Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION

radio · tv · hi-fi

Vol. 14, No. 6 Dec., 1962

G-E HORIZONTAL PHASE DETECTOR II

The preceding issue presented basic theory of diode operation and the development of a voltage suitable for application in the horizontal base detector circuit. In this issue the practical application of this voltage will be discussed.

Practical Application

First — the phase detector is necessitated because it is desired to control the horizontal oscillator by DC means rather than direct application of sync pulses for the reasons given in the previous issue.

Simply expressed, a sample of the receiver-generated horizontal frequency is compared with the transmitted sync pulses. As long as they are in proper relationship time-wise, no correction voltage is generated. It is important that the last statement be absorbed literally. The basic intent of any synchronizing circuit is not to change the frequency but rather to bring two things which are already on the same frequency into step so that each one starts and stops at the same time.

Although, over a limited range, it is possible for the synchronizing source to pull an oscillator into frequency, this is not its real purpose. Two wheels with equal size holes and revolving at the same speed in front of a light source will not allow the light to pass through unless they are in sync — i.e., the holes of each must pass the light at the same time.

It is important, therefore, when confronted with a sync problem, to always determine first that the local oscillator is operating in a free running state at the correct frequency. Until this is achieved, it cannot reasonably be expected that the application of sync signals will consistently be successful in maintaining the desired stability. As the procedures necessary for establishing these conditions are already outlined in the service notes pertinent to the various

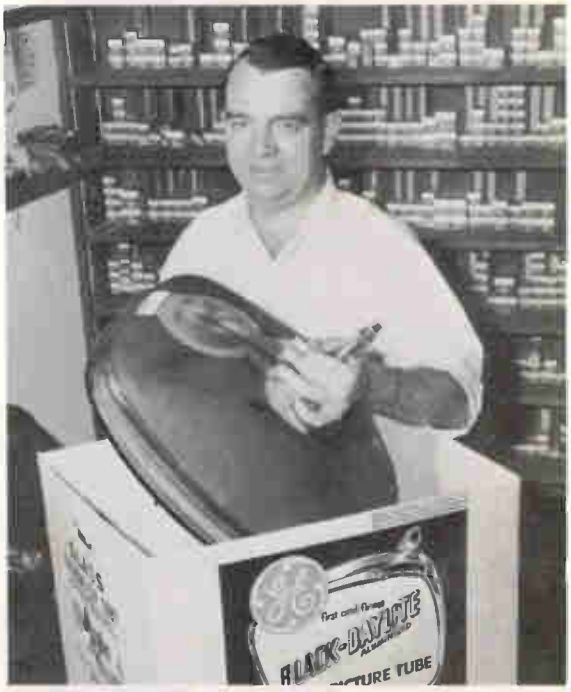
(Continued on Page 3)

G-E Receives Award for Educational Film

A cartoon-style film which has been viewed by hundreds of service dealers brought this merit award plaque to Thomas S. Knight (left) and Fred J. Nataly (center) of the General Electric dealer products group. The educational film, entitled "A Few Will Do," explains the usage of replacement electrolytic capacitors in radio and television maintenance.

Presenting the plaque for the National Visual Presentation Association is Irvine D. Daniels, general manager of the G-E Receiving Tube Department, Owensboro, Ky. Other awards won for achievements in science and promoting independent service dealers are in background.

Pittsburgh TV Dealer Puts Accent on Value



Carl Kirschbaum of Pittsburgh, Pa., reports that his 14 years experience in radio and television service shows that it pays to accent value — in both high quality parts and service.

Carl became a licensed radio amateur in 1946, shortly after World War II, and holds the call letters W3OOE. He went into radio and television service work the following year, and started his own business in 1952. He now has three employees.

