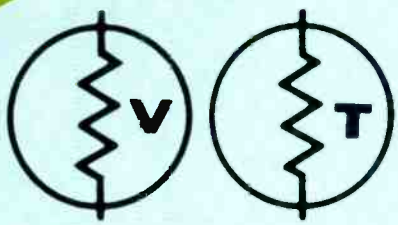
NOVEMBER, 1971 ☐ 75 cents

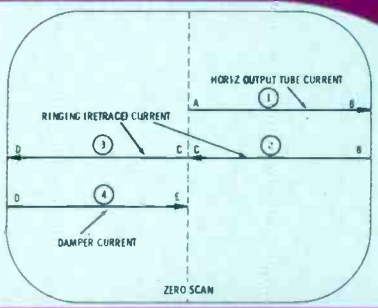
A HOWARD W. SAMS PUBLICATION

Electronic Servicing

TESTING and CIRCUIT OPERATION of:

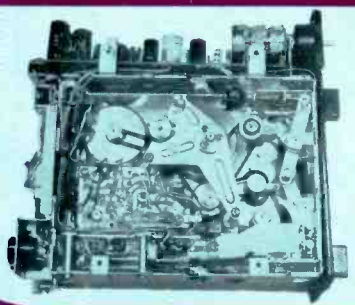


Varistors and Thermistors, page 14

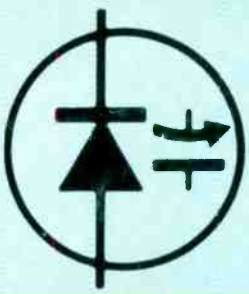


Horizontal Sweep, page 36

Auto Cassette Drive Systems, page 44

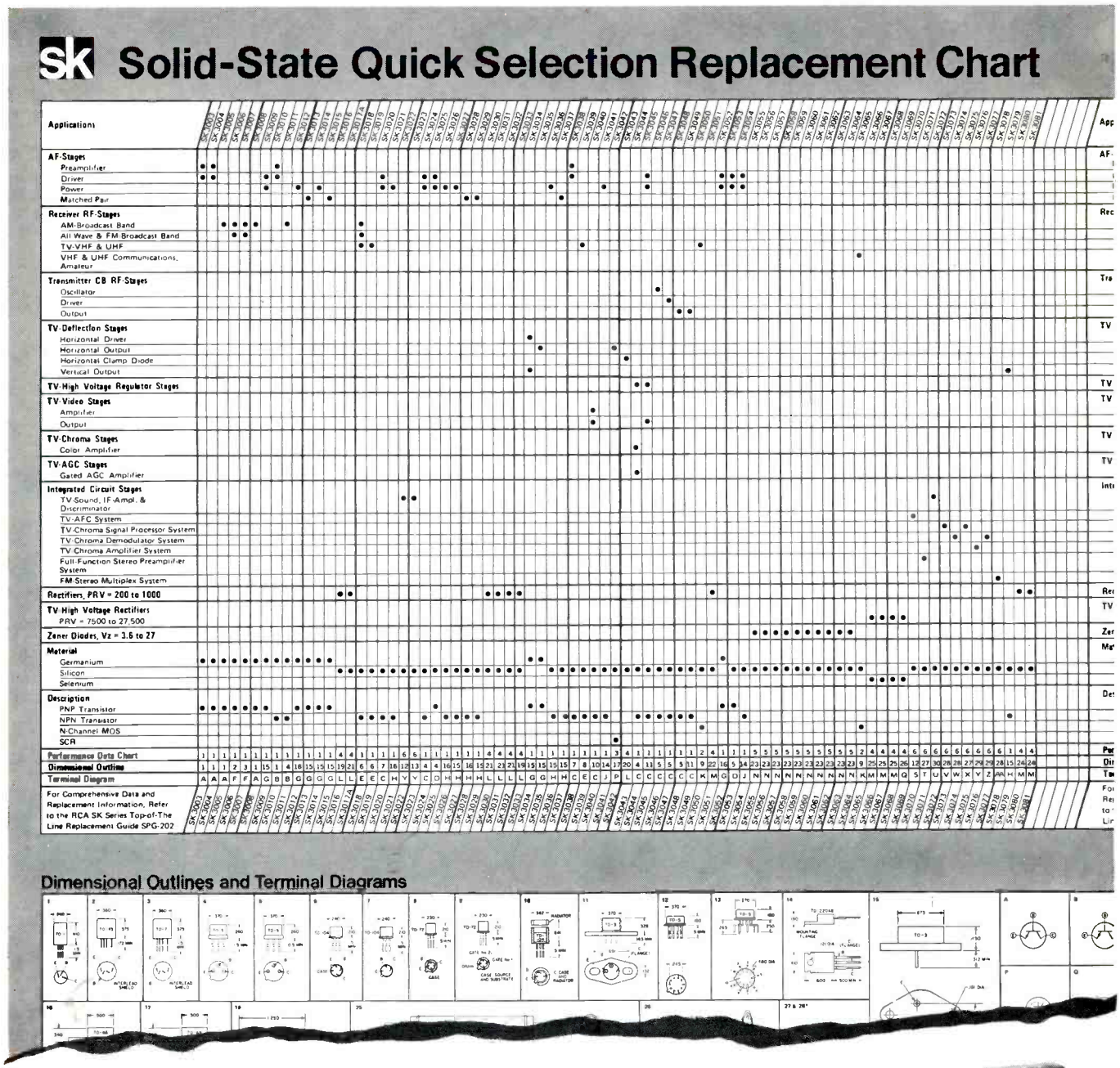


TV Varactor-Equipped Tuners, page 26



SOURCE GUIDE TO IMPORTED PRODUCTS, page 50

Find SK replacements fast with the new RCA SK Wall Chart



Dimensional Outlines and Terminal Diagrams

A brand new expanded, king-size SK Quick Selection Wall Chart which shows you the correct SK replacement when the device to be replaced cannot be identified is now available from your local RCA distributor.

Keying all RCA SK types to applications, and showing terminal diagrams and performance data charts, this 23" x 35" chart is just what you need for fast SK replacement.

Also available is the new edition of RCA's SK Series Top-of-the-Line Replacement Guide which shows how only 79 RCA SK devices can replace more that 20,000 OEM solid state devices in radios, TV's, stereos, tape equipment and other home entertainment equipment.

The new Guide also features 17 industrial type SK's that replace devices used in power control and switching circuits and other industrial applications.

All RCA SK types are accurately cross-referenced with industry types in this updated Replacement Guide which you can use to advantage on every service call. See your local RCA distributor for both the SK Quick Selection Wall Chart (1L1367) and the SK Replacement Guide (SPG-202L). They work hand in hand to make your replacement job faster and easier.

RCA | Electronic Components | Harrison, N. J. 07029

RCA

"I put a radio in a racing car for a Yellow Pages customer!"

"I don't think he turns it on when he's racing, but I guess he uses his racer around town," says Stephen Nyikos, owner of Ra-dis-co, Inc., Indianapolis Indiana. "He found me in the Yellow Pages, where a lot of my customers do. I've been advertising with the Yellow Pages for about thirty years now, and it sure pays off. It's a constant reminder to past customers, and it's a great way to get new customers. I advertise in three local directories, and I take full advantage of the multiple listings. So no matter where a customer looks for me, he's bound to find me."

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An effective way to build business.

November, 1971 • Volume 21, No. 11

Electronic Servicing

in this issue...

DEPARTMENTS

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Subscription Prices: 1 year—$5.00, 2 years—$8.00, 3 years—$10.00, in the U.S.A., its possessions and Canada.

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Robert E. Hertel, Publisher

Intertec Publishing Corp.
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Breakthrough!

The new B & K Precision 1440 General Purpose Oscilloscope breaks through with laboratory performance at a Service Technician price.

And it comes with an exclusive feature: the CALI-BRAIN system of measuring waveform voltages. Only B & K scopes have CALI-BRAIN – a real advance in TV test equipment.

Use this scope for troubleshooting in the latest Transistor & IC equipment. It has 10 MHz frequency response, 35n Sec rise time and high sensitivity. A choice of AC or DC coupled vertical amplifier for complete testing flexibility. And sweep rates from 5 Hz to 500 kHz, two TV sweep rates synchronized with built-in automatic TV sync separator. Use the 1440 as a vectorscope for color TV testing or as a general purpose instrument for TV-radio/audio testing.

The B & K Precision 1440 breaks through with greater capability, reliable, all-solid-state design, CALI-BRAIN voltage measuring. And it gives you an ease of operation you will have to see to believe . . . So break through to higher servicing profits today!

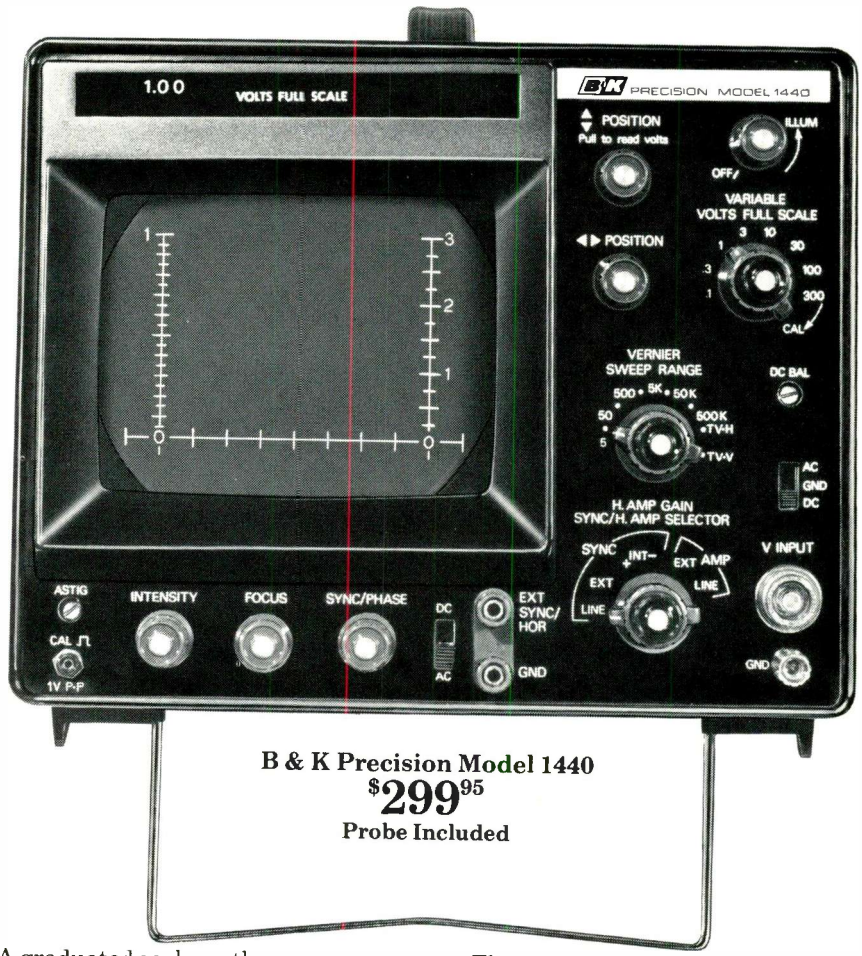
About the Cali-Brain® System

The CALI-BRAIN voltage measuring system increases your efficiency because it lets you examine any waveform and measure its peak-to-peak voltage without changing your test set-up. Now you can confirm the manufacturer's service data exactly – checking out typical waveforms and peak-to-peak voltage readings at various test points.

Cali-Brain® in Action

Use CALI-BRAIN when you want to measure peak-to-peak voltage of the waveform displayed on the scope screen. Here's what happens when the CALI-BRAIN switch is activated:

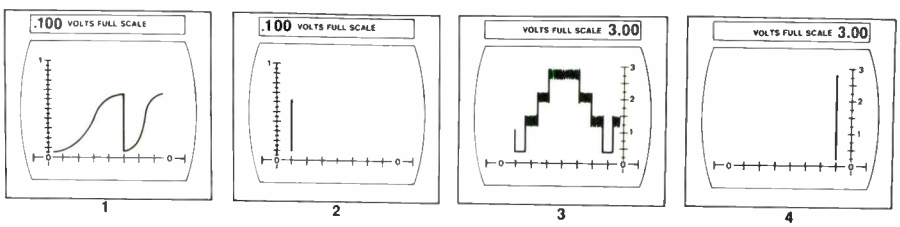
A. The horizontal sweep collapses and the waveform under examination appears as a straight vertical line.
B. A numerical indicator in the CRT bezel lights up to show the full scale voltage (including decimal point) corresponding to the Vertical Attenuator setting.



B & K Precision Model 1440
$299.95
Probe Included

C. A graduated scale on the graticule overlay is illuminated on either side of the scope screen. The scale corresponds to the full scale voltage indicator in the bezel.
D. The vertical waveform line on the CRT moves to either side of the screen, to align itself with the illuminated scale.

The entire CALI-BRAIN action is automatic – and takes less than a second. After you have read waveform voltage, you deactivate CALI-BRAIN system with a single switch, and the waveform is again displayed. One probe and one test instrument – lets you concentrate on trouble shooting, not the test equipment!



To read peak-to-peak voltages utilizing Cali-Brain, note the full scale voltage reading in the bezel above the screen (fig. 1–.100 volts full scale) (fig. 3–3.00 volts full scale). Pull out the Cali-Brain knob and you will notice that the 1st waveform in fig. 2. reads .067 volts P-P and the second waveform in fig. 4. reads 2.95 volts P-P.

See your local distributor or write us for more information

B&K

Product of
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1801 W. Belle Plaine • Chicago, Illinois 60613

Circle 5 on literature card

electronicscanner

news of the industry

Motorola Initiates Inspection And Service Modification Of One Portable Color TV To Correct Possible Shock Hazard

Motorola has announced an inspection and modification program for one newly introduced 19-inch portable color TV model which, under certain conditions, could present a possible shock hazard. About 3,000 units are involved, with most believed to be in wholesale distributor and dealer inventory.

Owners of Motorola model WP581HW were urged by the company to immediately disconnect this color TV model and to phone the retailer from whom the product was purchased. Owners also can call the nearest Motorola distributor, whose name and location is listed in the guarantee booklet.

Or, consumers owning the model WP581HW may call collect to the headquarters of Motorola's consumer products division. The phone number is Area Code 312-451-1000. Callers should ask for Ed Gaiden, national service manager, who will arrange for assistance in the inspection and modification of this product.

Motorola servicers, located throughout the country, will make the necessary inspection and modifications of the set. The model number "WP-581HW" can be located on the back cover of the set just under the picture tube bell, a "bulge" in the back of the cabinet. After the set has been modified and safety inspected, a large red letter "S" will be added to the model number.

Edward P. Reavey, Jr., Motorola vice president and divisional general manager, said that the task of locating any WP581HW models which have passed into consumer hands will be greatly aided by a program setup as part of the Motorola consumer satisfaction program. The safety modification program was placed into operation immediately upon discovery of the possible shock hazard. The company has a field force tracing WP-581HW models through distributor, retailer and consumer channels.

Shumavon Elected President of NATESA

Leo Shumavon, Dorchester, Mass., was elected president of the National Alliance of Television & Electronic Service Associations (NATESA), at the Association's 26th annual convention, at Hot Springs, Ark., in August. Shumavon succeeds LeRoy Ragsdale, Fort Smith, Ark.

Other officials elected included: Harold Eales, Oklahoma City, vice president; Stanley Brohn, Rouge, La., secretary-general; and Tom Easum, Memphis, Tenn., re-elected treasurer.

Frank Moch, Chicago, Ill., was reappointed executive director of the Association.

GE To End Radio Production

General Electric Company will curtail radio production by 1972, according to a report in a recent issue of *Home Furnishings Daily*.

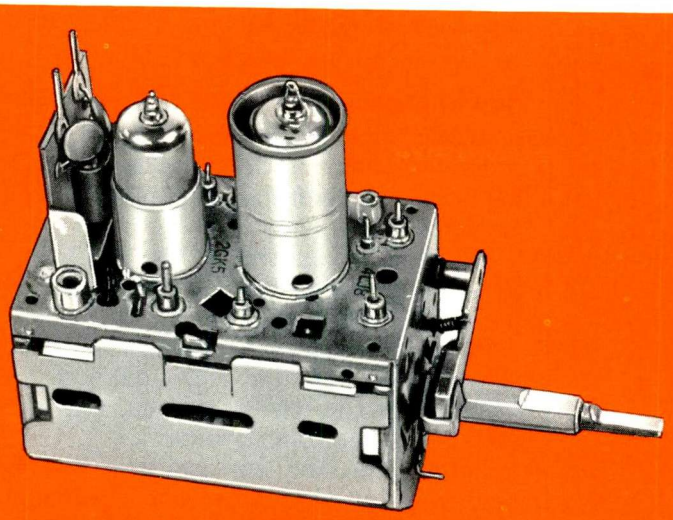
GE, reportedly the last remaining major U.S. company manufacturing radios, presently produces radios in its Utica, New York plant.

System Developed To Provide Stereo Music Over Existing CATV Lines

A system to supply stereo music to CATV subscribers has been announced by Tape-Athon Corp. of Inglewood, California.

Initial plans, according to David Anthony, president of Tape-Athon, call for use of a signal splitter on the incoming TV line at the subscribers' residence and feeding the multiplex stereo music signal to any FM radio, FM receiver or FM hi-fi set in the home. A decoder, installed at the receiver, would unscramble the signal and permit the subscriber to select any of a number of music channels.

(Continued on page 6)



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PROVIDES YOU WITH A COMPLETE SERVICE FOR ALL YOUR TELEVISION TUNER REQUIREMENTS AT ONE PRICE.

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VHF Or UHF Any Type $9.75.
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In this price all parts are included. Tubes, transistors, diodes, and nuvistors are charged at cost.

Fast efficient service at our 4 conveniently located service centers.

1 year guarantee backed up by the largest tuner manufacturer in the U.S.—SARKES TARZIAN INC.

All tuners are cleaned inside and out, repaired, realigned and air tested.

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SOUTH-EAST	1505 CYPRESS ST., TAMPA, FLA. 33606	TEL: 813-253-0324
WEST	SARKES TARZIAN, Inc. TUNER SERVICE DIVISION 10654 MAGNOLIA BLVD., North Hollywood, California	TEL: 213-769-2720

Circle 7 on literature card

(Continued from page 4)

Adams Named President Of RCA Service Company

Appointment of Robert F. Adams as President of the RCA Service Company has been announced by Edgar H. Griffiths, Executive Vice President, Services, RCA.

Mr. Adams succeeds Mr. Griffiths, who has been President of the RCA Service Company for the past three years.

In his new post, Mr. Adams will direct the overall activities of the RCA service unit, which, among other services, installs and services RCA consumer electronic products.

Before his new appointment, Mr. Adams had been division vice president, Technical Products Service, RCA Service Company, since February, 1967. He joined the RCA Service Company in March 1948, and subsequently served in a series of management assignments in the consumer and commercial areas.

GE Receives NEA "Special Recognition Award"

General Electric's Television Receiver Products Department has been cited "for unselfish efforts in upgrading the Electronic Industry by supporting the National Electronic Service Conference, and much appreciated co-operation with the Country's Service Associations," by the National Electronic Associations (NEA) Inc.

The Special Recognition Award was announced at the NEA Annual Convention in Portland, Oregon, by Norris Browne, President, National Electronic Associations, Inc. Of the 24 awards made, two went to electronic companies. The awards are presented annually to individuals, organizations or firms that have provided outstanding service to the servicing industry as a whole.

Mr. Browne presented the Special Recognition Award to W. H. "Dutch" Meyer, national product service manager, Television Receiver Products Department, during the National Electronic Service Conference Meeting in Hot Springs, Arkansas, August 25th.

Improved service and product serviceability are two target areas of the television department. "Quality and reliable service is a joint responsibility of the manufacturer and the servicing industry," said Mr. Meyer. "Our aim is to take our experience and knowledge, couple it with that of the television service industry and establish systems which work."

"We are grateful to the servicing industry," Meyer said, "for its cooperation and guidance, and to the National Electronic Associations for this award. It will be a source of continuous encouragement for us. We look forward to continuing our relationship and work with the independent electronic service dealers and their associations."

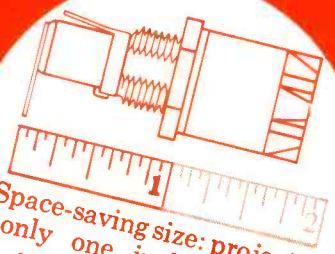
This year, GE television has been working closely with the Virginia Electronics Association (VEA) of Tidewater, Virginia, an affiliate of the

(Continued on page 8)

only a BUSS fuseholder could have so many quality features squeezed into such a small package

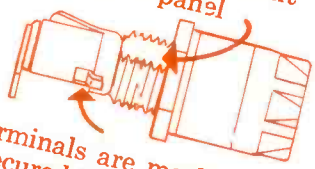
Space Saver!

Space Saver!



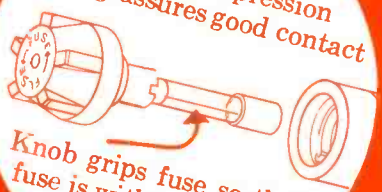
Space-saving size: projects only one inch behind panel, only 1-25/32 inches overall length

Made for installation in D-hole to prevent turning in panel



Terminals are mechanically secured in holder as well as soldered

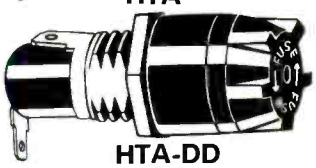
Easy-grip bayonet-type knob –sturdy compression spring assures good contact



Knob grips fuse so that fuse is withdrawn when knob is removed

BUSS

HTA



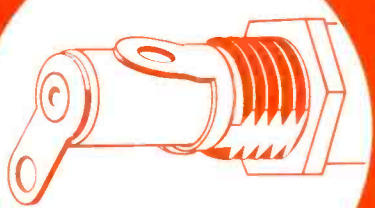
HTA-DD

HTA-HH

FUSEHOLDERS

FOR ¼ x 1¼ INCH FUSES

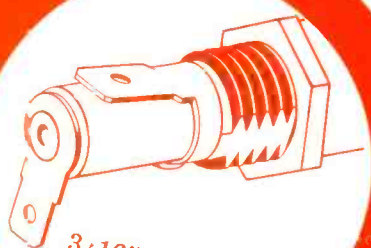
Knob has break-out hole to allow use of test probe



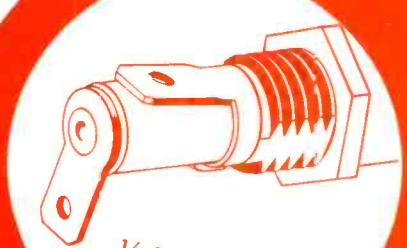
Solder Terminals (HTA)

Rated for 15 amps at any voltage up to 250

Dielectrically capable of withstanding 1500 volts A.C. between terminals and between terminals and panel



3/16" Quick-Connect Terminals (HTA-DD)



¼" Quick-Connect Terminals (HTA-HH)

For more information on the HTA Fuseholder and the complete BUSS QUALITY line of small dimension fuses, fuseholders, and fuseblocks, write for BUSS Bulletin SFB.

BUSSMANN MFG. DIVISION,
McGraw-Edison Co., St. Louis, Mo. 63107

SUPPLIED THE ECONOMICAL WAY . . . THRU DISTRIBUTORS

BUSS QUALITY FUSES

(Continued from page 6)

National Alliance of Television & Electronic Service Associations (NATESA). Several VEA members serve on an independent servicer panel and conduct pre-production serviceability inspections on television receivers. The nationally adopted National Electronics Associations (NEA) Serviceability Rating Form, a weighed, quantitative, measurement, is the prime evaluation tool.

General Electric television also has made moves in availability of replacement parts and communications. They are expanding their network of franchised independent parts distributors and are running tests on a new credit policy out of the Chesapeake regional parts center as well as toll-free telephone ordering systems in the Southeast.

A Guaranteed Active Parts (GAP) program also is in operation. A parts distributor and television service company can participate by stocking recommended parts which the Company guarantees they will sell. General Electric will buy the parts back if they don't.

In addition, each of the Company's districts has implemented direct-mail communication with television servicers. The goal is to get the General Electric "Television Service News" in the hands of every television company and servicer who regularly services television sets. The "Television Service News" is a free quarterly publication which provides data on parts outlets, technical publications, training and new products and tells whom to contact in any given area for assistance.

According to Meyer, these programs are "just the beginning."

Bank Interest Rates Charged Independent Business On Rise According to NFIB

Bank interest rates reported currently being paid by independent business firms continued a relaxed upward push in August, according to data compiled from the continuous field survey of the National Federation of Independent Business (NFIB).

The national average in September reportedly was 7.97 percent, up from 7.91 percent the previous month. The rate of increase apparently was dampened by the reverse trend in the Pacific Coast States which showed the average interest rate dropping from 8.56 percent the previous month to 8.4 percent, according to the NFIB.

This reportedly is not only the lowest rate shown this year in this block of states, but is also the first time in some 36 months that the average interest rate has shown a decline. In the west-south-central states centered around Texas, the average rate showed a slight gain from 7.77 percent to 7.9 percent.

The biggest increases reportedly were in the New England and mountain states. In the former, the movement upward was from 7.63 percent to 7.9 percent, and in the latter from 8.14 percent to 8.7 percent.

There reportedly appears to be some correlation between the average bank interest rate as reported by the survey respondents and the demand for bank loans. Nationally, 33 percent of the respondents report making bank loans, which is the same percentage as the previous month, but up from the 31 percent negotiating loans at mid-year. In the Pacific states where the average interest rate is shown on a downward trend, only 29 percent report that they have currently taken out loans, compared with 27 percent at midyear.

In New England, 37 percent report taking out loans as compared to 30 percent at midyear, and in the mountain states, 35 percent reported loan activity, compared to a midyear average of 32 percent.

The survey results also show variations in respect to vocations. Independent retailers, wholesalers, service firms and construction firms all show a current bank interest rate of a flat 8 percent. This reflects a slight increase for all but the construction field, in which a decline of one tenth of one percent is indicated. ▲

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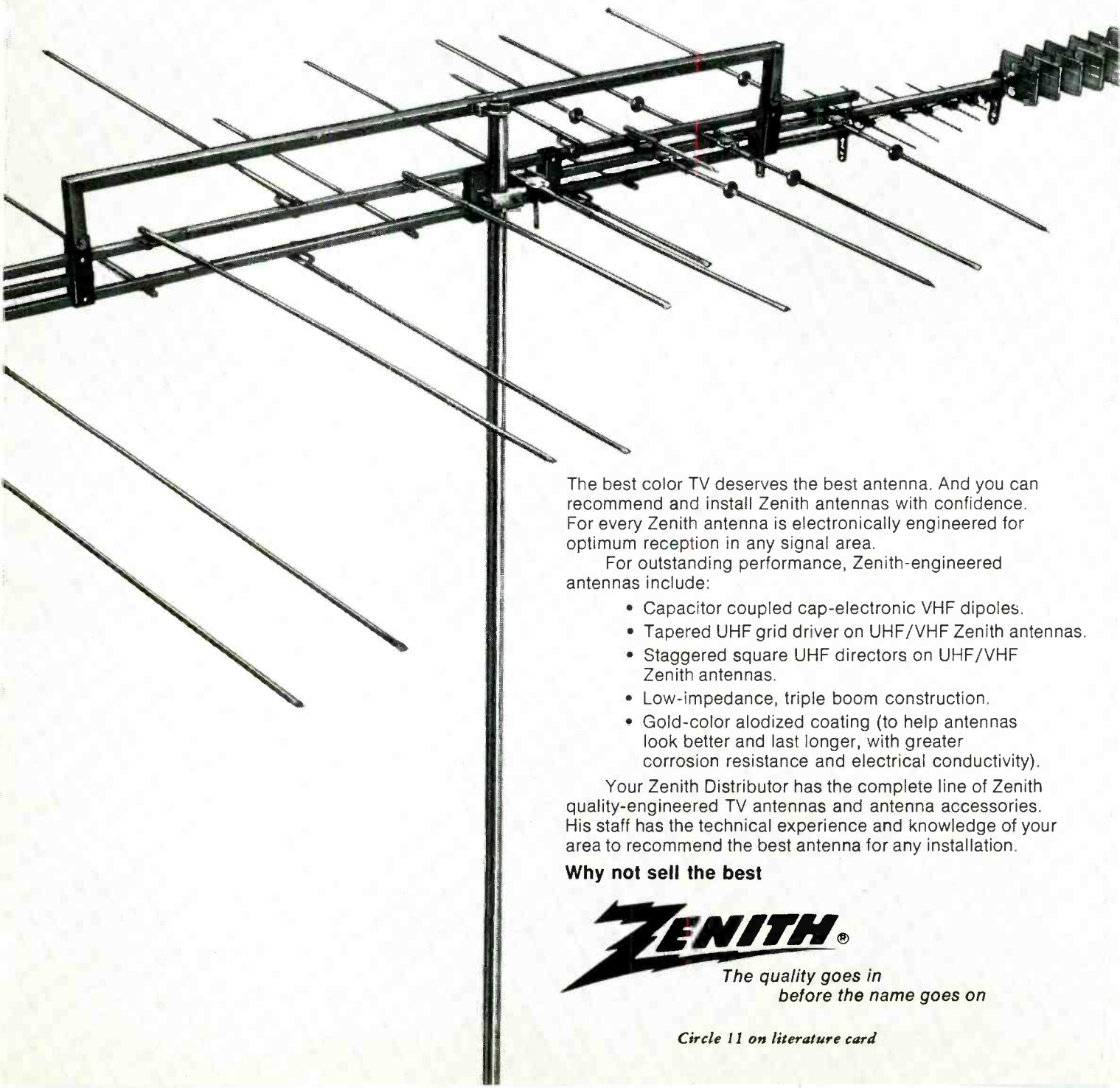
Engineered for outstanding reception – Zenith outdoor antennas for Color TV!



The best color TV deserves the best antenna. And you can recommend and install Zenith antennas with confidence. For every Zenith antenna is electronically engineered for optimum reception in any signal area.

For outstanding performance, Zenith-engineered antennas include:

- Capacitor coupled cap-electronic VHF dipoles.
- Tapered UHF grid driver on UHF/VHF Zenith antennas.
- Staggered square UHF directors on UHF/VHF Zenith antennas.
- Low-impedance, triple boom construction.
- Gold-color alodized coating (to help antennas look better and last longer, with greater corrosion resistance and electrical conductivity).

Your Zenith Distributor has the complete line of Zenith quality-engineered TV antennas and antenna accessories. His staff has the technical experience and knowledge of your area to recommend the best antenna for any installation.

Why not sell the best

ZENITH®

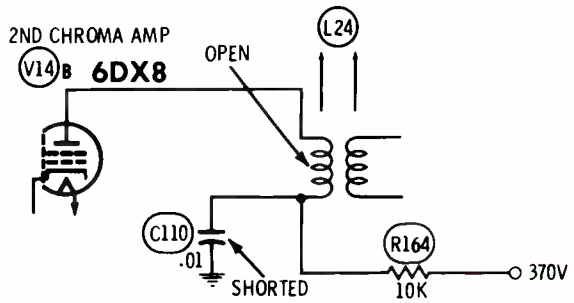
The quality goes in before the name goes on

Circle 11 on literature card

symcure

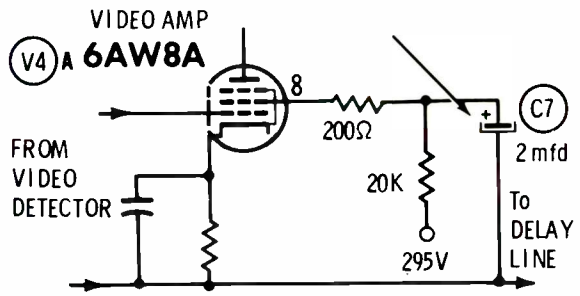
Symptoms and cures compiled from field reports of recurring troubles

Chassis—Motorola TS914
PHOTOFACT folder—798-2



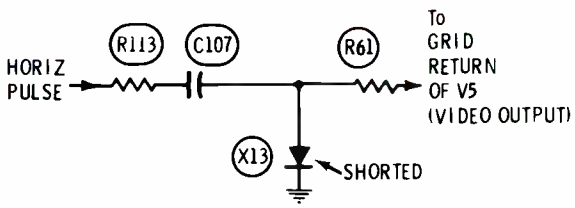
Symptom—no color; no plate voltage on pin 6 of V14
Cure—check for open transformer L24 or shorted C110 and burned R164

Chassis—Sears 562.10130
PHOTOFACT folder—806-3



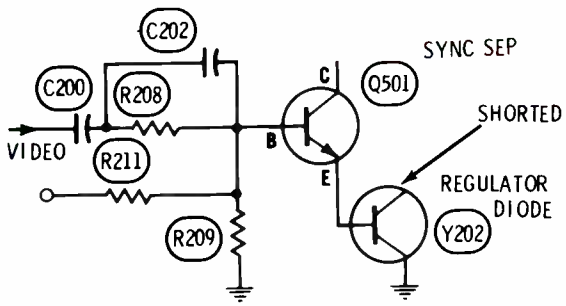
Symptom—smeared picture and poor vertical locking
Cure—test C7 by replacement; the value is not critical

Chassis—Sylvania DO6-1
PHOTOFACT folder—922-3



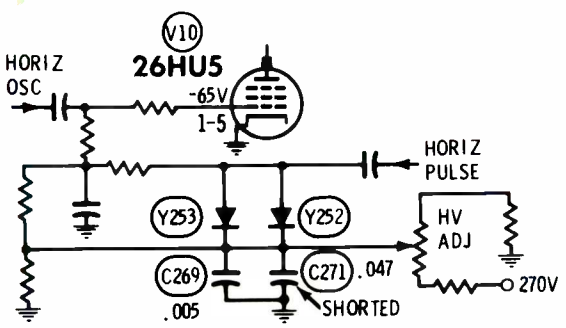
Symptom—black, vertical bars on left side of screen
Cure—check diode X13 and replace, if shorted

Chassis—General Electric C-1
PHOTOFACT folder—1100-2



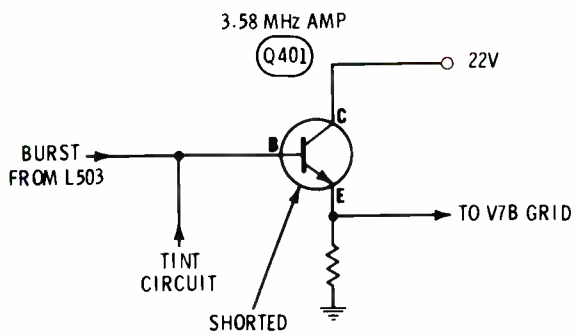
Symptom—no vertical or horizontal locking
Cure—check diode Y202 and replace, if shorted

Chassis—General Electric C-1
PHOTOFACT folder—1100-2



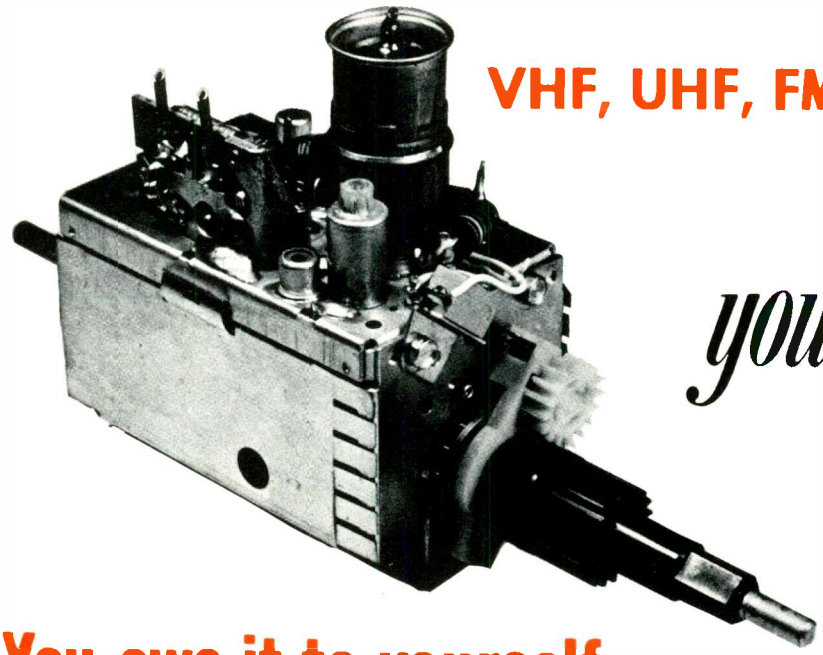
Symptom—dim raster; reduced high voltage
Cure—check C271 and replace, if shorted

Chassis—General Electric C-1
PHOTOFACT folder—1100-2



Symptom—missing or weak color
Cure—check transistor Q401 and replace, if shorted

TV TUNER SERVICE



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you get...

