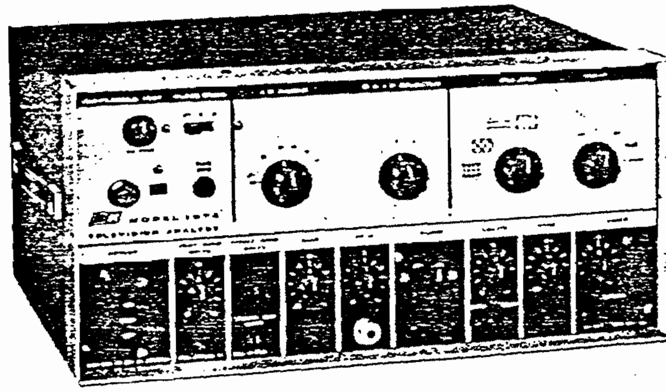
TELEVISION ANALYST

Model 1074

B&K

INSTRUCTION MANUAL



B & K DIVISION OF DYNASCAN CORPORATION
1801 W. BELLE PLAINE AVENUE, CHICAGO, ILLINOIS 60613

While most of the archives were created from original manufacturers instruction and service manuals, there are occasions where we were not able to find a good original manual so had to resort to making a copy from a copy. This B&K 1074 is one of them. The important thing is not so much as how clean the copy is, but if you can clearly and easily read all of the text and other service related information. While this copy is not perfect, it is, however, completely and easily read. So the important thing is that you can read the instructions and read the service information completely.

INSTRUCTION MANUAL

FOR

Model 1074

TELEVISION ANALYST

B & K DIVISION OF DYNASCAN CORPORATION

1801 West Belle Plaine Avenue

Chicago 13, Illinois

TABLE OF CONTENTS

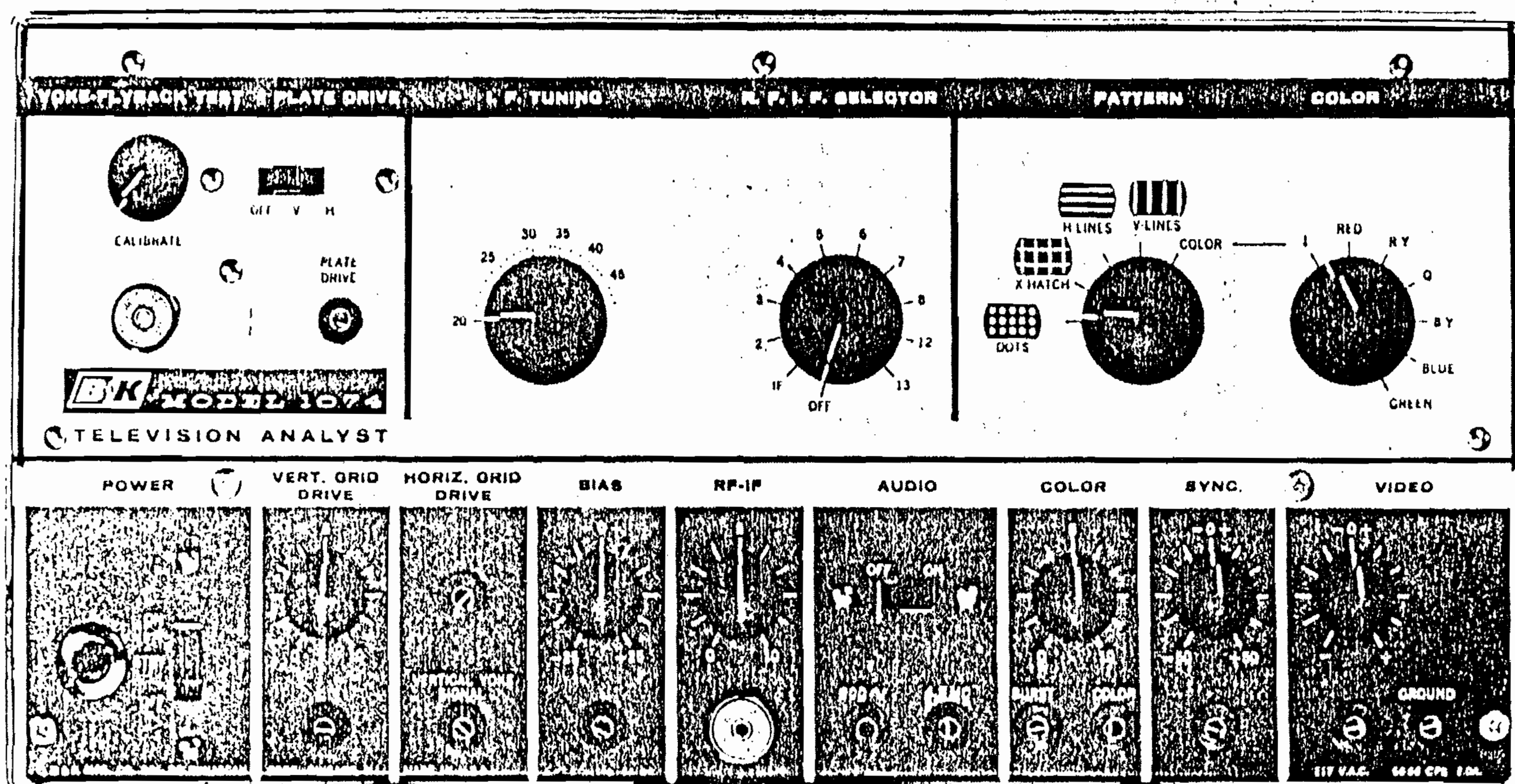


Figure 1.—Front Panel Controls

CONTROLS: WHAT THEY DO

Main Controls

The following main operating controls are provided on the front panel of the Model 1074 Television Analyst, see Figure 1.

All controls and their associate output jacks are related and contained within a box as drawn on the front panel of the instrument. Each control and its associated output jack are located directly one above the other.

1. POWER SWITCH. This switch is labeled OFF-STBY-ON and permits the unit to be kept at readiness by using the STBY position to keep the tubes hot, yet prevents any radiation of signal from the unit. The pilot light will light in either the "STBY" or "ON" position.
2. PATTERN SELECTOR SWITCH. This switch has five positions and enables the operator to select any one of four different black and white patterns, or the color signal. The four black and white patterns are dots, crosshatch, horizontal lines and vertical lines. The normal pattern to be used for signal injection as explained in this instruction manual would be the vertical line pattern. In the color position the color circuitry is now activated and the specific color can then be selected by the adjacent color switch.
3. COLOR SWITCH. This switch enables the operator to select any one of a number of colors for use in color trouble shooting.
4. R.F. I.F. SELECTOR SWITCH. By means of this switch the Television Analyst can be tuned to Channels 2 thru 6, 7, 8, 12 or 13. When switched to the "I.F." position, the unit will transmit on I.F. Both R.F. and I.F. frequency generators are turned off in the "OFF" position of the R.F. SELECTOR switch, when using other signals.
5. I.F. TUNING. This control enables the Television Analyst to tune any I.F. frequency between 20 and 48 mc.
6. VIDEO CONTROL. This control is used to adjust the level of signal coming out of the video jack located just below this control. When the control is rotated to the left of center, the video polarity is — (minus), and when rotated to the right of center the video polarity is + (plus).
7. SYNC AMPLITUDE CONTROL. This control adjusts the amplitude and phase of the sync signal available from the sync output jack. This control is calibrated in peak to peak volts for both sync positive and sync negative. Clockwise rotation results in positive sync, counter clockwise rotation results in negative sync.
8. COLOR CONTROL. This control adjusts the level of color coming out of the color jack located just below this knob. The color portion of the Analyst is active only when the Pattern Selector Switch is in the "COLOR" position. The actual color that is adjusted by the Color Level Control is selectable by means of the COLOR SELECTOR switch.
9. AUDIO SWITCH. The audio switch is used to turn on the internal sound system. In the "ON" position both the 900 cycle signal and the 4.5 mc signal appear at their respective jacks located below this switch. In the "OFF" position the total sound system is disabled.
10. R.F.-I.F. ATTENUATOR. The R.F. Attenuator control determines the amount of signal output of both R.F. and I.F. frequencies. At R.F. this control should normally be set at mid range.

11 BIAS CONTROL This calibrated control enables the operator to select a negative or positive voltage to ground between 0 and 25 volts. Clockwise rotation of the control results in a positive bias, and counter clockwise rotation results in a negative bias.

12. VERTICAL GRID DRIVE AMPLITUDE. This control adjusts the amplitude of both the vertical grid drive signal and the vertical plate drive signal.

13. PLATE DRIVE SELECTOR. This three position switch provides a choice of vertical plate drive signal or horizontal plate drive signal to directly drive horizontal output transformers or vertical output transformers. When not using the plate drive function this switch should always be in the "OFF" position.

14. CALIBRATE CONTROL. This control calibrates the shorted turns tester. If the calibrate control is rotated clockwise the test indicator lamp will glow.

Output Jacks and Indicators

(When not using a particular drive signal always disconnect the test lead from the jack as interference may occur.)

1. VIDEO OUTPUT. The signal at video frequencies is taken from the video output jack. The polarity of the signal is controlled by the Video Gain Control. A separate jack is used for a ground return for this signal and for the following output signals. The video signal is selectable by means of the pattern switch. (Do not feed video signal to a point with voltage of more than 350 volts).
2. SYNC OUTPUT. High level composite sync signal is taken from this jack, amplitude and phase are selected by the sync amplitude control.
3. COLOR. Color sub-carrier (3.58 mc) output is taken from this jack for injection into chroma circuits.
4. BURST. A low level burst signal is available from this jack for injection in burst amplifiers of color TV receivers.
5. 900 CYCLE. The 900 cycle tone signal from the audio oscillator is available from this jack at a fixed output level.
6. 4.5 MC. A 4.5 mc signal FM modulated with 900 cycles is available at this jack for sound system trouble shooting.
7. R.F. - I.F. OUTPUT. Output signal at the R.F. and I.F. frequencies are taken from this jack.
8. BIAS. The adjustable bias between 0 and 25 volts is available at this jack. Polarity can be either positive or negative based on the setting of the bias control.
9. HORIZONTAL GRID DRIVE. Horizontal grid driving pulses are available from this jack to feed into the TV receiver being serviced.
10. VERTICAL YOKE TEST SIGNAL. This jack provides a low impedance test signal to ground to directly drive the vertical winding of a deflection yoke.
11. VERTICAL GRID DRIVE. Vertical grid driving impulses are available from this jack to feed into the TV receiver being serviced. The amplitude of these pulses is controlled by the vertical drive amplitude control.

12. FLYBACK YOKE TEST SIGNAL. Provides the necessary test signal to determine the presence of shorted turns in a flyback transformer or horizontal yoke winding. (Do not use this test for a vertical yoke winding).
13. TEST INDICATOR. This indicator is used when making a shorted turns test on a flyback transformer or a yoke.
14. PLATE DRIVE. The plate drive signal for either the vertical or horizontal system is available from this jack. The plate drive selector switch position determines whether it is horizontal or vertical drive.
15. PILOT LIGHT. Indicates the Television Analyst is either ON or in the STBY position.

Auxiliary Controls

In addition to the Main controls on the front panel of the Model 1074 Television Analyst, there are Auxiliary Controls located inside the instrument. These inside controls are accessible by removing the cover. Do not adjust these controls unless the instrument requires service. A tube and control layout diagram is shown in Figure 2.

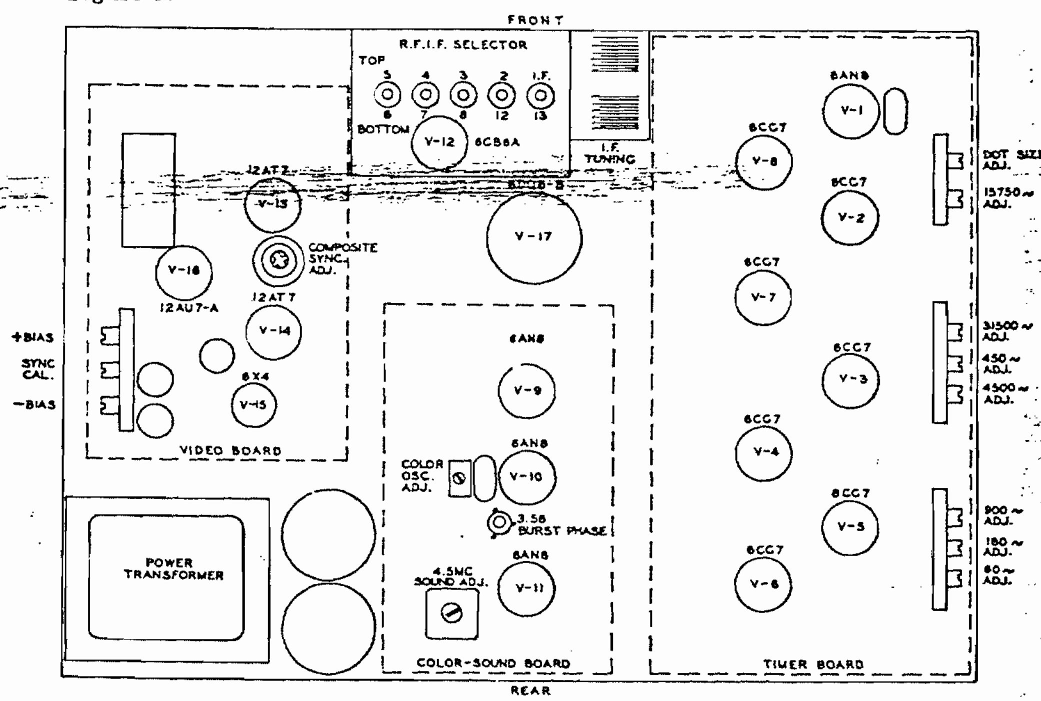


Figure 2—Tube and Control Layout

1. VERTICAL LINES CONTROL. This control adjusts the brightness or amplitude of the vertical lines of the crosshatch display, and also affects the size and brightness of the dots in the dot display.
2. 15,750 ADJUST. This adjusts the frequency of the 15,750 cycle multi-vibrator.
3. 31,500 ADJUST. This adjusts the frequency of the 31,500 cycle multi-vibrator.
4. 450 CYCLE ADJUST. This adjusts the frequency of the 450 cycle multi-vibrator.

5. 4500 CYCLE ADJUST. This adjusts the frequency of the 4500 cycle multi-vibrator.
6. 900 CYCLE ADJUST. This adjusts the frequency of the 900 cycle multi-vibrator.
7. 180 CYCLE ADJUST. This adjusts the frequency of the 180 cycle multi-vibrator.
8. 60 CYCLE ADUST. This adjusts the frequency of the 60 cycle multi-vibrator.
9. COLOR OSCILLATOR. This trimmer capacitor adjusts the frequency of the color oscillator to the precise frequency of the color sub-carrier.
10. BURST PHASE. This coil adjusts the phase of the burst signal with reference to the chroma signal and establishes the proper phase relationship for the total color display.
11. 4.5 MC OSCILLATOR ADJUST. This coil adjustment sets the frequency of the internal 4.5 mc FM oscillator.
12. SYNC LEVEL ADJUST. This control sets the level of sync signal present in the composite video signal.
13. NEGATIVE BIAS ADJUST. This control provides the internal calibration to set the —25V bias on the front panel to the proper value.
14. FRONT PANEL SYNC ADJUST. This control calibrates the front panel sync controls so that the full 50 volt peak to peak appears at the front panel.

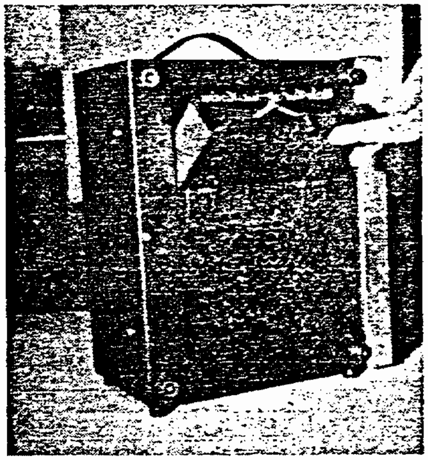


Figure 3—Cable Compartment Location

15. POSITIVE BIAS ADJUST. This control provides the internal calibration to set the +25V bias on the front panel to the proper value.
16. The R.F. Channel adjustments and the I.F. adjustments are slug tuned coils accessible thru the holes in the shield of the R.F. assembly. The I.F. slugs and Channels 2, 3, 4 and 5 are the top slugs while the bottom slugs cover Channels 6, 7, 8, 12 and 13.
17. CABLE COMPARTMENT RELEASE. A compartment for test leads and RF cables is located on the bottom of the 1074 Television Analyst. (See Fig. 3) Access to this compartment can be obtained by standing the instrument on end. Pull on the black plastic knob and the compartment will come open and tip downward. The hinges are of the come-apart type so that the compartment can be removed when it is completely open and then lifted up slightly. Access to the primary line fuse can be obtained through this compartment.

OPERATION OF THE TELEVISION ANALYST

In order to become familiar with the operation of this instrument, it is suggested that you set up on a bench an operating TV receiver. In this way you will become familiar with the operating procedures and with the available signals and their uses. Assume that you have an operating TV set before you and a B&K Model 1074 Television Analyst. (When performing normal signal injection procedures, use the crosshatch or vertical lines pattern for the test signal.) (You will note that the horizontal lines in the crosshatch are precisely one horizontal line wide. This is the ideal display for use of color convergence. Due to the manner in which this pattern must be obtained, a 30 cycle flicker will be observed when the TV receiver under test is operating at very high brightness. This flicker is normal to the operation of the instrument and may be disregarded.) If the technician finds this flicker diverting when doing black and white TV analyzing, he should use the vertical lines pattern. Proceed in the following manner as outlined in the step by step procedure and you will be taken through a "dry run" operation of all of the functions of the Television Analyst in order to improve your familiarity with this product.

1. Stand Television Analyst on end and open cable compartment by pulling outward on the black knob located on the under side of the instrument. Open test lead compartment and remove test leads and line cord. Pass line cord thru hole in cover of the test lead compartment. Close test lead compartment by pushing on black knob until it seats in its hole.
2. Plug the Television Analyst into 117 volts, 60 cycle single phase A.C. power outlet. Turn Power switch to "STBY" position.
3. Connect one end of the R.F. test cable to the R.F. output jack on the front panel. Connect the other end of this cable to the antenna terminals on the receiver.
4. Turn the Pattern switch to the desired pattern position.
5. Turn the Television Analyst Power switch to ON.
6. Set the Channel Selector of the TV set to an unused channel, preferably Channel 6 or below. Set Analyst Channel Selector to the same channel.
7. Set the R.F. Attenuator to #5. Adjust fine tuning of monitor TV if necessary. At this point you should now be receiving on the face of the picture tube the standard pattern as produced by the Television Analyst.
8. Rotate the Pattern switch through the DOTS, HORIZONTAL LINES, VERTICAL LINES and CROSSHATCH positions to become familiar with these patterns. If a color set is available, rotate the Pattern switch to the COLOR position and a color display will now be seen. The colors may be changed by rotating the color selector switch through each of its positions. Return the Pattern switch to the desired test pattern position.
9. Set the Audio switch to the ON position. This will turn on the sound channel modulated with a 900 cycle audio tone. You will now be receiving a complete TV test signal consisting of a video pattern, and an audio tone signal which are both being generated by the Television Analyst and going completely through the monitor receiver.
   The R.F. Attenuator control will allow maximum output signal when turned to the maximum clockwise position. As the R.F. Attenuator is turned down the output signal is gradually decreased until it falls to

zero output. Zero output does not occur at the point marked "Zero" on the R.F.-I.F. Attenuator, but will occur at some point above it. Just before the output falls to zero, an unstable condition is reached due to the extremely low level of the signal being transmitted. This unstable condition occurs at a level too low to be useful and can be ignored. After the user becomes familiar with the operation of the Main Controls on the Television Analyst, he can proceed to learn to use the other signals available from the front panel of the instrument. (Whenever testing a transformerless TV set, use an isolating 1-1 transformer for safety).

10. Connect the R.F.-I.F. output cable to the grid of the first I.F. amplifier of the monitor TV receiver (making sure ground end goes to ground).

11. Select the I.F. position of the R.F.-I.F. Selector Switch.

12. Tune the I.F. Tuning Control to the correct I.F. frequency for the particular model receiver you are using as a monitor. The I.F. frequencies of the receivers being manufactured today and those produced within the last few years are mainly in the 45 mc region. There are, however, many sets in operation which still use the 25 mc I.F. frequencies. You will notice that when you tune to the correct I.F. frequency you will again see the test pattern and hear the tone on the monitor receiver. Tune for best picture and sound.

13. Move the R.F.-I.F. output cable from the first I.F. to the grid and plate of the second I.F. and then to the grid and plate of the third I.F. tubes and notice how the reproduced video signal on the monitor screen becomes weaker and weaker. This is an effective way of determining whether an I.F. stage is contributing gain to the overall I.F. amplifier system. Notice that with only one I.F. stage, the last I.F. stage, being used there is still enough gain to reproduce the complete test pattern on the monitor receiver. In going through the I.F. stages, it must be noted that the R.F. Attenuator Control also controls the output level of the I.F. signals from the Television Analyst. Turn the audio selector switch to "Off" and remove the R.F. cable from the monitor receiver.

14. Using the test leads provided, connect the Ground Jack on the Analyst to the chassis ground or B— of the monitor receiver. Connect the Video output jack of the Analyst to the video detector load resistor of the receiver. This load can usually be found very easily by looking for the peaking coils associated with this video detector circuit. You will now see the complete video pattern once again, if the video signal is of the right polarity. If the picture is negative, reverse the polarity of the Video by means of the video control. If there is more than one video amplifier stage in the monitor receiver, the signal can be injected into the grid of the second video amplifier and the test pattern can again be reproduced. It will be necessary to reverse the polarity of the video because the polarity of the signal is reversed in going through each amplifier stage. Remove the video output cable from the monitor receiver.

