HIGH VOLTAGE WARNING

EXTREMELY HIGH VOLTAGES ARE USED IN THE OPERATION OF THIS RECEIVER. THEREFORE, THE OPERATION OF THIS RECEIVER OUTSIDE THE CABINET OR WITH THE SAFETY BACK REMOVED INVOLVES A SHOCK HAZARD. IT IS EXTREMELY IMPORTANT TO BE THOROUGHLY FAMILIAR WITH ALL PRECAUTIONARY SAFETY MEASURES BEFORE ATTEMPTING ANY SERVICE WORK ON THE CHASSIS.

GENERAL INFORMATION

The TS series Stromberg-Carlson Television receiver is composed of (3) general subdivisions:
1. TS-125 using the 12" kinescope tube.
2. TS-15 using the 15" glass kinescope tube.
3. TS-16 using the 16" metal kinescope tube.

All models use a basic chassis assembly with modifications of the kinescope tube mount and the deflection and high voltage systems to accommodate the different size picture tubes.

SPECIFICATIONS

**Picture Presentation**
- TS-125 — 12" electromagnetic cathode ray tube.
- Picture size 11 1/2" x 9 3/4".
- TS-15 — 15" electromagnetic cathode ray tube.
- Picture size 15 1/2" x 9 3/4".
- TS-16 — 16" electromagnetic cathode ray tube.
- Picture size 12 1/2" x 9 3/4" (early models)

**Input Impedance**
- 300 ohm balanced.

**Tuning Range**
- AM — 540 to 1400 KC.
- FM — 88 to 108 Mc.
- TV — 15 to 88 Mc.
- TV — 7-13 to 174 to 216 Mc.

**Sensitivity**
- Video: 18 microvolts to give 25 volts peak to peak on kinescope grid.
- Sound: 13 microvolts to give .5 watts output.
- FM: 20 microvolts to give .5 watts output.
- AM: 6 microvolts to give .3 watts output.

**Audio Power Output**
- TS-125 H-1 — 3 watts
- TS-125 L-1 — 10 watts
- TS-125 M — 10 watts
- TS-15 — 10 watts
- TS-16 — 10 watts

**Speaker Voice Coil Impedance**
- 6 — 8 ohms

**Operating Voltage**
- 117 volts 60 cycles.

**Power Consumption**
- TS-125 H — 300 watts
- TS-125 L & M — 205 watts
- TS-15 — 325 watts
- TS-16 — 325 watts

**Intermediate Frequencies**
- AM — 655 Kc.
- FM — 2.9 Mc.
- TV audio carrier — 21.9 Mc.
- TV video carrier — 41.4 Mc (bandwidth 3.7 Mc).

**Metal Kinescope Precautions**

Be extremely careful when working around the metal kinescope tube. The entire metal cone and clamping ring are at 2nd anode potential (12000 volts).

These tubes have a protective coating on the bulbous portion of the neck where the glass is joined to the metal. This coating is a special material compounded to minimize the leakage of electricity across the glass surface. Care should be used in handling the tube to prevent finger prints and other foreign matter from contaminating this coating as its protective properties would be nullified by any forms of foreign matter. This is especially important insomuch as this surface may not be cleaned, with solvents normally used to remove grease, without destroying the coating entirely.

**Picture Tube Handling**

The picture tube bulb encloses a high vacuum, and due to its large surface area is subjected to considerable air pressure. Therefore, handle the picture tube with care since a fracture may result in an implosion with the possibility of flying glass. Always wear shatter-proof safety goggles and heavy gloves when handling the kinescope tube in the shop or in a customer's home. Keep unprotected onlookers at a safe distance.

DO NOT SUBJECT THE LARGE END OF THE PICTURE TUBE TO MORE THAN A MODERATE PRESSURE AT ANY TIME. IF, WHEN INSTALLING THE TUBE IN THE RECEIVER, IT STICKS OR FAILS TO SLIP THROUGH THE DEFLECTION YOKE ASSEMBLY, DO NOT FORCE BUT INVESTIGATE AND REMOVE THE OBSTRUCTION.

