ANDREA RADIO CORPORATION

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 I. 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 IF 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 IF 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 I-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 I-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 6AG5, V3, modulator, three 6AG5'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 pass-band from the average top level. When adjusted correctly, the pass-band 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. reinserter 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, V11A, which is ½ 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 intergrating 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, V11B, 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 (V11B) 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 months' operation should be made. See Fig. 2 - Top View of Chassis - VK12.

Horizontal Synchronizing (Picture-lock)

Returning now to the synchronizing amplifier tube, V11A, 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, V12, 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, V14. 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 V14 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 $\frac{1}{2}$ 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 V12 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 fougd 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 bythe 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 readjustment 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 6BG6G, (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), intergrates 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 6BG6G 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 readjustment 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 6BA6 V21 dual I-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 padder, 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 +B 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.

FIG. 1 - TROUBLE SHOOTING BLOCK DIAGRAM - "VK12"

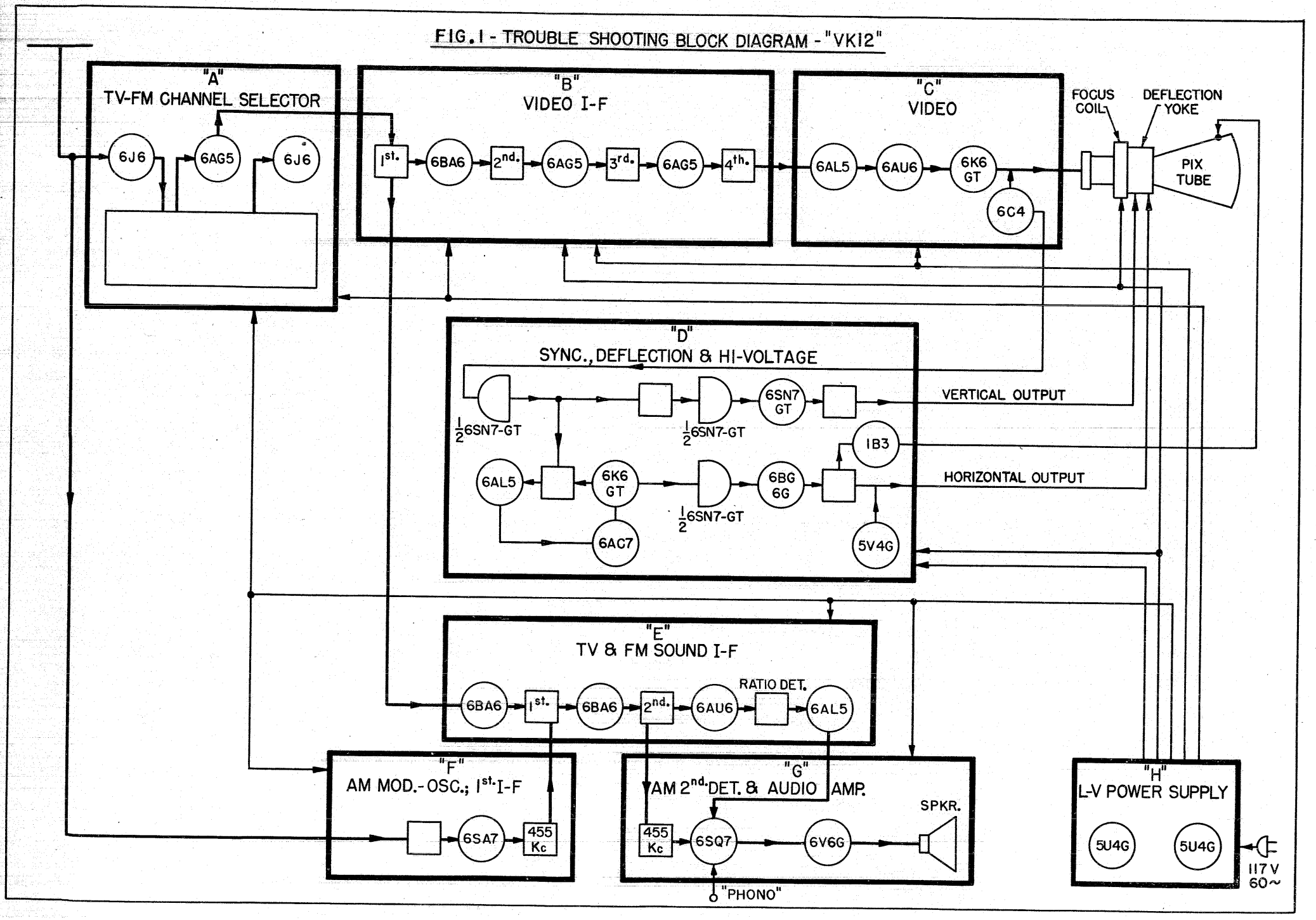
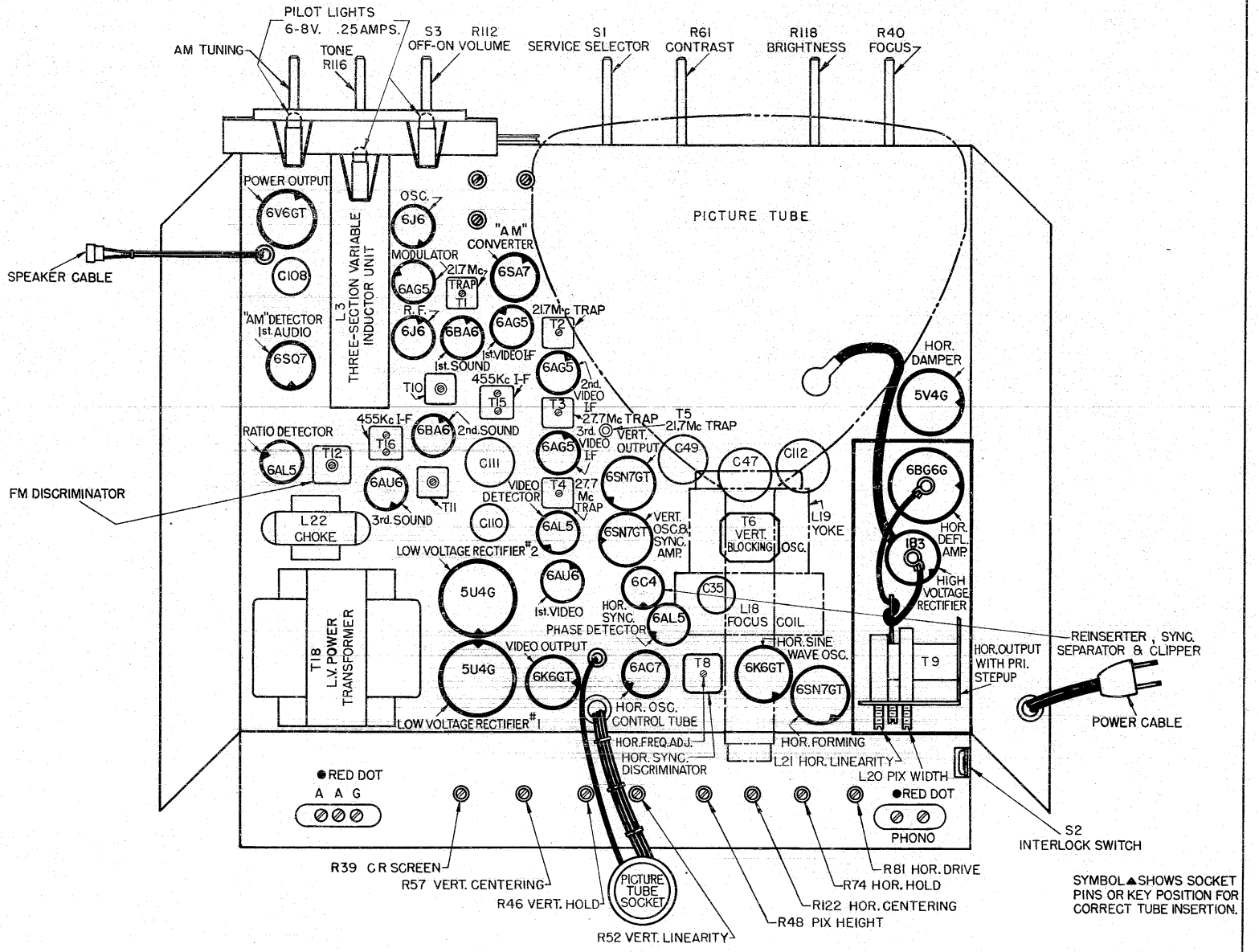


FIG. 2

TOP VIEW OF CHASSIS - "VK12"



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 hi-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 I2LP4 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^{o} 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 I2LP4 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).