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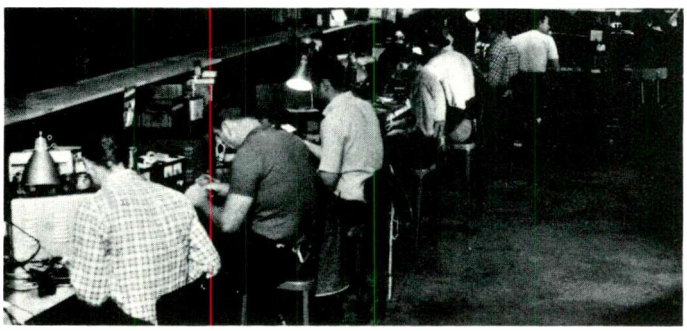

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servicebulletin

a digest of info from manufacturers

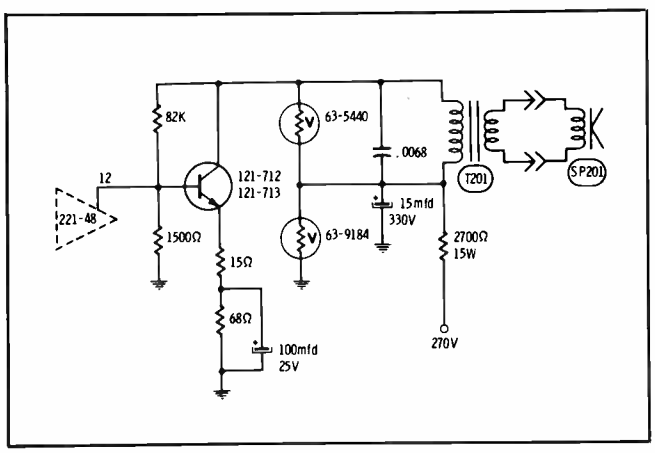
New high-voltage regulator tube
Magnavox T958 and T962 color TV chassis

The new 6EN4 high-voltage regulator tube is used in all productions of the T958 chassis and has been used in some of the T962 chassis.

Magnavox recommends the 6EN4 as replacement for the 6BK4/6EL4 type. However, the 6BK4/6EL4 cannot be used in any chassis designed for the newer 6EN4 tube, because the grid is brought out to a different pin. The grid of the 6BK4 is pin 5; pin 6 is used for the grid for the 6EN4. If a 6BK4/6EL4 is installed in a chassis designed for the 6EN4, the high-voltage hold-down circuit will limit the high voltage to 18KV.

Replace VDR when transistor is replaced
Zenith 4B25C19 or 19CC19 TV chassis

If replacement of the audio output transistor is necessary, Zenith recommends that the varistor (VDR) which is in parallel with the primary of the audio-output transformer should be replaced at the same time. The transistor part number is 121-712 or 121-713, and the part number of the varistor is 63-5440.



Do not service the receiver without a speaker or a load resistor connected across the speaker output leads, because the output transistor and the varistor can be damaged by the high peak voltages which can result.

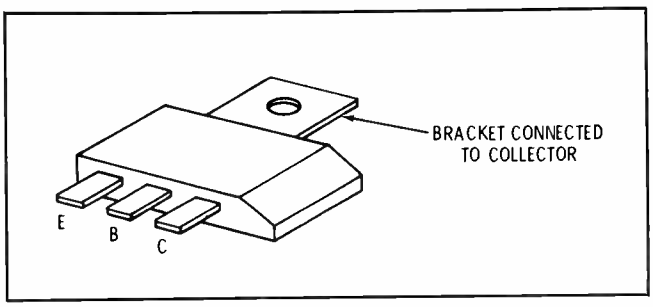
Circuit change to prevent repeated failure of power supply diodes
General Electric KE color TV chassis

Add a .001-mfd 1KV capacitor (furnished by GE with the diode) in parallel with both CR109 and CR110 power supply diodes when the diodes are replaced.

These capacitors help protect the diodes against line-voltage transients.

Design of audio-output transistors changed
Zenith late-production color TV chassis

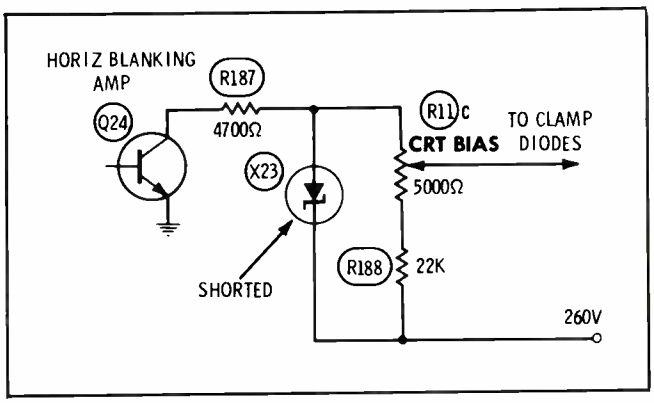
The original-equipment, matched-pair audio-output transistors used in these chassis have clips which press the transistors against an aluminum shield, for better heat dissipation.



Replacement transistors, Zenith part number 964-27986, have an adequate heat sink that is part of the transistor and is connected internally to the collector. These extruded flat brackets, projecting from the tops of replacement transistors, should NOT be clipped to the aluminum shield, because this would short the collector circuit.

Excessive brightness
RCA CTC40, CTC44 or CTC47 color TV chassis

Excessive brightness symptoms, such as retrace lines or screen too bright when brightness and screen controls are turned down completely, might be caused by leakage or a short in zener diode CR712 (X23 in PHOTOFACT Folder 1111-3).



An ohmmeter test of the zener diode should be sufficient to detect such leakage. ▲

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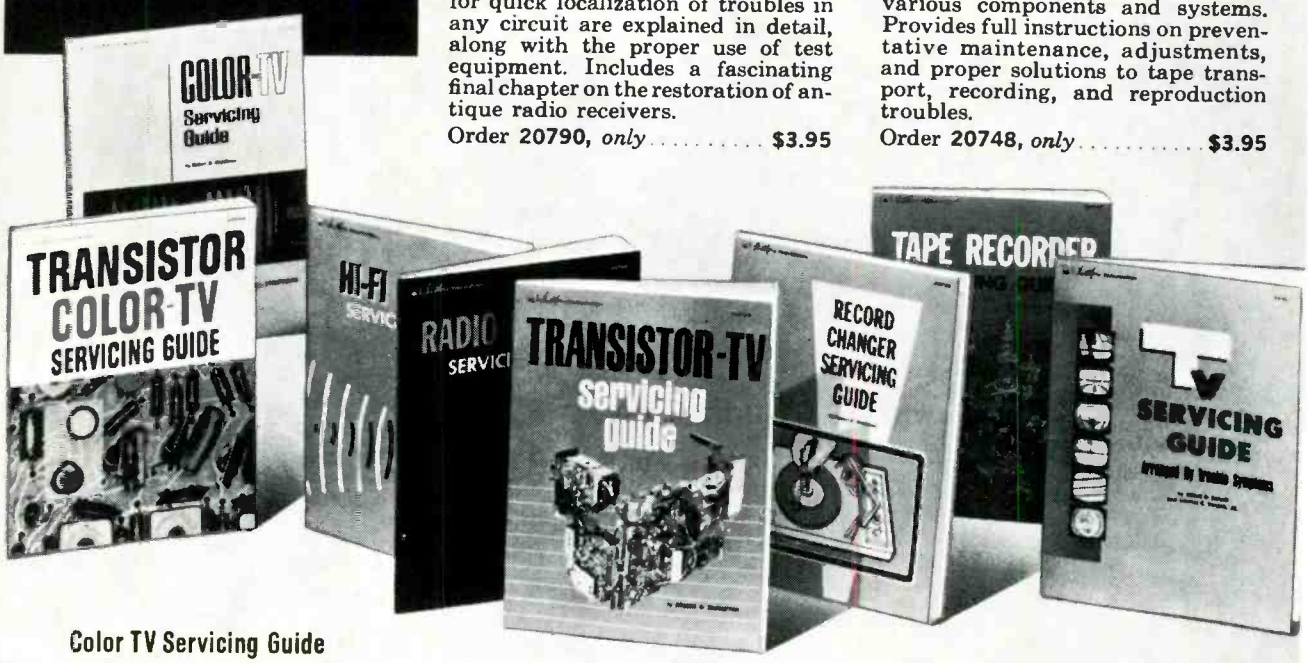

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troubleshooter

Varistors and Thermistors—Operation and Testing

by Carl Babcoke

Conventional resistors can be tested with an ohmmeter, because their values are not significantly changed by reasonable variations of applied voltages or their operating temperatures.

Other, less conventional types of resistors, such as varistors (VDR) and thermistors, are not so easily measured, because they are designed so that their values change a predictable amount when the internal temperature or the voltage applied to them is varied. A varistor is a type of resistor which is designed to change resistance when the applied voltage is changed. A thermistor is a type of resistor whose resistance varies with temperature. The symbols for varistors and thermistors are shown in Fig. 1.

Characteristics Of Varistors

Ordinary resistors have linear characteristics. If the voltage which is applied to such a resistor is doubled, the current is doubled. Application of 10 times the original voltage also causes the current to increase 10 times.

By comparison, doubling the voltage applied to a varistor, which is a nonlinear device, might cause 8 times the original current flow. To say this another way: the higher the applied voltage, the lower the resistance of a varistor. A varistor attempts to maintain a constant voltage across itself.

Testing Varistors

Varistors are manufactured in many different wattages, shapes and resistances. However, a detailed study of just one type should provide us with enough information to guide our troubleshooting tests.

A varistor which often is teamed with a thermistor in many degaussing circuits was measured in the ELECTRONIC SERVICING laboratory. Factory ratings of the varistor were 8 volts at 15 milliamps: no resistance was specified.

Ohmmeter readings

The resistance of the varistor as read on the ohmmeter function of a VTVM depended on the scale used, because the voltage applied to the varistor was different in each case. The readings obtained are shown in Table 1, along with the voltages applied to the varistor by the VTVM on different ohmmeter scales.

According to Ohm's law, this varistor should have measured 530 ohms at 8 volts (a voltage level a VOM or VTVM cannot supply). An ohmmeter test of a varistor obviously cannot give accurate readings. And, because the characteristics of the varistor are nonlinear, the ohmmeter reading cannot be multiplied by a conversion factor to achieve better accuracy.

However, a nearly equal reading between a new varistor of the same ratings and the suspected one should serve as proof the varistor is not defective, if there are no visible signs of damage.

Voltage vs current tests

Because the varistor was rated in volts and milliamps, a graph of voltage and current seemed the best way to display these relationships, as shown in Fig. 2B. The curve on the graph appears to be exponential, and would have become more steep if the voltage had been increased.

During routine servicing, the current through the varistor should be checked only at the **rated** voltage. One measurement is sufficient, unless you are not certain it is a varistor. In that event, the current should be measured at several levels of applied voltage, to determine if the response is linear (normal resistor) or exponential (varistor).

A graph of resistance readings

Resistance readings made with the rated voltages applied are not very practical. However, computation by Ohm's law can give us a graph of resistance readings from the voltage and current values graphed in Fig. 2. A graph produced by such computations is shown in Fig. 3.

Varistors are voltage regulators

Because an increase of voltage causes the resistance of a varistor to decrease, a varistor can be used in a voltage divider circuit as a voltage regulator. The percentage of regulation is not so high as that obtained with zener diodes, but a varistor can withstand arcs or other temporary overloads without damage.

Fig. 4 shows the voltage regulator circuit and a graph of the voltages obtained when the supply voltage was varied.

Varistor Circuits That Rectify

Under certain conditions, a varistor can be substituted for a diode in a rectifier circuit, and a positive or negative DC voltage produced.

Varistors will not rectify sine or other symmetical waves

Fig. 5A shows the schematic of a shunt rectifier circuit. Polarity of the DC voltage at the output is **positive,** although rectifier current

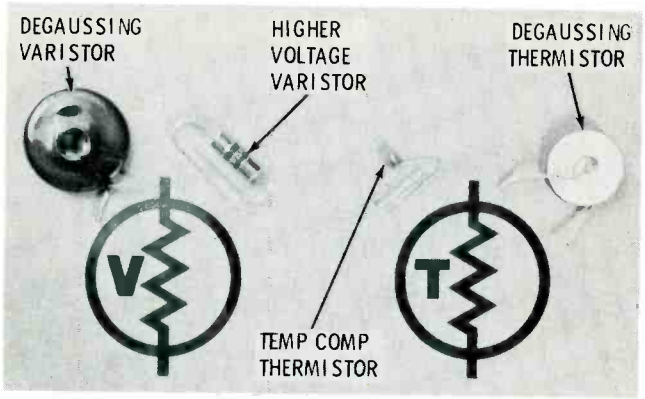


Fig. 1 Examples of varistors and thermistors and their symbols.

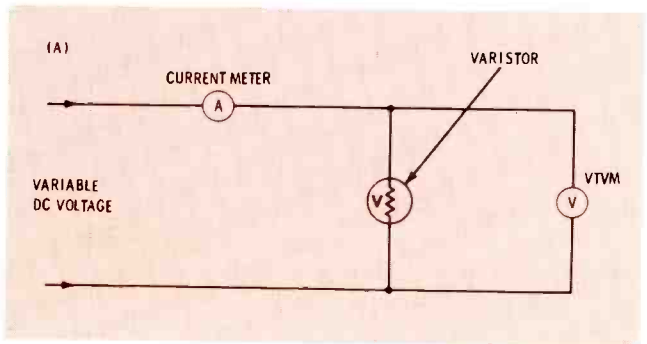
Table 1

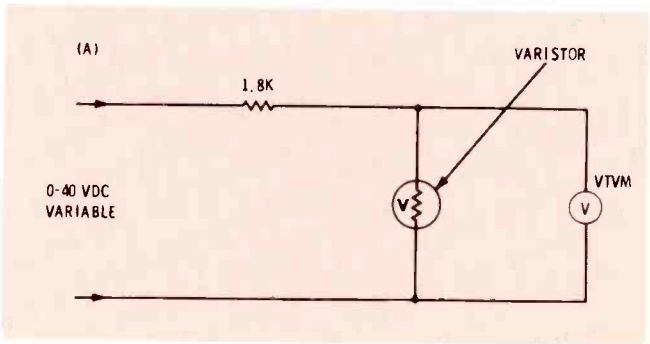
X10 scale	about 10K	1.5 volts
X100 scale	10K	1.4 volts
X1000 scale	14K	.9 volt
X10K scale	20K	.26 volt

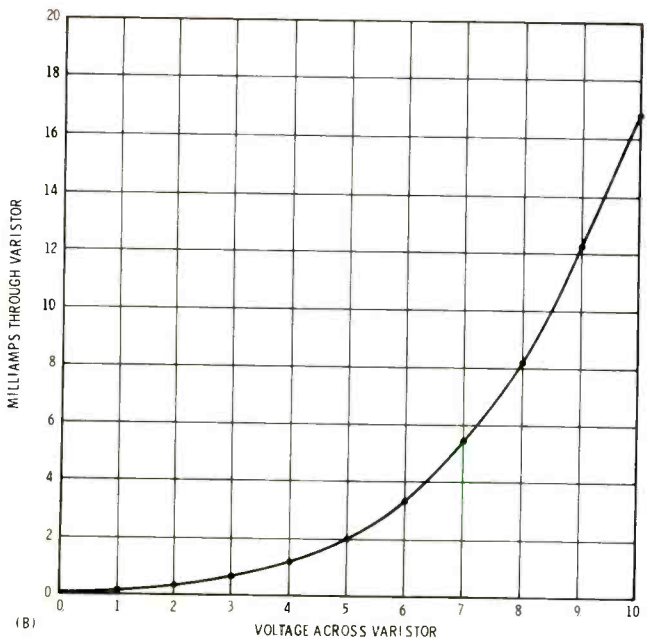
Fig. 2 One way of testing varistors is by the voltage-current method. A) Circuit used to test varistors by voltage and current. B) Parabolic graph obtained when the applied voltage and resulting current are plotted.

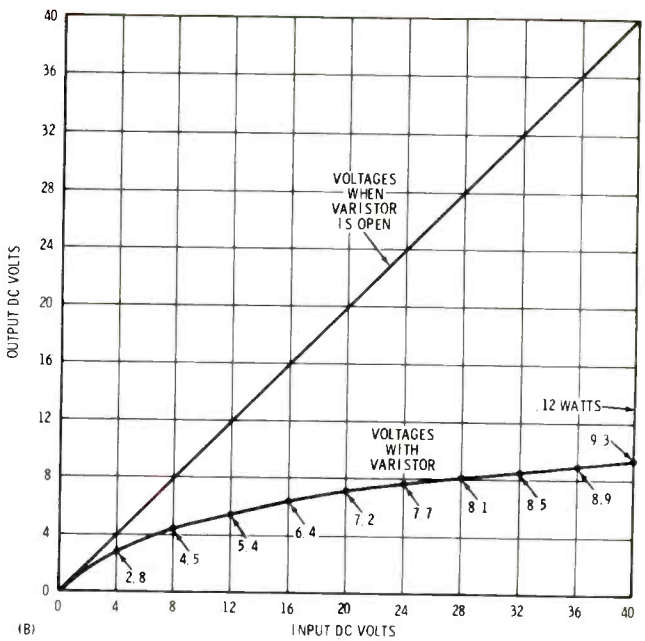
Fig. 3 A graph of applied voltage versus resistance can be computed by Ohm's law, using the values in Fig. 2.

Fig. 4 Because a varistor attempts to maintain a constant voltage across itself, it is a type of voltage regulator.









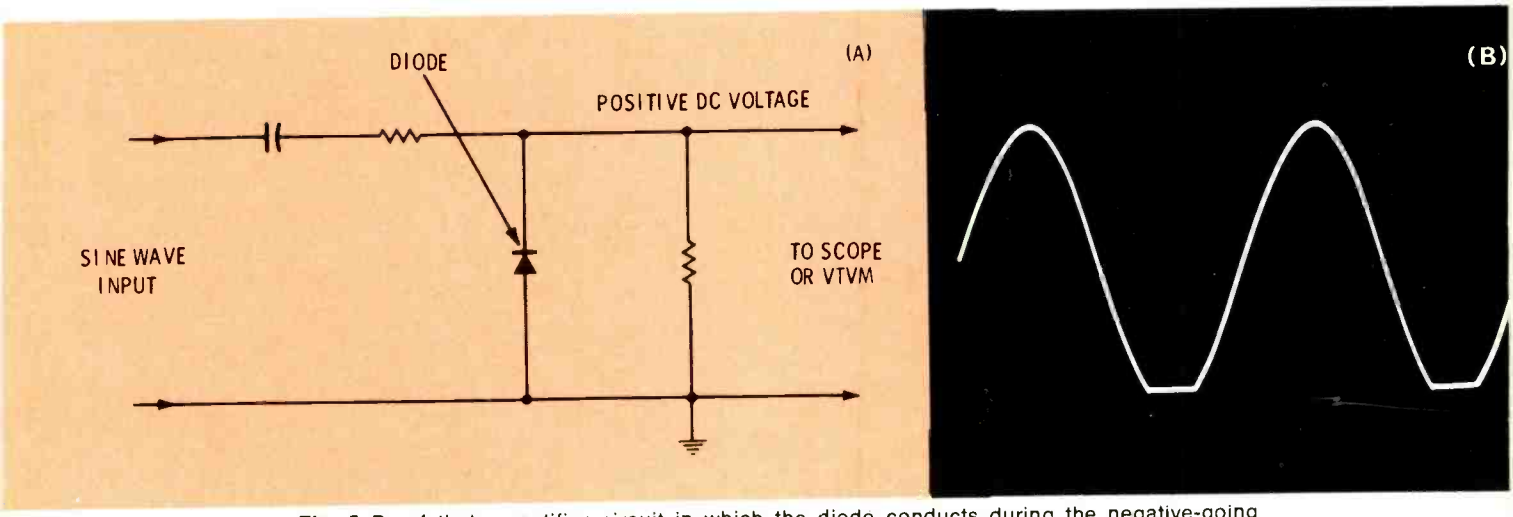


Fig. 5 Proof that a rectifier circuit in which the diode conducts during the negative-going peak of the waveform produces positive voltage. A) Circuit used for waveform and voltage measurements. B) Scope waveform showing that, because of the clipped negative peak, diode current during the negative peak produced positive DC voltage.

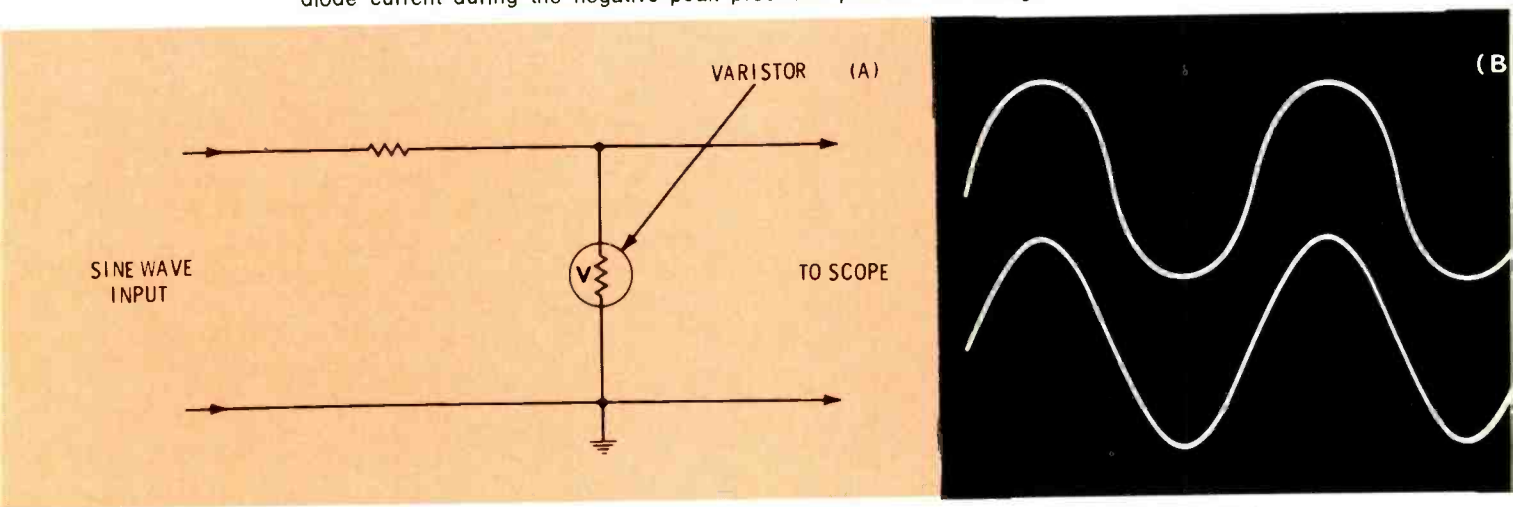


Fig. 6 A varistor passes the same amount of current whether the applied voltage is positive or negative, provided the amplitude of the applied voltage is the same. A) Circuit of a sine wave applied to a varistor. B) Bottom waveform is the input sine wave for comparison; both the positive and negative peaks of the top waveform have been rounded by varistor current. The existence of identical positive and negative alterations prove that a varistor has no diode characteristics.

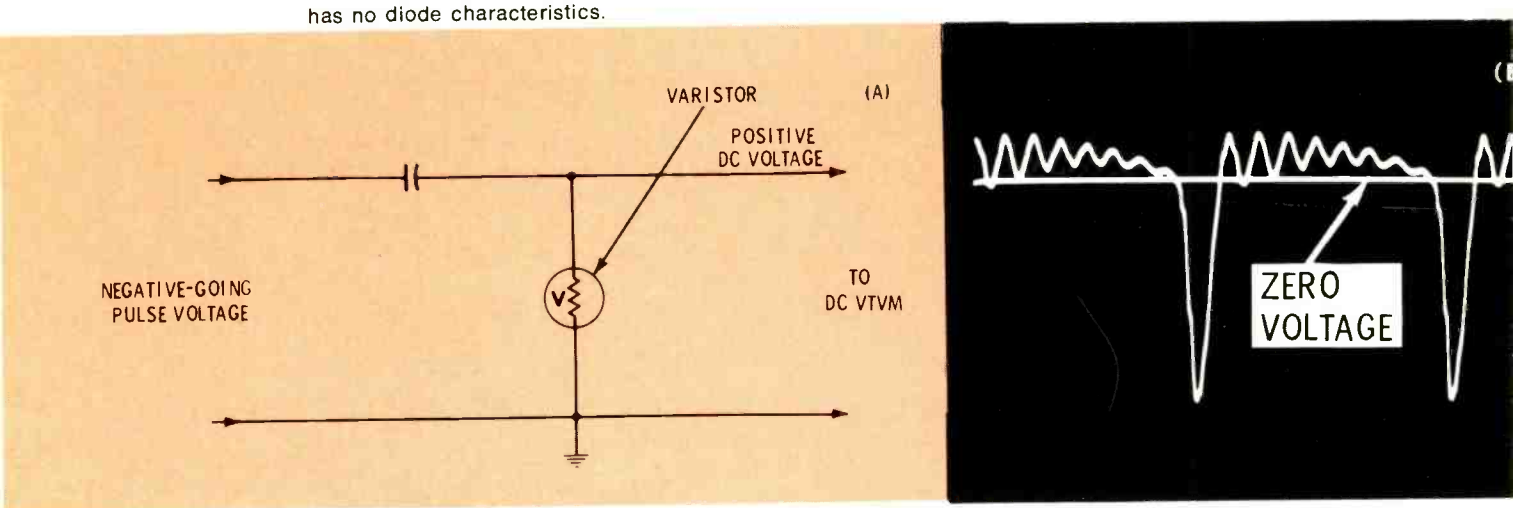


Fig. 7 DC voltage can be obtained from varistors, if the applied waveform is non-symmetrical. A) Circuit which produced the waveforms and DC voltages. B) Scope waveform of the input signal, showing the true zero voltage line. The negative-going voltage is greater than the positive-going.

occurs at the tip of the **negative** peak, as shown in Fig. 5B by the clipping of the lower tip.

We can conclude, therefore, that any similar rectifier circuit which mainly draws current from the negative tip of the input waveform will produce a positive voltage (and vice-versa). Let's sidestep this conclusion for a time and examine another characteristic of varistors.

A varistor operated in the circuit shown in Fig. 6A did **not** produce any DC voltage. The waveform across the varistor exhibited equal rounding of both the positive and negative peaks, as shown in Fig. 6B. Substitution of a coupling capacitor for the series resistor produced no DC voltage; however, the waveform tilted somewhat, the amount depending on the value of the capacitor. These experiments prove that the current through the varistor is the same for negative as for positive voltages. In other words, a varistor has no diode characteristics, and will not rectify a sine wave or any other **symmetrical** waveform.

Varistor will rectify pulses

The circuit shown in Fig. 7A is the same as that in Fig. 6A, except that the resistor in Fig. 6A was removed and a capacitor substituted. When the 24-volt PP, negative-going pulse shown in Fig. 7B was applied to the circuit, a +3.7 volts was produced at the output.

"Rectification" produced a DC voltage in this example because the input waveform was not symmetrical. We cross-switched the leads to the varistor, but the output voltage remained positive. However, when a positive-going input pulse was substituted, the output voltage was negative.

These results are proof that pulses can be "rectified" by a varistor, but further facts are needed to explain why it is true.

Across the top of the negative-going waveform shown in Fig. 7B is a line which indicates true zero voltage in a capacitance-coupled circuit. The photograph is a double exposure: first, a normal waveform picture was made when the scope was adjusted for AC input (through a coupling capacitor). Next, the scope probe was disconnected from the rectifier circuit, and a second exposure was made on the same film, to show the true zero-voltage line.

Any varistor draws the same amount of current regardless of whether the pulse is positive or negative, provided the shape and PP amplitude are identical. When the input to the circuit was the waveform shown in Fig. 7B, the varistor drew current from both positive and negative peaks. However, because the waveform is not symmetrical—there is much more voltage below the zero-voltage line than above—the positive voltage developed by the negative-going varistor current is dominant over the lesser negative voltage produced by the smaller positive peak. The net output is a small amount of positive voltage. By way of comparison, a diode, substituted for the varistor, produced +17 volts when connected in one polarity and −2.3 volts when the connections were reversed.

Color TV Circuits Which Use A Varistor For "Rectification"

A circuit which should be familiar to many technicians is shown in Fig. 8. It is part of the vertical sweep circuit used in many RCA color receivers. (The first of these varistor-equipped circuits was introduced in 1963).

The function of the circuit is to change automatically the bias of the vertical output tube, to compensate for any small drift in the height. It is, in effect, a one-tube AGC circuit.

The varistor rectifies the huge non-symmetrical pulse coming from the plate of the vertical-output tube, producing an output of −30 volts. This negative voltage is filtered by R133 and C95 and applied to the grid of the output tube. A slightly larger positive voltage from the height control is added to the same grid. The net result is a positive voltage on the grid; however, because the cathode is even more positive, the tube normally is still held below cutoff until the application of a drive signal from the oscillator.

With this circuit arrangement, if the output tube weakens, for example, the reduction of the PP amplitude of the positive-going plate pulse causes the varistor to produce less negative voltage; consequently, the voltage on the grid of the output tube becomes more positive and the effects of the weakened tube are partially cancelled out.

The −30 volts produced by the varistor cannot be measured on a chassis that is operating normally, because it is usually cancelled out by the positive voltage from the height control. The DC voltage at

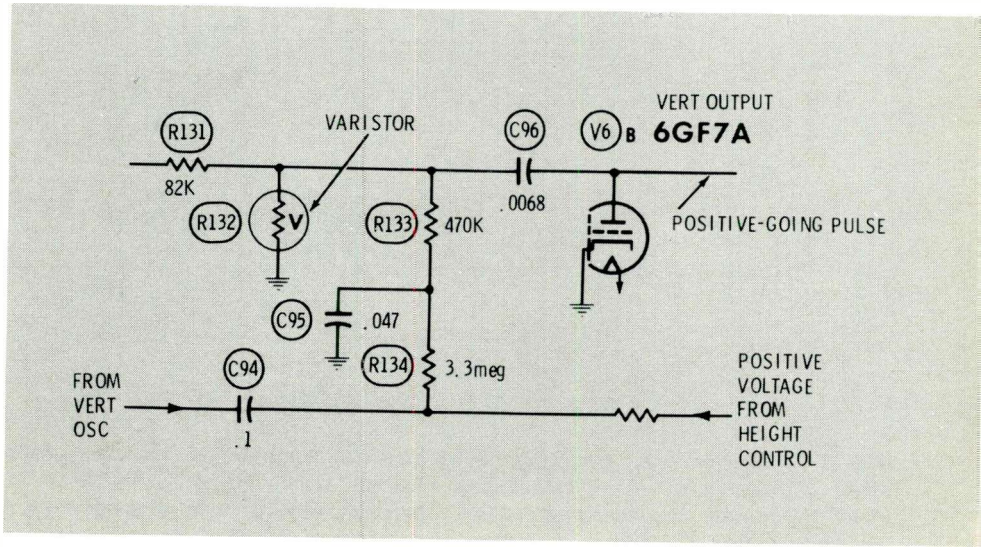
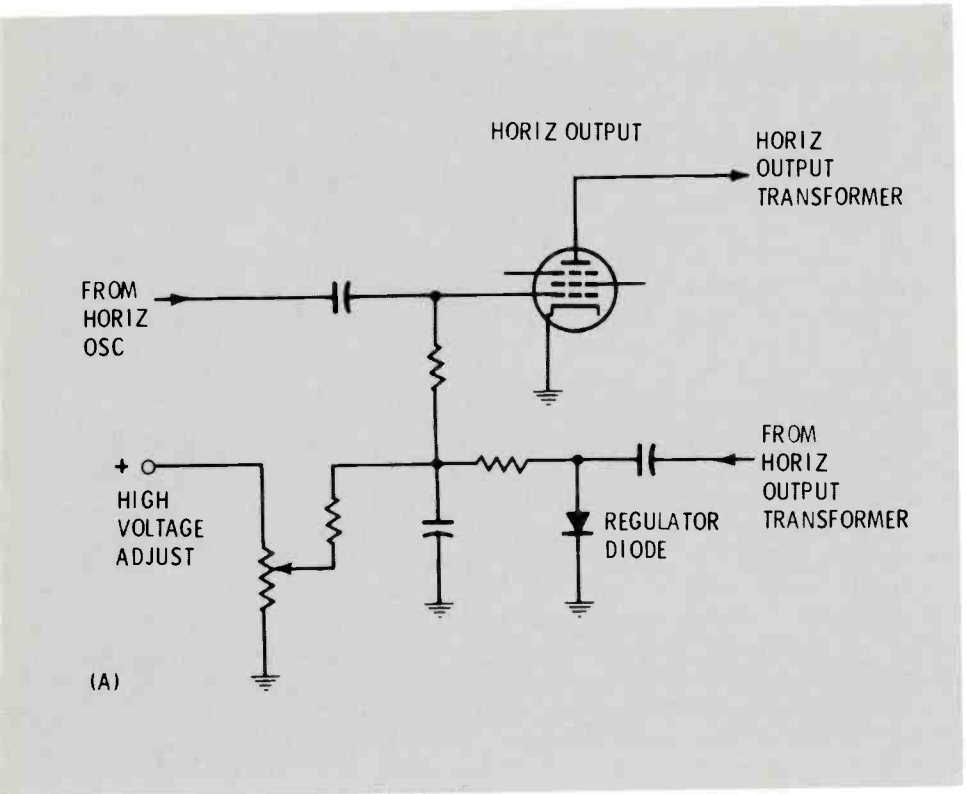


Fig. 8 Schematic of part of the vertical-output stage in the RCA CTC38A color TV chassis. The varistor "rectifies" the positive-going pulse from the plate of the output tube, producing a negative voltage, the amplitude of which varies with the amplitude of the pulse. This variable negative voltage changes the grid voltage of the output tube, to partially cancel any change in height.



