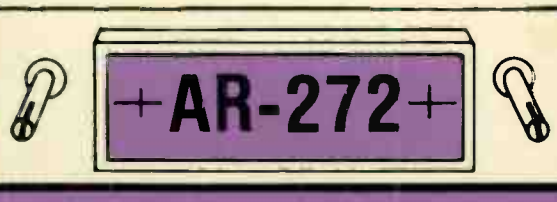
sams

AUTO RADIO SERVICE DATA



Audiovox *CP-750, ID-700, 77/78-CXP, GM-CXP*

Chrysler by Mitsubishi

Dodge Colt *AR-3100 CR/CR-B*

Ford *D77J19A171AA, D8AF171AA, D8EF19A171AA, D8TF19A171AA, D8VF19A171AA*

Midland *67-250*

Pioneer *KP-5005*

RCA *12R704*

Sanyo *FT414*

Ten *DP-640-1/3*

Tenna *RR-2015 MPX, RR-2017 MPX*

sams

AUTO RADIO

SERVICE DATA

AR-272

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

FIRST EDITION
FIRST PRINTING-JANUARY, 1979

Library of Congress Catalog Card Number: 49-11493

TABLE OF CONTENTS

MODEL NUMBER *PAGE*

GENERAL SERVICING INFORMATION

The following information applies to all tape units in this volume, and should be followed before any adjustments are made or trouble diagnosis is attempted. Any exceptions or additions will be found in the detailed servicing procedures for each tape unit.

POWER SOURCES

Many tape units require full supply voltage for proper operation. Be sure the supply voltage is maintained at the rated value under load while making adjustments.

CLEANING

All head faces should be cleaned with head cleaner or methyl alcohol to remove dust and accumulated oxide. (An applicator may be fashioned from absorbent cotton.) Do not use a screwdriver or any metallic object near the head faces.

CAUTION: *Avoid getting head cleaner on any plastic surface.*

Clean capstans, pressure rollers, and tape guides with alcohol using a soft lint-free cloth. Also use alcohol to remove oil and grease from drive belts and other driving surfaces.

LUBRICATING

Clean all surfaces before lubricating. Apply a few drops of #20 machine oil to all bearings and rotating bushings. Apply a thin film of light, nonhardening grease to all cam surfaces and pawls, if they have been factory lubricated. Always wipe excess oil or grease from parts that have been lubricated.

CAUTION: *Oil and grease must be kept off all driving surfaces as well as any parts which may transfer oil or grease to them.*

DEMAGNETIZING

Heads require demagnetizing at regular intervals to maintain high-frequency response, dynamic range, and low distortion. (Follow instructions included with the demagnetizing unit.) After demagnetizing the heads, keep all screwdrivers and other metallic objects away from the head faces. Tape guides may also require occasional demagnetizing.

IMPORTANT: *Be sure to demagnetize the heads after making resistance measurements in the head circuits.*

CARTRIDGES

Many problems associated with tape units result from defective cartridges. Always try a cartridge known to be good before attempting repairs.

ALIGNMENT PROCEDURE

Alignment is performed at factory with laboratory equipment. Therefore before alignment is attempted, the unit should be thoroughly checked for circuit troubles.

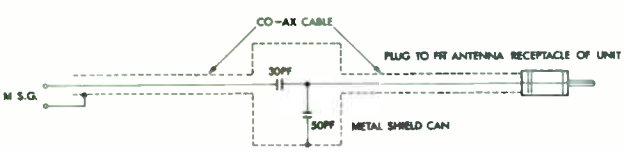
NOTES:

1. Check specified source voltage —DC, 14.4 volts —
2. Connect an AC voltmeter (VTVM) across speaker or dummy load (8 ohms, 10W, wire wound resistor)
3. Signal input must be kept as low as possible to avoid overload and clipping use output indicator of highest possible sensitivity.
4. Repeat adjustment to insure good results.
5. Non-metalic alignment tools must be used.
6. Alignment location details: See fig. 8, 9

AM IF & RF ALIGNMENT USING AM SIGNAL GENERATOR

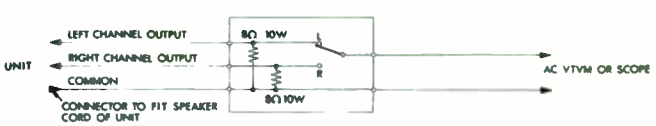
Set the radio for AM reception. AM signal generator should be coupled with antenna receptacle (J1) through dummy.
Set volume control to maximum and tone to treble.
Attenuate signal generator output to maintain 0.5 watts (2.0 volts across 8 ohms load) on AC volt meter.

STEP	GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT INDICATOR	ADJUST	REMARKS
1	262.5KHz 400Hz, 30% mod.	Around 1000KHz of non-interference.	AC VTVM across voice coil (L or R) or 8 ohms load.	T301 T302	Adjust for maximum.
2	1630KHz	High frequency end stop.	"	C310	"
3	1400KHz	Tune to signal	"	C305 C6	"
With radio installed in car and antenna extended to desired height, tune in a weak station around 1400KHz and adjust antenna trimmer (C6) for maximum output.					



AM DUMMY ANTENNA

Fig. 2



DUMMY LOAD & SWITCH BOX (FOR STEREO UNIT)

Fig. 3

FM IF ALIGNMENT USING FM SWEEP GENERATOR

Set the radio for FM reception. High side of sweep generator through 0.01 mfd. to test poing ◇F1◇ low side to ground. Use only enough marker signal for indication. Set volume control to minimum and tone to treble.

STEP	GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT INDICATOR	ADJUST	REMARKS
1	10.7MHz (sweep)	Point of non-interference	Vert. amp of scope to point ◇F2◇ low side to ground.	T101	Adjust T101 to obtain symmetry of response similar to fig. 3 or 4 or 5 according to the colour of Ceramic filter used.
2	"	"	"	T201	Adjust T201 for maximum amplitude and straightness of line.
3	Repeat above steps 1 and 2 for two or three times.				

NOTE:

1. FM SWEEP GENERATOR should be definitely required for FM IF alignment, because ceramic filters are used in IF circuit. Five kinds of ceramic filters are used and they are different in their center frequencies as shown below: RED: 10.7MHz, BLUE: 10.67MHz, ORANGE: 10.73MHz, BLACK: 10.64MHz, WHITE: 10.76MHz.
2. If the ceramic filters except RED are used, 10.7MHz marker will not appear at the center of "S" curve (See fig. 4) in these cases disregard 10.7MHz marker.
3. The colour of ceramic filters used is different according to the production lots, but, the same colour-dotted ceramic filters should be replaced as one pair on the individual units.
4. Be carefull of static coupling between output lead of sweep generator and input lead of scope. The leads must be as short as possible and carefully shielded.

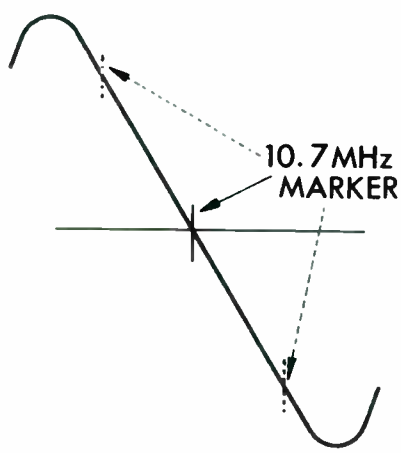
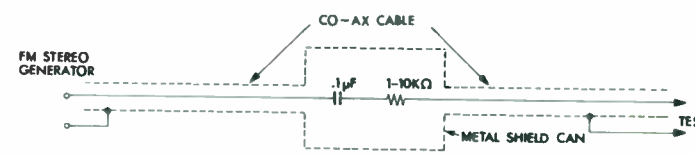


Fig. 4



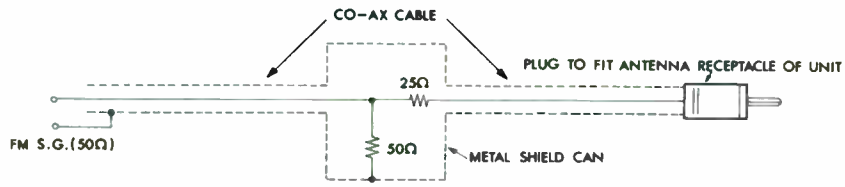
FM IF COUPLING CIRCUIT

Fig. 5

FM RF ALIGNMENT USING FM SIGNAL GENERATOR

Set the radio for FM reception. Connect FM signal generator with antenna receptacle (J1) through FM dummy antenna. FM S.G. output level; 5–10 microvolts. Set volume control to 0.5 watts output (2.0 volts at 8 ohms load) and tone to treble.

STEP	GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT INDICATOR	ADJUST	REMARKS
1	108.5MHz (400Hz 22.5KHz dev)	Low frequency end stop	Output meter across 8 ohms load	C120	Adjust for maximum
2	98MHz (400Hz 22.5KHz dev)	Tune for Signal	"	C103 C109	"



FM DUMMY ANTENNA

Fig. 6

FM MULTIPLEX ALIGNMENT USING FREQUENCY COUNTER

Set the radio for FM reception.

STEP	OUTPUT INDICATOR	ADJUST	REMARKS
1	Connect frequency counter to test point ◈M◈	R-218	Adjust to 19.000KHz (18.950–19.050KHz is permissible)
Note: Test point ◈F2◈ should be grounded while adjusting R-218.			

FM MULTIPLEX ALIGNMENT WITHOUT USING FREQUENCY COUNTER

STEP	RADIO DIAL SETTING	ADJUST	REMARKS
1	Tune radio to strong FM STEREO station.	R-218	Rotate R-218 CW or CCW and mark the points where the STEREO INDICATOR LAMP is turned off. Then, fix R-218 at the center of the above marked points.

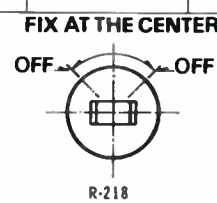


Fig. 7

CASSETTE PLAYER ALIGNMENT USING TEST CARTRIDGE

STEP	ITEM	ADJUSTMENT
1	Head Azimuth	Play a test cassette. monitor LEFT or RIGHT channel output and adjust Azimuth adjustment screw for maximum.

PROFESSIONAL SERVICE INFORMATION

All service and internal adjustment of this unit should be performed only by a qualified service technician equipped with the proper tools and instruments.

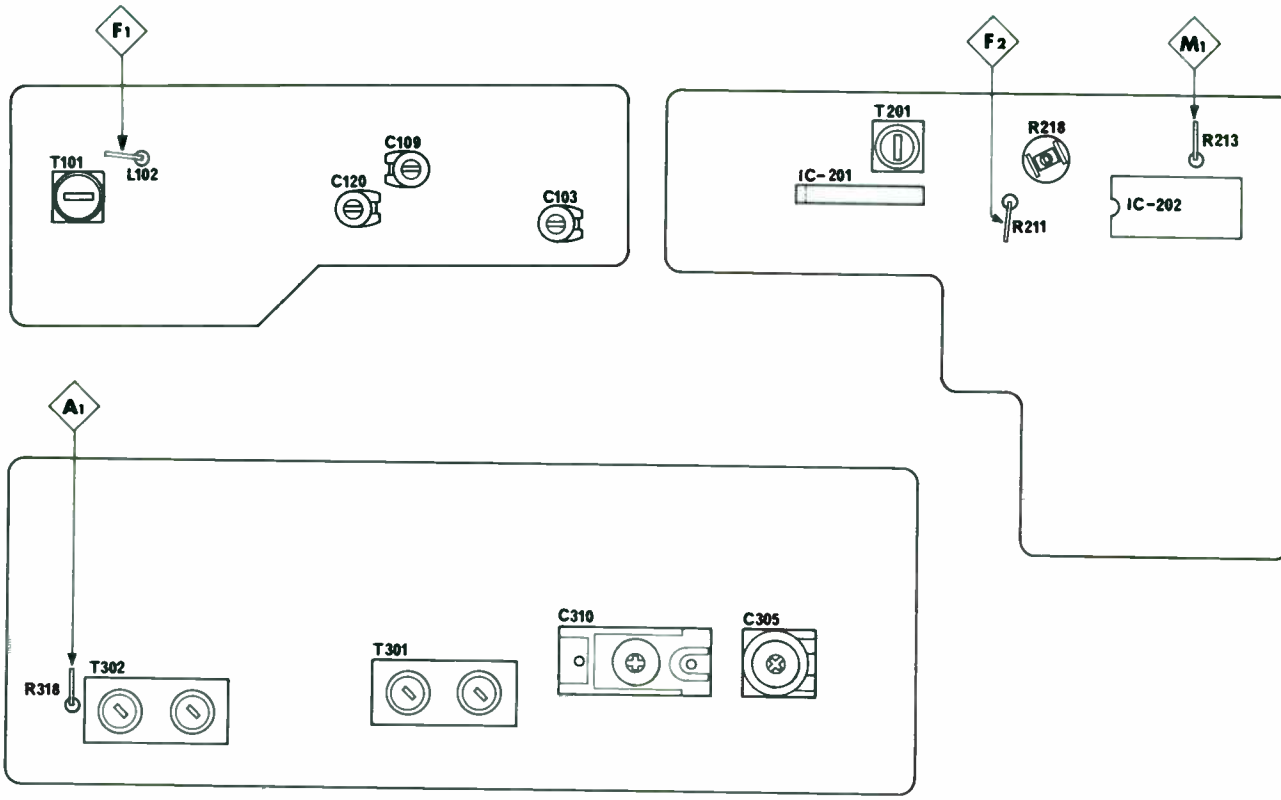


Fig. 8

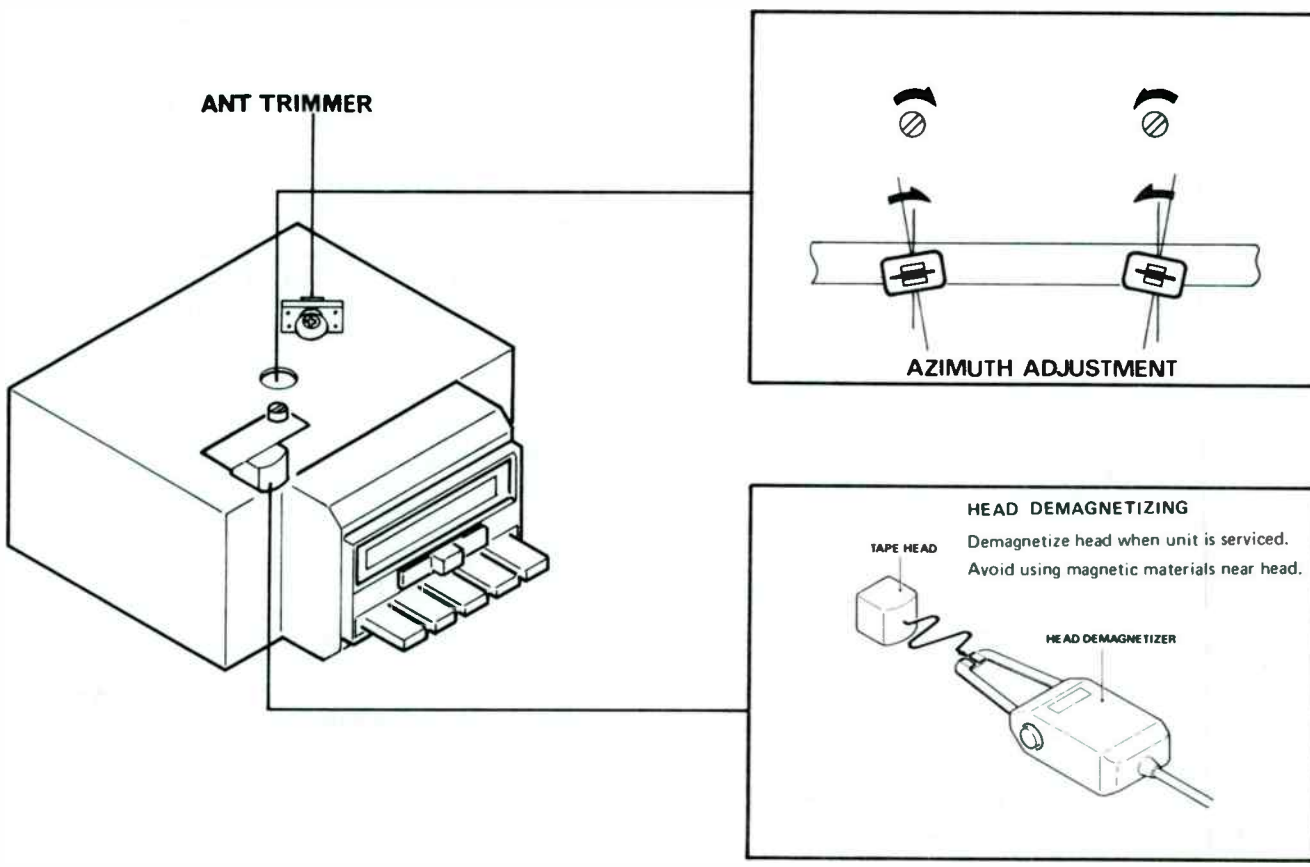
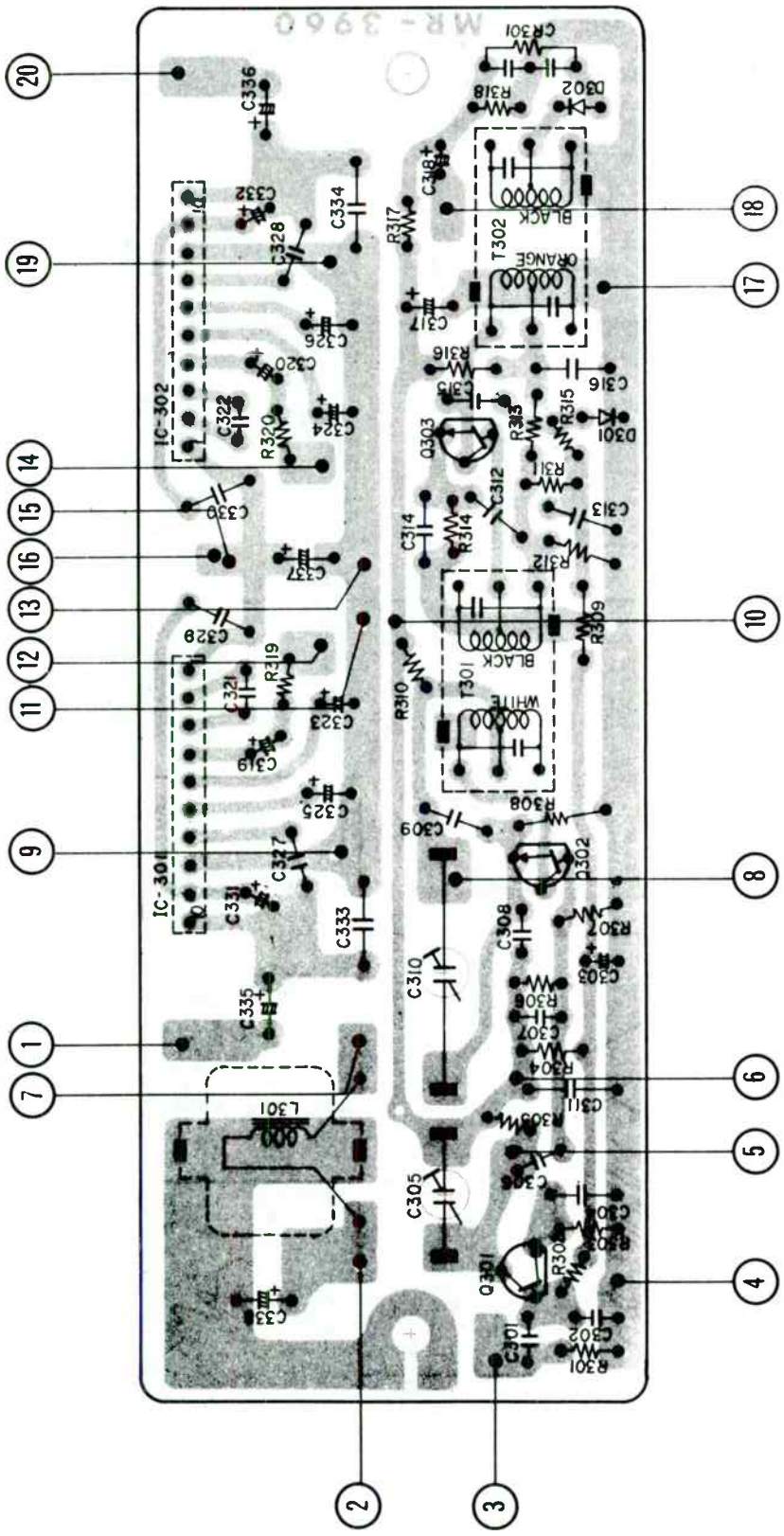
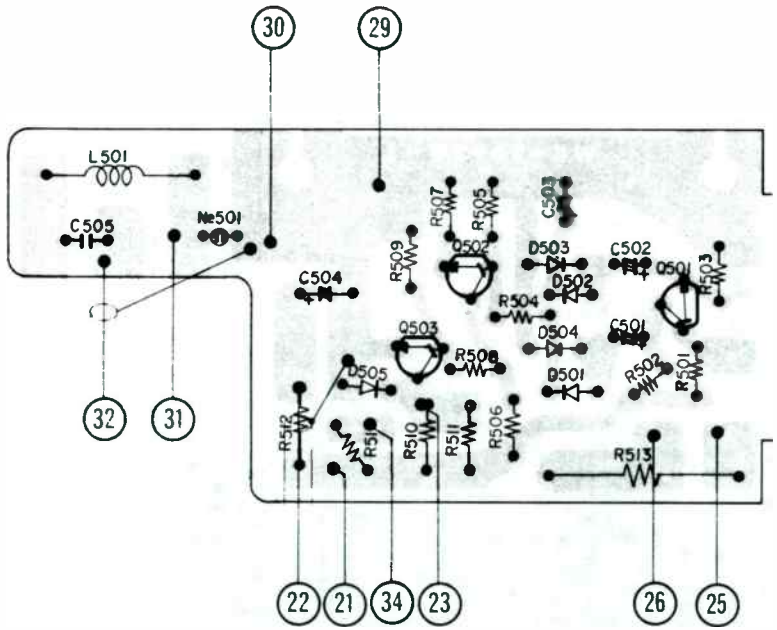
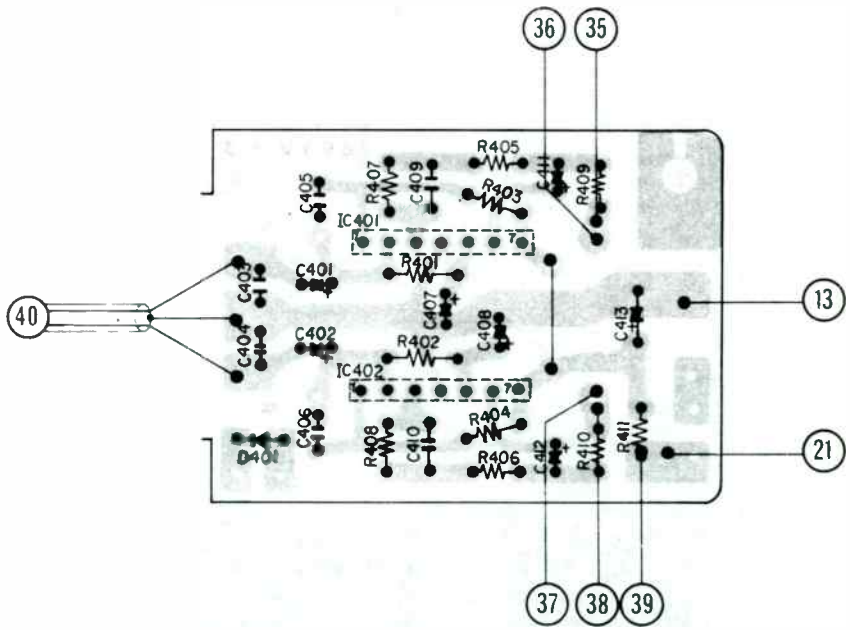


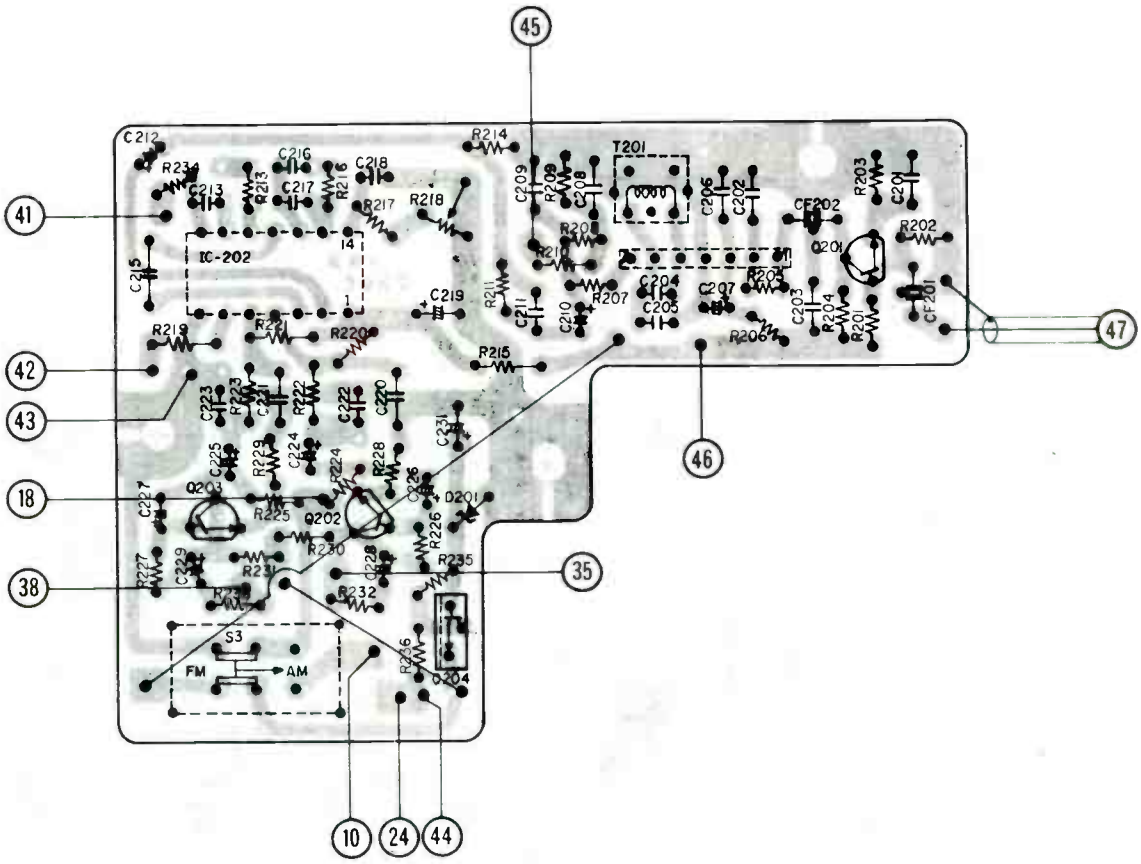
Fig. 9

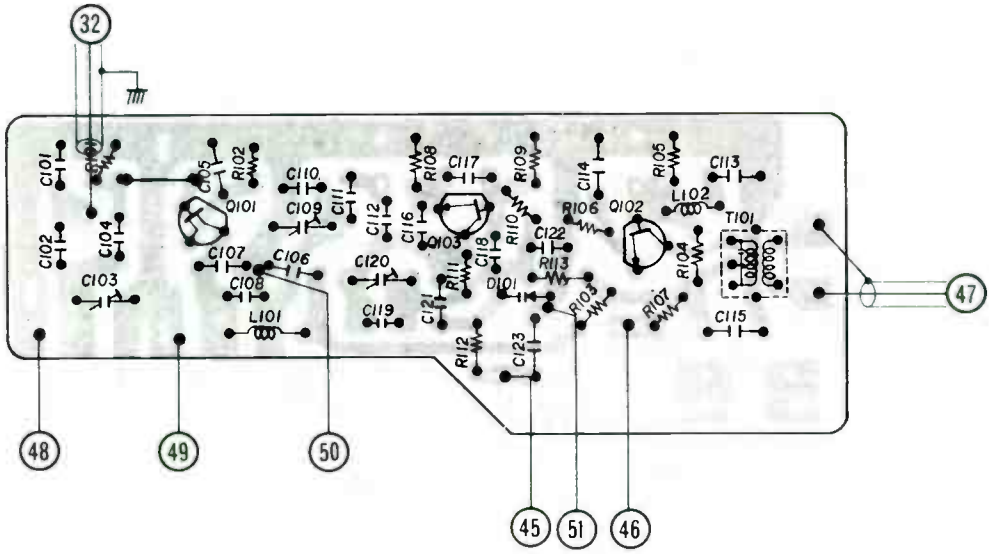
ALIGNMENT LOCATION DETAIL











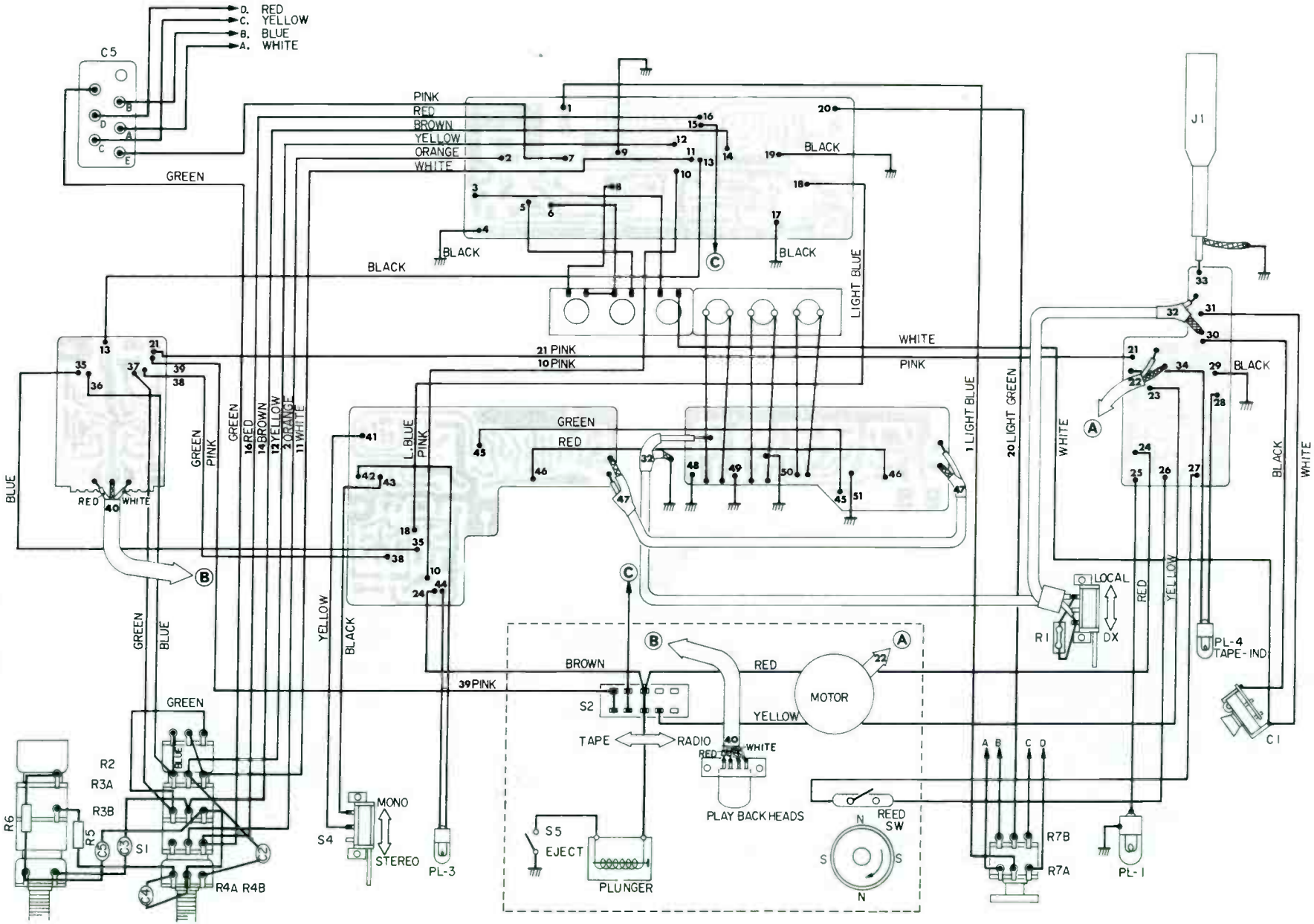
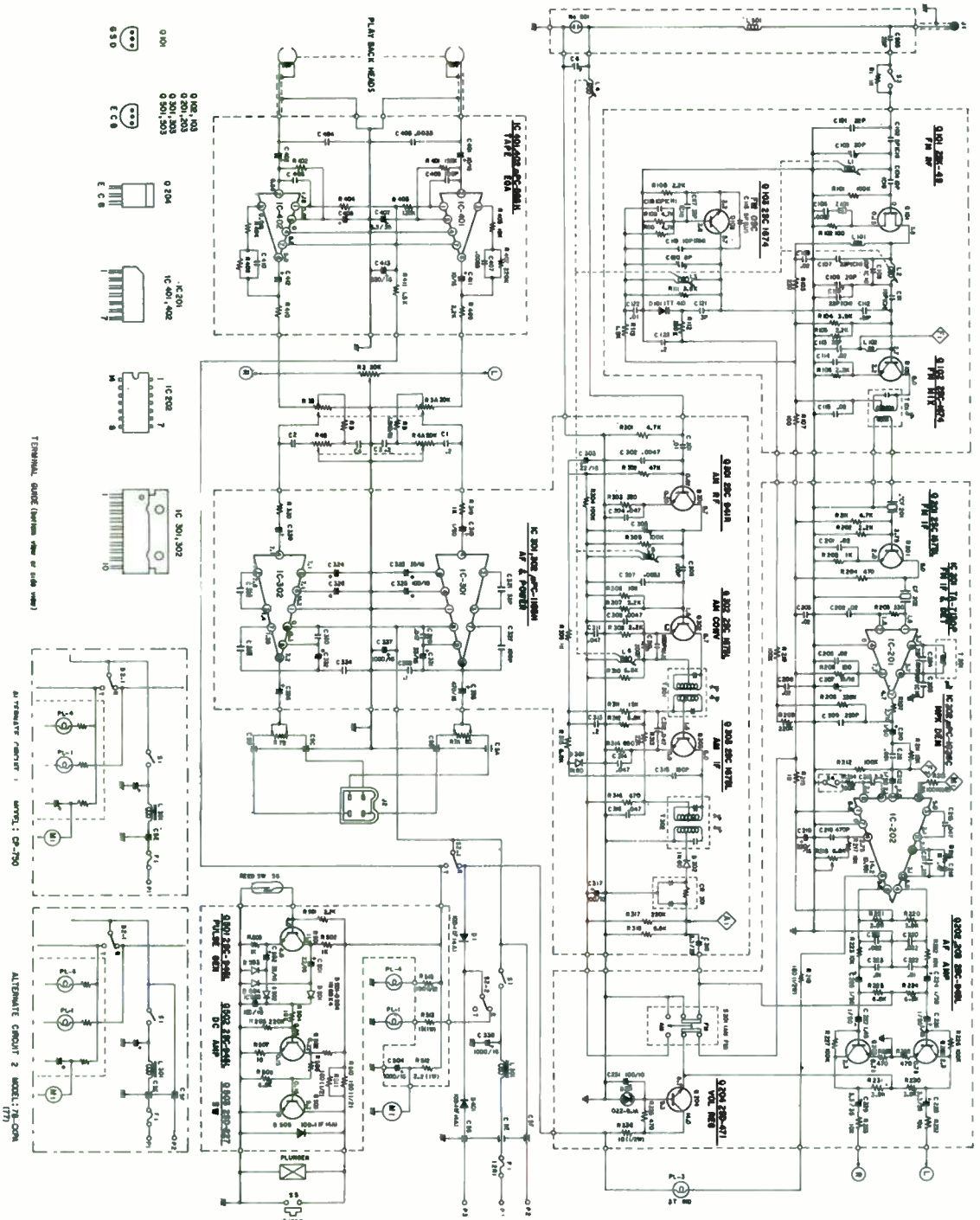


Fig. 14

WIRING DIAGRAM



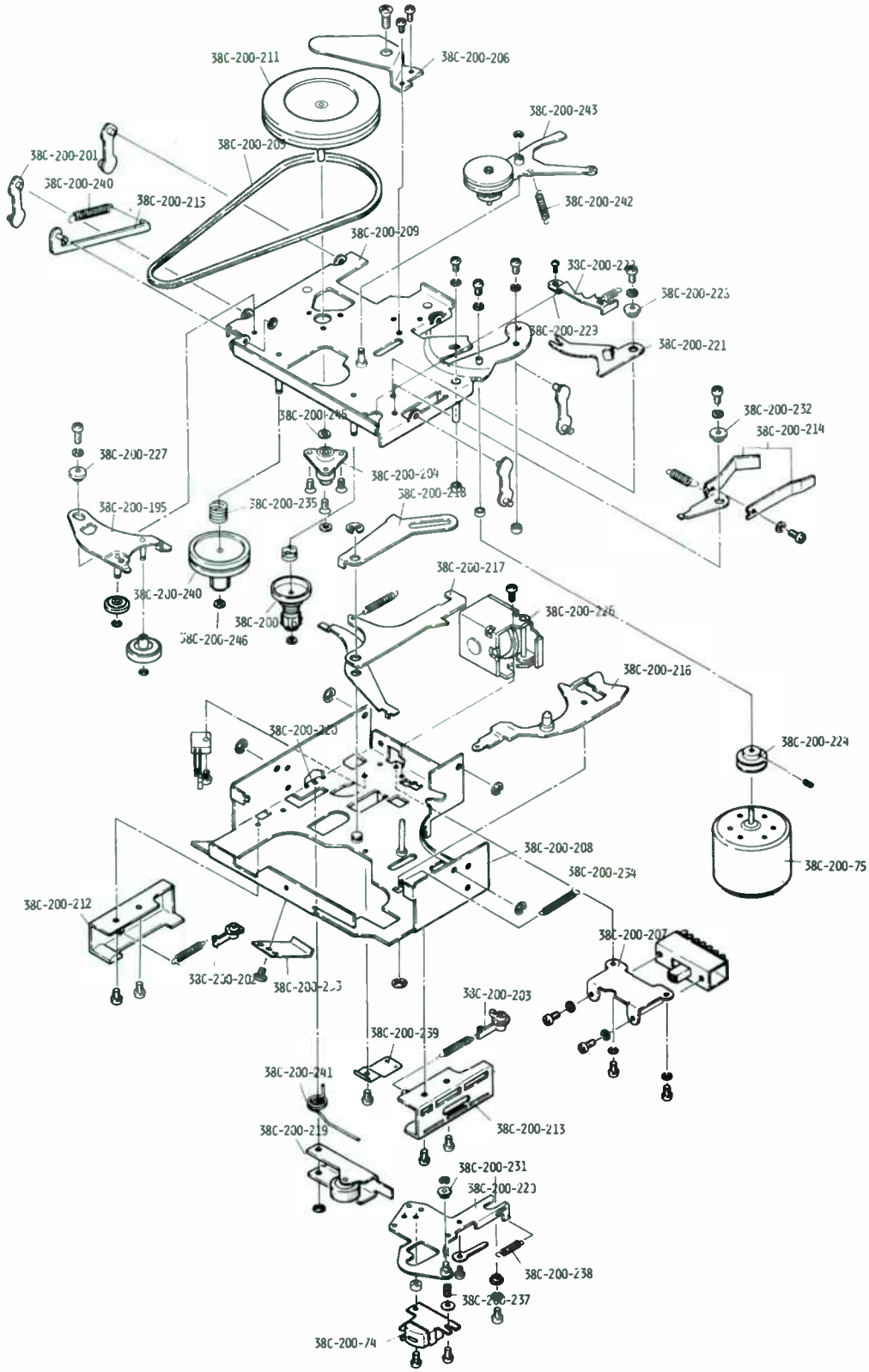


Fig. 17

(DECK SHASSIS)

ASSEMBLY LAYOUT

Audiovox CP-750, ID-700, 77/78-CXP, GM-CXP

Reference No	Part No	Description	Q'ty CP-750 ID-700	Q'ty CXPA	Q'ty GM-CXP
ELECTRICAL PARTS					
CAPACITORS	(Unlisted capacitors on this parts list are Ceramic Disc Type, 50V See schematic diagram for specific values)				
C-1, 2, 3, 4, 123, 313	38C-200- 1	2uF, 12V semi-conductor	6	6	6
C-5A, B, C, D, E	38C-200- 2	1,000PF × 5 feed-thru KC-1215	1	—	—
C-5A, B, C, D, E, F	38C-200- 3	1,000PF × 6 feed-thru KC-1206	—	1	—
C-5A, B, C, D, E, F, G	38C-200- 4	1,000PF × 7 feed-thru KC-1207	—	—	1
C- 6	38C-200- 5	120PF max., trimmer TC-17	1	1	1
C-102	38C-200- 6	5PF 50V NPO ceramic	1	1	1
C-103, 109	38C-200- 7	20PF max trimmer TC-33	2	2	2
C-104, 108, 111, 118, 205	38C-200- 8	10PF 50V NPO ceramic	5	5	5
C-107, 110	38C-200- 9	22PF 50V NPO ceramic	2	2	2
C-112	38C-200-10	51PF 50V fixed-composition	1	1	1
C-116	38C-200-11	5PF 50V N750 ceramic	1	1	1
C-117	38C-200-12	33PF 50V NPO ceramic	1	1	1
C-119	38C-200-13	10PF 50V N220 ceramic	1	1	1
C-120	38C-200-14	8PF max trimmer TC-32	1	1	1
C-121	38C-200-15	3PF 50V NPO ceramic	1	1	1
C-122, 301	38C-200-16	01uF 50V mylar	2	2	2
C-204	38 -200-17	22PF 50V N220 ceramic	1	1	1
C-207, 401, 402, 411, 412	38C-200-18	10uF 16V electrolytic	5	5	5
C-210, 212, 224, 225, 226 227, 319, 320	38C-200-19	1uF 50V electrolytic	8	8	8
C-213	38C-200-20	2.2uF 16V tantalum	1	1	1
C-215, 311	38C-200-21	047uF 50V mylar	2	2	2
C-216	38C-200-22	47uF 25V tantalum	1	1	1
C-217	38C-200-23	22uF 25V tantalum	1	1	1
C-218	38C-200-24	470PF 50V polystyrene	1	1	1
C-219	38C-200-25	220uF 16V electrolytic	1	1	1
C-220, 221	38C-200-26	022uF 16V semi-conductor	2	2	2
C-222, 223	38C-200-27	01uF 16V semi-conductor	2	2	2
C-228, 229, 318, 407, 408	38C-200-28	33uF 35V electrolytic	5	5	5
C-231, 317, 325, 326, 503	38C-200-29	100uF 10V electrolytic	5	5	5
C-302, 308	38C-200-30	0047uF 50V mylar	2	2	2
C-303, 501	38C-200-31	22uF 15V electrolytic	2	2	2
C-304, 312, 314, 316, 329 330	38C-200-32	047uF, 16V, semi-conductor	6	6	6
C-305	38C-200-33	70PF max. trimmer TC-42	1	1	1
C-307, 493, 404, 403	38C-200-34	0033uF, 50V, mylar	3	3	3
C-309	38C-200-35	180PF 50V N750, ceramic	1	1	1
C-310	38C-200-36	200PF max. trimmer TC-19	1	1	1
C-323, 324, 331, 332, 502	38C-200-37	33uF, 16V electrolytic	5	5	5
C-333, 334	38C-200-38	1uF, 50V mylar	2	2	2
C-335, 336	38C-200-39	470uF 16V electrolytic	2	2	2
C-337, 338, 504	38C-200-40	1,000uF 16V electrolytic	3	3	3
C-409, 410	38C-200-41	0068uF 50V mylar	2	2	2
C-413	38C-200-42	330uF, 16V, electroltic	1	1	1
COILS & CHOKES					
L-1, 2, 3, 4, 5, 6	38C-200-51	Tuner Assembly CT-8088	1	1	1
L-101	38C-200-52	Choke, RF LH-22	1	1	1
L-102	38C-200-53	Coil, IF Trap FL-10	1	1	1
L-301	38C-200-54	Choke, DC NL-6	1	1	1
L-501	38C-200-55	Choke ANT SL-47	1	1	1
CONTROLS					
R-2, 3A, B, 4A, B, S-1	38C-200-61	Volume Tone & Balance L/R, On-Off Sw VR-289	1	1	1
R-7A, B	38C-200-62	Balance F/R VR-234	1	1	1
MISCELLANEOUS					
CF-201, 202	38C-200-71	Ceramic Filter SFE-10.7MA-5	2	2	2
CR-301	38C-200-72	CR component SM-02	1	1	1
F-1	38C-200-73	Fuse 2A	1	1	1
H-1	38B-200-74	Play Back Head 940-03-06	1	1	1
M-1	38C-200-75	Motor MMS-3NF2M	1	1	1
Ne-501	38C-200-76	Neon Bulb NE-2	1	1	1
PL-1	38C-200-77	Lamp pilot PL-1B	1	1	1
PL-3, 4	38C-200-78	Lamp stereo & tape indicator PL-15	1	1	1
Z-101	38C-200-79	Ferrite Bead FB-202	1	1	1

Reference No	Part No	Description	Q'ty CP-750 ID-700	Q'ty CXPA	Q'ty GM-CXP
RESISTORS	(Unlisted resistors are carbon type, 1/4W. See schematic diagram for specific values)				
R-1	38C-200- 81	1,000, 10%, 1/4W, carbon (small size)	1	1	1
R-5, 6	38C-200- 82	1,500, 10% 1/2W fixed-composition	2	2	2
R-213	38C-200- 83	100,000, 10% 1/2W, fixed-composition	1	1	1
R-218	38C-200- 84	6,800 semi-fixed VR-218	1	1	1
R-219, 515	38C-200- 85	180, 10%, 1/2W fixed-composition	2	2	2
R-236	38C-200- 86	10, 10%, 1/2W carbon	1	1	1
R-510, 511	38C-200- 87	150, 10% 1/2W fixed composition	2	2	2
R-512	38C-200- 88	2.2, 1W Metal film	1	1	1
R-513	38C-200- 89	15, 1W Metal film	1	1	1
SWITCHES					
S-2	38C-200- 91	Tape/Radio SW 940-06-31	1	1	1
S-3	38C-200- 92	Local/DX Sw SW-128-2	1	1	1
S-4	38C-200- 93	Stereo/Mono Sw SW-128	1	1	1
S-5	38C-200- 94	Eject Sw MSW-0083	1	1	1
S-6	38C-200- 95	Reed Sw Assembly 943-11-93	1	1	1
S-201	38C-200- 96	AM/FM Sw SW-133	1	1	1
SEMI-CONDUCTORS					
D-101	38C-200-101	Diode vari-cap 1TT-410	1	1	1
D-201	38C-200-102	Diode, zener 022-91A	1	1	1
D-301, 302, 501, 502, 503 504	38C-200-103	Diode, Det & Rect 1N-60	6	6	6
D-505	38C-200-104	Diode Spark Supp 10D-1	1	1	1
IC-201	38C-200-105	Integrated Circuit TA-7130	1	1	1
IC-202	38C-200-106	Integrated Circuit uPC-1026C	1	1	1
IC-301, 302	38C-200-107	Integrated Circuit uPC-1166H	2	2	2
IC-401, 402	38C-200-108	Integrated Circuit uPC-566H	2	2	3
Q-101	38C-200-109	Transistor 2SK-49	1	1	1
Q-102, 103	38C-200-110	Transistor 2SC-1674L	2	2	2
Q-201, 302, 303	38C-200-111	Transistor 2SC-1675L	3	3	3
Q-202, 203, 501, 502	38C-200-112	Transistor 2SC-945L	4	4	4
Q-204	38C-200-113	Transistor 2SD-471	1	1	1
Q-301	38C-200-114	Transistor 2SC-941R	1	1	1
Q-503	38C-200-115	Transistor 2SD-227	1	1	1
TRANSFORMERS					
T-101	38C-200-121	FM IFT IT-830B-1	1	1	1
T-201	38C-200-122	FM IFT IT-7130	1	1	1
T-301	38C-200-123	AM IFT IT-808A	1	1	1
T-302	38C-200-124	AM IFT IT-218B-1	1	1	1
MECHANICAL PARTS					
	38C-200-131	Background, dial KR-14620	1	1	1
	38C-200-132	Bracket, antenna trimmer KR-14884	1	1	1
	38C-200-133	Bracket, deck KR-14758	2	2	2
	38C-200-134	Bracket, local/dx switch KR-14755	1	1	1
	38C-200-135	Bracket, pc board KR-14621	1	1	1
	38C-200-136	Bracket, stereo/mono switch KR-14619	1	1	1
	38C-200-137	Bracket, top cover KR-14759	1	1	1
	38C-200-138	Cable Ass'y, battery & speaker cord QS-763	1	—	—
	38C-200-139	Cable Ass'y, battery & speaker cord QS-773	—	1	—
	38C-200-140	Cable Ass'y, battery & speaker cord QS-708	—	—	1
	38C-200-141	Chassis base PR-14754C	1	1	1
	38C-200-142	Chassis front MR-14760C	1	1	1
	38C-200-143	Cover, bottom MR-14768	1	1	1
	38C-200-144	Cover, top MR-14767	1	1	1
	38C-200-145	Dog-washer, volume & tuning shaft KR-12549	2	2	—
	38C-200-146	Dog-washer, volume & tuning shaft KR-14374	—	—	2
	38C-200-147	Escutcheon Ass'y, with band selector knob & dial plate 38C-200	1	—	—
	38C-200-148	Escutcheon Ass'y with band selector knob & dial plate 38C-202	—	1	—
	38C-200-149	Escutcheon Ass'y with band selector knob & dial plate 38C-201	—	—	1

Reference No.	Part No.	Description	Q'ty CP-750 ID-700	Q'ty CXPA	Q'ty GM-CXP
	38C-200-150	Heatsink, power IC : KR-14756	1	1	1
	38C-200-151	Holder, pilot lamp : PLH-26	1	1	1
	38C-200-152	Holder, stereo indicator lamp KR-30988	1	1	1
	38C-200-153	Holder, tape indicator lamp KR-30956A	1	1	1
	38C-200-154	Knob, FF/Eject/Rewind : KN-229T	1	1	1
	38C-200-155	Knob, Local/DX : KN-231TA	1	—	1
	38C-200-156	Knob, Local/DX KN-231TCRA	—	1	—
	38C-200-157	Knob, stereo/mono : KN-230TA	1	—	1
	38C-200-158	Knob, stereo/mono : KN-230TCRA	—	1	—
	38C-200-159	Lever, band selector switch KR-14769	1	1	1
	38C-200-160	Lever, local/dx switch : KR-14791	1	1	1
	38C-200-161	Lever, stereo/mono switch : KR-14792	1	1	1
	38C-200-162	Linkage, band selector switch: MR-14623	1	1	1
	38C-200-163	Nut, volume & tuning shaft N3/8", 3t	2	2	4
	38C-200-164	P C Board, EQA MR-3963-1	1	1	1
	38C-200-165	P C Board, AM, power : MR-3960	1	1	1
	38C-200-166	P.C Board, EQA : MR-3963-2	1	1	1
	38C-200-167	P.C. Board, front end : KR-3961	1	1	1
	38C-200-168	P.C. Board, MPX : KR-3962	1	1	1
	38C-200-169	Plate, power IC retaining : KR-14757	2	2	2
	38C-200-170	Plate, shield KR-14848	1	1	1
	38C-200-171	Pointer, dial : KR-14846	1	1	1
	38C-200-172	Receptacle, antenna : AJ-12	1	1	1
	38C-200-173	Reflector, pilot lamp : KR-14904	1	1	1
	38C-200-174	Retainer, antenna receptacle : KR-12285	1	1	1
	38C-200-175	Retainer, battery & speaker cord : KR-13769	1	1	1
	38C-200-176	Screw, machie : P B 3 × 4	5	5	5
	38C-200-177	Screw, machine P B 3 × 8	2	2	2
	38C-200-178	Screw, machine P B 3 × 6	8	8	8
	38C-200-179	Screw, machine P B 2 × 4 (stereo/mono, local/dx sw)	5	5	5
	38C-200-180	Screw, machine P B 2 × 3 (ff/eject knob)	1	1	1
	38C-200-181	Screw, machine P B 3 × 6 (BS) (heatsink)	2	2	2
	38C-200-182	Screw, tapping hex. 3 × 6	22	22	22
	38C-200-183	Screw, tapping P B 3 × 8	4	4	4
	38C-200-184	Screw, tapping P B 3 × 6	14	14	14
	38C-200-185	Shaft Ass'y, tuning & balance : TSA-25	1	1	1
	38C-200-186	Spacer, band selector lever KR-13358A	1	1	1
	38C-200-187	Sticker, model no 38C-200C2(10-700)	1	—	—
	38C-200-188	Sticker, model no 38C-200C3 (77-CXPA/78-CXP)	—	1	—
	38C-200-189	Sticker, model no 38C-200C(CP-750)	1	—	—
	38C-200-190	Sticker, model no 38C-201C(GM-CXP)	—	—	1
	38C-200-191	Washer, lock LW-9	2	2	2
	38C-200-192	Washer, volume & tuning shaft KR-13853	—	—	2

MECHANICAL PARTS (DECK)

	38C-200-201	Arm, deck chassis joint 940-13-06	4	4	4
	38C-200-202	Arm (L), eject : 430-33-01	1	1	1
	38C-200-203	Arm (R), eject 430-32-01	1	1	1
	38C-200-204	Bearing, flywheel : 1085-12-01	1	1	1
	38C-200-205	Belt, flywheel drive 940-12-06	1	1	1
	38C-200-206	Bracket, flywheel 940-12-03	1	1	1
	38C-200-207	Bracket, tape/radio switch 940-06-01	1	1	1
	38C-200-208	Chassis Ass'y, (main), 945-01-91	1	1	1
	38C-200-209	Chassis Ass'y (sub), 940-07-91	1	1	1
	38C-200-210	Feed Reel Ass'y 940-11-92	1	1	1
	38C-200-211	Flywheel 940-12-91	1	1	1
	38C-200-212	Guide(L), cartridge 940-01-93	1	1	1
	38C-200-213	Guide(R), cartridge 940-01-92	1	1	1
	38C-200-214	Lever Ass'y, rewind : 940-09-92	1	1	1
	38C-200-215	Lever, deck chassis lift : 940-13-81	1	1	1
	38C-200-216	Lever, ff/eject/rewind : 945-02-81	1	1	1
	38C-200-217	Lever, lock : 940-02-91	1	1	1
	38C-200-218	Lever, tape/radio switch : 940-02-06	1	1	1
	38C-200-219	Pinch Roller Ass'y : 430-31-00	1	1	1
	38C-200-220	Plate Ass'y, feed reel : 940-08-91	1	1	1
	38C-200-221	Plate, ff : 940-09-01	1	1	1
	38C-200-220	Plate Ass'y, ff/rewind lock : 943-09-93	1	1	1

Reference No.	Part No.	Description	Q'ty CP-750 ID-700	Q'ty CXPA	Q'ty GM-CXP
	38C-200-223	Plate Ass'y, head rest : 943-03-81	1	1	1
	38C-200-224	Pulley, motor (with screw) 940-12-05	1	1	1
	38C-200-225	Shaft, Pinch roller 940-04-02	1	1	1
	38C-200-226	Solenoid Ass'y 940-05-81	1	1	1
	38C-200-227	Spacer, feed reel plate : 940-08-03	1	1	1
	38C-200-228	Spacer, ff plate : 940-09-03	1	1	1
	38C-200-229	Spacer, ff/rewind lock plate, 943-09-08	1	1	1
	38C-200-230	Spacer, head : 940-03-07	1	1	1
	38C-200-231	Spacer, head rest plate : 940-03-05	1	1	1
	38C-200-232	Spacer, rewind lever : 940-09-06	1	1	1
	38C-200-233	Spring, cartridge retaining : 940-01-05	1	1	1
	38C-200 234	Spring, deck chassis lift : 238-04-06	1	1	1
	38C-200-235	Spring, feed/take-up reel, 05-05-02	2	2	2
	38C-200-236	Spring, ff plate 395-15-02	1	1	1
	38C-200-237	Spring, head : 328-05-09	1	1	1
	38C-200-238	Spring, head rest plate 238-03-10	1	1	1
	38C-200-239	Spring, head rest plate retaining 940-03-10	1	1	1
	38C-200-240	Spring, lift lever 18-06-06	1	1	1
	38C-200-241	Spring, pinch roller 940-04-01	1	1	1
	38C-200-242	Spring, take-up arm 940-10-03	1	1	1
	38C-200-243	Take up Arm Ass'y 940-10-81	1	1	1
	38C-200-244	Take up Reel Ass'y 943-11-91	1	1	1
	38C-200-245	Washer, flywheel 430-13-11	1	1	1
	38C-200-246	Washer, reel retaining 192-06-02A	1	1	1

INSTALLATION & ACCESSOSY MODEL CP-750

		Q'ty
38C-200-251	Back up plate MR-12200A	1
38C-200-252	Collar, escutcheon : KR-14874	1
38C-200-253	Fuse 2A	1
38C-200-254	Insert KR-13109	2
38C-200-255	Knob, tone & balance KN61TCR	2
38C-200-256	Knob, volume & tuning KN-54VCR	2
38C-200-257	Owner's Guide 38C-200C(01)	1
38C-200-258	Rear Support Strap : KR-1011	1
38C-200-259	Screw Bag 38C-200C(01)	1
38C-200-260	Speaker Cord QS-672	1
38C-200-261	Trimplate MR-14950	1

INSTALLATION & ACCESSORY MODEL 77-CXPA/78-CXP

38C-200-271	Collar, escutcheon : KR-14874	1
38C-200-272	Owner's Guide 38C-202C(03)	1
38C-200-273	Rear Support Strap KR-1011	1
38C-200-274	Screw Bag : 38C-202C(03)	1
38C-200-275	Spacer : 27/32", KR-14418 (106A-1068)	1
38C-200-276	Spacer 5/8", KR-14419 (106A-1074)	1
38C-200-277	Spacer 9/32", KR-14417 (106A-1075)	1

INSTALLATION & ACCESSORY MODEL ID-700

38C-200-281	"A" Lead Adaptor Bag QS-579	1
38C-200-282	Back up Plate MR-12200A	1
38C-200-283	Collar, escutcheon KR-14874	1
38C-200-284	Fuse 2A	2
38C-200-285	Insert KR-13109	2
38C-200-286	Knob Bag (No 1) KN-73T (shallow)	1
38C-200-287	knob Bag (No 2) KN-61T (deep)	1
38C-200-288	Knob Bag (No 3) KN-54V (front),	1
38C-200-289	Owner's Guide : 38C-200C(02)	1
38C-200-290	Rear Support Strap : KR-1011	1
28C-200-291	Screw Bag 38C-200(02)	1
38C-200-292	Spacer Bag : S-099	1
38C-200-293	Speaker Cord : QS-672	1
38C-200-294	Trimplate : MR-14950	1
38C-200-295	Wire Nut Bag : S-100	1

INSTALLATION ACCESSORY MODEL GM-CXP

38C-200-301	Owner's Guide : 38C-201C(03)	1
38C-200-302	Rear Support Strap : KR-1011	1
38C-200-303	Screw Bag : 38C-201C (03)	1

ALIGNMENT PROCEDURES

In case of readjustment, the test oscillator, vacuum tube voltmeter or tester should be available for carrying out adjustment according to the table of the sequence of adjustment.

