

CABINET-REAR VIEW

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

Remove six screws holding cabinet back. Release AC cord and remove cabinet back. Disconnect HV anode, CRT socket, deflection yoke connector, degaussing coil connector, speaker connector, ground leads, and all required cabling. Release two latches holding main board in cabinet frame. Slide main board out of frame and cabinet.

CRT REMOVAL

Follow "Chassis Removal" procedure and lay set facedown on a soft protective surface. Loosen and remove CRT neck assemblies. Remove four screws holding CRT to cabinet front and lift CRT out of cabinet. Do not lift CRT by the neck.

SERVICING IN THE FIELD

CRT IMPLOSION PROTECTION AND CLEANING

Implosion protection is an integral part of the picture tube, cleaning accomplished without CRT removal.

FUSE DEVICES

A 1-amp fuse is used for low-voltage power-supply protection. (See photo, Main Board - Top View.)

A 4-amp is used for AC line protection. (See photo, Main Board - Top View.)

VHF/UHF TUNER

See Miscellaneous Adjustments.

CHANNEL TUNING

Channel Up and Down buttons are provided for channel scanning with ten numbered buttons (on remote transmitter) provided for one or two digit entry direct access channel selection. Fine tuning is automatic.

HIGH VOLTAGE

For high voltage procedure, refer to Miscellaneous Adjustments.

FOCUS

The focus may be varied by a focus control. (See photo, Cabinet - Rear View.)

AGC

The RF AGC may be varied by an RF AGC control. (See photo, Main Board - Top View.)

CHASSIS REMOVAL

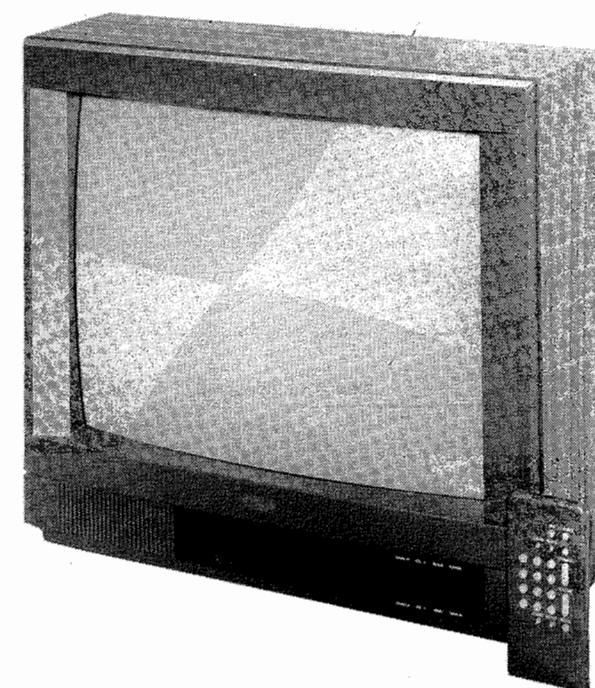
SET 2707 FOLDER 1

SAMS

PHOTOFACT®

For Supplier Address See PHOTOFACT Index

GE
CHASSIS CTC146B/C



Representative model

SAFETY PRECAUTIONS

See Page 1.

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Howard W. Sams & Company

2647 Waterfront Parkway, East Drive, Suite 300, Indianapolis, Indiana 46214 U.S.A.

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co. as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co. by the manufacturers of the particular type of replacement part listed.

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SET 2707 FOLDER 1



10 9 8 7 6 5 4 3 2 1

GE
CHASSIS CTC146B/C

SET 2707 FOLDER 1

SAFETY PRECAUTIONS

SERVICE WARNING

Service work should be performed only by qualified service technicians who are familiar with safety checks and guide lines.

1. For continued safety, no modification of any circuit should be attempted unless recommended by manufacturer.
2. Disconnect power source before replacing parts as some parts may be electrostatic sensitive.
3. Use an isolation transformer between the line cord and power receptacle, when servicing chassis.

SERVICING HIGH VOLTAGE AND PICTURE TUBE

When servicing the High Voltage circuits, extreme caution should be used.

1. Discharge static High Voltage by connecting a 10 kohms resistor in series with a test lead between chassis and anode lead of picture tube.
2. Wear shatter-proof eye protection (goggles) when handling the picture tube in case of implosion.
3. DO NOT lift picture tube by the neck.

X-RAY RADIATION AND HIGH VOLTAGE LIMITS

Service personnel should be aware of the procedures and instructions covering x-ray radiation. The only potential source of x-ray in present day solid state receivers and monitors is the picture tube.

1. It is only when High Voltage is excessive that x-ray radiation is capable of being emitted from shell of picture tube. Be sure the High Voltage is set at specified level.
2. An accurate High Voltage meter should be available at all times. Meter calibration should be checked periodically.
3. High Voltage should be kept at rated value - NO HIGHER. Higher voltages may cause x-ray radiation or failure of other associated components. DO NOT depend on protection circuit to keep voltages at rated value.
4. Every time a chassis is serviced, High Voltage should be checked at various brightness levels to be sure it is regulating properly.
5. While troubleshooting a set with excessive High Voltage, avoid being close to picture tube. DO NOT operate longer than it is necessary to locate the cause of excessive High Voltage. Use a variable AC transformer to regulate voltage.
6. Many components, electrical and mechanical, in present chassis have safety related characteristics which are not evident with visual inspection. When these components are known, they are identified with a # on the schematic and in the parts list. When replacing these components, for SAFETY, use only an equivalent replacement part.

SAFETY CHECKS-FIRE AND SHOCK HAZARD

Cold Leakage Checks (Sets with isolated ground.)

1. Unplug the AC cord and connect a jumper across the two prongs on the plug.
2. Turn on power switch.
3. Measure the resistance, with an Ohm meter, between the jumpered AC plug and any exposed metal cabinet parts on the set such as: antenna screw heads, control shafts, handle brackets. Exposed metal parts that have a return path should measure between 200 kohms and 5 megohm. Parts without a return path must measure infinity.

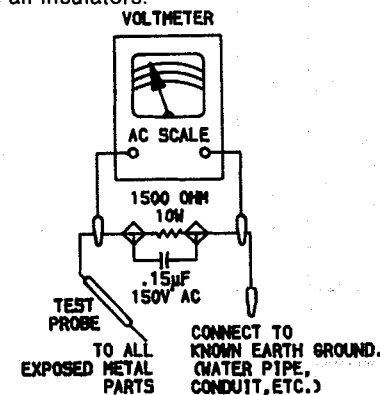
Leakage Current Hot Check

1. Plug the AC cord directly into AC outlet. DO NOT use an isolation transformer.
2. Connect a 1500 Ohm 10 watt resistor, in parallel with a .15 μ F 150V AC capacitor, between any exposed metal parts on the set and a good earth ground such as a water pipe. (See Figure below.)
3. Using an AC volt meter, with 1000 Ohms per volt or more sensitivity, measure the voltage across the resistor. Check each exposed part and measure voltage at each point.
4. Reverse the AC plug and repeat voltage measurement at each point.
5. The voltage at any point should not exceed .75 volts RMS. This corresponds to .5 milliamps AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected.

GENERAL GUIDE LINES

A final SAFETY check before returning the set to customer.

1. Check area repaired for poorly soldered or de-soldered connections. Check entire circuit board surface for solder splashes.
2. Check interboard wiring for pinched wires or wires contacting any high-wattage resistors.
3. Check that all control knobs, shields, covers, grounds and mounting hardware have been replaced. Be sure to replace all insulators.



TROUBLESHOOTING AID

Note: Waveforms taken with triggered scope, Keyed-Rainbow generator. Schematic voltages measured with digital meter, no signal. Controls adjusted for normal operation.

PICTURE OR SOUND

NO PIC, NO SOUND, NO RASTER: Check AC power supply and sources generated from Horizontal Output Transformer (T402). Refer to "Troubleshooting" Power Supply and Horizontal circuits.

NO PIC, NO SOUND, HAS RASTER: Check IF-AGC and source voltages from Horizontal Output Transformer (T402). Refer to "Troubleshooting" IF-AGC and Horizontal circuits.

NO PIC, HAS SOUND, NO RASTER: Check Horizontal Output Transformer (T402) sources and Video circuit. Refer to "Troubleshooting" Horizontal and Video circuits.

NO PIC, HAS SOUND, HAS RASTER: Refer to "Troubleshooting" Video circuit.

HAS PIC, NO SOUND: Refer to "Troubleshooting" Audio circuit.

OVERLOADED PICTURE: Refer to "Troubleshooting" IF-AGC circuit.

LOW OR EXCESSIVE BRIGHTNESS: Check Video and Luminance circuits. Refer to "Troubleshooting" Video circuit.

SWEEP

NO RASTER, HAS SOUND: Check HV rectifier, Part of Horizontal Output Transformer (T402). Refer to "Troubleshooting" Horizontal circuit.

NO RASTER, NO SOUND: Refer to "Troubleshooting" Horizontal circuit.

NO VERT DEFLECTION: Refer to "Troubleshooting" Vertical circuit.

POOR VERT LIN OR FOLDOVER: Refer to "Troubleshooting" Vertical circuit.

POOR HORIZ LIN OR FOLDOVER: Refer to "Troubleshooting" Horizontal circuit.

NARROW PICTURE: Refer to "Troubleshooting" Horizontal circuit.

VERT OFF FREQUENCY: Refer to "Troubleshooting" Vertical circuit.

HORIZ OFF FREQUENCY: Refer to "Troubleshooting" Horizontal circuit.

SYNC

NO VERT/HORIZ SYNC: Refer to "Troubleshooting" Sync circuit.

RASTER

YELLOW (NO BLUE): Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

CYAN (NO RED): Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

MAGENTA (NO GREEN): Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

COLOR (B/W operating normally)

NO COLOR: Refer to "Troubleshooting" Chroma circuit.

WEAK COLOR: Refer to "Troubleshooting" Chroma circuit.

NO COLOR SYNC: Refer to "Troubleshooting" Chroma circuit.

NO GREEN: Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

NO BLUE: Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

NO RED: Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

INCORRECT HUE (TINT): Refer to "Troubleshooting" Chroma circuit.

TEST EQUIPMENT

Test Equipment listed by Manufacturer illustrates typical or equivalent equipment used by SAMS' Engineers to obtain measurements and is compatible with most types used by field service technicians.

Equipment	B&K Precision Equipment No.	Sencore Equipment No.	Notes
OSCILLOSCOPE	1541A, 2120, 2125, 2160	SC61	
GENERATORS			
RGB	1249, 1260	RG67	
MULTIBURST SIGNAL	1251, 1260	VA62A	
COLOR BAR	1211A, 1249, 1251, 1260	VA62A, CG25, NT64	
ANALOG VOM	114, 117, 177, 214		
DIGITAL VOM	388HD, 2900 SERIES	DVM37, DVM56A, SC61	
FREQUENCY METER	1803, 1804, 1805	FC71, SC61	
HI-VOLTAGE PROBE	HV-44	HP200	
VOM/DMM		TP212	
Accessory probes	PR-28(HV)		
ISOLATION TRANSFORMER	TR110, 1604, 1653, 1655	PR57	
CAPACITANCE ANALYZER	820, 810, 830	LC76, LC101, LC102	
CRT ANALYZER	467, 470, 480, 490	CR70	
TEMPERATURE PROBE	TP-28, TP-30		
AC LEAKAGE TESTER	1655	PR57	
LOGIC PROBE	DP51, DP21		
LOGIC PULSER	DP101, DP31		
INDUCTANCE ANALYZER	875A	LC76, LC101, LC102	
FLYBACK YOKE TESTER	875A	VA62A, LC76, LC101, LC102	
TV STEREO GENERATOR	2009	ST65, ST66	
TV STEREO POWER MONITOR		SR68	
FIELD STRENGTH METER		FS73, FS74	
TRANSISTOR TESTER		TF46	
VIDEO ANALYZER		VA62A	

TV ALIGNMENT INSTRUCTIONS

Use an isolation transformer and observe power supply polarity. Maintain line voltage at 120V AC. Allow a 20-minute warm-up period for receiver and test equipment.
Suggested Alignment Tools: GC-THORSEN

PRELIMINARY INSTRUCTIONS

Set the channel selector to the highest unused channel. Set scope sweep to external. Connect scope vertical input to scope vertical input on sweep/marker generator. Connect scope external horizontal input to scope horizontal input on sweep/marker generator. Ground test equipment to TV chassis unless specified otherwise. Use only enough generator output to provide a usable indication.
Note: Response may vary slightly from that shown.
Connect a 5.5V - 6.0V Bias to TP2305.

VIDEO IF ALIGNMENT (SWEEP MARKER GENERATOR)

DIRECT PROBE FROM SWEEP/MARKER GENERATOR	SWEEP GENERATOR OUTPUT	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	REMARKS
TP2307	TP2303	44MHz (10MHz Sweep)	45.75MHz	Adjust L2304 for best overall symmetry and position of marker as shown. See Figure 1.

TV ALIGNMENT INSTRUCTIONS (Continued)

VIDEO IF ALIGNMENT (BAR SWEEP GENERATOR)

BAR SWEEP GENERATOR	SCOPE INPUT	REMARKS
Antenna Terminal TP2307		Perform Video IF Adjustments per SWEEP/MARKER GENERATOR instructions. See Figure 2.

SOUND IF ALIGNMENT

Tune in a station and adjust L1201 for maximum sound. Reduce signal strength at the antenna terminals until distortion appears. Continue to reduce the signal while aligning for undistorted output by adjusting L1201.

AUTOMATIC FINE TUNING ALIGNMENT

Connect as explained in preliminary instructions unless specified otherwise. Connect a 6.0V Bias to TP2305. Set AFT R2323 fully clockwise, perform instructions below. Adjust R2323 for 1.0VDC at TP2342 after L2303 has been adjusted.

DIRECT PROBE FROM SWEEP/MARKER GENERATOR	SWEEP GENERATOR OUTPUT	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	REMARKS
TP2342	TP2303	44MHz (10MHz Sweep)	45.75MHz	Adjust L2303 to place 45.75MHz marker at crossover. See Figure 3.

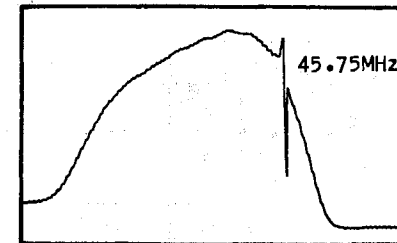


Figure 1

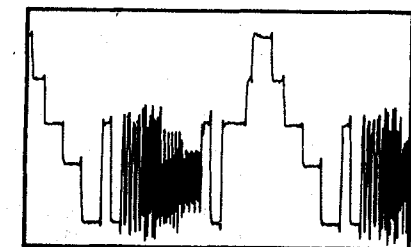


Figure 2

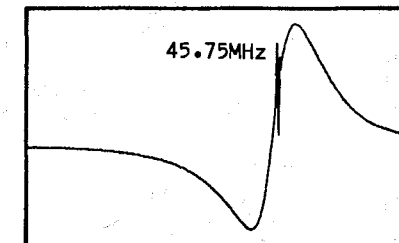


Figure 3

TEST JIG HOOKUP

FUNCTION	Chek-A-Color ADAPTER NO.	P.C. BOARD PLUG # J451	PIN 1	RED
			PIN 3	BLUE
			PIN 4	YELLOW
			PIN 5	BLACK
CRT YOKE YOKE SETTING	B239 D482 YP3 FOCUS TAP			

TROUBLESHOOTING

POWER SUPPLY

Check the AC Fuse (F4101) and DC Fuse (F4102). If Fuse F4101 is open, check Bridge Rectifier Diodes (CR4101 thru CR4104), Capacitors C4102 thru C4105 and Electrolytic C4106. If Fuse F4102 is open, check Power Regulator (Q4102) and Horizontal Output Transistor (Q4402). Apply 120V and check for 150V at the cathode of CR4103. If 150V is missing at the cathode of CR4103, check Line Filter (L4101), Power Relay (RL4101) and Resistor (R4101). If 150V is present at the cathode of CR4103, check for 140V at TP4110. If this voltage is missing, check voltages and components associated with Q4102, Q4402, and Driver Transistor (Q4103). If the proper voltage is present at TP4110, refer to the "Horizontal" section of this Troubleshooting guide. If 150V is present at the cathode of CR4103 and there is clicking sound, the set may be in shutdown. Refer to the "High Voltage Shutdown" section of this Troubleshooting guide.