**Identification Table**

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**Television Frequency Ranges**

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OPERATING CONTROLS

1. 5-Position Range Control — This control has five positions and is used to select the type of service desired. In block wave at only five positions are:
   - Low band television (channels 2 to 6), high band television (channels 7 to 13), frequency modulation (FM) and monaural (AM1) and stereo (AM2) mode.

2. Off-On-Volume Control — This control is used to select the desired channel and is used on all bands (TV, FM and AM). The tuning indicator is used to display the channel number.

3. Tuning Control — This control is used for selecting the desired station and is used on all bands (TV, FM and AM). The tuning indicator is used to display the channel number.

4. Dial Light Switch and Picture Control — This control is used to select the desired brightness of the picture (most pleasing proportions of black and white). A note: An automatic background control is incorporated in the receiver which eliminates the necessity of adjusting the brightness control when turning from station to station. The outer knobs control the dial light. When viewing a telecast the dial light may be extinguished, eliminating distraction from the picture.

5. Vertical Hold Control — This control is located behind the small removable panel just below the picture tube, and three more on the rear flange of the chassis. These are for service adjustment only.

6. Non-Operating Controls
   - Six of these controls are located behind the small removable panel just below the picture tube, and three more on the rear flange of the chassis. These are for service adjustment only.

7. To place the television receiver in operation use the following sequence:
   - Turn the off-on switch clockwise and wait about 1 minute for the receiver to warm up.
   - Choose the proper television band on the range control (first position, channels 2 to 6; second position, channels 7 to 13).
   - Use the tuning control to select the desired channel as indicated by the dial and pointer. Final tuning is made for maximum output of the tuning eye.
   - Adjust the volume control for desired brightness.
   - Adjust off dial light using dial light switch.
Horizontal Linearity and Drive Adjustments

On the TS series, the horizontal drive control should be set slightly clockwise from the point of "folding" in order to remove the "folding" completely and yet not exceed the rating on the 6B56 tubes. This adjustment must be made in conjunction with the linearity control.

On the interior of the Horizontal Synchro transformer is a screwdriver adjustment for phasing of the horizontal sync. To readjust this control, the horizontal hold should first be adjusted in the normal manner. (The Horizontal Hold control should be in the middle of its range). Turn the brightness up until the raster background is seen around the edges of the picture. The phasing control is then turned until the edges of the raster are equal on each side of the picture, using the Horizontal Centering Control to move the picture from side to side to see the complete raster.

The diagram shown below gives the location and function of each of these controls.

**ALIGNMENT**

Refer to the tube location chart for the location of coils and trimmers.

**AM Alignment**

- Before starting the alignment procedure, set the range switch to the broadcast band position. Use a non-metallic aligning tool and be careful to use light pressure on all slugs in order to prevent damage to the iron cores. Use a 30% modulated signal for all adjustments.

1. **AM IF Alignment**

   Connect the 455 KC signal through a .01 MFD capacitor to the grid of the converter tube (pin No. 7 of 6AS6, V-5). The vacuum tube voltmeter should be connected between the junction of C-147 and R-148 and ground. With the potentiometer at the low frequency end of the dial, adjust the top and bottom cores of the AM IF transformers (T-40 and T-101) for maximum AVC voltage.

2. **AM RF Alignment**

   With the tuning condenser fully meshed, adjust the pointer on the dial at the low frequency end of the dial. Turn the tuning control until the pointer in on the 1400 KC point and align the RF section as follows: Couple a 1400 KC modulated signal through a .01 MFD capacitor into the grid of the AM RF amplifier (pin 2 of C8A, V-3) keep the VTVM across the AVC line as above. Adjust the oscillator trimmer C-320 for maximum output. Keep the input and output at the same points adjust the RF trimmer C-326 for maximum output.

