SAFETY PRECAUTIONS

SERVICE WARNING

Only qualified service technicians who are familiar with safety checks and guidelines should perform service work. Before replacing parts, disconnect power source to protect electrostatically sensitive parts. Do not attempt to modify any circuit unless so recommended by the manufacturer. When servicing the receiver, use an isolation transformer between the line cord and power receptacle.

SERVICING THE HIGH VOLTAGE AND CRT

Use EXTREME CAUTION when servicing the high voltage circuits. To discharge static high voltage, connect a 10K ohms resistor in series with a test lead between the receiver and CRT anode lead. DO NOT lift the CRT by the neck. Always wear shatterproof goggles when handling the CRT to protect eyes in case of implosion.

X-RAY RADIATION AND HIGH VOLTAGE LIMITS

Be aware of the instructions and procedures covering X-ray radiation. In solid-state receivers and monitors, the CRT is the only potential source of X-rays. Keep an accurate high voltage meter available at all times. Check meter calibration periodically. Whenever servicing a receiver, check the high voltage at various brightness levels to be sure it is regulating properly. Keep high voltage at rated value, NO HIGHER. Excessive high voltage may cause X-ray radiation or failure of associated components. DO NOT depend on protection circuits to keep voltage at rated value. When troubleshooting a receiver with excessive high voltage, avoid close contact with the CRT. DO NOT operate the receiver longer than necessary. To locate the cause of excessive high voltage, use a variable AC transformer to regulate voltage. In present receivers, many electrical and mechanical components have safety related characteristics which are not detectable by visual inspection. Such components are identified by a # on both the schematic and the parts list. For SAFETY, use only equivalent replacement parts when replacing these components.

GENERAL GUIDELINES

Perform a final SAFETY CHECK before returning receiver to customer. Check repaired area for poorly soldered connections, and check entire circuit board for solder splashes. Check inner board wiring for pinched wires or wires contacting any high wattage resistors. Check that all control knobs, shields, covers, grounds, and mounting hardware have been replaced. Be sure to replace all insulators and restore proper lead dress.

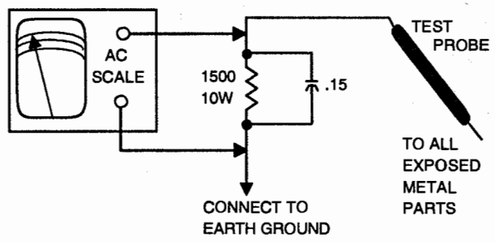
SAFETY CHECKS -- FIRE AND SHOCK HAZARD

Cold Leakage Checks for Receivers with Isolated Ground

Unplug the AC cord, connect a jumper across the plug prongs, and turn the power switch on (if applicable). Use an ohmmeter to measure the resistance between the jumped AC plug and any exposed metal cabinet parts such as antenna screw heads, control shafts, or handle brackets. Exposed metal parts with a return path should measure between 1M ohms and 5.2M ohms. Parts without a return path must measure infinity.

Hot Leakage Current Check

Plug the AC cord directly into an AC outlet. DO NOT use an isolation transformer. Use a 1500 ohms, 10W resistor in parallel with a .15µF capacitor to connect between any exposed metal parts on the receiver and a good earth ground. (See figure below.) Use an AC voltmeter with at least 5000 ohms per volt sensitivity to measure the voltage across the resistor. Check all exposed metal parts and measure voltage at each point. Voltage measurements should not exceed .75VAC, 500µA. Any value exceeding this limit constitutes a potential shock hazard and must be corrected. If the AC plug is not polarized, reverse the AC plug and repeat exposed metal part voltage measurement at each point.



TEST JIG HOOKUP

Chek-A-Color Function	Adapter No.	PC Board Plug No.	Pin	Color
CRT	B239	P Horiz	E4401	Red
Yoke	D4160	P Horiz	E4402	Blue
Yoke Setting	YP3	P Vert	E4501	Yellow
Comments	Focus Tap	P Vert	E4502	Green

HIGH VOLTAGE SHUTDOWN TEST

Apply 120VAC. Use remote transmitter to set customer controls for normal operation. Momentary short XRP1 to XRP2. The receiver should lose raster and sound. If receiver 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 the receiver on.

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PHOTOFACT® Technical Service Data

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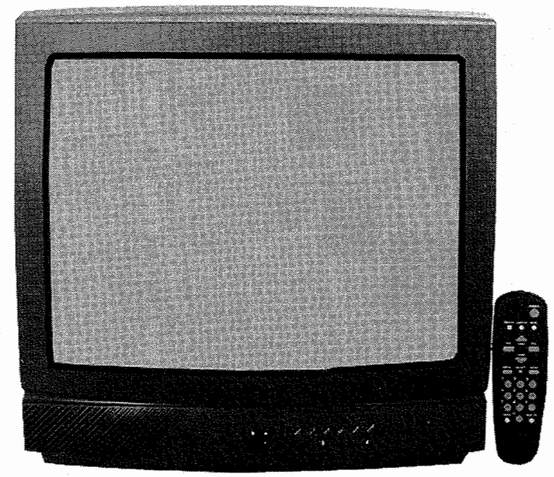
For Supplier Address,
See PHOTOFACT Annual Index

GE

Model 20GT320TX2 (Chassis CTC175A2)



Representative Model

Complete coverage for servicing a television receiver...

- **Schematics**
- **Parts list**
- **Component locations**
- **Troubleshooting guide**

Coverage includes these additional models and chassis:

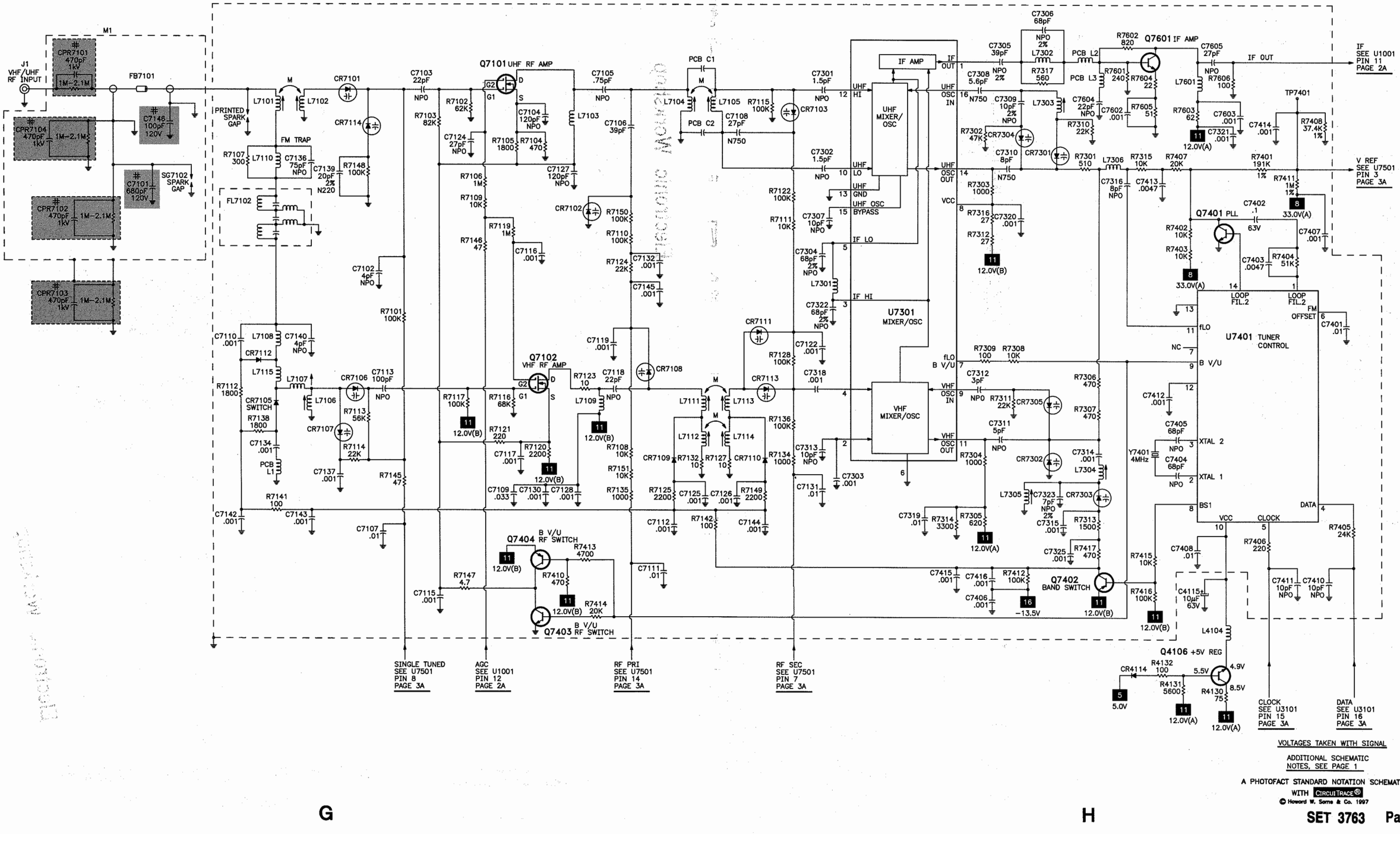
MODELS	CHASSIS
20GT324JX2	CTC175A2
20GT324TX2	CTC175A2

HOWARD W. SAMS & COMPANY

JANUARY 1997 SET 3763

3763

TUNER SCHEMATIC



TROUBLESHOOTING

POWER SUPPLY CIRCUIT DESCRIPTION

Check F4001 and F4150. If F4001 is open check CR4001 thru CR4004, Q4150, C4001, C4003, C4004, C4007, C4009, and C4010. If F4150 is open, check Q4150, C4153, T4401, and Q4401. Apply 120VAC and check for 12.1V at pin 3 of U4102. If 12.1V is missing, check U4102, CR4157 thru CR4160, L4001, R4001, and T4102.

