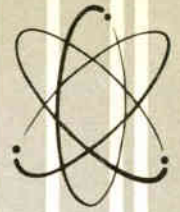




# Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION  
radio • tv • hi-fi



VOL. II NO. 2

MAR.-APR., 1959

## THE "STEREO" HUM PROBLEM II

In the last issue the basic principle for hum prevention was discussed. In this issue the techniques used to minimize hum, when a second monaural amplifier is installed, will be described.

### Two-Monaural-Amplifier Installations

It is, of course, equally important that power-line currents be kept out of the signal wiring in two-monaural-amplifier installations. Signal wiring problems peculiar to two-monaural-amplifier systems must be specially considered. Regardless of whether the three-wire or the four-wire system is used with two monaural amplifiers, it is most necessary that each amplifier's ground system be brought to the same ground potential as the metal base or frame of the record player unit. Failure to do this will result in severe hum.

The requirement for common grounding obviously results in the two amplifiers being connected together in some manner. This should be done by connecting the two amplifier ground systems together at one point, usually at the signal grounds or at the player's terminal board. A ground loop similar to that shown in Figure 1 will be formed if they are connected together at both locations.

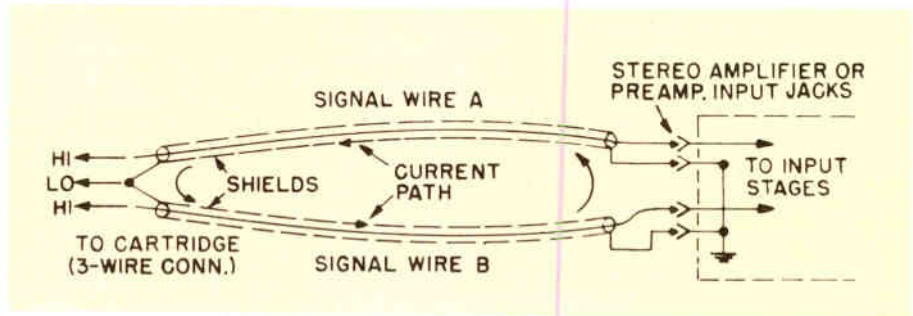


Fig. 1 Induced current in signal wires of either stereo amplifier or pre-amplifier.

### Common Amplifier Grounding

To understand what happens when the common amplifier grounding takes place it is necessary to examine the ground potentials involved. Each amplifier ground system will assume a certain AC potential above powerline or earth ground because of inductive and capacitive coupling between the chassis, the power transformer, and power wiring. The assumed potential may be anywhere from a few volts to thirty or forty volts. Usually any two separate amplifiers will assume different ground potentials.

If the AC potential assumed by each amplifier chassis is not exactly the same, the act of connecting them together anywhere will cause a minute powerline ground current to flow between them. If this current is high enough and is forced to flow through the signal path shields, or if it should disturb the ground potentials of the signal paths within the amplifiers, hum will be introduced with the signal.

A separate connecting wire (wire B, Figure 2A) between the two signal grounds can provide the necessary equalization of chassis potential, while the flow of AC current through the external signal path shields may be completely prevented if necessary by separating the signal paths for the two channels into a four wire connection between the cartridge and amplifiers. See Figure 2A. Where the current flow between the two chassis is sufficiently low, the more convenient connection between the shields at the player terminal board will suffice. Three-wire as well as four-wire connection diagrams

are shown for the latter arrangement in Figures 2B and 2C.

### Use of AC-DC Units

The use of a transformerless (AC-DC) phono amplifier, radio, or television set in a stereo installation is extremely hazardous and not recommended. Aside from the fact that such units do not normally provide true high fidelity reproduction, their use in a stereo system can be very dangerous. Protection against human contact with the chassis or other grounded parts was probably provided originally by the manufacturers of these units.

To connect such a unit directly to another monaural amplifier or record changer which does not have such built-in protection could result in serious electrical shock. Where the quality and investment in such a unit will justify further expenditure, the use of an isolation transformer will eliminate the shock hazard but will not necessarily eliminate hum.

In the next issue record changer or turntable grounding will be discussed.

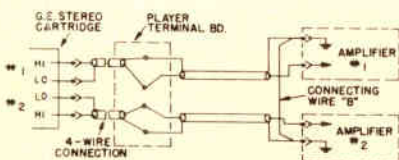


Fig. 2A Two-monaural-amplifier connection

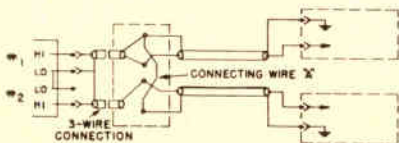


Fig. 2B Alternate three-wire connection

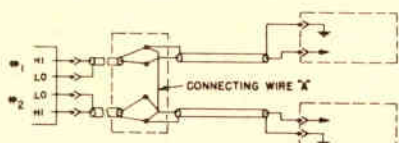
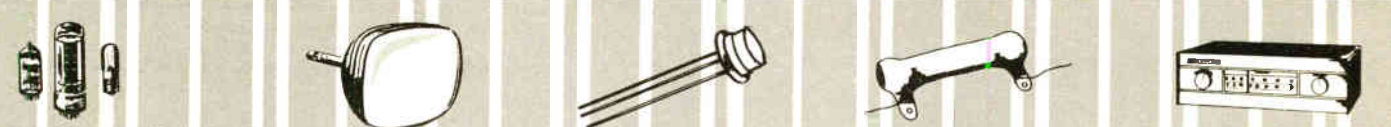


Fig. 2C Alternate four-wire connection



Save your fingers! Use G-E Tube Puller to remove and replace "HOT" tubes. Ask your distributor for No. ETR-1094-A.



## SUCCESSFUL SERVICE MANAGEMENT

# THE INTERRELATION OF LARGE AND SMALL BUSINESS

Excerpts From the Address by Senator John Sparkman at the Presentation of General Electric's 1958 All-American Awards for TV Service Technicians.



An unexpected, and therefore doubly pleasurable, distinction which came my way recently was being asked by the General Electric Company to serve as one of the judges in G.E.'s 1958 All-American Award Contest for television service technicians. My good fortune in being associated with the evaluation of the many contestants whose names were submitted for consideration placed me in a position to realize more than most how richly deserving are the winners of this year's awards for community services.