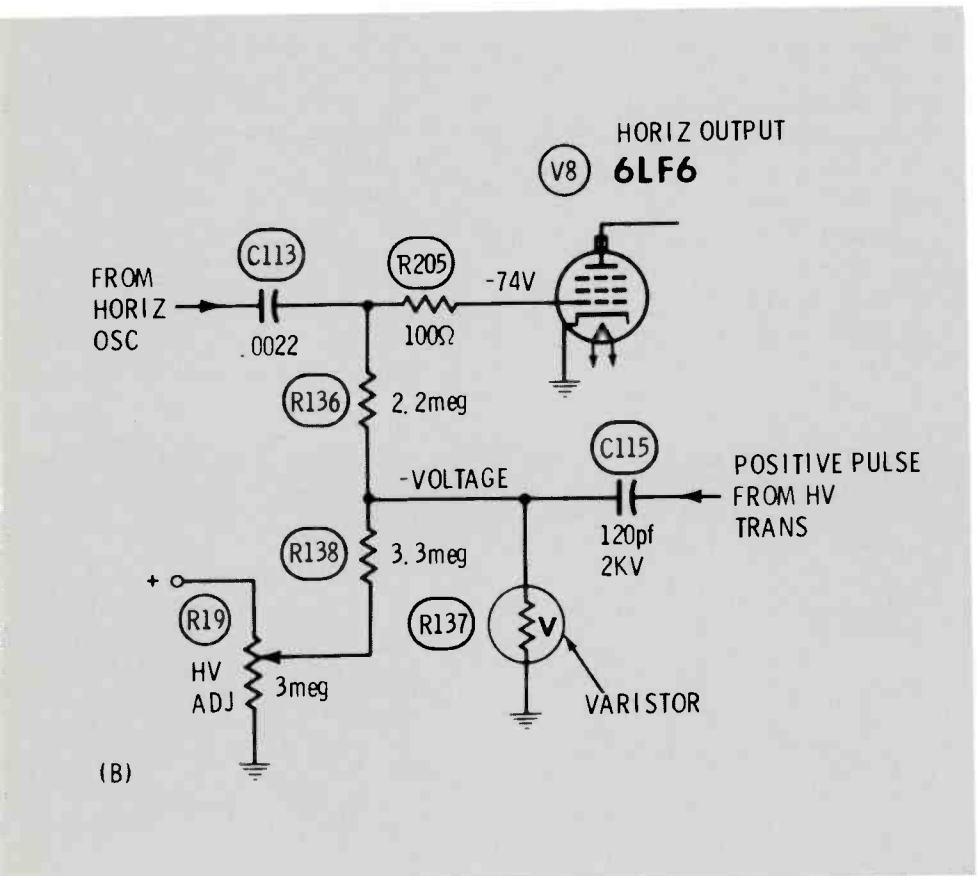


Fig. 9 A) Conventional, grid-type, high-voltage regulator system employs silicon diode. B) Schematic of the high-voltage regulator circuit in the Zenith 12A10C15 color TV chassis. The varistor "rectifies" the positive-going pulse obtained from a winding on the high-voltage transformer, producing a negative voltage which normally varies according to the amplitude of the pulse. Because voltage from the high-voltage control cancels part of the negative voltage, changes in the negative voltage become larger in proportion when the pulse increases only slightly. It also determines the maximum plate current in the output tube, which, in turn, determines the amount of width and high voltage.

the varistor will be less positive than that found at the grid.

If you doubt that the varistor actually produces a negative voltage, just disconnect R133 from C96 and ground the loose end of R133. Then measure the voltage at the varistor. It will be negative.

An open varistor in this circuit would significantly increase the height. If you suspect that the varistor is defective, remove it and substitute a fixed resistor of about 470K. There will be no automatic height control, but the sweep should be normal otherwise.

Varistors Used in High-Voltage Regulator Circuits

Conventional high-voltage regulator circuits which vary the grid bias of the horizontal-output tube to regulate the sweep power and high voltage use a silicon diode to rectify the horizontal pulse, as shown in Fig. 9A. The negative voltage thus obtained was usually "balanced" by a positive voltage from the high-voltage adjustment control. The resultant voltage is connected to the "low" end of the grid resistor of the horizontal-output tube.

If the high voltage and pulses from the high-voltage transformer increase, the conduction of the diode also increases, producing a negative voltage, which, applied to the grid, reduces the maximum plate current of the horizontal-output tube. In this manner, the horizontal sweep power and high voltage are reduced to almost the same level that existed before the increase.

We might also call this a one-tube AGC circuit; however, the primary objective is to regulate the current (power), not the gain of the tube.

Many later chassis designs have substituted a varistor for the diode, as shown in Fig. 9B. Operation is the same except that a higher pulse is needed to produce the same amount of negative voltage. Because of the difference in pulse amplitude required, you should not substitute a varistor in a circuit originally designed for a diode, or vice versa.

Varistors are usually stable and dependable. For example, varistors are nearly immune to damage from high-voltage arcs or other transient voltages which would destroy a diode. Undoubtedly, this accounts

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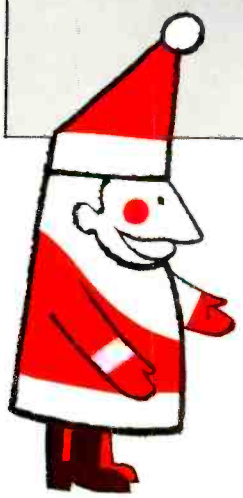

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for their increased use in circuits in which a diode previously has been used.

Testing Thermistors

The resistance of a thermistor changes according to the internal temperature. The resistance of most of those used in TV or stereo products decreases when the temperature is increased (negative temperature coefficient).

Although thermistors in fragile glass "beads" are used in electronic thermometers, the thermistors found in home entertainment products are usually more rugged and their performance less critical. Therefore, a satisfactory test of a thermistor can be obtained by merely checking, at two or three easily duplicated temperatures, the resistance as measured on an ohmmeter.

For example, one small thermistor is factory rated at 270 ohms @ 25 degrees Centigrade (77 degrees Fahrenheit) and 39.7 ohms @ 75 degrees Centigrade (167 degrees Fahrenheit). (To change Centigrade readings to Fahrenheit, multiply by 9/5 and add 32.) At a room temperature of approximately 73 degrees Fahrenheit, the resistance measured 250 ohms. When the thermistor was squeezed between two fingers for about a minute, the resistance decreased to 190 ohms. A small soldering iron was touched to the leads of the thermistor and the resistance slowly decreased to 24 ohms. At this time, the thermistor was uncomfortably hot to the touch.

Another large thermistor, designed for surge duty in series with the primary of the power transformer in a color receiver, was tested in a similar fashion. Room temperature produced a resistance reading of 76 ohms, finger heat reduced the reading to 60 ohms, and heating the leads with a soldering iron decreased the resistance to 1.6 ohms, which is approximately the "hot" resistance obtained in normal use.

The recommended ohmmeter tests using these three easily obtained temperatures are sufficiently accurate for evaluating the condition of thermistors used in television and stereo receivers. ▲

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Because tubes are tubes, we can't promise to reduce the number you'll have to carry. But, with the Sylvania line, chances are your distributor will have the tube you need when you need it.

In semiconductors, the story is different. Just 124 ECG solid-state devices including transistors, diodes and integrated circuits will replace over 41,000 different types. In the vertical and horizontal sections alone, only 6 ECG solid-state devices will take care of almost every job.

And they save a lot of space in your tube caddy.

When your distributor is stocked with Sylvania receiving tubes and ECG semiconductors you'll have the parts you need. And you'll get them fast.

It's like having a complete warehouse built into your telephone.

And that should take some of the dog work out of your job.

GTE SYLVANIA

Circle 16 on literature card

test equipment report

CRT Tester/Rejuvenator

A new cathode ray tube tester/rejuvenator, for checking color and b-w CRT's without removing them from the chassis, has been introduced by Leader Instruments Corp.

Model LCT-910 compares color gun emission and grid cutoff characteristics, and rejuvenates the picture tube to proper emission and brightness along with the ability to "super rejuvenate" for added tube life, according to the manufacturer. It reportedly also repairs shorts, opens and leakage between elements and will predict useful tube life via meter readings.

Other features include: continuously adjustable element voltages, for "as needed settings"; automatic rejuvenator rate control; RC timer; 0 to 40-volt heater potentials available; 117 VAC, 60-Hz operation; 4½-inch scaled meter.

The LCT-910 reportedly is self-contained in a high-impact, grained vinyl carrying case with handle. The case has 8 rubber bumpers for vertical or horizontal use.

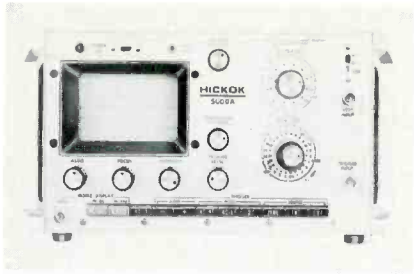
The unit is supplied with plug-in sockets to facilitate test procedures. Size is 13 inches x 8½ inches x 5 inches and weight is approximately 12 pounds.

Price is $129.50.

Circle 50 on literature card

25-MHz Bandwidth Oscilloscope

A new wide-band oscilloscope,



with a vertical bandwidth from DC to 25 MHz (–3 dB point), has been introduced by the Hickok Company.

Model 5000A reportedly has a built-in vertical delay line which provides 50 nanoseconds of display prior to the triggering point on the input waveform.

Specifications include: 3-percent calibrated vertical sensitivities from 10 millivolts to 50 volts per division in 1, 2, 5 sequence; input impedance of 1 megohm, 30 picofarads; overload protection up to 600 volts (300 volts for sensitive ranges); rise time of 14 nanoseconds; sweep speed from 50 nanoseconds to 2 seconds per division in a 3-percent calibrated 1, 2, 5 sequence.

The 5000A measures 6⅞ inches x 11¼ inches x 19 inches and weighs 24 pounds.

The price is $595.00.

Circle 51 on literature card

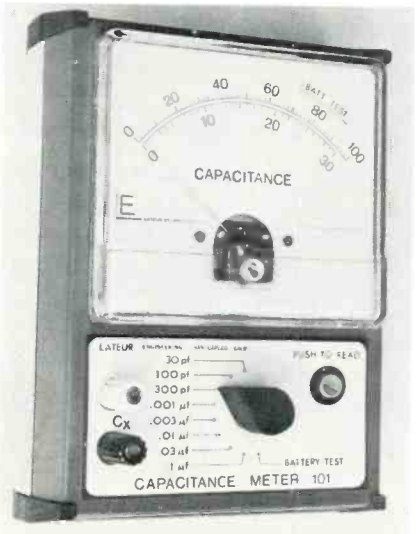
Direct-Reading Capacitance Meter

A direct-reading, portable, battery operated instrument capable of measuring capacitors with values from 2 pf to .1mfd has been developed by Lateur Engineering Co.

Capacitance is determined by switching the unit through each of eight ranges until a reading is indicated on the meter.

Model 101 is 5 inches x 7 inches x 2 inches and weighs 1¾ pounds. Price of the unit is $94.50.

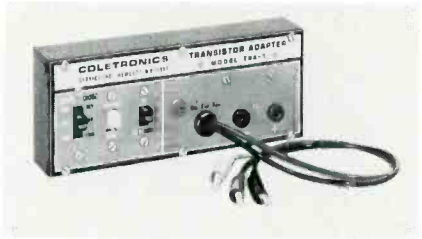
Circle 52 on literature card



Adapter Converts VOM To Transistor/Diode Tester

An adapter which reportedly converts any VOM into an in- or out-of-circuit transistor and diode tester has been announced by Coletronics.

Model TRA-1 Adapter reportedly permits measurement and/or detection of shorts, leakage, opens and beta of both high- and low-power PNP and NPN transistors, and open and shorts and forward and reverse currents of diodes. A switching system reportedly eliminates the need for transferring of leads during front-to-back resistance measurements of diodes.



(Continued on page 24)

(Continued from page 23)

The two leads of the VOM are plugged into their respective jacks on the front panel of the adapter. The results of tests are read directly from the meter of the VOM. The transistor to be tested is either plugged into a socket on the front of the adapter or three color-coded leads protruding from the front of the adapter are connected to the respective elements of the transistor or diode.

The unit operates from two "AA" batteries, which are included with it.

Price is $15.95.

Circle 53 on literature card

Wheatstone Fault Location Bridge

A new Wheatstone bridge, Model 2103, that can be used for DC resistance measurements and also for finding faults in multi-conductor cables, has been introduced by the Special Instruments & Machinery Co.

Resistances from 0.09 ohms to 110K ohms reportedly can be measured with an accuracy of 0.5%, in six ranges. Shorts between conductors and ground faults in cables with low or high resistance, as well as common ground faults of all conductors and differences between conductors can be detected and

measured with the bridge, according to the manufacturer.

The 2103 bridge is supplied with a galvanometer, battery and two cables. It has an 11-inch circular dual scale with sub-divisions from 0.9 to 11 for resistance readings and from 0 to 55 percent for fault localization.

Model 2103 weighs 2.5 pounds, and sells for $180.00. A carrying case with cable compartment is available for $18.00.

Circle 54 on literature card

Digital VOM

A 3½-digit digital VOM which can be used as a portable test instrument or can be panel-rack-mounted is being marketed by Triplett Corp.

Model 8035 features: a chopper-stabilized amplifier which provides a high input resistance of 10 megohms on all AC and DC ranges; drift-free stability circuitry; 7-bar fluorescent tube display with wide-angle viewing window; ±.1 percent, ±.2 percent, ±.25 percent accuracy on the DC voltage, AC voltage and ohmmeter ranges, respectively; frequency compensated on AC voltage range; Automatic Polarity display; 100-percent over-range (1999 counts) and out-of-range display blanking, preventing any erroneous reading. The instrument also is capable of precision measurements of AC or DC current.

The compact digital VOM weighs 4½ pounds and is 3½ inches by 8⅛ inches x 10 inches.

The readout display of Model

8035 consists of four plug-in, type-seven bar fluorescent display tubes; a movable decimal point; and plus/minus autopolarity symbols. A green circularly polarized window reportedly provides maximum light transmission from the display tubes while minimizing internal reflection caused by ambient light. The plug-in type readout tubes can be easily removed when maintenance is required, according to the manufacturer.

Front panel controls of the compact test instrument include a DC offset adjust and power switch, located on the lower left portion of the front panel; two input terminals, marked "Input" and "Com", which are used for all measurements; two function selector push-button switches marked DC-Ω, for DC and ohms, and the other marked AC, for AC voltage and current measurements. The range selector panel, in the upper right portion of the 8035, is suitably labeled voltage, current and ohms. A single, molded polarized plug is used for current input terminal connection.

All the electronic circuitry of the Model 8035 DVOM is designed for easy serviceability, and is mounted on one circuit board which is supported by the side panels, according to the manufacturer. The metal case of lightweight aluminum reportedly also has good electrical shielding characteristics, which permit the unit to be operated in high-noise areas.

A unique cord rack located on the rear of the digital tester provides cord storage when the instrument is being transported or not in use and also takes up cord slack when the instrument is in use.

DC Voltage Ranges are: 0-.1, 1.0, 10, 100 and 1000 VDC. Accuracy is ±.1 percent reading (RDG), ±1 Digit. Full-scale step response is 1 second nominal.

AC Voltage Ranges are: 0-.1, 1.0, 10, 100, 1000 VAC. Basic accuracy is ±.2 percent reading (RDG), ±1 digit. Full-scale response is 3 seconds.

Ohmmeter Ranges are: 100, 1K, 10K, 100K, 1 megohms and 10 megohms. Basic accuracy is ±.25 percent reading (RDG), ±1 digit.

Current AC & DC Ranges are: 100 μA, 1mA, 10mA, 100mA and 1000mA.

Basic accuracy is **DC:** ±.2 percent reading, ±1 digit.

AC: ±.5 percent reading, ±1 digit.

Full-scale response is DC, 1 second; AC, 3 seconds.

The basic measuring circuit of the new Triplett test instrument consists of a 100-millivolt, 3½-digit DC voltmeter which utilizes dual-slope integration and a chopper-stabilized amplifier to provide accuracy, long-term stability and high-input impedance, according to the manufacturer. All ranges and functions are converted to a DC level for measurement by this circuit. All ranges are fuse protected to prevent damage from overloading.

Any measurement which produces an indication which is out of range of the unit (more than 1999 counts) will cause the three least significant digits to blank. This feature prevents erroneous readings.

The price of the Model 8035 DVOM is $385.00. It comes equipped with test probe, two alligator clips, instruction manual and warranty. ▲

Circle 55 on literature card

Varactor tuners—operation and servicing

by Bruce Anderson/ES Contributing Author

A look at RCA's and Sylvania's mechanicalless VHF and UHF tuners.

■ One of the more important developments in television receivers in the past couple of years is the varactor tuner. Because it is still relatively costly, compared to a standard VHF tuner, it isn't likely to take the industry by storm in the near future—no more than the transistor has completely replaced the vacuum tube. Nevertheless, at least two major US manufacturers, Sylvania and RCA, and one Canadian manufacturer, Electrohome, have introduced it in their top-of-the-line instruments.

Design and Servicing Features of the Varactor Tuner

The outstanding feature of the varactor tuner is the absence of any mechanical tuning devices within the tuner. While this may not seem particularly spectacular, the advantages to be gained are very real.

Design advantages

From the design standpoint, the bulk of the tuner can be reduced; its life expectancy is much greater because there are no moving parts; there is no deterioration of switch contacts because there are none in the tuner (although a switch might be used externally to control it); and there is no need to locate the tuner so that its shaft can extend through the front panel of the cabinet. And, there are no reasons why this tuner can't be placed right on the circuit board along with the rest of the receiver section.

Servicing advantages

From the servicing aspect, the absence of the wafer switches, or turret contacts, removes the need for tuner cleaning, which always has been a time-consuming job. And, because there are no internal switches, the remaining components inside the shield are more accessible than their counterparts in a standard tuner.

The RCA version, which is the only varactor tuner we have had an opportunity to work with, can be removed from the cabinet and replaced in less than five minutes. The UHF and VHF tuners are mounted on a single metal base, and the whole assembly is attached with one screw. There are three coaxial cables to unplug, and one six-pin plug to pull—no knobs, shafts, drum indicators, etc., to fight.

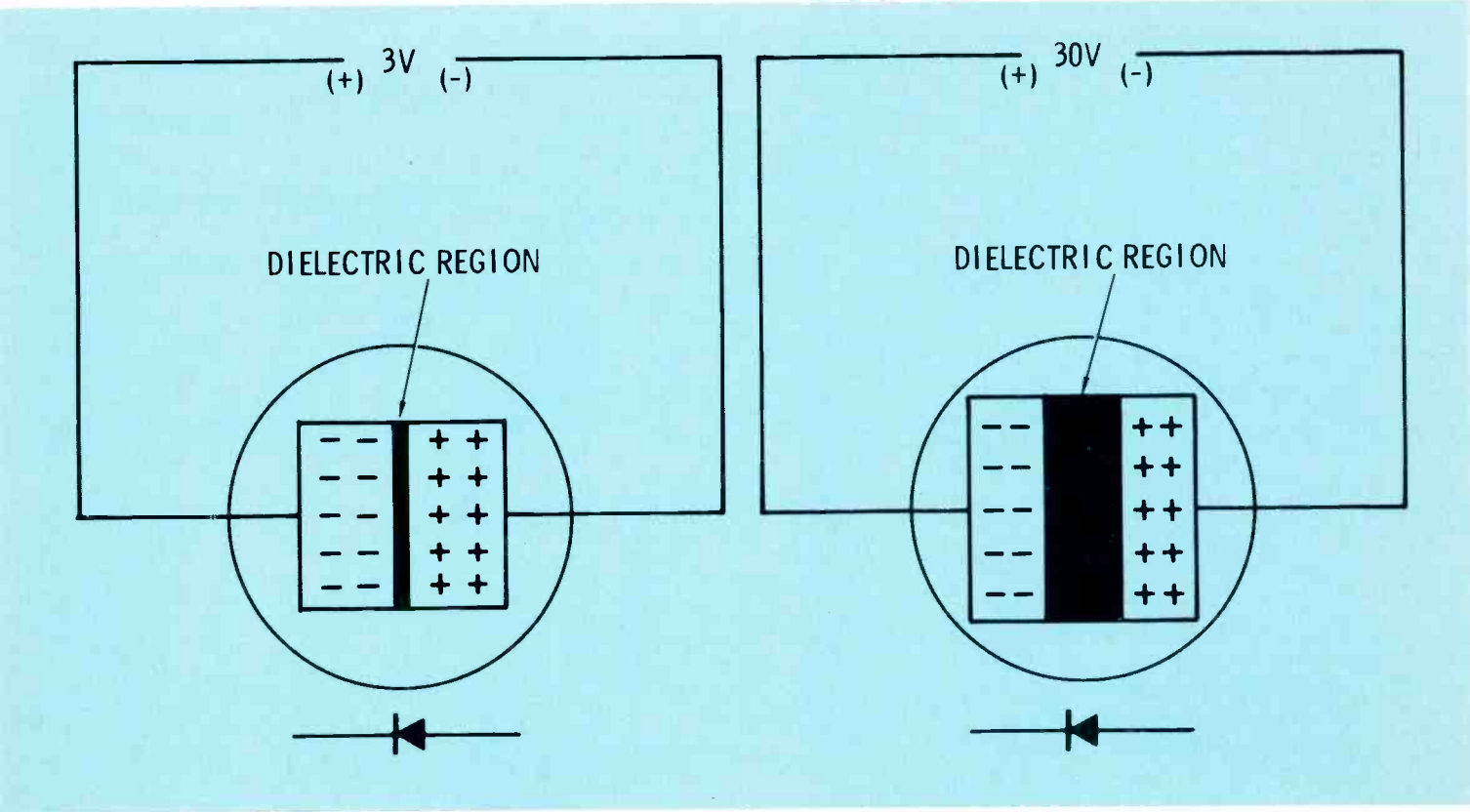


Fig. 1 Varactor diode with moderate reverse bias.

Fig. 2 Varactor diode with high reverse bias.

Varactors and Switching Diodes

In many ways, a varactor VHF television tuner is more similar to a radio tuner with bandswitching than it is to a conventonal TV tuner. The bandswitching is used to select electronically either the high band or the low band; within each band, tuning is continuous. The actual tuning is accomplished by varying the capacitance of the resonant circuits; but the conventional variable capacitor has been replaced by an electronic device called a **varactor,** a word coined from **variable reactor.**

How a varactor functions

In essence, a varactor is simply a reverse-biased, solid-state diode. Most "garden variety" diodes will exhibit the characteristic, although diodes used for this purpose are specially designed, for optimum operation.

Fig. 1 illustrates the conditions within a solid-state diode when it is reverse biased by a moderate voltage—perhaps 3 or 4 volts. Because the N-type cathode material is connected to a positive source, the free electrons are attracted away from the PN junction. Likewise, the negative potential applied to the P-type anode attracts the holes (positive current carriers) away from the junction. Thus there are three distinct regions within the semiconductor material: 1) Near the cathode terminal there are many negative current carriers; 2) near the anode terminal there are many positive current carriers; and 3) near the junction of N and P material there are no carriers at all.

The effect of the conditions within the diode are similar to those within an ordinary capacitor. Because the regions of the material which are rich in current carriers are separated by a region which has no current, we have, in effect, two conductors separted by a dielectric.

Varying the capacitance of a varactor

Fig. 2 illustrates the effect of increasing the reverse bias on the diode. Because the attraction of the carriers to the voltage sources is greater, the region around the junction, which becomes an insulator, is enlarged. In effect, the distance between the two capacitor "plates" has been increased, and the capacitance is less.

The amount of capacitance obtainable from a diode is relatively small. The capacitance produced by applying a very small reverse bias to the diode used as a varactor is somewhat less than 50 picofarads. With as much as 40 or 50 volts of reverse bias applied, the capacitance decreases to only 2 or 3 picofarads. In one tuner presently in use, the capacitance of the varactors increases from 5 picofarads with 20 volts of bias applied, to about 25 picofarads with 5 volts. In this same tuner, the range of the control, or tuning, voltage is from about 4 volts to about 20 volts. This 5:1 capacitance range is adequate to tune a resonant circuit across either the low band or the high band of the VHF television spectrum.

Bandswitching with diodes

Because of several design factors, it is simpler to switch the varactor tuner from low band to high band than it is to tune it continuously from channel 2 to channel 13. To accomplish this switching, the designers again rely on diodes, but here they are used as switches rather than variable capacitors.

Fig. 3 illustrates the general circuit configuration used for switching. When the switching diode is forward biased by applying to its anode a positive voltage from the band switch, it effectively connects the lower end of L1 to RF ground by way of C1, and the resonant circuit consists of L1 and the varactor diode. If the inductance of L1 is roughly .05 microhenrys, the varactor can tune the circuit across the high-band TV channels. (For convenience, the stray capacitance of the circuit has been ignored. Because the capacitances of C1, C2, and C3 are so large, they do not affect the tuning.)

If the supply voltage for Q1 is switched through L2, rather than through the bandswitch diode, the diode is cut off by the positive voltage supplied to its cathode, C1 is effectively disconnected from L1, and L2 is connected in series with L1. If the inductance of L2 is about 0.74 microhenry, the total inductance is about .8 microhenry, and the varactor can tune the circuit across the lower VHF band. (Again, the effects of stray capacitance have been ignored.)

The VHF Tuner

Although the Sylvania and the RCA VHF tuners are different in many details, their general configurations are so similar that the RCA diagram in Fig. 4 can be used to illustrate both.

Each uses a MOSFET RF amplifier, a cascode mixer and a transistor local oscillator. These three active circuits are very similar to their counterparts in a conventional tuner—only the method of tuning them is basically different.

Both tuners use four distinct tuner circuits: 1) The RF input circuit matches the 75-ohm output impedance of the balun and IF trap to the gate of the FET and also tunes the gate circuit to the desired channel. To get the desired impedance match, the tuned circuit must also act as an autotransformer, which makes the bandswitching a little complicated. Both tuners use two bandswitching diodes in this circuit (CR1 and CR2). A single varactor, CR11, is used for tuning. 2) The RF output circuit tunes the drain of the MOSFET, Q1. The resonant circuit consists of a varactor and two inductances, which are in series for low band. The bandswitching diode takes one inductor out of the circuit for high-band operation. 3) The mixer input is tuned by a pair of inductors (L12 and L13) and a varactor (CR13).

Again, for high-band operation, a bandswitching diode removes one inductor. The Sylvania tuner uses a transformer to couple the MOSFET output to the mixer input; RCA depends on mutual inductance of the bandswitching diode leads in high band and an inductance common to both circuits in low band. 4) The local oscillator, Q4, is tuned about the same way in both tuners, and once again tuning is accomplished by a varactor (CR14) connected across a pair of series inductors, one of which can be disconnected by the bandswitching diode.

Both of these tuners are unlike conventional tuners in that the output of the UHF tuner, which is at the IF frequency, is injected at the base of the Cascode mixer, Q2 and Q3, rather than into the VHF RF amplifier. Because the "front end" of the VHF tuner isn't used during UHF reception, it is possible for VHF reception to be snowy or completely absent, while UHF reception is normal. In conventional tuners, this symptom almost always indicates a faulty VHF balun or antenna system.

In RCA sets employing the new tuner, it is possible to plug the IF input cable (link cable) into the output jack of the UHF tuner and obtain reasonably good UHF reception. This can be a useful in-home troubleshooting technique.

The method of switching the diodes is a bit different in the RCA and Sylvania tuners. RCA does it by applying positive voltage to the anodes of the switching diodes, to turn them on, and by feeding positive voltage to the cathodes when they are to be turned off (for high and low bands, respectively). Sylvania uses positive voltage to the anodes to turn them on for high band, but simply removes this voltage for low-band operation.

The UHF Tuner

There also are many similarities in the UHF tuners. (Again, the RCA circuit is used for illustrations; see Fig. 5.)

Both the RCA and the Sylvania tuners use an RF amplifier with forward AGC, and both have an IF amplifier. These two stages of amplification make it unnecessary to use the RF amplifier of the VHF tuner as an IF amplifier during UHF reception, and this is the reason for the additional amplifiers in the UHF tuner. Without them, the design of the VHF tuner would have been much more difficult.

There are four resonant circuits tuned by varactors in each of these tuners: RF amplifier input, RF amplifier output, mixer input and local oscillator. Because the UHF band covers only about one octave (as opposed to about two octaves in the VHF band) bandswitching is not required. Mixing takes place in a diode, just as in a conventional UHF tuner, and the IF amplifier is a straightforward, common-base circuit.

A unique feature of the RCA UHF tuner is the ceramic substrate which forms the "chassis" of the tuner and also "contains" the tuned-line inductors, plus some of the capacitors. The substrate is a slab of alumina silicate, which is similar to the material from which chinaware is made. The material is specially compounded to be very durable and also to have high heat conductivity, along with very high electrical resistance. After firing, conductors, resistors, and small capacitors (actually two conductors close together) are printed or plated on the surface, and the discrete components are then soldered to the exposed conductors.

Tuner Control

Frequency selection using a varactor tuner requires two functions: bandswitching and varactor biasing. Sylvania elected to use pushbuttons for these purposes, while RCA chose a motor-driven rotary switch. In Canada, RCA Limited is marketing both types of control systems, the pushbutton variety, for local-control receivers, and the motor-driven-rotary switch version, for remote-control sets.

Regardless of the physical characteristics of the control system, the electronics are similar. In all cases the switches apply the appropriate voltage to the bandswitching diodes

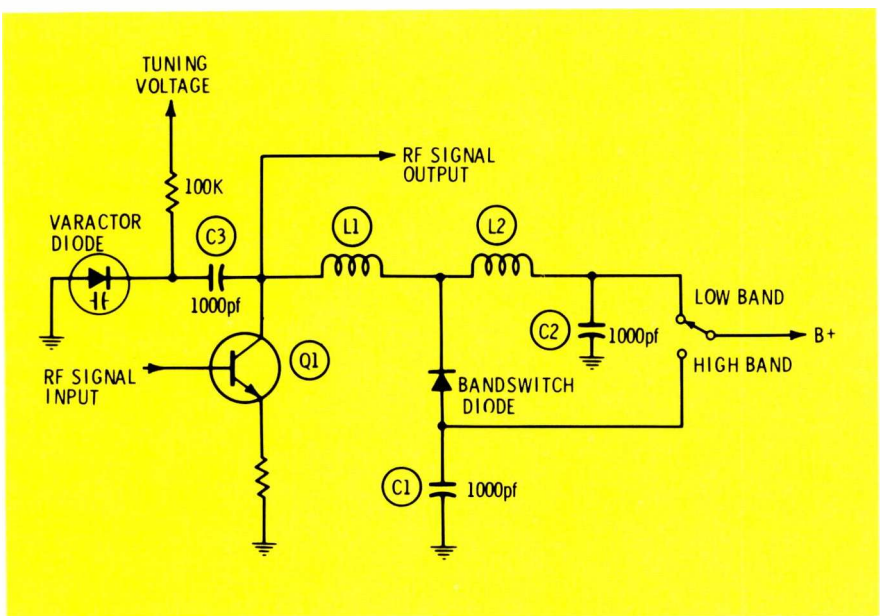


Fig. 3 Representative RF amplifier with bandswitching and varactor tuning.

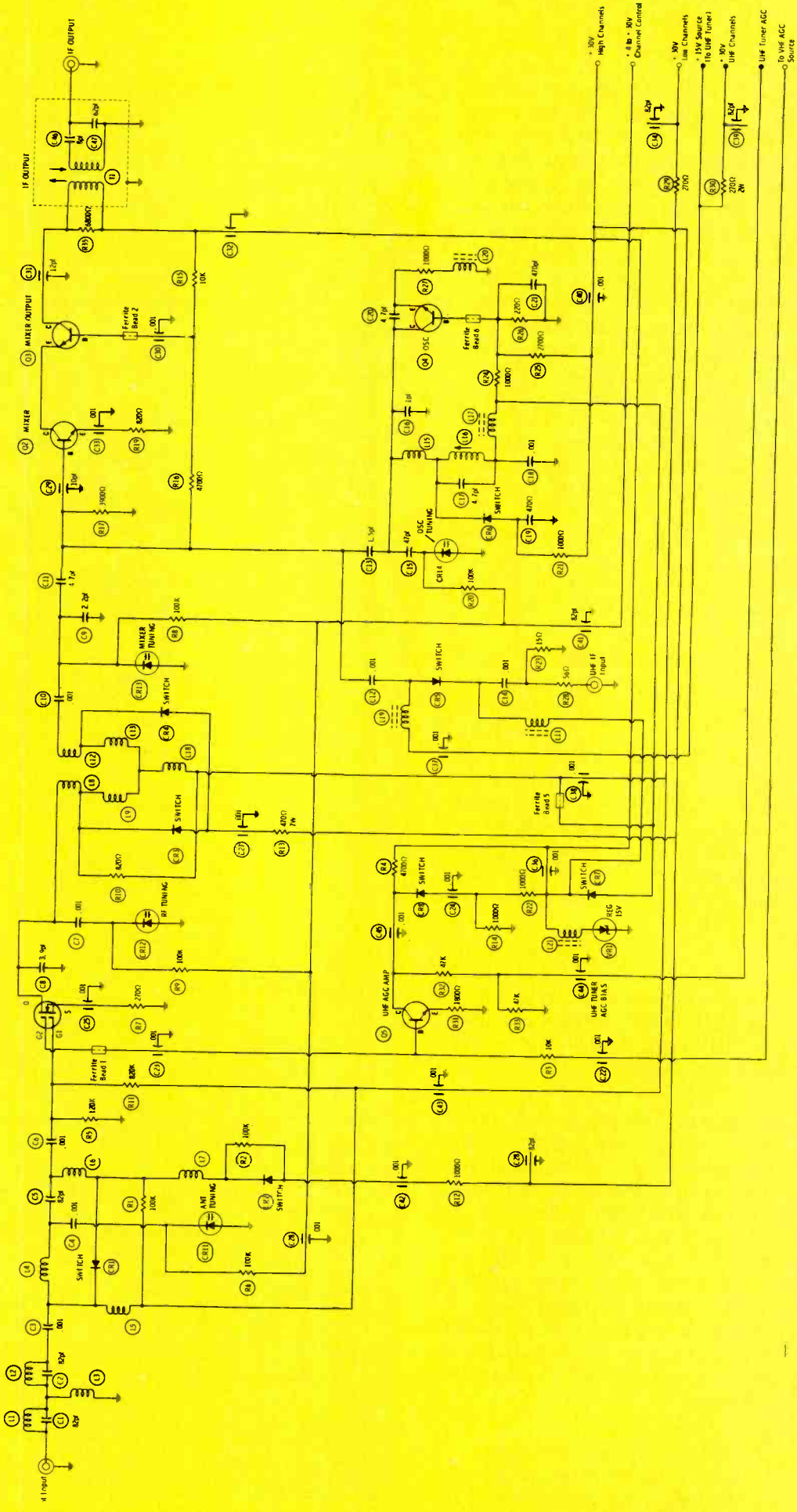


Fig. 4 The RCA KRK 155 varactor VHF tuner. (Courtesy RCA Technical Services)

of the VHF and also control the B+ supply to the UHF tuner and to the VHF local oscillator and RF amplifier, which are turned off during UHF operation. A second set of contacts on each pushbutton (or position of the rotary switch) connects a potentiometer wiper to all the varactors. There is a separate potentiometer for each channel. Sylvania has eleven potentiometers, which can be set to receive any eleven channels, either UHF or VHF. RCA has twenty channel "pots", with twelve for VHF and eight for UHF; however, a simple wiring change allows either two, three, or five of the VHF channels to be changed over to UHF. The RCA Canadian pushbutton version has a pot for each VHF channel and four which may be tuned to any frequency in the UHF band.

AGC and AFT

Because the UHF tuner is equipped with amplifiers, both it and the VHF tuner require automatic gain control (AGC). In both the RCA and Sylvania VHF tuners, reverse bias is used (which means that a less positive bias voltage reduces the gain). In the UHF tuners, forward bias is used (that is, more positive bias reduces the gain).

In the RCA receiver, the VHF tuner bias is inverted by a circuit in the VHF tuner and supplied to the UHF tuner. Sylvania supplies the UHF tuner separate bias voltage from the chassis.

Because these tuners are **tuned** by a voltage, the source of this voltage must be well regulated. An approximate 25-volt change in voltage tunes the UHF tuner across all 70 channels; a 0.1-volt drift in the supply voltage to the tuning potentiometers would cause nearly a 2-MHz change in tuning. Because of this, extremely good regulators are used, and AFC voltage is added to this, to hold the tuners on frequency.

