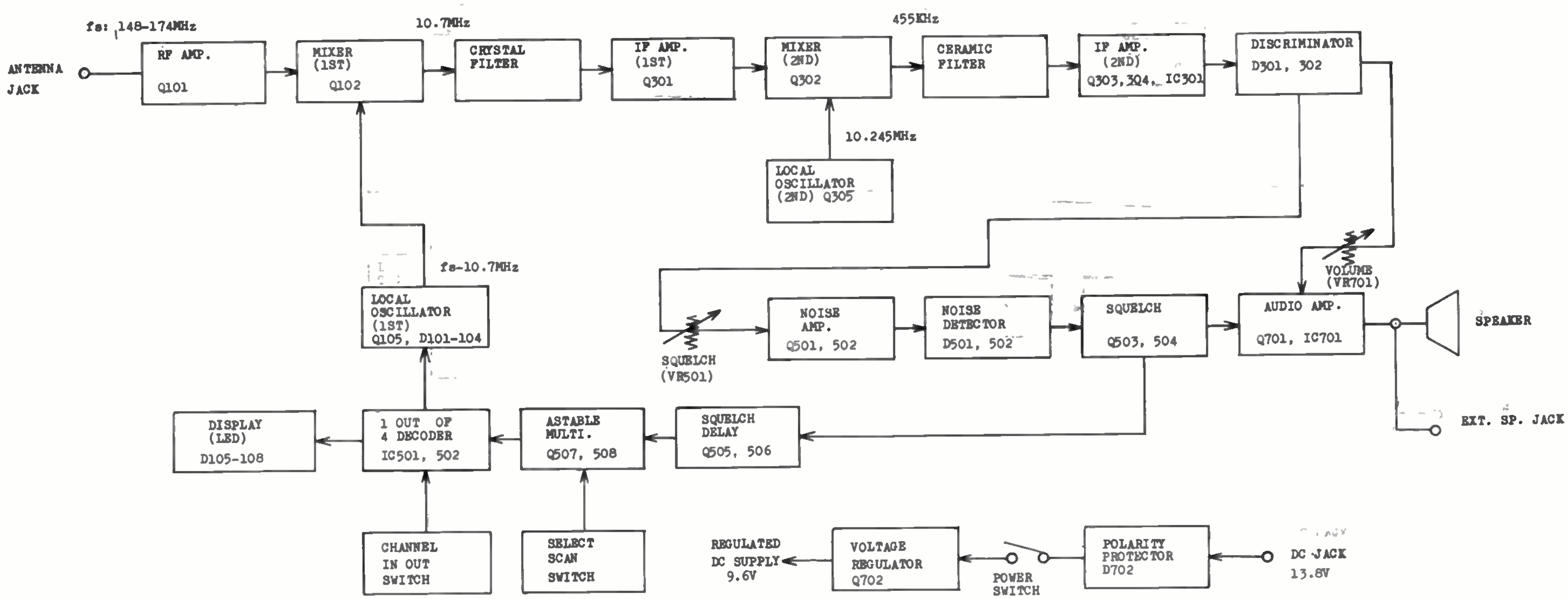
ITEM	NAME	PART NO.
HF301	Crystal Filter	4-253R903
		4-253R90371 (1)
HF302	Ceramic Filter	4-253R906
HF303	Ceramic Filter	4-253R908
SW1	Switch	4-231R179A
SW2	Switch	4-231R953
	Crystal, 10.245MHz	4-225R802
	Fuse, 1.5A	4-234R102

(1) Used in some versions.

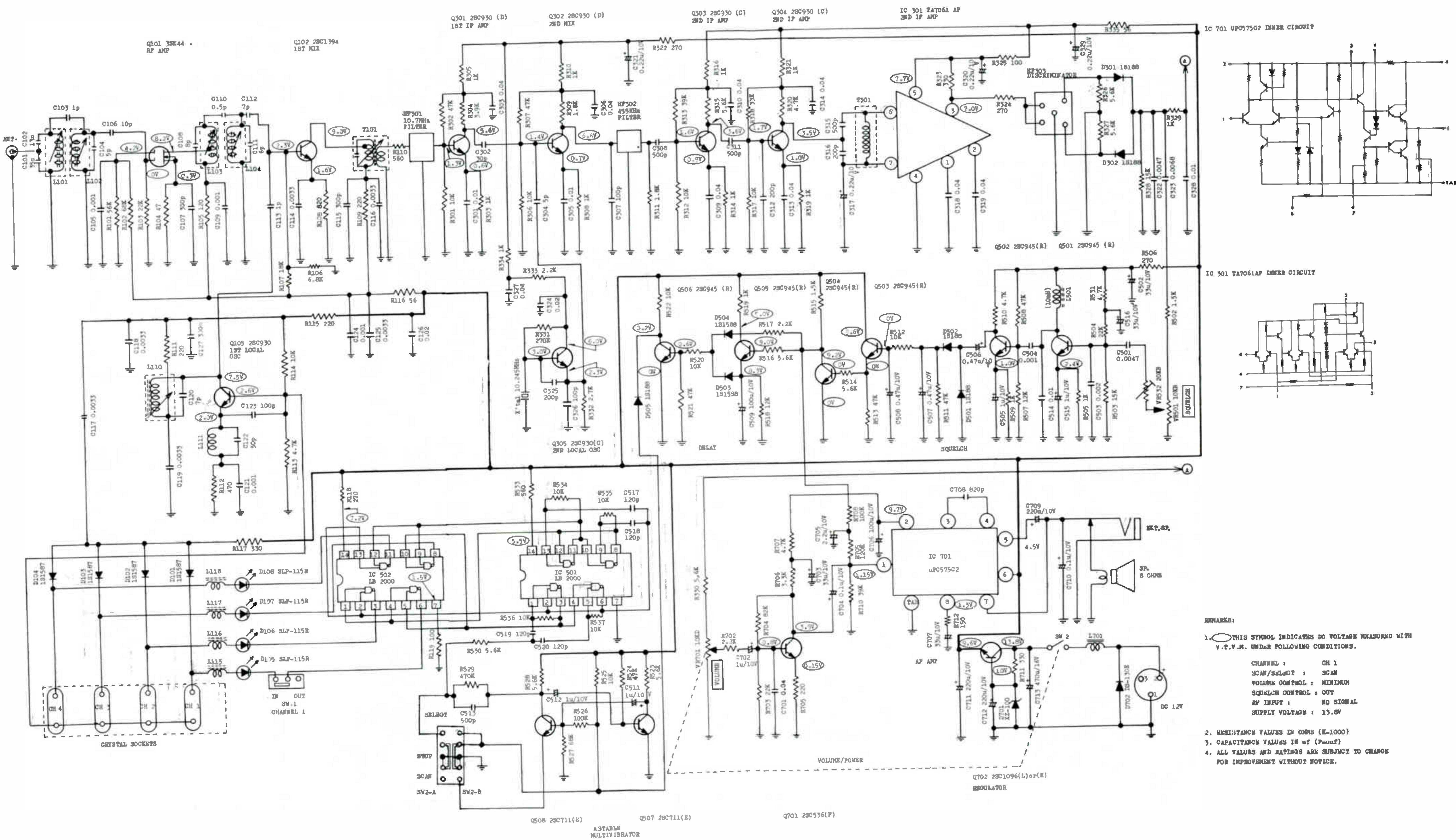
CABINET PARTS

NAME	PART NO.
Cabinet	176-2-111R130A
Front Panel	176-2-122R117
Back Lid	176-2-126R127A

BLOCK DIAGRAM



SCHEMATIC DIAGRAM



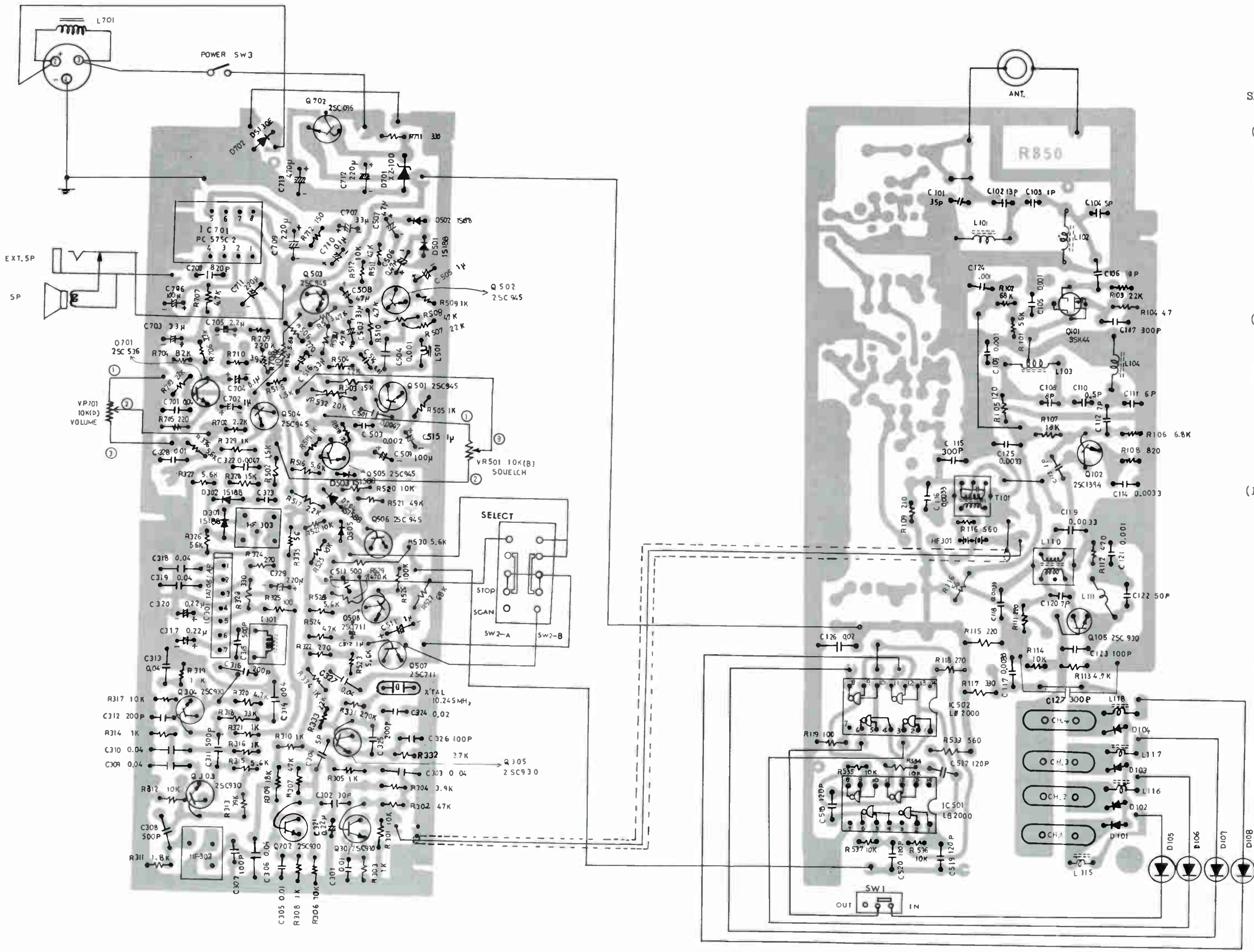
REMARKS:

1. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH V.T.V.M. UNDER FOLLOWING CONDITIONS.

CHANNEL :	CH 1
SCAN/SELECT :	SCAN
VOLUME CONTROL :	MINIMUM
SQUELCH CONTROL :	OUT
RF INPUT :	NO SIGNAL
SUPPLY VOLTAGE :	13.8V

2. RESISTANCE VALUES IN OHMS (K=1000)
3. CAPACITANCE VALUES IN uf (P=uuf)
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

CIRCUIT BOARD DIAGRAM (BOTTOM VIEW)



SEMICONDUCTOR IDENTIFICATION (Bottom View)

(A)

1. Drain
2. Gate 2
3. Gate 1
4. Source

(B)

1. Collector
2. Emitter
3. Base

(C)

1. Base
2. Collector
3. Emitter

(D)

1. Base
2. Collector
3. Emitter

(E)

1. Emitter
2. Collector
3. Base

(F)

1. Base
2. Collector
3. Emitter

A	3SK44
B	2SC1394
C	2SC930, 2SC536
D	2SC945
E	2SC711
F	2SC1096

Pages 83-92 Courtesy of RADIO SHACK

GENERAL ALIGNMENT

Test equipment required:

1. VHF signal generator (120-200MHz)
2. UHF signal generator (400-470MHz)
3. RF frequency counter (10-60MHz)
4. V.T.V.M.
5. Oscilloscope
6. 8 ohm dummy load

NOTE: Use non-metallic tool.
The test equipment should be warmed up at least 1 hour before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.
Refer to PCB illustrations for Alignment points.

RF AND IF ALIGNMENT

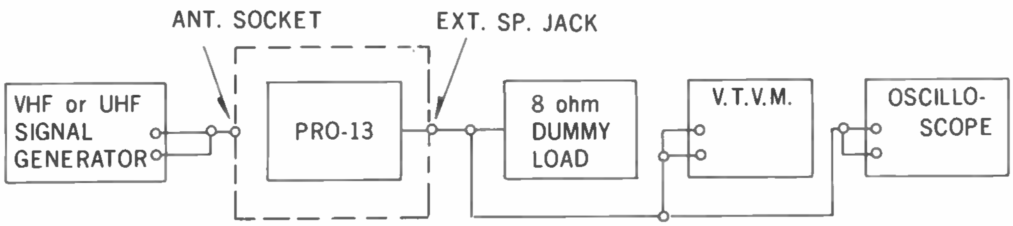


Figure 3. RF ALIGNMENT CONNECTION DIAGRAM

VHF BAND

STEP 1. Connect the instrument as shown in Figure 3.
STEP 2. Adjust voltage 3.0V ±0.1V between Drain and Source of Q509 with VR539 (with no crystals installed)
STEP 3. Insert a crystal for 156MHz into the VHF Band side of CH. 1 socket.
STEP 4. Set Signal Generator to 156 MHz.
STEP 5. Adjust L101, L102, L103, L104 and T101 for maximum output and best signal-to-noise ratio.
STEP 6. Confirm that the unit has been peaked for maximum at 156 MHz.
STEP 7. Adjust VR532 for squelch open with 1.5μV input. (Squelch set maximum clockwise)

UHF BAND

STEP 8. Insert a crystal for 458 MHz into the UHF Band side of CH. 1 socket.
STEP 9. Set Signal Generator to 458 MHz.
STEP 10. Adjust C120, C121, C141 and L110 for maximum output and best signal-to-noise ratio.

SENSITIVITY MEASUREMENT

STEP 1. Connect the instruments as shown in Figure 3.

VHF Band

STEP 2. Insert a crystal for 156 MHz in the VHF Band side of CH. 1 socket.
Depress the channel select switch to activate CH. 1.

STEP 3. Turn the SQUELCH control fully counterclockwise, and adjust the signal generator to 156 MHz (3.3 kHz deviation, 1 kHz modulation).

STEP 4. Increase the output of the signal generator and adjust the VDLUME control to obtain a reading 0.774(0 dB) on the V.T.V.M.

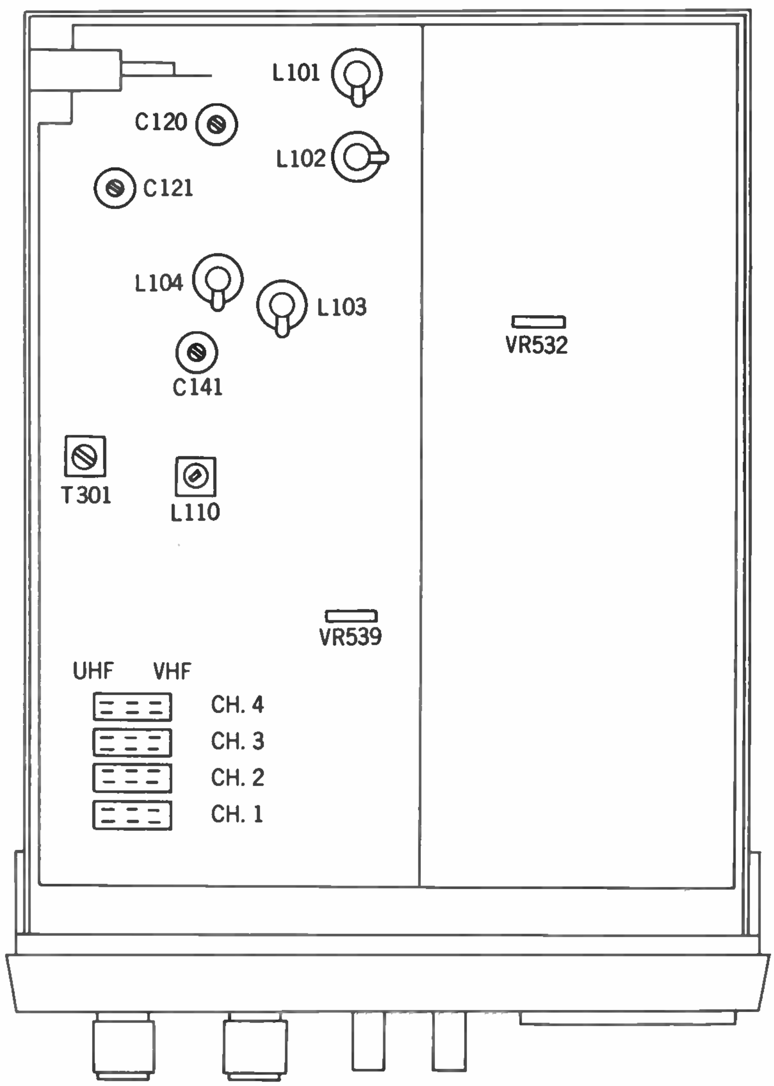
STEP 5. Turn off the modulation of the signal generator, and adjust signal generator output to obtain a reading of –20dB on the V.T.V.M.
The generator output now equals the sensitivity at the 20dB signal-to-noise ratio point.

UHF Band

STEP 6. Insert a crystal for 458 MHz in the UHF Band side of CH. 1 socket.
Depress the channel select switch to activate CH. 1.

STEP 7. Measure sensitivity as noted in step 3 to step 5(at a Receiving frequency of 458 MHz).

ALIGNMENT POINT (CHASSIS LAYOUT)



LOCAL OSCILLATOR CHECKING

STEP 1. Insert all crystals in to sockets.
STEP 2. Couple the frequency counter thru a pickup coil to oscillator coil L111. Refer to Figure 4.

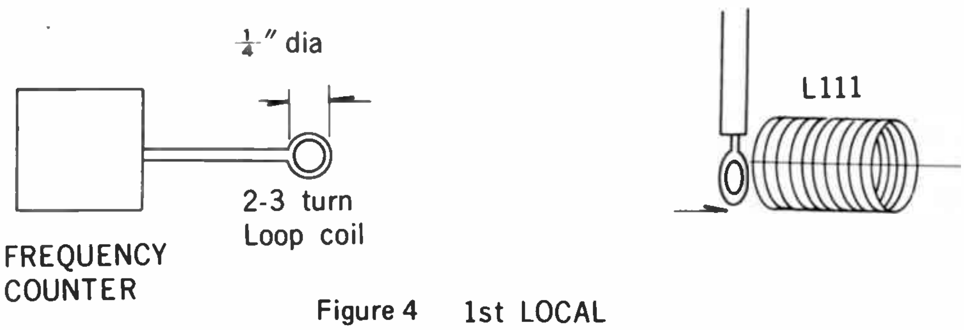


Figure 4 1st LOCAL OSCILLATOR

CHECK FREQUENCY OF THE SECOND LOCAL OSCILLATOR

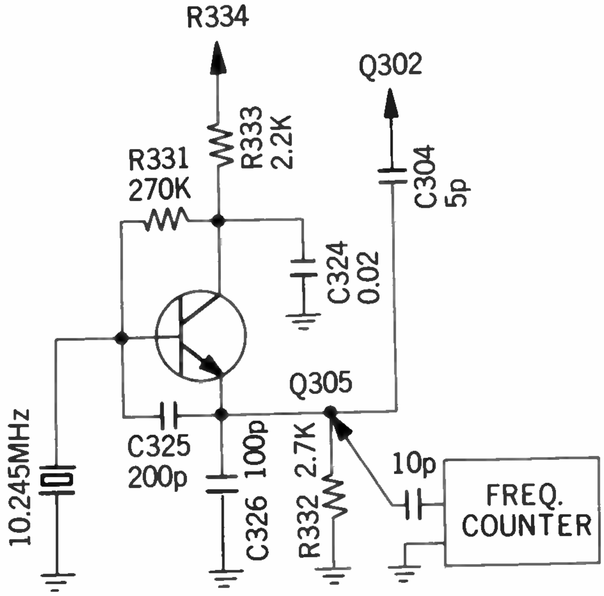


Figure 5 2ND LOCAL OSCILLATOR

STEP 1. Connect Frequency Counter thru a 10pf capacitor to Q305 emitter.
STEP 2. Read frequency on the Frequency Counter.
Normal: 10.245MHz ±0.7 kHz

NOTE: **Crystal Frequency Calculation**
The crystal frequencies are obtained by the following formulas.
VHF Band: Frequency (MHz) = (Fr – 10.7)/3
UHF Band: Frequency (MHz) = (Fr – 10.7)/9
Where Fr is the desired receiver frequency, in MHz

TROUBLE SHOOTING

Symptom	Possible Cause
1) LED (Light Emitting Diode, D105 to D108) doesn't light and no sound. VOLUME : MAX. CHANNEL 1 : IN SQUELCH : OFF (non squelch)	A) Blown FUSE B) Defective ON-OFF switch in VOLUME control C) Regulator Q702 circuit broken or shorted
2) LED lights but no sound. VOLUME : MAX. SQUELCH : OFF (non squelch)	A) Defective EXT. Speaker socket or speaker B) Faulty component part in Audio amp. or IF amp. circuit
3) Noise sound but can't receive desired signal and LED does not light. VOLUME : MAX. SQUELCH : OFF (non squelch) CHANNEL 1 : IN	A) Faulty LED and / or defect in LED PC Board B) Faulty IC 502 C) Short or open in L115-L118 D) Defective D101-D104
4) No sound through EXT. SP. socket.	A) Defective EXT. SP. socket
5) Doesn't scan and SQUELCH doesn't operate. SCAN/SELECT : SCAN SQUELCH : ON (tight)	A) Defective VR501(SQ), VR532(VOLUME) B) Faulty component part in Noise amp. or Noise Detector circuit C) Faulty Transistor Q503, Q504 D) Faulty component part in IF amp. circuit
6) Doesn't scan but SQUELCH operates normally. SCAN/SELECT : SCAN CHANNEL 1 : IN SQUELCH : ON (tight)	A) Faulty Transistor Q505, Q506 B) Either Transistor Q507 or Q508 defective C) Defective SCAN/SELECT switch D) Faulty IC IC501
7) Manual selector doesn't operate. SCAN/SELECT : SELECT	A) Defective SCAN/SELECT selector switch
8) Delay doesn't operate.	A) Faulty Transistor Q505 or capacitor C509
9) Only scans channel 1, 2 or channel 3, 4. SCAN/SELECT : SCAN CHANNEL 1 : IN SQUELCH : ON (tight)	A) Faulty IC IC501
10) Noise sound can be heard and LED lights but can't receive desired signal.	A) Defective X'tal socket B) Faulty component part in the appropriate RF amp. or 1st MIXER circuit C) Faulty Transistor Q510, Q511
11) Low sensitivity	A) Faulty component part in RF amp. or IF amp. circuit B) X'tal Frequency not covering the correct channel
12) Mixed reception	A) X'tal not set to proper receiving frequency

NOTE: For optimum sensitivity, use crystal frequencies within the specified band coverage.
For reception outside of the optimum frequency range, you can realign for best reception either above or below the specified optimum range.
For best sensitivity at any one frequency, align for that one frequency.

SEMICONDUCTORS

ITEM	TYPE NO.
D101	1S1587
D102	1S1587
D103	1S1587
D104	1S1587
D105	SLP115RA
D106	SLP115RA
D107	SLP115RA
D108	SLP115RA
D109	MV201
D110	MV201
D301	1S188
D302	1S188
D501	1S188
D502	1S188
D503	1S1588
D504	1S1588
D505	1S188
D701	XZ-100
D702	DS-1300
IC301	TA7061
IC501	LB2000
IC502	LB2000
IC701	uPC575C2
Q101	3SK44W
Q102	2SC1394L
Q103	2N5485-1
Q104	2SC787
Q105	2SC930D
Q106	2SC387A
Q301	2SC930D
Q302	2SC930D
Q303	2SC930C
Q304	2SC930C
Q305	2SC930C
Q501	2SC945R
Q502	2SC945R
Q503	2SC945R
Q504	2SC945R
Q505	2SC945R
Q506	2SC945R
Q507	2SC711E
Q508	2SC711E
Q509	2SK44D
Q510	2SA733Q
Q511	2SA733Q
Q701	2SC536F
Q702	2SC1096K,L

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C120	Trimmer	4-224R153
C121	Trimmer	4-224R153
C141	Trimmer	4-224R153
C317	0.22uF 10V	
C320	0.22uF 10V	
C321	0.22uF 10V	
C329	0.22uF 10V	
C502	33uF 10V	
C505	1uF 10V	
C506	0.47uF 10V	
C507	0.47uF 10V	
C508	0.47uF 10V	
C509	100uF 10V	
C510	0.47uF 10V	
C511	1uF 10V	
C512	1uF 10V	
C515	1uF 10V	
C516	33uF 10V	
C523	10uF 10V	
C702	1uF 10V	
C703	33uF 10V	
C704	0.1uF 10V	
C705	2.2uF 10V	
C706	100uF 10V	
C707	33uF 10V	
C709	220uF 10V	
C710	0.1uF 10V	
C711	220uF 10V	
C712	220uF 10V	
C713	470uF 16V	

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR501	Squelch Control, 10K	4-222T328
VR532	Semi-Fixed, 20K	4-222R757
VR539	Semi-Fixed, 10K	4-222R002
VR701	Volume Control, 10K	4-222R040A

COILS/TRANSFORMERS

ITEM	PART NO.
L101	4-257R803
L102	4-257R803
L103	4-257R812
L104	4-257R803
L105	4-265R001A
L106	4-259R810
L107	4-259R810
L108	4-259R810
L110	4-259R820
L111	4-265R106
L112	4-253R706
L113	4-253R706
L115	4-253R701
L116	4-253R701
L117	4-253R701
L118	4-253R701
L501	4-253R
L701	4-255R806
	4-255R802
T101	4-256R725
T301	4-256R724

MISCELLANEOUS

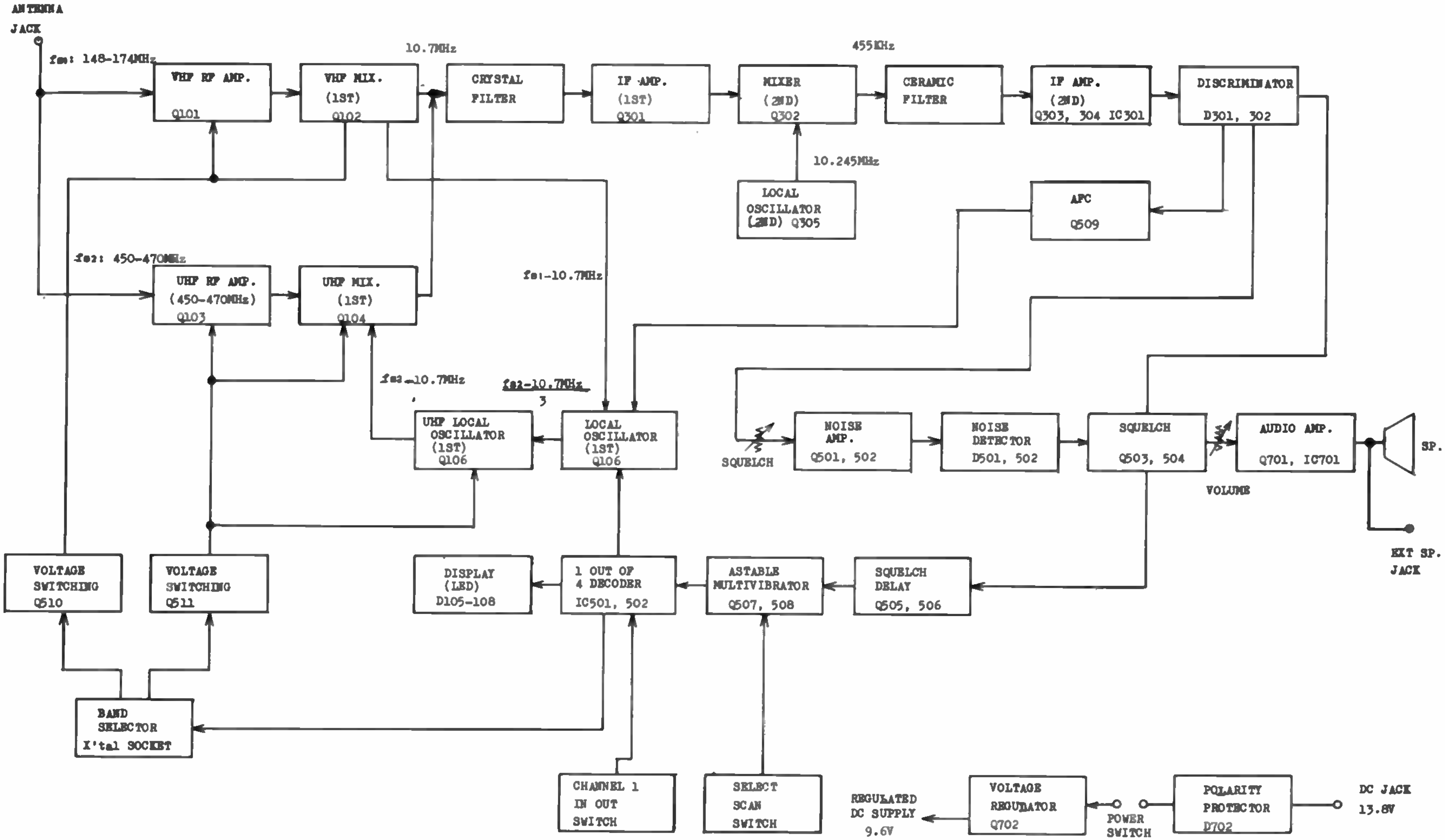
ITEM	NAME	PART NO.
HF301	Crystal Filter	4-253R903
		4-253R90371 (1)
HF302	Ceramic Filter	4-253R906
HF303	Ceramic Filter	4-253R908
SW1	Switch	4-231R179A
SW2	Switch	4-231R953
	Fuse, 1.5A	4-234R102

(1) Used in some versions.

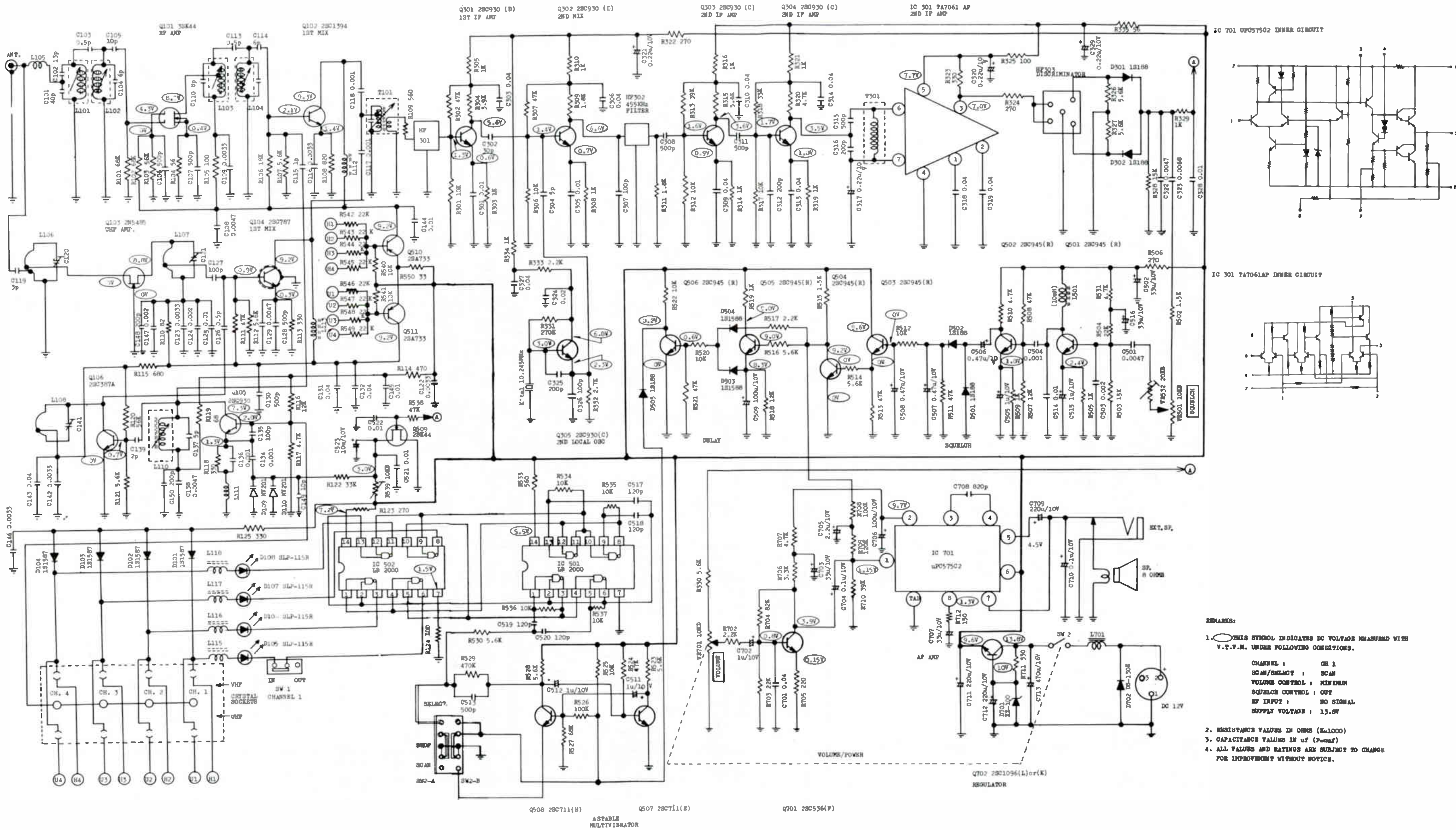
CABINET PARTS

NAME	PART NO.
Cabinet	176-2-111R130
Front Panel	176-2-122R117
Back Lid	176-2-126R127

BLOCK DIAGRAM



SCHEMATIC DIAGRAM



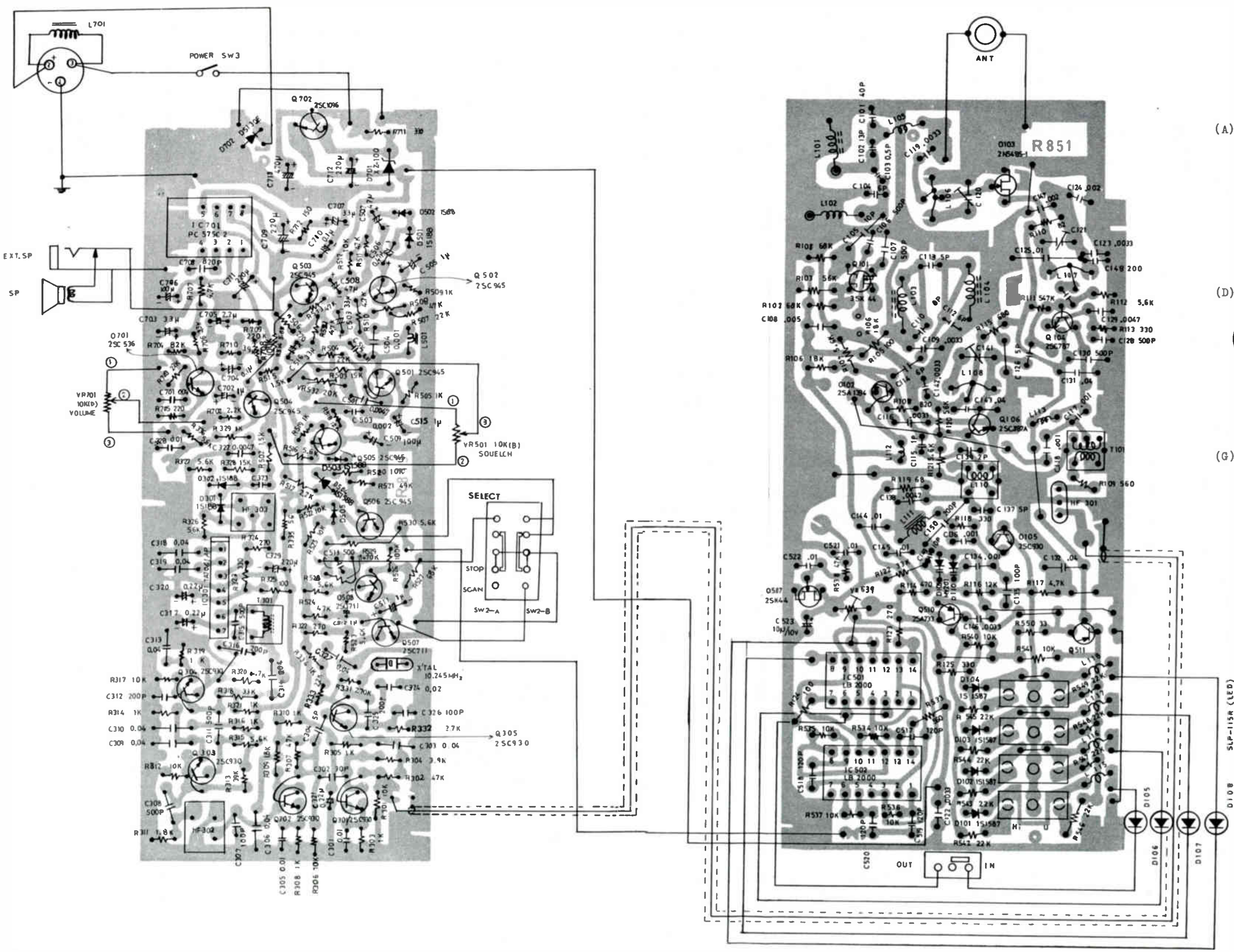
REMARKS:

1. ◯ THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH V.T.V.M. UNDER FOLLOWING CONDITIONS.

CHANNEL :	CH 1
SCAN/SELECT :	SCAN
VOLUME CONTROL :	MINIMUM
SQUELCH CONTROL :	OUT
RF INPUT :	NO SIGNAL
SUPPLY VOLTAGE :	13.8V

2. RESISTANCE VALUES IN OHMS (K=1000)
3. CAPACITANCE VALUES IN uf (P=uuf)
4. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE.

CIRCUIT BOARD DIAGRAM (BOTTOM VIEW)



SEMICONDUCTOR IDENTIFICATION (Bottom View)

(A)
1. Drain
2. Gate 2
3. Gate 1
4. Source

(B)
1. Collector
2. Emitter
3. Base

(C)
1. Drain
2. Gate
3. Source

(D)
1. Base
2. Collector
3. Emitter

(E)
1. Emitter
2. Base
3. Collector
4. Base

(F)
1. Gate
2. Source
3. Drain

(G)
1. Base
2. Collector
3. Emitter

(H)
1. Emitter
2. Collector
3. Base

(I)
1. Base
2. Collector
3. Emitter

A	3SK44
B	2SC1394
C	2SK44
D	2SA733, 2SC387A, 2SC945
E	2SC787
F	2N5485
G	2SC930, 2SC536
H	2SC711
I	2SC1096

Pages 93-106 Courtesy of REGENCY ELECTRONICS INC.

SECTION 2 ALIGNMENT AND TUNING PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

2-2 QUADRATURE DETECTOR

2-2-1 Connect the FM Signal Generator to the antenna input jack. Accurately set the frequency to the center of the channel being used for alignment. Modulate Signal Generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the Oscilloscope to Junction of C150, C161 and R148.

2-2-3 Adjust Signal Generator's output until all of the noise in the scope pattern just disappears.

2-2-4 Adjust L115 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal. When L115 is properly aligned, signal at above Junction should be approximately 0.2 volts RMS with test signal input as noted in 2-2-1.

2-3 IF ALIGNMENT

2-3-1 Pre-set the cores of L107, L110 and L111 9 turns in from the outer end of the coil form.

2-3-2 Connect AC voltmeter to the Junction of R143 and the collector of Q108.

2-3-3 Set AC voltmeter to the 300 millivolts scale.

2-3-4 With generator accurately set to the frequency of the center of the channel being used for alignment, increase Signal Generator's output until AC voltmeter reading is mid-range.

2-3-5 Adjust L107, L110 and L111 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

2-4 RF ALIGNMENT

LOW BAND SECTION (ACT-M 8 H/L & 8 L)

2-4-1 Pre-set the cores of L102 and L103 one turn from the outer ends of the coil form. (NOTE: Due to the broadness of the Low Band Section, presetting the above cores will give you optimum performance over the entire band).

HIGH BAND SECTION (ACT-M 8 H/L & 8 H)

2-4-2 Connect AC voltmeter to the Junction of R143 and the collector of Q108.

2-4-3 Set AC voltmeter to the 300 millivolts scale.

2-4-4 Activate High Band channel nearest to center of High Band frequencies being used.

2-4-5 With Signal Generator accurately set to the frequency of the center of the channel being used for alignment and connected to antenna input jack, increase Signal Generator's output until AC voltmeter reading is mid-range.

2-4-6 Adjust L109, L104, L105 and L106 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

2-5 NOISE BALANCE ADJUSTMENT

NOTE: This adjustment may be required only if excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper or inadequate noise suppression of the vehicle's ignition system.

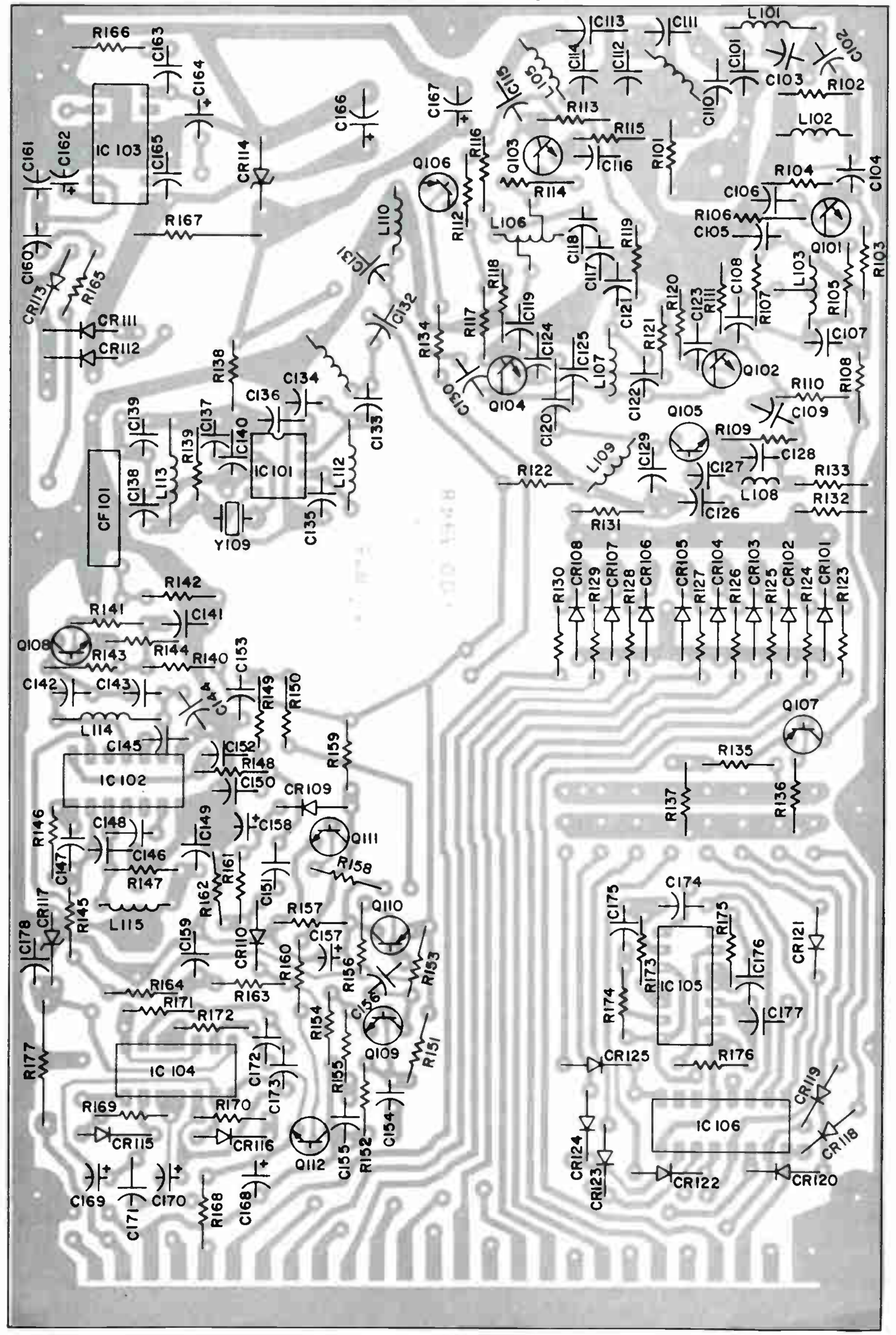
2-5-1 Using a "T" connector, connect the FM Signal Generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L206.

2-5-2 Connect the Oscilloscope to the Junction of Q109's emitter and Q110's collector, or to the speaker terminals.

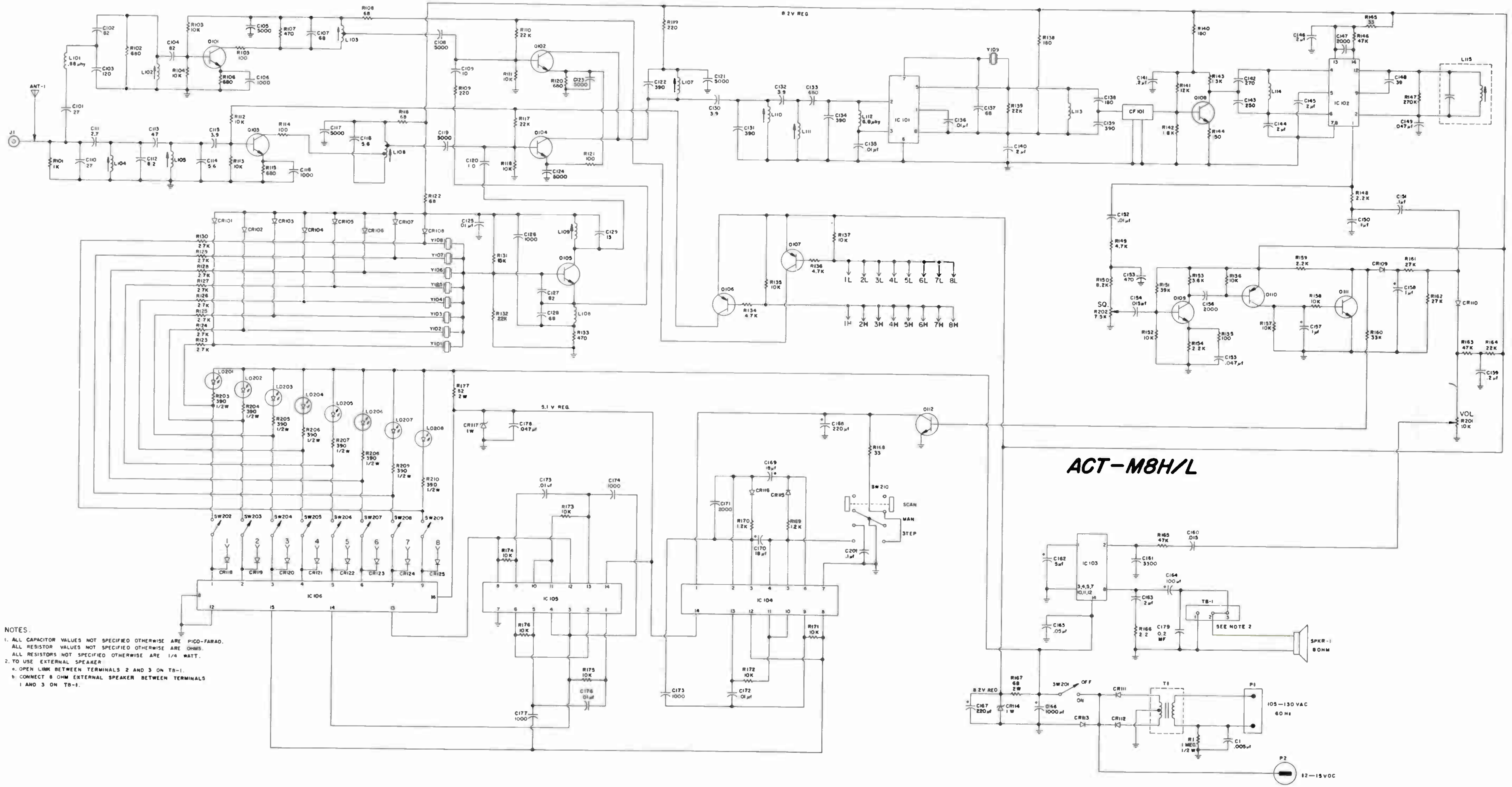
2-5-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the Noise Generator until spikes are clearly seen in the audio output as viewed on the Oscilloscope. The noise spikes will be either mostly positive or negative if an unbalanced condition exists.

2-5-4 Turn L102 (Quadrature Detector Coil) until the noise spikes are equally positive or negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.

MAIN BOARD 600-394

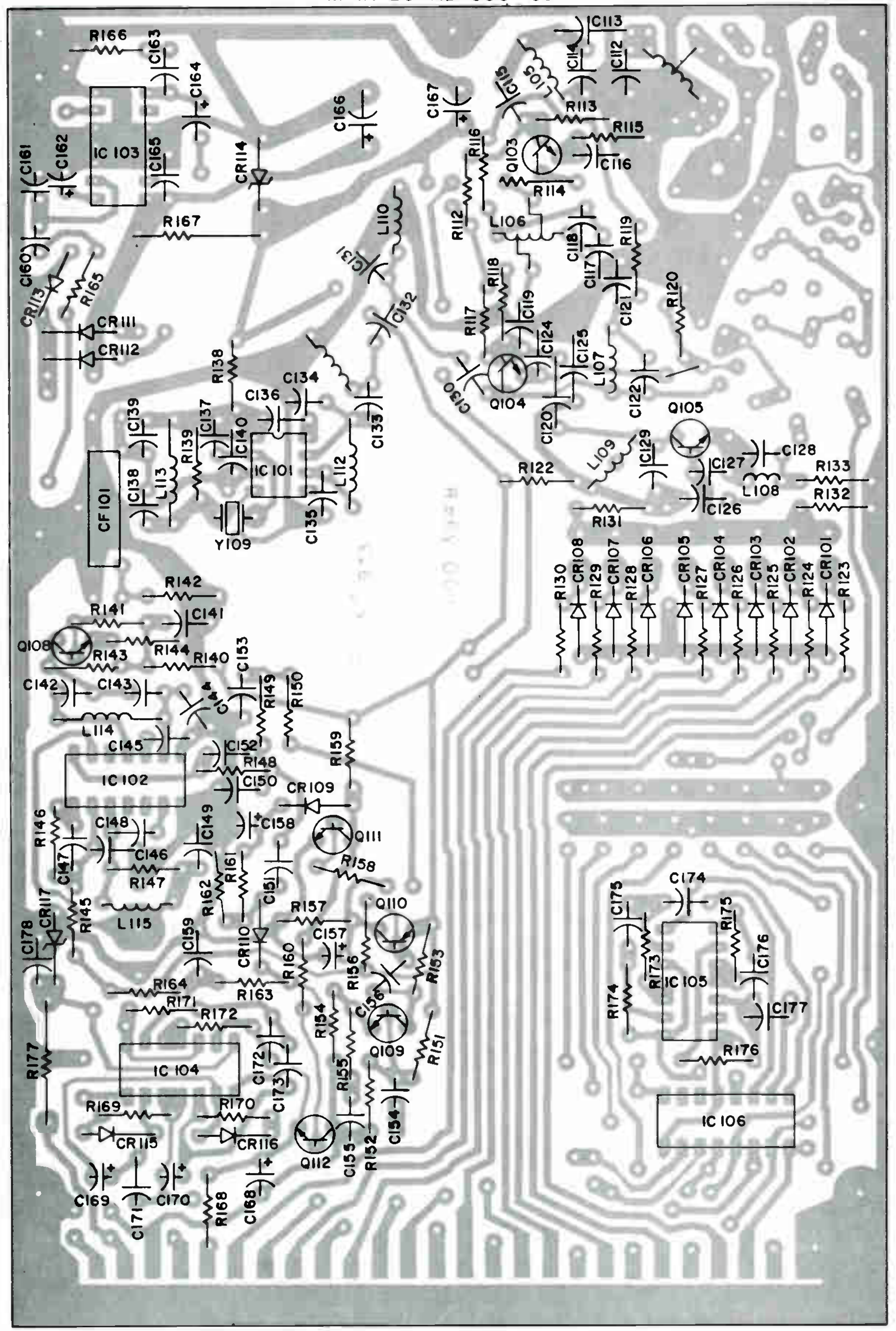


3-2 MAIN BOARD BOTTOM VIEW (H/L)



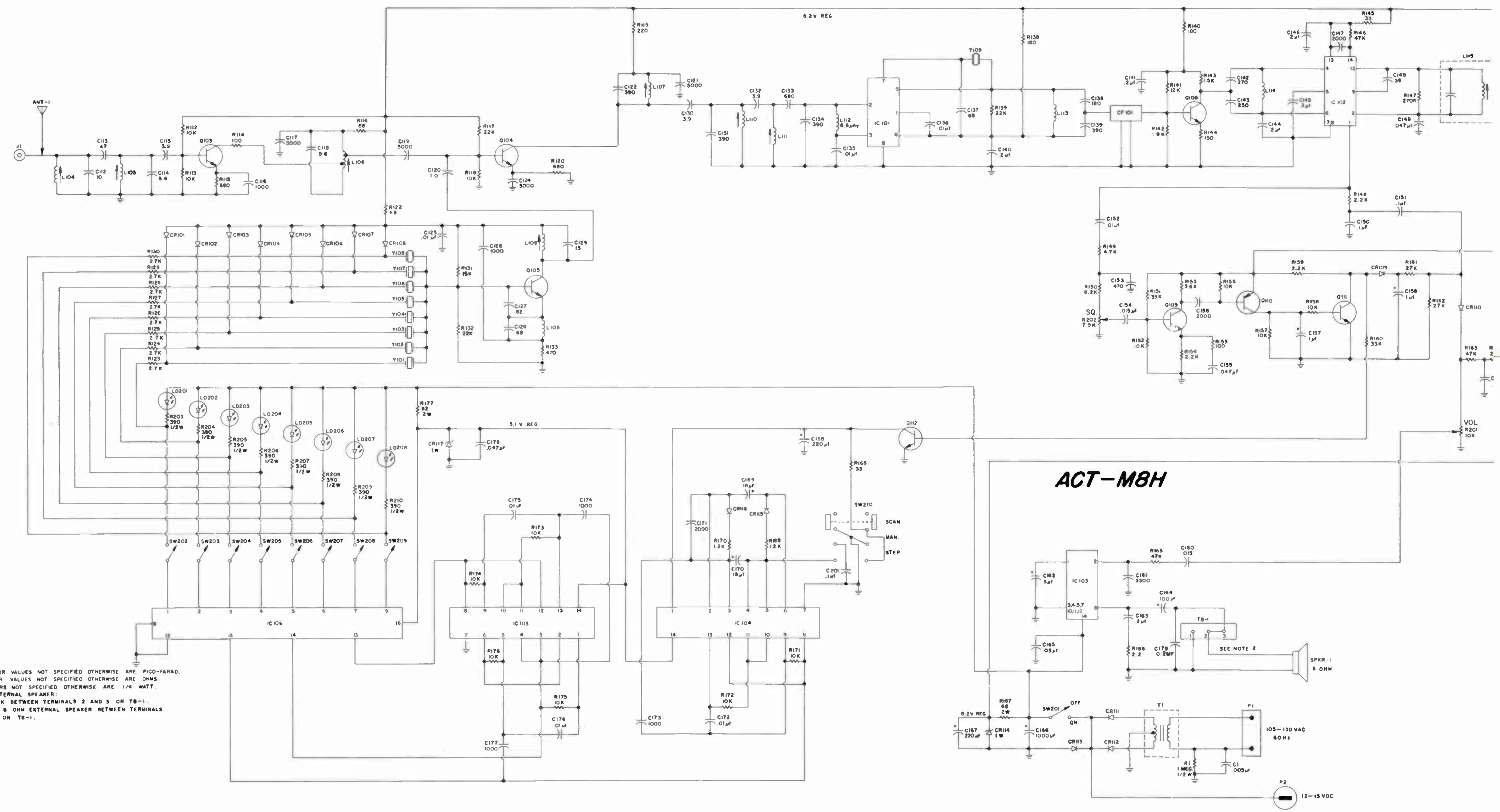
3-11 SCHEMATIC (ACT-M8H/L)

MAIN BOARD 600–394



3-4 MAIN BOARD BOTTOM VIEW (H)

Regency ACT-M8H, ACT-M8L, ACT-M8H/L



NOTES.
1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD.
ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS
ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT.
2. TO USE EXTERNAL SPEAKER:
a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1.
b. CONNECT 8 OHM EXTERNAL SPEAKER BETWEEN TERMINALS 1 AND 3 ON TB-1.

3-12 SCHEMATIC (ACT-M8H)

3-9 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – SEMICONDUCTORS:

Transistor	Emitter	Base	Collector	
Q101	3.1	3.8	7.0	Low Band Activated
	0	0	0	High Band Activated
Q102	1.6	2.3	7.7	Low Band Activated
	1.6	0	7.7	High Band Activated
Q103	0	0	8.2	Low Band Activated
	3.1	3.8	7.9	High Band Activated
Q104	1.6	0	7.7	Low Band Activated
	1.6	2.3	7.7	High Band Activated
Q105	3.7	4.4	7.4	No Crystal
	3.4	4.0	7.4	With Crystal
Q106 (PNP)	8.2	8.2	0	Low Band Activated
	8.2	7.5	8.1	High Band Activated
Q107 (PNP)	8.2	7.5	8.1	Low Band Activated
	8.2	8.2	0	High Band Activated
Q108	0.4	1.1	4.5	
Q109	1.0	1.7	5.0	
Q110	8.2	8.2	0	(Unsquelched)
	8.2	8.2	1.0	(Squelched)
	8.2	8.2	1.5	Min. (Tight Squelched)
Q111	0	0	7.2	(Unsquelched)
	0	0.8	0.2	(Squelched)
	0	0.8	0.1	(Tight Squelched)
Q112	0	0	1.5	(SCAN)
	0	0.8	0.1	(MAN)

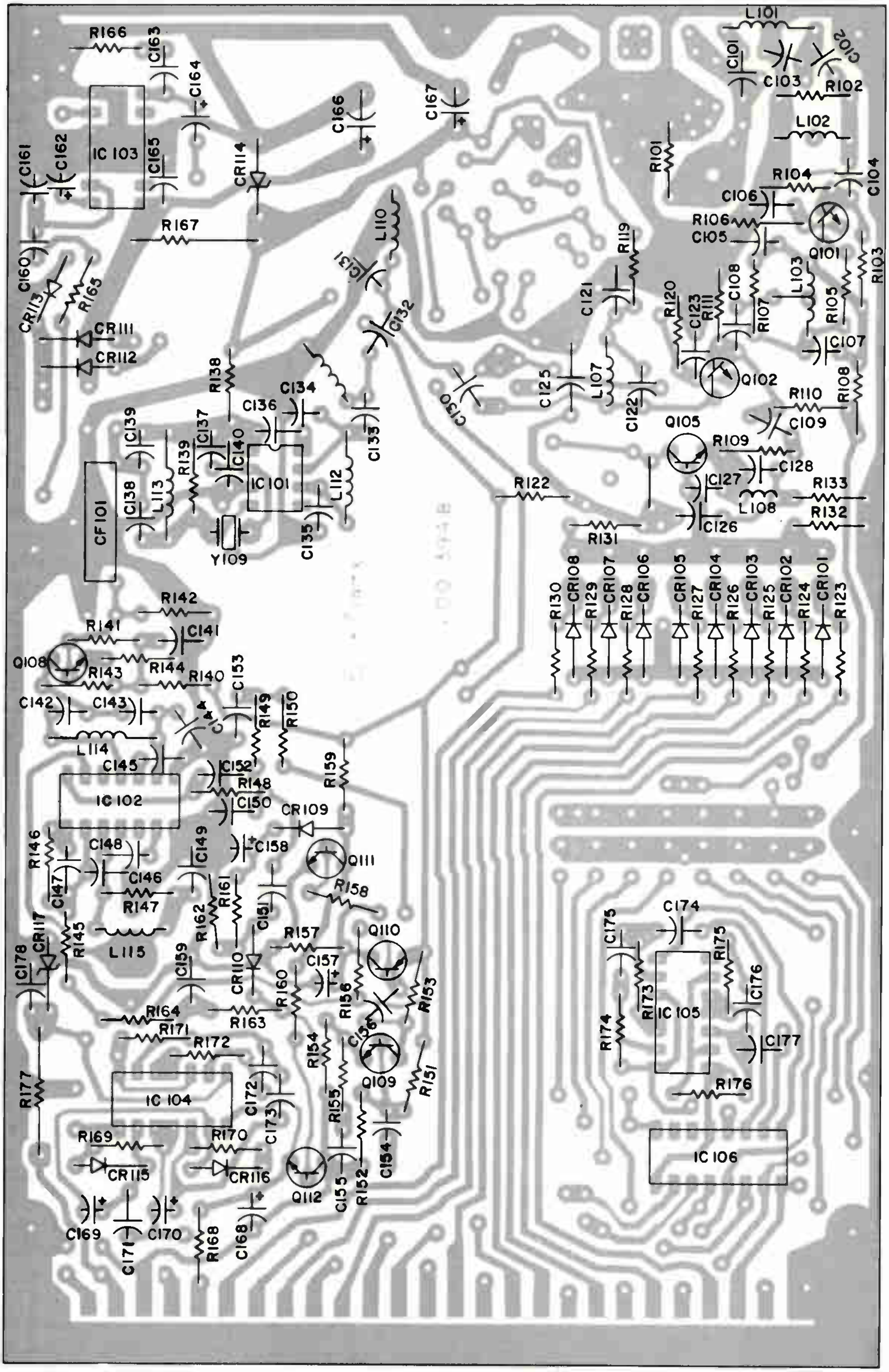
VOLTAGE DATA (CONTINUED)

INTEGRATED CIRCUITS

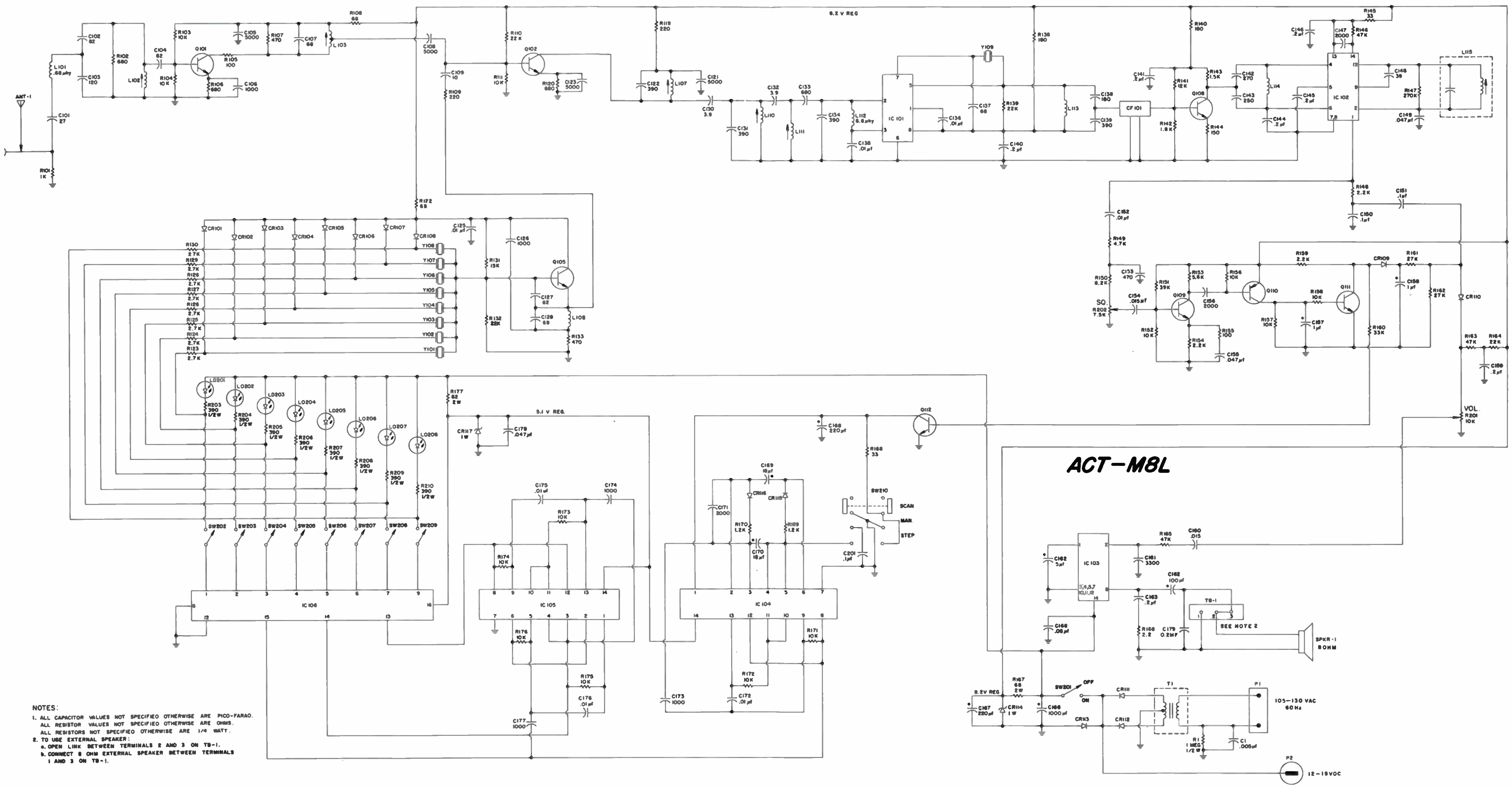
NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M301 is lighted).

IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–	–	–	
IC102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0	–	–	
IC103	7.1	.01	0	0	0	.01	0	6.9	0	0	0	0	0	13.8	–	–	
IC104	.1	.2	3.0	1.2	1.2	.2	0	.1	1.4	3.2	3.2	.1	3.2	5.1	–	–	
	1.4	1.2	1.4	1.2	1.2	1.6	0	2P	2P	2P	2P	2P	2P	5.1	–	–	
IC105	1.4	3.2	.1	.1	3.2	3.2	0	.1	1.4	3.2	3.2	.1	3.5	5.1	–	–	
	2P	2P	2P	2P	2P	2P	0	2P	2P	2P	2P	2P	2P	5.1	–	–	
IC106	.5	11.2	11.2	11.2	11.2	11.2	11.2	0	1.0	1.0	1.0	0	.1	.1	.1	5.1	Manual
	9P	9P	9P	9P	9P	9P	9P	0	1.0	1.0	1.0	0	2P	1P	2P	5.1	SCAN

MAIN BOARD 600-394



3-6 MAIN BOARD BOTTOM VIEW (L)



ACT-M8L

NOTES:

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD.
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS.
   ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT.
2. TO USE EXTERNAL SPEAKER:
   a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1.
   b. CONNECT 8 OHM EXTERNAL SPEAKER BETWEEN TERMINALS 1 AND 3 ON TB-1.

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
MAIN BOARD (H/L)		
CR101		4807-1233-900
CR102		4807-1233-900
CR103		4807-1233-900
CR104		4807-1233-900
CR105		4807-1233-900
CR106		4807-1233-900
CR107		4807-1233-900
CR108		4807-1233-900
CR109	IN4148	4805-1241-200
CR110	IN4148	4805-1241-200
CR111	IN4002	4806-0000-004
CR112	IN4002	4806-0000-004
CR113	IN4002	4806-0000-004
CR114		4808-0000-009
CR115	IN4148	4805-1241-200
CR116	IN4148	4805-1241-200
CR117		4808-0000-007
CR118	IN4148	4805-1241-200
CR119	IN4148	4805-1241-200
CR120	IN4148	4805-1241-200
CR121	IN4148	4805-1241-200
CR122	IN4148	4805-1241-200
CR123	IN4148	4805-1241-200
CR124	IN4148	4805-1241-200
CR125	IN4148	4805-1241-200
IC101	MC-1550P	3130-3167-901
IC102	MC-13579	3130-3157-603
IC103	LM-380N	3130-3157-614
IC104	MC-7400P	3130-3157-604
IC105	MC-7400P	3130-3157-604
IC106	SN-74145N	3130-3193-507
Q101	SPS-1473	4801-0000-035 (1)
Q102	SPS-1473	4801-0000-035 (1)
Q103	SPS-1473	4801-0000-035 (1)
Q104	SPS-1473	4801-0000-035 (1)
Q105	SM-4306-5	4801-0000-100
Q106	SPS-1539	4801-0000-060 (2)
Q107	SPS-1539	4801-0000-060 (2)
Q108	SPS-952	4801-0000-010
Q109	SPS-952	4801-0000-010
Q110	SPS-1539	4801-0000-060 (2)
Q111	SPS-952	4801-0000-010
Q112	SPS-952	4801-0000-010
MAIN BOARD (H)		
CR101		4807-1233-900
CR102		4807-1233-900
CR103		4807-1233-900
CR104		4807-1233-900
CR105		4807-1233-900
CR106		4807-1233-900
CR107		4807-1233-900
CR108		4807-1233-900
CR109	IN4148	4805-1241-200
CR110	IN4148	4805-1241-200
CR111	IN4002	4806-0000-004
CR112	IN4D02	4806-0000-004
CR113	IN4002	4806-0000-004
CR114		4808-0000-009
CR115	IN4148	4805-1241-200
CR116	IN4148	4805-1241-200
CR117		4808-0000-007
IC101	MC-1550P	3130-3167-901
IC102	MC-13579	3130-3157-603
IC103	LM-380N	3130-3157-614
IC104	MC-7400P	3130-3157-604
IC105	MC-7400P	3130-3157-604
IC106	SN-74145N	3130-3193-507
Q103	SPS-1473	4801-0000-035 (1)
Q104	SPS-1473	4801-0000-035 (1)
Q105	SM-4306-5	4801-0000-100
Q108	SPS-952	4801-0000-010
Q109	SPS-952	4801-0000-010
Q110	SPS-1539	4801-0000-060 (2)
Q111	SPS-952	4801-0000-010
Q112	SPS-952	4801-0000-010
MAIN BOARD (L)		
CR101		4807-1233-900
CR102		4807-1233-900
CR103		4807-1233-900
CR104		4807-1233-900
CR105		4807-1233-900
CR106		4807-1233-900
CR107		4807-1233-900
CR108		4807-1233-900
CR109	IN4148	4805-1241-200
CR110	IN4148	4805-1241-200
CR111	IN4002	4806-0000-004
CR112	IN4002	4806-0000-004
CR113	IN4002	4806-0000-004
CR114		4808-0000-009
CR115	IN4148	4805-1241-200
CR116	IN4148	4805-1241-200
CR117		4808-0000-007
IC101	MC-1550P	3130-3167-901
IC102	MC-13579	3130-3157-603
IC103	LM-380N	3130-3157-614
IC104	MC-7400P	3130-3157-604
IC105	MC-7400P	3130-3157-604
IC106	SN-74145N	3130-3193-507
Q101	SPS-1473	4801-0000-035 (1)
Q102	SPS-1473	4801-0000-035 (1)
Q105	SM-4306-5	4801-0000-100
Q108	SPS-952	4801-0000-010
Q109	SPS-952	4801-0000-010
Q110	SPS-1539	4801-0000-060 (2)
Q111	SPS-952	4801-0000-010
Q112	SPS-952	4801-0000-010
CONTROL BOARD		
LD201		4810-1282-900
LD202		4810-1282-900
LD203		4810-1282-900
LD204		4810-1282-900
LD205		4810-1282-900
LD206		4810-1282-900
LD207		4810-1282-900
LD208		4810-1282-900

(1) Red Top.
(2) White Top.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
MAIN BOARD (H/L)		
C157	1uF 16V	1513-0010-002
C158	1uF 16V	1513-0010-002
C162	5uF 10V	1513-0050-001
C164	100uF 16V	1513-0101-002
C166	1000uF 16V	1513-0102-002
C167	250uF 10V	1513-0251-001
C168	250uF 10V	1513-0251-001
C169	18uF 10V	1513-0180-005
C170	18uF 10V	1513-0180-005
MAIN BOARD (H)		
C157	1uF 16V	1513-0010-002
C158	1uF 16V	1513-0010-002
C162	5uF 10V	1513-0050-001
C164	100uF 16V	1513-0101-002
C166	1000uF 16V	1513-0102-002
C167	250uF 10V	1513-0251-001
C168	250uF 10V	1513-0251-001
C169	18uF 10V	1513-0180-005
C170	18uF 10V	1513-0180-005
MAIN BOARD (L)		
C157	1uF 16V	1513-0010-002
C158	1uF 16V	1513-0010-002
C162	5uF 10V	1513-0050-001
C164	100uF 16V	1513-0101-002
C166	1000uF 16V	1513-0102-002
C167	250uF 10V	1513-0251-001
C168	250uF 10V	1513-0251-001
C169	18uF 10V	1513-0180-005
C170	18uF 10V	1513-0180-005

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R201	Volume Control, 10K	4752-5107-501
R202	Squelch Control, 7.5K	4752-5107-502

COILS/TRANSFORMERS

ITEM	PART NO.
MAIN BOARD (H/L)	
L101	1802-0688-003
L102	1800-3152-005
L103	1800-3152-004
L104	1800-3152-002
L105	1800-3152-002
L106	1800-3152-003
L107	1800-3191-401
L108	1801-1236-900
L109	1800-3152-009
L110	1800-3191-401
L111	1800-3191-402
L112	1802-0689-003
L113	1803-3238-600
L114	1803-3238-600
L115	1800-3151-700
MAIN BOARD (H)	
L104	1800-3152-001
L105	1800-3152-002
L106	1800-3152-003
L107	1800-3191-401
L108	1801-1236-900
L109	1800-3152-009
L110	1800-3191-401
L111	1800-3191-402
L112	1802-0689-003
L113	1803-3238-600
L114	1803-3238-600
L115	1800-3151-700
MAIN BOARD (L)	
L101	1802-0688-003
L102	1800-3152-005
L103	1800-3152-004
L107	1800-3191-401
L108	1801-1236-900
L110	1800-3191-401
L111	1800-3191-402
L112	1802-0689-003
L113	1803-3238-600
L114	1803-3238-600
L115	1800-3151-700
CHASSIS	
T1	5604-5100-600

MISCELLANEOUS

ITEM	NAME	PART NO.
ANT-1	Antenna (H/L & L)	1201-5108-802
	Antenna (H)	1201-5108-801
CF101	Ceramic Filter	2700-0000-007
SW201	Switch, Power	5113-3221-002
SW202	Switch, Channel	5113-3221-002
SW203	Switch, Channel	5113-3221-002
SW204	Switch, Channel	5113-3221-002
SW205	Switch, Channel	5113-3221-002
SW206	Switch, Channel	5113-3221-002
SW207	Switch, Channel	5113-3221-002
SW208	Switch, Channel	5113-3221-002
SW209	Switch, Channel	5113-3221-002
SW210	Switch, Selector	5113-3221-104
Y109	Crystal	2301-3151-601
	Power Cord, AC	6041-3215-900
	Power Cord, DC	7011-1047-800

CABINET PARTS

NAME	PART NO.
Cabinet	1408-6039-301
Front Panel	1405-6037-902
Knob, Volume/Squelch	2402-3167-002

2-2-8 Adjust the slugs in L101 and L102 (starting with L101) for minimum noise reducing the Signal Generator level to maintain the noise reading near 0.1 volt RMS. Repeat several times until no further improvement is noted.

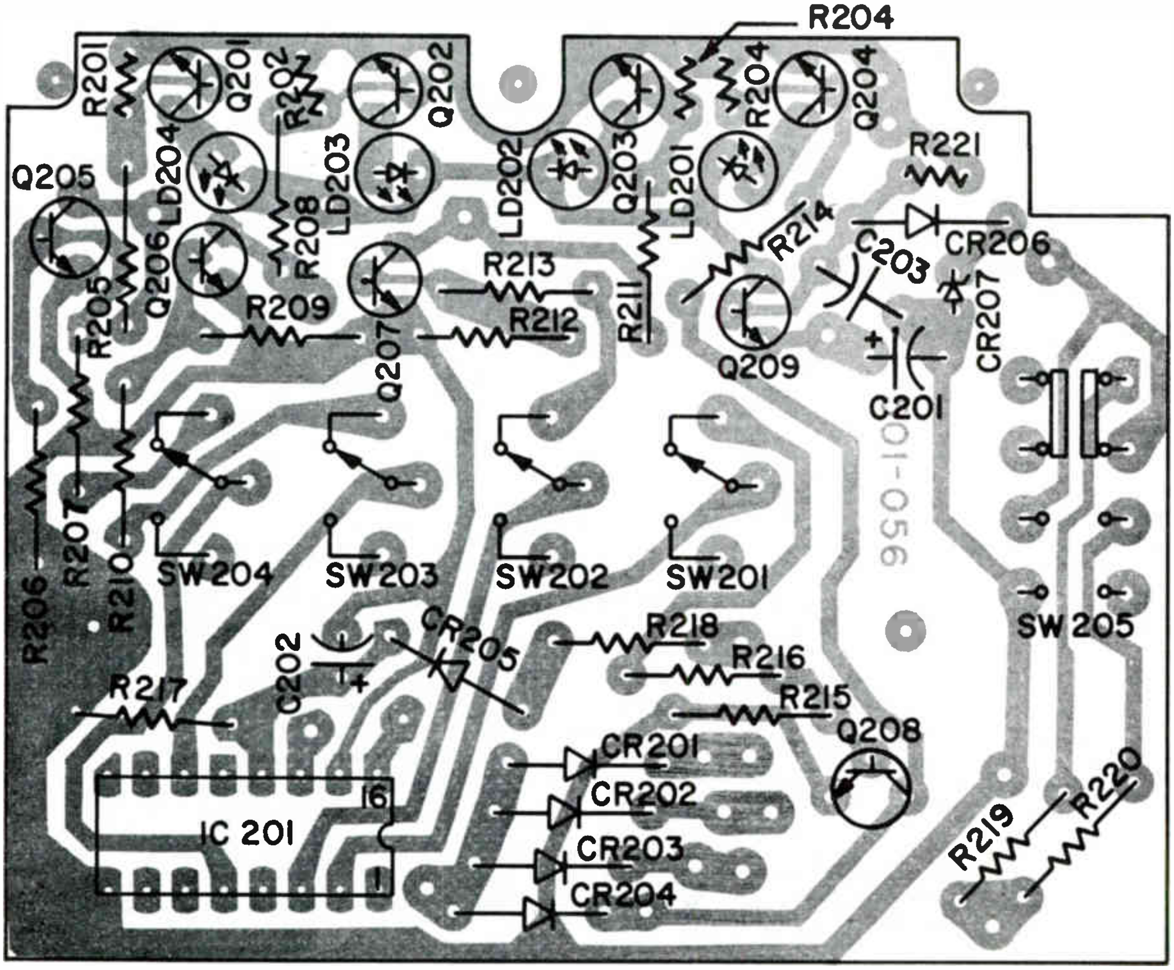
This completes the alignment of the receiver.

NOTE: If the receiver is badly misaligned it may be necessary to preset the slugs before beginning the alignment procedure, in order to insure that the coils are adjusted to the correct peak, since some will have two peaks. If this should be necessary - preset all coils as follows and adjust for the indicated peak:

Coil	Set Slug To:	Adjust for:
L101, L102, L103, L104	Top of Coil Form	1st Peak; as slugs are rotated into coil form
L106	Bottom of Coil Form	1st Peak; as slug is backed out

After pre-setting the slugs, the alignment procedure beginning with 2-2-1 is followed.

SCAN BOARD 501—056



Pages 107-115 Courtesy of REGENCY ELECTRONICS INC.

SECTION 2 ALIGNMENT PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator

2-1-2 A.C. Vacuum Tube Voltmeter

NOTE: During all steps of the alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range over which they will operate.

Figure 3-1 shows the location of all coils which are to be adjusted.

2-2 ALIGNMENT

2-2-1 Remove the antenna from the receiver.

2-2-2 Using the slow scan mode, set the receiver to the channel nearest the frequency range to be covered. Set the "Scan" switch to "Stop", and rotate the squelch control to the maximum clockwise position (minimum squelch action), opening the audio circuits.

2-2-3 Connect the A.C. VTVM across the speaker terminals (Note Polarity).

2-2-4 Connect the FM Signal Generator between the antenna post and ground.

2-2-5 Adjust the receiver volume control for 0.3 volt RMS noise reading on AC voltmeter.

2-2-6 Increase Signal Generator level and tune L104 for minimum noise (maximum quieting), reducing the Signal Generator level as necessary to maintain a noise reading near 0.1 volt RMS.

NOTE: This and following steps should be performed with an unmodulated signal.

2-2-7 Adjust the slugs in L103 and L106 (starting with L106) for minimum noise, reducing the Signal Generator level to maintain the noise level near 0.1 volt RMS. Repeat this procedure several times until no further improvement is noted.

3-10 VOLTAGE DATA

VOLTAGE DATA – TRANSISTORS:

NOTES: 1. All voltages are nominal and are measured with a VTVM.

1. For transistors Q101 through Q113 "SCAN" indicates that the receiver is scanning all four channels in the "FAST" scan mode.
3. "STOP" indicates that the receiver is stopped on oen of the channels 1-4.
4. For transistors Q201 through Q209 "SCAN" indicates that the receiver is scanning in the "SLOW" scan mode. "STOP" indicates that the scanner is stopped ON THE INDICATED CHANNEL.

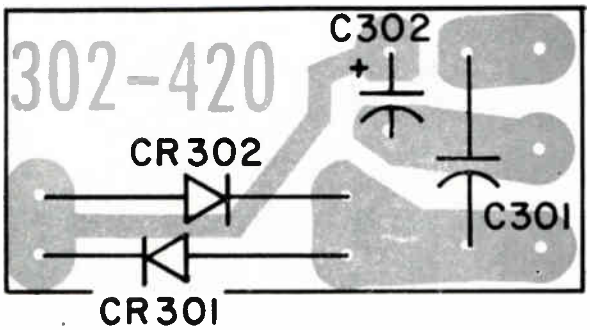
Main Bd.
No. 501-055

Transistor	Emitter (Source)	Base (Gate)	Collector (Drain)
Q101			
Scan	4.2P	3.6P	1.5P
Stop	4.8	4.1	2.0
Q102			
Scan	1.5P	2.2P	4.9P
Stop	2.0	2.7	5.8
Q103			
Scan	0.9P	1.6P	4.8P
Stop	1.2	1.9	5.8
Q104			
Scan			
Stop	3.8	3.8	5.8
Q105			
Scan	0.8	1.4	3.8
Stop	1.2	1.8	4.5
Q106	8.3	8.3	5.5
Q107	7.8	7.8	3.9
Q108			
Squelch Tight	8.2	8.0	0
Squelch Open	6.3	5.8	0.6
Q109			
Squelch Tight	0	0	8.0
Squelch Open	0	0.6	3.9
Q110			
Squelch Tight	8.3	8.7	9.3
Squelch Open	4.0	4.3	8.6
Q111	9.0	9.0	
Squelch Tight	9.0	9.0	8.2
Squelch Open	9.0	8.9	4.0
Q112			
Squelch Tight	8.2	8.0	0
Squelch Open	4.0	3.8	0
Q113			
Squelch Tight	8.3	8.3	7.5
Squelch Threshold	8.3	8.3	7.0
Squelch Open	7.8	7.8	0.3

3-10 VOLTAGE DATA (CONTINUED)

Scan Bd. No. 501-056	Q201			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 4)	8.2	7.2	8.1
	Q202			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 3)	8.2	7.2	8.1
	Q203			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 2)	8.2	7.2	8.1
	Q204			
	Scan (Slow)	8.4	8.3	0-8 (P)
	Stop (CH 1)	8.2	7.2	8.1
	Q205			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 4)	0	0.7	0
	Q206			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 3)	0	0.7	0
	Q207			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 2)	0	0.7	0
	Q208			
	Scan (Slow)	0	0-0.7 P	0-8.5 P
	Stop (CH 1)	0	0.7	0
	Q209			
	Stop (Any Channel)	5.8	6.4	6.8

NOISE LIMITER BOARD 302-420



Used in all units with serial no. prefix 166-A

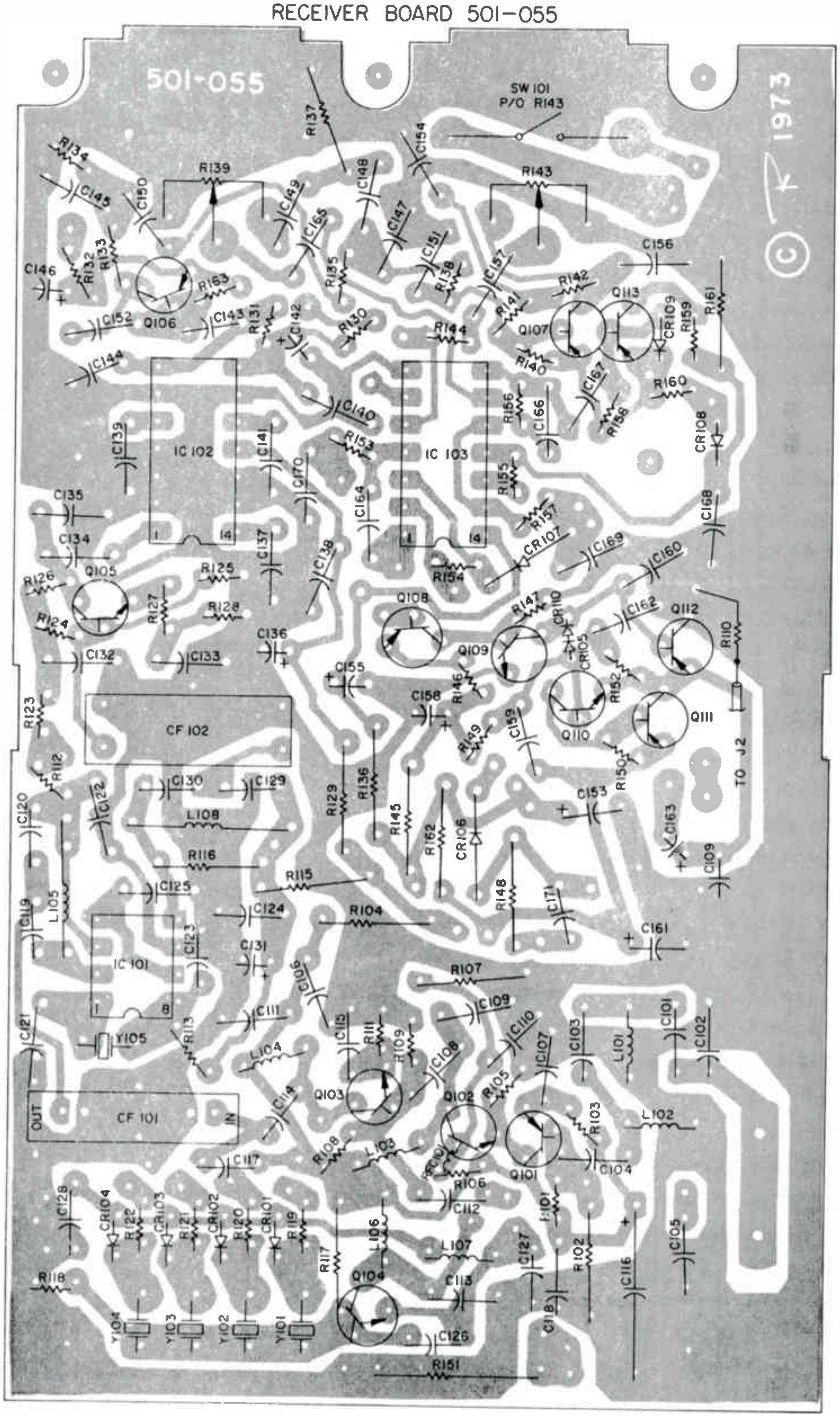
3-10 VOLTAGE DATA (CONTINUED)

VOLTAGE DATA - INTEGRATED CIRCUITS

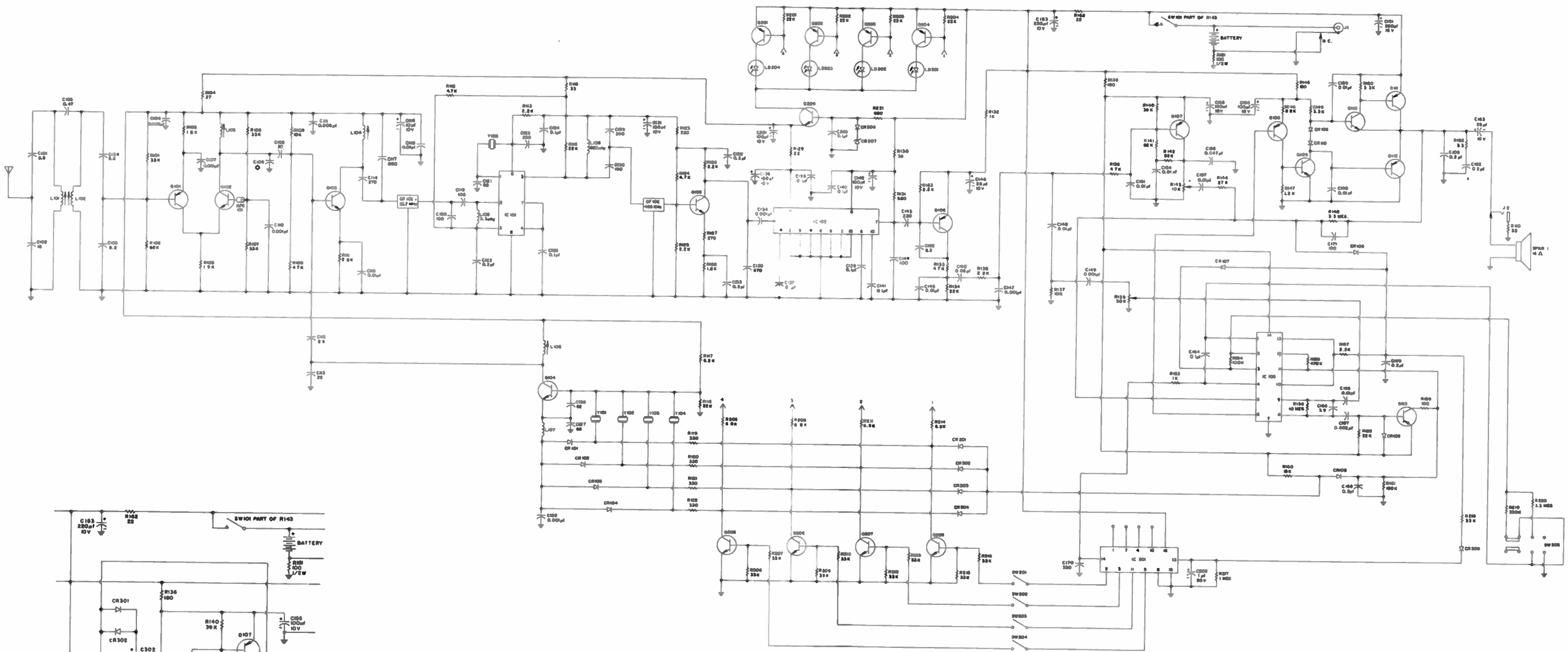
NOTES:
1. All voltages are nominal and are measured with a VTVM.
2. For IC's 101, 102 and 103, "SCAN" indicates that the receiver is in the "FAST" scan mode.
3. For IC201, "SCAN" indicates that the receiver is in the "SLOW" scan mode.
4. A "P" beside a reading indicates that the meter is pulsating (fluctuating) because the scanner section is operating.
5. For IC201, "STOP" indicates that the receiver is stopped ON THE INDICATED CHANNEL.

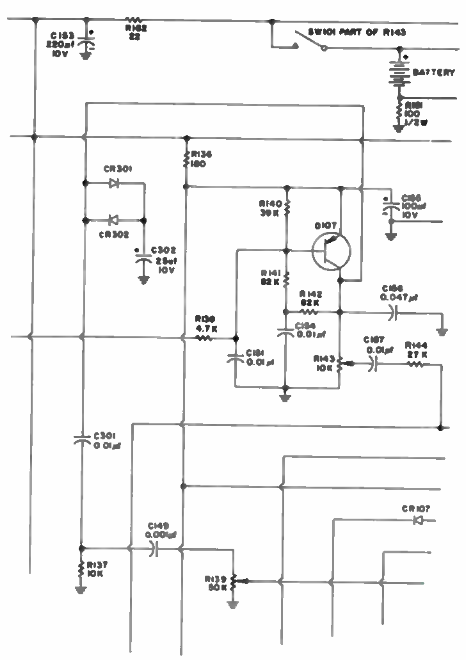
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Main Bd. No. 501-055	IC101 pin																
	Scan	1.8 P	0.8 P	0.8 P	1.8 P	4.7 P	0	1.8 P	2.8 P								
	Stop	2.0	0.8	0.8	1.9	5.8	0	1.9	3.3								
	IC102																
	Scan	2.3	0	0	0	2.4 P	0	6.3 P	7.8	0	2.4 P	4.5P	0	0	2.4 P		
	Stop	2.9	0	0	0	2.9	0	6.0	7.7	0	3.0	5.7	0	0	3.0		
	IC103																
	Scan (slow)	4.2 P	4.5 P	4.5 P	4.0 P	0.3	8.2	0	4.5 P	4.0	0	7.5	8.3	0	8.3		
	Stop (squelched)	0	8.1	8.0	0	0.3	8.0	0	4.5	4.0	0	7.2	8.0	0	8.0		
	Unsquelched	0	7.8	7.6	0	4.3	5.9	0	4.4	4.0	7.8	0.2	0	7.8	7.8		
Scan Bd. No. 501-056	IC201																
	Scan (slow)	0/9 P	0/7.5 P	0/9 P	0/9 P	0/7.5 P	0	0/9 P	0	0	0/9 P	0/7.5 P	0/9 P	0	0/9 P	0	9
	Stop (squelched)	0	0/7.5 (CH 1)	0/7.5 (CH 2)	0	0/7.5 (CH 4)	0	0	0	0	0	0/7.5 (CH 3)	0/9	0	0/9	0	9
	Unsquelched	0	0/7	0/7	0	0/7	0	0	0	0	0	0/7	7.0	7.0	0	0	8.4

RECEIVER BOARD 501-055



3-2 RECEIVER BOARD BOTTOM VIEW





Alternate version

NOTES:

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS.
   ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT.
2. RFC101 IS A FERRITE BEAD PLACED ON THE BASE LEAD OF Q102
3. LAST USED NUMBERS: R163, C171, Q113, L108, IC103, SW101, CR110, Y105, R221, C203, Q209, IC 201, SW205, CR207, LD204, CF102, & J2
4. R144 IS NOT USED.

SEMICONDUCTORS

ITEM	TYPE NO.	PART NO.
RECEIVER BOARO		
CR101	IN4148	4805-1241-200
CR102	IN4148	4805-1241-200
CR103	IN4148	4805-1241-200
CR104	IN4148	4805-1241-200
CR105	IN4148	4805-1241-200
CR106	IN4148	4805-1241-200
CR107	IN4148	4805-1241-200
CR108	IN4148	4805-1241-200
CR109	IN4148	4805-1241-200
CR110	102-339	4807-1233-900
IC101		3130-3167-901
IC102		3130-3157-618
IC103		3130-3157-617
Q101	2N4258	4801-1284-100
Q102	2N3563/2N5130	4801-0000-018
Q103	2N3563/2N5130	9801-0000-018
Q104		4801-0000-035 (1)
Q105	MPS5172	4801-0000-100
Q106		4801-0000-060 (2)
Q107		4801-0000-060 (2)
Q108		4801-0000-060 (2)
Q109	MPS5172	4801-0000-100
Q110	MPS5172	4801-0000-100
Q111		4801-0000-060 (2)
Q112		4801-0000-060 (2)
Q113		4801-0000-060 (2)
SCANNER BOARO		
CR201	IN4148	4805-1241-200
CR202	IN4148	4805-1241-200
CR203	IN4148	4805-1241-200
CR204	IN4148	4805-1241-200
CR205	IN4148	4805-1241-200
CR206	IN4148	4805-1241-200
CR207	IN4148	4805-1241-200
CR208	IN4148	4805-1241-200
CR209	MZ92-6.0B	4808-0000-012
IC201		3130-3193-502
L0201		4810-1282-900
L0202		4810-1282-900
L0203		4810-1282-900
L0204		4810-1282-900
Q201		4801-0000-060 (2)
Q202		4801-0000-060 (2)
Q203		4801-0000-060 (2)
Q204		4801-0000-060 (2)
Q205	MPS5172	4801-0000-100
Q206	MPS5172	4801-0000-100
Q207	MPS5172	4801-0000-100
Q208	MPS5172	4801-0000-100
Q209	MPS5172	4801-0000-100

(1) Red Top.
(2) White Top.

ELECTROLYTICS /VARIABLE CAPS

ITEM	VALUE	PART NO.
RECEIVER BOARO		
C116	10uF 10V	1511-0100-001
C131	100uF 10V	1513-0101-001
C136	100uF 10V	1513-0101-001
C142	100uF 10V	1513-0101-001
C146	25uF 10V	1513-0250-001
C153	220uF 10V	1513-0101-001
C155	100uF 10V	1513-0101-001
C158	100uF 10V	1513-0101-001
C161	250uF 16V	1513-0251-002
C163	25uF 10V	1513-0250-001
SCANNER BOARO		
C201	100uF 10V	1513-0101-001
C202	1uF 16V	1513-0010-002

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
R139	Squelch Control, 50K	4750-3220-102
R143	Volume Control, 10K	4750-3220-101

COILS/TRANSFORMERS

ITEM	PART NO.
L101	1800-5100-508
L102	1800-5100-508
L103	1800-5100-504
L104	1800-5100-402
L105	1802-0339-007
L106	1800-5100-503
L107	1801-1236-900
L108	1800-0000-002

MISCELLANEOUS

ITEM	NAME	PART NO.
CF101	Ceramic Filter	2700-3209-600
CF102	Ceramic Filter	2700-0000-007
SW201	Switch, Channel	5113-3221-001
SW202	Switch, Channel	5113-3221-001
SW203	Switch, Channel	5113-3221-001
SW204	Switch, Channel	5113-3221-001
SW205	Switch, Scan	5113-3221-101
Y101	Crystal, High Band	2302-0000-000
Y102	Crystal, High Band	2302-0000-000
Y103	Crystal, High Band	2302-0000-000
Y104	Crystal, High Band	2302-0000-000
Y105	Crystal, 10.245MHz	2301-3151-601
	Antenna	1201-0000-001

CABINET PARTS

NAME	PART NO.
Case	1411-7010-000
Ooor, Battery	1411-6038-700

Pages 116-121 Courtesy of WESTERN AUTO SUPPLY CO.

1. TEST EQUIPMENT REQUIRED

   FM Signal Generator (183.03 MHz)
   Sweep Generator (30 - 50 MHz)
   Sweep Generator (150 - 170 MHz)
   Oscilloscope
   V.T.V.M.
   Power Supply DC 6 V 200 mA
   Crystal for test 156 MHz
   8 ohm Dummy Load or Speaker
   Sweep Oscilloscope 2 Units
   Screw Diver for alignment

2. TEST EQUIPMENT SET-UP DIAGRAM

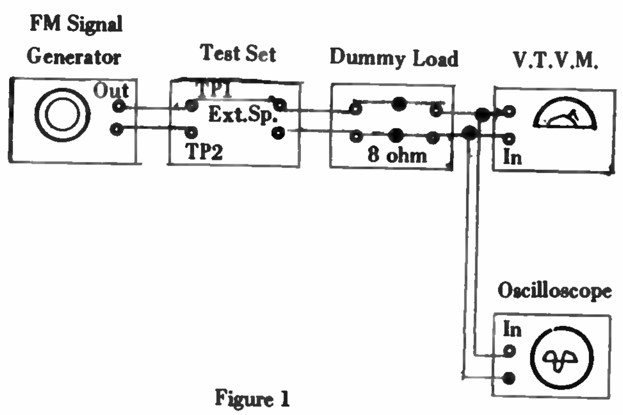


Figure 1

3. PROCEDURE

(1) RF ALIGNMENT

1. Connect the DC Power Supply to the Test Set.
2. Turn the VOLUME and SQUELCH controls fully counter-clockwise.
3. Activate CH 4 in manual scanning operation. (Light CH 4 Indicator Light.)
4. Plug only one pin of a HC-25U type crystal (Any frequency can be used) for activating the RF and Mixer circuits into CH 4 crystal socket on the High Band side. See Figure 2.

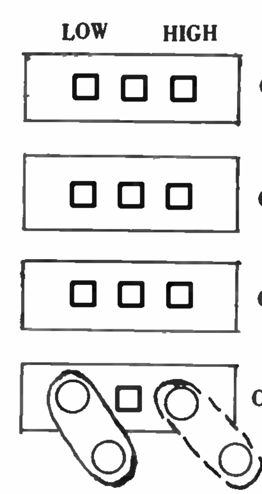


Figure 2

5. Connect the Sweep Generator to TP 1 and TP 2 of the Test Set as shown in Figure 1.
6. Connect the Sweep Oscilloscope to R103 and the wire between L108 and HF301 (ground) as shown in Figure 1 & 4.
7. Set the Sweep Generator to 158 MHz and keep its output level medium.
8. Adjust L101, L102, L103 and L104 for the waveform shown in Figure 3 on the Oscilloscope.

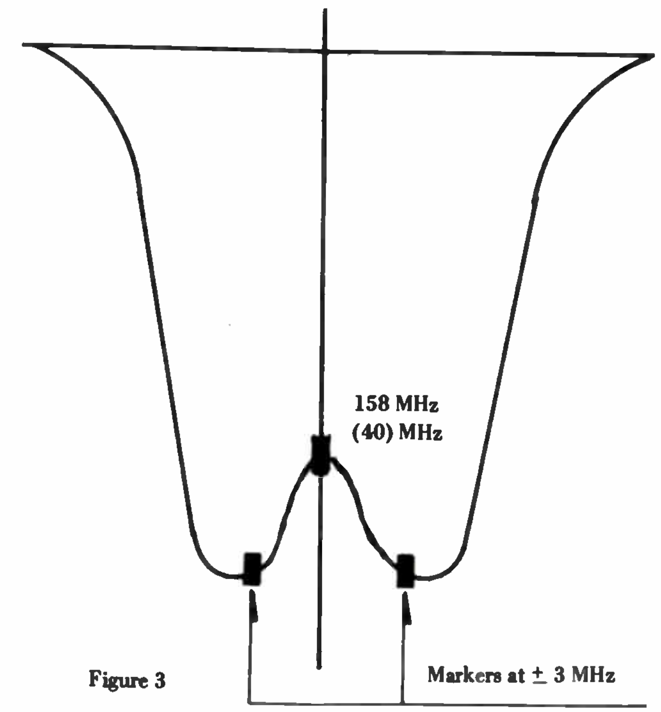


Figure 3

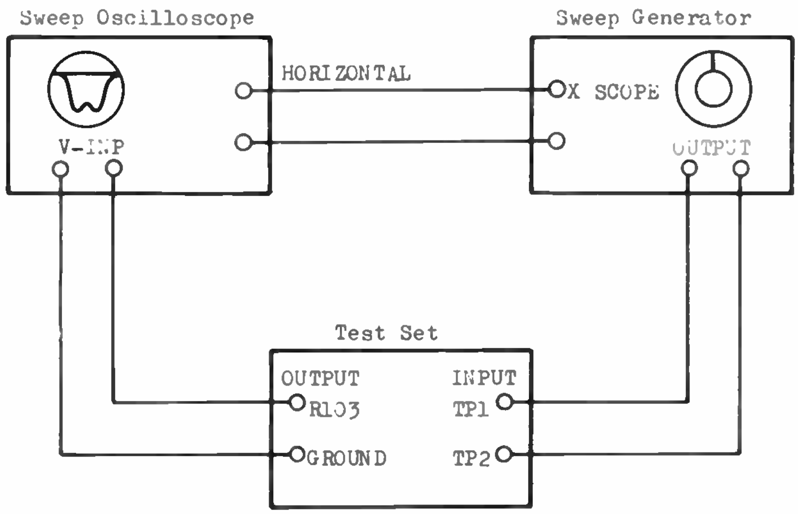
9. Remove the crystal from CH 4 crystal socket on the High Band side.
10. Plug the same crystal into CH 4 crystal socket on the Low Band side in the same way. See Figure 2.
11. Connect the Sweep Oscilloscope to R110 and the wire between L108 and HF301 (ground) as shown in Figure 1 and 4.
12. Set the Sweep Generator to 40 MHz and keep its output level medium.
13. Adjust L105, L106, L107 and L108 for the waveform shown in Figure 3 on the Oscilloscope.

(2) ALIGNMENT FOR MINIMIZING SPURIOUS RADIATION

1. Connect the DC Power Supply to the Test Set.
2. Activate CH 4 in manual scanning operation.
3. Plug the Test Crystal (156 MHz) into CH 4 crystal socket on the High Band side.
4. Connect the FM Signal Generator to TP 1 and TP 2 as shown in Figure 1.
5. Set the FM Signal Generator to 183.03 MHz.
6. Keep output level from the FM Signal Generator about 1 mV and adjust L109 for minimum spurious output level.

TEST EQUIPMENT SET-UP DIAGRAM

(RF ALIGNMENT)



Alignment Points

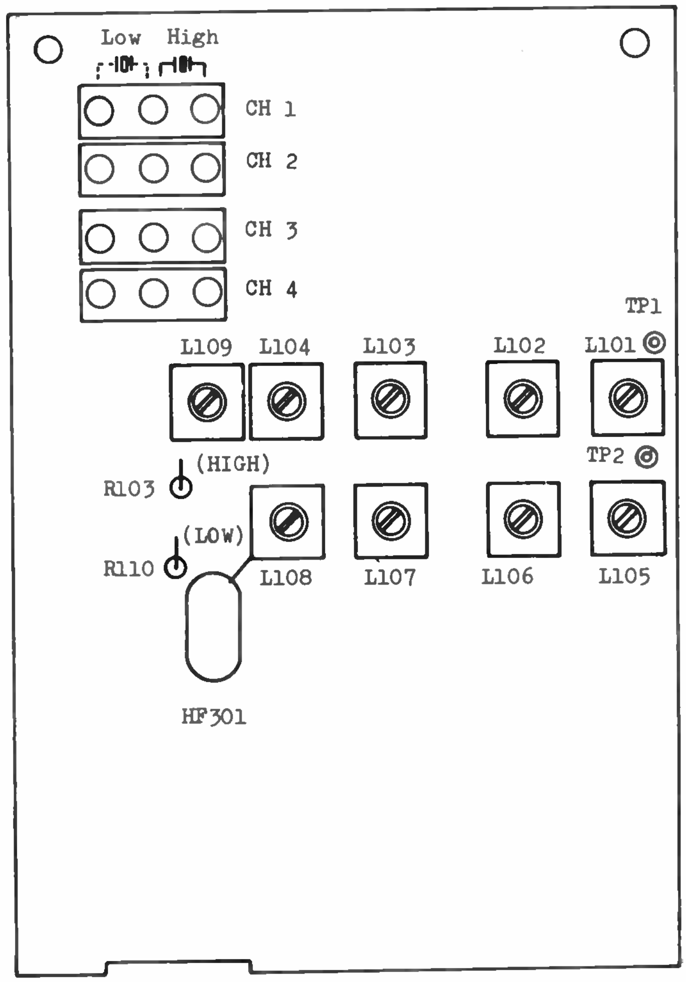
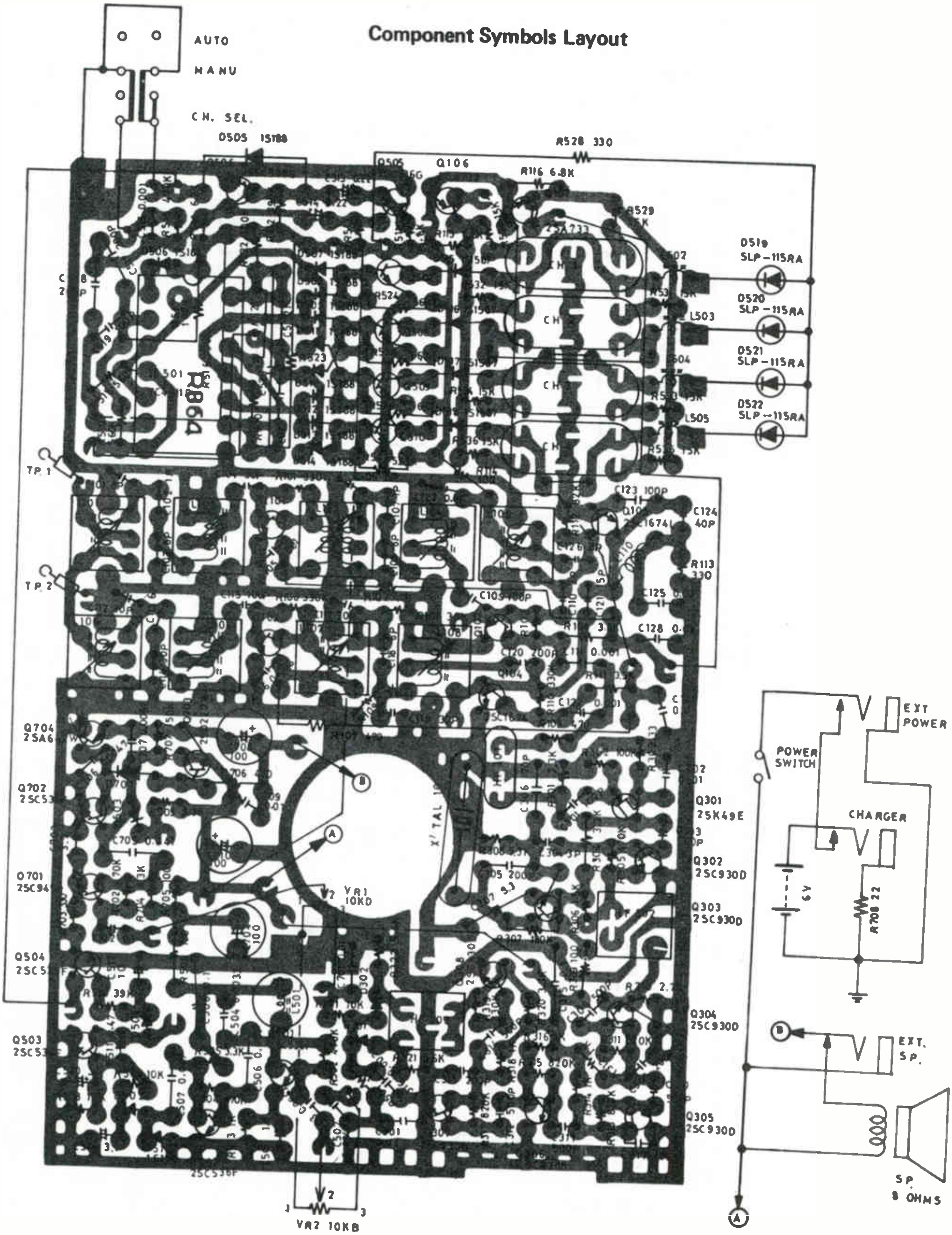
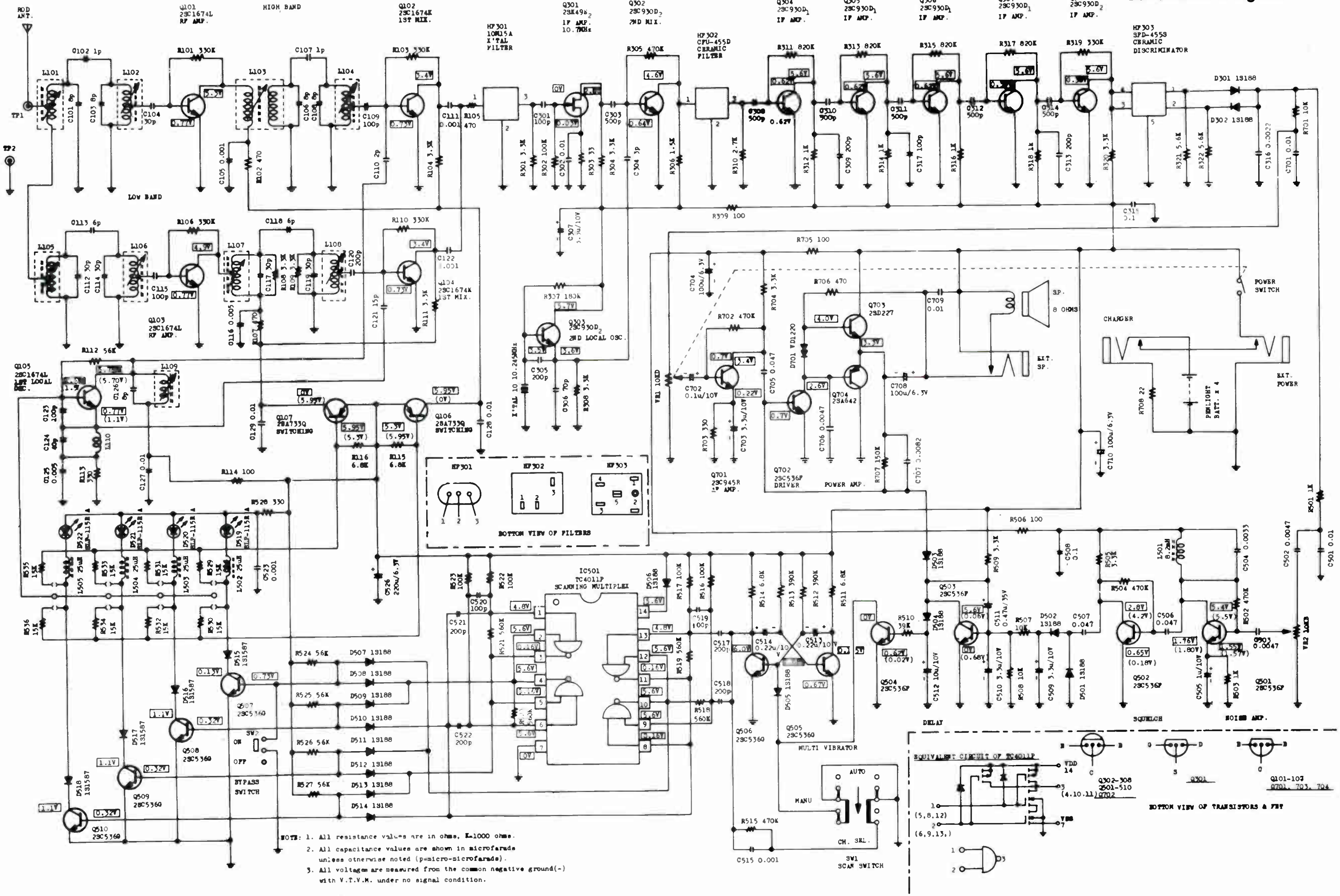


Figure 4

Component Symbols Layout



Schematic Diagram



SEMICONDUCTORS

ITEM	TYPE NO.
D101	MV201
D102	MV201
D301	IS188
D302	IS188
D501	IS188
D502	IS188
D503	IS188
D504	IS188
D505	IS188
D506	IS188
D507	IS188
D508	IS188
D509	IS188
D510	IS188
D511	IS188
D512	IS188
D513	IS188
D514	IS188
D515	IS1587
D516	IS1587
D517	IS1587
D518	IS1587
D519	SLP-115RA-LED
D520	SLP-115RA-LED
D521	SLP-115RA-LED
D522	SLP-115RA-LED
D701	VD1220
IC501	CMOSTC4011P
	CMO3MC14011-CP (1)
Q101	2SC1393
Q102	2SC1394
Q103	2N5485-1
Q104	2SC787
Q105	2SC930
Q106	2SC387
Q107	2SA733
Q108	2SA733
Q301	2SK49
Q302	2SC930
Q303	2SC930
Q304	2SC930
Q305	2SC930
Q306	2SC930
Q307	2SC930
Q308	2SC930
Q501	2SKC536
	2SC945 (1)
Q502	2SKC536
	2SC945 (1)
Q503	2SKC536
	2SC945 (1)
Q504	2SKC536
	2SC945 (1)
Q505	2SC536G
Q506	2SC536G
Q507	2SC536G
Q508	2SC536G
Q509	2SC536G
Q510	2SC536G
Q511	2SK44
Q701	2SKC945
Q702	2SKC536
	2SC945 (1)
Q703	2SD227
Q704	2SA642

(1) Used in some versions.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE	PART NO.
C505	1uF 10V	
C509	3.3uF 10V	
C510	3.3uF 10V	
C511	0.47uF 35V	
C512	10uF 6.3V	
C513	0.22uF 10V	
C514	0.22uF 10V	
C524	10uF 6.3V	
C702	0.1uF 10V	
C703	3.3uF 10V	
C704	100uF 6.3V	
C708	100uF 6.3V	
C710	100uF 6.3V	
CT101	Trimmer	13-123061
CT102	Trimmer	13-123061
CT103	Trimmer	13-123061

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	Volume Control, 10K	13-161004
VR2	Squelch Control, 10K	13-166065
VR3	AFC Control, 10K	13-161033

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-094161
L102	13-094161
L103	13-176429
L104	13-094161
L105	13-176427
L106	13-176427
L107	13-094166
L108	13-094162
L109	13-176427
L501	13-178183
L502	13-178122
L503	13-178122
L504	13-178122
L505	13-178122

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	Crystal, 10M15A	13-179042
	Crystal, 10F15AG	13-179058 (1)
HF302	Crystal, CFU-455D	13-179041
HF303	Ceramic Disc	13-179047
SW1	Switch, Scan	13-180085
SW2	Switch, Bypass	13-180084
	Crystal, 10.245MHz	13-128354
	Antenna	13-040083

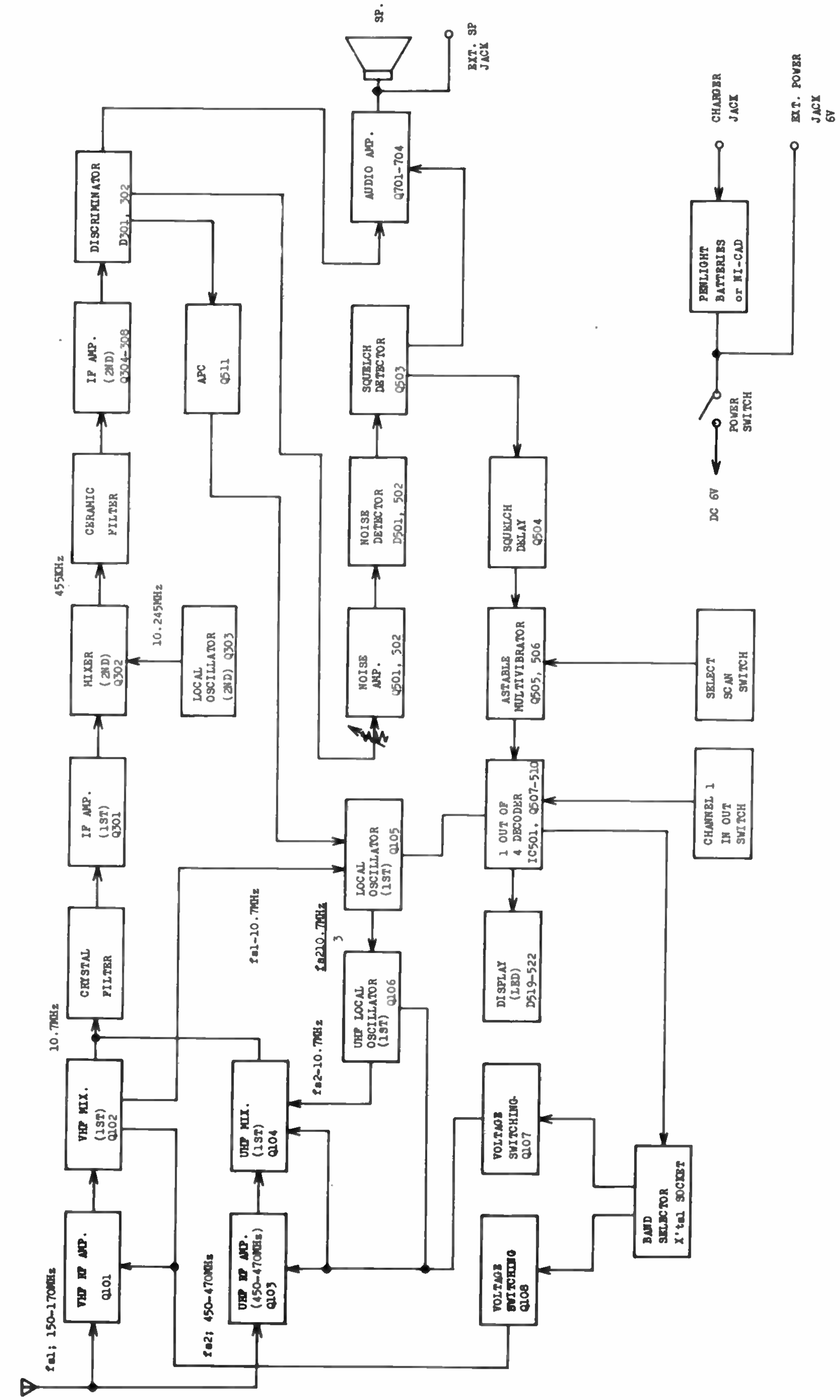
(1) Used in some versions.

CABINET PARTS

NAME	PART NO.
Case, Front	13-010284
Case, Rear	13-013127
Panel, Front	13-010284
Knob, Scan/Channel	13-110190
Knob, Volume/Squelch	13-115123

Pages 122-127 Courtesy of WESTERN AUTO SUPPLY CO.

BLOCK DIAGRAM



ALIGNMENT INSTRUCTIONS

1. TEST EQUIPMENT REQUIRED

   FM Signal Generator VHF Hi: 100 - 200 MHz

   UHF Hi: 400 - 500 MHz

   Oscilloscope

   V.T.V.M.

   DC Power Supply 6V - 500 mA

   DC Volt Meter 5V

   Screw Driver for alignment

   Crystals for test VHF Hi: 156 MHz

   UHF Hi: 458 MHz

   Dummy Load 8 ohms - 500 mW

2. TEST EQUIPMENT SET-UP DIAGRAM

TEST EQUIPMENT SET-UP DIAGRAM

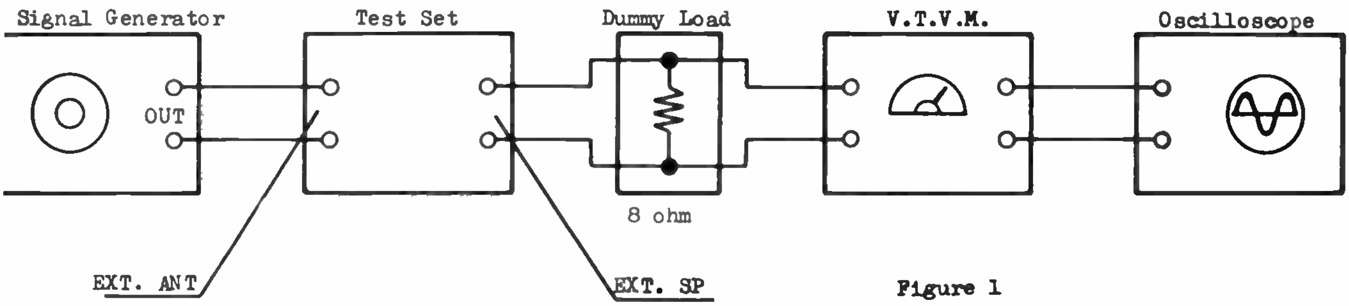


Figure 1

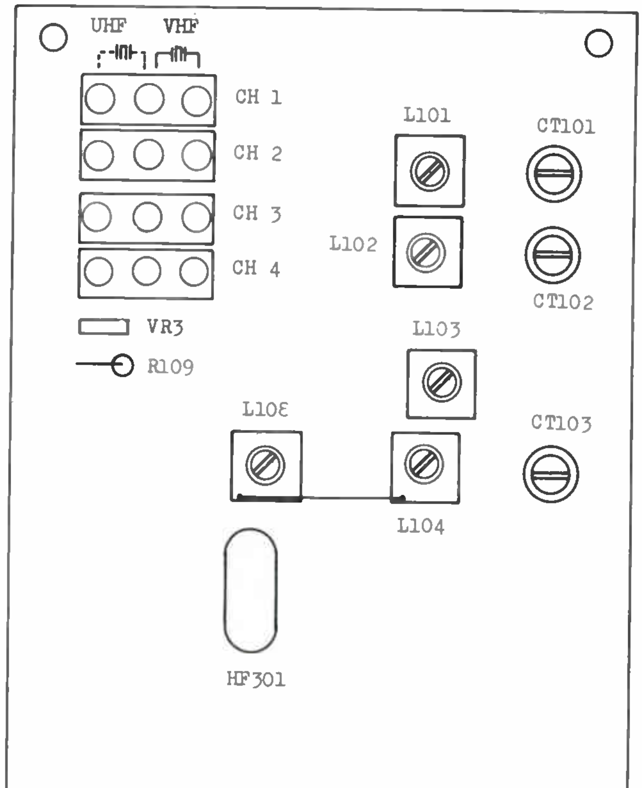
3. PROCEDURE

   (VHF Hi Band)

   1. Connect the DC Power Supply to the Test Set.
   2. Activate CH 4 in manual scanning operation. (Light CH 4 Indicator Light)
   3. Turn the SQUELCH control counterclockwise.
   4. Keep noise level about 0.5V reading on the V.T.V.M. by rotating the VOLUME control.
   5. Plug 156 MHz crystal into the CH4 crystal socket on the High Band side.
   6. Connect the DC Volt Meter to R109 and the ⊖ terminal of the DC Power Supply.
   7. Adjust VR502 for 3 volts reading on the DC volt Meter.
   8. Connect the FM Signal Generator to EXT. ANT. socket.
   9. Set the FM Signal Generator to 156 MHz.
   10. Adjust L101, L102, L103, L104 and L108 for maximum output. Repeat this step two or three times.

   (UHF Band)

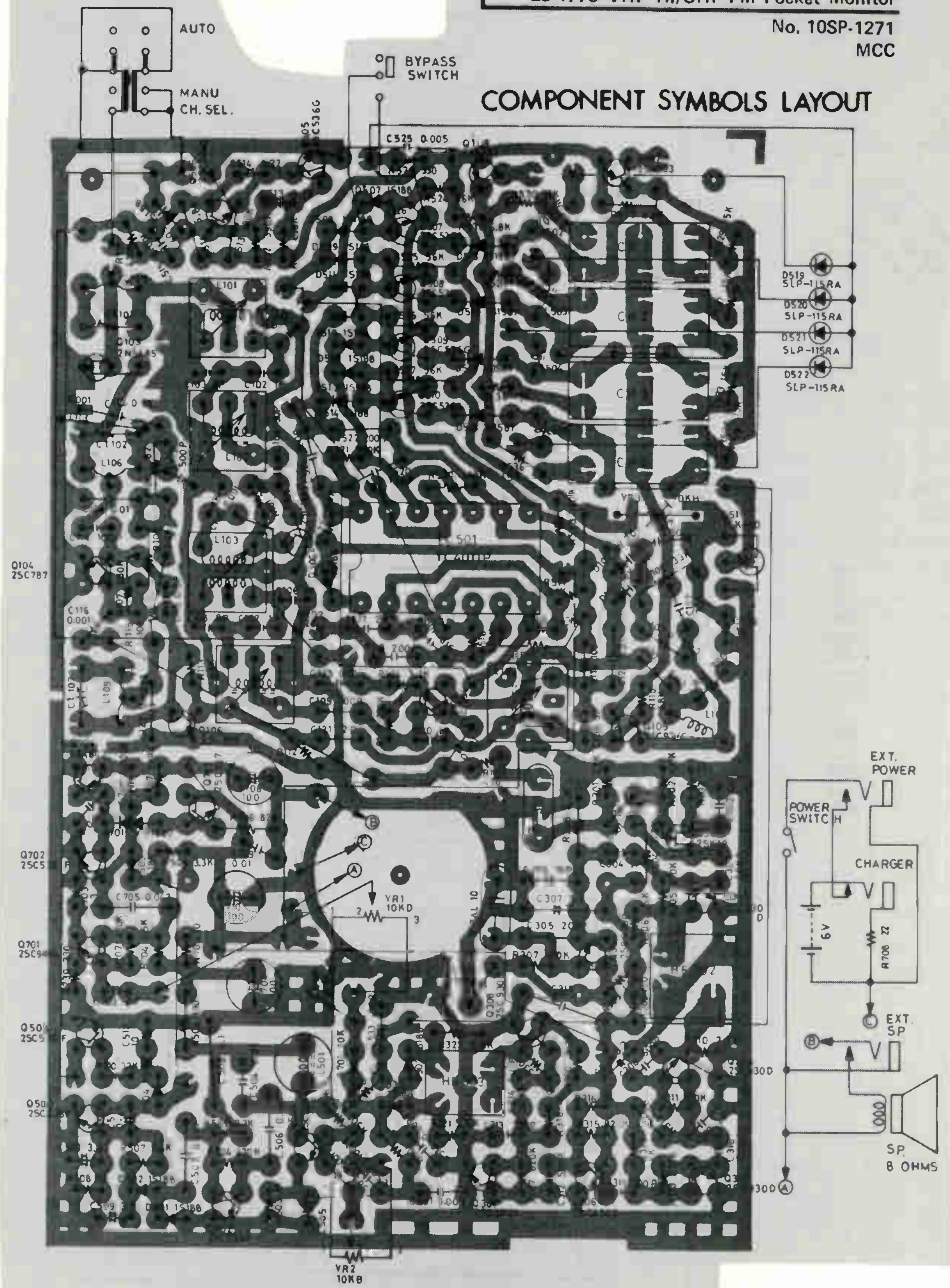
   1. Plug 458 MHz crystal into the CH 4 crystal socket on the UHF Band side.
   2. Set the FM Signal Generator to 458 MHz.
   3. Adjust CT101, CT102, CT103 and L107 for maximum output. Repeat this step two or three times.



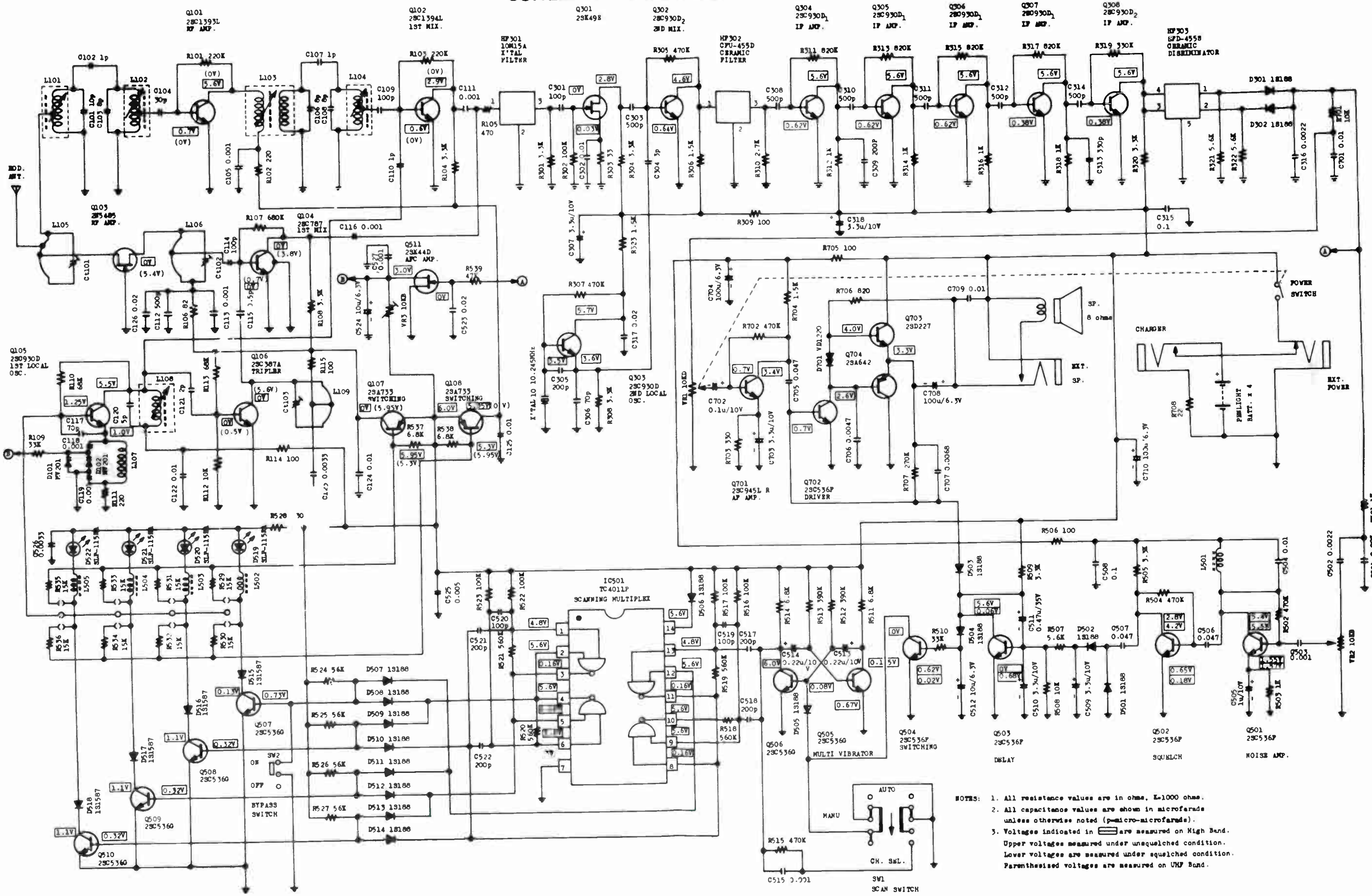
ALIGNMENT POINTS

23-4778 VHF Hi/UHF-FM Pocket Monitor
No. 10SP-1271
MCC

COMPONENT SYMBOLS LAYOUT



SCHEMATIC DIAGRAM



NOTES: 1. All resistance values are in ohms, K=1000 ohms.
2. All capacitance values are shown in microfarads unless otherwise noted (p=micro-microfarads).
3. Voltages indicated in ▭ are measured on High Band.
Upper voltages measured under unsquelched condition.
Lower voltages are measured under squelched condition.
Parenthesised voltages are measured on UHF Band.

SEMICONDUCTORS

ITEM	TYPE NO.
D301	IS188
D302	IS188
D501	IS188
D502	IS188
D503	IS188
D504	IS188
D505	IS188
D506	IS1588
D507	IS188
D508	IS188
D509	IS188
D510	IS188
D511	IS188
D512	IS188
D513	IS188
D514	IS188
D515	IS1587
D516	IS1587
D517	IS1587
D518	IS1587
D519	SLP-115RA-LED
D520	SLP-115RA-LED
D521	SLP-115RA-LED
D522	SLP-115RA-LED
D701	VD-1220
IC501	CMOS-TC4011P
	CMO3-MC14011CP (1)
Q101	2SC1674
Q102	2SC1674
Q103	2SC1674
Q104	2SC1674
Q105	2SC1674
Q106	2SA733
Q107	2SA733
Q301	2SK49
Q302	2SC930
Q303	2SC930
Q304	2SC930
Q305	2SC930
Q306	2SC930
Q307	2SC930
Q308	2SC930
Q501	2SC945
Q502	2SC945
Q503	2SC945
Q504	2SC945
Q505	2SC536
Q506	2SC536
Q507	2SC536
Q508	2SC945
Q510	2SC945
Q702	2SC945
Q703	2SD227
Q704	2SA642

(1) Used in some versions.

ELECTROLYTICS/VARIABLE CAPS

ITEM	VALUE
C505	1uF 10V
C509	3.3uF 10V
C510	3.3uF 10V
C511	0.47uF 35V
C512	10uF 6.3V
C513	0.22uF 10V
C514	0.22uF 10V
C702	0.1uF 10V
C703	3.3uF 10V
C704	100uF 6.3V
C708	100uF 6.3V
C710	100uF 6.3V

CONTROLS/SPECIAL RESISTORS

ITEM	DESCRIPTION	PART NO.
VR1	Volume Control, 10K	13-160126
VR2	Squelch Control, 10K	13-166065

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-094161
L102	13-094161
L103	13-176429
L104	13-094161
L105	13-176498
L106	13-176498
L107	13-176498
L108	13-176498
L109	13-094162
L110	13-176333
L501	13-178183
L502	13-178122
L503	13-178122
L504	13-178122
L505	13-178122

MISCELLANEOUS

ITEM	NAME	PART NO.
HF301	Crystal, 10M15A	13-179042
	Crystal, 10F15AG	13-179058 (1)
HF302	Crystal, CFU-455D	13-179041
HF303	Ceramic Disc	
SW1	Switch, Scan	13-180085
SW2	Switch, Bypass	13-180084
	Antenna	13-040083
	Crystal, 10.245MHz	13-128364

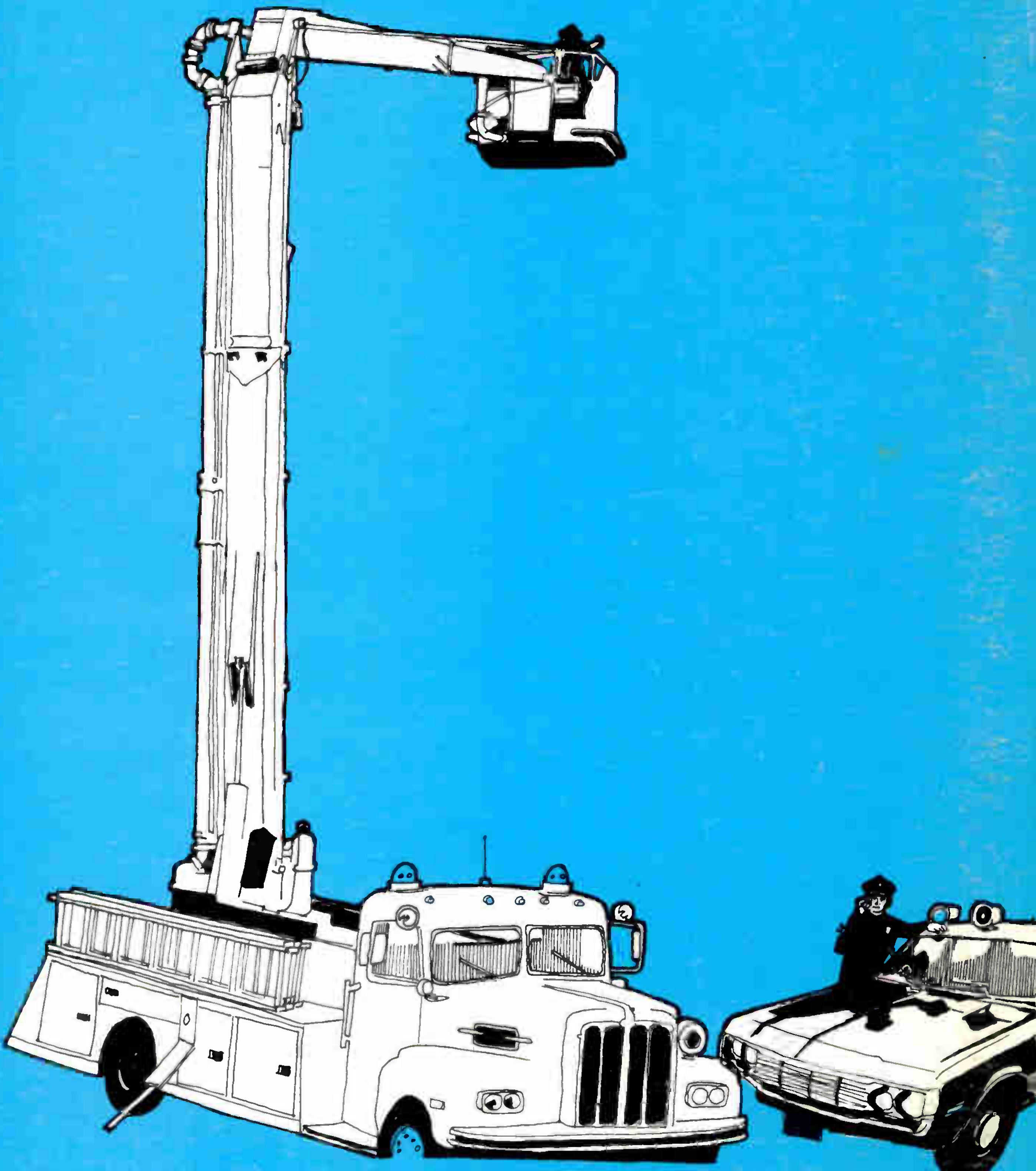
(1) Used in some versions.

CABINET PARTS

NAME	PART NO.
Case, Front	13-010284
Case, Rear	13-013126
Panel, Top	13-010283
Lid, Battery	13-018026
Knob, Volume/Squelch	13-110190
Knob, Scan/Channel	13-115123

INDEX

THIS INDEX LISTS ALL SCANNERS AND MONITORS
IN "SAMS SCANNER-MONITOR SERVICING DATA" VOLUMES.



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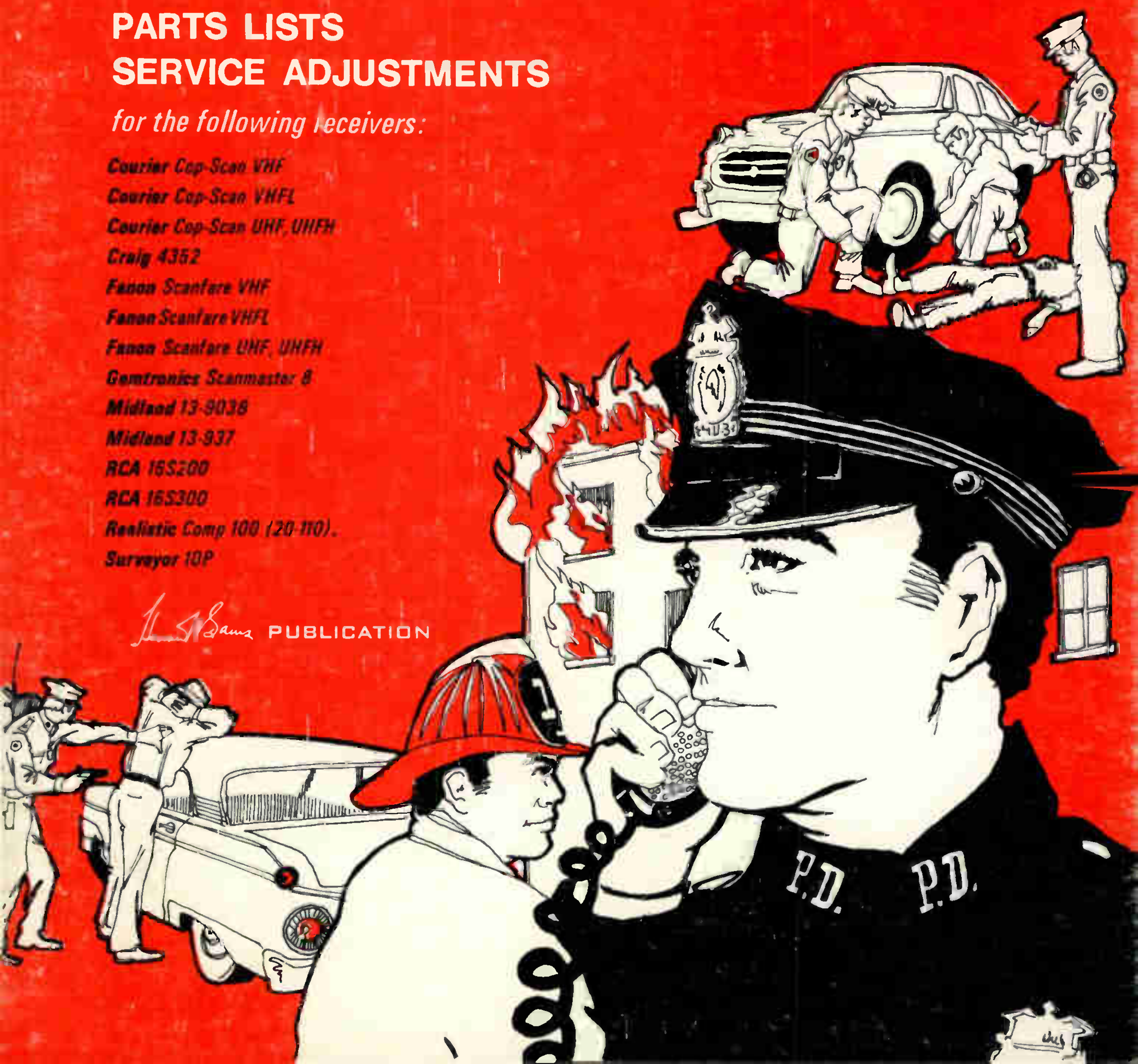
Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

Courier Cop-Scan VHF
Courier Cop-Scan VHFL
Courier Cop-Scan UHF, UHFH
Craig 4352
Fanon Scanfare VHF
Fanon Scanfare VHFL
Fanon Scanfare UHF, UHFH
Gemtronics Scanmaster 8
Midland 13-903B
Midland 13-937
RCA 16S200
RCA 16S300
Realistic Comp 100 (20-110).
Surveyor 10P

Howard W. Sams PUBLICATION



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Scanner-Monitor Servicing Data

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INDIANAPOLIS, INDIANA

First Edition
First Printing-July, 1977

Sams

Scanner-Monitor Servicing Data

SD-11

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

TABLE OF CONTENTS

Model Number *Page*

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Crystal Correlation Data

Monitor Model		Crystal Frequency Formula	Load Capacity
VHFL	30 to 45 MHz:	Frequency (+) 10.7 MHz	Series resonance (-) 450 Hz (62 pF)
	45 to 50 MHz:	Frequency (-) 10.7 MHz	Series resonance (-) 450 Hz (62 pF)
VHF	146 to 175 MHz:	Frequency (-) 10.7 MHz / Divided by 3	Series resonance (-) 450 Hz (62 pF)
UHF UHFH	450 to 512 MHz:	Frequency (-) 10.7 MHz / Divided by 9	18 PF

All Crystals are 3rd overtone and use a HC25/U type holder.

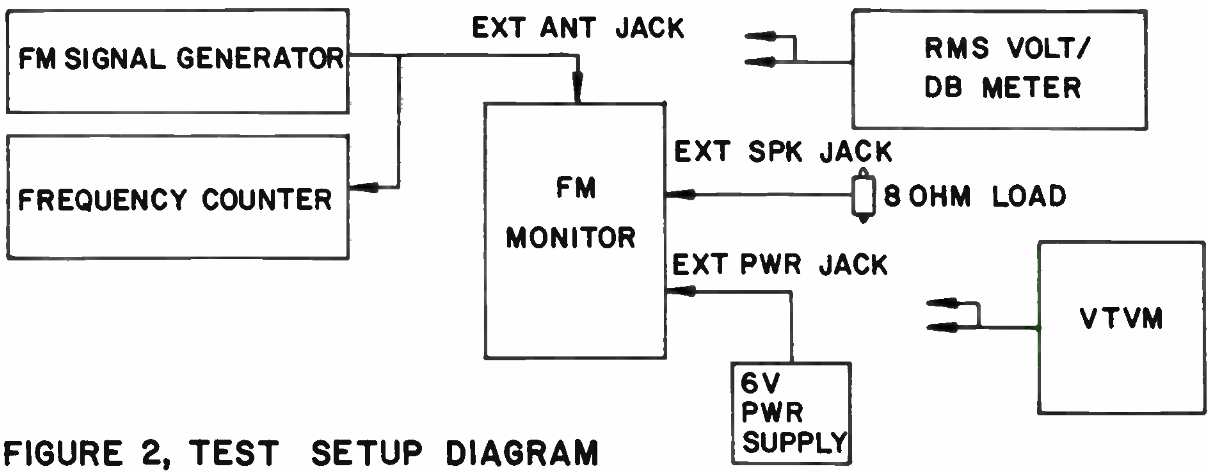


FIGURE 2, TEST SETUP DIAGRAM

VHFL and VHF Monitor Alignment Procedure

A. Disassemble the cabinet, top half only. Connect the monitor to the test equipment as shown in the diagram. Connect the RMS Volt/Wattmeter across the EXT SPK 8 ohm load.

B. Select a crystal with the desired frequency and install in channel 1 position. Adjust the external power supply to 6 ± 0.5 volts. Adjust the monitor controls as follows:

Volume Control	to	0.25 VRMS (0db) of noise across load
Squelch Control	to	Full CCW position
Bypass Switch	to	OFF
Manual/Scan Switch	to	Center position

C. Operate the Manual/Scan switch to select channel 1 and set in the center position.

D. RF Coil Adjustments

1) Adjust the FM signal generator to the same frequency as the channel frequency of the crystal installed (observe on the frequency counter).

2) Set signal generator modulation to the OFF position. Adjust the RF output to obtain a drop of 10db (0.1 volts) on the RMS Volt/DB meter.

3) Adjust the following coils for minimum reading on the db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10db quieting.

   Adjust: L101,L102,L103,L104,L105,L106 and T301 for maximum quieting.

4) Disconnect the external antenna adapter and install its antenna. Adjust the monitor volume control to obtain zero db reference on the RMS voltmeter, without receiving a signal.

5) Connect a short length of copper wire to the signal generator output and position vertically. Place the monitor approximately 24 inches from the signal generator.

6) Adjust the signal generator output (without modulation) to obtain 10db drop in the reading on the RMS voltmeter.

7) Adjust L101 or C101 (as applicable) to obtain maximum quieting.

E. Discriminator Adjustment

1) Connect a VTVM to the junction of R501, C501 and C502. Test point may be reached from the component side of the circuit board, top end of R501. Adjust T302 for zero reading on the VTVM.

F. Sensitivity Measurement

1) Set the squelch control full CCW and adjust the volume control to obtain a zero db (0.25 VRMS) reading on the RMS. Volt/DB meter (no signal should be received).

2) Without changing the adjustments of the monitor, reconnect the signal generator to the EXT ANT jack and adjust the RF output to obtain a noise drop of 20 db on the RMS Volt/DB meter. The signal generator RF output should be 1.0 uV(6db) or less.

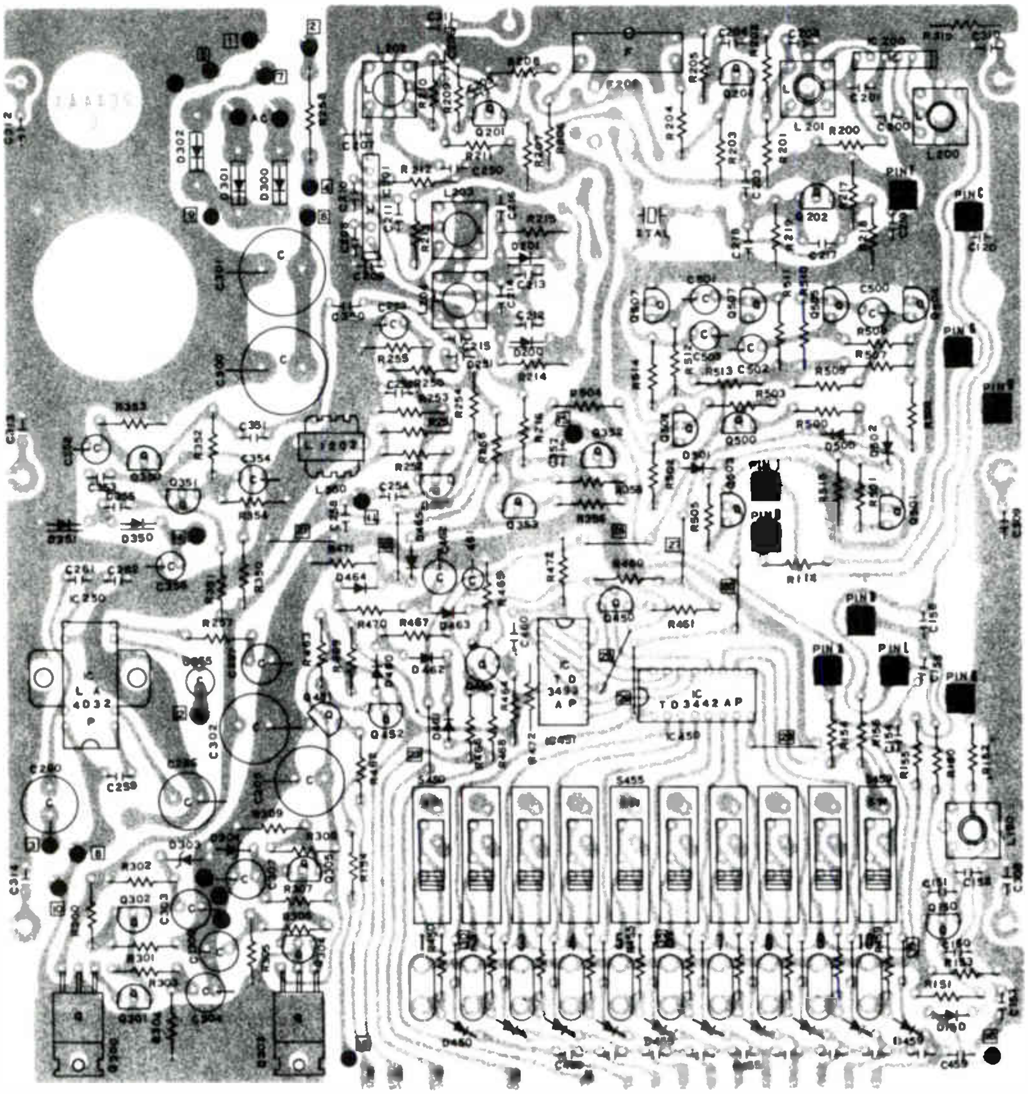
G. Audio Output Measurement

1) Adjust the volume control full CW and the squelch control full CCW. Modulate the signal generator +5KHz at 1KHz.

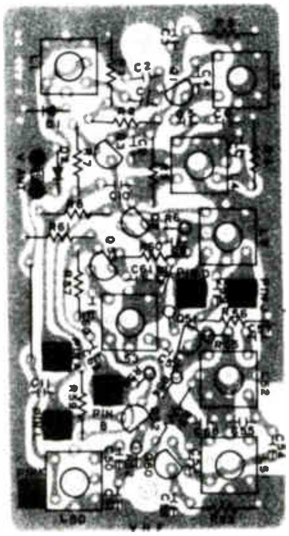
2) Adjust the signal generator RF output to 5 uV. The RMS Volt/DB meter should indicate 250 mW to 300 mW.

