# Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION

radio • tv • hi-fi

VOL. II NO. 1 JAN.-FEB. 1959


# THE "STEREO" HUM PROBLEM

The swing to stereo which is sweeping the country is destined to bring new listening pleasure to millions of people. In most quarters, where stereo is now just a word, the realism of the original performance as reproduced from stereo recordings will surely arouse enthusiasm rarely displayed.

Along with this revolutionary advance in the art of musical reproduction, however, come new problems. One problem that merits attention is *hum*. The purpose of this article is to examine the hum problem and explain some techniques of application which will minimize this problem. Close attention to the principles and techniques described will result in the best performance.

## A Principle for Hum Prevention

Fundamental in the approach to hum prevention in any system is the following rule:

The flow of AC power-line current through the signal wiring (shields) from any source must be avoided.

The presence of such powerline currents in signal wiring often occurs because a complete physical loop in the input shield wiring has been formed by connecting the two ground paths (shields) together at both ends.

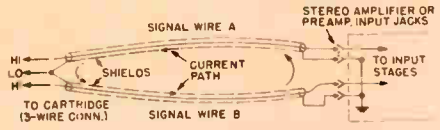



**Fig. 1A Induced Current in Signal Wires (Stereo Amplifier or Preamplifier)**


**Fig. 1B Signal Wires Twisted**

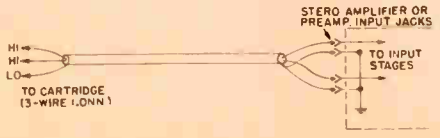



**Fig. 1C Two Conductor Shielded Cable**

When a stereo amplifier (or preamplifier) is used, the two signal grounds* are almost always connected together internally in some manner within the amplifier. A ground loop in the external signal wiring shields is thus inevitably formed when the conventional dual shielded cable arrangement is installed for a three-wire connection to the cartridge. See Figure 1A.

In a closed ground loop, stray powerline fields may induce hum voltage in some portion of one of the shields, which will cause current to flow continuously throughout the loop. The resulting voltage drop in the shields is mixed with the signal voltage and appears as hum in the output.

Also, some stereo amplifiers do not have the two signal grounds connected directly together at the inputs but instead are connected together only through the common power supply. In this instance, an external connection of the two ground systems as is required by a three-wire cartridge connection will extend the external ground loop into the internal signal wiring of the amplifier as well. This will very likely increase the hum level of such an amplifier. Where a ground loop does exist and hum from this source is encountered, it can usually be corrected either by eliminating the loop or by minimizing the currents induced in the loop.

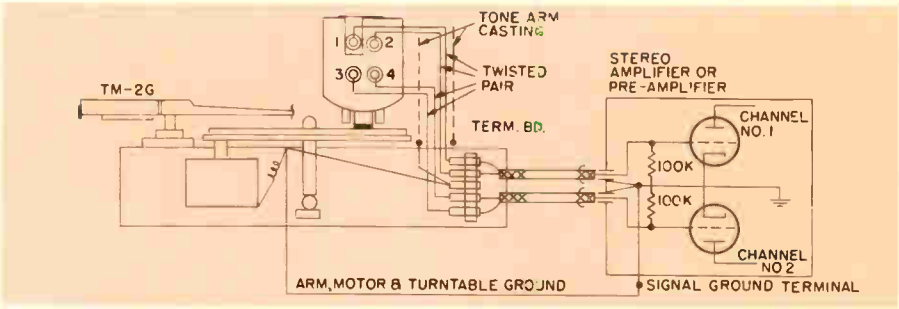



**Fig. 2 Four Wire System Used on Stereo Classic TM-2G Tone Arm.**

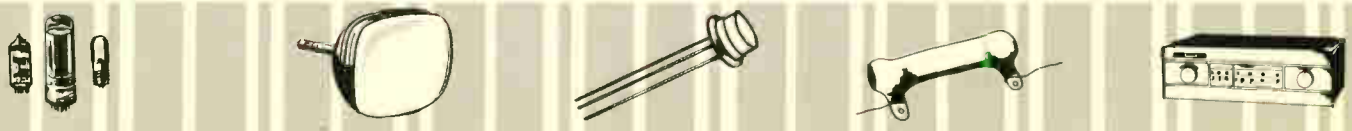
## Use of Four-Wire System

One method of preventing this loop and the surest way to eliminate the problem completely is to use a four-wire system between the cartridge and the amplifier inputs, as shown in Figure 2. The technique of twisting the two shielded input cables together will minimize the externally induced currents in the loop and will suffice in some cases without converting to the four-wire system. See Figure 1B. The use of a sometimes proposed method of breaking the loop by disconnecting one of the shields at one end usually provides no improvement because the open-ended shield creates an antenna pick-up effect.

Another method of avoiding the external portion of such a loop would be to use two-conductor shielded cable from cartridge to amplifier input as shown in Figure 1C. This cannot eliminate loops within certain stereo amplifiers which will be closed by any external 3-wire system, however. Connections between a stereo preamplifier and two monaural power amplifiers should cause no hum problems because of the lower sensitivity of the amplifiers at that stage of the system.

The Stereo Hum Problem will be continued in the next issue.

