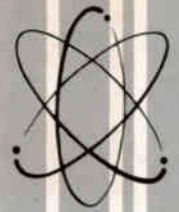




Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION
radio • tv • hi-fi



VOL. 12, No. 6

DEC., 1960

SERVICING TELEVISION TUNERS I

Television tuners (or head-ends), by virtue of their construction as sub-assemblies, dictate the same trouble-shooting techniques as the main chassis.

To complement the various publications available to the technician on the subject of television servicing, a series of articles has been prepared as a guide to the practical approach to tuner repairs.

As an introduction to the subject of tuner servicing, it might be interesting to review the nature of tuner failures from a statistical standpoint. A recent analysis of repairs made on approximately 2000 tuners illustrates the major categories, not including tube failures, into which defects normally fall:

- Antenna input transformer.....30-35%
- Feed-through capacitors.....20-25%
- Charred, off-value or open resistors (due mainly to shorted tubes and feed-thru capacitors)15%
- Capacitors (oscillator feed-back 22. and 12. uuf).....5%
- Capacitors (mainly coupling r-f to converter 150 uuf).....2-3%
- Wafer contacts (required cleaning)
- Broken switches
- Solder connections
- Shorted Coax (lead from l-f output transformer)10%
- Miscellaneous5-7%

These percentage figures may not hold for later types of tuners due to design variations. However, these figures are valuable as a guide because the majority of tuners in use today are represented.

General Description of VHF Tuner Unit

The most efficient and practical method of trouble-shooting an r-f tuner is with the tuner installed with its associated chassis. This is important, because a touch-up or complete re-alignment is generally necessary when major tuner repairs are made.

This becomes significant when considering the fact that there are loading variations between television chassis of the same type and therefore, some difficulty can be expected with tuners aligned on any chassis other than the original.

It is however, possible to trouble-shoot, repair and re-align dismantled tuners if the final alignment is per-

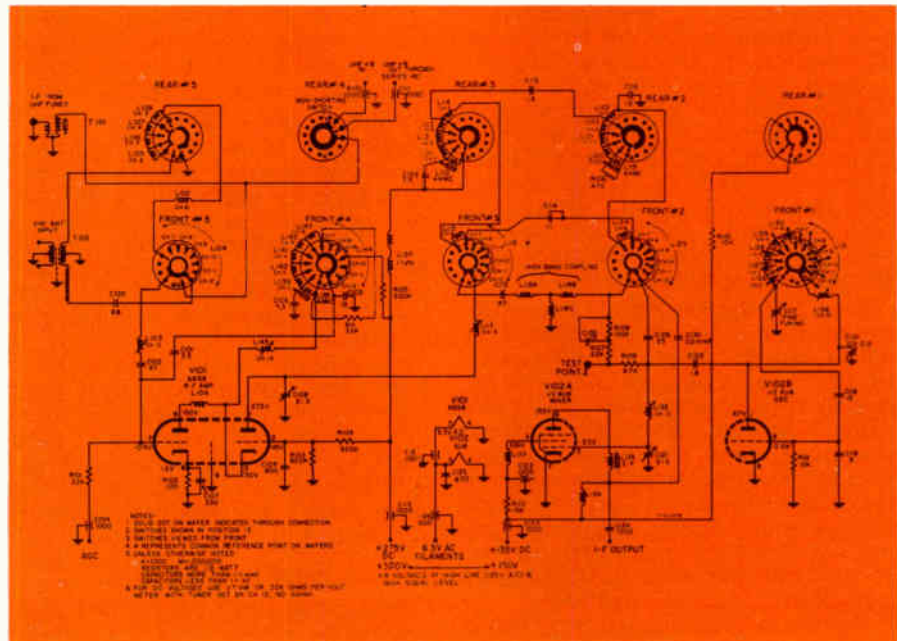


Fig. 1 Complete VHF Tuner Schematic

formed on the tuner after it has been reinstalled in the original chassis.

These tuners consisting of the r-f amplifier, oscillator and converter, are constructed as a sub-assembly and can easily be removed from the main chassis.