15. Connect the ground jack on the Television Analyst to the chassis ground, or B— of the monitor receiver. Connect a second test lead to the sync jack of the Television Analyst and inject this signal to the grid or cathode of the picture tube of the monitor receiver. Select the element which receives video modulation. Rotate the amplitude control to +50 volts and observe black and white bars running out of sync on the monitor receiver. Rotate the sync amplitude control to the —50 volt position, notice that the phase of the modulation on the monitor

receiver changes. This signal is used to determine whether or not a picture tube will accept video modulation. Restore receiver to normal operation.

16. Turn the Audio Switch to "ON" position and connect the appropriate test leads from the 4.5 mc Audio I.F. Output jack of the Analyst to the grid of the first audio I.F. (4.5 mc) amplifier. You will now hear the audio signal in the sound system of the TV receiver. Move this signal to the grid of the video amplifier and the tone will still be heard. To verify this signal, turn the Audio Switch to the "Off" position and see if the sound in the monitor speaker disappears.

17. Connect a ground lead of the Television Analyst to ground, or B— on the monitor receiver. Remove a sync amplifier tube from the monitor receiver. If this is a series string set, short out the heater pins in the socket of the tube just removed. This permits the remainder of the receiver to operate normally. Connect a second test lead to the Sync jack of the Analyst. Inject this signal to the plate of the socket of the tube just removed. Rotate the sync amplitude control to +50 volts. If this sync signal is of the proper phase, the picture on the monitor receiver will be properly in sync. If the picture is not in sync, rotate sync amplitude control to the opposite phase, or —50 volts. This illustrates how the sync signal is used.

18. Plug the test lead into the 900 cycle Audio Tone jack and connect the other end of the cable to the grid of the first audio amplifier tube. With the Audio Switch in the "ON" position, the 900 cycle signal will be heard in the TV monitor loudspeaker. Move the test signal lead to the grid of the audio output tube. The tone again will be heard in the receiver speaker.

19. Remove the audio signal lead from the monitor receiver and connect the cable from the Vertical Grid Drive Jack on the Analyst to the grid of the vertical output amplifier tube of the monitor receiver. Remove the vertical oscillator of the monitor receiver. If it cannot be removed because it is a dual purpose tube or a series heater set, disable the oscillator circuit. Notice that the pulse from the Analyst will operate the vertical amplifier and produce a vertical sweep on the TV monitor receiver. The magnitude of the vertical sweep can be controlled by the Vertical Drive Amplitude control. This sweep may not be linear or it may not fill the complete vertical size of the picture tube because the pulse may not be matched to this particular vertical output circuit. However, it can very nicely and qualitatively determine whether the vertical amplifier circuit is operating correctly.

20. Remove the vertical pulse lead from the monitor and the Television Analyst. Connect the lead from the Horizontal Grid Drive Pulse output jack on the Analyst to the grid of the horizontal output tube (6BG6-6BQ6). Disable the TV set horizontal oscillator, or remove it from its socket. Note: Do not turn the TV set on without any horizontal driving pulse to the horizontal output tube (either from the Analyst or the horizontal oscillator of set. Without driving pulses to the horizontal output tube, the tube will burn up).

    You will notice that the horizontal output of the monitor receiver has a complete horizontal sweep and provides high voltage through the high voltage rectifier, of the receiver. This will provide a quick check to determine whether the fault is with the oscillator circuit or the output circuit in trouble shooting horizontal circuits.

21. Remove the Horizontal Grid Driving lead. Connect a test lead from the Plate Drive Jack on the Television Analyst to the plate cap

connector of the flyback transformer (the horizontal output tube plate cap) of the test receiver. We are actually replacing the horizontal section, including the output tube of the receiver with the horizontal section and output tube in the Analyst. Put the Plate Drive Selector switch on the Television Analyst to the horizontal position. Turn on the test receiver. The test reciever will now have full Horizontal scan and high voltage. The Television Analyst is providing complete drive for the horizontal output transformer of the test receiver.

22. Remove the horizontal plate drive lead from the plate cap of the flyback and restore set to original condition. Now connect plate drive lead to the plate pin of the vertical output tube of the test receiver. Remove the vertical output tube of the test receiver. Put the Plate Drive Selector switch of the Television Analyst to the Vertical position. Apply power to the test receiver. Vertical scan will now result. The size of the scan on the test receiver can be adjusted by means of the Vertical Drive Amplitude control on the front of the Television Analyst. The scan will not necessarily be linear but provides an excellent test on the vertical output transformer and yoke. Disconnect the Plate Drive test lead and reinsert the vertical output tube in the test receiver. Turn the Plate Drive Selector switch to the "OFF" position.

23. Disconnect the leads of the vertical winding of the deflection yoke of the test receiver. Connect one lead to ground on the Analyst and the other lead to the Vertical Yoke Test Signal jack on the Television Analyst. Turn on the test receiver. Vertical Scan will be seen on the test receiver. While not linear in deflection it proves that the vertical yoke will provide deflection. Remove test leads and reconnect vertical yoke leads to the test receiver.

24. To test a transformer for shorted turns connect the shielded cable to the Flyback-Yoke test signal jack. Adjust the Calibrate control until the test indicator lamp just goes out. Connect the flyback transformer to this cable. The connection is made from horizontal output plate cap connector to hi voltage rectifier plate cap connector. If the test indicator glows this indicates that the transformer has shorted turns. This test will respond to as little as one shorted turn. If the component to be tested is the horizontal winding of the deflection yoke, connection is made across the deflection yoke winding. Do not use the yoke test on the vertical winding, as erroneous results will be obtained.

25. To observe the action of the Bias Supply, connect the Television Analyst to obtain a picture on the test receiver. Connect the ground lead from the Television Analyst to the test receiver, and connect the test lead from the Bias Supply output jack to the AGC buss of the test receiver video I.F. stages. Set the RF Attenuator of the Analyst to #10, maximum RF output. Since the Bias Supply is very low impedance, it will take over control from the high impedance AGC system. In other words, the AGC bias being fed back from the AGC network is completely overcome by the bias voltage we are feeding in from our supply. We can now control the AGC bias and therefore the test receiver gain. Adjusting the Bias supply varies the receiver gain. With the Bias Supply set to—25 volts (rotated fully counter clockwise) the receiver will be cut off and no picture will be seen. As the negative bias supply voltage is reduced, a picture will become visible. Most receivers will begin to show a picture in the region of —6 to —12 volts. As the bias voltage is reduced even further the picture will begin to overload. This will usually show up first as a snaking in the picture due to sync clipping. If the bias is reduced even further, the picture will get blacker and then will

reverse phase and then completely disappear at zero bias, indicating complete blocking of the receiver. Disconnect the bias test leads and restore the test receiver to normal operation.

26. Connect the RF output of the Analyst to the RF antenna terminals of a color TV receiver. Tune the receiver to an unused TV channel. Turn the Analyst to the same channel as described above. Rotate the Pattern Selector switch to the COLOR position. Fine tune the receiver until a color display is seen. You may now change the color as seen on the monitor receiver by rotating the Color Selector switch through each of its positions. If the color sequence does not seem proper, adjust the Chroma control and Hue Range control on the color TV receiver until any one color is in the proper sense. All other colors will then follow. This Chroma signal can also be fed into the IF system by setting the Channel Selector switch to the IF position and tuning the IF tuning control to the proper IF frequency. By using the Chroma signal from the front panel jack you can directly inject the signal into chroma amplifiers and demodulator grid circuits and observe the same color display on the face of the tube of the monitor receiver. The correct absolute color may not always be seen due to phase shifts produced in the chroma signal by connecting across various parts of the color TV receiver.

TROUBLE SHOOTING WITH THE TELEVISION ANALYST

The Television Analyst provides the service technician with a powerful tool to quickly and accurately trouble shoot television receivers. Outputs are provided to enable the service technician to inject signals into any section of a TV receiver to isolate trouble to (1), a section of a receiver, and (2), to the specific stage. In many cases it is also possible to locate the exact defective component. This method of trouble shooting is called signal injection. The Television Analyst provides output signals which can be injected into any of the stages shown in Fig. 4. The indication as to whether or not that portion of the receiver is capable of processing the television signal properly is seen directly on the screen of the television receiver being serviced. Signal injection is best accomplished by starting at that portion of the receiver that is farthest from the antenna.

For example:—a defective receiver is to be serviced where the complaint is "no video". Refer to Fig. 4. The farthest point from the antenna in this case would be point J, the grid of the picture tube. The high level signal from the Sync output jack would be injected at this point. If the picture tube is capable of showing video, black and white blanking bars running out of sync will be seen. If the Phase of the sync signal is reversed with the Sync Amplitude control the phase of the Black and White bars will be reversed. The signal must of necessity be out of sync since the sync take off point in most receivers occurs in the video amplifier section of the receiver.

Since the picture tube circuits checked out we must now inject a video signal at point H, the grid of the 2nd video amplifier. This video signal is obtained at the Video Output jack on the Television Analyst. If the 2nd video amplifier is working properly the test signal will be displayed on the picture tube. The signal should also be in sync since the sync take off point occurs in the second video amplifier. The proper phase of video must be obtained with the video level control. To the right of center the phase is positive and to the left of center the phase is negative. We now move our video test signal to point F, the grid of the first video amplifier, as shown in Fig. 4. Remember to reverse the phase of the video signal to account for the 180 degree phase reversal that occurs in the first video amplifier. If the test pattern failed to appear on the picture tube with the signal injected at point F we would know that our trouble must lie between point H and F. Obviously the first video amplifier is defective. A few voltage and resistance readings will quickly locate the defective component.

If, however, with the test signal injected at point F we saw a test pattern on the picture tube of the receiver, we would then have to inject a signal at points E, D and C (the grids of the I.F. amplifiers) at the I.F. frequency of the receiver. This is done by setting the R.F.-I.F. Selector switch to the I.F. position and setting the I.F. tuning to the correct frequency. Using the shielded cable provided and connected to the R.F.-I.F. output jack, inject signals to the grids of the third, second and first I.F. amplifier stages. If the test signal should fail to appear on the screen of the picture tube at any of these points then the defective stage has been located. This same technique can be applied to the Tuner, the Sound system, the Sync circuits and the Deflection circuits.

As long as the signal injection point is somewhere along the series path that the signal must travel from the antenna terminals all the way through to the picture tube or loud speaker, this complete signal path can be analyzed in minutes. Included in this series path are all of the series components which are directly involved in passing the signal; for example, inter-stage I.F. transformers, video peaking coils, coupling condensers, etc.

The Television Analyst can also be used to trouble shoot intermittents. The following portions of this manual cover the methods used to trouble shoot other parts of a TV receiver, giving step by step procedures.

HOW TO USE THE TELEVISION ANALYST FOR TROUBLE SHOOTING INTERMITTENTS

TV receivers which come into the shop for intermittent troubles can be extremely time consuming and cause a grat deal of irritation to the service man. This is especially true when the technician cannot even isolate the section of the receiver where the source of the trouble is located.

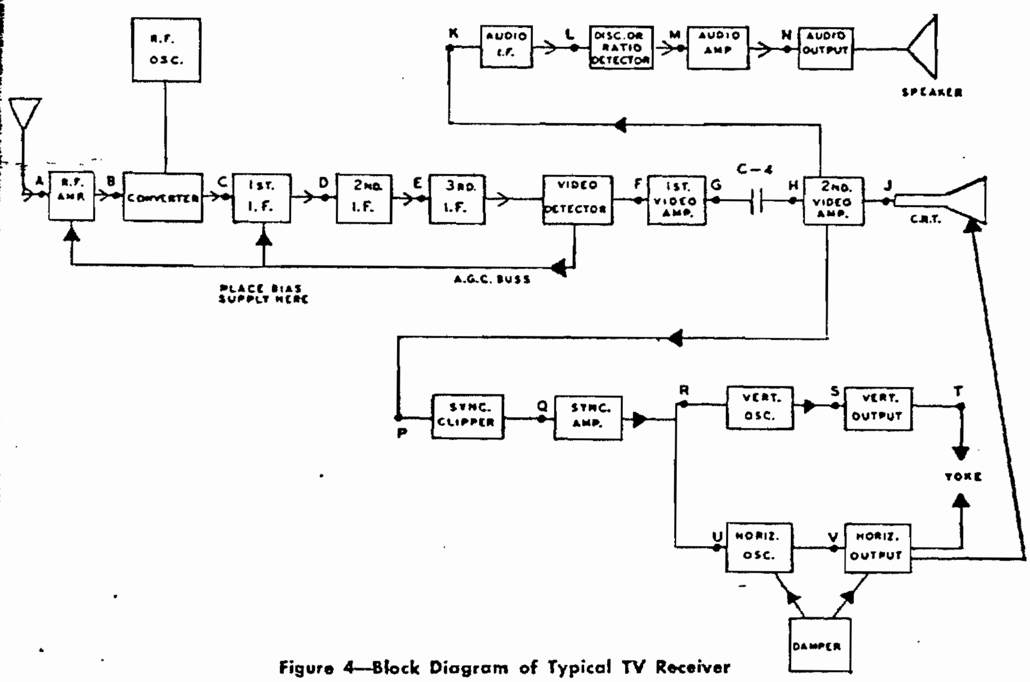


Figure 4—Block Diagram of Typical TV Receiver

As a typical example, let us assume a TV set has a video coupling condenser (C4) which is opening up at random intervals for just a few seconds at a time.

The block diagram Figure 4 shows all the sections of the receiver. By using the Television Analyst we can inject signals at various points in the receiver and by observing the results isolate the difficulty down to a section or single stage. Once the stage has been isolated it is just a matter of checking the individual components in that stage to determine the actual culprit.

Many service men after narrowing an intermittent trouble down to one stage find it economically sound to replace the suspected components one by one until the guilty one is found. When you consider the cost of your time, it is often wise to "waste" a few 20c capacitors to save ½ hour of your time.

In the typical example:—The customer complained that the picture and sound went off for a few seconds every ten minutes. The service man in the field ascertained that when this occured the raster was still there, eliminating the possibility of A.C. power failure, or D.C. power supply trouble. In order to get a raster, the low voltage supply must be working as well as the complete horizontal and vertical sweep and high voltage circuits.

By looking at the block diagram it can be seen that the video and audio signals are together in all the R.F., I.F. and Video stages. It is after the last video amplifier that the video and audio separate. Since both video and audio are lost when the intermittent trouble appears, it is obvious that the trouble must be in the R.F. tuner, I.F. amplifier, Video detector, Video amplifier or A.G.C. circuits.

The Television Analyst will now be used to locate the source of the trouble. The signals available from the instrument will be injected into the receiver at various points, so that by the process of elimination the trouble can be analyzed down to one stage.

First it is necessary to disable the A.G.C. circuits by connecting the negative bias supply to the A.G.C. buss which feeds A.G.C voltage to the tuner and I.F. amplifier stages. (Incidentally, if the trouble were in the A.G.C. circuit, using this bias supply would probably eliminate any symptoms of trouble. This would indicate that the source of trouble was in the A.G.C. Circuits).

Now by feeding R.F. signal into the antenna terminals of the set (A) the test signal and sound will intermittently disappear, just as it did on the local TV stations.

By moving our signal injection point stage by stage from the antenna terminals to the picture tube, we can localize the trouble. Still using R.F. output, inject the signal on the grid of the R.F. converter tube (B). If the intermittent still appears, it means that the trouble is NOT in the R.F. amplifier stage, or the R.F. oscillator.

Now we switch the instrument output to the I.F. signal, and inject this signal at the same point at the grid of the converter (B). (Note:—If the intermittent appeared when R.F. signal was fed to the grid of the converter, and it did *not* appear when I.F. signal was fed into the grid of the converter, then the trouble would have been pin-pointed directly to the R.F. oscillator).

With I.F. signal fed into the converter grid (B) we find that the intermittent still appears. That means the R.F. oscillator is not causing the trouble.

Now we move our signal cable to the grid of the first I.F. amplifier (C). Finding the trouble still intermittently appearing, we move our signal to the second (D) and the third (E) I.F. stage. (Obviously, if the trouble appeared when injecting on the grid of the second I.F. stage (D) but no longer showed up when injecting signal to the third I.F. stage (E), the trouble would have been pin-pointed to the second I.F. stage).

Since the intermittent still appeared, the Television Analyst signal output is now switched to Video and the signal is injected into the video detector load. (See Figure 5). This is usually around a 4,000 ohm resistor and can easily be located because it will have a video peaking coil associated with it. (Note:—For video signal make sure you are using the correct output cable as it is *not* taken from the same output jack as the R.F.-I.F. signals. Also, if the picture appears negative, reverse the polarity of the video signal by turning the video control to the opposite polarity.

Since the intermittent trouble still appears, the video detector has been eliminated from suspicion and the video signal is injected on the grid of the first video amplifier (F). The intermittent trouble still shows up at this point.

The video signal is now injected into the grid of the second video amplifier tube (H) after reversing the polarity to compensate for the 180° phase reversal in the first amplifier tube. Now, for the first time, the intermittent disappearance of sound and video is no longer evident. The trouble has been isolated to an area between the grid of the first video amplifier (F) and the grid of the second video amplifier (H).

Now to use the Television Analyst once more to check the coupling capacitor (C-4) from the plate of the first video amplifier to the grid of the second video amplifier. Inject the video signal on the plate side (G) of the coupling capacitor (See Figure 5). The intermittent condition again appears, placing the blame for intermittent loss of signal to the coupling capacitor C-4 which is opening up intermittently.

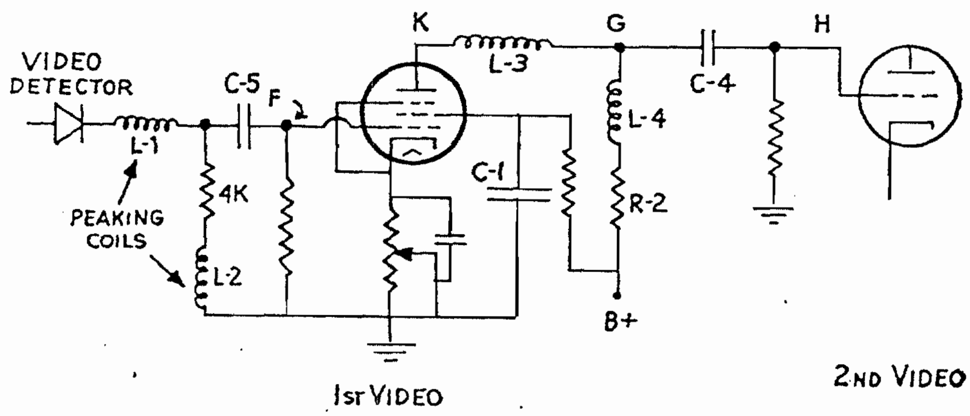


Figure 5—Video Section of Typical TV Receiver

(If it were the first video amplifier tube itself, screen bypass capacitor C-1, plate load resistor R-2, peaking coil L-4, or any other component in the first video amplifier circuit, the trouble would not have appeared with the signal injected at point (H) in the circuit. However, if the signal was injected at point (K) on the plate of the first video amplifier and the same intermittent indication appeared, then both the peaking coil L-3 and the coupling capacitor C-4 would be suspected).

It should be clear at this point that the signal injection procedure can actually begin at either end of the circuit. That is, we could have started at video and worked toward the R.F. Tuner, or start at the Tuner and work toward the Video. Each individual technician will develop his own technique for use of the instrument. Where the trouble is an intermittent one, then it is sometimes preferable to start at the tuner because we are looking for a "drop out or loss" of signal for short intervals.

Where the trouble is in the circuit constantly, it may be preferable to start at the video end and work toward the R.F. tuner. Also, it is evident that as the technician becomes more familiar with the instrument he will skip stages for quick analysis and take complete sections at one time (I.F., R.F., Video). After determining which section is at fault, he could then signal inject to find the one stage or component which was at fault.

Let us take another example of a receiver which comes into the shop having intermittent sync. The sync circuit of this receiver is shown in Fig. 6. Let us trouble shoot by signal injection from the rear of the signal path. We inject sync signal from our Television Analyst to the plate of the 6BF6 sync amplifier. We would now observe the raster of the television set and would see that it was in sync.

If the picture now remains in sync, this would tell us that from the plate of the sync amplifier tube into the oscillators there was no trouble. We would now shift our point of sync injection to the grid of the 6BF6 sync amplifier. At this point we would have to reverse the phase of the sync signal to allow for the phase inversion of the sync amplifier tube and also reduce the level of the sync signal to take into account the gain of this stage. Again we would observe the picture on the face of the tube and watch for the intermittent trouble to occur. If it did not occur, we would know that there was no difficulty from the grid of this amplifier tube all the way through to the oscillators.

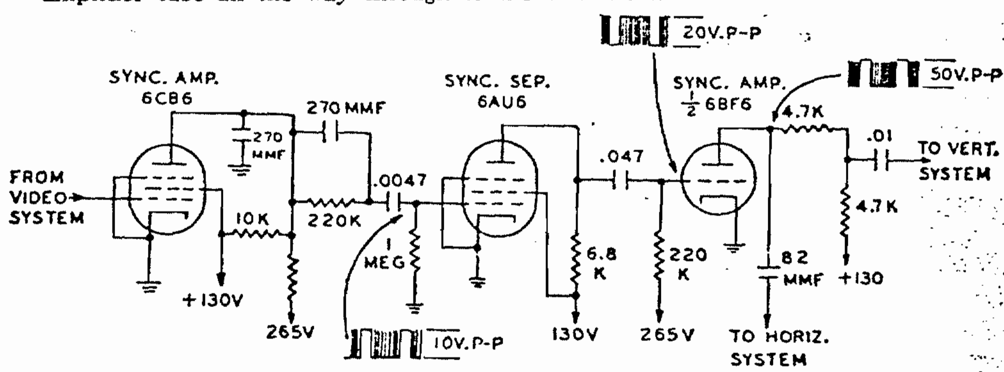


Figure 6—A Sync Separator System

We will now shift our sync signal to the plate of the 6AU6 sync separator and again observe the picture on the face of the CRT. We now find that the intermittent sync condition occurs. This tells us that the trouble lies between the plate circuit of the 6AU6 sync separator and the grid circuit of the 6BF6 sync amplifier. A few voltage and resistance measurements would now certainly point out the trouble. It might even be worth while to replace all of the components that lie between plate of 6AU6 and the grid of 6BF6, since this would save a great deal of time and would eliminate the necessity of determining which component is intermittent.