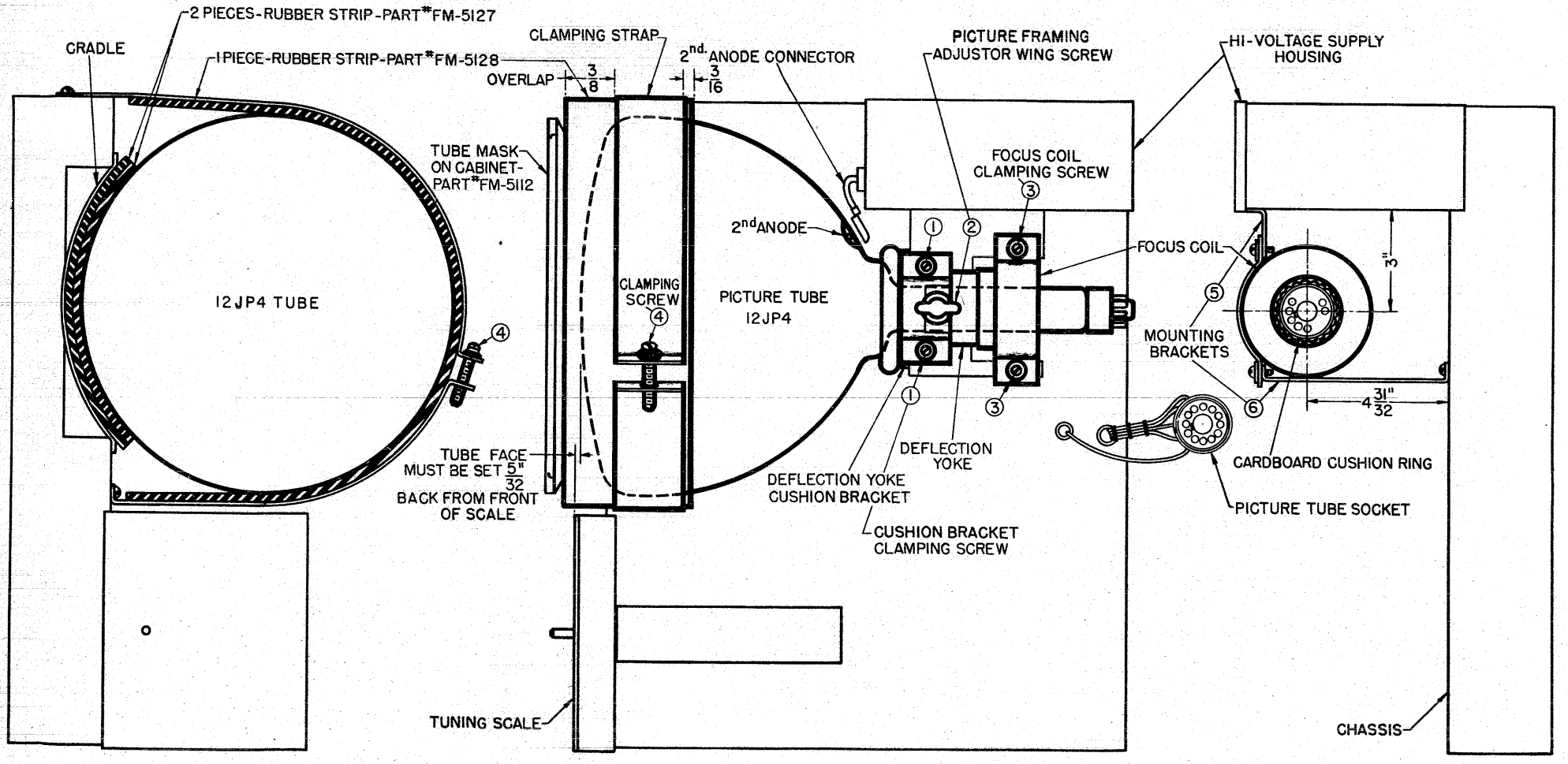
(e) Now decrease the brightness until a dim raster is obtained. No corner should be cut, but if it is, the Ion Trap must be re-adjusted.

(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.

FIG. 3

12JP4 PICTURE TUBE, DEFLECTION YOKE & FOCUS COIL ASSEMBLY



FRONT VIEW

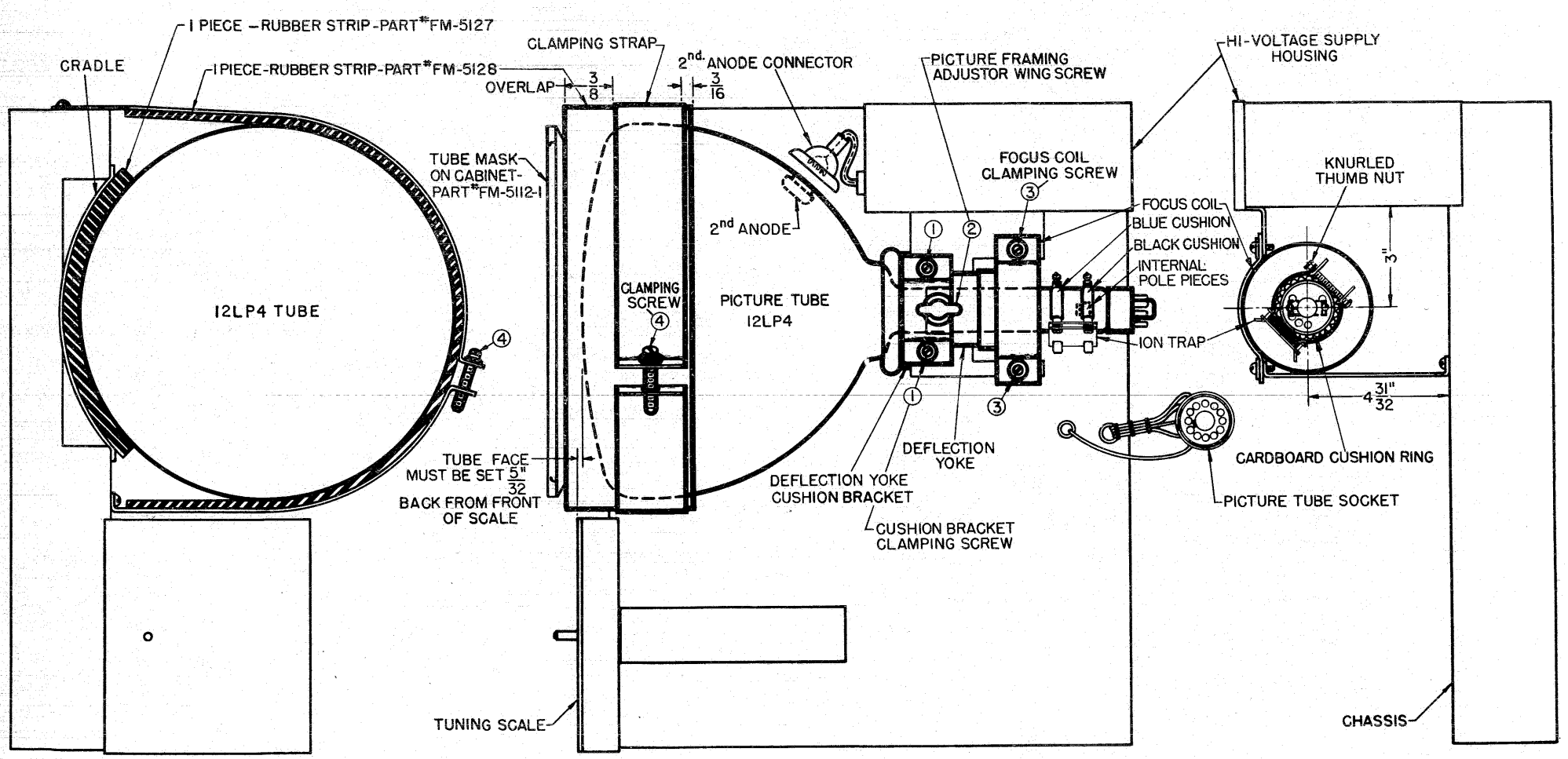
TOP VIEW

REAR VIEW

"VK12"

FIG. 4

12LP4 PICTURE TUBE, DEFLECTION YOKE, FOCUS COIL & ION TRAP ASSEMBLY



"VK12"

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.