### Large and Small Business

I have been asked to say a few words about the interrelation of large and small business.

It would be impossible within the limits of a short talk to list the numerous illustrations of the true partnership existing between little and large business units. We do have time, however, for one or two examples. Take the manufacturing process. It stands to reason that only a few large companies have the facilities and technical ability to manufacture huge generators. But that does not mean that small plant operators do not play an important role in the production of even the largest types of industrial equipment. In such cases, small manufacturers fulfill their natural function as subcontractors and produce components of the size and complexity their equipment is capable of turning out.

Let us now turn our attention for a moment to the distribution and service segments of our national economy. Here again we find the partnership between small and large business fully effective. As essential channels of distribution, retailers and the service trades bring to the ultimate consumer the products produced by big business. In addition, those in the service and repair trades, such as you award winners, perform the vital function of keeping the products of our large corporations in good working order.

In a very real sense, therefore, service repair technicians are ambassadors of good will for manufacturers. A repair job accomplished with courtesy, efficiency, and honesty inspires confidence not only in the service function, but also in the product itself. That means, it seems to me, that a repair job well done contains elements of salesmanship which will bear fruit in the future when the householder considers the purchase of a later model appliance.

In alluding to the future, I might say that from what I have been told, the prospects for all segments of the television industry look encouraging. Industry sources have estimated, for instance, that the number of TV sets

now in use total 46 million and that by 1965 more than 53 million sets will be in the hands of consumers. This is the expanding market that the present 100,000 full-time TV service men and the 150,000 part-time repairers can anticipate serving.

I wish that I could say to you that the future looks equally bright for all segments of the small business community within our national economy, but I am afraid any such statement would be somewhat at odds with the facts as I see them. It is only natural that as Chairman of the Senate Small Business Committee information should come to me about the problems of small business men which is not readily available to those less centrally situated. From the economic evidence at hand, therefore, I have been forced to conclude that the current business climate is not as favorable for the growth and profitable existence of many types of small enterprises as it has been in the past.

### New Laws Aid Small Business

The 85th Congress when ended last August passed several bills designed to improve the competitive position of our millions of small business concerns. For one thing, the Small Business Administration was made a permanent agency of the Federal Government. In addition, the maximum interest rate which the SBA may charge small companies on loans was lowered from 6 to 5½ per cent.

And that was far from all. The Small Business Investment Act of 1958 for the first time made it possible for small companies to obtain long-term and equity capital. This Act provides for the establishment of private lending institutions organized under state laws and chartered by the Small Business Administration. These private investment companies may make loans to small businesses with terms running up to 20 years and which may, under certain circumstances, be extended for another ten years.

Of equal importance to small business are the changes which the 85th Congress made in our tax laws concerning small firms which were set forth in what is known as The Technical Amendments Act of 1958.

As briefly as possible, I shall now merely mention some of the benefits this measure contains for small companies.

First, small firms winning damage awards in civil antitrust action may now pay taxes on these damages as if the sums were received over the entire period during which the illegal actions took place instead of being regarded as income in the year of award.

Second, small, closely-held corporations may now elect to be taxed as partnerships if that is considered an advantage by the small corporation.

Third, an owner of stock in a small corporation may now treat any loss from the sale of such stock as an ordinary loss up to a maximum amount of \$25,000 in any one year, or up to \$50,000 in the case of a husband and wife filing a joint return.

Fourth, small firms may now carry-back losses over a three-year period. This, together with the present provision allowing a five-year carry-forward of losses, allows an averaging out of business deficits over a nine-year period.

Fifth, any individual or corporation, buying depreciable property having a useful life of at least six years and costing up to \$10,000, may take an additional first-year depreciation deduction of 20 per cent of the cost of such property purchased in that year up to \$2,000 a year. In the case of a joint husband and wife return, a 20% or \$4,000 deduction may be taken on equipment costing up to \$20,000. This special allowance is in addition to ordinary depreciation on the remaining 80 per cent of the cost. It also applies to used as well as to new equipment.

Sixth, small companies have been hurt by the accumulated earnings tax. This problem resulted in the establishment of a \$60,000 minimum credit in the Revenue Code of 1954. Section 205 of the new act increases this minimum credit of accumulated earnings to \$100,000 in recognition of the rise in costs since the lower figure of \$60,000 was set.

And finally, executors of an estate consisting of a closely-held business may elect to pay the Federal estate levy in ten annual installments rather than in a lump sum. This should help to ease the problem where small companies have had to be liquidated upon the death of the owner in order to pay the estate tax.

### True Partnership

The true partnership of little and big business has become in recent years an accepted fact of our business life. In this day and age, no sensible men believe that to be *for* small business you must be *against* big business.

I am supremely confident that if business and Government continue to work hand in hand to promote the economic welfare of our nation, America will be strong enough to withstand any challenge.

This meeting here today is just one more proof that basically the aims and purposes of small and large business go hand in glove. Each has always needed the other and I can see no possibility of change in this traditionally profitable interrelationship.

# EIA BOARD ADOPTS 5-POINT PLAN FOR FIGHTING TUBE COUNTERFEITING PRACTICES

The Board of Directors of the Electronic Industries Association (EIA) recently adopted a "Five-Point Plan for Fighting Tube Counterfeiting Practices." This plan was proposed by General Electric last year.

The General Electric Company has long been active in uncovering illegal marking and branding of tubes with intent to defraud. General Electric has also been instrumental in breaking up receiving tube counterfeiting rings in Boston, Brooklyn and the Bronx.

The EIA pledged cooperation with law enforcement agencies which have prosecuted tube counterfeiters.

## I. The Problem

The tube counterfeiter is a modern criminal who has proved to be imaginative and resourceful in carrying out a new form of commercial fraud. This fraud is made possible by the availability of hundreds of thousands of out-of-warranty defective receiving tubes. The counterfeiter arranges to obtain large numbers of out-of-warranty defective tubes for the purpose of washing them so that no identifying marks remain to indicate the manufacturer or the warranty date. After the washing process, the counterfeiter proceeds to remark the tubes with spurious trade-marks and warranty dates. He then either sells them as new tubes or he takes advantage of warranty policies in the industry to obtain

a new tube from the manufacturer. The counterfeiter works a direct and substantial injury to the public who must bear the expense created by such counterfeiting.