As you can see, this sync injection method for locating intermittents will in every case isolate the trouble to a particular stage. From that point on the repair is very simple.

HOW TO USE THE TELEVISION ANALYST FOR TROUBLE SHOOTING LOSS OF AUDIO

This trouble shooting procedure for Audio I.F. Stages applies to inter-carrier type of sets.

Let us assume there is no audio in a TV receiver. Within a couple of minutes we will find the defective stage by using the Television Analyst. Refer to Fig. 7. Assume a shorted screen bypass capacitor (5000 mmf) on the 4.5 mc Audio I.F. amplifier.

To check the speaker and audio output stage, inject the 900 cycle audio tone on the grid of the audio output tube (point A). A good tone will be heard. Then move the signal injection point to the grid of the audio amplifier (point B). Now use the 4.5 mc audio I.F. output with 900 cycle tone modulation and inject the signal at the plate of the sound I.F. amplifier (point C). You will still hear the tone signal indicating all the stages from this point to the loudspeaker are O.K. Now the 4.5 mc signal is injected on the grid of the 4.5 I.F. amplifier (point D), and the tone signal is no longer heard in the loudspeaker. This immediately tells you that the trouble is in this stage. A simple voltmeter test will discover the bad component, as no B+ or very low B+ will appear on the screen of this tube. It is always a good practice to check the screen dropping resistor under these conditions, to see if the excessive current has caused it to increase in value.

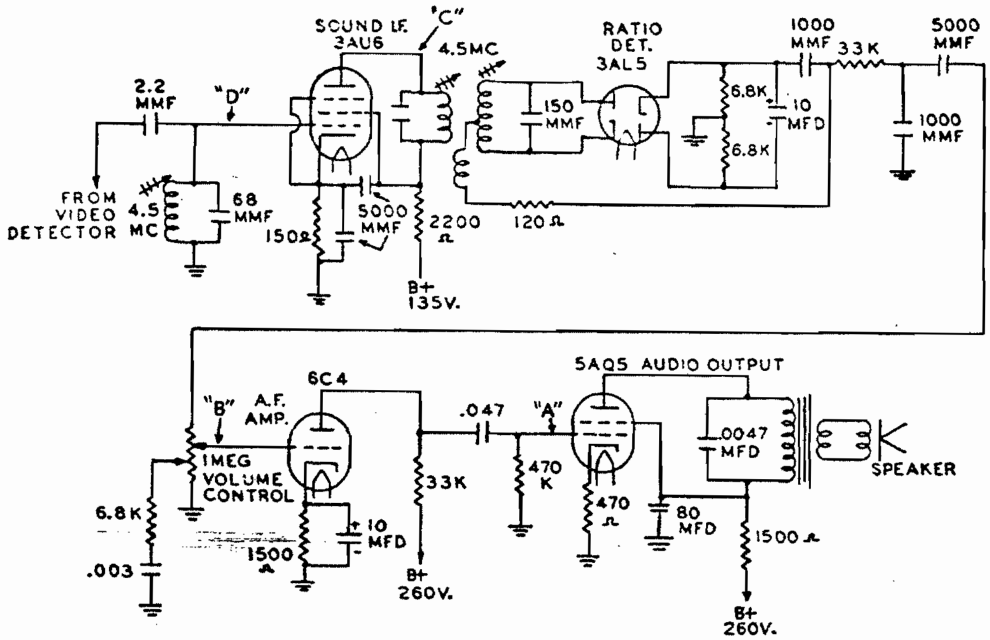


Figure 7—A Typical TV Audio System

HOW TO TROUBLE SHOOT SYNC AMPLIFIERS AND SYNC SEPARATOR STAGES

With the Television Analyst it is possible to quickly and thoroughly check the sync separator stages of any television receiver. To illustrate the procedure to follow, three representative sync separator sections will be discussed.

A fairly simple sync separator system is shown in Fig. 8. This is seen to consist

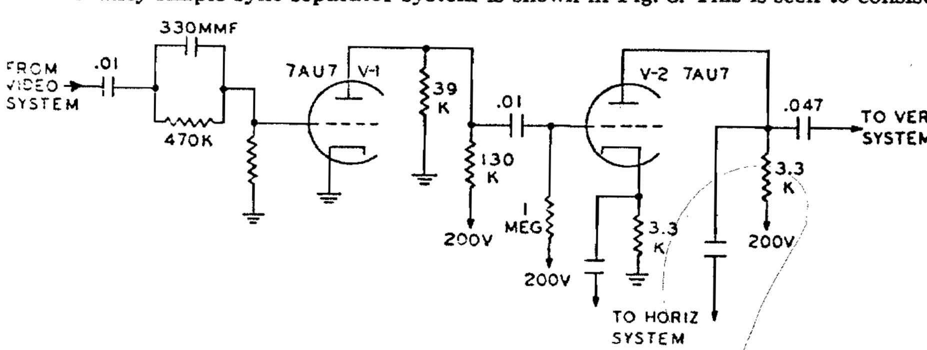


Figure 8—A Typical Sync Separator System

of the two triode sections of a 7AU7. We will assume that the picture is completely out of sync vertically and horizontally and we wish to check out these stages to determine if the trouble lies here.

As a first step, connect the Television Analyst to the receiver so that an image appears on the screen. The point of signal injection may be at the antenna terminals. It would be desirable not to inject the test signal into the video amplifier stages because we might do this beyond the point where the sync signal take-off occurs. Rather than spend time looking for this point, inject the signal as indicated above.

The next step is to apply a composite sync signal from the Television Analyst to the grid (and chassis or B—) of V2, Fig. 8. It is important that the proper polarity sync signal be applied and ordinarily the technician would have to figure this out by checking through the schematic. With the Television Analyst such checking is not necessary. Simply apply the sync pulses from the Television Analyst to the control grid of V2. If the image on the screen locks into sync, we know the sync signal is passing through V2 and locking in the vertical and horizontal oscillators, and we have chosen the proper phase of sync signal.

If the picture on the screen remains out of sync then reverse the polarity of the sync signal by turning the Sync Amplitude Control to the other phase. This is the reason we do not have to know the proper sync signal polarity before hand. The Analyst permits us to try both phases by simply rotating the Sync Amplitude control. The picture will lock in now, if both deflection systems are operating normally.

If the picture still remains out of sync, the sync pulses are not reaching the vertical and horizontal sweep oscillators. In that case inject the sync pulses at the plate of V2 and repeat the procedure. The receiver should now sync indicating that the trouble must lie between the grid circuit and the plate circuit of V2.

If application of the test pulses at the grid of V2 does lock the picture in, shift the signal injection lead to the control grid of V1. Inability to sync the nicture indicates a defect in V1 or its associated circuit. Voltage and resistance checks should then uncover the faulty component.

The level of the test sync pulses may be set at any point between 0 and 50 volts. In most instances, a mid-setting of the sync level control will serve satisfactorily. However, if you find that the full 50 volts peak-to-peak must be used in order to secure adequate synchronization, chances are there is something defective in the circuit. It may be that the pulses are not being properly amplified or that some component has radically changed its value, reducing the stage gain far below its normal figure. It is also well to keep in mind that the level of the injected sync pulses should be lowered whenever the signal lead is moved from plate to grid of a stage, or in going from the grid of one stage to the grid of a prior stage. In short, whenever you add more stages through which the pulse signal must pass, lower the output of the Sync Amplitude control.

Since the Sync Amplitude control is calibrated in volts, any level of signal required may be injected into a receiver sync system. A schematic may indicate that 35 volts peak-to-peak may be required to drive a particular stage. By setting the sync level control to 35 and injecting sync at this point you may determine if that stage will work properly with this level of signal.

A more elaborate sync separating system is shown in Fig. 9. The method of approach is still the same, however. That is, when a symptom of poor synchronization appears, you inject the composite sync signal from the Television Analyst at the plate and grid of each stage in the sync separation system, working from the stage closest to the deflection systems back to the stage that receives the initial video signal from the video system. The only thing to remember is that sync polarity must be reversed when switching from plate to grid. Failure to observe this precaution may erroneously lead you to believe that a stage is defective.

As a precautionary rule, whenever you reach a point in the sync separator system where the injected pulses do not lock in the picture, try both polarity pulses. If you find that one polarity of sync pulse does lock in the picture, the stage is operating satisfactorily.

Within the past few years pentagrid tubes have been employed for the sync separating function, at the same time also helping to reduce the amplitude of

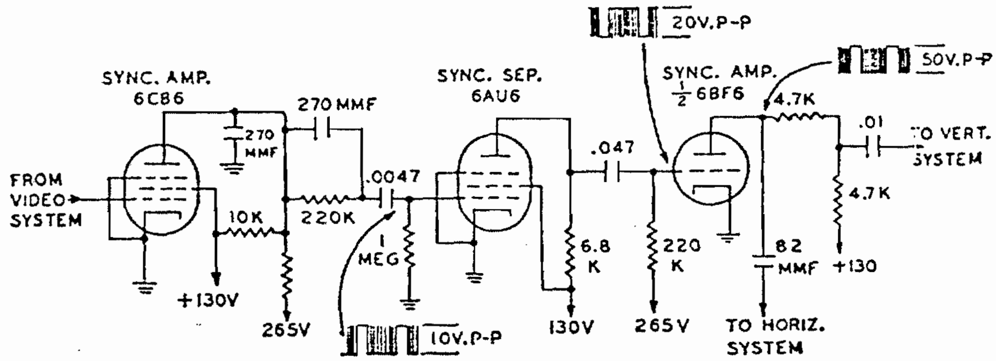


Figure 9—A More Elaborate Sync Separator System

any noise pulses that may be riding along with the signal. A typical circuit of this type is shown in Fig. 10. There is a 6BY6 pentagrid tube followed by a triode sync amplifier. A fairly small video signal with the sync pulses negative is fed to grid No. 1. The sync stabilizer control connected to the grid is adjusted so that tube current just flows with normal input signals.

An amplified version of the same video signal, with the sync pulses positive now, is obtained from the plate of the video amplifier and applied to grid No. 3 of the 6BY6. These sync pulses are strong enough to cause grid currents to flow in this circuit, charging capacitor C1 to a value approximately equal to the

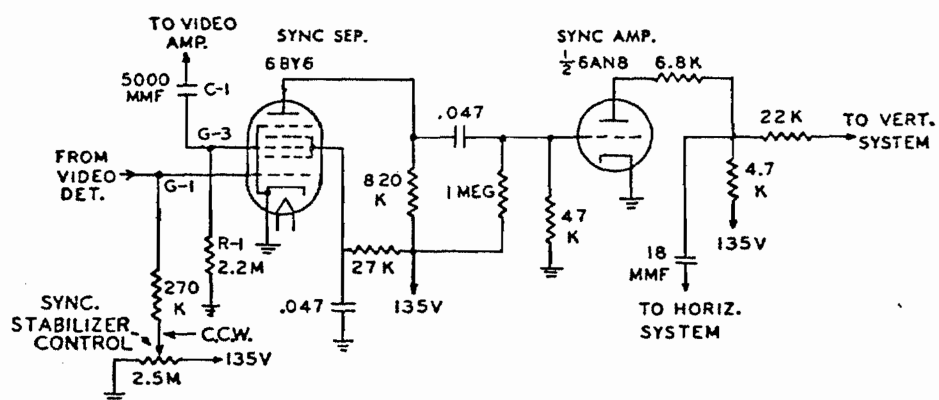


Figure 10—Sync Separator System

peak-to-peak amplitude of the applied pulses. In the interval between pulses, the negative voltage on grid No. 3 is high enough to prevent current from flowing through the tube. Thus, when the circuit is operating normally and a video signal is received, current will flow through the 6BY6 only during the sync pulse interval and only sync pulses will appear across the output load resistor.

Consider now what happens when noise pulses appear at the same time. These noise pulses will be transferred first to grid No. 1 and if they are strong enough, they will cut this grid off. The same noise pulses, reversed 180°, will appear at grid No. 3. However, since grid No. 1 has cut the current off, nothing will appear in the plate circuit. In this way the 6BY6 suppresses any pulses which arrive stronger than the sync pulses. The pulses received from the 6BY6 by the following triode (½-6AN8) are then amplified and forwarded to the vertical and horizontal deflection systems.

To check out such a system when non-synchronization occurs, we would proceed as follows. With the set in operation, apply a composite sync pulse from the Analyst to the plate of the 6AN8 triode. If the picture locks in, reverse the polarity of the sync pulses and apply them to the grid of the same tube. If the circuit is functioning normally, the picture will again become synchronized. Now reverse the polarity of the applied sync pulses again and then touch the probe to grid No. 3 of the 6BY6. If the picture synchronizes, the sync separator system is functioning normally. If the circuit does not permit sync pulses to pass through, trouble in the 6BY6 stage is indicated. While the pulses are being applied to grid No. 3 of the 6BY6, rotate the sync stabilizer control in the receiver completely counter-clockwise. This places 0 volts on grid No. 1 and permits plate current to flow through the tube.

If injected test pulses at grid No. 3 synchronize the image but the receiver, without the injected sync pulses, still displays the same lack of synchronization, then the path between the 6BY6 and the preceding video system should be checked. Move your probe back component by component, until you reach the video system. An open capacitor, an open resistor or a shorted shunt capacitor will be readily uncovered by this point-to-point tracing method.

The sync pulses delivered by the Analyst are powerful enough to be applied directly to the integrator network leading into the vertical oscillator or to the capacitor leading into the horizontal phase detector. Thus you can trace the signal path from these two deflection systems all the way back to the video amplifier system of the receiver.

TROUBLE SHOOTING AFC SYSTEMS

There are many occasions when there are difficulties in a horizontal oscillator circuit with regard to proper synchronization. Some of the more modern receivers employ a synchronization circuit known as AFC, or Automatic Frequency Control. This type of circuit can be broken down into three separate and distinct functions as shown in Figure 10A. Note that in Figure 10A the sync information is fed to a double diode phase detector. This network compares the frequency of the horizontal oscillator circuit with the frequency of the incoming sync information. The output from this phase detector will be a D.C. voltage, either positive or negative. This will depend on whether the oscillator frequency is high or low with respect to the sync signal. This D.C. voltage is then filtered and applied to the grid of the horizontal AFC tube. This tube is nothing more than a D.C. amplifier the output of which is then D.C. coupled to the horizontal oscillator tube. The control exerted on the horizontal oscillator is a D.C. voltage whose value changes as the horizontal oscillator frequency tends to change. Since the action of the horizontal AFC circuit is primarily D.C., a D.C. voltage can be used to test the effectiveness of the circuit.

A typical symptom on a defective TV set with a trouble in this circuit would be as follows. Picture and high voltage present, sound and vertical sync OK, no horizontal sync. This indicates that the trouble must logically occur somewhere between the sync separator tube and the grid of the horizontal output tube. We know that the horizontal oscillator is operating since high voltage is present.

Connect the ground lead of the Television Analyst to B— or ground of the TV set. Connect a test lead from the bias supply output to the grid of the horizontal AFC tube. By rotating the Bias control from some minus voltage through zero to some plus voltage, we should cause the horizontal oscillator to change frequency. This will be evident because the picture will be out of sync and slanting to the left or right as the case may be and then gradually stand errect and fall out of sync in the opposite direction as the bias supply is changed. This indicates that the horizontal AFC tube is operating properly since connecting a voltage to this grid will influence the horizontal oscillator frequency.

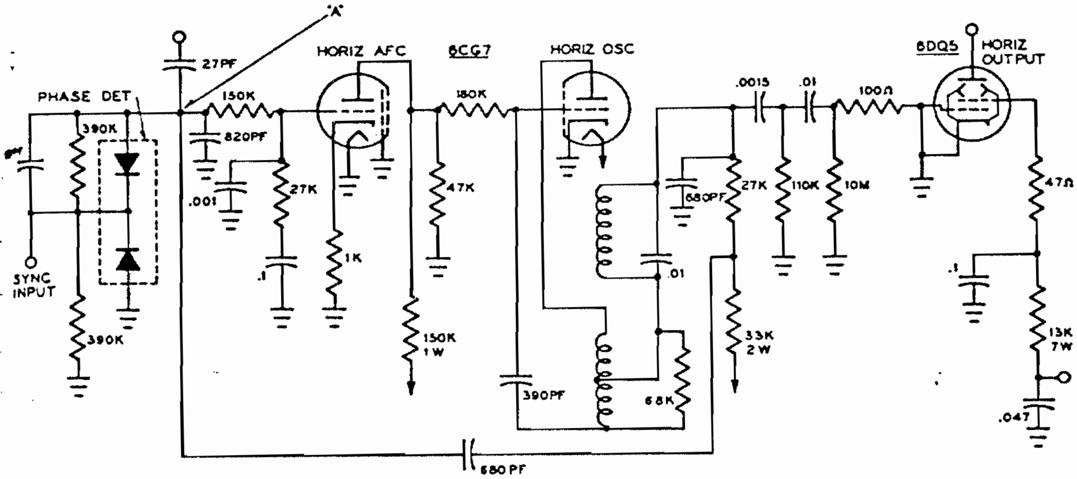


Figure 10A—A Horizontal Sync Circuit

We now shift the D.C. voltage to Point "A"which is to the left of the 150K resistor that appears in the grid of the horizontal AFC tube. This resistor and the associated capacitors form a filter to supply a D.C. voltage to this tube. Again we adjust the bias supply output and find that we no longer exert any control upon the horizontal oscillator frequency. The trouble must obviously be a shorted 280 PF capacitor, or possibly a defective diode in the phase discriminator.

HOW TO TROUBLE SHOOT A.G.C. SYSTEMS

Locating defects in the A.G.C. (Automatic Gain Control) system in a television receiver represents one of the more difficult troubles that the technician is called upon to service. The first step that must be performed is the positive proof that the trouble lies in the A.G.C. system. Once this has been established the location of the defect will be relatively simple.

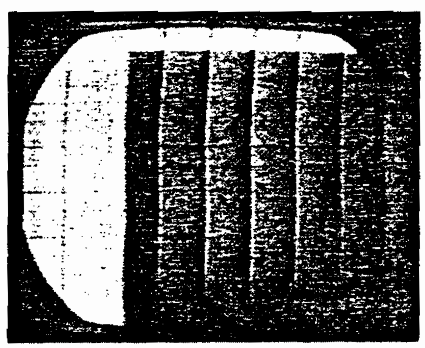


Figure 11—Crosshatch Pattern When One of the Video I.F. Stages Has Been Overloaded

Let us take as an example the case of a television receiver where the customer complains of a picture that seems to be negative and out of sync. The Television Analyst is connected to the antenna terminals of the receiver and the test signal tuned in. The displayed picture appears in Fig. 11. We must now take the video output signal from the Analyst and inject this signal to the grid of the 1st video amplifier. The result is viewed on the television receiver's picture tube. We observe that the displayed picture is satisfactory and we see the normal test signal appears properly in sync. We must therefore conclude that the trouble does not lie in the video portion of the receiver. We now select an I.F. signal from the Television Analyst of the proper frequency and inject this signal to the grid of the 1st Video I.F. amplifier. This is point A in Fig. 12. Examination of the picture displayed on the receiver picture tube shows a negative picture that is out of sync. This is the same result that we saw in Fig. 11. Therefore, the trouble apparently lies in the I.F. portion of the receiver. We will now try to isolate the trouble to a specific stage.

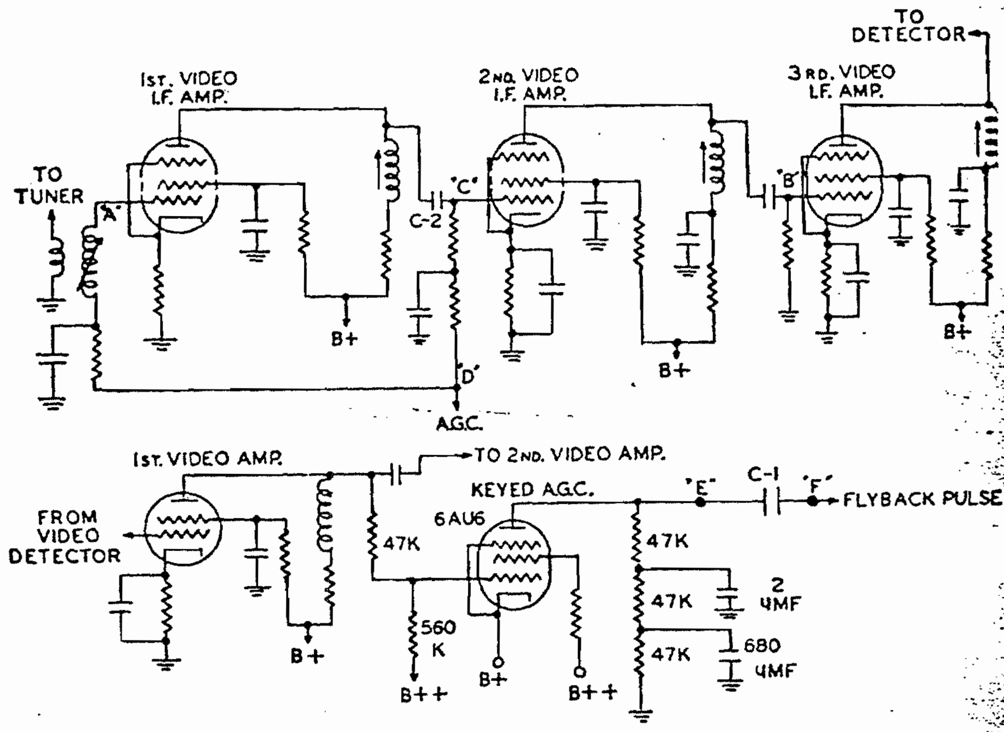


Figure 12—Video I.F. System and Keyed A.G.C.