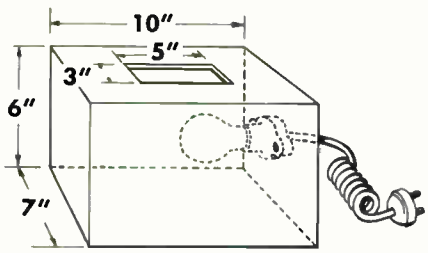
With high interest in his work, he likes the tough ones. He feels that people appreciate good work and quality parts. His feeling that the way to build a business is on this positive attitude is shown in his comment as follows:

"The General Electric Black-Daylite tubes are consistently of high quality. I can install them with peace of mind, knowing they'll give my customers complete satisfaction. I could save a couple dollars buying a cheaper tube, but it's no saving when you lose a customer. I've built my business on the basis of quality work, and the only way to turn out first class work is by using quality parts on the entire job."

BENCH NOTES

PRINTED WIRING BOARD VIEWER

Position the component side of the printed wiring board over the opening (on top of viewer) so that the components can be seen from the wiring-foil side. This viewer will aid the Service Technician as follows:



Cabinet made of ¼" plywood. lined with aluminum foil. Use 25 watt lamp.

1. Visual inspection for broken or minute cracks in wiring board.
2. Inspection for unbonded foil (blisters) caused by excessive soldering heat.
3. Inspection for shorts or causes for leakage paths.
4. A must for circuit tracing.
5. To determine the exact soldering point when unsoldering miniaturized components from wiring foil side of closely spaced conductor patterns, such as found in small transistorized portable radios of the shirt pocket size.

Carl Magrie
633 Lillibridge Ave.
Detroit 14, Mich.

KEYSTONE EFFECT

I have seen in some TV receivers what the servicemen call Keystoning The cause may be slightly different from the easily recognized "short" usually found in the horizontal winding of deflection yokes. This particular model had an open winding in the plate circuit of the horizontal output transformer.

Robert W. Amberogio
Bob's Radio Service
196 Lakeview Ave.
Hamden 14, Conn.

HV LEAD HOLDER

One of the problems that confront service technicians during alignment and other service procedures is what to do with the high voltage anode connector, to prevent shock and spurious radiation.

Most alignment instructions tell us to tape the lead away from the chassis. I solved this problem by inserting the lead into a small glass bottle or jar, this will lessen the danger of shock and the weight of the bottle or jar will hold the lead away too.

Cleon Mallory
Service Dept.
Genes Appliance Center
26 West Second St.
Maysville, Ky.

DIRTY TUNER STRIPS

If you have experienced dirty and corroded tuner strips, as I have, which will yield to none of the conventional liquid cleaners, I am sure this tip will do the job for you. All you need is a small rectangular suede brush which may be obtained at any shoe repair or hardware store.

First remove drum whenever possible for easiest operation. Then lightly brush contacts of strip until all dirt and corrosion is removed. You will then find the contacts gleaming and shining like new. If strips must be removed separately, take care not to remove channel markings when brushing. Finally apply vaseline or similar product to the contacts to complete the job.

Robert A. Morgan
Mr. TV
5407 West Center Street
Milwaukee 10, Wisc.

PORTABLE PROTECTION

The modern TV Portable poses a real problem on the service bench, inasmuch as they have to be turned on their sides, back, top, front, etc., to work on, and to disassemble and reassemble. Handles, knobs, controls, antennas, etc., protrude and could be broken or damaged. Cabinets are also susceptible to scratches or marring.

A good solution is to use a roll of paper towels. The roll is several inches thick, and when placed under one end, raises the cabinet off the bench, preventing scratches, and protecting knobs, etc. The roll is soft, will not mar, dents easily for irregularities of the cabinet, and will not skid. Soiled sheets are removed for a clean surface. A roll of paper toweling is also handy around the shop and service bench for many other uses, including cleaning CRT screens and safety glass.

John J. Hancock
Hancock Television &
Radio Service
212 North Eight St.
Keokuk, Iowa

"N" FUSE REMOVAL

A ¼" socket wrench fits perfectly over the head of the N-Type fuses. In many sets these fuses are buried between or next to a 5U4 tube or in some cramped spot which is hard to get at. If you are not careful you can get a nasty burn.