If 12.1V is present, check for 5.0V at the emitter of Q4103 and Q4105. If 5.0V is missing, check Q4103, Q4105, CR4104, pin 1 of U1001, Q3101, and Q3102. The 5.0V sources at the emitters of Q4103 and Q4105 are active 30 seconds after 120VAC is applied to the receiver.

If 5.0V is present at the emitter of Q4103 and Q4105, turn the set on and check for 140V at the emitter of Q4150. If 140V is missing, check CR4001 thru CR4004, R4150, Q4150, Q4151, Q4153, and pins 29 and 30 of U1001. With the receiver turned off, the voltage at the emitter of Q4150 is approximately 164V. When the receiver is turned on, the voltage at the emitter of Q4150 will be 140V. The 140V is monitored at pin 30 of U1001. U1001 has an internal pulse width modulator that supplies a voltage at pin 29 that is adjusted as the load on the B+ line changes. If the B+ load increases, the voltage at pin 29 of U1001 will also increase. This causes Q4153 to conduct harder and Q4151 to conduct less. When Q4151 conducts less, the voltage at the base of Q4150 will increase, and Q4150 will supply more current to the B+ line. If the B+ load decreases, the voltage at pin 29 of U1001 will also decrease. This will cause Q4153 to conduct less and Q4151 to conduct harder. When Q4151 conducts harder, the voltage at the base of Q4150 will decrease, and Q4150 will supply less current to the B+ line.

If 140V is present, refer to the "Horizontal" and "System Control Microprocessor Circuit" sections of this Troubleshooting guide.

HIGH VOLTAGE SHUTDOWN

CAUTION: When defeating the high voltage shutdown circuit, do not exceed the maximum high voltage specified on the schematic, as this may cause excessive X-radiation and damage to the CRT and associated components. Monitor high voltage while troubleshooting.

The high voltage from T4401 is monitored and rectified by CR4901. Should the high voltage increase, the rectified voltage at the cathode of CR4901 will also increase and trigger CR4902. Voltage at emitter of Q4901 will increase and turn on Q4901. Voltage at pin 26 of U1001 will increase, which will cause the receiver to shut down. To troubleshoot, disconnect one end of CR4902 and check Q4901, CR4901, and CR4902.

Voltages Taken With Receiver In Shutdown

U1001		Q4901	
Pin 24	2.6V	E	0V
Pin 26	.3V	B	0V
		C	.1V

HORIZONTAL

To determine if the receiver is in shutdown, refer to the "High Voltage Shutdown" section of this Troubleshooting guide. If the receiver is not in shutdown, inject a horizontal signal at the base of Q4401. If horizontal deflection is now present, check T4301, Q4301, Q4302, and pins 24 thru 27 of U1001. If horizontal sweep is missing, check Q4401 and T4401.

VERTICAL

Check pin 17 of U1001 for 3.0Vp-p vertical ramp signal. If the vertical ramp signal is present, check U4501. If the vertical ramp signal is missing, check for 7.5V at pin 32 of U1001 and check for 3.1V at pin 18 of U1001. If 3.1V is missing, check C4501, C4503, and U1001.

VIDEO & CHROMA

Inject a video signal at pin 48 of U1001 and check for video on the CRT. If video is now present, check Q2704 and refer to the "IF AGC" section of this Troubleshooting guide. Check for the proper waveforms at pins 36, 37, and 38 of U1001. If the waveforms are missing, check U1001. If the waveforms are present at pins 36, 37, and 38 of U1001, refer to the "Raster" section of this Troubleshooting guide.

RASTER

Check the CRT and CRT voltages. If red is missing, check pin 36 of U1001, pin 8 of CRT, and Q5001. If green is missing, check pin 37 of U1001, pin 6 of CRT and Q5002. If blue is missing, check pin 38 of U1001, pin 11 of CRT and Q5003.

AUDIO

Select an active TV channel, and check for an audio waveform at pin 59 of U1001. If the audio waveform is missing, check pins 3, 5, 55, 57, and 58 of U1001. If the audio waveform is present, check Q1951 thru Q1954, Q1903, and pin 29 of U3101.

IF AGC

Inject a video IF signal at pin 11 of U1001 and check for video on the CRT. If video is present, check the tuner circuit. Check for a video waveform at pin 51 of U1001. If the waveform is present refer to the "Video & Chroma" section of this Troubleshooting guide. Apply AGC bias to pin 13 of U1001. If video is now present, check pins 6, 12, 13, and 14 of U1001.

SYSTEM CONTROL MICROPROCESSOR CIRCUIT

Check all standby power supplies sources. Press power button and check for horizontal drive pulses at pin 24 of U1001. If drive pulses are present, even momentarily, the system control circuit is operating properly and the problem is in the horizontal circuit. If drive pulses are not present at pin 24 of U1001, check for 7.0V at pin 22 of U1001. If the 7.0V is missing, unsolder pin 22 and check for voltage at the cathode of CR4115. Check U1001 by substitution. If 7.0V is still missing, check the source of 7.0V and check all standby voltages. Check for 4.9V standby voltage at pin 20 of U3101 and 5.4V at pin 1 of U3101. If 5.4V is missing at pin 1, check the reset circuit. If 4.9V is missing at pin 20, check the power supply circuit. Check for 5.0Vp-p waveform at pins 41 and 42 of U3101. If response is less than 5.0Vp-p, check Y3101. If the signal is missing, check U3101 and Y3101. Monitor pins 14, 15, and 16 of U3101. Ensure that there is no data activity in the standby mode. Press the power button and check for 5.0Vp-p data pulses. If no data pulses appear when the power button is depressed, unsolder pins 4 and 5 of U7401. Recheck pins 14, 15, and 16 of U3101. If data activity appears, check U7401 and associated components. If data pulses do not return, unsolder pins 14, 15, and 16 of U3101, and check for 5.0Vp-p data pulses in the standby mode. If no data pulse are present, check U3101 by substitution. If data pulses are present, reconnect pins 14, 15, and 16 of U3101. Unsolder pins 5 and 6 of U3201, check for data pulses in the stand by mode at pins 5 and 6 of U3201. If data pulse are now present, check U3201 by substitution and perform the "Chassis Alignment Parameter" section of Miscellaneous Adjustments. If data activity is missing at pins 14, 15, and 16 of U3101, with U3201 out of circuit, resolder pins 5 and 6 of U3201. When U3101 is initialized, it checks for the presence of U3201. Under normal conditions, it finds U3201 immediately, and ceases data activity. When pins 5 and 6 of U3201 are disconnected, U3101 continues looking for U3201. This indicates that U3101 is not defective. If U3201 is to be replaced, complete chassis alignment must be performed. Unsolder pins 52, 53, and 54 of U1001. Check for data pulses on the foil leading to these pins. If data pulses are not present, check for an open connection, a bad resistor, or a leaky capacitor on the data line. After locating the problem and correcting it, resolder all connections that have been unsoldered during the troubleshooting procedures.

SERVICE TIPS

INTERMITTENT GROUND CONNECTIONS

Intermittent ground connections on the shield of the microcomputer and the tuner can result in a variety of symptoms. The intermittent connection is normally caused by the shield not being seated prior to soldering. The problem is most prevalent in early production units. Open ground tabs on the microcomputer shield can cause loss of audio and video, noise in the picture, and intermittent shutdown. Open ground tabs on the tuner shield can cause reduced height. Carefully inspect the ground connections, resolder if necessary. It is necessary to remove the bottom cover of the tuner in order to gain access to the ground connections on the shield. Failure to remove the bottom cover can result in repeat symptoms.

NO COLOR ON SOME CHANNELS

Early production units may have no color on some cable channels or when used with video games. These units have serial numbers lower than 401000000. To correct this problem, check the value of R2805. It should be 750 ohm 1/10W (part number 215200). Also R2806 should be a jumper (part number 205408). Finally, C2806 should be a 1µF capacitor (part number 220998).

NO VERTICAL AND NO AUDIO

This symptom can be caused by CR4704 being shorted or R4702 and R4517 being open. Replace CR4704 (part number 207878) or R4702 and R4517 as necessary.

INTERMITTENT TUNER

The picture may be good initially, but may have snow after warm-up. Y7401 may stop oscillating as the temperature increases. Check Y7401 (part number 182839) and replace as necessary.