Servicing Considerations

The techniques for servicing varactor tuners are very similar to

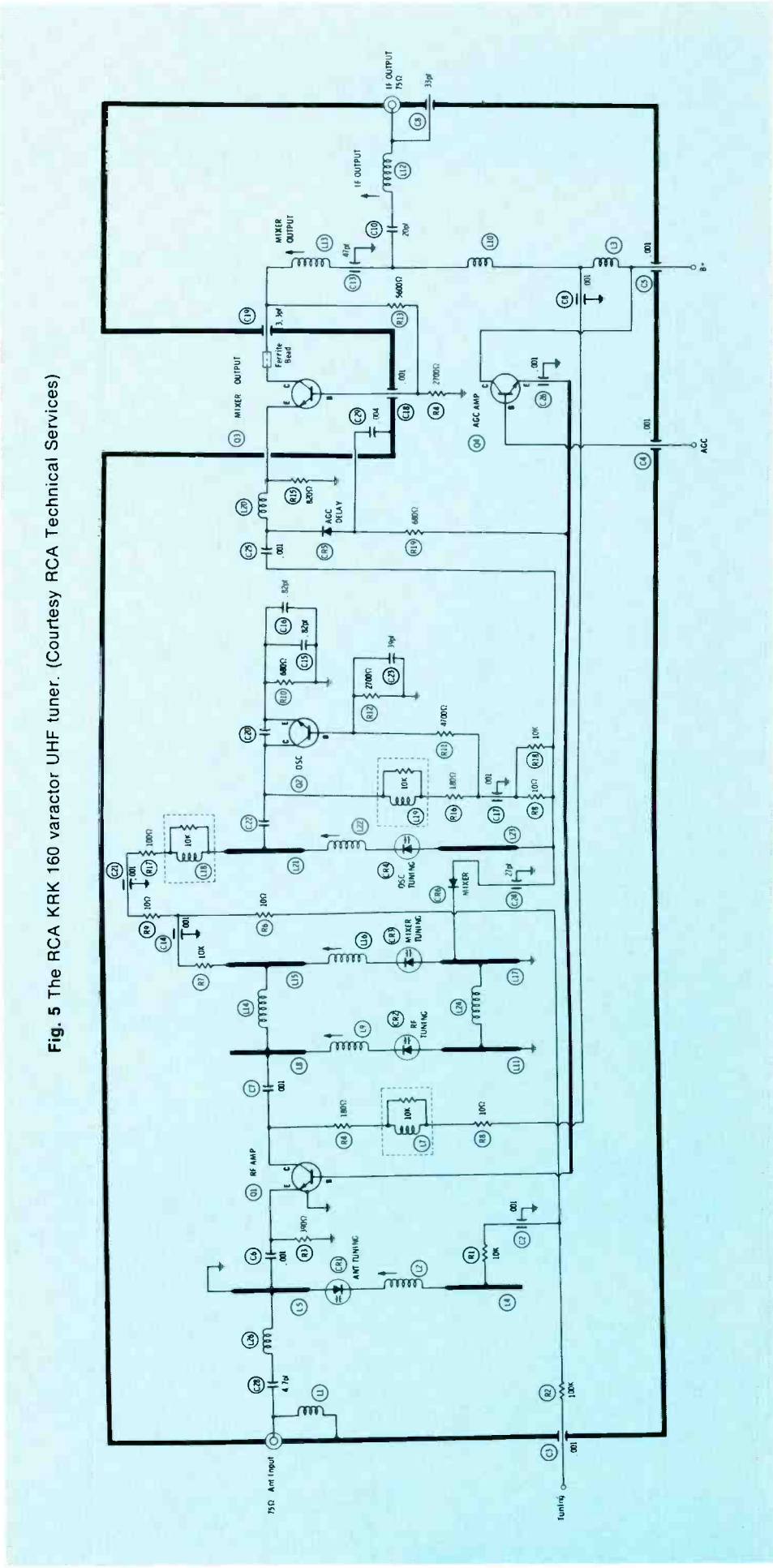


Fig. 5 The RCA KRK 160 varactor UHF tuner. (Courtesy RCA Technical Services)

those used for conventional tuners, insofar as the amplifier and mixer stages are concerned. There are, however, a lot of other problems which can occur because of the voltage-controlled tuning.

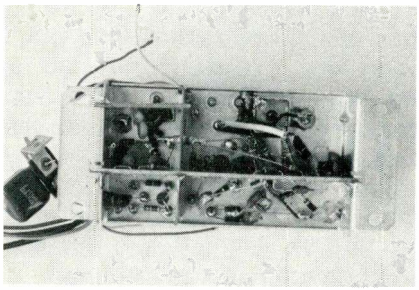
First, it is very important that the regulation of the tuning voltage remains optimum. If there is a tendency of the tuner frequency to drift, it is likely that the tuning voltage also is drifting. If drifting frequency is the problem, check the voltage regulation.

The possibility of a varactor diode opening or shorting is relatively remote, but it can happen. The varactor and bandswitching diodes can be checked in the conventional manner with an ohmmeter. However, because the capacitance-versus-voltage curves for varactors are not very uniform, replacing a single varactor will cause misalignment of the tuner. The varactors are supplied in **matched sets** and have to be replaced that way.

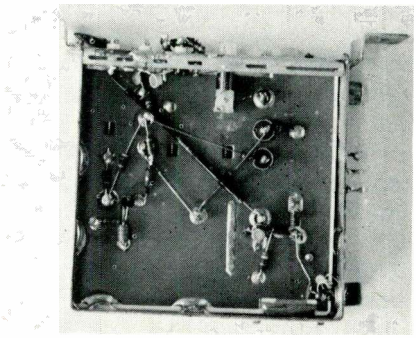
Bandswitching diodes are not so critical, and a single diode can be replaced without tuner alignment.

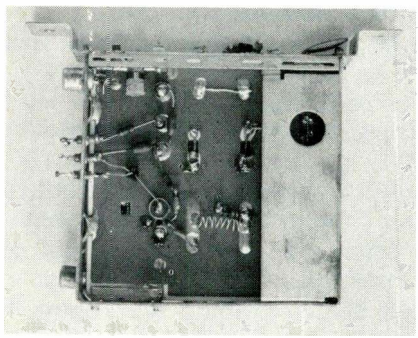
A shorted varactor will completely disable the tuner. If it opens, low gain with increased noise might result. If a local-oscillator varactor opens, the oscillator will swing completely off frequency, and there will be, of course, no reception.

If a bandswitching diode shorts, operation of the tuner will be normal whenever it is set up to operate in the mode in which that particular diode normally is saturated. For example, if an RF amplifier input diode, which normally is saturated during high-VHF-band operation, becomes shorted, operation will be normal for channels 7 through 13, because the diode would have been conducting (shorted) anyway. Nor will it cause any problems with UHF reception, because the RF amplifier of the VHF normally is disabled during UHF reception.



Bottom view of the RCA VHF tuner. (Courtesy RCA Technical Services)





Obverse and reverse views of the RCA UHF tuner. (Courtesy RCA Technical Services)

Summary

The signal processing functions of the varactor tuner are essentially the same as those in a conventional tuner. Only the method of tuning is changed.

So far, there are only two major entries in this field, and both systems are basically similar. No doubt, other manufacturers will introduce their own versions of varactor tuners, but it is likely that their operation also will be similar to that of the RCA and the Sylvania tuners.

In general, servicing varactor tuners is not particularly difficult; it is actually simpler in one respect —there is no switch to contend with. If you have been in the habit of repairing your tuners, you shouldn't really worry about this new type. If you send them to a jobber, as many service shops do, these jobbers can do just as good a job on varactor tuners as they have done in the past on conventional tuners. ▲

better
management guides

by Robert G. Amick/ES Business Consultant

Business management checklist

Check your own management IQ

Management of a small business generally is tougher than managing an industrial giant, for a number of reasons.

For one thing, the industrial giant usually has considerably greater resources—its own assets and its reserve line of credit. For another, its affairs will be guarded and controlled by a staff of specialists—each responsible for only one area, or a part of one area, of the firm's activities. The *real* management is mostly concerned with directing, organizing, and coordinating the specialists. With its resources and its specialists, the big business isn't jeopardized by common garden-variety mistakes. It takes a real champion goof to put the giant under.

Small businessmen, by comparison, are often both the front office and back shop of their businesses. They are both chief executive and chief bottle-washer. Both of these jobs demand time and skill. But, too often, time spent managing is classed as "overhead", while time spent "doing the business" is classed as profit-making. This concept turns management into a neglected stepchild.

Good managers may have some inborn traits, but there are also a lot of good ones who've acquired the traits they need, and learned the skills they lacked without getting closer to a formal classroom than the local public library. Some of the traits they value are:

- Curiosity—to wonder about the hows and whys of problems.
- Stubbornness—to pursue answers to the hows and whys until they're in the bag.
- Inventiveness—the ability to devise your own solution when no other can be found.
- Adaptability—the ability to keep up with the times and conditions, instead of trying to keep things the way they were.
- Personality—the ability to be an individual and to respect the individuality of others.

Most important, you need the ability to think straight and reduce matters to their absolute basic terms. I heard (or read) a discussion by members of *Operations Research,* a business consulting operation, in which this recent technology/philosophy was described in terms of what it might have been able to do for the buggy-whip and harness manufacturers when they were shut down by development of the automobile. These gentlemen, having decided they were in the buggy-whip and harness-making business and that there was no more market for whips and harness, quietly shut their doors and went out of business.

The boys from *Operations Research* would have clarified their basic premise for them. They weren't in the buggy-whip and harness-making business—they *really* were in the *transportation business.* Some determined searching in that wider field might have turned up new opportunities which fitted their experience, skills and plant capabilities. Transportation was then, and still is, a rapidly changing but still-growing field. But, ideally, a skillful manager would have foreseen the end of "natural" motive power (bone, muscle and horseshoes) and would have began plans to convert his company's efforts to another area. The steamboat, railroad and their ancestor, the stationary engine, had shown what was coming.

So, that leads to the one thing every good manager has—a firm, clear idea of what business he's in, why he's in it, what he expects to do with it and where he expects it to take him. There it is—goals and objectives, the heart of any philosophy of management. After that comes planning, procedures and methods directed at achieving the goals and objectives.

Maybe this little quiz about the seven major areas of management, gathered from a number of sources, will help you check your management interests and abilities, and measure your own management effectiveness. It may show you the weak spots in your own management skills.

What Kind Of A Planner Are You?

☐ Have you a long-range plan for the growth of your business?

☐ Have you plans to cover actions to be taken when the most dangerous or most likely emergencies strike?

Real management calls for constructive change. That means change as the result of planning, not change forced on you by a crisis or dictated by circumstances. Changes leading to growth, not directed at just holding on. You're in a business that features change—new chassis designs every year, new concepts and applications at a rapid pace. You have to plan to be ready for them, and plan to get the most out of them.

Emergency planning is a must. A financial crisis should find you with plans to carry you through. Pre-plan your search for credit, if a loan is needed. Know where you'll go for that loan (and why). Have that lender, at least, aware of your past record for good management and credit handling. Have your plan ready to present to him, to show him a serious, business-like borrower at his deskfront.

Don't forget this: No small business is ever more secure than the health of its owner-manager. Planning should include what's to be done to protect your business if you're ill or disabled. An extended absence can destroy the value of your business when you need it most. Who among your employees can be groomed to take over? (*Before* he's needed, of course—that's part of planning.) If you haven't any employees, can you get someone in to handle your business for the duration of the emergency? If you can't, you'll probably have to sell out—and a defunct business isn't worth as much as a going one.

☐ Do your plans include a budget?

A short-term plan stating your goals in budgetary terms is a good idea. Keeping it short-term gives you control of current operations through your budget. Setting down your objectives in your budget gives you something definite to shoot for. Frequent comparisons between plan and result shows you what adjustments you must make to achieve those goals.

How About Organization? Personnel Skills? Efficiency Of Equipment and Shop Layout?

☐ If you have help, do you delegate as much as you can so that you have time for planning and other management duties?

☐ Do your employees have adequate supervision?

☐ Is one of your employees prepared and designated to take over in your absence?

☐ Do you maintain the personnel records required by law, union contracts and your own personnel policies?

☐ Do you review job performance periodically to determine each man's job competency and proper compensation level?

Delegating authority and work doesn't just set you free to manage. It also develops your employees, expands their capabilities and keeps them busy. Supervision is part of the training function, as well as keeping the work flowing and minimizing time-wasting. Control is at the heart of management, and record-keeping is essential to effective control. Periodic reviews are the fairest way of determining who gets raises, and the most objective way of dealing with job performance problems.

☐ Are your fixtures and equipment adequate and up-to-date?

☐ Are your stock areas as close as possible to the bench they serve?

Time spent waiting to use a piece of test equipment can take the profit out of a job. Maybe you need more than one of that item, or something to replace it on certain types of jobs. Does every man you have in the shop have adequate bench space, test equipment and tools? Crowding isn't a money saver, either. Just as waiting time eats up profit, so does walking time to a basement-stockroom, or one clear at the back of the building. Three or four steps should be the average. Shop layout can be an important profit-saver, and should be part of your growth and improvement plans.

How About Inventory Control and Purchasing?

☐ Is your parts inventory organized and controlled?

☐ Do you keep complete stock count, purchasing and sales records for it?

☐ Do you have a "never-out" list for staple items, to be sure you're really never out of them?

☐ Do you keep close checks on slow-moving, or high-cost items and those nearing obsolescence?

☐ Do you have adequate safeguards against theft, breakage, shortages and other inventory shrinkage?

☐ Do you keep separate records of those items in your shop which belong to others?

An organized inventory saves expensive time when a part is needed. You have what you need, know where to find it and can get it quickly. It also shortens the time required to make the stock-control count you should be taking periodically. Controlled inventory avoids excessive stocks of items that are rarely used, involve large investments, or are facing early obsolescence. Inventory shrinkage—by theft, breakage and items not delivered as ordered—eat into *your* share of the business. You *must* keep that leak plugged.

Records of consignment goods (those which belong to others) is the beginning of control for these items. Aside from questions of legal responsibility for them while they're in your possession, you need to know what you have, what's to be done with them, when, and who owns them. If you have parts or merchandise on consignment, you might be using them on a trial basis or to meet a temporary need. Once the need or trial period is past, you should either purchase or return them. Records keep you on top, or ahead of, the problems that consignment deals bring up.

☐ Do you issue purchase orders in writing?

☐ Do you follow up your orders, to see that goods are being received as ordered, in correct quantities and on time?

☐ Do you take advantage of available discounts—trade, quantity or cash—and include them on your written orders?

Written orders avoid most arguments, and quickly end the others. They show what you ordered and give you your own record to compare with what's delivered. Your written purchase order can also specify whatever special conditions must be met—delivery dates, times and shipment methods, for example. Checking deliveries is the one way you can be certain that you get what you ordered, in good condition, and get what you're being charged for.

Discounts are added incentives to good management. There are some businesses which earn cash discounts almost equal to their operating profits. You can't earn money any easier than the discount you receive for paying cash with your order, or for paying ahead of time. Mark that down as "profit derived directly from good management." That's where it belongs.

How Are You At Advertising, Promotion and Customer Relations?

- ☐ Do you plan promotional activities?
- ☐ Do you have an advertising program, geared to your market, your kind of business and your planned objectives?
- ☐ Do you try to assess the performance of your advertising or promotions in the light of those factors?
- ☐ Do you add value to your service by projecting an image of your business that your customers respect?
- ☐ Do you develop customer confidence in your judgement and your readiness to assure their satisfaction?
- ☐ Do you, and your people, see each customer as an individual or just as "one of the crowd"?

Knowing objectives, reducing them to basics, really pays off here. You have to decide what "image" you want. You must know what you have to sell that is *special,* in very specific terms. Not "better service", but, "Better service *because* . . ." You promote, and advertise, the "Because . . .".

One aspect of promotion you should always pay attention to: Your replacement customers. Your old ones die off, move away, retire, lose interest or give in to the push of your competitors. This attrition shouldn't sink you, and it won't, if you keep getting replacements lined up for your "old reliables".

Accounting and Finance

- ☐ Do you have an accurate, complete bookkeeping system that is balanced and summarized each month?
- ☐ Do you keep careful records of cash outlays for parts, supplies and services?
- ☐ Do you deposit each day's cash receipts in the bank without delay?
- ☐ Do you have a petty cash fund, limit its use to small amounts, and hold it to what's needed for short periods of, say, two weeks or so?
- ☐ Do you avoid frequently drawing checks payable to "Cash"?
- ☐ Do you avoid signing your checks in advance?
- ☐ Do you watch over your liabilities with the same care you give your assets?

Keeping records of cash expenditures takes little time, and it's far more reliable than memory. A check stub or small cash ticket is all that's needed. Without such records, your expenses can get out of control. Books, properly kept and summarized at regular intervals, keep you informed about which way your business is headed and give you time to correct faults while they're small.

Holding cash in the shop overnight is bad business, and it's even worse to start making cash payments out of your cash receipts. Daily bank deposits prevent both from getting started. A petty cash fund avoids check-writing for small items and keeps your overnight cash-holding to a minimum. Pre-signed checks are invitations to dishonesty — whether among your staff or outsiders. **Cash is your most vulnerable asset.** It deserves your most determined efforts to protect and conserve it.

Watching your liabilities is another important way to protect your investment in your business. Not just to keep liabilities to a level you can handle, but to make sure that the liabilities you pay on are really *yours.* That means checking statements from your suppliers against your own records, to avoid overcharges, paying someone else's bill, or paying for merchandise you didn't order. You need records and well-established procedures to substantiate your claims.

How Do You Stand On Insurance, Tax and Legal Understanding?

- ☐ Do you have an insurance program, handled by a knowledgeable and conscientious insurance agent, to protect you from casualty losses?
- ☐ Does it cover your business properly?
- ☐ Are you getting the most protection for your premium dollar?

It is possible to become an expert about your insurance needs, but you don't have to, if you rely on a conscientious, knowledgeable and reliable agent. You periodically should review your protection and your loss exposures with him—to cover changes in values, to cover changes in your business properties or changes in your operations and procedures. Additional hazards, new coverage requirements, added risks, special exclusions might be involved in some of the changes you make, so keep your agent informed. Let him help

you get the most for your money through proper use of deductibles, planning coverages for expansion according to need and/or means, and careful shopping for the best policies.

- ☐ Do you file your required tax reports on time?
- ☐ Have you someone who's responsible for this, and do you check to make sure it's taken care of?
- ☐ Have you any way of checking to make sure that you're not overpaying your taxes?

Unless you keep a tax calendar, or have someone do it for you, you risk being late filing returns and reports required by law. That can cost you penalties and interest. An occasional tax "checkup" by an expert is a good idea, to be sure you're not paying more than you should. He can save you more than his fee for such services.

- ☐ Do you know your legal obligations to your customers, suppliers, neighbors and local government?
- ☐ Do you have access to a good attorney who can advise you about these matters and represent you if serious legal problems arise?

Following are some of the things you should understand in a general way, as they apply to you and the way you do business:

- Your local zoning regulations, regulations about signs, licenses, advertising and business practices.
- You should have a fair idea of your legal rights and obligations in your dealings with customers, suppliers and others with whom you have business relationships.
- You should have a fair smattering of knowledge of contracts—oral and written.

You need to know these things to stay out of difficulties. You needn't have more than a basic knowledge to guide your decisions, with an attorney available to handle trouble or resolve the complex questions.

Some Miscellaneous Points

- ☐ Do you belong to a local, regional or national trade organization?
- ☐ Do you take an active part in its programs for progressive legislation, industry standards, professional upgrading?

There's strength in good industry or trade association memberships. Some associations help with educational matters, others with sound licensing and certification programs, or still others provide a forum for exchange of ideas and business data. If yours doesn't. it will only do so when its members demand that it serve them. It will only hear your demand if you belong.

If association membership isn't practical, or if there's no association for you to join, you can work for the changes on your own. Or take the lead, and get your colleagues to help you form an association that's geared to your needs.

- ☐ Speaking of upgrading, how about your own efforts?
- ☐ Do you regularly read the technical bulletins, promotional aids and trade papers and magazines available to you?
- ☐ Do you participate in the programs they offer?

Upgrading yourself calls for a constantly expanding knowledge of the products, techniques, concepts and applications which represent the "state of the art". It also calls for improving your skills at running your business. To ignore either one is to invite disaster—you can't survive unless you keep up technically, nor can you survive if you fall behind as a manager.

Summary

There they are, the seven major areas of management skills: Planning; organization; inventory control and purchasing; advertising; promotion and human relations; financial control; relationships with legal and governmental institutions; and, for lack of a better name, business citizenship.

They should give you this kind of picture of a good manager:

- He knows what he wants and what he must do to accomplish it.
- He has, or gets, information to guide his plans and decisions.
- He is rarely unprepared for developments in his operations, because he has either made those developments happen or has planned for their occurrence. When he acts, it is for a purpose he has defined and for reasons he knows.

One thing you'll never hear a good manager say is: "The way things were going, I had to do *something!*" ▲

shoptalk

With Carl Babcoke
ES Technical Editor

Horizontal sweep—operation and troubleshooting

This first of two parts explains how horizontal scan is achieved and provides general troubleshooting tips. Part 2 will provide specific troubleshooting techniques.

Horizontal Sweep Is Produced By Current

Currents through the coils of deflection yokes generate magnetic fields which move the electron beam in a picture tube to produce a raster. Voltages are of secondary importance.

General Requirements For Correct Horizontal Deflection

Without any horizontal deflection of the electron beam in the picture tube, the raster would consist of one vertical line located at the center of the screen. There is no current in the horizontal yoke coils when the beam is at the center of the screen, a condition which occurs twice during each horizontal cycle—once during trace time and once during retrace.

Direct current of **positive** polarity flowing through the yoke deflects the electron beam to the **right** of center. Direct current of **negative** polarity flowing through the yoke deflects the electron beam to the **left** of the zero-current center of the screen.

Horizontal deflection is accomplished in four separate operations. The locations where these four basic steps take place on the screen of the picture tube are shown in Fig. 1A.

Current through the horizontal coils in the deflection yoke should be large enough to move the picture tube beam the full width of the screen. Theoretically, the current waveform should have a perfect sawtooth shape. In practice, this ideal waveform is compromised somewhat, although the basic sawtooth shape always can be seen in a normally operating receiver. To compensate for excessive scan at

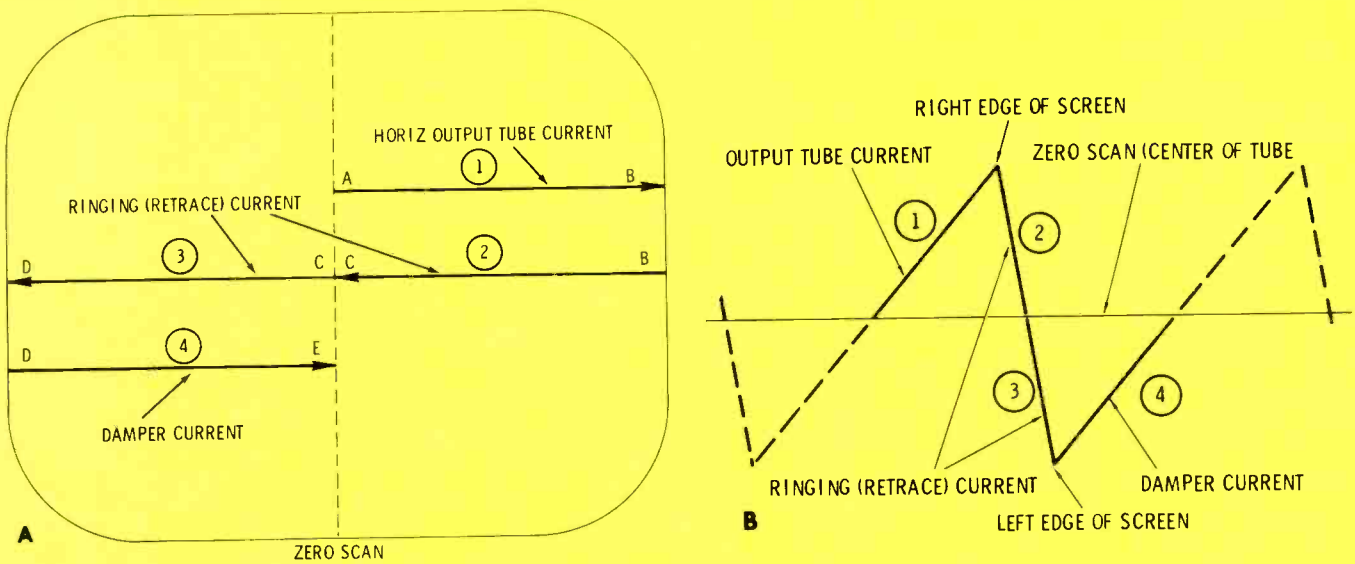


Fig. 1 Locations where the four steps of horizontal deflection occur on the screen of the picture tube, and also where they are located on the waveform of yoke current. This information can help technicians correlate visual symptoms with the area of the circuit where the defect is most likely to be. A) Power to scan from the center of the picture tube screen (point A) to the right edge (point B) is supplied by plate current of the horizontal-output tube. Current from ringing of the yoke circuit moves the electron beam, in two separate steps, to the left side of the screen (point D). Current from damper rectification moves the beam from the left edge (point D) to the zero-current center of the picture tube screen (point E). These four steps constitute one cycle of horizontal scan. B) The same four steps of horizontal deflection as they relate to the waveform of yoke current.

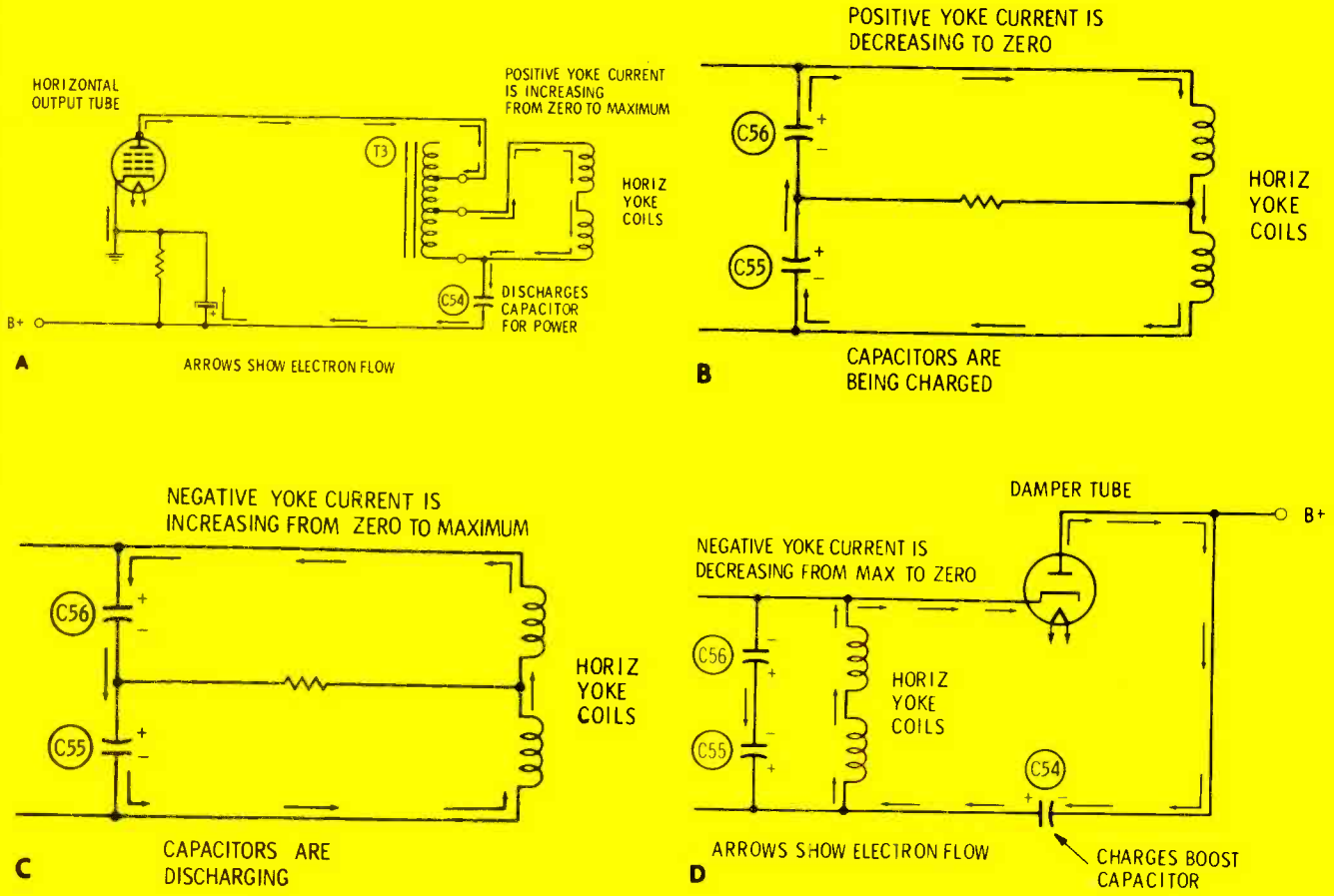


Fig. 2 Simplified schematics show electron current through the yoke, and any other parts directly involved, during the four steps of horizontal deflection. It is assumed that deflection has been operating normally long enough to charge C54, and the beam is at the horizontal center of the picture tube screen, at which point no current is flowing through the yoke. A) Gradually increasing plate current through the horizontal output tube moves the electron beam of the picture tube from the point of no deflection at the center to the extreme right edge of the screen. The yoke capacitors have no effect on the yoke current, because ringing is damped by the load and the slow rate of change of the tube current. When the drive waveform at the grid of the output tube starts down the trailing edge of the sawtooth, the current through the output tube is stopped abruptly. This is the end of step 1. B) The sudden cessation of tube current shock excites the main tuned circuit (yoke coils, C55 and C56) into ringing at the unloaded frequency of approximately 75 KHz. The polarity of the yoke current at this time is positive, the **same** as that previously supplied by the output tube; however, it is becoming less positive because C55 and C56 are being charged. Yoke current rapidly decreases to zero, and the beam is returned to the center of the screen. Because the damper cathode is positive relative to the plate, the damper cannot conduct. During the small interval at the center of the screen, when the yoke current is zero, the yoke capacitors are fully charged with positive voltage—which produces the large positive-going pulse that is rectified to supply the high voltage for the CRT anode. This is the end of step 2. Both this action and the similar ringing step which follows proceed very rapidly; they are the complete retrace. C) Ringing continues, and the capacitors discharge back into the yoke coils. The polarity of the yoke current reverses (becomes negative) and gradually increases until the beam is moved to the extreme left edge of the picture tube screen. The damper cathode gradually becomes less positive and nearer conduction during this time. This is the end of step 3. D) A negative-going voltage pulse starts to form as the ringing attempts to continue, but this pulse causes the cathode of the damper tube to become negative relative to the plate, and the damper conducts. This conduction continues for about ⅓ to ½ of the total deflection time; both the damper and the yoke currents gradually decreases as the ringing is damped out and the beam is moved to the center of the picture tube. Because the damper current loads the tuned circuit the yoke capacitors have little effect on the yoke current. Damper conduction (rectification) also replenishes the charge in C54, because the voltage previously stored in the capacitor was used during Step 1 by the horizontal output tube. This is the end of step 4, and the end of one cycle of horizontal deflection.

the edges of picture tubes which use wide-angle deflection, the waveform often is curved at each end. Because of such variations, the most accurate method of judging linearity is by visual observation of the crosshatch pattern displayed on the screen.

Yoke current can be viewed easily by adding a low-value resistor (.5 to 5 ohms) in series with the yoke, and connecting the scope leads across the resistor. (**Warning:** Because the yoke is connected to B-boost voltage, the scope will be several hundred volts more positive than chassis ground.)

Fig. 1B shows the points where

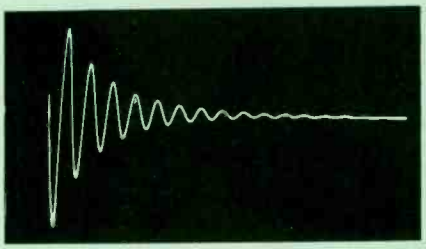
Circuit "Ringing"

A capacitor accepts a charge when it is connected to a source of voltage. This charge is obtained gradually. A charged capacitor will discharge into a resistor, a coil or another capacitor. This, too, is a gradual process.

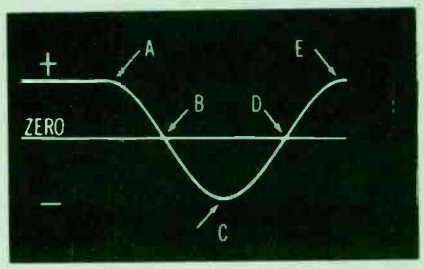
Voltage applied to an inductor produces current, but the current increase is gradual and not instantaneous. If the supply voltage is disconnected, the current flows in the same direction but at a decreasing rate until the energy is dissipated. An inductor will discharge into a resistor, capacitor or another inductor. If no external component is connected to an inductor when the supply voltage ceases, the inductor will discharge into the stray capacitance of its own windings.

A capacitive reactance (capacitor) and an inductive reactance (coil), connected in parallel become a tuned circuit, which transfers energy from one reactance to the other until circuit losses drain the power to zero. This is often called "ringing", or damped oscillation.

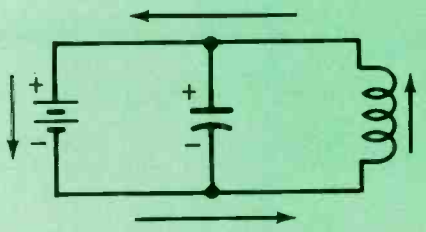
The following analysis of the action of a tuned circuit is confined to coil current and capacitor voltage, because these two are the most important factors in the deflection circuits of television receivers.



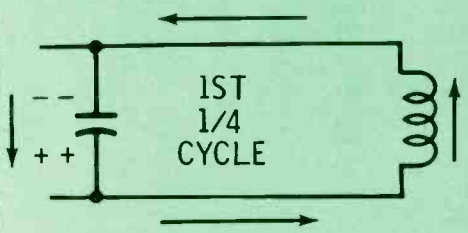
A DC supply voltage was connected to a tuned circuit long enough for the current to reach maximum. When the power supply was suddenly disconnected the damped wavetrain of sine waves shown here was produced. The first ¼ cycle is not displayed on the scope screen because the vertical amplifier section of this particular triggered-sweep scope is not equipped with a delay line.



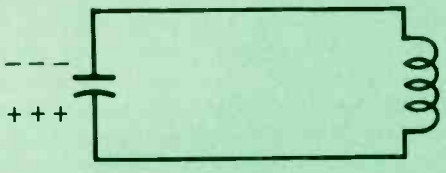
Shows the power supply voltage and the first cycle of the sine wave of coil current. Beginning and ending points of each ¼ cycle are indicated by letters.



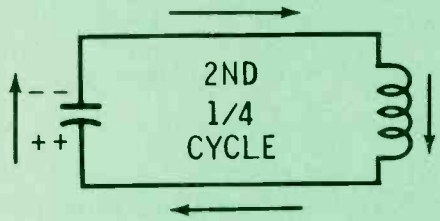
A battery was the source of the maximum "positive" coil current. The small battery voltage also appeared across the capacitor.



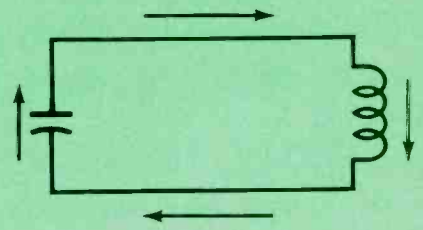
When the battery was disconnected, "positive" coil current flowed from the coil (source of power) into the capacitor and charged it with a negative voltage. The coil current gradually decreased in step with the increase in capacitor voltage. This action is shown between points "A" and "B" in Photo 2.



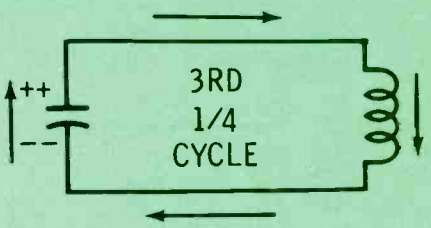
The coil current was zero at point "B" in Photo 2, and the negative voltage across the capacitor was nearly 50 times larger than the original battery voltage.