Take the ¼" wrench press down and twist. The fuse will come out extremely easy and it will not slip out of wrench when removing. If found defective you can insert the new fuse in wrench with the same ease and without danger from burns or shock.

John J. Daugila
4 Helen Avenue
Freehold, N. J.

Editor's Note: Some socket wrenches may require a piece of tape inside socket to prevent fuse from falling out.

KNOB PROTECTION

Prevent new plastic knobs from cracking during installation, by first immersing them in very hot water for a bit, to make them pliable.

H. Josephs
P. O. Box 22
Gardenville, Penna.

TIMESAVER

An easy and safe way to discharge the picture tube is with about 15 to 18 inches of spark plug wire. Remove about ½" of the insulation from the ends and then coat the ends of the wire with solder.

E. Jacobosky
257 So. 8th Ave.
Highland Park, N. J.

REPLACE THAT 2 MFD CAPACITOR

The 2mfd at 350V capacitor located on the Video Amplifier board of the RCA CTC9, 10 and 11 series color receivers has turned out to be quite a troublemaker.

If any one of the above chassis is brought into your service shop with such symptoms as 4.5 mc trap at input to video amplifier not effective, poor sensitivity, sound bars and 900 KC beat in picture which alignment will not cure, or picture rolls but vertical sync pulse looks healthly, replace the 2mfd at 350V capacitor on the Video board with a new 2mfd at 450V condenser.

A very large percentage of color receivers with any one of the above symptoms have been cured by replacing this part. The original part seems to check OK on all capacitor testers tried.

Paul Noel, Jr.
350 E. Locust St.
York, Penna.

Editor's Note: Ask your distributor for General Electric Capacitor No. QT1-1.

CAR ANTENNA TESTER

A simple 5 minute check for car antenna trouble, for a broken inside wire or shorted car antenna. Make a compact trial antenna using 5 feet of insulated stranded wire, solder one end to the center pin of a phono plug, these fit the antenna socket on car radios.

To check the car radio antenna pull out the car radio antenna plug and put the phono plug antenna in the socket. I have used this pocket size antenna for many years both on the bench and in the car radio work.

Stanley Weirczak
14 River Ave.
Newton Upper Falls,
64, Mass.

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.

G-E HORIZONTAL PHASE DETECTOR II

(Continued from Page 1)

receivers, no further mention of this will be made. Instead, we will proceed with the study of the phase detector.

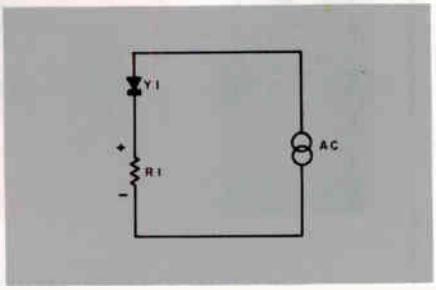


Fig. 1. Beginning Circuit

In the "Designer Series" of General Electric television receivers, a sample of the output of the horizontal oscillator is used for a reference voltage. In Fig. 1 is shown the beginning of the creation of this circuit.

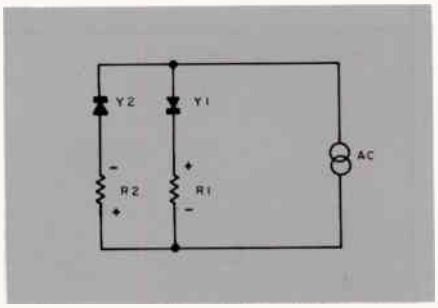


Fig. 2. Adding a Second Diode

In Fig. 2 another diode and similar load are added. This time, however, the second diode is reversed. Now each half of the AC wave supplied by the generator is rectified resulting in a current flow through R1 and R2 as shown. This configuration is not quite what we want, however. By transposing the positions of Y2 and R2 (maintaining the diode polarity) we arrive at a circuit as shown in Fig. 3.