COLORED BAR AT THE TOP OF PICTURE DURING TAPE PLAYBACK

While a tape is played a colored band may appear at the top of the picture. This occurs with a copy protected tape. The colored band is usually red, but can be green or blue. To repair this problem, replace U1001 (part number 215524). After replacing U1001, perform the "Service Adjustment Parameters" and the "Chassis Alignment Parameters" sections of Miscellaneous Adjustments.

TUNER LOCAL OSCILLATOR INOPERATIVE ON BAND TWO

When the tuner local oscillator stops working, the tuning voltage drops to 0V, and the chassis locks up all band two channels (off air channels 7 thru 13 and cable channels 18 thru 51). This problem occurs with higher temperatures. To repair this problem, replace C7311 (part number 194906). The value changes from 2pF to 6pF. After replacing C7311, it is necessary to perform "Electronic Tuner Alignment" section of Miscellaneous Adjustments.

NO STEREO OPERATION

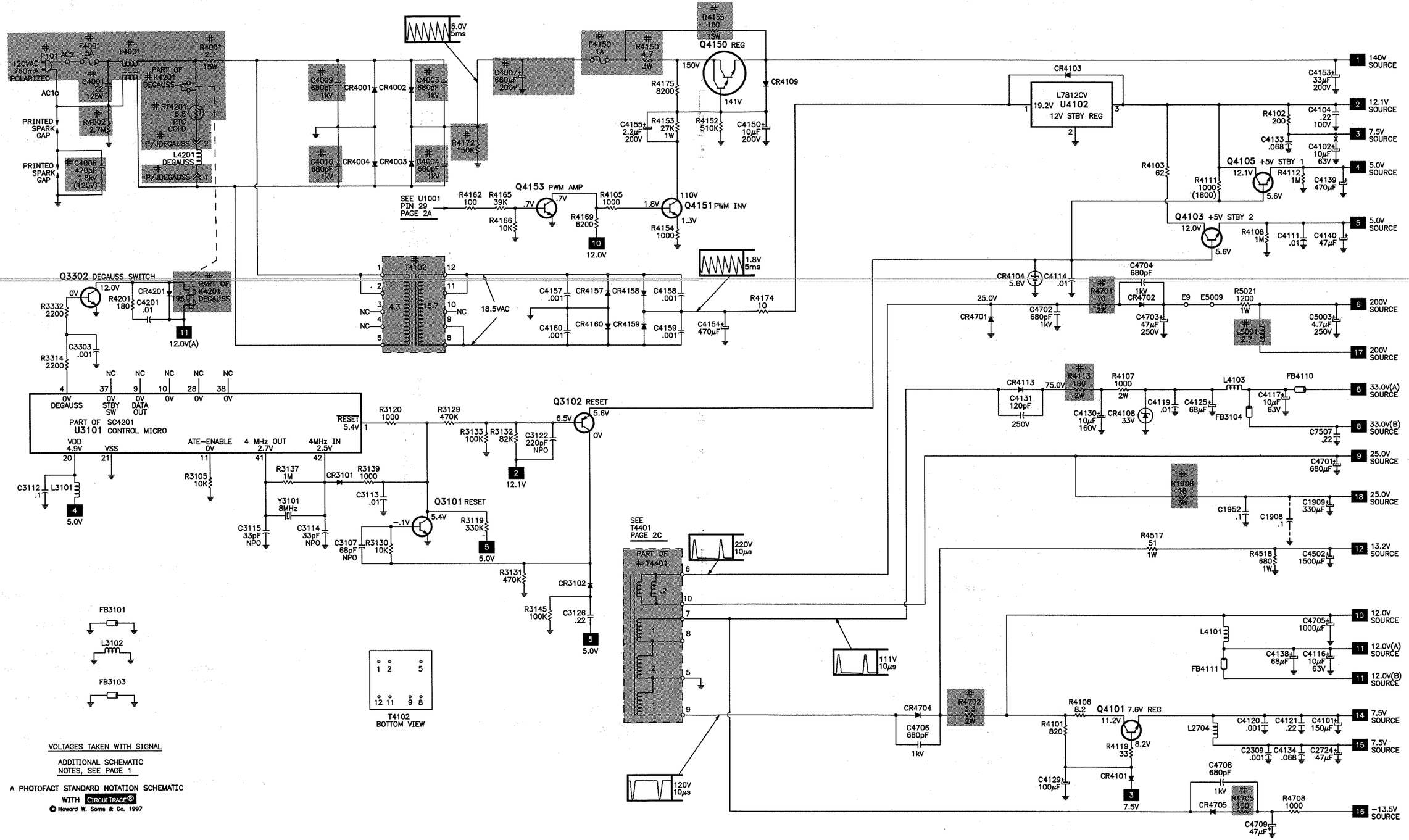
This chassis may not enter the stereo mode even though the stereo mode is selected. C1707 may be open. Replace C1707 (part number 205230) as necessary.

SCHEMATIC NOTES

#	**For SAFETY use only equivalent replacement part, see parts list.**
-x-	Circuitry not used in some versions.
---	Circuitry used in some versions.
⏚	Ground
⏚	Chassis ground
▽	Common tie point
△	Taken from common tie point
3	Schematic CIRCUITRACE ® Voltage source tie point.
A	Cabling: Heavy lines reduce use of multiple lines.

Waveforms and voltages are taken from ground, unless noted otherwise.
Waveforms taken with triggered scope and colorbar signal. Waveform voltage is peak to peak. Timebase is per division. Waveforms shown at 10 divisions.
Supply voltages maintained as seen at input.
Voltages measured with digital meter and a 1000µV RF signal, with colorbar pattern, applied to antenna terminal.
Controls adjusted for normal operation.
Capacitors are 50 volts or less, 5% or greater unless noted.
Electrolytic capacitors are 50 volts or less, 20% or greater unless noted.
Resistors are 1/2W or less, 5% or greater unless noted.
Value in ( ) used in some versions.
Measurements with switching as shown, unless noted.
Rated voltage shown on zener diodes.

POWER SUPPLY SCHEMATIC



VOLTAGES TAKEN WITH SIGNAL

ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

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MISCELLANEOUS ADJUSTMENTS

PRETUNING

NOTE: All procedures require an antenna connected and power applied to the receiver.

Auto Program

1. Press the menu button to select setup menu and highlight autoprogram.
2. Press the + button. All available channels are scanned and stored in memory.
3. When finished, press done button to save selections.

Channel Memory

1. Press the menu button to select the setup menu.
2. Press channel down button to highlight channel memory.
3. Select channel to add or delete with number buttons.
4. Press + to add a channel or - to erase a channel.
5. Repeat steps 3 and 4 to add or erase other channels.
6. When finished, press done button to save selections.

HIGH VOLTAGE CHECK

Tune in a picture. Set brightness, contrast, and color to minimum. Connect a high voltage probe to the CRT anode. High voltage should measure 25.5kV to 27.5kV.

COLOR TEMPERATURE

NOTE: See Service Adjustment Parameters to change drive and bias values. While in parameters 07 thru 12, pressing the menu button on the receiver toggles between collapsed raster service line and full raster.

Set the receiver to S-Video with no video signal. Preset the red, green, and blue drive values to 32. Preset the red, green, and blue bias values to provide 170V at the collector of the respective output transistors. Adjust screen control for a service line that is just visible. Adjust red, green, and blue drives to obtain a white raster. Check the low light to high light gray scale tracking. Repeat the procedure, if necessary, to obtain the best performance.

SERVICE MENU

The following adjustment and alignment procedures are accessed thru a service menu. To access the service menu, turn the receiver on, press the menu button and hold it down while pressing the power button. While holding down the menu button, release the power button and press the volume + button. The screen will display a one line menu, on the left the parameter P 00, and on the right the value of that parameter V 00. Release buttons. Adjustments are made by selecting the proper parameter and changing the value of that parameter. To change the parameter number use channel up and down buttons. To adjust the current value of that parameter use volume + and - buttons. The three main groups of parameters are, the service adjustment parameters, the chassis alignment parameters, and the tuner alignment parameters. To access and change any of the adjustments, the proper parameter pass number and value must be entered. This information is listed at the beginning of each alignment. When these parameters are modified, the T-Chip and the corresponding EEPROM are updated. All service adjustments are bus controlled, except focus and screen.

WARNING: When adjusting the horizontal frequency be careful not to exceed the value range, or the receiver will go into shutdown, and replacement of U3101 may be required. If the receiver goes into shutdown, connect a capacitor across C4402 with the same value, redo horizontal frequency adjustment, then remove the capacitor. It may be necessary to readjust the horizontal frequency again.