The intermediate output frequencies are 45.75 megacycles for video and 41.25 megacycles for audio. The antenna is coupled into the cathode or grid of the first r-f amplifier by a balanced in-pur transformer. In some of the tuner units an intermediate frequency trap is included in the antenna input circuit to remove interfering frequencies in the intermediate frequency pass-band. This trap is connected into the circuit only when the receiver is connected to the critical channels, 2 through 6. Circuits are resonated by series coils, their distributed capacity, the tube capacity and the capacity of several adjustable trimmers. As the channel selector is switched to lower channels, coils are added in series to lower the frequency.

The oscillator section of some tuners is adjustable on all channels and on others only on certain channels. In all cases, the oscillator sec-

tion has sufficient tuning adjustments to allow the oscillator frequency to be adjusted so that one setting of the fine tuning control holds for all channels. Automatic gain control bias is applied to the r-f amplifier. The i-f output of the converter is applied to the first i-f amplifier through a low impedance coupling to the i-f input coil. A test point is added at the converter grid which is isolated from the grid by a resistor.

Twelve and thirteen position tuners are alike, except in the thirteenth position the r-f and converter sections are switched to provide amplification at 44 megacycles. The oscillator section is made inoperative in this position and the 44 megacycle input transformer is connected to the r-f grid section. B+ and filament voltages for the UHF tuner are available at terminals on the top deck of the VHF tuner. When changing tubes or components associated with the r-f or oscillator circuits, alignment should be checked and adjusted if necessary. Always refer to the service notes applicable to the tuner under repair for pertinent facts concerning alignment procedure, location of parts, etc.



SMALL MARKETERS AIDS

FROM THE SMALL BUSINESS ADMINISTRATION A service of the UNITED STATES GOVERNMENT

An often overlooked but extremely valuable source for better management information in the small business community is the Small Business Administration. The Small Marketers Aid series was started in 1954 and has grown considerably in stature and in use by owners and operators of small marketing businesses. The purpose of the series is to disseminate basic management information, within the marketing concept for top executives of small retail, wholesale and service establishments. The authors of the Aids are selected for their competence in their respective fields and include business consultants, university educators and Government specialists.

Copies of the Small Marketers Aids are available at no charge from field offices and Washington headquarters of the Small Business Administration. A recent publication (Aid #55) "How Good are Your Servicemen" contained some pertinent information on the wisdom and necessity of training employees in service-mindedness and salesmanship. Excerpts of that publication are given below to acquaint you with this source of information and its contents.

"What is a serviceman? A 'fixer' of ailing appliances, a traveling mechanic, a good Samaritan who braves sleet and storm to mend that ailing machine? That's what he is to some. A man who messes up that polished floor, who charges seemingly high prices for a small amount of work, who gruffly rebuffs questions the worried customer wants to ask about his ailing TV set or heater? That's how others see him.

If there is some difference of opinion on the part of the public about servicemen and their practices, the answer probably lies not with the individuals performing those tasks but with you, the owner-manager. Service starts at home — which in this case is the serviceman's home office — your office. And that puts the service problem right into your lap.

Attitude of Service Men

The attitude of your servicemen toward your customers is largely the result of what you, the owner-manager and also their boss, have taught them about service-mindedness. Your service staff is not going to be any better than you make it.

If you complain about a certain customer in your servicemen's hearing, or make derogatory statements about him in their hearing, you'll create an attitude of indifference or

discourtesy toward customers on your servicemen's part. The result will be poor service and worse public relations.

Serving the Customer

• *The Importance of Servicemen.* 'My servicemen,' an owner-manager might say, 'make service calls and fix appliances; that's all there is to it.' He might say that — but he shouldn't. Servicemen can be of great importance to a business — be the business small or large.

• *Training Your Serviceman.* If the serviceman is so important to the profit-and-prestige picture of your firm, then it's important to take time to train him. Training him need not be a formal affair. Rather, it should be a continuous direct and indirect process of education which should start the moment he becomes your employee.

Now, what more is meant by 'training'? Obviously, a serviceman has to be trained in the methods and mechanics of his job; but he also needs training in service-mindedness and salesmanship. It is this latter type of training with which the following sections of this Aid will deal.

