SENCORE®

Means Success In Electronic Servicing

tech tips

Adjusting The RCA/GE CTC175/176/177 Chassis With The VG91 Universal Video Generator

This Tech Tip outlines the electronic adjustment procedure for the RCA/GE CTC175/176/177 chassis using the Sencore VG91 Universal Video Generator. Similar procedures are used for newer RCA/GE chassis, as well as for chassis from other manufacturers.

Digital Microprocessor Adjustments

The CTC175 chassis is the first RCA/GE chassis to eliminate mechanical adjustment potentiometers and coils. Service adjustments are now performed electronically through the TV system control microprocessor, a memory EEPROM IC (Electronically Erasable Programmable Read Only Memory), and the Thomson chip (T-Chip). The T-Chip decodes digital memory information it receives from the system control microprocessor and performs adjustments of the deflection, CRT, IF, video, tuner, and other circuits.

The electronic adjustment information in the memory IC is changed with the TV's user controls after entering a special service menu. Each adjustment is first selected by its "parameter number" and is

Parameter #	Alignment Description	Value Range
Service Adjustment Parameters		
00	Security Pass	76
01	Horiz Free-Run Freq	00-31
02	Horiz Phase	00-15
03	Horiz Width 27" 31"	00-15
04	Pin. Amp 27" 31"	00-07
05	Vert Center	00-15
06	Vert Height	00-31
07	Red Bias	00-127
08	Green Bias	00-127
09	Blue Bias	00-127
10	Red Drive	00-63
11	Green Drive	00-63
12	Blue Drive	00-63
Chassis Alignment Parameters		
13	Security Pass	77
14	IF VCO Free-Run	00-63
15	4.5 MHz Trap	00-07
16	Video Level	00-07
17	FM Level Wideband Audio	00-15
18	B+ Trim	00-15
19 – 22	RF AGC	00-31
23 – 26	D - PIP	00-63
27	Factory Tint	
Tuner Alignment Parameters		
25 or 28	Security Pass	78
100 through 111	Tuner BAND 1 – LC Bandpass	00-63
112 through 129	Tuner BAND 2 – LC Bandpass	00-63
130 through 156	Tuner BAND 3 – LC Bandpass	00-63

Fig. 2: Alignments within the service menu are divided into three groups.

then changed by selecting a "value number" within the adjustment range for that parameter. Electronic adjustments are divided into three groups (Fig. 2):

P00 to P12 – Service Adjustment Parameters – deflection and color temperature adjustments.

P13 to P27 – Chassis Alignment Parameters – IF, video, and audio alignment.

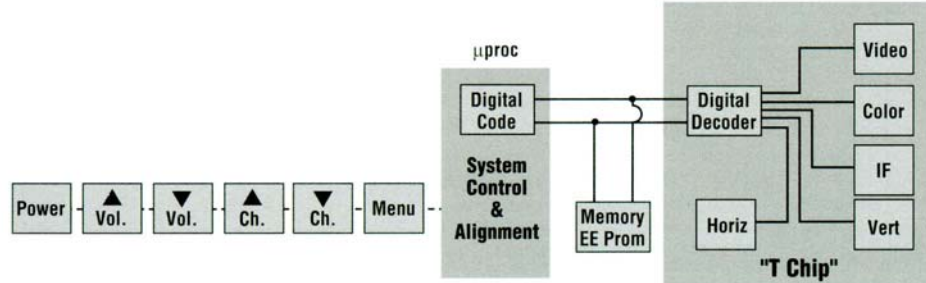**P100 to P156** – Tuner Alignment Parameters – tuner LC circuit alignment.

Fig. 1: Digital data is transferred by the microprocessor from memory to the T-Chip, where it is decoded and used to adjust the TV circuits

Preset User Controls And Prepare Test Points

To perform all electronic service adjustments without having to exit and reenter the service menu, preset the following user preference controls and attach the following needed test points to the bottom of the PC board before entering the service menu.

Preset user preference controls:
1. Set brightness to mid-range.
2. Set contrast (picture) to 3-4 of maximum.
3. Set color to mid-range.
4. Set tint to mid-range.

Attach these test points:
1. IF Input - Saw Filter SF2301, pin 1.
2. TP1201 - U1001, pin 55.
3. TP1202 - U1001, pin 3.
4. TP2302 - U1001, pin 63.
5. TP2305 - U1001, pin 14 (IF AGC).
6. TP7102 - U1001, pin 12 or junction of R7130 and R2313 (RF AGC).
7. Ground.