INDEX

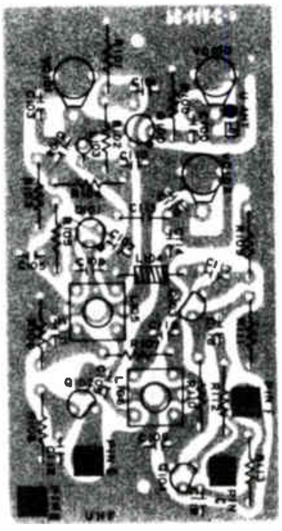
Listing all models/chassis covered in SAMS SD (Scanner Data) Series volumes



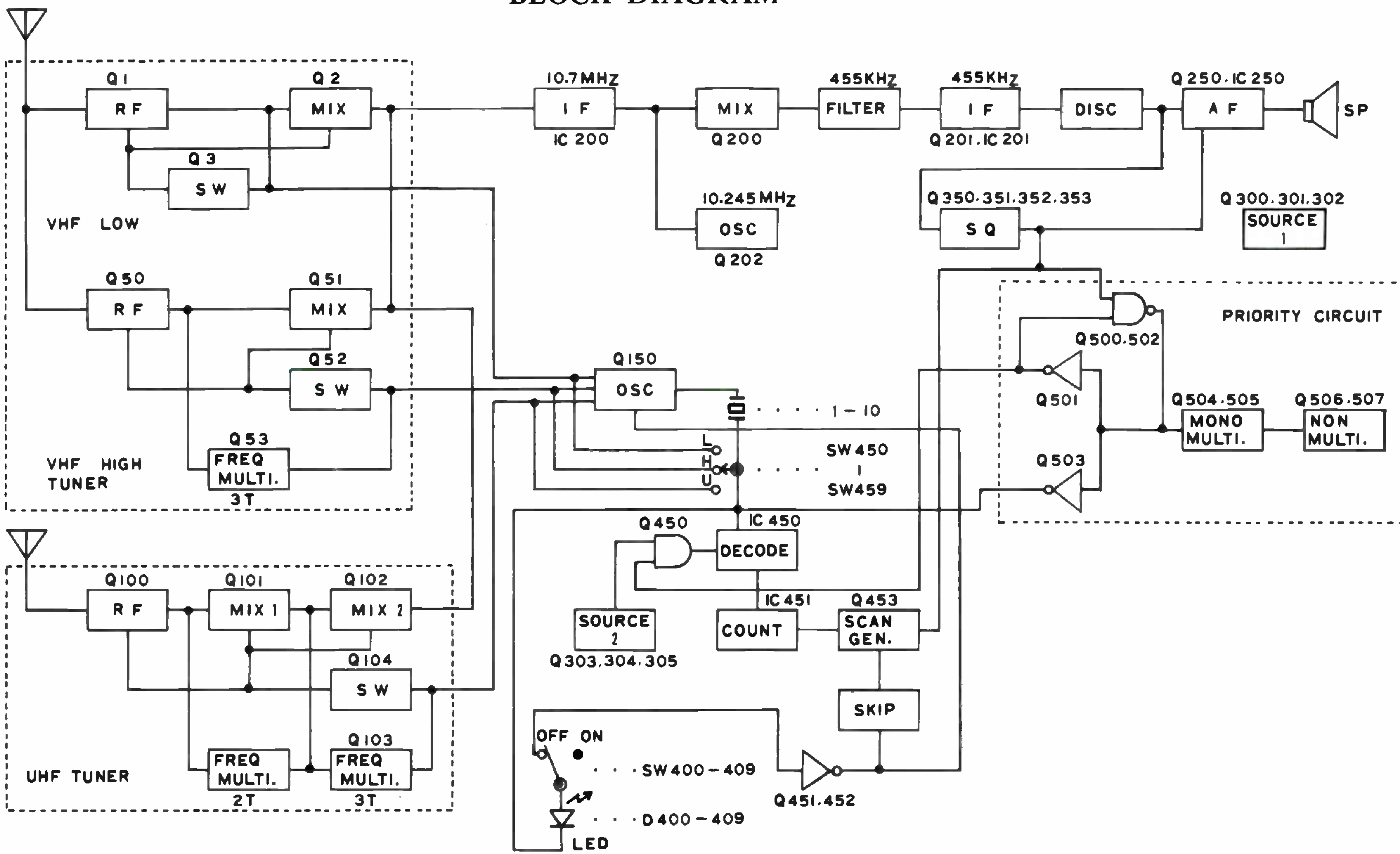
VHF TUNER



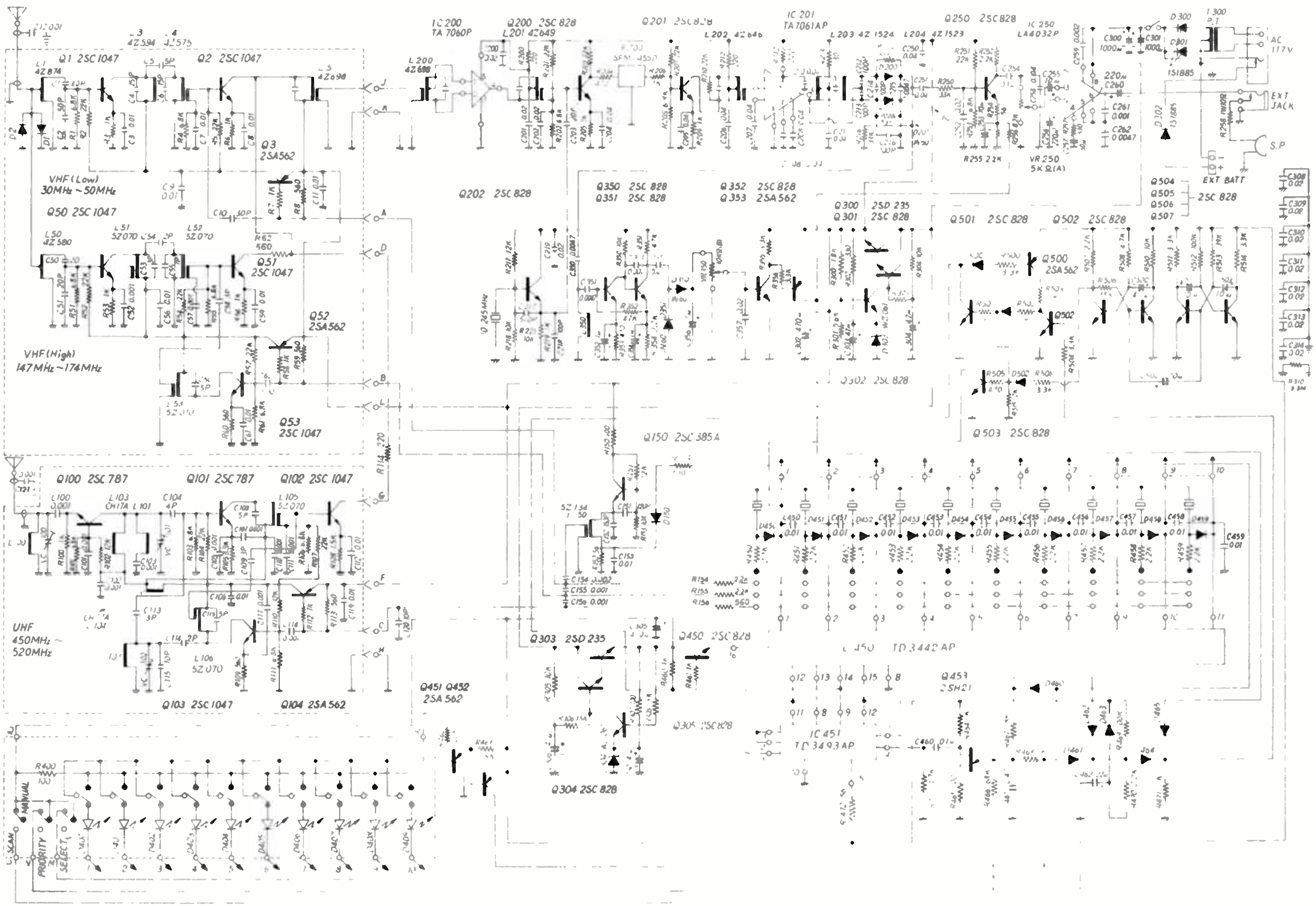
UHF TUNER



BLOCK DIAGRAM



CIRCUIT DIAGRAM



Surveyor 10P

Ref. No.	Description			RS Part Number	MFR's Part Number
SEMICONDUCTORS					
D1	Diode	Germanium		1N60	1N60
D2	Diode	Germanium		1N60	1N60
D3	Diode	Germanium		1N60	1N60
D4	Diode	Geramanium		1N60	1N60
D5	Diode	Silicon		HV80	HV80
D6	Diode	Germanium		1N60	1N60
D7	Diode	Germanium		1N60	1N60
D8	Diode	Germanium		1N60	1N60
D9	Diode	Silicon		HV80	HV80
D10	Diode	Germanium		1N60	1N60
D11	Diode	Germanium		1N60	1N60
D12	Diode	Germanium		1N60	1N60
D13	Diode	Germanium		1N60	1N60
D14	Diode	Germanium		2N60	1N60
D15	Diode	Germanium		1N60	1N60
D16	Diode	Germanium		1N60	1N60
D17	Diode	Germanium		1N60	1N60
D18	Diode	Germanium		1N60	1N60
D19	Diode	Germanium		1N60	1N60
D20	Diode	Germanium		1N60	1N60
D21	Diode	Silicon		HV80	HV80
IC-1	Integrated circuit			N74145	N74145
IC-2	Integrated circuit			N74145	N74145
IC-3	Integrated circuit			N7400	N7400
IC-4	Integrated circuit			N7493	N7493
IC-5	Integrated circuit			N7400	N7400
IC-6	Integrated circuit			N7493	N7493
IC-7	Integrated circuit			N7404	N7404
Q1	Transistor	Silicon	Toshiba	2SC373	2SC373
Q2	Transistor	Silicon	Toshiba	2SC373	2SC373
TA-1	Transistor	Array		TA-58	TA-58
TA-2	Transistor	Array		TA-58	TA-58
TA-3	Transistor	Array		TA-58	TA-58
MISCELLANEOUS					
	IC socket				C831402
	IC socket			J-6462	C831602
	Test pin			HB-3996	CTP
J_A	P.C. Board connector				3024-20A
J_B	P.C. Board connector				3024-9A
J_C	P.C. Board connector				3024-20A
27	P.C. Board				GE-21B-5700

SCANNING/PROGRAMMER P.C. BOARD PARTS LIST

Ref. No.	Description				RS Part Number	MFR's Part Number
			CAPACITORS			
C1	Mylar	0.01μF		±10%		
C2	Tantalum	3.3μF	10WV	±20%		CS15E1A3R3M1S
C3	Tantalum	1μF	35WV	±20%		CS15E1E010M1S
C4	Tantalum	1μF	35WV	±20%		CS15E1E010M1S
C5	Tantalum	33μF	6.3WV	±20%		CS15E0J330M1S
C6	Electrolytic	100μF	10WV	+50 ~ -10%		CE04W1A101A
C7	Mylar	0.01μF		±10%		
C8	Mylar	0.01μF		±10%		
C9	Ceramic	220pF		±10%		FC-80
C10	Mylar	0.002μF		±10%		
C11	Mylar	0.047μF		±10%		
C12	Mylar	0.01μF		±10%		
C13	Mylar	0.0068μF		±10%		
C14	Mylar	0.0068μF		±10%		
C15	Electrolytic	10μF	16WV	+50 ~ -10%		CE04W1C100F
C16	Mylar	0.01μF		±10%		
			RESISTORS			
R1	Carbon film	3.3KΩ	1/8W	±5%		ERD-18TJ-332
R2	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R3	Carbon film	470Ω	1/8W	±5%		ERD-18TJ-471
R4	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R5	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R6	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R7	Carbon film	4.7KΩ	1/8W	±5%		ERD-18TJ-472
R8	Carbon film	1KΩ	1/8W	±5%		ERD-18TJ-102
R9	Carbon film	4.7KΩ	1/8W	±5%		ERD-18TJ-472
R10	Carbon film	4.7KΩ	1/8W	±5%		ERD-18TJ-472
R11	Carbon film	330Ω	1/8W	±5%		ERD-18TJ-331
R12	Carbon film	3.9KΩ	1/8W	±5%		ERD-18TJ-392
R13	Carbon film	1KΩ	1/8W	±5%		ERD-18TJ-102
R14	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R15	Carbon film	47KΩ	1/8W	±5%		ERD-18TJ-473
R16	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R17	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R18	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R19	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R20	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R21	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R22	Carbon film	470Ω	1/8W	±5%		ERD-18TJ-471
R23	Carbon film	470Ω	1/8W	±5%		ERD-18TJ-471
R24	Carbon film	47Ω	1/8W	±5%		ERD-18TJ-470
R25	Carbon film	4.7KΩ	1/8W	±5%		ERD-18TJ-472
R26	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R27	Carbon film	4.7KΩ	1/8W	±5%		ERD-18TJ-472
R28	Carbon film	100KΩ	1/8W	±5%		ERD-18TJ-104
R29	Carbon film	100KΩ	1/8W	±5%		ERD-18TJ-104
R30	Carbon film	4.7KΩ	1/8W	±5%		ERD-18TJ-472
R31	Carbon film	10KΩ	1/8W	±5%		ERD-18TJ-103
R32	Carbon film	100KΩ	1/8W	±5%		ERD-18TJ-104

Ref. No.	Description				RS Part Number	MFR's Part Number
R7	Carbon film	3.3KΩ	1/8W	±5%		ERD-18VJ-332
R8	Carbon film	1KΩ	1/8W	±5%		ERD-18VJ-102
R9	Carbon film	470Ω	1/8W	±5%		ERD-18VJ-471
R10	Carbon film	470Ω	1/8W	±5%		ERD-18VJ-471
R11	Carbon film	2.7KΩ	1/8W	±5%		ERD-18VJ-272
R12	Carbon film	3.3MΩ	1/8W	±5%		ERD-18VJ-335
R13	Carbon film	4.7KΩ	1/8W	±5%		ERD-18VJ-472
R14	Carbon film	10KΩ	1/8W	±5%		ERD-18VJ-103
R15	Carbon film	10KΩ	1/8W	±5%		ERD-18VJ-103
R16	Carbon film	1KΩ	1/8W	±5%		ERD-18VJ-102
R17	Carbon film	10KΩ	1/8W	±5%		ERD-18VJ-103
R18	Carbon film	4.7KΩ	1/8W	±5%		ERD-18VJ-472
R19	Carbon film	220KΩ	1/8W	±5%		ERD-18TJ-224
SEMICONDUCTORS						
IC-1	Integrated circuit				N7405	N7405
IC-2	Integrated circuit				N7405	N7405
IC-3	Integrated circuit				N7405	N7405
IC-4	Integrated circuit				MCM14537	MCM14537
IC-5	Integrated circuit				MC4044	MC4044
IC-6	Integrated circuit				TC-5082P	TC-5082P
IC-7	Integrated circuit				N74164	N74164
IC-8	Integrated circuit				N74164	N74164
IC-9	Integrated circuit				MC4016P	MC4016P
IC-10	Integrated circuit				MC4018P	MC4018P
IC-11	Integrated circuit				MC4018P	MC4018P
IC-12	Integrated circuit				MC4016P	MC4016P
IC-13	Integrated circuit				MC12014	MC12014
IC-14	Integrated circuit				MC12013	MC12013
D1	Diode	Silicon			HV80	HV80
D2	Diode	Silicon			HV80	HV80
Q1	Transistor	Silicon	Toshiba		2SC373	2SC373
Q2	Transistor	Silicon	Toshiba		2SC373	2SC373
Q3	Transistor	Silicon	Toshiba		2SC373	2SC373
Q4	Transistor	Silicon	Toshiba		2SC373	2SC373
Q5	Transistor	Silicon	Toshiba		2SC373	2SC373
Q6	Transistor	Silicon	Toshiba		2SC373	2SC373
Q7	Transistor	Silicon	Toshiba		2SC373	2SC373
Q8	Transistor	Silicon	Toshiba		2SC373	2SC373
Q9	Transistor	Silicon	Toshiba		2SC373	2SC373

PLL/PROGRAMMER P.C. BOARD PARTS LIST

Ref. No.	Description	RS Part Number	MFR's Part Number
	CAPACITORS		
C1	Electrolytic 47μF 10WV +50 ~ -10%		CE04W1A470B
C2	Mylar 0.01μF ±10%		
C3	Mylar 0.01μF ±10%		
C4	Electrolytic 220μF 10WV +50 ~ -10%		CE04W1A221E
C5	Electrolytic 1μF 50WV +75 ~ -10%		CE04W1H010
C6	Mylar 0.01μF ±10%		
C7	Mylar 0.01μF ±10%		
C8	Ceramic 22pF ± 5%		FC-50
C9	Tantalum 1μF 35WV ±20%		CS15E1E010M1S
C10	Ceramic 5pF ±0.5pF		FC-50
C11	Ceramic 100pF ±10%		FC-70
C12	Ceramic 20pF ±5%		FC-50
C13	Mylar 0.01μF ±10%		
C14	Mylar 0.01μF ±10%		
C15	Mylar 0.01μF ±10%		
C16	Mylar 0.01μF ±10%		
C17	Mylar 0.01μF ±10%		
C18	Mylar 0.01μF ±10%		
C19	Mylar 0.01μF ±10%		
C20	Mylar 0.01μF ±10%		
C21	Mylar 0.01μF ±10%		
C22	Mylar 0.1μF ±10%		
C23	Mylar 0.001μF ±10%		
C24	Mylar 0.01μF ±10%		
C25	Mylar 0.01μF ±10%		
TC-1	Trimmer 20pF	C-0730	ECV-1ZW20X53
	MISCELLANEOUS		
JD	P.C. Board connector	HB-5489	3024-9A
JE	P.C. Board connector	HB-5488	3024-20A
JF	P.C. Board connector	HB-5488	3024-20A
JG	P.C. Board connector		3024-3A
25	P.C. Board		GE-21B-5703
X1	Crystal 5.12 MHz		
	IC socket		C831402
	IC socket	J-6462	C831602
	Test pin	HB-3996	CTP
	RESISTORS		
R1	Carbon film 22KΩ 1/8W ±5%		ERD-18VJ-223
R2	Carbon film 100KΩ 1/8W ±5%		ERD-18VJ-104
R3	Carbon film 100KΩ 1/8W ±5%		ERD-18VJ-104
R4	Carbon film 330Ω 1/8W ±5%		ERD-18VJ-331
R5	Carbon film 100Ω 1/8W ±5%		ERD-18VJ-101
R6	Carbon film 330Ω 1/8W ±5%		ERD-18VJ-331

DISPLAY P.C. BOARD PARTS LIST

Ref. No.	Description	RS Part Number	MFR's Part Number
	SEMICONDUCTORS		
D1	Light emitting diode	L-0740	TLR-104 (C or D)
D2	Light emitting diode	L-0740	TLR-104 (C or D)
D3	Light emitting diode	L-0740	TLR-104 (C or D)
D4	Light emitting diode	L-0740	TLR-104 (C or D)
D5	Light emitting diode	L-0740	TLR-104 (C or D)
D6	Light emitting diode	L-0740	TLR-104 (C or D)
D7	Light emitting diode	L-0740	TLR-104 (C or D)
D8	Light emitting diode	L-0740	TLR-104 (C or D)
D9	Light emitting diode	L-0740	TLR-104 (C or D)
D10	Light emitting diode	L-0740	TLR-104 (C or D)
D11	Light emitting diode	L-0740	TLR-104 (C or D)
D12	Light emitting diode	L-0740	TLR-104 (C or D)
D13	Light emitting diode	L-0740	TLR-104 (C or D)
D14	Light emitting diode	L-0740	TLR-104 (C or D)
D15	Light emitting diode	L-0740	TLR-104 (C or D)
D16	Light emitting diode	L-0740	TLR-104 (C or D)
	MISCELLANEOUS		
	P.C. Board holder		GE-11D-593
(22)	P.C. Board		GE-21C-5706

LED P.C. BOARD PARTS LIST

Ref. No.	Description	RS Part Number	MFR's Part Number
D1	Light emitting diode	L-0740	TLR-104 (C or D)
(23)	P.C. Board		GE-21D-5708

MISCELLANEOUS

	Push switch	S-7293	2FQ-0001DF-3220
	Push switch	S-7294	16FQ-0001BF-3220
J_A	P.C. Board connector	HB-5490	3022-20A
J_B	P.C. Board connector	HB-5491	3022-9A
J_C	P.C. Board connector	HB-5490	3022-20A
J_D	P.C. Board connector	HB-5491	3022-9A
J_E	P.C. Board connector	HB-5490	3022-20A
J_F	P.C. Board connector	HB-5490	3022-20A
J_G	P.C. Board connector	HB-5492	3022-3A
J_H	P.C. Board connector	HB-5493	5048-12A
J_I	P.C. Board connector	HB-5493	5048-12A
(26)	P.C. Board		GE-21B-5697

SEMICONDUCTORS

D1	Diode	Germanium		1N60	1N60
D2	Diode	Zener		HZ3-C	HZ3-C
D3	Diode	Silicon		HV80	HV80
1C-1	Integrated circuit			N74150	N74150
Q1	Transistor	Silicon	Toshiba	2SC373	2SC373
Q2	Transistor	Silicon	Toshiba	2SC373	2SC373

Ref. No.	Description				RS Part Number	MFR's Part Number
Q9	Transistor	Silicon	Toshiba		2SC272(0)	2SC372(0)
Q10	Transistor	Silicon	Toshiba		2SC372(0)	2SC372(0)
Q11	Transistor	Silicon	Toshiba		2SC372(0)	2SC372(0)
Q12	FET	Silicon	Toshiba		3SK35 or 3SK59	3SK35 or 3SK59
Q13	FET	Silicon	Toshiba		3SK35 or 3SK59	3SK35 or 3SK59
Q14	Transistor	Silicon	Toshiba		2SC785(R)	2SC785(R)
Q15	Transistor	Silicon	Toshiba		2SC373	2SC373
Q16	Transistor	Silicon	Toshiba		2SC373	2SC373
Q17	Transistor	Silicon	Toshiba		2SC373	2SC373
Q18	Transistor	Silicon	Toshiba		2SC373	2SC373
Q19	Transistor	Silicon	Hitachi		2SC1117	2SC1117
Q20	Transistor	Silicon	Hitachi		2SC1117	2SC1117
Q21	Transistor	Silicon	Toshiba		2SC387A	2SC387A
Q22	Transistor	Silicon	Toshiba		2SC394(Y)	2SC394(Y)
Q23	Transistor	Silicon	Toshiba		2SA495(0)	2SA495(0)
Q24	Transistor	Silicon	Toshiba		2SA495(0)	2SA495(0)
Q25	Transistor	Silicon	Toshiba		2SA495(0)	2SA495(0)
Q26	Transistor	Silicon	Hitachi		2SC535(B)	2SC535(B)
Q27	Transistor	Silicon	Toshiba		2SD526 or 2SC789	2SD526 or 2SC789
Q28	Transistor	Silicon	Toshiba		2SD526 or 2SC789	2SD526 or 2SC789
Q29	Transistor	Silicon	Toshiba		2SC735(Y)	2SC735(Y)
Q30	Transistor	Silicon	Toshiba		2SD526 or 2SC789	2SD526 or 2SC789
IC-1	Integrated circuit				N7405A	N7405A
IC-2	Integrated circuit				BA-511A	BA-511A
IC-3	Integrated circuit				N74145B	N74145B
IC-4	Integrated circuit				MC1648P	MC1648P
	RESISTORS					
R1	Carbon film	1KΩ	1/8W	±5%		ERD-18VJ-102
R2	Carbon film	1KΩ	1/8W	±5%		ERD-18VJ-102
R3	Carbon film	1KΩ	1/8W	±5%		ERD-18VJ-102
R4	Carbon film	1KΩ	1/8W	±5%		ERD-18VJ-102
R5	Carbon film	100KΩ	1/8W	±5%		ERD-18VJ-104
R6	Carbon film	47KΩ	1/8W	±5%		ERD-18VJ-473
R7	Carbon film	100KΩ	1/8W	±5%		ERD-18VJ-104
R8	Carbon film	47KΩ	1/8W	±5%		ERD-18VJ-473
R9	Carbon film	100Ω	1/8W	±5%		ERD-18VJ-101
R10	Carbon film	100Ω	1/8W	±5%		ERD-18VJ-101
R11	Carbon film	100KΩ	1/8W	±5%		ERD-18VJ-104
R12	Carbon film	100KΩ	1/8W	±5%		ERD-18VJ-104
R13	Carbon film	100KΩ	1/8W	±5%		ERD-18VJ-104
R14	Carbon film	3.3KΩ	1/8W	±5%		ERD-18VJ-332
R15	Carbon film	100Ω	1/8W	±5%		ERD-18VJ-101
R16	Carbon film	3.3KΩ	1/8W	±5%		ERD-18VJ-332
R17	Carbon film	3.3KΩ	1/8W	±5%		ERD-18VJ-332
R18	Carbon film	470KΩ	1/8W	±5%		ERD-18VJ-474
R19	Carbon film	1KΩ	1/8W	±5%		ERD-18VJ-102
R20	Carbon film	100Ω	1/8W	±5%		ERD-18VJ-101
R21	Carbon film	470KΩ	1/8W	±5%		ERD-18VJ-474
R22	Carbon film	100Ω	1/8W	±5%		ERD-18VJ-101

Ref. No.	Description			RS Part Number	MFR's Part Number
SEMICONDUCTORS					
D1	Diode	Silicon		HV80	HV80
D2	Diode	Silicon		HV80	HV80
D3	Diode	Silicon		HV80	HV80
D4	Diode	Variable capacitor		FC-54M	FC-54M
D5	Diode	Variable capacitor		FC-54M	FC-54M
D6	Diode	Variable capacitor		FC-54M	FC-54M
D7	Diode	Variable capacitor		FC-54M	FC-54M
D8	Diode	Variable capacitor		FC-54M	FC-54M
D9	Diode	Variable capacitor		FC-54M	FC-54M
D10	Diode	Silicon		HV80	HV80
D11	Diode	Silicon		HV80	HV80
D12	Diode	Silicon		HV80	HV80
D13	Diode	Silicon		HV80	HV80
D14	Diode	Silicon		HV80	HV80
D15	Diode	Silicon		HV80	HV80
D16	Diode	Silicon		HV80	HV80
D17	Diode	Silicon		HV80	HV80
D18	Diode	Germanium		1N60	1N60
D19	Diode	Germanium		1N60	1N60
D20	Diode	Germanium		1N60	1N60
D21	Diode	Germanium		1N60	1N60
D22	Diode	Silicon		HV80	HV80
D23	Diode	Silicon		HV80	HV80
D24	Diode	Silicon		HV80	HV80
D25	Diode	Silicon		HV80	HV80
D26	Diode	Silicon		HV80	HV80
D27	Diode	Germanium		1N60	1N60
D28	Diode	Germanium		1N60	1N60
D29	Diode	Germanium		1N60	1N60
D30	Diode	Germanium		1N60	1N60
D31	Diode	Germanium		1N60	1N60
D32	Diode	Variable capacitor		FC-54M	FC-54M
D33	Diode	Zener (9.1V)		02Z9.1A	02Z9.1A
D34	Diode	Zener (5.6V)		02Z5.6A	02Z5.6A
D35	Diode	Silicon		HV80	HV80
D36	Diode	Zener (5.6V)		02Z5.6A	02Z5.6A
D37	Diode	Silicon		HV80	HV80
D38	Diode	Zener (5.6V)		02Z5.6A	02Z5.6A
D39	Diode	Silicon		1S1885	1S1885
D40	Diode	Silicon		1B2C1	1B2C1
D41	Diode	Silicon		1B2Z1	1B2Z1
Q1	Transistor	Silicon	Toshiba	2SC373	2SC373
Q2	FET	Silicon	Toshiba	3SK35 or 3SK59	3SK35 or 3SK59
Q3	FET	Silicon	Toshiba	3SK35 or 3SK59	3SK35 or 3SK59
Q4	Transistor	Silicon	Hitachi	2SC535(B)	2SC535(B)
Q5	Transistor	Silicon	Toshiba	2SC372(0)	2SC372(0)
Q6	Transistor	Silicon	Toshiba	2SC372(0)	2SC372(0)
Q7	Transistor	Silicon	Toshiba	2SC372(0)	2SC372(0)
Q8	Transistor	Silicon	Toshiba	2SC372(0)	2SC372(0)

Ref. No.	Description	RS Part Number	MFR's Part Number
	COIL/TRANSFORMERS/FILTERS/CRYSTALS		
T1	VHF Lo RF coil	CA-4549	113KN-4427
T2	VHF Lo RF coil	CA-3482	113KN-5344Z
T3	VHF Lo RF coil	CA-3482	113KN-5344Z
T4	IFT 10.7 MHz	CA-4653	119LC-470033N3
T5	IFT 10.7 MHz	CA-4653	119LC-470033N3
T6	IFT coil	CA-3484	7MC-452503N
T7	Discriminator coil	CA-2997	7MC-2091N
T8	VHF Hi RF coil	CA-3481	113KN-5127Z
T9	VHF Hi RF coil	CA-3481	113KN-5127Z
T10	VHF Hi RF coil	CA-4547	113SN-4580X
T11	Coil	CA-3483	126LN-5730A
T12	VCO coil	CA-3482	113KN-5344Z
L1	VHF RF coil	CA-3486	6.5SN0-097
L2	RFC 10 μH	C-0728	LF4-100K
L3	Balun coil	CA-3487	6.5SN0-099
L4	VHF OSC coil	CA-4546	6.5SN0-087
L5	RFC 2.2mH	C-727	FL-7H
L6	UHF Tank coil	CA-4654	8LNR-093
L7	RFC 10 μH	C-0728	LF4-100K
L8	UHF Tank coil	CA-4654	8LNR-093
L9	VHF OSC coil	CA-3485	6.5SN0-104
L10	RFC .68 μH	CB-2190	EL0606-R68M
L11	RFC 1.8 μH	CA-2909	LF4-1R8K
L12	RFC .33 μH	C-0726	FL-3H
L13	RFC .33 μH	C-0726	FL-3H
L14	RFC .33 μH	C-0726	FL-3H
L15	RFC .2 μH	CA-3488	4LNC-092
L16	RFC .2 μH	CA-3488	4LNC-092
L17	Choke coil 18 μH	CA-3182	3B-037
CF-1	Crystal filter 10.7 MHz	C-0725	CMF-10.7 or 10M15B
CF-2	Crystal filter 10.7 MHz	C-0725	CMF-10.7 or 10M15B
CF-3	Ceramic filter 455 kHz		LF-C18
CF-4	Ceramic filter 455 kHz	C-0578	BFB455L or EF-A8
CF-5	Ceramic filter 455 kHz	C-0578	BFB455L or EF-A8
X1	Crystal 10.245 MHz		
X2	Crystal 65.71464 MHz		
X3	Crystal 62.85750 MHz		
X4	Crystal 60.00000 MHz		
	MISCELLANEOUS		
	Test pin	J-6461	CTP
	IC socket		C831402
	Shield plate		CE-21D-5910
	Ceramic stand off L = 10 mm.		
	Ceramic stand off L = 20 mm.		
24	P.C. Board		GE-21B-5694
	VCO shief plate with insulator		GE-21D-6070/6071

Ref. No.	Description				RS Part Number	MFR's Part Number
C103	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C104	Ceramic	10pF		±0.5pF		FC-50
C105	Ceramic	56pF		±10%		FCC-100
C106	Ceramic	47pF		±10%		FCC-100
C107	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C108	Ceramic	10pF		±0.5pF		FC-50
C109	Ceramic	2pF		±0.5pF		FC-50
C110	Ceramic	2pF		±0.5pF		FC-50
C111	Ceramic	7pF		±0.5pF		FC-50
C112	Ceramic	0.1μF		+ 80 ~ -20%		MC-135
C113	Mylar	0.01μF		±10%		
C114	Mylar	0.02μF		±10%		
C115	Mylar	0.01μF		±10%		
C116	Mylar	0.1μF		±10%		
C117	Mylar	0.0027μF		±10%		
C118	Ceramic	0.001μF		±20%		SCP-100
C119	Ceramic	0.01μF		+80 ~ -20%		MC-70
C120	Electrolytic	220μF	16WV	+50 ~ -10%		CE04W1C221E
C121	Ceramic	0.001μF		±20%		SCP-60
C122	Ceramic	100pF		±10%		FC-70
C123	Ceramic	100pF		±10%		FC-70
C124	Ceramic	10pF		±0.5pF		FC-50
C125	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C126	Ceramic	10pF		±0.5pF		FC-50
C127	Mylar	0.01μF		±10%		
C128	Electrolytic	220μF	25WV	+50 ~ -10%		CE04W1E221C
C129	Ceramic	0.04μF		+80 ~ -20%		MC-100
C130	Electrolytic	220μF	25WV	+50 ~ -10%		CE04W1E221C
C131	Electrolytic	3300μF	25WV	+50 ~ -10%		1E332
C132	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C133	Ceramic	0.04μF		+80 ~ -20%		MC-100
C134	Electrolytic	220μF	16WV	+50 ~ -10%		CE04W1C221E
C135	Electrolytic	220μF	16WV	+50 ~ -10%		CE04W1C221E
C136	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C137	Ceramic	0.04μF		+80 ~ -20%		MC-100
C138	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C139	Electrolytic	220μF	16WV	+50 ~ -10%		CE04W1C221E
C140	Electrolytic	1000μF	25WV	+50 ~ -10%		CE04W1E102C
C141	Ceramic	0.01μF		+80 ~ -20%		MC-70
C142	Ceramic	0.01μF		+80 ~ -20%		MC-70
C143	Tantalum	22μF	6.3WV	±20%		CS15EOJ22OMIS
TC-1	Trimmer	10pF			C-0729	ECV-1ZW10X52
TC-2	Trimmer	10pF			C-0729	ECV-1ZW10X52
TC-3	Trimmer	50pF			C-0561	ECV-1ZW50X32
TC-4	Trimmer	50pF			C-0561	ECV-1ZW50X32
TC-5	Trimmer	50pF			C-0561	ECV-1ZW50X32
TC-6	Trimmer	10pF			C-0561	ECV-1ZW10X52

Ref. No.	Description				RS Part Number	MFR's Part Number
C51	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C52	Ceramic	10pF		±0.5pF		PC-50
C53	Ceramic	1pF		±0.5pF		FC-50
C54	Ceramic	10pF		±0.5pF		FC-50
C55	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C56	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C57	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C58	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C59	Ceramic	10pF		+0.5pF		FC-50
C60	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C61	Ceramic	150pF		+10%		PC-80
C62	Ceramic	10pF		±0.5pF		FC-50
C63	Ceramic	470pF		±10%		SCP-50
C64	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C65	Ceramic	0.002μF		±20%		SCP-80
C66	Electrolytic	10μF	16WV	+50 ~ -10%		CE04W1C100F
C67	Ceramic	0.0022μF		±20%		SCP-80
C68	Ceramic	0.0022μF		±20%		SCP-80
C69	Electrolytic	10μF	16WV	+50 ~ -10%		CE04W1C100F
C70	Ceramic	330pF		±10%		SCP-50
C71	Ceramic	0.001μF		±20%		SCP-60
C72	Ceramic	0.1μF		+80 ~ -20%		MC-135
C73	Electrolytic	1μF	50WV	+75 ~ -10%		CE04W1H010
C74	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C75	Mylar	0.01μF		±10%		
C76	Electrolytic	220μF	16WV	+50 ~ -10%		CE04W1E221C
C77	Mylar	0.0047μF		±10%		
C78	Mylar	0.02μF		±10%		
C79	Mylar	0.0047μF		±10%		
C80	Electrolytic	1μF	50WV	+75 ~ -10%		CE04W1H010
C81	Mylar	0.01μF		±10%		
C82	Mylar	0.0027μF		±10%		
C83	Electrolytic	10μF	16WV	+50 ~ -10%		CE04W1C100F
C84	Electrolytic	10μF	16WV	+50 ~ -10%		CE04W1C100F
C85	Mylar	0.01μF		±10%		
C86	Electrolytic	10μF	16WV	+50 ~ -10%		CD04W1C100F
C87	Ceramic	0.1μF		+80 ~ -20%		MC-135
C88	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C89	Ceramic	10pF		±0.5pF		FC-50
C90	Ceramic	7pF		±0.5pF		FC-50
C91	Ceramic	33pF		±5%		FC-50
C92	Ceramic	5pF		±5%		FC-50
C93	Ceramic	0.001μF		±20%		SCP-60
C94	Ceramic	20pF		±5%		FC-50
C95	Ceramic	2pF		±0.5pF		FC-50
C96	Ceramic	0.001μF		±20%		SCP-60
C97	Mylar	0.1μF		±10%		
C98	Ceramic	0.001μF		±10%		SCP-60
C99	Ceramic	0.001μF		±10%		SCP-60
C100	Ceramic	5pF		±0.5pF		FC-50
C101	Ceramic	0.001μF		±20%		SCP-60
C102	Ceramic	0.001μF		±20%		SCP-60

RF/IF P.C. BOARD PARTS LIST

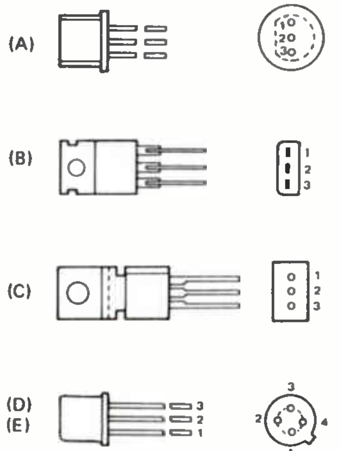
Ref. No.	Description				RS Part Number	MFR's Part Number
	CAPACITORS					
C1	Ceramic	0.001μF		±20%		SCP-60
C2	Ceramic	0.01μF		+80 ~ -20%		MC-70
C3	Ceramic	0.001μF		±20%		SCP-60
C4	Ceramic	0.001μF		±20%		SCP-60
C5	Ceramic	0.001μF		±20%		SCP-60
C6	Ceramic	0.002μF		±20%		SCP-80
C7	Ceramic	0.001μF		±20%		SCP-60
C8	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C9	Ceramic	100pF		±10%		FC-70
C10	Ceramic	0.0047μF		+80 ~ -20%		SCP-80
C11	Ceramic	0.0047μF		+80 ~ -20%		SCP-80
C12	Ceramic	0.001μF		±20%		SCP-60
C13	Ceramic	0.0047μF		+80 ~ -20%		SCP-80
C14	Ceramic	0.002μF		±20%		SCP-60
C15	Ceramic	100pF		±10%		FC-70
C16	Ceramic	0.002μF		±20%		SCP-80
C17	Ceramic	47pF		±10%		FCC-100
C18	Ceramic	0.001μF		±20%		SCP-60
C19	Ceramic	22pF		±5%		FC-50
C20	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C21	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C22	Ceramic	0.001μF		±20%		SCP-60
C23	Ceramic	0.0047μF		+80 ~ -20%		SCP-100
C24	Ceramic	0.001μF		±20%		SCP-60
C25	Ceramic	0.001μF		±20%		SCP-60
C26	Ceramic	470pF		±10%		SCP-50
C27	Ceramic	330pF		±10%		SCP-50
C28	Ceramic	68pF		±10%		FC-70
C29	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C30	Mylar	0.1μF		±10%		
C31	Ceramic	10pF		±0.5pF		FC-50
C32	Tantalum	0.1μF	35WV	±20%		CS15E1V0R1M
C33	Ceramic	0.001μF		±20%		SCP-60
C34	Ceramic	470pF		±10%		SCP-50
C35	Electrolytic	47μF	16WV	+50 ~ -10%		CE04W1C470B
C36	Ceramic	470pF		±10%		SCP-50
C37	Ceramic	470pF		±10%		SCP-50
C38	Ceramic	470pF		±10%		SCP-50
C39	Ceramic	470pF		±10%		SCP-50
C40	Mylar	0.1μF		±10%		
C41	Tantalum	0.1μF	35WV	±20%		CS15E1V0R1M
C42	Ceramic	100pF		±10%		FC-70
C43	Ceramic	330pF		±5%		SCU-100
C44	Ceramic	330pF		±5%		SCU-100
C45	Mylar	0.001μF		±10%		
C46	Ceramic	2pF		±0.5pF		FC-50
C47	Ceramic	2pF		±0.5pF		FC-50
C48	Ceramic	22pF		±5%		FC-50
C49	Ceramic	0.001μF		±20%		SCP-60
C50	Ceramic	0.0047μF		+80 ~ -20%		SCP-100

Symptom	Possible cause
15) UHF Lo, Mid Hi does not operate but VHF Lo and Hi are OK.	1) Defective band selector (IC-3) and/or power supply switching circuit component parts on RF/IF P.C. Board. 2) Faulty diode D22, 23 and/or tripler (Q21) circuit component on RF/IF P.C. Board. 3) Defective UHF RF amp and/or mixer circuit component on RF/IF P.C. Board.
16) UHF Mid band does not operate but VHF Lo and UHF Lo are OK.	1) Defective band selector (IC-3) or diode D25, D31 on RF/IF P.C. Board. 2) Defective crystal X-3 (62.85750 MHz) and/or associated circuit component parts on RF/IF P.C. Board.
17) UHF Hi does not operate but VHF Lo, Hi and UHF Lo, Mid are OK.	1) Defective band selector (IC-3) or diode D26, D29 on RF/IF P.C. Board. 2) Defective crystal X-2 (65.71464 MHz) and/or associated circuit component parts on RF/IF P.C. Board.
18) VCO does not oscillate correct frequency.	1) Faulty crystal X-1 and/or integrated circuit IC-6 of PLL/PROGRAMMER CIRCUIT. 2) Defective programmable counter circuit, phase detector circuit and/or associated circuit component of PLL/PROGRAMMER P.C. Board. 3) Faulty 5 kHz filter and/or buffer amp (Q26) circuit component parts on RF/IF P.C. Board. 4) Defective VCO IC-4 and/or varicap D32 or associated circuit component on RF/IF P.C. Board.

NOTE: *Recheck to see that each connector is connected firmly.*

SEMICONDUCTOR LEAD IDENTIFICATIONS

(A) : 2SA495(O), 2SC372(O), 2SC373, 2SC387(A), 2SC394(Y), 2SC785(R), 2SC735(Y)
(B) : 2SC535(B)
(C) : 2SC789, 2SD526
(D) : 2SC1117
(E) : 3SK35, 3SK59



(A)
1. Emitter
2. Collector
3. Base

(B)
1. Emitter
2. Collector
3. Base

(C)
1. Base
2. Collector (Heat Sink)
3. Emitter

(D) (E)
1. Emitter
2. Base
3. Collector
4. Case

H. Squelch Sensitivity Measurements

1) Disconnect the signal generator from the EXT ANT jack. Set the monitor volume control full CW position. Remove the phone plug from the EXT SPK jack.

2) Adjust the squelch control from full CCW position to a point where the noise just stops. Control should be approximately 1/4 rotation from CCW.

3) Adjust the signal generator RF output to zero and reconnect to the EXT ANT jack. Slowly increase the RF output until audio is heard in the speaker.

4) The RF output should be approximately 0.25 uV (-6db).

5) Adjust the squelch control full CW position. Increase the signal generator RF output until the audio is heard in the speaker.

6) The RF output reading should be between 2 and 10 uV (12 to 26 db)

I. Scanning Observations and Tests

1) Set the monitor controls as follows:

Volume Control	to	1/2 rotation
Squelch Control	to	Full CW
Manual/Scan Switch	to	Scan position

2) Scan Time Measurement

a. Cover up channel lights 2, 3 and 4 with masking tape or finger. Count the number of scans of channel 1 for 30 seconds.

$$\frac{\text{No. Scan X 4 channels}}{\text{30 seconds}} = \text{4 to 10 channels per second.}$$

3) Delay time (after carrier is OFF)

b. Measure the time scanning starts again after the carrier is removed; delay should be approximately 2 seconds. Delay time may be increased or decreased by changing the value of C512 (higher the capacity, longer the delay).

NOTE: IF SCANNING DELAY FEATURE IS NOT REQUIRED REMOVE CAPACITOR C512 FROM CIRCUIT.

TABLE 1, TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE
1. Monitor will not operate. -No sound from speaker. -Channel indicators do not light.	a. Battery voltage low, less than 4 volts. b. Defective power On/Off switch. c. Defective EXT PWR jack. d. Defective CHG jack.
2. No sound from speaker. -Channel lights glow. -Manual scan functions normal.	a. Defective speaker. b. Defective EXT and SPK jack. c. Squelch Control (shorted to ground). d. D501,shorted. e. Q508 defective. f. Defective Audio Amplifier Component, (Q701,Q702, or Q704).
3. No automatic scanning. -Audio and Squelch functions, operates normally.	a. Defective component in IC501 driving circuit (Q505,506, D504,D503,Q508 or Q510) b. Defective IC501.
4. No Manual scanning. -All other functions operate normally.	a. Manual/Scan switch defective. b. C520 open. c. Battery voltage low. (less than 4 volts)
5. Irregular scanning. -Channels 1 and 2 only scan. -Channels scan in pairs.	a. IC500 defective. b. C523, D510 or D506 shorted. c. Defective diodes. d. D506 through D513 shorted. e. See Table 4.
6. Squelch functions inoperative. -Background noise very low. -No squelch control. -Receiver will not awaken.	a. C521 and C501 shorted. b. C502, C503 and R502 open.
7. Poor Sensitivity.	a. Defective Crystal. b. Poor alignment. c. Defective antenna.

TABLE 4, INTEGRATED CIRCUIT IC 501 VOLTAGE CHART

The Channel scanning circuit is common to all Models of the FM monitors. Set the monitor control as follows: Volume and Squelch controls to FULL CW positions; Bypass switch to OFF; Manual/Scan selector to center position. Adjust the external power supply to 6 ±.5 volts. Measure the voltages with a VTVM from the back side of the printed circuit board. MANUALLY SELECT EACH CHANNEL BEFORE MAKING A MEASUREMENT. Terminal 7 is common ground and terminal 14 is +6 volts. Refer to Figure 5 for terminal locations.

	IC 501 TERMINAL													
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4.50	5.45	0.08	0.08	5.40	5.45	0	5.45	5.40	0.08	0.08	5.45	4.50	5.45
2	5.40	5.45	0.08	0.08	5.45	5.45	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45
3	5.40	0.08	5.45	5.45	4.52	0.08	0	5.45	5.40	0.08	0.08	5.45	5.40	5.45
4	5.40	0.08	5.45	5.45	4.52	0.08	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45

TABLE 2, MODEL VHF AND VHFL VOLTAGE CHART

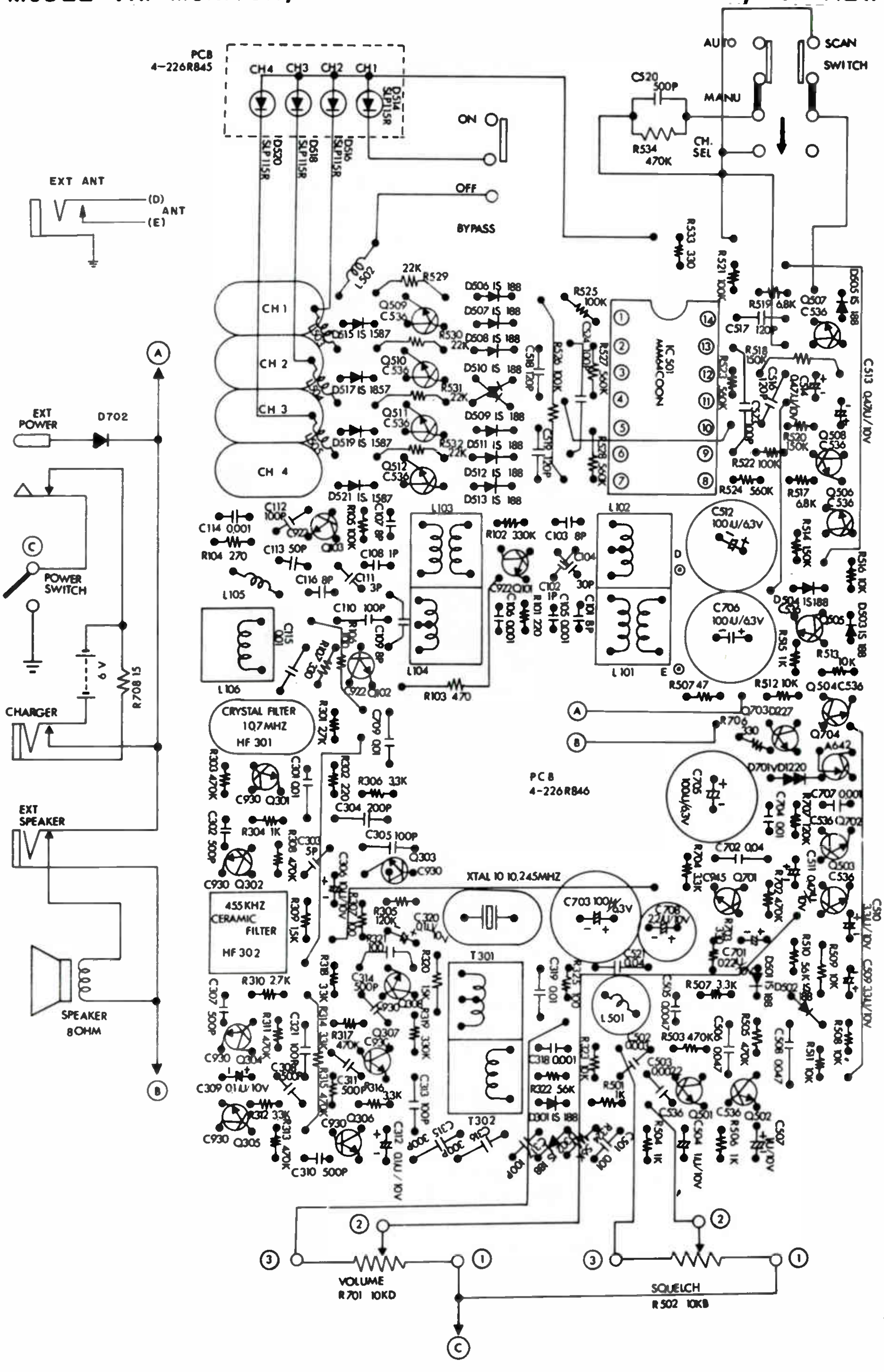
Measure all voltages with a DC-VTVM with no signal at the antenna. Set the monitor controls as follows: Volume Control 1/4 turn CW; Squelch Control full CCW; Bypass switch OFF. Manual/Scan switch, center position. Adjust the external power supply to 6, ±0.5 volts. Voltage reading may vary ±10%.

Transistor	Base	Emitter	Collector
Q101	1.02	0.27	4.42
Q102	0.68	0	2.92
Q103	1.33	0.65	4.75
Q301	0.82	0.15	4.17
Q302	0.63	0	3.82
Q303	3.58	3.43	4.80
Q304	0.63	0	1.90
Q305	2.92	2.35	4.37
Q306	0.27	0	1.75
Q307	2.25	2.59	4.18
Q308	0.33	0	4.61
Q501	1.88	1.28	4.42
Q502	0.61	0	2.45
Q503	0.06	0	0.66
Q504	0.08	0	3.15
Q505	3.13	2.55	5.30
Q506	0.62	0	0.02
Q507	0.12	2.29	5.43
Q508	0.62	0	0.10
Q509	0.69	0	0.12
Q510	0.69	0	0.12
Q511	0.69	0	0.12
Q512	0.69	0	0.12
Q701	0.77	0.17	3.28
Q702	0.66	0	2.33
Q703	3.62	3.00	5.45
Q704	2.33	2.99	0

Courier Cop-Scan VHF

Fanon Scanfare VHF

MODEL VHF MONITOR, COMPONENT LOCATION DIAGRAM, TOP VIEW



REPLACEMENT PARTS LIST FOR VHF MONITOR

SOLID STATE DEVICES

SYMBOL	DESCRIPTION	PART NUMBER
Q103	Transistor, 2SC922 (L)	2004-01
Q701	" 2SC945 (R)	1080-21
Q304,305,306,307	" 2SC930 (C)	2004-02
Q101,102	" 2SC922 (K)	2004-03
Q301,302,303,308	" 2SC930 (D)	1013-15
Q501,502,503,504, 505,506,507,508, 509,510,511,512	" 2SC9450 " or " 2SC536 (F)	2004-04 2018-01
Q703	" 2SD227	2004-05
Q704	" 2SA642	2004-06
Q505,506,507,508, 508,510,511,512	" 2SC945 (R) " or 2SC536 (E)	1080-21 296-55-9
D515,517,519	Diode, 1S1587	2004-67
D501,502,503,504, 505,506,513,301, 302	" 1S188	1010-145
D701	" VD1220	2004-68
D514,516,518,520	Light Emitting Diode TLR104	2004-69
IC501	Intergrated Circuit (IC) CMOS MM64COON	2004-70

CRYSTAL

SYMBOL	DESCRIPTION	PART NUMBER
	Crystal 10.245 MHz HC-18/U	2004-65

COILS AND TRANSFORMERS

SYMBOL	DESCRIPTION	PART NUMBER
L101,103	RF Coil	2004-37
L102,104	RF Coil	2004-38
L106	RF Coil	2004-39
T301	1FT 455 KHz	2004-40
T302	1FT 455 KHz	2004-41
L502,503,504,505	Choke Coil 25uH	2004-43
L501	Choke Coil 8.2mH	2004-44
L105	VHF Coil 6.5uH	2004-45
HF301	HF Filter, crystal filter, 10F15A	2004-49
HF302	HF Filter, ceramic filter CFU-455D	2004-50

CONTROLS

SYMBOL	DESCRIPTION	PART NUMBER
R701	Miniature trimmer 10KD	2004-46
R502	Miniature trimmer 10KB	2004-47
	Switch, Auto-Manual/ Channel Selector	2004-56
	Switch, Slide	2004-57

SYMBOL	DESCRIPTION	PART NUMBER
	CAPACITORS	
C512,705,706,703	100mfd 6.3V Electrolytic	1003-102
C708	2.2mfd 10V "	2004-51
C504,507	1mfd 10V "	1014-107
C511,513,514	0.47mfd 10V "	2004-52
C701	0.22mfd " "	2004-53
C309,312,320	0.1mfd " "	2004-54
C306	10mfd " "	170-66-9
C509,510	3.3mfd " "	2004-55
C102,108	1pfd ±0.25pfd 50V Ceramic	1010-155
C111	3pfd ±0.5pfd " "	1014-92
C303	5pfd " " "	1014-94
C101,103,107, 109,116	8pfd " 25pfd " "	1009-103
C104	30pfd ±10% " "	160-56-9
C113	50pfd " " "	160-86-9
C110,112,305, 313,317,523, 524,516,517,518,519, 321	100pfd " " "	160-04-9
C304	200pfd " " "	1047-82
C315,316	300pfd " " "	1004-102
C302,307,308,310, 311,314,520	500pfd " " "	160-96-9
C105,106,114,707	0.001mfd ±20% " "	1011-36
C115,301,709	0.01mfd +80%, (-) 20% "	160-55-9
C318	0.001mfd ±20% 50V Mylar	1010-162
C502	0.0033mfd " " "	1010-93
C505	0.0047mfd " " "	1010-157
C319,501,704	0.01mfd " " "	1044-76
C506,508	0.047mfd " " "	1004-91
C702	0.04mfd " " "	2004-72
	RESISTORS	
R106,307,321,325	100 ohm ±10% 1/4W Resistor	1017-68
R101,302	220 ohm " " "	1017-69
R104	270 ohm " " "	1004-99
R533,703,706	330 ohm " " "	1010-204
R103	470 ohm " " "	1010-206
R708	10 ohm " " "	1002-73
R506,515,304,501,504	1 K ohm " " "	1010-209
R309	1.5K ohm " " "	1010-210
R301,310	2.7K ohm " " "	1010-213
R306,312,314,316,318, 507,704	3.3K ohm " " "	1010-214
R517,519	6.8K ohm " " "	1010-218
R323,508,509,511,512, 513,516	10K ohm " " "	1010-220
R320,514	15K ohm " " "	1011-25
R529,530,531,532	22K ohm " " "	1044-71
R322,324,510	56K ohm " " "	1053-86
R105,521,525,526	100K ohm " " "	1010-225

SYMBOL	DESCRIPTION	PART NUMBER
	RESISTORS (Continued)	
R518,520	150 ohm ±10% 1/4W Resistor	1010-233
R305,707	120K ohm " " "	1004-95
R102,107,319	330K ohm " " "	1010-227
R303,308,311,313, 315,317,503,505, 702,534	470 ohm " " "	1010-228
R532,524,527,528,	560 ohm " " "	2004-71
R705	47 ohm ±5% " "	1004-96
	MISCELLANEOUS	
	Cabinet, Front Section	2004-07
	Cabinet, Back Section	2004-08
	Panel, Front	2004-09
	Lid, Bottom	2004-10
	Lid, Battery Compartment	2004-11
	Lid, Crystal Compartment	2004-12
	Label, Crystal Layout	2004-15
	Plate, Front Panel	2004-17
	Nut, External Antenna Jack	2004-19
	Knob, Manual/Scan switch	2004-29
	Knob, Volume and Squelch controls	2004-26
	Speaker, 8 ohm, 0.3 watt	2004-48
	Earphone Assembly	1012-26
	Socket, Crystal	1002-28
	Socket, EXT. Power	2004-58
	Socket, EXT. Antenna	2004-62
	Socket Assembly, Charger & EXT SPK	2004-59
	Battery Lead Assembly	2004-63
	Battery Holder Assembly	2004-64
	Antenna, Rubberized	AN-13
	Instruction Manual, Scanfare VHF	LI549
	Instruction Manual, Cop-Scan VHF	LI548

Courier Cop-Scan VHF
Fanon Scanfare VHF

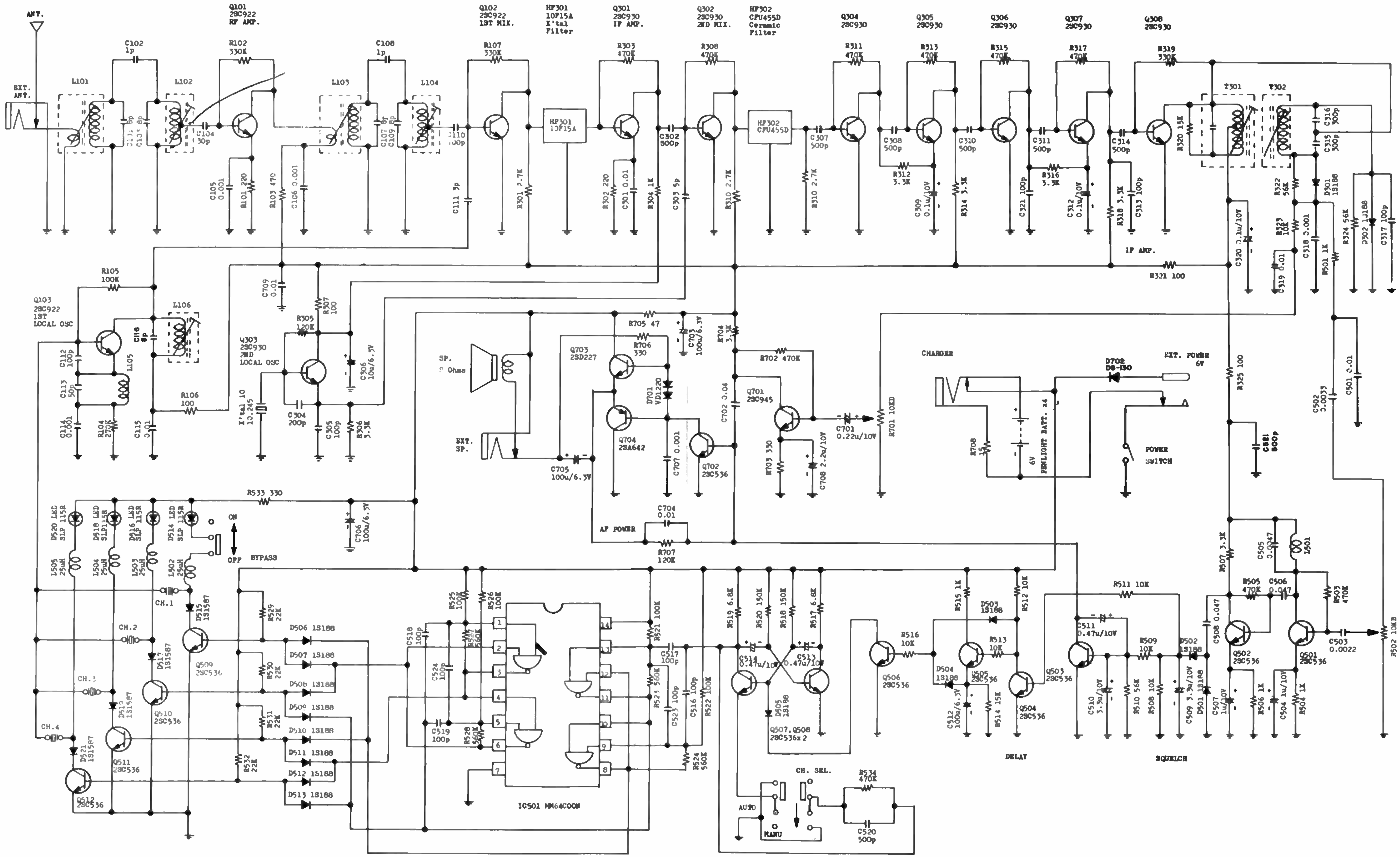


FIGURE 8, MODEL VHF MONITOR, SCHEMATIC DIAGRAM

Crystal Correlation Data

Monitor Model		Crystal Frequency Formula	Load Capacity
VHFL	30 to 45 MHz:	Frequency (+) 10.7 MHz	Series resonance (-) 450 Hz (62 pF)
	45 to 50 MHz:	Frequency (-) 10.7 MHz	Series resonance (-) 450 Hz (62 pF)
VHF	146 to 175 MHz:	Frequency (-) 10.7 MHz / Divided by 3	Series resonance (-) 450 Hz (62 pF)
UHF UHFH	450 to 512 MHz:	Frequency (-) 10.7 MHz / Divided by 9	18 PF

All Crystals are 3rd overtone and use a HC25/U type holder.

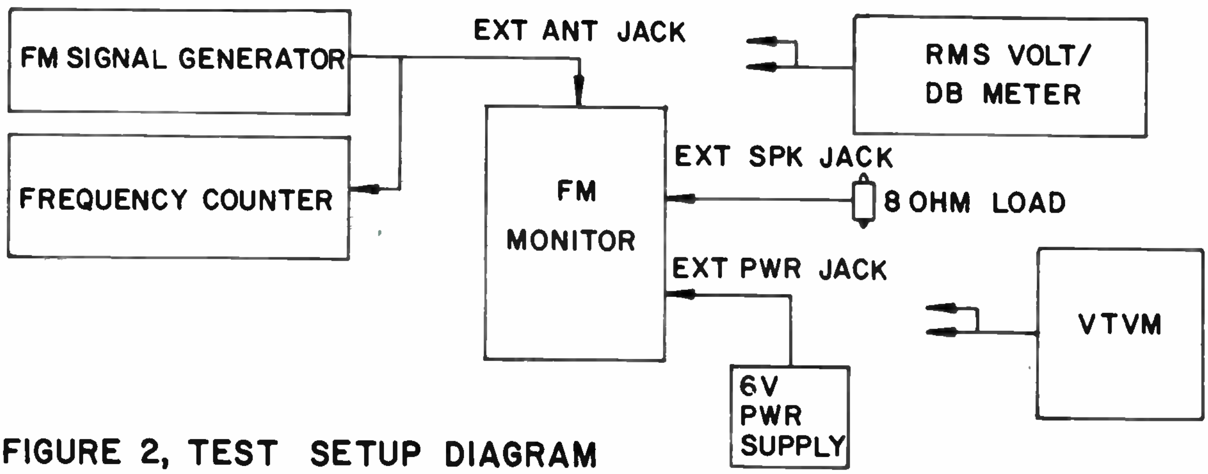


FIGURE 2, TEST SETUP DIAGRAM

VHFL and VHF Monitor Alignment Procedure

A. Disassemble the cabinet, top half only. Connect the monitor to the test equipment as shown in the diagram. Connect the RMS Volt/Wattmeter across the EXT SPK 8 ohm load.

B. Select a crystal with the desired frequency and install in channel 1 position. Adjust the external power supply to 6 ± 0.5 volts. Adjust the monitor controls as follows:

Volume Control	to	0.25 VRMS (0db) of noise across load
Squelch Control	to	Full CCW position
Bypass Switch	to	OFF
Manual/Scan Switch	to	Center position

C. Operate the Manual/Scan switch to select channel 1 and set in the center position.

D. RF Coil Adjustments

1) Adjust the FM signal generator to the same frequency as the channel frequency of the crystal installed (observe on the frequency counter).

2) Set signal generator modulation to the OFF position. Adjust the RF output to obtain a drop of 10db (0.1 volts) on the RMS Volt/DB meter.

3) Adjust the following coils for minimum reading on the db meter. Reduce the signal generator output as the coils are peaked to maintain approximately 10db quieting.

   Adjust: L101,L102,L103,L104,L105,L106 and T301 for maximum quieting.

4) Disconnect the external antenna adapter and install its antenna. Adjust the monitor volume control to obtain zero db reference on the RMS voltmeter, without receiving a signal.

5) Connect a short length of copper wire to the signal generator output and position vertically. Place the monitor approximately 24 inches from the signal generator.

6) Adjust the signal generator output (without modulation) to obtain 10db drop in the reading on the RMS voltmeter.

7) Adjust L101 or C101 (as applicable) to obtain maximum quieting.

. Discriminator Adjustment

1) Connect a VTVM to the junction of R501, C501 and C502. Test point may be reached from the component side of the circuit board, top end of R501. Adjust T302 for zero reading on the VTVM.

F. Sensitivity Measurement

1) Set the squelch control full CCW and adjust the volume control to obtain a zero db (0.25 VRMS) reading on the RMS. Volt/DB meter (no signal should be received).

2) Without changing the adjustments of the monitor, reconnect the signal generator to the EXT ANT jack and adjust the RF output to obtain a noise drop of 20 db on the RMS Volt/DB meter. The signal generator RF output should be 1.0 uV(6db) or less.

G. Audio Output Measurement

1) Adjust the volume control full CW and the squelch control full CCW. Modulate the signal generator +5KHz at 1KHz.

2) Adjust the signal generator RF output to 5 uV. The RMS Volt/DB meter should indicate 250 mW to 300 mW.

H. Squelch Sensitivity Measurements

1) Disconnect the signal generator from the EXT ANT jack. Set the monitor volume control full CW position. Remove the phone plug from the EXT SPK jack.

2) Adjust the squelch control from full CCW position to a point where the noise just stops. Control should be approximately 1/4 rotation from CCW.

3) Adjust the signal generator RF output to zero and reconnect to the EXT ANT jack. Slowly increase the RF output until audio is heard in the speaker.

4) The RF output should be approximately 0.25 uV (-6db).

5) Adjust the squelch control full CW position. Increase the signal generator RF output until the audio is heard in the speaker.

6) The RF output reading should be between 2 and 10 uV (12 to 26 db)

I. Scanning Observations and Tests

1) Set the monitor controls as follows:

Volume Control	to	1/2 rotation
Squelch Control	to	Full CW
Manual/Scan Switch	to	Scan position

2) Scan Time Measurement

a. Cover up channel lights 2, 3 and 4 with masking tape or finger. Count the number of scans of channel 1 for 30 seconds.

$$\frac{\text{No. Scan X 4 channels}}{\text{30 seconds}} = \text{4 to 10 channels per second.}$$

3) Delay time (after carrier is OFF)

a. Set the signal generator frequency to the frequency of the crystal installed. Adjust the RF output to zero. Slowly increase the RF output and observe that the scanning stops (upon the receipt of a signal), on the channel in which the crystal is installed.

3) Delay time (after carrier is OFF)

b. Measure the time scanning starts again after the carrier is removed; delay should be approximately 2 seconds. Delay time may be increased or decreased by changing the value of C512 (higher the capacity, longer the delay).

NOTE: IF SCANNING DELAY FEATURE IS NOT REQUIRED REMOVE CAPACITOR C512 FROM CIRCUIT.

TABLE 1, TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE
1. Monitor will not operate. -No sound from speaker. -Channel indicators do not light.	a. Battery voltage low, less than 4 volts. b. Defective power On/Off switch. c. Defective EXT PWR jack. d. Defective CHG jack.
2. No sound from speaker. -Channel lights glow. -Manual scan functions normal.	a. Defective speaker. b. Defective EXT and SPK jack. c. Squelch Control (shorted to ground). d. D501,shorted. e. Q508 defective. f. Defective Audio Amplifier Component, (Q701,Q702, or Q704).
3. No automatic scanning. -Audio and Squelch functions, operates normally.	a. Defective component in IC501 driving circuit (Q505,506, D504,D503,Q508 or Q510) b. Defective IC501.
4. No Manual scanning. -All other functions operate normally.	a. Manual/Scan switch defective. b. C520 open. c. Battery voltage low. (less than 4 volts)
5. Irregular scanning. -Channels 1 and 2 only scan. -Channels scan in pairs.	a. IC500 defective. b. C523, D510 or D506 shorted. c. Defective diodes. d. D506 through D513 shorted. e. See Table 4.
6. Squelch functions inoperative. -Background noise very low. -No squelch control. -Receiver will not awaken.	a. C521 and C501 shorted. b. C502, C503 and R502 open.
7. Poor Sensitivity.	a. Defective Crystal. b. Poor alignment. c. Defective antenna.

TABLE 2, MODEL VHF AND VHFL VOLTAGE CHART

Measure all voltages with a DC-VTVM with no signal at the antenna. Set the monitor controls as follows: Volume Control 1/4 turn CW; Squelch Control full CCW; Bypass switch OFF. Manual/Scan switch, center position. Adjust the external power supply to 6, ±0.5 volts. Voltage reading may vary ±10%.

Transistor	Base	Emitter	Collector	Transistor	Base	Emitter	Collector
Q101	1.02	0.27	4.42	Q504	0.08	0	3.15
Q102	0.68	0	2.92	Q505	3.13	2.55	5.30
Q103	1.33	0.65	4.75	Q506	0.62	0	0.02
Q301	0.82	0.15	4.17	Q507	0.12	2.29	5.43
Q302	0.63	0	3.82	Q508	0.62	0	0.10
Q303	3.58	3.43	4.80	Q509	0.69	0	0.12
Q304	0.63	0	1.90	Q510	0.69	0	0.12
Q305	2.92	2.35	4.37	Q511	0.69	0	0.12
Q306	0.27	0	1.75	Q512	0.69	0	0.12
Q307	2.25	2.59	4.18	Q701	0.77	0.17	3.28
Q308	0.33	0	4.61	Q702	0.66	0	2.33
Q501	1.88	1.28	4.42	Q703	3.62	3.00	5.45
Q502	0.61	0	2.45	Q704	2.33	2.99	0
Q503	0.06	0	0.66				

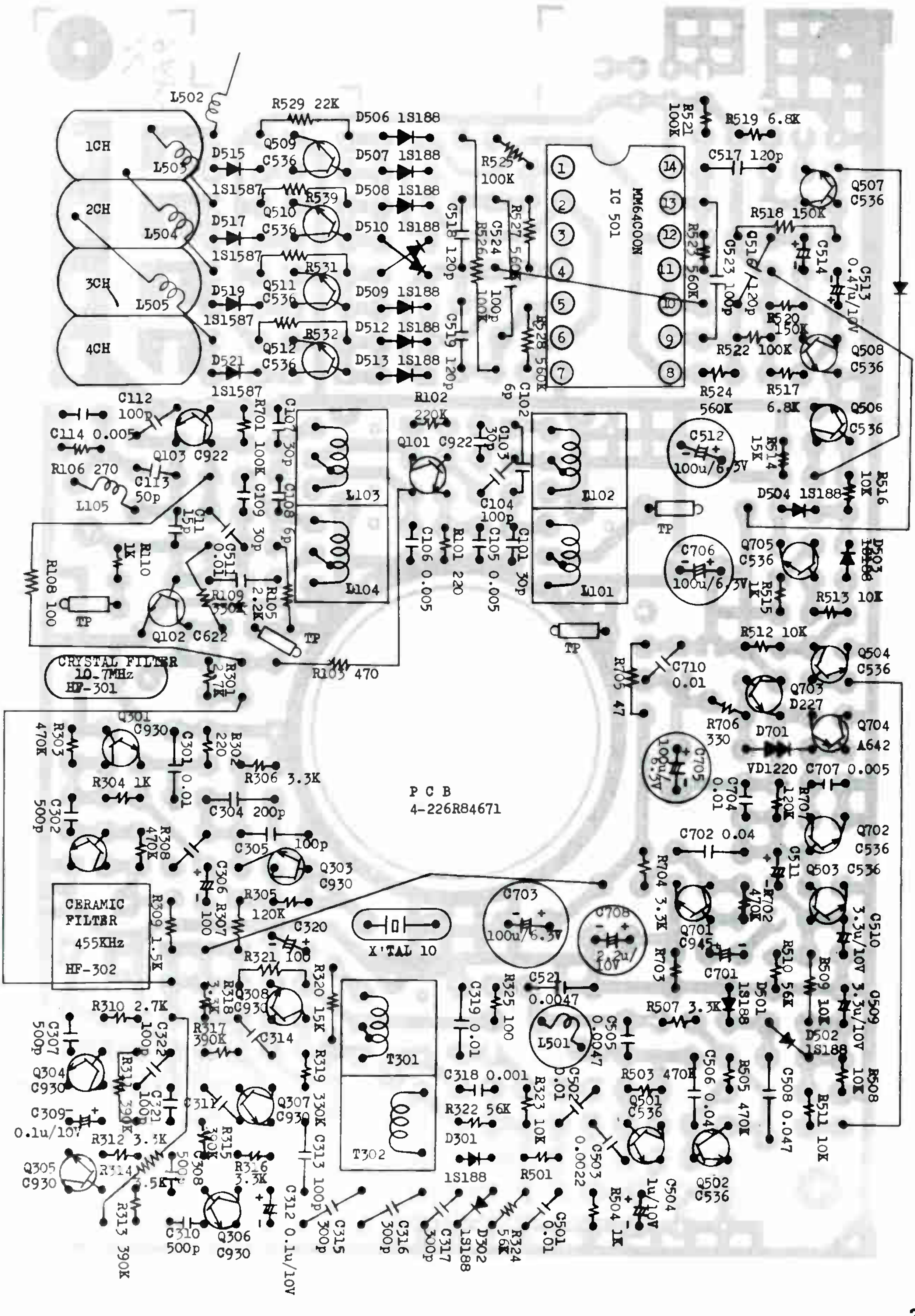
TABLE 4, INTEGRATED CIRCUIT IC 501 VOLTAGE CHART

The Channel scanning circuit is common to all Models of the FM monitors. Set the monitor control as follows: Volume and Squelch controls to FULL CW positions; Bypass switch to OFF; Manual/Scan selector to center position. Adjust the external power supply to 6 ±.5 volts. Measure the voltages with a VTVM from the back side of the printed circuit board. MANUALLY SELECT EACH CHANNEL BEFORE MAKING A MEASUREMENT. Terminal 7 is common ground and terminal 14 is +6 volts. Refer to Figure 5 for terminal locations.

IC 501 TERMINAL

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4.50	5.45	0.08	0.08	5.40	5.45	0	5.45	5.40	0.08	0.08	5.45	4.50	5.45
2	5.40	5.45	0.08	0.08	5.45	5.45	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45
3	5.40	0.08	5.45	5.45	4.52	0.08	0	5.45	5.40	0.08	0.08	5.45	5.40	5.45
4	5.40	0.08	5.45	5.45	4.52	0.08	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45

MODEL VHFL, COMPONENT LOCATION DIAGRAM, TOP VIEW



REPLACEMENT PARTS LIST FOR VHFL MONITOR

SYMBOL	DESCRIPTION	PART NUMBER
	SOLID STATE DEVICES	
Q101,102	Transistor, 2SC922 (K)	2004-03
Q103	" 2SC922 (L)	2004-01
Q301,302,303	" 2SC930 (D)	1013-15
Q304,305,306,307	" 2SC930 (C)	2004-02
Q308	" 2SC930 (D)	1013-15
	or	
	" 2SC945	1043-07
	" or	
	2SC945 (Q)	2004-04
Q501,502,503,504	" 2SC536 (F)	2018-01
	or	
	" 2SC945	1043-07
	" or	
	2SC945 (Q)	2004-04
Q505,506,508,509, 510,511,512	" 2SC536 (E)	296-55-9
	or	
	" 2SC945	1043-07
	" or	
	2SC945 (R)	1080-21
Q507	" 2SC536 (E)	296-55-9
Q701	" 2SC945 (R)	1080-21
Q702	" 2SC945	1043-07
	or	
	" 2SC945 (Q)	2004-04
	or	
	" 2SC536 (F)	2018-01
Q703	" 2SD227	2004-05
Q704	" 2SA642	2004-06
D301,302,501,502, 503,504,505,506,507,508, 509,510,511,512,513	Diode, 1S188 FM	1010-145
D514,516,518,520	LED, SLP-115R	2018-12
D515,517,519,521	Diode, 1S1587	2004-67
D701	" VD1220	2004-68
D702	" DS-130 (E)	291-20
IC501	Integrated circuit, CMOS MM6400N	2004-70
	COILS AND TRANSFORMERS	
L101,102,103,104	RF Coil	2018-02
L105	VHF Filter	2018-03
L501	Choke coil, 8.2 mH	2004-44
L502,503,504,505	Choke coil, 25 uH	2004-43
T301	IF Transformer, 455 KHz	2004-40
T302	IF Transformer, 455 KHz	2004-41
HF301	HF Filter, Crystal filter	2004-49
HF302	HF Filter, Ceramic filter	2004-50
L106	Choke Coil, 2.2μH	1041-49

SYMBOL	DESCRIPTION	PART NUMBER
	CONTROLS	
R502	Miniature trimmer control 10KB	2004-47
R701	Miniature trimmer control 10KD	2004-46
	Switch, Auto-manual & Chan. Sel.	2004-56
	Switch, Bypass	2004-57
	CAPACITORS	
C101,103,107,109	Ceramic, 30 pfd, ±10%, 50V	160-56-9
C102,108	" 6 pfd, ±0.5pfd "	2018-09
C104,110,112,305,313, 317,321,322	" 100 pfd, ±10%	160-04-9
C105,106,114,707	" 0.005mfd, ±80%-20%, 50V	2018-11
C11	" 15 pfd, ±10%, 50V	2018-10
C115,301,501,710	" 0.01mfd, ±80%-20%, 50V	2018-04
C113	" 50 pfd, ±10%, 50V	160-86-9
C302,307,308,310 311,314,520	" 500 pfd, " "	160-99-9
C303	" 5 pfd, ±0.5pfd "	1014-94
C304	" 200 pfd, ±10%, "	1047-82
C315,316	" 300 pfd, " "	1004-102
C508,521	" 0.047mfd, ±20% "	2018-06
C516,517,518,519	" 120pfd, ±10% "	2018-07
C318	Mylar, 0.001mfd, ±20% 50V	1010-162
C319,502,704	" 0.01mfd, " "	1044-76
C503	" 0.0033mfd, " "	1004-93
C505	" 0.0047mfd, " "	1010-93
C506	" 0.047mfd, " "	1004-91
C702	" 0.04mfd, " "	2018-08
C306	Electrolytic, 10mfd, 10V	170-66-9
C309,312	" 0.1mfd, "	2004-54
C320	" 0.01mfd, "	2018-05
C504	" 1 mfd, "	1014-107
C509,510	" 3.3mfd, "	2004-55
C511,513,514	" 0.47mfd, "	2004-52
C512,705,706,703	" 100mfd, 6.3V	1003-102
C701	" 0.22mfd, 10V	2004-53
C708	" 2.2 mfd, "	2004-51
	RESISTORS	
R101,312	Carbon, 220 ohm, ±10%, 1/4W	1017-69
R102	" 220K ohm, " "	2018-13
R103	" 470 ohm, " "	1010-206
R104,105	" 2.2K ohm, " "	1010-212
R106	" 270 ohm, " "	1004-99
R107,521,522,525,526	" 100K ohm, " "	1010-225
R108,307,321,325	" 100 ohm, " "	1010-68
R109,319	" 330 ohm, " "	1010-227
R110,304,501,515,504	" 1 K ohm, " "	1010-209
R301,310	" 2.7K ohm, " "	1010-213

SYMBOL	DESCRIPTION	PART NUMBER
	RESISTORS (Continued)	
R303,308,503,505,702	Carbon, 470K ohm ±10%, 1/4W	1010-228
R305,707	" 120K ohm " "	1004-95
R306,312,316,507,704	" 3.3K ohm " "	1010-214
R309	" 1.5K ohm " "	1010-210
R311,313,315,317	" 390K ohm " "	2018-16
R320,514	" 15K ohm " "	1011-25
R322,324,510	" 56K ohm " "	1053-86
R323,508,509,511,512, 513,516	" 10K ohm " "	1010-220
R517,519	" 6.8K ohm " "	1010-218
R518,520	" 150 ohm " "	1010-233
R523,524,527,528	" 560 ohm " "	2004-71
R529,530,531,532	" 22K ohm " "	1044-71
R533,703,706	" 330 ohm " "	1010-204
R705	" 47 ohm " "	1004-96
R708	" 15 ohm " "	2018-17
	MISCELLANEOUS	
	Cabinet, Front Section	2004-07
	Cabinet, Back Section	2004-08
	Panel, Front	2004-09
	Lid,Bottom	2004-10
	Lid, Battery Compartment	2004-11
	Lid, Crystal Compartment	2004-12
	Label, Crystal Layout	2004-15
	Plate, Front Panel	2004-17
	Nut, External Antenna Jack	2004-19
	Knob, Manual/Scan switch	2004-29
	Knob, Volume and Squelch controls	2004-26
	Speaker, 8 ohm, 0.3 watt	2004-48
	Earphone Assembly	1012-26
	Socket, Crystal	1002-28
	Socket, Ext. Power	2004-58
	Socket, Ext. Antenna	2004-62
	Socket Assembly, Charger & EXT SPK	2004-59
	Battery Lead Assembly	2004-63
	Battery Holder Assembly	2004-64
	Antenna, Rubberized	AN-13
	Instruction Manual, Scanfare VHFL	LI599
	Instruction Manual, Cop-Scan VHFL	LI597
	Crystal, 10.245MHz, HC-18/U	2004-65

Courier Cop-Scan VHFL
Fanon Scanfare VHFL

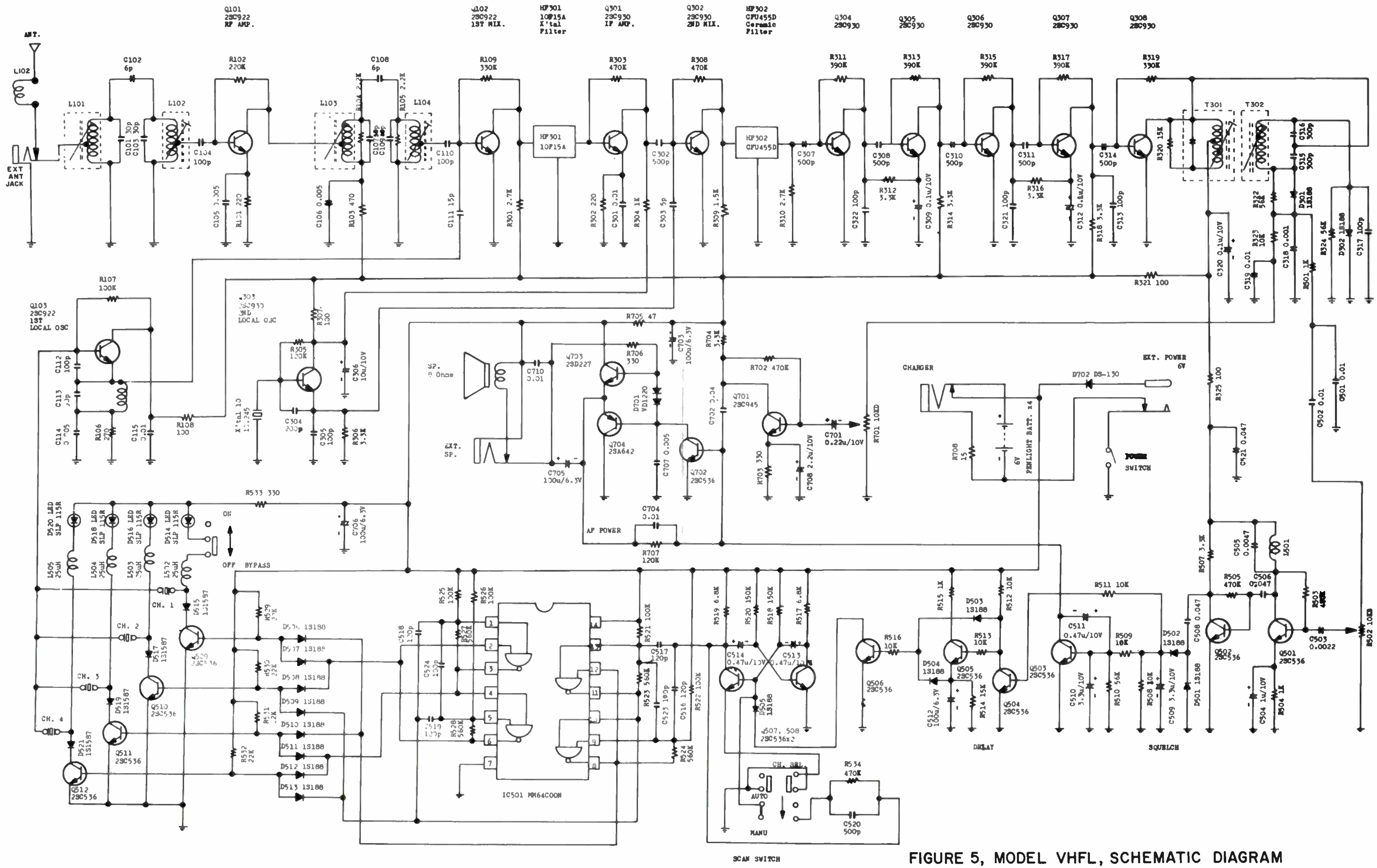


FIGURE 5, MODEL VHFL, SCHEMATIC DIAGRAM

Crystal Correlation Data

Monitor Model		Crystal Frequency Formula	Load Capacity
VHFL	30 to 45 MHz:	Frequency (+) 10.7 MHz	Series resonance (-) 450 Hz (62 pF)
	45 to 50 MHz:	Frequency (-) 10.7 MHz	Series resonance (-) 450 Hz (62 pF)
VHF	146 to 175 MHz:	Frequency (-) 10.7 MHz / Divided by 3	Series resonance (-) 450 Hz (62 pF)
UHF UHFH	450 to 512 MHz:	Frequency (-) 10.7 MHz / Divided by 9	18 PF

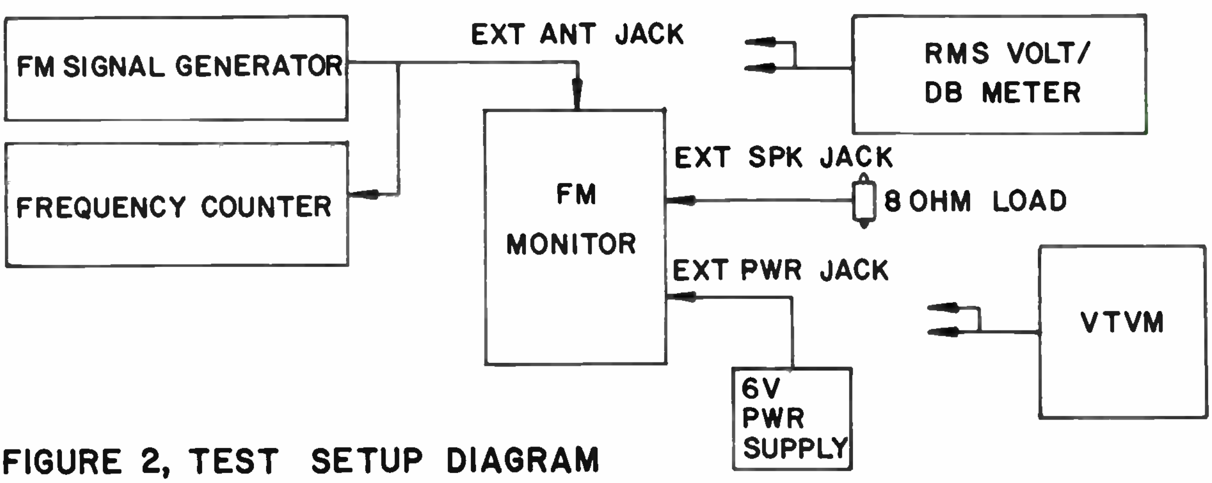


FIGURE 2, TEST SETUP DIAGRAM

4. UHF and UHFH Monitor Alignment and Tests

A. Disassemble the cabinet and install an applicable crystal in channel 1 position. Connect the monitor to the test equipment as shown in the diagram and adjust the external power supply to 6 ±0.5 volts.

B. Connect the RMS Volt/DB meter across the 8 ohm load and adjust the signal generator frequency of the crystal installed.

C. Set the monitor control as follows:

Volume Control	to	Full CW position
Squelch Control	to	Full CCW position
Bypass Switch	to	OFF position
Manual/Scan switch	to	Center position (select Ch. 1)

D. RF Coil Adjustment

1) Set the Signal Generator Modulation to OFF and adjust the RF output to obtain a drop of 10 db on the RMS Volt/DB meter.

2) Adjust C101, C102, L104 and C112 for minimum reading of the db meter. Repeat these adjustments to assure maximum quieting.

3) Disconnect the signal generator and install an antenna. Repeat test for VHFL/VHF steps 3 D4 through 7.

E. AFC Voltage Adjustment

1) Connect the VTVM to the arm of R503, (Q501 drain) and adjust R503 to obtain +3.0 VDC.

F. Sensitivity Measurement (maximum quieting)

1) Without receiving a signal (noise only) adjust the volume control to obtain zero db reference. Reconnect the signal generator (without modulation) and adjust the RF to obtain (-)20db on the voltmeter.

2) Signal generator output should be 3uV or less (8 to 16db). Read just C101 and C102, if necessary, to obtain at least (-)20db quieting.

G. Audio Output Measurement

1) Adjust the volume control full CW and the squelch control full CCW. Modulate the signal generator +5KHz at 1KHz.

2) Adjust the signal generator RF output to 5 uV. The RMS Volt/DB meter should indicate 250 mW to 300 mW.

H. Squelch Sensitivity Measurements

1) Disconnect the signal generator from the EXT ANT jack. Set the monitor volume control full CW position. Remove the phone plug from the EXT SPK jack.

2) Adjust the squelch control from full CCW position to a point where the noise just stops. Control should be approximately 1/4 rotation from CCW.

3) Adjust the signal generator RF output to zero and reconnect to the EXT ANT jack. Slowly increase the RF output until audio is heard in the speaker.

4) The RF output should be approximately 0.25 uV (-6db).

5) Adjust the squelch control full CW position. Increase the signal generator RF output until the audio is heard in the speaker.

6) The RF output reading should be between 2 and 10 uV (12 to 26 db)

I. Scanning Observations and Tests

1) Set the monitor controls as follows:

Volume Control	to	1/2 rotation
Squelch Control	to	Full CW
Manual/Scan Switch	to	Scan position

2) Scan Time Measurement

a. Cover up channel lights 2, 3 and 4 with masking tape or finger. Count the number of scans of channel 1 for 30 seconds.

$$\frac{\text{No. Scan X 4 channels}}{\text{30 seconds}} = \text{4 to 10 channels per second.}$$

3) Delay time (after carrier is OFF)

a. Set the signal generator frequency to the frequency of the crystal installed. Adjust the RF output to zero. Slowly increase the RF output and observe that the scanning stops (upon the receipt of a signal), on the channel in which the crystal is installed.

3) Delay time (after carrier is OFF)

b. Measure the time scanning starts again after the carrier is removed; delay should be approximately 2 seconds. Delay time may be increased or decreased by changing the value of C512 (higher the capacity, longer the delay).

NOTE: IF SCANNING DELAY FEATURE IS NOT REQUIRED REMOVE CAPACITOR C512 FROM CIRCUIT.

TABLE 1, TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE
1. Monitor will not operate. -No sound from speaker. -Channel indicators do not light.	a. Battery voltage low, less than 4 volts. b. Defective power On/Off switch. c. Defective EXT PWR jack. d. Defective CHG jack.
2. No sound from speaker. -Channel lights glow. -Manual scan functions normal.	a. Defective speaker. b. Defective EXT and SPK jack. c. Squelch Control (shorted to ground). d. D501,shorted. e. Q508 defective. f. Defective Audio Amplifier Component, (Q701,Q702, or Q704).
3. No automatic scanning. -Audio and Squelch functions, operates normally.	a. Defective component in IC501 driving circuit (Q505,506, D504,D503,Q508 or Q510) b. Defective IC501.
4. No Manual scanning. -All other functions operate normally.	a. Manual/Scan switch defective. b. C520 open. c. Battery voltage low. (less than 4 volts)
5. Irregular scanning. -Channels 1 and 2 only scan. -Channels scan in pairs.	a. IC500 defective. b. C523, D510 or D506 shorted. c. Defective diodes. d. D506 through D513 shorted. e. See Table 4.
6. Squelch functions inoperative. -Background noise very low. -No squelch control. -Receiver will not awaken.	a. C521 and C501 shorted. b. C502, C503 and R502 open.
7. Poor Sensitivity.	a. Defective Crystal. b. Poor alignment. c. Defective antenna.

TABLE 3, MODEL UHF AND UHFH VOLTAGE CHART

(All Conditions Same As Table 2)

Transistor	Base	Emitter	Collector	Transistor	Base	Emitter	Collector
Q101 (FET)	0 (Drain)	0 (Gate)	3.42 (Source)	Q504	0.01	0	5.41
Q102	0.68	0	2.82	Q505	0	0	2.15
Q103	1.10	0.44	4.04	Q506	2.14	1.59	5.31
Q104	0.50	0	3.86	Q507	0.60	0	0.01
Q301	0.65	0	3.12	Q508	0	0	0.62
Q302	0.63	0	3.17	Q509	0.59	0	0.07
Q303	0.72	0.05	4.04	Q510	0.10	1.20	5.41
Q304	0.66	0	3.97	Q515	0.68	0	0.07
Q305	0.64	0	3.94	Q516	0.68	0	0.07
Q306	0.32	0	3.71	Q517	0.68	0	0.07
Q307	0.30	0	2.45	Q518	0.68	0	0.07
Q308	2.38	1.98	3.95	Q701	0.65	0.05	2.59
Q501	0.03	0	2.45	Q702	0.63	0	1.94
Q502	2.07	1.51	5.01	Q703	3.22	2.59	5.41
Q503	0.61	0	2.58	Q704	1.94	2.59	0

TABLE 4, INTEGRATED CIRCUIT IC 501 VOLTAGE CHART

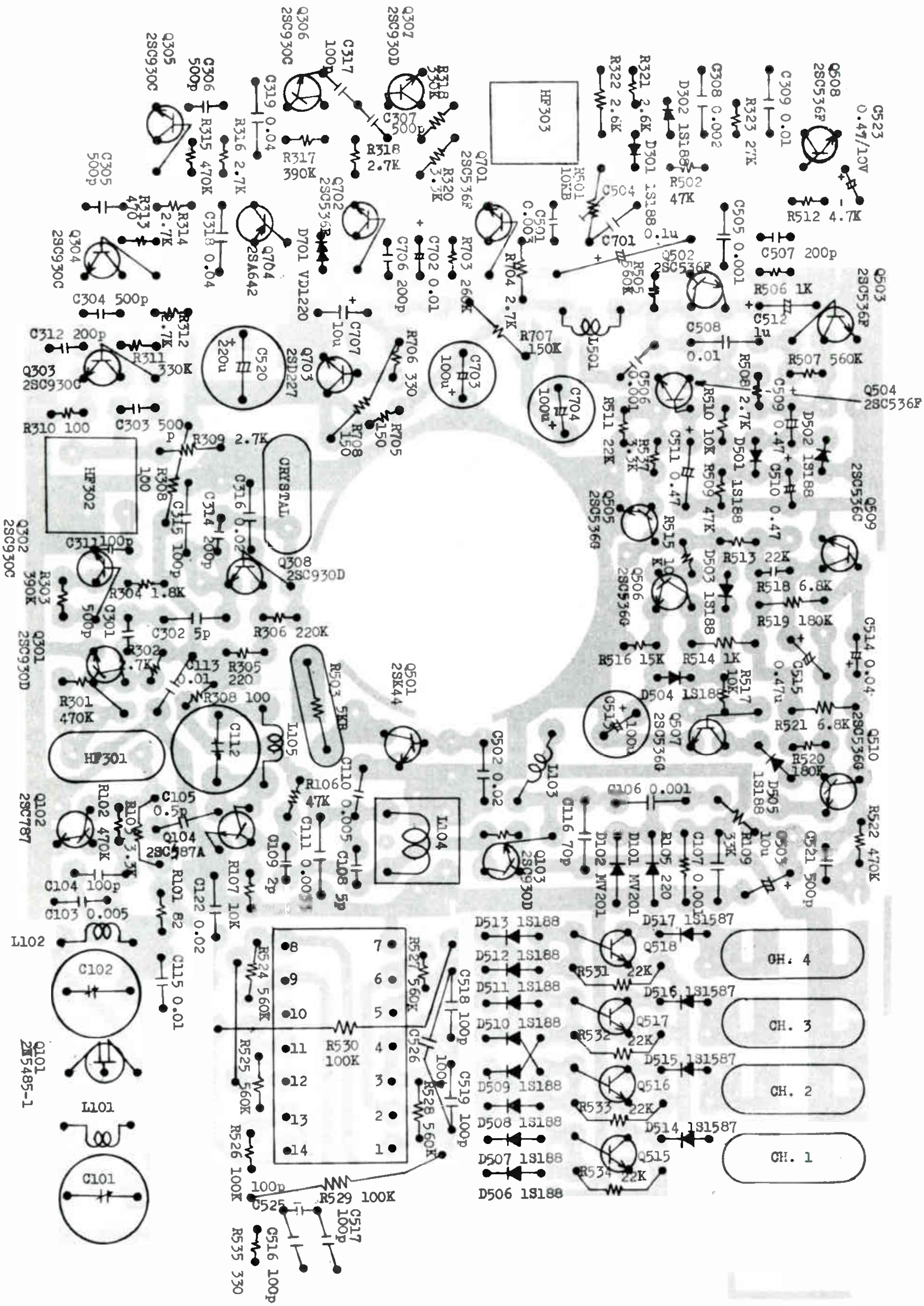
The Channel scanning circuit is common to all Models of the FM monitors. Set the monitor control as follows: Volume and Squelch controls to FULL CW positions; Bypass switch to OFF; Manual/Scan selector to center position. Adjust the external power supply to 6 ±.5 volts. Measure the voltages with a VTVM from the back side of the printed circuit board. MANUALLY SELECT EACH CHANNEL BEFORE MAKING A MEASUREMENT. Terminal 7 is common ground and terminal 14 is +6 volts. Refer to Figure 5 for terminal locations.

IC 501 TERMINAL

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4.50	5.45	0.08	0.08	5.40	5.45	0	5.45	5.40	0.08	0.08	5.45	4.50	5.45
2	5.40	5.45	0.08	0.08	5.45	5.45	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45
3	5.40	0.08	5.45	5.45	4.52	0.08	0	5.45	5.40	0.08	0.08	5.45	5.40	5.45
4	5.40	0.08	5.45	5.45	4.52	0.08	0	0.08	4.57	5.45	5.45	0.08	5.40	5.45

MODEL UHF AND UHFH MONITORS,
COMPONENT LOCATION DIAGRAM, TOP VIEW

Courier Cop-Scan UHF, UHFH
Fanon Scanfare UHF, UHFH



SECTION IV

REPLACEMENT PARTS

A list of Special Replacemnet Parts is provided to facilitate replacement of defective parts. When ordering from FANON/COURIER, include the model and serial number of the unit being serviced. In case of a discrepancy between a "listed" part number and the number actually printed on a part, employ the latter. Address your communications to the FANON/COURIER Service Department, 990 South Fair Oaks Avenue, Pasadena, Californina, 91105.

UHF/UHFH MONITORS

REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NUMBER
	SOLID STATE DEVICES	
Q101	Transistor, 2N5485-1	2020-01
Q102	" 2SC787	2020-02
Q103,301,302,307, 308	" 2SC930 (D)	1013-15
Q104	" 2SC387 (A)	2020-03
Q303,304,305,306	" 2SC930 (C)	2004-02
Q501	" 2SK44 (D)	2020-04
Q502,503,504,508, 701,702	" 2SC536 (F)	2018-01
Q505,506,507,509,510	" 2SC536 (G)	2020-05
Q515,516,517,518,	" 2SC945 (R)	1080-21
Q703	" 2SD227 (W)	2020-06
Q704	" 2SA642 (R)	2020-07
D101,102	Diode, MV201	2020-08
D301,302,501,502 503,504,505,506, 507,508,509,510, 511,512,513	" IS188 (FM)	1010-145
D514,515,516,517	" IS1587	2004-67
D518,519,520,521	LED, SLP115 (R)	2018-12
D702	Diode, DS-130 (E)	291-20
D701	Varistor, VD1220	2004-68
IC501	Integrated circuit	2004-70
	CRYSTAL	
	Crystal, 10.245 MHz, HC-18U	2004-65
	COILS AND TRANSFORMERS	
L101,102	RF Coil	2020-21
L103	VHF Coil	2018-03
L104	RF Coil	2004-39
L501	RF Choke, 8.2 mH	2004-44
L502,503,504,505	RF Choke, 25 uH	2004-43
HF301	HF Filter, 10u, 15A	2004-49
HF302	HF Filter, CFU455D	2004-50

REPLACEMENT PARTS LIST (Continued)

SYMBOL	DESCRIPTION	PART NUMBER
	CONTROLS	
	Switch, Auto/Man & Chan selector	2004-56
	Switch, Bypass	2004-57
R501	Miniature Trimmer Control 10KB	2004-47
R503	" " " 5KB	1002-24
R504	" " " 10KB	2020-10
R702	" " " 10KD	2004-46
	CAPACITORS	
C101,102,112	Ceramic Trimmer	2020-22
C103,110	Ceramic, 0.005mfd +80%-20%,50V	2018-11
C104,311,315, 317,516,517, 518,519,525, 526	" 100pfd, ±10%, 50V	160-04-9
C105	" 0.5pfd ±0.25pfd, 50V	2020-23
C106,107,115,117, 504,505,506	" 0.001mfd, ±10% "	2020-24
C108,302	" 5pfd ±0.25pfd "	2020-25
C109	" 2pfd "	1004-88
C111	" 0.0033mfd, ±20% "	2020-26
C113,309	" 0.01mfd +80%-20% "	160-55-9
C116	" 70pfd, ±5%	1009-140
C122,316,502	" 0.02mfd +80%-20% "	1047-89
C301,303,304,305, 306,307,521,706	" 500pfd, ±10%, "	160-99-9
C308	" 0.002mfd, ±20%, "	1010-156
C312,314,507	" 200pfd, ±10% "	1047-82
C313,318	" 0.04mfd +80%-20% "	1010-153
C501	" 0.003mfd " " "	2020-27
C319	Mylar, 0.04mfd, ±20% " "	1010-160
C503,707	Electrolytic, 10mfd, 10V	170-66-9
C509,510,511,514 515,523	" 0.47mfd "	2004-52
C512	" 1mfd "	1014-107
C513,703,704	" 100mfd "	1012-18
C520	" 220mfd "	1012-19
C701,702	" 0.1mfd "	2004-54
	RESISTORS	
R101	Carbon, 82 ohm, ±10%, 1/4W	1013-19
R102,301,313,315, 317,522	" 470K " " "	1010-228
R103,320,537	" 3.3K " " "	1010-214
R104,707	" 150K " " "	1010-233
R105,305	" 220 " " "	1017-69
R106,502,509	" 47K " " "	1010-223
R107	" 10K " " "	1010-220
R108,308,310	" 100 " " "	1017-68
R109	" 33K " " "	1010-76
R302,309,312,314 316,318,509,704	" 2.7K " " "	1010-213

REPLACEMENT PARTS LIST (Continued)

SYMBOL	DESCRIPTION	PART NUMBER
	RESISTORS (Continued)	
R303,319	Carbon, 390K ohm, ±10%, 1/4W	2018-16
R304	" 1.8K " " "	1010-211
R306	" 220K " " "	2018-13
R307	" 2.2K " " "	1010-212
R311	" 330K " " "	1010-227
R321,322	" 5.6K " " "	1010-217
R323	" 27K " " "	1013-18
R505,507,524,525, 527,528,703	" 560K " " "	2004-71
R506,514	" 1K " " "	1010-209
R510,515,517	" 10K " " "	1010-220
R511,513,531,532, 533,534	" 22K " " "	1044-71
R512	" 4.7K " " "	1010-216
R516	" 15K " " "	1011-25
R518,521	" 6.8K " " "	1010-218
R519,520	" 180K " " "	1010-226
R523,526,529,530	" 100K " " "	1010-225
R535,706	" 330 " " "	1010-204
R701	" 15 " " "	2018-17
R705,708	" 150 " " "	1002-76
R709	" 56 " " "	1004-101
	MISCELLANEOUS	
	Cabinet, Front Section	2004-07
	Cabinet, Back Section	2004-08
	Panel, Front	2004-09
	Lid, Bottom	2004-10
	Lid, Battery Compartment	2004-11
	Lid, Crystal Compartment	2004-12
	Label, Crystal Layout	2004-15
	Plate, Front Panel	2004-17
	Nut, External Antenna Jack	2004-19
	Knob, Manual/Scan switch	2004-29
	Knob, Volume and Squelch controls	2004-26
	Speaker, 8 ohm, 0.3 watt	2004-48
	Earphone Assembly	1012-26
	Socket, Crystal	1002-28
	Socket, Ext. Power	2004-58
	Socket, Ext. Antenna	2004-62
	Socket Assembly, Charger & EXT Spk	2004-59
	Battery Lead Assembly	2004-63
	Battery Holder Assembly	2004-64

Courier Cop-Scan UHF, UHFH
Fanon Scanfare UHF, UHFH

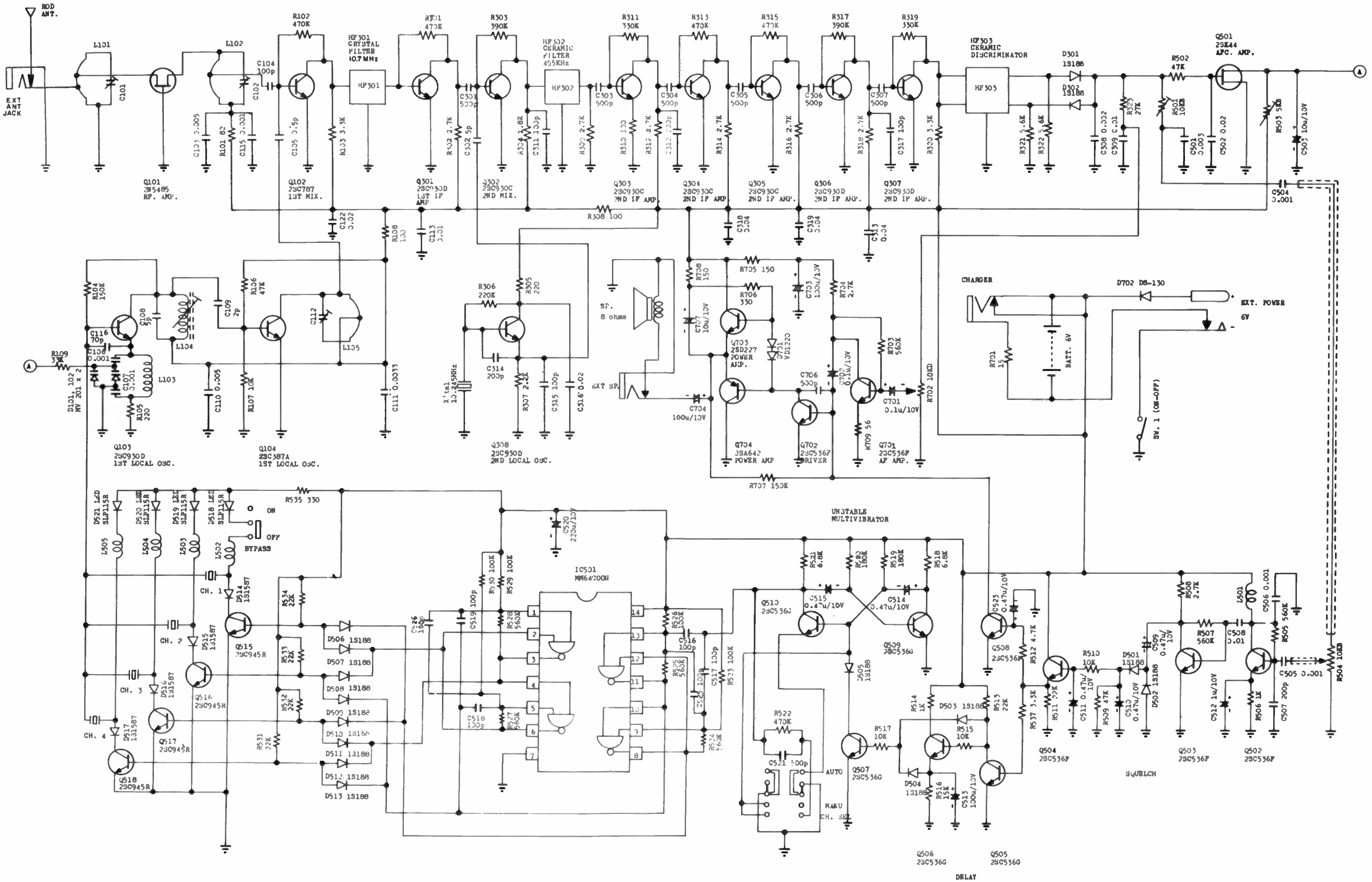
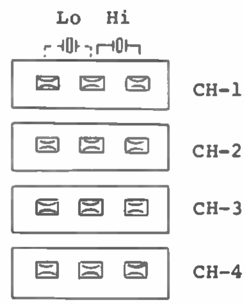


FIGURE II, MODEL UHF AND UHFH MONITORS, SCHEMATIC DIAGRAM

Pages 41 - 46 Courtesy of CRAIG CORP.

4352 UHF



4352 CRYSTAL SOCKET

ALIGNMENT PROCEDURES

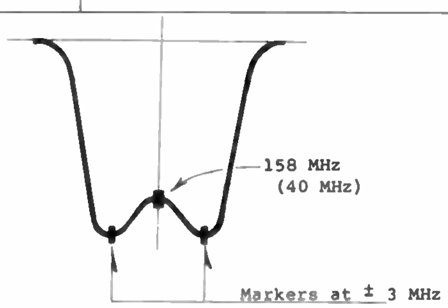
Alignment is performed at factory with laboratory test equipment. Therefore, before alignment is attempted the unit should be thoroughly checked for circuit troubles.

EQUIPMENT REQUIERED

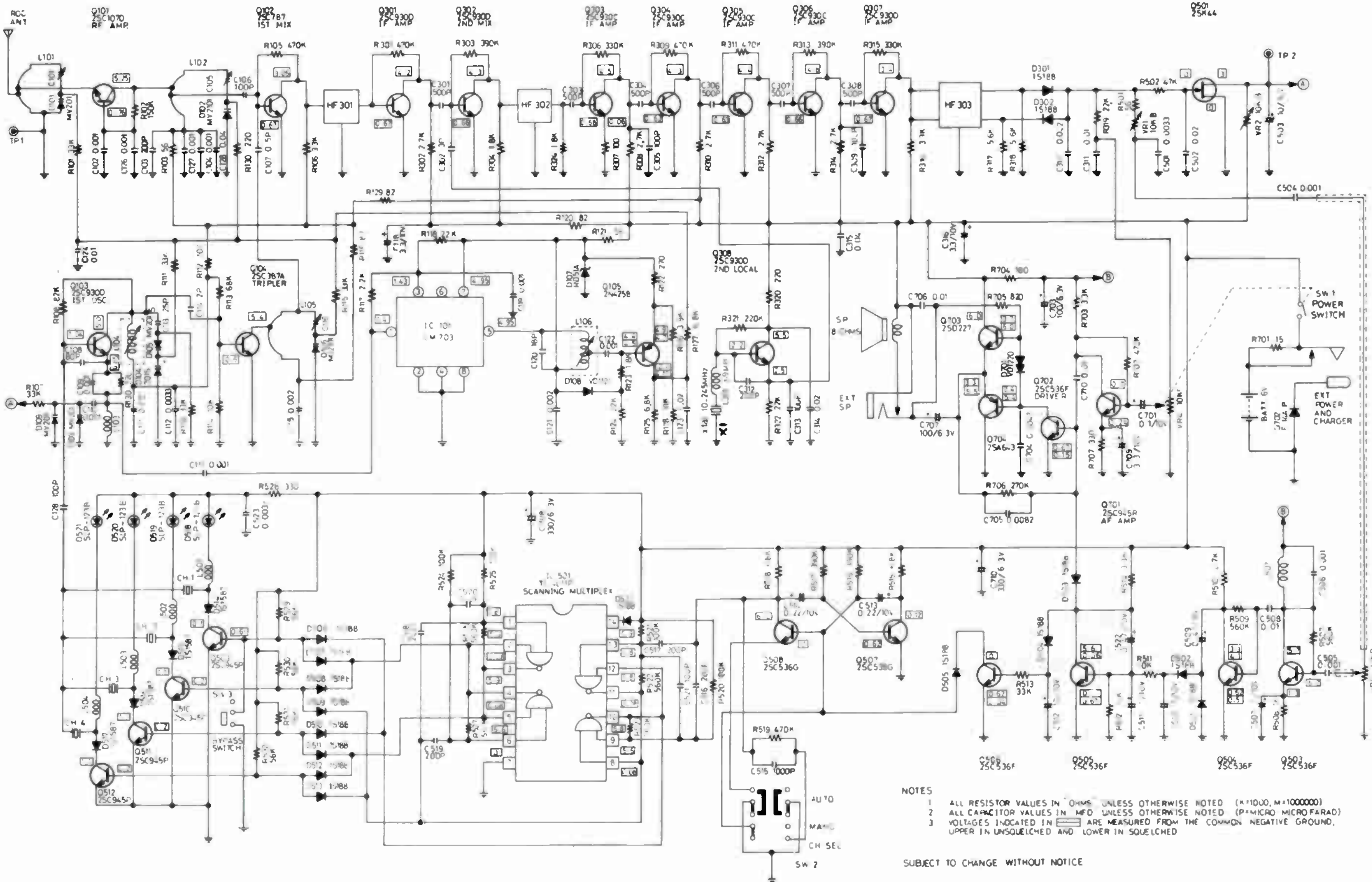
1.) FM SIGNAL GENERATOR - 30 to 190 MHz (VHF Band)
2.) FM SIGNAL GENERATOR - 450 to 512 MHz (UHF Band)
3.) SWEEP GENERATOR - 30 to 170 MHz
4.) OSCILLOSCOPE
5.) POWER SUPPLY - 6V DC 200 mA
6.) CRYSTALS - 156 MHz, 450 MHz, 470 MHz & 480 MHz
7.) DUMMY LOAD - 8 Ohms
8.) V.T.V.M.

Turn power on and squelch control fully counterclockwise. Plug the 450 MHz crystal (type HC-25U) in CH-3 crystal socket, set unit to manual scanning and activate CH-3.

V.V.C.	UHF			Connect Voltmeter between R101 & Gnd	L106	Reading of 0.4V on Voltmeter
Remove the 450 MHz crystal and plug the 470 MHz crystal in the same socket.						
A.F.C.	UHF			Connect Voltmeter between TP2 & ground	VR2	Reading of 3.0V on Voltmeter
SENSITIVITY	UHF	Connect signal generator to EXT. ANT. jack. Attenuator of SG aprox. 1 mV NOTE: Decrease output level of SG gradually while adjusting.	470 MHz	Connect Oscilloscope, V.T.V.M. to 8 Ohm dummy load across EXT. speaker jack	L104, C116, C105, C101	Best signal to noise ratio (repeat adj)
Remove 470 MHz crystal and plug the 480 MHz crystal in the same socket. Turn the squelch control fully clockwise.						
SQUELCH	UHF	Set attenuator of signal generator to 10 uV		Connect oscilloscope, V.T.V.M. to 8 Ohm dummy load across EXT. speaker jack	VR1	open SQ with 10uV signal input



4352 SCHEMATIC DIAGRAM

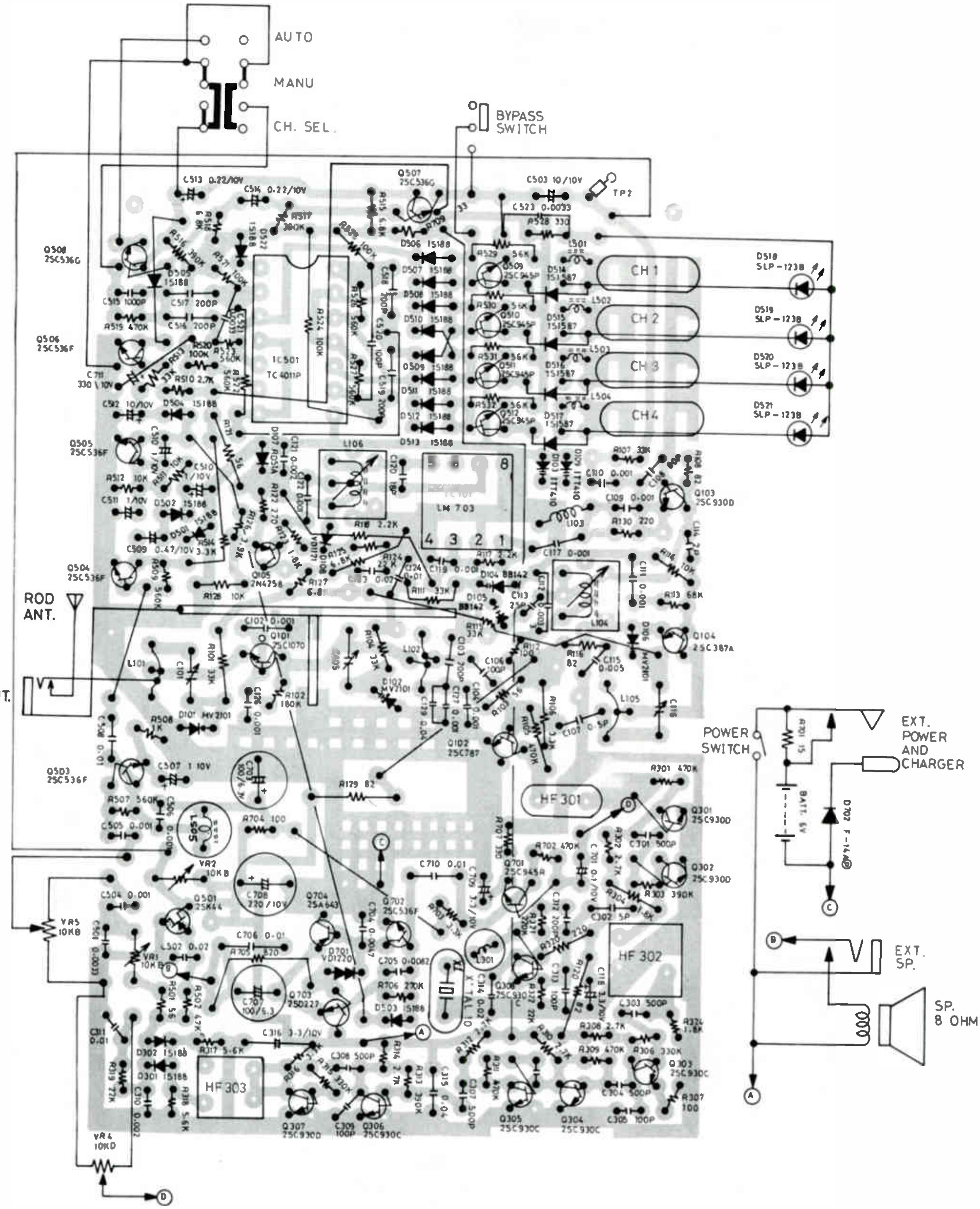


NOTES

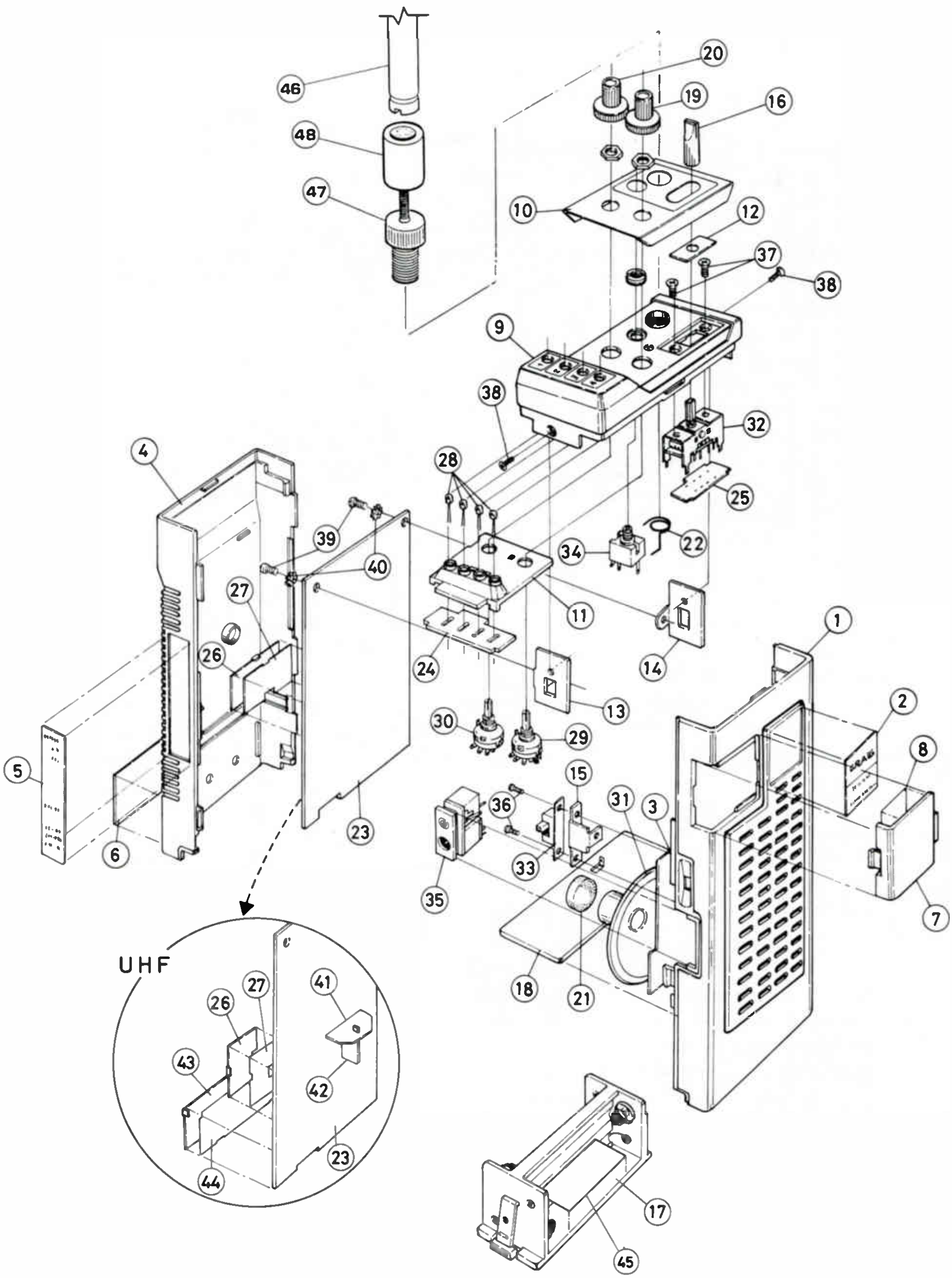
1 ALL RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED (K=1000, M=1000000)
2 ALL CAPACITOR VALUES IN MFD UNLESS OTHERWISE NOTED (P=MICRO MICRO FARAD)
3 VOLTAGES INDICATED IN ▭ ARE MEASURED FROM THE COMMON NEGATIVE GROUND, UPPER IN UNSQUELCHED AND LOWER IN SQUELCHED

SUBJECT TO CHANGE WITHOUT NOTICE

4352 P.C.B. LAYOUT (Bottom View)



CABINET AND CHASSIS



PARTS PRICE LIST

SUBJECT TO CHANGE WITHOUT NOTICE. USE ALL AVAILABLE NUMBERS AND COMPLETE DESCRIPTION WHEN ORDERING, INCLUDING MODEL NUMBER

* * * "THESE PRICES HAVE BEEN REVISED AS OF 5-11-76" * * *

PACKAGING

Ref. No.	CRAIG KEY NO. MODEL 4352	Description	Mfr's Sugg Ret. Price
	4352001	Individual Carton	2.50
	4352002	Carton Sleeve	1.20
	4351003	Cushion, Unit Pad	1.70
	4352003	Plastic Base	1.20
	4351005	Leather Carrying Case	6.35

Ref. No.	CRAIG KEY NO. MODEL 4352	Description	Mfr's Sugg Ret. Price
46	4351006	Telescopic Antenna	3.70
	4351007	Extension Antenna Wire	.90
47	4351008	Scr, Telescopic Ant Mtg	1.05
48	4351009	Bushing, Telescopic Antenna	.40
	2603123	Earphone	.60

CABINET EXPLODED VIEW

Ref. No.	CRAIG KEY NO. MODEL 4352	Description	Mfr's Sugg Ret. Price
1	4351056	Front Cabinet	4.90
2	4352021	Plate, Decoration	.65
3	4351058	Net, Speaker Grille	.35
4	4351059	Back Cabinet	4.90
5	4351060	Plate, Decoration	.65
6	4352022	Craig Model Bedge	.75
7	4351017	Lid, Crystal Access	.70
8	4352012	Label, Crystal Layout	.25
9	4351019	Top Panel	4.40
10	4351020	Face Plate, Top Panel	.70
11	4351021	Plastic Bkt, LED & Cont Mtg	.85
12	4351022	Dust Cover, Switch	.25
13	4351023	Bkt (L), Main PCB Mtg	.40
14	4351024	Bkt (R), Main PCB Mtg	.40
15	4351025	Bkt, Slide Sw Mtg	.30
16	4351026	Knob, Select Sw	.95
17	4351027	Battery Case	3.90
18	4351028	Ass'y, Batt Terminal	.75
19	4351029	Knob, Vol Cont	.95
20	4351030	Knob, Squelch Cont	.95
21	4351031	Felt Cushion, Speaker Mtg	.25
22	4351032	Spr, Ant. Extension Jack	.25
23	*******	Main P.C.B.	****

Ref. No.	CRAIG KEY NO. MODEL 4352	Description	Mfr's Sugg Ret. Price
28	SLP123B	L.E.D. (D519~D522)	1.35
29	4351038	Var Res 10k, Vol W/Sw	2.35
30	4351039	Var Res 10k, Squelch	2.05
31	4351040	Speaker, 8 Ohms	3.25
32	4351041	AUTO/MANU/CH-SEL Switch	2.60
33	4351042	BYPASS Switch	1.50
34	9109025	Jack, Antenna Extension	.40
35	4351043	Jack Ass'y, Ext. SP & Power	1.50
36		Scr, PH M2x4	.25
37		Scr, FH M2.6x6	.25
38		Scr, FH M2x4	.25
39		Scr, PH M2.6x6	.25
40		Toothed Lock Washer, M2	.25
41	NSP	Shield Plate(A), PCB	**
42	NSP	Shield Plate(B), PCB	**
43	4352014	Shield Plate	.35
44	4351015	Insulator	.35
45	4351044	Coution Label	.25
24	4351034	LED PCB W/O Comp	.75
25	4351035	PCB, CH Select Sw	.75
26	4351036	Shield Plate	.35
27	4351037	Fiber Insulator	.35
	4352023	Crystal Socket	1.65

4352 SEMICONDUCTORS

Q101	2SC1070	Transistor	1.95
Q102	2SC787	"	1.95
Q103,301,302,	2SC930	"	1.50
Q303,304,305,	"	"	"
Q306,307,308	"	"	"
Q104	2SC387	"	1.95
Q105	2N4258	"	1.85
Q501	2SK44D	"	1.50
Q503,504,505,	2SC536	"	2.30
Q506,507,508,	"	"	"
Q702	"	"	"
Q509,510,511,	2SC945	"	1.50
Q512,701	2SC945	"	"
Q703	2SD227	"	1.55
Q704	2SA642	"	1.20
IC101	LM703	I.C.	3.95

IC501	TC4011P	I.C.	5.00
D101,102,106	MV2101	Variable Capacitance Diode	1.85
D103,104,105	MV201	" " "	1.85
D109	"	" " "	"
D107	RD51	Zener Diode	1.05
D108	VD1121	Varistor	.95
D301,302,501	1S188	Diode	.60
D502,522	"	"	"
D503 513	"	"	"
D514,515,516,	1S1587	Diode	.95
D517	"	"	"
D518,519,520,	SLP123B	L.E.D.	1.60
D521	"	"	"
D701	VD1220	Varistor	.85
D702	F14A	Diode	.95

L101,102,	4352016	RF Coil	1.50
L105	4352016	RF Coil	1.50
L104	4352018	RF Coil	1.50
L106	4351048	RF Coil	1.50
L505	4351050	RF Choke, 8.2 mH	1.05
L501,502,	4351049	RF Choke 25 mH	.75
L503,504	4351049	RF Choke 25 mH	.75
L301	4352019	Choke Coil, 3.9 uH	1.05
HF301	4351052	Crystal Filter (10M15A)	8.95
HF302	4351053	Ceramic Filter (CFU455D)	4.95
HF303	4351054	Ceramic Discriminator	3.95
X1	4351055	Crystal, 10.245MHz (HC-18U)	7.70
L103	4352017	VHF Coil	.45

4 3 5 2 CAPACITORS

C114	Ceramic,	2pF/50V	±0.25pF	.45
C302	"	3pF/50V	±10%	.45
C106,128,313,520,	"	100pF/50V	"	.45
521,305,309	"	" "	"	"
C103,312,516,517,	"	200pF/50V	"	.45
518,519	"	" "	"	"
C301,303,304,306,	"	500pF/50V	"	.45
307,308	"	" "	"	"
C107	"	0.5pF/50V	"	.45
C120	"	18pF/50V	"	.45
C113	"	25pF/50V	"	.45
C102,104,109,110,	"	0.001uF/50V	"	.45
111,115,117,119,	"	" "	"	"
122,126,127,504,	"	" "	"	"
505,506	"	" "	"	"
C124	"	0.01uF/50V	"	.45
C123,314,502	"	0.02uF/50V	"	"

C108	Ceramic,	8pF/50V	±10%	.45
C121,125,310	"	0.002uF/50V	±10%	.45
C112,501,523	"	0.0033uF/50V	"	"
C129,128	"	0.04uF/50V	"	.45
C704	Mylar,	0.0047uF/50V	±20%	.45
C705	"	0.0082uF/50V	"	.45
C515	"	1000pF/50V	"	.45
C311,508,706,710	"	0.01uF/50V	"	.45
C315	"	0.047uF/50V	"	.45
C703,707	Electrolytic,	100uF/6.3V		.45
C513,514	"	0.22uF/10V		.55
C701	"	0.1uF/10V		.55
C708,711	"	330uF/10V		1.85
C118,709,316	"	3.3uF/10V		.75
C509,522	"	0.47uF/35V		1.50
C507,510,511	"	1uF/25V		.65
C512,503	"	10uF/10V		.60

TRIMMERS & VARIABLE RESISTORS

Ref. No.		Craig Key No.	Description	Mfr's Sugg Ret. Price
VR1	4351 ONLY	4351038	Var Res 10k, Vol Cont W/Sw	2.35
VR2		4351039	Var Res 10k, Squelch	2.05

Ref. No.		Craig Key No.	Description	Mfr's Sugg Ret. Price
VR1,2		4352009	Semi-Varible Res, 10k	.75
VR4	4352 ONLY	4351038	Vol Cont W/Sw	2.35
VR5		4351039	Squelch Cont	2.05
C101,105		4352007	Trimmer Cap	1.50
C116		4352007	Trimmer Cap	1.50

4 3 5 2 RESISTORS

R112,307,	100	Ohms,	¼W
704	"	"	"
R528,707	330	"	"
R701	15	"	"
R508	1k	"	"
R302,308,	2.7k	"	"
310,312,	"	"	"
314,510	"	"	"
R106,316,	3.3k	"	"
514,703	"	"	"
R317,318	5.6k	"	"
R125,127,	6.8k	"	"
515,518		"	"

R114,128,	10k	Ohms,	¼W
511,512	"	"	"
R101,104,	33k	"	"
107,110,	"	"	"
111,115,	"	"	"
513	"	"	"
R529,530,	56k	"	"
531,532	"	"	"
R108	82k	"	"
R520,521,	100k	"	"
524,525	"	"	"
R102	150k	"	"
R306,315	330k	"	"

R303,313,	390k	Ohms,	¼W
516,517	"	"	"
R105,301,	470k	"	"
309,311,	"	"	"
519,702	"	"	"
R507,509,	560k	"	"
522,523,	"	"	"
526,527	"	"	"
R123,304,	1.8k	"	"
324	"	"	"
R117	2.2k	"	"
R126	3.9k	"	"
R321	220k	"	"

R706	270k	Ohms,	¼
R130,320	220	"	"
R122	270	"	"
R705	820	"	"
R118,124,	22k	"	"
319,322	"	"	"
R502	47k	"	"
R113	68k	"	"
R103,121,	56	"	"
501	"	"	"
R116,120,	82	"	"
129			

Pages 47 - 50 Courtesy of GEMTRONICS

		High Band	Low Band
Frequency Range		150 – 160 MHz	35 – 45 MHz
Tuned Center Frequency		156 MHz	40 MHz
Band Width		±3 MHz	±3 MHz
Frequency Separation		25 MHz	25 MHz
Sensitivity (20 dB NQ)		0.7 μV	0.5 μV
Squelch Sensitivity		0.5 μV	0.3 μV
Selectivity		6 dB : ± 6 KHz	6 dB: ± 6 KHz
		50 dB : ± 15 KHz	50 dB: ± 15 KHz
Frequency Deviation		± 5 KHz	± 5 KHz
I.F. Frequency	(1st)	10.7 MHz	10.7 MHz
	(2nd)	455 KHz	455 KHz
A.F. Output Power			
	(10% dist.)	1.0 Watt	1.0 Watt
	(Maximum)	1.5 Watts	1.5 Watts
Semiconductor			
	I.C.	5	5
	Transistor	33	33
	Diode	38	38
	UJT	1	1

Power Supply	DC 13.8V & AC 117V
Power Consumption	
DC Maximum	10 Watts
AC Maximum	15 Watts
Antenna	Built-in Swivel Antenna
	50 Ohm (When to use external Antenna)
Dimension	170mm (W) x 55mm (H) x 220mm (D)
Weight (Nett)	appx. 1.8 Kgs
Standard Accessories:	Mounting Bracket with Screws
	AC Cord & DC Cord

Crystals are not included with this set when despatched from the factory because of difference in frequency used at the area of every user. Suitable crystals must be installed before operation.

TO INSTALL CRYSTALS:

1) Remove lock screws at the back of the cabinet and pull out the chassie.
2) Install crystals in the sockets according to the channel numbers. Be careful not to bend crystal pins.

IMPORTANT:

CRYSTALS HAVE TO BE SELECTED CAREFULLY IN ACCORDANCE WITH THE BASIC RECEIVING FREQUENCY.

RECEIVING FREQUENCY	CRYSTAL FREQUENCY
LOW BAND	Channel Frequency + 10.7 MHz
HIGH BAND	$\frac{\text{Channel Frequency} - 10.7\text{ MHz}}{3}$

A) PREPARATION
1. Be sure AC or DC power cord is properly plugged in.
2. Turn your set "ON" turning on-off switch, which is volume control at the same time, (VOLUME) clockwise.

B) MANUAL SCANNING:
1. Set the SLIDE SWITCH on the position of "MAN.".
2. Push the lever switches to the position of the desired channels, "HIGH" or "LOW".
3. Turn the on-off switch clockskwise.
4. Push CHANNEL SELECTION SWITCH (SEL.) every-time when monitoring the desired channel.

C) AUTOMATIC SCANNING:
1. Set the SLIDE SWITCH on the position of "SCAN".
2. Push lever switches to the position of the desired channels "HIGH" or "LOW".
3. Turn the on-off switch (VOLUME) clockwise.
4. Turn the "SQUELCH" control counter-clockwise until scanning stops.
5. Turn the VOLUME control further until you get adequate sound volume.
6. Turn the "SQUELCH" control clockwise gradually until noise fades out.

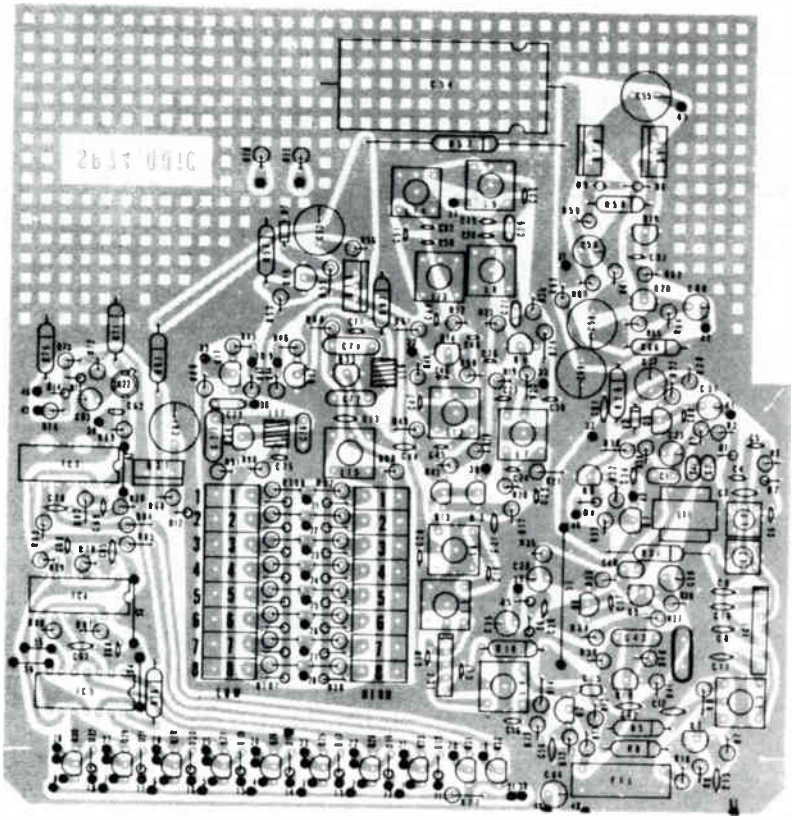
D) DEALY
1. Set the slide switch on the position of "DELAY".
2. Repeat the same process as in Automatic Scanning in (C) except SLIDE SWITCH position. (Scanning is held up for about two (2) seconds when a pause comes in conversation in which you are listening on the desired channel. You can continue monitoring the same channel when the conversation starts again within the above-mentioned period - two (2) seconds.)

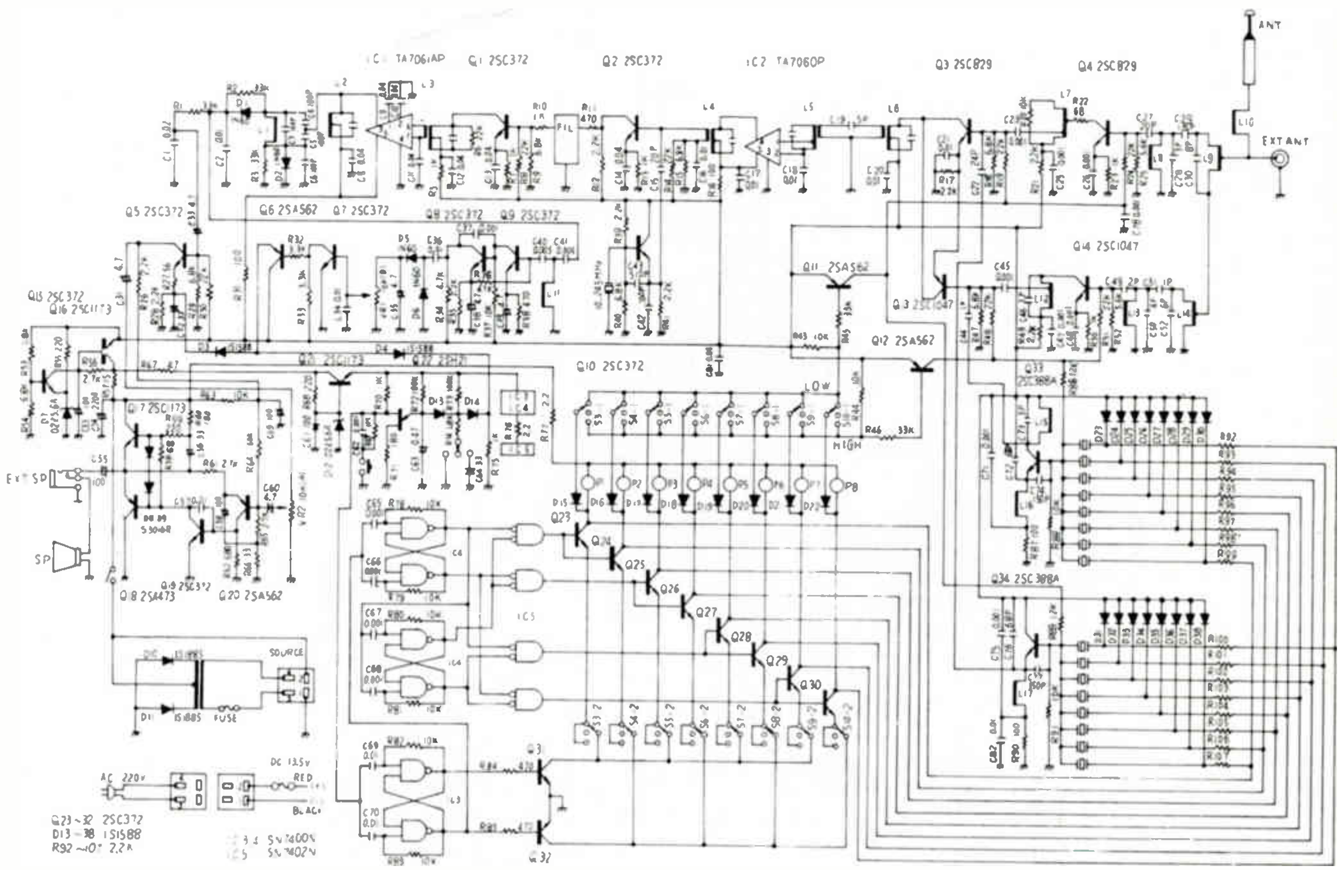
NOTE: You can shift the SLIDE SWITCH from "SCAN" to "DELAY" position during the automatic scanning if you wish.

E) SKIPPING

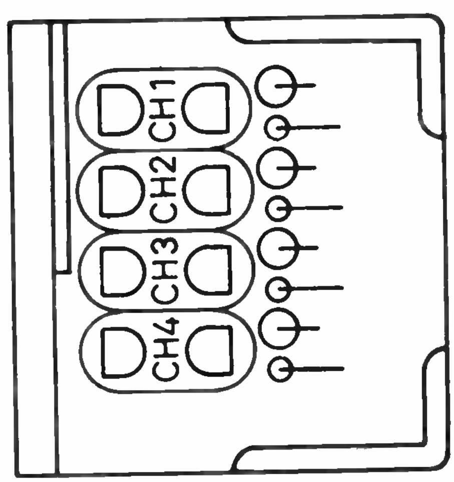
To skip unnecessary channels, keep the lever switches under individual channels, which are not desired, in the "OFF" position (Center).

Do not attempt any adjustments without proper equipment and knowledge. The Q factor of these coils is extremely high so only a ±5 MHz tolerance will give greatest sensitivity.




IC1 TA7061AP
Q1 2SC372
Q2 2SC372
IC2 TA7060P
Q3 2SC829
Q4 2SC829
ANT
EXT ANT
Q5 2SC372
Q6 2SA562
Q7 2SC372
Q8 2SC372
Q9 2SC372
Q11 2SA562
Q12 2SA562
Q13 2SC1047
Q14 2SC1047
Q15 2SC372
Q16 2SC1173
Q10 2SC372
Q17 2SC1173
Q18 2SA473
Q19 2SC372
Q20 2SA562
Q33 2SC388A
Q34 2SC388A
LOW
HIGH
EXT SP
SP
SOURCE
FUSE
AC 220V
DC 13.5V
RED
BLACK
Q23~32 2SC372
D13~38 1S1588
R92~107 2.2K

Pages 51 - 58 Courtesy of MIDLAND INTERNATIONAL

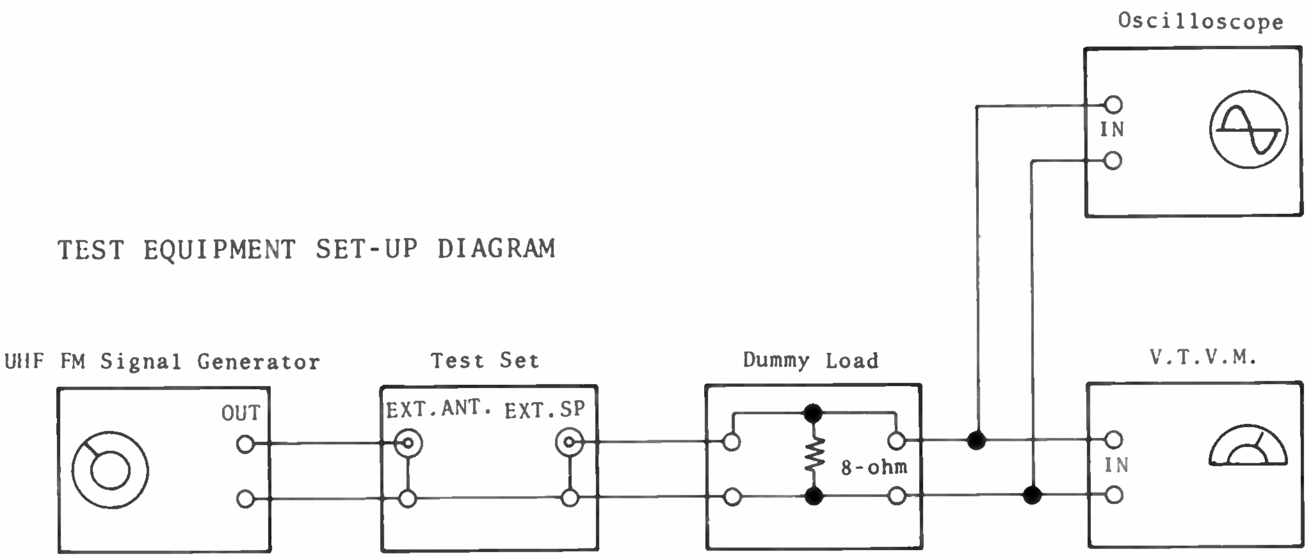


CRYSTAL SOCKET LAYOUT

ALIGNMENT INSTRUCTIONS

1. TEST EQUIPMENT REQUIRED
   (1) UHF FM Signal Generator (450-512 MHz)
   (2) Oscilloscope
   (3) V.T.V.M.
   (4) DC Power Supply (6 V/200 mA)
   (5) DC Voltmeter or Multimeter
   (6) Non-metallic Screw Driver for adjustment
   (7) Test Crystal (450, 470, 480, 500, 512 MHz)
   (8) 8-ohm Dummy Load or Speaker
2. TEST EQUIPMENT SET-UP DIAGRAM

TEST EQUIPMENT SET-UP DIAGRAM



3. ALIGNMENT PROCEDURE
   (1) V.V.C. VOLTAGE Adjustment
      1) Connect DC Power Supply to the test set.
      2) Turn VOLUME and SQUELCH fully counter-clockwise.
      3) Activate CH. 3 by using SCAN CONTROL/CHANNEL SELECT switch.
      4) Plug the test crystal (450 MHz) into the CH. 3 crystal socket.
      5) Connect DC Voltmeter between R101 and ground.
      6) Adjust L106 for 0.4 V reading on DC Voltmeter.
      7) Remove the test crystal (450 MHz) from the CH. 3 crystal socket.
      8) Plug the test crystal (470 MHz) into the CH. 3 crystal soçket.
      9) Check if DC Voltmeter indication is approx. 1.2 V.
   (2) AFC Adjustment
      1) Connect DC Voltmeter between R107 and ground.
      2) Adjust VR502 for 3.0 V reading on DC Voltmeter with no signal input

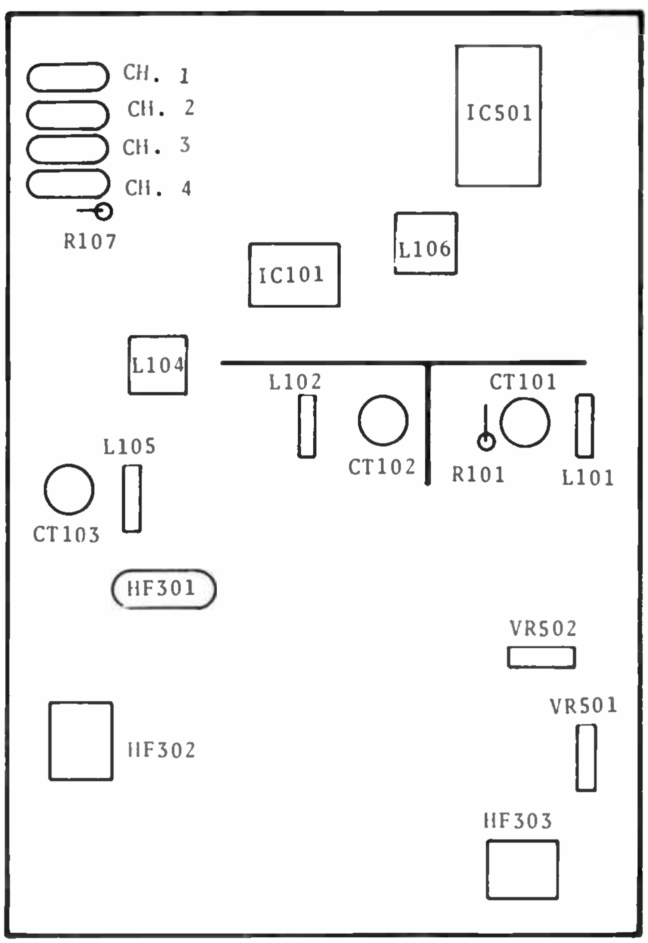
(3) Sensitivity Alignment

1) Set the signal Generator to 470 MHz.
2) Connect the output of the signal generator to EXTERNAL ANTENNA SOCKET.
3) Primarily, set the attenuator of the signal generator around 1 mV and adjust L104, CT103, CT102 and CT101 for maximum audio output in the following sequence, decreasing the attenuator of the signal generator.
   L104 - CT103 - CT102 - CT101
   Repeat this step as necessary to obtain proper sensitivity.
4) Remove the test crystal (470 MHz) from the CH. 3 crystal socket.
5) Plug the test crystal (480 MHz) into the CH. 3 crystal socket.
6) Check the desired items in the specifications.
7) Check the noise quieting sensitivity at 450 MHz and 508 MHz by using the appropriate cyrstals.

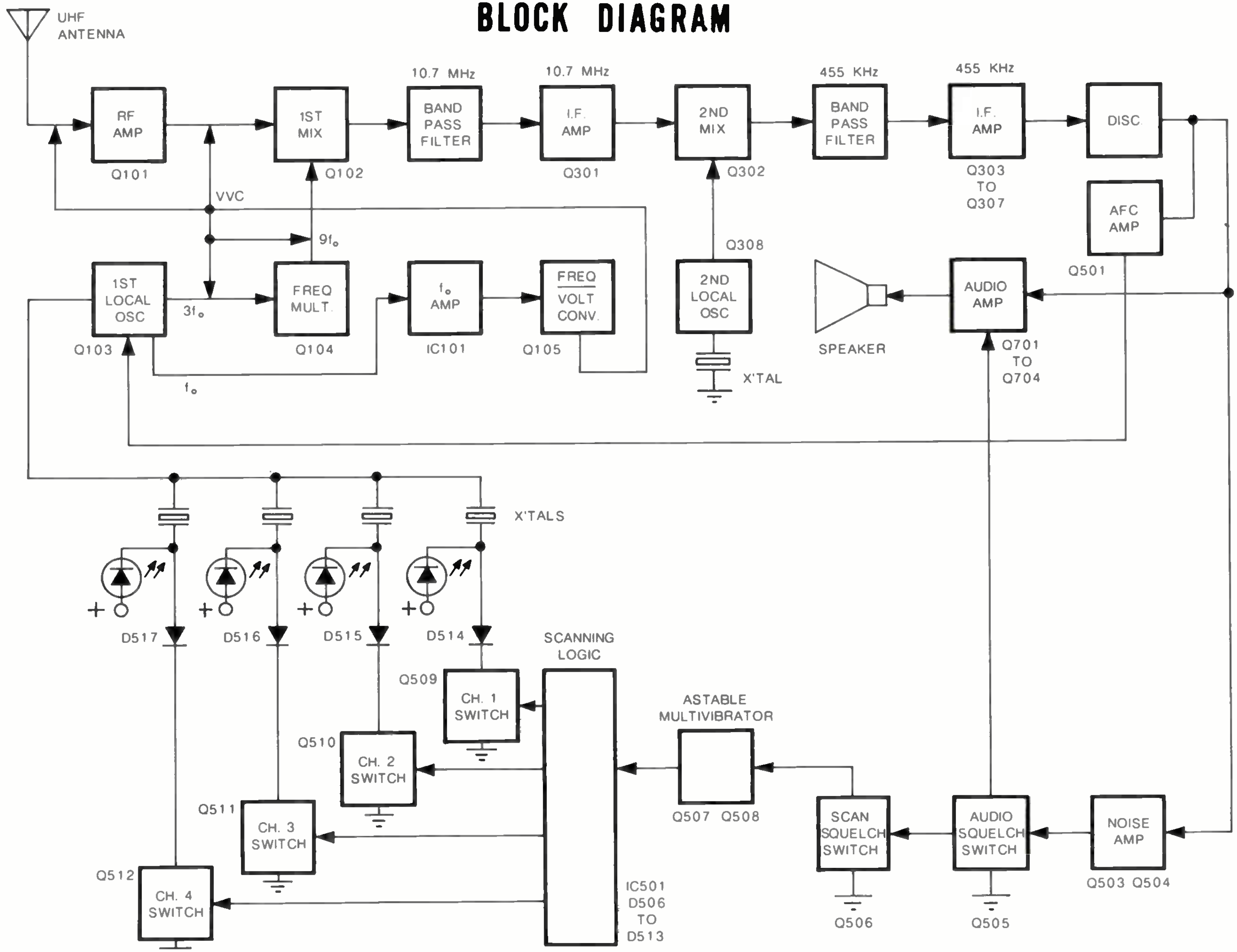
(4) TIGHT SQUELCH ADJUSTMENT

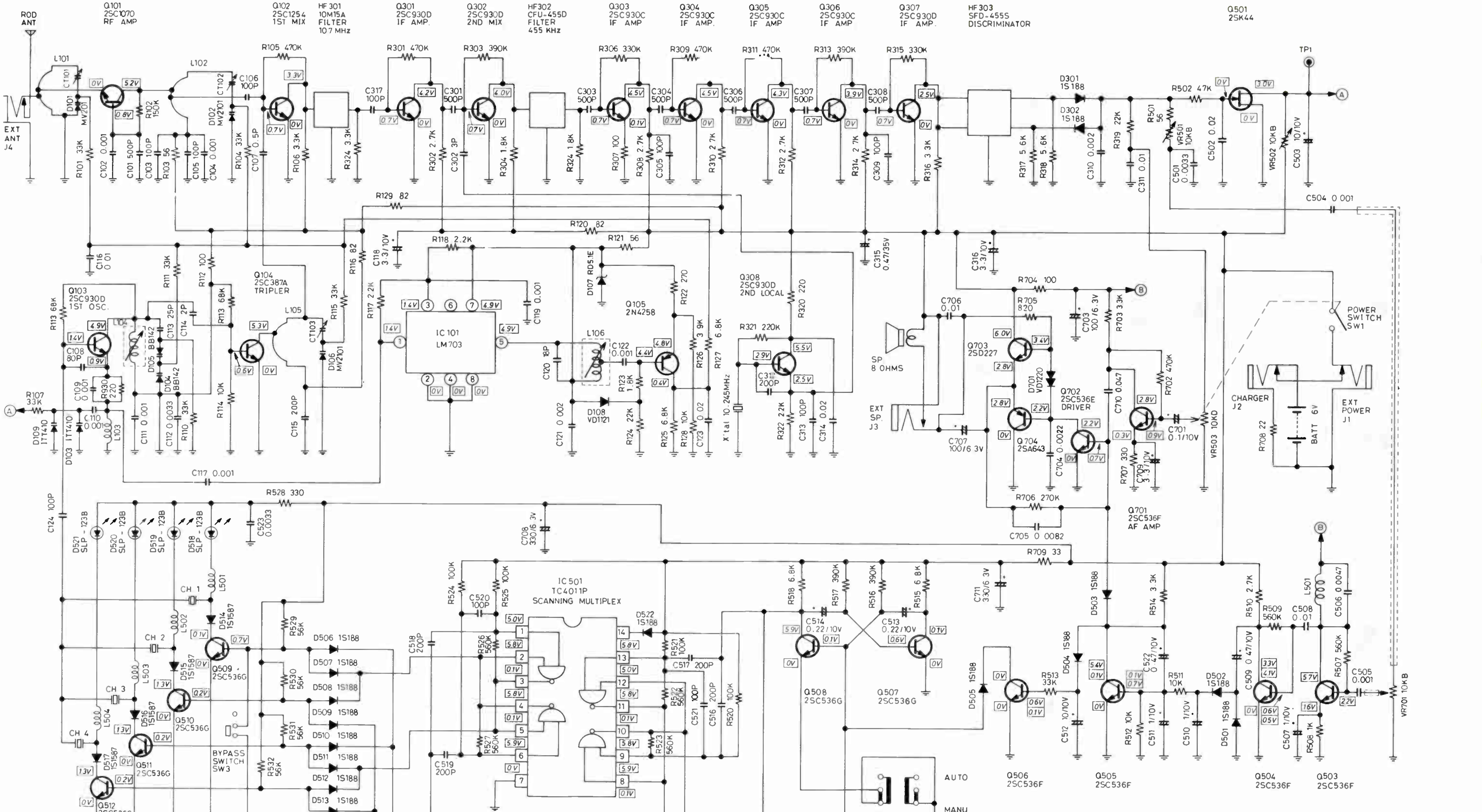
1) Plug the crystal (480 MHz) into the CH. 3 cyrstal socket.
2) Turn SQUELCH fully clockwise.
3) Adjust VR501 for squelch open.