HORIZONTAL

Determine if the TV is in shutdown, refer to the "High Voltage Shutdown" section of this Troubleshooting guide. If the TV is not in shutdown, inject a horizontal signal at the base of the Horizontal Output Transistor (Q4402). If horizontal deflection is now present, check the voltages, waveforms and components associated with pins 58 thru 64 of the IF/SIF/Chroma/Vert/Horiz/AFT IC (U1001) and the Horizontal Driver Transistor (Q4401). If there is no horizontal sweep, check the voltages, waveforms and components associated with Horizontal Drive Transformer (T4401) and Q4402. Check voltages and components associated with Diodes CR4108, CR4401 and CR4405 for defects. The high voltage rectifier is part of Transformer T402 and if defective will affect the performance of the horizontal circuits. If the horizontal oscillator is off frequency, check the voltages, waveforms and components associated with pins 61, 62 and 63 of U1001. Horizontal linearity or foldover problems may be caused by Capacitors C4416 and C4417 being defective.

HIGH VOLTAGE SHUTDOWN

The high voltage is monitored by Diode CR4401, rectifying pulses from the Horizontal Output

Transformer (T402). Should the high voltage increase, the rectified voltage at the cathode of Diode CR4401 will also increase and trigger X-radiation Protect Circuit at pin 1 of U1001. To troubleshoot, remove CR4401 from the circuit and use a variac for AC power. Start at 90V AC and increase as necessary to locate and repair the defect. Return CR4401 to the circuit. NOTE: Care should be taken in defeating the high voltage shutdown circuit, as this may cause excessive X-radiation and damage to the CRT, Transformer T402 and associated components. Monitor the high voltage and troubleshoot.

Voltages Taken with TV in Shutdown

	U1001	
Pin 1		0.0V

HIGH VOLTAGE SHUTDOWN TEST

Apply 120V AC, turn set On, set all customer controls for normal operation and short XRP4001 to XRP4002. Set should lose raster and sound. The set will turn back On after 2 seconds. If the short is still present it will again go into shutdown for 2 seconds. If set does not lose raster and sound, the shutdown circuit should be repaired. To resume normal operation, remove AC power and wait 30 seconds then turn set On.

IF-AGC

Inject a video IF signal at the IF Input and check for video on the CRT. If video is present, check the tuner, tuner control and tuner AFC circuits. If there is no video on the CRT, check for a video waveform at TP2307. If video is present at TP2307, refer to the "Video" section of this Troubleshooting guide. If there is no video at TP2307, apply AGC bias to TP2305 of IF/SIF/Chroma/Vert/Horiz/AFT IC (U1001). If video is now present at TP2305, check the voltages, waveforms and components associated with pins 18, 22 and 46 of U1001. If there is still no video at TP2307, check the voltages, waveforms and components associated with pins 18 thru 24, 42 thru 47 of U1001, IF Amp Transistor Q2301 and Video Amp Transistor Q2302. A defective AGC circuit can cause an overloaded picture, excessive snow or loss of audio and video. See the AGC Voltage Chart for AGC voltages with signal.

TROUBLESHOOTING (Continued)

AGC Voltage Chart

	U1001
Pin 18	2.2V
Pin 22	8.7V
Pin 46	8.4V

VIDEO

Inject a video signal at TP2307 and check for video on the CRT. If video is present, refer to the "IF-AGC" section of this Troubleshooting guide. If there is no video on the CRT, check for a video waveform at TP2712. If video is missing at TP2712, check the voltages, waveforms and components associated with TP2712. If video is present at TP2712, check for a video waveform at pin 13 of IF/SIF/Chroma/Vert/Horiz/AFT IC U1001. If the waveform is missing, check the voltages, waveforms and components associated with pins 8, 13 thru 17 and 51, 52, 53 of U1001. If the waveform is present at pin 13 of U1001, check the voltages, waveforms and components associated with Output Transistors (Q5001, Q5002, Q5003) and Luminance Buffer Transistor (Q2901). If the brightness is inadequate or cannot be controlled, check the voltages, waveforms and components associated with pin 15 of U1001, it should be 0.6V at MINIMUM and 2.1V at Maximum.

CHROMA

Check for a chroma waveform at pin 49 of the IF/SIF/Vert/Horiz/AFT IC (U1001). If the waveform is missing, check the components associated with pin 49. If a chroma waveform is present at pin 49, check for the proper chroma waveforms at pins 9, 10 and 11 of U1001. If these waveforms are missing, check the voltages, waveforms and components associated with pins 2 thru 12, 48 and 49 of U1001. Check the 3.58MHz oscillator at pins 4 and 6. Check the voltages and components associated with the color control at pin 17 of U3300. It should be 0.7V at MINIMUM and 7.8V at Maximum. If there is inadequate tint range, check the voltages, waveforms and components associated with the tint control at pin 18 of U3300. It should be 9.3V at MINIMUM and .1V at Maximum. If the proper chroma waveforms are present at pins 9, 10 and 11 of U1001, refer to the "Raster" section of this Troubleshooting guide.

VERTICAL

Inject a vertical deflection signal at pin 54 of the IF/ SIF/ Chroma/ Vert/ Horiz/ AFT IC (U1001). If vertical deflection is now present, check the voltages, waveforms and components associated with pins 54 and 55 of U1001. If there is still no vertical sweep, check the voltages, waveforms and components associated with the Vertical Output IC (U4501). Vertical linearity or foldover problems may be caused by vertical feedback and bias circuits, check Electrolytics C4501, C4503, C4504, C4505, C4510 and C4511 for defects.

SYNC

If there is no vertical or horizontal sync, check the voltages, waveforms and components associated with pins 57 and 58 of IF/SIF/Chroma/Vert/Horiz/AFT IC (U1001). If there is no vertical sync, check the voltages, waveforms and components associated with pins 54 thru 58 of U1001. If there is no horizontal sync, check the voltages and components associated with pins 57 thru 62 of U1001.

RASTER

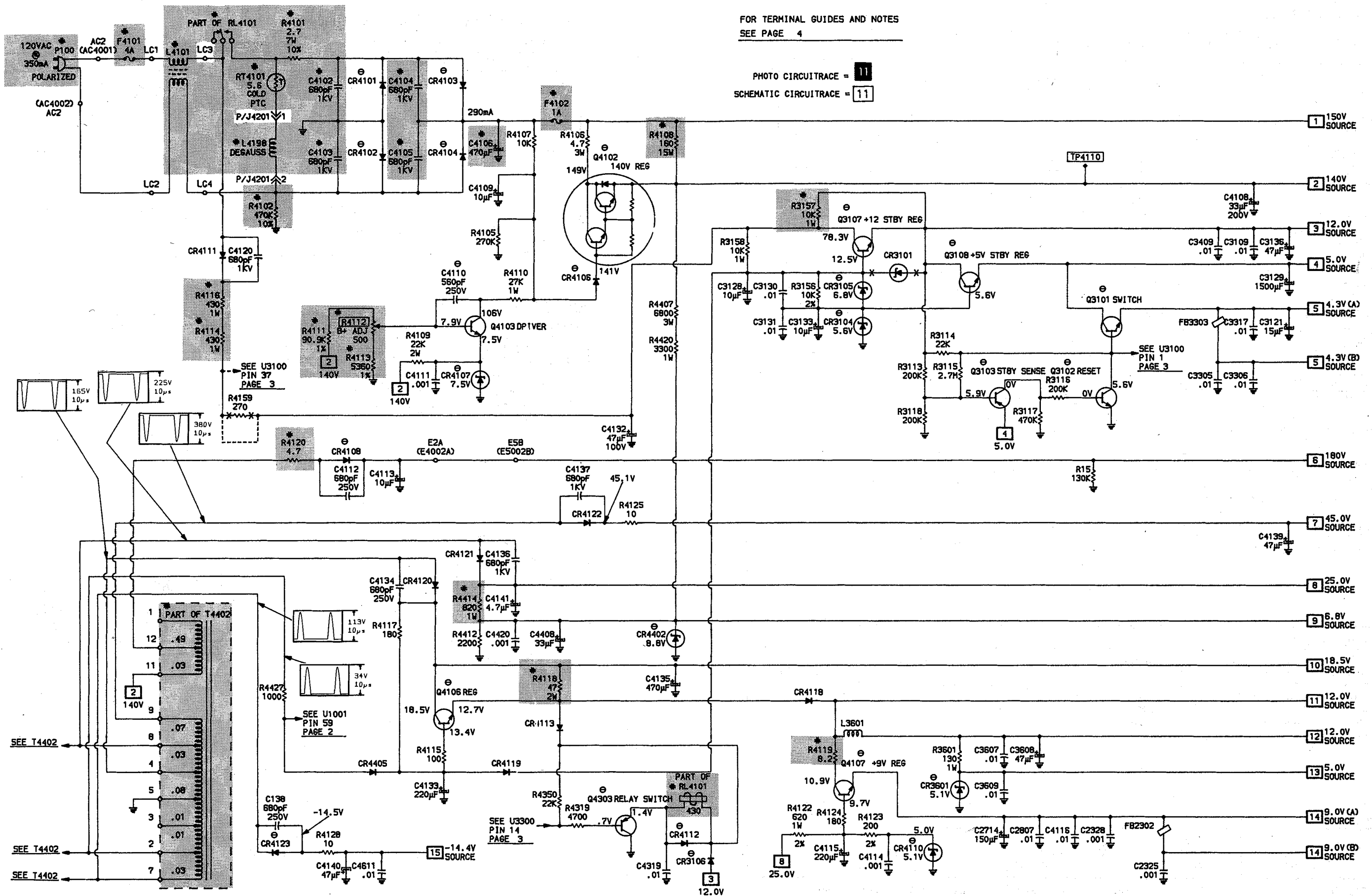
Check the CRT and CRT voltages. If there is no Red, check the voltages and components associated with pin 9 of the IF/SIF/Chroma/ Horiz/Vert IC (U1001) and Red Output Transistor (Q5001). If there is no Green, check the voltages and components associated with pin 10 of U1001 and Green Output Transistor (Q5002). If there is no Blue, check the voltages and components associated with pin 11 of U1001 and Blue Output Transistor (Q5003). If the raster has a keystone shape, check the Deflection Yoke (L501). If the raster has height or width problems, refer to the "Vertical", "Horizontal" and "Power" sections of this Troubleshooting guide.

AUDIO

Select an active TV channel and check for an audio waveform at pin 28 of the IF/SIF/Chroma/ Vert/Horiz/AFT IC (U1001). If there is no audio, check the voltages, waveforms and components associated with pins 25 thru 42 of U1001. If waveform is present, check for an audio waveform at Speaker SP1. If audio is missing, check the voltages, waveforms and components associated with the Audio Amp Transistor (Q1201) and Output Transistors (Q1202, Q1203). Check the voltage at pin 30 of U1001, it should measure 1.5V at mute and 5.0V at Maximum volume.

FOR TERMINAL GUIDES AND NOTES
SEE PAGE 4

PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11



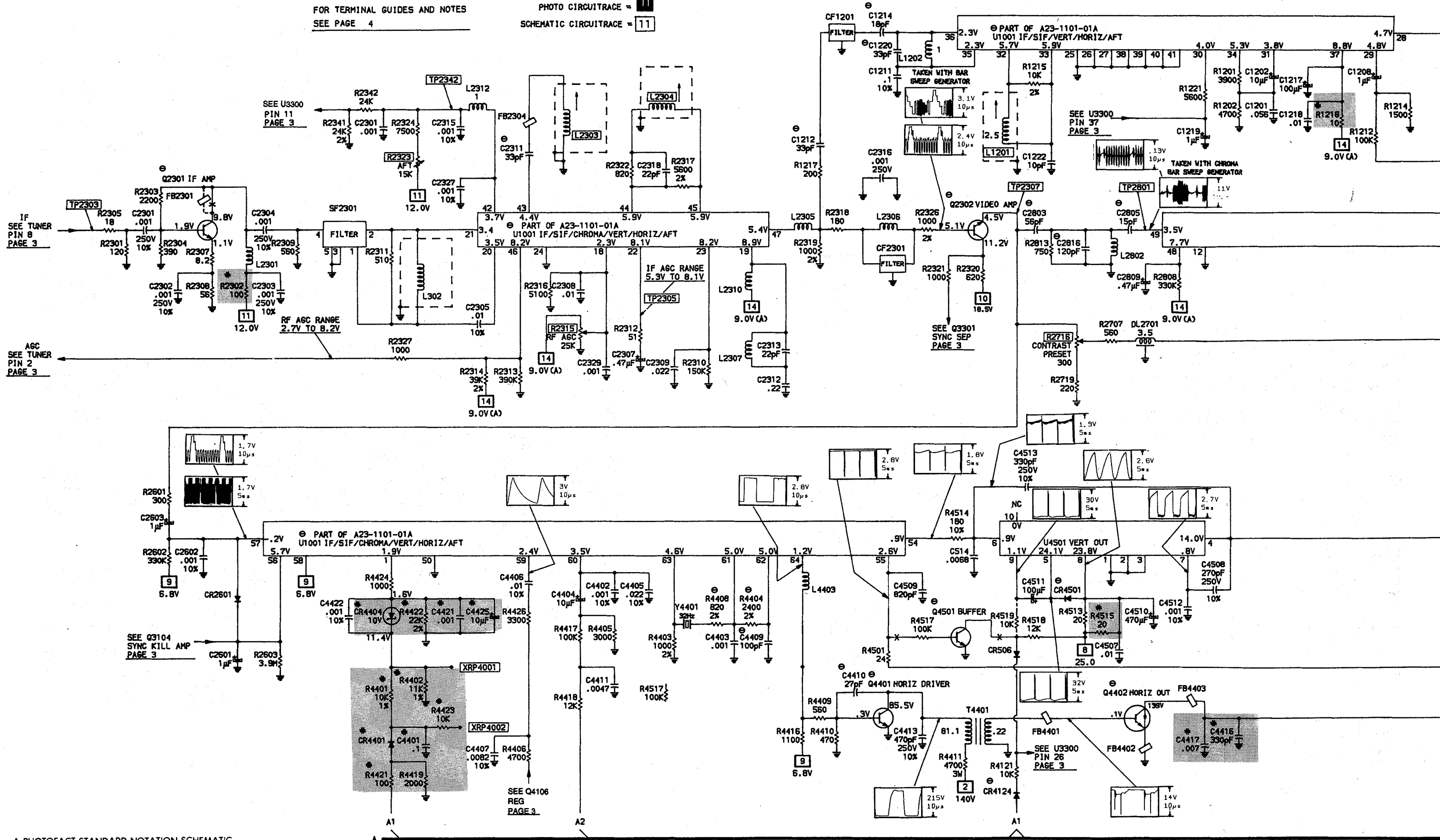
A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE

POWER SUPPLY

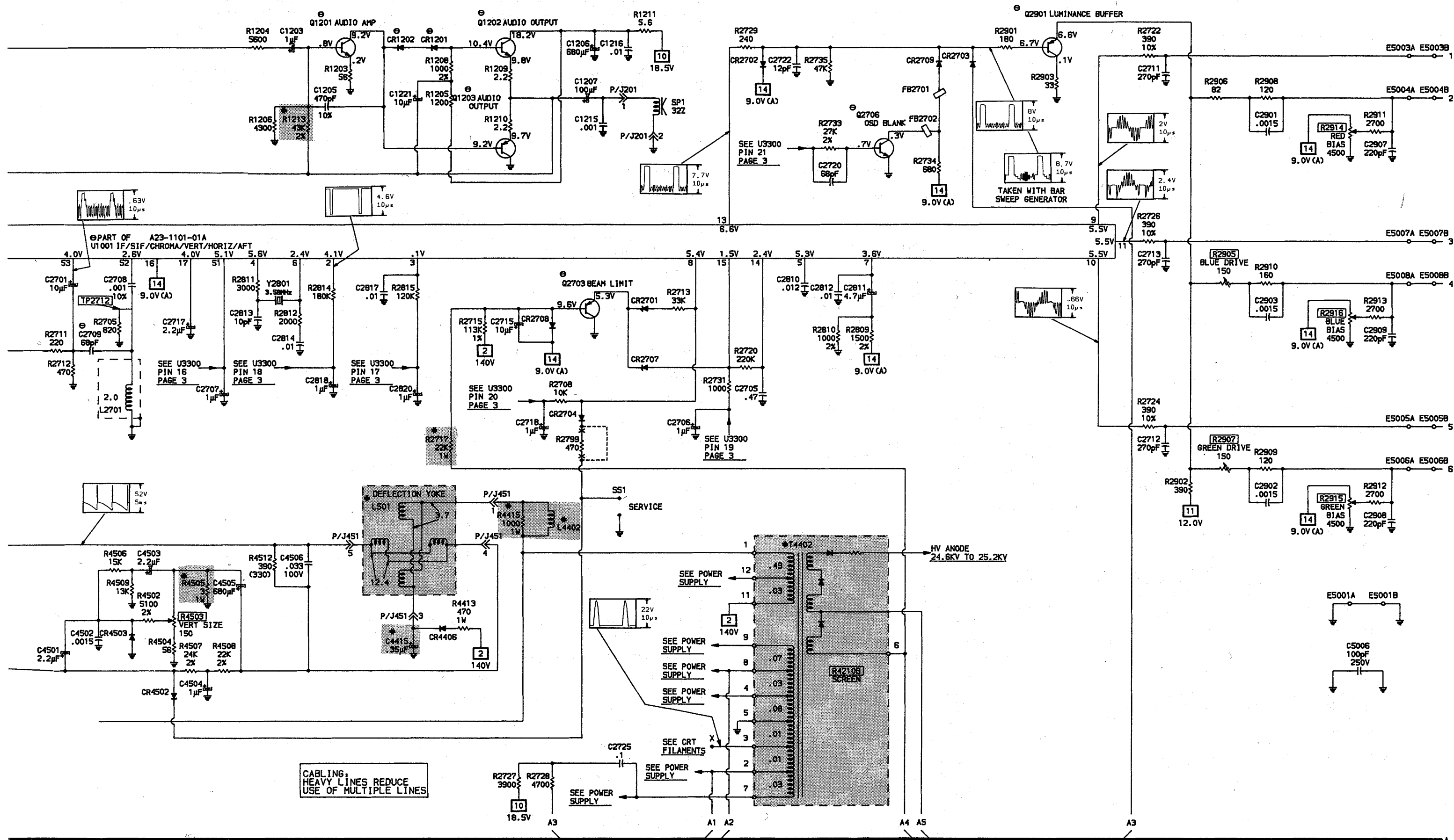
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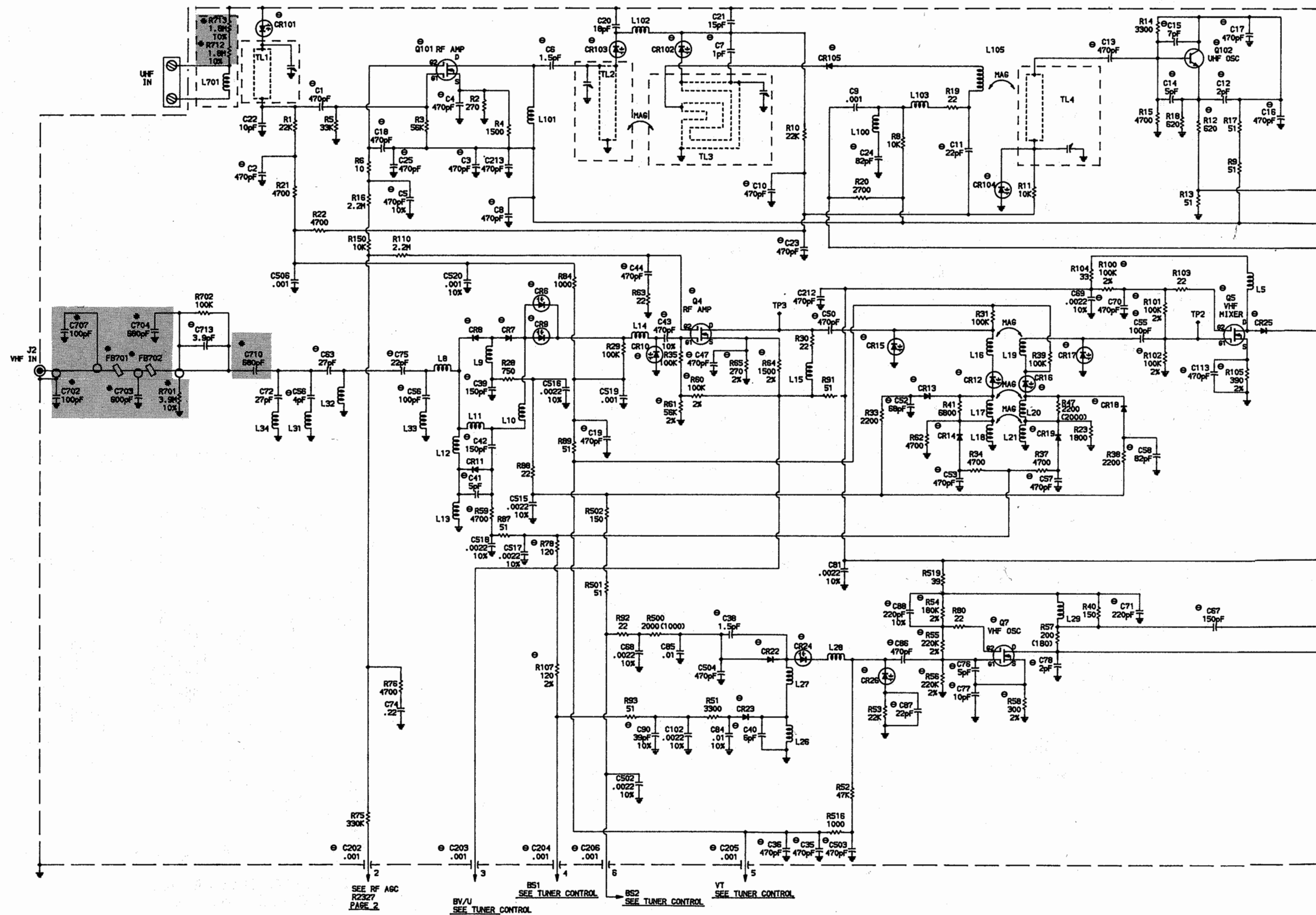
FOR TERMINAL GUIDES AND NOTES
SEE PAGE 4

