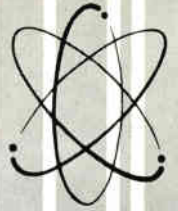




# Techni-talk

COMPLETE ELECTRONIC SERVICING INFORMATION  
radio • tv • hi-fi



Vol. 15, No. 2

Summer, 1963

## STEREO/AUDIO TEST AND REPAIR BENCH

Service technicians engaged in servicing audio equipment will find the test and repair bench described in this article a real timesaver.

This bench, shown in Figs. 1 and 2, was designed at the General Electric Audio Products Department and is used in the test and research facilities at Decatur, Ill. The drawings in Fig. 3 give the measurements of this particular bench. A service dealer wishing to make such a bench may want to vary these dimensions to suit his own space and equipment.

### Test Equipment

The following is a brief description of this bench, listing some of the features that make this set up ideal for stereo testing and repair.

The bench should be equipped with the following basic pieces of test equipment:

1. Oscilloscope — G.E. ST2A or equivalent.
2. Audio signal gen. — 60 to 150k cycles per second.
3. Audio VTVM — frequency response, 10 cps to 500 kc.
4. AC-DC VOM — 20,000 ohms per volt sensitivity.

Some additional "extras" for making your audio servicing and testing faster and more efficient are:

1. A pair of matched speakers for a final listening test.
2. An amplifier mounted on the bench to use as a standard.
3. A tuner to be used as a source

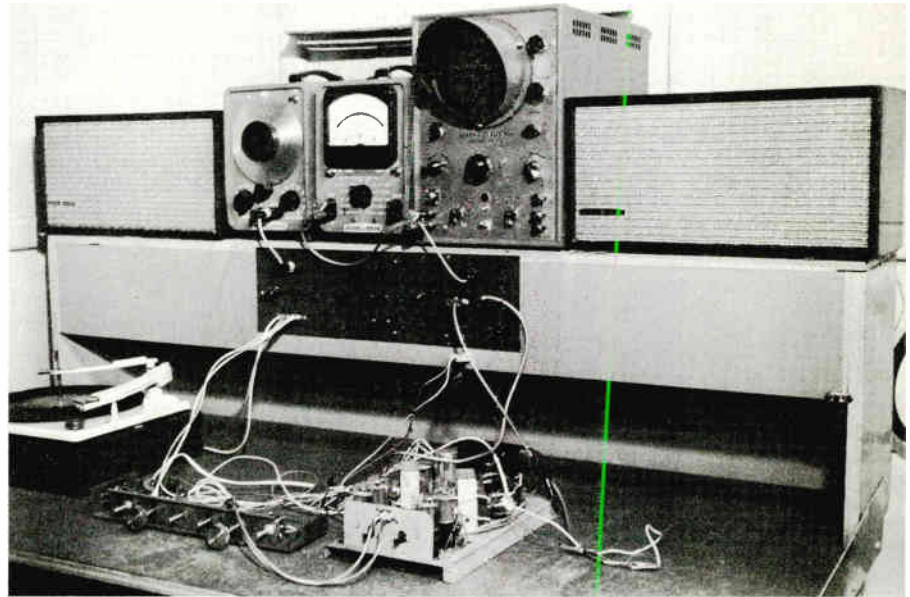


Fig. 1 Photo of audio test and repair bench in use.

of program material.

4. A turntable to be used along with records as a source of music for final listening tests or whatever test tones might be pressed upon the record.

5. A test panel mounted to the bench which serves as a "go-between" for the unit under test or repair and the test equipment.

This test panel, shown in Fig. 2, is constructed of parts readily available from any local electronic parts job-

ber. The parts for the test panel are mounted on an aluminum plate. However, a thin sheet of plywood or masonite material could be utilized instead. The schematic diagram in Fig. 4 further describes the features of this test aid.

