

TELEVISION Service Manual

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1956 Supplement No. 22

GORDON OLIVER TELEVISION
T. V. INDEX SERVICE
RD 4815 923 CALVERHALL ST.
NORTH VANCOUVER, B. C.

ADMIRAL

Chassis	Page
18Y4BSX Same as 18Y4EX.	
18Y4EX Circuit	47, 48
18Y4EX Printed circuits	3
18Y4EX Front end alignment	2
18Y4EX Chassis layouts	4
18Y4EX All other data same as 20Y4DX in Sup. #20.	
18Y4LX Same as 18Y4EX.	

CBS-COLUMBIA

Chassis	Page
817-81 Circuit	49, 50
817-81 Tuner circuit	7
817-81 Alignment	5, 6
817-81 Chassis layouts	8
817-81 Coil identification	7
817-86 Same as 817-81.	
821-20 Circuit	51, 52
821-20 Tuner circuit	12
821-20 Radio circuit	12
821-20 Alignment	9, 10
821-20 Chassis layouts	11, 13
821-20 Coil identification	13
822-2 Same as 817-81.	
822-4 Same as 817-81.	

DUMONT

Chassis	Page
810 Circuit	53, 54
810 Alignment	16, 17
810 Voltages	15
810 Resistances	14
810 Chassis layouts	15, 16
810 Coil identification	14
960 Same as 810.	

EMERSON

Chassis	Page
TV-V-308 Circuit	57, 58
TV-V-308 Alignment	18 to 23
TV-V-308 Tuner circuit	24
TV-V-308 Resistances	25
TV-V-308 Voltages	26
TV-V-398 Same as TV-V-308.	
Models:	
EM-3020 Uses chassis TV-V-398.	
EM-3021 Uses chassis TV-V-308.	
EM-3022 Uses chassis TV-V-398.	

MARCONI

Chassis	Page
TV-218 (Code Y) Circuit	55, 56
TV-218 All other data same as TV-175M in Supp. #12.	
TV-V-308 Circuit	57, 58
TV-V-308 Alignment	18 to 23
TV-V-308 Tuner circuit	24
TV-V-308 Resistances	25
TV-V-308 Voltages	26
TV-V-398 Same as TV-V-308.	
Models:	
TV-2151 Uses chassis TV-218.	
TV-2331 Uses chassis TV-218.	
TV-2532 Uses chassis TV-V-398.	
TV-2832 Uses chassis TV-V-308.	
TV-2952 Uses chassis TV-V-398.	

PHILCO

Chassis	Page
TV-360 Circuit	59, 60
TV-360 Alignment	27 to 30
TV-360 Automatic Tuning system	30, 31
TV-360 Chassis layouts	32 to 36
TV-360 Coil identification	36
TV-361 Same as TV-360.	
TV-362 Same as TV-360.	
TV-390 Circuit	61, 62
TV-390 Other data same as TV-360.	
TV-391 Same as TV-390.	
TV-392 Same as TV-390.	
TV-394 Same as TV-390.	
Models:	
2134L, M, W Uses chassis TV-390.	
2136L, M Uses chassis TV-392.	

RCA-VICTOR

Chassis	Page
CT1707 Same as CT2118.	
CT2118 Circuit	65, 66
CT2118 Tuner circuit	84
CT2118 Alignment	82 to 84
CT2118 Chassis layouts	80, 81
CT2118 Coil identification	80
CT2118 Circuit	67, 68
CT2118 Tuner circuit	90
CT2118 Video-sound circuit	87
CT2118 Deflection circuit	88
CT2118 Alignment	85, 86
CT2118 Chassis layouts	89
CT2118 Coil identification	90
CT2406 Circuit	63, 64
CT2406 Alignment	39 to 42
CT2406 Tuner circuit	43
CT2406 Chassis layouts	37, 38
CT2406 Coil identification	43
Models:	
17T180 (Driscoll) Uses chassis CT1707.	
17T180A (Huron) Uses chassis CT1707.	
21T134B (Barrett) Uses chassis CT2118.	
21TC147A (Whitfield) Uses chassis CT2118.	
21T162 (Creighton) Uses chassis CT2118.	
21T164 (Morton) Uses chassis CT2118.	
24TA181 (Marquis) Uses chassis CT2406.	

Color TV:

CTC4, A Additional data	44 to 46
For original data see Supp. #18.	

SIMPSON-SEARS

Model	Page
C100.4150 Circuit	69, 70
C100.4150 Tuner circuit	91
C100.4150 Chassis layouts	91
C100.4150 Parts list	92
C100.4150 Alignment See Stewart-Warner 9300 in Supp. #9.	
C100.4151 Circuit	71, 72
C100.4151 Tuner circuit	93
C100.4151 Chassis layouts	93
C100.4151 Parts list	94
C100.4151 Alignment Same as C100.4150.	
C100.4180 Same as C100.4150.	
C100.4250 Same as C100.4150.	
C100.4280 Same as C100.4150.	
C100.4181 Same as Stewart-Warner T742 in Supp. #14.	

SPARTON

Chassis	Page
21E2 Circuit	73, 74
21E2 Alignment	95
21E2 Chassis layouts	96
21E2 Coil identification	95
21E3 Circuit	75, 76
21E3 Radio circuit	99
21E3 Alignment	97
21E3 Chassis layouts	98
21E3 Coil identification	97
All 1956 models: Changes	100
Models:	
21E2-S Uses chassis 21E2.	
21E2-T Uses chassis 21E2.	
21E3-C Uses chassis 21E3.	