Since the trouble has been isolated to the video I.F. stages we will now examine each stage in turn to locate the difficulty.

Inject I.F. signal at point B which is the grid of the third video I.F. amplifier. We now observe on the screen that the picture appears to be normal. That is, it is of the proper phase and is in sync. Notice that this stage is not controlled by A.G.C. The signal might be a little weak since very little gain is obtained using only one stage of video I.F. amplification. We now move our I.F. injection signal to point C, (the grid of the 2nd I.F. Amplifier) and again observe the result on the receiver picture tube. We now see that the receiver display is negative and out of sync. The trouble apparently is in the second video I.F. stage. Examination of the schematic of Fig. 12 will show that both the second I.F. stage and the first I.F. stage are subject to the controlling action of A.G.C. voltage.

Since the picture displayed in Fig. 11 could be caused by overload of the I.F. stage it might be wise at this point to determine the signal handling capabilities of these stages. By reducing the setting of the R.F.-I.F. Attenuator on the Television Analyst we are capable of lowering the level of the I.F. output to very low levels. As the amount of I.F. is reduced we reach a point where the picture on the customer's receiver no longer appears negative and is in sync. The picture will very likely be snowy as the signal is very weak at this point. We have now proved that the receiver is capable of handling a very weak signal but is certainly not able to handle a strong signal. This definitely points to an A.G.C. defect. The next step is to see if the I.F. strip will accommodate a strong signal if an external bias voltage is used to control the gain. With the I.F. signal injected at point C we connect a test lead from the bias supply of the Television Analyst to point D which is the A.G.C. feed point. A ground lead from the Television Analyst must also be connected. With the Negative Bias control set to —25 we see that the picture has completely disappeared. This is due to the fact that with this large bias we have cut-off the I.F. amplifier. As the bias voltage is reduced we will observe that a picture will begin to appear at around 6 to 12 volts. At about 3 or 4 volts we observe a normal picture and as the bias is reduced even further the sync begins to get unstable and then finally turns negative. These tests conclusively prove that this I.F. stage in the receiver is capable of handling without overload a wide range of signals running from the very weak to the very strong only if external bias control is exerted on the I.F. stage. This proves conclusively the trouble must be related to the A.G.C. circuits. Remove the negative bias lead.

The receiver under test employs a keyed A.G.C. system, which depends for its operation on a high level pulse which is derived from the horizontal deflection system. The absence of this pulse will render the A.G.C. inoperative and cause the receiver to overload. The difficulty in this case could be lack of A.G.C. pulse or defective C-1. An ohmmeter test of the coil supplying the pulse and a test of C-1 will determine the defective part.

Another example of an A.G.C. trouble is as follows. A receiver having the same symptoms as the previous example is to be repaired. Signal injection has isolated the trouble to the 2nd video I.F. stage. We find that by reducing the I.F. Attenuator control until the signal is at a very low level that a normal picture results. We now connect the negative bias supply to point D in Fig. 12 which is the A.G.C. bias buss. We find that adjustment of the Bias Control will not result in a normal picture at any setting of the control, with signal injection at point C at the I.F. frequency. These two tests indicate that the I.F. strip will amplify, as indicated by its ability to show a picture when the signal is very weak. However when the signal is very strong, a control voltage placed upon the A.G.C. buss has no effect on the stage as indicated by the use of the negative bias supply. This would indicate that if the A.G.C. system were operating normally it would have no effect on the stage gain and therefore the trouble must be peculiar to the 2nd video I.F. amplifier and must not relate to the control voltage that the A.G.C. system exercises. This points to the Grid circuit. A few voltage and resistance checks indicate a slight positive voltage on the grid of the 2nd I.F. amplifier. A positive voltage was found on the grid of the stage and a resistance check showed a leaky C-2.

In summary the receiver I.F. system must pass two tests to establish that the trouble is specifically in the A.G.C. First it must be capable of amplifying a very weak signal without distortion. Secondly, with a strong signal input and an external bias supply, control can be maintained. If both of the conditions are met then the trouble is definitely A.G.C. If only one test is passed then the trouble must be peculiar to the I.F. stage under test.

TROUBLE SHOOTING VERTICAL SWEEP CIRCUITS

The following steps should be taken when checking the vertical deflection systems. We will assume that the indications on the television receiver screen to be tested reveal that there is no vertical driving voltage being delivered to the vertical winding of the deflection yoke resulting in a horizontal line on the picture tube.

In order to isolate the defects in a receiver between the vertical oscillator stage and the vertical output stage, proceed as follows:

1. Using the Vertical Grid Drive pulse available on the front of the Television Analyst, apply this signal to the vertical output stage grid (See Fig. 13). If, when this signal is applied, the image develops vertical deflection, then we know that the proper driving signal is not being supplied to the output stage by the vertical oscillator. The defect is either in the oscillator itself or in the capacitor (C-3) coupling the oscillator to the output stage. However, if vertical deflection of the image doesn't occur when the signal is injected at the grid of the output stage, the defect is located somewhere between this grid and the deflection yoke.

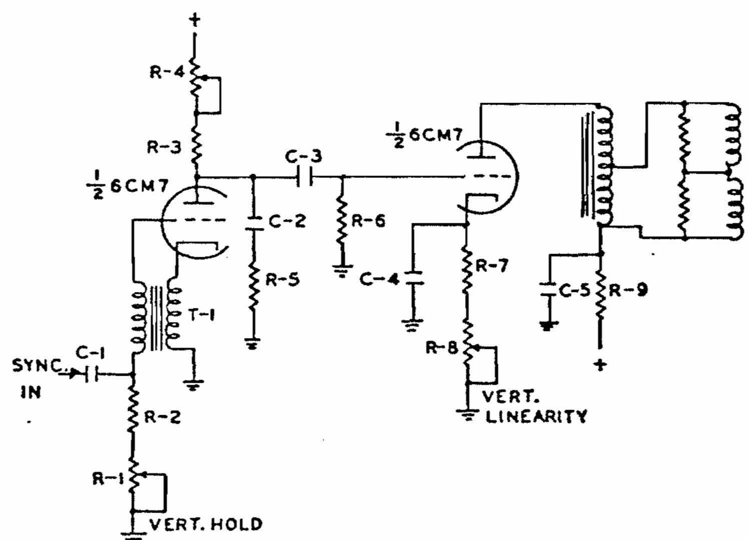


Figure 13—Vertical Deflection System

The grid driving pulse signal may not necessarily result in linear deflection on the screen of the television receiver. However, we are primarily interested in the presence or lack of deflection. A closer approach to good linearity can be obtained by adjusting the linearity control in the receiver (R-8) in Fig. 13 and by adjusting the Vertical Drive Amplitude control located on the front of the Television Analyst. In all cases this control should be at maximum when first starting to troubleshoot vertical deflection systems.

2. Assuming that no vertical deflection results when the signal is injected at the grid of the output stage, inject the Vertical Plate Drive pulse from the Television Analyst at the plate of the vertical output tube. The vertical output tube itself is removed from the set. In sets where the heaters are series-wired, the filament terminals on the sockets can

be shorted out, so that all the other tubes in the series string will continue to operate.

We are now driving the output transformer from the vertical output stage contained within the TV analyst. However, the B+ applied to this remote output stage in the instrument is derived from the receiver circuit itself. If vertical deflection is restored with this plate signal, the defect is in the vertical output stage, generally in the cathode circuit, assuming the tube to be good. If the vertical deflection is still missing then it indicates that either the vertical output transformer or the vertical windings of the deflection yoke are at fault.

We are assuming, in the preceding paragraph, that B+ is reaching the plate of the vertical output tube. This B+ is required by the TV Analyst to power its output tube. If no B+ should be present, no signal will be obtained from the PLATE DRIVE terminal. Hence, if application of the test lead from the instrument at the plate of the output stage does not produce vertical deflection, it would be desirable to check the voltage in this circuit to make certain it is present. Absence of the necessary voltage indicates an open circuit in the vertical output transformer winding, or an open resistor or shorted capacitor in the B+ network bringing this voltage to the vertical system.

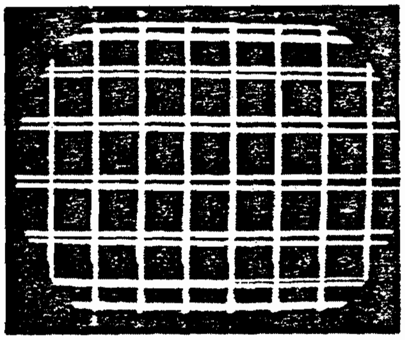


Figure 14—Sweep Developed Using Vert Yoke Test Signal

To check the vertical windings of the deflection yoke, disconnect its wires from the circuit and connect them to the two test leads from the Vertical Yoke Test signal jack and GROUND of the TV Analyst. If the yoke is good, vertical deflection of the picture tube image will result. The image will possess poor linearity and overlap or go back on itself (Fig. 14) because the driving signal is a sine wave and not a sawtooth. However, we are not concerned here with checking linearity and, therefore, any indication of deflection would reveal the yoke to be good. The trouble now is definitely indicated to be in the vertical output transformer.

TROUBLE SHOOTING HORIZONTAL DEFLECTION CIRCUITS

We come now to the horizontal circuit of a television receiver and it is here that the instrument offers the service technician several quick test features that will greatly simplify the task of servicing this section of the set.

One such outstanding feature is the ability to check the output circuit completely, both from the grid of the horizontal output tube and from the plate of this stage. In essence, then, we can completely bypass the horizontal output tube. A second innovation is a high-voltage indicator light which further serves to pin-point troubles in the output transformer, or the high-voltage network. The light operates on a "go - no-go" basis, *clearly revealing to the* serviceman the presence or absence of certain hard-to-find troubles.

And last, but not least, a shorted turns test can be made quickly and conclusively on yokes and horizontal output transformers, again providing the user with positive information.

Let us assume the receiver under test has no picture or raster and there is an absence of high voltage.

1. In order to determine whether the defect lies in the horizontal oscillator stage or the horizontal output amplifier and the stages following it, proceed as follows:

   Using the Horizontal Grid Drive pulse available from the front panel of the TV Analyst apply this signal to the grid of the horizontal output tube. Connect the high voltage indicator lamp to the insulated wire going to the plate cap of the high voltage rectifier tube and remove the plate cap from this tube. See Fig. 15. Apply power to the receiver under test and observe the high voltage indicator lamp.

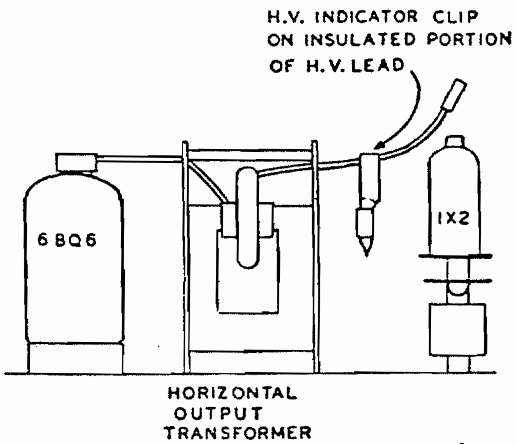


Figure 15—Connecting High Voltage Indicator

   If the lamp glows this indicates the presence of high level R.F. pulses on this lead. Turn off the power and reconnect the high voltage plate lead to the rectifier tube and again apply power. If the high voltage rectifier circuit is O.K., the lamp should still remain lit and hi voltage should be present and deflection will be observed on the face of the CRT. Since the application of a driving pulse to the grid of the horizontal output resulted in restoring operation to the receiver the trouble definitely lies in the horizontal oscillator circuit. A few voltage and resistance checks will certainly bring the trouble to light.

   Let us take another case where no hi voltage is again the trouble. Application of grid driving pulses do not restore hi voltage or deflection. This indicates that the trouble is not in the horizontal oscillator but that the difficulty lies in the output circuit of the receiver. Turn the Plate Drive Selector switch of the Television Analyst to the Horizontal position. Connect the ground lead of the instrument to chassis ground or B— and connect a test lead from the Plate

Drive jack to the plate lead connection on the horizontal output transformer. Be sure the hi voltage indicator lamp is connected to the plate cap lead going to the hi voltage rectifier and that this lead is removed from the plate cap of the tube. Apply power to the receiver and check B+ boost with a meter.

If B+ boost is present and the hi voltage indicator lamp comes on, they indicate the presence of boost voltage in the flyback system and hi level R.F. pulses in the hi voltage lead. Both of these indications tell us that the flyback system is now operating properly. The trouble must be in either the high voltage rectifier circuit or the output tube circuit. To eliminate the hi voltage circuit, reconnect the plate cap of the hi voltage rectifier tube, apply power to the receiver, and again check the boost voltage and the hi voltage indicator lamp. If both are O.K. this indicates that the high voltage rectifier circuit is O.K. We must still check whether the high voltage dropping resistor R-4 is open, preventing the high voltage from getting to the picture tube. If R-4 is O.K., then this proves conclusively that the trouble must be in the horizontal output tube circuit. It could be the screen resistor R-1, or by pass condenser C-1, or the cathode bias resistor R-3 (See Fig. 16)

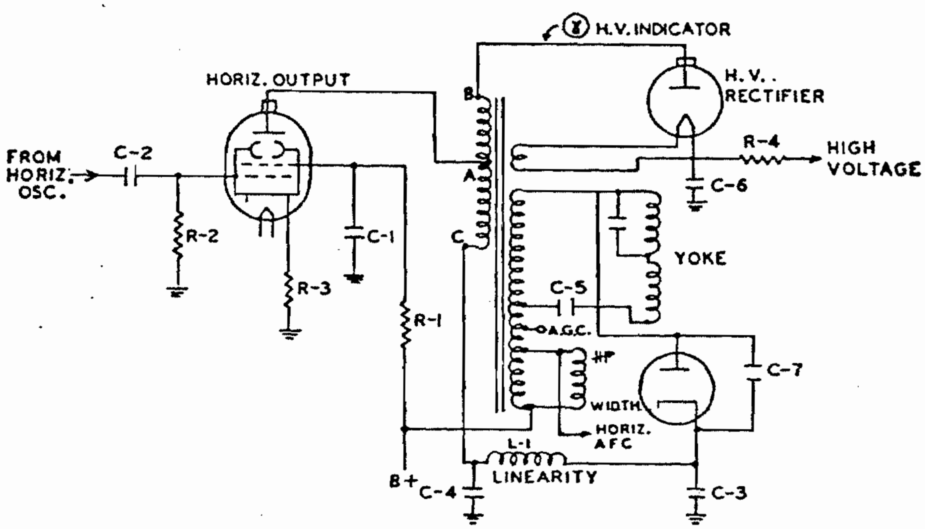


Figure 16—A Horizontal Output Section Using An Isolation Type of Output Transformer

Screen voltage is applied to the horizontal output tube through the screen dropping resistor R-1. There is also a bypass capacitor C-1 between the screen grid and ground. If resistor R-1 increases in value, the screen voltage will decrease, there will be less drive to the horizontal output transformer, and the picture width will decrease. If R-1 opens up, there will be no drive and no high voltage. Generally, if R-1 is open it will be found that capacitor C-1 has shorted and the excessive current drain has caused R-1 to burn out. In this case, both C-1 and R-1 should be replaced. As a matter of prudence, whenever R-1 has been found to increase in value substantially, it is good practice to change capacitor C-1 because it frequently is the cause of such resistance change.

In the grid circuit of the horizontal output stage, grid leak resistor R-2 and coupling capacitor C-2 bring the signal to the horizontal output stage from the horizontal oscillator. This coupling capacitor is frequently the cause of much difficulty in the horizontal output circuit. If C-2 becomes leaky or shorted, a positive voltage will be applied to the control grid of the horizontal output stage from the plate circuit of the oscillator. If the leakage resistance of C-2 is low enough, this could load down the horizontal oscillator circuit sufficiently to prevent any horizontal output or high voltage from being developed.

It is interesting to note, that if C-2 is leaky, with a fairly low resistance, applying the grid driving pulse to the horizontal output stage from the Analyst may not cause the high voltage to reappear since the shorted coupling capacitor may load down the Analyst circuit as well. To see if this is so, uncouple one side of C-2 and reapply the grid drive. If the high voltage now appears, capacitor C-2 should be changed.

2. If you find that injecting the signal from the TV Analyst at the plate of the horizontal output tube *does not* restore high voltage, then the trouble lies somewhere in the circuit *beyond* the horizontal output stage. NOTE: This is a *conclusive* test and it is due *entirely* to the fact that the TV Analyst can take the place of the horizontal output amplifier.

   The procedure to check out the output circuit with the instrument is as follows:

   The cap lead is lifted from the top of the horizontal output tube; also the cap lead connecting to the high voltage rectifier is removed from its tube. As an added precaution, the high voltage rectifier tube is removed from its socket. The TV Analyst is then set to deliver a horizontal plate driving pulse. The lead from the Plate Drive terminal is connected to the cap lead that ordinarily goes to the horizontal output amplifier. Next, the B & K high voltage indicator light is attached directly to the *insulated* wire leading to the cap that connects to the high voltage rectifier. (See Fig. 15). The instrument and the television receiver are both turned on.

   If boost voltage is present and the high voltage indicator lights up, high voltage is being developed, boost B+ is present, and R.F. is being produced in the circuit. This is the condition that would generally be obtained when the set is working normally. In the present instance, the set is presumed to be defective; therefore, if such an indication is obtained, but there is no high voltage on the picture tube as indicated by lack of raster, it is possible that capacitor C-6 in Fig. 16 may be shorted, or the high voltage cable is not connected to the CRT. (We are assuming that all the tubes in the circuit including the picture tube have previously been checked before any testing with the instrument is begun).

   Another possible cause of no raster when the hi voltage indicator lights up is an open in the current limiting resistor R-4, preventing any high voltage from appearing on the picture tube. Each of these components can be checked individually to determine which is defective.

   If B+ boost is present when the horizontal plate drive is applied to the transformer but the hi voltage indicator *does not* light and there is no high voltage, then we have a definite indication that the trouble is in the transformer winding from point A to point B in Fig. 16.

3. If neither B+ boost is present nor the high voltage indicator lights up when the horizontal plate driving pulse is applied to the transformer, we proceed in the following manner:

With a voltmeter, check the DC voltage at the plate of the horizontal output tube. We know that boost B+ is absent and this test is designed to reveal if any B+ is reaching the tube. If zero voltage is measured at this point, then either the voltage is being shorted out by boost filter capacitors C-3 and C-4 or the linearity coil L-1 is open. Short out the linearity coil and test the circuit again. If everything returns to normal, the linearity coil is open. If no change occurs we can presume that the coil is OK.

Check capacitors C-3 and C-4 for any short or leakages. It should be noted here that a failure of the boost B+ voltage being applied to transformer terminal C will cause very little horizontal output signal because the output tube does not have enough plate voltage. This is because the boost B+ voltage is providing the power for the plate of the horizontal output stage.

Returning to the damper circuit, if B+ voltage only is measured on the boost B+ line, it indicates that no high pulse voltage is being rectified and added to the B+ to develop a boost B+ voltage. There is another boost circuit defect which can cause this and that occurs when capacitor C-7 (Fig. 16) is shorted. For this condition, the B+ voltage will be applied from the plate of the damper tube to the cathode; there will be no rectification in the damper tube and hence no boost B+ voltage. This possibility can be checked by removing the damper tube from its socket and noting whether the B+ voltage is still being measured at the cathode terminal of the damper tube socket. If the answer is yes, C-7 is shorted and should be replaced. However, if no voltage is present at the cathode of the damper tube with the tube out of its socket, then C-7 is not shorted and the damper tube can be returned to its socket.

The role played by the special indicator lamp provided with the TV Analyst demonstrates how useful it is in assisting the technician to isolate a defect in the horizontal output circuit. Once its use becomes understood, it will be found to save many hours of service work.

4. We shall now demonstrate how to locate quickly a defect in the horizontal output system consisting of the transformer itself, the horizontal yoke or any of the associated components attached to these units. To check the horizontal yoke, it is only necessary to disconnect the yoke from the circuit so that any shorting effect a defective yoke might have on the rest of the circuit is removed. If now, with the plate drive signal applied to the horizontal output transformer, B+ boost is present and the hi voltage indicator glows, showing that high voltage is being produced, then the defect in the set has been isolated to a shorted yoke. As a matter of fact, a vertical white line will appear on the screen of the TV receiver being tested, if the high voltage rectifier has been replaced in its socket. However, if the yoke is not the defective component, there will be no change in indications at this time.

Make careful note where the yoke wires connect in the circuit. Also keep the yoke disconnected while the remaining tests are being made.

Next, the width coil is tested. To do this, it is disconnected completely from the circuit. Note the effect upon B+ boost and the hi voltage light. If the width coil is defective, its removal from the circuit will bring back the high voltage. Under these conditions, both the B+ boost voltage will be present and the hi voltage indicator will light up. If the width coil is in series with the yoke in a particular circuit, remove the width coil at the same time the yoke is being removed. If the high voltage comes back again, one of these components is at fault. Reconnect the yoke first, using the connecting lead in place of the width coil. If the high voltage reappears, the width coil is the defective unit. This conclusion can be checked out by testing the yoke with the Shorted Turns Test of the TV Analyst.