** The signal ground of an amplifier is defined as the grounding point of the input amplifying stage. Sometimes the signal ground will be brought out to an identified external ground terminal on the amplifier. Where this is not done the "Lo" side (body or shield-connecting point) of the signal input jack or plug may be considered to be the alternate signal ground.*



# ELECTRONIC COMPONENTS PREVIEW OF 1959

by L. Berkley Davis, General Manager
Electronic Components Division
General Electric Company, Owensboro, Kentucky

This forecast of the electronics industry will be of interest to service technicians and others who may wish to plan for future expansion.

The electronic components industry in 1959 will show substantial sales increases, recouping for the most part recession losses of the past year.

Dollar volume in several areas will register these gains over 1958: electronic tubes, up 5 to 10 percent; semiconductors up 30 percent; stereo and high fidelity components, up 30 percent.

In 1959, receiving tubes—backbone of the components industry—will chalk up sales of $380 million. This is about 10 percent above tube sales of $345 million estimated for 1958, and nearly matches the 1957 record of $384 million. This indicated recovery means that the principal factors which attenuated activity during the past year now are being reversed: (1) General business activity is up; (2) radio and television set inventories have dropped; (3) repairs heretofore considered marginal now are being made by set owners; and (4) industrial and military equipment manufacturers have reduced excessive tube inventories.

Commercial receiving tube sales will amount to about $300 million in 1959, and industrial and military tubes about $80 million. Of the approximately 400 million entertainment type tubes, slightly more than half will go into the renewal market.

Tube engineering will concentrate on the special, tough and unusual jobs that only tubes can handle— high voltage pulsing circuits, UHF amplifiers and oscillators, and operation in high temperatures and in high nuclear radiation environments. Advances in grid-making techniques — particularly "framed grids" for television tuners — will feature development work in the entertainment tube field. Materials development also will advance rapidly to cut costs in producing entertainment tubes and to achieve even greater uniformity of characteristics in industrial and military tubes.

### $255 Million Semiconductor Sales

The semiconductor component industry is growing about twice as fast as the market. Applications for semiconductor products will continue to grow until they become a major portion of the market in the late 1960's.

In 1959 the semiconductor dollar volume will grow to $255 million from 1958's $195 million, an increase of more than 30 percent. The largest growth percentage wise will be in rectifier sales, which will increase by about 50 percent from the 1958 level of $33 million to around $50 million. However, the dollar increase for transistors will be twice as large, from $104 million to $140 million. Diodes, which accounted for $58 million in 1958, will rise to $65 million in 1959.

Semiconductor rectifier growth is evident in their wide usage in new military aircraft and missile power supplies, in high power direct conversion equipment in the steel and chemical industries, and in 80 percent of today's television sets.

A major factor in opening new fields for semiconductor rectifiers will be applications of the silicon controlled rectifier developed by General Electric in 1958. This thimble-size device can not only change alternating current to direct current and vice versa, but also can control the volume of current fed into a load.

Although 1959 sales of controlled rectifiers will be small as compared with transistors and conventional semiconductor rectifiers, there is a future application for these new devices in almost all electrical and electronic equipment — motor and lighting controls, instruments, communications equipment, automobiles and home appliances as well as in missile systems.

The new year will see 62 million transistors sold at prices averaging somewhat lower than the 45 million that were sold in 1958.

It is not expected transistor circuits will penetrate the television market very deeply, if at all, in 1959 — and certainly not until there is price equality with tube circuits. The use of transistors in computers, though still relatively small, will almost double in 1959. Military usage of transistors will increase by about 40 percent.

### Missiles Boost Power Tube Market

Over-all, the power tube market increased about 10 percent in 1958 due to substantial increases in military procurement resulting from accelerated missile activity, and depot stock replenishments made necessary by procurement cutbacks in 1957.

In 1959, the power tube market will increase again, by 5 to 10 percent over 1958, thereby continuing steady power tube industry growth which will more than double the market in the next ten years.

Last year's decline in commercial and industrial power tube sales will be reversed as the general level of industrial activity and plant capacity gradually rises. Military products, representing the major power tube industry volume, will increase as new products from recent research and development activity are incorporated in defense systems. Moreover, the present high level of research and development activity will continue to meet the demanding requirements of future defense systems.

### Cathode Ray Tube Market Up

During 1959, 12.3 million television picture tubes will be sold by the industry at an estimated $265 million. Slightly more than half of these will go into the replacement market, the remainder in new sets. This volume will be up approximately 5 percent over 1958. Set manufacturers will continue to reduce cabinet depth through use of still shorter 110-degree picture tubes.

There will be increased requirements for special industrial and military cathode ray tubes utilizing features such as transparent phosphors, high resolution, multiguns and unique deflection devices.

### Stereo to Bring New Hi-Fi Sales Mark

The wide interest in stereophonic sound should boost high fidelity components to a dramatic growth record in 1959. The industry should top its 1958 dollar volume by more than 30 percent.

Most of this growth will result from sales of stereo components, as 1959 will be the first full year when all types of these components will be generally available. Stereo components generally will bear higher price tags because of their specialized nature.

The industry also faces the new challenge and opportunity to educate consumers on the basic technical points of stereo hi-fi. Such education will enable consumers to derive maximum performance and listening pleasure, and thus will contribute to further healthy growth of the market.

# G-E TV SERVICE POLICY STATEMENT WELCOMED BY DEALERS, DISTRIBUTORS

SYRACUSE, N. Y. — The General Electric television receiver department, here, has briefed its distributors on the principles and policies which will govern its future product service operation.