**FM Alignment**

1. **IP Alignment**

   Set the range switch in the FM position and the pointer at the low frequency end of the dial. Couple an unmodulated 21.9 MC signal through a 0.1 MFD to the signal grid of the FM converter (pin 2 of 12AT7, V-2) taking care to keep the leads straight to avoid the possibility of regeneration, connect to VTVM between the FM AVC line (junction of C-124 and R-124) and ground. Align all FM IF transformers (T-20, T-90, T-100) top and bottom and the primary (bottom) of the ratio detector for maximum AVC voltage.

   Note — Keep the AVC voltage below 3 volts by reducing the signal input as the circuits are brought into resonance.

2. **Ratio Detector Alignment**

   The ratio detector may be aligned with a 21.9 MC unmodulated signal and a VTVM. The signal is coupled to the grid of the driver tube (pin 7 of 6AS6, V-51) through a .01 MFD capacitor. The VTVM is connected between the output of the detector circuit (junction of R-121 and C-121) and the junction of R-122 and R-123 (the two 10,000 ohm resistors across the 5MF6 electrolytic capacitor in the detector circuit). With an input of approximately 1 volt (secondary) plug of T-110 is adjusted for zero DC voltage. (The meter should swing through zero as the circuit is passed through resonance).

3. **FM RF Alignment**

   Before attempting the FM RF alignment, AM alignment and the calibration of the dial should be checked. With the AM tuning condenser fully meshed and the}

**VIDEO I.F. ALIGNMENT**

This procedure is a duplicate of that used in the factory for the alignment of the receiver, and it is possible the exact wave forms will not be obtained due to differences between the equipment in the factory and the service shop. It is very important to keep the leads from the receiver as short as possible since, at the frequencies used in television, a lead 3 inches long may distort the band pass picture and give an incorrect alignment.

In aligning the video IF portion of the TS series television receivers, the vertical deflection of the oscilloscope is always connected to the junction of L-220 and C-240 (a 100 K ohm resistor in the oscillator lead is recommended) and the gain of the scope is adjusted to give 1 volt per inch. Throughout the alignment, the output from the television receiver should be kept at approximately 2 volts (12.5 volts deflection on the calibrated scope). A 3.5 volt bias is connected between the junction of R-434, R-435, and R-203 and ground. Set the range switch on the high band (T-13).  

1. Connect the output of the sweep generator through a small capacitor (220 pF or the equivalent of V-21 4th picture IF) and adjust the primary (bottom) and secondary (top) of T-210 for a symmetrical curve around 24.8 Mc as shown in Fig. 1. Note: the small notches in the picture are due to the action of the sound horns L-201 and L-210 can be eliminated by grounding the junction of G-210 and L-210 with a screwdriver or short lead.

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2. Remove the driver sweep from the grid of V-21 and connect a 21.9 Mc 30% modulated signal to the grid V-20 (3rd picture IF) and adjust L-201 for minimum response on the oscilloscope.

3. Connect a 27.5 Mc 30% modulated signal to the grid V-20 (3rd picture IF) and adjust L-210 for minimum response on the oscilloscope.

4. Remove the fixed frequency signal from the grid of V-20 and connect the output of the sweep generator to the grid of V-20. Adjust L-200 and L-211 for a symmetrical curve around 24.8 Mc as shown in Fig. 2.

5. Connect the output of the 24.8 Mc 30% modulated signal to the top of the special converter shield (construction details shown below). Damp the first IF grid coil by placing a 680 ohm resistor across L-111 and adjust the converter plate coil (L-82) for maximum response on the scope. Remove the damping from L-181 and damp the converter plate coil by placing the 680 ohm resistor across L-82 and adjust the first IF grid coil L-181 for maximum response on the oscilloscope.

6. Connect the sweep signal to the special converter shield and adjust the first and second IF plate coils for a response as shown in Fig. 3. The second IF plate coil L-190 will be used to place the 26.4 Mc point 50% down from the top of the pattern and the first IF plate coil L-180 will flatten the top of the response.