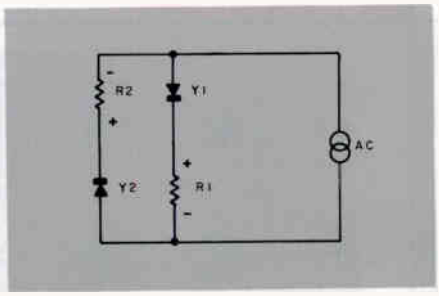


Fig. 3. Transposed R2 and Y2

Now we have a circuit with which we can work. Notice that the positive half cycle pushes current through Y1 and R1, while the negative half cycle pushes current through Y2 and R2. The important point here is to understand that the load associated with each diode is in series with, *not* in shunt with it.

A comparison of Fig. 1 in the Vol. 14, No. 4 issue and Fig. 3 on this page should reveal similarities not previously noted. Y1 and Y2, being normally constructed physically as a single component, are shown that way in Fig. 1 in the last issue. This standard practice has to quite a degree obscured the literal interpretation of the circuit's exact function as illustrated in Fig. 3. By adding the tie between the two diodes and resistors, and capacitors C1 and C2, we can complete the circuitry necessary for the reference voltage portion of the phase detector. This is shown in Fig. 4.

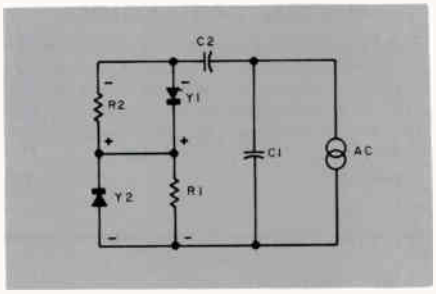


Fig 4. Common Diode Tie

It is possible to make the tie between the elements because they are both at positive potential so there will be no short circuit as there would have been had we tried this with the circuit in Fig. 2.

C1 is required for wave shaping (integrating) purposes while C2 is needed as a coupling and DC blocking medium.

Both capacitors together also serve another function to be discussed later.

Basic Circuit Completed

The addition of C3 completes the basic circuit by providing a means of injecting the incoming sync pulses to the network. This appears in Fig. 5.

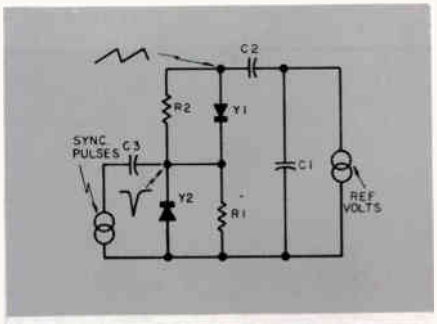


Fig. 5. Complete Basic Circuit

C3 also serves another function not perhaps immediately obvious. Prior to its addition, each diode passed current during the proper half cycle, causing a continuous voltage drop across their load resistors. C3 changes all that. After some few cycles, this capacitor becomes fully charged by this current as does a filter capacitor. This charge, you will note, is positive. Until either the reference voltage increases in ampliture or the capacitor is relieved of some of its charge neither diode may any longer conduct.

Before examining the effect of introducing sync pulses, it should pay to once more review the action of the reference voltage circuit. To do this, let us assume that the receiver has been turned on but is off channel, completely free of any incoming signals other than random noise.

As the oscillator commences to furnish this reference voltage, a sample is wave shaped by C1 and coupled to Y1 and C2. The positive half cycle causes Y1 to conduct through R1 back to the source, thus completing the circuit. As this occurs, the voltage drop across R1 also appears across C3, which stores some of the positive charge. As the negative half cycle appears, conduction through Y2 does not start until the amplitude of the negative swing exceeds the positive charge already built up in C3.