PHOTO CIRCUITACE = 11
SCHEMATIC CIRCUITACE = 11

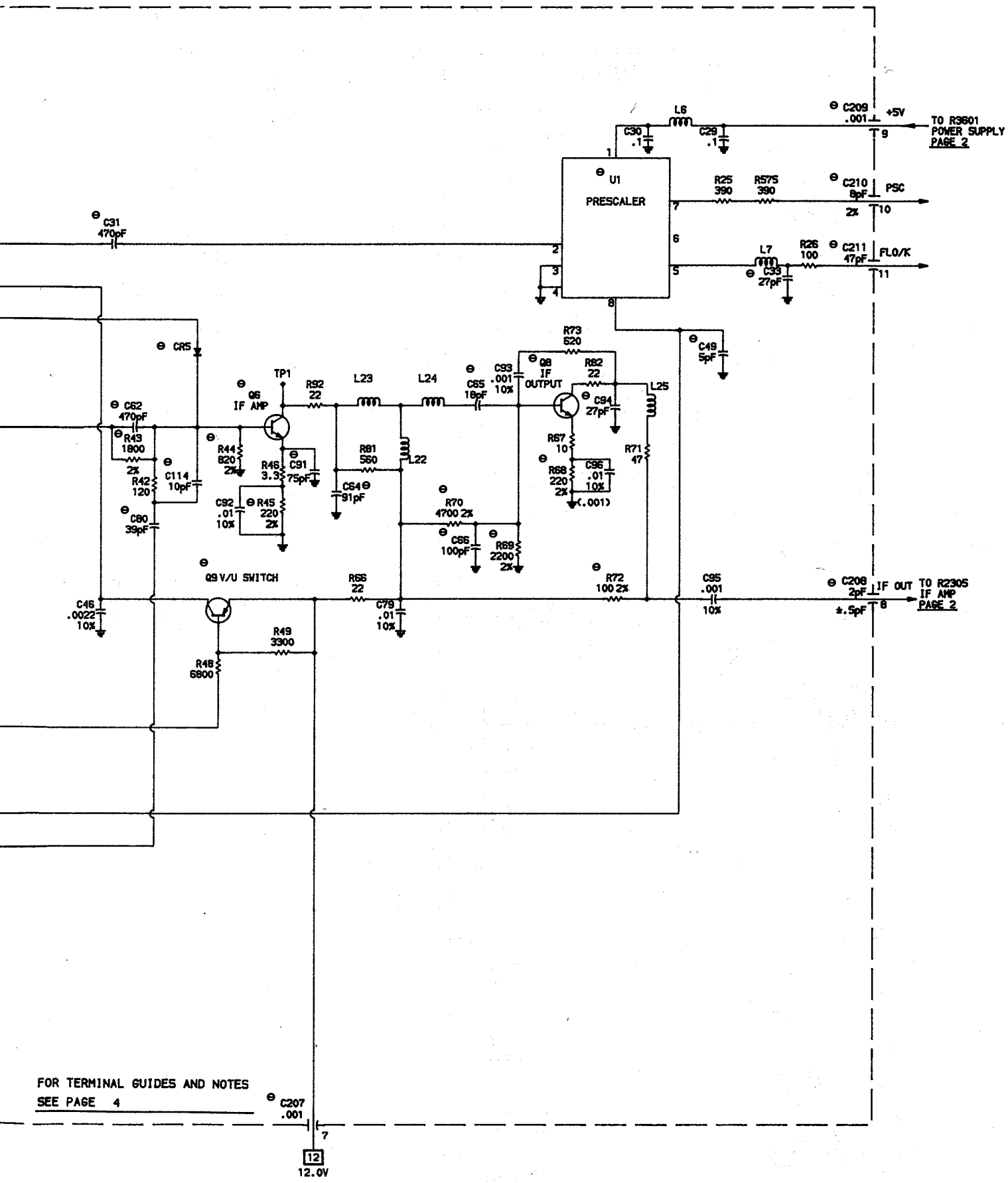


A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH CIRCUITACE

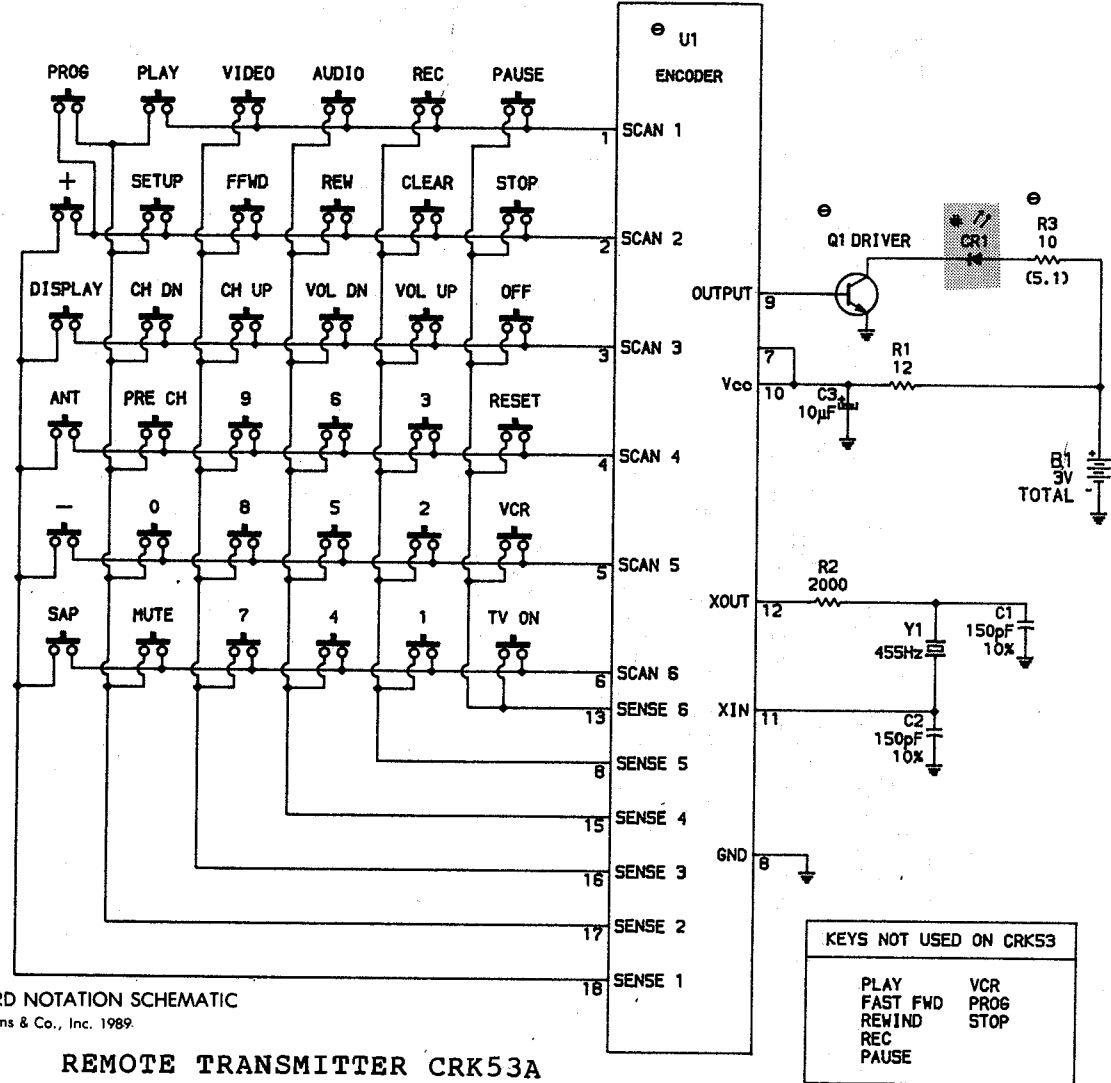




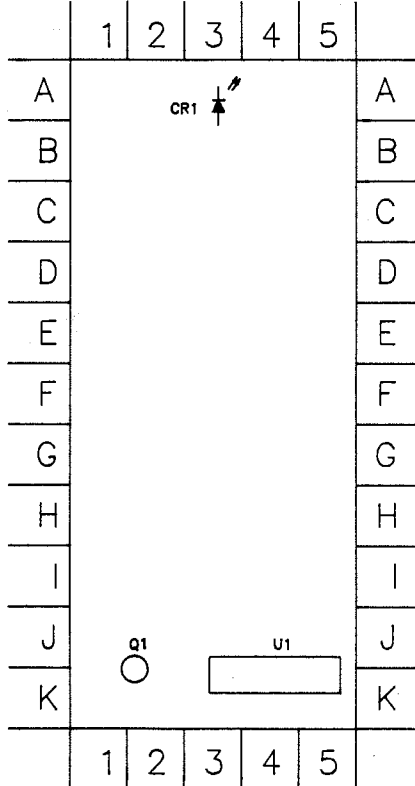




A PHOTOFAC STANDARD NOTATION SCHEMATIC
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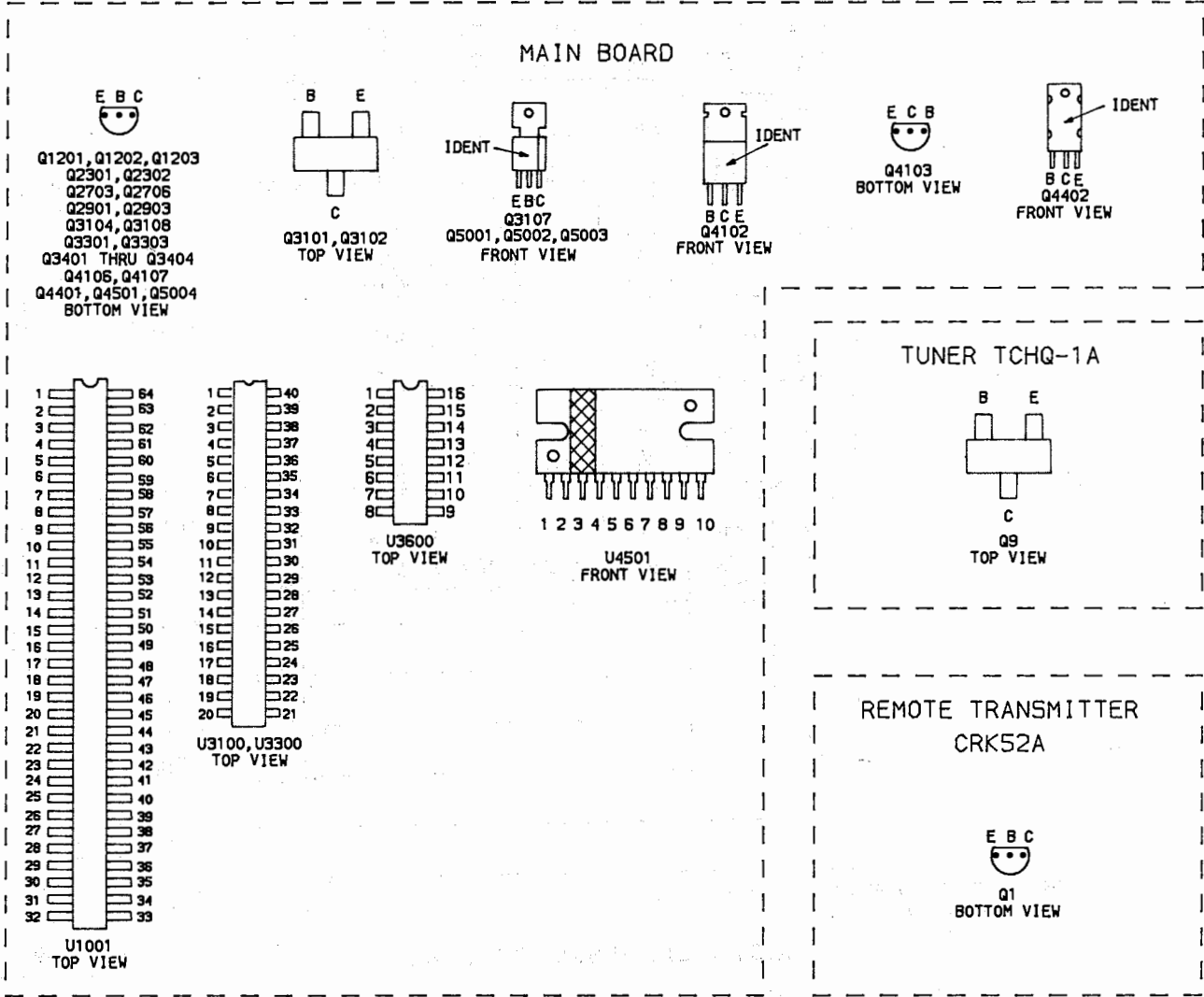
REMOTE TRANSMITTER CRK53A



REMOTE CONTROL TRANSMITTER-
GridTrace LOCATION GUIDE

+	G-4	AUDIO	H-2	PRE CH	C-5
-	G-1	B1	K-1	Q1	K-2
0	G-2	C1	J-2	R1	J-2
1	D-1	C2	I-2	R2	J-3
2	D-3	CH DN	E-5	R3	B-2
3	D-4	CH UP	D-5	RESET	D-4
4	E-1	CLEAR	D-5	SAP	D-1
5	E-2	CR1	A-3	SETUP	H-4
6	E-4	DISPLAY	C-4	U1	J-4
7	F-1	JW1	J-2	VIDEO	H-1
8	F-2	MUTE	H-5	VOL DN	G-5
9	F-4	OFF	C-1	VOL UP	F-5
ANT	D-2	ON/DISPLAY	C-2	Y1	I-3

TERMINAL GUIDES AND NOTES



For SAFETY use only equivalent replacement part, see parts list.

--- Circuitry not used in some versions

- - - Circuitry used in some versions

• See parts list

* Nominal value

⊥ Ground

≡ Chassis

▽ Common tie point

Waveforms and voltages are taken from ground, unless noted otherwise.

Waveforms: triggered scope, keyed rainbow generator.
Item numbers in rectangles appear in the alignment/adjustment instructions.

Supply voltages maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

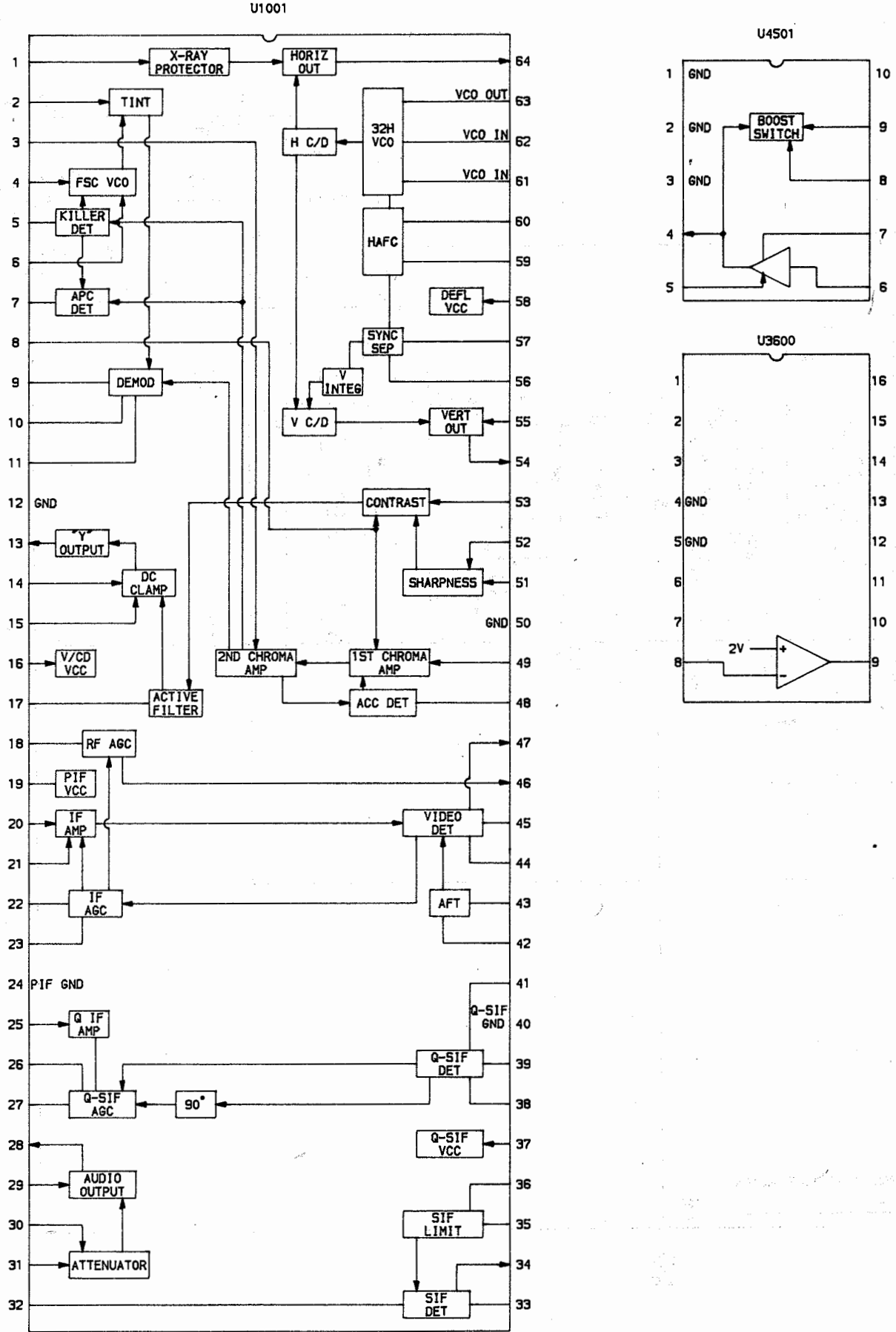
Capacitors are 50 volts or less, 5% unless noted.
Electrolytic capacitors are 50 volts or less, 20% unless noted.

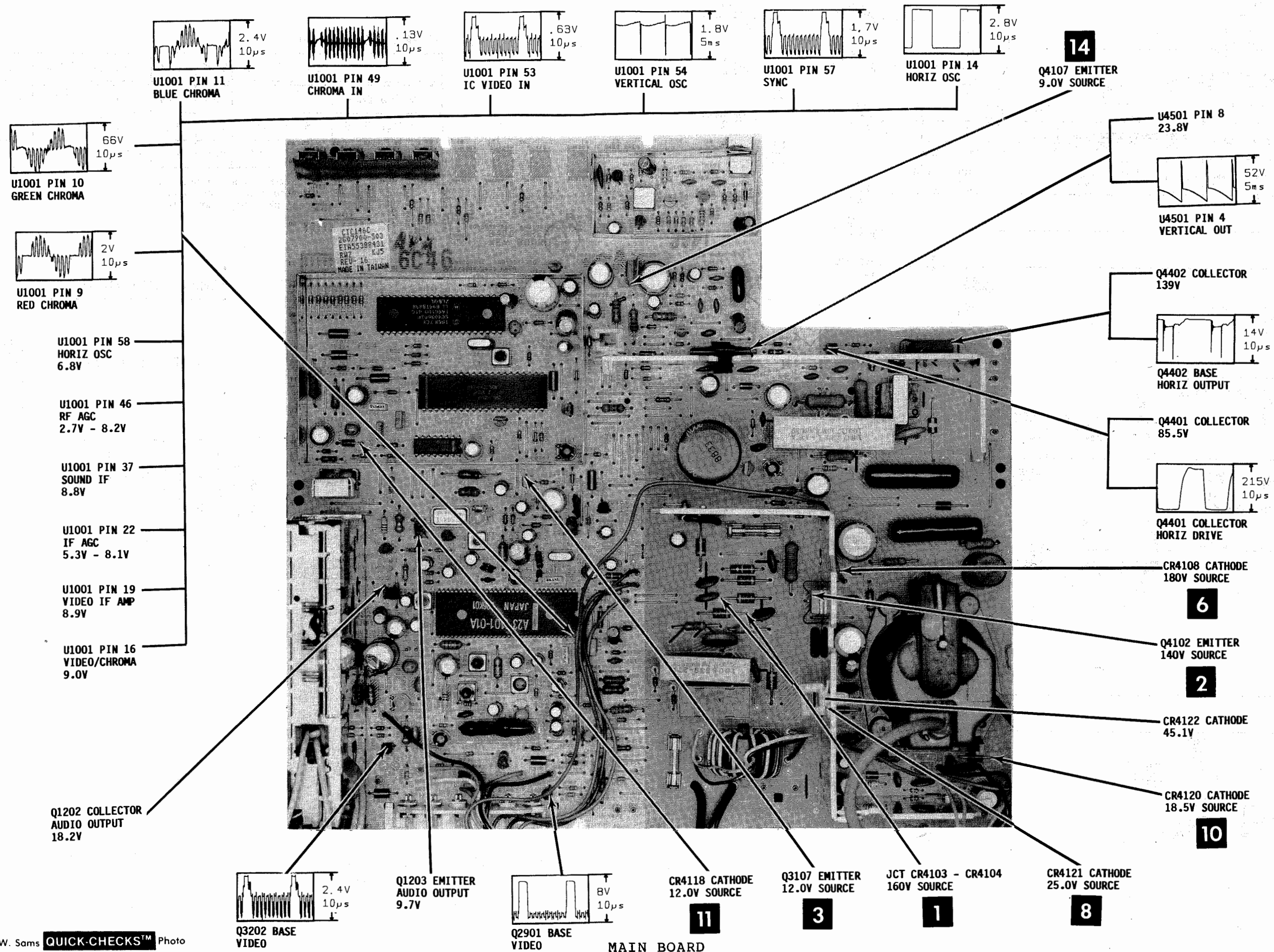
Resistors are 1/2W or less, 5% unless noted.

Value in () used in some versions.

Measurements with switching as shown, unless noted.

IC FUNCTIONS





MISCELLANEOUS ADJUSTMENTS

PRETUNE

Auto Program

1. Connect antenna to unit.
2. Momentarily depress the Power button.

The auto program automatically functions, when unit is turned on (power applied) for the first time. Unit scans for and stores active channels in memory. Channels stored in memory remain unless power is interrupted.

NOTE: This set employs digital customer controls, set as follows. Use VOL UP/+ Switch (SW3413) and VOL DOWN/- Switch (SW3412) to adjust all functions. Use Video Switch (SW3422) to select any of the following functions: Color, Tint, Contrast, Brightness, Sharpness, or Reset (unless otherwise indicated use Reset for all adjustments). Use SETUP Switch (SW3423) to Select Sleep Time to OFF, Auto Program, Channel Memory, Clock Set, or Cable/Air to Air.

B+ ADJUSTMENT

Tune in a picture. Connect a DC voltmeter to TP4110, low side to ground. Adjust B+ Control (R4112) for 140.0V DC.

HIGH VOLTAGE CHECK

Tune in a picture. Set Brightness, Color and Contrast Controls to MINIMUM. Connect a high voltage probe to CRT anode, high voltage should read 24.0KV and 25.2KV.

RF AGC ADJUSTMENT

Tune in a picture. Turn AGC Control (R2315) clockwise until snow is evident in picture, then adjust counterclockwise until snow disappears.

SUB CONTRAST ADJUSTMENT

Tune in a crosshatch pattern. Set Color and Brightness Controls to MINIMUM. Set Contrast Control to Midrange. Adjust Contrast Preset Control (R2716) for just visible highlights.

TINT PRESET ADJUSTMENT

Tune in a color bar pattern. Connect an oscilloscope to the red cathode of the picture tube, low side to ground. Adjust Tint Preset Control (R2335) to balance the 2nd and 4th bars.

