Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION

radio • tv • hi-fi

VOL. II NO. 3 MAY—JUNE, 1959

SERVICING PRINTED CIRCUITS

The present trend in both radio and television design is toward smaller more compact receivers. One method, which has been used to reduce size is the use of printed circuit boards. Since these boards require somewhat different servicing techniques the purpose of this article is to familiarize the service technician with these new techniques. The ideas presented here have been used for quite some time. It is hoped that they will help the technician in the repair of both radio and television receivers.

Many short cuts are found while working at the bench, and some of these might be helpful to other technicians. If you come across any ideas or service hints that have been helpful to you, please send them in for publication as a Bench Note.

Suggested Servicing Procedures

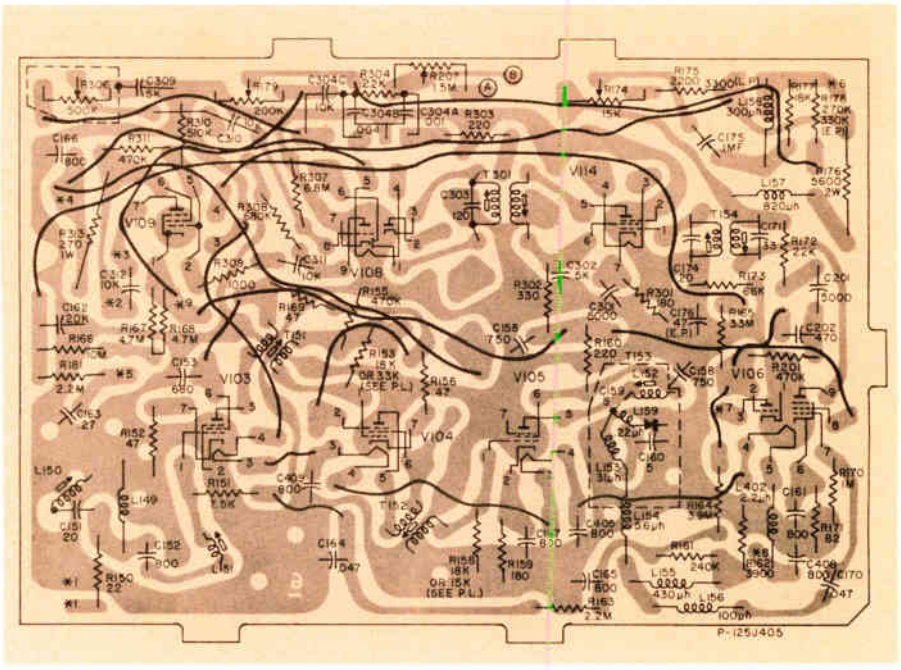
Service of printed or plated circuit boards requires additional care in soldering and/or trouble shooting.

Special consideration should be placed on circuit analysis as substitution of components is more difficult. Solder joints and connection points are not readily accessible, and therefore the technician should be thoroughly familiar with the circuit under test and be reasonably sure the suspected component is defective.

Excessive heat should never be applied to the component board as permanent damage may result. The use of a 35–50-watt soldering iron is recommended.

Whenever possible components should be replaced by cutting the defective component from the board, leaving the mounting leads as long as possible, and replacing the new part by soldering the leads to the ends left on the boards.

Additional lead length may be obtained when necessary by cutting the component apart. The ends of the new part are then looped around the rewiring leads and soldered. The removal of the component board from the chassis is seldom necessary since most components are accessible from the front side of the chassis.



Typical Printed Circuit Board Showing Location of Various Components

In some receivers the component board may be tilted away from the main chassis by removing the mounting screws, but it should be remembered that the electrical ground connections between the chassis and ground strips of the plated board will probably be broken. Therefore, testing must be accomplished with the boards either secured to the metal chassis or with a jumper ground connection.

Tube sockets and transformers may be replaced by cutting the supporting and conducting members with diagonals, then cleaning off the remaining pieces from the component board. The new part can now be soldered into place. Caution must be observed when soldering since too much heat will damage the component board.

Tools for Servicing Transistor Receivers

When component replacement is required on printed boards, it is sometimes quite difficult to remove the solder from the circuit board. Three (3) simple methods of doing this utilize items which are readily available:

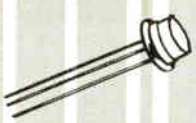
First, the ordinary pipe cleaner can be used to remove solder from large holes or slots in the circuit board.

Second, the ordinary broom straw will readily clean solder out of small transistor holes, etc.

