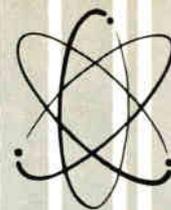




Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION
radio • tv • hi-fi



Vol. 16. No. 3

Fall, 1964

The Oscilloscope — Calibrating — 4

The first two issues in this series contained construction information on a high impedance probe and square wave generator. Various distortions of square wave shapes and the interpretation of these distortions were given in the last issue. In this issue information on measuring wave shapes and the construction of a calibrating voltage source will be described.

Defects in certain receiver components can attenuate the desired pulse or waveform without seriously affecting its shape. It is therefore essential during troubleshooting to examine both the shape of the wave and its amplitude. As the oscilloscope reproduces both the positive and negative going excursions of a sine or complex wave, amplitude measurements are made of their peak-to-peak values and it is therefore necessary to make calibrations on the basis of peak-to-peak voltage. Figure 1A illustrates the peak-to-peak value of a sine wave in comparison to its rms value.

In order to make accurate measurements, the scope should be equipped with a graph or transparent ruled scale mounted over the face of the cathode ray tube. This graph may be divided into five or ten squares per inch in both the vertical and horizontal direction. The scope is then calibrated, for example by adjusting the vertical gain control to expand a 100-volt peak-to-peak voltage to 2 inches or 10 squares. Usually, the horizontal gain is reduced to a minimum during calibration.

This results in a single vertical line as shown in figure 1B. This is less confusing to view than an expanded waveform thus minimizing the possibility of making an error. An unknown signal producing 4 squares of signal using the same gain setting in the vertical direction would have a value of 40 volts pp. or, if 12 squares, would represent 120 volts pp.

Fixed Voltage Sources

Two sources of ready-made calibrating voltages are the filament voltage present in the television receiver and the AC line voltage. For

accuracy in either case, measure those voltages with a reliable AC meter. If the meter used is calibrated in peak-to-peak voltage, no conversion will be necessary.

If, however, the meter is calibrated in rms values, it will be necessary to convert the rms to peak-to-peak values by using the following formula: Peak-to-peak voltage = $2.828 \times \text{rms}$. 6.3 volts will then equal approximately 18 volts peak-to-peak, or the line voltage (if 115 volts,) will equal approximately 325 volts peak-to-peak. Assuming the scope is adjusted to display the 18-volt signal at an amplitude of 5 squares, then each square would represent 3.6 volts peak-to-peak. As the maximum usable area is about 4 inches on a 5-inch tube, this would allow for a measurement of 20 squares, or in the case of the above voltage and gain setting, a limit of 72 volts.

Variable Voltage Sources

Greater flexibility can be obtained by using a variable voltage source. Several types of calibration units are available or a simple inexpensive unit may be constructed. Details for two such units are illustrated in figures 2 and 3. These units offer isolation as well as a smooth variable control of the calibrating voltage source. Table I lists the range of the peak-to-peak voltages that may be required and their rms values.

Peak-to-peak voltages in excess of 300 volts can be measured by adjusting the scope gain to one-inch deflection with 106 volts rms applied. With this setting, the peak-to-peak value of an unknown voltage will be 300 volts times the number of inches deflection. Do not apply voltages to the scope or probe in excess of the limits suggested by the manufacturer. In order to insure error-free calibrations, always feed the calibrating voltages through the probe or any isolating resistor or capacitor which will be attached to the scope cable while troubleshooting or making measurements. Do not remove the voltmeter from the calibrating unit during scope calibration if the meter used tends to load down the circuit, such as a 20,000-ohm-per-volt type.