- **Measurement of output voltage**
  Measure the voltage at both ends of the voice coil of the speaker by using the vacuum tube voltmeter (or AC range of tester).
- **Test oscillator and its connection**
  The test oscillator should be used at 400 Hz or 1000 Hz with 30~40% modulation. Connect the oscillator to VC1 or the antenna receptacle in series with a capacitor or dummy antenna, with the cold side to the metal chassis, as shown in the ALIGNMENT PROCEDURE CHART.
- **Procedure of adjustment**
  For tuning the screw core of the oscillator coil, etc., use of a driver made of bakelite stick is recommended for avoiding aberration due to adjusting.

List of Alignment Procedures

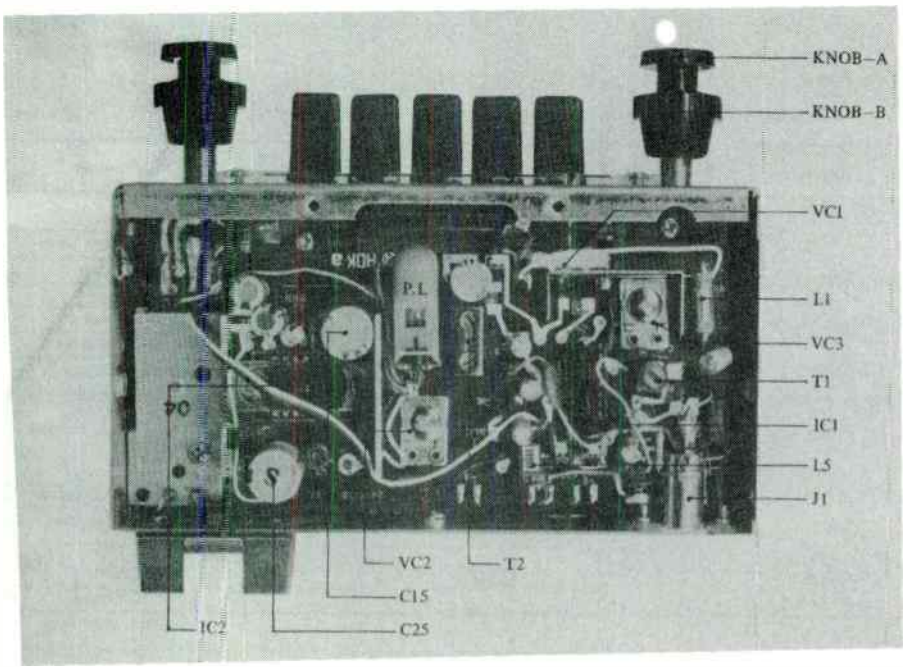
Procedures	Circuit	Signal generator coupling	Signal generator frequency	Radio dial setting	Indicator	Adjust	Remarks
1	IF circuit	Hot side to the VC1 terminal through 1~3pF Cold side to chassis	450 KHz	Point of non interference near 1600 KHz	Output meter across voice coil	T2	Try to equalize the degree of decrease near±10 KHz
2							
3						Repeat procedures 1	
4	Oscillation and RF circuit	Through dummy (Fig. 4, 5) to antenna receptacle	525±5 KHz	Lower freq. stop end	"	T1	
5			1650±10 KHz	Higher freq. stop end	"	VC3	
6						Repeat procedures 3~4	
7			1400 KHz	1400 KHz	"	VC1 VC2	Adjust VC1,VC2 , and get the maximum voltage output.
8			600 KHz	600 KHz	"	T1	Turn T1 gradually and find the maximum sensitivity near 600 KHz.
9			1400 KHz	1400 KHz	"	VC3	When the receiving frequency has changed because of adjusting 8 adjust VC3 to correct.
10					"	Repeat procedures 6~8	Check the range of the frequency of the received wave. This is the end of the adjustment.

When you have installed the set in the car raise the antenna at its maximum length, receive a weak station near 1400 KHz, and adjust antenna trimmer VC_1 in order to get the maximum output.

GUIDE TO TROUBLE REPAIR

Circuit	Procedures	Check	Judgement	Trouble cause
RF circuit	1	RF IC voltage Pin 5 6.1V	Drop or OV	• R10 open • C14, 15 short • RF IC damaged
			Proper	• Check for procedure 2
	2	RF IC voltage Pin 7 0.65V	Drop or up	• C16, 17 short • RF IC damaged
			Proper	• Check for procedure 3
	3	RF IC voltage Pin 6 5.6V	Drop or up	• R8 open • C11 short • RF IC damaged
			Proper	• Check for procedure 4
	4	RF IC voltage Pin 2 1.35V	Drop or up	• R4 open • RF IC damaged
			Proper	• Check for procedure 5
	5	RF IC voltage Pin 14 3.4V	Drop or up	• C7 short • RF IC damaged
			Proper	• Check for procedure 6
	6	RF IC voltage Pin 1 1.26V	Drop or up	• R5 open • RF IC damaged
			Proper	• Check for procedure 7
	7	RF IC voltage Pin 14 5.0V	Drop or up	• R7 open • T2 damaged • RF IC damaged
			Proper	• Check for procedure 8
	8	FR IC voltage Pin 12 0.54V	Drop or up	• R1, 2 open • D1, 2 short • RF IC damaged
			Proper	• Check for procedure 9
	9	RF IC voltage Pin 3 0.88V	Drop or up	• C9 short • RF IC damaged
			Proper	• Check for procedure 10
	10	RF IC voltage Pin 4 5.0V	Drop or up	• R3, L3 open • C4, VC2 short • RF IC damaged
			Proper	• Check for procedure 11

Circuit	Procedures	Check	Judgement	Trouble cause
RF circuit	11	VR circuit		• VR lead open • VR PCB patern open
		Oscillation circuit		• L4, L5, T1 open • VC3 short
		Antenna circuit		• L1, L2, C3 open • VC1, D1, D3 short
		Others		• C8, C13 open
Power circuit	1	Power IC voltage Pin 7 13.0V	Drop or OV	• Fuse open • CP1 short • L6 open • Power IC damaged
			Proper	• Check for procedure 2
	2	Power IC voltage Pin 5 6.0V	Drop or OV	• L7, C25 open • Power IC damaged
			Proper	• Check for procedure 3
	3	Power IC voltage Pin 6 12.5V	Drop or up	• C24 short • Power IC damaged
			Proper	• Check for procedure 4
	4	Power IC voltage Pin 2 7.0V	Drop or up	• C23 short • Power IC damaged
			Proper	• Check for procedure 5
	5	Power IC voltage Pin 14 3.4V	Drop or up	• C22 short • Power IC damaged
			Proper	• Check for procedure 6
	6	Power IC voltage Pin 11 2.6V	Drop or up	• C19, 20 short • Power IC damaged
			Proper	• Check for procedure 7
	7	Power IC voltage Pin 13 3.0V	Drop or up	• C21 short • Power IC damaged
			Proper	• RF IC check



In order to expedite delivery of replacement part orders, unless full information is supplied, delay in processing of orders will result.

Specify: 1. Model number
2. Part number and Description
3. Quantity

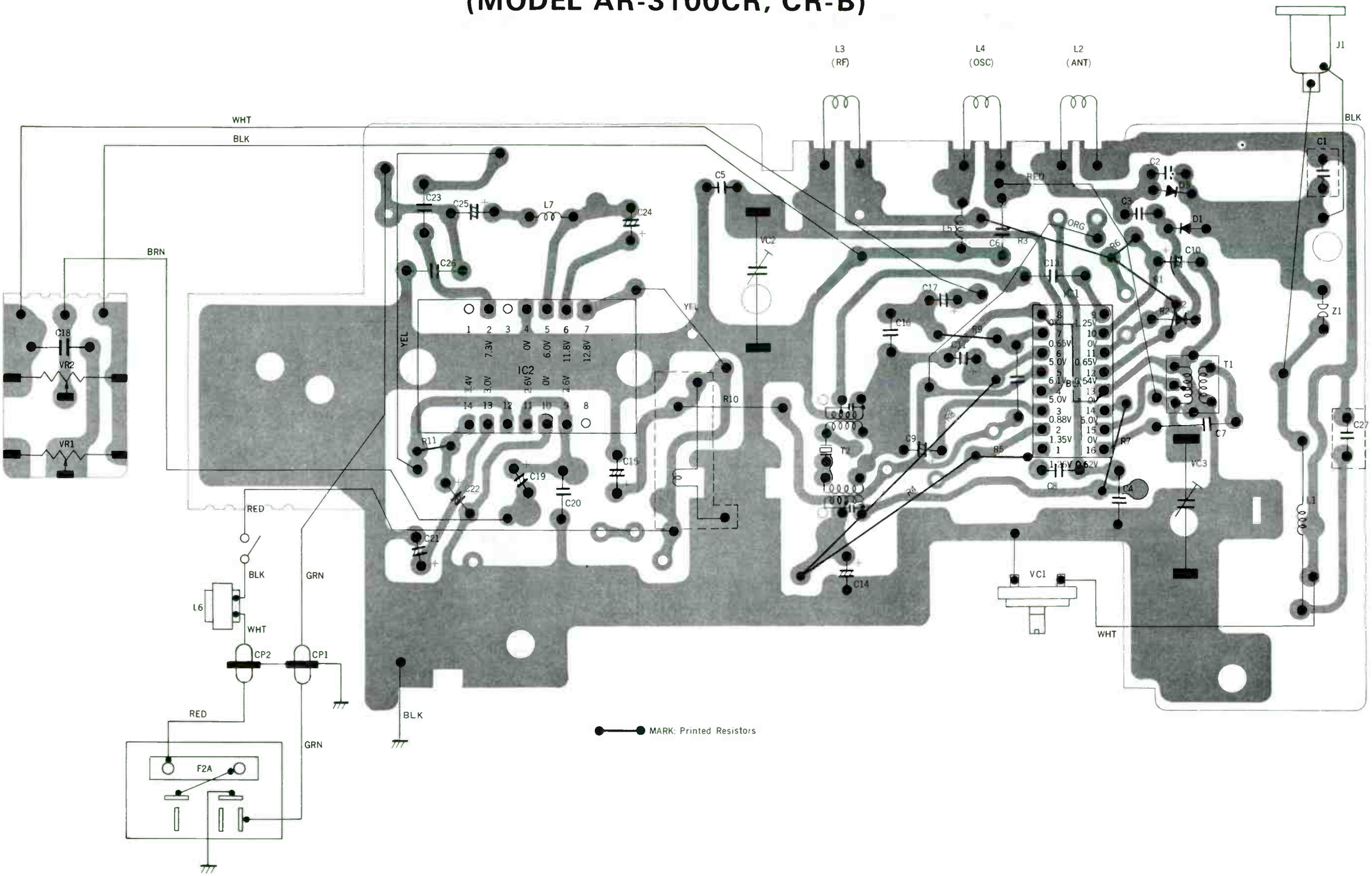
Symbol No.	Part No.	Description	Remarks
		Capacitors	
C1	154P02208	47pF±5%	Ceramic (CR)
,,	154P02306	100pF±5%	,, (CR-B)
2	*	0.0022μF±10%	Polyester
3	*	0.01μF±10%	,,
4	*	0.001μF±10%	,,
5	154P02400	150pF±5%	Ceramic
6	154P14309	180pF±5%	,,
7	*	0.022μF±20%	Polyester
8	*	0.01μF±10%	,,
9	181P06709	10μF/16WV	Electrolytic
10	181P06202	4.7μF/16WV	,,
11	,,	,,	,,
12	*	0.047μF$^{+100}_{0}$%	Ceramic
13	*	0.001μF±10%	Polyester
14	181L01206	220μF/16WV	Electrolytic
15	181L01204	330μF/16WV	,,
16	*	0.01μF±10%	Polyester
17	181P06200	2.2μF/16WV	Electrolytic
18	*	0.047μF$^{+100}_{0}$%	Ceramic
19	181P06709	10μF/16WV	Electrolytic
20	*	0.01μF±10%	Polyester
21	181P06202	47μF/16WV	Electrolytic
22	,,	,,	,,
23	*	3300pF±20%	Ceramic
24	181P06709	10μF/16WV	Electrolytic
25	181L01102	470μF/10WV	,,
26	*	0.1μF±20%	Polyester
27	189D01907	1800pF	Styrol
VC1	202P10603	70pF	Trimmer
2, 3	202P10601	,,	,,
CP1~3	141P02001	1000pF	Lead through type
		Resistors	
R1	*	12kΩ	Printed Carbon
2	*	4.7kΩ	,,
3	*	,,	,,
4	*	3.9kΩ	

Symbol No.	Part No.	Description	Remarks
		Resistors	
R5	*	3.3kΩ	Printed Carbon
6	*	470kΩ	,,
7	*	1kΩ	,,
8	*	2.2kΩ	,,
9	*	,,	,,
10	*	180Ω±10%	$\frac{1}{4}$W Carbon
11	*	68Ω	Printed Carbon
VR1, 2	122C13005	30kΩ–A	Variable Carbon
		IC and Diodes	
IC1	266P31101	μPC–30C	RF Amplifier
2	266P30801	M5151RE	Power Amplifier
D1, 3	264P11701	1S953	
2	264P00401	MD34	
		Transformers Coils and Filter	
T1	373M00103		OSC Transformer
2	299P00801		Ceramic Filter
L1	351L00101	3.2μH	RF Choke Coil
2~4	295K02603		Tuner (CR)
,,	295K02604		,, (CR-B)
5	351D02105	6.8μH	Oscillation Coil
6	351P00105		Power Supply Choke Coil
7	351M00201	20μH	AF Choke Coil
		Others	
	283P00102		2A Fuse
	253D00301		Lamp
	704D91802		Knob – A
	704M01902		Knob – B
	707L02704		Dial (CR, CR-B)
	923J00603		Assy PWB (CR)
	923J00604		,, (CR-B)

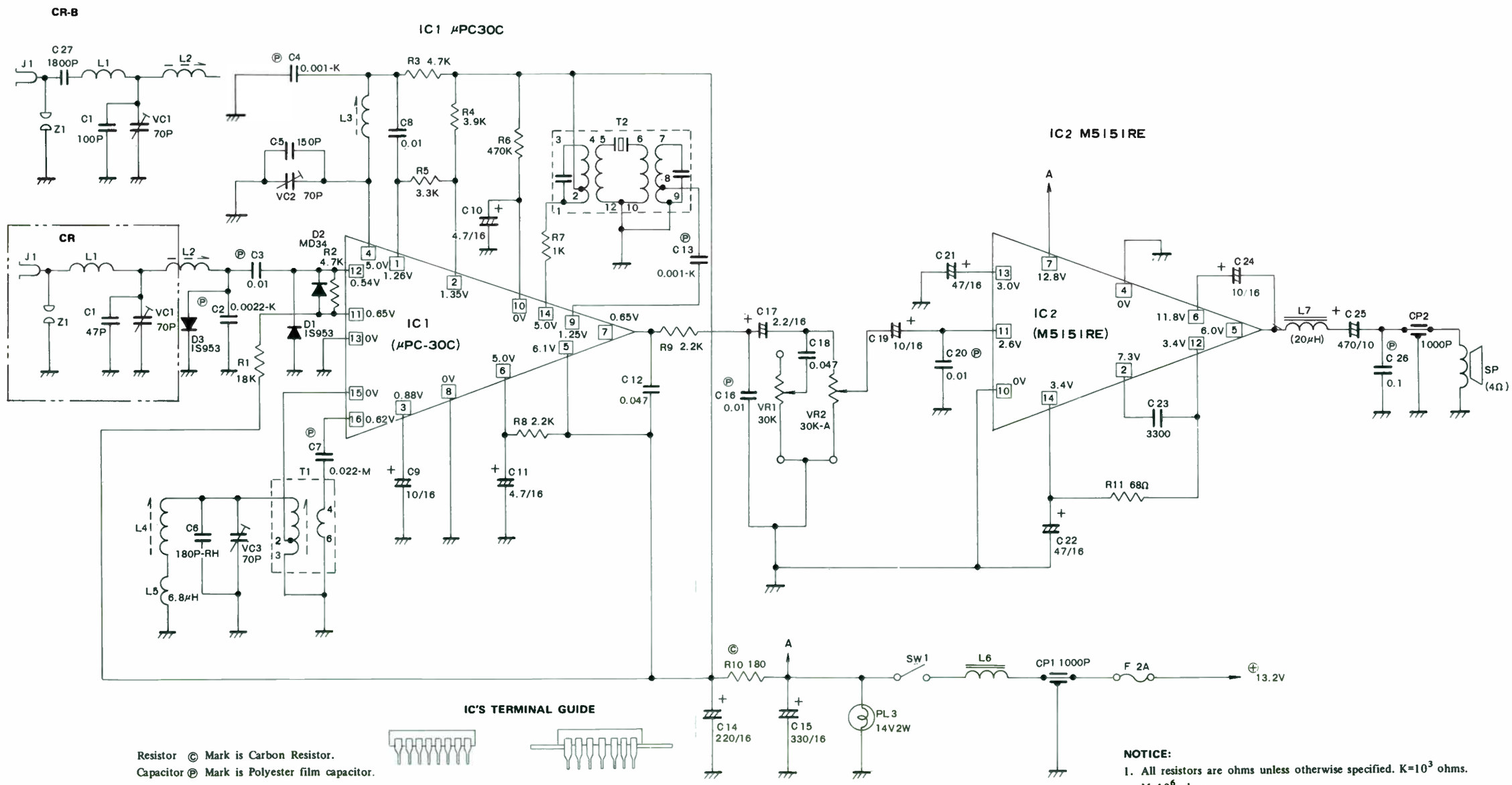
Notice: * Part available in local areas.

PRINTED CIRCUIT BOARD AND WIRING DIAGRAM (Printed Side)

(MODEL AR-3100CR, CR-B)



SCHEMATIC DIAGRAM (MODEL AR-3100CR, CR-B)



Resistor © Mark is Carbon Resistor.
Capacitor Ⓟ Mark is Polyester film capacitor.

NOTICE:

1. All resistors are ohms unless otherwise specified. K=10^3 ohms. M=10^6 ohms.
2. All capacitors are in microfarads unless otherwise specified. P=10^{-6} microfarad.
3. Voltage measurements taken with tester.
4. Each terminal is measured at the minimum position of tone volume when no signal is given. (near 1000 KHz)
5. The standard point to measure voltage is on chassis.
6. Supply voltage maintained at rated value for voltage readings. (13.2V)

Ford D77J19A171AA, D8AF171AA, D8EF19A171AA, D8TF19A171AA, D8VF19A171AA

ALIGNMENT INFORMATION

FM ALIGNMENT
AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

EQUIPMENT

1. Power Supply — Hewlett Packard 6285A or equivalent.
2. A-C VTVM — Hewlett Packard 400H or equivalent.
3. FM Generator — Boonton 202H or equivalent.
4. Oscilloscope — Tektronix 504 or equivalent.
5. RF Voltmeter or Detector Probe (see Diagram A for information on building an RF detector probe).
6. Varactor supply voltage from Varactor Supply Panel.

SERVICE NOTES

Before proceeding with the FM alignment, read the Service Notes and follow preliminary information steps 1 through 3 under VARACTOR POWER SUPPLY ALIGNMENT to determine whether the varactor voltages are within acceptable limits.
Use a VTVM with an input impedance of 1 megohm or greater for voltage measurements.
A wiring harness as shown in Figure 6-8 can be used when performing FM alignment.

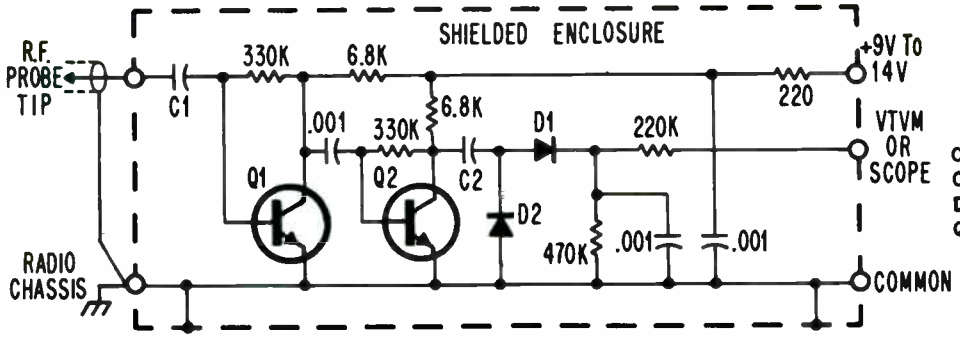
PRELIMINARY INFORMATION

1. Connect RF signal generator through dummy antenna to antenna input jack J101. (Refer to Diagram C for dummy antenna configuration.) Use 22.5 KHz modulated signal at frequency indicated in complete FM alignment procedure (except where otherwise indicated), and keep generator output at 1 millivolt for entire procedure.
2. Use test point J201 or P401 for indication of FM audio output.

PARTIAL FM ALIGNMENT PROCEDURE FOLLOWING PARTS REPLACEMENT

When replacing a component on the FM tuner panel, alignment should be performed only on the component replaced. The procedure in each case is shown in simplified chart form below.

PART REPLACED	GENERATOR SETTING	ADJUSTMENT FOR MAX. OUTPUT
L207	88MHz	L207
C226	108MHz	C226
C203, C208	104MHz	Only the capacitor or capacitors replaced
L201, L204	92MHz	Only the coil or coils replaced
TD203	108MHz 88MHz	C226 L207
TD201 TD202	104MHz 92MHz	The associated capacitor (C203 or C208) The associated coil (L201 or L204)
T202 FM detector transformer	Follow procedure as explained in step 10 of COMPLETE FM ALIGNMENT PROCEDURE.	



PARTS LIST

C1	1pF	3L0-11093
C2	10pF	3L0-0010-6
D1, D2	—	3L4-2001-3
Q1, Q2	AR2II	3L4-6009-12

DIAGRAM A. RF DETECTOR PROBE SCHEMATIC

COMPLETE FM ALIGNMENT PROCEDURE

STEP	PROCEDURE
1	Connect VTVM or scope to test point J201 or P401 for indication of FM audio output.
2	Connect RF voltmeter or RF detector to input (pin 1) of IC201 (junction of F202 and R221. (If RF voltmeter is not available, use detector probe suggested in Diagram A.) See Note:
3	Pull out high end pushbutton to unlock. Manually tune radio to 108 MHz for varactor tuning voltage into FM panel (J203) of +6.5 VDC on VTVM. Push the button in to lock in voltage setting.
4	Set generator to 108 MHz and adjust C226 for max. output.
5	Set generator to 104 MHz and adjust antenna trimmer C203, and RF trimmer C208 for max. output on scope or meter. Adjust generator output as needed to prevent limiting in IC201.
6	Pull out low end pushbutton to unlock. Manually tune radio to 88 MHz for varactor tuning voltage of 0.75 VDC on VTVM. Push the button in to lock in voltage setting.
7	Set generator to 88 MHz and adjust L207 for max. output.
8	Set generator to 92 MHz and adjust antenna coil L201, and RF coil L204 for max. output on scope or meter.
9	Repeat steps 4,5,7 & 8. If output reading on scope or meter is within 1 dB of max. output, no further tuning is required. If output reading is not within limit specified, repeat steps 4 through 8 until output is within the limit.
10	Align FM detector at 98 MHz as follows: a. Ground AFC line at junction of R231, R232, C229, and R224. b. Adjust generator frequency for max. output at pin 1 of IC201. c. Set generator to 75 KHz deviation, 400 Hz modulated signal at 1 millivolt output. d. Adjust FM detector transformer T202 for max. output on scope or meter. e. Adjust generator frequency for min. distortion in output indication. f. At null point, readjust T202 for max. output on scope or meter. g. Adjust T201 for max. output on scope or meter.

Note: This terminal will become accessible when the shield over F202 is bent slightly away from the IC toward R217.

Ford D77J19A171AA, D8AF171AA, D8EF19A171AA, D8TF19A171AA, D8VF19A171AA

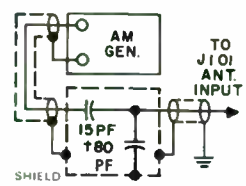
AM ALIGNMENT
AM-FM MONAURAL MODELS D8AF, D8EF, D8TF
D8VF AND D77J

PRELIMINARY INFORMATION

1. Disassemble radio as required. (See Disassembly Instructions.)
2. Connect +14 VDC output from power supply to A+ cable lead, and negative lead of power supply to chassis ground.
3. Connect VTVM on scope to AM audio shown in Diagram E.
4. Connect AM signal generator as directed in AM ALIGNMENT PROCEDURE.
5. Set AM-FM mode switch for AM operation.

AM ALIGNMENT PROCEDURE

STEP	SPECIAL INSTRUCTIONS	SIGNAL GENERATOR		RECEIVER	
		CONNECTION TO RECEIVER	DIAL SETTING	DIAL SETTING	ADJUST
1	Follow preliminary instructions.	To Q102 base (converter) thru .1 MF capacitor.	262.5 KHz	1000 KHz	T102 (black core) for max.
2	Same as step 1.	Same as step 1.	262.5 KHz	1000 KHz	T102 (blue core) for max.
3	Same as step 1.	Same as step 1.	262.5 KHz	1000 KHz	T101 (black core) for max.
4	Same as step 1.	Same as step 1.	262.5 KHz	1000 KHz	T101 (red core) for max.
5	Re-assemble radio with exception of cover. Connect +14 VDC to A+ cable lead of radio. Connect a 3.2 ohm load resistor across the output socket PZ. Connect VTVM or scope across load resistor. Set vol. control to max. and adjust generator output for 1.8V RMS across load resistor.	Thru dummy antenna (Diagram D) to antenna input.	1610 KHz	1610 KHz	1. C109 (OSC.) max. 2. C105 (RF) max. 3. C101 (ANT.) max. (Repeat)
6	Install completely assembled radio in car with antenna fully extended. Tune in a weak station above 1400 KHz and readjust antenna trimmer C101 for maximum volume.				



†48pf D8EF
57pf D77J
73.5pf D8TF
187pf D8VF

DIAGRAM D.
AM DUMMY ANTENNA

PERFORM THE FOLLOWING ALIGNMENT PROCEDURE ONLY IF TUNING COIL OR CORES HAVE BEEN REPLACED. FACTORY INSTALLED TUNER ASSEMBLIES ARE FACTORY ALIGNED.

1,2,3,4	Same as above.				
5	Remove bezel and sub dial. Rotate screw part of all three AM cores counterclockwise as much as possible. Then follow step 5 above except do not re-assemble bezel and sub dial.**	Thru dummy antenna to antenna input. (Refer to Diagram D for dummy antenna.)	1610 KHz	1610 KHz	1. C109 (OSC.) max. 2. C105 (RF) max. 3. C101 (ANT.) max. (Repeat)

**CAUTION: Avoid scratching sub dial on removal. (See disassembly instructions.)

STEP	SPECIAL INSTRUCTIONS	SIGNAL GENERATOR		RECEIVER	
		CONNECTION TO RECEIVER	DIAL SETTING	DIAL SETTING	ADJUST
6	Tune coils by adjusting screw part of each core.	Same as step 5.	1000 KHz	1000 KHz	1. L105 (OSC.) max. 2. L103 (RF) max. 3. L102 (ANT.) max. (Repeat)
7	Repeat adjustments in steps 5 and 6, if necessary, to improve dial tracking.				
8	After dial tracking is completed, cement brass screw part of each core to its grommet on carriage housing. Re-assemble sub dial, bezel, and cover.				
9	Install completely assembled radio in car with antenna fully extended. Tune in a weak station above 1400 KHz and readjust antenna trimmer C101 for maximum volume.				

VARACTOR POWER SUPPLY ALIGNMENT
AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

SERVICE NOTES

Follow preliminary information steps 1 through 3 below to determine whether the varactor power supply requires complete alignment.

The external test point and adjustment locations in Diagram E can be used during this procedure.

The FM voltage tuning chart in Diagram B can be used as a visual aid to determine whether complete alignment is required.

PRELIMINARY INFORMATION

1. Connect +14 VDC output from power supply to A+ cable lead, and negative lead of power supply to radio chassis.
2. Set AM-FM mode switch for FM operation.
3. To determine whether varactor power supply alignment is necessary, use VTVM to measure VRAC tuning voltage at J203 under conditions listed below. (If any voltage measured is not within limits specified, proceed with COMPLETE VARACTOR ALIGNMENT PROCEDURE.)
   a. Dial pointer set to extreme high end (at stop) — output on VTVM should be 6.7 to 6.9 VDC.
   b. Dial pointer set to 94 MHz — output on VTVM should be 1.4 to 1.6 VDC.
   c. Dial pointer set to extreme low end (at stop) — output on VTVM should be 0.68 to 0.72 VDC.

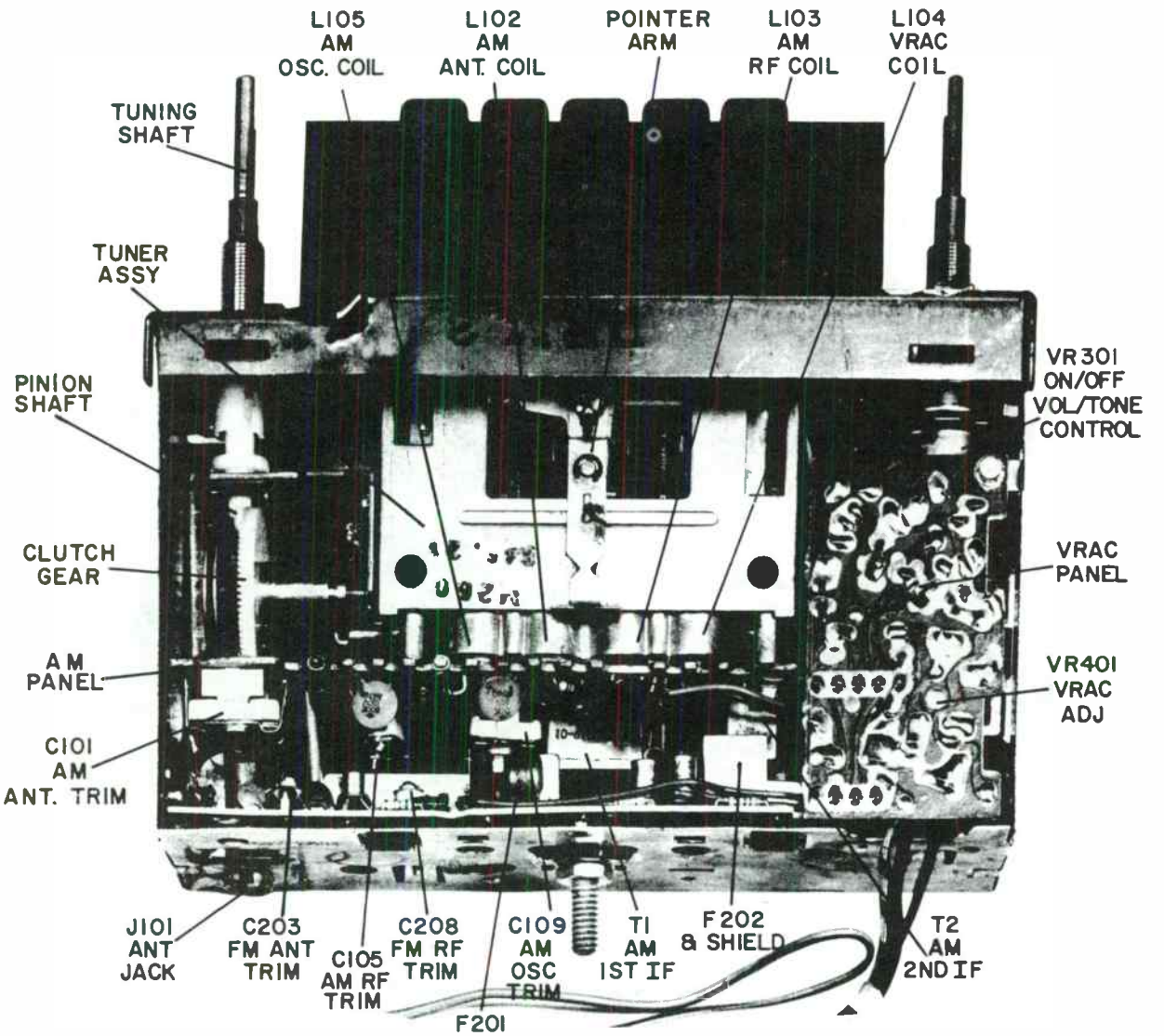
COMPLETE VARACTOR ALIGNMENT PROCEDURE

STEP	PROCEDURE
1	Disassemble radio as required. (See Disassembly Instructions.)
2	Rotate core of L104 to minimum inductance (fully out of coil).
3	Set dial pointer to extreme high end of band. (Lightly press a push button to release the clutch.)+ Adjust VR401 for 6.8 ± 0.05 VDC on VTVM at P403.
4	Set dial pointer to 94 MHz. (Make sure dial pointer is straight and centered on dial pointer arm before tuning to 94 MHz.) Adjust L104 for 1.5 ± 0.05 VDC on VTVM at P403.
5	Repeat steps 3 and 4 until desired voltages are obtained. End alignment with adjustment of VR401 at high end of band.
6	Set dial pointer to extreme low end of band. (Release clutch as instructed in step 3.) Check voltage at extreme low end for 0.7 ± 0.02 VDC on VTVM at P403. If voltage is not correct, proceed with step 7A or 7B.
7A	If voltage at low end is greater than 0.72 VDC, adjust L104 at 94 MHz for a voltage slightly greater than 1.5 VDC. Recheck and adjust VR401 for 6.8 VDC at high end; then re-check voltage at low end. Repeat, as required, until voltage at low end is less than 0.72 VDC.
7B	If voltage at low end is less than 0.68 VDC, adjust L104 at 94 MHz for a voltage slightly less than 1.5 VDC. Re-check and adjust VR401 for 6.8 VDC at high end; then re-check voltage at low end. Repeat, as required, until voltage at low end is greater than 0.68 VDC.

+It is necessary to release the clutch in order to remove the spring tension on the paddle bar at the extreme ends of the dial. This is done to get repeatability of dial end setting.

Those models with a fixed resistor instead of a variable resistor will use the following alignment procedure:

STEP	PROCEDURES
1	Dissassemble radio as required (see disassembly instructions).
2	Set pointer to 94 MHz (lightly press a push button to release clutch). Adjust core of L104 for 1.50 VDC on VTVM at P403.
3	Check voltages at extreme ends of tuner travel. These voltages should be 0.72 VDC, or less at low end, and 6.6 VDC, or greater at the high end.
4	Adjustment of the core can be made at 98 MHz to meet this minimum tuning voltage range or to center the tuning voltage range.



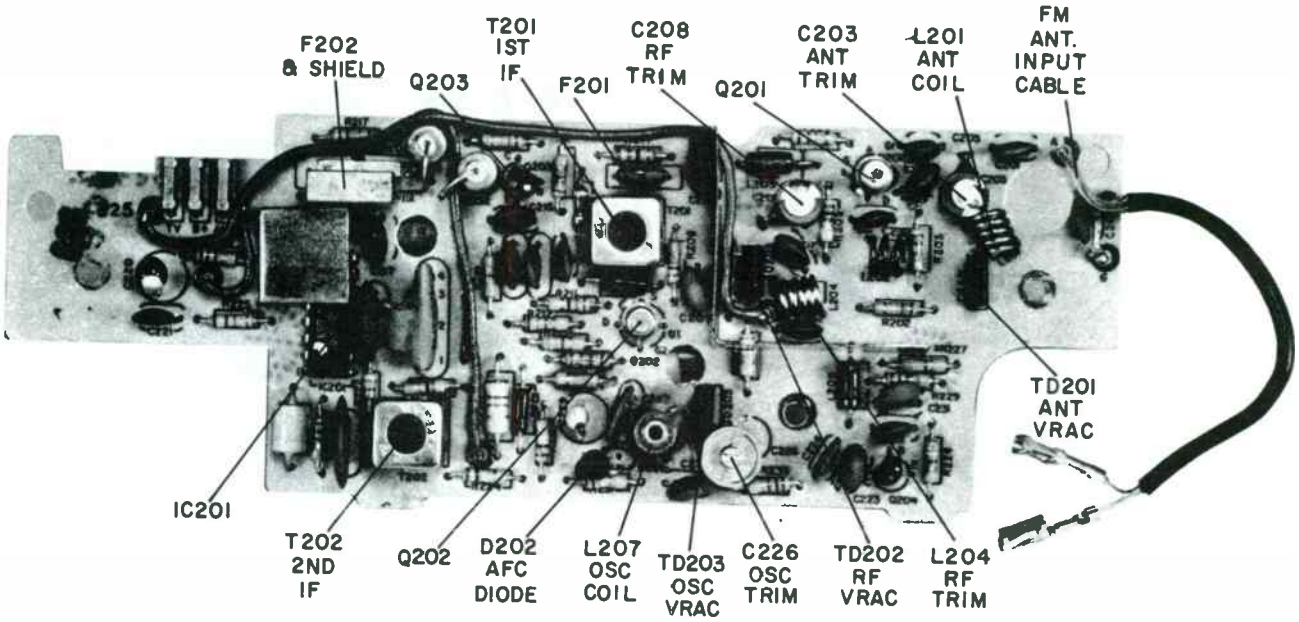


FIGURE 6-2. FM TUNER PANEL
AM-FM MONAURAL MODELS D8AF, D8EF, D8TF,
D8VF AND D77J

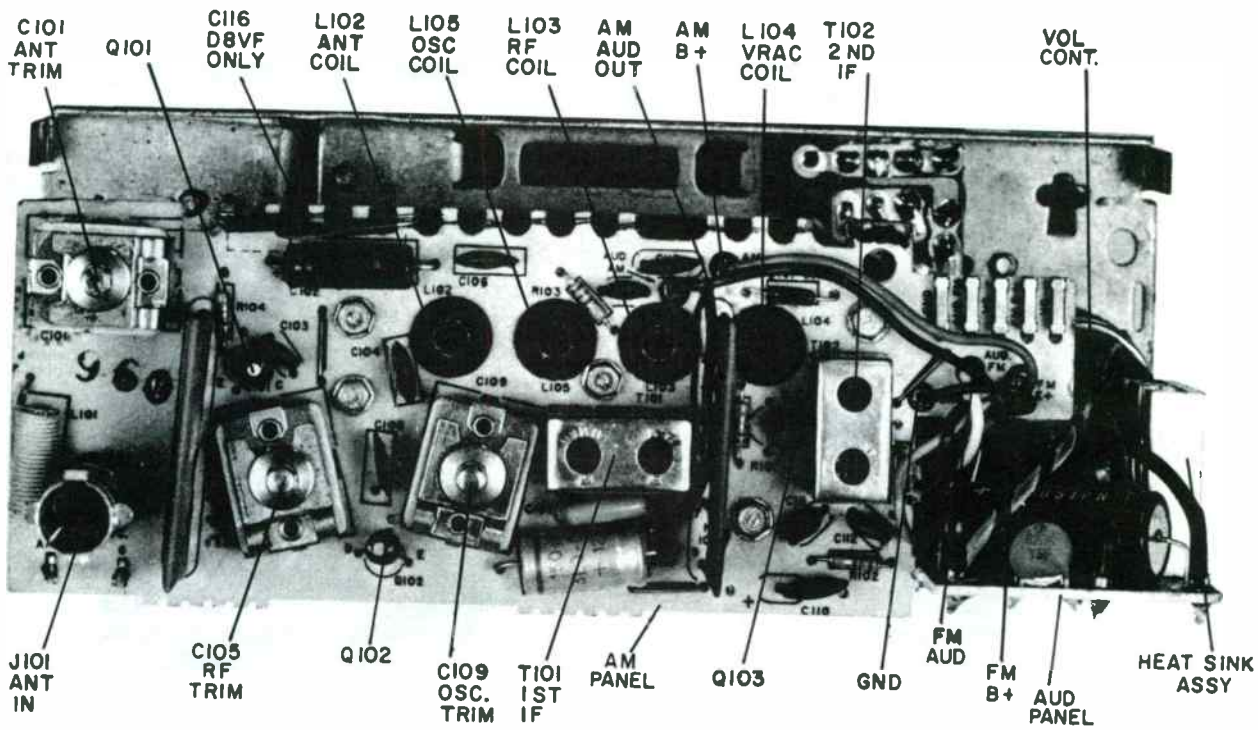


FIGURE 6-3. AM AND AUDIO TUNER PANEL
AM-FM MONAURAL MODELS D8AF, D8EF, D8TF,
D8VF AND D77J

FM TUNER PANEL TROUBLESHOOTING — AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

After a trouble has been localized to the FM tuner panel, follow systematic troubleshooting procedures using the troubleshooting chart for assistance in locating the trouble.

The FM tuner panel can be powered through use of the wiring harness method shown in Figure 6-8 or by a separate 14 volt B+ source to J201 and as external varactor supply voltage to J203 obtained through a 10K potentiometer across a 9 volt battery.

FM TUNER PANEL TROUBLESHOOTING CHART

TROUBLE SYMPTOM	PROBABLE CAUSE	CORRECTION
FM Microphonic	1. VR401 dirty	1. Clean or replace if defective.
Low audio output on station. Critical AFC. No noise between stations.	1. Q203 IC201 T202	1a. Check Q203, IC201, and associated circuitry for faulty components. 1b. Replace faulty transistor or IC if voltage or resistance measurements indicate a defective unit. 1c. FM detector transformer alignment.
No AFC	1. D202 or C228 open or shorted, or D201 bias voltage incorrect. 2. Defective IC201.	1. Check components and associated circuitry and replace any defective component. 2. Check circuitry and voltages and replace IC if defective.
No FM station. Only noise — AM OK	1. No varactor tuning voltage.	1a. Check varactor voltage at J203. Refer to varactor power supply section troubleshooting chart in AM tuner panel troubleshooting. 1b. J203 and P303 connection open and power off J203 to GND should measure well over 100 megohms. If not, check for a shorted varactor or C225. 1c. Check for broken or defective connection from varactor tuning voltage source to J203.
No FM station or sound — AM OK	1. No FM B+	1a. No voltage on FM B+ line. Refer to AM-FM B+ switch section of audio panel troubleshooting. 1b. Check for broken or defective connection in FM B+ line.
No FM station. Some background sound - AM OK	1. Defective I.F. stage. 2. VRAC OSC. circuit dead (Q401). DC bias OK	1. Check IC201 and associated circuitry and replace any defective component. 2. Check for open or partially shorted capacitors C402, C403, and C404.
Poor sensitivity and/or selectivity	1. Defective antenna socket 2. Defective C202, C201, C203, L201, C205, C207, C208, C209, TD201, TD202. 3. Defective F201 or F202 4. Varactor or bias voltage incorrect	1. Check and replace, as required. 2. Check circuit and replace defective component. 3. Check dB loss through ceramic filter (−3dB drop is normal). 4. Check VRAC OSC. DC bias and associated circuitry and replace any defective component.

TROUBLESHOOTING PROCEDURES
AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

LOCATING THE FAULTY PANEL

Because of the modular construction and the ease of disconnecting the leads between panels, the service technician should have no difficulty in localizing most failures to the faulty section requiring service. Most likely only one panel will be at fault and the other panels will operate satisfactorily. It is possible, with proper grounding, to cross-patch panels between a good operating receiver and panels in a faulty, or dead receiver, as a method in determining which panel is bad.

Once the faulty, or dead, panel has been found, the other two panels in the radio can be used as an aid in servicing through use of the wiring harness suggested in Figure 6-8 . For example: the FM tuner panel, or the AM tuner panel, can supply a signal for servicing the audio section of the audio panel; the varactor supply voltage can supply tuning voltage when servicing the FM tuner panel, etc.

The General Troubleshooting Chart below will help in determining the probable panel requiring service from the various trouble symptoms given. The test point and adjustment locations given in Diagram E should also be helpful in localizing trouble to a probable faulty panel before disassembling the radio.

GENERAL TROUBLESHOOTING PRECAUTIONS

1. All a-c powered test equipment and soldering devices should be grounded to avoid voltage transients greater than transistors can withstand.
2. Avoid applying excessive heat to prevent loosening of the terminals and possible damage to the printed circuit boards.
3. Use Ford Aerospace replacement parts and transistors as indicated in the Parts List of this manual. If other than recommended parts are substituted, equipment performance may be affected.
4. When the audio panel is operated separately from the chassis, provide an additional external heat sink for the output transistors on the panel. The normal heat sink assembly provided for the output transistors may get quite hot if this precaution is not followed.

GENERAL TROUBLESHOOTING CHART

TROUBLE SYMPTOM	PROBABLE FAULTY PANEL				
	VARAC	SW	AM	FM	AUDIO
AM Dead — FM OK		X	X		
FM Dead — AM OK — Varactor tuning voltage to FM tuner panel OK				X	
FM Dead — AM OK — No varactor tuning voltage from varactor supply panel	X	X			
Distorted or weak on AM — FM OK			X		
Distorted output on FM — AM OK				X	
Distorted output on both AM and FM reception					X
FM weak — AM OK				X	
FM stations too far off calibration with dial scale — AM OK	X				
FM Microphonic — AM OK				X	
Blows fuses					X
Dial pointer will not move on manual tuning			X		

FM TUNER PANEL TRANSISTORS VOLTAGE AND RESISTANCE CHECKS

Should suspicion, or troubleshooting checks, point to the possibility of a faulty transistor, it is recommended that voltage and resistance measurements be made at the terminals of the transistor on the panel before proceeding with replacement. Attempt to make sure the transistor is at fault to avoid an unnecessary replacement. The normal, averaged d-c voltage (to ground) values are given on the schematic; the d-c resistance (to ground) values are given in the following chart.

FM TUNER PANEL TRANSISTOR D-C RESISTANCE CHART

TRANSISTOR	* RESISTANCE (OHMS)			
	E OR S	B OR G1	G2	C OR D
Q201	85	** 15K	** 30K	200
Q202	250	** 10K	** 20K	320
Q203	1K	250		800
Q203•	900	1.2K		320

* ALL READINGS RX100 SCALE UNLESS OTHERWISE NOTED
** RX1000 SCALE

FM TUNER PANEL ICs VOLTAGE AND RESISTANCE CHECKS

Should suspicion or troubleshooting checks point to the possibility of a faulty IC, it is recommended that voltage and resistance measurements be made at the terminals of the chip on the panel before proceeding with replacement. Attempt to make sure the IC is at fault to avoid an unnecessary replacement. The normal, averaged d-c voltage (to ground) values are given on the schematic; the d-c resistance (to ground) values are given in the following chart.

PW PANEL SERVICE TIPS

Use a hot, well tinned iron when unsoldering a component so removal can be made quickly without damage to panel or associated components through excessive heat conduction.

Observe physical position and polarity of component before removal to assure replacement is installed correctly. This applies particularly to the ceramic filters, varactars, coils, transistors, diodes and the ICs.

When installing replacement components, keep the leads as short as possible.