At the same time, it has urged its distributors to adopt a specific program "to supplement existing distributor and dealer service facilities by the appointment of qualified independent service organizations as authorized G-E service points."

In explaining the program, G-E's TV product service manager, S. R. Mihalic, stresses the important part played by the independent service industry to G. E.'s television marketing activity. "Our customers," Mihalic says, "will continue to depend upon the independent service dealer for the vast majority of service rendered on General Electric television receivers."

### Independent Service Stressed

He labels as "impractical" the idea that G. E. could provide all these services through its own resources. "It is imperative," he continues, "that we develop communications and relationships with independent service organizations so that we may work together for our mutual benefit and for the benefit of the consumer."

In detailing the principles behind the new operating policies, Mihalic states that "manufacturing and marketing television receivers in our prime business motive." He calls attention to the fact that G. E.'s television receiver department has an obligation to service its products to the extent required to obtain customer satisfaction. Furthermore, Mihalic says "We cannot abdicate our service responsibility."

### Fair Service Charges

"G. E.'s TV service operations must be financially self-sufficient," according to Mihalic, and he adds, "their service charges not only must be competitive but also computed fairly." Because the preponderance of General Electric TV service is performed by its own set dealers and by independents, Mihalic feels that an unimpeded flow of parts and service information must be insured. In addition, the district and distributor service operations are sources of quantitative product quality data vital to manufacturing quality programs, he says.

With these considerations in mind, G. E.'s TV service manager suggests a five point program designed to be beneficial both to independent servicemen and to General Electric and to contribute to an improved understanding of G. E.'s interest in consumer service:

1. Contact local independent service groups to explain G. E.'s programs and policies.
2. Analyze and do everything possible to resolve local differences which might exist, particularly in the areas of warranties and parts availabilities.
3. Supplement existing distributor and dealer service facilities by the appointment of qualified independent service organizations as authorized General Electric service points in both rural and urban areas.
4. Take an active part in assisting local service organizations to achieve such common goals as will serve to bring order to the industry and increase the stature of all segments of the industry.
5. Invite all independent servicemen to attend distributor service schools and to subscribe to G. E.'s service publication programs.

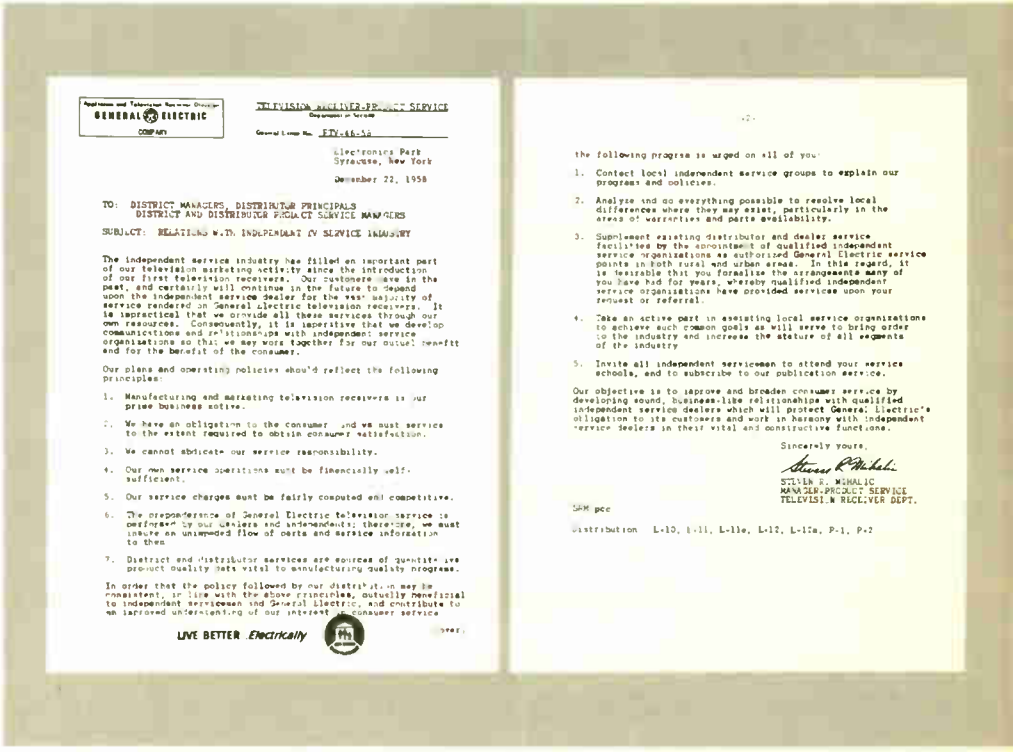
Amplifying on his suggestion that existing distributor and dealer service facilities be supplemented, Mihalic says it is desirable to formalize arrangements which may have existed for many years whereby qualified independent service organizations have provided services upon request or referral.

When this program is put in operation, Mihalic feels, it will "protect General Electric's obligation to its customers and permit the company to work in harmony with independent service dealers in their vital and constructive functions."