SERVICE ADJUSTMENT PARAMETERS

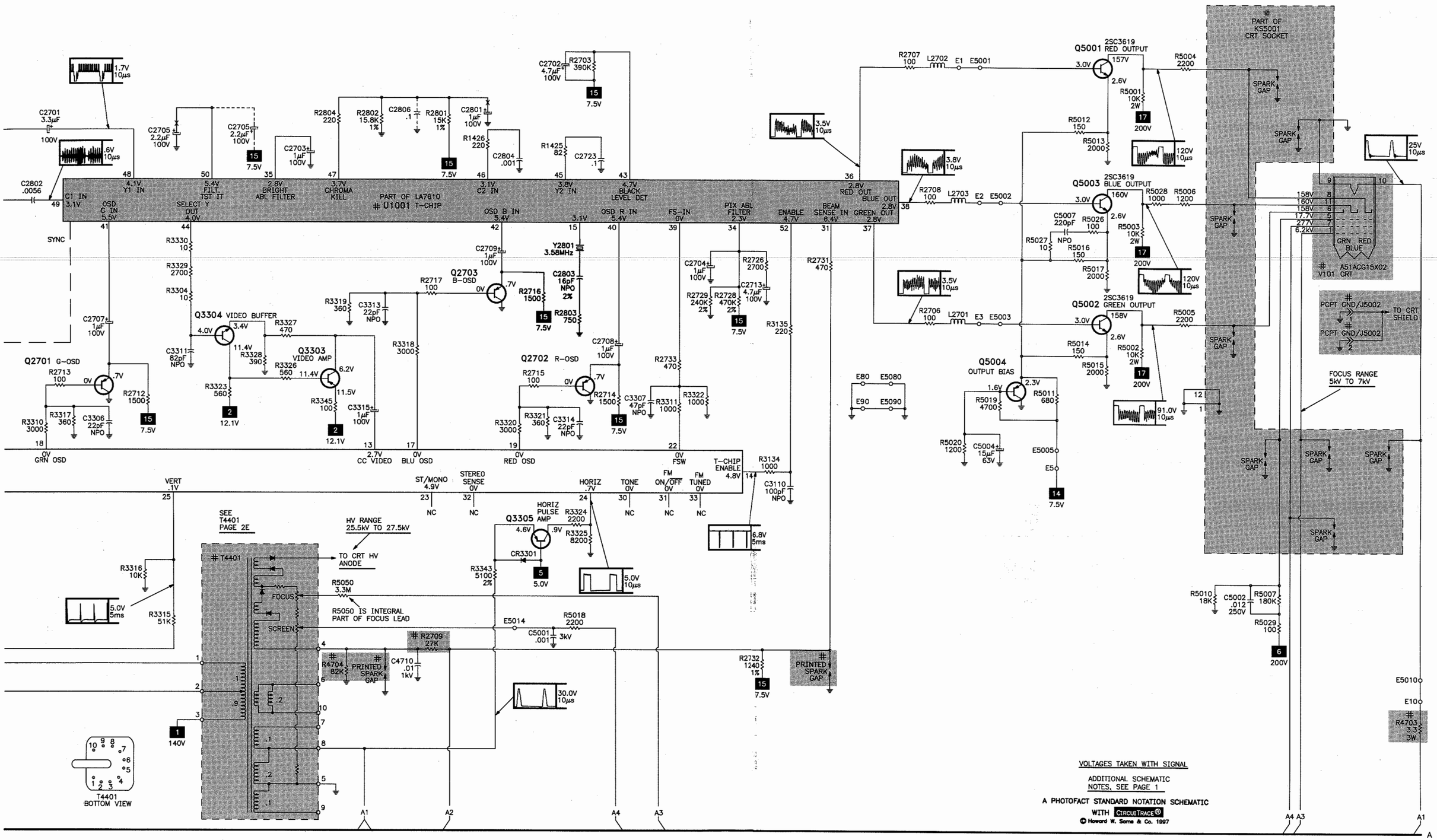
Parameter No.	Parameter Name	Value Range	On-Set Value	Comment
00	Pass number for service adjustment parameters.	Must set to 76	-	May not advance until value is set.
01	Horizontal Frequency	00 - 63	15	Adjust for stable or slowly moving horizontal lines.
02	Horizontal Phase	00 - 15	9	Adjust to center picture left to right.
03	EW DC	00 - 15	7	Used in 27" receivers.
04	EW Amplitude	00 - 07	3	Used in 27" receivers.
05	Vertical DC	00 - 15	9	Adjust to center picture top to bottom.
06	Vertical Size	00 - 31	20	Adjust to 1/4" overscan top and bottom of screen.
07	Red Bias	00 - 127	41	Press menu button on the receiver for setup line.
08	Green Bias	00 - 127	38	Press menu button on the receiver for setup line.
09	Blue Bias	00 - 127	29	Press menu button on the receiver for setup line.
10	Red Drive	00 - 63	25	Press menu button on the receiver for setup line.
11	Green Drive	00 - 63	24	Press menu button on the receiver for setup line.
12	Blue Drive	00 - 63	23	Press menu button on the receiver for setup line.

CHASSIS ALIGNMENT PARAMETERS

Parameter No.	Parameter Name	Value Range	On-Set Value	Comment
13	Pass number for chassis alignment parameters.	Must set to 77	-	May not advance to higher parameter until value is set.
14	PLL Tuning	00 - 63	38	Apply 4.0V to pin 14 of U1001. Short the junction of R7130 and R2313 to ground. Connect 41.25MHz marker to pin 1 of SF2301. Connect an oscilloscope to pin 55 of U1001. Adjust value for 2.2µs sinewave.
15	4.5MHz Trap	00 - 07	3	Short the junction of R7130 and R2313 to ground. Apply 45.75MHz (300mV) and 41.25 MHz (100mV) to pin 1 of SF2301. Connect an oscilloscope to pin 63 of U1001, and adjust value for minimum 4.5MHz sinewave.
16	Video Level	00 - 07	3	Tune in a color bar pattern, 100% modulation, super pulse display. Connect oscilloscope to pin 63 of U1001. Adjust value range to produce 2.0Vp-p response.
17	FM Level	00 - 15	7	Connect signal generator to pin 55 of U1001, inject 4.5MHz carrier, 1kHz modulation, with 25kHz deviation. Apply 4.0V to pin 14 of U1001. Connect oscilloscope to pin 3 of U1001, and adjust value range for 1.2Vp-p of 1kHz component.
18	B+ Trim	00 - 15	9	CTC175 only.
19	RF AGC (1)	00 - 31	19	Manual tune channel 6.
20	D-PIP Chroma	00-127	0	Adjust value levels to match big picture levels.
21	D-PIP Tint	00-255	0	Adjust value levels to match big picture levels.
22	D-PIP Brightness	00-31	0	Adjust value levels to match big picture levels.
23	D-PIP Contrast	00-63	0	Adjust value levels to match big picture levels.
24	Factory Tint	00 - 63	29	

(1) RF AGC has been preset at time of manufacture for optimum operation over a wide range of RF signal input conditions. Readjustment should not be required unless the tuner has been repaired, U1001, U3101, or U3201 has been replaced, or unusual signal conditions exist. Use weakest local signal to adjust RF AGC parameter setting.

TELEVISION SCHEMATIC continued



MISCELLANEOUS ADJUSTMENTS continued

ELECTRONIC TUNER ALIGNMENT

Use tuner alignment generator, RCA stock no. TAG001, and a VCR for signal source. Monitor RF AGC at pin 12 of U1001, and adjust for minimum voltage at each parameter. The entire Electronic Tuner Alignment procedure, once started, must be completed in its entirety. Electronic Tuner Alignment is performed with top and bottom covers in place with bottom cover soldered.

Parameter No.	Parameter Name	Value Range	On-Set Value
25	Pass number for tuner alignment parameters.	Must set to 78	
100	Ch. 2 secondary	00-63	25
101	Ch. 2 primary	00-63	22
102	Ch. 2 single	00-63	11
103	Ch. 6 secondary	00-63	52
104	Ch. 6 primary	00-63	46
105	Ch. 6 single	00-63	25
106	Ch. 14 secondary	00-63	57
107	Ch. 14 primary	00-63	53
108	Ch. 14 single	00-63	48
109	Ch. 17 secondary	00-63	26
110	Ch. 17 primary	00-63	46
111	Ch. 17 single	00-63	32
112	Ch. 18 secondary	00-63	46
113	Ch. 18 primary	00-63	37
114	Ch. 18 single	00-63	40
115	Ch. 13 secondary	00-63	55
116	Ch. 13 primary	00-63	45
117	Ch. 13 single	00-63	45
118	Ch. 34 secondary	00-63	59
119	Ch. 34 primary	00-63	46
120	Ch. 34 single	00-63	44
121	Ch. 37 secondary	00-63	58
122	Ch. 37 primary	00-63	45
123	Ch. 37 single	00-63	43
124	Ch. 48 secondary	00-63	40
125	Ch. 48 primary	00-63	45
126	Ch. 48 single	00-63	25

Parameter No.	Parameter Name	Value Range	On-Set Value
127	Ch. 50 secondary	00-63	27
128	Ch. 50 primary	00-63	48
129	Ch. 50 single	00-63	12
130	Ch. 51 secondary	00-63	45
131	Ch. 51 primary	00-63	42
132	Ch. 51 single	00-63	30
133	Ch. 57 secondary	00-63	47
134	Ch. 57 primary	00-63	42
135	Ch. 57 single	00-63	24
136	Ch. 63 secondary	00-63	47
137	Ch. 63 primary	00-63	39
138	Ch. 63 single	00-63	17
139	Ch. 76 secondary	00-63	44
140	Ch. 76 primary	00-63	35
141	Ch. 76 single	00-63	14
142	Ch. 83 secondary	00-63	43
143	Ch. 83 primary	00-63	34
144	Ch. 83 single	00-63	16
145	Ch. 93 secondary	00-63	44
146	Ch. 93 primary	00-63	36
147	Ch. 93 single	00-63	20
148	Ch. 110 secondary	00-63	46
149	Ch. 110 primary	00-63	37
150	Ch. 110 single	00-63	18
151	Ch. 117 secondary	00-63	50
152	Ch. 117 primary	00-63	41
153	Ch. 117 single	00-63	16
154	Ch. 125 secondary	00-63	63
155	Ch. 125 primary	00-63	62
156	Ch. 125 single	00-63	11

TUNER COIL ALIGNMENT

The tuner coil alignment is preset at the time of manufacture and should require no further adjustment. The following recommended procedure should be performed only in event a complete tuner alignment is necessary, which is unlikely. Use plastic or wooden tool to knife coils. This procedure is performed with top tuner cover removed and bottom tuner cover in place and soldered.