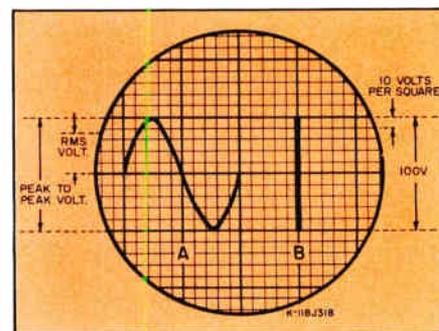


Fig. 1 (a) Comparison of Peak to Peak and R. M. S. Voltages

(b) Horizontal Gain Reduced to Minimum During Calibration

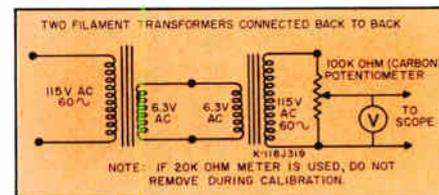


Fig. 2 Calibration Unit using two transformers

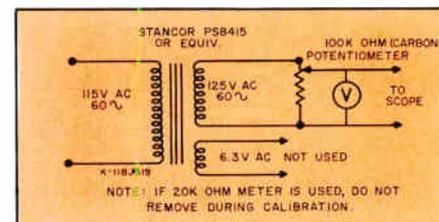
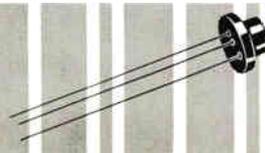


Fig. 3 Calibration Unit using one transformer

TABLE I

| RMS | P. to P. |
|------|----------|
| .53 | 1.5 |
| 1.06 | 3.0 |
| 5.3 | 15. |
| 10.6 | 30. |
| 53. | 150. |
| 106. | 300. |

The above peak-to-peak values are approximate and were rounded off for convenience.





BENCH NOTES

SOLDER REMOVING AID

When removing components from printed circuitry, it is desired to remove excess solder in order to facilitate the operation. A "solder-sucker" may be easily made, at virtually no expense from a small size plastic squeeze bottle.

Fit a two-inch piece of tubing to the top (the tubing from an old ball-point pen cartridge does nicely — aluminum preferred). A bit of epoxy type glue will secure the tubing to bottle top.

To operate, heat the joint until the solder flows, squeeze the bottle, and apply the tip to the heated joint. Release the bottle and excess solder will be easily removed, making component removal convenient.

Edward Grey
3205 Keniston Lane
Jacksonville, Fla.

YOKE REMOVAL

Here is a very simple solution to removing a yoke that has become "frozen" to the picture tube neck. Merely use a good tuner cleaner solution, and spray the liquid around the picture tube neck. This lubricates the neck and allows the yoke to be removed easily.

Any approved tuner cleaner will not affect the wiring on the yoke which can be wiped dry after its removal. This procedure has worked every time.

Carlton C. Mills TV
20 Gordon Place
Scarsdale, N. Y.

USE A BLANKET

When transporting receivers in a passenger stationwagon, place a blanket on the tailgate. Put the set on the blanket and slide both into the wagon. When unloading, just pull the blanket. Set will come out with out crawling inside or using an additional man.

Alvin Krum
644 Lincoln Avenue
Maywood, N. J.

CUTOUT IMPROVES EYE LOUPE

I find a jeweler's eye loupe very helpful in the study of tiny components, but it's a chore to be continually removing and replacing the loupe when doing fine work.

By cutting out a section of the housing, the loupe is improved so I can see objects in normal size with out removing it from the eye — sort of a bifocal effect.

Because light can enter through the cutout, I can also place the modified tool directly on small drawings and schematics for easier reading.

Harry J. Miller
Advance Television-Radio
991 Forty-Second St.
Sarasota, Fla.

CHECK SOLDERING GUN TIPS CLOSELY

When a soldering gun tip does not produce heat, the tip is cracked or open. An open soldering gun tip is the cause of the loss of high heat. When the trigger is depressed, the tip will only get slightly warm. This open tip can not be seen without the use of a magnifying glass. Yet, the tip will look perfect to the naked eye.

A. von Zook
Corralitos Radio Shop
142 Hanes Road
Corralitos, Calif.

SHADED SCREEN

A Magnavox 24" TV, Chassis V-21-06CB, came into the shop with the following symptom.

