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Old Hands at Dependability
Servicing With An Absorption Analyzer

An absorption analyzer is a useful piece of test equipment. The techniques for using this device are discussed in this article.

IME is money. Any device that will enable a service technician to cut the length of time required to service a receiver is a money-saver.

A typical absorption analyzer, (Fig. 1) is a dynamic test equipment unit capable of extremely fast and accurate checks of circuit operation, without the necessity of removing the equipment from its cabinet. Although this article will deal mainly with the use of the instrument for service of black and white, and color TV receivers, the uses are wide and varied. Essentially the instrument can be used wherever a waveform is present in a vacuum tube circuit. This covers a lot of territory, and a lot of equipment. Some of the additional uses are in repair of radios, communication receivers, transmitters, radar, etc.

Pickup Probes

The heart of the analyzer is an electrostatic pick-up probe. The probe, by its special shape and design, is capable of being capacity coupled to the signal in the plate circuit of a tube. Since the plate of a vacuum tube is the outermost electrode, placing a circular metal conductor about the tube envelope permits capacitive coupling to the circuit.

Picking up the plate signal in this manner has two great advantages. First, there is no direct connection to the circuit and therefore no loading of the circuit under test. Second, the ease and speed with which it can be accomplished. As shown in Fig. 2, the probes are constructed for the various size tube envelopes. A half ring or crescent probe is for use with dual type tubes such as the 6SN7, where each half of the tube may have a different signal. In addition to the electrostatic pick-up probe, a direct probe, (Fig. 3) with a built-in attenuator is available for conventional oscilloscope servicing with the analyzer.

Analyzer Input

The signal picked up by the probe is applied to the analyzer. The analyzer block diagram (Fig. 4) shows the basic circuits to consist of a front end, (tuner), detector and a specially designed oscilloscope. The input, if already detected, may be switched directly to the vertical amplifier of the oscilloscope. When applying an rf, or if signal, the input is switched to the appropriate position and applied to

Fig. 1—Absorption analyzer and probe. Note the few controls.

Fig. 2—Several probe tips are supplied for different tubes.

Fig. 3—This probe permits the analyzer to be used as a scope.

Fig. 4—The block diagram of the absorption analyzer is much the same as that of a scope except for the special input circuit.
the tuner.
The temperature is the well-known Standard CoI rotary drum type, which comes complete with all 12 of channel strips. In addition, special tuner coil strips are supplied for 3.58, 4.5, 20 and 40 me bands. These are inserted in place of the unused channels in the local area in which the service technician is located. These special tuner coil strips are for use with TV TV circuits, TV intercarrier sound if circuits, and both 20 and 40 me if circuits.

Sweep Amplifiers

The oscilloscope sweep amplifiers differ slightly with the two other analyzer models available. The analyzer model illustrated has been designed exclusively for the radio and television service technician. A quick snap of the switch will set the oscilloscope sweep circuits to the correct frequency for use with either a vertical circuit signal, or a horizontal circuit signal. Another model analyzer designed for general purpose use contains a variable frequency stepping switch permitting the selection of any desired oscilloscope sweep frequency.

Operation

Operation of the instrument in actual use is rapid and it takes more time to discuss than to do. All operations can be carried out without removal of the receiver chassis from its cabinet. The entire instrument has been designed for portable field use as well as bench use.

The use of the instrument is simple since the number of controls having been kept to a minimum. When checking an rf or if signal the input selector is set to the appropriate setting, the band selector switch, (tuner), is set for the desired channel or if frequency, and the oscilloscope sweep switch set to V or H for vertical or horizontal signal viewing. The probe is then used to follow the signal throughout the circuits for quick location of weak, distorted, noisy, or missing signals. The use of the electrostatic probe, permitting top-side operation, alleviates the time consuming job of disassembling a receiver. Probing about the underside of a chassis with its accompanying tedious, frustrating location of the correct tube socket, and tube socket terminal, is also reduced. The accompanying trouble shooting chart will best illustrate the ease and rapid use of the analyzer in following the signal waveforms from antenna to CRT and speaker.