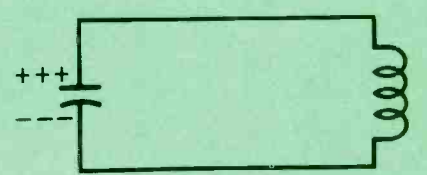
The negative capacitor voltage (source) discharged back into the coil and caused "negative" coil current. This corresponds to the waveform portion "B" to "C" in Photo 2.



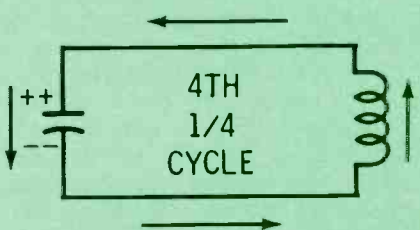
The capacitor voltage (source) was zero, and the "negative" coil current was maximum at point "C".



"Negative" coil current (source) decreased as it charged the capacitor with positive voltage. Points "C" to "D" in Photo 2.



The coil "negative" current (source) reached zero, and the capacitor was charged to maximum positive voltage at point "D" in Photo 2.



Positive voltage from the capacitor (source) flowed into the coil producing an increasing "positive" coil current. This action is between points "D" and "E" in Photo 2. The capacitor voltage was zero and the "positive" coil current maximum at point "E".

Succeeding cycles of "ringing" occur in the same way as described for this first cycle, except that the amplitude of each succeeding cycle becomes smaller because of power losses imposed by the circuit.

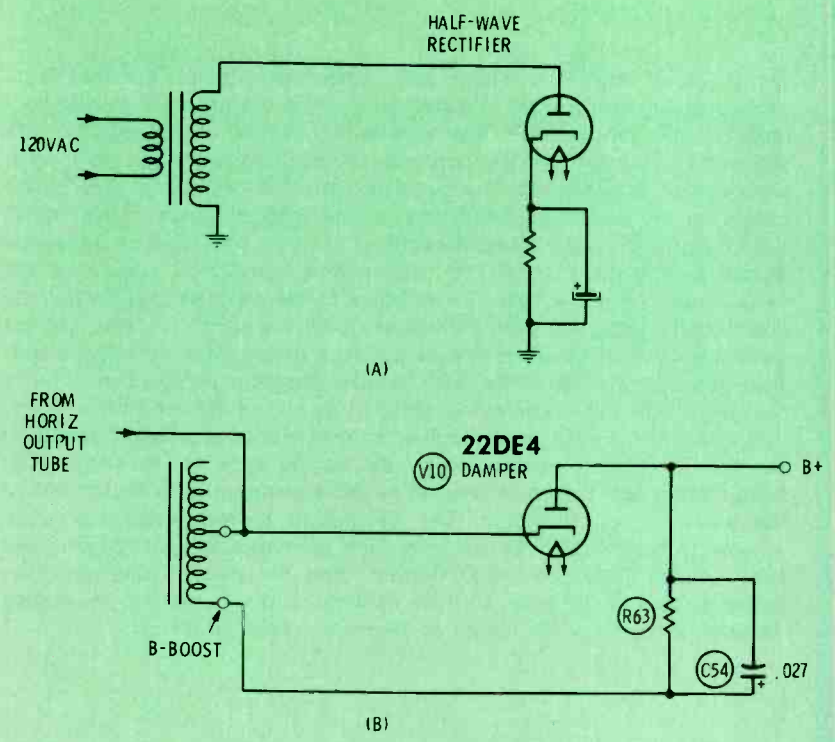


Fig. 3 Damper action is exactly the same as that in a series, peak-reading rectifier circuit. A) Schematic of a conventional, series, half-wave, peak-reading rectifier circuit. The larger the capacitance of the peak-reading filter capacitor, the shorter the period of time during which tube current flows. B) Schematic of a typical damper circuit is the same as that of the previous rectifier circuit, except that it is inverted and is connected to B+ instead of ground. The size of the B-boost capacitor (peak-reading capacitor) determines the linearity of the left half of the raster.

the four steps of horizontal deflection occur on the sawtooth waveform of yoke current.

The four steps of horizontal deflection are illustrated and explained in Fig. 2.

Damper Tube Operation

Operation of the damper tube circuit seemingly is different and more complicated than that of most other circuits. This false impression is due, in part, to the way the circuit is drawn on most schematics. Actually the damper functions much like a half-wave rectifier. Fig. 3A shows the schematic of a simple rectifier circuit, which is nearly identical to the typical damper circuit shown in Fig. 3B.

Conduction of the damper tube occurs whenever the cathode becomes more negative than the plate. Capacitor C54 is charged during conduction. Because this stored voltage keeps the cathode positive relative to the plate, further conduction cannot occur until the normal oscillation, or ringing, voltage of the horizontal deflection system swings negatively enough to exceed this stored voltage.

The voltage developed by damper conduction is called B-boost. Because it is added in series, it increases the supply voltage which is applied to the plate of the output tube. Thus, power which would otherwise be lost is changed into deflection power.

The capacitance and leakage of the B-boost capacitor are critical for correct deflection. Horizontal-linearity, or horizontal-efficiency, tuned circuits are often inserted between B-boost and the supply voltage, in place of the simple capacitor described here.

Waveforms Producted By Horizontal Deflection Systems

Each scope waveform taken from horizontal deflection circuits contributes some information. Several such waveforms, which have the same phase, are shown in Fig. 4. These verify the theory of horizontal sweep operation given previously. (The waveforms in Fig. 4 are from a Sears 456/528.51912 b-w television chassis, the schematic of the horizontal deflection circuit of which is shown in Fig. 5.)

Grid drive for the horizontal output tube (Fig. 4, W1)

The first important voltage waveform is that of the horizontal oscillator signal at the control grid of the output tube. This waveform is subject to considerable variation from model to model. Some chassis require a rounded sawtooth with a pulse at the bottom, while others require a more linear sawtooth without a pulse. The purpose of the pulse, when required, is to cut off the output tube current more rapidly.

The top of the sawtooth at the grid of the output tube in the Sears chassis is rounded more than that in some chassis, apparently to reduce excessive scan at the extreme right edge of the picture. This improves the linearity on the right side.

The sawtooth grid waveform in all chassis has a small, flattened area on the top of the waveform, because the grid current drawn by the output tube clips the voltage. If the normal flat spot is missing, no current is being drawn by the output grid.

Cathode current (Fig. 4, W6)

Many color receivers produce a sawtooth of horizontal output cathode current that has less ringing than the amount seen here. In any event, the tube should not be continuously drawing current. Current should flow for slightly more than 50 percent of the time. After you have observed the waveform produced by the output tube cathode current in a number of different receivers, you will know what is normal and what is not, and can use the waveform to diagnose many horizontal defects.

Yoke current (Fig. 4, W8)

Not many occasions demand that we view the waveform of yoke cur-

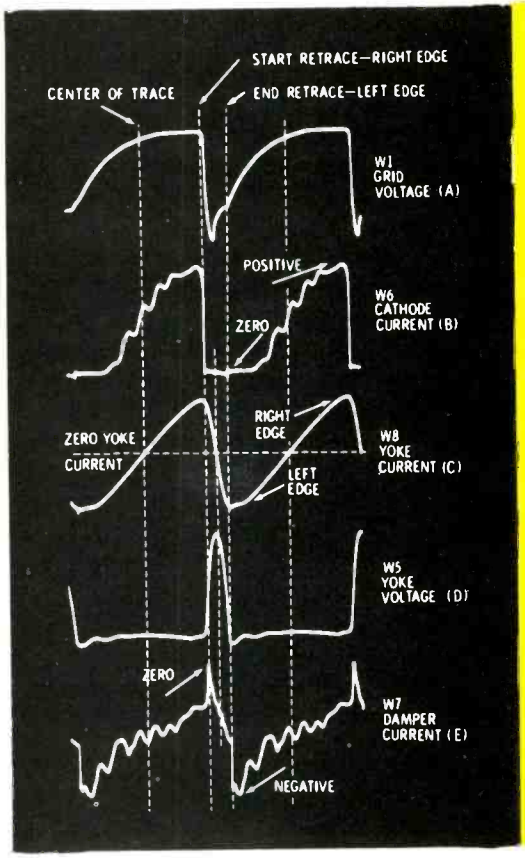


Fig. 4 These important voltage and current waveforms from the Sears chassis (schematic in next illustration) illustrate the phase (time) relationships of the various deflection actions. A) The downward edge of the sawtooth at the grid of the horizontal output tube causes a very rapid cessation of tube current. The cutoff of current is so fast the line barely shows on the waveform. Reduction of high voltage occurs if this line is tilted, which indicates slower shutoff of current. B) Cutoff of horizontal output tube current starts the ringing which produces retrace of the beam. Notice that the tube current stops at the exact instant the retrace starts (trailing edge of yoke current sawtooth waveform). C) Zero damper current occurs at the same time as cutoff of output tube current(the start of retrace). D) The tip of the pulse of yoke voltage occurs at the center of retrace, which is the only action revealed by any of the waveforms at that particular time. E) Maximum damper current (negative polarity) occurs at the end of retrace, represented by the trailing edge of the sawtooth of yoke current and the tip of a small negative-going pulse at the bottom of the yoke voltage waveform. The decreasing damper current is small enough to be cancelled by the increasing current of the horizontal output tube at the center of trace. Current from the output tube increases (positive polarity of yoke current) enough to overcome the decreasing damper current near the center of the trace (center of picture).

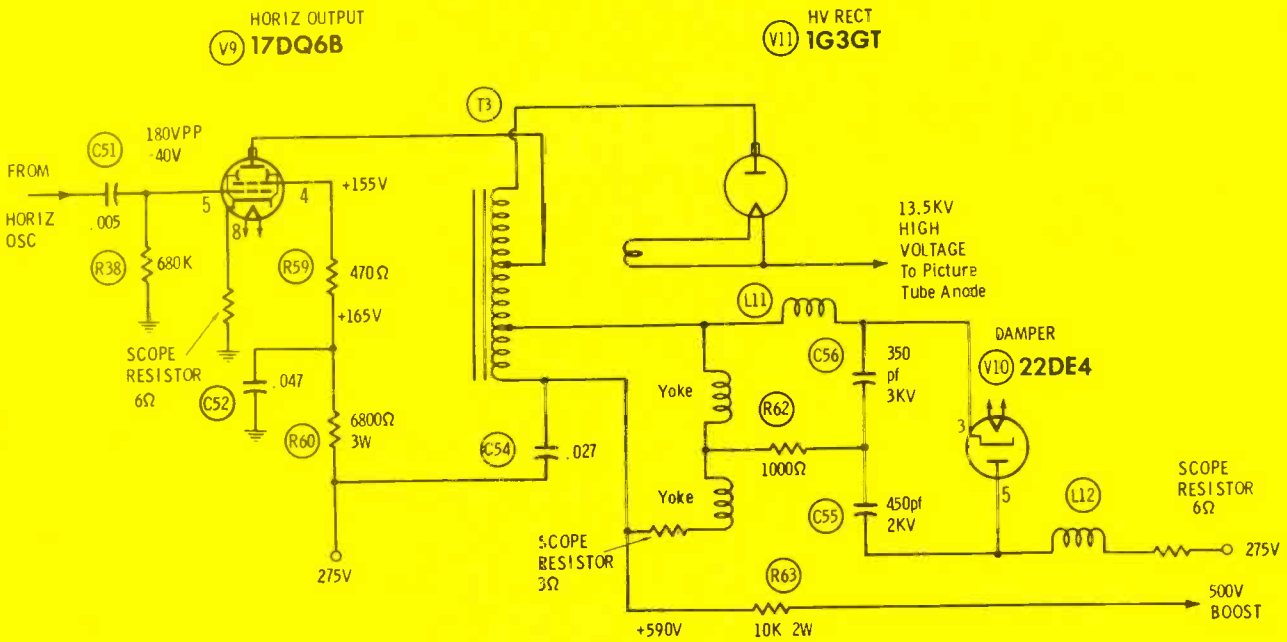


Fig. 5 Complete schematic of the horizontal sweep and high-voltage section of the Sears 456/528.51912 b-w television chassis. Normal DC voltages for this one individual chassis are included. Waveforms will be added next month, to illustrate a detailed discussion about troubleshooting the horizontal sweep sections of television receivers.

rent. If there is a raster, the condition of the sweep can be determined by viewing it. The normal shape of the yoke current waveform is an approximate sawtooth, and it is included here to show the time relationship between yoke current, which is the final product, and the other voltages and currents.

Yoke voltage (Fig. 4, W5)

The yoke voltage waveform, and other pulse voltages taken from the horizontal output transformer for AGC, blanking or other uses, is the one normally associated with horizontal deflection. However, the yoke pulse is **not** the force which causes yoke current, and, consequently, has only limited value for trouble analysis. Beyond a certain point, some conclusions based on this waveform alone will be misleading. . Next month, we shall give specific examples for your guidance.

Damper current (Fig. 4, W7)

Damper current is another waveform which is seldom analyzed. The characteristic of damper current that surprised me the most the first time I saw it was the long duration of current. I had assumed incorrectly that the damper tube conducted once on the first negative ringing pulse. and that was the end of damper conduction.

The damper current waveform **appears** to indicate zero current at the start of trace (left side of the screen), followed by increasing current toward the right side. However, this interpretation is wrong. The current at the start of the trace at the left edge is **maximum negative.** Remember, as stated previously, negative yoke current is necessary for any kind of deflection on the left side of the screen. For example, during retrace from the center to the left edge of the screen, the current with the beam at the center is zero, gradually becomes more negative, reaching maximum negative at the extreme left edge. Deflection from the left edge to the center of the screen begins with maximum negative current (from the damper tube) at the left edge, and gradually decreases to zero at the center.

General Troubleshooting Tips

To help with troubleshooting, remember that damper circuit conditions are mainly responsible for the left side of the picture. For example: A weak damper tube will stretch the extreme left side of the picture.

The horizontal output tube contributes scan for the right side of the picture.

Some interdependency exists between the sequence of steps in horizontal deflection, and this can cause some blurring of the symptoms. For example, a weak horizontal output tube would be expected to give the primary symptom of narrow width on the right side of the picture. However, cutoff of the abnormally low plate current reduces the amplitude of the yoke ringing during retrace. This reduced ringing generates a smaller pulse of voltage, which, in turn, produces less damper conduction, and, consequently, reduced scan on the left side of the screen. The final result is a picture that is narrowed on **both** sides. ▲

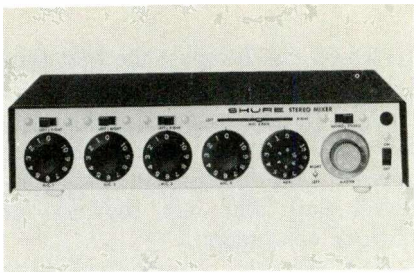
audio systems report

Stereo Microphone Mixer

The Model M688 stereo microphone mixer, which reportedly is designed to deliver high-quality performance when used with stereo tape recorders without built-in mixing capabilities, has been introduced by Shure Brothers Inc.

The M688 reportedly accepts four high- or low-impedance microphones through four inputs, plus a stereo auxiliary high-level input, each with its own volume control. Three microphone inputs have front-panel switches for left- or right-channel output. The fourth microphone input has a pan control which reportedly allows this input to be directed to the left channel, the right channel, or anywhere in between.

The M688 can also be used in audio-visual and multi-media presentations in which a stereo music source is used, or for stereo sound



reinforcement applications.

The unit is equipped with a stereo high-level, high-impedance output plus a left-plus-right (mono) microphone level output (high or low impedance), according to the manufacturer.

Model M688 sells for $114.00.

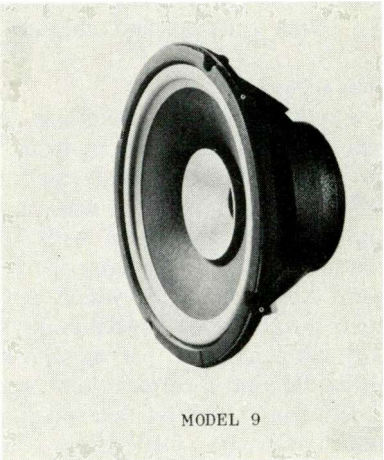
Circle 70 on literature card

12-Inch Loudspeakers

The Model 9, a 12-inch, two-element, dual-cone speaker, and the Model 10, a three-element, coaxial speaker, have been introduced by Jensen Sound Laboratories.

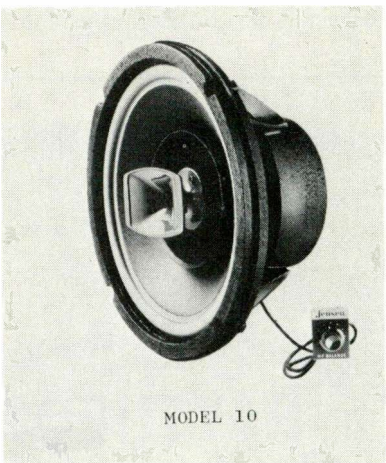
Specifications include:

Nominal size—12 inches for both
Power rating—20 watts for both
Frequency range—25-15,000 Hz for Model 9; and 25-18,000 Hz for Model 10
Impedance—8 ohms for both
Crossover—6,000 Hz, mechanical crossover, for Model 9; 4,000 Hz for Model 10
Balance control—Model 10, high frequency; none on Model 9
Woofer resonance—30 Hz for both



MODEL 9

Dimensions—12⅜ inches x 5¾ inches for both
Connections—Push-type binding posts for both



MODEL 10

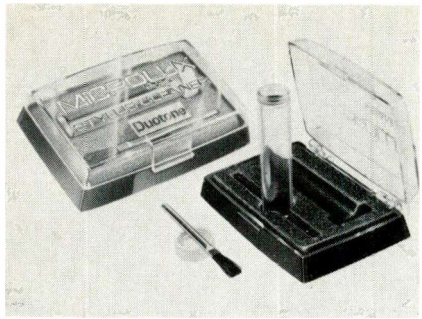
Weight—8½ pounds for Model 9, and 10 pounds for Model 10. Model 9 sells for $30.00, and Model 10 sells for $45.00.

Circle 71 on literature card

Stylus Cleaner

Duotone Company announces the availability of Microlux Stylus Cleaner.

The stylus cleaner is a chemical known as Formula ML-365, which is applied to the stylus with a brush. It cleans the stylus and acts as a deterrent to further accumulation of dirt. The Microlux application does not harm the stylus, its mounting or the records, and it acts



as an antistatic, according to the manufacturer. It reportedly is equally effective with diamond or sapphire stylus.

The Microlux stylus cleaner sells for $2.50.

Circle 72 on literature card

X-R Series Metal Cassette

A new metal cassette which reportedly eliminates static charge problems developed by plastic cassettes has been introduced by Auricord Div. of Scovill.

Static charge problems are reduced because the metal cassette is a ground, draining off any static charges. The metal housing reportedly insures dimensional stability and contains two machined bearing tape guides for tape location and low internal friction. Temperature and humidity do not affect the stability of the metal cassette, and decreased flutter and wow are provided, according to the manufacturer.

The metal cassette will fit any standard cassette machine, and is offered in PRO 60-, 90-, or 120-minute lengths.

The X-R PRO 60 sells for $3.95. ▲

Circle 73 on literature card

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B. Paid Circulation		
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2. Mail Subscriptions	48,835	52,946
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ROBERT E. HERTEL

carr electronics

by Joseph J. Carr/ES Auto Electronics Editor

Auto Cassette Players-- Drive Systems and Related Common Troubles

This month, we will look at the basic systems in auto cassette players, as well as some of the problems which are common to most, if not all, brands. We will bypass the audio amplifiers and motorspeed regulator circuits, because these are similar to circuits of similar function in four- and eight-track machines, which were covered in the January, 1971, issue of ES. In fact, some Japanese manufacturers use the same audio printed-circuit board in cassettes as that which they use in eight-track units.

The Cassette

A typical cassette is shown in Fig. 1. The player's capstan shaft fits through the bottom front lip of the cassette, in a position directly behind the tape. The pinch roller of the player fits through the front slot, to rest on the capstan, with the tape sandwiched between them.

The backside of the cassette is shown in Fig. 2. The two knock-outs, one on each side of the rear apron, prevent accidentally recording over recorded information which you wish to retain. The knock-out is removed after a side has been recorded, as shown in Fig. 2. Most machines which can record have a lever that presses against the knock-out. If the little piece of plastic is missing, the lever will slide forward to prevent the record button from being activated.

This feature is often the source of the type of complaints for which "fixing the customer" will prove more successful than attempting to find a trouble in the set. Such a situation popped up recently in my shop. A fellow purchased a cassette recorder/playback machine with which is supplied a "sampler" cassette. These tapes usually have some type of music on one side and are blank on the other. The proud owner was trying to record on the pre-recorded side of his sampler.

The Player

A typical automotive-type cassette playback unit is shown in Fig. 3. This particular machine is the Craig Model 3501. The indicator lamp to the left of the loading slot lights whenever a cassette is playing. The red lamp to the right of the slot turns on only after the cassette has finished playing. The play lamp will extinguish when the stop lamp comes on. The three center push buttons are, left to right rewind, manual eject, and fast forward. The other controls are tone, balance, and volume.

The drive system

The drive systems of most automotive cassette players fall into one of two basic catagories: belt driven or idler driven. Both types use a drive belt between the motor pulley and the flywheel. The system we are calling belt driven, however, also uses either the same belt or an additional belt to drive the take-up spindle. Such a player, the Automatic Radio Model ACS-6000, is shown in Fig. 4. The undercarriage of the Craig 3501, which uses idler wheels to drive the take-up mechanism, is shown in Fig. 5. Notice that the idler style of player seems less complicated than the drive belt design. It isn't.

Fig. 6 is a side-view drawing of

Fig. 1 A typical cassette (top and front view).

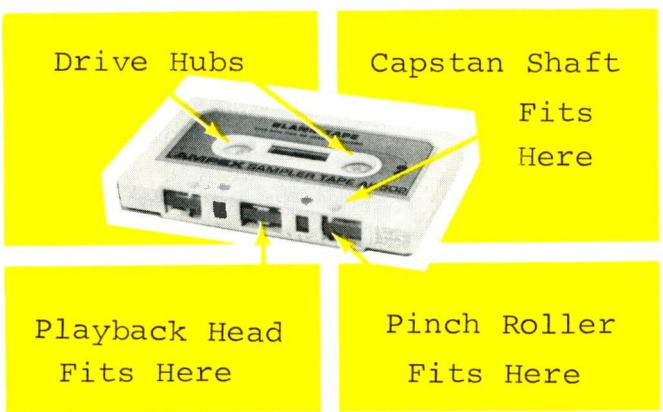


Fig. 2 Rear view of typical cassette, with anti-record notches pointed out.

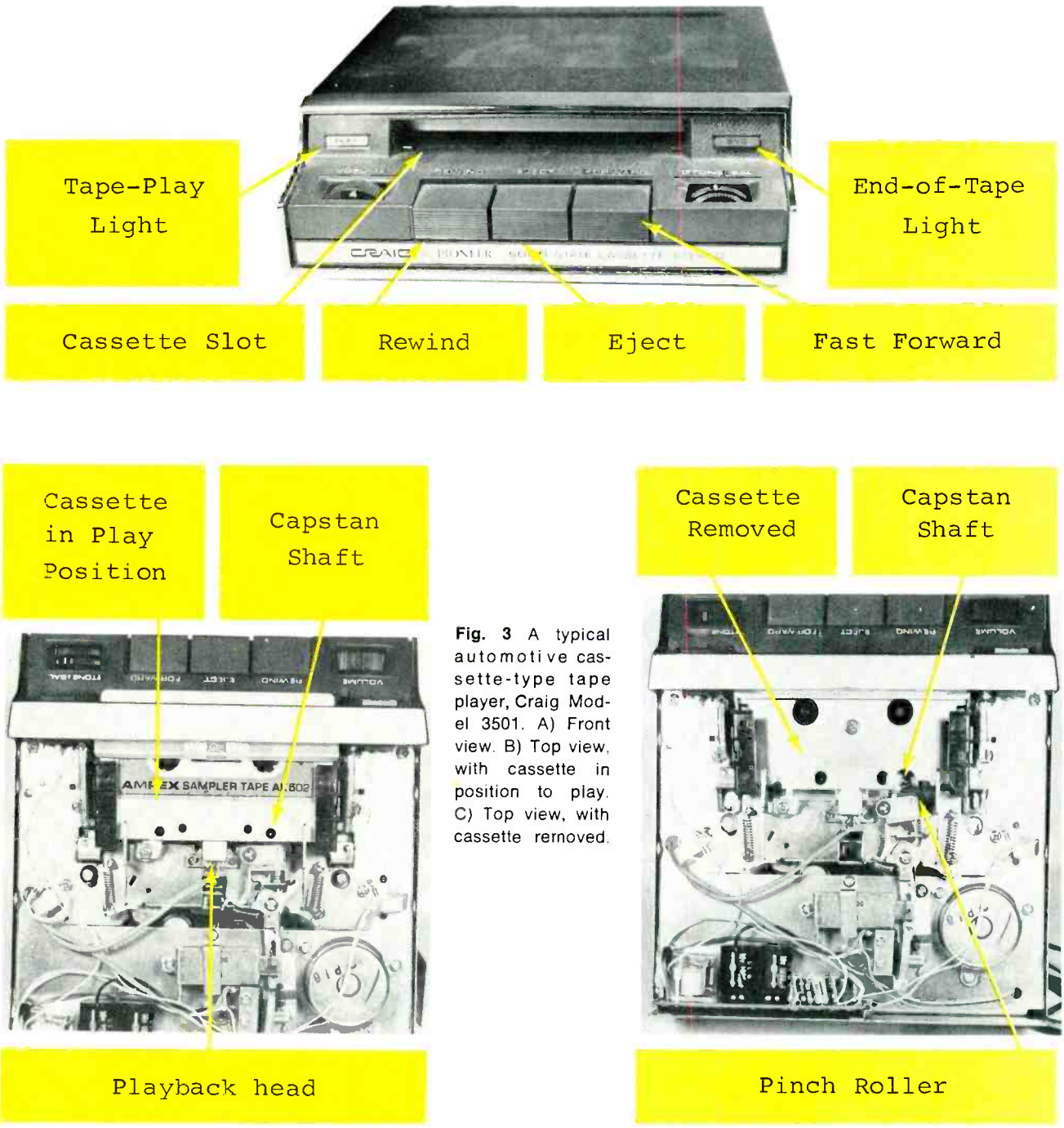


Fig. 3 A typical automotive cassette-type tape player, Craig Model 3501. A) Front view. B) Top view, with cassette in position to play. C) Top view, with cassette removed.

the capstan and flywheel assembly used in most cassette players. (The relative spacing is somewhat exaggerated, for illustration purposes. The capstan and bearing, for example, make a much closer fit.) The capstan shaft is attached and concentric to the flywheel. It fits through the chassis or cassette carriage via a sleeve bearing and flange. The rubber pinch roller is mounted to the top side of the chassis and presses against the capstan. Pressure is generally supplied by a tension spring. This pressure is usually adjustable either by anchoring one end of the spring in one of several chassis holes or by turning a cam-screw assembly. The flywheel usually has two grooves for drive belts. The larger of the two is usually the motor belt.

In belt-driven take-up systems, there is usually a pulley and drive shaft asembly connected to the flywheel via a rubber belt. The drive shaft rotates against a rubber tire on the rim of the take-up spindle. This is frequently a trouble point and will be discussed in greater detail later.

Fig. 7 shows the top view of a popular make of cassette player. The two black circular objects are the take-up reel (left) and the supply reel (right). The tape spindles and the motor-drive mechanism are mounted on a movable platform. When not in use, this platform is at

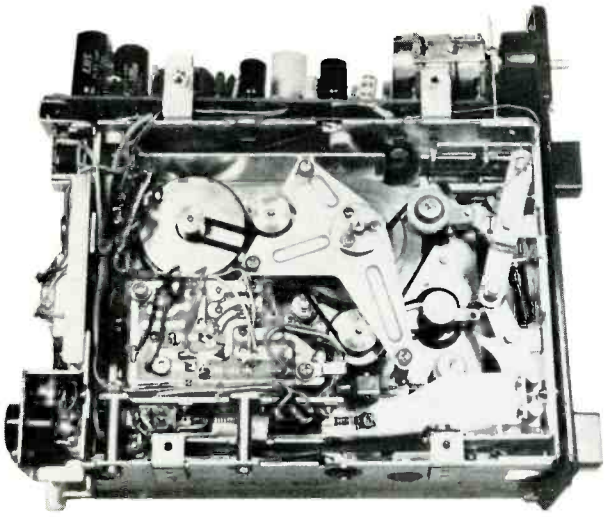


Fig. 4 Bottom view of Automatic Radio Model ACS-6000 casette tape player, which used a belt-drive system between motor and flywheel and take-up sprocket.

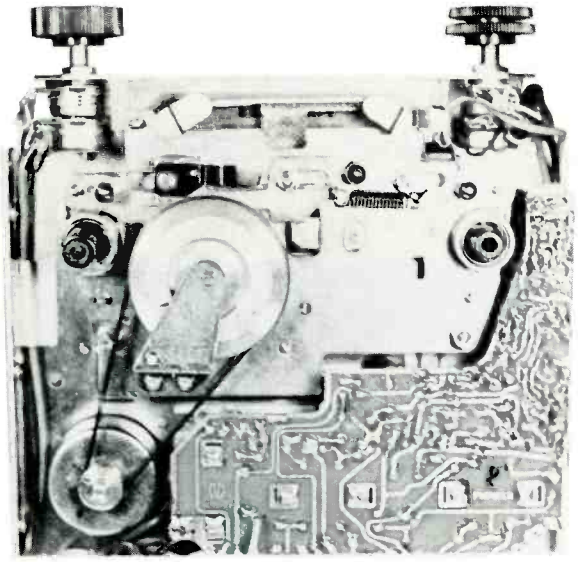


Fig. 5 Bottom view of Craig Model 3501 cassette tape player, which employs a belt between the motor pulley and the flywheel, but uses idler wheels to drive the take-up sprocket.

rest at the bottom of the machine. The cassette strikes two tape guide locks when it is inserted into the machine. This releases the mechanism and forces the platform up into the play position. When the cassette and the platform are both in position, several things occur simultaneously: 1) The power switch closes, energizing the circuits; 2) the pinch roller presses against the capstan shaft; 3) the spindles engage the two reel sprockets inside the cassette; and 4) a lock shaft on the platform engages the lock bar on the chassis. (This lock bar is mechanically coupled to the automatic eject solenoid.)

The automatic eject system

An automatic eject system, a feature found on most automotive cassette players, turns the machine off and ejects the cassette when a side has finished playing. This is done to prevent the tape leader from being torn off the supply reel at the end of play. (It is glued to the reel and is not an endless loop like the eight-track cartridge.) An electromechanical sensor tells the eject amplifier when the supply spindle has stopped turning. There are significant differences among the several popular types of sensors.

A version of one of the most popular sensors is shown in Fig.

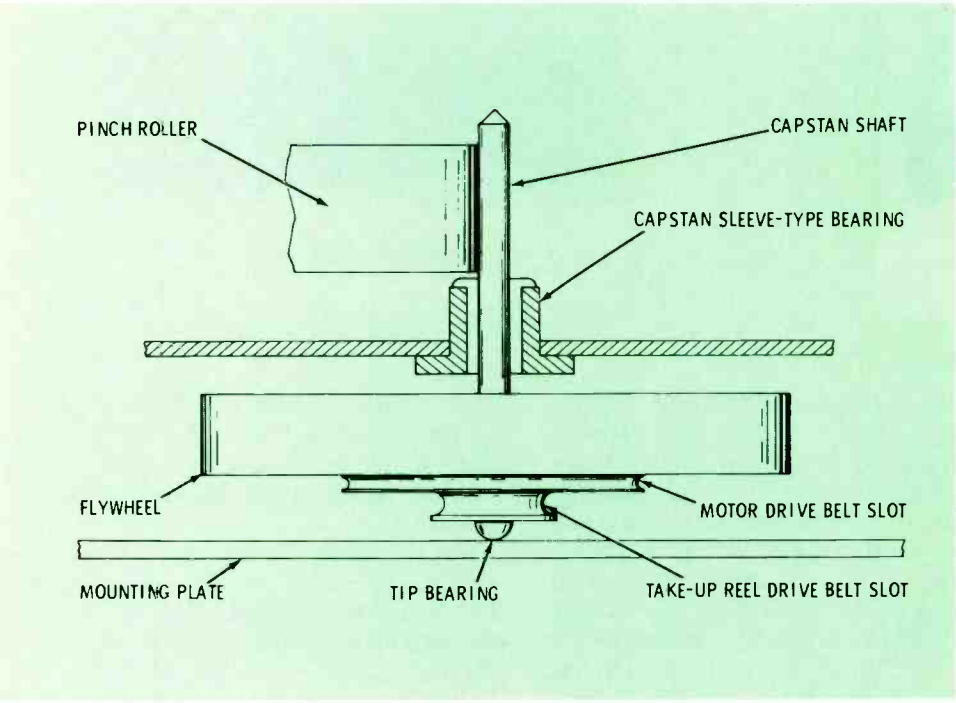


Fig. 6 Side-view drawing of capstan and flywheel assembly used in most automotive cassette tape players.

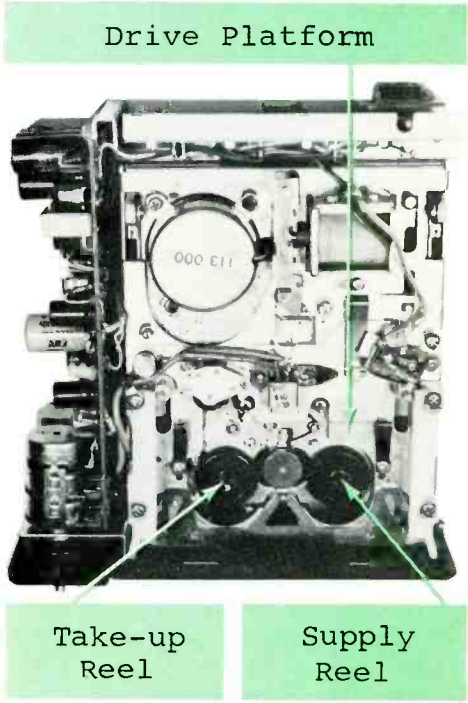


Fig. 7 Top view of Automatic Radio Model ACS-6000 cassette tape player.

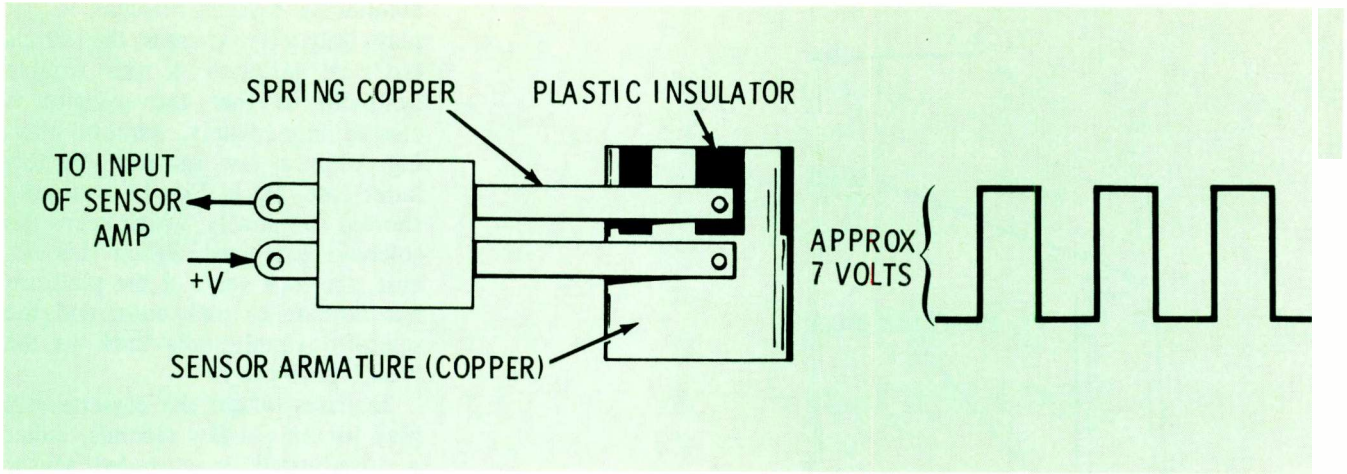


Fig. 8 A) Drawing of cartridge-stop sensor mechanism used in many cassette tape players. B) Rectangular pulse, produced by sensor mechanism, drives sensor amplifier.