ALIGNMENT POINTS



BLOCK DIAGRAM

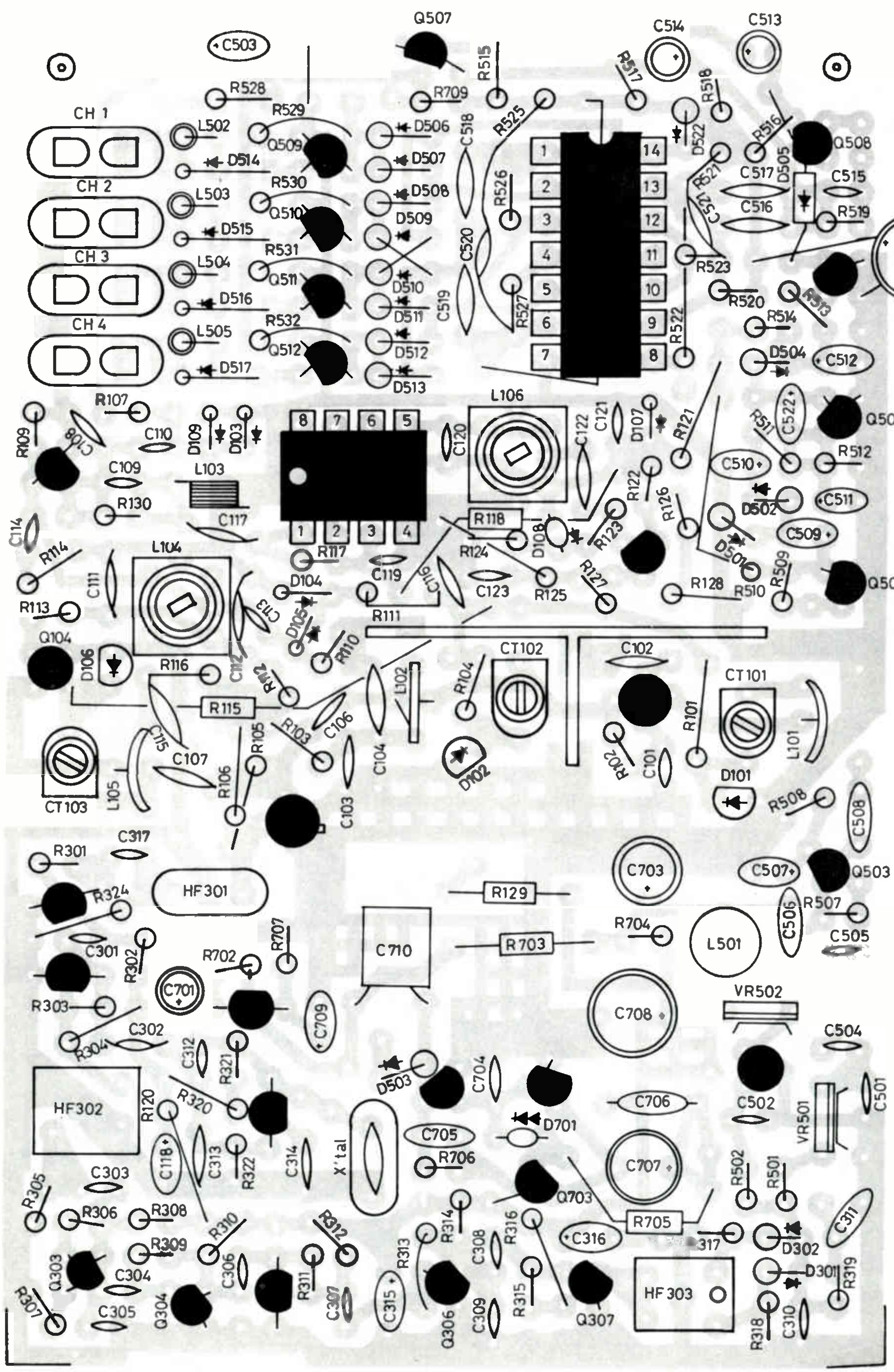




NOTES
1 ALL RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED (K 1000 M 1000000)
2 ALL CAPACITOR VALUES IN MFD UNLESS OTHERWISE NOTED (P MICRO-MICROFARAD)
3 VOLTAGES INDICATED IN ▭ ARE MEASURED FROM THE COMMON NEGATIVE GROUND UPPER IN UNSQUELCHED AND LOWER IN SQUELCHED

SUBJECT TO CHANGE WITHOUT NOTICE

COMPONENT LAYOUT



PARTS LIST

MODEL NO. 13-903B

PAGE 1

REF. NO.	DESCRIPTION	PART NO.
	CASE PARTS	
	SEE EXPLODED VIEW	
1	Case, Top	13-010243
2	Plate, Marking	13-020573
3	Case, Front	13-010350
4	Door, Crystal Access	13-018029
5	Label, Crystal Socket	13-020762
6	Case, Back	13-013161
7	Knob, Volume/Squelch	13-110164
8	Bracket, By-Pass Switch	13-158582
9	Mask, Scan Control/ Channel	13-020675
10	Cap, Knob	13-110165
11	Battery Holder Ass'y.	13-030120
13	Board, PC LED	13-070116
14	Board, PC Scan Control/ Channel Select	13-070117
15	Bracket, PCB MTG R	13-158329
16	Bracket, PCB MTG L	13-158330
17	Knob, Scan Control/ Channel	13-115123
18	Bracket	13-158331
19	Button, Push	13-115101
20	Lever	13-155008
21	Spring, Coil	13-152008
22	Terminal	13-155012
23 SW2	Switch, Scan Control/ Channel Select	13-180085
23 SW3	Switch, By-Pass	13-183254
25 J1-3	Socket, Ext. Power/ Charger/Ext. Speaker	13-159181
26 J4	Socket, Ext. Antenna	13-159287
27 DS18-521	LED SLP 115	
28	Plate, Rating	13-020763
29	Plate, Marking	13-020647
30	Plate, Name	13-020764
38 VR701/SW1	Control, Volume W/Switch	13-161004
39 VR503	Control, Squelch	13-161003
	MISCELLANEOUS	
	Case, Carry W/Hanger	13-036059
	Speaker, 8 ohm 0.3W	13-068003
	Cover, Speaker	13-020765
	Lid, Battery	13-018030
	Terminal, Battery	13-030144
	Terminal, Battery	13-030145
	Screw, Rod Antenna Mtg.	13-151406
	Bracket, Rod Antenna Mtg.	13-158333
	Spring, Coil Ant. Socket/ Ext. Ant. Socket	13-152017
	Bracket, Battery Compartment	13-158583
	Plate, Shield	13-155062
	Plate, Shield	13-155009
	Plate, Shield PCB Top (Large)	13-155010
	Plate, Shield PCB Top (Small)	13-155063
	Insulator	13-157261
	Insulator	13-157223
	Screw, Cabinet/Back Lid	13-151496
	Nut, Hex, Cabinet/ Back Lid	13-151497
32	Screw, Bypass Switch Mtg.	13-151498
	Screw, Scan Control/ Channel	13-151499
HF301	Filter, Crystal 10M15A	13-179078
HF302	Filter, Ceramic CFU-455D	13-179041
HF303	Filter, Ceramic Discrim.	13-179047
VR501,502	Control, Sensitivity 10K	13-164176
CT101-103	Capacitor, Trimmer	13-123085
	Crystal, 10.245 MHz	13-128399
	Socket, Crystal	13-159288
	Antenna, Telescoping	13-040079

REF. NO.	DESCRIPTION	PART NO.
	COILS & TRANSFORMERS	
L101,102,105	Coil, RF	13-176689
L103	Coil, VHF	13-090322
L104	Coil, RF	13-176428
L106	Coil, RF	13-176498
L501	Coil, RF Choke 8.2 mH	13-178183
L502-505	Coil, RF Choke 25mH	13-178127
	TRANSISTORS	
Q101	2 SC 1070	
Q102	2 SC 1254	
Q103,301-308	2 SC 930	
Q104	2 SC 387	
Q105	PN 4258	
Q501	2 SK 44 FET	
Q503-512, 701,702	2 SC 536	
SUB	2 SC 945	
Q703	2 SD 227	
Q704	2 SA 642	
	INTEGRATED CIRCUITS	
IC101	LM 703	
IC501	TC 4011	
	DIODES	
D301,302,503	1 S 188 FM 1A	
D501,502, 504-513,522	1 S 188	
D107	RD5.1 EB	
D514-517	1 S 1587	
	VARICAPS	
D101,102,106	SMV 764	
SUB	MV 2101	
D103,109	ITT 410	
D104,105	BB 142	
SUB	BB 122	
	VARISTORS	
D108	VD 1121	
D701	VD 1220	

RESISTORS

ALL RESISTORS ARE CARBON, 1/4 W. SEE SCHEMATIC FOR SPECIFIC VALUES.

CAPACITORS

ALL CAPACITORS NOT SHOWN ON THIS PARTS LIST ARE CERAMIC, 50V. SEE SCHEMATIC FOR SPECIFIC VALUES.

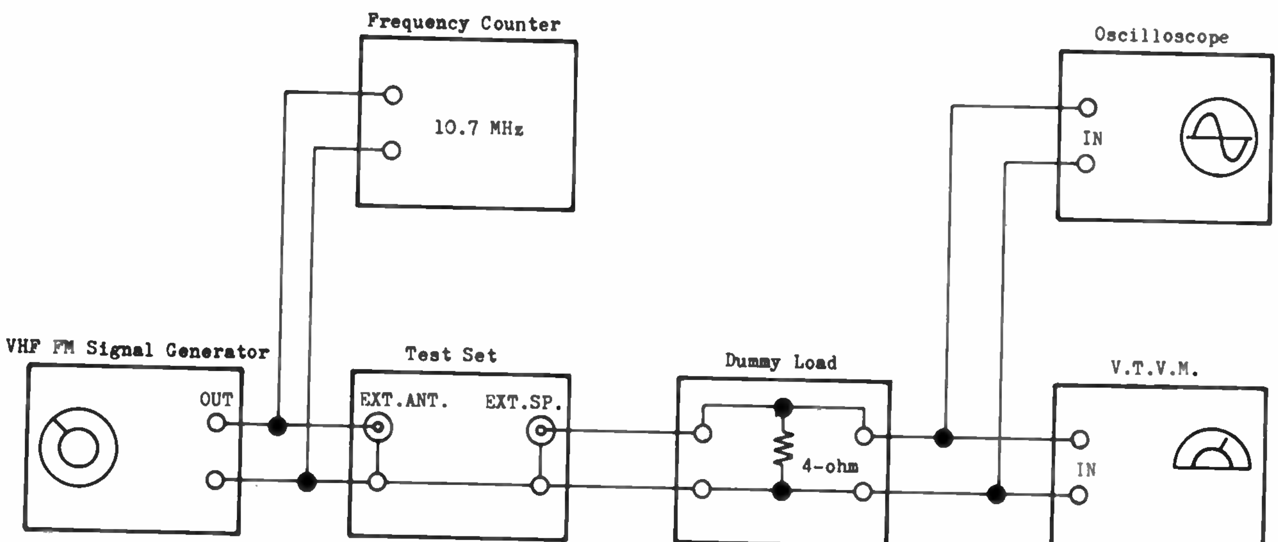
REF. NO.	VALUE		
	CERAMIC, 25V		
C116	0.01	MF	
C123,314,502	0.02	MF	
	MYLAR, 50V		
C311,508,706	0.01	MF	
C704	0.0047	MF	
C705	0.0082	MF	
C710	0.047	MF	
	TANTALUM		
C118,316,709	3.3	MF	10V
C503,512	10.	MF	10V
C507,510,511	1	MF	25V
C509,522,315	0.047		35V
	ELECTROLYTIC, ALUMINUM		
C513,514	0.22	MF	10V
C701	0.1	MF	10V
	ELECTROLYTIC, 6.3V		
C703,707	100	MF	
C708,711	330	MF	

Pages 59 - 68 Courtesy of MIDLAND INTERNATIONAL

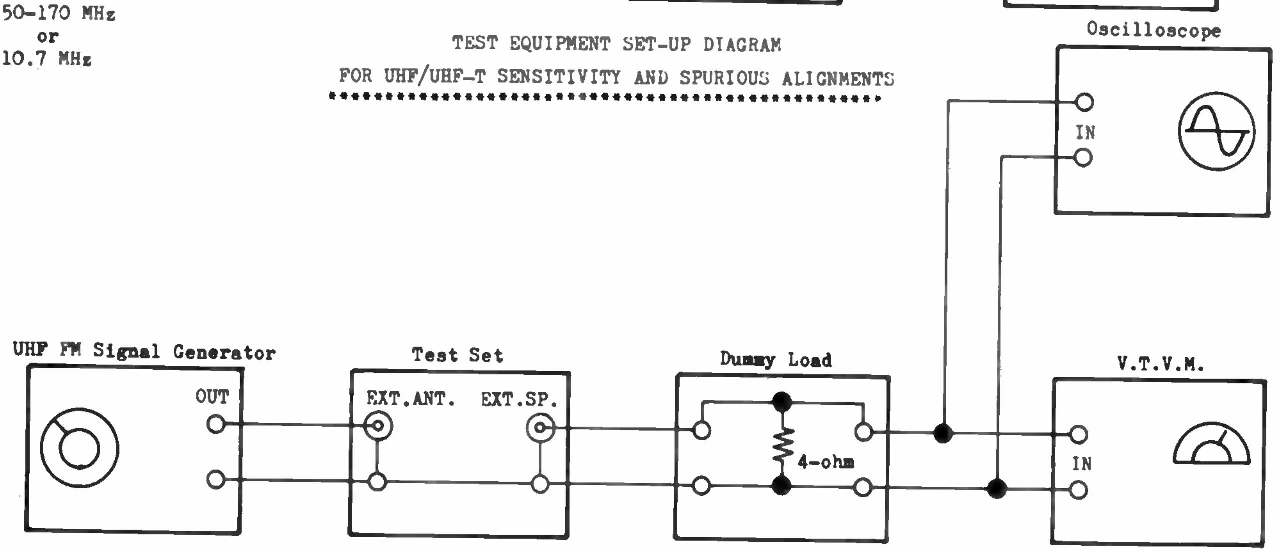
ALIGNMENT INSTRUCIONS

1. IF, AFC, RF of VHF BAND and SQUELCH ALIGNMENTS
   1) TEST EQUIPMENT REQUIRED
      * Sweep Generator (30-50 MHz)
      * Sweep Generator (150-170 MHz)
      * Sweep Oscilloscope 2 units
      * FM Signal Generator (10.7 MHz)
      * VHF FM Signal Genrator (150-170 MHz, 1 kHz modulation, 3.3 kHz deviation)
      * DC Power Supply (13.8 V, 1 A)
      * V.T.V.M. or Oscilloscope
      * DC Voltmeter (10 V)
      * Audio Output Load (4-ohm, 3 W Dummy or Speaker)
      * Frequency Counter (10.7 MHz)
      * Screw Driver for adjustment
   2) TEST EQUIPMENT SET-UP DIAGRAM

TEST EQUIPMENT SET-UP DIAGRAM
FOR IF, AFC AND SQUELCH ALIGNMENTS



TEST EQUIPMENT SET-UP DIAGRAM
FOR UHF/UHF-T SENSITIVITY AND SPURIOUS ALIGNMENTS



3) ALIGNMENT PROCEDURE (See Alignment Points Drawing)
Before starting the alignment, preset all PROGRAM SWITCHES to "U" position.

(a) IF and AFC Alignment

1. Connect DC Power Supply to the test set.
2. Preset the receiver as follows.
   - Channel: Ch. 1
   - Program Switches: All "U" positions
   - Squelch Control: fully counterclockwise
3. Set Signal Generator to 10.7000 MHz. Connect the output of Signal Generator to UHF Antenna Jack.
4. Adjust T101 for the least noise on Oscilloscope.
5. Short-Circuit C523.
6. Connect DC Voltmeter between TP1(+ side) and TP2. Adjust VR503 for 5.32 V(5.2-5.35 V) reading.
7. Increase the output level of Signal Generator with no modulation. Remove short-circuit from C523.
8. Connect DC Voltmeter between TP3 and TP4(+ side). Adjust VR504 for 4.5 V (±0.1 V) reading.

NOTE: During steps 5 thru 8, the intermediate frequency must be 10.7000 MHz.

(b) VHF RF Alignment

1. Connect DC Power Supply to the test set.
2. Preset the receiver as follows.
   - Volume: fully counterclockwise
   - Squelch Control: fully counterclockwise
   - Channel: Ch. 1
   - Program Switches: All "LO" positions
3. Connect the output of Sweep Generator to VHF Antenna Jack.
4. Connect the input of Sweep Oscilloscope between R117 and ground (R119).
5. Set the center frequency of Sweep Generator to 40 MHz.
6. Adjust the following coils for maximum waveform as shown in Figure 1.
   - L106 for 47 MHz
   - L107 for 33 MHz
   - L108 for 40 MHz

   During this step, keep the output level of Signal Generator as low as possible.
7. Set Program Switches to all "HI" positions
8. Connect the input of Sweep Oscilloscope between R106 and ground(R108).
9. Set the center frequency of Sweep Generator to 156.5 MHz.

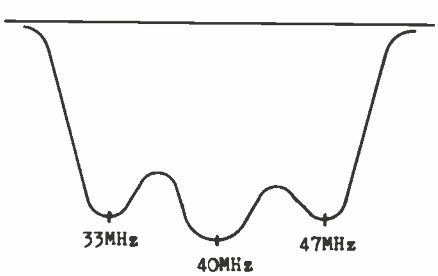


Figure 1

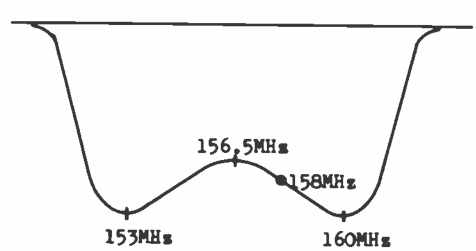


Figure 2

10. Adjust the following coils for maximum waveform as shown in Figure 2. Then, adjust L103 and L104 for symmetrical waveform as shown in Figure 2.

NOTE: The following circuit is required in the input line of Sweep Oscilloscope. 0.1 uf (Ceramic)

To Sweep Oscilloscope

To Test Set

(c) Squelch Alignment

1. Set Program Switches to all "HI" positions.
2. Plug the test crystal (158 MHz) into the Ch. 1 crystal socket.
3. Set Signal Generator to 158 MHz. Connect the output of Signal Generator to VHF Antenna Jack.
4. Set the attenuator of Signal Generator to 1.5 uV.
5. Preset the top surface of L114 core to the top of its bobbin.
6. Turn Squelch Control fully clockwise. Adjust VR502 for squelch open.

2. UHF/UHF-T ALIGNMENTS

1) TEST EQUIPMENT REQUIRED

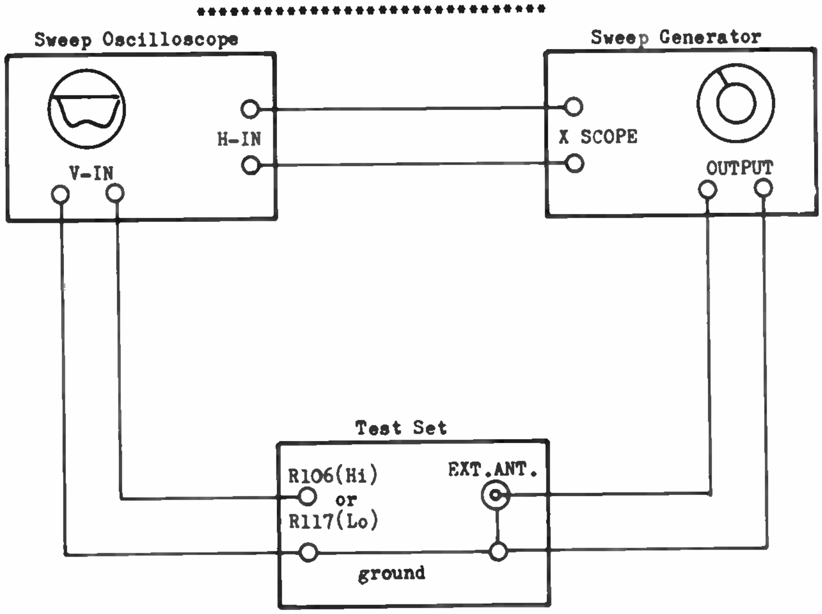
FOR VVC VOLTAGE ALIGNMENT
* DC Voltmeter (0-10 V, High impedance : more than 10 Mohms)
* DC Power Supply (13.8 V, 500 mA)
* Test Crystal (450 MHz, 490 MHz, 508 MHz)
* Screw Driver for adjustment (regular and hexagonal)

FOR UHF/UHF-T SENSITIVITY AND SPURIOUS ALIGNMENTS
* FM Signal Generator (450-508 MHz)
* DC Power Supply (13.8 V, 500 mA)
* V.T.V.M. or Oscilloscope
* Test Crystal (480 MHz)
* Non-metallic Screw Driver for trimmer adjustment

2) TEST EQUIPMENT SET-UP DIAGRAM

TEST EQUIPMENT SET-UP DIAGRAM

FOR VHF RF ALIGNMENT



3) ALIGNMENT PROCEDURE

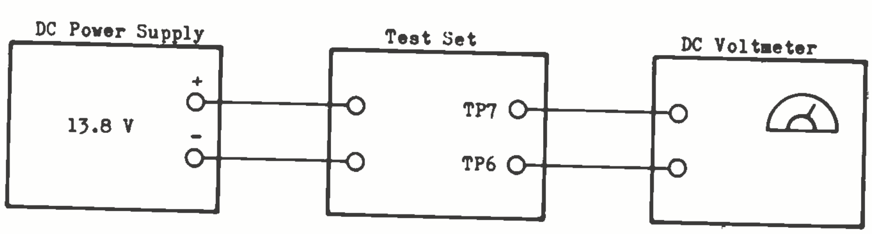
(a) VVC Voltage Alignment

1. Connect DC Power Supply to the test set.
2. Preset the receiver as follows.
   Program Switches: All "U" positions
   Channel Lock-out Push-buttons: Button out
   Volume; fully counterclockwise
   Squelch Control: fully counterclockwise
   Auto Scan Push-button: Button out (Manual)
   Channel: Ch. 1
3. Preset the top surface of L115 core to the top of its bobbin.
4. Plug the test crystal (490 MHz) into the Ch. 1 crystal socket.
5. Adjust L119 for 4.0$\pm$0.1 V DC Voltmeter indication.
6. Remove the test crystal (490 MHz) from the Ch. 1 crystal socket.
7. Plug the test crystal 9450 MHz) into the Ch. 1 crystal socket.
8. Adjust VR101 for 0.8$\pm$0.1 V DC Voltmeter indication.
9. Remove the test crystal (450 MHz) from the Ch. 1 crystal socket.
10. Plug the test crystal (508 MHz) into the Ch. 1 crystal socket.
11. Check if the Dc Voltmeter indication is within 5.8 V - 7.4 V.
12. Repeat steps 4 thru 11 as necessary to obtain proper values.

(b) UHF/UHF-TEST Sensitivity and Spurious Alignment

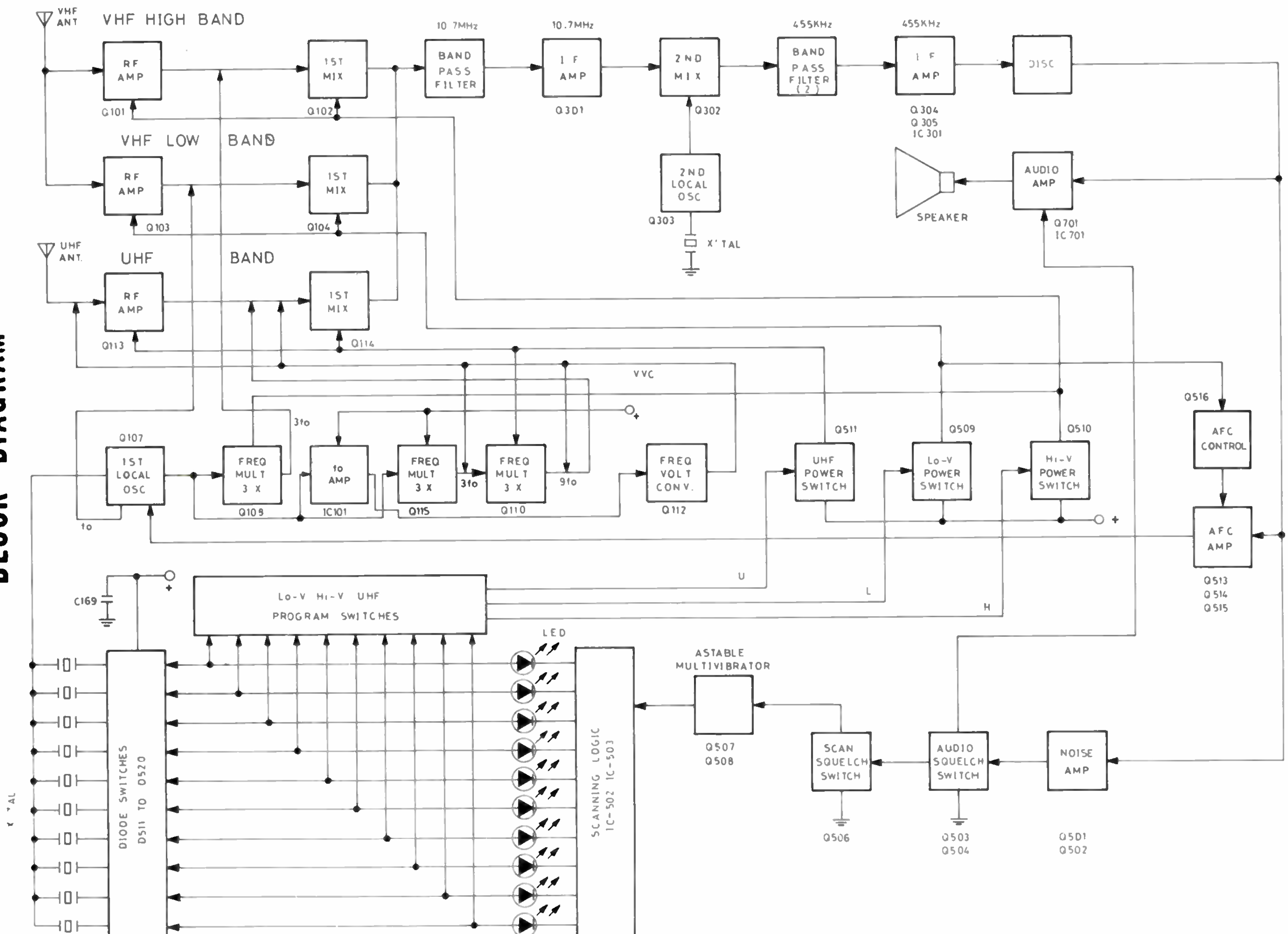
1. Connect DC Power Supply to the test set.
2. Preset the receiver as follows.
   Program Switches: All "U" positions
   Channel Lock-out Push-buttons: Button out
   Volume: Standard audio output (50 mW)
   Squelch Control: fully clockwise
   Auto Scan Push-button: Button out (Manual)
   Channel: Ch. 1
3. Set Signal Generator to 480 MHz.
4. Plug the test cyrstal (480 MHz) into the Ch. 1 crystal socket.
5. Adjust CT101, CT102 and CT103 for maximum sensitivity and best signal to noise ratio. Repeat this step as necessary.
6. Plug the test crystal (480 MHz) into the Ch. 1 crystal socket.
7. Set Signal Generator to 436.744 MHz (8f +10.7).
8. Adjust L115 for minimum audio output.

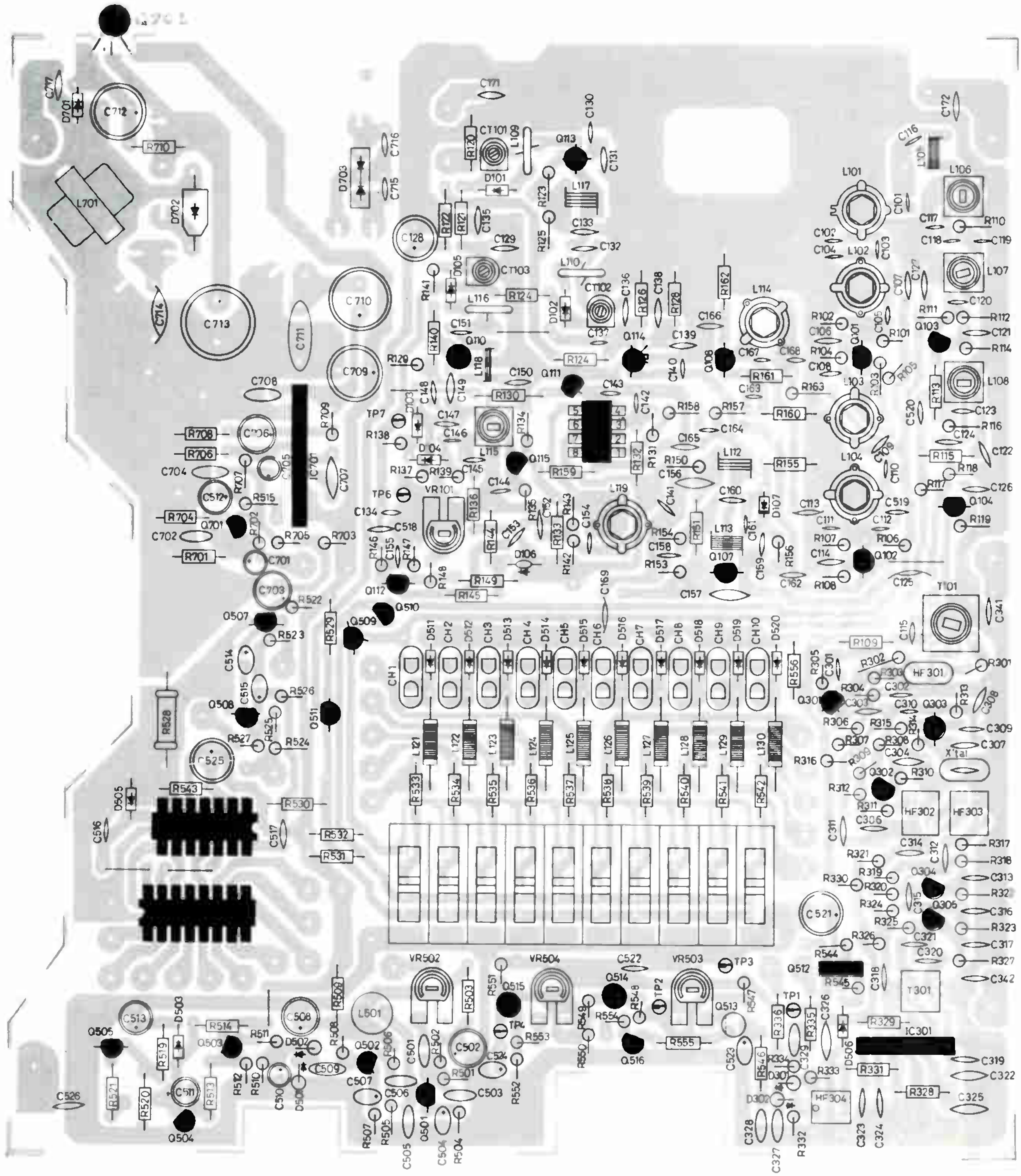
TEST EQUIPMENT SET-UP DIAGRAM
FOR VVC VOLTAGE ALIGNMENT
****



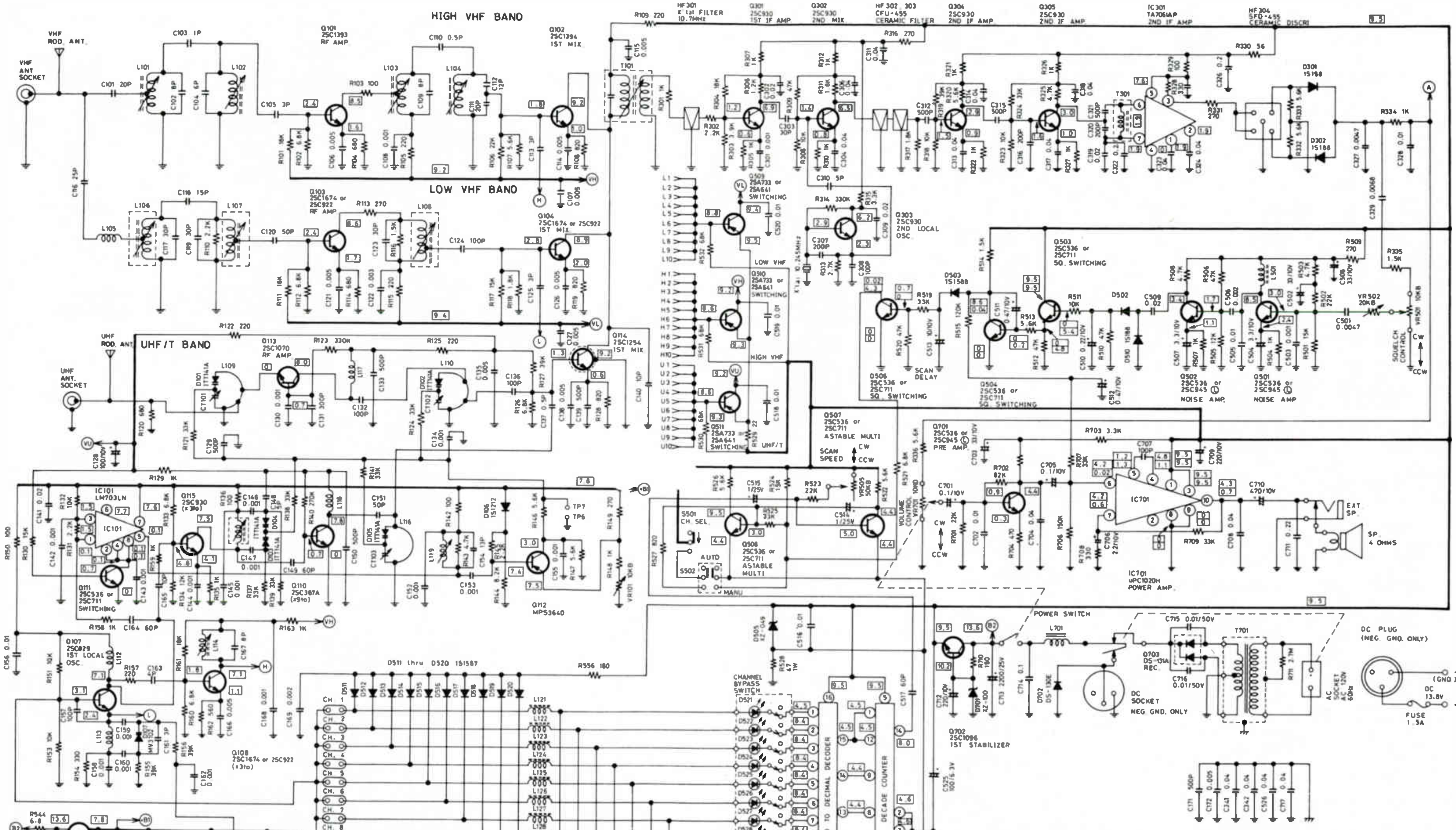
Midland 13-937

BLOCK DIAGRAM





COMPONENT LAYOUT



NOTES:

1. ALL RESISTOR VALUES IN "OHMS" UNLESS OTHERWISE NOTED. (K=1000, M=1000000)
2. ALL CAPACITOR VALUES IN "MFD" UNLESS OTHERWISE NOTED. (P=MICRO-MICROFARAD)
3. ALL VOLTAGES IN " VOLTS".
4. INDICATED VOLTAGES ARE MEASURED UNDER FOLLOWING CIRCUIT CONDITIONS.

TRANSISTORS AND ICS	CIRCUIT CONDITIONS
1) ALL	MANUAL SCAN-VOLUME CCW-SQUELCH CW*
	SET TO CHANNEL 1 HAVING NO CRYSTAL**
2) Q101 Q102 Q108 Q510	PROGRAM SWITCH SET TO "H" POSITION
3) Q103 Q104 Q509 Q516	PROGRAM SWITCH SET TO "L" POSITION
4) Q110 Q111 Q113 Q114 Q511 IC101	PROGRAM SWITCH SET TO "U" POSITION
**5) Q112	PROGRAM SWITCH SET TO "U" POSITION
	SET TO CHANNEL 1 HAVING A 480 MHz CRYSTAL
6) Q507 Q508	AUTOMATIC/MANUAL SWITCH SET TO "AUTO" POSITION
*7) Q503 Q504 Q505 Q506 IC701	SQUELCH: UPPER BLOCK=CW/LOWER BLOCK=CCW
8) Q513 Q514 Q515	PROGRAM SWITCH SET TO "U" POSITION
	I. F.=10.7000 MHz

ALL VOLTAGES REFERENCED TO COMMON NEGATIVE GROUND USING A VTVM OR HIGH IMPEDANCE EQUIVALENT.

PARTS LIST

MODEL NO. 13-937 PAGE 1

REF. NO.	DESCRIPTION	PART NO.
	CASE PARTS	
	SEE EXPLODED VIEW	
1	Case, Top Ass'y	13-010351
2	Case, Bottom Ass'y	13-010352
3	Door, Crystal Access Ass'y	13-018031
4	Label, Crystal Socket	13-020766
5	Feet, Rubber	13-026009
6	Knob, Vol/Sq/Scanrate	13-110155
7	Screw, Mtg. Bracket	13-151469
8	Bracket, Mounting	13-158584
9	Panel, Front Ass'y	13-020767
10	Button, Push Auto Scan/Manu Scan	13-118101
11	Button, Push Channel Lock-out	13-118102
12	Spacer, P/B Mounting	13-157262
14	Plate, Shield Ass'y	13-155064
15	Bracket, AC Power Socket	13-158585
16	Holder, VHF Antenna	13-158586
17	Holder, UHF Antenna	13-158587
19	Board, PC LED	13-070118
	MISCELLANEOUS	
41 D521-530	LED SLP 123	
42 VR701	Control, Volume W/Switch	13-160151
43 VR501	Control, Squelch 10K	13-166091
44 VR505	Control, Scanrate 50K	13-165046
45	Socket, Ext. Speaker	13-159289
46	Socket, DC Power	13-159118
47	Socket, AC Power	13-159290
48	Terminal, Wiring	13-151500
49	Switch, Auto/Manu Scan	13-183255
50	Switch, Channel Lock-out	13-188008
	Antenna, Telescopic VHF	13-040093
	Antenna, Telescopic UHF	13-040094
	Crystal 10.245 MHz	13-128364
	Socket, Crystal	13-159288
HF301	Filter, HF 10.7 MHz	13-179078
HF302, 303	Filter, HF 455 KHz	13-179041
HF304	Filter, HF Discriminator	13-179047
VR101	Control, Sensitivity 10K	13-164177
VR502, 504	Control, Sensitivity 20K	13-164178
VR503	Control, Sensitivity 300 ohm	13-164179
CT101-103	Capacitor, Trimmer 6PF	13-123086
	Cord, AC Power Ass'y	13-034115
	Cord, DC Power Ass'y	13-034072

REF. NO.	DESCRIPTION	PART NO.
	COILS & TRANSFORMERS	
L101	Coil, Antenna	13-176690
L102, 104,114	Coil, RF	13-176335
L103	Coil, RF	13-176691
L105	Coil, VHF	13-176333
L106-108	Coil, RF	13-176692
L109,110, 116	Coil, RF	13-176364
L112,117	Coil, VHF	13-176694
L113	Coil, VHF	13-176693
L115	Coil, RF	13-176428
L118	Coil, VHF	13-176695
L119	Coil, RF	13-176696
L121-130	Coil, RF Choke 25 mH	13-178127
L501	Coil, AF Choke 10 mH	13-178273
L701	Coil, Power Choke	13-178274
T101	IFT 10.7 MHz	13-090458
T301	IFT 455 KHz	13-090459
39 (T701)	Transformer, Power	13-098026
	TRANSISTORS	
Q101	2 SC 1393	
Q102	2 SC 1394	
Q103,104, 108	2 SC 922	
Sub	2 SC 1674	
Q107	2 SC 829	
Q110	2 SC 387	
Q111, 503-505, 507,508	2 SC 711	
Q112	MPS 3640	
Q113	2 SC 1070	
Q114	2 SC 1254	
Q115, 301-305	2 SC 930	
Q501,502, 516,701	2 SC 945	
Q509-511	2 SA 641	
Sub	2 SA 733	
Q512	2 SD 471	
Q513-515	2 SK 44	
Q702	2 SC 1096	
	DIODES	
D101-105	ITT 141	
Sub	BB 121	
D106	IS 1212	
D107	MV 3102	
D301,302, 501,502	IS 188 FM	
D503	IS 1588	
D505	XZ 049	
D506	XZ 084	
D511-520	IS 1587	
D701	XZ 100	
D702	DS 130	
D703	DS 131	

INTEGRATED CIRCUITS

IC101	LM 703 LN
IC301	TA-7061 AP
IC501	TD 3490 BP
Sub	SN 7490
IC502	TD 3442 AP
Sub	SN 7442
IC701	MPC 1020 H

RESISTORS

ALL RESISTORS NOT SHOWN ON THIS PARTS LIST ARE CARBON, OR SOLID, 1/4 W. SEE SCHEMATIC FOR SPECIFIC VALUES.

SOLID

R711	2.7 M 1/2 W

METAL OXIDE FILM

R528	47 ohm 1 W

CAPACITORS

ALL CAPACITORS NOT SHOWN ON THIS PARTS LIST ARE CERAMIC, 50V. SEE SCHEMATIC FOR SPECIFIC VALUES.

CERAMIC, 25V

C516, 518-520	0.01 MF
C141,302, 309,319	0.02 MF
C304,306, 311,313, 314,317, 318,323, 324,341, 342,522, 526,717	0.04 MF

CERAMIC BARRIER

C322,325, 326	0.2 MF 12V

MYLAR, 50V

C503	0.001 MF
C506	0.0022 MF
C327,501	0.0047 MF
C329	0.0068 MF
C328,505, 702	0.01 MF
C509	0.02 MF
C704,708	0.04 MF
C711	0.22 MF

TANTALUM

C514,515, 523,524	1 MF 25V
C504,507	3.3 MF 10V

ALUMINUM, 10V

C701,705	0.1 MF
C510	0.22 MF
C511,512	0.47 MF
C706	2.2 MF

ELECTROLYTIC

C513	10 MF 10 V
C502,508, 703	33 MF 10 V
C525	100 MF 6.3 V
C128,521	100 MF 10 V
C709,712	220 MF 10 V
C710	470 MF 10 V
C713	2200 MF 25 V

Troubleshooting

General

If any of the operational checks indicate that the receiver is not performing normally, standard troubleshooting techniques should be used to locate the defective part of the receiver.

The RF and audio circuits are straight forward designs and should not present any servicing difficulty. Before attempting to troubleshoot the squelch, scanning or switching circuits, study the circuit description, the schematic, and the block diagram to obtain a thorough understanding of these circuits.

Service Hints

1. The dc voltages shown on the schematic are approximate and will vary slightly from unit to unit. Refer to the circuit condition notes on the schematic.
2. All first local oscillator crystals should be removed from the crystal sockets before making dc voltage measurements.
3. Oscillator Q103 may oscillate at some parasitic frequency when all crystals are removed. To measure the dc voltages on Q103, a small capacitor (approximately 0.047 μF) should be temporarily connected from the base of Q103 to ground to "kill" these oscillations.

NOTE:
The dc voltages for 2nd local oscillator Q308 are shown with Q308 in its oscillating mode. These voltages change only slightly when the crystal is shorted out with a 0.047 μF capacitor.

4. RF alignment should be made using a signal level just high enough to give a useful output. Excessive signal input can result in front-end overload and distortion which may appear to be a receiver problem.
5. The front and back covers of the scanner cabinet are held together by six "snap-in" tabs—three on each side of the case. One pair of tabs is located in the center; the other two pairs are located respectively about one inch from the top and one inch from the bottom ends of the case.

   To remove the back cover, first remove the battery and crystal compartment lids. Tightly squeeze the sides of the back cover about one inch below the top of the unit. While holding the front cover firmly, pull back hard on the back cover. To obtain a better grip on the back cover while pulling, insert your index finger into the crystal compartment opening.

Adjustment Procedure

This section contains information on adjusting the AFC, Frequency/Voltage Converter, RF, and Squelch circuits. These adjustments must be made in the order given to assure proper scanner performance.

AFC Adjustment

Test Equipment Required
- RF Signal Generator (Wavetek Model 3000 or equivalent)
- High Impedance DC Voltmeter.

Procedure:
1. Remove the crystals from the crystal sockets.
2. Connect the voltmeter across the drain terminal of AFC amplifier Q501 and ground.
3. Turn the scanner on and inject a 100mV, 10.7 MHz ± 1.0 kHz signal into the antenna jack.
4. Adjust VR2 for a reading of 4.7 volts.
5. Remove the test lead from the drain terminal of Q501 and connect it to TP1.
6. Adjust VR3 for a reading of 3.0 volts.

Frequency/Voltage Converter Adjustment

Test Equipment Required
- High Impedance DC Voltmeter.
- 450 MHz Test Crystal.

Procedure:
1. Connect the DC Voltmeter between R101 (C124 side) and ground.
2. Insert a 450 MHz crystal into the channel one socket.
3. Turn the scanner on and manually set the scanner to channel one.
4. Set the Squelch control fully CCW.
5. Adjust L106 for a reading of 0.4 volts.

RF Alignment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8 Ohms—½ Watt)
- 470 MHz Test Crystal

Procedure:

1. Connect the test equipment as shown in Figure 3.
2. Insert a 470 MHz crystal into the channel one socket.
3. Turn the scanner on and manually set the scanner to channel one.
4. Set the generator to 470 MHz, (unmodulated).
5. Adjust the generator output voltage to the 20 dB quieting level. (See Sensitivity Measurement Procedure).
6. Adjust L104, CT103, CT102 and CT101 for maximum noise quieting (minimum output).

Squelch Adjustment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- 470 MHz Test Crystal

Procedure:

1. Connect the output of the signal generator to the antenna input jack.
2. Insert a 470 MHz crystal into the channel one socket.
3. Set the generator to 470 MHz (unmodulated). Set the output level to 8 μV.
4. Turn the scanner on and manually set the scanner to channel one. Set the Squelch Control fully CCW and the Volume Control to mid-range.
5. Adjust VR1 to the point at which squelch just opens ("rushing" sound is heard).

Measurement Procedures

Crystal Frequency Measurement

Test Equipment Required

- Frequency Counter (Hewlett Packard Model 5381A or equivalent)
- Counter Preamplifier (If required)

Procedure:

Before measuring crystal frequencies, make certain that the AFC is properly adjusted. (See the Adjustment Procedure section).

1. Connect the test equipment as shown in Figure 4.
2. Insert the crystals to be measured into the crystal sockets.
3. Turn the scanner on and adjust the squelch and volume controls fully counterclockwise.
4. Manually set the scanner to the channel position of the crystal to be tested.

NOTE:

Signal pick-up from the crystal's metal case is recommended because it has negligible loading effect on the oscillator circuit. In most cases, the signal pick-up from the crystal case will be sufficient to provide an accurate and steady count. If no count is displayed, or if the count is erratic, a counter preamplifier having a minimum gain of 15 dB between 40 MHz and 60 MHz should be used.

5. Record the frequency displayed on the counter.

NOTE:

The measured crystal frequency is determined by the accuracy of the crystal and the AFC correction voltage. This frequency should remain within 225 Hz of the crystal frequency calculated from the formula:

$$\text{Crystal Frequency} = \frac{\text{Channel Freq.} - 10.7\text{ MHz}}{9}$$

The following example will illustrate how to calculate the frequency range that is acceptable if the crystal is oscillating within the specified tolerance.

Example: Middle of UHF Band.

$$\begin{aligned}
\text{Channel Frequency} &= 465.400 \\
\text{Crystal Frequency} &= \frac{\text{Ch. Freq.} - 10.7}{9}\text{ MHz} \\
&= \frac{465.400 - 10.7}{9}\text{ MHz} \\
&= 50.522222\text{ MHz} \\
\text{Upper Frequency Limit} &= 50.522222\text{ MHz} + 225\text{ Hz} \\
&= 50.522447\text{ MHz} \\
\text{Lower Frequency Limit} &= 50.522222\text{ MHz} - 225\text{ Hz} \\
&= 50.521997\text{ MHz}
\end{aligned}$$

Sensitivity Measurement (20 dB Noise Quieting)

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8 Ohms—½ Watt)

Procedure:

1. Connect the test equipment as shown in Fig. 3.
2. Insert the crystal for the channel frequency to be measured into the appropriate socket.

NOTE:

If a general overall sensitivity performance check is being made, the test crystals recommended on page 8 should be used. Additional crystals having frequencies of particular interest may also be included.

3. Turn the scanner on and manually set it to the channel position corresponding to the frequency to be measured.
4. Set the generator for CW opertion. Adjust the RF output level to zero.
5. Turn the scanner's squelch control fully clockwise.
6. Adjust the scanner's volume control until the audio output noise indicated on the ac voltmeter is 0.5 volt.
7. Increase the generator's RF output to approximately 10 microvolts.
8. Adjust the generator's output frequency to the exact center of the channel being measured. This frequency must remain stable within ± 500 Hz during Step 9.

NOTE:

At this point, the noise level indicated on the AC voltmeter should drop to a low level (less than 0.05 volt).

9. Decrease the generator's RF output level until the audio noise level indicated on the ac voltmeter increases to 0.05 volt. This RF output level is the 20 dB noise quieting sensitivity for the channel frequency being measured.
10. Repeat steps 1 through 9 for each channel frequency to be measured.

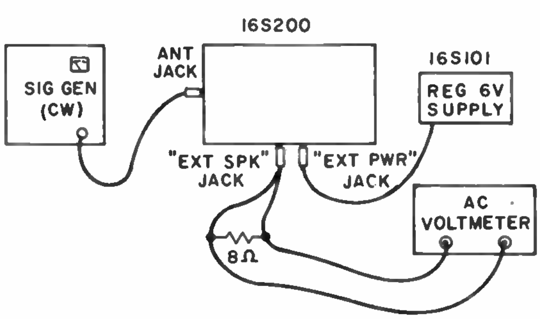


Figure 3—Test setup for RF Alignment and Sensitivity Measurement

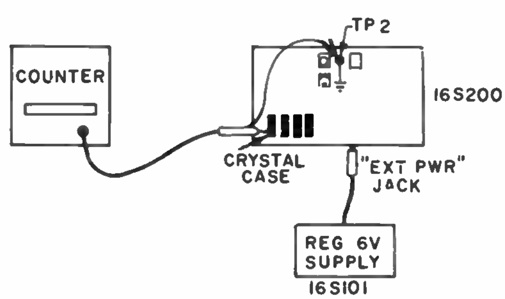


Figure 4—Test setup for Crystal Frequency Measurement

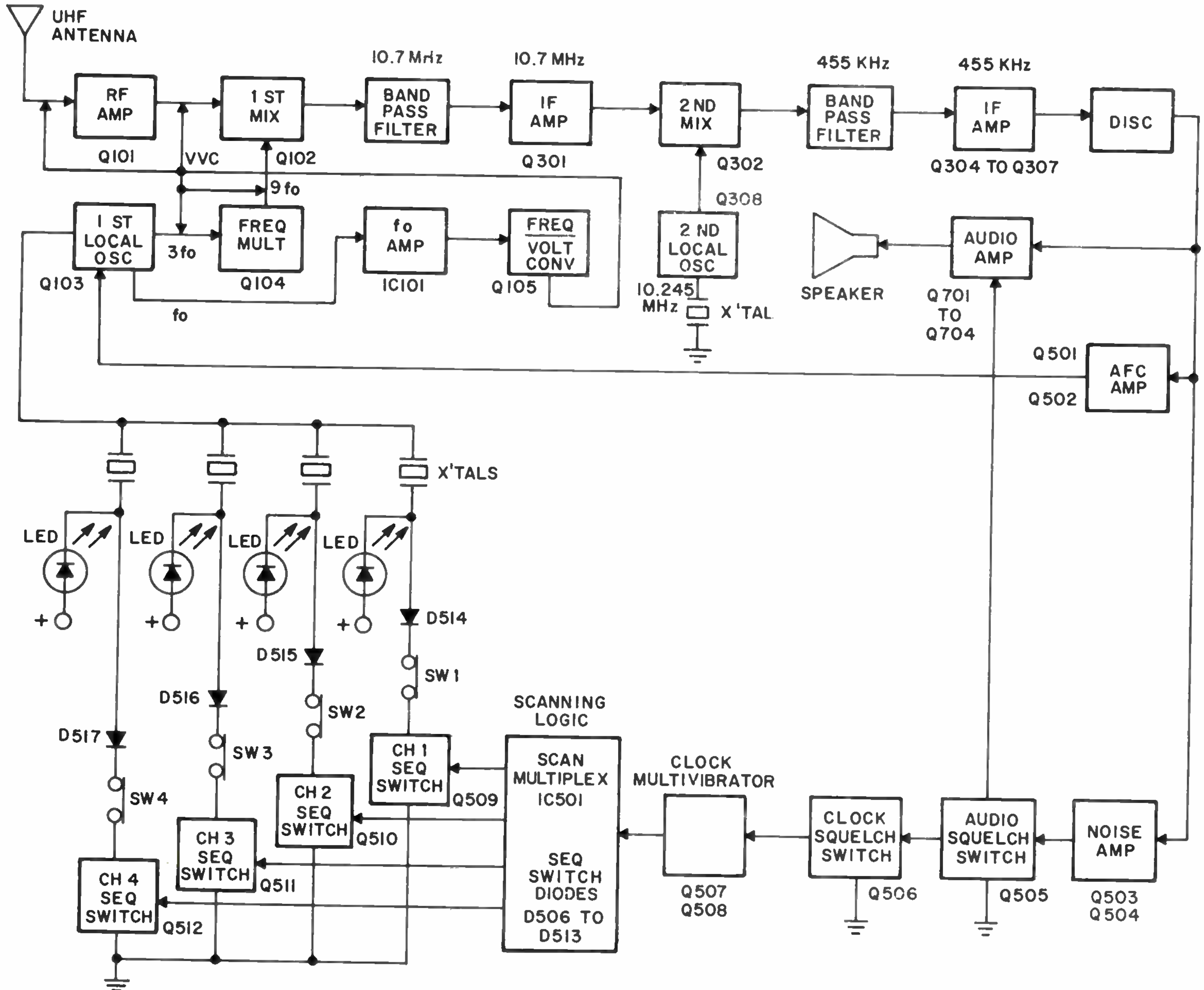


Figure 7—Block Diagram—16S200

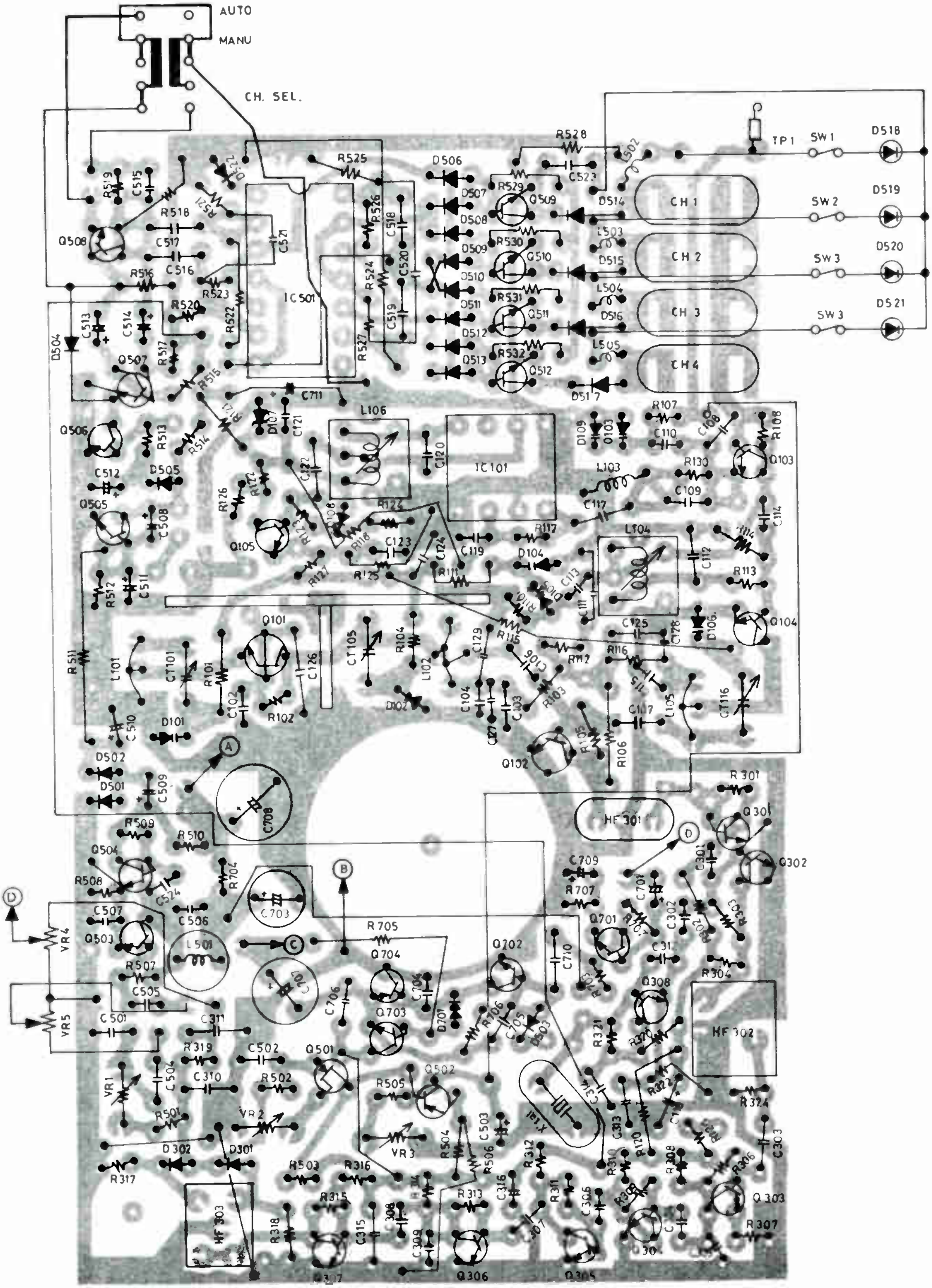


Figure 5—Bottom View: Location of components

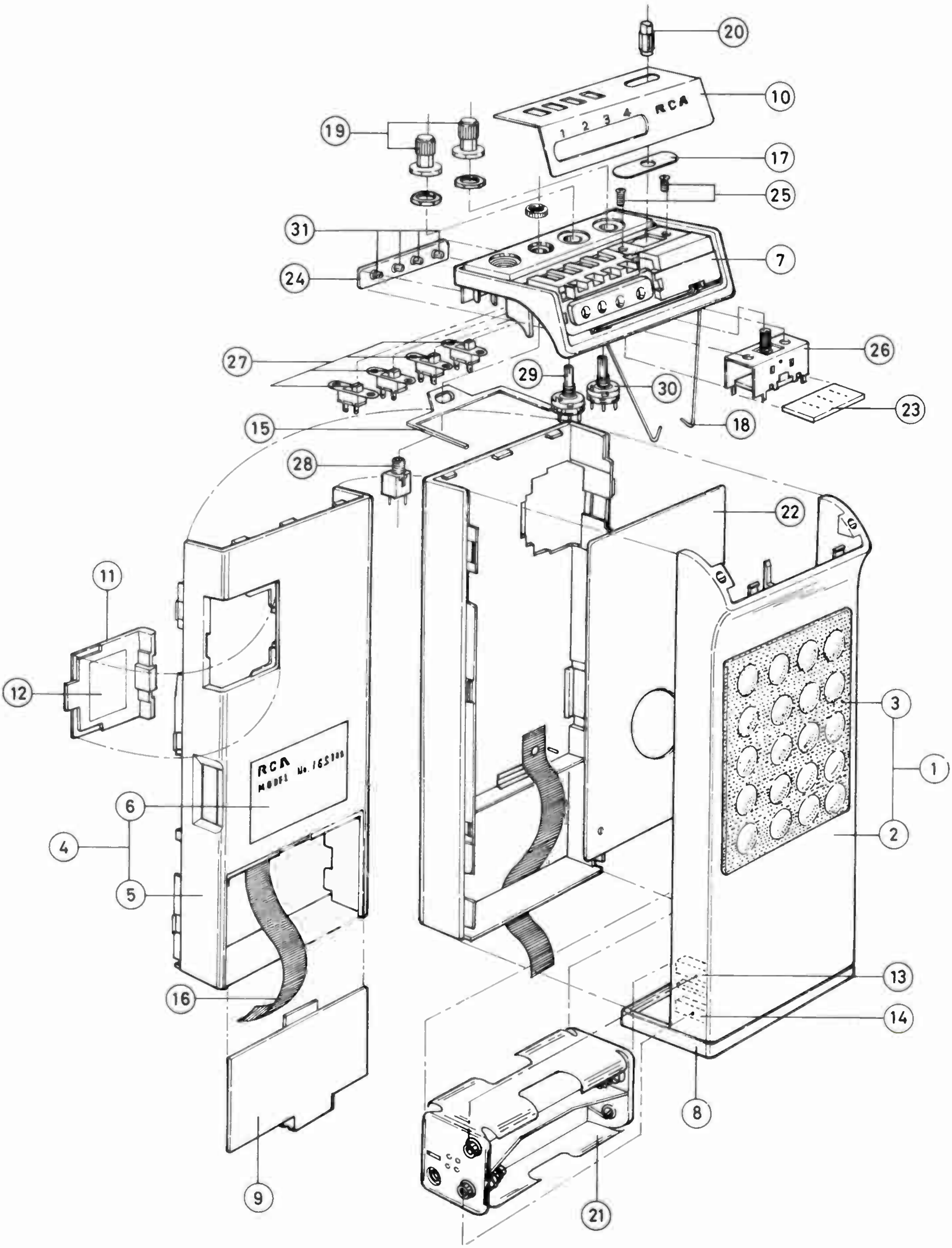
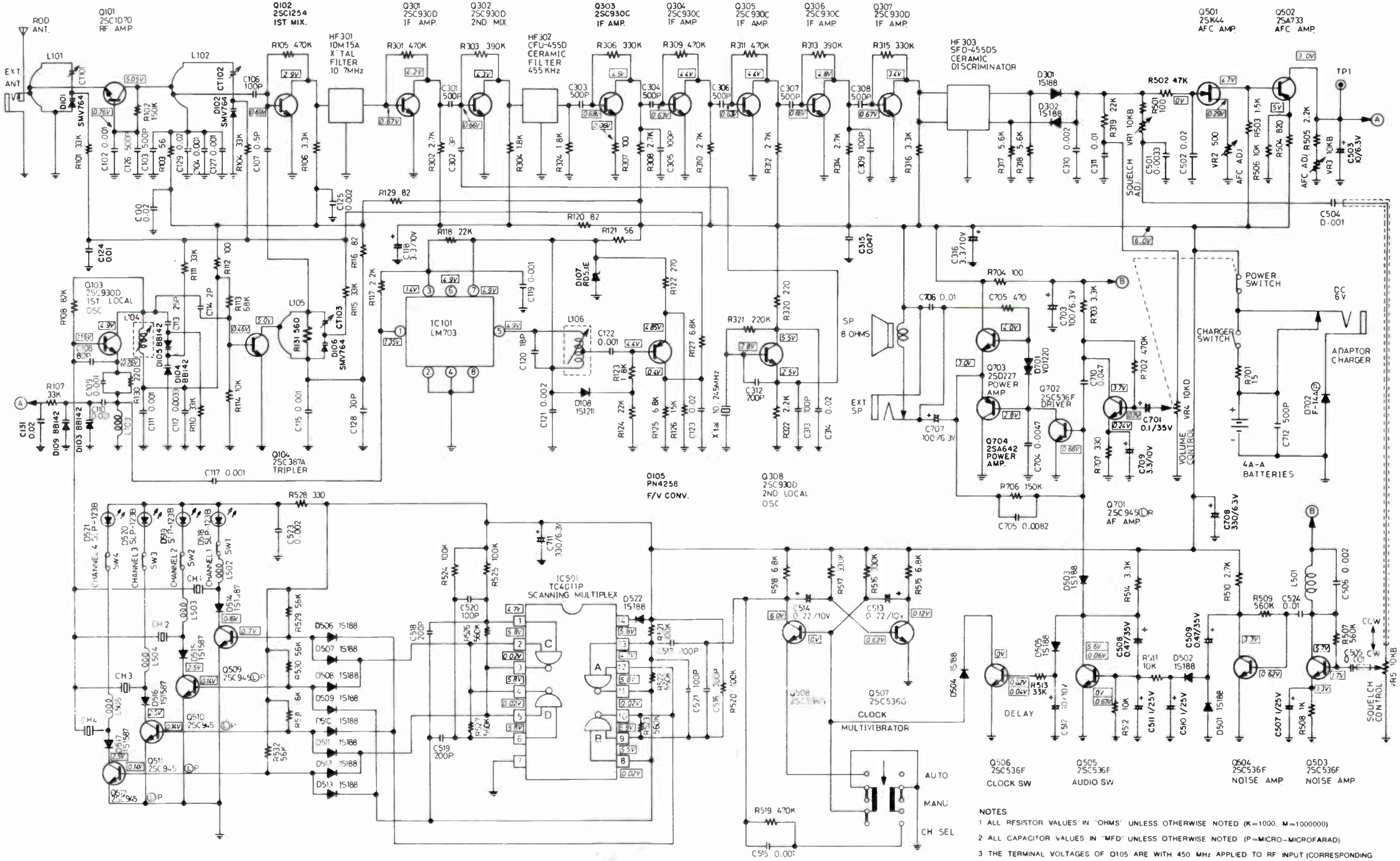


Figure 8—Exploded View—16S200



NOTES

1. ALL RESISTOR VALUES IN "OHMS" UNLESS OTHERWISE NOTED (K=1000, M=1000000)
2. ALL CAPACITOR VALUES IN "MFD" UNLESS OTHERWISE NOTED (P=MICRO-MICROFARAD)
3. THE TERMINAL VOLTAGES OF Q105 ARE WITH 450 MHz APPLIED TO RF INPUT (CORRESPONDING X'TAL INSTALLED)
4. VOLTAGES SHOWN IN ▭ ARE WITH SQUELCH FULLY CW (UPPER BLOCK) AND FULLY CCW (LOWER BLOCK)
5. ALL VOLTAGES REFERENCED TO COMMON NEGATIVE GROUND USING A VTVM OR HIGH IMPEDANCE EQUIVALENT

Figure 2—Schematic Diagram—16S200

Replacement Parts

Electrical Parts

Symbol	Stock No.	Description
C102	426408	0.001 uF, 20%, 50V, ceramic
C103	741231	500 pF, 10%, 50V, ceramic
C104	426408	0.001 uF, 20%, 50V, ceramic
C106	741081	100 pF, 10%, 50V, ceramic
C107	741236	0.5 pF, ±0.25 pF, 50V, ceramic
C108	741228	80 pF, 10%, 50V, ceramic
C109, 110 111	426408	0.001 uF, 20%, 50V, ceramic
C112	741238	0.0033 uF, 20%, 50V, ceramic
C113	741235	25 pF, 10%, 50V, ceramic
C114	741070	2 pF, ±.25 pF, 50V, ceramic
C115	741232	50 pF, 10%, 50V, ceramic
C117	426408	0.001 uF, 20%, 50V, ceramic
C118	741227	3.3 uF, 10V, electrolytic
C119	426408	0.001 uF, 20%, 50V, ceramic
C120	741234	18 pF, 10%, 50V, ceramic
C121	741230	0.002 uF, 20%, 50V, ceramic
C122	426408	0.001 uF, 20%, 50V, ceramic
C123	741233	0.02 uF, +80 −20%, 25V, ceramic
C124	227756	0.01 uF, +80 −20%, 25V, ceramic
C125	741230	0.002 uF, 20%, 50V, ceramic
C126	741231	500 pF, 10%, 50V, ceramic
C127	426408	0.001 uF, 20%, 50V, ceramic
C128	426404	30 pF, 10%, 50V, ceramic
C129, 130 131	741233	0.02 uF, +80 −20%, 25V, ceramic
C301	741231	500 pF, 10%, 50V, ceramic
C302	741075	3 pF, ±.25 pF, 50V, ceramic
C303, 304	741231	500 pF, 10%, 50V, ceramic
C305	741081	100 pF, 10%, 50V, ceramic
C306, 307 308	741231	500 pF, 10%, 50V, ceramic
C309	741081	100 pF, 10%, 50V, ceramic
C310	741230	0.002 uF, 20%, 50V, ceramic
C311	429696	0.01 uF, 20%, 50V, Mylar
C312	741237	200 pF, 10%, 50V, ceramic
C313	741081	100 pF, 10%, 50V, ceramic
C314	741233	0.02 uF, +80 −20%, 25V, ceramic
C315	418198	0.047 uF, 20%, 50V, Mylar
C316	741227	3.3 uF, 10V, electrolytic
C501	741238	0.0033 uF, +80 −20%, 50V, ceramic
C502	741233	0.02 uF, +80 −20%, 25V, ceramic
C503	423359	10 uF, 6.3V, electrolytic
C504, 505	426408	0.001 uF, 20%, 50V, ceramic
C506	419849	0.0022 uF, ±20%, 50V, Mylar
C507	741226	1.0 uF, 25V, electrolytic
C509	141654	0.47 uF, 10V, electrolytic
C510, 511	741226	1.0 uF, 25V, electrolytic
C512	741225	10 uF, 10V, electrolytic
C513, 514	741239	0.22 uF, 10V, electrolytic
C515	426408	0.001 uF, 20%, 50V, ceramic
C516, 517 518, 519	741237	200 pF, 10%, 50V, ceramic
C520	741081	100 pF, 10%, 50V, ceramic
C521	741081	100 pF, 10%, 50V, ceramic
C523	741230	0.002 uF, 20%, 50V, ceramic
C524	429696	0.01 uF, 20%, 50V, Mylar
C702	741223	0.1 uF, 35V, electrolytic
C703	431269	100 uF, 6.3V, electrolytic
C704	241793	0.0047 uF, ±20%, 50V, Mylar
C705	741229	0.0082 uF, ±20%, 50V, Mylar
C706	429696	0.01 uF, 20%, 50V, Mylar
C707	431269	100 uF, 6.3V, electrolytic
C708	741224	330 uF, 6.3V, electrolytic
C709	741227	3.3 uF, 10V, electrolytic
C710	418198	0.047 uF, 20%, 50V, Mylar
C711	741224	330 uF, 6.3V, electrolytic
C712	741231	500 pF, 10%, 50V, ceramic
CT101, 102 103	741213	Capacitor, trimmer
D101, 102	741206	Diode-SMV764 (varicap)
D103, 104 105	741207	Diode-BB142 (varicap)

In some early units, MV201 was used instead of Varactor BB142. Use replacement part No. 741207.

Symbol	Stock No.	Description
D106	741206	Diode-SMV764 (varicap)
D107	741429	Diode-RD5-1EB
D108	741208	Diode-1S1211
D109	741207	Diode-BB142 (varicap)
D301, 302	119919	Diode-1S1587
D501, 502, 503, 504 505, 506 507, 508 509, 510 511, 512 513	119919	Diode-1S188
D514, 515 516, 517	741171	Diode-1S1587
D518, 519 520, 521	741167	Diode-SLP-123B (LED)
D522	119919	Diode-1S1587
D701	741170	Diode-VD1220
D702	741169	Diode-F-14A
HF301	741191	Filter, crystal, 10M15A or 10F15AH
HF302	741192	Filter, ceramic, CFU-455D
HF303	741198	Discriminator, ceramic
IC101	741342	I.C.-Type LM703
IC501	741168	I.C.-Type TC4011P
L101, 102	741201	Coil, RF
L103	741202	Coil, VHF
L104	741193	Coil, RF
L105	741201	Coil, RF
L106	741190	Coil, RF
L502	434772	Choke, RF, 25 uH
L501	741196	Choke, RF, 8.2 mH
L503, 504 505	434772	Choke, RF, 25 uH
Q101	741220	Transistor-2SC1070
Q102	741205	Transistor-2SC1254
Q103	170794	Transistor-2SC930
Q104	741209	Transistor-2SC387
Q105	741211	Transistor-2N4258 or PN4258
Q301, 302 303, 304 305, 306 307, 308	170794	Transistor-2SC930
Q501	741210	Transistor-2SK44D
Q502	741175	Transistor-2SA733
Q503, 504 505, 506	741172	Transistor-2SC945
Q507, 508	169792	Transistor-2SC536
Q509, 510 511, 512	741172	Transistor-2SC945
Q701, 702	741172	Transistor-2SC945
Q703*	741427	Transistor—2SD227-R
Q703*	741426	Transistor—2SD227-W
Q704*	741425	Transistor—2SA642-R
Q704*	741174	Transistor—2SA642-W
R101	426219	33,000 ohm, 10%, ¼W, film
R102	223770	150,000 ohm, 10%, ¼W, film
R103	228878	56 ohm, 10%, ¼W, film
R104	426219	33,000 ohm, 10%, ¼W, film
R105	232389	470,000 ohm, 10%, ¼W, film
R106	107972	3300 ohm, 10%, ¼W, film
R107	426219	33,000 ohm, 10%, ¼W, film
R108	430297	82,000 ohm, 10%, ¼W, film
R110, 111	426219	33,000 ohm, 10%, ¼W, film
R112	239450	100 ohm, 10%, ¼W, film
R114	218499	10,000 ohm, 5%, ¼W, film
R115	426219	33,000 ohm, 10%, ¼W, film
R116	227959	82 ohm, 10%, ¼W, film
R117	108866	2200 ohm, 10%, ¼W, film

*Both Audio Output Transistors must have the same suffix letter. Order the stock number corresponding to the R or W suffix on the transistor.

Symbol	Stock No.	Description
R118	426112	22,000 ohm, 10%, ¼W, comp.
R120	227959	82 ohm, 10%, ¼W, film
R121	228878	56 ohm, 10%, ¼W, film
R122	108863	270 ohm, 10%, ¼W, film
R123	219460	1800 ohm, 10%, ¼W, film
R124	426112	22,00 ohm, 10%, ¼W, comp.
R125	108867	6800 ohm, 10%, ¼W, film
R126	243304	15,000 ohm, 10%, ¼W, film
R127	108867	6800 ohm, 10%, ¼W, film
R129	227959	82 ohm, 10%, ¼W, film
R130	245925	220 ohm, 10%, ¼W, film
R131	420316	560 ohm, 10%, ¼W, film
R301	232389	470,000 ohm, 10%, ¼W, film
R302	113524	2700 ohm, 10%, ¼W, film
R303	232388	390,000 ohm, 10%, ¼W, film
R304	219460	1800 ohm, 10%, ¼W, film
R306	426249	330,000 ohm, 10%, ¼W, film
R307	239450	100 ohm, 10%, ¼W, film
R308	113524	2700 ohm, 10%, ¼W, film
R309	232389	470,000 ohm, 10%, ¼W, film
R310	113524	2700 ohm, 10%, ¼W, film
R311	232389	470,000 ohm, 10%, ¼W, film
R312	113524	2700 ohm, 10%, ¼W, film
R313	232388	390,000 ohm, 10%, ¼W, film
R314	113524	2700 ohm, 10%, ¼W, film
R315	426249	330,000 ohm, 10%, ¼W, film
R316	107972	3300 ohm, 10%, ¼W, film
R317, 318	219464	5600 ohm, 10%, ¼W, film
R319	426112	22,000 ohm, 10%, ¼W, film
R320	245925	220 ohm, 10%, ¼W, film
R321	227755	220,000 ohm, 10%, ¼W, film
R322	108866	2200 ohm, 10%, ¼W, film
R324	219460	1800 ohm, 10%, ¼W, film
R501	239450	100 ohm, 10%, ¼W, film
R502	108871	47,000 ohm, 10%, ¼W, film
R503	219459	1500 ohm, 10%, ¼W, film
R504	426234	820 ohm, 10%, ¼W, film
R505	108866	2200 ohm, 10%, ¼W, film
R506	218499	10,000 ohm, 5%, ¼W, film
R507	241991	560,000 ohm, 10%, ¼W, film
R508	239454	1000 ohm, 10%, ¼W, film
R509	241991	560,000 ohm, 10%, ¼W, film
R510	113524	2700 ohm, 10%, ¼W, film
R511, 512	218499	10,000 ohm, 5%, ¼W, film
R513	426219	33,000 ohm, 10%, ¼W, film
R514	107972	3300 ohm, 10%, ¼W, film
R515	108867	6800 ohm, 10%, ¼w, film
R516	426249	330,000 ohm, 10%, ¼W, film
R517	426249	330,000 ohm, 10%, ¼W, film
R518	108867	6800 ohm, 10%, ¼W, film
R519	232389	470,000 ohm, 10%, ¼W, film
R520	223769	100,000 ohm, 10%, ¼W, film
R521	223769	100,000 ohm, 10%, ¼W, film
R522	241991	560,000 ohm, 10%, ¼W, film
R523	241991	560,000 ohm, 10%, ¼W, film
R524	223769	100,000 ohm, 10%, ¼W, film
R525	223769	100,000 ohm, 10%, ¼W, film
R526	241991	560,000 ohm, 10%, ¼W, film
R527	241991	560,000 ohm, 10%, ¼W, film
R528	245958	330 ohm, 10%, ¼W, film
R532	426199	56,000 ohm, 10%, ¼W, film

Symbol	Stock No.	Description
R701	424970	15 ohm, 10%, ¼W, film
R702	232389	470,000 ohm, 10%, ¼W, film
R703	107972	3300 ohm, 10%, ¼W, film
R704	239450	100 ohm, 10%, ¼W, film
R705	240580	470 ohm, 10%, ¼W, film
R706	223770	150,000 ohm, 10%, ¼W, film
R707	245958	330 ohm, 10%, ¼W, film
VR1	741215	10,000 ohm, variable
VR2	741214	500,000 ohm, variable
VR3	741215	10,000 ohm, variable
VR4	741200	10,000 ohm, variable-with switch
VR5	741199	10,000 ohm, variable

Mechanical Parts

See Figure 8

Symbol	Stock No.	Description
1	741177	Case, front with grill
2		Case, front
3		Grill
4	741203	Case, back with rating plate
5		Back
6		Rating Plate
7	741178	Case, top
8	741194	Case, bottom
9	741179	Cover, battery
10	741161	Escutcheon
11	741195	Door, crystal compartment
12		Label, crystal layout
13	741180	Terminal, battery
14	741181	Terminal, battery
15		Bracket, channel lock-out sw. antenna jack
16		Ribbon, battery compartment
17	741182	Cover, mode switch
18		Spring, case assembly
19	741183	Knob, volume-squelch
20	741184	Knob, mode switch
21	741185	Battery holder
22		PC board, main
23	741217	PC board, mode switch
24	741218	PC board, LED
25		Screws, mode switch assem (pair)
26	741186	Switch, mode-Auto-Man.-Ch. Sel
27	741188	Switch, lock-out
28	741187	Jack, antenna with nut
29	741200	Control, vol. w/switch (w/nut)
30	741199	Control, squelch-w/nut
31	741167	LED (D518–D521) — each

Miscellaneous

Stock No.	Description
741159	Antenna, telescoping
741189	Crystal-10.245 MHz
741187	Socket, crystal
741163	Jack, ext. power and ext. speaker
741219	Speaker, 8 ohm, 0.3W

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Troubleshooting

General

If any of the operational checks indicate that the receiver is not performing normally, standard trouble-shooting techniques should be used to locate the defective part of the receiver.

The RF and audio circuits are straight forward designs and should not present any servicing difficulty. Before attempting to troubleshoot the squelch, scanning or switching circuits, study the circuit description, the schematic, and the block diagram to obtain a thorough understanding of these circuits.

Service Hints

1. The dc voltages shown on the schematic are approximate and will vary slightly from unit to unit. Refer to the circuit condition notes on the schematic.
2. All first local oscillator crystals should be removed from the crystal sockets before making dc voltage measurements
3. Oscillator Q107 may oscillate at some parasitic frequency when all crystals are removed. To measure the dc voltages on Q107, a small capacitor (approximately 0.047 μF) should be temporarily connected from the base of Q107 to ground to "kill" these oscillations.

NOTE:
The dc voltages for 2nd local oscillator Q303 are shown with Q303 in its oscillating mode. These voltages change only slightly when the crystal is shorted out with a 0.047 μF capacitor.

4. RF alignment should be made using a signal level just high enough to give a useful output. Excessive signal input can result in front-end overload and distortion which may appear to be a receiver problem.
5. If servicing is required, replace components and leads as they were originally. To reduce the possibility of parasitic oscillations bend Q105 toward the power transformer.

Adjustment Procedure

The following adjustments should be made in the order given to assure proper scanner performance.

IF Adjustment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8-ohm — ½ watt)
- DC Power Supply (13.8 volts—1 ampere)

Procedure:

1. Connect the test equipment as shown in Figure 2.
2. Remove crystals from the crystal sockets and set the program switches to the UHF (U) position. Manually set the scanner to channel 1 and the squelch control fully CW.
3. Set the generator to 10.700 MHz and adjust the output level to zero. Adjust the scanner's volume control for a noise voltage of 0.5 volt on the ac voltmeter.
4. Increase the generator's 10.700 MHz output voltage until the reading on the ac voltmeter decreases to 0.05 volt.
5. Adjust T101 for minimum noise output (0.05 volt or less).

AFC Adjustment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- High Impedance DC Voltmeter
- Audio Dummy-Load Resistor (8-ohms — ½ watt)
- DC Power Supply (13.8 volts—1 ampere)

Procedure:

1. Complete the IF adjustment.
2. Connect the RF Generator and AC Voltmeter as shown in Figure 2.
3. Connect the DC Voltmeter between TP1(+) and TP2(−).
4. Short TP5 and TP3.
5. Increase the 10.700 MHz signal generator output to 40 dB above the 20 dB noise-quieting level obtained during the IF adjustment.
6. Adjust VR505 for a reading of 5.3 Vdc.
7. Remove the short between TP5 and TP3.
8. Connect the DC Voltmeter between TP4(+) and TP3(−).
9. Adjust VR504 for a reading of 4.5 Vdc.

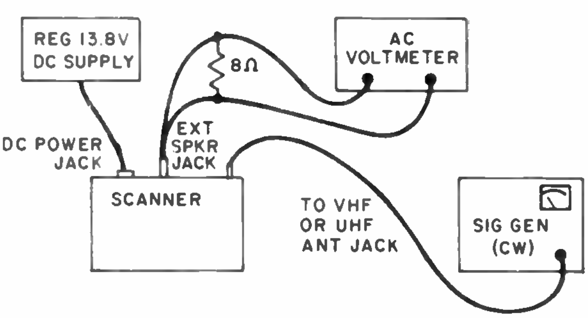


Figure 2—Test Setup for IF, AFC, and High VHF Oscillator Adjustment.

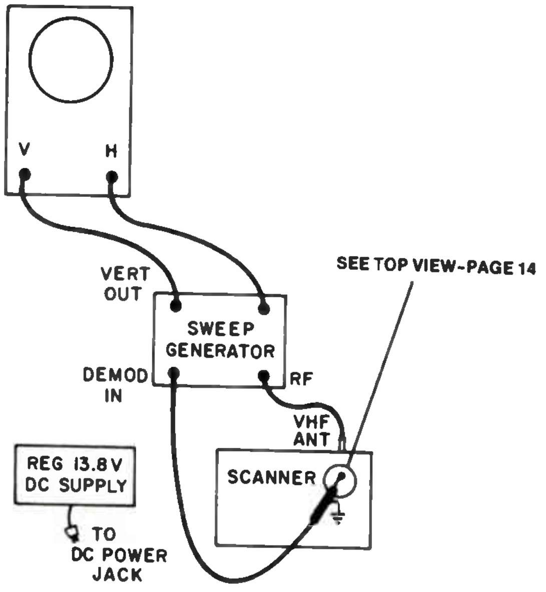


Figure 3—Test Setup for VHF RF Alignment.

RF Alignment—VHF

Test Equipment Required

- RF Sweep Generator (Wavetek Model 2000 with 1, 10, 50 MHz Harmonic Markers—or equivalent).
- Oscilloscope (Wavetek Model 1901A or equivalent).
- RF Oscilloscope Probe (RCA WG-400A Direct/Low Cap. Probe with slip-on RF Detector Probe WG-302B or equivalents).
- DC Power Supply (13.8 volts—1 ampere).

Low VHF Alignment

Procedure:

1. Connect the test equipment as shown in Figure 3.
2. Manually set the scanner to channel 1.
3. Set the squelch control CW, the volume control CCW, and the program switch to low (L).
4. Connect the RF Detector Probe between the base of mixer Q104 (top of R128) and ground.
5. Set the generator to sweep between 30 MHz and 50 MHz.
6. Adjust: L106 for maximum output at 47 MHz
   L107 for maximum output at 33 MHz
   L108 for maximum output at 40 MHz

   Figure 4 shows the low VHF RF waveform.

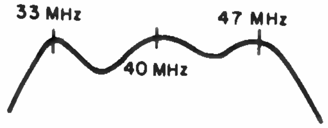


Figure 4—Low-VHF RF Waveform.

High VHF Alignment

Procedure:

1. Connect the test equipment as shown in Figure 3.
2. Manually set the scanner to channel 1.
3. Set the squelch control CW, the volume control CCW and the program switch to high (H).
4. Connect the RF Detector Probe between the base of mixer Q102 (top of R107) and ground.
5. Set the generator to sweep between 150 MHz and 170 MHz.
6. Adjust: L101 for maximum output at 160 MHz.
   L102 for maximum output at 153 MHz.
   L103 and L104 for best balance between 153 MHz peak and 160 MHz peak.

   Figure 5 shows the high-VHF RF waveform.

High VHF Oscillator Alignment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8-ohms—½ watt)
- DC Power Supply (13.8 volts—1 ampere)

Procedure:

1. Connect the test equipment as shown in Figure 2.
2. Insert a 158 MHz test crystal into the channel 1 socket.
3. Set the program switch to high (H).
4. Set the generator to 158 MHz.
5. Adjust the generator output to the 20 dB quieting level. (See Sensitivity Measurement Procedure).
6. Adjust L114 for maximum noise quieting (minimum output).

Tight Squelch Adjustment

Test Equipment Required

- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8 ohms—½ watt)

Procedure:

1. Complete the high VHF RF and oscillator alignment.
2. Set the squelch control fully CCW and the volume control to mid-range.
3. Set the signal generator output to 1.8 μV at 158 MHz.
4. Adjust VR502 to the point at which squelch just opens ("rushing" sound is heard).

Adjustment Procedure Continued on Page 12

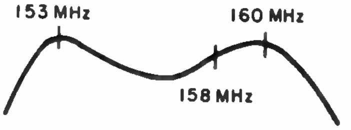


Figure 5—High-VHF RF Waveform.

UHF—RF Alignment

Test Equipment Required
- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8-ohms—½ watt)
- 460 MHz Test Crystal
- DC Power Supply (13.8 volts—1 ampere)

Procedure:
1. Connect the test equipment as shown in Figure 8.
2. Insert a 460 MHz crystal into the channel 1 socket.
3. Set the channel 1 program switch to UHF (U) and the squelch control CW.
4. Manually set the scanner to channel 1.
5. Set the generator to 460 MHz unmodulated.
6. Set the generator output to the 20 dB quieting level (See Sensitivity Measurement).
7. Adjust CT101, CT102, CT103, and L115 for maximum sensitivity (minimum output). Repeat these adjustments until the lowest noise measurement is obtained.

Measurement Procedures

Crystal Frequency Measurement

Test Equipment Required
- Frequency Counter (Hewlett Packard Model 5381A or equivalent)
- Counter Preamplifier (If required)

Procedure:
1. Insert the crystals to be measured into the appropriate sockets.
2. Turn the scanner on and adjust the squelch and volume controls fully counterclockwise.
3. Manually set the scanner to the channel position of the crystal to be tested.
4. Connect the test equipment as shown in Figure 7.

NOTE:
Signal pick-up from the crystal's metal case is recommended because it has negligible loading effect on the oscillator circuit. In most cases, the signal pick-up from the crystal case will be sufficient to provide an accurate and steady count. If no count is displayed, or if the count is erratic, a counter preamplifier having a minimum gain of 15 dB between 40 MHz and 60 MHz should be used.

5. Record the frequency displayed on the counter.

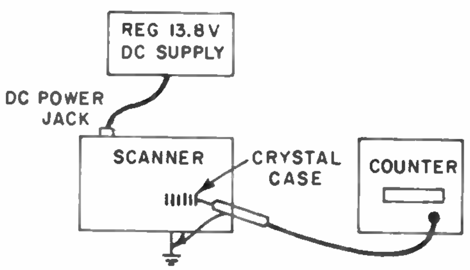


Figure 7—Test Setup for Crystal Frequency Measurement.

The following examples will illustrate how to calculate the frequency range that is acceptable if the crystal is oscillating within the specified tolerance.

Example No. 1: Low VHF Band

Channel frequency = 33.860 MHz
Crystal frequency = Ch. Freq. + 10.700 MHz
= 33.860 MHz + 10.700 MHz
= 44.560 MHz

The accuracy specified for low VHF band crystals is 0.003%.

Upper Frequency Limit = 1.00003 x 44.560 MHz
= 44.561336 MHz
Lower Frequency Limit = .99997 x 44.560 MHz
= 44.558663 MHz

Example No. 2: High VHF Band

Channel frequency = 158.970 MHz

$$\text{Crystal frequency} = \frac{\text{Ch. Freq.} - 10.700\text{ MHz}}{3} = \frac{158.970\text{ MHz} - 10.700\text{ MHz}}{3} = 49.423333\text{ MHz}$$

The accuracy specified for high VHF crystals is 0.002%.

Upper Frequency Limit = 1.00002 x 49.423333 MHz
= 49.424321 MHz
Lower Frequency Limit = 0.99998 x 49.423333 MHz
= 49.422344 MHz

Example No. 3: Middle of UHF Band

The measured crystal frequency is determined by the accuracy of the crystal and the AFC correction voltage. This frequency should remain within 225 Hz of the crystal frequency calculated from the formula:

$$\text{Crystal Frequency} = \frac{\text{Channel Freq.} - 10.700\text{ MHz}}{9}$$

The following example will illustrate how to calculate the frequency range that is acceptable if the crystal is oscillating within the specified tolerance.

Channel frequency = 465.400

$$\text{Crystal Frequency} = \frac{\text{Ch. Freq.} - 10.700\text{ MHz}}{9} = \frac{465.400\text{ MHz} - 10.700\text{ MHz}}{9} = 50.522222\text{ MHz}$$

Upper Frequency Limit = 50.522222 MHz + 225 Hz
= 50.522447 MHz
Lower Frequency Limit = 50.522222 MHz − 225 Hz
= 50.521997 MHz

Sensitivity Measurement (20 dB Noise Quieting)

Test Equipment Required
- RF Signal Generator (Wavetek Model 3000 or equivalent)
- AC Voltmeter (Ballantine Model 314 or equivalent)
- Audio Dummy-Load Resistor (8 ohms—½ watt)

Procedure:
1. Connect the test equipment as shown in Figure 8
2. Insert the crystal for the channel frequency to be measured into the appropriate socket.

NOTE:
If a general overall sensitivity performance check is being made, the test crystals recommended on page 7 should be used. Additional crystals having frequencies of particular interest may also be included.

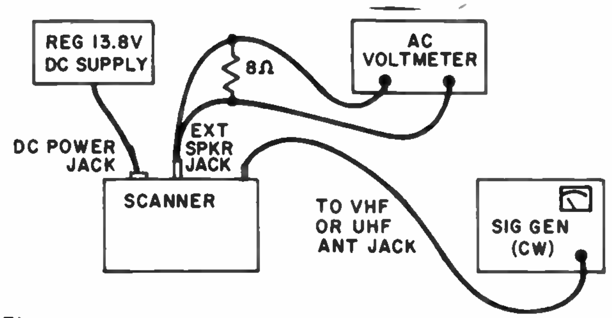


Figure 8—Test Setup for UHF RF Alignment and Sensitivity Measurement.

3. Turn the scanner on and manually set it to the channel position corresponding to the frequency to be measured.
4. Set the generator for CW operation. Adjust the RF output level to zero.
5. Turn the scanner's squelch control fully clockwise.
6. Adjust the scanner's volume control until the audio output noise indicated on the ac voltmeter is 0.5 volt.
7. Increase the generator's RF output to approximately 10 microvolts.
8. Adjust the generator's output frequency to the exact center of the channel being measured. This frequency must remain stable within ±500 Hz during Step 9.

NOTE:
At this point, the noise level indicated on the AC voltmeter should drop to a low level (less than 0.05 volt).

9. Decrease the generator's RF output level until the audio noise level indicated on the ac voltmeter increases to 0.05 volt. This RF output level is the 20 dB noise quieting sensitivity for the channel frequency being measured.
10. Repeat steps 1 through 9 for each channel frequency to be measured.

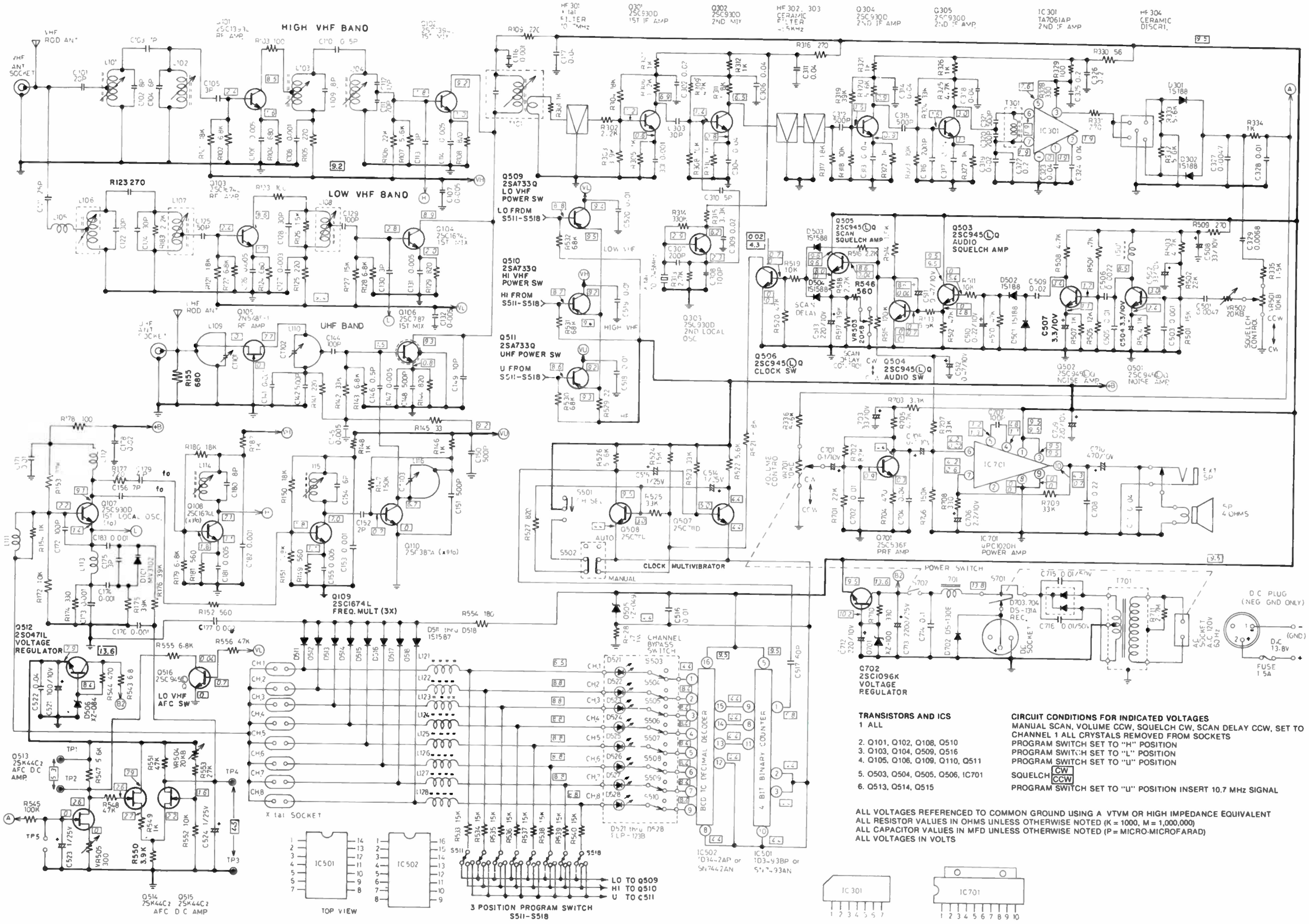


Figure 6—Schematic Diagram 16S300.

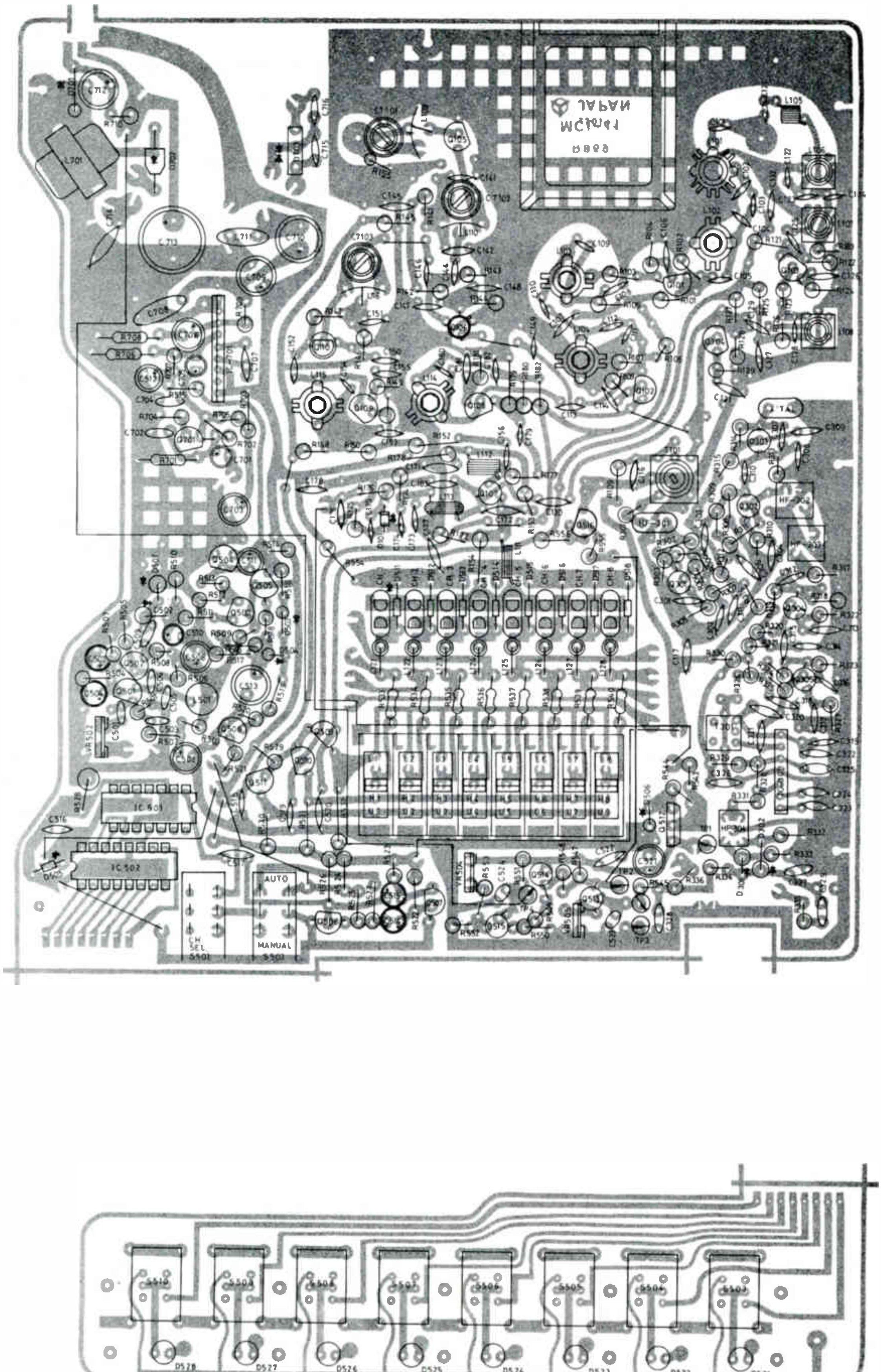
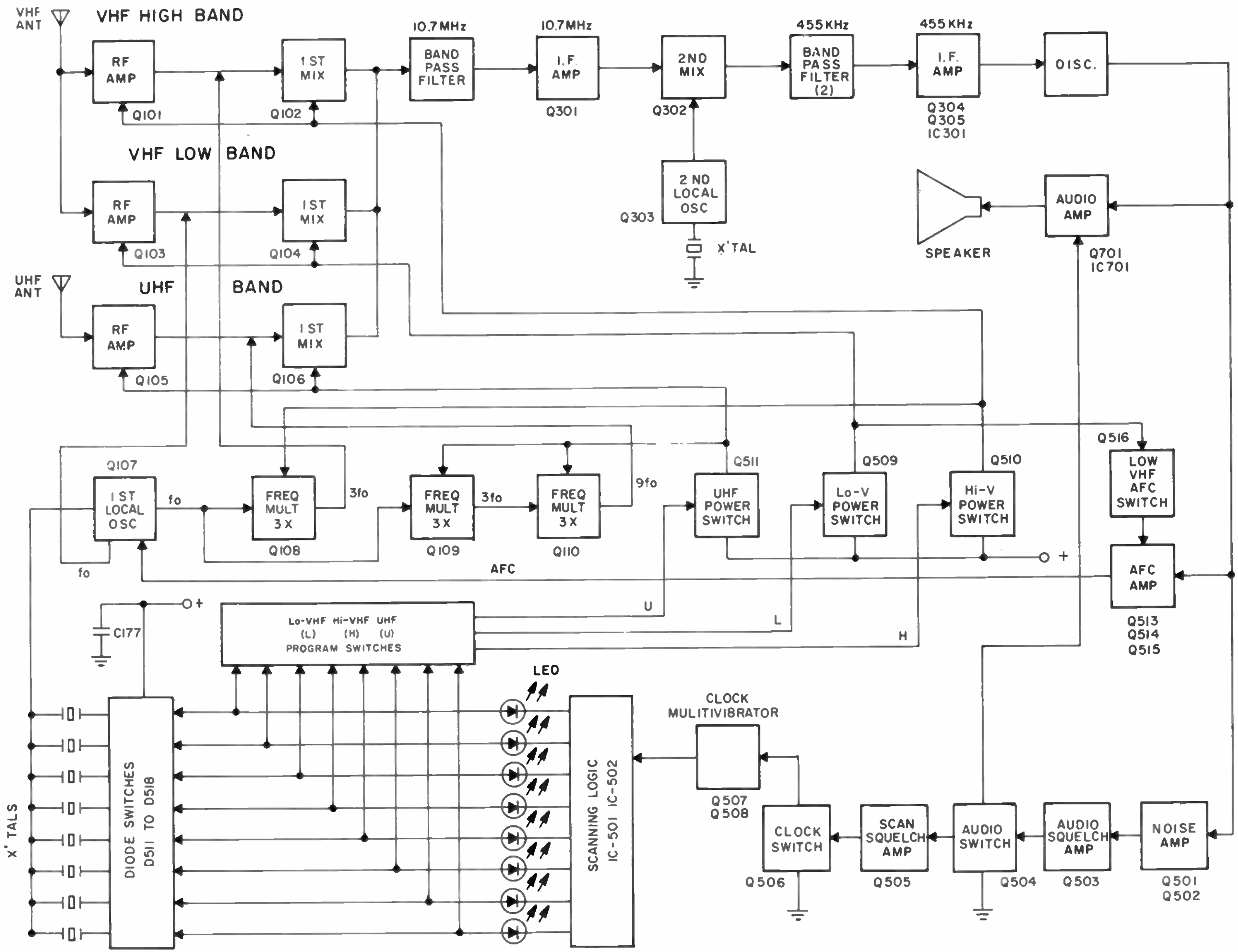


Figure 9—Top View: Location of Components.


VHF ANT
VHF HIGH BAND
RF AMP
Q101
1 ST MIX
Q102
10.7 MHz
BAND PASS FILTER
10.7 MHz
I.F. AMP
Q301
2ND MIX
Q302
455 KHz
BAND PASS FILTER (2)
455 KHz
I.F. AMP
Q304
Q305
IC301
DISC.
VHF LOW BAND
RF AMP
Q103
1ST MIX
Q104
2 ND LOCAL OSC
Q303
X'TAL
SPEAKER
AUDIO AMP
Q701
IC701
UHF ANT
UHF BAND
RF AMP
Q105
1 ST MIX
Q106
Q107
1 ST LOCAL OSC
fo
fo
FREQ MULT 3X
Q108
3fo
FREQ MULT 3X
Q109
3fo
FREQ MULT 3X
Q110
9fo
Q511
UHF POWER SWITCH
Q509
Lo-V POWER SWITCH
Q510
Hi-V POWER SWITCH
+
Q516
LOW VHF AFC SWITCH
AFC AMP
Q513
Q514
Q515
AFC
C177
+
Lo-VHF Hi-VHF UHF
(L) (H) (U)
PROGRAM SWITCHES
U
L
H
LED
X' TALS
DIODE SWITCHES D511 TO D518
SCANNING LOGIC IC-501 IC-502
CLOCK MULITIVIBRATOR
Q507
Q508
CLOCK SWITCH
Q506
SCAN SQUELCH AMP
Q505
AUDIO SWITCH
Q504
AUDIO SQUELCH AMP
Q503
NOISE AMP
Q501
Q502

Symbol	Stock No.	Description
L116	741311	Coil RF
L121, 122, 123, 124, 125, 126, 127, 128	741315	Choke RF
L501	741313	Coil choke
L701	741314	Coil choke
Q101	741327	Transistor-Type 2SC1393
Q102	741328	Transistor-Type 2SC1394
Q103, 104	741173	Transistor-Type 2SC1674
Q105	741347	Transistor-Type 2N5485-1
Q106	741205	Transistor-Type 2SC787
Q107	170794	Transistor-Type 2SC930
Q108, 109	741173	Transistor-Type 2SC1674
Q110	741209	Transistor-Type 2SC387
Q301, 302, 303, 304, 305	170794	Transistor-Type 2SC930
Q501, 502, 503, 504, 505, 506, 507, 508	741172	Transistor-Type 2SC945
Q509, 510, 511	741175	Transistor-Type 2SA733
Q512	741330	Transistor-Type 2SD471
Q513, 514, 515	741329	Transistor-Type 2SK44
Q516	741172	Transistor-Type 2SC945
Q701	169792	Transistor-Type 2SC536
Q702	741115	Transistor-Type 2SC1096
R101	108870	18,000 ohm, 5%, ¼W, comp.
R102	108867	6800 ohm, 5%, ¼W, comp.
R103	108861	100 ohm, 5%, ¼W, comp.
R104	426215	680 ohm, 5%, ¼W, comp.
R105	218758	220 ohm, 5%, ¼W, comp.
R106	426112	22,000 ohm, ¼W, comp.
R107	219464	5600 ohm, 5%, ¼W, comp.
R108	426234	820 ohm, 10%, ¼W, comp.
R109	218758	220 ohm, 5%, ¼W, comp.
R121	108870	18,000 ohm, 5%, ¼W, comp.
R122	108867	6800 ohm, 5%, ¼W, comp.
R123	108861	100 ohm, 5%, ¼W, comp.
R124	426215	680 ohm, 5%, ¼W, comp.
R125	218758	220 ohm, 5%, ¼W, comp.
R126	219459	1500 ohm, 5%, ¼W, comp.
R127	108869	15,000 ohm, 5%, ¼W, comp.
R128	108867	6800 ohm, 5%, ¼W, comp.
R129	426234	820 ohm, 10%, ¼W, comp.
R141	218758	220 ohm, 5%, ¼W, comp.
R142	426219	33,000 ohm, 5%, ¼W, comp.
R143	108867	6800 ohm, 5%, ¼W, comp.
R144	426324	820 ohm, 10%, ¼W, comp.
R145	233931	33 ohm, 5%, ¼W, comp.
R146	108865	1000 ohm, 5%, ¼W, comp.
R147	232687	270,000 ohm, 5%, ¼W, comp.
R148	108865	1000 ohm, 5%, ¼W, comp.
R149	420316	560 ohm, 5%, ¼W, comp.
R150	108870	18,000 ohm, 5%, ¼W, comp.
R151	108867	6800 ohm, 5%, ¼W, comp.
R152	420316	560 ohm, 5%, ¼W, comp.
R153	219467	27,000 ohm, 5%, ¼W, comp.
R154	108862	180 ohm, 5%, ¼W, comp.
R172	218499	10,000 ohm, 5%, ¼W, comp.
R174	219458	330 ohm, 5%, ¼W, comp.
R175, 176	218500	39,000 ohm, 5%, ¼W, comp.
R177	218758	220 ohm, 5%, ¼W, comp.
R178	108861	100 ohm, 5%, ¼W, comp.
R179	108867	6800 ohm, 5%, ¼W, comp.
R180	108870	18,000 ohm, 5%, ¼W, comp.
R181	420316	560 ohm, 5%, ¼W, comp.
R301	108865	1000 ohm, 5%, ¼W, comp.
R302	108866	2200 ohm, 5%, ¼W, comp.
R303	427563	3900 ohm, 5%, ¼W, comp.
R304	108870	18,000 ohm, 5%, ¼W, comp.
R305	108865	1000 ohm, 5%, ¼W, comp.
R306	426210	1200 ohm, 5%, ¼W, comp.
R307	108865	1000 ohm, 5%, ¼W, comp.
R308	218499	10,000 ohm, 5%, ¼W, comp.
R309	108871	47,000 ohm, 5%, ¼W, comp.

Symbol	Stock No.	Description
R310	108865	1000 ohm, 5%, ¼W, comp.
R311	219460	1800 ohm, 5%, ¼W, comp.
R312	108865	1000 ohm, 5%, ¼W, comp.
R313	113524	2700 ohm, 5%, ¼W, comp.
R314	426249	330,000 ohm, 5%, ¼W, comp.
R315	107972	3300 ohm, 5%, ¼W, comp.
R316	108863	270 ohm, 5%, ¼W, comp.
R317	219460	1800 ohm, 5%, ¼W, comp.
R318	218499	10,000 ohm, 5%, ¼W, comp.
R319	218500	39,000 ohm, 5%, ¼W, comp.
R320	219464	5600 ohm, 5%, ¼W, comp.
R321, 322	108865	1000 ohm, 5%, ¼W, comp.
R323	218499	10,000 ohm, 5%, ¼W, comp.
R324	426219	33,000 ohm, 5%, ¼W, comp.
R325	426213	4700 ohm, 5%, ¼W, comp.
R326, 327	108865	1000 ohm, 5%, ¼W, comp.
R328	219458	330 ohm, 5%, ¼W, comp.
R329	108861	100 ohm, 5%, ¼W, comp.
R330	228878	56 ohm, 5%, ¼W, comp.
R331	108863	270 ohm, 5%, ¼W, comp.
R332, 333	219464	5600 ohm, 5%, ¼W, comp.
R334	108865	1000 ohm, 5%, 104W, comp.
R335	219459	1500 ohm, 5%, ¼W, comp.
R336	219464	5600 ohm, 5%, ¼W, comp.
R501	108869	15,000 ohm, 5%, ¼W, comp.
R502	426112	22,000 ohm, ¼W, comp.
R503	426213	4700 ohm, 5%, ¼W, comp.
R504	108865	1000 ohm, 5%, ¼W, comp.
R505	108868	12,000 ohm, 5%, ¼W, comp.
R506	108871	47,000 ohm, 5%, ¼W, comp.
R507	108865	1000 ohm, 5%, 104W, comp.
R508	426213	4700 ohm, 5%, ¼W, comp.
R509	108863	270 ohm, 5%, ¼W, comp.
R510	108871	47,000 ohm, 5%, ¼W, comp.
R511	218499	10,000 ohm, 5%, ¼W, comp.
R512	108871	47,000 ohm, 5%, ¼W, comp.
R513	219464	5600 ohm, 5%, ¼W, comp.
R514	219459	1500 ohm, 5%, ¼W, comp.
R515	229965	120,000 ohm, 5%, ¼W, comp.
R516	108866	2200 ohm, 5%, ¼W, comp.
R517	218500	39,000 ohm, 5%, ¼W, comp.
R518	108866	2200 ohm, 5%, ¼W, comp.
R519	218499	10,000 ohm, 5%, ¼W, comp.
R520	108871	47,000 ohm, 5%, ¼W, comp.
R521	108867	6800 ohm, 5%, ¼W, comp.
R522	219464	5600 ohm, 5%, ¼W, comp.
R523	426219	33,000 ohm, 5%, ¼W, comp.
R524	108869	15,000 ohm, 5%, ¼W, comp.
R525	426219	33,000 ohm, 5%, ¼W, comp.
R526	219464	5600 ohm, 5%, ¼W, comp.
R527	426234	820 ohm, 10%, ¼W, comp.
R528	512047	47 ohm, 5%, 1W, comp.
R529	426233	22 ohm, 5%, ¼W, comp.
R530, 531, 532	427566	68,000 ohm, 5%, ¼W, comp.
R533, 534, 535, 536, 537, 538, 539, 540	108869	15,000 ohm, 5%, ¼W, comp.
R543	234551	6.8 ohm, 5%, ¼W, comp.
R544	227741	560 ohm, 5%, ¼W, comp.
R545	223769	100,000 ohm, 5%, ¼W, comp.
R546	227741	560 ohm, 5%, ¼W, comp.
R547	219464	5600 ohm, 5%, ¼W, comp.
R548	108871	47,000 ohm, 5%, ¼W, comp.
R549	108865	1000 ohm, 5%, 104W, comp.
R550	107972	3300 ohm, 5%, ¼W, comp.
R551	108871	47,000 ohm, 5%, ¼W, comp.
R552	218499	10,000 ohm, 5%, ¼W, comp.
R553	219467	27,000 ohm, 5%, ¼W, comp.
R554	108865	180 ohm, 5%, ¼W, comp.
R555	108867	6800 ohm, 5%, ¼W, comp.
R556	108871	47,000 ohm, 5%, ¼W, comp.
R701	426112	22,000 ohm, ¼W, comp.
R702	430297	82,000 ohm, 5%, ¼W, comp.
R703	107972	3300 ohm, 5%, ¼W, comp.
R704	227741	560 ohm, 5%, ¼W, comp.
R705	426213	4700 ohm, 5%, ¼W, comp.
R706	223770	150,000 ohm, 5%, ¼W, comp.
R707	426219	33,000 ohm, 5%, ¼W, comp.
R708	108861	100 ohm, 5%, ¼W, comp.
R709	426219	33,000 ohm, 5%, ¼W, comp.
R710	219458	330 ohm, 5%, ¼W, comp.
R711	120998	2.7 Megohm, 5%, ½W, comp.

Symbol	Stock No.	Description
VR501	741323	10,000 ohm, variable
VR502	741324	20,000 ohm, variable
VR503	741322	20,000 ohm, variable
VR504	741324	20,000 ohm, variable
VR505	741326	300 ohm, variable
VR701	741325	10,000 ohm, variable
T101	741317	IF transformer, 10.7 MHz
T301	741318	IF transformer 455 kHz
T701	741319	Transformer, power (Ref. No. 22)

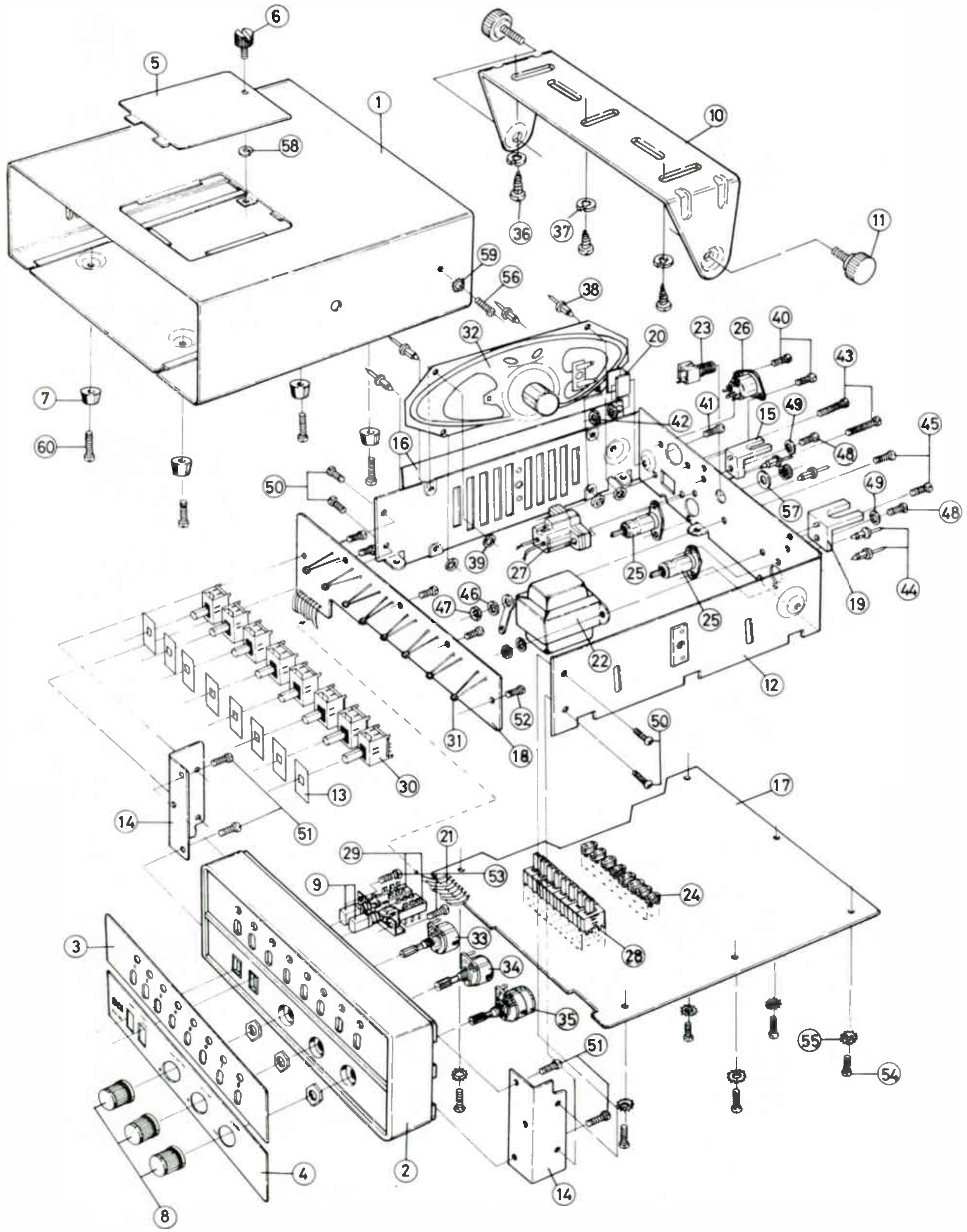
Mechanical Parts

See Figure 12

Symbol	Stock No.	Description
1		Case
2	721344	Panel, front
3		Plate, upper-for channel indicators and lock-out switches
4		Plate, lower-for controls
5	741289	Door, crystal compartment
6		Screw-crystal compartment door
7	741291	Foot
8	741345	Knob for volume, squelch, scan delay control-each
9		Pushbutton
10		Bracket, mounting
11	741292	Screw, thumb
12		Main chassis
13	741294	Cover, switch
14		Bracket, front panel
15	741295	Holder, UHF antenna
16		Grill, speaker
17		PC board, main
18		PC board, LED
19	741297	Holder, VHF antenna
20		Heat sink,-power transistor
21		Connector, flexible
22		Transformer, power (T701)
23	741296	Socket, external speaker
24	741204	Socket, crystal
25	741298	Socket, antenna-VHF or UHF
26	741299	Socket, DC power
27	741368	Socket, AC power
28	741305	Switch, program (S511-S518)
29	741306	Switch, Ch Sel or A/M (S501, S502)
30	741346	Switch, lock-out (S503-S510)
31		LED-Type SLP-123
32		Speaker, 4-ohm
33		Control, scan delay (VR503)
34		Control, squelch (VR501)
35		Control, volume w/switch (VR701)
36		Screw, pan head, tapping-5x16 mm
37		Washer, spring-5 mm
38		Rivet, special
39		Washer-3 mm
40		Screw, pan head-3x6 mm
41		Screw, pan head-3x8 mm
42		Nut, hexagonal-3 mm
43		Screw, pan head-2.6x6 mm
44		Rivet, special
45		Screw, pan head-3x8 mm
46		Washer-3 mm
47		Nut, hexagonal-3 mm
48		Screw, pan head-3x6 mm
49		Washer-3x8 mm
50		Screw, pan head-3x6 mm
51		Screw, pan head, tapping-3x8 mm
52		Screw, pan head, tapping-3x8 mm
53		Screw, pan head, tapping-3x8 mm
54		Screw, pan head-3x6 mm
55		Lockwasher, toothed-3 mm
56		Screw, pan head-3x6 mm
57		Washer-6 mm
58		Washer, C-type-2 mm
59		Lockwasher, toothe4d-3 mm
60		Screw, pan head, tapping-3x10 mm

Miscellaneous

Symbol	Stock No.	Description
	741303	Antenna, telescoping-UHF
	741304	Antenna, telescoping-VHF
	741300	Power cord assem.-AC
	741307	Power cord-DC
	741372	Speaker, 4 ohm



Replacement Parts

Electrical Parts

Symbol	Stock No.	Description
C101	741350	20 pF, 10%, 50V, ceramic
C102	741069	8 pF, ± .5 pF, 50V, ceramic
C103	741268	1 pF, ± .5 pF, 50V, ceramic
C104	111838	6 pF, ± .5 pF, 50V, ceramic
C105	169499	3 pF, ± 0.25 pF, 50V, ceramic
C106, 107	741279	5000 pF, 10%, 50V, ceramic
C108	741276	1000 pF, 10%, 50V, ceramic
C109	741069	8 pF, ± .5 pF, 50V, ceramic
C110	741236	0.5 pF, ± .25 pF, 50V, ceramic
C111	741350	20 pF, 10%, 50V, ceramic
C112	741270	12 pF, 10%, 50V, ceramic
C113	169499	3 pF, ± .25 pF, 50V, ceramic
C114	741279	5000 pF, 10%, 50V, ceramic
C116	741276	1000 pF, 10%, 50V, ceramic
C117	741280	40,000 pF, 10%, 25V, ceramic
C121	741235	25 pF, 10%, 50V, ceramic
C122	741351	30 pF, 10%, 50V, ceramic
C123	117907	15 pF, 10%, 50V, ceramic
C124	741351	30 pF, 10%, 50V, ceramic
C125	741232	50 pF, 10%, 50V, ceramic
C126	741279	5000 pF, 10%, 50V, ceramic
C127	741278	0.003 uF, 10%, 50V, ceramic
C128	741351	30 pF, 10%, 50V, ceramic
C129	741353	100 pF, 10%, 50V, ceramic
C130	169499	3 pF, ± 0.25 pF, 50V, ceramic
C131, 132	741279	5000 pF, 10%, 50V, ceramic
C141	741276	1000 pF, 10%, 50V, ceramic
C142	741355	500 pF, 10%, 50V, ceramic
C144	741353	100 pF, 10%, 50V, ceramic
C145	741279	5000 pF, 10%, 50V, ceramic
C146	741236	0.5 pF, ± .25 pF, 50V, ceramic
C147	741279	5000 pF, 10%, 50V, ceramic
C148	741355	500 pF, 10%, 50V, ceramic
C149	116214	10 pF, 10%, 50V, ceramic
C150, 151	741355	500 pF, 10%, 50V, ceramic
C152	741369	2 pF, ± .25 pF, 50V, ceramic
C153	741276	1000 pF, 10%, 50V, ceramic
C155	741279	5000 pF, 10%, 50V, ceramic
C156	741370	7 pF, ± .5 pF, 50V, ceramic
C171	426027	.01 uF, 20%, 50V, ceramic
C172	741081	100 pF, 5%, 50V ceramic
C173, 174	741276	1000 pF, 10%, 50V, ceramic
C175	169499	3 pF, ± 0.25 pF, 50V, ceramic
C176	741276	1000 pF, 10%, 50V, ceramic
C177	741277	0.002 uF, 10% 50V, ceramic
C178	741233	.02 uF, + 80 − 20% 25V, ceramic
C179	741269	4 pF, ± .5 pF, 50V, ceramic
C180	741069	8 pF, ± .5 pF, 50V, ceramic
C181	741279	5000 pF, 10%, 50V, ceramic
C182, 183	741276	1000 pF, 10%, 50V, ceramic
C301	741276	1000 pF, 10%, 50V, ceramic
C302	741233	.02 uF, + 80 − 20%, 25V, ceramic
C303	741351	30 pF, 10%, 50V, ceramic
C304	741280	40,000 pF, 10%, 25V, ceramic
C306	741280	40,000 pF, 10%, 25V, ceramic
C307	741237	200 pF, 10%, 50V, ceramic
C308	741353	100 pF, 10%, 50V, ceramic
C310	169252	5 pF, ± 0.5 pF, 50V, ceramic disc
C311	741280	40,000 pF, 10%, 25V, ceramic
C312	741355	500 pF, 10%, 50V, ceramic
C313, 314	741280	40,000 pF, 10%, 25V, ceramic
C315	741355	500 pF, 10%, 50V, ceramic
C316	741237	200 pF, 10%, 50V, ceramic
C317, 318	741280	40,000 pF, 10%, 25V, ceramic
C320	741237	200 pF, 10%, 50V, ceramic
C321	741355	500 pF, 10%, 50V, ceramic
C322	741275	0.2 uF, + 80 − 20%, 12V, BC
C323, 324	741280	40,000 pF, 10%, 25V, ceramic
C325, 326	741275	0.2 uF, + 80 − 20%, 12V, BC
C327	741064	0.0047 uF, 20%, 50V, Mylar
C328	741282	0.01 uF, 20%, 50V, Mylar
C329	741274	0.0068 uF, 20%, 50V, Mylar
C501	741064	0.0047 uF, 20%, 50V, Mylar
C502	741362	33 uF, 10V, electrolytic
C503	741063	0.001 uF, 20%, 50V, Mylar
C504	741359	1 uF, 10V, electrolytic
C505	741282	0.01 uF, 20%, 50V, Mylar

Symbol	Stock No.	Description
C506	741281	0.0022 uF, 20%, 50V, Mylar
C507	741359	1 uF, 10V, electrolytic
C508	741362	33 uF, 10V, electrolytic
C509	741272	0.02 uF, 20%, 50V, Mylar
C510	741239	0.22 uF, 10V, electrolytic
C511, 512	741358	0.47 uF, 10V, electrolytic
C513	741365	220 uF, 10V, electrolytic
C514, 515	741361	1 uF, 25V, electrolytic
C516	117706	0.02 uF, 50V, + 80 − 20%, ceramic
C517	741352	60 pF, 5%, 50V, ceramic
C518, 519		
520	117706	0.02 uF, 50V, + 80 − 20%, ceramic
C521	741364	100 uF, 10V, electrolytic
C522	741280	40,000 pF, 10%, 25V, ceramic
C523	741361	1 uF, 25V, electrolytic
C534	741361	1 uF, 25V, electrolytic
C701	741357	0.1 uF, 10V, electrolytic
C702	741282	0.01 uF, 20%, 50V, Mylar
C703	741362	33 uF, 10V, electrolytic
C704	740614	0.04 uF, 20%, 50V, Mylar
C705	741357	0.1 uF, 10V, electrolytic
C706	741360	2.2 uF, 10V, electrolytic
C707	741081	100 pF, 5%, 50V, ceramic
C708	741273	0.22 uF, 20%, 50V, Mylar
C709	741365	220 uF, 10V, electrolytic
C710	741366	470 uF, 10V, electrolytic
C711	740614	0.04 uF, 20%, 50V, Mylar
C712	741365	220 uF, 10V, electrolytic
C713	741367	2200 uF, 25V, electrolytic
C714	741221	0.1 uF, + 80 − 20%, 12V, BC
C715, 716	426027	.01 uF, + 80 − 20%, 50V, ceramic
CT101	741349	Trimmer
CT102	741349	Trimmer
CT103	741349	Trimmer
D101	741331	Diode-Type MV3102
D301, 302		
303	119919	Diode-Type 1S188
D501, 502	119919	Diode-Type 1S188
D503, 504	741051	Diode-Type 1S1588
D505	741334	Diode-Type XZ-049
D506	741335	Diode-Type OZ-084
D511, 512		
513, 514		
515, 516		
517, 518	741171	Diode-Type 1S1587
D521, 522		
523, 524		
525, 526		
527, 528	741337	LED-Type SLP-123
D701	741336	Diode-Type XZ-100
D702	741333	Diode-Type DS130
D703	741332	Diode-Type DS131
HF301	741191	HF Filter
HF302	741192	Ceramic filter-Type CFU-455D
HF303	741192	Ceramic filter-Type CFU-455D
HF304	741320	Filter HF
IC301	741340	IC-Type TA-7061
IC501	741348	IC-Type TD3493
IC502	741533	IC-Type TD3442 or SN7442
IC701	741341	IC-Type UPC1020
L101	741308	Coil antenna
L102	741309	Coil antenna
L103	741310	Coil RF
L104	741309	Coil antenna
L105	741202	VHF coil
L106, 107		
108	741190	Coil, RF
L109, 110	741311	Coil RF
L111	741356	Coil VHF
L112	741312	Coil VHF
L113	741166	VHF coil
L114, 115	741309	Coil antenna

Pages 91 - 124 Courtesy of RADIO SHACK

ALIGNMENT PREPARATION

Test equipment required

1. Oscilloscope (0 ~ 500 kHz, 0 ~ 50 MHz)
2. AC VTVM
3. DC VTVM
4. Frequency counter (60 MHz)
5. 8 ohm dummy load
6. Slow sweep generator with variable marker (10.7 MHz)
7. VHF sweep generator with variable marker (30 ~ 52 MHz, 148 ~ 174 MHz)
8. UHF sweep generator with variable marker (450 ~ 512 MHz)
9. FM signal generator (30 ~ 50 MHz, 150 ~ 172 MHz, 450 ~ 512 MHz)

NOTE 1: *Use non-metallic tuning tools.*
The test equipment and receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the generator should be kept as low as possible and still obtain usable output.

NOTE 2: *The 9-volt battery is required to hold the memory when AC is disconnected. Always be sure the unit is loaded with a fresh 9-volt battery or the pre-programmed channels will be lost (and will have to be re-programmed).*

NOTE 3: *The extension P.C.Boards are prepaired to check and/or repair the PLL/PROGRAMMER and SCANNING/PROGRAMMER P.C.Boards.*

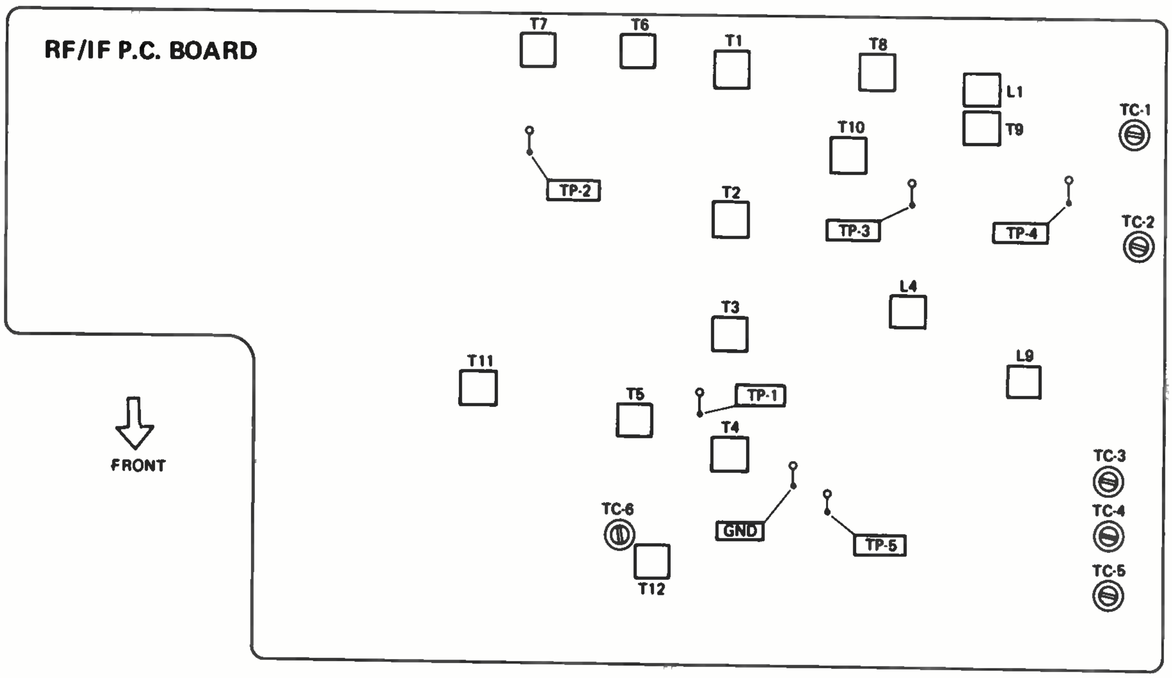
For PLL/PROGRAMMER P.C.Board	*MFR's Part No.*	*GE-22B-6321*
For SCANNING/PROGRAMMER P.C.Board	*MFR's Part No.*	*GE-22B-6322*

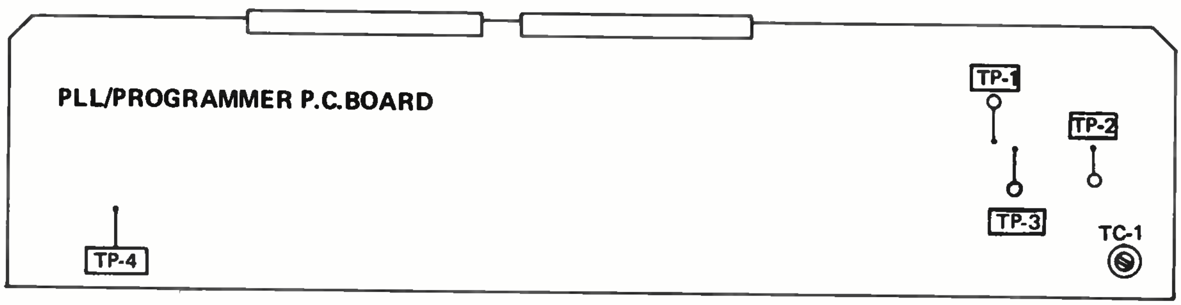
REFERENCE FREQUENCY OSC/DIVIDER ALIGNMENT

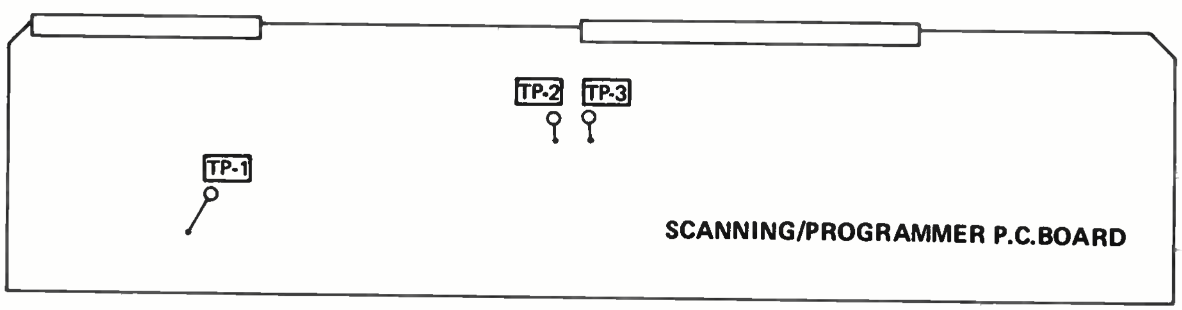
NOTE: *The reference frequency OSC/Divider circuit is on the PLL PROGRAMMER P.C. Board.*

Step 1: Connect Frequency Counter to TP-2 and ground.
Step 2: Adjust TC-1 (On the PLL/PROGRAMMER PCB) so that the frequency is 5.120000 MHz ±30 Hz.
Step 3: Connect Frequency Counter to TP-1 and ground. Read frequency on the frequency counter.
Normal: 5.000 kHz.

ALIGNMENT AND TEST POINT POSITIONS







FREQUENCY CODE PROGRAMMING FOR ALIGNMENT PREPARATION

Before starting alignment, enter program code into channels 1 through 16 as follows: (See page 13 for procedure to enter code.)

Receiving Frequency	Channel/Digit Switches 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VCO Frequency
VHF low																	
CH 1 30 MHz	*	*	*	4	*	*	7	*	9	10	11	*	*	*	*	*	40.700 MHz
CH 2 40 MHz	*	*	*	4	5	6	7	8	*	10	11	*	*	*	*	*	50.700 MHz
CH 3 50 MHz	*	*	*	*	5	*	7	8	9	10	11	*	*	*	*	*	60.700 MHz
CH 4 52 MHz	*	*	*	*	5	6	7	*	*	10	11	*	*	*	*	*	62.700 MHz
VHF high																	
CH 5 150 MHz	*	*	3	4	*	*	7	*	9	10	11	*	*	*	*	*	40.700 MHz
CH 6 160 MHz	*	*	3	4	5	6	7	8	*	10	11	*	*	*	*	*	50.700 MHz
CH 7 172 MHz	*	*	3	*	5	6	7	*	*	10	11	*	*	*	*	*	62.700 MHz
UHF low																	
CH 8 450 MHz	*	2	*	4	*	*	7	*	9	10	11	*	*	*	*	*	40.700 MHz
CH 9 460 MHz	*	2	*	4	5	6	7	8	*	10	11	*	*	*	*	*	50.700 MHz
CH10 470 MHz	*	2	*	*	5	*	7	8	9	10	11	*	*	*	*	*	60.700 MHz
UHF mid																	
CH11 470 MHz	*	2	3	4	*	*	7	*	9	10	11	*	*	*	*	*	40.700 MHz
CH12 480 MHz	*	2	3	4	5	6	7	8	*	10	11	*	*	*	*	*	50.700 MHz
CH13 490 MHz	*	2	3	*	5	*	7	8	9	10	11	*	*	*	*	*	60.700 MHz
UHF high																	
CH14 490 MHz	1	*	*	4	*	*	7	*	9	10	11	*	*	*	*	*	40.700 MHz
CH15 500 MHz	1	*	*	4	5	6	7	8	*	10	11	*	*	*	*	*	50.700 MHz
CH16 512 MHz	1	*	*	*	5	6	7	*	*	10	11	*	*	*	*	*	62.700 MHz

NOTE: *Code * = Button "in"*
Code Number = Button "out"

VOLTAGE CONTROLLED OSCILLATOR (VCO) ALIGNMENT

NOTE: *For this test you will MANUALLY select either channel 1, 2, 3 or 4.*

Step 1: Connect a DC VTVM and a Frequency Counter as shown in Figure 4.

Step 2: Select Channel 1 and adjust T12 for 0.4 V on the DC VTVM. The Frequency Counter should read 40.700000 MHz ± 600 Hz.

Step 3: Next, select Channel 3 and adjust TC-6 for 4 V on the DC VTVM. The Frequency Counter should read 60.700000 MHz ±600 Hz.

Step 4: Repeat steps 3 and 4 until no improvement is observed. Make sure that the Frequency Counter reads 40.700 MHz for CH 1, 50.700 MHz for CH 2, 60.700 MHz for CH 3 and 62.700 MHz for CH 4.

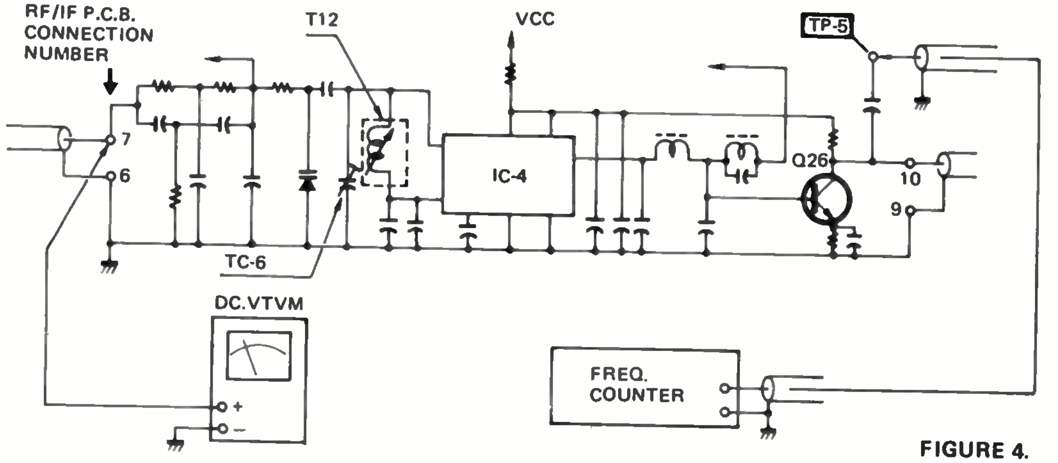


FIGURE 4.

VHF, UHF LOCAL OSCILLATOR FREQUENCY CHECK

NOTE: *For this test you will MANUALLY select either channel 1, 5, 8, 11 or 14.*

Step 1: Couple the frequency Counter through a pickup coil to oscillator coil L9. Refer to Figure 5.

Step 2: If necessary, adjust L9 as follows:

As you adjust this coil, you will note output increasing up to a certain point; further adjustment will cause output to drop off slightly and still further adjustment will cause the oscillator to drop out. Proper adjustment is at a point just before you get to maximum (on the side away from oscillator drop out).

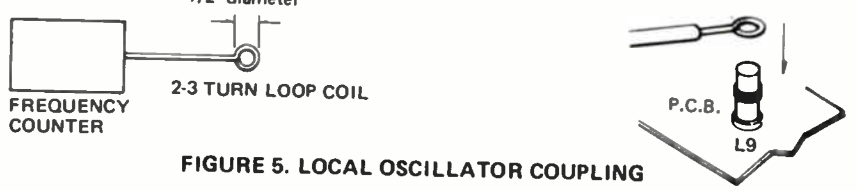


FIGURE 5. LOCAL OSCILLATOR COUPLING

Step 3: Adjust TC3, 4 and 5 for the following frequencies:

Channel	Adjust	Freq.
1	None	0
5	TC5	60.000000 MHz ±200 Hz
8	–	60.000000 MHz ±200 Hz
11	TC4	62.857500 MHz ±200 Hz
14	TC3	65.714642 MHz ±200 Hz

LOCAL OSCILLATOR FREQUENCY CHECK (10.245 MHz)

Step 1: Connect Frequency Counter through a 10 pF capacitor to Q6 Emitter circuit. Refer to Figure 6.

Step 2: Read frequency on the Frequency Counter. Normal: 10.245 MHz ±1 kHz.

NOTE: *Frequency Counter coupling capacitor should be as small a value as possible. Frequency Counter should be high impedance type.*

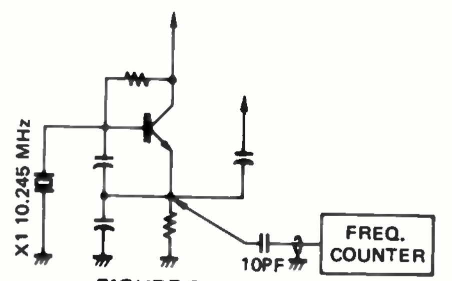


FIGURE 6.

IF SECTION ALIGNMENT

Step 1: Connect instruments as shown in Figure 7.
Step 2: Maintain Sweep Generator output at the lowest level possible to prevent overloading.

NOTE: *To perform the next adjustments, it is necessary to remove the Battery Compartment.*

Step 3: Adjust T4 and T5 for maximum output and adjust T6 and T7 so that the 455 kHz marker is in the center of the discriminator curve and for best linearity as shown in Figure 8.

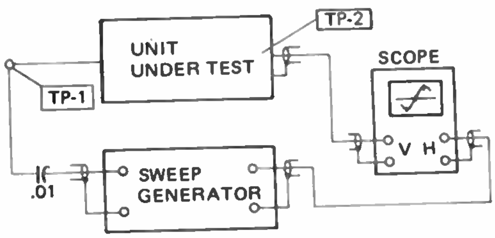


FIGURE 7. IF SECTION ALIGNMENT TEST EQPT. HOOK UP

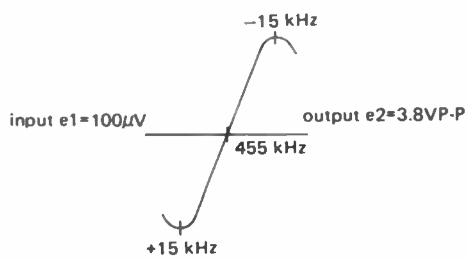


FIGURE 8. IF DISCRIMINATOR CURVE

VHF LOW BAND RF AMP ALIGNMENT

NOTE: *For this test you will MANUALLY select either channel 1, 2, 3 or 4.*

Step 1: Connect instruments as shown in Figure 9.
Step 2: Select Channel 1 with the MANUAL button.
Step 3: Adjust T1, T2 and T3 so that the 30 MHz marker is in the center of the curve and for maximum output.
Step 4: Select Channel 3. The Sweep Generator output should appear with the 50 MHz marker in the center of the curve. If necessary, readjust TC-6 by rechecking step 3 of the VCO alignment.
Step 5: Make sure that the output curves are similar to Figure 10 (for channels 1 thru 4).

NOTE: *It is difficult to track these 4 different frequencies, but differences of up to -6 dB are acceptable.*

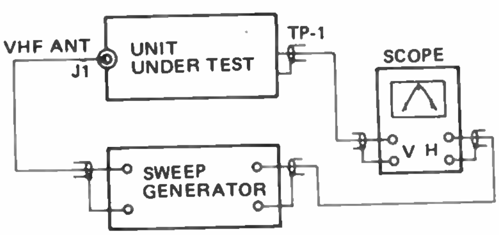


FIGURE 9. VHF LOW BAND RF TEST EQPT. HOOK UP

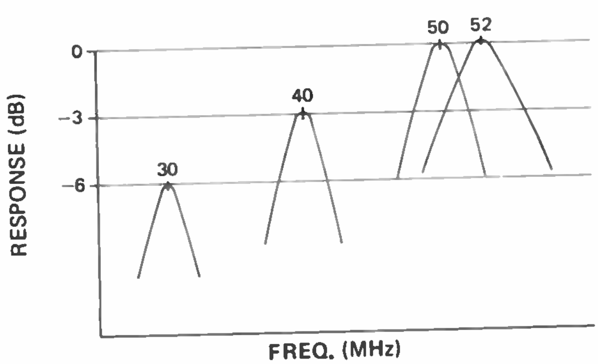


FIGURE 10.

VHF HI BAND RF AMP ALIGNMENT

NOTE: *For this test you will MANUALLY select either Channel 5, 6 or 7.*

Step 1: Connect instruments as shown in Figure 11.
Step 2: Adjust T8, 9, 10 and L1 for maximum output similar to the Figure 12 curve. This curve should be dropping down by about −3 dB for CH 5 to 7.

NOTE: *If you change the connection from TP-3 to TP-1, you should see a display similar to Figure 10 curve.*

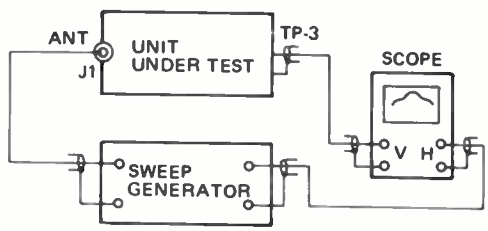


FIGURE 11. VHF HIGH BAND RF TEST EQPT. HOOK UP

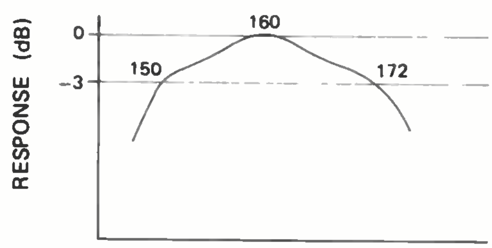


FIGURE 12.

UHF BAND RF AMP ALIGNMENT

NOTE: *For this test you will MANUALLY select either Channel 9, 12 or 15.*

Step 1: Connect instruments as shown in Figure 13.
Step 2: Set TC-2 to minimum capacitance.
Step 3: Adjust TC-1 for maximum output and best curve symmetry as shown in Figure 14.

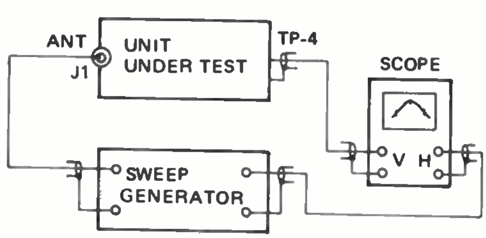


FIGURE 13. UHF BAND RF TEST EQPT. HOOK UP

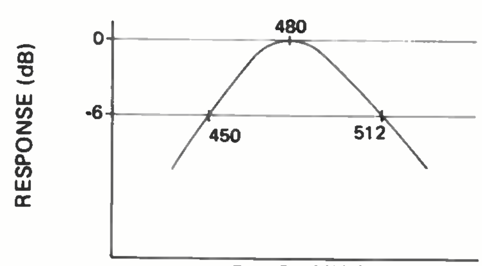


FIGURE 14.

VHF LOW/HIGH, UHF OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect Signal Generator to ANTenna jack and AC VTVM with 8-ohm dummy load to EXT. SPeaKeR jack.

Step 2: Turn SQUELCH fully counterclockwise. Set for reception of the channels noted in the following chart. Set the SSG to the center of each band.

CH	BAND	FREQ.
2	VHF LO	40 MHz
6	VHF HI	160 MHz
9	UHF LO	460 MHz
12	UHF MID	480 MHz
15	UHF HI	500 MHz

Step 3: Set the Signal Generator frequency to 40 MHz (channel 2) and readjust T4 and T5 for maximum output.

Step 4: Set the Signal Generator frequency to 160 MHz (channel 6) and adjust L4 for maximum output.

Step 5: Set the Signal Generator frequency to 480 MHz (channel 12) and adjust L9 and TC-2 for maximum output.

Step 6: For each frequency/channel set the signal generator to each frequency, no modulation and minimum output, and set VOLUME control to 0 dB (0.775 V) reading on the VTVM.

Step 7: Increase output of the generator to obtain reading -20dB on the AC VTVM. The generator output now equals the 20 dB noise quieting sensitivity.

NOTE: *Alignment of T11 on the RF/IF P.C. Board is not required. It happens to be adjustable only because of ease of parts procurement and does not need any adjustment.*

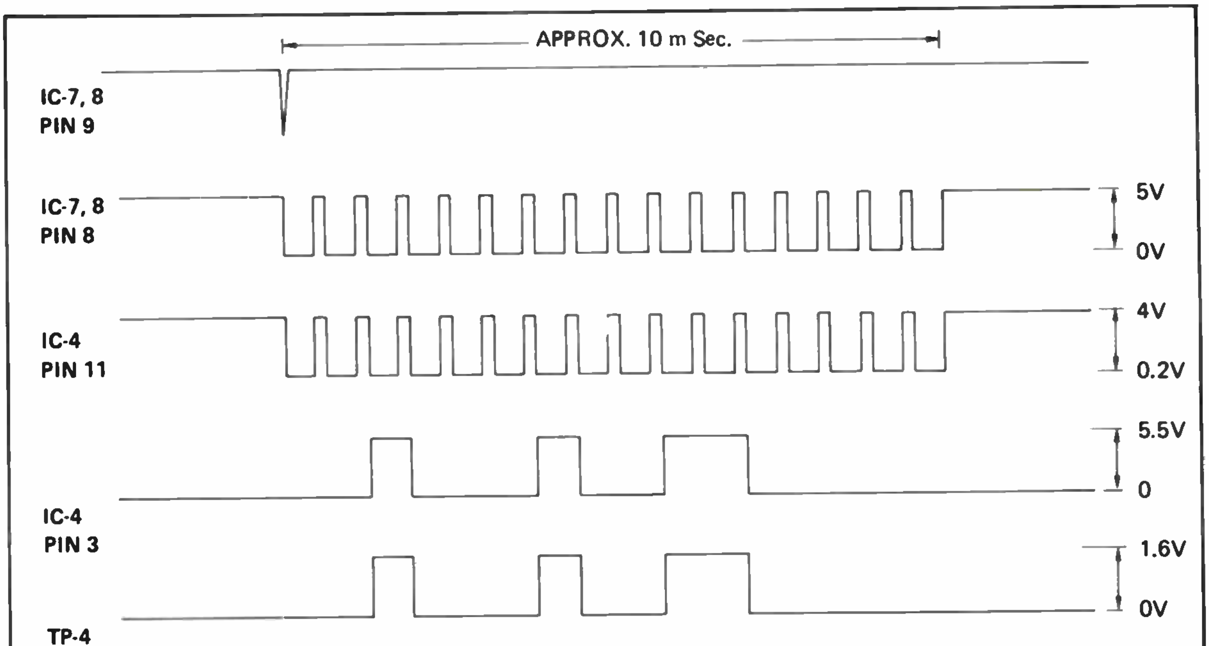
OPERATION OF PLL/PROGRAMMER CIRCUIT

1. To program the National Weather Service station frequency 162.40 MHz, for example, select channel 1 with the MANUAL selector button. Slide the Program Door open and press in the PROGRAM button, then set the Digit switches in or out as shown below.

Indicator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
The code	*	*	3	*	*	*	7	*	*	10	11	*	*	*	*	*

Press to release Digit switches at 3, 7, 10 and 11.
All other switches are to remain pushed in.

2. After setting the Digit switches, press the ENTER button. The code is then memorized and displayed by the channel/program code indicators instantly. See Figure 15 for the timing diagram. The displays shown in the timing diagram can be seen whenever the ENTER button is pressed.
3. The memorized code controls the programmable counter (IC 9 ~ 14) thru shift register (IC 7, 8). The programmable counter divides VCO frequency by the given code.
4. The phase of the divided frequency and 5 kHz reference frequency are detected by phase detector IC-5. This phase difference controls VCO frequency.
5. TP-3 is a PROGRAMMABLE COUNTER output terminal, when in locked condition 5 kHz pulse signals appear.



	IC-8								IC-7							
IC PIN NO.	13	12	11	10	6	5	4	3	13	12	11	10	6	5	4	3
LEVEL	0	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0

	IC-3				IC-2						IC-1					
IC PIN NO.	2	8	10	12	2	4	6	8	10	12	12	10	11	4	6	8
LEVEL	1	1	0	1	1	1	0	1	1	0	0	1	1	1	1	1

DISPLAY	•	•	¤	•	•	•	¤	•	•	¤	¤	•	•	•	•	•
CH. NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

NOTE : 0 = LOW LEVEL 1 = HIGH LEVEL ¤ : LED ON

FIGURE 15.

OPERATION OF SCANNING/PROGRAMMER CIRCUIT

1. Data read-out and write-on Clock OSC (IC7 2/6, TA-3, D21) generates sixteen pulses.
2. After address counter IC-6 counts sixteen pulses, word senser (IC-5 1/4, D17 ~ 20) operate. Then channel counter counts the next pulse and LED display will read out the next channel.
3. Then word senser becomes H level and scanning control is driven from this signal. Scanning rate is decided by C5 (33 μF) on the Scanning/Programmer P.C. Board.
4. Channel counter and channel display-driver operation are the same as PRO-16A (20-165).
5. See Figure 16, for timing diagrams at each point.

