

TROUBLESHOOTING

POWER SUPPLY CIRCUIT DESCRIPTION

Check F4001. If F4001 is open check CR4001 thru CR4004, C4001, C4003, C4004, C4007, C4009, and C4010. Apply 120VAC and check for 150V* at pin 11 of U4101. If 150V* is missing, check CR4001 thru CR4004, L4001, R4001, and T4101. If 150V* is present, check for 140V at the cathode of CR4106. If 140V is missing, check U4101, CR4109, and T4101. If 140V is present, check for 5.0V at the emitter of Q4105. If 5.0V is missing, check U4102, Q4105, CR4104, Q3101, and Q3102. If 5.0V is present at the emitter of Q4105, refer to the "Horizontal" section of this Troubleshooting guide.

* Taken from common tie point.

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, CR4702, CR4701, CR4113, CR4704, Q4101, CR4705, 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

Check for the proper waveform at pin 51 of U1001. If the waveform is missing, refer to the "IF AGC" section of this Troubleshooting guide. If the waveform is present, check for the proper waveform at pin 48 of U1001. If the waveform is missing, check Q2704. If the waveform is present, 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 and Q5001. If green is missing, check pin 37 of U1001 and Q5002. If blue is missing, check pin 38 of U1001 and Q5003.

AUDIO

Select an active TV channel, and check for an audio waveform at pin 5 of U1701. If the audio waveform is missing, check pins 3, 55, 57, and 58 of U1001. If the audio waveform is present, check for audio waveforms at pins 59 and 60 of U1001. If audio waveforms are missing, check U1701 and pins 4, 5, 59, and 60 of U1001. If audio waveforms are present, check U1901 and Q1903.

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. If video is still missing, check U1001.

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.

DEAD SET OR INTERMITTENT SHUTDOWN CONDITION

This problem can be caused by loss of B+ due to bad solder connection at pin 8 of T4101. T4101 transformers with date codes 3266, 3272, and 3273 might have been made with an incorrect wire type that does not take solder at normal manufacturing temperatures. Replace T4101 with part number 215538.

SCHEMATIC NOTES

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

* Circuitry not used in some versions.

--- Circuitry used in some versions.

⊥ Ground

⏏ Chassis ground

∇ Common tie point

△ Taken from common tie point

3 Schematic CIRCUI TRACE © 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.

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.

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.

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. After adjustment, exit the service menu by pressing the power button.

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	00	May not advance until value is set.
01	Horizontal Frequency	00 - 63	12	Adjust for stable or slowly moving horizontal lines.
02	Horizontal Phase	00 - 15	09	Adjust to center picture left to right.
03	EW DC	00 - 15	07	Used in 27" receivers.
04	EW Amplitude	00 - 07	03	Used in 27" receivers.
05	Vertical DC	00 - 15	08	Adjust to center picture top to bottom.
06	Vertical Size	00 - 31	17	Adjust to 1/4" overscan top and bottom of screen.
07	Red Bias	00 - 127	46	Press menu button on the receiver for setup line.
08	Green Bias	00 - 127	59	Press menu button on the receiver for setup line.
09	Blue Bias	00 - 127	71	Press menu button on the receiver for setup line.
10	Red Drive	00 - 63	24	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	21	Press menu button on the receiver for setup line.

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.

Press menu button on the receiver for collapsed raster setup line. Disconnect the antenna. 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 line. Check the low light to high light gray scale tracking. Repeat the procedure, if necessary, to obtain the best performance.

PURITY / CONVERGENCE

Yoke is bonded and part of the CRT. Adjustment is not recommended.

CHASSIS ALIGNMENT PARAMETERS

Parameter No.	Parameter Name	Value Range	On Set Value	Comment
13	Pass number for chassis alignment parameters.	Must set to 77	00	May not advance to higher parameter until value is set.
14	PLL Tuning	00 - 63	36	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	03	Short the junction of R7130 and R2313 to ground. Apply 45.75MHz (300mV) and 41.25MHz (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	05	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	07	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	04	Adjust for the B+ to be 140V ± .5V.
19	RF AGC (1)	00 - 31	21	Manually tune channel 6.
20	D-PIP Chroma	00-127	00	Used in models with PIP only.
21	D-PIP Tint	00-255	00	Used in models with PIP only.
22	D-PIP Brightness	00-31	00	Used in models with PIP only.
23	D-PIP Contrast	00-63	00	Used in models with PIP only.
24	Factory Tint	00 - 63	28	-

(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.

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.

