



# RADIO HI-FI TV

## Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION

Vol. 20, Nos. 1 & 2

Spring — Summer, 1968

### COLOR TELEVISION--NTSC STANDARDS-I

In the last four issues Colorimetry was discussed in considerable detail. Beginning in this issue the NTSC system will be described.

It has been determined how three colors could be used to reproduce, with considerable accuracy, a color scene. In the case of color television, this is only half the battle. The next problem to be undertaken is the transmission of the signals necessary to convey the color information to a receiver designed to pick up color signals.

To better accomplish the task of designing a suitable system of color television, a committee known as the National Television System Committee was formed. This committee had the monumental task of setting standards for color television which would be acceptable to such diverse groups as broadcasters, receiver and transmitter manufacturers, and common carriers, such as telephone relay systems. In addition to satisfying the industry, the committee had to keep in mind at all times that the viewing public had to be served satisfactorily.

To say that an understanding of the NTSC color standards is desirable is certainly an understatement. To the serviceman, an understanding of the color standards is absolutely necessary for efficient servicing of color receivers. The following sections build up the NTSC standards bit by bit. Starting with three signals corresponding to red, green and blue information present in a color scene, a system will be built up that will give the desired results most economically and with the least amount of objectionable characteristics. The end result will be the NTSC standards for color television.

#### CLOSED CIRCUIT COLOR TV SYSTEM

Figure 1 represents the simplest possible system of color transmission using three primaries. The object being scanned is viewed by three cameras through a dichoric mirror-filter system so that each camera has an output corresponding to only one primary color. In order to have a picture of comparable detail with that of a monochrome signal, each camera must have about 3.5 to 4 megacycles bandwidth. In figure 1 the three signals are sent through separate gain controls to three receivers. The receiver which is connected to the red camera has a red filter in front of the picture tube. The other receivers also have the appropriate filters, placed in front of their picture tubes. After the three outputs have been superimposed using another dichoric mirror system, the original scene can be observed.

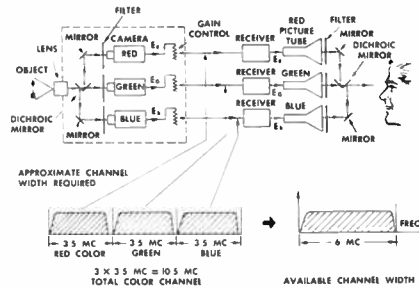


Fig. 1 — Color transmission system with three colors.

Before going further, some mention should be made of the gain controls. These are controls within the camera unit and are adjusted so that when a white object (Illuminant C — Fig. 6, Vol. 19, No. 2 issue) is scanned there are equal output from all three cameras. For this reason Illuminant C is often called "equal-energy white."

If these signals were to be transmitted, it would be necessary to have a carrier for each primary. Since each primary needs 3.5 or 4 megacycles bandwidth, the minimum bandwidth would be 10.5 megacycles with no thought given to the necessary audio carrier. This fact alone makes figure 1 an impractical system since it was found long ago by experience that even with the additional UHF channels, it would be necessary to keep the color transmissions to the same 6 megacycles being used for monochrome. If the bandwidth of each signal were cut down to 1.5 or 2.0 megacycles, the loss of detail would make the resultant picture much inferior to the monochrome signal to which the public is accustomed.

#### LOW DEFINITION COLOR INFORMATION

There is a characteristic of the human eye discussed in the issues on colorimetry which might be utilized to advantage. It will be recalled that the human eye does not respond well to detail in color. It was found

in the case of tinted photographs, for instance, that low definition coloring was all that was necessary to create the effect of a high quality color photograph. The high detail information was all supplied by the black and white photograph upon which the color was placed.

Would it be possible to use this principle in color television? Indeed it would, and that is exactly what is done. This, of course, will not be a complete answer to the transmission problem, but it will help to alleviate it. The advantage gained is that the only signal of high detail will be the brightness signal. In colorimetry, it was found that for color determination, three items had to be specified — brightness, hue and saturation. A monochrome picture furnishes brightness variations. Recall again that the eye responds only to brightness variations in high detail. Therefore, the other two dimensions, hue and saturation, need not have high detail, which means that less bandwidth is required.