<table>
<thead>
<tr>
<th>Circuit under test.</th>
<th>Test for the following.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna</td>
<td>Test for the input rf signal. An open or intermittent lead-in. Use for antenna orientation. Check for incoming noise signals. Feed the lead-in through the probe, run the probe up and down the lead-in to check for standing waves.</td>
</tr>
<tr>
<td>RF Amplifier</td>
<td>Check for cathode to heater 60 cycle leakage. Test for weak rf input signal. Check for overloading and sync clipping due to wrong setting or defective agc, gassy tube, etc.</td>
</tr>
<tr>
<td>Oscillator and Mixer</td>
<td>An if output indicates the oscillator and mixer are operating correctly. To localize the difficulty with no if output, set the analyzer tuner for the correct channel. An rf output indicates the mixer is operating, and the difficulty is in the oscillator.</td>
</tr>
<tr>
<td>IF Amplifier</td>
<td>Test for increasing gain with each succeeding stage. Check for cathode to heater 60 cycle leakage. Examine the waveform for 120 cycle power supply hum. Check for overloading and sync clipping due to wrong setting or defective agc, gassy tube, etc. Test for noise pickup at the same frequency as that used for the if circuits.</td>
</tr>
<tr>
<td>Detector and Video Amplifier</td>
<td>Check for detected output signal. Test for gain from detector to output signal applied to the CRT. Check for proper contrast action by examining the variation in gain while varying the contrast control.</td>
</tr>
<tr>
<td>Sync Separator</td>
<td>Check for the presence of sync pulses. Examine the waveform for the absence of video information. Test for the correct amplitude of the sync pulses.</td>
</tr>
<tr>
<td>AGC</td>
<td>To check for agc action, check the waveform of the rf amplifier, remove an if amplifier tube. The agc applied to the rf amplifier will increase the gain of the rf amplifier, increasing the amplitude of the waveform present. Replacing the if amplifier tube, the increased agc voltage will return the gain of the rf amplifier to normal. For series string tube circuits, varying the AGC control will indicate variation in gain in the rf amplifier.</td>
</tr>
<tr>
<td>Keyed agc</td>
<td>Check for the presence of horizontal pulses in the keyed agc tube.</td>
</tr>
<tr>
<td>Vertical Oscillator and Amplifier</td>
<td>Check the oscillator for sweep signal output. Test the vertical amplifier for the presence and proper amplitude of the vertical sweep voltage waveform. In receivers using the vertical pulse for vertical retrace blanking, check for the presence of the vertical blanking pulse at the signal lead of the CRT.</td>
</tr>
<tr>
<td>Horizontal Oscillator and Amplifier</td>
<td>Test for the presence of the horizontal oscillator signal waveform. The shape of the horizontal oscillator waveform will vary with the type of horizontal circuit used. Test the horizontal amplifier for the presence and proper amplitude of the horizontal sweep voltage waveform. Check the damper tube operation by the presence of the horizontal output pulse waveform.</td>
</tr>
<tr>
<td>Sound if Amplifier</td>
<td>For audible signal testing plug earphones into the front panel jack labelled Sound. Test for the presence of sound at the video amplifier. Where the sound take-off is at video detector, the presence of audio will have to be tested at the sound if tube.</td>
</tr>
</tbody>
</table>

[Continued on page 28]
Dear Mr. Answerman:

I have a condition of vertical bars appearing in the left portion of the picture on an Emerson chassis 120381-M that I don't seem to be able to eliminate. I have checked the circuits thoroughly and nothing appears to be defective. The only possible reason I can find for the deflection circuit ringing is the fact that the customer has just moved into a new home where the line voltage is abnormally high. The high B plus voltage may be causing the trouble. If this is the case what can you suggest I do?

L. G.
Dallas, Texas

Horizontal deflection coil ringing produces a fluctuation in the horizontal deflection magnetic field. This causes the electron beam to slow down or speed up according to the nonlinearity or ripple developed in the deflection current sawtooth for each horizontal line. Thus, vertical bars result, generally on the left side of the picture. This condition is different from that of each line being displaced vertically due to a defect in the vertical deflection system. It is therefore most important to determine which type of trouble is being experienced. In other words, deflection in the picture on the left side can be due to ringing in the horizontal deflection coils, an unbalance between the two deflection coils or an excessive coupling between the horizontal and vertical deflection coils. To be able to correct the condition requires that the nature of the problem be known.