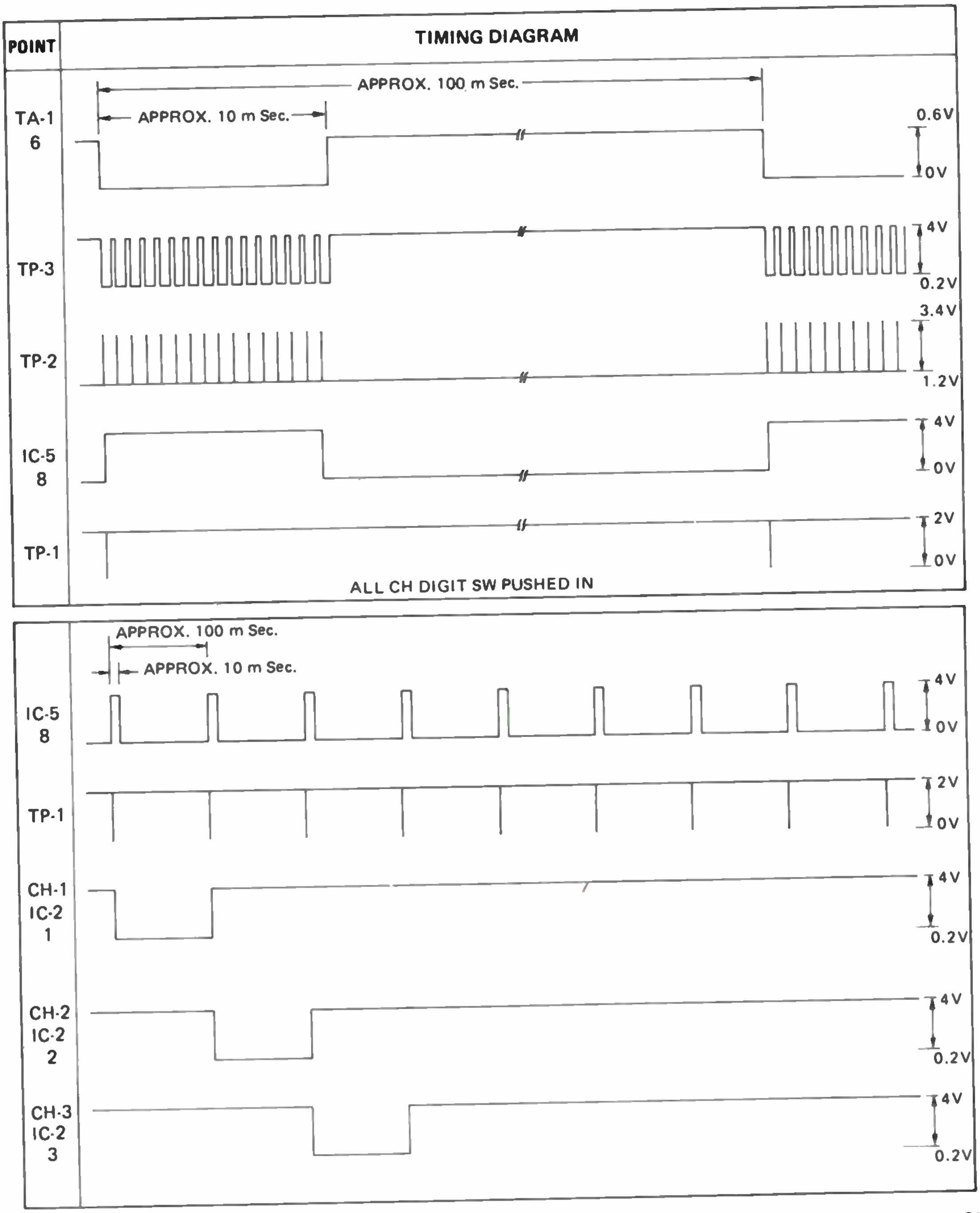


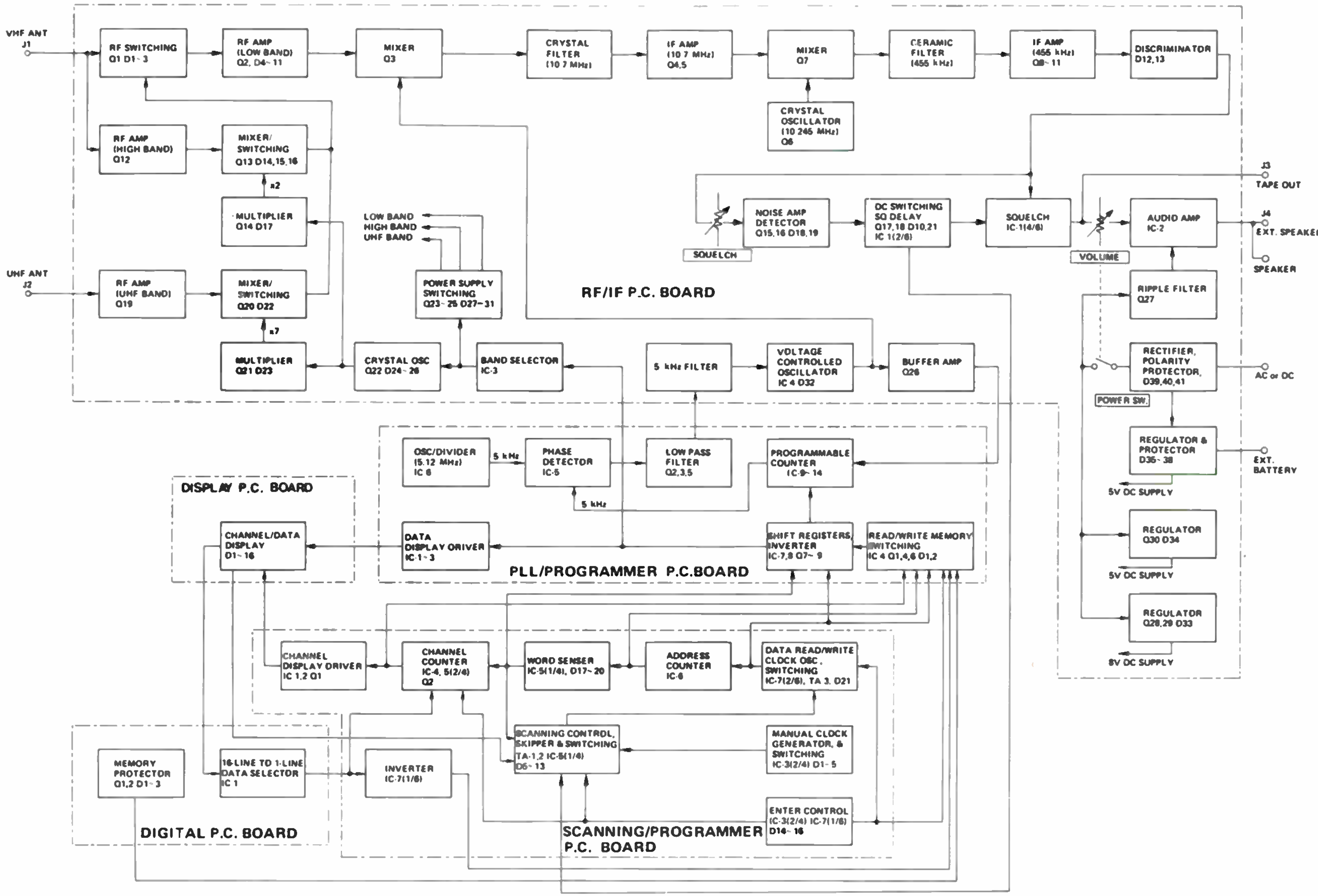
FIGURE 16.

CHANNEL COUNTER/DISPLAY DRIVER TRUTH TABLES

Pin No. / Channel No.	IC-4					IC-2								IC-1								
	14	12	9	8	11	1	2	3	4	5	6	7	9	12	1	2	3	4	5	6	7	9
CH. 1	↓	0	0	0	0	*0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CH. 2	↓	1	0	0	0	1	*0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CH. 3	↓	0	1	0	0	1	1	*0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CH. 4	↓	1	1	0	0	1	1	1	*0	1	1	1	1	1	1	1	1	1	1	1	1	1
CH. 5	↓	0	0	1	0	1	1	1	1	*0	1	1	1	1	1	1	1	1	1	1	1	1
CH. 6	↓	1	0	1	0	1	1	1	1	1	*0	1	1	1	1	1	1	1	1	1	1	1
CH. 7	↓	0	1	1	0	1	1	1	1	1	1	*0	1	1	1	1	1	1	1	1	1	1
CH. 8	↓	1	1	1	0	1	1	1	1	1	1	1	*0	1	1	1	1	1	1	1	1	1
CH. 9	↓	0	0	0	1	1	1	1	1	1	1	1	1	0	*0	1	1	1	1	1	1	1
CH. 10	↓	1	0	0	1	1	1	1	1	1	1	1	1	0	1	*0	1	1	1	1	1	1
CH. 11	↓	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	*0	1	1	1	1	1
CH. 12	↓	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	*0	1	1	1	1
CH. 13	↓	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	*0	1	1	1
CH. 14	↓	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	*0	1	1
CH. 15	↓	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	*0	1
CH. 16	↓	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	*0

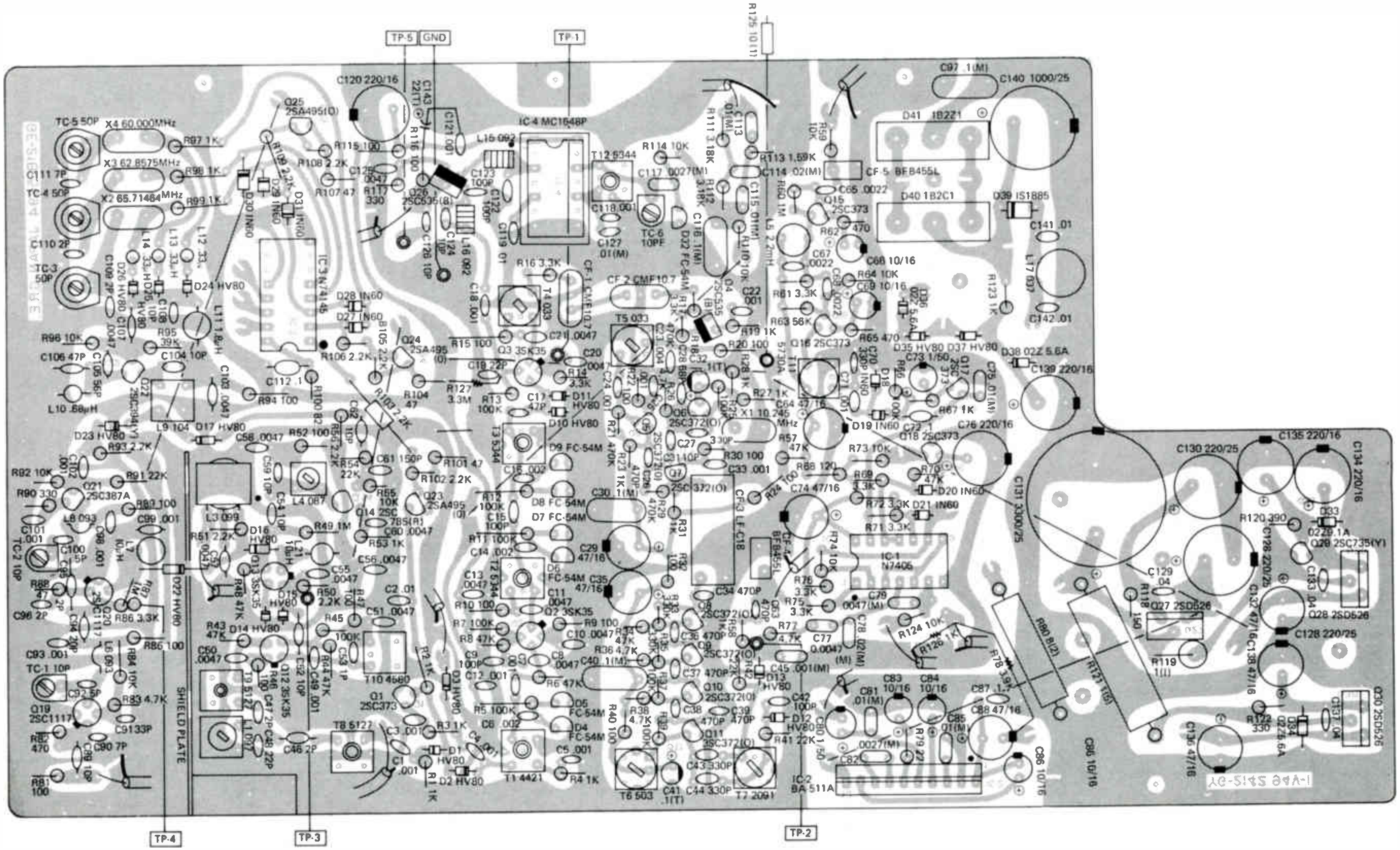
Note: ↓ = Transition from high to low level   0 = low level   1 = high level   marked* = Display (LED) "on"

BLOCK DIAGRAM

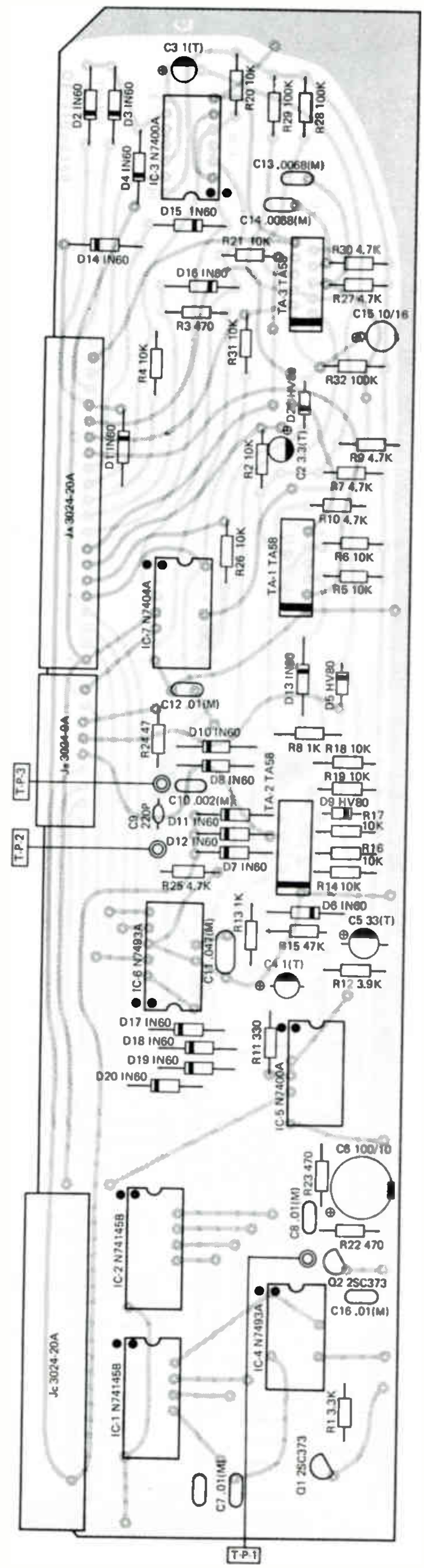


Realistic Comp 100 (20-110)

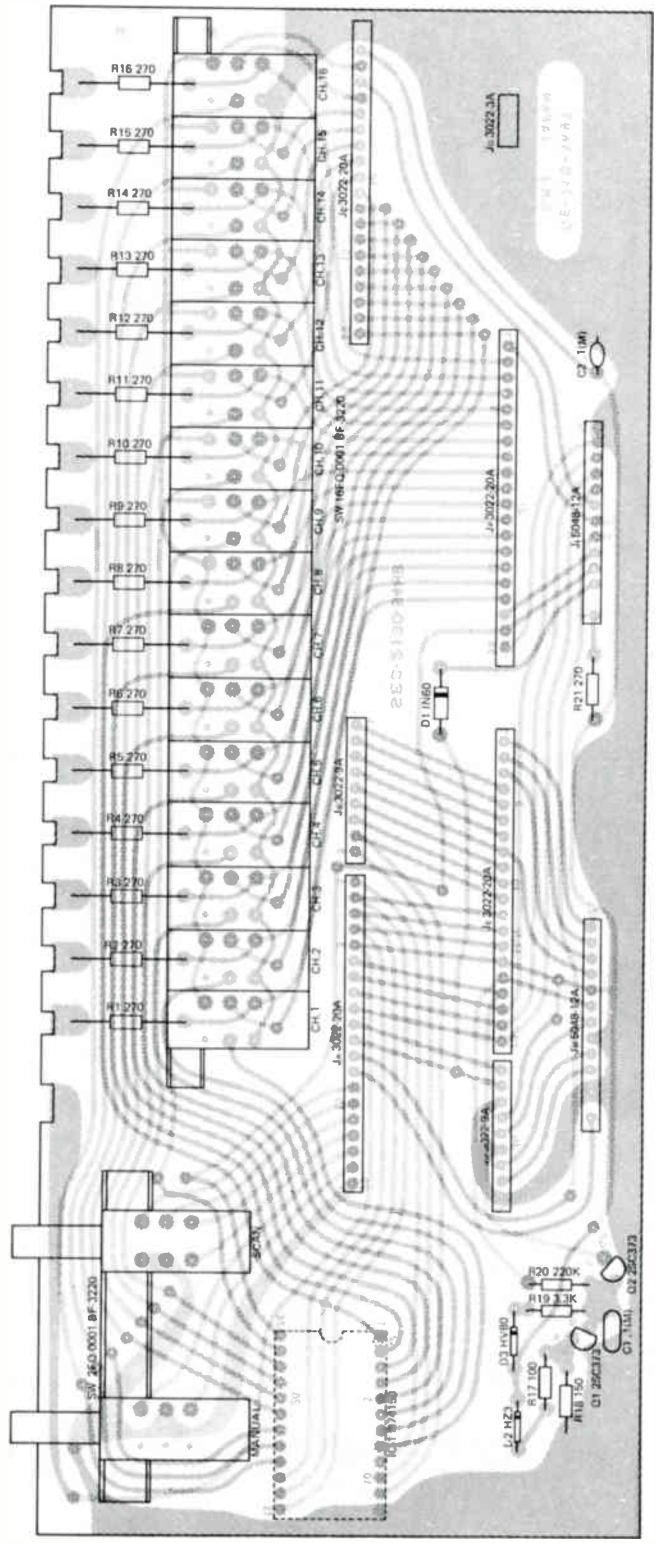
RF/IF P.C. BOARD (TOP VIEW)



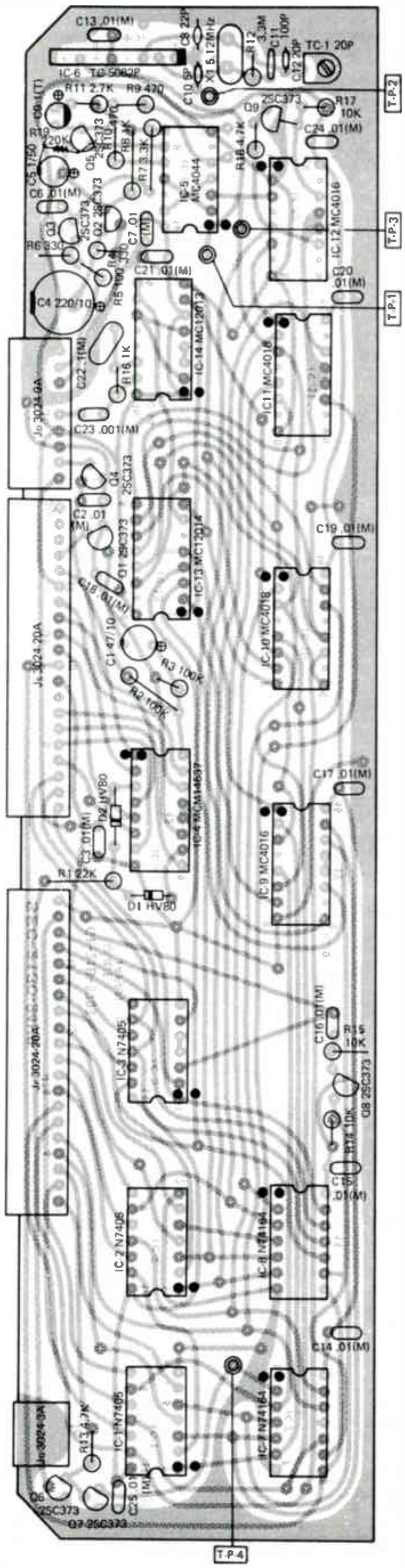
SCANNING/PROGRAMMER P.C. BOARD
(TOP VIEW)



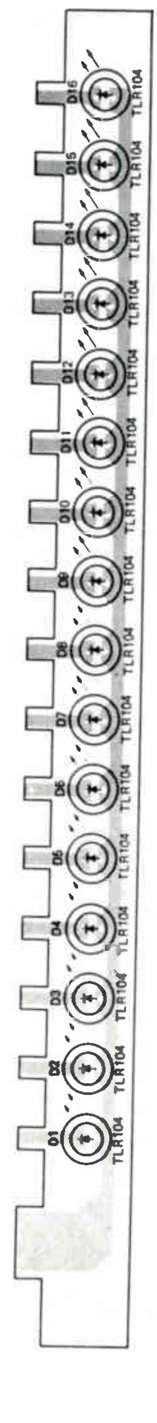
DIGITAL P.C. BOARD
(TOP VIEW)



PLL/PROGRAMMER P.C. BOARD
(TOP VIEW)

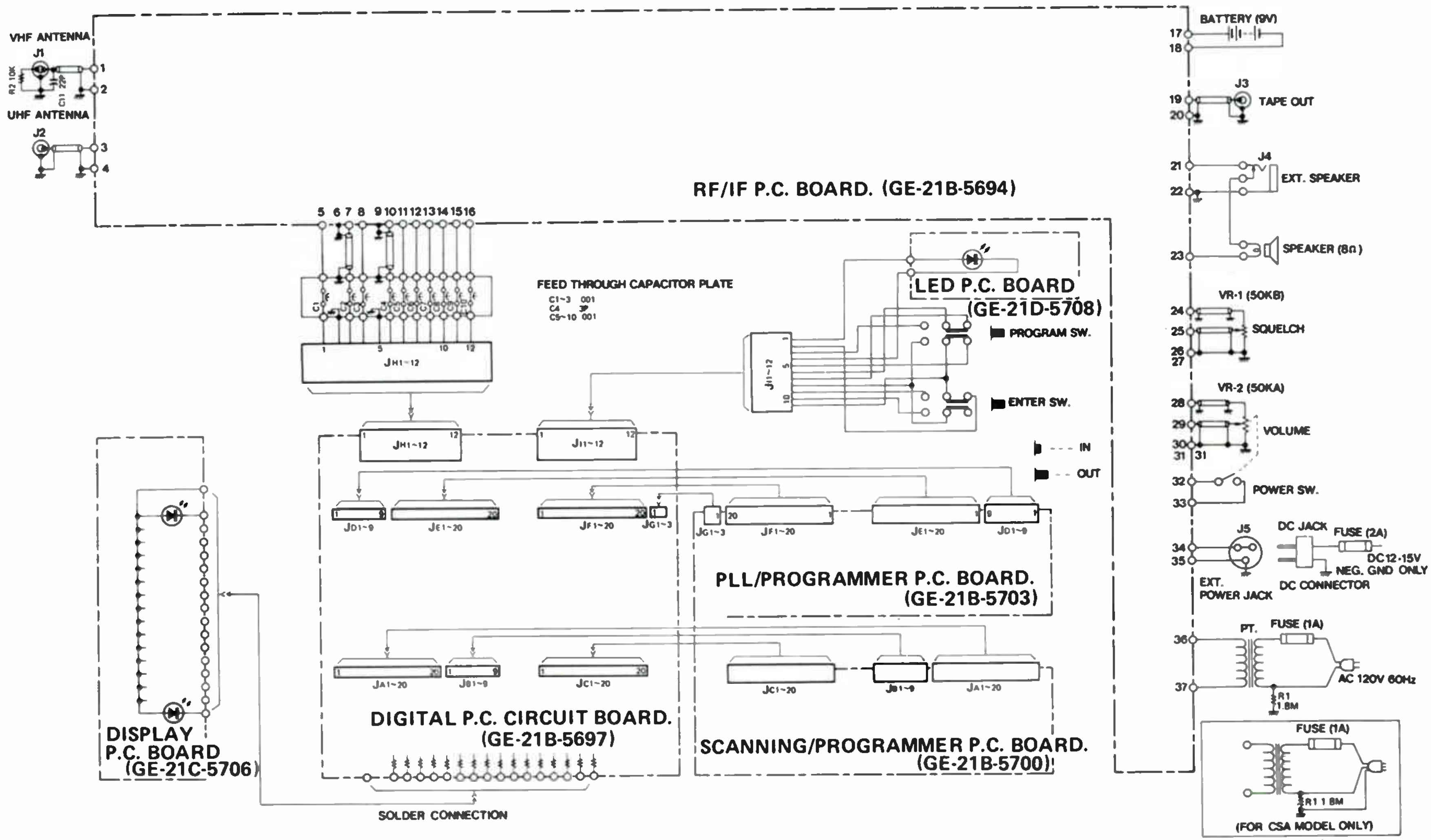


DISPLAY P.C. BOARD
(TOP VIEW)

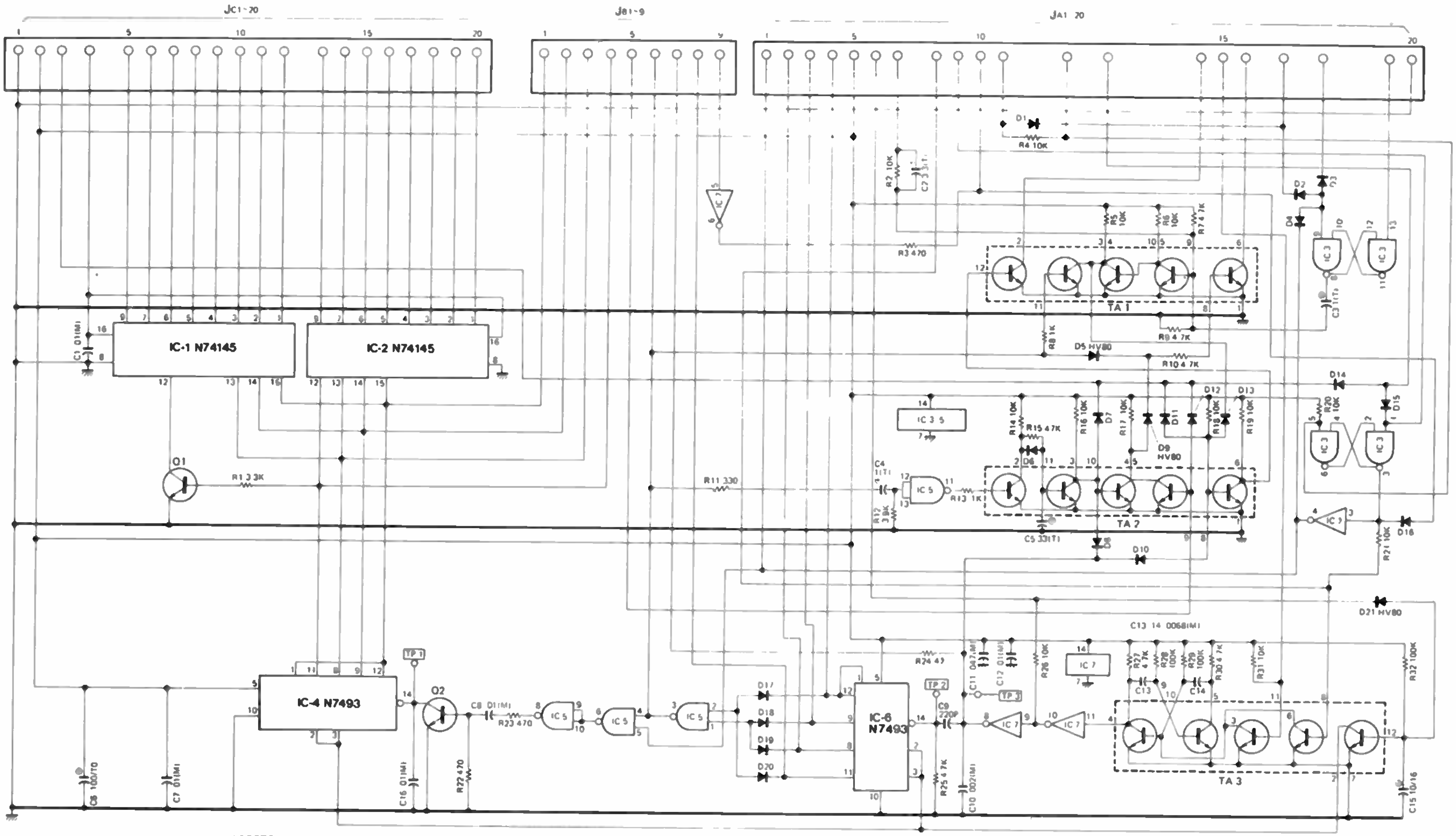


MASTER INTER-CONNECT DIAGRAM

***Realistic* Comp 100 (20-110)**



SCANNING/PROGRAMMER P.C. BOARD SCHEMATIC DIAGRAM



Q1,2 2SC373

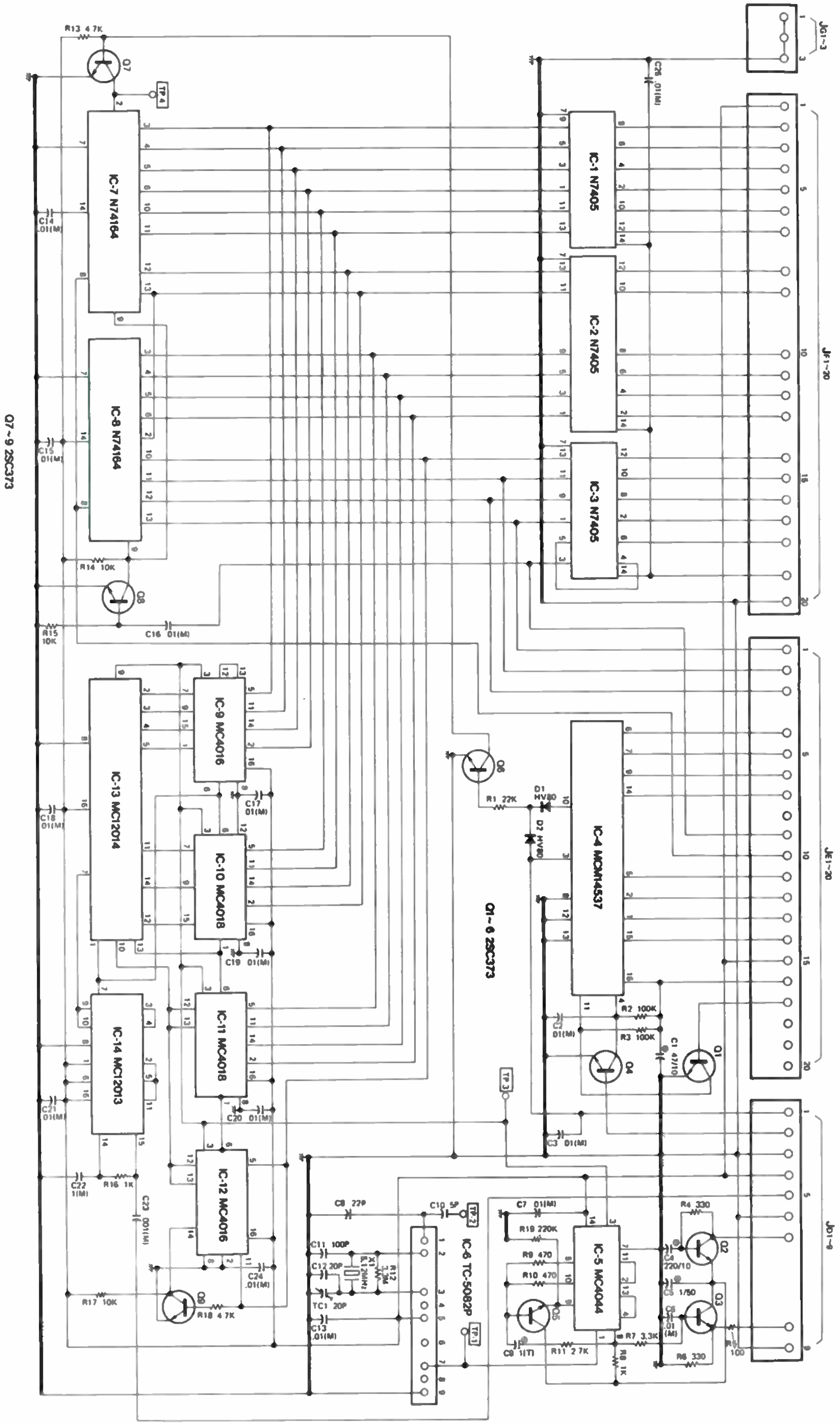
IC-3,5 N7400

D1~4, 6~8, 10~20 IN60

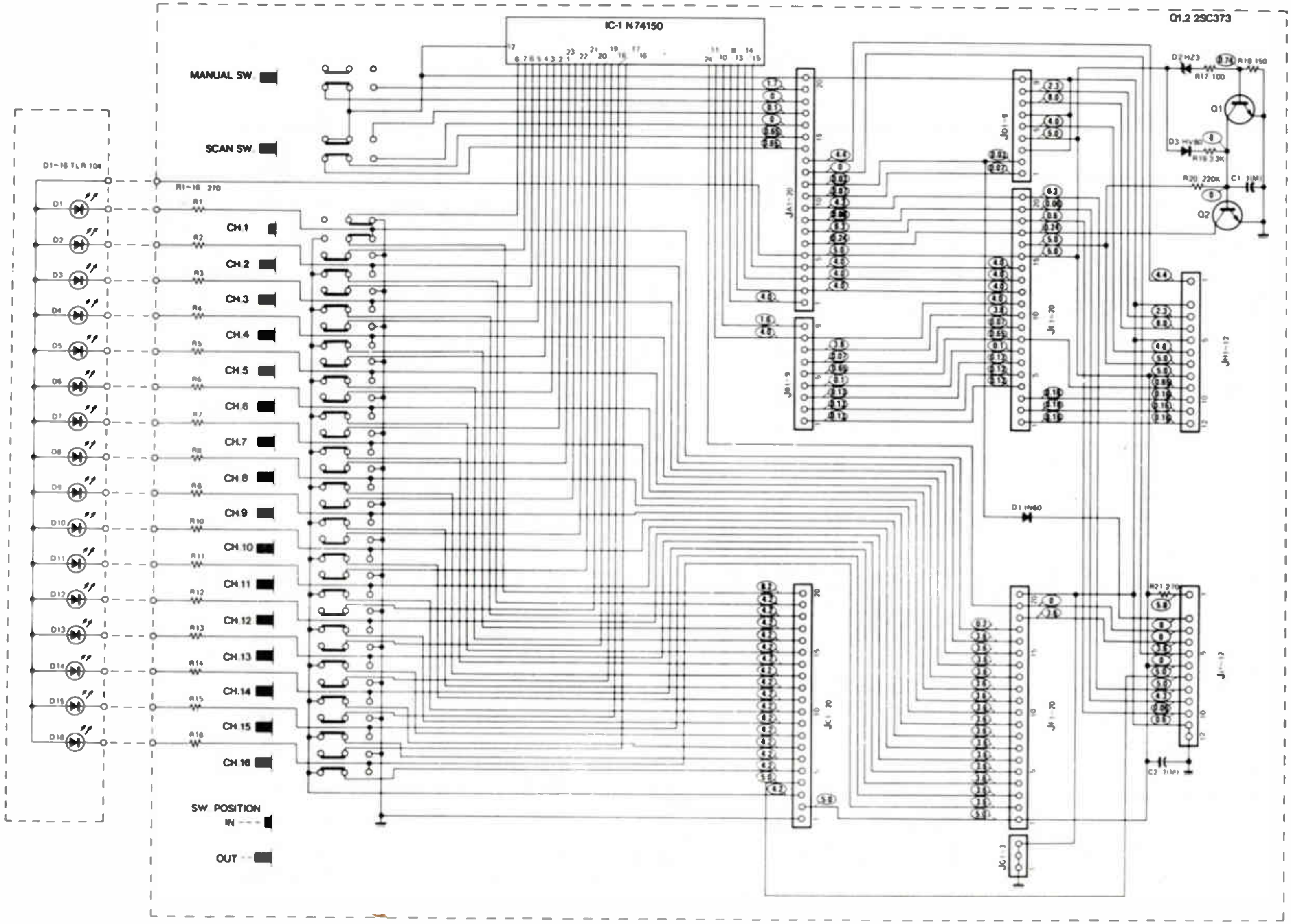
IC-7 N7404

TA-1~3, TA-58

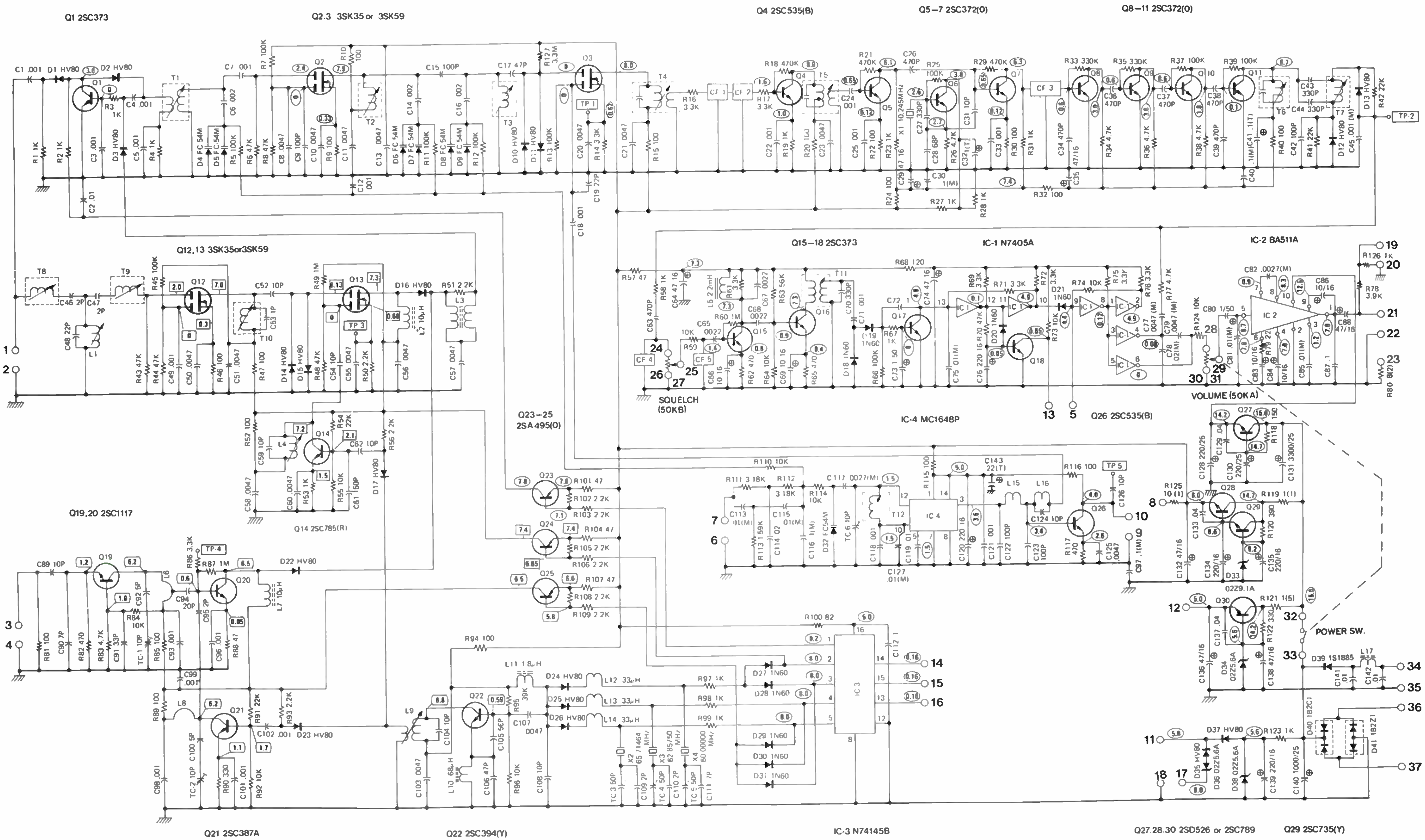
PLL/PROGRAMMER P.C. BOARD



DIGITAL/DISPLAY P.C. BOARDS SCHEMATIC DIAGRAM



RF/IF P.C. BOARD SCHEMATIC DIAGRAM



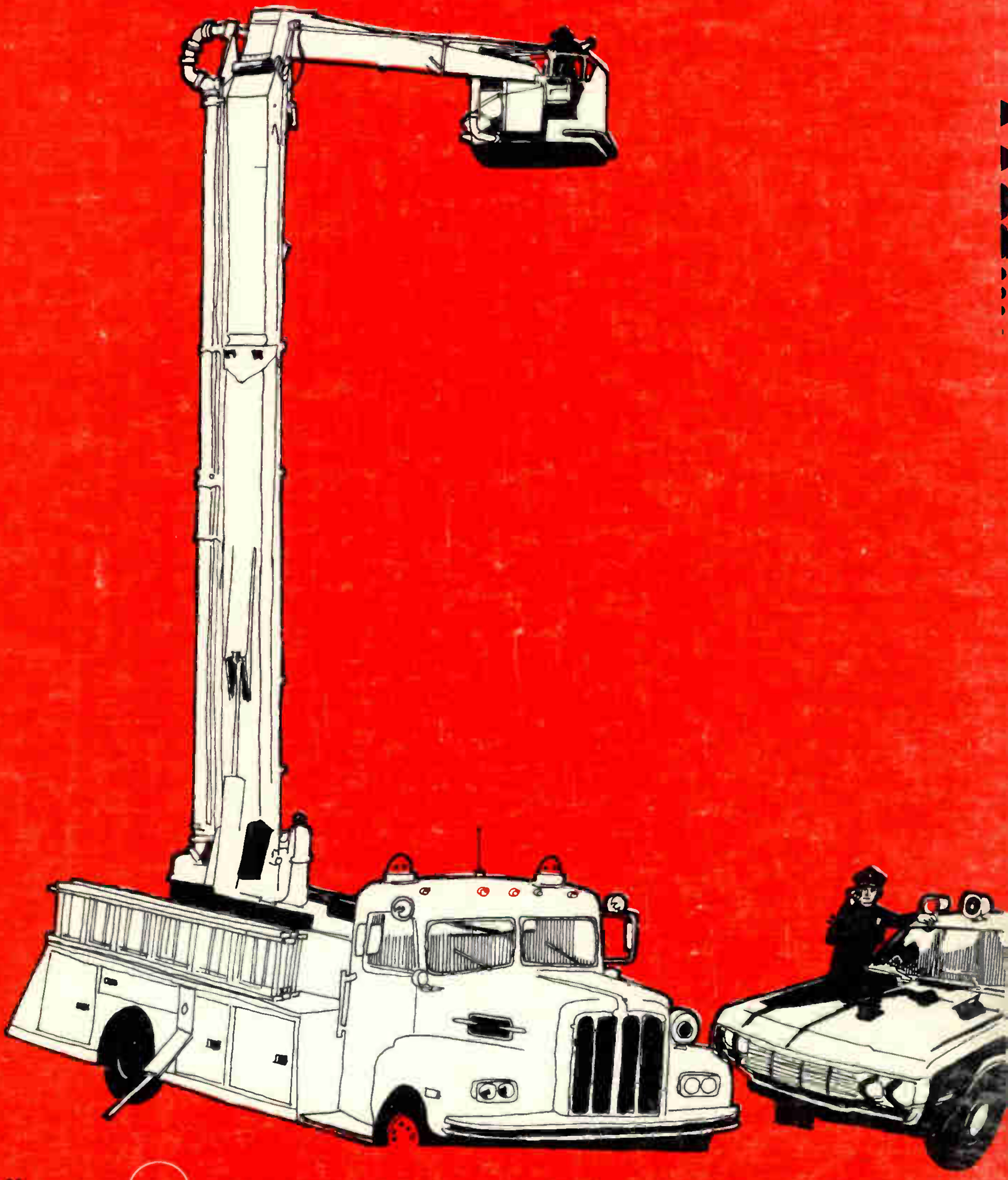
REMARKS

1. RESISTANCE VALUES IN OHMS (K=1,000), (M=1,000,000)
2. CAPACITANCE VALUES IN μF (P=μμF)
3. (T) TANTALUM CAPACITOR
4. (M) MYLAR CAPACITOR
5. ⬭ THIS SYMBOL INDICATES DC VOLTAGE MEASURED WITH DC VOLTMETER (100KΩ/V) UNDER FOLLOWING CONDITIONS: CH-1 LO BAND, MANUAL OPERATION, VOLUME AT MINIMUM AND SQUELCH "OUT".
▭ THIS SYMBOL INDICATES VOLTAGES FOR HIGH BAND OPERATION.
⬭ THIS SYMBOL INDICATES VOLTAGES FOR UHF BAND OPERATION.

TROUBLESHOOTING

Symptom	Possible cause
1) Channel Indicator LED does not light and no sound output. Volume Control : MAX. Channel/Digit Switches : Pushed-in Squelch Control : Extreme CCW	1) Faulty line power cord. 2) Defective power transformer. 3) Defective power switch. 4) DC or AC line fuse blown. 5) Defective diodes D39 ~ D41 on RF/IF P.C. Board. 6) Defective voltage regulator circuit component on RF/IF P.C. Board.
2) Channel Indicator LED lights but no sound. Volume Control : MAX. Squelch Control : Extreme CCW Channel/Digit Switches : Pushed-in	1) Defective speaker or speaker jack. 2) Faulty AF amplifier circuit component on RF/IF P.C. Board. 3) Faulty IF amplifier circuit component on RF/IF P.C. Board.
3) Sound but channel lamp does not light. Volume Control : MAX. Squelch Control : Extreme CCW Channel/Digit Switches : Pushed-in	1) Defective Channel/Digit switch or defective display circuit component. 2) Defective 5 V Regulator circuit component on RF/IF P.C. Board.
4) Does not scan and Squelch does not operate.	1) Defective Squelch control. 2) Defective IF amplifier circuit on RF/IF P.C. Board. 3) Defective noise amplifier, noise detector and/or integrated circuit IC-1 on RF/IF P.C. Board.
5) Does not scan but Squelch operates.	1) Defective SCANNING/PROGRAMMER P.C. Board. 2) Defective SCAN or MANUAL switch or faulty associated circuit component.
6) MANUAL selector does not operate but auto SCAN operates.	1) Defective MANUAL switch or associated circuit component. 2) Defective D3 and integrated circuit IC-3 or transistor array TA-1 on SCANNING/PROGRAMMER P.C. Board.
7) Auto SCAN does not operate but MANUAL selector operates.	1) Defective SCAN switch or associated circuit component.
8) Skipper does not operate.	1) Defective Channel/Digit switch. 2) Faulty diodes D7, D11 and D12 or skipper circuit component on SCANNING/PROGRAMMER P.C. Board.
9) Delay does not operate.	1) Faulty diode D-20 or Electrolytic capacitor C76 on RF/IF P.C. Board.

Symptom	Possible cause
10) PROGRAM does not operate or makes mistakes in read out and/or write on.	1) Defective PROGRAM switch, ENTER switch and/or associated circuit component. 2) Defective Channel/Digit switch. 3) Defective integrated circuit IC-1 on DIGITAL P.C. Board. 4) Defective SCANNING/PROGRAMMER P.C. Board component parts. 5) Defective PLL/PROGRAMMER P.C. Board component parts. 6) Faulty memory integrated circuit IC-4 and/or associated circuit component parts on the PLL/PROGRAMMER P.C. Board. 7) Faulty integrated circuit IC-1, 2, 3, 7, 8, and/or associated circuit components parts on the PLL/PROGRAMMER P.C. Board. 8) Faulty DISPLAY P.C. Board.
11) Memory operates but after a certain period the read out memory becomes faulty.	1) Weak battery (9 volt) 2) Defective diode D35 ~ 38 and/or associated circuit component on RF/IF P.C. Board. 3) Faulty memory IC, IC-4 or associated circuit component on PLL/PROGRAMMER P.C. Board.
12) Program memory operates but in case of repeated moving of power switch to ON and OFF the memory read out becomes faulty.	1) Weak battery (9 volt) 2) Faulty memory protector Q1, 2 and/or associated circuit component on DIGITAL P.C. Board. 3) Faulty power supply and regulator circuit component parts on RF/IF P.C. Board.
13) Program memory operates in read out and write on but unit does not operate on any bands.	1) Defective integrated circuit IC-5, 6, 9 ~ 14 and transistor Q2, 3, 5 or PLL circuit component parts of PLL/PROGRAMMER P.C. Board. 2) Defective VCO circuit component parts on RF/IF P.C. Board. 3) Defective band selector (IC-3) and power supply switching circuit component parts on RF/IF P.C. Board. 4) Defective Low band RF amp and/or mixer circuit component on RF/IF P.C. Board.
14) VHF Hi band does not operate but VHF Lo and program are OK.	1) Defective band selector (IC-3) and/or power supply switching circuit component parts on RF/IF P.C. Board. 2) Faulty crystal X-4 (60.000 MHz) and OSC circuit component parts on RF/IF P.C. Board. 3) Faulty RF switching circuit component on RF/IF P.C. Board. 4) Defective high band RF amp, mixer and buffer amp circuit component on RF/IF P.C. Board.



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4300 WEST 62nd ST. · INDIANAPOLIS, INDIANA 46268

Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

JCPenney Pinto (981-6080/81/82/83/84/85)
Lafayette Monitorscan-8 (99-26288W, 99-26296W)
Midland 13-912
Midland 13-930
Regency TME-8H, TME-8H/LH, TME-8H/LL, TME-8H/LM
Regency TME-8H/LH/U, TME-8H/LL/U, TME-8H/LM/U, TME-8H/U, TME-8LHM
Regency TMR-1H (Late Version), TMR-1LH TMR-1LL, TMR-1LM, TMR-4H (Late Version), TMR-4LH, TMR-4LL, TMR-4LM, TMR-8H (Late Version), TMR-8LH, TMR-8LL, TMR-8LM, TMR-12H, TMR-12LH, TMR-12LL, TMR-12LM
Unimetrics Dura Scan-4
Unimetrics Dura Scan-8

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Scanner-Monitor Servicing Data

SD-4

REPRODUCED THROUGH THE COURTESY OF THE MANUFACTURER

HOWARD W. SAMS & CO., INC.
INDIANAPOLIS, INDIANA

First Edition
First Printing—June, 1974
Second Printing— August, 1975

Sams

Scanner-Monitor Servicing Data

SD-4

Library of Congress Catalog Card Number 72-92711

Scanner-Monitor Servicing Data

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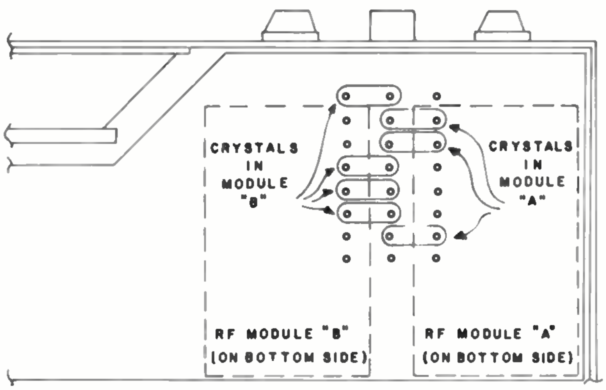


L, H or U modules may be in either position.

Figure 1

CRYSTAL FORMULAS

146-174 mHz – $\dfrac{\text{Received frequency} - 10.80\text{ mHz}}{3}$ = crystal frequency.

Example: $\dfrac{155.01\text{ mHz} - 10.80\text{ mHz}}{3} = 48.07000\text{ mHz}$

30-50 mHz – Received frequency + 10.80 mHz = crystal frequency.

Example: 35.80 mHz + 10.80 mHz = 46.60000 mHz

450-512 mHz – $\dfrac{\text{Received frequency} - 10.80\text{ mHz}}{9}$ = crystal frequency.

Example: $\dfrac{453.250\text{ mHz} - 10.80\text{ mHz}}{9} = 49.16111\text{ mHz}$

CRYSTAL INSTALLATION

DISCONNECT POWER BEFORE REMOVING CABINET

To remove the cabinet, first remove the screw at the bottom rear edge. Push the rear panel forward through the cabinet. The components and crystal sockets are in full view and easily accessible.

The three crystal pin sockets at the front are for channel No. 1. The second row of 3 is for channel 2 etc. Each crystal will be installed between the center row and one outside row. The outside rows connect to the r-f module nearest them on the opposite side of the board. Only one outside row will be used when only one r-f module is used. A total of eight crystals may be used. They may be installed in any order and in either band as long as each crystal frequency is proper for the particular module to which it is connected.

Remove the crystal by a gentle pull upward. Insert the crystal by aligning the pins with the sockets and pushing straight down. DO NOT BEND THE SOCKETS. THESE MINIATURE SOCKETS ARE MADE OF SPRING BRONZE AND WILL BREAK OFF IF BENT EXCESSIVELY.

NOTE: Do not install two crystals of the same frequency.

Rigid quality standards are applied to crystals furnished by us to assure full performance, therefore our warranty does not include correcting poor operation caused by crystals from other sources.

Unless ordered otherwise the "U" alignment spread is 450mHz to 470mHz, the "H" 150 mHz to 174mHz, and the "L" 33 mHz to 48 mHz. New frequencies may be added within these spreads.

USER HINTS

Radio equipment usually operates in an environment of man-made electro-magnetic noise which radiates from power lines, fluorescent lights, motors, appliances, ignition systems, etc. Modern radios are designed to minimize interference from such sources but operation may be affected under conditions of unusually strong noise.

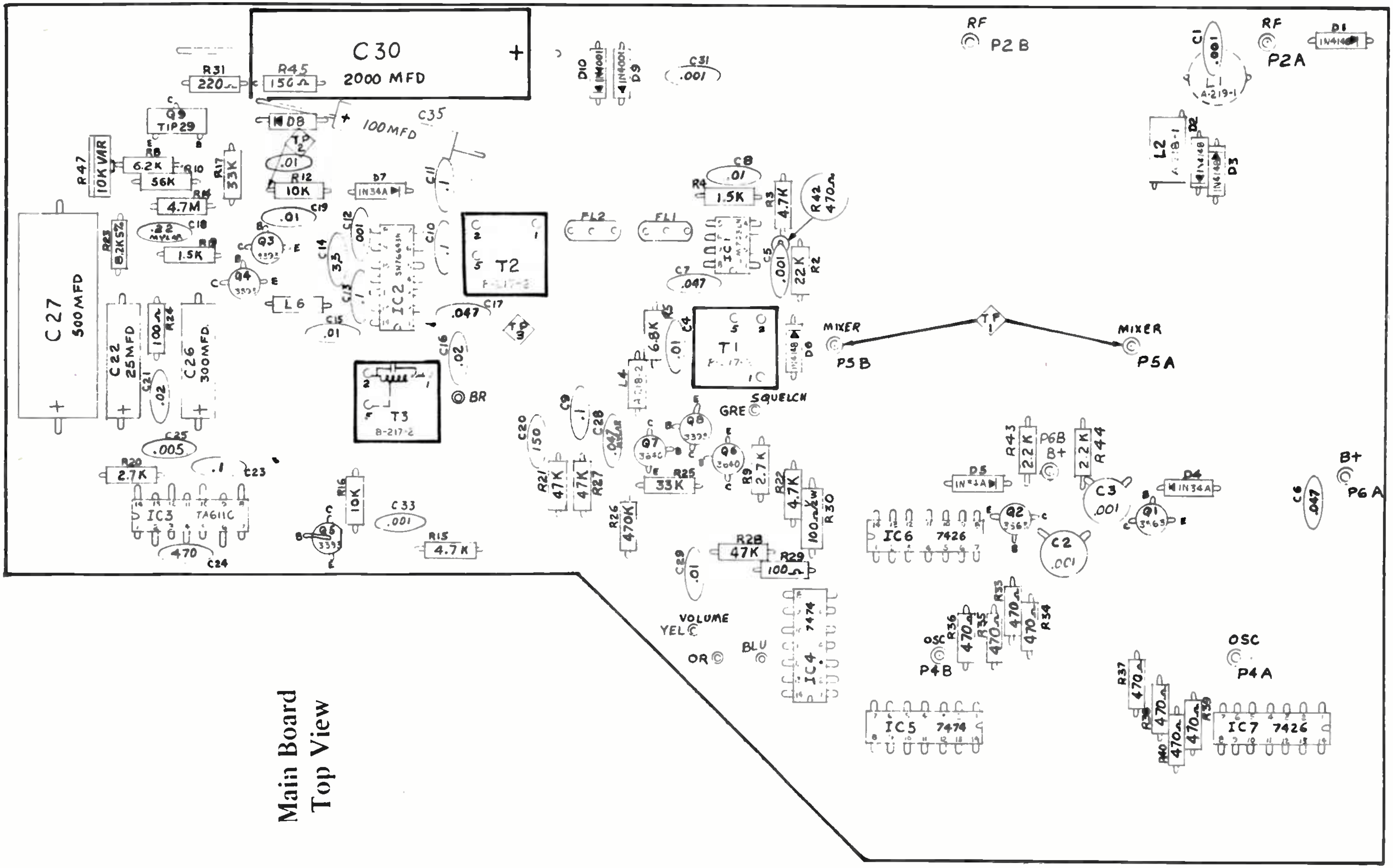
Distant weak, "skip" or noise signals may be received by this receiver because of its high sensitivity. Whenever such conditions interupt scanning or whenever a very busy channel prevents reception of other desired signals, the affected channel may be bypassed by means of its individual panel switch.

The squelch control functions in the normal manner and, in addition, as it is rotated counterclockwise farther, it becomes a sensitivity control. By careful setting, it can accept weak signals or can be adjusted to receive only medium or strong signals. Interference from weak signals on the same channel may be reduced in this manner.

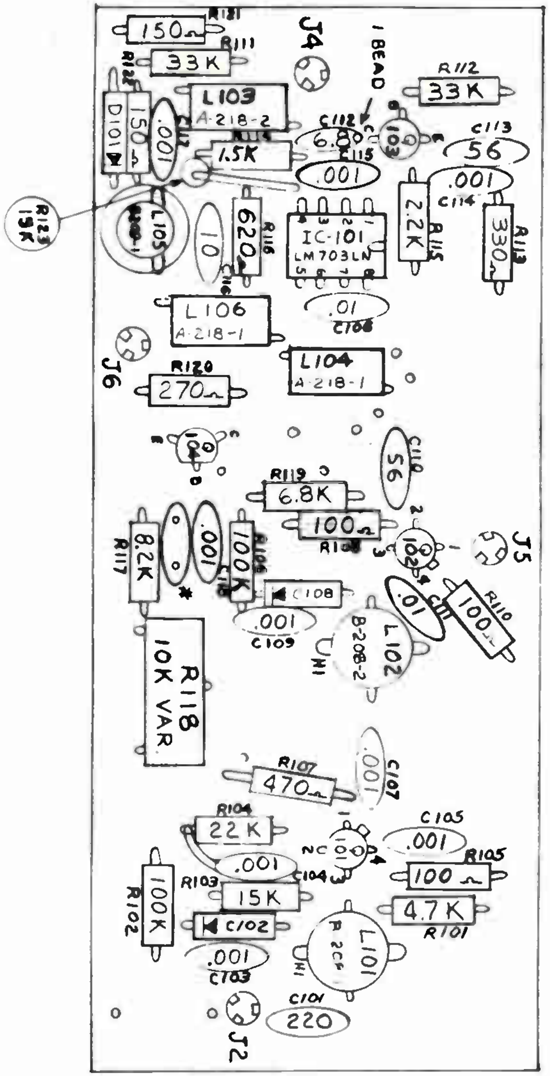
In cases of strong interfering noise or signals it may be desirable to reduce the length of the antenna to reduce noise pickup below a critical level. This may be very effective in medium and strong signal areas.

In mobile service the commonly encountered poor reception conditions are signal fading, nearby faulty ignition systems, power lines and proximity to strong signals. Careful setting of the squelch control will minimize these conditions.

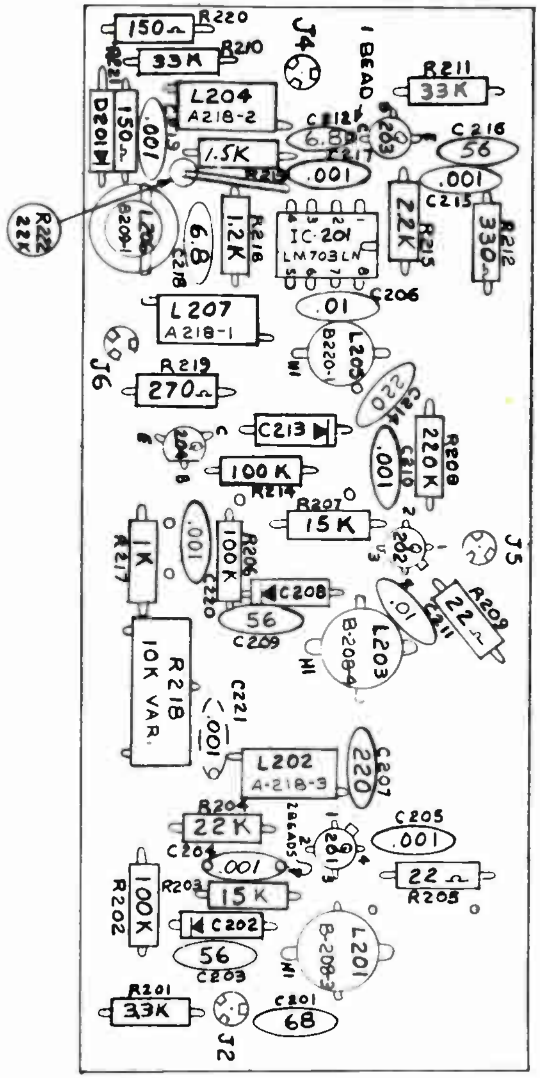
When moving or shipping the radio, remove the telescoping antenna to avoid damage to it or to the internal circuit assemblies.



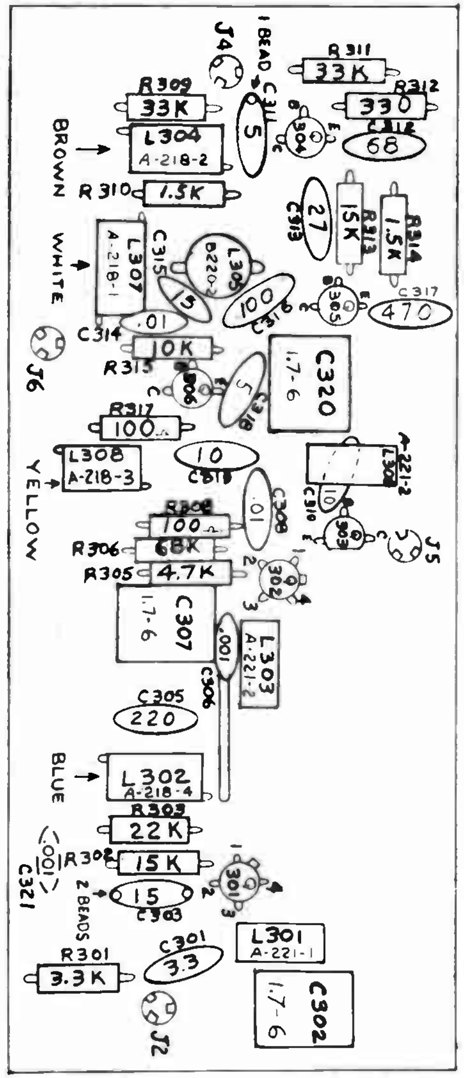
Main Board
Top View



LO BAND
3 L MODULE
Top View



HI BAND
3 H MODULE
Top View



UHF BAND
3 U MODULE
Top View

VOLTAGE CHART

The Voltage Chart may be used as an approximate guide in following circuit operation or locating a defective stage. You should be familiar with the entire manual before attempting measurements.

TRANSISTOR VOLTAGES				
Q#	E	B	C	
‡ 1	GND	.2/0	0/3.2	
‡ 2	GND	0/.2	3.2/0	
* 3	GND	.4/.6	.7/0	
* 4	GND	.7/0	.01/9	
† 5	0	.01/.7	GND	
† 6	10.2	10.2	4.0/.9	
7	4.0/.9	5.8	.5	
8	GND	.5	5.8	
9	11.0	11.5	16.0	
103	3.0	3.6	10.3	
104	7.4	10.0	9.6	
203	2.9	3.6	10.2	
204	.6	9.9	9.6	
303	9.6	10.3	10.3	
304	2.9	3.4	10.3	
305	6.9	5.5	10.2	
306	.15	-.25	9.0	
---	1	2	3	4
101	8.2	3.8	0	.08
102	10.2	.16	0	.05
201	10.2	4.3	0	.2
202	10.2	.7	0	.24
301	10.3	4.2	0	.14
302	9.6	.65	0	.13

INTEGRATED CIRCUIT VOLTAGES							
PIN NO.	I.C. NUMBER						
	1	2	3	4	5	6	7
1	1.6	4.6	13	NC	NC	5.0	.1
2	GND	3.5	NC	4.4	5.0	5.0	.1
3	1.4	NC	9.1	5.0	.1	9.0	9.0
4	NC	1.4	.7	1.5	NC	5.0	.1
5	10	1.4	.5	.1	.1	.1	5.0
6	NC	1.4	NC	4.4	5.0	9.0	9.0
7	1.6	GND	0	GND	GND	GND	GND
8	NC	GND	GND	4.4	5.0	9.0	.2
9		.14	NC	.1	.1	.1	5.0
10		1.4	GND	1.4	NC	.1	5.0
11		NC	.5	6.2	5.0	9.0	9.0
12		3.5	7.9	4.4	5.0	.1	5.0
13		10	0	5.5	NC	5.0	.1
14		5.3	15	6.2	6.2	.1	4.4

Voltages are measured with "Manual-Scan" switch in manual position, "Volume" control counterclockwise and "Squelch" counterclockwise except:

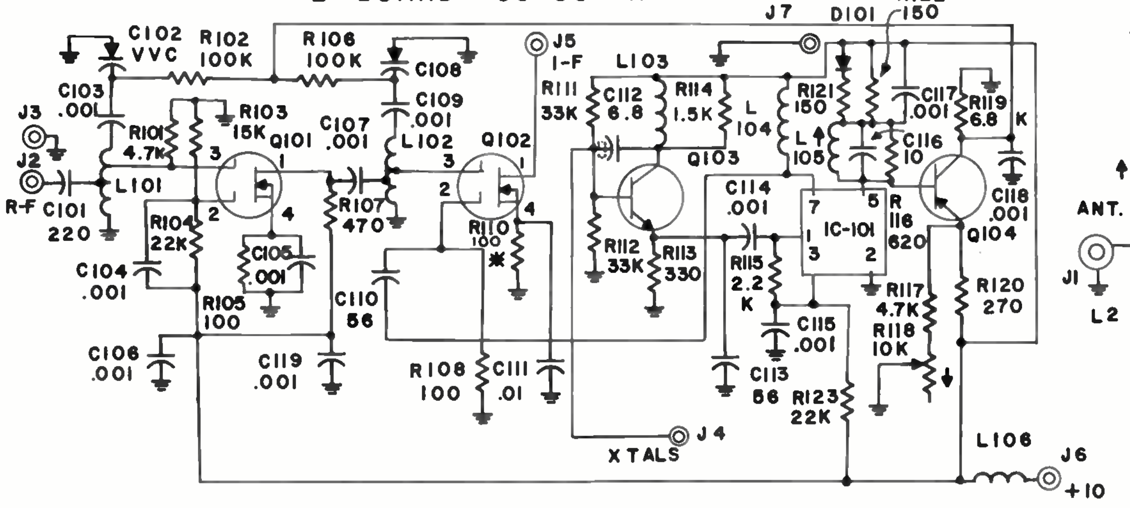
- * Squelch control CW/CCW
- † Scanning/Manual
- ‡ Crystal operating on A/B side

	COUNT								
I.C. No.	PIN	1	2	3	4	5	6	7	8
4	5	0	0	0	0	1	1	1	1
	6	1	1	1	1	0	0	0	0
	8*	1	1	1	1	1	1	1	1
	9*	0	0	0	0	0	0	0	0
5	5	0	1	0	1	0	1	0	1
	6	1	0	1	0	1	0	1	0
	8	1	1	0	0	1	1	0	0
	9	0	0	1	1	0	0	1	1
7	8	0	1	1	1	1	1	1	1
	11	1	0	1	1	1	1	1	1
	6	1	1	0	1	1	1	1	1
	3	1	1	1	0	1	1	1	1
6	3	1	1	1	1	0	1	1	1
	6	1	1	1	1	1	0	1	1
	11	1	1	1	1	1	1	0	1
	8	1	1	1	1	1	1	1	0

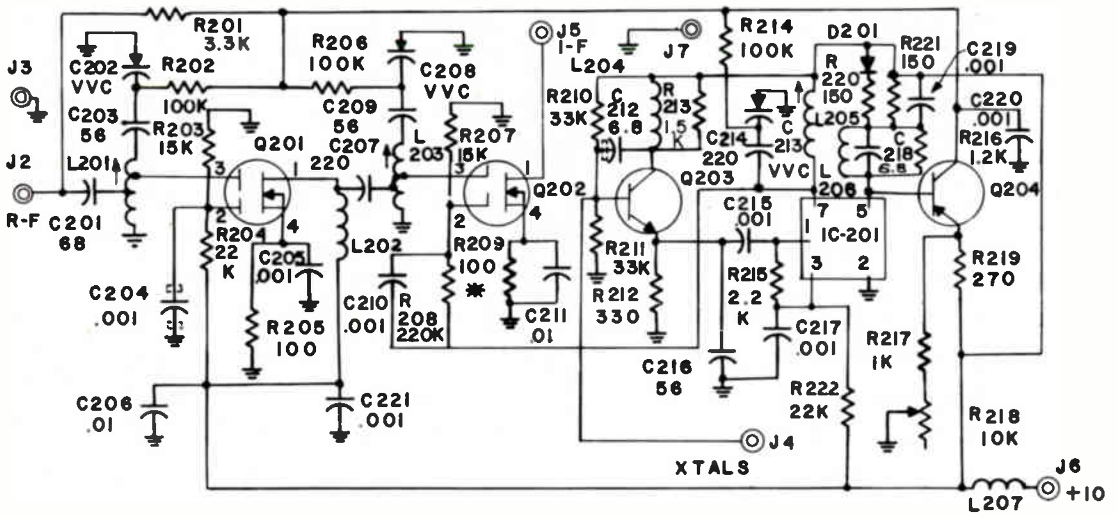
LOGIC CHART

The logic sequence for counting is shown by "0" under .5v and "1" over 4v. I.C.-4, pins 8 & 9 (*) change state on each movement, up or down, of the "Manual-Scan" Switch.

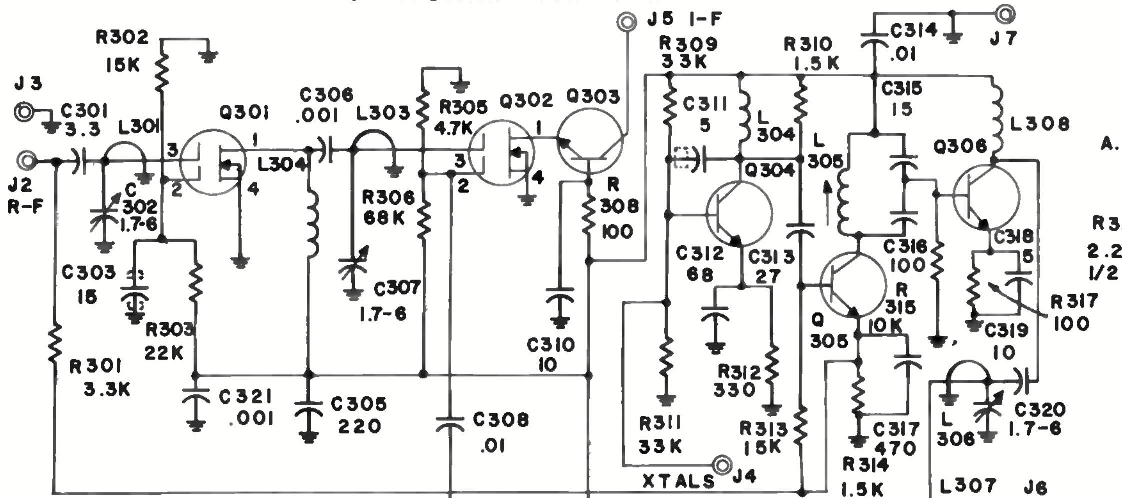
L BOARD 30-50 MHZ

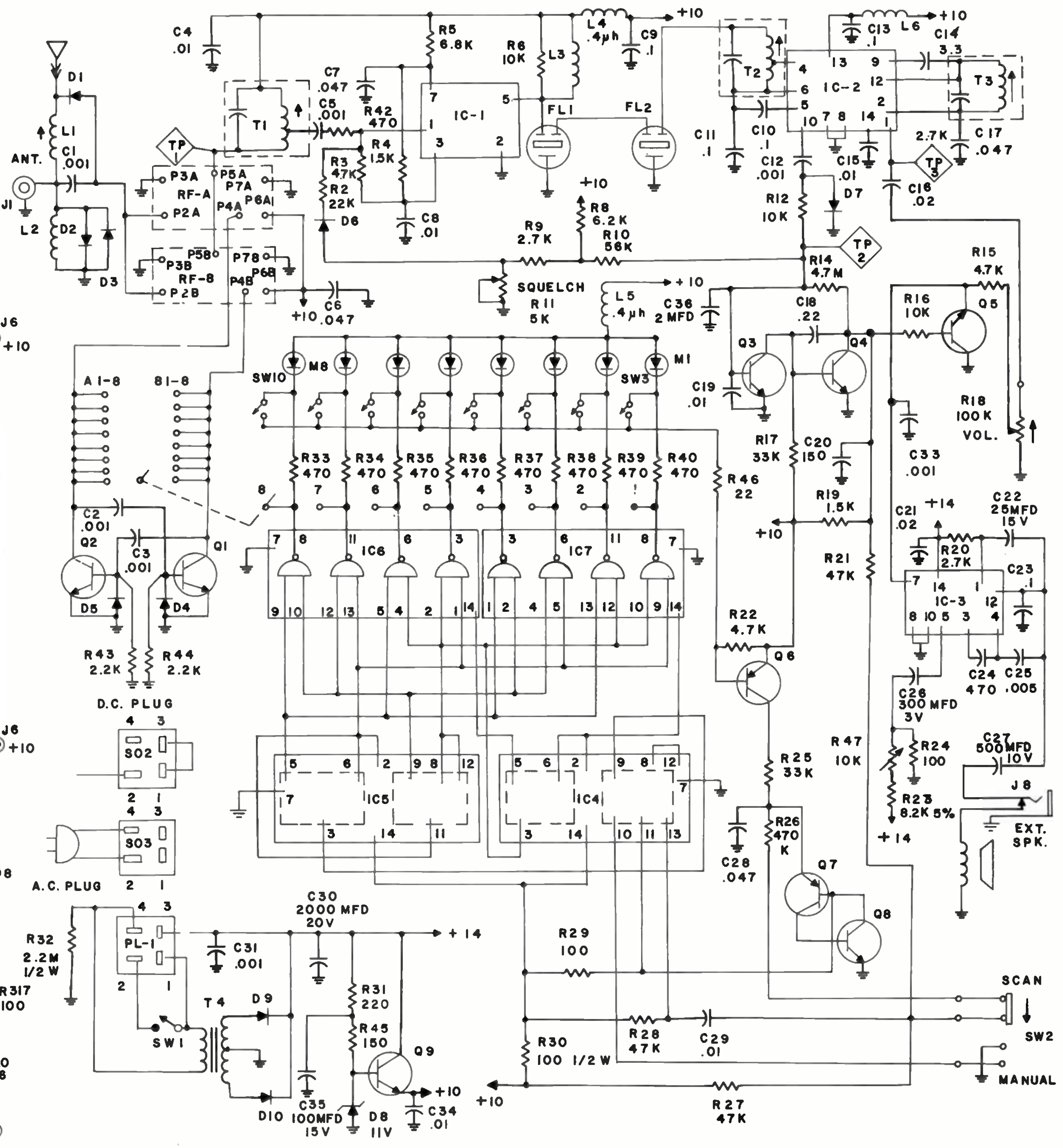


H BOARD 146-174 MHZ



U BOARD 450-470 MHZ





✱ VALUE MAY CHANGE

RESISTOR VALUES IN OHMS

CAPACITOR VALUES BELOW 1 IN MFD, ABOVE 1 IN pf

UNLESS OTHERWISE SPECIFIED

ALIGNMENT

I–F SECTION

Alignment of the I–F system consists of optimizing the input and output networks and balancing the detector output. The bandpass and center frequency are established by quartz crystal filters and "peaking" the coils can result in bandpass ripple or poor sensitivity. Field alignment should not be necessary but the procedure is given for general information.

EQUIPMENT NEEDED

Oscilloscope

Sweep generator with 10.79, 10.80 and 10.81mHz markers

1. Connect sweep generator to TP–1 through a 1pf capacitor.
2. Connect oscilloscope to TP–2.
3. Maintain output of 10.8mHz sweep generator at a low level to prevent distortion from overloading.
4. Adjust T1 and T2 for maximum output, and minimum ripple. See Figure 2.

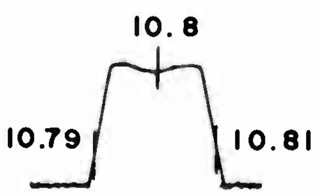


Figure 2

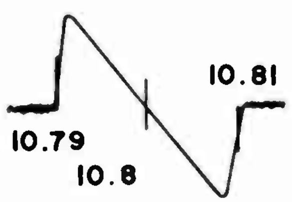


Figure 3

5. Connect scope to pin TP–2 and adjust T3 so that 10.8mHz is in center of discriminator curve and for best linearity. See Figure 3.

ALTERNATE METHOD: I–F alignment may be checked using a Measurements Model 800 Generator or equivalent tuned to an operating frequency and swept ±25kc. Markers are not essential since center frequency is determined by the filter.

R–F SECTION

DO NOT ATTEMPT ALIGNMENT OR "PEAKING" OF R–F MODULES.

The R–F alignment points are adjusted and sealed at the factory and should not be disturbed. Factory alignment involves multi-frequency signal generation systems, add-on test modules, output indicators and training beyond the scope of normal service activities.

The unique R–F system includes electronic tracking of R–F and oscillator circuits for maximum performance over a wide range of frequencies. THIS PERFORMANCE CAN BE DESTROYED BY AN ATTEMPT TO "PEAK UP" OR "TWEAK" OR "OPTIMIZE", ETC.

NOTE: When ordering replacement parts not otherwise listed, order from manufacturer by item number and description.

SEMICONDUCTORS

ITEM	PART NO./TYPE
(Main Board)	
D1	1N4148
D2	1N4148
D3	1N4148
D4	1N34A
D5	1N34A
D6	1N4148
D7	1N34A
D8	1N5241B(11 V, 5%)
D9	1N4001
D10	1N4001
IC1	LM703LN NAT.
IC2	SN76643N (ULN2111A)
IC3	TA-611CS.G.S
IC4	SN-7474
IC5	SN-7474
IC6	SN-7426
IC7	SN-7426
M1-8	A-259
Q1	2N3563 F.C.
Q2	2N3563 F.C.
Q3	MPS3393Mot.
Q4	MPS3393Mot.
Q5	MPS3393Mot.
Q6	2N3640
Q7	2N3640
Q8	MPS3393Mot.
Q9	TIP-29T.I.
("L" Module)	
C102	A-225-1
C108	A-225-1
D101	1N34A
IC101	LM703LN Nat.
Q101	3N201T.I.
Q102	3N201T.I.
Q103	2N3563F.C.
Q104	2N3640
("H" Module)	
C202	A-258-1
C208	A-258-1
C213	A-258-1
D201	1N34A
Q201	3N201T.I.
Q202	3N201T.I.
Q203	2N3563F.C.
Q204	2N3640
("U" Module)	
Q301	3N201T.I.
Q302	3N201T.I.
Q303	2N3563F.C.
Q304	2N3563F.C.
Q305	MPS-3393
Q306	2N3563F.C.

ELECTROLYTIC/VARIABLE CAPS

ITEM	VALUE
(MAIN BOARD)	
C22	25 uF 10 V
C26	100 uF 3 V
C27	500 uF 10 V
C30	2000 uF 20 V
C35	100 uF 15 V
C36	2 uF 35 V
("U" Module)	
C302	1.7-6 pF Trimmer
C307	1.7-6 pF Trimmer
C320	1.7-6 pF Trimmer

CONTROLS

ITEM	DESCRIPTION
(Main Board)	
R11	5000 ohms Squelch
R18	100 K Volume/Switch
("L" Module)	
R118	10 K Bias
("H" Module)	
R218	10 K Bias

COILS/TRANSFORMERS

ITEM	PART NO.
(Main Board)	
L1	A-219-1
L2	A-218-1
L3	A-205-1
L4	A-218-2
L5	A-261
T1	B-217-2
T2	B-217-2
T3	B-217-2
T4	B-202
("H" Module)	
L201	B-208-3
L202	A-218-3
L203	B-208-4
L204	A-218-2
L205	B-220-1
L206	B-209-1
L207	A-218-1
("L" Module)	
L101	B-208-1
L102	B-208-2
L103	A-218-2
L104	A-218-1
L105	B-209-2
L106	A-218-1
("U" Module)	
L301	A-221-1
L302	A-218-4
L303	A-221-2
L304	A-218-2
L305	B-220-2
L306	A-221-2
L307	A-218-1

MISCELLANEOUS

ITEM	NAME	PART NO.
FL1	Filter,Crystal	A-226
FL2	Filter,Crystal	A-226
SP1	Speaker,3"X5",3.2 ohms	B-248
SW2	Switch, Manual/Scan	B-254
	Antenna, Telescopic	A-138-2

CABINET PARTS

NAME	PART NO.
Panel, Front	B-228P
Trim, Cabinet	C-233
Knob, Control	RB-155-840

Pages 13-22 Courtesy of
LAFAYETTE RADIO & ELECTRONICS.

TELESCOPING WHIP ANTENNA

A specially designed telescoping whip antenna is supplied with this receiver. In a primary signal strength area, this antenna will give you satisfactory results.

When using this antenna, simply remove rubber stopper [located on the upper rear side of the cabinet] and insert antenna into mounting hole provided and screw it into cabinet securely. Then extend whip antenna to its full length in order to provide best reception.

NOTE: If your reception is not adequate using the Telescoping whip antenna supplied with unit, refer to the following section titled "ANTENNAS".

ANTENNAS

The receiving capabilities with your new Lafayette MONITORSCAN-8 will be greatly determined by the efficiency of the antenna system used. Due to the complexity of the subject, it is not within the scope of this manual to provide detailed information on antenna systems, although this section does contain some general information which may be of value.

RG58/U or RG8/U should be used as the antenna lead-in cable. For optimum results in a mobile installation, the length of antenna cable should be made as short as possible. In a base station installation, an exceptionally long lead-in cable may be required, when lengths of over 50 feet are necessary, RG8/U coaxial cable is more suitable since it offers lower loss than RG58/U.

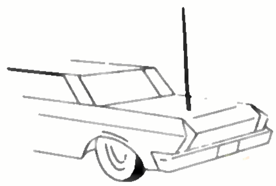
The antenna lead-in cable [RG58/U or RG8/U] should be terminated with a PL-259 type male coaxial connector which should then be attached to the "ANT" connector located at the rear of the receiver.

VHF MOBILE ANTENNAS

Various types of VHF antennas are available [see Lafayette Catalog] for "high" band VHF operation [150 – 170 MHz].

Two of the most popular locations for an automobile antenna are the center of the roof or the trunk lid as shown in Figure 3.

ROOF MOUNTING



TRUNK LID MOUNTING

Figure 3. VHF Automobile Antenna Mounting

BASE STATION ANTENNAS

There are three basic types of antennas that are used for the reception of high frequency FM signals. These antennas are shown in Figure 4

VERTICAL GROUND PLANE ANTENNA

The vertical ground plane antenna is an omnidirectional type antenna that provides optimum performance for reception of signal that are vertically polarized. Most stations transmitting on the "high" band of frequencies [frequencies covered by your receiver] use antennas that are also vertically polarized, making this type of antenna adequate for reception of signals from medium to long range distance.

COAXIAL ANTENNA

The coaxial type antenna is an antenna similar in operation to the ground plane antenna. This type of antenna performs as well in most application as that of the ground plane type. The coaxial antenna is ideal for these installations where a vertical ground plane is not feasible. This antenna, as in the case of the ground plane, is good for reception of signals from medium to long range distance.

VERTICAL BEAM ANTENNA

The vertical beam antenna is a highly efficient and directional generally intended for long range reception of signals. An average five elements vertical beam provides an equivalent of 8 dB increase in signal reception.

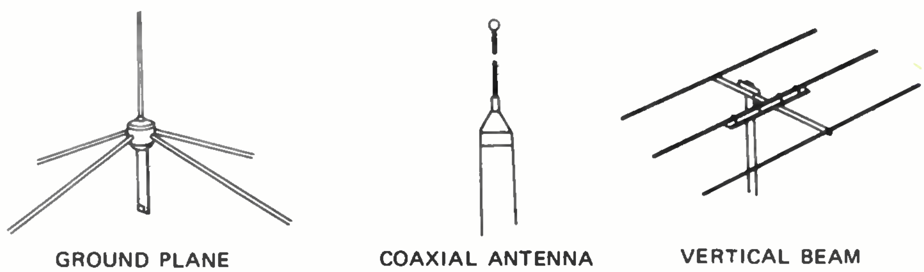


Figure 4. Base Station Antennas

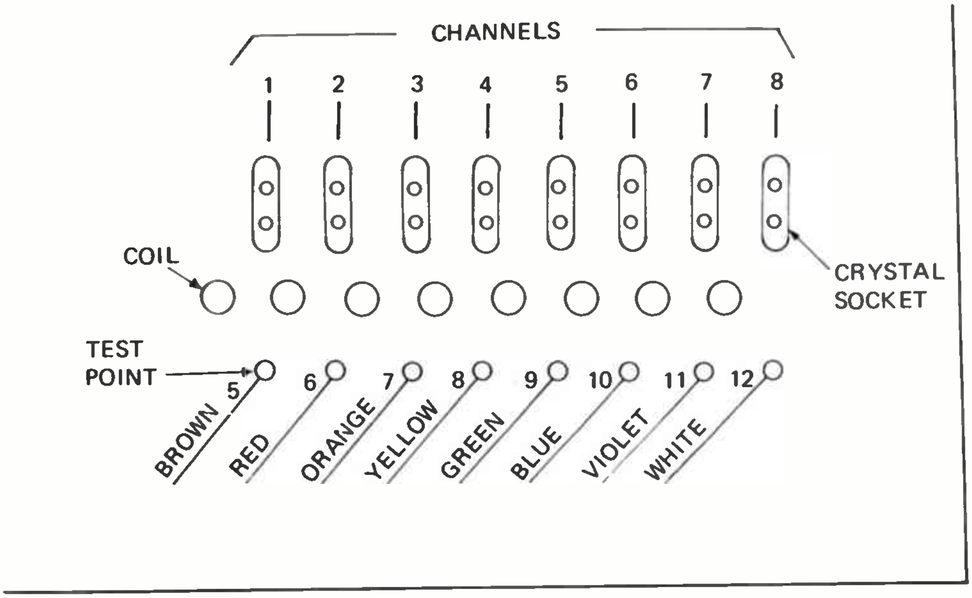
CRYSTAL INSTALLATION

Crystals are not normally installed at the factory, but by the seller or owner of the receiver.

1. Remove the uppermost chassis cover by removing 2 screws on each side of the unit. Then, remove cover with care -- the internal speaker is connected by two leads to the main chassis.

NOTE: To identify which crystal socket is for which channel, there is a different color-coded wire going to a test point opposite each crystal socket. See Figure 5. for means of identification.

2. Insert as many crystals as desired [up to 8 crystals] into the crystal sockets on the printed circuit board. Make sure each crystal is firmly seated into each socket. Then, make a chart showing the crystal receiving frequency versus the channel affected by that frequency for your own future reference.



MONITORSCAN-8 FRONT PANEL

Figure 5. Crystal Locations

PLEASE READ THE FOLLOWING BEFORE ORDERING CRYSTALS

Each Lafayette MONITORSCAN-8 is normally available from the factory tuned to the following standard center frequency.

1. Lafayette Stock No. 99-26213W - "150-160 MHz". Standard center frequency 155 MHz.
2. Lafayette Stock No. 99-26221W - "160-170 MHz". Standard center frequency 165 MHz.

ORDERING CRYSTALS

To order crystals, send for a crystal certificate from Lafayette Radio Electronics under Stock No. 40-82145Y.

When you receive your crystal certificate, fill it out as follows:

1. Print name and address on both portions of certificate.
2. Where it says "MAKE" print the word "LAFAYETTE".
3. Where it says "MODEL" print "MONITORSCAN-8".
4. Where it says "MONITOR FREQUENCY" print the "RECEIVING FREQUENCY". For example, if you wish to monitor Marine Channel 16 [156.800 MHz], print in this box "156.800 MHz" [receiving frequency].

NOTE: We recommend 156.800 MHz [Marine Channel 16] for monitoring Intership, and Ship-to-Shore for Distress, Safety and Calling Channel.

5. Detach customer copy [this is your receipt] and mail crystal certificate directly to manufacturer [as stated on certificate]. Allow approximately 4 weeks for delivery of crystals.

OPERATION CONTROLS AND FEATURES

1. VOLUME/ON-OFF . . . .
   Varies the sound output from the built-in speaker, or any external speaker connected to the "EXT. SP." jack [located at the rear of the receiver]. Also incorporates an "ON-OFF" power switch at the extreme counter-clockwise position.

2. SQUELCH CONTROL . . . .
This control is used to quiet the receiver during "no-signal" conditions. Degree of sensitivity to incoming signals is adjustable. When the control is rotated to the extreme right position [clockwise], it provides maximum squelch; in the extreme left position [counter-clockwise], it provides minimum squelch.

3. AUTO/MAN PUSH-BUTTON . . . .
Selects mode of operation for the receiver, either automatic scanning or manual selection of all 8 channels.

4. DELAY PUSH-BUTTON . . . .
When this button is depressed the receiver circuitry will delay switching to the next channel by holding it 1 second longer when a transmission is no longer being received. The "DELAY" push-button is only operative when the "AUTO/MAN" push-button is in the "AUTO" [released] position.

5. SEL PUSH-BUTTON . . . .
This push-button is used to manually select a desired channel.

6. CHANNEL INDICATORS . . . .
Instant-reading, digital read-out indicator shows crystal position selected [one through eight].

7. CHANNEL BYPASS PUSH-BUTTONS . . . .
Individual push-buttons for each channel position permit skipping of any channels [when depressed] during autoscanning or manual mode of operation.

8. TELESCOPING ANTENNA MOUNTING HOLE . .
For use with Telescoping Antenna supplied with receiver.

9. MOUNTING BRACKET . . . .
Specially designed bracket simplifies mobile installation under the dash -- has "quick-release" feature for fast removal of receiver.

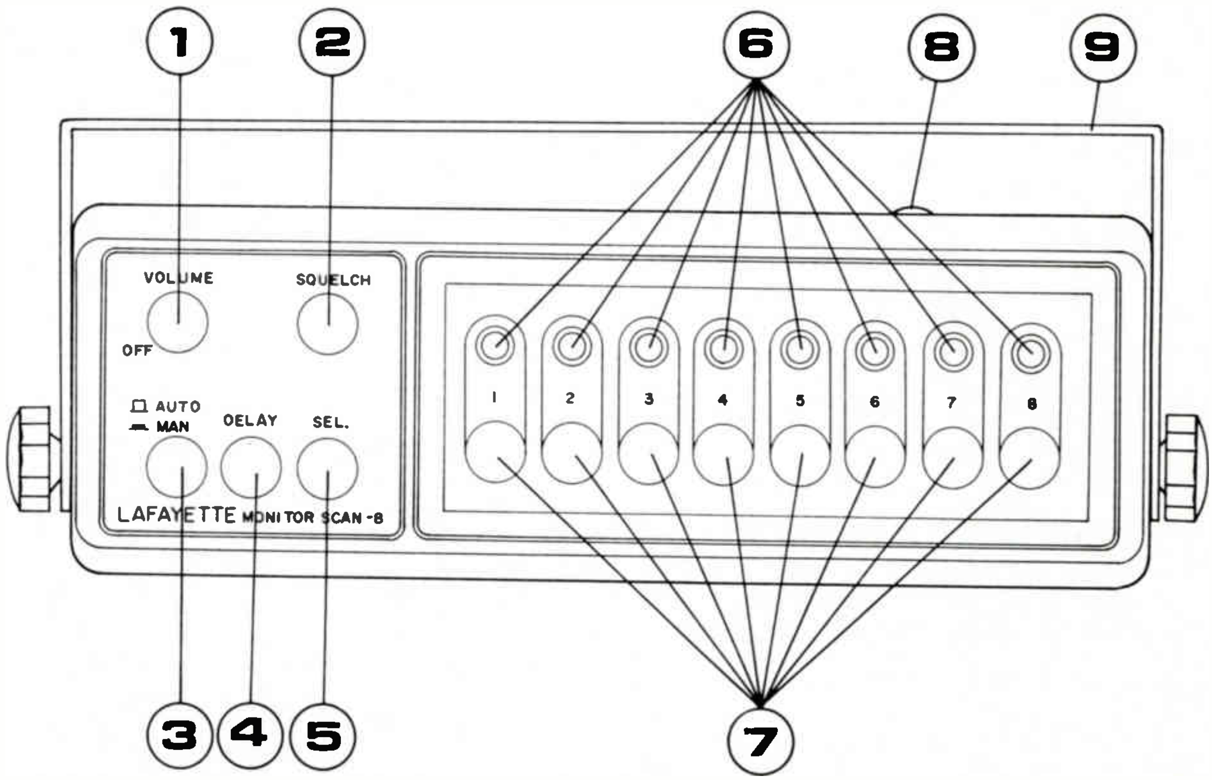


Figure 6. MONITORSCAN-8 Front Panel View

10. ANTENNA RECEPTACLE ....
For connection of external antenna lead-in cable [RG-58/U or RG-8U] with matching PL-259 type coaxial connector.

11. RECORD [REC] OUTPUT JACK ....
For connection of a tape recorder using an audio lead-in cable with an RCA-phono type plug to be inserted into this jack.

12. EXTERNAL SPEAKER JACK ....
The impedance of earphones or speakers connected to this jack should be 8-16 ohms. Insertion of a plug into this jack automatically silences the internal speaker.

13. DC POWER RECEPTACLE ....
For connection of DC Power Cable, [13.8 Volts DC, negative ground only].

14. AC POWER RECEPTACLE ....
For connection of AC Power Cable, [105-120 Volts AC, 50/60 Hz].

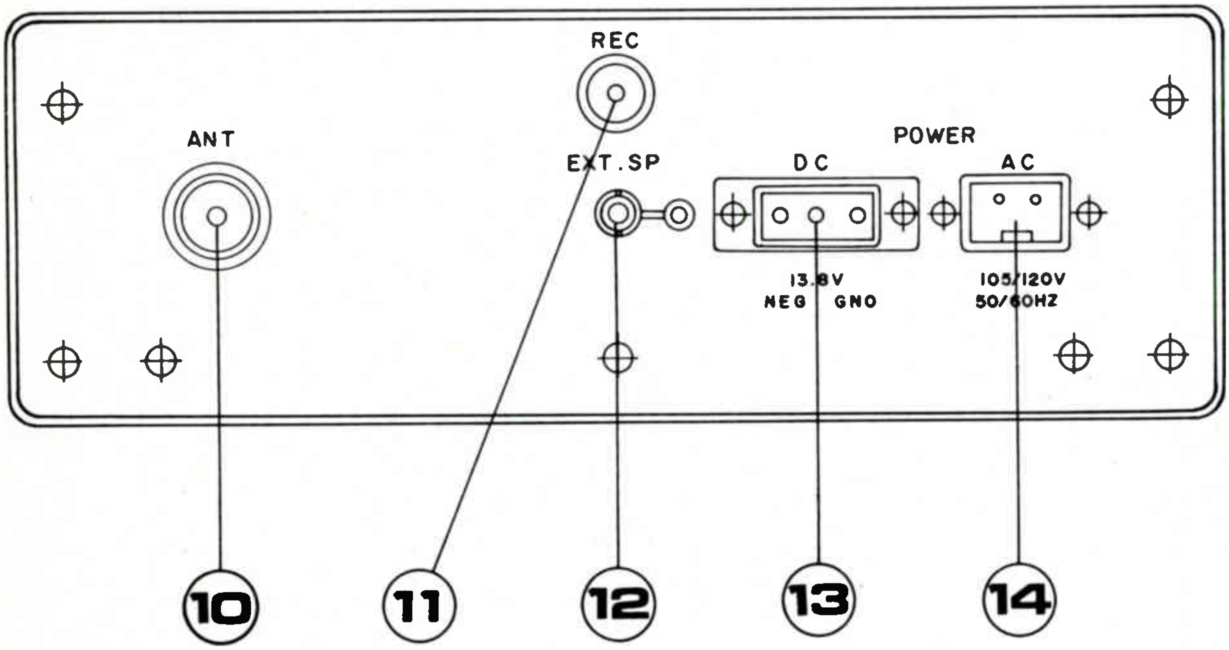


Figure 7. MONITORSCAN-8 Rear Panel View

OPERATING INSTRUCTIONS

1. Make sure the receiver is properly installed for mobile or base operation.

2. Make sure the Telescoping Antenna [supplied with unit] or an external antenna is connected to the receiver [as previously indicated].

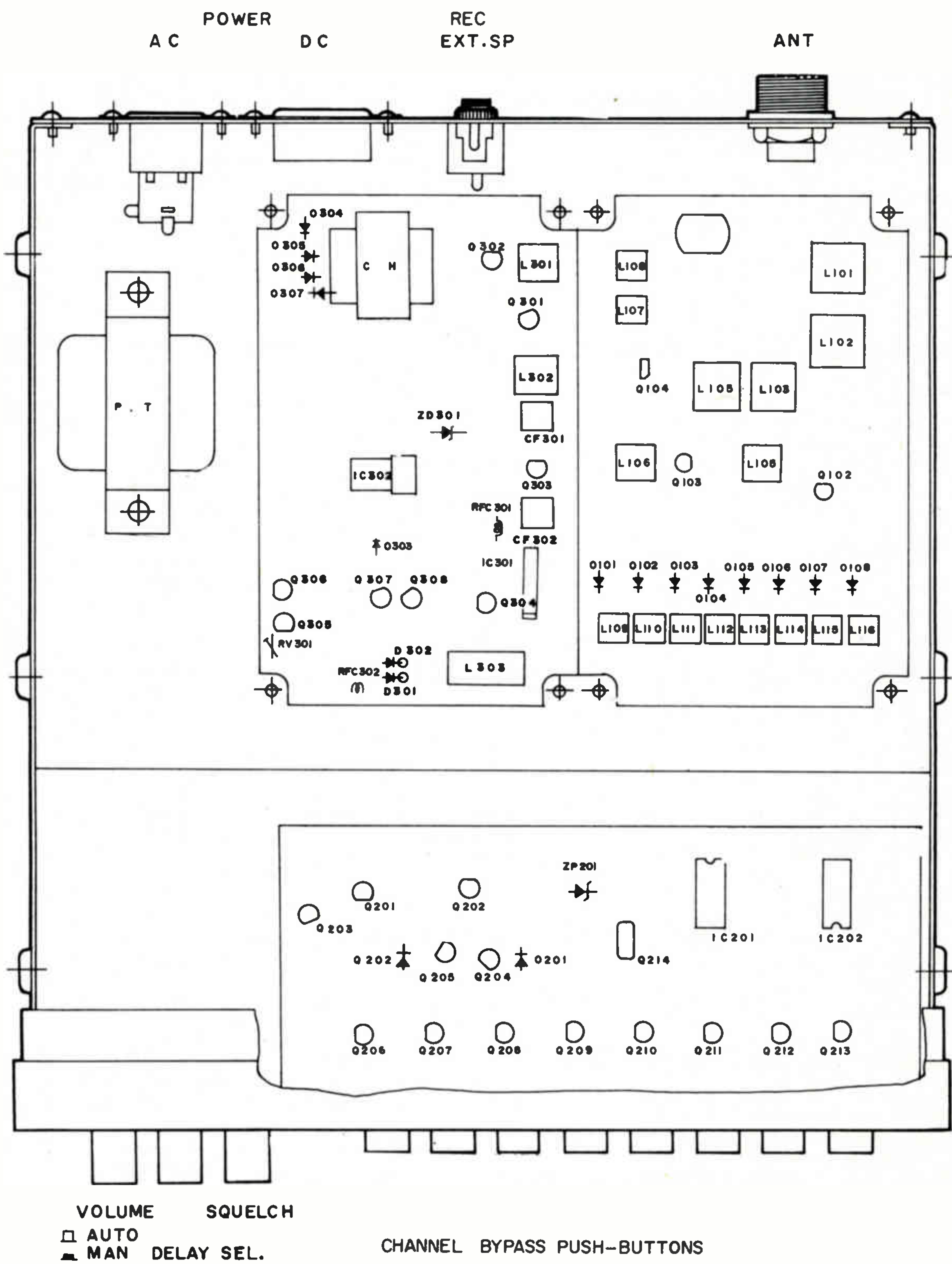
3. Make sure the receiver is connected to an AC or DC Power Source [as indicated previously].

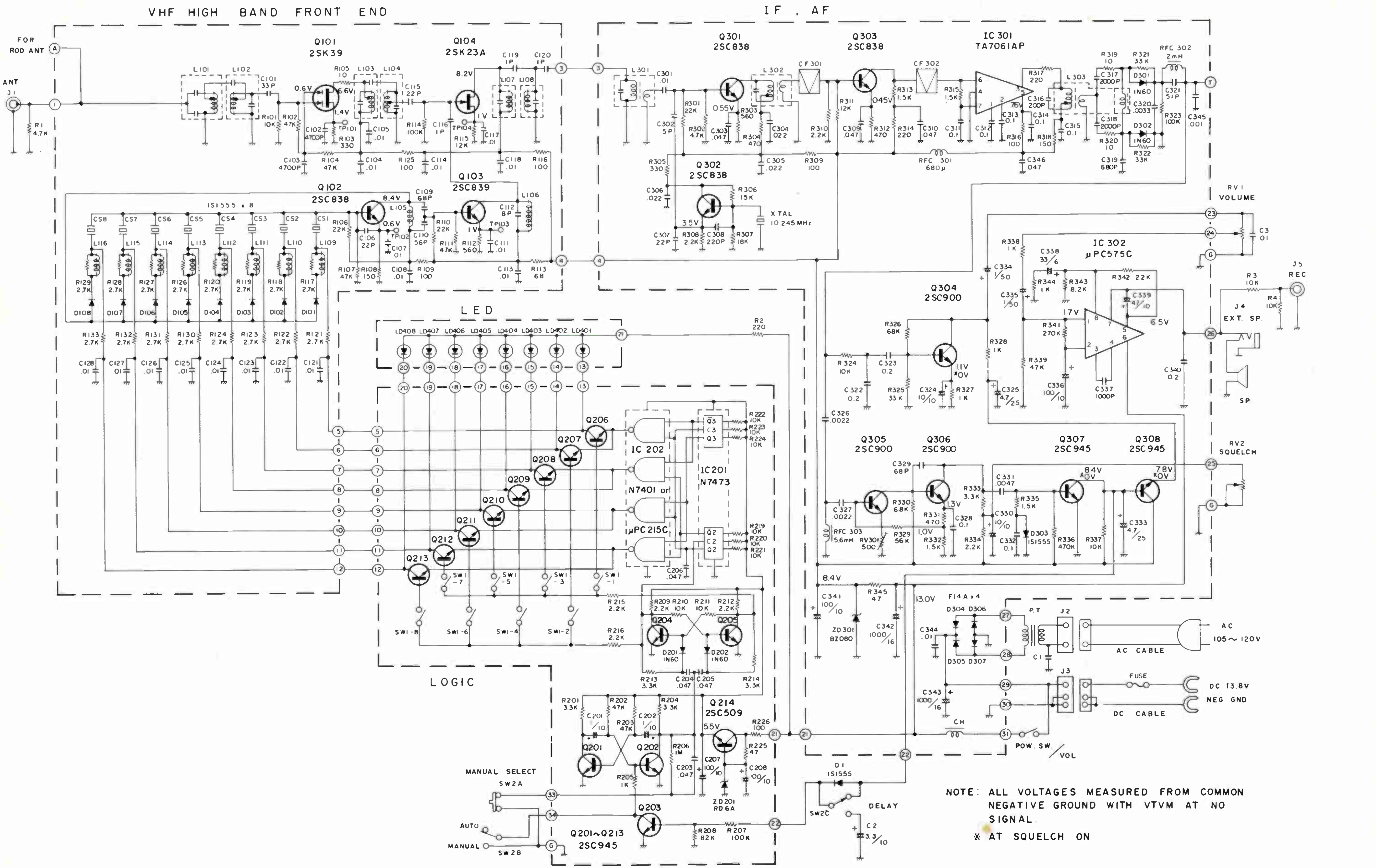
4. Make sure that you have inserted at least one crystal into one of the crystal sockets in the receiver [See Figure 6].

5. Rotate the "SQUELCH" control to the extreme counter-clockwise position

6. Apply power to the receiver by rotating the "VOLUME ON/OFF" knob clockwise [a discernable click will be heard], then further rotate the volume control knob clockwise to about 1/3 setting.

INTERIOR PARTS LOCATION FOR MONITORSCAN-8





NOTE: ALL VOLTAGES MEASURED FROM COMMON NEGATIVE GROUND WITH VTVM AT NO SIGNAL.
※ AT SQUELCH ON

* This Schematic Diagram may be changed for improvement without advance notice.

Lafayette Monitorscan-8
(99-26288W, 99-26296W)

SERVICING THE RECEIVER

The receiver has been fully aligned at the factory before shipment and will not usually require any further adjustmetns.

NOTE: Only competent service personnel using factory-approved procedures should attempt adjustments to the circuits in this transceiver. Failure to follow the proper alignment procedures may disturb the critically tuned circuits sufficiently to cause improper operation of the unit.

It should also be noted that under the terms of the Warranty, units which show evidence of having been serviced by unauthorized personnel will be ineligible for free service.

RECEIVER ALIGNMENT PROCEDURE

The receiver has been fully aligned at the factory before shipment to you and does not normally require further adjustment. When necessary, however, the receiver may be aligned as follows:

COVER REMOVAL

Place the receiver on a flat surface [speaker grille upward], and remove the uppermost chassis cover by removing two screws on each side of chassis. Remove cover with care -- the speaker is connected by two leads to the main chassis.

TUNER ALIGNMENT

a. Oscillator Circuit Alignment

Connect a frequency counter to the base of Q103 through a capacitor of 1 pF.

Turn the core of L105 clockwise until oscillator stops its oscillation, then turn the core again 3/4 turn in the counter-clockwise direction from the position at which the oscillation starts.

Adjust L106 for the frequency multiplied in three times the original frequency.

b. Tracking Alignment

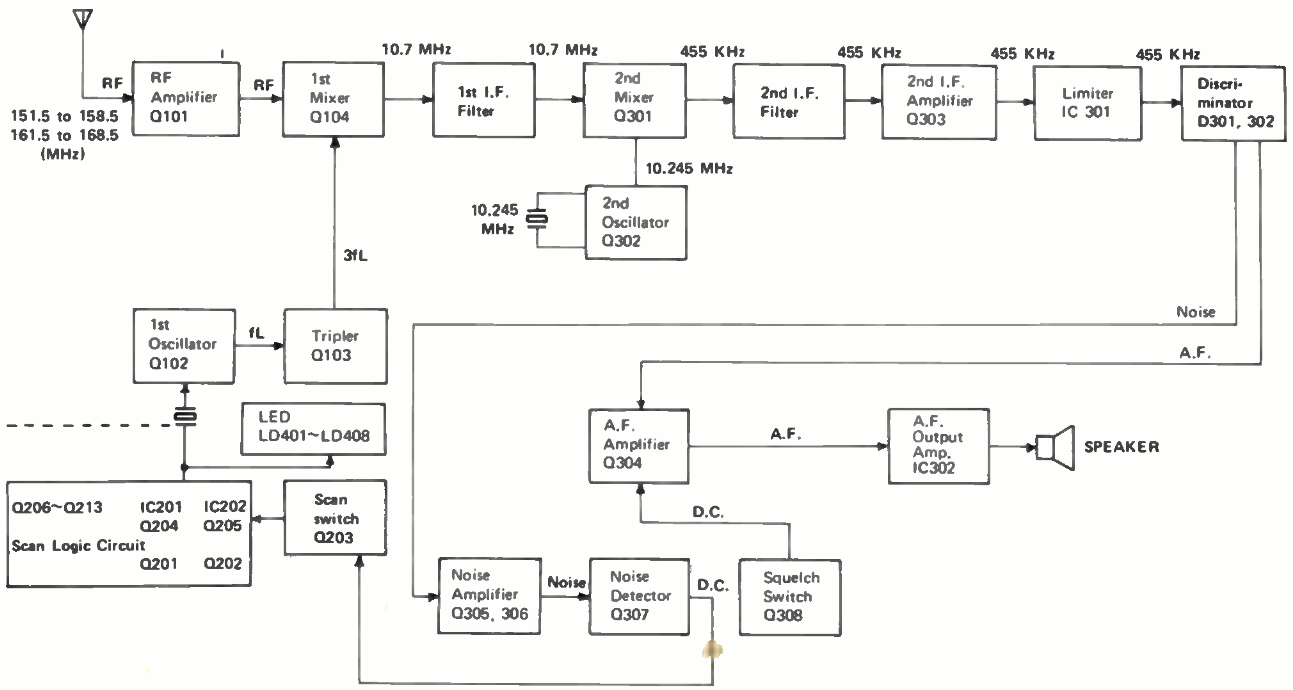
Set SG output (with no modulation) to provide about the level which will give 20dB noise quieting sensitivity. Adjust L102 and L104 for maximum 20dB noise quieting sensitivity at low end of the band.

Adjust L101 and L103 for maximum 20dB noise quieting sensitivity at high end of the band.

Repeat the above steps until no further improvement is obtained.

c. Crystal Frequency Alignment

The crystal frequency for each channel will be slightly adjusted by turning the core of L109 (1CH), L110 (2CH), L111 (3CH), L112 (4CH), L113 (5CH), L114 (6CH), L115 (7CH) and L116 (8CH), respectively to set the correct frequency.



FUNCTIONAL BLOCK DIAGRAM FOR MONITORSCAN-8

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	1937-17	1S1555
D101	1937-17	
D102	1937-17	
D103	1937-17	
D104	1937-17	
D105	1937-17	
D106	1937-17	
D107	1937-17	
D108	1937-17	
D201	1000-17	1N60
D202	1000-17	1N60
D203	1000-17	1N60
D301 &	2196-17	1N60P
D302		1N60P
D303	1937-17	1S1555
D304	2084-17	F-14A
D305	2084-17	F-14A
D306	2084-17	F-14A
D307	2084-17	F-14A
IC201	1030-25	N7473
IC202	1031-25	N7401
IC301	1021-25	TA7061AP
IC302	1032-25	UPC575C
LD401	2360-17	SL103
LD402	2360-17	SL103
LD403	2360-17	SL103
LD404	2360-17	SL103
LD405	2360-17	SL103
LD406	2360-17	SL103
LD407	2360-17	SL103
LD408	2360-17	SL103
Q101	2359-17	2SK39
Q102	1835-17	2SC838(H)
Q103	2337-17	2SC839(H)
Q104	2336-17	2SK23A
Q201	2121-17	2SC945(Q)
Q202	2121-17	2SC945(Q)
Q203	2121-17	2SC945(Q)
Q204	2121-17	2SC945(Q)
Q205	2121-17	2SC945(Q)
Q206	2121-17	2SC945(Q)
Q207	2121-17	2SC945(Q)
Q208	2121-17	2SC945(Q)
Q209	2121-17	2SC945(Q)
Q210	2121-17	2SC945(Q)
Q211	2121-17	2SC945(Q)
Q212	2121-17	2SC945(Q)
Q213	2121-17	2SC945(Q)
Q214	2361-17	2SC509
Q301	1835-17	2SC838(H)
Q302	1835-17	2SC838(H)
Q303	1835-17	2SC838(H)
Q304	2132-17	2SC900(F)
Q305	2132-17	2SC900(F)
Q306	2132-17	2SC900(F)
Q307		2SC945
Q308		2SC945
ZD201	2362-17	RD-6A(M)
ZD301	2339-17	BZ080

ELECTROLYTIC CAPACITORS

ITEM	PART NO.	VALUE
C2	1146-52	3.3 uF 10 V
C201	1009-52	1 uF 10 V
C202	1009-52	1 uF 10 V
C207	1077-52	100 uF 10 V
C208	1077-52	100 uF 10 V
C324	1040-52	10 uF 10 V
C325	1031-52	4.7 uF 25 V
C330	1040-52	10 uF 10 V
C333	1031-52	4.7 uF 25 V
C334	1015-52	1 uF 50 V
C335	1015-52	1 uF 50 V
C338	1140-52	33 uF 6 V
C339	1062-52	47 uF 10 V
C342	1116-52	1000 uF 16 V
C343	1116-52	1000 uF 16 V

CONTROLS

ITEM	PART NO.	DESCRIPTION
RV1	1766-11	Volume
RV2	1749-11	Squelch
RV301	2294-13	500 ohms

COILS/TRANSFORMERS

ITEM	PART NO.
CH	2739-23
L101	2715-23
L102	2738-23
L103	2716-23
L104	2717-23
L105	2718-23
L106	2719-23
L107	2193-24
L108	2193-24
L109	2720-23
L110	2720-23
L111	2720-23
L112	2720-23
L113	2720-23
L114	2720-23
L115	2720-23
L116	2720-23
L301	2194-24
L302	2200-24
L303	2201-24
P.T.	1819-15
RFC301	2386-23
RFC302	2740-23
RFC303	2560-23

MISCELLANEOUS

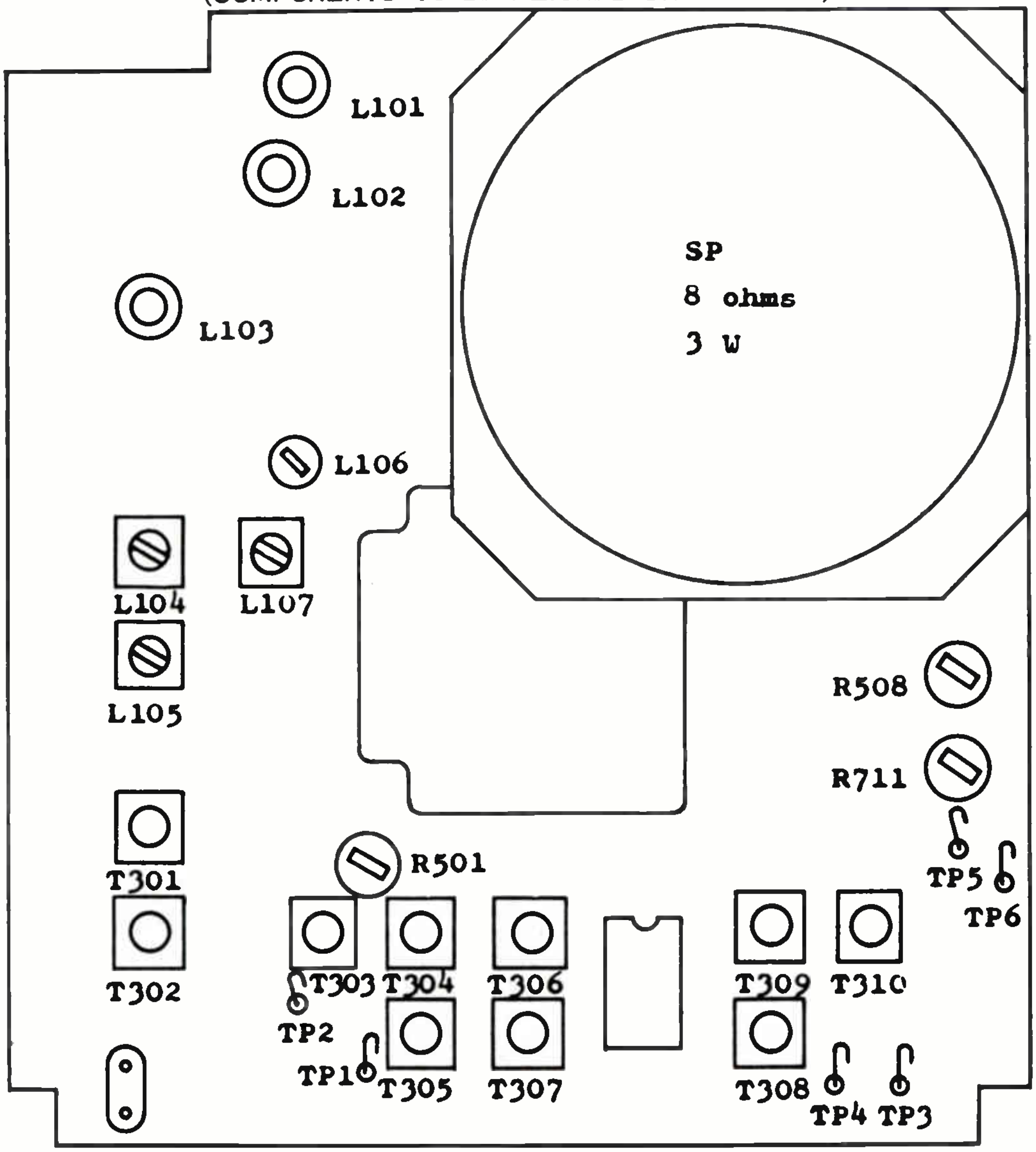
ITEM	NAME	PART NO.
C1	Component Combination	1609-58
CF301	Ceramic Filter (CFU455C)	1359-35
CF302	Ceramic Filter (CFU455C)	1359-35
SP	Speaker	1232-36
SW1	Switch, Push	2056-14
SW2	Switch, Push	2057-14
	Antenna, Telescopic	1199-39
	Crystal (10.245 MHz)	1358-35
	P.C. Board, VHF Front End	1749-16
	P.C. Board, L.E.D.	1750-16
	P.C. Board, Logic	1751-16
	P.C. Board, IF/AF	1752-16
	P.C. Board, Logic(Complete)	1300-31
	Power Cord, AC	1287-38
	Power Cord, DC	1301-38

CABINET PARTS

NAME	PART NO.
Knob, Volume	1953-18
Knob, Squelch	1953-18
Push Button, (11 used)	1979-18

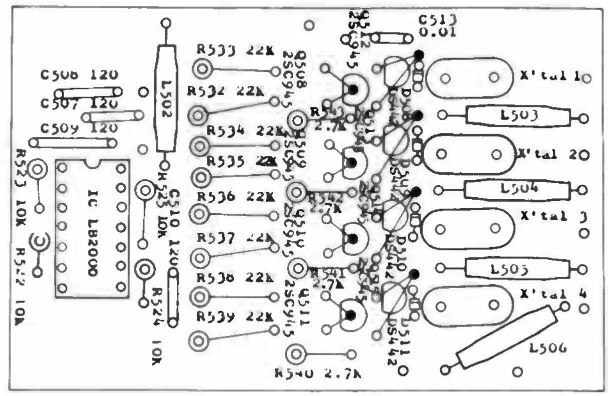
Pages 23-28 Courtesy of MIDLAND INTERNATIONAL CORP.

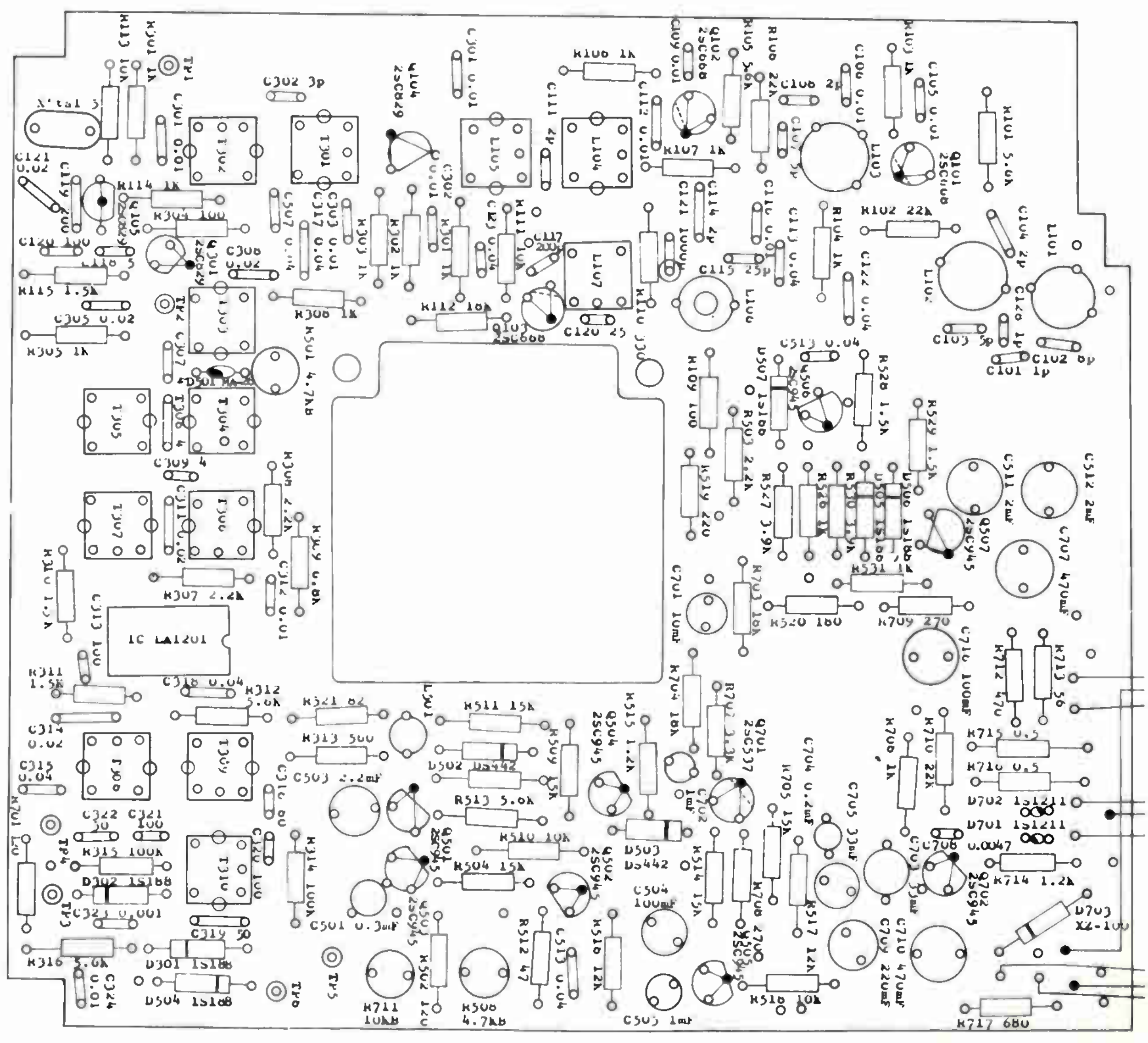
PARTS LOCATION DIAGRAM
(COMPONENTS TO BE ALIGNED SHOWN ONLY)



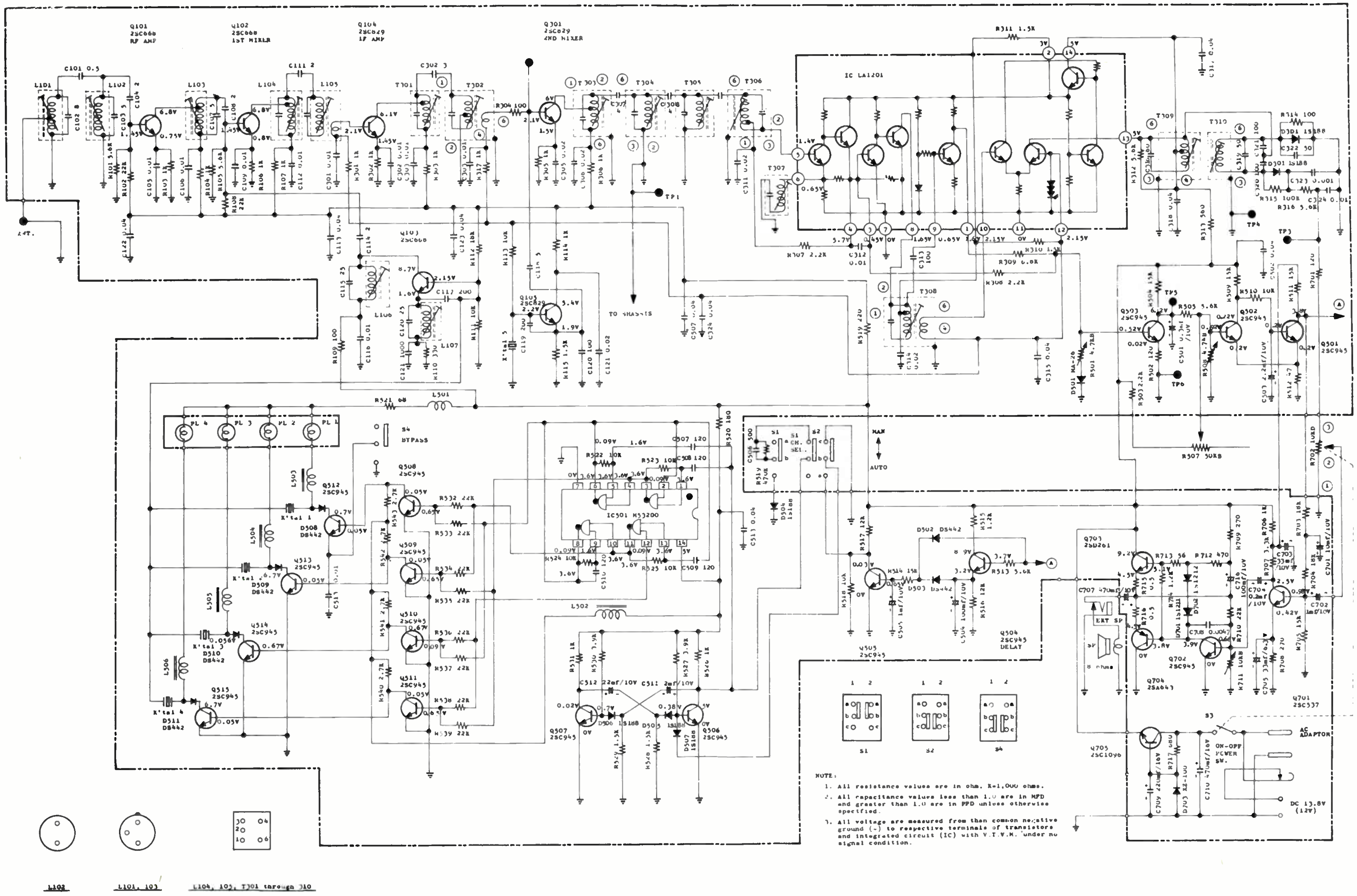
L101, 102..............................ANT. Coil
L103...................................RF Coil
T301, 302, L104, 105...............10.7MHz, IFT
T303 - T307.......................455KHz, IFT
T308................455KHz, IFT (No Adjustment)
T309, 310.........................Detector Coil
T106, 107.......................Oscillator Coil
R501, 508, 711........Semi fixed Volume Control

COMPONENT LAYOUT DIAGRAM (TOP VIEW)



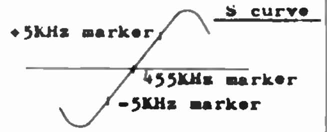
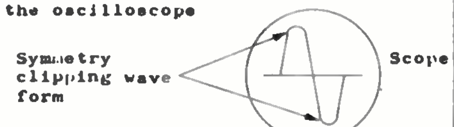


SCHEMATIC DIAGRAM



NOTE:

1. All resistance values are in ohm. K=1,000 ohms.
2. All capacitance values less than 1.0 are in MFD and greater than 1.0 are in PFD unless otherwise specified.
3. All voltage are measured from than common negative ground (-) to respective terminals of transistors and integrated circuit (IC) with V.T.V.M. under no signal condition.

Step	Test Equipment	Meter Point	Alignment Procedure
1. IF Stage	455KHz Sweep Generator	TP1, TP2, TP3, TP4	1) Preset VR cont. for a min. 2) Adjust IFT, from T303 to T310 for S curve characteristics. 3) Adjust 455KHz marker signal to center position in the S curve by adjustment of T309 and T310. 4) Adjust T303-310 to symmetry on S curve characteristics and ±5KHz marker signal in the scope.  Fig. 1
2. Audio Stage	FM SSG 156MHz Mod. Freq. 1KHz Deviation ±5KHz 8 ohms dummy load V.T.V.M. Oscilloscope	Ant. Terminal Ext. Speaker socket 8 ohms load Terminal	1) Preset a) Bypass switch off b) Scanning switch off c) Squelch control volume min. d) Insert crystal (Receiving Freq. 156MHz) to channel 3 e) Select for channel 3 by channel selector 2) Adjust volume control for a little clipping audio output wave form.
	SSG output 10KuV		3) Adjust semi fixed volume control R711 to symmetry clipping of audio wave form in the oscilloscope  Fig. 2
3. Antenna and RF Stage	Same as above After sensitivity increase SSG output decrease Adjust SSG output Voltage for a small level in the item (3) and (4)	Same as above	1) Adjust L104, L105, T301, T302 for a max. output 2) Adjust L106 for a max. output 3) Adjust L101-L103 for a max. output Repeat above item (1), (2) amd (3) 4) Adjust T303-T307 for a max. output Adjust L101-L103 and L104, L105, T301, T302 for a max. output
	Same as above But FM SSG Freq. 162.55MHz	Same as above	5)*Adjust L106 for min. audio output at 191, 764MHz
4. Squelch Adjustment	DC volt meter	TP6, TP7	1) Preset semi fixed volume control R501 and R508 to mechanical center position 2) Preset squelch volume control for max. (clockwise position) 3) Adjust semi fixed volume control R501 to obtain 0.5 volt between TP5 and TP6
	SSG 156MHz Mod. Freq. 1KHz Deviation ±5KHz Load 8 ohms V.T.V.M. Oscilloscope	Ant. Terminal Ext. Speaker socket	4) Adjust semi fixed volume control R508 to obtain just audio output at 3.2uV output of signal generator 5) Repeat item (3) and (4)
5. Battery Drain	DC current meter (300mA full scall) DC power supply 13.8V	Series connection to power supply	Indication of current meter is under 160mA at squelched

NOTE
*Only is this case, channel frequency is 162.55MHz.

Generally speaking, frequencies for the various radio seavices such as police, fire, business, etc. vary from area to area and it is suggested that you contact your local authorities for frequency information for your area. You should also verify that the area in which you will use this monitor does not have laws or regulations prohibiting it use. Once you have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.
The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

$$\text{CRYSTAL 3RD OVERTONE FREQUENCY} = \frac{\text{DESIRED CHANNEL FREQUENCY} - 10.7\text{ MHz}}{\text{Divided by 3}}$$

Crystal Type	:	HC-25U Third overtone
Frequency Tolerance	:	±0.001% (+25°C)
	:	±0.005% (-55°C ~ +105°C)
Load Capacity	:	20 pF
Max. Series Resistance	:	40 ohms
Maximum Drive	:	2 milliwatts

SEMICONDUCTORS

ITEM	PART NO.	TYPE
0301	09-306010	1S188
0302	09-306010	1S188
D501	09-306223	MA-26
D502	09-306222	DS442
D503	09-306222	DS442
D504	09-306010	1S188
D505	09-306010	1S188
0506	09-306010	1S188
D507	09-306010	1S188
D508	09-306222	DS442
D509	09-306222	DS442
D510	09-306222	DS442
D511	09-306222	DS442
D701	09-306224	1S1211
D702	09-306110	1S1212
D703	09-306235	XZ-100
IC	09-308008	LA1201
IC501	09-308021	LB2000
Q101	09-302009	2SC668
Q102	09-302009	2SC668
Q103	09-302009	2SC668
Q104	09-302033	2SC829
Q105	09-302033	2SC829
Q301	09-302033	2SC829
Q501	09-302125	2SC945
Q502	09-302125	2SC945
Q503	09-302125	2SC945
Q504	09-302125	2SC945
Q505	09-302125	2SC945
Q506	09-302125	2SC945
Q507	09-302125	2SC945
Q508	09-302125	2SC945
Q509	09-302125	2SC945
Q510	09-302125	2SC945
Q511	09-302125	2SC945
Q512	09-302125	2SC945
Q513	09-302125	2SC945
Q514	09-302125	2SC945
Q515	09-302125	2SC945
Q701	09-302007	2SC537
Q702	09-302125	2SC945
Q703	09-303019	2SD261
Q704	09-300072	2SA643
Q705	09-302126	2SC1096

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C501	77-336304	.3 uF 10 V
C503	77-336225	2.2 uF 10 V
C504	77-336107	100 uF 10 V
C505	77-336105	1 uF 10 V
C511	77-336226	22 uF 10 V
C512	77-336226	22 uF 10 V
C701	77-336106	10 uF 10 V
C702	77-336105	1 uF 10 V
C703	77-332336	33 uF 6.3 V
C704	77-336204	.2 uF 10 V
C705	77-332336	33 uF 6.3 V
C706	77-336107	100 uF 10 V
C707	77-337477	470 uF 16 V
C708	77-337477	470 uF 16 V
C709	77-337227	220 uF 16 V

CONTROLS

ITEM	PART NO.	DESCRIPTION
R501	13-164067	4700 ohms Squelch Sensitivity
R507	13-166034	50 K Squelch
R508	13-164067	4700 ohms Squelch Sensitivity
R702	13-166034	50 K Squelch
R711	13-164068	10 K Sensitivity

COILS/TRANSFORMERS

ITEM	PART NO.
L101	13-176334
L102	13-176335
L103	13-176336
L104	13-090234
L105	13-090234
L106	13-170178
L107	13-170180
L501	13-178120
L502	13-178122
L503	13-178122
L504	13-178122
L505	13-178122
L506	13-178122
T301	13-090234
T302	13-090234
T303	13-090235
T304	13-090234
T305	13-090235
T306	13-090235
T307	13-090235
T308	13-090236
T309	13-090235
T310	13-090235

MISCELLANEOUS

ITEM	NAME	PART NO.
S1	Switch, Channel Select	13-183141
S2	Switch, Scan Select	13-183142
S4	Switch, 8ypass	13-183142
	Crystal, 10.245 MHz	13-128248
	Fuse, 1.5 Amp	13-204003
	Holder, Fuse	13-159116
	Speaker (8 ohms, 1 Watt)	13-060075

CABINET PARTS

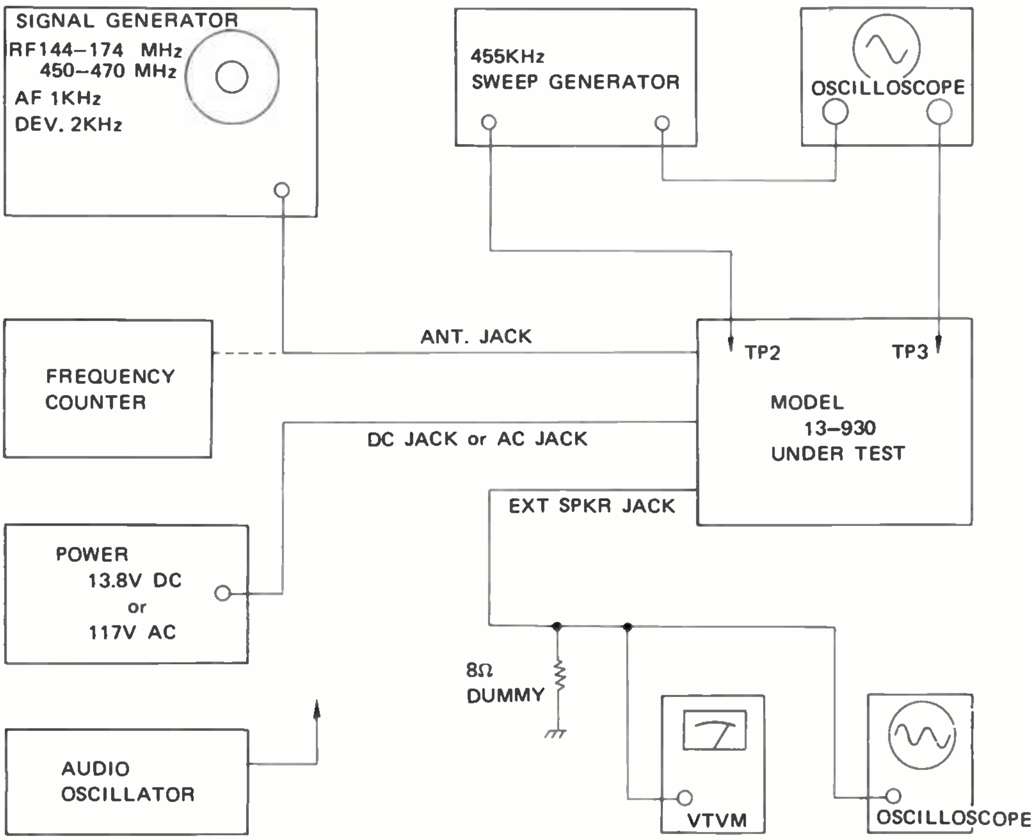
NAME	PART NO.
Cabinet, Main	13-010161
Panel, Front Trim	13-010162
Lid, Crystal Compartment	13-018011
Knob, Volume	13-110127
Knob, Squelch	13-110127
Knob, Channel Select	13-115055
Knob, 8ypass	13-115056
Knob, Auto Scan	13-115056

Pages 29-36 Courtesy of MIDLAND INTERNATIONAL CORP.

TEST EQUIPMENTS REQUIRED

1. POWER SOURCE: of 13.8 V DC capable of 1 amp. regulated
   (Hewlett-Packard model 6201B or equivalent)
2. AUDIO GENERATOR: frequency range of 200Hz to 5KHz or more.
   (Hewlett-Packard model 209A or equivalent)
3. FREQUENCY COUNTER: capable of counting up to 200MHz or more
   (Hewlett-Packard model 5246L with convertor model 5253B or equivalent)
4. OSICLLOSCOPE: 450KHz bandwidth.
   (Hewlett-Packard model 120B or equivalent)
5. VACUUM TUBE VOLT METER: 1mV to 50V, 1MHz
   (Hewlett-Packard model 400D or equivalent)
6. RF FM SIGNAL GENERATOR: capable of tuning 455KHz, 10.7MHz, 33-48MHz, 144-173MHz, for narrow band receiver.
7. SWEEP GENERATOR: capable of tuning 450, 455 and 460KHz.

TEST CONNECTION



ALIGNMENT

1. Connect all test equipment as illustrated in Fig. 1.

2. Check all voltage readings as shown on schematic diagram.

3. AF SECTION

3-1 Apply a 1KHz audio signal to VR 601.
On the oscilloscope check the wave form of the audio power and volume control. (Audio clipping level is near 3V at 8 ohms load.)

4. DISCRIMINATOR
Due to a ceramic discriminator being employed in this model, alignment of the discriminator is not necessary.

5. CRYSTAL OSCILLATOR

5-1 Second Local Oscillator and A.F.C.

5-1-1 Check for specified frequency of second local oscillator (10.245MHz) at the base of Q 501.

5-1-2 Short out resistor R 523.

5-1-3 Adjust VR 501 to obtain the second local oscillator frequency of 10.245MHz±1KHz.

5-1-4 Adjust T 112, 113 and 114 for maximum noise level on the oscilloscope or volt-meter at speaker.

5-1-5 Re-check the frequency of the second local oscillator. If the frequency is 10.245MHz±2KHz, the oscillator is functioning properly. Repeat alignment steps 5-1-1 through 5-1-4 if the oscillator frequency is below or above the specified frequency

5-2-1 The emitter voltage of Q301 (High Band) or Q203 (Low Band) should increase slightly when a crystal is placed in an operative channel. No increase in voltage indicates either a defective crystal or the oscillator is malfunctioning.

5-2-2 Automatic Self Tuning Control for RF Stages. The check point on High Band is the collector of Q302, Low Band Q204 collector.

5-2-3 Place a 144MHz crystal in an operative channel. Adjust VR301 to obtain a 1 volt or less indication at the collector of Q302. Place a 33MHz crystal in an operative channel. Adjust VR201 to obtain a 1 volt or less indication at the collector of Q203. Place a 162.55MHz crystal in an operative channel. Adjust T 109 for 5 volts at the collector of Q302. Place a 44MHz crystal in an operative channel. Adjust T104 for 5 volts at the collector of Q204.

Caution: 1. Adjust High Band first.
2. Do not try to obtain peak point in voltage at 162.55MHz on High Band and at 44MHz on Low Band on multimeter for ohm/volt.

For reference, the list below shows approximate voltage at certain frequencies.

frequency	voltage at collector of Q302 and Q204 on High and Low, respectively
144.0MHz	1.0±0.2V
150.0MHz	2.0±0.5V
155.16MHz	3.0±0.5V
162.55MHz	5.0±0.5V
173.0MHz	6.0 or over
33MHz	1.0±0.2V
36MHz	1.5±0.5V
39MHz	2.0±0.5V
41MHz	3.0±0.5V
44MHz	5.0±0.5V
47MHz	6.0 or over

6. IF STAGES

6-1 Second IF Section

6-1-1 Turn volume control to obtain proper audio level (around 0.5W).

6-1-2 Turn squelch control fully counter-clockwise.

6-1-3 Apply a 455KHz, unmodulated signal to the base of Q501 (Second Mixer) through a 0.001μF capacitor.

6-1-4 Adjust T113 and 114 for maximum quieting (minimum noise) while decreasing the output of the signal generator. With the output of the signal generator at about 300μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-2 First IF Section

6-2-1 Apply a 10.7MHz unmodulated signal to the base of Q202 or Q306 through 0.001μF capacitor.

6-2-2 Adjust T105, (110), 111 and 112 for maximum noise quieting while decreasing the output of the signal generator. 100μV quieting sensitivity should be around 20db which can be monitored at speaker.

6-3 RF Section

6-3-1 Short out T101

6-3-2 Apply a channel frequency in High Band from signal generator to antenna connector of the unit. Modulation of signal generator should be 1KHz with 2KHz deviation.

6-3-3 Adjust T106, 107, 108 and 110 on High Band for best audio wave form (in terms of sine wave form), while decreasing output of signal generator.

6-3-4 Change the frequency of signal generator to Low Band channel frequency.

6-3-5 Adjust T102, 103 and 105 for Low Band RF section alignment.

6-3-6 Adjust T110 (T105), T111 and 112 to obtain best audio wave in terms of sine wave on oscilloscope while decreasing the output of signal generator.

6-3-7 Check the difference between noise level and signal level on VTVM. If it is less than 3db your adjustment is correct.

6-3-8 T 101 should be replaced in the circuit.

7. TIGHT SQUELCH

7-1 From signal generator apply any freuqency modulated at 1KHz with 2KHz devaition to antenna connector.

7-2 Turn squelch control fully clockwise.

7-3 Increase the signal generator output until the audio output is silenced.

7-4 Slowly decrease the generator output until audio is heard or seen on the oscilloscope. Generator output level should be 1 to 0.5μV to open squelch.

7-5 By adjusting V 602 the tight squelch level can be varied.

FREQUENCY AND CRYSTAL

Once your have determined the frequencies you want to monitor, crystals may be ordered from your Midland dealer or by writing directly to a crystal manufacturer.

The following information may be required by the crystal manufacturer in order to properly prepare the crystals.

Low Band (30-50MHz)

Crystal Frequency	: Channel Frequency+10.7MHz
Frequency Tolerance	: +2,000, -1,500Hz
Crystal Type	: HC-25/U (Plug-in Type)
Series Resonance	: -450Hz ; Third Overtone
maximum Impedance	: 35Ω
Drive Level	: 2mW
Shunt Capacitancw	: Less than 6pF

High Band (144-173MHz)

Crystal Frequency	: (Channel Frequency -10.7MHz)/3
Frequency Tolerance	: +1,000, -800Hz
Crystal Type	: HC-25/U (Plug-in Type)
Series Resonance	: -450Hz ; Third Overtone
Maximum Impedance	: 35Ω
Drive Level	: 2mW
Shunt Capacitance	: Less than 6pF

SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	09-306219	1S247Z
D2	09-306020	1N34A
D3	09-306020	1N34A
D101	09-306219	1S247Z
D102	09-306219	1S247Z
D103	09-306219	1S247Z
D104	09-306219	1S247Z
D105	09-306219	1S247Z
D106	09-306219	1S247Z
D117	09-306020	1N34A
D118	09-306020	1N34A
D119	09-306020	1N34A
D120	09-306020	1N34A
D121	09-306020	1N34A
D122	09-306020	1N34A
D123	09-306020	1N34A
D124	09-306020	1N34A
D125	09-306020	1N34A
D126	09-306020	1N34A
D127	09-306020	1N34A
D128	09-306020	1N34A
D129	09-306020	1N34A
D131	09-306191	1S330
D132	09-306020	1N34A
D201	09-306240	MA320B
D202	09-306240	MA320B
D301	09-306020	1N34A
D302	09-306240	MA320B
D305	09-306240	MA320B
D501	09-306191	1S330
D502	09-306191	1S330
D503	09-306191	1S330
D504	09-306191	1S330
D505	09-306240	MA320B
D507	09-306191	1S330
D701	09-306180	BZ090
D702	09-306149	10D4(1N4004)
D703	09-306149	10D4(1N4004)
D704	09-306149	10D4(1N4004)
IC101	09-308015	M5340P
IC102	09-308015	M5340P
IC201	09-308013	UPC555A
IC301	09-308013	UPC555A
IC501	09-308041	TA7061
IC502	09-308052	UPC577H
IC601	09-308043	TA7063
IC602	09-308053	UPC20C
Q101	09-302039	2SC372(2SC403)
Q102	09-302039	2SC372(2SC403)
Q103	09-302039	2SC372(2SC403)
Q104	09-302039	2SC372(2SC403)
Q105	09-302039	2SC372(2SC403)
Q106	09-302039	2SC372(2SC403)
Q107	09-302039	2SC372(2SC403)
Q108	09-302039	2SC372(2SC403)
Q109	09-302039	2SC372(2SC403)
Q110	09-302039	2SC372(2SC403)
Q111	09-304012	XA495
Q112	09-302039	2SC372(2SC403)
Q201	09-302095	2SC784R(2SC535B)
Q202	09-302095	2SC784R(2SC535B)
Q203	09-302095	2SC784R(2SC535B)
Q204	09-302039	2SC372(2SC403)
Q301	09-302095	2SC784R(2SC535B)
Q302	09-304012	XA495
Q303	09-302039	2SC372(2SC403)
Q304	09-304012	XA495
Q305	09-302095	2SC784R(2SC535B)
Q306	09-302095	2SC784R(2SC535B)
Q501	09-302012	2SC710
Q502	09-302012	2SC710
Q503	09-302012	2SC710
Q504		FET3SK39P
Q601	09-302039	2SC372(2SC403)
Q602	09-302039	2SC372(2SC403)
Q603	09-302039	2SC372(2SC403)
Q701	09-302155	2SC1383

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C110	77-337227	220 uF 16 V
C121	77-337106	10 uF 16 V
C522	77-337106	10 uF 16 V
C524	77-337476	47 uF 16 V
C525	77-337475	4.7 uF 16 V
C527	77-337476	47 uF 16 V
C603	77-337476	47 uF 16 V
C612	77-337476	47 uF 16 V
C618	77-337476	47 uF 16 V
C619	77-337107	100 uF 16 V
C620	77-337227	220 uF 16 V
C623	77-337477	470 uF 16 V
C631	77-337107	100 uF 16 V
C701	77-337476	47 uF 16 V
C702	77-337107	100 uF 16 V
C703	77-337108	1000 uF 16 V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
TH201	09-307072	TD5-A090
TH301	09-307072	TD5-A090
VR101	13-166039	100 K Scan Rate
VR601	13-160087	10 K Volume /Switch
VR502	13-166048	50 K Squelch

COILS/TRANSFORMERS

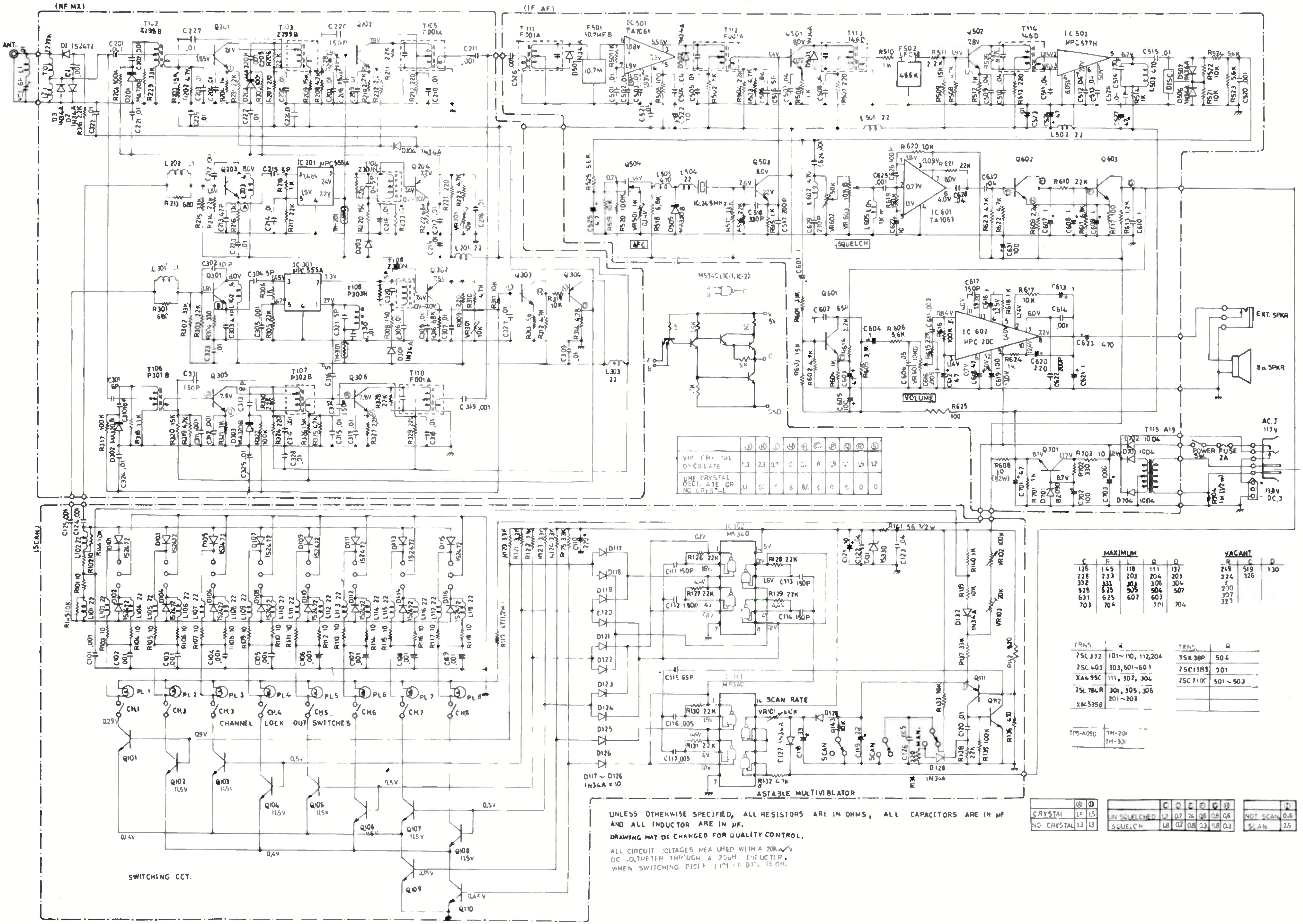
ITEM	PART NO.	ITEM	PART NO.
L05	13-178156	L602	13-178152
L1	13-178154	L605	13-178156
L2	13-178155	T101	13-094043
L101	13-178151	T102	13-094944
L118	13-178151	T103	13-094956
L201	13-178151	T104	13-094946
L202	13-178154	T105	13-094047
L203	13-178153	T106	13-094048
L301	13-178154	T107	13-094049
L302	13-178153	T108	13-094050
L303	13-178151	T109	13-094946
L501	13-178151	T110	13-094047
L502	13-178151	T111	13-094047
L503	13-178152	T112	13-094047
L504	13-178151	T113	13-094051
L505	13-178152	T114	13-094051

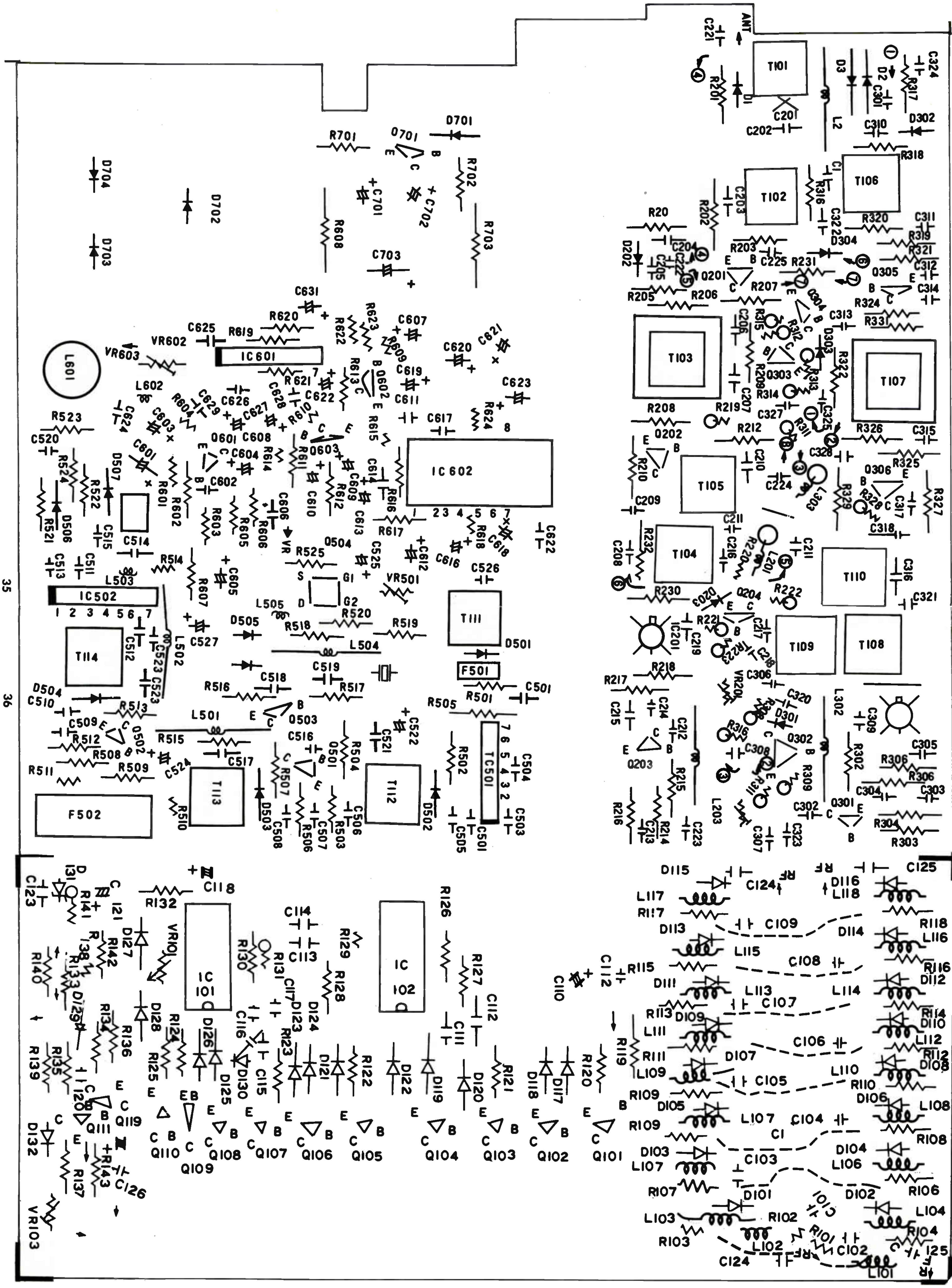
MISCELLANEOUS

ITEM	NAME	PART NO.
Disc.	Ceramic Disc., H55D	13-179023
F501	Ceramic Filter, 10.7 MHz	13-179021
F502	Ceramic Filter, 455 kHz	13-179022
	Antenna, Telescopic	13-040067
	Holder, Fuse	13-159154
	Speaker, 8 ohms, .5W	13-060073
	Switch, Channel Push-button Assembly	13-188005
	Switch, Scan Push-button Assembly	13-183164

CABINET PARTS

NAME	PART NO.
Case, Top	13-010203
Case, Bottom	13-010204
Door, Crystal	13-018015
Knob, Volume	13-033116
Knob, Squelch	13-033116
Knob, Scan Rate	13-033116


(RF MX)
(IF AF)
(SCAN)
SWITCHING CCT.
CHANNEL LOCK OUT SWITCHES
ASTABLE MULTIVIBLATOR
SCAN RATE
SQUELCH
VOLUME
AFC
EXT. SPKR
8Ω SPKR
POWER FUSE 2A
UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS, ALL CAPACITORS ARE IN μF AND ALL INDUCTOR ARE IN μF.
DRAWING MAY BE CHANGED FOR QUALITY CONTROL.
MAXIMUM
VACANT



Midland 13-930

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Pages 37-52 Courtesy of

REGENCY ELECTRONICS, INC.