STEWART-WARNER

Model	Page
21C-9700 Circuit	77 to 79
21C-9700 Alignment	101 to 107
21C-9700 Coil identification	107

RCC
TELEVISION
Supplement
No. 22

MODEL TV-2832 CHASSIS TYPE TV-V-308

MODELS TV-2532 & TV-2552 CHASSIS TYPE TV-V-398

- 1 - Rotate horizontal hold control (R-105) fully counter-clockwise.
- 2 - Short phasing coil (L-10) by using a clip lead across phasing coil terminal lug.
- 3 - Starting with horizontal frequency dial (L-9) all the way "out" towards you (looking at rear of chassis) rotate "up" until picture just looks into sync.
- 4 - Starting with horizontal frequency dial (L-9) all the way "out" towards you (looking at rear of chassis) rotate "up" until picture just looks into sync.
- 5 - Connect the low capacity probe of an oscilloscope to the horizontal phase coil (junction of L-9 and L-10, low end to chassis).
- 6 - Remove short from phase coil terminal lug.
- 7 - Check for horizontal hold with oscilloscope. If this is not obtained at extreme clockwise position of hold control or if squelching is noticed (Christmas Tree effect) turn frequency dial (L-9) "up" slightly until desired results are obtained.
- 8 - Repeat steps 1 through 7.
- 9 - Repeat steps 1 through 7.
- 10 - Repeat steps 1 through 7.
- 11 - Repeat steps 1 through 7.
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- 95 - Repeat steps 1 through 7.
- 96 - Repeat steps 1 through 7.
- 97 - Repeat steps 1 through 7.
- 98 - Repeat steps 1 through 7.
- 99 - Repeat steps 1 through 7.
- 100 - Repeat steps 1 through 7.

- 1 - Turn Signal Monitor (R-105) fully counter-clockwise and Local-Suburban switch in Suburban position, tune set to a known good channel.
- 2 - Short phasing coil (L-10) by using a clip lead across phasing coil terminal lug.
- 3 - Rotate horizontal hold control (R-105) fully counter-clockwise.
- 4 - Starting with horizontal frequency dial (L-9) all the way "out" (towards you looking at rear of chassis), rotate "up" until picture just looks into sync.
- 5 - Remove short from phase coil and starting with dial all the way "out", adjust "up" until picture almost looks into sync (2 - 3 diagonal bars).
- 6 - Turn horizontal hold (R-105) is counter-clockwise direction to keep picture "up", then turn horizontal hold to full clockwise position. The picture should be stable.
- 7 - Check for horizontal hold with oscilloscope. If this is not obtained at extreme clockwise position of hold control (R-105), turn frequency dial (L-9) "up" slightly until desired results are obtained. If necessary repeating (steps 1 through 6) until picture is satisfactory.
- 8 - Repeat steps 1 through 7.
- 9 - Repeat steps 1 through 7.
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- 98 - Repeat steps 1 through 7.
- 99 - Repeat steps 1 through 7.
- 100 - Repeat steps 1 through 7.



- 1 - Set the magnets so that the adjusting arms are approximately 120° apart.
- 2 - Adjust the ion trap magnet for maximum brightness.
- 3 - Rotate the two rings together, this will cause the picture to move around a circle. Stop when the picture is most nearly centered.
- 4 - Rotate the rings separately, in equal distances but in opposite directions to complete the centering.
- 5 - Repeat steps 2, 3 and 4 if necessary.
- 6 - Readjust the ion trap to give maximum brightness.

CENTERING PROCEDURE

MODEL TV-3021 CHASSIS TYPE TV-V-308

MODELS TV-3020 & TV-3022 CHASSIS TYPE TV-V-398

The L-5 m. intermediate back is fed to the first L-5, tube # 58 (P-48) where it is amplified and then fed to the sound amplifier, detector, composite video signal is fed to the video amplifier tube 12B7A (P-7) where it is amplified so that it can properly modulate the beam of the picture tube. This composite video signal is also fed to the sync separator which passes only vertical and horizontal sync information. This sync is then used to control the frequency of the horizontal and vertical oscillators. The sync is also fed to the sync separator which passes only vertical and horizontal sync information. This sync is then used to control the frequency of the horizontal and vertical oscillators. The sync is also fed to the sync separator which passes only vertical and horizontal sync information. This sync is then used to control the frequency of the horizontal and vertical oscillators.

When a burst of electrical interference is picked up by the receiver, positive peak noise pulses are applied to the grid of the video amplifier tube 12B7A (P-7) and fed to the sync separator tube # 58 (P-48). In order to improve sync stability the signal heater control (R-105) is rotated clockwise introducing limiting resistance between the output of the video amplifier and the grid of the sync separator tube # 58 (P-48).

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HIGH VOLTAGE SUPPLY

High voltage is applied by the horizontal deflection system. During horizontal retrace the magnetic field within the horizontal deflection yoke is reversed and the electron beam is deflected to the right. This deflection is caused by the horizontal deflection yoke which is connected to the horizontal deflection coil (L-10) and the horizontal deflection capacitor (C-10). The horizontal deflection coil (L-10) is connected to the horizontal deflection capacitor (C-10) and the horizontal deflection capacitor (C-10) is connected to the horizontal deflection coil (L-10).