If examination reveals that the vertical bars are the result of ringing in the horizontal deflection system, it is quite possible, as you mention, that the high line voltage has brought about the nonlinearity or ringing in the horizontal deflection circuit. Since you have most probably checked the condensers shown in Fig. 1, the next step that can be taken is to make several changes that will possibly clear up the condition. Resistor R83 can be reduced from 10K ohms to 2.2K ohms adding to the damping affect of this resistor. Condenser C39, .047 mf, can be removed from its connection at terminal 2 of the horizontal output transformer and connected directly to the 255 volt source which will also decrease the possibility of deflection circuit.

Fig. 1—Flyback transformer for the Emerson 120381M.
resonance.

Of course, the possibility exists that at some previous time the yoke may have been replaced by a supposed equivalent substitution and now with the higher $B$ plus the ringing is more pronounced. It may very well be that more capacity is required to lower the resonant frequency of the horizontal windings and thereby reduce the susceptibility to ringing. Therefore if the condition persists vary the capacitances of $C_{40}$ and $C_{41}$ to see if the condition can be corrected. Another 68 muf might be added in parallel with the existing condenser $C_{40}$.

If the inspection of the picture has revealed that the vertical bars are the result of the electron beam being displaced vertically it is most likely occurring because of a large amount of capacitive coupling between the horizontal and vertical windings of the yoke. This allows a horizontal deflection on pulse to be coupled into the vertical deflection coil.

This latter type of picture distortion is frequently reduced or eliminated by adding a condenser of about 270 muf between the horizontal and vertical windings of the yoke. Connect the condenser between the center of the vertical winding and the rf ground side of the horizontal winding thereby bypassing the high frequency pulses to rf ground potential. If the addition of a condenser does not correct the condition it is suggested that the yoke be replaced with a replacement recommended by the receiver manufacturer.

Dear Mr. Answerman:

We have a problem with a 27 series Magnavox TV receiver which you may be able to help us with. There is a hum or horizontal bright bar across the center of the picture which I have been unable to eliminate. I have checked by substitution all tubes in the receiver which might cause such a hum in the picture, and tested all the electrolytic condensers, etc. We would appreciate any thoughts you may have that might permit us to correct this trouble.

E. C.
St. Louis, Mo.

The Magnavox Service News Letter made available through their general service manager mentions in the April 3, 1958 issue a correction for this possible trouble. The letter states that a 0.05 mf, 500 volt ceramic capacitor should be shunted across the power rectifier as shown in Fig. 2 to eliminate the hum bar. Evidently the power rectifier is radiating a pulse which is being picked up somewhere along the video signal path and applied to the picture tube.

[Continued on page 30]
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### ALIGNMENT REQUIREMENTS

**Signal Generator** — Use generator providing modulated 455KC and AM broadcast frequencies. Connect a 4 or 5 turn loop of wire across output cable. Keep output of generator low enough to just give an indication on VTVM or output meter. Keep volume control at maximum to avoid AVC action.

**Indicator** — Connect VTVM or output meter across voice coil.

**Receiver** — Set volume control to maximum. Be sure during RF alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.

**Alignment Tool** — Use a fiber aligning tool that snugly fits the slot in the ferrite core to prevent chipping of the slot.

### ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Loosely couple modulated signal to:</th>
<th>Generator frequency</th>
<th>C1 setting</th>
<th>Adjust for maximum:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop L1</td>
<td>455KC</td>
<td>maximum</td>
<td>T3, T2 and T1 in order. Reduce generator output if necessary for T2 and T1 adjustments</td>
</tr>
<tr>
<td>Loop L1</td>
<td>1625KC</td>
<td>minimum</td>
<td>Oscillator trimmer &quot;D&quot;</td>
</tr>
<tr>
<td>Loop L1</td>
<td>1400KC</td>
<td>1400KC</td>
<td>RF trimmer &quot;B&quot;</td>
</tr>
<tr>
<td>Loop L1</td>
<td>600KC</td>
<td>600KC</td>
<td>Oscillator coil, L2, if necessary</td>
</tr>
</tbody>
</table>

### NOTES:
1. DURING SERVICING, TOTAL CURRENT SHOULD BE METERED. WITH NO SIGNAL, AND VOLUME CONTROL AT MAXIMUM, TOTAL BATTERY SHOULD BE APPROX. 6 MA.
2. VOLTAGE MEASUREMENTS MADE WITH A VTVM FROM POINTS INDICATED TO GND. WITH TUNING CAPACITOR AT MAXIMUM, VOLUME CONTROL AT MINIMUM, BATTERY SOURCE AT 9 VOLTS.
3. AUDIO OUTPUT TRANSISTORS 2N1115 MUST BE MATCHED PAIRS.
4. ALL CAPACITORS ARE IN MICROFARADS AND RESISTORS ARE IN OHMS.
IMPORTANT!