Third, an item which can be obtained at most dry goods stores, a small plated crochet hook. To use this, simply cut off the hook with a pair of cutting pliers and use it to clean solder out of the holes when they are heated. Be sure to buy the plated type as it will not "tin" for a considerable length of time.

(Continued in next issue)





SUCCESSFUL SERVICE MANAGEMENT

DEALER MODERNIZATION

by

H. B. NELSON, JR.

Manager of Trade Relations

And Electronic Components Distributor Development

To modernize his shop, a dealer need only review three major areas—and then lay out a plan for making the needed improvements in each area. How much time the modernization will take and how much it will cost depends upon two things: (1) How bad a shape he is in to start with, and (2) how carefully he plans his renovations.

Here is the procedure to follow:

1. List the improvements needed in each of the areas below.
2. Decide which improvements should be made first—considering the benefits they will bring, cost, and time available.
3. Write out a time and cost schedule that will fit the pocketbook.

Generally, the best rule to follow in laying out such a plan is to give priority to the improvements that will bring in either the most customers or the most money (or both) the fastest. For once having made a decision to modernize, a dealer should begin to reap the benefits of his program as soon as possible.

Let's review the three major areas which need modernization in most dealer shops:

I—Physical Appearance

Customers are drawn to a bright clean store. They tend to turn away from dirt, dull walls, dark corners, dim lighting. The first consideration here is the general neighborhood. Other things being equal, customers will shun a shabby location. Give this serious thought. If rent, traffic, parking facilities and cost of moving seem to merit a move—then move.

A customer's first view usually is of a sign or a store front. A bright new sign, with modern-styled lettering is important. Storefront improvement can range from a coat of paint to a complete revamping in wood or tile. A new door alone will make a world of difference.

Once inside the door, the customer gets an all-important "first impression." Immediately his subconscious mind says either "What a dump!" or "Nice place!". He doesn't bother to analyze *why* he gets the impression. But now is the time for the dealer to do some analyzing and see if the general impression is bad, and what can be done about it.

Here the single most important point is light. A dark interior pushes people away mentally—and sometimes even physically. A dealer who will stand in his own doorway and make believe he is a customer looking into the store for the first time may get a shock. But if he is smart he will immediately begin to think of how he can change or install some lights, wield a paint brush, tack up some paneling, clean the shelves, sweep the floor—and dozens of other small improvements that all add up to making a good impression.

The physical aspect of modernization extends also to the physical appearance of his truck and even himself and his employees. Modern businessmen wear neat clothes and are clean-shaven.

II—Equipment and Layout

After a pleasant impression, a customer wants good service at a fair price. He wants value. This means, in a nutshell, sufficient tools and equipment and an efficient layout of workshop space.

Unfortunately, most workshops just grow, with a shelf added here, a storage bin there—whatever seems most convenient at the moment. Actually, a great deal of careful thought must go into shop layout. Here each dealer must take his own requirements into consideration, such as lighting plans, time-saving arrangements, sales counters, small-parts inventory, work bench, test and storage racks, and filing of technical data and records.

Tools and test equipment are necessary and here the big question is: What tools and what test equipment? A dealer must follow the same rule that a manufacturer applies when deciding whether or not to buy a big expensive machine: Will a new piece of test equipment save enough time to make it worth while? Generally the rule to follow is: How busy will the machine, or piece of test equipment be? Idle equipment makes no money.

Storage space always costs money. And if it is mis-arranged in such a fashion that it also costs time—well there is a double loss that can be avoided. For example, instead of having receiving tubes tumbled into a cabinet or on a shelf, a special tube storage rack saves space and time both in finding a needed tube and in keeping track of inventory.

Special service aids are available from G-E tube distributors which offer a dealer inexpensive ways of saving time.

A "must" in modernization is technical data on color television, electronic switches and other electronic devices which are beginning to be used more and more in the home.

III—Business Promotions and Methods

Here modernization means two things: Better business getters, and better business doers.

A dealer who plods along with the "business as usual" attitude soon finds himself trailing the field. In this day of increasing "hard sell," bright new promotions and offers are needed to attract customers and clinch the sale.

Another important activity that will win customers is participation in community affairs to the extent that the public recognizes the dealer as an important factor in public service. The experience General Electric has had in the All-American Awards for public service by television service technicians has demonstrated to us that the men who become a part of their community are widely respected, and much of their business gravitates toward them for this reason.

Modernization in the business end of the operations also means attaining a fine balance between the extremes of "paper work" and "no paper work." The dealer who goes overboard on keeping records finds himself doing nothing else—and ending up with no business. The dealer who goes to the other extreme and keeps no records, suddenly finds he is bankrupt.

