HIGH VOLTAGE WARNING

OPERATION OF THE RECEIVER OUTSIDE THE CABINET OR WITH COVERS REMOVED INVOLVES A SHOCK HAZARD FROM THE RECEIVER POWER SUPPLIES. NO WORK SHOULD BE ATTEMPTED BY ANYONE NOT THOROUGHLY ACQUAINTED WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON HIGH VOLTAGE EQUIPMENT. ALL SERVICE WORK, EXCEPT AIR TESTING, CAN BE SUCCESSFULLY CARRIED OUT WITHOUT THE HIGH VOLTAGE SUPPLY OPERATING (USE DUMMY LOAD).

PICTURE TUBE HANDLING

WHENEVER IT IS NECESSARY TO REMOVE OR HANDLE THE PICTURE TUBE IN ANY MANNER, SHATTERPROOF GOGGLES AND HEAVY GLOVES MUST BE WORN. AS THE TUBE ENCLOSES A HIGH VACUUM AND HAS A LARGE SURFACE IT IS SUBJECTED TO CONSIDERABLE AIR PRESSURE. FOR THESE REASONS PICTURE TUBE MUST BE HANDLED WITH CAUTION AND CARE. IF THE TUBE STICKS IN ANY MOUNTING POSITION DURING INSTALLATION, NEVER FORCE THE TUBE.

POWER

THIS RECEIVER OPERATES FROM 117 V 60 CYCLES POWER LINES.
DO NOT USE IN ANY OTHER SERVICE.
NOTES FOR INSTALLATION AND GENERAL CIRCUIT FUNCTIONS

The basic sections of the Andrea Sharp Focus television receiver is shown in the Trouble Shooting Block Diagram, Figure 1. For ease and simplification, each section has been designated by a reference letter such as: "A" for the TV-FM Channel Selector, "B" for the Video I-F section, etc. Difficulties arising throughout the chassis, therefore, can be readily isolated and repaired. Isolating or trouble shooting time is further reduced by first associating the operational difficulty with the section or sections of the receiver responsible.

Consequently, it is of utmost importance that the service technician become acquainted with the visual effects of any operational difficulties in TV receivers in order that rapid diagnosis of the circuit sections involved can be made.

Until such time as the service technicians build up sufficient experience and technique in television circuit requirements, the following basic requirements must be rigidly maintained to assure customer satisfaction. Remember, exactness of frequency in the signal generating equipment used must be rigid, particularly when the TV oscillator circuits are re-adjusted. Such equipment, not crystal controlled, should be checked before use and calibrated with a heterodyne frequency meter or crystal calibrator, otherwise serious customer complaints of poor performance will result.

To adequately service the TV portion of the receiver, the following pieces of equipment are a must. Wherever any piece or pieces of such equipment are not available, much harm can be done by attempting to carry out re-alignment or adjustments.

(a) R.F. Sweep generator covering all TV & FM bands. Minimum sweep width 10 Mc, Output 1.0 V preferred, with attenuator (Use: Head End Alignment).

(b) Single Frequency Source providing accurate markers for: Trap frequencies, TV sound frequencies, Pix IF carrier setting, Video IF end band, fall off Sound IF system (Use: All Alignment).

(c) AM & FM band Signal Generator. (Use: AM, FM & TV Sound).

(d) Oscilloscope: Sensitivity .01 RMS Volts per inch preferred. Vertical Amplifier flat to 150 KC. Expanded Horizontal Sweep position. (Use: Head End, Video & Sound IF, Video, Sync.).
(e) Volt-Ohm meter with multiplier for 15 KV. (Use: General Continuities).

(f) Video & Sound 1F Sweep Generator, range 19 to 30 Mc. Sweep width 250 Kc & 10 Mc. (Use: Sound & Video IF Alignment).

(g) Wide band amplifier 18-32 Mc, 70 X gain. (Use: Head End Alignment).

GENERAL CIRCUIT FUNCTIONS

TV-FM Channel Selector - (Section A)

The Andrea TV-FM Channel Selector embodies a design insuring freedom from radiation and its deleterious effect on other receivers. This principle of good engineering practice is obtained by adequate shielding, circuit isolation and design.

The input system is unbalanced and is designed for use with a 72-ohm line such as the RG/59U cable, which is recommended. Care must be exercised to use an antenna system designed for use with the RG/59U cable to insure best performance.

The TV-FM Channel Selector consists of: a 6J6 grounded-grid r-f amplifier, V1; a 6AG5 modulator, V3; a 6J6 oscillator, V2. Each of these stages is continuously tuneable by means of the three-section variable inductor, L3A, B & C. The front section, L3C, of this tuning unit is used in the 6J6 oscillator circuit. The center and rear sections provide the variable elements of a band-pass filter used to couple the R-F tube, V1, to the Modulator, V3. A "T" network of adjustable capacitors (C7, C8 & C9) is used in the band-pass filter for setting the bandwidth to the desired width. Adjustable inductors having a hairpin shape provide the means for aligning the circuits at the high-frequency end of the tuning range.

Reference Figures:

Fig. 1. Trouble Shooting Block Diagram - VK12.

Fig. 2. Top View of Chassis - VK12.

Fig. 6. Display Curves - Head-End Representative Response Curves.

Fig. 14. Schematic Circuit Diagram - VK12.
The oscillator circuit contains several fixed and adjustable elements for the purpose of obtaining the desired dial calibration. These elements are: L9, L11 and C11. Of these, L9 is fixed to produce the desired dial calibration at the low-frequency. Inductor L11 and capacitor C11 are adjustable for the purpose of adjusting the high-frequency and the low-frequency dial calibration respectively, so the dial calibration will be accurate despite variations in tubes and other components.