To match the cunning and resourcefulness of the receiving tube counterfeiter requires continued awareness by the industry and continued diligence to frustrate every effort of the counterfeiter.

## II. Recommended Procedures

The EIA plan recommends that manufacturers employ the following procedures to frustrate these criminal activities.

1. Cooperation with law enforcement authorities.

It is the duty of the manufacturer of receiving tubes to cooperate fully with law enforcement authorities in the detection, investigation and prosecution of tube counterfeiters.

2. Education of interested segments of the industry.

It is the duty of the manufacturer to assist vigorously in the exposure of tube counterfeiting wherever it exists. To fulfill this obligation, the manufacturer must help to educate the tube distributors, set manufacturers, set distributors and service technicians about the seriousness of counterfeiting.

3. Recommendations of Law Enforcing Agencies.

In the furtherance of establishing and maintaining an effective program to combat tube counterfeiting, manufacturers should endeavor to put into effect wherever proper and possible the recommendations of grand juries and other public bodies.

4. Drying up of counterfeit tube sources.

Inasmuch as there is no known substantial legitimate market for defective tubes and no known method to renew worn-out receiving tubes, it is the responsibility of the manufacturer to continue to encourage the destruction of defective used tubes at all distributive levels and in the hands of set manufacturers in order to prevent them from getting into the possession of a counterfeiter.

5. Warranty Policies.

It is recognized that each manufacturer should independently establish and administer its warranty policies. These policies should, however, be so constructed as to insure against permitting counterfeit tubes from being introduced into the channels of commerce.

## General Electric Cooperates

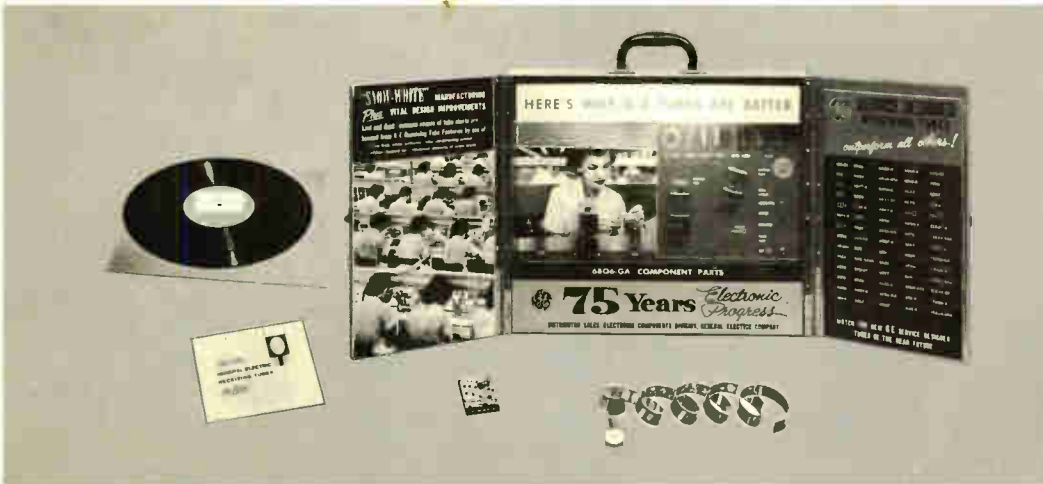
Sometime before EIA adopted the foregoing policy, General Electric advised its franchised distributors to take precautions which would prevent or materially reduce tube counterfeiting. Servicemen have also become aware of the tube counterfeiting problem through contact with distributors as well as numerous articles published in newspapers and trade publications.

Service technicians have a responsibility to themselves, their customers, and to other service technicians to cooperate in the EIA program. There are at least three ways that will help:

(1) When replacements are necessary give the "bad" tubes to the customer. He has paid for them and has the right to dispose of them as he sees fit. There is very little likelihood that tubes given to the customer will ever find their way to the counterfeiter.

(2) Do not sell or give away large accumulated quantities of defective tubes. Either break the glass or snip off at least one pin before disposing of them.

(3) Purchase only recognized "brand name" tubes through authorized tube distributors. All G-E tubes purchased from an authorized General Electric tube distributor have passed numerous quality tests to assure the best performance in any make receiver. A counterfeit or "off-brand" tube may be either used or poor quality to start with. No service technician can afford to risk his reputation with products of this type.



## FILMED TOUR OF G. E. TUBE PLANTS

It is physically impossible to bring all Radio and TV Service Dealers to General Electric Tube plants for a "guided tour" — so, we have prepared a color slide film which will help bring General Electric to you.

Many General Electric tube distributors will soon present this new color slide film at informal service dealer

meetings. This film and the accompanying recorded narration highlight the unparalleled research, development, and production facilities which are used to make General Electric "Service Designed" tubes better.

Watch for the announcement at your General Electric tube distributors.

# BIRTH OF A TELEVISION BULB\*

The television industry owes much of its growth to television bulb manufacture and each new tube size has represented steps forward in glass technology. Since every services technician cannot visit glass making plants this photo tour of the Corning Glass Works should be of interest.



## Pressing Face Plate

The face plate of the TV bulb is formed when a gob of molten glass is dropped into an accurately machined mold and a plunger presses it into the specified shape (here rectangular). Pressing operation is automatic. Face plate panels are then sealed to the funnel and polished with sand and pumice.



## Funnel for Bulbs

Funnels of the television bulbs are made by centrifugal casting. In the operation, a gob of molten glass is dropped into the chamber and the mold is rapidly spun. This centrifugally forms the glass into a funnel. A rod automatically sets down into the mold, forming the stem. They are shown before the neck, made from accurately drawn tubing, and face plate panel are sealed to the funnel. The anode button, sealed to the side of the funnel, serves to make contact with the conductive coating inside the bulb.



## Making the Seal

As they are slowly rotated within an enclosure, the face plate and funnel of the TV bulb are sealed. Heat for sealing is derived from gas jets and electrical currents which are applied simultaneously.

