RADIO HI-FI TV
Techni-talk
COMPLETE ELECTRONIC SERVICING INFORMATION

VOL. 25, NO. 1 SPRING, 1973

COLOR TELEVISION - VECTORS

In attempting to add or subtract two out-of-phase sine waves of equal frequency it becomes immediately apparent that a simpler method of manipulation would ease a difficult situation. For this reason, a method of sine wave addition was derived using vectors.

As shown in Figure 1, a sine wave can be represented by a vector whose length is equal to the peak amplitude of the sine wave. This vector represents the sine wave by rotating about an axis at the sine wave frequency. When observed at some instant in time, such as at T=0, the vertical amplitude of the vector shows the value of the sine wave at that instant.

Now let us take two sine wave of the same frequency but 90° out of phase, as in Figure 2. Wave A and vector A represent the wave previously observed in Fig. 1. Notice that sine wave B is maximum when sine wave A is equal to zero. To represent this wave vectorially at T=0 we, therefore, place vector B in a vertical direction.

From the vector diagram it can easily be seen why we refer to wave B as being 90° out of phase with respect to wave A. It should be noted that the waves must have the same frequency to have this 90° relationship remain constant.

Now, what happens if these two waves are added, as shown in Fig. 3: The resultant sine wave C is a point-by-point addition of these two waves.

To add these two waves (A and B) vectorially, let us anticipate the solution and construct a parallelogram. Then, starting from the center point, run a vector diagonally to form the resultant vector (C). The length of this vector is determined by the intersection of the two parallel lines.

Figure 4 shows the addition of two sine waves (A and B) whose amplitudes are unequal. The resultant wave (C) is obtained by the same point-by-point addition of the two waves. The vector addition is also accomplished as before. Note that the resultant vector (C) indicates that the change in wave (B) has caused a phase shift towards vector A. It can be seen that this phase shift exists in the waveform diagram also.

Therefore, by varying amplitudes and polarities of waves A and B, any resultant phase can be obtained.

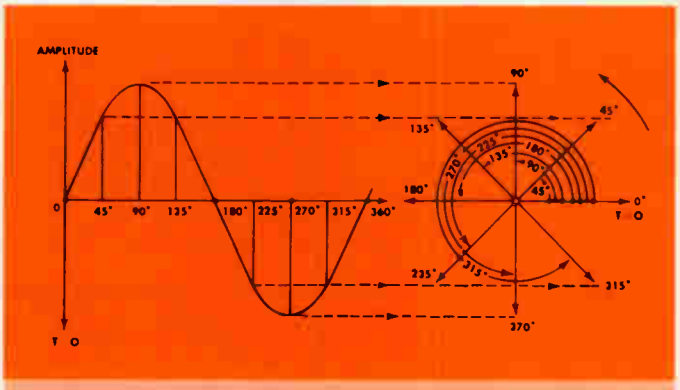


Fig. 1
Sine wave and its vector representation.

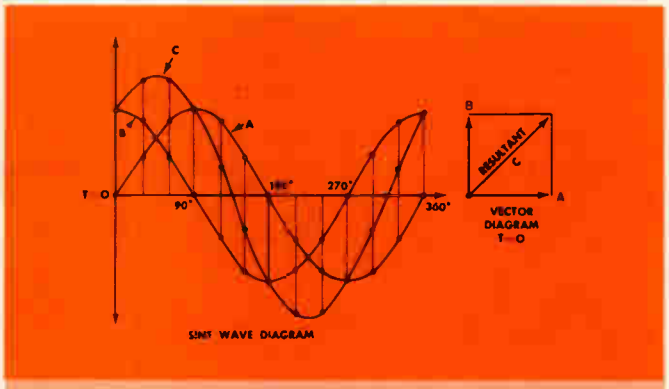


Fig. 3
Vector additional of two out-of-phase sine waves of equal amplitude.

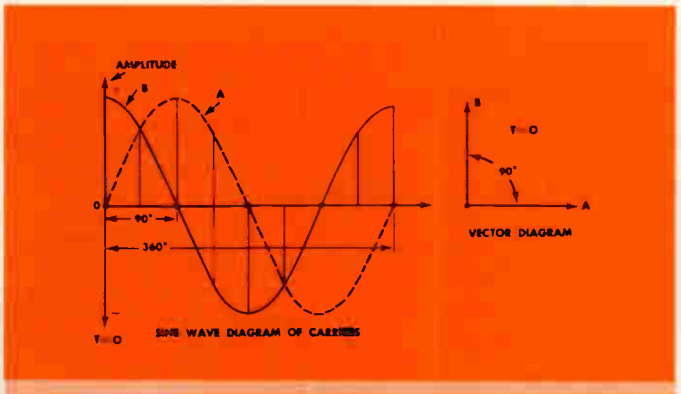


Fig. 2
Two sine waves and their vectors showing 90° phase relationship.