FM TUNER PANEL IC + NETWORK D-C RESISTANCE CHART

IC OR NETWORK (PIN NO.)	* RESISTANCE (OHMS)													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC 201	5K	3.7K	5K	0	6K	1K	** 20K	** 13K	** 13K	** 13K	330		** 75K	0
N 201	300	** 80K		** 13K										

* ALL READINGS RX100 UNLESS OTHERWISE NOTED
** RX1000 SCALE

AM TUNER PANEL TROUBLESHOOTING — AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

After a trouble has been localized to the AM tuner panel, follow systematic troubleshooting procedures using the troubleshooting chart for assistance in locating the trouble. For servicing, the AM tuner panel can be operated in the following way.

AM Radio Section — B+ supply and AM audio output through audio panel; AM input signal through J101.

AM RADIO SECTION TROUBLESHOOTING CHART

TROUBLE SYMPTOM	PROBABLE CAUSE	CORRECTION
Dead AM reception-air signal.	No signal fed into AM input.	Check for broken or defective connection from J101.
Poor sensitivity.	1. Misalignment. 2. Defective L102, L103, C101, and C105.	1. Perform necessary AM alignment. 2. Check RF and I.F. circuitry to locate defective component.
Oscillates with low or moderate input signal.	Problem in AVC circuit.	Locate defective C102, R102, N102 and replace.
Dead AM reception-air check or signal generator.	Open C101 or L102 primary.	Replace.
Dead air check. Generator sens 4-5Kμv.	Shorted C103.	Replace.
Dead air check. Generator sens 10-15Kμv.	L101A secondary open L102.	Replace.

VARACTOR POWER SUPPLY PANEL TROUBLESHOOTING — AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

After a trouble has been localized to the varactor power supply panel, follow systematic troubleshooting procedures using the following troubleshooting chart for assistance in locating the problem. The varactor panel can be powered by use of the wiring harness as shown in Figure 6-10.

VARACTOR POWER SUPPLY PANEL TROUBLESHOOTING CHART

TROUBLE SYMPTOM	PROBABLE CAUSE	CORRECTION
No varactor tuning voltage.	Open or shorted component in varactor oscillator or oscillator control circuitry.	Locate cause through step by step voltage measurements from the output toward the oscillator.
Incorrect range on calibration	1. Out of alignment on calibration. 2. L402 or core of L104 defective.	1. Perform alignment procedure for varactor power supply. 2. Repair or replace faulty component.
Insufficient range of VR401 during alignment.	1. Improper alignment. 2. R411 increased in value. 3. Low DC voltage at cathode of D401.	1. Repeat alignment before suspecting a faulty component. 2. Replace. 3. Replace defective D401 or C406.

AM TUNER PANEL TRANSISTORS VOLTAGE AND RESISTANCE CHECKS

Should suspicion or troubleshooting checks point to the possibility of a faulty transistor, it is recommended that voltage and resistance measurements be made at the terminals of the transistor on the panel before proceeding with replacement. Attempt to make sure the transistor is at fault to avoid an unnecessary replacement. The normal, averaged d-c voltage (to ground) values are given on the schematic; the d-c resistance (to ground) values are given in the accompanying chart.

AM TUNER PANEL TRANSISTORS
D-C RESISTANCE CHART

TRANSISTOR	* RESISTANCE (OHMS)		
	E	B	C
Q101	330	IK	3.5K
Q102	1.5K	2K	2.2K
Q103	5.6	750	4K

*ALL READINGS RX 100 SCALE UNLESS OTHERWISE NOTED

VARACTOR POWER SUPPLY PANEL TRANSISTORS VOLTAGE AND RESISTANCE CHECKS

Should suspicion or troubleshooting checks point to the possibility of a faulty transistor, it is recommended that voltage and resistance measurements be made at the terminals of the transistor on the panel before proceeding with replacement. Attempt to make sure the transistor is at fault to avoid an unnecessary replacement. The normal, averaged d-c voltage (to ground) values are given on the schematic; the d-c resistance (to ground) values are given in the accompanying chart.

VARACTOR PANEL TRANSISTORS
D-C RESISTANCE CHART

TRANSISTOR	* RESISTANCE (OHMS)		
	E	B	C
Q401	100	850	800
Q402	0	700	850

*ALL READINGS RX 100 SCALE UNLESS OTHERWISE NOTED

AUDIO PANEL TROUBLESHOOTING — AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

After a trouble has been located to the audio panel, follow systematic troubleshooting procedures using the troubleshooting chart for assistance in locating the trouble.

For servicing, all panels can be interconnected using the wiring harness shown in Figure 6-10, or the AM and audio panels may be powered as a unit without the other panels.

AUDIO PANEL AUDIO SECTION

When the trouble appears to be in the audio section, it may be helpful to remember that the driver is the most vulnerable component, with the output transistors next. It is very unlikely that the problem will occur inside the packaged network as the transistors in the network are protected by limiting resistors. The single most serious fault would be a short to ground of the driver collector or output emitter point. If this happens, it is possible for both

output transistors to be destroyed; even the P.T.C. resistors could fail. A glowing P.T.C. resistor could be a sure indication of a shorted speaker lead.

Because of the loop effect and the directly coupled relationship of all components to one another, measuring voltages after a fault can be misleading. The best way to troubleshoot the circuit would be to disconnect both output collectors, short the driver collector to the P.T.C., and then activate the circuit. If the packaged network and driver are satisfactory, the driver collector will be 7.2 volts and exhibit a signal across a high impedance speaker. If the above does not check out, chances are the driver is destroyed. If the check-out is satisfactory, the output transistors may be the problem.

AUDIO PANEL AUDIO SECTION TROUBLESHOOTING CHART

TROUBLE SYMPTOM	PROBABLE CAUSE
More than 6.5 volts at output transistor emitters.	1. Driver shorted. 2. R303 (100 OHMS) or speaker lead open. 3. NPN output transistor Q302 shorted. 4. Pin 2, 6, 7, 9 of network N301 shorted to ground.
Less than 6.5 volts at output transistor emitters.	1. Driver transistor Q301 open. 2. Shorted PNP output transistor Q303. 3. Shorted pin 4 of network N301.
Blown driver or NPN output transistor.	Short at collector of driver or emitter of output transistor.
Excessive current or high voltage at collector of driver.	Open D301 or D302.
Excessive current or glowing P.T.C.	Speaker lead shorted.
Blown PNP output transistor.	Short at base of PNP output transistor.

AUDIO PANEL TRANSISTORS VOLTAGE AND RESISTANCE CHECKS

Should suspicion or troubleshooting checks point to the possibility of a faulty transistor, it is recommended that voltage and resistance measurements be made at the terminals of the transistor on the panel before proceeding with replacement. Attempt to make sure the transistor is at fault to avoid an unnecessary replacement. The normal, averaged d-c voltage (to ground) values are given on the schematic; the d-c resistance (to ground) values are given in the accompanying chart.

AUDIO PANEL TRANSISTOR D-C RESISTANCE CHART

TRANSISTOR	* RESISTANCE (OHMS)		
	E	B	C
Q 301	1.8 K	1.8K	680
Q 302	470	680	1.8 K
Q 303	470	100	0

* ALL READINGS RX 100 SCALE UNLESS OTHERWISE NOTED

Ford D77J19A171AA, D8AF171AA, D8EF19A171AA, D8TF19A171AA, D8VF19A171AA

ELECTRICAL PARTS LIST
AM-FM MONAURAL MODELS D8AF, D8EF, D8TF, D8VF AND D77J

Parts listed are for all models unless otherwise noted.
New parts not previously carried are indicated by the symbol "#" following the number.

SYMBOL	*WARR.	DESCRIPTION	SERVICE PART NO.
		CAPACITORS	
C101	C	80 nom., ant. trimmer	3L1-0005-5
C102	C	68 µf/16V, AGC	3L0-0009-26
C103	C	100 pf +10%/50V, RF neut.	3L0-0007-19
C104	C	180 pf ±20%/50V, N750, RF coil temp. comp.	3L0-0006-25
C105	C	120 pf nom., RF trimmer	3L1-0005-1
C106	C	150 pf +10%/50V, N750, RF coil temp. comp.	3L0-0006-28
C107	C	.01 uf ±10%, Q102 emitter bypass	3L0-1001-8
C108	C	180 pf ±20/50V, N750, osc. coil temp. comp.	3L0-0006-25
C109	C	300 pf nom., osc. trimmer	3L1-0005-3
C110	C	.47 µf +30%/3V, AGC	3L0-0008-14
C111	C	.02 µf +80 -20%/16V, I.F. B+	3L0-0008-17
C112	C	330 pf +10%/500V, AGC	3L0-0007-1
C113	C	.05 µf +80 -20%/16V, AM B+	3L0-0008-24
C114	C	.05 µf +80 -20%/10V, AM audio output	3L0-0008-10
C115	C	150 µf/16V, AM B+	3L0-0009-45
C116	C	500pf 10%/150V ant. tuning (D8VF only)	3L0-0006-24
C201	C	4.7 pf ±.5 pf/500V, NPO, ant. divider	3L0-0006-17
C202	C	22 pf +10%/500V, ant. divider	3L0-0007-13
C203	C	2-10 pf var., ant. trimmer	3L1-0004-1
C204	C	.001 µf ±20%/50V, AGC bypass	3L0-0007-37
C205	C	3.3 pf ±.5 pf/500V, RF gate #1 coup.	3L0-0006-13
C207	C	220 pf +10%/500V, RF DC blocking	3L0-0007-15
C208	C	2-10 pf var., RF trimmer	3L1-0004-1
C209	C	2.2 pf ±.5 pf/500V, mixer gate #1 coup.	3L0-0006-34
C210	C	220 pf +10%/500V, mixer I.F. trap	3L0-0007-15
C211	C	.05 pf +80 -20%/16V, RF B+	3L0-0008-24
C212	C	.001 µf ±20%/50V, mixer bypass	3L0-0007-37
C213	C	.05 µf +80 -20%/10V, I.F. bypass	3L0-0008-10
C214	C	10 µf/16V, I.F. B+	3L0-0024-1
C215	C	.05 µf +80 -20%/10V, Q203 emitter bypass	3L0-0008-10
C216	C	.1 µf +80 -20%/16V, IC201 B+	3L0-0008-38
C217	C	.05 µf +80 -20%/10V, IC201 bypass	3L0-0008-10
C218	C	.05 µf +80 - 20%/10V, IC201 bypass	3L0-0008-10
C219	C	150 pf ±5%/100V. N-470 det. tuning	3L0-0006-58#
C220	C	10 µf ±20%/20V, audio coup.	3L0-0011-4

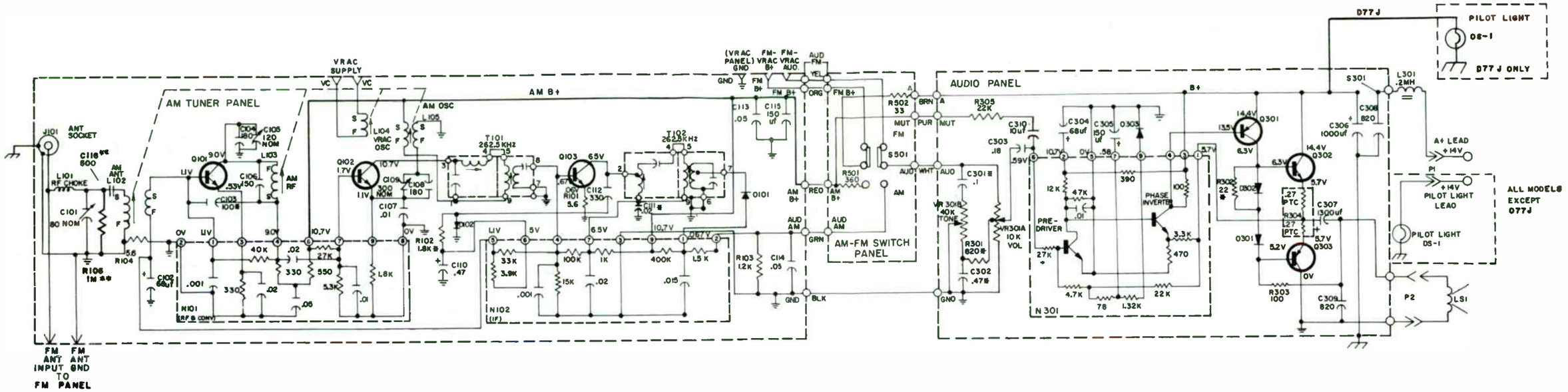
SYMBOL	*WARR.	DESCRIPTION	SERVICE PART NO.
C221	C	.033 µf ±20%/12V, de-, emphasis	3L0-0008-32
C222	C	220 pf ±10%/500V, osc. base	3L0-0007-15
C223	C	4.7pf ±.5 pf/150V, N330, osc. feedback div.	3L0-0006-44
C224	C	220 pf ±10%/500V, decoup.	3L0-0007-15
C225	C	.05µf+80-20%/25V, VRAC supply	3L0-0008-39
C226	C	2.5-7.5 pf var., osc. trimmer	3L1-0004-5
C227	C	47 pf ±10%/500V, NPO, osc. to mix. coup.	3L0-0006-15
C228	C	5.6 pf ±.5 pf/150V, N750, AFC divider	3L0-0006-59#
C229	C	.47 µf ±20%/10V, AFC bypass	3L0-0011-7
C230	C	.001 µf ±20%/50V, RF bypass	3L0-0007-37
C231	C	3.3 pf ±.5 pf/500V, N330, osc. feedback div.	3L0-0006-43
C232	C	10 µf/16V, AGC bypass	3L0-0024-1
C301	C	.1 µf +30%/3V, hi cut	3L0-0008-12
C302	C	.47 µf +30%/3V, bass boost	3L0-0008-03
C303	C	.18 µf ±20%/3V, audio coupling	3L0-0008-50
C304	C	68 µf/16V, audio B+	3L0-0009-26
C305	C	150 µf/6V, DC feedback	3L0-0009-50
C306	C	1000 µf/16V, A+ line bypass	3L0-0009-44
C307	C	1300 µf/16V, output coup. spk.	3L0-0009-51
C308	C	820 pf ±10%/500V, A+ line bypass	3L0-0007-25
C309	C	820 pf ±10%/500V, output bypass	3L0-0007-25
C310	C	10 µf/16V, switch pop filter	3L0-0024-1
C401	C	10 µf ±20%/20V, Q401 base bypass	3L0-0011-04
C402	C	.0012 µf ±10%/500V, VRAC osc. F.B. div.	3L0-0007-20
C403	C	.1 µf ±10%/50V, VRAC osc. F.B. div.	3L0-1001-15
C404	C	500 pf +10%/150V, N4700, VRAC osc. coup.	3L0-0006-23
C405	C	.01 µf ±20%/16V, VRAC VRAC rect. filter	3L0-0008-21
C406	C	.05 µf +80-20%/25v.rectifier filter	3L0-0008-39
C407	C	.1 µf +80-20%/10V, output filter	3L0-0008-11
C408	C	68 µf/16V, VRAC B+ filter	3L0-0009-26

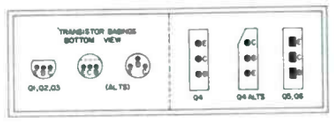
*Warranty Component Category

SYMBOL	*WARR.	DESCRIPTION	SERVICE PART NO.
		DIODES	
D101	P	AM detector	3L4-2003-1
D102	P	AM AGC detector	3L4-2003-1
D201	P	7.5V zener	3L4-3506-3
D202	P	AFC	3L4-3503-5
D202	P	AFC (opt.)	3L4-3503-6
D301	P	Output temp. comp. (silicon)	3L4-3002-10
D302	P	Output temp. comp. (germanium)	3L4-2003-4
D303	P	Pre-driver bias and comp.	3L4-2003-4
D401	P	Varactor osc. rectifier	3L4-3002-33
D402	P	Varactor osc. rectifier	3L4-3002-33
D403	P	6.8V zener	3L4-3506-43
		PILOT LAMPS	
DS301	K	1893 pilot lamp	3L4-0001-6
		VARACTORS	
TD201	P	Ant. tuning (blue)	3L4-3504-2
TD202	P	RF tuning (blue)	3L4-3504-2
TD203	P	Osc. tuning (white)	3L4-3504-3
		CAUTION: Varactors are used together in combinations listed above or below. Replace with same color dot.	
TD201	P	Ant. tuning (red)	3L4-3504-4
TD202	P	RF tuning (green)	3L4-3504-1
TD203	P	Osc. tuning (white)	3L4-3504-3
		NETWORKS	
F201	B	I.F. filter, 10.7 MHz	3L5-5003-1
F201	B	I. F. filter, 10.7 MHz (opt.)	3L5-5004-1#
F202	B	I. F. filter, 10.7 MHz	3L5-5003-1
F202	B	I. F. filter, 10.7 MHz (opt.)	3L5-5004-1#
		NOTE: Replace I. F. filter with same color code as on component removed or replace both filters with a pair having the same color code. (and Part Number)	
N101	B	RF conv.	3L5-1002-4
N102	B	I.F. filter	3L5-1002-6
N201	B	AGC amp.	3L5-0017-1
N301	B	Audio pre-amp.	3L5-0016-2
		COILS	
L101	D	Ant. RF choke	3L2-0034-4
L102	D	AM ant. tuning	3L2-0007-17
L103	D	AM RF tuning	3L2-0007-19
L104	D	AM VRAC tuning	3L2-0027-2
L105	D	Osc. tuning	3L2-0002-9
L201	D	FM ant. tuning	3L2-0037-5#
L202	D	Spurious response RF choke	3L2-0037-2
L203	D	1 μH RF decoup. choke	3L2-0023-11
L204	D	FM RF tuning	3L2-0037-3
L205	D	38 μH IC201 decoupling	3L2-0023-10
L206	D	1 μH osc. decoup. choke	3L2-0023-11
L207	D	FM osc. tuning	3L2-0044-01
L208	D	1 μH I.F. filter choke	3L2-0023-11
L301		Part of A+cable assy.	
L401	D	2.7 MH ±5%, RF choke	3L2-0023-5
L402	D	30 μH ±5%, osc. tank	3L2-0023-12

SYMBOL	*WARR.	DESCRIPTION	SERVICE PART NO.
		TRANSFORMERS	
T101	E	AM 1st I.F.	3L2-0019-1
T102	E	AM 2nd I.F.	3L2-0019-2
T201	E	FM 1st I.F.	3L2-0022-1
T202	E	FM quad. detector	3L2-0030-2
		TRANSISTORS	
Q101	A	AR200 AM RF amp. (white dot)	3L4-6007-1
Q102	A	AR201 AM conv. (yellow dot)	3L4-6007-2
Q103	A	AR202 AM I.F. amp. (green dot)	3L4-6007-3
Q201	A	AR501 FM RF amp	3L4-6503-1
Q202	A	AR502 FM I.F. mix.	3L4-6503-2
Q203	A	AR221 FM I.F. amp. (red-yellow)	3L4-6007-22
Q204	A	AR222 FM osc. (blue-yellow)	3L4-6007-23
Q301	A	AR44 audio driver	3L4-6011-9
	A	Audio driver (option)	3L4-6011-12
	A	Audio driver (option)	3L4-6011-14
Q302	A	NPN output amp. (order assy. no. includes Q302, Q303, and heat sink)	7L6-0531-1
Q303	A	PNP output amp. (order assy. no. includes Q302, Q303, and heat sink)	7L6-0531-1
Q401	A	AR213 FM varactor osc. (violet dot)	3L4-6007-14
Q402	A	AR218 FM VRAC volt. cont. (red dot)	3L4-6007-41#
		INTEGRATED CIRCUITS	
IC201	S	AE 914 FM I.F. amp. and det.	3L4-9014-1
		RESISTORS	
R101	G	5.6 ±10%, 1/4W, Q103 emitter	
R102	G	1.8 K ±10%, 1/4W, AGC	
R103	G	1.2 K ±10%, 1/4W, tone comp.	
R104	G	5.6 ±10%, 1/4W, ground	
R105	G	1meg. 5% 1/4w. ant. (D8VF only)	
R201	G	18 K ±10%, 1/4W, AGC (gate #2, RF stage)	
R202	G	560 K ±10%, 1/4W, ant. VRAC bias	
R203	G	22 K ±10%, 1/4W, Q201 gate #1	
R205	G	100 ±10%, 1/4W, Q201 source	
R206	G	56 K ±10%, 1/4 W, Q201 bias	
R207	G	100 K ±10%, 1/4W, RF VRAC bias	
R208	G	10 K ±10%, 1/4W, Q202 gate #1	
R209	G	33 K ±10%, 1/4W, Q202 gate #2 bias	
R210	G	56 K ±10%, 1/4W, Q202 gate #2 div.	
R211	G	56 ±10%, 1/4W, Q202 source	

*Warranty Component Category





NOTES

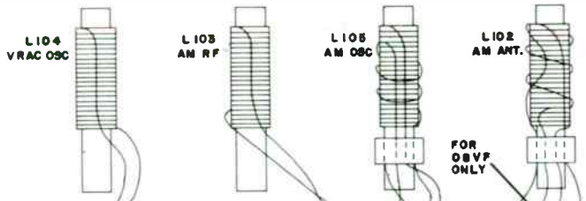
1. ALL VOLTAGES MEASURED WITH HIGH-IMPEDANCE VTVM UNDER NO SIGNAL CONDITIONS WITH VOLUME CONTROL SET TO MINIMUM
2. ALL RESISTANCES IN OHMS (K=1000, M=MEGOHMS)
3. CAPACITANCE (UNLESS OTHERWISE SPECIFIED) VALUES LESS THAN ONE = MICROFARADS (uf). VALUES GREATER THAN ONE = PICOFARADS
4. TUNING RANGES 540 KHZ TO 1640 KHZ (IF = 262.5 KHZ)
5. L3 IS LOCATED IN EXTERNAL A+ LEAD

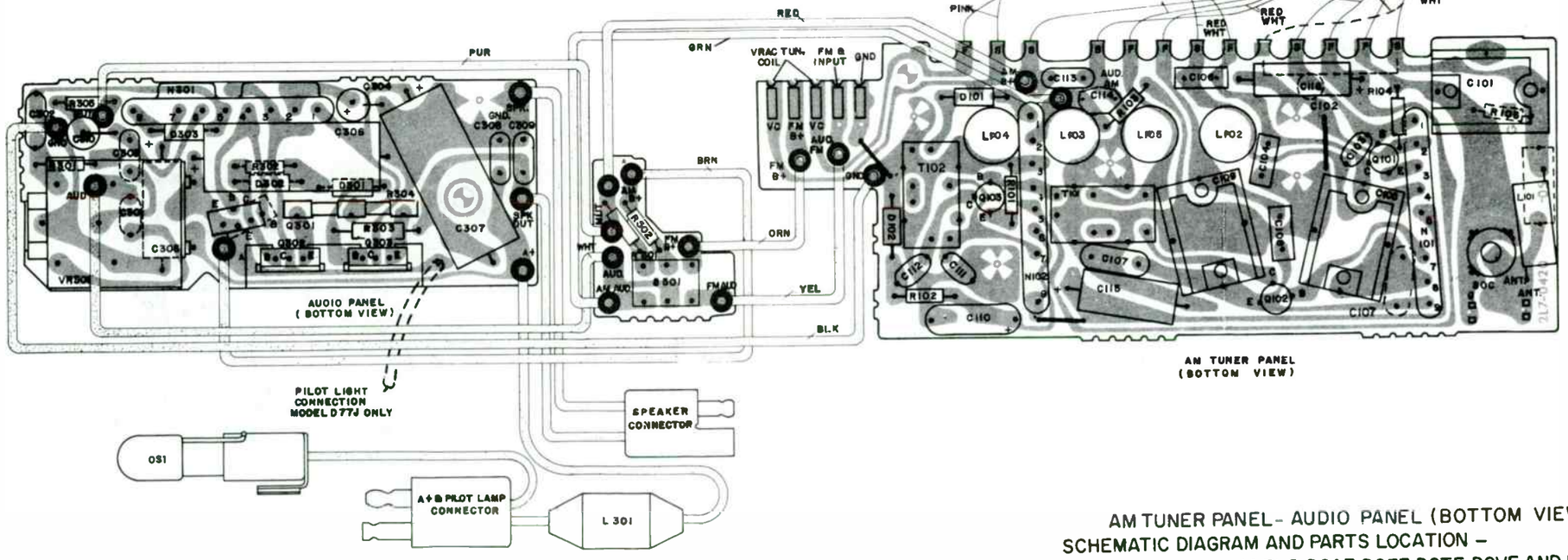
⏚ GROUND, RADIO CHASSIS OR HOUSING

⏚ GROUND, PW PANEL

* VALUES SUBJECT TO CHANGE WITH PRODUCTION CENTERING OF TOLERANCE

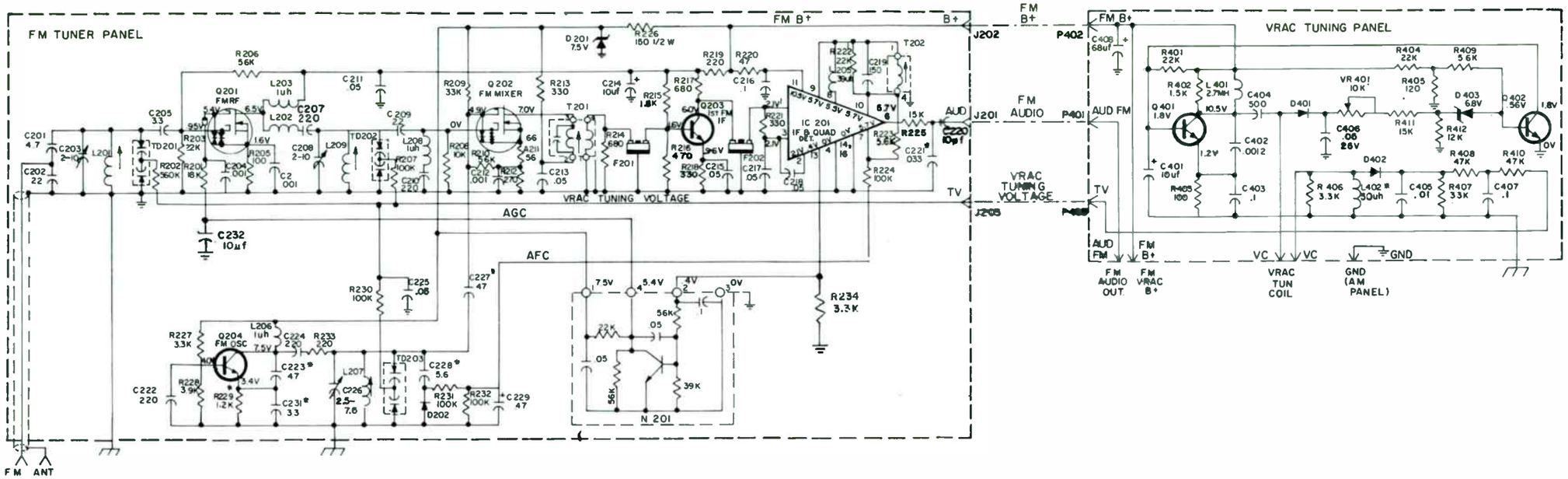
** D8VF ONLY

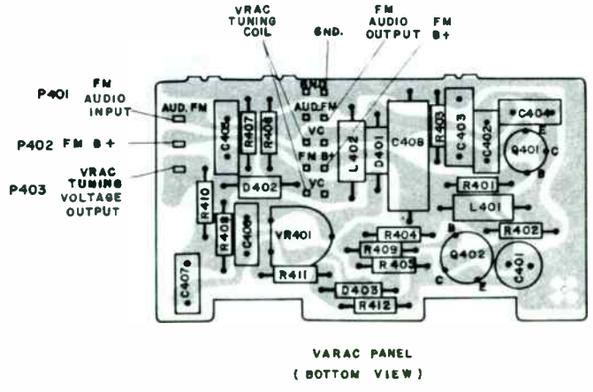


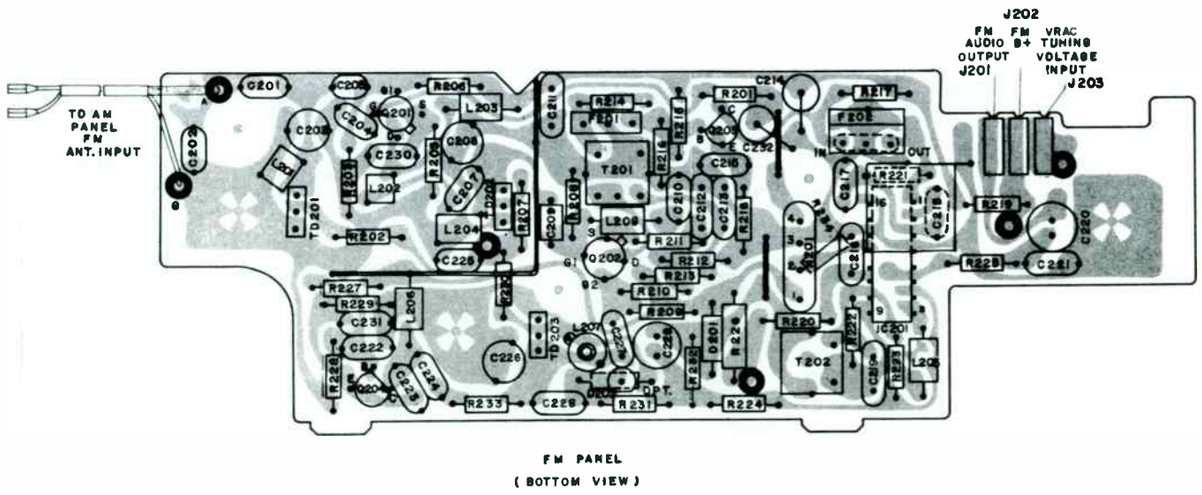


AM TUNER PANEL- AUDIO PANEL (BOTTOM VIEW)
SCHEMATIC DIAGRAM AND PARTS LOCATION –
AM-FM MONAURAL RADIO MODELS D8AF, D8EF, D8TF, D8VF AND D77J

Ford *D77J19A171AA, D8AF171AA, D8EF19A171AA, D8TF19A171AA, D8VF19A171AA*







FM TUNER AND VRAC TUNING PANEL (BOTTOM VIEW)
SCHEMATIC DIAGRAM AND PARTS LOCATION -
AM-FM MONAURAL RADIO MODELS D8AF, D8EF, D8TF, D8VF AND D77J

NOTES:

1. ALL VOLTAGES MEASURED WITH A HI-IMPEDANCE VTVM UNDER NO SIGNAL CONDITIONS WITH RADIO SET FOR FM & VOL. CONTROL SET TO MIN. EXCEPT WHERE OTHERWISE NOTED.
2. RESISTANCES ARE IN OHMS. K = 1000.
3. CAPACITANCE (UNLESS OTHERWISE SPECIFIED), VALUES LESS THAN ONE - MICROFARADS (µF)
   VALUES ABOVE ONE - PICOFARADS (PF)
4. TUNING RANGE - FM 88 MHz TO 108 MHz (I.F. 10.7 MHz)

* VALUES SUBJECT TO CHANGE WITH PRODUCTION CENTERING OF TOLERANCE
⏚ GROUND, RADIO CHASSIS OR HOUSING
⏚ GROUND, PW PANEL.

ALIGNMENT PROCEDURES FOR DIGITAL TUNING CAR RADIO

1. TEST CONDITIONS

Power Supply Voltage: DC 13.8V ± 1%, unless otherwise specified.
The condition of room temperature: 25 C, 65% (Normal).
Perform the alignments under normal conditions (5-35 C, 45-85%), unless otherwise specified. NOTE: To prevent damage (static electricity destruction) to the IC (C-MOS) provided inside digital logic P.C. Board, perform the alignments with caution.

2. EQUIPMENT REQUIRED

The test equipment listed below is required to evaluate and to align the digital tuning car radio. All test equipment should be properly calibrated.

(1) Audio Signal Generator	: OSC	:	Sine Wave 50Hz - 20kHz, including ATT.
(2) VTVM	: VTVM	:	1mV measurable
(3) Digital Voltmeter	: DV	:	10mV measurable, input impedance 1 M ohm/V or higher.
(4) Syncroscope	: CRT	:	0 - 20 MHz, High sensitivity and high input impedance type.
(5) Frequency Counter	: FC	:	0 - 20 MHz, High sensitivity and high input impedance type, 1 kHz measurable.
(6) Standard Signal Generator	: SG	:	100 kHz - 150 MHz, -10dB - 100 dB, 50 ohm unbalanced. 10 Hz frequency deviation measurable.
(7) Multiplex Generator	: So	:	50 Hz - 20 kHz
(8) AC VTVM	: AC VTVM	:	1 mV measurable for Head Azimuth Alignment.
(9) Speaker Dummy Resistor		:	8 ohms, 50W
(10) Circuit Tester	: T	:	DC, 20k ohm/V
(11) Regulated Power Supply		:	DC 0 - 20V, 8A or higher

CAUTION

Before alignments or adjustments, refer to the owner's guide which provides any operating instructions and functions. Pay special attention to wiring instruction and wiring diagram.

1. DIGITAL TUNING CAR RADIO ALIGNMENT PROCEDURES

1.1. PRELIMINARY

1. Before performing any adjustments, check visually all jacks, plugs and solder joints for good connection. Shown in the schematic are nominal test voltage values for the transistors. In addition, certain other pertinent voltages are shown on the schematic.
2. Before adjustment or alignment of this model, temporarily adjust VR1 through VR4, in that order, to its center position.
3. Turn each trimmer CT1, CT2, CT4, CT5 on the Tuner PC Board and CT1 on the Digital PC Board to its center position.

1.2 POWER AMPLIFIER ALIGNMENT

There are no adjustments provided in the audio amplifier circuits. First check for correct voltage distribution, referring to the voltage values shown on the schematic diagram.

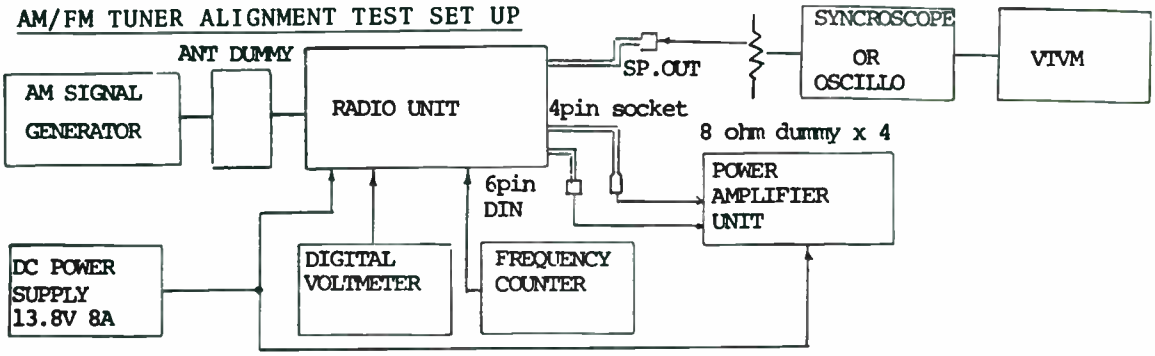
1.3 DIGITAL SYNTHESIZER ALIGNMENT

A. PLL CIRCUIT ALIGNMENT

1. Connect a frequency counter to PLL LSI (IC2), pin No. 19 through its probe and adjust the trimming capacitor CT1 to obtain frequency reading of: 5.12000 MHz ± 10 Hz
NOTE: This alignment must be done with frequency counter's gate placed 1 sec. To activate the standard reference oscillator for digital clock, be sure to check as mentioned above.

1.4 AM TUNER ALIGNMENT

AM/FM TUNER ALIGNMENT TEST SET UP



Unless otherwise noted, place the LO-DX switch in "DX" position.

A. LOCAL OSCILLATOR ALIGNMENT

1. First, make sure that both trimmers TC 4 & TC5 are placed at the center position, refer to illustration.

2. Depress the AM/FM select button in "AM" positon.
3. Turn the Manual Frequency Shift Control to clockwise or counterclockwise until digital readout frequency displays 1610 kHz.
4. Connect a Digital volt meter at the point between LPF OUT pin 14 (on AM/FM & MPX Decoder Unit PC Board) and chassis ground.
5. Adjust RED core of T8 to obtain 8.5V ± 0.05V on the meter.
6. Next, tune the Manual Frequency Shift Control to read 530 kHz on the LED indicator. Make sure the reading is within 0.8V- 2V. (Do not use a Circuit Tester in the above step (4) measurement.)

B. AM TUNER ALIGNMENT

1. Connect an AM Signal Generator to antenna connector through the AM ANT dummy.
2. Adjust an AM Signal Generator frequency to 1000 kHz, 30% modulation at 400 Hz with the radio tuning set to the same frequency.
3. Increase the AM Signal Generator output until a sine wave appears on the scope display.
4. Then, adjust T6 and T7 (RF coil) for maximum audio output.
5. Also, adjust T10 and T11 (IF coil) for maximum audio output.
6. Repeat the above step (4) until no further improvement is obtained.
7. Next, adjust the AM Signal Generator Frequency to 600 kHz or 1400 kHz and tune the radio to the same frequency. Make sure that the receiver sensitivity is obtained within standard value.

   NOTE: When adjusting the cores the audio output level will rapidly increase and the VTVM pointer go off scale. In this case, always decrease the signal generator output for proper audio output.

C. AM AUTO SCAN STOP CIRCUIT ALIGNMENT

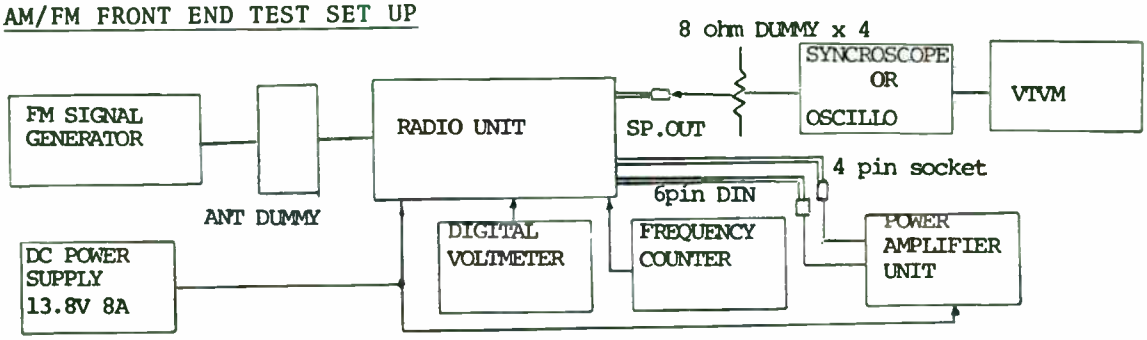
NOTE: The operation of Auto scan stop is adjusted by T11 transformer. Since the position of VR3 depends upon gain of IC2 - IC3, the VR3 should be fixed in its center position unless otherwise noted. To adjust this circuit, connect a DC 8V output line from terminal 48 pin to scan mute terminal 31 pin, using a jumper lead, because the circuit cannot be adjusted without supplying the voltage of 8V. If DC supply voltage is more than 8V (using the other power supply), the integrated circuit may be damaged; therefore, always use this terminal 48 pin in this alignment. Do not forget to remove the jumper lead used after this alignment. Though connecting two terminals makes Q12 transistor turn ON, and it makes audio signal mute, this operation is no trouble.

1. Connect a digital voltmeter at the point between TP1 and TP 2 on AM/FM & MPX Decoder Unit PC Board.
2. Connect an AM signal generator to the antenna terminal through the AM dummy ANT.
3. Adjust an AM signal generator frequency to 1000 kHz with the radio tuning set to the same frequency.
4. Turn on an AM signal generator and increase the signal generator output level to provide 74 dB (5000 microvolts).
5. Make sure that the Audio signal appears on audio stage and then, connect a jumper lead at the point between terminal 48 pin and terminal 31 pin. **See above note.

6. Adjust T11 so that the meter reading becomes 0V on the scale.
7. Reconnect a digital voltmeter at the point between TP3 and chassis ground.
8. Increase the signal generator output level gradually and the voltmeter reading rapidly increases from 0 to 8V at a certain signal output level. The signal generator output level is the threshold level for the auto scan stop action.
9. Remove the jumper lead used between terminal 48 pin and 31 pin after this alignment.

1.5 FM FRONT END ALIGNMENT

AM/FM FRONT END TEST SET UP



Unless otherwise noted, place the LO-DX switch in "DX' position.

A. LOCAL OSCILLATOR ALIGNMENT
1. Depress the AM/FM select button in "FM" position.
2. Turn the Manual Frequency Shift Control clockwise or counterclockwise and tune the radio to 107.9 MHz.
3. Connect a digital voltmeter at the point between LPF OUT pin 14 (on AM/FM & MPX Decoder Unit PC Board) and chassis ground.
4. Adjust T3 (local OSC coil) to obtain 8V ± 0.05V on the meter.
5. Next, tune the Manual Frequency Shift Control to read 88.1 MHz on the LED indicator. Be sure to check this voltage. The standard regulation voltage should be more than 1.5V at minimum and less than 8.5V at maximum. (Do not use a Circuit Tester in the above step (3) measurement.)

B. IF DETECTOR TRANSFORMER ALIGNMENT
1. Connect an FM Signal Generator to the antenna terminal through the FM ANT dummy.
2. Connect a digital voltmeter at the point between TP1 and TP2 on AM/FM & MPX Decoder Unit PC Board.
3. Adjust an FM Signal Generator frequency to 98.1 MHz with the radio tuning set to the same frequency.
4. Increase the signal generator output level to provide 60 dB or higher (60 dB = 1000 uV).
5. Adjust T5 to become 0V on the meter.
NOTE: This adjustment should be repeated because the coarse adjustment has some influence on the receiver's distortion and scan stop operation.

C. FM FRONT END ALIGNMENT
1. Depress the APC Control in "ON" position.
2. Connect an FM Signal Generator to the antenna terminal through the FM ANT dummy.
3. Connect an 8 ohm dummy load to the speaker output multi socket and connect a VTVM & Syncroscope across the dummy load, refer to the AM/FM Front End Alignment Test Set Up.
4. Adjust the signal generator frequency to 90.1 MHz for 30% modulation at 400 Hz with 22.5 kHz deviation and tune the radio to the same frequency.
5. Increase the signal generator level until a sine wave appears on syncroscope display.
6. Alternately adjust T1 and T2 for maximum sine wave on the scope display.
7. Re-adjust the signal generator frequency to 106.1 MHz for 30% modulation at 400 Hz with 22.5 kHz deviation and tune the radio to the same frequency.
8. Then, adjust CT1 and CT2 for maximum indication on VTVM.

9. Repeat the above steps (at 90.1 MHz and 106.1 MHz) until no further improvement is obtained.
10. Next, adjust the signal generator frequency to 98.1 MHz for 30% modulation at 400 Hz with 22.5 kHz deviation and tune the radio to the same frequency.
11. Adjust T4 for maximum indication on VTVM.
NOTE: When adjusting cores the audio output level will rapidly increase and VTVM pointer go off scale. In this case always decrease the signal generator output for proper audio output.

D. 19 kHz PILOT SIGNAL ALIGNMENT
1. Adjust an FM signal generator frequency to 98.1 MHz without modulation and tune the radio to the same frequency.
2. Connect a frequency counter at the point TP4 and chassis ground and read frequency. It should be 19.00 kHz ± 10 Hz. If not, adjust VR2 to obtain that reading.

E. SEPARATION ALIGNMENT
1. Modulate an FM Signal Generator (Multiplex Generator) with stereo composite signal (400 Hz 100% modulation) (F = 98.1 MHz).
2. Tune the radio exactly to the signal generator frequency.
3. Then, increase the signal generator output up to about 60 dB.
4. Modulate the signal generator with the normal left channel composite signal and observe the output signal of the right channel. Adjust VR1 for minimum leakage voltage (separation).
5. Next, modulate the signal generator with right channel composite signal and observe the right channel signal leakage appearing on the left channel. The leakage voltage should have the same level as that of the right channel. If not, re-adjust VR1 for equal and minimum leakage at both outputs. The normal leakage (separation) is approximately 32 dB (40 uV).

1.6 APC CIRCUIT ALIGNMENT
1. Adjust an FM Signal Generator to 98.1 MHz for 100% modulation at 400 Hz to provide an output signal of 60 dB and tune the radio to the same frequency
2. Release the APC Control switch to APC"OFF" position. Decrease the signal generator output level until the AF output level lowers by 0.5 dB from the output level at the 60 dB input.
3. Next, depress the APC Control Switch in "ON" position. Adjust VR4 until the AF output level further lowers by 20 dB (10 uV).

1.7 FM AUTO SCAN STOP ALIGNMENT
Usually no adjustment will be necessary, since this alignment is fixed at the factory.

PARTS LIST

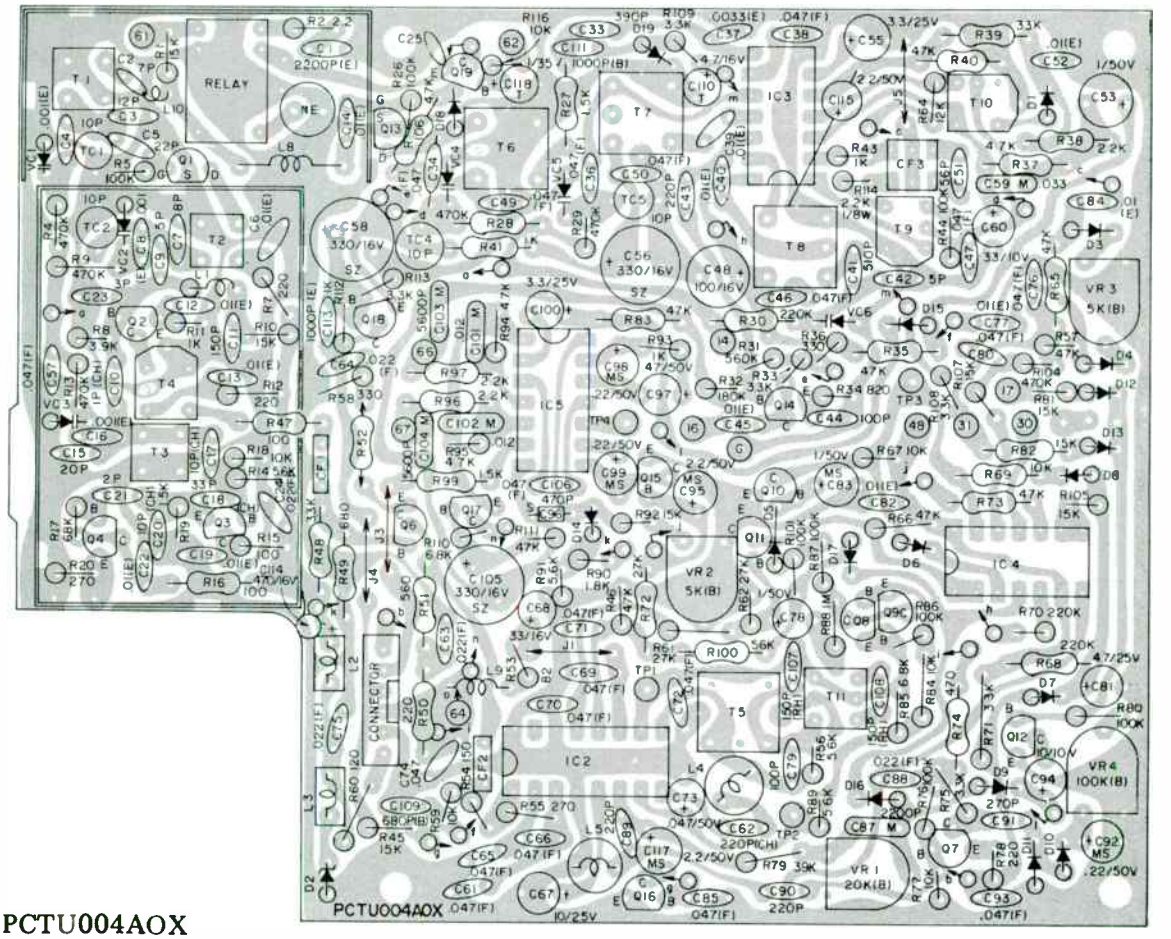
MODEL NO. 67-250 PAGE 3

REF. NO.	DESCRIPTION	PART NO.
	ELECTROLYTIC	
C48	100 uF, 10 V	00-132165
C53,78,83	1 uF, 50 V	00-132053
C55,100	3.3 uF, 25 V	00-132465
C56,58,105	330 uF, 16 V	00-132540
C67	10 uF, 25 V	00-132115
C73,97	.47 uF, 50 V	00-132575
C81	4.7 uF, 25 V	00-132600
C60,68	33 uF, 10 V	00-132505
C92,98,99	.22 uF, 50 V	00-132255
C94,116	10 uF, 10 V	00-132100
C95	2.2 uF, 50 V	00-132280

REF. NO.	DESCRIPTION	PART NO.
	POWER AMPLIFER BOARD	
	MISCELLANEOUS	
F1	Fuse, 3 Amp	13-204017
RY1	Relay	67-105002
	COILS	
CH1	Coil, Choke	67-178001
	INTEGRATED CIRCUITS	
IC1,2,3,4	TA7205	02-257205
	DIODES	
D1	1SS53	05-180053
D2	3BZ61	05-060361
	CAPACITORS	
	MYLAR	
C5,6	.001 uF, 50 V	03-000210
C15,16,17,18, 35,36,37,38	.068 uF, 50 V	03-000356
C53	.01 uF, 50 V	03-000205
C54	.047 uF, 50 V	03-000300
	ELECTROLYTIC	
C1,2,3,4	4.7 uF, 25 V	00-132600
C7,8,9,10,19, 20,21,22,23, 24,25,26	47 uF, 25 V	00-132635
C31,32,33,34, 50,51,52	2200 uF, 16 V	00-132345

PARTS LAYOUT

COMPONENT SIDE



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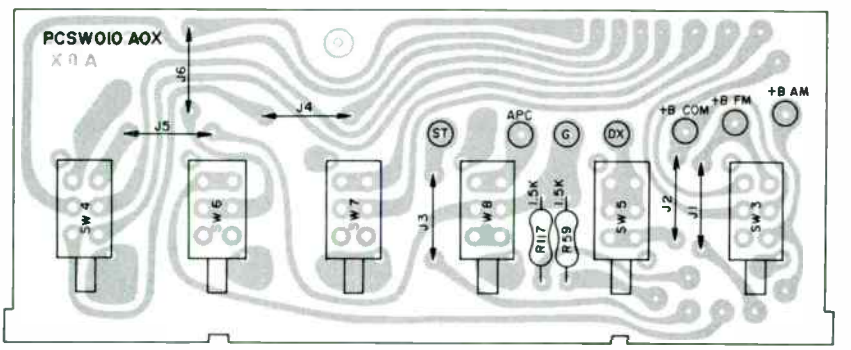

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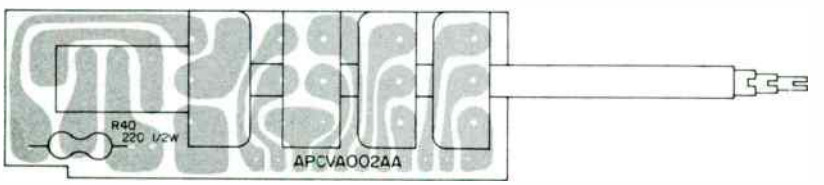

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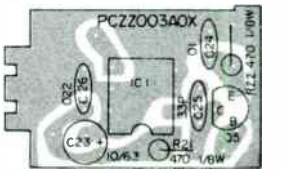

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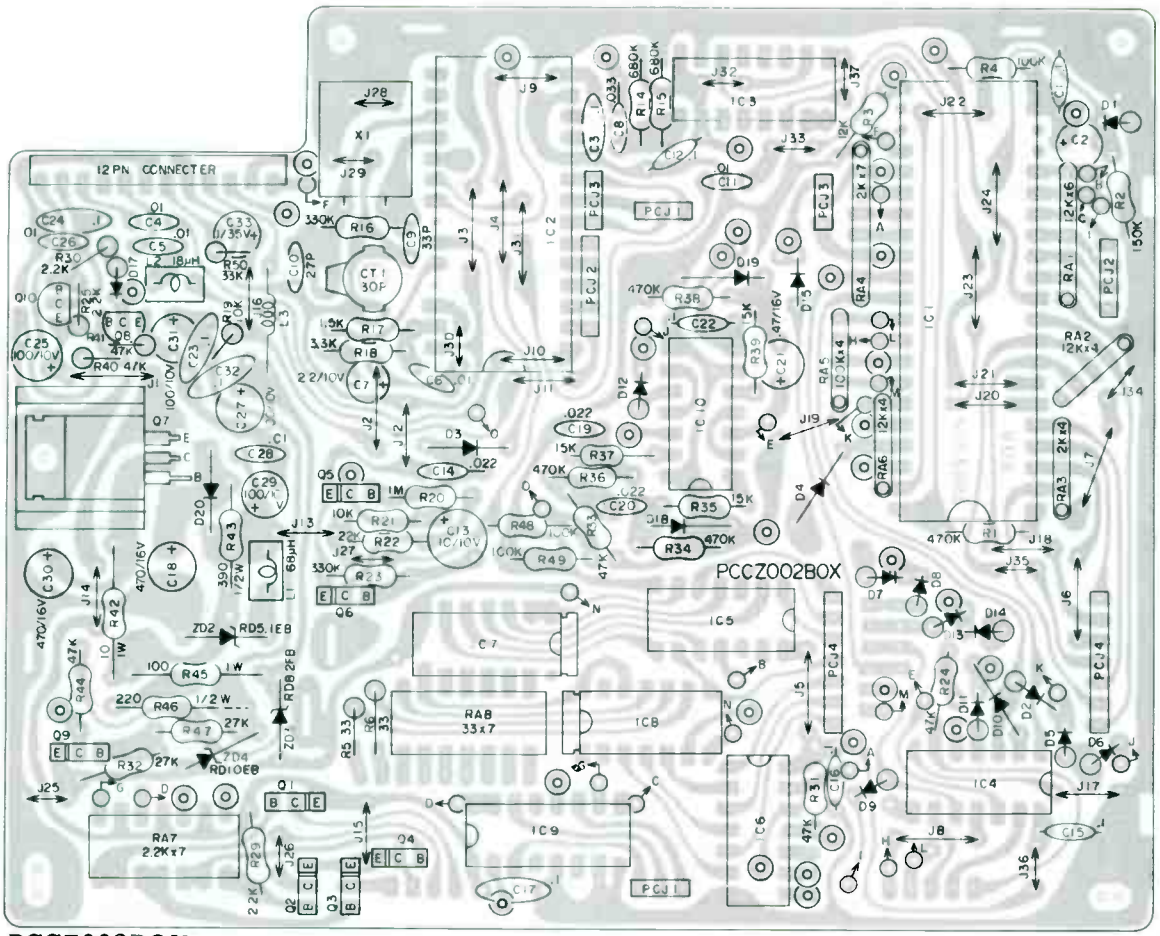
COMPONENT SIDE