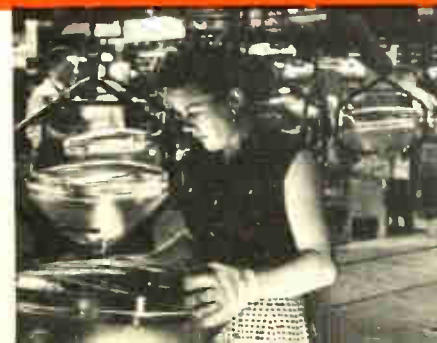
Neck of the bulb is made from accurately drawn tubing, produced in another Corning plant, cut to size, and shipped to the TV bulb production lines. Here it is sealed onto the funnel.



## TV Bulb Production

Completed all-glass television bulbs move through annealing lehr. Corning Glass Works pioneered in the production of TV bulbs, introducing a special glass and automatic machinery to upgrade product standards. Corning bulbs are 100 per cent inspected at seven points during manufacture.

Still another production step not illustrated involves polishing the face plate panel. In this operation, the panel is treated with sand and pumice. The finished bulb also is polished before final inspection, packing, and shipment.



## Final Inspection

After each production step, television bulbs undergo rigid inspection. Here, a skilled Corning Glass Works technician examines a finished bulb with the aid of a strong light. Imperfect bulbs, no matter how slight the flaw, are discarded.

When television was still a laboratory curiosity, Corning Glass Works was asked to design and make bulbs on an experimental basis. From this pioneering role, the company has advanced through research and development efforts to rank today as the largest manufacturer of all-glass picture tube enclosures.

Scientists at Corning, N. Y., are credited with discovering a better glass for the television industry. From their research came a special glass, tailored to meet requirements of the TV picture tube. It is 15 percent lighter than lead glass formerly used (making it less costly to manufacture, ship and handle); has high electrical resistivity; and can be melted to exacting quality demands.

The company also developed quality control methods to assure adequate and uniform strength of its product. The present-day Corning TV bulb, for example, is 100 percent inspected at seven points during manufacture. A quality control sampling plan is in effect at more than eight manufacturing steps. The face plate is inspected at four different stations.

With the growth of television, high-speed automatic machinery was designed and installed. New production facilities were opened. TV bulbs are now being produced at two Corning plants — Pressware in Corning, N. Y., and the Albion, Mich., factory.

Television bulbs are made up of three major glass pieces: the funnel, the neck and the face plate panel. Some of the steps in the manufacture and inspection of these parts are shown in the photographs at the left.

Perhaps no other single component has played such an important role in the television industry as have television picture tubes. A good deal of pioneering efforts and foresight in picture tube developments can be attributed to glass suppliers such as Corning.

Corning works with its customers such as GE for continued product development and such work has contributed significantly to upgrading of TV bulb standards and production of new bulb types.

\* This article prepared and submitted by Corning Glass Works and printed with its permission.

# What's new!

## tubes



### 6L6-GC BEAM PENTODE

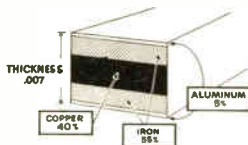
The 6L6-GC is a beam pentode with 30 watts plate dissipation and 5 watts screen. Two 6L6-GC tubes will provide 55 watts of output power with only 2% distortion and without feedback when used push-pull in Class AB<sub>1</sub> service, with 450 volts on the plate. The 6L6-GC is completely interchangeable with types KT-66 and 5881 and also with type 7027 if equipment has correct grid connections.

Key design-max ratings, per tube are:

|                    |           |
|--------------------|-----------|
| Plate voltage      | 500 volts |
| Plate dissipation  | 30 watts  |
| Screen voltage     | 450*volts |
| Screen dissipation | 5 watts   |
| Cathode current    | 110 ma    |

The 6L6-GC is a new tube through-out, designed to handle easily the speaker requirements of the finest audio systems. Type 6L6-GC has, among other features:

- .. Special 5-layer bonded-metal plate, developed by G.E. for improved heat conduction and radiation, see drawing.



- .. New large control grid heat radiator minimizes grid emission.
- .. Redesigned screen grid, for higher dissipation.
- .. New protective slots on micras, to reduce high-voltage interelement leakage.
- .. New-design bulb, to radiate heat more efficiently.

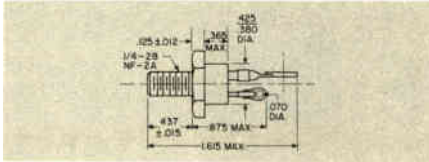
\* In push-pull circuits where the screen of each tube is connected to a tap on the plate winding of the output transformer the maximum screen voltage is 500 volts.



### G-E SILICON CONTROLLED RECTIFIERS MAY REVOLUTIONIZE THE ELECTRICAL INDUSTRY

In less than a year, G.E.'s Semiconductor Products Department has completely evaluated their fabulous Silicon Controlled Rectifier and now offers it through their authorized distributors. This pea sized device has the ability not only to rectify alternating current but at the same time to control the

amount of power. As reported in Business Week Magazine this newest semiconductor phenomena is as important a development to the electrical field as the transistor was to electronics. The Type C35 Silicon Controlled Rectifier is available in production quantities but the price range is still high. This device will be appearing in many home appliances and other devices in the next few years making possible a degree of home automation that will truly bring about the "home of tomorrow."



### GENERAL ELECTRIC "STEREO CLASSIC" SPEAKERS, SPEAKER SYSTEMS AND SPEAKER ENCLOSURES.

General Electric has added a five-cubic-foot "distributed port" 12-inch speaker enclosure to its line of "Stereo Classic" speakers and speaker systems. The new EN-50 series speaker enclosure accommodates all makes of 12-inch speakers, and tweeters of 4-inch or less outside diameters.

The "Stereo Classic" line of speakers, speaker systems, and speaker enclosures includes:



### I SPEAKERS

#### "Stereo Classic" Model LK-12 Kit

Included are the LW-12 Woofer, the LT-2 Tweeter and the LX-2 Cross Over Network. These components are NOT available separately.

#### Model LW-12 Twelve-Inch Woofer Speaker

High excursion cone, long voice coil, treated cloth cone suspension, specially-curved cone shape, aluminum base voice coil, all-steel welded construction for outstanding audio performance and long life.

Effective Frequency Response: 40 to 1500 cycles.  
Power Rating: 60 w. Integrated Program Material.  
Impedance: 8 to 16 Ohms.  
Magnet: 31 Ounce Alnico V.