When this occurs, of course, Y2 conducts through R2 and C2 back to the source completing the entire operation. At this time, the positive potential across R2 contributes further to the accumulation of positive charge stored in C3. Eventually (probably some fraction of a second) the capacitor becomes fully charged so that no further conduction can take place except at the extreme peaks of the half cycles. The amount of discharge would represent the leakage across R1 and R2, which as far as C3 is concerned are connected in parallel.

In order to understand this last statement, we now arrive at the secondary purpose of C1 and C2 about which we hinted earlier. The actual values of C1 is 820 μμfd and C2 is 1000 μμfd. In series across the network they represent 450 μμfd., which as far as the short duration sync pulses coupled through C3 are concerned looks like a short circuit.

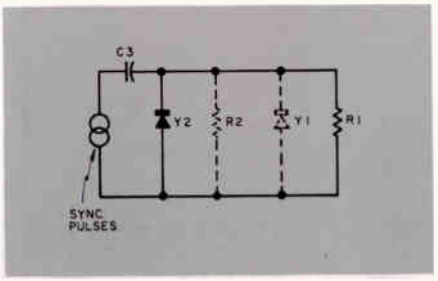
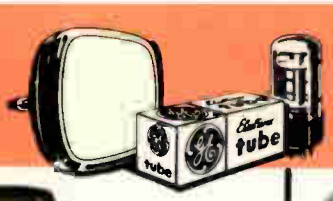
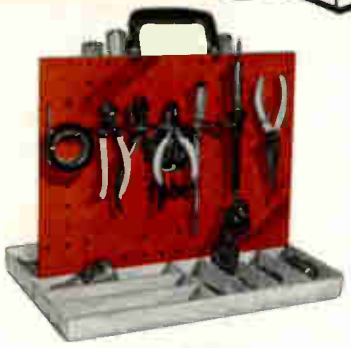


Fig. 6. Apparent Effect of C1 and C2

Looking at Fig. 6, we can see that this AC short circuit in effect has taken R2 and Y1 and folded them over into the same configuration as Y2 and R1. This association is only true as far as the sync pulses are concerned.

(To be continued)





TOOL TOTER

A convenient, lightweight, portable unit designed for use wherever tools are needed and used.
The pegboard keeps screw drivers, pliers, nut drivers and wrenches clearly visible and easily removed or replaced.
High-impact plastic trays hold screws, nuts, fuses, tape, capacitors and other small parts or tools.

ETR-2338 **Cost $3.50**

SOLDERING GUN OR ELECTRIC DRILL HOLDER

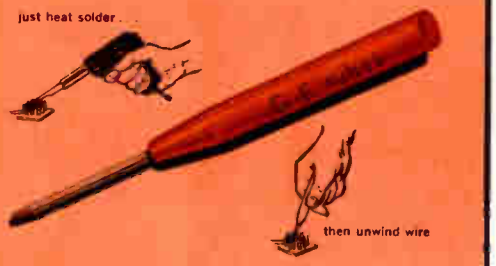
This G-E Soldering Gun or Electric Drill Holder prevents burns and damage to instruments, wires and service manuals. Holds an electric drill in a safe, ready-to-use position. It can be easily mounted to ony surface with clamps and screws supplied with units.

ETR-2582 **Cost $0.75**

SOLDERING IRON HOLDER

Made to mount on bench edge or bench top. Will accommodate soldering irons up to ¾" in diameter. Protects your hands, wires, diagrams, other tools from burns. Cadmium aluminum finish resists heat discoloration. Holes in both inside and outside cylinders provide maximum air circulation.

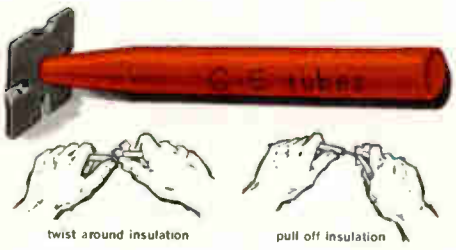
ETR-2790 **Cost $1.20**



SOLDERING TOOL

Helps remove "wrap-around" soldered wires. (Heat solder first.)
Convenient size (6" long) and shaped for general repair work.
Orange-color handle makes it easy to locate on the bench or in service case.
Single-ended tool, easier, to hold and use.