## SIGNIFICANCE

### G-E Lauds Role Of Independents In TV Service

1. General Electric recognizes that TV customer satisfaction depends basically upon the work of independent servicemen.
2. Cooperative efforts of independent service dealers, set dealers, and various components of the General Electric Company will offer G-E set owners the most complete and reliable service in the industry.
3. Improved public opinion of the TV service industry can be built on this framework of ground rules—thus counteracting derogatory publicity servicemen recently have received.
4. Flexibility to fit local situations is assured as TV set distributors have authority to alter details of service agreements locally within these ground rules.
5. The "impracticality" of dotting the country with factory-owner service centers is recognized.
6. Technical assistance and flow of service information will be improved by service schools, courses, cooperative forums and meetings in activities encouraged by this policy.



GENERAL ELECTRIC COMPANY

TELEVISION RECEIVER-PRODUCT SERVICE

General Letter No. PTV-46-58

Electronics Park
Syracuse, New York

December 22, 1958

TO: DISTRICT MANAGERS, DISTRIBUTOR PRINCIPALS
DISTRICT AND DISTRIBUTOR PRODUCT SERVICE MANAGERS

SUBJECT: RELATIONS WITH INDEPENDENT TV SERVICE INDUSTRY

The independent service industry has filled an important part of our television marketing activity since the introduction of our first television receivers. Our customers are in the past, and certainly will continue in the future to depend upon the independent service dealer for the vast majority of service rendered on General Electric television receivers. It is impractical that we provide all these services through our own resources. Consequently, it is imperative that we develop communications and relationships with independent service organizations so that we may work together for our mutual benefit and for the benefit of the consumer.

Our plans and operating policies should reflect the following principles:

1. Manufacturing and marketing television receivers is our prime business motive.
2. We have an obligation to the consumer and we must service to the extent required to obtain consumer satisfaction.
3. We cannot abdicate our service responsibility.
4. Our own service operations must be financially self-sufficient.
5. Our service charges must be fairly computed and competitive.
6. The preponderance of General Electric television service is performed by our dealers and independents; therefore, we must insure an unimpeded flow of parts and service information to them.
7. District and distributor services are sources of quantitative product quality data vital to manufacturing quality programs.

In order that the policy followed by our distributor may be consistent, in line with the above principles, mutually beneficial to independent servicemen and General Electric, and contribute to an improved understanding of our interest in consumer service

LIVE BETTER Electrically

-2-

the following program is urged on all of you:

1. Contact local independent service groups to explain our programs and policies.
2. Analyze and do everything possible to resolve local differences where they may exist, particularly in the areas of warranties and parts availability.
3. Supplement existing distributor and dealer service facilities by the appointment of qualified independent service organizations as authorized General Electric service points in both rural and urban areas. In this regard, it is desirable that you formalize the arrangements many of you have had for years, whereby qualified independent service organizations have provided services upon your request or referral.
4. Take an active part in assisting local service organizations to achieve such common goals as will serve to bring order to the industry and increase the stature of all segments of the industry.
5. Invite all independent servicemen to attend your service schools, and to subscribe to our publication service.

Our objective is to improve and broaden consumer service by developing sound, business-like relationships with qualified independent service dealers which will protect General Electric's obligation to its customers and work in harmony with independent service dealers in their vital and constructive functions.

Sincerely yours,

STEVEN R. MIHALIC
MANAGER-PRODUCT SERVICE
TELEVISION RECEIVER DEPT.

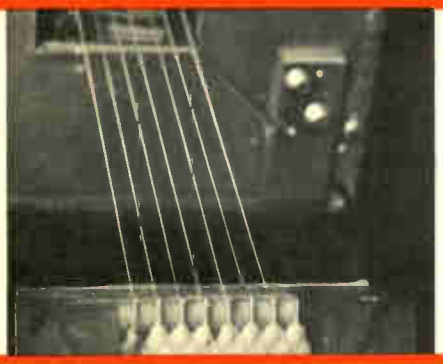
SRM:pce

Distribution: L-10, L-11, L-11a, L-12, L-12a, P-1, P-2

Television Receiver-Product Service General Letter No. PTV-46-58 Mailed to: General Electric District Managers, Distributor Principals District and Distributor Product Service Managers.

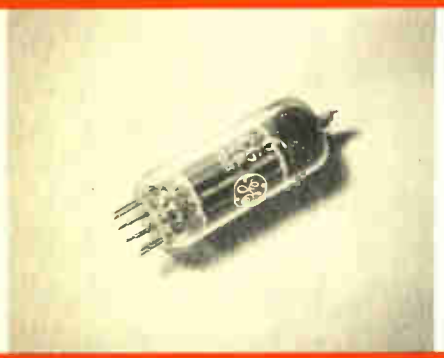
# HOW SERVICE-DESIGNED TUBES ARE MADE

**"Snow White" Manufacturing Techniques**
One of the most valuable manufacturing techniques originated by General Electric to produce high-reliability receiving tubes was the "Snow White" program. This contaminant-control program minimizes the threat of short-causing lint and dust particles. G-E workers wear Nylon or Dacron uniforms to eliminate lint which clings to ordinary cloth. All manufacturing areas are air-conditioned and in addition, filter-cleaned air is pressure-forced into plants to exclude dust and dirt particles.



**New Device Prevents "Off-Center" Heater Wire Coating**
Off-center insulation coating of tungsten heater wire in an electron tube can cause "hot spots" and increase the possibility of leakage or shorts between the heater and cathode. General Electric has developed a new method of applying ceramic coating to heater wire that keeps wire away from machinery until after the coating is baked — thus producing near-perfect concentricity of coating.

