ELECTRONIC TECHNICIAN

VOLUME 7

TEKFAK

TV-RADIO SCHEMATICS • OVER 28 MANUFACTURERS • COVERS HUNDREDS OF CHASSIS & MODEL NUMBERS

PUBLISHED BY ELECTRONIC TECHNICIAN MAGAZINE, OJIBWAY BUILDING, DULUTH, MINNESOTA 55802
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- Models: V-2474-1, -2, -3
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**Western Auto**
- Tape Recorder 123
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SCHEMATIC NOTES
Numbers or letters inside hexagons indicate alignment points.
Fixed resistor values shown in ohms ± 10% tolerance; 1/2 watt; remaining values shown in microfarads ± 20% unless otherwise specified.
B: Circuit Breaker: B+ supply of this receiver is protected by a thermal type circuit breaker having a manual reset button. Allow a few minutes for circuit breaker to cool off before pressing the reset button.

VOLTAGES AND WAVEFORMS
Isolation transformer used. Line voltage: 117 volt, 60 cycle; 120 volt, 60 cycle. Transformer is mains powered only; all controls remote controlled. Do not disturb Horizontal Hold control.

VOLTAGE WARNING
Pulsed high voltage is present at cap of V406, and pins 4 and 5 of V404. Use suitable test equipment at these points. Servicing receiver out of cabinet involves a shock hazard. The isolated line (shutter) cord and plug, part number NK 121-2.

Important: To prevent possibility of static discharge, never touch strip M303 (at top of cabinet). should only make contact with steel band around face plate of picture tube. Do not connect steel band to picture tube dag or chassis ground.
SOUND MARKER (MAY NOT BE VISIBLE) AT LEAST 90%

TO TEST POINT 47K OSMS

DESIGN CHASSIS GROUND

SOUND MARKER MAY BE AS HIGH AS 10% DOWN SIDE OF CURVE

MARKER, VIDEO CARRIER

MARKER, VIDEO CARRIER

DESIGN CHASSIS GROUND

1/6JV8

1/210ALII

VOLUME

1/210ALII

1/6JV8

1/211ALII

1/210ALII

1/210ALII

1/210ALII

1/210ALII

1/210ALII

1/210ALII

1/210ALII

1/210ALII

1/210ALII

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1/210ALII

1/210ALII
OPERATING AUTOMATIC OFF-ON TIMER

Some models are equipped with an automatic OFF-ON timer. The OFF timer (at side of cabinet) can be set to turn television receiver "OFF" after a pre-selected time period, up to ten hours. The timer can also be set to turn receiver "ON" after a pre-selected time period, up to twelve hours. Models having an automatic OFF-ON timer, are listed in Model Identification Chart on front page.

IMPORTANT: Push-pull ON-OFF switch (at front of set) must be "ON" (pulled out) and timer must be in "ON" detention position for set to operate. Dial light is lit, when set is turned on.

Turning Receiver "OFF" Automatically

With television receiver operating, turn timer knob counterclockwise until time interval marking on knob is opposite indication pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

Turning Receiver "ON" Automatically

For turning receiver "ON" automatically, set timer knob to "ON" (pulled out) and timer must be in "OFF" detention position for set to operate. Dial light is lit, when set is turned on.

For turning receiver "ON" automatically, set timer knob to "OFF" (pulled in), then turn clockwise until interval marking on knob is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

For turning receiver "ON" automatically, set timer knob to "OFF" (pulled in), then turn clockwise until interval marking on knob is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

For turning receiver "ON" automatically, set timer knob to "OFF" (pulled in), then turn clockwise until interval marking on knob is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

For turning receiver "ON" automatically, set timer knob to "OFF" (pulled in), then turn clockwise until interval marking on knob is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

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For turning receiver "ON" automatically, set timer knob to "OFF" (pulled in), then turn clockwise until interval marking on knob is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.
- SCHEMATIC NOTES -
1. C-21 BROWN IN EARLY PRODUCTION MODELS.
2. J-21 - MOUNT IN EARLY PRODUCTION MODELS.
3. M-10 JAPAN IN EARLY PRODUCTION MODELS.

- VOLTAGES & WAVEFORMS -
1. LINE VOLTAGE D.C. THROUGH ISOLATION TRANSFORMER.
2. ALL VOLTAGES SHOWN ON SCHEMATIC ARE D.C. READINGS.
3. VOLTAGE READINGS TAKEN WITH NORMAL SIGNAL INPUT USING A V.T.V.M.
4. CONTROLS SET FOR NORMAL OPERATION.
5. WAVEFORMS TAKEN WITH NORMAL SIGNAL INPUT.
6. ALL WAVEFORM VOLTAGES SHOWN ON SCHEMATIC ARE PEAK-TO-PEAK READINGS.
DC SOCKET VOLTAGES

All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.
TO REMOVE CHASSIS FROM MOUNTING BOARD FIRST REMOVE TUNER AS FOLLOWS:

1. Remove knobs.
2. Disconnect leads from antenna terminal board.
3. Loosen or remove screws as shown in Fig. 1.
4. Lift Tuner upward and away from mounting board.
5. Disconnect jack plug from socket.
6. Disconnect socket from tube base.
7. Remove high voltage clip from picture tube.
8. Disconnect speaker wires at audio output transformer.
9. Remove five (5) chassis bolts from underside of mounting board and remove chassis.