Generally, no re-alignment will be found necessary for the r-f circuits. Should it be desirable to examine the RF Pass Band of any of the 13 TV channels or the FM Pass Band, proceed as follows:

(a) Disconnect blue lead from pin #5 of modulator tube, V3. Connect a 220 ohm load resistor in the modulator plate and couple it to the input of a wide-band amplifier (18-32 Mc) with a ceramic capacitor.

(b) Connect an oscilloscope to the detector output of the amplifier.

(c) Connect r-f sweep generator, 50-100 ohms impedance, to input terminals designated for the antenna transmission line. Adjust sweep for channel under test and satisfactory scope display.

(d) Set the tuner dial to channel #2 and examine the response curve by using suitable marker frequencies. Compare the curve with that shown in Fig. 6. If there is an appreciable discrepancy, re-adjust capacitors C7, C8 & C9.

(e) Set the tuner dial and sweep generator for channel #13 and compare the response curve with that given in Fig. 6. If there is an appreciable discrepancy, re-adjust the hairpin inductors L5 & L8.

(f) Remove 220 ohm load resistor and reconnect blue lead to pin #5 of modulator tube, V3.

Since the dial calibration is directly dependent on the oscillator circuit adjustment, the service technician should not re-adjust this circuit until it is definitely established that the dial calibration is seriously off. If it becomes necessary to correct the dial calibration in either TV channels #1 to #6 or in the FM band, the correction shall be made by means of capacitor, C11. Observe caution in adjusting C11 since a small amount of rotation produces a large change in dial calibration. If channel #13 is off calibration after this adjustment is made, it may be restored by adjusting the inductor L11, slightly by spreading or compressing the turns. Remember, a small change in this adjustment results in a large frequency change.

**TV & FM Sound I-F System - (Section E)**

The 21.7 Mc TV & FM sound IF frequency is taken from the 21.7 Mc trap contained in T1 and amplified successively by V20, V21 & V22 and applied to the 6AL5 ratio detector, V23, where the FM signal is converted to audio.
The I-F amplifier is ± 125 Kc wide at the 6db level while the ratio detector "S" curve is linear over ± 75 Kc.

To align, apply the sound 1F sweep generator to pin #1 of V22. First disconnect C83 from pin #1 of V23, connect oscilloscope to C85 of de-emphasis circuit, and adjust iron core located at bottom of T12 to peak at 21.7 Mc. Connect scope to pin #1 V23, adjust iron core on top of T12 to obtain an "S" shape curve with 21.7 Mc in center, and linear over ± 75 Kc. Repeat these adjustments. In each case place scope in proper position for these checks. Connect scope to pin #1 of V23 and apply sound 1-F sweep generator successively to pin #1 of V21 and V20 and get desired pass-band by adjusting successively transformers T11 and T10.

Reference Figures:

Fig. 1. Trouble Shooting Block Diagram - VK12
Fig. 2. Top View of Chassis - VK12
Fig. 8. Display Curve - Sound 1-F Response
Fig. 9. Display Curve - "S" Curve
Fig. 14. Schematic Circuit Diagram - VK12

See TV-FM Frequencies, page 15

Video I-F System (Section B)

The video I-F system employs stagger-tuned stages consisting of a 6A65, V3, modulator, three 6A65's, V4, V5 & V6, 1st, 2nd and 3rd video I-F and a 6AL5, V7, video detector.

The converted Pix carrier is 26.2 Mc and is adjusted to conform to RMA standards to be 6db down the slope of the video I-F passband from the average top level. When adjusted correctly, the passband extends from 26.2 Mc to a point 3db down at 22.95 Mc. (See Fig. 7) Traps are provided in the video I-F system to properly attenuate the accompanying and adjacent sound carrier frequencies at 21.7 Mc and 27.7 Mc, respectively. The 21.7 Mc traps are located in the modulator I-F transformer, T1, and 1st video I-F transformer, T2. The 27.7 Mc adjacent sound traps are located in the 3rd and 4th video I-F transformers, T3 and T4. The 21.7 Mc traps and the 27.7 Mc traps provide a 40 to 50 db attenuation. All traps, except T5, are tuned from the top of the chassis while all signal circuits are tuned from the bottom.

To align the video I-F, connect the video I-F sweep generator to the modulator, V3, grid through a coupling capacitor. Set the sweep to cover 19 to 30 Mc and provide markers at 21.7, 22.95, 26.2 and 27.7 Mc. Connect the oscilloscope to the high side of resistor, R24, in the plate circuit of the video detector, V7. Adjust contrast control for -4.5 volts. If the response curve obtained on the oscilloscope is appreciably different from that shown in Fig. 7, the tuning slugs of transformers T1, T2, T3 and T4 should be adjusted from
the underside of the chassis. The low-frequency skirt of the response curve is principally affected by T1; the high-frequency skirt by T3. The flatness of the central region is determined by T2 and T4.

The sound traps should be adjusted by the single frequency method rather than by attempting to use the sweep generator. A 400-cycle AM signal set at exactly 21.7 Mc is fed to the modulator and the trap slugs of T1 and T2 tuned for minimum output at the video detector. Similarly the traps of T3 and T4 are tuned for minimum output using a 27.7 Mc signal. After these traps are tuned, the cathode trap T5 of V6 should be adjusted using the sweep generator. The correct adjustment of T5 will be recognised by observing the greatest reduction in amplitude of the peak normally produced slightly below 21.7 Mc.