1-2 CRYSTAL SPECIFICATIONS

If desired, the crystals may be purchased from other manufacturers. The following specifications must be included in the order:

High Band Crystal:

a. Crystal frequency, determined as follows:
   Crystal frequency = $\frac{\text{channel frequency - 10.7 MHz}}{3}$
b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC -25/u

Low Band Crystal:

a. Crystal frequency, determined as follows:
   Crystal frequency = channel frequency + 10.7 MHz
b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC - 25/u

1-3 CRYSTAL INSTALLATION AND BAND PROGRAMMING

Prior to installing a crystal, the receiver will have to be partially pulled out of its cabinet. First, remove the telescopic antenna if it is installed. Second, remove the two knobs (volume and squelch). Third, remove the rear panel (cover) by removing the four mounting screws. Fourth, remove the four rubber feet by unscrewing each one. The receiver may then be slid rearward from the cabinet until the crystal socket pins are accessible.

Insert the crystal, or crystals, in the proper socket

Band programming will have to be performed on Model TME-8H/L only. This is described in the following paragraph.

If the crystal inserted is for the High Band (148-174 MHz), place the proper color-coded wire and socket onto the proper High Band pin; if the crystal is for the Low Band (30-50 MHz), place the proper wire and socket onto the proper Low Band pin. Pictorial B illustrates how the band selection wires are properly connected. Pictorial C shows an example of a partially programmed board. See Diagram 3-11.

NOTE: If a particular channel is not used (in other words, there is no crystal installed for that channel), the band selection wire must still be connected to either a High band pin or to a Low band pin.

SECTION 2 ALIGNMENT AND TUNING PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM
2-1-4 Noise Generator (to be used in 2-6 only)

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range in the band over which they will operate

Diagrams 3-1, 3-3 and 3-5 show the location of all coils to be adjusted.

2-2 QUADRATURE DETECTOR ALIGNMENT

2-2-1 Connect the FM Signal generator to the antenna input jack. Accurately set frequency to the center of the channel being used for alignment. Modulate signal generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to test point A, (Junction of C126, C128, R113). See diagram 3-6.

2-2-3 Adjust output of signal generator until all noise in scope pattern just disappears.

2-2-4 Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal.

2-3 IF ALIGNMENT

2-3-1 Disconnect RF signal generator from antenna input.

2-3-2 Connect AC voltmeter across speaker terminals.

2-3-3 Adjust volume control for .5 volt noise reading on AC voltmeter.

2-3-4 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the cores' present position.

NOTE: Coils will have two peaks; adjust core to peak away from the center of the coil form.

2-3-5 Adjust volume control for 1.0 volt noise reading on AC voltmeter.

2-3-6 Connect the R.F. signal generator to the antenna input jack.

Turn modulation off. Set the generator to the high band crystal frequency that will be used for high band section alignment.

2-3-7 Adjust the signal generator output until the voltmeter reads 0.2 volts.

2-3-8 Adjust T101 and T201, (in that order), for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts. If two peaks occur, use the one away from the center of the coil form.

2-3-9 Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency.

NOTE: Some receivers may have the second oscillator at 11.155 MHz, if this is the case, the image frequency is 910 KHz ABOVE the channel frequency. Check the frequency marked on top of the crystal (10.245 MHz for below and 11.155 MHz for above). The reverse is true for low band channels due to high side injection for the first oscillator.

2-3-10 Adjust the signal generator output until voltmeter reads .2 volts.

2-3-11 Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order), for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the cores should be within two turns of the position in step No. 4 and 8.

2-4 RF ALIGNMENT (H/L)

2-4-1 Preset the cores of L201, L202 and L203 out of the outer end of the coil form three turns. Preset the cores of L204, L206, L207 and L208 four turns from the outer ends of the coil form.

2-4-2 Connect AC voltmeter across speaker terminals.

2-4-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

HIGH BAND SECTION

2-4-4 Activate high band channel nearest to center of high band frequencies being used.

2-4-5 Connect signal generator to antenna input jack. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-4-6 Adjust output signal generator until AC voltmeter reads .2 volts.

2-4-7 Adjust L206, L207, L208 and L204, in that order, for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

LOW BAND SECTION

2-4-8 Activate Low Band channel nearest to center of low band frequencies being used.

2-4-9 Set generator accurately to the center frequency of the channel being used for alignment. Turn modulation off.

2-4-10 Adjust output of signal generator until AC voltmeter reads 0.2 volts.

2-4-11 Adjust coils L201, L202 and L203 (in that order) for maximum quieting (lowest meter reading). Adjust the signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made.

2-5 RF ALIGNMENT (H)

2-5-1 Preset the cores of L201, L202, L203 and L204 four turns from the outer ends of the coil form.

2-5-2 Connect AC voltmeter across speaker terminals.

2-5-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

2-5-4 Activate channel nearest to center of frequencies over which the unit will operate.

2-5-5 Connect signal generator to antenna input jack. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-5-6 Adjust output signal generator until AC voltmeter reads .2 volts.

2-5-7 Adjust L201, L202, L203 and L204, in that order, for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

2-6 NOISE BALANCE ADJUSTMENT

NOTE: This adjustment may be required only of excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper or inadequate noise suppression of the vehicle's ignition system.

2-6-1 Using a "T" connector, connect the FM signal generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L206 (TME-8H/L) or L201 (TME-8H).

2-6-2 Connect the oscilloscope to the junction of Q109's emitter and Q110's collector, or to the speaker terminals.

2-6-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the noise generator until spikes are clearly seen in the audio output as viewed on the oscilloscope. The noise spikes will be either mostly positive or negative if an unbalanced condition exists.

2-6-4 Tune L102 (quadrature detector coil) until the noise spikes are equally positive and negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.

SEMICONDUCTORS

ITEM	PART NO	TYPE
(RF Board, TME-8H/L)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
Q201	SPS-1473(RT)	2N5222
Q202	SPS-1473(RT)	2N5222
Q203	SPS-1473(RT)	2N5222
Q204	SPS-1473(RT)	2N5222
Q205	SPS-1539(WT)	2N5227
Q206	SPS-1539(WT)	2N5227
Q207	SM-4304-S	2N5230
(RF Board, TME-8H/L)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
Q201	SPS-1473(RT)	2N5222
Q202	SPS-1473(RT)	2N5222
Q203	SM-4304-S	2N5130
(IF-Audio Board)		
CR101	102-412	1N4148
CR102	1N4738A	8.2 V Zener
CR103	1N4002	1N4002
CR104	1N4002	1N4002
IC101	301-679-1	
IC102	301-576-3	MC-1357P
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539(WT)	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107	MPS-A55	
Q108	MPS-A55	
Q109	MJE-521	
Q110	MJE-521	

(CONTINUED ON PAGE 42)

(Scanner Board)

CR301	102-412	1N4148
CR302	102-412	1N4148
CR303	102-412	1N4148
CR304	102-412	1N4148
CR305	102-412	1N4148
CR306	102-412	1N4148
CR307	102-412	1N4148
CR308	102-412	1N4148
CR309	1N4733A	5.1 V Zener
CR310	102-412	1N4148
CR311	102-412	1N4148
CR312	102-412	1N4148
CR313	102-412	1N4148
CR314	102-412(1)	1N4148
CR315	102-412(1)	1N4148
CR316	102-412(1)	1N4148
CR317	102-412(1)	1N4148
CR318	102-412(1)	1N4148
CR319	102-412(1)	1N4148
CR320	102-412(1)	1N4148
CR321	102-412(1)	1N4148
CR322	102-412	1N4148
IC301	301-576-2	
IC302	301-576-2	
IC303	301-576-6	
IC304	301-576-6	
Q301	SPS-952	MPS5172
Q302	SPS-952	MPS5172
Q303	SPS-952	MPS5172
Q304	SPS-952	MPS5172
Q305	SPS-952	MPS5172
Q306	2N4871	2N4871
Q307	SPS-1539(WT)	2N227
Q308	SPS-952	MPS5172

ELECTROLYTICS

ITEM	PART NO.	VALUE
(IF-Audio Board)		
C127		1 uF 50 V
C130		50 uF 10 V
C135		250 uF 16 V
C136		1000 uF 16 V
C137		250 uF 10 V
(Scanner Board)		
C302		1 uF 25 V
C303		10 uF 25 V
C304		3.3 uF 16 V
C306		10 uF 25 V
C307		5 uF 10 V
(Chassis)		
C2		100 uF 10 V

CONTROLS

ITEM	PART NO.	DESCRIPTION
R1	102-479-3	5000 ohms Volume
R2	102-479-2	7500 ohms Squelch

(1) Used in TME-8H/L only

COILS/TRANSFORMERS

ITEM	PART NO.
(RF Board, TME-8H/L)	
L201	301-520-4
L202	301-520-5
L203	301-520-6
L204	301-520-9
L205	102-369
L206	301-520-1
L207	301-520-2
L208	301-520-3
T201	102-405
(RF Board, TME-8H)	
L201	301-520-1
L202	301-520-2
L203	301-520-3
L204	301-520-9
L205	102-369
T201	102-405
(IF-Audio Board)	
L101	ES-2228
L102	ES-2228
L103	301-517
T101	102-507
T102	301-730
(Chassis)	
T1	301-515

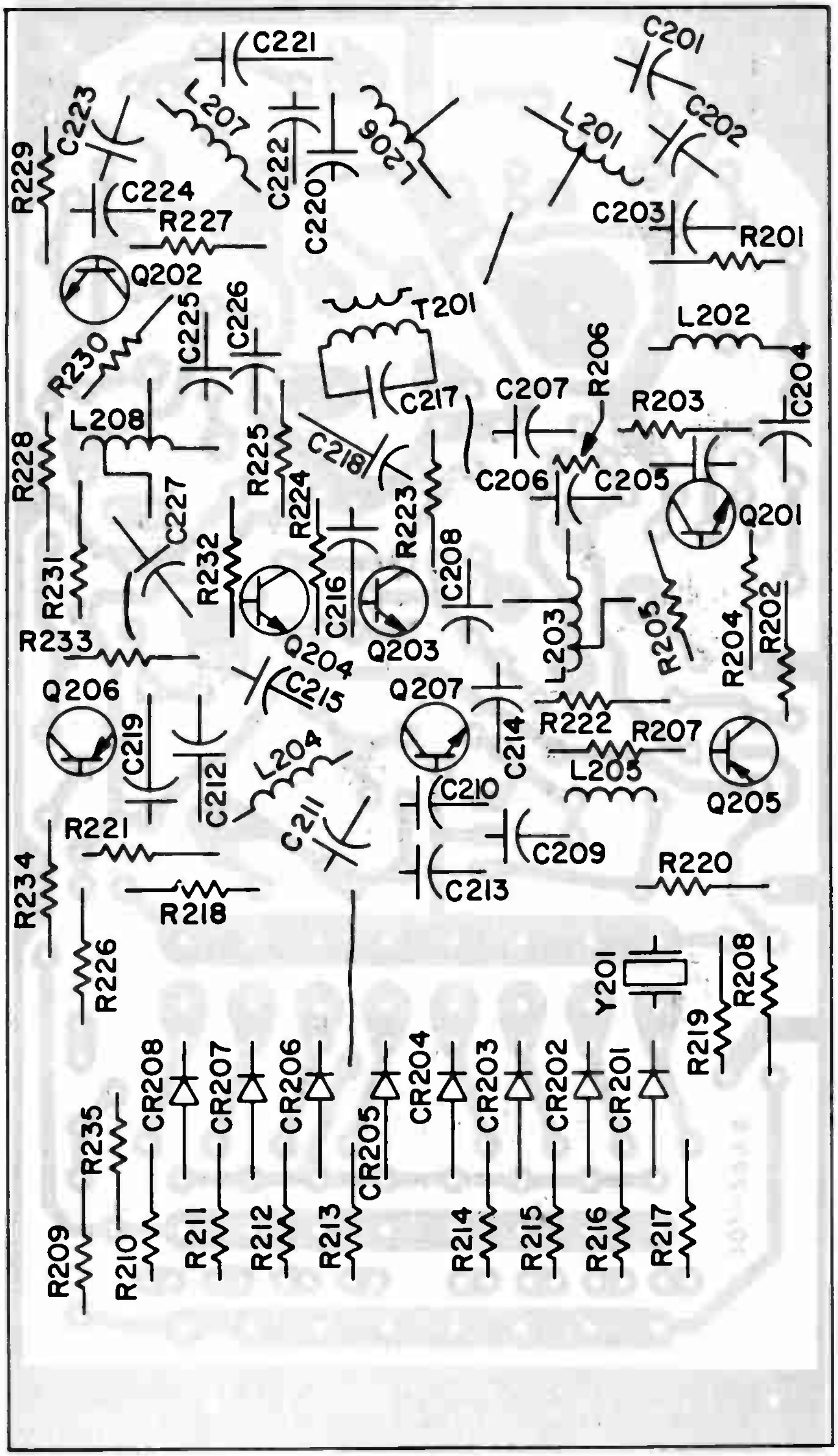
MISCELLANEOUS

ITEM	NAME	PART NO.
(IF-Audio Board)		
CF-1	Ceramic Filter, 455 kHz	301-723
Y101	Crystal, 10.245 MHz	301-516-1
	Crystal, 11.155 MHz	301-516-2
(Chassis)		
SW1-8	Switch	
SW9-10	Switch	UID500-874-19
SP1	Speaker (3-1/2",3.2ohms)	301-793
	Antenna, Telescopic (TME-8H/L)	TAD-392450-AD
	Antenna, Telescopic (TME-8H)	P-6-125/102

CABINET PARTS

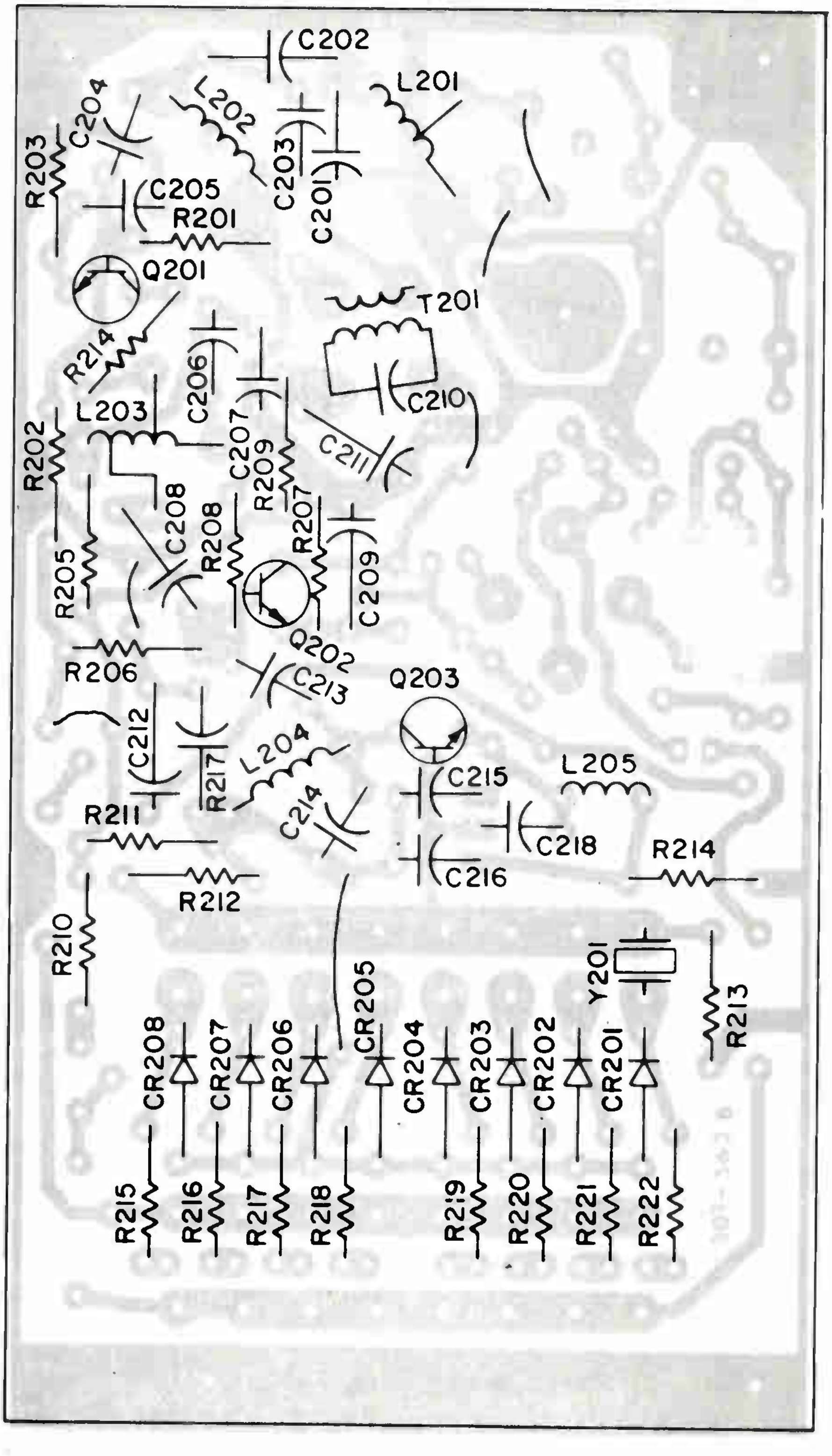
NAME	PART NO.
Cabinet/Wrap Assembly	600-312-2
Panel, Front	600-339
Panel, Back	301-675
Knob, Volume	40600CC
Knob, Squelch	40600CC

RF BOARD 301-563



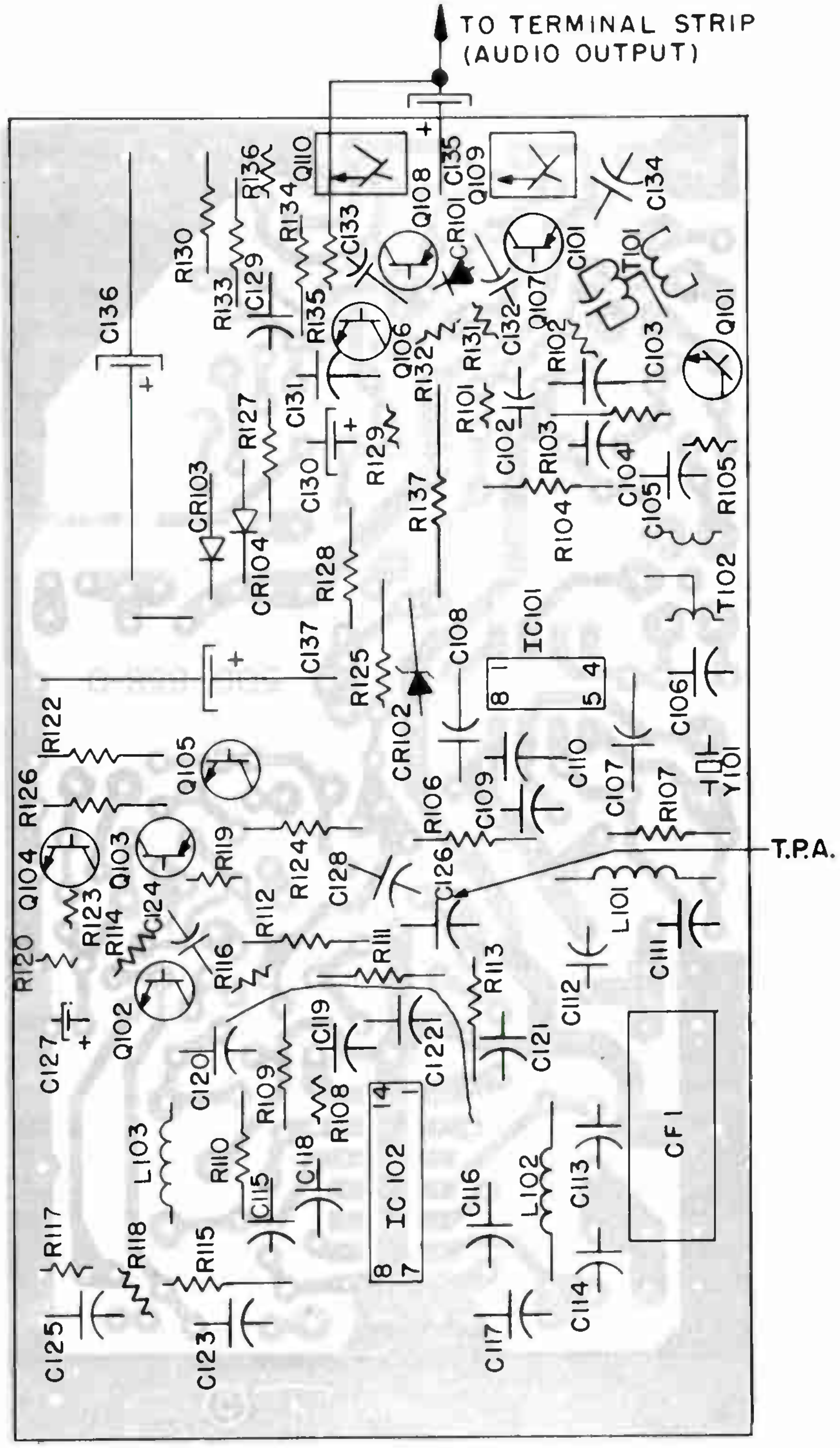
RF BOARD BOTTOM VIEW (TME-8H/L)

RF BOARD 301-563



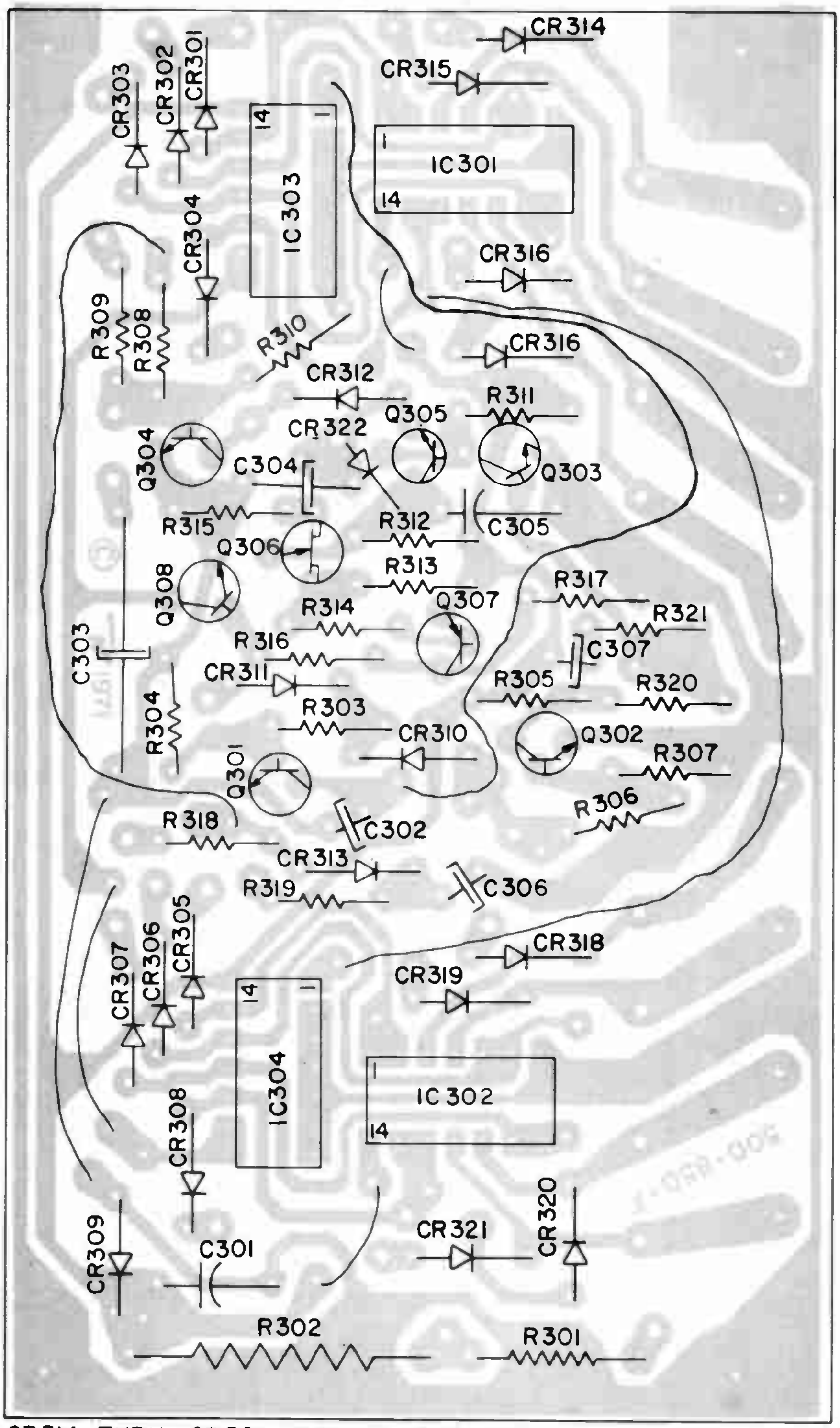
RF BOARD BOTTOM VIEW (TME-8H)

IF BOARD 500-858



IF-AUDIO BOARD BOTTOM VIEW

SCAN BOARD 500-850



CR314 THRU CR321 OMIT ON TME-8H ONLY.

SCANNER BOARD BOTTOM VIEW

3-9 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – TRANSISTORS:

TRANSISTOR EMITTER (Source BASE (Gate) COLLECTOR (Drain)

	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
RF Board No. 301-563 (TME-8H/L only)	Q201	3.1	3.8	7.0	Low Band Activated
		0	0	7.6	High Band Activated
	Q202	0	0	7.6	Low Band Activated
		3.1	3.8	7.0	High Band Activated
	Q203	1.6	2.3	7.1	Low Band Activated
		1.6	0	7.1	High Band Activated
	Q204	1.6	0	7.1	Low Band Activated
		1.6	2.3	7.1	High Band Activated
	Q205	7.8	7.4	7.6	Low Band Activated
		7.8	11.0	0	High Band Activated
	Q206	7.8	11.0	0	Low Band Activated
		7.8	7.0	7.6	High Band Activated
	Q207	3.4	4.1	7.0	
RF Board No. 301-563 (TME-8H only)	Q201	3.1	3.8	7.0	
	Q202	1.6	2.3	7.1	
	Q203	3.4	4.1	7.0	
IF Board No. 500-858	Q101	2.3	3.0	5.8	
	Q102	1.0	1.7	4.8	
	Q103 (PNP)	8.2	8.2	0	(unsquelched)
		8.2	8.2	1.0	(squelched)
		8.2	8.2	1.5	Min. (tight squelch)
	Q104	0	0	7.2	(unsquelched)
		0	.80	.30	(squelched)
		0	.80	.10	(tight squelch)
	Q105	1.4	1.9	5.1	(unsquelched)
		1.1	.10	8.2	(tight squelch)
	Q106	0.7	1.3	12.4	
	Q107 (PNP)	13.8	13.1	7.2	
	Q108 (PNP)	6.9	6.6	.10	
	Q109	6.9	7.2	13.8	
	Q110	0	.10	6.9	

VOLTAGE DATA (CONTINUED)

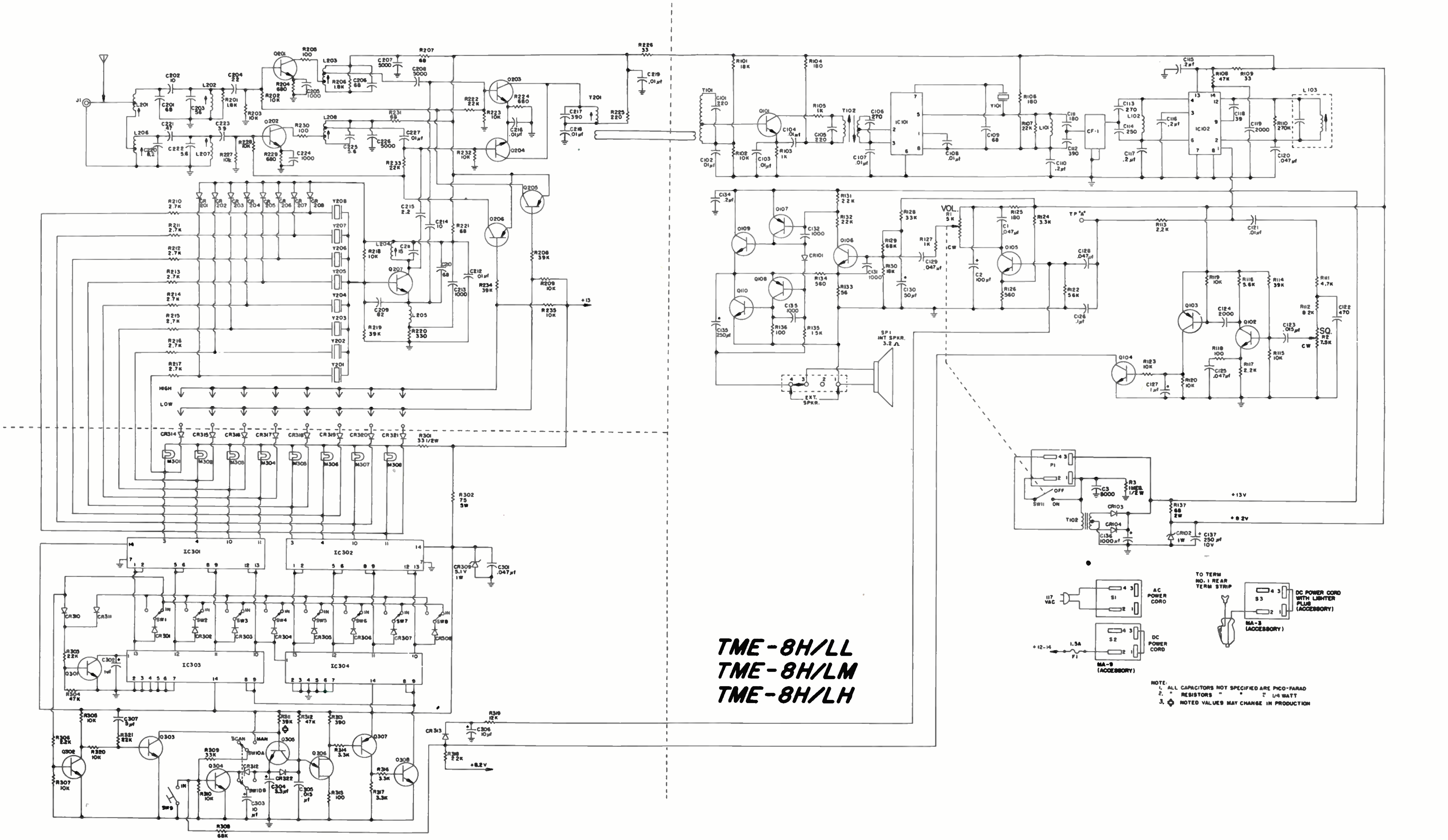
Scan Board No. 500-850	Q301	0	.70	.10 (SCAN)
		0	.70	0 (MAN)
	Q302	0	.70	.10
	Q303	0	.10	3.6 (SCAN)
		0	.10	1.2 (MAN)
	Q304	0	.10	2.8 (SCAN)
		0	.70	0.2 (MAN)
	Q305	3.1	3.6	3.2 (SCAN)
		0.7	1.2	0.7 (MAN)
	Q307 (PNP)	5.1	4.5	2.0 (SCAN)
		5.1	4.6	.10 (MAN)
	Q308	0	.10	1.5
		Base 1	**Emitter**	**Base 2**
	Q306 (unijunction)	.20	3.2	4.6 (SCAN)
		.20	0.7	4.6 (MAN)

VOLTAGE DATA (CONTINUED)

Voltage Data **Integrated Circuits**

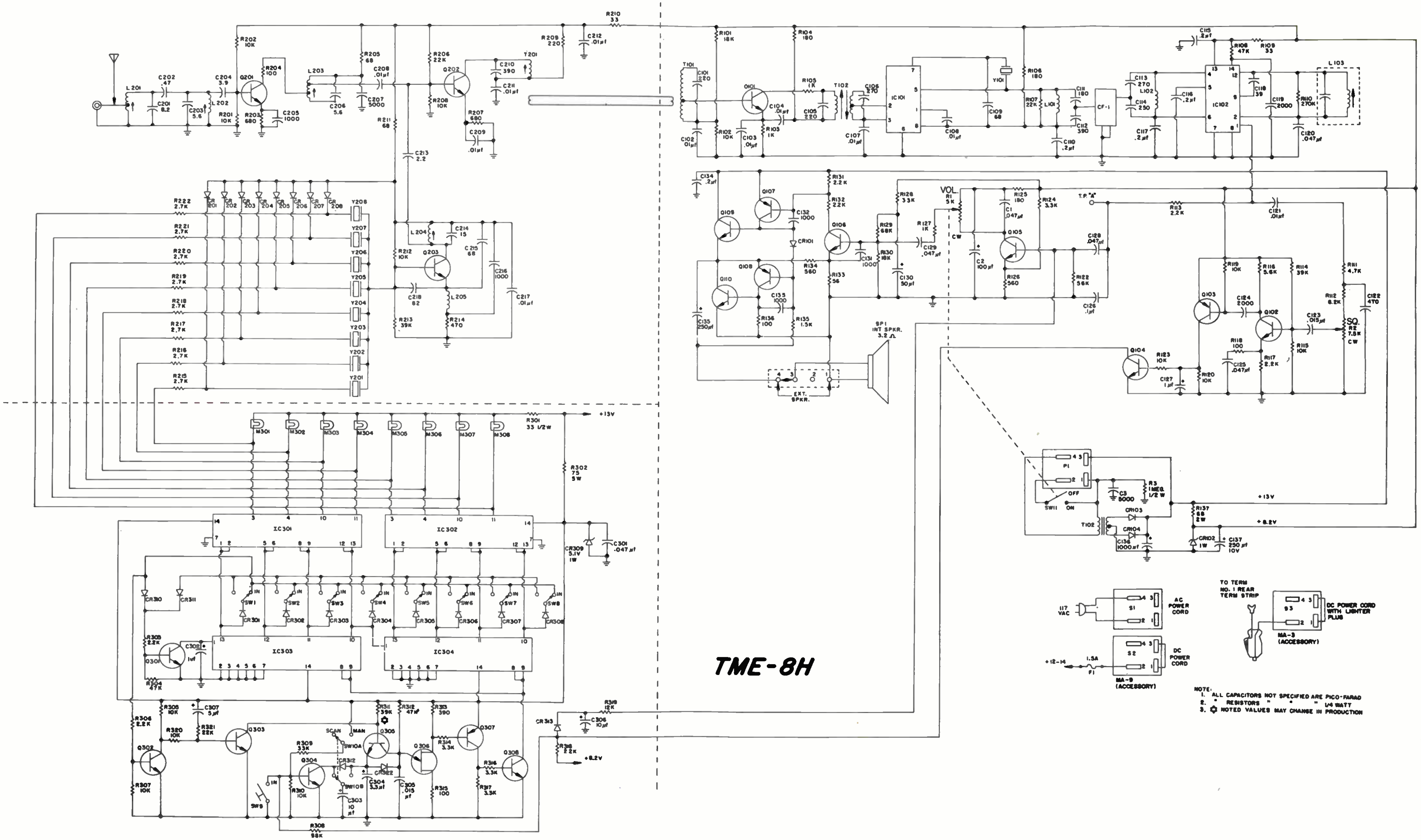
NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M301 is lighted).

	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IF Board 500-858	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0
Scan Board	IC 301	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		3.3	3.3	0.5	10.8	0.2	0.2	0	0.2	0.2	10.8	10.8	0.2	0.2	5.1 (Man)
	IC 302	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		0.2	0.2	10.8	10.8	0.2	0.2	0	0.2	0.2	10.8	10.8	0.2	0.2	5.1 (Man)
	IC 303	0.1	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0	0	0	0	0	0	0	1.5	1.5	0.2	0.2	0.2	3.3	5.1 (Man)
	IC 304	.7P	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0.2	0	0	0	0	0	0	1.5	1.5	0.2	0.2	0.2	0.2	5.1 (Man)

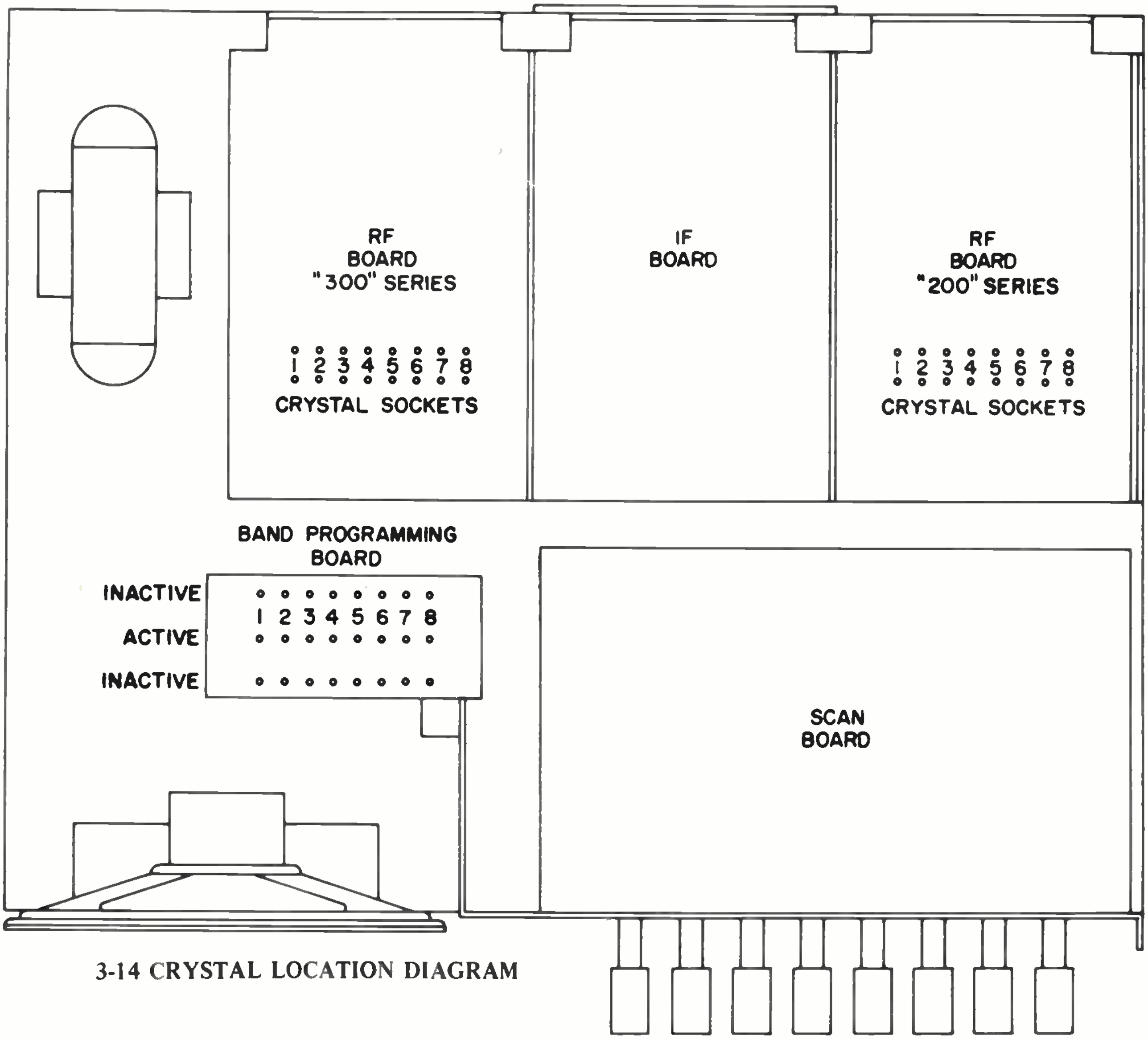


TME-8H/LL
TME-8H/LM
TME-8H/LH
NOTE:
1. ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
2. " RESISTORS " " " 1/4 WATT
3. NOTED VALUES MAY CHANGE IN PRODUCTION

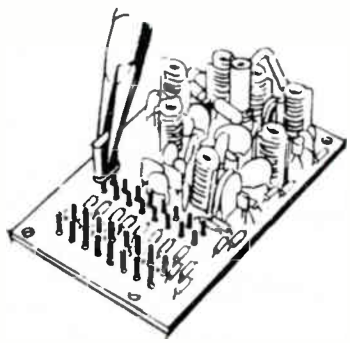
Regency TME-8H, TME-8H/LH, TME-8H/LL, TME-8H/LM



Pages 53-80 Courtesy of
REGENCY ELECTRONICS, INC.

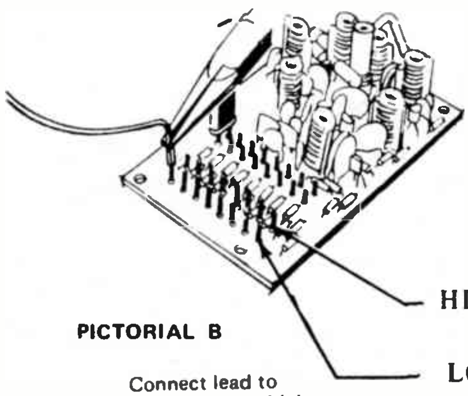


3-14 CRYSTAL LOCATION DIAGRAM



PICTORIAL A

Insert crystal for high or low band frequency of your choice



PICTORIAL B

Connect lead to corresponding high or low band terminal programmer

SECTION 2 ALIGNMENT AND TUNING PROCEDURE

2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM
2-1-4 Noise Generator (To Be Used In 2-9 Only)

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

2-2 QUADRATURE DETECTOR

NOTE: Omit this section for Models TME-8 H/L/U and TME-8 H/U.

2-2-1 Connect the FM Signal Generator to the antenna input jack of the "200" series band. Accurately set the frequency to the center of the channel being used for alignment. Modulate Signal Generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to test point A. (Junction of C126, C128 and R113). See diagram 3-10.

2-2-3 Adjust Signal Generator's output until all of the noise in the scope pattern just disappears.

2-2-4 Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal. When L103 is properly aligned, signal at TP-A should be approximately 0.2 volts RMS with test signal input as noted in 2-2-1.

2-3 IF ALIGNMENT

2-3-1 Disconnect RF Signal Generator from the antenna input.

2-3-2 Connect AC voltmeter across the speaker terminals.

2-3-3 Adjust volume control for 0.5 volt reading on AC voltmeter.

2-3-4 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If the circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

NOTE: Coils will have two peaks; adjust the core to peak away from the center of the form.

2-3-5 Pre-align Quadrature Detector by tuning L103 for maximum noise (AC voltmeter). Models TME-8 H/L/U and TME-8 H/U only.

2-3-6 Adjust volume control for 1 volt noise reading on AC voltmeter.

2-3-7 Connect the RF Signal Generator to the antenna input jack of "200" series board. Turn the modulation off. On Models TME-8 H/L/U and TME-8 H/U, set the generator to the High Band crystal frequency that will be used for High Band Section alignment. On Model TME-8 LMH, set the generator to the Low Band crystal frequency that will be used for RF Section alignment.

2-3-8 Adjust the Signal Generator output until the voltmeter reads 0.2 volts.

2-3-9 Adjust T101 and T201 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts.

NOTE: Coils will have two peaks; adjust core tc peak away from the center of the coil form.

2-3-10 Set the generator frequency to the secondary Image frequency. This is 910 KHz below the channel frequency for High Band channels and 910 KHz above for Low Band channels. NOTE: Sòme receivers have the second oscillator at 11.155 MHz, in this case the Image frequency is 910 KHz to the opposite side of the channel frequency previously stated. Check the frequency marked on top of the crystal.

2-3-11 Adjust the Signal Generator output until the voltmeter reads .2 volts.

2-3-12 Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order) for maximum quieting degradation (highest meter reading). Adjust Signal Generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the cores should be within two turns of the position in Step No. 4 and 9.

2-4 RF ALIGNMENT ("200" SERIES BOARD - TME - 8 H/L/U)

2-4-1 Preset the slugs L201, L202 and L203 out of the outer end of the coil form three turns. Preset L204, L206, L207 and L208 four turns from the outer ends of the coil form.

2-4-2 Connect AC voltmeter across the speaker terminals.

2-4-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

HIGH BAND SECTION

2-4-4 Activate High Band channel nearest the center of high band frequencies being used.

2-4-5 Connect signal generator to antenna input jack of "200" series R.F. board. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-4-6 Adjust output signal generator until AC voltmeter reads .2 volts.

2-4-7 Adjust L206, L207, L208 and L204, in that order, for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

LOW BAND SECTION

2-4-8 Activate Low Band channel nearest to center of low band frequencies being used.

2-4-9 Set generator accurately to the center frequency of the channel being used for alignment. Turn modulation off.

2-4-10 Adjust output of signal generator until AC voltmeter reads 0.2 volts.

2-4-11 Adjust coils L201, L202 and L203 (in that order) for maximum quieting (lowest meter reading). Adjust the signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

2-5 RF ALIGNMENT ("200" SERIES BOARD - TME - 8H/U)

2-5-1 Preset L201. L202 L203 and L204 four turns from the outer end of the coil form.

2-5-2 Connect AC voltmeter across the speaker terminals.

2-5-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

2-5-4 Activate High Band channel nearest to center of High Band frequencies being used.

2-5-5 Connect Signal Generator to antenna input jack of "200" series R.F. board. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-5-6 Adjust output Signal Generator until AC voltmeter reads .2 volt.

2-5-7 Adjust L201, L202, L203 and L204, in that order, for maximum quieting (lowest meter reading). Adjust Signal Generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

2-6 RF ALIGNMENT ("300" SERIES BOARD - TME -8 H/L/U AND TME - 8 H/U)

2-6-1 Connect the R.F. Signal Generator to the antenna input jack of the "300" series board. Set the generator to the operating crystal frequency.

2-6-2 Adjust output of Signal Generator until AC voltmeter reads 0.2 volts.

2-6-3 Pre-adjust Trimmer Capacitor (C317) so that the silvered half-moon section is nearest to the rear of the receiver.

2-6-4 Adjust T301 for maximum quieting (lowest meter reading). Adjust Signal Generator output to maintain voltmeter reading between .1 and .2 volts. Adjust core to peak nearest the center of the coil form.

2-6-5 Adjust C301 and C302 (trimmer capacitors) in that order, for maximum quieting (lowest meter reading). Adjust Signal Generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

NOTE: Use non-metallic screwdriver for trimmer adjustments.

Peaks are very sharp, tune with care. Two peaks can be observed, tune to peak with silver moon section away from I.F. Board.

2-6-6 Adjust the core of L303 for maximum quieting (lowest meter reading). Adjust Signal Generator to maintain reading on AC voltmeter between .1 and .2 volts.

NOTE: To properly adjust L303, C317 must be pre-adjusted as in Step 2-6-3.

2-6-7 Adjust C317 counter clockwise with non-metallic screwdriver for maximum quieting (lowest meter reading). Adjust Signal Generator to maintain reading on AC voltmeter between .1 and .2 volts. Do NOT re-adjust L303 after C317 is adjusted.

2-6-8 Re-adjust C301, C302 and C317 (only) for maximum quieting (lowest meter reading). Adjust Signal Generator output to maintain .1 and .2 volts. Repeat adjustments until no further improvements can be made.

2-7 RF ALIGNMENT (TME - 8LMH)

2-7-1 Preset L201, L202, L203, L301, L302 and L303 out of the outer end of the coil form three turns.

2-7-2 Connect AC voltmeter across speaker terminals.

2-7-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

2-7-4 Activate channel on "200" series board that will be used for alignment.

2-7-5 Connect Signal Generator to antenna input jack of "200" series R.F. board. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-7-6 Adjust output Signal Generator until AC voltmeter reads .2 volts.

2-7-7 Adjust coils L201, L202 and L203 (in that order) for maximum quieting (lowest meter reading). Adjust the Signal Generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

2-7-8 Activate channel on "300" series board that will be used for alignment.

2-7-9 With no input signal, adjust volume control for 1 volt of noise on AC voltmeter at speaker terminals.

2-7-10 Connect Signal Generator to antenna input jack of "300" series board. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-7-11 Adjust output Signal Generator until AC voltmeter reads .2 volts.

2-7-12 Adjust T301 for maximum quieting (lowest meter reading). Adjust

Signal Generator output to maintain voltmeter reading between .1 and .2 volts. Adjust core to peak away from center of coil form.

2-7-13 Adjust coils L301, L302 and L303 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made.

2-8 AFC ALIGNMENT (TME - 8 H/L/U AND TME - 8 H/U)

NOTE: This adjustment requires an accurate 10.7 MHz ±1 KHz oscillator or 455 KHz ±500 Hz oscillator to be used as a reference signal. If none are available, proceed to Step 2-8-5.

2-8-1 Pre-align Quadrature Detector by tuning L103 for maximum noise (AC voltmeter reading) at the speaker terminals.

2-8-2 With a coupling loop, inject "Reference" signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R326 for reading of 3.8 to 4.0 volts at the collector of Q304.

2-8-3 Remove the "Reference" signal and have the unit squelched and receiving no signal. The voltage on the collector of Q304 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 2-8-4. If voltage is between 3.2 and 4.6 volts, AFC alignment is complete.

NOTE: Any further adjustments made to L103 and R326 will require AFC to be re-adjusted.

2-8-4 Inject "Reference" signal and monitor voltage on collector of Q304, adjust L103 for same voltage as noted in Step 3. Re-adjust R326 for a voltmeter reading of 3.8 to 4.0 volts. Repeat Step 2-4-3.

NOTE: Do not adjust L103 more than 1/4 turn at a time.

2-8-5 If an accurate I.F. signal source is not available, an approximate AFC alignment can be made by adjusting L103 for maximum noise (AC voltmeter reading) at the speaker terminals, and with the unit squelched and receiving no signal, adjust R326 for voltmeter reading of 3.2 to 4.6 on the collector of Q304.

NOTE: Units equiped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q304 and collector of Q306. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q304 and the collector of Q305. If the crystal is changed from one frequency to the other, the jumper must be changed.

2-9 NOISE BALANCE ADJUSTMENT (TME - 8 LMH)

NOTE: This adjustment may be required only if excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper or inadequate noise suppression of the vehicle's ignition system. In models containing UHF RF board. the noise balance is achieved through AFC Alignment.

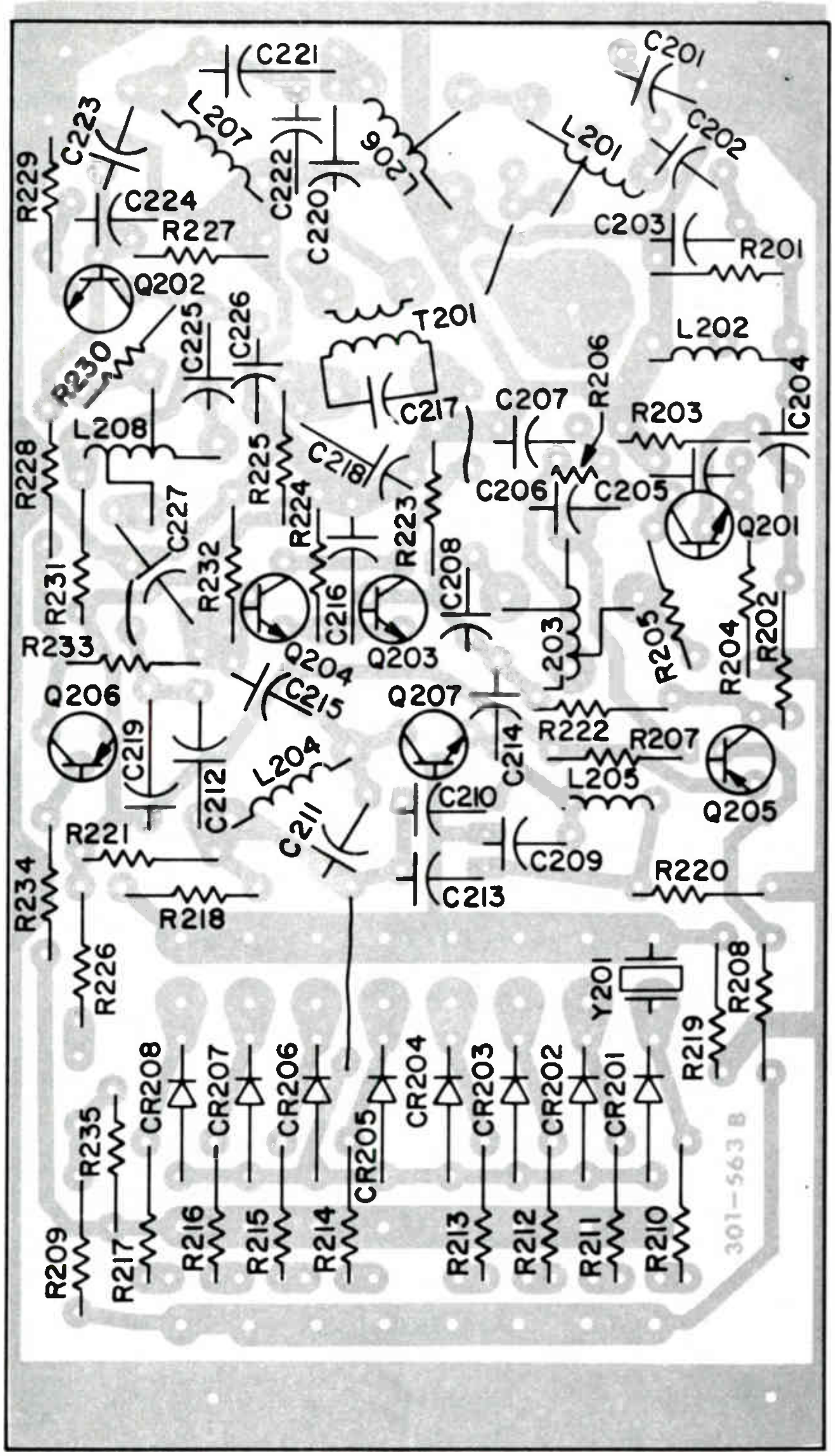
2-9-1 Using a "T" connector, connect the FM Signal Generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L201.

2-9-2 Connect the oscilloscope to the junction of Q109's Emitter and Q110's collector, or to the speaker terminals.

2-9-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the Noise Generator until spikes are clearly seen in the audio output as viewed on the oscilloscope. The noise spikes will be either mostly positive or negative if an unbalanced condition exists.

2-9-4 Tune L103 (Quadrature Detector Coil) until the noise spikes are equally positive and negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.

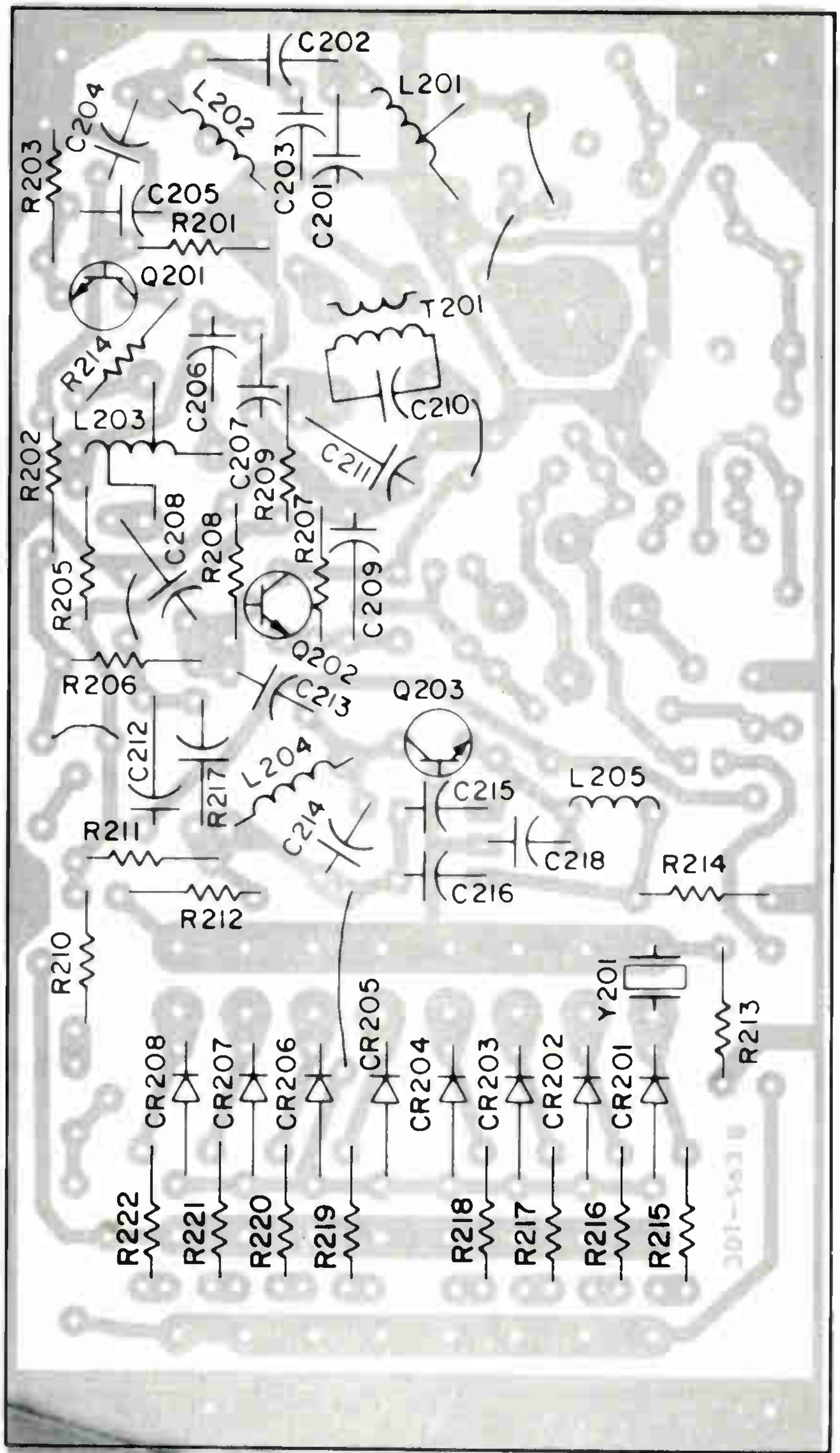
RF BOARD 301-563



(TME-8H/L/U ONLY)

RF BOARD BOTTOM VIEW (H/L BOARD)

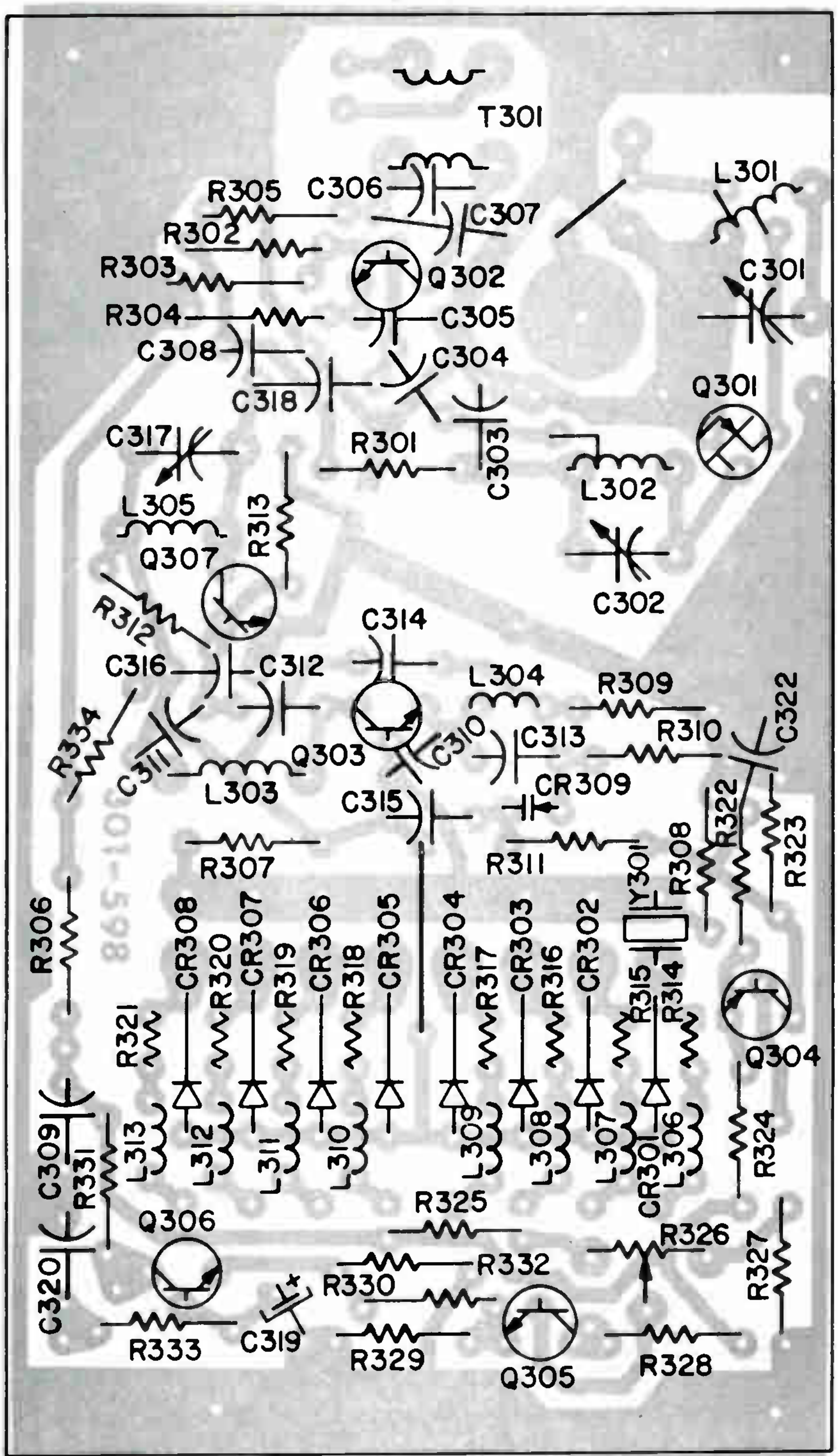
RF BOARD 301-563



(TME-8H/U ONLY)

RF BOARD BOTTOM VIEW (HIGH BOARD)

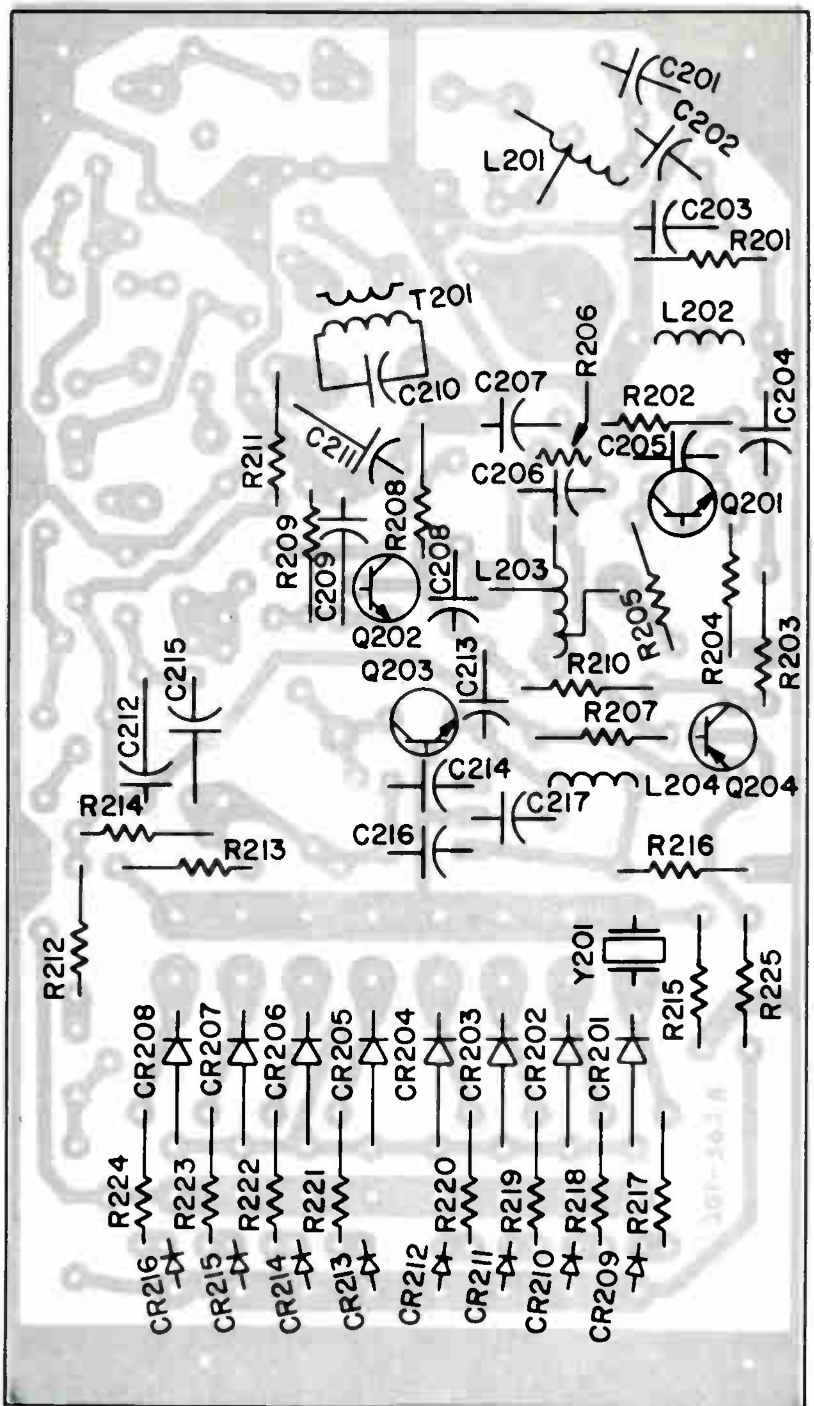
RF BOARD 301-598



(TME-8H/L/U & TME-8H/U ONLY)

RF BOARD BOTTOM VIEW (UHF BOARD)

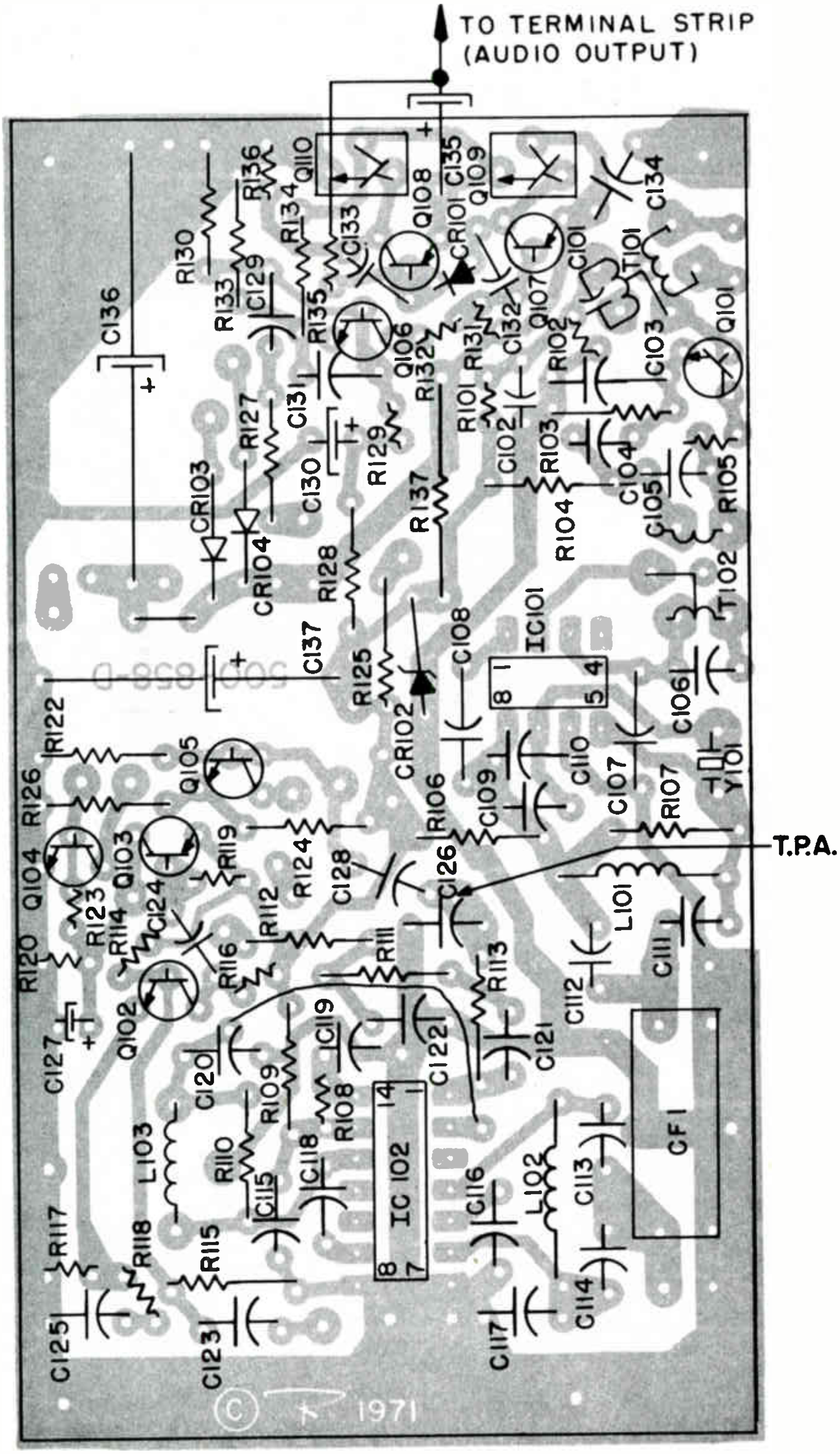
RF BOARD 301-563



TME-8LMH ONLY: BOTH RF BOARDS ARE IDENTICAL EXCEPT FOR ONE BEING A "200" SERIES BOARD AND THE OTHER A "300" SERIES BOARD.

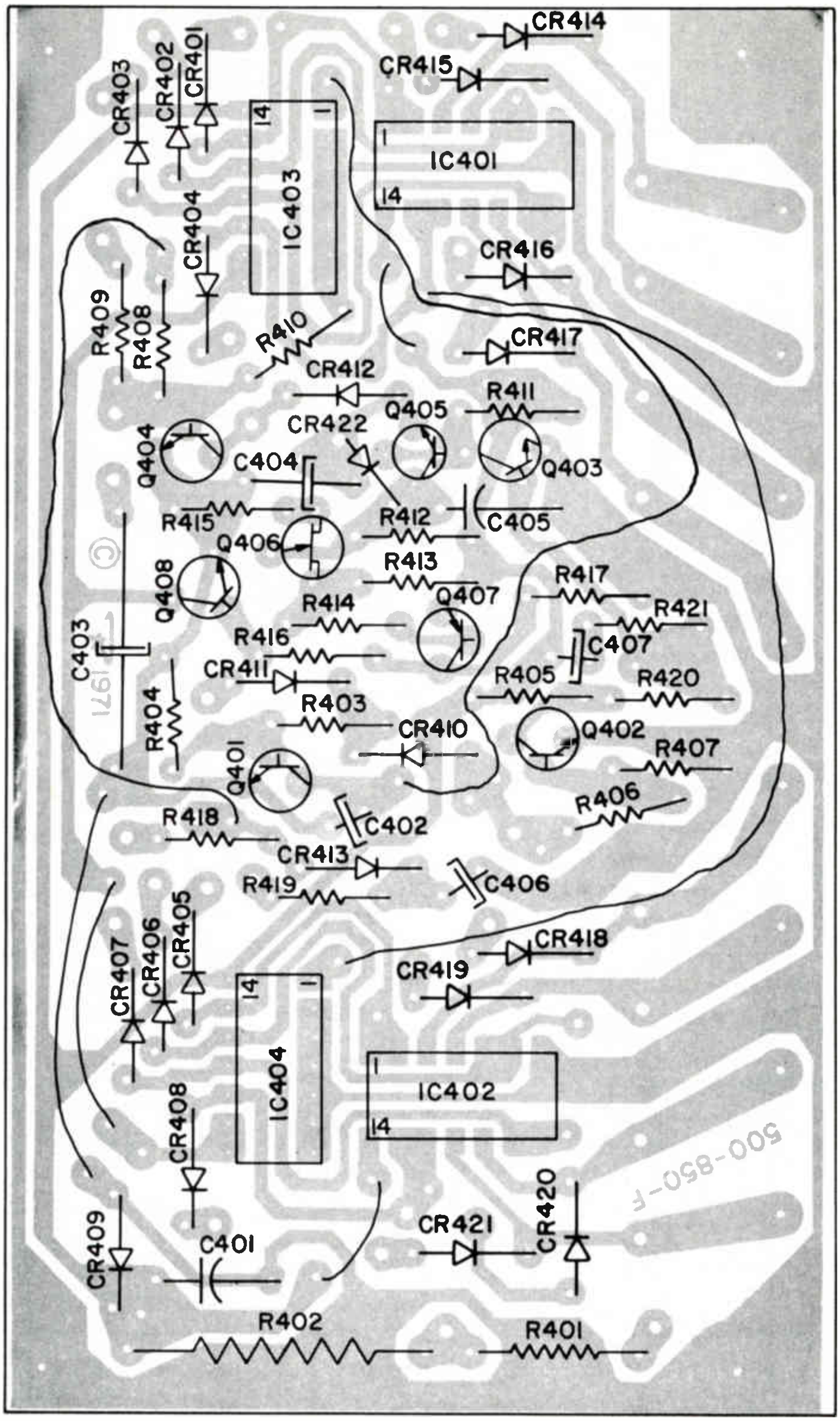
RF BOARD BOTTOM VIEW (LMH BOARD)

IF BOARD 500-858

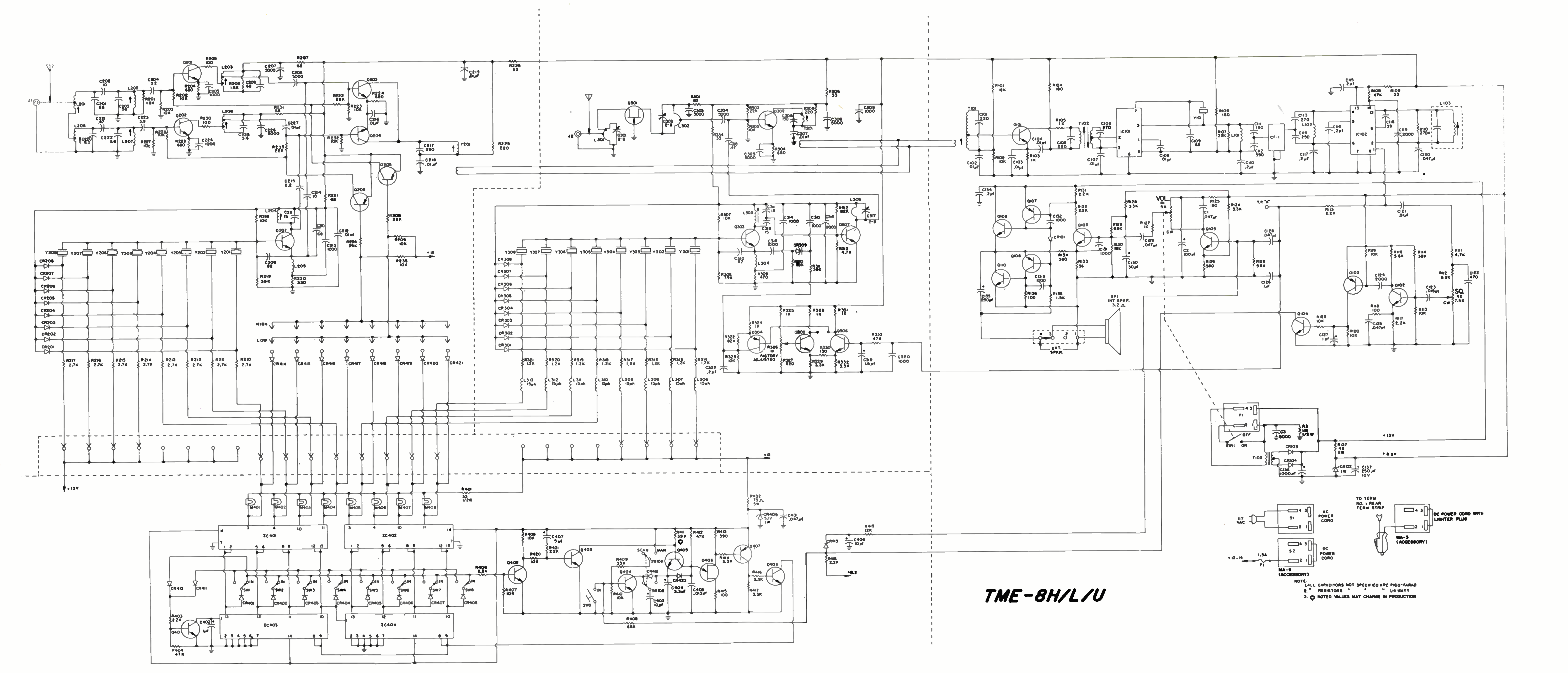


IF - AUDIO BOARD BOTTOM VIEW

SCAN BOARD 500-850

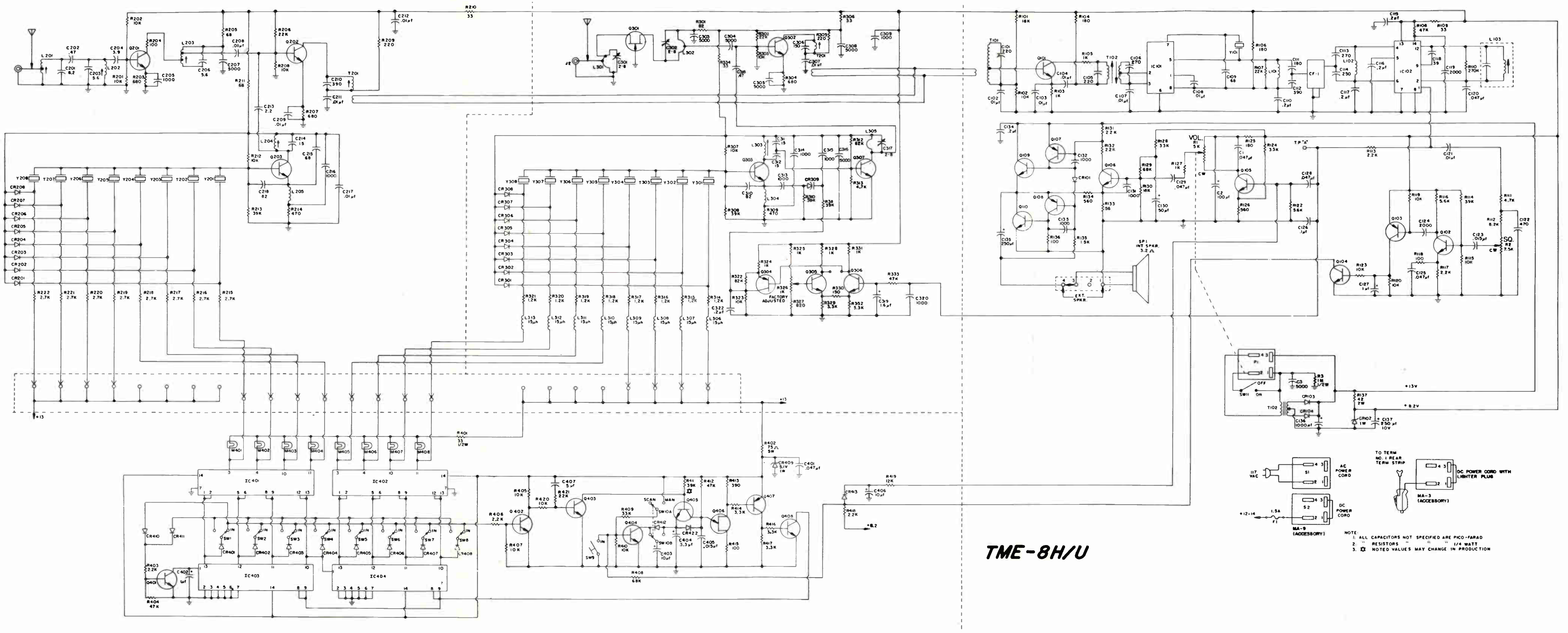


SCANNER BOARD BOTTOM VIEW


NOTE:
1. ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
2. " RESISTORS " " " 1/4 WATT
3. NOTED VALUES MAY CHANGE IN PRODUCTION

TME-8H/L/U

Regency *TME-8H/LH/U, TME-8H/LL/U, TME-8H/LM/U, TME-8H/U, TME-8LMH*



3-13 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – TRANSISTORS:

	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
RF Board					
No. 301-563	Q201	3.1	3.8	7.0	Low Band Activated
Note: Model		0	0	7.6	High Band Activated
TME - 8 H/L/U	Q202	0	0	7.6	Low Band Activated
		3.1	3.8	7.0	High Band Activated
	Q203	1.6	2.3	7.1	Low Band Activated
		1.6	0	7.1	High Band Activated
	Q204	1.6	0	7.1	Low Band Activated
		1.6	2.3	7.1	High Band Activated
	Q205	7.8	7.4	7.6	Low Band Activated
		7.8	11.0	0V	High Band Activated
	Q206	7.8	11.0	0	Low Band Activated
		7.8	7.0	7.6	High Band Activated
	Q207	3.4	4.1	7.0	
RF Board					
No. 301-563	Q201	3.1	3.8	7.0	
Note: Model	Q202	1.6	2.3	7.1	
TME - 8 H/U	Q203	3.4	4.1	7.0	
RF Board					
No. 301-598	Q301 (FET)	0	0	5.5	
Note: Model	Q302	1.5	2.2	6.8	
TME - 8 H/L/U	Q303	.25	3.1	6.8	
and	Q304	7.8	7.2	3.0-5.0	
TME - 8 H/U	Q305	2.9	3.6	7.4	
	Q306	2.9	3.6	7.2	
	Q307	0	.2	6.8	
RF Board					
No.301-563	Q201	3.1	3.8	7.0	Activated
Note: Model		0	0	7.6	Unactivated
TME - 8 LMH					
has "300" Series	Q202	1.6	2.3	7.1	Activated
RF Board Voltages		0	0	7.6	Unactivated
Identical To					
"200" Series	Q203	3.4	4.1	7.0	
RF Voltages	Q204	7.8	7.4	7.6	Activated
		7.8	11.0	0	Unactivated

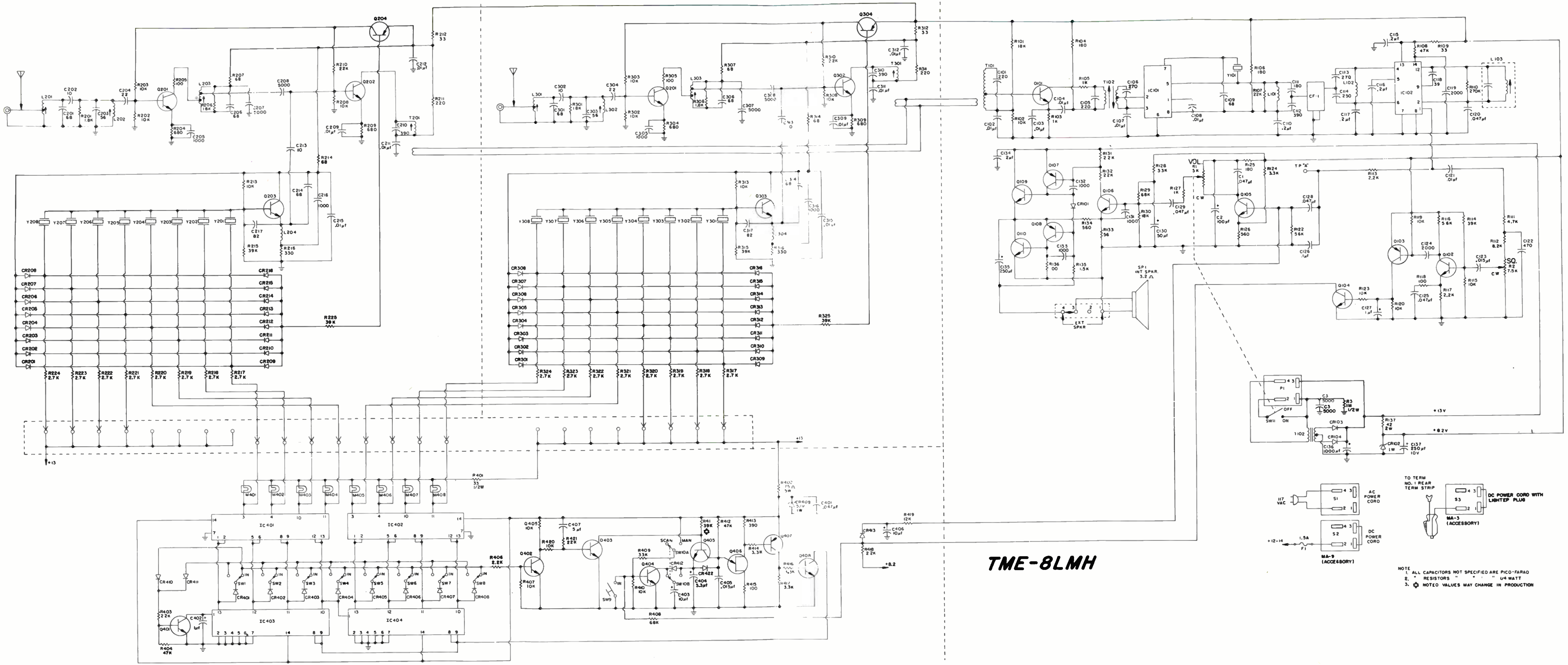
3-13 VOLTAGE DATA

	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)
IF Board No. 500-858	Q101	2.3	3.0	5.8
	Q102	1.0	1.7	4.8
	Q103 (PNP)	8.2	8.2	0 (unsquelched)
		8.2	8.2	1.0 (squelched)
		8.2	8.2	1.5 Min. (tight squelch)
	Q104	0	0	7.2 (unsquelched)
		0	.80	.30 (squelched)
		0	.80	.10 (tight squelch)
	Q105	1.4	1.9	5.1 (unsquelched)
		1.1	.10	8.2 (tight squelch)
	Q106	0.7	1.3	12.4
	Q107 (PNP)	13.8	13.1	7.2
	Q108 (PNP)	6.9	6.6	.10
	Q109	6.9	7.2	13.8
	Q110	0	.10	6.9
Scan Board	Q401	0	.70	.10 (SCAN)
		0	.70	0 (MAN)
No. 500-850	Q402	0	.70	.10
	Q403	0	.10	3.6 (SCAN)
		0	.10	1.2 (MAN)
	Q404	0	.10	2.8 (SCAN)
		0	.70	0.2 (MAN)
	Q405	3.1	3.6	3.2 (SCAN)
		0.7	1.2	0.7 (MAN)
	Q407 (PNP)	5.1	4.5	.20 (SCAN)
		5.1	4.6	.10 (MAN)
	Q408	0	.10	1.5
		Base 1	**Emitter**	**Base 2**
	Q406	.20	3.2	4.6 (SCAN)
	(unijunction)	.20	0.7	4.6 (MAN)

VOLTAGE DATA – INTEGRATED CIRCUITS

NOTE A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M401 is lighted).

	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IF Board 500-858	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0
Scan Board 500-850	IC 401	.7P 3.3	.7P 3.3	9P 0.5	9P 10.8	.7P 0.2	.7P 0.2	0 0	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
	IC 402	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	0 0	.7P 0.2	.7P 0.2	9P 10.8	9P 10.8	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)
	IC 403	0.1 0	0 0	0 0	0 0	0 0	0 0	0 0	1.5 1.5	1.5 1.5	.7P 0.2	.7P 0.2	.7P 0.2	.7P 3.3	5.1 (Scan) 5.1 (Man)
	IC 404	.7P 0.2	0 0	0 0	0 0	0 0	0 0	0 0	1.5 1.5	1.5 1.5	.7P 0.2	.7P 0.2	.7P 0.2	.7P 0.2	5.1 (Scan) 5.1 (Man)


TME-8LMH
NOTE
1. ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
2. " RESISTORS " " " 1/4 WATT
3. NOTED VALUES MAY CHANGE IN PRODUCTION

1-2 CRYSTAL SPECIFICATIONS

Minature plug-in crystals are utilized in the receiver. Because of the high accuracy (close tolerances) required, Shepherd Industries' crystals are recommended. If the crystals are ordered from Regency, it is only necessary to specify Part No. 301-532 for High band crystals, Part No. 301-542 for Low band crystals or Part No. 301-603 for UHF crystals and the desired receive frequency.

If desired, the crystals may be purchased from other manufacturers. The following specifications must be included in the order:

High Band Crystal:

a. Crystal frequency, determined as follows:
Crystal frequency = $\frac{\text{channel frequency - 10.7 MHz}}{3}$

Example:
Crystal frequency =
$\frac{\text{155.55 MHz - 10.7 MHz}}{3} = \frac{\text{144.85 MHz}}{3}$ = 48.2833 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC-25/u

Low Band Crystal:

a. Crystal frequency, determined as follows:
Crystal frequency = channel frequency + 10.7 MHz

Example:
Crystal frequency = 39.5 MHz + 10.7 MHz = 50.2 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC-25/u

UHF Band Crystal:

a. Crystal frequency = $\frac{\text{receive frequency - 10.7 MHz}}{9}$

Example:
Crystal frequency = $\frac{\text{458.000 MHz - 10.700 MHz}}{9}$

Crystal frequency = 49.70000 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Parallel resonance - 18pf load capacity
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC-25/u

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(RF Board, H/L)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
Q201	SPS-1473(RT)	2N5222
Q202	SPS-1473(RT)	2N5222
Q203	SPS-1473(RT)	2N5222
Q204	SPS-1473(RT)	2N5222
Q205	SPS-1539(WT)	2N5227
Q206	SPS-1539(WT)	2N5227
Q207	SM-4304-S	2N5230
(RF Board, H)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
Q201	SPS-1473(RT)	2N5222
Q202	SPS-1473(RT)	2N5222
Q203	SM-4304-S	2N5130
(RF Board, UHF)		
CR301	102-339	
CR302	102-339	
CR303	102-339	
CR304	102-339	
CR305	102-339	
CR306	102-339	
CR307	102-339	
CR308	102-339	
CR309	MV2209(Motorola)	
Q301	2N5245	2N5222
Q302	SPS-1473(RT)	2N5222
Q303	SM-4304-S	2N5130
Q304	SPS-1539(WT)	2N5227
Q305	SPS-952	MPS-5172
Q306	SPS-952	MPS-5172
Q307	SPS-1473(RT)	2N5222
(RF Board, LMH)		
CR201/301	102-339	
CR202/302	102-339	
CR203/303	102-339	
CR204/304	102-339	
CR205/305	102-339	
CR206/306	102-339	
CR207/307	102-339	
CR208/308	102-339	
CR209/309	102-405	
CR211/311	102-339	
CR212/312	102-339	
CR213/313	102-339	
CR214/314	102-339	
CR215/315	102-339	
CR216/316	102-339	
Q201/301	SPS-1473(RT)	2N5222
Q202/302	SPS-1473(RT)	2N5222
Q203/303	SM-4304-S	2N5130
Q204/304	SPS-1539(WT)	2N5227
(IF-Audio Board)		
CR101	102-412	1N4148
CR102	1N4738A	8.2 V Zener
CR103	1N4002	1N4002
CR104	1N4002	1N4002
IC101	301-679-1	
IC102	301-576-3	MC-1357P
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539(WT)	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107	MPS-A55	
Q108	MPS-A55	
Q109	MJE-521	
Q110	MJE-521	
(Scanner Board)		
CR401	102-412	1N4148
CR402	102-412	1N4148
CR403	102-412	1N4148
CR404	102-412	1N4148
CR406	102-412	1N4148
CR407	102-412	1N4148
CR409	1N4733A	5.1 V Zener
CR410	102-412	1N4148
CR411	102-412	1N4148
CR413	102-412	1N4148
CR414	102-412	1N4148
CR415	102-412	1N4148
CR416	102-412	1N4148
CR417	102-412	1N4148
CR418	102-412	1N4148
CR419	102-412	1N4148
CR420	102-412	1N4148
CR421	102-412	1N4148
CR422	102-412	1N4148
IC401	301-576-2	
IC402	301-576-2	
IC403	301-576-6	
IC404	301-576-6	
Q401	SPS-952	MPS5172
Q402	SPS-952	MPS5172
Q403	SPS-952	MPS5172
Q404	SPS-952	MPS5172
Q405	SPS-952	MPS5172
Q406	2N4871	2N4871
Q407	SPS-1539(WT)	2N227
Q408	SPS-952	MPS5172

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
(RF Board, UHF)		
C301	10S-Triko 22	2-8 pF Trimmer
C302	10S-Triko 22	2-8 pF Trimmer
C317	10S-Triko 22	2-8 pF Trimmer
C319		1 uF 50 V
(IF-Audio Board)		
C127		1 uF 50 V
C130		50 uF 10 V
C135		250 uF 16 V
C136		1000 uF 16 V
C137		250 uF 10 V
(Scanner Board)		
C402		1 uF 25 V
C403		10 uF 25 V
C404		3.3 uF 16 V
C406		10 uF 25 V
C407		5 uF 10 V
(Chassis)		
C2		100 uF 10 V

CONTROLS

ITEM	PART NO.	DESCRIPTION
(RF Board, UHF)		
R326	X201R102B	1000 ohms
(Chassis)		
R1	102-479-3	5000 ohms Volume
R2	102-479-2	7.5 K Squelch

COILS/TRANSFORMERS

ITEM	PART NO.
(RF Board, H/L)	
L201	301-520-4
L202	301-520-5
L203	301-520-6
L204	301-520-9
L205	102-369
L206	301-520-1
L207	301-520-2
L208	301-520-3
T201	102-405
(RF Board, H)	
L201	301-520-1
L202	301-520-2
L203	301-520-3
L204	301-520-9
L205	102-369
T201	102-405
(RF Board, UHF)	
L301	301-600-1
L302	301-600-2
L303	301-520-2
L304	102-369
L305	301-600-3
T301	301-619
(RF Board, LMH)	
L201/301	301-5204
L202/302	301-5205
L203/303	301-5206
L204/304	102-369
T201/301	102-405
(IF-Audio Board)	
L101	ES-2228
L102	ES-2228
L103	301-517
T101	102-507
T102	301-730
(Chassis)	
T1	301-515

MISCELLANEOUS

ITEM	NAME	PART NO.
(IF-Audio Board)		
CF1	Ceramic Filter, 455 kHz	301-724
	Ceramic Filter, 455 kHz	301-723
Y101	Crystal, 10.245 MHz	301-516-1
	Crystal, 11.155 MHz	301-516-2
(Chassis)		
SW9-10	Switch	UID500-874-19
SP1	Speaker (3-1/2",3.2ohms)	301-793
	Antenna, Telescopic (H/L,LMH)	1201-0000-002
	Antenna, Telescopic(H)	1201-0000-001
	Antenna, Telescopic(UHF)	1201-0000-003

CABINET PARTS

NAME	PART NO.
Cabinet/Wrap Assembly	600-312-2
Panel, Front	600-339
Panel, Back	301-675
Knob, Volume	40600CC
Knob, Squelch	40600CC

Pages 81-104 Courtesy of REGENCY ELECTRONICS, INC.

ALIGNMENT PROCEDURE

EQUIPMENT REQUIRED - FM Signal Generator
Oscilloscope
AC VTVM

The following chart shows the center frequency and frequency spread of each version of the TMR series radio. All multi channel radios should be aligned to the channel nearest the center of the range over which they will operate.

Single frequency units should be aligned to the channel installed.

There is no electrical difference in the low band units, except for the center frequency to which they are aligned.

MODEL	CENTER FREQUENCY	FREQUENCY SPREAD
TMR-1 LL	36 MHz	33-39 MHz
TMR-4 LL	"	"
TMR-8 LL	"	"
TMR-12 LL	"	"
TMR-1 LM	39.5 MHz	37-43 MHz
TMR-4 LM	"	"
TMR-8 LM	"	"
TMR-12 LM	"	"
TMR-1 LH	43.5 MHz	41-47 MHz
TMR-4 LH	"	"
TMR-8 LH	"	"
TMR-12 LH	"	"
TMR-1 H	157 MHz	153-161 MHz
TMR-4 H	"	"
TMR-8 H	"	"
TMR-12 H	"	"

During all steps of alignment, the squelch control should be in maximum clockwise position (minimum squelch action).

455 KHz QUADRATURE DETECTOR ALIGNMENT

1. Connect the FM Signal generator to the antenna input jack. Accurately set frequency to the center of the channel being used for alignment. Modulate signal generator with 1000 Hz, 3KHz deviation.

2. Connect the oscilloscope to point A, (Junction of C122, C123, R116).

3. Adjust output of signal generator until all noise in scope pattern just disappears.

4. Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal.

IF ALIGNMENT.

1. Disconnect RF signal generator from antenna input.

2. Connect AC voltmeter across speaker terminals.

3. Adjust volume control for .5 volt noise reading on AC voltmeter.

4. Peak cores of T101 (one core) and T202 (two cores) for maximum noise (maximum reading on AC voltmeter). If the circuits are not badly misaligned, the correct point should be within 2 turns of the slugs present position.

5. Connect the RF generator to the antenna input jack. Turn modulation off. Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency. Note, some receivers have the second oscillator at 11.155 MHz, in this case the image frequency is 910 KHz above the channel frequency. Check the frequency marked on top of the crystal.

6. Adjust the signal generator output until voltmeter reads .2 volts.

7. Adjust T101 for maximum quieting degradation, (Highest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. The correct position for the slug should be within two turns of the position in step 4.

8. Adjust both cores of T202 for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. The correct position of the slugs should be within two turns of the position in step 4.

RF ALIGNMENT.

1. Pre-set the slugs of L201, L202, L203 flush with the tops of the coil forms. Pre-set both slugs of T201 flush with the outer ends of the coil form.

2. Connect AC voltmeter across the speaker terminals.

3. With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1 volt of noise.

4. Connect signal generator to antenna input jack. Set generator accurately to the center frequency of the channel being used for alignment. Turn modulation off.

5. Adjust output of signal generator until AC voltmeter reads .2 volts.

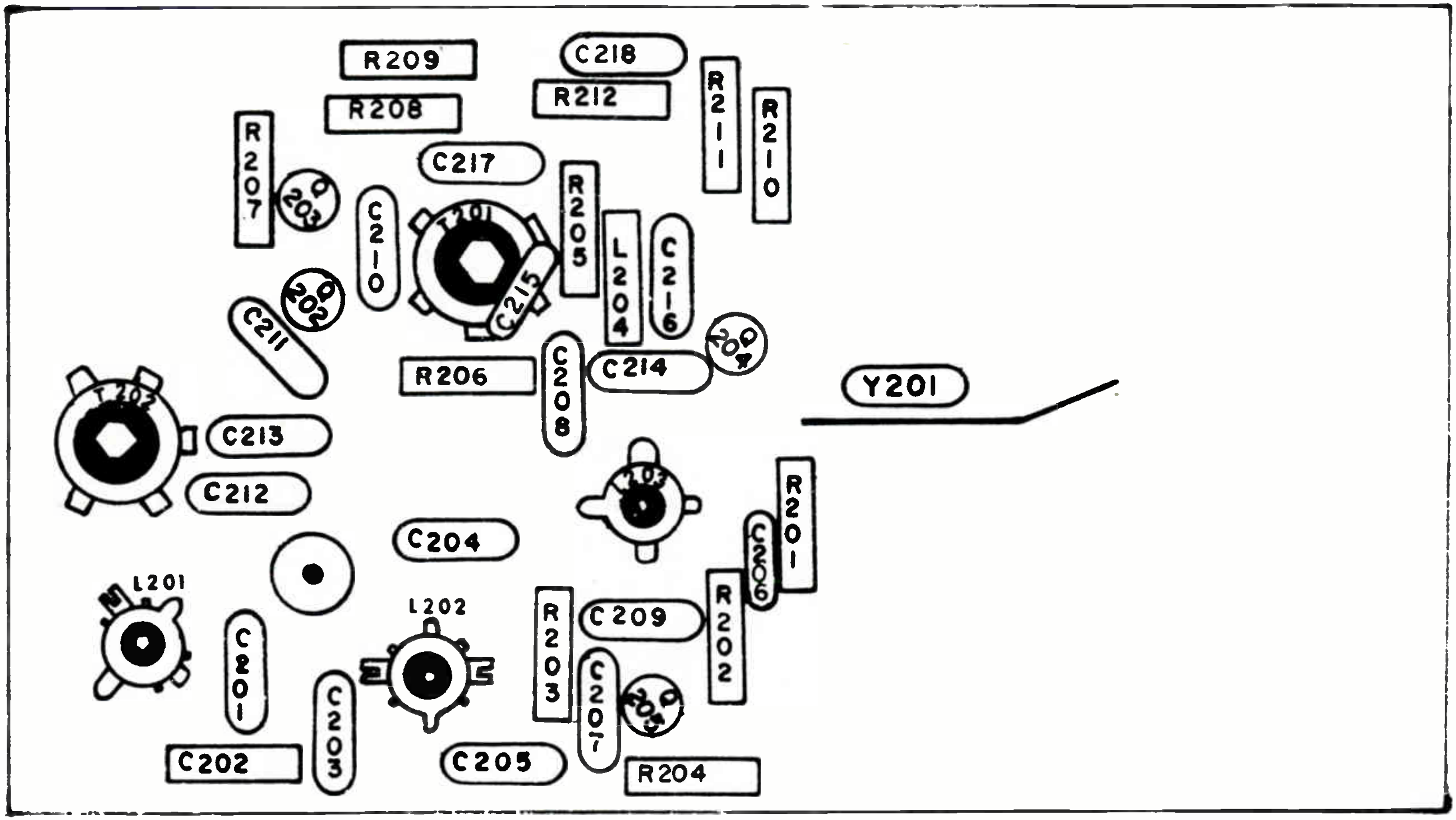
6. Adjust L201, L202 and L203, in that order, for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made. If two peaks occur on any slug, use the peak with the slug nearest the top of the coil form.

7. Adjust the top core of T-201 for maximum quieting (lowest) meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. If two peaks occur, use the one with the slug nearest the top of the coil form.

8. Adjust the bottom core of T201 for maximum quieting. The proper adjustment point should occur within 2 turns of the bottom of the coil form, if no peak occurs, set the slug flush with the bottom of the coil form.

IC NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC 101	.70V	0V	0V	.70V	7.5V	0V	4.2V	7.5V	3.32V	3.3V				
IC 102	4.0V	3.5V		1.3V	1.3V	1.3V						3.5V	7.6V	5.0V
IC 301, IC 302, IC 303	0V	.70V	0V	0V	.25V	0V	1.4V	3.6V	DEACTIVATED					
	0V	.70V	0V	0V	1.4V	0V	.25V	3.6V	ACTIVATED					

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q201	3.5V	4.3V	6.8V
Q202	1.2V	1.8V	6.4V
Q203	1.2V	1.8V	6.4V
Q204	2.5V	3.2V	7.2V
Q101	3.0V	3.3V	7.5V
Q102	3.8V	4.4V	6.3V
Q103	8.5V 8.5V 8.5V	8.5V 8.5V 8.5V	0V Unsquelched .8V Squelched 1.5V Tight Squelch
Q104	0V 0V 0V	0V Unsquelched .8V Squelched 1.5V Tight Squelch	1.9V Unsquelched .10V Squelched-Scanning
Q105	1.6V Unsquelched 1.1V Squelched-Scanning	1.9V .10V	5.1V 8.3V
Q106	5.8V	6.6V	12.5V
Q107	13V DC Operation 14V AC Operation	12.5V	7.2V
Q108	6.5V	7.2V	.10V
Q109	6.5V 6.5V	7.2V 7.2V	13V DC Operation 14V AC Operation
Q110	0V	.10V	6.5V
Q301 thru 307	.70V Deactivated	.55V	11V
Q308	.35V Activated	1.3V	.8V
Q309	0V	.55V Deactivated	.70V
Q310	0V	.85V Activated	.35V
Q311	0 0V	.55V Deactivated .10V Activated	.20V 6.2V
Q3 2	.60V Deactivated 3.7V Activated	.10V 3.6V	8.2V 6.3V
Q313	7.3V Deactivated 6.5V Activated	8.2V 6.3V	7.5V 7.5V

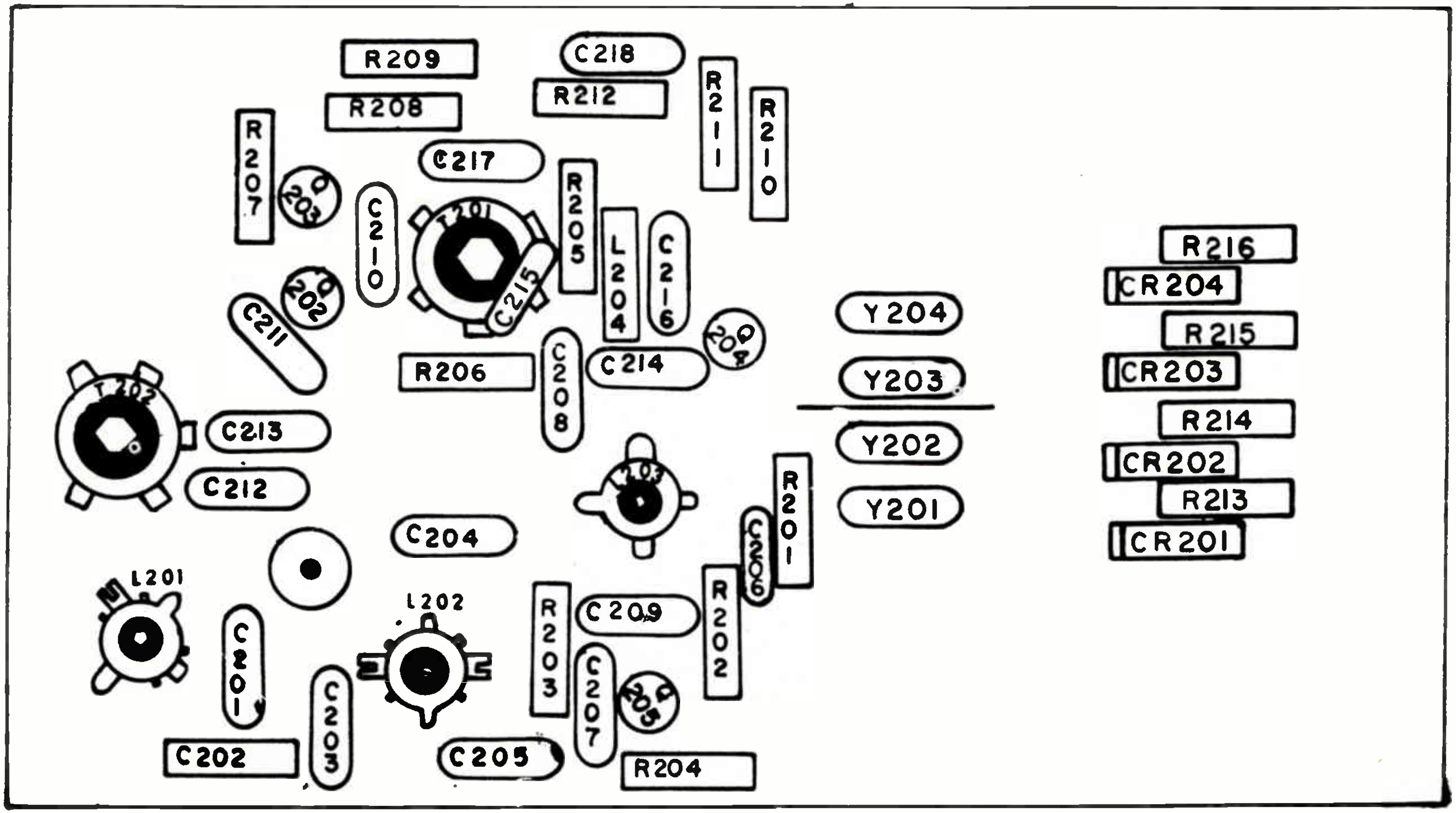


RF CIRCUIT BOARD, MODEL TMR-1

NOTE

ON LOW BAND MODELS (TMR-L) C209, C215, AND L204 ARE DELETED AND R221 AND R222 (1.8K) ARE ADDED TO BOTTOM OF BOARD.

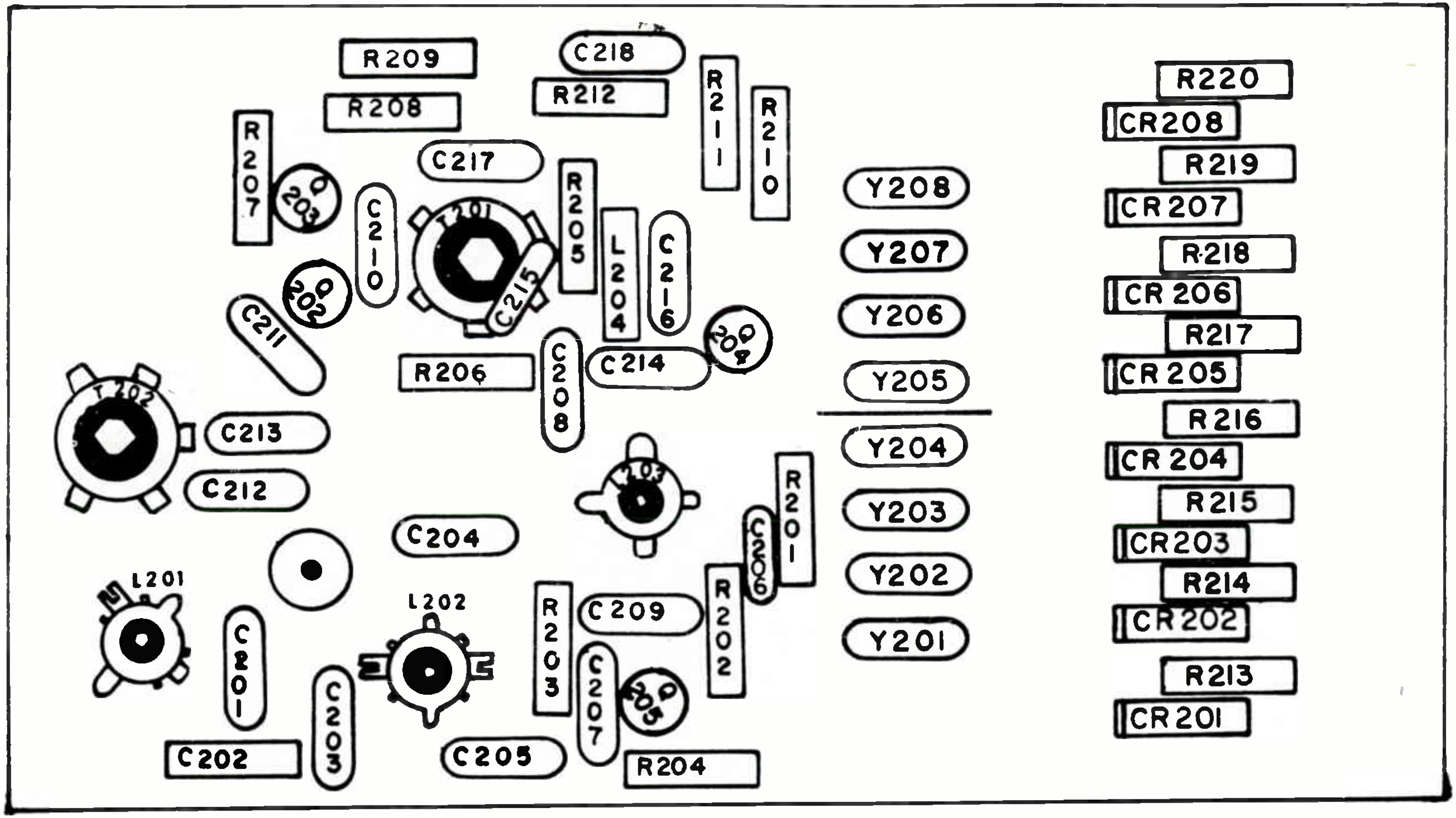
RF CIRCUIT BOARD, MODEL TMR-4



NOTE

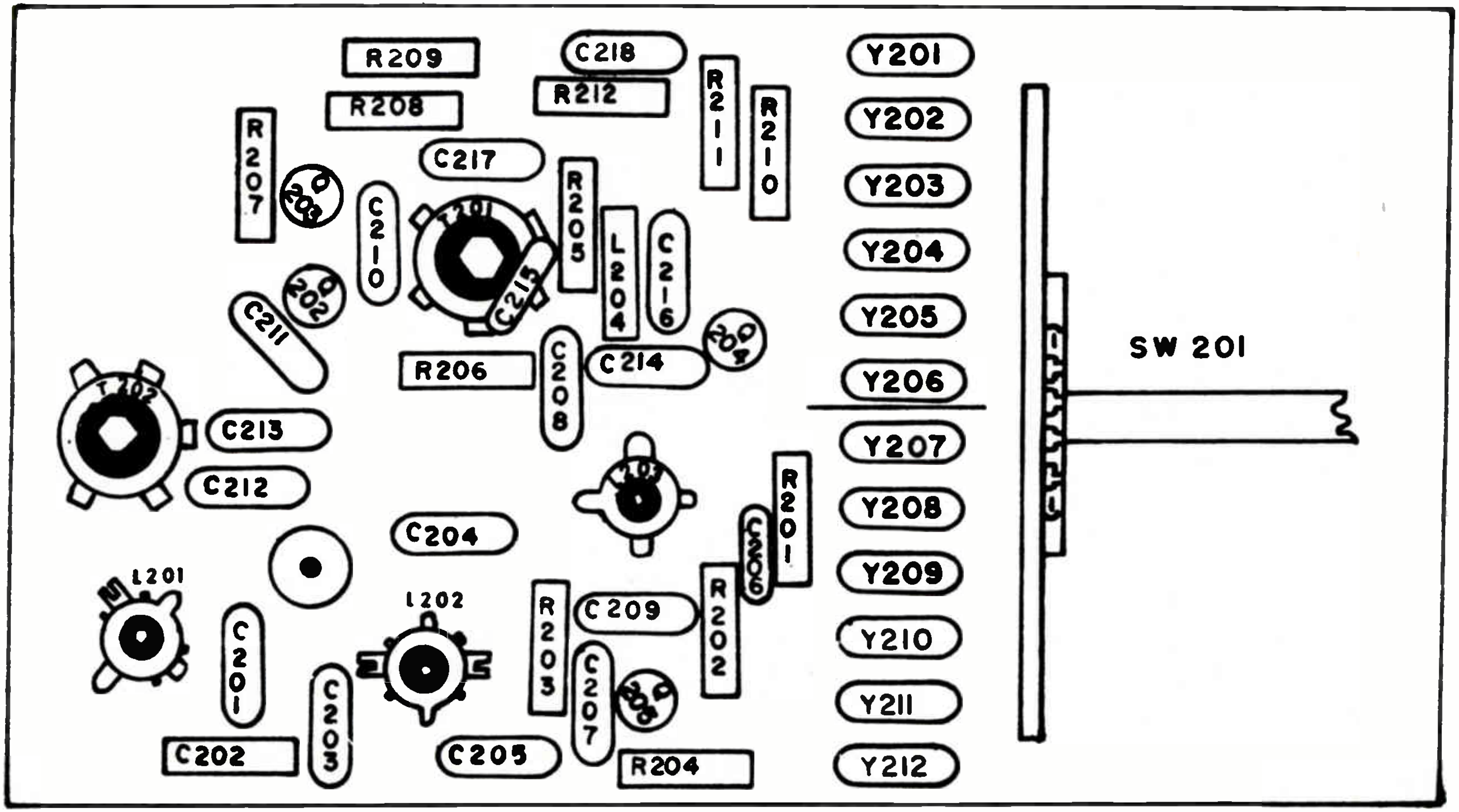
ON LOW BAND MODELS (TMR-L) C209, C215, AND L204 ARE DELETED AND R221 AND R222 (1.8K) ARE ADDED TO BOTTOM OF BOARD.

RF CIRCUIT BOARD, MODEL TMR-8



NOTE

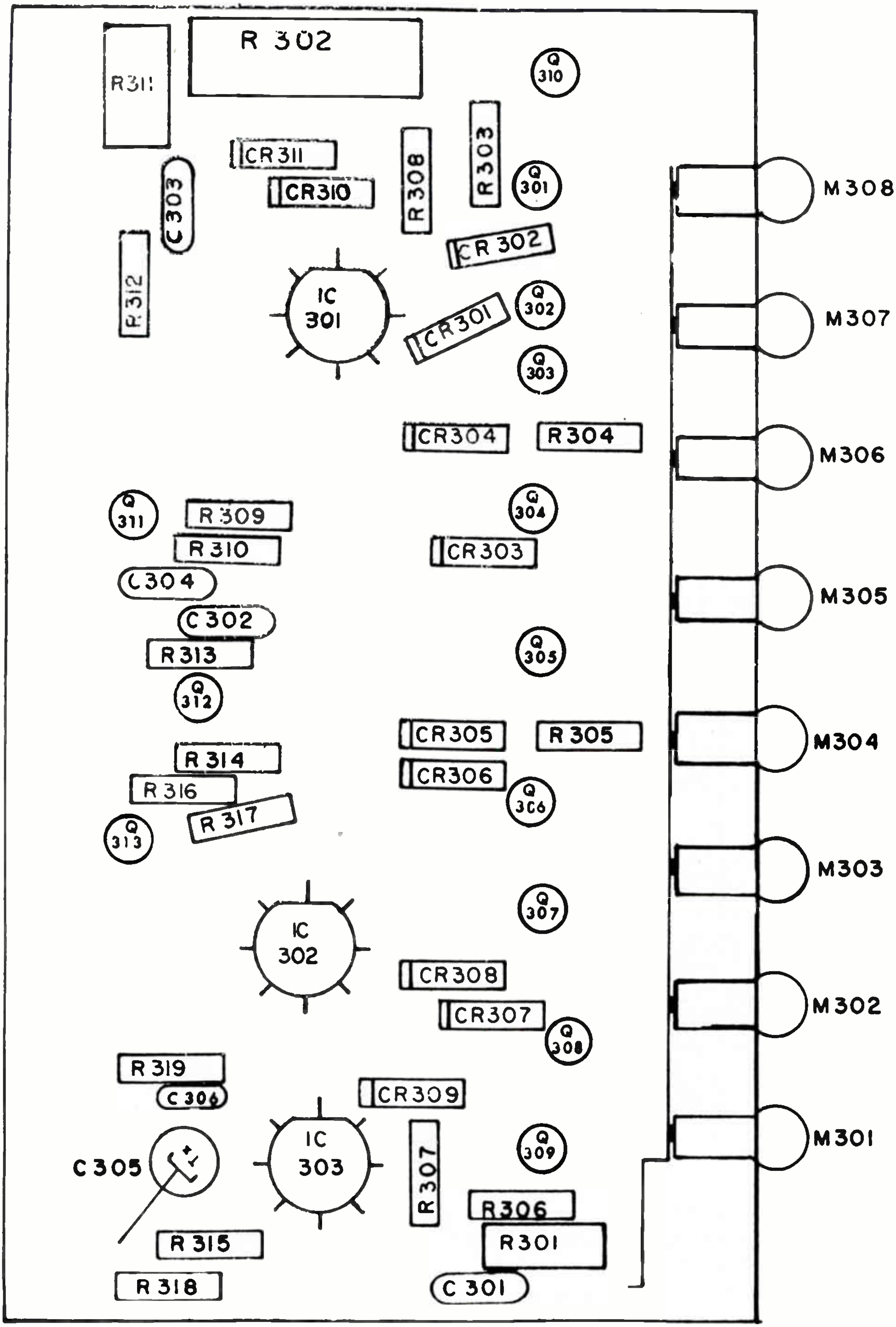
ON LOW BAND MODELS (TMR-L) C209,C215, AND L204 ARE DELETED AND R221 AND R222 (1.8K) ARE ADDED TO BOTTOM OF BOARD.



RF CIRCUIT BOARD, MODEL TMR-12

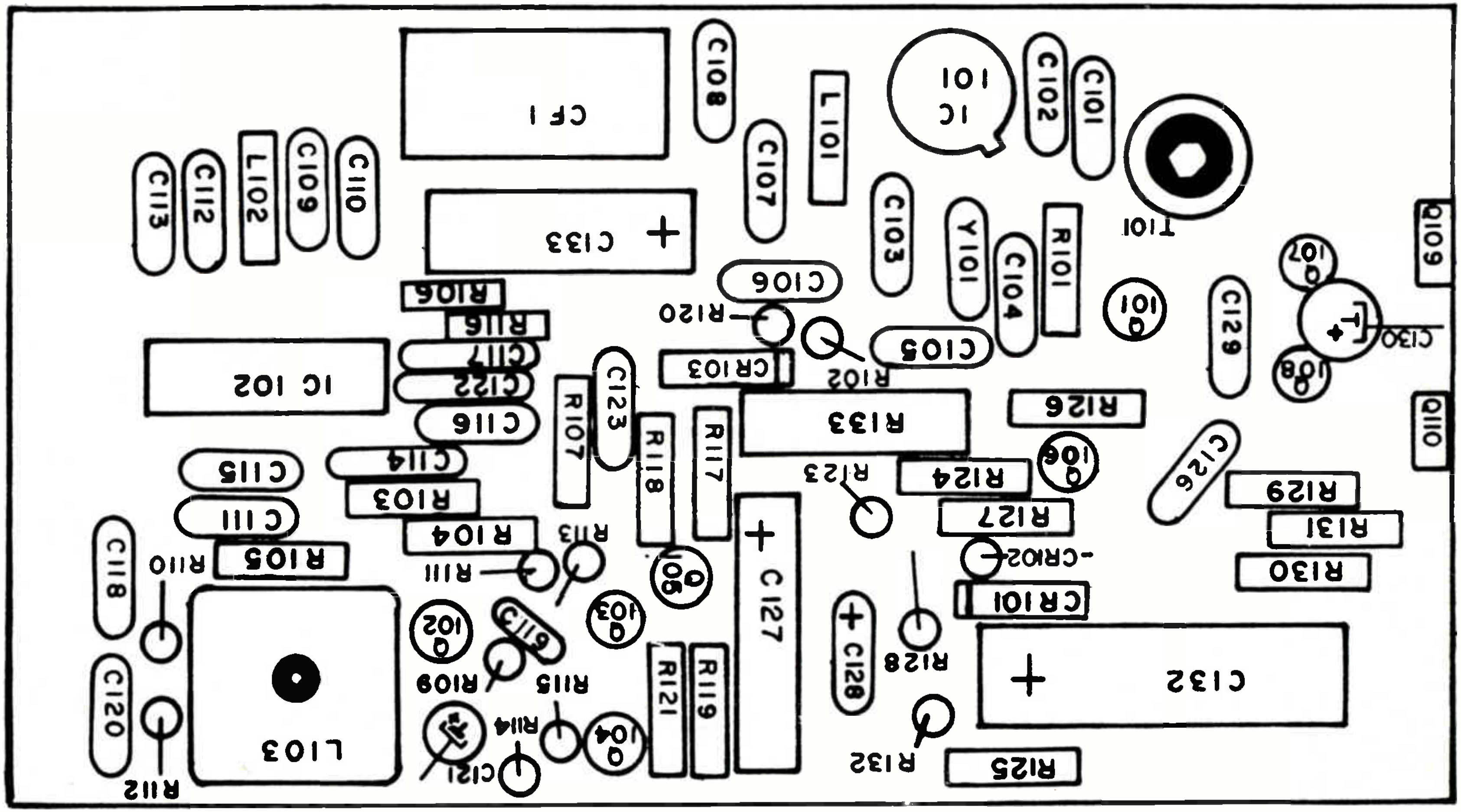
NOTE

ON LOW BAND MODELS (TMR-L) C209, C215, AND L204 ARE DELETED AND R221 AND R222 (1.8K) ARE ADDED TO BOTTOM OF BOARD.



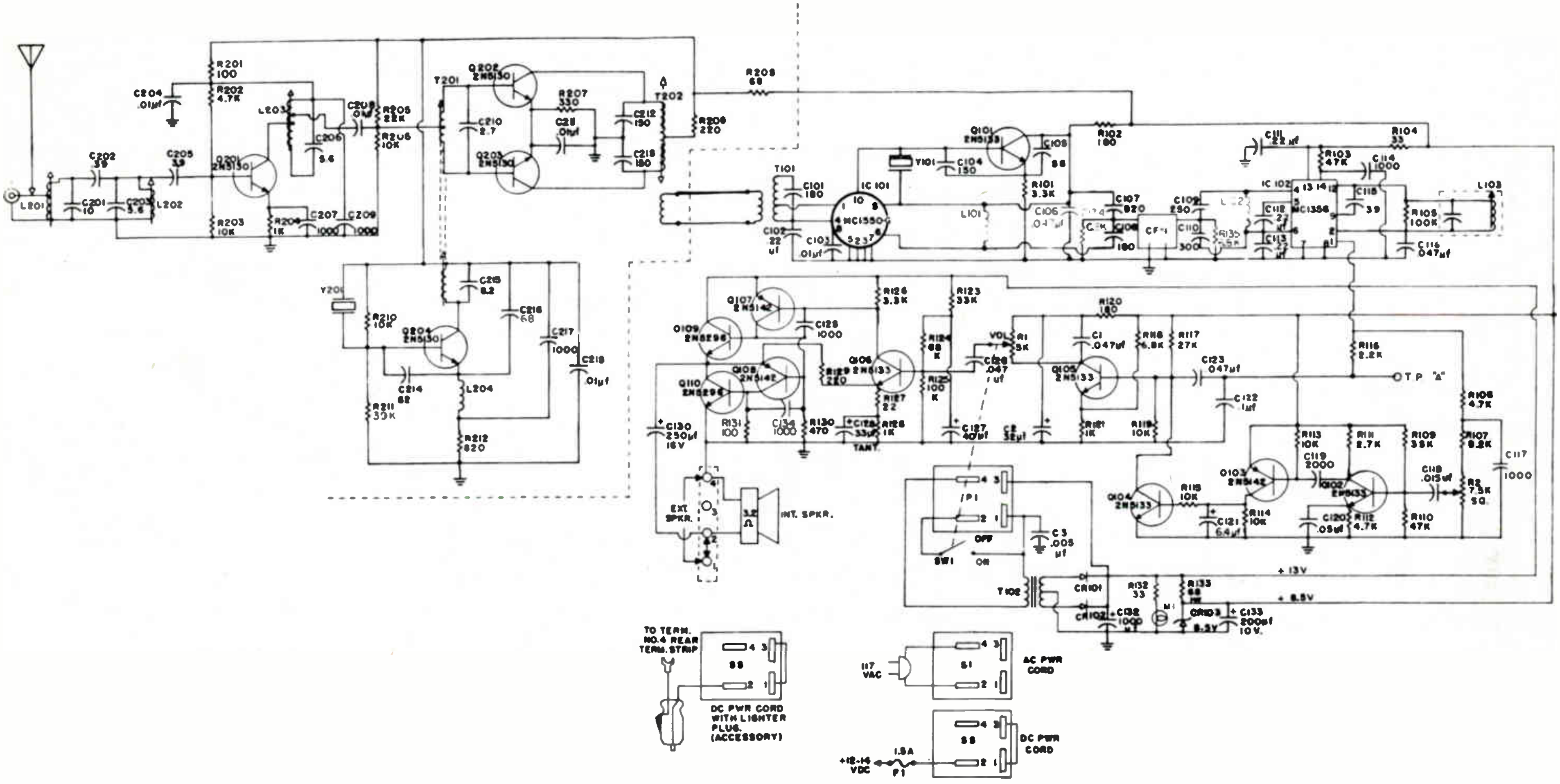
SCANNER CIRCUIT BOARD, MODEL TMR-8

IF-AUDIO CIRCUIT BOARD



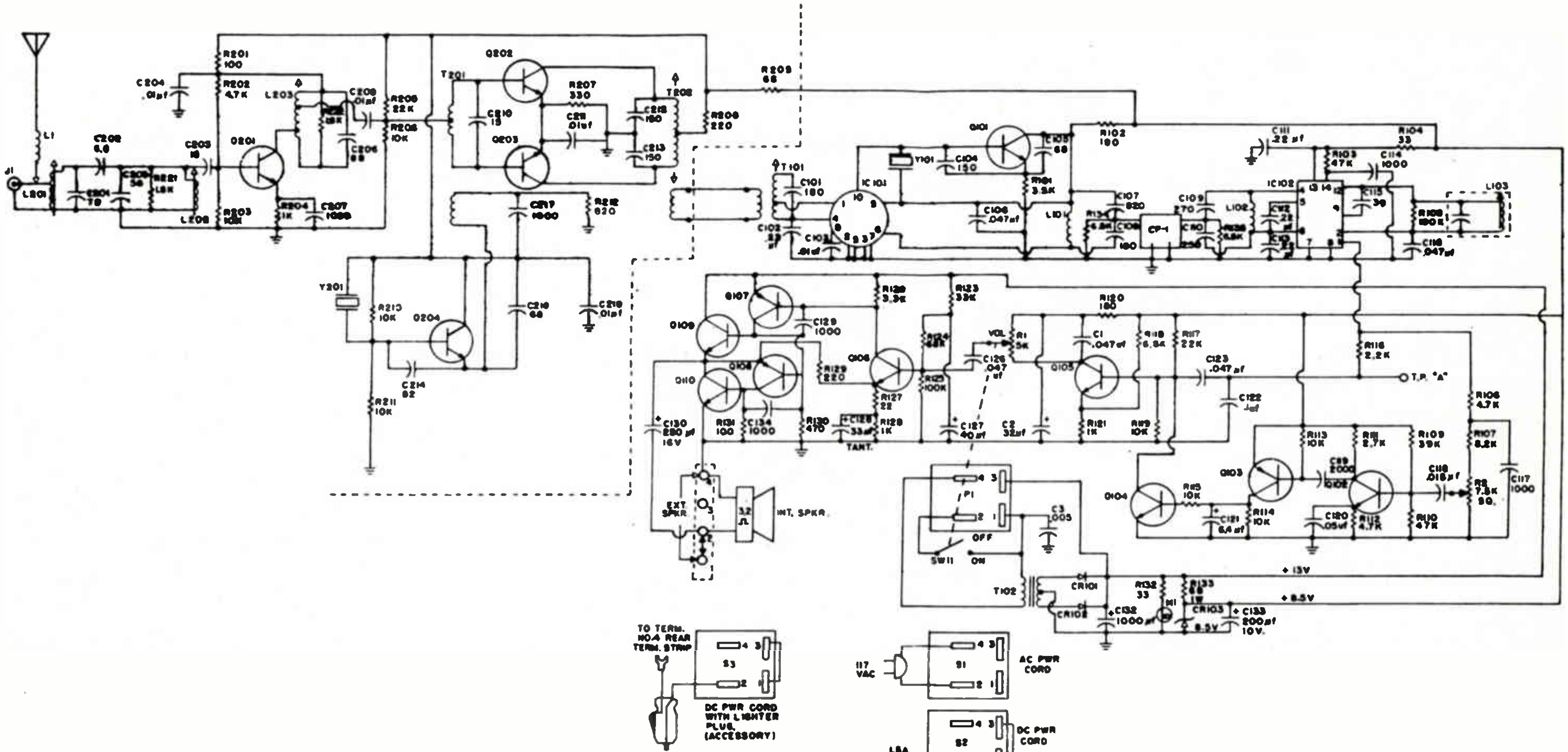
NOTES:

1. C134, R134 & R135 ARE LOCATED ON THE BOTTOM OF THE BOARD
2. R132 DELETED IN TMR-4 AND TMR-12



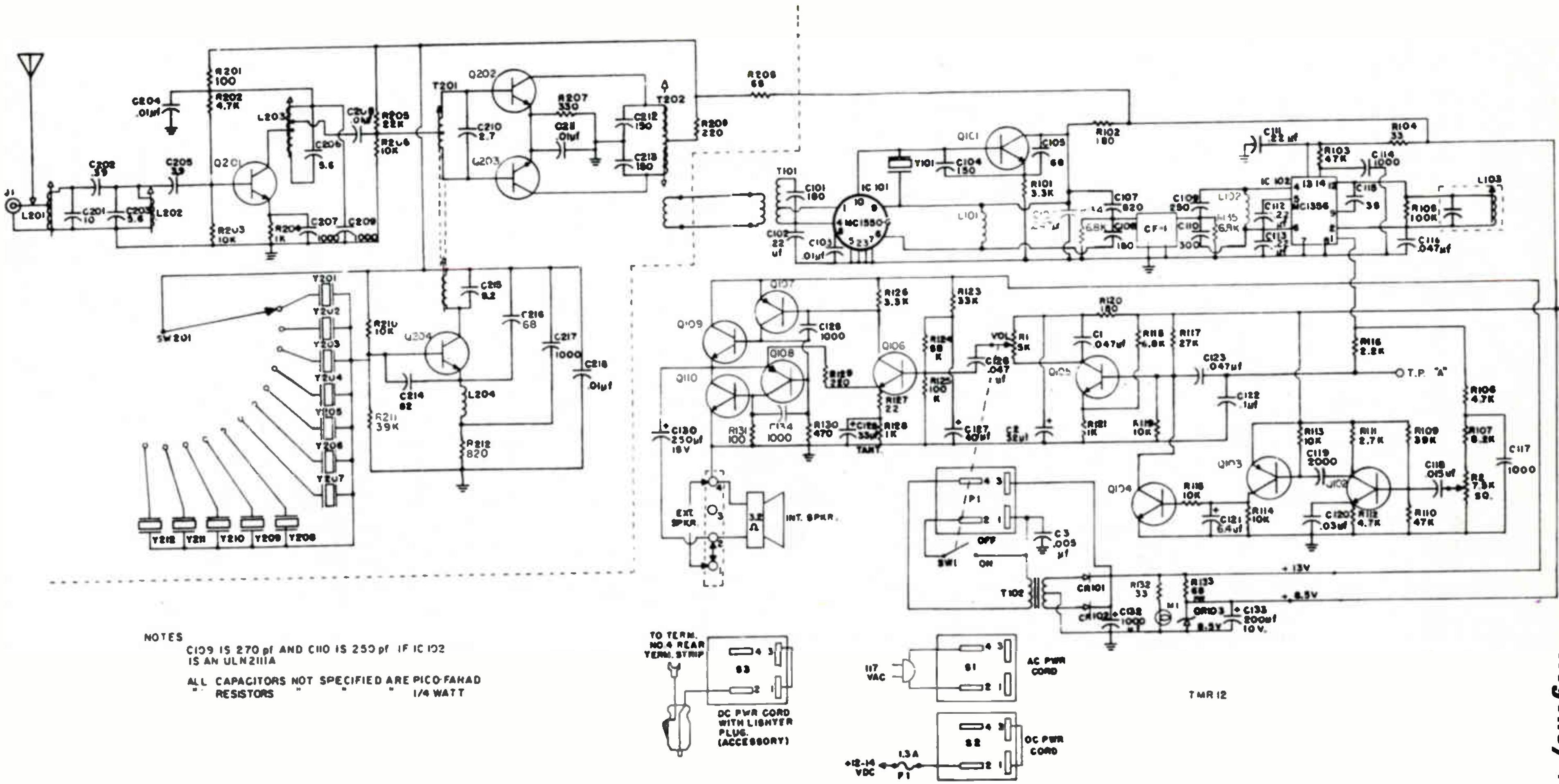
MODEL TMR-1H

NOTE:
C109 IS 270pf AND C110 IS 250pf IF IC102 IS AN ULN2111A
ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
" RESISTORS " " " 1/4 WATT



MODEL TMR-1L

NOTE:
ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
" RESISTORS " " " 1/4 WATT

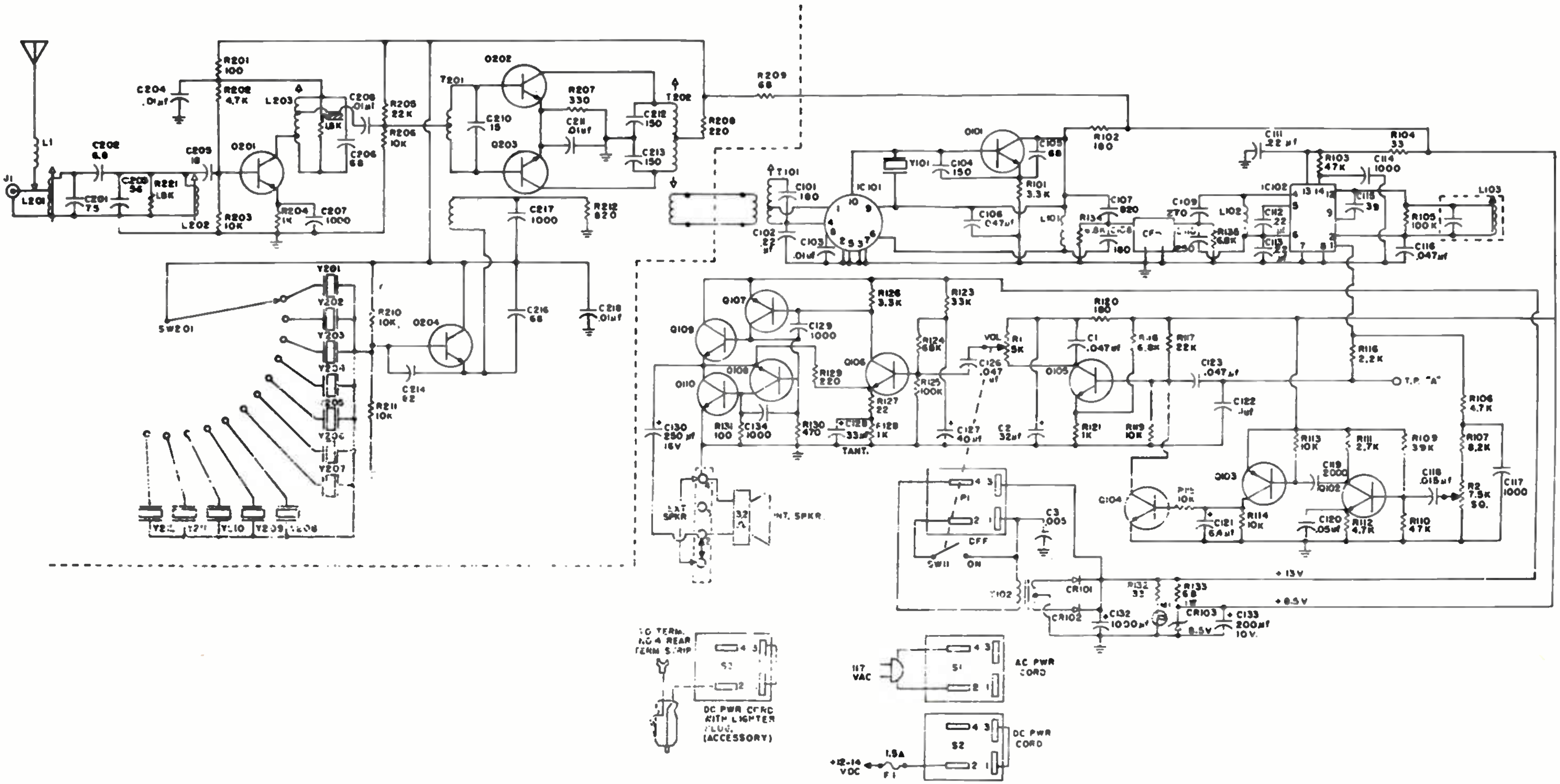


NOTES

C109 IS 270 pf AND C110 IS 250 pf IF IC 102 IS AN ULN2111A

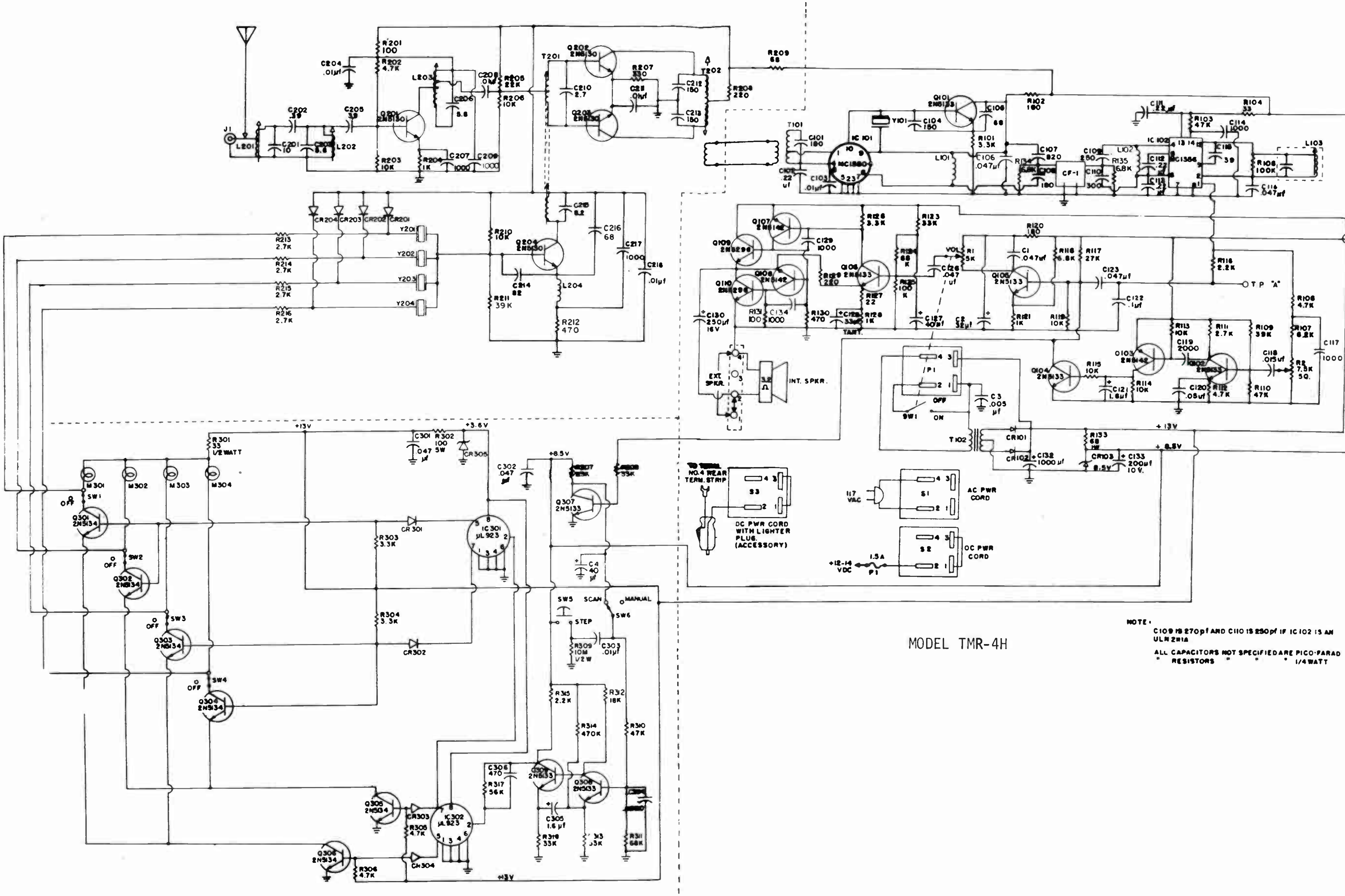
ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
" RESISTORS " " " 1/4 WATT

MODEL TMR-12H



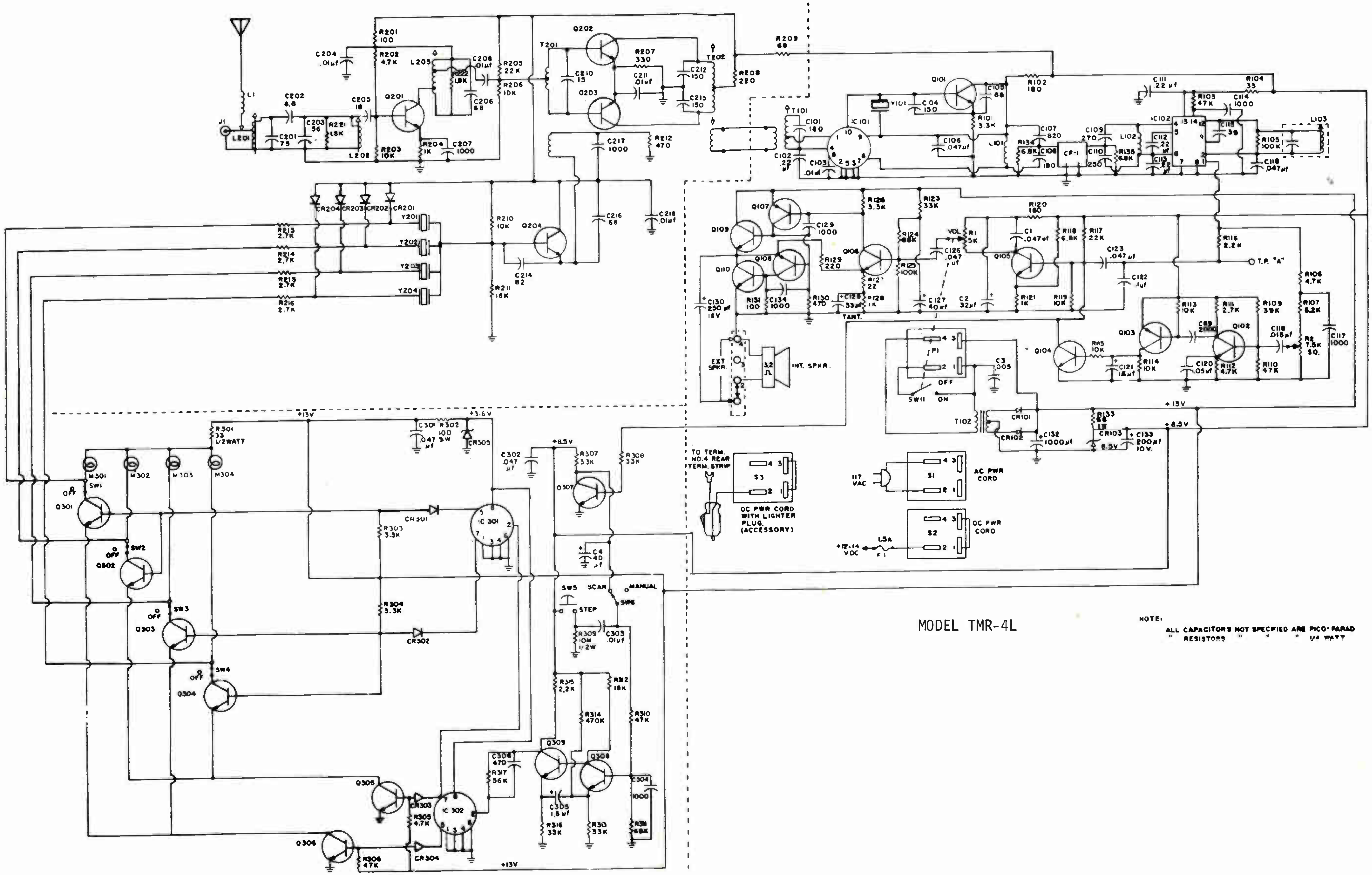
MODEL TMR-12L

NOTE:
ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
" RESISTORS " " " 1/4 WATT



MODEL TMR-4H

NOTE:
C109 IS 270pf AND C110 IS 250pf IF IC102 IS AN ULN2111A
ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
" RESISTORS " " " 1/4 WATT


MODEL TMR-4L
NOTE:
ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
" RESISTORS " " " 1/4 WATT
AC PWR CORD
DC PWR CORD
DC PWR CORD WITH LIGHTER PLUG. (ACCESSORY)
TO TERM. NO.4 REAR TERM. STRIP
117 VAC
+12-14 VDC
EXT SPKR.
INT. SPKR.
T.P. "A"

SEMICONDUCTORS

ITEM	PART NO./TYPE
(RF, High Band)	
CR201	102-339/1N198 (1)
CR202	102-339/1N198 (1)
CR203	102-339/1N198 (1)
CR204	102-339/1N198 (1)
CR205	102-339/1N198 (1)
CR206	102-339/1N198 (1)
CR207	102-339/1N198 (1)
CR208	102-339/1N198 (1)
Q201	2N5130
Q202	2N5130
Q203	2N5130
Q204	2N5130

(1) Used in TMR-4H/8H

(RF, Low Band)	
CR201	102-339/1N198 (1)
CR202	102-339/1N198 (1)
CR203	102-339/1N198 (1)
CR204	102-339/1N198 (1)
CR205	102-339/1N198 (1)
CR206	102-339/1N198 (1)
CR207	102-339/1N198 (1)
CR208	102-339/1N198 (1)
Q201	2N5222
Q202	2N5222
Q203	2N5222
0204	MPS-3563

(1) Used in TMR-4L/8L

(IF-Audio Board)	
CR101	S1-1
CR102	S1-1
CR103	MB6356(Zener 8.5 V)
IC101	MC1550G
IC102	ULN-2111A (1)
	(MC-1356P)(1)
Q101	2N5133
Q102	2N5133
Q103	2N5142
Q104	2N5133
Q105	2N5133
Q106	2N5133
Q107	2N5142
Q108	2N5142
Q109	2N5296
Q110	2N5296

(1) Replace with original part.

(Scanner Board,TMR-8)	
CR301	1N198
CR302	1N198
CR303	1N198
CR304	1N198
CR305	1N198
CR306	1N198
CR307	1N198
CR308	1N198
CR309	1N198
CR310	1N198
CR311	1N747B(Zener 3.6 V)
IC301	9923-U8A-992328X
IC302	9923-U8A-992328X
IC303	9923-U8A-992328X
Q301	2N5134
Q302	2N5134
Q303	2N5134
Q304	2N5134
Q305	2N5134
Q306	2N5134
Q307	2N5134
Q308	2N5134
Q309	2N5134
Q310	2N5134
Q311	2N5133
Q312	2N5133
Q313	2N5133

ELECTROLYTIC CAPS

ITEM	PART NO.	VALUE
(I-F-Audio Board)		
C121	C426AR/F1.6	1.6 uF 25 V
	C426AR/G6.4	6.4 V 40 V
C127	C426AR/E40	40 uF 16 V
C128	196D-336X00115FB	33 uF 15 V
C130	C437AR/E250	250 uF 16 V
C132	C437AR/E1000	1000 uF 16 V
C133	C426AR/D200	200 uF 10 V
(Scanner Board, TMR-8)		
C305	C426AR/F1.6	1.6 uF 25 V
(Chassis)		
C2	C426AR/D32	32 uF 10 V

CONTROLS

ITEM	PART NO.	DESCRIPTION
(Chassis, TMR-1)		
R1	102-303-5	5000 ohms Volume/ Switch
R2	102-303-6	7.5 K Squelch

(Chassis, TMR-8)

R1	102-312-3	5000 ohms Volume/ Switch
R2	102-312-2	7500 ohms Squelch

(Chassis, TMR-12)

R1	102-303-5	5000 ohms Volume/ Switch
R2	102-303-6	7500 ohms Squelch

COILS/TRANSFORMERS

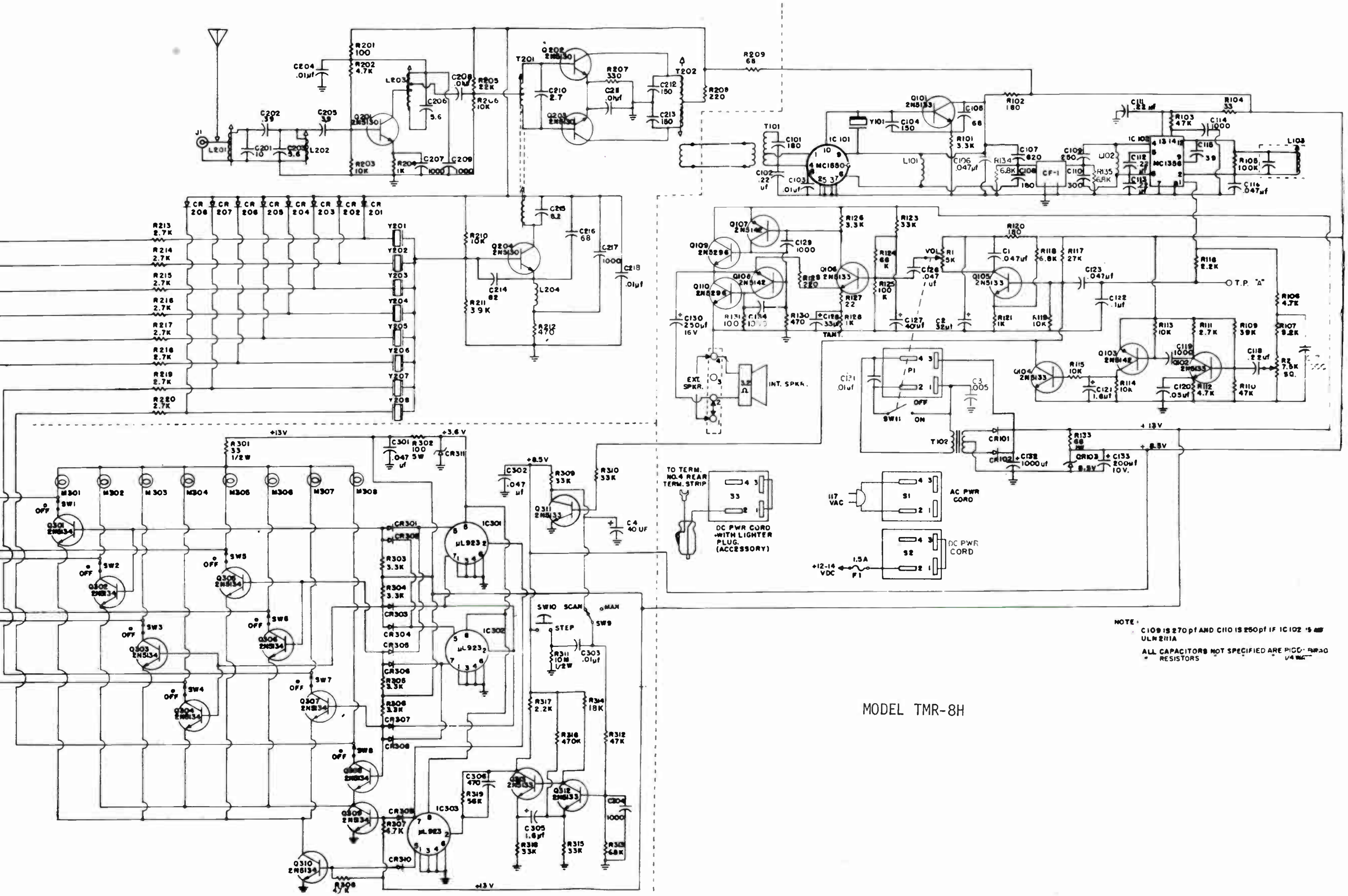
ITEM	PART NO.
(RF, High Band)	
L201	301-520-1
L202	301-520-2
L203	301-520-3
L204	102-369
T201	102-368
T202	102-367
(RF, Low Band)	
L1	102-380-1
L201	301-520-4
L202	301-520-5
L203	301-520-6
T201	102-379
T202	102-367
(IF-Audio Board)	
L101	ES-2228
L102	ES-2228
L103	301-517
T101	102-366
(Chassis)	
T102	301-5

MISCELLANEOUS

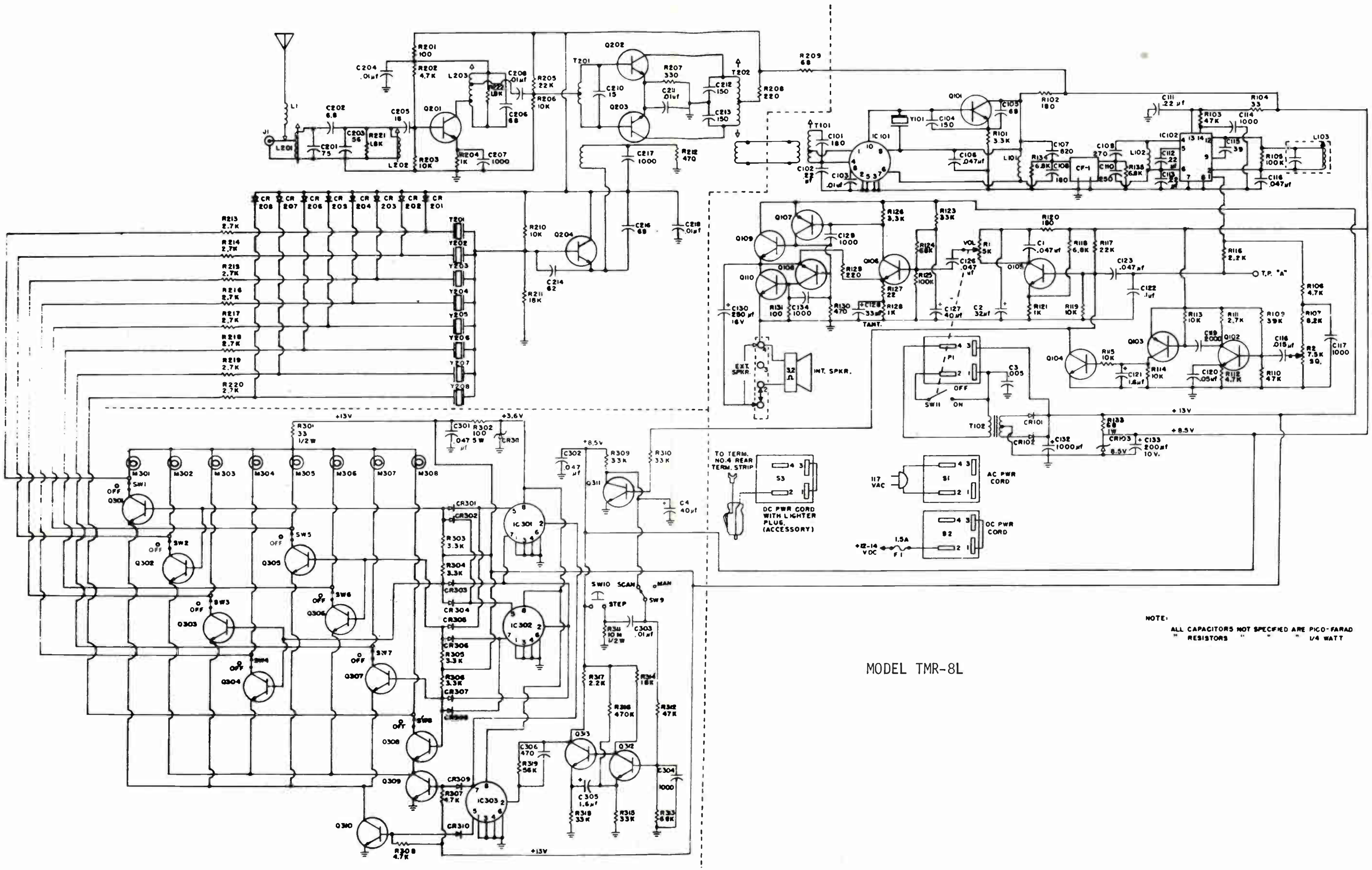
ITEM	NAME	PART NO
(IF Board)		
CF-1	Ceramic Filter, 455KC	CFP-455D
Y101	Crystal, 10.245 MHz	301-516-1
(RF, 12L/H)		
	Switch Assembly	500-753 & 301-422-2
(Chassis)		
SW1-8	Switch, Push-Push	5P08-312N-H000
SW9-10	Switch, 2 Stations	5S02-312N-H000
	Speaker	102-377
	Antenna Telescopic	P-6-125/102
	Crystal(Specify Freq.)	301-532 (High Band) 301-542 (Low Band)

CABINET PARTS

NAME	PART NO.
Front Panel (TMR-1, TMR-12)	301-500-1
Knob, Volume/Squelch (TMR-1, TMR-12)	3-9
Knob, Volume/Squelch	27500
Knob, Push Button	UID-1B1
Knob, Channel Selector	6-13


J1
L201
IC101
MC1350
IC102
MC1358
IC301
μL923
IC302
μL923
IC303
μL923
INT. SPKR.
EXT. SPKR.
T.P. "A"
AC PWR CORD
DC PWR CORD
117 VAC
+12-14 VDC
TO TERM. NO.4 REAR TERM. STRIP
DC PWR CORD WITH LIGHTER PLUG. (ACCESSORY)
+13V
+8.5V
NOTE:
C109 IS 270 pf AND C110 IS 250 pf IF IC102 IS
ULN2111A

MODEL TMR-8H



NOTE:
ALL CAPACITORS NOT SPECIFIED ARE PICO-FARAD
" RESISTORS " " " 1/4 WATT

MODEL TMR-8L

Pages 105-115 Courtesy of UNIMETRICS, INC.

