

ELECTRONIC TECHNICIAN / DEALER

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

NOVEMBER 1968

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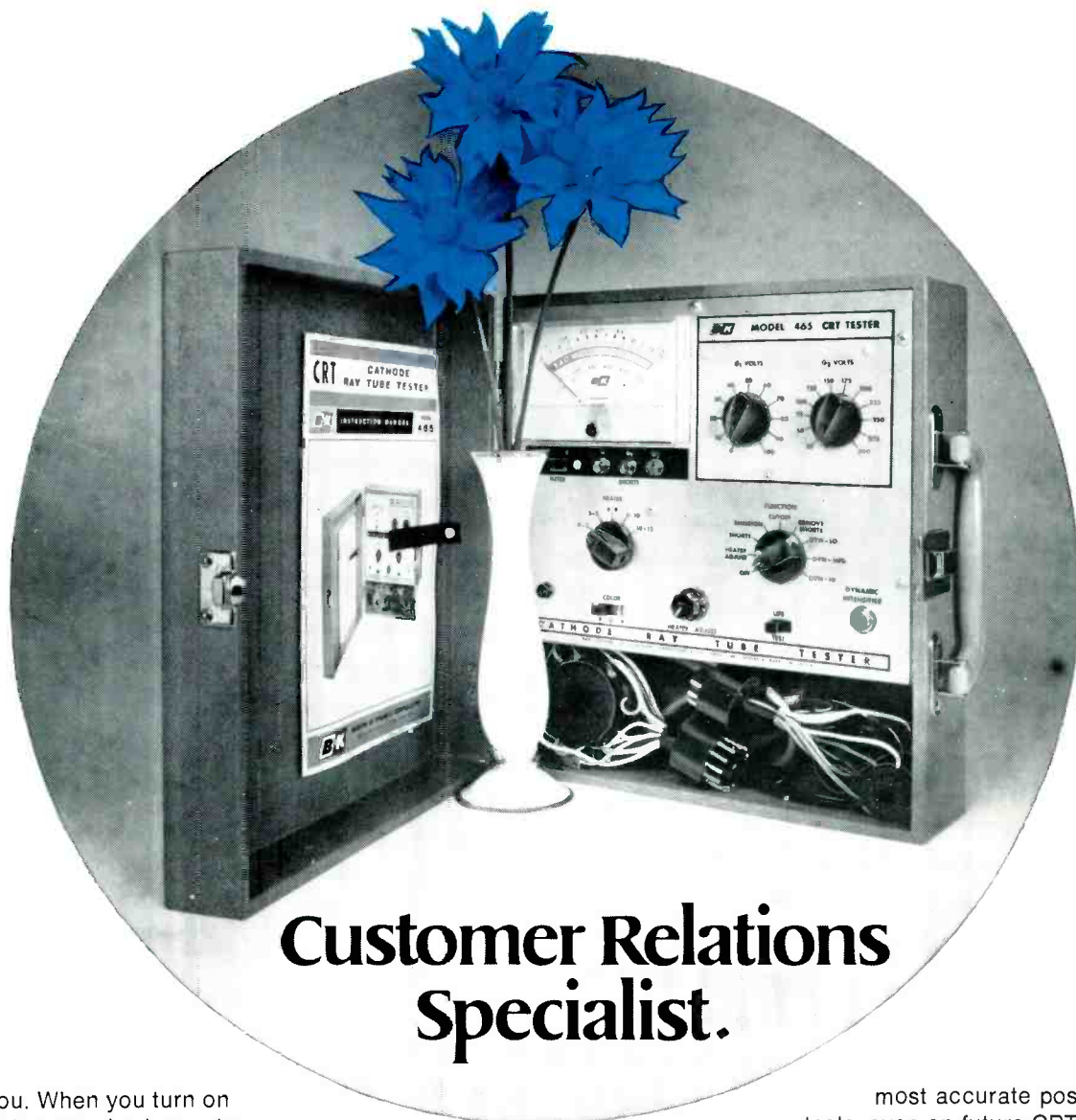
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PREVIEW 1969 TV

VECTORSCOPE SERVICING

TV SALES IN SPANISH



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That's you. When you turn on your B & K tester / rejuvenator. A real customer pleaser (even the tough ones). At the same time, it ups your income and quickly pays for itself. This has been proved time and again:

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purchase of a picture tube. Third, by being able to test and repair all black & white and all color tubes, imports as well as American, in a few minutes. Without removing the picture tube from the TV set.

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The B & K 465 is the professional serviceman's tester.

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EFFECTIVE 8/1/67

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Four conveniently located service centers assure speedy in-and-out service. All tuners thoroughly cleaned, inside and out . . . needed repairs made . . . all channels aligned to factory specs, then rushed back to you. They look—and perform—like new.

"Prefer a replacement? Sarkes Tarzian universal replacements are only \$10.45, customized replacements \$18.25. Universal replacements shipped same day order received. On customized, we must have original tuners for comparison purposes, also TV make, chassis, and model number. Send orders for universal and customized replacements to Indianapolis."

Part #	Intermediate Frequency	AF Amp Tube	Osc. Mixer Tube	Heater
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MFT-2	41.25 mc Sound 45.75 mc Video	3GK5	5LJ8	Series 450 MA
MFT-3	41.25 mc Sound 45.75 mc Video	2GK5	5CG8	Series 600 MA

Genuine Sarkes Tarzian universal replacement tuners with Memory Fine Tuning—UHF Plug in for 82-channel sets—Pre-set fine tuning—13-position detent—Hi gain—Lo noise—Universal mounting

FOR FASTEST SERVICE, SEND FAULTY TUNER WITH TV MAKE, CHASSIS, AND MODEL NUMBER, TO TUNER SERVICE CENTER NEAREST YOU



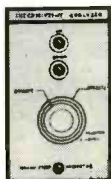
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Another benchwarmer?

Not this one. Our new B&K Diagnostic Oscilloscope is more than re-engineering of an old model to keep pace with TV technology. It is instead a basic departure from all other oscilloscopes. A departure that has simplified a complex instrument to make it easier for you to use. But there's something else.



What this oscilloscope has is exclusive. An Intermittent Analyzer with electronic memory—and optional remote Audio/Visual Alarm.

With it, the elusive intermittent conditions that make so many TV sets tough dogs can now be detected and identified in your absence. Preset one control.

When the faulty stage is detected, you'll know about it as soon as you come back from service calls. Then run the scope overnight to check another set for an intermittent condition.

All this adds up to greater shop efficiency, more time for profit-making service calls and a lot more mileage out of a very fine diagnostic oscilloscope.

An oscilloscope that shows vector patterns exactly as specified by color TV manufacturers. (All vectorscope inputs and controls are conveniently located on the front panel.) Also allows you to read peak-to-peak voltages in all ranges on a double-scale calibrated screen—just by turning a switch. (As the range is selected, the appropriate scale lights automatically.)

Automatic synchronization locks in all patterns at any signal level or frequency. There are also fewer controls and these are positioned for easier operation.

Give our Diagnostic Oscilloscope some thought. It's worth it not to be sidelined with a benchwarmer. See your B&K Distributor or drop us a note for detailed literature on Model 1450 and our full-line test equipment catalog, AP-24.

DIAGNOSTIC OSCILLOSCOPE
Model 1450, Net: \$279⁹⁵



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COVER

As circuits become more advanced and more solid state, the need to provide an easier path for servicing also becomes apparent. To clear this path, many of the manufacturers are designing circuits with transistor "plugability" as shown in the enlarged segment of a color TV circuit board.

TEKFAX • 16 PAGES OF THE LATEST SCHEMATICS • Group 195

ELECTRONIC TECHNICIAN/DEALER is published monthly by Ojibway Press, Inc., Ojibway Building, Duluth, Minnesota 55802, a subsidiary of Harcourt, Brace & World, Inc. Subscription rates: One year \$5, two years \$8, three years \$10, in the United States and Canada. Other countries: One year \$9, two years \$14, three years \$18. Single copies 60c. "Application to mail at second-class rates at Dansville, New York and at additional mailing offices pending at Dansville, New York." Copyright 1968 by Ojibway Press, Inc.

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The Model 6000 Modular Frequency Meter will measure frequencies 10 KHz to 600 MHz with .000125% accuracy. Special plug-in modules allow the instrument to be used as an audio frequency meter from 500 Hz to 20 KHz full scale and in addition to be used as a dc voltmeter (10,000 ohms/volt).

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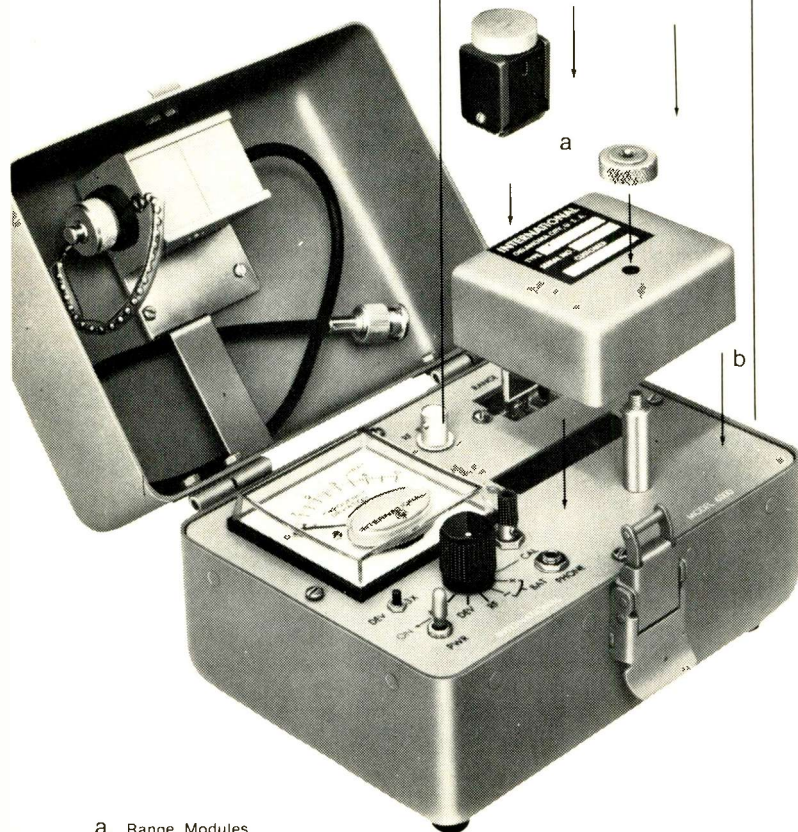


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Comments Welcomed

We receive hundreds of letters from readers patting us on the back, and some slapping us in the face. We welcome both. We don't want to be ignored if you are enthusiastic about ETD, and we certainly expect to get criticized when we omit areas of interest or foul up in other aspects.

ELECTRONIC TECHNICIAN/DEALER is for you. We anticipate big things in the future for ETD and its readers. These include keeping you informed of the latest circuit designs for as many new products as we can. We especially want to let you know what is available in test instruments.

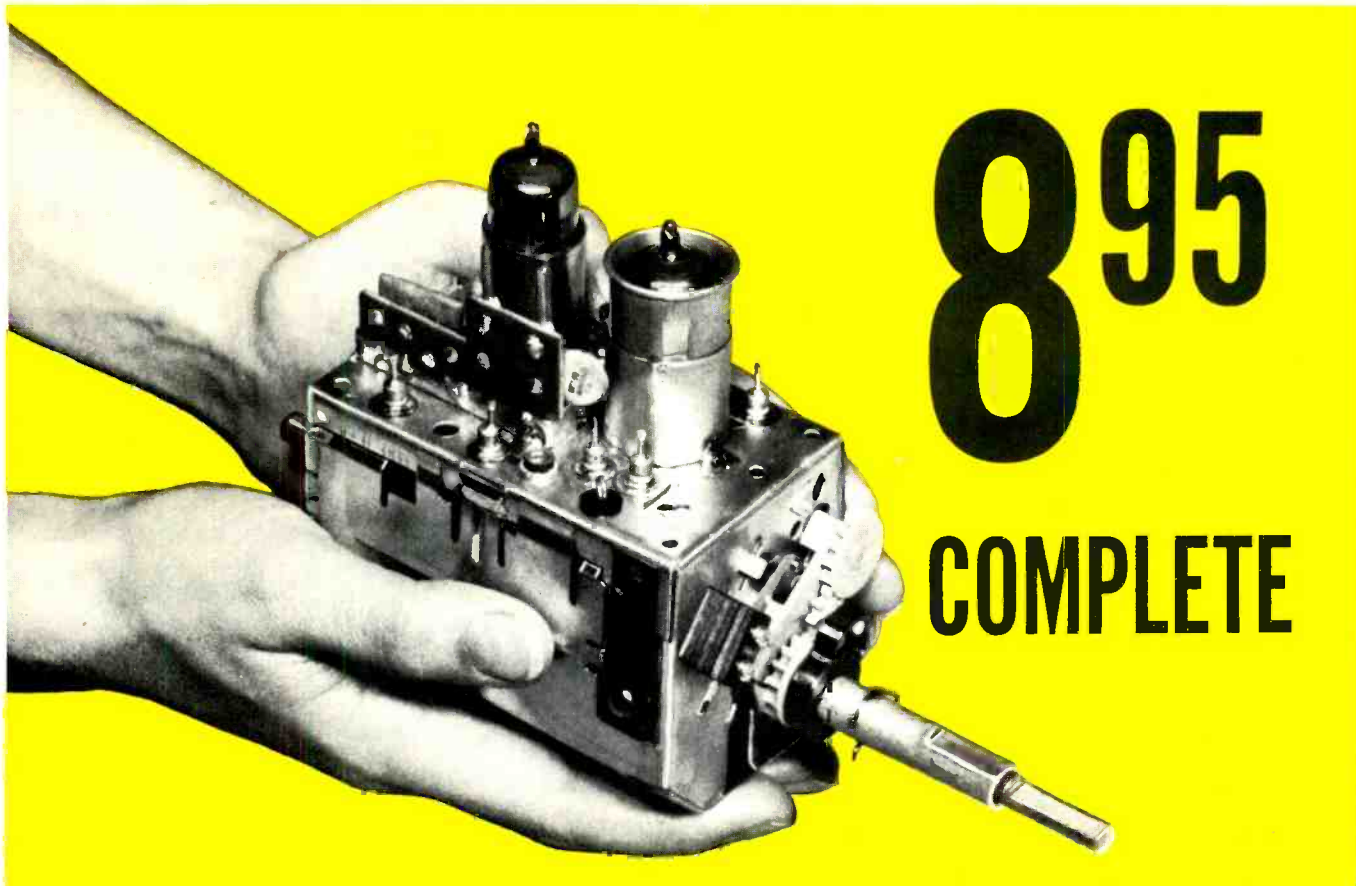
It is no secret that there have been problems concerning many of these areas. Some technicians and dealers have thrown up their hands in despair. Manufacturers have made claims which, at times, appear to be inconsistent. But they are trying to correct the situation. One of our jobs is to let you know what progress is being made, and you can help by letting us know what you have done to overcome these problems.

We want to present both sides of the story. If a TV service-dealer has found new ways to make use of a particular instrument or modified it to do additional jobs, we would like to know about it. Perhaps you have a shelf full of expensive equipment collecting dust. We would like to know why. Is it because it doesn't do what the manufacturer said it would? Is it broken down waiting for parts, or is it just that no one ever showed you how to use it?

Lack of proper service technology and techniques can cause a hangup in any shop. Sometimes it is because the technician doesn't understand the circuit, or he can't make proper use of the instruments he has to test it with. To offset this lack of understanding he will blame the set and give the customer a snow job on its poor circuit design. The poor customer doesn't want to appear ignorant and agrees with the technician that the thing never did work right from the start.

There are two sides to every story. What are you doing to help your cause? Are you providing feedback to the proper people, or are you just griping and hoping it will all be different tomorrow? If your problems are legitimate, don't lay them on deaf ears—make your comments to the manufacturer, to people concerned and in a position to give you results (including us).

ELECTRONIC TECHNICIAN/DEALER



895 COMPLETE

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(Guaranteed color alignment . . . no additional charge)

Overhaul includes parts, except tubes and transistors.

Simply send us the defective tuner complete; include tubes, shield cover and any damaged parts with model number and complaint. Your tuner will be expertly overhauled and returned promptly, performance restored, aligned to original standards and warranted for 90 days.

UV combination tuner must be single chassis type; dismantle tandem UHF and VHF tuners and send in the defective unit only.

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● **CUSTOM REPLACEMENTS**

Exact replacements are available for tuners that our inspection reveals are unfit for overhaul. As low as \$12.95 exchange. (Replacements are new or rebuilt.)

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		Min.*	Max.*	Snd.	Pic.	
CR6P	Parallel 6.3v	1¾"	3"	41.25	45.75	8.95
CR7S	Series 600mA	1¾"	3"	41.25	45.75	9.50
CR9S	Series 450mA	1¾"	3"	41.25	45.75	9.50
CR6XL	Parallel 6.3v	2½"	12"	41.25	45.75	10.45
CR7XL	Series 600mA	2½"	12"	41.25	45.75	11.00
CR9XL	Series 450mA	2½"	12"	41.25	45.75	11.00

*Selector shaft length measured from tuner front apron to extreme tip of shaft.

These Castle replacement tuners are all equipped with memory fine tuning, UHF position with plug input for UHF tuner, rear shaft extension and switch for remote control motor drive . . . they come complete with hardware and component kit to adapt for use in thousands of popular TV receivers.

Order universal replacements out of Main Plant (Chicago) only.



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MAIN PLANT: 5713 N. Western Ave., Chicago, Illinois 60645
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. . . for more details circle 108 on postcard

No Justice

A while back a Mr. Rosa complained in Letters to the Editor that TEKFAK was quite bent on television. I feel inclined to agree with him. In fact, I would say that the whole magazine is monopolized by television. Since electronics is a big field that covers computers, space satellites, missile systems, microwave, audio engineering, video tape, broadcasting, telemetry, radar,

two-way radio, and a host of other fields, I suggest you re-name the magazine "Television Technician/Dealer."

You see, since I work in avionics in the military service and also hold a first class radiotelephone ticket which allows me to dabble in broadcasting and two-way radio, all those articles on television do me no justice whatsoever. Your articles on two-way about men who built and run a successful business do not serve to help a technician with a tough-dog problem in a police communications transmitter. I also suggest that you can bring the magazine standards up to par by presenting more service and troubleshooting articles in

a wider variety of specialized fields to help the struggling industrial technician. Please remember you have reader interest in other areas besides home entertainment electronics. I am reasonably sure my opinion is shared by others and openly invite any comments from your readers.

EUGENE E. DAVIS JR.
Avionic Tech. Third

P.O. Box 102
Staten Island, N.Y.

• We agree with Mr. Davis—on some points. *ELECTRONIC TECHNICIAN/DEALER* does not include articles on microwave, radar and telemetry. It isn't meant to. Our reader is not normally an industrial electronics technician. Mr. Davis can attest to that since he is not a subscriber.

We are happy to hear that he has a first class radiotelephone and time to "dabble" in two-way radio, broadcasting, etc. Many people have licenses to dabble—and they prove it. But *ET/D* is not written for "dabblers," it is written for do-ers. The technicians and dealers whose careers are in consumer electronics are interested in articles dealing with those products. They, too, fill a vital need and work hard to earn their bread. Our job is to make their job just a little easier. Consequently, articles on microwave, radar and telemetry would do them no justice... Ed.

Built Backward!

After building what I thought was a simple dc bench power supply using two amp, 400 PIV stud-mounted diodes, I proceeded to apply ac power. It immediately blew an 8a fuse.

Thinking that I may have shorted a lead to ground, I opened the box and checked the wiring. Nothing was touching ground. I then checked the diodes and all seemed to have the proper front-to-back ratio. Everything seemed normal so I replaced the fuse and again applied ac. Wham! It blew another 8a fuse. I pulled out the diodes and rechecked them with my VTVM. I couldn't believe my eyes. One of the diodes was actually backward according to it's markings. In reversing it, the power supply operated normally.

D. L. BRINTON

Wilmington, Del.

Logistics Bugaboo

I have just finished reading "Nuts to Full Time" in your Letters to the Editor column (*ET/D* August) and it is truly a note that all set manufacturers should be made aware of. It recently took me three months to obtain a UHF decal for the drum of a current model UHF tuner assembly. I sent them the part

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You can spread that satisfaction around by using many of them for universal application, too. They're great for upgrading performance wherever you use them.

Call your RCA distributor. He'll set you up with a supply of the fastest moving ones today.

Parts and Accessories, Deptford, N.J.



number which was imprinted on the face of the decal. In return I received over \$7 worth of useless parts before getting the 50-cent decal. I gave the parts to a local distributor as I had no use for them.

It seems to me that the common items such as resistors and capacitors are not too difficult to obtain. But items peculiar to the cabinet such as dials, decals and antennas appear to be real

problems. With all of our modern computers, the logistics involved in maintaining accurate supply control is still a bugaboo that plagues the industry. Most of the error is human. But when the correct part number is sent to a supplier, who in turn sends the wrong parts COD which are not subject to return for credit, it makes us wonder what is happening.

Thanks for giving me the chance to sound off on one of my pet gripes. Keep up the good work and try to educate the set manufacturers as well as you do the serviceman.

C. C. KING

St. Petersburg, Fla.

Thanks to the Readers

I was overwhelmed by the response to my plea for help on the Crosley Showbox published in the August issue of ET/D. You have a great bunch of guys reading your magazine and I would like to express my thanks to everyone who went to the trouble of writing me. I returned from vacation and found my mail box overflowing with letters of help and suggestion. I wouldn't have believed it possible that so many people could be interested in helping a fellow technician, especially in these days where it sometimes appears to be every man for himself.

The reaction I received is worth far more than the price of a subscription to ET/D. These electronic technicians are a great group of guys and I'm proud to be one of them. Thanks again to all and keep up the good work.

ROBERT C. PITTS

Fort Smith, Ark.

Help Needed

I need an instruction manual for an Eico #470 oscilloscope. The company writes that the manuals are no longer available. I will gladly defray costs involved if any ET/D reader can supply me with either an original or a copy.

JOSEPH C. OERTEL JR.

80 N. Passaic Ave.

Chatham, N. J. 07928

I have a TEC Transistor stereo amplifier, Model S15, manufactured by Transis-Tronic, Inc., Calif. I understand that they have been out of business for the last four years. The audio output transformer, P-43 ATC133, burned out. I have been unable to locate one and hope that perhaps one of the technicians reading ET/D may have worked on these sets and have one in stock. Any help will be appreciated.

J. GAGLIARDO

128 Clinton Ave.

Brooklyn, N.Y. 11205

I would like to complete my files of ET/D schematics. I am interested in obtaining schematic issues from number 1 to 833. I would appreciate any help your readers can offer.

LEON TEBIS

434-4th St.

Brooklyn, N.Y. 11215

No Use for Scopes

A recent ET/D article (May 1968) indicates that 50 percent or less of the electronic technicians servicing home entertainment equipment use an oscilloscope. Those of us who do not use this instrument have nearly all given it a fair trial and placed it on the inactive shelf for good reasons.

Physically the scope is expensive.



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World's Finest Tube Analyzer

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Plus Advanced
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- Regulated for complete accuracy and assurance on marginal tubes.

If you want to go first class—go with the MU150 Continental II. Only **\$219⁵⁰**

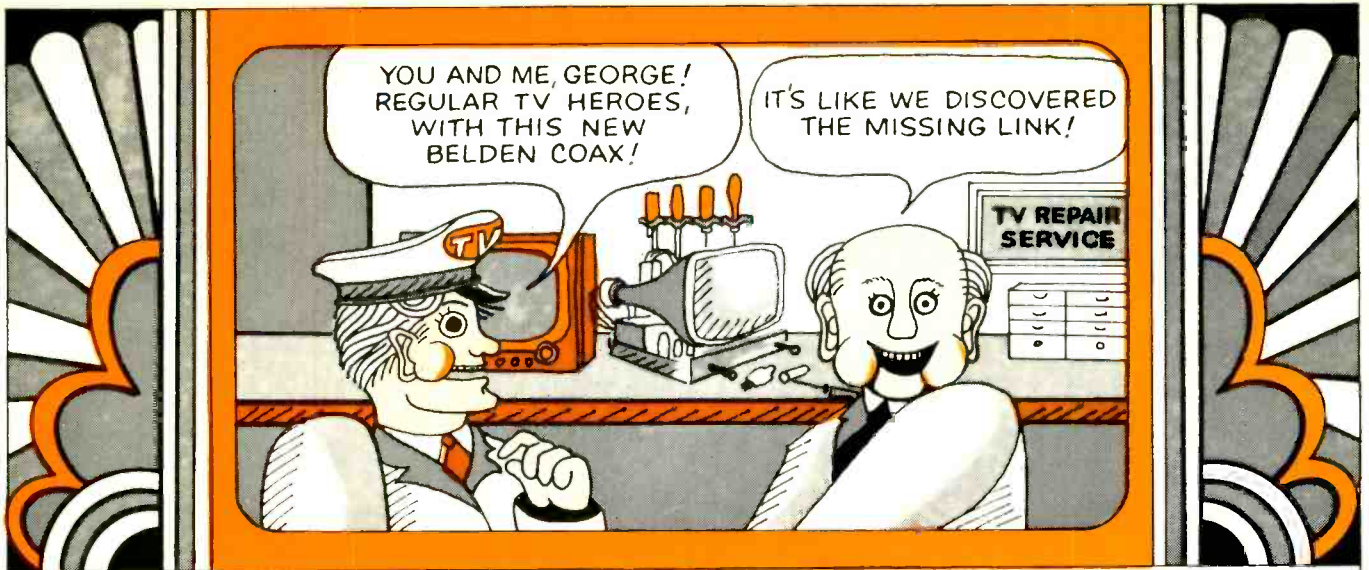


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Low loss cellular polyethylene, .180" nominal O.D.