Set had complete raster, however, video appeared on $\frac{2}{3}$ of right side, with picture area rolling slowly and with fair sound.

Fault with a defective electrolytic filter capacitor C 1 which has four units in one can.

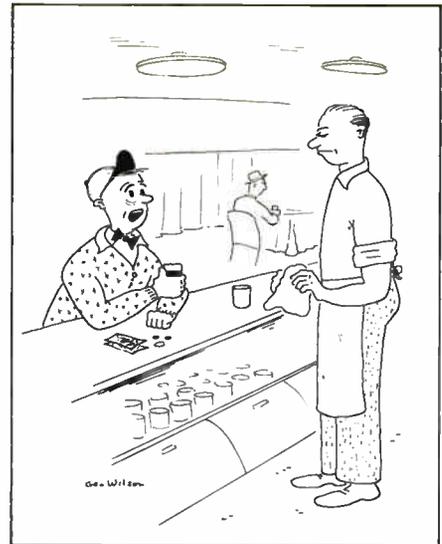
B+ voltage showed only a slight reduction. Apparent defect was common coupling between the various sections of the electrolytic capacitor. All symptoms disappeared when complete unit was replaced.

A. Borgetti
A & B T.V. Service
6735 Baring Avenue
Hammond, Ind.

SPRAY EXTENSION

The needle of an old hypodermic makes an excellent extension for pressurized spray cans. The small diameter makes it possible to spray through very small holes in control and other parts.

William Schoeck
1133 Oak Street
W. Palm Beach, Fla.



"I've had it two weeks — checked all the tubes, cleaned and straightened the pins, replaced the linearity coil, pulled every capacitor, changed the transformer and yoke . . ."

SOLDERING HINT

Wrapping a piece of aluminum foil around the element of a soldering iron speeds its heating action, and wrapping a few turns of asbestos tape around the shank will help prevent burning insulation or components when soldering in cramped spots.

Stan Clark
Box 2162
East Bradenton, Fla.

TOOTHPICKS ARE USEFUL

I have found that a box of toothpicks are useful in my shop. After removing transistors, condensers, and resistors from the P-C board, you can melt the solder and then insert the round toothpick in the hole where the old part was removed and solder will not stick to the toothpick, therefore leaving the hole open to install the new part with ease.

Carlos Brownderville
Carlos Brownderville's
Radio & Television Service
Weiner, Arkansas

NOTE:

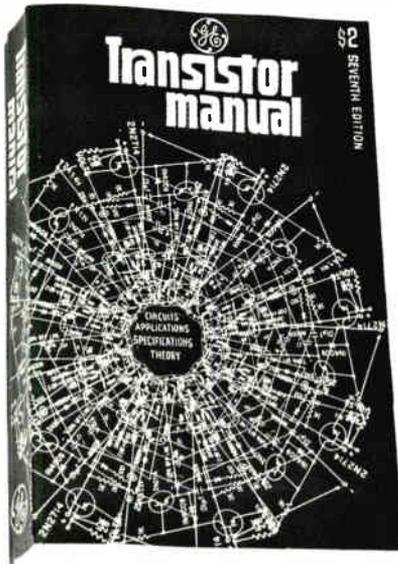
Those desiring to have letters published in this column should write the Editor Techni-Talk, Electronic Components Division, General Electric Company, Owensboro, Kentucky. For each such letter selected for publication you will receive \$10.00 worth of General Electric tubes. In the event of duplicate 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.