**Comparison of Ceramic Coating**
These cross-section views, magnified several hundred times, show a comparison of the results of new and old method of applying the ceramic coating. The off-center wire shown is an extreme condition which would have been detected in manufacturing tests. The near-perfect concentricity now attained 100% of the time provides a safety factor against possible inter-element shorts, "hot spots" and uneven tube warm-up time.



**New Branding Ink**
A new hard-to-remove branding ink resists rubbing-off of the warranty date code either accidentally or by deliberate erasure by tube counterfeiters.

With the cooperation of ink manufacturers, General Electric has been able to put into production use on the "Service Designed" tubes a new type ink several times more resistant to removal by handling. The ink alsa has a tendency to become more permanent from the heat of actual tube usage rather than to chalk off as former inks did.

**Compensation For Line Voltage Variations**
Recent surveys indicate the nation's power distribution systems deliver an average of 122 volts to American homes — 5% above the conventional 117-volt design point for television receivers. General Electric "Service Designed" tubes are now *manufactured and tested* to withstand the higher voltages. The heater cycling "life test" has been improved by increasing the heater voltage and the repetition rate of the cycling.

The G-E "Service-Designed" tube line is made up of dependable TV entertainment tubes. General Electric introduced the "Service-Designed" line of receiving tubes to meet the specific requirement for superior service in TV sets. Many high-reliability features are built into each "Service Designed" tube type. Five of these features are illustrated on the left.

General Electric leads the industry in the development of receiving tube types widely used in the television service industry. Advanced tube designs are developed and current production types are continually improved to meet the stringent requirements of professional service technicians. "Service-Designed" tubes reflect the latest developments and improvements in both design and performance.

### Rigid Inspection of Raw Materials

Raw materials are specially selected and tested to conform to General Electric's demanding specifications. Scientific analysis and the most modern equipment is utilized to maintain constant quality control and raw material uniformity. General Electric's manufacturing philosophy of quality control *from the beginning* is maintained throughout the production cycle of each receiving tube.

### Performance Testing

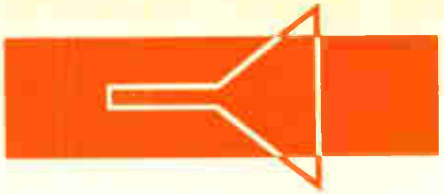
All G-E receiving tubes undergo rigorous characteristics tests which meet and exceed customer requirements. The series of tests given *each tube* includes check of all essential electrical characteristics necessary to its principal function. In addition, a representative sampling of each production lot is given a series of further acceptance and quality tests. If the sample fails to measure up to G.E.'s high standard of quality, the entire production lot is rejected.

### Complete Interchangeability

The principal objective is to provide the highest quality product with *maximum interchangeability*. To achieve this objective G-E engineers work closely with TV service technicians to isolate problems encountered in the service business. Prompt corrective action is then taken in tube redesign or manufacturing. Also Howard W. Sams & Co. is engaged to test and report on the performance of each G-E tube type in all makes and models of popular TV receivers. The resulting development of new tubes and the constant improvement of current types gives the TV service industry a superior replacement product.

"Service-Designed" receiving tubes increase profit opportunities and reduce call-backs. Actual sales and usage statistics prove that these popular types meet most of your replacement needs in television servicing.

# What's new!



### 21DEP4/21DAP4 and 24AHP4
### New General Electric Black-Daylite 110° Aluminized Picture Tubes

The **21DEP4/21DAP4** is a rectangular 110° all glass picture tube with a high-quality fluorescent screen and gray faceplate. The fluorescent screen is aluminized to increase light output and the gray faceplate improves contrast. It has electrostatic focus and magnetic deflection. The picture size is 19 1/16 x 15 1/16 inches. The 21DEP4/21DAP4 has a short straight electron gun that does away with the need of an ion-trap magnet. When grounded the external conductive coating serves as a filter capacitor.

The **24AHP4** is an electrostatic-focus magnetic-deflection, rectangular all glass picture tube with a high-quality fluorescent screen which is aluminized to increase light output. The gray faceplate improves picture contrast and provides a 21 7/16 x 16 7/8 inch picture. The 24AHP4 has a short straight electron gun which does not require an ion-trap magnet. An external conductive coating serves as a filter capacitor when grounded.


### TYPE 7077 — CERAMIC TUBE

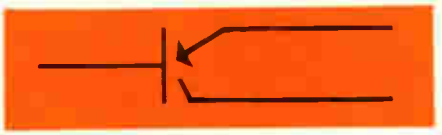
A new low-noise military receiving tube a half-inch long and a half-inch wide for use as a radio-frequency amplifier in equipment operating up to frequencies of 1,200 megacycles has been developed by the Receiving Tube Department. This tube is now available through General Electric tube distributors.

The new tube, registered as type 7077, is a high-mu triode of planar construction intended primarily for use in grounded grid circuitry in communications, radar and navigation equipment. The power gain is 14.5 decibels, and noise figure 5.5 decibels at a frequency of 450 mc.

Special tests and ratings for the tube include a survival rate life test, a heater-cycling test, a shock rating of 450 G, fatigue rating of 10 G, altitude rating of 100,000 feet, and envelope temperature up to 250 degrees Centigrade.