Service Menu

The service menu is entered with a special user control button sequence. Each of the three groups of adjustment parameters are then accessed by entering a security pass number.

To enter the service menu:
1. Turn the TV on.
2. Press & hold the MENU button.
3. Press & release the POWER button
4. Press & release the VOL+ button.
5. Release the MENU button.

A parameter number of "POO" should appear on the left side of the TV CRT screen with a current adjustment value of "V00" on the right side of the screen. The CH +/- buttons change the parameter numbers and the VOL +/- buttons change the value numbers. However, if the CH +/- buttons are pressed without first entering the correct security pass number value, the service menu will be exited.

Service Adjustments

At parameter P00, press the VOL+ button to step to the security pass number value of V76. This allows access to the service adjustment parameters to adjust deflection and color temperature. Then, press the CH+ button to step to the first adjustment parameter, P01, which is the horizontal frequency adjustment. The value range of this adjustment is V00-V31. Press the VOL+ and VOL- buttons to change the value, which adjusts the horizontal frequency.

P01 - Horiz Frequency
Horizontal sync is disabled during this adjustment. Connect the Sencore VG91

Universal Video Generator to the antenna input and select the matching RF channel to view the VG91's Window Circle pattern on the TV. Step the VOL + or VOL - buttons to change the value of the adjustment until the horizontal blanking bars stand upright and the picture almost stands still. This occurs when the free-running frequency is closest to 15,734 Hz.

Be careful making this adjustment, as adjusting the frequency too low in the value range will cause high voltage shutdown, preventing further adjustments. If you are unsure of the horizontal frequency adjustment, connect a Sencore Waveform Analyzer to test point TP4302 and change the value to adjust the frequency to 15,734 Hz. When finished with this adjustment, press the CH+ button to advance to the next adjustment parameter

P02 thru P06 - Vertical & Horizontal Deflection
These adjustments include vertical and horizontal deflection centering, size, and linearity. Select the VG91's Window Circle pattern to make these adjustments. For parameters P02 and P05, adjust the center cross of the pattern to the center of the CRT. For parameters P03 and P06, adjust the outer lines of the pattern approximately 5% in from the CRT edge. For parameter P04, adjust for straight vertical lines on the left and right edges of the display.

P. No.	Adjustment	Value Range	Orig. Value	VG91 Setup	Comments
	Service Adjustments		**Adjusting The RCA/GE CTC175/176/177 Chassis With The VG91 Universal Video Generator**		
00	Security Pass Number	76	N/A	None.	Must be set to 76 to advance to Service Adjustments.
01	Horizontal frequency	00-31		RF to ant. Window Circle pattern.	Adjust for stable or slowly moving horizontal lines.
02	Horizontal centering	00-15		RF to ant. Window Circle pattern.	Adjust to center picture left to right.
03	Horizontal width	00-15		RF to ant. Window Circle pattern.	Adjust to 1/4" overscan at sides of screen. (27" and 31" only)
04	Pincushion amplitude	00-07		RF to ant. Window Circle pattern.	Adjust for straight lines at sides of screen. (27" and 31" only)
05	Vertical centering	00-15		RF to ant. Window Circle pattern.	Adjust to center picture top to bottom.
06	Vertical size	00-31		RF to ant. Window Circle pattern.	Adjust to 1/4" overscan top and bottom of screen.
07	Red bias	00-127		RF to ant. 10 Bar Staircase pattern.	Preset for 170VDC at red video output collector.
08	Green bias	00-127		RF to ant. 10 Bar Staircase pattern.	Preset for 170VDC at green video output collector.
09	Blue bias	00-127		RF to ant. 10 Bar Staircase pattern.	Preset for 170VDC at blue video output collector.
10	Red drive	00-63		RF to ant. 10 Bar Staircase pattern.	Preset to value of 32.
11	Green drive	00-63		RF to ant. 10 Bar Staircase pattern.	Preset to value of 32.
12	Blue drive	00-63		RF to ant. 10 Bar Staircase pattern.	Preset to value of 32.

Warning: When adjusting the horizontal frequency, be careful not to exceed the specified value range or the set will go into shutdown. Replacement of U3101 may be required. In case the set goes into shutdown, connect a capacitor across C4402 with the same value, readjust horizontal frequency, then remove the capacitor. It may be necessary to then repeat the horizontal frequency adjustment.

Fig. 3: Service adjustment parameters P00 through P12 are used for deflection and color temperature adjustments.