This is no place for a course in business bookkeeping. We merely wish to advise here that efficient help and record keeping are attained only with thought and care. In this area, a dealer must occasionally take a long look at his operations and decide whether or not his business methods need modernization.

All in all, modernization means a lot of little things. Modernization is a matter of depth more than any single act. To keep up with the crowd one must get into the water—but at the same time be careful not to go in over his head.

TV TUBE INVENTORY GUIDE

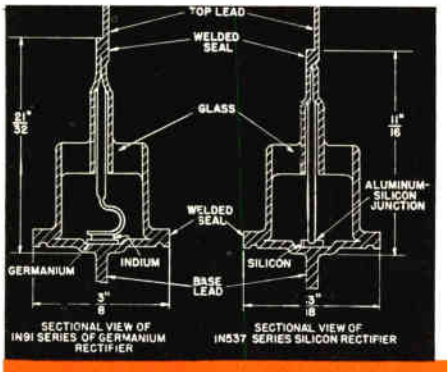
The chart shown below includes most of the tubes used in TV receivers both old and new. It is based on information obtained from various manuals, service publications, sales records and individual service technicians.

Obviously, it should not be considered as a recommendation to stock all of the types shown or the quantities given. It should only be used as a guide. If this information is combined with your own experience, you should be able to develop an inventory guide tailor-made to your own operation.

Tube types shown in red are newer tube types that have been added during the past year and are now available at your General Electric tube distributor. Tube types preceded by (*) are General Electric "Service Designed" types. Color TV types are preceded by (**).

TUBE TYPE	QUAN-TITY
*1B3GT	3
*1H2	1
*1J3	3
1V2	2
*1X2A/-B	5
*2AF4A	2
2BN4	1
*2CY5	1
**3A2	1
**3A3	1
3AL5	2
3AU6	5
3AV6	2
**3B2	1
3BC5	5
3BN4	1
*3BN6	2
*3BU8	1
3BY6	1
*3BZ6	2
*3CB6	5
3CF6	1
3CS6	1
3DK6	1
*3DT6	1
4BC5	2
4BC8	1
*4BN6	1
4BQ7A	2
4BS8	1
*4BU8	1
*4BZ6	1
4BZ7	1
4CB6	2
4DT6	1
5AM8	1
5AN8	1
*5AQ5	2
5AS8	1
5AT8	1
5AV8	1
5AW4	1
5B8	1
5BE8	1
*5BK7A	1
5BQ7A	1
5BR8	1
5BT8	1
*5CG8	1
*5CL8-A	1
5CQ8	1
5CZ5	1
5DH8	1
5J6	1
5T8	1
*5U4GB	5
*5U8	2
*5V3/5AU4	1
5V4GA	1
5V6GT	1
5X8	1
*5Y3GT	3
6AB4	2
6AC7	2
*6AF4	3
*6AF4-A	3
6AG5	1
6AG7	1
6AH4GT	1
6AH6	1
6AK5	2
6AK6	1
*6AL5	3
6AL7GT	1
6AM8-A	1
6AN8	1
*6AQ5-A	2
6AQ6	1
6ARS	1
6ASS	1
6AS8	1
6AT6	2
6AT8	1
*6AU4GTA	2
6AU5GT	1
*6AU6A	4
6AU8-A	2
6AV5GA	3
6AV6	2
6AW8A	1
*6AX4GT	5
6AX5GT	1
6AZ8	1
6BA6	2
6BA8A	1
6BC5/6CE5	5
**6BC7	1
6BC8	1
6BD6	1
6BE6	1
6BF5	1
6BF6	1
6BH6	1
6BG6GA	3
6BH8	1
6BJ6	1
6BJ7	1
**6BJ8	1
**6BK4	1
6BK5	1
*6BK7B	3
**6BL4	1
6BL7GTA	3
6BN4	1
*6BN6	1
**6BN8	1
6BQ5	2
*6BQ6GA	3
6BQ6GTB	2
*6BQ7A	5
6BR8	1
6BS8	1
*6BU8	1
6BV8	1
6BW8	1
6BX7GT	3
6BY6	2
6BY8	1
*6BZ6	1
*6BZ7	5
6BZ8	1
6C4	1
**6CBSA	1
*6CB6-A	5
*6CD6GA	3
6CF6	1
*6CG7	2
*6CG8A	1
6CH8	1
6CL6	2
*6CL8-A	1
6CM6	1
6CM7	1
6CN7	1
6CQ8	1
6CR6	1
6CS6	1
6CS7	1
6CU5	1
*6CX8	1
6CY7	1
6CZ5	1
6DB5	1
6DE6	1
6DG6GT	1
*6DN7	1
*6DQ6A	2
6DS5	1
*6DT6	1
*6EA8	1
6EB8	1
6EH8	1
*6EW6	1
6EZ8	1
6H6	1
6J5	1
*6J6	3
6K6GT	2
6L6GC	1
6S4A	1
6S8GT	1
6SH7	1
6SL7GT	2
*6SN7GTB	5
6SQ7	2
*6T8A	4
*6U8A	5
6V3A	2
*6V6GT	3
6W4GT	3
6W6GT	3
6X4	1
6X8	3
6Y6GT	1
7AU7	2
*7EY6	1
7F8	1
7N7	1
8AU8A	1
8AW8A	1
8BH8	1
9BR7	1
9CL8	1
9U8	1
10C8	1
10DE7	1
*12AT7	5
*12AU7-A	5
12AV5GA	1
12AV7	1
*12AX4GTA	3
12AX7	1
12AZ7	1
12B4A	1
12BH7A	3
12BK5	1
*12BQ6GA	3
12BQ6GTB	2
12BR7	1
12BV7	1
*12BY7-A	1
12BZ7	1
12C5/12CU5	1
12CA5	1
12CT8	1
12D4	1
12DB5	1
*12DQ6-A	2
12DQ7	1
12L6GT	1
12R5	1
*12SN7GTA	4
12W6GT	1
17AV5GA	1
*17AX4GT	1
17D4A	1
*17DQ6A	1
17H3	1
18A5	1
*19AU4GTA	1
19BG6	1
19T8	1
25AV5GA	1
25AX4GT	1
25BK5	1
25BQ6-GA	3
25BQ6GTB	2
25C5	1
25CD6GB	3
25DN6	1
25EC6	1
25L6GT	2
25W6-GT	1
50DC4	1