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18 AWG solid, annealed, bare copper.

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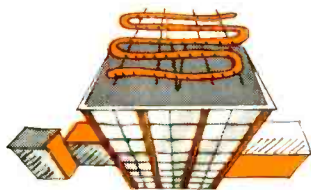
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4-28 AWG solid tinned copperweld conductors applied spirally and positioned uniformly around the circumference of the shield.

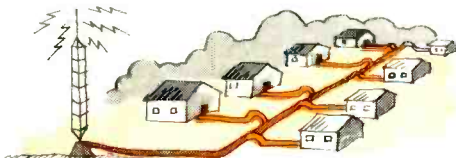
Shield

Belden DUOFOIL 100% shield is a polyester film with aluminum lamination on both outside surfaces.

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100	2.1
200	3.1
300	3.8
400	4.5
500	5.0
600	5.5
700	6.0
800	6.5
900	6.9

Available in 100, 500 and 1000 ft. spools. See your local Belden Distributor for full details or to order. For a copy of the reprint article, "Electronic Cable," write: Belden Corporation, P.O. Box 5070-A, Chicago, Illinois 60680.

Don't forget to ask them what else needs fixing?

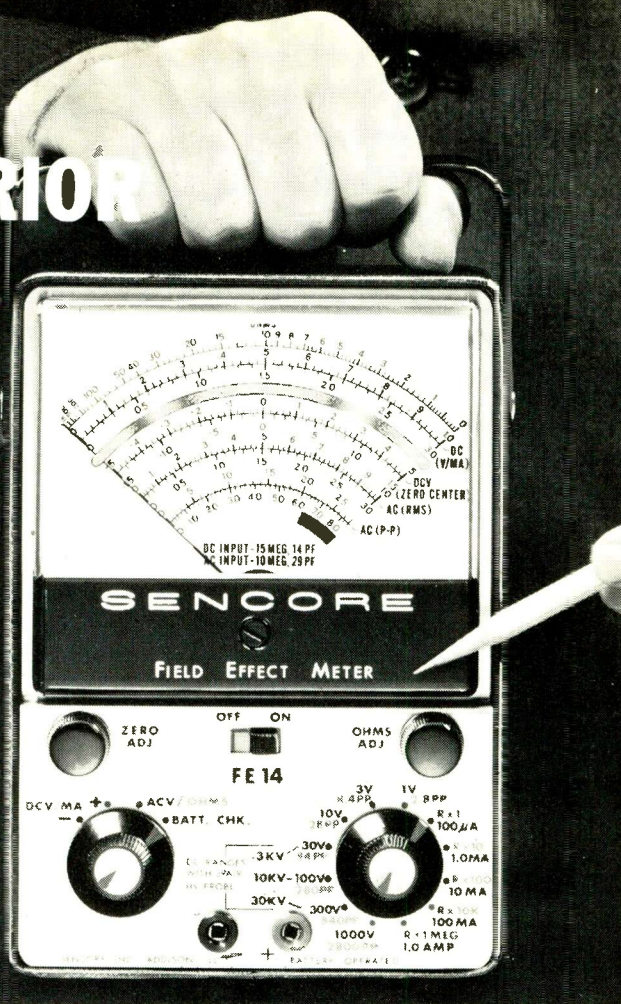


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Here is the revolutionary new approach to circuit testing, the solid state Sencore FIELD EFFECT METER. This FE14 combines the advantages of a VTVM and the portability and versatility of a VOM into a single low-cost instrument. This is all made possible by the use of the new space age field effect transistor that is instart in action but operates like a vacuum tube in loading characteristics. Compare the features of the FIELD EFFECT METER to your VTVM or VOM.

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heavy, bulky and complex; however, most of these objections, except expense, have been overcome in modern scopes. Operationally, the chassis of the equipment being repaired must be removed and arranged so that it can be operated with power applied in order that the test points may be contacted by the scope probes and this is sometimes difficult to accomplish.

The leading objection to the scope is that it does not indicate any bad component directly but merely displays in less understandable form the symptoms already displayed by the defective equipment.

Open capacitors are difficult to pinpoint, and scope users usually claim that their instrument combined with reading and mental analysis is infallible in this respect. These defective components are directly and rapidly located by the proper use of a capacitance analyzer (in circuit tester plus bridge) applied to a cold chassis. A capacitance analyzer cannot be used on transistorized equipment. We may hope that owners of defective transistorized equipment will return it to factory service centers until someone develops a suitable test instrument.

A technician can be over-instrumented as well as under-instrumented, and the experience of a majority of technicians shows that the scope is not a troubleshooting instrument.

Please maintain your editorial policy of adequate coverage of television. I dropped subscriptions to two other electronics publications because their coverage of television was inadequate.

CARK REETZ

Quinton, Okla.

We have to disagree with Mr. Reetz. An oscilloscope can be a very valuable tool for servicing if it is properly used and understood. There are a number of good books covering the uses of a scope in servicing. Unfortunately, Mr. Reetz is probably one of many technicians with not enough time to keep current on the uses of test instruments and not enough time to spend reading about new procedures. There are new service procedures developed every day by manufacturers to go along with the new circuits. And that's a fact technicians schooled in the old methods are going to have to face up to, just as many of the old-timers have finally come to realize that solid-state devices are replacing tubes...Ed.

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The next time you're stocking up on receiving tubes, open a savings account with a participating Sylvania distributor. It's like putting money in the bank without putting money in the bank.

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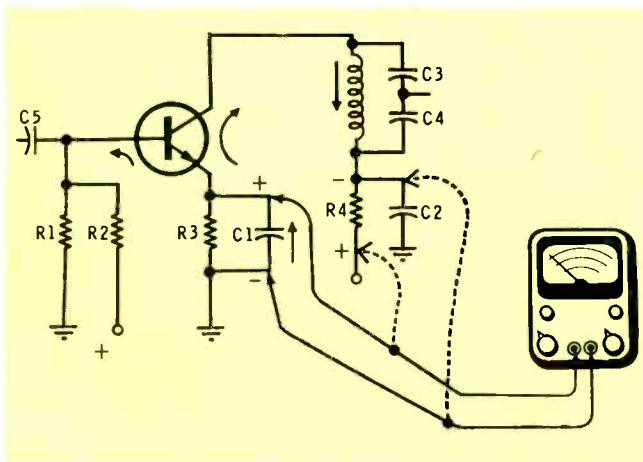
MOTOROLA

Checking a Transistor Stage with the Transistor in Place

In transistor circuits, many defects can be localized by measuring the voltage on the transistor elements since the defective component in the majority of cases will upset the current drawn by the stage. This change from normal current will cause a different voltage to develop across the resistive components in the circuit.

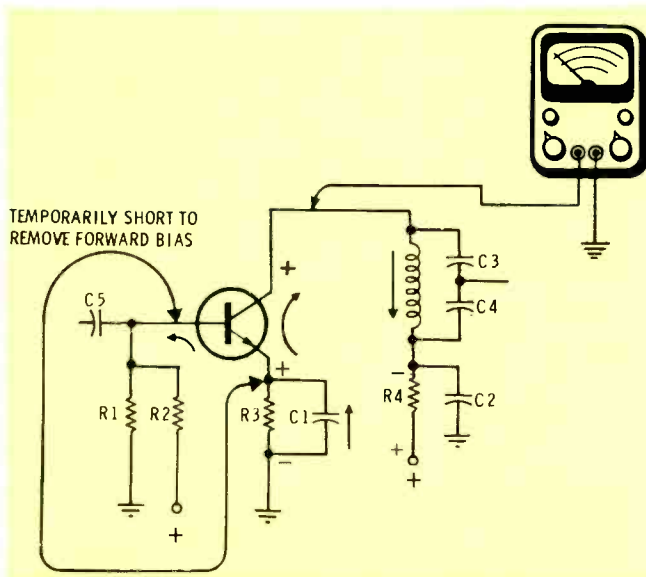
The illustration shows a typical transistor circuit with the necessary meter connections for measuring voltage drops as a result of transistor current. Electronic flow is in the direction indicated by the arrows and causes the polarity of voltage drop across the resistors as shown.

The emitter resistor is common to both the input and output circuits. The voltage drop across R3 is the sum of the



total transistor base and collector currents. The voltage drop across R3, therefore, indicates the total transistor current. Collector current can be determined separately, if desired, by metering the voltage drop across R4.

If a circuit irregularity is indicated by an incorrect voltage across the emitter resistor R3, as compared to the serv-



ice manual, it then becomes desirable to know if the transistor is capable of controlling its current. If we can determine that the transistor base is not capable of controlling current, we would suspect that the transistor is defective. If we find that the base is capable of controlling current, we would then suspect that the stage is biased incorrectly indicating a defective bias resistor or other component such as a shorted coupling capacitor.

In servicing NPN transistor circuits, we can determine if the transistor base is capable of controlling the current by temporarily subtracting from the bias voltage and noting if there is a corresponding change in voltage at the collector element (see illustration).

By using a short piece of jumper wire connected from base element to emitter, we can eliminate the forward bias. If after removing the forward bias there is no change in voltage at the collector element, you can assume that the base element is not able to control the current and probably indicates a defective transistor. However, should the voltage change, it indicates that the base is capable of controlling current, that the transistor is probably good and the defect likely to be a biasing component, such as R1, R2, or C5.

ADMIRAL

50Hz TV and Phono Conversion

Admiral TV receivers are suitable for use in 60Hz power areas of the United States, Canada, Mexico, Central America, South America and the islands of the Caribbean, without modification except in some cases for voltages other than 117v. Some of these areas do, however, have 50Hz power which may create difficulties. We suggest that you write to Admiral regarding such areas, giving the name of the city of intended location and the model number of the set to be moved.

Most other areas of the world have sufficiently different systems of TV telecasting so as to greatly minimize the possibility of economical conversion. We suggest that you write Admiral giving city and model information if you need assistance for a customer moving to these areas.

The practical use of color TV is limited to the United States, Hawaii, Puerto Rico and the 60Hz areas of Canada and Mexico (Mexico City is 50Hz). We do not recommend the use of color TV sets in other 60Hz areas of the Western Hemisphere because of problems arising from the differences in transmitting systems and the shortage of technicians trained in color techniques. Do not plan to take a color TV set to a 50Hz area.

Some manufacturers, including Admiral, have plants in other countries which manufacture sets conforming to that country's transmitting standards and frequencies.

There are increasing numbers of inquiries regarding the operation of Admiral phonographs in areas with 50Hz power. If a phonograph designed for 60Hz power is used on 50Hz power, the turntable will operate at a slower speed. This is especially noticeable on the 45 and 78 rpm speed settings.

Admiral has made available a number of 50Hz conversion kits which will permit conversion of most Admiral record changer drive mechanisms. The part numbers for these kits are listed in the phonograph and record changer

NEW

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"the ANTENNA that captures the RAINBOW"

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There is a model scientifically designed and engineered for your area.

Check this chart for the FINCO "Signal Customized" Antenna best suited for your area.

STRENGTH OF UHF SIGNAL AT RECEIVING ANTENNA LOCATION ▼	Strength of VHF Signal at Receiving Antenna Location				
	NO VHF ▼	VHF SIGNAL STRONG ▼	VHF SIGNAL MODERATE ▼	VHF SIGNAL WEAK ▼	VHF SIGNAL VERY WEAK ▼
NO UHF →→→		 CS-V3 \$11.50	 CS-V5 CS-V7 \$18.50 \$25.95	 CS-V10 \$37.95	 CS-V15 CS-V18 \$50.95 \$59.50
UHF SIGNAL STRONG →→→	 CS-U1 \$10.50	 CS-A1 \$19.95	 CS-B1 \$31.50	 CS-C1 \$45.95	 CS-C1 \$45.95
UHF SIGNAL WEAK →→→	 CS-U2 \$15.95	 CS-A2 \$23.95	 CS-B2 \$41.95	 CS-C2 \$54.50	 CS-D3 \$73.50
UHF SIGNAL VERY WEAK →→→	 CS-U3 \$22.95	 CS-A3 \$32.50	 CS-B3 \$52.50	 CS-C3 \$62.95	 CS-D3 \$73.50



NOTE: In addition to the regular 300 ohm models (above), each model is available in a 75 ohm coaxial cable download where this type of installation is preferable. These models, designated "XCS", each come complete with a compact behind-the-set 75 ohm to 300 ohm balun-splitter to match the antenna system to the proper set terminals.

All Prices Subject to Change

THE FINNEY COMPANY

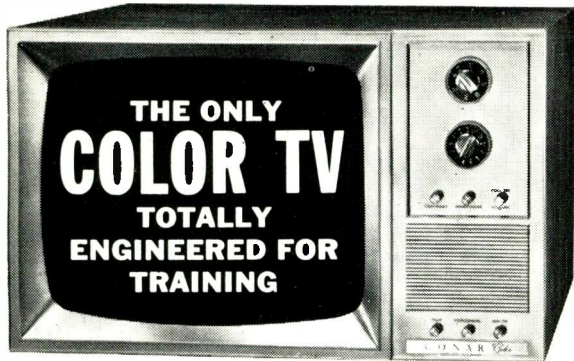
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ET/D TECHNICAL DIGEST

service manuals. Also, the entire back page of the S1015, RC704 record changer manual, is devoted to such information. If a particular unit has no number listed for a 50Hz conversion kit, that unit is not recommended for use on 50Hz power. Record changer model numbers are located behind the tone arm base.

In general, conversion can be made on all 117vac phono motors having a field coil lamination stack of at least 1/2in. thickness. Motors with less than 1/2in. stacks, 90v motors, and motors with extra windings for amplifier power supplies are not recommended for 50Hz conversion.

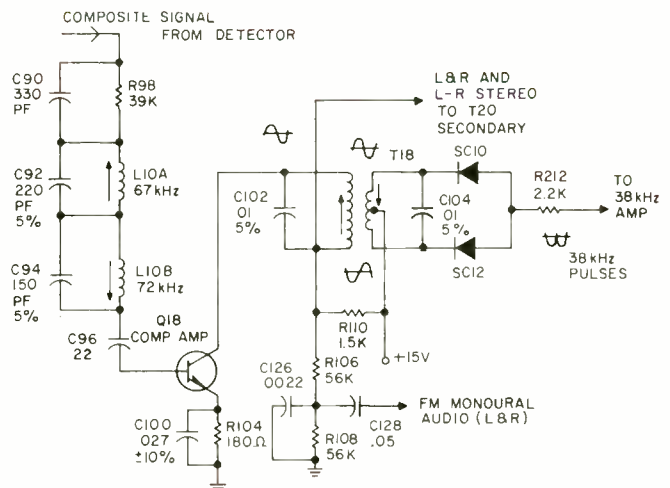
For areas with other than 117v power, a voltage adjusting device such as a step-down or step-up transformer may be necessary to prevent damage to the record changer motor and phonograph amplifier. Such devices are generally available in the areas where they are needed.

In general, ac/dc equipment is more adaptable to use on 50Hz power than transformer-powered equipment. Even though a conversion kit is available for the record changer, a console stereo with transformer-powered amplifier may present some difficulty in 50Hz operation. A degree of caution should be used in selling an electronics product to someone you know will be taking it out of the country.

SYLVANIA

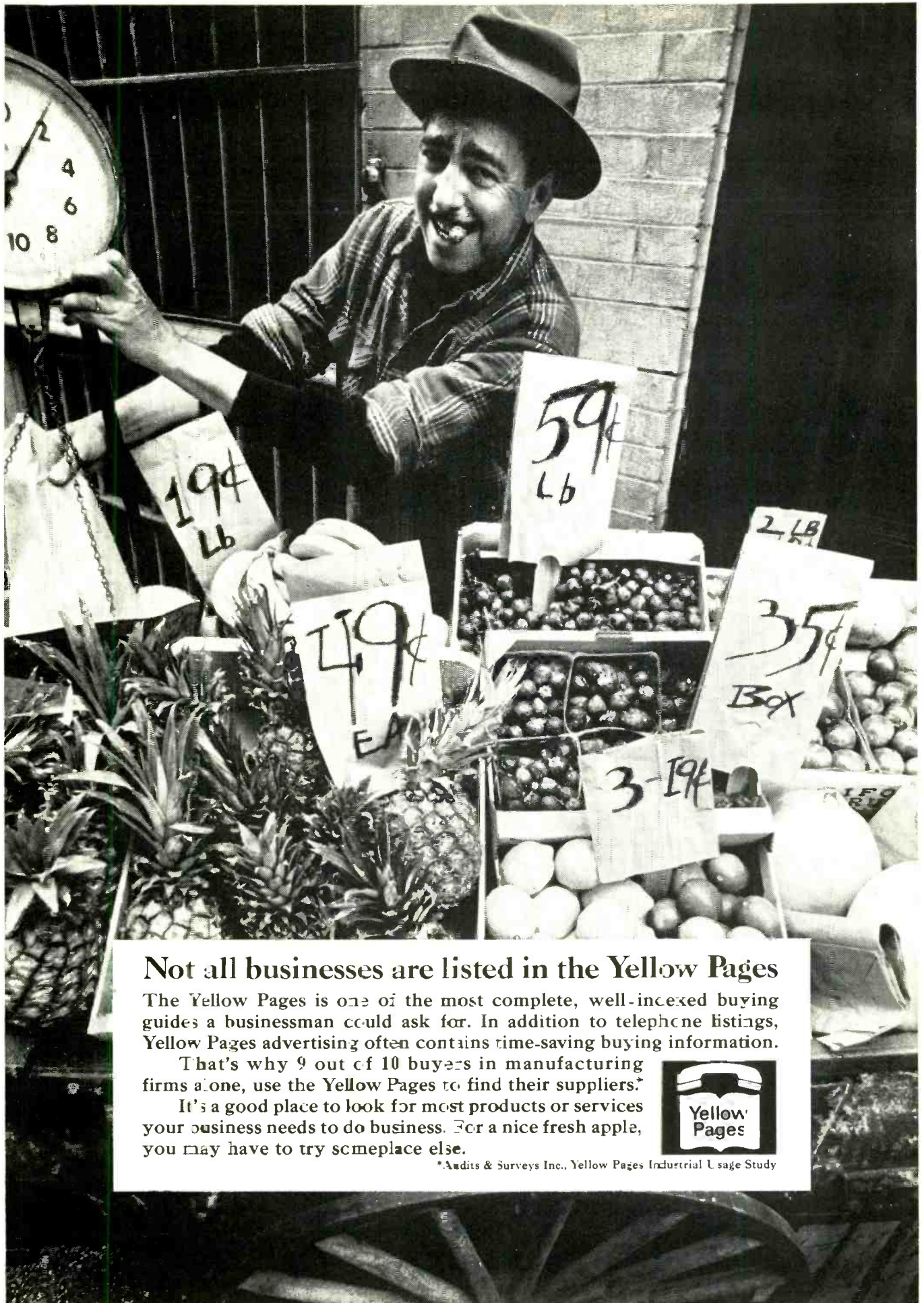
FM Stereo Multiplex Decoder — Circuit Description

A new version of an old circuit for proven good performance and known reliability—this multiplex decoder also makes service easier by its simplicity.



The composite signal containing monaural information from 0 to 15kHz, the 19kHz pilot carrier and the FM stereo signal at $38\text{kHz} \pm 15\text{kHz}$ is fed to traps L10A and L10B. These traps remove the unwanted SCA signals to feed a clean composite signal to the base of Q18 (see schematic). The 38kHz sidebands containing FM stereo audio information are coupled from the bottom of T18 primary to the secondary center tap of T20.

The 19kHz pilot carrier is removed by the tuned circuit T18 in the collector of the composite amplifier. The secondary of this transformer is center-tapped so that 19kHz information is present at SC10 and SC12 with a 180deg phase difference at the diodes. These diodes now perform



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The Yellow Pages is one of the most complete, well-indexed buying guides a businessman could ask for. In addition to telephone listings, Yellow Pages advertising often contains time-saving buying information.

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*Audits & Surveys Inc., Yellow Pages Industrial Usage Study

Why is a Vectorscope essential for Color TV servicing?

- 1 Check and align demodulators to any angle . . . 90°, 105°, 115° . . . accurately and quickly. No guesswork. New color sets no longer demodulate at 90°. Only with a Vectorscope can these odd angles be determined for those hard-to-get skin tones.
- 2 Check and align bandpass-amplifier circuits. Eliminate weak color and smeared color with proper alignment. No other equipment required. Only a V7 Vectorscope does this.
- 3 Pinpoint troubles to a specific color circuit. Each stage in a TV set contributes a definite characteristic to the vector pattern. An improper vector pattern localizes the trouble to the particular circuit affecting either vector amplitude, vector angle or vector shape. Only a V7 Vectorscope does this.



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ONE YEAR WARRANTY

V6-B New, improved complete color bar generator with all the features of the V7 except the Vectorscope. Only **99.50**

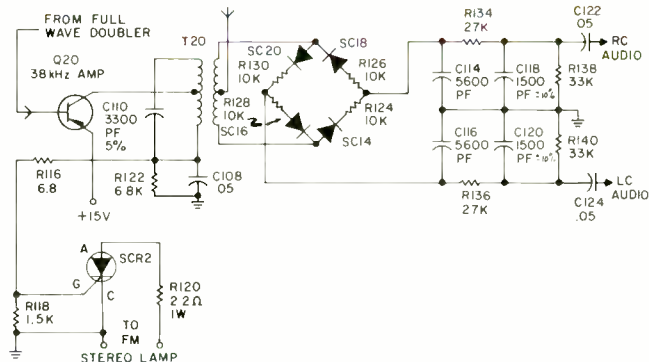


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ET/D TECHNICAL DIGEST

the function of a fullwave rectifier and produce two pulses for every cycle of input signal. These 38kHz (2X19kHz) pulses drive Q20 at a 38kHz rate. The 38kHz switching signal present in T20, turn "on" the decoding and bias



diodes in the secondary of this transformer to give a left and right channel audio input for the stereo amplifier (see illustration).

Remember during alignment to always tune the 19kHz coils in FM stereo decoders for maximum output and the 38kHz coils for best stereo separation.

With this decoder system, 38kHz information will be present in T20 only when FM stereo is being broadcast, or when the 19kHz pilot carrier is present. The gate of the silicon controlled rectifier SCR2 is connected to the collector circuit of Q20. When Q20 is driven, the SCR will be turned on to close the circuit for the stereo indicator lamp indicating that a stereo signal is being received.

MAGNAVOX

Model 1V9000 Tape Recorder—Erratic Speed

In cases of reported speed problems it is wise to check the Speed Change Idler (172) and Take-Up Drive Idler (190) for possible excessive wear. If the idlers are worn they should be replaced. A replacement Idler Wheel Kit Part No. 170911-1 is available from your Magna-Par branch on an in-warranty exchange basis.

TV Chassis T937—Failure of Vertical Driver

Failure of the vertical driver transistor may be caused by arcing from the dag coating on the CRT to chassis components. Capacitor C405 in some chassis was a .33µf, 400v unit which is larger than the originally specified .33µf, 75v unit. It is possible for this larger capacitor to touch the dag coating resulting in an "arc-through" damaging the transistor. When replacing the vertical driver always use the exact replacement transistor Part No. 610070-2 and if the larger capacitor is used, replace it with Part No. 250555-94.