If T5 is tuned to frequencies above 21.7 Mc, it may cause the video I-F amplifier to oscillate. This is normal and will stop when the cathode trap is tuned to the correct frequency.

Reference Figures:

Fig. 1. Trouble Shooting Block Diagram - VK12
Fig. 2. Top View of Chassis - VK12
Fig. 7. Display Curve - Correct Video I-F Response
Fig.14. Schematic Circuit Diagram - VK12

Video System (Section C)

The video amplifier consists of: 6AL5 (V7) video detector; 6AU6 (V8) 1st video amplifier and noise limiter; 6K6GT (V9) video output; 6C4 (V10) clipper and D.C. reinsertor and picture tube (V29). The video amplifier is compensated with inductors (L12, L13, L14, L15, L16, L17) so that it is flat from 20 cycles to 4.5 Mc within ±1db. The circuit constants are fixed and require no adjustments. Should the pass band become defective, care must be exercised in replacement of components otherwise the frequency and phase conditions may be upset and poor performance result.

The screen voltage for the picture tube (V29) is adjusted by means of R39 located at the rear of the chassis. Should it be found necessary to replace the picture tube, set the contrast control to zero and the brightness control to 30 to 35V. Then adjust R39 until the illumination on the picture tube just fades out.

The Brightness control, R118, is used to adjust the picture background brightness and is located on the front of the chassis. Functionally, the control is in the low voltage bleeder and applies voltage to the cathode of the picture tube. Range of the control is 0 to 120 volts.
Sync., Deflection & Hi-Voltage (Section D)

Sync. Separation

The sync. circuit consists of: 6C4 (C10), Clipper which clips the sync. from the video just below the pedestal level. The mixed sync., negative polarity, is taken from the plate of this tube, and fed to a sync. amplifier, VIIA, which is 1/2 of a 6SN7GT tube. In the plate of this tube, the vertical and horizontal sync. pulses are separated. The vertical is taken off the plate through a 15,000 ohm isolating resistor, R42, and is then passed through a fast integrating network and fed to the low end of the vertical oscillator blocking transformer, T6.

Vertical Scanning

The vertical sawtooth waveform is derived in the 6SN7GT, VIIA, vertical blocking oscillator and is applied to the grid of the 6SN7GT (V15) which supplies the necessary sawtooth current to the vertical scanning coils, through the output transformer, T7.

Three controls are required to adjust the vertical scanning system properly, namely: Vertical Hold (R46), Pix Height (R48) and Vertical Linearity (R52).

The Vertical Hold control is a 2 megohm potentiometer located in the grid circuit of the blocking oscillator tube (VIIA) and is used to adjust the frequency of the vertical oscillator to 60 cycles.

The Pix Height control, R48, and the Vertical Linearity control, R52, are used to adjust the vertical size and linearity of the scanning. R48 varies the amplitude of the sawtooth applied to the 6SN7GT grid and is located in the plate of the vertical oscillator tube. R52, located in the cathode of the 6SN7GT, (V15), adjusts the bias of the output tube. These controls are interdependent and an adjustment of one will require a re-adjustment of the other for best linearity and size results. In general, the vertical size control will affect the lower half of the pattern, while the vertical linearity control will operate on the upper half. NEVER ATTEMPT TO ADJUST LINEARITY ON ANYTHING BUT THE STATION TEST PATTERN.

These three controls are factory adjusted but should be re-checked at the time of installation. They are supplied with knurled shafts which are available for adjustment at the rear of the chassis. To allow for settling conditions, a re-check after the first month's operation should be made. See Fig. 2 - Top View of Chassis - VK12.

Horizontal Synchronizing (Picture-lock)

Returning now to the synchronizing amplifier tube, VIIA, the horizontal pulses are taken from the plate circuit of this tube and fed through a 60 mmf condenser (C50) to the center tap, E, of the AFC transformer, T8, where they are mixed with the sine wave from the Horizontal Oscillator tube, V13, operating at 15,750 cycles. This mixed signal is applied to the plates of the Horizontal Sync. Phase
Detector, VI2, which develops a voltage in its cathode circuit dependent upon the relative phase of the horizontal sync. and horizontal oscillator sine wave. This voltage is filtered and applied to the grid of the Horizontal Oscillator Control tube, VI4. Any tendency of the Horizontal Oscillator to deviate in frequency from the frequency of the sync. signals causes a change in the voltage applied to VI4 grid. This voltage counteracts the tendency of the horizontal oscillator to change frequency and consequently the horizontal oscillator is maintained in rigid synchronism with the sync. signals. Since the control action is not dependent upon the amplitude of the sync. pulses but upon their repetition rate, noise pulses, therefore, do not produce horizontal tearing common to other types of sync. systems.

The horizontal synchronizing transformer T8 is adjusted in the following manner:

1. Tune the receiver to one of the TV stations transmitting its test pattern.

2. Set the contrast control for a washed-out picture by:
   a) turning the contrast control to the extreme C.C.W. position;
   b) measuring D.C. voltage at junction of L12 and L13 to ground with this value in mind;
   c) advancing contrast control until voltmeter reads 0.2V more than value read in b). (This setting should give a low contrast picture, washed-out);
   d) turning Horizontal Centering Control until right side of picture is visible.