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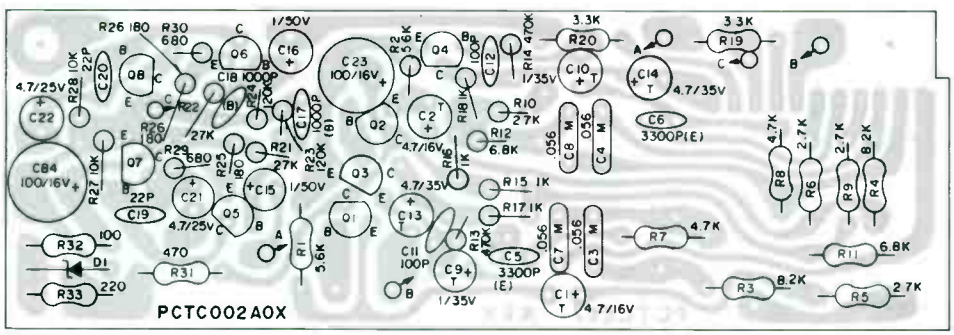
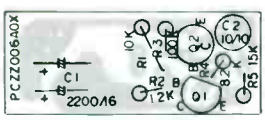


PCTC002AOX



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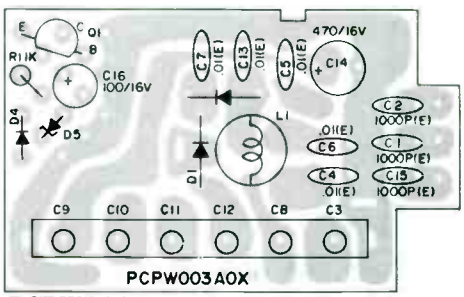

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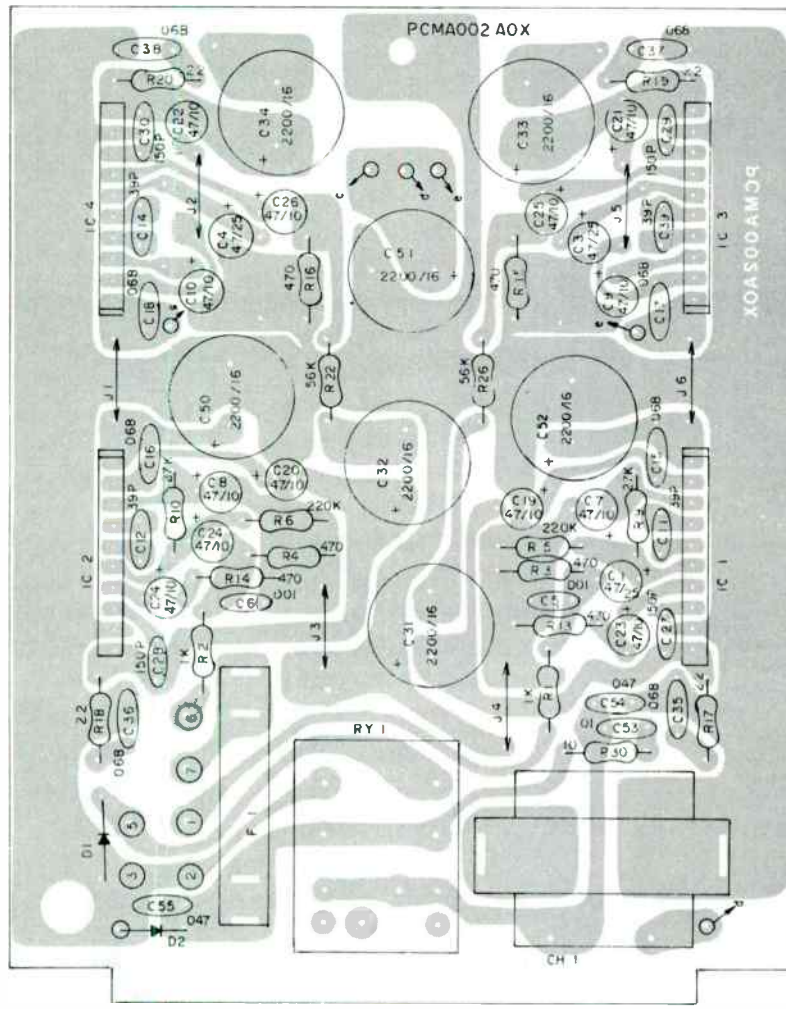
COMPONENT SIDE



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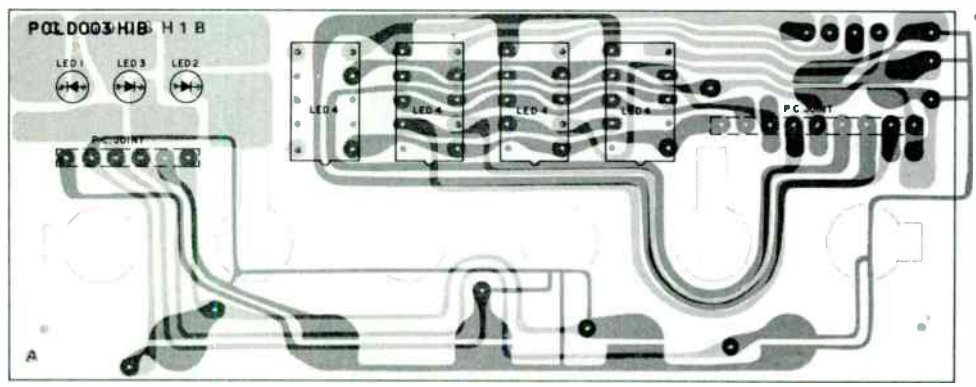


PCLD003H1B

PARTS LIST

MODEL NO. 67-250

REF. NO.	DESCRIPTION	PART NO.
	CASE PARTS (EXPLODED VIEW)	
3	Positioner, Control	67-151001
6	Bracket, PC Board Mt.	67-158020
7	Panel, Case (Side)	67-015003
11	Bracket, Rear	67-158023
12	Clamp, Capacitor	67-158023
24	Clamp, Cable, Ant.	67-158003
16	Barrier, Shield	67-089008
22	Clamp, Cord, Spkr. Wire	67-158002
29	Insulator, PC Board	67-157005
30	Insulator, PC Board	67-157006
31	Bracket, LED	67-158022
32	Insulator, Clock Switch	67-157003
33	Knob, Time Switch	67-115010
34	Insulator, Switch	67-157009
36	Spacer, LED	67-157010
37	Panel, Case Front	67-010004
38	Knob, Memory Switch	67-115004
40	Case, Top	67-011002
41	Insulator, Case Top	67-157011
42	Gasket, Rubber (Front Plate)	67-010003
43	Plate, Front Trim	67-020001
44A	Panel, Trim, Left	67-020002
44B	Panel, Trim, Left	67-020004
45A	Panel, Trim, Right	67-020007
45B	Panel, Trim, Right	67-020008
46	Knob, Balance/Tone	67-115007
47	Knob, Treble/Fader	67-115008
48	Spring, Knob	67-158006
49	Knob, Volume/Auto Scan	67-115009
50	Plate, Knob	67-020006
66	Heatsink	67-089003
72	Plate, Bottom	67-016001
73	Plate, Rear	67-013002
74	Clamp, Cable	67-158007
75	Plate, Top	67-011001
76	Panel, Front	67-010003
	P. C. BOARDS (COMPLETE WITH COMPONENTS)	
4	Board, PC, Volume Control	67-075001
5	Board, PC, Tone	67-075011
9	Board, PC, Power	67-075012
13	Board, PC, Regulator	67-075007
14	Board, PC, Control	67-075005
15	Board, PC, Pre-Scale	67-075013
26	Board, PC, Push Switch	67-075014
28	Board, PC, LED	67-075015
AMP	Board, PC, Power Amplifier	67-075010
TUNER	Board, PC, Tuner	67-075016
	CORDS	
17 (J2)	Cord, Din	67-034001
18	Cord, DC	67-034006
19 (J4)	Cord, Connector	67-034002
20 (J3)	Cord, Connector	67-034003
21 (J5)	Cord, Antenna	67-034004
23 (J1)	Cable, Antenna	67-034005
	Cord, Connector, 6 Pin (Switch Board)	67-034010
70	Cord, Connector	67-034011
71	Cord, Connector	67-034012
	Cord, Connector (Tune-Bal)	67-034013
69	Cord, DC	67-034014
	Cord, Din	67-034015
	MISCELLANEOUS	
	Connector, Flexible PC Board - LED	67-070008
	Connector, Flexible PC Board - LED 110 mm	67-070009
	Connector, Flexible PC Board, 100 mm	67-070001
	Connector, Flexible PC Board, 80 mm	67-070002
	Connector, Flexible PC Board, 40 mm	67-070003
	Connector, Flexible PC Board, 55 mm	67-070004
	Connector, Flexible PC Board - Vol. Cont.	67-070010
	Strap, Mount	67-158008

NOTE: ALL RESISTORS NOT SHOWN ON THIS PARTS LIST ARE CARBON TYPE, 1/4 WATT. REFER TO SCHEMATIC FOR SPECIFIC VALUES.

NOTE: ALL CAPACITORS NOT SHOWN ON THIS PARTS LIST ARE CERAMIC DISC TYPE, 50 VOLT. REFER TO SCHEMATIC FOR SPECIFIC VALUES.

VOLUME CONTROL BOARD

VR1	Control, Volume 50K Ohm	67-160001

METAL OXIDE RESISTOR

R40	220 Ohm, 1/2 W	04-992210

REF. NO.	DESCRIPTION	PART NO.
	TONE CONTROL BOARD	
	TRANSISTORS	
Q1,2,3,4,7,8	2SC945 (P)	01-030945
Q5,6	2SA640 (E)	01-010640
	DIODES	
D1	RD8.2EB	05-540082
	MYLAR CAPACITORS	
C3,4,7,8	.056 uF, 50 V	03-000350
	ELECTROLYTIC CAPACITORS	
C15,16	1 uF, 50 V	00-132055
C21,22	4.7 uF, 25 V	00-132600
C23,24	100 uF, 25 V	00-132180
	TANTALUM CAPACITORS	
C1,2	4.7 uF, 16 V	03-003020
C9,10	1 uF, 35 V	03-003039
C13,14	4.7 uF, 35 V	03-003019
	POWER BOARD	
	MISCELLANEOUS	
	Terminal Ass'y	67-159003
	Shield, Case	67-089009
	Shield, Case	67-089010
	TRANSISTOR	
Q1	2SC945	01-030945
	DIODES	
D1	V06C	05-90006
D5	RD8	05-540008
D4	1SS53	05-180053
	COIL	
L1	Coil, Choke	79-176033
	ELECTROLYTIC CAPACITORS	
C14	470 uF, 16 V	00-132675
C16	100 uF, 6.3 V	00-132160
	REGULATOR BOARD	
	TRANSISTORS	
Q1	2SC945	01-030945
Q2	2SA733	01-010733
	CAPACITORS	
	ELECTROLYTIC	
C1	.0022 uF, 25 V	00-132236
	TANTALUM	
C2	10 uF, 25 V	03-003057
	CONTROL BOARD	
	MISCELLANEOUS	
	Shield	67-089011
	Shield	67-089012
	Heatsink, 2SD313	67-089004
X1	Crystal, 10.240 MHz	67-128001
	Plug, 12 Pin	67-159001
	COILS	
L1	Coil, RF	13-178210
L2	Coil, Peaking	67-176016
L3	Coil, RF	13-178228
	TRANSISTORS	
Q1,2,3,4	2SB462-S	01-020462
Q5,6,9	2SD637-S	01-040637
Q7	2SD313	01-040313
Q8	2SC945-P	01-030945
Q10	2SA719-R	01-010719

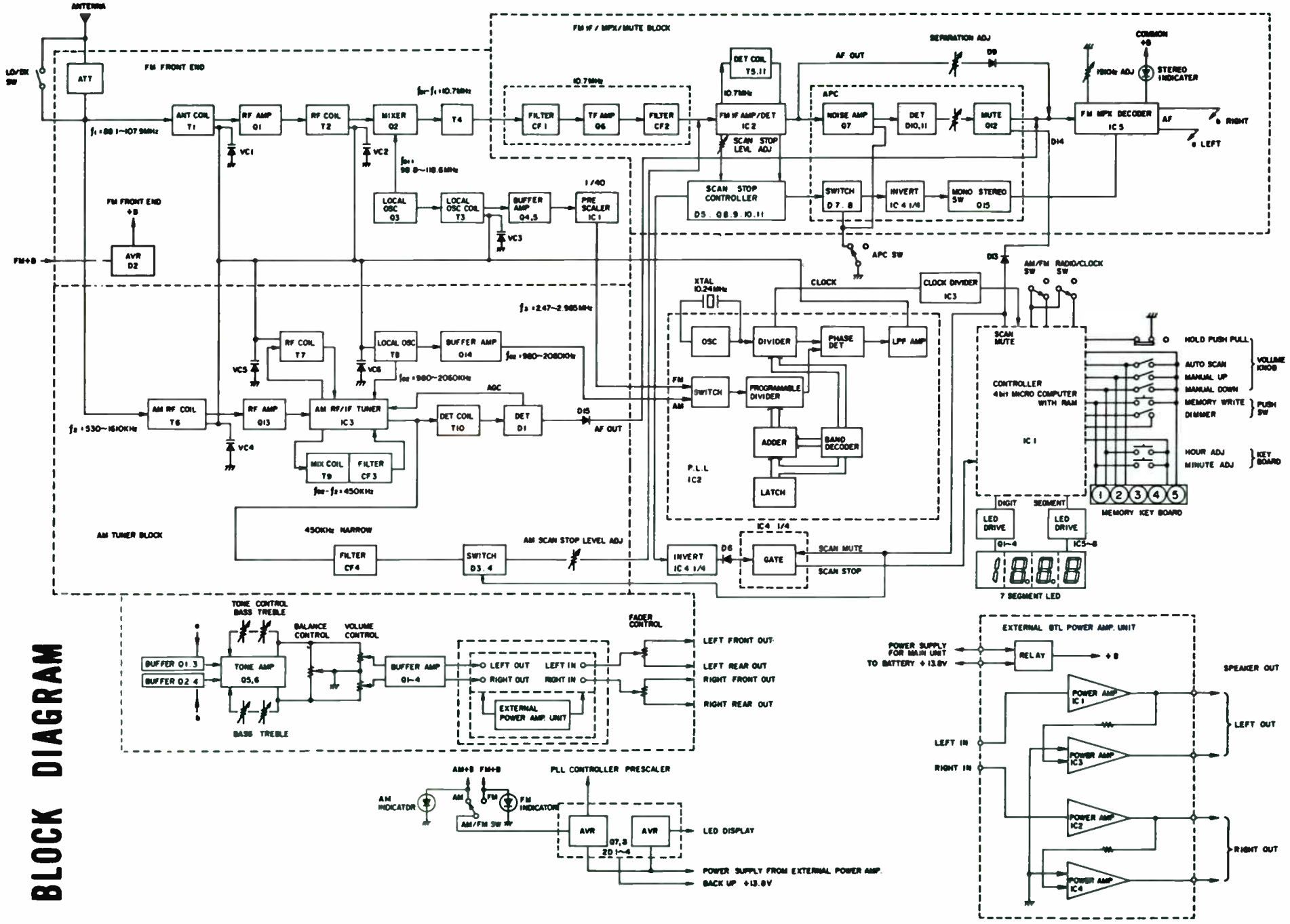
PARTS LIST

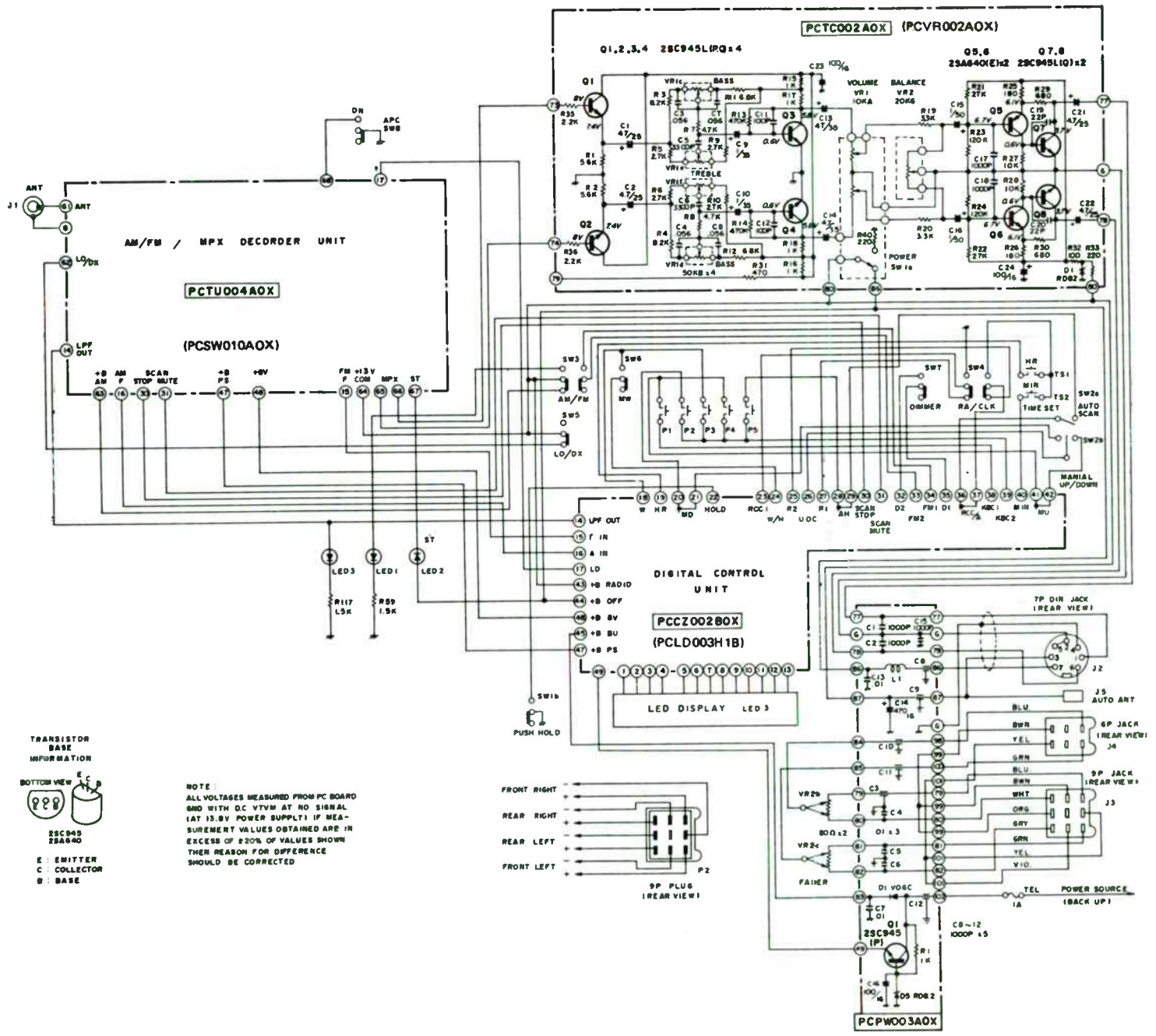
MODEL NO. 67-250 PAGE 2

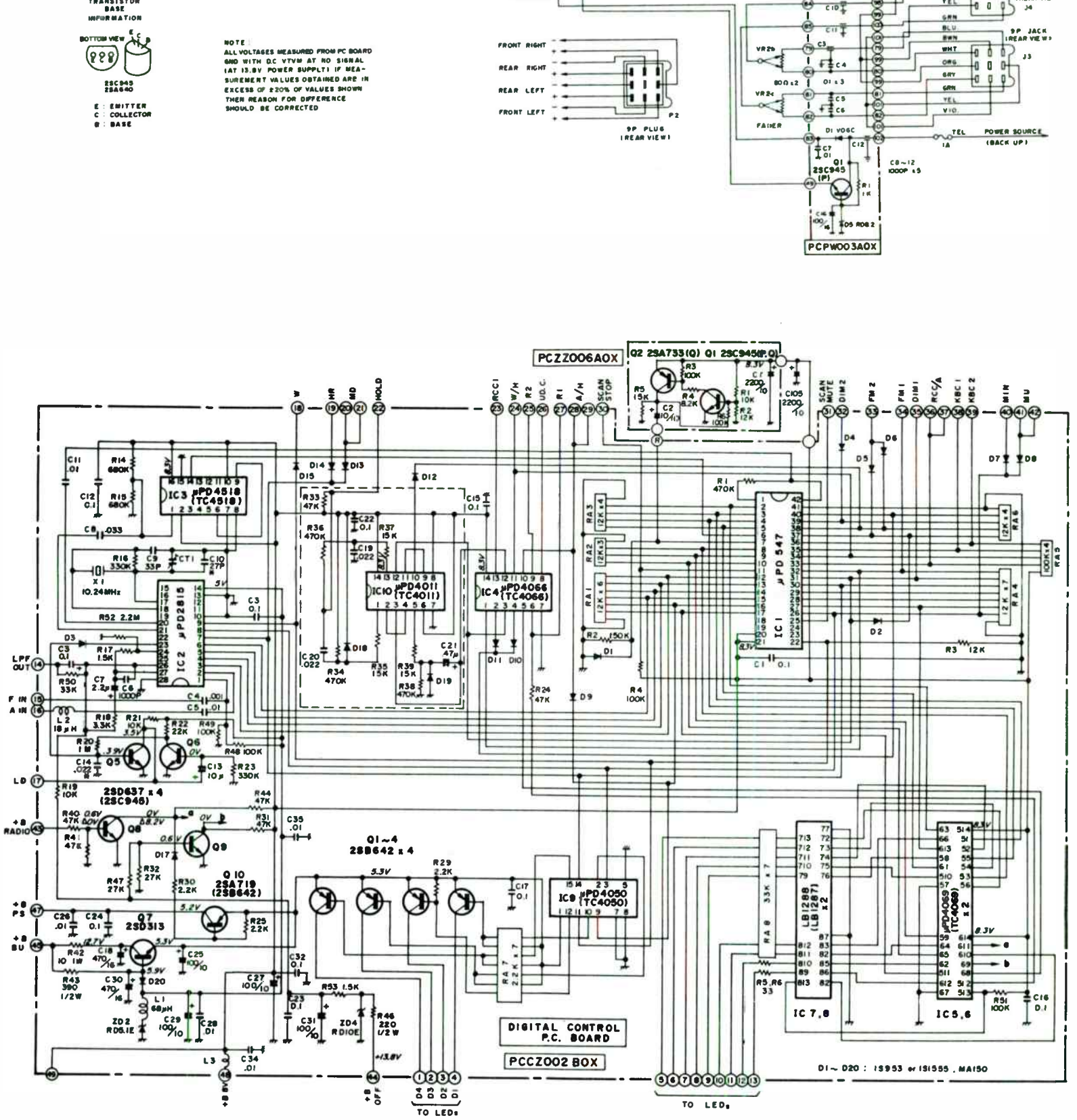
REF. NO.	DESCRIPTION	PART NO.
	INTEGRATED CIRCUITS	
IC1	UPD547LC	02-390547
IC2	UPD2815	02-392815
IC3	UPD4518	02-394518
IC4	UPD4066	02-394066
IC5,6	UPD4069	02-394069
IC7,8	LB1288F	02-131288
IC9	UPD4050	02-394050
IC10	UPD4011	02-264011
	DIODES	
D1,2,3,4,5,6, 7,8,9,10,11, 12,13,14,15, 17,18,19,20	1SS53	05-180053
ZD2	RD5.1EB	05-540051
ZD4	RD10EB	05-540010
	RESISTOR MODULES	
RA1,2,3,4,6	Module, Resistor, 12K Ohm	67-130002
RA5	Module, Resistor, 100K Ohm	67-130003
RA7	Module, Resistor, 2.2K Ohm	67-130004
RA8	Module, Resistor, 33 Ohm	67-130005
	RESISTORS	
	METAL OXIDE	
R42	10 Ohm, 1 W	04-011100
R43	390 Ohm, 1/2 W	04-993900
R46	220 Ohm, 1/2 W	04-992210
	CAPACITORS	
	MYLAR	
C4,5,11,26,28	.01 uF, 50 V	03-000205
C6	.001 uF, 50 V	03-000210
C8	.033 uF, 50 V	03-000266
C14,19,20	.022 uF, 50 V	03-000240
	TANTALUM	
C13	10 uF, 10 V	03-003055
C21	47 uF, 16.3 V	03-003025
C33	.1 uF, 35 V	03-003035
C7	2.2 uF, 10 V	03-003042
	ELECTROLYTIC	
C18,30	470 uF, 16 V	00-132675
C25,27,29,31	100 uF, 10 V	00-132165
	PRE-SCALE BOARD	
	MISCELLANEOUS	
	Shield, Trimmer	67-089013
	Shield, Pre-Scale, #1	67-089014
	Shield, Pre-Scale, #2	67-089015
	COILS	
L6,7	Coil, Peaking	67-176016
	TRANSISTOR	
Q5	2SC1675	01-031675
	INTEGRATED CIRCUIT	
IC1	UPD551C	02-390551
	CAPACITORS	
	TANTALUM	
C23	10 uF, 50 V	03-003058
	ELECTROLYTIC	
C104,105	.0022 uF, 25 V	00-132236
	SWITCH BOARD	
	SWITCHES	
SW3,4,5,7,8	Switch, Push, AM/FM, RA/CL, LO/DX, DIM, APC	67-183005
SW6	Switch, MW	67-183006
	L.E.D. BOARD	
	LIGHT EMITTING DIODES	
LED 1,2,3	SL132B	67-202001
LED 4	TLR313	67-202003

REF. NO.	DESCRIPTION	PART NO.
	TUNER BOARD	
	MISCELLANEOUS	
	Shield, Tuner, #1 (Ant.)	67-089016
	Shield, Tuner, #2 (FM RF)	67-089017
	Shield, Tuner, #3 (FM RF Cover)	67-089018
	Plug	67-159004
NE	Lamp, Stereo	67-201001
	Relay	67-105001
16	Terminal	67-159005
	TRIMMER CAPACITORS	
TC1,2,4,5	Capacitor, Trimmer 10 PF	67-123001
	CERAMIC FILTERS	
CF1,2	Filter, Ceramic, 10.7 MHz	67-179001
CF3	Filter, Ceramic, 450 kHz	67-179002
	COILS & TRANSFORMERS	
L1	Coil, RF	67-176011
L2,3	Coil, RF	13-178210
L4	Coil, RF	67-176012
L5	Coil, RF, 3.9 mH	67-176013
L8	Coil, RF, 6.2 uH	67-176014
L9	Coil, RF, 680 uH	67-176015
L10	Coil, RF	67-176017
T1,2	Transformer, RF	67-176002
T3	Coil, FM Oscillator	67-176003
T4	I.F.T.	67-176004
T5	I.F.T.	67-176005
T6,7	Transformer, RF	67-176006
T8	Transformer, AM Oscillator	67-176001
T9	I.F.T.	67-176008
T10	I.F.T.	67-176009
T11	I.F.T.	67-176010
	CONTROLS	
VR1	Control, Sensitivity 20K Ohm	13-164134
VR2,3	Control, Sensitivity 5K Ohm	13-164146
VR4	Control, Sensitivity 100K Ohm	67-164001
	TRANSISTORS	
Q1	2SK120-Z	01-070120
Q2	2SC1674-L	01-031674
Q3,4,6	2SC1675-L	01-031675
Q7,11,14,15,16	2SC945-Q	01-030945
Q8,9	2SA733-Q	01-010733
Q10,12,17,18, 19	2SC945-K	01-030945
Q13	2SK49-H	01-070049
	INTEGRATED CIRCUITS	
IC2	HA1137W	02-091137
IC3	UPC1021C	02-301021
IC4	TC4011	02-264011
IC5	UPC1026C	02-301026
	DIODES	
VC1,2,3	ITT310	05-200310
D1	1N60	05-170060
D2	RD8.2EB	05-540082
D3,4,5,6,7,8, 9,10,11,12, 13,14,15,16, 17,18	1SS53	05-180053
VC4,5,6	SVC303	05-780303
	CAPACITORS	
	MYLAR	
C59	.033 uF, 50 V	03-000266
C87	.0022 uF, 50 V	03-000245
C101,102	.012 uF, 50 V	03-000331
C103,104	.0056 uF, 50 V	03-000349
	STYROL	
C96	470 PF, 50 V	03-009065
	TANTALUM	
C110	4.7 uF, 16 V	03-003020
C118	1 uF, 25 V	03-003037

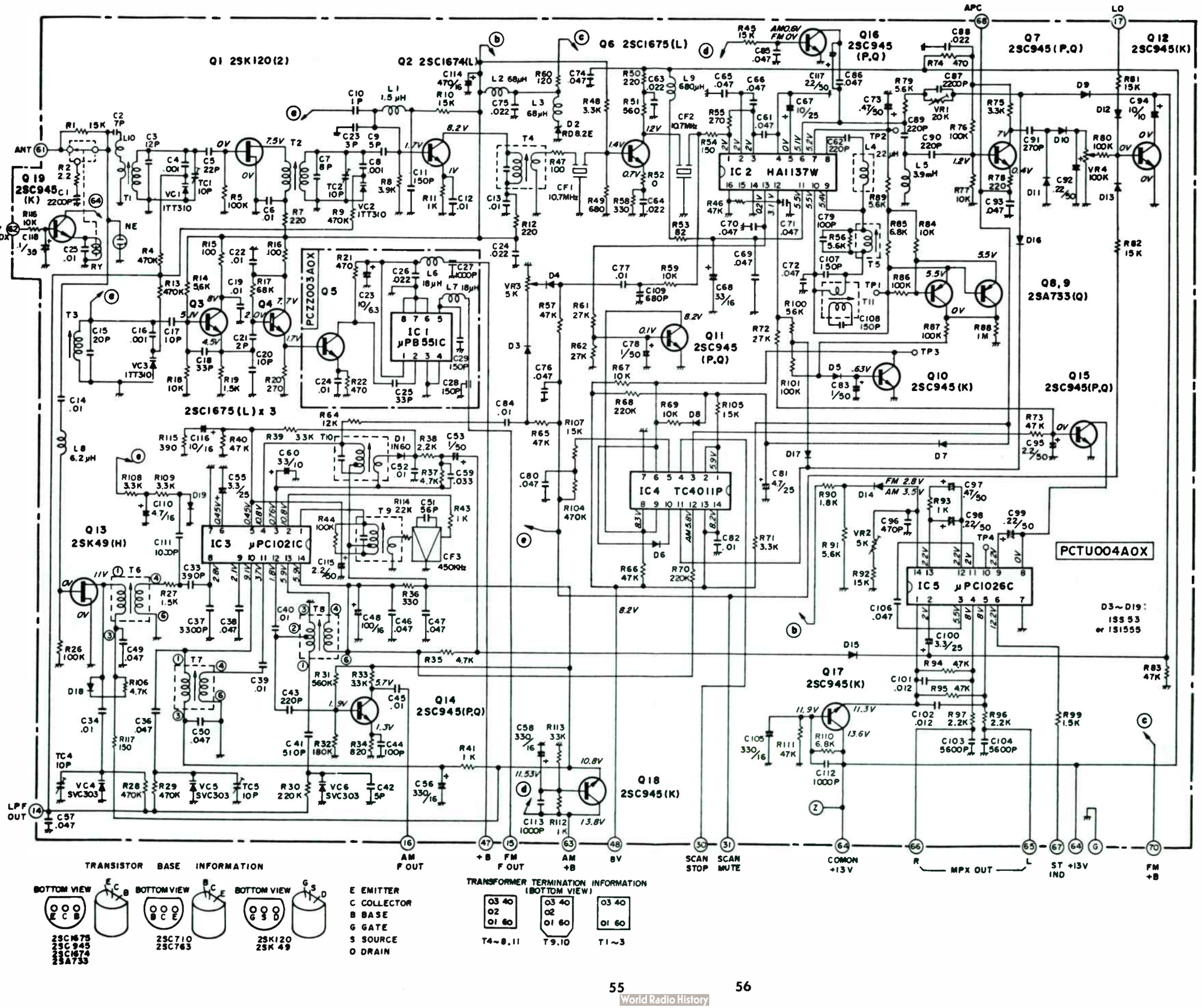
BLOCK DIAGRAM







B. AM/FM/MPX DECODER CIRCUIT



TRANSISTOR BASE INFORMATION

E EMITTER
C COLLECTOR
B BASE
G GATE
S SOURCE
O DRAIN

TRANSFORMER TERMINATION INFORMATION (BOTTOM VIEW)

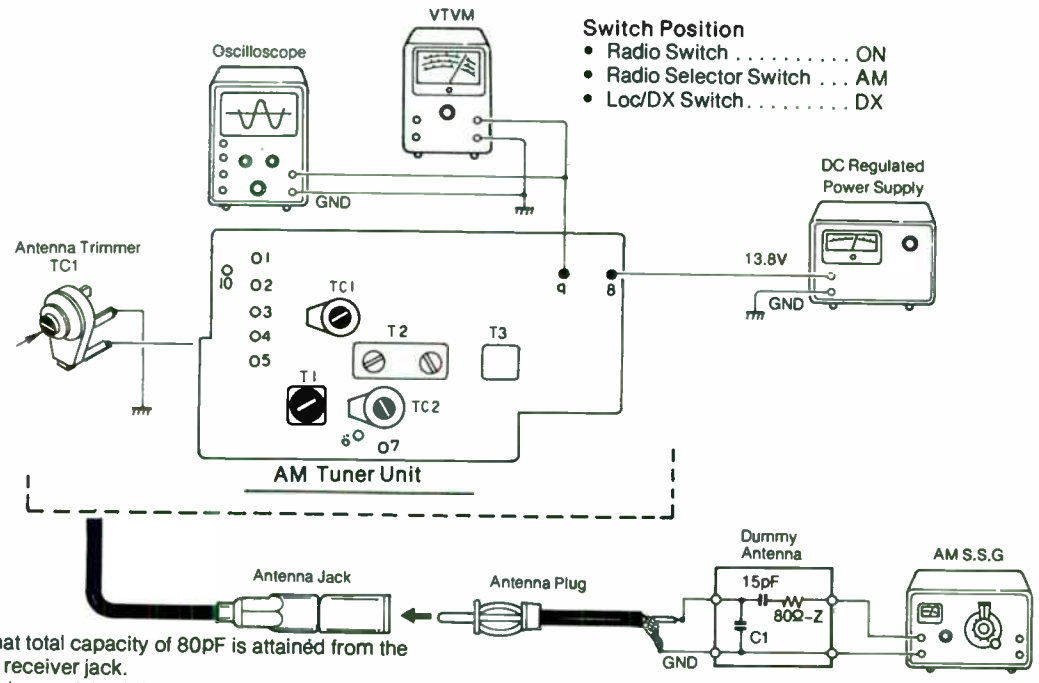
NOTE:

ALL VOLTAGES MEASURED FROM PC BOARD GND WITH D.C. VTVM AT NO SIGNAL (AT 13.8V POWER SUPPLY) IF MEASUREMENT VALUES OBTAINED ARE IN EXCESS OF ±20% OF VALUES SHOWN THEN REASON FOR DIFFERENCE SHOULD BE CORRECTED

ADJUSTMENT

4.2 AM TRACKING ADJUSTMENT

- **Connection Diagram**



NOTICE:
Select C1 so that total capacity of 80pF is attained from the direction of the receiver jack.
Z: Output impedance of the S.S.G.

Fig. 12

- **To Adjust**

SSG Frequency	Pointer Position	Adjustment Point	Note
1. 520kHz (400Hz, 30% modulation), output level 20dB(μV)	Minimum	T1	520kHz can be received
2. 1,660kHz (400Hz, 30% modulation), output level 20dB (μV)	Maximum	TC2	1,660kHz can be received
3. Repeat (1) and (2) alternately and adjust so that broadcast can be received at the frequency between 520kHz and 1,660kHz.			
4. 1,000kHz (400Hz, 30% modulation), output level 20dB (μV)	Tune to 1,000kHz	TC1, Antenna trimmer (TC1)	VTVM at maximum

4.3 FM IF ADJUSTMENT

- **Connection Diagram**

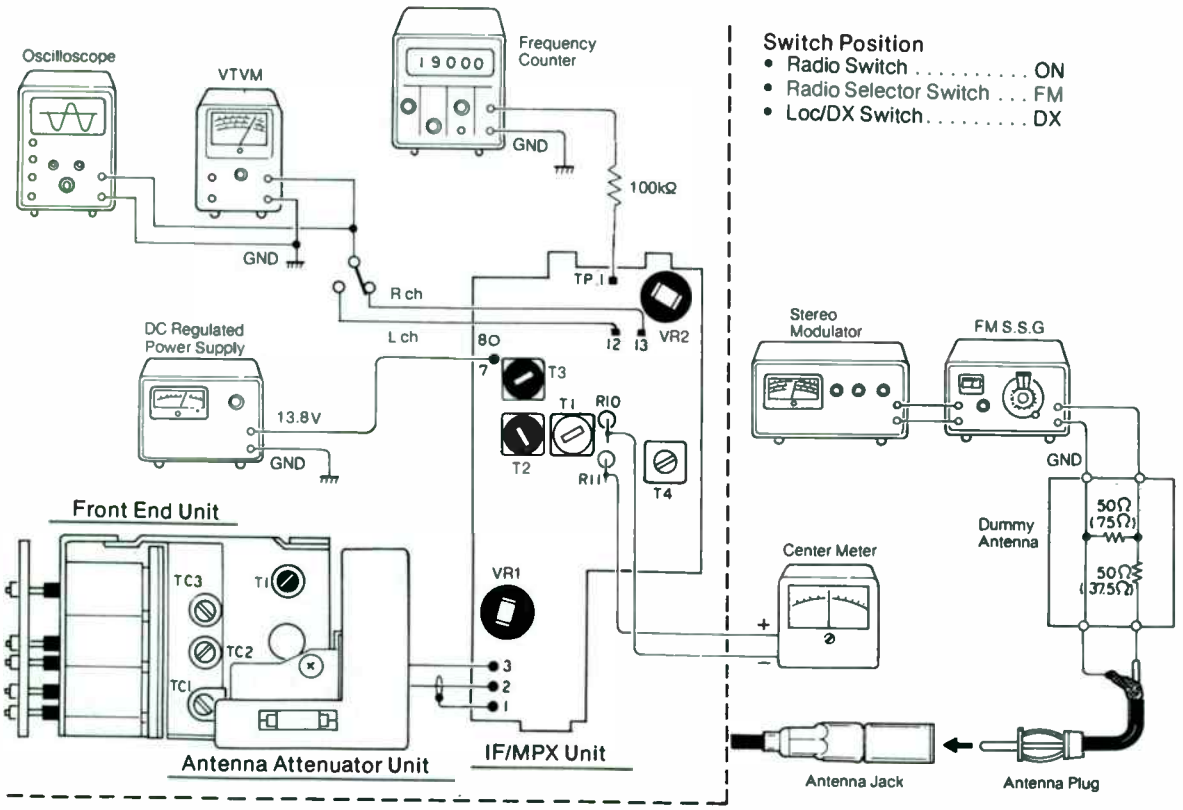


Fig. 13

- **To Adjust**

1. Add output signal of zero from SSG and adjust T2 (black color) so that the pointer of center meter (use one graduated for over 200μA) will come to the center. When using an DC volt ammeter (use one graduated for over 200μA), set the pointer to 0.
2. Add signal of 98 MHz 60 dB (monaural) from SSG and adjust T3 (blue color) so that the distortion factor will be minimal.
3. Add output signal of 98 MHz 60 dB from SSG, multi-signal of modulated frequency 1,000 Hz of stereo modulator and tune to 98 MHz on the dial (the pointer of the center meter is at the center).
4. Adjust T1 (front end unit) so that separated signal will be minimal in its distortion factor.
5. Check if the distortion factor is minimal, and when the adjustment is found imperfect, adjust T3 (blue color).

NOTE:
When adjusting, do not move T1.

ADJUSTMENT

4.4 FM TRACKING ADJUSTMENT

- **Connection Diagram**

Switch Position
- Radio Switch . . . . . ON
- Radio Selector Switch . . . FM
- Loc/DX Switch . . . . . DX

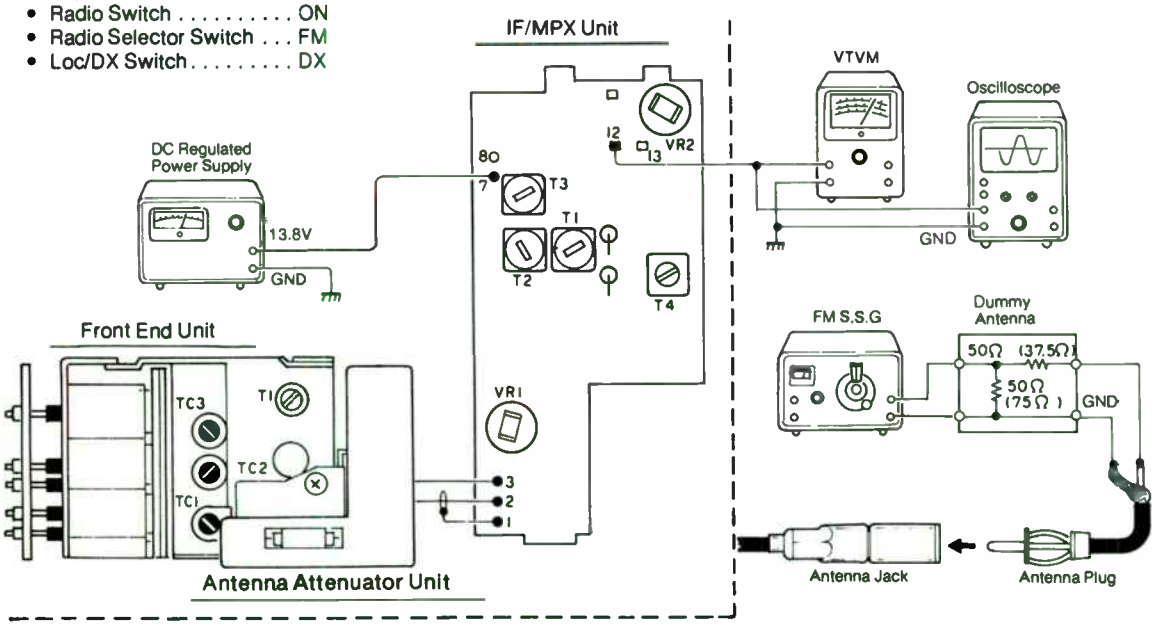


Fig. 14

- **To Adjust**

SSG Frequency	Pointer Position	Adjustment Point	Note
1. 87.5 MHz (400 Hz, 100% modulation), output level 8dB (μV)	Minimum	TC3	87.5 MHz can be received
2. 108.5 MHz (400 Hz, 100% modulation), output level 8dB (μV)	Maximum		Check if 108.5 MHz can be received
3. 98 MHz (400 Hz, 100% modulation), output level 5dB (μV)	Tuned position	TC1, TC2	Maximum output

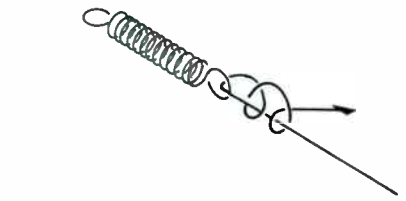
4.5 STEREO LIGHTING LEVEL ADJUSTMENT

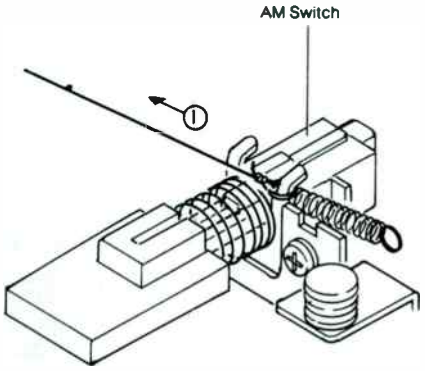
- **Connection Diagram**

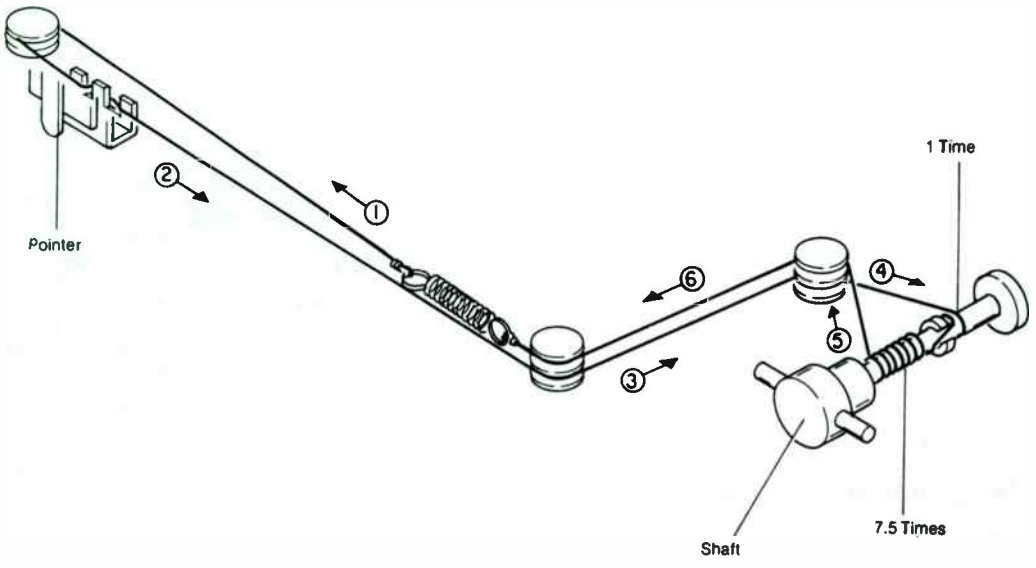
Connect as shown in Fig. 13. Set the position of the switch as well.

- **To Adjust**

1. Add unmodulated signal of 60 dB from SSG and adjust VR1 so that the frequency counter will indicate 19 kHz ±20 Hz.
2. Add 98 MHz output 20 dB from SSG and multi-signal of modulated frequency 1,000 Hz of stereo modulator. Adjust VR2 so that the stereo indicator will light up. Slowly turn VR2 and set it at the position just before the stereo indicator will go out.
3. Gradually lower SSG output signal from 60 dB and check if the stereo indicator is lighting at the range between 15 and 25 dB.

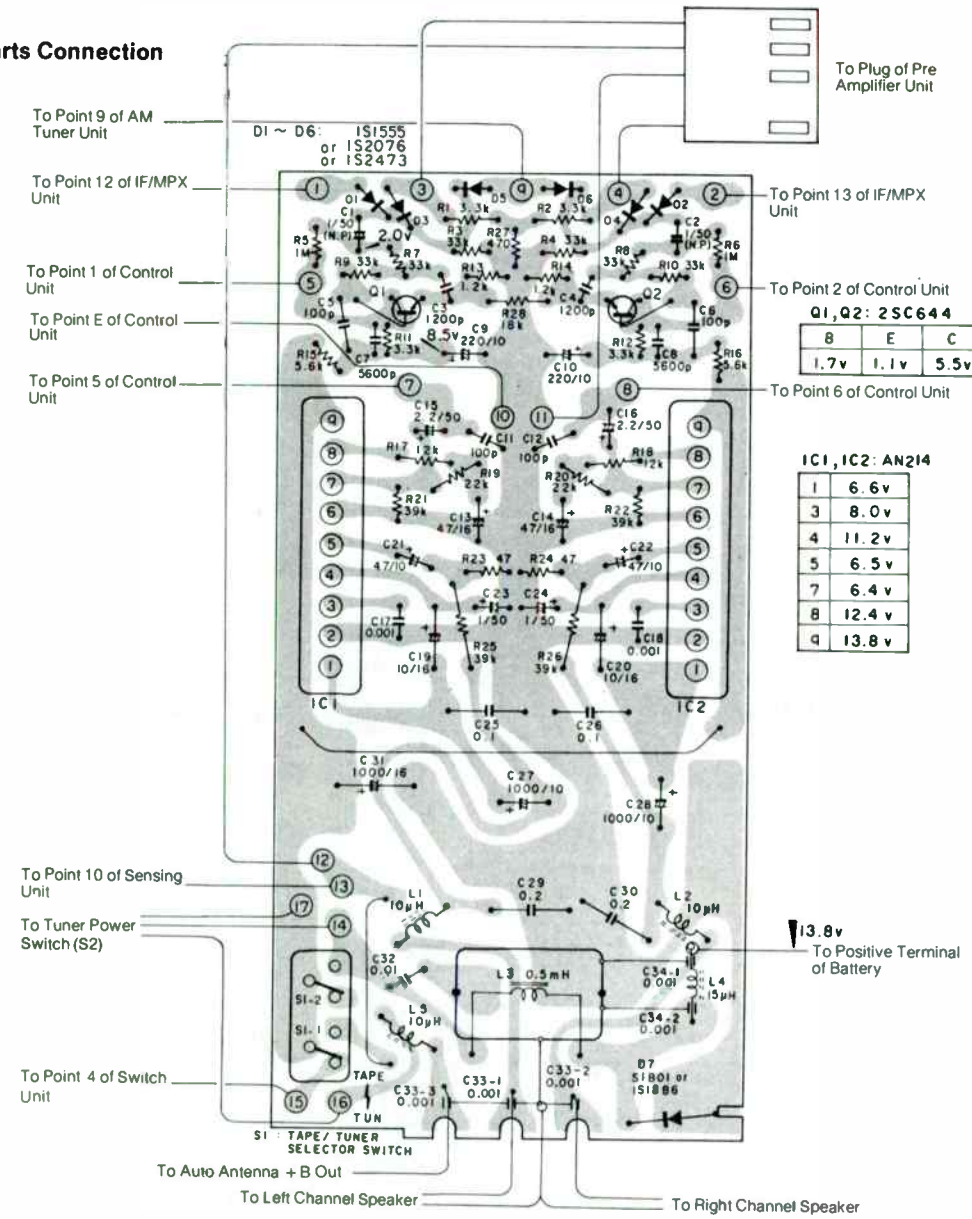






MAIN AMPLIFIER UNIT (CWH-046) KP-5005

- **Parts Connection**



NOTICE: Of the descriptive symbols of the resistor and capacitor, the encircled alphabetic letter denotes the allowable error.