It is common practice to tap off pulses from various points on the secondary of the horizontal output transformer for use in the horizontal AFC and in keyed A.G.C. circuits. It may very well be that a defect exists in one of these auxiliary circuits which is having an adverse affect on the horizontal output transformer, loading it down and thereby preventing it from functioning normally. To determine if this is true here, disconnect one tap at a time, each time checking the indicators to see whether high voltage has returned. If B+ boost is present and the high voltage indicator lights up after one of these leads have been disconnected, then we know that the trouble exists in that particular auxiliary circuit. After this, it simply becomes a matter of tracking down the defect in the auxiliary circuit.

It may happen that even after all of the auxiliary components have been removed from the horizontal output transformer neither the boost or hi voltage indicators will light. This certainly points to a defective transformer and the TV Analyst has available the necessary tests to prove that the transformer is defective. At this point it might well be worthwhile to review the nature of defects that can occur in a horizontal output transformer. Some of the more obvious defects that can occur are open windings, shorts from one winding to another, hi resistance leakage from one winding to another or from a winding to the core of the transformer. The instrument provides a test for these conditions. There is another fault that is less obvious. A flyback transformer in operation is subject to both very high voltage pulses and relatively high temperatures. This can cause breakdown between turns in a winding resulting in one or two or more shorted turns within the winding of the transformer. These shorted turns represent a load on the flyback and a serious reduction in the "Q" of the whole system. As little as one shorted turn in a winding can result in an inoperative flyback system. These shorted turns can also occur in the horizontal windings of the deflection yoke and all of these tests are equally applicable to both. To test these components they must be completely disconnected from the circuit.

To test a transformer for shorted turns connect the shielded cable to the Flyback-Yoke test signal jack. Adjust the Calibrate control until the test indicator lamp just goes out. Connect the flyback transformer to this cable. The connection is made from horizontal output plate cap connector to hi voltage rectifier plate cap connector. If the test indicator glows this indicates that the transformer has shorted turns. This test will respond to as little as one shorted turn. If the component to be tested is the horizontal winding of the deflection yoke, connection is made across the deflection yoke winding. It is also important to test the yoke for leakage between the vertical and horizontal winding and from the horizontal winding to the metal frame of the yoke.

Another very common arrangement is the autotransformer shown in Fig. 17. Here there is one winding to which all taps are made. The horizontal output tube is connected at point A and the stepped-up voltage for the high voltage rectifier tube is obtained from point B. Horizontal deflection yoke coils are connected across points C, D and E. All of the testing methods just outlined for the isolation horizontal output transfor are applicable here, too.

In Fig. 17 L-1 serves primarily as a filter coil. If this component should open, no B+ would be available to the horizontal output tube, and if L-1 was shorted, the circuit would still operate normally; it is quite possible that considerable RF interference would appear in the picture. If no interference did appear, there would be no visual indication of a short in L-1. If C-1 should short, the damping tube would be effectively cut out of the circuit and no boost B+ would be developed. B+ voltages, however, would appear on the B+ boost line and at

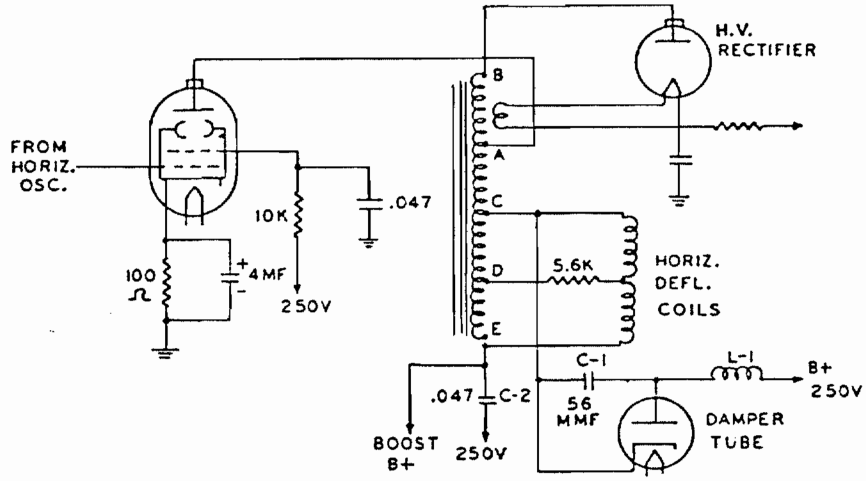


Figure 17—A Horizontal Output Section Using An Auto Transformer Type of Output Transformer

the plate of the horizontal output tube. If C-1 should open, it would have very little effect on overall operation, although here, again, RF interference might appear in the image.

Capacitor C-2 is the component receiving the additional voltage which the damper tube develops. If C-2 should short, no boost B+ could be developed by the circuit and it would prevent the development of the normal amount of high voltage or the normal amount of horizontal drive for the yoke. If C-2 should open, the circuit would again be disrupted by the lack of boost B+ voltage. B+ voltage, however, would still appear because the damper tube and L-1 would still be intact.

The foregoing examples indicate the complete flexibility of this instrument. With continuous use the technician will certainly develop his own procedure which will completely remove all of the complexities of Sweep Circuit Analyzing.

SETTING UP COLOR TV RECEIVERS

The Model 1074 Television Analyst is a powerful tool to assist in setting up color TV receivers. This setup process generally consists of degaussing the color TV picture tube, linearity and convergence adjustment. This process involves the use of a degaussing coil and serves the purpose of eliminating any magnetic fields within the television receiver itself which might affect the convergence adjustments. Purity, Linearity and Size must also be set up properly before the convergence adjustments themselves are undertaken. It is recommended that the actual procedure to be used, be that of the manufacturer of the particular television receiver. For the convenience of the service technician we are reproducing in its entirety those sections of both the RCA and Zenith maintenance manuals covering the setup on their particular sets. Both extracts of these manuals are reproduced through the permission of Radio Corp. of America and Zenith Radio Corp.

COMPLETE SET-UP PROCEDURE

(Courtesy RCA Victor)

Initial Adjustments

Adjust the receiver for a black and white picture. The receiver should be placed in the location and position in which it will be operated.

Check the horizontal oscillator and the conventional adjustments of height, vertical linearity, focus, and electrical centering. Make adjustments where necessary.

Preliminary Convergence Adjustment

The Model 1074 generator should be connected to the receiver to provide a dot pattern on the kinescope for making convergence adjustments.

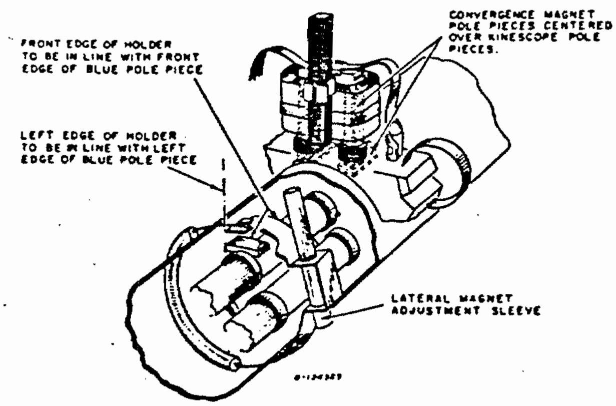


Figure 18—Location of Convergence and Lateral Beam Magnets

Adjust the red, green and blue magnets, and the lateral magnet to attain convergence of the dots in the center of the kinescope screen. The direction of movement of the dots, using the magnets is shown in Fig. 19A. Lateral movement dots is accomplished by adjustment of the lateral magnet, see Fig. 18. Red and green movement is opposite the blue, with the dots moving as shown in Fig. 19B. The motion of each dot when its magnet is adjusted is shown in Fig. 6A.

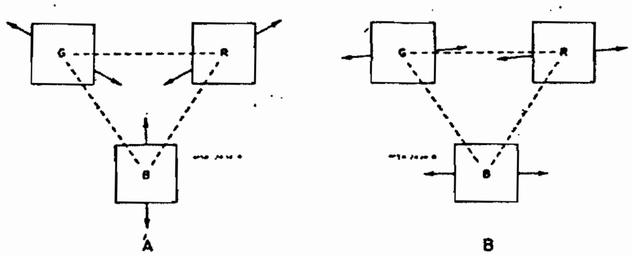


Figure 19—Dot Movement Pattern

The magnets may be reversed to produce a greater range of adjustments. To do this slide the plastic magnet holder out of its metal clip and rotate the holder 180°. Replace the holder in the clip making sure that the magnet is reinserted in the clip.

Keep the receiver in focus when making the above adjustment. Set the generator to "STAND BY" position.

Color Purity Adjustments

The kinescope and associated components should be subjected to a strong demagnetizing field before any purity adjustments are made. Use a demagnetizing coil and slowly move the coil around the kinescope and around the sides and front of the receiver; then slowly withdraw the coil at least 10 feet from the receiver before de-energizing it.

Set the red tabs on the purity magnet together. Refer to Figure 20.

Loosen the screw on the yoke clamp and slide the yoke as far to the rear as possible. See Figure 20.

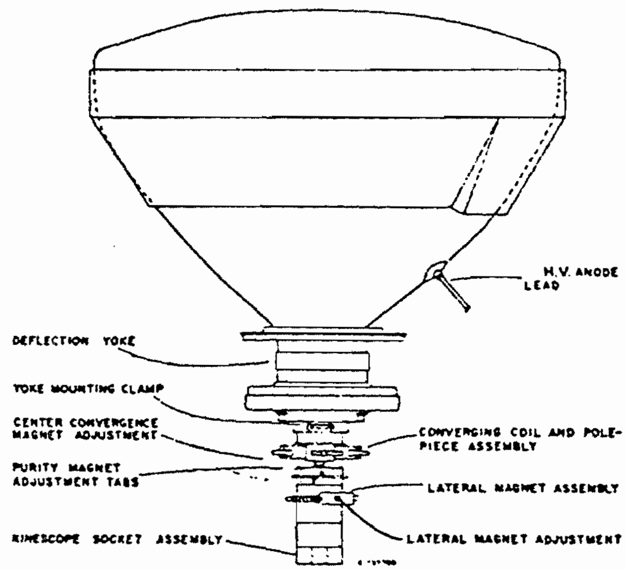


Figure 20—Kinescope Adjustments and Components

Shunt the blue and green kinescope grids to ground through individual 100,000 ohm resistors.

Rotate the purity magnet around the neck of the kinescope and at the same time adjust the tabs on the magnet to produce a uniform red screen area at the center of the kinescope.

Then, to obtain proper edge landing, move the yoke forward and adjust for best overall red screen.

For optimum purity, observe beam landing using a low-power microscope, and check all three screens. If any of the three colors cannot be seen while observing beam landing advance the setting of the associated screen control. If any one of the three colors is still not visible, adjust the setting of the "Kine Bias" control in the clockwise direction.

Kinescope Temperature Adjustments

Turn the kinescope bias and screen controls fully counterclockwise. Refer to Figure 21. Move the "Normal Service" switch on the rear apron to the "Service" position.

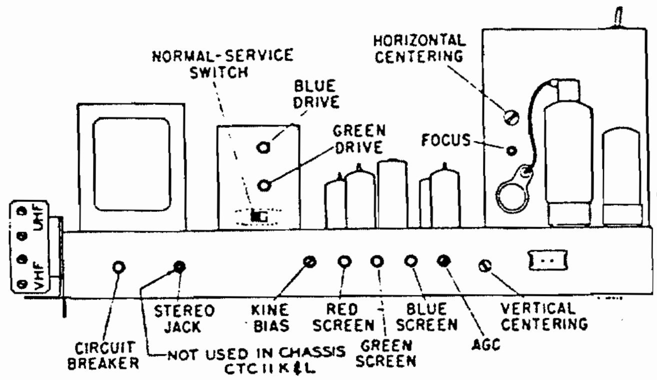


Figure 21—Rear Chassis Adjustments

Advance the screen controls so that each control just produces a horizontal line on the kinescope.

Note: When one or more of the controls fails to produce a line, the kinescope bias control must be advanced clockwise. After the bias control has been advanced to make the extinguished screen just light, the other screen controls must be adjusted to just light the screen in each case.

Return the "Normal-Service" switch to "Normal."

Alternately adjust the blue and green video drive controls to produce a normal black and white picture (9300° Kelvin).

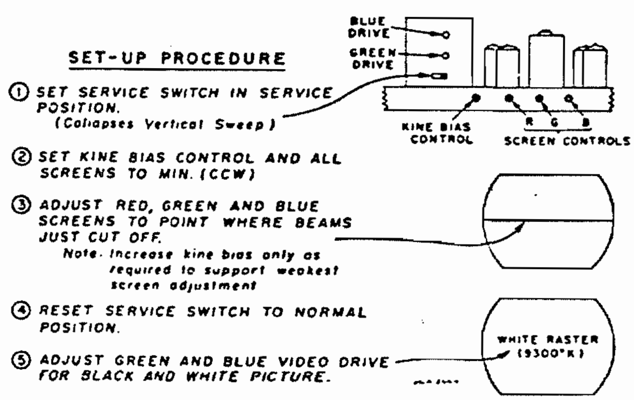


Figure 22—Alternate Method of Kinescope Temperature Setup

Check the picture from highlights to lowlights at all brightness levels for proper tracking. If the screen controls were accurately adjusted as outlined above, proper tracking at all brightness levels should be obtained.

An alternate method for adjusting kinescope temperature that sometimes provides greater accuracy involves just extinguishing the horizontal line after lighting it as explained previously. See Figure 22.

Center Convergence Adjustments

A dot pattern should be used to center convergence. Center convergence is performed with the three magnet adjustments on the convergence coil assembly around the kinescope neck and with the lateral magnet also on the kinescope neck.

Recheck the dot pattern for white dots in the center of the screen. If necessary, readjust to produce this condition, following the procedure under "Preliminary Convergence Adjustment".

For optimum performance recheck the screen purity. If adjustment is required refer to "Color Purity Adjustments." After correcting for purity error, recheck the center convergence.

Vertical Convergence Adjustments

Note: In following the procedure on vertical convergence adjustments, instances may be encountered whereby adjustment of the vertical tilt controls will not produce optimum convergence. If this condition exists, the range of the tilt controls

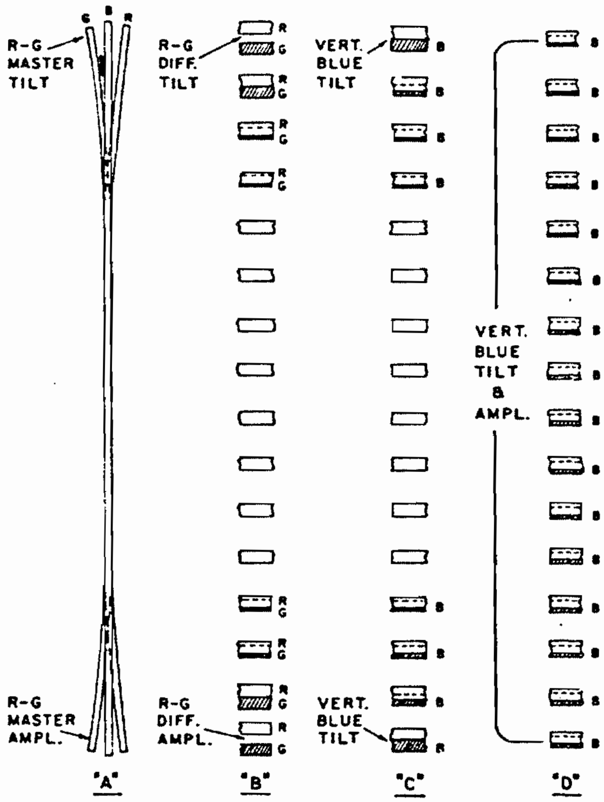


Figure 23—Vertical Convergence Pattern

may be broadened by changing the ground jumper connection of the tilt winding on vertical output transformer from the tap (black-green wire) to the end of the winding (black-red wire).

Changing the connections in this manner will provide all the required vertical tilt range for optimum convergence.

Vertical convergence adjustments should be performed before making horizontal convergence adjustments. Turn the generator to vertical lines.

The convergence board assembly is designed to permit adjustments to be made from the front of the receiver. Loosen the two screws holding the board and slide the bracket to the left and remove. Fasten the bracket to the two screws provided on the top rear rail of the cabinet with the controls facing to the front. Slots are provided in the bottom of the bracket for mounting in this position.

Referring to the vertical line at the center of the screen, adjust the Vertical R-G Master Amplitude control to converge the center line at the bottom, refer to Figures 23A and 24. Adjust the Vertical R-G Master Tilt control to converge the center line at the top of the screen. Touch up both adjustments for best convergence along the entire center vertical line.

Turn the generator to horizontal lines. Referring to the center line of the screen, converge the horizontal line at the bottom of the screen with the Vertical R-G Differential Amplitude control. Adjust the Vertical R-G Differential Tilt control to converge the top horizontal line at the center of the screen, refer to Figures 23 B and 24. Touch up both adjustments for best convergence of all lines at the vertical center line of the screen.

Switch to DOTS and CONVERGE the center area of the screen with the convergence magnets on the kinescope neck. Switch the generator back to HORIZONTAL LINES.

Advance the Vertical Blue Amplitude control to produce displacement of the lines at the top and bottom of the screen at the center line. Adjust the Vertical Blue Tilt control to produce equal displacement of the lines at both top and bottom of the screen at the center line. Refer to Fig. 23C. Adjust the Vertical Blue Amplitude and Tilt controls to produce equal displacement of all lines from top to bottom of the screen along the center line, see Fig. 23-D.

Switch the generator to crosshatch and again converge the center of the screen. Retouch the Vertical Blue Tilt and Amplitude controls for best convergence along the vertical center of the screen.

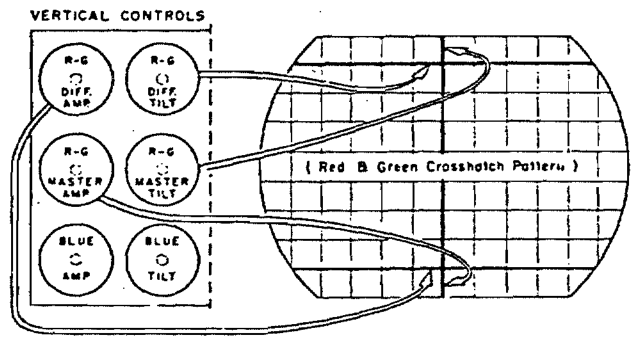


Figure 24—Use of Vertical Master and Differential Controls

Horizontal Convergence Adjustments

Turn the generator to produce a crosshatch pattern. Recheck for good center convergence and readjust center convergence magnets if required. Refer to Fig. 25 during the horizontal convergence adjustments.

Adjust coil B-1 to make the blue line at the right center of the kinescope a straight line.

Adjust control B-2 for a straight blue line from the center to the left side of the kinescope.

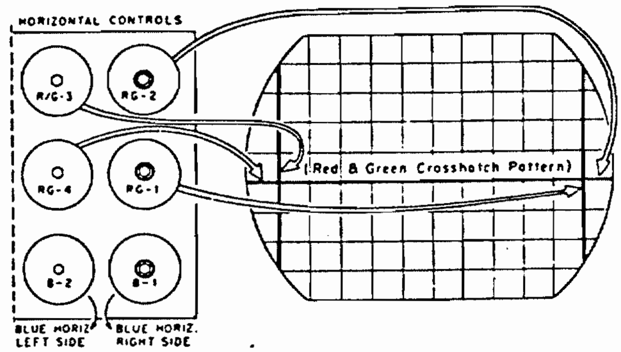


Figure 25—Use of Horizontal R/G Convergence Controls

Adjust coil RG-1 to make vertical lines at the right side converge.

Adjust coil RG-2 to make horizontal red and green lines at the right side converge. Readjust coil B-1 to make the blue line at the right center fall on the converged red and green lines. Retouch RG-1 for convergence of vertical lines at the right side.

Adjust control RG-3 to make red and green vertical lines at the left side converge.

Adjust control RG-4 to make the red and green horizontal lines at the left side of the screen converge.

After adjusting RG-4 repeat adjustment of RG-3 to compensate for any inter-action. Readjust control B-2 to make the blue line at the left center fall on the converged red and green lines. The pattern should now show proper convergence on all areas of the screen.

After completion of vertical and horizontal convergence adjustments, check and if necessary repeat "COLOR TEMPERATURE ADJUSTMENTS".

COMPLETE SET-UP PROCEDURE

ZENITH—29JC20 and 29JC20Q

(Courtesy Zenith Radio Corp.)

The following section is the Zenith Set-Up Procedure and has been incorporated for your convenience.

Focus

The focus adjustment (variable inductance L39) is in series with a winding on horizontal output transformer T10 and the plate of the Focus Rectifier tube. It is physically located at the rear of the high voltage cage. When adjusting for proper focus. Brightness and Contrast controls should be set at approximately viewing level.

Delay Line Termination

The Delay Line Termination is a factory adjustment which should require resetting only if the Delay Line or associated terminating component(s) are replaced.

If adjustment is required. apply a steady RF crosshatch pattern to the receiver antenna terminals or tune receiver to steady test pattern. Set Contrast to maximum and Brightness control for reasonable brightness without "blooming." Adjust for minimum reflections on delay line (reflections will appear similar to video "ringing" caused by excessive high frequency response).

Color Purity

The first step toward adjusting a color receiver for good purity is to demagnetize (degauss) the picture tube. If the picture tube shadow mask has become slightly magnetized, good purity may be difficult to achieve.

Demagnetizing the Color Picture Tube

The demagnetizing procedure may be performed with the receiver either in or out of the cabinet. To demagnetize the picture tube shadow mask, a degaussing coil is required, and procedure is as follows:

1. Place the receiver (either ON or OFF) in the same position as for viewing. Position the degaussing coil in a parallel plane against the face of the picture tube. Energize the coil.
2. Slowly rotate the coil around the face of the picture tube for approximately one full minute. If the receiver is turned ON during the degaussing procedure, the raster will exhibit a "swirling" rainbow type pattern. Slowly withdraw the coil while continuing to rotate it parallel to the picture tube face plate.
3. Withdraw to a distance of 10 ft. or more and deenergize coil. If impossible to back off 10 ft., this distance can be simulated by withdrawing the coil to a distance of about 5 ft. and then gradually reducing the coil supply voltage to zero by use of a variac or similar device.

