Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION

radio · tv · hi-fi

VOL. II NO. 4 JULY—AUG. 1959

SERVICING PRINTED CIRCUITS II

In the previous issue component replacement and several simple servicing aids were described. In this issue the latest type printed board and the repair of cracked boards will be discussed.

Imprinted Boards

When printed boards were first introduced it was difficult to trace circuits since the components were usually located on one side and the printed circuitry on the other side. A light was frequently used on the printed side of the board to outline the wiring on the component side and thereby help in circuit tracing. Printed boards used in current receivers have the wiring connections, ground and B+ locations, test points, etc., imprinted in white on the component side of the board as shown in Fig. 1. Circuits can therefore be easily traced from the component side. This makes circuit tracing a printed circuit every bit as easy and in many cases easier than wired circuits.

Repairing Cracked Boards

Occasionally a "printed" conductor will crack. If such a defect occurs, a simple repair can be made. Scraping the conductor about ¼ inch on either side of the break will clean the copper and allow it to hold solder. A piece of bare hook-up wire is heated until solder melts on it, and it is then placed over the break. Now, with a short time application of the iron and solder, solder will flow across the break and imbed the wire as reinforcement. The piece of wire is not essential although recommended for reinforcement.

This technique is useful only on minor cracks in the conductor. Where large breaks are made, usually through carelessness, or multiple cracks are present, a somewhat modified technique is suggested. Here, it is advisable to cut the conductor about ¼ inch from each end of the crack with a razor or *sharp* knife, again scraping the solder resist from the copper ¼ inch from the cut ends. Remove the damaged conductor from between the razor cuts and discard it. A piece of insulated hook-up wire can then be cut to size and shaped to conform to the original conductor pattern. This is advisable because the placement of the lead with respect to the other conductors has been designed for optimum performance results.

Lead Dress

Arbitrary lead dress can cause regeneration or other adverse effects as you probably know from experience with hand-wired receivers. By applying some cement to the hook-up wire, it can be secured in place of the defective piece of conductor. Soldering the exposed ends of the hook-up wire to the scraped conductor will complete the operation.

Some parts, of which tube sockets are a prime example, require a little work to change. There are special soldering iron tips which can be used to heat all socket terminals at once. In this way the socket can be removed quickly and easily. There are, however, some sockets which will not lend themselves to this technique because of the method of insertion into the boards. These sockets must be removed by breaking the bakelite or other material with diagonal pliers and then unsoldering the individual pins that are left.

Arc-over

Occasionally, an arc-over will occur between strips of copper on a "printed board." Although this is a thing of the past, it can happen under peculiar conditions, particularly if the board was serviced previously and little care was used then. Arc-over will generally cause a carbonizing of the phenolic board and provide an excellent path for shorts of low or high resistance. Scraping the board to remove the carbonized area may work, but this is undependable. It leaves rough spots, and the possibility of not removing all of the carbon is great.

The simplest and most dependable method of correcting this condition is to drill out those areas of the phenolic that are carbonized. As can be seen, there will be no phenolic left to allow any future carbonizing at that point. Obviously this practice must be limited to smaller areas. A two-inch area is out of the range of correction by this method. Conditions leading to carbonizing in some brands have been minimized by proper location of components most apt to become very hot in the event of shorts, etc.

Nonfusible resistors are used for the majority of board applications so that an excessive current through the resistor will cause it to open rather than cause it to fuse into a solid piece of carbon which will allow the resistor to overheat and eventually burn the board. Then too, spacing of adjacent board conductors is planned to minimize the possibility of arc-over as much as possible.

(Continued in next issue)