HOW SEMICONDUCTOR RECTIFIERS ARE MADE



Cross-sectional Views of Basic Cells

Both germanium and silicon cells appear to be alike in outward appearance. Fundamental difference, besides use of different semiconducting materials, lies in the use of indium and aluminum electrodes, respectively.

Soldering of Rectifying Junction to Base

Skilled operators carefully center semiconductor wafers into position for automatic soldering operation. Latest techniques provide finest possible electrical connection with maximum resilience to shock and mechanical degradation.

Putting on the "Top Hat"

A vital operation that results in contamination-free products. Operator assembles base and metal top prior to welding both units together. Inert gas is used in sealing operation to drive out moisture and provide pure operating atmosphere inside rectifier housing.

Testing for Operating Stability

Special ovens create extreme conditions where any contamination will reflect in decreased rectifier performance. Stringent operating tests follow this step with cells being required to meet General Electric's "safety margin" of operation before being approved.

Semiconductor Rectifiers For Every Purpose

Pictured here (left to right) are G.E.'s Germanium TV Rectifiers, the Type C35 Silicon Controlled Rectifier, stud and lead mounted cells, and the much-in-demand, Vac-u-Sel* Double Diodes, all with their distinctive, bright packages. In the background, two typical stack configurations, low and medium current outputs.

** Registered trade-mark of General Electric Co.*

More and more applications are being found in radio and TV circuits for a brash newcomer to the electronics field, the compact, highly efficient semiconductor rectifier. Although its development like the transistor is still in a relatively early stage, inherent with this device is a remarkable, almost unbelieveable long life. Improved manufacturing techniques and advanced solid state physics laboratory facilities have enabled General Electric to make great strides in improved performance.

Built-in Safety Factor

These miniature two-element devices are constructed around a single P-N junction. Being designed to primarily handle power rather than small signals, large cross-sectional area junctions and efficient means for dissipating heat losses, such as fins, and heat sinks, are used. As with transistors, immaculate factory production lines make possible contamination-free results.

Basic Construction

One of the industry's most popular types with millions in use, the G-E 1N91 Series is constructed by soldering a 1/16" square germanium pellet to the base disk with indium alloy serving as the connecting junction material (see top left drawing). Germanium, among other things, provides a rectifier with unexcelled low forward voltage drop. In outward appearance, G.E.'s silicon rectifiers look identical to germanium. However, instead of a germanium-indium junction inside, this cell employs the junction of a piece of aluminum wire alloyed into a wafer of silicon. While its forward resistance is approximately 40% higher than a germanium device of the same rating, its reverse leakage current may be several hundred times less than a comparable germanium cell. Silicon, of course, allows operation over 95°C (203°F), the limiting range of germanium.