Some of the advantages of this panel are as follows:

A. Eliminates long and cumbersome test leads from test equipment to the unit under test.

B. Provides phono jacks for accommodating the input cables from the amplifier to feed amplifier whatever signal is desired. Phono jacks are also installed to plug in the output cables from the turntable. At this point, you may either: (1) read

(Continued on page 7)

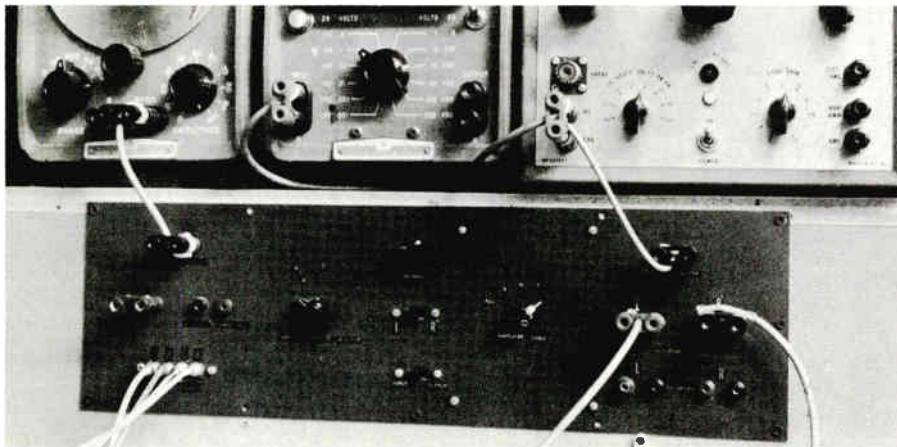
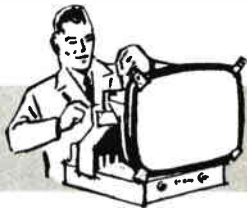


Fig. 2 Close up view of test panel.

### G-E OFFERS \$4800 IN PRIZES TO SERVICE TECHNICIANS

\$4,800 in prizes — exclusively for radio and television service technicians — are available in a new General Electric contest. Ask your authorized G-E tube distributor for rules and entry blanks — and how to get the new G-E book "101 TELECLUES." See page 4.



## BENCH NOTES

### NUT MAKING

When an extra-thin nut is needed to fit a screw in a cramped space, cut a small square of sheet metal, punch a hole through it, then tap the hole with threads to match the screw. Punching instead of drilling bends the metal outwards around the hole, thus adding metal for a longer thread.

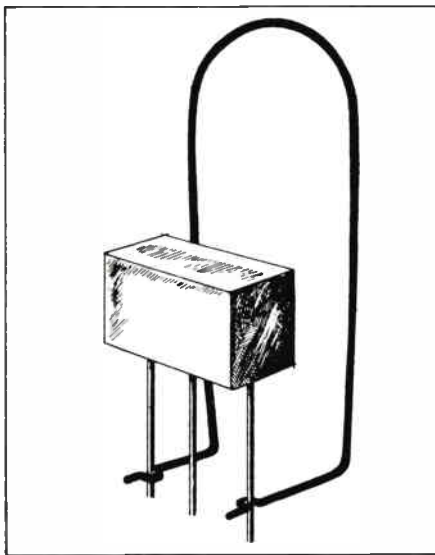
*H. Josephs  
P. O. Box 22  
Gardenville, Penna.*

### EXTRA HEAT

Every once in a while you need just a little more heat from the soldering iron for a chassis bond, or some heavy material. If the barrel of the iron is wrapped with 2 or 3 turns of asbestos paper or cloth (obtainable at any plumber or tin shop) an appreciable amount of extra heat is available at the working end. To protect the asbestos I wrap it with a piece of metal cut from a tin can. This has made many of those occasional tough jobs much easier.

*Ed Gates  
2161 Old Phila Pike  
Lancaster, Pa.*

### HORIZONTAL ADJUSTMENT



As most horizontal AFC diodes are placed in not easily reached places, I made this diode shorting pin, which makes adjusting easy. It can be made of most any diameter piano wire, preferably, about the size of the diode wire connections. (This is used when setting the horizontal frequency on late model G.E. sets.)

*Gerald Chambers  
3415-25th  
Lubbock, Texas*

### SOLDER REMOVAL

Here is an easy way to remove solder from any terminal including multi-terminal transformers from printed

circuit boards.