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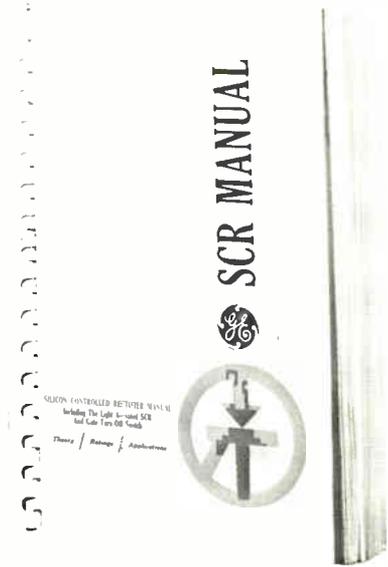
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NEW GENERAL ELECTRIC TUBES AND COMPACTRONS LISTED BY RECEIVER

tubes



Here is a list of *NEW* General Electric receiving tubes and compactrons and the manufacturers using these types in their receivers. Be ready to service the new model re-

ceivers by having at least one of each type on hand. They are now available from your General Electric tube distributor. Asterisk indicates compactron types.

| TYPE | SET MANUFACTURER | FUNCTION |
|--------|--|---|
| 2DV4 | RCA — TV | RF Ampl. |
| 2HA5 | Admiral TV | RF Ampl. |
| 4JC6 | RCA TV | IF Amp. |
| 4JD6 | RCA TV | IF Amp. |
| 5HA7* | Emerson TV | Syn, AGC |
| 5LJ8 | Sarkes tuner, TV (Use by Admiral, etc.) | Oscillator-Mixer |
| 6BH11* | G-E | Hor. Osc., control & discharge |
| 6HB7 | St'd K Tuner, Motorola) | Osc.-Mixer |
| 6HQ5 | St'd K Tuner, Motorola) | RF Amp. |
| 6J10* | Zenith TV | Sound Det. & Output |
| 6JM6* | Zenith TV | Hor. Out |
| 6JN6* | Zenith TV | Hor. Out |
| 6JS6A* | GE & Zenith Color TV | Horizontal output |
| 6JV8 | Admiral TV | Vid. Amp. & Sound IF |
| 6KR8 | Philco | Video Amp. and Sync. Sep. |
| 6KT8 | Zenith | Chroma amplifiers, color killer and sound IF & Sync. Amp. Limiter |
| 9GV8 | Admiral TV | Vert. Osc. & Output |
| 10KR8 | Philco | Video Amp. |
| 12GN7 | Zenith Color TV | Video Amp. |
| 12JN6* | Motorola TV | Horizontal output |
| 12JN8 | G-E-AM, FM | RF & Osc. mixer multiplex |
| 13GF7 | RCA TV | Ver. Osc.-Out |
| 15LE8 | Motorola | Color demodulator |
| 16GY5* | Emerson TV | Hor. Output |
| 17AY3 | Zenith | Damper |
| 17JB6 | RCA TV | Hor. Out. |
| 17JM6* | Zenith TV | Hor. Out. |
| 17JN6* | Zenith TV | Hor. Out. |
| 21HB5* | G-E TV | Hor. Output |
| 23Z9* | G-E TV | Vert. Osc. -Out & Sync. Sep. |
| 33GY7* | G-E TV | Hor. Damper & Output |
| 33JV6* | Admiral TV | Horizontal output |
| 38HE7* | Motorola TV Admiral | Hor. Output and Damper |