Broad Field of Application

With a selection of circuit configurations covering countless applications, G.E.'s semiconductor stacks save designers countless hours and do the job better. In a new modern design commercial 50 KW AM radio transmitter put in operation just last year, G-E germanium rectifier stacks supply all direct current.

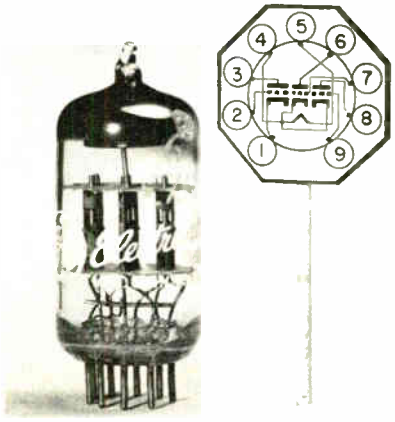
The latest, most revolutionary device in the semiconductor power rectifier field is the G-E Silicon Controlled Rectifier. Carrying a one-year written warranty and available now from your G-E Distributor, it can replace thyratrons, be used as an inverter, and in general, perform many power control operations. In the near future, consumer appliances will make use of this fantastic device, bringing the automated electronic home of tomorrow into reality.

What's new!

tubes

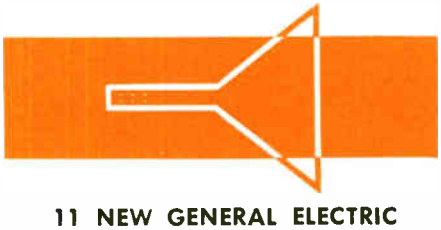
NEW TRIPLE TRIODE TYPE 6EZ8 ANOTHER GENERAL ELECTRIC "FIRST"

The new 6EZ8 9-pin miniature receiving tube now in production by the General Electric Company represents an advance in tube design which can offer high frequency performance and power dissipation with considerable economy and space-saving as compared with a string of transistors.



The 6EZ8, which is the industry's first triple triode receiving tube, can literally serve as a one-tube tuner for frequencies as high as the FM band. The cathodes of two of the three sections have a common connection; the third section's cathode is brought out to a separate pin. Possible applications include: (1) RF amplifier, oscillator and mixer; and (2) oscillator, mixer and AFC tube.

Each triode in the tube is rated for a maximum of 330 plate volts, 50 volts negative DC grid, and 2 watts plate dissipation. In typical operation with 125 plate volts and minus 1 grid volt, each section has an amplification factor of 57, transconductance of 4,200 micromhos, plate resistance of 13,500 ohms and draws 4.2 milliamperes.



11 NEW GENERAL ELECTRIC BLACK-DAYLITE PICTURE TUBES

Listed below is a summary of significant characteristics for each of the new General Electric Black-Daylite picture tubes. All of these tubes use a 6.3-volt, 0.6-amp heater.

14RP4-A

Construction	14", Rectangular, Glass
Length	Over-all 14 3/16", Neck 6½"
Picture Size	12 1/16" x 9½"
Focus	Elec., −500 to +500 volts
Deflection	Magnetic, 90°
Gun	Single Magnet Ion-trap
External Conductive Coating	500–750 μμf
Anode Voltage	14 KV Max.

17CFP4

Construction	17", Rectangular, Glass
Length	Over-all 15", Neck 5½"
Picture Size	14¾" x 11 11/16"
Focus	Elec., −500 to +1000 volts
Deflection	Magnetic, 90°
Gun	Non Ion-trap
External Conductive Coating	1200–1500 μμf
Anode Voltage	16 KV Max.

17DLP4
Short Neck

Construction	17", Rectangular, Glass
Length	Over-all 11 1/16", Neck 3 15/16"
Picture Size	14¾" x 11 11/16"
Focus	Elec., −500 to +1000 volts
Deflection	Magnetic, 110°
Gun	Non Ion-trap
External Conductive Coating	1000–15000 μμf
Anode Voltage	18 KV Max.

17QP4-A

Construction	17", Rectangular, Glass
Length	Over-all 19 3/16", Neck 7½"
Picture Size	14½" x 10¾"
Focus	Magnetic
Deflection	Magnetic, 70°
Gun	Single Magnet Ion-trap
External Conductive Coating	750–1500 μμf
Anode Voltage	18 KV Max.