Rules for Servicemen

What non-technical skills are essential for a serviceman to possess? What should you, as owner-manager, tell him to do — and not to do? Here are some rules that may help to heighten your servicemen's non-technical skills and, incidentally, weed out un-fit, un-trained, and un-diplomatic. You might tell them:

Rule No. 1: Be Clean, Be Courteous. Most service work is messy. Nobody can expect the serviceman to be as clean and trim at 5 P. M. as he was at 9 A. M. But, at least, he should start the day looking neat. After all, he is going to call on customers: your customers. A tidy uniform or work clothes, clean shoes, and a shave are the minimum personal appearance requirements.

As far as his equipment is concerned, the same holds true. His tool box, spare parts, and test equipment should be presentable. As the representative of your business, he should present an alert, businesslike appearance.

Courtesy is as important as cleanliness. The serviceman should greet the customer courteously, identify himself and his firm, and mention the name or type of appliance he has come to repair.

Rule No. 2: Be Neat. It's the serviceman's job to fix faulty machines. In doing so, he is likely to create some havoc. But let that havoc be as minor as possible.

The experienced repairman, well-trained and well-liked by customers, remembers to spread newspapers or use a drop cloth when he works on appliances in the home. This is particularly important, of course, if he works in the kitchen, living room, or any other upstairs room in the house.

Even in the basement, he should at least spread newspapers if he expects any kind of mess. Using newspapers or a drop cloth is particularly important if the appliance has to be turned over or moved, but they should be used even if the repairman works on it in its accustomed position. It shows the customer that the repairman exercises care. Obviously if the cloth is greasy or oily, it will not protect but possibly ruin the customer's floor, carpet, or appliance.

An eager but thoughtless serviceman will put his tools where they don't belong: on chairs, or tables, or TV sets. Furniture is not a repository for tools. They should be put on the cloth or newspaper.

Finally, if he has had to move the appliance while working on it, he should put it back in place. If he got dirt or grease on it, he should clean it. As he leaves the house, the place should in no way proclaim that a serviceman has just worked in it.

Rule No. 3: Be Informative. The customer is the firm's as well as the repairman's bread-and-butter. He or she has a right to know what's wrong with an ailing appliance, and how soon it can be fixed. Nothing is more aggravating to the average appliance owner than a vague answer to his or her question about the condition and repairability of an appliance.

Estimates

True, the serviceman can't always tell to the minute — or even the hour — when a job will be completed. In the case of, say, a TV set, he may want to make sure that, if it needs to be taken to the shop, that it is kept there long enough for proper tests. But — and this is a BIG BUT — he should at least give the customer the best indication he can as to when she may expect to have her set returned.

If the serviceman takes the appliance with him, or if he plans to return to finish his work later on, he should set up a definite time. And he should try to keep that appointment. In the case of refrigerators (particularly in summer time) and heaters (in winter time), he should make every effort to give quick service — even if he has to make incomplete repairs to get the equipment back into temporary operation and return to finish the job later."

"DON'T BE A VIDIOT!"

That's the screaming headline of an aggressive advertising campaign in mass consumer magazines. Its purpose is to convince TV owners of the desirability of buying replacement picture tubes using new glass envelopes. The advertiser is Kimble Glass Company, a subsidiary of Owens-Illinois.

The ad defines a "Vidiot" as a person who pays the new price for a rebuilt picture tube.

We believe that the consumer could benefit by proper education. This ad does not do it!

On the contrary, it is in poor taste and raises some questionable implications. No doubt a number of people find it offensive, if not downright insulting, to be told that they are idiots for not recognizing the difference between new and rebuilt picture tubes. It is doubly annoying that the consumer's irritation should once again be directed to something relating to TV. There is the possible unintentional implication that the technician pulled a fast one.

The ad carefully refrains from saying explicitly that a picture tube using new glass actually performs better than one with reclaimed glass. However, the ad does *imply* to the consumer that it is better. Comments such as "They look alike . . . but they are not alike," are used.

We do not begrudge Kimble the right to sell as many picture tube envelopes as they can. And they certainly are correct in saying that the consumer has a right to know whether or not the glass is new.