*Compactron Type



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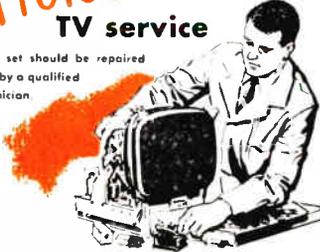
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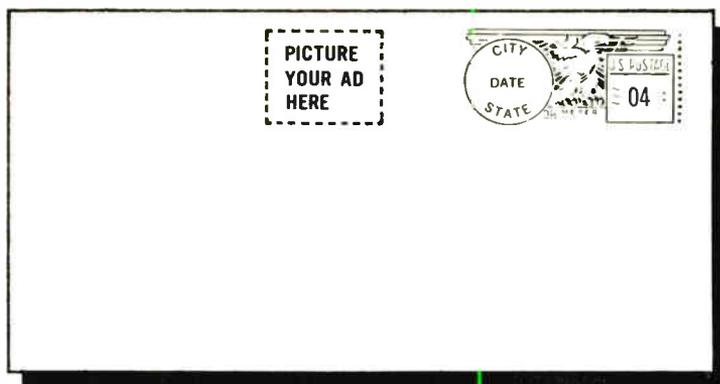
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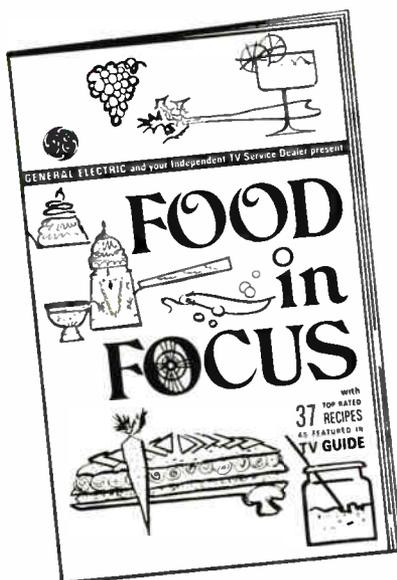


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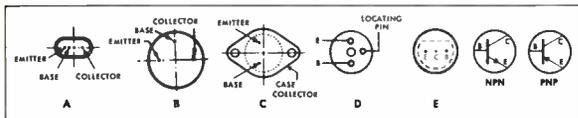
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| Catalog No. | Outline Drawing | Use | Application | List Price |
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| GE-2 | B | PNP | AF AMPLIFIER | 2.00 |
| GE-3 | C | PNP | AF POWER AMPLIFIER | 3.75 |
| GE-4 | D | PNP | AF HIGH POWER AMPLIFIER | 7.40 |
| GE-5 | B | NPN | MIXER/OSCILLATOR CONVERTER * RF and AF AMPLIFIER | 2.75 |
| GE-6 | A | NPN | MIXER/OSCILLATOR CONVERTER * RF AMPLIFIER | 2.90 |
| GE-7 | A | NPN | IF AMPLIFIER | 2.65 |
| GE-8 | B | NPN | AF AMPLIFIER | 2.00 |
| GE-9 | *B | PNP | MIXER/OSCILLATOR CONVERTER * RF and IF AMPLIFIER | 2.00 |
| GE-10 | E | NPN | AF AMPLIFIER * DRIVER * OUTPUT | 1.95 |

*GE-9 Smaller size than GE-1 (GE-9 .209 diameter — GE-1 .335 diameter.)



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| PNP TYPE | | GE-1 INTERCHANGEABLE WITH THE FOLLOWING | |
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| 2N111A | 2N140 | 2N271A | 2N413 |
| 2N112 | 2N218 | 2N273 | 2N413A |
| 2N112A | 2N219 | 2N274 | 2N414 |
| 2N113 | 2N247 | 2N409 | 2N414A |
| 2N135 | 2N252 | 2N410 | 2N414B |
| 2N136 | 2N257 | 2N411 | 2N415 |
| | | 2N415A | 2N485 |
| | | 2N416 | 2N486 |
| | | 2N417 | 2N614 |
| | | 2N481 | 2N616 |
| | | 2N482 | 2N617 |
| | | 2N483 | 2N1107 |
| | | 2N1108 | GT-760R |
| | | 2N1109 | GT-761 |
| | | 2N1110 | GT-761R |
| | | 2N1111 | GT-762R |
| | | 2N1266 | GT-766 |
| | | CR-760 | 2SA37 |
| | | CH-766 | 2SA38 |
| | | 2S30 | 2SA49 |
| | | 2S45 | 2SA52 |
| | | 2S52 | SYL-1536 |
| | | 2S53 | SYL-1537 |
| | | 2S437 | SYL-1583 |
| | | 2SA38 | SYL-1608 |
| | | 2SA39 | SYL-1621 |

BACK

NEW G.E. GE-504 UNIVERSAL RECTIFIER

A silicon rectifier with a 45-amp surge rating. Recommended as a replacement for all selenium, germanium and silicon rectifiers used in TV receivers. The 45-amp surge rating eliminates the need for the surge limiting resistors normally required when silicon rectifiers are used.