NOTE: It is important that the speaker wires and yellow picture tube wire be placed in the supporting bracket when the chassis is remounted on the mounting board. It is also important to dress the deflection coil wires away from the tubes. This can easily be done by giving the deflection coil cable one full twist in a counter-clockwise direction.

REPLACING BATTERY IN THE TRANSMITTER

Should the system lose sensitivity after a year's use it is advisable to test the battery in the transmitter. The transmitter contains a 4.5 volt Mercury battery. (Delco TR 163H equivalent). Replace only with similar type.

Observe Polarity when replacing the battery. Be sure to insert the new battery in the same position as the one removed. Failure to do so may cause damage to the unit.

Two button transistorized transmitter with cover removed

Schematic diagram of Transmitter Assembly

At distances of less than 12 inches the Remote Control System may not operate due to the High Sensitivity of the Receiver. This is a normal condition.
NOTES:
1. CAPACITOR SYMBOLS:
   C = CERAMIC
   M = MICA
2. UNPOLARIZED CAPACITOR VALUES LARGER THAN (1.0) ARE MMF, (1.0) OR LESS ARE MF
3. ARROWS ON CONTROLS INDICATE C.W. ROTATION.
4. ALL CERAMIC CAPACITORS ARE GMV UNLESS OTHERWISE NOTED
5. UNMARKED AND NON-POLARIZED CAPACITORS ARE PAPER, ± 20 %, 400 V, EXCEPT AS NOTED.
6. RESISTORS ARE 1/4 W, ± 10 %, EXCEPT AS NOTED.
Balloons, etc. shown on schematic indicate points of observation of the waveforms.

Use low-capacity probe when observing waveforms.

PW 200

PW 300

PW 500

Dumont
Color TV Chassis
120699 and 120722

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ELECTRONIC TECHNICIAN
TEKFAX

Dumont
TV Chassis
120708, 712, 725

CHASSIS No. 120708, 712, 725.
ELECTRONIC TECHNICIAN
OJIBWAY BUILDING, DULUTH, MINNESOTA 55802
HEATHKIT
Color TV
Model GR53

ELECTRONIC TECHNICIAN

TEKFAX

NOTES:
0 - 99 PARTS MOUNTED ON THE CHASSIS
100 - 199 PARTS IN UHF TUNER
200 - 299 PARTS ON IF CIRCUIT BOARD
300 - 399 PARTS ON SOUND-SYNC CIRCUIT BOARD
400 - 499 PARTS ON COLOR CIRCUIT BOARD
500 - 599 PARTS ON CONVERGENCE BOARD
600 - 699 PARTS ON VHF TUNER
700 - 799 PARTS MOUNTED ON THE CHASSIS
800 - 899 PARTS ON CONVERGENCE BOARD
900 - 999 PARTS MOUNTED ON THE CHASSIS

ALL RESISTOR VALUES ARE IN KΩ - 1000, MΩ = 1,000,000.
ALL CAPACITORS ARE IN µF UNLESS MARKED µµF.
INDICATES POSITIVE DC VOLTAGE MEASUREMENT,
TAKEN WITH AN 11 MEGOHM VOM FROM POINT
INDICATED TO CHASSIS GROUND.
VOLTAGE MEASUREMENTS WERE MADE WITH NO SIGNAL INPUT.
HEATHKIT
Color TV
Model GR53

ELECTRONIC TECHNICIAN
TEKFAK

HEATHKIT
Color TV
Model GR53

ELECTRONIC TECHNICIAN
OJIBWAY BUILDING, DULUTH, MINNESOTA 55802
Chroma Board

Deflection Board

Video Board

Convergence Board
NOTES:
1. Capacitors having value of less than 1 are shown in microfarad, values more than 1 in millifarad.
2. All voltages measured with VTVM with no signal applied, line voltage maintained at 110 volts AC, voltage reading tolerance ±20%.
3. On some chassis R531 is moved outside PV-500 and R169 is connected to 1300 and R10 is added from pin 2 to terminal TT on PM-100.
NOTES:

1. VOLTAGE AND RESISTANCE MEASUREMENTS: SEE CHART
2. TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM+ 20%.
3. LINE VOLTAGE MAINTAINED AT 120V AC.
4. VOLTAGES INDICATED BY AN ASTERISK WILL VARY WITH ASSOCIATED CONTROL SETTINGS.
5. TAKEN WITH CONTRAST CONTROL AT MINIMUM AND ALL OTHER CONTROLS IN NORMAL OPERATING POSITION WITH NO SIGNAL INPUT.

Waveform Measurements:

1. TAKEN FROM POINT INDICATED TO CHASSIS WITH A WIDE-BAND OSCILLOSCOPE.
2. OSCILLOSCOPE SYNCED NEAR SWEEP RATE INDICATED.
3. TAKEN WITH STRONG SIGNAL, CONTRAST CONTROL AT MAXIMUM; ALL OTHER CONTROLS IN NORMAL OPERATING POSITION.
DYNAMIC CONVERGENCE

Vertical Dynamics
Obtain a red-green raster by turning Blue G-2 to minimum. Use Figure 5, the convergence panel diagram, and observe the effect as illustrated at each control.