#### DEVELOPMENT LUMINANCE SIGNAL

Thus, the first step in building up the color signal is to construct a normal monochrome signal from the outputs of the three cameras. This signal, as shown in Figure 2, will be transmitted in an identical manner to a standard monochrome signal. Fig. 2 also indicated that a narrower bandwidth may be used for color information.

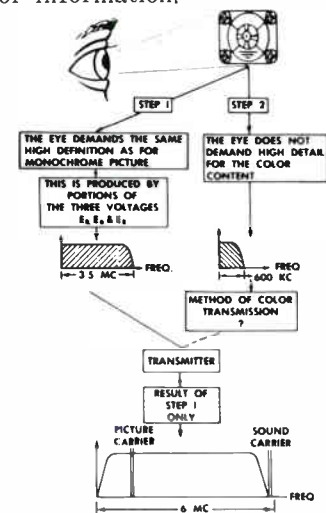
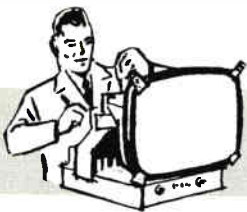


Fig. 2— Two step development of color signal. (continued on page 2)



# BENCH NOTES

## SPEEDY TUBE TESTING

When a transformer type TV requires a complete tube check, do it faster by removing the rectifier, then turn the set on. The tubes are then preheated and can be swiftly checked in numerical-alphabetical order.

H. Josephs  
Box 22  
Gardenville, Pa. 18926

## HASH

Recently I had a radio set in with a severe hash problem. The tubes checked out O.K., there were no wiring problems, and the tuning capacitor plates were not shorted (a common problem). The audio section was functioning properly, and the problem was finally pinpointed to the I.F. stage. An I.F. transformer was removed, and the metal shield taken off. Close inspection revealed iron particles shorting out the capacitor at the bottom of the unit. These particles were blown out, the receiver reassembled, adjusted, and it worked perfectly. Evidently, someone had turned the powdered iron inductor with a screwdriver, chipping off the particles that caused all the trouble!

Robert Schultz  
144-07 Sanford Avenue  
Flushing, New York 11355

## CLEANING TIPS

Dirty soldering tips, corroded terminals, etc. can be easily cleaned with a small steel bristle suede shoe brush. Heat your soldering gun or pencil then brush off the old solder. You'll find it is a handy addition to your bench tools.

Ray Van Tassel  
807 Dearborn NE  
Salem, Ore. 97303

## SOCKET HUM

We had a new small table model radio come into the shop for repairs with a low hum as the complaint. It was a sure bet that this was a defective filter, but we were wrong again. Looking the printed board over a little closer, we noticed that a tube socket had been removed and a new one soldered into its place. This socket was the first IF amplifier 12BA6 tube socket.

The socket which was installed was a different type than the one that came in the set. One thing was sure, there was no center grounding pin. By simply pushing a small screw driver down through this hole and into the middle of the new socket, the hum disappeared, the radio played on as it should. There was no metal grounding pin in this new socket and when the screw driver was slipped into it, the screw driver acted as a grounding shield. The replaced socket was removed and a new grounding pin socket was installed in its place. It just goes to show that all troubles that happen to a radio and to the TV receiver are not caused by their own failures.

Homer L. Davidson  
2821 5th Avenue, S.  
Fort Dodge, Iowa

## RCA VICTOR KCS 141 CHASSIS MODEL 193B571

Symptoms: Weak picture with severe horizontal bend, poor vertical and horizontal sync.

Cure: This problem was isolated to the AGC and sync tube 6KA8, V501, stage by simply removing the tube which then caused the picture gain to increase (to an overload condition). This showed picture gain problem was within this area. A check of components showed that R543, 12K resistor had increased to over 1 megohm. Replacement restored normal picture and sync.

Also in some sets of this model R545, 10K has been found reduced in value to less than 5K. This decreases the range adjustment of the AGC control. In all these models we now automatically replace both resistors as they are common to the cathodes in the 6KA8 and this prevents call backs.

Leonard Chioma  
Electronic Model Engineering  
2020 Natalen Rd.  
Winter Park, Fla.