21CBP4/21CBP4-A

Construction	21", Rectangular, Glass
Length	Over-all 18", Neck 5½"
Picture Size	19 1/16" x 15 1/16"
Focus	Elec., −500 to +1000 volts
Deflection	Magnetic, 90°
Gun	Non Ion-trap
External Conductive Coating	2000–2500 μμf
Anode Voltage	18 KV Max.

21CEP4

Construction	21", Rectangular, Glass
Length	Over-all 14¾", Neck 5 7/16"
Picture Size	19 1/16" x 15 1/16"
Focus	Elec., 0 to +400 volts
Deflection	Magnetic, 110°
Gun	Non Ion-trap
External Conductive Coating	2000–2500 μμf
Anode Voltage	18 KV Max.

21CMP4

Construction	21", Rectangular, Glass
Length	Over-all 19", Neck 6½"
Picture Size	19 1/16" x 15 1/16"
Focus	Elec., −64 to +352 volts
Deflection	Magnetic, 90°
Gun	Single Magnet Ion-trap
External Conductive Coating	2000–2500 μμf
Anode Voltage	22 KV Max.

21CQP4
Flexible Lead

Construction	21", Rectangular, Glass
Length	Over-all 14 7/16", Neck 5 3/16"
Picture Size	19 1/16" x 15 1/16"
Focus	Elec., −550 to +1100 volts
Deflection	Magnetic, 110°
Gun	Non Ion-trap
External Conductive Coating	2000–2500 μμf
Anode Voltage	19.8 KV Max.

21CXP4
Low G_2 Voltage

Construction	21", Rectangular, Glass
Length	Over-all 18", Neck 5½"
Picture Size	19 1/16" x 15 1/16"
Focus	Elec., −550 to +1100 volts
Deflection	Magnetic, 90°
Gun	Non Ion-trap
External Conductive Coating	2000–2500 μμf
Anode Voltage	22 KV Max.

21ESP4
Short Neck

Construction	21", Rectangular, Glass
Length	Over-all 13 3/16", Neck 3 15/16"
Picture Size	19 1/16" x 15 1/16"
Focus	Elec., −500 to +1000 volts
Deflection	Magnetic, 110°
Gun	Non Ion-trap
External Conductive Coating	2000–2500 μμf
Anode Voltage	18 KV Max.

24AEP4

Construction	24", Rectangular, Glass
Length	Over-all 19⅛", Neck 5½"
Picture Size	21 7/16" x 16⅞"
Focus	Elec., −500 to +1000 volts
Deflection	Magnetic, 90°
Gun	Non Ion-trap
External Conductive Coating	2000–2500 μμf
Anode Voltage	20 KV Max.

GENERAL ELECTRIC MODEL FA-10 AND FA-12 FM-AM HIGH FIDELITY TUNER

General Electric now has available an FM-AM tuner that features high quality audio performance and trim, modern cabinet design, for compatibility with virtually any hi-fi amplifier.

The model FA-10 is available with saddle brown vinyl finish, and the FA-12 with willow gray vinyl finish. The two models are similar in all other design and performance details.

The tuner features high sensitivity, precision tuning, ability to receive weak signals with minimum distortion, and an unusually low hum and noise level. It also has an FM multiplex jack, for reception of FM multiplex broadcasts with addition of a special adaptor.

The tuner has an FM sensitivity of 2.5 microvolts on 300-ohm input for 20-decibel quieting, an AM sensitivity of 200 microvolts per meter for a 20-decibel signal-to-noise ratio, and an FM maximum deviation sensitivity rating of five microvolts, for minimum distortion on weak signals.

Its automatic frequency control will maintain sharp tuning, and FM drift is negligible during warmup. A built-in dual-purpose tuning meter allows precise visual FM center tuning and maximum signal AM tuning.

The tuner is equipped with a folded dipole FM antenna, and a built-in ferrite rod AM antenna with a tuned radio frequency stage for increased sensitivity and low noise level.

The FM frequency response falls within plus or minus two decibels of the FCC standard de-emphasis curve, and the FM tuning range is from 88 to 108 megacycles. The AM tuning range is between 535 and 1620 kilocycles.

The tuner's trim, "flat" cabinet is highly compatible with modern amplifier and hi-fi furniture styling, and its control panel features a textured escutcheon with extra-size knobs, a special station logging scale, and easily read white, edge-lighted dial numerals.