PO7 thru P12 · Color Temperature Bias and Drive Adjustments (Gray Scale)

1. Select the VG91 10 Bar Staircase video pattern at the antenna input.
2. Disconnect any signals from the TV's Line and S-Video inputs.
3. Press the CH+ button to advance to P07.
4. Press the MENU button to produce a collapsed raster service line.
5. Preset the values of bias parameters P07, P08, and P09 to produce 170 VDC at the collectors of Q1P, Q2P, and Q3P respectively.
6. Preset the drive parameters P10, P11, & P12 each to a value of V32.
7. Adjust the screen control on the flyback for a service line that is just visible.
8. Increase the bias settings (P07, 08, 09) of the two weakest colors to produce a white service line.
9. Press the MENU button to remove the service line and reselect the video pattern.
10. Retouch the previous two bias settings to remove any coloration in the low-light bars of the 10 Bar Staircase video pattern.
11. Adjust the red, green, and blue drive (P10, 11, 12) values to remove any coloration in the high-light bars of the video pattern.

Chassis Alignment

Select parameter P13 and step to the security pass number value of V77. This allows access to the chassis alignment parameters to align the IF and PIP circuits. The first two chassis alignment parameters (P14 and P15) require an IF input signal to pin 1 of the SAW filter, SF2301.

1. Attach the VG91 IF Troubleshooting Balun to the VG91's RF/IF output cable.
2. Connect one balun clip to pin 1 of SF2301 and the other clip to circuit ground.
3. Set the VG91 RF/IF switch to 45.75 MHz VIDEO IF.
4. Set the RF/IF Range switch to HI.
5. Set the RF/IF Level between .5 and 1 to produce a noise-free picture.
6. Set the MTS Stereo Mode switch to L+R to add a 41.25 MHz audio carrier.

P14 · IF VCD PLL Tuning

1. Connect the VG91 to the SAW filter input as outlined above.
2. Connect a short jumper from TP7102 (junction of R7130 and R2313) to ground.
3. Apply 4.0 VDC to TP2305 (pin 14 of U1001) with a DC bias supply.
4. Connect the Waveform Analyzer to TP1201 (pin 55 of U1001).
5. Set the timebase to .1 uS.
6. Set the volts/div to .02 V.

Check for a low amplitude 4.5 MHz (.22 uS) sinewave on the Waveform Analyzer. Noise and interference may make the waveform difficult to verify. If so, use the SC3100 "AUTO TRACKER" DELTA FREQ feature to confirm that you are viewing the 4.5 MHz signal. If you do not see the 4.5 MHz waveform, set the value of parameter P14 to V32 and manually adjust coil L2303 to produce the waveform. Then, adjust the value of parameter P14 for minimum noise and interference on the 4.5 MHz waveform.

Chassis Alignment	Adjusting The RCA/GE CTC175/176/177 Chassis With The VG91 Universal Video Generator				
P. No.	Adjustment	Value Range	Orig. Value	VG91 Setup	Comments
13	Security Pass Number	77	N/A	None.	Must be set to 77 to advance to Chassis Alignment.
14	PLL tuning	00-63		45.75 MHz Video IF, HI, 3. MTS Mode - L+R, Audio - OFF Pilot - 0.	Apply 4.0 VDC to pin 14 of U1001. Short TP7102 (junction of R7130 and R2313) to gnd. Connect VG91 IF Output to pin 1 of SF2301. Connect oscilloscope to pin 55 of U1001. Adjust value for cleanest 4.5 MHz sinewave. *(Note 1)*
15	4.5 MHz trap	00-07		45.75 MHz Video IF, HI, 3. MTS Mode - Mono, Audio - 1 kHz.	Short TP7102 (junction of R7130 and R2313) to gnd. Connect VG91 IF Output to pin 1 of SF2301. Connect oscilloscope to pin 63 of U1001. Adjust value downward from V07 for first 4.5 MHz sinewave amplitude null.
16	Video level	00-07		RF to ant. EIA Color Split Field pattern.	Connect VG91 RF Output to antenna input. Connect oscilloscope to pin 63 of U1001. Adjust value for 2VPP amplitude.
17	FM level	00-15		4.5 MHz FM, HI, 1. MTS Mode - Mono, Audio - 1 kHz.	Connect VG91 IF Output to pin 55 of U1001. Connect oscilloscope to pin 3 of U1001. Adjust value for 1.2VPP amplitude of 1 kHz signal.
18	B+ trim	00-15		None.	Adjust for 140 VDC (CTC175 only).
19	RF AGC *(Note 2)*	00-31		None.	Adjust on weakest local signal, check all channels.
20	PIP chroma match	00-127		RF to ant. EIA Color Bar pattern.	Adjust value to match chroma level of large picture.
21	PIP tint match	00-255		RF to ant. EIA Color Bar pattern.	Adjust value to match tint of large picture.
22	PIP bright match	00-31		RF to ant. 10 Bar Staircase pattern.	Adjust value to match brightness of large picture.
23	PIP contrast match	00-63		RF to ant. 10 Bar Staircase pattern.	Adjust value to match contrast of large picture.
24	Factory tint	00-63		RF to ant. EIA Color Bar pattern.	Adjust value up from V00 until cyan bar starts to turn green.