## TRANSISTOR RADIO SERVICE TIPS

1. Before servicing transistor radio, obtain a piece of rug with thick piling and spread out on workbench, this will prevent scratches to case and loss of small parts.
2. Upon completion of repair, you can clean outer case with soap and water. A toothbrush is very helpful to clean knobs and getting into case crevices. Applying the above hints will show you to take pride in your work.

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

## USE FOR OLD TUBE TESTER

The old tester can be used as a tube warm up unit. More sockets can be wired to the tester panel sockets.

With the different filament voltage ranges available, any tube can be warmed up for testing (where other warm-up devices only have one or two filament voltages).

Even different filament voltage tubes can be warmed up as long as the lowest filament voltage is used.

Cal Abbott  
17 Nelson Ave.  
Bradford, Pennsylvania 16701

## 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.

## COLOR TV NTSC STANDARDS I

(continued from page 1)

There is more than one advantage to this method of color transmission. This monochrome signal, which is going to be brightness variations in the color picture, is also going to make the color signal compatible. If the additional hue and saturation information will not interfere, and such will be the case, a perfectly good black and white picture will be seen on a monochrome receiver.

Having decided that a monochrome signal must be developed, the method of obtaining this signal must be considered. The point from which to begin is, as before, the three outputs of the color cameras. There are voltages corresponding to the red, the blue and the green information in the scene being scanned by the camera. It has previously been pointed out that the outputs are equal for a white scene. The first thought when developing a monochrome signal might be to sample the three signals equally and add the results together, as in Figure 3A. This would result in one signal containing all the color information. However, this is not satisfactory. Unfortunately the eye does not respond to all colors equally in brightness. With this in mind Figure 3B and C illustrate why this equal addition of primaries is insufficient. Look at the value of the monochrome signal for a green bar and a red bar. Note that they are the same value.