1. Adjust R-G vertical amp to converge the center vertical lines at bottom of screen (Step 1).

2. Adjust R-G vertical tilt to converge the center vertical lines at top of screen (Step 2).

Alternately repeat Steps 1 and 2 for center vertical lines, if necessary. Re-adjust disc magnets if necessary.

3. Adjust the R-G vertical differential amp control to converge the center portion of the horizontal lines at the bottom of the screen (Step 3).

4. Adjust the R-G vertical differential tilt to converge the center portion of the horizontal lines at the top of the screen (Step 4).

If the horizontal lines in the center of the screen are misconverged, repeat Steps #3 & 4 for equally spaced horizontal lines from top to bottom of screen.

5. Turn up the blue G-2 control. Adjust the blue vertical amp to produce displacement in the same direction of the blue horizontal lines at top and bottom of the screen (Step 5).

6. Adjust the blue vertical tilt control to produce equal displacement in the same direction of the blue horizontal lines from top to bottom of screen (Step 6).

Alternately repeat Steps 5 and 6 for satisfactory convergence of the blue horizontal lines from top to bottom of screen along the center of screen, or for equal displacement to permit convergence of the disc magnets.

Horizontal Dynamics

7. Adjust the right blue horizontal line control to make the blue line at the right-hand center of the screen a straight line (Step 7).

8. Adjust the left blue horizontal line control for a straight blue line from the center to the left side of the screen (Step 8).

9. Turn off the blue G-2 leaving the red and green fields on the screen.

10. Adjust the right-side R-G vertical line control to make the vertical lines from the center to the right side converge (Step 9).

11. Adjust the left-side R-G vertical line control to make the vertical lines from the center to the left side converge (Step 10).

12. Adjust the left side blue horizontal line control to make the horizontal blue lines on the left side of the screen converge with the red and green lines (Step 11).

13. Turn up the blue G-2. Re-adjust the right side blue horizontal line control to make the horizontal blue lines on the right side of the screen converge with the red and green lines (Step 12).

14. Re-adjust the left side blue horizontal line control to make the horizontal blue lines on the left side of the screen converge with the red and green lines (Step 13).

Due to interaction, it may be necessary to re-touch Steps 11 and 12 above.

15. (For Type B Blue Lateral Magnet Assembly Only) - Adjust Dynamic Blue Lateral Size Adjustment until the blue is converged on the R-G along the vertical lines on the left and right edges of the screen.

The G-2 controls should now be reset for a white background. Generally, since the blue G-2 is the only one disturbed, it is possible to set this control at its proper adjustment at normal brightness while observing a local station.
TV SCHEMATIC - NB & NBU CHASSIS

NOTES:
ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
ALL CAPACITOR VALUES LESS THAN 10 ARE IN MICROFARADS AND
GREATER THAN 10 ARE IN MICRO-MICROFARADS UNLESS OTHERWISE NOTED.
ALL VOLTAGES ±15%, MEASURED WITH A VTM, BETWEEN INDICATED
POINTS AND GROUND WITH AN INPUT VOLTAGE OF 175 VAC.
NORMAL SIGNAL INPUT WITH CONTRAST CONTROL SET TO PRODUCE
V0V, P-P AT KINESCOPE.

SOME SETS HAVE A 6.3V OR A 15V CENTER-TAP CAPACITOR OR BOTH IN PARALLEL.
SECTION SHOWN OMITTED IN CL31739.

NB & NBU:
CL31704: 250W, 4W WITH CL31739
CL31793 & CL31763

-1.5V AGC
600V P-P
30,1.5, 30,1.
470K
50V P-P
31,1.
7875.1.
1106
12M VIO
500K

TV TUNER PLUG (ON TV TUNER BRACKET)
CONNECT PIN 5 TO PIN 1 OR PIN 4, WHICHER
DOES NOT APPLY.

-31

TV TUNER PLUG (ON TV TUNER BRACKET)
CONNECT PIN 5 TO PIN 1 OR PIN 4, WHICHER
DOES NOT APPLY.

-31

TV TUNER PLUG (ON TV TUNER BRACKET)
CONNECT PIN 5 TO PIN 1 OR PIN 4, WHICHER
DOES NOT APPLY.
These waveforms were taken with the receiver adjusted for an approximate output of 3.5 volts p/p at the}