MISCELLANEOUS ADJUSTMENTS continued

TUNER CIRCUIT VOLTAGE CHART

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	00
100	Ch. 2 secondary	00-63	20
101	Ch. 2 primary	00-63	18
102	Ch. 2 single	00-63	05
103	Ch. 6 secondary	00-63	50
104	Ch. 6 primary	00-63	42
105	Ch. 6 single	00-63	27
106	Ch. 14 secondary	00-63	57
107	Ch. 14 primary	00-63	53
108	Ch. 14 single	00-63	52
109	Ch. 17 secondary	00-63	29
110	Ch. 17 primary	00-63	42
111	Ch. 17 single	00-63	46
112	Ch. 18 secondary	00-63	40
113	Ch. 18 primary	00-63	30
114	Ch. 18 single	00-63	40
115	Ch. 13 secondary	00-63	52
116	Ch. 13 primary	00-63	41
117	Ch. 13 single	00-63	47
118	Ch. 34 secondary	00-63	57
119	Ch. 34 primary	00-63	42
120	Ch. 34 single	00-63	51
121	Ch. 37 secondary	00-63	57
122	Ch. 37 primary	00-63	42
123	Ch. 37 single	00-63	50
124	Ch. 48 secondary	00-63	40
125	Ch. 48 primary	00-63	41
126	Ch. 48 single	00-63	35

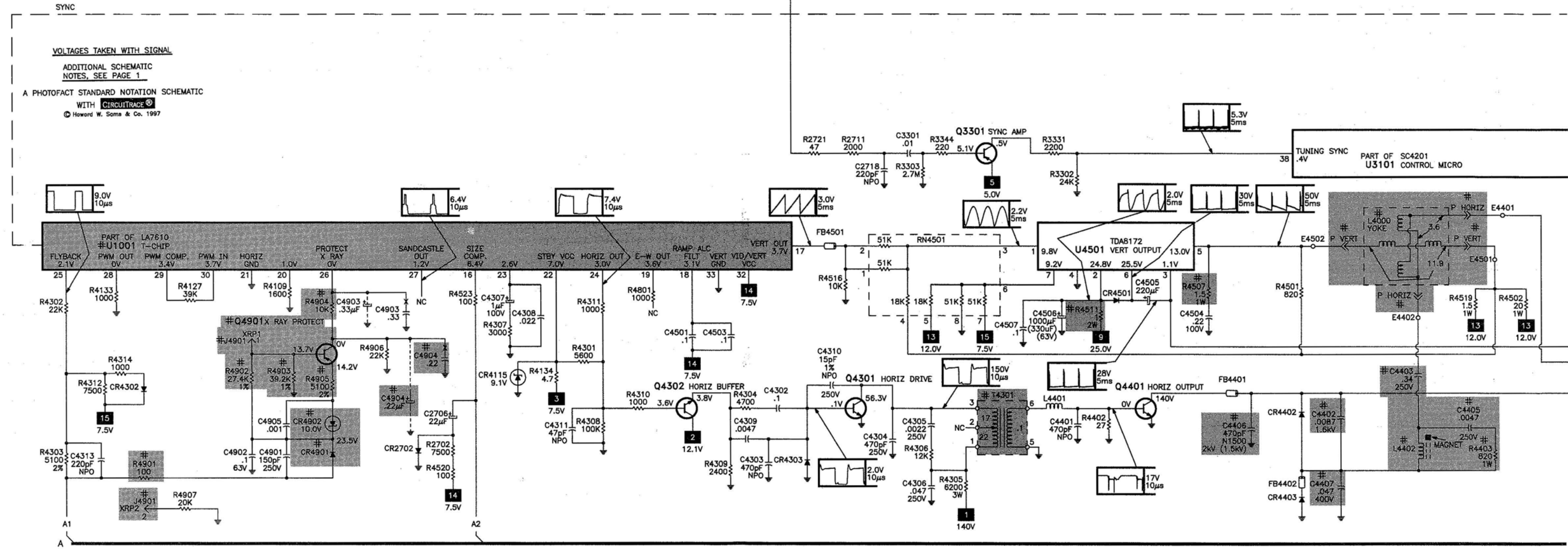
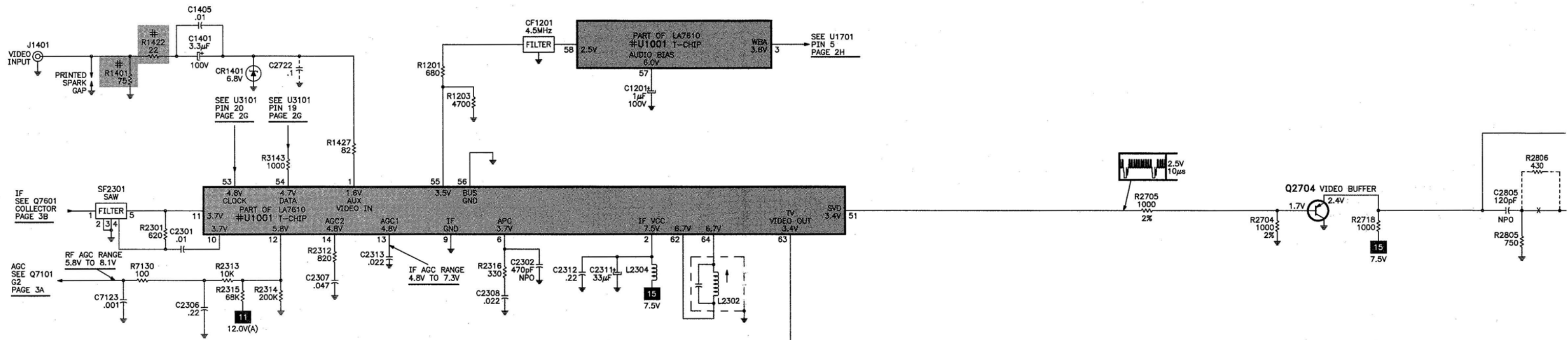
Parameter No.	Parameter Name	Value Range	On-Set Value
127	Ch. 50 secondary	00-63	29
128	Ch. 50 primary	00-63	33
129	Ch. 50 single	00-63	27
130	Ch. 51 secondary	00-63	44
131	Ch. 51 primary	00-63	31
132	Ch. 51 single	00-63	31
133	Ch. 57 secondary	00-63	47
134	Ch. 57 primary	00-63	29
135	Ch. 57 single	00-63	26
136	Ch. 63 secondary	00-63	47
137	Ch. 63 primary	00-63	26
138	Ch. 63 single	00-63	23
139	Ch. 76 secondary	00-63	45
140	Ch. 76 primary	00-63	23
141	Ch. 76 single	00-63	21
142	Ch. 83 secondary	00-63	45
143	Ch. 83 primary	00-63	26
144	Ch. 83 single	00-63	23
145	Ch. 93 secondary	00-63	45
146	Ch. 93 primary	00-63	27
147	Ch. 93 single	00-63	25
148	Ch. 110 secondary	00-63	49
149	Ch. 110 primary	00-63	26
150	Ch. 110 single	00-63	22
151	Ch. 117 secondary	00-63	55
152	Ch. 117 primary	00-63	26
153	Ch. 117 single	00-63	19
154	Ch. 125 secondary	00-63	63
155	Ch. 125 primary	00-63	29
156	Ch. 125 single	00-63	16