    If it is not possible to obtain the response as shown in Fig. 3, adjust L-180 and L-190 to the best possible response and repeat step No. 5. This should make it possible to duplicate the picture as shown in Fig. 3. The final response should be essentially flat on top with 26.4 Mc and 22.7 Mc 30% down.

    Fig. 4 shows the special converter shield used to fit over V-8 for injecting the signal into the converter stage. This special shield is constructed by cutting tube shield No. 131036 in two, 3/8" from the base. Separate the two parts by 1/4" and secure by soldering 4-1 meg. ohm resistors to each part. Attach a lead for connecting to the generator to each part of the shield, the generator ground going to the base of the shield.
CIRCUIT DESCRIPTION

Refer to Schematic and Block Diagrams

Television Tuner

The television tuner covers the twelve television channels in each frequency band: channels No. 2 and No. 6 from 51 Mc to 88 Mc, and channels No. 7 from 13 from 74 Mc to 126 Mc. Both bands contain a tuned band and a band antenna, transformer T-50 and T-70 for coupling the 300 ohm balanced input into the grids of each RF tube, V-5 (6AQG) and V-7 (68HT). Each input transformer T-50 and T-70 is fixed tuned by the trimmer capacitors in the primary to be essentially flat over the entire band. The plates are tuned by the variable inductance L-50 and L-70 and the associated tube capacity in parallel with the trimmer capacitors C-53 and C-73. In the "Hi Band" section of the tuner, the RF signal is coupled from the plate of the RF amplifier thru a T network into the grid coil of the converter L-30 thru the inductive link L-31, while in the "Lo Band" section, the RF signal is coupled from the plate of the RF amplifier thru a T network into the grid of the converter tube V-3A (1/566). The T network is designed to give proper band-pass as well as to provide added image rejection thru the use of the series resonant circuit C-76 and L-71. The grid circuits of the converter sections are tuned by coils L-60 and L-80. The local oscillators are a modified Collins circuit. The voltage from the "Hi Band" local oscillator is undoubledly coupled into the grid circuit of the "Hi Band" converter while the voltage from the "Lo Band" local oscillator is injected thru C-83 into the grid of the "Lo Band" converter.

The output of the range switch is used to disable the "Hi Band" converter when using the "Lo Band" section of the tuner by applying a negative bias to the grid of the "Hi Band" amplifier. The "Hi Band" section of the tuner is operating, the "Lo Band" converter is disabled by applying a --22 volts bias to its grid.

The IF output from the converter plate is coupled into the grid of the 1st picture tube thru a double tuned circuit L-105 and L-115 and is tuned to 24.8 Mc to give about a 6 Mc band pass.

Picture IF Amplifier

The 1st and 2nd Picture IF stages are a staggered tuned sync-coupled amplifier V-24 (6AU6) and 21.9 Mc sound trap L-201 and a 27.9 Mc adjacent channel noise trap L-210. The 4th picture IF stage consists of an over coupled transformer T-210 to provide a saddle shaped response curve for the 4 Mc video IF band pass.

Picture Decoder and Video Discriminator

The intermediate frequency signal is detected by one half of V-22 (6AL5). The signal developed across R-223, the diode load is sync pulse negative. The signal is coupled into the input of the video amplifier V-24 (6AU6) thru the peaking coil L-220 and capacitor C-240. The grid of the 1st video amplifier is maintained at +1/2 volts. A portion of the video signal is developed across the Primary coil by grid current while the sync is amplified. The sync separator V-28A (6SL5A) in conjunction with the time constant of C-280 and R-290 removes all of the remaining video except only sync pulses are fed into the grid of the 2nd sync limiting amplifier. The 2nd and 3rd sync amplifier V-29 (6166) amplifies the sync pulse voltage and develops the output pulses. The 2nd and 3rd sync amplifiers are cascade coupled in order to obtain a wide range of input signal levels. V-29A further clips and amplifies the sync pulses.