COLOR PURITY ADJUSTMENT

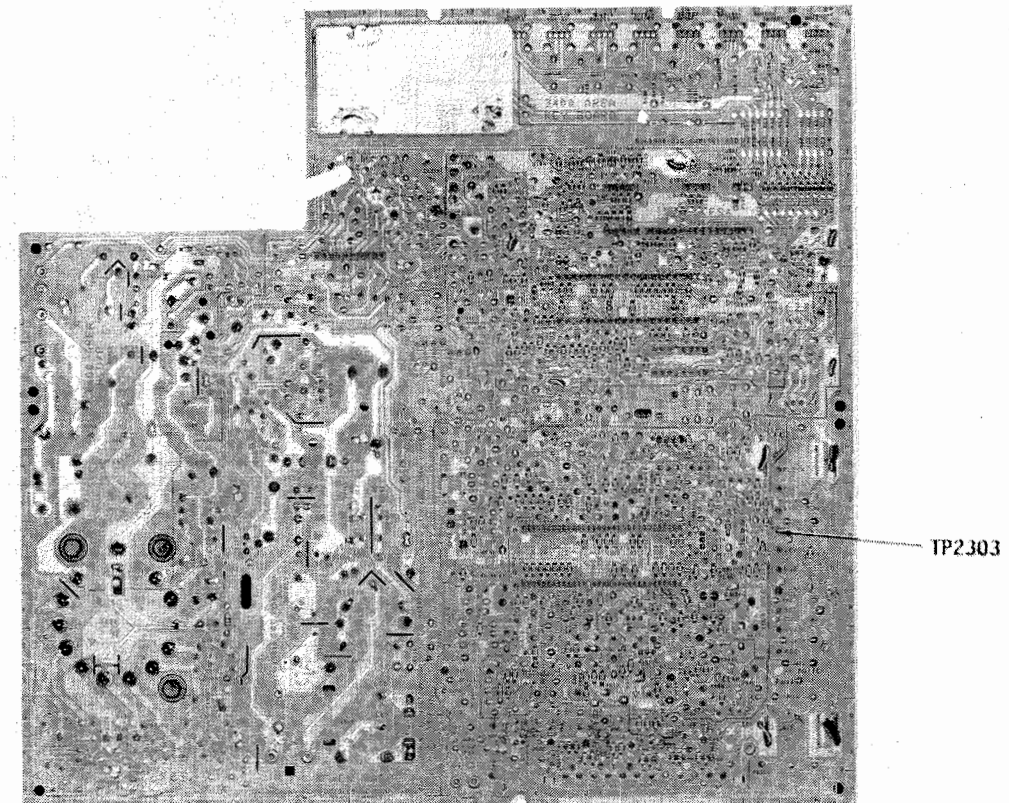
Operate the receiver for 20 minutes. If magnetic tape beam bender is used, remove and discard it, order adjustable type beam bender. Use a degaussing coil to demagnetize the CRT and mounting hardware. Set Color, and Contrast to MINIMUM. Connect a jumper to TP2712 and ground to remove video. Set Brightness Control for a visible raster. Adjust Red (R2914), and Blue (R2916) Bias Controls to MINIMUM. Adjust Green (R2915) Bias Control to obtain a green raster. Loosen the yoke clamp screw and slide the yoke backward to obtain a vertical green band. Rotate and spread the tabs of the purity magnets until the green band is centered on the screen. Move the yoke forward until a uniform green screen is obtained.

COLOR TEMPERATURE ADJUSTMENT

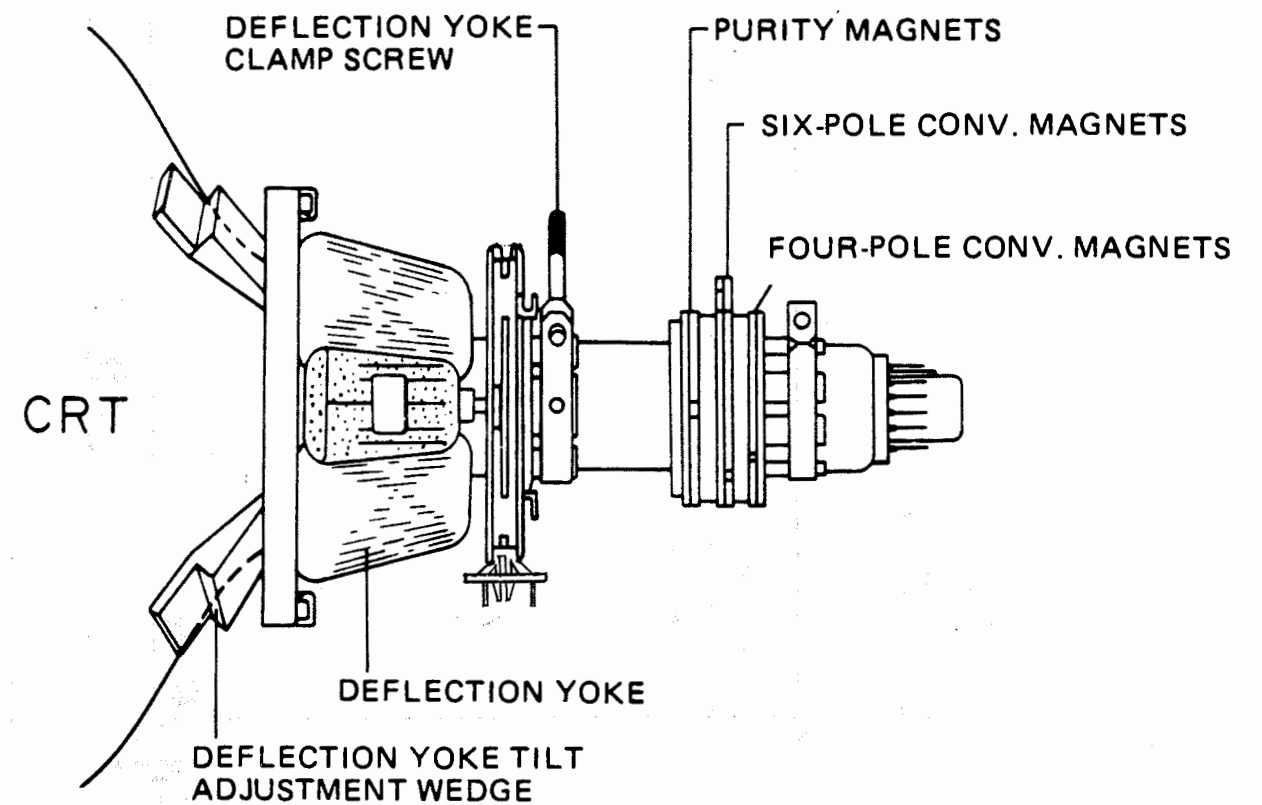
Tune in a picture. Set Color, Brightness, Contrast Controls to MINIMUM. Set Red (R2914), Green (R2915), and Blue (R2916) Bias Controls to MINIMUM. Set Blue (R2905) and Green (R2907) Drive Controls to Midrange. Set Screen Control (R4210B) to MINIMUM. To obtain a service line, connect a jumper wire between SS1 and ground. Advance Screen Control so that a horizontal line is just visible. Adjust 2 Bias Controls to obtain a dim white line. Remove jumpers. Set Brightness and Contrast Controls to Maximum. Adjust the Blue and Green Drive Controls for best black and white picture. Check tracking at low and high brightness.

CONVERGENCE ADJUSTMENTS

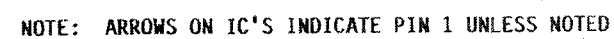
Operate the receiver for 20 minutes. Connect a color bar generator to the antenna terminals and tune in a dot pattern. Adjust the tabs of the 4-pole magnets to converge the red and blue dots at the center of the screen. Adjust the tabs of the 6-pole magnets to converge the red/blue dots over the green dots at the center of the screen. NOTE: Rotate the two tabs of each set of magnets equally and opposite to converge horizontally and rotate both tabs in the same direction to converge vertically. Four and 6 pole magnets interact, repeat adjustment until center convergence is correct. Remove the rubber wedges from the CRT. Tilt the yoke up or down to converge the vertical lines at top and bottom of screen and the horizontal lines at the right and left sides of the screen. Tilt the yoke right or left to converge horizontal lines at the top and bottom of screen and the vertical lines at the right and left sides of the screen. Apply adhesive to wedges and carefully replace on CRT. Tighten yoke clamp screw.



MAIN BOARD-SHIELD LOCATION (BOTTOM VIEW)

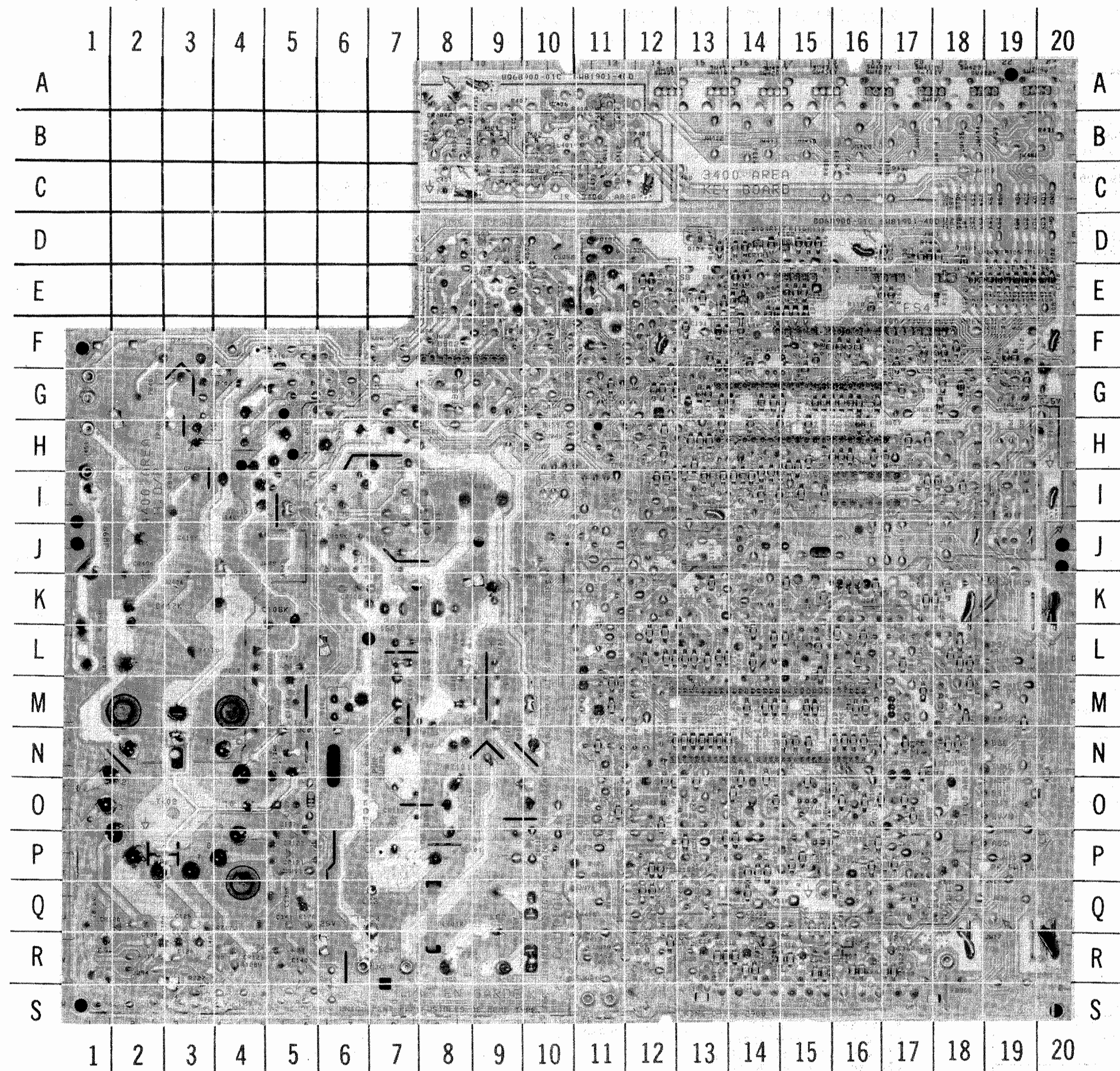


CRT NECK ASSEMBLY



MAIN BOARD

SET 2707 FOLDER 1

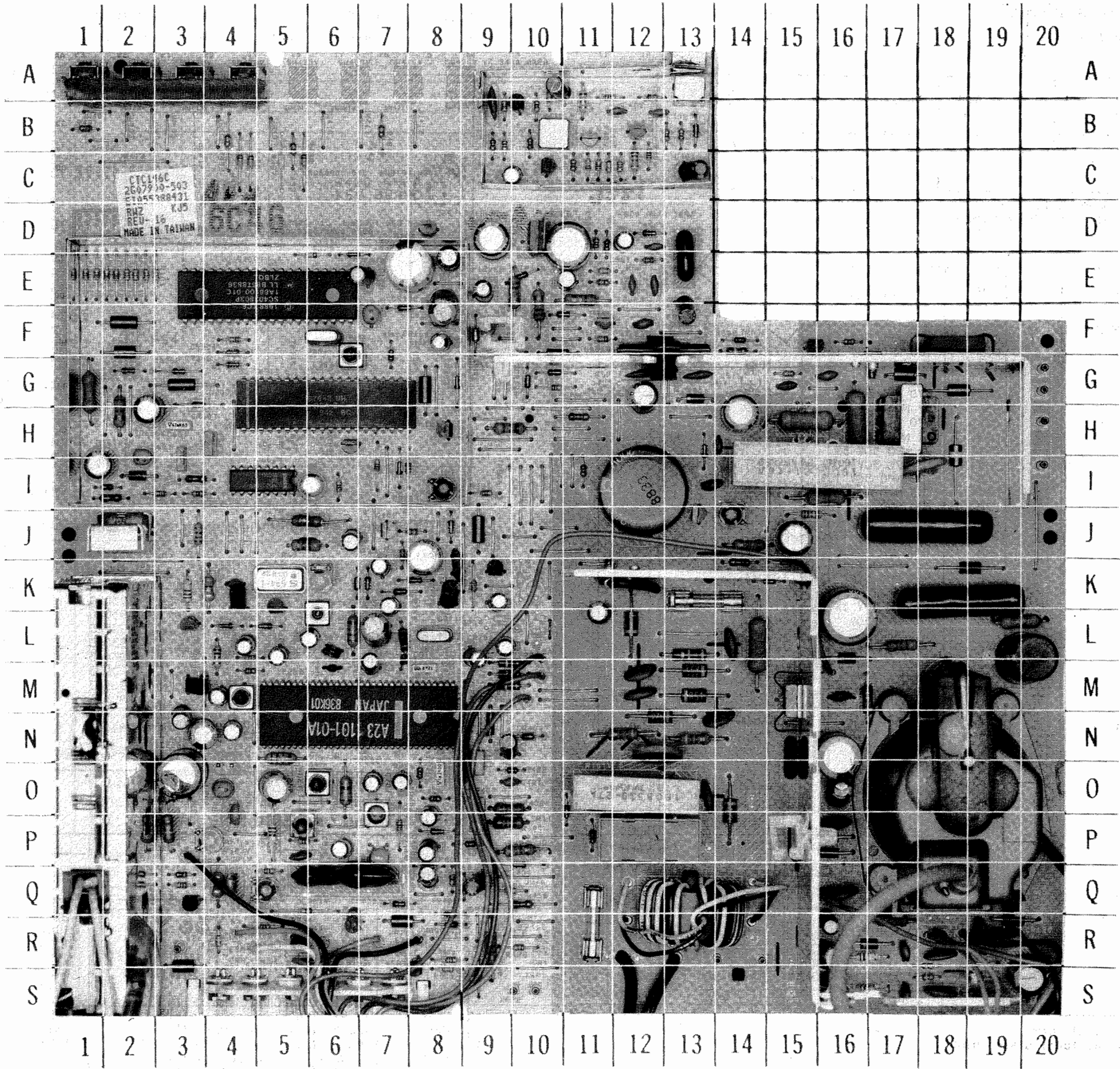


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MAIN BOARD

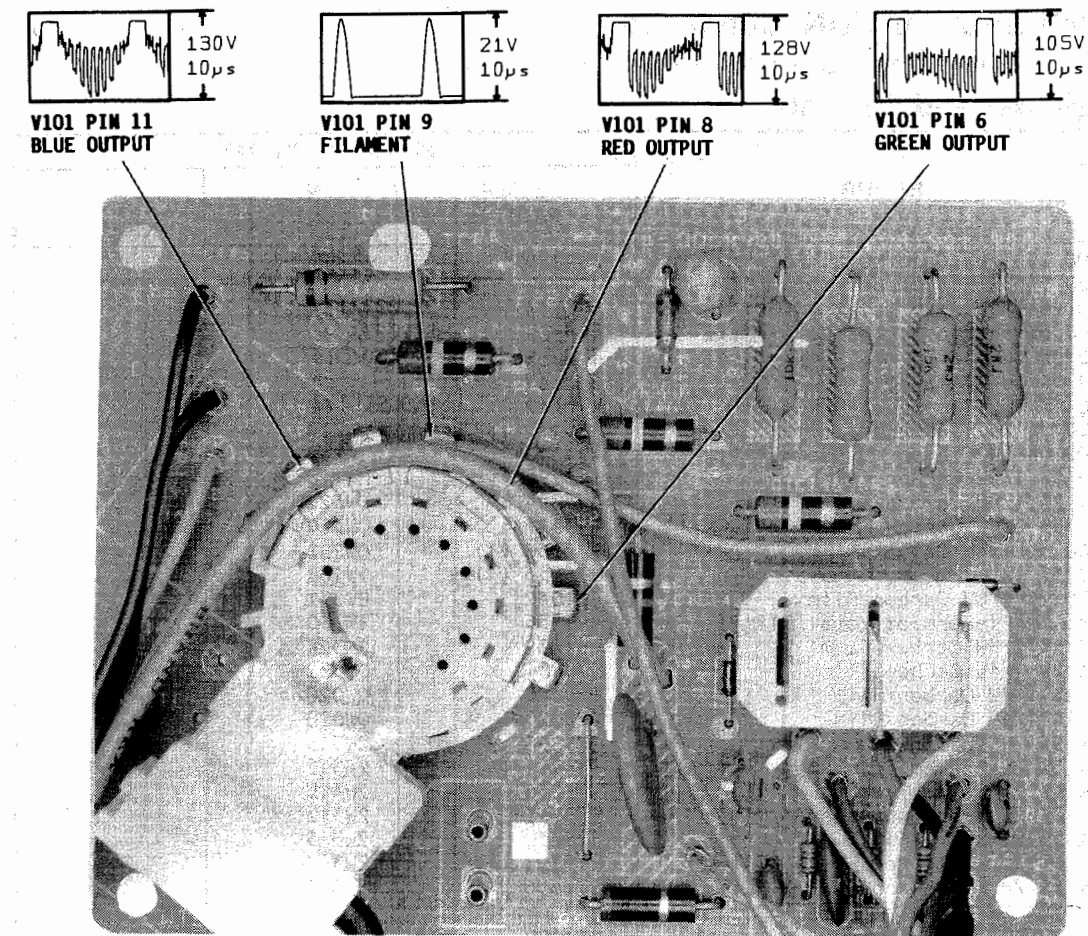
MAIN BOARD (BOTTOM VIEW)-GridTrace LOCATION GUIDE