Stereo Theatre Models T933/R220—Raspy Sound

In reported cases of too much high frequency response causing raspy sound, check the value of C713 in the TV sound de-emphasis circuit. If it is 680pf, change it to 1000pf. Also check the TV audio input circuit on the radio-chassis to see if capacitor C232 (1500pf) is used. If it is, remove it.

More than 5 million two-way transmitters have skyrocketed the demand for service men and field, system, and R & D engineers. Topnotch licensed experts can earn \$12,000 a year or more. You can be your own boss, build your own company. And you don't need a college education to break in.

HOW WOULD YOU LIKE to earn \$5 to \$7 an hour... \$200 to \$300 a week ... \$10,000 to \$15,000 a year? One of your best chances today, especially if you don't have a college education, is in the field of two-way radio.

Two-way radio is booming. Today there are more than *five million* two-way transmitters for police cars, fire trucks, taxis, planes, etc. and Citizen's Band uses—and the number is growing at the rate of 80,000 new transmitters per month.

This wildfire boom presents a solid gold opportunity for trained two-way radio service experts. Most of them are earning \$5,000 to \$10,000 a year *more* than the average radio-TV repair man.

Why You'll Earn Top Pay

One reason is that the U.S. doesn't permit anyone to service two-way radio systems unless he is *licensed* by the FCC (Federal Communications Commission). And there aren't enough licensed experts to go around.

Another reason two-way radio men earn so much more than radio-TV service men is that they are needed more often and more desperately. A two-way radio user *must* keep those transmitters operating at all times, and *must* have them checked at regular intervals by licensed personnel to meet FCC requirements.

This means that the available li-

censed expert can "write his own ticket" when it comes to earnings. Some work by the hour and usually charge at least \$5.00 per hour, \$7.50 on evenings and Sundays, plus travel expenses. Others charge each customer a monthly retainer fee, such as \$20 a month for a base station and \$7.50 for each mobile station. A survey showed that one man can easily maintain at least 15 base stations and 85 mobiles. This would add up to at least \$12,000 a year.

How to Get Started

How do you break into the ranks of the big-money earners in two-way radio? This is probably the best way:

1. Without quitting your present job, learn enough about electronics fundamentals to pass the Government FCC License. Then get a job in a two-way radio service shop and "learn the ropes" of the business.

2. As soon as you've earned a reputation as an expert, there are several ways you can go. You can move out, and start signing up your own customers. You might become a franchised service representative of a big manufacturer and then start getting into two-way radio sales, where one sales contract might net you \$5,000. Or you may be invited to move *up* into a high-prestige salaried job with one of the same manufacturers.

The first step—mastering the fundamentals of Electronics in your spare time and getting your FCC License—can be easier than you think.

Cleveland Institute of Electronics has been successfully teaching Electronics by mail for over thirty years. Right at home, in your spare time, you learn Electronics step by step. Our AUTO-PROGRAMMED™ lessons and coaching by expert instructors make

everything clear and easy, even for men who thought they were "poor learners." You'll learn not only the fundamentals that apply to all electronics design and servicing, but also the specific procedures for installing, troubleshooting, and maintaining two-way mobile equipment.

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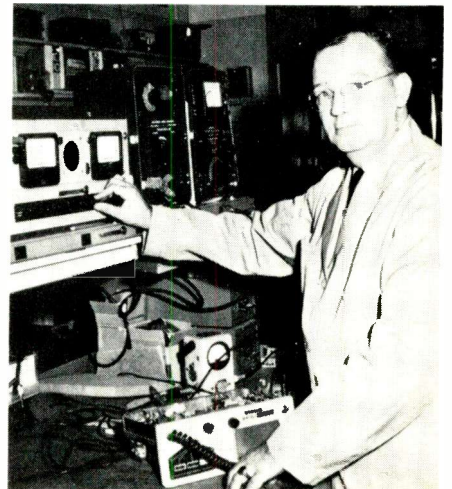
Cleveland Institute of Electronics

1776 E. 17th St., Dept. ET-47
Cleveland, Ohio 44114

How to get into one of today's hottest money-making fields—servicing 2-way radios!



He's flying high. Before he got his CIE training and FCC License, Ed Dulaney's only professional skill was as a commercial pilot engaged in crop dusting. Today he has his own two-way radio company, with seven full-time employees. "I am much better off financially, and really enjoy my work," he says. "I found my electronics lessons thorough and easy to understand. The CIE course was the best investment I ever made."



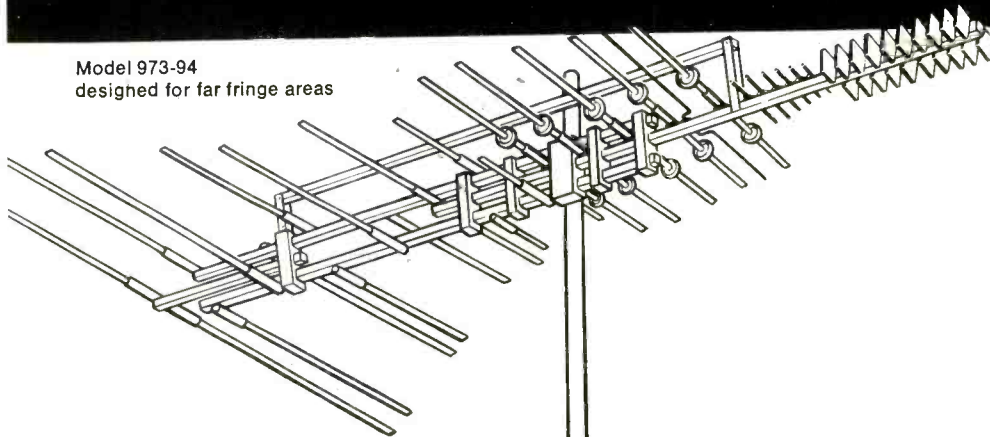
Business is booming. August Gibbemeyer was in radio-TV repair work before studying with CIE. Now, he says, "we are in the marine and two-way radio business. Our trade has grown by leaps and bounds."

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- Tapered UHF grid driver.
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You can choose from twelve all-new Zenith VHF/UHF/FM or VHF/FM antennas. All are gold color alodized aluminum for better conductivity, greater corrosion resistance and longer service.

Ask your Zenith distributor for a *free* technical manual. He has charted the reception characteristics of your area, so he can recommend the best antenna for each installation.



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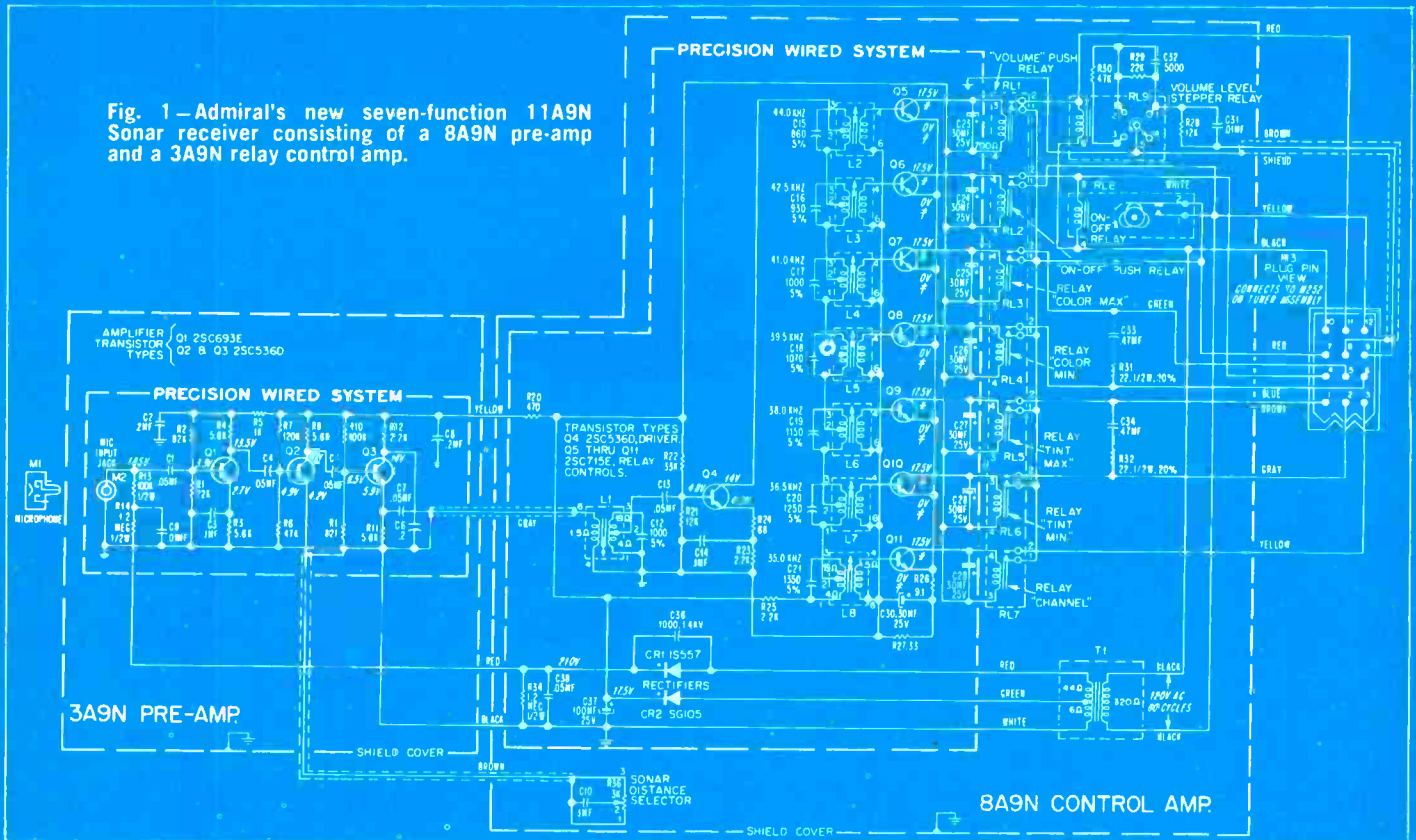
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ELECTRONIC TECHNICIAN/DEALER

What You Can Expect In Television For 1969

Fig. 1—Admiral's new seven-function 11A9N Sonar receiver consisting of a 8A9N pre-amp and a 3A9N relay control amp.



More transistors with sockets and instant-picture circuits highlight the B/W line for the coming year

■ In 1969 we will have a larger number of sets in the lower price range than ever before.

Practically all manufacturers are making more small screen portables available in both B/W and color television sets for the coming year.

According to Electronic Industries Assn. (EIA) reports in 1964, table and portable sets accounted for 9.8 percent of the units sold. From January to June 1968 the figures jumped to approximately 37.7 percent of the total color units, distributor-to-dealer sales.

Some retailers claim the increased sales came about because more people can afford color TV in the low price range. Others base the sales on the purchase of a small screen for the second set.

We will not have only more small screens available, but more sets with features such as: automatic tuning, remote control systems, brighter picture tubes and more transistors being employed.

ADMIRAL

A three year replacement warranty on picture tubes, automatic fine tuning, Instant Play and a seven-button wireless remote control Fig. 1

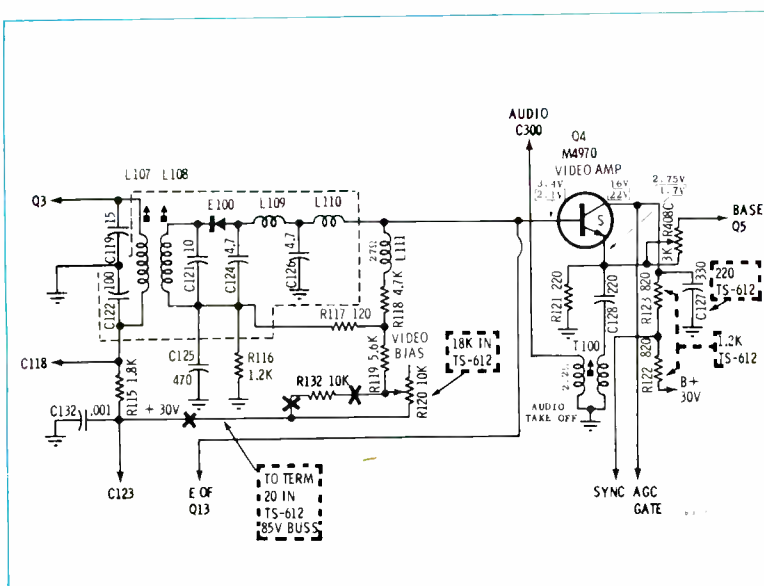


Fig. 2—The partial schematic shows the changes made in Motorola's video amp circuit of the TS-612 chassis which will replace the present TS-592 chassis.

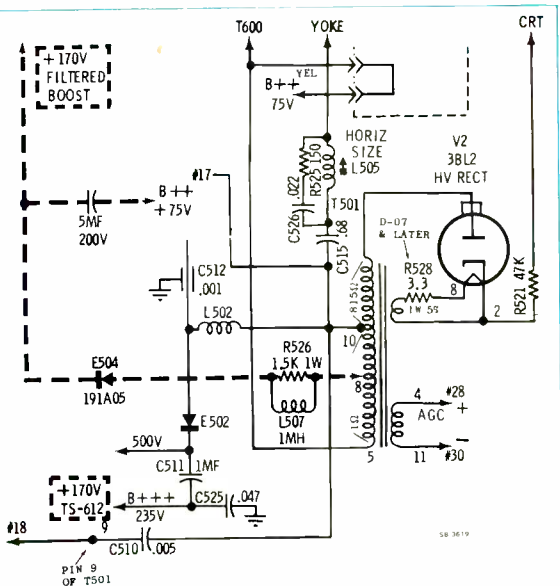


Fig. 3—Motorola's new flyback transformer used in the TS-612 chassis with an additional tap to provide the 170v filtered boost voltage for the video output section.

will highlight Admiral's 1969 line of color TV receivers.

An automatic fine tuning control which locks in both the picture and sound is incorporated in all 20in. sets and most of the 23in. models.

Virtually the entire color line has Instant Play, a feature that provides sound instantly and a picture approximately six seconds later.

The seven-button sonar remote control, featured on 18, 20, and 23in. models has a separate on/off volume control. The independent volume button allows the viewer to pre-set and change the volume to any of the four levels. In addition, the wireless remote control system changes stations and adjusts tint and color intensities.

Admiral's new color line will include a 26kv chassis, three-stage IF amplifier, automatic degaussing, two speed transistorized UHF tuner and super-scope VHF tuner with pre-set fine tuning.

Four 18in. portable TV receivers lead the line with 180sqin. of viewing area, dipole antenna, Instant Play and all but the leader model are packaged with a deluxe roll-about stand.

GENERAL ELECTRIC

General Electric is adding five new television receivers to its growing line of personal color portables. In addition, two new 18in.

(diagonal measure) models will be added to the 1969 line of color portables.

The company introduced the first color portable with its first application of the Porta Color system in 1965.

The portable color TV model WM226HWD-2 receiver containing the new H-2 chassis is similar to past versions of the H chassis and has new features employed.

This new chassis will use the 11WP22 CRT which has the same basic in-line gun features as the original 11SP22 CRT, but contains definite design improvements over the earlier type picture tube.

The same rare earth red phosphor and blue phosphor will be used along with a new type of green phosphor which provides truer yellows.

Smaller phosphor dot size, 60 percent more dots and aperture mask holes, sharper electron gun beams and the use of tinted faceplate glass combine to give finer picture detail, less dot blooming at high brightness levels and gives greater picture contrast.

In the main chassis, a new design HV transformer, encapsulated in RTV silicone rubber for high reliability, is capable of providing more power for the sweep and HV circuits.

Varactor tint control circuitry of

the type used on the more expensive longer screen color receivers has been added. Now the customer has a wider flesh tone range for easy tint control adjustment.

MOTOROLA

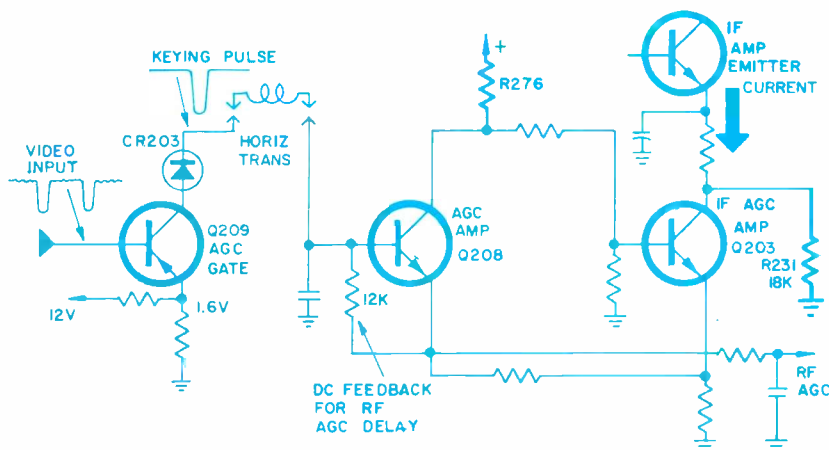
Motorola introduced a new small screen color television receiver. The models CP468 and CP469 employ the TS924 chassis. A 90-deg deflection angle is used in the 102in. CRT which measures 14in. diagonally. A small phosphor dot size (.022in) in connection with three-gun and shadow mask are used in the CRT which is somewhat unconventional with its blue gun mounted down rather than up.

The portable weighs 50 lb with a top-mounted carrying handle and measures 20in. x 14in. x 16in.

Some of the important chassis features include: automatic degaussing, three stage video IF, four etched circuit panels which contain most of the circuitry with component references, circuit legend and test points screened on both sides.

Nineteen tubes provide 25 tube functions, with 17 semiconductors replacing tube functions in many important areas which include: power supply, UHF conversion, video detector, color demodulators, horizontal AFC and many others.

The chassis also features a tran-



The AGC system used in RCA Victor's KCS169 chassis. Courtesy of RCA Sales Corp.

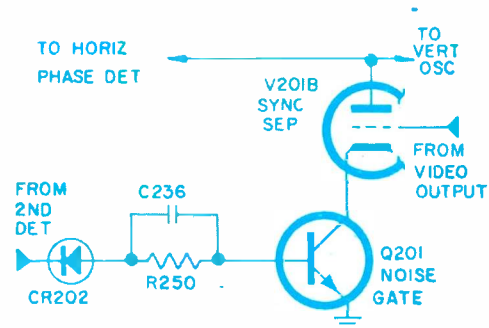


Fig. 4—An NPN transistor (Q201) is located in series with the cathode of the sync separator and serves as a noise gate on RCA Victor's KCS175A chassis.

sistorized, fixed-tuned color IF amplifier color killer circuit, "X" and "Z" axis color difference demodulators which employ two simple duo-diode networks, and a pulse sampling diode HV regulator eliminating the shunt regulator tube.

Motorola's 1969 B/W line consists of 21 models using five different chassis.

The TS611 is a new chassis introduced in February 1968 and is transformer powered. The circuitry is identical to the TS597 except for design changes necessary for the transformer operation.

Chassis E19TS597, introduced in December of 1967 and chassis F, G19TS597 introduced in February of 1968, have the "quick-on" feature, other TS597 versions do not employ this feature.

The TS612 chassis features transistor sockets. All transistors formally wired to panel will now plug into sockets.

A number of modifications were made in the following circuits: video amplifier, Fig. 2, video output, flyback transformer Fig. 3 and power supply.

RCA VICTOR

The 1969 B/W television line features a total of eight different chassis. Three of these chassis (KCS156/157/168) were used in last year's TV line. Five new

chassis are used in the new line which include the KCS169/171-173/174 and KCS175.

The KCS169 is different from two standpoints: the majority of the low level circuitry features solid-state devices and the deflection and sound stages use tubes. This unit does not use a conventional metal chassis. All components are mounted on a single laminated fiberglass circuit board which slides into grooves located on the sides of the cabinet. When the rear cover is removed all components are accessible for servicing.

The KCS171 is another new chassis. This series-wired, vertically mounted chassis is similar in electrical design to the KCS168. The principal difference between the two chassis is in the horizontal circuitry which has some design changes to drive the larger 19FEP4 CRT. One model is equipped with a 20SP4 CRT.

This chassis employs four new tube types, including a 13V19 sound detector and audio output, 21LR8 vertical oscillator and output, 22JR6 horizontal output and a 17CT3 damper tube. The 13V10 has a duodeca type base, the 17CT3 is a nine-pin miniature type, while the 21LR8 and 22JR6 are novars.

The KCS173 chassis is similar in design to the KCS160 series.

The chassis is a series-wired, vertical type delivering 20kv to the CRT second anode. This chassis also employs the four new tube types which were previously described. The tuners used in these chassis include the KRK122C UHF tuner and the frame grid KRK127 VHF tuner. Instant PIC is featured on the model AL-248K, basically, the same system used last year.

A series-wired, vertical chassis similar in design to the KCS164 is featured in the new KCS174 chassis. This chassis is used in portable instruments which have 19 and 20in. diagonal screens for 20SP4 or 21GP4 CRT operation at 20kv.

The KCS175 chassis is employed in portable, table and console models.

The horizontal KCS175 chassis (equipped with a power transformer) uses conventional tube circuitry. However, an NPN transistor (Q201) is located in series with the cathode of the sync separator and serves as a noise gate (see schematic Fig. 4). Instruments using the KCS175 chassis are equipped with the four-circuit nuvistor KRK133 VHF tuner and the transistorized KRK120 UHF tuner.

A new deflection yoke has been developed which employs a special

(Continued on page 89)

Understanding proper vectorscope procedures can shorten your service time for alignment and troubleshooting color circuits

■ Color television has brought several new pieces of test equipment to the service field. The newest is the vectorscope. The vectorscope allows the service technician to view the R-Y and B-Y demodulator signals and determine the phase angle between the demodulators, the tint or hue range, and the color sync of the chroma circuit.

To eliminate the mystery of the vector pattern, let's see how it is derived. The vector pattern is composed of two signals; one is applied to the horizontal plates of a scope, and the other to the vertical plates. The result is a LISSAJOUS pattern. If two sine waves are applied and one is 90 deg out of phase but at the same frequency, the results will be a circle as shown in Fig. 1. If we take the "S" patterns formed by a standard 10 color bar generator from the grids of the CRT and apply these to the deflection plates of a scope, we get the resultant pattern as seen in Fig. 2. This pattern is referred to as a vector pattern. The phase between the R-Y and B-Y signals can readily be seen on the screen of the scope. A complete

circle represents 360 deg so the screen of the scope can be marked off in degrees and measurements made using the vector pattern. The length of the arm of "petals" may vary depending on the strength of the signal and the entire pattern will rotate to a different position if the tint control range is not correct.

Connecting the Vectorscope

Connecting a vectorscope is very easy. Signals from the red and blue grids of the receiver's picture tube must be applied to the vertical and horizontal deflection plates of the scope. One vectorscope has the leads permanently attached. The red lead goes to the red grid, and the blue lead to the blue grid. The green lead is for the color gun interrupters, and is not required for a vector pattern. Some vectorscopes have banana jacks on the rear and a switch that converts them from a wide band scope to a vectorscope. Plug the red lead into the R-Y input jack and connect the other end to the red grid. Connect the blue lead to the B-Y input jack and the other end to the blue grid. Set the

VECTORSCOPE

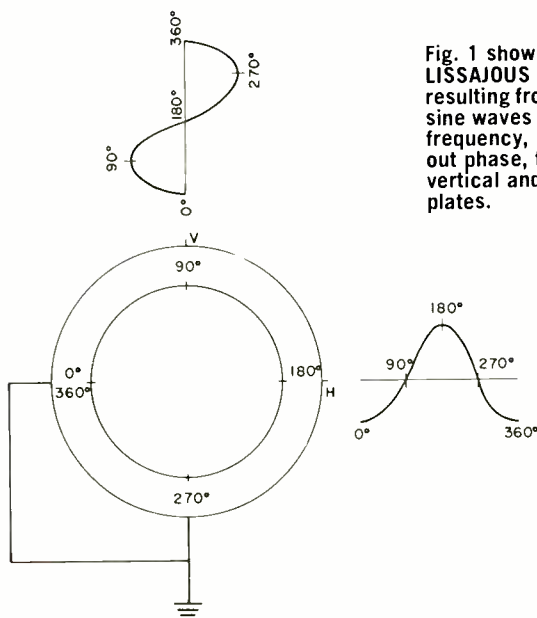


Fig. 1 shows a circular LISSAJOUS pattern resulting from applying sine waves of the same frequency, but 90deg out of phase, to the vertical and horizontal plates.