ETR-2377 **Cost $0.65**



WIRE STRIPPER

Four cutting edges for most wire sizes.
Select cutting edges slightly smaller than outside dimension of insulation.
Press insulated wire fully into cutting channel.
Rotate wire stripper completely around wire and pull.

ETR-2376 **COST $0.65**

BENCH MIRROR

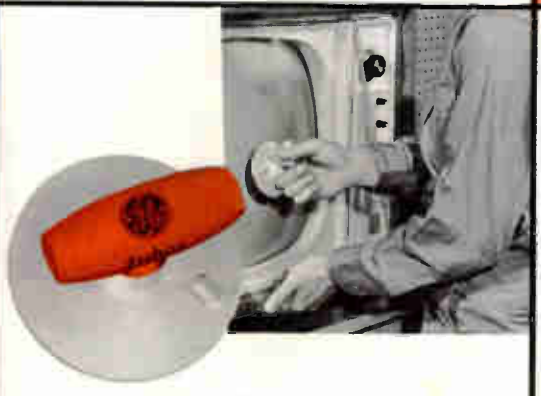
A mirror that saves you valuable time because it's designed specifically for the TV workbench. Adjusts quickly to any desired height.

ETR-1275 **Cost $3.50**

TUBE PULLER

Never be without it on your workbench or in your service case. It protects you against burns, cuts and shocks — no matter how firmly the tubes may be wedged in their socket. Fits all regular glass types, all metal tubes, plus seven- and nine-pin miniatures.

ETR-1094 **Cost $0.35**



SAFETY GLASS PULLER

It's exactly what you need to remove safety glass quickly, easily — and safely! Prevents cracking, chipping and other damage while you remove the glass. The three-inch suction cup holds firmly, is easily removed from the glass by unique vacuum release tip. Won't leave marks on glass.

ETR-1592 **Cost $0.95**

PICTURE TUBE PILLOW

This ½" thick foam-plastic cushion provides the surest possible protection against scratches on the tube face and edges. Order at least one for every technician in your shop. Never lay a picture tube on anything else.

ETR-1469 **Cost $0.75**

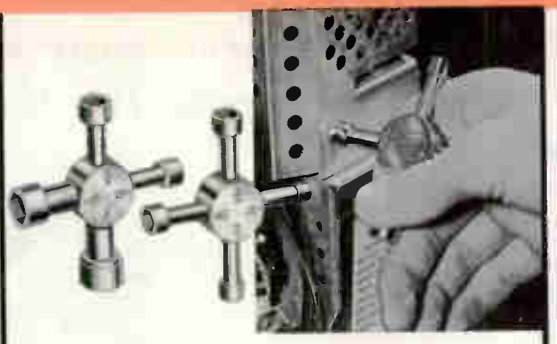
SERVICE AIDS

specifically engineered and field-tested for the TV/radio service dealer

SERVICE DROP CLOTH

A rugged, hard-wearing plastic sheet that does double duty: It protects furniture and floor coverings, even against hot solder. It serves as a protective cover for radio and TV cabinets when moving them to or from the home.

ETR-1021 Cost $1.95



TWIN-X-WRENCH SET

The two wrenches in this set actually do the work of eight hex-head socket wrenches, save plenty of space and weight in your repair kit. They're designed especially for TV and radio service work, where you need to get maximum leverage, often in very close quarters.

ETR-752 Cost $3.45

SERVICE CALL BOARD

In a single glance, this easy-to-use rolling chart tells you where your work stands — shows you your work schedule for days or weeks in advance — enables you to schedule work immediately. Marking pencil and complete instructions included.

ETR-2144 Cost $5.00

FUSE AND HEATER CHECKER

Pocket-size — yet it will check virtually all tubes used in series-string TV sets and radios (AC, DC, and portable), including picture tubes. Also tests pilot lamps and fuses. Rugged construction. Battery powered. Actual size — 4" x 2¾" x 1¾".