Purity Adjustment Procedure

To adjust for purity, perform the following adjustments:

1 Converge pattern at center of screen by sliding the permanent magnet adjusting sleeves in or out. See Figure 26. If range is inadequate, remove sleeve, rotate 180° and reinsert.

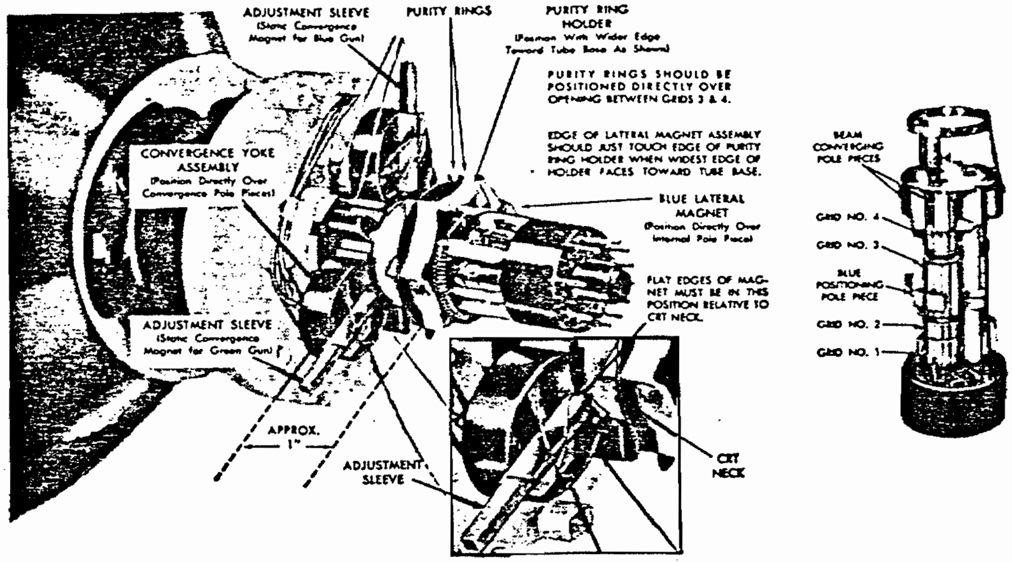


Figure 26—Rear View of Picture Tube, Showing Correct Positioning of Neck Components

2. Place the receiver in the same position as for viewing. With receiver ON, set the Contrast control to minimum. Brightness control to near maximum.

3. Disable the blue and green picture tube guns by turning their Screen adjustments to minimum (counter-clockwise). See Figure 27.

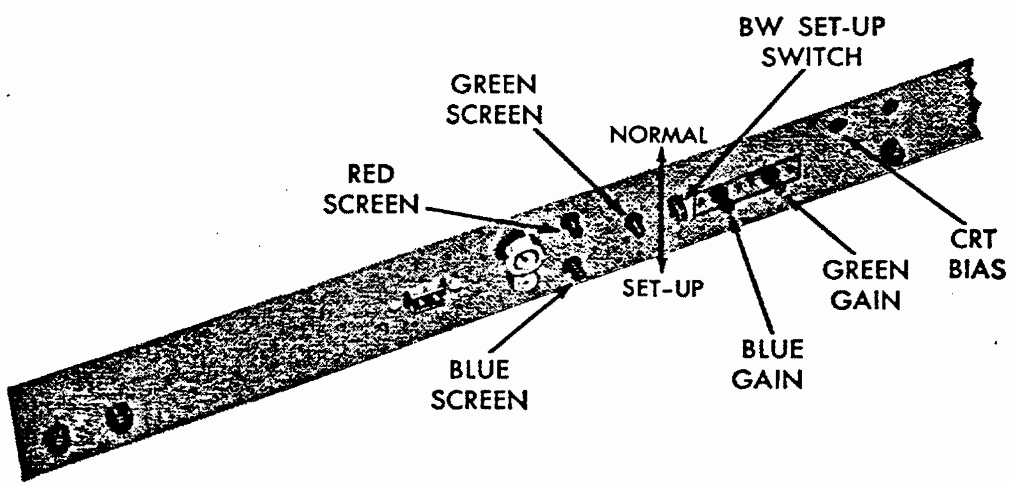


Figure 27—Rear View of Chassis, Showing Location of Black and White Tracking Adjustments.

4. Rotate each Purity Ring (spreading the tabs apart) until the purest red raster is obtained over all of the screen area. If a pure red raster cannot be obtained over all of the screen area, move the deflection yoke forward or backward to improve overall purity until the entire screen is pure red. Purity in the central area of the raster is achieved by the Purity Ring adjustment; outer area purity is achieved by deflection yoke positioning.

5. Check the green raster by turning the Red screen adjustment to minimum and turning up the Green Screen adjustment. The raster should appear green over the entire screen area.

6. Check the blue raster by turning the Green Screen adjustment to minimum and turning up the Blue Screen adjustment. The raster should appear uniformly blue over the entire screen area.

7. Perform black and white tracking.

Black and White Tracking

If a color set is to have good black and white tracking, it must produce black and white pictures within the normal usable range of both the Contrast and Brightness controls. At the extreme settings of the Brightness and Contrast controls, blooming may occur and off-colors may exist even though the receiver may have good black and white tracking within the normal usable range. The three Screen Grid adjustments, the B and G gain, and CRT Bias adjustments, plus the Brightness and Contrast controls, are used for adjusting black and white tracking. During this procedure, the voltages on the cathodes, control grids, and screen grids of the picture tube guns are adjusted to produce black and white pictures throughout the usable range of the Brightness Contrast controls.

To adjust, tune in a monochrome picture that displays an adequate range of light levels, light and grey objects, dark objects, etc. Set the Brightness and Contrast controls for a normal picture. Do not bloom the picture.

1. Set the CRT bias and the three Screen adjustments to minimum (fully counter clockwise.) See Figure 27.

2. Set the BW Switch to Set-Up position. In this position the vertical sweep is removed to facilitate adjustments.

3. Advance each Screen adjustment to just produce a white horizontal line of low brightness through the center of the screen. If one or more of the Screen adjustments fail to produce a line, leave the particular Screen setting(s) at maximum. Advance the CRT Bias setting to just produce a line for that particular Screen adjustment(s).

4. Return the BW Switch to "Normal" position.

5. Alternately adjust the Blue and Green Gain adjustments to produce a normal black and white picture.

   NOTE: If difficulty is encountered in obtaining good black and white tracking, refer to manufacturers' manual.

Check overall black and white tracking throughout the normal Brightness and Contrast range. Accuracy of Screen adjustments is important.

Tune in a CROSSHATCH pattern. Of the twelve adjustments on the dynamic convergence panel, three are used for convergence at the top of the raster; three for the bottom of the raster; three for the left side of the raster; and three for the right side of the raster.

1. Converge pattern at center of screen by adjusting the blue lateral magnet and sliding the permanent magnet adjusting sleeves in or out. If range is inadequate, remove sleeve, rotate 180° and reinsert. See Fig. 28.

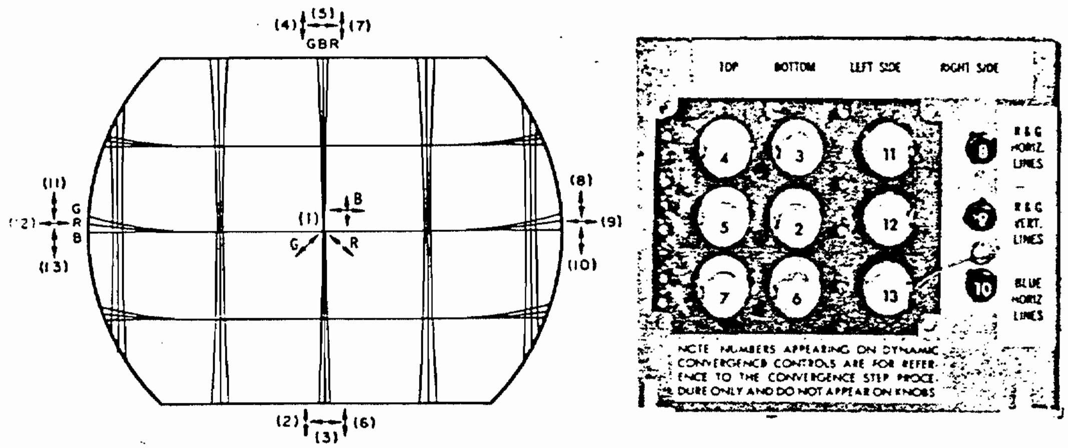


Figure 28

2. Merge the red and green horizontal lines at bottom center of pattern using R&G Horiz. Lines, bottom adjustment.
3. Merge the red and green vertical lines at bottom center of pattern using R&G Vert. Lines, bottom adjustment.
4. Merge the red and green horizontal lines at top center of pattern using R&G Horiz. Lines, top adjustment.
5. Merge the red and green vertical lines at top center of pattern using R&G Vert. Lines, top adjustment.

   Repeat adjustments 1 through 5 to achieve best vertical red-green convergence from top center to bottom center.

6. Merge the blue horizontal line with red and green lines at bottom center of pattern using Blue Horiz. Lines, bottom adjustment.
7. Merge the blue horizontal line with red and green lines at top center of pattern using Blue Horiz. Lines, top adjustment.

   Repeat adjustments 6 and 7 to achieve convergence of blue line with red and green lines from top center to bottom center. If necessary, repeat step 1 to converge the blue beam with the red and green beams.

8. Merge the red and green horizontal lines at right center of pattern using R&G Horiz. Lines, right side adjustment.
9. Merge the red and green vertical lines at right center of pattern using R&G Vert. Lines, right side adjustment.
10. Merge the blue horizontal line with the red and green lines at right center of pattern using Blue Horiz. Lines, right side adjustment.
11. Merge the red and green horizontal lines at left center of pattern using R&G Horiz. Lines, left side adjustment.
12. Merge the red and green vertical lines at left center of pattern using R&G Vert. Lines, left side adjustment.

13. Merge the blue horizontal line with red and green lines at left center of pattern using Blue Horiz. Lines, left side adjustment.

If necessary, repeat adjustments 8 through 13 to achieve best horizontal convergence from left side center to right side center. Although the degree to which color receivers can be converged will vary, good convergence should be achieved within an area out to approximately 2″ from the edges, top and bottom of the raster. Some misconvergence may exist at extreme edges of the raster which is normal and undetected at normal viewing distance.

TROUBLE SHOOTING COLOR CIRCUITS ....

In this section we will simulate certain troubles in a color TV receiver to show you how the Model 1074 Television Analyst will enable you to quickly and accurately locate the defective stage and in some cases even the defective component. We will take full advantage of the fact that the color signals are available at R.F., where it is fed into the antenna terminals, and from the front panel where both the burst and chroma output signals are available for signal injection.

The high level sync signals can be used to test the color amplifiers for their ability to pass demodulated color information. Figure 29 is the color circuitry of a typical color TV receiver. There are various points marked on the schematic from A to Q inclusively. These are the various test points at which we will inject the signals available to us in order to determine that portion of the receiver that has the defect.

No discussion of demodulator alignment will take place in this section, however, the following section is devoted entirely to that subject. A further assumption is made that the black and white portion of the receiver is operating properly and that the only troubles encountered are those in the chroma circuits. Any defects in the black and white portion of the receiver would be serviced in accordance with the trouble shooting procedures outlined in the previous sections of this manual.

Let us asume that a color TV receiver is to be serviced where the complaint is loss of color. Connect the Television Analyst to the color TV receiver, feeding RF signal at some convenient channel, obtaining normal black and white video pattern. Put Pattern switch to the COLOR position, and the Color switch to the RED position. Adjustment of the chroma control and fine tuning will not display a color picture on the kinescope. The trouble is, therefore, in the color circuits of the receiver. As in servicing a black and white portion of the receiver, we always begin our signal injection at the rear end of the signal path of the receiver which in the case of the color circuitry would be the outputs of the demodulator, or the grid of the color picture tube. See Figure 29. This would be Points O, P & Q, the grids of the color kinescope. Since the signal at the grid of the color kinescope is already a demodulator signal, any low frequency source of signal can be used. We will use the composite sync signal which is adjustable in both, phase and amplitude.

Connect the ground lead from the Television Analyst to the ground of the color TV receiver. Connect the test lead into the sync jack and touch the test lead to Points O, P & Q of Figure 29. If the picture tube is capable of accepting color modulation, the raster will turn Red, Green and Blue in turn as the respective grids receive the high level sync signal. The sync level control should be set to the +50V point. We have now established that the picture tube is capable of receiving color modulation and our trouble must lie elsewhere.

We will now check the color difference amplifiers by using the same high level sync test signal, except that we must turn the sync level control to the —50V

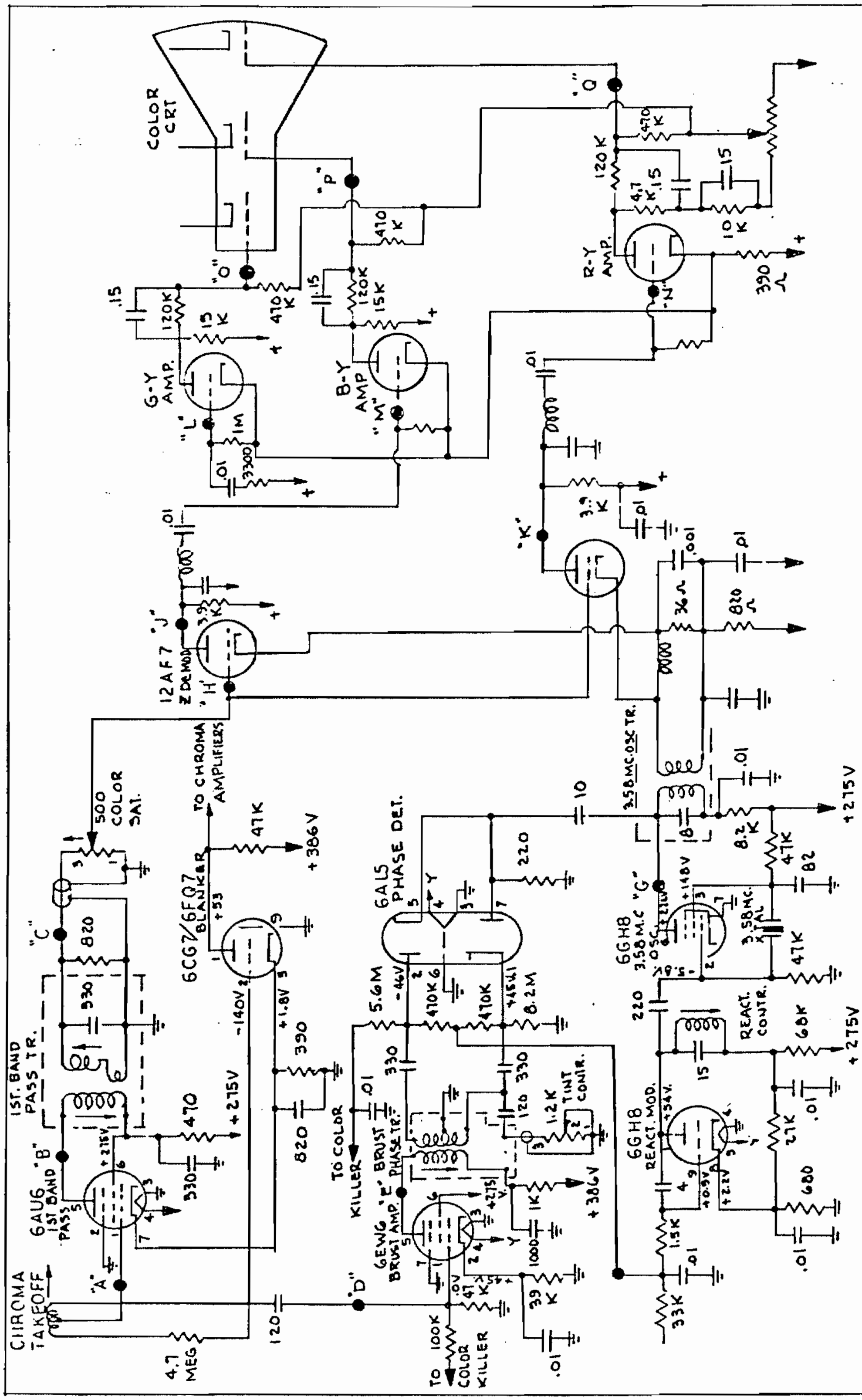


Figure 29—Typical Color Receiver Schematic

position to take into account the phase inversion of these amplifier stages. Again we inject the sync signal to Points L, M & N and the kinescope should light up Green, Blue and Red respectively as the signal is applied to the appropriate color difference amplifiers. If this is the case, then from the grids of the color difference amplifiers to the grid of the picture tube everything is working properly.

We must now test the color demodulators. Shift a signal injection test lead from the sync test jack to the color test jack rotating the color amplitude control to #10. Inject this color signal to point H, which are the demodulator grids, of Figure 29. At this point we see no color. In order for the demodulator to work properly, they must receive two signals. One signal is to the demodulator grid which the Television Analyst is supplying, and the second signal is the reference carrier which is fed to the cathodes and is supplied by the 6GH8 pentode section of Figure 29. Since we are supplying one signal to the grids, the cathode signal must be missing. This points to a defective oscillator section. Voltage and resistance measurements should detect the defective component.

Let us assume another set producing no color and we have already performed the signal injection steps as above explained; when color was injected to the demodulator grids (Point H) color was visible on the kinescope. This establishes that the color oscillator is operating properly and the demodulator sections are operating properly, and our problem must lie in the chroma amplifier.

We now shift our color signal injection to Point B, the plate of the 6AU6 bandpass amplifier. Again we see color on the kinescope; this establishes that the bandpass transformer and the color saturation control are operating properly. We now shift our color signal injection to Point A, the grid of the first bandpass amplifier. At this point we see no color. We have isolated the trouble in the receiver between the grid and the plate circuit of the bandpass amplifier. Voltage readings indicate that the screen voltage is abnormally low, indicating that the 330 mmf screen bypass capacitor could be leaky or shorted.

DEMODULATOR ALIGNMENT

Demodulator Alignment Without Oscilloscope

Demodulator alignment without an oscilloscope can be readily performed using the Model 1074 Television Analyst and observing the result directly on the face of the color kinescope. This technique is both rapid and simple and

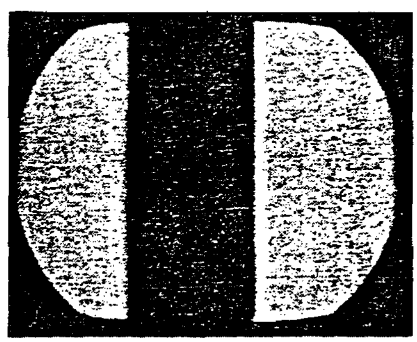


Figure 30—Normal Color Display

every receiver can easily be checked for proper demodulator alignment even in a customer's home. To check for demodulator alignment proceed as follows.

Connect Television Analyst to the receiver antenna terminals. Set Pattern switch to COLOR, and the Color switch to R-Y. Fine tune receiver properly on some unused channel. A color image will be seen as shown in Figure 30 where both the right and left hand sides of the color display are red and the center area is the reference area. Always make this check with the Chroma control at a low level. Disable the red and green guns, or use a gun killer. The picture tube is now displaying only output of the blue demodulator and the Television Analyst is feeding in a R-Y signal. Adjust the Hue control so that the color of the left and right sections of the color display are the same color as the reference area in the center, see Figure 31. Switch the color selector switch to the

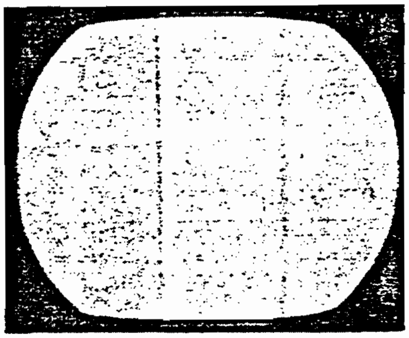


Figure 31—Properly Balanced Demodulators

B-Y position and disable the blue and green grids and leave only the red grid active. We are now feeding in a B-Y signal and observing the output of the R-Y demodulator on the color kinescope. Again the left and right hand color section of the center reference area should be of the same color. Any substantial difference between the color of the reference area and the left and right hand color areas indicate a need for demodulator alignment.

In essence what we just did is as follows. In the first case we fed in an R-Y signal and turned off the red and green guns allowing only the blue gun to remain on. When R-Y is fed into the receiver there should be no signal from the B-Y demodulator, or at the blue grid. When you adjust the Hue control so that the left and right color sections and the center section have the same shade and intensity, you are adjusting the phase angle so that no signal is present at the output of the B-Y demodulator, or blue grid. This means that the B-Y demodulator is properly set for an R-Y signal. When we then feed in a B-Y signal and observe the output of the R-Y demodulator, or red grid, the proper pattern should be obtained without further adjustment of the receiver and the Hue range control should be approximately in the center of its range. If this condition is not satisfied, the demodulators require alignment. This is accomplished by setting the Hue control in the middle of its range. Feed in an R-Y signal and activate only the blue gun. The B-Y demodulator is then adjusted so that all three areas of the picture have the same brightness and color. This is then repeated for the R-Y demodulator by feeding in a B-Y signal with only the red gun active, and adjusting the R-Y demodulator for equality of the three areas on the color kinescope.

Demodulator Alignment Using an Oscilloscope.