#### Model LT-2 Two-Inch Tweeter Speaker

Two-inch diameter curved cone, low mass moving system, large aluminum base voice coil, and new combined phasing dome and shorting ring. These provide excellent uniform high frequency response to 18,000 cycles, highly-efficient spherical sound dispersion, efficient heat radiation, and increased power output at high frequencies.

Effective Frequency Response: 1500 to 18,000 Cycles.  
Power Rating: 20 Watts above 1500 cycles; Compatible with amplifiers up to 60 Watts.  
Impedance: 8 to 16 Ohms.  
Magnet: 6.8 Ounce Alnico V.

#### Model LX-2 Audio Crossover Network

Inductive-capacitive type. Passes low frequency signals to woofer and effectively filters these from tweeter. Provides much smoother tweeter response ( $\pm 1$  db) in the important range between 1500 and 7000 cycles.

### II SPEAKER SYSTEMS

#### "Stereo Classic" Model LC-12 12-Inch Coaxial Speaker



The separately-mounted woofer and tweeter speakers of the LH-12 system are offered in a coaxial mounting as the Model LC-12 Coaxial Speaker. The Crossover Network also is included. The tweeter is mounted slightly off axis, in a trim, sturdy metal frame, for smooth frequency response.

#### Model LH-12 Extended Bass 12-Inch Speaker System



Includes high-compliance 12-inch woofer LW-12, two-inch tweeter LT-2, and crossover network LX-2, mounted in enclosure available in four different finishes. Features wide and very smooth response, with woofer offering four times (+6db) power output capability of conventional speakers in similar enclosures.

#### Enclosure Dimensions

Length: 23 1/4 inches. Height: 14 1/2 inches.  
Depth: 15 inches  
Matching Base: 3" high, recessed 1 1/2" each side and 2" in front. Has two angled brackets attached for mounting on the enclosure.

#### Genuine Wood Veneer Enclosure Finishes

Model LH-121-M Mahogany.  
Model LH-122-B Blond Oak.  
Model LH-123-C Cherry. Model LH-124-W Walnut

### III SPEAKER ENCLOSURES

#### Model EN-50 "Distributed Port" Speaker Enclosure



The enclosure is proportioned for minimum width, and its height is compatible with the G-E EQ-1 series equipment cabinet.

With a high quality 12-inch coaxial or biaxial speaker such as the G-E LC-12 or LK-12, the EN-50 series has more than double the low frequency power output capability (up to 4 db) of closed type enclosures. Its response is unusually clean down to 35 cycles.

The enclosure features an optional front panel tweeter mount opening, with a removable cover plate, for tweeters of four inches outside diameter or less. The larger front panel opening accommodates all makes of 12-inch speakers.

The seven "distributed port" openings are in the rear panel, to eliminate grille cloth interference and improve the enclosure's acoustic resistance function. Possible spurious sound from air turbulence through the openings is eliminated by the size and placement of the ports.

#### Specifications

Designed to accommodate air pressures of speakers up to 60 watts. Two rear panel terminal connections marked "plus" and "minus" for correct speaker phasing.

#### Genuine Wood Veneer Enclosure Finishes

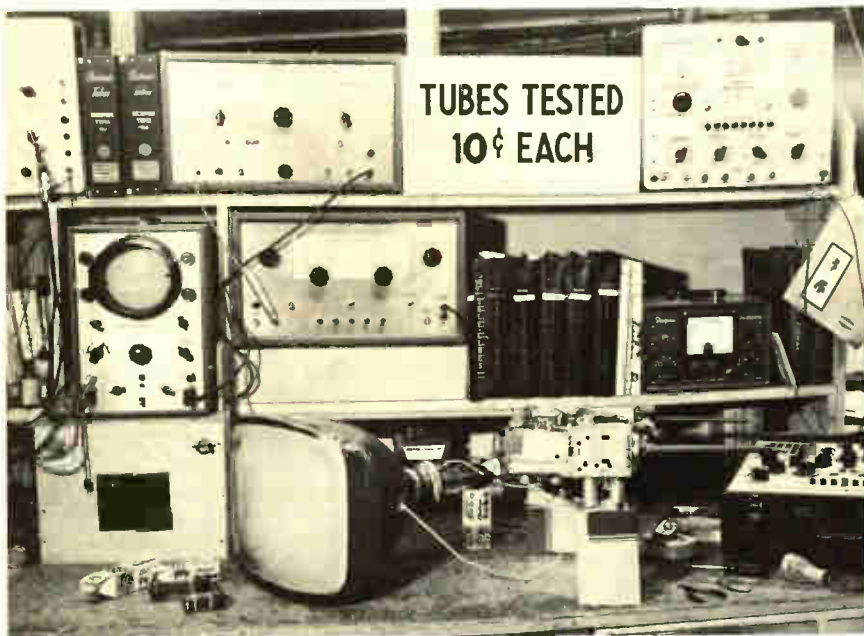
Model EN-51-M Mahogany.  
Model EN-52-B Blond Oak.  
Model EN-53-C Cherry. Model EN-54-W Walnut.

#### Enclosure Dimensions

Height: 31 3/8 inches. Width: 23 1/4 inches.  
Depth: 16 3/4 inches.

## WHAT'S WRONG WITH THIS PICTURE?\*

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



\* First of a series.

## BENCH NOTES

### FUSE PROTECTION

A simple gadget for discovering the reason for burned out fuses in TV sets is a 1/2 to 2 ampere auto light bulb soldered across a burned out fuse. Insert this into the TV fuse clips and intermittent shorts can be spotted by jarring suspected components and watching the bulb's brilliance.

Stan Clark  
Box 2162  
East Bradenton, Florida

### TIGHT SPOT SOLDERING

This is a simplified way to replace defective resistors and condensers in tuners and other jammed up places. Heat the end of the new component part and stick a six inch piece of solder to the end of the new part. This will serve as a tool for holding the part in place while soldering the other end in the circuit.

Thomas O. Britt  
Britt's Radio-TV Service Co.  
1305 Hillsboro St.  
Raleigh, N. C.