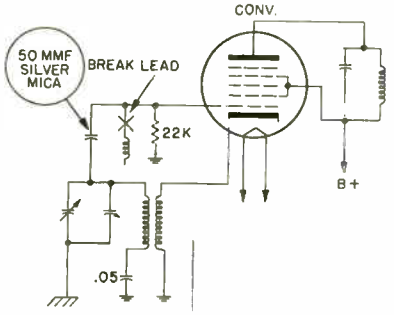
WHAT'S WRONG WITH THIS PICTURE?

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

Radio Service Hint

Here is a cure for a chronic trouble which I have used several times with complete success.



On table radios and portables the tickler winding on the oscillator coil will sometimes open up. When this happens, I install a capacitor as shown and the trouble clears up. I have found that an intermittent oscillator is often caused by this same winding.

Edward Sulzbach
5819 Newtown Ave.
Philadelphia 20, Pa.

Pleated Raster

The condition shown in Tele-Clue E-252 (page 7) was caused by an "open" in the horizontal output transformer. The "open" occurred between the plate of the horizontal output tube and the plate of the HV rectifier. The receiver was an Arvin Model 21-551TM.

Robert E. Redd
Redd's Radio & TV Service
Post Office Box No. 12
Union Furnace, Ohio

Tube Testing Hint

Here is a time and finger-saving trick I use when testing tubes in a set with parallel filaments. First pull and test ALL low voltage rectifier tubes. (5U4's and/or 5Y3's.) Then apply power to the set and slip rubber finger protectors on all fingers of one hand. Thus the filaments are pre-heated, saving time in testing, and the fingers are protected from hot tubes. With the rectifiers out there is less danger from shock. When through testing, turn the set off momentarily while replacing rectifiers, to prevent overloading them.

Glen R. Ward
610 Fillmore St.
Taft, California

Editor's Note: The General Electric Tube Puller, ETR-1094-A can be used with less trouble and gives more protection.

Focus Adjustment

As part of every TV servicing job, doing a few little extras for improving picture quality goes a long way in justifying your bill to the customer. Making a focus adjustment after the set has been repaired should be one of these extras.

I adjust the focus for sharpness of raster lines without any picture information, rather than try to get the best possible focus when there is a picture on the screen. Any focusing adjustments which are made are more readily noticeable on raster lines than they are on a screen which has constantly changing picture information on it. Here's how I make my focusing adjustments:

A. Turn the contrast control fully counterclockwise. (Minimum)

B. Disconnect the antenna lead or short out the antenna terminals.

C. Tune the receiver to an unused channel or between channels if any interference or modulation of the raster brightness occurs on the screen.

D. Adjust the brightness control for a normal raster. (Once the receiver controls have been set in this manner, the raster lines can be clearly seen at all points on the screen.)

E. Make the focus adjustments while observing the sharpness of raster lines over the entire screen area.

F. If any compromise is necessary, adjust for best focus at the center and as far out to the edges of the screen as possible.

John Iannelli
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Hollywood 27, Calif.

Editor's Note: It may be found that on some picture tubes the focus will change when a picture is tuned in. In these cases it will be desirable to make the focus adjustment under normal viewing conditions.

Those desiring to have letters published in this column should write the Editor, Techni-Talk, Electronic Components Division, General Electric Company, Schenectady 5, New York. 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

Excessive Width—M4 Sets

The Vol. 10 No. 5 issue described a method of reducing the width of the picture on G-E U2 receivers. The same procedure can also be applied to M4 sets if it appears necessary to do so to satisfy a customer complaint.

To decrease width on M4, the following changes may be made:

1. Increase horizontal output tube screen resistor, R266, to 15,000 ohms.
2. Decrease damper capacitor C263 to 210 mmf. Part #WT18X327, which is a 210 mmf. 4KV capacitor, may be used.

Both components must be changed to preserve circuit relationships. This will result in an over-all width reduction of approximately two inches.

Slippage in Fine Tuning Control

On some types of tuners the rotor of the fine tuning capacitor is coupled to the tuner shaft by a friction plate. These can be identified by the circular fine tuner enclosure which is mounted outside the tuner shield.

Occasionally more than normal slippage develops making it impossible to fine tune when the fine tuning shaft is rotated. To correct this remove the enclosure and insert a very small quantity of beeswax or capacitor wax between the cork and Textolite* laminated surfaces of the friction unit.

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RADIO

Model P755—Oscillation and Distortion

Several reports have been received pertaining to oscillation and distortion in the P755 transistor radios.

It has been found in some receivers that the capacity of C5 is below rated capacity value, thereby causing the above symptoms.

Check out C5 by placing an 8 uf. capacitor in parallel with C5, turn set on and observe if symptoms occur. If symptoms are eliminated, replace C5 with capacitor, replacement part #RS1592.