ETR-981 Cost $2.95

COMPACTRON SOCKETS

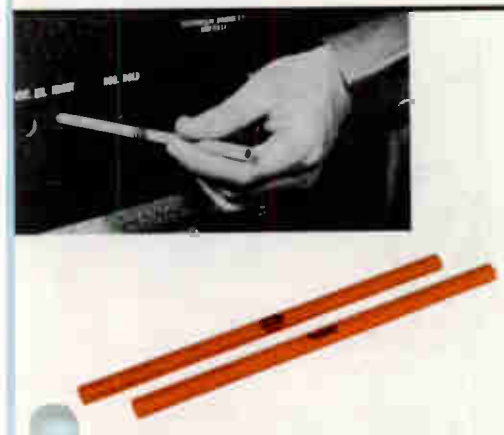
Two 12-pin sockets for compactron devices in each package. New feature — a raised "key" ridge between pins 1 and 12 to help when inserting the compactron in hidden locations. The pins are numbered on the bottom of each socket.

ETR-2975 Cost $0.39

CAPACITOR TAB ADJUSTER

Simplifies removal and installation of twist-prong electrolytic capacitors and also some types of variable controls. Hollow tip fits perfectly over mounting tabs. With a twist you break off old tab . . . lock in new.

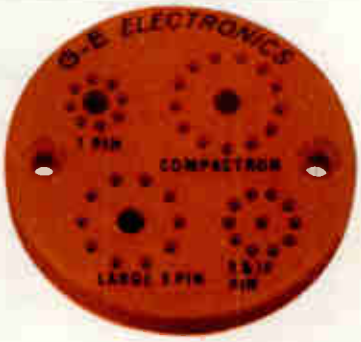
ETR-2968 Cost $1.00



REAR CONTROL EXTENSION

Permits quick, sure adjustment of TV controls without removing back of set. One end tapered to fit snugly over knurled control shafts. Pin in other end fits slotted shafts and, unlike screwdrivers, cannot slip off.

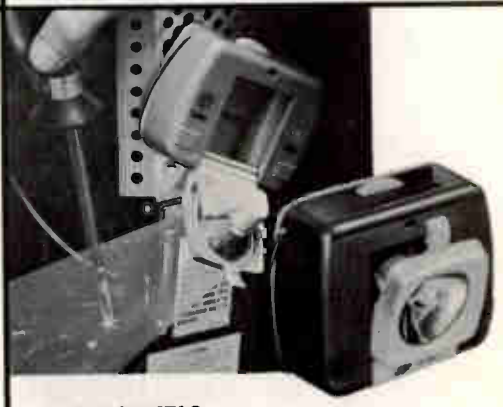
ETR-2089 Cost $0.60



MULTI-TUBE PIN STRAIGHTENER

Straightens pins in a jiffy. Helps to eliminate tube damage caused by bent pins. New small size just right to slip into trouser or shirt pocket. Red-orange color makes it easy to find.

ETR-3200 Cost $0.60



MAGNETIC SWING-BEAM SERVICE LIGHT

This TV Service Light has a magnet that holds it firmly to the chassis, leaving both hands free for work. The front of the lamp swings out to any desired angle, allowing you to aim the beam exactly where you need it.

ETR-1593 Cost $2.25

What's new!

ACCENT ON VALUE

It has always been embarrassing to have a top cap loosen or fall off an otherwise perfectly good tube. General Electric has been working on this problem for several years. Various improvements have been tried including high temperature solder but without complete success. The only answer seemed to be a welded top cap.

After many months spent in designing and developing special welding equipment and a new top cap all production of 6DQ6B tubes now feature the welded top cap. A top view of the new welded top cap is shown at the right of Fig. 1 and the old soldered type at the left. Fig. 2 is a side view in the same relative positions.

This new G-E development should eliminate all of the service problems due to solder melting or crystallizing because of age and heat.