But they are twisting the facts when they say, "Your most reliable

guide is the manufacturer's warranty tag that says a particular tube is New . . . and has all-new parts and all-new glass." The fact is that a consumer's most reliable guide is the reputability of the manufacturer, *regardless* of whether the glass is new or used.

Though glass manufacturers have tightened their production tolerances we do not believe that they can show any measurable improvement in picture performance over tubes using glass reclaimed by a high quality tube manufacturer. The electron gun in good rebuilds is brand new, and frequently the screen is too. Glass is a most durable material, if it does not crack. That is why milk bottles are used and reused many, many times with no deterioration in performance.

It is probable that set manufacturers would use rebuilt tubes if Government regulations did not require the elimination of the new label from the entire set.

So the next time one of your customers asks you about new and rebuilt picture tubes, let him know that he can obtain excellent performance from a rebuilt *as long as it was made by a high quality manufacturer*. For those who want an all-new tube, they may be obtained at higher cost.

In any case, it does not seem like good business to call a customer by a name which impugns his mental normality. We propose that Kimble correct the abuses noted.

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G-E HAM NEWS BIMONTHLY FOR AMATEUR RADIO OPERATORS



Do you receive copies of G-E HAM NEWS, published six times yearly by G. E.'s Receiving Tube De-

partment? Each issue contains articles on amateur radio written by the 1,000 radio amateurs at General Electric.

G-E HAM NEWS is available free of charge if you pick it up from your local G-E Tube distributor. Some distributors mail copies locally to their customers. Or, for those who prefer receiving copies directly from us, we have a low-cost subscription plan at \$1.00 per year. Order your subscription from: G-E HAM NEWS, General Electric Company, Receiving Tube Department, 316 E. Ninth Street, Owensboro, Kentucky, U.S.A.

TECHNI-TALK BINDER ETR-2000 NOW AVAILABLE

Here is the Techni-Talk binder you have been waiting for! It is both attractive and sturdy, has adequate capacity and it opens flat without tearing the holes. Your authorized G-E tube distributor has a supply — the price is \$2.00 each.

ETR-2000 is a black brushed vinyl covered, velocity type binder with a special process design in two colors of ink on the front, back, and back edge. The binder has a hard cover and comes complete with two tabbed index sheets one for Tele-Clues and one for Tele-Clue Schematics.

This binder has adequate capacity to hold all issues of Techni-Talk that have been printed to date plus at least 50 more issues.

Keep your copies of Techni-Talk in this new binder with tabbed dividers to separate Tele-Clues and Tele-Clue Schematics. All back issues of Techni-Talk from Vol. 1, No. 1 through Vol. 12, No. 5 are available at five cents per copy or \$3.25 per set. Use order coupon on page nine.

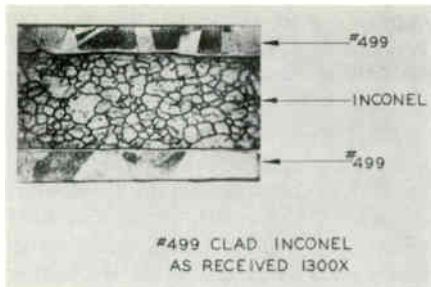
The velocity type binder is a telescoping three-post binder with locking bar. This type binder opens flat and provides adequate support so that pages seldom tear out. Issues can be readily inserted or removed without disturbing those already in binder.

Ask your G-E tube distributor for one of the new Techni-Talk binders ETR-2000. If your distributor is unable to supply you use the coupon on page nine and mail to our Chicago warehouse.



HOLDS OVER 100 ISSUES

Photomicrograph of a Cross Section of the New Material



This metal sandwich is produced by pressure bonding a strip of Inconel between two layers of high purity nickel. This new material combines the good thermionic emission properties of the nickel alloy with the high hot strength of the Inconel without compromising either, as would result from normal alloying practices.

The excellent thermionic emission as measured initially and after extended life tests indicate that the chemistry of the surface alloy is not altered appreciably during long life.