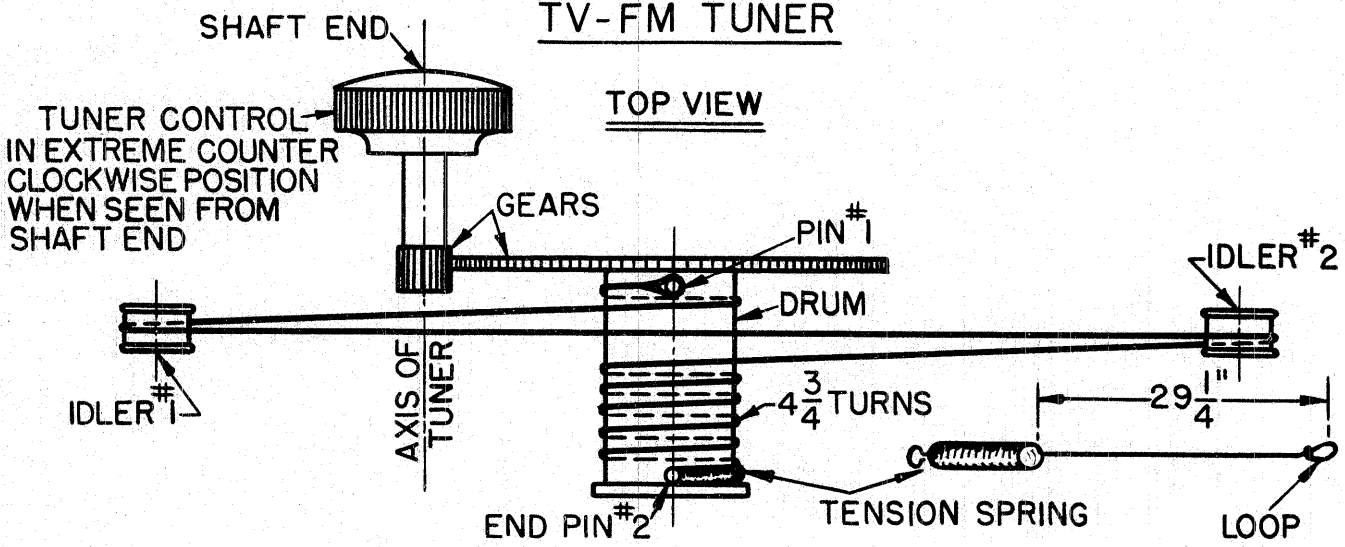
4. Place loop of tension spring over hook on drum and pass drive cord over drum, tuning shaft and idler pulleys #1 & #2 in the order indicated by the arrows.

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.

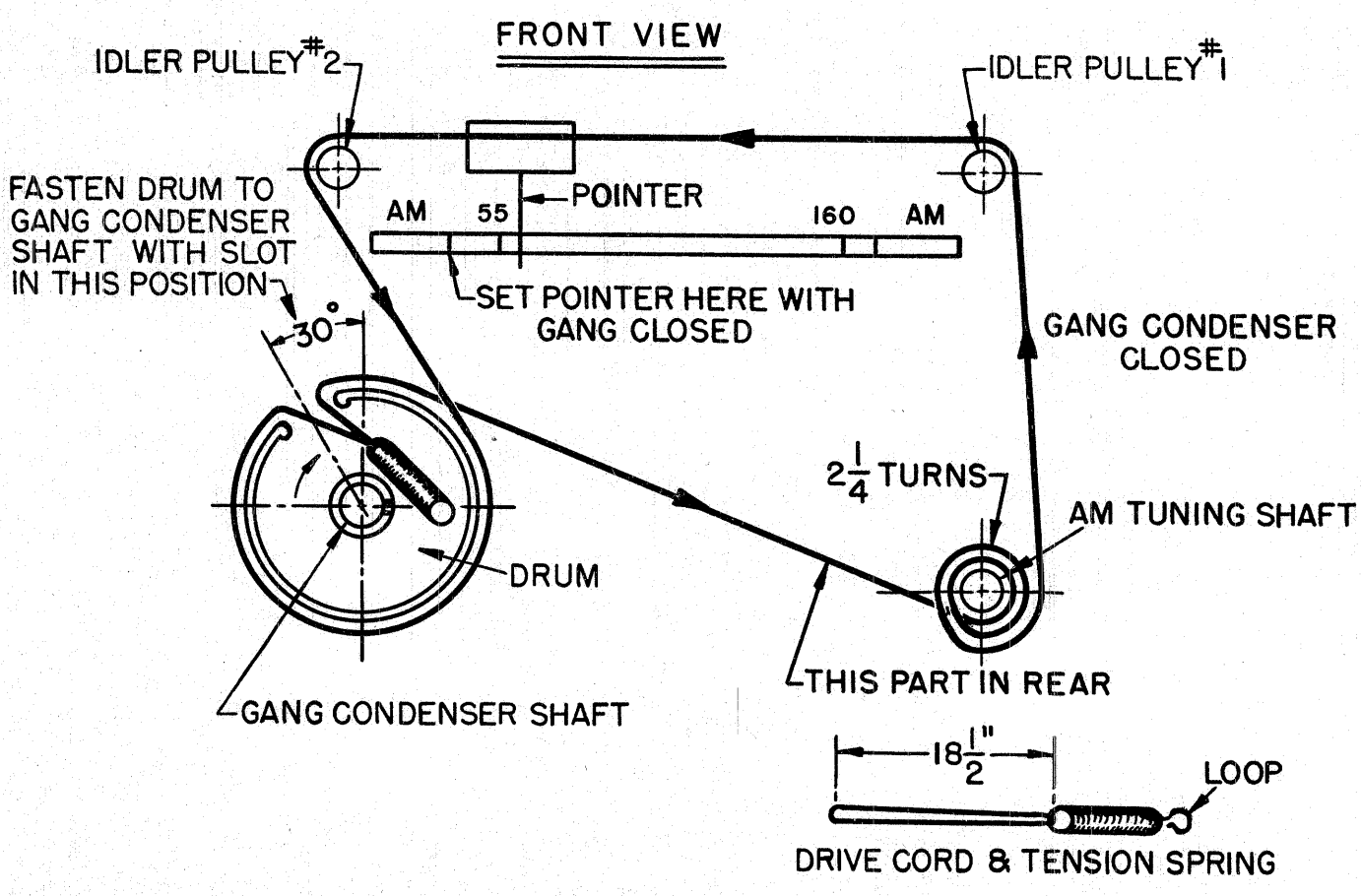
FIG. 5

DRIVE CORD ASSEMBLIES - "VK12"

TV-FM TUNER



AM TUNER



TV CHANNEL FREQUENCIES

CHANNEL NO.(Mc)	PICTURE CARRIER (Mc)	SOUND CARRIER (Mc)	LOCAL OSC. (Mc)
1 (44-50)	45.25	49.75	61.45
2 (54-60)	55.25	59.75	81.45
3 (60-66)	61.25	65.75	87.45
4 (66-72)	67.25	71.75	93.45
5 (76-82)	77.25	81.75	103.45
6 (82-88)	83.25	87.75	109.45
7 (174-180)	175.25	179.75	201.45
8 (180-186)	181.25	185.75	207.45
9 (186-192)	187.25	191.75	213.45
10 (192-198)	193.25	197.75	219.45
11 (198-204)	199.25	203.75	225.45
12 (204-210)	205.25	209.75	231.45
13 (210-216)	211.25	215.75	237.45

FM BAND 88 Mc - 108 Mc

IMPORANT I.F. FREQUENCIES

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

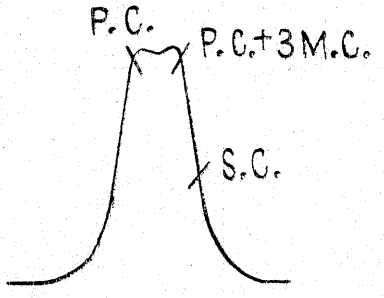
I.F. TRAPS

Sound	21.7 Mc
Adjacent Sound	27.7 Mc

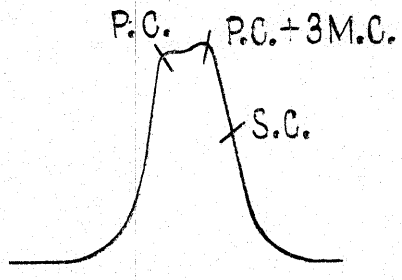
FIG. 6.

DISPLAY CURVES

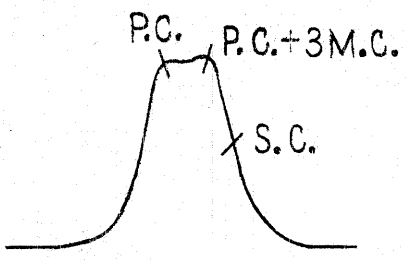
VK-12 HEAD-END REPRESENTATIVE RESPONSE CURVES.