oscilloscope waveform patterns.
LENGEND FOR PERMA-CIRCUIT PANEL

HORIZONTAL CIRCUITS

SOUND I.F. DETECTOR AND AUDIO CIRCUITS

VIDEO AND AGC CIRCUITS

VIDEO I.F. CIRCUITS

VERTICAL CIRCUITS

SYNC SEPARATOR AND NOISE INVERTER CIRCUITS

PANEL LUG CONNECTIONS - 14N50

M1  RED LEAD TO A.O.T.
M2  BLUE LEAD TO A.O.T.
M3  GREEN LEAD TO VOL. CONT. C.T.
M4  LEAD TO TUNER PWR. PLUG
M5  LEAD TO CS2A
M7  LEAD TO VERT. HOLD CONT.
M8  RED LEAD FROM V.O.T.
    LEAD TO PIN 6 OF YOKE SOCKET
M9  HORIZ. OSC. TEST POINT
M10 LEAD TO HORIZ. HOLD CONT.
M11 1-F INPUT CABLE
M13 LEAD TO TUNER PWR. PLUG
M14  SYNC TEST POINT
M15 LEAD TO CS5A
M16 LEAD TO CS5D
M17 LEAD TO PIN 6 H.O.T.
M18 LEAD TO CONTRAST CON.
    TROL C.T. + LEAD TO CS28
M19 LEAD TO BRIGHTNESS CON.
    TROL C.T.
M20 1-F TEST POINT
M21 LEAD TO CS5C
M22 LEAD TO M26
M23 LEAD TO B1-7
M24 LEAD TO CONTRAST CON.
M25 LEAD TO TUNER PWR. PLUG
M26 LEAD TO M22 + LEAD TO B1-7
M27 BLUE LEAD FROM V.O.T.
M28 BLUE V.I.F TEST POINT
M29 LEAD TO CRT CATHODE
M30 LEAD TO GND. G10
M31 LEAD TO PIN 5 H.O.T.
M32 LEAD TO PIN 8 H.O.T.
M33 LEAD TO PIN 3 H.O.T.
M34 LEAD TO CRT FILAMENT
M35 LEAD TO CRT FOCUS GRID
M36 LEAD TO CRT G2
M37 LEAD TO VERT. HOLD CONT. C.T.
M39 2ND DET. TEST POINT
M40 LEAD TO CRT G1

LEADS PART OF PANEL

M19 TO R65
R41 TO V11 (VERT. SIZE)
PIN 3 OF V10 TO N2
NOTES:
1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNEL.
2. VOLTAGES MEASURED WITH A "PRECISION MODEL 88" VTVM FROM POINT INDICATED TO CHASSIS GROUND.
3. VOLTAGES MARKED \( \Delta \) WERE TAKEN UNDER AVERAGE SIGNAL CONDITIONS. ANTENNA CONNECTED, TUNER ON ACTIVE CHANNEL AND ALL CONTROLS SET FOR NORMAL PICTURE VIEWING.
4. ALL RESISTANCES READ WITH COIL IN CIRCUIT EXCEPT FOR A, B, C, T, SECONDARY, HOP, 2, AND VERT. YOKE WHERE THE COMPONENTS WERE DISCONNECTED AND MEASURED INDIVIDUALLY.
5. BALLOONS 1, 2, ETC., SHOWN ON SCHEMATIC INDICATE WAVEFORM TEST POINTS.
6. CONTROL SETTINGS: VOLUME - MINIMUM CONTRAST - MID-RANGE BRIGHTNESS - MID-RANGE
ALL OTHER CONTROLS SET FOR NORMAL OPERATION.

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**Philco**
Chassis 14N50

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**Electronic Technician**
Ojibway Building, Duluth, Minnesota 55802

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65
OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver isolated for an approximate peak-to-peak output of 5.5 volts of the video detector. Voltage readings taken with meter (set filling groove) and all controls set for normal operation are approximate peak-to-peak values. The frequencies shown are those of the waveforms—set the sweep rate of the oscilloscope. All readings were taken with a Model EK-505B Precision oscilloscope.

1. 80 volts p/p, 15,750 c.p.s.
2. 3.5 volts p/p.
3. 90 volts p/p, 80 c.p.s.
4. 30 volts p/p.
5. 12 volts p/p.
6. 10 volts p/p, 90 c.p.s.
7. 40 volts p/p.
8. 110 volts p/p, 60 c.p.s.
9. 90 volts p/p.
10. 40 volts p/p, 60 c.p.s.
11. 40 volts p/p.
12. 80 volts p/p, 60 c.p.s.
13. 30 volts p/p.
14. 15 volts p/p, 15,750 c.p.s.
15. 30 volts p/p.
16. 15 volts p/p, 15,750 c.p.s.
17. 30 volts p/p.
18. 15 volts p/p, 15,750 c.p.s.
19. 30 volts p/p.
20. 15 volts p/p, 15,750 c.p.s.
21. 60 volts p/p, 15,750 c.p.s.
22. 60 volts p/p, 15,750 c.p.s.
23. 60 volts p/p, 15,750 c.p.s.
24. 60 volts p/p, 15,750 c.p.s.
25. 60 volts p/p, 15,750 c.p.s.
26. 60 volts p/p, 15,750 c.p.s.

ELECTRONIC TECHNICIAN

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PHILCO
Chassis 14G20

NOTES:
1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITION; ANTENNA CONNECTED WITH TUNER OUT CHANNEL.
2. VOLTAGES MEASURED WITH 2" PRERESSION MODEL 525K OSCILLOSCOPE FROM POINT INDICATED ON CHASSIS GROUND. POINTS NOT MARKED WERE TAKEN AT POINTS WITH SIGNAL CONNECTIONS AND ALL CONTROLS ADJUSTED FOR A NORMAL PICTURE.
3. NOV. A. DIMENSION MARKS WERE TAKEN AT THESE MARKS WITH SIGNAL CONNECTIONS AND ALL CONTROLS ADJUSTED FOR A NORMAL PICTURE.
4. NOV. A. DIMENSION MARKS WERE TAKEN AT THESE MARKS WITH SIGNAL CONNECTIONS AND ALL CONTROLS ADJUSTED FOR A NORMAL PICTURE.
5. ALL OTHER CONTROLS SET FOR normal OPERATION.
6. CONTROL SETTINGS:
   BRIGHTNESS — LIMITS
   CONTRAST — LIMITS
   S. A. — LIMITS
   H. O. T. — LIMITS CONTROLS, ETC. SHOWN ON SCHEMATIC.