C1202	N-4	C3313	G-16	R2322	O-16	R3328	H-16
C1203	L-16	C3314	G-18	R2324	P-17	R3329	K-13
C1205	L-16	C3316	H-16	R2326	Q-17	R3330	I-13
C1211	N-16	C3317	G-13	R2341	H-15	R3331	I-12
C1212	P-16	C3318	G-13	R2342	H-15	R3332	I-14
C1214	O-17	C3320	H-13	R2601	Q-14	R3333	I-14
C1215	N-17	C3321	I-12	R2602	Q-12	R3334	H-16
C1216	N-18	C3322	I-13	R2705	P-14	R3336	I-14
C1218	N-16	C3323	I-14	R2706	Q-16	R3337	H-14
C1221	O-17	C3324	I-14	R2707	L-13	R3338	G-14
C2301	L-18	C3325	I-14	R2712	P-13	R3339	H-17
C2301A	I-15	C3326	G-16	R2713	L-13	R3340	H-16
C2302	K-18	C3328	L-14	R2720	L-14	R3343	H-16
C2303	K-17	C3330	G-14	R2731	L-14	R3344	H-16
C2305	L-15	C3331	G-15	R2733	Q-15	R3347	H-12
C2308	M-14	C3332	G-12	R2735	R-12	R3349	G-12
C2309	M-15	C3334	G-13	R2808	P-15	R3351	G-13
C2311	O-16	C3338	G-14	R2810	L-12	R3355	F-14
C2312	L-15	C3601	Q-9	R2811	L-13	R3414	B-9
C2315	O-16	C3602	I-3	R2812	L-13	R3439	A-11
C2318	O-15	C3603	H-4	R2813	P-14	R3604	H-17
C2327	N-15	C3605	I-17	R2814	L-12	R3605	H-17
C2328	K-15	C3607	I-15	R2815	L-12	R3611	I-18
C2708	O-14	C3609	G-18	R2906	R-13	R4113	E-14
C2709	O-14	C4319	H-12	R2908	R-13	R4114	E-13
C2711	M-11	C4402	N-13	R2909	R-17	R4117	D-14
C2712	M-11	C4404	E-19	R2910	R-16	R4319	H-13
C2713	L-13	C4405	N-13	R2911	R-14	R4350	H-13
C2720	Q-15	C4406	O-13	R2912	R-15	R4403	N-12
C2803	P-14	C4407	P-13	R2913	R-15	R4404	O-12
C2805	O-14	C4409	N-13	R3107	E-16	R4408	O-12
C2812	L-13	C4411	P-12	R3110	E-16	R4416	O-12
C2813	L-12	C4414	K-13	R3112	F-19	R4417	P-12
C2814	L-13	C4420	N-13	R3115	D-14		
C2816	P-14	C4422	N-11	R3116	D-15		
C2817	L-12	C4509	N-13	R3117	D-14		
C2901	R-13	C4611	N-20	R3118	E-14		
C2902	R-17	J451	H-20	R3119	E-15		
C2903	R-15	JC1	D-17	R3120	F-14		
C2905	Q-16	JC9	G-11	R3121	E-6		
C2907	R-14	JC12	M-19	R3122	E-6		
C2908	R-15	JC13	M-16	R3123	F-15		
C2909	R-15	JC14	M-14	R3124	F-16		
C3101	D-18	JC15	O-16	R3125	F-18		
C3102	E-18	Q3101	E-14	R3126	F-18		
C3103	E-19	Q3102	D-14	R3127	F-18		
C3104	E-19	Q3103	D-14	R3128	F-17		
C3105	E-19	R1201	N-16	R3129	E-14		
C3106	E-19	R1202	N-16	R3135	D-13		
C3107	E-20	R1204	L-16	R3149	E-18		
C3108	E-20	R1205	N-18	R3150	E-19		
C3109	D-17	R1206	L-16	R3151	E-19		
C3111	D-18	R1208	M-18	R3152	F-16		
C3112	E-14	R1212	M-17	R3153	E-17		
C3116	D-15	R1214	L-17	R3154	F-16		
C3121	F-13	R1215	M-16	R3155	F-16		
C3126	E-11	R1217	P-17	R3156	E-12		
C3127	L-11	R2301	L-18	R3301	G-16		
C3130	E-12	R2303	G-16	R3302	G-16		
C3131	F-13	R2304	L-18	R3303	I-16		
C3134	E-15	R2305	L-18	R3304	I-15		
C3135	F-13	R2306	M-18	R3305	H-14		
C3148	D-17	R2308	K-18	R3308	G-15		
C3302	H-15	R2309	K-16	R3311	G-19		
C3304	G-19	R2310	M-15	R3313	G-17		
C3305	G-13	R2311	K-15	R3314	F-17		
C3306	H-16	R2312	L-15	R3318	G-14		
C3307	G-15	R2313	N-15	R3320	H-13		
C3308	G-15	R2314	P-15	R3322	I-13		
C3309	G-15	R2316	M-15	R3324	I-12		
C3310	G-16	R2317	N-15	R3325	I-14		
C3311	E-15	R2318	P-16	R3326	Q-7		
C3312	E-15	R2319	O-14	R3327	I-14		

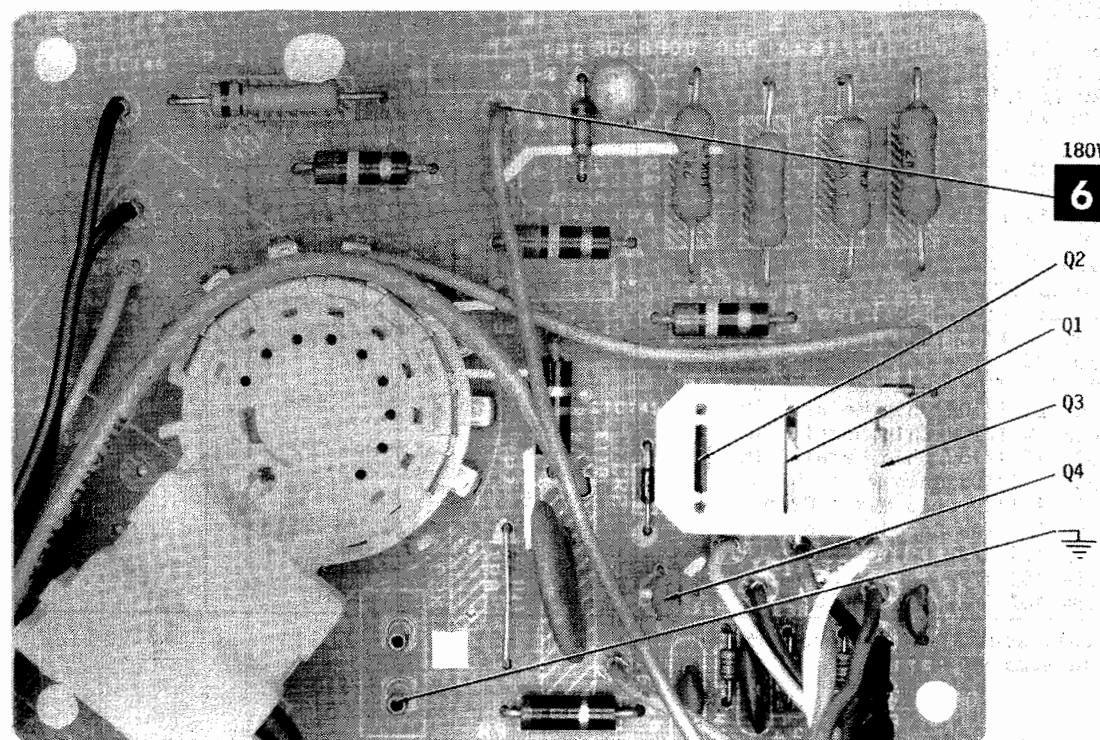


MAIN BOARD (TOP VIEW)-GridTrace LOCATION GUIDE

C1202	N-4	C4408	P-8	CR4503	D-12	R2320	Q-3	R4104	E-2	SW3423	A-2
C1206	O-3	C4410	G-15	CR4506	G-10	R2321	Q-3	R4105	K-15	SW3432	A-1
C1207	N-3	C4413	G-16	DL2701	Q-6	R2323	P-4	R4106	L-14	SW3433	A-1
C1208	L-4	C4415	J-18	F4101	F-11	R2327	P-5	R4107	K-14	T4401	H-17
C1217	O-5	C4416	I-18	F4102	K-13	R2602	Q-8	R4108	I-15	T4402	O-8
C1219	M-4	C4417	K-18	FB2304	O-6	R2711	P-7	R4109	I-16	TP2303	M-1
C1221	N-3	C4421	O-9	FB2701	R-7	R2714	L-7	R4110	J-14	TP2305	M-6
C2304	K-4	C4425	N-9	FB2702	R-6	R2715	H-16	R4111	I-16	TP2307	N-7
C2307	L-6	C4501	D-12	FB3101	F-3	R2716	Q-5	R4112	J-14	TP2342	N-5
C2313	M-6	C4502	D-12	FB3302	F-9	R2717	R-17	R4113	J-15	TP2712	O-7
C2601	Q-9	C4503	E-11	FB3303	G-8	R2719	Q-5	R4114	N-12	TP2801	N-7
C2602	N-13	C4504	F-13	FB3304	F-2	R2722	M-9	R4116	N-13	TP4110	N-5
C2603	Q-8	C4505	D-11	FB3305	R-3	R2724	M-9	R4117	I-2	XRP4001	S-10
C2608	I-6	C4506	D-13	FB4401	F-18	R2726	M-9	R4118	G-1	XRP4002	S-10
C2705	K-7	C4507	G-12	FB4402	G-17	R2727	R-18	R4119	J-6	U1001	N-6
C2706	K-7	C4508	F-12	FB4403	I-18	R2728	S-16	R4120	M-7	U3100	E-5
C2707	O-7	C4510	H-14	J451	H-20	R2729	N-9	R4121	S-17	U3300	G-6
C2715	J-6	C4511	G-12	JC1	D-17	R2734	Q-5	R4122	H-9	U3600	I-5
C2717	M-7	C4512	E-12	JC12	M-19	R2809	K-9	R4123	J-7	U4501	F-12
C2718	K-9	C4513	E-12	JC13	M-16	R2901	S-8	R4124	J-8	Y1301	F-6
C2721	O-11	C4514	G-13	JC14	M-14	R2902	R-4	R4125	O-16	Y2801	L-8
C2725	S-17	CF1201	P-4	JC15	O-16	R2903	R-8	R4128	R-17	Y4401	O-9
C2807	M-14	CF2301	Q-4	L1201	M-4	R2905	S-4	R4134	R-19		
C2809	P-6	CR2301	O-4	L1202	O-4	R2914	S-6	R4135	S-20		
C2810	M-8	CR1201	L-4	L2301	K-4	R2915	S-6	R4136	Q-16		
C2811	K-8	CR1202	L-5	L2302	L-6	R2916	S-5	R4137	P-16		
C2818	L-9	CR2601	Q-8	L2303	P-5	R3101	E-3	R4139	O-16		
C2820	L-9	CR2701	K-7	L2304	Q-4	R3102	E-2	R4140	R-16		
C3116	K-8	CR2702	Q-7	L2305	O-6	R3103	E-2	R4141	R-16		
C3117	G-13	CR2703	R-8	L2306	Q-4	R3104	E-2	R4401	P-9		
C3121	F-8	CR2704	L-7	L2307	L-6	R3105	E-2	R4402	O-9		
C3125	E-7	CR2707	K-7	L2310	L-6	R3106	E-2	R4405	O-8		
C3128	F-8	CR2708	K-6	L2312	N-5	R3107	E-1	R4406	P-9		
C3129	E-8	CR2709	R-8	L2701	P-7	R3108	E-1	R4407	H-15		
C3132	D-9	CR3101	E-6	L2802	P-7	R3115	I-2	R4409	G-15		
C3133	E-7	CR3103	E-10	L3101	F-7	R3321	I-9	R4410	F-16		
C3136	E-8	CR3104	F-7	L3301	G-6	R3326	I-7	R4411	H-16		
C3401	C-13	CR3105	F-9	L3601	H-2	R3329	I-7	R4412	Q-9		
C3402	B-12	CR3106	G-10	Q1201	K-5	R3335	I-8	R4413	L-17		
C3403	B-12	CR3301	F-4	Q1202	M-3	R3352	G-7	R4415	A-10		
C3406	A-10	CR3302	G-3	Q1203	K-4	R3401	B-13	R4418	Q-10		
C3407	C-9	CR3303	G-8	Q2301	L-3	R3402	C-11	R4419	R-19		
C3409	A-9	CR3304	I-7	Q2302	Q-3	R3403	B-13	R4420	P-10		
C3606	H-3	CR3305	G-8	Q2703	K-9	R3404	C-12	R4421	S-19		
C3608	I-6	CR3306	G-4	Q2706	R-6	R3405	C-11	R4422	O-9		
C4101	D-18	CR3401	B-13	Q2901	S-8	R3406	C-12	R4423	K-10		
C4102	M-12	CR3404	A-13	Q2903	R-5	R3407	A-11	R4424	N-9		
C4103	L-14	CR3601	G-3	Q3104	D-8	R3408	C-11	R4426	O-8		
C4104	N-12	CR4101	L-12	Q3107	D-10	R3409	C-11	R4427	S-16		
C4105	N-14	CR4102	M-13	Q3108	F-9	R3410	A-10	R4501	E-11		
C4106	I-12	CR4103	N-12	Q3301	H-6	R3411	B-10	R4502	D-11		
C4108	L-16	CR4104	M-13	Q3303	H-8	R3412	B-9	R4503	S-7		
C4109	J-15	CR4106	K-15	Q3401	B-12	R3413	B-9	R4504	I-11		
C4110	I-13	CR4107	H-13	Q3402	B-11	R3414	R-9	R4505	E-11		
C4111	H-14	CR4108	L-16	Q3403	C-10	R3429	C-12	R4506	D-11		
C4112	M-16	CR4110	K-8	Q3404	B-10	R3430	A-12	R4507	E-12		
C4113	N-16	CR4111	O-14	Q4102	M-15	R3431	B-1	R4508	F-14		
C4115	J-8	CR4112	P-11	Q4103	J-13	R3432	B-4	R4509	E-11		
C4122	H-9	CR4113	O-11	Q4106	J-2	R3433	B-5	R4512	F-14		
C4123	J-4	CR4118	J-2	Q4107	J-7	R3434	B-7	R4513	H-15		
C4124	R-18	CR4119	J-8	Q4401	F-15	R3435	C-4	R4514	H-15		
C4133	I-1	CR4120	R-19	Q4402	F-18	R3437	C-4	R4515	L-20		
C4134	R-19	CR4121	P-16	Q4501	F-11	R3438	C-5	R4517	F-11		
C4135	S-20	CR4122	P-16	R1209	M-3	R3601	H-2	R4518	G-10		
C4136	Q-16	CR4123	R-17	R1210	L-4	R3602	Q-8	RL4101	P-12		
C4137	P-16	CR4124	S-18	R1211	P-3	R3603	P-2	RT4101	N-12		
C4138	R-17	CR4401	S-9	R1213	L-13	R3605	I-3	SF2301	K-5		
C4139	O-16	CR4402	P-8	R1216	P-5	R3606	J-5	SS1	L-10		
C4140	R-16	CR4404	N-10	R1221	L-4	R3608	I-3	SW3402	A-4		
C4141	R-16	CR4405	Q-10	R2302	J-3	R3609	I-3	SW3403	A-4		
C4401	P-9	CR4406	K-19	R2307	K-3	R4101	O-12	SW3412	A-3		
C4403	O-8	CR4501	G-13	R2315	K-6	R4102	L-13	SW3413	A-3		
C4404	P-8	CR4502	F-11	R2316	P-5	R4103	E-2	SW3422	A-2		