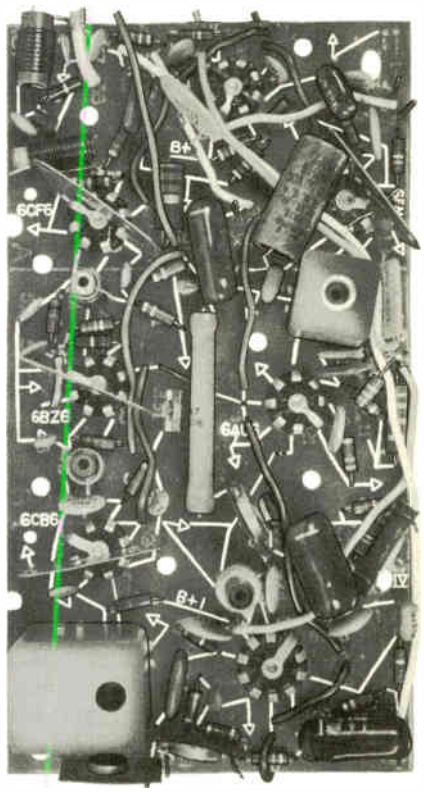
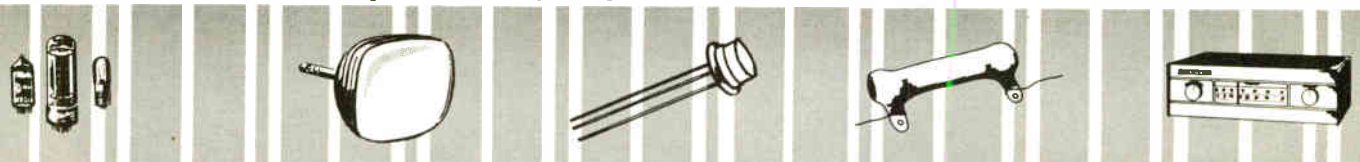


Fig. 1. Component side of I-F board used in "M-5" line of General Electric TV receivers.



SUCCESSFUL SERVICE MANAGEMENT

YOU AND YOUR CUSTOMERS

by W. F. Greenwood
MANAGER—MARKETING
GENERAL ELECTRIC RECEIVING TUBE DEPT.

The words "Public Relations" and "Customer Relations" have a lofty sound—seemingly far removed from the work-a-day world of the radio and television servicemen.

But turn these words around and relate them directly to the service dealer and see what happens. Let's speak of "Your relations with the public" and "Your relations with your customers."

Put like this, these lofty-sounding concepts fall right out of their ivory tower into the hustle and bustle of practical business. With a little thought, a little planning, the radio and television service dealer can put these concepts to work for him.

Two Vital Facts

When a customer appears at your front door, two things have happened:

1. The customer wants someone in your industry to help him.
2. The customer has been persuaded that you, in particular, are the best qualified to help him.

You had nothing to do with the first event. But the chances are that you had everything to do with the second—for the customer appeared at your door either as the result of some sort of advertising, or by the fact that your reputation has spread.

It is the area of circumstances around this second event that a service dealer can and must exploit to the fullest degree. That is, he must, by building good public and customer relations, convince more potential customers that *he* is the man best fitted to provide the service needed. You must strive to create in people's minds the favorable impressions that will make them think of you whenever they need service.

What can you do to build, enhance, and spread your reputation? There is always something that can be done. True, such activities take some time and, in many cases, some money. So you must balance your public relations activities with your sales and working activities in such a manner that each supports the others.

Three-point Program

In broad outline, here is what every service dealer must plan for in order to achieve a balanced program leading toward good relations with the public:

1. Advertising—judicious use of various types of advertising.
2. Community Service—participation in the civic and social affairs of the community lend the specialized knowledge of your business.
3. Build Your Reputation—by demonstrating integrity, and grasping every opportunity to impress the public with your ability and honesty.

Now there are a few old hands in business who do all these things without giving much thought to the fact that they thereby are fostering good relations with the public—and that is why the cash register keeps ringing.

Most of us, however, suffer from the common human failing of being unable to see the forest because there are so many trees all around us. And to continue the simile, it is in just such a situation that we had better stop our aimless plunging about in the woods, climb up a high tree, and take a look at where we've been and where we're going.

The point is that in most cases planning is necessary to improve public relations. Such planning need not be impractical "blue-sky" dreaming. One need only stop and think a bit about his community, his neighbors, and his possible customers—and then set a few not-too-distant objectives to shoot at.

Let's relate this to the broad outline above:

1. Advertising—Is your store well-identified so that people can find you? Are there any local publications that you may have missed wherein a few advertisements would do some good? Can a direct mail campaign dig into a new possible market area? Is there a field of electronic service you have yet to explore?
2. Community Service—Before you can expect your fellow citizens to know you, you must know them. The better you like and understand people the better they will like and understand you. And it is in participation in community affairs that your life and your business can become rich. For the most basic rule of civilization and business is the Golden Rule—help others, and they will help you.
3. Reputation Building—The obvious need here is to avoid doing or saying anything that can damage your good reputation or give you a bad one. The point is that human dignity—your own dignity and that of your customers, friends, and associates—can be irreparably damaged by even a slight accidental misstep from the straight and narrow path. To assess this aspect of your relations with the public, ask yourself first if there is anything you have said or done in the past that would be detrimental to your reputation. If so, plan to rectify the error. Then look forward. Look for areas where you can improve and spread your reputation—both as to ability and integrity.