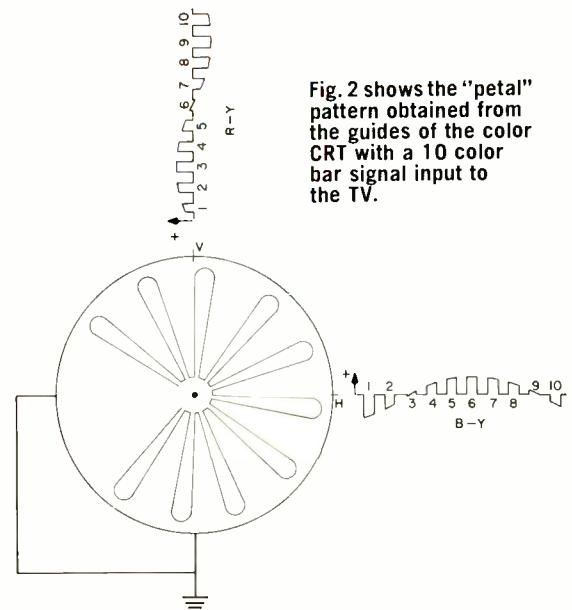


Fig. 2 shows the "petal" pattern obtained from the guides of the color CRT with a 10 color bar signal input to the TV.

switch to the VECTOR position. If your vectorscope has a built-in color generator, it should be connected to the set. If not, any separate color bar generator capable of producing the 10 color bar pattern may be used. In both cases, be sure the fine tuning of the TV receiver is set properly. If the fine tuning is misadjusted, it will distort the vector pattern and cause an inaccurate indication of the chroma circuits. If your color generator has a video output, this may be injected into the video detector to eliminate tuning problems. The position controls on the vectorscope are set so that the center dot in the pattern is in the center of the scope screen. The receiver's color level or saturation control is used to control the size of the vector display on the scope screen. Now that we have the pattern, let's see what we can do with it.

The reference for the color oscillator is the burst signal and is zero degrees, or no phase shift. This is represented by the "O" or burst mark on the scope screen. The red bar of the 10 standard color bar

pattern is the third bar and is 90-deg from the burst. This will be at right angles to the burst line and at the top of the scope screen. It is marked R-Y. The numbers "1" and "2" represent the first and second bars of the pattern and are all 30-deg apart on the screen. The B-Y mark is 90 deg away from the R-Y mark, and 180 deg from burst. As you can see, each bar is readily identified on the scope screen.

Using Vectorscope Patterns

By using the vector pattern and the markings on the scope screen, we can troubleshoot and align the chroma circuits of a color receiver.

The vectorscope pattern is very useful for adjusting the phase angle between the red and blue demodulators for a 90, 105, or 116 deg system with ease and accuracy. To align a 90 deg demodulator system, adjustment is made until the third bar rests on the R-Y mark while the sixth bar is on the B-Y mark. This sets the angle of demodulation at 90 deg. (See Fig. 3). If the set calls for a demodulator angle of 105 deg, then the third bar should rest on the

R-Y mark while the sixth bar falls half-way between the B-Y and number "7" on the scope screen as shown in Fig. 4. Note that the pattern of Fig. 4 is not as round as that in Fig. 3. This is due to the increased angle of demodulation and is normal. As the angle is increased to 116 deg, the pattern appears more squared as shown in Fig. 5. Each type of demodulator will have its own over-all shape of vector patterns as can be seen from the foregoing illustrations. The over-all shape of the vector patterns is not as important as is the position and shape of the "petals or fingers" of the pattern. You will note that the pattern in Fig. 2 is an ideal pattern for a 90 deg demodulator, while Fig. 3 is an actual photo of a normal chroma circuit.

Tint Adjustment

The tint range can also be set very easily using the vector patterns. By rotating the tint or hue control from one end of its range to the other, the third bar or R-Y, should be able to be adjusted from the number "2" mark, through

SERVICING

Fig. 3 shows the proper pattern for a demodulator phase angle of 90deg.

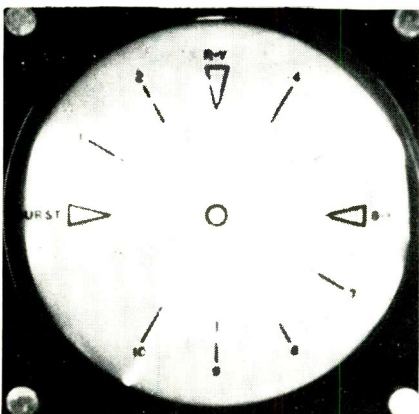


Fig. 4 shows the proper pattern for a demodulator phase angle of 105deg.

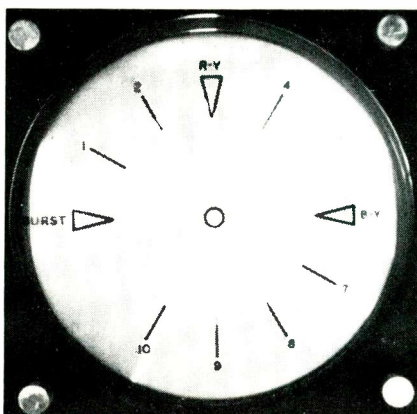
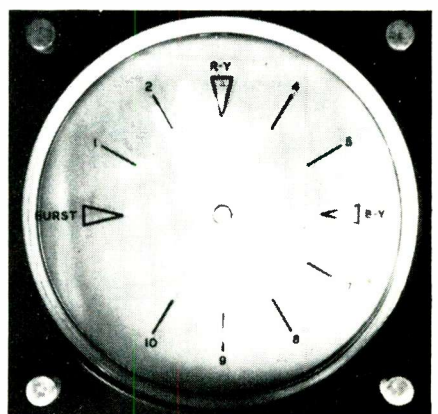


Fig. 5 shows the proper pattern for a demodulator phase angle of 116deg.



R-Y, to the number "4" mark on the scope screen. This indicates a range of 30 deg on each side of the proper setting. If this cannot be achieved, an adjustment should be made. Set the tint or hue control to the physical center of its range and adjust the burst amplifier plate coil or phase transformer until the third bar of the pattern touches the R-Y mark on the scope screen. Recheck the range of the tint control again by rotating the control and watching the third bar. Some sets may have more than a 30 deg shift on each side of the R-Y mark and the amplitude of the pattern may change as the control is rotated. A small variation is normal in most receivers.

Color Sync

Alignment of an off-frequency 3.58 MHz reference oscillator is a relatively simple procedure using the vector pattern. The vectorscope is connected to the grids of the CRT and on newer transistorized color sets it should be connected to the cathode leads. A 10 bar color

signal is applied. Short-out the AFPC or test point on the receiver. The pattern should now rotate on the scope screen. The pattern may appear to rotate or be a blurred circle depending on how far off frequency the reference oscillator is. This can be verified by the barber-pole effect on the receiver screen. Adjust the 3.58 MHz oscillator until the pattern locks in or rotates very slowly. This will be the correct frequency for the reference oscillator. In some sets the pattern will appear to pulsate from a maximum point to zero and back to maximum when the proper point is reached.

Alignment of the Bandpass Amplifier

The vectorscope and the 10 color bar pattern can be used to "touch-up" the alignment of a bandpass amplifier in a color receiver. In some cases, the bandpass alignment may have been moved or touched up and the response curve changed by a replaced component. By using the vector pattern and ad-

justing the bandpass transformers to get as close to the ideal pattern as possible, the technician can often get himself out of the woods. A word of caution...this is suggested as a *touch-up* only. Some receivers are critical in this alignment and are best aligned using a sweep generator to get the correct response curve. In most cases the vectorscope instruction manual will indicate the alignment procedure recommended by the set manufacturer. In the case of a Zenith TV, a bias supply is recommended. A -6v source should be applied to test point, C1, the ACC. Be sure the receiver fine tuning is set correctly. If not, the bandpass alignment will be incorrect. Each slug should be turned slowly and the effects observed on the vectorscope screen. Try to get the sides of the vector petal as straight as possible while keeping the tips brighter in intensity than the sides with the center circle as small as possible. It may seem complicated at first, but with a little practice it will become easier. You may have

Fig. 6 illustrates a vector pattern of a misaligned bandpass amplifier.

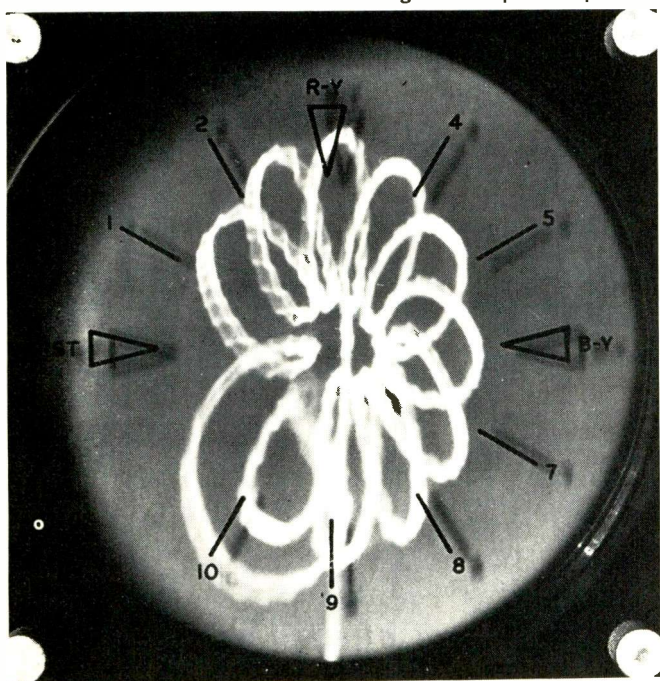
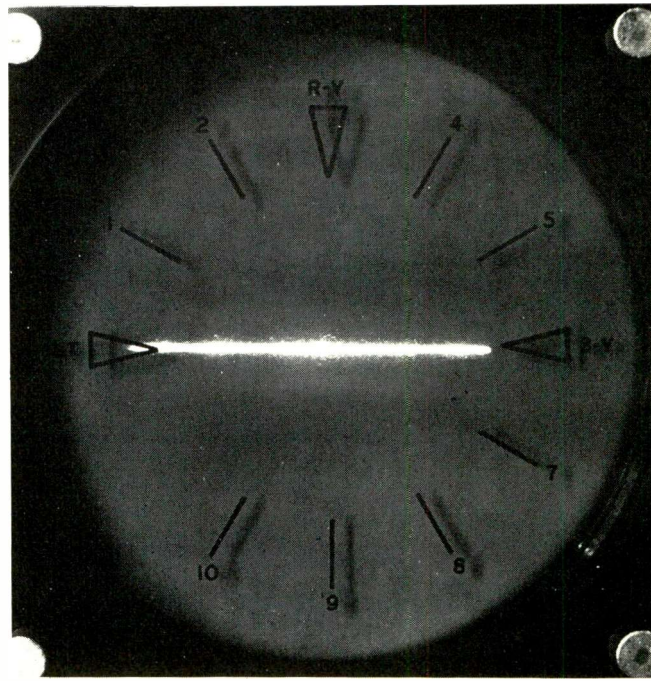


Fig. 7 indicates a loss of the R-Y signal which causes a lack of vertical deflection.



to sacrifice some gain in the color signal to get the best pattern. This is a normal condition unless the pattern cannot be made to fill the vectorscope screen with the color level control. If this is the case, use a wide band scope and voltmeter to track down the loss of color signal. Fig. 6 shows a vector pattern of a misaligned bandpass.

Vectorscope View of Typical Troubles

The vectorscope can also be used for troubleshooting the chroma circuits. Here are a few troubles and what they look like on the screen of the vectorscope.

A loss of the R-Y signal will cause no vertical deflection and the pattern will appear as shown in Fig. 7. The B-Y signal will deflect the beam along the horizontal axis producing a bright line. This indicates that the trouble lies in the R-Y demodulator, matrix or difference amplifier, depending upon the circuit used in the receiver. If the R-Y signal is weak, some deflection will be noted and an extremely dis-

torted pattern will result, again pointing to the R-Y circuits.

A loss of blue, or the B-Y signal, will result in no horizontal deflection on the scope screen and appear as shown in Fig. 8. The R-Y signal will cause the beam to deflect vertically. This indicates the problem is in the B-Y difference amplifier, matrix or demodulator circuits. Again, if the B-Y is weak, some deflection will be noted. With increased demodulation angles, the B-Y signal appears smaller as seen in Fig. 3. If in doubt as to the pattern, hook-up a normal set and compare it with a normal pattern. Generally a weak B-Y signal will produce very little deflection on the scope screen.

The vector pattern will not show a loss of green because green is not used in obtaining the vector pattern. However, if green is lacking in the picture and the vector pattern appears normal, then the trouble lies in the B-Y difference amplifier, or matrix systems.

The pattern in Fig. 9 shows a complete loss of color information.

Because of the nature of the chroma circuits, the trouble could be almost anywhere. When this condition occurs, a wide band scope must be used to locate the point where the color is lost.

The vectorscope can be a useful shop tool for color servicing and a little experience using the vectorscope will provide the technician with much information on just what to expect from different receivers. Each type of demodulation system will produce a slightly different pattern, but the general procedures will be the same for almost all sets.

If the pattern on the vectorscope appears fuzzy and has heavy lines, try reducing the brightness and contrast. If the set has a picture peaking control, reduce that also. This will generally clear up most of the trouble. If the receiver has 3.58 MHz traps, they may be out of alignment and may also cause fuzzy traces on the vectorscope screen. Aligning the 3.58 MHz traps will not only clear up the pattern, but will reduce the 3.58 MHz interference in the picture as well. ■

Fig. 8 shows the vectorscope pattern resulting from a loss of the B-Y signal—no horizontal deflection.

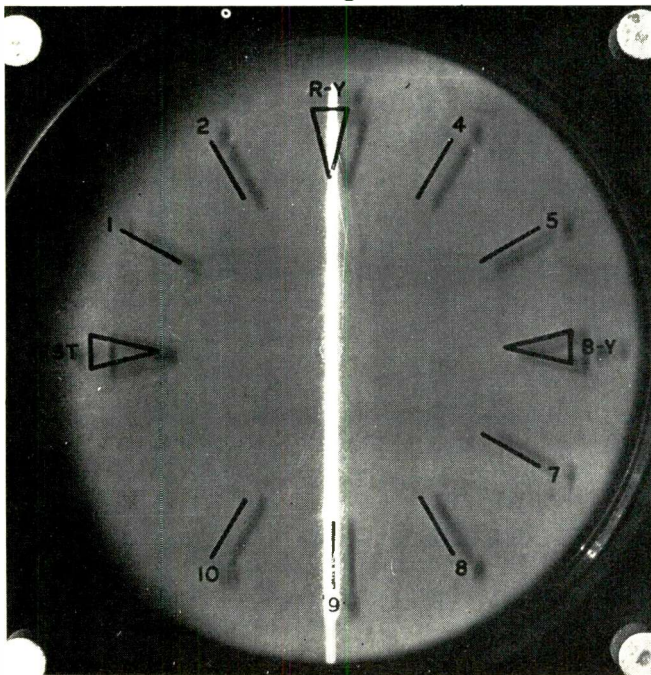
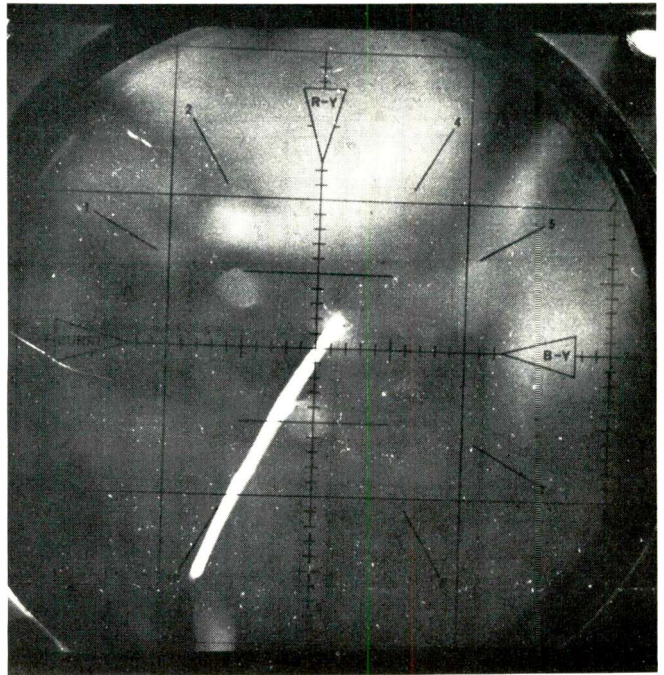
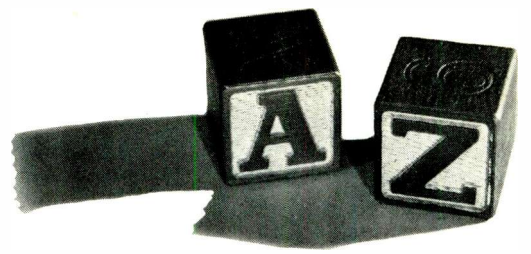


Fig. 9 indicates a complete loss of color information.





The 26th and concluding article

SEMICONDUCTORS from A TO Z

Effective servicing requires an understanding of filters and dc regulating circuits in the power supplies of solid-state electronic products

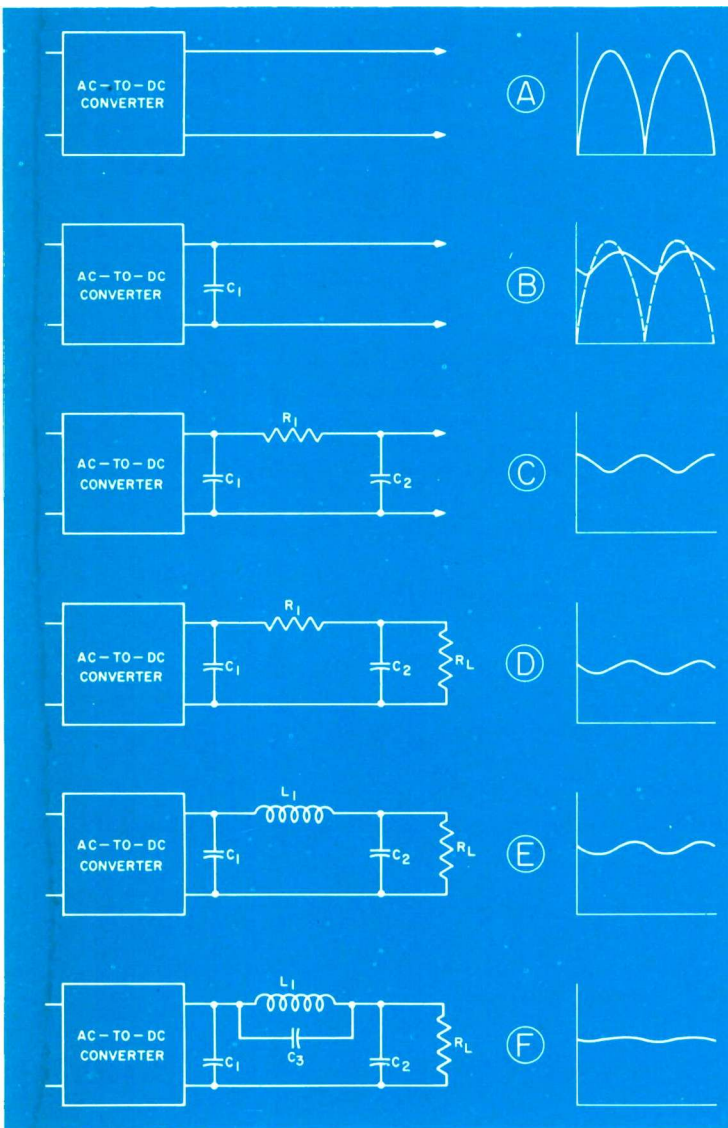


Fig. 1(A)—The unfiltered dc output voltage from an ac-to-dc converter; (B) this voltage after it has been filtered by a single capacitor; (C) as it appears across a second capacitor; (D) across the load of an R-C filter circuit; (E) across the load of a brute-force filter circuit; and (F) across the load of a resonant-filter circuit.

Single or multiple diode rectifier bridge circuits alone are not capable of providing dc voltages and currents suitable for use in most solid-state electronic circuits. The curves showing the dc voltages produced by a single diode rectifier circuit (Fig. 2 in the October 1968 article) and multiple diode rectifier circuits (Fig. 3, 4 and 5 in the October 1968 article) indicate that these dc voltages are not constant. The dc voltage fluctuations (called ripple) occur at either the frequency of the applied ac voltage in a single diode rectifier circuit or at twice that frequency in most multiple diode rectifier circuits. Ripple can produce hum in amplifier circuits, cause errors in counting and switching circuits, and even damage some semiconductors.

Filters

A single capacitor (Fig. 1B) can be used to reduce the ripple present at the output of an ac-to-dc converter (Fig. 1A). The greater its capacitance, the greater the number of electrons absorbed and released by the capacitor to reduce the ripple.

Many diodes used in rectifier bridge circuits have a small negative resistance and oscillate at high frequencies. This has occasionally caused picture interference in solid-state TV sets. Unfortunately some large value capacitors, despite theory, are unable to filter these high frequencies. It is then necessary to shunt these large-value capacitors with small-value capacitors to filter out the high-frequency oscillations.

When a resistor (R_1) and capacitor (C_2) are added to the filter circuit (Fig. 1C), the voltage developed across capacitor C_2 is smaller than that developed across capacitor C_1 , and these voltages are out of phase. The additional resistor (R_1) and capacitor (C_2) in this R-C filter circuit (Fig. 1C) function like resistor R_1 and capacitor C_1 in the circuit shown in Fig. 12 of the September 1968 article—the change in phase angles and ac voltages being like that shown in Fig. 13 of the September 1968 article. The load resistor (R_L) draws current (Fig. 1D) from both capacitors (C_1 and C_2); and the ripple present in the voltage drop across the load resistor is less than the ripple voltage previously present across each capacitor, since capacitor ripple currents are out of phase and tend to cancel each other.

Pages 54 and 55 of the October 1967 article tell

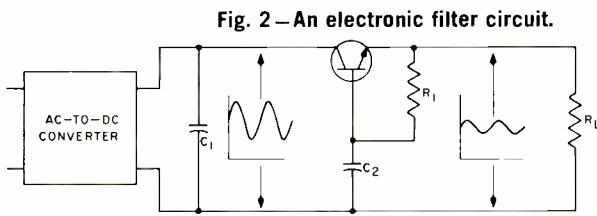


Fig. 2—An electronic filter circuit.

how coil impedances reduce ac currents. Only the resistance of the wire coil windings reduces the dc current. A choke (L_1), which is a coil with a high ac resistance and a low dc resistance, can be used (Fig. 1E) to produce a greater reduction in ripple current without also causing a greater reduction in dc current. As a result of this brute force filter circuit, the dc voltage drop across the load resistor (R_L) is greater with less ripple.

The impedance of the choke (L_1) used in this circuit (Fig. 1E) must not equal the impedance of the second capacitor (C_2) or they will form a series resonant circuit, and the ripple voltage across the capacitor (C_2) and load (R_L) will be even greater than that across the first capacitor (C_1). (Series resonant circuits are described on pages 56 and 57 of the March 1967 article.)

A choke (L_1) and capacitor (C_1) can be selected (Fig. 1F) that have equal impedances at the ripple frequency. Together they will act as a parallel resonant circuit, and practically no ripple current is conducted. (Parallel resonant circuits are described on pages 58 and 59 of the November 1967 article.) This resonant-filter circuit causes a greater reduction in ripple than the R-C filter circuit or the brute-force filter circuit.

The common-base amplifier circuits described earlier in this series (first introduced in Fig. 10 of the August 1966 article and then converted to a more conventional form in Fig. 4 of the September 1966 article) were used to amplify signals. A small signal applied between the transistor's base and emitter resulted in a larger signal between its base and collector. Conversely, a signal applied between the base and collector in a common base circuit (Fig. 2) will result in a smaller signal between the base and emitter. In this manner, the circuit can function as an electronic filter to reduce ripple.

Electronic filters are frequently used in low-voltage circuits. They have the advantage of being lighter, smaller, more efficient and less expensive than large capacitors and inductive filters. These filters are generally designed in semiconductor dc voltage regulators, which maintain such a constant voltage that virtually no ripple is permitted to travel through them.