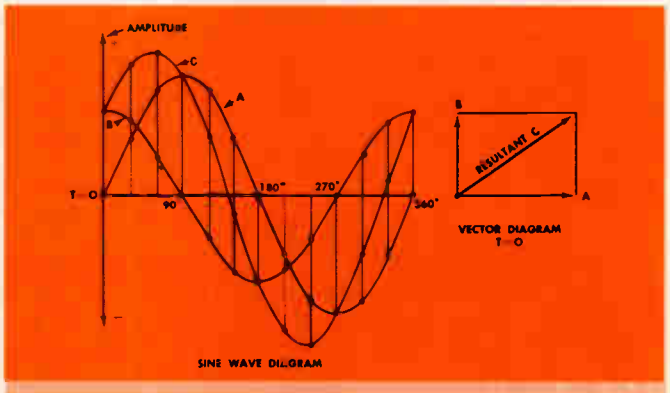
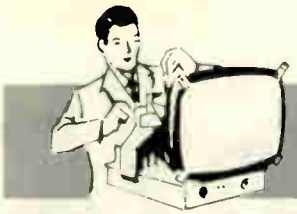


Fig. 4
Vector additional of two out-of-phase sine waves of unequal amplitude.



BENCH NOTES

UNUSUAL COLOR TV SOLUTION

Zenith 24MC42 chassis: Problem — wrong colors, no sound. This set was serviced previously by another. However, customer continued complaint of wrong color; finally sound also gave out and we were called in for service. To check colors (as tint control hardly worked) a color bar generator revealed the bars to be 180° out of phase! After tedious checking it was noted that the red and green leads from the demodulators had been reversed! Leads were restored to original position, bars then looked good, just needed slight adjustment of burst amp.

The audio problem turned out to be an open volumn control. When set was first turned on the grid would go positive and block out signal. Replaced control.

Leonard D. Chioma
Video-Sound Sales & Service
2020 Natalen Road
Winter Park, Florida 32789

INSUFFICIENT WIDTH ON ALL SETCHELL-CARLSON COLOR CHASSIS NOS. U-800 THRU U-807

The customary remedy is given in S/C Form #69RS 329 and consists of shunting the horizontal yoke windings with 75 to 150 mmfd. capacitor. This tends to increase retrace time, however. If the 6JE6 cathode current seems about 10% low and the tubes are good, check for capacity change in the 680 mmfd. capacitor in the horizontal peaking circuit (680 mmfd. in series with 47K ½w from plate of horizontal oscillator to ground). Tolerance here should be held within 5%.

Incidentally, older Setchell-Carlson's should have the horizontal deflection unit modified to conform to the circuit of unit CF-6A. This generally applies to a chassis marked U-805 and below. Modify to conform with circuit for U-806 (Sams 978-2) or U-807 (Sams 979-2).

This modification will result in better all-over performance as regards the horizontal sweep and will reduce the cathode current on the 6JE6 considerably.

Francis C. Wolven
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Saugerties, New York 12477

RENEWING TRANSISTOR TESTER SOCKETS

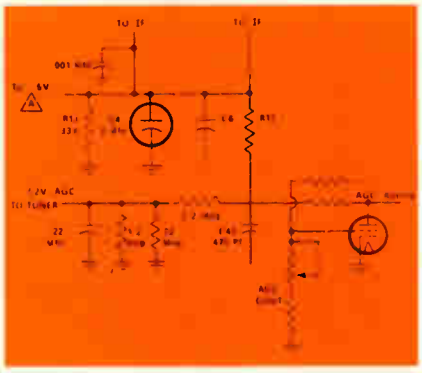
The TV, radio technician or hobbyist who makes frequent use of a transistor tester, eventually runs into the same problem technicians run into with tube tester-worn sockets in which the tube or transistor can no longer be seated properly.

The easy remedy to firm up the contacts of a defective socket in a tube tester is well known-use a commercially available adapter socket which plugs into the defective one in the tube tester.

The same idea can be used to remedy a worn socket in a transistor tester. Purchase a transistor socket of the same configuration as the defective one, plugging it into the worn socket firms up the contacts, and transistor testing can be resumed without problems.

Frank Damico
86-75 Midland Pky.
Jamaica, New York

EMERSON MODELS 13C12 to 19P21



Gradual darking of the left side of the screen, which is similar to parasitic oscillation in the horizontal output circuit. This problem in these emerson models were in the AGC circuit. The electrolic capacitor C-4 (2 mfd) will usually be open.

Louis Proctor
1811 Mulberry Street
Waterloo, Iowa 50703

MORE GAIN FROM TABLE RADIOS.

Small table radios that use 50B5 or 50C5 output stages are made considerably more sensitive by changing the output tube to a 50EH5, which requires only 3 volts peak audio drive against the 50C5's and the 50B5's 8 volts.

Only change required is to replace the usual 150 to 180 ohm cathode resistor with a 68 ohm resistor. To replace the 50B5, the resistor must be changed and the socket rewired for the different base connections.

Once the resistor is changed, the old type tubes must not be used; the lower bias resistance will cause too much plate current to flow.

Of course this change applies as well to small record players or intercoms, and a 35B5 or 35C5 can be replaced by 35EH5.

If hum is more audible with the more sensitive tube, use larger filter capacitors.

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Box 22
Gardenville, Penna. 18926

SUBSTITUTE BIAS CELL

We restore old radio receivers for antique-radio buffs, and finding a replacement bias cell is a frustrating job. (These cells were used in early sets to supply a fixed 1.5 volt negative potential to the grids of IF and first AF amplifiers.) However, a successful replacement can be obtained in the form of the mercury cells used in some hearing aids. These have a voltage of 1.35 but do perform excellently for several years. A physical size to fit the original holder with a minimum of modification can usually be found.