Obtain a solution of rosin dissolved in alcohol and a length of small shield braid stripped from scrap coax or small shielded wire. Dip the end of the shield braid in the flux, shake off excess flux, and apply end to the connection to be cleaned of solder. Apply well-tinned hot soldering iron to the braid above the connection. The solder will be taken up by the braid and the connection will be left free of solder. Repeat process using fresh part of braid if necessary. Flux left on terminal or board may be flushed off while soft with alcohol and a brush.

Wires may be unwrapped as though they had never been soldered. Miniature IF cans can readily be removed and replaced without trying to heat 5 terminals at once. Printed circuit holes are left clean, tinned, and undamaged by prying or excess heat.

Try this once and you'll never break off tube socket terminals or destroy components and dispositions again.

*Dave Rotbart TV  
P. O. Box 3032  
Lennox, Calif.*

### BELT REPLACEMENTS

An ideal replacement for hard-to-get belts for tape recorder transports can be made with 2 pieces of plastic tape put together back-to-back with ends staggered. Trim if needed.

*A. S. Cohen  
451 Kingston Ave.  
Brooklyn, N. Y.*

### DRILL SAVER

Save undue breakage of small, delicate drills, by pushing the drill through a cork or rubber ball. This keeps the drill from bending and breaking in the middle.

*E. Mayover  
1601 — 14th St. W.  
U. S. 41  
Bradenton, Fla.*



"Art, you seen my tuner cleaner? It was in an old gin bottle."

### PHONO TIP

Place a mirror from your wife's compact in the bottom of a small can and hold it underneath when inserting a stylus or crystal in a phono arm. You'll be able to see the under side of the arm; and if a screw should drop, it will be caught in the can and prevent its loss.

*Henry Mullen  
3274 Fulton Road  
Cleveland 9, Ohio*

### SPEAKER REPAIR

Speaker cones that are dried and/or cracked on old sets that are not worth a new or repaired speaker or coning job can be salvaged in just a few minutes. Make the repair to the rip, tear or crack in the usual way, then thin down a small amount of white glue with about 25% water and gently paint the whole cone with it. Just one caution: Don't get the glue on the center felt cover. This mixture will soak into the cone and bring back some of its flexibility and strength with little or no effect on the sound. This will also sometimes improve some of the inexpensive radio speakers that have too much cone flutter and sound tinny.

*D. R. Gladish  
TV Service  
1925 Goodhope St.  
Cape Girardeau, Mo.*

### BREAK FINDER

A very simple device can be made to quickly find the break in printed circuitry that may be intermittent and cannot be seen with a magnifying glass.

It is merely necessary to solder a straight pin to each end of a one foot length of insulated wire. Then flex the printed circuit board at various points until the defect occurs and keep in this position in any convenient manner. The final step is to take your pin test wire and bridge the various soldered points connected by printed circuitry. The instant normal operation returns you know that the break must be between the two bridged points.

This may seem involved but I have repaired many transistor sets by this method in a matter of minutes. Any other method involves schematics and test equipment which takes more time and trouble.

*Carlton C. Mills TV  
20 Gordon Place  
Scarsdale, N. Y.*

### NOTE:

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.



Enter General Electric's ONE-O-ONE Contest. 101 prizes given every month... \$10 to \$100 with a Grand Prize of \$500 in cash. See your General Electric tube distributor for complete rules and official entry blank.

Get this book **FREE** with the purchase of G-E tubes. Here's *101 Tele-Clues* to help make TV repair easier and more profit-



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# G-E HORIZONTAL PHASE DETECTOR—IV

In the last issue the effect of sync pulses superimposed on the horizontal sawtooth was discussed. The last illustration (Fig. 2) showed the position of these sync pulses when the receiver was operating normally and, therefore, no correction voltage was developed.

Examination of the waveforms in Fig. 1 will show the action when the oscillator is slow.

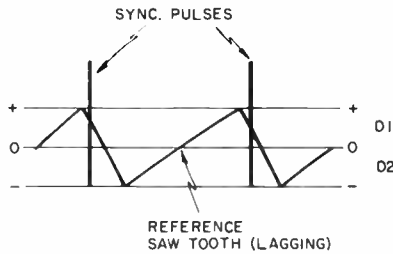


Fig. 1. Lagging Sawtooth Pulse

In this instance, the sync pulse occurs before the reference voltage crosses the zero voltage axis. This, of course, means that the sync pulse will be added to the voltage level that it crosses. This means, then, that Y1 will pass more current than Y2, again referring to Fig. 5, in the Vol. 14, No. 6 issue.