Each service dealer must do his own planning—according to his circumstances and his community. The important thing is to guide your career and your life. In this complex world, too many persons drift aimlessly, victims of the vagaries of chance. Be warned; a successful business is not built on aimless drifting; it is cut, planned, and tailored to the community and its people.

FIVE-STAR TUBES

High-Reliability Receiving Tubes for Critical Applications

Receiving Tube Type	Five-Star Type	Classification	Heater		Average Characteristics						
			Volts	Amps	Plate Volts	Screen Volts	Grid Volts	Plate ma.	Screen ma.	Gm μmhos	μ
5Y3-GT	6087	Full-Wave Power Rectifier	5.0	2.0	*Voltage drop = 50V @ 125 ma; d-c output current = 125 ma						
6AK5	5654	Sharp Cutoff RF Pentode	6.3	0.175	120	120	−2.0	7.5	2.5	5000	.....
6AL5	5726	Twin Diode	6.3	0.3	*Voltage drop = 10V @ 60 ma; d-c output current = 9.0 ma						
6AQ5	6005	Beam Power Amplifier	6.3	0.45	250	250	−12.5	●45	●4.5	4100	P_o 4.5
6AS6	5725	Dual Control RF Pentode	6.3	0.175	120	120	−2.0	5.2	3.5	3200	$E_{c3} = 0$
6AU6	6136	Sharp Cutoff RF Pentode	6.3	0.3	250	150	$R_k = 68$	10.6	4.3	5200	G_3 tied to K
6BA6	5749	Remote Cutoff RF Pentode	6.3	0.3	250	100	$R_k = 68$	11.0	4.2	4400	$E_{c3} = 0$
6BE6	5750	Pentagrid Converter	6.3	0.3	250	100	$R_{g1} = 20K\Omega$	2.5	7.6	$G_c = 500$	.....
6BH6‡	6265	Sharp Cutoff RF Pentode	6.3	0.175	250	150	$R_k = 100$	7.4	2.9	4600	$E_{c3} = 0$
6C4	6100	Medium Mu Triode	6.3	0.15	250	....	−8.5	12.0	. . .	2400	17
6X4	6202	Full-Wave Power Rectifier	6.3	0.6	*Voltage drop = 22V @ 50 ma; d-c output current = 50 ma						
12AT7	6201	High-Frequency Twin Triode	6.3/12.6	0.3/0.15	250	....	$R_k = 200$	10.0	....	5500	60
12AU7	5814-A	Medium Mu Twin Triode	6.3/12.6	0.35/0.175	250	....	−8.5	10.5	....	2200	17
12AX7	5751	High Mu Twin Triode	6.3/12.6	0.35/0.175	250	....	−3.0	1.0	....	1200	70
12AY7	6072	Twin Triode	6.3/12.6	0.35/0.175	250	....	−4.0	3.0	....	1750	44

* Typical operating conditions.
‡ Heater current approx 17% lower.
R_k Cathode bias resistor in ohms.
● Zero signal.
G_c Conversion transconductance in Micromhos.
E_{c3} Supressor voltage.
P_o Maximum Signal Power output in watts.

EASY OPEN - - - EASY OUT - - - G-E TUBE CARTON

Fig. 1. EASY OPEN . . . Thumbnail pressure at the edge of the locking tab on G.E.'s new tube carton permits opening without tearing.

Fig. 2. EASY OUT . . . Tube slips out easily with gentle pressure on the side panels of the G-E tube carton.

Many service technicians may not be aware of the advantages that have been built into the General Electric tube carton. It is both easy to open and easy to get the tube out.

The carton can be opened without tearing the self-locking tuck-in flap simply by exerting pressure at the tab fold as illustrated in Fig. 1.

The "Easy Out" feature results from the fact that spring tension suspends the tube in the center of the carton to provide maximum cushioning on all sides. Yet, with the end flap open, gentle thumb and finger pressure on two side panels releases this tension and permits miniature tubes to slip out easily. This is illustrated in Fig. 2.