Harry J. Miller
Advance Television-Radio
991 Forty-Second Street
Sarasota, Florida 33580

SPACE SAVER

Can you imagine using a dolly to put a TV in a station wagon or truck. Many times a television will hardly clear the top as it is without using a dolly which requires at least 1½" more height. Why not lift the television up and put it on a large piece of cardboard already on the floor of the car and merely pull the cardboard in with the TV on it. This way you have an additional 1½" or more clearance. If you try using a mat you're liable to tear the mat. Cardboard doesn't cost anything and you can get boxes at grocery stores, etc.

Michael Meharra
2512 A Street
Liberty Boro
McKeesport, Pa. 15133

MANY USES FOR RUBBING ALCOHOL

It can be used for cleaning glass and picture tubes, (better than a glass cleaner) and cheaper. About 15 cent a pint.

It can be used for cleaning plastic cabinets; it does not hurt plastic. Also good for cleaning H.V. anodes or pix tubes. Good for cleaning windows (Try it & see).

Volkstore Television Service
613 Chestnut Street
Portsmouth, Virginia

Note:
Those desiring to have letters published in this column should write the Editor, Techni-talk, Tube Dept., GENERAL ELECTRIC COMPANY, 316 E. Ninth St., Owensboro, Kentucky 42301. For each such letter selected for publication you will receive $10.00 worth of General Electric tubes. In the event of duplicate or similar items, selection will be made by the Editor and his decision will be final. The Company shall have the unlimited right without obligation to publish or otherwise use any idea or suggestion sent to this column. Caution: The ideas and suggestions expressed in this column are those of the individual writers. These ideas and suggestions have not been tried by the General Electric Company and therefore are not endorsed, sponsored or recommended.

SERVICE NOTES

SUBJECT: Model TA600A Tape accessory — Service Hint
SYMPTOM: FM interference from record bias oscillator
CAUSE: Bias voltage across erase windings to high
CURE: Change C203, .01 ceramic capacitor on tape oscillator circuit board to .03 mfd
SUBJECT: 45 RPM records; slow speed or stalled
Models involved — Portable phonos using RD703 Series Changer

Reports indicate that the subject defect may be evident on portable phonographs when certain types of 7" 45 RPM records are used.

Experimental tests indicate that these problems exist, in most instances, when playing lightweight (thin) 45RPM records which are heavily modulated and that have high-gloss label (contact) surfaces. Tests further indicate that, in most instances, these records can be played satisfactorily if the stylus tracking force is reduced to a value of 6 grams.

NOTE: Badly damaged, extremely dirty or warped records can also cause slow speed or stalling.

To adjust the stylus tracking force, relocate the stylus pressure spring clip forward toward the cartridge in the mounting ribs of the plastic tone arm.

CAUTION: DO NOT adjust the stylus tracking force below 6 grams as this may cause the stylus to skip during velocity trip!

On early production RD703 changers employed in monaural portable phonographs, a stylus pressure spring and mounting clip was not used. A spring and mounting clip should be installed in these units and the stylus tracking pressure adjusted to 6 grams.

The stylus pressure spring is cataloged as No.EA2980, and mounting clip is cataloged as No.EA3091.

SUBJECT: 4-H 10" COLOR HUMMING CLOCKS (CLOCK MODELS)

The humming is created by the magnetic shield located at the back of the clock vibrating at a 60 cycle rate. The vibration is induced by the magnetic field of the clock motor. This shield is not to be removed as it is required to maintain purity in the corner of the CRT in the proximity of the clock. The humming can be minimized by pulling the HVT assembly back and spring the free end of the magnetic shield back approximately 1/2" so that when the HVT assembly is pushed back in place, it will apply pressure to the magnetic shield and minimize the vibration.

SUBJECT: SERVICING INFORMATION—C1/L1 and C2/L2 CHASSIS

Symptom: Sound Distortion on Community Cable Systems

Performs normally on outside antenna. Careful fine tuning will usually produce clear sound, but use of AFC will result in one or more stations with distorted sound.

The probelm is caused by cable sound carrier levels being more than 16db below the video carrier (broadcast ratio is 10db). In these cases, sound sensitivity can be increased by installing a EP50X6 sound kit. Production receivers have the new circuit beginning with serial numbers 5G40XXXXX.

C AND L CHASSIS SOUND MODIFICATION TO INCREASE SENSITIVITY.

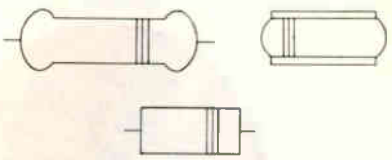
Parts in Kit:

(1) Double tuned audio interstage transformer
(1) 820 ohm 1/2 watt resistor
(1) .0012pf ceramic disc capacitor
(1) 36 microhenry choke
(1) 100K 1/2 watt resistor
(1) Diode

1. Remove 4T300 audio interstage (on board no. 4) (Do not install new coil at this time.)
2. Remove 4R304, 680 ohm resistor and replace with 820 ohm 1/2 watt resistor.
3. Remove 4C304, 150pf capacitor and discard.
4. Remove 4C307, .005pf capacitor and replace with .0012 ceramic disc capacitor.
5. Remove 4R301, 47K resistor and replace with 100K 1/2 watt.
6. Install new double tuned audio interstage transformer in place of old 4T300.
7. Remove 4L301 audio take-off coil and replace with 36 microhenry choke.
8. Remove 3L156 (on board no 3) and replace with diode. The diode cathode connects to ground.
9. Align 4T300 and retouch 4L303 quad coil.