A COMPOSITE BASE METAL FOR OXIDE COATED CATHODES

A cathode base metal for electron tubes has been developed which is composed of a three layer clad "sandwich" of two different metals. The outside surfaces consist of a material which has the desired thermionic properties of a good cathode alloy and the core material is chosen for its high hot strength and minimum effect on the thermionic process. These thermionic properties are very difficult to obtain with an alloy, but can be obtained with a three layer sandwich of metals.

High hot strength is desirable in the usual form of cylindrical cathodes used in receiving tubes, in order to resist bowing of the cathode during the processing of the tube and during tube operation particularly in applications subject to severe shock. Cathode bowing produces a change in the spacing between the cathode and the surrounding tube element, resulting in the alteration of the tubes' characteristics and in some cases, inter-element shorts.

In addition to the high hot strength and the resistance to bowing this material offers:

(1) Equal electrical characteristics — measurements of transconductance, emission, anode current, interface resistance, and grid emission characteristics which are descriptive of the thermionic properties.

(2) Lower thermal expansion — this is desirable in cathode materials because of the wide range of processing temperatures.

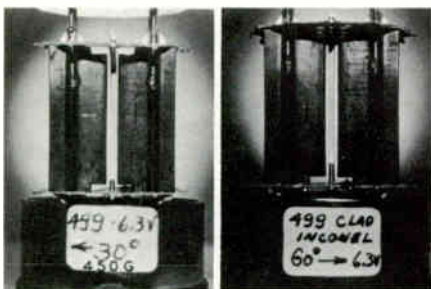
(3) Lower thermal conductivity — this is desirable in a cathode material because of the reduction in heat loss to the cathode connector and supports.

(4) Less microphonism — much of the microphonic output of conventional tubes is due to the softness of the nickel sleeve which permits the mica spacer to form indentations, resulting in loose fittings.

(5) Less hum output — the combination of the above physical characteristics of this material provides the latitude for variations in processing techniques in such a direction as to eliminate the cause of much hum output.

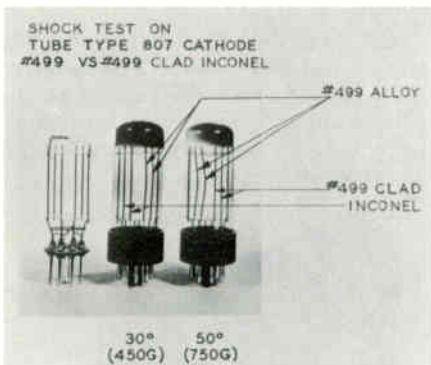
General Electric receiving tubes are constantly being improved. Many of these improvements such as the "sandwich" cathode cannot be seen just by looking at the outside of a tube. "Inside" improvements such as the "sandwich" cathode reduce the possibility of (1) cathode-heater leakage or shorts, (2) cathode-grid leakage or shorts, (3) microphonics and (4) hum. Why not buy up-to-date tubes? Buy General Electric!

Shock Tests on a Modified 6A57 Structure



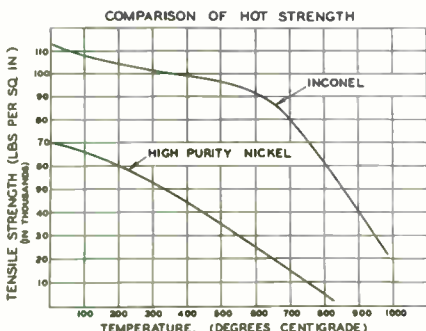
These pictures show the results of actual shock tests in the Navy type high impact (flyweight) shock machine. Shock loads of 450G (30 degree hammer angle) caused serious bowing of the normal 499 nickel sleeves whereas, the clad composite sleeve shows no bowing at shock loading up to 900G (60 degree hammer angle) the highest load tested.

Shock Test on the Type 807 Sleeve



Each structure shown contains four type 807 cathode sleeves (same length as 6L6) supported between micas and heated by parallel heaters. The structure in the center was subjected to 450G (30 degree hammer angle) in the Navy shock machine and the two clad sleeves were still straight, whereas, the nickel sleeves showed enough distortion to have caused grid to cathode shorts in an 807 tube. In the structure at the right the two clad sleeves were still straight after 750G (50 degree hammer angle) shock levels.