ELECTRONIC TECHNICIAN OJIBWAY BUILDING, DULUTH, MINNESOTA 55802

67
1. All voltages taken under no signal conditions, antenna removed and tuner off channel.
2. Voltages measured with a precision model 88 V.T.V.M. from point indicated to chassis ground.
3. All coil resistances read with coil in circuit.
4. Balloons 1, 2, etc., shown on schematic, indicate waveform test points.

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 2.5 volts at the video output. Voltage readings taken with meter lead filling scope and all resistors set for normal program viewing except photos 1, 2 and 3 where contrast was set for maximum. The voltmeter gains were approximately peak-to-peak values. The frequencies shown are those of the waveforms, not the sweep rates of the oscilloscope. All voltages were taken with a Model 88-1500 Precision Oscilloscope.
These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 3.5 volts at the video detector. Voltage readings taken with the raster just filling screens and all controls set for normal picture viewing, except photocon one and two where contrast controls were set for maximum. The voltages given are approximate peak-to-peak values.

- 8 volts p/p
- 50 volts p/p
- 60 volts p/p
- 60 cps
- 750 cps
- 15.750 cps

Voltage readings taken with the raster just filling screen and all controls set for normal picture viewing, except photocon one and two where contrast controls were set for maximum. All readings were taken with a Model SH-4440 Precision Oscilloscope.

NOTES:

1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNELS.

2. VOLTAGES MEASURED WITH A "PRECISION MODEL ES-416" V.V.M., FROM POINT INDICATED TO CHASSIS GROUND.

3. VOLTAGES MARKED V WERE TAKEN UNDER AVERAGE SIGNAL CONDITIONS. ANTENNA CONNECTED.

4. VOLTAGE READINGS MADE WITH COIL IN CIRCUIT EXCEPT FOR A.R.T. SEC. AND SPEAKER V.C.

5. BULLETIONS 5, 6, ETC. SHOWN ON SCHEMATIC INDICATE PATTERN TEST POINTS.

6. CONTROL SETTINGS:
- VOLUME: MINIMUM
- BRIGHTNESS: MID-RANGE
- CONTRAST: MID-RANGE

ALL OTHER CONTROLS SET FOR NORMAL OPERATION.
Oscilloscope Waveform Patterns

These waveforms were taken with the receiver adjusted for an approximate output of 2.5 V p/p at the video detector. Voltage readings taken with standard testing devices and all controls set for normal picture viewing except for phone 1, 3 and 5 where contrast was at maximum. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms... not the sweep rate of the oscilloscope. All readings taken with Model 55-5006 Precision Oscilloscope.

NOTES:
1. All voltages taken under no signal conditions. Receiver tuned to channel 3 and all controls set for normal picture viewing except for phone 1, 3 and 5 where contrast was at maximum.
2. Voltages measured with a V.T.V.M. from point indicated to chassis ground.
3. Coil resistances read with coil in circuit.
4. All controls set for normal operation.

All voltages taken under no signal conditions. Receiver tuned to channel 3 and all controls set for normal picture viewing except for phone 1, 3 and 5 where contrast was at maximum. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms... not the sweep rate of the oscilloscope. All readings taken with Model 55-5006 Precision Oscilloscope.
RESISTOR VALUES IN OHMS, 2/4000.
CAPACITANCE VALUES (LESS THAN 1 MFD, 2ND DEGREE)
H.F. SPECIAL CIRCUIT METER.
VOLTAGE MEASUREMENTS WITH VOM, AC METER.
INDICATIONS OF VOLTAGE METER INDICATE CIRCUIT VOLTAGE.
RESISTOR IN SERIES WITH METER PROBE.
VOLTAGES MEASURED WITH VOM.
WITHIN ±20% WITH 120VAC SUPPLY.

TV CHASSIS

OJIBWAY BUILDING, DULUTH, MINNESOTA 55802

ELECTRONIC TECHNICIAN

RCA VICTOR

TV Chassis

KCS 142
BALLOONS 1, 2, etc., shown on schematic indicate points of observation of the waveforms. Use low capacity probe when observing waveforms.
RCA VICTOR TV Chassis
KCS 136X

ALL VOLTAGES EXCEPT PEAK-TO-PeAK VOLTAGES MEASURED UNDER NO SIGNAL CONDITIONS WITH TUNER ANTENNA TERMINALS SHORTED & 120 VOLT A.C. SUPPLY.
Balloons 1 2 ETC., shown on schematic indicate points of observation of the waveforms.

Use low-capacity probe when observing waveforms.
OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide band television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak-to-peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corners of the pulses will tend to be more rounded than those shown on the schematic diagram and the amplitude of any high frequency pulse will tend to be less.