SYMPTOM: NO HORIZONTAL SYNC, 5R251 HORIZONTAL FEEDBACK RESISTOR OVERHEATED

Replace 5R251 1/2 watt resistor with a smooth body type which has a better voltage breakdown rating (Allen Bradley or IRC are the preferred types.) Don't use the round end types in this application.



SYMPTOM: JUMPING VHF CHANNELS (EITHER HIGHER OR LOWER)

May or may not be intermittent, or may be OK cold and jump channels after set heats up. Symptom is only with AFC, and is caused by 100pf AFC input capacitor C124 changing value. If the tuner oscillator is jumping frequently upward (higher channels), the capacitor is opening and C124, EU23X4 can be changed successfully. If the oscillator is jumping frequently downward (lower channels), the tuner should be replaced. In this case, oscillator alignment on each strip in use would be required if C124 were replaced. (Tuner capacitor was originally aligned with an open C124 which intermittently cures itself.)

SYMPTOM: HVT SQUEAL (MAY ALSO CAUSE INSUFFICIENT WIDTH)

This difficulty may be caused by chips from the High Voltage Transformer core. The chips will vibrate in their lodging place usually in the air gap between the core halves. If the core is cracked (usually at the right angle corners) the chips will lodge in the crack. Removal of chips will minimize the squeal, but if the core is cracked, it should be replaced. If the portions of a cracked core are separated, insufficient width may occur.

SYMPTOM: FOUR OR FIVE INCH VERTICAL STRIATIONS IN RASTER (18" 19" 20" SETS ONLY)

An open R270 or open solder joint at either end may cause this condition. R270 is a sweep damping resistor across L260, 500 uh choke, and is located on a terminal strip in front of the 26HU5 Horizontal Output tube. Replace only with EP14X38 flame proof type resistor.

SYMPTOM: SMALL VERTICAL SWEEP' TOP STRETCHED AND BOTTOM PULLED UP

R223, 27K resistor increased in value or open.

TUBES and TRANSISTORS

NEW SERVICE AIDS

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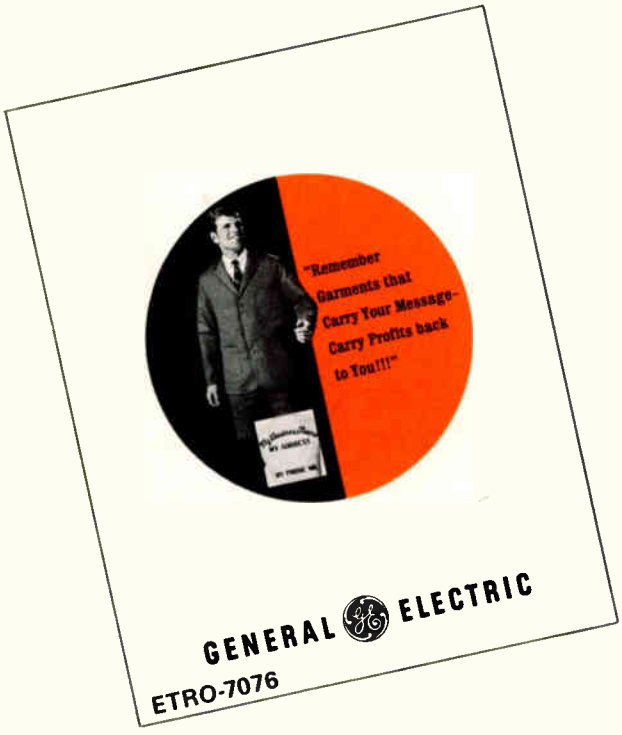

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In this issue: Page

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TUBES AND TRANSISTORS

This copy of **Techni-talk** comes to you through the courtesy of your General Electric Tube and Transistor distributor.

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VOL. 25, No. 2 SUMMER, 1973

VDR's (VOLTAGE DEPENDENT RESISTORS – VARISTORS) and TDR's (TEMPERATURE DEPENDENT RESISTORS – THERMISTORS)

In modern television design, devices are being used in critical circuits to automatically adjust circuit parameters to maintain constant performnce regardless of variables such as line voltage changes, component aging, and thermal effects.

Two of these devices which are quite popular today are the VDR and TDR. Both are non-linear resistors. This means, for instance, that doubling the voltage across them does not double the current through them. These non-linear resistors can be manufactured with either a positive or negative coefficient. A negative coefficient device is one whose resistance will decrease with an increase of the electrical or environmental conditions to which it is sensitive.

Checking a non-linear resistor requires some knowledge of how it functions. A simple ohmmeter check will not provide an accurate test. Most non-linear resistors can be checked in operational circuits using simple voltage measurements and observing circuit performance. The absolute ohmic value is not the important measurement – the device's reaction to environmental change is what must be determined.