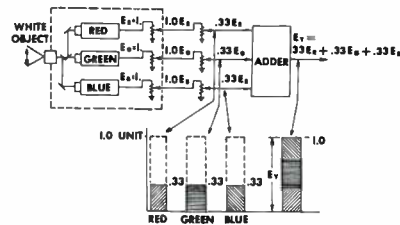


Figure 3A

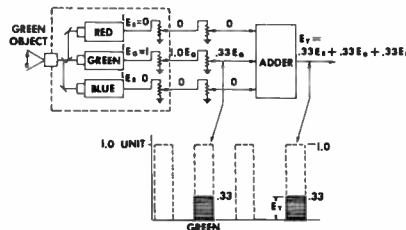


Figure 3B

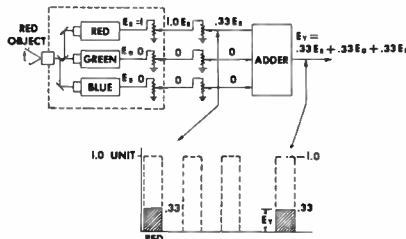
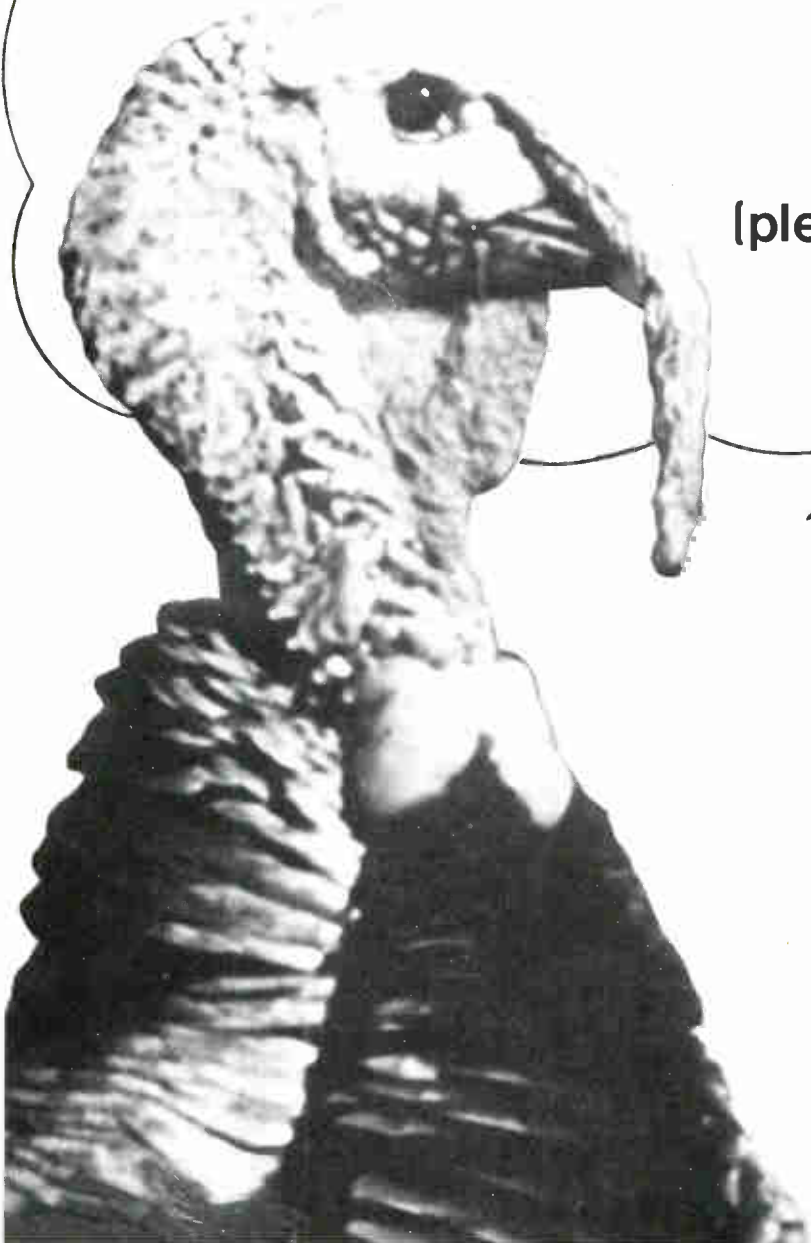


Fig. 3C—Luminance signal development using equal portions of color signals.

(continued next issue)

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a selection of toys,  
GE appliances or me  
with all the trimmings.**

**(please take a gift)**



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TUBE DEPARTMENT, OWENSBORO, KY.