LOW VOLTAGE SUPPLY

A single selenium rectifier is used to supply the proper D.C. voltages to the receiver from the applied A.C. power. Filtering of the D.C. voltage is accomplished by a two stage condenser input circuit consisting of a 100,000 ohm resistor (R-10) and a 100,000 ohm resistor (R-10). The filament of all tubes is in series with the selenium rectifier to protect the rectifier in the event a short in the filament occurs.

ADJUSTMENTS

When the set is first received, it is important that an isolation transformer be used between the main source of power and the chassis. If an isolation transformer is not available, you will have to make certain that the A.C. power is properly grounded. The filament of all tubes is in series with the selenium rectifier to protect the rectifier in the event a short in the filament occurs.

ALIGNMENT OF MIRROR PICTURE LOCK (Horizontal Oscillator and AFC)

This can be accomplished without removing chassis from cabinet as follows:
A - STEP METHOD
To do this accurately you must use an oscilloscope and a calibrated low capacity probe.

- 1 - Turn Signal Monitor (R-105) fully counter-clockwise and Local-Suburban switch in Suburban position and tune set to a known good channel.

When the set is first received, it is important that an isolation transformer be used between the main source of power and the chassis. If an isolation transformer is not available, you will have to make certain that the A.C. power is properly grounded. The filament of all tubes is in series with the selenium rectifier to protect the rectifier in the event a short in the filament occurs.

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ALIGNMENT

The use of an isolation transformer between the set and line is recommended. (A.C. only).

EQUIPMENT REQUIRED

- a sweep generator, (10 MC sweep with centre frequency of 4.4 MC. plus all necessary R.F. sweep frequencies as listed in R.F. table), accurate marker generator, oscilloscope and V.T.V.M. are required for alignment. The marker generator must supply frequencies of 4.5 Mc., 20 to 28 Mc., and 50 to 216 MC.
- Alignment Points - The location of all I.F. transformers, tuned circuits and trimmers shown in Figure

TV R.F. AND MIXER ALIGNMENT

Connect 3 volt bias battery to both I.F. and R.F. AGC circuit, positive terminal to chassis, negative terminal to junction of R-5 and C-16.

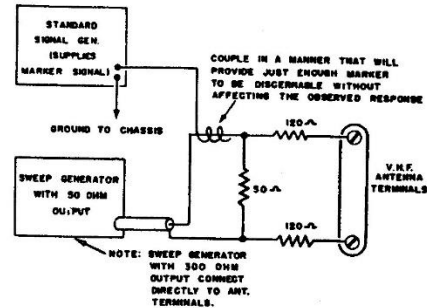


Figure 2. GENERATOR CONNECTIONS FOR TELEVISION R.F. CHANNEL ALIGNMENT.

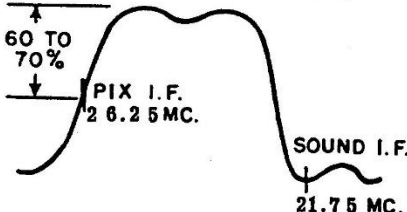
SWEEP & MARKER GENERATOR		MARKER GEN.	OSCILLOSCOPE CONNECTIONS	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
CONNECTIONS	FREQ. RANGE	FREQ.				
Connect as shown in Fig. 2. and adjust sweep controls for width so that complete channel response may be observed as shown in Fig. 3.	Channel 12 207 Mc. Centre Freq.	209.75 Mc. Sound Carrier 205.25 Mc. Pix Carrier	Vert. input of scope through 10K resistor to test point on Tuner, Fig. 5. Low side to chassis.	Set Channel Selector to 12 NOTE Keep output of R.F. Marker Generator at a level that provides a readable marker but does not distort the curve that is being observed on the scope.	C-3 R.F. Amp. Input Trimmer C-5 R.F. Plate Trimmer C-10 Mixer Grid Trimmer	Adjust Trimmers C-3, C-5 & C-10 to obtain response shown in Fig. 3. IMPORTANT: When adjusting trimmers C-3, C-5 & C-10 it will be noted that the band pass characteristic can be broadened by sacrificing amplitude. It is undesirable to overly broaden the curve as that would result in a loss of sensitivity.
Same as Above	13 213 Mc. 11 201 Mc. 10 195 Mc. 9 189 Mc. 8 183 Mc. 7 177 Mc. 6 85 Mc. 5 79 Mc. 4 69 Mc. 3 63 Mc. 2 57 Mc.	* 215.75 Mc. ** 211.25 Mc. * 203.75 Mc. ** 199.25 Mc. * 197.75 Mc. ** 193.25 Mc. * 191.75 Mc. ** 187.25 Mc. * 185.75 Mc. ** 181.25 Mc. * 179.75 Mc. ** 175.25 Mc. * 87.75 Mc. ** 83.25 Mc. * 81.75 Mc. ** 77.25 Mc. * 71.75 Mc. ** 67.25 Mc. * 65.75 Mc. ** 61.25 Mc. * 59.75 Mc. ** 55.25 Mc.	Same as Above	Set Channel Selector to 13 (See Note above) Set Channel Selector to 11 (See Note above) Set Channel Selector to 10 (See Note above) Set Channel Selector to 9 (See Note above) Set Channel Selector to 8 (See Note above) Set Channel Selector to 7 (See Note above) Set Channel Selector to 6 (See Note above) Set Channel Selector to 5 (See Note above) Set Channel Selector to 4 (See Note above) Set Channel Selector to 3 (See Note above) Set Channel Selector to 2 (See Note above)	The R.F. band pass characteristic of the other television channels should now be checked without disturbing the settings of trimmers C-3, C-5 and C-10. Adjust the RF sweep generator and marker generator for operation on the other channels, observing position of both the sound and picture carrier markers.	
* Indicates Sound Carrier Marker ** Indicates Picture Carrier Marker						The response for all channels should meet the requirements of Fig. 3. To do so it may be necessary to compromise by slightly changing the initial channel 12 adjustment of C-3, C-5 and C-10 while switched to channel which does not conform.