Comparison of Hot Strength



Cathode operating temperatures in the 800 degree C range are typical of receiving tubes. The Inconel seven-to-one advantage in hot strength as shown on the chart at the 750 point clearly indicates why the shock test results should have been exactly as demonstrated.

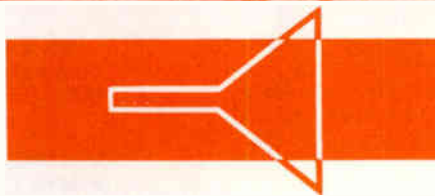
What's new!

tubes



SERVICE-DESIGNED TUBES

Have you seen these two ads that appeared recently in Electronic Technician and PF Reporter? They point out Service-Designed features which increase customer satisfaction and reduce callbacks. Ask your distributor for G-E Service-Designed receiving tubes.

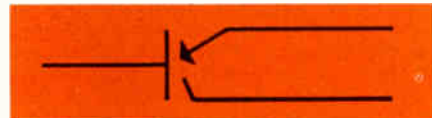


19ZP4 GENERAL ELECTRIC BLACK-DAYLITE PICTURE TUBE

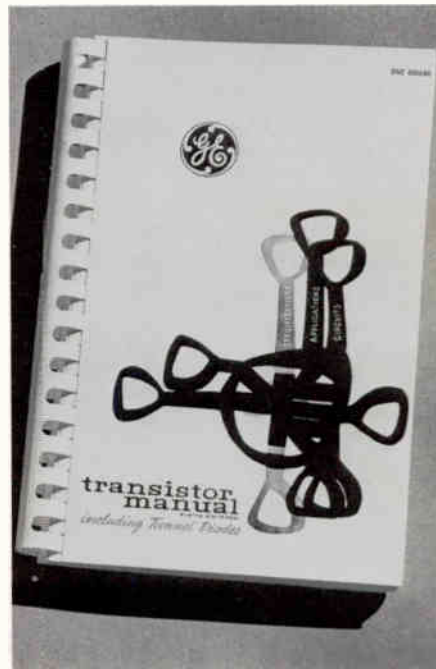
Listed below is a summary of the significant characteristics for the 19ZP4 Black-Daylite picture tube. This tube is used in 19" General Electric television receivers. The 19ZP4 is a 114° magnetic deflection electrostatic focus type with the new square faceplate.

Construction 19" Rectangular Glass
 Length Overall 11½", Neck 4¼"
 Heater 6.3V., 0.6A
 Gun Non Ion-Trap
 External Conductive
 Coating 1000-1500 mmfd
 Anode Voltage 18KV Max.

Robert E. Snare, national sales manager for General Electric cathode ray replacement tubes, holds new 19ZP4 Black-Daylite picture tube.



FIFTH EDITION OF G-E TRANSISTOR MANUAL NOW AVAILABLE



A completely revised and up-to-date fifth edition of the General Electric Semiconductor Products Department's ever-popular Transistor Manual has just been announced.

Starting with the fresh multi-colored cover pictured above, the book contains the latest theory, application and technical information available on silicon controlled rectifiers, tunnel diodes, and both germanium and silicon transistors.

New sections on test circuits, feedback and servo amplifiers, tunnel diode amplifiers, and new specifications on listed G-E transistors and rectifiers have been added. This edition contains more than 328 pages, as compared with 226 pages for the fourth edition.

Ask your G-E tube distributor for a copy of ECG-517 (ETR-2538). The price remains at one dollar. If your distributor is out of stock or for some other reason is unable to supply you with a copy, use order coupon on page 9.

BENCH NOTES

NUT HOLDER

In many instances when working on radio and TV sets the occasion arises for replacement of a small nut in out of the way and hard to reach places. Cut a length of solder about a foot long or longer if necessary, place one end of this piece of solder on top of the nut to be replaced and strike sharply with a hammer.

This will drive part of the solder into the hole threads of the nut and the length of solder can be used as a tool to hold the nut in place while the screw is being tightened. I have used this method quite successfully in our shop.