288-19

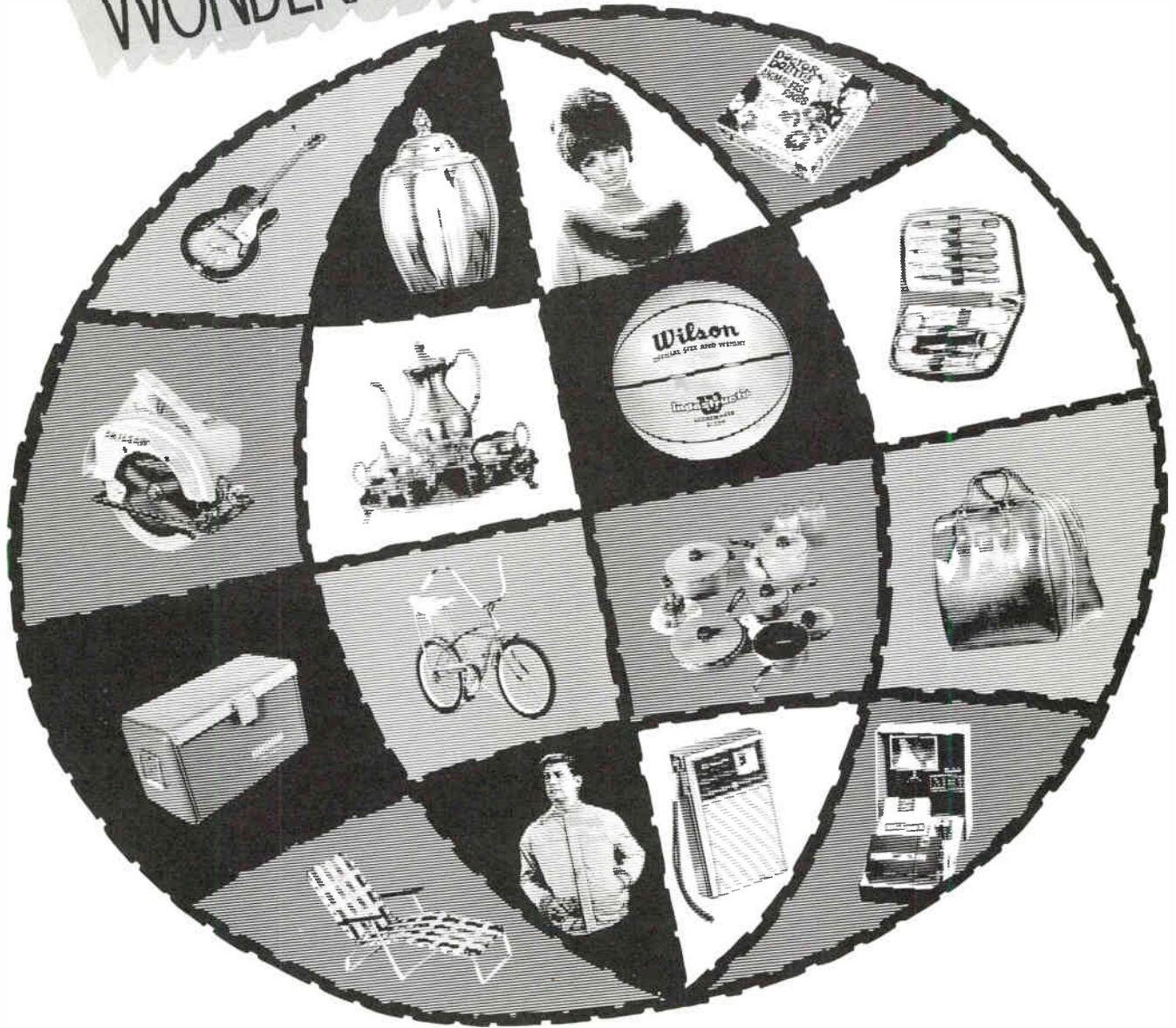
\*Details referred to above appeared in  
ELECTRONIC TECHNICIAN, OCT. 1968 PF REPORTER, NOV. 1968





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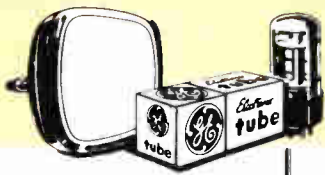
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GENERAL  ELECTRIC



# GENERAL ELECTRIC



## EXPERIMENTER HOBBYISTS KIT

Easy to assemble and wire simple electronic circuits.

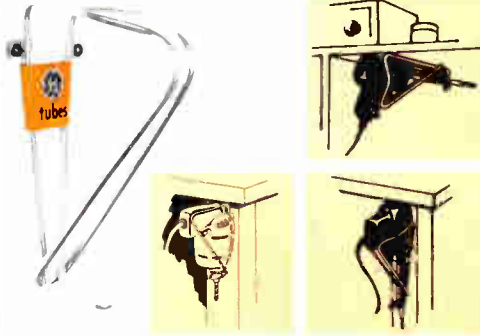
Same typical circuits can be found in the new G E Hobby Manual, ETR-3960.

Rubber feet (4) — fasten with self-tapping screws to each corner.

Push-In terminals (15) — fit board holes. Serrated slots go on top.

3 1/2" x 4 1/2" terminal board will fit many small metal boxes or can be cut to size.

ETR-4288 Cost \$ .98



## 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 any surface with clamps and screws supplied with units.

ETR-2582 Cost \$0.75



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Made to mount on bench edge or bench top. Will accommodate soldering irons up to 3/4" 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.

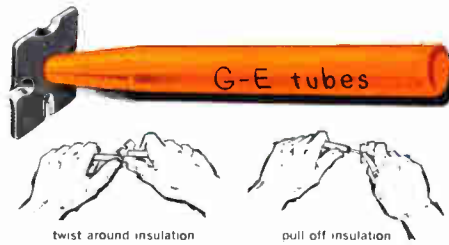
ETR-2790 Cost \$1.70



## TRANSISTOR CIRCUIT TROUBLE-SHOOTING COURSE

Contains three volumes with over 80 pages in each volume. This course is designed especially to meet the on-the-job needs of the electronic service technician who will be servicing transistorized radios, stereos, TV, and other home entertainment products yet to come.