DC Voltage Regulation

About the simplest solid-state voltage regulator (Fig. 3) consists merely of a zener diode (described with Fig. 7 in the June 1968 article) and a voltage-

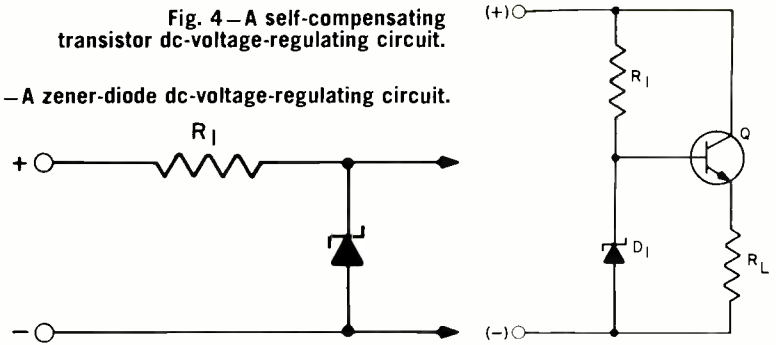


Fig. 3—A zener-diode dc-voltage-regulating circuit.

dropping resistor (R_1). When the applied voltage is less than the zener-breakdown voltage, there is virtually no current flowing through the diode and virtually no resulting voltage drop across the resistor (R_1) connected in series with it—the voltage across the diode is equal to the applied voltage.

The voltage across the diode will increase as the applied voltage increases, until the zener-breakdown voltage is exceeded and the diode begins to conduct current. Sufficient current will then be conducted by the diode to cause a voltage drop across the series resistance (R_1) that is equal to the amount that the applied voltage exceeds the zener-breakdown voltage. The voltage across the zener diode can in this manner remain virtually constant as the applied voltage varies, as long as the applied voltage remains greater than the zener-breakdown voltage.

The single transistor voltage regulator shown in Fig. 4 is similar to the integrated circuit voltage regulator described with Fig. 13 in the July 1967 article. In the IC circuit two groups of diodes (D_1 and D_2) are used to provide a voltage drop between the negative supply voltage and transistor base that varies with changes in temperature, to offset corresponding changes in transistor characteristics. In the circuit shown in Fig. 4, a zener diode (D_1) is used instead of the other diodes to maintain a voltage drop between the negative supply and transistor base that will not change with any changes in the supply voltage. A temperature-compensating diode could have been used in place of the zener diode to supply a nearly constant voltage drop that would change slightly with temperature to match transistor characteristics.

When a constant dc voltage is applied to the circuit (Fig. 4), it will function like the IC voltage regulator, and with even moderate changes in load resistance (R_L), the voltage drop across the load remains virtually unchanged.

An increase in supply voltage will result in a slightly greater voltage drop across the load resistor (V_{RL}), but since the voltage drop across the zener diode (V_{D1}) remains unchanged, the base-to-emitter voltage (V_{BE}) is reduced ($V_{BE} = V_{D1} - V_{RL}$). The transistor base is, therefore, less forward biased, and with the resulting reduction in collector current, the voltage drop across the load resistor is reduced to approximately what it was with the lower supply voltage. In this manner, moderate changes in supply voltage results in only very minor changes in the voltage drop across the load resistance—the circuit has kept it virtually constant.

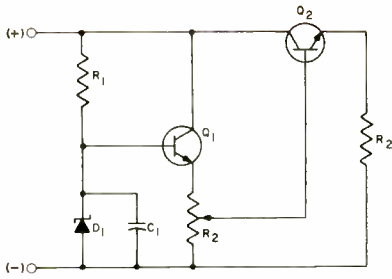


Fig. 5—A variable dc-voltage-regulating circuit.

Fig. 6—A dc voltage matching circuit.

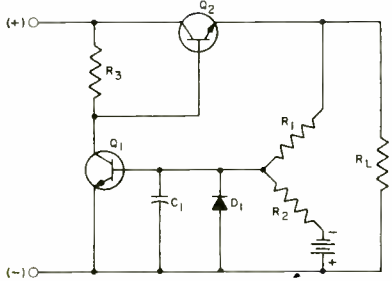


Fig. 7—A simple dc-current-regulating circuit.

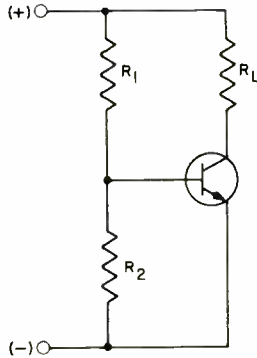


Fig. 8—A self-compensating dc-current-regulating circuit.

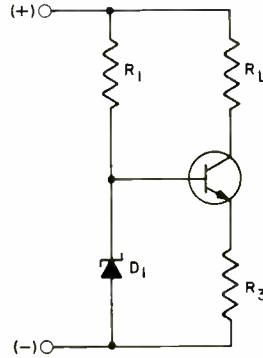
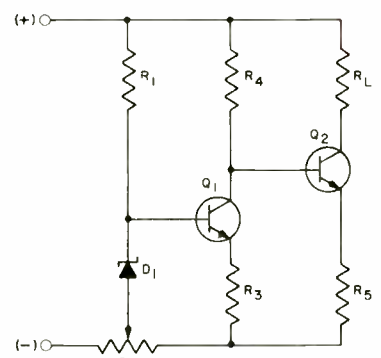


Fig. 9—A variable dc-current-regulating circuit.



A two-transistor voltage regulator is shown in Fig. 5. There transistor Q_1 functions as it did in the circuit shown in Fig. 4, providing a virtually constant voltage drop across resistor R_2 . With a capacitor (C_1) connected in parallel with the zener diode (D_1), the transistor (Q_1) also acts as an electronic filter, functioning as a reversed common-base amplifier like in Fig. 2.

Since the voltage drop across resistor R_2 remains virtually constant, any tapped voltage from that resistor is also regulated and can be used for biasing the base of transistor Q_2 . That transistor (Q_2) then functions in the same manner described for transistor Q_1 in Fig. 4. Transistor Q_2 supplies a regulated voltage across the load resistor (R_L)—that voltage being determined by the setting of the resistor (R_2) tap.

Many power supplies on the market, particularly the solid-state high-voltage ones, regulate the output voltage by comparing it with a reference voltage. For simplicity the circuit shown in Fig. 6 uses a battery to supply the reference voltage, while many circuits operating on this principle use a separate zener-diode regulated power supply to provide this voltage.

Currents from the positive and negative voltage sources pass through resistors R_1 and R_2 ; and when the voltages are equal, they cancel out and no bias voltage is present at the base of transistor Q_1 .

When the voltage from the power supply is greater than the battery reference voltage, the positive current is greater than the negative current and the base of transistor Q_1 is forward biased. It (Q_1) then conducts current, causing a voltage drop across its collector resistor (R_3). This voltage drop reduces the forward bias at the base of transistor Q_2 ; and it conducts less current, reducing the voltage at the output of the power supply. In this manner, transistors Q_1 and Q_2 function to keep the power supply voltage from becoming significantly greater than the battery reference voltage.

Should there be a failure resulting in the absence

of voltage from the power supply but not the battery, diode D_1 would short-circuit the battery, protecting transistor Q_1 from any reverse bias voltage that would damage it.

Capacitor C_1 is used in this voltage regulating circuit, like the others, to remove ripple.

DC Current Regulation

The single transistor current-regulating circuit shown in Fig. 7 operates on the same principle as the integrated circuit current regulator described with Fig. 5 in the April 1967 article (resistors R_1 and R_2 are the same in both circuits; load resistor R_L is substituted for transistor Q_1 in the IC circuit; and for convenience of polarity, PNP transistor Q_1 is substituted for NPN transistor Q_2 in the IC circuit).

An even more constant current can be obtained from the circuit (Fig. 8) by substituting a zener diode (D_1) for resistor R_2 and inserting an emitter resistor (R_3) in the circuit. Then any increase in current as a result of an increase in the applied voltage or a reduction in the load resistance (R_L) will slightly increase the transistor's emitter current and the voltage drop across the emitter resistor (R_3). This will reduce the transistor's base-to-emitter voltage and the resulting emitter and collector currents, keeping the collector current nearly constant.

The operation of transistor Q_1 in the circuit shown in Fig. 9 is basically the same as in the previous circuit (Fig. 8). A tapped resistor (R_2) has been added, however, so that the base bias voltage can be adjusted to select the constant collector current desired. Since transistor Q_1 has a nearly constant collector current, the voltage drop across resistor R_4 is also nearly constant, supplying a regulated voltage to the base of transistor Q_2 .

Transistor Q_2 also operates like transistor Q_1 in Fig. 8, providing a nearly constant regulated current to its load resistor (R_L). ■

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Fuses and circuit breakers serve specific needs as protective devices in electronic circuits. However, the technician should understand the characteristics of protective devices and be aware that there are times when it is better to 'fuse' than to 'break'

Fuses and Circuit Breakers

■ Not many years ago the UL (Underwriters' Laboratories) allowed TV manufacturers to design clip-in type fuses (Fig. 1) into their sets for the protection of components. Often the designer would specify fuses not only in the power supply line, but in other potentially hazardous circuits, such as the horizontal circuit. A few years ago, UL decided that these fuses were being improperly replaced with higher rated fuses because they were easily accessible by the user. They decided to avert danger by allowing only size-limiting and/or solder-in pigtail type fuses to be used.

The user, however, proved that he could, and usually did, replace components properly, such as tubes, fuses, etc. This and the fact that any protective device, whether it be a fuse or circuit breaker, could be wired around or otherwise intentionally defeated, caused the UL to realign its thinking once again. Presently the clip-in fuse is being designed into new models.

The significance of UL's change in policy is primarily one of economics. TV manufacturers can now design two or three fuses into their set for the proper protection of potentially hazardous circuits, thereby enhancing safety. Formerly, TV designers were limited to one expensive device usually employed at the power supply. Protection only at the power supply generally cannot sense trouble in remote circuits.

Critical Circuits

The horizontal circuit has always

been a potential danger spot and with the advent of color television this circuit becomes even more hazardous due to higher power requirements.

Let's take a look at the circuit in Fig. 2 a moment. Say for some reason the high voltage rectifier becomes defective. The cathode current of the horizontal output tube normally operates at from 250 to 300ma. But, because of an abnormal condition, the current increases to 450ma. Although this is not an extreme current increase, it is sufficient to cause heavy heat dissipation from the horizontal output tube, possibly to the point of damaging surrounding components. The object here is to de-energize this circuit as quickly as possible.



Fig. 1 — Clip-in and solder-in type fuses are among the fuses approved by UL.

A 300ma clip-in type fuse is available which will open at a 450ma overcurrent in a matter of seconds. Fig. 2 shows proper location of this fuse in the cathode circuit.

In this case the direct protection approach to the horizontal circuit problem appears to be more feasible than the indirect approach suggested by a dual-circuit breaker method. The dual breaker method

would appear to be difficult to achieve from the standpoint of critical calibration. A typical dual breaker specification might read as follows:

B + Current (Amperes)		Horizontal Output Tube Cathode Current (Amperes)	
Hold	Break	Hold	Break
0.90	1.20	0.325	0.480

Most TV design engineers recommend approximately a 10 percent safety factor on the "hold" current, so the normal operating cathode current should not exceed 0.295a (0.325a minus 10 percent). Now the current in the cathode increases to 450ma (150 percent), a result of some abnormal condition. The dual breaker specification tells us that the breaker must trip at 480ma and may or may not trip at 450ma. To eliminate a "may" or "may not" condition in our color set, we would use a fuse.

The full-wave bridge rectifier circuit requires the use of protection in the event of a short-circuit condition. Fig. 3 shows the full-wave rectifier circuit popular in today's color receivers. Here the object is to protect the bridge in the event that the output voltage suddenly goes to ground. The need for a fast-opening protective device is apparent and a fuse appears to be a logical choice.

Other solid-state circuits are being designed into TV receivers in increasing numbers. Due to the fact that these devices generally have little capacity to store heat,

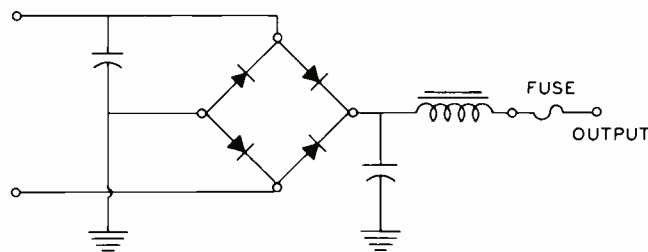
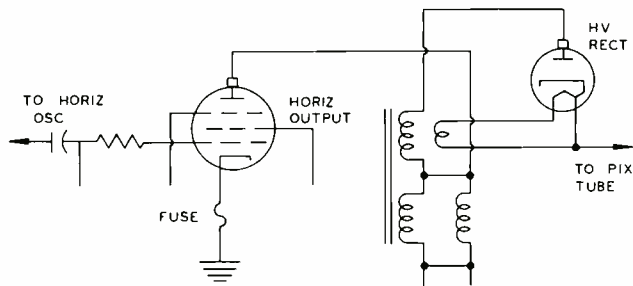


Fig. 2—Horizontal output circuit shows location of fuse for proper protection.

Fig. 3 shows fuse protection of full wave rectifier circuit.

they can only withstand overcurrents for a relatively short period of time. As a result, TV designers are leaning heavily toward fuses for this type of protection.

Circuit Breaker Tripping

Circuit breakers are often blamed for nuisance tripping. However, before the technician claims the breaker to be defective, he should examine a typical breaker characteristic curve to better understand this type of protective device. Every breaker is calibrated to open at a given overcurrent within a certain length of time. The circuit breaker curve shown in Fig. 4 exhibits a rather smooth slope with no delay. Remember that when a breaker is used, it is applied in the power supply circuit where line transients frequently occur. We realize that these transient conditions are often of such magnitude and long enough in duration to cause the circuit breaker to trip. Line transients occur from a variety of causes which are external to the set and usually harmless. Tripping of the breaker may be a result of these transient line surges. So where breakers are used, don't bury the breaker as it probably was only doing its job according to its characteristic. Try resetting before replacing, and if the breaker won't reset, look for internal circuit problems. Do not replace with a larger size breaker (or fuse) than that recommended by the set manufacturer or you will be asking for trouble.

Also shown in Fig. 4 is the typi-

cal characteristic of a time-delay type fuse which has been engineered to override momentary transients. This type of fuse, like the breaker, is normally found in power supply circuits where line transients may occur. Note that momentary currents of 300 percent (3.00a) which last as long as one second, could trip the circuit breaker. The time-delay fuse allows this surge to pass without being disturbed.

Short-Circuit Currents

It is not unusual to obtain 300 or 400a (and sometimes more) of short-circuit current at the primary of a TV power transformer. (Some apartment buildings are known to have as much as 10,000a available at the apartment power panel.) Most fuses that are UL-listed have short-circuit ratings of 10,000a and may be safely applied in either the primary or secondary side of a power transformer, assuming, of course, that the fuse voltage rating agrees with its application voltage. Circuit breakers for TV application, however, have contacts which will withstand 12 to 25 and sometimes 30a. If these breakers are applied on the secondary side of the power transformer, the impedance of the transformer generally reduces the fault current to a value that the contacts can withstand. If, however, these breakers are improperly applied on the primary side of the power transformer, they could be severely damaged and even result in a fire hazard under shorted conditions. ■

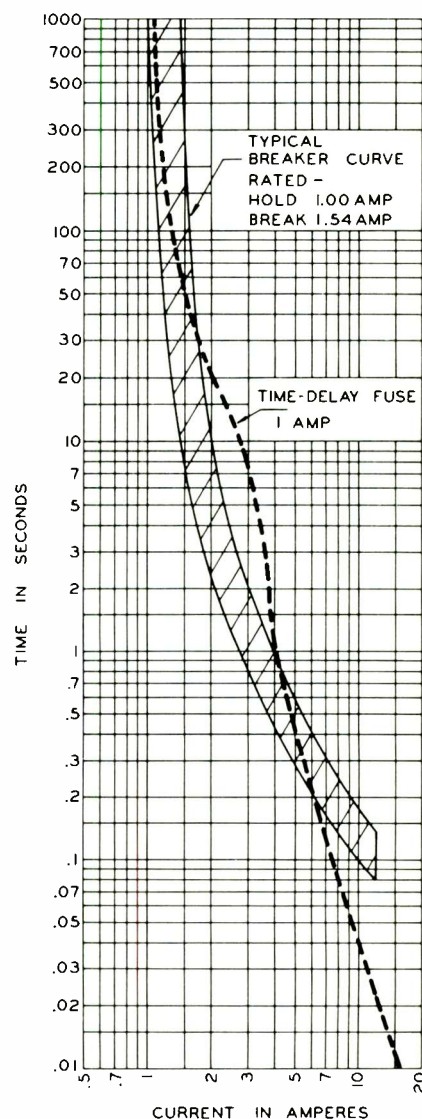
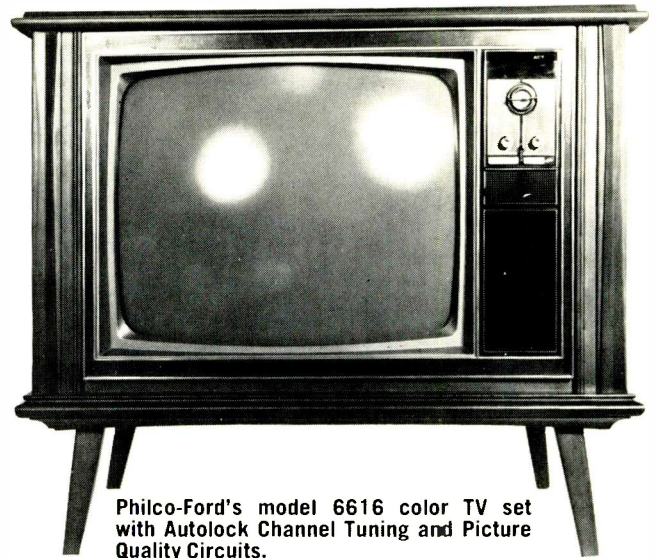


Fig. 4 indicates curves for a typical circuit breaker and time-delay type fuse.

Getting Acquainted With Philco-Ford's 19QT87 Color TV Chassis



Philco-Ford's model 6616 color TV set with Autolock Channel Tuning and Picture Quality Circuits.

Study the new tuning circuits and the servicing will be as simple as they are to tune

■ Every year we see more solid-state circuitry and hybrid chassis on the market.

Tuning and picture adjustments are making color TV virtually as easy to tune as the B/W receiver. Automatic tuning circuits lock in the signal automatically and prevent drifting on both UHF and VHF channels.

The new circuitry eliminates the confusion of adjusting the color set and not getting it adjusted properly. The customer can now watch a tuning eye and obtain precision tuning.

Philco-Ford's Model 6616 employing the 19QT87 chassis is similar to the last year's model in cabinet appearance. The only exposed controls are the channel selector, fine tuning, on/off volume control, tint and ACT switch. All other controls are hidden under a flip-down panel.

As we began to adjust the set we noticed a new slide switch on the front control panel with the letters ACT which is new on this model. ACT means Auto-Lock Channel tuning and is coupled to Philco-Ford's Color Tuning Eye.

With the addition of solid-state ACT, the set owner merely turns the tuning dial until the eye narrows, then flicks the ACT switch and the new circuit locks in on the signal automatically.

All components on the chassis are arranged for easy servicing. The wires leading to the tuner and controls are long enough so the chassis can be tipped up, exposing the circuit boards for easy removal of components.

The horizontal output tube cathode connection is placed on terminals on the top of the chassis making the cathode current measurement more convenient.

Tuner IF and Sound Circuits

The UHF tuner is transistorized and is electrically similar to the previous tuner. It employs one

transistor as an oscillator and a diode as a mixer. The VHF tuner uses three transistors; one each as RF amplifier, mixer and oscillator.

The IF uses three transistors of the silicon planar type, each with different characteristics. The first two stages are AGC-controlled.

The sound and video detectors are diodes. The sound circuits are the same as those used in previous models.

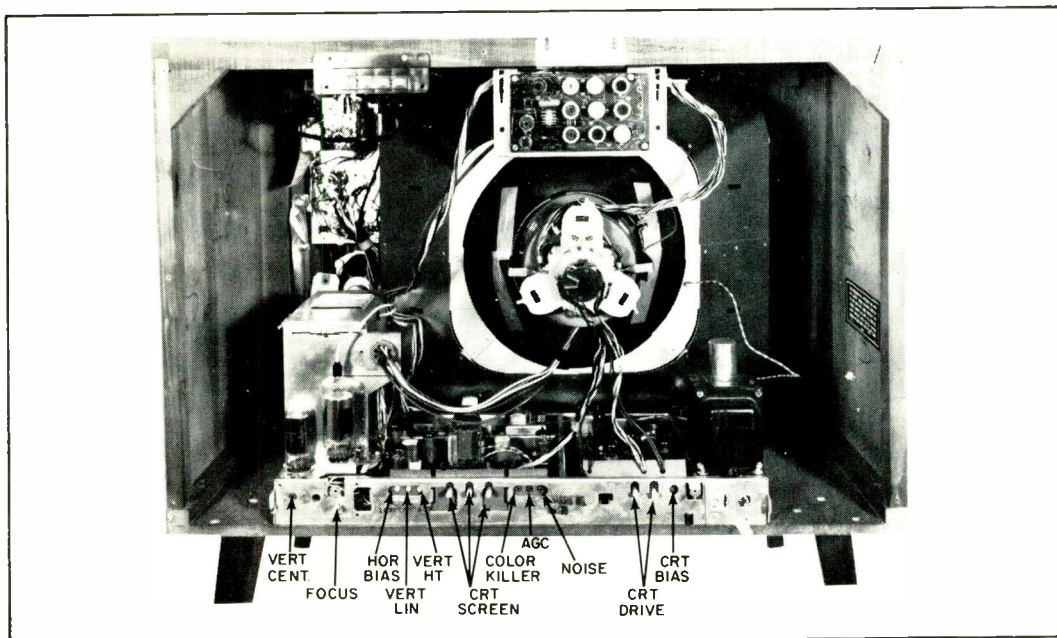
The video driver is transistorized (the circuit will be described later in the article) and, because of its low impedance circuitry, matches the delay line. The video output uses a 12GN7 tube. This circuit and tube remain unchanged. Video distribution, noise inverter and sync separator circuits also remain the same as in previous models.

Autolock Channel Tuning

Autolock Channel Tuning (ACT), featured in Philco-Ford TV receivers, operates in conjunction with the video carrier and the receiver local oscillator to insure that all channels are automatically tuned for best color reception.

The ACT circuit consists of two transistors, a discriminator circuit and varactor diodes for VHF and UHF frequency control. The input ACT amplifier transistor (Q7) is mounted on the video IF panel. The discriminator circuit and dc amplifier transistor (Q1C) are mounted on a sub panel which is located on the front apron (Fig. 1) of the main 19QT87 chassis. The varactor diode (base-collector junction SE6010 transistor) for VHF frequency control is mounted in the VHF tuner and the varactor diode for UHF frequency control is mounted in the UHF tuner.

The complete ACT circuit is shown in Fig. 2. B+ is supplied from the 18v source and stabilized at 8v by zener diode D3C. The 45.75MHz IF video carrier is coupled from the collector of Q4 (3rd video IF amp.)



A rear view of the compact 19QT87 chassis showing the service adjustments.

through C16 (1.8pf) capacitor to the base of Q7 (ACT amplifier) transistor. Transistor Q7 (ACT amplifier) is connected as a broadband amplifier in a common emitter configuration. This stage provides gain for discriminator circuit operation and isolation of the discriminator circuit from the 3rd video IF pole.

Resistors R25B (47K) and R26B (22K) establish the base bias on Q7, the ACT amplifier transistor. Resistor R27B (330 Ω) in the emitter circuit provides bias stabilization. C23B (.001 μ f) capacitor across R27B prevents signal degeneration across R27B (330 Ω) emitter resistor.

The amplified 45.75MHz signal is coupled from the collector of Q7 through RF choke L208A to the series fed tank circuit, L2C and C9C (43pf). This tank circuit is tuned to approximately 46.25MHz. The tuning characteristics are quite broad and field adjustment of inductor L2C is required. Inductor L2C can be easily identified as it has an aluminum rather than a ferrite core. It must be remembered that the aluminum core acts as a shorted turn; therefore, the resonant frequency increases as the core is moved into the coil. Resistor R2C (100 Ω) and capacitor C3C (.0015 μ f) constitute the B+ decoupling network for Q7 (ACT amplifier transistor).