Automatic Level Diode

The 3rd and 4th stage of a 6166A is a peak detector which is used to reinsert the DC component of the video signal on the kinescope grid. Since the plate of V-28A is tied into the output of the 3rd sync limiting amplifier which detects on the tip of the pedestal rather than the sync tips as in a normal DC restore circuit and the voltage developed across R-263 is a function of pedestal height and not sync tips.

Horizontal Sync and Deflection

The output of the 4th sync amplifier is fed into the center tap of the primary of the Horizontal Sync Transformer T-301. It is combined with a 1270 cycle sine wave of 60 volt amplitude on the second of T-301 which is impressed on the secondary of T-301. The voltages in each plate of V-31 (6AL5) Horizontal Sync Transformer reverse the sine wave 180° out of phase having a sync pulse superimposed on it. The sine wave with sync pulse will cause current to flow in each diode and the resultant voltage across R-311 and R-312 will be zero if the current is equal and opposite in polarity. If the frequency of the oscillator changes the phase of the sync will shift. When the phase changes, the current in the oscillator so as to bring it back in resonance. This automatically keeps the oscillator at the horizontal sync frequency rate.

The time constant of the filter circuit R-313 C-312 and C-22 is such that a sudden change in voltage due to noise will not be impressed on the grid of V-31 as the change in frequency of the oscillator cannot change rapidly, hence the so called "flywheel effect."

The output of the grid of the Horizontal Oscillator is fed thru a differentiating network consisting of C-332 and R-333. The time of the differentiated pulse causes the grid of V-40 to go from -16.0 volts to -4.0 volts in 220 microseconds. The grid of V-40 and V-41 is used to act as a switch, discharges the sweep generating capacitor C-346. This in turn is fed to the grids of the Horizontal Oscillator V-24 and V-42 (6B6CS). The tubes in conjunction with the Horizontal transformer T-340 the Horizontal Amplifier tube V-27 (54VB) and tuned circuit L-263A generate a saw tooth waveform. The second anode voltage is developed by the auto-transformer action of T-240 when the high voltage pulse is formed thru the sudden collapse of the current in the horizontal deflection coil when the horizontal output tubes areutoff. A voltage doubler type of rectifier is used to obtain the necessary secondary anode potential.

Vertical Deflection

The output of the 4th amp is fed into an integrating network consisting of R-40, C-400, R-401, C-402 and C-432. The integrating network develops the vertical pulses and amplitude of the saw tooth waveform which are fed into the grid of the vertical output transformer T-410 as a centertapped saw tooth. R-409 and R-409 control the amount of radiant DC thru the yoke to allow the picture to be centered on the face of the kinescope.

TROUBLE SHOOTING

1. No picture — Sound Normal, Raster Normal.
   B. Check voltages on V-19, V-20, V-21, V-24, and V-25.

2. No raster — sound normal.
   A. Incorrect adjustment of ion trap.
   B. Defective kinescope.
   C. No high voltage check high voltage by drawing arc between second anode connector and grid.
   D. Defective V-42, V-45, V-35, or V-36.
   E. Defective 3/4 amp. fuse in high voltage supply.
   F. Shorted C-300, C-351, or C-352.
   G. Defective R-351.
   H. Defective C-346.

3. No picture — sound normal, raster normal.
   A. Defective antenna.
   B. Defective tubes V-5, V-6, V-7, V-8 or V-18.
   C. Oscillator off frequency.

4. No sound — picture normal.
   A. Defective V-5, V-10, V-11, V-12, V-14, V-15, V-16, V-17.
   B. Defective T-110.
   C. Defective speaker.

5. No vertical deflection.
   A. Defective V-40, or V-41.
   B. Check voltages and wave forms on V-27, V-28, V-29.
   C. Defective vertical deflection yoke L-263B.