While it may appear that this is a relatively simple improvement which could have been made long ago, as in the case of many other significant technological contributions, the solution to this problem is apparent only when viewed in hindsight. The successful solution of this problem has practically eliminated all complaints caused by open or arcing top cap connections.

At present only the 6DQ6B features the welded top cap. It is expected that this improvement will soon be added to the other horizontal output tubes.

General Electric tubes are constantly being improved. This latest improvement is another indication why G-E tubes are "Best for any set."

"There is nothing wrong with the set. I just had to have a sitter for a couple of hours."

RECENT G-E IMPROVEMENT MEANS

No More Loose Top Caps on 6DQ6B

Fig. 1. Top view of soldered top cap, left, and the new General Electric welded top cap, right.

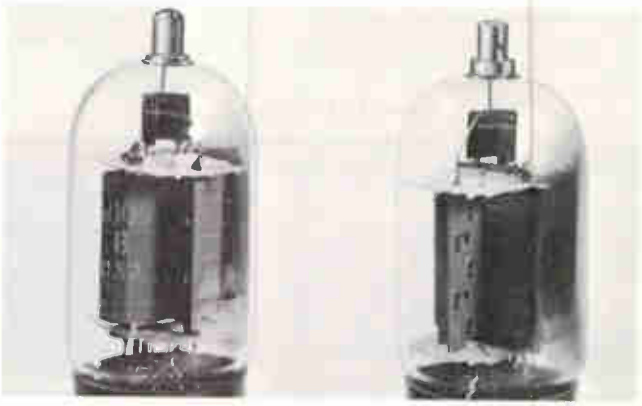
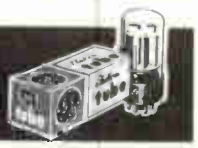


Fig. 2. The difference in the cap design can be seen in this side view of the same two tubes shown in Fig. 1.

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 receivers by having at least one of each type on hand. They are now available from your General Electric tube distributor.

TYPE	SET MANUFACTURER	FUNCTION
2CW4	RCA-TV	RF Ampl.
3FS5	Sears	RF Ampl.
6BD11*	GE "LX" Chassis	Video Amp., Sync. Clipper
6BF11*	GE "LX" Chassis	Audio Det. and Output
6BJ3*	GE "LX" Chassis	Damper
6FM7*	Zenith-TV	Vert. Osc. and Output
6FJ7*	GE-TV	Vert. Osc. and Output
6GM5	Philca-TV	Audio Output
6GV5*	Zenith-TV	Hor. Output
6HB5*	GE "LX" Chassis	Hor. Output
6JZ8*	GE "LX" Chassis	Vert. Osc. and Output
8B10*	GE-TV	Hor-Osc.
15FY7*	GE-TV	Vert. Osc. and Output
17BE3*	Philco-TV	Damper
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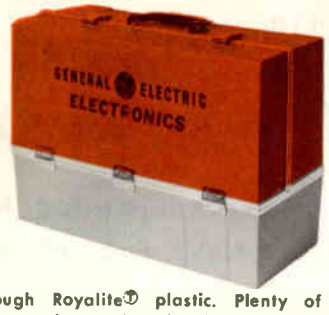

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ROLAND G. KEMPTON, Editor

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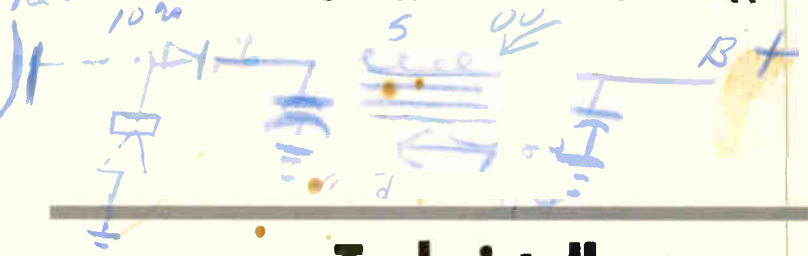

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