DC SOCKET VOLTAGES

All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.

SCHÉMATIQUE IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS.

ALL RESISTANCE VALUES IN OHMS AND HALF WATT UNLESS OTHERWISE SPECIFIED.

ALL CAPACITANCE VALUES LESS THAN 10 IN UQ AND ABOVE 100 UF UNLESS OTHERWISE NOTED.

ALL RESISTANCE VALUES LESS THAN 10 OHM ARE NOT SHOWN.
WESTINGHOUSE
TV Chassis
V-2475-1

NOTES:
1. All capacitance values less than 1 pF are in nF and values greater than 1 pF are in pF.
2. All resistance values are in ohms, 1/2 watt unless otherwise indicated.
3. Waveforms were taken with controls set for normal picture using an Indian head pattern.
4. Makes contact on chan 1.
5. Yellow numbers refer to wave forms.
6. V.S.B.S.-1 cutout is 0.1000A- Safety glass slide required.
7. F.A.C.S. 4- cutout is 0.0050A- No glass slide required.
8. Part of quadruple control assy.

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EELECTRONIC TECHNICIAN

WESTINGHOUSE
TV Chassis
V 2444-1, 2, 3, 5, 9, 10

LATER PRODUCTION V13
PIN PLACED BETWEEN
VID AND V11
WESTINGHOUSE
TV Chassis
V-2446-1, 2, 3, 4

ELECTRONIC TECHNICIAN
TEKFAX

OJIBWAY BUILDING, DULUTH, MINNESOTA 55802
VOLUME CONTROL - SWITCH

FILAMENT (BROWN LEAD)

To VHF A.G.C. (YEL. LEAD)

To VHF A.G.C. (YEL. LEAD)

B+ (RED LEAD)

TEST PLUG CONNECTS TO THE I.F. OUTPUT FROM TUNER

1ST I.F. TRANSFORMER and 47.25 MC TRAP
(TOP SLUG 47.25 ADJACENT SOUND)
(BOTTOM SLUG 1ST I.F. TRANSFORMER)

TEST POINT "E" I.F. A.G.C.

TEST POINT "J" SOUND OUTPUT

2ND I.F. TRANSFORMER

TEST POINT "F" GROUND DURING I.F. ALIGNMENT

TEST POINT "G" DETECTOR OUTPUT

TEST POINT "D" VIDEO OUTPUT

3RD I.F. TRANSFORMER

4TH I.F. TRANSFORMER

TEST POINT "H" SOUND TAKE-OFF COIL

INTERCARRIER COIL

QUADRATURE COIL

PIX CENTERING ADJUSTMENT

VERTICAL LINEARITY

BUZZ CONTROL

A.C. INTERLOCK

VERTICAL SIZE

A.G.C.

WIDTH CONTROL

NOTE: REPLACE TUNER TUBE ONLY WITH TUBE TYPE ORIGINALLY SUPPLIED BY ZENITH, AND STAMPED ON TUNER CHASSIS.

SOUND CIRCUIT

COMPOSITE VIDEO

CYCLES 60

120 VOLTS

VERTICAL CIRCUIT

HORIZONTAL CIRCUIT

INTERMEDIATE FREQUENCY

MODEL 14L20

WATTS 155

AMPS 1.45
TV Chassis 14M23

Electrical schematic diagram for a Zenith TV Chassis 14M23, showing various components and connections such as resistors, capacitors, diodes, and transformers. The diagram includes labels for parts like V3, V4, V5, V6, V7, and V8, indicating their functions and connections within the circuit. The diagram is a detailed technical representation used for troubleshooting and understanding the internal workings of the TV.
SCHEMATIC DATA
Voltages measured terminal to chassis with a volt-ohm meter — no signal and 12 volts applied to the radio. Use VTVM in Trigger Circuit.
Total battery drain 1.2 amps at 12 volts.
Tolerance on voltages ± 10%.
** Before measuring transistor voltage a 10 ohm speaker must be connected to the radio. If power transistor is replaced, adjust bias potentiometer to obtain proper collector voltage with 12 volts applied to radio. Voltage should be measured from power transistor case to ground.
1 El. #64 is a fuse resistor for the power transistor. Service with exact Delco service replacement.
Trigger voltages are read with a VTVM and with the tuner seeking. Use a Delco P-612 power supply or battery for proper tuner action.

SIGNAL INJECTION

<table>
<thead>
<tr>
<th>ISLAND NO.</th>
<th>LOCATION</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>Base of DS-501</td>
<td>Weak</td>
</tr>
<tr>
<td>44</td>
<td>Base of Audio Driver</td>
<td>Loud</td>
</tr>
<tr>
<td>42</td>
<td>Base of Audio Pre Amp</td>
<td>Very Loud</td>
</tr>
<tr>
<td>14</td>
<td>Base of I.F. Amp.</td>
<td>Louder</td>
</tr>
<tr>
<td>9</td>
<td>Base of Converter</td>
<td>Louder</td>
</tr>
<tr>
<td>1</td>
<td>Base of R.F. Amplifier</td>
<td>Very Loud</td>
</tr>
</tbody>
</table>
1. Band switch in AM position.
2. C15 used on models 11R31 and T225A only.
   * Components used on models 11R31, T225A, T225A & T225A only.