Instead of viewing the result of demodulator alignment on the color kinescope, the same information can be displayed on an oscilloscope. It is not necessary to de-activate the un-used grids of the color kinescope since when feeding in an R-Y signal the scope would be connected to the blue grid only and when feeding in a B-Y signai the scope would be connected to the red grid. Figure 32 shows an

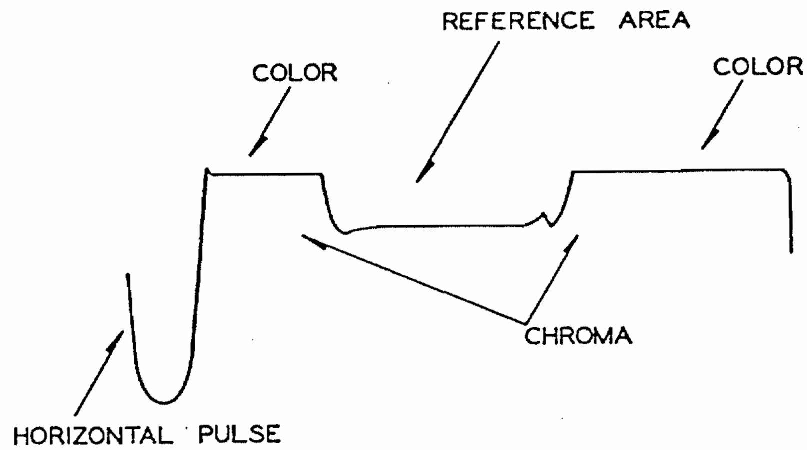


Figure 32

oscilloscope display for an improper aligned demodulator. As you can see the reference area is not at the same amplitude as the color area on either side of it. Therefore, there is some output of a demodulator when a quadrature signal is fed into the receiver. Figure 33 shows an oscilloscope display where the demodulators are properly aligned. You will note that the reference area in the center of the two color areas to the left and right of the reference area are of the same

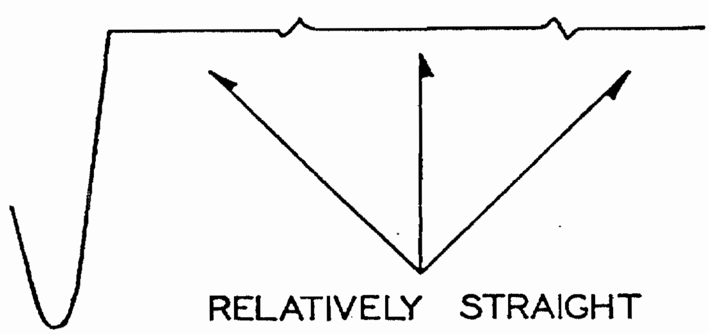


Figure 33

amplitude and form essentially a straight line. The three areas may not be completely straight in some receivers but as long as they are about the same average level correct alignment has been achieved. As an aid in synchronizing the oscilloscope, the horizontal grid drive signal from the front panel of the Television Analyst may be used to externally sync the scope.

THEORY OF OPERATION MODEL 1074

The circuits of the Model 1074 can be conveniently divided into three separate sections. One section is the Frequency Divider Circuits which divide a crystal controlled 189KC frequency down to 60 cycles. The second section is the Color and Sound Circuitry, and the third section is the R.F. Oscillator, Modulator and Sync Circuits. These logical separations actually appear in the finished unit in such a manner that each of the sections is located on a separate printed circuit board.

Frequency Divider Circuits

The Frequency Divider Circuits' function is to provide a fixed frequency relationship between the horizontal and vertical pulses. This is the same technique employed in a TV broadcasting station. This frequency relationship between vertical and horizontal sync pulses is important. It results in a highly stable video pattern without jitter or movement which is so necessary for color servicing.

The beginning of the frequency division chain is a 189KC crystal oscillator. See Fig. 34, a block diagram of the Model 1074 Television Analyst. These 189KC pulses are used to synchronize a 31.5KC multi-vibrator. A second output from the 189KC is used to supply the vertical lines information which will appear when the selector switch is in the Crosshatch or Vertical Lines position. The 31.5KC multi-vibrator has two outputs, one output is used to synchronize the 15.75KC multi-vibrator. This multi-vibrator has four outputs. One output is used to drive the horizontal grid drive amplifier. The second output is used for horizontal sync pulses, the third output is used to key in color burst information, and the fourth output is used to phase-lock a 450 cycle oscillator.

Going back to the 31.5KC multi-vibrator, we find that another output is used to key in color information for the single color display. The third output from this multi-vibrator is used to sync the 4.5KC multi-vibrator. This stage merely acts as an intermediate frequency divider. This enables the instrument to perform frequency division ratios that are not excessive. This is a desirable situation and will result in long term stability of the instrument. The 4.5KC multi-vibrator in turn synchronizes a 900 cycle multi-vibrator. Three signal outputs are available from this stage. One signal is used to synchronize a 450 cycle multi-vibrator, the second output is used to provide an audio tone signal for FM modulated sound carrier, and the third output is used to synchronize a 180 cycle multi-vibrator.

The 450 cycle multi-vibrator has only one output and this is the source of video information for the horizontal lines video signal. This multi-vibrator is synchronized by the 900 cycle multi-vibrator and held in phase-lock by means of the 15.75KC multi-vibrator. This unique arrangement results in a horizontal line that is one scanning line wide and begins and ends with the origin and ending of the horizontal scanning line. This is the ideal signal for use in color convergence.

Let us return to the 180 cycle multi-vibrator which is synchronized by the preceding 900 cycle multi-vibrator. Again, this is an intermediate frequency divider whose sole purpose is to provide long term stability by minimizing frequency division ratios. The 60 cycle multi-vibrator which is synchronized by the 180 cycle multi-vibrator has two outputs. One output is a source of vertical sync pulses, and the second output is used as a driving pulse to drive the vertical grid drive.

Synchronization and Video Circuits

Video information which consists of 189KC vertical lines, 450 cycle horizontal lines and color information are all presented to the pattern selector switch. All mixing and adding of video signal takes place in this switch. The output of this switch is any of the patterns selected by the pattern selector knob. This output signal is fed to V-14A, the video amplifier and sync adder stage. Along with the video information you will note the 15.75KC signal derived from V-8 and the 60 cycle signal derived from V-6 are also applied to V-14A, the video amplifier and sync adder. The output of V-14A is now the composite video signal which is fed to V-16A, the video paraphase amplifier. This stage supplies the video signal that appears at the front panel video output jack and also supplies signal to V-13A, the R.F. modulator. The R.F. modulator receives an R.F. carrier from V-12 and the output of V-13A is the R.F.-I.F. output that appears on the front panel. High level pulses from V-1B, the horizontal grid driving amplifier, and V-13B, the vertical grid amplifier, are mixed together with V-14B to provide a high level composite sync signal. This high level signal is fed to V-16B, the sync paraphase amplifier. The output of this stage appears on the front panel as a 50V separate signal of either plus (+) or minus (—) polarity.

4.5mc Sound System

V-11 is the 4.5mc oscillator and reactance tube to provide FM modulation on the R.F. carrier. The reactance tube receives its source of audio tone signal from V-4 the 900 cycle multi-vibrator. The output of the modulated R.F. oscillator is directly coupled to V-13A, the modulator.

Color Circuits

The color signal originates with V-10 a stable crystal controlled oscillator at the color sub-carrier frequency. A sample of this signal is fed thru the horizontal multi-vibrator where it is keyed in thru the horizontal sync interval and becomes the burst information in the composite video signal. A second output is fed to a delay line. By means of a selector switch control, delays upon this signal can be selected. Various degrees of delay represents different colors and by accurately controlling the delay in each section of the delay line, highly accurate colors are reproduced. The output of this delay line is fed to the pattern switch where it is keyed in by means of the 31.5KC multi-vibrator. When the pattern switch is in the Color position this keyed chroma signal is fed to the video amplifier and becomes part of the composite sync signal.

Shorted Turns Test

V-9 is a shorted turns tester used to detect shorted turns in horizontal deflections transformers and horizontal yoke windings. This is a simple circuit based on a pulse oscillator that is sensitive to both inductance and "Q". When a defective transformer is connected into this shorted turns oscillator the affect on the oscillator is to reduce the operating bias on that stage. This changes any D.C. level as coupled to the second half of V-9 where it is D.C. amplified to a level sufficiently high to strike the neon lamp. This neon lamp is the Good-Bad indicator.

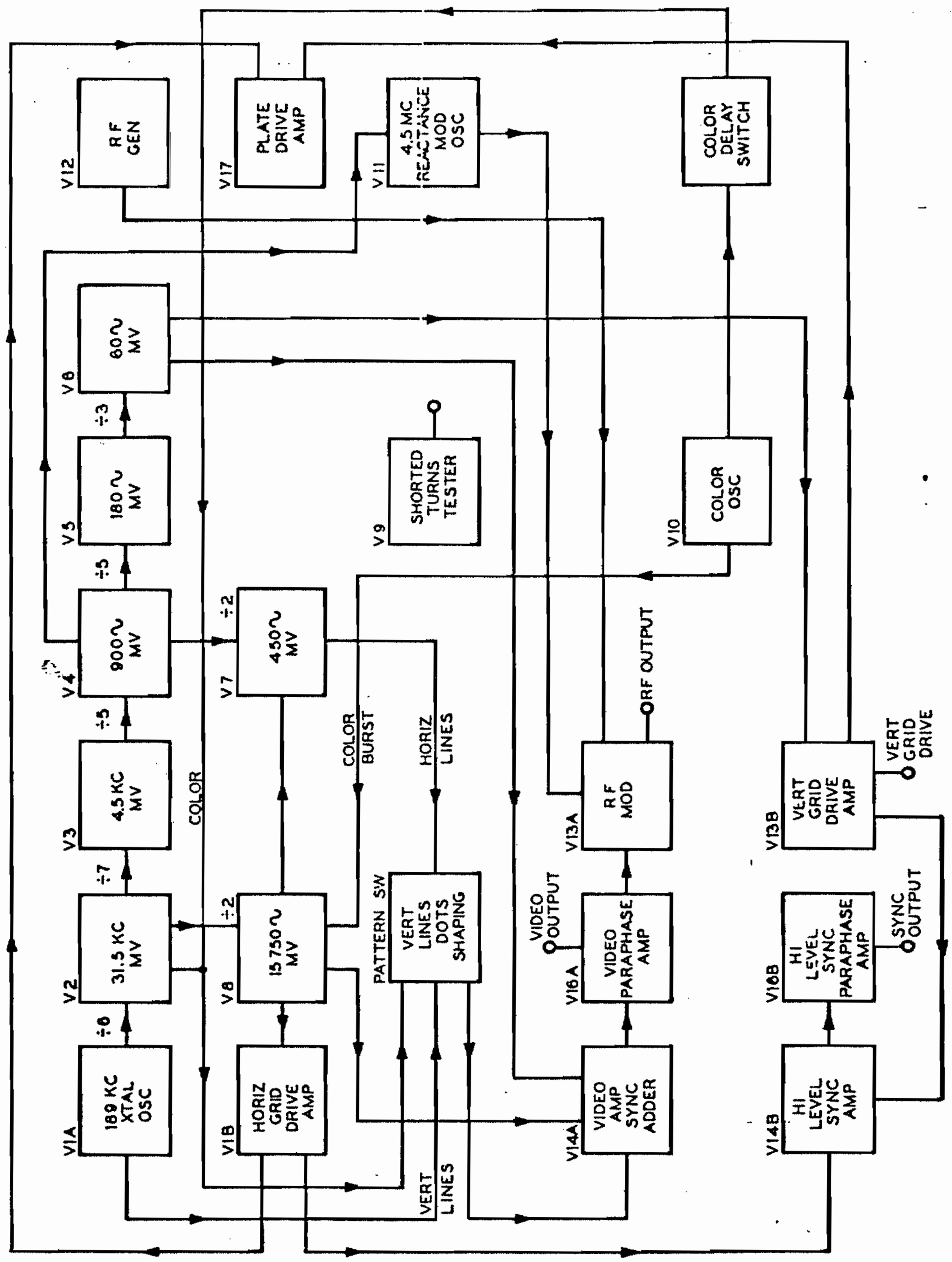


Figure 34—Block Diagram and Signal Path

SERVICE INFORMATION

The enclosed schematic contains complete voltage chart and all key waveforms to assist in trouble shooting the Television Analyst.

The instrument contains a 1 amp line fuse accessible through the cable compartment door on inside rear apron of chassis. Replacement must be made with identical type in order to retain the protection offered by this fuse.

Tubes are accessible from the top of the analyst and can be replaced by removing the chassis from the cabinet.

Under the chassis components are available by removing the cabinet. To remove the cabinet perform the following steps:

1. Remove the two screws at the rear of the cabinet.
2. Remove the screw on bottom rear of cabinet.
3. Remove one screw on each side of unit. DO NOT REMOVE ANY SCREWS FROM FRONT PANEL.
4. Remove cable compartment from bottom of instrument.
5. Slide chassis forward and out of cabinet.

WARRANTY SERVICE INSTRUCTIONS

1. Refer to the maintenance section of the instruction manual for adjustments that may be applicable.
2. Check common electronic parts such as tubes and batteries. Always check instruction manual for applicable adjustments after such replacement.
3. Defective parts removed from units which are within the warranty period should be sent to the factory prepaid with model and serial number of product from which removed and date of product purchase. These parts will be exchanged at no charge.
4. If the above mentioned procedures do not correct the difficulty, pack the product securely (preferably double packed). A detailed list of troubles encountered must be enclosed as well as your name and address. Forward prepaid (express preferred) to the nearest B&K authorized service agency.

Contact your local B&K Distributor for the name and location of your nearest service agency, or write to

Service Department

B&K DIVISION OF DYNASCAN CORPORATION

1801 W. Belle Plaine

Chicago, Illinois 60613

WARRANTY

"B & K warrants that each product manufactured by it will be free from defects in material and workmanship under normal usage and service for a period of ninety days after its purchase new from an authorized B & K distributor. Our obligation under this warranty is limited to repairing, or replacing any product or component which we are satisfied does not conform with the foregoing warranty and which is returned to our factory or our authorized service contractor, transportation prepaid, and we shall not otherwise be liable for any damages, consequential or otherwise. *The foregoing warranty is exclusive and in lieu of all other warranties (including any warranty of merchantability), whether express or implied.* Such warranty shall not apply to any product or component (i) repaired or altered by anyone other than B & K or its authorized service contractor (except normal tube replacement) without B & K's prior written approval; (ii) tampered with or altered in any way or subjected to misuse, negligence or accident; (iii) which has the serial number altered, defaced or removed; or (iv) which has been improperly connected, installed or adjusted otherwise than in accordance with B & K's instructions. B & K reserves the right to discontinue any model at any time or change specifications or design without notice and without incurring any obligation. *The warranty shall be void and there shall be no warranty of any product or component if a B & K warranty registration card is not properly completed and postmarked to the B & K factory within five days after the purchase of the product new from an authorized B & K distributor.*"

B & K DIVISION OF DYNASCAN CORPORATION

1801 W. BELLE PLAINE AVE. • CHICAGO, ILL. 60613

PM 382 4-67 R R PRESS

B & K MODEL 1074 PARTS AND PRICE LIST

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART No.	DEALER'S NET
	Tuner Cover	A-157A	.63
	Front Panel with Decorative Frame, Banana Jacks, Slide Switches	ASM-B091	10.92
	Case Assembly with Handle, Feet, and Cable Compartment	ASM-B093	13.59
	Cable Compartment Only	A-300A	3.00
	Cable Compartment Spring	SP-20	.15
	Nylatch Grommet	H-399	.15
	Nylatch Plunger	H-400	.15
	Complete Probe Assembly	ASM-B094	7.17
Consists of:			
	1 Red Test Lead—Alligator Clip One End	ASM-B038	.69
	1 Hi-Voltage Indicator	ASM-B037	.60
	1 Black Test Lead—Alligator Clip One End	ASM-B036	.75
	1 Red Test Lead—Tip Plug One End	ASM-B035	.75
	1 R.F. Cable	ASM-B033	3.00
	1 Slip On Alligator Clip	ASM-B034	.45
	1 Slip On Probe with Hook Tip	H-143	.93
	Rubber Feet	H-250	.06
	Handle with Mounting Plates	H-228	.33
	Panel Microphone Jack	J-16	.24
	Black Banana Jack	J-59	.09
	Red Banana Jack	J-60	.09
	¾" Dia. Skirt Knob	K-13	.33
	1" Dia. Skirt Knob	K-14	.39
	Line Cord	W-49	.42
	Carton & Fillers	PKG-123	2.37
	Instruction Book	PM-382	1.00 each
	Voltage & Wave Form Chart	PM-409	

(Prices subject to change without notice.)

NOTE—Standard value resistors and capacitors are not listed. Values may be obtained from schematic diagram.

Minimum charge $1.00 per invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover postage or express charges.

PM 388 10-63 R R Press

B & K MODEL 1074 PARTS AND PRICE LIST

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART No.	DEALER'S NET
	CAPACITORS		
C-4	20 MFD @ 350 WV Non-Polarized Pigtail Electrolytic	CL-20-350NP	1.08
C-6	20 - 20 - 20 - 20 }MFD Quad.-Section 450-450-250-250}WVDC Electrolytic	CL-20-20-20-20 450-450-250-250	1.80
C-7	40 - 40 - 80 }MFD Tri.-Section 250-250-250 }WVDC Electrolytic	CL-40-40-80 250-250-250	1.77
C-8	I. F. Tuning	CV-10-280X2 Available only as part of ASM-B087	
C-15	180-680 PF Trimmer (B-Y Adjust, Internal)	CV-179-681	.45
C-212	64 MFD @ 10 WV Electrolytic	CL-64-10	.33
C-216	2-20 PF Variable Trimmer (Color Frequency, Internal)	CV-2-20	.24
C-407	20 MFD @ 250 WV Pigtail Electrolytic	CL-20-250	.72
C-412 C-413 C-414	10 MFD @ 175 WV Printed Circuit Electrolytic	CL-10-175PC	.63
	RESISTORS — CONTROLS		
R-3	100K Ohm SHORTED TURNS Cal Control	P-60	.54
R-6	50K Ohm VIDEO Gain & Polarity Control	P-69	.57
R-24	50K Ohm, SYNC Gain & Polarity Control	P-69	.57
R-7A R-7B	Dual Pot. 500 Ohm—500K R.F. Attenuator	P-56	1.20
R-8	100K Ohm COLOR Gain Control	P-60	.54
R-9	250K Ohm VERTICAL GRID DRIVE Control	P-57	.57
R-21	Part of M-2 Not Available Separately.		
R-23	Plus, Minus BIAS Control	P-130	.63
R-108 R-109 R-160	31.5KC Adjust Control (Internal) 4.5KC Adjust Control (Intenral) 450 Cycle Adjust Control (Internal) }3 Section Control	P-127	1.11
R-112 R-151	1 Megohm ½ W ± 5% Deposited Carbon Resistor	RCA-105-A-5	.09
R-113 R-117 R-121	900 Cycle Adjust Control (Internal) 180 Cycle Adjust Control (Internal) 60 Cycle Adjust Control (Internal) }3 Section Control	P-127	1.11
R-116 R-157	2.7 Megohm ½ W ± 5% Deposited Carbon Resistor	RCA-275-A-5	.21
R-120 R-129 R-133 R-135 R-161	2.2 Megohm ½W ± 5% Deposited Carbon Resistor	RCA-225-A-5	.21
R-124	360K Ohm ½W ± 5% Depoisted Carbon Resistor	RCA-364-A-5	.09
R-127 R-150	Dot Amplitude Adjust (Internal) 15.750 KC Adjust (Internal) }Dual Section Control	P-126	.93
R-128 R-147	820K Ohm ½W ± 5% Deposited Carbon Resistor	RCA-824-A5	.09

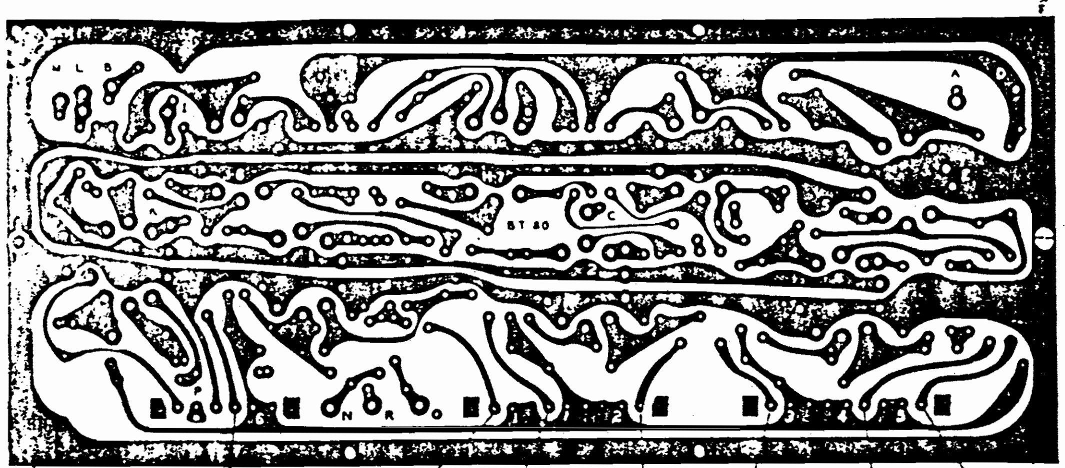
B & K MODEL 1074 PARTS AND PRICE LIST

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART No.	DEALER'S NET
R-137	5.6 Megohm ½W ± 5% Deposited Carbon Resistor	RCA-565-A-5	.21
R-164	1.2 Megohm ½W ± 5% Deposited Carbon Resistor	RCA-125-A-5	.21
R-405	1.2K Ohm 1 Watt ± 5% Glass Resistor	RG-122-1-5	.21
R-407	500 Ohm Composit Sync Level Adjust (Internal)	P-63	.33
	CHOKES — COILS — TRANSFORMERS		
L-1	30 UH, 3.58 MC Peaking Coil	L-13	.39
L-2	6.8 UH, Blue to Green Delay Coil	CH-11	.36
L-3	2.2 UH, B-Y to Blue Delay Coil	CH-10	.33
L-4	3.3 UH, Q to B-Y Delay Coil	CH-8	.33
L-5 L-6	1 UH, I to R Delay Coil 1 UH, R to R-Y Delay Coil	CH-7	.33
L-7	3.3 UH, R-Y to Q Delay Coil	CH-8	.33
L-101	39 UH, Peaking Coil	L-27	.18
L-201	50 Millihenry Shorted Turns Oscilator Coil	L-47	.45
L-202	4.5 MC Oscillator Coil	L-23	.63
L-203	30 UH Peaking Coil	L-13	.39
L-204	18-36 UH Color Burst Phase Adjust	L-53	.42
L-301	I.F. Coil Less Slug & Form	L-28	.06
L-302	Channel No. 2 Coil Less Slug & Form	L-29	.09
L-303	Channel No. 3 Coil Less Slug & Form	L-30	.09
L-304	Channel No. 4 Coil Less Slug & Form	L-31	.12
L-305	Channel No. 5 Coil Less Slug & Form	L-32	.12
L-306	Channel No. 6 Coil Less Slug & Form	L-33	.12
L-307	Channel No. 7 Coil Less Slug & Form	L-34	.06
L-308	Channel No. 8 Coil Less Slug & Form	L-34	.06
L-309	Channel No. 12 Coil Less Slug & Form	L-37	.06
L-310	Channel No. 13 Coil Less Slug & Form	L-36	.09
	Slug for I.F. Coil and Channels 2-3-4-5	H-222	.03
	Slug for Channels 6-7-8-12-13	H-223	.06
	Coil Form for I.F. & R.F. Coils	IN-20	.03
L-401	68 UH Peaking Coil	L-54	.57
L-402 L-403	3.3 UH R.F. Chokes	CH-8	.33
T-1	Power Transforemr (60 Cycle)	TP-38	7.32
T-1	Power Transformer (117-234V—50 Cycle)	TP-40	11.28
	SWITCHES		
SW-1	PATTERN Switch	S-89	1.05
SW-2	COLOR Switch	S-84	1.32
SW-3 SW-4	PLATE DRIVE Selector Switch OFF STANDBY ON Switch	S-3	.42
SW-5	AUDIO Off-On Switch	S-22	.12
SW-301	Channel Selector Switch	S-88	1.35