When radio is operated on battery eliminator, the tuner may stop seeking every time a solenoid energizes, due to voltage regulation.

Speaker socket, Illus. 96, is a shorting-type to prevent transistor damage if speaker is disconnected. If not opened, radio will be very weak or dead.
The tube stages in this receiver may be checked in the same manner as similar stages in high voltage tube circuit radios. CAUTION: Do not ground any point in the transistor base circuit, including the input transformer secondary, Illustration 91 as this will either damage the transistor or open the emitter resistor.

THE TRANSISTOR IS FUSED BY A FUSE TYPE RESISTOR (Illus. 71) IN THE EMITTER CIRCUIT. THIS RESISTOR OPENS QUICKLY IF A SHORT OCCURS IN THE 2N278 CIRCUIT. CHECK ACROSS THIS RESISTOR (SEE PAGE 4) USING OHMMETER ON RX1 SCALE. IF OVER 1 OHM, MOUNT A NEW RESISTOR AT THIS POINT. CAUTION: THIS SPECIAL RESISTOR PREVENTS FIRE, AND MUST BE REPLACED WITH EXACT PART OR WARRANTY IS VOID.

The recommended procedure for checking this radio is as follows:
1. Make certain the antenna is good, and the "A" supply voltage normal.
2. Check the tubes by substituting new ones.
3. Signal trace, using isolated (capacitor in lead) signal generator or "signal tracer." A strong audio signal injected at the 12DV8 tube plate, pin #6, should be heard in the case of a dead radio. (A quick check of the audio stage can be made with the radio warmed up by pulling out the 12DV8 tube and listening for a "click." If the "click" is heard, the transistor stage is working.)

TROUBLE SHOOTING THE OUTPUT STAGE
A quick way to determine that the 2N278 is conducting can be made by checking the collector voltage, from transistor case to the radio case. If no voltage is present, the transistor is not conducting or the transistor heat radiator is grounded to the radio case. If the voltage at the collector is higher than listed, the transistor is conducting too heavily (check with milliammeter) or the output transformer is open. The amount of current the transistor conducts is determined by the voltages at each element, the voltage in the base and emitter circuits, the input transformer secondary resistance, and the transistor itself. The most common defect in the transistor is an internal short between emitter and collector. To check for this, use the following procedure.
1. Unsolder base and emitter leads from the circuit.
2. Set ohmmeter on the "R x 1" scale (no other scale should be used.)
3. Place negative lead of ohmmeter (polarity refers to internal ohmmeter battery) on collector, and positive lead on the emitter.
4. The transistor is shorted if reading is "0."
If a transistor is replaced, the "bias" adjustment should be made for the new transistor. Adjust bias potentiometer (Illus. 83) to obtain proper collector voltage with 12 volt input to radio.

RADIO BLOWS FUSES
If the radio blows fuses, check for a shorted transistor. If the transistor is okay, check for a short in the radio "A" supply circuit.
NOTE:
1- LINE VOLTAGE 1170 VAC THROUGH ISOLATION TRANSFORMER
2- ALL VOLTAGES SHOWN ON SCHEMATIC ARE A.C. MEASUREMENTS
3- VOLTMETERS READ VOLTAGE PEAK TO PEAK USING ELECTRONIC VOLTMETER
4- BAND PASS AMPLIFIER VOLTAGES ARE SHOWN AT MAXIMUM
   SENSITIVITY SETTINGS OF CONTRAST CONTROL. ALL OTHER
   CONTROLS SET FOR NORMAL OPERATION.
ALIGNMENT PROCEDURE