### ILLEGIBLE TUBE TYPES

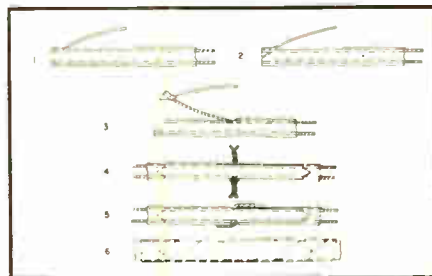
When type numbers on old tubes become illegible, apply a little ammonia on a piece of cotton. When the ammonia dries, the letters or numbers will be readable.

Harry J. Miller  
991 — 42nd St.  
Sarasota, Fla.

### SPlicing TV ANTENNA WIRE

A good splice, both mechanical and electrical, is very important for good reception especially in fringe areas. It is best to have a splice-free lead but sometimes this is unavoidable. If a splice is necessary try to make it in a protected area such as under the eaves or in the attic.

We use the following step-by-step procedure illustrated in drawing:



- (1) Slice off a thin strip of insulation with a pocketknife. Start slice about one or two inches from end of wire.
- (2) Cut the corner diagonally but try not to cut through the wire.
- (3) Pull the cut corner out and down. Follow same procedure on all four wires.
- (4) Overlap ends in position shown, then twist and solder.
- (5) Cut off excess wire and spray with waterproof coating such as Krylon No. 1302. Now bend ends parallel with lead-in as shown.
- (6) Cover completely with plastic electrical tape. Tape should extend slightly beyond overlap to make a tight seal at both ends. Spray the outside and you have a trouble-free splice.

Williamson Radio-TV Service  
631 W. Dallas  
Cooper, Texas

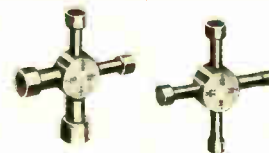
### CLOCK KNOB REPAIR

Clock knobs made of plastic which have the stop notch stripped out of them are easy to repair and better than new when repaired. Cut a small piece out of a tin can about 1/16" wider than the hole in knob and about 1/4" deep. Drive this into the knob hole so as to cut into the plastic on both sides. The knob will then slip into the slot in the shaft making a permanent repair.

W. W. Brackenridge  
Electric Service Shop  
303 Broadway  
Harrison, Ohio

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.

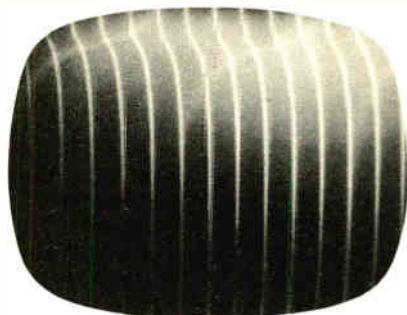
Caution: The ideas and suggestions expressed in this column are those of the individual writers. These ideas and suggestions have not been tried by the General Electric Company and therefore are not endorsed, sponsored or recommended.



Is your service or tool case crowded? Perhaps you are using individual hex-head socket wrenches instead of the G-E Twin-X wrench set. This set actually replaces eight hex-head socket wrenches and thereby saves valuable space. Size is clearly marked on each wrench. Ask your distributor for ETR-752.

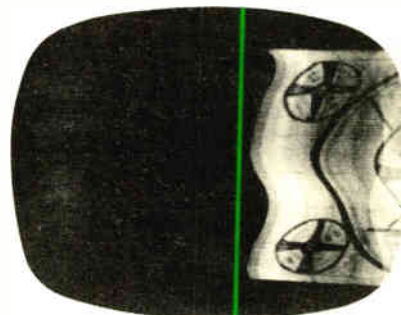
# Tele-Clues

FILE THIS SHEET IN YOUR TELE-CLUE BINDER



**Tele-Clue F-241**

**Receiver:** Any with Full-Wave Rectifier Tube.  
**Component:** Rectifier tube with one open plate connection.  
**Symptom:** (1) shading of picture. (2) One plate in tube may turn pink. (3) Tube could test "ok" on tube testers that tie plates together.



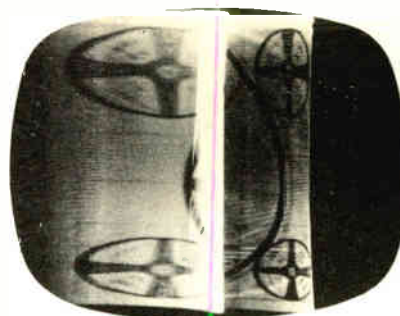
**Tele-Clue F-244**

**Receiver:** G-E "M-4" line.  
**Component:** C401B, 100 mfd, 350 v, output filter capacitor — OPEN.  
**Circuit:** Heater circuit of low voltage rectifier.  
**Symptom:** (1) Distorted raster reduced in size. (2) Horizontal off frequency. (3) Hum in audio.



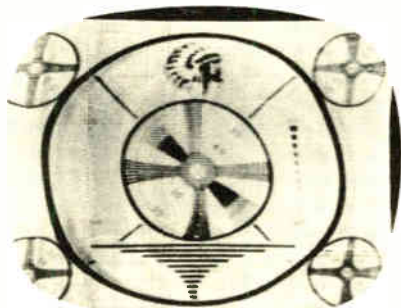
**Tele-Clue G-242**

**Receiver:** Any 21" with flat safety glass.  
**Component:** Faceplate of picture tube and safety glass.  
**Symptom:** Ring of dust precipitated at edge of a circular area where safety glass and picture tube faceplate are in close proximity.  
**Cause:** Electrostatic charge developing between safety glass and faceplate.



**Tele-Clue F-245**

**Receiver:** G-E "M-4" line.  
**Component:** C-260, 40 mfd, 400 volt, B+ to B+ "boost" capacitor — OPEN.  
**Circuit:** Plate circuit of damper tube.  
**Symptom:** (1) Reduced size. (2) Horizontal foldover at center of picture.



**Tele-Clue F-243**

**Receiver:** G-E "M-4" line (see M-4 Tele-Clue Schematic in Vol. 10, No. 5 issue).  
**Component:** C401A, 60 mfd, 350 v, input filter capacitor — OPEN.  
**Circuit:** Heater circuit of low voltage rectifier.  
**Symptom:** (1) Curl at edge of raster. (2) Reduced size. (3) Horizontal pulling.  
**Cause:** Reduced B+ voltage with increased hum level.