TESTING THE VDR

The VDR is a non-linear resistor whose resistance is a function of voltage. VDR's currently used in General Electric portable TV's have a negative coefficient.

VDR's are used in high voltage regulator and boost voltage circuits and in degaussing circuits.

Most VDR's will read open when checked with a simple ohmmeter. Therefore, the VDR must be tested by applying a voltage to it and measuring the current through it. Such a test may be done with the VDR in the TV circuit or in a special bench test circuit. In either case, a milliammeter is placed in series with the VDR, and the voltage applied to it is varied. (See Figure 1.)

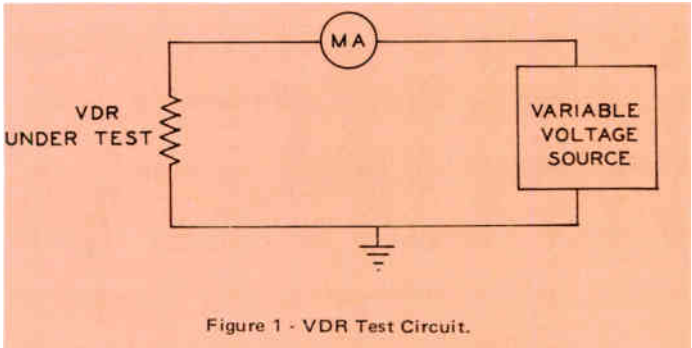


Figure 1 - VDR Test Circuit.

Plotting a graph of voltage vs. current for the VDR shows its performance characteristics. Such a graph might look like that in Figure 2.

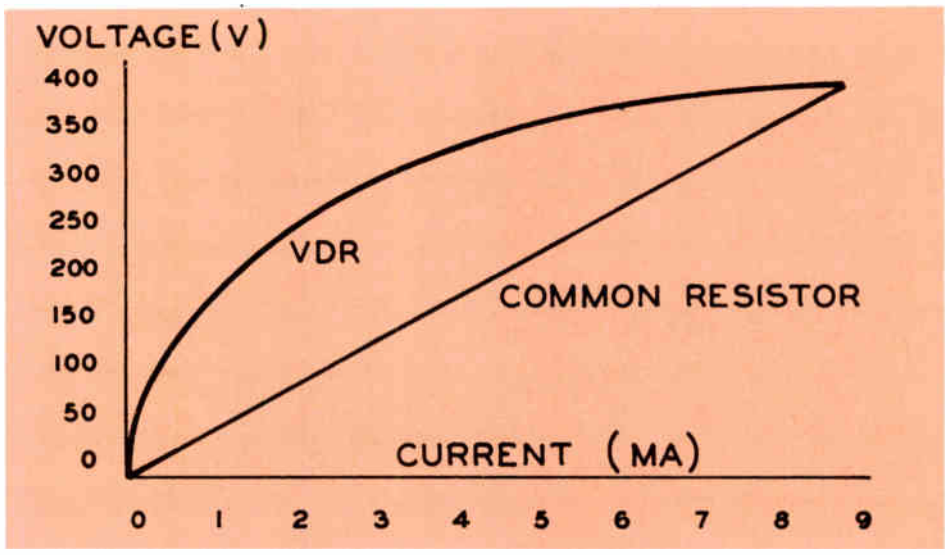


Figure 2 - Voltage vs. Current for a negative coefficient VDR.

VDR's come with many voltage and current ratings, so don't expect the values in Figure 2 to exactly agree with the numbers on your graph. The important thing is for the non-linearity of current change with voltage variations to be evident.

In most instances, suspected defective units can be verified by checking the current at the voltage specified in the parts list.

Some of the VDR's currently being used include:

EU14X196	65MA @ 20V	±20%(C CHASSIS)
EP13X1	65Ma @ 20V	±20%(G CHASSIS)
EP13X2	1MA @ 85OV	±15%(G CHASSIS)
ES14X212	1MA @ 17V	±15%(TC/T1 CHASSIS)

One precaution must be observed with this test procedure: DON'T EXCEED THE POWER RATING OF THE VDR. Power ratings are similar to carbon resistors; that is, physical sizes are approximately the same. Also, note that VDR's have a negative thermal coefficient, so the readings should be taken quickly.

TESTING THE TDR

The TDR is a non-linear resistor whose resistance is a function of temperature. The heat that influences the TDR can be externally applied or developed by the current passing through the device. Characteristics of a typical negative coefficient TDR are compared with an ordinary resistor in Figure 3.

(Continued on page 2)

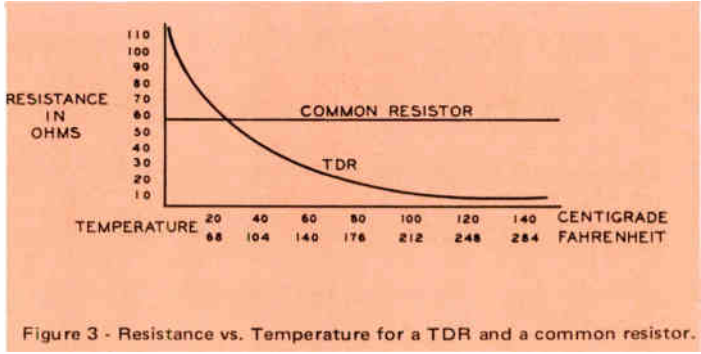


Figure 3 - Resistance vs. Temperature for a TDR and a common resistor.