PIV is 400 volts; max. Idc, 750 ma. Shpg. wt. 2 oz.

LIST \$2.00



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| Type | Description | Average Forward Current (ma) | Peak Reverse Voltage (volts) | List Price |
|--------|-------------------|------------------------------|------------------------------|------------|
| 1N34AS | General Purposes | 50 | 75 | \$.60 |
| 1N60 | Video Detector | 50 | 30 | .85 |
| 1N82A | Silicon UHF Mixer | — | 5 | 1.45 |
| 1N295 | 50 MC Detector | 30 | 50 | .55 |

G.E. VAC-U-SEL^A DOUBLE DIODES

Miniature double diodes for TV horizontal phase detector, replacement and other applications. $\frac{1}{16}$ x $\frac{9}{16}$ x $\frac{1}{16}$ ". Shpg. wt. 2 oz.



| Type No. | Ifwd | Imr | Description | Max. Case Temp. | List |
|----------|------------|---------|------------------|-----------------|-------|
| 6GC1 | 1.1 @ 2.5V | 4 @ 20V | Common cathode | 85°C | \$.99 |
| 6GD1 | 1.1 @ 2.5V | 4 @ 20V | Series connected | 85°C | .99 |
| 6GX1 | 1.1 @ 2.5V | 4 @ 20V | Common anode | 85°C | .99 |

G.E. SILICON AND GERMANIUM RECTIFIERS

These top hat, hermetically sealed rectifiers are designed for general purpose applications requiring maximum economy.

| TYPE | PIV | MAX IDC | LIST PRICE |
|--------|-----|---------|------------|
| 1N91 | 100 | 150 | \$1.20 |
| 1N1692 | 100 | 600 | .75 |
| 1N1693 | 200 | 600 | .80 |
| 1N1694 | 300 | 600 | .95 |
| 1N1695 | 400 | 600 | 1.10 |
| 1N1696 | 500 | 600 | 1.20 |
| 1N1697 | 600 | 600 | 1.55 |



SELENIUM RECTIFIERS FOR USE IN COLOR TV SETS

The GE CR series are the replacement rectifiers for all color chassis made by RCA, Zenith, GE and others, giving a complete color rectifier line for electronic parts distributors.

| CATALOG NUMBER | TYPE | LIST PRICE |
|----------------|---------------|------------|
| GE CR — 1 | Focus Rect. | \$4.85 |
| GE CR — 2 | Boosted Boost | 2.25 |
| GE CR — 3 | Convergence | 1.60 |

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Model K-915A convenient kit covers a majority of entertainment-type semiconductor replacement needs — an ideal aid for radio and TV servicemen. Contains 22 units of service-designed semiconductors including 7 universal transistors, 3 silicon rectifiers, 6 crystal diodes, 5 dual diodes, and 1 power transistor. Units are housed in a sturdy cabinet with 15 clearly labeled drawers. Every unit always within handy reach. Cabinet size, 8½ x 12½ x 9". Shpg. wt., 4 lbs.



SERVICE NOTES

COLOR TV SERVICE HINTS CY, CX, CW CHASSIS

The following service hints have been compiled from information supplied by distributors and from factory experience.