This page of Tele-Clues has been punched for insertion in your Tele-Clue binder. These binders which contain two hundred and forty Tele-Clues and an index sheet are available through your local G-E tube distributor.

The letter which precedes each Tele-Clue number identifies the circuit in which the defect exists. Please enter the Tele-Clue number in the proper column on the index sheet according to the key letter. Tele-Clues pertaining to BLANK RASTER WITHOUT SOUND will be coded with the letter R. Please write this reference above the letter R on the index sheet of your binder.



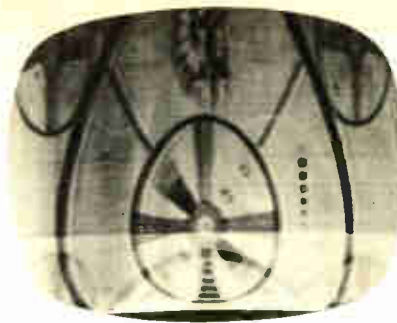
**Tele-Clue R-246**

Receiver: G-E "M-4" line.

Component: C401C-100 mfd, 150 volt filter capacitor for 135 volt B+ — SHORTED.

Circuit: Cathode circuit of audio output tube.

Symptom: (1) Blank raster. (2) Reduced width. (3) No audio. (4) Resistor R314 burns.



**Tele-Clue D-249**

Receiver: G-E "M-4" line.

Component: C209-.027 mfd, 500 volt, temperature compensated ceramic capacitor — LEAKY (1 megohm).

Circuit: Grid (pin 1) circuit of vertical output tube.

Symptom: Bottom foldover and top stretch.



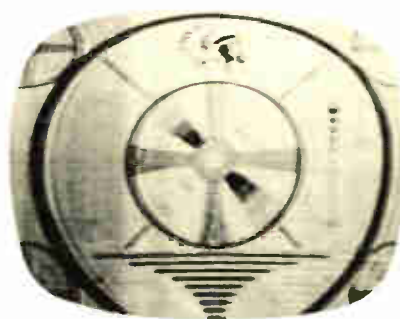
**Tele-Clue G-247**

Receiver: G-E "M-4" line.

Component: R270-1.5 megohm, 1/2 watt resistor — OPEN.

Circuit: G2 (pin 3) circuit of picture tube.

Symptom: Dim picture and raster.



**Tele-Clue D-250**

Receiver: G-E "M-4" line.

Component: C205-.033 mfd 200 volt tubular capacitor — OPEN.

Circuit: Grid (pin 1) circuit of vertical output tube.

Symptom: Top compression and bottom stretch.



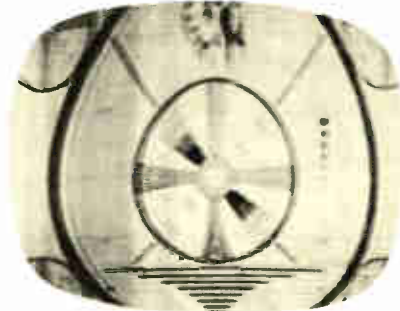
**Tele-Clue D-248**

Receiver: G-E "M-4" line.

Component: C204-.0039, 1000 volt capacitor — LEAKY (200 K ohms).

Circuit: Grid (pin 4) circuit of vertical oscillator tube.

Symptom: (1) Top stretch. (2) Vertical roll. (3) Vertical hold control ineffective.



**Tele-Clue D-251**

Receiver: G-E "M-4" line.

Component: C205-.033 mfd, 200 volt tubular capacitor — LEAKY (2.2 meg).

Circuit: Grid (pin 1) circuit of vertical output tube.

Symptom: Top stretch with slight compression at bottom.

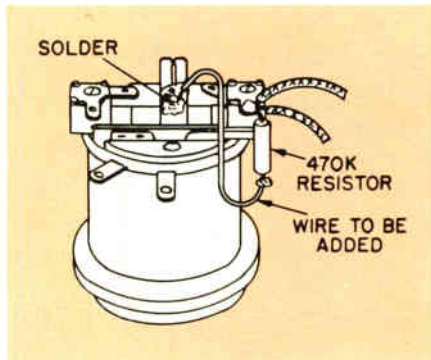


# SERVICE NOTES

## TELEVISION

### Apparent Ignition Interference On "U3" Receivers

There has been noted in some of our "U3" receivers an intermittent interference very closely resembling ignition interference. An investigation of this condition resulted in tracing the trouble to the relay in the remote control box. Due to the necessary close clearances in the latching mechanism, there is the possibility that some of the free metal parts will rub together and thus set up a noise pattern in the picture which may or may not be sustained by an audio signal or other vibration. This is more or less intermittent and can always be reduced or eliminated temporarily, by switching the relay once or twice which will reposition the armature in the gap of the relay.



A correction which will eliminate the condition entirely, consists of connecting this free metal part to the circuit thereby putting all of these parts at the same potential. A 470K resistor is connected in the jumper circuit to prevent the 110 volt circuit from coming in contact with the case if the jumper wire should come loose from the armature. The correct location of the jumper wire is illustrated in the accompanying figure. The wire used is the same as used for the remote control cable. It is imperative that this extremely flexible wire be used so as not to interfere with the proper action of the relay.

### Material required is:

- (1) 470K ohm 1/2 watt resistor and
- (2) a 3" piece of insulated flexible wire, same as used in the remote control cable WT67X15. This wire has been tested by Engineering in this application and found to be acceptable and is the only wire recommended. This is available as cable hank WT67X15. Correct length of pieces should be cut off from this hank as needed to make the correction.

### Procedure:

1. Remove cover from relay box.
2. Solder resistor and wire together.
3. Solder resistor to terminal having two black leads as illustrated.
4. Solder wire to brass piece on plunger with relay laying flat so solder will not run down plunger. Dress wire as shown in the illustration.

The "U3" receiver is no more affected by ignition interference than any other set. Therefore, if a complaint of ignition interference is noticed on the "U3" and not on others, then it is assumed that the latching relay is the cause and the above described correction should be made.

### Removal of the Metal Back on "M4" Models

On "M4" UHF models, the I-F filter which is attached to the tuner has been redesigned mechanically so that it projects towards the rear of the chassis and interferes with the retractable VHF antenna when removing a metal back.