The tube's coated unipotential cathode is heated with a 6.3-volt heater drawing 0.24 ampere. Plate to heater and cathode capacitance is 0.01 micro-microfarads; and the capacitances between cathode and heater-to-grid, plate-to-grid, and heater-to-cathode are each 1.0 micro-microfarad. Other ratings: Plate voltage, 250 v.; plate dissipation, 1.0 w.; cathode current, 10 ma; plate resistance, 9,000 ohms; transconductance, 10,000 micromhos; and amplification factor, 90.

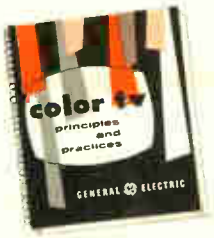
**Size comparison of type 7077 with ordinary thimble.**



### WATCH FOR G-E TEN-PACK STACKS

Take a good glance at your G-E Distributors shelves and you'll see G-E Semiconductors in their new TEN-PACK Carton, each small package holding either individual transistors or rectifier cells. This simplifies shelf arrangement for your distributor and helps him keep fully stocked at all times to meet your rush requests. A new fine container for holding fine products that can do a fine job for you . . . every time.


**ETR-1432**




Are you servicing Color Receivers? If not, are you ready for color? The General Electric "Color TV Principles and Practices" book is a fact-crammed color course written exclusively for the practicing TV service technician. Ask your distributor for ETR-1432.


### GENERAL ELECTRIC "STEREO CLASSIC" STEREOPHONIC PREAMPLIFIER MODEL MF-1

A new dual stereophonic high fidelity preamplifier, featuring high sensitivity, low hum and noise, high channel separation, and individual switching for each channel to select phono or tape input, is now available.

The new General Electric "Stereo Classic" Model MF-1 Dual Stereophonic Preamplifier was designed primarily for conversion of stereo systems using ceramic cartridges to magnetic cartridges, where the essential preamplification is not available in the system.

The MF-1 features individual switching for each channel for selection of either tape or phono input. It includes two input jacks for use with stereo tape phonographs. In addition to providing two stages of preamplification in each channel, it provides proper feedback type circuit equalization for discs (RIAA) and for tape (NARTB), for very low distortion.

It may be used as a stereo headphone amplifier, for individual listening, and, with a minor circuit modification, as a high gain, high quality monaural or stereo tape recorder microphone preamplifier. Its low impedance output of less than 10K ohms at 1 kc allows the use of a coaxial output cable up to 50 feet long.

### Nominal Specifications

*Stereo Magnetic Phono Inputs (2):* For all stereo magnetic cartridges; resistance, 47K ohms; sensitivity, 4 millivolts to produce 0.6 volt output at 1 kc; RIAA record equalization.
*Stereo Tape Head Inputs (2):* Sensitivity 4 millivolts to produce 0.4 volt output at 1 kc; NARTB tape equalization.
*Gain, Both Inputs:* Over 40 db.
*Frequency Response:* Within 1.5 db of stated equalization characteristics, at rated output
*Hum and Noise:* Better than 60 db below 1 volt output, unweighted.
*Distortion:* Less than 0.15% harmonic at 1 kc, at 1 volt output; will handle peak voltages at all frequencies from recordings without clipping.
*Separation Between Channels:* Better than 40 db at rated operating levels.
*Channel Balance:* Gain of channels at 1 kc equal within 1.5 db.
*Power Supply:* Self-contained selenium rectifier; line power, 105-125 volts; 50-60 cycles; four watts at 117 volts.
*Tube Complement:* 2 7025 12AX7 special low noise dual function triodes.
*Dimensions:* Length, 6½"; width, 3¾"; height, 4".

# NOISE CANCELLER CIRCUITS III

### Simplified Clipper-Canceller Circuit Used in "S", "ST", "U" and "U2" Receivers

Probably the most unique type of noise canceller circuit is used in the "S", "ST", "U", and early version "U2" receivers. This circuit is similar to that used in the "G" and "K" receivers, but with additional embellishments.

The circuit used in the "S", "ST", "U", and early version "U2" receivers is shown in Fig. 1. The sync clipper and noise canceller operation is the same as described for the "G" and "K" receivers. The principle difference is that the d-c bias on grid #1 is obtained automatically instead of manually as illustrated in Fig. 2.

In previous receivers employing this type of canceller clipper circuit, the bias on the first grid was set according to the strength of locally available signals by means of the manually adjusted area control. As the signal strength increases, progressively less cancelling action is desired to prevent sync compression. In the circuits shown in Figs. 1 and 2, this is automatically accomplished by the canceller control tube, V106B. The grid of this tube is tied to the I-F system AGC line. As the strength of receiver signals increases, the rising negative AGC voltage applied to the grid of V106B causes its plate resistance to rise also. Therefore, the voltage at the junction of the two resistors will rise in the positive direction, thus automatically setting the operating point of the canceller, V107. In this manner, truly automatic action of the noise canceller is achieved.