1. Manually tune the receiver and the tuner alignment generator to channel 125 (band 3) and enter parameter 154. Connect voltmeter to tuner side of R7525. Check for voltage reading between 4.6V and 4.8V. If incorrect, expand or compress L7303 to set voltage within these limits.
2. Manually tune the receiver and the tuner alignment generator to channel 50 (band 2) and enter parameter 127. Check for voltage reading between 4.8V and 5.0V. If incorrect, expand or compress L7304 to set voltage within these limits.
3. Manually tune the receiver and the tuner alignment generator to channel 17 (band 1) and enter parameter 109. Check for voltage reading between 4.4V and 4.6V. If incorrect, expand or compress L7305 to set voltage within these limits.
4. Manually tune the receiver and the tuner alignment generator to channel 125 (band 3) and enter parameter 154. Connect a voltmeter to pin 8 of U7501. Set parameter value range to 31. Expand or compress L7105 for minimum RF AGC voltage.
5. Enter parameter 155 and set parameter value range to 31. Expand or compress L7104 for minimum RF AGC voltage.
6. Enter parameter 156 and set parameter value range to 31. Expand or compress L7102 for minimum RF AGC voltage.
7. Manually tune the receiver and the tuner alignment generator to channel 50 (band 2) and enter parameter 127. Set parameter value range to 31. Expand or compress L7113 for minimum RF AGC voltage.
8. Enter parameter 128 and set parameter value range to 31. Expand or compress L7111 for minimum RF AGC voltage.
9. Enter parameter 129 and set parameter value range to 31. Expand or compress L7107 for minimum RF AGC voltage.
10. Manually tune the receiver and the tuner alignment generator to channel 17 (band 1) and enter parameter 109. Set parameter value range to 31. Expand or compress L7114 for minimum RF AGC voltage.
11. Enter parameter 110 and set parameter value range to 31. Expand or compress L7112 for minimum RF AGC voltage.
12. Enter parameter 111 and set parameter value range to 31. Expand or compress L7106 for minimum RF AGC voltage.
13. Perform the entire Electronic Tuner Alignment.

TEST EQUIPMENT

Test equipment listed by participating manufacturer illustrates typical or equivalent equipment used by Sams engineers to obtain measurements. This equipment is compatible with most types used by field service technicians.

Equipment	Sencore No.	Equipment	Sencore No.
Oscilloscope	SC3100	Isolation Transformer	PR57
Generators		Capacitance Analyzer	LC101, LC102
RGB	CM2000	CRT Analyzer	CR70
Multiburst Signal	VG91	AC Leakage Tester	PR57
Color Bar	VG91	Inductance Analyzer	LC101, LC102
TV Stereo	VG91	Flyback Yoke Tester	TVA92
Digital VOM	SC3100	TV Stereo Power Monitor	SR68, PA81
Frequency Meter	SC3100	Field Strength Meter	SL750
Hi-Voltage Probe	HP200	Transistor Tester	TF46
Accessory Probes	TP212	Video Analyzer	VG91, TVA92