As Y2 passes less current, the opposing voltage will be less so that the resultant across the entire network becomes more negative.

Perhaps a clearer analogy would be to picture the voltage drops across the entire network with Y2 removed, which illustrates the maximum extreme to which the circuit could be driven. Y1 then looks like a shunt rectifier across which a negative voltage may be built up.

Conversely, if the oscillator were fast, we would get opposite condition of a positive voltage across the network. Fig. 2 shows the wave form of the oscillator leading the sync pulses.

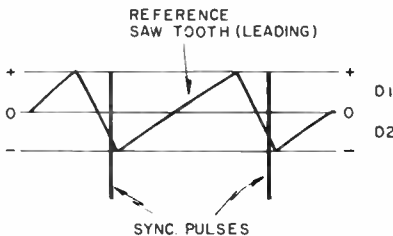


Fig. 2. Leading Sawtooth Pulses

It must be remembered that although the changes in phasing of the sync and reference voltage may appear rapidly, the actual change in the control voltage is slowed down by the integration (or filtering) action of C2 and C1 in series (see Fig. 5 in Vol. 14, No. 6 issue). This feature adds in reducing noise pulse interference and is further augmented by applying the control voltage to the horizontal oscillator through an "antihunt" circuit not shown.

## CIRCUIT VARIATIONS

So much for the basic theory. In addition to this, there are several possible variations or additional refinements which an engineer may choose to use. A look at Fig. 3 shows two of these. Note the 68 uufd capacitor across the top diode. This represents the amount of capacity that the sync amplifier circuit reflects across the lower diode as shown in Fig. 4.

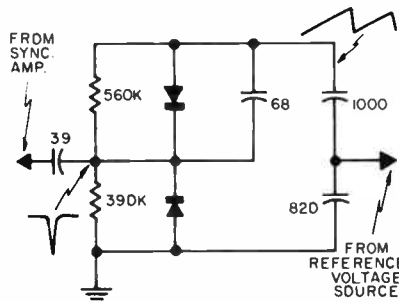


Fig. 3. Additional Refinements

The second thing that is different is that the load resistors are not equal. As you will note (referring again to Fig. 3) the top one is 560K while the lower one is 390K. This is necessary because both diodes do not see the exact same saw waveform. Diode Y1 (top) sees a sawtooth, but diode Y2 (bottom) sees a reverse sawtooth. In other words, Y1 sees the trace time portion of the wave as the leading edge while Y2 sees the retrace portion as the leading edge. If this were not taken into account, equal voltages could not be built up, as the charging and discharging rate of the capacitors are affected by the waveshape.

Some designers desire that the local oscillator rest on frequency with

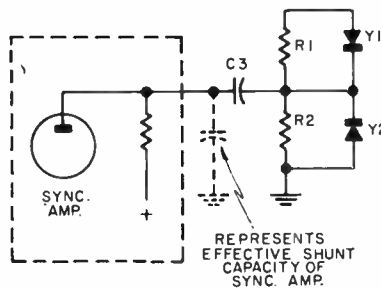


Fig. 4. Effective Capacity

an externally-applied bias. This may be inserted in series with the phase detector as in Fig. 5, and has no bearing on its operation.

There are, of course, as many modifications of this basic subject as there are design engineers concerned with this phase of television circuitry.

A careful examination of circuit deviations encountered in daily service work, keeping the above principles in mind, will pay off in the long run with less time required for defect analyses.

The illustration in Fig. 6 serves as an excellent example of this.

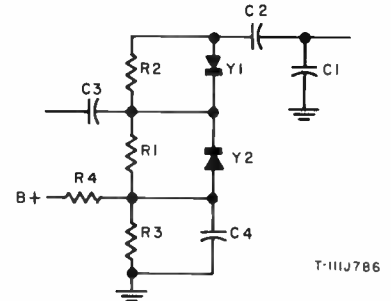


Fig. 5. Externally Applied Bias

At first glance, it appears to be the same circuit as shown in Fig. 3. Closer inspection, however, will show that the reference voltage is fed to the bottom of the circuit rather than the top. Further study shows that the reference voltage is taken from the horizontal flyback transformer rather than the oscillator as in previous circuits. This voltage is fed through R4 and R5 and divided and wave-shaped by C2 and C4 and presented to the phase detector across R3. This last resistor is required only to provide a DC path to ground for the grid of the horizontal oscillator which is attached at R6.