CRYSTAL INSTALLATION

NOTE: Due to the numerous frequencies (channels) involved and the accuracy required (0.001%), it is recommended that the proper crystal for the desired channel frequency be purchased directly from Unimetrics, Inc. The crystal is not normally installed by the factory, but by the seller or owner of the unit. Crystals are available on special order only. When ordering crystals, specify desired receiving frequency.

PLEASE READ THE FOLLOWING BEFORE ORDERING CRYSTALS

Each DURA Scan-4 is normally available from the factory tuned to the following standard center frequency.

[1] Low Band Receivers (30-50MHz): Standard Center Frequency 35MHz

[2] High Band Receivers (150-174MHz): Standard Center Frequency 155MHz

[3] UHF Receivers (450-470MHz): Standard Center Frequency 460MHz

These are center frequencies, of course. The circuits are so designed as to permit operation of up to 4 channels over a band of frequencies without retuning, as follows:

[1] Low Band: 31.0-39.0MHz (*35±4MHz), Total spread 8MHz.

[2] High Band: 151.0-159.0MHz (*155±4MHz), Total spread 8MHz.

[3] UHF Band: 456.0-464.0 (*460±4MHz), Total spread 8MHz.

* Center Frequency

31.0	35.0	39.0
151.0	155.0	159.0
456.0	460.0	464.0

When ordering additional crystals for a receiver tuned to a standard center frequency, make sure the monitoring frequencies requested fall within the specific spread indicated above. If the monitoring frequencies requested with the original order of the receiver fall outside of the frequency spread provided by a standard center frequency, the receiver must be retuned to a new center frequency before being shipped to accommodate the requested monitoring frequency (s). When ordering additional crystals for such a receiver, be sure the requested monitoring frequencies fall within the total spread provided by the new center frequency.

INSERTING CRYSTALS

Remove top compartment cover of the receiver by removing the 2 Phillips head screws on each side. Refer to Figure 5 and insert the crystals desired. For convenience, a record should be kept of the monitoring frequencies and the channels in which they appear.

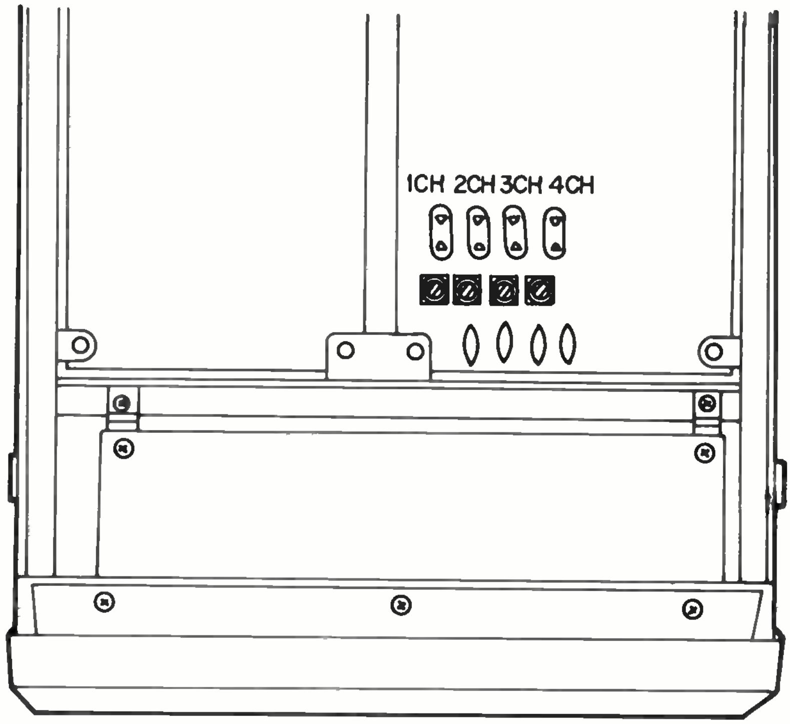


Figure 5

CRYSTAL FREQUENCY DETERMINATION AND CORRELATION

Crystals used in DURA Scan-4 are type HC-25/U

Crystal frequencies are normally determined as follows.

Frequency for Low Band VHF 30-50MHz:

$$\text{Crystal fundamental frequency} = \text{Channel frequency F} + 10.7\text{MHz}$$

Frequency for High Band VHF 150-174MHz:

$$\text{Crystal 3rd overtone frequency} = \frac{\text{Channel frequency F} - 10.7\text{ MHz}}{3}$$

Frequency for UHF Band 450-470MHz:

$$\text{Crystal 9th overtone frequency} = \frac{\text{Channel frequency F} - 10.7\text{ MHz}}{9}$$

Frequency deviation is less than 2/100,000 in low VHF band 30-50MHz and high VHF band 150-174MHz.

Frequency deviation is less than 1/100,000 in UHF band 450-470MHz.

CRYSTAL CORRELATION:

Resonance	Parallel
Overtone	Fundamental, 3rd, 9th
*Load Capacity	32pF *
*Max. Series Resistance	Less than 40 ohms
*Frequency Tolerance	±0.001% (at 25°C)

* This particular number could vary depending upon crystal manufacturer, but crystal trimmer will take care of any error.

* NOTE: UHF Load Capacity 22pF

For convenience, a record should be kept of the frequencies as they are added, and the positions in which they have been inserted.

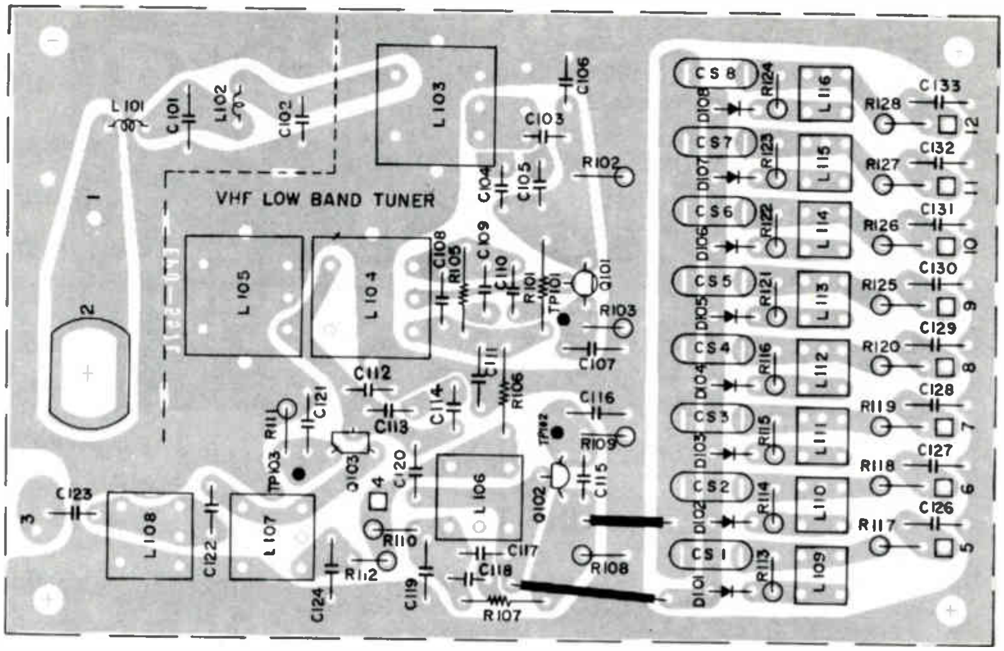
CHANGING RF MODULES

This receiver features interchangeable RF modules for the front end, permitting any unit to be operated on any one of the three available bands.

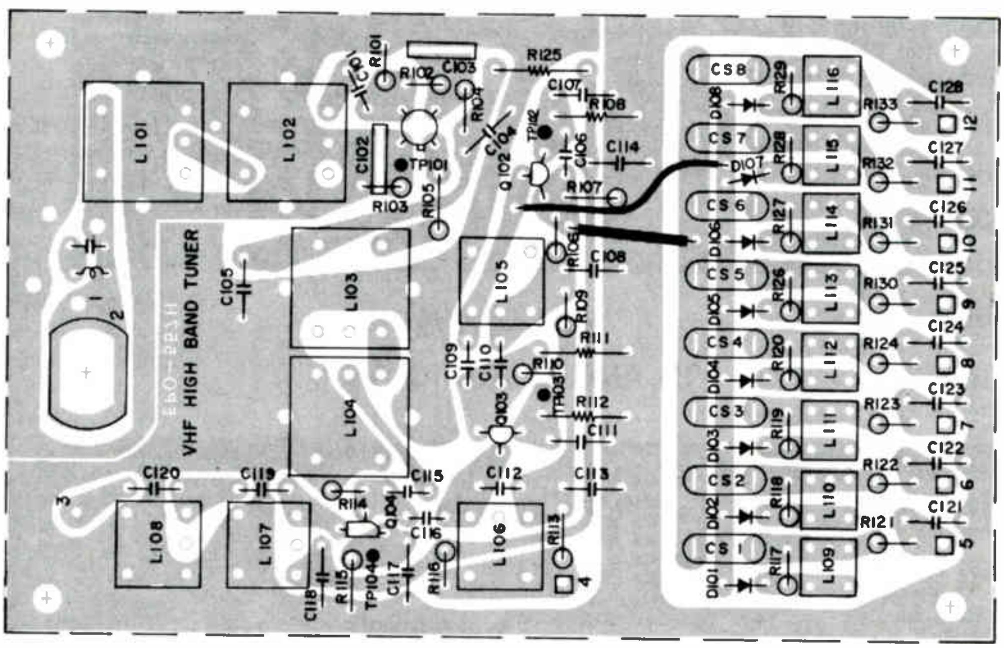
To replace RF modules, proceed as follows:

1. Remove the top and bottom cover of the receiver.
2. Remove 4 screws at side of receiver bolding module plate.
3. Unsolder and remove the leads connected to the terminals on the module.
4. Remove existing module.
5. Insert the new module, attaching (soldering) the leads to corresponding terminals on the module. When all leads have been connected to their proper terminals, secure the module in place by means of the four screws previously removed.

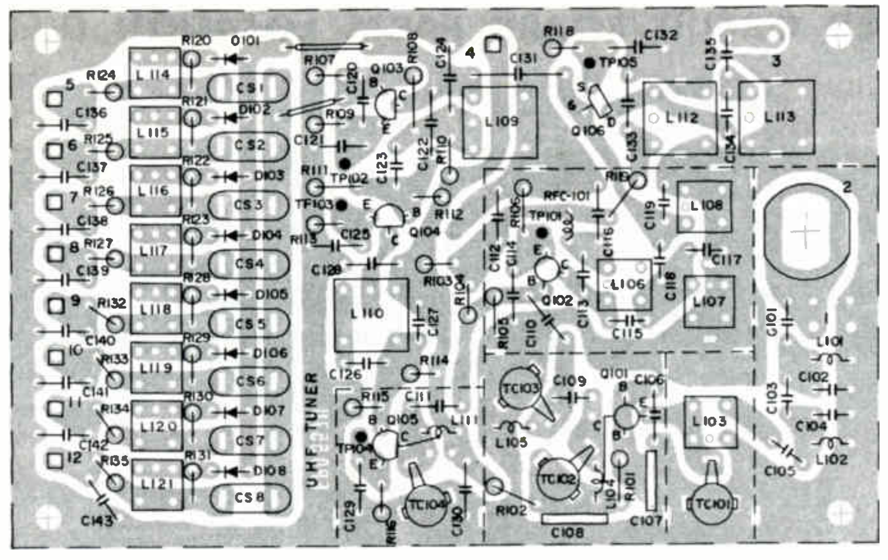
PRINTED CIRCUIT BOARD PARTS LOCATION DIAGRAM



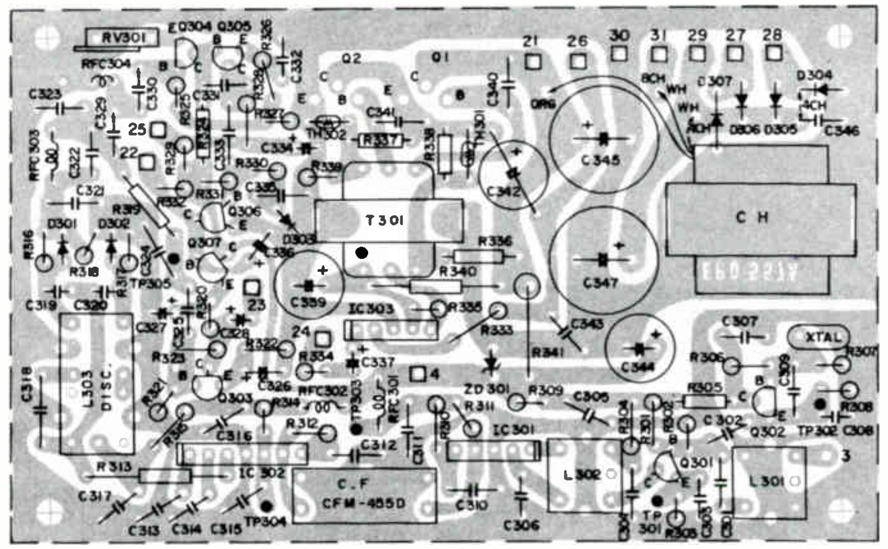
EPO-557L
VHF LOW-BAND TUNER



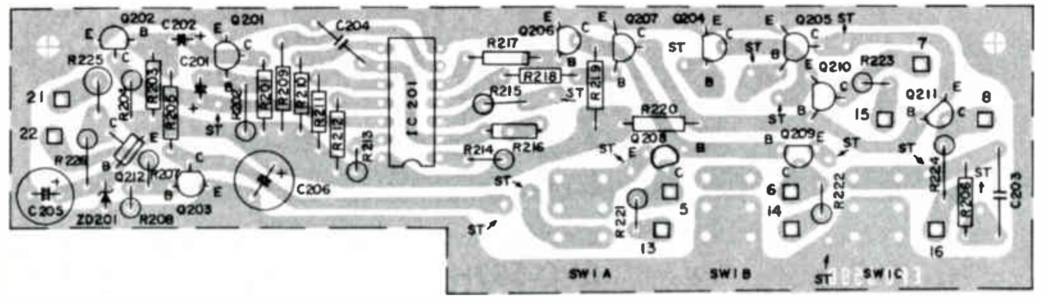
EPO-557H
VHF HI-BAND TUNER



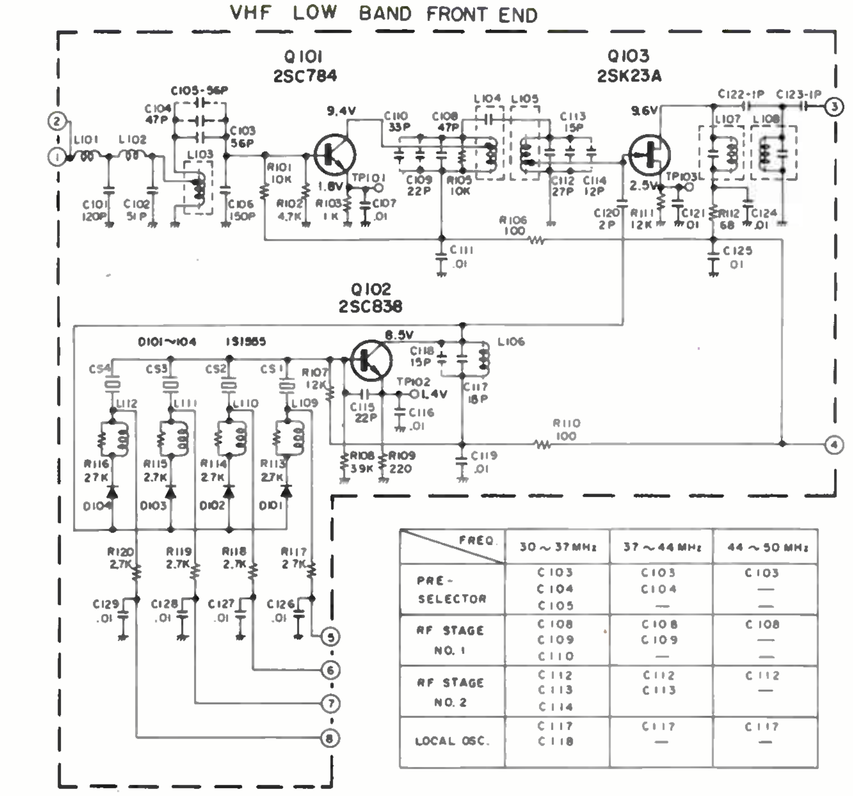
EPO-557U/2
UHF TUNER



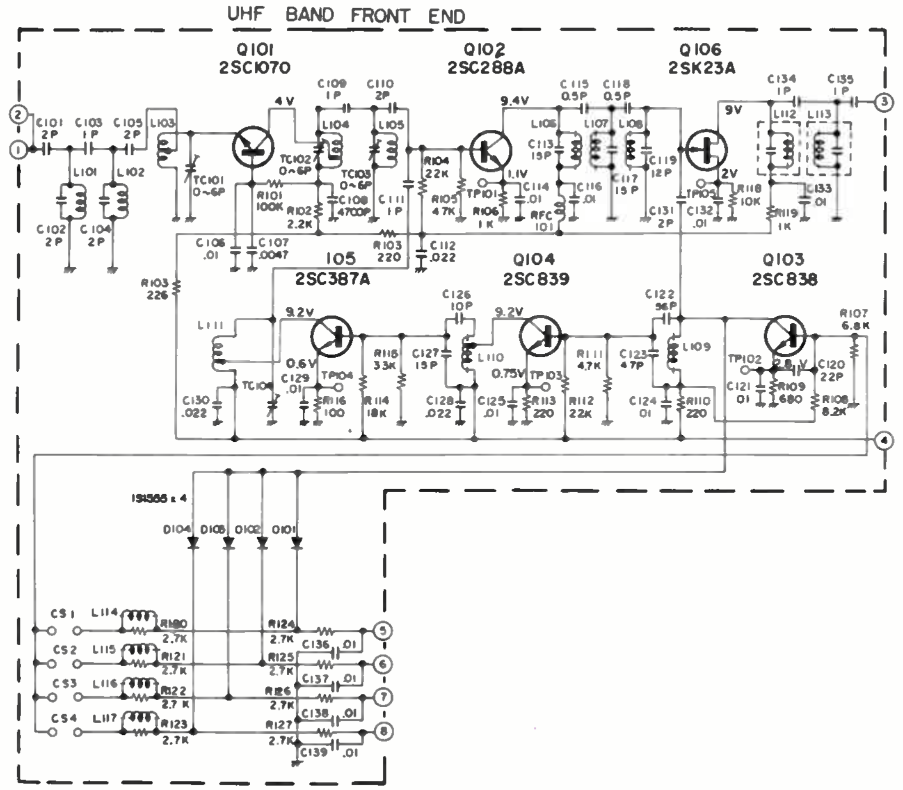
EPO-557A/2
IF AMP. & AUDIO AMP.

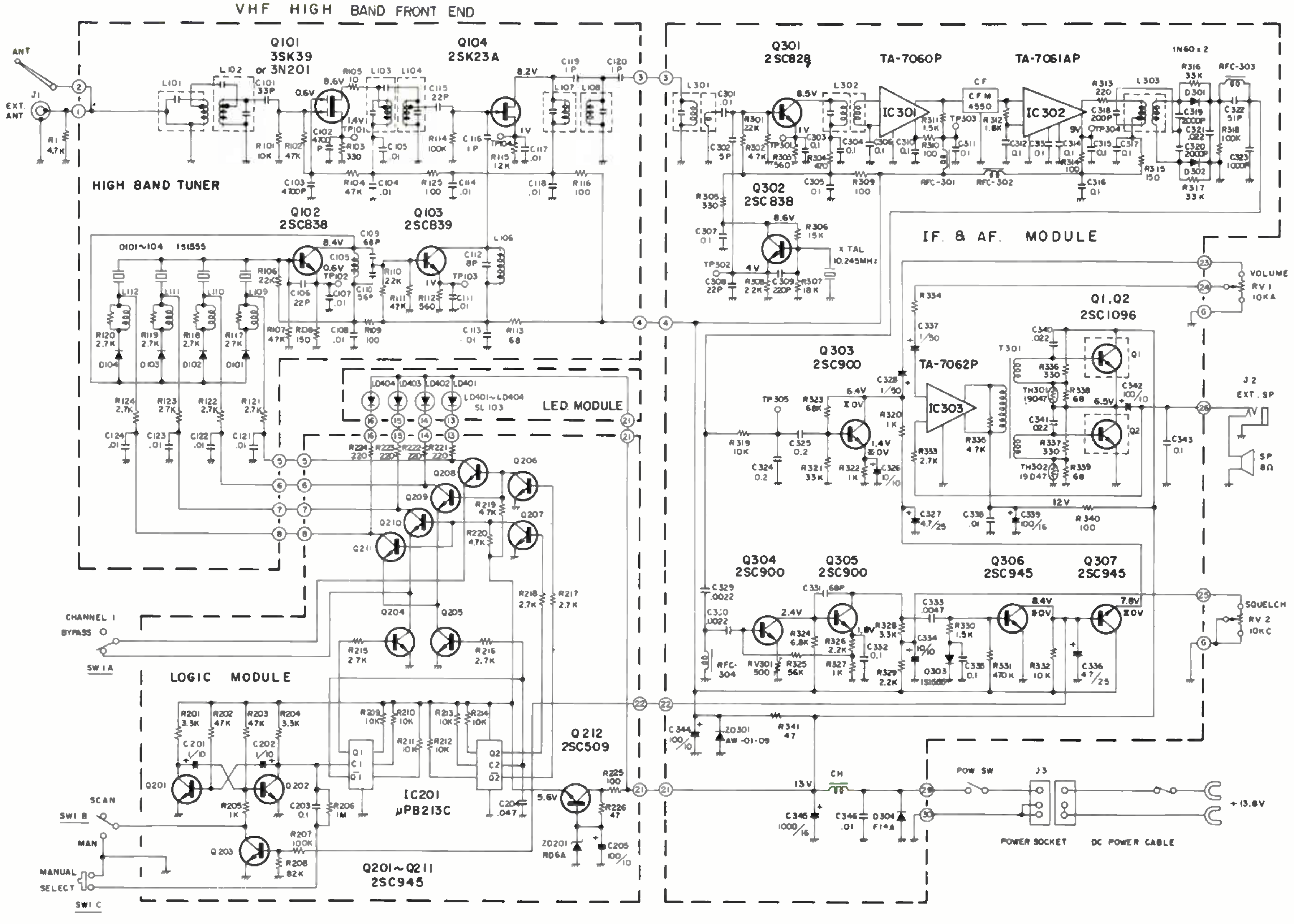


EPO-559D
LOGIC CIRCUIT



FREQ.	30 ~ 37 MHz	37 ~ 44 MHz	44 ~ 50 MHz
PRE-SELECTOR	C103 C104 C105	C103 C104 —	C103 — —
RF STAGE NO. 1	C108 C109 C110	C108 C109 —	C108 — —
RF STAGE NO. 2	C112 C113 C114	C112 C113	C112 —
LOCAL OSC.	C117 C118	C117 —	C117 —





NOTE : ALL VOLTAGES MEASURED FROM COMMON NEGATIVE GROUND WITH VTVM AT NO SIGNAL.
* AT SQUELCH ON

ALIGNMENT INSTRUCTIONS

The following test equipments will be necessary for aligning the precision DURA SCAN-4 receiver.

1. DC Power Supply (13.8V)
2. FM Standard Signal Generator
3. Frequency Counter
4. Oscilloscope
5. VTVM

ALIGNMENT PROCEDURES

1. 455KHz IF AMPLIFIER ALIGNMENT

Connect a CRT across the speaker terminals.
Connect 455KHz signal generator output to the base of Q301 through a capacitor of 0.01μF and adjust L302 and L303 for maximum height of wave shape on the scope. (Or adjust so that minimum noise level is obtained.)

NOTE: The signal generator output should be kept small as could as necessary to avoid limitter action which will give unaccurate alignment due to the saturation caused.

Always reduce the SG output during this alignment if there is a saturation observed on the scope.

2. 10.7MHz IF AMPLIFIER ALIGNMENT

VHF LOW BAND:

Connect signal generator output to the gate of Q103 through 0.01μF capacitor and adjust L107, L108 and L301 for maximum output (maximum height on the scope).

VHF HIGH BAND:

Connect a signal generator output to the gate of Q106 through a capacitor of 0.01μF and adjust L112, L113 and L301 for maximum output.

A sweep generator may be used for this alignment instead of the signal generator.

3. LOW BAND TUNER ALIGNMENT

a. Oscillator circuit alignment

Connect a frequency counter to the collector of Q102 through a capacitor of 1pF.

Turn the core of L106 clockwise until oscillation stops, then turn the core one turn in the counter-clockwise direction from the position at which the oscillation starts.

b. Tracking Alignment

Set signal generator output (with no modulation) to provide about a level which will give 20dB noise quieting sensitivity.

Adjust L104 for maximum 20dB noise quieting sensitivity at the low end of the band.

Adjust L103 and L105 for maximum 20dB noise quieting sensitivity at the center and high end of the band, respectively.

c. Crystal Frequency Alignment

The crystal frequency for each four channel will be slightly adjusted by turning the core of L109, L110, L111 and L112, respectively, to obtain the correct frequency.

d. Alignment for Moving Center Frequency

Since the DURA SCAN-4 has been tuned to the standard center frequency (35MHz) and its specific spread frequency is about ± 4MHz as stated in the "CRYSTAL INSTALLATION", to receive the signals higher than 39MHz, the center frequency must be shifted up to a proper center frequency by removing the some stray capacitors according to the following chart. In this case the entire circuit must be readjusted as stated in the a.b. and c above.

FREQ.	30~37MHz	37~44MHz	44~50MHz
Pre-Selector	C103 : 56P C104 : 47P C105 : 56P	C103 : 56P C104 : 47P Remove C105	C103 : 56P Remove C104 Remove C105
RF Stage No. 1	C108 : 47P C109 : 22P C110 : 33P	C108 : 47P C109 : 22P Remove C110	C108 : 47P Remove C109 Remove C110
RF Stage No. 2	C112 : 27P C113 : 15P C114 : 12P	C112 : 27P C113 : 15P Remove C114	C112 : 27P Remove C113 Remove C114
Local Osc.	C117 : 10P C118 : 15P	C117 : 10P Remove C118	C117 : 10P Remove C118

4. HIGH BAND TUNER ALIGNMENT

a. Oscillator Circuit Alignment.

Connect a frequency counter to the base of Q103 through a capacitor of 1pF.

Turn the core of L105 clockwise until oscillator stops its oscillation, then turn the core again 3/4 turn in the counter clockwise direction from the position at which the oscillation starts.

Adjust L106 for the frequency multiplied in three times the frequency.

b. Tracking Alignment

Set SG output (with no modulation) to provide about the level which will give 20dB noise quieting sensitivity. Adjust L102 and L104 for maximum 20dB noise quieting sensitivity at low end of the band.

Adjust L101 and L103 for maximum 20dB noise quieting sensitivity at high end of the band.

Repeat the above steps until no further improvement is obtained.

c. Crystal Frequency Alignment

The crystal frequency for each channel will be slightly adjusted by turning the core of L109, L110, L111 and L112, respectively to set the correct frequency.

d. Alignment for Moving Center Frequency

Adjust for new center frequency as stated above procedures, a., b., and c.

No stray capacitors will be necessary to remove.

5. UHF BAND TUNER ALIGNMENT

a. Oscillator Circuit Alignment

Connect a frequency counter to the base of Q103 through a capacitor of 1pF.

Turn the core of L109 clockwise until oscillator stops its oscillation, then turn the core 3/4 turn in the counter-clockwise direction from the position at which the oscillation starts.

Adjust L110 for the frequency multiplied in three times of the oscillating frequency.

Adjust L111 for the frequency multiplied in nine times of the oscillating frequency.

b. Tracking Alignment

Set a signal generator (with no modulation) to provide about the level which will give 20dB noise quieting sensitivity.

Adjust TC101, TC102 and TC103 for maximum noise quieting sensitivity. Adjust L106, L107 and L108 for maximum 20dB noise quieting sensitivity also.

Pages 116-127 Courtesy of UNIMETRICS, INC.

IGNITION INTERFERENCES

Reception of FM signals is usually not affected by automobile ignition noises, and therefore should not be a problem in most cases. However, sufficient noise may be generated by some vehicles to make it necessary to install additional suppression. Ignition radiation suppression requires the use of resistor spark plugs, feed-thru capacitors and distributor suppressors. Of prime importance is a properly adjusted ignition system. The following steps will serve as a guide.

1) SPARK PLUGS -- Install resistor spark plugs or Belden IRS cable.
2) DISTRIBUTOR CAP -- Install suppressor resistor IRS cable between distributor cap and ignition coil
3) GENERATOR -- Install 0.5mfd coaxial capacitor (Sprague #48P18 or equivalent) at the "A" terminal of generator.
4) ALTERNATORS -- Require no attention except when the diodes become defective or when the slip-rings are dirty.
5) IGNITION COIL PRIMARY -- Install 0.1mfd coaxial capacitor (Sprague #48P9 or equivalent) in the lead from ignition switch to coil. Keep capacitor close to coil terminal. Brighten the metal acround the coil mounting bracket to engine block, apply grease and retighten mounting screws.
6) REGULATOR FIELD TERMINAL -- Connect a 39 ohm resistor in series with 0.01mfd ceramic capacitor between the field terminal and ground.
7) ARMATURE TERMINAL -- Insert 0.2mfd coaxial capacitor (Sprague #48P18 or equivalent).
8) GAUGES -- Install 0.5mfd, 200 volts capacitors from terminals to ground.
9) WHEELS AND TIRES -- Inject special graphite powder (available at automotive parts supplier) into the tires.

CRYSTAL INSTALLATION

NOTE: Due to the numerous frequencies (channels) involved and the accuracy required (0.001%), it is recommended that the proper crystal for the desired channel frequency be purchased directly from Unimetrics, Inc. The crystal is not normally installed by the factory, but by the seller or owner of the unit. Crystals are available on special order only. When ordering crystals, specify desired receiving frequency.

PLEASE READ THE FOLLOWING BEFORE ORDERING CRYSTALS

Each DURA SCAN-8 is normally available from the factory tuned to the following standard center frequency.

[1] Low Band Receivers (30-50MHz): Standard Center Frequency 35MHz

[2] High Band Receivers (150-174MHz): Standard Center Frequency 155MHz

[3] UHF Receivers (450-470MHz): Standard Center Frequency 460MHz

c. Crystal Frequency Alignment

The crystal frequency for each channel will be slightly adjusted by turning the core of L114 (1CH), L115 (2CH) L116 (3CH) and L117 (4CH), respectively to set the correct frequency.

d. Alignment for Moving the Center Frequency

Adjust for a new center frequency as stated in the above procedures, a, b, and c.

No stray capacitors will be removed.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(UHF TUNER)		
D101	100-120	1S1555
D102	100-120	1S1555
D103	100-120	1S1555
D104	100-120	1S1555
Q101	90-45	2SC1070
Q102	90-46	2SC288A
Q103	90-47	2SC288A
Q104	90-48	2SC839
Q105	90-49	2SC387A
Q106	90-50	2SK23A
(VHF HIGH BAND TUNER)		
D101	100-125	1S1555
D102	100-125	1S1555
D103	100-125	1S1555
D104	100-125	1S1555
Q101	90-58	3SK39 (3N201)
Q102	90-56	2SC838
Q103	90-57	2SC839
Q104	90-55	2SK23A
(VHF LOW BAND TUNER)		
D101	100-130	1S1555
D102	100-130	1S1555
D103	100-130	1S1555
D104	100-130	1S1555
Q101	90-60	2SC784
Q102	90-61	2SC838
Q103	90-62	2SK23A
(AF/IF/LOGIC)		
D301	100-12	1N60
D302	100-12	1N60
D303	100-11	1S1555
D304	100-13	F14A
IC201	90-39	uPB213C
IC301	90-37	TA7060P
IC302	90-36	TA7061AP
IC303	90-35	TA7062P
LD401	100-15	SL103
LD402	100-15	SL103
LD403	100-15	SL103
LD404	100-15	SL103
Q1	90-38	2SC1096
Q2	90-38	2SC1096
Q201	90-30	2SC945
Q202	90-30	2SC945
Q203	90-30	2SC945
Q204	90-30	2SC945
Q205	90-30	2SC945
Q206	90-30	2SC945
Q207	90-30	2SC945
Q208	90-30	2SC945
Q209	90-30	2SC945
Q210	90-30	2SC945
Q211	90-30	2SC945
Q212	90-31	2SC509
Q301		2SC828
Q302		2SC838
Q303	90-33	2SC900
Q304	90-33	2SC900
Q305	90-33	2SC900
Q306	90-32	2SC945
Q307	90-32	2SC945
AD201	100-10	RD-6A
ZD301	100-14	AW-01-09

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C201	80-83	1 uF	10 V
C205	80-81	100 uF	10 V
C326	80-92	10 uF	10 V
C327	80-96	4.7 uF	25 V
C328	80-97	1 uF	50 V
C334	80-92	10 uF	10 V
C337	80-97	1 uF	50 V
C339	80-94	100 uF	16 V
C342	80-93	100 uF	10 V
C344	80-93	100 uF	10 V
C345	80-95	1000 uF	16 V
TC101-104	80-118	Trimmer	

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
RV1	70-106	10 K Volume
RV2	70-107	10 K Squelch
RV301	70-109	500 ohm Bias
TH301	70-79	Thermistor, 19D47
TH302	70-79	Thermistor, 19D47

COILS/TRANSFORMER

ITEM	PART NO.
(UHF TUNER)	
L101	50-61
L102	50-61
L103	50-58
L104	50-62
L105	50-62
L106	50-59
L107	50-59
L108	50-59
L109	50-55
L110	50-57
L111	50-62
L114	50-56
L115	50-56
L116	50-56
L117	50-56
RFC101	50-60
(VHF HIGH BAND TUNER)	
L101	50-65
L102	50-66
L103	50-67
L104	50-68
L105	50-69
L106	50-71
L107	50-72
L108	50-72
L109	50-70
L110	50-70
L111	50-70
L112	50-70
(VHF LOW BAND TUNER)	
L101	50-75
L102	50-76
L103	50-77
L104	50-78
L105	50-79
L106	50-80
L107	50-82
L108	50-82
L109	50-81
L110	50-81
L111	50-81
L112	50-81
(AF/IF/LOGIC)	
CH	50-45
L301	50-44
L302	50-43
L303	50-42
RFC301	50-47
RFC302	50-46
RFC303	50-49
RFC304	50-48

MISCELLANEOUS

ITEM	NAME	PART NO.
CF	Filter, Ceramic	60-63
SW1	Assembly, Scan Switches	60-67
	Oscillator, Crystal	60-62
	Speaker, 8 ohm	60-72

CABINET PARTS

NAME	PART NO.
Assembly, Escutcheon	60-73
Case, Upper	60-75
Case, Lower	60-76
Panel, Front	60-77
Knob, Scan Control	40-23
Knob, Volume	40-25
Knob, Squelch	40-25

These are center frequencies, of course. The circuits are so designed as to permit operation of up to 8 channels over a band of frequencies without retuning, as follows:

[1] Low Band: 31-39MHz (*35±4MHz), total spread 8MHz.

[2] High Band: 151-159MHz, (*155±4MHz) total spread 8 MHz.

[3] UHF Band: 456-464MHz, (*460±4MHz): total spread 8MHz

* Center Frequency

Low Band:	31	35	39	MHz
High Band:	151	155	159	MHz
UHF Band:	456	460	464	MHz

When ordering additional crystals for a receiver tuned to a standard center frequency, make sure the monitoring frequencies requested fall within the specific spread indicated above. If the monitoring frequencies requested with the original order of the receiver fall outside of the frequency spread provided by a standard center frequency, the receiver must be retuned to a new center frequency before being shipped to accommodate the requested monitoring frequency (s). When ordering additional crystals for such a receiver, be sure the requested monitoring frequencies fall within the total spread provided by the new center frequency.

INSERTING CRYSTALS

To install new crystal, remove the cage of DURA SCAN-8, removing 4 screws on the cabinet bottom. Refer to Figure 5 and insert the crystals desired. For convenience, a record should be kept of the monitoring frequencies and the channels in which they appear.

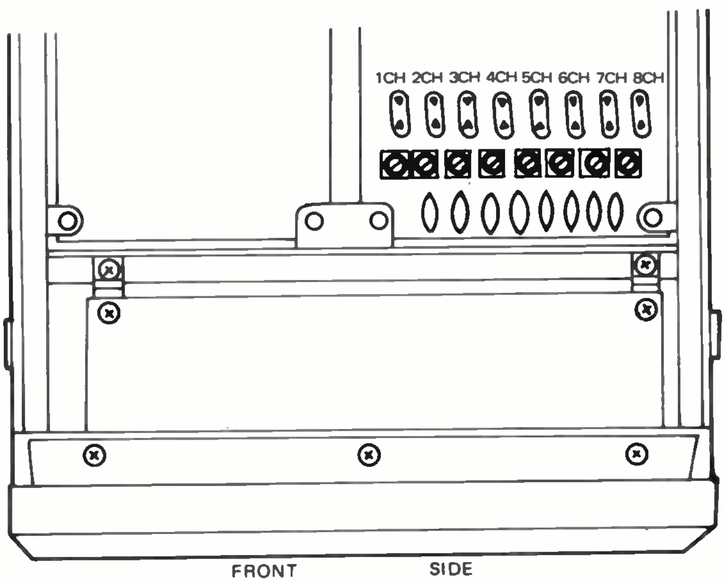


Figure 5

LOCATION OF CRYSTAL SOCKETS

Each channel number in the illustration corresponds to the number of digital indicator on the front panel.

CRYSTAL FREQUENCY DETERMINATION AND CORRELATION

Crystals used in Dura Scan-8 are type HC-25/U.
Crystal frequencies are normally determined as follows.

Frequency for Low Band VHF 30-50MHz:

Crystal fundamental frequency = Channel frequency F + 10.7MHz

Frequency for High Band VHF 150-174MHz:

$$\text{Crystal 3rd overtone frequency} = \frac{\text{Channel frequency F} - 10.7\text{MHz}}{3}$$

Frequency for UHF Band 450-470MHz:

$$\text{Crystal 9th overtone frequency} = \frac{\text{Channel frequency F} - 10.7\text{MHz}}{9}$$

Frequency deviation is less than 2/100,000 in low VHF band 30-50MHz and high VHF band 150-174MHz.

Frequency deviation is less than 1/100,000 in UHF band 450-470MHz.

CRYSTAL CORRELATION:

Resonance .... Parallel

Overtone .... Fundamental, 3rd, 9th

*Load Capacity 32pF

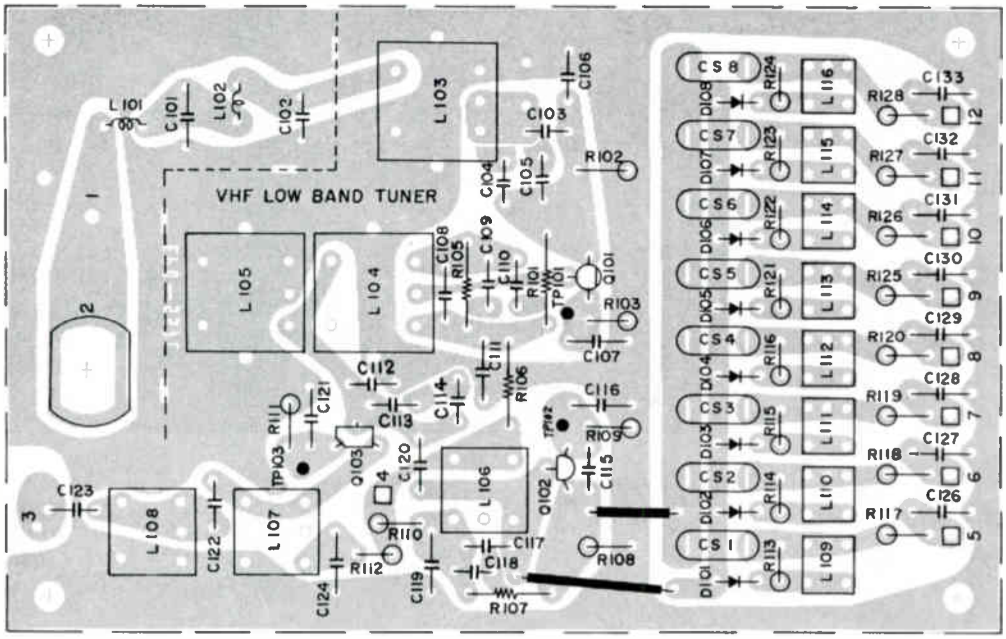
Max. Series Resistance .... Less than 40 ohms

Frequency Tolerance .... ±0.001% (at 25°C)

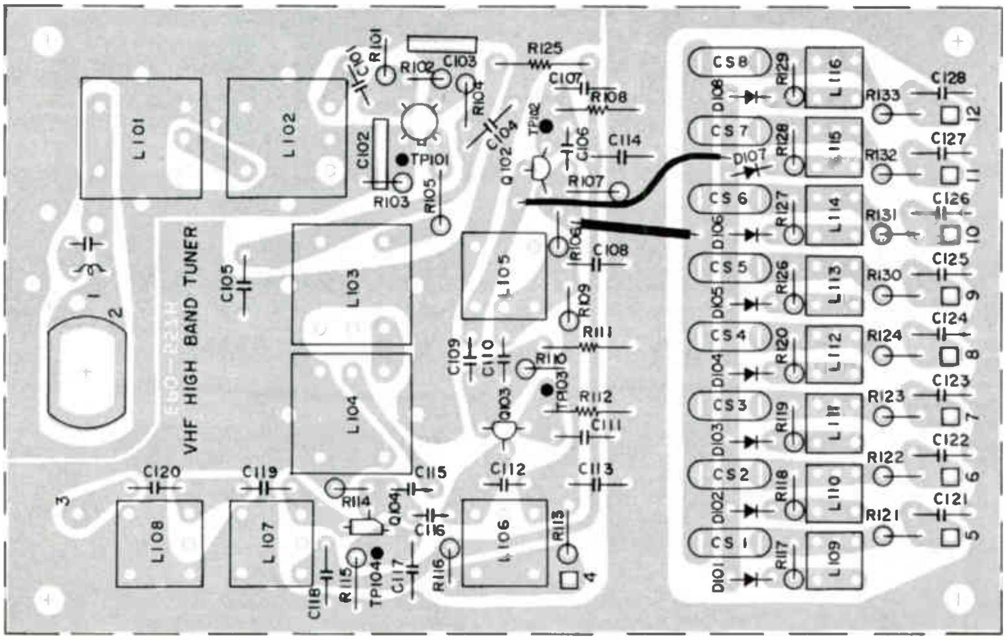
* This particular number could vary depending upon crystal manufacturer, but crystal trimmer will take care of any error. UHF LOAD CAPACITY: 22pF.

For convenience, a record should be kept of the frequencies as they are added, and the positions in which they have been inserted.

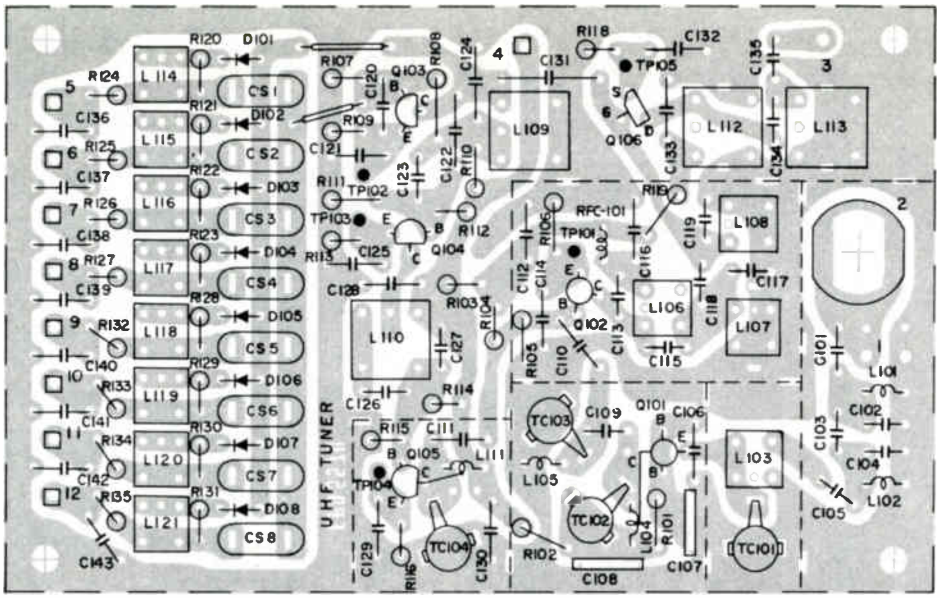
PRINTED CIRCUIT BOARD PARTS LOCATION DIAGRAM



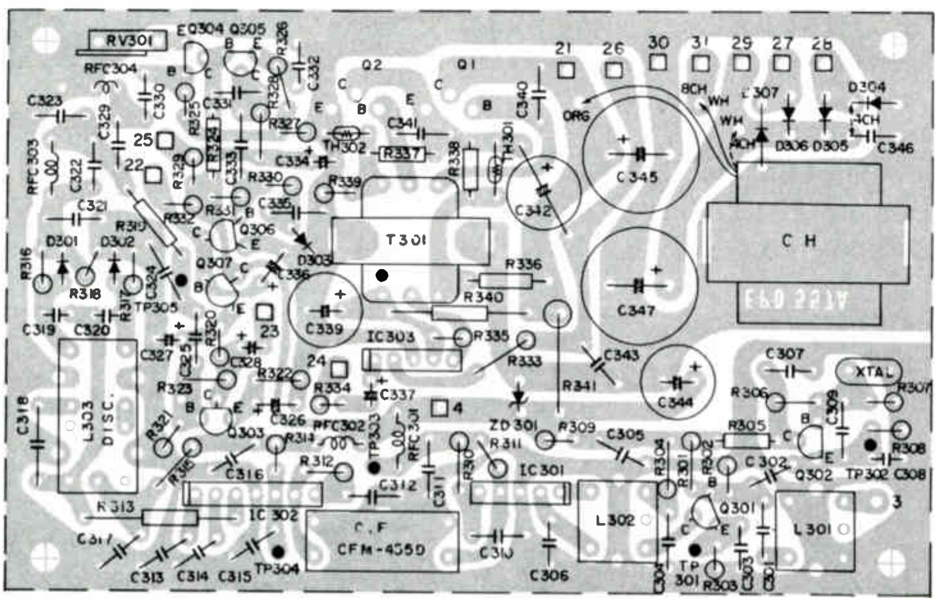
EPO-557L VHF LOW-BAND TUNER



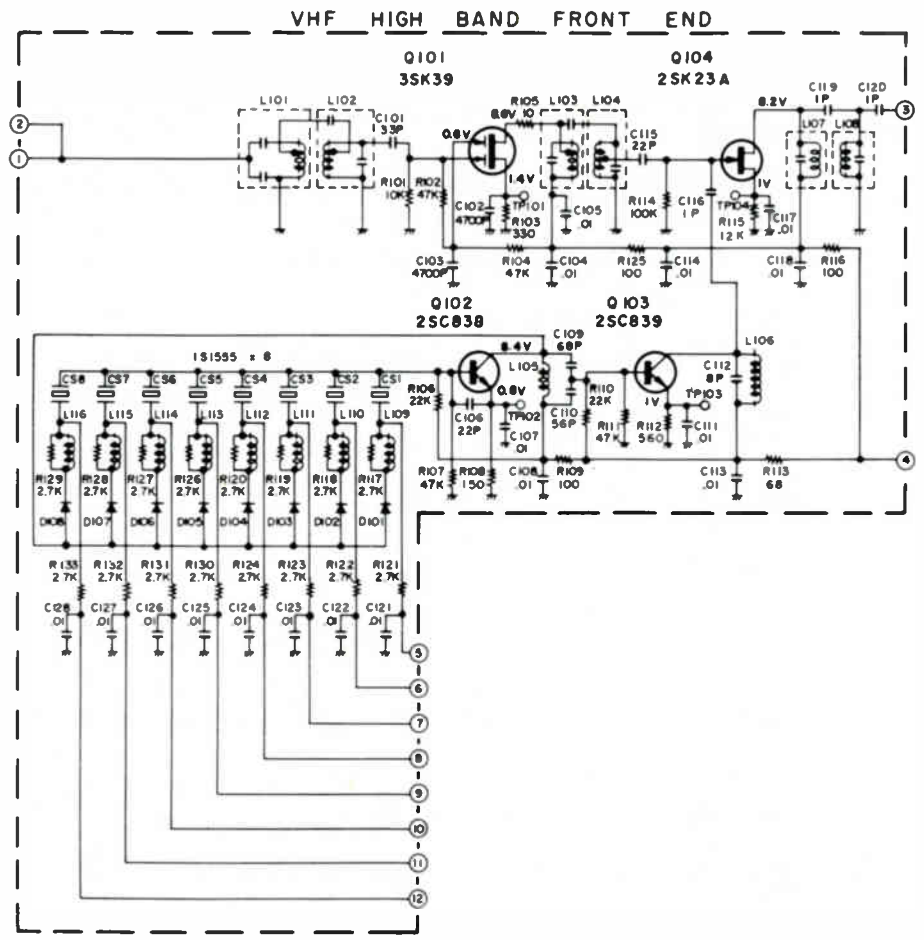
EPO-557H VHF HI-BAND TUNER

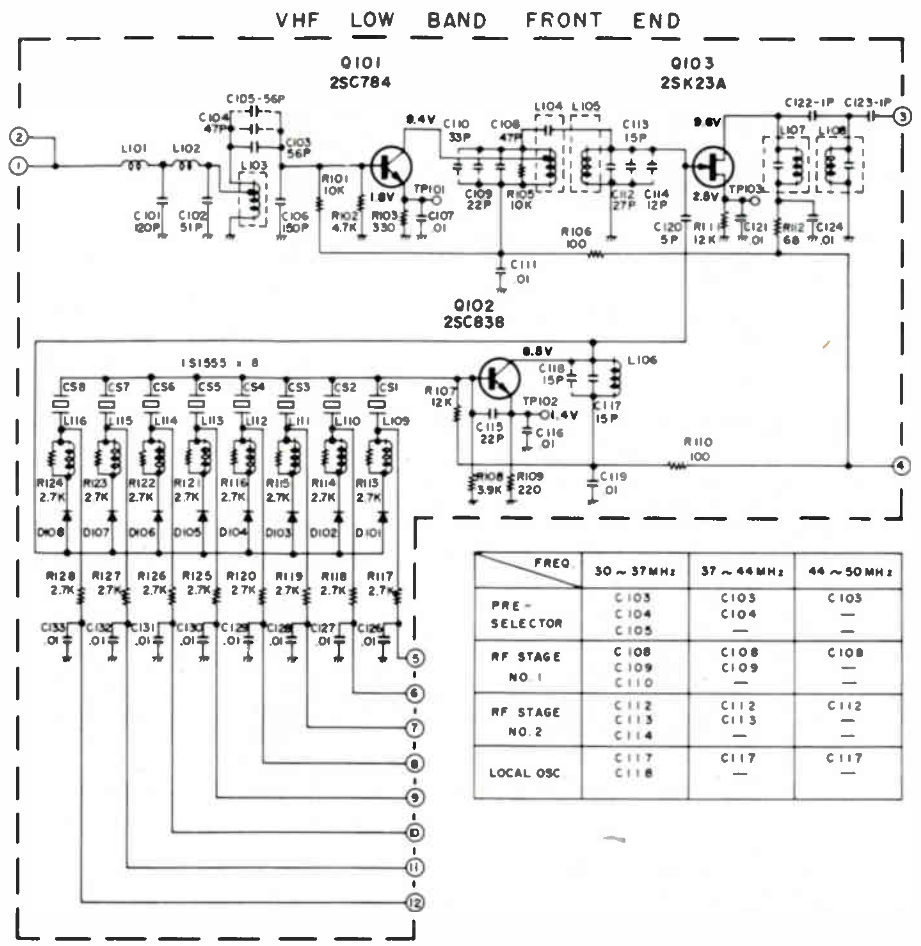


EPO-577U/2 UHF TUNER

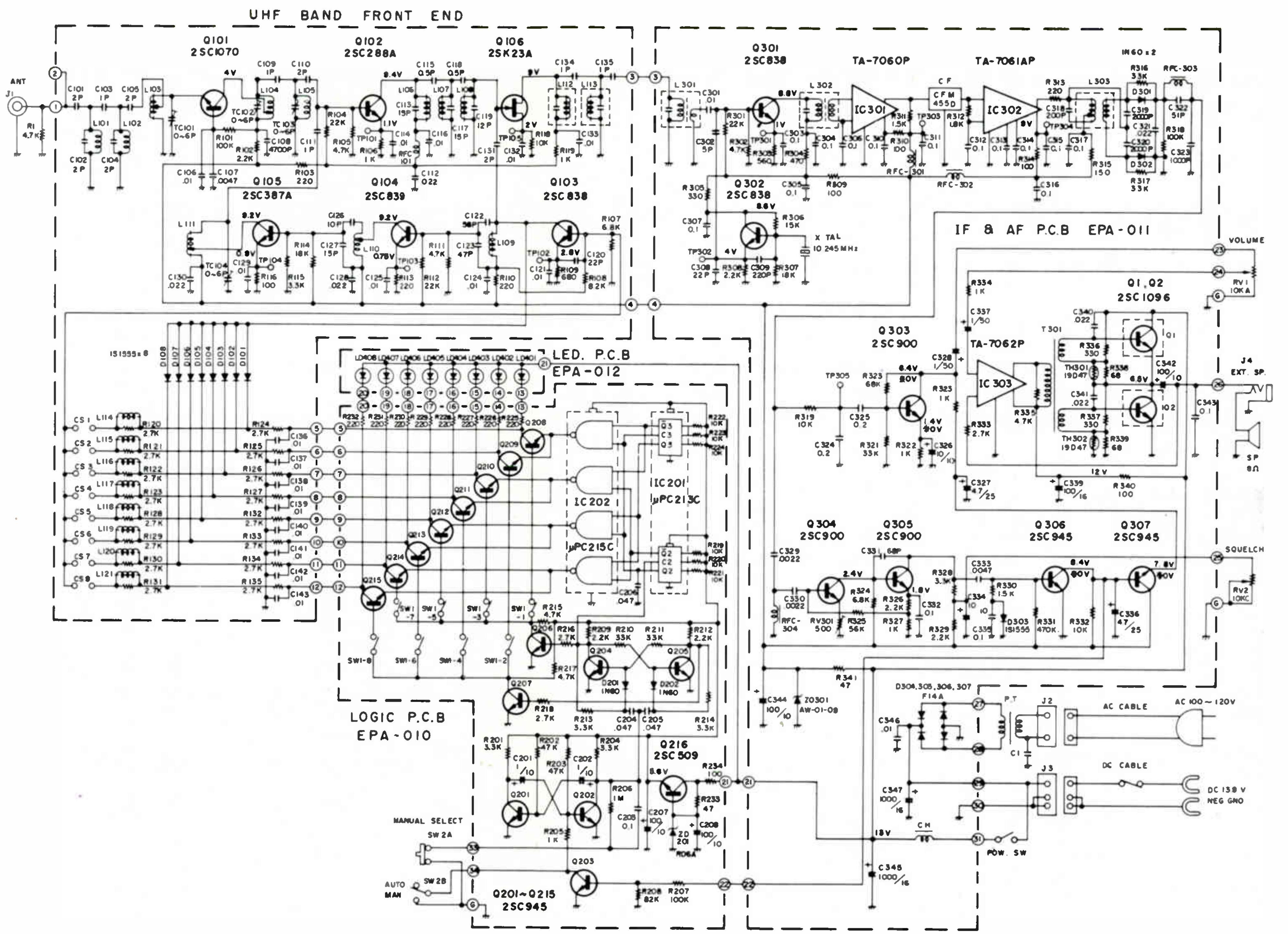


EPO-557A/2 IF AMP. & AUDIO AMP.

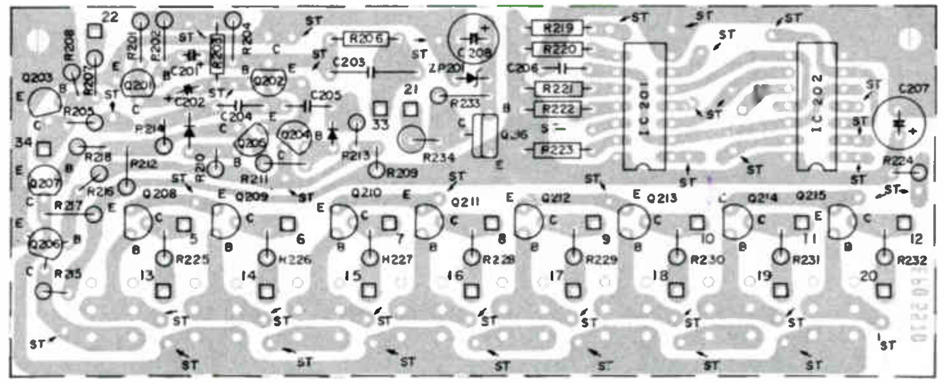




FREQ	30 ~ 37MHz	37 ~ 44MHz	44 ~ 50MHz
PRE-SELECTOR	C103 C104 C105	C103 C104 —	C103 — —
RF STAGE NO.1	C108 C109 C110	C108 C109 —	C108 — —
RF STAGE NO.2	C112 C113 C114	C112 C113 —	C112 — —
LOCAL OSC	C117 C118	C117 —	C117 —



NOTE: ALL VOLTAGES MEASURED FROM COMMON NEGATIVE GROUND WITH VTVM AT NO SIGNAL.
* AT SQUELCH ON



EPO-557D LOGIC CIRCUIT

CHANGING RF MODULES

This receiver features interchangeable RF modules for the Front End, permitting any unit to be operated on any one of the three available bands.

To replace RF modules, proceed as follows:

1. Remove the cage from the entire chassis by removing four screws under bottom side of the unit.
2. Unsolder and remove the leads connected to the terminals on the Front End Module.
3. Remove the existing Front End Module.
4. Insert the new module, attaching (soldering) the leads to the corresponding terminals on the module. When all leads have been connected to their proper terminals, secure the module in place by means of the four screws previously removed.

TELESCOPING ANTENNA

A specially designed telescoping antenna is prepared as the optional accessory. When using this antenna insert it into the antenna mounting hole provided on the upper-rear side of the cabinet and screw it tightly.

In the primary signal strength area, the telescoping antenna will give satisfactory results.

LOW BAND TUNER ALIGNMENT

a. Oscillator circuit alignment

Connect a frequency counter to the collector of Q102 through a capacitor of 1pF.

Turn the core of L106 clockwise until oscillation stops, then turn the core one turn in the counter-clockwise direction from the position at which the oscillation starts.

b. Tracking Alignment

Set signal generator output (with no modulation) to provide about a level which will give 20dB noise quieting sensitivity.

Adjust L104 for maximum 20dB noise quieting sensitivity at the low end of the band.

Adjust L103 and L105 for maximum 20dB noise quieting sensitivity at the center and high end of the band, respectively.

c. Crystal Frequency Alignment

The crystal frequency for each eight channel will be slightly adjusted by turning the core of L109 (1CH), L110 (2CH), L111 (3CH), L112 (4CH), L113 (5CH), L114 (6CH) L115 (7CH), L116 (8CH), respectively, to obtain the correct frequency.

d. Alignment for Moving Center Frequency

Since the DURA SCAN-8 has been tuned to the standard center frequency (35MHz) and its specific spread frequency is about ±4MHz as stated in the "CRYSTAL INSTALLATION", to receive the signals higher than 39MHz, the center frequency must be shifted up to a proper center frequency by removing the some stray capacitors according to the following chart. In this case the entire circuit must be readjusted as stated in the a), b) and c) above.

FREQ.	30-37MHz	37-44MHz	44-50MHz
Pre-Selector	C103 : 56pF C104 : 47pF C105 : 56pF	C103 : 56pF C104 : 47pF Remove C105	C103 : 56pF Remove C104 Remove C105
RF Stage No. 1	C108 : 47pF C109 : 22pF C110 : 33pF	C108 : 47pF C109 : 22pF Remove C110	C108 : 47pF Remove C109 Remove C110
RF Stage No. 2	C112 : 27pF C113 : 15pF C114 : 12pF	C112 : 27pF C113 : 15pF Remove C114	C112 : 27pF Remove C113 Remove C114
Local Osc.	C117 : 10pF C118 : 15pF	C117 : 10pF Remove C118	C117 : 10pF Remove C118

HIGH BAND TUNER ALIGNMENT

a. Oscillator Circuit Alignment

Connect a frequency counter to the base of Q103 through a capacitor of 1pF.

Turn the core of L105 clockwise until oscillator stops its oscillation, then turn the core again 3/4 turn in the counter clockwise direction from the position at which the oscillation starts.

Adjust L106 for the frequency multiplied in three times the frequency.

b. Tracking Alignment

Set SG output (with no modulation) to provide about the level which will give 20dB noise quieting sensitivity. Adjust L102 and L104 for maximum 20dB noise quieting sensitivity at low end of the band.

Adjust L101 and L103 for maximum 20dB noise quieting sensitivity at high end of the band.

Repeat the above steps until no further improvement is obtained.

c. Crystal Frequency Alignment

The crystal frequency for each channel will be slightly adjusted by turning the core of L109 (1CH), L110 (2CH) , L111 (3CH), L112 (4CH), L113 (5CH), L114 (6CH), L115 (7CH) and L116 (8CH), respectively to set the correct frequency.

d. Alignment for Moving Center Frequency

Adjust for new center frequency as stated above procedures, a), b) and c).

No stray capacitors will be necessary to remove.

UHF BAND TUNER ALIGNMENT

a. Oscillator Circuit Alignment

Connect a frequency counter to the base of Q103 through a capacitor of 1pF.

Turn the core of L109 clockwise until oscillator stops its oscillation, then turn the core 3/4 turn in the counter-clockwise direction from the position at which the oscillation starts.

Adjust L110 for the frequency multiplied in three times of the oscillating frequency.

Adjust L111 for the frequency multiplied in nine times of the oscillating frequency.

b. Tracking Alignment

Set a signal generator (with no modulation) to provide about the level which will give 20dB noise quieting sensitivity. Adjust TC101, TC102 and TC103 for maximum noise quieting sensitivity. Adjust L106, L107 and L108 for maximum 20dB noise quieting sensitivity also.

c. Crystal Frequency Alignment

The crystal frequency for each channel will be slightly adjusted by turning the core of L114 (1CH), L115 (2CH), L116 (3CH), L117 (4CH), L118 (5CH), L119 (6CH), L120 (7CH) and L121 (8CH), respectively, to set the correct frequency.

d. Alignment for Moving the Center Frequency

Adjust for new center frequency as stated in the above procedures a), b) and c).

No stray capacitors will be removed.

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(UHF TUNER)		
D101	100-120	1S1555
D102	100-120	1S1555
D103	100-120	1S1555
D104	100-120	1S1555
D105	100-120	1S1555
D106	100-120	1S1555
D107	100-120	1S1555
D108	100-120	1S1555
Q101	90-45	2SC1070
Q102	90-46	2SC288A
Q103	90-47	2SC288A
Q104	90-48	2SC839
Q105	90-49	2SC387A
Q106	90-50	2SK23A
(VHF HIGH BAND TUNER)		
D101	100-125	1S1555
D102	100-125	1S1555
D103	100-125	1S1555
D104	100-125	1S1555
D105	100-125	1S1555
D106	100-125	1S1555
D107	100-125	1S1555
D108	100-125	1S1555
Q101	90-58	3SK39
Q102	90-56	2SC838
Q103	90-57	2SC839
Q104	90-55	2SK23A
(VHF LOW BAND TUNER)		
D101	100-130	1S1555
D102	100-130	1S1555
D103	100-130	1S1555
D104	100-130	1S1555
D105	100-130	1S1555
D106	100-130	1S1555
D107	100-130	1S1555
D107	100-130	1S1555
D108	100-130	1S1555
Q101	90-60	2SC784
Q102	90-61	2SC838
Q103	90-62	2SK23A
(AF/IF/LOGIC)		
D301	100-136	1N60
D302	100-136	1N60
D303	100-137	1S1555
D304	100-138	F14A
D305	100-138	F14A
D306	100-138	F14A
D307	100-138	F14A
IC201	90-67	uPC213C
IC202	90-68	uPC215C
IC301	90-74	TA-7060P
IC302	90-73	TA-7061P
IC303	90-72	TA-7062P
LD401	100-140	
LD402	100-140	
LD403	100-140	
LD404	100-140	
LD405	100-140	
LD406	100-140	
LD407	100-140	
LD408	100-140	
Q1	90-75	2SC1096
Q2	90-75	2SC1096
Q201	90-65	2SC945
Q202	90-65	2SC945
Q203	90-65	2SC945
Q204	90-65	2SC945
Q205	90-65	2SC945
Q206	90-65	2SC945
Q207	90-65	2SC945
Q208	90-65	2SC945
Q209	90-65	2SC945
Q210	90-65	2SC945
Q211	90-65	2SC945
Q212	90-65	2SC945
Q213	90-65	2SC945
Q214	90-65	2SC945
Q215	90-65	2SC945
Q216	90-66	2SC509
Q301	90-71	2SC838
Q302	90-71	2SC838
Q303	90-70	2SC900
Q304	90-70	2SC900
Q305	90-70	2SC900
Q306	90-69	2SC945
Q307	90-69	2SC945
ZD201	100-135	RD6A
ZD301	100-139	AW-01-09

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C201	80-146	1 uF	10 V
C202	80-146	1 uF	10 V
C207	80-147	100 uF	10 V
C208	89-147	100 uF	10 V
C326	80-157	10 uF	10 V
C327	80-161	4.7 uF	25 V
C328	80-162	1 uF	50 V
C334	80-157	10 uF	10 V
C336	80-161	4.7 uF	25 V
C337	80-162	1 uF	50 V
C339	80-159	100 uF	16 V
C342	80-158	100 uF	10 V
C344	80-158	100 uF	10 V
C345	80-160	1000 uF	16 V
C346	80-160	1000 uF	16 V
TC101-104	80-118	Trimmer	

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
RV1	70-199	10 K Volume
RV2	70-200	10 K Squelch
RV301	70-173	500 ohm Bias
TH301	70-172	Thermistor, 19D4:
TH302	70-172	Thermistor, 19D4:

COILS/TRANSFORMERS

ITEM	PART NO.
(UHF TUNER)	
L101	50-61
L102	50-61
L103	50-58
L104	50-62
L105	50-62
L106	50-59
L107	50-59
L108	50-59
L109	50-55
L110	50-57
L111	50-62
L114	50-56
L115	50-56
L116	50-56
L117	50-56
RFC101	50-60
(VHF HIGH BAND TUNER)	
L101	50-65
L102	50-66
L103	50-67
L104	50-68
L105	50-69
L106	50-71
L107	50-72
L108	50-72
L109	50-70
L110	50-70
L111	50-70
L112	50-70
(VHF LOW BAND TUNER)	
L101	50-75
L102	50-76
L103	50-77
L104	50-78
L105	50-79
L106	50-80
L107	50-82
L108	50-82
L109	50-81
L110	50-81
L111	50-81
L112	50-81

MISCELLANEOUS

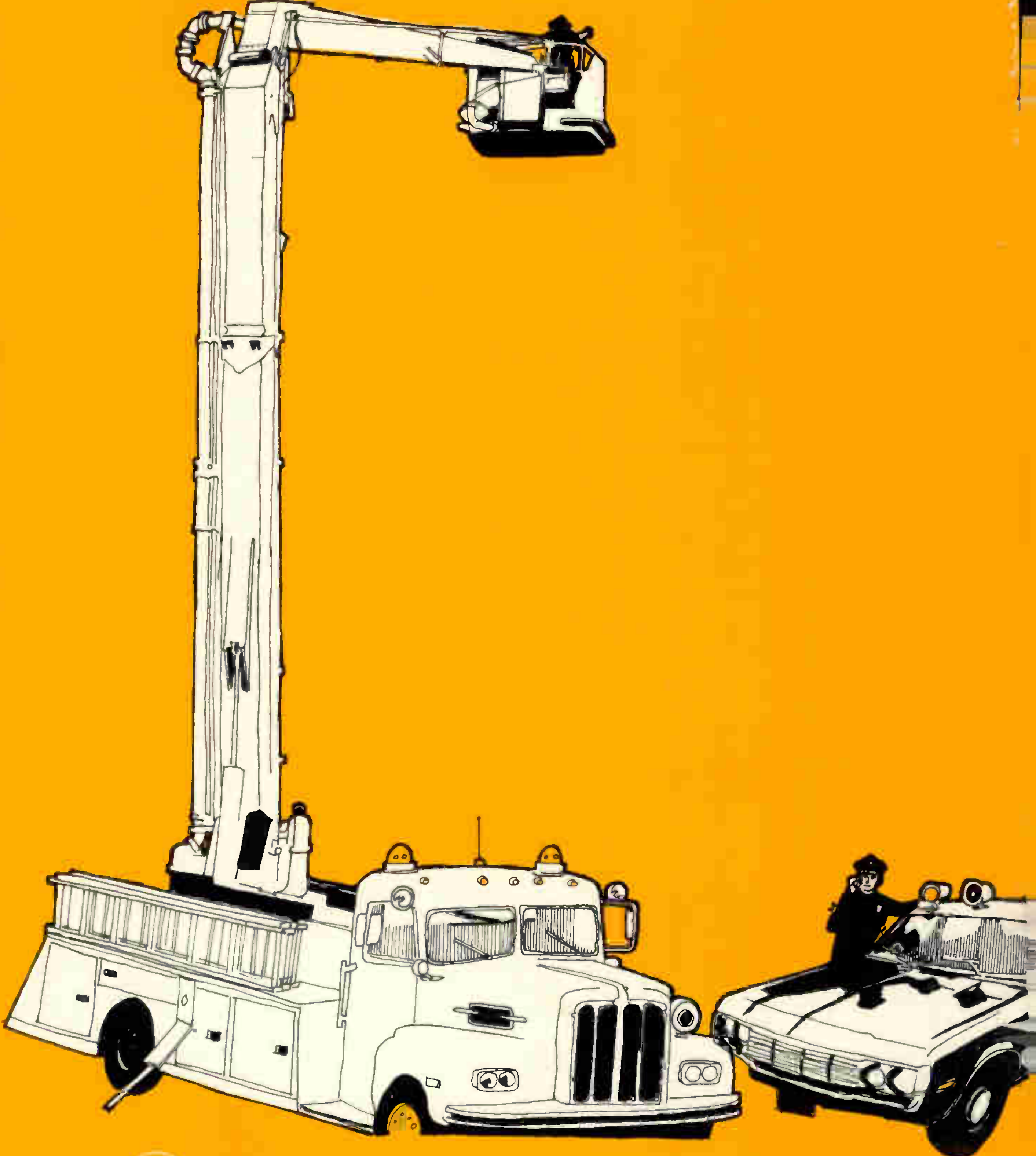
ITEM	NAME	PART NO.
C1	Component Combination	60-124
CF	Filter, Ceramic	60-117
SP	Speaker	60-133
SW1	Assembly, Bypass Switches	60-127
SW2	Assembly, Auto/Manual Switches	60-128
XTAL	Oscillator, Crystal	60-118

CABINET PARTS

NAME	PART NO.
Assembly, Escutcheon	60-134
Panel, Front	60-136
Panel, Rear	60-137

INDEX

THIS INDEX LISTS ALL SCANNERS AND MONITORS
IN "SAMS SCANNER-MONITOR SERVICING DATA" VOLUMES.



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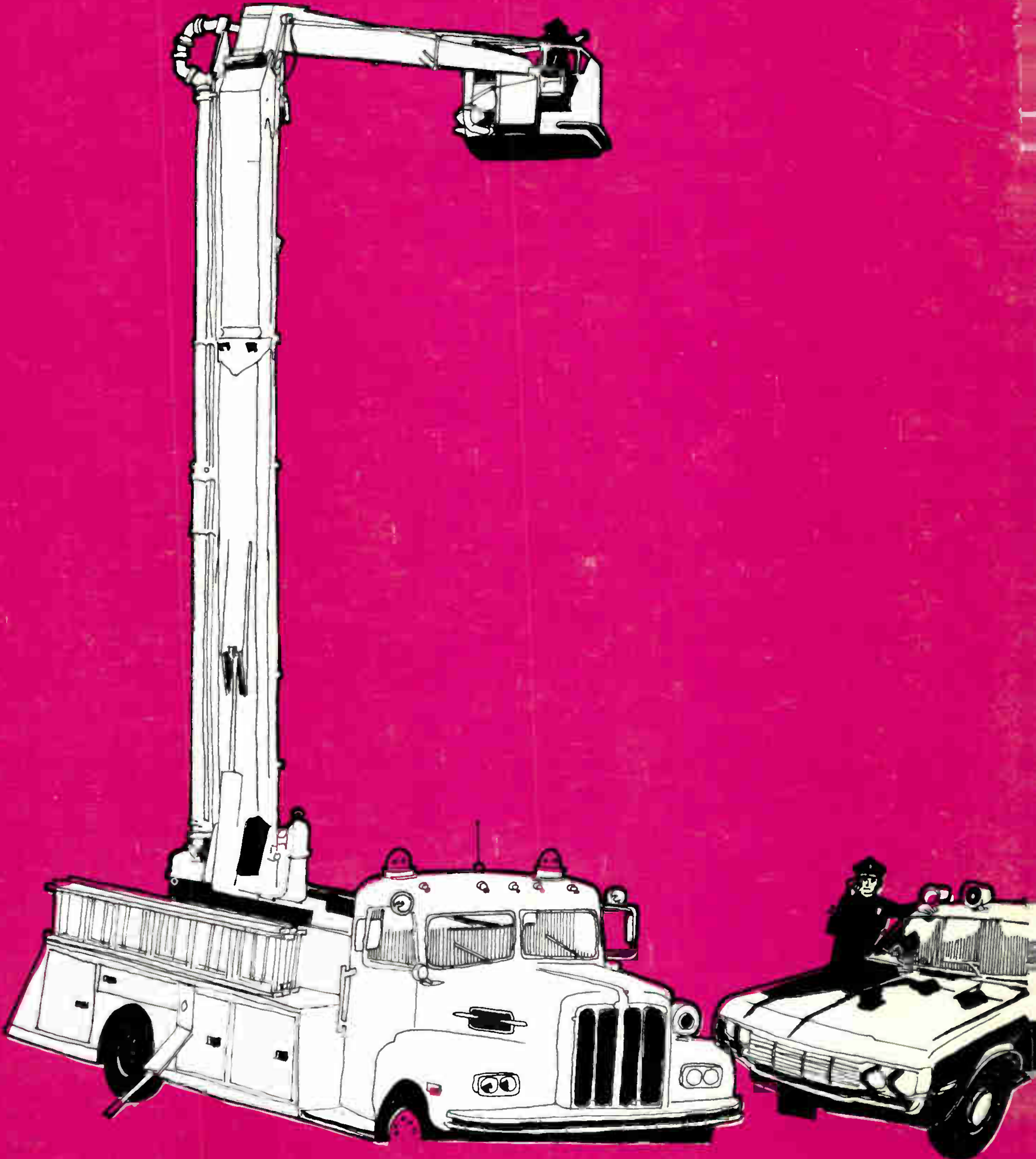

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INDEX

THIS INDEX LISTS ALL SCANNERS AND MONITORS
IN "SAMS SCANNER-MONITOR SERVICING DATA" VOLUMES.

seen in the audio output as viewed on the oscilloscope. The noise spikes will be either mostly positive or negative if an unbalanced condition exists.

2-5-4 Tune L102 (quadrature detector coil) until the noise spikes are equally positive and negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.

CRYSTAL SPECIFICATIONS

High Band Crystal:

a. Crystal frequency, determined as follows:
Crystal frequency = $\dfrac{\text{channel frequency} - 10.7\text{ MHz}}{3}$

<u>Example:</u>
Crystal frequency =
$\dfrac{155.55\text{ MC} - 10.7\text{ MHz}}{3} = \dfrac{144.85\text{ MHz}}{3} = 48.2833\text{ MHz}$

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC - 25/u

Low Band Crystal:

a. Crystal frequency, determined as follows:
Crystal frequency = channel frequency + 10.7 MHz

<u>Example:</u>
Crystal frequency = 39.5 MHz + 10.7 MHz = 50.2 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC - 25/u

ALIGNMENT AND TUNING PROCEDURE

EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM
2-1-4 Noise Generator (to be used in 2-5 only)

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

QUADRATURE DETECTOR ALIGNMENT

2-2-1 Connect the FM Signal generator to the antenna input jack. Accurately set frequency to the center of the channel being used for alignment. Modulate signal generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to test point A, (Junction of C126, C128, R113).

2-2-3 Adjust output of signal generator until all noise in scope pattern just disappears.

2-2-4 Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal.

IF ALIGNMENT

2-3-1 Disconnect RF signal generator from antenna input.

2-3-2 Connect AC voltmeter across speaker terminals.

2-3-3 Adjust volume control for .5 volt noise reading on AC voltmeter.

2-3-4 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

NOTE: Coils will have two peaks; adjust core to peak away from the center of the coil form.

2-3-5 Adjust volume control for 1.0 volt noise reading on AC voltmeter.

2-3-6 Connect the R.F. signal generator to the antenna input jack. Turn modulation off. Set the generator to the high band crystal frequency that will be used for high band section alignment.

2-3-7 Adjust the signal generator output until the voltmeter reads 0.2 volts.

2-3-8 Adjust T101 and T201, (in that order), for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts. If two peaks occur, use the one away from the center of the coil form.

2-3-9 Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency.

NOTE: Some receivers may have the second oscillator at 11.155 MHz, if this is the case, the image frequency is 910 KHz ABOVE the channel frequency. Check the frequency marked on top of the crystal (10.245 MHz for below and 11.155 MHz for above). The reverse is true for low band channels due to high side injection.

2-3-10 Adjust the signal generator output until voltmeter reads .2 volts.

2-3-11 Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order), for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the slugs should be within two turns of the position in step No. 4 and 8.

RF ALIGNMENT

2-4-1 Preset the slugs L201, L202 and L203 out of the outer end of the coil form three turns. Preset L204, L206, L207 and L208 flush with the outer ends of the coil form.

2-4-2 Connect AC voltmeter across speaker terminals.

2-4-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

HIGH BAND SECTION

2-4-4 Activate high band channel nearest to center of high band frequencies being used.

2-4-5 Connect signal generator to antenna input jack. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-4-6 Adjust output signal generator until AC voltmeter reads .2 volts.

2-4-7 Adjust L206, L207, L208 and L204, in that order, for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjusment until no further improvements can be made.

LOW BAND SECTION

2-4-8 Activate Low Band channel nearest to center of low band frequencies being used.

2-4-9 Set generator accurately to the center frequency of the channel being used for alignment. Turn modulation off.

2-4-10 Adjust output of signal generator until AC voltmeter reads 0.2 volts.

2-4-11 Adjust coils L201, L202 and L203 (in that order) for maximum quieting (lowest meter reading). Adjust the signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made.

NOISE BALANCE ADJUSTMENT

NOTE: This adjustment may be required only of excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper or inadequate noise suppression of the vehicle's ignition system.

2-5-1 Using a "T" connector, connect the FM signal generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L206.

2-5-2 Connect the oscilloscope to the junction of Q109's emitter and Q110's collector, or to the speaker terminals.

2-5-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the noise generator until spikes are clearly

VOLTAGE DATA

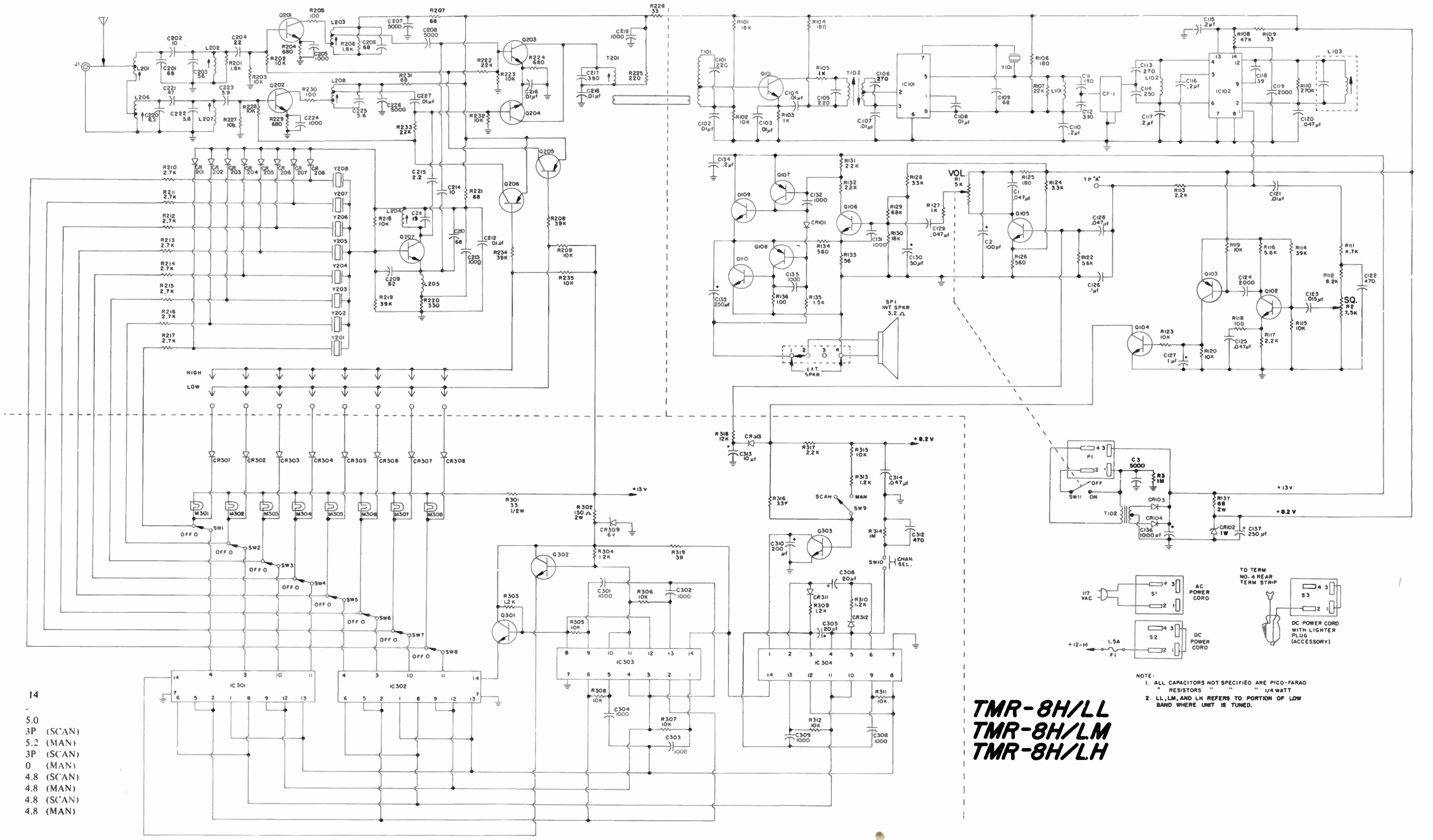
NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

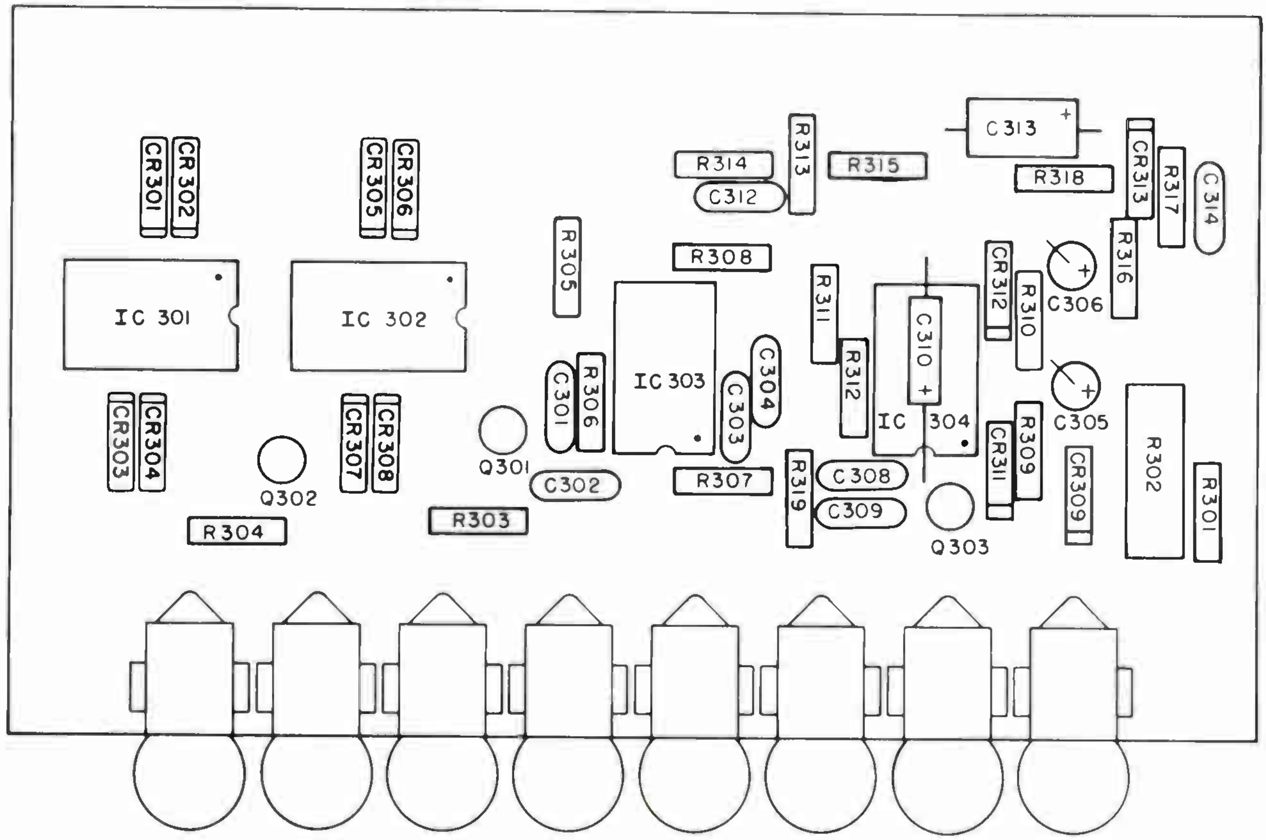
VOLTAGE DATA – TRANSISTORS:

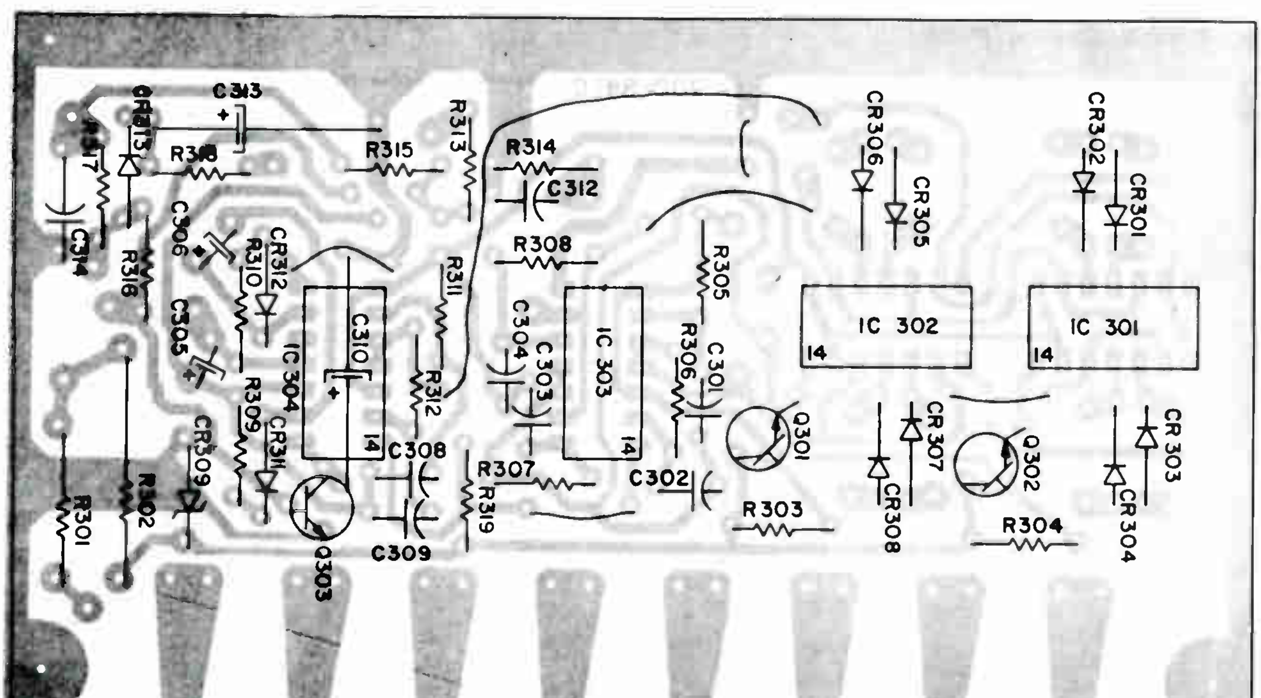
	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
	TRANSISTOR	EMITTER (Source	BASE (Gate)	COLLECTOR (Drain)	
RF Board No. 301-563	Q201	3.1	3.8	7.0	Low Band Activated
		0	0	7.6	High Band Activated
	Q202	0	0	7.6	Low Band Activated
		3.1	3.8	7.0	High Band Activated
	Q203	1.6	2.3	7.1	Low Band Activated
		1.6	0	7.1	High Band Activated
	Q204	1.6	0	7.1	Low Band Activated
		1.6	2.3	7.1	High Band Activated
	Q205	7.8	7.4	7.6	Low Band Activated
		7.8	11.0	0V	High Band Activated
	Q206	7.8	11.0	0	Low Band Activated
		7.8	7.0	7.6	High Band Activated
	Q207	3.4	4.1	7.0	
IF Board No. 500-858	Q101	2.3	3.0	5.8	
	Q102	1.0	1.7	4.8	
	Q103 (PNP)	8.2	8.2	0	(unsquelched)
		8.2	8.2	1.0	(squelched)
		8.2	8.2	1.5	Min. (tight squelch)
	Q104	0	0	7.2	(unsquelched)
		0	.80	.30	(squelched)
		0	.80	.10	(tight squelch)
	Q105	1.4	1.9	5.1	(unsquelched)
		1.1	.10	8.2	(tight squelch)
	Q106	0.7	1.3	12.4	
	Q107 (PNP)	13.8	13.1	7.2	
	Q108 (PNP)	6.9	6.6	.10	
	Q109	6.9	7.2	13.8	
	Q110	0	.10	6.9	
Scan Board No. 500-841	Q301	.2	.2	6.0 Manual	
		3P	3P	6.0 Scan	
	Q302	5.2	5.9	6.0 Manual	
		3P	3P	6.0 Scan	
	Q303	0	.7	.1 Manual	
		0	.1	1.6 Scan	

VOLTAGE DATA – INTEGRATED CIRCUITS

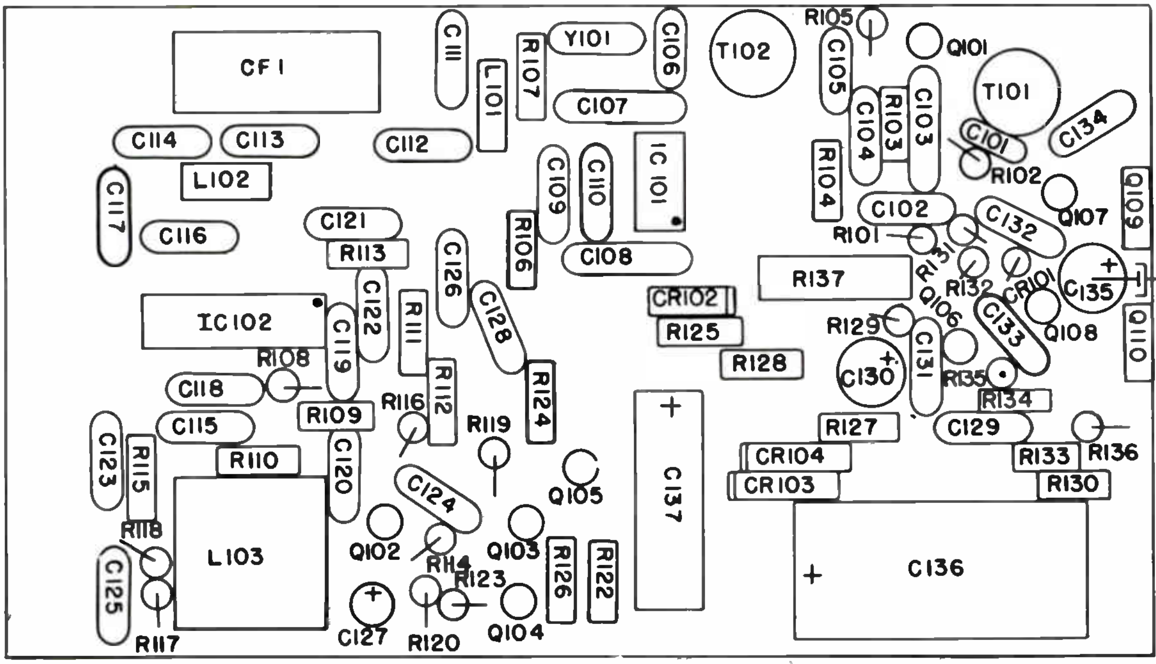
	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
IF Board	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	-	-	-	-	-	-	
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0	
	IC 301	2.0P	2.0P	9.P	9.P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
		.2	3.6	11	.7	3.6	3.6	0	3.6	.2	11	11	.2	.2	5.2	(MAN)
	IC302	2.0P	2.0P	9P	9P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
		.2	3.6	11	11	3.6	3.6	0	3.6	.2	11	11	.2	.2	0	(MAN)
	IC 303	2.7P	2.0P	2.0P	2.0P	2.7P	2.0P	0	3P	4P	3P	3P	3P	4P	4.8	(SCAN)
		1.5	3.6	.2	.2	3.6	3.6	0	.2	1.5	5.9	5.9	.2	5.9	4.8	(MAN)
	IC 304	1.6	1.3P	1.8P	1.3P	1.3P	1.3P	0	2P	2.7P	2.0P	2.0P	2.0P	2.0	4.8	(SCAN)
		.1	.2	3.8	3.8	1.5	1.5	0	.2	1.5	3.6	3.6	.2	3.6	4.8	(MAN)

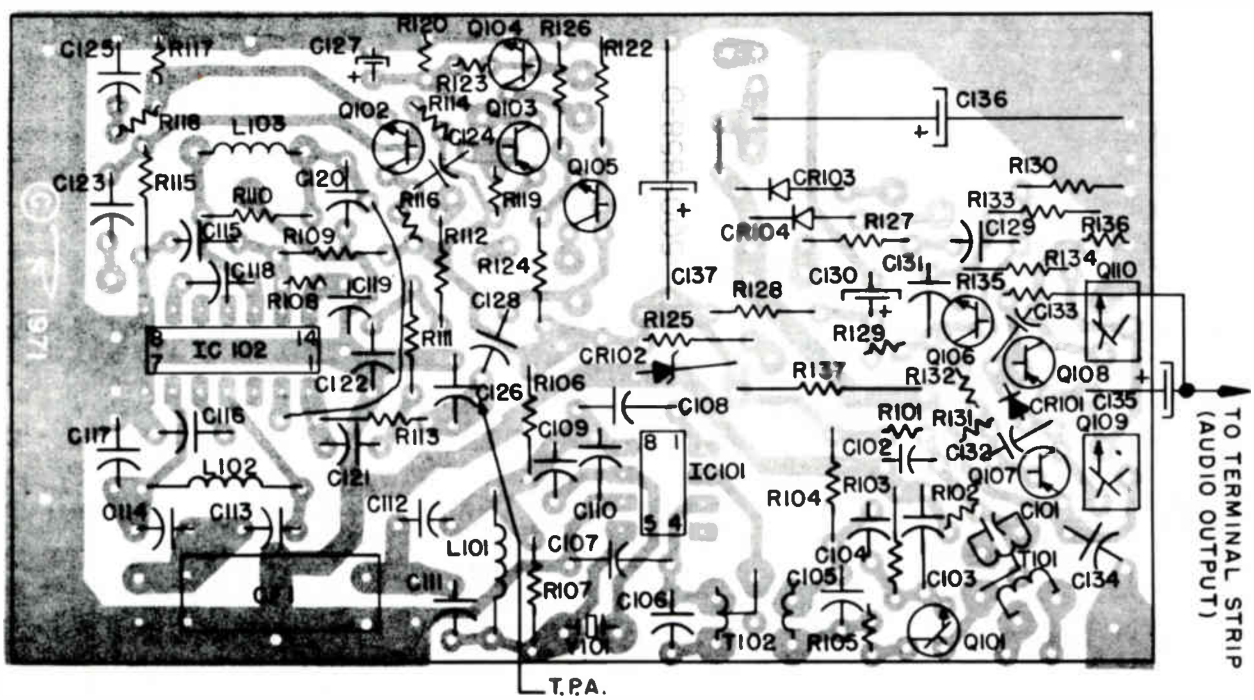




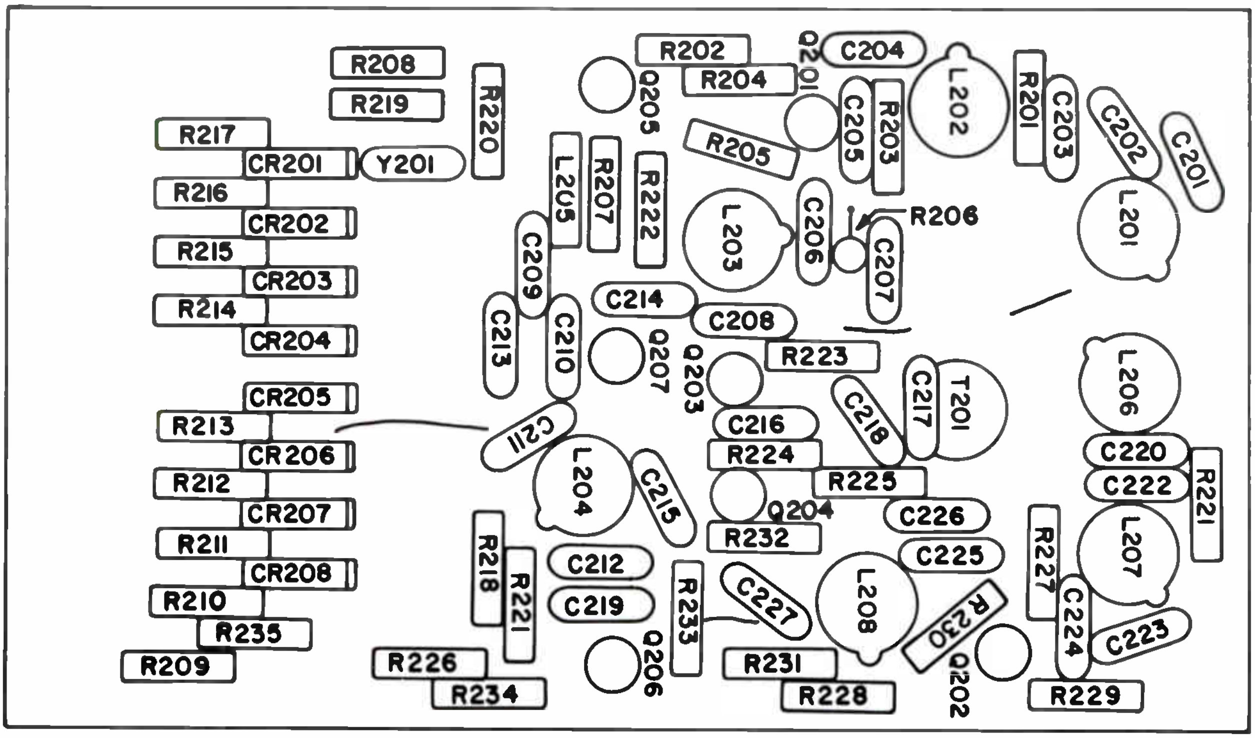


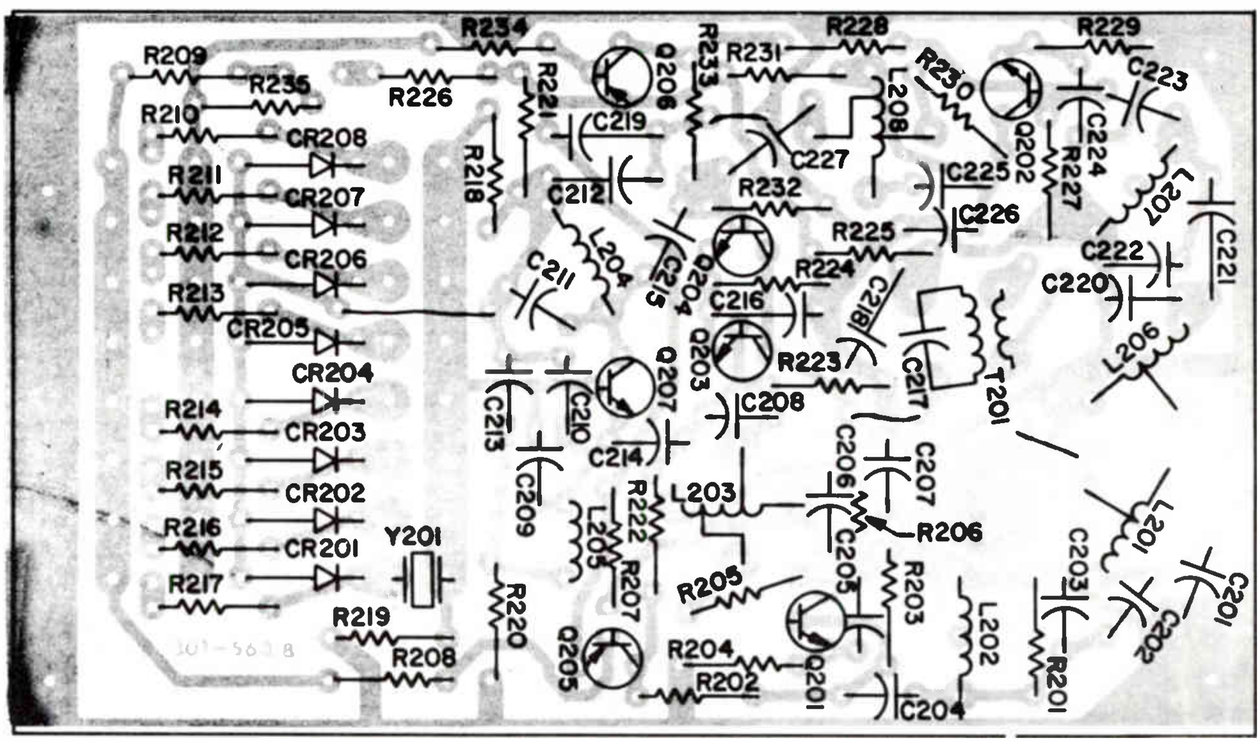
SCAN BOARD 500-841





IF BOARD 500-858





RF BOARD 301-563

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(RF, 301-563)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
Q201	SPS-1473RT	2N5222
Q202	SPS-1473RT	2N5222
Q203	SPS-1473RT	2N5222
Q204	SPS-1473RT	2N5222
Q205	SPS-1539WT	2N5227
Q206	SPS-1539WT	2N5227
Q207	SM-4304-S	2N5230
(IF-AUDIO, 500-858)		
CR101	102-412	1N4148
CR102	1N4738A	Zener, 8.2V
CR103	1N4002	
CR104	1N4002	
IC101	301-679-1	
IC102	301-576-3	MC-1357P
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539WT	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5712
Q106	SPS-952	MPS5712
Q107	MPS-A55	
Q108	MPS-A55	
Q109	MJE-521	
Q110	MJE-521	
(SCANNER, 500-841)		
CR301	102-412	1N4148
CR302	102-412	1N4148
CR303	102-412	1N4148
CR304	102-412	1N4148
CR305	102-412	1N4148
CR306	102-412	1N4148
CR307	102-412	1N4148
CR308	102-412	1N4148
CR309	MZ92-6.0B	Zener, 6.0V
CR310	102-412	1N4148
CR311	102-412	1N4148
CR312	102-412	1N4148
CR313	102-412	1N4148
IC301	301-576-2	
IC302	301-576-2	
IC303	301-576-4	
IC304	301-576-4	

ELECTROLYTIC/VARIABLE CAPS

ITEM	VALUE	
(CHASSIS)		
C2	100uf	10V
(IF-AUDIO, 500-858)		
C127	1uf	50V
C130	50uf	10V
C135	250uf	16V
C136	1000uf	16V
C137	250uf	10V
(SCANNER, 500-841)		
C305	20uf	16V
C306	20uf	16V
C310	200uf	10V
C313	10uf	10V

CONTROLS, SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R1/SW11	102-479-3	5000 ohms Volume/Switch
R2	102-479-2	7500 ohms Squelch

MISCELLANEOUS

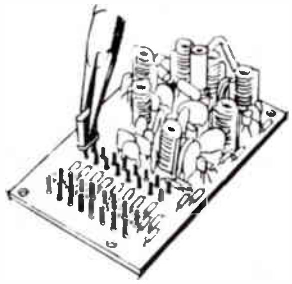
ITEM	PART NO.
(CHASSIS)	
T1	301-515
(RF 301-563)	
L201	301-520-4
L202	301-520-5
L203	301-520-6
L204	301-520-9
L205	102-369
L206	301-520-1
L207	301-520-2
L208	301-520-3
T201	102-405
(IF-AUDIO, 500-858)	
L101	ES-2228
L102	ES-2228
L103	301-517
T101	102-507
T102	301-730

COILS/TRANSFORMERS

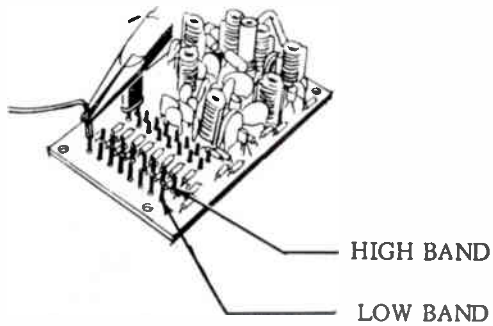
ITEM	NAME	PART NO.
(CHASSIS)		
Spk-1	Speaker, 3.2 ohm	301-537-1
SW1-8	Switch, SPDT	UID500-874-3
SW9	Switch, SPDT	UID500-874-1
SW10	Switch, SPDT	UID500-874-1
Y200	Crystal, High Band Receive (Specify Frequency)	301-532
Y200	Crystal, Low Band Receive (Specify Frequency)	301-542
(IF-AUDIO) 500-858		
CF-1	Filter, Ceramic, 455kHz	301-723
Y101	Crystal, 10.245MHz	301-516-1
Y101	Crystal, 11.155MHz	301-516-2

CABINET PARTS

NAME	PART NO.
Panel, Front	500-813
Plate, Face	301-556
Knob, Volume/Squelch	Plasticware 27500
Cabinet, Wrap Assembly	600-259-1

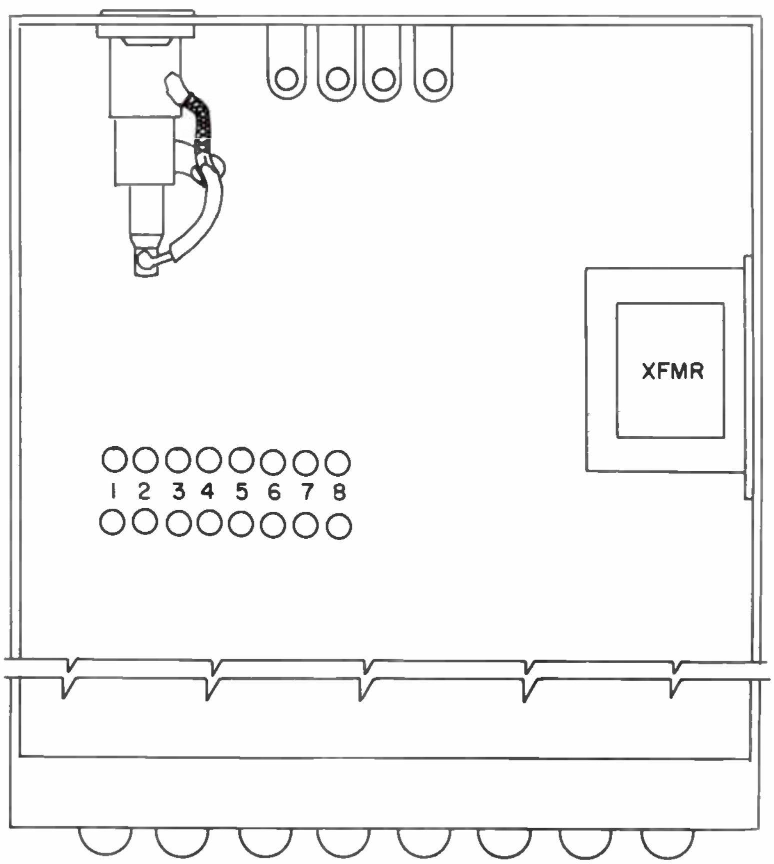


Insert crystal for high or low band frequency of your choice

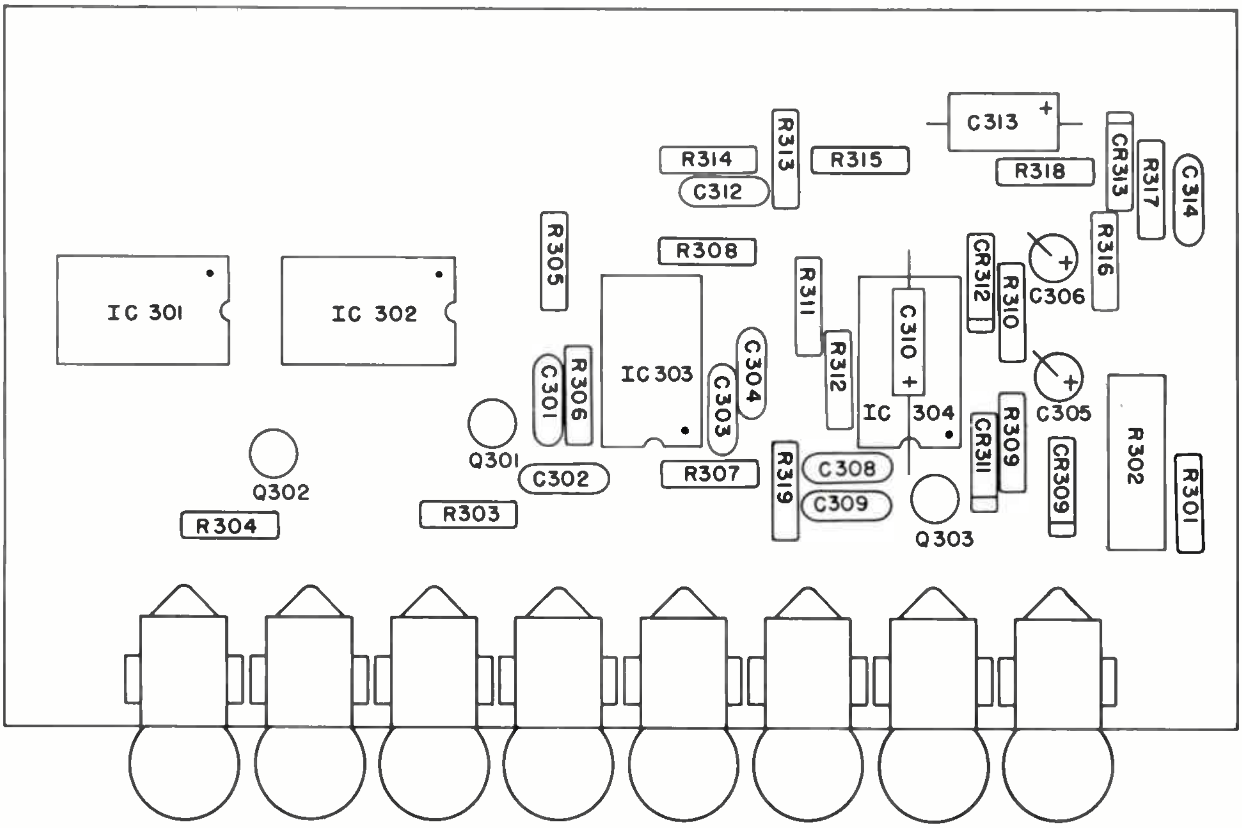


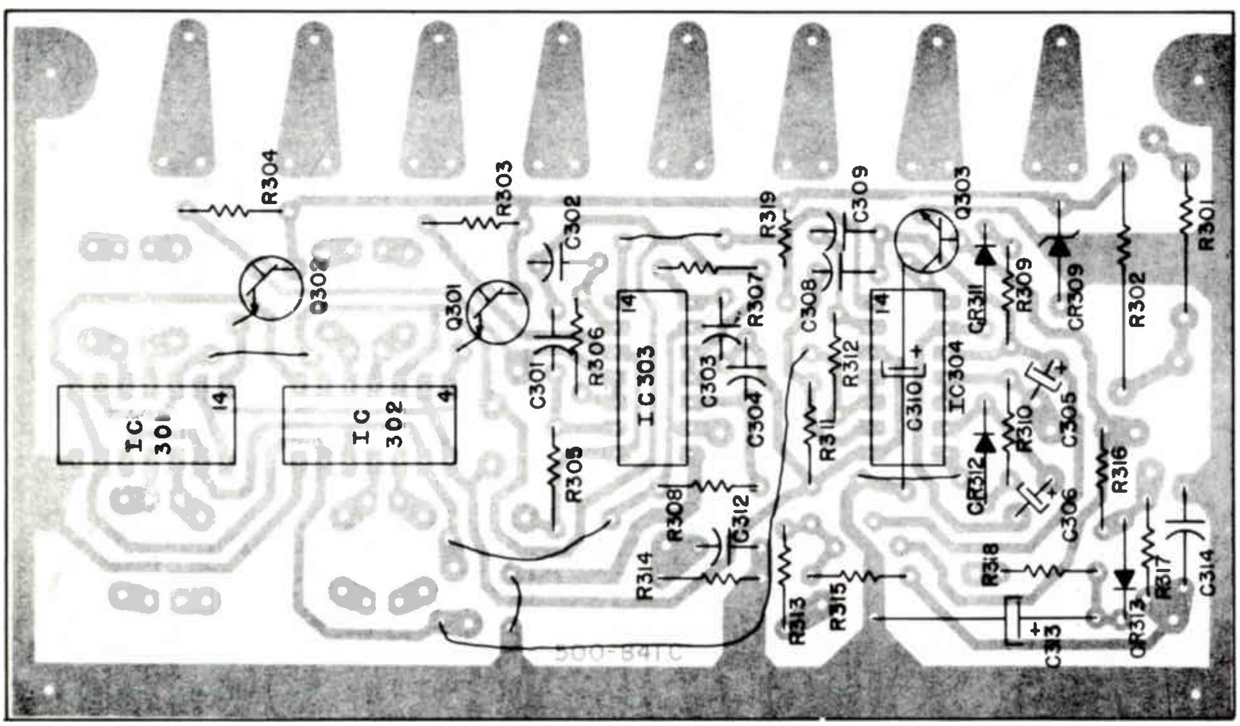
Connect lead to corresponding high or low band terminal programmer

BAND PROGRAMMING DIAGRAM



CRYSTAL LOCATION DIAGRAM

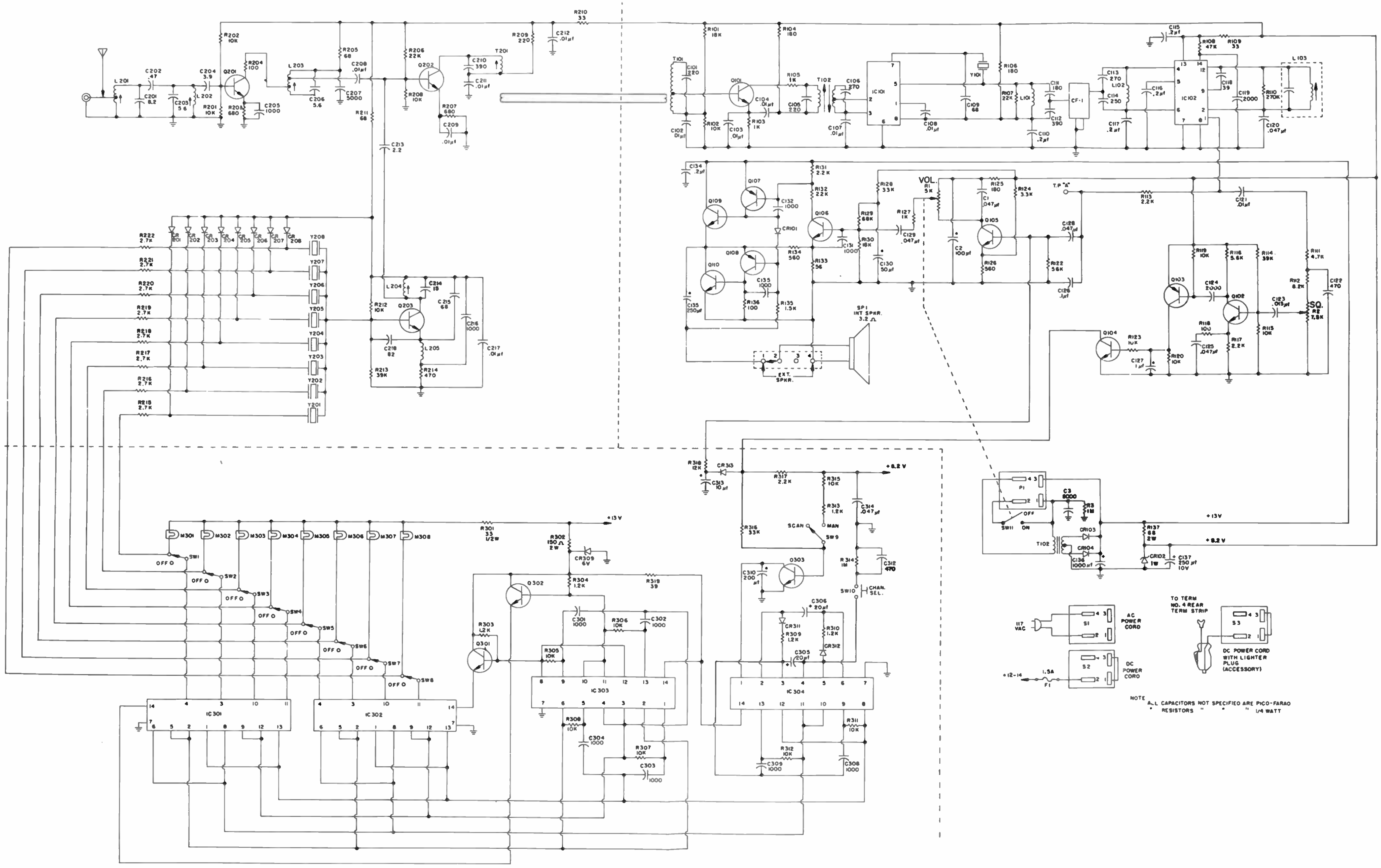




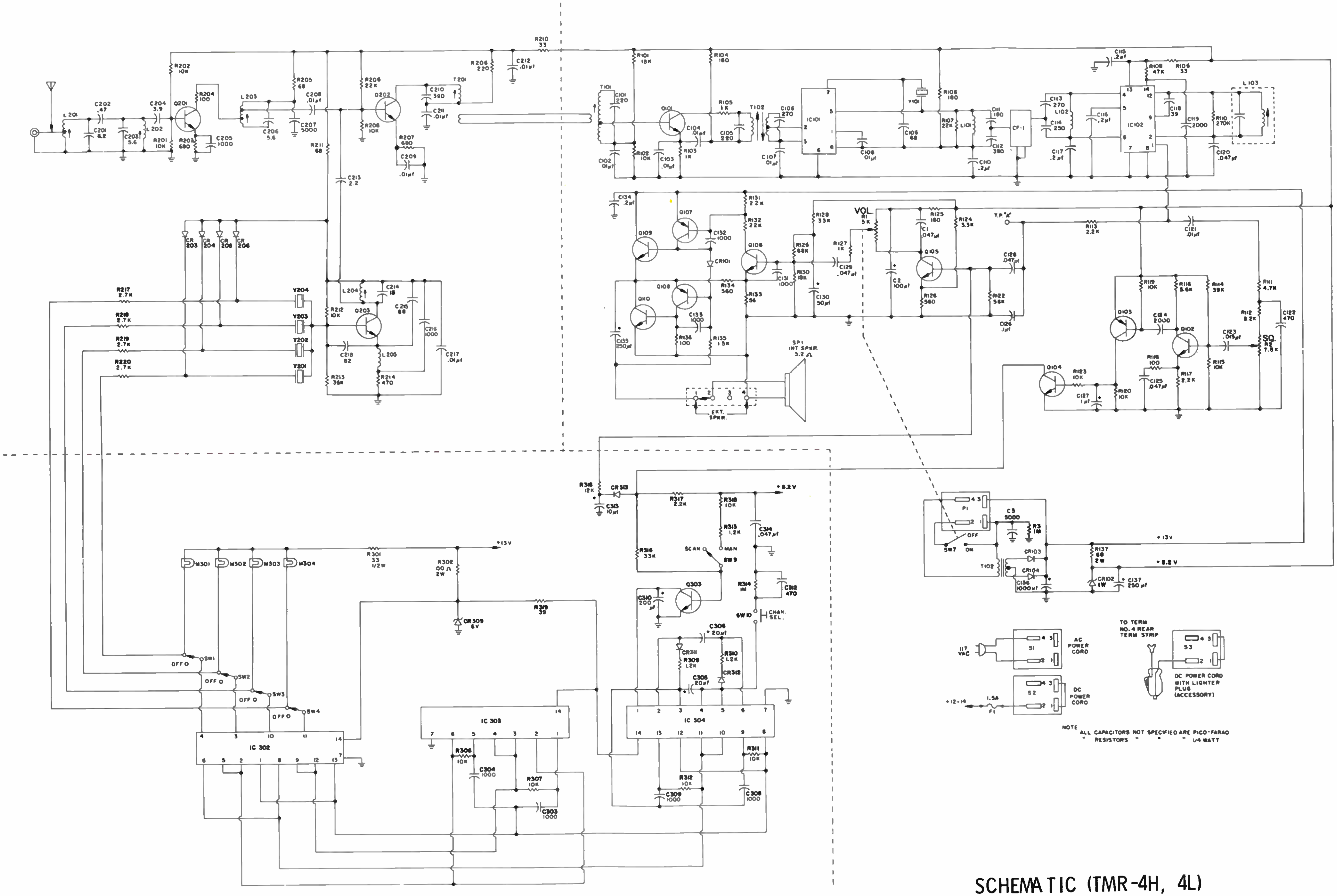
SCAN BOARD 500-841

(TMR-8H, 8L)

Regency *TMR-1H, TMR-1L, TMR-4H, TMR-4L, TMR-8H, TMR-8L*



SCHEMATIC (TMR-8H, 8L)



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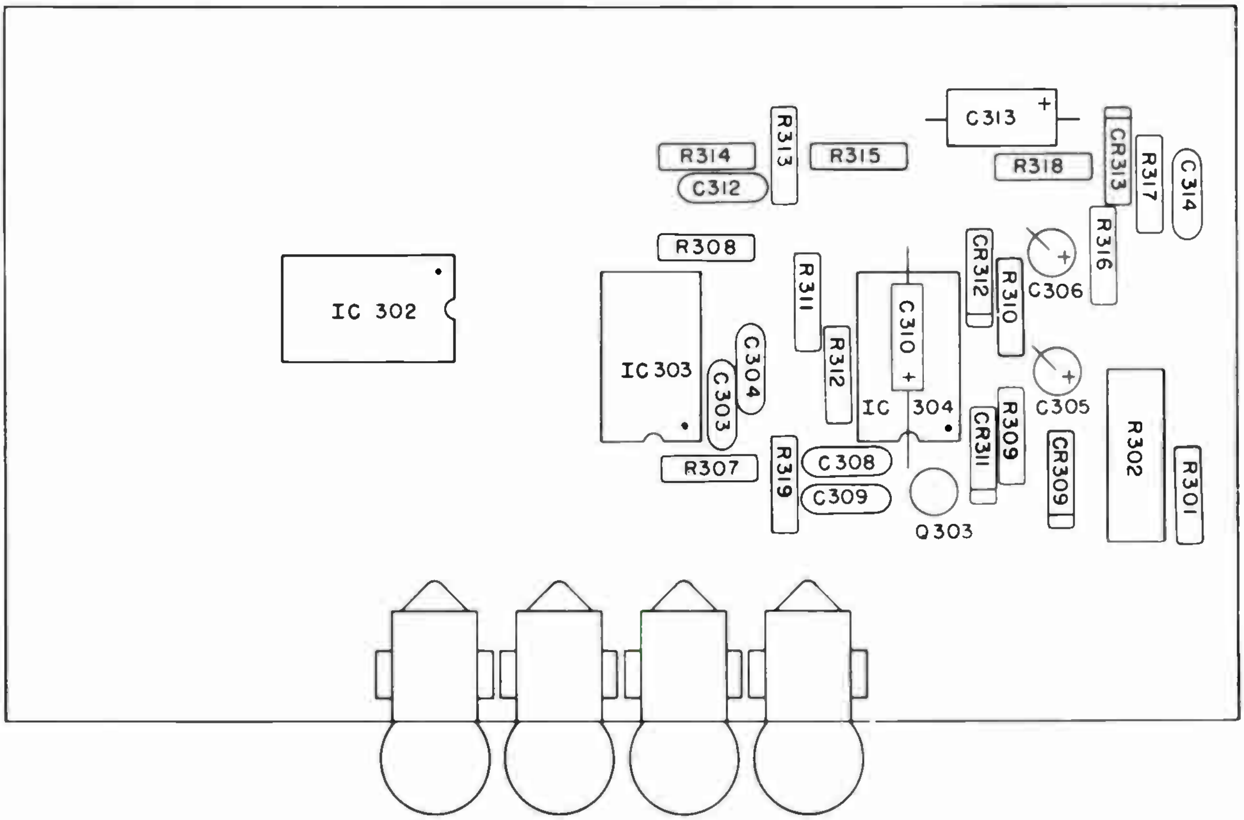
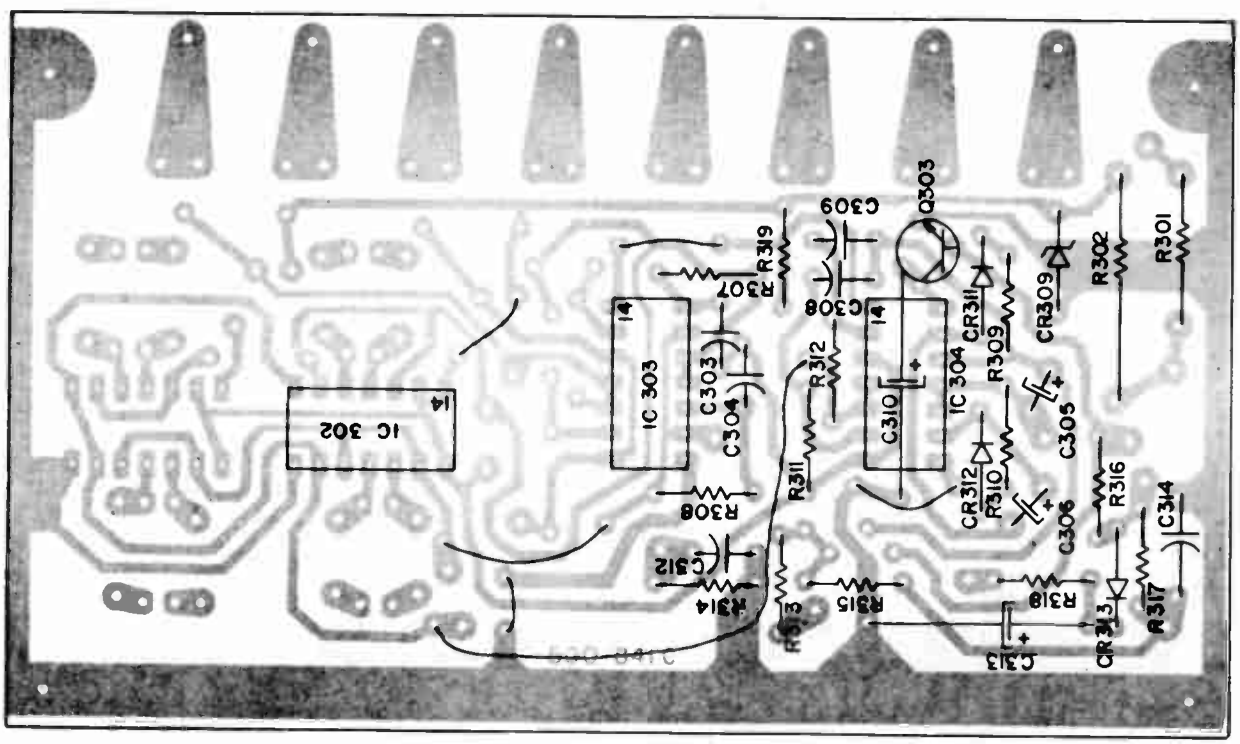
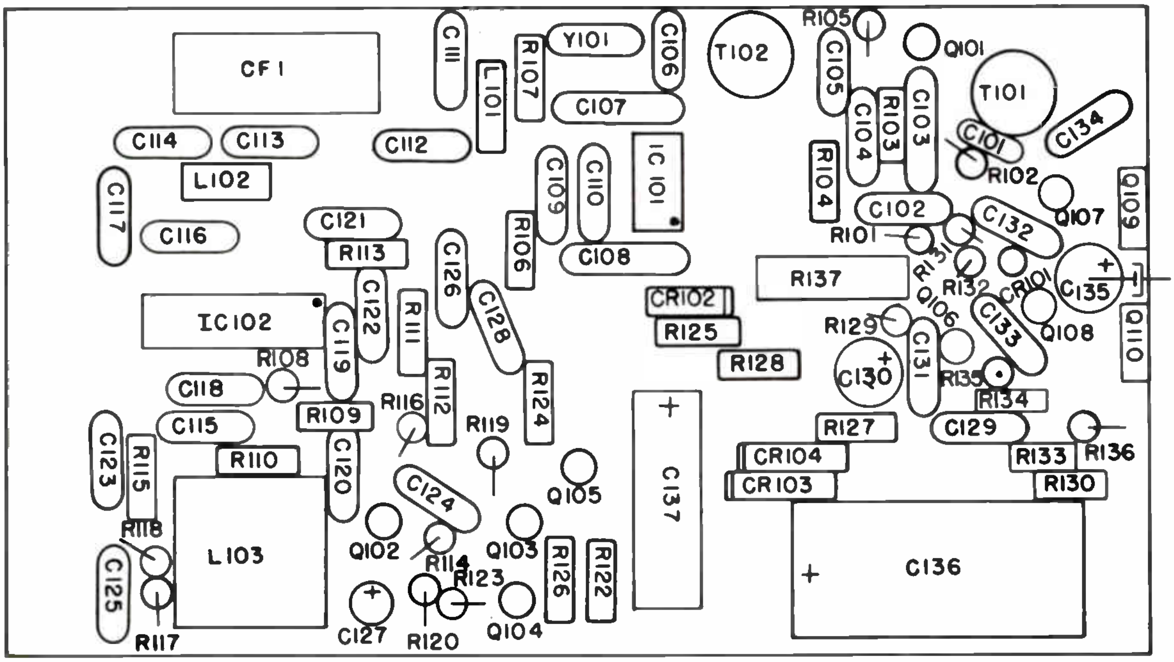
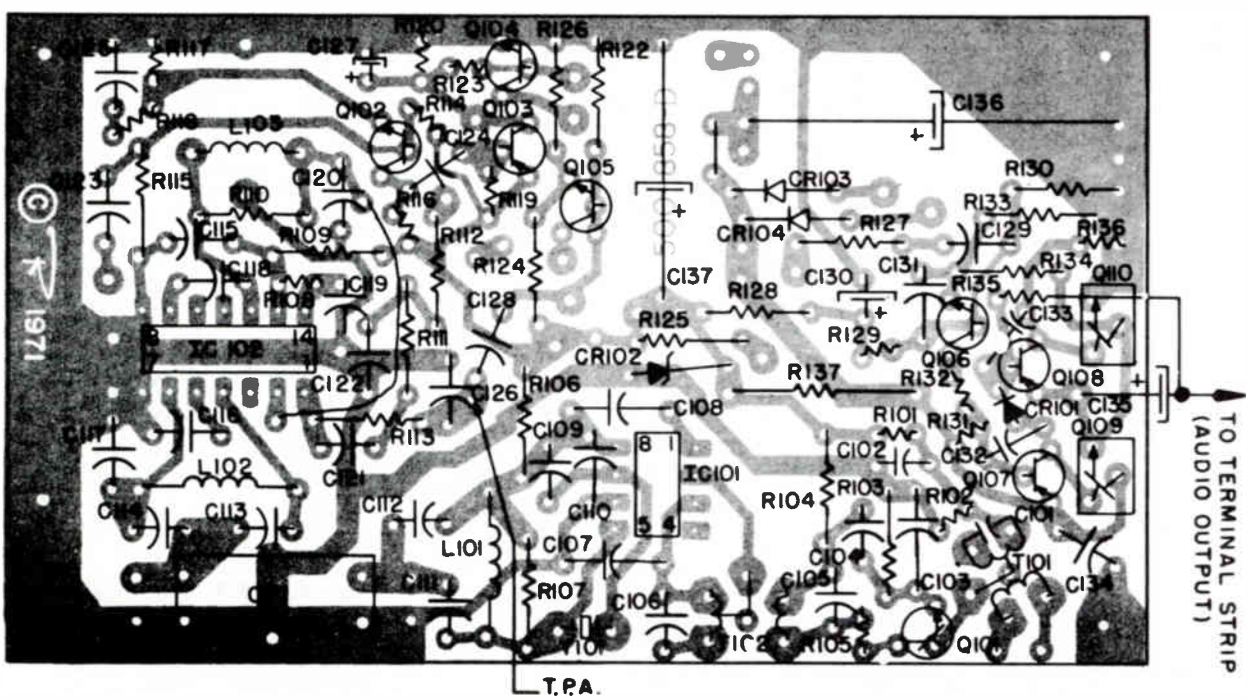




SCAN BOARD 500-841

(TMR-4H,4L)





IF BOARD 500-858

(TMR-4H,4L,8H,8L)

3-13 VOLTAGE DATA

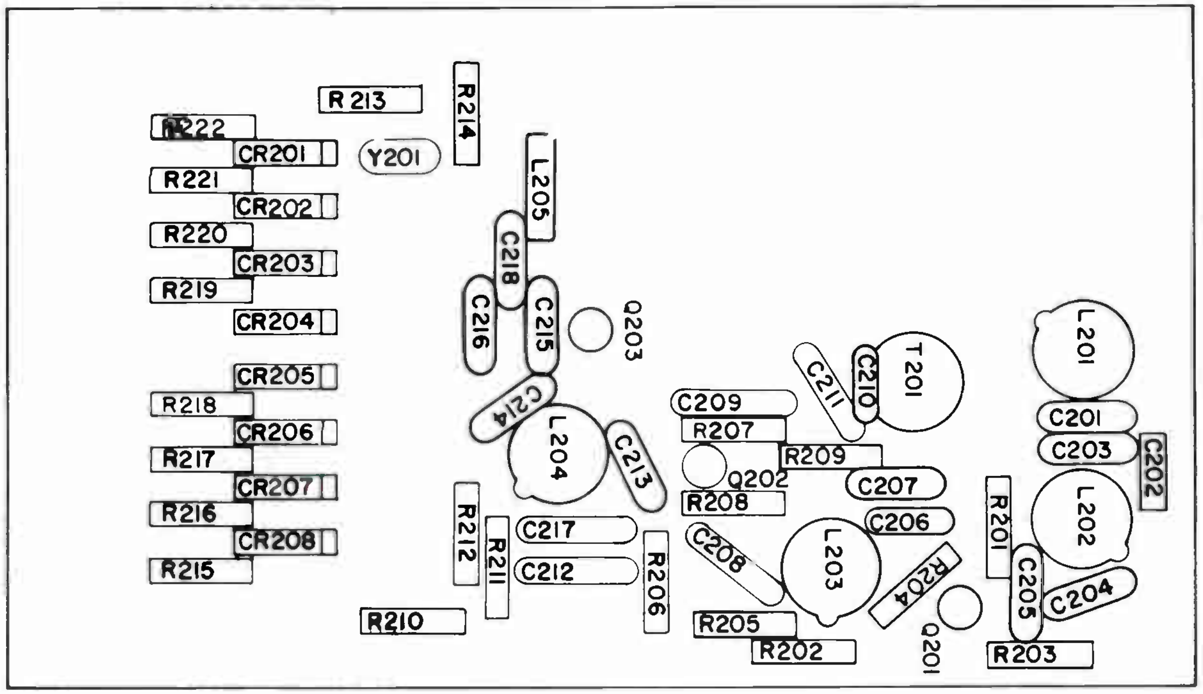
NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

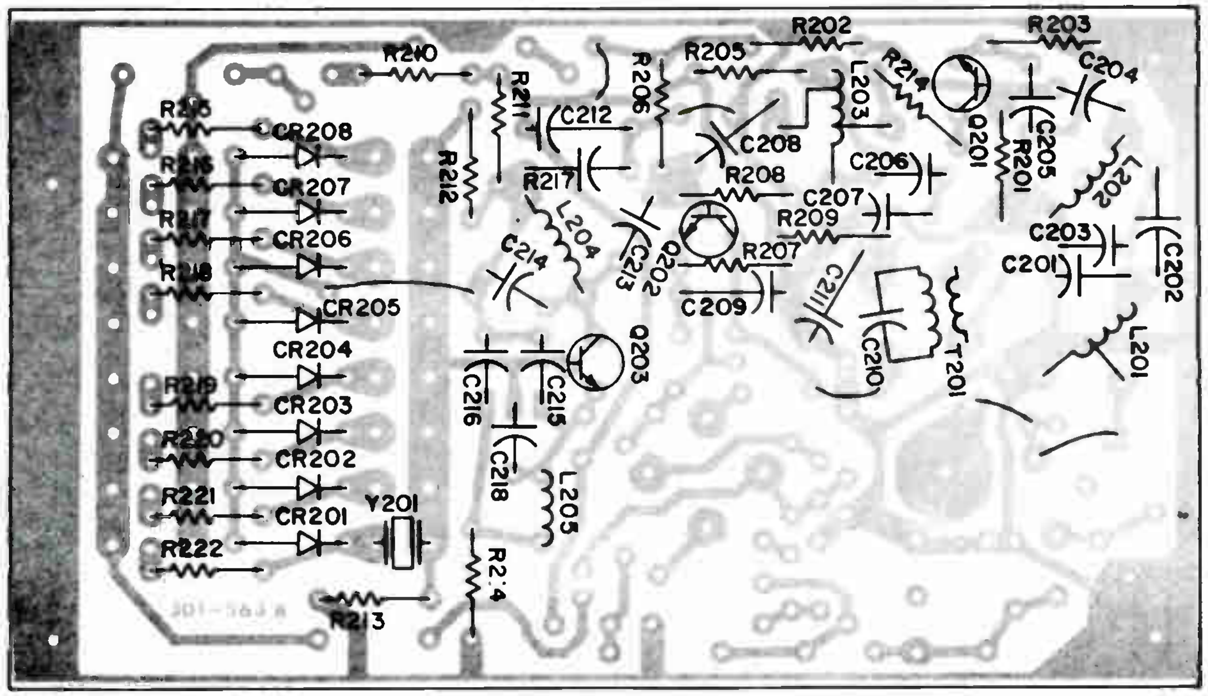
VOLTAGE DATA – TRANSISTORS:

	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
RF Board No. 301-563	Q201	3.1	3.8	7.0	
	Q202	1.6	2.3	7.1	
	Q203	3.4	4.1	7.0	
IF Board No. 500-858	Q101	2.3	3.0	5.8	
	Q102	1.0	1.7	4.8	
	Q103 (PNP)	8.2	8.2	0	(unsquelched)
		8.2	8.2	1.0	(squelched)
		8.2	8.2	1.5	Min. (tight squelch)
	Q104	0	0	7.2	(unsquelched) (TMR-8H, 4H)
		0	0	1.9	(unsquelched) (TMR-1H)
		0	.80	.30	(squelched)
		0	.80	.10	(tight squelch)
	Q105	1.4	1.9	5.1	(unsquelched)
		1,1	,10	8.2	(tight squelch)
	Q106	0.7	1.3	12.4	
	Q107 (PNP)	13.8	13.1	7.2	
	Q108 (PNP)	6.9	6.6	.10	
	Q109	6.9	7.2	13.8	
	Q110	0	.10	6.9	
Scan Board No. 500-841	Q301	.2	.2	6.0	Manual
		3P	3P	6.0	Scan
	Q302	5.2	5.9	6.0	Manual
		3P	3P	6.0	Scan
	Q303	0	.7	.1	Manual
		0	.1	1.6	Scan

VOLTAGE DATA – INTEGRATED CIRCUITS

IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–	
IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0	
IC 301	2.0P	2.0P	9.P	9.P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
	.2	3.6	11	.7	3.6	3.6	0	3.6	.2	11	11	.2	.2	5.2	(MAN)
IC 302	2.0P	2.0P	9P	9P	2.0P	2.0P	0	2.0P	2.0P	9P	9P	2P	2P	3P	(SCAN)
	.2	3.6	11	11	3.6	3.6	0	3.6	.2	11	11	.2	.2	0	(MAN)
IC 303	2.7P	2.0P	2.0P	2.0P	2.7P	2.0P	0	3P	4P	3P	3P	3P	4P	4.8	(SCAN)
	1.5	3.6	.2	.2	3.6	3.6	0	.2	1.5	5.9	5.9	.2	5.9	4.8	(MAN)
IC 304	1.6	1.3P	1.8P	1.3P	1.3P	1.3P	0	2P	2.7P	2.0P	2.0P	2.0P	2.0	4.8	(SCAN)
	.1	.2	3.8	3.8	1.5	1.5	0	.2	1.5	3.6	3.6	.2	3.6	4.8	(MAN)

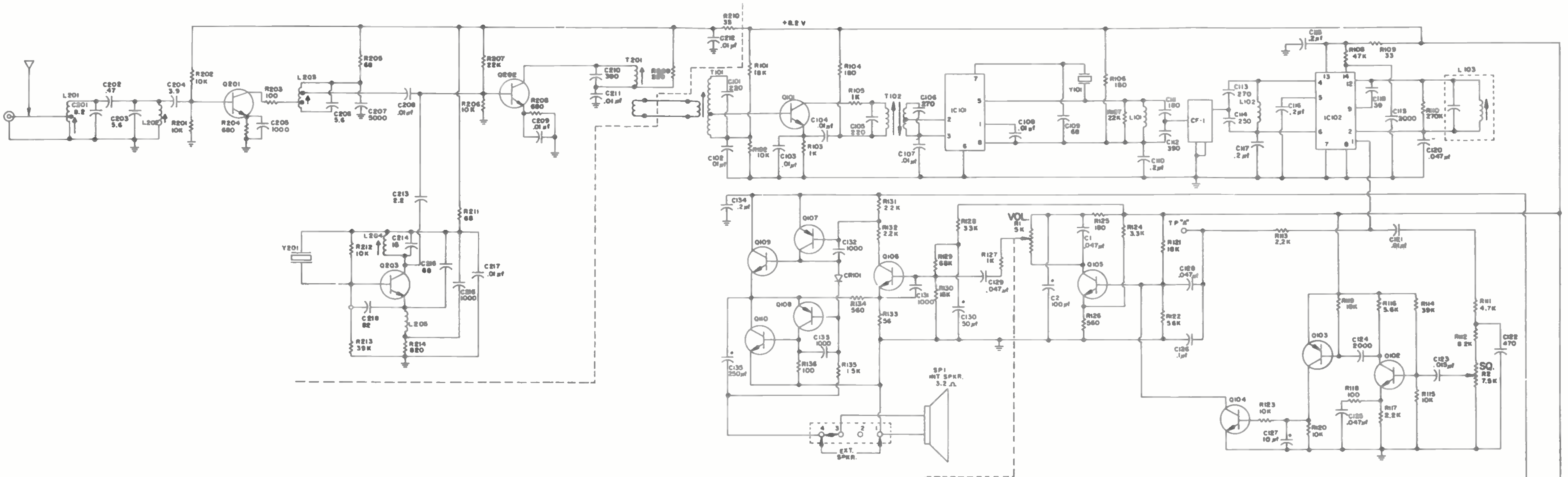




R215, R216, R221, R222, CR201, CR202, CR207, AND CR208 USED ON TMR-8H ONLY.

RF BOARD 301-563

(TMR-4H, 4L, 8H, 8L)



CRYSTAL DATA (HIGH BAND)

If desired, the crystals may be purchased from other manufacturers. The following specifications must be included in the order:

a. Crystal frequency, determined as follows:

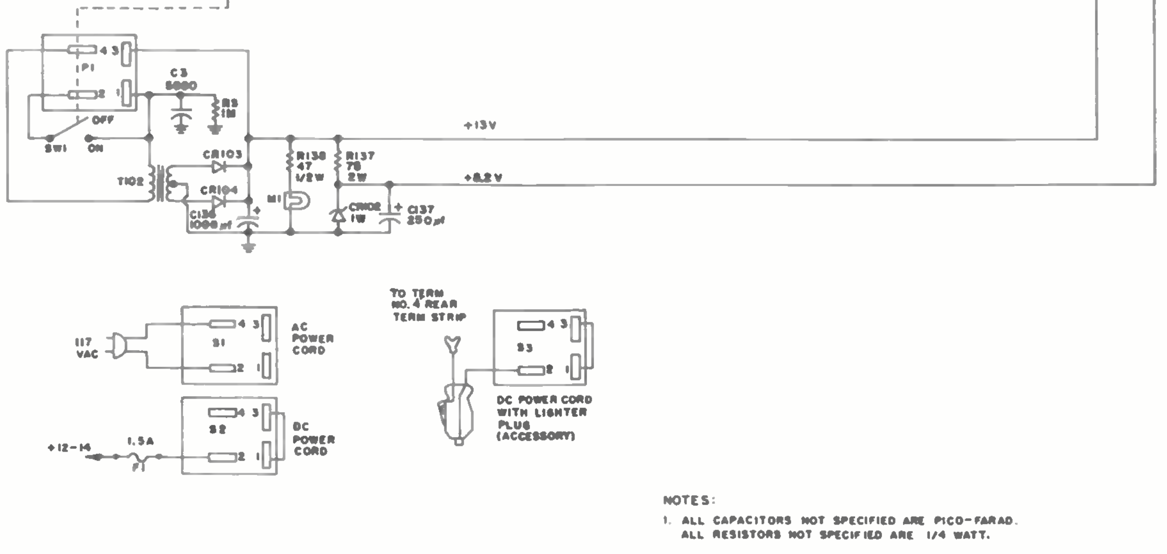
Crystal frequency $= \dfrac{\text{channel frequency} - 10.7\ \text{MHz}}{3}$

Example:

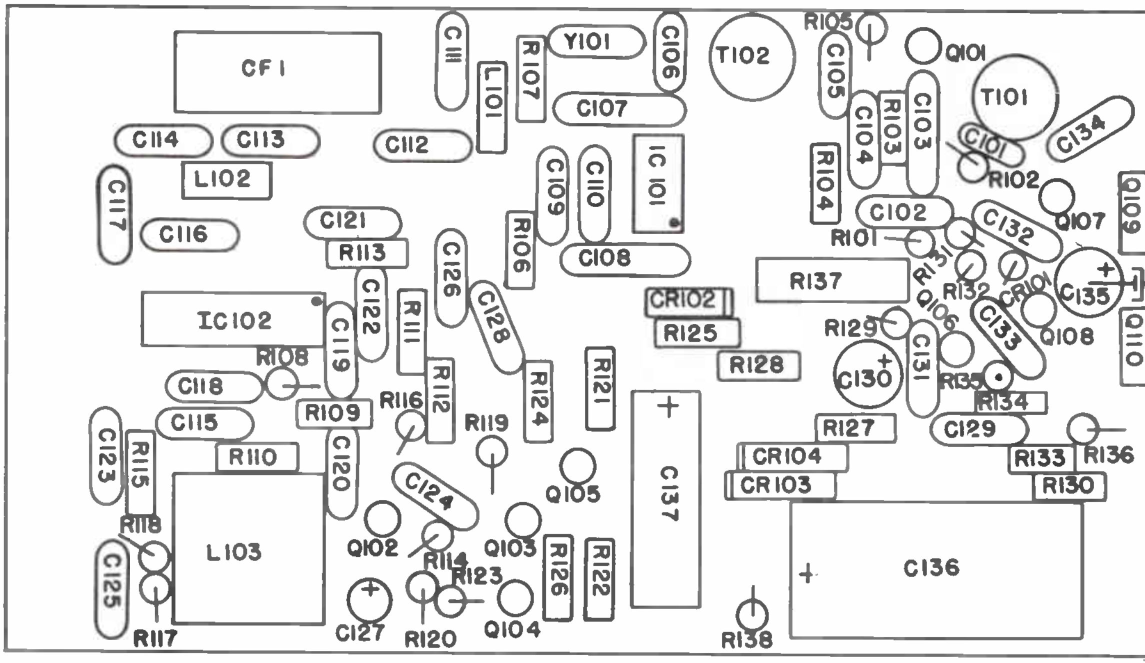
Crystal frequency $=$

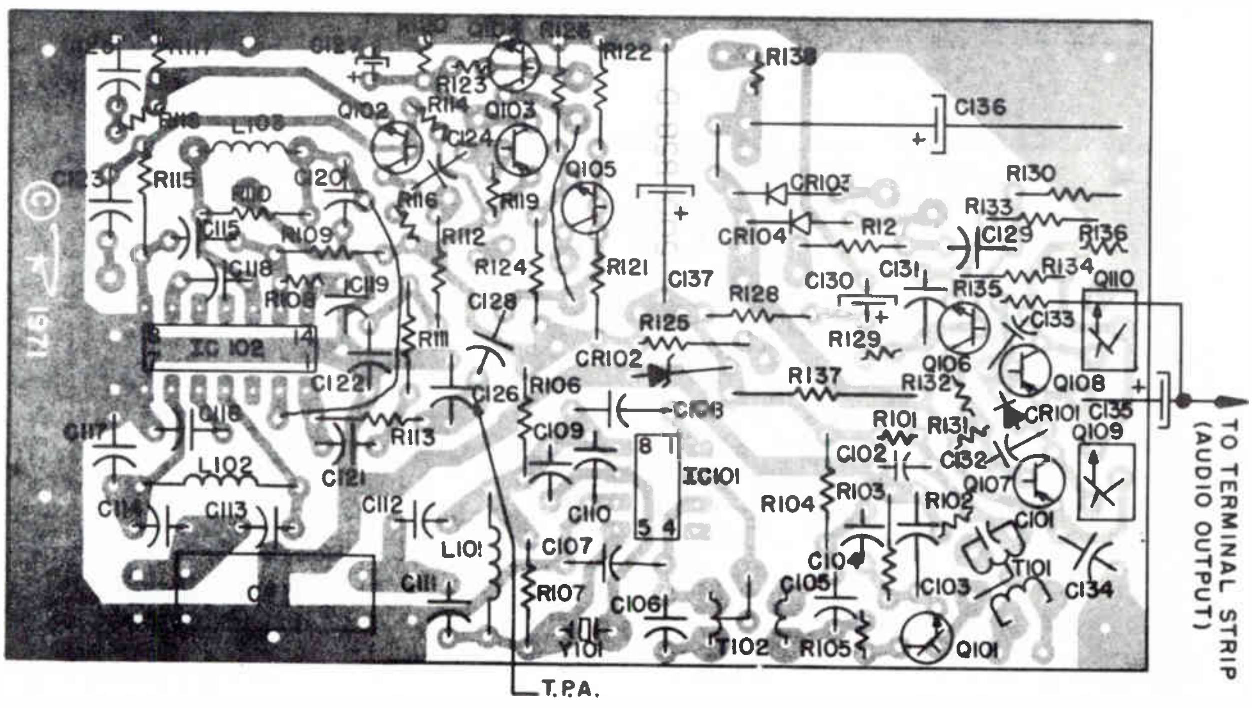
$$\frac{155.55\ \text{MHz} - 10.7\ \text{MHz}}{3} = \frac{144.85\ \text{MHz}}{3} = 48.2833\ \text{MHz}$$

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz.
e. Maximum equivalent series resistance of 35 ohms
f. Drive level of 2 MW
g. Holder: HC-25/u



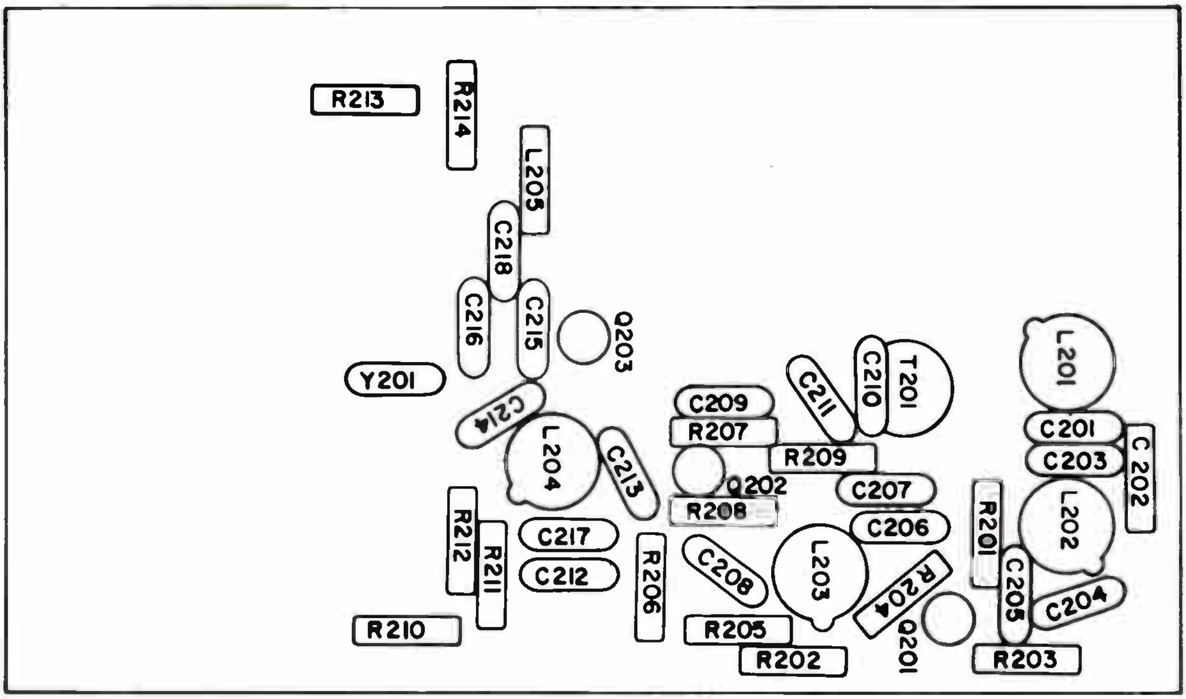
SCHEMATIC (TMR-1H, 1L)

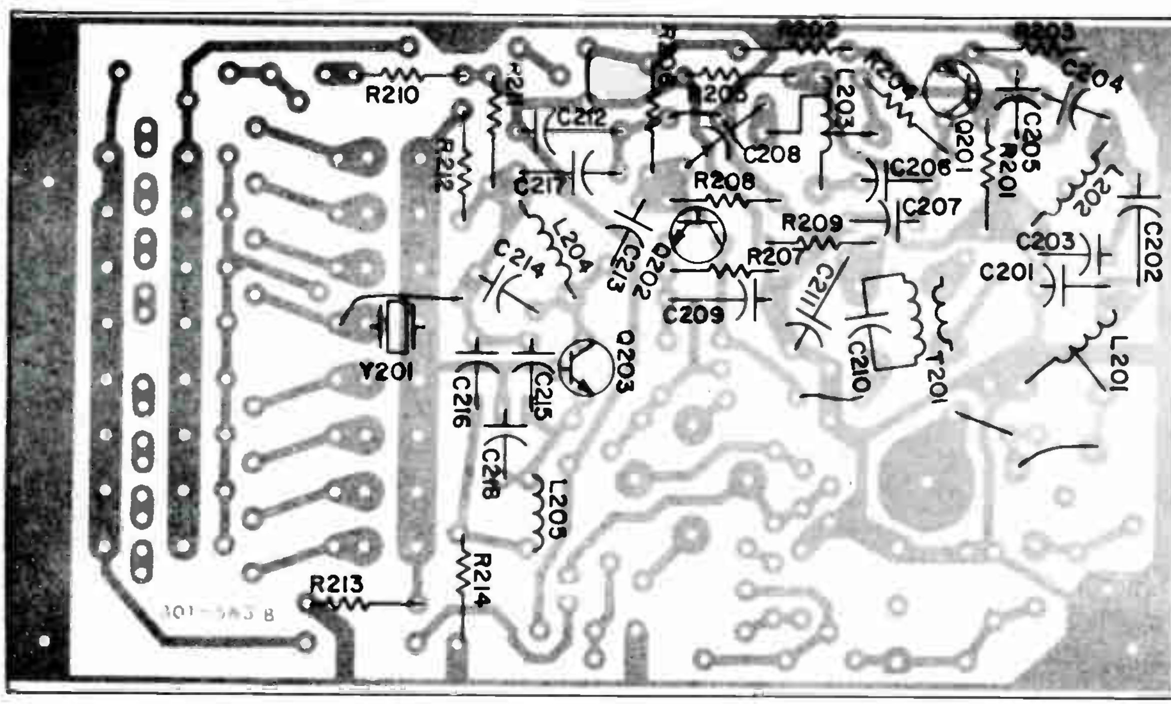




IF BOARD 500-858

(TMR-1H,1L)





RF BOARD 301-563

(TMR-1H,1L)

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(RF, 301-563)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
Q201	SPS-1473(RT)	2N5222
Q202	SPS-1473(RT)	2N5222
Q203	SM-4304-S	2N5130
(IF-AUDIO, 500-858)		
CR101	102-412	1N4148
CR102	1N4738A	Zener, 8.2V
CR103	1N4002	1N4002
CR104	1N4002	1N4002
IC101	301-679-1	
IC102	301-576-3	MC-1375P
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539(WT)	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107	MPS-A55	
Q108	MPS-A55	
Q109	MJE-521	
Q110	MJE-521	
(SCANNER, 500-841)		
CR309	MZ92-6.0B	Zener 6.0V
CR311	102-412	1N4148
CR312	102-412	1N4148
CR313	102-412	1N4148
IC301	301-576-2	
IC302	301-576-2	
IC303	30-576-4	
IC304	30-576-4	
Q301	SPS-952	MPS5172
Q302	SPS-952	MPS5172
Q303	SPS-952	MPS5172

ELECTROLYTIC/VARIABLE CAPS

ITEM	VALUE		
(CHASSIS)			
C2	100uf	10V	
(IF-AUDIO, 500-858)			
C127	1uf	50V	(2,3,5,6)
C127	10uf	10V	(1,4)
C130	50uf	10V	
C135	250uf	16V	
C136	1000uf	16V	
C137	250uf	10V	
(SCANNER, 500-841)			
C305	20uf	16V	
C306	20uf	16V	
C310	200uf	10V	
C313	10uf	10V	

(1) Model TMR-1H.
(2) Model TMR-4H.
(3) Model TMR-8H.
(4) Model TMR-1L.
(5) Model TMR-4L.
(6) Model TMR-8L.