THE STEREO HUM PROBLEM III

In the last issue the techniques used to minimize hum when a second monaural amplifier is installed were discussed. In this issue record changer or turntable grounding will be described.

An additional consideration is the technique of proper grounding of the record changer or turntable motor, metal base, and tone arm. It is important that the metal base and tone arm be as near the amplifier(s) signal ground AC potential as is possible in order to avoid any capacitive hum coupling to the cartridge or signal wiring. A record changer or turntable base will, however, assume a certain potential above AC ground because of inductive and capacitive coupling from the motor and power wiring.

Since the voltage assumed is almost inevitably different than the AC potential of the amplifier(s) it is necessary to ground the metal base of the player unit to the amplifier's signal ground to equalize these voltages. Failure to ground the player base to the amplifier by some means will result in severe hum; as high as 30 to 40 db above the amplifier hum level. When such a connection is made, however, a minute power-line ground current will flow between the metal base and the amplifier(s).

If the signal shields are connected to the base and forced to carry this ground current (as is commonly the case) as well as the signal current, hum will be introduced with the signal. A separate grounding wire between the motor, the record changer or turntable base, and the amplifier signal ground point should be connected to provide the necessary path for the ground current. Isolation from the signal path can then be accomplished by removing all connections between the ground-current-carrying path and the signal ground shields, except for the one at the amplifier inputs. This isolation of signal path (shields) and ground-current path can decrease the hum from signal wiring by as much as 8 db in 3-wire systems.

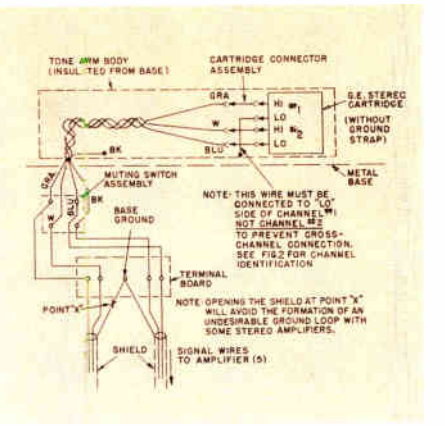

Fig. 1. Wiring diagram for a stereo changer which uses isolated tone arm as fourth conductor.

Separate Ground Wire

For greatest precaution, a separate ground wire from the tone arm body to the changer or turntable base should be used (unless the arm is intentionally isolated from the base of the unit and used as the fourth conductor in a four-wire system, as is done in early models of one stereo changer manufacturer, as illustrated in Fig. 1). In stereo amplifier installations the separate ground wire should be connected to the identified signal ground terminal of the amplifier if one has been provided. If not, the separate ground wire should be connected to the alternate signal ground ("LO" side of the input jack or plug) of whichever channel that produces the least hum in both channels. In two-monaural amplifier installations, the separate ground wire from the player may be returned to the signal ground point of either amplifier, since they are grounded together.

(Continued in next issue)

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 in. Information, if available, will be sent to you by return mail.

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Answers To: What's Wrong with This Picture? On page 6.

1. *Picture tube carton opened from wrong end.* Carton is marked "open other end." If carton is opened correctly, tube will be in proper position for removal (see No. 2 below).
2. *Picture tube lifted from carton by neck alone.* Since the glass used in the neck is by far the thinnest, there is a good possibility that the neck might break off. If this happens, it will result in financial loss (this type of breakage is not covered by manufacturers' warranty) plus the possibility of personal injury due to broken glass.
3. *Safety glasses not worn.* Safety glasses should be worn whenever a picture tube is exposed. If a picture tube should implode, there is a possibility of personal injury as well as financial loss. The use of approved safety glasses (preferably with side shields) will provide adequate protection for the eyes.

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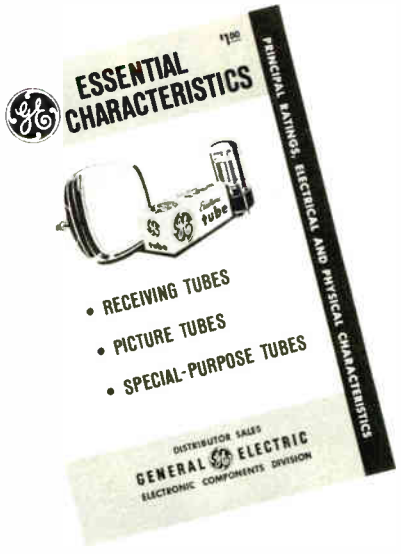

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