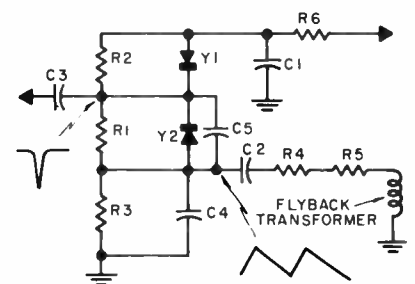


Fig. 6. A Common Circuit Variation

Looking at the waveform developed across R3, it can be seen that it is a reverse sawtooth. This, then, is the reason why it is inserted at this point rather than at the top as in the previous circuits.

These articles have covered mainly the theoretical background of the phase detector operation and may be used as an aid to understanding General Electric receiver phase detectors. Having a good basic knowledge of the subject material covered should make the technician more proficient in his trouble shooting analysis.

(Continued from page 1)

## TELEVISION

### 23-INCH DEMAGNETIZING COIL FOR COLOR TV

A few instances have been encountered in the field where it has not been possible to completely eliminate color shading with a 12-inch demagnetizing coil.

When the above occurs, it has been found necessary to use a 23-inch diameter coil wound to the specifications given below.

**CAUTION:** The front of the receiver may be demagnetized in the usual manner. However, if it is found necessary to demagnetize the sides of the receiver, the center of the coil should not be moved towards the rear of the receiver any further than the plane of the cabinet front.

#### COIL DIMENSIONS

- Diameter — 23 inches
- Width — 3¼ inches
- Wire Size — #16 heavy Formex® (approx. 1100 feet)
- Turns — 210 total in 4 layers
- Resistance — 5.2 ohms
- Input Rating — 120 volts 60 cycle @ 6.8 amps.
- Coil Form — 1/16 inch Textolite, 3½ inches wide x 7 ft. long. Overlap the ends of the form until the required diameter is attained and tape ends together.
- Insulation — Wrap completed coil with black plastic electrical tape.

## RADIO

### P870 DIAL SLIPPAGE

Some model P870's may be returned to you where the complaint is dial pointer sticking at either end.

This condition is usually caused by excessive tension in the dial spring used in the bead chain that drives the dial pointer. Correct this by either substituting a replacement spring or by reducing the tension on the dial bead chain by stretching the spring slightly.

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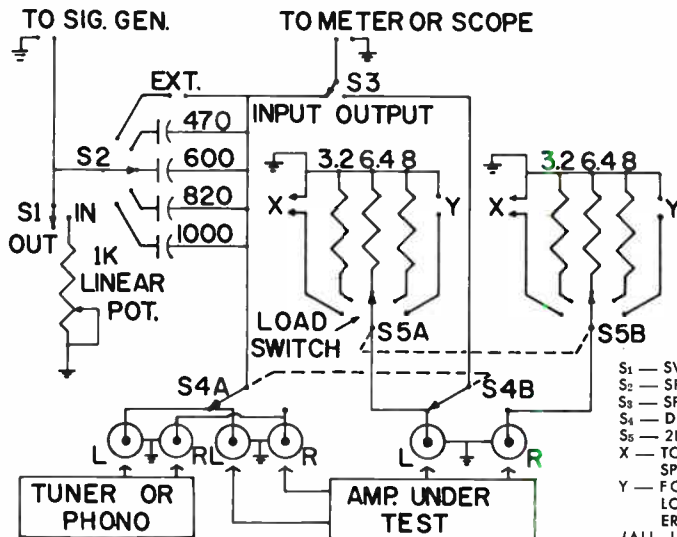


Fig. 4 Schematic diagram of test panel.