3. Set the Horizontal Hold Control, R74, to a position 1/2 of its full rotation.

4. Setting the frequency of the horizontal AFC Transformer (the knurled knob at the top of T8).
   a) measure voltage to ground at pin #5 of VI2 using a vacuum tube voltmeter (VTVM). This voltage is approximately 2.0V read value. Then place the VTVM on pin #1 and adjust the frequency control of T8 until VTVM reads approximately 1.6V or 0.4V less than what was read on pin #5. The frequency setting of the AFC Transformer is now set correctly.

5. To set the Phase Control of the AFC Transformer (screw driver adjustment at bottom of T8):
   a) To understand correctly the function of this operation as the adjustment is run through its full range, the following description must be understood. When the adjustment is turned all the way out, it will be observed: the picture content will move to the left, relative to the raster, revealing in the order given: A grey vertical bar approximately 3/8" wide, followed
by a wider black bar, then a second grey bar, wider than the first but narrower than the black and, finally, the same picture content usually found at the beginning of line trace. Turning the phase control to its opposite extreme, all the way in, will cause the picture to move to the right relative to the raster and successively the reverse of the above will occur. The desired setting is obtained when the vertical line, made by the common boundary of the first grey bar and the black bar, is 1/8" from the right-hand end of the raster. Adjustments of the phase control may require a re-adjustment of the frequency control to maintain pin #1 at 0.4V less negative than pin #5.

b) Turn the Horizontal Hold control to its extreme positions. Pattern should remain in sync. over 80% rotation of the Horizontal Hold control. If adjustment is correct, set Horizontal Hold control to center of rotation. If necessary, repeat adjustments a) and b) until this condition is obtained.

c) Finally switch the set on and off a number of times to make sure that the horizontal will always fall into sync. If this is not the case, repeat a), b), and c).

d) If the horizontal sync. has been set up correctly, the Horizontal Hold control will operate at about 50% of its rotation and sync. will be held perfectly over 80% of rotation for all levels of contrast between a washed-out picture and an over-loaded picture.

NEVER MAKE THE ABOVE ADJUSTMENT EXCEPT ON THE STATION TEST PATTERN.

Horizontal Scanning

Horizontal drive for the 6B66G, (V17), is obtained by differentiating the wave form at the horizontal oscillator plate and applying the resultant pulse to a forming tube, V16, in the plate circuit of which a 500 mmf condenser, (61), integrates the 15,750 cycle pulse to obtain the required sawtooth wave shape. A pulse is added to this sawtooth by the Horizontal Drive control, R81, which is connected from C61 to B-. This is fed to the 6B66G grid which in turn supplies the horizontal scanning coils with sawtooth current.

Associated with the horizontal synchronizing and scanning circuits are a number of controls which are set at the factory and re-set at the time of installation on a customer's premises.

The horizontal controls located at the rear of the chassis, Fig. 2, are Pix Width, Horizontal Linearity and Horizontal Drive. All these controls are set at the factory but may require a re-adjustment at the time of installation. The procedure used to set controls is as follows:
(1) Adjust Horizontal Drive control, R81, until extreme right and left sides of pattern are equal. In the extreme clockwise position of R81, the right side of the picture will be compressed. In the extreme counterclockwise position, the 2nd anode voltage will be reduced as indicated by misfocusing and picture expansion.

(2) Now adjust Horizontal Linearity control, L21, until the linearity of the center portion of the picture becomes acceptable.

(3) Adjust Horizontal Width control, L20, to get proper width.

(4) All the above controls affect both LINEARITY and SIZE and after the initial set-up has been made, any one of the controls may be re-adjusted by small amounts so that correct size and best linearity may be obtained.

Note that WNBT, WCBS and WABD patterns do not show the same linearity and size. Therefore, the adjustment of the set must be made with this in mind so that an average linearity is obtained on all three stations.

NEVER ADJUST LINEARITY EXCEPT ON THE TEST CHART.

Horizontal and vertical centering controls are used to position the picture with the mask opening. It must be remembered that relative positions of the focus coil, yoke and picture tube affect the centering of the raster and if a tube has to be changed, the yoke and focus coils will have to be re-adjusted to obtain an approximately centered raster. If this is done, the centering controls will then correct any slight misalignment of the raster with the mask. The proper position of the coils is with the yoke and focus coils as far forward as possible, both adjusted to be concentric with the neck of the tube.

AM MOD.-OSC; 1st I-F (Section F)

The AM system consists of: a 6SA7 V24 oscillator-modulator, a GBA6 V21 dual 1-F tube, a 6SQ7 V25, 2nd detector and 1st audio tube and a 6V6GT V26 audio output tube. The triode section of the 6SQ7 and the 6V6GT are used on all four services.

The two I-F transformers are tuned to 455 Kc by means of the trimmers located at the top of each I-F can.

The oscillator and antenna shunt trimmers and the oscillator series padder are mounted underneath the chassis. On the scale background plate is an alignment chart for setting the pointer position (with the gang at maximum capacity) and the 600 & 1500 Kc alignment points. The alignment procedure is as follows:

Set the pointer to the mark on the alignment scale, Fig. 5, with gang at maximum capacity.
Connect the signal generator to the antenna terminals through a standard dummy antenna or a 250 uuf condenser. With the generator at 1500 Kc and the tuning condenser set at 1500 Kc adjust the oscillator shunt trimmer until the signal is received and then tune the antenna trimmer for maximum signal. Then set generator to 600 Kc and tune in the signal on receiver and adjust the oscillator series pad-der, C88, for maximum response. Repeat procedure.