The video IF signal is coupled from L2C coil through C8C (10pf) and C10C (10pf) capacitor to the discriminator tuned circuit consisting of L1C inductor and C7C (27pf) capacitor. This circuit is tuned to 45.75MHz. Since the gain of the video IF amplifier is greater below 45.75MHz and less above this frequency, the discriminator circuit is unbalanced by C1C (3.9pf) to compensate for gain variation. The unbalancing of the discriminator is necessary to keep the discriminator output from developing a high negative voltage at the base of Q1C dc amplifier transistor when switching through the unused channel selector positions. A high negative voltage would occur if the

discriminator was not unbalanced because of the large amount of noise signal present below 45.75MHz and the small amount of noise signal present above this frequency in the absence of a video carrier. Should a condition of this nature occur, it would cause the collector current of dc amplifier Q1C to decrease. The voltage at the ACT output point would increase approximately to 8v B+, also charging capacitor C222 (10 μ f) to this level. This would result in a decrease in capacity of Q4T (variable capacitance transistor) since it is reverse biased.

When a signal is received, the tuner oscillator might lock on the sound carrier rather than the video carrier. The discriminator diodes D2C and D4C (1N60D) are bridged with resistors R4C (12K) and R11C (100K) to further compensate for the IF response variation as well as provide a current path for the bias network of Q1C dc amplifier transistor.

The current path for biasing of Q1C dc amplifier transistor is through R13C (1K) resistor, D4C (1N60D) diode, L1C inductor, R4C (12K) resistor and R8C (470K) resistor to the 8v B+ point. Potentiometer VR1C (100 Ω) is used to establish the no-signal bias level of Q1C dc amplifier transistor by varying the voltage at the junction of resistor R8C (470 Ω) and diode D1C (SD7). Diode D1C (SD7) is used to provide temperature compensation for the emitter-base junction of Q1C, the dc amplifier transistor. As the ambient temperature increases, current through transistor Q1C increases. At the same time, current through diode D1C also increases reducing the forward bias of transistor Q1C. As the forward bias is reduced, current through transistor Q1C decreases and a 2.5v potential is maintained at the ACT output terminal. Resistors R3C (1.5K), R1C (470 Ω), VR1C (100 Ω) and R12C (100 Ω) constitute a 2.5v reference voltage divider on the ACT panel. The 2.5v reference is taken from the junction of resistor R3C and R1C,

AUTOLOCK CHANNEL
TUNING DISCRIMINATOR
CIRCUIT AND DC AMP
TRANSISTOR SUB PANEL

SOLID-STATE VIF &
DETECTOR PANEL

IF AGC ADJ.

TUNING EYE COIL

DEGAUSSING COIL SOCKET

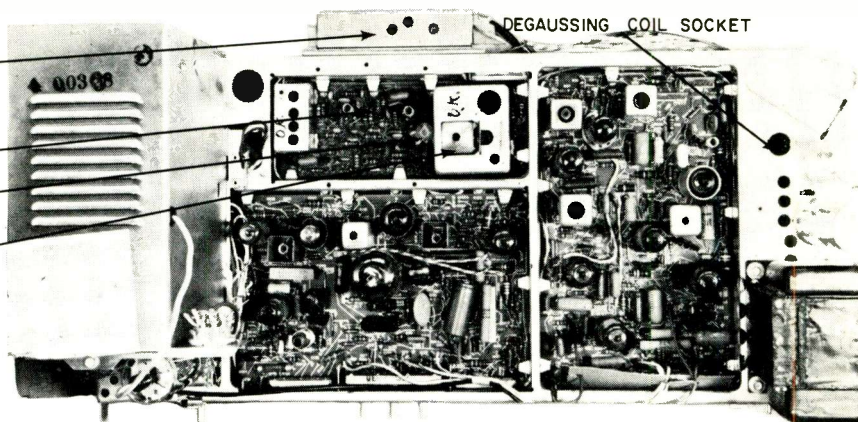


Fig. 1 — Top view of the 19QT87 chassis showing the location of new and important circuits.

through RF choke L3C. Capacitor C4C (.0015 μ f) is an RF bypass capacitor.

In parallel with the ACT reference voltage divider on the ACT panel is a second 2.5v high impedance reference voltage divider consisting of resistors R230 (6.8K) and R231 (39K). This second divider is mounted on the tuner mounting bracket to maintain a 2.5v reference signal for the tuner in the event the ACT panel is removed for service.

The discriminator output signal is coupled from diode D4C (1N60D) through resistor R13C (1K) to the base of Q1C dc amplifier transistor. The discriminator output controls the bias of Q1C which, in turn, determines the current flow through Q1C and the IR drop across resistor R7C (3.9K) in the collector circuit. The static bias of Q1C is set by VR1C for 2.5v at the ACT output lug; therefore, there is "0" volts difference between the reference output and the ACT output lug. The bias adjustment of VR1C must be made with the IF AGC lug, M4, clamped at 15v to prevent signal or noise from producing an erroneous reading. Under signal conditions with a proper color picture, the resultant discriminator output will be zero and will not change the forward bias on Q1C dc amplifier transistor. Therefore, there will be 2.5v appearing at the ACT output lug.

Picture Quality Circuit

All Philco-Ford color television models which incorporate autolock channel tuning (ACT) also feature a picture quality circuit. This circuit provides control of picture highlights by varying the over-all video IF response. The effect on received picture quality is similar to the effect obtained by varying the fine tuning control on receivers not equipped with ACT. Since the ACT circuit locks the receiver to the point of optimum color reception, a customer control to provide picture highlight variation is highly desirable.

The complete picture quality circuit (is shown in Fig. 3). Control of the picture highlights is accom-

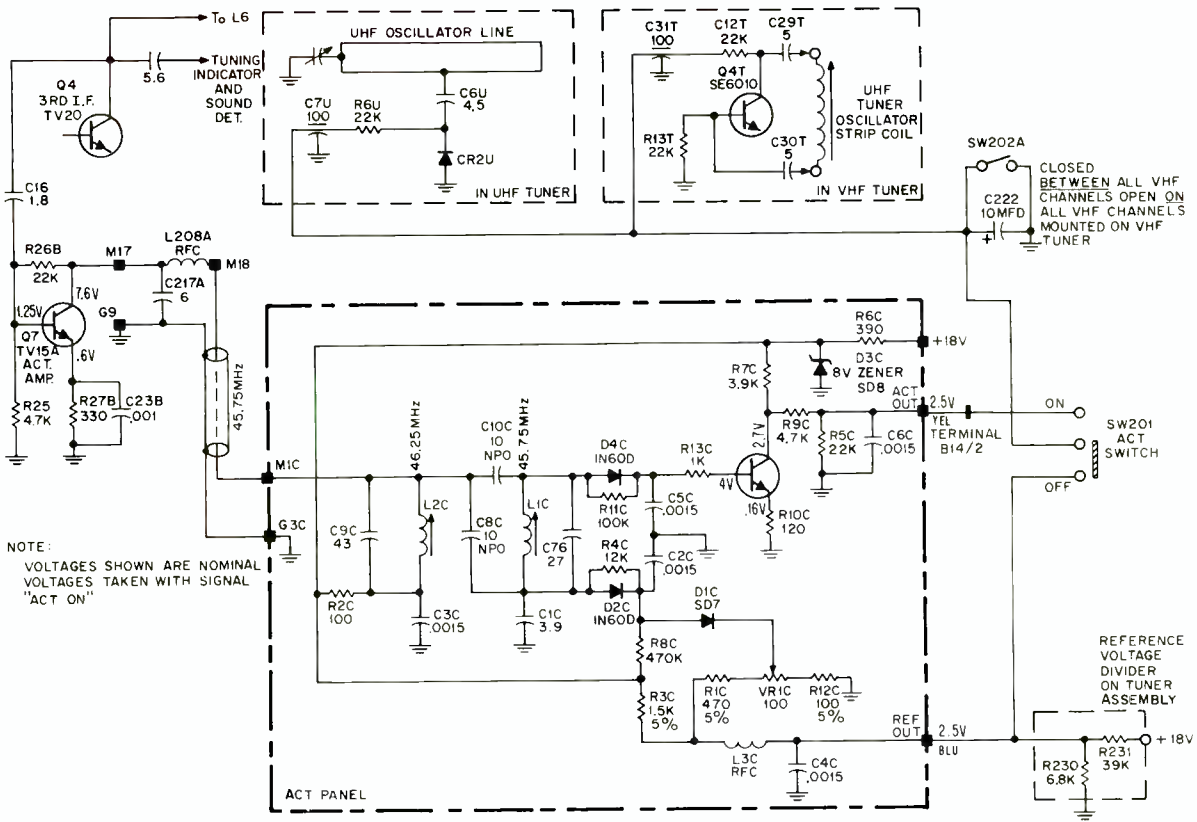
plished by varying the resonant point of the mixer output coil, LIT. The varactor diode (CR200) controls the total capacity across LIT and, therefore, the resonant points of this coil. The varactor diode is reverse biased, therefore an increase in applied potential will cause a decrease in capacity.

The varactor diode is coupled to the mixer output coil (LIT) through a dc blocking capacitor C220 (100pf). Resistor R229 (1M) and capacitor C221 (.001uf) form a decoupling network for the control voltage which is taken from the 18v supply across a voltage divider consisting of resistors R226 (18K 5%), R227 (6.8K 5%) R228 (4.3K 5%), and potentiometer VR204A (1M).

The actual voltage applied to the varactor diode ranges from 2.5v to 6.7v. Control VR204A has a detent position at 50% of its mechanical rotation. This detent position corresponds to 30% of the total resistance of the control and is the correct position for normal viewing. In this position the potential across the varactor diode is approximately 3.7v. When a complete alignment of a receiver chassis employing the picture quality circuit is performed, the picture quality control must be in the detent position to obtain a proper IF response curve.

Should the 45.75MHz video IF signal drift lower in frequency, the discriminator output voltage will go less positive decreasing the conduction of Q1C transistor. This will cause the IR drop across collector resistor R7C (3.9K) to decrease resulting in more than 2.5v appearing at the ACT output lug. A greater potential across the collector base junction of Q4T variable capacitance transistor will cause its capacity to decrease thereby raising the tuner oscillator frequency and restore the video IF carrier to 45.75MHz. If the 45.75MHz video IF carrier drifts higher in frequency, the opposite effect will occur to return the carrier to 45.75MHz.

The ACT switch (SW201) is a front panel control to permit customer control of the ACT function. In the OFF position, the 2.5v reference voltage is



NOTE:
VOLTAGES SHOWN ARE NOMINAL
VOLTAGES TAKEN WITH SIGNAL
"ACT ON"

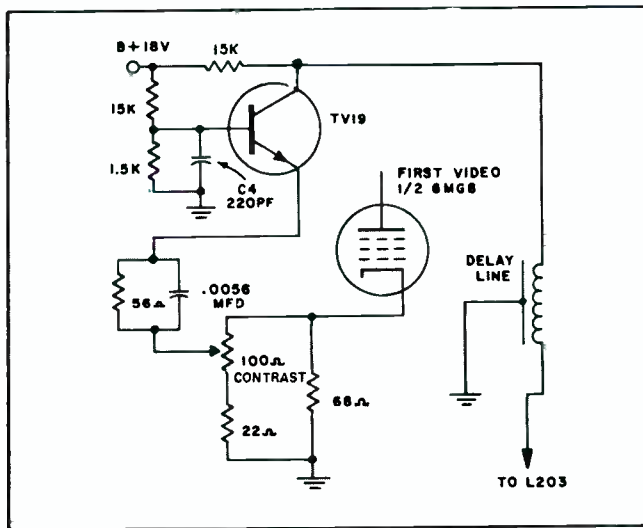
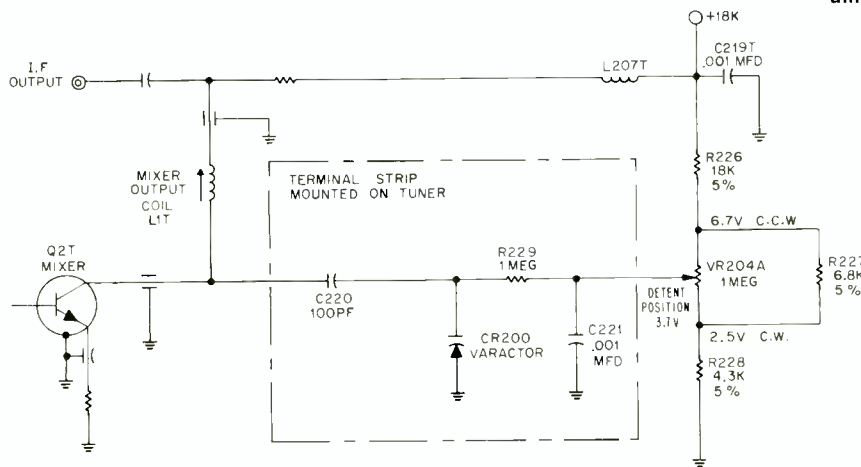


Fig. 2 —
The complete Autolock Channel
Tuning Circuit.

Fig. 3 — The
complete Picture
Quality Circuit.

Fig. 4 — Simplified
diagram of the
transistorized video
driver circuit a
common base
amplifier.



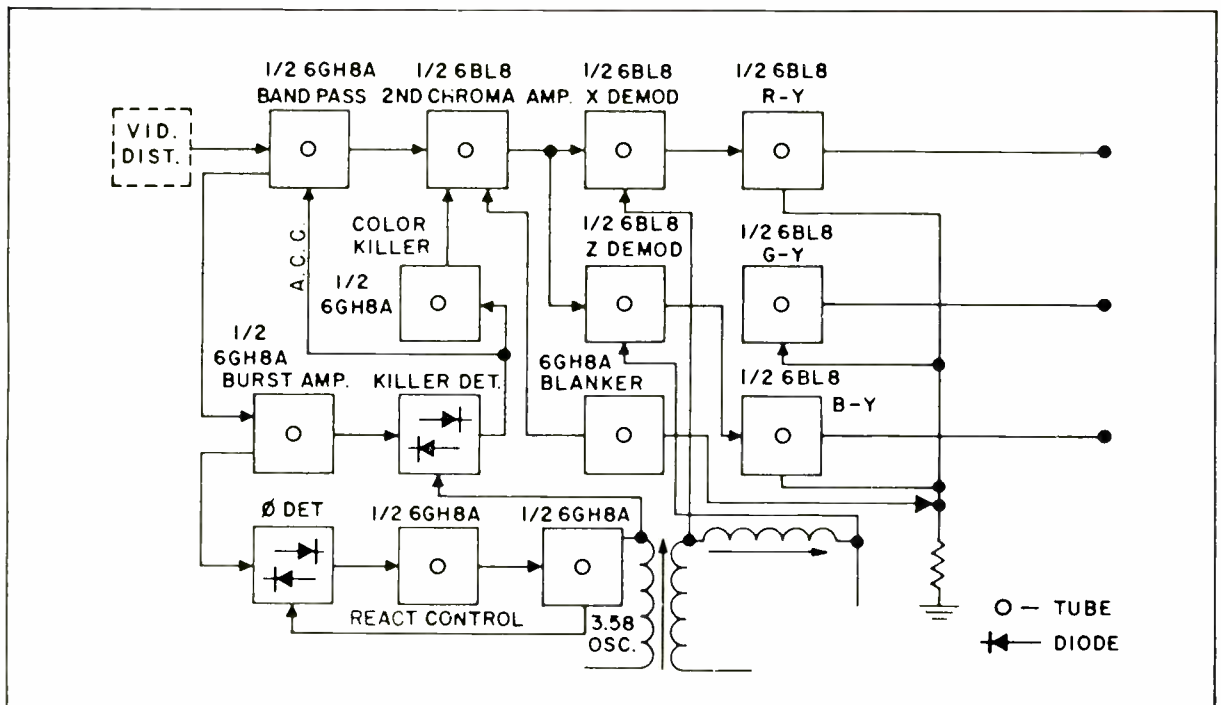


Fig. 5 - Block diagram of the color circuits showing the tubes and diodes employed.

applied to the frequency control elements Q4T and CR2U in the VHF and UHF tuners respectively.

This reference voltage establishes a fixed capacity of the frequency control elements and allows manual fine tuning of the receiver. When the ACT switch (SW201) is in the ON position, the output voltage developed by Q1C dc amplifier transistor is applied to frequency control elements Q4T and CR2U to provide automatic tuning action.

Switch SW202A is mounted on the rear of the VHF tuner assembly. This switch grounds the control voltage between all VHF channels to insure that the ACT circuit will lock on the desired video carrier. This feature is not used on the UHF tuner since it is a continuous tuner.

Capacitor C222 (10 μ f) is connected across the control line to prevent instantaneous voltage variations from detuning the VHF and UHF oscillator circuits.

The VHF control voltage is applied to the VHF control element Q4T through C31T (100pf) feed-through capacitor and resistor R12T (22K). Resistor R13T (22K) is the dc return for the circuit. Transistor Q4U actually uses only the base-collector junction to provide the variable capacitance necessary to tune the oscillator tank circuit. The base-collector junction is connected to the oscillator tank circuit through C29T (5pf) and C30T (5pf) capacitors which provide dc isolation for Q4T and limit the total capacity that can appear across the oscillator coil.

The UHF control voltage is applied to the UHF control element CR2C through C7U (100pf) feed-through capacitor and resistor R6U (22K). Diode CR2U is coupled to the UHF oscillator line through capacitor C6U (4.5pf). This capacitor provides dc isolation and limits the maximum capacity that can

be applied across the oscillator tank circuit.

Video Driver Circuit

The video driver is a common-base amplifier. (Shown in Fig. 4). Input is provided to the emitter from the contrast control. Bias is controlled mainly by the voltage divider in the base circuit. The contrast control has very little effect on the bias, acting merely as a signal divider to pick off the required signal amplitude. The .0056 μ f capacitor provides for high frequency boost. Output is matched to the delay line by the low value (1.5K) collector load resistor.

Color Circuits

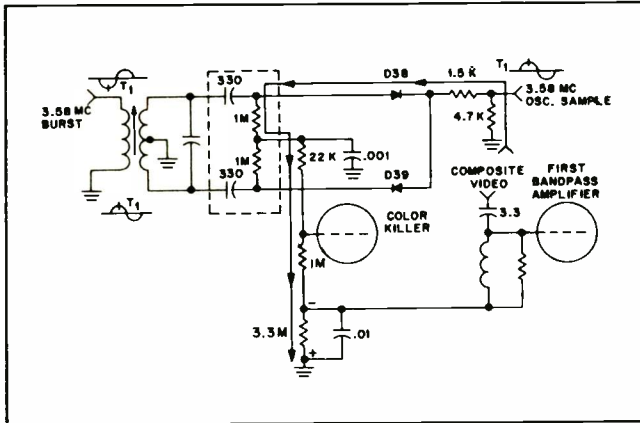
A block diagram of the color circuits is shown in Fig. 5. From the video distributor (or 1st video) we have the bandpass amplifier using a 6GH8 tube type. This circuit is the control stage for the Automatic Chroma Control. (See Fig. 6).

The function of the two demodulators is the same as in the past with minor circuit differences. The three color difference amplifiers are also similar to previous chassis.

Horizontal Output Circuit

In Fig. 7 we see the horizontal output transformer circuit. This circuit performs a number of functions other than horizontal sweep, HV, focus voltage and boost. Several separate windings are used to feed retrace pulses for use in other areas of the receiver.

The AGC gate winding is used to supply the positive gating pulse to the collector of the AGC gate. Because of the relative positions of the gate winding with its positive pulse and the horizontal phase comparator winding with a negative pulse, some inter-action would take place if not corrected.



Top: Fig. 6—Simplified schematic of the automatic chroma control circuit.

A portion of the negative pulse would be capacitively coupled into the AGC gate winding and collector load circuit. This negative pulse would cause AGC action and prevent a true zero signal condition. Obviously, this coupled negative pulse must be eliminated. A Faraday shield between the gate and phase comparer windings reduces the interwinding capacitive coupling. Since the Faraday shield in itself is not completely effective, a small capacitor, 13pf, is connected between the positive pulse source and the gate winding as neutralization to cancel the remaining negative pulse.

As the picture quality control is moved in a clockwise direction, the voltage across the varactor diode decreases, causing an increase in the total capacity across mixer output coil, L1T. The increase in total capacity moves the resonant point of the mixer output coil L1T down in frequency. Moving the resonant point in this direction reduces the amplitude of the video carrier and low frequency sideband signal. The effect on the received picture is increased highlights or overshoot.

As the picture quality control is moved in a counterclockwise direction, the voltage across the varactor increases, causing a decrease in the total capacity across the mixer output coil, L1T. The decrease in total capacity moves the resonant point of the mixer output coil L1T up in frequency and increases the amplitude of the video carrier and low frequency sideband signal. The effect on the received picture is a decrease in over-all picture highlights, or a smoothing of the dark to light transitions.

Shop Alignment

1. Receiver on, ACT switch off, no signal applied

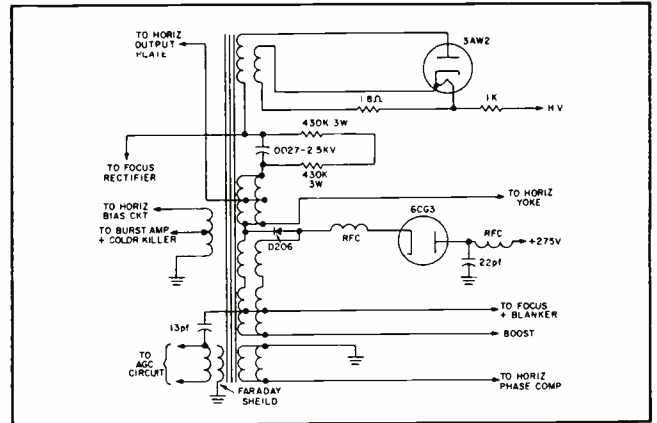


Fig. 7—Simplified diagram of the horizontal output transformer circuit showing functions performed.

and Pix Quality Control in detent position.

2. Apply 15vdc bias to AGC buss (M4) to cut off video IF amplifiers.
3. Connect VTVM to ACT output test point (yellow lead) (B14/2) on tuner mounting bracket, and adjust bias control (VR1C) on ACT panel for 2.5vdc at this point.
4. Remove 15v clamping bias and tune receiver to local color broadcast. ACT switch off.
5. Adjust fine tuning for best color picture.
6. Adjust L15 inductor for maximum tuning eye closure, if required.
7. Connect VTVM "O" center scale across ACT output test point (yellow lead) (B14/2) on tuning mounting bracket and reference output test point (blue lead) connected to junction of resistors R230 (6.8K) and R231 (39K) on tuner mounting bracket.
8. Turn ACT switch on. Adjust inductor L1C on ACT panel (ferrite core) for "O" reading on VTVM.
9. Operate ACT switch a few times and note that there is no picture quality change and that the VTVM indicates "O" when the ACT switch is on.
10. Check ACT operation on all normally used channels.

Diode D206 is used as a fixed horizontal centering diode. Addition of this diode causes a dc shift of the raster to the right. The amount of shift is $\frac{1}{4}$ in. to $\frac{5}{16}$ in. When servicing a chassis with fixed horizontal centering, if the raster appears to be off-center and to the left, short-out the diode mounted on the horizontal output transformer between lugs three and ten. Do not remove the diode from the circuit. If the diode opens, the raster will move about 1in. to the right and continue moving to the right as the brightness control is advanced. ■



TV Sales in Spanish

A TV-radio service-dealer in a city with a large Spanish-speaking population explains why honest practices are most important for a successful business in a community of this kind

■ Charles Deason, owner of the Deason's Radio and TV Co., which was established in San Antonio, Tex., 39 years ago, tells our ET/D reporter that one way to increase business is to "keep an alert ear to the needs of the community." This philosophy has brought Deason TV a 30 percent increase in sales volume this past year and a 35 percent increase in service.

Listening to the "demands of youth" caused Mr. Deason to stock a full line of walkie talkies. "It's a good volume item," he declares, adding that in addition to the youngsters and teenagers "who use it as a kind of hobby," he also has enjoyed very brisk sales on this item from adults who are hunters. "They use them for communication while they are out hunting," he explains. "And the walkie talkie has saved many of them from getting lost in the woods." Right now, he is making an effort to bring this item to the attention of fishermen who want to keep in touch with other fishermen.

"These increases have made this my best year in business here." It has also allowed him to add two more service technicians and a full-time auditor. "This means we are going to be able to give better service to our customers than ever before," he predicts.

The old-fashioned virtue of "always keeping your promises to your customer" is the main reason

given by Mr. Deason for his continuing success.

He says it has proven a particularly valuable business policy for him because 80 percent of his customers are Spanish-speaking citizens of San Antonio, Tex. Many of these customers speak little or no English. For that reason, they report that they are often taken advantage of, especially when they buy large ticket merchandise.