The "Easy Open-Easy Out" tube carton saves the service technician financial loss (due to breakage) as well as time loss. General Electric tubes can now be removed without pushing or shaking and without carton damage.

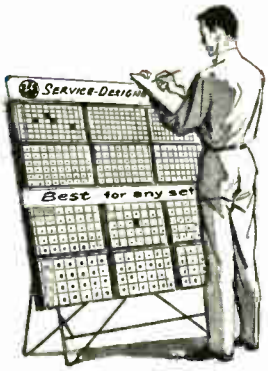
New G-E PROFIT* PROGRAM

* TURNOVER OF INVENTORY
REPLENISHMENT PROGRAMMED

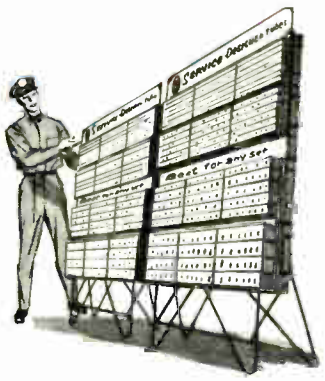
Display rack with wall hanger $23.95, or free with purchase of 650 General Electric tubes. Rack with floor easel, $25.95 or 700 G-E tubes.

Streamlines Your Tube Sales for Fast Turnover, Top Volume!

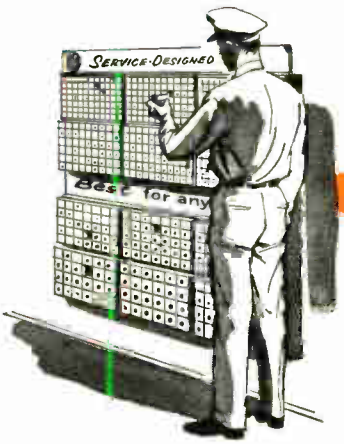
Missing cartons show what tube types you should reorder.



Your tube inventory can easily be checked at a glance.



A second display will accommodate additional supply of tubes.



Rack can be hung on a wall if floor space is not available.

A General Electric "first"...that sells more tubes, saves record-keeping, *provides the tubes you need when you need them!* This is G.E.'s new PROFIT* Program, packaged for you in the finest, most complete tube display rack ever offered to TV technicians.

See (left) how easy it is to select types... how stock rotation is assured by orderly tube removal and replacement! Note the Display's ample dimensions—44" high plus 16" for easel base; 40½" wide—providing plenty of space for a scientifically planned tube inventory!

If you invite customer self-service, the Display is ideal for that purpose. Also, your stock of tubes can be checked visually at any time. Missing cartons tell you what types to reorder, and how many, since the type numbers of all tubes taken out can be recorded in back. Book-keeping is virtually eliminated.

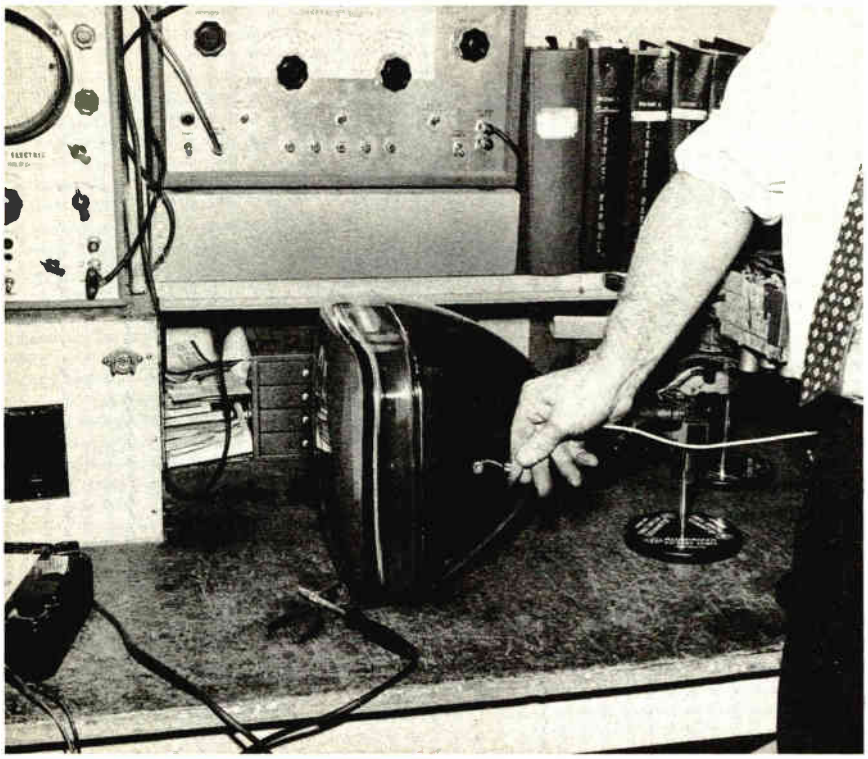
Over-stocking and tube shortages: both are banned by the Balanced Inventory feature. Your tube dollars work harder than ever before. See your nearby G-E tube distributor today about General Electric's Service-Designed Tube Display with brand-new, built-in inventory control! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