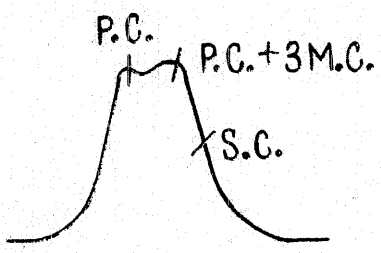
CH.#2



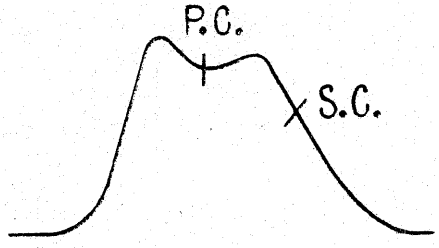
CH.#4



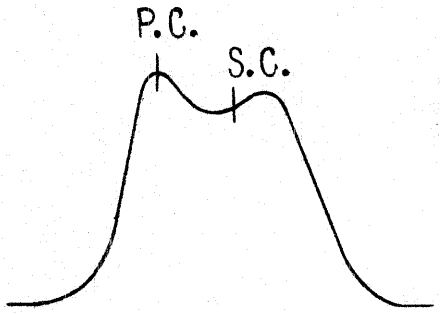
CH.#5



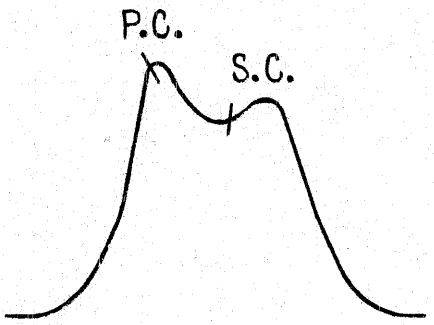
CH.#6



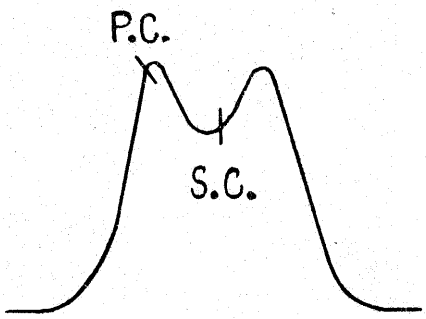
CH.#7



CH.#9



CH.#11

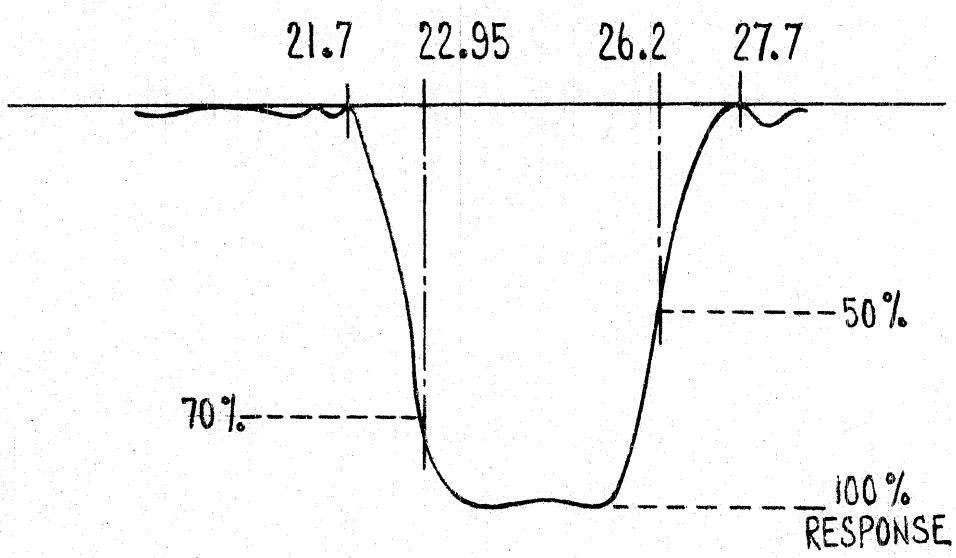


CH.#13

V. C. = Picture Carrier
S. C. = Sound Carrier

FIG. 7.

DISPLAY CURVE - CORRECT VIDEO 1-F RESPONSE

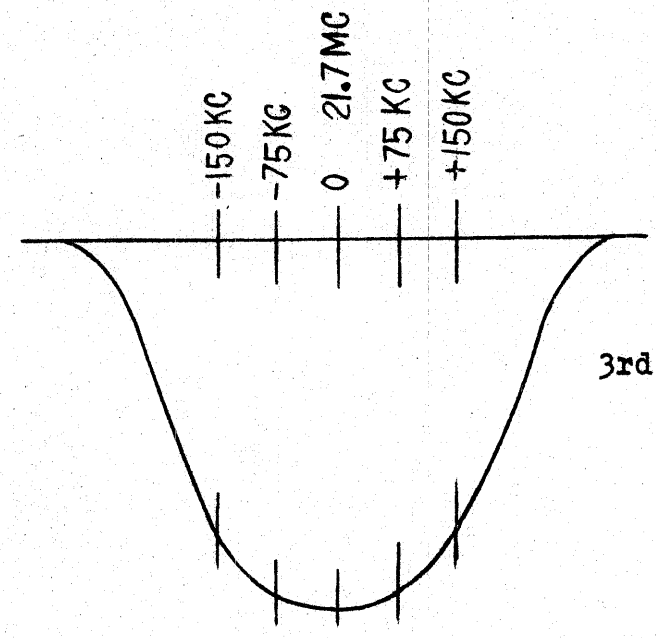


Band Width	3.25Mc
Picture Carrier	(26.2Mc)
Sound Trap	(21.7Mc)
Adjacent Sound	(27.7Mc)

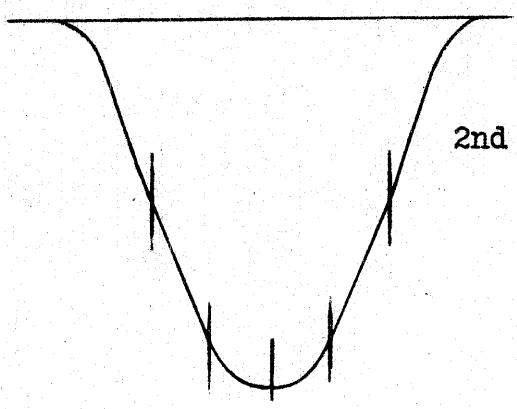
Contrast bias set at - 4.5V.

FIG. 8.

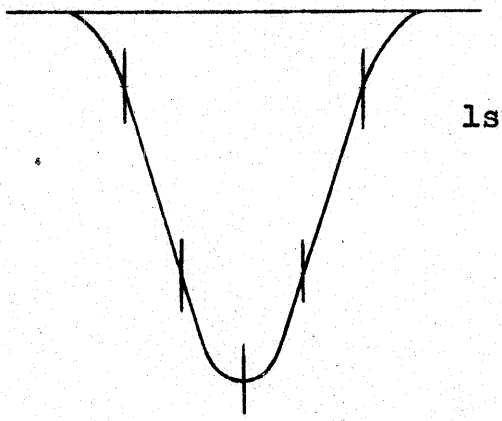
DISPLAY CURVES - SOUND I-F RESPONSE.



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



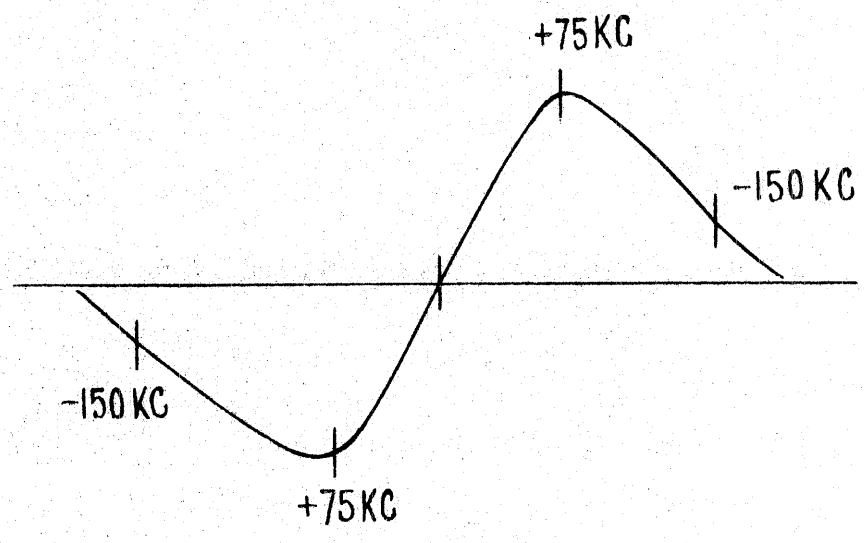
2nd (Dual) I-F. Input to pin 1, V21



1st I-F. Input to pin 1, V20

FIG. 9.