ETR-4423 Cost \$14.25



## WIRE STRIPPER

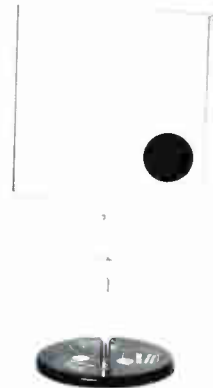
Four cutting edges for most wire sizes. Select cutting edges slightly smaller than outside dimension of insulation. Press insulated wire fully into cutting channel. Rotate wire stripper completely around wire and pull.

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 \$3.75



## 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, and compactrons.

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 1/2" 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-1459 Cost \$0.75



# SERVICE AIDS

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

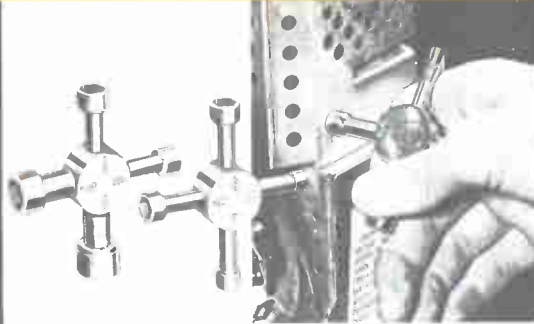


## SERVICE DROP CLOTH

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

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## 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 \$1.49



## 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 compactons, novars and picture tubes. Also tests pilot lamps and fuses. Rugged construction. Battery powered. Actual size — 4" x 2 3/4" x 1 3/4".

ETR-981

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## 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.

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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

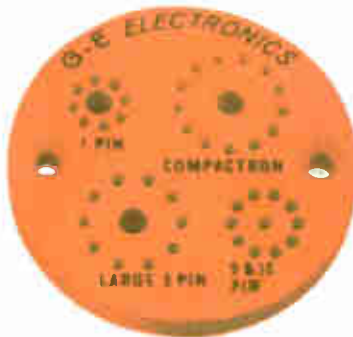


## REAR CONTROL EXTENSION

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.

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## 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

*Multi-Purpose*  
**POCKET TOOL**



**POCKET TOOL**

Here is a practical and useful tool that will make servicing easier and faster. This new pocket tool will enable you to remove the back of any receiver regardless of the type of fastening without opening your tool or service case.

Lightweight pocket tool clips to a shirt pocket and contains Phillips and standard screw driver; 1/4", 5/16" and 3/8" hex sockets; high voltage tester and level.

Use screwdriver end as prod, neon bulb in handle indicates presence of high peak voltage at plate of horizontal output tube or high voltage rectifier.

Lay unit flat with G E monogram down to use as a level when installing phonographs, air conditioners, etc.

ETR-3594 Cost \$1.98

**PRINTED CIRCUIT BOARD CUTTING TOOL**

This new G E Service Aid is a real time saver when servicing printed circuit boards. This versatile tool makes Printed Circuit trouble shooting easy. Use tool to cut through — make test — then flow solder across cut.

Blade slides horizontally — adjusts to cut "paper thin." In this position tool cuts only the printed circuit and does not weaken board.

Handy for opening packages and numerous other daily tasks. Blade retracts — safe to carry in pocket or service case.

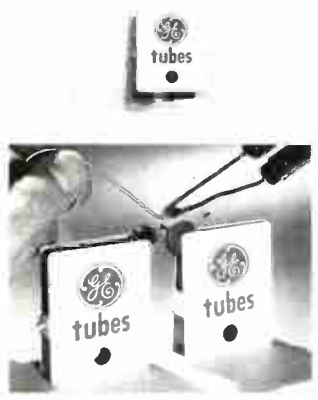
Uses standard single-edge blade.  
ETR-3896 Cost \$0.25



**PART HOLDER**

The General Electric Part Holder is designed to stand upright or attach to edge of service bench. Many times a "third hand" is needed to hold parts in position particularly while soldering. Other times something is needed to hold a piece of solder or some other item when both hands are being used. More than one G E Part Holder can be used to hold different parts in a fixed position until solder "sets."