MARCONI

EMERSON TV-V-308, TV-V-398

R.F. OSCILLATOR ALIGNMENT

1. Connect marker and sweep generator as shown in Fig. 2, low side to chassis.
2. Connect scope to video I.F. align point (See location Fig. 5).
3. Connect 3 volt bias battery positive terminal to chassis, negative terminal to top of C-16 (See Fig. 5).
4. Before undertaking oscillator alignment be sure I.F. circuits are correctly aligned for band pass characteristic and trap settings.
5. During oscillator alignment, it is necessary to set the fine tuning control to the centre of its capacity range.

MARKER SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY		TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
209.75 Mc. 205.25 Mc.	Channel 12 Centre Frequency 207 Mc. 10 Mc. Sweep	Be sure that fine tuning control has been properly positioned (See step 5 above). NOTE During this step and thru-out all succeeding steps it is necessary to: 1. Keep output of sweep generator at a level that does not allow the reading on a V.T.V.M. to exceed minus 1 volt when connected across video detector load at minimum sweep width. 2. Keep output of standard signal generator at a level that provides a readable marker but does not distort the curve that is being observed on the scope.	Adjust Slug A-12	NOTE: Before making the following adjustments, advance the vertical gain control on the scope in order to magnify the sound trap portion of the response curve. Then, use a non-metallic screwdriver to adjust channel 12 oscillator slug (accessible thru hole on front of r-f tuner unit) and shift response curve so that sound carrier marker is located at the position indicated below. Now reduce gain control setting of scope to restore pattern to normal amplitude and observe position of picture carrier marker. This marker should appear on the high frequency side of the characteristic curve. The amplitude of the picture carrier should be between 60 and 70% down from peak response.
* 215.75 Mc. ** 211.25 Mc. * 203.75 Mc. ** 199.25 Mc. * 197.75 Mc. ** 193.25 Mc. * 191.75 Mc. ** 187.25 Mc. * 185.75 Mc. ** 181.25 Mc. * 179.75 Mc. ** 175.25 Mc. * 173.75 Mc. ** 169.25 Mc. * 167.75 Mc. ** 163.25 Mc. * 161.75 Mc. ** 157.25 Mc. * 155.75 Mc.	Channel 13 213 Mc. Channel 11 201 Mc. Channel 10 195 Mc. Channel 9 189 Mc. Channel 8 183 Mc. Channel 7 177 Mc. Channel 6 171 Mc. Channel 5 165 Mc. Channel 4 159 Mc. Channel 3 153 Mc. Channel 2 147 Mc.	Set Channel Selector to 13 (See Note above) Set Channel Selector to 11 (See Note above) Set Channel Selector to 10 (See Note above) Set Channel Selector to 9 (See Note above) Set Channel Selector to 8 (See Note above) Set Channel Selector to 7 (See Note above) Set Channel Selector to 6 (See Note above) Set Channel Selector to 5 (See Note above) Set Channel Selector to 4 (See Note above) Set Channel Selector to 3 (See Note above) Set Channel Selector to 2 (See Note above)		Adjust the RF sweep generator and marker generator for operation on other television channels; set marker generator to sound carrier frequency. After setting Channel Selector to corresponding channel, adjust oscillator slug thru hole on front of RF tuner unit. (A-2 to A-13). This permits response curve to be shifted so that sound carrier will appear at the position indicated below.  TYPICAL OVERALL RESPONSE CURVE NOTE: Make sure that cam on fine tuning control shaft remains properly positioned during this step. (See step 5 above).
* Denotes Sound Carrier Marker ** Denotes Picture Carrier Marker				
NOTE: If an unsatisfactory overall response is obtained for a particular channel, observe RF Amp. and Mixer response curve for that channel (as described in RF Amp. and Mixer Alignment Table). If characteristic curve does not conform well within the typical curve shown in Fig. 3 then do the following things: 1. Check method of connecting scope, voltmeter and generator leads to eliminate possible distortion of observed response, or: 2. Attempt to obtain a better compromise for RF response on all channels by realigning RF Amp. and Mixer circuits, or: 3. Try replacing Antenna, RF and Oscillator coils for the particular channel.				

- 1) Tune receiver to unused channel 10 or 12.
- 2) Connect 3 volt bias battery with negative terminal to AGC (Top of C-16), positive terminal to chassis.
- 3) Connect D.C. V.T.V.M. to junction of L-5 and R-23, low side to chassis.
- 4) Connect terminated marker generator to floating shield of converter tube V-2 (5J6). (Shield raised slightly so that it does not make contact with chassis). Use unmodulated marker.