1. Align loop ant. to dial scale. Set Oscillator to max. For IF Trans. Set trimmers.

2. Connect Inner Conductor From Oscillator To Chassis. Set Dial At Trimmers. One Wave Magnet.


4. Repeat Steps 2 & 3.

5. Align loop ant.

---

**Part No.**
- 121-63 PNP
- 121-62 PNP
- 121-65 PNP
- 121-66 PNP
- 103-19 IN87G

**Chassis**
- R.C.A.
- Matched Pair

**Driver/Emitter/Diode**
- 8AT40Z2 Black
- 8AT40Z2 Red

**Input Signal**
- 1260 KC
- 1620 KC
- 2330 KC
- 3330 KC

**Operation Frequency**
- 121-61 STIFF DRIVER
- 121-64 24F
- 121-66 DRIVER
- 121-67 1ST I.F.
- 121-68 2ND I.F.
- 121-69 3RD I.F.
- 121-70 1ST I.F.
- 121-71 2ND I.F.
- 121-72 3RD I.F.
- 121-73 crystals
- 121-74 crystals

**Output - Output**
- 121-61 MATCHED PAIR
- 121-62 MATCHED PAIR
- 121-63 MATCHED PAIR
- 121-64 MATCHED PAIR
- 121-65 MATCHED PAIR

**Manufacturer**
- Zenith
Mfr: Admiral Card No: AD-14YP-1
Chassis No. 14YP3B
Section Affected: Sound.
Symptoms: Poor sound on very weak signals.
Reason For Change: To improve sound on weak signals by lowering Q of L202.
What To Do: Add R211, 100K in parallel with L202.

Mfr: Admiral Card No: AD-14YP-2
Chassis No. 14YP3B
Section Affected: Raster
Symptoms: Drive lines appearing with different 12DQ6 output tubes.
Reason For Change: To reduce the possibility of drive lines with different output tubes.
What To Do: Reduce R436 from 470K to 330K.

Mfr: Admiral Card No: AD-14YP-3
Chassis No. 14YP3B
Section Affected: Raster
Symptoms: Excessive brightness. Little or no brightness control action.
Cause: Leakage or short in C410, part of printed circuit M401.
What To Do: Replace M401.
Mfr: Admiral  Chassis No. 14YP3B
Card No: AD-14YP-4
Section Affected: Raster
Symptoms: No raster.
Cause: Shorted C413.
What To Do: Replace C413, .001 mfd. It is also possible that the excessive positive voltage applied to the diodes CR401 may damage them and require their being replaced.

Mfr: Admiral  Chassis No. 14YP3B
Card No: AD14YP-5
Section Affected: AC Line
Symptoms: Horizontal radiation interference through ac line.
Reason For Change: To suppress horizontal sweep radiation reducing beat interference on am radios.
What To Do: Remove C501 between ac line and ground. Add C505, .047 1KV, across the line at the terminals of the ac interlock. Insert rf choke L502, part #73B31-1 between one side of the ac line and the junction of resistors R502 and R503.

Mfr: Admiral  Chassis No. 14YP3B
Card No: AD-14YP-6
Section Affected: Pix
Symptoms: Excessive contrast, poor pix detail, (focus good).
Cause: Open L305 causing R317 to act as part of video amp plate load resistance.
What To Do: Repair or replace L305 (L305 is wound on R317).
Mfr: Motorola  
Card No: MO-TS423-1  
Section Affected: Raster  
Symptoms: Excessive brightness. Brightness control inoperative.  
Cause: Leaky or shorted C201 in vertical blanking circuit.  
What To Do: Replace C201, .01 mid., check R204, 3.3k and R205, 47K and replace if they have changed value.

Mfr: Motorola  
Card No: MO-TS423-2  
Section Affected: Sync  
Symptoms: No vertical hold.  
Cause: Shorted C602.  
What To Do: Replace C602, .001 mfd.

Mfr: Motorola  
Card No: MO-TS423-3  
Section Affected: Vertical sweep.  
Symptoms: Poor vertical linearity. Linearity control at extreme end.  
Reason For Change: To center the vertical linearity action.  
What To Do: Change R517 from 1 meg to 470K.
Section Affected: Pix—Sync. Sound

Symptoms: Video overload and sync instability. Buzz in sound.

Cause: Leaky or shorted C401.

What To Do: Replace C401, .01 mfd.

Section Affected: Sound

Symptoms: Drift. Frequent fine tuning necessary.

Reason For Change: To reduce drift in sound detector circuit.

What To Do: Change C315 from 4.7 mmf to 5.6 mmf. Replace C307, 18 mmf with Motorola part #21K125707 and C316, 10 mmf, with part #21R121114. These are special condensers chosen for minimum drift.