R. C. Betzenderfer
TV Field Service
Crescent Electric Supply Co.
505 Pershing Ave.
P. O. Box 88
Davenport, Iowa

AUTO VIBRATORS

Instead of discarding those old vibrators, remove the foam rubber from the inside. It can be put to a number of good uses. To name a few, (1) a bench tube puller, (2) glued to the wall it makes a good pencil holder, (3) when checking tubes by substitution, place the old tube inside, and it won't roll off the bench.

Albert Whitman
P. O. Box 64
Springboro, Pa.

Editor's Note: The G-E Tube Puller ETR-1094A can also be used for (1) and (3).

RESISTOR REPLACEMENT

On some receivers the 6BQ7 shorts internally causing the plate resistors R7-1K Ω (1W) and R133 100 Ω ($\frac{1}{2}$ W) to burn. The tube may intermittently heat itself or the resistors may read normally when checked with an ohmmeter. If the customer complains of intermittent snow on some channels replace these two resistors.

To save yourself time should this ever happen again, replace the 1K ohm 1 watt, R7 resistor with a 5 watt. This resistor is inside the tuner. The 100 ohm $\frac{1}{2}$ watt R113 is outside the tuner and easy to replace without pulling the chassis. If another 6BQ7 shorts R113 will open and you will be able to replace it without removing the chassis and taking the tuner apart.

Sal. D'Amico
8858 - 15th Ave.
Brooklyn 28, N. Y.

STETHOSCOPE

A simple "amplifier" made out of a 2-foot stick having a small square or cardboard atop one end, quickly locates leaking condensers of the 500mmfd, 20 kv type found in some TV sets in the high voltage supply section.

Using the cardboard end up against your ear, poke the other end of the stick near the bothersome condensers, and the clearest noisy clicks are heard when the stick pinpoints the ailing condenser.

The fault appears as black pips or streaks on one side of the screen at the same time the clicks are heard.

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

MAKING SMALL SPRINGS

When you need a dial, record-changer or any other kind of small special spring, wind spring wire along the threads of a bolt or machine screw of suitable diameter, winding from tip to head.

After the spring is long enough turn the screw counter-clockwise to get the spring off.

E. Mayover
1601 14th St. W. (US 41)
Bradenton, Florida

SOLDERING TIP

Add long life to the tips on soldering guns and irons by wiping them on a water-dampened sponge, instead of the customary cloth which poses a fire hazard.

Lint-free, a wiping sponge is a boon when it comes to soldering printed circuits, since no lint from the iron tip gets into the soldered connections.

Mrs. S. Clark
Box 2162
East Bradenton, Florida

Those desiring to have letters published in this column should write the Editor Techni-Talk, Electronic Components Division, General Electric Company, Owensboro, Kentucky. For each such letter selected for publication you will receive \$10.00 worth of General Electric tubes. In the event of duplicate or similar items, selection will be made by the Editor and his decision will be final. The Company shall have the unlimited right without obligation to publish or otherwise use any idea or suggestion sent to this column.

Caution: The ideas and suggestions expressed in this column are those of the individual writers. These ideas and suggestions have not been tried by the General Electric Company and therefore are not endorsed, sponsored or recommended.

G-E Wireless Remote Control System VI

Transmitter Adjustments (Continued)

In the previous issue the shifting of r-f carrier frequencies was discussed. In this issue the actual adjustment procedure will be described.

1. With the television receiver turned on, tune in an active channel and adjust the receiver for best picture with sound. Adjust the tone controls so as to accentuate the high frequencies. The phono switch on the back of the television receiver is then set to the "Phono Position."

2. Remove the bottom half of the remote transmitter case, then connect a short jumper lead and phono input harness to the transmitter and television receiver as shown in Figure 1. Turn the volume control of the television to full volume.

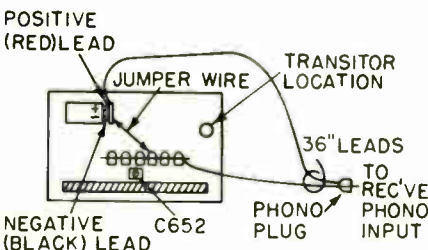


Fig. 1 Test Connections on transmitter.