WHAT'S WRONG WITH THIS PICTURE?

There are at least three things wrong with this picture. See how many you can find—then turn to page 9 for answers.



BENCH NOTES

ROLL CHART TUBE CHECKERS

When you are replacing your old roll chart, cut out the most popular types. Paste these on a card and tack to the lid of your checker. This will enable you to provide quicker service with less time wasted looking for settings on the new chart.

Anthony Tomashunis
826 Winters Ave.
W. Hazleton, Pa.

MAGNETS

I have found that an old P.M. focus magnet makes a good soldering iron rest. The magnetism insures it against falling off.

Also an old ion trap magnet taped or fastened to a cheater cord at the set end will stick to the chassis when not plugged in, making it unnecessary to reach to the FLOOR to connect it when wanted.

Albert J. Collar
Rt. 8, Box 241
San Antonio, Tex.

TV SOUND PROBLEM

The Set: G-E Model 21T048.
Symptom: Distorted and weak sound.
Remedy: Reverse leads to speaker.

Harold Jones
Harold's TV
810 College
Bowling Green, Ky.

EDITOR'S NOTE: *In this model, a metal cabinet is used in which the speaker frame is grounded to the cabinet. Since the receiver chassis is also grounded to the cabinet, there is a common connection between the two, possibly with some unknown resistance condition due to paint, and so forth. The receiver speaker leads are coded green and black, the black one being connected to receiver chassis and should be connected to the grounded lug at the speaker. In the event that the green and black wires were interchanged at the speaker lugs, a shorting of audio output will occur. Depending upon conditions in the common ground some audio might appear and it would certainly be distorted.*

TELEVISION MISCELLANEOUS FIELD NOTES

Admiral 20V1 Combinations (TV, Radio, Phono)

Trouble: There was an over-all degradation in performance of the radio and TV in this unit. The radio was not as peppy as it should be and the television did not have its full range of contrast and there was always some foldover at the bottom of the raster.
Remedy: The B+ bleeder resistor R503 had changed value from 15K to 1.5K ohms. This lowered the B-plus voltages to the TV and radio chassis by 50 volts.

Philco 8H25-8H25U Chassis

Trouble: Voice slowly became distorted and low in volume over a period of weeks and eventually became almost inaudible.
Remedy: Since all elements of the audio output tube, 12CA5, operate at B-plus potentials, it is imperative that the proper voltages appear on the tube elements for proper operation. It was found that instead of 140 VDC on the cathode of the 12CA5 there was 190 VDC. The voltage dropping resistor R1 is 12K 2W., in this chassis. This resistor had changed value to 1500 ohms. Replacement of this resistor with a new value (5.6K 7W) used in later chassis (8H25U) cured the trouble.

Proper voltages for this stage are: Pin 1 140V. DC, pin 2 130V. DC, pin 5 270V. DC, pin 6 280V. DC, pin 7 275V. DC.

Motorola Chassis VTS 0505

Trouble: Customer complained that on some days the picture would be intermittent along with the sound, the raster remained. There was no pattern to this trouble.
Remedy: This receiver worked fine in the shop for several days before it acted as the customer described. It was noted that when the trouble occurred the brilliance of one string of filaments was slightly reduced. Soldering was tried in the filament circuit to no avail and to further complicate matters, the receiver repeatedly went off and on. One morning, when the receiver was on its side, a sparking was observed near the filament transformer. Investigation showed that the sparking took place intermittently at a point where a rivet held a terminal strip to the chassis. The filament transformer ground wire was soldered to this strip. A good soldering job cured the trouble.