5) Connect vertical input of an oscilloscope instead of V.T.V.N. to video test point with vertical scope gain set at, or near, maximum. (Horizontal scope sweep set at 400 cycles).

MARKER GENERATOR	ADJUST	PROCEDURE
27.75 Mc. 400 Cycles Amp. Mod.	I-1A	With signal generator set at maximum output, adjust I-1A for minimum vertical response on scope.

6) Now that all the I.F. coils have been set, the oscilloscope

6) Now that all the I.F. coils have been set, the overall response can be observed and adjusted if necessary.

Providing overall curve is within tolerance as shown in Fig. 4, no further adjustments are needed. If band width or tilt is not as specified, repeat entire alignment procedure. If still out then a slight retouching is permissible. Trap L-1A must be adjusted as indicated above. Do not re-adjust while observing overall I.F. response curve.

Keep output of signal generator as low as possible when observing the overall I.F. shape since tube overload might result and the response will appear incorrectly flat and wide.

NOTE: It may be impossible to observe the 27.75 Mc. marker with the average service equipment due to the high attenuation of trap L-1A (Adjacent sound).

All instrument leads should be dressed as shown and kept as short as possible to prevent interaction between input and output leads. Failure to do this may result in an unstable response indication.

NOTE: It is important that the output cable of the sweep and marker generator be properly terminated in their characteristic impedance which is usually from 50 to 70 ohms. If this termination has not been built into the end of the cable by the instrument manufacturer, then a resistor of the proper value (characteristic impedance) should be connected as shown in Fig. 5.

If in doubt check your instruction book which is issued by test equipment manufacturer.

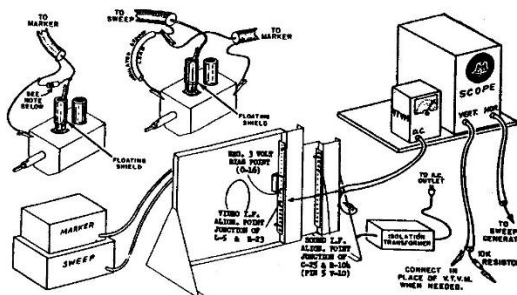


Figure 5. - CONNECTIONS FOR I.F. ALIGNMENT

WAVE SHAPE ANALYSIS

The wave shapes and the peak to peak voltage values shown in the "WAVE SHAPE ANALYSIS CHART" were taken on a **TEXTORITE OSCILLOSCOPE**.

NOTE: It may be impossible to observe the full amplitude of the wave shapes or to read the same peak to peak voltage values shown with average service equipment due to the low sensitivity found in some oscilloscopes.

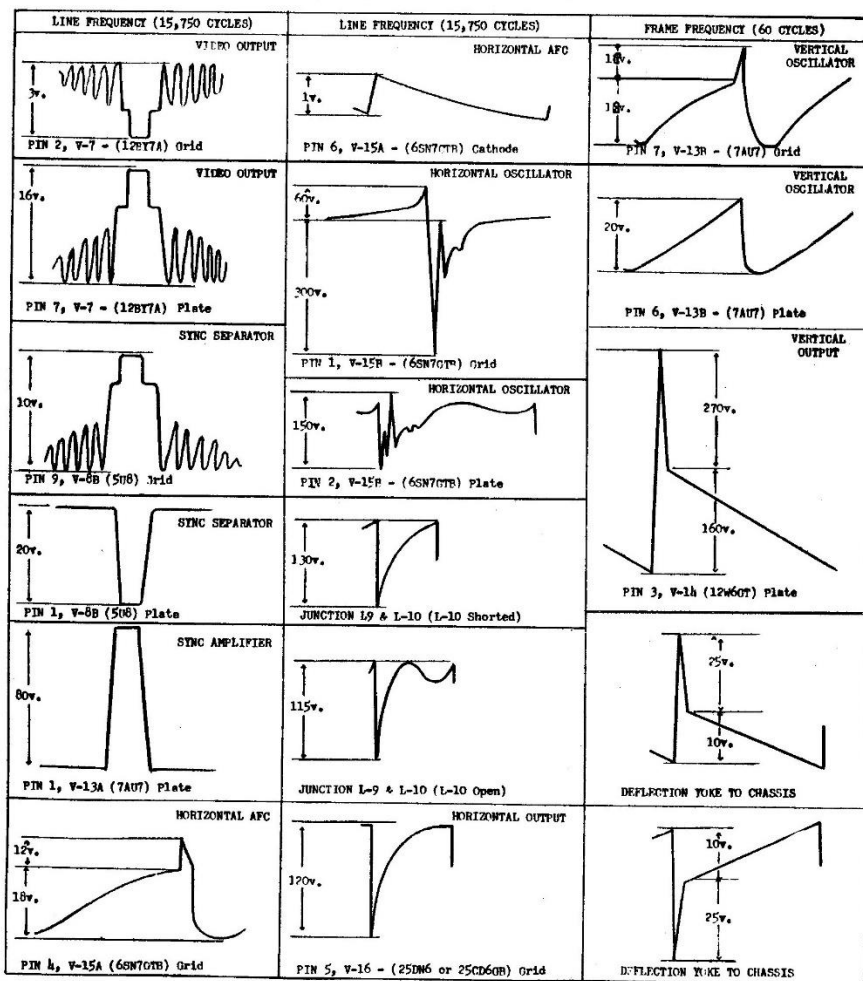
The peak to peak voltages given may vary slightly depending on signal strength and component variations.