DISPLAY CURVES - "S" CURVE



Input to pin 1, V 22.

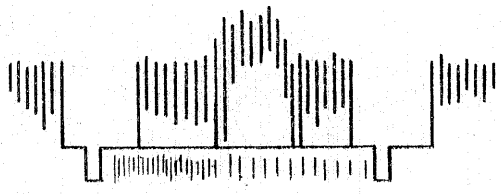
DISPLAY CURVES - FIG. 10

VIDEO WAVEFORMS - RECEIVER TUNED TO STATION

At V 7

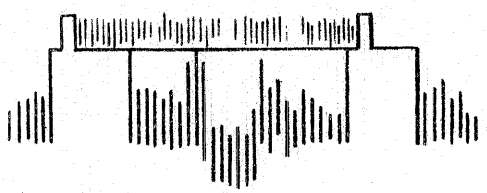
Junction of L12 & L13
Full contrast = ½-3/4 V. P-P
20 - 25% Sync.

30 ~ SWEEP



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.

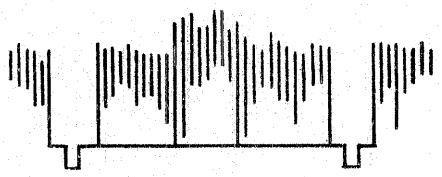
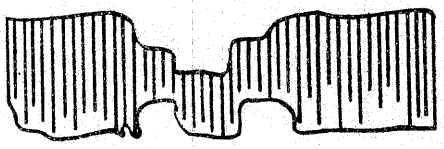


FIG. 11.

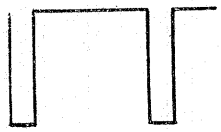
DISPLAY CURVES - SYNC. WAVEFORMS

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

60 ~ SWEEP

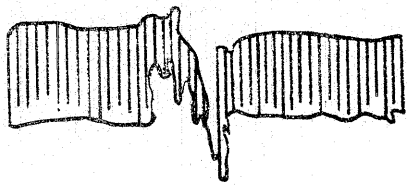


7875 ~ SWEEP



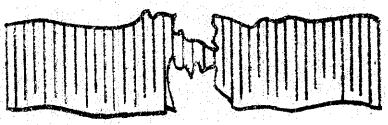
V11A - Pin 2
Sync. Only
35-40 V. P-P

15750 ~ SWEEP



Terminal "E" of T8
Hor. Sync. Only
10 V. P-P

60 ~ SWEEP



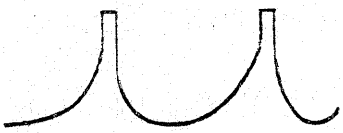
7875 ~ SWEEP

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

30 ~ SWEEP

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

30 ~ SWEEP



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

30 ~ SWEEP

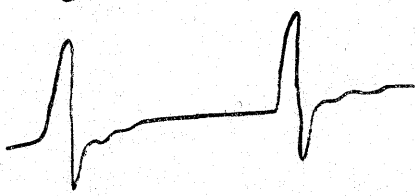


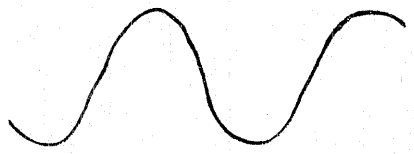
FIG. 12.

DISPLAY CURVES - HOR. SCAN WAVEFORMS - FULL RASTER

V 13 - Pin 5

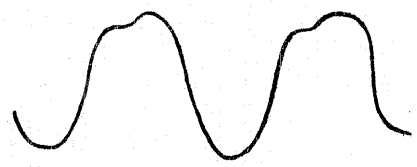
Hor. Osc. Grid
60 V. P-P Sine Wave

7875 ~ SWEEP



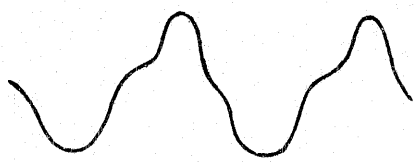
V13 - Pin 3

Hor. Osc. Plate
Distorted Sine Wave
220 V P-P



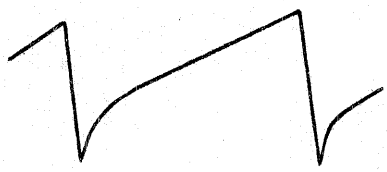
V16 - Pin 1

Hor. Forming Tube Grid
110 V. P-P



V16 - Pin 2

Hor. Forming Tube Plate
27 V. P-P



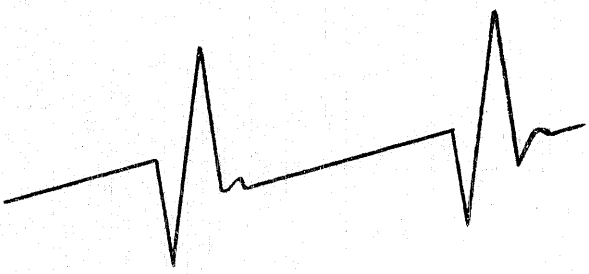
V17 - Pin 5

Same Waveform
65V P-P

FIG. 13.

DISPLAY CURVES - VERT. SCAN WAVEFORMS - FULL RASTER

30 ~ SWEEP



V11B - Pin 4

Vertical Oscillator Grid.
75 V P-P

V15 - Pins2&5

Vertical Output Plate.
600 V. P-P
150 V. Sawtooth

V15 - Pins3&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

SERVICE SWITCH POSITION	LINE WATTS	LINE VOLTS	LINE AMPS.	B+ at C111A VOLTS	B+ at C111B VOLTS	B+ at C112A VOLTS	B+ at C112B VOLTS	LOAD CURRENT MA	TOTAL B- VOLTS	TAP 1 VOLTS	TAP 2 VOLTS	HEATER WDG. (BLU-BLU LEADS) AC VOLTS	V28 FIL.(5U4G) AC VOLTS
TV	278	117	2.6	435	415	318	160	204	-10.2	-6.2	-2.2	6.1	4.9
FM	128	117	1.2						- 5.3			1.8	0
AM	123	117	1.15		All B off				- 5.0			1.8	0
PHONO	123	117	1.15						- 4.5			1.8	0
TV	330	130		475	450								

LO-VOLTAGE POWER SUPPLY #2

SERVICE SWITCH POSITION	LINE VOLTS	B+ at C110A VOLTS	B+ at C110B VOLTS	B+ at C108B VOLTS	LOAD CURRENT MA	HEATER WDG. (Yel-Grn—Yel-Grn) AC VOLTS	V27 FIL.(5U4G) AC VOLTS
TV	117	275	250	250	118	6.3	4.9
FM	117	285	265	275	113	6.35	5.0
AM	117	290	270	280	109	6.4	5.0
PHONO	117	295	275	290	99	6.4	5.0
TV	130	305	280				
PHONO	130	330	305				

TUBE VOLTAGES

Line Voltage - 117 A.C. No Signal Contrast -3V
Receiver adjusted for 7½" X 10" Picture, then Brightness turned down

REF. NO.	TUBE TYPE	FUNCTION	SERVICE SWITCH POSITION: TV PLATE	TV SCREEN	TV GRID	TV CATHODE	FM PLATE	FM SCREEN	FM GRID	FM CATHODE	AM PLATE	AM SCREEN	AM GRID	AM CATHODE	PHONO PLATE	PHONO SCREEN	PHONO GRID	PHONO CATHODE
1*	6J6	RF Amp.	140	-	0	2.6	145	-	0	2.6	145	0	0	2.7	150	0	0	2.7
2	6J6	Osc.	1/150	-	6/11.5	0	163		-12.8			OFF			0	OFF		
		Grounded	2/0	-	5/0	0												
3	6AG5	Modulator	240	150	-3(a)	.3	250	130	0	.3	270	0			275	0		
4	6AG5	#1 Vid I-F	240	165	-3(a)	.1												
5	6AG5	#2 Vid. I-F	165	200	-3(a)	.4		OFF				OFF				OFF		
6	6AG5	#3 Vid. I-F	210	165	0	.88												
7	6AL5	Vit. Det.	2/-.5	-	-	5/0												
		Grounded	7/0	-	-	1/0												
8	6AU6	1st Video	122	135	-2.2	0												
9	6K6	Vid. Output	110	165	-6.3	4												
10	6C4	Sync. Clipper	9.5	-	0	1.2												
11	6SN7	Sync.																
		Separator	2/74	-	1/-.5	3/0												
		Vert. Osc.	5/82	-	4/28	6/0												
12	6AL5	Hor. Sync.	7/6	-	-	1/-1												
		Phase Det.	2/6	-	-	5/-2.2												
13	6K6	Hor. Osc.	175	210	-27	0	268	0	0	0		OFF						
14	6AC7	Hor. Osc.																
		Control	255	95	-2.0	0												
15*	6SN7	Vert. Output	300	-	0	13.5		OFF				OFF				OFF		
16	6SN7	Hor. Forming	2/85		1/-40	3/0												
		Grounded	5/0		4/0	6/0												
17	6BG6G	Hor. Output	485	258	-11	8.5												