Wade H. Lockey
4518 Old York Road
Philadelphia 40, Penna.

TOP REMOVAL

A few drops of oil applied to the threads of the bottle or can of fast drying liquids, or pastes, will permit easy removal of the cap any time when needed.

Harry L. Baney
1722 E. 22nd St.
Muncie, Indiana

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.

SERVICE NOTES

TELEVISION

Horizontal Jitter in "M4" Television Receivers

If horizontal jitter is noticed on an "M-4" TV receiver, it may be due to a bad ground connection on the WT31X-165 Filter Capacitor or the filter capacitor may be defective.

A quick check for this condition, without removing the chassis, is to ground the body of the can to the chassis using a screwdriver.

The poor ground is caused by a poor riveted connection between the ground terminal and chassis. The ground terminal is connected to the capacitor twist tab.

To correct this condition, connect and solder a wire from the capacitor twist tab to a good ground terminal on the chassis. This terminal may be assembled under an existing screw on the chassis.

This condition has been corrected at the factory by adding a lockwasher to the riveted ground terminal assembly.

Speaker Phasing on 2-Speaker and 3-Speaker Models

When using multiple speaker arrangements for sound reproduction, it is very important that the speakers be connected in the correct phase to properly reproduce the low audio frequencies. This insures full range audio response. An improper connection will result in noticeable lack of low frequencies.

This is published to emphasize the importance of these correct connections, especially if, for some reason, the speaker leads have been disconnected. The correct connection is diagrammed in the speaker compartment of each set.

RADIO

Model RP1120, AS2— Improvement of Tone Response

In order to improve the tone response of the RP1120 phonograph and the AS2 amplifier/speaker, a .005 mf. capacitor is now being connected externally between pins 1 and 8 of the capacitor-resistor network in both units.

On customer complaints of insufficient tone control effect, a check should be made to see if this .005 mf. capacitor is in the circuit. If not, the addition of this capacitor can be used to improve the tone response in the following manner:

1. Wrap one lead of the capacitor around pin 1 of the capacitor-resistor network *on the component side* of the circuit board. (Circuit board does not have to be removed from grille.)
2. Wrap the other end of the capacitor lead around pin 8 of the capacitor-resistor network.
3. *Carefully* solder leads to network pins.

SUGGESTION AND INQUIRY COUPON

If you would like to receive additional information on some specific G-E Electronic Component, just clip out this coupon, write in the material desired, and send it to the Editor. Information, if available, will be sent to you by return mail.

_____

_____

_____

Please check your name and address on the reverse side. Make any necessary corrections below.

Name .....

Street Address .....

City, Zone No. and State .....

If you expect to move within next two months, please print new address above.

ANSWERS TO: WHAT'S WRONG WITH THIS PICTURE? ON PAGE 6.

1. *Checking high voltage by sparking anode lead to anode button on picture tube.* The practice of drawing a spark in this manner may produce a minute air leak in the anode button which over a period of time causes the picture tube to lose emission.

2. *Soldering iron supported by pliers instead of a suitable holder.* There is a possibility of fire if the iron is knocked off and the hot pliers can cause a severe burn.

3. *Hot soldering iron too close to critical area of picture tube.* Heat from the iron could, due to a temperature difference on the glass, cause the tube to implode. The area adjacent to the faceplate is the most critical part of a picture tube. A scratch or fracture in this area can cause an implosion which can violently scatter pieces of glass in all directions.

THE STEREO HUM PROBLEM IV

In the last issue some of the techniques used to ground the record changer or turntable were discussed. In this issue additional information on grounding plus cartridge isolation will be described.

One changer manufacturer provides an extra signal conductor within each cable so that the cable shield may be used as the separate ground-current path without difficulty. In the latter instance it may be advisable to connect only one shield to the player base when using a stereo amplifier to avoid the adverse effect of forming a ground loop within the amplifier as previously explained. The antenna effect of the open-ended shield caused by disconnecting the one shield at the terminal board is unimportant since the shield is not being used as a signal conductor.