ETR-3851 Cost \$0.35



**FIVE-IN-ONE COMBINATION TOOL**

Here is a new lightweight tool that will save time either on the bench or on home service calls.

It is five tools in one with a pocket clip. Contains No. 1 Phillips screwdriver and standard screwdriver; 1/4", 5/16" and 3/8" hex sockets.

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**DOOR CLOCK SIGN**

Let your customers know when — you are OPEN, you are CLOSED, you will be BACK.

It can be used to hang on front door or in a visible location. Hands movable to time of return when leaving for lunch — for the day — for service calls — for emergencies. Sign turns around so OPEN is visible when you return.

ETR-3826 Cost \$0.50



**NEW G E TUBE AND PARTS CABINET**

Here is the answer to your tube and parts storage problem. Dress up your store with one or more for over-the-counter stock. Save time by having another at the bench to hold servicing supplies

Six shelves provide over twelve feet of storage space. The pegboard hanger holes on each side give additional capacity for numerous items such as capacitors, semiconductors, tape, etc.

Cabinets can be mounted side by side or stacked one above the other.

Designed for shipping via parcel post. Can be assembled in a few minutes. All parts snap into place without use of nuts or bolts

ETR-3803 Cost \$13.75





# SERVICE NOTES

## TELEVISION

### DC-DD CHASSIS

#### 21GBP4 ARC-OVER and 8LT8 FAILURE

A filament failure of the 8LT8 tube can occur in "DC/DD" models under arcing conditions in the 21GBP4. The arc appears to reach the common filament string and open the 8LT8 filament.

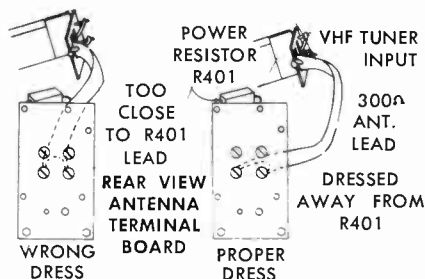
The "DD" chassis service notes shows a production change adding a Spark Gap (SG201) between pins 3 and 4 of the CRT. This change starting with the "D" chassis stamped EN159 and above is to correct this problem. We suggest that the Spark Gap be added when servicing a receiver having this failure mode. The gap can be placed on the CRT socket.

Resistor R179 was added prior to the addition of the Spark Gap to prevent failure of C211 blanking capacitor if the CRT should arc.

### VHF TUNER 300 OHM LEAD DRESS-V CHASSIS RECEIVERS

The 300 ohm twin lead which connects VHF tuner input terminals to the antenna input terminal board can contact power resistor R401 if not properly dressed.

Heat from the resistor could melt the insulation on the 300 ohm lead, causing a short from 120V AC to the monopole antenna assembly.



Refer to the drawing and dress the 300 ohm lead well away from R401 as shown before the back of the receiver is reassembled.

Check this lead dress whenever a "V" chassis receiver is serviced. Models included in this chassis line are M106, M107, M108, M138 and M140, containing VC Chassis, V-1 Chassis or V-2 Chassis.

### SB-SC CHASSIS—LIGHTNING PROTECTION

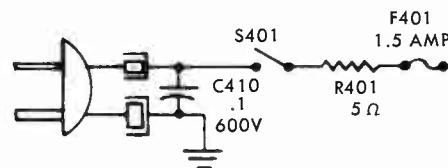
Starting with Chassis stamped EN75, the SC Chassis will incorporate a 4 amp fast blow fuse (ET10X52) series with the AC line ahead of C410. This provides lightning protection for C410 even when the set is off. (This is in addition to F401 1.5 amp fuse already in the set.)

This feature should be added to every

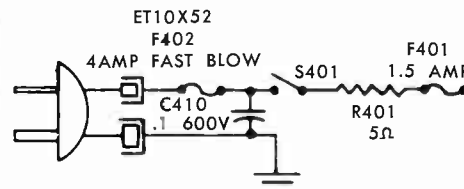
SB and SC Chassis stamped below EN75 that comes in for service. The modification is simple and takes only a few minutes, since only the cabinet back need be removed. Your customers will appreciate this added protection.