Example: RD1/4VS100 Ⓙ C: ±0.25pF F: ±1pF J: ±5% M: ±20% Z: $^{+80}_{-20}$%

CEA100 Ⓟ 25 D: ±0.5pF G: ±2% K: ±10% X: $^{+40}_{-20}$% P: $^{+100}_{-10}$%

- **Parts List**

MISCELLANEOUS

Ref. Key	Parts No.	Description
IC1	AN214-Q	IC
IC2	AN214-Q	IC
Q1	2SC644-R,S	Transistor
Q2	2SC644-R,S	Transistor
D1	1S2076 or	Diode

Ref. Key	Parts No.	Description
	1S1555 or	Diode
	1S2473	Diode
D2	1S2076 or	Diode
	1S1555 or	Diode
	1S2473	Diode

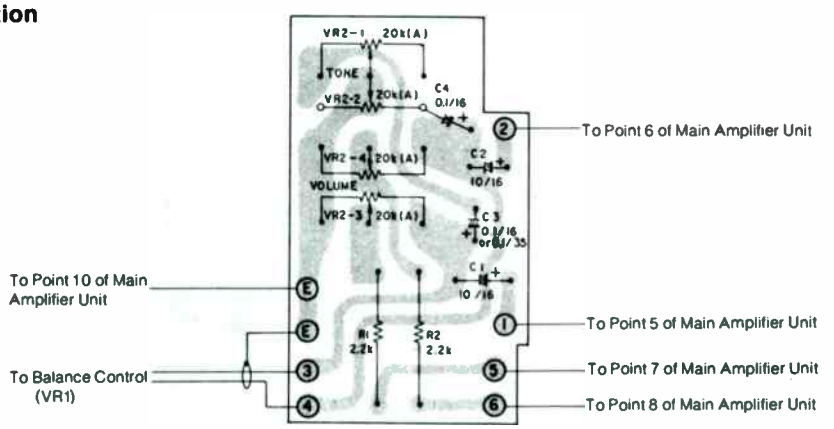
MAIN AMPLIFIER UNIT (CWH-046)

Ref. Key	Parts No.	Description
D3	1S2076 or	Diode
	1S1555 or	Diode
	1S2473	Diode
D4	1S2076 or	Diode
	1S1555 or	Diode
	1S2473	Diode
D5	1S2076 or	Diode
	1S1555 or	Diode
	1S2473	Diode
D6	1S2076 or	Diode
	1S1555 or	Diode
	1S2473	Diode
D7	SIB01-01 or	Diode
	SIB01-02 or	Diode
	1S1886	Diode

Ref. Key	Parts No.	Description
L1	CTH-035	Coil, 10μH
L2	CTH-035	Coil, 10μH
L3	CTH-018	Coil, 0.5mH
L4	CTF-003	Coil, 15μH
L5	CTH-035	Coil, 10μH
S1	CSL-003	Switch

CONTROL UNIT (CWG-039)

- **Parts Connection**



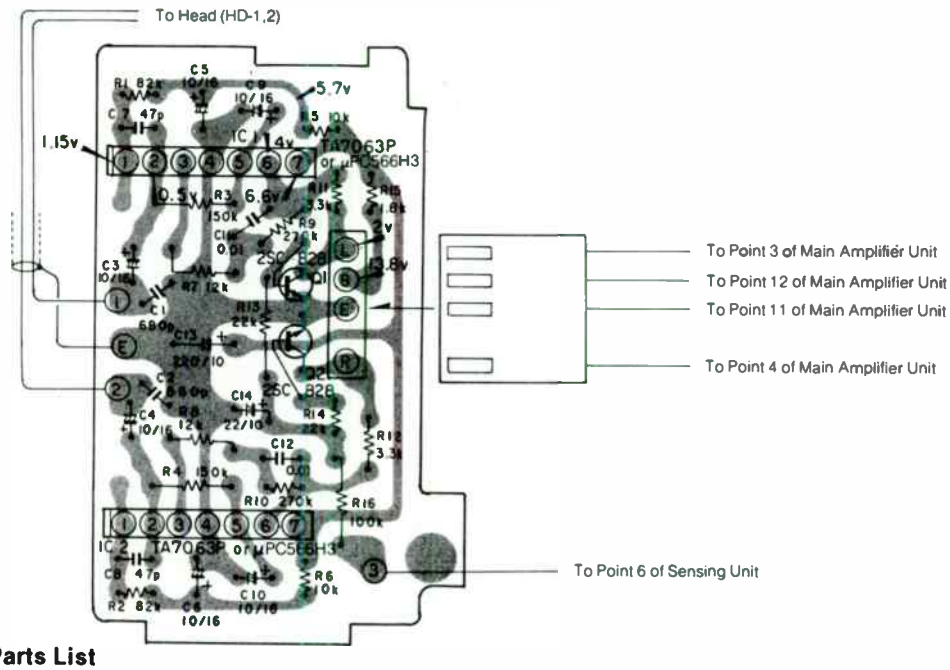
- **Parts List**

Ref. Key	Parts No.	Description		
VR2	CCS-139	Volume	20kΩ (A)	
R1	RD1/4PS222J	Resistor	2.2kΩ	1/4W
R2	RD1/4PS222J	Resistor	2.2kΩ	1/4W
C1	CEA100P16	Capacitor	10μF	16V
C2	CEA100P16	Capacitor	10μF	16V

Ref. Key	Parts No.	Description		
C3	CSYA0R1M16 or	Capacitor	0.1μF	16V
	CSZA0R1M35	Capacitor	0.1μF	35V
C4	CSYA0R1M16	Capacitor	0.1μF	16V

PRE AMPLIFIER UNIT (CWF-043)

- **Parts Connection**



- **Parts List**

MISCELLANEOUS

Ref. Key	Parts No.	Description
IC1	TA7063P-C,D,E	IC
	μPC566H3-N,M,L	IC
IC2	TA7063P-C,D,E	IC
	μPC566H3-N,M,L	IC
Q1	2SC828-Q,R	Transistor

Ref. Key	Parts No.	Description
Q2	2SC828-Q,R	Transistor

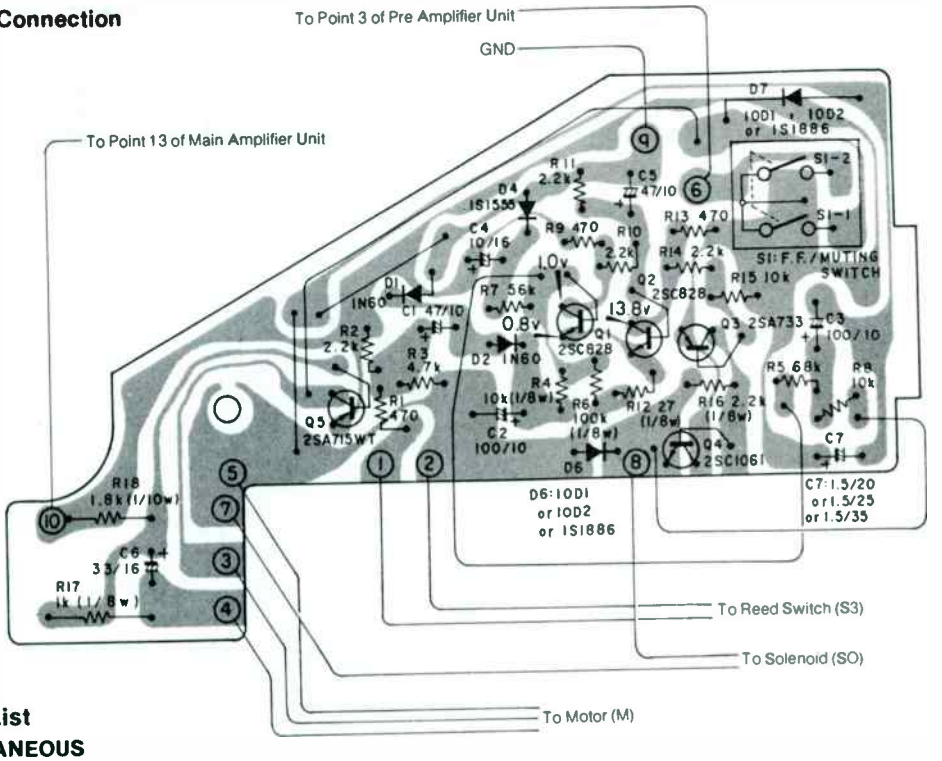
PRE AMPLIFIER UNIT (CWF-043)

CAPACITORS

Ref. Key	Parts No.	Description		
C1	CKDYB681K50	Capacitor	680pF	50V
C2	CKDYB681K50	Capacitor	680pF	50V
C3	CEA100P16	Capacitor	10μF	16V
C4	CEA100P16	Capacitor	10μF	16V
C5	CEA100P16	Capacitor	10μF	16V
C6	CEA100P16	Capacitor	10μF	16V
C7	CCDSL470K50	Capacitor	47pF	50V
C8	CCDSL470K50	Capacitor	47pF	50V
C9	CEA100P16	Capacitor	10μF	16V
C10	CEA100P16	Capacitor	10μF	16V

Ref. Key	Parts No.	Description		
C11	CQMA103K50	Capacitor	0.01μF	50V
C12	CQMA103K50	Capacitor	0.01μF	50V
C13	CCH-028	Capacitor	220μF	10V
C14	CSZA220M10	Capacitor	22μF	10V

• Parts Connection



• Parts List

MISCELLANEOUS

Ref. Key	Parts No.	Description
Q1	2SC828-R,S	Transistor
Q2	2SC828-R,S	Transistor
Q3	2SA733-Q,P,K	Transistor
Q4	2SC1061-B,C,D	Transistor
Q5	2SA715WT-B,C,D	Transistor
D1	1N60	Diode
D2	1N60	Diode
D3	VACANT	
D4	1S1555	Diode
D5	VACANT	

Ref. Key	Parts No.	Description
D6	10D1 or	Diode
	10D2 or	Diode
	1S1886	Diode
D7	10D1 or	Diode
	10D2 or	Diode
	1S1886	Diode
S1	CSN-047	Switch

RESISTORS

Ref. Key	Parts No.	Description		
R1	RD1/4VS471J	Resistor	470Ω	1/4W
R2	RD1/4VS222J	Resistor	2.2kΩ	1/4W
R3	RD1/4VS472J	Resistor	4.7kΩ	1/4W
R4	CCN-023	Resistor	10kΩ	1/8W
R5	RD1/4VS683J	Resistor	68kΩ	1/4W
R6	CCN-024	Resistor	100kΩ	1/8W
R7	RD1/4VS563J	Resistor	56kΩ	1/4W
R8	RD1/4VS103J	Resistor	10kΩ	1/4W
R9	RD1/4VS471J	Resistor	470Ω	1/4W
R10	RD1/4VS222J	Resistor	2.2kΩ	1/4W

Ref. Key	Parts No.	Description		
R11	RD1/4VS222J	Resistor	2.2kΩ	1/4W
R12	CCN-022	Resistor	27Ω	1/8W
R13	RD1/4VS471J	Resistor	470Ω	1/4W
R14	RD1/4VS222J	Resistor	2.2kΩ	1/4W
R15	RD1/4VS103J	Resistor	10kΩ	1/4W
R16	CCN-021	Resistor	2.2kΩ	1/8W
R17	RD1/8PS102J	Resistor	1kΩ	1/8W
R18	RD1/10PS182J	Resistor	1.8kΩ	1/10W

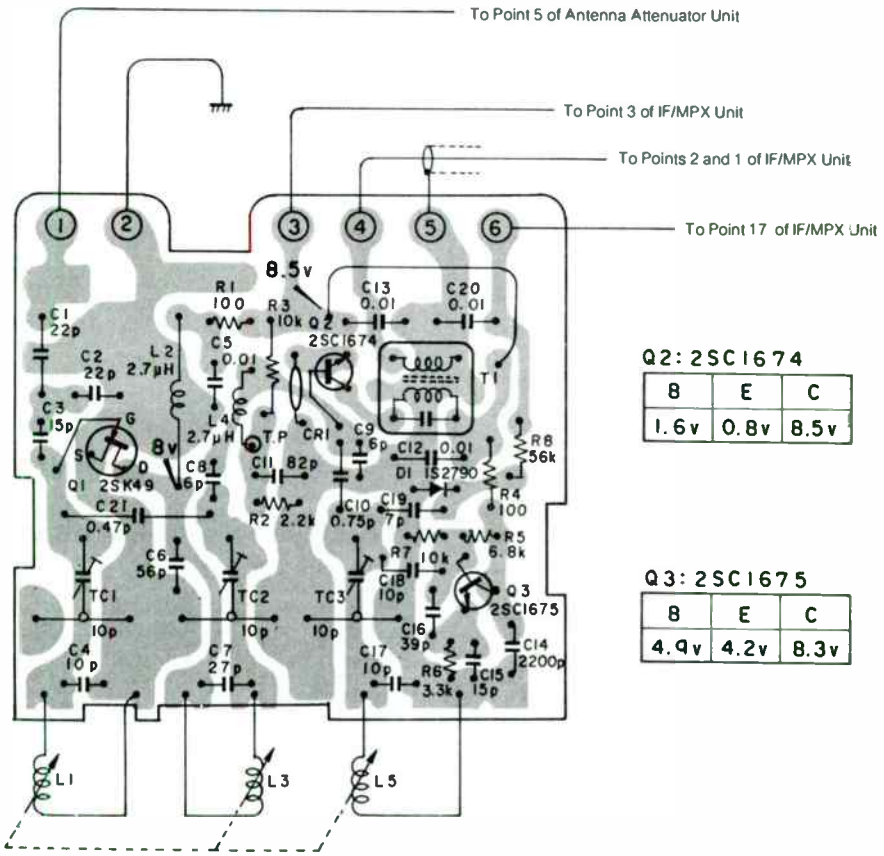
CAPACITORS

Ref. Key	Parts No.	Description		
C1	CEA470P10	Capacitor	47μF	10V
C2	CEA101P10	Capacitor	100μF	10V
C3	CEA101P10	Capacitor	100μF	10V
C4	CEA100P16	Capacitor	10μF	16V
C5	CEA470P10	Capacitor	47μF	10V

Ref. Key	Parts No.	Description		
C6	CEA330P16	Capacitor	33μF	16V
C7	CSZA1R5K20	Capacitor	1.5μF	20V
	CSZA1R5K25	Capacitor	1.5μF	25V
	CSZA1R5K35	Capacitor	1.5μF	35V

FRONT END UNIT (CWB-057) KP-5005

- **Parts Connection**



Q2: 2SC1674

B	E	C
1.6v	0.8v	8.5v

Q3: 2SC1675

B	E	C
4.9v	4.2v	8.3v

- **Parts List**

MISCELLANEOUS

Ref. Key	Parts No.	Description
Q1	2SK49-H2	FET
Q2	2SC1674-L,K	Transistor
Q3	2SC1675-M	Transistor
D1	1S2790	Diode
L2	CTF-039 or	Ferri-Inductor, 2.7μH
	CTF-065	Ferri-Inductor, 2.7μH
L4	CTF-039	Ferri-Inductor, 2.7μH
T1	CTC-043	IF Transformer
TC1	CCG-008	Ceramic Trimmer, 10pF
TC2	CCG-008	Ceramic Trimmer, 10pF
TC3	CCG-008	Ceramic Trimmer, 10pF
CR1	CCX-001	Multiple Components

RESISTORS

Ref. Key	Parts No.	Description		
R1	RD1/8VS101J	Resistor	100Ω	1/8W
R2	RD1/8VS222J	Resistor	2.2kΩ	1/8W
R3	RD1/8VS103J	Resistor	10kΩ	1/8W
R4	RD1/8VS101J	Resistor	100Ω	1/8W
R5	RD1/10PS682J	Resistor	6.8kΩ	1/10W
R6	RD1/10PS332J	Resistor	3.3kΩ	1/10W
R7	RD1/10PS103K	Resistor	10kΩ	1/10W
R8	RD1/8VS563J	Resistor	56kΩ	1/8W

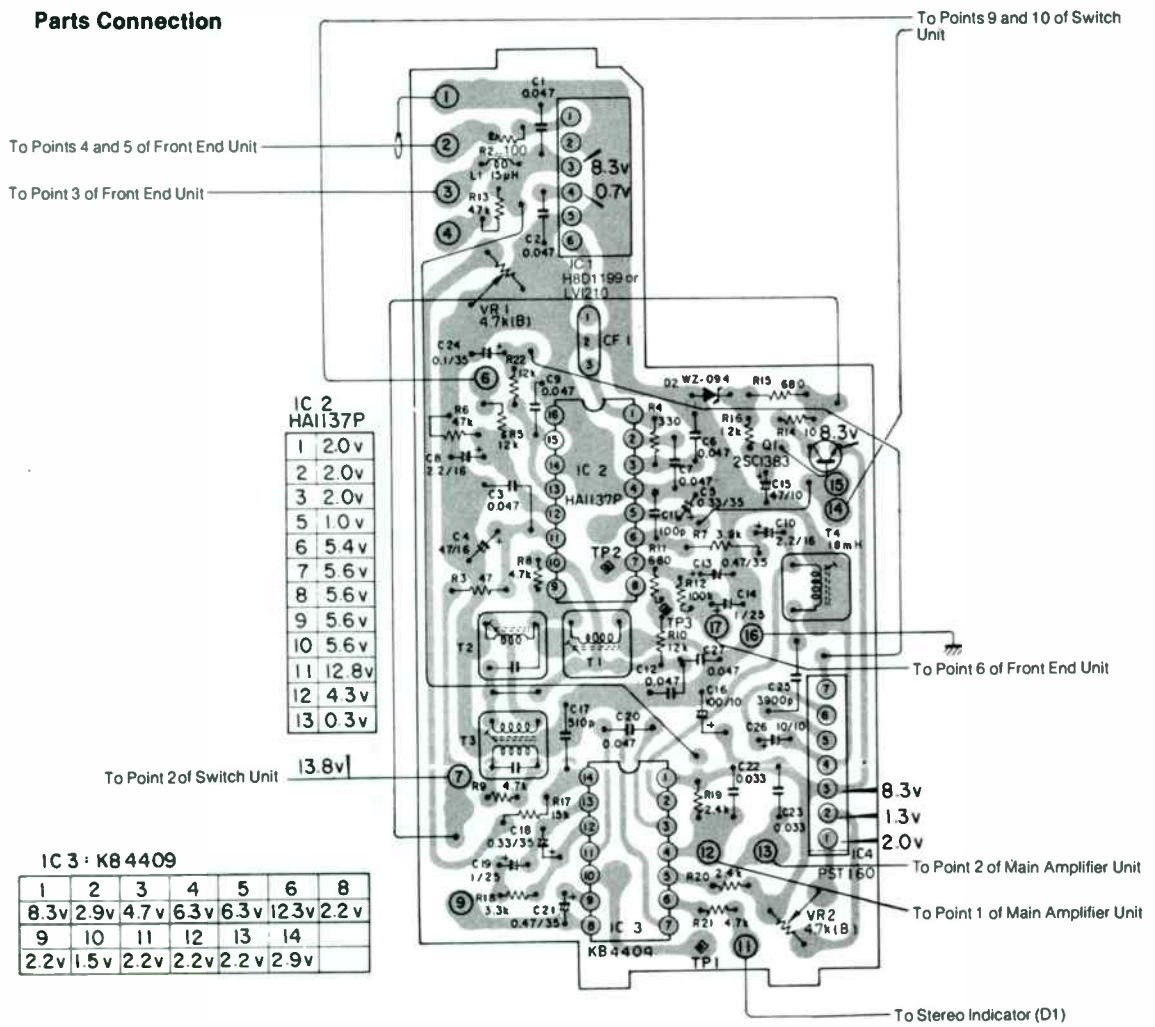
CAPACITORS

Ref. Key	Parts No.	Description		
C1	CCDSL220K500	Capacitor	22pF	500V
C2	CCDSL220J50	Capacitor	22pF	50V
C3	CCDSL150J50	Capacitor	15pF	50V
C4	CCDRH100F50	Capacitor	10pF	50V
C5	CKDYF103Z25	Capacitor	0.01μF	25V
C6	CCDSL560J50	Capacitor	56pF	50V
C7	CCDRH270J50	Capacitor	27pF	50V
C8	CCDCH060D50	Capacitor	6pF	50V
C9	CCDCH060D50	Capacitor	6pF	50V
C10	CGBR75K500	Capacitor	0.75pF	500V

Ref. Key	Parts No.	Description		
C11	CCDSL820J50	Capacitor	82pF	50V
C12	CKDYD103M50	Capacitor	0.01μF	50V
C13	CKDYF103Z25	Capacitor	0.01μF	25V
C14	CKDYB222K50	Capacitor	2200pF	50V
C15	CCDTH150J50	Capacitor	15pF	50V
C16	CCDTH390J50	Capacitor	39pF	50V
C17	CCDTH100F50	Capacitor	10pF	50V
C18	CCDTH100F50	Capacitor	10pF	50V
C19	CCDCH070D50	Capacitor	7pF	50V
C20	CKDYF103Z25	Capacitor	0.01μF	25V
C21	CGBR47K500	Capacitor	0.47pF	500V

IF/MPX UNIT (CWE-187)

Parts Connection



IC 2 HA1137P	
1	2.0v
2	2.0v
3	2.0v
5	1.0v
6	5.4v
7	5.6v
8	5.6v
9	5.6v
10	5.6v
11	12.8v
12	4.3v
13	0.3v

IC 3 : KB4409

1	2	3	4	5	6	8
8.3v	2.9v	4.7v	6.3v	6.3v	12.3v	2.2v
9	10	11	12	13	14	
2.2v	1.5v	2.2v	2.2v	2.2v	2.9v	

IF/MPX UNIT (CWE-187) KP-5005

• Parts List

MISCELLANEOUS

Ref. Key	Parts No.	Description
IC1	CWW-011	IC and Ceramic Filter
IC2	HA1137P	IC
IC3	KB4409	IC
IC4	PST160	IC
Q1	2SC1383-R,S	Transistor
D1	VACANT	
D2	WZ-094	Diode
L1	CTF-016	Ferri-Inductor, 15μH
T1	CTC-056	IF Transformer
T2	CTE-080	IF Transformer
T3	CTE-022	IF Transformer
T4	CTC-057 or	Coil, 18mH
	CTC-058	Coil, 18mH
VR1	C92-618	Volume, 4.7kΩ (B)
VR2	C92-618	Volume, 4.7kΩ (B)

RESISTORS

Ref. Key	Parts No.	Description		
R1	VACANT			
R2	RD1/8VS101J	Resistor	100Ω	1/8W
R3	RD1/8VS470J	Resistor	47Ω	1/8W
R4	RD1/8VS331J	Resistor	330Ω	1/8W
R5	RD1/8VS123J	Resistor	12kΩ	1/8W
R6	RD1/8VS473J	Resistor	47kΩ	1/8W
R7	RD1/8VS392J	Resistor	3.9kΩ	1/8W
R8	RD1/8VS472J	Resistor	4.7kΩ	1/8W
R9	RD1/8VS472J	Resistor	4.7kΩ	1/8W
R10	RD1/4PS123J	Resistor	12kΩ	1/4W
R11	RD1/4PS681J	Resistor	680Ω	1/4W
R12	RD1/8VS104J	Resistor	100kΩ	1/8W
R13	RD1/8VS473J	Resistor	47kΩ	1/8W
R14	RD1/4VS100J	Resistor	10Ω	1/4W
R15	RD1/8VS681J	Resistor	680Ω	1/8W
R16	RD1/8VS122J	Resistor	1.2kΩ	1/8W
R17	RD1/8VS153J	Resistor	15kΩ	1/8W
R18	RD1/8VS332J	Resistor	3.3kΩ	1/8W
R19	RD1/8VS242J	Resistor	2.4kΩ	1/8W
R20	RD1/8VS242J	Resistor	2.4kΩ	1/8W
R21	RD1/4VS472J	Resistor	4.7kΩ	1/4W
R22	RD1/8VS123J	Resistor	12kΩ	1/8W

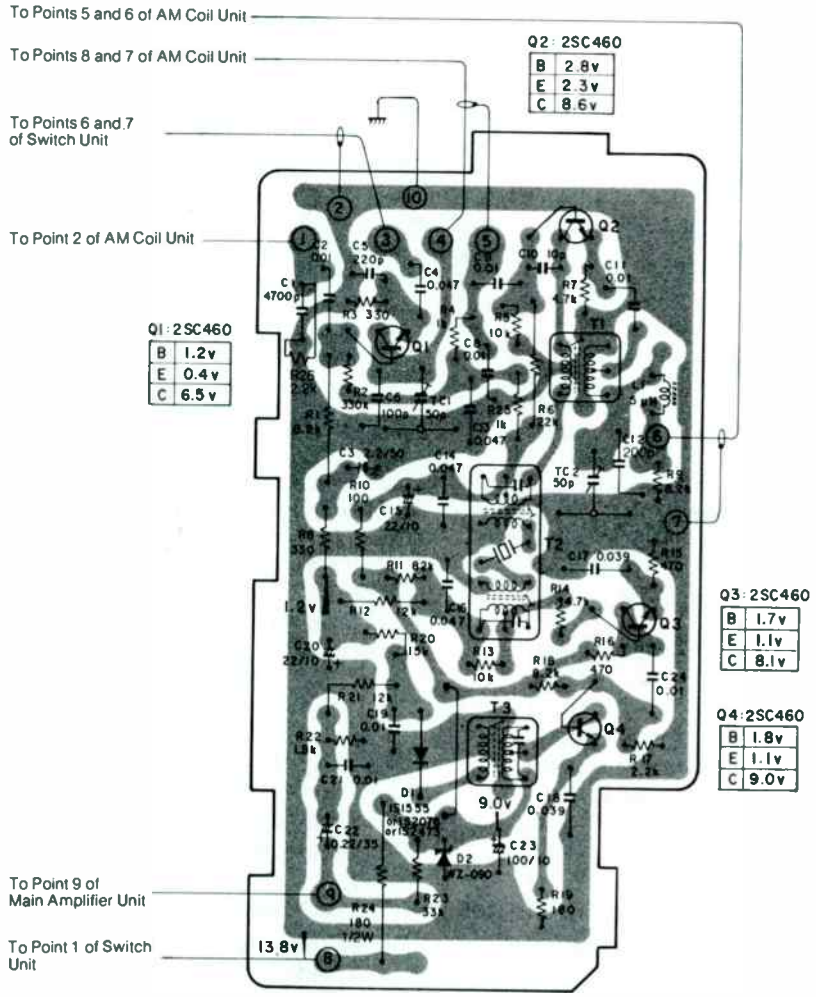
CAPACITORS

NOTE: Use capacitor manufactured by NEC* for CSZA. *Nippon Electric Co., Ltd.

Ref. Key	Parts No.	Description		
C1	CKDYF473Z25	Capacitor	0.047μF	25V
C2	CKDYF473Z25	Capacitor	0.047μF	25V
C3	CKDYF473Z25	Capacitor	0.047μF	25V
C4	CEA470P16	Capacitor	47μF	16V
C5	CSZAR33M35	Capacitor	0.33μF	35V
C6	CKDYF473Z25	Capacitor	0.047μF	25V
C7	CKDYF473Z25	Capacitor	0.047μF	25V
C8	CSZA2R2M16	Capacitor	2.2μF	16V
C9	CKDYF473Z25	Capacitor	0.047μF	25V
C10	CSZA2R2M16	Capacitor	2.2μF	16V
C11	CCDSL101K50	Capacitor	100pF	50V
C12	CKDYF473Z25	Capacitor	0.047μF	25V
C13	CSZAR47M35	Capacitor	0.47μF	35V
C14	CSZA010M25	Capacitor	1μF	25V
C15	CEA470P10	Capacitor	47μF	10V
C16	CEA101P10	Capacitor	100μF	10V
C17	CQSA511J50 or	Capacitor	510pF	50V
	CQSH511J50	Capacitor	510pF	50V
C18	CSZAR33M35	Capacitor	0.33μF	35V
C19	CSZA010M25	Capacitor	1μF	25V
C20	CQMA473K50	Capacitor	0.047μF	50V
C21	CSZAR47M35	Capacitor	0.47μF	35V
C22	CQMA333K50	Capacitor	0.033μF	50V
C23	CQMA333K50	Capacitor	0.033μF	50V
C24	CSZA0R1M35	Capacitor	0.1μF	35V
C25	CQSA392J50	Capacitor	3900pF	50V
C26	CSZA100M10	Capacitor	10μF	10V
C27	CKDYF473Z25	Capacitor	0.047μF	25V

AM TUNER UNIT (CWE-188)

• Parts Connection



• Parts List

MISCELLANEOUS

Ref. Key	Parts No.	Description
Q1	2SC460-A	Transistor
Q2	2SC460-B	Transistor
Q3	2SC460-A	Transistor
Q4	2SC460-A	Transistor
D1	1S1555 or	Diode
	1S2076 or	Diode
	1S2473	Diode
D2	WZ-090	Diode
T1	CTE-002	Coil
T2	CTE-037	IF Transformer
T3	CTE-038	IF Transformer
L1	CTF-005	Ferri-Inductor, 5μH
TC1	C43-610	Ceramic Trimmer, 50pF
TC2	C43-610	Ceramic Trimmer, 50pF

AM TUNER UNIT (CWE-188) KP-5005

RESISTORS

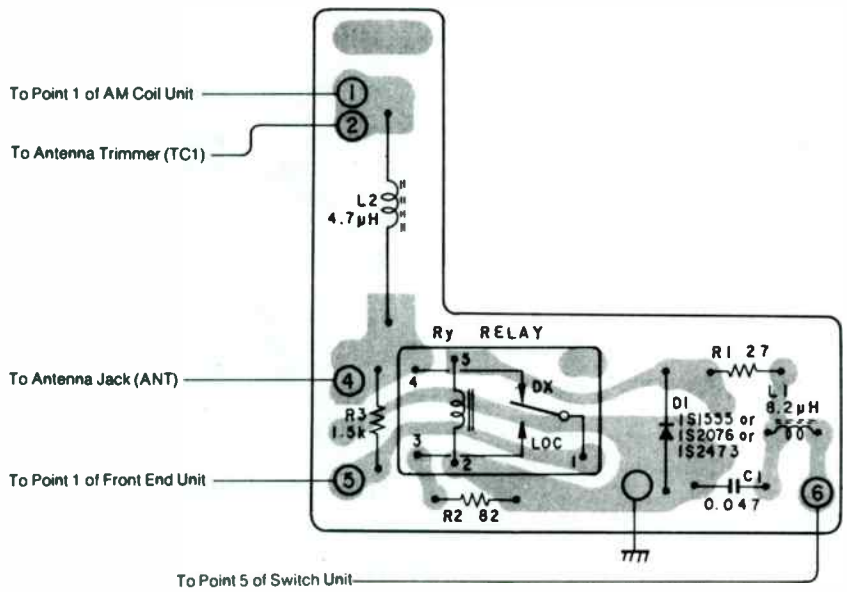
Ref. Key	Parts No.	Description		
R1	RD1/4PS822J	Resistor	8.2kΩ	1/4W
R2	RD1/4VS334J	Resistor	330kΩ	1/4W
R3	RD1/4VS331J	Resistor	330Ω	1/4W
R4	RD1/4VS102J	Resistor	1kΩ	1/4W
R5	RD1/4VS103J	Resistor	10kΩ	1/4W
R6	RD1/4PS223J	Resistor	22kΩ	1/4W
R7	RD1/4VS472J	Resistor	4.7kΩ	1/4W
R8	RD1/4VS331J	Resistor	330Ω	1/4W
R9	RD1/4VS822J	Resistor	8.2kΩ	1/4W
R10	RD1/4VS101J	Resistor	100Ω	1/4W
R11	RD1/4VS823J	Resistor	82kΩ	1/4W
R12	RD1/4VS123J	Resistor	12kΩ	1/4W
R13	RD1/4VS103J	Resistor	10kΩ	1/4W
R14	RD1/4VS472J	Resistor	4.7kΩ	1/4W
R15	RD1/4VS471J	Resistor	470Ω	1/4W
R16	RD1/4VS471J	Resistor	470Ω	1/4W
R17	RD1/4VS222J	Resistor	2.2kΩ	1/4W
R18	RD1/4VS822J	Resistor	8.2kΩ	1/4W
R19	RD1/4VS181J	Resistor	180Ω	1/4W
R20	RD1/4VS153J	Resistor	15kΩ	1/4W
R21	RD1/4PS123J	Resistor	12kΩ	1/4W
R22	RD1/4VS182J	Resistor	1.8kΩ	1/4W
R23	RD1/4VS333J	Resistor	33kΩ	1/4W
R24	RD1/2PS181K	Resistor	180Ω	1/2W
R25	RD1/4VS102J	Resistor	1kΩ	1/4W
R26	RD1/4PS222J	Resistor	2.2kΩ	1/4W

CAPACITORS

Ref. Key	Parts No.	Description		
C1	CQMA472J50	Capacitor	4700pF	50V
C2	CCG-019	Capacitor	0.01μF	50V
C3	CEA2R2P50	Capacitor	2.2μF	50V
C4	CKDYF473Z25	Capacitor	0.047μF	25V
C5	CKDYB221K50	Capacitor	220pF	50V
C6	CCDSL101K50	Capacitor	100pF	50V
C7	VACANT			
C8	CQMA103J50	Capacitor	0.01μF	50V
C9	CCG-019	Capacitor	0.01μF	50V
C10	CCDSL100F50	Capacitor	10pF	50V
C11	CCG-019	Capacitor	0.01μF	50V
C12	CCDSH201K50	Capacitor	200pF	50V
C13	CKDYF473Z25	Capacitor	0.047μF	25V
C14	CKDYF473Z25	Capacitor	0.047μF	25V
C15	CEA220P10	Capacitor	22μF	10V
C16	CKDYF473Z25	Capacitor	0.047μF	25V
C17	CQMA393M50	Capacitor	0.039μF	50V
C18	CQMA393M50	Capacitor	0.039μF	50V
C19	CCG-019	Capacitor	0.01μF	50V
C20	CEA220P10	Capacitor	22μF	10V
C21	CCG-019	Capacitor	0.01μF	50V
C22	CSZAR22M35	Capacitor	0.22μF	35V
C23	CEA101P10	Capacitor	100μF	10V
C24	CCG-019	Capacitor	0.01μF	50V

ANTENNA ATTENUATOR UNIT (CWX-230)

- **Parts Connection**

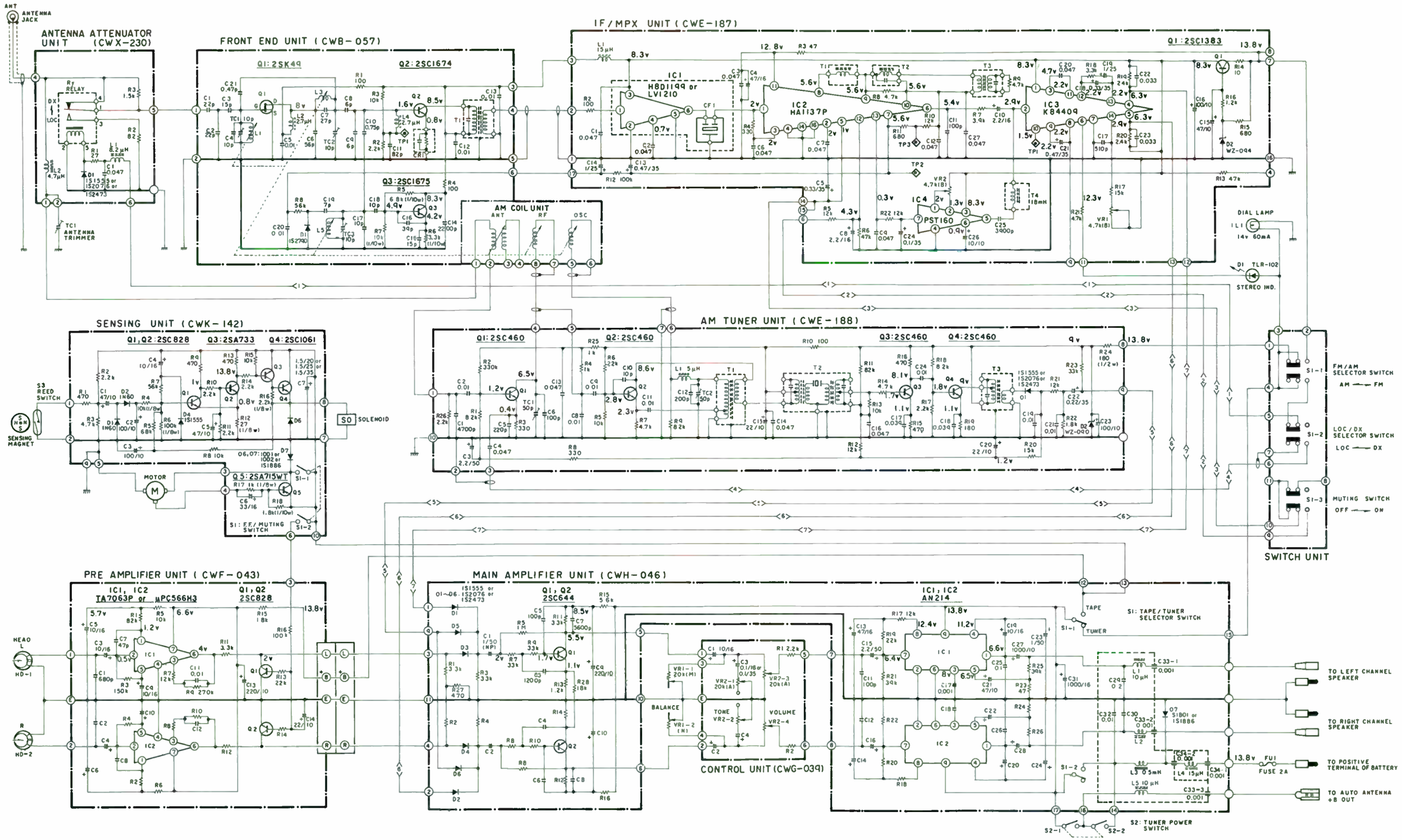


- **Parts List**

Ref. Key	Parts No.	Description
D1	1S1555 or	Diode
	1S2076 or	Diode
	1S2473	Diode
Ry	CSR-012	Relay
L1	CTF-018	Ferri-Inductor, 8.2μH

Ref. Key	Parts No.	Description	
L2	CTH-025	Coil, 4.7μH	
R1	RD1/8VS270J	Resistor 27Ω	1/8W
R2	RD1/8VS820J	Resistor 82Ω	1/8W
R3	RD1/8VS152J	Resistor 1.5kΩ	1/8W
C1	CKDYF473Z25	Capacitor 0.047μF	25V

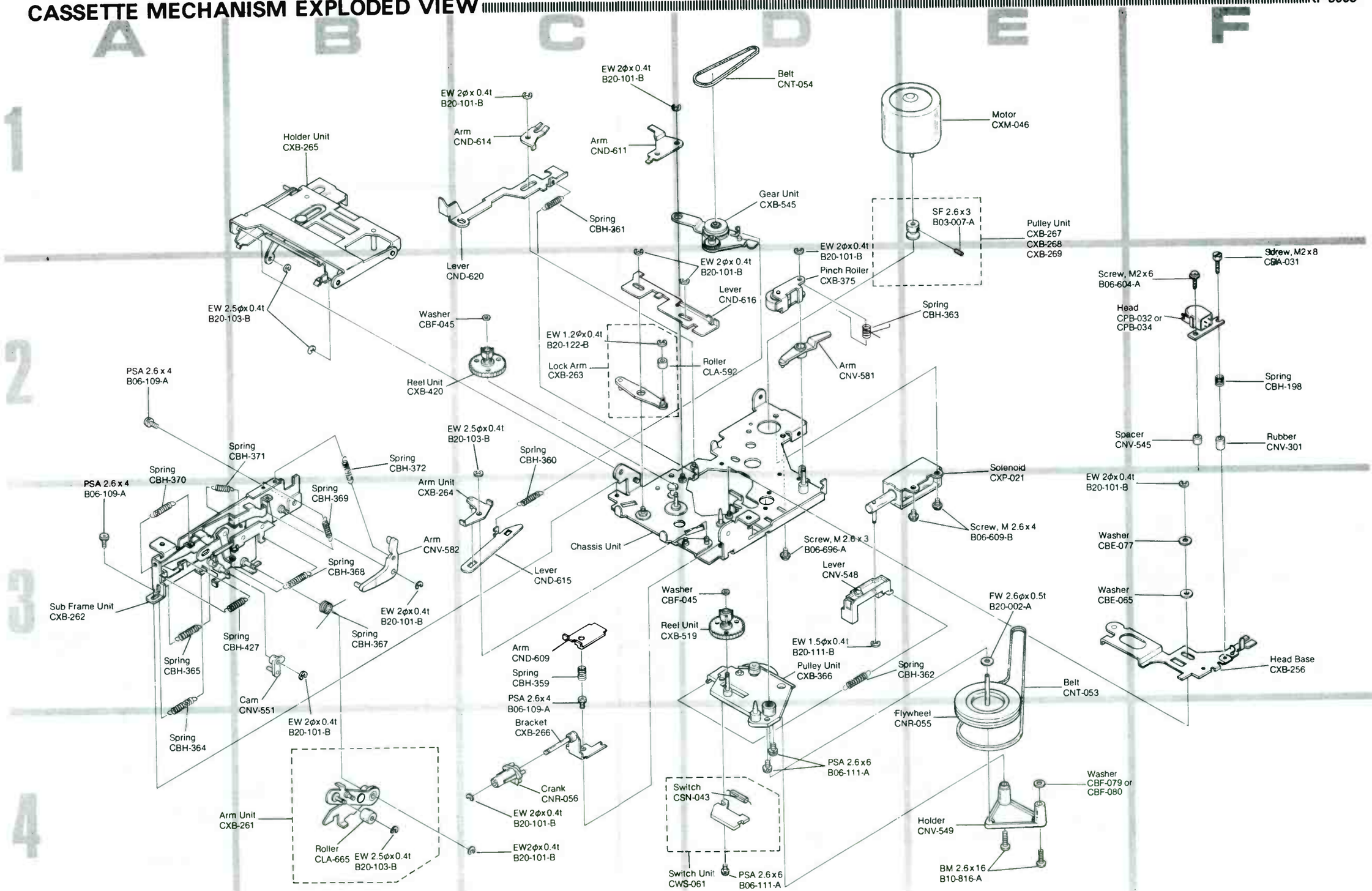
6. SCHEMATIC CIRCUIT DIAGRAM



CASSETTE MECHANISM EXPLODED VIEW

NOTICE: Part whose parts number is omitted is subject to being not supplied.

KP-5005



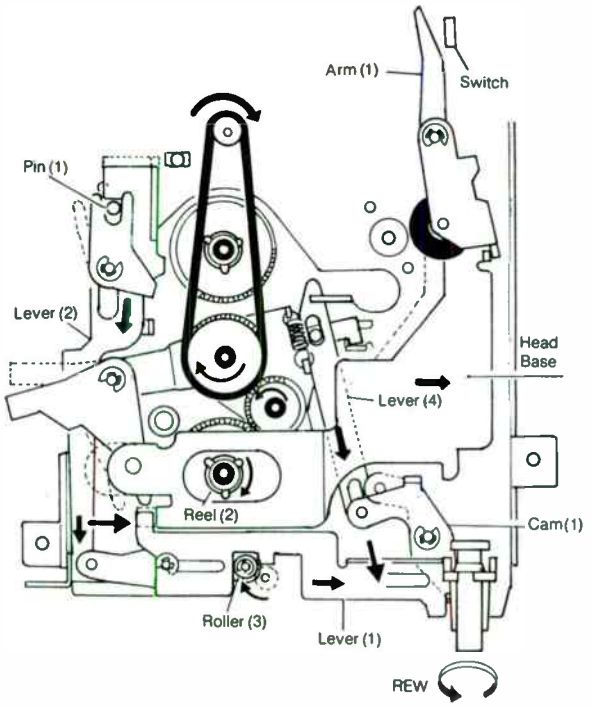


Fig. 17

2. ADJUSTMENT

2.1 TAPE SPEED ADJUSTMENT

Tape speed can be adjusted by replacing the motor pulley. Three types of pulleys differing in diameter available as shown in the table below. The pulley surface has either one groove, two grooves or no groove to help distinguish the diameter (Fig. 18).

Diameter	Parts No.	No. of Grooves
9.50mm	CXB-267	None
9.60mm	CXB-268	One
9.70mm	CXB-269	Two

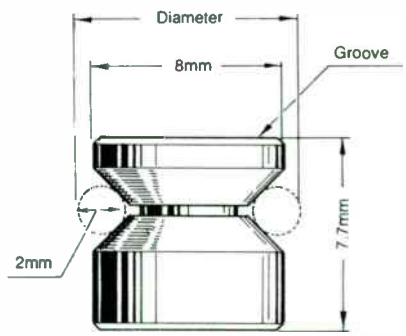


Fig. 18

2.2 AZIMUTH ADJUSTMENT

1. Connect VTVM and the speaker (4Ω)to the green and gray leads, respectively. Connect the red lead to a DC regulated power supply and apply 13.8V.
2. Insert a 333 Hz (STD-331) test tape. With balance set at medium and tone at maximum, turn volume for an output reading of 0 dB.
3. Insert a 6.3 kHz (STD-331) test tape.
4. Turn the azimuth adjusting screw so that outputs of Lch and Rch are each at maximum symmetrically (Fig. 19).

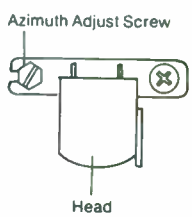
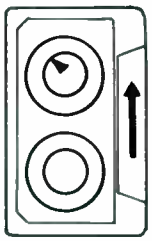


Fig. 19

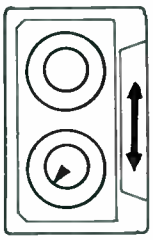
2.3 CHECK POINTS OF CASSETTE MECHANISM

When replaced or repaired cassette mechanism parts, refer to values in the following table.

(1) Wind torque
Take measurement for 5~6 seconds using a cassette torque meter (120g/cm) to make sure torque is 55~75g/cm.

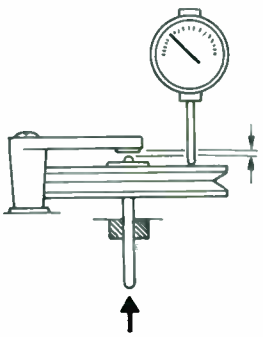


(2) F.F. and rewind torque
Take measurement for 5~6 seconds using a cassette torque meter (120g/cm) to make sure torque is 65g/cm or more.

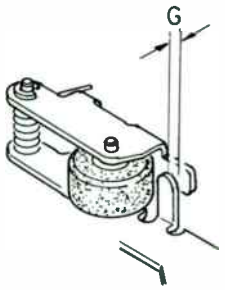


(3) Pinch roller press adhesion force
Measure using a tension gauge (500g) to make sure the load is 200~300g with the pinch roller starting to rotate in contact with the capatan shaft.

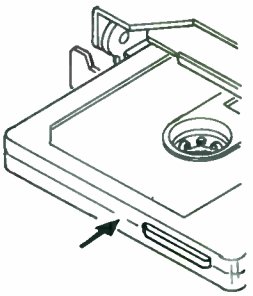
(4) Clearance between flywheel and flywheel bracket
Set a dial pick gauge as shown in the figure, and check to make sure the difference is between 0.1 mm and 0.5 mm, when the flywheel is applied with pressure in the arrowed direction.



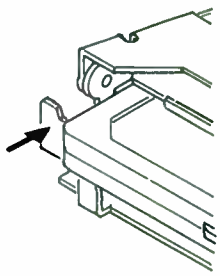
(5) Clearance between pinch roller and head base stopper
Determine using a thickness gauge that clearance is 0.5±0.2 mm, when in play mode.



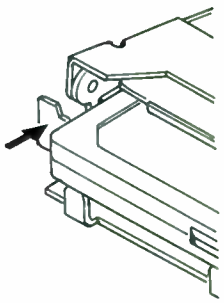
(6) Cassette loading force
Using tension gauge (3 kg) at the center of the cassette, check to make sure the indication is less than 2.3 kg.



(7) F.F. and rewind releasing force
Using a tension gauge (1 kg) in the arrowed direction, check to make sure the indication is less than 0.5 kg.



(8) Eject force
Using tension gauge (3 kg) in the arrowed direction, check to make sure the indication is less than 1 kg.



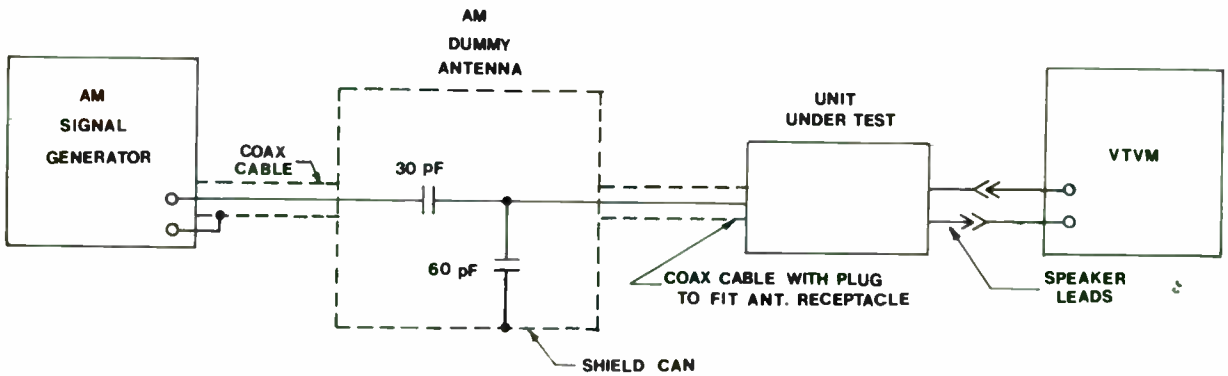


Figure 5 – Test connections for AM IF and RF alignment.

Alignment Procedure

NOTE: Before attempting alignment, check unit for acceptable source voltage of 12-16 volts DC.

AM IF and RF ALIGNMENT

Equipment Required:

- AM RF Signal Generator
- VTVM
- Dummy Antenna (See Fig. 5)

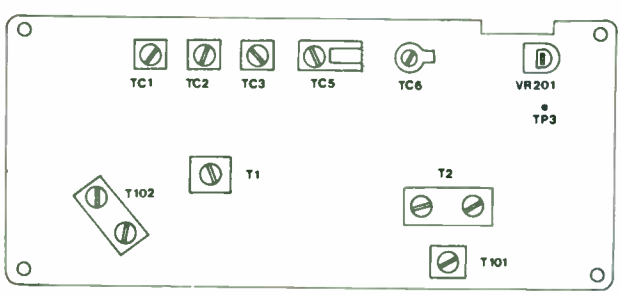
A. Make connections as shown in Fig. 5:
   a) Signal generator to dummy antenna
   b) Dummy antenna to radio antenna receptacle
   c) Radio speaker output to VTVM
B. Set AM/FM slide bar for AM reception; volume control and tone control to maximum clockwise positions.
C. Proceed with Steps 1 through 5 of Table I.

ANTENNA TRIMMER ADJUSTMENT

Trimmer TC4 will require readjustment when radio is installed in car. Extend antenna to desired height, tune in a weak station around 1,400 kHz and adjust TC4 for maximum output.

TABLE I. AM ALIGNMENT PROCEDURE

Step	Generator Setting	Radio Dial Setting	Indicator	Procedure
1	262.5 kHz 400 Hz, 30% mod.	About 1,000 kHz (area of no interference)	VTVM across voice coil	Adjust T102 for max. out. (both coils)
2	1,650 kHz 400 Hz, 30% mod.	High frequency end stop	VTVM across voice coil	Adjust TC6 for max. out.
3	525 kHz 400 Hz, 30% mod.	Tune to signal	VTVM across voice coil	Adjust T2 for max. out. (both coils)
4	1,400 kHz 400 Hz, 30% mod.	Tune to signal	VTVM across voice coil	Adjust TC4 for max. out. Adjust TC5 for max. out.
5	Repeat Steps 2, 3 and 4 until no further increase. Step 4 should be last step.			



FM ADJUSTMENTS

TC1: ant.
TC2: RF
TC3: osc.
T1: 1st IF
T101: 2nd IF

AM ADJUSTMENTS

TC4: Ant.
TC5: RF
TC6: OSC.
T2: 1st IF
T102: 2nd IF

VR201: FM MPX Separation (pilot signal at 19 kHz)

Figure 6 – Alignment controls on AM/FM pc board.

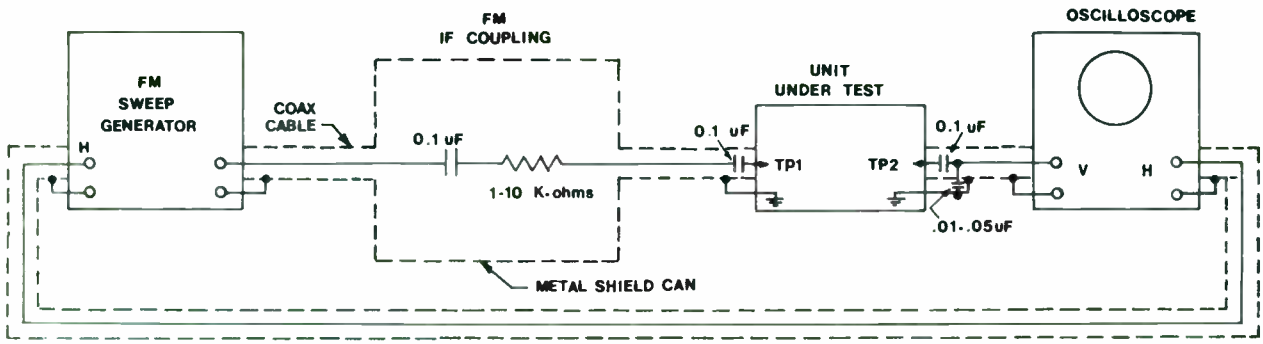


Figure 7 – Test connections for FM IF alignment.

FM IF AND RF TRACKING ALIGNMENT

Equipment Required:

- FM Sweep Generator
- Oscilloscope
- FM IF Coupling (See Fig. 7)

A. Make connections as shown in Fig. 7:

a) High side of Sweep Generator through IF Coupling circuit to TP1 of unit. (See Fig. 11) Low side to ground.

b) TP2 (FM IF detector output – see Fig. 11) of unit through 0.1 uF isolation capacitor to oscilloscope vertical input.

NOTE: Make output lead of sweep generator and input lead of oscillscope as short as possible and shield carefully to minimize static coupling.