Cartridge Isolation

It is important that there be no electrical connection between any metallic portion of the cartridge and a metal tone arm. The ground shield on the top of the cartridge (see Fig. 1) should

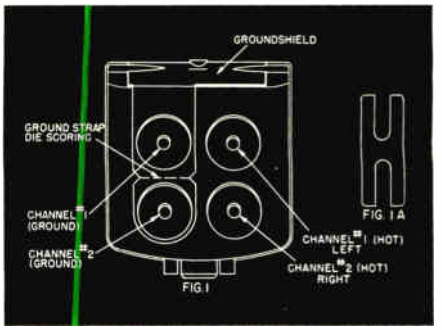


Fig. 1. Drawing of G-E cartridge showing the two different types of ground straps used. Separate grounds are available by cutting through die scoring on one type (Fig. 1) and removing connector on the other (Fig. 1A).

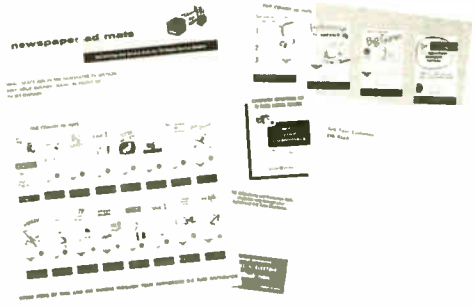
not touch the cartridge mounting screws or the female mounting bosses; otherwise the signal ground system and the separate tone arm ground system will be connected together, eliminating the benefits of path isolation mentioned above. The only exception is the instance where the metal tone arm is isolated and purposely used as the fourth conductor of a four-wire system, as shown in the May–June issue. It is likewise important that any bare portions of the signal cable shields not touch each other, or any metal part of the record player unit or the amplifier except at the intended connection points.

Some wiring modifications which may be required to minimize hum in stereo record changers will be described in the next issue.

NEW BUSINESS BUILDERS

Newspaper Ad Mats

NOW *AVAILABLE THROUGH YOUR AUTHORIZED G-E TUBE DISTRIBUTOR*



Are you using the various ad mats described in publication number ETR-1620? Regular newspaper advertising can help you increase your business, keeping your name in front of radio and television set owners. It is recommended that you place your ads in the TV or sports section of your local newspaper. These ad mats tie in with the direct mail program presented in publication number ETR-1610 and described in the May-June issue of *Techni-talk*.

A variety of single and double column ad mats are available to help you "build" local promotions which take advantage of local trends and interests. Ad mats are available from your authorized General Electric tube distributor.

Also described is publication number ETR-935-A which is a folder of newspaper ad mat material containing authorized dealer signatures, trade marks and illustrations to help you tell your customers who you are, what you offer them, and how to contact you. All of the material described will be helpful in planning your newspaper advertising campaign.

Ask your General Electric tube distributor for a copy of publication numbers ETR-1620 and ETR-935-A. Make your selection; then ask him to order the newspaper advertising material you require.

NEW

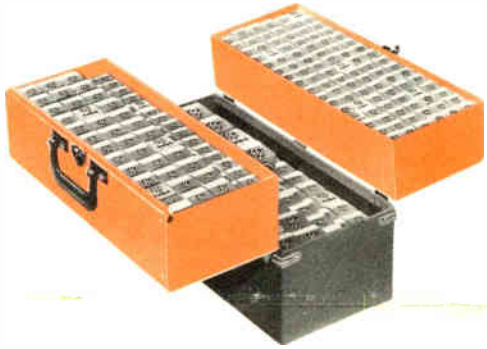
LIGHTWEIGHT

SERVICE CASE

NOW *AVAILABLE THROUGH YOUR AUTHORIZED G-E TUBE DISTRIBUTOR*

- Holds 210 Receiving Tubes
- Weighs less than 4½ pounds
- Modern Two-Tone Styling
- Rugged Construction

Service Case ETR-1778



Techni-talk

Vol. II No. 4 July–Aug. 1959

In this issue:

Techni-talk on AM, FM, TV Servicing, published bi-monthly by Electronic Components Division, General Electric, Owensboro, Ky. In Canada: Canadian General Electric Co., Ltd., 189 Dufferin St., Toronto 3, Ontario. R. G. Kempton, Editor.

ELECTRONIC COMPONENTS DIVISION

GENERAL ELECTRIC

Owensboro, Ky.

BULK RATE
U.S. Postage
PAID
Schenectady, N. Y.
Permit No. 148

Mr. Thomas F. Boyd
415 Fredericksburg Rd.
San Antonio 1, Texas
E-25C/HOU-23

5-18-54

Form 3547 Requested

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