B & K MODEL 1074 PARTS AND PRICE LIST

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART No.	DEALER'S NET
	CRYSTALS — DIODES		
X-101	189 KC Crystal	C-11	7.80
X-201	3.579545 MC Crystal	C-9	3.60
D-1 D-2 D-101 D-103 D-201	Diode	D-4-25	.18
D-102 D-401	Diode	D-S1-50	.42
D-402 D-403 D-404	Diode	D-360	.69
	TUBES		
V-1	6AN8 (189KC Osc. & Horiz. Grid Drive Amplifier)	V-6AN8	2.00
V-2	6CG7 (31.5KC Multi-Vibrator)	V-6CG7	1.23
V-3	6CG7 (4.5KC Multi-Vibrator)	V-6CG7	1.23
V-4	6CG7 (900 Cycle Multi-Vibrator)	V-6CG7	1.23
V-5	6CG7 (180 Cycle Multi-Vibrator)	V-6CG7	1.23
V-6	6CG7 (60 Cycle Multi-Vibrator)	V-6CG7	1.23
V-7	6CG7 (450 Cycle Multi-Vibrator)	V-6CG7	1.23
V-8	6CG7 (15.750KC Multi-Vibrator)	V-6CG7	1.23
V-9	6AN8 (Shorted Turns Oscillator & D.C. Amplifier)	V-6AN8	2.00
V-10	6AN8 (Color Amplifier; Color Oscillator)	V-6AN8	2.00
V-11	6AN8 (4.5 MC Osc., Reactance Mod.)	V-6AN8	2.00
V-12	6CB6 (R.F.-I.F. Osc.)	V-6CB6	1.13
V-13	12AT7 (RF Mod. & Vertical Grid Drive Amp.)	V-12AT7	1.53
V-14	12AT7 (Video Amp., Sync Amp.)	V-12AT7	1.53
V-15	6X4 (High B+ Rectifier)	V-6X4	.83
V-16	12AU7A (Sync Paraphase Amp., Video Paraphase Amp.)	V-12AU7A	1.23
V-17	6DQ6B (Plate Drive Amp.)	V-6DQ6B	2.08
	MISCELLANEOUS		
M-1	NE-2-L Lamp	PL-9	.33
M-2	Pilot Light Assembly	PL-16	.57
F-1	1 Amp. "Slo-Blo" Fuse	F-16	.27
	Complete Counter Board (Board #1 with All Components Less Tubes)	ASM-B090	35.52
	Complete Audio Board (Board #2 with All Components Less Tubes)	ASM-B089	17.43
	Complete Tuner Assembly (Board #3 with All Components Less Tubes)	ASM-B087	16.59
	Complete Video-Sync-Power Board (Board #4 with All Components Less Tubes)	ASM-B088	18.36

BOTTOM VIEW OF COUNTER BOARD



COUNT CIRCUIT ALIGNMENT

ADJUST VOLTAGES AT EACH TEST POINT WITH ASSOCIATED POT WHICH IS DIRECTLY ABOVE TEST POINT ON OTHER SIDE OF BOARD.

ADJUST IN SEQUENCE 1 THRU 7.

ALL VOLTAGES MEASURED WITH VTVM WITH 11 MEG INPUT IMPEDANCE.

ALL VOLTAGES MEASURED WITH 117VAC LINE AND ARE MEASURED WITH RESPECT TO GND.

VOLTAGE CHART—MODEL 1074

TUBE		PIN NUMBERS 1	2	3	4	5	6	7	8	9	CAP
V-1	6AN8	296	−18	.89	6.3 AC	0	136	93.5	−12.6	.014	—
V-2	6CG7	78	−14	.86	6.3 AC	0	85	−15.1	0	0	—
V-3	6CG7	79	−43	.03	6.3 AC	0	63	−21	0	0	—
V-4	6CG7	89	−28.5	1.2	6.3 AC	0	69	−21	0	0	—
V-5	6CG7	70	−39	.09	6.3 AC	0	75	−27	0	0	—
V-6	6CG7	130	−40	.13	6.3 AC	0	9.8	−3.25	0	0	—
V-7	6CG7	137	−24	.41	6.3 AC	0	39.5	2.7	0	0	—
V-8	6CG7	98	−14	.11	6.3 AC	0	17.5	−2.5	0	0	—
V-9	6AN8	150	−8.05	3.8	0	6.3 AC	80	53	−.43	0	—
V-10	6AN8	114*	−1.0*	0*	0	6.3 AC	27*	69*	−9.0*	.52*	—
V-11	6AN8	30	−2.6	.26	0	6.3 AC	128	101	0	2.0	—
V-12	6CB6	−.18	.44	6.3 AC	0	93	85	0	—	—	—
V-13	12AT7	95	−.92	0	6.3 AC	6.3 AC	220	−56	.05	0	—
V-14	12AT7	105	.04	.66	6.3 AC	6.3 AC	134	−.03	.89	0	—
V-15	6X4	325 AC	0	0	6.3 AC	0	325 AC	420	—	—	—
V-16	12AU7A	66	−113	−92	6.3 AC	6.3 AC	106	7.2	10.0	0	—
V-17	6DQ6B	359	6.3 AC	−134	113	−52	−52	0	0	—	¶

¶ *Do not Measure.*

* *Measurements on V10 made with pattern switch in COLOR position.*

All front panel controls CW

Audio switch ON

Measurements on V17 made with plate drive switch in HORIZ. position.

All voltages read with pattern switch in CROSSHATCH position.

All voltages read with 11 meg. VTVM A.C. and D.C.

All voltages read with respect to chassis ground.

All voltages read with unit connected to 117VAC line.

Measurements on V12 made in I.F. position with tuning gang fully C.W.

MODEL 1074 WAVE FORMS

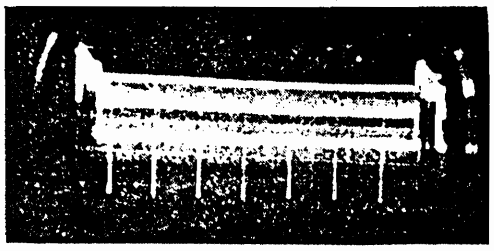


Fig. 1. VIDEO OUTPUT JACK. Pattern switch in "Dots" position scope freq. 60~ 2.0V P-P variable, and ± phase available with front panel control.

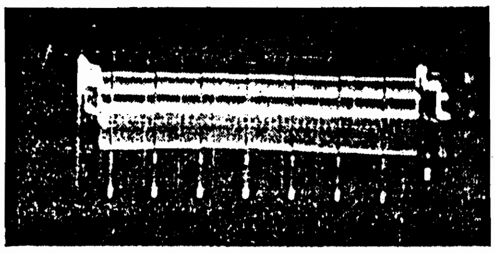


Fig. 2. VIDEO OUTPUT JACK. Pattern switch in "Crosshatch" position scope freq. 60~ 2.5V P-P variable, and ± phase available with front panel control. Adjust sync level for .8V P-P with "Composite Sync. Adj." This pot is between V13 and V14.

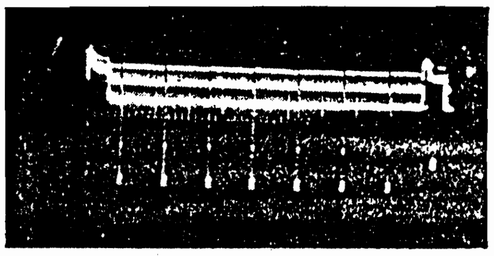


Fig. 3. VIDEO OUTPUT JACK. Pattern switch in Horiz. Lines position scope freq. 60~ 2.5V P-P variable, and ± phase available with front panel control.

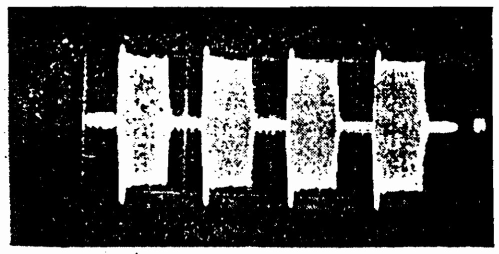


Fig. 4. COLOR OUTPUT JACK. Pattern switch in Color position scope freq. 7875~ 15V P-P (variable with front panel control).

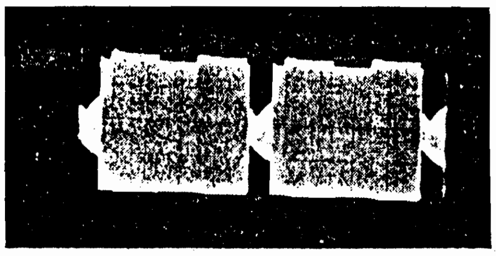


Fig. 5. BURST OUTPUT JACK. Pattern switch in Color position scope freq. 7875~ 5V P-P.

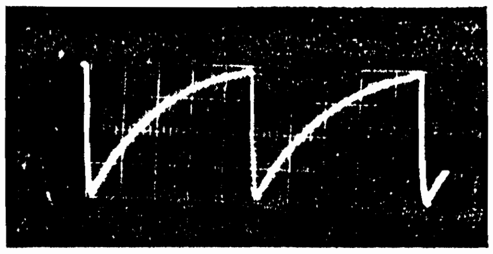


Fig. 6. VERTICAL GRID DRIVE JACK. Scope freq. 30~ 265V P-P (variable with front panel control).

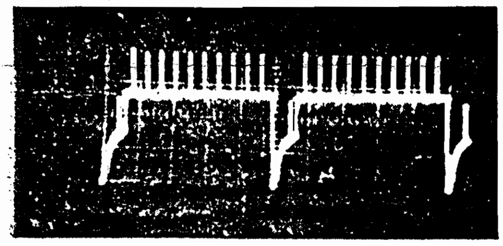


Fig. 7. VIDEO OUTPUT JACK. Pattern switch in "Vert. Lines" position. Scope freq. 7875~ 2.0V P-P variable, and ± phase available with front panel control.

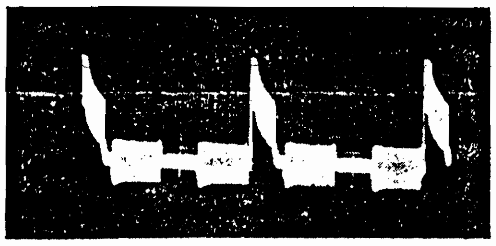


Fig. 8. VIDEO OUTPUT JACK. Pattern switch in "Color" position scope freq. 7875~ 1.5V P-P variable, and ± phase available with front panel control.

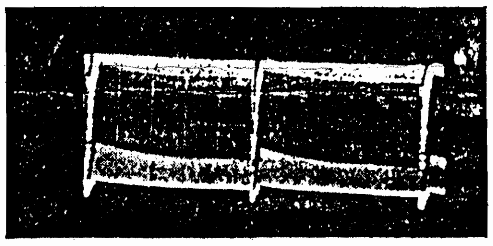


Fig. 9. SYNC OUTPUT JACK. Scope freq. 30~ 50V P-P variable, and ± phase available with front panel control.

Fig. 10. PIN #3 of V2 scope freq. = 7875~ 2.0V P-P.
(Test point #1)

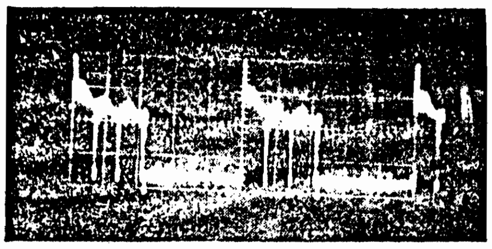


Fig. 11. PIN #3 of V3 scope freq. = 2250~ 0.4V P-P.
(Test point #2)

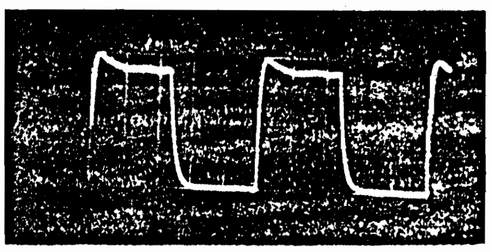


Fig. 12. PIN #3 of V4 scope freq. = 450~ 3.0V P-P.
(Test point #3)
Same as 900~ audio front panel.

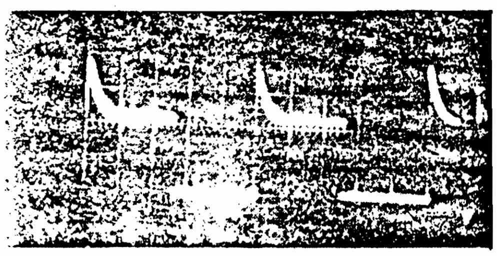


Fig. 13. PIN #3 of V5 scope freq. 90~ 0.35 V P-P.
(Test point #4)

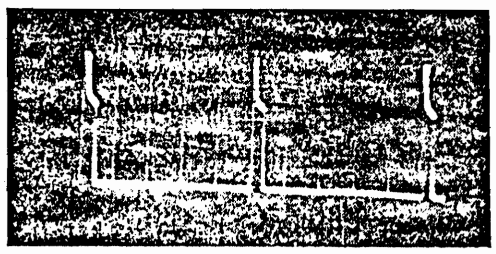


Fig. 14. PIN #3 of V6 scope freq. 30~ 2.6V P-P.
(Test point #5)

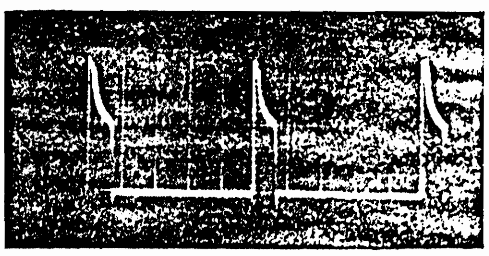


Fig. 15. PIN #3 of V8 scope freq. 7875~ 1.25V P-P.
(Test point #6)

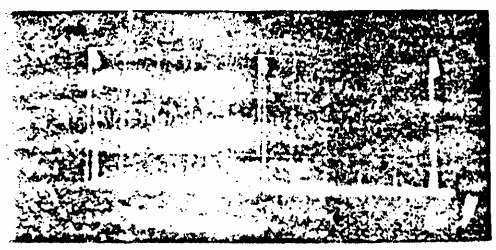


Fig. 16. PIN #3 of V7 scope freq. 225~ 6.0V P-P.
(Test point #7)

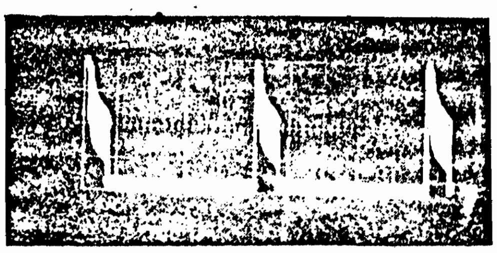


Fig. 17. POINT "I" near V8 on board #1 scope freq. 7875~ 1.25V P-P. Pattern sw. in Color pos. 3.579545 burst on horiz. sync. pulse.

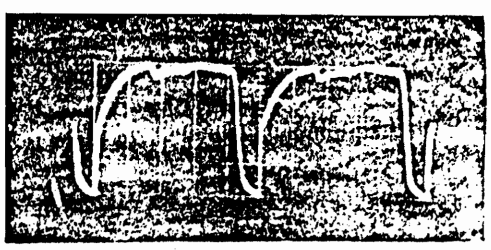
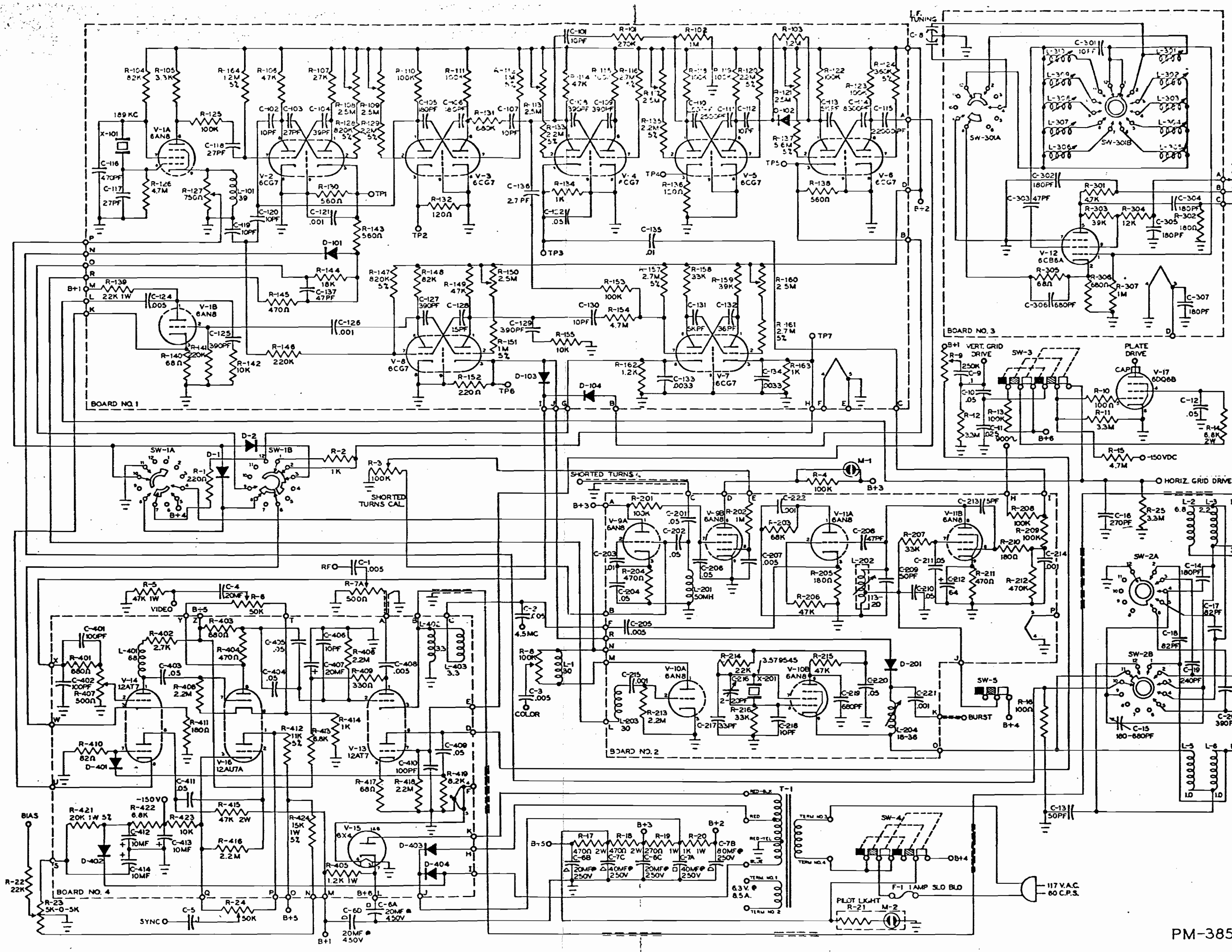


Fig. 18. PIN #1 of V1 scope freq. 7875~ 275V P-P. Same as "Horiz. Grid Drive" front panel


BOARD NO. 1
BOARD NO. 2
BOARD NO. 3
BOARD NO. 4
I.F. TUNING
189 KC
HORIZ. GRID DRIVE
VERT. GRID DRIVE
PLATE DRIVE
-150VDC
SHORTED TURNS
SHORTED TURNS CAL.
VIDEO
SYNC
BIAS
RF
COLOR
4.5 MC
BURST
3.579545
PILOT LIGHT
F-1 1 AMP SLO BLO
117 V.A.C. 60 C.P.S.

PM-385-B