Lo-Voltage Supply (Section H)

One power transformer with tapped secondary supplies all the power required. Lo-Voltage Rectifier #1, (V28), supplies +8 voltage to all tubes which are used on T.V. only. In FM, AM and Phono positions, the filament of V28 is opened, thus reducing power consumption in these positions. In addition, tubes used only in T.V. obtain their filament voltage from a separate 6.3V winding. Provision is made to run these tubes at 2V when the Service Selector switch is in the FM, AM or phono position. This method of operation prolongs the life of the tubes since they are protected from filament voltage surges during repeated switchings from T.V. to other services, and yet are not operative in any except the T.V. position.

In T.V., power consumption is 320 watts, while in F.M., A.M. and phono, 120 watts is required.
MECHANICAL ASSEMBLY NOTES

12JP4 Picture Tube, Deflection Yoke & Focus Coil Assembly

(1) Refer to Figure 3.

(2) Remove focus coil assembly from mounting brackets 5 & 6 by removing screws 3, 3.

(3) Place picture tube in cradle with tube face 5/32" back from front of tuning scale. Position "2nd Anode" towards outside of chassis, approximately 45° from the vertical. Hold tube so that neck is parallel to top of chassis & side of high-voltage supply housing at a distance of 5" and 3" respectively. Refer to "Rear View" of Fig. 3. Place one piece of rubber strip in place, back edge of strip extending 3/16" beyond clamping strap. Tighten clamping strap screw 4.

(4) Push cushion bracket snug against tube envelope and tighten both screws 1, 1. Slide yoke as far forward as possible and tighten wing screw 2.

(5) Slide focus coil assembly over neck of tube and butt against the rear of the yoke. Slide cardboard cushion ring between focus coil and tube neck to maintain coil concentric with neck. Never permit focus coil to rest on neck of picture tube. Tighten screws 3, 3.

12LP4 Picture Tube Assembly

(1) Refer to Figure 4.

(2) Steps (1) to (5), outlined under 12JP4 Picture Tube Assembly, are to be followed.

(3) Detailed instructions for the setting of the Ion Trap for the 12LP4 tube, are to be found in the following section.
SETTING OF THE ION TRAP FOR THE 12LP4 TUBE

When installing a 12LP4 Tube in the VK12 chassis, an Ion Trap must be used or no raster will appear on the face of the tube.

The Ion Trap must be carefully adjusted to obtain best results and, therefore, the following procedure should be carefully followed.

(A) MECHANICAL ALIGNMENT

1. Set the scanning yoke as far forward on the neck of the 12LP4 as possible and keep concentric with the tube neck. When in the correct position, fasten by means of screws for this purpose. (See Figure 4)

2. Place the Focus Coil in position, pushing it tight against the scanning yoke and keeping it concentric with the neck of the 12LP4. Fasten it in position by means of screws. To protect the glass neck of the tube from damage, insert corrugated cardboard cushion ring between the Focus Coil and the 12LP4 neck.

3. Place the Ion Trap on the tube neck with the black cushion strips towards the tube socket and the blue towards the front of the tube.

   Position approximately as shown in Figure 4, and tighten lightly so that it may be rotated or moved easily along the axis of the neck.

4. Connect the 2nd anode lead to the tube.

(B) LOCATING THE ION TRAP FOR PROPER OPERATION

1. Turn set on.

   Turn brightness control about 1/4 turn from its extreme clockwise position.

2. (a) Now set the Ion Trap so that the knurled-thumb nuts are at the right side of the tube neck with the black cushion clamp over the pole pieces in the 12LP4. (See Fig. 4.)

   (b) While watching the raster, rotate the Ion Trap and slide it along the tube neck until the maximum brightness is obtained.
This will result when the magnet poles contained in the 12LP4 tube neck are approximately located in line with the black cushion strip of the Ion Trap assembly. It will be found by trial that the region about the correct setting, throughout which some screen brightness appears, is limited to approximately a 3/8" movement in either direction, rotation about the axis and movement along the axis. Within this region, the optimum setting should be found. During the adjustment the Brightness control should be set to give a bright raster without "blooming" and in focus. At this point the face of the tube may not be fully illuminated or there may appear darkened regions within the raster area, which invariably appear in the corner regions. This condition is sometimes referred to as "corner cutting". Tilting the focus coil slightly, will usually remove this "cut corner", i.e., the desired full bright raster will appear. A "false" setting of the trap will be found approximately 180° from the "true" setting. No amount of adjustment in this "false" setting will bring up the screen brightness.

(c) Tighten the Ion Trap to the 12LP4 neck by means of the knurled-thumb nuts. (Watch when tightening to see that assembly does not move.)

(d) Now rotate the Brightness control to its maximum clockwise position. The raster brightness will increase and then fall off slightly, but no corner should be "cut". If corner is cut, the Ion Trap must be re-adjusted as in (b).

(e) Now decrease the brightness until a dim raster is obtained. No corner should be cut, but if it is, the Ion Trap must be re-adjusted.

(C) CAUTION

In localities where the line voltage is known to fluctuate, the Ion Trap should be set at or near the highest line voltage. If this is not done and the trap is set when the line voltage is low, corners of the raster may be cut when the line voltage increases.
DRIVE CORD ASSEMBLIES

(A) TV-FM TUNER DRIVE CORD ASSEMBLY

1. See Figure 5.

2. Turn TV-FM tuner control to extreme counterclockwise position as seen from shaft end.

3. Place gears in mesh so that pins #1 & #2 are facing up.

4. Hook loop in drive cord over pin #1 and wrap one turn counterclockwise, as seen from rear, around drum, then over idler pulleys #1 & #2 and back to drum.