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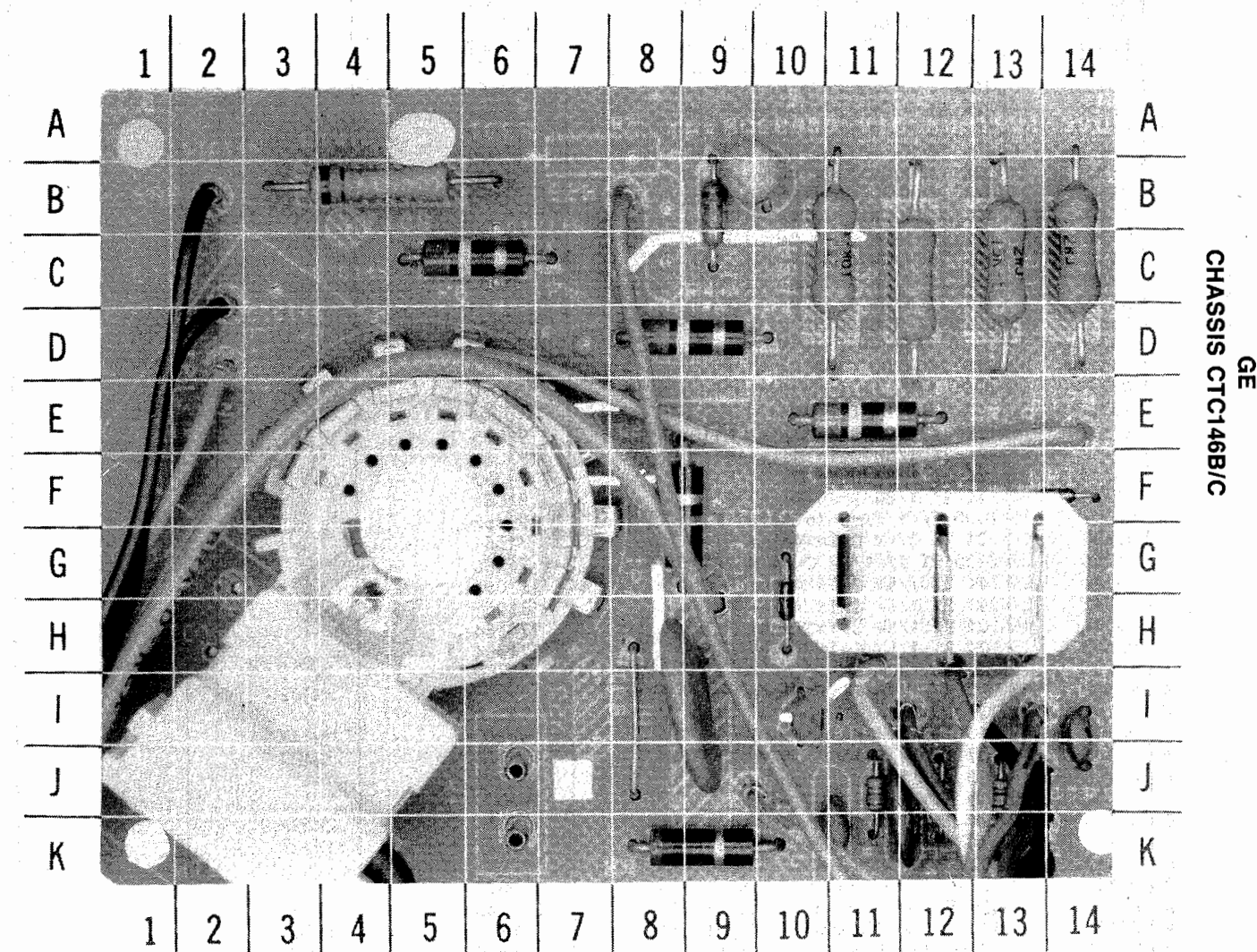


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CRT BOARD

CRT BOARD-GridTrace LOCATION GUIDE

C5001	I-9	Q5003	G-13	R5008	C-11
C5003	I-13	Q5004	I-10	R5009	K-9
C5004	J-12	J5001	J-6	R5013	F-9
C5006	K-11	R5001	C-13	R5014	B-4
CR5001	F-14	R5002	C-12	R5015	B-9
CR5002	H-10	R5003	G-13	R5018	J-11
L5001	B-9	R5004	D-9	R5020	J-12
Q5001	G-12	R5005	E-11	R5021	J-13
Q5002	G-11	R5006	C-6	R5022	F-12



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CRT BOARD

SET 2707

FOLDER 1

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PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.	ITEM No.	FUNCTION	MFGR. PART No.
L1201	Sound IF	190504	L2701	Peaking (68uH)	149167
L1202	Peaking (28uH)	161245	L2802	RF Choke (8.2uH)	149170
L2301	RF Choke (.82uH)	193051	L3101	RF Choke	160518
L2302	SAW	193052	L3301	Oscillator	190505
L2303	AFT	190506	L3401	RF Choke	181240
L2304	DET	190503	L3601	RF Choke (100uH)	161243
L2305	Peaking (1.8uH)	160143	L4101	RF Choke	193053
L2306	Peaking (8.2uH)	181472	L4402	Linearity	193055
L2307	Peaking		L4403	Peaking (6.8uH)	193056
L2310	RF Choke (2.2uH)	143893	L5001	RF Choke (470uH)	176622
L2312	Peaking (2.2uH)	143893			
	TCHQ-A U/V TUNER				
L5	Peaking		L20	Peaking	
L6	Peaking (4.7uH)	158726	L21	RF Choke	
L7	Peaking (8.2uH)	181472	L23	Peaking	
L8	Peaking		L24	Peaking	
L9	Peaking		L25	Peaking	
L10	Peaking		L26	RF Choke	
L11	Peaking		L28	Peaking	
L12	Peaking		L29	Peaking	
L13	RF Choke		L31	RF Choke	
L14	Peaking		L32	RF Choke	
L15	Peaking (1uH)	181473	L33	RF Choke	
L16	Peaking		L34	RF Choke	
L17	Peaking		L100	RF Choke	
L18	RF Choke		L101	Peaking	
L19	Peaking		L102	Peaking	
			L103	Peaking	
			L105	Oscillator	

For SAFETY use only equivalent replacement part.

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR. PART No.	OTHER IDENTIFICATION	NOTES
L501	Yoke 90° Horiz 3.1mh Vert 22.9mh	192204	2G27006-501 (1)	
T4401	Horiz Driver	193079	2821709-8 (1)	
T4402	Horiz Out	193081	2G25003-501 (1)	

For SAFETY use only equivalent replacement part.
(1) Number on unit.

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SP1	2 3/16" x 3 9/16" PM 32 Ohm	183163		

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
CF1201	Filter	160139	
CF2301	Filter	160140	
CR3404	Diode	150711	Photo (Used with Chassis CTC146C)
DL2701	Delay Line	177795	
F4101	Fuse	177793	4 Amp @ 125VAC Slow Blow
F4102	Fuse	193050	1 Amp @ 250VDC Fast Acting
FB2304	Ferrite Bead	157346	
FB2701	Ferrite Bead	154052	
FB2702	Ferrite Bead	152102	
FB3101	Ferrite Bead	153328	
FB3301	Ferrite Bead	153328	
FB3302	Ferrite Bead	153328	
FB3303	Ferrite Bead	153328	
FB3304	Ferrite Bead	154052	
FB3305	Ferrite Bead	154052	
FB4401	Ferrite Bead	154052	
FB4402	Ferrite Bead	154052	
FB4403	Ferrite Bead	154053	
L4201	Degaussing	191794	
P100	Cord	182239	
RL4101	Relay	193078	
SF2301	Filter	176852	Saw
SW3400	Switch		(5)
SW3401	Switch		(0)
SW3402	Switch		Channel Down (9)
SW3403	Switch		Channel Up (4)
SW3410	Switch		(6)
SW3411	Switch		(1)
SW3412	Switch		Volume Down (Channel Down)
SW3413	Switch		Volume Up (Channel Up)
SW3420	Switch		(7)
SW3421	Switch		(2)
SW3422	Switch		Video (Volume Down)
SW3423	Switch		Set Up (Volume Up)
SW3430	Switch		(8)
SW3431	Switch		(3)
SW3432	Switch		Display (Menu)
SW3433	Switch		Power
V101	CRT	A51ACG14X	A51ACG14X01
X2801	Crystal	161235	(3.58MHz)
Y3301	Crystal	182839	
Y4401	Resonator	179267	
	Remote Transmitter	186344	CRK53B, Used In Models 20GT421
	Remote Transmitter	186345	CRK53C, Used In Models 20GT420, 20GT423
	Socket	189986	For CRT
		193110	
	Switch	193087	Vert Dual Button
	UHF Antenna	10E0113	
	VHF Antenna	156265	
	Window	122569	Used In Models 20GT420, 20GT421, 20GT423

For SAFETY use only equivalent replacement part.

CABINETS & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.	ITEM	PART No.
Cabinet, Mask (1)	MK0921		
Cabinet, Mask (2)	MK0922		
Cabinet, Mask (3)	MK0923		
Cabinet, Mask (4)	MK0924		
Cabinet, Mask (5)	MK0877		
Cabinet, Back	BK0878		

For SAFETY use only equivalent replacement part.

- (1) Used in model 20GT309.
(2) Used in model 20GT311.
(3) Used in model 20GT420.
(4) Used in model 20GT421.
(5) Used in model 20GT423.

GE
CHASSIS CTC146B/C

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
# C4106	470 200V	179809
# C4108	33 200V 20%	193038
# C4425	10 50V 20%	179229

For SAFETY use only equivalent replacement part.
Items not listed are normally available at local distributors.**CAPACITORS**

ITEM No.	RATING	MFGR. PART No.
	TCHQ-1A U/V TUNER	
C1	470 NPO 50V 10%	174416
C2	470 NPO 50V 10%	192040
C3	470 NPO 50V 10%	192040
C4	470 NPO 50V 10%	192040
C5	470 NPO 50V 10%	192040
C6	1500 NPO 50V	192051
	±.5pF	
C7	1pF NPO 50V	181457
	±.5pF	
C8	470 NPO 50V 10%	174416
C10	470 NPO 50V 10%	174416
C11	22 NPO 50V 10%	192042
C12	2pF NPO 50V	192043
	±.5pF	
C13	470 NPO 50V 10%	174416
C14	5pF NPO 50V	192044
	±.25pF	
C15	7pF NPO 50V	192045
	±.5pF	
C16	470 NPO 50V 10%	192040
C17	470 NPO 50V 10%	192040
C18	470 NPO 50V 10%	192040
C19	470 NPO 50V 10%	174416
C23	470 NPO 50V 10%	192040
C24	82 NPO 50V 5%	192049
C25	470 NPO 50V 10%	192040
C31	470 NPO 50V 10%	174416
C33	27 NPO 50V 10%	192050
C35	470 NPO 50V 10%	192040
C36	470 NPO 50V 10%	192040
C38	1500 NPO 50V	192051
	±.5pF	
C39	150 NPO 50V 10%	192056
C40	6pF NPO 50V	181452
	±.5pF	
C41	5pF NPO 50V	192044
	±.25pF	
C42	150 NPO 50V 10%	192056
C43	470 NPO 50V 10%	192040
C44	470 NPO 50V 10%	174416
C47	470 NPO 50V 10%	192040
C49	5pF NPO 50V	192044
	±.25pF	
C50	470 NPO 50V 10%	174416
C52	68 NPO 50V 5%	193339

For SAFETY use only equivalent replacement part.
Items not listed are normally available at local distributors.

ITEM No.	RATING	MFGR. PART No.

ITEM No.	RATING	MFGR. PART No.
C53	470 NPO 50V 10%	174416
C55	100 NPO 50V 10%	175399
C56	4pF NPO 50V	192058
	±.5pF	
C57	470 NPO 50V 10%	192040
C58	82 NPO 50V 5%	192049
C62	470 NPO 50V 10%	174416
C63	27 NPO 50V 10%	192050
C64	91 NPO 50V 5%	192057
C65	18 NPO 50V 10%	193337
C66	100 NPO 50V 10%	175399
C67	150 NPO 50V 10%	192056
C70	470 NPO 50V 10%	192040
C71	220 NPO 50V 10%	192052
C72	27 NPO 50V 10%	192050
C73	100 NPO 50V 5%	193340
C75	22 NPO 50V 10%	192042
C76	5pF NPO 50V	192044
	±.15pF	
C77	10 NPO 50V 1%	174402
C78	2pF NPO 50V	192043
	±.5pF	
C80	39 NPO 50V 5%	181090
C86	470 NPO 50V 10%	174416
C87	22 NPO 50V 10%	192042
C91	75 NPO 50V 5%	192061
C94	27 NPO 50V 10%	192050
C113	470 NPO 50V 10%	192040
C114	10 NPO 50V 1%	174402
C202	.001 FT 50V	181511
C203	.001 FT 50V	181511
C204	.001 FT 50V	181511
C205	.001 FT 50V	181511
C206	.001 FT 50V	181511
C207	.001 FT 50V	181511
C208	2pF FT 50V ±.5pF	181512
C209	.001 FT 50V	181511
C210	8pF FT 50V 1%	181513
C211	47 FT 50V	181514
C503	470 NPO 50V 10%	192040
C504	470 NPO 50V 10%	192040
# C702	100 1.4KV 20%	193341
# C703	600 1.4KV 20%	147918
# C704	600 1.4KV 20%	147918
# C707	100 1.4KV 20%	193341
# C710	600 1.4KV 20%	147918
# C713	3.9pF NPO 100V	
	±.25pF	193336

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C1205	470 NPO 50V 10%	174416
C1212	33 NPO 50V 5%	174408
C1214	18 NPO 50V 5%	174405
C1220	33 NPO 50V 5%	174408
C1222	10 NPO 50V 1%	174402
C2311	33 NPO 50V 5%	174408
C2313	22 NPO 50V 5%	157199
C2318	22 NPO 50V 5%	174406
C2709	68 NPO 50V 5%	174410
C2720	68 NPO 50V 5%	174410
C2722	12 NPO 50V 5%	174403
C2803	56 NPO 50V 5%	190542
C2805	15 NPO 50V 5%	174404
C2813	10 NPO 50V 1%	174402
C2816	120 NPO 50V 10%	193033
C2907	220 NPO 50V 5%	178188
C2908	220 NPO 50V 5%	178188
C2909	220 NPO 50V 5%	178188
C3111	100 NPO 50V 5%	174412
C3308	100 NPO 50V 5%	174412
C3309	100 NPO 50V 5%	174412
C3310	100 NPO 50V 5%	174412
C3311	56 NPO 50V 5%	190542