- S<sub>1</sub> — SWITCH ON POT.
- S<sub>2</sub> — SP, 5 POS.
- S<sub>3</sub> — SPDT
- S<sub>4</sub> — DPDT
- S<sub>5</sub> — 2P, 5 POS.
- X — TO BENCH TEST SPEAKERS
- Y — FOR EXTERNAL LOADS OR SPEAKERS
- (ALL LOAD RESISTORS 20-WATT)

the cartridge output on the Audio VTVM by using a test record, (2) use the test signal from the record to test the output of the amplifier itself, or (3) use a musical record and switch in the speaker system for a music listening test on the amplifier.

C. Provides four standard input capacities from the signal generator to the amplifier to duplicate various

cartridge capacities, plus one dummy jack that may be used to install any other value of input capacitor that may be desired. These capacitors are mounted on the back side of the control panel and may be selected with the input selector switch.

D. An attenuator is also installed in the input circuit, so that a means is provided for attenuating the input signal in cases where a smaller

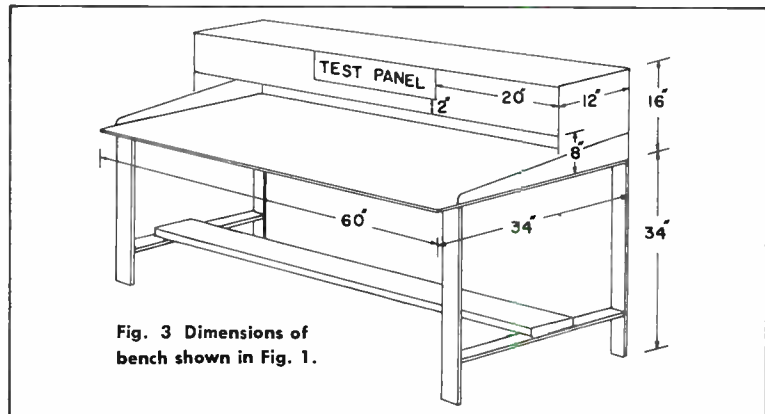


Fig. 3 Dimensions of bench shown in Fig. 1.

signal than the signal generator will produce is needed.

E. A switch to monitor either the input or output signal of the amplifier under test.

F. A switch to monitor either left or right channel. This may be either left or right channel input or output depending upon the position of the switch described in E.

G. A five-position rotary switch used to select any of the standard load resistors mounted on the back side of the panel, or the external position where any other load may be applied to the amplifier under test. Or, the output of the amplifier may be switched to the speaker system for a listening test.

The time and effort spent in constructing this bench will pay dividends in time saved when servicing all types of audio equipment.

# NEW G-E SERVICE AIDS

## 1963 EDITION OF "ESSENTIAL CHARACTERISTICS" NOW AVAILABLE

The tenth edition of "Essential Characteristics" (ETR-15K), the General Electric handbook on receiving, Five-Star and special-purpose tubes, compactrons, thyratrons, gas filled diodes, television picture tubes and replacement capacitors, now is available from your General Electric tube distributor.

New tube characteristics added to this edition bring to over 2600 the total number of tubes, including 574 picture tubes.

The new edition contains a number of improvements which will make this booklet easier to use and even more practical in electronic servicing than previous editions.

One such improvement is the re-arrangement of base diagrams which have been enlarged to make them easier to read. All tube types using the same base drawing are listed with each diagram.

Also, the basing diagrams are arranged in numerical-alphabetical

order with four on each individual page. The base diagram portion of each page has been cut so the basing can be viewed at the same time as the tube characteristics. First the base diagram number is located in the "Base Connections" column for any tube type. Then, without turning the top section, the appropriate base diagram can be located in the lower section and opened so both the electrical characteristics and the base drawing are visible at the same time.

The listing of all tube types using the same base diagram should be of considerable value particularly when servicing older model receivers. If a tube type is not available, a check of the electrical characteristics for other tubes with the same basing will enable the technician to determine whether or not a substitution can readily be made with another type.

As before, the book includes typical characteristics curves, tube outline drawings, circuit diagrams showing typical applications of receiving tubes and capacitors, and construction data for speaker enclosures.

Tube classification charts have been expanded to facilitate reference to similar types. Cross-reference listings of prototypes for Five-Star and special-purpose types are included.

Get the new ETR-15K from your distributor — or if he is unable to supply you, use order coupon on page seven. The price is still \$1.50.



## Techni-talk



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