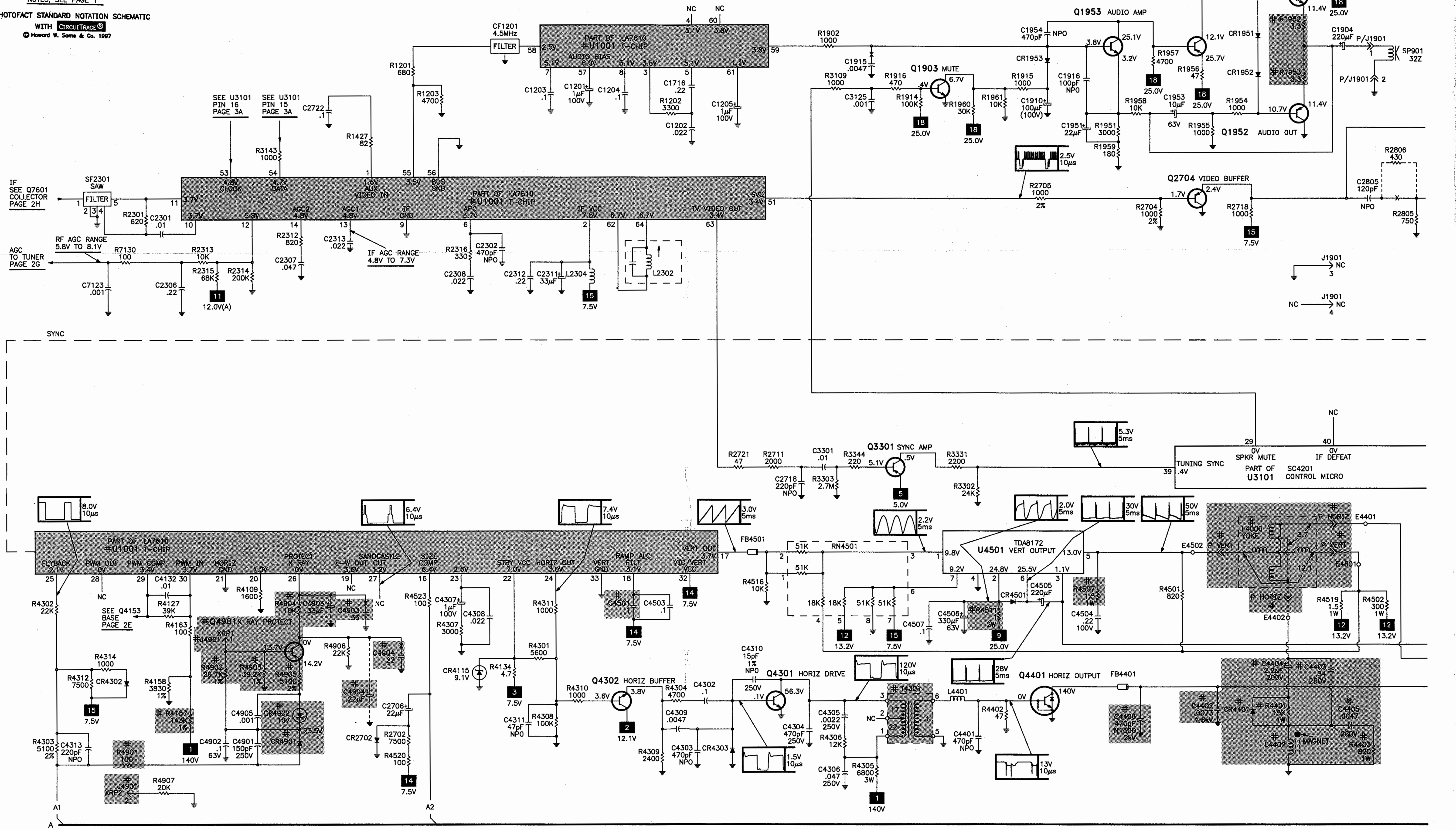
A B

TELEVISION SCHEMATIC

VOLTAGES TAKEN WITH SIGNAL

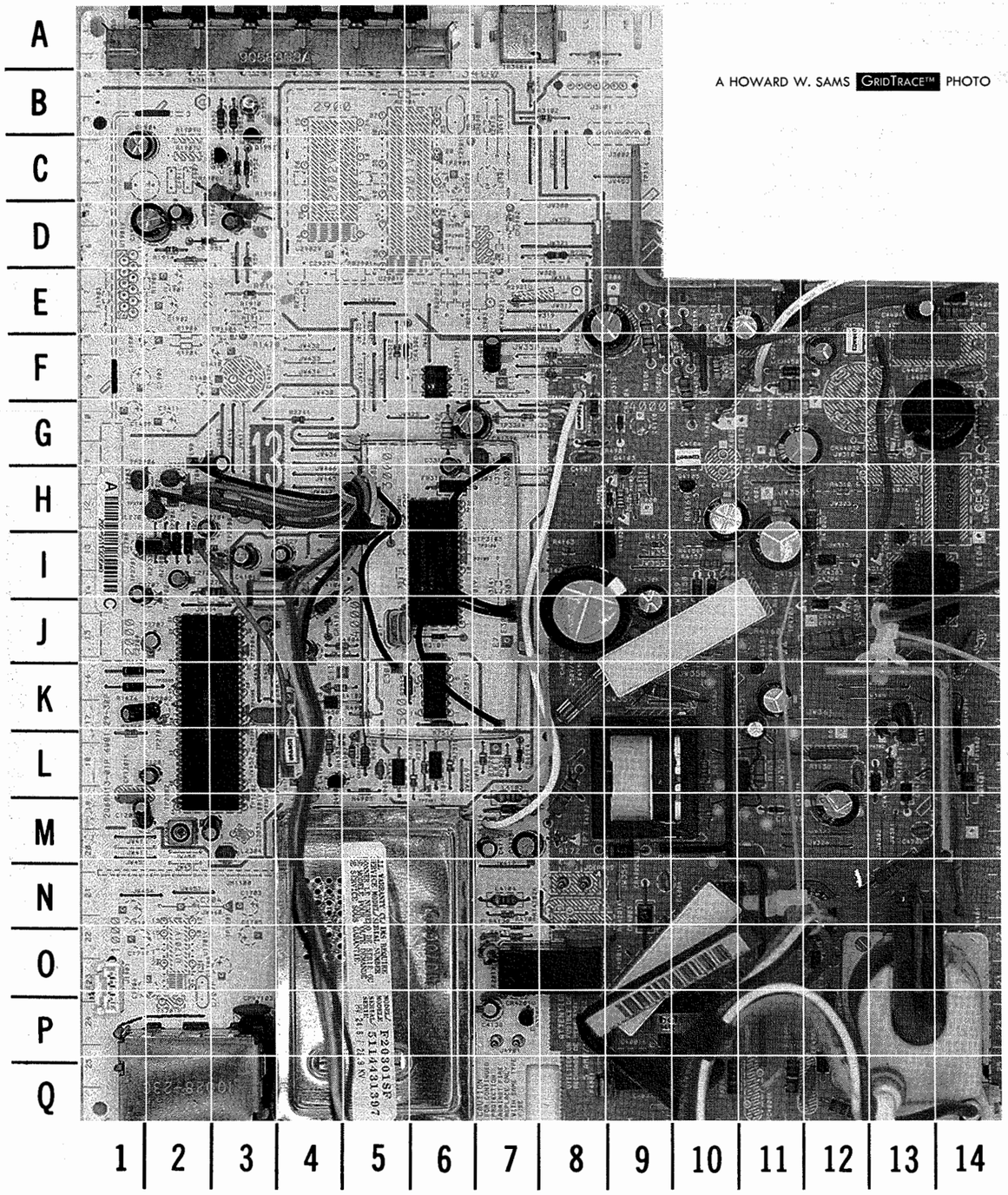
ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CircuitTrace®



PART OF LA7610 #U1001 T-CHIP
AUDIO BIAS
CF1201 4.5MHz FILTER
Q1951 AUDIO OUT
Q1954 INVERTER
Q1953 AUDIO AMP
Q1903 MUTE
Q1952 AUDIO OUT
SP901 32Ω
P/J1901
Q2704 VIDEO BUFFER
SF2301 SAW FILTER
IF SEE Q7601 COLLECTOR PAGE 2H
AGC TO TUNER PAGE 2G
RF AGC RANGE 5.8V TO 8.1V
IF AGC RANGE 4.8V TO 7.3V
SEE U3101 PIN 16 PAGE 3A
SEE U3101 PIN 15 PAGE 3A
TV VIDEO OUT
SYNC
Q3301 SYNC AMP
PART OF SC4201 U3101 CONTROL MICRO
TUNING SYNC
SPKR MUTE
IF DEFEAT
U4501 TDA8172 VERT OUTPUT
RN4501
L4000 YOKE
Q4901X RAY PROTECT
SEE Q4153 BASE PAGE 2E
Q4302 HORIZ BUFFER
Q4301 HORIZ DRIVE
Q4401 HORIZ OUTPUT
T4301
FB4401
FB4501
MAGNET
FLYBACK
PWM OUT
PWM COMP.
PWM IN
HORIZ GND
PROTECT X RAY
E-W OUT
SANDCASTLE OUT
SIZE COMP.
STBY VCC
HORIZ OUT
VERT GND
RAMP ALC FILT
VERT OUT VID/VERT VCC

MAIN BOARD - TOP VIEW



A HOWARD W. SAMS GRIDTRACE™ PHOTO

MAIN BOARD - TOP VIEW, GRIDTRACE LOCATION GUIDE

C1201	L-2	C4404	E-13	E1	H-2	R1916	E-3	R4403	G-14
C1205	M-1	C4405	F-13	E2	H-2	R1952	B-3	R4501	F-10
C1904	C-1	C4406	J-14	E3	H-2	R1953	B-3	R4502	F-9
C1909	D-2	C4502	E-9	E9	O-12	R1958	D-3	R4507	F-11
C1910	D-2	C4504	F-12	E10	M-14	R1959	D-3	R4511	F-11
C1951	D-3	C4505	F-12	E80	P-12	R1960	D-2	R4517	F-10
C1953	B-3	C4506	E-11	E90	G-2	R2706	I-2	R4518	F-9
C2306	L-4	C4701	M-12	E4401	N-14	R2707	I-2	R4519	F-10
C2311	M-3	C4702	P-12	E4402	F-13	R2708	I-2	R4523	K-3
C2701	K-1	C4703	N-12	E4501	E-10	R2709	Q-11	R4701	P-12
C2702	H-3	C4704	O-12	E4502	F-11	R2711	G-4	R4702	H-12
C2703	I-2	C4705	G-11	F4001	Q-8	R2718	L-1	R4703	N-13
C2704	H-2	C4706	I-12	F4150	K-8	R2732	D-8	R4704	Q-12
C2705	H-3	C4708	M-13	FB3101	H-6	R2733	I-2	R4705	L-13
C2706	J-3	C4709	K-13	FB3103	L-5	R3102	B-8	R4708	N-7
C2707	I-1	C4710	Q-12	FB3104	L-6	R3143	H-4	R4901	G-8
C2708	I-2	C4901	G-8	FB4401	L-14	R3203	G-7	R4902	L-5
C2709	J-2	C4902	G-8	FB4501	K-4	R3315	G-7	R4903	L-4
C2713	I-3	C4905	L-5	IR3401	A-7	R3329	G-4	R4904	J-5
C2724	G-3	CF1201	M-1	J4901	P-7	R3332	L-7	R4905	L-5
C2801	H-3	CPR7103	P-3	JDegauss	N-8	R3343	F-8	R4906	K-5
C3315	H-6	CR1951	C-3	K4201	O-8	R3401	B-7	R4907	L-5
C4001	Q-9	CR1952	C-3	L2302	M-2	R3402	A-8	R7512	K-6
C4003	N-9	CR1953	D-3	L2304	M-3	R4001	O-9	R7515	K-6
C4004	N-9	CR2702	I-4	L2701	H-2	R4002	Q-10	R7518	L-6
C4006	Q-9	CR3101	J-6	L2702	H-2	R4102	K-5	R7519	L-6
C4007	J-8	CR3301	H-5	L2703	H-1	R4103	H-9	R7520	L-7
C4009	O-10	CR4001	N-10	L2704	I-3	R4105	J-10	R7525	L-6
C4010	O-10	CR4002	M-9	L3101	G-7	R4106	J-4	RN4501	F-10
C4101	I-3	CR4003	N-9	L3102	G-6	R4107	M-8	RT4201	O-8
C4102	K-3	CR4004	O-10	L4001	P-10	R4111	H-9	SF2301	L-3
C4104	G-10	CR4101	J-4	L4101	L-4	R4113	L-12	SW3410	A-4
C4115	O-7	CR4103	H-9	L4103	M-7	R4130	O-7	SW3411	A-2
C4116	L-4	CR4104	G-9	L4104	N-7	R4131	O-7	SW3420	A-5
C4117	M-7	CR4108	M-7	L4401	K-13	R4150	K-9	SW3421	A-2
C4125	M-7	CR4109	M-11	L4402	G-14	R4152	M-10	SW3430	A-6
C4129	I-4	CR4113	L-13	M1	Q-2	R4153	L-11	SW3431	A-3
C4130	J-9	CR4114	L-7	Q1951	C-3	R4155	J-10	T4102	L-9
C4131	L-12	CR4157	J-10	Q1952	B-3	R4157	I-10	T4301	I-13
C4138	P-7	CR4158	I-10	Q3302	P-7	R4158	I-10	T4401	P-13
C4139	G-6	CR4159	I-10	Q4101	I-3	R4162	I-8	TUNER	O-5
C4140	F-7	CR4160	J-10	Q4103	H-9	R4163	I-8	U1001	K-3
C4150	K-11	CR4201	P-7	Q4105	H-10	R4169	H-10	U3101	I-6
C4153	I-11	CR4302	F-5	Q4150	L-11	R4172	M-8	U3201	F-6
C4154	H-10	CR4303	I-12	Q4151	K-11	R4174	I-9	U4102	I-9
C4155	L-11	CR4401	E-14	Q4301	I-13	R4175	L-10	U4501	E-11
C4304	I-13	CR4501	F-11	Q4401	L-14	R4303	F-8	U7501	K-6
C4305	J-13	CR4701	Q-12	Q4901	L-4	R4305	J-12	XRP1	P-7
C4306	J-13	CR4702	O-12	R1425	K-1	R4306	J-13	XRP2	P-7
C4307	J-4	CR4704	J-12	R1426	K-1	R4310	H-12	Y2801	K-3
C4310	I-13	CR4705	L-13	R1908	C-3	R4312	F-5	Y3101	J-5
C4402	H-14	CR4901	G-8	R1914	D-2	R4401	E-14		
C4403	F-13	CR4902	L-5	R1915	D-2	R4402	L-13		

PARTS LIST

SEMICONDUCTORS

(Select the replacement that gives the best results.)

Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
CR1951, 52, 53	-	164717	NTE519	ECG519	SK3100
CR2702	-	164717	NTE519	ECG519	SK3100
CR3101	-	164874	NTE177	ECG177	SK9091
CR3102	-	201133	-	-	-
CR3301	-	164717	NTE519	ECG519	SK3100
CR4001 Thru					
CR4004	-	147015	NTE125	ECG125	SK5010A
CR4101	-	164874	NTE177	ECG177	SK9091
CR4103	-	164717	NTE519	ECG519	SK3100
CR4104	-	215488	-	-	-
CR4108	-	217306	-	-	-
CR4109	-	164717	NTE519	ECG519	SK3100
CR4113	-	176296	NTE125	ECG125	SK5010A
CR4114	-	164874	NTE177	ECG177	SK9091
CR4115	-	215491	-	-	-
CR4157, 58, 59	-	147015	NTE125	ECG125	SK5010A
CR4160	-	147015	NTE125	ECG125	SK5010A
CR4201	-	164717	NTE519	ECG519	SK3100
CR4302	-	164717	NTE519	ECG519	SK3100
CR4303	-	176296	NTE125	ECG125	SK5010A
# **CR4401**	-	140971	NTE552	ECG552	SK9000
CR4501	-	147015	NTE125	ECG125	SK5010A
CR4701	-	207878	-	-	-
CR4702	-	176296	NTE125	ECG125	SK5010A
CR4704	-	207878	-	-	-
CR4705	-	176296	NTE125	ECG125	SK5010A
# **CR4901**	-	157301	NTE177	ECG177	SK9091
# **CR4902**	-	159429	NTE5019T1	ECG5019T1	SK9970
CR7101	-	215492	-	-	-
CR7102	-	-	-	-	-
CR7103	-	-	-	-	-
CR7105	-	215493	-	-	-
CR7106	-	215494	-	-	-
CR7107	-	-	-	-	-
CR7108	-	-	-	-	-
CR7109, 10	-	215493	-	-	-
CR7111	-	-	-	-	-
CR7112	-	215493	-	-	-
CR7113	-	-	-	-	-
CR7114	-	-	-	-	-
CR7301	-	-	-	-	-
CR7302	-	-	-	-	-
CR7303	-	215493	-	-	-
CR7304	-	-	-	-	-
CR7305	-	-	-	-	-
Q1903	-	215495	-	-	-
Q1951	-	177788	NTE31*	ECG31*	SK3866A*
Q1952	-	177789	NTE32*	ECG32*	SK3867A*
Q1953	-	215495	-	-	-
Q1954	-	215496	-	-	-

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

SEMICONDUCTORS continued

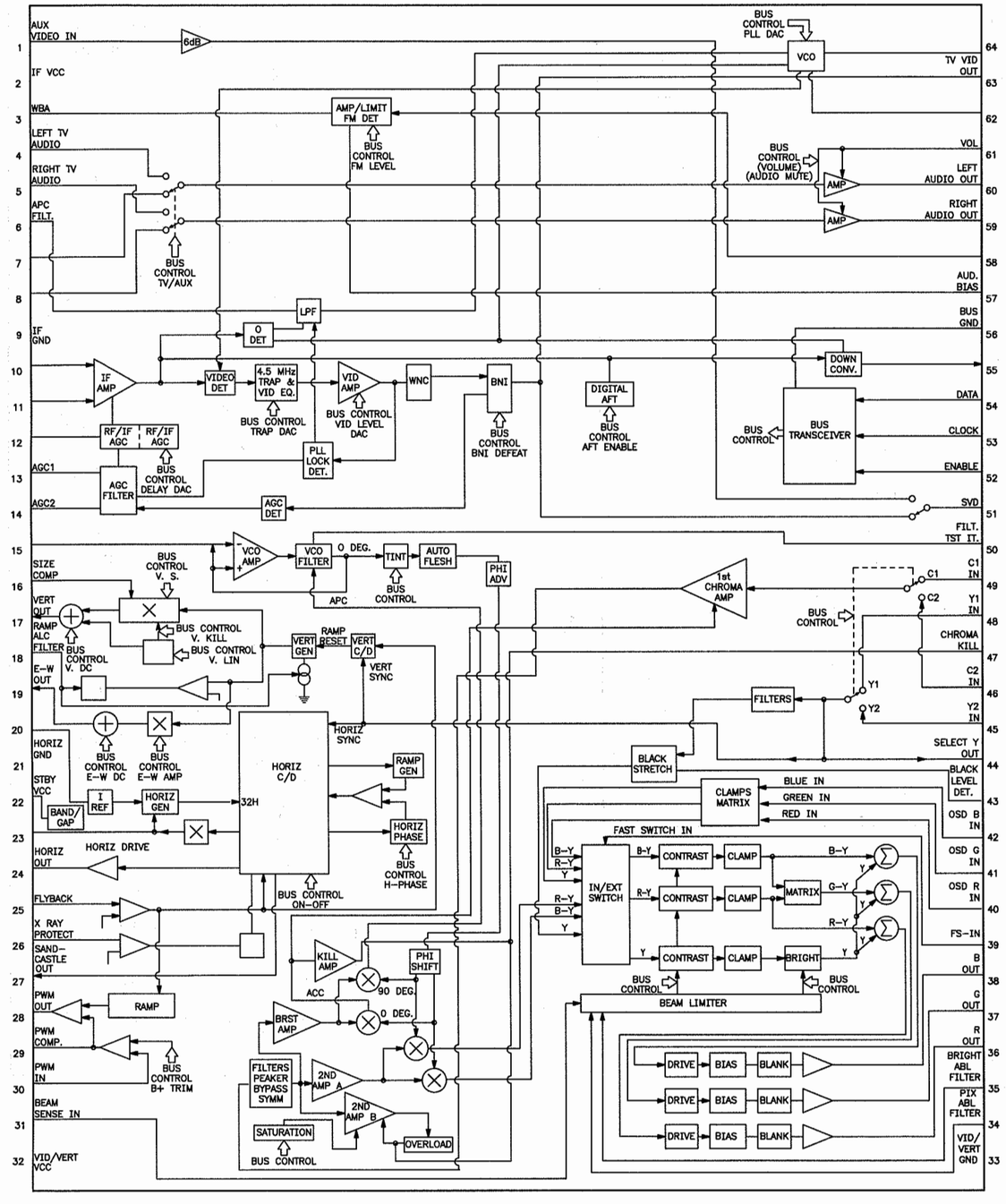
(Select the replacement that gives the best results.)

Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
Q2701 Thru					
Q2704	-	215496	-	-	-
Q3101	-	215495	-	-	-
Q3102	-	215496	-	-	-
Q3301	-	215496	-	-	-
Q3302	-	223704	-	-	-
	-	229220	-	-	-
Q3303	-	215496	-	-	-
Q3304	-	215495	-	-	-
Q3305	-	215496	-	-	-
Q4101	-	157627	NTE54	ECG54	SK9366
Q4103, 05	-	146851	NTE287	ECG287	SK3433
Q4106	-	215495	-	-	-
Q4150	-	217309	-	-	-
Q4151	-	146851	NTE287	ECG287	SK3433
Q4153	-	215495	-	-	-
Q4301	-	146851	NTE287	ECG287	SK3433
Q4302	-	215495	-	-	-
Q4401	-	177791	NTE2302	ECG2302	SK9422
# **Q4901**	-	147665	NTE159	ECG159	SK3466
Q5001, 02, 03	2SC3619	215497	NTE157	ECG157	SK3747
Q5004	-	143806	NTE159	ECG159	SK3466
	-	219025	NTE159	ECG159	SK3466
Q7101, 02	-	200566	-	-	-
Q7401	-	215495	-	-	-
Q7402	-	215496	-	-	-
Q7403	-	215495	-	-	-
Q7404	-	215496	-	-	-
Q7501, 02	-	215495	-	-	-
Q7601	-	146848	NTE229*	ECG229*	SK3246A*
# **U1001**	LA7610	215524	-	-	-
U3101	SC4201	217320	-	-	-
U3201	24C02C	217321	-	-	-
U4102	L7812CV	162394	NTE966	ECG966	SK3592
U4501	TDA8172	215531	NTE1788	ECG1788	SK9875
U7301	-	215532	-	-	-
U7401	-	215533	-	-	-
U7501	-	215534	-	-	-