For SAFETY use only equivalent replacement part.
Items not listed are normally available at local distributors.
(1) May be found in only some models.**CONTROLS (All wattages 1/2 watt, or less, unless listed)**

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R2315	RF AGC	25K	193059	
R2323	AFT Slope	15K	193060	
R2716	Contrast	300	190525	
R2905	Blue Drive	200	193063	
R2907	Green Drive	200	193063	
R2914	Red Bias	4500	190533	
R2915	Green Bias	4500	190533	
R2916	Blue Bias	4500	190533	
R3335	TInt Preset	10K	181107	
# R4112	B+ Adj	500	181112	
# R4210	Focus-Screen		(1)	
R4503	Vert Height	150	193062	

For SAFETY use only equivalent replacement part.
(1) Part of Focus Pack Part Number 193074.**RESISTORS (Power and Special)**

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	
R3	5.1 2% 1/4W Metal Film	829A51	QW5D1	
R1208	1000 2% 1/8W Chip Metal Film	190462		
# R1209	2.2 5% 1/4W Carbon Film	152829	QW2D2	
# R1210	2.2 5% 1/4W Carbon Film	152829	QW2D2	
# R1211	5.6 5% 1/2W Flameproof Metal Film	830A56	HW5D6	
R1213	43K 2% 1/8W Carbon Film	161038	EW343	
R1215	10K 2% 1/8W Chip Metal Film	174364		
# R1216	10 5% 1/4W Flameproof Metal Film	829010	QW010	
R2301	120 2% 1/8W Chip Metal Film	181485		
# R2302	100 5% 1/4W Flameproof Carbon Film	829110	QW110	
R2307	10 5% 1/4W Flameproof Metal Film	829010	QW010	
R2314	39K 2% 1/8W Chip Metal Film	161030		

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	
R2319	1000 2% 1/8W Chip Metal Film	190462		
R2326	1000 2% 1/8W Chip Metal Film	190462		
R2708	10K 2% 1/8W Chip Metal Film	174364		
# R2715	113K 1% 1/4W Carbon Film			
# R2717	22K 5% 1W Flameproof Metal Film	179259	1W322	
R2731	1000 2% 1/8W Chip Metal Film	190462		
R2733	27K 2% 1/8W Chip Metal Film	193061		
R2809	1500 2% 1/8W Chip Metal Film	161041		
R2810	1000 2% 1/8W Chip Metal Film	190462		
R2908	120 2% 1/8W Chip Metal Film	181485		
R2909	1202% 1/8W Chip Metal Film	181485		
R3110	10K 2% 1/8W Chip Metal Film	174364		
R3120	10K 2% 1/8W Chip Metal Film	174364		
R3129	1000 2% 1/8W Chip Metal Film	190462		
R3133	10K 2% 1/8W Chip Metal Film	174364		
R3135	1000 2% 1/8W Chip Metal Film	190462		
# R3156	10K 2% 1/8W Chip Metal Film	174364		
# R3157	10K 5% 1W Flameproof Metal Film	180029	1W310	
# R3158	10K 5% 1W Flameproof Metal Film	180029	1W310	
R3301	24K 2% 1/8W Chip Metal Film	181061		
R3305	24K 2% 1/8W Chip Metal Film	181061		
R3307	10K 2% 1/8W Chip Metal Film	174364		
R3313	10K 2% 1/8W Chip Metal Film	174364		
R3314	10K 2% 1/8W Chip Metal Film	174364		
R3320	39K 2% 1/8W Chip Metal Film	161030		
R3322	10K 2% 1/8W Chip Metal Film	174364		
R3323	6800 2% 1/8W Chip Metal Film	178281		
R3324	3900 2% 1/8W Chip Metal Film	157377		
R3325	820 2% 1/8W Chip Metal Film	176814		
R3327	8200 5% 1/8W Chip Metal Film	181065		
R3327	10K 2% 1/8W Chip Metal Film	174364 (1)		
R3331	15K 2% 1/8W Chip Metal Film	192835		
R3332	27K 2% 1/8W Chip Metal Film	193061		
R3333	12K 2% 1/8W Chip Metal Film	174365		
R3336	24K 2% 1/8W Chip Metal Film	181061		
R3337	1000 2% 1/8W Chip Metal Film	190462		
R3338	10K 2% 1/8W Chip Metal Film	174364		
R3340	2200 5% 2% 1/8W Chip Metal Film	176366		
R3341	24K 2% 1/8W Chip Metal Film	181061		
R3342	24K 2% 1/8W Chip Metal Film	181061		
R3347	10K 2% 1/8W Chip Metal Film	174364		
R3355	10K 2% 1/8W Chip Metal Film	174364		
# R3601	130 5% 1W Flameproof Metal Film	175783	1W113	
# R3607	820 5% 1/2W Flameproof Metal Film	193065	HW182	
# R4101	2.7 10% 7W WW	194300		
# R4102	470K 10% 1/2W Carbon Comp	180243	HW447	
# R4106	4.7 5% 3W Flameproof Metal Film	193068	3W4D7	
# R4108	160 5% 15W WW	193069		
	200 5% 15W WW	193070 (1)		
# R4109	22K 5% 2W Flameproof Metal Film	179956	2W322	
R4110	27K 5% 1W Flameproof Metal Film	831327	1W327	
# R4111	90.9K 1% 1/2W Metal Film	193071		
# R4113	5360 1% 1/4W Metal Film	193072		
# R4114	430 5% 1W Flameproof Metal Film	831143	1W143	
# R4116	430 5% 1W Flameproof Metal Film	831143	1W143	
# R4118	47 5% 2W Flameproof Metal Film	176806	2W047	
# R4119	8.2 5% 1/2W Flameproof Metal Film	120595	HW8D2	
# R4120	47 5% 1/4W Flameproof Metal Film	829047	QW047	
	4.7 5% 1/2W Flameproof Carbon Film	830A47 (1)		
# R4122	620 2% 1W Flameproof Metal Film	193092	1W162	
R4123	200 2% 1/4W Carbon Film	175363	QW120	
# R4125	10 5% 1/4W Flameproof Metal Film	829010	QW010	
# R4128	10 5% 1/4W Flameproof Metal Film	829010	QW010	
# R4401	10K 1% 1/2W Metal Film	160155		
# R4402	14.3K 1% 1/2W Metal Film	179247		
	11K 1% 1/2W Metal Film	193076 (1)		
R4403	1000 2% 1/8W Chip Metal Film	190462		

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	
R4404	2400 2% 1/8W Chip Metal Film	192829		
# R4407	6200 5% 3W Flameproof Metal Film	179249	3W262	
R4408	620 2% 1/8W Chip Metal Film	181493		
# R4411	4700 5% 3W Flameproof Metal Film	175368	3W247	
# R4413	680 5% 1W Flameproof Metal Film	176653	1W168	
	470 5% 1W Flameproof Metal Film	831147 (1)		
# R4414	820 5% 1W Flameproof Metal Film	175349	1W182	
# R4415	1000 5% 2W Flameproof Metal Film	180175	2W210	
# R4420	3300 5% 1W Flameproof Metal Film	831A33	1W233	
# R4421	100 5% 1/2W Carbon Film	176796	HW110	
# R4422	22K 2% 1/4W Carbon Film	175054	QW322	
# R4423	10K 5% 1/4W Carbon Film	175317	QW310	
	8200 5% 1/4W Carbon Film	175366 (1)	QW282	
R4428	680 5% 1W Flameproof Metal Film	176653 (1)	1W168	
R4502	5100 2% 1/8W Carbon Film	161042	EW251	
# R4505	3 5% 1W Flameproof Metal Film	179256	1W3D0	
R4507	24K 2% 1/8W Carbon Film	161032	EW324	
R4508	22K 2% 1/4W Carbon Film	175054	QW322	
# R4513	20 2% 1/4W Carbon Film	829020	QW020	
# R4515	20 2% 1/4W Carbon Film	829020	QW020	
# R5001	15K 5% 2W Metal Film	179236	2W315	
	12K 5% 2W Flameproof Metal Film	175791 (1)	2W312	
# R5002	15K 5% 2W Metal Film	179236	2W315	
	12K 5% 2W Flameproof Metal Film	175791 (1)	2W312	
# R5003	15K 5% 2W Metal Film	179236	2W315	
	12K 5% 2W Flameproof Metal Film	175791 (1)	2W312	
# R5008	10K 5% 2W Flameproof Metal Film	176656	2W310	
# R5014	.22 10% 2W WW	193108 (1)		
# R5023	6.8 10% 2W WW	193109		
# RT4101	6.4 Cold PTC	149680		
	6.4 Cold PTC	190002 (1)		
TCHQ-1A U/V TUNER				
R43	1800 2% 1/8W Chip Metal Film	181484		
R44	820 2% 1/10W Chip Metal Film	192088		
R45	220 2% 1/10W Chip Metal Film	192089		
R54	180k 2% 1/10W Chip Metal Film	192092		
R55	220k 2% 1/10W Chip Metal Film	192093		
R56	220k 2% 1/10W Chip Metal Film	192093		
R58	300 2% 1/8W Chip Metal Film	181055		
R60	100k 2% 1/10W Chip Metal Film	192094		
R61	56K 2% 1/10W Chip Metal Film	192095		
R64	1500 2% 1/8W Chip Metal Film	181482		
R65	270 2% 1/8W Chip Metal Film	181481		
R68	220 2% 1/10W Chip Metal Film	192089		
R69	2200 2% 1/10W Chip Metal Film	192096		
R70	4700 2% 1/10W Chip Metal Film	192097		
R72	100 2% 1/10W Chip Metal Film	192099		
R100	100k 2% 1/10W Chip Metal Film	192094		
R101	100k 2% 1/10W Chip Metal Film	192094		
R102	100k 2% 1/10W Chip Metal Film	192094		
R105	390 2% 1/10W Chip Metal Film	192102		
R107	120 2% 1/8W Chip Metal Film	181485		
# R701	3.9m 5% 1/2W Carbon Comp	182843	HW539	
# R702	100K 10% 1/2W Carbon Comp	174380	HW410	
# R712	1.8m 10% 1/2W Carbon Comp	179996	HW518	
# R713	1.8m 10% 1/2W Carbon Comp	179996	HW518	

For SAFETY use only equivalent replacement part.

(1) May be found in some versions.

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PARTS LIST AND DESCRIPTION

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.				NOTES
		NTE PART No.	ECG PART No.	TCE PART No.	
CR1201,2	164874	NTE177	ECG177	SK9091/177	
CR2601	164874	NTE177	ECG177	SK9091/177	
CR2701,2,3,4,7,8,9	164717	NTE519	ECG519	SK3100/519	
CR3101	164874	NTE177	ECG177	SK9091/177	
CR3102	146320	NTE135A	ECG135A	SK5V1/135A	
CR3103					
CR3104	176746	NTE5011A	ECG5011A	SK5A6/5011A	
CR3105	132616	NTE5071A	ECG5071A	SK6V8/5071A	
CR3106	164717	NTE519	ECG519	SK3100/519	
CR3301,2,3,4,5,6	164874	NTE177	ECG177	SK9091/177	
CR3401	164874	NTE177	ECG177	SK9091/177	
CR3601	146320	NTE135A	ECG135A	SK5V1/135A	
CR4101,2,3,4	147993	NTE125	ECG125	SK3033A	
CR4106	139706	NTE177	ECG177	SK9091/177	
CR4107	180338				
CR4108	176296	NTE552	ECG552	SK9000/552	
CR4110	146320	NTE135A	ECG135A	SK5V1/135A	
CR4111	147993	NTE125	ECG125	SK3033A	
CR4112,3	164717	NTE519	ECG519	SK3100/519	
CR4118	147015	NTE125	ECG125	SK5010A/117A	
CR4119	164874	NTE177	ECG177	SK9091/177	
CR4120,1,2,3	176296	NTE552	ECG552	SK9000/552	
CR4124	164717	NTE519	ECG519	SK3100/519	
CR4401	157301	NTE177	ECG177	SK9091/177	
CR4402	132616	NTE5071A	ECG5071A	SK6V8/5071A	
CR4404	159429	NTE5019T1	ECG5019T1		
CR4405	164717	NTE519	ECG519	SK3100/519	
CR4406					
CR4501	147015	NTE125	ECG125	SK5010A/117A	
CR4502,3,6	164717	NTE519	ECG519	SK3100/519	
CR5001,2	139706	NTE177	ECG177	SK9091/177	
Q1201	146847	NTE123AP	ECG123AP	SK3854/123AP	
Q1202	177788	NTE31	ECG31	SK3866A/31	
Q1203	177789	NTE32	ECG32	SK3867A/32	
Q2301	146848	NTE229 *	ECG229 *	SK3246A/229 *	
Q2302	146847	NTE123AP	ECG123AP	SK3854/123AP	
Q2703	143806	NTE159	ECG159	SK3466/159	
Q2706	146847	NTE123AP	ECG123AP	SK3854/123AP	
Q2901,3	143806	NTE159	ECG159	SK3466/159	
Q3101,2	179740	NTE2406	ECG2406		
Q3104	146847	NTE123AP	ECG123AP	SK3854/123AP	
Q3107	146826	NTE171	ECG171	SK3201/171	
Q3108	146847	NTE123AP	ECG123AP	SK3854/123AP	
Q3301	143802	NTE159	ECG159	SK3466/159	
Q3303	146850	NTE159	ECG159	SK3466/159	
Q3401	148061				
Q3402	145410	NTE159	ECG159	SK3466/159	
Q3403,4	148061				
Q4102	193057				
Q4103	193058				
Q4106	146849	NTE210	ECG210	SK3202/210	
Q4107	177788	NTE31	ECG31	SK3866A/31	
Q4401	146851	NTE287	ECG287	SK3433/287	
Q4402	177791	NTE2302	ECG2302	SK9422	
Q4501	146847	NTE123AP	ECG123AP	SK3854/123AP	

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.				NOTES
		NTE PART No.	ECG PART No.	TCE PART No.	
Q5001,2,3	146826	NTE171	ECG171	SK3201/171	
Q5004	146851	NTE287	ECG287	SK3433/287	
U1001	A23-1101-01A				
U3100	193082				
U3300	SC403603P				
U3600	193084				
U4501	189998	NTE1797	ECG1797	SK9753	
	179733	NTE1797	ECG1797	SK9753	
	LA7831				
	176853				
TUNER TCHQ-1A					
CR5	129095	NTE553	ECG553	SK3322	MATCHED SET
CR6	192062				INCLUDES CR6,9,10,12,15,16,17,24,26
CR7,8	181466				USE CR6 MATCHED SET
CR9,10					
CR11	129095	NTE553	ECG553	SK3322	USE CR6 MATCHED SET
CR12					
CR13	181466	NTE553	ECG553	SK3322	USE CR6 MATCHED SET
CR14	129095				
CR15,6,7					
CR18,9	129095	NTE553	ECG553	SK3322	USE CR6 MATCHED SET
CR22,3	129095	NTE553	ECG553	SK3322	USE CR6 MATCHED SET
CR24					
CR25	181466				USE CR6 MATCHED SET
CR26					
CR101	192063				MATCHED SET INCLUDES CR101,102,103,104
CR102,3,4					USE CR101 MATCHED SET
CR105	192064				
Q4,5	192066				
Q6	192067				
Q7	192068				
Q8	192067				
Q9	179741	NTE2407	ECG2407		
Q101	192069				
Q102	192067				
U1	181498				
REMOTE TRANSMITTER CRK52A					
Q1	148996	NTE123AP	ECG123AP	SK3854/123AP	
U1	181040				

For SAFETY use only equivalent replacement part.
* Lead configuration may vary from original.