An FM sweep generator is convenient for FM alignment. Because a pair of ceramic filters are used in the IF circuit, the exact frequency of the filter determines the exact frequency of the radio IF. Five different ceramic filters may be used in 12R704 production lots, and their color codes and center frequencies are as follows:

Red – 10.7 MHz
Blue – 10.67 MHz
Orange – 10.73 MHz
Black – 10.64 MHz
White – 10.76 MHz

Figure 8 – 10.7 MHz marker position for each of five different ceramic IF filters that may be used in production.

If ceramic filters other than Red are used, the 10.7 MHz marker will not and should not appear at the center of the "S" curve (See Fig. 8). When replacing ceramic filters, replace with matching colors.

B. Set AM/FM slide bar for FM reception; set volume control to minimum and tone control to maximum.

C. Proceed with Step 1 in Table II.

TABLE II. FM ALIGNMENT PROCEDURE

Step	Generator Setting	Radio Dial Setting	Output Indicator	Procedure
1 (IF Alignment)	10.7 MHz (sweep) at TP1	Point of no interference	Vertical ampl of 'scope at TP2	Adjust T1 and T101 to obtain symmetrical response per Fig. 8
2 (Tracking)	109 MHz (FM) at J1	High frequency end stop	VTVM across voice coil	Adjust TC3 for max. out.
3 (Tracking)	88 MHz (FM) at J1	88 MHz	VTVM across voice coil	Adjust TC1 and TC2 for max. out.
4	Repeat steps 1, 2, and 3 until no further improvement results.			

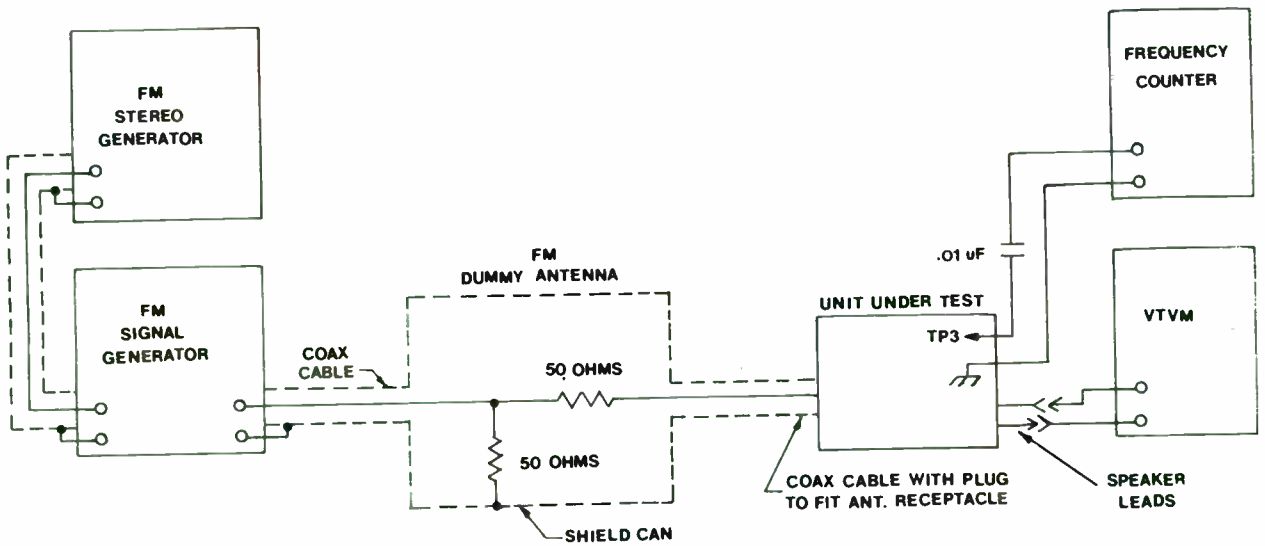


Figure 9 – Test connections for FM RF alignment.

FM DEMULTIPLEXER ALIGNMENT

Equipment Required:

- FM Stereo Signal Generator
- FM Signal Generator
- Frequency Counter
- Dummy Antenna (See Fig. 9)

Demultiplexer Alignment:

A. With connections as shown in Fig. 9, modulate FM signal generator by FM stereo generator as follows:
19 kHz .....10% (7.5 kHz dev.)
1,000 Hz .....30% (75 kHz dev.)

B. Set signal generator to 98 MHz at 1mV output level.

C. Tune radio to signal; adjust volume control to provide 2 volts across 4-ohm load (1 watt) on VTVM; set tone control to high, and set balance control at mechanical midpoint.

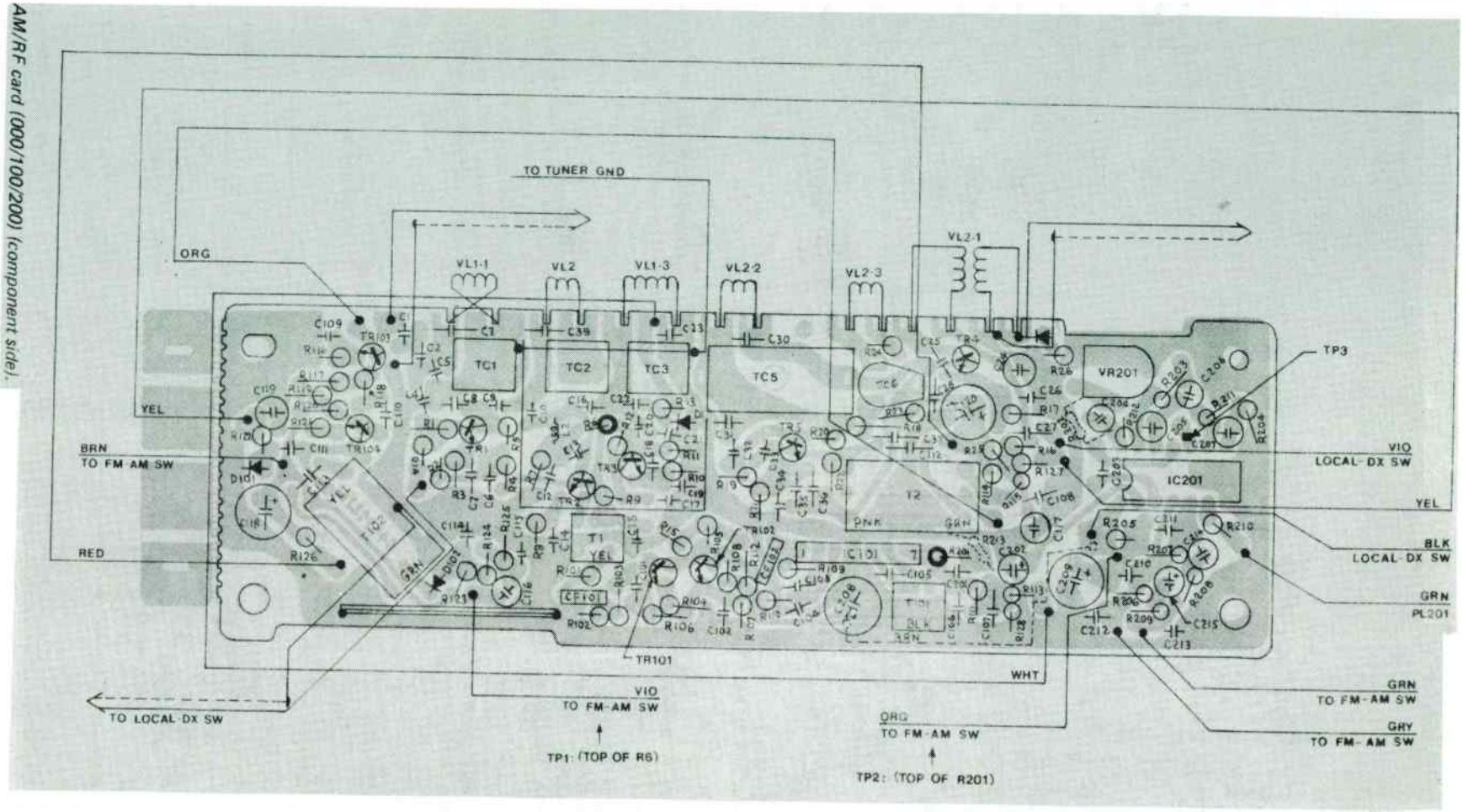
D. Proceed with steps in Table III.

E. If counter is not available, reasonable adjustment can be effected by tuning to strong stereo station and adjusting VR201 first to the left until stereo indicator light goes out. Then turn to the right until stereo indicator light goes out. Set VR201 half way between these two points.

TABLE III.
FM MPX ALIGNMENT PROCEDURE

Step	Modulation Frequency	Output Indicator	Procedure
1	No signal	Frequency Counter	Adjust VR201 for 19 kHz
2	19 kHz (pilot signal)		Check for firing of STEREO indicator

AM/RF card (000/100/200) (component side).



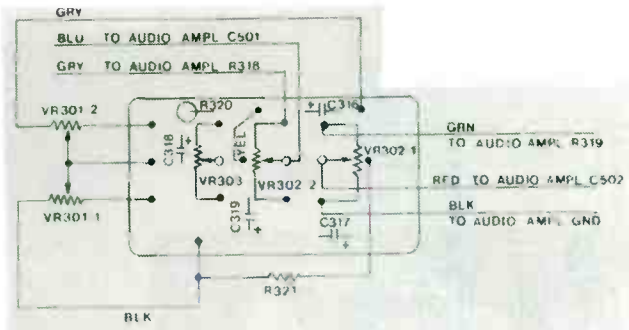


Figure 12 – Volume control card (300) (component side).

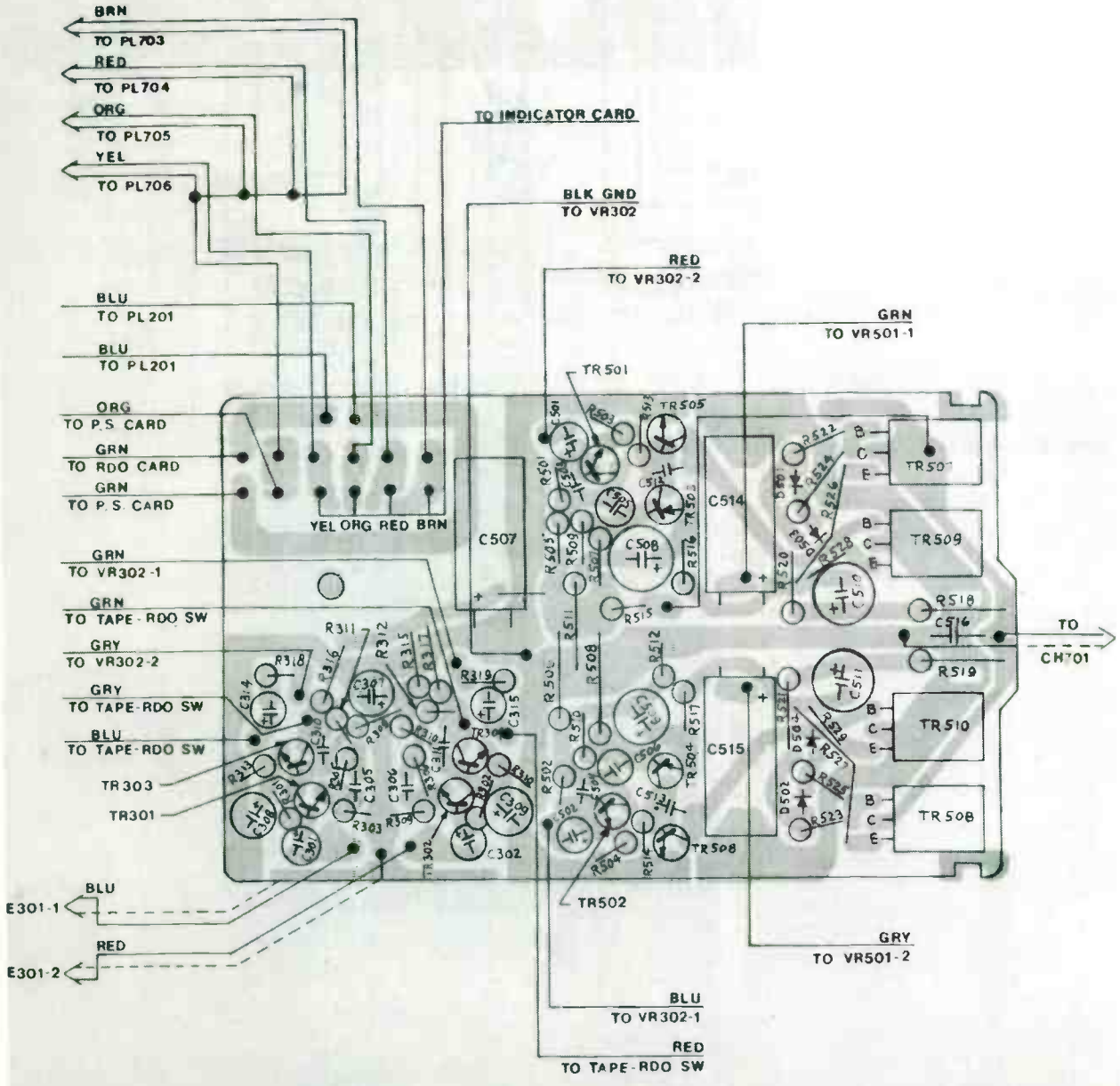


Figure 13 – Audio amplifier card (500) (component side).

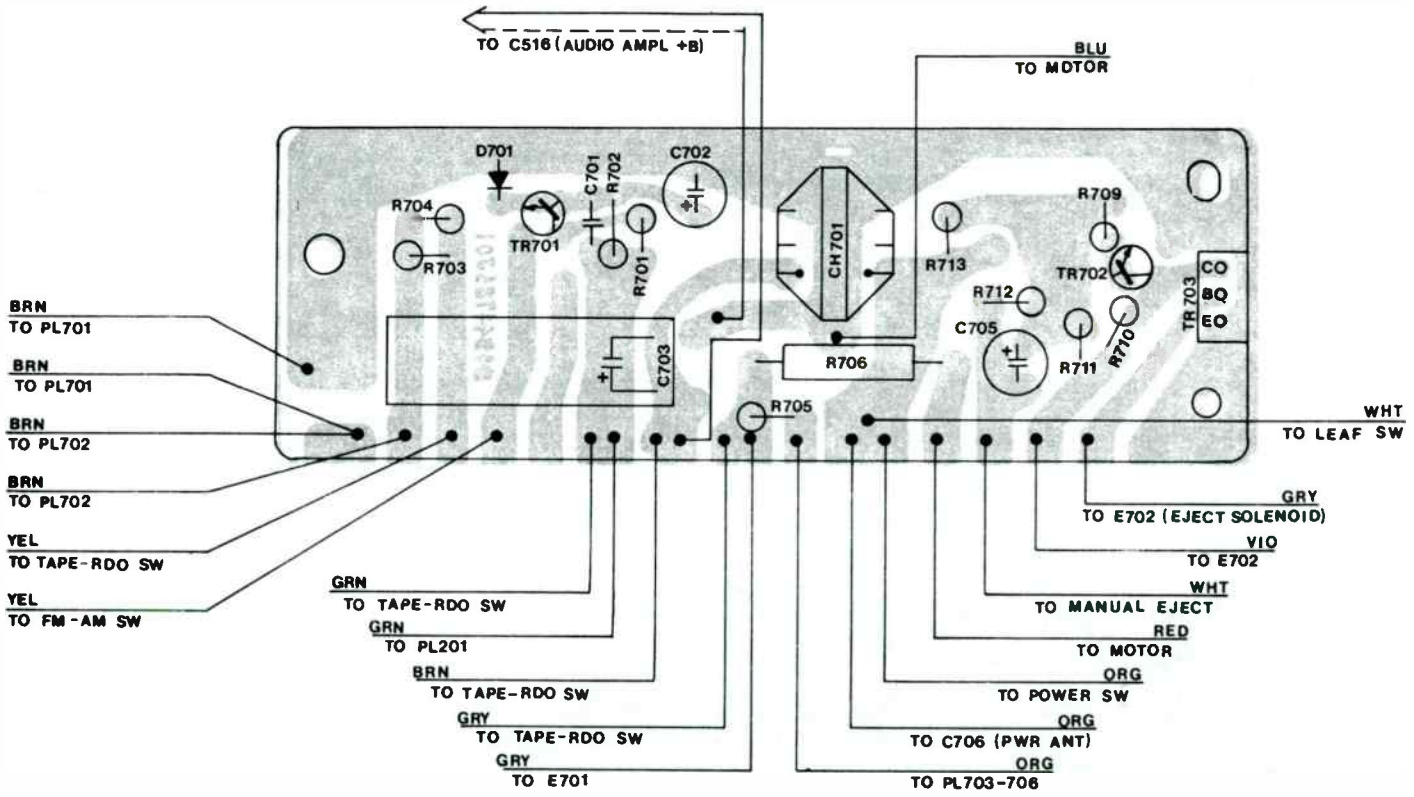


Figure 14 – Power supply card (700) (component side)

Replacement Parts

Symbol	Stock No.	Description
		ELECTRICAL PARTS
C1	742172	18PF CER
C2	742173	9PF CER
C3	742174	47PF CER
C4	742175	2PF CER
C5	742176	4PF CER
C6	742177	.022UF CER
C7	742178	.01UF CER
C8	742179	39PF CER
C9	742180	10 PF CER
C10	742181	5PF CER
C12	742182	150PF CER
C13	742183	15PF CER
C14	742178	.01UF CER
C15	742178	.01UF CER
C16	742184	1PF CER
C17	742178	.01UF CER
C18	742185	33PF CER
C19	742186	15PF CER
C20	742187	4PF CER
C21	742188	8PF CER
C22	742189	2PF CER
C23	742177	.022UF CER
C24	742190	1UF ELYT
C25	742191	1000PF CER
C26	742192	220PF CER
C27	742193	.1UF CER
C28	742194	330PF CER
C30	742195	68PF CER
C31	742216	.01 UF FILM
C32	742216	.01 UF FILM
C33	742184	1PF CER
C34	742196	.0047UF CER
C35	742197	270PF CER
C36	742198	150PF CER
C37	742193	.1UF CER
C38	742199	33PF CER
C39	742177	.022UF CER
C101	742178	.01UF CER
C102	742178	.01UF CER
C103	742177	.022UF CER
C104	742177	.022UF CER
C105	742200	7PF CER
C106	742192	220PF CER
C107	742201	.2 UF CER
C108	742202	.047UF CER
C109	742203	.1UF CER
C110	742216	.01 UF FILM
C111	742192	220PF CER
C112	742204	3PF CER
C113	742184	1PF CER
C114	742216	.01 UF FILM
C115	742216	.01 UF FILM
C116	742205	4.7UF ELYT
C117	742206	10UF ELYT
C118	742207	220UF ELYT
C119	742206	10UF ELYT
C120	742208	100UF ELYT
C201	742209	.001UF FILM
C202	742205	4.7UF ELYT
C203	742210	.05UF CER
C204	742211	470 PF FILM
C205	742212	.22 UF ELYT
C206	742213	.47UF ELYT
C207	742214	.68UF ELYT
C208	742208	100UF ELYT
C209	742208	100UF ELYT
C210	742215	.033 UF FILM
C211	742215	.033 UF FILM
C212	742196	.0047UF CER
C213	742196	.0047UF CER
C214	742190	1UF ELYT
C215	742190	1UF ELYT
C301	742205	4.7UF ELYT
C302	742205	4.7UF ELYT
C305	742216	.01 UF FILM
C306	742216	.01 UF FILM
C307	742217	47UF ELYT
C308	742217	47UF ELYT
C309	742217	47UF ELYT
C310	742218	150 PF CER
C311	742218	150 PF CER
C314	742205	4.7UF ELYT
C315	742205	4.7 UF ELYT
C316	742219	.1UF TANT
C317	742219	.1UF TANT
C318	742220	.22 UF TANT
C319	742220	.22 UF TANT
C501	742205	4.7UF ELYT
C502	742205	4.7UF ELYT
C503	742221	470PF CER
C504	742221	470PF CER
C505	742205	4.7UF ELYT
C506	742205	4.7UF ELYT
C507	742222	470UF 10V ELYT
C508	742223	100 UF CER.
C509	742223	100 UF CER.
C510	742223	100 UF CER.
C511	742223	100 UF CER.
C512	742224	330 PF CER
C513	742224	330 PF CER
C514	742222	470UF 10V ELYT
C515	742222	470UF 10V ELYT
C516	742225	.1UF FILM
C517	77084	1000PF +100 -0%, 500V., FEED-THRU
C518	77084	1000PF +100 -0%, 500V., FEED-THRU
C519	77084	1000PF +100 -0%, 500V., FEED-THRU
C520	77084	1000PF +100 -0%, 500V., FEED-THRU
C701	742227	.022 UF FILM
C702	742208	100UF ELYT
C703	742228	2200 UF ELYT
C705	742207	220UF ELYT
C706	77084	1000PF +100 -0%, 500V., FEED-THRU
C707	77084	1000PF +100 -0%, 500V., FEED-THRU
CF101	742272	FILTER-CER 10.7 MHZ
CF102	742272	FILTER-CER 10.7 MHZ
CH701	742233	CHOKE-FILTER
D1	741689	DIODE - TYPE ITT410
D2	741741	DIODE - TYPE 1S1555
D101	741741	DIODE - TYPE 1S1555
D102	226344	DIODE - TYPE 1N60
D501	742266	VARISTOR
D502	742266	VARISTOR
D503	742266	VARISTOR
D504	742266	VARISTOR
D701	742267	ZENER DIODE
D702	742268	RECTIFIER-SILICON
E301	742251	HEAD-PLAYBACK STEREO CONSISTING OF- E301-1 E301-2
E701	742252	SOLENOID COIL ASSEMBLY
IC101	742269	I C - TYPE TA7130
IC201	742270	I C - TYPE MPX MC1310P
J1	742244	CONNECTOR - JACK - ANT RECEPTACLE
L1	742238	COIL - 3.9
L2	742239	COIL 1.5
PL201	742245	LAMP - PILOT
PL701	742246	LAMP - PILOT
PL702	742246	LAMP - PILOT
PL703	742247	LAMP-PILOT-BRN.
PL704	742248	LAMP - PILOT - RED
PL705	742249	LAMP - PILOT - ORG
PL706	742250	LAMP - PILOT - YEL
R1	435513	3300 OHMS 5% 1/4W FILM
R2	435515	10,000 OHMS 5% 1/4W FILM
R3	239454	1000 OHM 5% 1/4W FILM
R4	239450	100 OHMS 5% 1/4W FILM
R5	246397	2200 OHMS 5% 1/4W FILM
R6	245920	8200 OHMS 5% 1/4 WATT FILM
R7	246397	2200 OHMS 5% 1/4W FILM
R8	246397	2200 OHMS 5% 1/4W FILM
R9	240580	470 OHMS 5% 1/4 WATT FILM
R10	435513	3300 OHMS 5% 1/4W FILM
R11	435515	10,000 OHMS 5% 1/4W FILM
R12	245920	8200 OHMS 5% 1/4 WATT FILM
R13	241593	100,000 OHMS 5% 1/4W FILM
R14	239455	1200 OHMS 5% 1/4W FILM
R15	428561	47 OHM 1/4W 5%, FILM
R16	243078	4700 OHM 5% 1/4W FILM
R17	239450	100 OHMS 5% 1/4W FILM
R18	240580	470 OHMS 5% 1/4 WATT FILM
R19	243078	4700 OHM 5% 1/4W FILM
R20	239462	18,000 OHMS 5% 1/4W FILM
R21	435513	3300 OHMS 5% 1/4W FILM
R22	239466	82,000 OHM 5% 1/4W FILM
R23	431971	220 OHM 2% 1/4W FILM
R24	239460	5600 OHMS 5% 1/4W FILM
R25	426249	330000 OHM 5% 1/4W COMP.
R26	241860	22000 OHM 5% 1/4W FILM
R101	420316	560 OHMS 5% 1/4W FILM
R102	245958	330 OHMS 5% 1/4W FILM
R103	245958	330 OHMS 5% 1/4W FILM
R104	428594	180 OHM 1/4W 2%, FILM
R105	435515	10,000 OHMS 5% 1/4W FILM
R106	435514	12,000 OHMS 5% 1/4W FILM
R107	249430	680 OHMS 5% 1/4W FILM
R108	240580	470 OHMS 5% 1/4 WATT FILM
R109	245958	330 OHMS 5% 1/4W FILM
R110	428594	180 OHM 1/4W 2%, FILM
R111	249435	150,000 OHM 5% 1/4W FILM
R112	428594	180 OHM 1/4W 2%, FILM
R113	241593	100,000 OHMS 5% 1/4W FILM
R114	249435	150,000 OHM 5% 1/4W FILM
R115	241594	33000 OHM 5% 1/4W FILM
R116	240580	470 OHMS 5% 1/4 WATT FILM
R117	420316	560 OHMS 5% 1/4W FILM
R118	240579	390 OHM 5% 1/4W FILM
R119	243078	4700 OHM 5% 1/4W FILM
R120	245920	8200 OHMS 5% 1/4 WATT FILM
R121	428594	180 OHM 1/4W 2%, FILM
R122	435513	3300 OHMS 5% 1/4W FILM
R123	426249	330000 OHM 5% 1/4W COMP.
R124	246397	2200 OHMS 5% 1/4W FILM

Replacement Parts (Continued)

Symbol	Stock No.	Description
R125	239457	2700 OHMS 5% 1/4W FILM
R126	239450	100 OHMS 5% 1/4W FILM
R127	435513	3300 OHMS 5% 1/4W FILM
R128	239465	47000 OHM 5% 1/4W FILM
R201	239460	5600 OHMS 5% 1/4W FILM
R202	239462	18,000 OHMS 5% 1/4W FILM
R203	239454	1000 OHM 5% 1/4W FILM
R204	241593	100,000 OHMS 5% 1/4W FILM
R205	240580	470 OHMS 5% 1/4 WATT FILM
R206	246397	2200 OHMS 5% 1/4W FILM
R207	246397	2200 OHMS 5% 1/4W FILM
R208	435513	3300 OHMS 5% 1/4W FILM
R209	435513	3300 OHMS 5% 1/4W FILM
R210	431971	220 OHM 2% 1/4W FILM
R211	241593	100,000 OHMS 5% 1/4W FILM
R212	239466	82,000 OHM 5% 1/4W FILM
R213	245922	15,000 OHMS 5% 1/4W FILM
R301	249435	150,000 OHM 5% 1/4W FILM
R302	249435	150,000 OHM 5% 1/4W FILM
R303	240579	390 OHM 5% 1/4W FILM
R304	240579	390 OHM 5% 1/4W FILM
R305	426249	330000 OHM 5% 1/4W COMP.
R306	426249	330000 OHM 5% 1/4W COMP.
R309	249434	27000 OHMS 5% 1/4W FILM
R310	249434	27000 OHMS 5% 1/4W FILM
R311	435515	10,000 OHMS 5% 1/4W FILM
R312	435515	10,000 OHMS 5% 1/4W FILM
R313	239454	1000 OHM 5% 1/4W FILM
R314	239454	1000 OHM 5% 1/4W FILM
R315	239460	5600 OHMS 5% 1/4W FILM
R316	239460	5600 OHMS 5% 1/4W FILM
R317	239460	5600 OHMS 5% 1/4W FILM
R318	239455	1200 OHMS 5% 1/4W FILM
R319	239455	1200 OHMS 5% 1/4W FILM
R320	239454	1000 OHMS 1/4W 5% FILM
R321	239454	1000 OHMS 1/4W 5% FILM
R501	430277	1000000 OHM 5% 1/4W FILM
R502	430277	1000000 OHM 5% 1/4W FILM
R503	245958	330 OHMS 5% 1/4W FILM
R504	245958	330 OHMS 5% 1/4W FILM
R505	435515	10,000 OHMS 5% 1/4W FILM
R506	435515	10,000 OHMS 5% 1/4W FILM
R507	239462	18,000 OHMS 5% 1/4W FILM
R508	239462	18,000 OHMS 5% 1/4W FILM
R509	245922	15,000 OHMS 5% 1/4W FILM
R510	245922	15,000 OHMS 5% 1/4W FILM
R511	428563	33 OHM 5% 1/4W FILM
R512	428563	33 OHM 5% 1/4W FILM
R513	239454	1000 OHM 5% 1/4W FILM
R514	239454	1000 OHM 5% 1/4W FILM
R515	245918	1800 OHM 5% 1/4W FILM
R516	435513	3300 OHMS 5% 1/4W FILM
R517	435513	3300 OHMS 5% 1/4W FILM
R518	239450	100 OHMS 5% 1/4W FILM
R519	239450	100 OHMS 5% 1/4W FILM
R520	248863	120 OHMS 5% 1/4W FILM
R521	248863	120 OHMS 5% 1/4W FILM
R522	232661	4.7 OHM 5%, 1/4W., COMP.
R523	232661	4.7 OHM 5%, 1/4W., COMP.
R524	428563	33 OHM 5% 1/4W FILM
R525	428563	33 OHM 5% 1/4W FILM
R526	232661	4.7 OHM 5%, 1/4W., COMP.
R527	232661	4.7 OHM 5%, 1/4W., COMP.
R528	742273	RESISTOR-WIRE
R529	742273	RESISTOR-WIRE
R701	230605	27 OHM 5%, 1/4W., COMP.
R702	240580	470 OHM 5% 1/4W FILM
R703	249428	82 OHMS 5% 1/4W FILM
R704	249428	82 OHMS 5% 1/4W FILM
R705	431971	220 OHM 2% 1/4W FILM
R706	742234	3.9 OHM 2W COMP.
R709	245922	15,000 OHMS 5% 1/4W FILM
R710	224252	560 OHM 1/2W COMP.
R711	245961	39000 OHM 5% 1/4W FILM
R712	239460	5600 OHMS 5% 1/4W FILM
R713	245961	39000 OHM 5% 1/4W FILM
T1	742240	TRANSFORMER - IF - FM
T2	742241	TRANSFORMER - IF AM (PINK)
T101	742242	TRANSFORMER - IF FM
T102	742243	TRANSFORMER - IF AM - YEL
TC1	742229	CAPACITOR - TRIMMER
TC2	742229	CAPACITOR - TRIMMER
TC3	742230	CAPACITOR - TRIMMER
TC4	742231	CAPACITOR - VARIABLE

Symbol	Stock No.	Description
TC5	742232	CAPACITOR - TRIMMER - AM
TC6	742231	CAPACITOR - VARIABLE
TR1	742274	TRANSISTOR - TYPE 2SC784-R
OR		
TR1	742275	TRANSISTOR - TYPE 2SC784-BN
TR2	742274	TRANSISTOR - TYPE 2SC784-R
OR		
TR2	742275	TRANSISTOR - TYPE 2SC784-BN
TR3	742257	TRANSISTOR-TYPE JSP7001
TR4	129146	TRANSISTOR-TYPE 2SC380
TR5	129146	TRANSISTOR-TYPE 2SC380
TR101	741855	TRANSISTOR - TYPE 2SC829
TR102	741855	TRANSISTOR - TYPE 2SC829
TR103	129146	TRANSISTOR-TYPE 2SC380
TR104	129146	TRANSISTOR-TYPE 2SC380
TR301	742258	TRANSISTOR - TYPE 2SC644-S
TR302	742258	TRANSISTOR - TYPE 2SC644-S
TR303	742259	TRANSISTOR-TYPE 2SC1335
OR		
TR303	742260	TRANSISTOR TYPE 2SC945L-M
TR304	742259	TRANSISTOR-TYPE 2SC1335
OR		
TR304	742260	TRANSISTOR TYPE 2SC945L-M
TR501	740306	TRANSISTOR TYPE 2SC373
TR502	740306	TRANSISTOR TYPE 2SC373
TR503	742261	TRANSISTOR - TYPE 2SA495
TR504	742261	TRANSISTOR - TYPE 2SA495
TR505	742262	TRANSISTOR - TYPE 2SC509
TR506	742262	TRANSISTOR - TYPE 2SC509
TR507	742263	TRANSISTOR - TYPE 2SC1173
TR508	742263	TRANSISTOR - TYPE 2SC1173
TR509	742264	TRANSISTOR - TYPE 2SA473
TR510	742264	TRANSISTOR - TYPE 2SA473
TR701	740306	TRANSISTOR TYPE 2SC373
TR702	742259	TRANSISTOR TYPE 2SC1335
TR703	742263	TRANSISTOR - TYPE 2SC1173
VR201	742235	RESISTOR - VARIABLE
VR301	742236	MULTIPLE VAR. RES.AND SWITCH ASSEM.
		CONSISTING OF-
		VR301-1
		VR301-2
		VR302-1
		VR302-2
		VR303
		POWER SWITCH
		MANUAL DETENT
VR501	742237	FADER CONTROL -
		CONSISTING OF-
		VR501-1
		VR501-2
		MECHANICAL PARTS
1	742141	DOOR - ASSEM
5	742142	TRIMCOVER
6	742143	NAME PLATE
7	742144	KNOB - AM/FM
9	742171	SPRING - DOOR
10	742145	SHAFT - DOOR
20	742146	KNOB - SW - L/D
29	742147	SPRING-AUTO LEVER
30	742148	SPRING - LEVER EJECT
40	742149	SPRING - COIL
41	742150	SPRING - COIL
50	742151	SPRING - COIL
51	742152	SPRING - COIL
54	742153	SWITCH ASSEM-TAPE GUIDE
59	742154	SWITCH - MOTOR
60	742155	SWITCH - LEVER
61	742156	SOLENOID ASSEM
69	742157	FUSE RECEPTACLE ASSEM
89	742158	BUSHING - LAMP HOLDER
90	742159	SPRING - SOLENOID
92	742160	BELT - DRIVE
93	742161	FLYWHEEL SHAFT - ASSEM
94	742162	MOTOR - DC
108	742163	SWITCH-SLIDE
114	742164	SWITCH - PUSH
115	742165	BUSHING-RUBBER
119	742166	KNOB - FRONT
120	742167	KNOB - CONTROL B
121	742168	POINTER
122	742169	POINTER-B
130	742170	SWITCH - LEFT

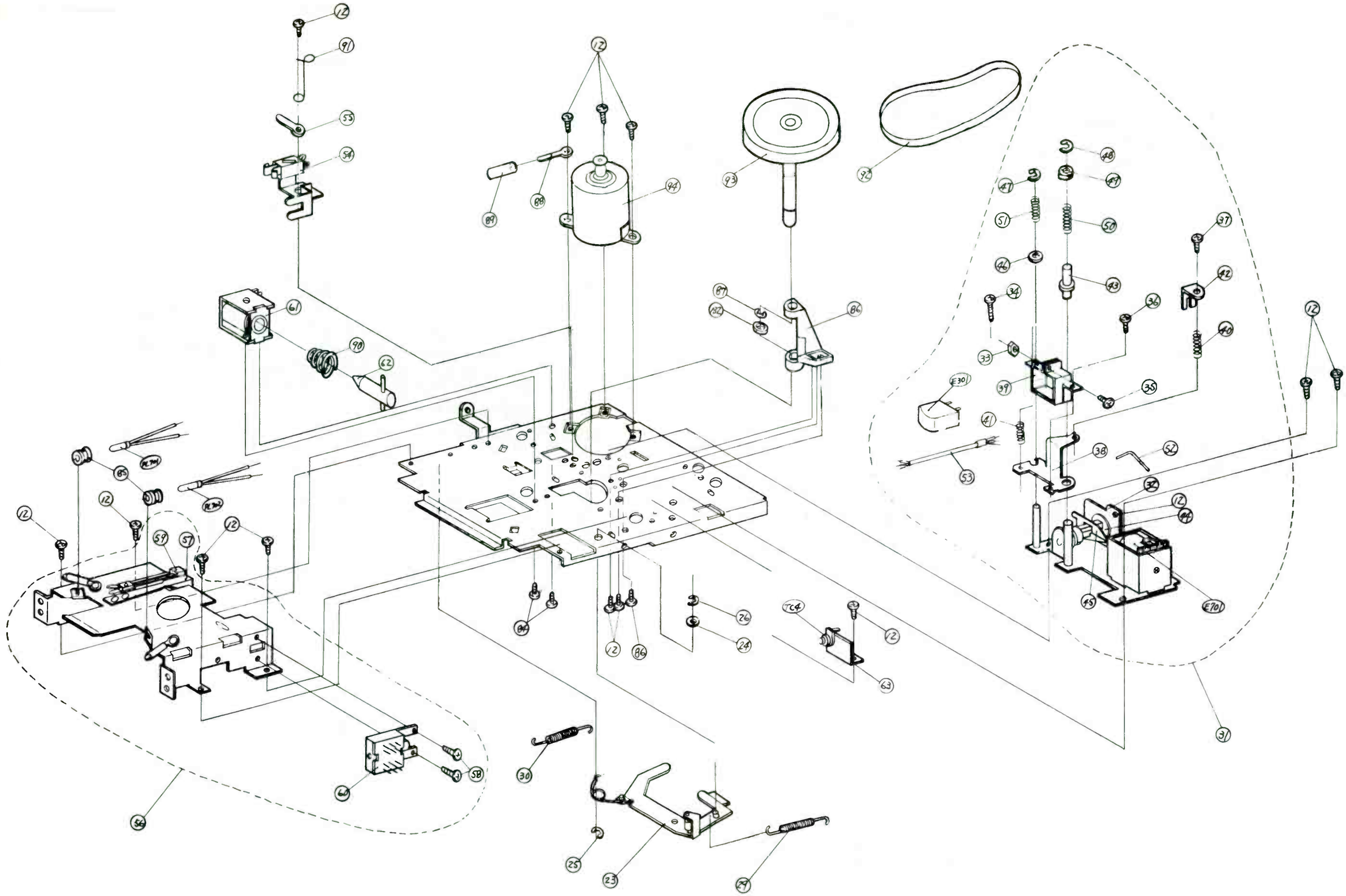
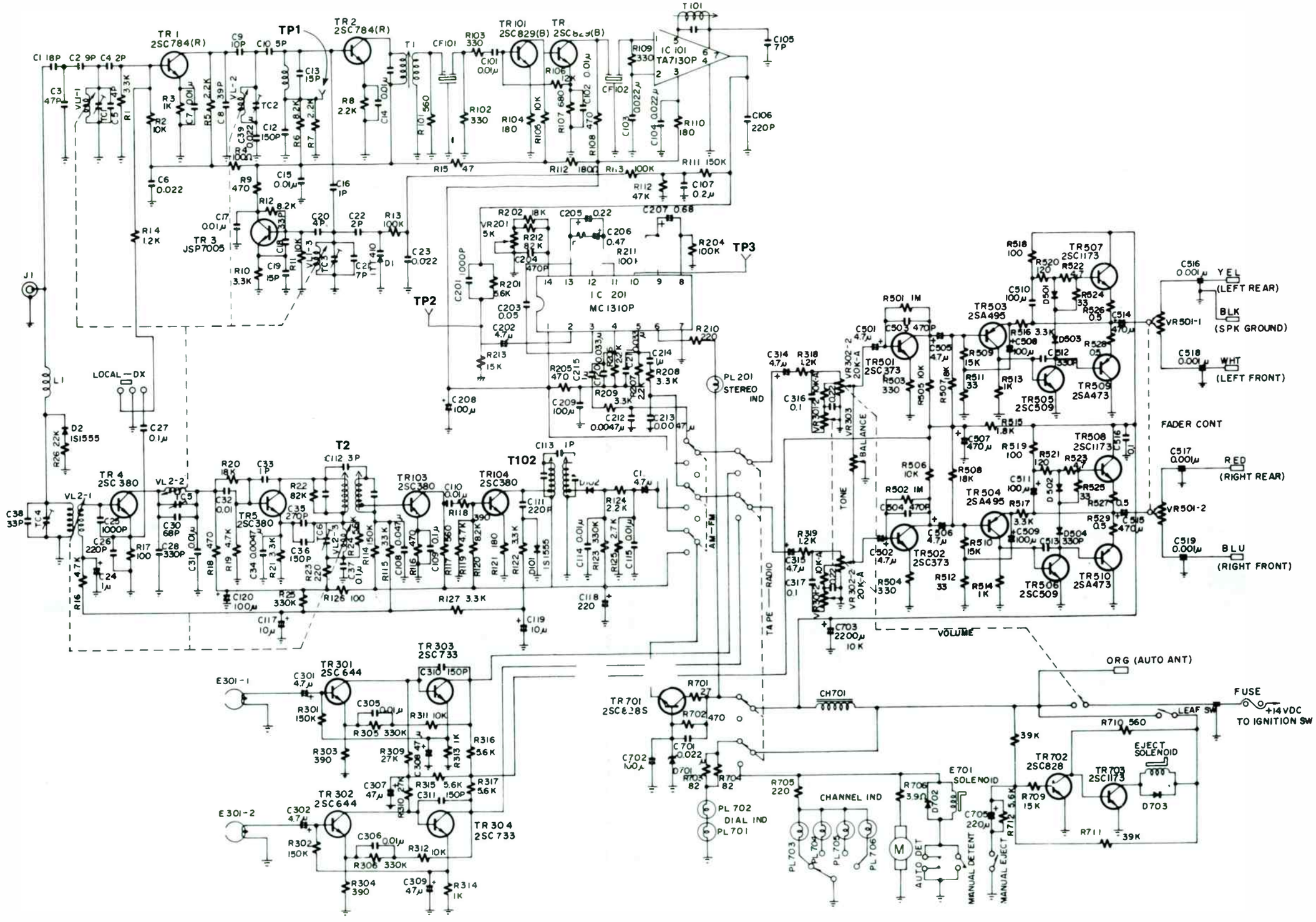


Figure 16 — Tape drive assembly.



TUNER ADJUSTMENT

The followings are radio alignment procedures for technicians reference.
Note: Use a screwdriver with plastic grip for all adjustments.

FM IF & RF ALIGNMENT

Step	Adjusting circuit	Connections		Frequency	Position of tuning dial	Adjustment	VTVM and Scope
		Input	Output				
1	IF	Connect sweep marker generator output to FM ANT terminal, Tuner Pack Case	Connect SMG input to test points R309. Chassis Ground.	10.7MHz (unmodulated)	Near maximum under no signal	T201 T301	
2	Detector		Connect SMG Input to test points R314. Chassis Ground.			T302	
3	Tuning Coverage and Dial Calibrator	Connect FM SG to FM ANT Terminals.	Connect VTVM to Speaker Terminals.	87MHz (400Hz 30% modulation)	Low End	CT203 (Tuner Pack)	Maximum reading on VTVM
4	Tracking			106MHz (400Hz 30% modulation)	106MHz	CT201,202 (Tuner Pack)	

FM MPX ALIGNMENT

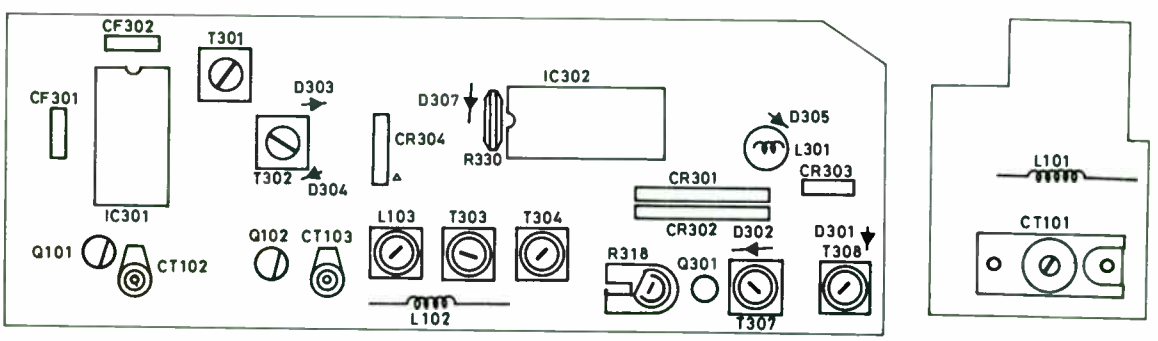
Adjusting circuit	Connections		Adjustment	Counter
	Input	Output		
MPX	————	IC302 No.12 Ground	R330	19.00kHz

AM ALIGNMENT

Note: Before alignment, obtain a 230μA collector current on Q101 with the R318 (SVR) at no signals condition.

Step	Adjusting circuit	Connections		SG frequency	Position of tuning dial	Adjustment	VTVM
		Input	Output				
1	IF	Connect AM IF SWEEP to ANT Terminals.	Connect VTVM to Speaker Terminals	262.5kHz	Minimum	T303, T304 T307, T308	Maximum reading on VTVM
2	Covering	Connect AM SG to ANT Terminals.	Connect VTVM to Speaker Terminals.	1,680kHz 525kHz	Maximum Minimum	CT-103 OSC (L103)	Maximum reading on VTVM
3		Repeat steps 2 at 1,680kHz and 525kHz alternately.					
4	Tracking	Connect AM SG to ANT Terminals.	Connect VTVM to Speaker Terminals.	1,400kHz	1,400kHz	CT-101 CT-102	Maximum reading on VTVM
5		Repeat steps 4 at 600kHz and 1,400kHz alternately.					

PARTS LOCATION



PARTS LIST

Schematic Location	Part No.	Description	Q'ty
SEMICONDUCTORS			
IC-301		IC, LA1201B2, FM IF	1
IC-302		IC, LA3350B, MPX	1
Q101,102		Transistor, 2SC941	2
Q301		Transistor, 2SC930	1
Q701,751		Transistor, 2SC536 AUD	2
Q702,752		Transistor, 2SC536 AUD	2
Q703,753		Transistor, 2SC711	2
Q704,754		Transistor, 2SA696	2
Q705,755*		Transistor, 2SD359 D1 or D2	2
Q706,756*		Transistor, 2SB529 D1 or D2 } a pair	2
(*	4-226T-76571B	Printed Circuit Board)	
Q705,755**		Transistor, 2SC1162WT C5 or C6	2
Q706,756**		Transistor, 2SA715WT C5 or C6 } a pair	2
(**	4-226T-76574	Printed Circuit Board)	
D301,302		Diode, 1S188AM	2
D303,304		Diode, 1S188FM	2
D305		Diode, WZ-090	1
D306		Diode, SLP114B, MPX	1
D307		Diode, DS442	1
D701,751, 702,752		Diode, MA-26A (Yellow)	4
D703		Diode, SLP114B-01	1

Schematic Location	Part No.	Description	Q'ty
ELECTRICAL PARTS			
L101	4-253T-05800	Choke Coil, 6.5μH	1
L102	4-253T-08600	Choke Coil, 3μH	1
L103	4-258T-10400 or 4-258T-10430	Oscillator Coil	1
L301	4-253T-01015	Choke Coil, 15mH	1
T301	4-256T-15130	Transformer, FM 2nd IF	1
T302	4-256R-02330	Transformer, FM 3rd IF	1
T303,307	4-256T-06700 or 4-256T-06730	Transformer, AM 1st IF & 3rd IF	2
T304	4-256T-06600 or 4-256T-06630	Transformer, AM 2nd IF	1
T308	4-256T-06800 or 4-256T-06830	Transformer, AM 4th IF	1
CF301,302	4-256T-80400	10.7MHz, Filter	2
CR301,302	4-227T-01400 or 4-227T-01410	C.R. Pack	2
B101	123-2-471R-10400	Bead Core	1
	4-235T-32672	Socket, 6P	1
	4-236T-09800	Plug, 6P	1
S1	4-231T-42172	Switch, Band Select	1
S2,3	4-231T-53200	Switch, ST-MONO, DX-LOCAL	2
CR303	4-227T-11600	C.R. Pack	1
CR304	4-227T-01500	C.R. Pack	1
	4-235T-33500	Socket, Antenna	1
40	4-125T-01501	Tuner Pack, FM	1
	4-235T-20200	Socket, 9P	1
41	4-226T-765911	P.C.B., Assembly* Audio (Transistor 2SD359 & 2SB529)	1
	4-226T-765931	P.C.B., Assembly** Audio (Transistor 2SC1162WT & 2SA715WT)	1
42	4-226T-811910	P.C.B. Assembly, FM/FM Tuner	1
43	4-226T-812910	P.C.B. Assembly, Trimmer	1
44	4-226T-81300	P.C.B., Volume	1
45	4-226T-81400	P.C.B., Switch	1
46	4-226T-81800	P.C.B., Diode	1
	4-612T-06473	Lamp, 5V, 60mA, Dial	1
	4-234T-00100	Fuse, 3A	1

Schematic Location	Part No.	Description	Q'ty
CAPACITORS			
C102		Ceramic, 5pF, ±0.5pF, 50V	1
C352		Ceramic, 7pF, ±0.5pF, 50V	1
C310		Ceramic, 30pF, ±10%, 50V	1
C353		Ceramic, 45pF, ±10%, 50V	1
C105,351		Ceramic, 100pF, ±10%, 50V	2
C106		Ceramic, 120pF, ±10%, 50V	1
C115		Ceramic, 220pF, ±10%, 50V	1
C107,301, 302,304, 305		Ceramic, 0.01μF, +80, −20%, 50V	5
C104,111, 303,314, 318		Ceramic, 0.022μF, +80, −20%, 50V	4
C108,351		Ceramic, 0.04μF, +80, −20%, 50V	2
C108,120		Mylar, 0.001μF, ±20%, 50V	2
C109		Mylar, 0.0047μF, ±20%, 50V	1
C320,321		Mylar, 0.033μFF, ±20%, 50V	2
C306		Mylar, 0.022μF, ±20%, 50V	1
C342		Mylar, 0.047μF, ±20%, 50V	1
C110		Styrol, 270pF, ±5%, 125V	1
C343		Styrol, 1500pF, ±5%, 125V	1
C330		Electrolytic, 0.22μF, 10V	1
C319		Electrolytic, 0.33μF, 10V	1
C312,341		Electrolytic, 0.47μF, 10V	2
C309,324,		Electrolytic, 4.7μF, 16V	4
C332		Electrolytic, 10μF, 16V	1
C331		Electrolytic, 470μF, 10V	1
C328,329		Mylar, 0.018μF, ±20%, 50V	2
CT101	4-224T-05600	Trimmer	1
CT102,103	4-224T-00100	Trimmer	2
C710,760		Ceramic, 50pF, ±20%, 50V	2
C704,754		Ceramic, 220pF, ±20%, 50V	2
C794		Ceramic, 0.1μF, +80, −20%, 50V	1
C701,751		Mylar, 0.0022μF, ±20%, 50V	2
C712,762, 713,763		Mylar, 0.022μF, ±20%, 50V	4
C703,753		Mylar, 0.033μF, ±20%, 50V	2
C714,764		Electrolytic, 0.1μF, 10V	2
C702,752, 705,755, 708,758		Electrolytic, 4.7μF, 10V	6
C706,756		Electrolytic, 33μF, 6.3V	2
C709,759		Electrolytic, 100μF, 6.3V	2
C791,792		Electrolytic, 220μF, 16V	2
C711,761		Electrolytic, 470μF, 10V	2
C793,354		Electrolytic, 1000μF, 16V	2
C715,765, 795	4-223T-02471	Feed Through Capacitor	1

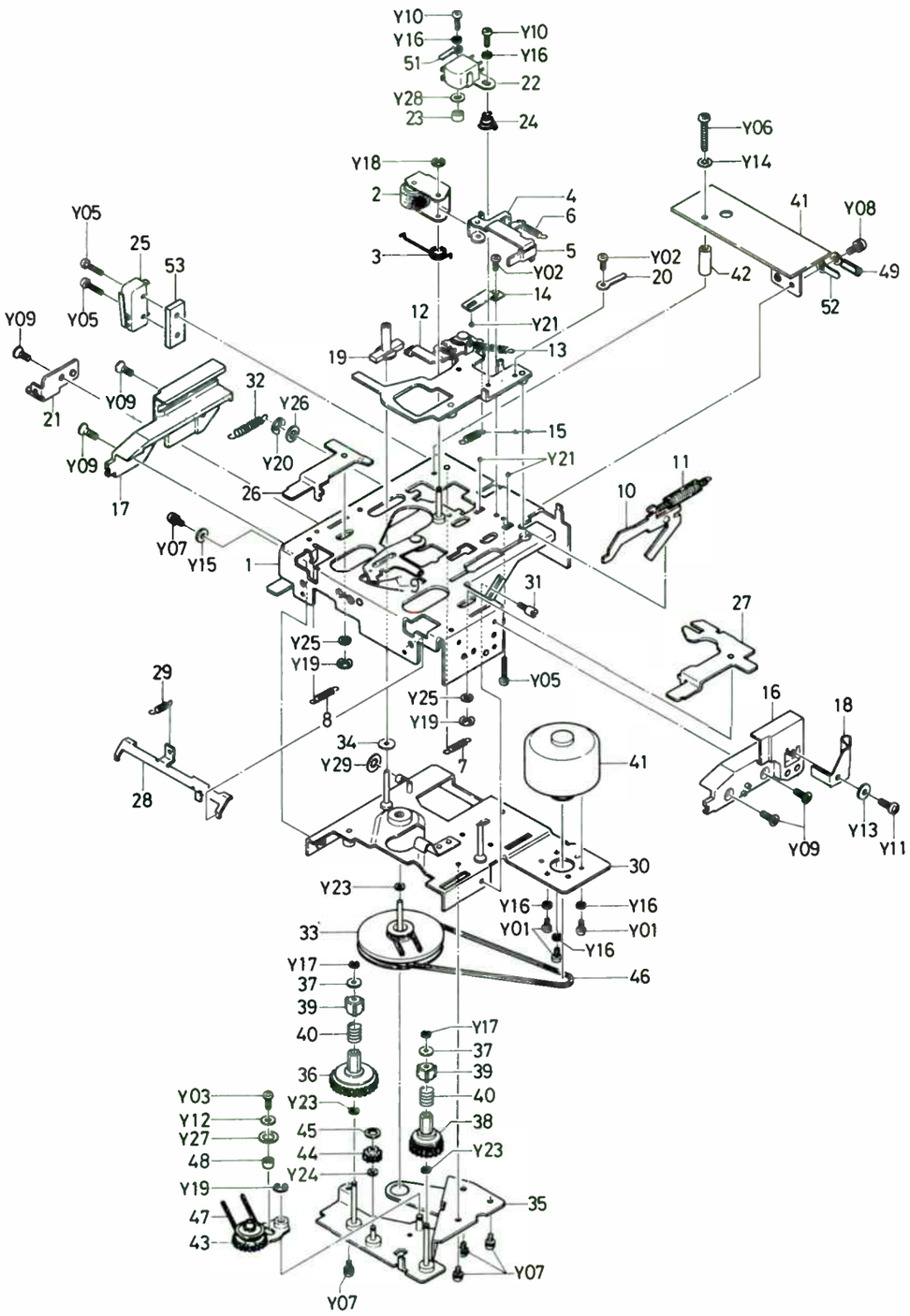
NOTES: 1. Parts orders must contain Model Number, Part Number and Description.
2. Ordering quantity of screws and/or resistors must be multiple of 10 pcs.