3. With the transmitter placed on top of the television receiver cabinet, directly above the yoke, orient the transmitter so as to obtain maximum audio. (Audio should be very low in amplitude and rather high in frequency.)

4. Carefully place a reference mark on the antenna trimmer condenser so as to indicate the original setting.

5. With a screw driver, turn the transmitter antenna trimmer (clockwise to shift from 322.7 to 291.2 KC and counterclockwise to shift from 322.7 to 354.2 KC) past two zero beats and stop at the point midway between the 2nd and 3rd zero beats.

6. Disconnect the remote receiver antenna and insert a dummy antenna in the r-f input jack (see Fig. 2).

7. Use VOM & detector adjusted to read the 2.5V a-c scale to Test Point II of the remote receiver.

8. With the transmitter "minus volume" button depressed bring the transmitter close to the dummy antenna and peak T602 top and bottom cores. Do not tune either core alone for maximum, but alternate for peak output.

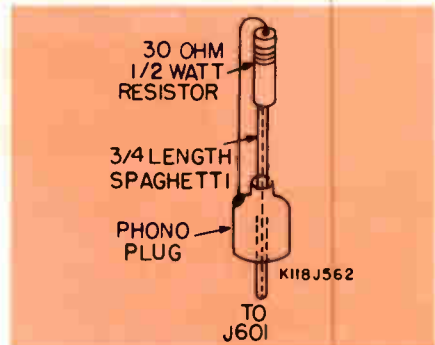


Fig. 2 Dummy antenna used when making adjustments.

9. Remove the dummy antenna and reconnect the remote receiver antenna to the remote receiver. With the transmitter "Volume Minus" button depressed, peak the receiver antenna trimmer.

NOTE: Rough adjustment can be accomplished using the transmitter close to the receiver antenna, however, the transmitter must be progressively moved away from the receiver antenna until it is peaked at maximum distance.

When completed it is advisable to mark the new frequency on the label of the remote receiver.

Tele-Clues

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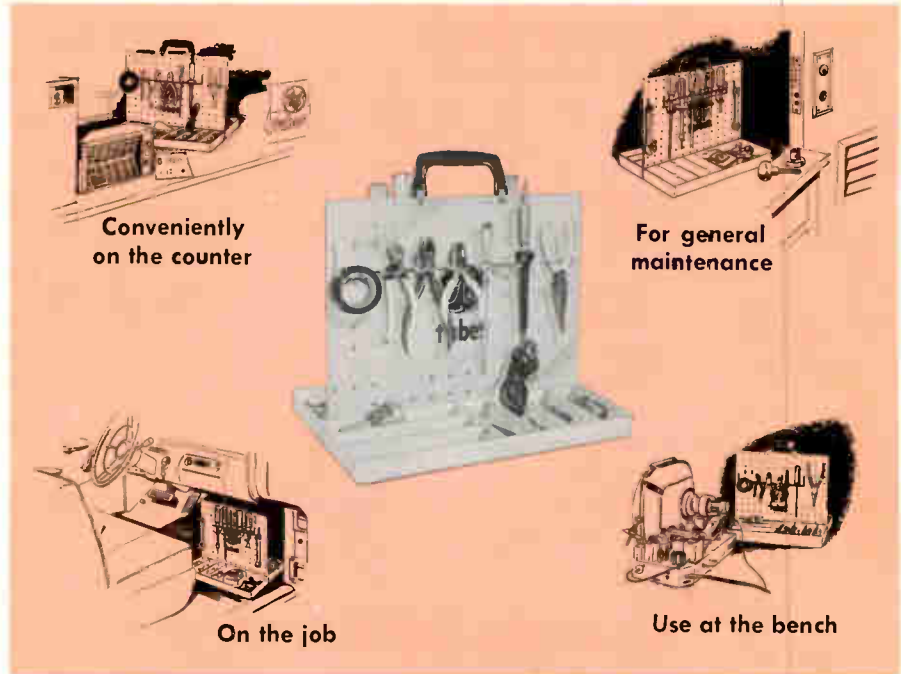
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