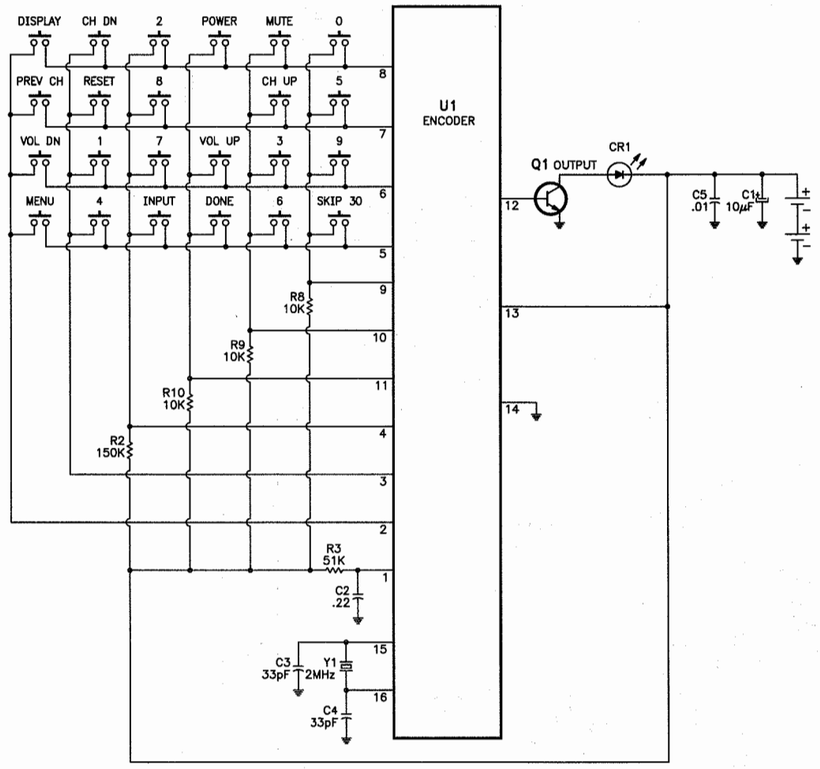
 # For SAFETY use only equivalent replacement part.
* Lead configuration may vary from original.

IC FUNCTIONS

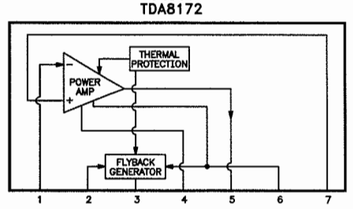
U1001
LA7610



REMOTE TRANSMITTER SCHEMATIC



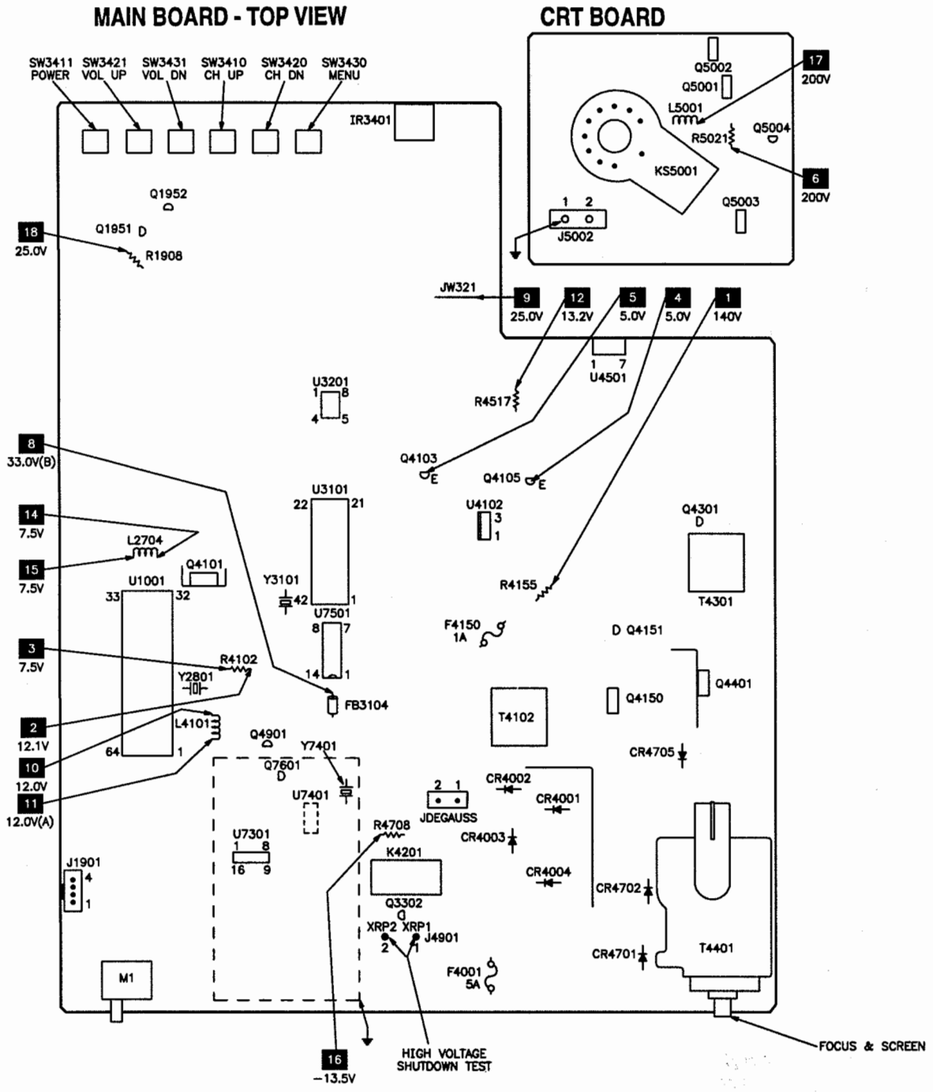
U4501
TDA8172

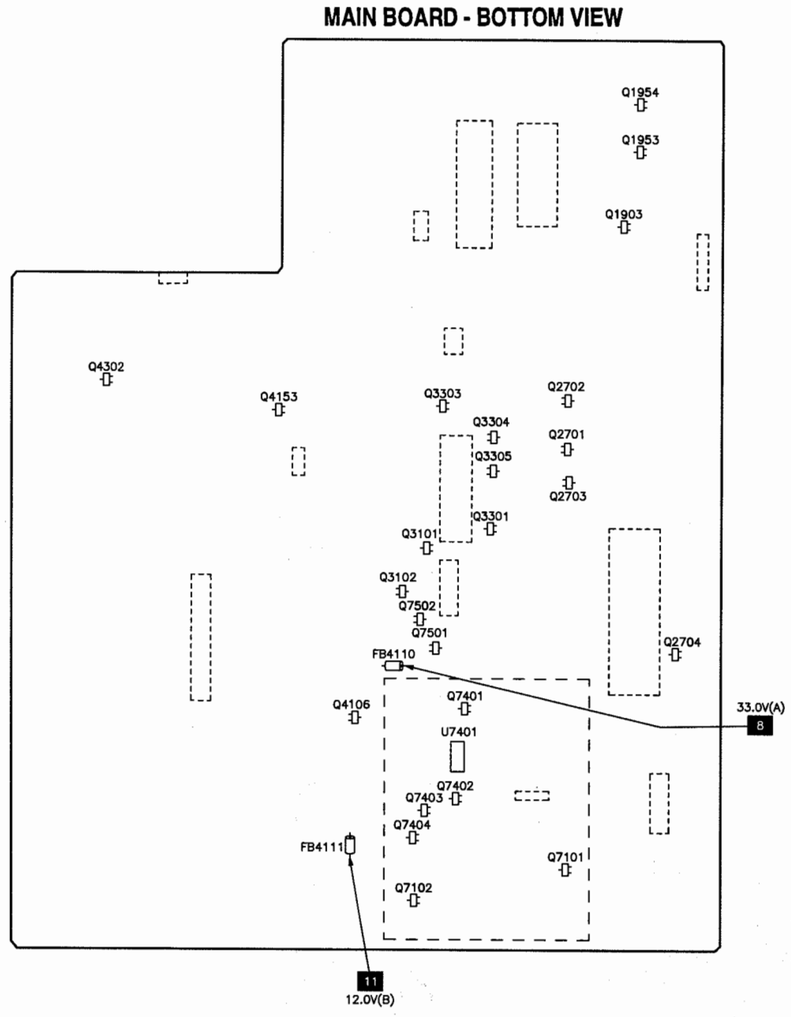


ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1

A PHOTOFACT STANDARD NOTATION SCHEMATIC

PLACEMENT CHART





Important Parts Information

- The parts listed here are those not usually available from a well-stocked supply cabinet or bin.
- Where items may be replaced with equivalent parts, several alternates are shown from participating vendors.
- On the parts lists, safety items are marked with a # to remind you that only exact replacements are recommended for these items.
- When ordering parts, state the model number, part number, and description.

Obtaining Parts

Many of these parts are available from your local Sams authorized distributor or the manufacturer of the equipment. Call Sams for the name of your nearest distributor:

800-428-7267

Or consult the Sams *Annual Index* for the address of the original equipment manufacturer.

Participating Vendors

Information on test equipment and replacement parts is listed in these pages for the following participating vendors. Consult the Sams *Annual Index* for their current address.

- Custom Components Corporation (Chek-A-Color)
- NTE Electronics, Inc. (NTE)
- Philips ECG Company (ECG)
- PTS Electronics Corporation (PTS)
- Sencore, Inc.
- Terrell & Nobis (TNI Electronics)
- Thomson Consumer Electronics, Inc. (SK, TCE)