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
(CHASSIS)		
R1/SW1	102-479-3	5000 ohms Volume/Switch (2,3,5,6)
R1/SW1	102-303-5	5000 ohms Volume/Switch (1,4)
R2	102-479-2	7500 ohms Squelch (2,3,5,6)
R2	102-303-6	7500 ohms Squelch (2,3,5,6)

COILS/TRANSFORMERS

ITEM	PART NO.
(CHASSIS)	
T1	301-515
(RF, 301-563)	
L201	301-520-1 (1,2,3)
L201	301-520-4 (4,5,6)
L202	301-520-2 (1,2,3)
L202	301-520-5 (4,5,6)
L203	301-520-3 (1,2,3)
L203	301-520-6 (4,5,6)
L204	301-520-9
L205	102-369
T201	102-405
(IF-AUDIO, 500-858)	
L101	ES-2228
L102	ES-2228
L103	301-517

MISCELLANEOUS

ITEM	NAME	PART NO.
CF-1	Filter, Ceramic, 455kHz	301-723
Spk-1	Speaker, 3.2 ohm	301-537-1
SW1-4	Switch, SPDT	UID500-874-2(2,5)
SW1-8	Switch, SPDT	UID500-874-3(3,6)
SW9	Switch, SPDT	UID500-874-1(2,3, 5,6)
SW10	Switch, SPDT	UID500-874-1(2,3, 5,6)
Y101	Crystal, 10.245MHz	305-516-1
Y101	Crystal, 11.155MHz	305-516-2
Y200	Crystal,Receive(Specify Frequency)	301-532 (1,2,3)
Y200	Crystal,Receive(Specify Frequency)	301-542 (4,5,6)

CABINET PARTS

NAME	PART NO.
Panel, Front	500-813
Plate, Face	301-535 (1,4)
Plate, Face	301-538 (2,5)
Plate, Face	301-513 (3,6)
Knob, Volume/Squelch	Plasticware 27500 (2,3,5,6)
Knob, Volume/Squelch	Phillips 3-9 (1,4)

quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

NOISE BALANCE ADJUSTMENT

NOTE: This adjustment may be required only of excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper or inadequate noise supression of the vehicle's ignition system.

2-5-1 Using a "T" connector, connect the FM signal generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L201.

2-5-2 Connect the oscilloscope to the junction of Q109's emitter and Q110's collector, or to the speaker terminals.

2-5-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the noise generator until spikes are clearly seen in the audio output as viewed on the oscilloscope. The noise spikes will be either mostly positive or negative if an unbalanced condition exists.

2-5-4 Tune L103 (quadrature detector coil) until the noise spikes are equally positive and negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.

2-3-6 Connect the R.F. signal generator to the antenna input jack. Turn modulation off. Set the generator to the frequency that will be used for alignment.

2-3-7 Adjust the signal generator output until the voltmeter reads 0.2 volts.

2-3-8 Adjust T101 and T201, (in that order), for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts. If two peaks occur, use the one away from the center of the coil form.

2-3-9 Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency.

NOTE: Some receivers may have the second oscillator at 11.155 MHz, if this is the case, the image frequency is 910 KHz ABOVE the channel frequency. Check the frequency marked on top of the crystal (10.245 MHz for below and 11.155 MHz for above).

2-3-10 Adjust the signal generator output until voltmeter reads .2 volts.

2-3-11 Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order), for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the slugs should be within two turns of the position in step No. 4 and 8.

RF ALIGNMENT

2-4-1 Preset the slugs L201, L202, L203, and L204 four turns from the outer ends of the coil form.

2-4-2 Connect AC voltmeter across speaker terminals.

2-4-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

2-4-4 Activate channel nearest to center of frequencies over which the unit will operate.

2-4-5 Connect signal generator to antenna input jack. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-4-6 Adjust output signal generator until AC voltmeter reads .2 volts.

2-4-7 Adjust L201, L202, L203 and L204, in that order, for maximum

Pages 99-115 Courtesy of REGENCY ELECTRONICS, INC.

ALIGNMENT AND TUNING PROCEDURE

EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM
2-1-4 Noise Generator (to be used in 2-5 only)

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range over which they will operate.

QUADRATURE DETECTOR

2-2-1 Connect the FM Signal generator to the antenna input jack. Accurately set frequency to the center of the channel being used for alignment. Modulate signal generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to test point A, (Junction of C126, C128, R113).

2-2-3 Adjust output of signal generator until all noise in scope pattern just disappears.

2-2-4 Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal.

IF ALIGNMENT

2-3-1 Disconnect RF signal generator from antenna input.

2-3-2 Connect AC voltmeter across speaker terminals.

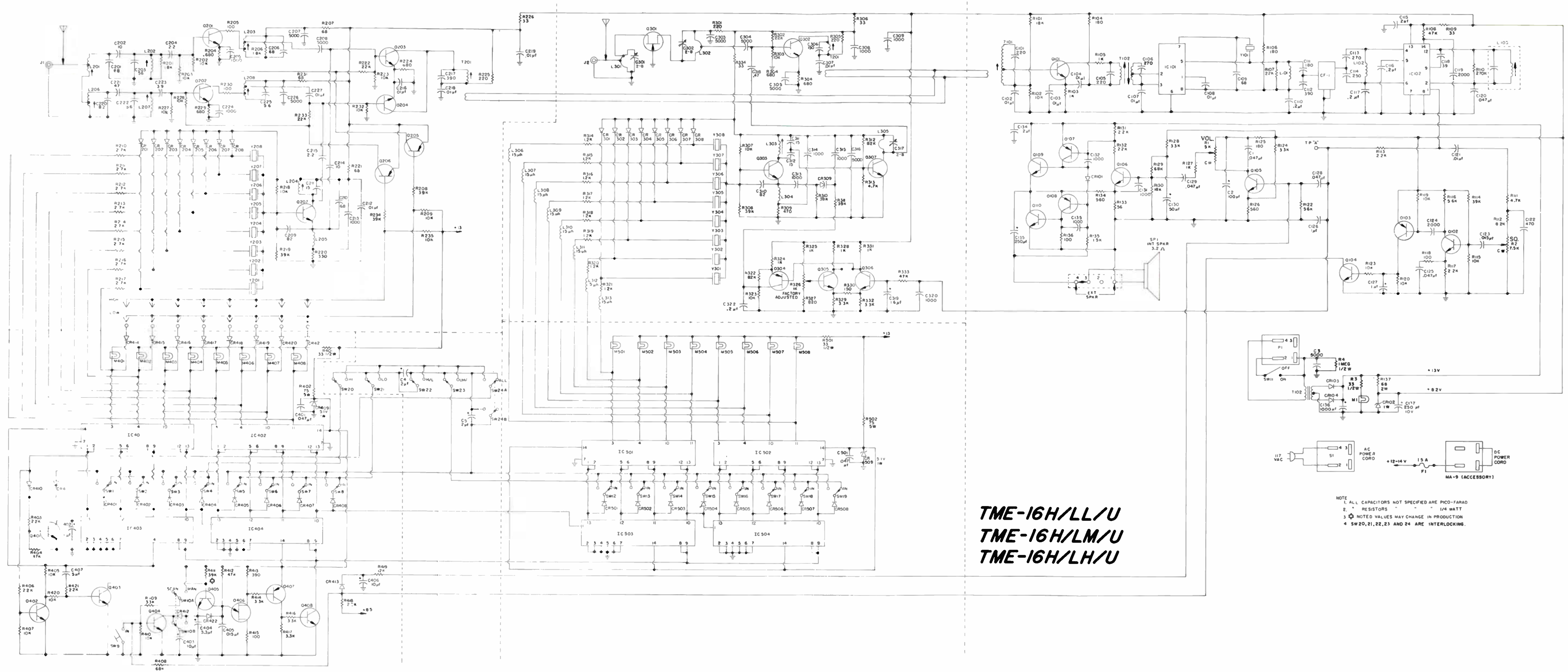
2-3-3 Adjust volume control for .5 volt noise reading on AC voltmeter.

2-3-4 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

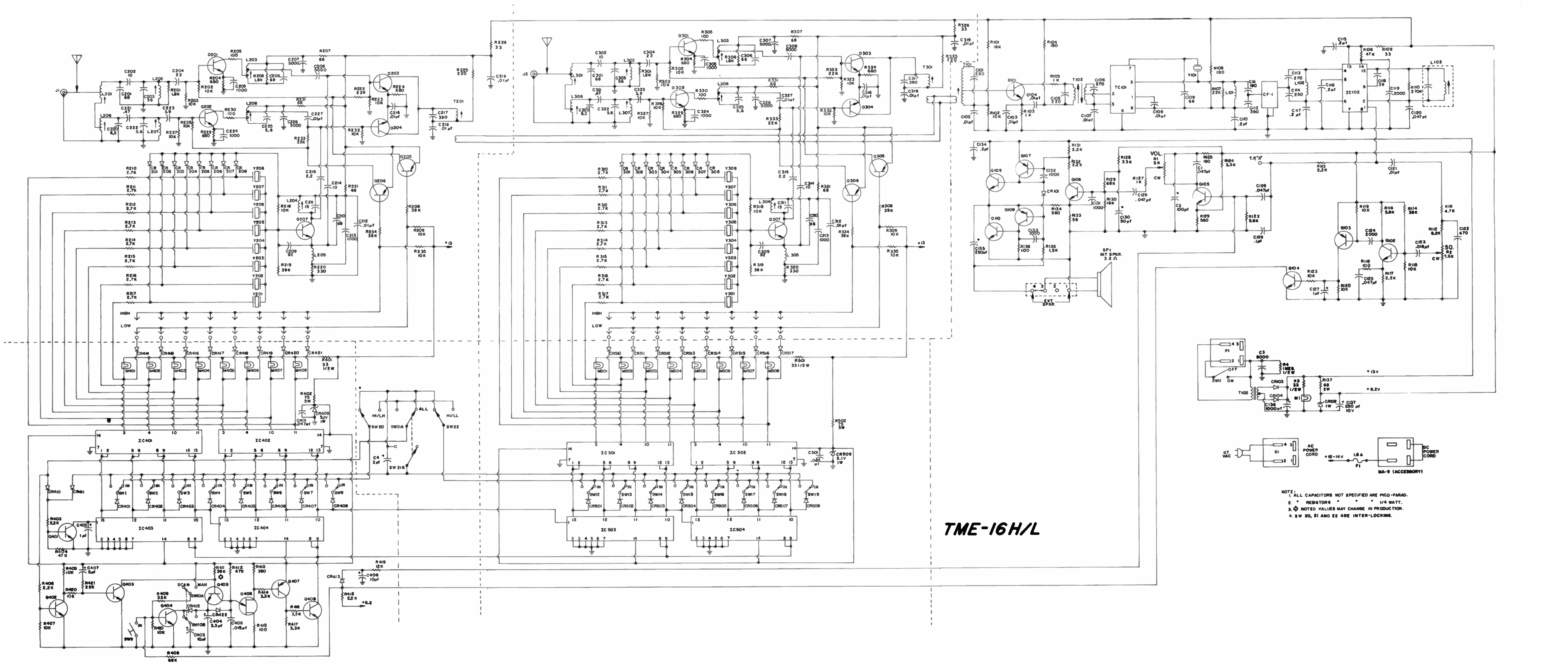
NOTE: Coils will have two peaks; adjust core to peak away from the center of the coil form.

2-3-5 Adjust volume control for 1.0 volt noise reading on AC voltmeter.

Regency TME-16H/L, TME-16H/LH/U, TME-16H/LL/U, TME-16H/LM/U



SCHEMATIC (TME - 16 H/L/U)



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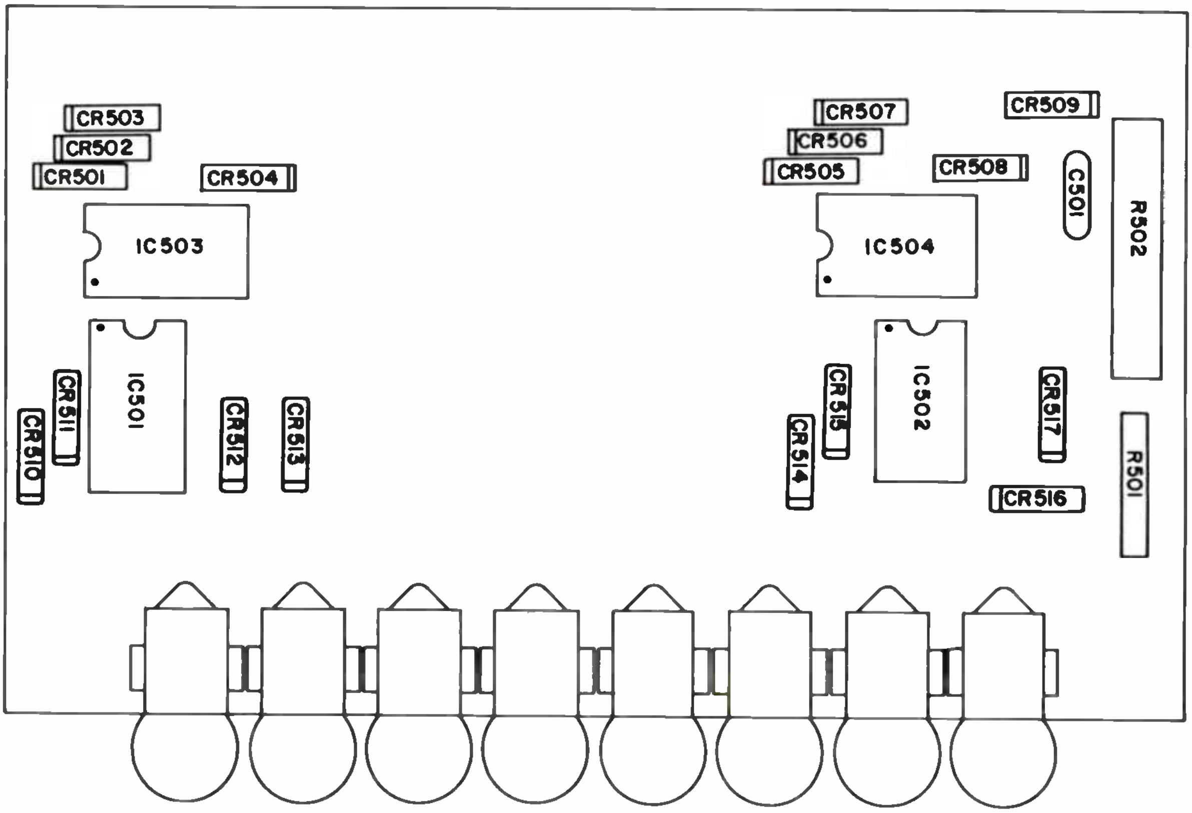
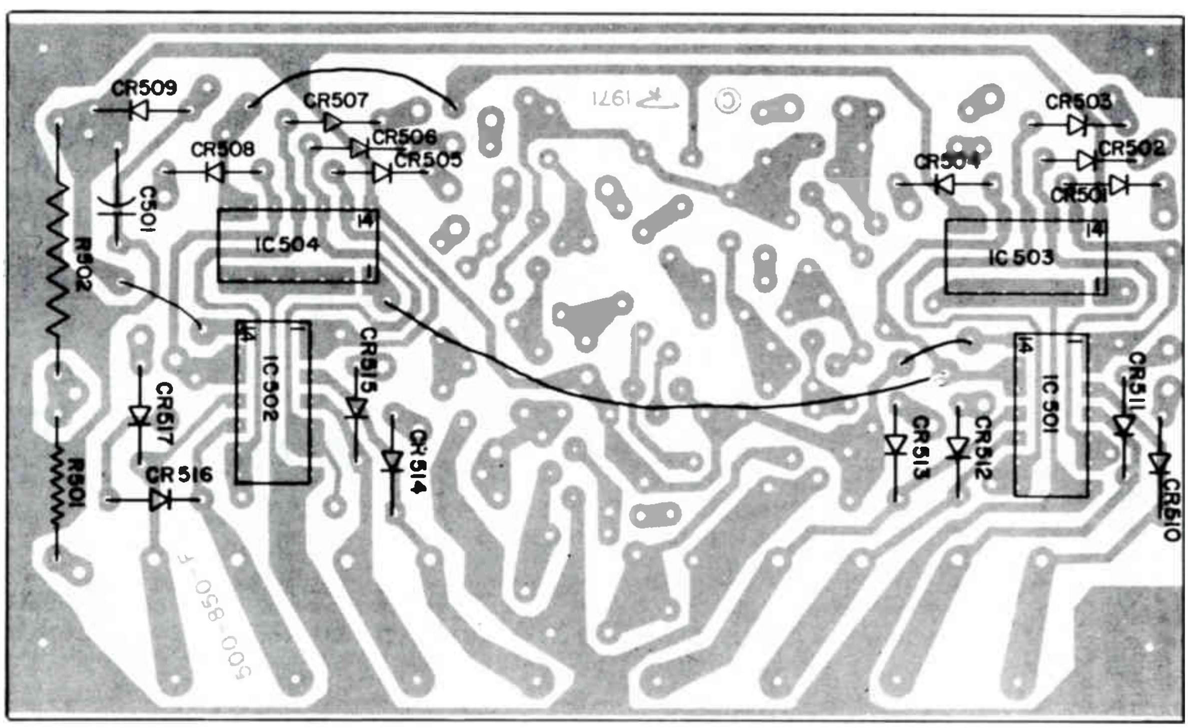
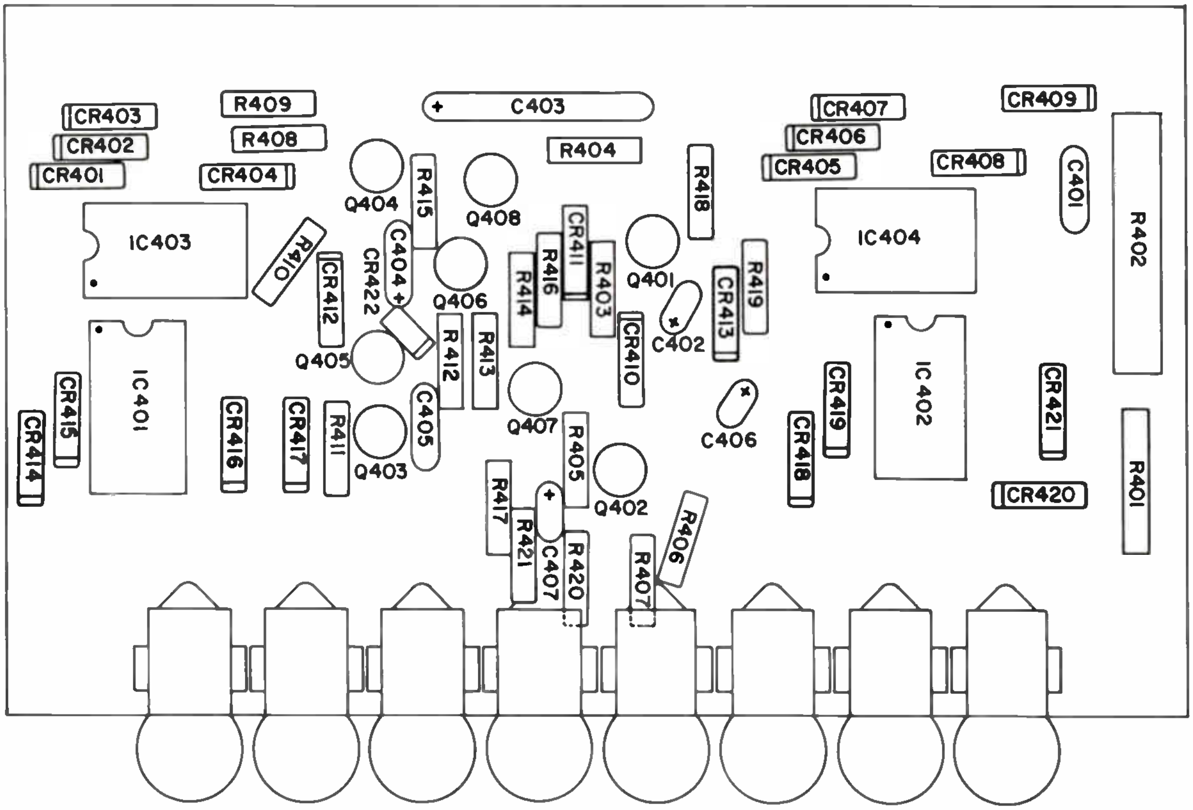
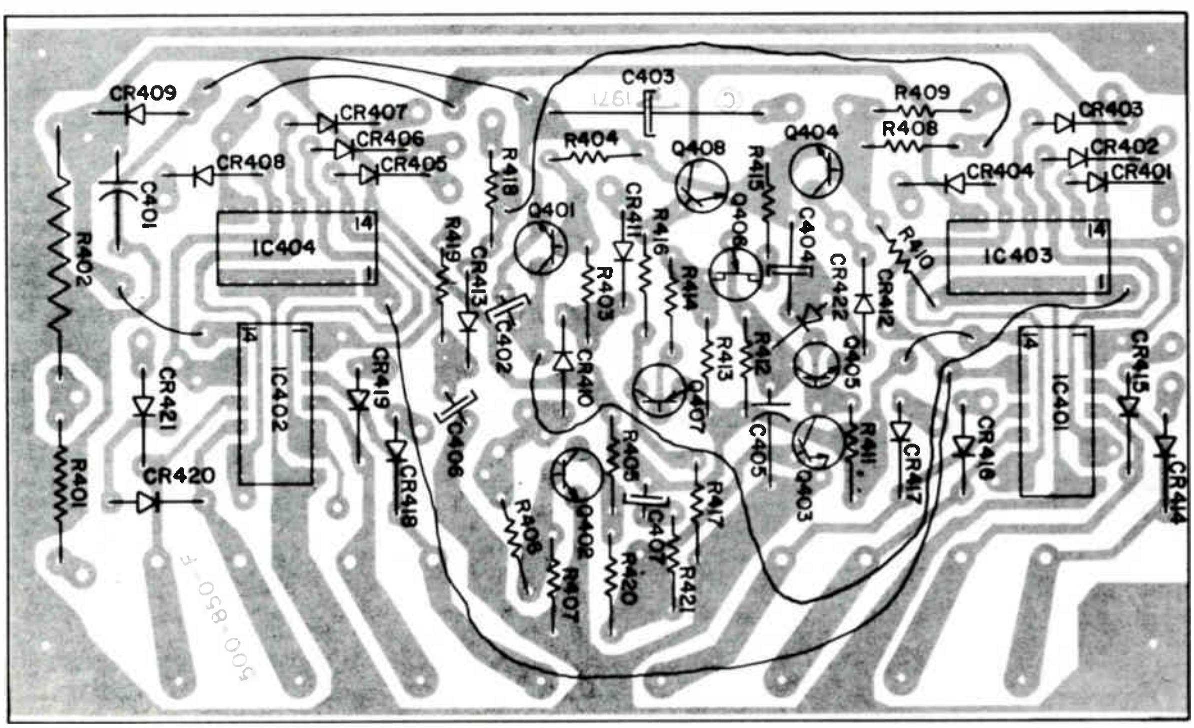


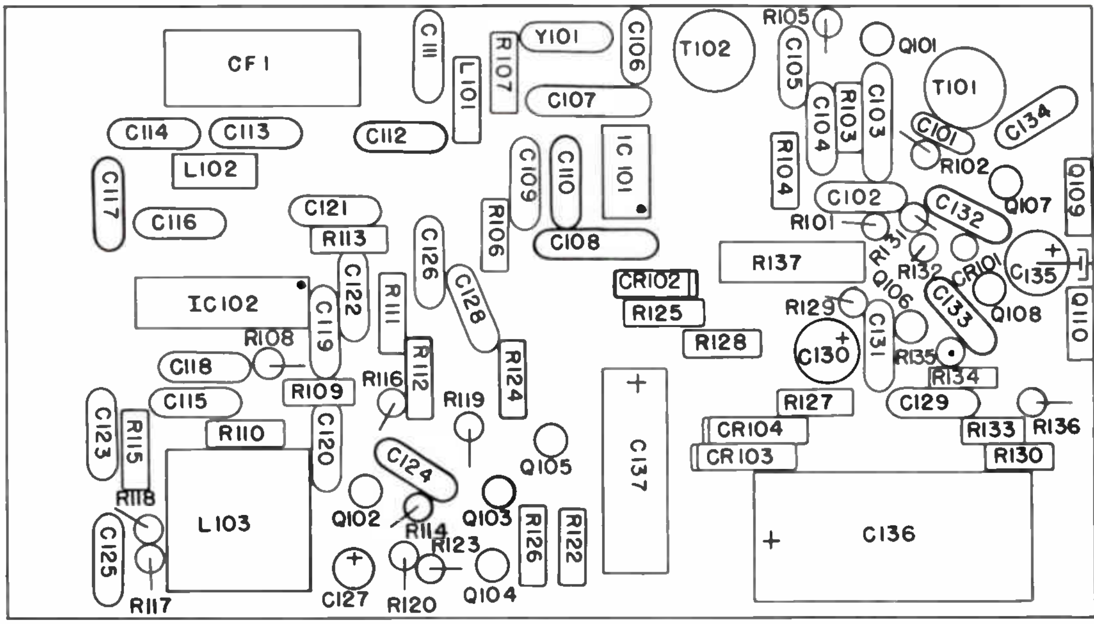


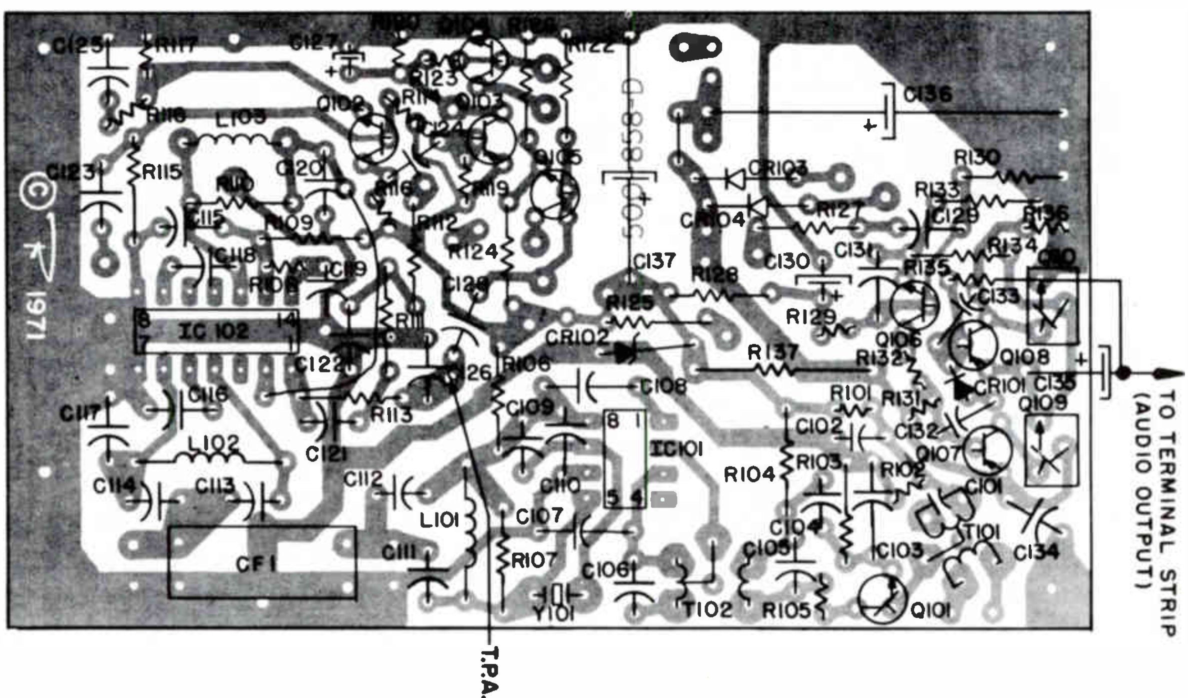
SCAN BOARD 500-850



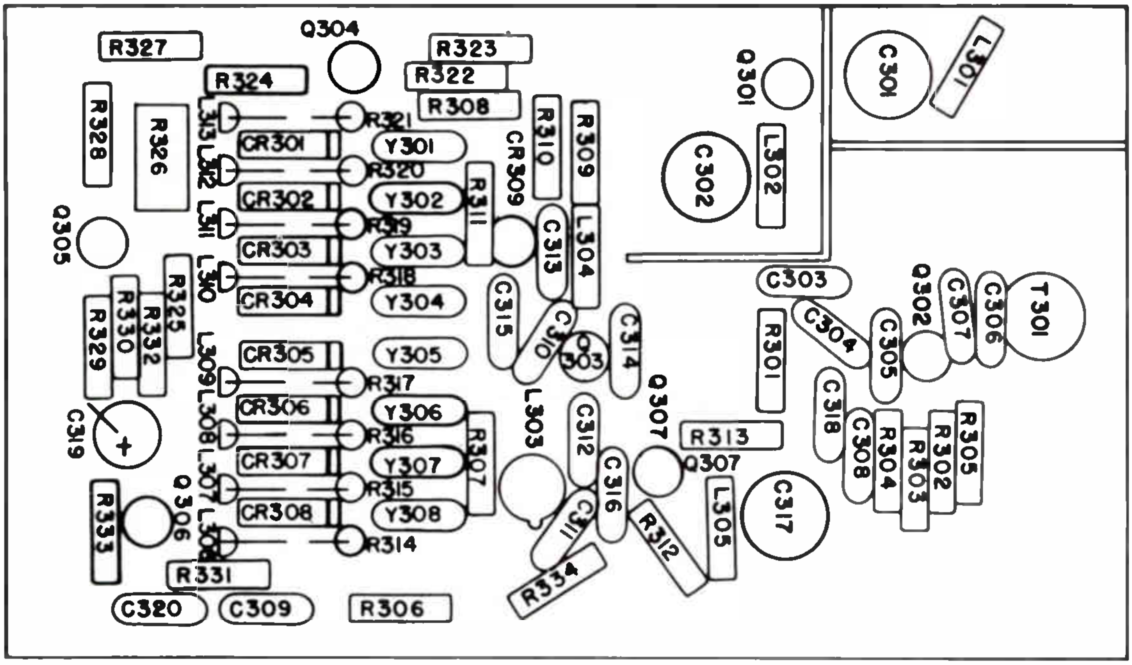


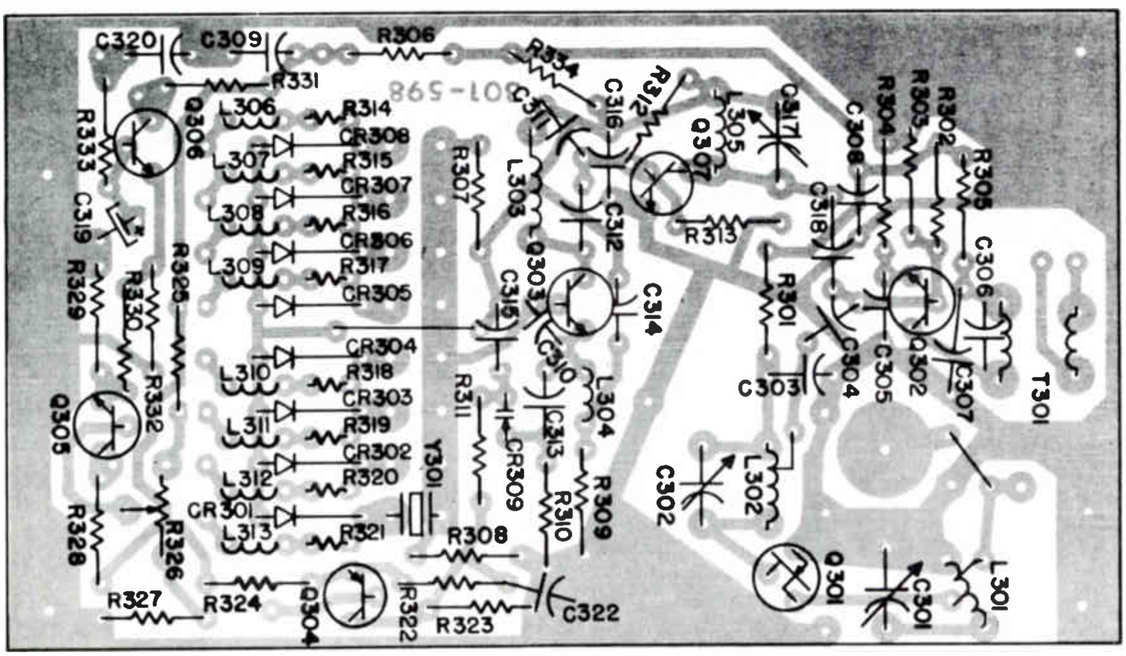
SCAN BOARD 500-850



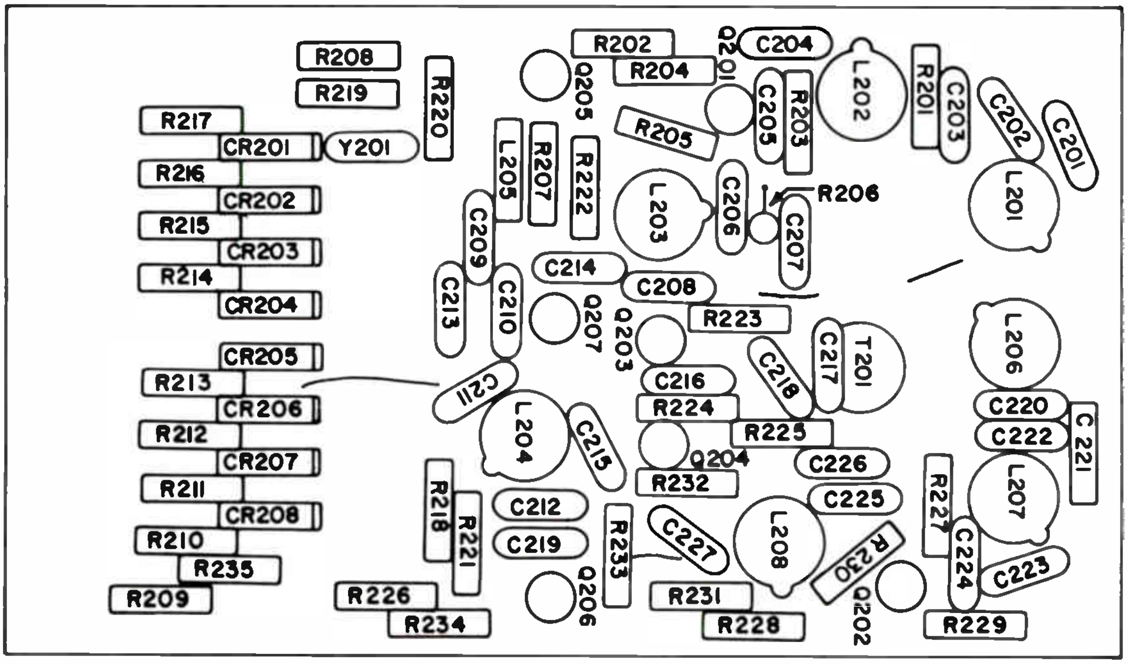


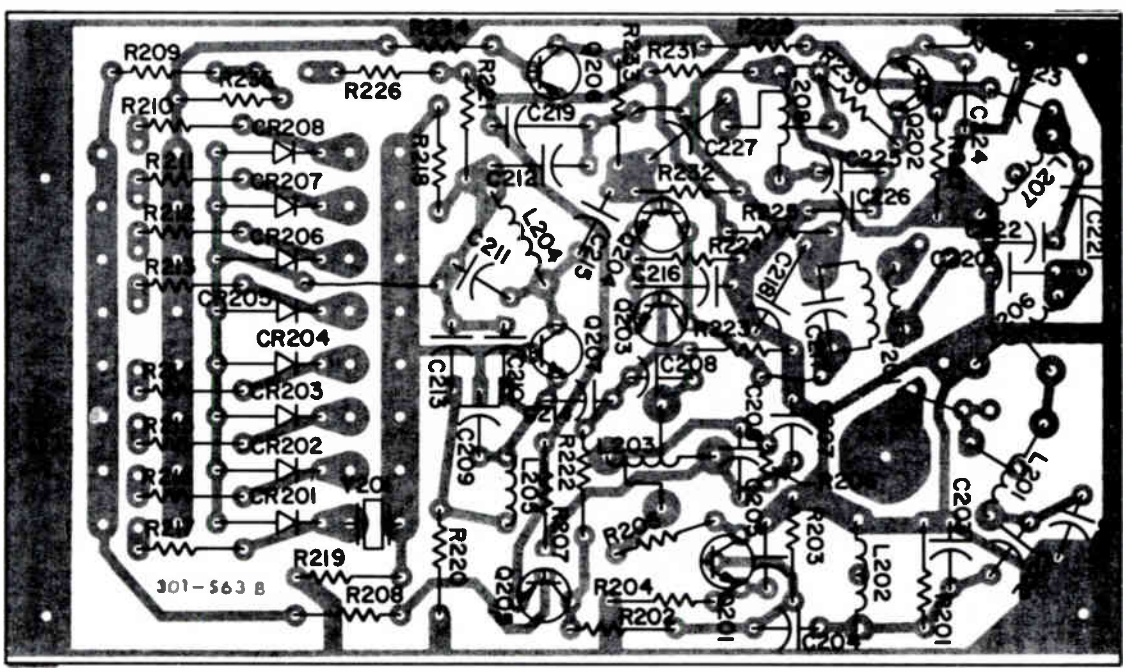
IF BOARD 500-858





R F BOARD 301-598
(TME – 16 H/L/U ONLY)





MODEL TME-16H/L: BOTH RF BOARDS ARE IDENTICAL
EXCEPT FOR ONE BEING A "200" SERIES
BOARD AND THE OTHER A "300" SERIES BOARD.

RF BOARD 301-563

VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – TRANSISTORS:

	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
RF Board No. 301-563	Q201	3.1	3.8	7.0	Low Band
		0	0	7.6	High Band
Note: Model TME-16H/L has "300" Series RF Board voltages identical to "200" Series RF Board voltages	Q202	0	0	7.6	Low Band
		3.1	3.8	7.0	High Band
	Q203	1.6	2.3	7.1	Low Band
		1.6	0	7.1	High Band
	Q204	1.6	0	7.1	Low Band
		1.6	2.3	7.1	High Band
	Q205	7.8	7.4	7.6	Low Band
		7.8	11.0	0V	High Band
	Q206	7.8	11.0	0	Low Band
		7.8	7.0	7.6	High Band
	Q207	3.4	4.1	7.0	
RF Board No. 301-598	Q301(FET)	0	0	5.5	
	Q302	1.5	2.2	6.8	
NOTE: Model TME-16H/L/U only.	Q303	.25	3.1	6.8	
	Q304	7.8	7.2	3.0-5.0	
	Q305	2.9	3.6	7.4	
	Q306	2.9	3.6	7.2	
	Q307	0	.2	6.8	
IF Board No. 500-858	Q101	2.3	3.0	5.8	
	Q102	1.0	1.7	4.8	
	Q103 (PNP)	8.2	8.2	0	(unsquelched)
		8.2	8.2	1.0	(squelched)
		8.2	8.2	1.5	Min. (tight squelch)

	TRANSISTOR	EMITTER (Source)	BASE (Gate)	COLLECTOR (Drain)	
	Q104	0	0	7.2	(unsquelched)
		0	.80	.30	(squelched)
		0	.80	.10	(tight squelch)
	Q105	1.4	1.9	5.1	(unsquelched)
		1.1	.10	8.2	(tight squelch)
	Q106	0.7	1.3	12.4	
	Q107 (PNP)	13.8	13.1	7.2	
	Q108 (PNP)	6.9	6.6	.10	
	Q109	6.9	7.2	13.8	
	Q110	0	.10	6.9	
Scan Board	Q401	0	.70	.10	(SCAN)
		0	.70	0	(MAN)
No. 500-850	Q402	0	.70	.10	
	Q403	0	.10	3.6	(SCAN)
		0	.10	1.2	(MAN)
	Q404	0	.10	2.8	(SCAN)
		0	.70	0.2	(MAN)
	Q405	3.1	3.6	3.2	(SCAN)
		0.7	1.2	0.7	(MAN)
	Q407 (PNP)	5.1	4.5	.20	(SCAN)
		5.1	4.6	.10	(MAN)
	Q408	0	.10	1.5	
		Base 1	Emitter	Base 2	
	Q406	.20	3.2	4.6	(SCAN)
	(unijunction)	.20	0.7	4.6	(MAN)

VOLTAGE DATA – INTEGRATED CIRCUITS

NOTE A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M401 is lighted).

	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IF Board 500-858	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0
Scan Board 500-850	IC 401	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		3.3	3.3	0.5	10.8	0.2	0.2	0	0.2	0.2	10.8	10.8	0.2	0.2	5.1 (Man)
	IC 402	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		0.2	0.2	10.8	10.8	0.2	0.2	0	0.2	0.2	10.8	10.8	0.2	0.2	5.1 (Man)
	IC 403	0.1	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0	0	0	0	0	0	0	1.5	1.5	0.2	0.2	0.2	3.3	5.1 (Man)
	IC 404	.7P	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0.2	0	0	0	0	0	0	1.5	1.5	0.2	0.2	0.2	0.2	5.1 (Man)
Scan Board Secondary 500-850	IC 501	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		0.2	0.2	10.8	10.8	0.2	0.2	0	0.2	0.2	10.8	10.8	0.2	0.2	5.1 (Man)
	IC 502	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		0.2	0.2	10.8	10.8	0.2	0.2	0	0.2	0.2	10.8	10.8	0.2	0.2	5.1 (Man)
	IC 503	.7P	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0.2	0	0	0	0	0	0	1.5	1.5	0.2	0.2	0.2	0.2	5.1 (Man)
	IC 504	.7P	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0.2	0	0	0	0	0	0	1.5	1.5	0.2	0.2	0.2	0.2	5.1 (Man)

(SCANNER 500-850, PRIMARY)

C402	1uf	25V
C403	10uf	25V
C404	3.3uf	16V
C406	10uf	25V
C407	5uf	10V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
(CHASSIS)		
R1	Stackpole R72-00691	5000 ohms Volume
R2	Stackpole R72-00692	7500 ohms Squelch
(RF 301-598)		
R326	X201R102B	1000 ohm
(IF-AUDIO 500-858)		
R137	IRC Type BWH	68 ohms 2W WW
(SCANNER 500-850, PRIMARY)		
R402		75 ohms 10% 5W WW
(SCANNER 500-850, SECONDARY)		
R502		75 ohms, 5% 5W WW

COILS/TRANSFORMERS

ITEM	PART NO.
(CHASSIS)	
T1	301-699
(RF 301-563)	
L201	301-520-4
L202	301-520-5
L203	301-520-6
L204	301-520-9
L205	102-369
L206	301-520-1
L207	301-520-2
L208	301-520-3
T201	102-405
(RF 301-598)	
L301	301-600-1
L302	301-600-2
L303	301-520-2
L304	102-369
L305	301-600-3
L306	Choke, 15uh
L307	Choke, 15uh
L308	Choke, 15uh
L309	Choke, 15uh
L310	Choke, 15uh
L311	Choke, 15uh
L312	Choke, 15uh
L313	Choke, 15uh
T301	301-619
(IF-AUDIO)	
L101	ES-2228
L102	ES-2228
L103	301-517
T101	102-507

MISCELLANEOUS

ITEM	NAME	PART NO.
Ant-1	Antenna, Telescopic	1201-0000-003(2)
Ant-1	Antenna, Telescopic	1201-0000-002(1)
Spk-1	Speaker, 3.2 ohms	301-793
SW1-8	Switch, SPDT 8 Section	UID500-874-3
SW9-10	Switch, DPDT	UID500-874-19
SW11	Switch, SPDT	UID500-874-6
SW20-22	Switch, DPDT	UID500-874-13(1)
SW20-24	Switch, DPDT	UID500-874-12(2)
(IF-AUDIO 500-858)		
CF-1	Filter, Ceramic	301-724(2)
CF-1	Filter, Ceramic	301-723(1)
Y101	Crystal, 10.245MHz	301-516-1
Y101	Crystal, 11.155MHz	301-516-2

CABINET PARTS

NAME	PART NO.
Panel, Front	600-330(1)
Panel, Front	600-307(2)
Panel, Rear	301-674
Knob, Volume/Squelch	301-670

(1) Model TME-16H/L
(2) Model TME-16H/L/U

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(RF 301-563)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
Q201	SPS-1473RT	2N5222
Q202	SPS-1473RT	2N5222
Q203	SPS-1473RT	2N5222
Q204	SPS-1473RT	2N5222
Q205	SPS-1539WT	2N5227
Q206	SPS-1593WT	2N5227
Q207	SM-4304-S	2N5230
(RF 301-598)		
CR301	102-339	
CR302	102-339	
CR303	102-339	
CR304	102-339	
CR305	102-339	
CR306	102-339	
CR307	102-339	
CR308	102-339	
CR309	MV2209	
(IF-AUDIO 500-858)		
CR101	102-412	1N4148
CR102	1N4738A	Zener 8.2V
CR103	1N4002	
CR104	1N4002	
IC101	301-679-1	
IC102	301-576-3	MC-1357P
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539(WT)	2N5227
Q104	SPS-952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107	MPS-A55	
Q108	MPS-A55	
Q109	MJE-521	
Q110	MJE-521	
(SCANNER 500-850, PRIMARY)		
CR401	102-412	1N4148
CR402	102-412	1N4148
CR403	102-412	1N4148
CR404	102-412	1N4148
CR406	102-412	1N4148
CR407	102-412	1N4148
CR409	1N4733A	Zener, 5.1V
CR410	102-412	1N4148
CR411	102-412	1N4148
CR413	102-412	1N4148
CR414	102-412	1N4148
CR415	102-412	1N4148
CR416	102-412	1N4148
CR417	102-412	1N4148
CR418	102-412	1N4148
CR419	102-412	1N4148
CR420	102-412	1N4148
CR421	102-412	1N4148
CR422	102-412	1N4148
IC401	301-576-2	
IC402	301-576-2	
IC403	301-576-6	
IC404	301-576-6	
Q401	SPS-952	MPS5172
Q402	SPS-952	MPS5172
Q403	SPS-952	MPS5172
Q404	SPS-952	MPS5172
Q405	SPS-952	MPS5172
Q406	2N4871	
Q407	SPS-1539(WT)	2N227
Q408	SPS-952	MPS5172
(SCANNER 500-850, SECONDARY)		
CR501	102-412	1N4148
CR502	102-412	1N4148
CR503	102-412	1N4148
CR504	102-412	1N4148
CR505	102-412	1N4148
CR506	102-412	1N4148
CR507	102-412	1N4148
CR508	102-412	1N4148
CR509	1N4733A	Zener, 5.1V
CR510	102-412	1N4148(1)
CR511	102-412	1N4148(1)
CR512	102-412	1N4148(1)
CR513	102-412	1N4148(1)
CR514	102-412	1N4148(1)
CR515	102-412	1N4148(1)
CR516	102-412	1N4148(1)
CR517	102-412	1N4148(1)
IC501	301-576-2	
IC502	301-576-2	
IC503	301-576-6	
IC504	301-576-6	

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE		
(CHASSIS)				
C2		250uf	16V	
C4		2uf	50V	
(RF 301-598)				
C301	10S-Triko22	2-8pf	NPO	Trimmer
C302	10S-Triko22	2-8pf	NPO	Trimmer
C317	10S-Triko22	2-8pf	NPO	Trimmer
C319		1uf	50V	
(IF-AUDIO 500-858)				
C127		1uf	50V	
C130		50uf	10V	
C135		250uf	16V	
C136		1000uf	16V	
C137		250uf	10V	

NOISE BALANCE ADJUSTMENT (TME-16H/L ONLY)

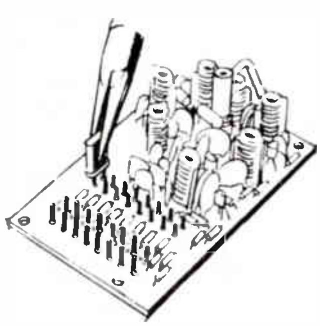
NOTE: This adjustment may be required only if excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper of inadequate noise suppression of the vehicle's ignition system. In Models containing UHF RF Board (TME-16H/L/U), noise balance is achieved through AFC Alignment.

2-8-1 Using a "T" connector, connect the FM signal generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L206.

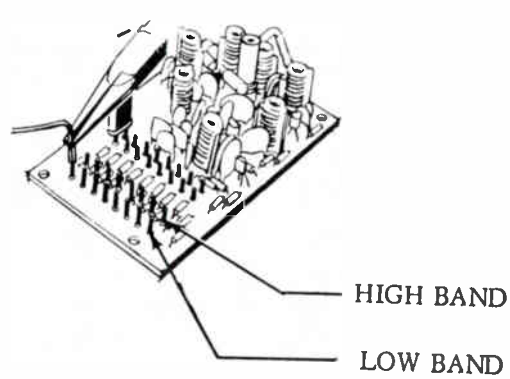
2-8-2 Connect the oscilloscope to the junction of Q109's emitter and Q110's collector, or to the speaker terminals.

2-8-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the noise generator until spikes are clearly seen in the audio output as viewed on the oscilloscope. The noise spikes will be either mostly positive of negative if an unbalanced condition exists.

2-8-4 Tune L103 (quadrature detector coil) until the noise spikes are equally positive and negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a 1/4 turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance can not be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.



Insert crystal for high or low band frequency of your choice



Connect lead to corresponding high or low band terminal programmer

BAND PROGRAMMING DIAGRAM

2-6-7 Adjust C317 counter clockwise with non-metallic screwdriver for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Do NOT re-adjust L303 after C317 is adjusted.

2-6-8 Re-adjust C301, C302 and C317 (only) for maximum quieting (lowest meter reading). Adjust signal generator output to maintain .1 and .2 volts. Repeat adjustments until no further improvements can be made.

AFC ALIGNMENT (TME-16H/L/U ONLY)

NOTE: This adjustment requires an accurate 10.7 MHz ±1 KHz oscillator or 455 KHz ±500 Hz oscillator to be used as a reference signal. If none are available, proceed to Step 2-7-5.

2-7-1 Pre-align Quadrature Detector by tuning L103 for maximum noise (AC voltmeter reading) at the speaker terminals.

2-7-2 With a coupling loop, inject "reference" signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R326 for reading of 3.8 to 4.0 volts at the collector of Q304.

2-7-3 Remove the "reference" signal and have the unit squelched and receiving no signal. The voltage on the collector of Q304 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 2-7-4. If voltage is between 3.2 and 4.6 volts, AFC Alignment is complete.

NOTE: Any further adjustments made to L103 and R326 will require AFC to be re-adjusted.

2-7-4 Inject "Reference" signal and monitor voltage on collector of Q304, adjust L103 for same voltage as noted in Step 3. Re-adjust R326 for a voltmeter reading of 3.8 to 4.0 volts. Repeat Step 2-4-3.

NOTE: Do not adjust L103 more than 1/4 turn at a time.

2-7-5 If an accurate I.F. signal source is not available, an approximate AFC alignment can be made by adjusting L103 for maximum noise (AC voltmeter reading) at the speaker terminals, and with unit squelched and receiving no signal, adjust R326 for a voltmeter reading of 3.2 to 4.6 on the collector of Q304.

NOTE: Units equiped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q304 and collector of Q306. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q304 and the collector of Q305. If crystal is changed from one frequency to the other, the jumper must be changed.

2-5-8 Adjust L306, L307, L308 and L304, in that order, for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

LOW BAND SECTION

2-5-9 Activate Low Band channel nearest to center of low band frequencies being used.

2-5-10 Set generator accurately to the center frequency of the channel being used for alignment. Turn modulation off.

2-5-11 Adjust output of signal generator until AC voltmeter reads 0.2 volts.

2-5-12 Adjust coils L301, L302, and L303 (in that order) for maximum quieting (lowest meter reading). Adjust the signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made.

RF ALIGNMENT ("300" SERIES BOARD - TME - 16 H/L/U)

2-6-1 Connect the R.F. signal generator to the antenna input jack of the "300" series board. Set the generator to the operating crystal frequency.

2-6-2 Adjust output of signal generator until AC voltmeter reads 0.2 volts.

2-6-3 Pre-Adjust Trimmer Capacitor (C317) so that the silvered half-moon section is nearest to the rear of the receiver.

2-6-4 Adjust T301 for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts.

2-6-5 Adjust C301 and C302 (trimmer capacitors) in that order, for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

NOTE: Use non-metallic screwdriver for trimmer adjustments.

Peaks are very sharp, tune with care. Two peaks can be observed, tune to peak with silver moon section away form I.F. Board.

2-6-6 Adjust the core of L303 for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltemter between .1 and .2 volts.

NOTE: To properly adjust L303, C317 must be pre-adjusted as in Step 2-3-11.

2-4-5 Connect signal generator to antenna input jack of "200" series R.F. board. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-4-6 Adjust output signal generator until AC voltmeter reads .2 volts.

2-4-7 Adjust L206, L207, L208 and L204, in that order, for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. Repeat adjustment until no further improvements can be made.

LOW BAND SECTION

2-4-8 Activate Low Band channel nearest to center of low band frequencies being used.

2-4-9 Set generator accurately to the center frequency of the channel being used for alignment. Turn modulation off.

2-4-10 Adjust output of signal generator until AC voltmeter reads 0.2 volts.

2-4-11 Adjust coils L201, L202 and L203 (in that order) for maximum quieting (lowest meter reading). Adjust the signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made.

RF ALIGNMENT ("300" SERIES BOARD - TME - 16 H/L)

2-5-1 Preset the slugs L301, L302 and L303 out of the outer end of the coil form three turns. Preset L304, L306, L307 and L308 four turns from the outer ends of the coil form.

2-5-2 Connect AC voltmeter across speaker ternimals.

2-5-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

HIGH BAND SECTION

2-5-4 Activate high band channel nearest to center of high band frequencies being used.

2-5-5 Connect signal generator to antenna input jack of "300" series RF board. Set generator accurately to the frequency of the channel being used. Turn modulation off.

2-5-6 Adjust output signal generator until AC voltmeter reads .2 volts.

2-5-7 Adjust T301 for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts of "300" series RF board.

NOTE: Coils will have two peaks; adjust core to peak away from the center of the form.

2-3-5 Pre-align quadrature detector by tuning L103 for maximum noise (AC voltmeter). Model TME-16H/L/U only.

2-3-6 Adjust volume control for 1 volt noise reading on AC voltmeter.

2-3-7 Connect the R.F. signal generator to the antenna input jack of "200" series board. Turn modulation off. Set the generator to the high band crystal frequency that will be used for high band section alignment.

2-3-8 Adjust the signal generator output until the voltmeter reads 0.2 volts.

2-3-9 Adjust T101 and T201 (in that order) for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts.

NOTE: Coils will have two peaks; adjust core of T101 to peak away from center of the coil form, and adjust core of T201 to peak nearest the center of the coil form.

2-3-10 Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency. NOTE: some receivers have the second oscillator at 11.155 MHz, in this case the image frequency is 910 above the channel frequency. Check the frequency marked on top of the crystal.

2-3-11 Adjust the signal generator output until voltmeter reads .2 volts.

2-3-12 Adjust T102 (bottom core), T102 (top core), T101 and T201 (in that order) for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the cores should be withing two turns of the position in step No. 4 and 9.

RF ALIGNMENT ("200" SERIES BOARD)

2-4-1 Preset the slugs L201, L202 and L203 out of the outer end of the coil form three turns. Preset L204, L206, L207 and L208 four turns from the outer ends of the coil form.

2-4-2 Connect AC voltmeter across speaker terminals.

2-4-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

HIGH BAND SECTION

2-4-4 Activate high band channel nearest to center of high band frequencies being used.

Pages 79-98 Courtesy of
REGENCY ELECTRONICS, INC.

ALIGNMENT AND TUNING PROCEDURE

EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM
2-1-4 Noise Generator (to be used in 2-8 only)

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

Diagrams 3-1, 3-3, and 3-5 show the location of all coils to be adjusted.

Diagram 3-12 shows location of RF boards.

QUADRATURE DETECTOR ALIGNMENT

NOTE: Omit this section for Model TME-16H/L/U

2-2-1 Connect the FM Signal generator to the antenna input jack. Accurately set frequency to the center of the channel being used for alignment. Modulate signal generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to test point A, (Junction of C126, C128, R113). See diagram 3-6.

2-2-3 Adjust output of signal generator until all noise in scope pattern just disappears.

2-2-4 Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal.

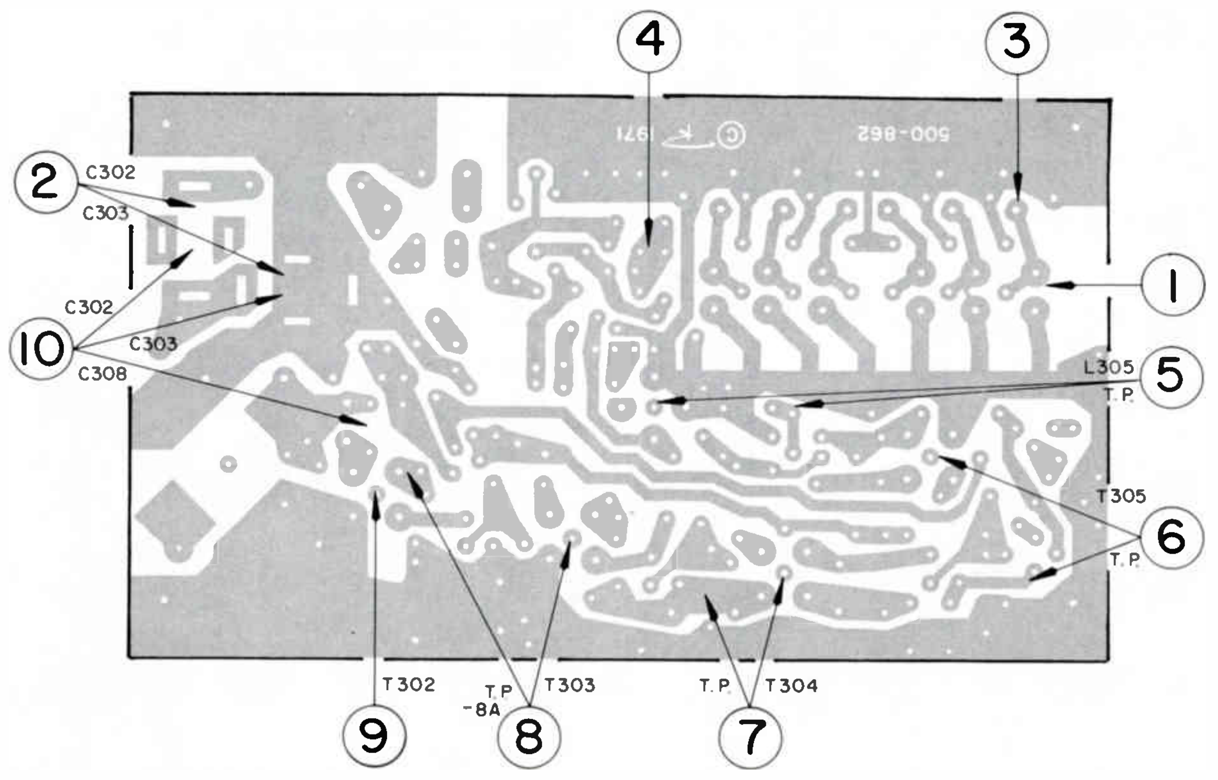
IF ALIGNMENT

2-3-1 Disconnect RF signal generator from the antenna input.

2-3-2 Connect AC voltmeter across speaker terminals.

2-3-3 Adjust volume control for 0.5 volt reading on AC voltmeter.

2-3-4 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.



VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 06.

Voltage Data – Transistors:

	Transistor	Emitter (Source)	Base (Gate)	Collector (Drain)
RF Board No. 500-861	Q201	3.8	4.5	6.9
	Q202 (FET)	1.0	–	6.2
	Q204	4.4	5.0	7.2
	Q205 (FET)	.80	–	5.0
	Q206	.20	.80	4.6
	Q207	.15–.30	.65–.90	6.0*(varies with setting of R228)
IF Board No. 500-858	Q101	2.3	3.0	7.3
	Q102	1.0	1.7	4.8
	Q103 (PNP)	8.2	8.2	0 (unsquelched)
		8.2	8.2	1.0 (squelched)
		8.2	8.2	1.5 min. (tight squelch)
	Q104	0	0	7.2 (unsquelched)
		0	.80	.30 (squelched)
		0	.80	.10 (tight squelch)
	Q105	1.4	1.9	5.1 (unsquelched)
		1.1	.10	8.2 (tight squelch)
	Q106	0.7	1.3	12.4
	Q107 (PNP)	13.8	12.9	7.5
	Q108 (PNP)	6.9	6.6	.10
	Q109	6.9	7.5	13.8
	Q110	0	.10	6.9

VOLTAGE DATA

Voltage Data – Transistors: (continued)

TX Board No. 500-862	Q301	0	0	13.2
	Q302	0	-.40	12.1
	Q303	.50	-.20	12.4
	Q304	0	.33	2.3
	Q305	1.4	2.3	1.6
	Q306	1.4	1.0	13.1
	Q307	1.9	1.4	12.2
	Q308	2.5	2.8	8.2
Scan Board No. 500-850	Q401	0	.70	.10 (SCAN)
		0	.70	0 (MAN)
	Q402	0	.70	.10
	Q403	0	.10	3.6 (SCAN)
		0	.10	1.2 (MAN)
	Q404	0	.10	2.8 (SCAN)
		0	.70	0.2 (MAN)
	Q405	3.1	3.6	3.2 (SCAN)
		0.7	1.2	0.7 (MAN)
	Q407 (PNP)	5.1	4.5	.20 (SCAN)
		5.1	4.6	.10 (MAN)
	Q408	0	.10	1.5
		Base 1	Emitter	Base 2
	Q406 (unijunction)	.20	3.2	4.6 (SCAN)
		.20	0.7	4.6 (MAN)

Voltage Data – Integrated Circuits

NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 06 (M403 is lighted).

	IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IF Board 500-858	IC 101	4.2	0.7	0.7	4.2	7.8	0	4.2	7.8	–	–	–	–	–	–
	IC 102	4.0	3.5	0	1.3	1.3	1.3	0	0	0.2	1.4	2.9	3.5	7.6	5.0
Scan Board 500-850	IC 401	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		0.2	0.2	10.8	10.8	0.2	0.2	0	3.3	3.3	0.5	10.8	0.2	0.2	5.1 (Man)
	IC 402	.7P	.7P	9P	9P	.7P	.7P	0	.7P	.7P	9P	9P	.7P	.7P	5.1 (Scan)
		0.2	0.2	10.8	10.8	0.2	0.2	0	0.2	0.2	10.8	10.8	0.2	0.2	5.1 (Man)
	IC 403	0.1	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0	0	0	0	0	0	0	1.5	1.5	0.2	3.3	0.2	0.2	5.1 (Man)
	IC 404	.7P	0	0	0	0	0	0	1.5	1.5	.7P	.7P	.7P	.7P	5.1 (Scan)
		0.2	0	0	0	0	0	0	1.5	1.5	0.2	0.2	0.2	0.2	5.1 (Man)

SEMICONDUCTORS

ITEM	PART NO.	TYPE
(CHASSIS)		
CR1	1N4002	1N4002
CR2	1N4002	1N4002
(RF-MODULATOR 500-861)		
CR201	102-412	1N4148
CR202	102-412	1N4148
Q201	SPS-1473(RT)	2N5222
Q202	2N5668	2N5668
Q204	SM-4304-S	2N5130
Q205	2N5668	MPS5668
Q206	SPS952	MPS5172
Q207	SPS952	MPS5172
(IF-AUDIO 500-858)		
CR101	102-412	1N4148
CR102	1N4738A	Zener 8.2V
IC101	301-679-1	MC-1550P
IC102	301-576-3	MC-1357P
Q101	SPS-952	MPS5172
Q102	SPS-952	MPS5172
Q103	SPS-1539(WT)	2N5227
Q104	SPS_952	MPS5172
Q105	SPS-952	MPS5172
Q106	SPS-952	MPS5172
Q107	MPS-A55	
Q108	MPS-A55	
Q109	MJE-521	
Q110	MJE-521	
(DIODE SWITCHING 301-697)		
CR201	102-339	
CR202	102-339	
CR203	102-339	
CR204	102-339	
CR205	102-339	
CR206	102-339	
CR207	102-339	
CR208	102-339	
(SCANNER 500-850)		
CR401	102-412	1N4148
CR402	102-412	1N4148
CR403	102-412	1N4148
CR404	102-412	1N4148
CR405	102-412	1N4148
CR406	102-412	1N4148
CR407	102-412	1N4148
CR408	102-412	1N4148
CR409	1N4733A	Zener, 5.1V
CR410	102-412	1N4148
CR411	102-412	1N4148
CR412	102-412	1N4148
CR413	102-412	1N4148
CR422	102-412	1N4148
IC401	301-576-2	
IC402	301-576-2	
IC403	301-576-6	
IC404	301-576-6	
(TRANSMITTER 500-862)		
CR301	102-412	1N4148
CR302	MV-2209	
CR303	MV-2209	
CR304	1N4738A	
Q301	301-695-1	
Q302	301-696-1	
Q303	2N4427	
Q304	SPS-952	MPS1572
Q305	MPS-A05	
Q306	SPS-1475(YT)	2N5224
Q307	SPS-1475(YT)	2N5224
Q308	SPS-1475(YT)	2N5224

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
(CHASSIS)		
C2		100uf 10V
C7		250uf 16V
(RF-MODULATOR 500-861)		
C223		25uf 10V
C234		10uf 10V
(IF-AUDIO 500-858)		
C127		1uf 25V
C130		10uf 10V
C135		250uf 16V
C136		1000uf 16V
(SCANNER 500-850)		
C402		1uf 25V
C403		10uf 25V
C404		3.3uf 16V
C406		10uf 25V
C407		5uf 10V
(TRANSMITTER 500-862)		
C302	Elmenco 402PC	3-20pf Trimmer
C303	Elmenco 404PC	4-6pf Trimmer
C306		10uf 10V
C308	Amperex HT10KA/218	2-18pf Trimmer
C320		10uf 25V
C333	Amperex C010KA/20E	2-20pf Trimmer
C335	Amperex C010KA/20E	2-20pf Trimmer
C337	Amperex C010KA/20E	2-20pf Trimmer
C339	Amperex C010KA/20E	2-20pf Trimmer
C341	Amperex C010KA/20E	2-20pf Trimmer
C343	Amperex C010KA/20E	2-20pf Trimmer

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	OESCRIPTION
(CHASSIS)		
R1/SW1	102-479-3	5000 ohms Volume/Switch
R2	102-479-2	7500 ohms Squelch
R4		20 ohms 5% 5W WW
(RF-MODULATOR 500-861)		
R217	Amperex E0868D/10K	10K Mike Gain
R228	Amperex E0868D/10K	10K Deviation
(SCANNER 500-850)		
R402		75 ohms 5% 5W WW

COILS/TRANSFORMERS

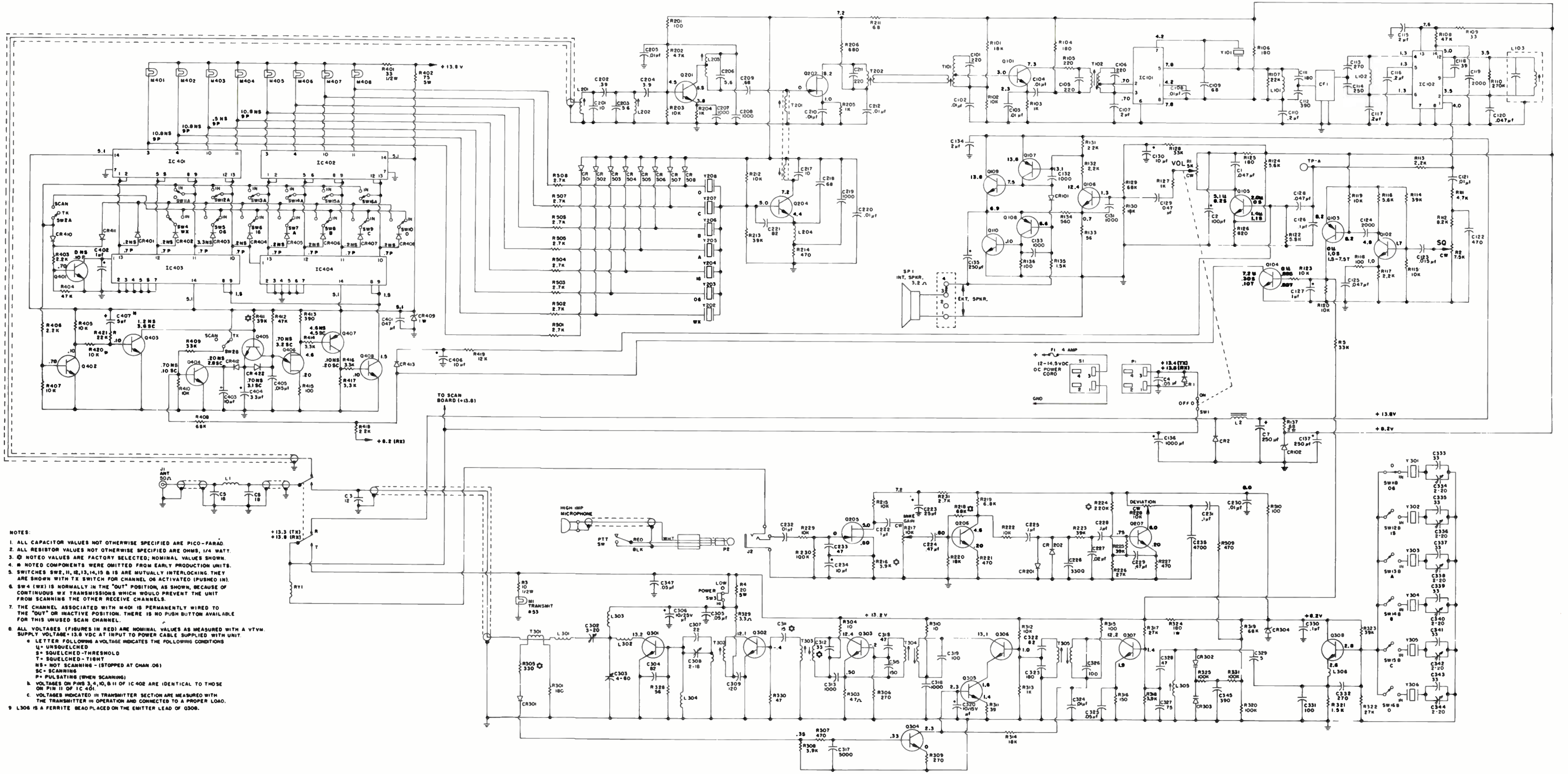
ITEM	PART NO.
(CHASSIS)	
L1	102-526
L2	301-430
(RF-MODULATOR 500-861)	
L201	301-520-1
L202	301-520-2
L203	301-520-8
L204	102-369
T201	301-727
T202	301-702
(IF-AUDIO 500-858)	
L101	ES-2502
L102	ES-2228
L103	301-517
T101	102-507
T102	301-683
(TRANSMITTER 500-862)	
L301	102-520
L302	102-519
L303	102-460
L304	102-459
L305	102-518
L306	56-59065/4A
T301	102-448
T302	102-445
T303	301-663
T304	301-662
T305	301-661

MISCELLANEOUS

ITEM	NAME	PART NO.
(CHASSIS)		
RY1	Relay, Transmit/Receive	(Potter-Brumfield) KNP14D21
SPK-1	Speaker, 3.2 ohms	301-793
SW2	Switch, DPDT	500-874-10
SW3	Switch, SPDT	500-874-10
SW4-10	Switch, WX	500-874-10
SW11-16	Switch, Crystal In/Out	500-874-11
Y200	Crystal,Receive(Specify Channel)	301-655
Y300	Crystal,Transmit(Specify Channel)	301-654
	Microphone, Ceramic	500-809-3
(IF-AUDIO 500-858)		
CF-1	Filter, Ceramic	301-723
Y101	Crystal 10.245MHz	301-516-1
Y101	Crystal, 11.155MHz	301-516-2

CABINET PARTS

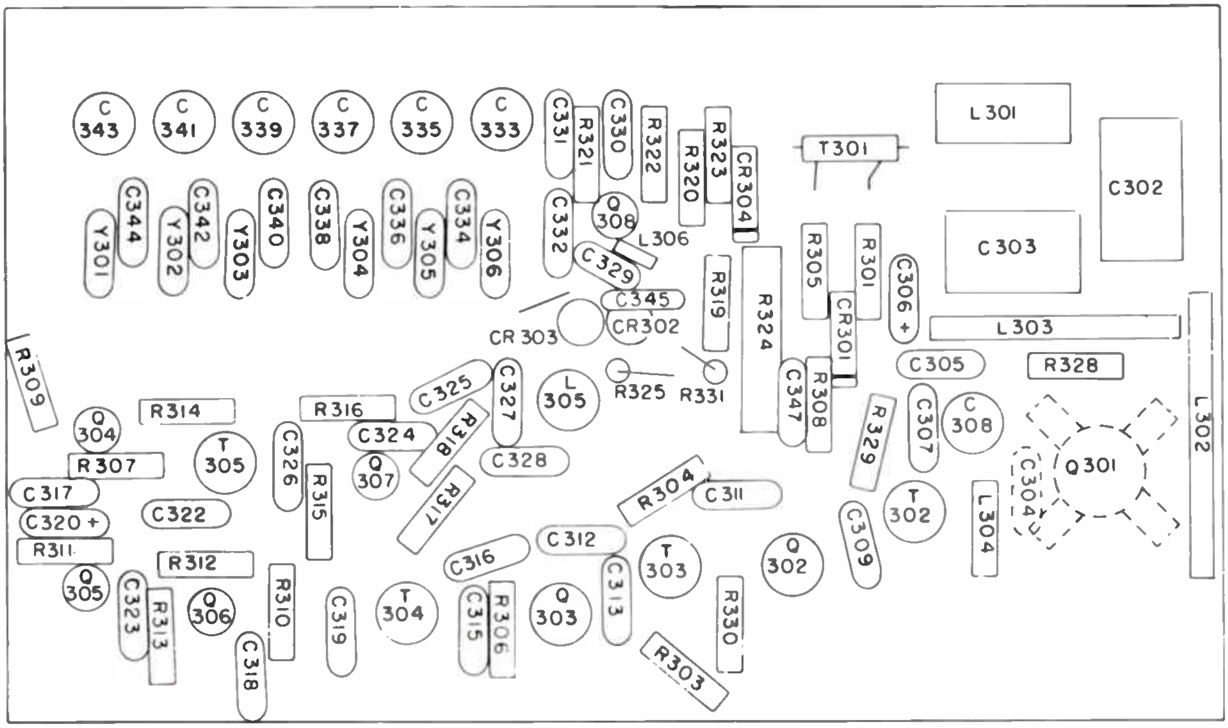
NAME	PART NO.
Panel, Front	600-322
Panel, Rear	301-675-1
Knob, Volume/Squelch	40600CC



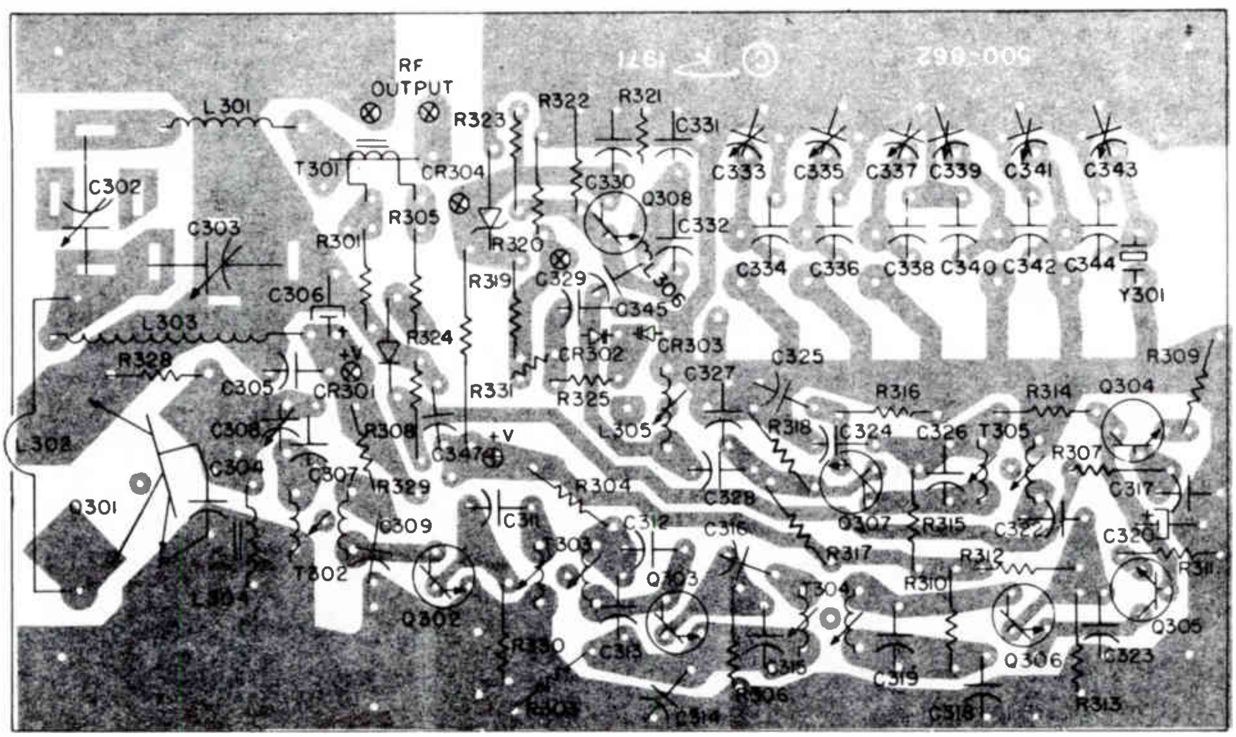
NOTES:

1. ALL CAPACITOR VALUES NOT OTHERWISE SPECIFIED ARE PICO-FARAD.
2. ALL RESISTOR VALUES NOT OTHERWISE SPECIFIED ARE OHMS, 1/4 WATT.
3. ✪ NOTED VALUES ARE FACTORY SELECTED; NOMINAL VALUES SHOWN.
4. * NOTED COMPONENTS WERE OMITTED FROM EARLY PRODUCTION UNITS.
5. SWITCHES SW2, 11, 12, 13, 14, 15 & 16 ARE MUTUALLY INTERLOCKING. THEY ARE SHOWN WITH TX SWITCH FOR CHANNEL 06 ACTIVATED (PUSHED IN).
6. SW4 (WX) IS NORMALLY IN THE "OUT" POSITION, AS SHOWN, BECAUSE OF CONTINUOUS WX TRANSMISSIONS WHICH WOULD PREVENT THE UNIT FROM SCANNING THE OTHER RECEIVE CHANNELS.
7. THE CHANNEL ASSOCIATED WITH M401 IS PERMANENTLY WIRED TO THE "OUT" OR INACTIVE POSITION. THERE IS NO PUSH BUTTON AVAILABLE FOR THIS UNUSED SCAN CHANNEL.
8. ALL VOLTAGES (FIGURES IN RED) ARE NOMINAL VALUES AS MEASURED WITH A VTVM. SUPPLY VOLTAGE = 13.8 VDC AT INPUT TO POWER CABLE SUPPLIED WITH UNIT.
   a. LETTER FOLLOWING A VOLTAGE INDICATES THE FOLLOWING CONDITIONS
      U = UNSQUELCHED
      S = SQUELCHED - THRESHOLD
      T = SQUELCHED - TIGHT
      NS = NOT SCANNING - (STOPPED AT CHAN. 06)
      SC = SCANNING
      P = PULSATING (WHEN SCANNING)
   b. VOLTAGES ON PINS 3, 4, 10, & 11 OF IC 402 ARE IDENTICAL TO THOSE ON PIN 11 OF IC 401.
   c. VOLTAGES INDICATED IN TRANSMITTER SECTION ARE MEASURED WITH THE TRANSMITTER IN OPERATION AND CONNECTED TO A PROPER LOAD.
9. L306 IS A FERRITE BEAD PLACED ON THE EMITTER LEAD OF Q306.

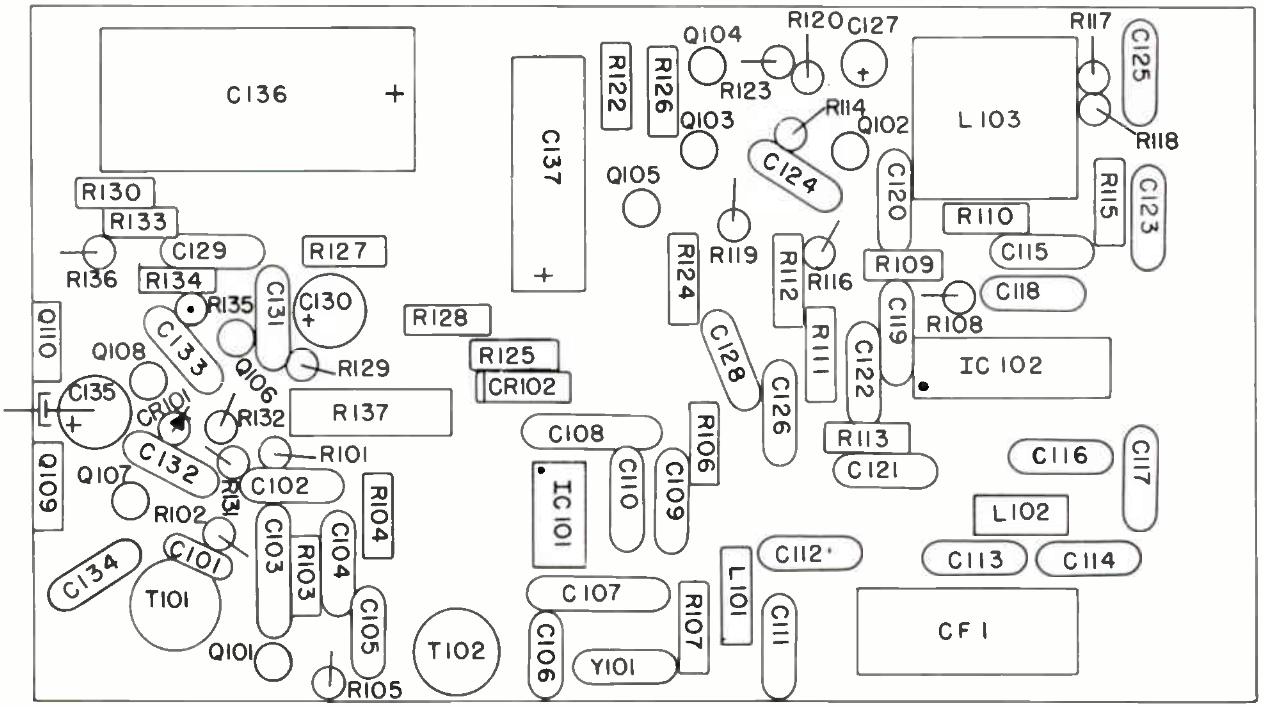
SCHEMATIC WITH VOLTAGES

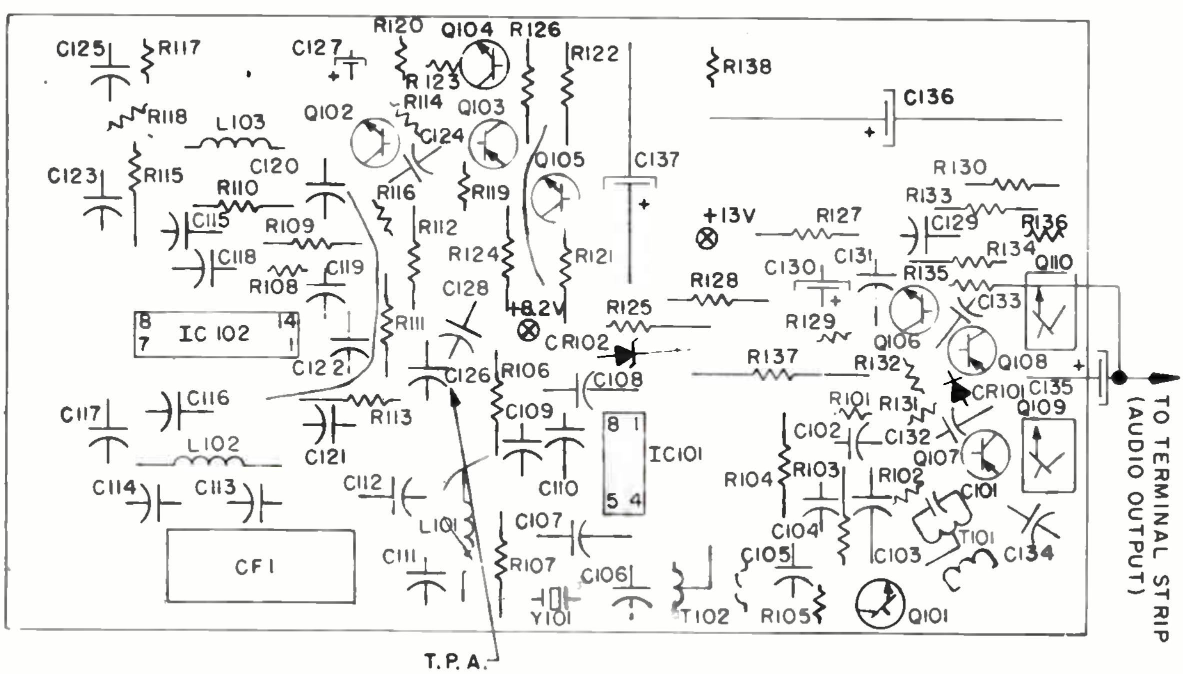


NOTE C304 & Q301 ARE ON THE BOTTOM OF THE BOARD

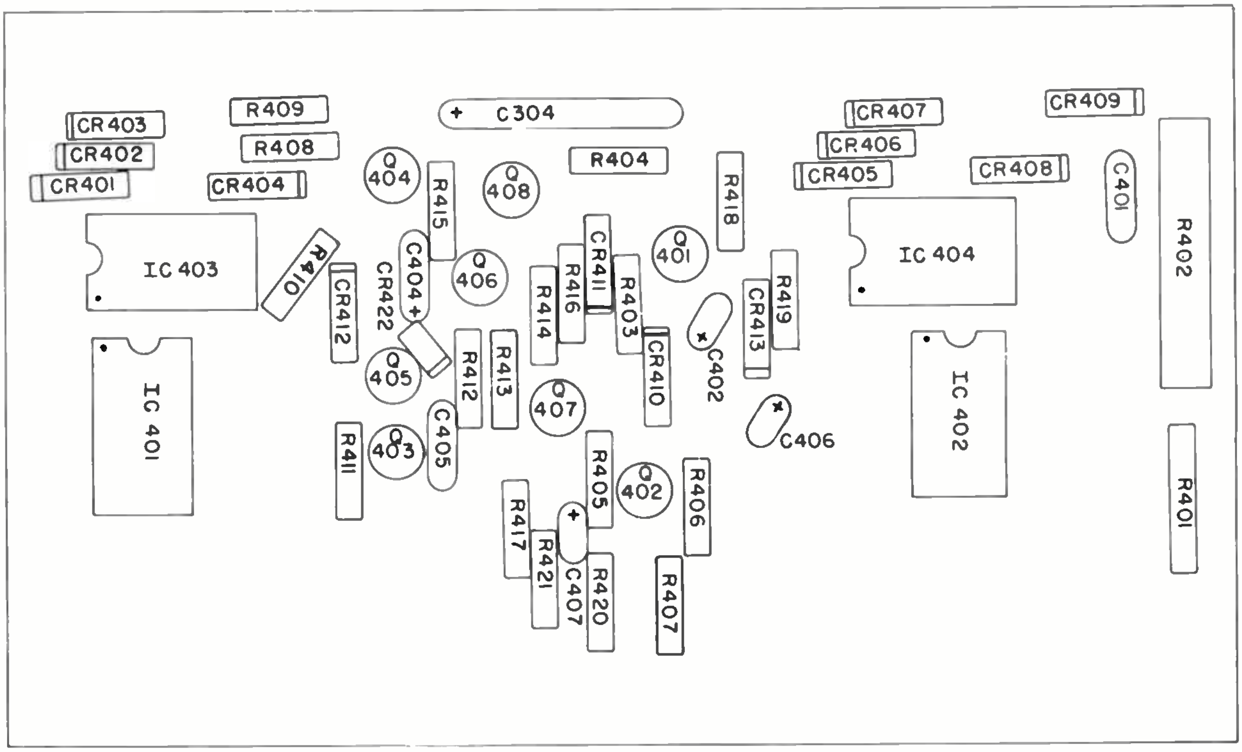


TRANSMITTER BOARD 500-862

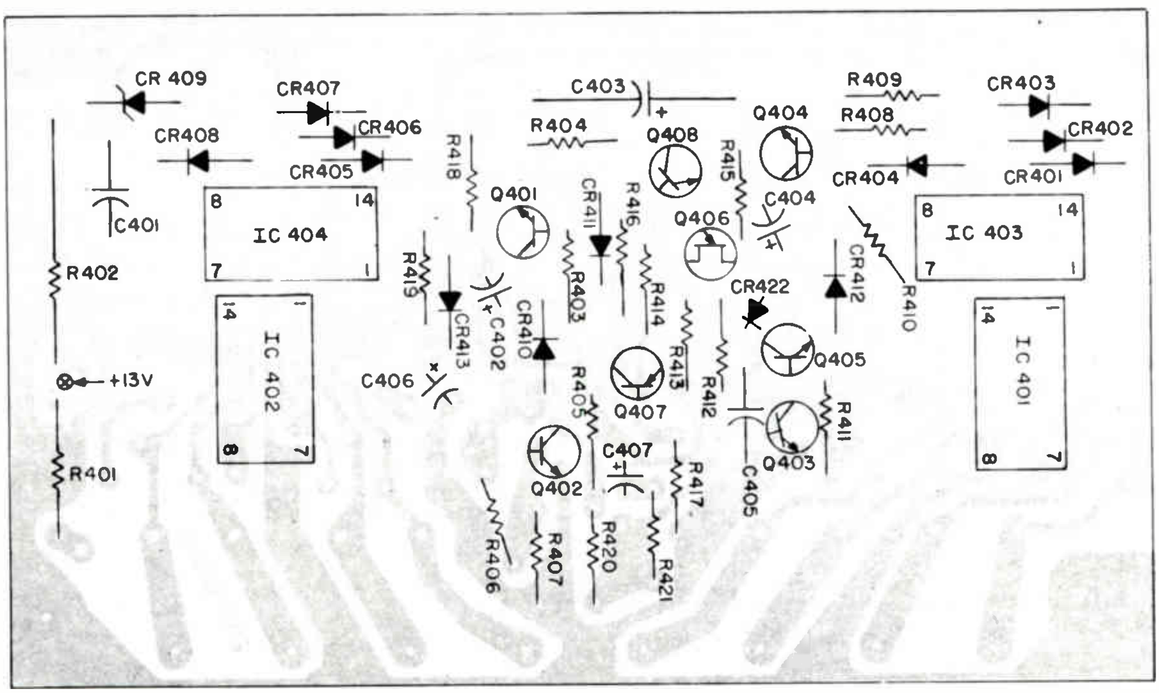




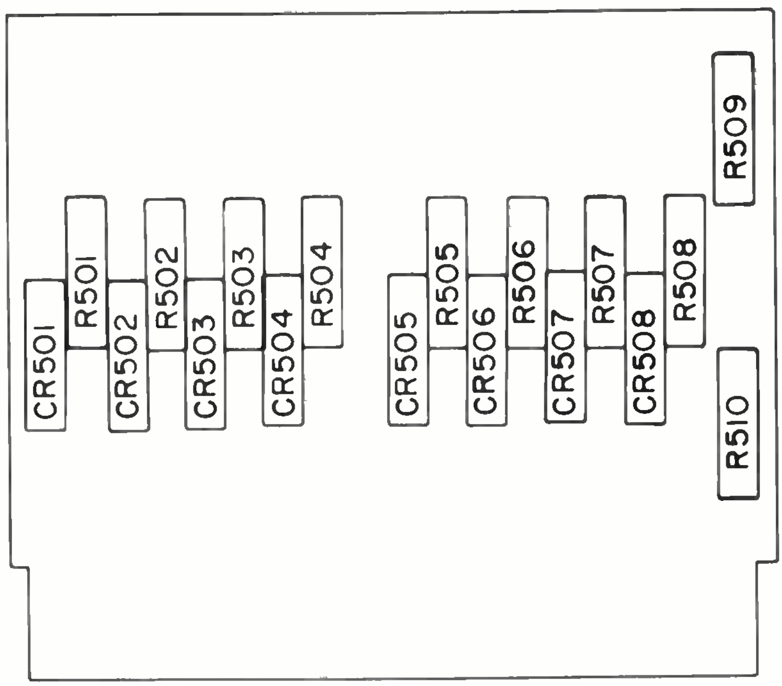
IF BOARD 500-858

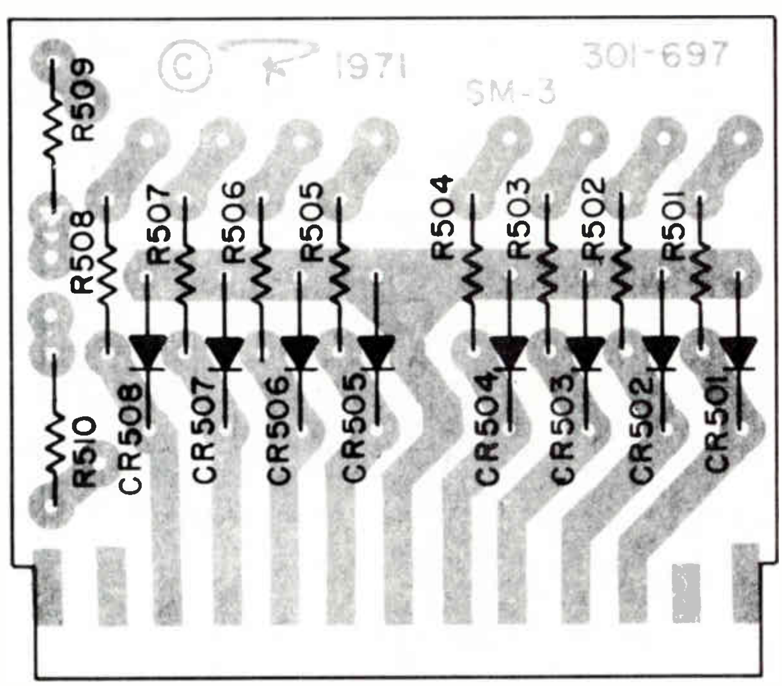


NOTE: ON EARLY PRODUCTION UNITS, C407 & R421 WERE OMITTED;
R420 WAS A JUMPER.

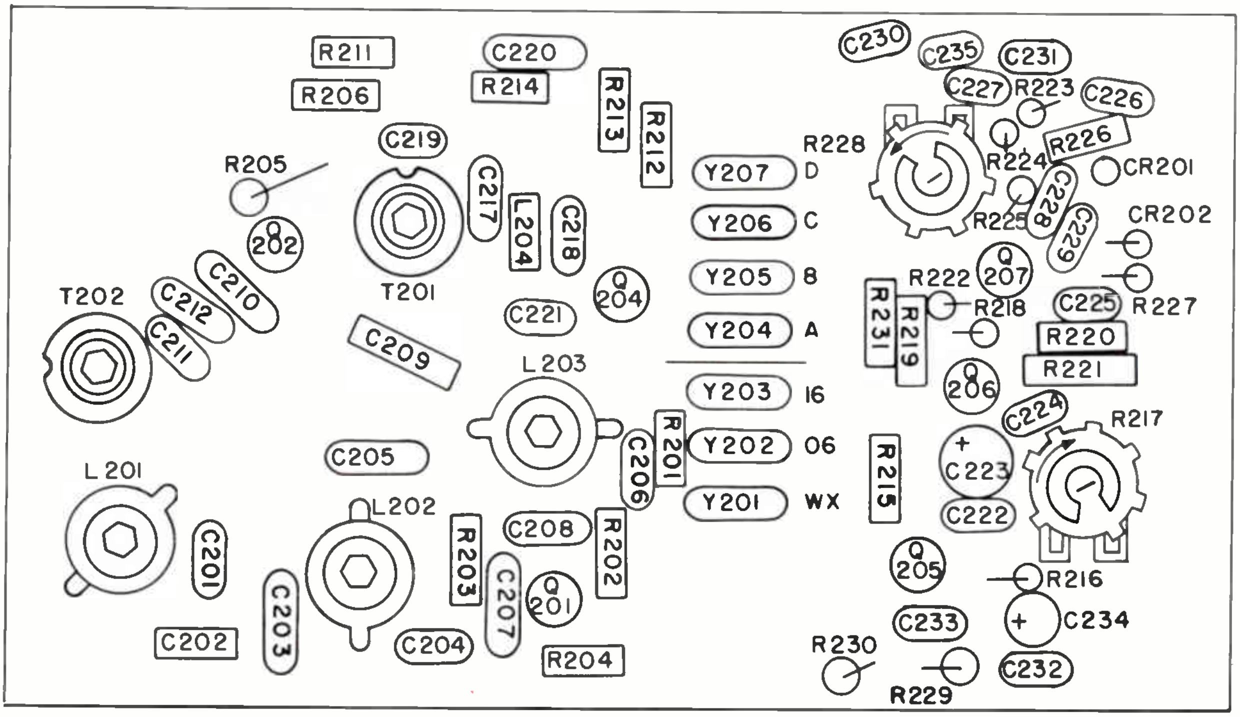


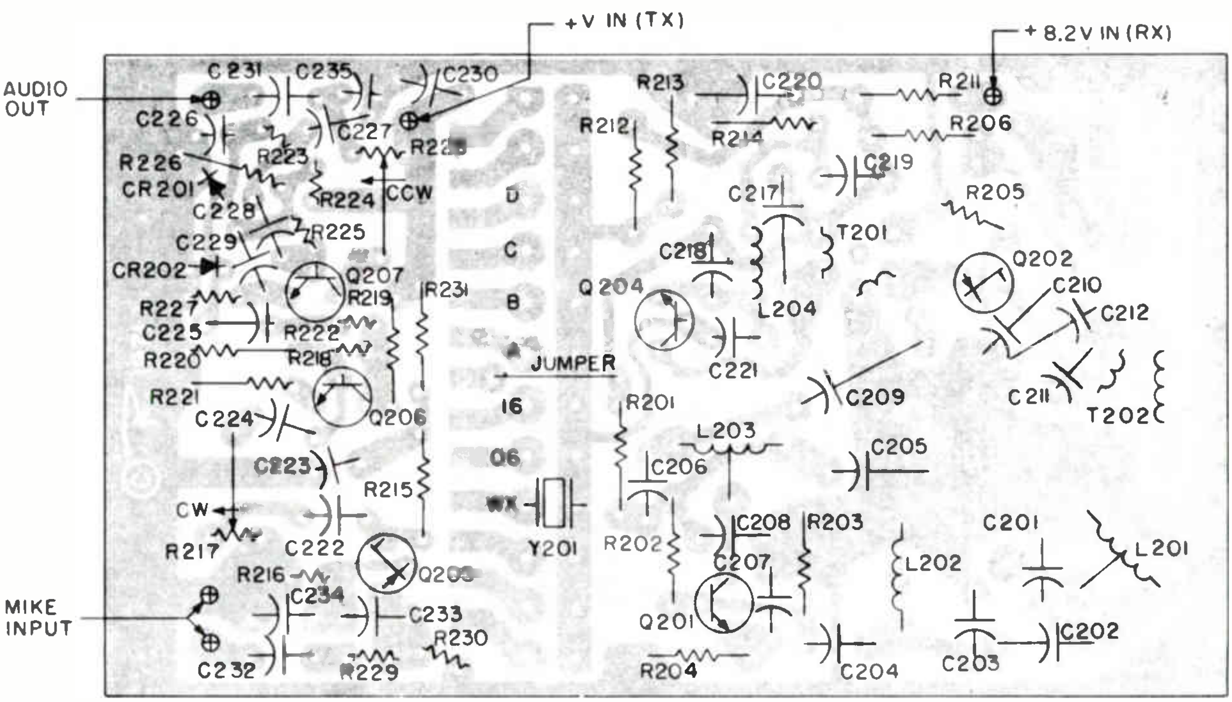
SCAN BOARD 500-850





DIODE SWITCHING BOARD 301-697





RF BOARD 500-861

c. Place an RF pick-up loop near the top of coil T-305.

NOTE: Due to a possible slight "pulling" of the crystal's frequency, couple the pick-up loop as lightly as possible to the top coil of T-305. Coupling to the bottom coil will pull the oscillator frequency and prevent a proper crystal netting adjustment from being made. FCC Regulations may be violated if an improper netting adjustment is made. Use the maximum sensitivity available at the counter's input.

d. Multiply the frequency read on the counter by four (4) to find the ultimate frequency being transmitted.

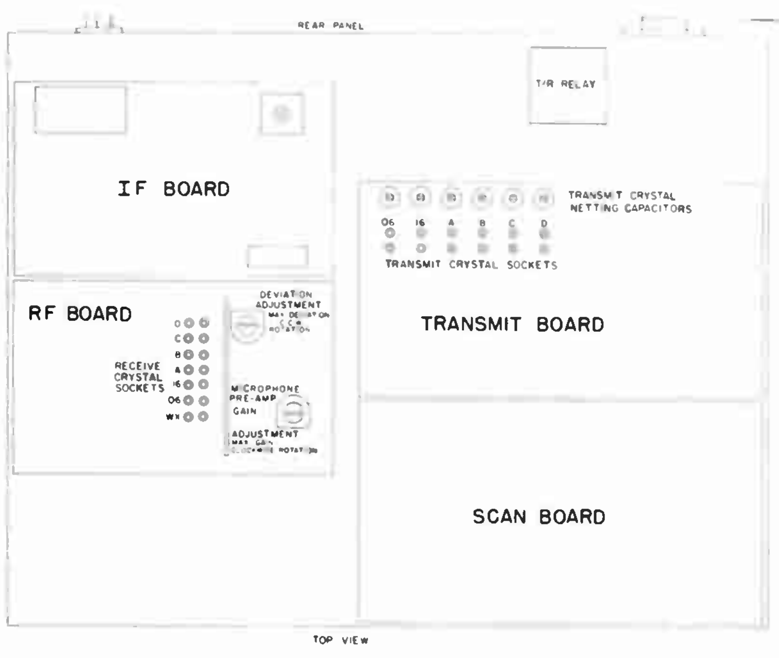
EXAMPLE: Frequency read = 39.200 00 MHz
Ultimate Frequency = 4 x 39.200 00 = 156.800 MHz

e. Adjust the appropriate netting capacitor until the frequency being read is within the required tolerance of one-fourth (¼) of the ultimate transmitted frequency.

DEVIATION AND MIKE GAIN ADJUSTMENT

3-9-1 Use the following procedure for proper adjustment of the mike gain (R217) and Deviation (R228) controls

a. Connect the unit to the RF Wattmeter or dummy load.
b. Connect the scope probe to the junction of C225 and CR201. It may be more convenient to connect the probe to the cathode lead of CR202.
c. Key the transmitter and talk into the microphone with a normal voice level. Observe the waveform on the scope and adjust R217 (Mike Gain) until approximately 10% of the voice peaks are clipped.
d. Connect the audio generator to the mike input terminals. Set the audio voltage level to 0.5 – 1.0 volts RMS at 1000 Hz.
e. Couple the FM Modulation Meter's RF pick up to the transmitter.
f. Key the transmitter and adjust R228 (Deviation Control) so that the maximum deviation is no greater than 5 KHz.
g. Reduce the audio input level to 0.25 Volts RMS. The deviation should not be greater than 5 KHz.



CRYSTAL LOCATION AND ADJUSTMENT DIAGRAM

3-7-7 Move the VTVM's probe to this point. Alternately peak the upper and lower slugs of T304 for a maximum reading (0.4 to 0.6 Volts) at this point.

3-7-8 T303: Set the bottom slug (primary) so that the top edge is midway between the top of the coil collar and the bottom winding. Key the transmitter and adjust the top slug (secondary) for maximum power output on the wattmeter. During Power Amplifier alignment, the secondary of T303 and, if necessary, the primary are retouched for maximum power.

NOTE: If the Power Amplifier stage (Q301) is detuned to the extent that no power indication can be obtained, the following procedure can be used to set the slugs of T303 near their correct position: Move the VTVM's probe to Test Point 8A. Starting with the top slug of T303, alternately adjust both slugs for a MINIMUM voltage at this point. Now procede with 3-7-9 and the rest of the Tuning Procedure. With the transmitter delivering rated output power, the voltage drop across R329 will normally be 1.0 to 1.3 V.

3-7-9 Set the slug (core) of T302 to the center of the coil winding.

3-7-10 Power Amplifier Alignment

a. Set C302 almost tight.

b. The following adjustments are peaked in the order listed for maximum power output as indicated on the R.F. wattmeter.

1) Peak C303
2) Peak C308
3) Peak C302
4) Repeat the above three steps until no further improvement is noted
5) Repeak T303 as in 3-7-8 above

c. Check bandwidth with low and high frequency crystals. Adjust T303 for best output compromise between high and low limits. Adjusting the slug of T302 will sometimes help widen the bandwidth. C308 is final adjustment for best compromise over frequency range.

CRYSTAL NETTING PROCEDURE

NOTE: The following procedures must be performed with the radio set at a temperature of 70°F to 80°F. The frequency of each channel must be set to within ± .0001% of the assigned channel frequency.

3-8-1 Use the following procedure if a 170 MHz Counter is available:

a. Connect the unit to the RF Wattmeter or dummy load,
b. Turn transmitter on (key the mike's PTT switch or insert a shorting plug into J2).
c. Place an RF pick-up loop consisting of 3 or 4 turns near the final transistor's output circuit (near L301; see diagram 4-9).
d. Read the frequency on the counter.
e. Adjust the appropriate netting capacitor (C333, C335, C337, C339, C341, C343; see diagram for their location) until the frequency being read on the counter is "on" channel.

3-8-2 Use the following procedure if only a 50 MHz counter is available:

a. Connect the unit to the RF Wattmeter or dummy load.
b. Turn transmitter on.

until spikes are clearly seen in the audio output as viewed on the oscilloscope. The noise spikes will be either mostly positive or negative if an unbalanced condition exists.

3-5-4 Tune L103 (quadrature detector coil) until the noise spikes are equally positive and negative in their amplitude. The overall amplitude of these spikes should be much less as a balance is achieved. Usually, only a ¼ turn, or less, is needed to obtain the proper adjustment for best noise balance. If a proper balance cannot be achieved, repeat the IF and RF alignments and then try the noise balance adjustment again.

EQUIPMENT REQUIRED – TRANSMITTER ALIGNMENT

3-6-1 RF Wattmeter (or any equivalent device which provides a 50 ohm load at the appropriate power range).

3-6-2 Frequency Counter – 170 MHz preferred; 50 MHz acceptable.

3-6-3 FM Modulation Meter – Lampkin 205A or equivalent peak reading deviation meter.

3-6-4 Audio generator – HP 200D or equivalent.

3-6-5 VTVM

3-6-6 Oscilloscope

TRANSMITTER TUNING PROCEDURE

NOTE: The encircled number on diagram 4-11 corresponds to the last digit in the following procedure steps. The unit must be connected to a suitable 50Ω load for proper alignment of the final transmitter stage.

3-7-1 Install crystals. For full bandwidth alignment, use crystals that cover each end of the band and also one whose frequency is near the center of the band. Alignment is done on the center frequency and then the bandwidth is checked using the high and low limit crystals.

3-7-2 Tighten trimmer capacitor C302 and C303.

3-7-3 Set the "Netting" capacitor (6 trimmers; see diagram 4-14) to mid-range.

3-7-4 With the transmitter keyed and the center frequency crystal operating, voltage at this point should be 2.5 to 3.0 Volts as read on a VTVM.

3-7-5 Move the VTVM's probe to this point and adjust L305 for a maximum reading (1.8 to 2.0 Volts).

3-7-6 Move the VTVM's probe to this point. Alternately peak the upper and lower slugs of T305 for a maximum reading (normally 1.5 to 2.0 Volts). Check this reading at the lowest and highest crystal frequencies installed for proper bandpass alignment.

Repeat steps 3-7-5 and 3-7-6 until no further improvement can be made. After these adjustments have been made, L305 and the primary (bottom slug) of T305 should not be changed during the remainder of the alignment procedure.

NOTE: The frequency of the oscillator will change slightly whenever L305 and T305 are adjusted. Therefore, if the adjustment of these parts is ever changed, it is important to perform the Crystal Netting Procedure

3-3-9 Set the generator frequency to the secondary image frequency. This is 910 KHz below the channel frequency.

NOTE: Some receivers may have the second oscillator at 11.155 MHz, if this is the case, the image frequency is 910 KHz above the channel frequency. Check the frequency marked on top of the crystal (10.245 MHz for below and 11.155 MHz for above).

3-3-10 Adjust the signal generator output until voltmeter reads .2 volts.

3-3-11 Adjust T102 (bottom core), T102 (top core), T101 and T202 (in that order) for maximum quieting degradation (highest meter reading). Adjust signal generator output to maintain voltmeter reading between 0.1 and 0.2 volts. The correct position for the slugs should be within two turns of the position in step No. 4 and 8.

RF (RECEIVER) ALIGNMENT

3-4-1 Pre-set the slugs of L201, L202, L203 flush with the tops of the coil forms.

3-4-2 Connect AC voltmeter across the speaker terminals.

3-4-3 With nothing connected to the antenna input, adjust the volume control until AC voltmeter reads 1 volt of noise.

3-4-4 Connect signal generator to antenna input jack. Set generator accurately to the center frequency of the channel being used for alignment. Turn modulation off.

3-4-5 Adjust output of signal generator until AC voltmeter reads .2 volts.

3-4-6 Adjust L201, L202 and L203, in that order, for maximum quieting (lowest meter reading). Adjust signal generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvement can be made. If two peaks occur on any slug, use the peak with the slug nearest the top of the coil form.

NOTE: The following step may be omitted if performed in IF Alignment section.

3-4-7 Adjust T102 (bottom core) and T201 (top core), in that order, for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between .1 and .2 volts. If two peaks occur, use the one away from center of the coil form.

NOISE BALANCE ADJUSTMENT

NOTE: This adjustment may be required only if excessive "ignition noise" is encountered. Usually, the "noise" problem is caused by improper or inadequate noise suppression of the vessel's ignition system.

3-5-1 Using a "T" connector, connect the FM signal generator and the Noise Generator to the antenna input jack. If a "T" connector is not available, connect the FM generator to the antenna jack and feed in the noise signal by means of a 3 or 4 turn loop coupled to the input coil, L201.

3-5-2 Connect the oscilloscope to the junction of Q109's emitter and Q110's collector, or to the speaker terminals.

3-5-3 Apply a 3 to 10 microvolt signal, as accurately as can be set to the exact channel frequency (carrier only, no modulation), and adjust the output of the noise generator

Pages 63-78 Courtesy of REGENCY ELECTRONICS, INC.

ALIGNMENT AND TUNING PROCEDURE

EQUIPMENT REQUIRED – RECEIVER ALIGNMENT

3-1-1 FM Signal Generator
3-1-2 Oscilloscope
3-1-3 AC VTVM
3-1-4 Noise Generator (to be used in 3-5 only)

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All transceivers should be aligned to the channel nearest the center of the frequency range over which they will operate.

QUADRATURE DETECTOR ALIGNMENT

3-2-1 Connect the FM Signal generator to the antenna input jack. Accurately set frequency to the center of the channel being used for alignment. Modulate signal generator with 1000 Hz, 3 KHz deviation.

3-2-2 Connect the oscilloscope to Test Point A, (Junction of C126, C128, R113).

3-2-3 Adjust output of signal generator until all noise in scope pattern just disappears.

3-2-4 Adjust L103 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal.

IF ALIGNMENT

3-3-1 Disconnect RF signal generator from antenna input.

3-3-2 Connect AC voltmeter across speaker terminals.

3-3-3 Adjust volume control for .5 volt noise reading on AC voltmeter.

3-3-4 Peak T102 (bottom core and top core, in that order) for maximum noise (maximum meter reading on AC voltmeter). If circuit is not badly misaligned, the correct point should be within 2 turns of the slugs present position.

NOTE: Coils will have two peaks; adjust core to peak away from the center of the coil form.

3-3-5 Adjust volume control for 1.0 volt noise reading on AC voltmeter.

3-3-6 Connect the R.F. signal generator to the antenna input jack. Turn modulation off. Set the generator to the operating crystal frequency.

3-3-7 Adjust the signal generator output until the voltmeter reads 0.2 volts.

3-3-8 Adjust T101, T202, T201 (bottom core) and T201 (top core), (in that order), for maximum quieting (lowest meter reading). Adjust signal generator to maintain reading on AC voltmeter between 0.1 and 0.2 volts. If two peaks occur, use the one away from the center of the coil form.

COMANCHE 16 ALIGNMENT

IF ALIGNMENT

1. Connect the output of a 455 kHz sweep generator to the base of Q302 (2nd mixer).
2. Connect the vertical input of an oscilloscope to the junction of R324 and R325. Connect the horizontal input of the oscilloscope to the sweep generator.
3. Adjust T303 and T304 for optimum linearity of discriminator curve, and centering of 455 kHz marker.

HIGH BAND RF ALIGNMENT

1. Move Priority switches to Off, and set the Squelch control to minimum. Move High/Low switch to All.
2. Move Scan Control switch to Manual, and select a receive channel near 156 MHz.
3. Connect an oscilloscope or AC VTVM across the speaker coil.
4. Connect an RF signal generator to the antenna terminals. Set the frequency of the RF signal generator to receiver frequency. Set modulation frequency to 1 kHz and deviation to ±5 kHz. Keep signal generator output level at minimum level necessary to produce a usable output indication on the oscilloscope or VTVM.
5. Adjust T301, T302, L105, L107 and L108 for maximum output.
6. Adjust L101, L102, L103 and L104 for maximum output, reducing signal level as receiver sensitivity increases.
7. Check receiver sensitivity on highest and lowest frequencies received. Step 6 may be repeated for a more uniform response across the receiver range.

LOW BAND RF ALIGNMENT

1. Move Priority switches to Off, and set the Squelch control to minimum.
2. Move Scan Control switch to Manual, and select a receive channel near 37 MHz.
3. Connect an oscilloscope or AC VTVM across the speaker coil.
4. Connect an RF signal generator to the antenna terminals. Set the frequency of the RF signal generator to receiver frequency. Set modulation frequency to 1 kHz and deviation to ±5 kHz. Keep signal generator output level at minimum level necessary to produce a usable output indication on the oscilloscope or VTVM.
5. Adjust T301*, T302* and L113 for maximum output.
6. Adjust L109, L110, L111 and L112 for maximum output, reducing signal level as receiver sensitivity increases.
7. Check receiver sensitivity on highest and lowest frequencies received. Step 6 may be repeated for a more uniform response across the receiver range.

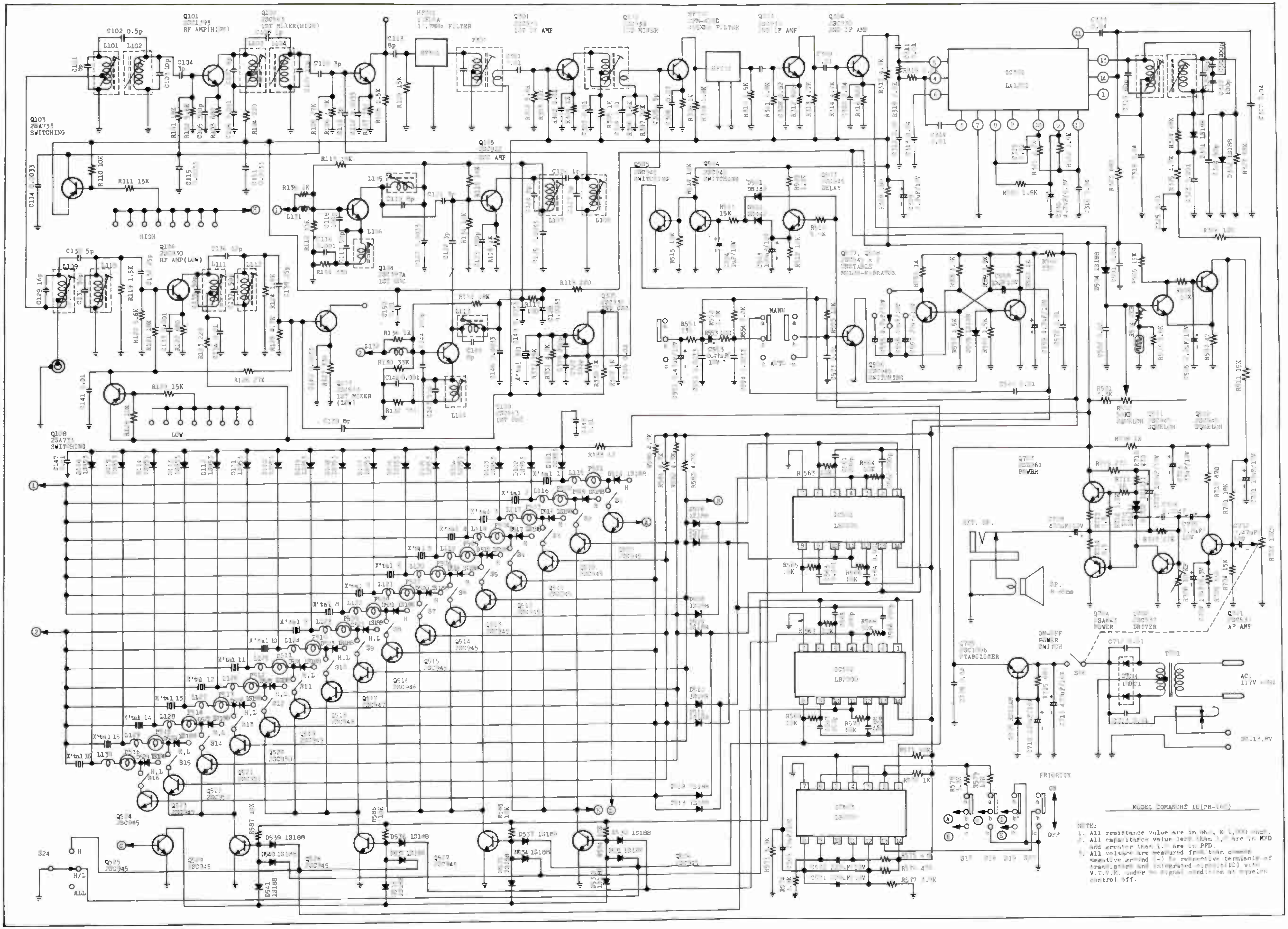
* Omit adjustment of T301 and T302 if High Band RF Alignment has been performed.

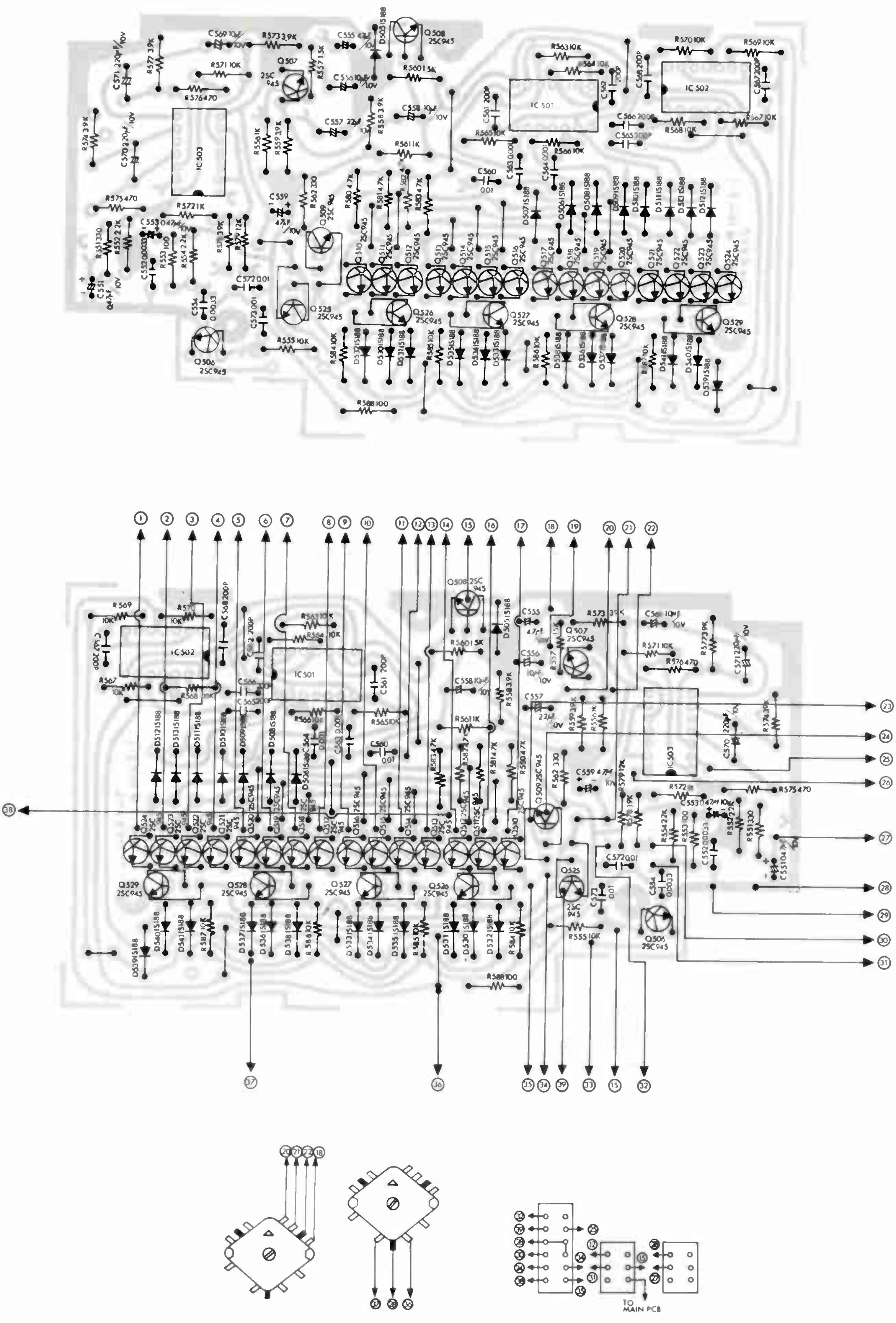
AUDIO ADJUSTMENT

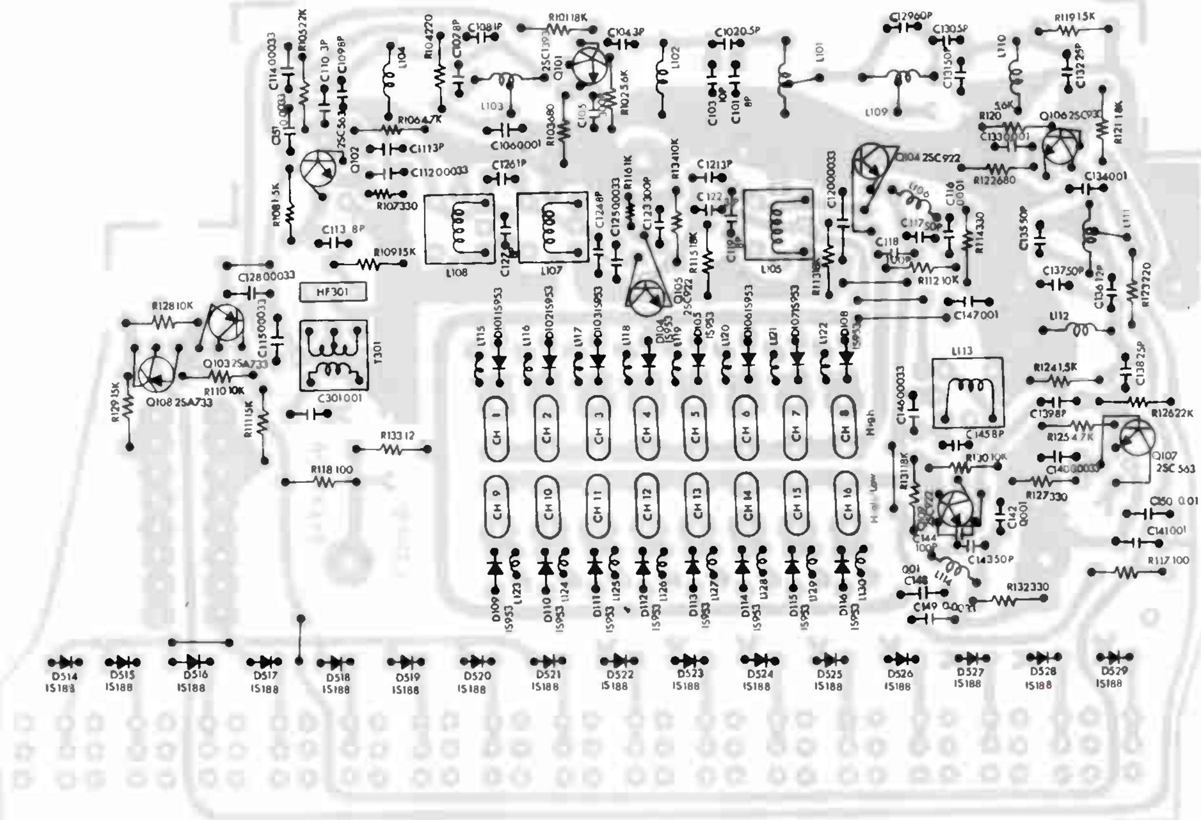
1. Set up receiver, signal generator, and oscilloscope as in Steps 1 through 4 of "High Band RF Alignment".
2. Set generator output to 10,000 uV.
3. Adjust Volume control toward maximum until audio signal displayed on oscilloscope shows clipping of positive or negative peaks.
4. Adjust R706 for equal clipping of positive and negative peaks.

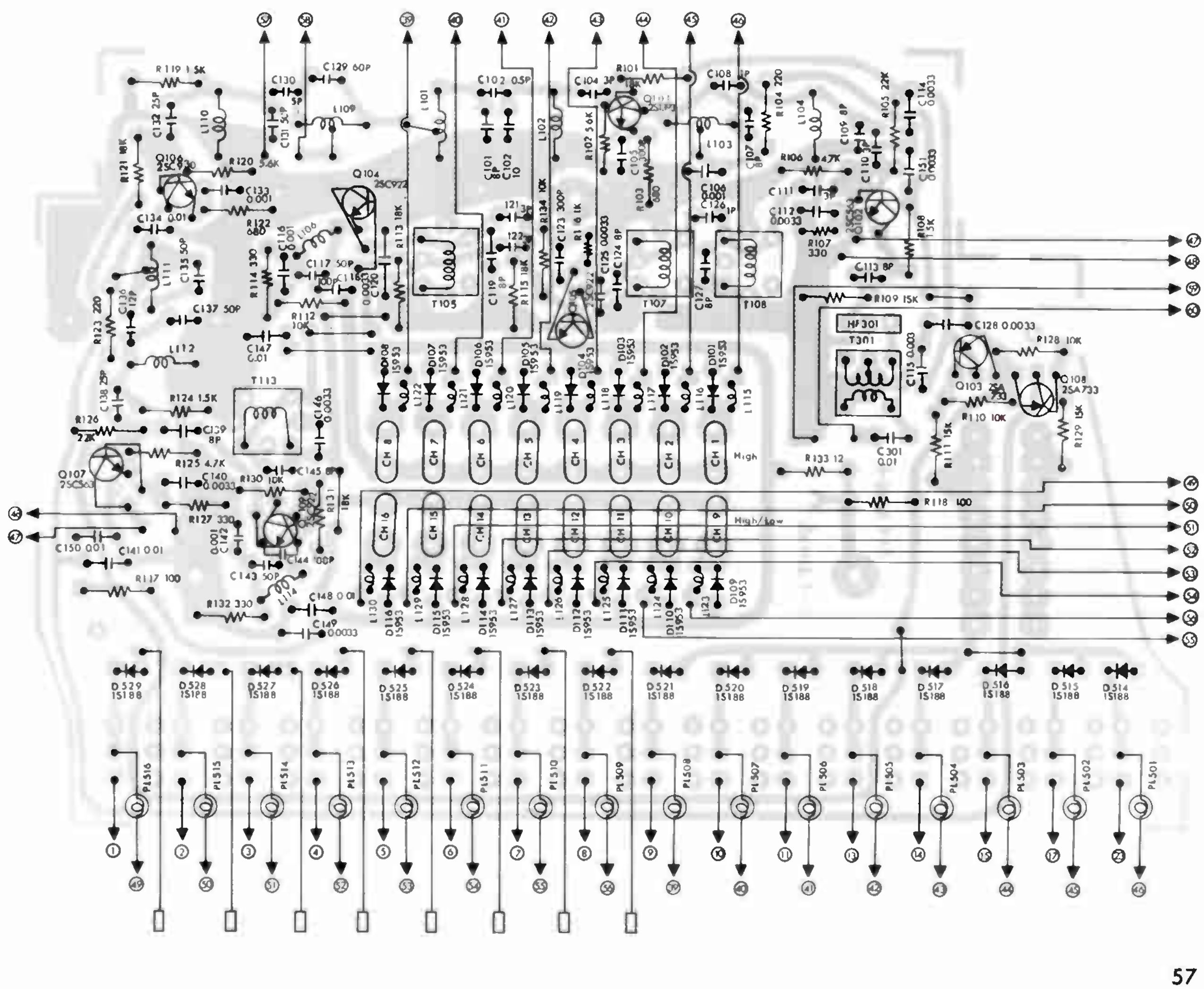
SQUELCH ADJUSTMENT

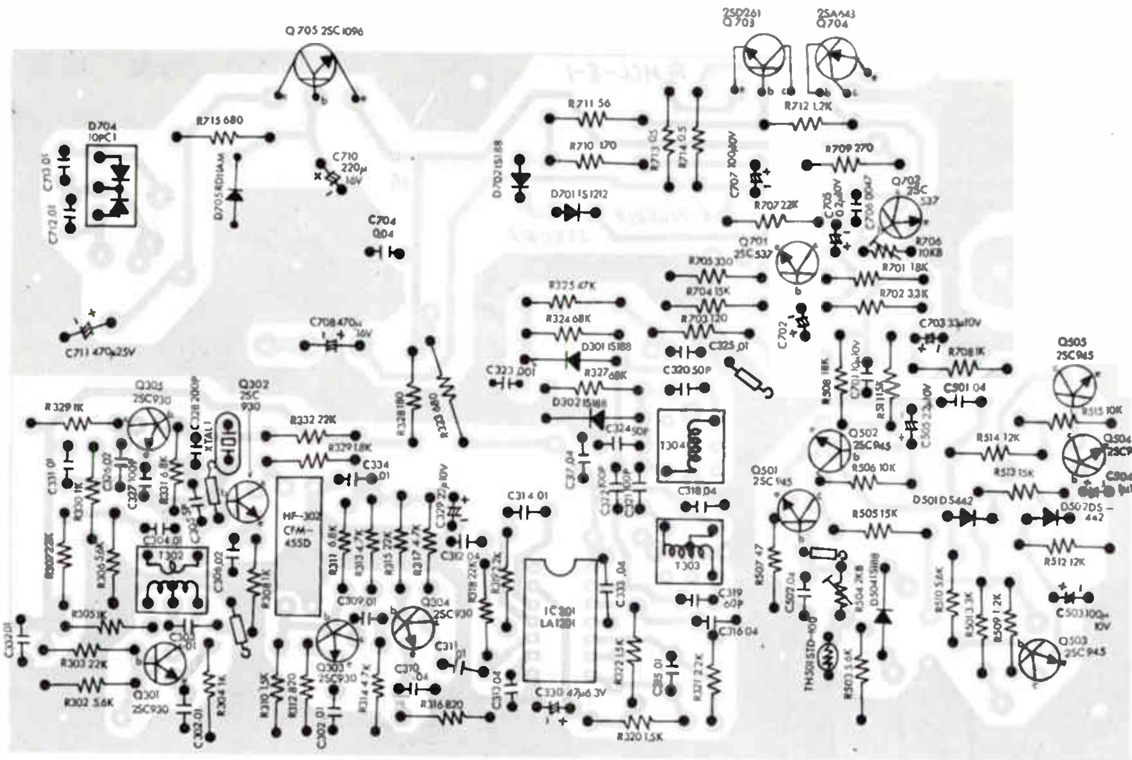
1. Set up receiver and signal generator as in Steps 1 through 4 of "High Band RF Alignment".
2. Set generator output to 2 uV.
3. Move Squelch control to maximum clockwise position.
4. Adjust R504 to point where squelch begins to open.

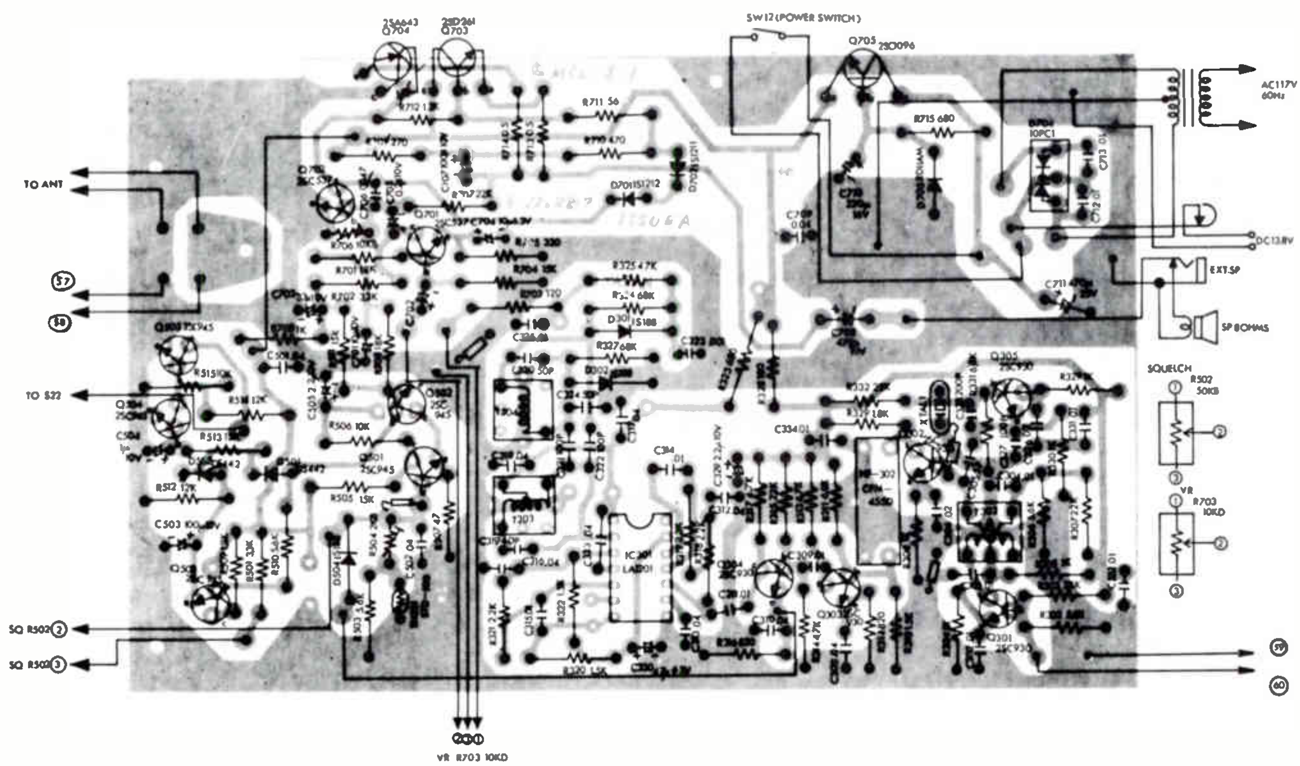

Q101
RF AMP(HIGH)
1ST MIXER(HIGH)
Q103
2SA733
SWITCHING
HIGH
Q106
RF AMP(LOW)
LOW
Q108
2SA733
SWITCHING
1ST MIXER
(LOW)
1ST OSC
SWITCHING
DELAY
MANU
AUTO
POWER
SQUELCH
DRIVER
AF AMP
STABILIZER
ON-OFF
POWER
SWITCH
EXT. SP.
SP.
AC.
117V
PRIORITY
ON
OFF
H/L
ALL
MODEL COMANCHE 16(PR-16)
NOTE:
1. All resistance value are in ohm, K
2. All capacitance value
and greater than
3. All voltage are measured
V.T.V.M.
control off.


S25
S24
S17~S20
S21,S22
S23
TO MAIN PCB



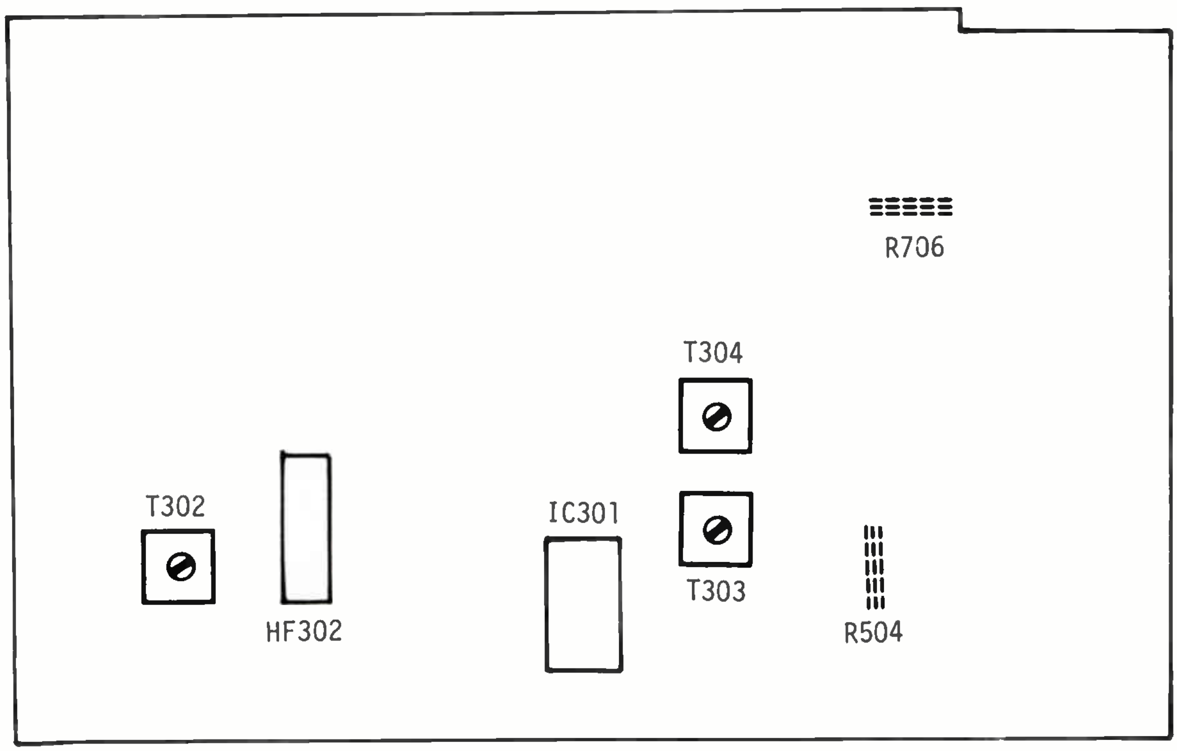


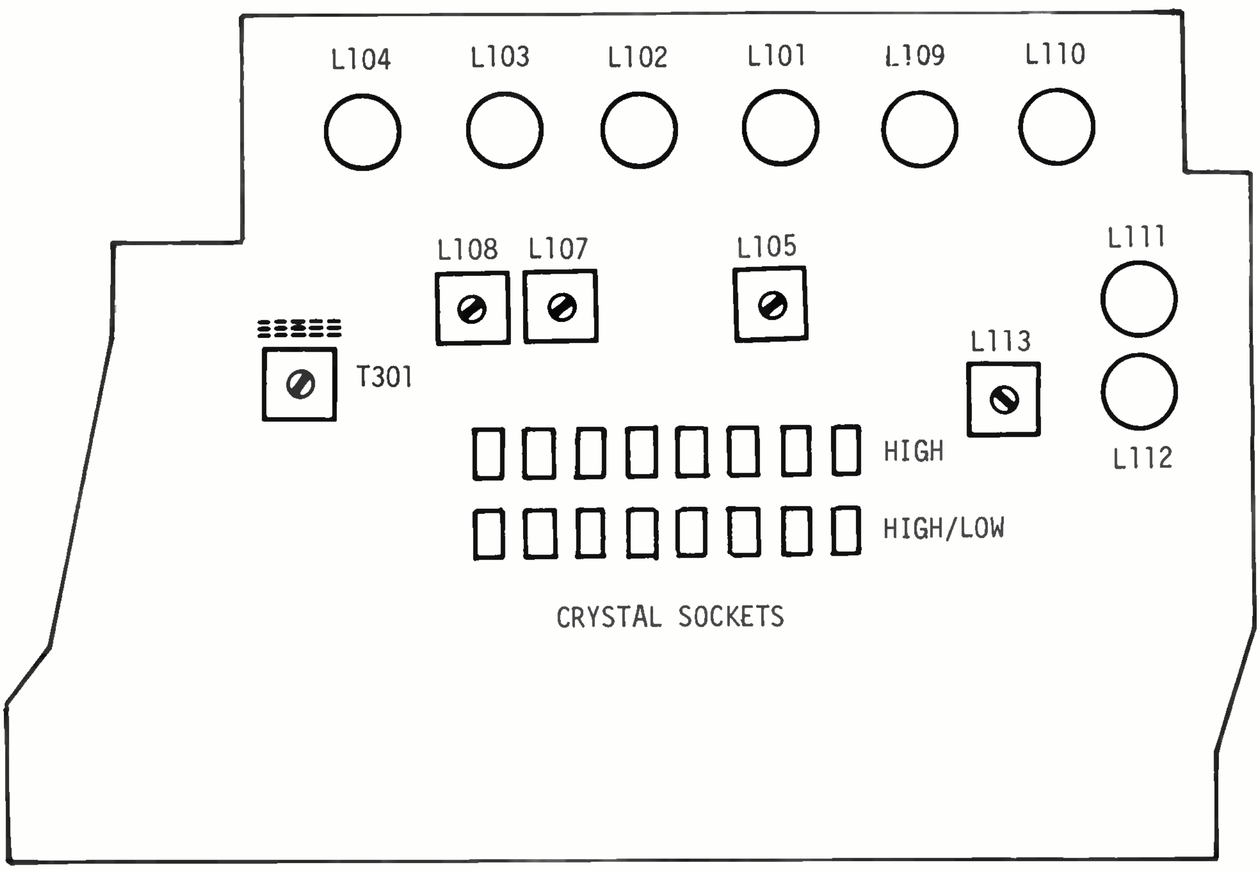


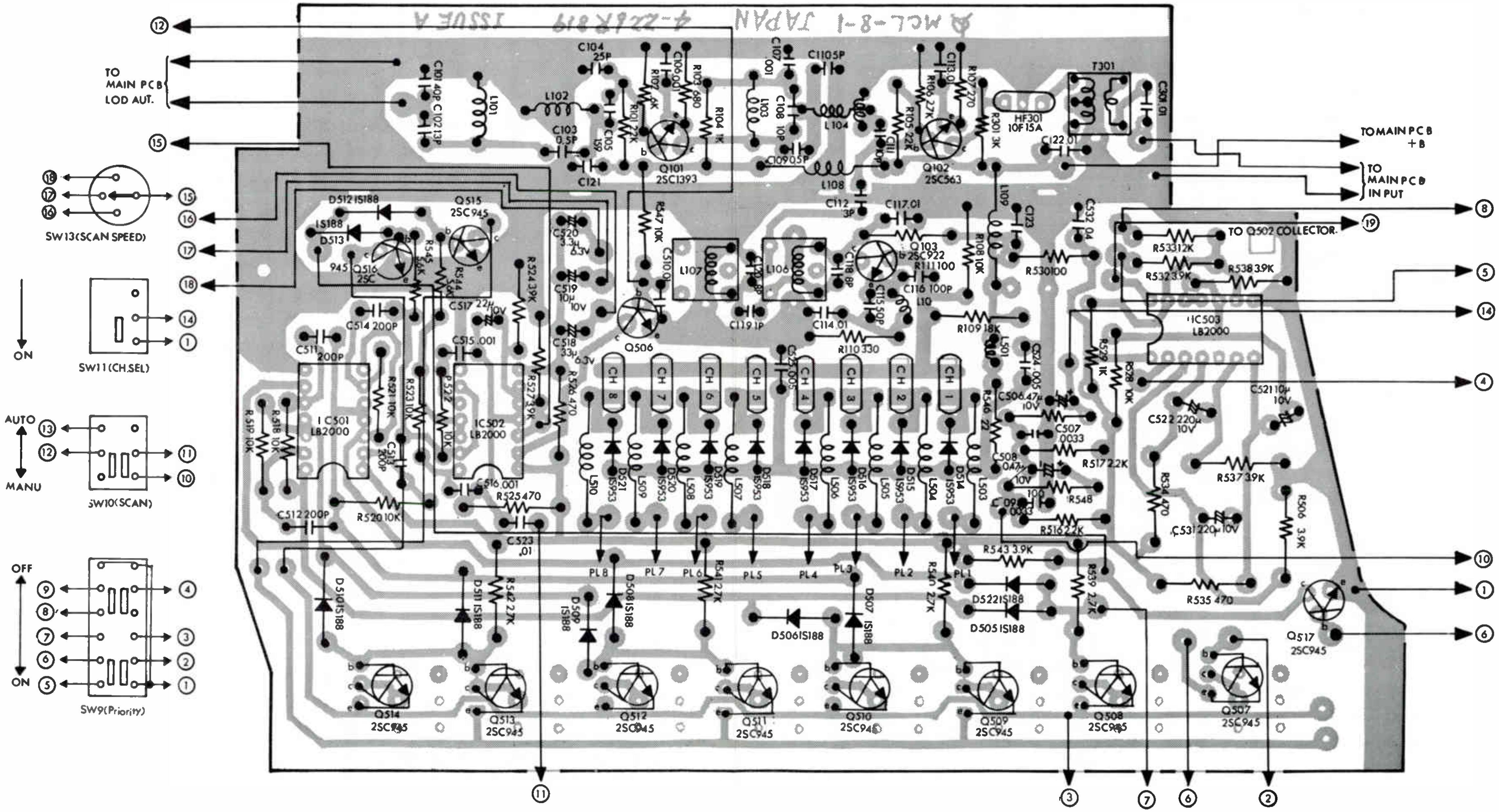

SW12 (POWER SWITCH)
TO ANT
TO S22
AC117V 60Hz
DC13.8V
EXT.SP
SP 8OHMS
SQUELCH R502 50KB
VR R703 10KD
SQ R502
VR R703 10KD

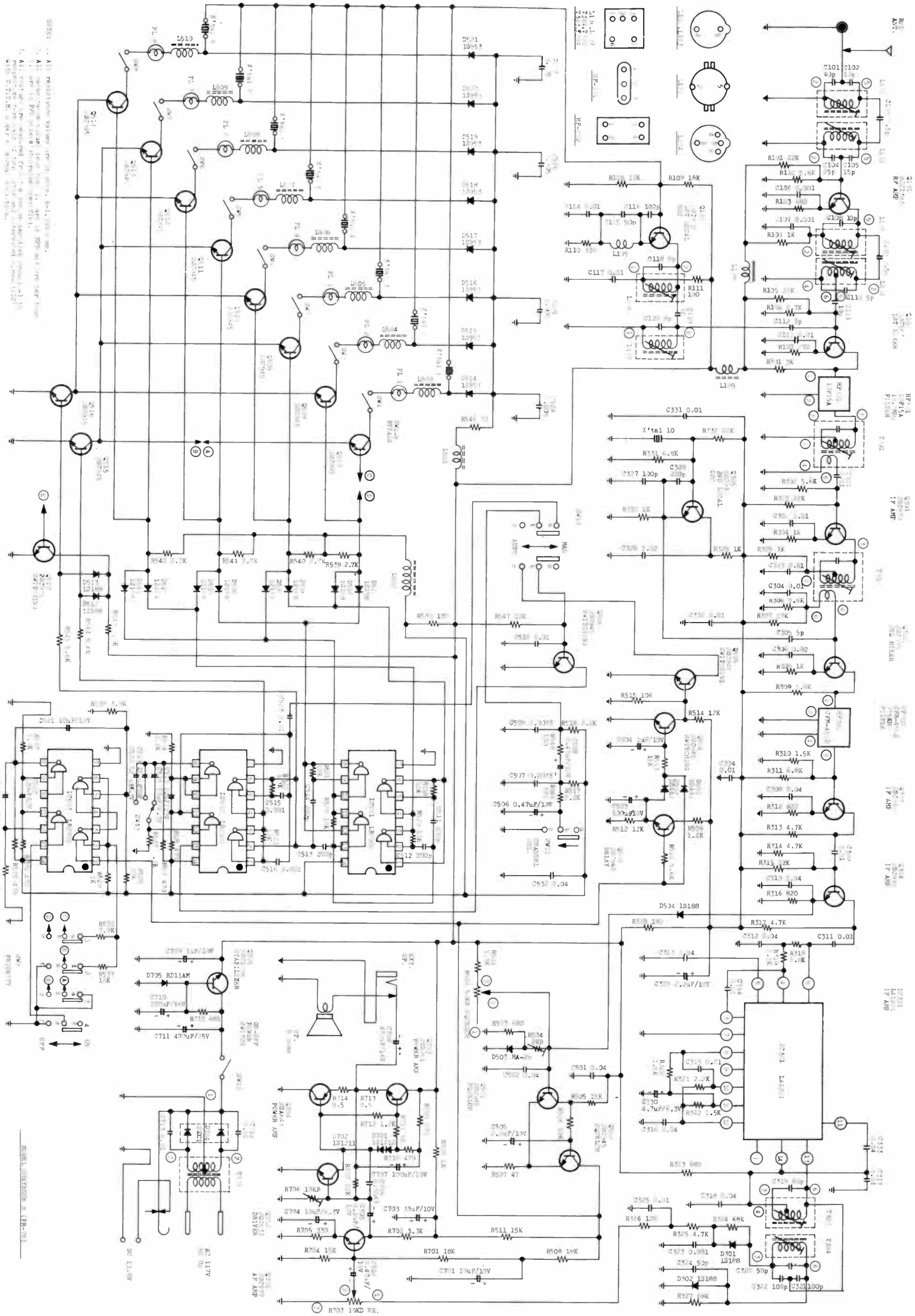
Pages 55-62 Courtesy of PEARCE-SIMPSON INC.