8. The sensor armature is a cylindrical device which is attached concentrically to the supply spindle shaft. The bottom half of the armature is solid copper; the top half, however, consists of equal-size bands of copper and plastic insulator. The switch section of the sensor consists of two strips of spring copper resting on each of the two halves of the armature. The armature rotates whenever the supply spindle rotates. One of the switch leaves is connected to a positive voltage source, and the other is connected to the input of the sensor amplifier. This arrangement supplies a rectangular pulse of approximately 7 volts amplitude to the amplifier. Because the frequency output of most sensors is about 1 Hz, it might be impossible to view the pulse on an oscilloscope. This is one case where a conventional VTVM might be better for viewing a waveform than a scope.

Another sensor system is shown in Fig. 9. In this case the switch is two pieces of spring conductor which alternately "make and break" as a square-shaped cam rotates with the supply spindle. The output of this sensor is also a low-frequency rectangular pulse. Adjustment is accomplished by varying the position of the support block so that the contacts open on the high points of the cam and close on the flat portions.

Some cassette players use a magnetic sensor, such as that shown in Fig. 10. These sensors usually consist of two electromagnetic coils positioned above and below an interrupter disc. This disc is driven by the supply spindle. The disc's rim is cut out so that metal alternately shields then exposes the two coils to each other. In this way, it alternately interrupts then restores the magnetic flux path between the two coils. A DC bias is supplied to one coil making it an electromagnet. This "shaded" induction produces a rectangular pulse across the leads of the opposite coil.

At least one brand of player uses an interrupter disc made of alternate sections of ferrite and powdered brass. The powdered iron of the ferrite sections will reinforce the flux density while the brass attenuates the flux. This produces the varying magnetic field necessary for transformer action.

Fig. 11 shows a typical cassette-stop/eject amplifier circuit. Pulses from the sensor are impressed on the base of the input transistor, Q1. Because Q1 is an NPN device, positive excursions of the input waveform cause an increase in collector-to-emitter current. This current also flows through resistor R2, developing across it an in-phase rectangular pulse of voltage. These pulses are coupled by capacitor C1 to a half-wave voltage doubler. The output of the doubler is used to charge a relatively large-value capacitor, C2. The charge on C2 forward biases NPN transistor Q2. The discharge path for C2 is through the transistor base-emitter junction and the two bias resistors. This discharge path has a time constant of 8 to 30 seconds, depending on the particular design. The forward biased condition of Q2 reduces the voltage at point A to almost zero. This prevents Q3 from conducting, because its bias network is effectively shorted.

When the sensor stops rotating, the pulses cease. Because it is the nature of a capacitor to respond to voltage **changes,** instead of to an absolute DC level, the position of the sensor switch when the reel stops is unimportant. What is important is that the pulses have ceased. With nothing passing through the voltage doubler to keep C2 charged, it slowly discharges at a rate determined by the time constant (RC). When the voltage across C2 has dropped to the proper level, Q2 is cut off. Because there no longer is any collector current flowing through Q2, the voltage at point A returns to the "normal" level, which is sufficient to forward bias transistor Q3. The suddenly increased collector-to-emitter current in Q3 is sufficient to energize the eject solenoid, K1. This solenoid is coupled to the lock bar. When it moves out of the way, the cassette platform drops down to the "rest" position, and the cassette is forced out of the loading door. A closer view of this mechanism is shown in Fig. 12. The solenoid plunger pulls the lock bar up and releases the lock shaft, which is mounted to the movable cassette platform. When the lock shaft is released, gravity, assisted by a pair of power springs, returns the platform to the rest position.

Common Troubles and Their Causes

A very common complaint about

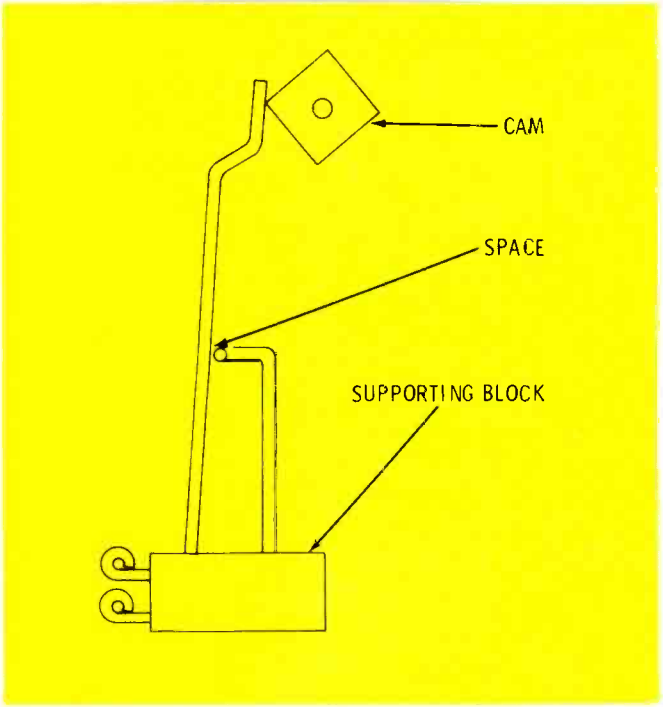


Fig. 9 Drawing of cam-type of cassette-stop sensor mechanism.

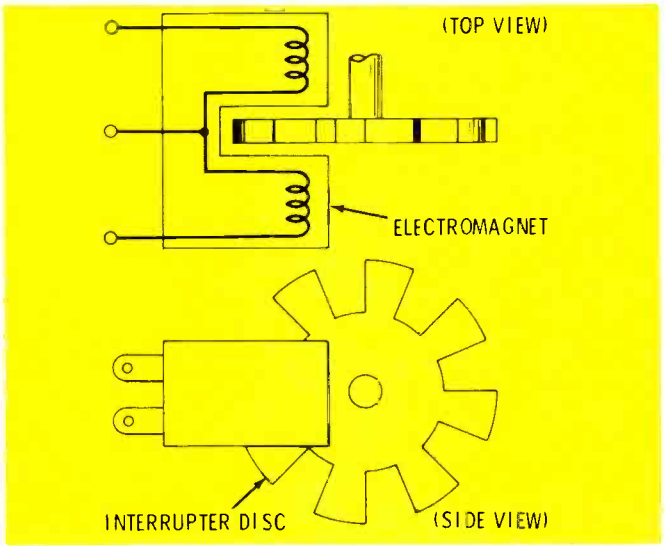


Fig. 10 Top- and side-view drawings of interrupter-disc-type of cassette-stop sensor.

automotive cassette machine is: "It plays only a few seconds, then drops out". A variation of this trouble symptom is that the cassette is ejected immediately, without playing, even a few seconds. In this latter case, Q3 in Fig. 11 is usually shorted completely, which keeps the solenoid energized. When this occurs, the lock shaft of the platform has nothing to lock onto, and the platform simply falls back to the "rest" position.

In cases where the cassette will play for only a few seconds, either a misadjusted or corroded sensor switch usually is the cause. It is best to replace both the sensor armature and switch leaves, if neither cleaning nor adjustment will restore proper functioning. Don't waste time troubleshooting the sense amplifier, until you have checked out the sensor switch and armature. I have found literally hundreds of defective sensors, but only a few defective sensor amplifiers.

The take-up spindle problem mentioned earlier is another common defect. A rubber belt drives the pulley drive shaft assembly, as shown in Fig. 13. The top edge of the drive shaft rubs directly against a rubber tire on the rim of the take-up spindle. If tension at this

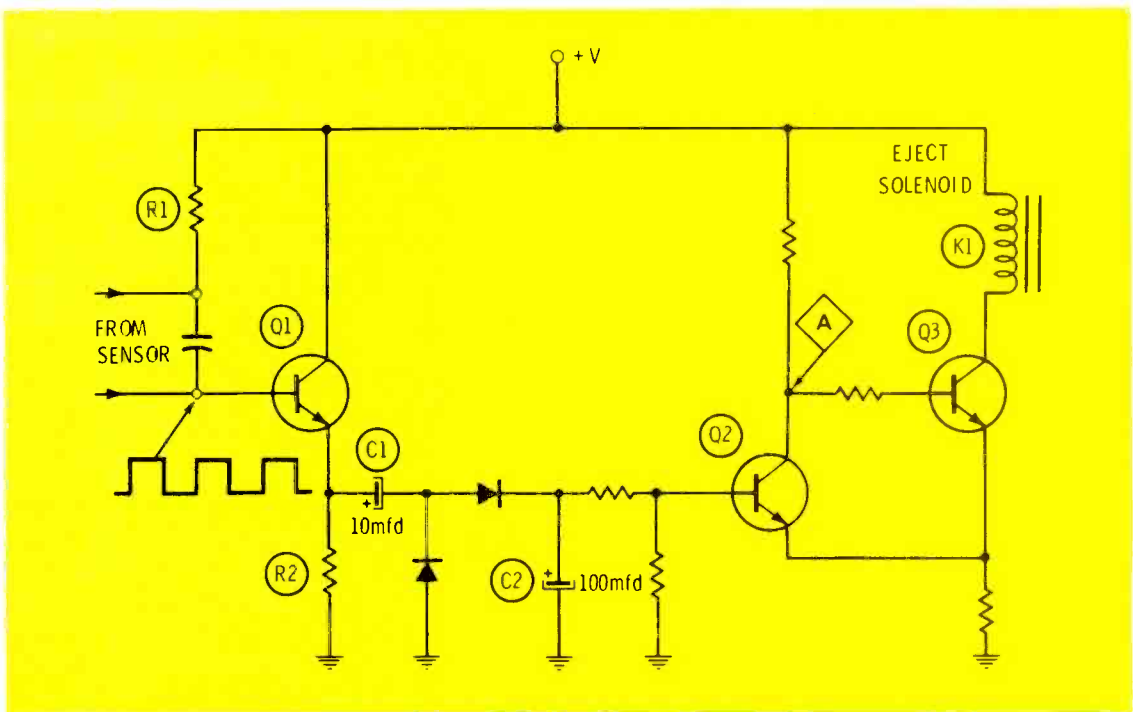


Fig. 11 Typical cassette-stop / eject amplifier, which controls current to the eject solenoid, K1. Input to the amplifier section is the pulses from the sensor mechanism. See text for details of operation.

point is too great, or if the unit has been used a lot, the drive shaft will tend to undercut the rubber tire (Fig. 3B). This might have been prevented if the top edge of the drive shaft were higher than, or on the same level as, the top edge of the rubber tire. In any event, the rubber tire should be replaced if it shows any signs of such undercutting.

If the tire is severely undercutted, the drive shaft will not make sufficient contact with it. This causes the take-up spindle to cease turning. The pinch roller and capstan, however, continue feeding tape. With the take-up reel not absorbing the slack, tape will begin feeding outside the cassette, into the pinch roller mechanism, and will wrap around the capstan shaft, eventually breaking. Multiple breaks are not uncommon.

Whether or not the tape actually breaks, I usually dispose of it. Most of the tape that spilled out of the cassette will be creased, twisted and otherwise damaged. A wrinkled tape is of little consequence when used in an eight-track unit, unless an extensive length of tape is damaged. Cassette players, however, have a small diameter capstan. Also, the top of the capstan is close to the top edge of the tape. A wrinkled tape tends to ride up and down on the capstan. It is only a matter of time before the tape spills over the top of the capstan and into the mechanism once again.

Another cause of tape spill and breakage is a bent capstan shaft, which will tend to wobble against the pinch roller. There seems to be some doubt as to whether a bent shaft causes the sleeve bearing to wear out or whether a worn out sleeve bearing will allow the shaft to bend. In any event, it is true that they both are usually found together. It is a good idea, therefore, to replace both.

Tape spill, by the way, is a leading complaint about automotive cassette machines. It is so common, and the results are so drastic, that it is considered poor bench procedure to operate one of these units without first removing the covers to examine the take-up reel. Immediately after inserting the cassette (this turns on the machine), take a quick look at the take-up reel. If it fails to turn, immediately eject the cassette. Failure to do this quick enough can cause irreparable damage to the cassette. If the cassette just happens to be your test tape, you, or someone who is likely to yell very loudly, will have paid between four and twenty dollars for it. ▲

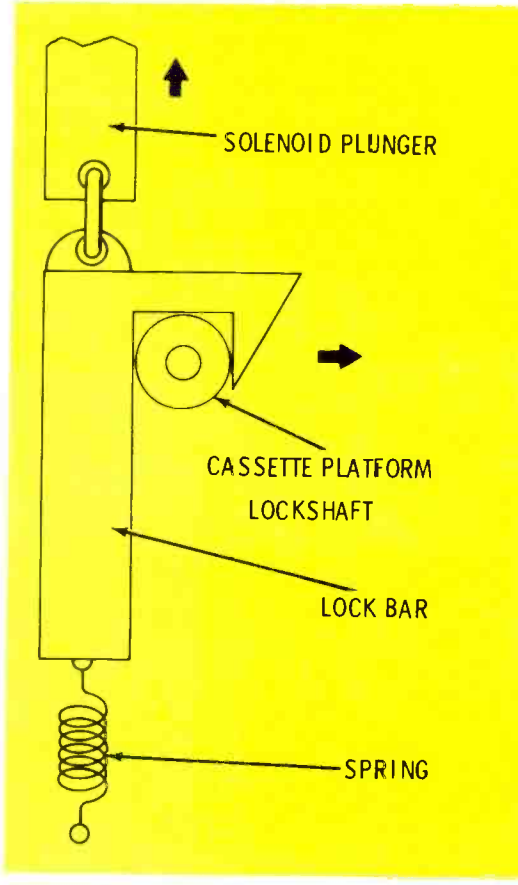
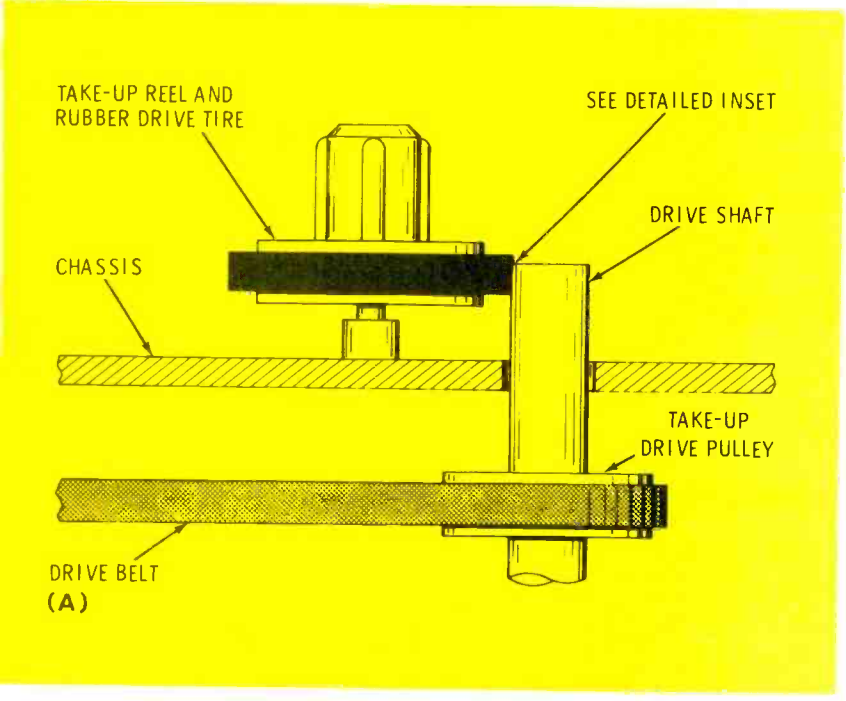


Fig. 12 Drawing of lock mechanism which holds cassette platform in play position until cassette-stop/eject amplifier energizes eject solenoid K1. Lock bar is then pulled up by solenoid plunger and cassette platform drops to "rest" position, forcing cassette out slot in front of player.



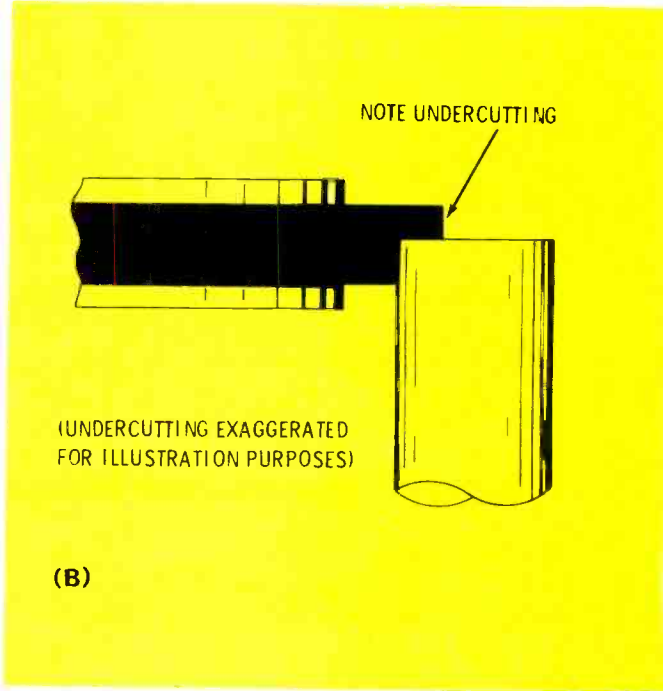


Fig. 13 A) Side-view drawing of take-up spindle drive mechanism. B) Enlarged view of drive shaft and rubber tire on take-up reel, showing undercutting of tire by shaft, caused by improper alignment and/or wear.

Source Guide To Imported Consumer Electronic Products

This guide correlates the brand name of an imported consumer electronic product with the manufacturer, importer and/or the distributor of that product and indicates whether or not that brand name is or has been covered in Howard W. Sams specialized series of transistor radio, auto radio and tape recorder manuals (TSM, AR and TR series) or in PHOTOFACT.

The number following each brand name indicates the most likely source from which service information and/or parts may be obtained, or to which a set may be sent for repair service. Before shipping a set, it is best to write the company indicated to determine if repair service is available, and if it is, what the company rules are concerning shipment of the set.

To provide continuous updating of this source guide, the editors of ELECTRONIC SERVICING would appreciate receiving from readers other brand names that are being used but do not appear here. If the manufacturer, importer and/or distributor is known, please include it. If it is not known, we will attempt to trace it and publish the information in ELECTRONIC SERVICING.

Complete Manufacturer/Importer/Distributor list beginning on page 58

Brand Name	Manufacturer, Importer and/or Distributor	Sams Coverage
ACME	251	yes
AFCO	3	no
AGS	406	no
AITC	201	no
AKAI	4	no
AMC (Aimcee)	11	yes
AMD	483	yes
APF	5	no
Adell	8	no
Adonis	6	no
Advanco	10	no
Aimor	2, 45	no
Aircastle	399	yes
Aircorder	347	no
Airline	280	yes
Aiwa	12	yes
Aiwa (Milovac)	375	yes
Akai (Camart)	60	no
Akai (Roberts)	353	no
Alaron	41	yes
Alfred	64	no
Alliance	14	yes
Allied	16	yes
Alpha	299	yes
Alps	18	no
Ambassador	17	yes
Amertone	19	no
Amico	130	no
Ampex	22	yes
Angel	26	no
Annabel	41	no
Apolec	2	yes
Aristo	24	no
Aristocrat	37	yes
Aristo-Tone	24	no
Arrow	26	no
Astrex	460	no
Astrotone	231	yes
Audio-Lite	91	no
Audio Magnetics	33	no
Audio/Stereo	283	yes
Audion	34	no
Audiopak	32	no
Audiotape	32	no
Audiovox	35	yes
Audition	481	no

Brand Name	Manufacturer, Importer and/or Distributor	Sams Coverage
Aud-I-Tone	206	yes
August Moon	148	no
Automatic	36	yes
Auto Music	323	no
Auto-Sonic	258	yes
Aztec	39	no
BASF	40	no
BSR (U.S.A.)	42	yes
B&K	41A	yes
Barkleigh	43	no
Baron	50	no
Baylor	468	yes
Belaic	146	no
Belair (Hamway)	177	no
Belair (Mason)	261	no
Belair (Toko)	436	no
Belair (Toyo)	445, 446	no
Belaire	146	no
Belcor	44	no
Belcorder	177	no
Bell & Howell	46	yes
Benjamin	48	yes
Big Ben	438	no
Bigston	230	no
Billion	373	no
Birch	424	yes
Blaupunkt	52	yes
Boeing	50	no
Boman	57	no
Bowman	57	yes
Bozak	120	no
Bradford	168	yes
Brand 5	354	no
Bravo	350	no
Brenell	136	no
Brightone	1	no
Broadmoor	55	yes
Browni	72	no
Bulova	56	yes
Bush	451	no
CBC	72	no
CEC	74	no
CONION	83	no
Caisonic	344	no
Califco	58	yes
Cameo	28	yes
Candle	61	yes
Capehart	63	yes
Capri (Nason)	291	no
Capri (Toepfer)	432	no
Captain	487	no
Car Pal	35	no
Car Tapes	65	no
Catalina	478A	yes
Cathy	306	no
Channel	70	no
Channel Master	71	yes
Chemicon	300	no
Chinon	366	no
Cipher	268	yes
Citation	179	no
Clairtone	75	yes
Claricon	482, 483	yes
Clarion	482, 483	yes
Clark	77	yes
Clasonic	76	no
Coach	101	no
Color Volt	392	no
Columbia	79	yes
Commodore	80	yes
Communica	439	no
Concertone	81	yes
Concertone (Monarch)	278	yes
Concord	82	yes
Constant	62	no
Consul	156	no
Consul Delux	160	no
Contelcee	85	no
Continental	57	yes
Coral	86	no
Coronado	154A	yes
Coronet	26	yes
Cortina	109	yes
Corvair	453	yes
Corvette	272	yes
Country	222	no
Courier	86A	yes
Craig	88	yes
Crest	432	yes
Crest-Line	62	no
Crown	90	yes
Crown (Industrial Suppliers)	196	yes
Crowncorder	90	no
Curtis-Mathes	92	yes
Daltone	95	no
Data Packaging	96	no
Dec	94	no
Decca	97	yes
Dejay	98	no
Delmonico	99	yes
Demco	79A	yes
Dempa	100	no
Denon	301	no
Denon (Sheraton)	379	no
Dia	308, 309	no
Dimension	427	no
Dokorder (Pengo)	332	no
Dokorder (Wilson)	479	no
Dolphin	102	no
Domino	308, 309	no
Doral	164	no
Dorset	430	no
Douglas	394	yes
Drexel	103	yes
Dual	462	yes
Durpoint	104	yes
Dyn	105	yes
Dyn-Sonic	105	no
Dynakits	106	no
Dynatronics	197	yes
Dynavox	107	yes
Ebner	136	no
Echo	225	no
Echo Radio	108	no
Edital	120	no
Eico	109	yes
Eicocraft	109	no
Eiwa	110	no
Eiwacorder	110	no
Elac	48	no
Eldorado	78	no
Electra	111	no
Electro	112	yes
Electro-Brand	112	yes
Electrohome	113	yes
Electrophonic	281	yes
Electro-Wipe	104	no

Source guide, continued . . .

Brand Name	Manufacturer, Importer and/or Distributor	Sams Coverage
Elgin	118	yes
Elite	119	no
Embassy	121	no
Emerald	203	no
Emi	48	no
Emud	99	yes
Empire	448	no
Empire	124	no
Encore	59	no
Engineers	356	no
Englishtown	399	yes
Epicure	126	no
Espo	128	no
Essex	237, 238	yes
Estey	129	no
Ever-Play	171	yes
E-Z Splice	104	no
Fabulloyds	238	no
Faircrest	139	yes
Fairfax	132	no
Fairmont	133	yes
Fairmont	134	yes
Falcon Sergeant G-2	116	no
Fanon	135	yes
Fantavox	257	no
Fanuc	153	no
Facom	153	no
Federal	138	yes
Fen-Tone	136	no
Ferrograph	120	yes
Fidela	288, 289	no
Fidelity	356	no
Fix Tuned	142	no
Fleetwood	455	yes
Foster	144	no
Four Star	143	no
Fuji	147	no
Fujiden	151	no
Fujion	149	no
Fuji Ricoh	150	no
Fujitsu	153	no
Fujitsu Ltd.	152, 153	no
Funia	154	no
GC	155	no
GRT	157	no
GW	158	no
Galaxy	29	no
Garrard	159	yes
Gaytone	177	no
Geloso	20	yes
Gema	29	no
General	451	yes
Gibbs	57	yes
Gibson Girl	354	no
Gidget	36	no
Global	164	yes
Globe	155	yes
Goer	166	no
Goer 8	70	no
Golden Shield	165	yes
Goodmans of England	119	no
Goodway	166	no
Gotham	167	yes
Granada	146	no
Grand Prix	72	no
Gregory	169	yes
Grenadier	123	no
Grundig	170	yes
Gusdorf	172	no
Guy Barry	134	yes
HTV	175	no
Halco	174	no
Hammarlund	114	yes
Harlie	178	no
Harman-Kardon	179	yes
Harp	145	no
Hatsune	181	no
Hemisphere	359	yes
Heritage	182	no
Hi-Delity	335	yes
Highsky	204	no
Highwave (Delmonico)	99	yes
Highwave (Marvel)	260	yes
Hinode	183	no
Hit	182	no
Hitachi	186	yes
Hiwave	261	no
Hokuyo Musen	189	no
Honey Tone	29	yes
Hosho	82	yes
J. B. Hunter	17	no
IEM	191	no
ISCO	196	yes
ITC (Ikegami)	193	no
ITC (Int'l Transistor)	201	no
ITT	192	yes
Ideal	199	no
Imperial	194	yes
Imperial Delux	194	no
Impex	195	no
Inland	197	yes
Inmont-Cass/8	69, 70	no
Intermart	198	no
Intersonic	202	no
Invico	67	no
Invicta	447	yes
Irish	203	no
JFD	205	yes
JIL	208	no
JJJ	206	no
JVC (Delmonico)	99	yes
Jade	350	no
Jaguar	293	yes
Japarc	209	no
Jensen	210	no
Jeolco	211	no
Juli-corder	437	no
Juliette	441	yes
Juli-phone	437	yes
KCK	212	no
KLH	213	yes
Katone	216	no
Kaysons	218	no
Kensington	430	no
Kent	219	yes
Kenwood	220	yes
Kenwood (Trio)	456	yes
Keystone	31	no
Kilts	101	no
Kitaron	223	no
Kits	224	no
Kleen-Sweep	104	no
Knight	16	yes
Kodam	225	no
Koronette	141	no
Korting	5	yes
Koss	226	no
Koss-Acoustech	226	no

Brand Name	Manufacturer, Importer and/or Distributor	Sams Coverage
Koss/Rek-O-Kut	226	no
Kowa	227	yes
Koyo	228	yes
Kron	194	no
Kroy (York)	491, 492	yes
Kuba	337	yes
Kupi-Tone	478	no
Kyocera	229	no
LIC	241	no
L.W.E.	7	no
Lafayette	231	yes
Lamie	415	no
Lark	59	no
Leader	232	no
Leak	127	yes
Lear Jet Stereo 8	233	yes
Lebo	234	no
Levtron	468	no
Lexington	341	yes
Liberty	235	yes
Lion	236	no
Little Pal	251	no
Lloyd's	238	yes
Loben	433	no
Longines Symphonette	239	yes
Lord Barkleigh	43	no
Loyal	240	no
Lucky	241	no
Lulu	329	no
Luxtone	242	no
Lynn	243	no
McIntosh	120	yes
MGA	275	yes
MYM	245	no
Macrosonic	490	no
Magatone	308, 309	no
Magnatone	129	yes
Magnecord	425	yes
Magnifique	356	no
Magnus	249	no
Major	250	no
Majorette	250	yes
Mallory	250A	yes
Mantone	251	no
Marantz	252	yes
Mar-Lin	253, 254	no
Mars	256	no
Martel	258	no
Marvel	251	yes
Mascot	356	yes
Master Control	483	no
Masterwork	263	yes
Masterwork (Columbia)	79	yes
Matsushita	264	yes
Maxell	184	no
Mayfair	27	yes
Mecca	259	no
Medallion	272	yes
Megatone	6	no
Melodian	221	no
Mercury	266	no
Mercury (Pax)	330	yes
Message Minder	53	no
Metex	308, 309	no
Metro	269	no
Mexko	342	no
Micro	271	no
Microsonic	344	no
Midland	272	yes
Miharu	273	no
Mikado	274	no
Milovac	375	yes
Mingon	415	no
Mini-Swinger	424	no
Miny	310, 259	no
Miracord	48	yes
Miradon	337	no
Mirandette	15	no
Mitsubishi	275	yes
Mitsumi	276	no
Miyakawa	277	no
Mody-Kit	54	no
Monacor	278	yes
Monarch	278	yes
Monarch (BSR)	42	yes
Mondo	279	no
Moore	314	no
Morse	281	yes
Mortone	203	no
Muntz Stereo-Pak	283	yes
Murata	284	no
Musicolor	285	no
Muskat	47	no
NAC	290	no
NACO	310	no
NAL	311	no
NDK	302	no
NGK	286	no
NIKKA	73	no
NTK	286	no
Nakamichi	288, 289	no
Nanaola	443	no
Nassau	423	no
National	327	yes
Nec (Kanamatsu)	214	yes
Nec (Nippon)	303	yes
Nemco	287	no
Net	294	no
Newell	2	no
Nichicon	297	no
Nitto	307	no
Nivico (Delmonico)	99	yes
Nobility	295	no
Nocturne	179	no
Nordmende	406	yes
Norelco	312	yes
North American	310	yes
Novel	147	no
NuVox	313	no
OKI	68	yes
OMGS	310	yes
Ocean	173	no
Ocean & Transonic	454	no
Olson	318	yes
Olympic	319	yes
Omron	321	no
Onkyo	325	no
Oral	322	no
Orion	324	yes
Orion (Fried Trading)	146	yes
Ortofon	120	no
Oscar	93	no
Pacific	326	no
Panasonic	327	yes
Panger	427	no
Paros	204	no
Patronic	328	no

Brand Name	Manufacturer, Importer and/or Distributor	Sams Coverage
Pax	330	no
Peerless	331	yes
Pencorder	341	no
Penneys-Penncrest	333	yes
Perfection	334	no
Perpetuum-Ebner	120	yes
Pet	365	no
Petely	335	no
Peter Pan	424	no
Petite	406	yes
Phoenix	59	no
Phonola	425	yes
Pianola	57	no
Pickering	338	no
Pioneer	339	no
Plata (Dyn)	105	yes
Plata (Kaysons)	218	yes
Playtape	89	no
Poly-Planer	247	no
Poly-Sonic	247	no
President	331	no
Princeton	25	no
Qatron	343	no
Quickmount	247	no
Radiant	344	no
Radiomaster	345	no
Raleigh	218	yes
Ranger	427	yes
Realistic	16	yes
Realtone	349	yes
Record-Matic	104	no
Recoton	350	no
Regency	350A	yes
Rembrandt Antennas	13	yes
Rhapsody	41	yes
Rising	188	no
Rivera	292	no
Roberts	353	yes
Roberts Ross	431	no
Robette	180	no
Robin	261	yes
Robins	354	yes
Robyn	354A	yes
Rolecor	355	no
Romar	340	no
Ross	356	yes
Rota	352	no
Rotacorp	352	no
Rotel	355	no
Roxy	315	no
Royal	250	yes
Rozinante	357	no
Rutherford	92	yes
St. Mortiz	251	no
SD	413	no
SMK	388	no
Saba	358	yes
Samac	372	no
Sampson	200	yes
Sandhurst	6	no
San-ei Instrument	360	no
Sankoh	362	no
Sanrin	363	no
Sansui	367, 368	yes
Sanyo	369	no
Satellite	49	yes
Saxony	450	yes
Scene	166	no
Scene Tuner	69, 70	no
Scotch	244	no
Scott	370	yes
Seavox	146	no
Seeburg	371	yes
Selecto	104	no
Seminole	364	yes
Sentry	31	no
Setico	376	no
Shamrock	203	no
Shannon	101	no
Sharp	377	yes
Sharpe	378	no
Sharpe (Elpa)	120	no
Sheraton	379	yes
Sherwood	380	yes
Shibaden	383	yes
Shimadzu	384	no
Shin-ei	385	no
Shin-Shirasuna	387	no
Shure	389	no
Silver	387	yes
Singer	390	yes
Skandia	391	no
Skyfon	320	no
Skymaster	295	no
Solo-phone	389	no
Sonics	393	no
Sonoco	395	no
Sonoramic	354	no
Sony/Superscope (Recorders)	410	yes
Sony	397	yes
Sound	304	yes
Sound N Color	109	no
Soundesign	349	yes
Sovereign	379	no
Spica	408	yes
Spico	398	no
Spinola	400	no
Sportmaster	401	yes
Squealer	71	no
Stanbrooke	430	no
Standard	402	yes
Stanford	404	no
Stanton	120	no
Starfire	255	no
Star-Lite	262	yes
Startone	190	no
Stellar	30	no
Stereo-Dyn	105	no
Stereo Dynetic	389	no
Stereo-Magic	405	no
Stereomatic	6	no
Sterling	406	yes
Stewart	243	yes
Sublime	347	no
Summit	408	no
Sun Bird (Katoh)	215	no
Sun Bird	208	no
Sun Glass	20	no
Sunny-vox	386	no
Sunsonic (Sankei)	361	no
Sunsonic	407	no
Suora	103	no
Super Dynamic	413	no
Superex	409	yes
Supersonic	399	yes
Supre-Macy	246	yes

Brand Name	Manufacturer, Importer and/or Distributor	Sams Coverage
Sylvano	23	no
Symphonette	239	yes
Synchronex	344	no
TDK	413	no
TDK Cassette	413	no
TMK	447	no
TWI	455	no
Tact (Fried)	146	no
Tact (Hamway)	177	no
Taico	414	no
Takt	416	no
Tamradio	417	no
Tamura	418	no
Tandberg	419	yes
Taya	444	no
Teac (Teac)	420, 420A	yes
Teaberry	419A	yes
Technicorder	317	no
Tel	427	no
Telecon	421	yes
Telefunken	422	yes
Tele-Tone	424	yes
Telex	425	yes
Telex-Phonola	425	yes
Telmar	426	yes
Telmar (Martel)	258	yes
Tempest	38	no
Ten (Fujitsu)	152, 153	yes
Ten (Sanyo)	369	yes
Ten Brand	35	no
Tenna	427	yes
Tennac	428	no
Tennamatic	427	no
Tenphonic	429	no
Thorens	120	yes
Three-Star	291	no
Tobi-Sonic	27	no
Toho	438	no
Tokai	434, 435	yes
Toko	436	no
Tonecrest	270	yes
Tonemaster (Broadmoor)	55	yes
Tonemaster (TAC)	451	yes
Tonex	59	no
Toshiba	442	yes
Toshiba (Trans World)	453	yes
Toshri	137	no
Townley	125	no
Trancel	453	yes
Transcriber	452	no
Transette	272	yes
Transicorder	305	yes
Transonic	453	yes
Transworld	115	no
Trio	456	no
Triumph	458	yes
Tropicana	45	no
Troubador	123	no
Truetone	477	yes
Tussah	459	no
Twin XX Twenty	247	no
USAC	463	no
Uher	258	yes
Ultra-82	467	no
Unelco	460	no
Unicord	20	no
Unidyne	389	no
Unimetrics	231	no
Union	461	no
Unisphere	389	no
United Audio	462	no
Valencia	208	no
Valient	464	yes
Vantage	131	yes
Velk	465	no
Venice	316	no
Versatek	121	no
Vesper	434	yes
Viking	425	yes
Vikoa	467	no
Viscount	84	yes
Vision	468	yes
Vista	88	yes
Voca	469	no
Vornado (Automatic)	36	no
Vornado	470	yes
Wald	471	no
Waltham (Int'l Importers)	200	no
Waltham	472	no
Watts	120	no
Wealth (Funia)	154	no
Wealth (Toyomenka)	447	no
Weather Ear	121	no
Weltron	475	yes
Webcor	474	yes
Westinghouse	476	yes
Wharfedale	478	no
Wilco	369	yes
Wilson	480	no
Windsor	481	no
Winston	447	yes
Winston	477	yes
Wollensak	244	yes
XAM	374	no
YAOU	162	yes
Yamaha	485	no
Yamatake-Honeywell	487	no
Yaskawa	489	no
Ye	486	no
Yec	493	no
Yew	490	no
York	492	yes
York (N.Y. Transistor)	296	yes
Zenon	494	no