For easy reference, the information is presented in a "Symptom-Cure" form. The cause or cure are those which have been reported, though not verified by use. Also, they are not necessarily the only ones which will produce the symptoms listed.

| CY CHASSIS | SYMPTOM | CAUSE — CURE |
|-------------------|--|---|
| Video | Signal Overload Busy Background | AGC Control R-130, open Replace 6DS4 |
| Audio | Hum or Buzz in background, volume at normal level. | Vertical pick-up on Vol. Control lead. |
| Chroma | Hue Control not in center of range. Loss of color on station but some color from generator. Lost color bar from Keyed Color Bar Generator, missing from display. | Adjust T-702 C-702 (.047 mfd.) defective. Slight overscan is intentional to permit best linearity and convergence at edges. (Will not be a customer complaint). Try another 6JE6. |
| Sync | No color Sync-Horizontal Hold unstable. Poor Sync | Defective 3.58 Crystal, C-520 leaky. Leaky Electrolytic Cap. C-118, 124, 136 |
| CRT Display | Raster Bloom No Hor-Sweep or H. V. Poor-Focus Red and Green will not converge at center Poor Purity | R-150 open Replace 6JE6 Focus Rectifier CR102 shorted. Reverse Red static magnet. Degauss — Adjust yoke tilt. |
| CX CHASSIS | | |
| CRT Display | Bright Hor. line 3 inches wide rolling up screen. Blooming Red and Green will not converge at center. Poor Purity | Poor ground on Electrolytic Cap. TSL 15-63). TSL 23-62) Reverse Red Static magnet. Degauss — Adjust yoke tilt. |
| CW CHASSIS | | |
| Video | Weak or no video — Audio present. | L-112 open |
| CRT Display | Intermittent loss of brightness and contrast Red and Green will not converge at center Poor purity | Electrolytic Cap. C-119D intermittent Reverse Red static magnet. Degauss — Adjust yoke tilt. |

RECORD CHANGER SERVICE HINTS

MODEL: G.E. RD100 Series

SYMPTOM: Unit will cycle to off position as if last record had completed playing, even though record balance arm is up on the record load position, or in automatic repeat position.

CAUSE: Quadrant lever is sticking (see Fig. 1) in shut-off position due to presence of oil, grease or foreign matter.

CORRECTION: Remove oil, grease, or foreign matter from quadrant lever. Quadrant lever should be dry and clear of any lubricant and move freely by gravity. The quadrant lever may be cleaned with a small brush and alcohol.

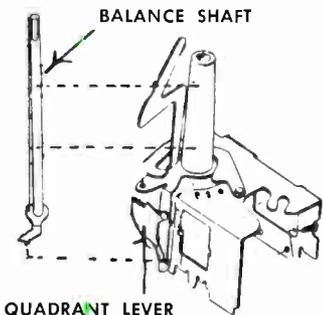


Fig. 1 Sticking Quadrant Lever

MODEL: G. E. RD100 Series

SYMPTOM: Unit does not shut off automatically after last record has finished playing. In some cases record support arm may be rotated much further than the normal 90° arc, causing damage to record indexing parts.

CAUSE: The foot on the lower end of record balance shaft (see Fig. 1) may be bent up, preventing the balance shaft from actuating the quadrant lever.

CORRECTION: Balance shaft can usually be straightened. If not, replace balance shaft.

NOTE: The balance shaft is usually bent up by the inadvertent application of excessive downward pressure exerted on the balance arm when in automatic repeat position. In later production, the balance shaft was beefed up to alleviate this problem.

99 SHUTOFF LEVER ASSEMBLY

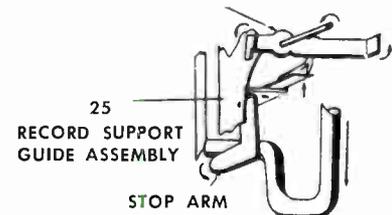


Fig. 2 Shutoff Mechanism Parts

MODEL: All V.M.

SYMPTOM: Tone arm returns to rest post and changer shuts off instead of playing record.

CAUSE: Stop arm (see Fig. 2) is binding in shut-off position. Binding may be due to burrs and/or gummy lubricant. Securing rivet can also cause binding.

CORRECTION: Remove burrs and/or gummy lubricant — free rivet.

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GE Techni-talk

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