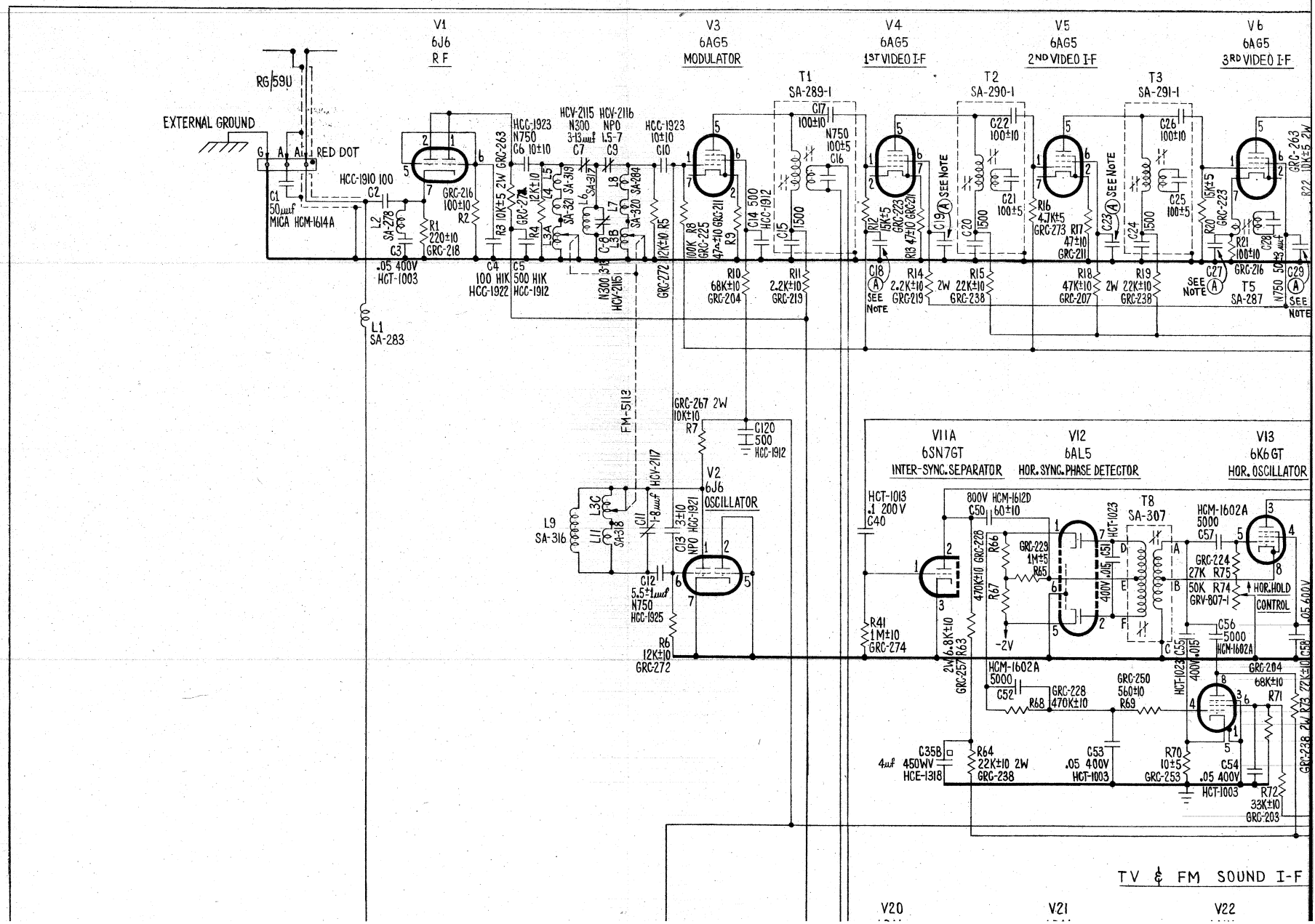
* - Tube elements connected in parallel
(a) - On contrast control - set at -3V

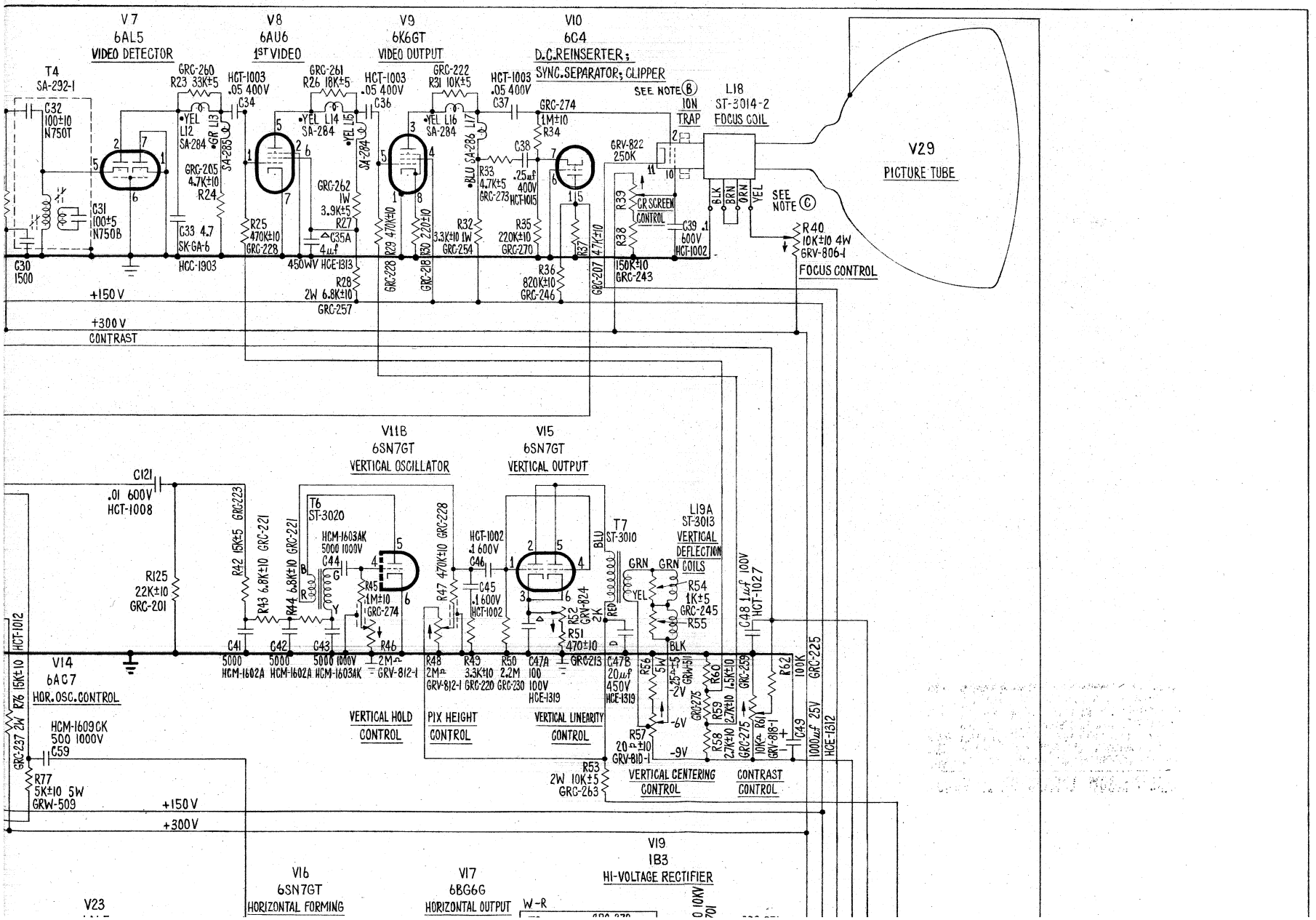
NOTE: Nos. in upper left of box give pin Nos. for dual purpose tubes.