Section Affected: Sound

Symptoms: Insufficient sound volume.

Reason For Change: To increase sound volume.

What To Do: Increase the value of C303 from .0015 mfd. to .0033 mfd. Replace L301 (sound take-off coil) with Motorola part #24K746552.
Workbench

By Paul Goldberg

Sylvania 1-508-1 Reduced Raster

The receiver was turned on and it was observed that there was insufficient high voltage and width. About one inch was lacking on each side. The vertical sweep moreover, just managed to fill the screen. Reference to the diagram indicated that the 560 volt positive boost voltage was supplied to the vertical oscillator, 6C4, V116, but was not supplied to V20, 12AU7, the horizontal oscillator and discharge tube. The first check was a voltage measurement at the high voltage fuse where the B+ supply voltage was located. The meter measured correctly at about 330 volts positive. This eliminated the low voltage supply as a possible cause of the trouble. The 1B3 high voltage rectifiers V24 and V25 were replaced individually, because if they have a plate to filament leak they could affect the width, boost and high voltage. The damper, 6V3, V23 and the horizontal output tube 6BQ6, V22 were replaced individually, but had no effect.

A scope was set up and a waveform check was made at the grid of the 6BQ6. The waveform checked correctly with the manufacturers service data. Therefore, the horizontal oscillator was supplying the correct drive. The boost voltage was next measured at the cathode (cap) of the 6V3, damper. Here, instead of measuring the correct 560 volts positive, the measurement was 450 volts positive. This low boost voltage we assumed was the reason for the insufficient vertical sweep and horizontal width. The screen pin #4 of the 6BQ6, was next measured correctly at about 160 volts.

Because there was not the slightest sign of a trapezoidal effect, which would accuse the yoke, I suspected T63, the horizontal output transformer. Before doing anything so rash as replacing it, a voltage leakage check was made of the following condensers in the high voltage section: C2667A, C267B, C264, C270, but all showed no leakage. No check was made of C268 and C269 across the horizontal linearity coil as the horizontal linearity seemed o.k.

It was noticed at this point after glancing at the diagram, that the bleeder resistor, R270, 39K, could most assuredly cause a trouble of this kind.

[Continued on page 28]
Absorption Analyzer

[from page 5]

Audio Amplifier

With gated beam type detector circuits check for sound at the gated beam detector tube. Test for increased audio output at the power output stage. With discriminator type detector circuits test for audio at the triode first audio amplifier. Test for increased output at the power output stage. Distortion may be checked at any of the above test points. To check the speaker, test for the presence of an audio in the leads carrying the signal to the speaker voice coil.

Workbench

[from page 27]

Resistor R270 was then checked and was found to measure 9K. What was amazing, was that this resistor didn’t show any signs of having been overheated. After replacing R270 with a new 39K, 2 watt, the receiver functioned properly. The boost voltage which was obviously diminished by the defective R270 is the plate voltage for the 6PQ6, horizontal output tube. If it is lowered due to a defect of this kind, it would cause insufficient width and high voltage.

RCA Color Receiver 21-CD-8725

Loss of Color

It was noted that the picture was seen in black and white on both color and black and white channels. A defect in practically any of the tubes in the color section of this receiver may cause this problem.

Referring to Fig. 2, the first and 2nd bandpass amplifiers, V701B and V702A amplify the chroma. During color reception the burst signal is amplified by V702B, and is processed by the phase detector, killer detector and killer stages in such a way that the 2nd bandpass amplifier, V702A is biased to allow conduction. The color signals therefore can pass through to the circuits which are necessary for color reproduction.

During black and white reception, no burst signal is present, and the stages mentioned above operate in such a way as to drive V702A into cutoff, thus rendering the following color stages inoperative, and producing a black and white picture.

The 3.58 mc oscillator and reactance tube V707A-B, feeds an important voltage to the killer detector, and in addition supplies the input for the demodulators. The X and Z de-modulators, V703A-B remove the chroma information from the 3.58 mc carrier.