Note 1: If 4.5 MHz sinewave isn't present, set value to V32 and manually adjust coil L2302 to produce the signal. Then readjust value for cleanest waveform.
Note 2: 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, U31001, or U3201 has been replaced, or unusual signal conditions exist. Use weakest local signal to adjust.

Fig. 4: These adjustments affect the IF, video, and audio parameter alignments.

Tuner Alignment	Adjusting The RCA/GE CTC175/176/177 Chassis With The VG91 Universal Video Generator		
P. No.	Adjustment	Value Range	Orig. Value
25 or 28	Security Pass Number	78	N/A
100*	Ch. 2 secondary	00-63	
101	Ch. 2 primary	00-63	
102	Ch. 2 single	00-63	
103	Ch. 6 secondary	00-63	
104	Ch. 6 primary	00-63	
105	Ch. 6 single	00-63	
106	Ch. 14 secondary	00-63	
107	Ch. 14 primary	00-63	
108	Ch. 14 single	00-63	
109	Ch. 17 secondary	00-63	
110	Ch. 17 primary	00-63	
111	Ch. 17 single	00-63	
112	Ch. 18 secondary	00-63	
113	Ch. 18 primary	00-63	
114	Ch. 18 single	00-63	
115	Ch. 13 secondary	00-63	
116	Ch. 13 primary	00-63	
117	Ch. 13 single	00-63	
118	Ch. 34 secondary	00-63	
119	Ch. 34 primary	00-63	
120	Ch. 34 single	00-63	
121	Ch. 37 secondary	00-63	
122	Ch. 37 primary	00-63	
123	Ch. 37 single	00-63	
124	Ch. 48 secondary	00-63	
125	Ch. 48 primary	00-63	
126	Ch. 48 single	00-63	
127	Ch. 50 secondary	00-63	
128	Ch. 50 primary	00-63	
129	Ch. 50 single	00-63	
130	Ch. 51 secondary	00-63	
131	Ch. 51 primary	00-63	
132	Ch. 51 single	00-63	
133	Ch. 57 secondary	00-63	
134	Ch. 57 primary	00-63	
135	Ch. 57 single	00-63	
136	Ch. 63 secondary	00-63	
137	Ch. 63 primary	00-63	
138	Ch. 63 single	00-63	
139	Ch. 76 secondary	00-63	
140	Ch. 76 primary	00-63	
141	Ch. 76 single	00-63	
142	Ch. 83 secondary	00-63	
143	Ch. 83 primary	00-63	
144	Ch. 83 single	00-63	
145	Ch. 93 secondary	00-63	
146	Ch. 93 primary	00-63	
147	Ch. 93 single	00-63	
148	Ch. 110 secondary	00-63	
149	Ch. 110 primary	00-63	
150	Ch. 110 single	00-63	
151	Ch. 117 secondary	00-63	
152	Ch. 117 primary	00-63	
153	Ch. 117 single	00-63	
154	Ch. 125 secondary	00-63	
155	Ch. 125 primary	00-63	
156	Ch. 125 single	00-63	

* P100 Not Used In All Chassis

Fig. 5: Use these parameters for properly aligning the tuner parameters.

P15 - 4.5 MHz Trap
1. Connect the VG91 to the SAW filter input as outlined above.
2. Leave the jumper wire from TP7102 to ground.
3. Remove the 4.0 VDC bias supply from TP2305.
4. Move the Waveform Analyzer probe to TP2302 (pin 63 of U1001).

A low-level 4.5 MHz waveform should again be present. Starting at V07. reduce the value until the first null, or dip point, of the 4.5 MHz waveform amplitude is seen.

P16 - T-Chip Video Output Level
1. Leave the Waveform Analyzer probe at TP2302.
2. Remove the TP7102 jumper.
3. Move the VG91 RF/IF Output from the SAW filter to the tuner input.
4. Set the VG91's RF/IF switch to STD CABLE.
5. Select the channel and level needed to produce a normal picture.
6. Select the VG91 EIA Color Bar Split Field video pattern.
7. Adjust the value setting for a video waveform amplitude of 2 VPP.