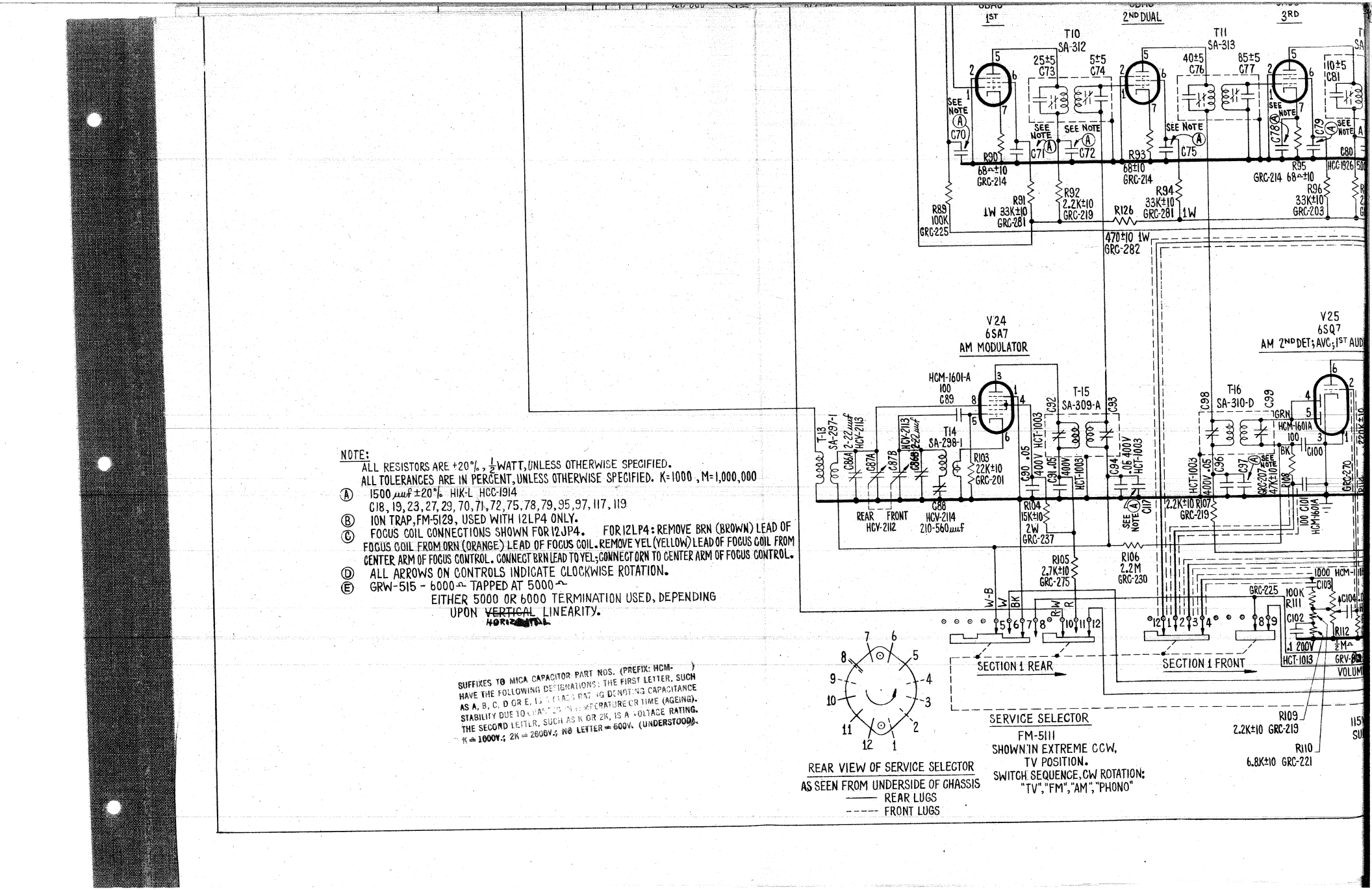
SERVICE SWITCH POSITION

REF. NO.	TUBE TYPE	TUBE FUNCTION	TV PLATE	TV SCREEN	TV GRID	TV CATHODE	FM PLATE	FM SCREEN	FM GRID	FM CATHODE	AM PLATE	AM SCREEN	AM GRID	AM CATHODE	PHONO PLATE	PHONO SCREEN	PHONO GRID	PHONO CATHODE
18	5V4G	Hor. Damper				485		OFF				OFF				OFF		
19	1B 3	Hi-V Rect.	A.C	-	-	9.5kv	230											
20	6BA6	#1 FM I-F	220	110	0	1	230	110		1.0	240	115		1.0	240	115		1
21	6BA6	#2 FM I-F	230	110	0	1	208	110		1.1	215	115		1.1	215	115		1.1
22	6AU6	#3 FM I-F(Driver)	235	135	0	.7	222	140		.9	230	145		.96	230	150		.96
23	6AL5	Ratio Det.	7/0	-	-	1/.7												
			2/-.8	-	-	5/-.1												
24	6SA7	AM Mod.		OFF				OFF			235	102	-6.6	0		OFF		
25	6SQ7	1st Aud. & AM Det.	80	-	0	0	85				85				85			
26	6V6GT	Audio Out.	250	255	0	13	250	265		13.4	265	270		14	265	275		14
27	5U4G	Lo-Voltage Rect. #2	A.C	-	-	8/435		OFF				OFF				OFF		
28	5U4G	Lo-Voltage Rect. #1	A.C	-	-	8/255				275				278				282
29	12JP4 12LP4	Pix Tube	9.4	0 to 300		0 to 120 ⓑ		OFF				OFF				OFF		

ⓑ - Brightness Control varies from 0 to 120 V.
For Measurement Control, set at extreme C.C.W. position (120V).


V1
6J6
R F
V3
6AG5
MODULATOR
V4
6AG5
1ST VIDEO I-F
V5
6AG5
2ND VIDEO I-F
V6
6AG5
3RD VIDEO I-F
T1
SA-289-1
T2
SA-290-1
T3
SA-291-1
T5
SA-287
RG 59U
EXTERNAL GROUND
RED DOT
HCC-1910 100
HCC-1923 N750 C6 10±10
HCV-2115 N300 3-13µµf C7
HCV-2116 NPO L5-7 C9
HCC-1923 10±10 C10
C1 50µµf MICA HCM-1614A
L2 SA-278
C3 .05 400V HCT-1003
R1 220±10 GRC-218
GRC-216 100±10 R2
R3 10K±5 2W GRC-263
GRC-272 12K±10
L3A L4 L5 SA-318
SA-321 SA-319
L6 SA-317
L7 L8 SA-320 SA-284
C4 100 HIK HCC-1922
C5 500 HIK HCC-1912
N300 3-13 HCV-2115
C8 C3B
R5 12K±10 GRC-272
R8 100K GRC-225
R9 47Ω±10 GRC-211
C14 500 HCC-1912
C15 1500
R10 68K±10 GRC-204
R11 2.2K±10 GRC-219
C17 100±10
N750 100±5 C16
R12 15K±5 GRC-223
R13 4.7K±10 GRC-211
C19 SEE NOTE
C18 SEE NOTE
R14 2.2K±10 GRC-219
C20 1500
C22 100±10
C21 100±5
R15 2W 22K±10 GRC-238
R16 4.7K±5 GRC-273
R17 47±10 GRC-211
C23 SEE NOTE
C24 1500
C26 100±10
C25 100±5
R18 47K±10 GRC-207
R19 2W 22K±10 GRC-238
R20 15K±5 GRC-223
C27 SEE NOTE
R21 100±10 GRC-216
C28 5µµf
C29 SEE NOTE
GRC-263 10K±5 2W
L1 SA-283
FM-5113
GRC-267 2W 10K±10 R7
C120 500 HCC-1912
V2
6J6
OSCILLATOR
L9 SA-316
L11 L3C SA-318
HCV-2117 1-8µµf C11
C13 13±10 NPO HCC-1921
C12 5.5±1µµf N750 HCC-1925
R6 12K±10 GRC-272
V11A
6SN7GT
INTER-SYNC. SEPARATOR
V12
6AL5
HOR. SYNC. PHASE DETECTOR
V13
6K6GT
HOR. OSCILLATOR
T8
SA-307
HCT-1013 .1 200V C40
800V HCM-1612D C50 60±10
470K±10 GRC-228 R66
GRC-229 1M±5 R65
R67 -2V
HCT-1023 C51 .015 400V
HCM-1602A 5000 C57
GRC-224 27K R75
50K R74 GRV-807-1
HOR. HOLD CONTROL
C56 5000 HCM-1602A
C55 .015 400V
C58 .05 400V
R41 1M±10 GRC-274
2W 6.8K±10 R63 GRC-257
HCM-1602A 5000 C52
R68 GRC-228 470K±10
GRC-250 560±10 R69
GRC-204 68K±10 R71
C35B 4µf 450WV HCE-1318
R64 22K±10 2W GRC-238
C53 .05 400V HCT-1003
R70 10±5 GRC-253
C54 .05 400V HCT-1003
R72 33K±10 GRC-203
GRC-238 2W R73 22K±10
TV & FM SOUND I-F
V20
V21
V22