PARTS LIST

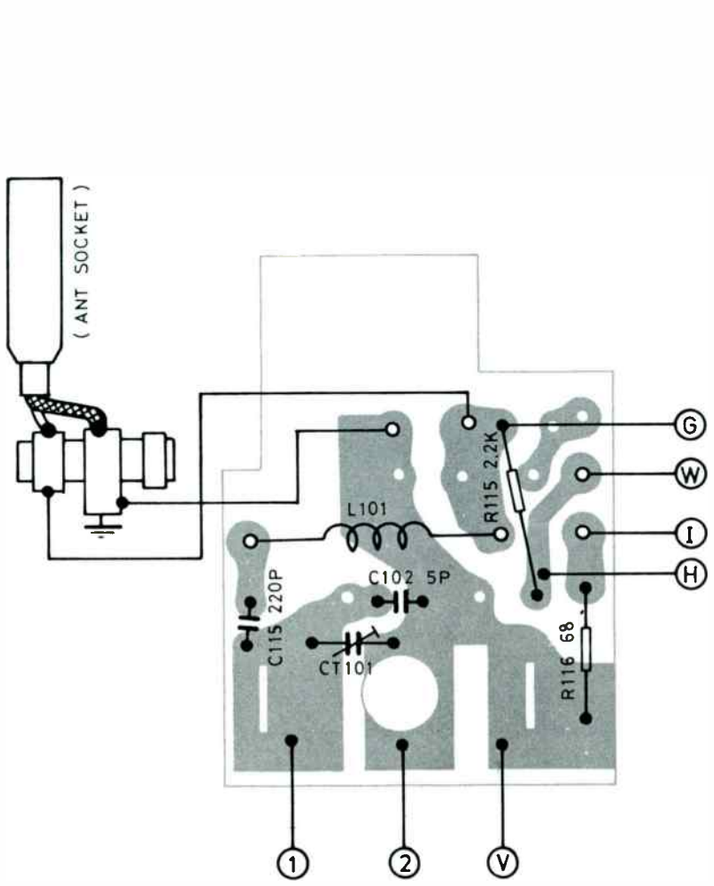
Key No.	Part No.	Description	Q'ty
	MECHANISM		
1	141-0-311T-04600	Chassis Assembly	1
2	141-0-545T-01800	Lever Pinch Roller Assembly	1
3	141-2-852T-31500	Spring Wire, Lever	1
4	141-2-721T-04000	Lever Shut Off, AUTO STOP	1
5	141-2-823T-01000	Lever Guide, AUTO STOP	1
6	141-2-851T-73700	Spring Coil, AUTO STOP	1
7	141-2-851T-90300	Spring Coil, Lever	1
8	141-2-851T-93900	Spring Coil, Slide	1
9	141-2-852T-31600	Spring Wire, REW	1
10	141-2-743T-03800	Arm	1
11	147-2-851T-06200	Spring Coil, Arm	1
12	141-0-731T-10900	Slide Assembly, Head	1
13	141-2-851T-69300	Spring Coil, Lever	1
14	141-2-853T-41400	Spring Plate, Head Slide	1
15	141-2-851T-92200	Spring Coil, Head Slide	1
16	141-2-737T-03800	Bracket Slide, Cassette Guide, Right	1
17	141-2-737T-03900	Bracket Slide, Cassette Guide, Left	1
18	141-2-382T-01102	Terminal	1
19	141-2-683T-23700	Ring, Cassette Guide	1
20	141-2-472T-02200	Lug, Lead mtg.	1
21	141-2-351T-34500	Bracket Mounting, Left Side	1
22	4-242T-18100	Magnetic Head	1
23	141-2-683T-27400	Ring, Head mtg.	1
24	141-2-851T-82100	Spring Coil, Head mtg.	1
25	4-231T-11902	Switch	1
26	141-0-731T-38591	Slide Assembly, FWD	1
27	141-0-731T-38691	Slide Assembly, REW	1
28	141-2-614T-04900	Lever Lock	1
29	141-2-851T-91500	Spring Coil, Lever Rock	1
30	141-0-312T-01200	Sub Chassis Assembly	1
31	141-2-421T-14900	Special Screw, Sub Chassis Guide	1
32	141-2-851T-90600	Spring Coil	1
33	141-0-521T-05700	Flywheel Assembly	1
34	141-2-457T-08200	Special Washer	1
35	141-0-535T-01200	Bracket, Reel Plate Assembly	1
36	141-0-531T-04600	Reel Plate Assembly, take up	1
37	141-2-452T-08801	Special Washer, 2.1 x 6.8 x 0.25mm	2
38	141-0-531T-04700	Reel Plate Assembly, Supply	1
39	141-2-532T-03100	Reel Guide	2
40	141-2-851T-76600	Spring Coil	2
41	4-527T-09500	Motor	1
42	141-2-461T-20001	Pipe, P.C.B. mtg.	1
43	141-0-741T-16200	Lever Assembly, Roller	1
44	141-2-661T-22300	Pulley	1
45	141-2-457T-04100	Special Washer, 6.7 x 4 x 0.5mm	1
46	141-2-564T-16100	Square Belt, Main	1
47	141-2-564T-15600	Square Belt, Reel	1
48	141-2-683T-28000	Ring, Lever	1
49	123-2-472R-00401	Lug, Lead mtg.	1
50		Vinyl Tube, 4x20mm	1
51	123-2-472R-00200	Lug, Head Earth	1
52	123-2-472R-00400	Lug, Head Earth	1
53	141-2-352T-19000	Spacer, Switch	1

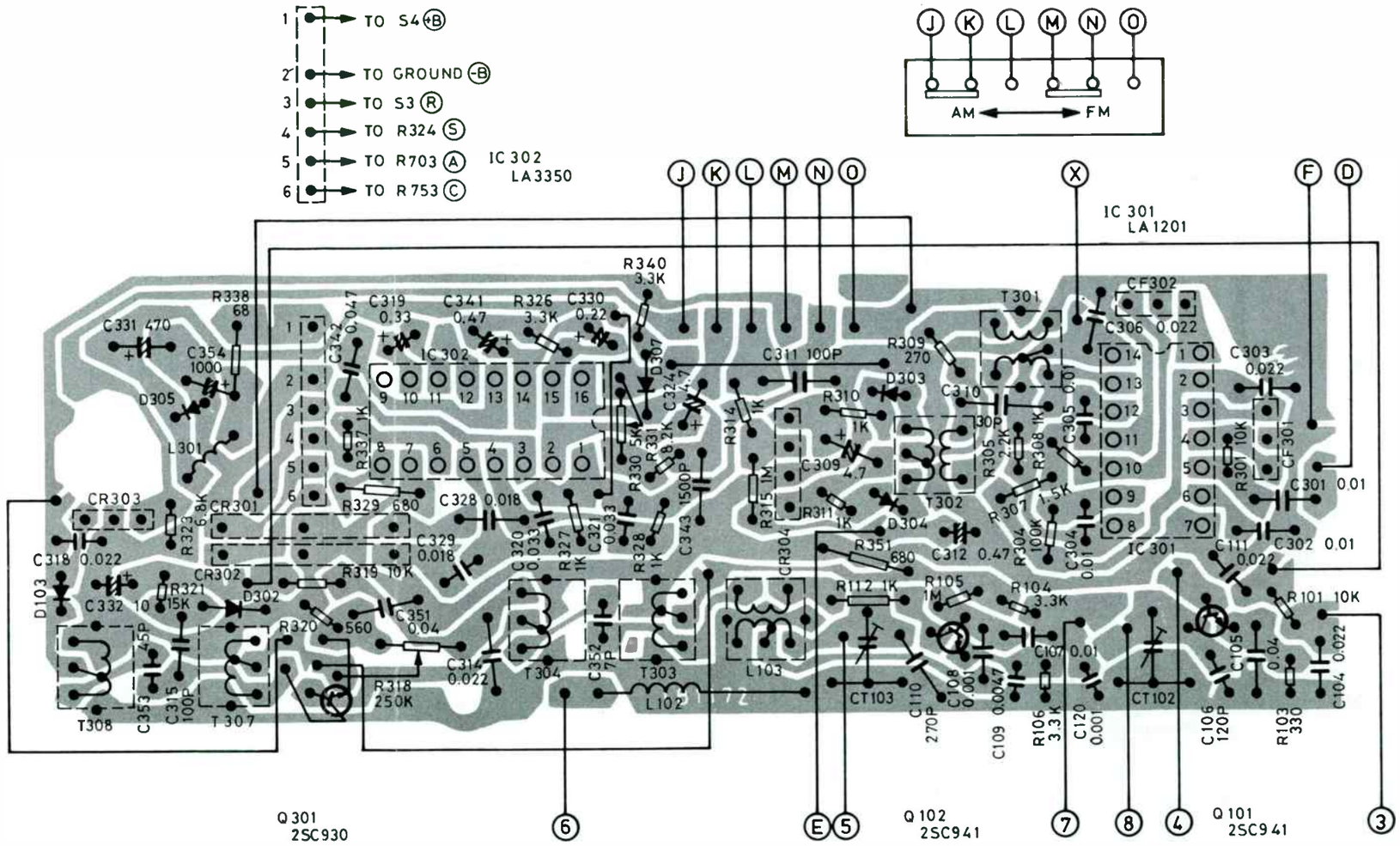
Key No.	Part No.	Description	
	MOUNTING PARTS		
Y01		Screw, Pan Hd., 2 x 3mm	3
Y02		Screw, Pan Hd., 2 x 4mm	2
Y03		Screw, Pan Hd., 2 x 5mm	1
Y04			
Y05		Screw, Pan Hd., 2 x 10mm	3
Y06		Screw, Pan Hd., 2.6 x 16mm	1
Y07		Screw, Pan Hd. with Washer, 2.6 x 4mm	5
Y08		Screw, Pan Hd. with Washer, 3 x 4mm	1
Y09		Screw, Flat Hd., 2.6 x 4mm	5
Y10		Screw, Round Hd. (–), 2 x 6mm	2
Y11		Tapping Screw, Pan Hd., 2.3 x 6mm	1
Y12		Washer, 2 x 6 x 0.4mm	1
Y13		Washer, 2.6 x 5 x 0.5mm	1
Y14		External tooth Lock Washer, 2.6mm	1
Y15		Washer, 2.6 x 7.5 x 0.5mm	1
Y16		Spring Washer, 2mm	5
Y17		"E" Ring, 1.5mm	2
Y18		"E" Ring, 2mm	1
Y19		"E" Ring, 2.5mm	3
Y20		"E" Ring, 3mm	1
Y21		Steel Ball, 2mm	3
Y22		Fiber Washer, 2.8 x 8 x 1mm	5
Y23		Graphite Nylon Washer, 2 x 4 x 0.25mm	3
Y24		Graphite Nylon Washer, 2 x 4 x 0.5mm	1
Y25		Graphite Nylon Washer, 3.1 x 5.4 x 0.13mm	2
Y26		Graphite Nylon Washer, 4 x 8 x 0.5mm	1
Y27		Graphite Nylon Washer, 5 x 8 x 0.25mm	1
Y28		Washer, 3 x 6 x 0.3mm	1
Y29		Graphite Nylon Washer, 4 x 8 x 0.13mm	1

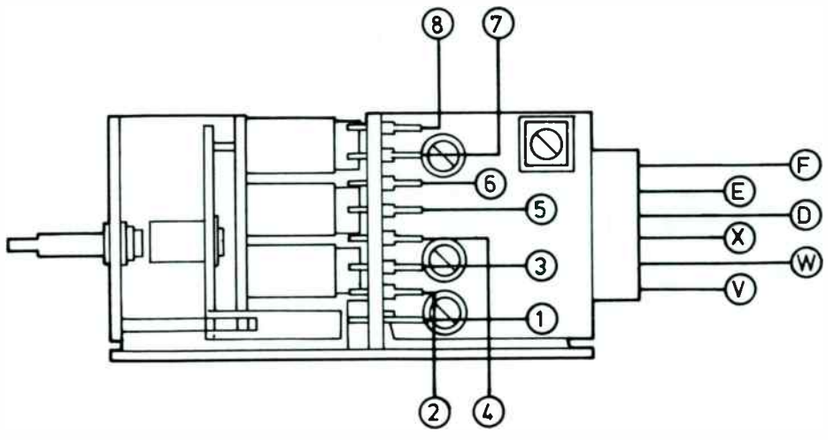
EXPLODED VIEW (MECHANISM)

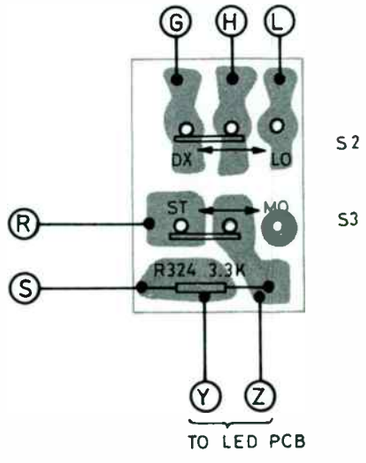


Sanyo FT414

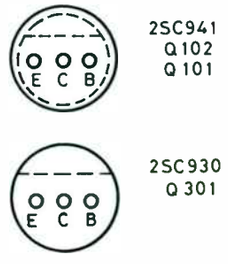






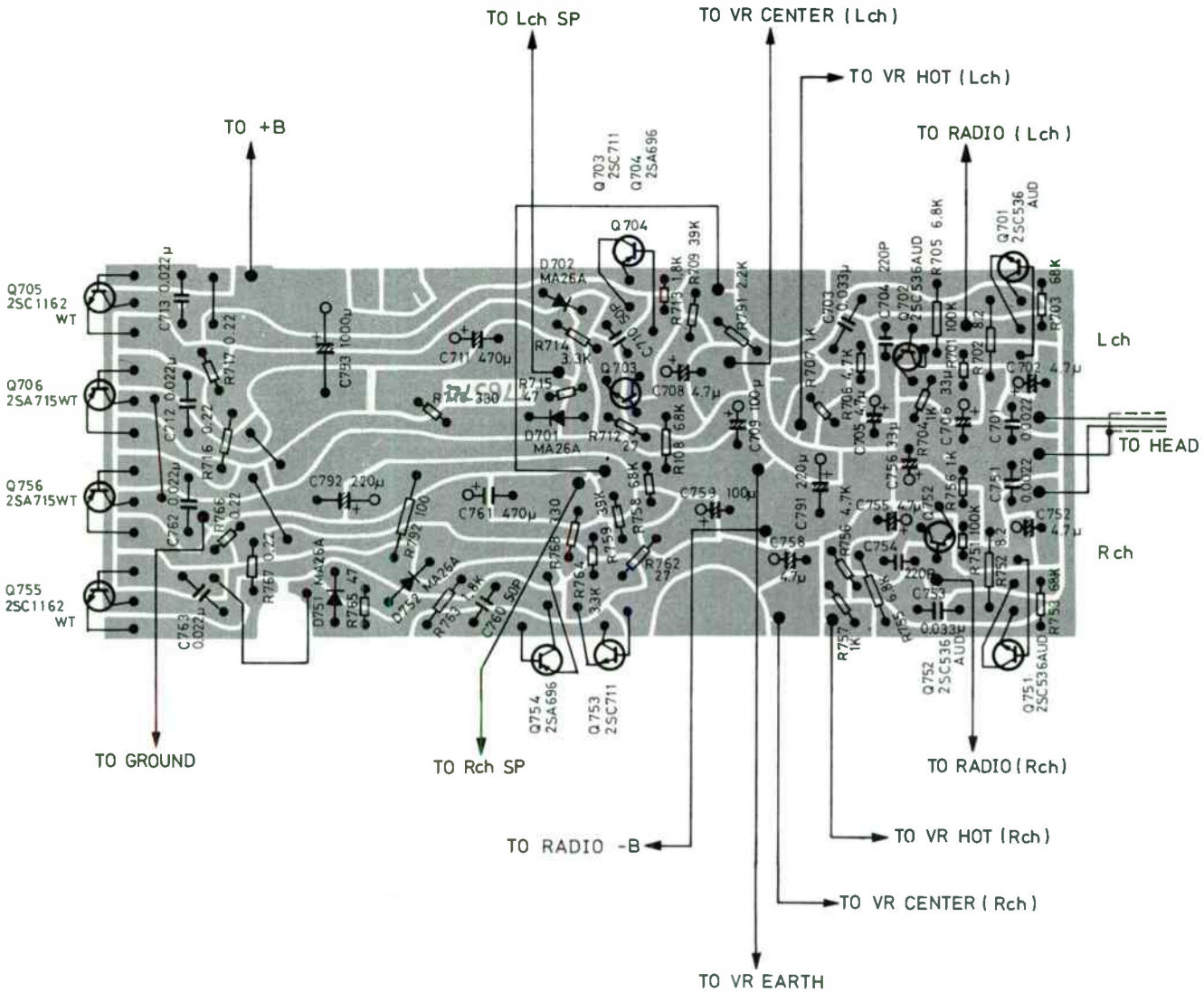


TRANSISTOR



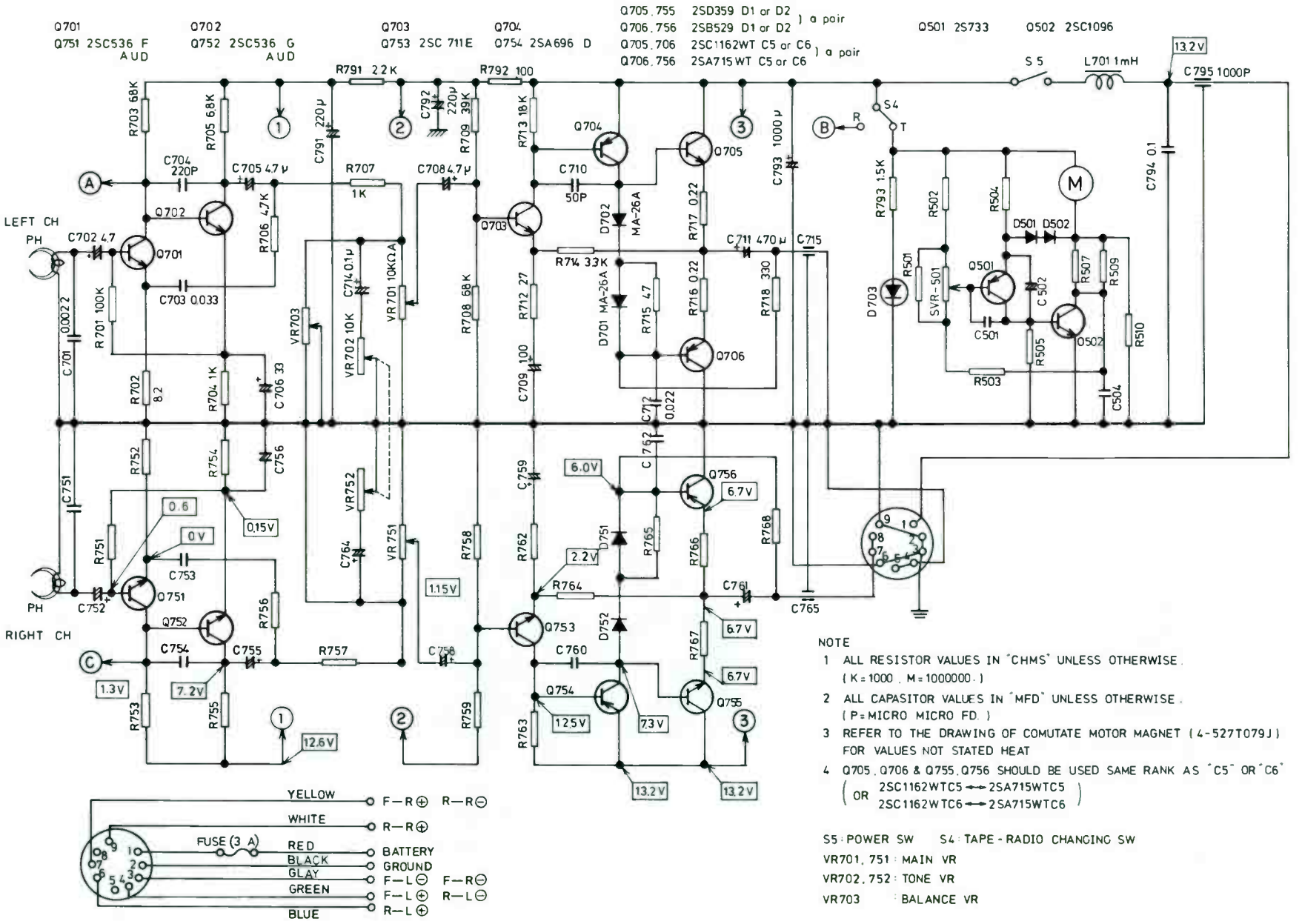
WARNING DIAGRAM (AMP)

NOTE : For Printed circuit board No. T76574 only.



PARTS	TRANSISTOR		
	2SC536AUD	2SC711 2SA696	2SC1162WT 2SA715WT
BOTTOM VIEW	E C B	E C B	E C B METAL SIDE

PARTS	DIODE
	MA26A
SYMBOL	K A
BOTTOM VIEW	K A



NOTE

1 ALL RESISTOR VALUES IN "OHMS" UNLESS OTHERWISE.
(K = 1000 , M = 1000000.)

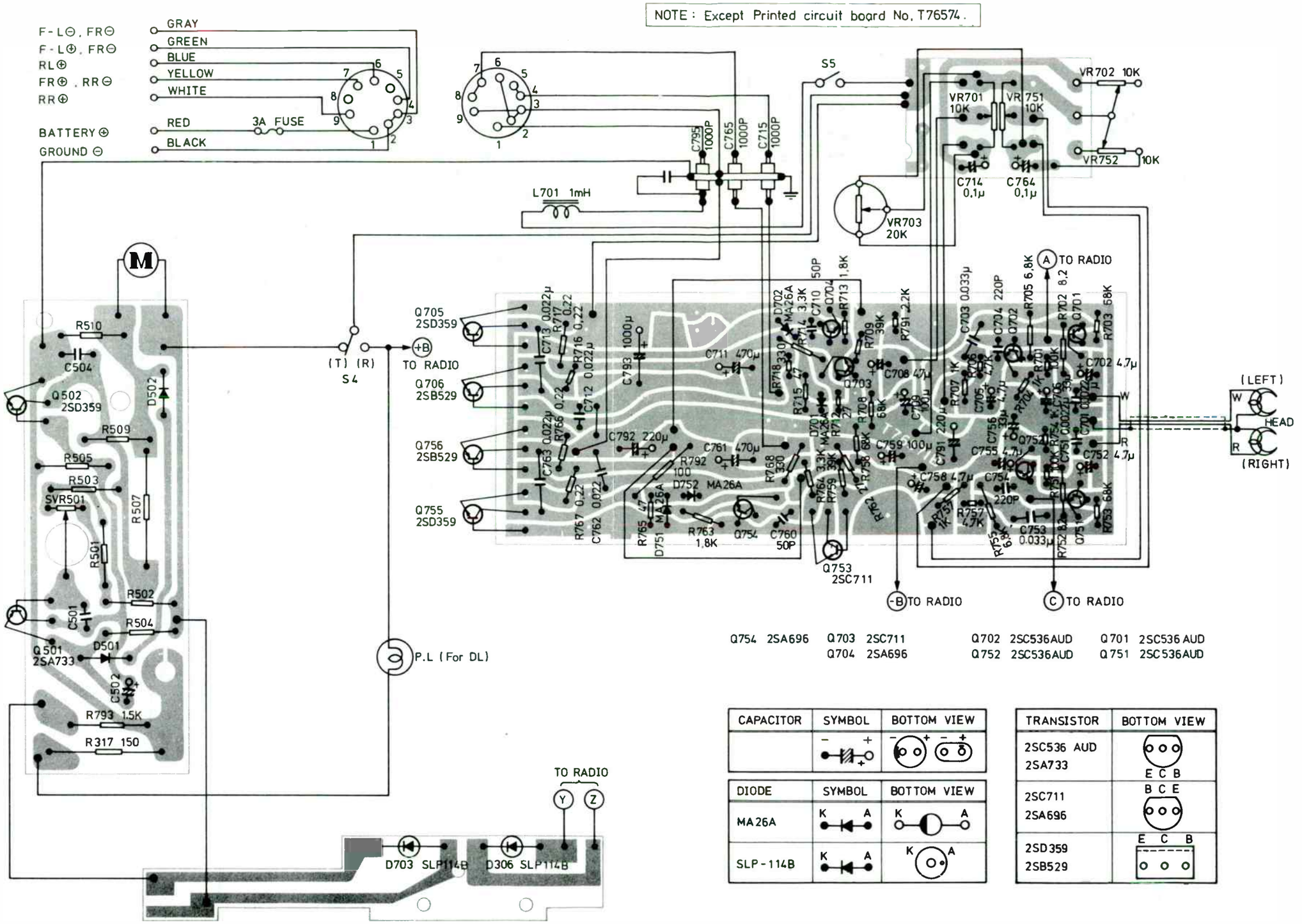
2 ALL CAPASITOR VALUES IN "MFD" UNLESS OTHERWISE.
(P = MICRO MICRO FD.)

3 REFER TO THE DRAWING OF COMUTATE MOTOR MAGNET (4-527T079J)
FOR VALUES NOT STATED HEAT

4 Q705, Q706 & Q755, Q756 SHOULD BE USED SAME RANK AS "C5" OR "C6"
(OR 2SC1162WTC5 ⟷ 2SA715WTC5
2SC1162WTC6 ⟷ 2SA715WTC6)

S5 : POWER SW S4 : TAPE - RADIO CHANGING SW
VR701, 751 : MAIN VR
VR702, 752 : TONE VR
VR703 : BALANCE VR

NOTE : Except Printed circuit board No. T76574 .



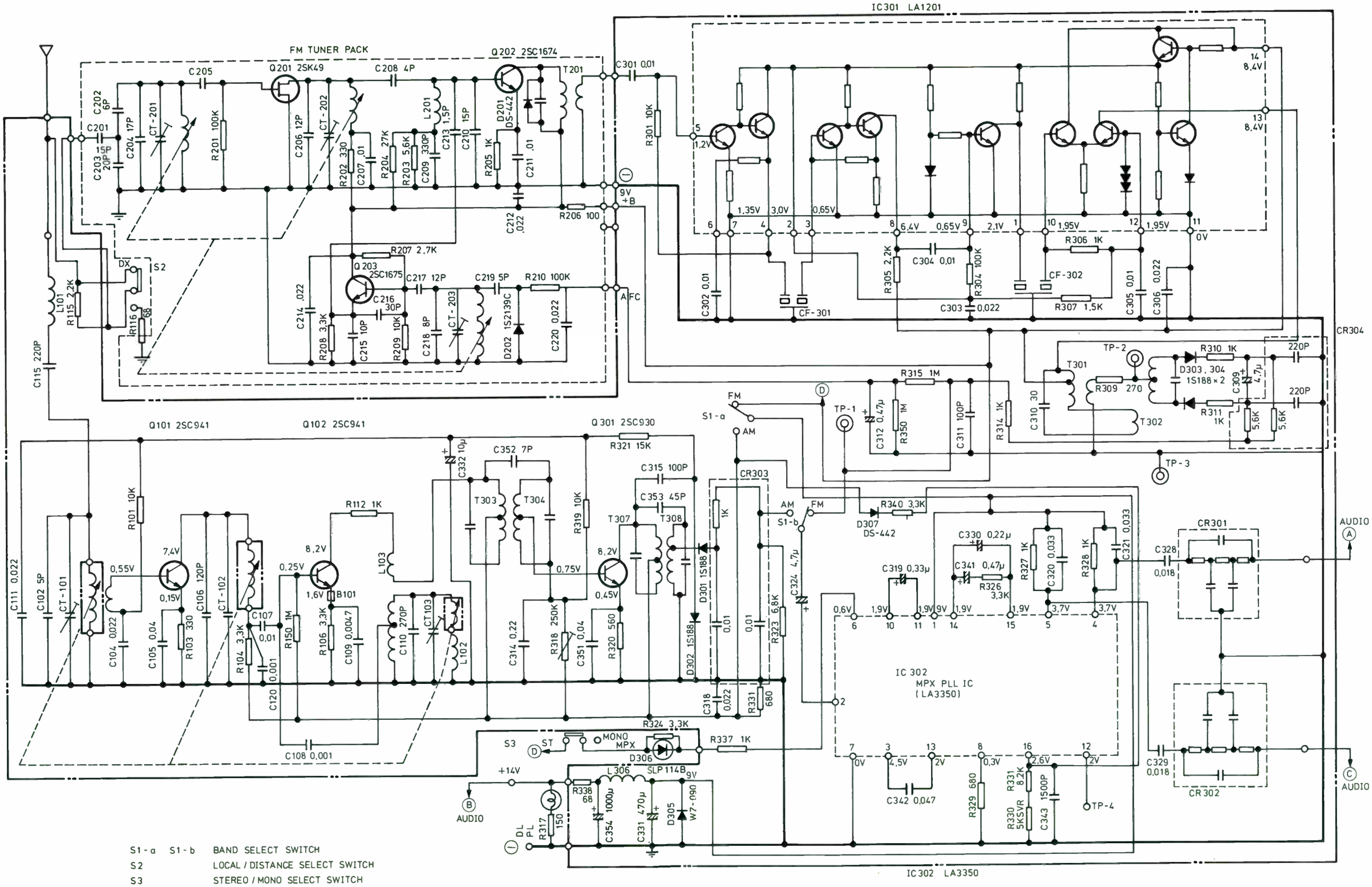
Q754 2SA696 Q703 2SC711 Q702 2SC536AUD Q701 2SC536 AUD
Q704 2SA696 Q752 2SC536AUD Q751 2SC536AUD

CAPACITOR	SYMBOL	BOTTOM VIEW
	− +	− + − +

DIODE	SYMBOL	BOTTOM VIEW
MA26A	K A	K A
SLP-114B	K A	K A

TRANSISTOR	BOTTOM VIEW
2SC536 AUD 2SA733	E C B
2SC711 2SA696	B C E
2SD359 2SB529	E C B

Sanyo FT414



S1 - a S1 - b BAND SELECT SWITCH
S2 LOCAL / DISTANCE SELECT SWITCH
S3 STEREO / MONO SELECT SWITCH

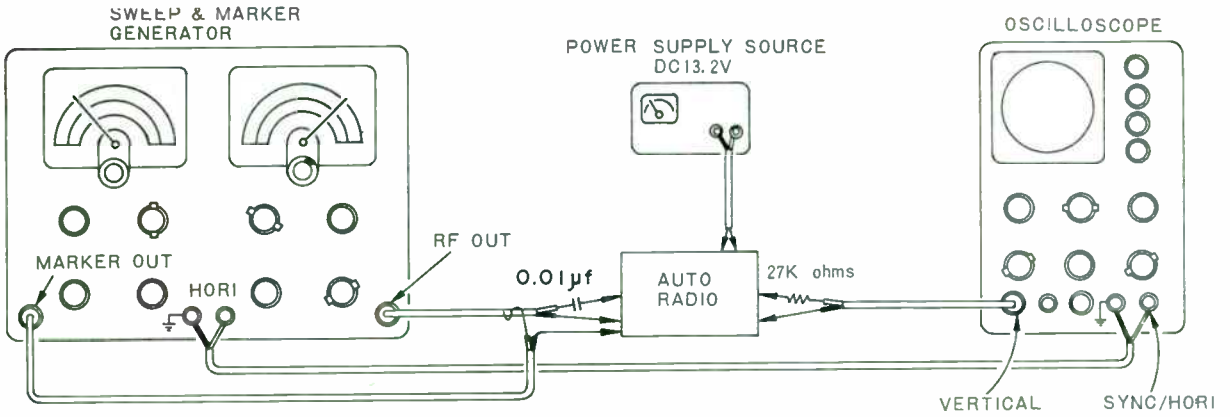


Fig. 6

SWEEP GENERATOR OUTPUT	OSCILLOSCOPE VERTICAL INPUT	OSCILLOSCOPE HORIZONTAL INPUT
Connect TP1 in Fig. 11 through 0.01 μF capacitor	Connect TP3 in Fig. 11 through 27k-ohm resistor	Connect with HORIZONTAL terminal of sweep generator

b. Power supply : 13.2 VDC

c. Switch : Band selector for AM

d. Controls : Volume for minimum
Tone for high

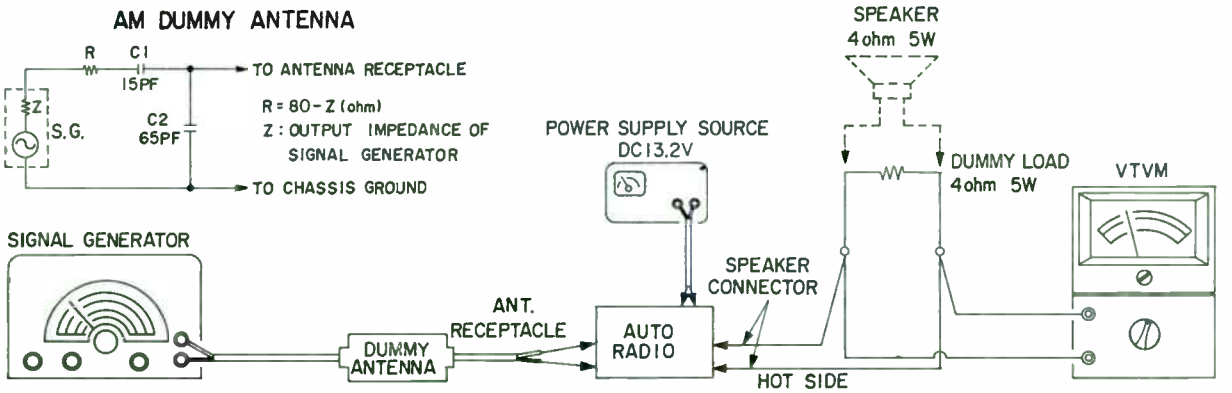
(2) Alignments (Refer to Fig. 11 for ADJUST POINTS.)

STEP	PURPOSE	SWEEP GENERATOR FREQUENCY	SET TUNER TO	ADJUST POINTS	PROCEDURE
1	IF	455 kHz	Near 1,000 kHz no signal exists	T_3 to T_6	Get maximum IF curve and best symmetry on both sides.
2	Repeat STEP 1 until no further gain in output can be obtained.				

[2] Tracking Alignment

(1) Preparations for alignment

a. Connections



b. Power supply : 13.2 VDC

c. Switch : Band selector for AM

d. Controls : Volume for maximum
Tone for high

(2) Alignment (Refer to Fig. 11 for ADJUST POINTS.)

STEP	PURPOSE	GENERATOR FREQUENCY	SET TUNER TO	ADJUST POINTS	PROCEDURE
1	Tuning range	1,650 kHz (400 Hz, 30%, AM modulated)	High-end stop	CV 3	Adjust for maximum meter indication.
2		510 kHz (400 Hz, 30%, AM modulated)	Low-end stop	T 2	
3	Repeat STEP 1 and 2 until no further gain in output can be obtained.				
4	Tracking	1,400 kHz (400 Hz, 30%, AM modulated)	Just tune in SG frequency	CV 1	Adjust for maximum meter indication.
5				CV 2	

NOTE: Always readjust antenna trimmer CV 1 when radio or antenna is reinstalled, tuning in a weak station around 1,400 kHz and get maximum volume.

FM ALIGNMENT

* The adjustment of the FM front-end is precisely performed at the factory and not to be requested normally. Inadequate adjustment results in inferior sensitivity and reception. In case something is wrong with FM front-end, follow the procedure described below.
* FM front-end (FM tuner, stock No. RN-ETE-2N-30) supplied as a replacement part is completely adjusted for tuning range and tracking, so adjustments are unnecessary except IF transformers.

[1] IF Alignment

◎ **Points to watch in replacing ceramic filter**

In the FM circuit there are two ceramic filters. It is important that both filters have the same color (i.e. the same center frequency).

a. Readjustment is not necessary if a defective ceramic filter is replaced with one of the same color.

b. Both filters should be made in the same color if one of them must be replaced with a different colored filter. Readjustment will be necessary because of the changed center frequency.

(1) Preparations for alignment

a. Connections (Refer to Fig. 6)

SWEEP GENERATOR OUTPUT	OSCILLOSCOPE VERTICAL INPUT	OSCILLOSCOPE HORIZONTAL INPUT
Connect TP1 in Fig. 11 through 0.01 μF capacitor	Connect TP2 in Fig. 11 through 27k-ohm resistor	Connect with HORIZONTAL terminal of sweep generator

b. Power supply : 13.2 VDC

c. Switch : Band selector for FM

d. Controls : Volume for minimum
Tone for high

(2) Alignment (Refer to Fig. 11 for ADJUST POINTS.)

STEP	PURPOSE	SWEEP GENERATOR FREQUENCY	SET TUNER TO	ADJUST POINTS	PROCEDURE
1	IF circuit	Center frequency varies according to the color of the ceramic filter (Refer to chart given below)	Near 98 MHz no signal exists	T_1 to T_{101}	S-curve adjust for full gain and length at linears. (See Fig. 9)
2					
3	Detector circuit				Keep S-curve straight at the center, and adjust waveform for best symmetry of S-curve against the axis as much as possible. (See Fig. 9)
4	Repeat STEP 1 to 3 until no further gain output can be obtained.				

COLOR	CENTER FREQUENCY
Black	10.64 MHz ± 30 kHz
Blue	10.67 MHz ± 30 kHz
Red	10.70 MHz ± 30 kHz
Orange	10.73 MHz ± 30 kHz
White	10.76 MHz ± 30 kHz

Fig. 8

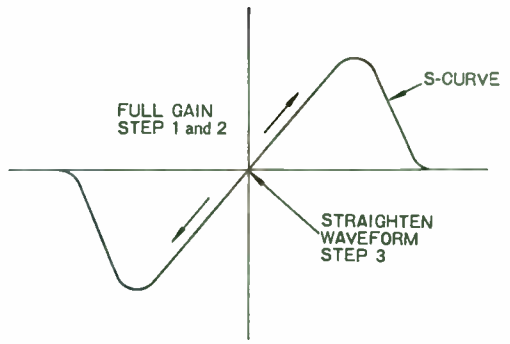


Fig. 9

[2] Tracking alignment (Refer to Fig. 11 for ADJUST POINTS.)

(1) Preparations for Alignment

a. Connections

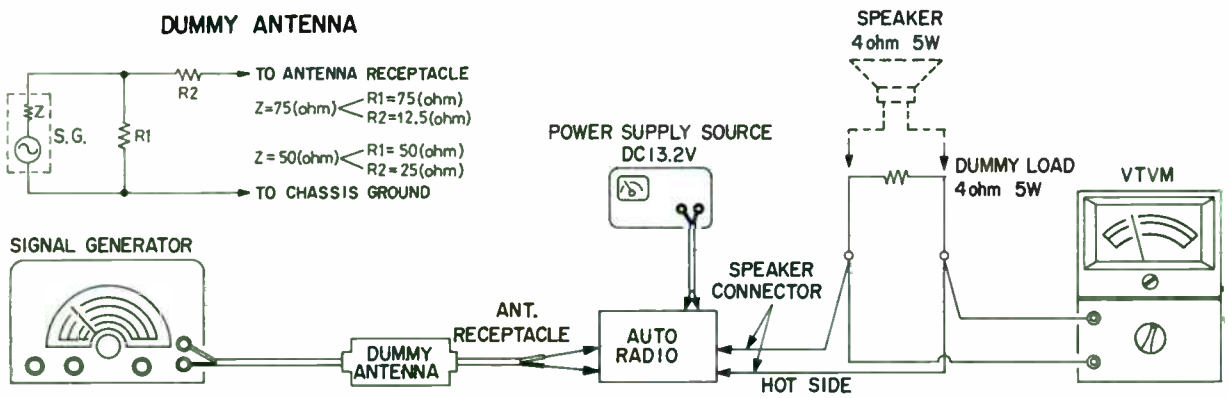


Fig. 10

b. Power supply : 13.2 VDC

c. Switch : Band selector for FM

d. Controls : Volume for maximum
Tone for high

(2) Alignment (Refer to Fig. 11 for ADJUST POINTS)

STEP	PURPOSE	GENERATOR FREQUENCY	SET TUNER TO	ADJUST POINTS	PROCEDURE
1	Tuning range	87.5 MHz (400 Hz, 30%, FM modulated)	Low-end stop	CV_{103}	Adjust for maximum meter indication.
2		109 MHz (400 Hz, 30%, FM modulated)	High-end stop		109 MHz must be received.
3	Tracking	98 MHz (400 Hz, 30%, FM modulated)	Just tune in SG frequency	CV_{101}	Adjust for maximum meter indication.
4				CV_{102}	

[3] FM STEREO (MPX.) SEPARATION ADJUSTMENT

(1) Alignment (Refer to Fig. 11 for ADJUSTMENT POINTS)

a. Adjustment with frequency counter

Connect frequency counter to TP_4 as per Fig. 11 and adjust RV_1 so that the counter frequency becomes 19 kHz ± 100 Hz.

b. Adjustment without frequency counter

Tune in a stereo broadcast and rotate the arm of potentiometer RV_6 slowly, and you can find a position where the stereo indicator L.E.D. lights.

Further rotating it in the same direction, the lamp may go out. Set the potentiometer arm at the center of lighting range of the L.E.D.

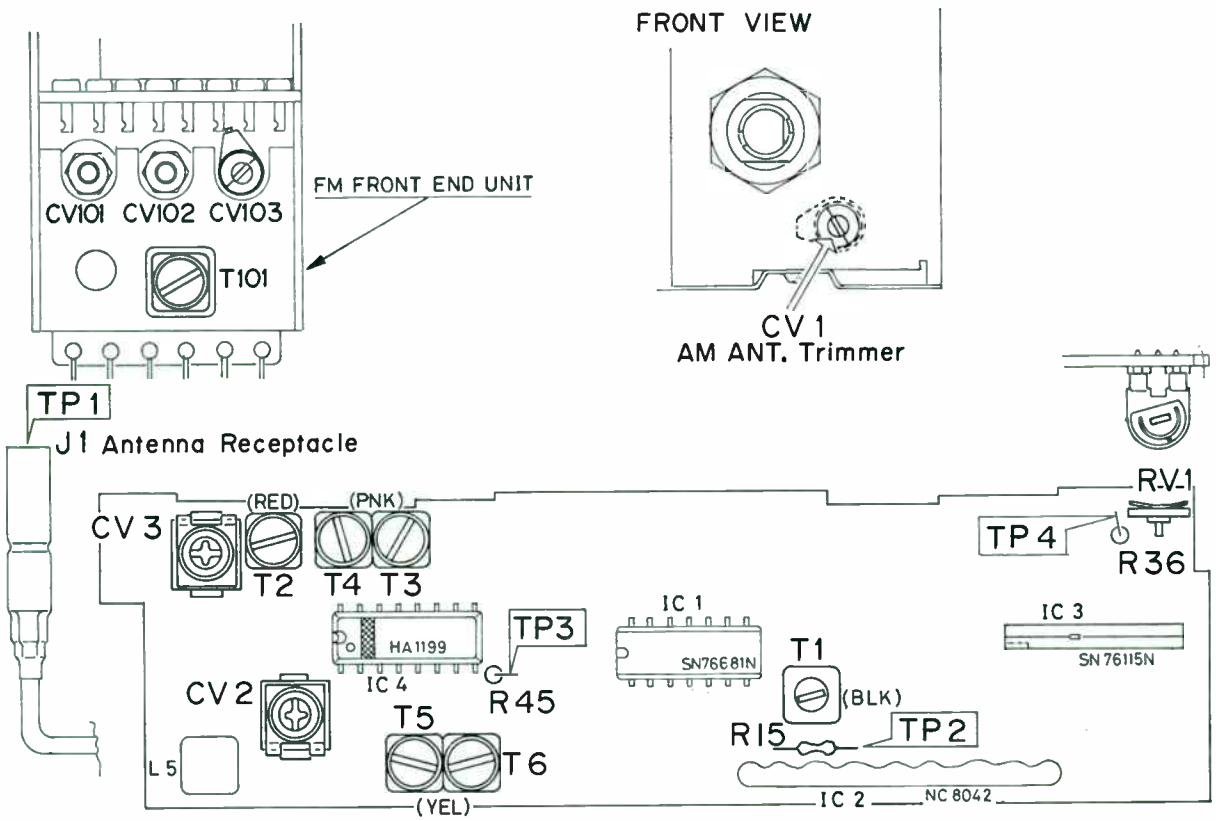


Fig. 11 ADJUSTMENT POINTS

REFERENCE

Alignment procedures in the factory are described below.

◎ **Adjustment for pinchroller pressure**

Hold a tension gauge to the pinchroller as shown in Fig. 1 (a), move the gauge as an arrow and measure the gauge at the point the pinchroller moves.

When the gauge shows under 300 gr., set the spring to B in Fig. 1 (b), and when it is more than 400 gr., set the spring to A.

Always these pressure should be between 300 and 400 gr. for both of left and right pinchrollers.

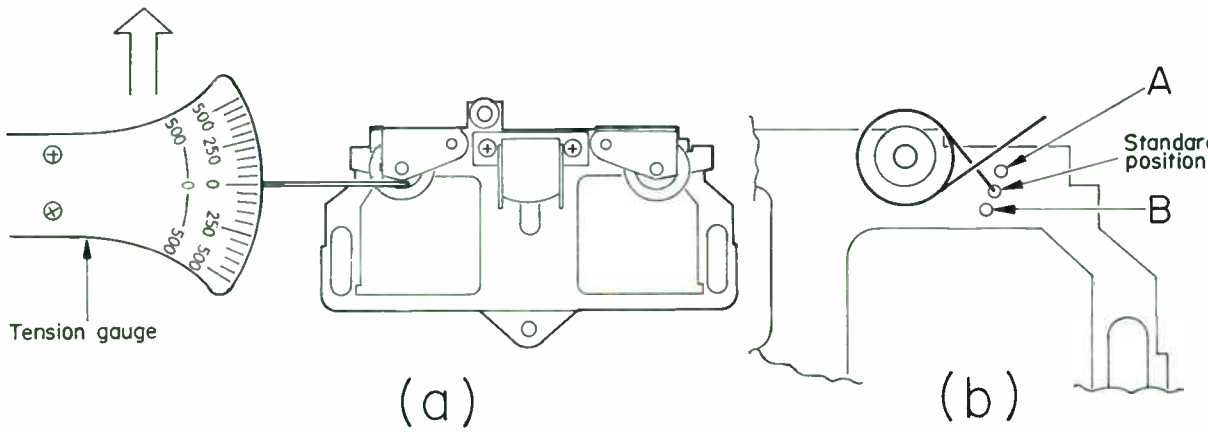


Fig. 1

◎ **Adjustment for take-up torque**

Take measure of take-up torque of slip mechanism by a torque gauge while the motor is being driven. When the torque shows 40g-cm or less, rotate the adjusting nut clockwise loosening the set-screw in Fig. 2. When it shows 55g-cm or more, rotate nut counterclockwise.

Adjust slip torque within 45~55g-cm ; 10 degrees of adjusting nut rotation correspond to 10g-cm torque variation.

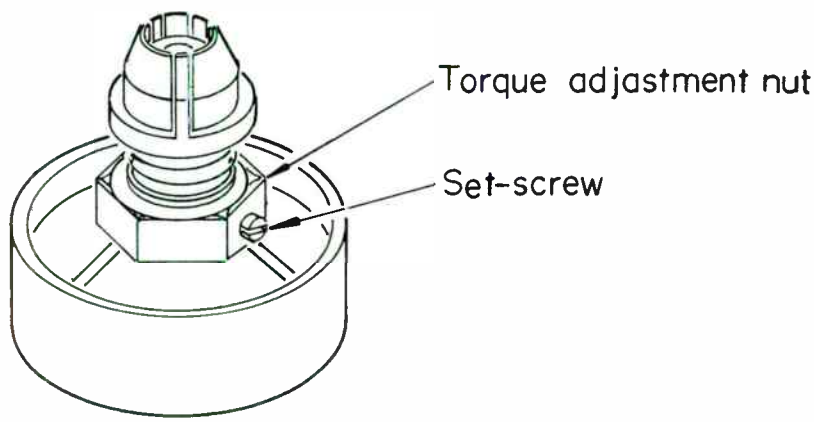


Fig. 2

◎ PLAYBACK HEAD ADJUSTMENT (Azimuth)

Normally the adjustment is precisely set at the factory and not be required unless the playback head or its mounting components are replaced. Beware of excessive adjustment, because inadequate adjustment results in inferior performance. In case the azimuth is unnecessarily varied, the angle gets out of order, which causes lowering of tonal quality. Carefully adjust the azimuth adjust screw as shown in Fig. 3.

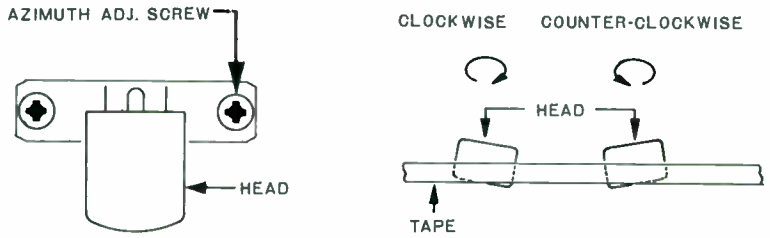


Fig. 3

* IN CASE OF USING TEST TAPE FOR AZIMUTH ADJUSTMENT

Insert a test tape for the azimuth adjustment and set each control knob to a proper level:

VOLUME CONTROL KNOB (VOL)..... In a proper level

BALANCE CONTROL KNOB (BAL) ..... In a center position

TONE CONTROL KNOB (TONE) ..... Treble tone (turn fully clockwise)

Carefully adjust the azimuth adjust screw for maximum volume and treble tone. It is recommended to connect a VTVM or circuit tester with the speaker terminals for obtaining the maximum value because test tape for azimuth adjustment is recorded high treble tones (6,300 Hz ordinary), and it is difficult to find the maximum volume without using test instrument. If test tape is not available, use a stereo tape with some high treble tones (piano or violin music is good for this) and follow the same procedure as outlined above.

◎ CLEANING

After extended use the tape playback head and the drive capstan will build up a layer of iron oxide from the tape. The oxide layer in the case of the tape head prevents the tape from making full contact with the head and the result is a gradual loss of high frequency response and an increased noise level.

The oxide deposit on the capstan can cause slippage (wow) which might be mistaken for more serious mechanical drive problems.

A cleaner pen or similar object like the alcohol moistened swab is used.

Rub the parts such as playback head, capstan and sensing contacts thoroughly to remove all traces of dirt and grime.

Do not use a solvent such as lighter fuel or lacquer thinner, which may cause damage to plastic parts or to instrument finish.

◎ DEMAGNETIZATION

The head may become magnetized over a period of time. A magnetized head will record noise on a tape even when it is being used for playback. It is important that the head should be demagnetized periodically.

The head can be demagnetized with a commerical demagnetizer (or degausser, as it is sometimes called.)

Such an instrument is not expensive, and represents a good investment for the owner who wants to keep his equipment in the best possible condition.