Pin No.	VHF Low Band	VHF High Band	UHF Band	Pin Name	VHF Low Band	VHF High Band	UHF Band
U7301				Q7101			
1	5.7V	5.6V	5.5V	G1	0V	0V	4.8V
2	3.0V	3.0V	3.2V	G2	5.0V	6.5V	7.2V
3	8.2V	8.1V	7.9V	D	.2V	.2V	11.3V
4	3.0V	3.0V	3.2V	S	.2V	.2V	4.8V
5	7.8V	7.7V	7.6V	Q7102			
6	0V	0V	0V	G1	4.6V	4.6V	4.6V
7	3.0V	3.1V	.1V	G2	5.3V	6.9V	7.2V
8	9.5V	9.3V	9.2V	D	11.3V	11.2V	11.4V
9	3.0V	3.0V	3.4V	S	4.1V	4.2V	11.3V
10	3.4V	3.2V	2.9V	Q7401			
11	4.9V	5.1V	10.0V	E	0V	0V	0V
12	3.4V	3.3V	2.9V	B	.6V	.6V	.6V
13	0V	0V	0V	C	2.1V	3.9V	17.8V
14	9.5V	9.3V	5.4V	Q7402			
15	3.5V	3.4V	2.9V	E	12.0V	12.0V	12.0V
16	3.5V	3.4V	2.9V	B	11.3V	10.5V	10.6V
U7401				C	-14.9V	11.1V	11.2V
1	1.7V	2.1V	1.7V	Q7403			
2	2.1V	2.1V	2.1V	E	0V	0V	0V
3	2.1V	2.1V	2.1V	B	.7V	.7V	0V
4	4.8V	4.8V	4.8V	C	.1V	.1V	11.3V
5	4.7V	4.7V	4.7V	Q7404			
6	0V	0V	0V	E	12.0V	12.0V	12.0V
7	1.3V	1.3V	1.3V	B	11.0V	11.9V	10.6V
8	11.5V	0V	0V	C	.1V	.1V	11.3V
9	7.4V	7.4V	0V	NOTE: VHF Low Band voltages taken on channel 2. VHF High Band voltages taken on channel 7. UHF Band voltages taken on channel 14.			
10	4.8V	4.8V	4.8V				
11	2.3V	2.3V	2.3V				
12	2.3V	2.3V	2.3V				
13	0V	0V	0V				
14	.6V	.6V	.6V				
U7501							
1	1.4V	1.6V	1.8V				
2	1.4V	1.6V	1.8V				
3	1.4V	1.6V	1.8V				
4	33.0V	33.0V	33.0V				
5	1.3V	1.5V	1.5V				
6	1.3V	1.5V	1.5V				
7	2.5V	4.2V	4.2V				
8	1.7V	3.7V	4.6V				
9	1.2V	1.4V	1.5V				
10	1.2V	1.4V	1.5V				
11	0V	0V	0V				
12	1.3V	1.4V	1.5V				
13	1.3V	1.4V	1.5V				
14	2.3V	3.4V	4.4V				