ALIGNMENT PARTS LOCATION

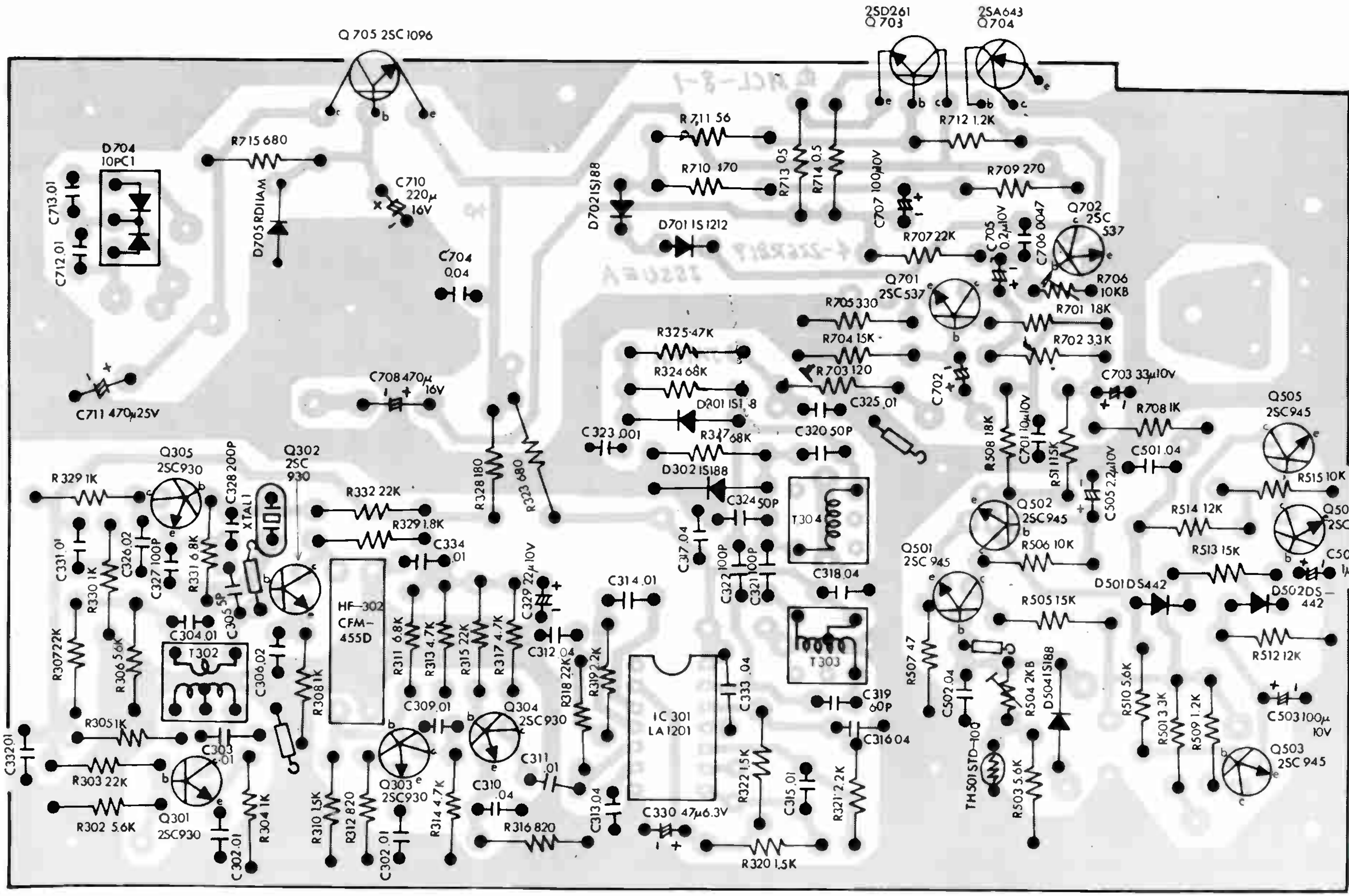


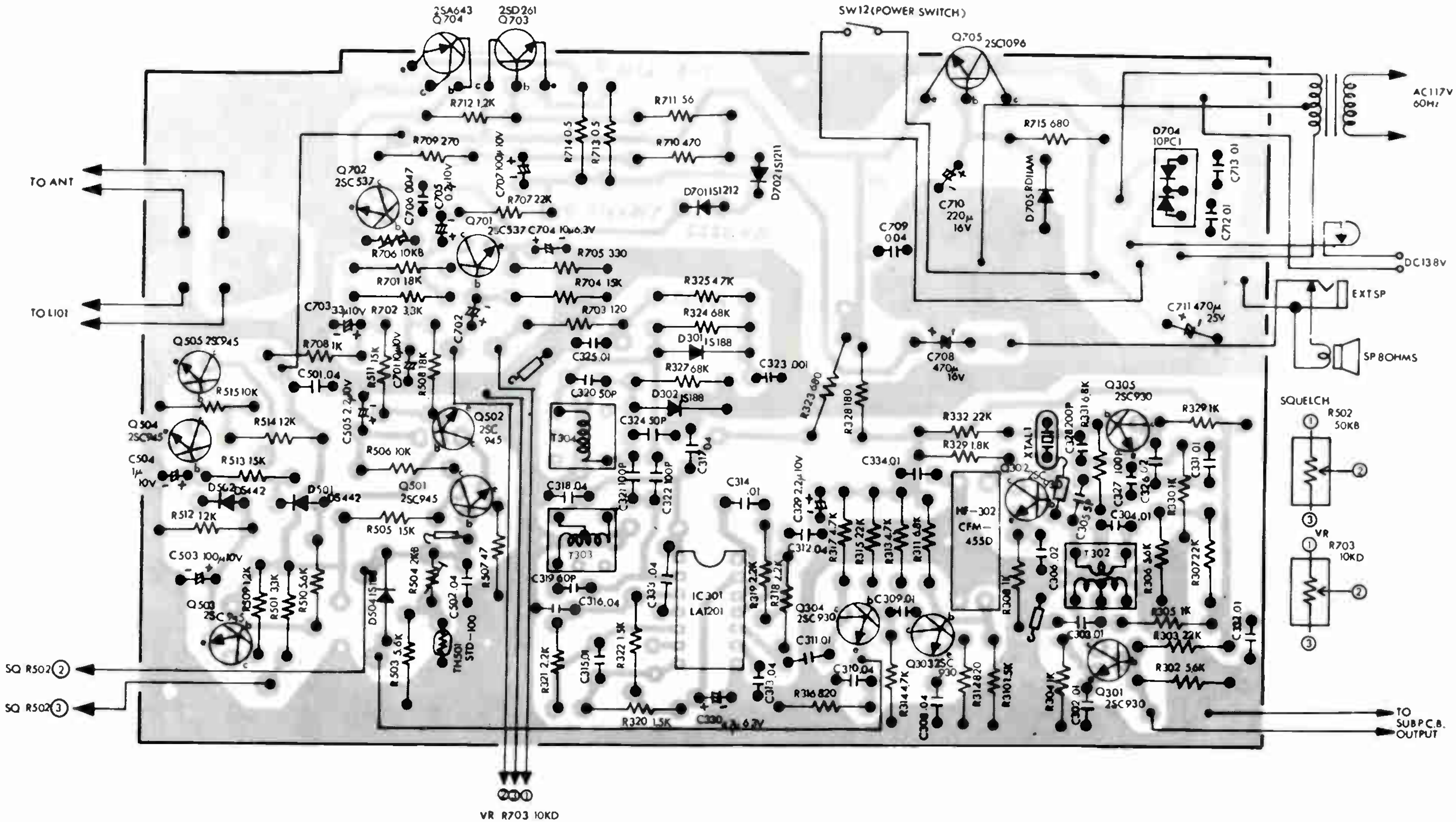



TO MAIN PCB LOD AUT.
SW13(SCAN SPEED)
SW11(CH.SEL)
ON
AUTO
MANU
SW10(SCAN)
OFF
ON
SW9(Priority)
TO MAIN PCB +B
TO MAIN PCB IN PUT
TO Q502 COLLECTOR
Q101 2SC1393
Q102 2SC563
Q103 2SC922
Q506
Q515 2SC945
Q516 2SC
IC501 LB2000
IC502 LB2000
IC503 LB2000
T301
HF301 10F15A
CH 8
CH 7
CH 6
CH 5
CH 4
CH 3
CH 2
CH 1
Q514 2SC945
Q513 2SC945
Q512 2SC945
Q511 2SC945
Q510 2SC945
Q509 2SC945
Q508 2SC945
Q507 2SC945
Q517 2SC945

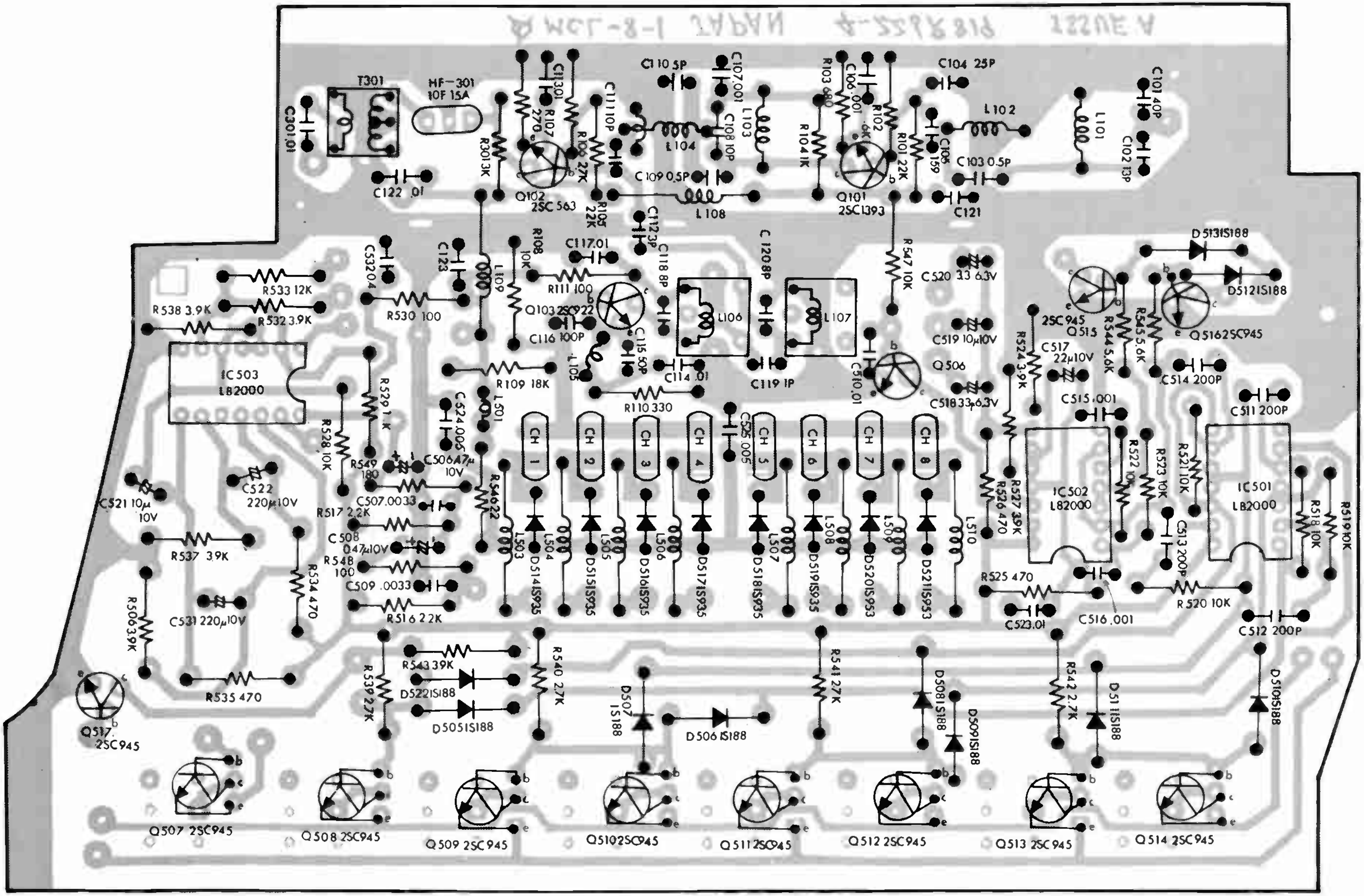


R.F. ANT.
C101 40p
C102
R101 22K
C104 5p
C105 15p
C108 10p
R104 1K
R105 22K
R106 4.7K
L109
C331 0.01
X'tal 10
C327 100p
C328
R515 10K
R514 12K
R512 12K
C506 0.47uF/10V
C502 0.04
R310 1.5K
R313 4.7K
R314 4.7K
R316 820
R317 4.7K
C312 0.04
C311 0.01
D504 1S188
R321 2.2K
R322 1.5K
D503 MA-26
D705 RD11AM
C711 470uF/25V
C709 10uF/10W
C710
R714 0.5
R713 0.5
D702 1S1211
R706 10KB
C707 100uF/10V
C703 33uF/10V
C704 10uF/6.3V
R705 330
R704 15K
R702 3.3K
R701 18K
R511 15K
R508 18K
C701 10uF/10V
R703 10KD VR.
R507 47
R505 22K
R326 100
R325 4.7K
R324 68K
D301 1S188
D302 1S188
C321 100p
C322 10p
C320 50p
C324 50p
C318 0.04
C319 50p
T303
T304
R541 2.7K
R540 2.7K
R539 2.7K
R542 2.7K
C512 200p
C515 0.001
C516 0.001
C507 0.001
R547 22K
C510 0.01
C532 0.04
EXT. SP.
AC 117V
DC 13.8V
OFF
ON
HF 1
MAN.
AUTO

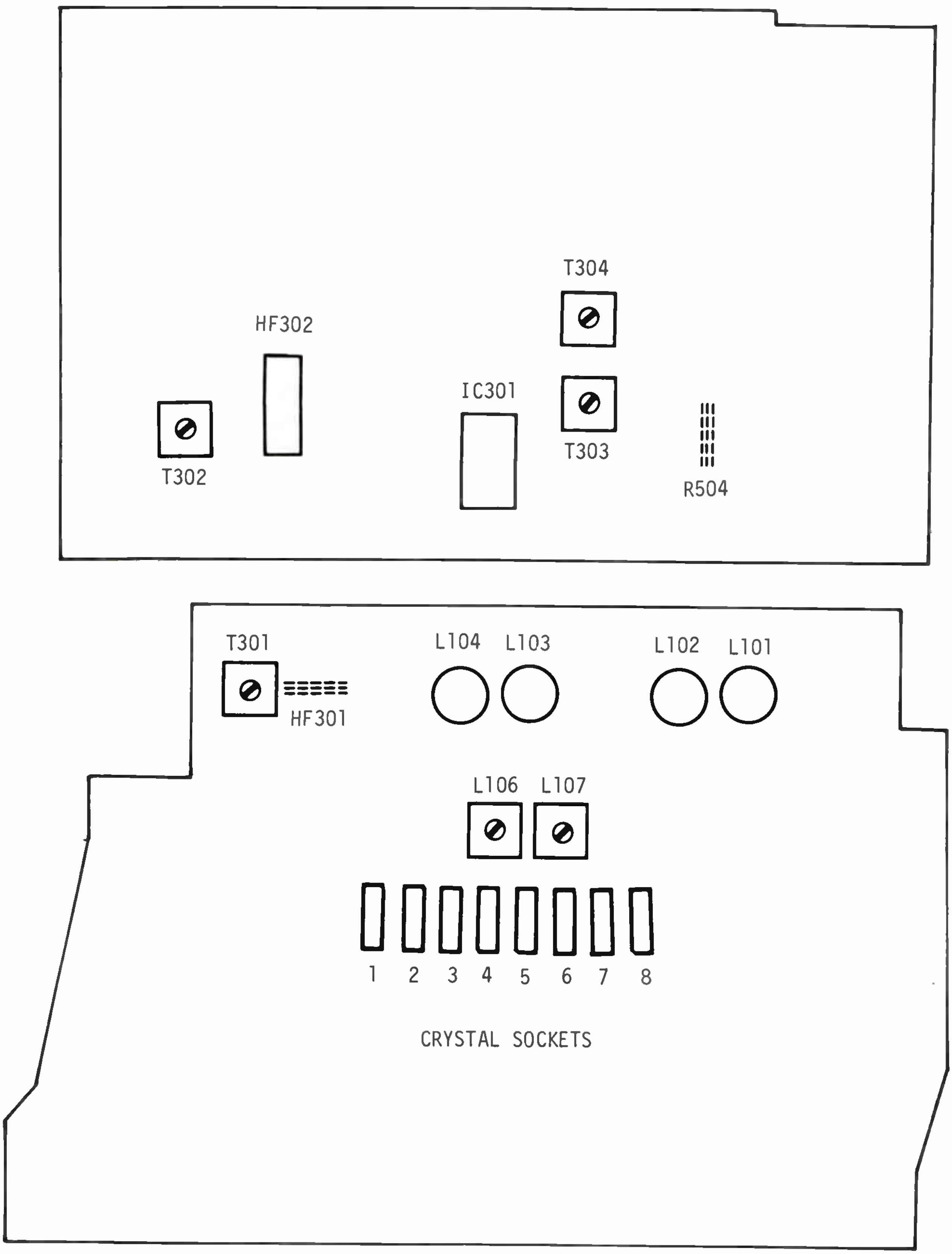

Q 705 2SC 1096
2SD261
Q 703
2SA643
Q704
D704
10PC1
R715 680
R 711 56
R 710 470
R713 0.5
R714 0.5
C707 100μ10V
R712 1.2K
R709 270
C713.01
C712.01
D705RD11AM
C710
220μ
16V
D702 1S188
D701 1S 1212
R707 22K
C705 0.2μ10V
C706 0.047
Q702
2SC
537
C704
0.04
Q701
2SC537
R706
10KB
R705 330
R701 18K
R325 47K
R704 15K
R702 3.3K
R324 68K
R703 120
C702
C703 33μ10V
C711 470μ25V
C708 470μ
16V
D201 1S1 8
C325 .01
C323 .001
C320 50P
R708 1K
Q505
2SC945
Q305
2SC930
Q302
2SC
930
C328 200P
XTAL1
R327 68K
R508 18K
C701 10μ10V
R511 15K
C501 .04
D302 1S188
C505 2.2μ10V
R329 1K
R332 22K
R328 180
R323 680
C324 50P
T304
Q502
2SC945
R515 10K
R329 1.8K
C334
.01
R514 12K
Q504
2SC945
C331.01
C326.02
C327 100P
R331 6.8K
R330 1K
C305 5P
HF-302
CFM-
455D
C329 22μ10V
C314 .01
C317.04
C322 100P
C321 100P
C318 .04
Q501
2SC 945
R506 10K
R513 15K
C504
1μ10V
D501 DS442
D502 DS-
442
R505 15K
C304 .01
R307 22K
R306 5.6K
T302
C306 .02
R308 1K
R311 6.8K
R313 4.7K
R315 22K
R317 4.7K
C312 .04
R318 22K
R319 2.2K
IC 301
LA 1201
C333 .04
T303
R507 47
C502 .04
R504 2KB
D504 1S188
R510 5.6K
R501 3.3K
R509 1.2K
R512 12K
C503 100μ
10V
R305 1K
C309 .01
Q304
2SC930
C319
60P
C316 .04
C332 .01
C303
.01
R303 22K
Q301
2SC930
R304 1K
R302 5.6K
C302 .01
Q303
2SC930
R310 1.5K
R312 820
C302 .01
R314 4.7K
C311
.01
C310
.04
R316 820
C313 .04
C330 47μ6.3V
R322 1.5K
C315 .01
R321 2.2K
R320 1.5K
TH501 STD-100
R503 5.6K
Q503
2SC 945



Pearce-Simpson Cheyenne 8 (PR-78)


T301
HF-301
10F 15A
C301.01
C122 .01
R301 3K
C113 01
R107 270
Q102
2SC 563
R106 27K
R105 22K
C111 10P
C110 5P
C107 .001
L104
C108 10P
L103
C109 0.5P
L108
C112 3P
R103 680
C106 .001
R102 .6K
R104 1K
Q101
2SC1393
R101 22K
C105 15P
C104 25P
L102
C103 0.5P
C121
L101
C101 40P
C102 13P
C532 04
C123
L109
R108 10K
C117 .01
R111 100
Q103 2SC922
C116 100P
C115 50P
C118 8P
C120 8P
L106
L107
L105
C114 .01
C119 1P
R110 330
R547 10K
C520 33 6.3V
C519 10µ10V
C510 .01
Q506
C518 33 6.3V
D513 1S188
D512 1S188
2SC 945
Q515
Q516 2SC945
R544 5.6K
R545 5.6K
R524 3.9K
C517 22µ10V
C514 200P
C515 .001
C511 200P
R533 12K
R532 3.9K
R538 3.9K
R530 100
IC 503
LB2000
R529 1.K
R528 10K
R109 18K
L501
C524 .005
R549 180
C506 47µ 10V
C507 .0033
R546 22
C521 10µ 10V
C522 220µ10V
R517 2.2K
C508 0.47µ10V
R548 100
C509 .0033
R516 2.2K
R537 3.9K
R534 470
C531 220µ10V
R506 3.9K
R535 470
Q517
2SC945
CH 1
CH 2
CH 3
CH 4
CH 5
CH 6
CH 7
CH 8
C525 .005
L503
L504
L505
L506
L507
L508
L509
L510
D514 1S935
D515 1S935
D516 1S935
D517 1S935
D518 1S935
D519 1S935
D520 1S953
D521 1S953
R527 3.9K
R526 470
IC502
LB2000
R522 10K
R523 10K
R521 10K
IC501
LB2000
R518 10K
R519 10K
C513 200P
R525 470
C516 .001
R 520 10K
C523 .01
C512 200P
R543 3.9K
D522 1S188
D505 1S188
R539 2.7K
R540 2.7K
D507 1S188
D506 1S188
R541 2.7K
D508 1S188
D509 1S188
R542 2.7K
D511 1S188
D510 1S188
Q507 2SC945
Q508 2SC945
Q509 2SC 945
Q510 2SC945
Q511 2SC945
Q512 2SC945
Q513 2SC 945
Q514 2SC945

ALIGNMENT PARTS LOCATION



AUDIO ADJUSTMENT

1. Move Priority switches to Off, and set the Squelch control to minimum.
2. Move Scan Control switch to Manual, and select a receive channel near 156 MHz.
3. Connect an oscilloscope or AC VTVM across the speaker coil.
4. Connect an RF signal generator to the antenna terminals. Set the frequency of the RF signal generator to receiver frequency. Set modulation frequency to 1 kHz and deviation to ± 5 kHz.
5. Set generator output to 10,000 uV.
6. Adjust Volume control toward maximum until audio signal displayed on oscilloscope shows clipping of positive or negative peaks.
7. Adjust R706 for equal clipping of positive and negative peaks.

SQUELCH ADJUSTMENT

1. Move Priority switches to Off, and set the Squelch control to minimum.
2. Move Scan Control switch to Manual, and select a receive channel near 156 MHz.
3. Connect an oscilloscope or AC VTVM across the speaker coil.
4. Connect an RF signal generator to the antenna terminals. Set the frequency of the RF signal generator to receiver frequency. Set modulation frequency to 1 kHz and deviation to +5 kHz.
5. Set generator output to 2 uV.
6. Move Squelch control to maximum clockwise position.
7. Adjust R504 to point where squelch begins to open.

Pages 45-54 Courtesy of PEARCE-SIMPSON INC.

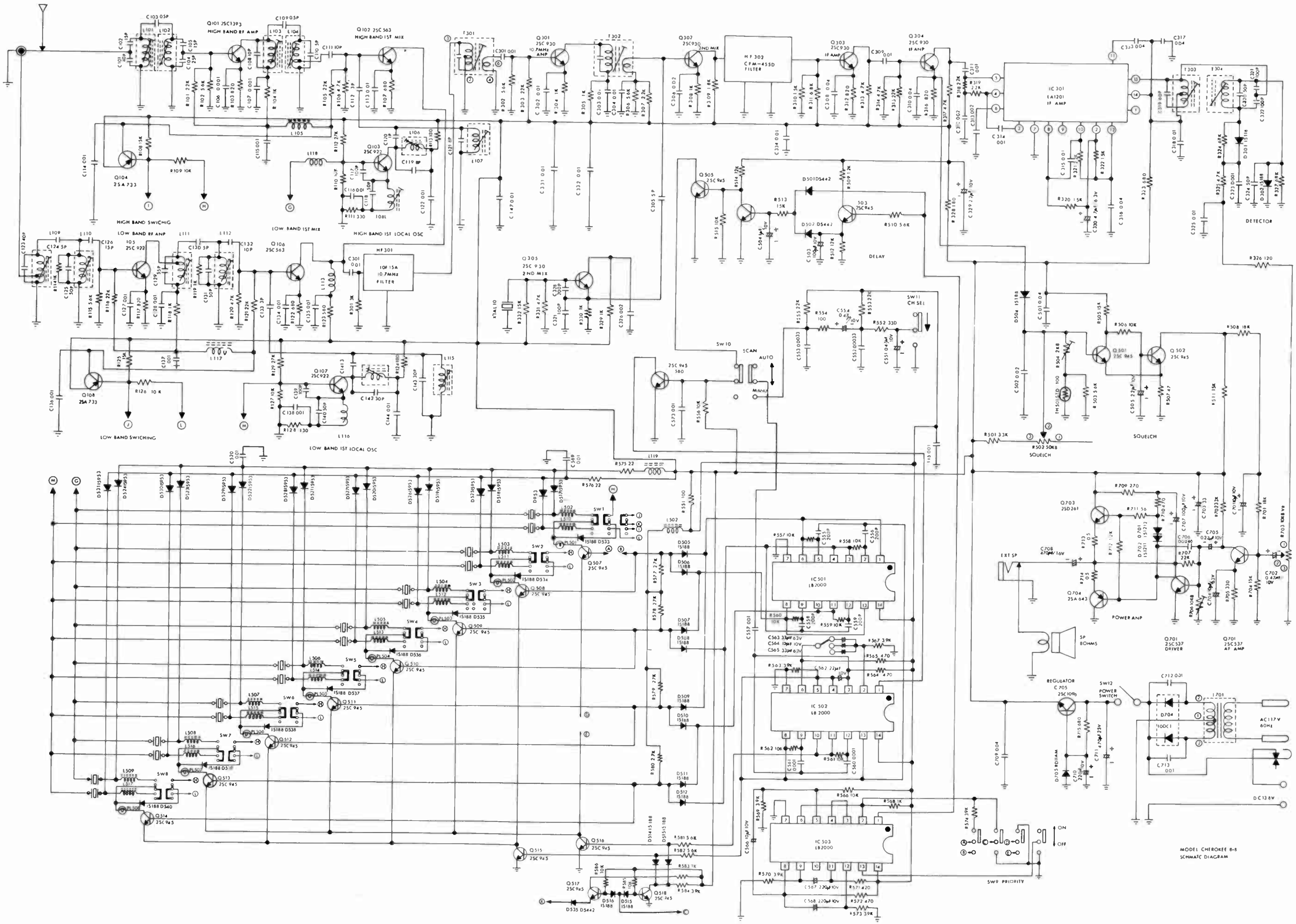
CHEYENNE 8
ALIGNMENT

IF ALIGNMENT

1. Connect the output of a 455 kHz sweep generator to the base of Q302 (2nd mixer).
2. Connect the vertical input of an oscilloscope to the junction of R324 and R325. Connect the horizontal input of the oscilloscope to the sweep generator.
3. Adjust T303 and T304 for optimum linearity of discriminator curve, and centering of 455 kHz marker.

RF ALIGNMENT

1. Move Priority switches to Off, and set the Squelch control to minimum.
2. Move Scan Control switch to Manual, and select a receive channel near 156 MHz.
3. Connect an oscilloscope or AC VTVM across the speaker coil.
4. Connect an RF signal generator to the antenna terminals. Set the frequency of the RF signal generator to receiver frequency. Set modulation frequency to 1 kHz and deviation to ±5 kHz. Keep signal generator output level at minimum level necessary to produce a usable output indication on the oscilloscope or VTVM.
5. Adjust T301, T302, L106 and L107 for maximum output.
6. Adjust L101, L102, L103 and L104 for maximum output, reducing signal level as receiver sensitivity increases.
7. Check receiver sensitivity on highest and lowest frequencies received. Step 6 may be repeated for a more uniform response across the receiver range.



MODEL CHEROKEE 8-8
SCHMATC DIAGRAM

CHEROKEE 8+8
ALIGNMENT

IF ALIGNMENT

1. Connect the output of a 455 kHz sweep generator to the base of Q302 (2nd mixer).
2. Connect the vertical input of an oscilloscope to the junction of R324 and R325. Connect the horizontal input of the oscilloscope to the sweep generator.
3. Adjust T303 and T304 for optimum linearity of discriminator curve, and centering of 455 kHz marker.

HIGH BAND RF ALIGNMENT

1. Move Priority switches to Off, and set the Squelch control to minimum.
2. Move Scan Control switch to Manual, and select a receive channel near 156 MHz.
3. Connect an oscilloscope or AC VTVM across the speaker coil.
4. Connect an RF signal generator to the antenna terminals. Set the frequency of the RF signal generator to receiver frequency. Set modulation frequency to 1 kHz and deviation to ± 5 kHz. Keep signal generator output level at minimum level necessary to produce a usable output indication on the oscilloscope or VTVM.
5. Adjust T301, T302, L106, L107 and L108 for maximum output.
6. Adjust L101, L102, L103 and L104 for maximum output, reducing signal level as receiver sensitivity increases.
7. Check receiver sensitivity on highest and lowest frequencies received. Step 6 may be repeated for a more uniform response across the receiver range.

LOW BAND RF ALIGNMENT

1. Move Priority switches to Off, and set the Squelch control to minimum.
2. Move Scan Control switch to Manual, and select a receive channel near 37 MHz.
3. Connect an oscilloscope or AC VTVM across the speaker coil.
4. Connect an RF signal generator to the antenna terminals. Set the frequency of the RF signal generator to receiver frequency. Set modulation frequency to 1 kHz and deviation to ± 5 kHz. Keep signal generator output level at minimum level necessary to produce a usable output indication on the oscilloscope or VTVM.
5. Adjust T301*, T302*, L114 and L115 for maximum output.
6. Adjust L109, L110, L111 and L112 for maximum output, reducing signal level as receiver sensitivity increases.
7. Check receiver sensitivity on highest and lowest frequencies received. Step 6 may be repeated for a more uniform response across the receiver range.

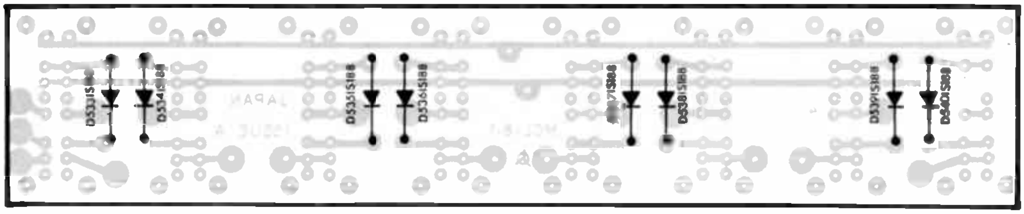
* Omit adjustment of T301 and T302 if High Band RF Alignment has been performed.

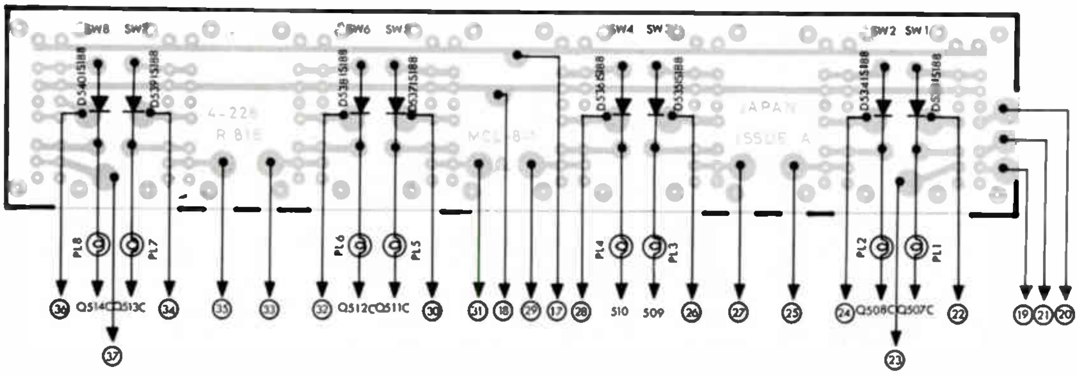
AUDIO ADJUSTMENT

1. Set up receiver, signal generator, and oscilloscope as in Steps 1 through 4 of "High Band RF Alignment"
2. Set generator output to 10,000 uV.
3. Adjust Volume control toward maximum until audio signal displayed on oscilloscope shows clipping of positive or negative peaks.
4. Adjust R706 for equal clipping of positive and negative peaks.

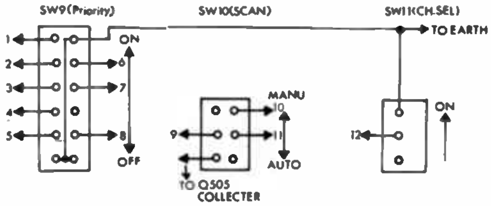
SQUELCH ADJUSTMENT

1. Set up receiver and signal generator as in Steps 1 through 4 of "High Band RF Alignment".
2. Set generator output to 2 uV.
3. Move Squelch control to maximum clockwise position.
4. Adjust R504 to point where squelch begins to open.

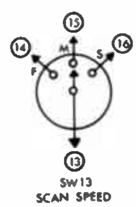




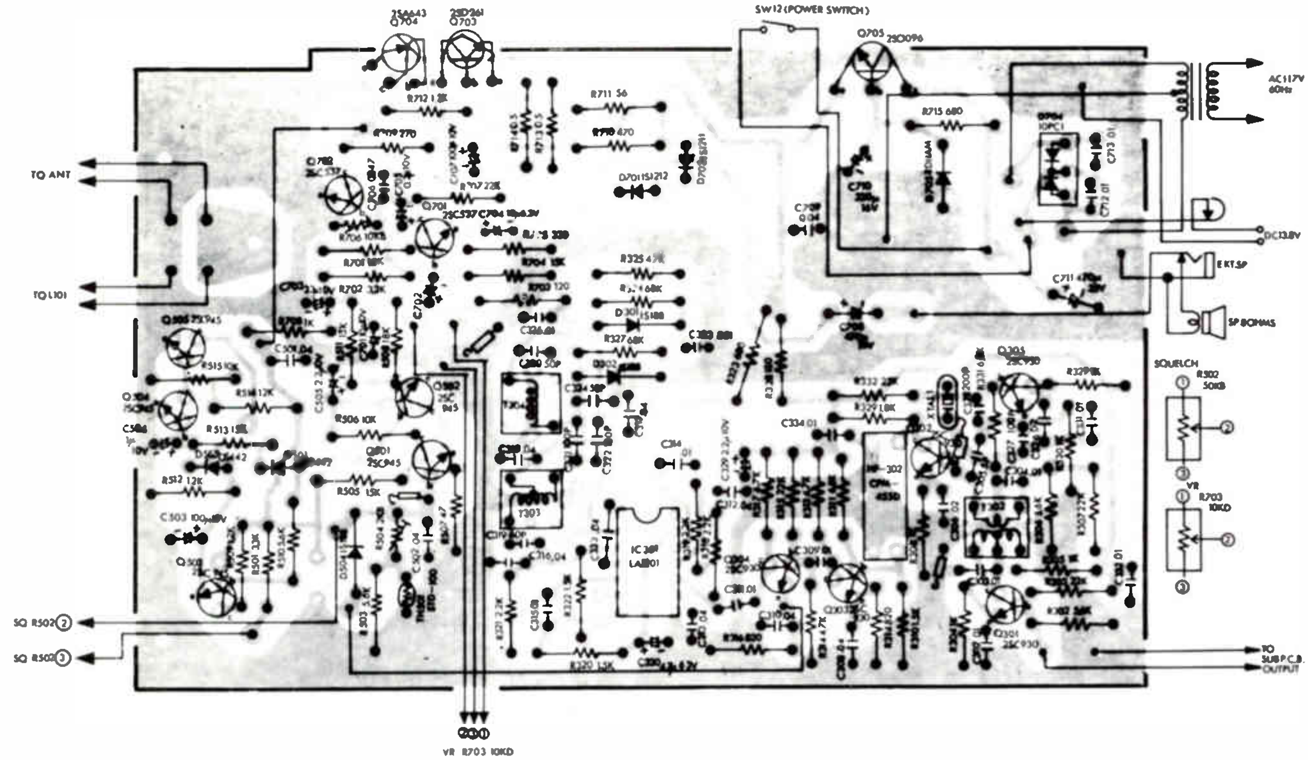
SW8
SW7
SW6
SW5
SW4
SW2
SW1
PL8
PL7
PL6
PL5
PL4
PL3
PL2
PL1
Q514C
Q513C
Q512C
Q511C
510
509
Q508C
Q507C

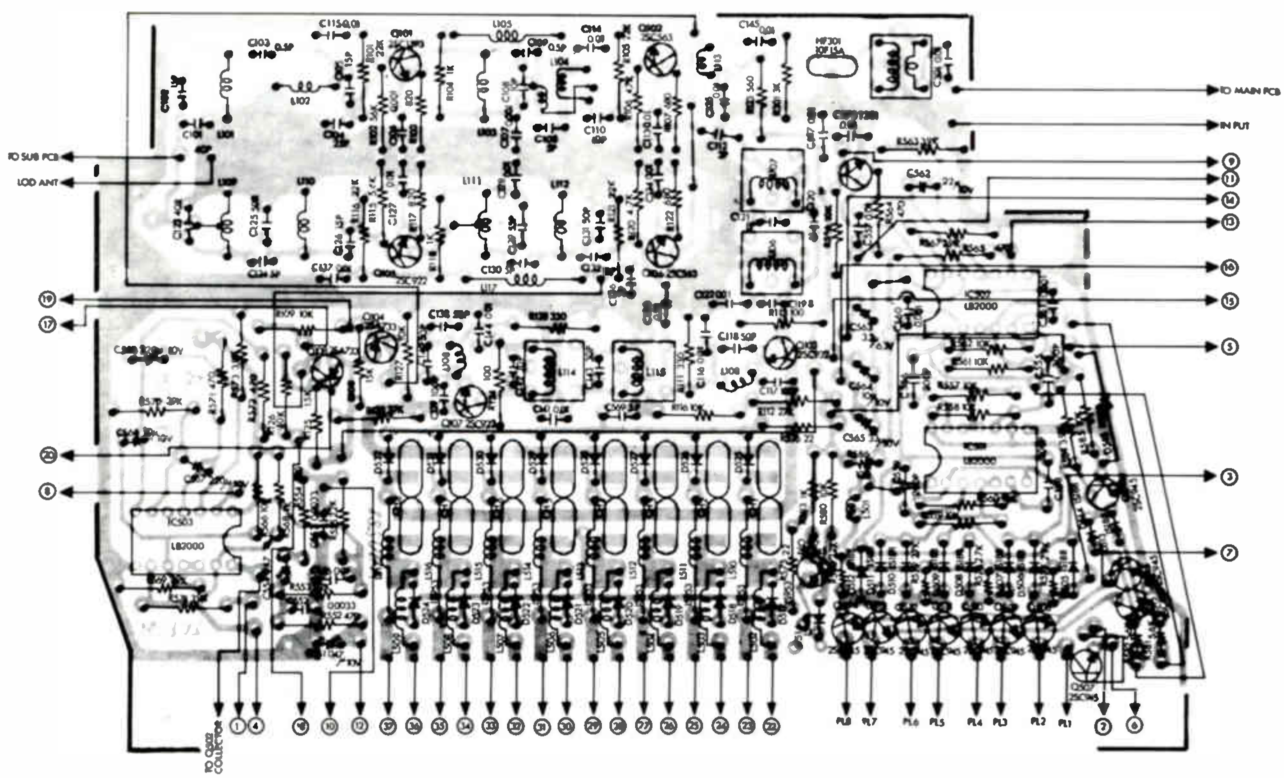


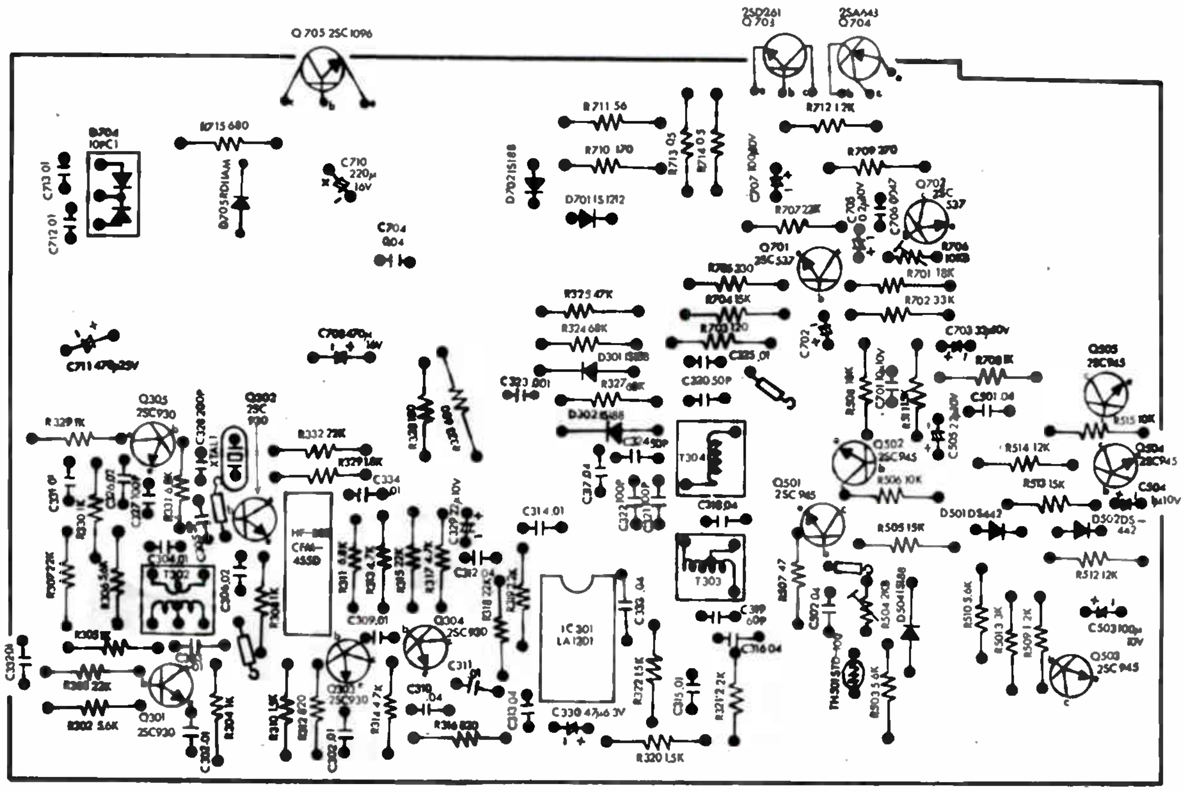
SW9(Priority)
ON
OFF
SW10(SCAN)
MANU
AUTO
TO Q505 COLLECTER
SW11(CH.SEL)
TO EARTH
ON

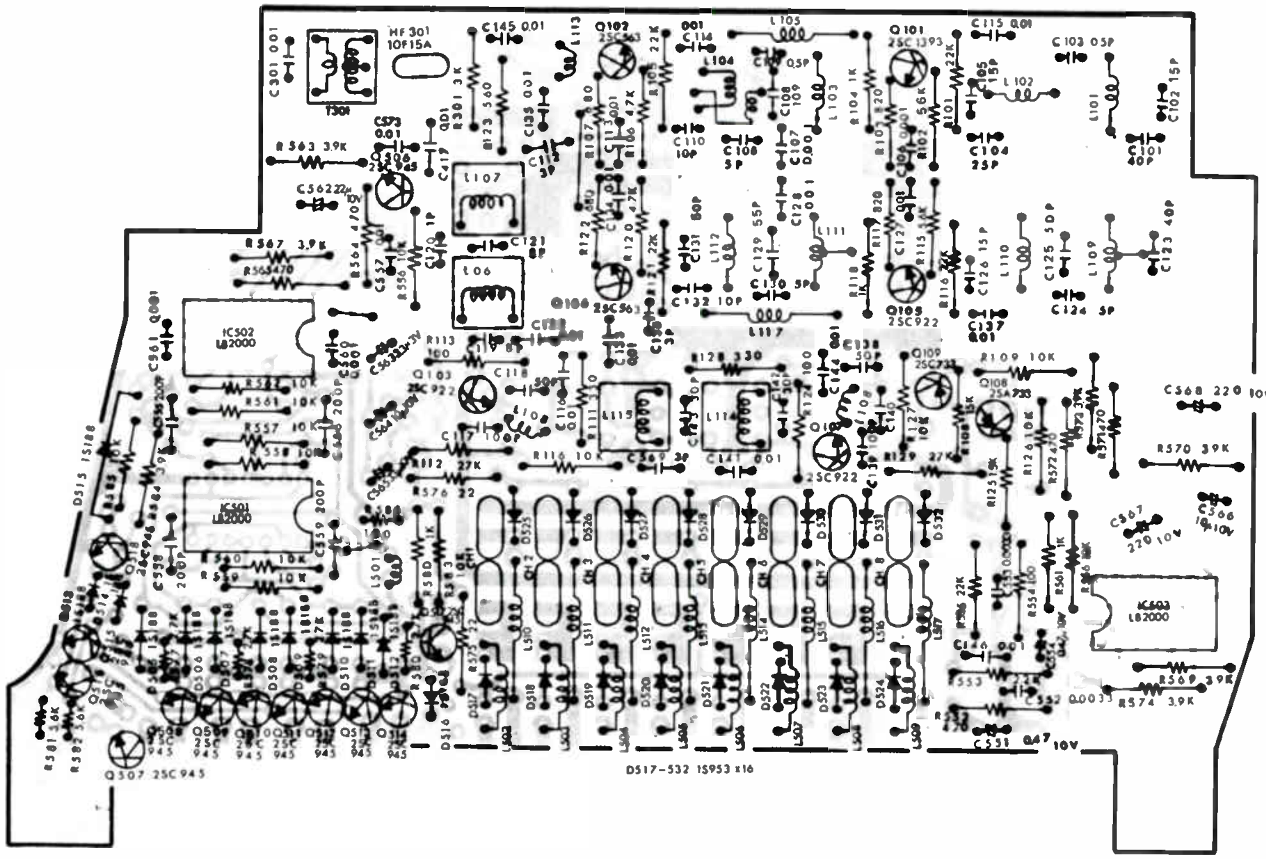


SW13
SCAN SPEED


TO ANT
TO L101
SQ R502②
SQ R502③
SW12 (POWER SWITCH)
AC117V 60Hz
DC13.8V
EXT.SP
SP 8OHMS
SQUELCH
R502 50KB
VR R703 10KΩ
TO SUB P.C.B. OUTPUT
VR R703 10KΩ
IC 301 LA1201

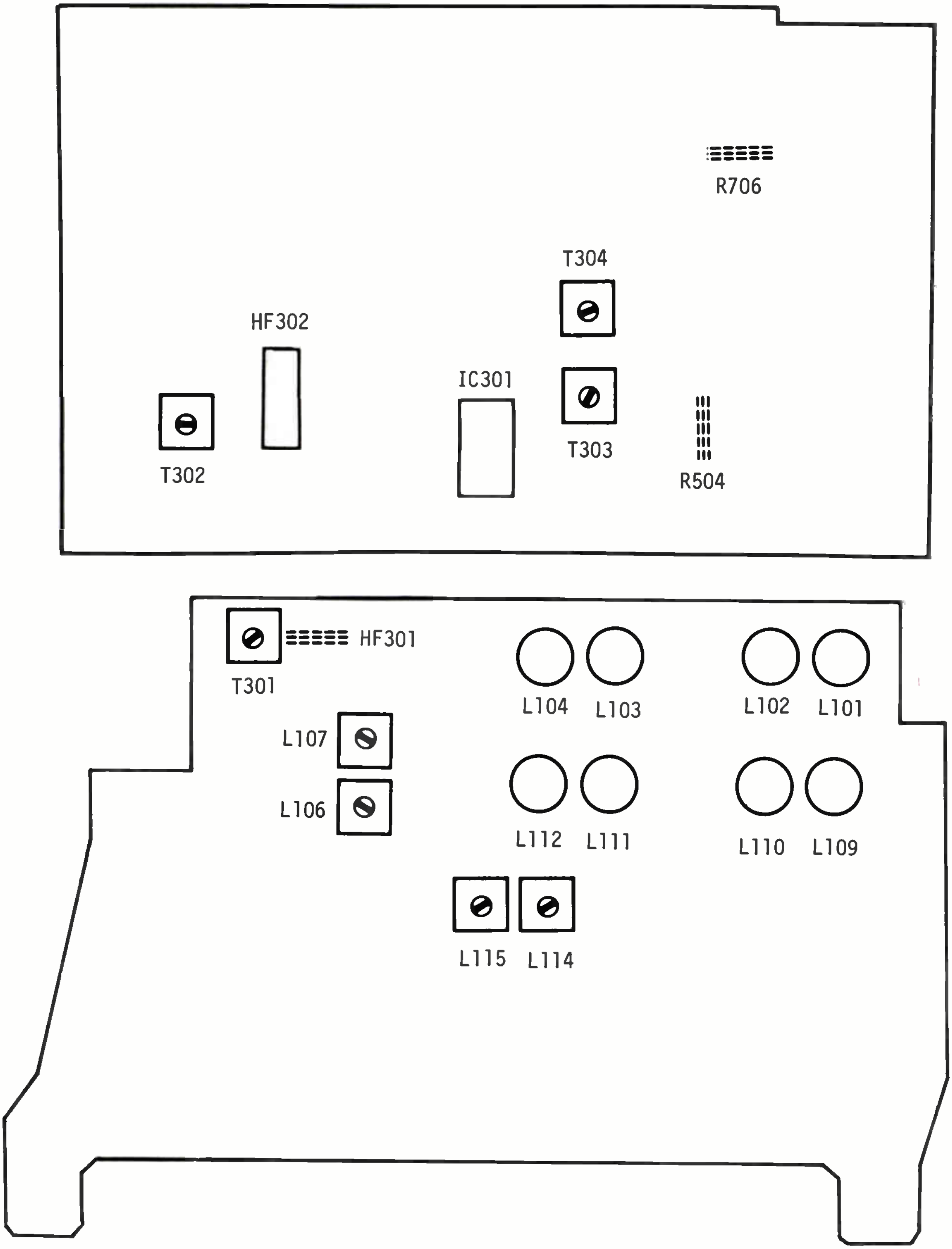

TO MAIN PCB
INPUT
TO SUB PCB
LOD ANT
IC503 LB2000
IC502 LB2000
TO Q602 COLLECTOR
PL8 PL7 PL6 PL5 PL4 PL3 PL2 PL1





Pages 37-44 Courtesy of PEARCE-SIMPSON INC.

ALIGNMENT PARTS LOCATION



SEMICONDUCTORS

ITEM	PART NO./TYPE
D101	MV201
D102	MV201
D301	1S188
D302	1S188
D501	MA-26
D502	DS442
D503	DS442
D504	1S188
D505	1S188
D506	1S188
D507	1S188
D508	DS442
D509	DS442
D510	DS442
D511	DS442
D701	1S1211
D702	1S1212
D703	XZ-100
IC301	LA1201
IC501	DN1946
Q101	2SC787
Q102	2SC787
Q103	2SC787
Q104	2SC387
Q301	2SC829
Q302	2SC829
Q303	2SC829
Q501	2SC945
Q502	2SC945
Q503	2SC945
Q504	2SC945
Q505	2SC945
Q506	2SC945
Q507	2SC945
Q508	2SC945
Q509	2SC945
Q510	2SC945
Q511	2SC945
Q512	2SC945
Q513	2SC945
Q514	2SC945
Q515	2SC945
Q516	2SC945
Q517	2SA733
Q701	2SC537
Q702	2SC945
Q703	2SA643
Q704	2SD261
Q705	2SC1096

ELECTROLYTIC/VARIABLE CAPS

ITEMS	PART NO.	VALUE	
C101	13-123031	Trimmer	
C105	13-123031	Trimmer	
C111	13-123031	Trimmer	
C501	77-336334	.33uf	10V
C503	77-336225	2.2uf	10V
C504	77-336107	100uf	10V
C505	77-336105	1uf	10V
C511	77-336226	22uf	10V
C512	77-336226	22uf	10V
C516	77-336224	.22uf	10V
C517	77-336106	10uf	10V
C701	77-336106	10uf	10V
C702	77-336105	1uf	10V
C703	77-332336	33uf	6.3V
C704	77-336224	.22uf	10V
C705	77-332336	33uf	6.3V
C706	77-336107	100uf	10V
C707	77-337477	470uf	16V
C709	77-337227	220uf	16V
C710	77-337477	470uf	16V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R501	13-164067	4700 ohms Sensitivity
R507	13-166034	50K Squelch
R508	13-164067	4700 ohms Sensitivity
R547	13-164074	5000 ohms Sensitivity
R702	13-160079	10K Volume/Switch
R711	13-164068	10K Sensitivity

COILS/TRANSFORMERS

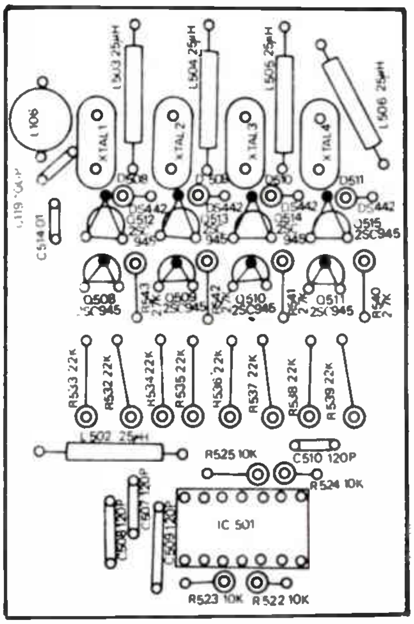
ITEM	PART NO.
L101	13-176362
L102	13-176363
L103	13-176364
L104	13-170185
L105	13-176365
L106	13-176366
L502	13-178127
L503	13-178127
L504	13-178127
L505	13-178127
L506	13-178127
T301	13-090234
T302	13-090234
T303	13-090234
T304	13-090234
T305	13-090235
T306	13-090235
T307	13-090235
T308	13-090235
T309	13-090235
T310	13-090236
T311	13-090235
T312	13-090235

MISCELLANEOUS

ITEM	NAME	PART NO.
S1	Switch, Channel Selector	13-183141
S4	Switch, Scan/Bypass	13-183142
SP	Speaker, 8 ohm, 3W	13-060075
	Crystal, 10.245MHz	13-128248
	P.C. Board, Crystal	13-070091
	Socket, Crystal	13-159133

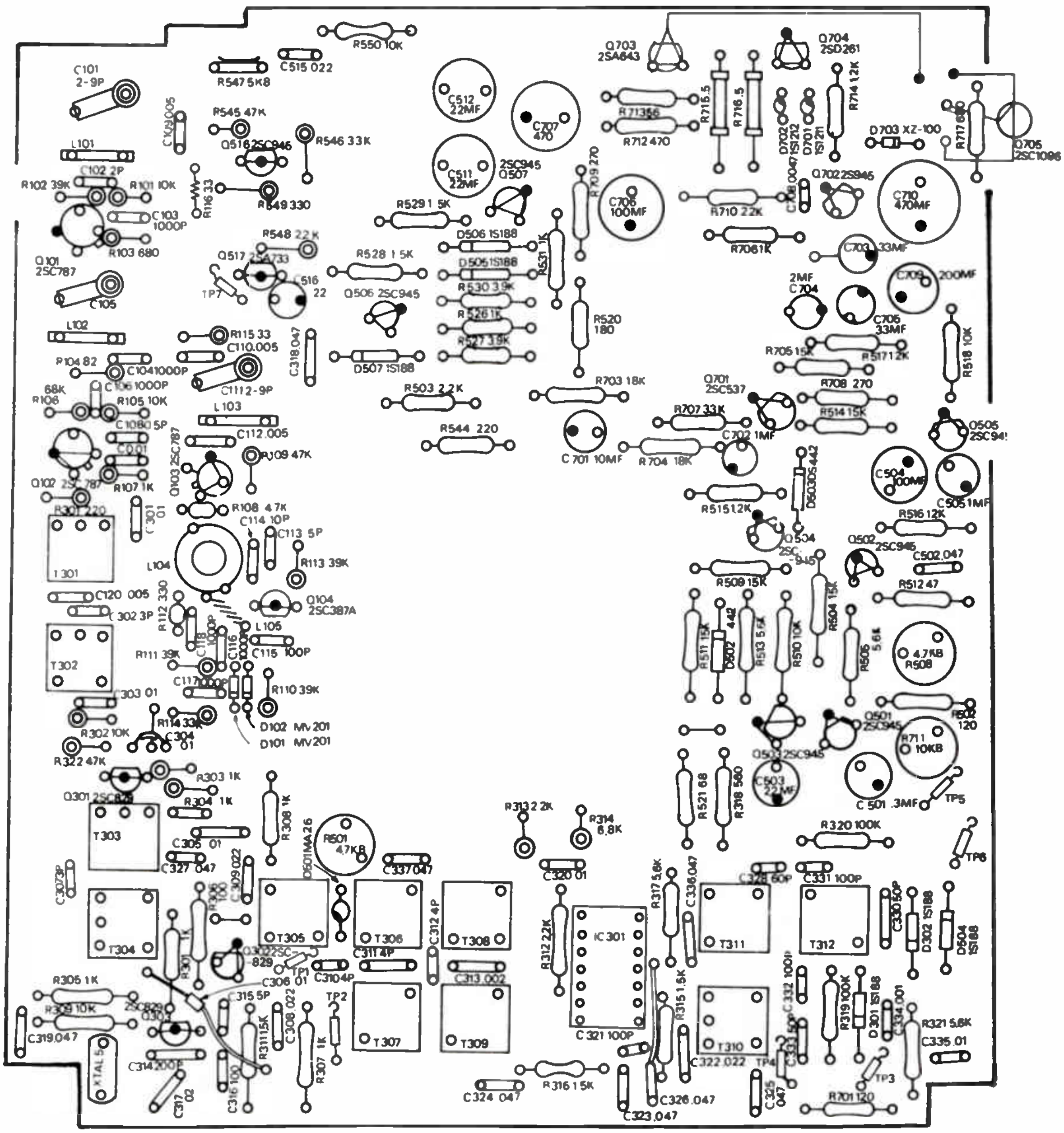
CABINET PARTS

NAME	PART NO.
Cabinet, Main	13-010182
Panel, Front	13-010162
Plate, Front	13-020980
Knob, Volume/Squelch	13-110127
Knob, Bypass/Scan	13-115056
Knob, Channel Select	13-115068

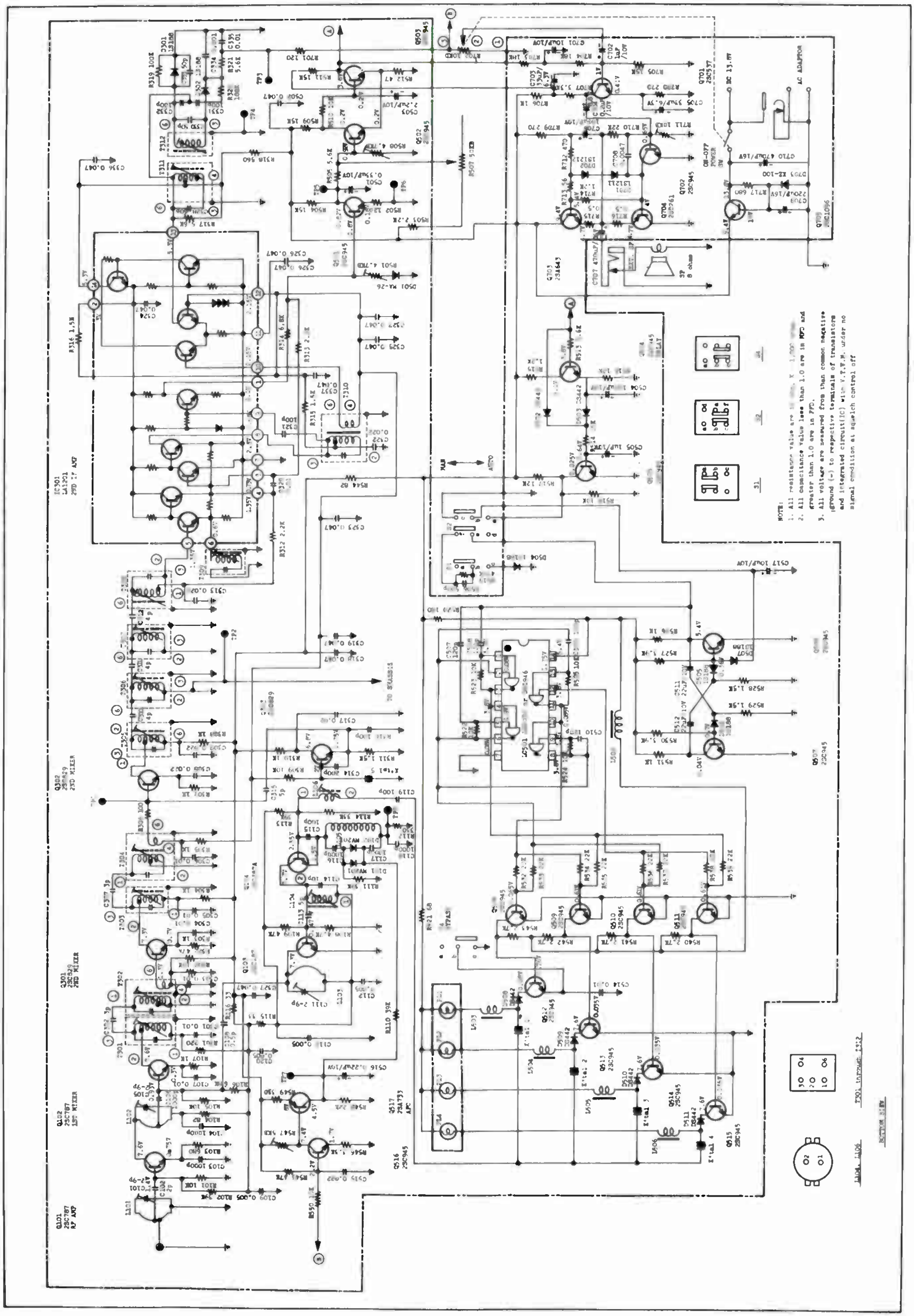


COMPONENT LAYOUT

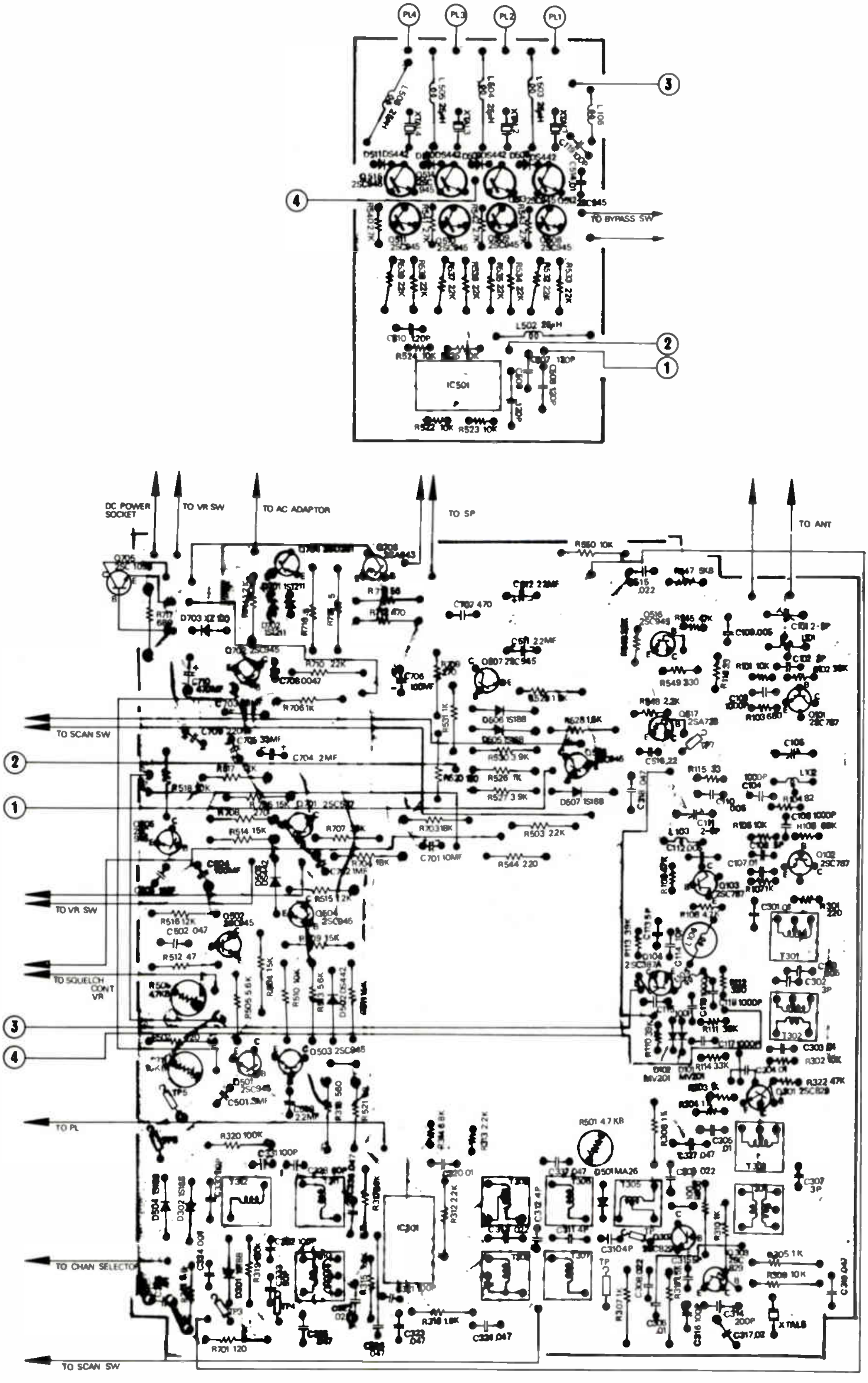
DIAGRAM



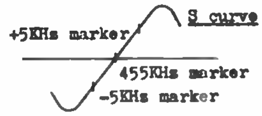
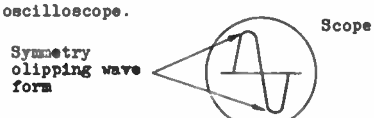
SCHEMATIC DIAGRAM



COMPONENT SYMBOL LAYOUT DIAGRAM



ALIGNMENT PROCEDURE

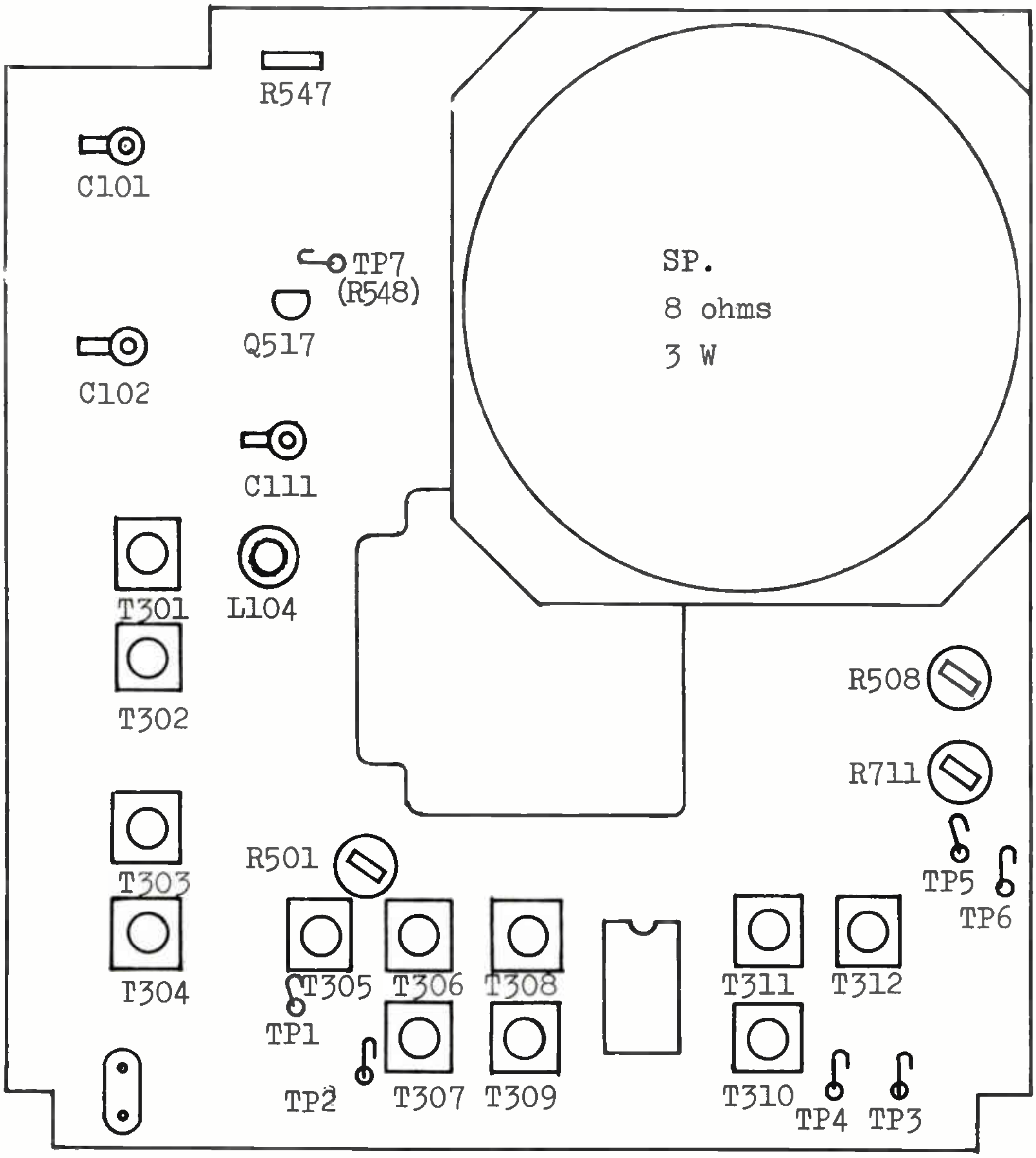
Step	Test Equipment	Meter Point	Alignment Procedure
1. IF Stage	455KHz Sweep Generator	TP1, TP2, TP3, TP4	1) Preset VR cont. for a min. 2) Adjust IFT, from T305 to T312 for S curve charaoteristics. 3) Adjust 455KHz marker signal to center position in the S curve by adjustment of T311 and T312. 4) Adjust T305-312 to symmetry on S curve charaoteristice and ±5KHz marker signal in the scope.  Fig. 1
2. AFC 1st local	DC Volt Meter	TP7, TP2	Adjust semi fixed volume R547 to obtain 3.7V between TP7(R548) and TP2.
3. Frequency	Frequency countor		Adjust L106 to 49.70000MHz.*
4. Audio Stage	FM SSG 458MHz Mod. Freq. 1KHz Deviation ±5KHz 8 ohms dummy load V.T.V.M. SSG output 10KuV	Ant. Terminal Ext. Speaker socket 8 ohms load	1) Preset a) Bypass switoh off b) Scanning switch off c) Squelch control volume min d) Inser crystal(Receiving Freq. 458MHz) to channel 1 e) Select for channel 1 by channel selector. 2) Adjust volume control for a little clipping audio output wave form. 3) Adjust semi fixed volume control R711 to symmetry clipping of audio wave form in the oscilloscope.  Fig. 2
5. Antenna and RF Stage	Same as above After sensitivity in-crease SSG output decrease. Adjust SSG output voltage for a small level in the item (3) and (4).	Same as above	1) Adjust T301, T302, T303, T304 for a max. output. 2) Adjust L104 for a max. output 3) Adjust C101, C102, C111 for a max. output. Repeat above item (1), (2) and (3). 4) Adjust T305-T309 for a max. output.
6. Squelch Adjustment	DC volt meter SSG 458MHz Mod. Freq. 1KHz Deviation ±5KHz Load 8 ohms V.T.V.M. Oscilloscope	TP5, TP6 Ant. Terminal Ext. Speaker socket	1) Preset semi fixed volume control R501 and R508 to mechanical center position. 2) Preset squelch volume control for max. (clockwise position) 3) Adjust semi fixed volume control R501 to obtain 0.4V between TP5 and TP6. 4) Adjust semi fixed volume control R508 to obtain just audio output at 3.2uV output of signal generator. 5) Repeat item (3) and (4).
7. Battery Drain	DC current meter (300mA full scall) DC power supply 13.8V	Series connection to Power supply	Indication of current meter is under 120mA at squelched.

* 1st Local fundamental frequency "fo"

$$fo \; \frac{fs-10.7}{9} \; (MHz)$$

Pages 31-36 Courtesy of MIDLAND COMMUNICATIONS CO.

COMPONENT LAYOUT DIAGRAM



C101, 102, 111 ....Trimmer Condenser
T301, 302, 303, 304 ....10.7MHz, IFT
T305 - 309 ....455KHz, IFT
T310 ....455KHz, IFT (No Adjustment)
T311, 312 ....Detector Coil
L104 ....Oscillator Coil
R501, 508, 711 ....Semi fixed Volume Control

SEMICONDUCTORS

ITEM	PART NO.	TYPE
CR1	523-0006-002	1N4149
CR2	523-0006-002	1N4149
CR3	523-0006-002	1N4149
CR4	523-0006-002	1N4149
CR5	523-0006-002	1N4149
CR6	523-0006-002	1N4149
CR7	523-0006-002	1N4149
CR8	523-0006-002	1N4149
CR9	523-1000-067	1N67A
CR10	523-1000-067	1N67A
CR11	523-0001-002	1N4003
CR12	523-0001-002	1N4003
CR13	523-0001-002	1N4003
CR14	523-0001-002	1N4003
CR15	523-2003-100	10V, 1W Zener
CR101	523-0009-049	MV2209VVC(1)
Q1	576-0003-029	(2)
Q2	576-0003-029	(2)
Q7	576-0003-029	
Q8	576-0003-028	
Q9	576-0003-011	
Q10	576-0002-006	
Q11	576-0002-001	
Q12	576-0002-001	
Q13	576-0003-011	
Q14	576-0003-011	
Q15	576-0003-011	
Q16	576-0003-028	
Q17	576-0003-028	
Q18	576-0003-017	
Q19	576-0003-028	
Q20	576-0003-028	
Q21	576-0003-028	
Q22	576-0003-028	
Q23	576-0003-028	
Q24	576-0003-028	
Q25	576-0003-028	
Q26	576-0003-028	
Q27	576-0003-028	
Q28	576-0003-028	
Q29	576-0002-001	
Q101	576-0003-011	
Q102	576-0003-011	
Q103	576-0003-017	(1)
Q104	576-0003-029	(1)
Q107	596-0003-027	(1)
Q108	576-0006-222	(1)
Q109	576-0003-029	(1)
U1	544-2002-004	CA3011
Q2	544-2003-002	MC1351PQ
U3	544-3001-002	MC723P, PQ
U4	544-3001-003	MC790P
U5	544-3001-001	MC724P

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C60	510-2045-109	1uf	35V
C63	510-2005-568	.56uf	35V
C65	510-2005-568	.56uf	35V
C66	510-4003-007	330uf	10V
C71	510-2045-229	2.2uf	35V
C74	510-2045-229	2.2uf	35V
C75	510-2045-229	2.2uf	35V
C76	510-2045-229	2.2uf	35V
C79	510-4006-005	1000uf	16V
C80	510-4006-005	1000uf	16V
C84	510-4006-005	1000uf	16V
C101	510-4006-002	100uf	25V(1)
C112	187-0106-005	1.7-11pf	Trimmer(1)
C118	187-0106-005	1.7-11pf	Trimmer(1)
C122	187-0106-005	1.7-11pf	Trimmer(1)
C125	187-0106-005	1.7-11pf	Trimmer(1)
C130	187-0106-005	1.7-11pf	Trimmer(1)

(1) UHF MONO-SCAN Only.
(2) VHF MONO-SCAN Only.

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R45	562-0018-008	10K Volume
R61	562-0018-007	5000 ohms Squelch
R57	569-2003-338	
R58	569-2003-338	

COILS/TRANSFORMERS

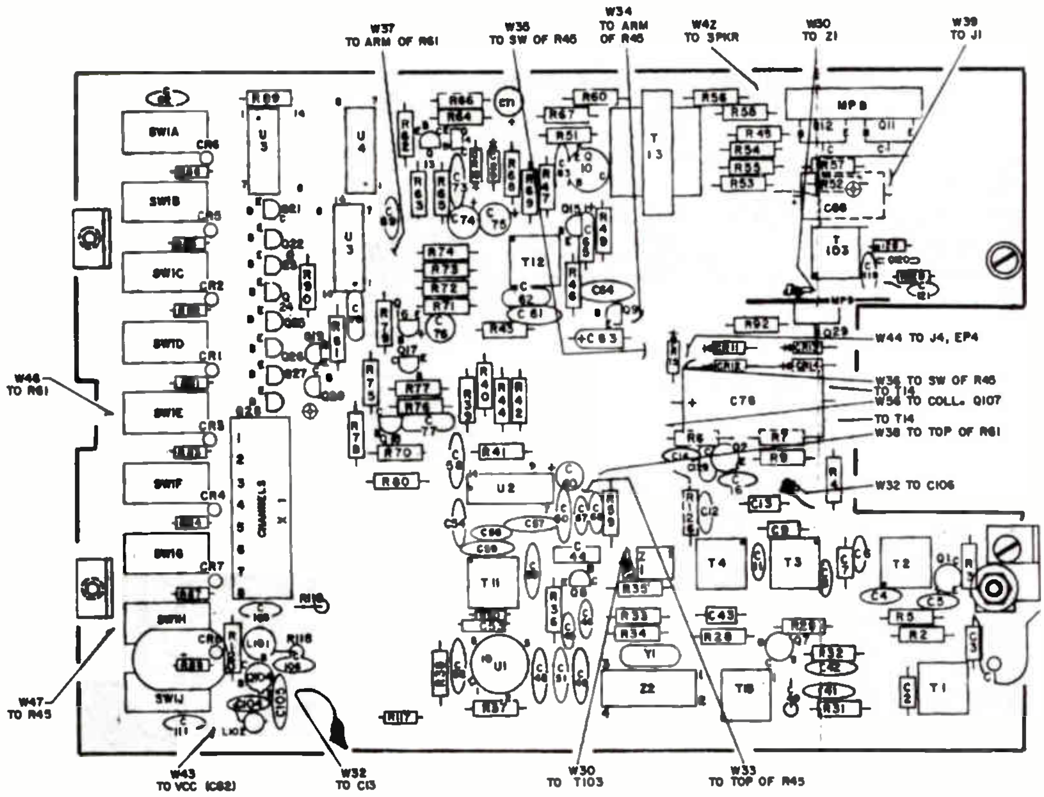
ITEM	PART NO.
L101	542-1006-001
L102	542-1006-020
L103	542-3002-002(1)
L104	023-3165-004(1)
L107	542-3002-001
L108	542-1006-017(1)
T1	592-5009-016(2)
T2	592-5009-016(2)
T3	592-5009-016(2)
T4	592-5009-016(2)
T11	592-5006-006
T12	592-5006-008
T13	592-1015-001
T14	592-3001-008
T15	592-5006-006
T101	023-3165-001(1)
T102	023-3165-002(1)
T103 (RF)	023-3165-003(1)
T103 (10.7MHz)	592-5009-011

MISCELLANEOUS

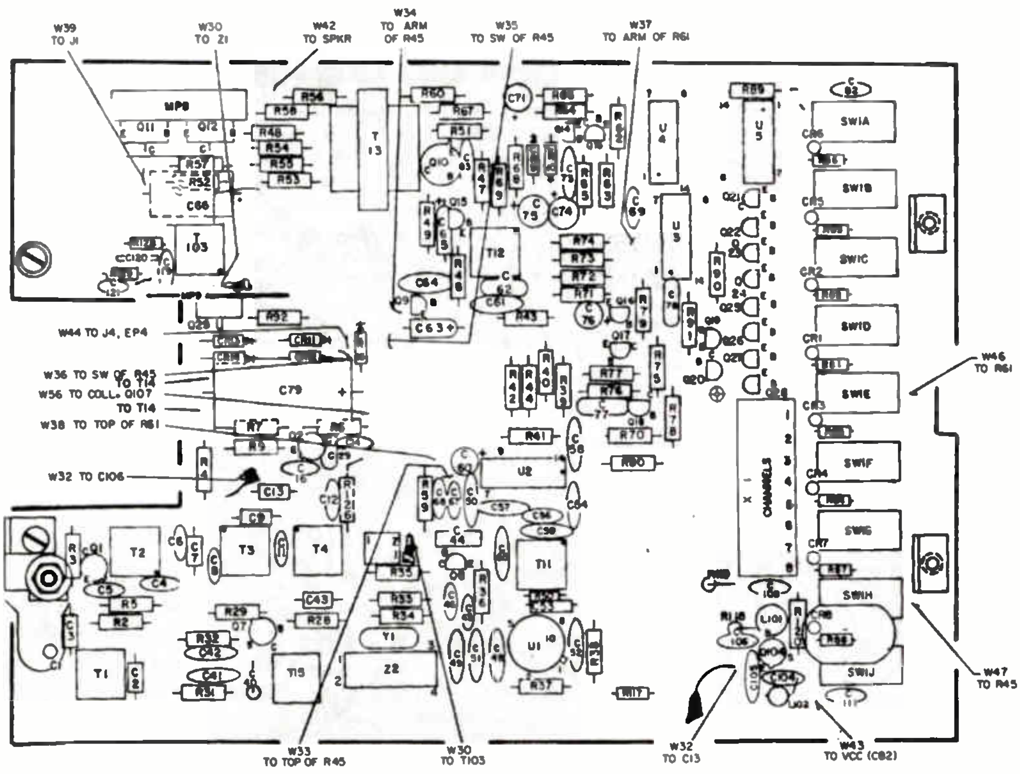
ITEM	NAME	PART NO.
E1	Antenna, Whip	501-0010-001
SW1	Switch, Push Button	583-4008-004
U6	P.C. Board, Main	035-0180-002
U7	Assembly, Speaker	023-2927-002
X1	Socket, Crystal	126-0110-108(1)
X1	Crystal, 11.155MHz	519-0009-001(2)
Z1	Filter, 10.7MHz	532-2001-011
Z2	Filter, 455kHz	532-2002-011(1)
Z2	Filter, 455kHz	532-2003-011(2)

CABINET PARTS

NAME	PART NO.
Assembly, Cabinet	023-2920-002
Panel, Rear	023-2965-003
Panel, Front	032-0307-001
Overlay, Front Panel	559-2058-011(1)
Overlay, Front Panel	559-2058-112(2)



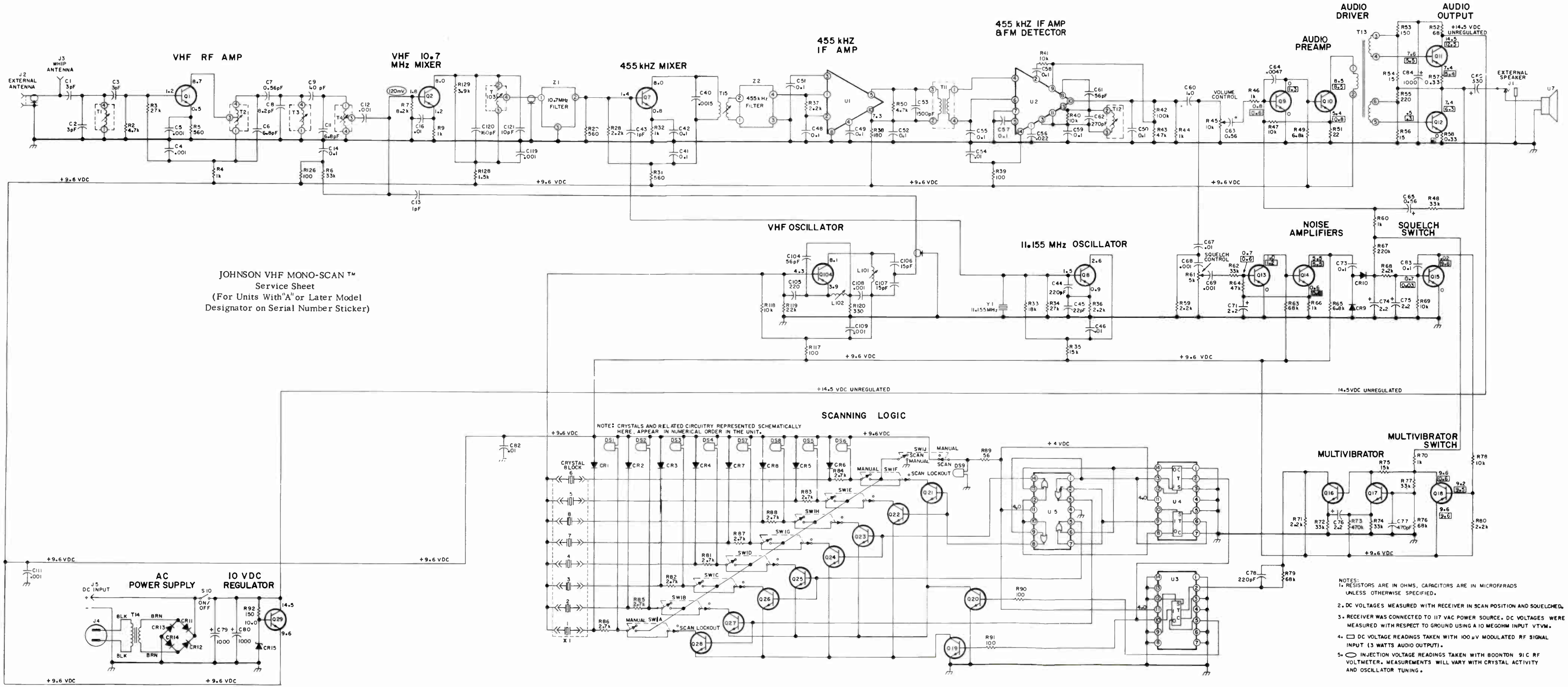
COMPONENT SIDE
(TOP VIEW)



SOLDER SIDE
(BOTTOM VIEW)

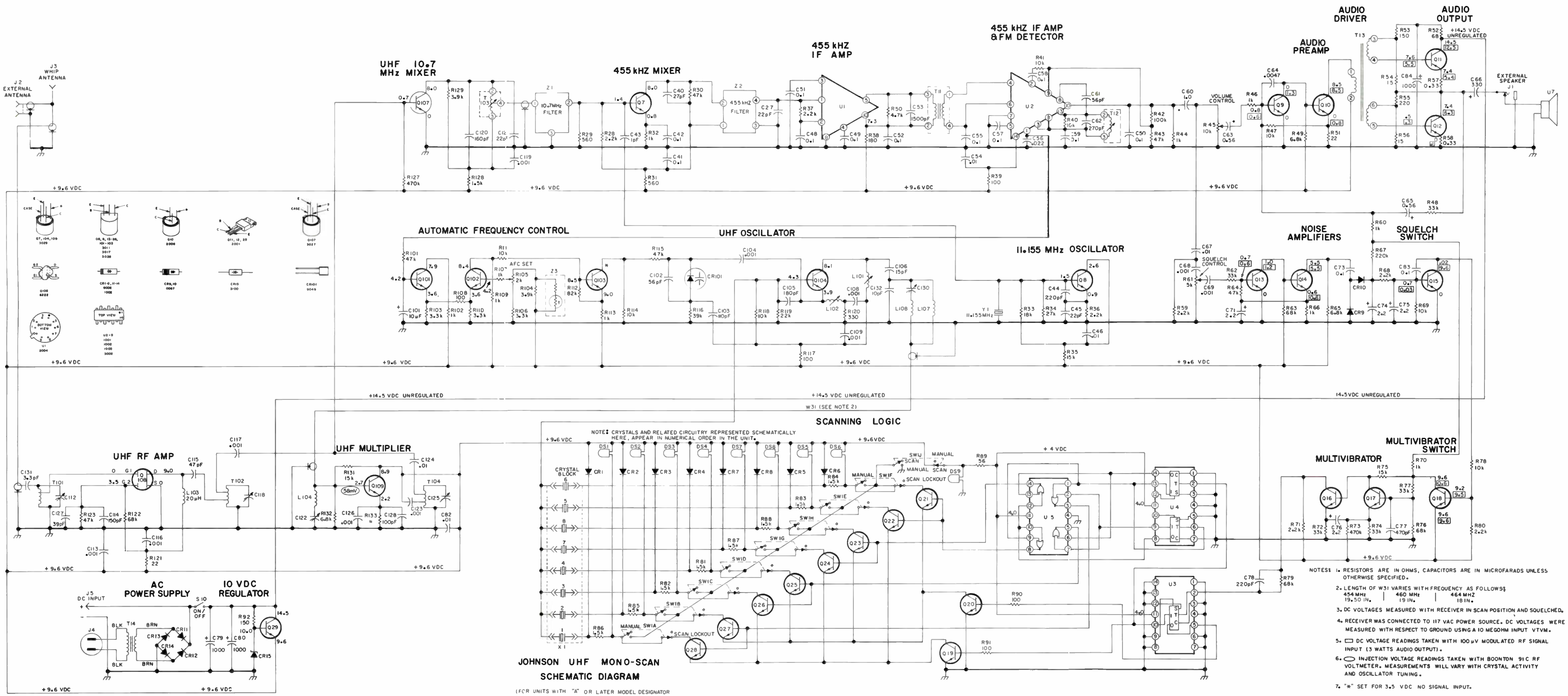
VHF MONO-SCAN

JOHNSON VHF MONO-SCAN ™
Service Sheet
(For Units With "A" or Later Model Designator on Serial Number Sticker)



NOTES:
1. RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. DC VOLTAGES MEASURED WITH RECEIVER IN SCAN POSITION AND SQUELCHED.
3. RECEIVER WAS CONNECTED TO 117 VAC POWER SOURCE. DC VOLTAGES WERE MEASURED WITH RESPECT TO GROUND USING A 10 MEGOHM INPUT VTVM.
4. ▭ DC VOLTAGE READINGS TAKEN WITH 100 µV MODULATED RF SIGNAL INPUT (3 WATTS AUDIO OUTPUT).
5. ⬭ INJECTION VOLTAGE READINGS TAKEN WITH BOONTON 91C RF VOLTMETER. MEASUREMENTS WILL VARY WITH CRYSTAL ACTIVITY AND OSCILLATOR TUNING.

VHF MONO-SCAN



JOHNSON UHF MONO-SCAN SCHEMATIC DIAGRAM

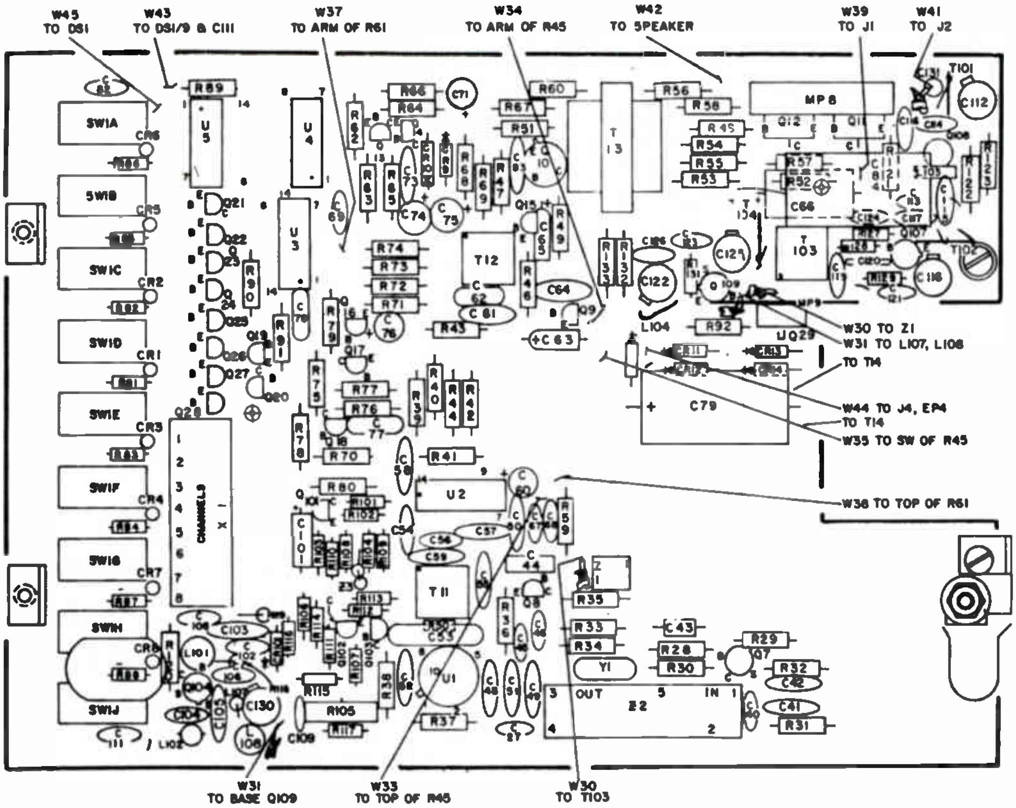
(FOR UNITS WITH "A" OR LATER MODEL DESIGNATOR ON SERIAL NUMBER STICKER)

NOTES:
1. RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. LENGTH OF W31 VARIES WITH FREQUENCY AS FOLLOWS:

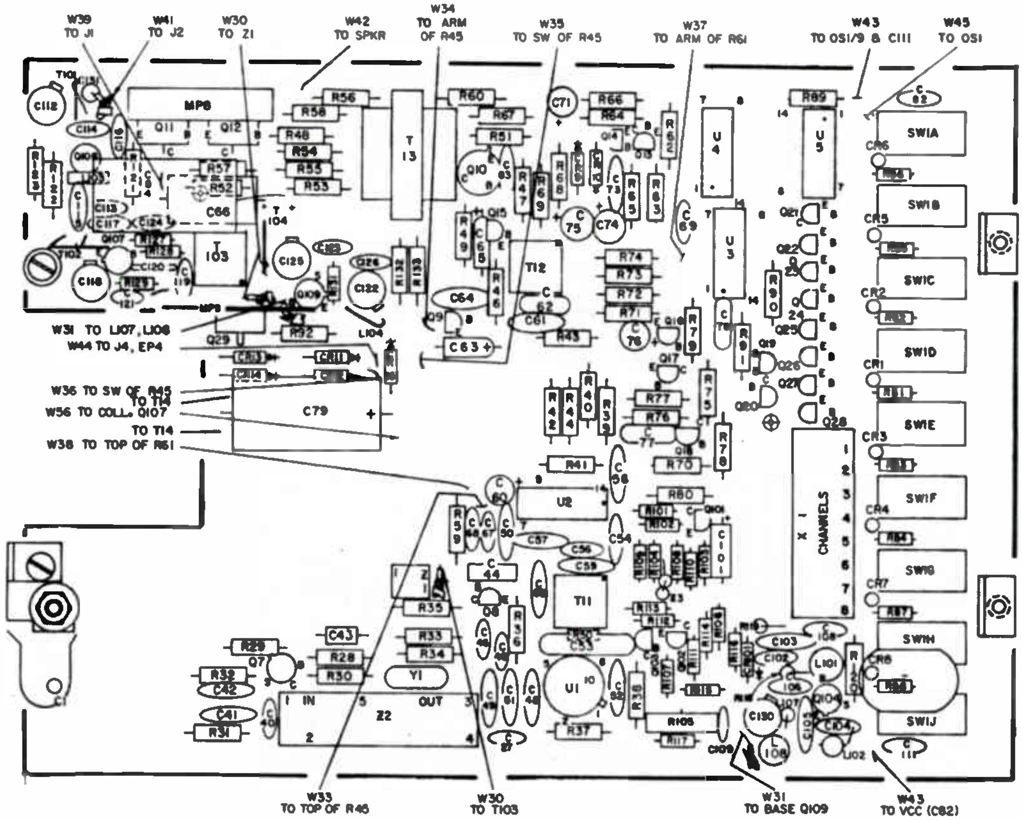
454 MHz	460 MHz	464 MHZ
19.50 IN.	19 IN.	18 IN.

3. DC VOLTAGES MEASURED WITH RECEIVER IN SCAN POSITION AND SQUELCHED.
4. RECEIVER WAS CONNECTED TO 117 VAC POWER SOURCE. DC VOLTAGES WERE MEASURED WITH RESPECT TO GROUND USING A 10 MEGOHM INPUT VTVM.
5. ▭ DC VOLTAGE READINGS TAKEN WITH 100 µV MODULATED RF SIGNAL INPUT (3 WATTS AUDIO OUTPUT).
6. ⬭ INJECTION VOLTAGE READINGS TAKEN WITH BOONTON 91C RF VOLTMETER. MEASUREMENTS WILL VARY WITH CRYSTAL ACTIVITY AND OSCILLATOR TUNING.
7. "*" SET FOR 3.5 VDC NO SIGNAL INPUT.

UHF MONO-SCAN



COMPONENT SIDE
(TOP VIEW)



SOLDER SIDE
(BOTTOM VIEW)

UHF MONO-SCAN

UHF MONO-SCAN ALIGNMENT (CON'T)

c. Adjust T12 for maximum undistorted audio output.

CERAMIC FILTER

The 455 kHz ceramic filter is factory adjusted and will not normally require realignment. However, if the ceramic filter or associated components are replaced, proceed as follows:

a. Connect an oscilloscope across speaker jack J1.

b. Connect the RF signal generator to the antenna connector. Set the generator output level for 5 μV and externally modulate with a 1 kHz audio signal at a 7 to 8 kHz deviation level.

c. Adjust the ceramic filter for clean audio waveform.

QUIETING SENSITIVITY CHECK

a. Adjust the receiver volume control for a 0 dB audio output reference level.

b. Set the RF signal generator to the "center frequency" with 0.7 μV at the antenna connector. The 0 dB audio output level should drop a minimum of 20 dB.

c. Repeat steps a. and b. on the remaining crystals with the signal generator set to each specific crystal frequency and the output level set to 1.0 μV. The 0 dB audio output level should drop a minimum of 20 dB on each channel.

VHF MONO-SCAN

ALIGNMENT

The standard Johnson VHF Mono-Scan™ Monitor Receiver is factory aligned on 157.000 MHz.

To obtain peak receiver performance, selected crystal frequencies should be within ±3.5 MHz of 157.000 MHz.

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the monitor receiver be realigned on the required "center frequency" by a QUALIFIED TECHNICIAN.

Align the monitor receiver on the available frequency which is close to the center of the frequencies installed in the individual customer's receiver. This frequency will be termed "center frequency" in the alignment procedure.

VHF OSCILLATOR

a. Manually select the VHF frequency crystal.

b. Connect an RF voltmeter probe to the base of Q2.

c. Adjust L101 for a maximum RF voltmeter reading. A typical reading between 85 and 500 mV should be indicated.

VHF MONO-SCAN ALIGNMENT (CON'T)

VHF RF AMPLIFIER AND IF AMPLIFIER

a. Connect the RF signal generator to the antenna connector and set the generator output to the "center frequency".

b. Connect the AC voltmeter across the external speaker jack.

1. Adjust T1, T2, T3, T4, T15 and T103 for a minimum AC voltmeter reading (maximum quieting sensitivity).

2. With an RF voltmeter connected to pin 1 of integrated circuit U1, a typical reading of approximately 90 mV should be indicated with a 0.5 μV signal input connected to the antenna connector.

c. Connect the RF voltmeter probe to pin 4 of IC U2.

1. Adjust T11 for a maximum RF voltmeter reading.

2. A typical reading is approximately 75.0 mV with a 0.5 μV signal input at the antenna connector.

DISCRIMINATOR

a. Connect the RF signal generator to the antenna connector and set the generator output to the "center frequency".

b. Externally modulate the RF signal generator with a 1 kHz audio signal at a deviation level of 3.5 kHz.

c. Adjust T12 for maximum undistorted audio output.

QUIETING SENSITIVITY CHECK

a. Adjust the receiver volume control for a 0 dB audio output reference level.

b. Set the RF signal generator to the "center frequency" with 0.5 μV at the antenna connector. The 0 dB audio output level should drop a minimum of 20 dB.

c. Repeat steps a. and b. on the remaining crystals with the signal generator set to each specific crystal frequency and the output level set to 1.0 μV.

Pages 20-30 Courtesy of E. F. JOHNSON COMPANY

REVISED CRYSTAL INFORMATION

Refer to this crystal information when ordering crystals for all monitor receiver models.

	30-50 MHz	150-170 MHz	450-470 MHz
Crystal Frequency	Rec. Freq. +10.7 MHz	$\frac{\text{Rec. Freq. -10.7 MHz}}{3}$	$\frac{\text{Rec. Freq. -10.7 MHz}}{9}$
Frequency Tolerance			
+25°C	±.001%	±.001%	±.001%
-10°C to +60°C	±.002%	±.002%	±.0015%
Mode	3rd Overtone	3rd Overtone	3rd Overtone
Drive Level	2 mW	2 mW	2 mW
Frequency Correlation	Series -450 Hz (or 70 pF load capacity)	Series -450 Hz (or 70 pF load capacity)	18 pF load capacity
Maximum Series Impedance	35 ohms	35 ohms	35 ohms
Holder	HC 25U	HC 25U	HC 25U

520 - xx xx - xxx

Crystal (520)

30 - 30-50 MHz
01 - 150-170 MHz
54 - 450-470 MHz

Crystal Operating Frequency

For Example: A crystal operating frequency of 35.080 MHz would have a part number of 520-3035-080

UHF MONO-SCAN
ALIGNMENT

The standard UHF Mono-Scan Monitor Receiver is factory aligned on 460.000 MHz.

To obtain peak receiver performance, selected crystal frequencies should be within ±4.0 MHz of 460.000 MHz.

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the monitor receiver be realigned on the required "center frequency" by a QUALIFIED TECHNICIAN.

Align the monitor receiver on the available frequency which is close to the center of the frequencies installed in the individual customer's receiver. This frequency will be termed "center frequency" in the alignment procedure.

AUTOMATIC FREQUENCY CONTROL (AFC)

a. Connect the DC VTVM to the collector of Q103.

b. With no signal input (scan mode), adjust AFC set control R105 for a 3.5 VDC reading.

UHF OSCILLATOR

a. Manually select the "center frequency" crystal.

b. Connect an RF voltmeter probe to the base of Q107.

c. Adjust L101 for a maximum RF voltmeter reading.

RF AMPLIFIER, MIXER AND IF AMPLIFIER

a. Connect the RF signal generator to the antenna connector and set the generator output to the "center frequency".

b. Connect the RF voltmeter to pin 1 of IC U1.

1. Adjust C125, C118, C121 and T103 for a maximum RF voltmeter indication.
2. A typical reading of approximately 3 mV with 0.5 μV at the antenna connector should be indicated.

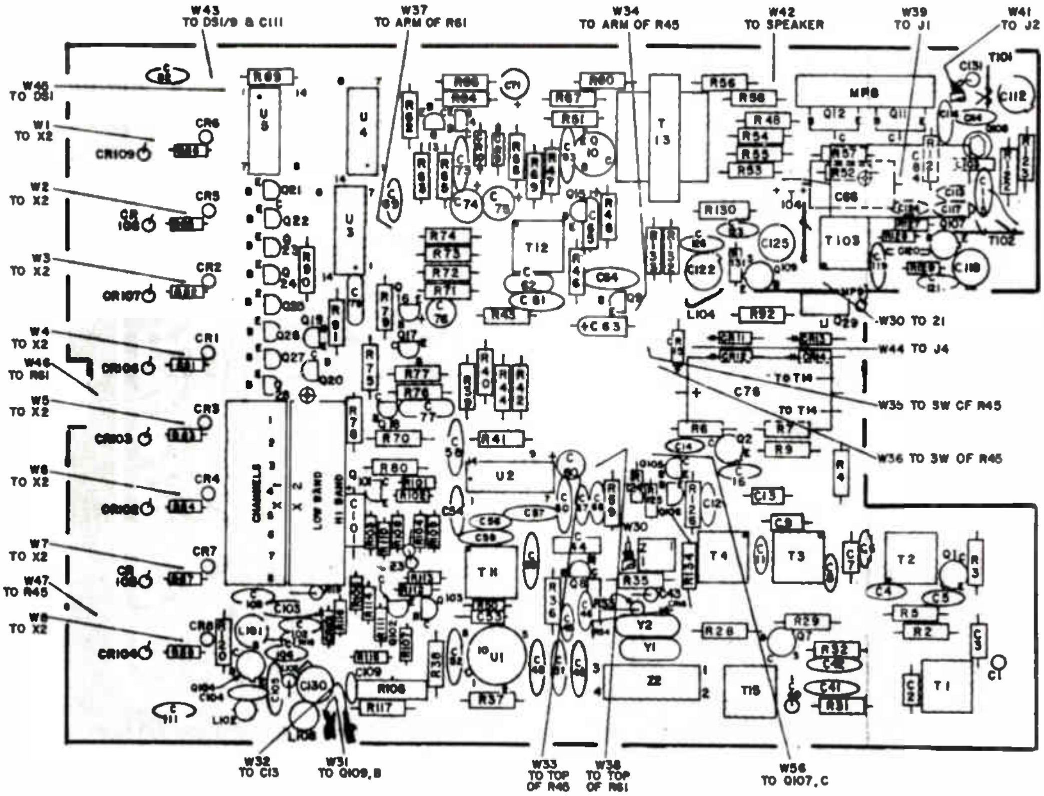
c. Connect the RF voltmeter to pin 4 of IC U2.

1. Adjust T11 for a maximum RF voltmeter reading.
2. A typical reading of approximately 45 mV with 0.5 μV at the antenna connector should be indicated.

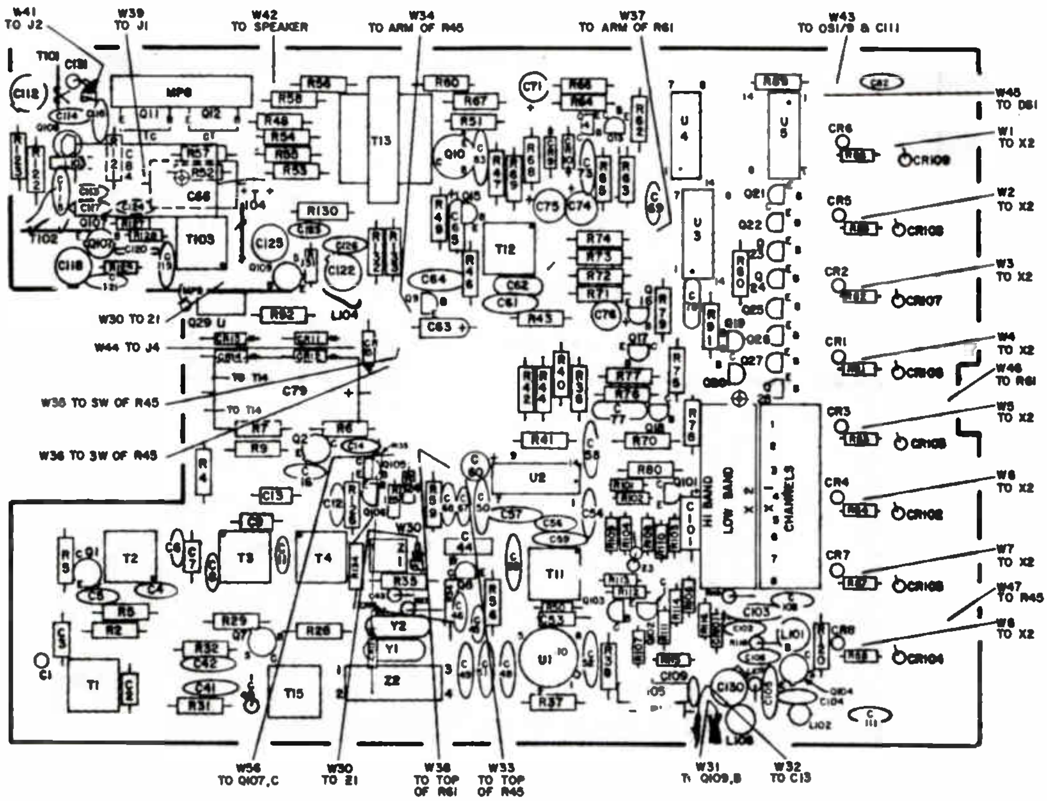
DISCRIMINATOR

a. Connect the RF signal generator to the antenna connector and set the generator output to the "center frequency".

b. Externally modulate the RF signal generator with a 1 kHz audio signal at a deviation level of 3.5 kHz.

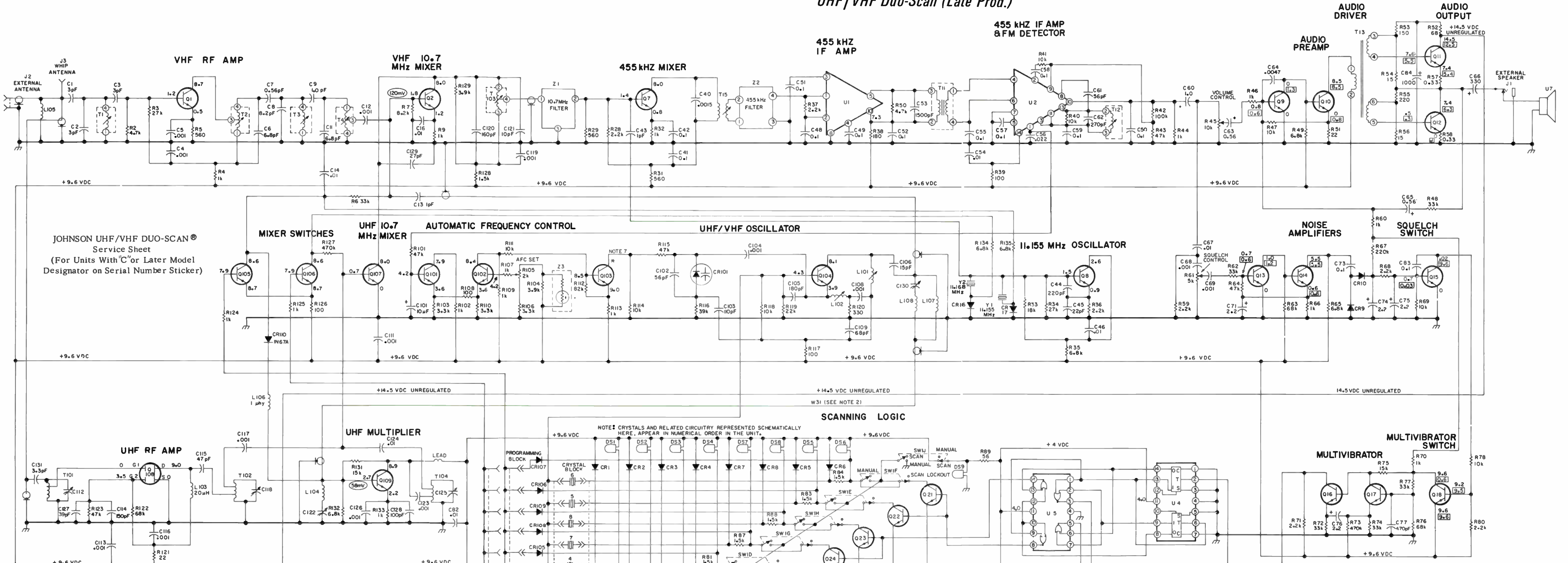


COMPONENT SIDE (TOP VIEW)



SOLDER SIDE (BOTTOM VIEW)

UHF/VHF DUO-SCAN



NOTES: 1. RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

2. LENGTH OF W31 VARIES WITH FREQUENCY AS FOLLOWS:

454 MHz	460 MHz	464 MHZ
16.75 IN.	15.50 IN.	14.25 IN.

3. DC VOLTAGES MEASURED WITH RECEIVER IN SCAN POSITION AND SQUELCHED.

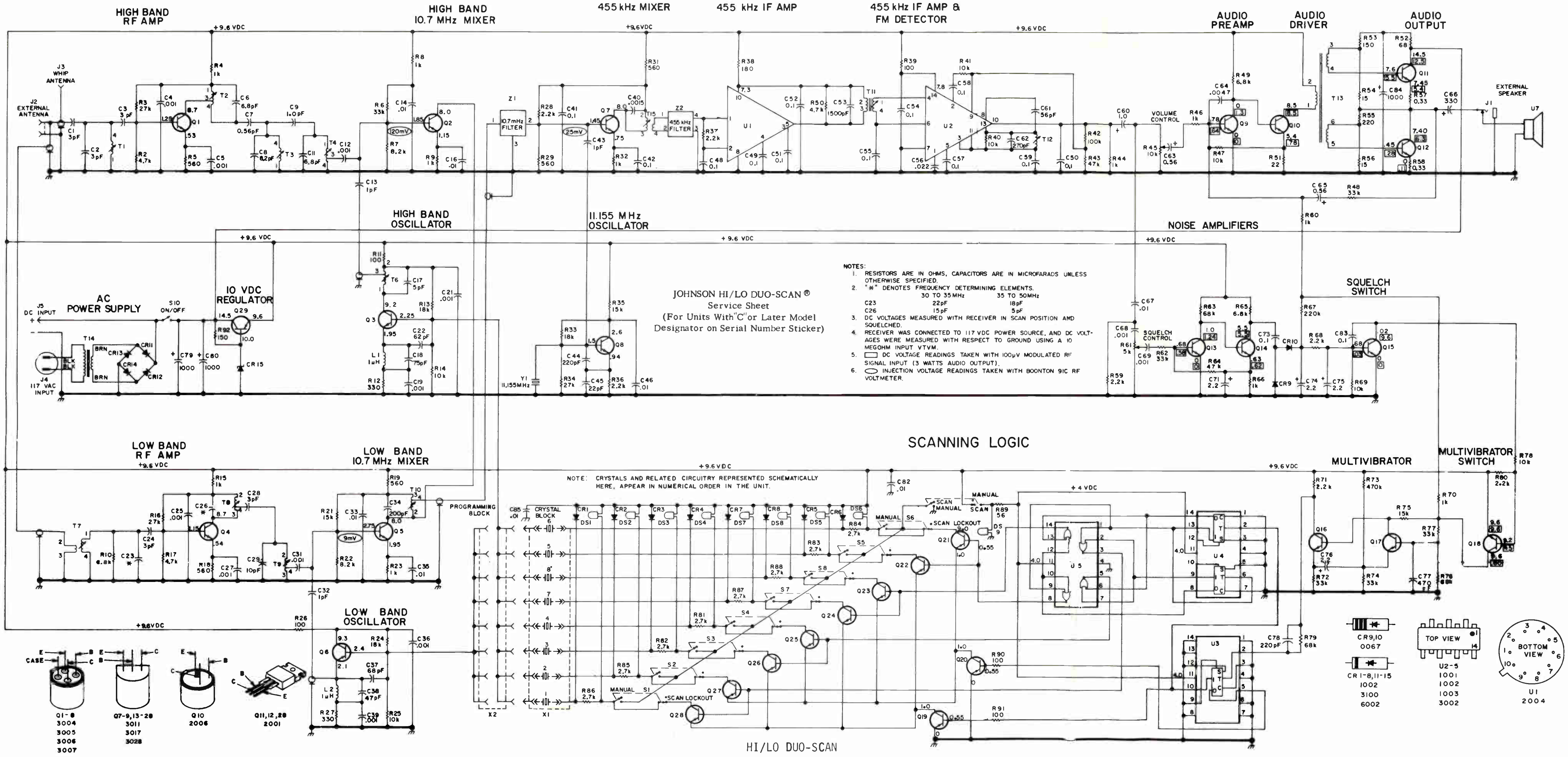
4. RECEIVER WAS CONNECTED TO 117 VAC POWER SOURCE. DC VOLTAGES WERE MEASURED WITH RESPECT TO GROUND USING A 10 MEGOHM INPUT VTVM.

5. ▭ DC VOLTAGE READINGS TAKEN WITH 100 µV MODULATED RF SIGNAL INPUT (3 WATTS AUDIO OUTPUT).

6. ⬭ INJECTION VOLTAGE READINGS TAKEN WITH BOONTON 91C RF VOLTMETER. MEASUREMENTS WILL VARY WITH CRYSTAL ACTIVITY AND OSCILLATOR TUNING.

7. "*" SET FOR 3.5 VDC WHILE SCANNING, WITH CRYSTALS.

UHF/VHF DUO-SCAN

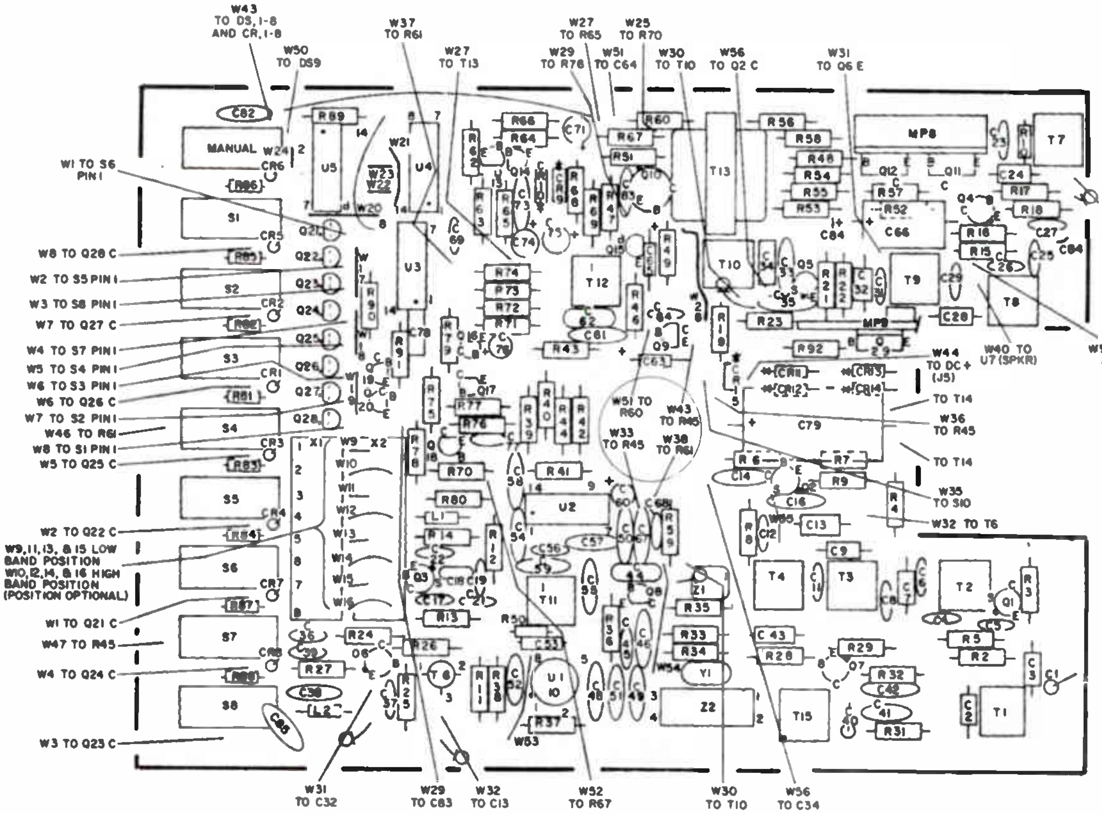


JOHNSON HI/LO DUO-SCAN®
Service Sheet
(For Units With "C" or Later Model Designator on Serial Number Sticker)

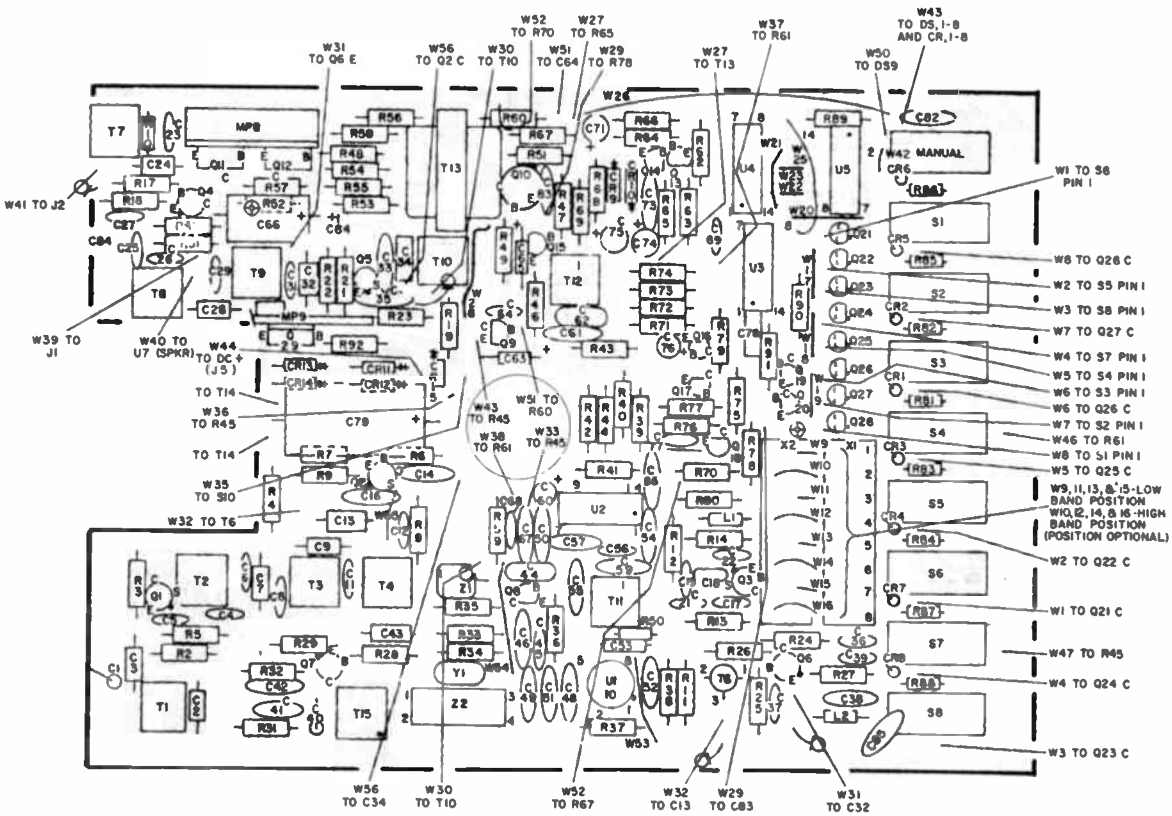
NOTES:
1. RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. "*" DENOTES FREQUENCY DETERMINING ELEMENTS.

	30 TO 35MHz	35 TO 50MHz
C23	22pF	18pF
C26	15pF	5pF

3. DC VOLTAGES MEASURED WITH RECEIVER IN SCAN POSITION AND SQUELCHED.
4. RECEIVER WAS CONNECTED TO 117 VDC POWER SOURCE, AND DC VOLTAGES WERE MEASURED WITH RESPECT TO GROUND USING A 10 MEGOHM INPUT VTVM.
5. ▭ DC VOLTAGE READINGS TAKEN WITH 100μV MODULATED RF SIGNAL INPUT (3 WATTS AUDIO OUTPUT).
6. ⬭ INJECTION VOLTAGE READINGS TAKEN WITH BOONTON 91C RF VOLTMETER.



COMPONENT SIDE
(Top View)



SOLDER SIDE
(Bottom View)

HI/LO DUO-SCAN

SEMICONDUCTORS

ITEM	PART NO.	TYPE
CR1	523-0006-002	FA111
CR2	523-0006-002	FA111
CR3	523-0006-002	FA111
CR4	523-0006-002	FA111
CR5	523-0006-002	FA111
CR6	523-0006-002	FA111
CR7	523-0006-002	FA111
CR8	523-0006-002	FA111
CR9	523-1000-67	1N67(1N67A)
CR10	523-1000-67	1N67(1N67A)
CR11	523-0001-002	1N4003
CR12	523-0001-002	1N4003
CR13	523-0001-002	1N4003
CR14	523-0001-002	1N4003
CR15	523-2003-100	10V, 1W, 25 mA Zener
CR101	523-0009-049	MV2209VVC(2)
CR102	523-1000-881	1N881(2)
CR103	523-1000-881	1N881(2)
CR104	523-1000-881	1N881(2)
CR105	523-1000-881	1N881(2)
CR106	523-1000-881	1N881(2)
CR107	523-1000-881	1N881(2)
CR108	523-1000-881	1N881(2)
CR109	523-1000-881	1N881(2)
CR110	523-1000-067	1N67A(2)
Q1	576-0003-029	
Q2	576-0003-029	
Q3	576-0003-029(1)	
Q4	576-0003-029(1)	
Q5	576-0003-029(1)	
Q6	576-0003-029(1)	
Q7	576-0003-029	
Q8	576-0003-028	
Q9	576-0003-011	
Q10	576-0002-006	
Q11	576-0002-001	
Q12	576-0002-001	
Q13	576-0003-011	
Q14	576-0003-011	
Q15	576-0003-011	
Q16	576-0003-028	
Q17	576-0003-028	
Q18	576-0003-017	
Q19	576-0003-028	
Q20	576-0003-028	
Q21	576-0003-028	
Q22	576-0003-028	
Q23	576-0003-028	
Q24	576-0003-028	
Q25	576-0003-028	
Q26	576-0003-028	
Q27	576-0003-028	
Q28	576-0003-028	
Q29	576-0002-001	
Q101	576-0003-001	(2)
Q102	576-0003-011	(2)
Q103	576-0003-017	(2)
Q104	576-0003-029	(2)
Q105	576-0003-017	(2)
Q106	576-0003-017	(2)
Q107	576-0003-027	(2)
Q108	576-0006-222	(2)
Q109	576-0003-029	(2)
U1	544-2002-004	CA3011
U2	544-2003-002	SC5245P(MC1351P, PQ)
U3	544-3001-002	MC723P
U4	544-3001-003	MC790P
U5	544-3001-001	MC724P

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE	
C60	510-2045-109	1uf	35V
C63	510-2005-568	.56uf	35V
C65	510-2005-568	.56uf	35V
C66	510-4003-007	330uf	10V
C71	510-2045-229	2.2uf	35V
C74	510-2045-229	2.2uf	35V
C75	510-2045-229	2.2uf	35V
C76	510-2045-229	2.2uf	35V
C79	510-4006-005	1000uf	16V
C80	510-4006-005	1000uf	16V
C84	510-4006-005	1000uf	16V
C101	150-4006-002	10uf	25V(2)

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R45	562-0018-008	10K Volume
R61	562-0018-007	5000 ohms Squelch

COILS/TRANSFORMERS

ITEM	PART NO.
L1	542-3002-001(1)
L2	542-3002-001(1)
L101	542-1006-001(2)
L102	542-1006-020(2)
L103	542-3002-002(2)
L104	023-3165-004(2)
L105	542-0007-001(2)
L106	542-3002-001(2)
L107	542-3002-001(2)
L108	542-1006-017(2)
T1	592-5009-016
T2	592-5009-016
T3	592-5009-016
T4	592-5009-016
T6	592-5030-021(1)
T7	592-5015-004(1)
T8	592-5009-011(1)
T9	592-5009-011(1)
T10	592-5009-011(1)
T11	592-5006-006
T12	592-5006-008
T13	592-1015-001
T14	592-3001-008(1)
T15	592-5006-006
T101	023-3165-001(2)
T102	023-3165-002(2)
T103	592-5009-011(2)
T104	023-3165-003(2)

MISCELLANEOUS

ITEM	NAME	PART NO.
E1	Antenna, Telescopic	501-0010-001
S1-S9	Switch, Channel	583-4008-004
U7	Assembly, Speaker	023-2927-002
X1	Block, Crystal	126-0110-108
X2	Block, Crystal	126-0110-109
Y1	Crystal, 11.155MHz (HC-18/U)	519-0009-001
Y2	Crystal, 11.168MHz (HC-18/U)	519-0009-005(2)
Z1	Filter, 10.7MHz	532-2001-011
Z2	Filter, 455kHz	532-2003-001

CABINET PARTS

NAME	PART NO.
Assembly, Cabinet	023-2920-002
Panel, Rear	023-2965-003
Panel, Front	032-0307-001
Overlay, Front Panel	559-2058-114(1)
Overlay, Front Panel	559-2058-113(2)
Knob, Control	013-1086-008
Button, Switch (9 Used)	023-0306-010

(1) HI/LO DUO-SCAN only.
(2) UHF/VHF DUO-SCAN only.

HI/LO DUO-SCAN ALIGNMENT (CON'T)

1. Adjust T7, T8 and T9 for minimum AC voltmeter reading (maximum quieting sensitivity).

2. With an RF voltmeter connected to pin 1 of IC U1, a typical reading is approximately 40 mV with 0.5 μV at the antenna connector.

DISCRIMINATOR ADJUST

a. Externally modulate the RF signal generator with a 1 kHz audio signal at a deviation level of 3.5 kHz.

b. Set the signal generator to "center frequency" and connect it to the receiver antenna connector.

c. Connect the RF voltmeter to the negative side of C60.

   1. Adjust T12 for a maximum RF voltmeter reading.

QUIETING SENSITIVITY CHECK

a. Adjust the receiver volume control for a 0 dB audio output reference level.

b. Set the RF signal generator to the "center frequency" with 0.5 μV at the receive antenna terminal.

   1. The 0 dB audio output level should drop a minimum of 20 dB for both the low and high band center frequency.

c. Repeat steps a and b on the remaining crystals with the signal generator set to each specific crystal frequency and the output level set to 1.0 μV.

UHF/VHF DUO-SCAN

ALIGNMENT

The standard Johnson UHF/VHF Duo-Scan® Monitor Receiver is factory aligned on 460.000 MHz and 157.000 MHz.

To obtain peak receiver performance, selected crystal frequencies should be within ±3.5 MHz of 157.000 MHz and ±4.0 MHz of 460.000 MHz.

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the monitor receiver be realigned on the required "center frequency" by a QUALIFIED TECHNICIAN.

Align the monitor receiver on the available frequency which is close to the center of the frequencies installed in the individual customer's receiver. This frequency will be termed "center frequency" in the alignment procedure.

AUTOMATIC FREQUENCY CONTROL (AFC)

a. Connect the DC VTVM to the collector of Q103.

b. With no signal input (scan mode), adjust AFC set control R105 for a 3.5 VDC reading.

UHF/VHF OSCILLATOR

a. Manually select the UHF or VHF center frequency crystal.

b. Connect an RF voltmeter probe to the base of Q2.

c. Adjust L101 for a maximum RF voltmeter reading. A typical reading between 85 and 500 mV should be indicated.

UHF/VHF DUO-SCAN ALIGNMENT (CON'T)

VHF RF AMPLIFIER AND IF AMPLIFIER

a. Connect an RF signal generator to the antenna connector.

   1. Set the generator output to the VHF band "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

   1. Adjust T1, T2, T3, T4, T15 and T103 for a minimum AC voltmeter reading (maximum quieting sensitivity).

   2. With an RF voltmeter connected to pin 1 of integrated circuit U1, a typical reading of approximately 90 mV should be indicated with a 0.5 μV signal input connected to the antenna connector.

c. Connect the RF voltmeter probe to pin 4 of IC U2.

   1. Adjust T11 for a maximum RF voltmeter reading.

   2. A typical reading is approximately 75 mV with a 0.5 μV signal input at the antenna connector.

UHF RF AMPLIFIER AND UHF MIXER

a. Connect an RF signal generator to the antenna connector.

   1. Set the generator output to the UHF "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

   1. Adjust C125, C118 and C112 for minimum AC voltmeter reading (maximum quieting sensitivity).

   2. With an RF voltmeter connected to pin 1 of IC U1, a typical reading is approximately 40 mV with 0.5 μV at the antenna connector.

DISCRIMINATOR

a. Externally modulate the RF signal generator with a 1 kHz audio signal at a deviation level of 3.5 kHz.

b. Set the RF signal generator to UHF or VHF "center frequency" and connect it to the antenna connector.

c. Adjust T12 for maximum undistorted audio output.

QUIETING SENSITIVITY CHECK

a. Adjust the receiver volume control for a 0 dB audio output reference level.

b. Set the RF signal generator to the "center frequency" with 0.7 μV at the antenna connector.

   1. The 0 dB audio output level should drop a minimum of 20 dB for both the UHF and VHF "center frequency".

c. Repeat steps a. and b. on the remaining crystals with the signal generator set to each specific crystal frequency and the output level set to 1.0 μV.

Pages 9-19 Courtesy of E. F. JOHNSON COMPANY

REVISED CRYSTAL INFORMATION

Refer to this crystal information when ordering crystals for all monitor receiver models.

	30-50 MHz	150-170 MHz	450-470 MHz
Crystal Frequency	Rec. Freq. +10.7 MHz	$\frac{\text{Rec. Freq. } -10.7\text{ MHz}}{3}$	$\frac{\text{Rec. Freq. } -10.7\text{ MHz}}{9}$
Frequency Tolerance +25°C	±.001%	±.001%	±.001%
-10°C to +60°C	±.002%	±.002%	±.0015%
Mode	3rd Overtone	3rd Overtone	3rd Overtone
Drive Level	2 mW	2 mW	2 mW
Frequency Correlation	Series -450 Hz (or 70 pF load capacity)	Series -450 Hz (or 70 pF load capacity)	18 pF load capacity
Maximum Series Impedance	35 ohms	35 ohms	35 ohms
Holder	HC 25U	HC 25U	HC 25U

520 - xx xx - xxx

- 520 → Crystal
- xx → 30 - 30-50 MHz; 01 - 150-170 MHz; 54 - 450-470 MHz
- xx - xxx → Crystal Operating Frequency

For Example: A crystal operating frequency of 35.080 MHz would have a part number of 520-3035-080

HI/LO DUO-SCAN

ALIGNMENT

The standard Johnson Hi/Lo Duo-Scan® Monitor receiver is factory aligned on a low band frequency of 42.000 MHz and on a high band frequency of 156.500 MHz.

To obtain peak receiver performance, selected crystal frequencies should be within ±2.5 MHz of 42.000 MHz and ±3.5 MHz of 156.000 MHz. The receiver will operate outside these limits, but with reduced sensitivity.

To maintain peak receiver performance on frequencies outside these limits, it is recommended that the monitor receiver be realigned on the required center frequency by a QUALIFIED TECHNICIAN.

Align the monitor receiver on the available frequency which is close to the center of the frequencies installed in the individual customer's receiver. This frequency will be termed "center frequency" in the alignment procedure.

NOTE

If the receiver is required to operate on a "center frequency" below 35 MHz, change capacitors C23 and C26 to 22 pF and 15 pF respectively, before realignment is started.

OSCILLATOR ADJUST (HIGH BAND)

a. Connect an RF voltmeter probe to the base of Q2.

b. Adjust T6 for a maximum RF voltmeter reading.

   1. A typical reading is 100 to 200 mV.

RF AND IF AMPLIFIER ADJUST (HIGH BAND)

a. Connect an RF signal generator to the receiver antenna connector.

   1. Set the generator output to the high band "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

   1. Adjust T1, T2, T3, T4, T10 and T15 for a minimum AC voltmeter reading (maximum quieting sensitivity).

   2. With an RF voltmeter connected to pin 1 of integrated circuit U1, a typical reading of approximately 90 mV should be indicated with a 0.5 μV signal input connected to the antenna connector.

c. Connect the RF voltmeter probe to pin 4 of IC U2.

   1. Adjust T11 for a maximum RF voltmeter reading.

   2. A typical reading is approximately 75 mV with a 0.5 μV signal input at the antenna connector.

RF AMPLIFIER ADJUST (LOW BAND)

a. Connect an RF signal generator to the receiver antenna connector.

   1. Set the generator output to the low band "center frequency".

b. Connect an AC voltmeter across the external speaker jack.

VOLTAGE MEASUREMENTS

NOTE: Unless otherwise indicated, all measurements made with Volume control fully counterclockwise, Mode switch in Auto, Channel switch in Ch-B, and Squelch control fully clockwise.

ALL MEASUREMENTS REFERENCED FROM GROUND (ALL READINGS NEGATIVE).

INTEGRATED CIRCUIT VOLTAGES

ITEM	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12	PIN 13	PIN 14
IC1	4.5	6.0	4.5	GND	0.0	GND	GND	GND						
IC2	4.5	6.0	4.5	GND	0.0	GND	GND	GND						
IC3	4.5	6.0	4.5	GND	2.7	GND	GND	GND	NC	6.0	5.3	2.6	NC	GND
IC4	0.0	NC	1.5	5.3	5.4	NC	6.0	6.0						

TRANSISTOR VOLTAGES

ITEM	E	B	C	REMARKS	ITEM	E	B	C	REMARKS	ITEM	E	B	C	REMARKS
Q1	6.0	5.8	6.0		Q6	5.2	6.0	0.4		Q101	4.7	4.0	0.0	VHF
	6.0 •	5.4 •	6.0 •		Q7	0.0	0.24	4.5		Q201	5.5	4.9	0.0	UHF
Q2	6.0	5.4	0.44		Q8	0.0	0.8	0.11		Q202	6.0	5.2	0.0	UHF
	6.0 •	5.4 •	6.0 •		Q9	2.9 ▲	2.4 ▲	0.0 ▲	UHF	Q301	4.6	4.1	0.0	AM
Q3	4.2	3.6	4.1			2.9 †	2.2 †	0.0 †	UHF	Q302	4.7	4.1	0.0	AM
	5.7 •	5.7 •	3.1 •		Q9	1.05 ▲	0.54 ▲	0.0 ▲	VHF	Q303	4.8	4.2	0.0	AM
Q4	3.5	4.0	3.5			1.2 †	0.47 †	0.0 †	VHF	Q304	6.0	5.8	2.0	AM
	2.9 •	3.1 •	5.7 •		Q10	6.0	5.3	6.0			6.0 •	5.5 •	6.0 •	AM
Q5	5.3	4.7	5.4			6.0 •	5.9 •	1.8 •						

• Denotes measurement made with Squelch control fully counterclockwise.
▲ Denotes measurement made with crystals Y1 and Y2 in position.
† Denotes measurement made with crystals Y1 and Y2 removed.

SEMICONDUCTORS

ITEM	PART NO./TYPE	ITEM	PART NO./TYPE
D1	1N34A	Q6	MPS3393
D2	1N34A	Q7	MPS3640
D3	1N914	Q8	MPS3640
D301	1N34A	Q9	2N3563
IC1	LM703LN	Q10	MPS3393
IC2	LM703LN	Q101	2N3563
IC3	LM703LN	Q201	2N3563
IC4	TAA611B	Q202	2N3563
Q1	MPS3393	Q301	MPS3393
Q2	MPS3393	Q302	MPS3393
Q3	MPS3393	Q303	MPS3393
Q4	MPS3640	Q304	MPS3393
Q5	MPS3393	Q305	MPS3393

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C13		100uf 15V
C17		500uf 10V
C18		200uf 6V
C20		2.2uf 10V
C21		.22uf 10V
C201		1.7-6pf Trimmer
C204		1.7-6pf Trimmer
C301	B-320-1	Tuning Gang
C310		1.0uf 10V

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R6		500K Balance
R7	B-317-1	100K Volume/Switch
R14		1meg Squelch

COILS/TRANSFORMERS

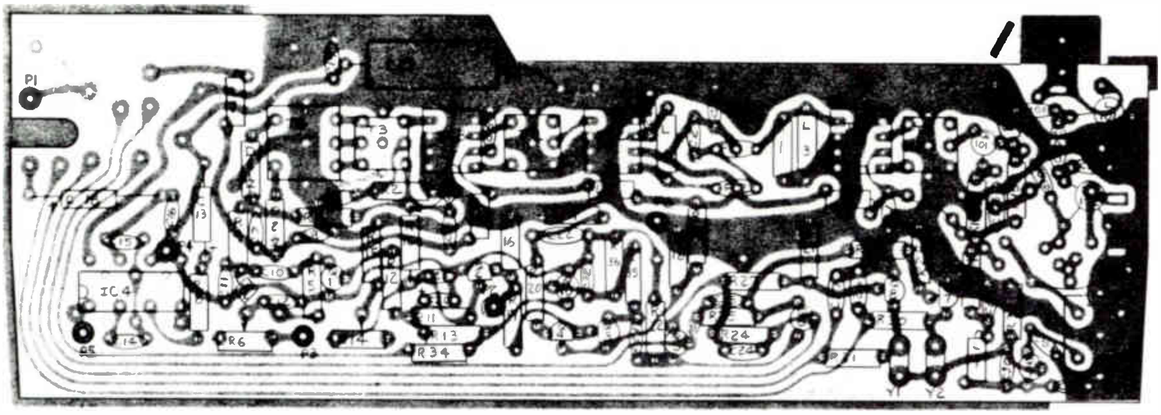
ITEM	PART NO.	ITEM	PART NO.
L1	A218-1	L201	A221-3
L2	A218-1	L202	A221-1
L3	A205-1	T1	B315-1
L4	A321-1	T2	B315-1
L5	A218-1	T3	B315-2
L6	A218-1	T4	B316-1
L7	A218-1	T301	B312-1
L8	A218-1	T302	B311-3
L9	A218-1	T303	B311-1
L10	B314-3(B314-2)	T304	B311-1
L101	B314-3	T305	B311-2
L102	B314-2		

MISCELLANEOUS

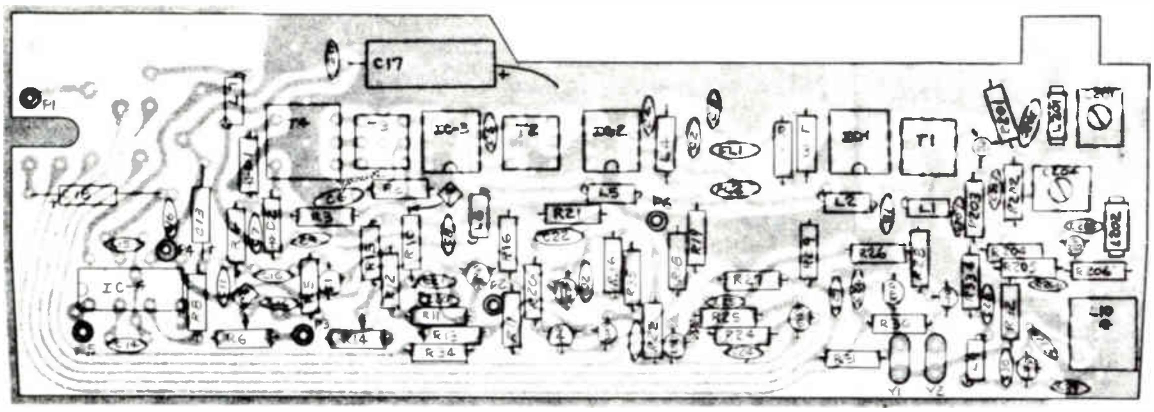
ITEM	NAME	PART NO.
FL1	Filter, Crystal	A226-1
FL2	Filter, Crystal	A226-1
SP-1	Speaker	B332
	Antenna, Telescopic	A-138-1

CABINET PARTS

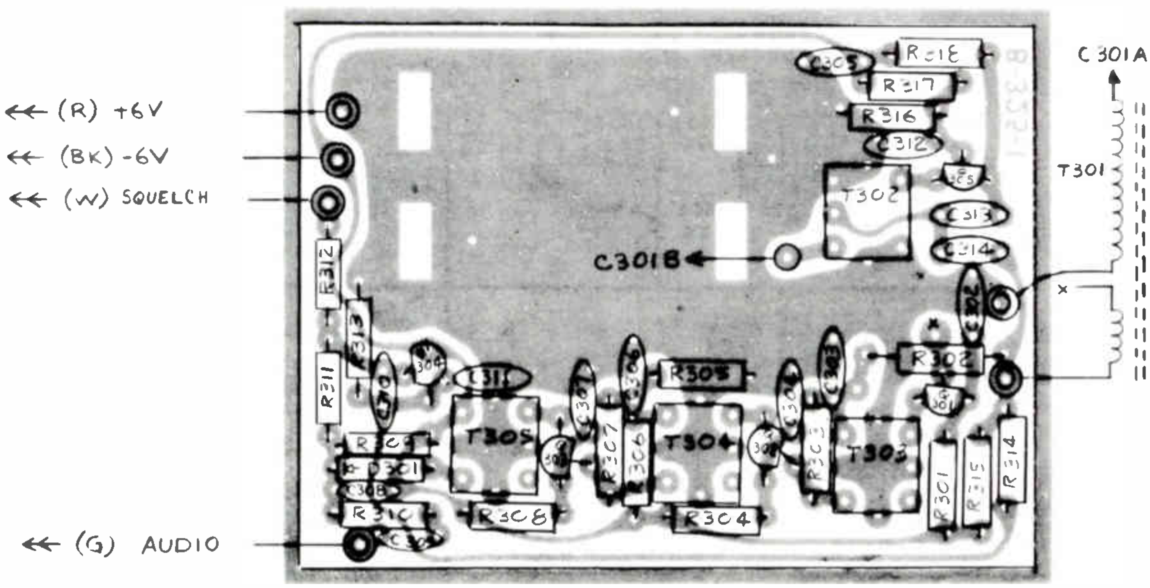
NAME	PART NO.
Knob, Volume	A307-1
Knob, Tuning	A307-1



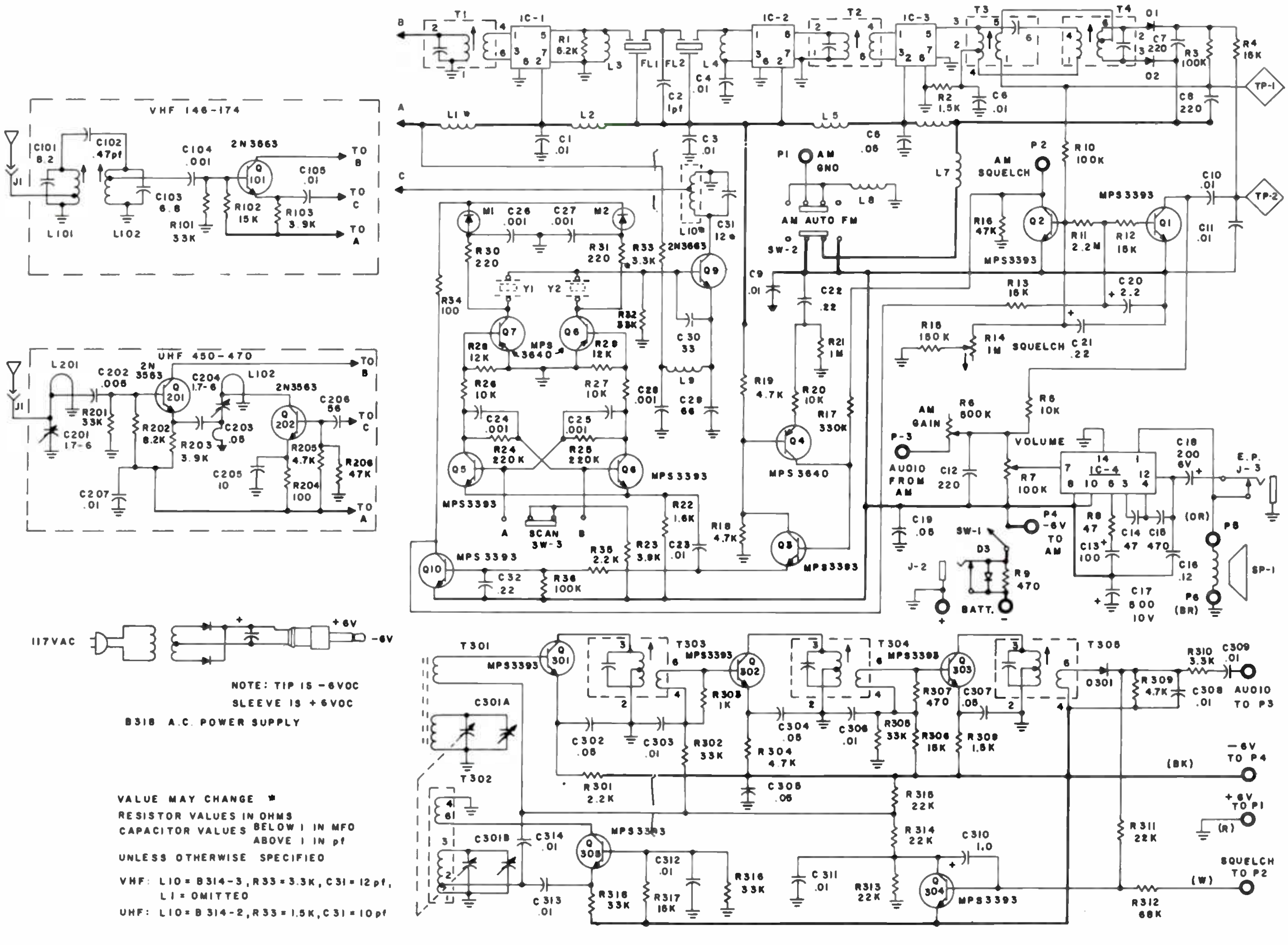
VHF PARTS PLACEMENT DIAGRAM



UHF PARTS PLACEMENT DIAGRAM



A M PARTS PLACEMENT DIAGRAM


VHF 146-174
UHF 450-470
117VAC
NOTE: TIP IS -6VDC
SLEEVE IS +6VDC
B318 A.C. POWER SUPPLY
VALUE MAY CHANGE *
RESISTOR VALUES IN OHMS
CAPACITOR VALUES BELOW 1 IN MFD
ABOVE 1 IN pf
UNLESS OTHERWISE SPECIFIED
VHF: L10 = B314-3, R33 = 3.3K, C31 = 12pf, L1 = OMITTED
UHF: L10 = B314-2, R33 = 1.5K, C31 = 10pf

Pages 5-8 Courtesy of ELECTRA COMPANY

JR FM ALIGNMENT
VHF MODEL

1. Install crystal in channel A to receive 157mHz (±.5mHz).
2. Turn Squelch control R14 fully clockwise.
3. Set Mode switch to H.F.
4. Set Scan switch to Ch. A.
5. Fully extend whip antenna.
6. Plug in external power supply.
7. Connect scope input between TP1 and chassis ground.
8. Connect an AC VTVM across speaker terminals.
9. Turn on Power switch.
10. Using a Measurements Model #800 or equivalent, radiate a signal maintaining the generator output at a level below receiver limiting.
11. Peak T3, T2, T1, for maximum output and properly shaped I.F. pattern. Tune L10 for maximum output.
12. Move scope input lead to TP2 and adjust T4 for a proper discriminator pattern.
13. Connect a 100 ohm resistor across L101, and tune L102 for maximum. Remove the 100 ohm resistor from L101, connect the 100 ohm resistor across L102, and tune L101 for maximum.
14. Check sensitivity.
15. Remove all test connections and turn the generator output to zero.
16. Adjust the Squelch pot R14 just past the point where automatic scanning starts.

JR FM ALIGNMENT
UHF MODEL

1. Install crystal in Channel A to receive 460mHz (±.5mHz).
2. Turn Squelch control R14 fully clockwise.
3. Set Mode switch to H.F.
4. Set Scan switch to Channel A.
5. Fully extend whip antenna.
6. Plug in external power supply.
7. Connect scope input between TP1 and chassis ground.
8. Connect an AC VTVM across speaker terminals.
9. Turn on Power switch.
10. Using a Measurements Model #800 or equivalent, radiate a signal maintaining the generator output at a level below receiver limiting.
11. Peak T3, T2, T1, C204 and C201 for a maximum output and properly shaped IF pattern as observed on scope. Adjust L10 for maximum output.
12. Move scope input lead to TP2, and adjust T4 for a proper discriminator pattern.
13. Check sensitivity.
14. Remove all test connections and turn the generator output to zero.
15. Adjust the Squelch pot R14 just past the point automatic scanning starts.

JR AM ALIGNMENT

1. Connect a DC voltmeter between the collector of Q304, and chassis ground. (The voltage at this point is negative with respect to chassis ground.)
2. Radiate a signal and maintain generator output levels which provide between 2 and 4 volts readings for the remainder of this procedure.
3. Adjust T305, T304 and T302 for a maximum output on the D.C. voltmeter at 455kc.
4. Set the receiver dial to 600kHz and tune the oscillator coil for a maximum output on the DC voltmeter with a radiated 600kc signal.
5. Set the receiver dial to 1640kHz (max. clockwise) and tune C301B (oscillator trimmer) for a maximum output on the DC voltmeter.
6. Set the receiver dial to 1380kc and tune C301a (RF trimmer) while rocking the main tuning capacitor for a maximum output on the DC voltmeter with a radiated 1380kc signal.
7. Repeat steps 4, 5 and 6 until no further improvement is noticed.
8. Check low voltage operation at 4.5V.

Scanner-Monitor Servicing Data

TABLE OF CONTENTS

First Edition
First Printing—December, 1973
Second Printing—January, 1975

Sams

Scanner-Monitor Servicing Data

SD-3

Library of Congress Catalog Card Number 72-92711

$4.95
$5.95 IN CANADA
Cat. No. SD-3

Sams

Scanner-Monitor Servicing Data

SD-3

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HOWARD W. SAMS & CO., INC.
INDIANAPOLIS, INDIANA

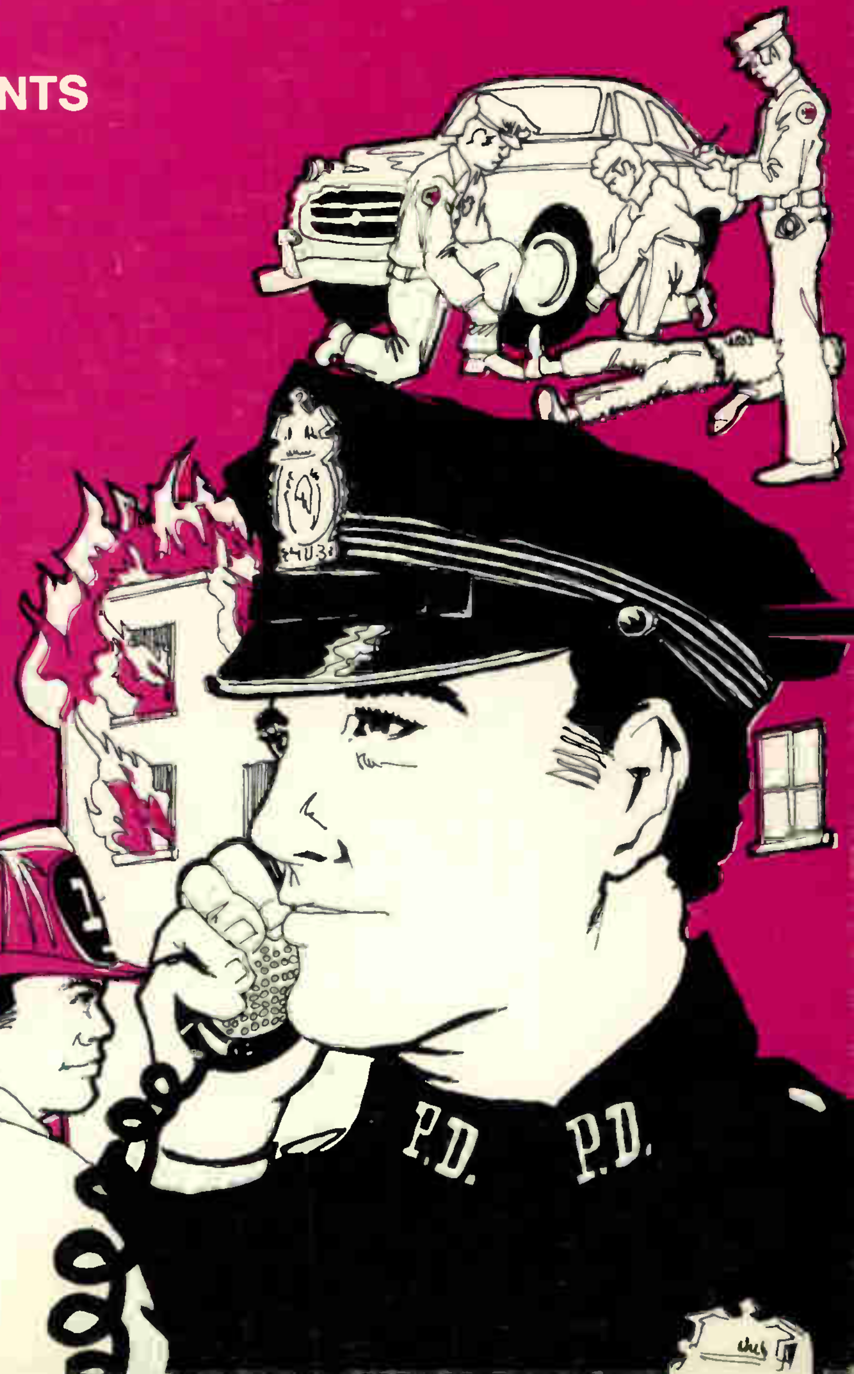
Sams

Scanner-Monitor Servicing Data

SCHEMATICS
PARTS LISTS
SERVICE ADJUSTMENTS

for the following receivers:

Electra Jolly Roger
Johnson Hi/Lo Duo-Scan (Late Prod.),
UHF/VHF Duo-Scan (Late Prod.)
Johnson UHF Mono-Scan,
VHF Mono-Scan
Midland 13-914
Pearce-Simpson Cherokee 8+8
Pearce-Simpson Cheyenne 8 (PR-78)
Pearce-Simpson Comanche 16 (PR-160)
Regency MT-155
Regency TME-16H/L, TME-16H/LH/U,
TME-16H/LL/U, TME-16H/LM/U
Regency TMR-1H, TMR-1L, TMR-4H,
TMR-4L, TMR-8H, TMR-8L
Regency TMR-8H/LH, TMR-8H/LL,
TMR-8H/LM



Howard W. Sams PUBLICATION