V7
6AL5
VIDEO DETECTOR
V8
6AU6
1ST VIDEO
V9
6K6GT
VIDEO OUTPUT
V10
6C4
D.C.REINSERTER; SYNC.SEPARATOR; CLIPPER
V29
PICTURE TUBE
L18
ST-3014-2
FOCUS COIL
ION TRAP
SEE NOTE B
SEE NOTE C
T4
SA-292-1
GR SCREEN CONTROL
FOCUS CONTROL
+150 V
+300 V
CONTRAST
V11B
6SN7GT
VERTICAL OSCILLATOR
V15
6SN7GT
VERTICAL OUTPUT
T6
ST-3020
T7
ST-3010
L19A
ST-3013
VERTICAL DEFLECTION COILS
V14
6AC7
HOR. OSC. CONTROL
VERTICAL HOLD CONTROL
PIX HEIGHT CONTROL
VERTICAL LINEARITY CONTROL
VERTICAL CENTERING CONTROL
CONTRAST CONTROL
V19
1B3
HI-VOLTAGE RECTIFIER
V16
6SN7GT
HORIZONTAL FORMING
V17
6BG6G
HORIZONTAL OUTPUT
V23
0.10KV



NOTE:

ALL RESISTORS ARE ±20%, ½ WATT, UNLESS OTHERWISE SPECIFIED.
ALL TOLERANCES ARE IN PERCENT, UNLESS OTHERWISE SPECIFIED. K=1000, M=1,000,000

Ⓐ 1500 μμf ±20% HIK-L HCC-1914
C18, 19, 23, 27, 29, 70, 71, 72, 75, 78, 79, 95, 97, 117, 119

Ⓑ ION TRAP, FM-5129, USED WITH 12LP4 ONLY.

Ⓒ FOCUS COIL CONNECTIONS SHOWN FOR 12JP4. FOR 12LP4: REMOVE BRN (BROWN) LEAD OF FOCUS COIL FROM ORN (ORANGE) LEAD OF FOCUS COIL. REMOVE YEL (YELLOW) LEAD OF FOCUS COIL FROM CENTER ARM OF FOCUS CONTROL. CONNECT BRN LEAD TO YEL; CONNECT ORN TO CENTER ARM OF FOCUS CONTROL.

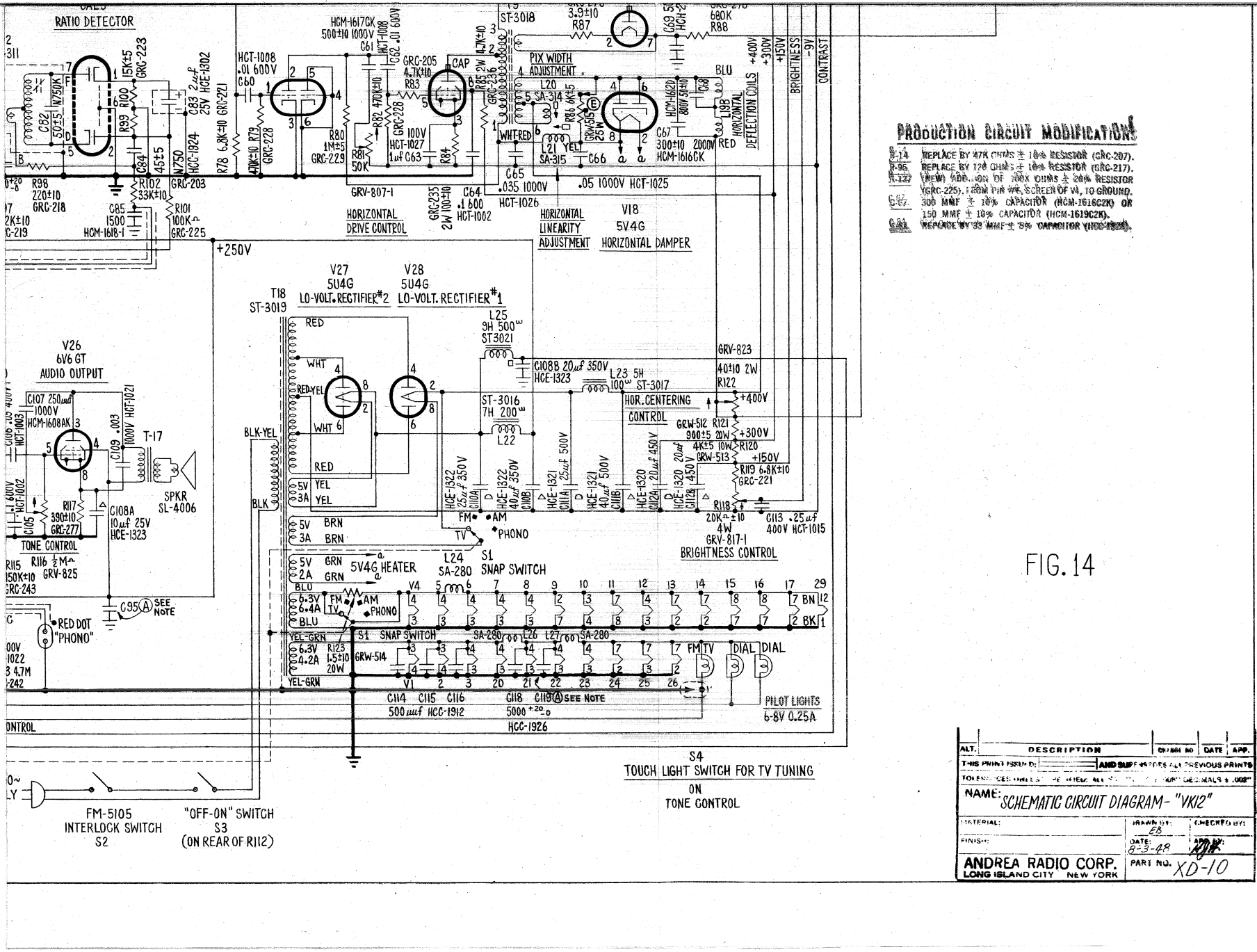
Ⓓ ALL ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION.

Ⓔ GRW-515 - 6000Ω TAPPED AT 5000Ω
EITHER 5000 OR 6000 TERMINATION USED, DEPENDING UPON ~~VERTICAL~~ HORIZONTAL LINEARITY.

SUFFIXES TO MICA CAPACITOR PART NOS. (PREFIX: HCM-) HAVE THE FOLLOWING DESIGNATIONS: THE FIRST LETTER, SUCH AS A, B, C, D OR E, IS A CHARACTERISTIC RATING DENOTING CAPACITANCE STABILITY DUE TO CHANGE IN TEMPERATURE OR TIME (AGEING). THE SECOND LETTER, SUCH AS K OR 2K, IS A VOLTAGE RATING. K = 1000V.; 2K = 2000V.; NO LETTER = 600V. (UNDERSTOOD).

REAR VIEW OF SERVICE SELECTOR
AS SEEN FROM UNDERSIDE OF CHASSIS
—— REAR LUGS
----- FRONT LUGS

SERVICE SELECTOR
FM-5111
SHOWN IN EXTREME CCW, TV POSITION.
SWITCH SEQUENCE, CW ROTATION:
"TV", "FM", "AM", "PHONO"



PRODUCTION CIRCUIT MODIFICATIONS

R-14	REPLACE BY 47K OHMS ± 10% RESISTOR (GRC-207).
R-96	REPLACE BY 120 OHMS ± 10% RESISTOR (GRC-217).
R-127	(NEW) ADDITION OF 100K OHMS ± 20% RESISTOR (GRC-225), FROM PIN #6, SCREEN OF V4, TO GROUND.
C-67	300 MMF ± 10% CAPACITOR (HCM-1616C2K) OR 150 MMF ± 10% CAPACITOR (HCM-1619C2K).
C-91	REPLACE BY 33 MMF ± 5% CAPACITOR (HCC-1926).

FIG. 14

ALT.	DESCRIPTION	CHANGE NO	DATE	APP.
THIS PRINT ISSUED:	AND SUPERSEDES ALL PREVIOUS PRINTS			

NAME: SCHEMATIC CIRCUIT DIAGRAM- "VK12"

MATERIAL: | DRAWN BY: EB | CHECKED BY:

FINISH: | DATE: 8-3-48

ANDREA RADIO CORP. LONG ISLAND CITY NEW YORK | PART NO. XD-10