5. Wind 4 3/4 turns CCW around drum and hook loop of tension spring over end pin #2.

6. Check that all turns on drum are neatly placed next to each other and do not overlap.

(B) AM TUNER DRIVE CORD ASSEMBLY

1. See Figure 5.

2. Set gang condenser shaft so that gang is closed. (Maximum capacity-maximum clockwise position of condenser shaft).

3. Slot in drum should now be 30° to the left of vertical as shown in Figure 5.

4. Place loop of tension spring over hook on drum and pass drive cord over drum, tuning shaft and idler pulleys #1 & #2 in the order indicated by the arrows.

5. Set scale pointer by sliding it along cord until pointer lines up with the first calibration mark on the "AM" scale to the left of the 550 Kc calibration mark.
FIG. 5
DRIVE CORD ASSEMBLIES - "VK12"
TV-FM TUNER

TOP VIEW

TUNER CONTROL
IN EXTREME COUNTER
CLOCKWISE POSITION
WHEN SEEN FROM
SHAFT END

GEARS

PIN #1

DRUM

4 3/4 TURNS

TENSION SPRING

END PIN #2

LOOP

IDLER #2

IDLER #1

AXIS OF TUNER

SHAFT END

A M TUNER

FRONT VIEW

IDLER PULLEY #2

FASTEN DRUM TO
GANG CONDENSER
SHAFT WITH SLOT
IN THIS POSITION

AM
55

- POINTER

160
AM

SET POINTER HERE WITH
GANG CLOSED

GANG CONDENSER
CLOSED

2 1/4 TURNS

AM TUNING SHAFT

THIS PART IN REAR

DRUM

GANG CONDENSER SHAFT

IDLER PULLEY #1

DRIVE CORD & TENSION SPRING

18 1/2"
### TV Channel Frequencies

<table>
<thead>
<tr>
<th>Channel No. (Mc)</th>
<th>Picture Carrier (Mc)</th>
<th>Sound Carrier (Mc)</th>
<th>Local Osc. (Mc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (44-50)</td>
<td>45.25</td>
<td>49.75</td>
<td>61.45</td>
</tr>
<tr>
<td>2 (54-60)</td>
<td>55.25</td>
<td>59.75</td>
<td>81.45</td>
</tr>
<tr>
<td>3 (60-66)</td>
<td>61.25</td>
<td>65.75</td>
<td>87.45</td>
</tr>
<tr>
<td>4 (66-72)</td>
<td>67.25</td>
<td>71.75</td>
<td>93.45</td>
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<tr>
<td>5 (76-82)</td>
<td>77.25</td>
<td>81.75</td>
<td>103.45</td>
</tr>
<tr>
<td>6 (82-88)</td>
<td>83.25</td>
<td>87.75</td>
<td>109.45</td>
</tr>
<tr>
<td>7 (174-180)</td>
<td>175.25</td>
<td>179.75</td>
<td>201.45</td>
</tr>
<tr>
<td>8 (180-186)</td>
<td>181.25</td>
<td>185.75</td>
<td>207.45</td>
</tr>
<tr>
<td>9 (186-192)</td>
<td>187.25</td>
<td>191.75</td>
<td>213.45</td>
</tr>
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<td>10 (192-198)</td>
<td>193.25</td>
<td>197.75</td>
<td>219.45</td>
</tr>
<tr>
<td>11 (198-204)</td>
<td>199.25</td>
<td>203.75</td>
<td>225.45</td>
</tr>
<tr>
<td>12 (204-210)</td>
<td>205.25</td>
<td>209.75</td>
<td>231.45</td>
</tr>
<tr>
<td>13 (210-216)</td>
<td>211.25</td>
<td>215.75</td>
<td>237.45</td>
</tr>
</tbody>
</table>

**FM Band 88 Mc - 108 Mc**

### Important I.F. Frequencies

- Picture Carrier IF Setting: 26.2 Mc
- Sound Carrier IF Setting: 21.7 Mc

### I.F. Traps

- Sound: 21.7 Mc
- Adjacent Sound: 27.7 Mc
FIG. 6.
DISPLAY CURVES

VK-12 HEAD-END REPRESENTATIVE RESPONSE CURVES.

CH. #2

CH. #4

CH. #5

CH. #6

CH. #7

CH. #9

CH. #11

CH. #13

V.C. = Picture Carrier
S.C. = Sound Carrier
Band Width 3.25 Mc
Picture Carrier (26.2 Mc)
Sound Trap (21.7 Mc)
Adjacent Sound (27.7 Mc)
Contrast bias set at -4.5 V.
FIG. 8.

DISPLAY CURVES - SOUND I-F RESPONSE.

-150 KC  -75 KC  0  21.7 MC  +75 KC  +150 KC

3rd I-F. Input to pin 1, V22

2nd (Dual) I-F. Input to pin 1, V21

1st I-F. Input to pin 1, V20
FIG. 9.
DISPLAY CURVES - "S" CURVE

Input to pin 1, V 22.
DISPLAY CURVES - FIG. 10

VIDEO WAVEFORMS - RECEIVER TUNED TO STATION

At V 7
Junction of L12 & L13
Full contrast = $\frac{1}{2}-3/4$ V. P-P
20 - 25% Sync.

At Pin 8 - V 9
7-8 V. P-P
20-25% Sync.