   A. Low B+ or low line voltage.
   B. Weak V-34.

7. No sync — signal on kinescope.
   A. Defective V-27, V-28, or V-29.
   B. Check voltages and wave forms on V-27, V-28, or V-29.

8. No vertical sync — Signal on kinescope.
   A. Integrating network defective.
   B. Defective R-404.

9. No horizontal sync — signal on kinescope.
   A. Defective V-31, or V-32.
   B. Check voltages.
   C. Check C-310.

10. Sound bars in picture.
    A. Check alignment of 21.9 Mc trap.
    B. Check alignment of IF stages.

11. Picture smear.
    A. RF, or I.F. stages misaligned.
    B. Open peaking coil.
PRODUCTION CHANGES

Since the start of production on the TS series the following changes have been made.

C-370 changed to SC No. 111071—44MF 450v. non polarized.
R-73 SC No. 149103—2200 ohms 20%. 1/2 Watt added across L-71.
R-68 SC No. 149107—10,000 ohms 20%. 1/2 Watt added across L-80.
R-274 and R-275 replaced by one resistor SC No. 149334 6,000 ohms 3%. 5 Watt.
R-307 SC No. 149151—150,000 ohms 20%. 1 Watt replaces R-306.
R-403 changed to SC No. 28194—1.8 meg ohm 20%. 1/2 Watt.

On the TS-16 PM the horizontal drive control R-304 has been changed to SC No. 145091—500,000 ohms 1/2 Watt.
On the TS-125 M, TS-125 L, and TS-16 the horizontal drive control R-304 has been changed to R-303, SC No. 145093—350,000 ohms 1/2 Watt.

The original high voltage power supply as shown on the large schematic has been replaced by the one shown below. This can be cut out and pasted over the high voltage power supply shown on the large schematic, bringing it up to date.
The photographs reproduced below were taken from a DuMont 208-B oscilloscope and were taken on a standard receiver with a normal picture. Set oscilloscope oscillator to sync with 15,750 cps, for figures 1 thru 13. Set oscilloscope oscillator to sync with 60 cps. for figures 14 thru 16.

FIG. 1
Grid (Pin 1) of 1st Sync Amp (V-27) 7v, peak to peak

FIG. 2
Cathode (Pin 11) of Sync Sep. (V-28A) 45v, peak to peak

FIG. 3
Grid (Pin 6) of 2nd Sync Amp (V-29) 4.5v, peak to peak

FIG. 4
Plate (Pin 11) of 2nd Sync Amp (V-29) 18v, peak to peak

FIG. 5
Plate (Pin 21) of 3rd Sync Amp (V-29) 22v, peak to peak

FIG. 6
Plate (Pin 21) of 4th Sync Amp (V-30A) 18v, peak to peak

FIG. 7
Pin 5 (E1) of Hor. Sync Transformer (V-310) 1.5v, peak to peak

FIG. 8
Plate (Pin 7) of Hor. Sync Dist. (V-31) 4.5v, peak to peak

FIG. 9
Plate (Pin 2) of Hor. Sync Dist. (V-31) 4.5v, peak to peak

FIG. 10
Grid (Pin 3) of Hor. Osc. (V-33) 64v, peak to peak

FIG. 11
Plate (Pin 3) of Hor. Osc. (V-33) 200v, peak to peak

FIG. 12
Grid (Pin 4) of Hor. Dist. (V-30 B1) 60v, peak to peak

FIG. 13
Plate (Pin 3) of Hor. Dist. (V-30 B1) 60v, peak to peak

FIG. 14
Grid (Pin 5) of Vert. Osc. (V-40) 330v, peak to peak

FIG. 15
Plate (Pin 3) of Vert. Osc. (V-40) 165v, peak to peak

FIG. 16
Plate (Pin 3) of Vert. Osc. (V-40) 795v, peak to peak

The schematic shown below is the audio system used on the TS-125 H. The remainder of the circuit is the same as shown on the large schematic.