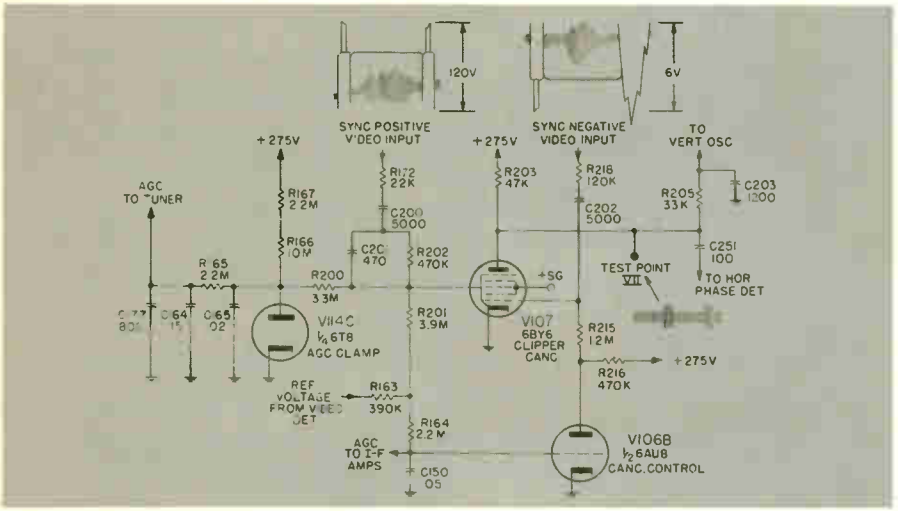



Fig. 1. Noise canceller and clipper circuit used in "S", "ST", "U" and "U2" receivers.

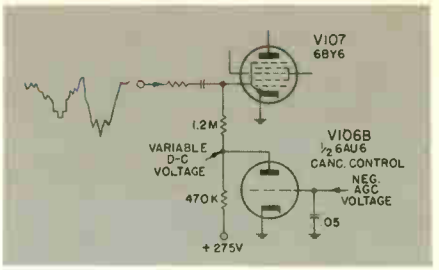



Fig. 2. Automatic canceller control circuit used in "S", "ST", "U" and "U2" receivers.

# BENCH NOTES

### NEW USE FOR SERVICE CEMENT

A transistor set came in with the complaint of very short battery life, obviously a case of excessive current drain or switch failure. Replacing the battery with a milliampere meter in series quickly indicated drain ok but switch remaining "on" in "off" position. The switch was of the popular, open, miniature type and made spotting the defect very easy. The trouble was that the fiber cam just did not move the contacts far enough apart on "off." The thought of putting in a new control was not encouraging to be sure. Since most technicians avoid disturbing "printed wiring" and since bending the contacts wasn't possible, we did the next best thing (except replacing) which worked out fine. We simply built up the cam a bit with a few layers of service cement. Inasmuch as the service cement was applied at the "off" spot where there's little wear, it should be a permanent repair.

*F. C. Hoffman*
*Radio TV Doctor*
*Kewaunee, Wis.*

### COMPACT FUSE CABINET

To minimize lost time in locating the proper type and value of fuse, both on service calls and in the shop, I stack the boxes of most used numbers in order of increasing ratings and solder the adjoining edges of the cans together to make a compact fuse cabinet. "Drawers" may be added, replaced or removed without difficulty and all fuses are indexed and readily available.

*W. E. Smith*
*60 South 70 East*
*Malad City, Idaho*

### HORIZONTAL OSC. ALIGNMENT

In June-July of 1956, Vol. 8, No. 3, a Bench Note was printed and titled, "Horizontal Trouble." This was a very helpful note. However, now I would like to suggest a method which I have used for approximately two years.

In place of using an oscilloscope to align the coils, just short circuit the newly replaced .01mfd600V condenser. Now, if the set uses a variable resistance type hold control, set it at the center of its range. Next, adjust osc. coil until railroad tracks are removed. Then remove short from sine wave coil and adjust it until picture falls in place.

*Paul Noel, Jr.*
*350 E. Locust St.*
*York, Pa.*

### USE STRING

A piece of string is a very important tool when you are trying to get a spring back in a tight place. You can do the trick in a second.

*Grigsby Radio & TV*
*Granger, Iowa*

### SPEAKER PROTECTON

Protect that bench speaker with a motor starting condenser in series with the voice coil. Any size between 40 and 100 mf will do. Then if you connect the speaker field supply from an auto radio, by mistake of course, to the speaker it will be blocked by the condenser. The audio will not be affected to any great extent. Also if a lead slips and contacts the B+, the speaker will be protected.

*Robert Archibald*
*813 Bluff St.*
*Fulton, Mo.*

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

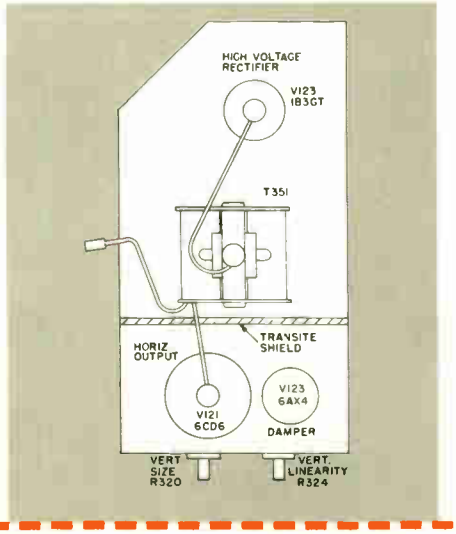
## TELEVISION

### Replacement Sweep Transformers

For some time, it has been noticed that the usage of this particular sweep transformer (RTO-146, WT77X21) has been rather high. Complaints have also been received that replacement transformers have not held up. To investigate this condition, a number of sets were returned from the field. In these sets, the transite heat shield (see drawing) that is supposed to be positioned between the output tube and the sweep transformer in the high voltage cage was missing entirely. Without this shield in place, the transformer becomes very much overheated to the extent that the wax melts and the transformer finally opens.