At Pin 2 - V 29
Full Contrast
35-40 V. P-P
15-20% Sync.
FIG. 11.
DISPLAY CURVES - SYNC. WAVEFORMS

V10 - Pin 5
Sync. Only
8 V. P-P

V11A - Pin 2
Sync. Only
35-40 V. P-P

Terminal "E" of T6
Hor. Sync. Only
10 V. P-P

V12 - Pin 7
Hor. Sync. & Hor. Osc.
11 V. P-P

V12 - Pin 2
Hor. Sync. & Hor. Osc.
9V. P-P

At C43 - Low End
V 11B Grid, pin 4, grounded
7 V P-P
FIG. 12.

DISPLAY CURVES - HOR. SCAN WAVEFORMS - FULL RASTER

V13 - Pin 5
Hor. Osc. Grid
60 V. P-P Sine Wave

V13 - Pin 3
Hor. Osc. Plate
Distorted Sine Wave
220 V P-P

V16 - Pin 1
Hor. Forming Tube Grid
110 V. P-P

V16 - Pin 2
Hor. Forming Tube Plate
27 V. P-P

V17 - Pin 5
Same Waveform
65V P-P

7875 ~ SWEEP
FIG. 13.

DISPLAY CURVES - VERT. SCAN WAVEFORMS - FULL RASTER

30 ~ SWEEP

V11B - Pin 4
Vertical Oscillator Grid.
75 V P-P

V15 - Pins 2 & 5
Vertical Output Plate.
600 V. P-P
150 V. Sawtooth

V15 - Pins 3 & 6
Vertical Output Cathode.
0.5 V. P-P
**TUBE REPLACEMENT**

Due to the nature of TV circuits, particularly the R.F., sync. and deflection circuits, the uniformity of tube characteristics has become increasingly more important. Present day tube manufacturing tolerances, however, have not kept step with these TV circuit requirements so that indiscriminate replacement of a tube, for any reason, may cause additional operational troubles. Careful selection of replacement tubes will prevent these troubles in most cases. Tube types with their associated circuit, along with the circuit troubles to be guarded against, are listed below.

6AC7 AFC control—Microphonics and noise

6AL5 Ratio detector and horizontal sync. phase detector—Hum content

6K6GT Video output—Washed-out bar in lower portion of picture

6J6 Oscillator—Microphonics and frequency shift
**VK12**

**VOLT - AMPERE CHARACTERISTICS**

**CONSTANTS:** Set Contrast Control for 3V
N.B.C. Pattern adjusted for 7 1/2" x 10" picture with good linearity and focus.
Turn Brightness Control to extreme C.C.W. position (Picture tube dark)

All voltages measured to ground with 1000 ohms-per-volt voltmeter, except B- measurement made with V.T.V.M.

### LO-VOLTAGE POWER SUPPLY #1

<table>
<thead>
<tr>
<th>SERVICE SWITCH</th>
<th>LIKE WATTS</th>
<th>LINE VOLTS</th>
<th>LINE AMPS.</th>
<th>B+ at CI11A</th>
<th>B+ at CI11B</th>
<th>B+ at CI12A</th>
<th>B+ at CI12B</th>
<th>CURRENT</th>
<th>LOAD TOTAL B-VOLS</th>
<th>TAP 1 TAP 2</th>
<th>HEATER WDG. (BLU-BLU LEADS) AC VOLTS</th>
<th>V28 FIL. (6U4G) AC VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>278</td>
<td>117</td>
<td>2.6</td>
<td>435</td>
<td>415</td>
<td>318</td>
<td>160</td>
<td>204</td>
<td>-10.2</td>
<td>-6.2</td>
<td>-2.2</td>
<td>6.1</td>
</tr>
<tr>
<td>FM</td>
<td>128</td>
<td>117</td>
<td>1.2</td>
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<td></td>
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<td>-5.3</td>
<td></td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>AM</td>
<td>123</td>
<td>117</td>
<td>1.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-5.0</td>
<td></td>
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<td>1.8</td>
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<tr>
<td>PHONO</td>
<td>123</td>
<td>117</td>
<td>1.15</td>
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<td></td>
<td></td>
<td>-4.5</td>
<td></td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>TV</td>
<td>330</td>
<td>130</td>
<td>2.6</td>
<td>475</td>
<td>450</td>
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### LO-VOLTAGE POWER SUPPLY #2

<table>
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<tr>
<th>SERVICE SWITCH</th>
<th>LIKE VOLTS</th>
<th>B+ at CI10A</th>
<th>B+ at CI10B</th>
<th>B+ at CI08B</th>
<th>LOAD CURRENT</th>
<th>HEATER WDG. (Yel-Grn—Yel-Grn) AC VOLTS</th>
<th>V27 FIL. (6U4G) AC VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>117</td>
<td>275</td>
<td>250</td>
<td>250</td>
<td>118</td>
<td>6.3</td>
<td>4.9</td>
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<tr>
<td>FM</td>
<td>117</td>
<td>250</td>
<td>265</td>
<td>275</td>
<td>113</td>
<td>6.35</td>
<td>5.0</td>
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<tr>
<td>AM</td>
<td>117</td>
<td>265</td>
<td>270</td>
<td>280</td>
<td>109</td>
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<td>5.0</td>
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<td>PHONO</td>
<td>117</td>
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<td>280</td>
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<td>99</td>
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<td>5.0</td>
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<tr>
<td>TV</td>
<td>130</td>
<td>280</td>
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<tr>
<td>PHONO</td>
<td>130</td>
<td>295</td>
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</table>
### TUBE VOLTAGES