DYNAMIC TO PM SPEAKER CONVERSION IN OLD RADIOS

We get to repair early radios that are highly valued by antique radio buffs. In these radios, speakers with electromagnets were used rather than permanent magnets, primarily because the field coil of electromagnetic speakers served as a first class filter choke.

When necessary to replace such a speaker, the problem of finding an exact or similar replacement is very great.

However, we use PM speakers of the same diameter this way: If the old speaker's diameter is 5 inches or less, filtering of the plate voltage supply is not overly critical because the speaker usually will not reproduce frequencies down to 60 cycles.

In this case, replace the field coil with a ten watt resistor that has the resistance equal to the original field coil's DC resistance, and connect the voice coil as usual.

When speaker size is over 5 inches, hum problems usually occur if the filtering effect of the field coil is removed.

In this instance, replace the field coil with a standard filter choke of similar internal resistance.

Another, and more economical solution: remove the field coil from the old speaker, mount it at some convenient spot on the chassis and use it as a filter choke!

H. Josephs
Box 22
Gardenville, Pa. 18926

SOLDERING CRT BASE CONNECTIONS

Loose solder connections in a picture tube base have always been hard to solder until I discovered an easy way to do the job. All that's needed is a round jewelers file.

Take and file a round notch about one-sixteenth of an inch from the end of the prong. File about half way through the pin taking care not to file into the wire.

Then wire is exposed just fill in the notch with solder and smooth the pin. The job is done and it only takes a few seconds to do the whole job.

John Mednansky
Modern TV Service
P. O. Box 259
Stevensville, Montana 59870

INSTANT MAGNETIC SCREWDRIVER NUTDRIVER

Have you ever been out on a service call and found you needed a magnetic driver?

Just flip open the high voltage box and nine times out of ten you'll find a deposit of drippings from the H.V. transformer.

Put a small piece of this waxy substance on your screwdriver, nutdriver, pliers, etc. You'll be amazed at the results. It holds better than most magnetic tools anyway.

Kurt Reichel
410 E. Riordon
Villa Park, Illinois 60181

HI-VOLTAGE SPRAY PRECAUTIONS

Servicemen who encounter hi-voltage leaks, (arcing and corona) use a high voltage spray in an aerosol can.

Recently a color television required a new H.V. transformer and it was almost impossible to identify the part number. Previous servicemen had used a Red Color High Voltage spray.

It is recommended that when spraying high voltage circuits or components be careful not to cover identification markings or use a clear type spray.

Bernard H. Serota
2502 S. Philip Street
Philadelphia, Pa. 19148

HICKOK 770 OSCILLAGRAPH: INTERMITTENT DE-CENTERING

The trouble began as an intermittent condition and gradually became worse. When the scope was turned on in the morning, the trace would be off-screen to the left. After a few minutes, it would snap back to center and remain there with no further difficulty. When it became necessary to operate the focus control near end-of-rotation, the scope was torn down and R-169 and R-171 replaced with 2-watt units. Both were off-value; a common malfunction in this model.

After several months, the original trouble re-appeared but this time the focus control was unaffected. Obviously, the troubles, while related, were not identical. The chassis was removed from its case and worked normally for days. At no time could the malfunction be observed with the chassis exposed.

Finally the intermittent condition became constant and it was observed that horizontal displacement occurred only when the horizontal selector switch was set for sawtooth sweep. In the Hor. Amp. and Line Sweep positions, centering and operation were normal. When in sawtooth sweep position, operating the horizontal gain control would move the trace left as the gain was advanced.

This is a D-C coupled scope with the gain control in the output of the first stage. Obviously a negative voltage must be getting into the input circuit and there was only one source of negative voltage; the -1400 volt supply and its associated divider. But why was it an off-on intermittent instead of one which gave a gradual variation?

With the chassis almost all the way into the case, it was possible to read -2 volts on the grid of the input stage where there should have been zero volts. While inspecting the chassis with a spotlight, the voltage dropped to zero and normal operation resumed. The spotlight was turned off and the trouble reappeared. The problem was solved.

By dint of some neck-craning, it was verified that the light would induce ionization in N-101, and NE-2 used as a voltage stabilizer in the negative voltage divided circuit. When the light was turned off, the NE-2 went out and the voltage rose. The chassis was pulled again and the voltage across N-101 was measured at 98 volts; it should be about 65.

(Continued from page 1)

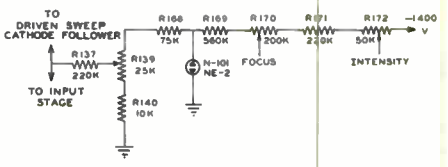
TDR's were used initially in filament systems for controlling warm-up or limiting surges. They were commonly referred to in the past as "globars". Currently they are being used extensively in automatic degaussing circuits and deflection yoke circuits. In degaussing circuits they provide a fading effect which results in a gradually decreasing magnetic field that eliminates undesired magnetism. In deflection circuits they correct for the increased resistance of the windings as they heat up.