Each one of these tubes was replaced individually, but had no effect. A voltage check was next made at pin 1 of the 6U8A color killer tube. The voltage measured about 23 volts negative. This voltage was enough to cut off the 2nd bandpass amplifier, V702A. This indicated that the killer tube was conducting. A voltage check was next made at pin 7 of the 6BN8 killer detector. Here the meter read 8 volts positive. For normal
A new data bulletin, recently published by Sprague Products Company, 71 Marshall St., North Adams, Mass., is entitled "The ABC's of Ceramic Capacitors." Prepared as part of Sprague's continuing educational service program, this bulletin treats in easy-to-understand language all the major ceramic capacitor types—high-k, general application, the three temperature compensating types, multiple, universal, buttonhead, high voltage "doorknob," and printed circuits. The bulletin covers the history of capacitors, the construction of modern capacitors, descriptions of basic terms and many photos, charts and application data.

A new pocket-size folder, "TV Service Safety Hints," just printed by P. R. Mallory & Co. Inc. is designed for use by television service engineers to give customers a better understanding of the job that the service profession is doing. Based on the series of cartoon advertisements which Mallory has been using for several years in TV Guide, this folder tells television set owners "don't do it yourself—call us!" It dramatizes the dangers and pitfalls of amateur "doctoring" of television ailments, in humorous and informative style.

The folder is an effective and inexpensive promotional piece which the service technician can mail to his customers, leave at neighboring homes after completing a service call, or present when delivering a new set. Space is provided for imprinting of the individual dealer's name. Service dealers and associations can obtain quantities of these folders at $1.00 per 100 from their nearest Mallory distributor, or by writing to Distributor Division, P. R. Mallory & Co. Inc., Indianapolis 6, Indiana.

The Chicago Standard Transformer Corporation, 3501 West Addison St., Chicago 18, Illinois, has published a handy wall chart, listing Stancor exact replacement flybacks and yokes, by original manufacturers part numbers. The chart, printed on index cardboard, lists each TV set manufacturer alphabetically. All units for

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**WORKBENCH**

[from page 28]

Color operation this voltage should be about 1 volt negative. This was the clue. A voltage from the output circuit of the 3.58 mc oscillator, V707B, is sent back through capacitor C720 to the plate of the killer detector. When the negative burst is fed to the killer detector cathode, and the feedback voltage goes positive at the plate, current flows causing C702 to charge up negatively and cut off the killer tube, V701A. Since the voltage at the plate of the killer detector read 8 volts positive instead of about 1 volt negative, C720 was clipped open and voltage leakage checked. It was found to have a dead short. Capacitor C720 was replaced with a new 0.022 mf and the color picture now came in properly. The threshold adjustment was made, and then checked for operation on a color channel. With C370 shorted, the positive 8 volt from the demodulator anode was now directly fed to the plate of the killer detector through the 1 meg resistor R742 to the grid of the killer tube. The positive 8 volts on the killer caused it to conduct heavily cutting off the 2nd chroma bandpass amplifier, thus killing the color.

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*A compilation of specific receiver service repairs, "bugs," chronic troubles, field circuit changes, manufacturers' production revisions, etc. The compilation enables the service technician to pinpoint what is wrong with any given TV set and to correct the fault in the shortest possible time.

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oped leakage, placing a positive voltage on the picture tube grid. If you remove condenser C115 from the circuit the brightness control will probably function normally but retrace lines will be evident.

The following letter is another example of the type of problem that can result from a failure in the vertical retrace circuitry.

Dear Sir:

I have a receiver in which I haven't been able to obtain a raster or picture even though there is sufficient high voltage, I believe. I don't have a high voltage meter so that I can't be certain on this point but I can draw a high voltage arc that appears about normal. I have changed and checked those components I suspected might be the cause of the trouble. I have even replaced the picture tube thinking the electron gun was defective but the tube was good as I found out by using it with another TV receiver. The voltages are normal at either side of the brightness control and at the variable arm.

The receiver is the Motorola TS-533 chassis.

H. T.
Boston, Mass.

The above problem is probably another condition where a component in the vertical retrace circuitry failed and caused an opposite condition to the case previously given. An interesting point about these two cases is that it was a condenser that failed in both instances. Here, condenser C603 (Fig. 5) has undoubtedly shorted bringing the grid down to ground potential. The positive voltage applied to the grid cancelled some of the positive voltage applied to the cathode. When C603 shorts it causes the picture tube to be biased beyond cutoff so that it would not be possible to obtain a raster or picture.

Fig. 5—Retrace blanking with a positive control grid voltage.
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