Before removing the metal back on an "M4" UHF model using the new filter, it is necessary to extend the outer section (or largest diameter) of each element of the VHF retractable antenna to its full length to prevent interference with the filter.

To avoid confusion, it is suggested that the above procedure be followed in removing any metal back from any "M4" model.

## RADIO

### No AM in Model T120 AM-FM radios

A quantity of T120 AF-FM radios were manufactured in which capacitor C12 connected to pin 1 of V4 was 20 mmf., as shown in the first preliminary service notes.

It has been found that better performance on AM results from the use of a 15 mmf. capacitor in this position. The higher value may cause the oscillator to cease functioning on part of the broadcast band. FM reception is not affected.

The first step in trouble shooting a "no AM" T120 is to check the value of C12. If C12 is 20 mmf., replace it with a 15 mmf. capacitor. (Catalog No. RS-1305)

If C12 is 15 mmf. and the AM is inoperative, check the other associated AM components such as the AM antenna (L8), AM oscillator coil (L7), V4 (12AU6), and AM I. F. transformers.

## ANSWERS TO:

What's wrong with this picture? appearing on page 6.

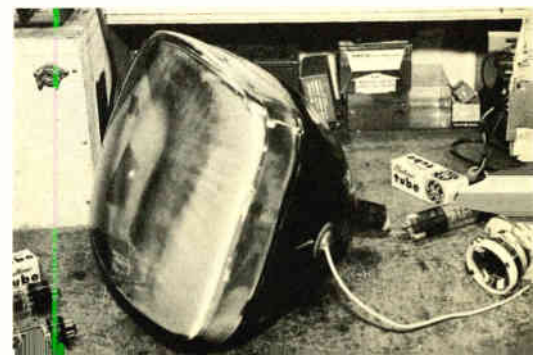
1. *Perimeter of picture tube face plate resting unprotected on hard surface.* A scratch or abrasion in this critical area can cause tube loss and even personal injury. G-E Picture Tube Pillow ETR-1469 will help protect picture tubes at contact points.

2. *Neck of picture tube precariously supported by tube carton.* This could result in tube loss or personal injury. Use G-E Picture Tube Nek-Rest ETR-1169 to hold neck firmly in place. Photo below shows what actually happened when picture tube was accidentally pulled off tube carton.

3. *TV chassis supported by cardboard box.* This presents an obvious risk to exposed tubes including picture tube plus possibility of damage to chassis parts. Use G-E Chassis-jack ETR-1470 to securely hold chassis in servicing position.

4. *Receiving tubes lying on bench.* Tubes could roll off causing breakage and even personal injury. Suggest temporarily storing tubes in empty tube cartons with flaps open.

5. *Tubes tested 10¢ each.* Since DO-IT-YOURSELF tube testers can be found in many drug stores, super markets, hardware stores, etc., radio and TV service shops seldom charge for this service. If the customer is unable to correct the trouble with new tubes, in all probability he will call the service shop that tested his tubes "free".



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

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Street Address.....

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

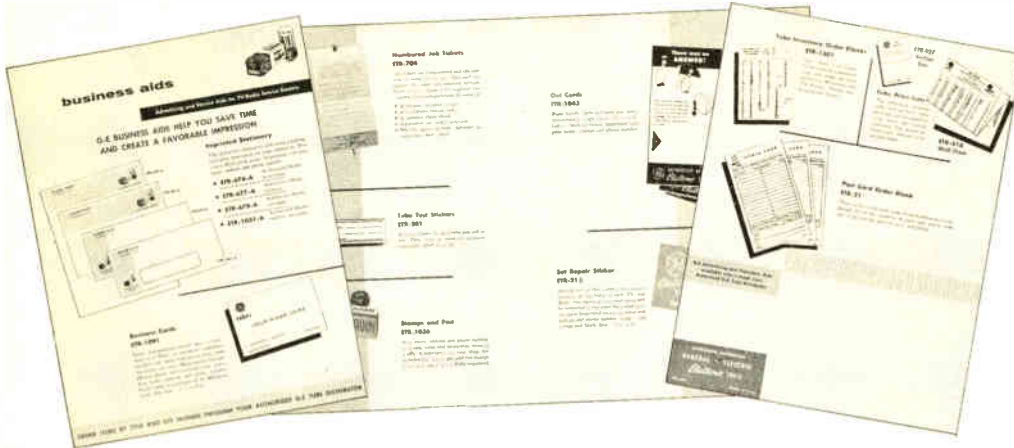
If you expect to move within next two months, please print new address above.

NEW



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NOW AVAILABLE THROUGH YOUR AUTHORIZED G-E TUBE DISTRIBUTOR



Do you use the many Business Aids described in Pub. No. ETR-1653? These G-E Business Aids will help you save time and create a favorable impression on your customers. Ask your authorized General Electric tube distributor for a copy of publication number ETR-1653.

The following Business Aids are available imprinted with your name, address and phone number:

- ETR-676-A Authorized Dealer letter-head
- ETR-677-A Authorized Dealer bill-head
- ETR-678-A Authorized Dealer envelope

- ETR-1031-A Authorized Dealer window envelope
  - ETR-1091 Business Cards
  - ETR-704 Numbered Job Tickets
  - ETR-201 Tube Test Stickers
  - ETR-1036 Rubber Stamps (2) and Pad
  - ETR-1043 Out Cards
  - ETR-215 Set Repair Sticker
- The following Business Aids do not require an imprint:
- ETR-1301 Tube Inventory Order Blanks
  - ETR-816 Tube Price List—Wall Size
  - ETR-927 Tube Price List—Pocket Size
  - ETR-21 Post Card Order Blanks

## Color Dot Magnifier

ETR-1761



- Adequate magnification makes individual color dots visible on Color Picture Tube.
- Dot visibility makes more accurate "purity" adjustments possible.
- Focus adjustable for complete screen coverage. Inner tube may be removed whenever necessary.
- Compact and easy to use.
- Two color protective storage cylinder assures long life.
- Can also be used to check phono needles for wear.



Vol. II No. 2 MAR-APR., 1959

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- Birth Of A Television Bulb.....Page 4
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