TDR's can usually be checked with an ohmmeter. To test a TDR, connect an ohmmeter to the device and apply a source of heat (such as a soldering iron or heat lamp). The resistance of the TDR will change as the temperature changes. For low ohmic values, the heating effects of the meter current will have to be allowed for.

Some of the TDR's currently being used include:

EP14X10	100	@ 25 °C	(C CHASSIS)
EU14X147	3.8	@ 25°C	(C CHASSIS)
EP14X206	1.052 meg	@ 25° C	(G CHASSIS) (H CHASSIS)
EP14X5	120	@ 25° C	(G CHASSIS)
ES14X213	3000	@ 25° C	(TC/T-1 CHASSIS)

NOTE: 25° C is assumed to be normal room temperature. All resistance figures are ±25%.



The trick of using a light source to assure ionization in gas regulators is well known and has been used for years, especially when the source voltage is not much higher than the regulator ionization voltage. Because of the high source voltage in this machine, the designers apparently thought it unnecessary. At any rate, replacement of N-101 and adjustment of the Sweep D-C Level Control (R-139) provided a permanent cure. If I had checked all the voltages, it would have saved considerable time!

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Saugerties, N. Y. 12477

Note:

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SERVICING INFORMATION

TELEVISION

SUBJECT: **JA CHASSIS PRODUCTION CHANGES – SOLID STATE**

Power Supply – 22 volt scan-rectified supply out of regulation

Beginning with receivers having serial numbers 5F40 and higher, the circuitry of the B+ regulator, Q400, has been changed to improve the regulation of the scan-rectified 22 volt supply. This voltage should vary ½ volt or less as the line voltage is changed from **112 to 128** volts. Failure to regulate properly could cause **symptoms** such as **low brightness,** or **overload with strong signal.**

The original Q400 circuit and physical layout is shown at the left below.

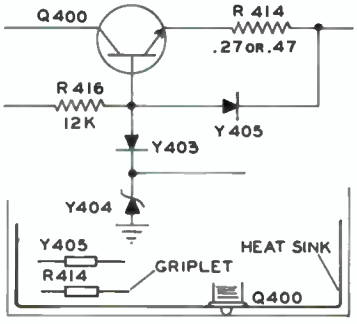
The circuitry and physical layout of the improved circuit is shown at the right. If you service a receiver which has poor regulation of the 22 volt scan-rectified supply or has a failure in the regulator circuit, we recommend that you modify it to incorporate the improved circuitry.

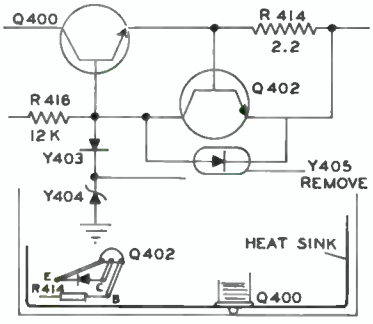
Remove Y405, R414, and the griplet. Replace R414 with a 2.2 ohm, ½ watt resistor. Replace Y405 with a Q402 Transistor (EP15X1). A Q402 and a 2.2 ohm, ½ watt resistor are supplied with replacement Q400 transistors (EP15X11).

Vertical Module – Picture shifts position with brightness changes

In some early production receivers, the vertical modules had diodes connected across the base-emitter terminals of Q263 and Q264. They were soldered on the copper side of the board. These diodes could cause the picture to shift position vertically as the brightness is varied.

If you have a receiver which exhibits this symptom and has the diodes, remove them and install a 1K, ½ watt resistor between the base of Q264, and the junction of R286, and C280. Unsolder the base of Q264 from the board and insert one end of the 1K resistor in the hole vacated by the base of Q264. Make a "flying joint" to connect the base lead to the top end of the resistor.





Horizontal Circuit – Striations at Left Side of Screen

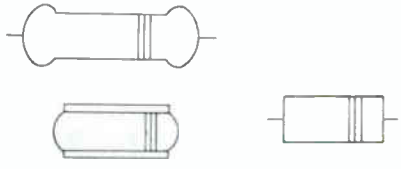
The value of C227 was .1uf in some receivers. It was changed to .22uf to eliminate striations of the left side of the screen. If you have a customer complain about the striations, change C227 to .22uf, 200V (cat. no. EP20X14).

Horizontal Circuit – Nuisance Blowing of F404

The value of C228 was .0033uf and R240 was 820 ohms in some receivers. C228 was changed to .005uf and R240 was changed to 1K to prevent nuisance blowing of F404. This problem is often accompanied by a "chirping" noise from the horizontal output transistor when the receiver is first turned on. Change C228 to .005uf (cat. no. EU22X203) and R240 to 1K if you have a complaint of this nature.

Chroma Circuit – One Predominate Color with Retrace Lines

This symptom could be due to a failure of one of the color output transistors, Q600, 604 or 606. If this is the case, inspect R624, 626 and 628 (6.8K, ½W) to see if they are the rounded end type as illustrated at the left. If they are, change them to the smooth body type as shown at the right. Stackpole or Allen-Bradley are preferred types in this application.