WIRING ON PC BOARD

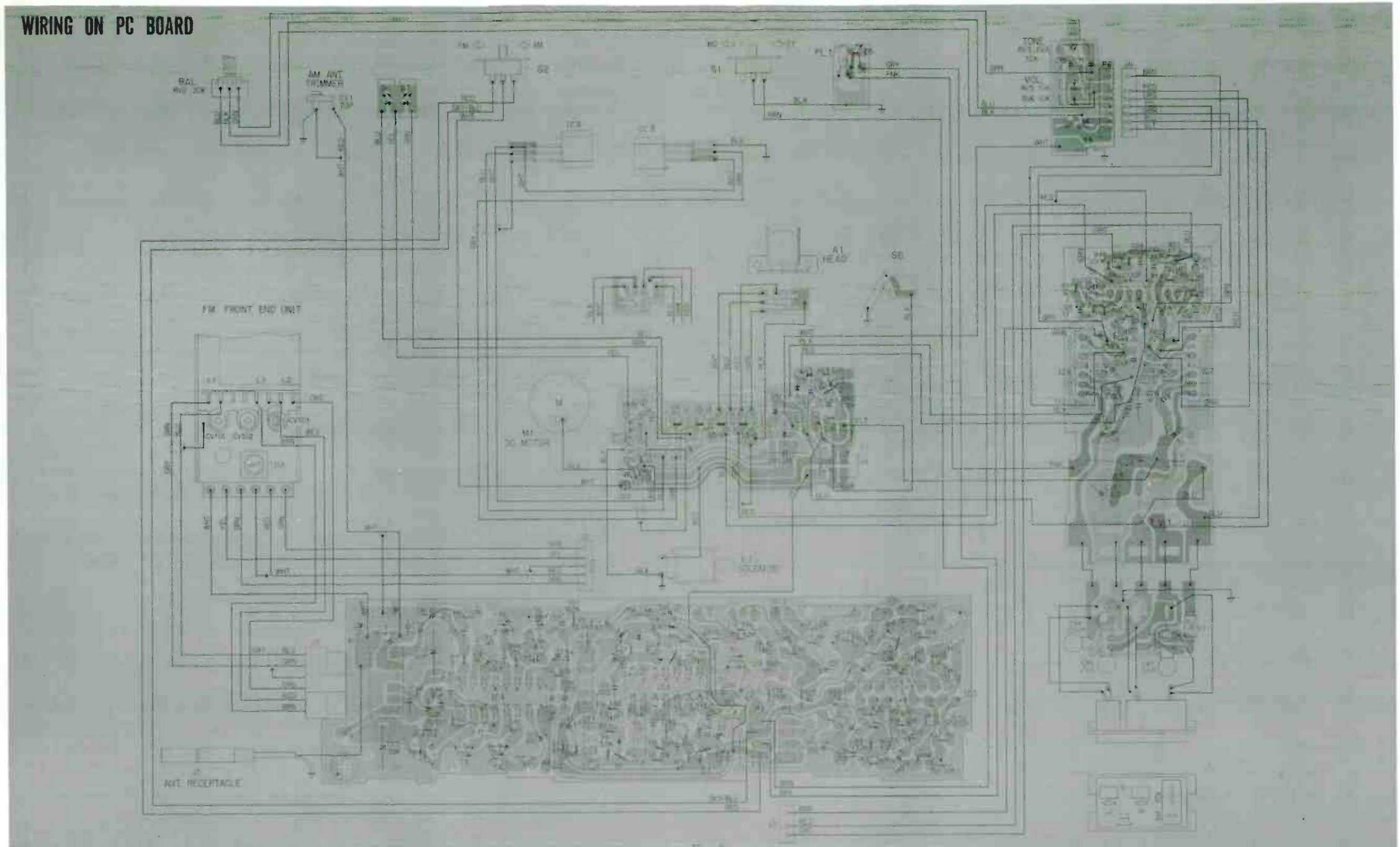


Fig. 5

	Q 1	Q 2	Q 3	Q 4	Q 5
Base	2.3V	2.8V	9.7V	1.6V	12.6V
Emitter	1.6V	2.1V	9.1V	1.0V	11.3V
Collector	8.0V	4.6V	12.1V	4.0V	13.1V

Pin No. / IC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
IC 1	—	2.0V	—	0V	2.6V	2.0V	2.7V	2.4V	2.7V	2.0V	8.4V	—	2.0V	2.0V	/	/
IC 4	0V	0V	3.7V	10.0V	2.7V	11.3V	1.8V	1.0V	4.2V	/	/	/	/	/	/	/
IC 5	12.1V	3.1V	4.0V	8.3V	4.2V	11.3V	0V	—	—	2.4V	2.4V	1.7V	2.4V	2.4V	2.4V	4.5V
IC 6	2.1V	0.9V	0.3V	6V	0.6V	0.7V	1.7V	1.8V	11.4V	2.2V	0V	10.4V	2.6V	1.3V	10.4V	10.4V
IC 7	1.8V	0.2V	0.3V	7.0V	0V	2.7V	0.7V	1.2V	/	/	/	/	/	/	/	/
IC 8, 9	0V	12.1V	1.3V	6V	0.6V	12.6V	13.1V	/	/	/	/	/	/	/	/	/
IC 10, 11	—	12.1V	2.4V	0V	/	/	/	/	/	/	/	/	/	/	/	/
IC 12	—	2.4V	2.4V	6V	0V	12.1V	12.8V	—	/	/	/	/	/	/	/	/

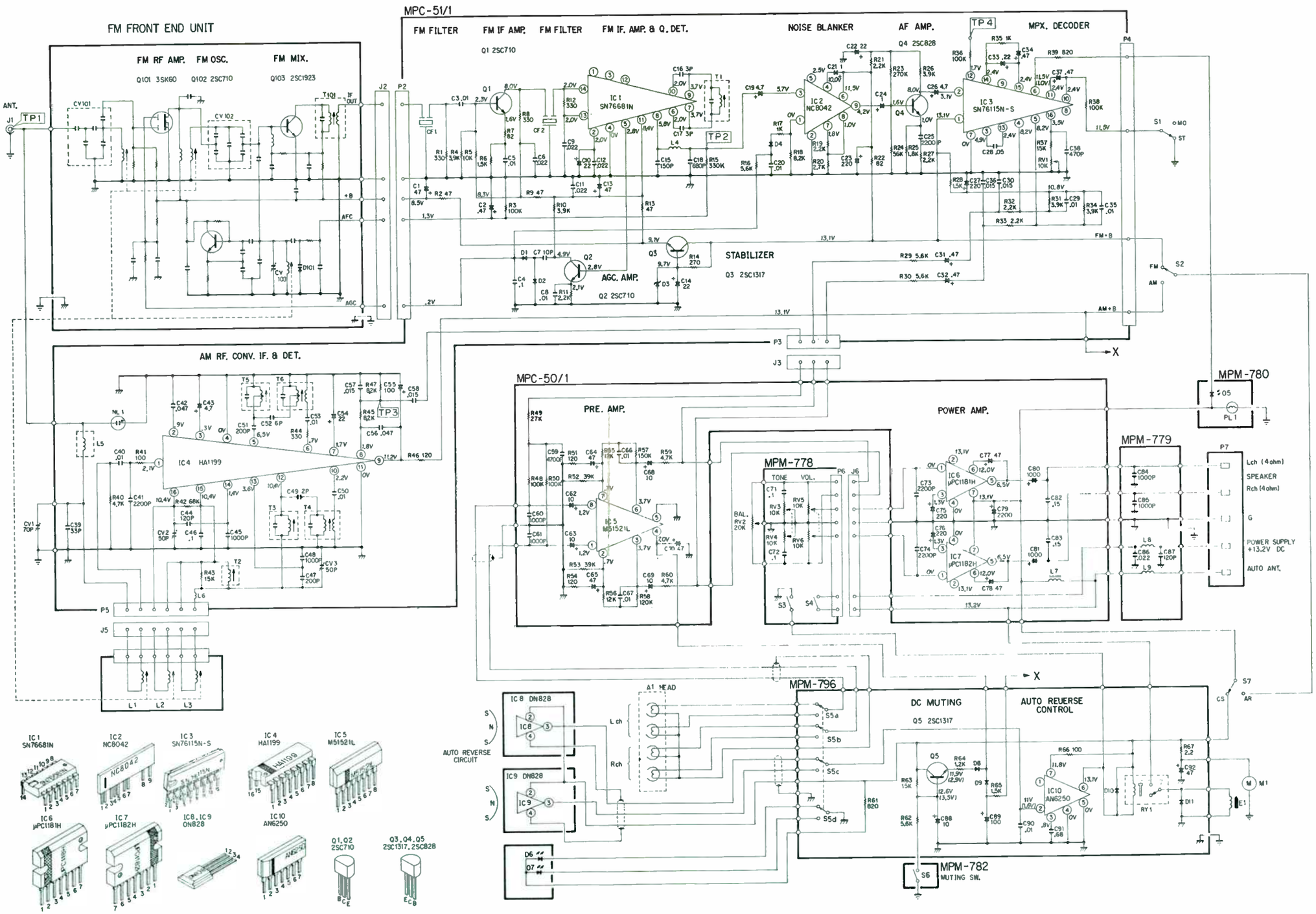


Fig. 4

NOTES:

1. All resistance in ohms, K=10^3
2. All capacitance in μF, P=$\mu\mu$F
3. DC voltages against the chassis measured with 100k ohm per volt meter, power supply set at +13.2 VDC, no signal input.
4. To order IC_6 (μPC1181H) and IC_7 (μPC1182H) specify their order numbers as RN-EIC-UPC1181H-EF and RN-EIC-UPC1182H-EF respectively.

Symbol No.	Stock No.	Description		
CAPACITORS				
C 1,13,64,65 70, 77, 78	RN-ECE-M470V10-4	47 μF	10V	electrolytic
C 2,31,32,37	RN-ECE-MR47V50	.47 μF	50V	〃
C 3, 5, 8 20, 29, 35 40, 50, 53	RN-ECB-DOX103E	.01 μF	〃	ceramic
C 4	RN-ECB-DBC104B	.1 μF	12V	〃
C 6, 9, 11 12, 86	RN-ECB-DOX223E	.022 μF	50V	〃
C 7	RN-ECC-DSL100DY	10 pF	50V	ceramic
C10,14,22,54	RN-ECE-M220V16	22 μF	16V	electrolytic
C15	RN-ECK-DB151KY	150 pF	50V	ceramic
C16, 17	RN-ECC-DSL030CY	3 pF	〃	〃
C18	RN-ECK-DB681KY	680 pF	〃	〃
C19, 26, 43	RN-ECE-M4R7V25	4.7 μF	25V	electrolytic
C21, 24	RN-ECE-M1R0V50	1 μF	50V	〃
C23, 27	RN-ECE-M221V16-1	220 μF	16V	〃
C25,41,73,74	RN-ECK-DB222KY	2200 pF	50V	ceramic
C28	RN-ECB-DBC503B	.05 μF	12V	〃
C30, 36	RN-ECF-R153V50	.015 μF	50V	mylar
C33	CA15E-1C-R2200-X07A	.22 μF	16V	alox
C34	CA15E-1A-R4700-X07A	.47 μF	〃	〃
C38	CQ09S-1H-470R0-K05A	470 pF	50V	styrol
C39	RN-ECC-DSL330JY	33 pF	〃	ceramic
C42, 56	RN-ECB-DOX473E	.047 μF	50V	ceramic
C44, 87	RN-ECC-DSL121JY	120 pF	〃	〃
C45, 60, 61	RN-ECK-DB102KY	1000 pF	〃	〃
C46	RN-ECF-R104V50	.1 Fp	〃	mylar
C47	RN-ECC-DVK201JY-2	200 pF	〃	ceramic
C48	RN-ECG-DSA102J	1000 pF		
C49	RN-ECC-DSL020CY	2 pF	50V	ceramic
C51	RN-ECC-DSL201JY	200 pF	〃	〃
C52	RN-ECC-DSL060DY	6 pF	〃	〃
C55, 89	RN-ECE-M101V16-4	100 μF	16V	electrolytic
C57, 58	RN-ECF-R153V50	.015 μF	50V	mylar
C59	RN-ECF-R472V50	4700 pF	〃	〃
C62, 63, 68 69, 88	RN-ECE-M100V16-1	10 μF	16V	electrolytic
C66, 67, 90	RN-ECF-R103V50	.01 μF	50V	mylar
C71, 72	RN-ECY-MR10V16-M1	.1 μF	16V	
C75, 76	RN-ECE-M221V10-3	220 μF	10V	electrolytic
C79	RN-ECE-M222V16	2200 μF	16V	〃
C80, 81	RN-ECE-M102V10-2	1000 μF	10V	〃
C82, 83	RN-ECF-R154V50	.15 μF	50V	mylar
C84, 85	RN-ECB-DOX102E	1000 pF	〃	ceramic

Symbol No.	Stock No.	Description			
C_{91}	RN-ECH-RR68V100	.68 μF	100V		metalized paper
C_{92}	RN-ECE-M470V16	47 μF	16V		electrolytic
CV 1	RN-ECV-B70-47	70 pF			AM ANT trimmer
CV 2, 3	RN-ECT-N500-53	50 pF			AM RF. OSC. trimmer
RESISTORS					
R 1, 8, 12, 44	RN-ERD-AE331JB	330 ohm	¼W	5%	carbon
R 2, 9, 13	RN-ERD-AE470JB	47 ohm	〃	〃	〃
R 3, 36, 38 48, 50	RN-ERD-AE104JB	100k ohm	〃	〃	〃
R 4, 10, 26 31, 34	RN-ERD-AE392JB	3.9k ohm	〃	〃	〃
R 5	RN-ERD-AE103JB	10k ohm	〃	〃	〃
R 6, 28, 65	RN-ERD-AE152JB	1.5k ohm	¼W	5%	carbon
R 7, 22	RN-ERD-AE820JB	82 ohm	〃	〃	〃
R 11, 19, 21 27, 32, 33	RN-ERD-AE222JB	2.2k ohm	〃	〃	〃
R_{14}	RN-ERD-AE271JB	270 ohm	〃	〃	〃
R_{15}	RN-ERD-AE334JB	330k ohm	〃	〃	〃
R 16, 29, 30, 62	RN-ERD-AE562JB	5.6k ohm	¼W	5%	carbon
R 17, 35	RN-ERD-AE102JB	1k ohm	〃	〃	〃
R 18, 45, 47	RN-ERD-AE822JB	8.2k ohm	〃	〃	〃
R_{20}	RN-ERD-AE272JB	2.7k ohm	〃	〃	〃
R_{23}	RN-ERD-AE274JB	270k ohm	〃	〃	〃
R_{24}	RN-ERD-AE563JB	56k ohm	¼W	5%	carbon
R_{25}	RN-ERD-AE182JB	1.8k ohm	〃	〃	〃
R 37, 43, 63	RN-ERD-AE153JB	15k ohm	〃	〃	〃
R 39, 61	RN-ERD-AE821JB	820 ohm	〃	〃	〃
R 40, 59, 60	RN-ERD-AE472JB	4.7k ohm	〃	〃	〃
R 41, 66	RN-ERD-AE101JB	100 ohm	¼W	5%	carbon
R_{42}	RN-ERD-AE683JB	68k ohm	〃	〃	〃
R_{46}	RN-ERC-CF121K	120 ohm	½W	10%	solid
R_{49}	RN-ERD-AE273JB	27k ohm	¼W	5%	carbon
R 51, 54	RN-ERD-AE121JB	120 ohm	〃	〃	〃
R 52, 53	RN-ERD-AE393JB	39k ohm	¼W	5%	carbon
R 55, 56	RN-ERD-AE123JB	12k ohm	〃	〃	〃
R 57, 58	RN-ERD-AE154JB	150k ohm	〃	〃	〃
R_{64}	RN-ERD-AE122JB	1.2k ohm	〃	〃	〃
R_{67}	RN-ERD-AE2R2JB	2.2 ohm	〃	〃	〃
VARIABLE RESISTOR					
RV 1	RN-ERV-0N1-135	10k ohm FM MPX separation adjustment			
RV 2	RN-ERV-2N1-68	Balance 20k ohm (includes tuning shaft)			
RV 3~6, S 3, 4	RN-ERV-2Z5-2	Tone: 10k ohm, Volume: 10k ohm (includes power ON/OFF switch)			
IC					
IC 1	RN-EIC-SN76681N	FM IF. amp., linear-monolithic			
IC 2	RN-EIE-NC8042	FM Noise blanker, linear-monolithic			
IC 3	RN-EIC-SN76115N-S	Multi-control, linear-monolithic			
IC 4	RN-EIC-HA1199	AM RF. CONV. IF. & DET. linear-momolithic			
IC 5	RN-EIC-M51521L	Equalizer amp., linear-momolithic			

Symbol No.	Stock No.	Description
IC 6	RN-EIC-UPC1181H-EF	Power amp., (left) linear-monolithic
IC 7	RN-EIC-UPC1182H-EF	Power amp., (right) linear-monolithic
IC 8, 9	RN-EID-DN838	Tape end sensing, digital monolithic
IC10	RN-EID-AN6250	Auto reverse, digital monolithic
TRANSISTORS		
Q 1, 2	RN-EVS-2SC710-C	FM IF. & AGC. amp., silicon
Q 3, 5	RN-EVS-2SC1317-QR	DC Stabilizer & DC muting, silicon
Q 4	RN-EVS-2SC828-QR	Relay control, silicon
DIODES		
D 1, 2	RN-EDG-1S446	FM AGC. and DET. germanium
D 3	RN-EDT-RD9R1E-C	Regulator, 9.6V zener
D 4	RN-EDS-ITT73N	AM AGC. silicon
D 5	RN-EDP-GL-31AR	Light emitting, stereo indicator
D 6, 7	RN-EDP-LN312GP	Light emitting, tape running indicator,
D 8, 9	RN-EDS-1S1555	Inverse current suppression, silicon
D10, 11	RN-EDS-1S1885	Relay spark suppression, silicon
TRANSFORMERS & CERAMIC FILTERS		
T 1	RN-ETF-138	Transformer, FM IF. 10.7 MHz (BLK)
T 2	RN-ETH-210	Transformer, AM OSC. (RED)
T 3, 4	RN-ETA-148	Transformer, AM IF. 455 kHz (PNK)
T 5, 6	RN-ETA-129	Transformer, AM IF. 455 kHz (YEL)
CF 1, 2	RN-EFC-F2-112	Ceramic filter, FM IF. 10.7 MHz
COILS		
L 1~3		AM ANT. RF. OSC. coil assy., parts of FM front end
L 4	RN-ELH-C680	Choke, 68 μH
L 5	RN-ELH-B6R2-2	Choke, 6.2 μH
L 6	RN-ELH-C4R7-1	Choke, 4.7 μH
L 7	RN-ELL-4	Choke filter, 3 mH
L 8	RN-ELL-325	Choke filter, 50 μH
L 9	RN-ELH-BR74	Choke filter, 0.74 μH
MISCELLANEOUS ELECTRICAL		
	RN-ETE-2N-30	FM front end unit (includes AM coils assy.,)
A 1	RN-EHM-C44-30	Playback head
E 1	RN-MKT-2	Solenoid assembly, (includes solenoid and plunger)
J 1	RN-EJL-135A	Receptacle antenna
J 2	RN-EWJ-830	5P Connector and lead assy., (BLK)
J 3	RN-EWJ-827	3P Connector and lead assy., (GRY)
J 5	RN-EWJ-829	6P Connector and lead assy., (BLK)
J 6	RN-EWJ-828	7P Connector and lead assy., (GRY)
M 1	RN-EDM-32	DC motor
NL 1	RN-EPN-54	Neonlamp

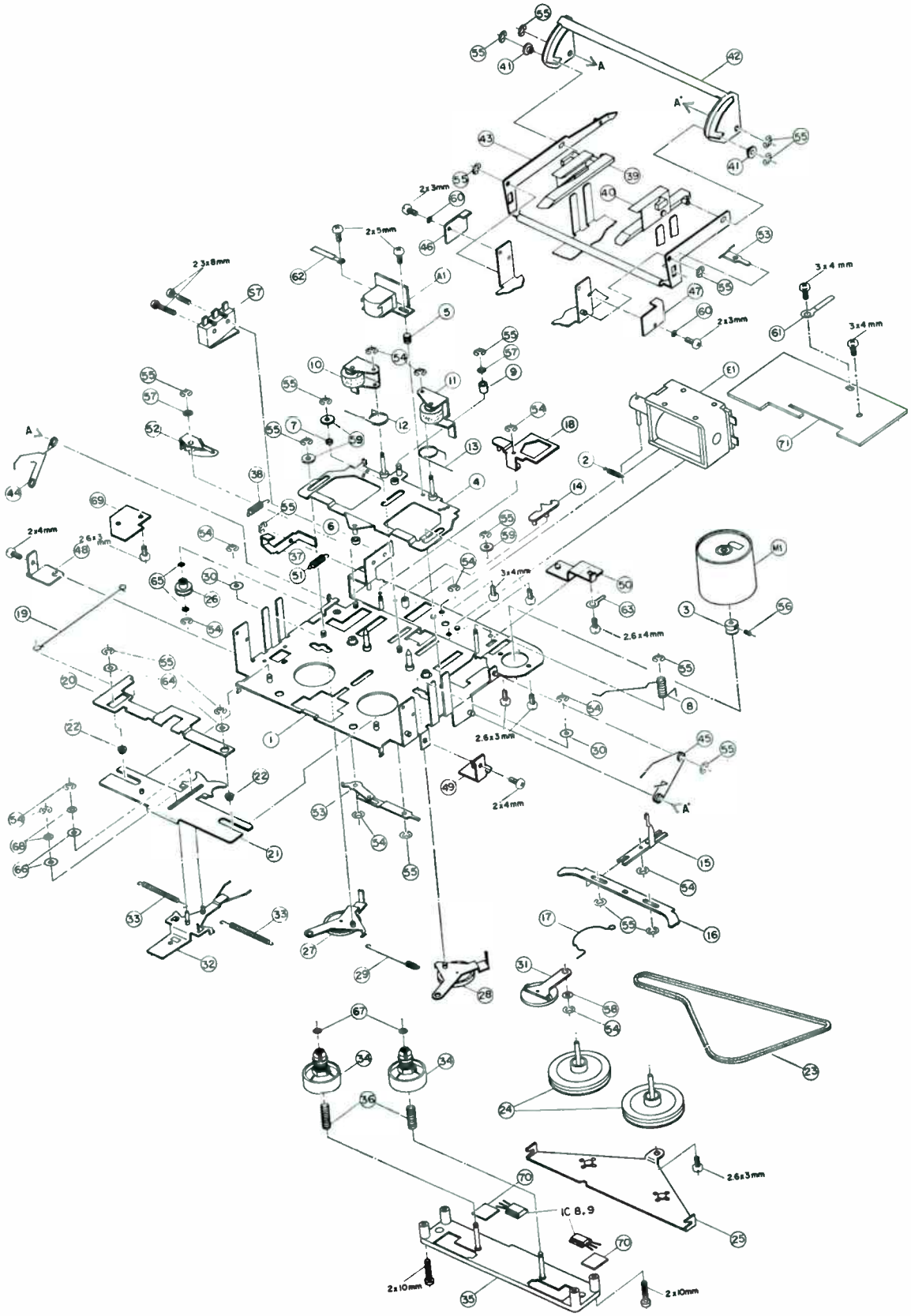


Fig. 13 (B)

Illus. No. (Fig. 13A)	Stock No.	Description	
	F6-SBD-3×10S	Screw, 3×10mm	2pcs.
	F6-SSA-2.6×4S	Screw, 2.6×4mm	2pcs.
	F6-SSA-3×6-M-ZN2A	Screw, 3×6mm (BLK)	2pcs.
	F6-SSA-3×8S	Screw, 3×8mm	2pcs.
32	F6-ER-1.2	E-type ring, snap (for 1.2mm shaft)	2pcs.
	RN-MCF-18	Clamp	1pcs.
29	RN-MIP-135	Insulator	

Illus. No. (Fig. 13B)	Stock No.	Description
CASSETTE DECK		
1	RN-MAS-75A	Chassis, tape-deck
2	RN-MSC-220	Spring, plunger
3	RN-MRP-175	Pulley, DC motor (M1)
4	RN-MYT-61	Slide plate, head and pinchroller mounting
5	RN-MSC-221	Spring, azimuth adjusting
6	RN-MRP-177	Roller, for ill. 4 slide plate (MYT-61)
7	RN-MRP-178	Roller, for ill. 4 slide plate (MYT-61)
8	RN-MSC-222	Spring, slid plate pressure
9	RN-MRP-193	Roller, for ill. 4 slide plate (MYT-61)
10	RN-MKR-6	Pinchroller assembly, (left)
11	RN-MKR-7	Pinchroller assembly, (right)
12	RN-MSC-223	Spring, pinchroller pressure (left)
13	RN-MSC-224	Spring, pinchroller pressure (right)
14	RN-MUL-175	Lever, pinchroller changing
15	RN-MMS-11	Lever assembly, actuater S $_{5}$a-d
16	RN-MUL-177	Lever, pinchroller changing
17	RN-MSC-225	Spring, lever (MUL-177) pressure
18	RN-MUL-178	Lever, FF/REW release
19	RN-MSE-132	Spacer, connection wire
20	RN-MUL-179	Lever, FF/REW leck
21	RN-MHG-38A	Cassette loading mechanism (FF/REW)
22	RN-MRP-190	Cassette loading mechanism (MHG-38A) slide
23	RN-MUB-29	Belt, drive
24	RN-MUF-24A	Flywheel with capstan
25	RN-MHU-127	Supporter, flywheel
26	RN-MRP-180	Pulley, belt
27	RN-MKR-3	Idler mechanism (left)
28	RN-MKR-4	Idler mechanism (right)
29	RN-MSC-226	Spring, idler mechanism pressure
30	RN-MWS-121	Spacer for ill. 28 idler mechanism (MKR-3, MKR-4)
31	RN-MKA-5A	Idler mechanism,
32	RN-MUL-183	Lever, stop, eject and FF/REW
33	RN-MSC-227	Spring, lever (MUL-183) return
34	RN-MKS-10A	Slip mechanism
35	RN-MYT-63	Sub-chassis, slip mechanism

Illus. No. (Fig. 13B)	Stock No.	Description	
36	RN-MSC-252	Spring, back tension	
37	RN-MUL-185	Lever, for S 7	
38	RN-MSC-231	Spring, for ill. 37 lever (MUL-185)	
39	RN-MHG-39	Cassette loading mechanism (left)	
40	RN-MHG-40	Cassette loading mechanism (right)	
41	RN-MRP-189	Spacer, for ill. ㊴ and ㊵	
42	RN-MUL-186	Lever, for ill. ㊴ and ㊵	
43	RN-MUL-187	Lever, for ill. ㊴ and ㊵	
44	RN-MSC-251	Spring, for ill. ㊴ and ㊵ (left)	
45	RN-MSC-240	Spring, for ill. ㊴ and ㊵ (right)	
46	RN-MHL-179	Holder, for ill. ㊴ and ㊵ (left)	
47	RN-MHL-180	Holder, for ill. ㊴ and ㊵ (right)	
48	RN-MHL-173A	Suppoter, cassette deck mounting (left)	
49	RN-MLH-174A	Suppoter, cassette deck mounting (right)	
50	RN-MHZ-86A	Suppoter, cassette deck mounting (back)	
51	RN-MSC-238A	Spring, muting switch	
52	RN-MMS-13	Lever assembly, muting switch	
53	RN-MUL-198A	Lever assembly, eject	
54	F6-ER-1.5	E-type ring, snap (for 1.5mm shaft)	13pcs.
55	F6-ER-2	E-type ring, snap (for 2mm shaft)	20pcs.
	F6-SBD-2×5S	Screw, 2×5mm, playback head mounting	2pcs.
	F6-SBD-2×10S	Screw, 2×10mm, Sub-chassis mounting	2pcs.
	F6-SBD-2.3×8S	Screw, 2.3×8mm, Micro switch mounting	2pcs.
	F6-SBD-2.6×3S	Screw, 2.6×3mm,	4pcs.
	F6-SBD-2.6×4S	Screw, 2.6×4mm,	3pcs.
	F6-SBD-3×4S	Screw, 3×4mm,	4pcs.
56	F6-SHT-2×3	Screw, 2×3mm, motor pulley mounting	1pcs.
57	F6-WK-3S	Washer, 3mm	2pcs.
58	F6-WM-2.6S	Washer, 2.6mm	1pcs.
59	F6-WM-3S	Washer, 3mm	3pcs.
60	F6-WB-2S	Washer, 2mm	1pcs.
	F6-SBD-2×3S	Screw, 2×3mm	2pcs.
61	RN-MCF-15	Clamp	2pcs.
62	RN-MCF-18	Clamp	1pcs.
63	RN-MCF-10	Clamp	1pcs.
64	RN-MWS-97	Washer, mm	2pcs.
65	RN-MWP-78	Washer, mm	2pcs.
66	RN-MWP-79	Washer, mm	2pcs.
67	RN-MWP-80	Washer, mm	2pcs.
68	RN-MWS-124	Washer, mm	2pcs.

DIAL CORD ARRANGEMENT

1. Turn the tuner shaft clockwise extremely (f max. end).
2. Tie cord (0.4mm×500mm) end as shown Ⓐ in Fig. 12 and make a loop, hook it as Ⓑ.
3. Let the cord go in the direction of the arrow. Wind the cord with tweezers around the shaft of tuner as shown in Ⓒ.
4. Undo the end of cord hooked above. Tie another end with the loop as shown Ⓓ in Fig. 12.
5. Turn the tuner shaft fully counterclockwise (f min. end).
6. Let the pointer sides be caught by the cord and set it to the center of marking Ⓔ in Fig. 12.
7. Drip paint at the knot and the pointer.

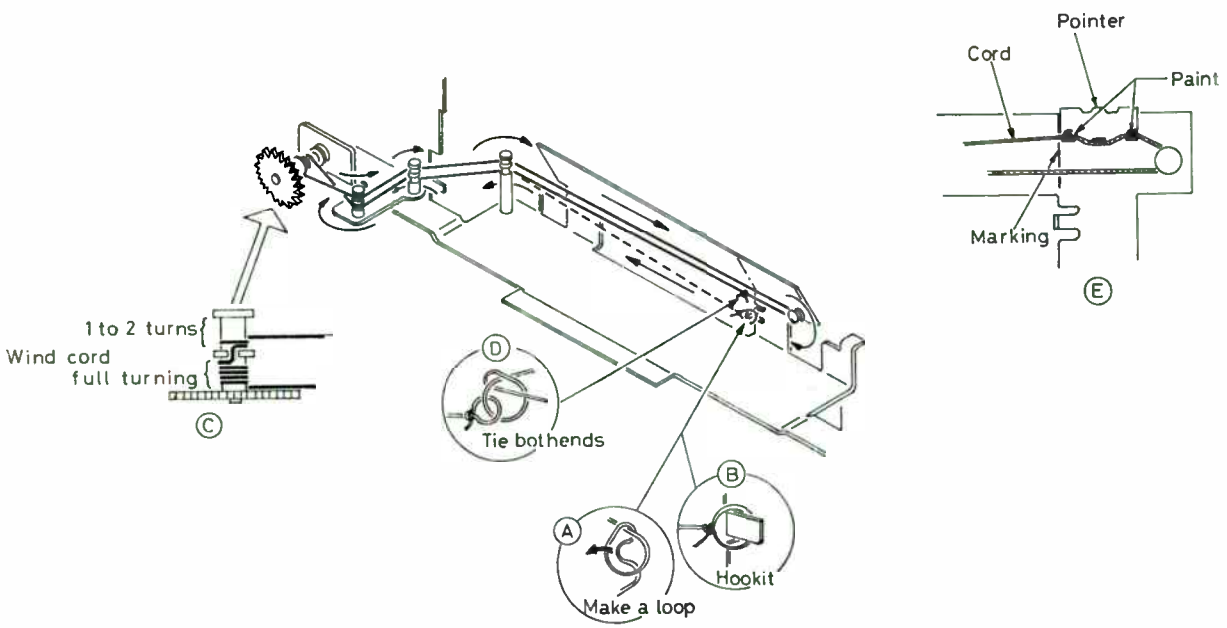
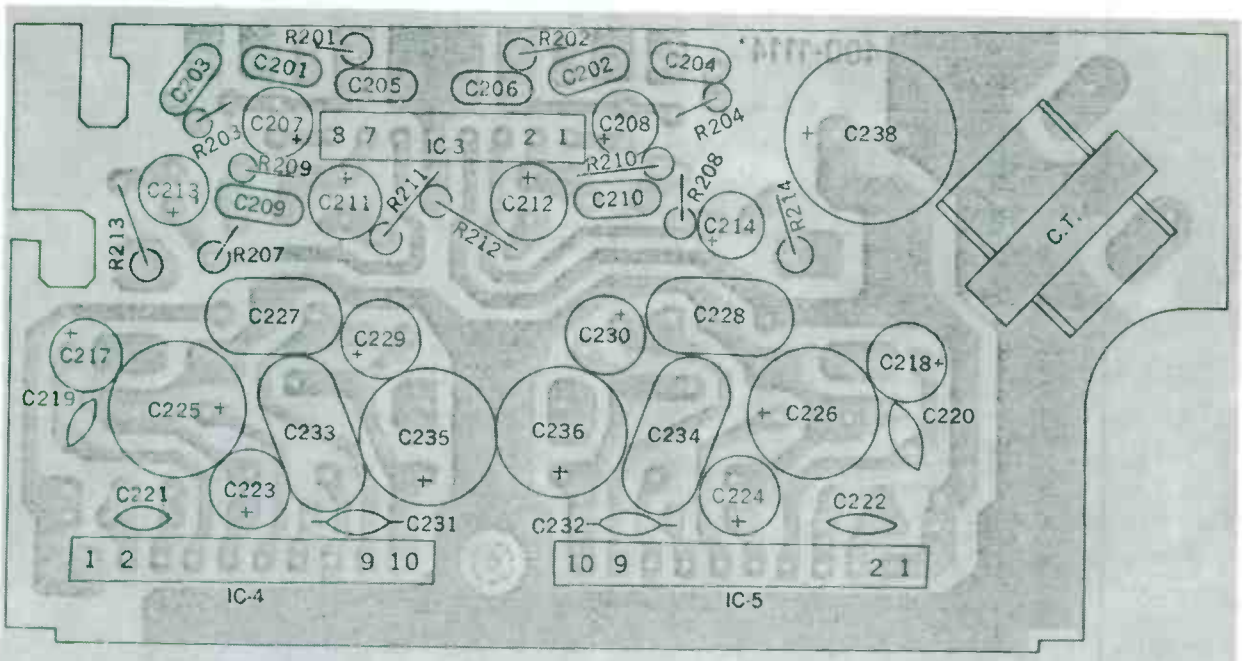


Fig. 12

Pages 118 - 122 Courtesy of TENNA CORP.



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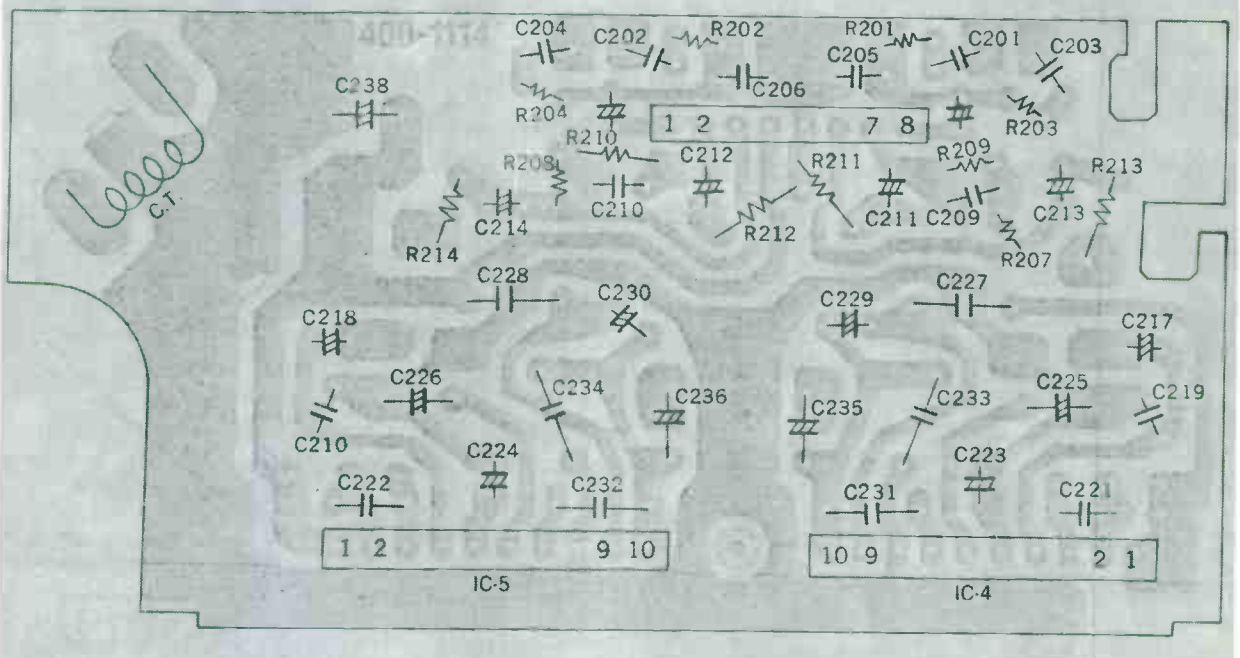

BOTTOM VIEW

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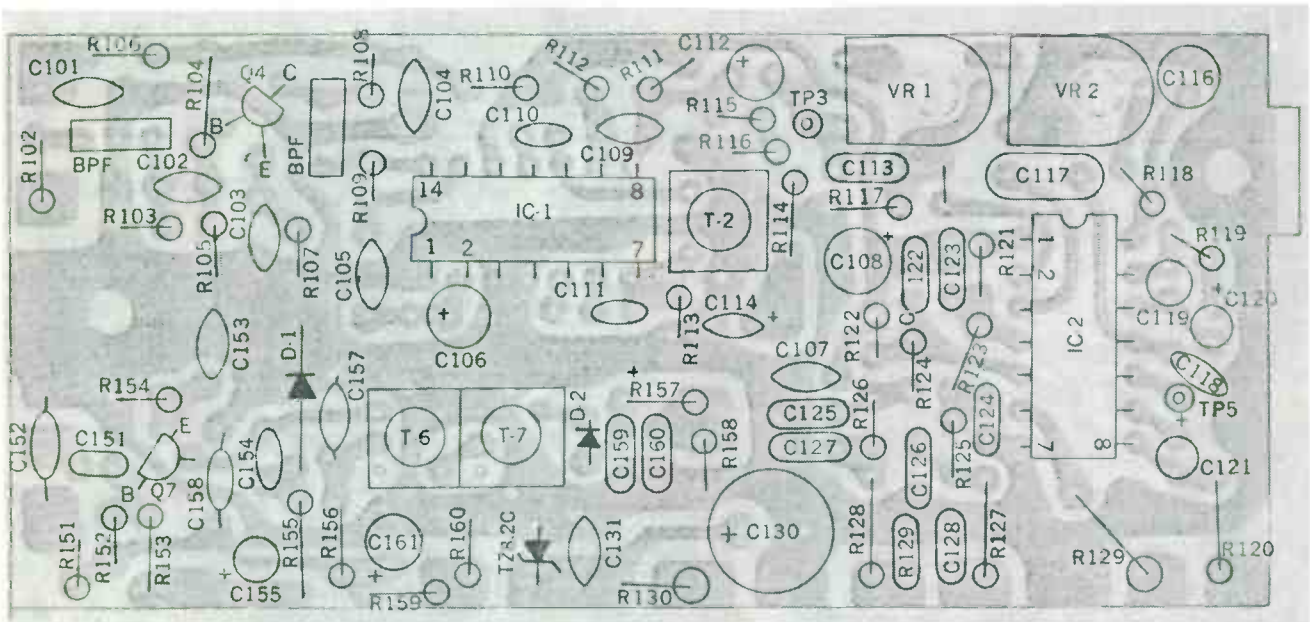
PR-2017 MPX **AF-PCB PARTS ASSEMBLY DIAGRAM**



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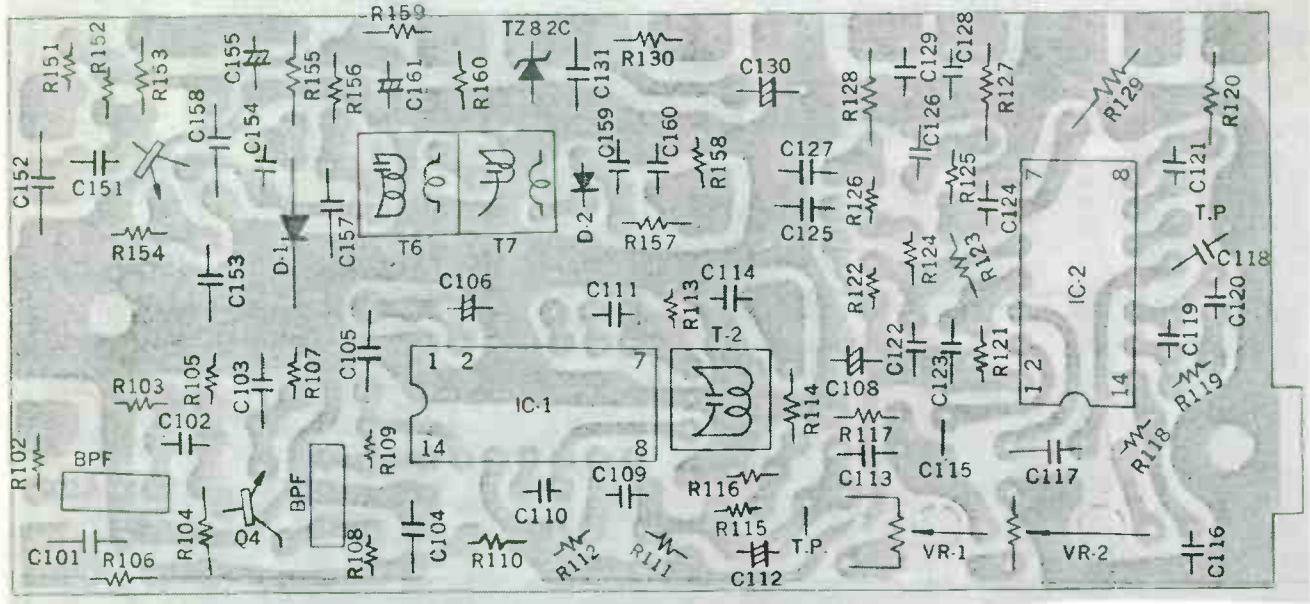

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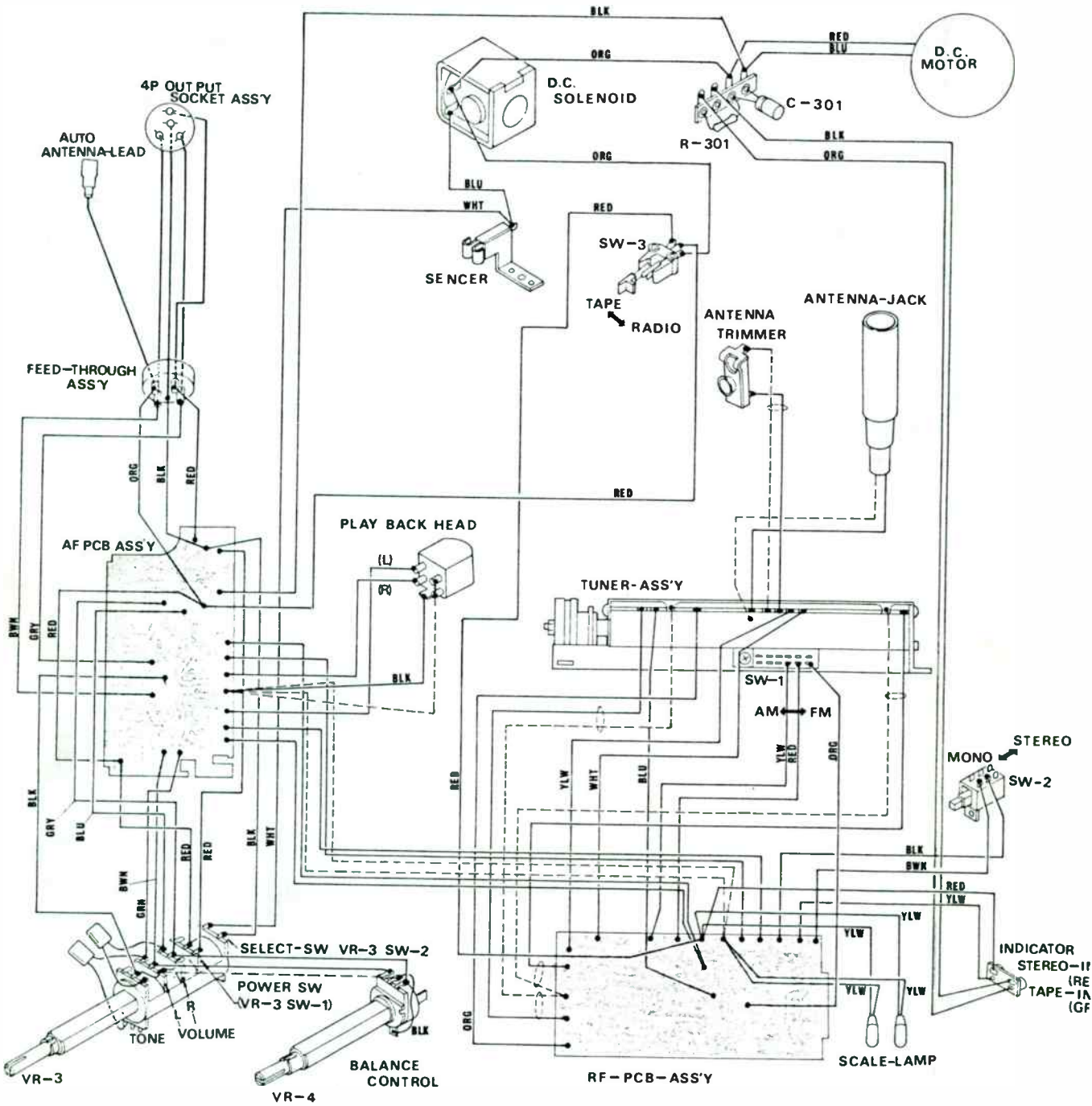
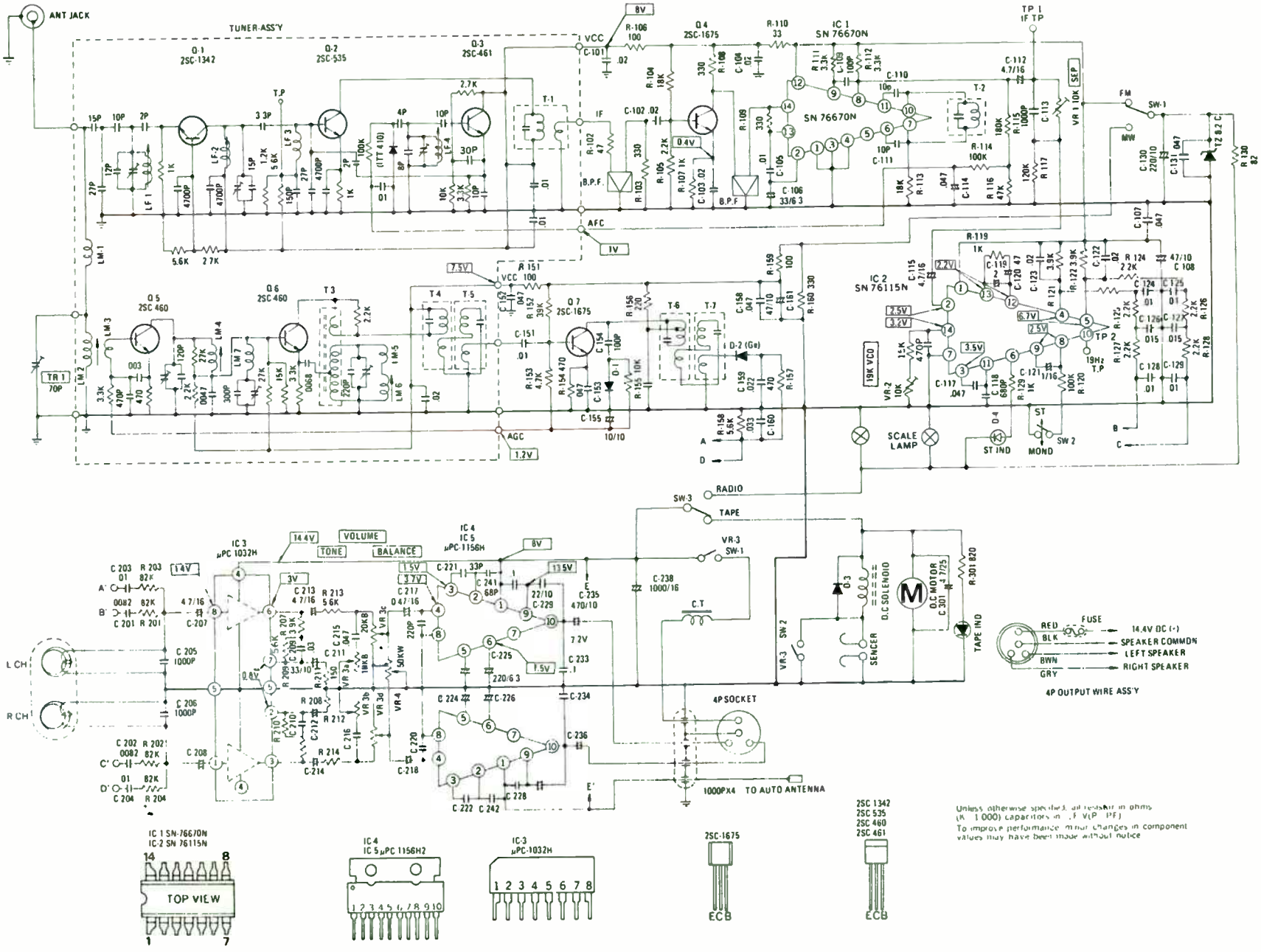
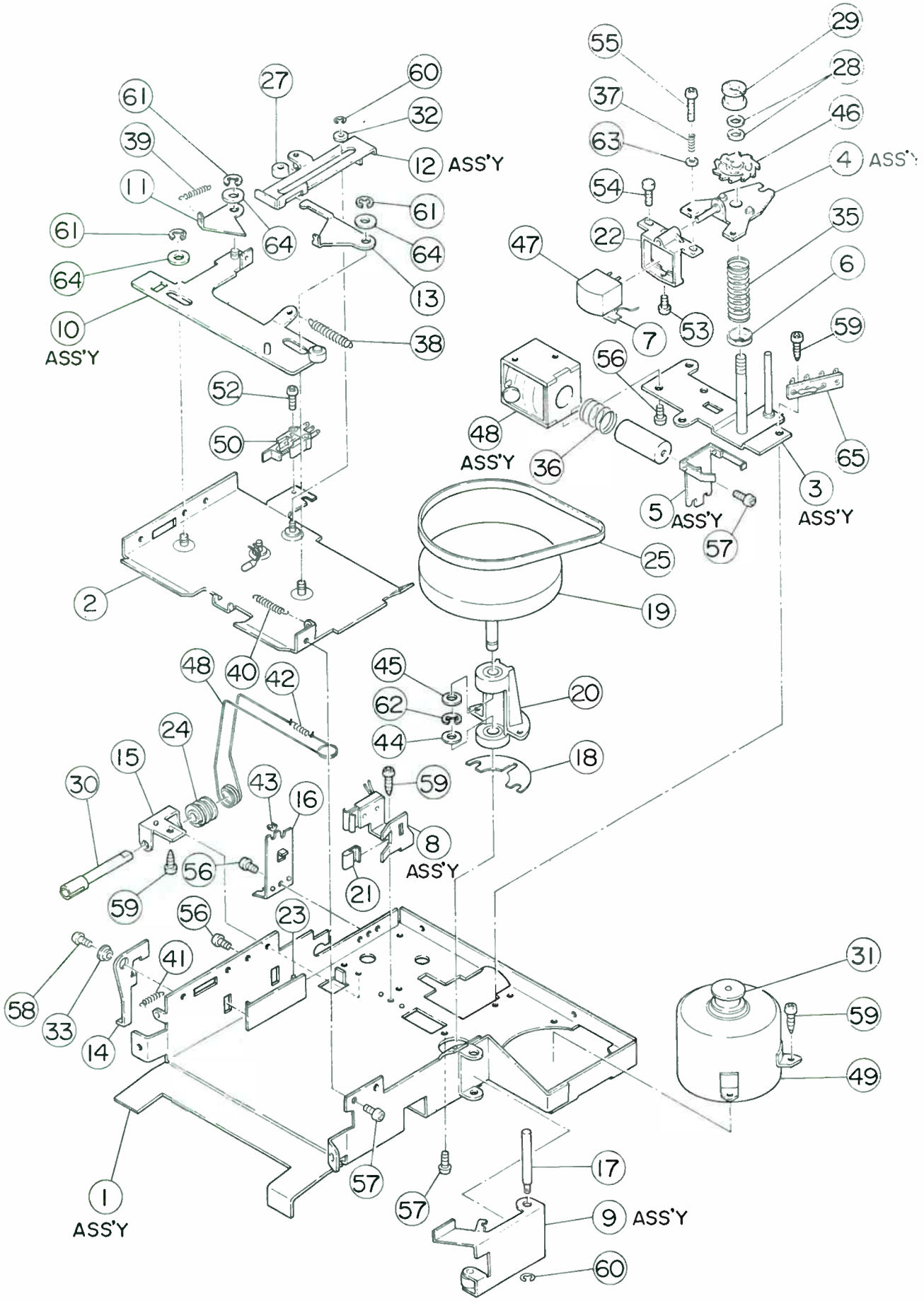


PR-2015 MPX
PR-2017 MPX WIRING DIAGRAM





RR-2015 MPX
RR-2017 MPX DECK CHASSIS PARTS LAYOUT

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For models covered before 1970, see the Annual Index.

Abbreviations used: (EP) Early Produ (LP) Late Production (SN) Serial Number (Rev) Revised (PCB) Production Change Bulletin

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