**Line Voltage - 117 A.C.**

**No Signal**

Contrast -3V

Receiver adjusted for 7½” X 10” Picture, then Brightness turned down

#### SERVICE SWITCH POSITION

<table>
<thead>
<tr>
<th>TUBE</th>
<th>TV</th>
<th>FM</th>
<th>AM</th>
<th>PHONO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REF. NO.</strong></td>
<td><strong>TYPE FUNCTION</strong></td>
<td><strong>P</strong></td>
<td><strong>S</strong></td>
<td><strong>G</strong></td>
</tr>
<tr>
<td>1**</td>
<td>6J6 RF Amp.</td>
<td>140</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>6J6 Osc.</td>
<td>1/150</td>
<td>6/11.5</td>
<td>0</td>
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<tr>
<td>3</td>
<td>6AG5 Modulator</td>
<td>240</td>
<td>150</td>
<td>0</td>
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<td>4</td>
<td>6AG5 #1 Vid. I-F</td>
<td>240</td>
<td>165</td>
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<td>5</td>
<td>6AG5 #2 Vid. I-F</td>
<td>165</td>
<td>200</td>
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<td>6</td>
<td>6AG5 #3 Vid. I-F</td>
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<td>7</td>
<td>6AL5 Vid. Det.</td>
<td>2/5</td>
<td>-</td>
<td>5/0</td>
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<tr>
<td>8</td>
<td>6AU6 1st Video</td>
<td>122</td>
<td>135</td>
<td>0</td>
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<td>9</td>
<td>6K6 Vid. Output</td>
<td>110</td>
<td>165</td>
<td>0</td>
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<tr>
<td>10</td>
<td>6C4 Sync. Clipper</td>
<td>9.5</td>
<td>-</td>
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<tr>
<td>11</td>
<td>6SN7 Sync.</td>
<td>2/74</td>
<td>-</td>
<td>1/-4.5</td>
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<td>12</td>
<td>6AL5 Hor. Sync.</td>
<td>5/82</td>
<td>-</td>
<td>4/28</td>
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<td>6K6 Hor. Osc.</td>
<td>7/6</td>
<td>-</td>
<td>5/1</td>
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<td>14</td>
<td>6AC7 Hor. Osc.</td>
<td>2/5</td>
<td>-</td>
<td>5/-2.2</td>
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<td>15**</td>
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<td>6SN7 Hor. Forming</td>
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<tr>
<td>17</td>
<td>6B66G Hor. Output</td>
<td>485</td>
<td>258</td>
<td>-11</td>
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</tbody>
</table>

* - Tube elements connected in parallel

(1) - On contrast control - set at -3V

**NOTE:** Nos. in upper left of box give pin Nos. for dual purpose tubes.
<table>
<thead>
<tr>
<th>REF. NO.</th>
<th>TYPE</th>
<th>FUNCTION</th>
<th>TV P</th>
<th>TV S</th>
<th>TV G</th>
<th>TV C</th>
<th>TV L</th>
<th>TV R</th>
<th>TV A</th>
<th>TV T</th>
<th>TV E</th>
<th>TV D</th>
<th>TV N</th>
<th>TV O</th>
<th>TV E</th>
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</thead>
<tbody>
<tr>
<td>18</td>
<td>5V4G</td>
<td>Hor. Damper</td>
<td>485</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
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<td>OFF</td>
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<tr>
<td>19</td>
<td>183</td>
<td>Hi-V Rect.</td>
<td>A.C.</td>
<td>9.5kV</td>
<td>230</td>
<td>OFF</td>
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<td>OFF</td>
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<td></td>
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</tr>
<tr>
<td>20</td>
<td>6BA6</td>
<td>#1 FM I-F</td>
<td>220</td>
<td>110</td>
<td>0</td>
<td>1</td>
<td>240</td>
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<tr>
<td>21</td>
<td>6BA6</td>
<td>#2 FM I-F</td>
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<td>1.1</td>
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<td>115</td>
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<tr>
<td>22</td>
<td>6AU6</td>
<td>#3 FM I-F(Driver)</td>
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<td>135</td>
<td>1</td>
<td>222</td>
<td>140</td>
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<tr>
<td>23</td>
<td>6AL5</td>
<td>Ratio Det.</td>
<td>7/0</td>
<td>1/7</td>
<td>2/-.8</td>
<td>5/-.1</td>
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<td>AM Mod.</td>
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<td>OFF</td>
<td>235</td>
<td>102</td>
<td>-6.6</td>
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<td>25</td>
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<td>1st Aud.&amp; AM Det.</td>
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<td>265</td>
<td>270</td>
<td>14</td>
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<tr>
<td>26</td>
<td>6V6GT Audio Out.</td>
<td>250</td>
<td>255</td>
<td>13</td>
<td>265</td>
<td>270</td>
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<tr>
<td>27</td>
<td>5U4G</td>
<td>Lo-Voltage Rect.</td>
<td>275</td>
<td>278</td>
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<tr>
<td>28</td>
<td>5U4G</td>
<td>Lo-Voltage Rect.</td>
<td>275</td>
<td>278</td>
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<tr>
<td>29</td>
<td>12JP4</td>
<td>12LP4 Pix Tube</td>
<td>9.4</td>
<td>0 to 300</td>
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<td>OFF</td>
<td>282</td>
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</tbody>
</table>

5 - Brightness Control varies from 0 to 120 V.

For Measurement Control, set at extreme C.C.W. position (120V).