ROUND END TYPES SMOOTH BODY TYPE

ORDER COUPON (please print)

Order from your local GE electronic components distributor or mail this form to: **General Electric Company, Dept. "B" 3800 North Milwaukee Ave., Chicago, Ill. 60641.** Enclosed is money order or check payable to General Electric Company, for: (Include all state and local taxes)

Quantity			Price
_____	ETRS-2000	Techni-Talk Binder	$2.00
_____	ETRS-2579	All Back Issues of Techni-Talk	6.25
_____	ETRB-704	Job Tickets Imprinted	500 for 11.75
_____		Imprint as shown below:	1000 for 21.00

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_____	ETRS-7084	Volume "G" TV Service Manual	$4.75
_____	ETRS-7092	Tuner Pads (10 per package)	3.75

TOTAL _____

Name _____

Address _____

City _____ **State** _____ **Zone** _____

RADIO

SERVICE TIPS.

1. A) SYMPTOM – Early production EP20 packs have hum on FM when tuning into a strong station.
   B) CAUSE – Power Supply zener regulator drop out.
   C) CURE – Add A 47 mfd/16v capacitor (cat. no. RT5477) between the junction of R2 and R3 to ground on the pushbutton switch board (see p. 12 of service manual). Later production sets have this capacitor (C5).

2. A) SYMPTOM –EP20-1 & 2 packs exhibit motorboating or blocking when tuning into a strong station in FM Stereo position.
   B) CAUSE – High frequency oscillations in amplifier.
   C) CURE – Change the value of C3 & C4 in amplifier from 47pf to 150pf (cat. no. RT2071) or add a 100 ohm resistor in series with the Tape Output leads at the connecting pins on amp board.

TUBES and TRANSISTORS

NEW SERVICE AIDS

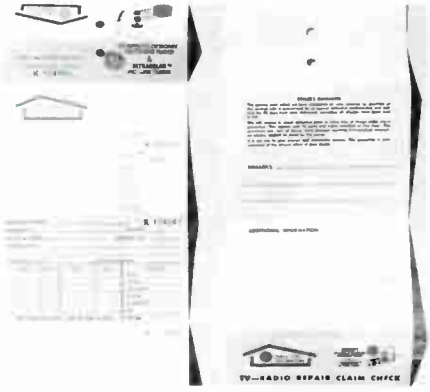
NUMBERED JOB TICKETS ETRB-704

Here is a two-color numbered job ticket imprinted with your name, address and phone number in two places.

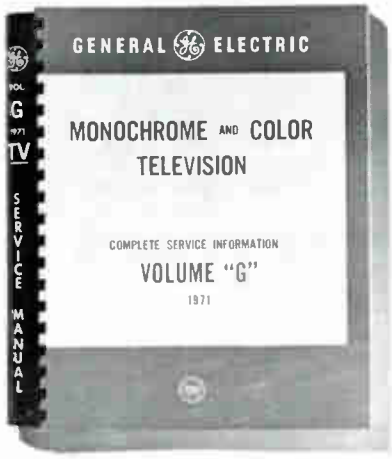
It measures 11" x 5" and includes a full-size customer invoice, a 3" x 5" dealer record card and a customer claim check at the bottom.

The top is die cut so it can be easily attached to a line cord. This keeps all the necessary information with the TV, radio or record player and eliminates the possibility of any mix-up.

Ask your distributor for ETRB-704 or use the handy order form on Page 3. If you use the order form be sure to show all the information you want on the imprint. The price is $11.75 for 500 or $21.00 for 1000.



NEW "G" LINE Consolidated TV Service Manual, ETRS-7084



Here is the new "G" line TV service manual containing complete service information on all 1971 General Electric Television Receivers. This 3/4" thick manual covers both Monochrome and Color Receivers.

Ask your distributor for a copy of ETRS-7084 – the price is only $4.75 – or use order coupon on page 3.

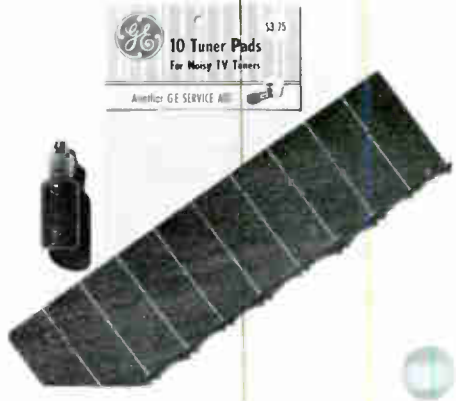
TEN TUNER PADS FOR NOISY TV TUNERS, ETRS-7092

How many times have you had repeat calls because of noisy VHF turret type tuners. Here is an inexpensive cure that should last for years. This kit includes ten foam pads with adhesive backs and a bottle of cleaning and lubricating jelly.

Just remove tuner cover, then remove paper backing on adhesive-backed foam pad and place on inside of tuner cover where pad will lightly wipe all tuner contacts when revolved.

Apply a coating of jelly, replace cover and tuner should not become noisy again for several years.

Ask your distributor for ETRS-7092 or use handy coupon on page 3. The price is only $3.75 or about 38 cents for each tuner repaired.



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TUBES AND TRANSISTORS

This copy of **Techni-talk** comes to you through the courtesy of your General Electric Tube and Transistor distributor.