### Modification Procedure

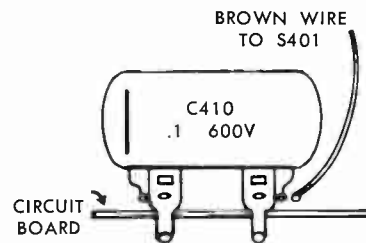
1. Unsolder end of C410 from circuit board beside small interlock pin.
2. Unsolder brown wire to S401 from circuit board beside small interlock pin.
3. Clip pigtail on one end of 4 amp fuse ET10X52 to  $\frac{1}{8}$ " long and install as shown in hole where brown wire was removed. Solder in place.
4. Clip pigtail at top end of R402 to  $\frac{1}{2}$ " length.
5. Splice the brown wire, C401 pigtail and F402 pigtail together as shown and solder.
6. Clip off any excess wire at joint and dress the splice outward to make sure that there is no possibility of splice touching vertical output transformer.



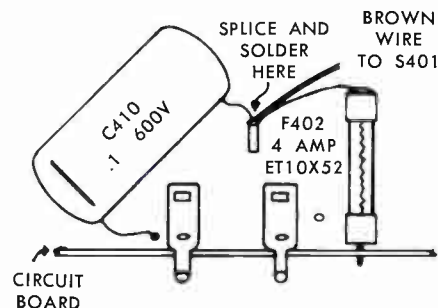
Schematic for SB and SC Prior to EN75



SC Schematic—EN75 and later



Configuration before Modification



Configuration after Modification

### USE ORDER COUPON BELOW

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Order from your local G E electronic components distributor or mail this form to:

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Enclosed is money order or check payable to General Electric Company for:

Quantity		Price
.....	ETRS-752 Twin-X Wrench Set.....	\$ 3.45
.....	ETRS-981 Fuse and Heater Checker.....	2.95
.....	ETRS-1021 Service Drop Cloth.....	1.95
.....	ETRS-1094 Tube Puller.....	.35
.....	ETRS-1275 Bench Mirror.....	3.75
.....	ETRS-1469 Picture Tube Pillow.....	.75
.....	ETRS-1592 Safety Glass Puller.....	.95
.....	ETRS-1593 Magnetic Swing-Beam Service Light.....	2.25
.....	ETRS-2089 Rear Control Extension.....	.35
.....	ETRS-2144 Service Call Board.....	1.49
.....	ETRS-2376 Wire Stripper.....	.65
.....	ETRS-2582 Soldering Gun or Electric Drill Holder.....	.75
.....	ETRS-2790 Soldering Iron Holder.....	1.70
.....	ETRS-2968 Capacitor Tab Adjuster.....	1.00
.....	ETRS-2976 Compactron Sockets.....	.39
.....	ETRS-3200 Multi-tube Pin Straightener.....	.60
.....	ETRS-3594 Pocket Tool.....	1.98
.....	ETRS-3803 Tube and Parts Cabinet.....	13.75
.....	ETRS-3826 Door Clock Sign.....	.50
.....	ETRS-3851 Part Holder.....	.35
.....	ETRS-3896 Printed Circuit Board Cutter.....	.25
.....	ETRS-3910 Five-in One Combination Tool.....	.98
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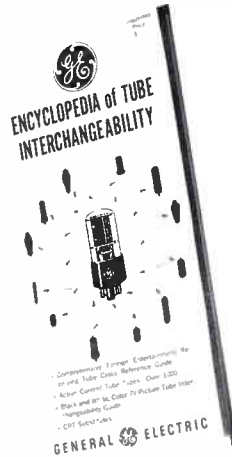
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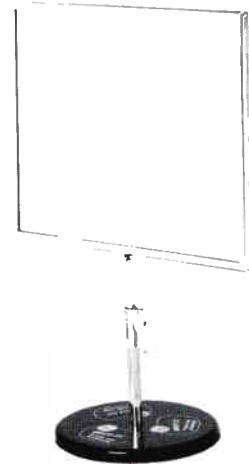
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