A

B

TELEVISION SCHEMATIC

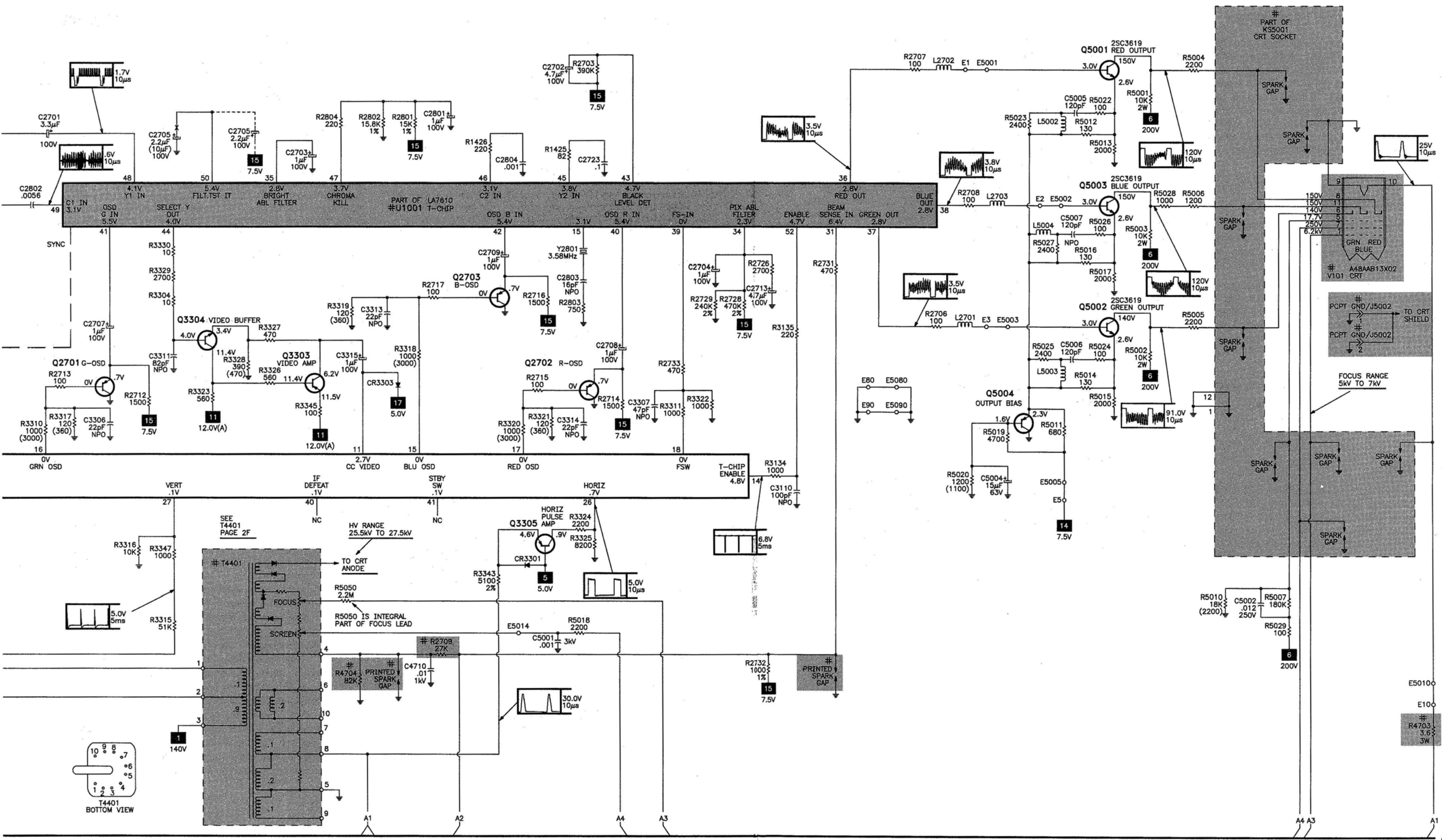


SYNC
 VOLTAGES TAKEN WITH SIGNAL
 ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1
 A PHOTOFACIT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE
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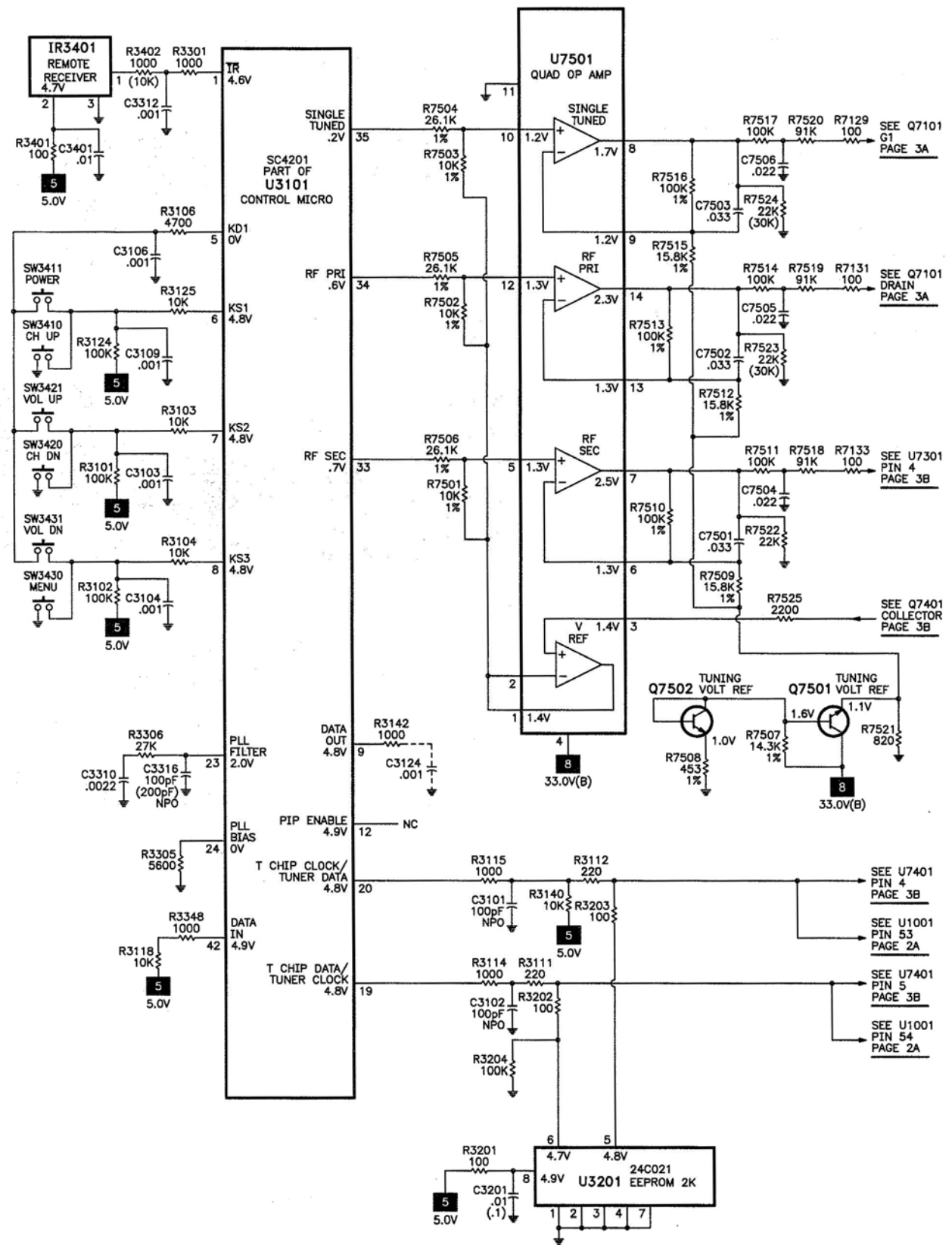
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TELEVISION SCHEMATIC