This service note is written to caution everybody to make sure that this heat shield is put back in place whenever service is required on these "EE" sets.

In case new shields are required, either due to breakage or loss, they may be obtained as catalog number WT60X83.




### Sync Buzz on U-2 Receivers

Vertical sync buzz in television receivers using the U-2 chassis may occur if the high-impedance grid circuit of the 6T8 (V114) 1st audio amplifier is subjected to the influence of the blue plate lead from the vertical output transformer.

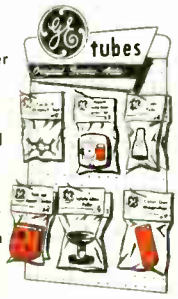
The blue plate lead from the vertical output transformer is normally pushed down and bundled with the other leads at the bottom of the board, next to the chassis. If for some reason the blue lead is not in its normal position and sync buzz is noticeable, then push the blue plate lead of the vertical output transformer away from the 6T8 grid, toward the bottom of the board. This will minimize sync pickup on the 6T8 grid.

Another type of buzz sometimes mistaken for sync buzz may be due to a defective ground connection to the picture tube aquadad coating. Try placing a good size screwdriver between coating and chassis *before* making other checks for sync buzz.

## SERVICE AIDS

Look for the "Original G-E Service Aids" display at your General Electric Tube and Parts Distributors. This attractive pegboard unit will have the following service aids neatly packaged and ready for your selection:

ETR-752 Twin-X Wrench Set
ETR-981-A Series Heater Checker
ETR-1021 Service Drop Cloth
ETR-1094-A Tube Puller
ETR-1527 Tri-plex Extension Lead
ETR-1540 Miniature Tube Pin Locator
ETR-1592 TV Safety Glass Puller
ETR-1593 Magnetic Swing-beam Service Light
ETR-1761 Color Dot Magnifier




## RADIO

### Model T120—No AM on low frequency end of band

Several reports have been received from the field concerning no signal on the low frequency portion of broadcast band on model T-120 AM-FM radio. This is caused by the AM oscillator becoming inoperative. Oscillation can usually be restored in the following manner:

1. Replace L11 with a 10uh choke (catalog no. RS-1473).
2. Replace C12 (150v 20mmf) with a 33uuf., plus or minus 20%, 500V., ceramic disc capacitor (common item).

After the tuner bottom plate shield is properly placed back into position, the AM RF stages must be realigned as described in steps 1 and 5 in the AM alignment chart in service manual; then recheck the FM alignment of T1 as described in step 4 in the FM alignment chart.

If the proper operation of AM does not result, make routine checks of other AM oscillator circuit components such as V4 and band switch connections, etc.

The new L11 chokes (10uh) are available as Catalog Number RS-1473. This catalog number should be used when ordering all L11 chokes.

## TV SERVICE GUIDE VOLUME 3

The Volume 3 issue of TV SERVICE GUIDE is now available from your General Electric Tube and Parts distributor. This volume includes 1955, 1956 and 1957 models M, MM, M-3, Q, Q-2, S. ST, T, U, U-2 plus 15-inch and 21-inch color receivers. Volume 1 contained service data on TV receivers manufactured from 1946 to 1953 and Volume 2 from 1953 to 1955. These three volumes contain the most important service information for *all* General Electric television receivers manufactured since 1945.


### 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.

_____

_____

_____

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.*

# NEW BUSINESS BUILDERS

## Indoor-outdoor Thermometer ETR-1568

This attention-getting thermometer gives you year-round advertising value. Works equally well inside or outside your shop. Sturdy construction with replaceable glass front. Size—12" diameter. Colors—red-orange, black, grey and white.



**Metal Flange Sign . . . . ETR-1565**

This colorful, double-faced flange mounted sign is a service business workhorse. Mount it on any flat surface, even masonry. Baked enamel on 20-gauge metal. Size-15" x 12" x 1½". Color — red-orange, black, grey and white.

## NEW LIGHTWEIGHT service case

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

**Service Case . . . . . ETR-1778**

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


# Techni-talk

**Vol. II No. 1 JAN.—FEB. 1959**


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

**In this issue:**


The "Stereo" Hum Problem.....page 1
G-E TV Service Policy .....page 3
How G-E Service-Designed Tubes Are Made.....page 4
Noise Canceller Circuits.....page 6



Techni-talk on AM, FM, TV Servicing, published bi-monthly by Electronic Components Division, General Electric, Schenectady 5, N. Y. In Canada: Canadian General Electric Co., Ltd., 189 Dufferin St., Toronto 3, Ontario. R. G. Kempton, Editor.




ELECTRONIC COMPONENTS DIVISION
GENERAL ELECTRIC
Schenectady 5, N. Y.


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

Mr. Thomas F. Boyd
415 Fredericksburg Rd.
San Antonio 1, Texas
E-250/HOU-23

5-18-54

*NOTE: The disclosure of any information herein conveys no license under any General Electric patent and, in the absence of an express written agreement to the contrary, the General Electric Company assumes no liability for patent infringement (or any other liability) arising out of use of such information by others.*

Form 3547 Requested