To accurately observe the wave shapes, the relatively high input capacity of an oscilloscope must be reduced so as not to change the operating characteristics of the television set. Failure to do this will result in wrong shape readings. This is accomplished by using a low capacity probe.

1. Connect antenna and tune receiver to a channel where best reception has been obtained in the past.

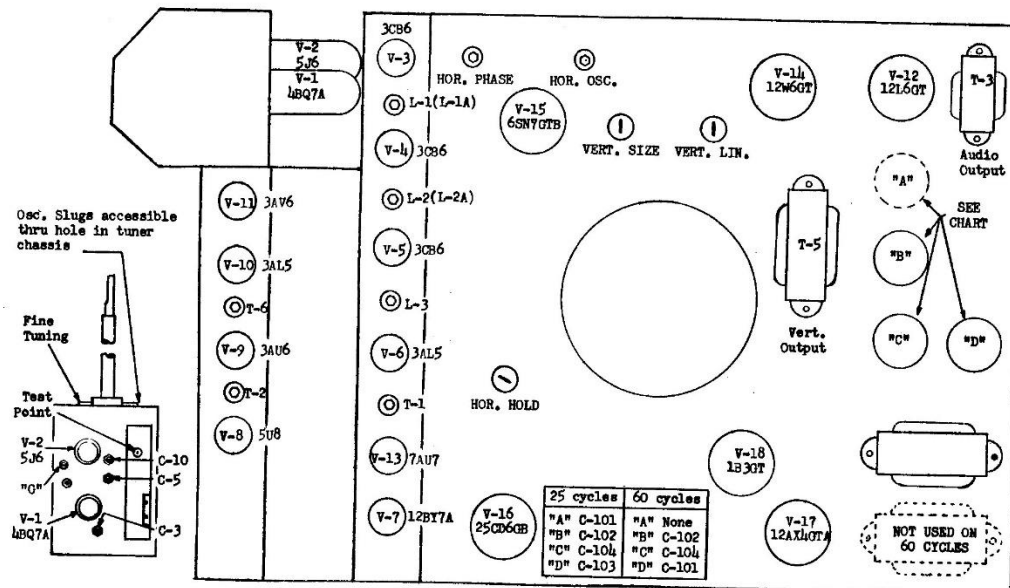
2. Low end of probe is connected to chassis and the contrast control is set to maximum counter-clockwise position. Local-Suburban switch on "Local", other controls normal.

NOTE: A wave shape seen in your oscilloscope may be upside down from same wave shape shown here. This will depend on the number of stages of amplification in the oscilloscope used.