Complete Manufacturer/Importer/Distributor list beginning on page 58

Manufacturer/Importer/Distributor List

1. A&A Trading Co.
23 E. 26th St.
New York, N.Y.

2. ABC Import & Export
47 W. 30th St.
New York, N.Y.

3. AFCO Electronics, Inc.
P.O. Box 973
Oakland, Calif. 94604

4. AKAI America, Ltd.
2139 E. Bell Amo Blvd.
Compton, Calif. 90020

5. APF Electronics, Inc.
515 Madison Ave.
New York, N.Y. 10022

6. A&S Trading Co.
124 W. 30th St.
New York, N.Y. 10001

7. Acoustron Corp.
2418 Bartlett
Houston, Tex. 77006

8. Adell International, Inc.
43700 Adell Blvd.
Novi, Mich. 48050

10. Advance Transistor Co.
1225 Broadway
New York, N.Y.

11. Amcrest Corp.
1440 Broadway
New York, N.Y. 10018

12. Aiwa International Corp.
One E. Wacker Dr.
Chicago, Ill. 60611

13. All Channel Products, Corp.
47-75 48th St.
Woodside, N.Y.

14. Alliance Mfg. Co., Ltd.
Lake Park Blvd.
Alliance, Ohio

15. Allied Impex Corp.
300 Park Ave. S.
New York, N.Y.

16. Allied Radio Shack
2617 W. 7th St.
Ft. Worth, Tex. 76107

17. Allied Stores Purchasing
401 Fifth Ave.
New York, N.Y. 10016

18. Alps Electric Co., Ltd.
c/o Kanamatsu-Gosho (USA), Inc.
One Whitehall St.
New York, N.Y. 10004

19. Amerex Trading Co.
417 Fifth Ave.
New York, N.Y.

20. American Geloso Electronics, Inc.
251 Park Ave. S.
New York, N.Y. 10010

21. American Sankyo Corp.
149 Fifth Ave.
New York, N.Y. 10004

22. Ampex Corp.
Landmeier Rd.
Elk Grove Village, Ill. 60007

23. Apex Repair Center
1141 Broadway
New York, N.Y.

24. Aristo-Tone Electronics
240 Fifth Ave.
New York, N.Y. 10001

25. Arlans Dept. Stores, Inc.
393 Seventh Ave.
New York, N.Y. 10001

26. Arrow Trading Co.
Seven W. 26th St.
New York, N.Y.

27. Artic Import Co.
(Bee Electronics)
(Mayfair Electronics Corp.)
666 W. Kinzie St.
Chicago, Ill.

29. Associated Importers
34 Dore St.
San Francisco, Calif.

30. Astra Trading Co.
175 Fifth Ave.
New York, N.Y. 10010

32. Audio Devices, Inc.
235 E. 42nd St.
New York, N.Y.

33. Audio Magnetics Corp.
14600 S. Broadway
Gardena, Calif. 90247

34. Audion Corp.
200 Fifth Ave.
New York, N.Y.

35. Audiovox Corp.
300 Denton Ave.
New Hyde Park, N.Y. 11040

36. Automatic Radio Sales
Two Main St.
Melrose, Mass. 02176

37. Automotive Associates
551 Fifth Ave.
New York, N.Y. 10017

38. Azad International
22 W. 27th St.
New York, N.Y.

39. Aztec Sound Corp.
2140 S. Lipan St.
Denver, Colo.

40. BASF Systems, Inc.
Crosby Dr.
Bedford, Mass. 01730

41. B&B Import & Export Co.
15755 Wyoming Ave.
Detroit, Mich. 48238

41A. B & K Dynascan Corp.
1801 W. Belle Plaine Ave.
Chicago, Ill. 60613

42. B.S.R. (USA), Ltd.
Route 33
Blauvelt, N.Y. 10913

43. Barker Stores
815 Hutchinson River Parkway
Bronx, N.Y. 10465

44. Belcor Corp.
457 Chancellor Ave.
Newark, N.J.

45. Bell Electronics
1180 Broadway
New York, N.Y. 10009

46. Bell & Howell Co.
7235 N. Linder Ave.
Skokie, Ill. 60076

47. Bel-Mar, Inc.
1942 N.E. 151st St.
N. Miami Beach, Fla. 33160

48. Benjamin Electronic Sound Co.
40 Smith St.
Farmingdale, Long Island, N.Y. 11736

49. Best of Tokyo
11 W. 42nd St.
New York, N.Y.

50. Boeing Electronics Co., Ltd.
1-9, Ryocho Sakata City
Yamagata, Japan

52. Robert Bosch Corp.
2800 S. 25th Ave.
Broadview, Ill. 60153

53. Boston Worldwide
148 State St.
Boston, Mass.

54. Bowman Electronics
155 E. First Ave.
Roselle, N.J.

55. Broadmoor Industry, Ltd.
530 Santa Rosa Dr.
Des Plaines, Ill. 60018

56. Bulova Watch Co.
630 Fifth Ave.
New York, N.Y. 10020

57. California Auto Radio, Inc.
9426 Stewart & Gary Rd.
Downey, Calif.

58. California Trading Co.
P.O. Box 3164
Torrance, Calif.

59. Caltrade Mfg. & Trading Co.
360 Ninth St.
San Francisco, Calif. 94103

60. Camart Products
Repair Center
1845 Broadway
New York, N.Y.

61. Candle America, Inc.
1457 Venice Blvd.
Los Angeles, Calif. 90006

62. Canton-Son, Inc.
12 W. 27th St.
New York, N.Y.

63. Capehart Corp.
770 Lexington Ave.
New York, N.Y. 10021

64. Capin Mercantile Corp.
109 Nelson Ave.
Nogales, Ariz. 85621

65. Car Tapes, Inc.
320 W. Ohio St.
Chicago, Ill. 60610

66. Cardinal Electronics
5069 Broadway
New York, N.Y.

67. Challenge Corp.
150 Fifth Ave.
New York, N.Y.

68. Chancellor Electronics, Inc.
457 Chancellor Ave.
Newark, N.J. 07112

69. Channel Marketing, Inc.
26 Springdale Rd.
Cherry Hill, N.J. 08034

70. Channel Marketing, Inc.
342 Madison Ave.
New York, N.Y.

71. Channel Master
Ellenville, N.Y. 12428

72. Charles Brown & Co.
1170 Broadway
New York, N.Y. 10001

73. Chiyoda Electronic Co., Ltd.
3-9, Soto Kanda 3-chome,
Chiyoda-ku
Tokyo, Japan

74. Chuo Denki Co., Ltd.
1767 Aza Higashidaira,
Higashi Matsuyama
Saitama, Japan

75. Clairtone Electronic Corp.
100 Ronson Dr.
Rexdale, Ontario, Canada

76. Clarion Shoji Co., Ltd. (USA)
2306 Cotner Ave.
Los Angeles, Calif. 90064

77. David Clark Co., Inc.
360 Franklin St.
Worcester, Mass. 01604

78. A. Cohen & Sons, Inc.
27 W. 23rd St.
New York, N.Y. 10010

79. Columbia Records Corp.
51 W. 52nd St.
New York, N.Y. 10019

79A. Command Electronics, Inc.
11830 Shaver Rd.
Schoolcraft, Mich. 49087

80. Commodore Import Corp.
507 Flushing Ave.
Brooklyn, N.Y. 11205

81. Concertone, Inc.
7035 Laurel Canyon Blvd.
N. Hollywood, Calif. 91605

82. Concord Electronics Corp.
1935 Arnacost Ave.
W. Los Angeles, Calif. 90025

83. Coney Onkyo Co., Ltd.
1-23, Iwaya Kita-machi 5-chome,
Nada-ku
Kobe, Japan

84. Consolidated Merchandising Corp.
59-50 Queens Midtown Expwy.
Maspeth, N.Y. 11378

85. Continental Telephone Answering Devices
17 W. 46th St.
New York, N.Y.

86. Coral Audio Corp.
8-9, Soto-Kanda 3-chome,
Chiyoda-ku
Tokyo, Japan

86A. Courier Communications, Inc.
100 Hoffman Pl.
Hillside, N.J. 07205

87. Craig Panorama, Inc.
2302 E. 15th St.
Los Angeles, Calif. 90021

88. Craig Corp.
921 W. Artesia Blvd.
Compton, Calif. 90220

89. Craigstan Corp.
1115 Broadway
New York, N.Y.

90. Crown Radio Corp.
228 E. Harris Ave.
S. San Francisco, Calif. 94080

91. Curtis-Electro Lighting, Inc.
1536 S. Paulina St.
Chicago, Ill. 60608

92. Curtis-Mathes Sales Co.
P.O. Box 151
Athens, Tex. 75751

93. Daishin Electric Industry Co., Ltd.
2-5, Ohmori-minami, Ohta-ku
Tokyo, Japan

94. Daiwa, Ltd.
1, Nihonbashi, Edobashi
2-chome, Chuo-ku
Tokyo, Japan

95. Dalamal & Sons
107 Franklin
New York, N.Y. 10002

96. Data Packaging Corp.
205 Broadway
Cambridge, Mass. 02139

97. MCA Dist. Corp.
445 Park Ave.
New York, N.Y. 10022

98. Dejay Industries
90 N. Washington St.
Boston, Mass.

99. Delmonico International
50-35 56th Rd.
Maspeth, L. I., N.Y. 11378

100. Delta International, Ltd.
P.O. Box 1946
Grand Junction, Colo.

101. Dictotape, Inc.
9090 Krier Place
Brooklyn, N.Y. 11236

102. Dolphin Sansho, Ltd.
11-13, Shimoigusa 5-chome,
Suginami-ku
Tokyo, Japan

103. Drexel Radio Corp.
P.O. Box 15156
New Orleans, La.

104. Duotone Co., Inc.
6875 SW 81st St.
Miami, Fla. 33143

105. Dyn Assoc. Importers, Inc.
270 W. 22nd St.
Hialeah, Fla. 33010

106. Dynaco, Inc.
3060 Jefferson St.
Philadelphia, Pa. 19121

107. Dynavox Electronics Corp.
40-05 21st St.
Long Island City, N.Y. 11101

108. Echo Tsushin Kogyo Co., Ltd.
29-9, Shimo Sueyoshi 1-chome,
Tsurumi-ku
Yokohama, Japan

109. Eico Electronic Instrument Co., Inc.
283 Malta St.
Brooklyn, N.Y. 11207

110. Eiwa Sangyo Co., Ltd.
6-11, Nishi Shinbashi 2-chome,
Minato-ku
Tokyo, Japan

111. Electra Radio Corp.
30 W. 23rd St.
New York, N.Y.

112. Electro-Brand, Inc.
210-220 W. Chestnut
Chicago, Ill. 60610

113. Electrohome, Ltd.
809 Wellington St. N.
Kitchener, Ontario, Canada

114. Electronic Assistance Corp.
20 Bridge Ave.
Red Bank, N.J. 07701

115. Electronic Industries, Inc.
901 Daniel St.
Kenner, La. 70062

116. Electronic Research & Development, Ltd.
6th Floor, Shiozaki Bldg. 7,
Hirakawa-cho, 2-chome,
Chiyoda-ku
Tokyo, Japan

118. Elgin National Industries, Inc.
50-35 56th Rd.
Maspeth, N.Y. 11378

119. Elite Electronics
195 E. Central Ave.
Farmingdale, N.Y. 11735

120. Elpa Marketing Industries, Inc.
Thorens & Atlantic Ave.
Garden City Park, N.Y. 11040

121. Embassy
5330 E. 38th St.
Indianapolis, Ind. 46218

123. Empire Scientific Corp.
1055 Stewart Ave.
Garden City, N.Y. 11530

124. Empire Ultrasonics, Ltd.
1199 Broadway
New York, N.Y. 10001

125. The Englishtown Corp.
42 Broadway
New York, N.Y. 10004

126. Epicure Products, Inc.
185 Somerville Ave.
Somerville, Mass. 02143

127. Ercona Corp.
432 Park Ave. S.
New York, N.Y. 10016

128. Espo Engineering Corp.
5334 W. 65th St.
Chicago, Ill. 60638

129. The Estey Co., Div. of Electro-Learner Corp.
Ziegler St.
Harmony, Pa.

130. Exhibit Sales Co.
South Third St.
Philadelphia, Pa. 19106

131. Fairfax Dist. Co., Inc.
1328 New York Ave. N.W.
Washington, D.C.

132. Fairfax Industries, Inc.
165 Ward St.
Paterson, N.J. 07505

133. Fairmont Electronics, Inc.
55 W. 39th St.
Suite 506
New York, N.Y. 10018

134. Fairmont Electronics
12 Crescent St.
Holyoke, Mass.

135. Fanon Electronic Industry
100 Hoffman Pl.
Hillside, N.J. 07205

136. Fen Tone International
106 Fifth Ave.
New York, N.Y. 10011

137. Fedco, Inc.
P.O. Box 2605
Terminal Annex
Los Angeles, Calif. 90054

138. Federal Transistor Co., Inc.
519 S. Broadway
Los Angeles, Calif. 90013

139. J.M. Fields
111 8th Ave.
New York, N.Y.

141. Fisher Sonic Co., Inc.
405 44th St.
Brooklyn, N.Y.

142. Fix Tune Solid State Electronics
One W. 30th St.
New York, N.Y. 10001

143. Fortune Star Products
1207 Broadway
New York, N.Y. 10001

144. Foster Electric Co., Ltd.
230 N. Michigan Ave.
Chicago, Ill. 60601

145. L. K. Franklin Co.
8412 S. Olympic Blvd.
Beverly Hills, Calif.

146. Fried Trading Co.
425 Bedford Ave.
Brooklyn, N.Y. 11211

147. Fuji Electrochemical Co., Ltd.
437 Fifth Ave.
New York, N.Y. 10016

148. Fuji Electronics Co., Ltd.
Mikko Mita Bldg., 26-4
Takanawa
1-chome, Minato-ku
Tokyo, Japan

149. Fuji Onkyo Co., Ltd.
15-13 Shimomaruko 1-chome,
Ohta-ku
Tokyo, Japan

150. Fuji Ricoh Co., Ltd.
1046-2 Ikebukuro Toshima-ku
Tokyo, Japan

151. Fujiden International Corp.,
Hase Bldg., 25, Bingomachi 3-chome,
Higashi-ku
Osaka, Japan

152. Fujitsu California, Inc.
16410 S. Figueroa St.
Gardena, Calif. 90247

153. Fujitsu, Ltd.
680 Fifth Ave.
New York, N.Y. 10019

154. Funai Electric Co., Ltd.
3004 W. Logan Blvd.
Chicago, Ill. 60647

154A. Gamble-Skogmo, Inc.
P.O. Box 458
Minneapolis, Minn. 55440

155. GC Electronics Co.
400 S. Wyman St.
Rockford, Ill. 61101

156. GCL Mercantile Corp.
36 Utter Ave.
Hawthorne, N.J. 07507

157. GRT Corp.
1286 N. Lawrence Station Rd.
Sunnyvale, Calif. 94086

158. GW Electronics, Inc.
1647-4 S. Sepulveda Blvd.
Torrance, Calif.

159. Garrard, Div. of British Industries Co.
Westbury, N.Y. 11590

160. General Consolidated
87 Dell Gen Ave.
Lodi, N.J.

161. The General Corp., Chicago
500 Fullerton Parkway
Chicago, Ill. 60614

162. General Corp.
Master Apartment
310 Riverside Dr.
New York, N.Y. 10025

164. Global Import & Export
858 W. Flagler St.
Miami, Fla. 33130

165. Golden Shield Corp.
56 Harvester Ave.
Batavia, N.Y.

166. Goodway, Inc.
11401 Roosevelt Blvd.
Philadelphia, Pa.

167. Gotham Electronics, Inc.
170 Michael Dr.
Syosset, N.Y. 11791

168. W. T. Grant Co.
1441 Broadway
New York, N.Y. 10018

169. Gregory Amplifier Corp.
3650 Dyre Ave.
Bronx, N.Y.

170. Grundig Electronic Sales
355 Lexington Ave.
New York, N.Y. 10017

Manufacturer / Importer / Distributor List continued . . .

171. Gulton Industries
212 Durham Ave.
Metuchen, N.J.

172. Gusdorf & Sons, Inc.
6900 Manchester Ave.
St. Louis, Mo. 63143

173. Hachiyo Electric Sound Co., Inc.
3-6, Higashigaoka 2-chome,
Meguro-ku
Tokyo, Japan

174. Halen Associates
125 Fifth Ave.
New York, N.Y. 10003

175. Hamamatsu TV Co., Ltd.
c/o Kinsho-Mataichi Corp.
80 Pine St.
New York, N.Y. 10005

177. Hamway Import Co.
40 W. 29th St.
New York, N.Y. 10001

178. Harlie Transistor Products
393 Sagamore Ave.
Mineola, L.I., N.Y.

179. Harman-Kardon, Inc.
55 Ames Court
Plainview, N.Y. 11803

180. Haskel Howard Co.
21 Hazelton Rd.
Yonkers, N.Y.

181. Hatsune Electric Industrial
Co., Ltd.
Yatsurugi, Twakura-cho,
Niwa-gun
Aichi, Japan

182. Heritage International Trading
Co.
1330 Stuyvesant Ave.
Union, N.J. 07083

183. Hinode Electric Works
13, Kamiyama-cho, Kita-ku
Osaka, Japan

186. Hitachi Sales Corp. of America
48-50 34th St.
Long Island City, N.Y. 11101

188. Hokuyo Musen Kogyo Co., Ltd.
6, Shikishima-cho 4-chome,
Johto-ku
Osaka, Japan

189. Hokuyo Musen Co., Ltd.
80-26 138th St.
Kew Gardens, N.Y.

190. Hotta Clock & Watch Co., Ltd.
23-12, Ueno 5-chome, Taito-ku
Tokyo, Japan

191. IEM
187, Kominato-cho 3-chome,
Naka-ku
Yokohama, Japan

192. ITT Distributor Products
250 Broadway
New York, N.Y.

193. Ikegami Electronics Industries,
Inc. of New York
35-27 31st St.
Long Island City, N.Y. 11106

194. Imperial Import Co.
1199 Broadway
New York, N.Y. 10001

195. Impex Electronics
213 S. Robertson Blvd.
Beverly Hills, Calif.

196. Industrial Suppliers
755 Folsom St.
San Francisco, Calif. 94107

197. Inland Dynatronics, Inc.
10 Horizon Blvd.
S. Hackensack, N.J. 07606

198. Intermart Corp.
147 W. 42nd St.
New York, N.Y.

199. International Distributors, Inc.
1178 Pope St.
Memphis, Tenn. 38102

201. International Transistor
1206 S. Maple
Los Angeles, Calif.

202. Intersonic Corp.
P.O. Box 215
Rockaway, N.J. 07866

203. Irish Tape Div. Morhan
National Sales Co., Inc.
458 Broadway
New York, N.Y. 10013

204. Izumi Co., Ltd.
9-13, 1-chome, Meauro Honcho,
Meauro-ku
Tokyo, Japan

205. JFD Electronics Corp.
62nd St. at 15th Ave.
Brooklyn, N.Y.

206. J.J.J. Merchandise
15 W. 26th St.
New York, N.Y. 10010

208. Japan Industry, Ltd.
Kawazu Bldg., 4 Kitayacho,
Shibuya-ku
Tokyo, Japan

209. Jappac Co., Ltd.
21-21, Joban 9-chome, Urawi-shi
Saitama, Japan

210. Jensen Mfg. Div. The Muter Co.
5655 W. 73rd St.
Chicago, Ill. 60638

211. Jeolco (USA), Inc.
477 Riverside Ave.
Medford, Mass. 02155

212. KCK Co., Ltd.
528 W. Wellington Ave.
Chicago, Ill. 60657

213. KLH Research and Development
Corp.
30 Cross St.
Cambridge, Mass. 02139

214. Kanematsu New York
One Whitehall St.
New York, N.Y.

215. Katoh Co., Ltd.
Oaawa Bldg., 2-13, Motohama-
cho,
Naka-ku
Yokohama, Japan

216. Katone Corp.
37 W. 28th St.
New York, N.Y.

217. Kay Jewelers
1328 New York Ave., NW
Washington, D.C. 20005

218. Kaysons International, Ltd.
6500 Flotilla St.
Los Angeles, Calif. 90022

219. Kent Overseas, Inc.
38 W. 33rd St.
New York, N.Y.

220. Kenwood Corp.
69-41 Calamus Ave.
Woodside, N.Y.

221. Keystone Electronics Corp.
11, Hirakawacho 1-chome,
Chiyoda-ku
Tokyo, Japan

222. King Korn Marketing Div.
of Fullview Industries, Inc.
6001 N. Clark St.
Chicago, Ill. 60626

223. Kitaron Electric Co., Ltd.
1-13, Arakawa 1-chome,
Arakawa-ku
Tokyo, Japan

224. Kits Industries, Inc.
729 Ceres Ave.
Los Angeles, Calif. 90021

225. Kodama Chemical Industry
Co., Ltd.
7-3, Soto Kanda 6-chome,
Chiyoda-ku
Tokyo, Japan

226. Koss Electronics, Inc.
2227 N. 31st St.
Milwaukee, Wisc. 53208

227. Kowa American Corp.
276 Fifth Ave.
New York, N.Y.

228. Koyo International, Inc. of
America
330 Madison Ave.
New York, N.Y. 10017

229. Kyocera International, Inc.
510 S. Mathilda Ave.
Sunnyvale, Calif. 94086

230. Kyokuyo Electric Co., Ltd.
605, Oazo Idogi Ageo
Saitama, Japan

231. Lafayette Radio & Electronics
111 Jericho Turnpike
Syosset, L.I., N.Y. 11791

232. Leader Instrument Corp.
24-20 Jackson Ave.
Long Island City, N.Y. 11101

233. Lear Jet Stereo, Inc.
13131 Lyndon Ave.
Detroit, Michigan 48227

234. Le-bo Products Co., Inc.
71-08 51st Ave.
Woodside, N.Y. 11377

235. Liberty Trading Co., Ltd.
Nippon Bldg., 8, Ohtemachi
2-chome
Chiyoda-ku
Tokyo, Japan

236. Lion Electronics Corp.
194 S. 8th St.
Brooklyn, N.Y.

238. Lloyd's Electronics of
California, Inc.
18601 S. Susana Rd.
Compton, Calif. 90221

239. Longines Symphonette
200 Myrtle Ave.
Larchmont, L.I., N.Y.

240. Loyal Sangyo Co., Ltd.
28-1, Sekiguchi 1-chome,
Bunkyo-ku
Tokyo, Japan

241. Lucky International
1155 Broadway
New York, N.Y. 10010

242. Luxor International
39 W. 29th St.
New York, N.Y.

243. Lynn Stewart Co.
439 E. Illinois St.
Chicago, Ill. 60611

244. 3M Company Mincom Div.
3M Center
St. Paul, Minn. 55101

245. MYM Trans-World Corp.
1165 Broadway
New York, N.Y.

246. Macy's Dept. Store
Herald Square
New York, N.Y. 10001

247. The Magitron Co., Div. Era
Acoustics Corp.
311 E. Park St.
Moonachie, N.J. 07074

249. Magnus Organ Corp.
1600 W. Edgar Rd.
Linden, N.J. 07036

250. Major Electronics Corp.
649 39th St.
Brooklyn, N.Y.

250A. P. R. Mallory & Co., Inc.
3029 E. Washington St.
Indianapolis, Ind. 46206

251. Manhattan Novelty Co.
263 Canal St.
New York, N.Y. 10013

252. Marantz Co., Inc.
8150 Vineland Ave.
Sun Valley, Calif. 91352

253. Mar-Lin Radio Corp.
45 W. 27th St.
New York, N.Y.

254. Mar-Lin West, Ltd.
1515 Santee St.
Los Angeles, Calif. 90015

255. Mar-Lin Enterprises
1472 Broadway
New York, N.Y.

256. Mars Radio Corp.
79, Hanazonocho, Shinjuku-ku
Tokyo, Japan

257. Marshall Field & Co.
111 N. State St.
Chicago, Ill. 60690

258. Martel Electronic Sales
2356 S. Cotner Ave.
Los Angeles, Calif. 90064

259. Maruwa Electronic & Chemical
Co., Ltd.
1-18, Nishiura-cho, Higashi-ku
Nagoya, Japan

260. Marvel International
30 E. 42nd St.
New York, N.Y.

261. Mason Camera Corp.
1141 Broadway
New York, N.Y. 10001

263. Masterwork Audio Products
1080 Graffle Rd.
Hawthorne, N.J. 07506

264. Matsushita Electric Corp. of America
200 Park Ave.
New York, N.Y. 10017

265. M.E. Parts & Repair
43-30 24th St.
Long Island City, N.Y.

266. Mercury Record Corp.
315 E. Wacker Dr.
Chicago, Ill. 60601

267. Metasco
401 Fifth Ave.
New York, N.Y. 10016

268. Metric TV Parts
Repair Center
65 Lexington Ave.
Passaic, N.J.

269. Metro of California
4861 Santa Monica
Los Angeles, Calif. 90029

270. Metro Wholesale Corp.
53 W. 43rd St.
New York, N.Y. 10036

271. Micro Seiki Co., Ltd.
19, Fujimicho, Itabashi-ku
Tokyo, Japan

272. Midland International Corp.
P.O. Box 1903
N. Kansas City, Mo. 64141

273. Miharu Shoji Co., Ltd.
P.O. Box 4
Ellenville, N.Y. 12428

274. Mikado Electronics Corp.
34 Dore St.
San Francisco, Calif.

275. Mitsubishi International Corp.
7045 N. Ridgeway Ave.
Lincolnwood, Ill. 60601

276. Mitsumi Electronics Corp.
One Lefrak City Plaza
Flushing, N.Y. 11368

277. Miyakawa Shoko Co., Ltd.
13-1, Higashi Azabu 1-chome,
Minato-ku
Tokyo, Japan

278. Monarch Electronics Corp.
7035 Laurel Canyon Blvd.
N. Hollywood, Calif. 91605

279. Mondo Electronic Corp.
19-3, Kami-Ochiai 1-chome,
Shinjuku-ku
Tokyo, Japan

280. Montgomery Ward
619 W. Chicago Ave.
Chicago, Ill. 60607

281. Morse Electro Products Corp.
101-10 Foster Ave.
Brooklyn, N.Y. 11236

283. Muntz Stereo Corp. of America
7715 Densmore Ave.
Van Nuys, Calif. 91406

284. Murata Corp. of America
Two Westchester Plaza
Elmsford, N.Y. 10523

285. Musicolor Products Visionics, Inc.
4332 Artesia Ave.
Fullerton, Calif. 92633

286. NGK Spark Plugs (USA), Inc.
12511 Beatrice St.
Los Angeles, Calif. 90066

287. Nagata Electric Mfg. Co., Ltd.
240, Hanakawaminamino-cho
Nishiyodogawa-ku
Osaka, Japan

288. Nakamichi Research, Inc.
153, Suzukicho 1-chome,
Kodiara
Tokyo, Japan

289. Nakamichi Research (USA), Inc.
130 Woodbury Rd.
Woodbury, N.Y. 11797

290. Nakayama Denshi Co., Ltd.
13-5, Nishimagome, 2-chome,
Ohta-ku
Tokyo, Japan

291. Nason Trading Co.
230 Fifth Ave.
New York, N.Y.

292. National Electronics
38-20 S.E. 8th
Miami, Fla.

293. National Silver Co.
241 Fifth Ave.
New York, N.Y.

294. Net Electronics
8315 E. Firestone Blvd.
Downey, Calif. 90241

295. New York Merchandise Co.
32 W. 23rd St.
New York, N.Y. 10010

296. New York Transistor Co.
New Jersey

297. Nichicon Capacitor, Ltd.
3941 N. Pine Grove Ave.
Chicago, Ill. 60613

298. Nichimen Co.
60 Broad St.
New York, N.Y.

299. Nippon Alpha Electric Co., Ltd.
200 Park Ave.
New York, N.Y. 10017

300. Nippon Chemical Condsenser Co., Ltd.
86-16 60th Ave.
Rego Park, N.Y. 11373

301. Nippon Columbia Corp. of America
Six E. 43rd St.
New York, N.Y. 10017

302. Nippon Densan Co., Ltd.
Morita Bldg., 15, Shibanishkubo,
Hiromachi, Minato-ku
Tokyo, Japan

303. Nippon Electric New York, Inc.
200 Park Ave.
New York, N.Y. 10017

304. Nippon Sound Co., Ltd.
5-12, Shinsayama 1-chome,
Sayama City
Saitama, Japan

305. Nippon Sound Equipment Co., Ltd.
55-1, Kamiishihara 3-chome,
Chofu
Tokyo, Japan

306. Nissho Electronic Corp.
225, Hirano Babacho, Higashi
Sumiyoshi-ku
Osaka, Japan

307. Nitto Gramophone Co., Ltd.
5, Higashi Irifunecho,
Nishinari-ku
Osaka, Japan

308. Noam Electronics Corp.
60 W. 45th St.
New York, N.Y. 10036

309. Noam Electronics Corp.
118-21 Queens Blvd.
Forest Hills, N.Y. 11375

310. North American Foreign Trading Co.
1115 Broadway
New York, N.Y. 10010

311. North American Leisure Corp.
1776 Broadway
New York, N.Y. 10019

312. North American Philips Co., Inc.
100 E. 42nd St.
New York, N.Y. 10017

313. NuVox Electronics
150 Fifth Ave.
New York, N.Y. 10011

314. OTC International (Chicago), Inc.
205 W. Wacker Drive
Chicago, Ill. 60606

315. Ofuna Electronics Industry, Co., Ltd.
526, Kamikashio-cho, Totsuka-ku
Yokohama, Japan

316. Oikawa Kogeisho Co., Ltd.
9-9, Minamidai 5-chome,
Nakano-ku
Tokyo, Japan

317. Oki Electric Industry Co., Ltd.
202 E. 44th St.
New York, N.Y. 10017

318. Olson Electronics, Inc.
260 S. Forge St.
Akron, Ohio 44308

319. Olympic International, Ltd.
89-89 Union Turnpike
Ellendale, N.Y. 11227

320. Omiya Electric Co., Ltd.
866, Sakaemachi 3-chome,
Funabashi City,
Chiba, Japan

321. Omron R & D, Inc.
440 E. Middlefield Rd.
Mountainview, Calif. 94040

322. Oral Denki Kogyo Co., Ltd.
Ginza Midori Bldg., 11-9, Ginza
5-chome, Chuo-ku
Tokyo, Japan

323. Original Industries Corp.
529 Jericho Turnpike
Mineola, N.Y. 11501

324. Orion Electric Co.
1170 Broadway
New York, N.Y.

325. Osaka Onkyo Co., Ltd.
43-23 Colden St.
Apt. 25D
Flushing, N.Y. 11355

326. Pacific Import Co.
37 W. 23rd St.
New York, N.Y.

327. Panasonic Repair
43-20 24th St.
Long Island City, N.Y.

328. Patson Trading Co., Inc.
1199 Broadway
New York, N.Y. 10001

329. J. J. Paulson Associates
24 Brooklyn Ave.
Freeport, N.Y. 11520

330. Pax, Ltd.
5125 Church St.
Skokie, Ill. 60076

331. Peerless Telerad, Inc.
37-15 61st St.
Woodside, N.Y. 11377

332. Pengo Traders
234 Fifth Ave.
New York, N.Y.

333. J. C. Penney Co., Inc.
1301 Ave. of the Americas
New York, N.Y. 10019

334. Perfect Sound Mfg. Co., Ltd.
5-16, Ginza 6-chome, Chuo-ku
Tokyo, Japan

335. Petely Enterprises
441 Lexington Ave.
New York, N.Y.

337. Phillips Audio, Inc.
29-28 41st Ave.
Long Island City, N.Y. 11101

338. Pickering and Co., Inc.
101 Sunnyside Blvd.
Plainview, N.Y. 11803

339. U.S. Pioneer Electronics Corp.
178 Commerce Rd.
Carlstadt, N.J. 07072

340. D. Plough Distributing Co.
P.O. Box 2266
Memphis, Tenn. 38102

341. Ponder & Best, Inc.
11201 W. Pico Blvd.
Los Angeles, Calif. 90064

342. Puchi Properties, Inc.
405 Grand Ave.
Nogales, Ariz.

343. Qatron Corp.
12000 Old Georgetown Rd.
Rockville, Md. 20852

344. Radiant Corp.
8220 N. Austin Ave.
Morton Grove, Ill. 60053

345. Radiomaster, Inc.
1314 Blondell Ave.
Bronx, N.Y. 10461

347. Ramson Trading Co.
1185 Broadway
New York, N.Y. 10001

349. Realtone Electronics Corp.
34 Exchange Place
Jersey City, N.J. 07302

350. Recoton Corp.
46-23 Crane St.
Long Island City, N.Y. 11101

Manufacturer / Importer / Distributor List continued . . .