UNITED
SCIENTIFIC
LABS
Citizens Band
Transceiver
Contact 23
NOTE: WHEN REPLACING BATTERY, NEW BATTERY MAY READ SEVERAL TENTHS OF A VOLT HIGHER THAN ORIGINAL BATTERY. THEREFORE, VOLTAGES MAY READ SLIGHTLY HIGHER THAN THOSE INDICATED ON BASE LAYOUT.
1. Connect Signal Generator To Signal Output— Dial Setting Adjust for maximum
2. 455 kc Fully Open T4 (3rd IF)
3. 1600 kc Fully Open C18-T (acc. trimmer)
4. Repeat steps 1, 2 and 3
5. Loop of wire placed near antenna
6. 1400 kc 1400 kc (Rock gang) C1A-T (ant. trimmer)
7. 600 kc 600 kc (Rock gang) T1
8. Repeat steps 5, 6 and 7
STEPS:
1. ONLY JUMPER V702-PIN 1 TO GROUND
2. SHORT TP703 IN STEP 3
3. VTVM (ADJUST FOR MAX)
4. R-Y (SCOPE PROBE IN STEPS 4 & 4A)
5. B-Y (SCOPE PROBE IN STEP 4C)
6. G-Y (SCOPE PROBE IN STEP 4B)

Connect Color Bar Generator to receiver antenna terminals & adjust for low level color bar signal.

Adjust T703 & T702 for maximum indication on V.T.V.M. at junction R750B and PIN9-V705.

Ground TP703 to T702 can & adjust L702 for zero beat.

Adjust color bar generator to generate a burst signal.

Connect Color Bar Generator to receiver antenna terminals & adjust for low level color bar signal.

Adjust T703 & T702 for maximum indication on V.T.V.M. at junction R750B and PIN9-V705.
Voltages and currents shown are measured with 1000 ohms per volt meter and at transistor stages with VTM of more than 10 megohms input resistance, in "Playback" position. Values in parenthesis ( ) are valid for "Record" only. Values in brackets [ ] refer to neg. side of C601 or C602. Schematic is shown in "Playback" position at 33 1/3 ips. Numbers and letters in layout drawings of switches correspond with those in schematic. 

1 = Values for radio tests taken with audio voltmeter input impedance ≥ 1 MΩ.
Voltages and currents shown are measured with
1000-ohms-per-volt meter and at transistor stages
Numbers and letters in layout drawings of switches
correspond with those in schematic.
Values in brackets ( ) are valid
for "Record" only. Values in brackets [ ] refer to neg.
side of C 501 or C 502.

Schematic is shown in "Playback" position at 3'/ips.
Numbers and letters in layout drawings of switches
in "Playback" position. Values in brackets ( ) are valid
for "Record" only. Values in brackets [ ] refer to neg.
side of C 501 or C 502.
GENERAL ALIGNMENT CONDITIONS

1. Connect low side of signal source and output indicator to chassis ground unless otherwise specified. Ground connection should be kept close to high side connection.
2. Signal input should be kept as low as possible to avoid AVC action. (Set output indicator to highest sensitivity.)
3. Markers should be accurate (crystal controlled or checked against a crystal calibrator). The 10.7 MHz marker used in each section of the FM alignment should be the same (generator dial should not be changed).
4. Marker insertion and amplitude should not distort the oscilloscope trace.
5. Standard Modulation is 400 cycles at 30% amplitude.
6. Volume or loudness control should be turned to maximum and tone controls to mid-position when they are between signal source and output indicator. AFC switch OFF.
7. Place dial Escutcheon on chassis.
8. Set function switch to band being aligned.
CRITICAL LEAD DRESS

RC-1211A

1. C66-C67 (.047 caps. across S4 switch contacts) must be dressed with bodies as far as possible away from and perpendicular to white wire on V11A pin 2.

2. R42, R12, R5 to be dressed up and away from chassis as far as possible for maximum circulation of air.

3. Wires from V11 pins 2 & 7 to terms. 3 & 1 of balance control R89, should be dressed to form an arc from as far as possible for maximum circulation of air.

4. All audio wires to and from function switch must be dressed down against chassis.

5. Green wire from top of matrix control to C47 must be dressed in an arc as far away from adjacent parts as possible.

6. Lead from AM gang C6SC to AM oscillator coil L2 should be dressed close to chassis bottom surface.

7. R32 should be dressed away from oscillator coil L2 and other adjacent parts for best air circulation.

8. Keep all filament leads as flat against chassis as possible.

9. R94, 1 meg resistor from V3 pin 1 to test point, must be dressed vertical to chassis bottom.

10. Blue and yellow leads from tone controls to terminal board must be routed between terminal board and adjacent ground lane and toward apron away from V11.