P17 - Audio Output Level
1. Connect a short jumper wire from TP2305 (pin 14 of U1001) to ground.
2. Disconnect the VG91's RF/IF cable from the chassis antenna input and attach the RF/IF Troubleshooting Balun.
3. Connect the balun clips to TP1201 (pin 55 of U1001) and ground.
4. Set the VG91's RF/IF Switch to 4.5 MHz.
5. Set the RF/IF Range to HI.
6. Set the RF/IF Level to 2.
7. Set the MTS Stereo Mode switch to Mono.
8. Set the Audio Frequency switch to 1 kHz.
9. Connect the Waveform Analyzer to TP1202 (pin 3 of U1001).
10. Adjust the value setting for a 1 kHz waveform amplitude of 1.2 VPP.

P18 - B+ Trim
This adjustment makes minor B+ power supply adjustments on the CTC175 chassis only. Connect a DC voltmeter to the B+ test point, TP4101, and adjust the value for 140 VDC.

P19 - RF AGC

The factory setting of this adjustment is not likely to require changing unless the tuner has been repaired or U1001, U31001, or U3201 have been replaced. Misadjustment of RF AGC causes either a noisy or overloaded picture. If RF AGC adjustment IS required, apply the VG91 RF signal to the antenna input as for the video level adjustment, but reduce the signal level to produce a slightly noisy picture (usually between 500 and 1000 (uV). Adjust the value to the extreme where additional noise is produced. Then, adjust the value in the opposite direction until the noise just stops decreasing.

Alternately, use the weakest local signal to make this adjustment. After RF AGC is adjusted, check all local channels for proper operation.

P20 thru P23 - PIP Match

These adjustments match the PIP display to the large display. Use the VG91's 10 Bar Staircase pattern to match the brightness and contrast (P22, 23). Use the VG91's EIA Color Bars pattern to match the chroma level and tint (P20, 21).

Note: Some chassis assign slightly different parameter numbers to the RF and PIP adjustments. Check the service literature for the correct numbers for the chassis being adjusted.

P24 · Factory Tint

Be sure that the user tint control is centered before making this adjustment.
1. Connect the VG91 to the TV antenna input and adjust for a normal picture.
2. Select the EIA Color Bar video pattern.
3. Starting at V00, increase the value until just before the point where the cyan bar (between yellow and green) starts to turn green.

Tuner Alignment

Select parameter P28 (P25 on some chassis) and step to the security pass number value of V78. This allows access to the tuner alignment parameters to align the tuner's LC circuits for each cable channel. Electronic Tuner Alignment is performed with top and bottom covers in place, with bottom cover soldered.

Note: Once the electronic tuner alignment procedure is started, it must be completed entirely.

Instead of storing a setting in the EEPROM for every channel, 19 "data channels" are aligned. The data channels are at the bottom, top, and at multiple mid points in each of the tuning bands. From the alignment values entered for the data channels, the microprocessor interpolates alignment values for all channels in each tuning band.

An all-channel RF TV signal generator is required to properly set the tuner alignment parameters. The generator must produce cable channels 2 to 125 and have an adjustable RF output level to properly observe the AGC action during alignment. Cable or off-air TV channels vary considerably in frequency and level and do not provide proper indications to make alignment changes. The Sencore VG91 Universal Video Generator is recommended for this alignment procedure.

P100 thru P156 - Tuner Alignment Procedure

1. Connect the VG91's RF/IF Output to the TV antenna input and select cable channel 2.
2. Set the RF Output Range to Hi.
3. Set the RF Level to .5.
4. Select the EIA Color Bar Video Pattern.
5. Use the TV remote control to set the TV to channel 2.
6. Connect the Waveform Analyzer to TP7102 (positive lead of C2306 or pin 12 of U1001). Hint: *DC-couple the Waveform Analyzer input to provide a convenient CRT analog voltage level indicator.*
7. Increase the VG91's RF/IF Level control until the measured AGC voltage just begins to decrease.
8. Adjust the parameter value to produce a voltage dip, or null.
9. Step to the next parameter number and select the correct cable channel on the VG91 for this parameter number.
10. Use the TV remote control to set the TV to the same channel.
11. Repeat steps 7-10 above for each channel specified.

Note: The secondary and primary adjustments on each channel may initially have little effect. After making the single adjustment on each channel, readjust the secondary and primary before going to the next channel.

NOTES