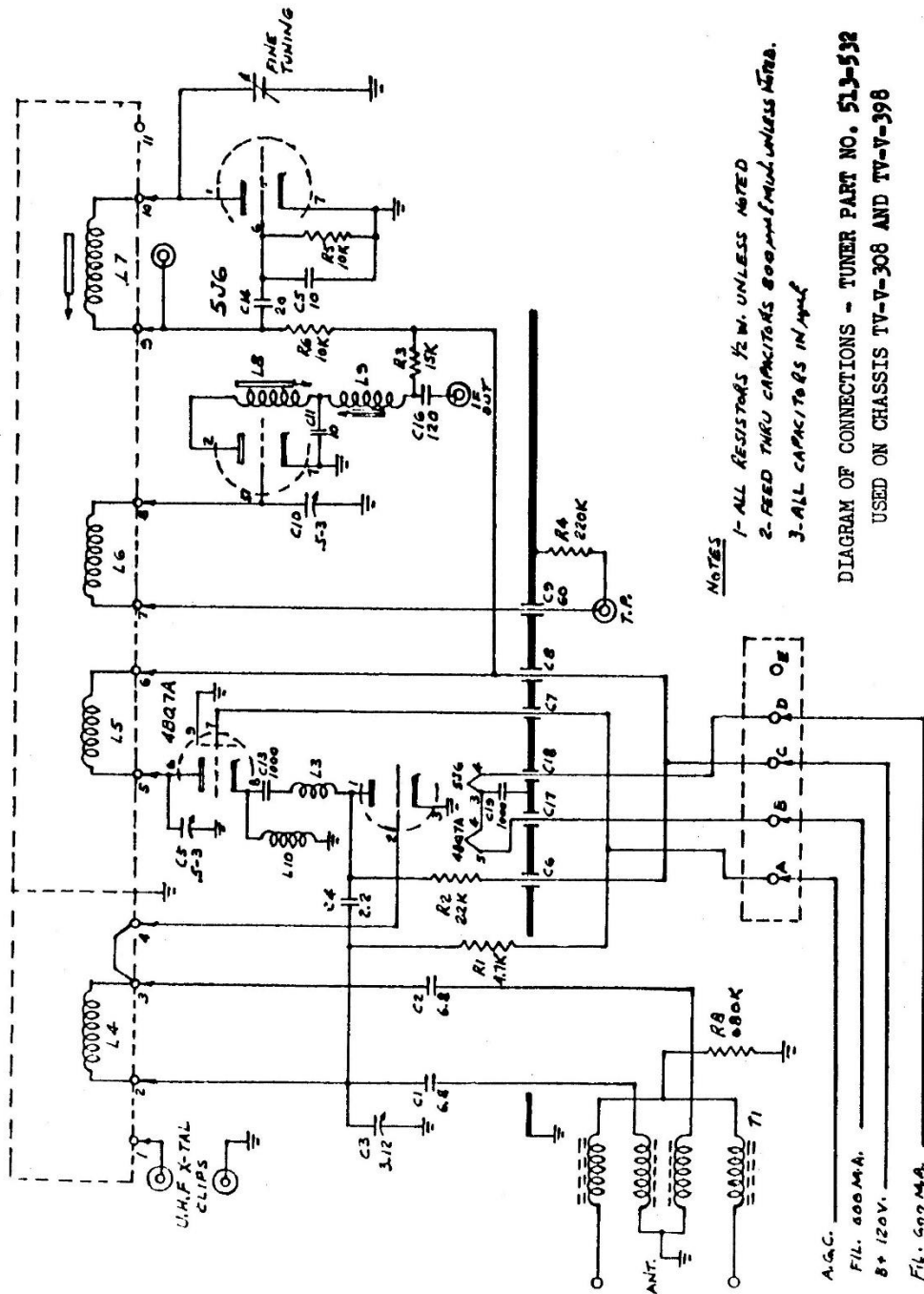
WAVE SHAPE ANALYSIS CHART

STEP	GENERATOR INPUT		MEASURING INSTRUMENT	ADJUST	REMARKS
	CONNECTION	FREQUENCY			
1	Signal Generator to pin 4 of sound I.F. transformer T-1. Low side to chassis.	4.5 Mc. AM Mod.	Connect A.C. probe of V.T.V.M. to pin 11 of V-12 (Picture Tube)	Bottom core of T-1	Set Signal Generator to high output. Adjust for minimum reading on V.T.V.M.
2					Set volume control at maximum and top core of T-6 all the way out. (Counter-clockwise)
3			Connect scope to pin 5 of V-12 (12L6GT)	Top core of T-1 & T-2. Bottom core of T-2 & T-6.	Set Signal Generator to lowest output that will provide a usable reading on scope. Adjust for maximum amplitude on scope.
4				Top core of T-6.	Set Signal Generator to high output. Adjust for minimum amplitude on scope.



ADJUSTMENT OF SIGNAL MONITOR

Before adjusting make sure the picture lock has been properly adjusted. This control (R-105) should normally be set at the extreme counter-clockwise position with the Local-Suburban switch in the Local position. If sync improvement is required in electrically noisy fringe areas, rotate the control R-105 clockwise for best picture stability.



MARCONI EMERSON TV-V-308, TV-V-398

25

LOCATING AN OPEN TUBE FILAMENT

This can be done quite rapidly by using an ohmmeter or another method of checking continuity such as a 3 volt battery in series with a No. 40 pilot light bulb. The procedure as shown below is to first isolate the open filament to one of 8 or 9 tubes rather than one of 19. When this is done, it is then localized further to one of 4 or 5 tubes and then to the exact tube.

NOTE: Pull A.C. line cord plug out of wall receptacle during this test.

1. Short both prongs of A.C. plug to chassis.
2. Remove V-6, 3AL5 and check heater continuity from Pin No. 4 to Pin No. 3.
3. Connect continuity checker from chassis to Pin No. 4 of V-6, 3AL5 tube socket (tube removed from socket). If an open circuit is found then the open filament is one of the following tubes: V-5, V-4, V-3, V-2, V-1, V-10, V-11 or V-19.
4. Check continuity from chassis to Pin No. 3 of V-6, 3AL5 tube socket (tube removed from socket). If an open circuit is found then the open heater is either one of the following tubes: V-17, V-12, V-14, V-15, V-16, V-7, V-8, V-9 or V-13.
5. If an open circuit is found in step 3 or 4 then the trouble can be localized by using similar continuity check on the 8 or 9 tubes in question.

NOTE: When looking at top of socket count pin numbers counter-clockwise from reference point (Key or wide pin spacing).

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS

Due to component variations, voltage and resistance readings may vary slightly from those given here. The picture tube, deflection yoke and high voltage circuits were connected to take the following readings.

1. Antenna disconnected and antenna terminals shorted on tuner and connected to chassis (Use short leads).
2. Line voltage maintained at 117 volts A.C. (Disconnect power for resistance reading).
3. All controls in position for normal picture. (Varied when it directly effects reading).
4. All measurements taken with a vacuum tube voltmeter and ohmmeter.
5. All readings listed in tables were taken between points shown unless otherwise noted.
6. N/C denotes no connection.