11. Any ferrite bead from T5 term. 3 must be routed away from T4 term. A and away from alignment hole of T4.

12. Blue wire from V2 pin 8 to T5 term. 1 must be dressed away from Black wire of item 11 and alignment hole of T5.

13. All resistors one watt and greater, should be dressed away from adjacent parts for best air circulation.

14. Black and red wires from J11 to S4 switch contacts shall be dressed away from PC3.

RS-204A

1. Dress all heater leads flat along bottom of chassis.

2. Dress R402 as far away from pins 4 and 5 of V404 as possible.

3. Dress all power resistors (R401 thru R406) away from all leads.

CHASSIS REMOVAL

The top of the record changer compartment comprises the complete chassis. It rests on and is secured to a ledge at the front and is held by screws at the rear. The recommended procedure for its removal is as follows:

1. Remove knobs.
2. Open small access panel as described in “Access to Chassis.”
3. Position two (2) holes in access panel over screws holding power cord interlock.
4. Remove two (2) machine screws holding interlock.
5. Pull record changer drawer down.
6. Un-screw two (2) bolts securing record changer in drawer. (Lift mat of turntable and reach bolts through access holes in turntable, one at front and one at rear.) DO NOT ATTEMPT TO REMOVE RECORD CHANGER DRAWER.
7. Lift up changer and disconnect cables.
8. Remove four (4) #8 slotted screws holding front of chassis to horizontal ledge located inside of compartment at front of top.
9. Remove wires, running down each back corner of compartment, from holding clips.
10. Remove four (4) #8 slotted screws holding rear of chassis to rear of instrument—just below the access panel. (Hold chassis—top of compartment—to prevent its falling.)
11. Chassis may then be lowered and removed.
12. Disconnect speaker cables from transformers and lift chassis out of case.
TO REMOVE AND REPLACE THE TURNTABLE

To remove the turntable, slide off turntable clip end lift the turntable with equal pressure on opposite sides.

LUBRICATION

The motor, turntable and idler wheel bearings are of the oil-retaining type and rarely need lubricating. When the need for oil is apparent, remove the turntable and lubricate these bearings with a fine grade of machine oil. Carefully remove all traces of surplus oil especially from the motor pulley, idler wheel tire and inside of turntable rim.

TONE ARM HEIGHT

The tone arm height is adjusted by turning screw (4) located at the rear of the tone arm. The height should be adjusted so that the stylus point is 2/32" above the turntable surface as the tone arm returns to its rest.

RECORD SPINDLE ASSEMBLY

Place the record spindle in position and rotate it until location is felt, then press firmly downwards to secure in turntable clip.

STYLUS SET-DOWN POSITION

To adjust the stylus set-down position lift the tone arm to gain access to stylus set-down adjustment screw (16). To move the tone arm away from the center of the record, turn screw (16) counterclockwise; to move the tone arm toward the center of the record, turn screw (16) clockwise.

STYLUS PRESSURE

The stylus pressure should be 5 grams ± 1 gram. It is recommended that a periodical check be made to see that the correct pressure is maintained. To adjust the stylus pressure, turn adjusting nut (9) clockwise to decrease and counterclockwise to increase stylus pressure.

MOTOR PULLEY AND IDLER WHEEL HEIGHT

The relative height of the motor pulley and idler wheel (33) must be such that, when they are in contact on either the 16, 33 or 45 rpm steps, the lower face of idler wheel (33) is about 1/64" clear of the adjacent pulley step.
**ELECTRONIC TECHNICIAN**

**WESTERN AUTO**

Tape Recorder Stock No.

4DC7260A

**BIAS VOLTAGE 72 V.A.C.**

Measured in Record Position.

- **Resistance in Ohms unless otherwise indicated. All measurements made in “play” position.**

**DC Voltage Measurements taken with medium tube voltmeter. AC voltages measured at 1000 ohms per volt.**

- **Socket connections are shown as bottom views.**
- **Voltages maintained at 117 V.**
- **No signal applied.**

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**BIAS VOLTAGE 72 V.A.C.**

- **Eye Tube does not indicate Record/Playback level.**
  - Possible Cause: Defective tube. (V-6).
  - Remedy: Replace.
- **No output from Internal Speaker.**
  - Possible Cause: Cold solder connection at slide switch.
  - Remedy: Reheat solder connection.
- **Distortion. (Not contributed to Wow.)**
  - Possible Cause: Extension Speaker Jack open, Internal Speaker normal.
  - Remedy: Check circuit with ohmmeter.
- **Low Output.**
  - Possible Cause: Insufficient Bias.
  - Remedy: Check output of oscillator coil.
- **No Erase.**
  - Possible Cause: No B-Plus.
  - Remedy: Check circuit with ohmmeter.
- **Excessive hiss on Record and Playback.**
  - Possible Cause: Open 50K Resistor (R-10), Noisy 6AV6.
  - Remedy: Check and replace if necessary.
- **Playback but will not Record.**
  - Possible Cause: Defective Oscillator.
  - Remedy: Check and replace if necessary.
- **Tubes will not light.**
  - Possible Cause: Defective interlock.
  - Remedy: Check and replace if necessary.
- **No Playback or Record.**
  - Possible Cause: Defective filter capacitor.
  - Remedy: Check and replace if necessary.

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**FUNCTION CONTROL does not lock.**

- **Possible Cause:** Set screw loose.
- **Remedy:** Tighten locking nut (M-42).

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**ELECTRICAL TROUBLE CHART**

**MECHANICAL TROUBLE CHART**

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**SYMPTOM**

**POSSIBLE CAUSE**

**REMEDY**