Mr. Deason, however, has their complete confidence. He has worked conscientiously toward this end in many ways. "Most important, we always stand behind the merchandise we sell," he explains, "and we always give them a fair price. Word of both has passed quickly from one Spanish-speaking family to another," Mr. Deason relates. He explains it this way: "If they are not satisfied with what they bought, we refund the money or replace the merchandise. This kind of advertising is quick, and of course, very priceless."

Originally, these Spanish-speaking customers began to venture into Deason Radio and TV because it had a Spanish-speaking crew. The secretary is also Spanish-American. "And I speak it quite well myself," Mr. Deason adds with a grin.

He believes in studying an area, deciding what it has to offer and then working to serve it. In Mr. Deason's case, San Antonio was an area with a large population of



Satisfied customers return to buy other merchandise as did these two attractive Spanish-American secretaries discussing a table radio with a salesman who looks as if he thoroughly enjoys his work.



This new store, which was built five years ago by Mr. Deason, displays three franchised lines of TV, radio and electronic merchandise.

Spanish-speaking citizens. He decided to find out what they liked so that he could make it available to them. "I found that they enjoy music very much," he says. "And I encouraged them to buy tape recorders so they could record their own music from radio and TV and then play it back on their stereo sets. I do the same thing myself and the idea has boosted my sales of both tape recorders and stereo sets."

San Antonio also has a television channel which is entirely devoted to programs in Spanish. "This station has most of the 300,000 Spanish-speaking residents of San Antonio tuning in," says Mr. Deason.

"Young people, as well as the older folks, like to hear their own language. And because of this station, it is easier to sell them television sets."

Mr. Deason has always been adept at finding sales opportunities. He has instituted many good business policies which have accounted for a steady growth and a \$353,000 sales volume last year. "We averaged a 10 percent increase every year for the past five years before 1967," he declares.

Five years ago the firm erected a new building at 802 S. St. Mary's in San Antonio. "It provided new values for our customers," Mr. Deason states.

"First of all, it has plenty of park-

ing space. It also has a through driveway at one side of the store so customers can drive right through from both streets. The store itself has two entrances allowing customers to enter either from the front or back."

The store is modern with full-length glass windows on the front and side, and fluorescent lighting to supplement the natural lighting.

The electronic merchandise is displayed well and is supported by brightly colored signs.

Prompt Service

"Any call for service gets prompt attention," Mr. Deason explains. "We give a 90-day warranty on every new TV set and a year's warranty on all parts."

A very direct and strictly honest advertising policy is a must with Mr. Deason. "Some dealers advertise the TV set cheaper and then sell the customer a service policy. We do not sell service policies of any kind. And when the warranty has run out, we charge for the service only."

There are other services that Mr. Deason includes for which some dealers charge. "We have free delivery and installation of TV or radio as well as antennas."

In-House Financing

Another policy instituted by Mr. Deason, which has won him customer confidence and many addi-

tional sales, is his own financing of credit sales. "We carry our own paper," he explains.

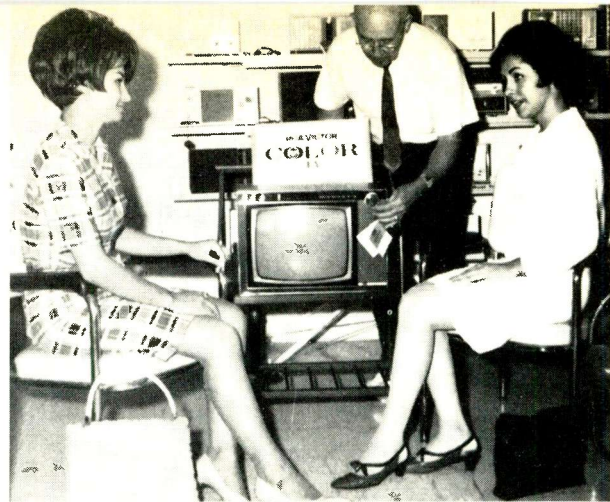
For dealers who have been debating whether or not they should do the same, Mr. Deason explains the values of the plan. "It brings goodwill and more profit to the dealer. As the customer comes in each week or each month, whenever his payment is due, he is automatically exposed to other merchandise in the store.

"As payments reduce the account, our bookkeeper reminds our salesman who can ask the customer if he is ready for something new. It's especially effective in October, November and early December. During this pre-Christmas period our salesman reminds customers that a new stereo would make a wonderful Christmas gift for the whole family—and they buy."

It is in these pre-Christmas months that Mr. Deason gets added customer traffic from Mexico. The trade from over the border makes up between 5 and 10 percent of his Spanish-speaking customers. "Most of them come to me recommended by our local customers."

There is also the second generation of customers, the teenager who comes in for a record player which he wants to buy on his own.

"He has no credit record, but he comes from a good family so we give him a chance to start off on his own. We use the local credit bureau



for checking credit ratings on customers but we also supplement this with our own judgment." And it is this judgment that brings Mr. Deason many new customers in the young generation who are already proving that they are good credit risks.

Special Advertising

Despite the valuable word-of-mouth advertising Mr. Deason receives, he also advertises in the San Antonio newspapers. "Most of it is done in the special section called THE SUN which reaches all Spanish-speaking areas on Friday and is issued by the SAN ANTONIO EXPRESS NEWS. We use certain items as leaders in these advertisements," Mr. Deason states, adding that he spends approximately 5 percent of his gross sales in such advertising per year.

As to the future for the established dealer in San Antonio, Mr. Deason sees "a very promising uptrend because the area is growing. Also most of the people here including the Spanish-speaking population are becoming more prosperous. The retired military personnel in San Antonio also offer a growing market for us, as does the HemisFair which opened here in April 1968. The HemisFair so far has delivered its promise for increased new business."

A Word of Wisdom

For newcomers to the radio, TV and electronic business, Mr. Deason urges caution plus fortification with a working capital of "at least \$50,000 plus at least five years' ex-

perience as a technician." He also urges that newcomers "get as much sales training and sales experience as they can."

Since Mr. Deason himself started on a capital of only \$250, which he borrowed on his automobile in 1928, he expressed extreme caution.

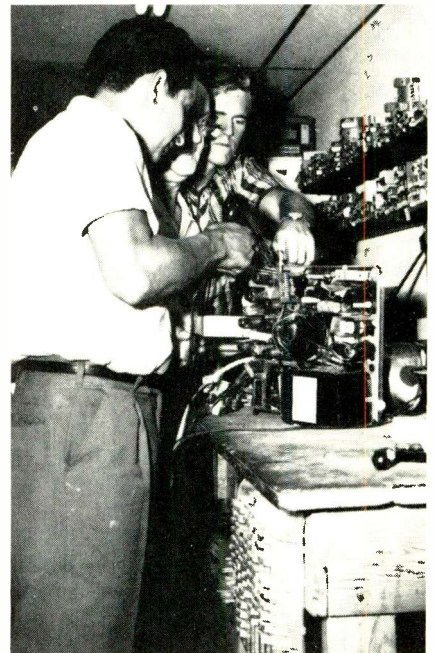
"Let's be realistic. The cost of the operation has been going up. The markup on television, radio and other electronic merchandise is becoming smaller each year. This means that you have to turn your stock over more rapidly. All of this means that the newcomer has it much tougher than the dealer who got established 38 years ago, 28 years ago or even 10 years ago. That's why the newcomer must fortify himself with more capital, with more experience and should be capable of selling, installing or servicing a set."

The need of greater capital is especially necessary if the newcomer decides to do his own customer financing. "In our own case, we built up our reserve gradually, adding more each year until we could carry all our own paper." He urges all newcomers to take this same precaution.

In April 1965, Mr. Deason was honored by the City Public Service Board of San Antonio when it named him "Salesman of the Month." He was featured on the cover of its monthly magazine which goes to all radio, TV and electronic dealers throughout the city and features a comprehensive story about his achievements in his successful electronic dealership operation. ■

Above left: Spanish-speaking salesman makes these Spanish-speaking families feel right at home. The entire family, even the grandchildren, come in to make a purchase, especially when it is an item to be used by the whole family.

Above: When the two young ladies decided they could afford a new color TV set, they returned to buy one from Mr. Deason, who is switching the set on for a demonstration.



Mr. Deason stands behind all the electronic merchandise that he sells. His experienced crew of technicians provide the customers with prompt and efficient service.



DEALERFAX

ADVERTISING/MERCHANDISING/SALES/BUSINESS MANAGEMENT

A West Coast technician tells why he went into picture tube rebuilding and how he has made it pay

PROFITS IN TUBE REBUILDING

■ Leo P. (Bud) Hycz, a retired Navy electronics chief, reportedly is the only man in San Diego who rebuilds defective color and B/W television tubes.

Bud started his rebuilding business—Hy-Lite Video Electronics—in April of 1966 just as he was completing 20 years in aviation electronics with the Navy. In the first eight months of his electronic venture he bought out his partner and grossed \$12,000 and soon expects to be nudging the \$100,000-a-year mark.

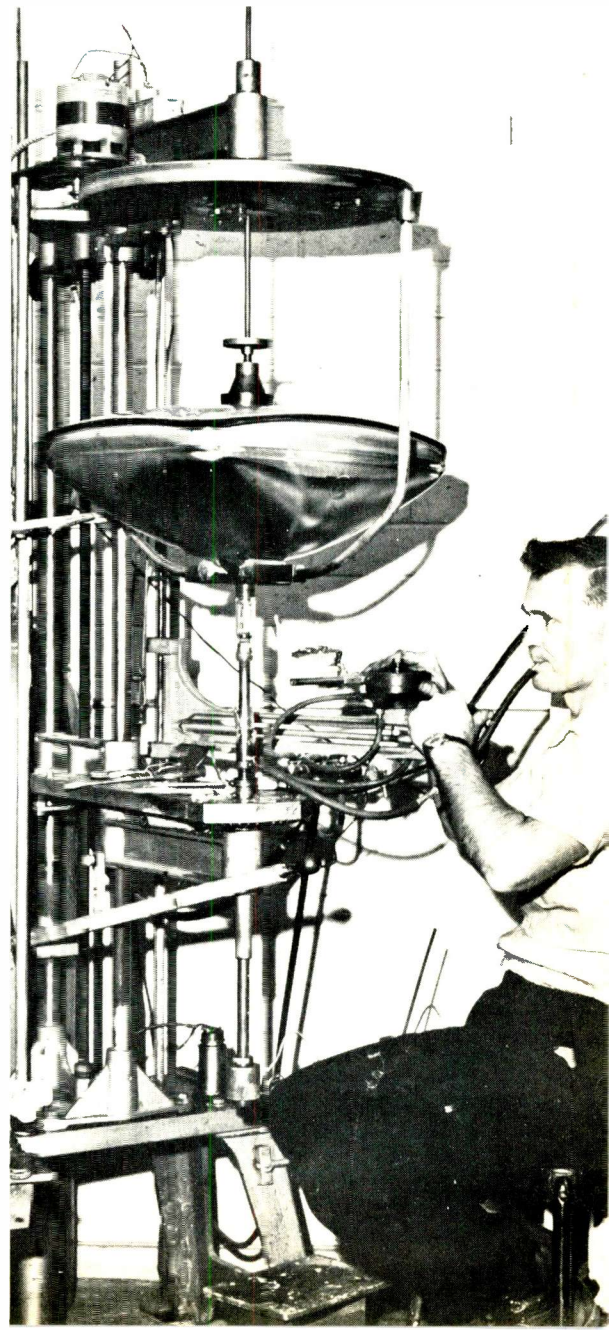
There are about 350 wholesale dealers in San Diego. Bud does business with 260 of them. However, in March he decided to add retail dealers and believes this trade will produce about 25 percent of his business in a couple of years.

Hy-Lite Video Electronics' 2200-sqft white stucco building is situated in the heart of San Diego's electronic distributors. It's only a few blocks from freeway entrances allowing quick routes to all dealers. It faces a main street and has ample parking for loading and unloading the delivery van as well as space for customer parking.

Tube Costs

Bud stocks between 300 to 350 tubes of various sizes and types

Bud Hycz, reportedly the only television tube rebuilder in San Diego, welds a new electron gun into a tube. He is using the rotating vertical lathe which turns the tube around the flame.





A tube is placed in the Windsor oven for baking. The temperature will be brought up to 240° F and evacuate the tube. This cycle normally takes two and one-half hours for a color tube.



Walter Zimmerman, one of Bud's supervisors, checks out tubes packed for shipment from the 350 tubes normally stocked.

most of the time. Presently, about 10 percent of his income comes from rebuilding color tubes but plans to expand that to 90 percent. "Color tube rebuilding will increase my gross income by three times with the same amount of help I have now," he indicates. "Our B/W tubes average \$14 while color tubes sell for about \$65. The difference in time it takes to rebuild the two isn't much—about an hour and a half more for color.

Rather than jump feet first into color rebuilding, Bud is hedging to see how his limited production goes first.

"Dealers are wary of shifting their business to a new man," Bud explains. "You have to prove you are going to be around and put out a quality product. Once you get their confidence and turn out quality tubes you've got it made."

In the rebuilding process, Bud can work with tubes ranging from 5 to 30in. He puts out only "Grade B" B/W tubes—ones which have had only the electron gun replaced—and guarantees them for one year. (A "Grade A" tube besides having a new electron gun also gets a new phosphor face and aluminization.) Dealers exchange rebuildable tubes for rebuilt ones. If the dealer's tube is unusable, he is charged extra.

Rebuilding Process

"There are about 14 steps in the tube rebuilding process," Bud tells

our ET/D reporter. "First, the tube is inspected with a 'black light' to see if there is any damage to the face. Chips, scratches, cracks or ion burns signal a dud. The tube is cleaned, slowly let down to atmosphere pressure and a new glass neck is welded on. We put the tube on a vertical lathe and make like an artisan glass blower and machinist as we weld the glass neck to the tube." He prefers the vertical lathe for gunning color tubes. "The vertical lathe is ideal," he says, "because the electron gun has to be perfectly aligned with the tube and when the tube is turning you can see small errors in the alignment you can't see as readily with a fixed apparatus. The lathe turns the tube while the flame is stationary, giving us greater control in the welding process. After that we apply a new inner dag—a combination of graphite and distilled water—then the electron gun is welded into the neck.

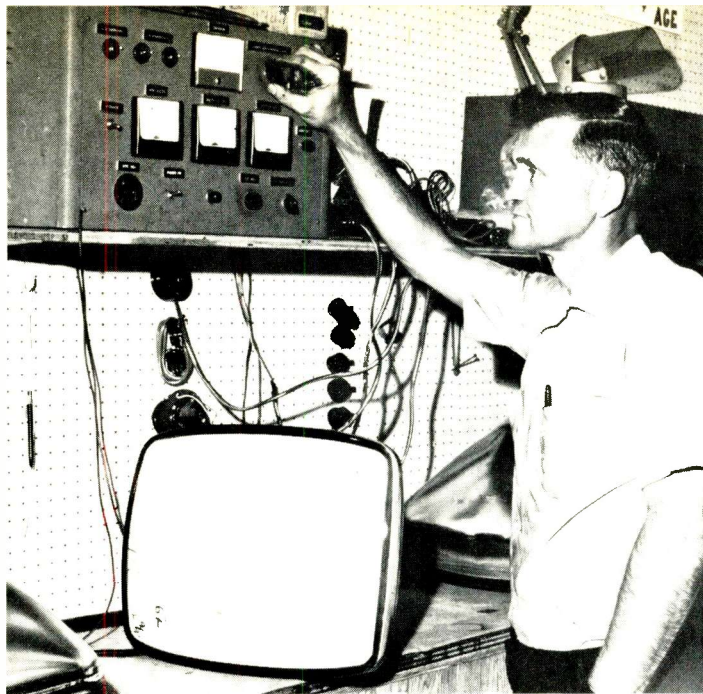
"The tube is then heated to 740° F in a special stainless steel oven—we have two of them to outgas the bulk aluminization and phosphor. During this 'cooking' process, the vacuum pumps take out the air.

"One of the most interesting parts of the rebuilding process," he continues, "is the oven action. A mechanical pump starts forcing air out of the tube until about 90 percent of it is removed. Then we throw a switching mechanism

putting the diffusion pump into action. The switching mechanism keeps air out of the diffusion pump and avoids burning the expensive (\$25 a pint) diffusion pump oil which runs in a vapor state. The pump uses about 100cc of oil at a time and uses the mechanical pump as a backer pump to maintain a vacuum on the oil reservoir. By adding the mechanical pump to the cycle we eliminate about 40 minutes from each cooking cycle and there is no cooling time needed. Without the mechanical pump it takes longer to preheat the diffusion oil." The pump evacuates the bulk initially enough to prevent diffusion oil oxidation, and in two shifts Bud can run about 20 B/W tubes through this process.

"Once the tube is under a vacuum," Bud explains, "it is 'flashed.' The flashing process vaporizes the barium inside the 'getter' by induction heating. If the vacuum is poor, the tube won't flash because barium won't vaporize at atmospheric pressure.

"We do this by applying filament voltage in large amounts. A tube that takes 6v is given a healthy 13½v for 1½min and 9v for another 28min. This cooks out any carbon dioxide in the barium carbonate cathode. After conversion, the cathode material is changed to barium oxide and is now considered a good emitter. After three hours of cooling, the tube is tested, an



Bud checks a rebuilt tube on his special test unit which indicates emission, shorts, leakage and gas content.



Video Electronics uses vans for delivery of rebuilt tubes to dealers within the city limits.



Bud's wife, Vivian, takes care of the office, answering the phone and processing orders.

outer dag is put on and it's labeled, boxed and ready for a dealer."

Production cost factors are \$1.50 per B/W electron gun and about one man-hour per tube. Color tube guns run about \$6.60 each. Bud sells the tubes for about 60 percent less than the price of a new one. Only about 2 to 3 percent of the tubes come out defective after processing and these are usually caught on the test run.

A color tube takes longer in the oven and on the lathe than B/W. This is because it has more glass mass—it takes longer to anneal the glass at the lathe and longer to cook it in the oven. At the beginning of the oven process for color, the tube is run for a half-hour on the mechanical pump and then to the diffusion pump for another half-hour before the full hour-and-a-half cycle is started. After the two-and-a-half-hour cycle, the tube is taken from the oven and a canvas bag is put over it to keep it from cooling too quickly and cracking the glass. The B/W cooking process lasts for about an hour.

Guarantee

Bud is so confident about the quality of his color production that he guarantees the rebuilt tubes for 18 months. He converges each color tube before sending it out. Currently, he's rebuilding about 20 color tubes a month. He plans to expand that to 50 a month, adding

about \$2500 more income per month to his shop. His ultimate goal in color tube work is 100 tubes a month. He says he can do the same monetary business rebuilding 50 color tubes as he now does rebuilding 200 B/W—without any increase in personnel.

Present and Future

Besides himself, Bud's personnel roster includes four employees and his wife, Vivian. She keeps the books and takes phone orders in the shop's 96sqft office. During the day, Bud has a plant manager and one driver/assistant. On the night shift he has a night supervisor and assistant. The crews get paid from \$1.75 an hour minimum to \$2.75 for plant manager. "As the business grows, so does the pay," says Bud.

"I have a training cycle here," says the 20-year Navy veteran, "the more you learn the more you get paid. There's no time requirement in any one phase of the operation. If a man catches on quickly and does a good job, he'll go right to the top." Bud still thinks Navy—he calls his shifts, "watches."

He cross-trains his men so if one is absent the other can handle the absent's man's area of responsibility.

Bud plans to activate a profit-sharing plan for employees earning \$3 an hour or more. He says the profit share will be about 2 percent of the monthly gross.

Bud has an attractive "anti-delivery" plan for his customers. If the dealer picks up his own tubes, 5 percent is cut from the price. Bud provides one-day delivery within city limits if the order is in before 12:30 p.m.

The shop has 1150sqft allocated to sales and stock storage and 1050sqft for working area. The business office commands a view of the entire retail area which takes up about 120sqft for selling and receiving picture tubes.

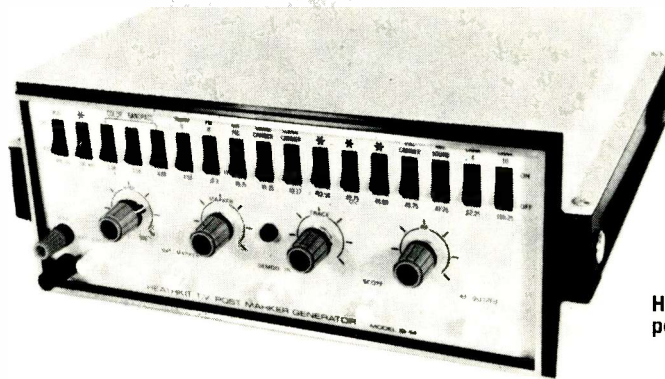
Contact Advertising

Bud has done little media advertising, relying mostly on monthly mailings to announce sales and discounts and for direct contact with dealers.

His most effective advertising campaigns have been the open houses he's held to give dealers the chance to come and get a look at his shop and its operation. "This particularly helped initially to gain their business," says Bud.

He conducts his business with the wholesalers on 30-day accounts. He has no credit policy for retail sales. "Future plans," he says, "call for just accepting bank credit cards and, of course, cash."

Bud Hycz spends a lot of time working with the Navy on defense systems, but explains, "I like to keep busy and I like running my own business and working for my country, too." ■



Heath Model IG-14
post marker generator.

ET/D TEST LAB REPORT

Test Lab Report on Heath IG-14

A few hours under the hot iron, wiring this crystal-controlled marker generator are worth the effort

■ The Heath IG-14 marker generator in kit form was assembled in our ET/D lab in a few short afternoons and needed no special tools. The unit comes with two printed circuit boards, one for the amplifiers and one for the oscillators. It even includes solder and tuning tools.

Assembly starts with the amplifier circuit board and the wiring covers one section of the board at a time. An accompanying pictorial parts location diagram describes each step.

The oscillator board follows the same assembly layout installing first all the resistors, then capacitors, transistors and finally, crystals and coils.

Mechanical assembly of the chassis is simplified by exploded views and three-dimensional drawings that should present no problem even to a novice.

Interwiring of the circuit boards is also supported with pictorial diagrams with the bulk of the wiring made between the circuit boards and the rocker switches. The instructions call out the wire lead lengths and colors at the beginning of each wiring stage which makes

things a little easier than cutting and stripping in each step.

Once the unit is completed, the oscillators, since they are crystal-controlled, may be aligned with a scope and a VTVM. The marker generator may be easily modified to operate with a sweep generator if desired.