D

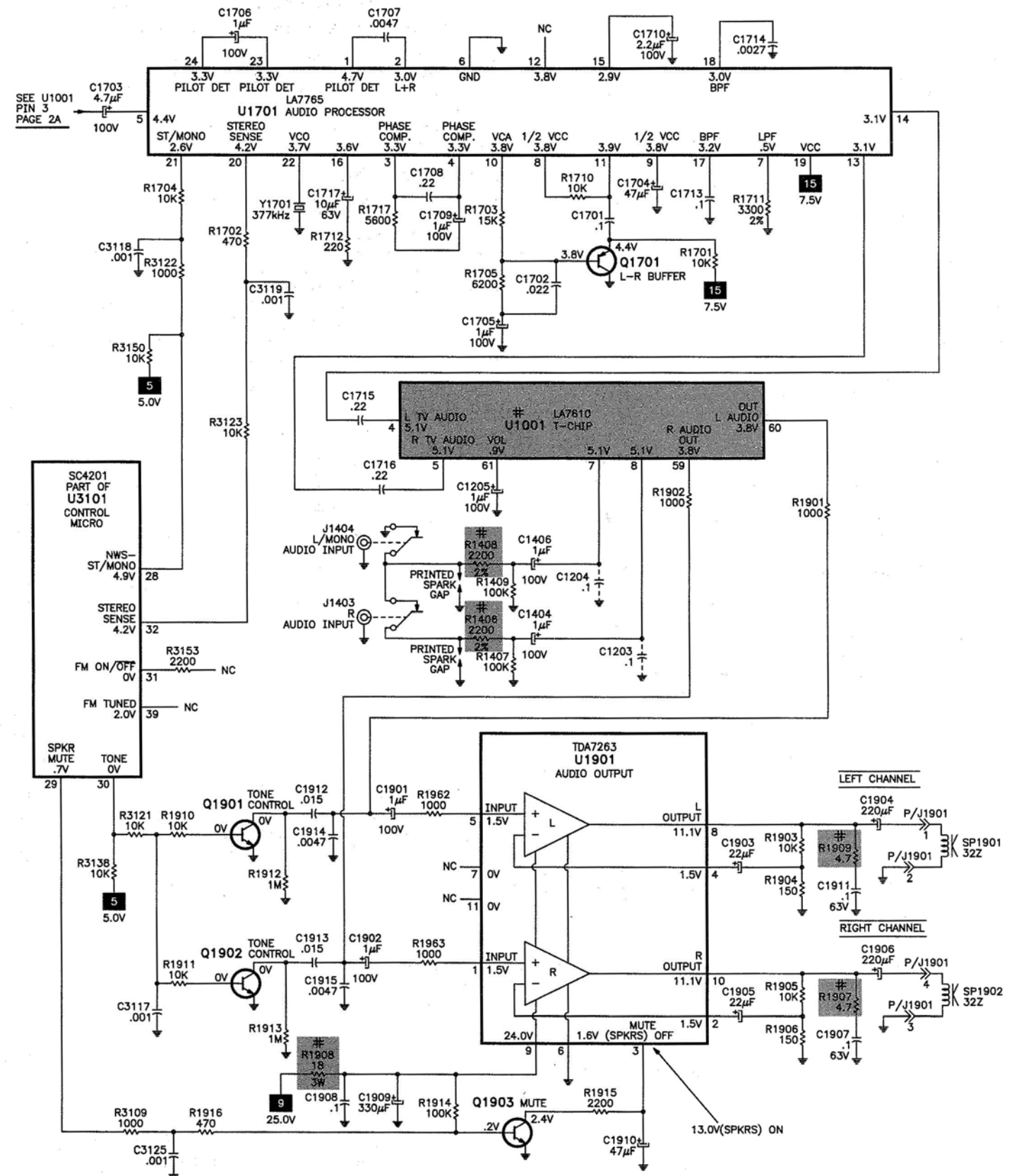


SYSTEM CONTROL SCHEMATIC



G

AUDIO SCHEMATIC



H

A

TUNER

B