RESISTANCE READINGS

SYMBOL	TUBE PIN NUMBERS								
	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-3	900 K	68 Ω	File.	File.	16 K	16 K	0 Ω	-	-
V-4	900 K	68 Ω	File.	File.	16 K	16 K	0 Ω	-	-
V-5	.2 Ω	180 Ω	File.	File.	16 K	110 K	0 Ω	-	-
V-6	.2 Ω	550 K	File.	File.	104 K	0 Ω	4.7 K	-	-
V-7	33/363 Ω CONTRAST	165 K	0 Ω	File.	File.	File.	21 K	16 K	0 Ω
V-8	12 K	1.04 Meg	38 K	File.	File.	16 K	150 K	0 Ω	2.67 Meg
V-9	47 K	0 Ω	File.	File.	164 K	18 K	0 Ω	-	-
V-10	0 Ω	97 K	File.	File.	166 K	0 Ω	97 K	-	-
V-11	3.3 Meg	0 Ω	File.	File.	0 Ω	1 Meg	236 K	-	-
V-12	N/C	File.	16.3 K	16 K	470 K	N/C	File.	180 Ω	-
V-13	28 K	1.1 Meg	0 Ω	File.	File.	1.07 Meg to 3.57 Meg VERT. SIZE	680 K to 1.68 Meg VERT. HOLD	2.2 K	File.
V-14	N/C	File.	16 K	15.8 K	2 Meg	2 Meg	File.	220/720 Ω VERT. LIN.	-
V-15	370 K	70 K	0 Ω	1.37 Meg	65/75 K HOR. HOLD	330 K	File.	File.	-
V-16	N/C	File.	0 Ω	N/C	165 K	180 K	File.	File.	-
V-17	N/C	N/C	80 K	N/C	16 K	N/C	File.	File.	-
V-18	1.5 Ω Between Pin No. 7 and 2.								
V-19	File.	12 Ω	-	-	-	16 K	PIN 10 70 K	PIN 11 150 K - TV-308 100 K - TV-398 BRIGHTNESS	PIN 12 File.

MARCONI

EMERSON TV-V-308, TV-V-398

VOLTAGE READINGS

SYMBOL	TUBE PIN NUMBERS								
	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1				15.4v AC	11.3v AC	B+ SUPPLY = 120 VOLTS			
V-2			15.4v AC	19.9v AC					
V-3	-.7v	.7v	19.9v AC	23.9v AC	118v	118v			
V-4	-.7v	.7v	23.9v AC	25.9v AC	118v	118v			
V-5	0v	1.8v	25.9v AC	28.9v AC	120v	110v			
V-6	0v	-1v	31.9v AC	28.9v AC	-.25v		-.4v		
V-7	2.1v	-2.2v		42.8v AC	42.8v AC	49v AC	112v	130v	
V-8	40v	-.6v	80v	42.8v AC	38.2v AC	120v		0v	-1.5v
V-9	-.7v		38.2v AC	34.2v AC	128v	63v	0v		
V-10	0v		11.3v AC	9.3v AC	-2v				
V-11	-.7v	0v	6.3v AC	9.3v AC			62v		
V-12		104.9v AC	100v	110v	0v		92.4v AC	8.5v	
V-13	55v	-.6v	0v	34.2v AC	34.2v AC	32v	-13v	.25v	31.9v AC
V-14		80.1v AC	123v	120v	0v		92.4v AC	11.5v (b)	
V-15	-60v	190v	0v	-14v	130v to 220v (a)	7v	73.8v AC	80.1v AC	
V-16		49.1v AC	0v		-24v		73.8v AC	110v	
V-17			DO NOT MEASURE		130v		117v AC	107.2v AC	
V-18	DO NOT MEASURE								
V-19	PIN 1	PIN 2	PIN 6	PIN 10	PIN 11	PIN 12	NOTES: (a) VARIES WITH HORIZONTAL HOLD (b) VARIES WITH LINEARITY CONTROL (c) VARIES WITH BRIGHTNESS CONTROL		
	0v	0v	120v	268v	20v to 130v(c)	6.3v AC			

TUBE TROUBLE ANALYSIS CHART

Weak or no Sound nor Video (Picture), Raster normal	V-1, V-2, V-3, V-4, V-5 or V-6.
Weak or no Sound - Video and Raster normal	V-8, V-9, V-10, V-11 or V-12.
Weak or no Video - Sound and Raster normal	V-7.
Poor or no horizontal nor vertical sync - Sound and Video normal	V-8, V-13 or V-15.
Poor or no horizontal nor vertical sync - Video weak or distorted, raster normal - Sound may or may not be normal	V-1, V-2, V-3, V-4, V-5, V-6 or V-7.
Poor or no horizontal sync - Raster normal and sound normal (Picture locks in vertically)	V-15.
Poor or no vertical sync - Raster normal and sound normal (Picture locks in horizontally) Vertical Oscillator off frequency	V-13 or V-14.
Horizontal line (no vertical sweep) - Sound normal	V-13 or V-14.
Insufficient horizontal size - Sound and Video normal	V-15, V-16, V-17 or Sel. Rectifier.
Insufficient vertical size, or white horizontal bar in picture, horizontal size O.K.	V-13 and V-14.
No sound, no raster - tubes lit	Fuse, Selenium Rectifier.
No sound, no raster - tubes not lit	Plug connection in wall socket, ON-OFF switch, line cord, open filament in tubes,

By raster we mean the illuminated scanning lines.

Another very common fault is a shorted or open circuit antenna connection to set.

NOTES:-

- 1- $\frac{1}{2}$ DENOTES CHASSIS.
- 2- CONNECTIONS MARKED $\odot$ ARE OPEN WHEN DOTTED CIRCUIT IS CONNECTED ON 25 CYCLE CHASSIS.
- 3- ALL CAPACITANCES IN WHOLE Nos. IN MMF., THOSE IN DECIMAL Nos. IN MFD. UNLESS OTHERWISE NOTED.
- 4- ALL RESISTANCES IN OHMS UNLESS OTHERWISE NOTED. K=1000 OHMS
- 5- ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION. (CONTROL VIEWED FROM KNOB END)