350A. Regency Electronics, Inc.
7900 Pendleton Pike
Indianapolis, Ind. 46206

352. Risui Corp.
3-2, Hongo 3-chome, Bunkyo-ku
Tokyo, Japan

353. Roberts Div./Rheem Mfg. Co.
5922 Bowcroft Ave.
Los Angeles, Calif. 90016

354. Robins Industries Corp.
15-58 127th St.
Flushing, N.Y. 11356

354A. Robyn Co.
P.O. Box 478
Rockford, Mich. 49341

355. Roland Electronics Co., Ltd.
36-8, Ohkayama 1-chome,
Meguro-ku
Tokyo, Japan

356. Ross Electronics
2834 S. Lock St.
Chicago, Ill. 60608

357. Rozinante, Inc.
878 Wing St.
Plymouth, Mich. 48170

358. Saba Corp. Service Dept.
724 N. 7th St.
Allentown, Pa. 18102

359. The Sampson Co.
2244 S. Western Ave.
Chicago, Ill. 60608

360. San-ei Instrument Co., Ltd.
Canterbury House, Apt. D-15
15 Canterbury Rd.
Great Neck, N.Y. 11021

361. Sankei Manufacturing Co., Ltd.
21-3, Shimomaruko 4-chome,
Ohta-ku
Tokyo, Japan

362. Sankoh Electric Co., Ltd.
25-11, Nishi Ochiai 1-chome,
Shinjuku-ku
Tokyo, Japan

363. Sanrin Electric Co., Ltd.
1-152, Kashiwagi 1-chome,
Shinjuku-ku
Tokyo, Japan

364. Sans & Streiffe, Inc.
8400 Brookfield Ave.
Brookfield, Ill. 60513

365. Sanshin Electric Co., Ltd.
35-20, Koenji Minami 5-chome,
Suginami-ku
Tokyo, Japan

366. Sanshin Optical Co., Ltd.
21-17, Takashima 1-chome, Suwa
Nagano, Japan

367. Sansui Electronics Corp.
2301 S. Grand Ave.
Los Angeles, Calif. 90007

368. Sansui Electronics Corp.
32-17 61st St.
Woodside, N.Y. 11377

369. Sanyo Electric, Inc.
1200 W. Walnut St.
Compton, Calif. 90220

370. H. H. Scott
111 Powder Mill Rd.
Maynard, Mass. 01754

371. Seeburg Corp.
1500 N. Dayton St.
Chicago, Ill. 60622

372. Seidai Manufacturing Co., Ltd.
Oaza-kudo, Koga-machi, Kasuya-
gun
Fukuoka, Japan

373. Sekii Industry Co., Ltd.
11-11, Kuramae 3-chome, Taito-
ku
Tokyo, Japan

374. Selectron Internationl Co., Inc.
55 Veteran Blvd.
Carlstadt, N.J. 07072

375. Milovac International Co., Inc.
4215 W. 45th St.
Chicago, Ill.

376. Setico Import Co.
2321 Liberty St.
Jacksonville, Fla.

377. Sharp Electronics Corp.
10 Keystone Plaza
Paramus, N.J. 07652

378. Sharpe Instruments Div. of
Scintrex, Inc.
Amherst Industrial Park
Tonawanda (Buffalo), N.Y. 14150

379. Sheraton Electronics Co., Inc.
401 Broadway
New York, N.Y.

380. Sherwood Electronic Labora-
tories, Inc.
4300 N. California Ave.
Chicago, Ill. 60618

383. Shibaden Corp. of America
58-25 Brooklyn Queens Expwy.
Woodside, N.Y. 11377

384. Shimadzu Seisakusho, Ltd.
c/o Ataka America, Inc.
633 Third Ave.
New York, N.Y. 10017

385. Shin-ei Electric Co., Ltd.
6-8, Tagara 4-chome, Nerima-ku
Tokyo, Japan

386. Shinkyo Co., Ltd.
3, Kanda Kaji-cho 3-chome,
Chiyoda-ku
Tokyo, Japan

387. Shin-Shirasuna Electric Corp.
521 Fifth Ave.
New York, N.Y. 10017

388. Showa Musen Kogyo Co., Ltd.
c/o Kanematsu-Gosho (USA),
Inc.
One Whitehall St.
New York, N.Y. 10004

389. Shure Brothers, Inc.
222 Hartrey Ave.
Evanston, Ill. 60204

390. Singer Consumer Products
30 Rockefeller Plaza
Room 6228
New York, N.Y. 10020

391. Skandia Electronics Corp.
4260, Nyoi-Gemba, Kusunoki-cho,
Kita-ku
Nagoya, Japan

392. Sola Electric Div. of Sola
Basic Industries
1717 Busse Rd.
Elk Grove Village, Ill. 60007

393. Sonics Corp.
2, Kojimachi 3-chome, Chiyoda-
ku
Tokyo, Japan

394. Son Lee Electronics
1227 Broadway
New York, N.Y.

395. Sonorac Co., Ltd.
1-10, Shimomeguro 1-chome,
Meguro-ku
Tokyo, Japan

397. Sony Corp. of America
47-47 Van Dam St.
Long Island City, N.Y. 11101

398. Spico Electronics
Div. of Spirling Products
Henrietta St. & Duffy Ave.
Hicksville, N.Y. 11802

399. Spiegel, Inc.
1061 W. 35th St.
Chicago, Ill. 60609

400. Spinola International Corp.
315 Fifth Ave.
New York, N.Y. 10016

401. Sportmaster Radio
2570 Devon Ave.
Des Plaines, Ill.

402. Standard Radio Corp.
60-09 39th Ave.
Woodside, N.Y. 11377

404. Stanford International
569 Laurel St.
San Carlos, Calif. 94070

405. Stereo Magic Div. Eastern
Specialties Corp.
Five Richard Dr. W.
Mt. Arlington, N.J. 07856

406. Sterling Hi Fidelity, Inc.
22-20 40th Ave.
Long Island City, N.Y. 11101

407. Sunsonic Corp.
10-5, Ginza 4-chome, Chuo-ku
Tokyo, Japan

408. Summit International
1140 Broadway
New York, N.Y. 10001

409. Superex Electronics
4 Radford Place
Yonkers, N.Y.

410. Superscope, Inc.
8150 Vineland Ave.
Sun Valley, Calif. 91352

413. TDK Electronics Corp.
23-73 48th St.
Long Island City, N.Y. 11101

414. Taisei Co., Ltd.
Kyodo Bldg., 6, Takaracho
3-chome,
Chuo-ku
Tokyo, Japan

415. Taiyo Koki Co., Ltd.
427, Oaza Iida, Ohmiya
Saitama, Japan

416. Takt Denki New York
1170 Broadway
New York, N.Y. 10001

417. Tamradio Co., Ltd.
241-20 Northern Blvd.
Douglaston, N.Y. 11363

418. Tamura Electric Works, Ltd.
427 Fifth Ave.
New York, N.Y. 10016

419. Tandberg of America
Eight Third Ave.
Pelham, N.Y. 10803

419A. Teaberry Electronics Corp.
3401 Shadeland Ave.
Indianapolis, Ind. 46226

420. Teac Corp. of America
2000 Colorado Ave.
Santa Monica, Calif. 90404

420A. Teac (Repair)
404 Jericho Turnpike
Syosset, N.Y.

421. Telecon Corp.
4-6, Osaki 5-chome,
Shinagawa-ku
Tokyo, Japan

422. Telefunken Sales Corp.
S. St./Roosevelt Field
Garden City, L.I., N.Y. 11530

423. Telephone Dynamics Corp.
1333 Newbridge Rd.
North Bellmore, N.Y. 11710

424. Tele-Tone Co., Inc.
444 S. 9th Ave.
Mount Vernon, N.Y.

425. Telex/Waters Conley Co., Inc.
9600 Aldrich Ave. S.
Minneapolis, Minn. 55420

426. Telmar
2339 S. Cotner Ave.
Los Angeles, Calif. 90064

427. Tenna Corp.
19201 Cranwood Parkway
Warrensville Heights, Ohio
44128

428. Tennac Antennas
P.O. Box 1005
Burlington, Iowa 52601

429. Tensho Electric Ind. Co., Ltd.
Electronics Div.
3-3, Koyama 1-chome,
Shinagawa-ku
Tokyo, Japan

430. Terra International
Three E. 28th St.
New York, N.Y. 10016

431. J. H. Thal Associates
200 Fifth Ave.
New York, N.Y.

432. Alfred Toepfer
One Broadway
New York, N.Y. 10004

433. Toho Boeki Kaisha, Ltd.
7-14, Uchikanda 2-chome,
Chiyoda-ku
Tokyo, Japan

434. Tokai Corp. of America
500 Fifth Ave.
New York, N.Y. 10036

435. Tokai Communication Apparatus Corp.
816, Nakahara, Shizuoka City,
Shizuoka, Japan

436. Toko New York, Inc.
350 Fifth Ave.
New York, N.Y. 10001

437. Tokyo Rokuon Kogyo Corp.
17-11, Daita 4-chome,
Setagaya-ku
Tokyo, Japan

438. Tokyo Sansei (N.Y.), Inc.
1170 Broadway
New York, N.Y. 10001

439. Tokyo Wireless Corp.
33-37, Tokumaru 3-chome,
Itabashi-ku
Tokyo, Japan

440. Topp Electronics, Inc.
4201 N.W. 77th Ave.
Miami, Fla. 33166

441. Topp Import & Export, Inc.
40 Whelan Rd.
E. Rutherford, N.J.

442. Toshiba America, Inc.
Warehouse-Service Center
41-06 Delong St.
Flushing, N.Y. 11355

443. Toshiba Audio Industrial Co., Ltd.
c/o Toshiba America, Inc.
477 Madison Ave.
New York, N.Y. 10022

444. Toshiba Denshionkyo Co., Ltd.
Third Wako Bldg., 12-1, Shiba
Nishikubo, Akefune-cho, Minato-ku
Tokyo, Japan

445. Toyo Radio Co., Ltd.
9-12, Osaki 2-chome,
Shinagawa-ku
Tokyo, Japan

446. Toyo Radio Corp. of America
1842B S.W. 169th St.
Gardena, Calif. 90247

447. Toyomenka, Inc.
Two Broadway
New York, N.Y.

448. Trade Distributors, Inc.
1199 Broadway
New York, N.Y. 10001

449. Trade Unlimited
75-03 Main St.
Flushing, N.Y.

450. Trans-Aire Electronics Corp.
393 Sagamore Ave.
Mineola, N.Y.

451. Trans America Electronics Co., Inc.
6479 N. Avondale
Chicago, Ill. 60631

452. Transcriber Co., Inc.
P.O. Box 478
Attleboro, Mass. 02703

453. Transistor World Corp.
52 Broadway
New York, N.Y. 10004

454. Transocean Electronics, Inc.
Tojo Bldg., 14 Shinjuku 4-chome,
Shinjuku-ku
Tokyo, Japan

455. Transworld Industrial Corp.
5204 Hudson Ave.
W. New York, N.J.

456. Trio Corp.
212 Fifth Ave.
New York, N.Y.

457. Trio Corp.
(Kenwood Electronics, Inc.)
15711 S. Broadway
Gardena, Calif. 90247

458. Triumph/General Time Corp.
599 S. Wheeling Rd.
Wheeling, Ill. 60090

459. Tussah Corp.
1412 Broadway
New York, N.Y. 10018

460. Unelco Electronics Corp.
322 N. Eutaw St.
Baltimore, Md. 21201

461. Union Co., Ltd.
22-31, Kamisueyoshi 5-chome,
Tsurumi-ku
Yokohama, Japan

462. United Audio Products, Inc.
1205 S. Columbus Ave.
Mount Vernon, N.Y. 10553

463. United States Antenna Corp.
P.O. Box 46462
Cleveland, Ohio 44146

464. Valiant Radio Corp.
380 Second Ave.
New York, N.Y.

465. Velk Electric Corp.
33-14, Zenpukuji 3-chome,
Suginami
Tokyo, Japan

466. Vendome Enterprises
212 Fifth Ave.
New York, N.Y.

467. Vikoa, Inc.
400 Ninth Ave.
Hoboken, N.J. 07030

468. Vision Electronics, Inc.
1116 E. Houston St.
San Antonio, Tex. 78206

469. Voca Dictating Machine
274 Madison Ave.
New York, N.Y.

470. Vornado, Inc.
174 Passaic St.
Garfield, N.J. 07026

471. Wald Sound
11131 Dora St.
Sun Valley, California 91352

472. Waltham Electronics, Ltd.
Toyokawa Bldg., 12-13, Ginza
8-chome, Chuo-ku
Tokyo, Japan

474. Webcor Div. of Consolidated Merchandising Co.
59-50 Queens Midtown Expwy.
Maspeth, N.Y. 11378

475. Weltron Co., Inc.
514 E. Peabody
P.O. Box 217
Durham, N.C. 27702

476. Westinghouse Electric
Route 27 Vineard Rd.
Edison, N.J. 08817

477. Western Auto Supply
2107 Grand Ave.
Kansas City, Mo. 64108

478. Wharfedale, Div. of British Industrial Co.
Westbury, N.Y. 11590

478A. White Stores, Inc.
Wichita Falls, Tex. 60639

479. Whitehall Overseas Corp.
1140 Broadway
New York, N.Y.

480. Wilson Import Co.
1157 Broadway
New York, N.Y. 10029

481. Windsor Industries, Inc.
88 Third Ave.
Brooklyn, N.Y. 11217

482. F.W. Woolworth
233 Broadway
New York, N.Y. 10010

483. World Mark Electronics
663 Dowd Ave.
Elizabeth, N.J.

484. World Mart, Inc.
201 N.W. 21st St.
Miami, Fla. 33127

485. Yamaha International Corp.
7733 Telegraph Rd.
Montebello, Calif. 90054

486. Yamano Electric Mfg. Co., Ltd.
12-27, Iwats 3-chome, Higashi
Osaka City,
Osaka, Japan

487. Yamatake-Honeywell Co., Ltd.
c/o Honeywell, Inc.
24-30 Skillman Ave.
Long Island City, N.Y. 11101

488. Yashima Electric Industrial Co., Ltd.
314, Kamifuda, Chofu
Tokyo, Japan

489. Yaskawa Electric America, Inc.
100 Bliss Dr.
Oak Brook, Ill. 60521

490. Yewtec Corp.
1995 Palmer Ave.
Larchmont, N.Y. 10538

491. Yokohama LPG Trading Co., Ltd.
80, Onoecho 5-chome, Naka-ku
Yokohama, Japan

492. York Radio Corp.
15 Empire St.
S. Hackensack, N.J. 07606

493. Yutaka Electric Mfg. Co., Ltd.
c/o Marubeni-Iida (America), Inc.
938 Merchandise Mart
Chicago, Ill. 60654

494. Zenon Corp.
12-4, Takanawa 1-chome,
Minato-ku
Tokyo, Japan

▲

productreport

for further information on any of the following items, circle the associated number on the reader service card.

Rosin-Core Solder

A new rosin-core solder reportedly formulated for service technicians has been introduced by Chemtronics, Inc.

The rosin-core flux is predetermined, to provide the correct

amount of flux, and in direct ratio to the size of the solder strand, according to the manufacturer. The rosin residue, after soldering, reportedly is non-corrosive, non-conductive, non-hygroscopic, and is fungus resistant.

The solder is available in dispenser tube and in 1-pound bulk reel. The dispenser tube contains 110 inches of .062 (1/16)-inch diameter solder with 60/40 tin-lead alloy.

One pound reels are available with either 40/60, 50/50 or 60/40 composition tin-lead alloy ratios and with various diameters.

The dispenser tube sells for $.39, and prices of the 1-pound spools start at $1.87.

Circle 60 on literature card

Soldering Iron With Automatic Heat Control

A soldering instrument with a control system mounted directly

within the instrument handle has been introduced by Edsyn, Inc.

The Loner electronic control reportedly automatically maintains thermal balance during each soldering cycle, matching termination load with preset temperature settings. The unit will "idle" at 9 watts or will match any soldering load up to 50 watts, according to the manufacturer.

The handle is constructed of transparent polycarbonate, to allow viewing of internal workings. Adjustment of temperature reportedly is accomplished by turning the control knob.

The Loner weighs 4 ounces and sells for $35.00.

Circle 61 on literature card

Scanning Receiver

A new scanning monitor receiver, the Bearcat III, which reportedly features interchangeable plug-in RF modules to cover any two of the three public safety/business bands (high, low and UHF), or single band, has been introduced by Electra Corp.

Placement of up to eight plug-in crystals in a crystal socket automatically determines the band of operation for each channel when two bands are used. With two-band operation, any combination of eight channels in the two bands can be monitored.

Features reportedly include: band

coverage without frequency spread limits; quartz crystal IF filters; solid-state LED channel-indicator lights; built-in 3 inch x 5 inch front-mounted speakers; improved squelch control; faster scan; sharper selectivity; external speaker jack; integrated circuitry, and non-sliding feet.

The Bearcat III measures 3½ inches x 9 inches x 6 inches. Front controls are: channel switches, squelch, volume/on/off and combined manual/scan/channel-select switch.

Bearcat III is made in six models, with installed RF modules, mobile-mounting bracket and cords for 115 VAC and 12 VDC, according to the manufacturer.

Bearcat III is priced from $139.95 to $159.95.

Circle 62 on literature card

Semiconductor Replacements

Twenty-two new types have been added to the ECG line of replacement semiconductors offered by GTE Sylvania, Inc.

The new types are described as linear integrated circuits; all ceramic high-voltage rectifiers; high-voltage silicon and selenium triplers; and silicon and germanium transistors and diodes. All reportedly are intended as replacement parts for use in home entertainment equipment.

Functionally, the added types include: NPN silicon power transistors, for use in television vertical and horizontal deflection sections, an NPN "Darlington" amplifier, for audio preamplifiers; a plastic NPN power transistor, for use in audio and video amplifiers; damper diodes; audio power amplifiers; a general-purpose silicon diode, for detection, switching, and gating applications; and a matched pair of silicon diodes for FM detection, AFT, stereo multiplex and horizontal AFC functions.

The new rectifiers are high-voltage types which feature all-ceramic construction. Each is furnished with a pair of step-down, clip-in adapters, for use in equipment requiring clip-in installations. ▲

Circle 63 on literature card

For more information about above products use reader service card

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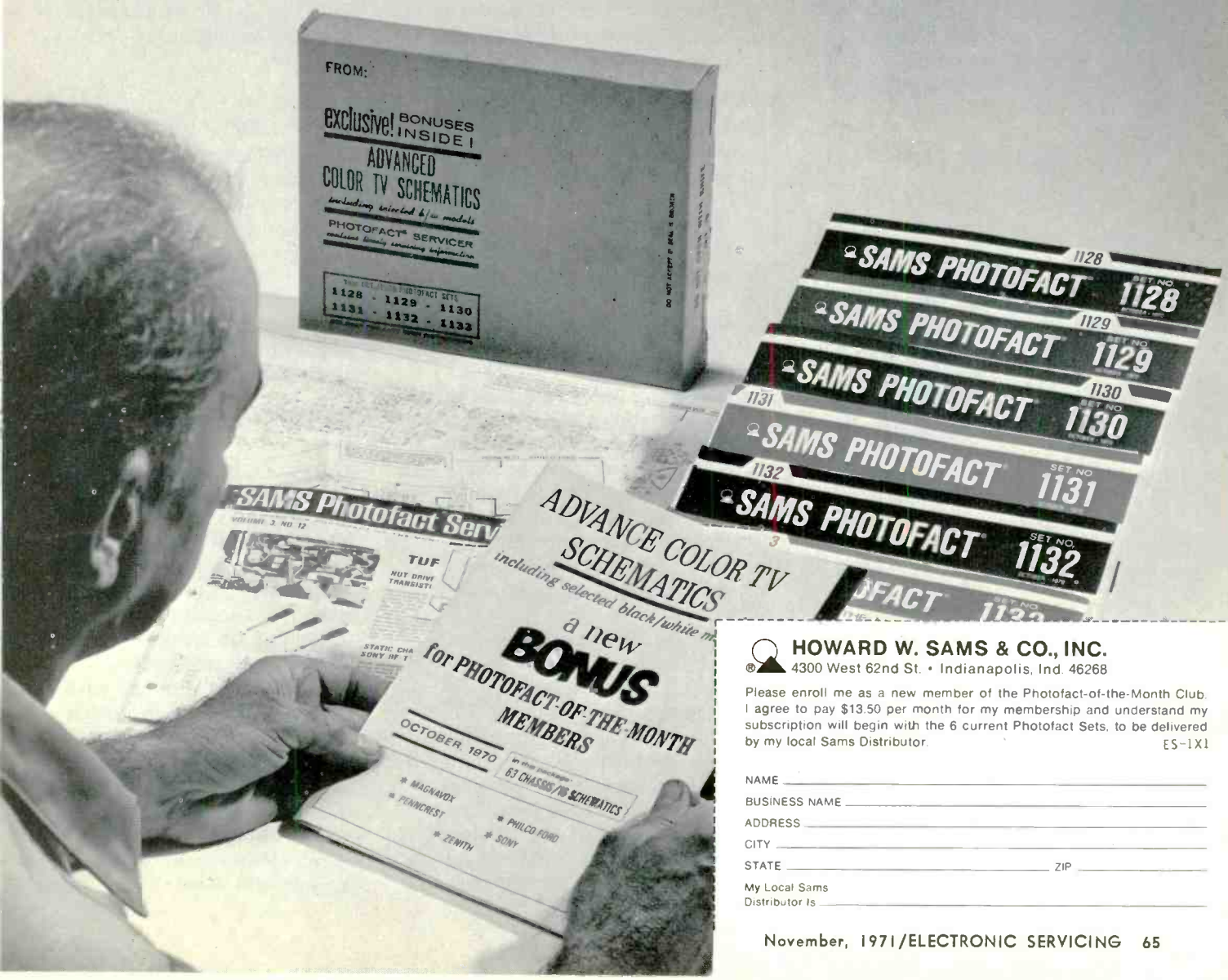

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catalogs literature

ANTENNAS

100. *Vikoa, Inc.* — is making available a 64-page, illustrated catalog covering their line of wire and cables and IDS-MATV equipment. Hardware, accessories, connectors and fittings and an index also are included.

101. *Jerrold Electronics Corp.*— Catalog S, titled "Systems and Products for TV Distribution," lists specifications of this manufacturer's complete line of antenna distribution products, including antennas and accessories, head-end equipment, distribution equipment and components, and installation aids.

AUDIO

102. *Bell P/A Products Corp.*— new 6-page catalog gives detailed specifications and descriptions of the company's broad line of commercial sound components and special purpose sound system products.

103. *GC Electronics*—has made available a 52-page, two-color catalog, (FR-71-A) featuring 350 items for the music listener and hobbyist. Included in the booklet are a variety of TV antenna installations, acoustic-suspension loudspeaker systems, speaker switching devices, stereo headphones, microphones and accessories.

104. *Jensen Manufacturing Div.* —has issued an 8-page catalog, No. 1090-E, which describes applications of 167 individual speaker models. Special automotive, communications, intercom and weathermaster speakers, plus a complete line of electronic musical instrument loudspeakers are featured.

AUTO ELECTRONICS

105. *Littelfuse, Inc.* — has released a new 32-page, 1971 automotive replacement fuse guide for passenger autos, sports cars, trucks, and taxi cabs. Fuse descriptions and circuits they protect are included.

CABLE

106. *Columbia Electronic Cables*—has published a 92-page wire, cable, and cordset catalog No. CEC-MC-571 which includes technical data concerning comparison charts of different types of insulating materials, copper wire specifications, estimating charts, and ampere ratings.

CAPACITORS

107. *Cornell-Dubilier Electronics*—has issued an 80-page cross-reference, 1972 catalog for location of single, dual, triple, and quadruple section replacement electrolytics.

COILS

108. *J. W. Miller Co.* — announces a new 92-page radio and TV replacement coil cross reference guide for known domestic and foreign color and black and white TV sets, home and car radios. Over 22,000 replacement coils for 327 manufacturers names reportedly are listed.

COMPONENTS

109. *Arco/LDP div. of Loral Corp.* — has published a new cross-reference guide and price book for its miniature aluminum electrolytic capacitors. The four-page publication includes specifications for the Arco/LDP line of Miniature Arcolytics, cross-references them by part number with similar products of other capacitor manufacturers.

110. *Essex International, Inc.*— announces their 24-page SC-5 RBM Standard Controls Catalog listing over 450 electrical/electronic relays and contactors.

111. *General Electric Tube Department* — has released a new 52-page Entertainment Semiconductor Almanac, No. ETRM-4311F. The almanac contains approximately 20,000 cross references from JEDEC, or OEM part numbers to GE parts numbers for universal replacement semiconductors, selenium rectifiers for color TV, dual diodes, and quartz crystals.*

112. *Loral Distributor Products* —has made available a 24-page electrolytic capacitor replacement guide. The catalog features replacement products by the original manufacturers part number.

113. *Precision Tuner Service* — announces a new tuner parts catalog, including a cross reference list of antenna coils and shafts for all makes of tuners.*

114. *RCA Distributor Products* —introduces a 72-page "SK Series Top-Of-The-Line Replacement Guide" (SPG-202L) which cross-references over 20,000 semiconductor device numbers. In addition a Solid State Quick Selection Replacement Chart (1L1367) listing 79 entertainment SK-Series devices is included. Price of this catalog is $.35.

115. *RCA / Solid-State Division* — announces a revised edition of the Power Transistor Directory, which reflects new product programs, as well as new product data. All product matrices have been updated to include the latest commercial types as well as preliminary data on developmental types, including RCA power transistors, both silicon and germanium. The Index of Types has been expanded to include DT types as well as JEDEC (2N-Series) types and RCA 40-K series types. Copies are $.40.*

116. *Semitronics Corp.* — has a new, revised "Transistor Rectifier, and Diode Interchangeability Guide" containing a list of over 100 basic types of semiconductors that can be used as substitutes for over 12,000 types. Include 25 cents to cover handling and postage.

117. *Sprague Products Co.*—has announced a 40-page manual which lists original part numbers for each manufacturer, followed by ratings, recommended Sprague capacitor replacements, and list prices. More than 2,500 electrolytice capacitors are included.

118. *Stancor Products*—pocket-size, 108-page "Stancor Color and Monochrome Television Parts Replacement Guide" provides the TV technician with transformer and deflection component part-to-part cross reference replacement data for over 14,000 original parts.

119. *Sylvania Electric Products, Inc.* — a 73-page guide which provides replacement considerations, specifications and drawings of Sylvania semiconductor devices plus a listing of over 35,000 JEDEC types and manufacturers' part numbers. Copies are $1.00.*

120. *Workman Electronic Products, Inc.*—has released a 32-page, pocket-size cross reference listing for color TV controls. 105 Workman part numbers are listed in numerical order with specifications and illustrations of the part.*

PICTURE TUBES

121. *General Electric* — a 12-page, 4-color, illustrated "Picture Tube Guidebook", Brochure No. ETRO-5372, provides a reference source for information about GE color picture tube replacements and tube interchangeability.*

122. *GTE Sylvania, Inc.* — has published an interchangeability guide listing 191 commonly used color TV

Circle 31 on literature card

Circle 32 on literature card

Circle 33 on literature card

Circle 34 on literature card

picture tubes which can be replaced with 19 GTE Sylvania Color Bright 85® types.*

MISCELLANEOUS

123. *Allied Radio Shack's*—new 132-page, 1972 Electronic Parts & Accessories catalog reportedly lists thousands of hard-to-find electronic items. Exclusive Allied, Realistic, and Radio Shack brand products are listed, as well as the complete line of Knight-Kit and Science Fair Kits.

SEMICONDUCTORS

124. *General Electric Tube Products Dept.* — announces the availability of their revised, 60-page, 1971 edition of the Entertainment Semiconductor Almanac. The Almanac reportedly provides approximately 24,000 cross-references from JEDEC, or OEM part numbers to GE part numbers for universal replacement semi-conductors, selenium rectifiers for color TV, dual diodes and quartz crystals.*
125. *GTE Sylvania, Inc.* — announces a revised semiconductor guide which reportedly gives replacement information for more than 41,000 solid-state devices. The 73-page catalog, ECG 212D, provides characteristics and outline drawings of the 124 components in the Sylvania ECG semiconductor line. The catalog is $1.00.*

SERVICE AIDS

126. *Kester Solder* — has released an 8-page brochure presenting the company's full line of soldering products. Presented are: "44" resin core solder, acid-core solder, solid-wire, bar solder, TV-radio solder, and Metal Mender.
127. *Chemtronics*—announces a new 12-page, 1971-1972 catalog of products, including: tuner sprays, circuit coolers, insulating sprays, contact and control sprays, lubricants, tape head and record cleaners/accessories, cartridge tape head cleaners and conditioners, electronic glues and cements, solder, and spray paints.

TV ACCESSORIES

128. *Telematic* — introduces a 14-page catalog featuring CRT brighteners and reference charts, a complete line of test jig accessories and a cross reference of color set manufacturers to Telematic Adapters and convergence loads.

TECHNICAL PUBLICATIONS

129. *Howard W. Sams & Co., Inc.* — literature describes popular and informative publications on radio and television servicing, communications, audio, hi-fi industrial electronics, including their 1971 catalog of technical books about every phase of electronics.*
130. *Sencore, Inc.* — Speed Aligner Workshop Manual, Form No. 576P, provides 20 pages of detailed, step-by-step procedures for operation and application of Sencore Model SM158 Speed Aligner sweep-marker generator.
131. *Sylvania Electric Products, Inc., Sylvania Electronic Components Div.* — has published the 14th edition of their technical manual, which includes mechanical and electrical ratings for receiving tubes, television picture tubes and solid-state devices. Price of this manual is $1.90.*
132. *Tab Books* — has released their Spring, 1971 catalog describing over 170 current and forthcoming books. The 20-page catalog covers: schematic/servicing manuals, broadcasting; basic technology; CATV; electric motors; electronic engineering; computer technology; reference; television, radio and electronics servicing; audio and hi-fi stereo; hobby and experiment; amateur ra-

dio; test instruments; appliance repair, and transistor technology.*

TEST EQUIPMENT

133. *Dynascan Corp.* — announces a new 24-page 2-color catalog of B&K Precision Test Equipment. A total of 21 instruments are reportedly presented; from a Mutual Conductance Tube Tester to a new DC to 10 MHz Triggered Sweep Oscilloscope.
134. *Eico* — has released a 32-page, 1971 catalog which features 12 new products in their test equipment line, plus a 7-page listing of authorized Eico dealers. *
135. *Information Terminals* — has introduced a new brochure featuring the M-100 Tension Monitor, the M-200 Torque Tester and the M-300 Head and Guide Gage.
136. *Leader Instruments Corp.* —announces the 1971 Catalog of Leader Test Equipment. Test equipment included is the LBO-301 portable triggered-sweep oscilloscope, LSW-330 new solid-state post injection sweep/marker generator, and the LCG-384 mini-portable, solid-state battery operated color-bar generator.
137. *Lectrotech, Inc.* — announces the 1972 catalog, "Precision Test Instruments for the Professional Technician". It contains specifications and prices on sweep marker generators, oscilloscopes, vectorscopes, color bar generators and other test equipment.
138. *Mercury Electronics Corp.* —14-page catalog provides technical specifications and prices of this manufacturers' line of Mercury and Jackson test equipment, self-service tube testers, testers, test equipment kits and indoor TV antennas.
139. *Tektronix, Inc.* — has announced a 4-page brochure describing the 54 Series oscilloscope manufactured by Tektronix English subsidiary, Telequipment.
140. *Triplett Corp.*—announces a 6-page, two-color brochure featuring four new portable, battery-operated, FET Volt-Ohm-Milliammeters and accessories.
141. *Triplett Corp.* — Bulletin No. 51570, a 2-page technical bulletin which provides the specifications and price of Triplett's new Model 602VOM.

TOOLS

142. *Chapman Manufacturing Co.* — offers a pamphlet containing their line of tools and tool kits. Kit No. 6320, the Midget Ratchet is featured along with other available tool kits.
143. *General Electric Industrial Heating*—a new two-page brochure describing a desolder tool which facilitates solder removal from electronic components on printed circuit boards, and permits the liquid solder to collect in a catcher under the tool's tip.
144. *Ideal Industries* — introduces a 2-page, 4-color brochure announcing their new Heat Gun. Performance characteristics applications, operating features, specifications and ordering information reportedly are included.
145. *Janel, Inc.* — announces a three-color catalog on precision hand tools used primarily in miniature and micro-miniature electronic assembly and production applications.
146. *Jensen Tools and Alloys*— has announced a new catalog No. 470, "Tools for Electronic Assembly and Precision Mechanics." The 72-page handbook-size catalog contains over 1,700 individually available items.*
147. *Xcelite, Inc.* — Bulletin N770 describes this company's three new socket wrench and ratchet screwdriver sets.

*Check "Index to Advertisers" for additional information. ▲

advertisers' index

The MARKETPLACE

This classified section is available to electronic technicians and owners or managers of service shops who have for sale surplus supplies and equipment or who are seeking employment or recruiting employees.

Advertising Rates in the Classified Section are:

- 25 cents per word (minimum $3.00)
- "Blind" ads $2.00 additional
- All letters capitalized—35 cents per word

Each ad insertion must be accompanied by a check for the full cost of the ad.

Deadline for acceptance is 30 days prior to the date of the issue in which the ad is to be published.

This classified section is not open to the regular paid product advertising of manufacturers.

EQUIPMENT FOR SALE

For Sale: C-G3 Lab grade frequency counter with converters, mint condition, very reasonable. John Perkovich, Route 1, Cascade, Wisc. 53011. 9-71-1t

CRT Picture Tube Rebuilder—used 3 months. Accessories included, cost $4000 sell $1500. Ray Davidson, 508 New York Avenue, Huntington, N.Y. 11743. 11-71-t

POSITION WANTED

Seeking employment in Montana as TV Technician or in parts. Have recent diploma from NRI. Harvey Kreiman, 922 8th. Ave. Helena, Mt. 59601. 11-71-1t

Now–Just 3 RCA Hi-Lite "V" Type Color Picture Tubes Replace 185 Types

Replaces 92 types

18VABP22
18VACP22
18VADP22
18VAHP22
18VAJP22
18VAQP22
18VARP22
18VASP22
18VATP22
18VBAP22
18VBCP22
19EXP22
19EXP22/ 19GVP22
19EYP22
19EYP22/ 19GWP22
19FMP22
19FXP22
19GLP22
19GSP22
19GVP22
19GVP22/ 19EXP22
19GWP22
19GWP22/ 19EYP22
19GXP22
19GYP22
19GZP22
19HBP22
19HCP22
19HCP22/ 19HKP22
19HFP22
19HJP22
19HKP22
19HQP22
19HRP22
19HXP22
19JBP22
19JDP22
19JHP22
19JKP22
19JNP22
19JQP22
19JYP22
19JZP22
19KEP22
19KFP22
490AB22
490ACB22
490ADB22
490AEB22
490AFB22
490AGB22
490AHB22
490AHB22A
490AJB22
490AJB22A
490AKB22
490ALB22
490AMB22
490ANB22
490ARB22
490ASB22
490BAB22
490BCB22
490BDB22
490BGB22
490BHB22
490BRB22
490CB22
490CHB22
490CUB22
490DB22
490EB22
490EB22A
490FB22
490GB22
490HB22
490JB22
490JB22A
490KB22
490KB22A
490LB22
490MB22
490NB22
490RB22
490SB22
490TB22
490UB22
490VB22
490WB22
490XB22
490YB22
490ZB22

Replaces 22 types

19VABP22
19VACP22
21AXP22
21AXP22A
21AXP22A/ 21AXP22
21CYP22
21CYP22A
21FBP22
21FBP22A
21FBP22A/ 21GUP22
21FJP22
21FJP22A
21FJP22A/ 21GVP22
21FKP22
21GUP22
21GUP22/ 21FBP22A
21GVP22
21GVP22/ 21FJP22A
21GXP22
21GYP22
21GZP22
21HAP22

Replaces 71 types

23VACP22
23VADP22
23VAHP22
23VALP22
23VAMP22
23VANP22
23VAQP22
23VARP22
23VASP22
23VATP22
23VAUP22
23VAWP22
23VAXP22
23VAYP22
23VAZP22
23VBAP22
23VBCP22
23VBDP22
23VBEP22
23VBGP22
23VBHP22
23VBJP22
23VBRP22
25ABP22
25ADP22
25AEP22
25AFP22
26AGP22
25AJP22
25ANP22
25AP22
25AP22A
25AP22A/ 25XP22
25AQP22
25ASP22
25AWP22
25AXP22
25AZP22
25BAP22
25BCP22
25BDP22
25BFP22
25BGP22
25BHP22
25BJP22
25BMP22
25BP22
25BP22A
25BP22A/ 25YP22
25BRP22
25BSP22
25BVP22
25BWP22
25BXP22
25BZP22
25CBP22
25CP22
25CP22A
25FP22
25FP22A
25GP22
25GP22A
25RP22
25SP22
25VP22
25WP22
25XP22
25XP22/ 25AP22A
25YP22
25YP22/ 25BP22A
25ZP22

Here's the way to save yourself time, give your customers faster service and improve your profit. Stock these three RCA Hi-Lite color picture tubes and have immediate replacements for the fastest moving industry types – 185 of them.

RCA Hi-Lite types are all new, made to OEM specifications and contain the newest RCA manufacturing technology, including Perma-Chrome and the latest X-ray attenuating glass.

It adds up to a big plus for you. Order these three RCA Hi-Lite tubes, and other types you may need, from your RCA Distributor. He also has the complete RCA Interchangeability Guide, available free of charge.

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THE ELECTRIC GIFTS WITH GENERAL ELECTRIC TUBES

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3. GE Marble Clock, 265 Gift Points
4. GE Youth Phono, 459 Gift Points
5. GE Portable Vacuum Cleaner, 564 Gift Points
6. GE Toast-R-Oven™, 608 Gift Points
7. GE Porta-Color® Television (reception simulated), 4331 Gift Points
8. Black & Decker® Drill Set, 412 Gift Points
9. Dremel Electric Shoe Polisher, 640 Gift Points
10. Brothers® Electric Pencil Sharpener, 260 Gift Points
11. Brothers® Calculator, 4728 Gift Points
12. Automatic Putting Set, 260 Gift Points

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GENERAL ELECTRIC

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