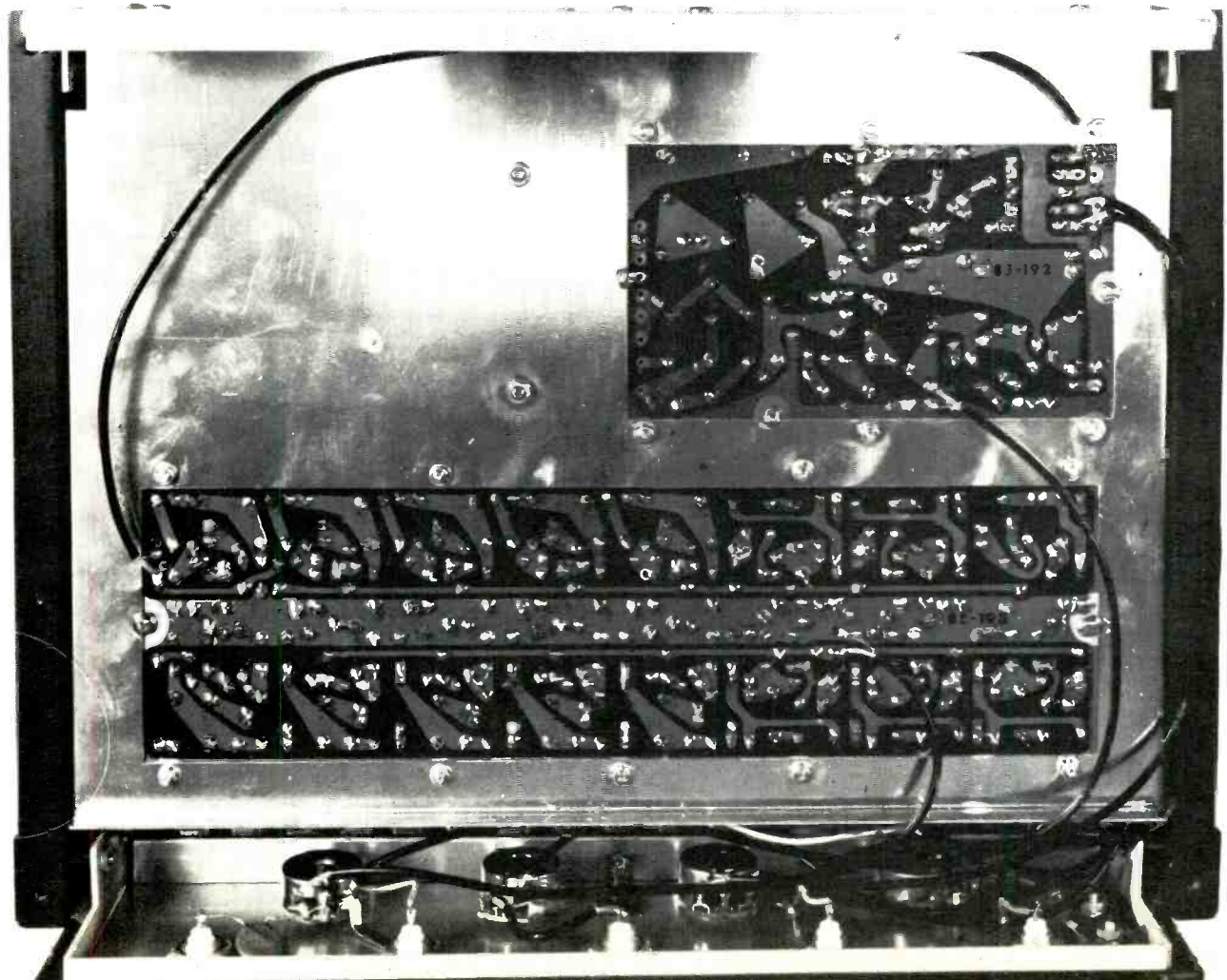
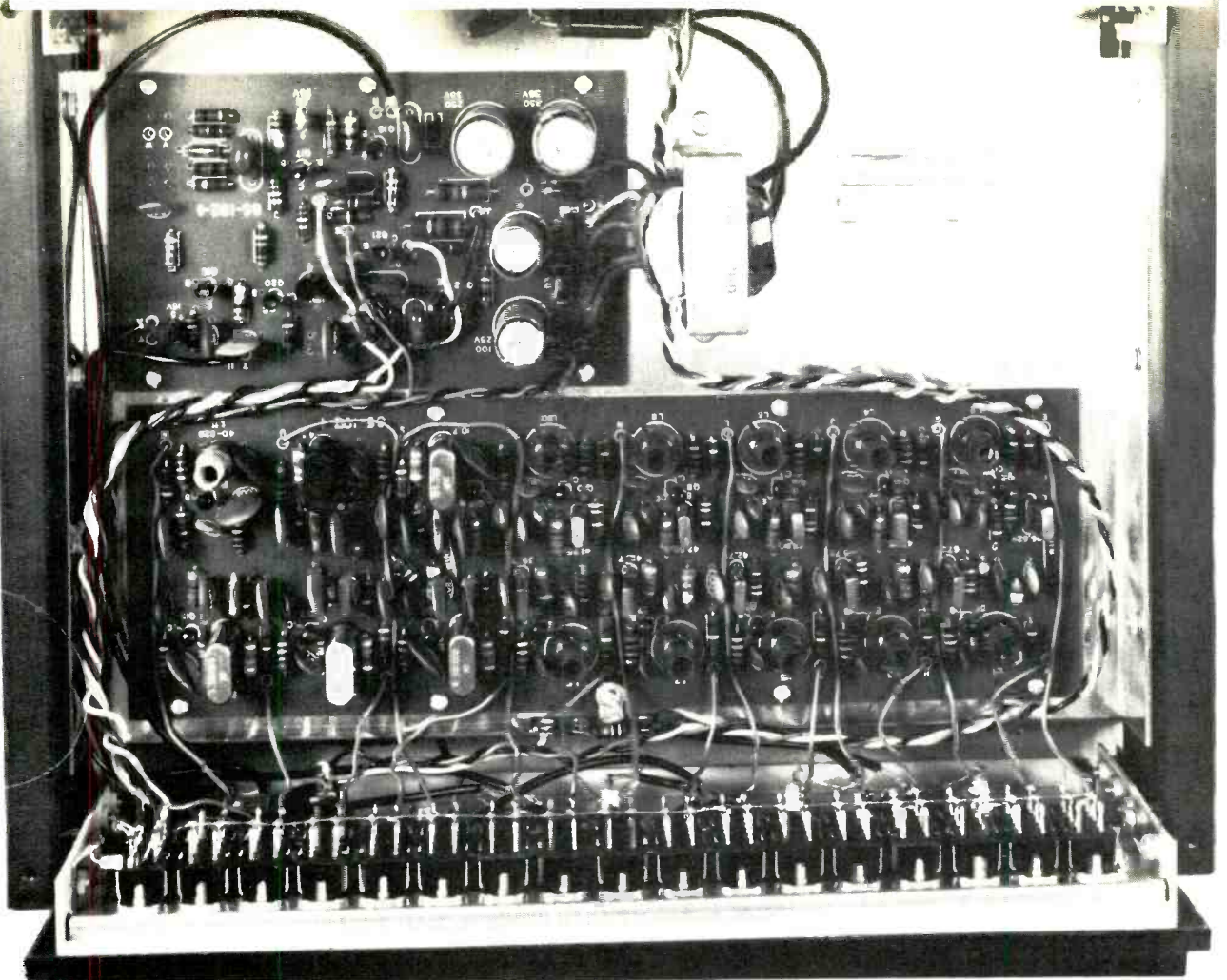
The assembly manual also includes instructions for using the marker generator to perform TV/IF, TV trap, VHF tuner, color bandpass, FM tuner, FM/IF and FM tuner tracking alignment. Troubleshooting is provided in chart form followed by a handy TV channel frequency guide and a complete circuit explanation.

The generator provides markers at 100kHz, 3.08, 3.58, 4.08, 4.5, 10.7, 39.75, 41.25, 42.17, 42.50, 42.75, 67.25 and 193.25MHz. Modulation is 300Hz. Input impedances are: 75Ω EXT sweep, 75Ω EXT marker and 220kΩ DEMOD IN. Output impedances are: 75Ω RF output and 22kΩ scope. The output voltage is either positive or negative 15vdc at 10ma.

The generator uses 22 silicon transistors, three silicon diodes and one zener for a total power consumption of less than 8w. ■

Interior views of completed generator shows circuit boards and interwiring to switches.

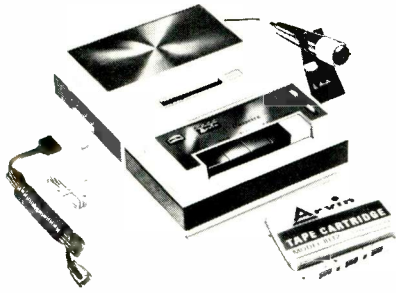
Bottom view of generator shows wiring to controls and output jacks.



For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly

Cassette Tape Recorder 700

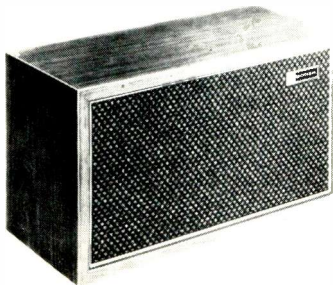
Introduced is a solid-state cassette cartridge tape recorder. This compact unit features push-button controls for record, rewind, play, fast forward and stop. Capstan drive is said to assure



constant tape speed at 1 7/8ips for fidelity. Solid-state circuit delivers instant response and dependability. Threading, tangling and tearing are eliminated with palm-sized cartridge tape containers employing 2 track monaural recording tape. The unit is powered by four "C" cell batteries or ac via detachable line cord. Other features include single volume control for both playing and recording, meter to indicate recording level and reserve battery life, output jack with earphone, remote control microphone and input jacks. Model 20L11-18 measures 6in. wide, 2 1/2in. high and 9 1/4in. deep. The recorder weighs 3 1/2 lb. Suggested retail price is \$54.94. Arvin.

Speaker Systems 701

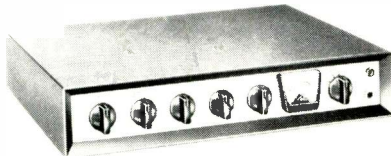
Announced is a new line of high fidelity loudspeaker systems—the "Row 10" Series. Designed to re-create the sound of the tenth row, the speaker series re-creates it with three bookshelf speaker systems that acoustically complement any home and any size room. Factory sealed with specially designed acoustic-suspension woofers and composition-cone tweeters, the three systems differ in size, components and



price, but all three share the same basic sound quality. The larger speakers are said to have more extended low bass response (though even the smallest, LS-10, goes down to 40Hz), more acoustic output and greater power handling capacity. To compensate for the response peak exhibited at about 17,000Hz by virtually all magnetic phono cartridges, the manufacturer has taken the following step: Since all tweeters have small, unavoidable dips and peaks in their response, the tweeter has been deliberately engineered so that it dips in the 17,000Hz region, canceling the cartridge peak. The result is said to be an almost perfectly flat overall response and a sharp reduction in such phenomena as over-sibilant "S" sounds. The system is a true two-way bookshelf loudspeaker system with a 6in. acoustic-suspension woofer and a 3in. composition-cone tweeter. Response: 40-20,000Hz; power handling capacity: 300w 1HF; impedance: 8Ω. Dimensions: 15in. x 8in. x 7in. List price: \$49.95. Bogen.

Mixer Preamps 702

Two new mixer-preamp combinations, said to feature over 70db gain for broadcast, recording and other professional applications have been intro-

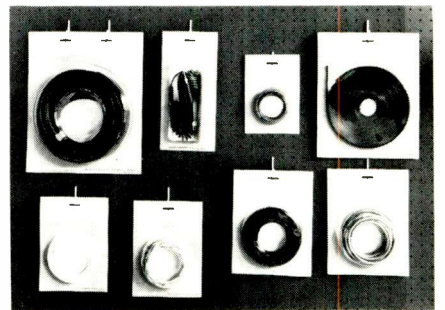


duced. The silicon, solid-state instruments are equipped with battery options for remote use. Low noise FET transistors used in the front ends permit the use of either high or low impedance microphones. The new mixer-preamps (Models BEM4A and BEM5), ideally suited for running long lines, are equipped with chassis sockets for quick, neat installation of Bell P/A low impedance No. 2274 transformers which provide a 200Ω balanced input. Input connectors on standard models are three-conductor XLR male type with female XLR type or screw connectors available on special order. Output of the units are said to be 0 dbm (maximum + 15 dbm, 600Ω, unbalanced). This permits the units to work into any load 600Ω or higher such as the auxiliary input of a PA amplifier. Model BEM4A includes the ability to cue and

preset the level of each channel before switching it into the output circuit. This unit has four microphone inputs with Mic No. 4 convertible to auxiliary high impedance for phonograph or other high level signals by means of a switch on the rear panel. The BEM5 is very similar to the BEM4A except that it does not include the cueing and monitoring features. It has five microphone inputs with Mic.No. 5 convertible to auxiliary high impedance for phonograph or other high level signal source. The units measure 2 7/8in. high, 15in. wide and 10 7/8in. in depth. Model BEM4A is priced at \$225, and BEM5 at \$180. Bell.

Wire and Cable 703

Introduced is an all-new bubble packaging program launched by a electronics wire and cable manufacturer.



The bubble pack is used to package microphone cable, speaker cable, communications cable and cord sets. These are popular products for home electronics hobbyists and those interested in home entertainment centers. Specially designed for strong point-of-purchase appeal, the new packaging and available peg-board type display rack is being used to help reduce the high costs of buying, handling and selling the products and to add to retail profits. The new packaging concept is also designed to provide retailers, through scientific selection, with about 95 percent of the most commonly purchased items. The tough, transparent plastic clearly shows the product, protects it from damage and keeps it clean. Belden.

Amateur and SWL Receiver 704

A 5-Band AM/CW/SSB unit, featuring advanced solid-state circuitry, tunes all amateur bands from 80 to 10 meters, international short wave, air-

This little part plays a big role in radio.

This box gives you top revues.



The transistor is no bit player when it comes to radio performance. That's why Delco transistors are manufactured under controlled conditions that assure high reliability. And why they're thoroughly tested before being placed in the familiar blue and black box.

Delco Radio engineers are leaders in auto radio design and transistor technology.

Delco radios are original equipment on over half of the cars on the road.

That United Delco box is your guarantee of genuine OEM

quality replacement parts. And just 12 Delco transistors replace over 7,500 other types.

Doesn't it make good sense to stock the best?

Remember these facts when you re-order. And remember, too, that your United Delco supplier handles the most recognized name in the parts business.

Next time you think little, think big. Think Delco.

DELCO RADIO, Div. of General Motors, Kokomo, Ind.



MARK OF EXCELLENCE



craft, marine and the standard AM broadcast band is introduced. Bands covered are 150-400kHz, 550-1600kHz, 1.6-4.8MHz, 4.8-14.5MHz and 10.5-30MHz. Of the 24 semiconductors in the circuit, two are field effect transistors in the RF stage to provide sensitivity and low noise level. Four mechanical filters are used for station separation with a noise limiter and automatic volume control to reduce noise, blasting and fading. A built-in variable BFO and product de-

tor give clear reception of code and single side-band. Visual tuning is made easier with an illuminated S-meter.

Other features include a push-pull audio stage with thermistor for low distortion, receiver muting connections and a headphone jack for private listening. The receiver is equipped with dual power supplies, 117vac and 12dc. The gray metal cabinet measures 7 5/8in. high, 15in. wide and 10in. deep. Receiver specifications are: ranges—Band A, 150 to 400kHz; Band B, 550 to 1600kHz; Band C, 1.6 to 4.8 MHz; Band D, 4.8 to 14.5MHz; Band E, 10.5 to 30MHz. Sensitivity— $2\mu\text{v}$ for 10db S/N. $3.2\mu\text{v}$ on standard AM broadcast



band. Selectivity—1.5kHz bandwidth at 6db down, 5kHz at 50db down. Signal-to Noise Ratio—30db down. IF Rejection—40db. Intermediate Frequency—455kHz. Audio Power Output—1.3w. Power Sources—117vac, 12vdc (negative ground). Power Consumption—10w. Semiconductors—11 transistors, 12 diodes plus 1 zener diode. Size—7 5/8 x 15 x 10in. Price \$99.95. Separate speaker \$9.95. Allied Radio.

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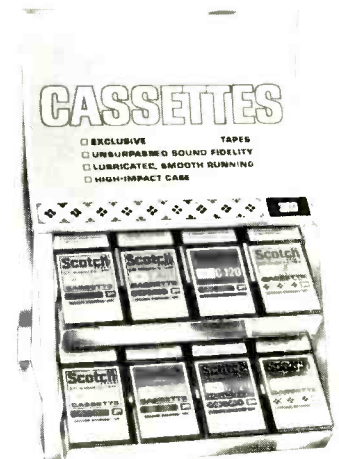
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Tape Cassettes

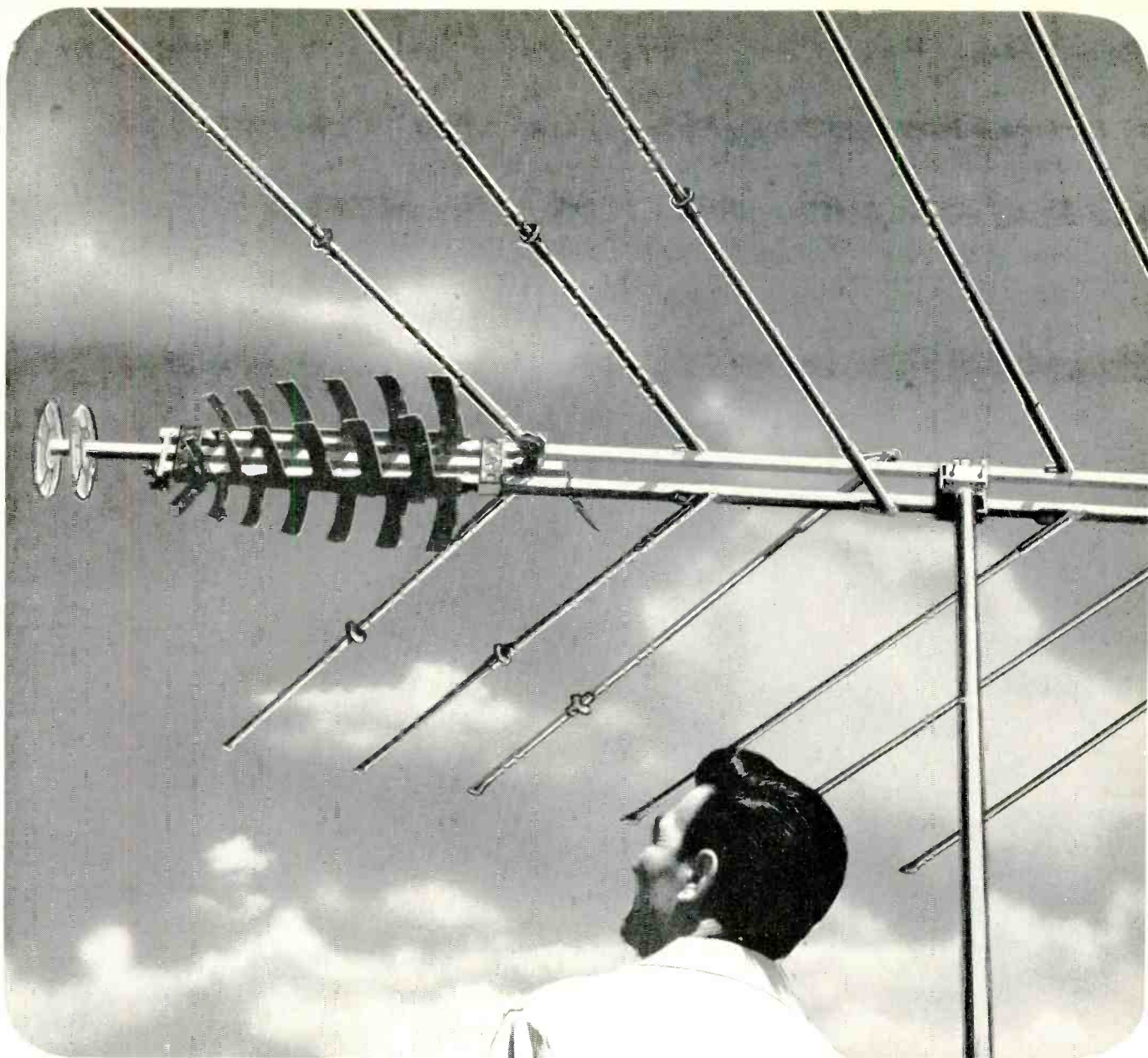
705

Announced is a new colorful packaging for magnetic tape cassettes. The cassette line, which includes 60, 90 and 120 minute models, will now be available in high impact, album style cases.



Previously the line was available only in the plastic mailer type container. The company will continue to feature its low noise Dynarange tape which it is said, provides improved short wavelength (high frequency) response while offering complete compatibility with slow speed recording applications. In addition, it reportedly contains a new and vastly improved shim material to offer total reliability while eliminating tape binding and jamming. “The new shim material effectively reduces frictional drag and has the effect of increasing recorder battery life by nearly 25 percent,” the company says. In introducing the newly styled cassette line, the company’s offering, without charge, an attractively styled cassette counter display which holds 72 cassettes. The display will be given to merchants placing a minimum order of one gross of assorted cassettes. 3M Co.

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Professional installers count on antenna gain not the numbers game.

If you count elements when you buy antennas, you might be shortchanging yourself and short-circuiting your customer's reception. It's *performance* that counts.

And that's where JFD Color Laser and Log Periodic antennas outclass all other all-channel antennas. Only patented JFD capacitor-coupled perform *double duty* — respond on the fundamental *and* harmonic modes. Actually *multiply* gain and signal-to-noise ratios over larger multi-element

(*but less efficient*) antennas.

That's why professional installers who count on antenna *gain* (not the numbers game) prefer JFD Color Lasers and LPV Log Periodics. Call your JFD distributor and prove it on your next installation.

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ET/D DEALER SHOWCASE

Music Systems 706

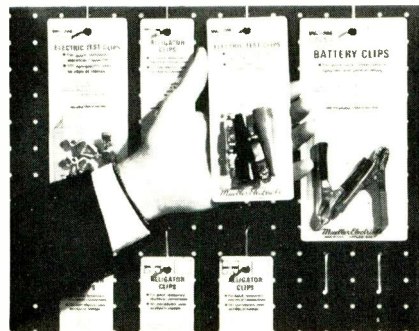
Introduced is a new compact music system. The SC1510 was designed for the consumer with very limited space. The system features a versatile 25w solid-state stereo amplifier with auto-



matic safety guard, a new circuit design which protects the output against shorts. Reset is automatic once the short is removed. Also featured is a novel speaker system switching arrangement which reportedly permits the user to install stereo and mono speakers in various sections of the house without the requirement of special networks. The record changer is a Garrard, equipped with a low tip-mass Grado pickup. A plastic dust cover is available as an optional accessory. Minimum resale of the SC1510 is \$199.50. Harman Kardon.

Clips and Insulators 707

Introduced is a merchandising vehicle which includes clips and insulators in bubble-pack cards. Only three different compact card sizes are involved. The line was created in order to present the company's quality clips and insulators in convenient cards which accent the 101 non-electric uses in shop, home and office. The line is also for industrial buyers who appreciate the speed and convenience of not hav-



ing to buy from bulk. The bright pumpkin-colored cards were designed for maximum simplicity in order to stand out against the most crowded backgrounds. The prepackaged line includes solid copper clips, cadmium plated steel clips and red and black insulators. Mueller.

Sound System 708

A new portable sound system reportedly with wide sound distribution and high efficiency is announced. Designated the A103, this system consists of a 1200A control console and one 1202A speaker system. The system is capable of controlling up to five independent input signals to the all-silicon transistorized mixer power amplifier which has an output of 145w peak music power (60w RMS). The built-in reverb has a switchable, individual control on each of four channels. As added protection when the top of the console is closed, the reverb is automatically locked in place to prevent damage. The speaker system is said to feature high



efficiency, wide dynamic range, outstanding clarity and 85w power handling capabilities. All components of the A103 system are covered with a vinyl lamination which adds to the attractiveness of the system while providing a measure of protection against rough handling. Vinyl slip covers are also available as accessories for additional protection. Altec Lansing.

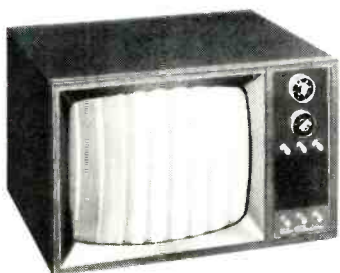
Stereo Tape Deck 709

Introduced is a new solid-state, three-motor stereo tape deck, Model TC-666D. The tape deck features a SNR noise reduction system and ESP automatic tape reverse—combined for the first time in a single unit. The SNR circuit reportedly provides noise-free playback of all recorded tapes by automatically reducing the gain of the playback amplifier during quiet passages

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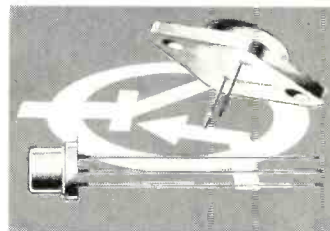
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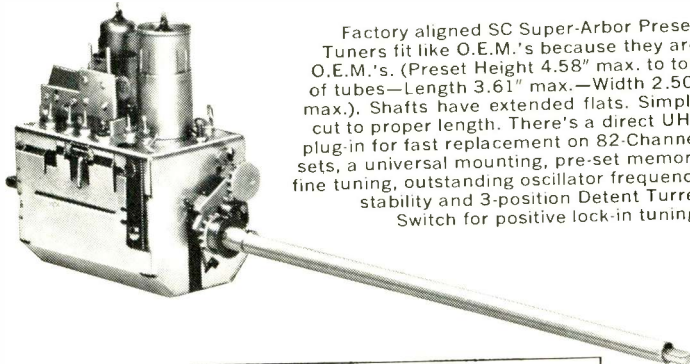
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Figure it out. Repairing costs about \$9.75. New tubes cost around \$3.00. Now add your time and cost for packing and shipping to say nothing of the money you're out while waiting for it to be returned. (And who pays for your call back if another part of the tuner fails.) A brand new SC Super Arbor Preset Tuner with mounting brackets and tubes costs \$12.95. And you can pick it up in whatever time it takes you to get to the distributor—5, 10, 15 minutes. You get a new tuner warranty—1 year from date of purchase. The new tuner costs you less in time and money. Your customer gets a brand new tuner instead of a used one. Everybody's happy. Right? Right. Available at your parts distributors.



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13 Position Switch	SBR-250	SBRS-252	SBR4S-251
Antenna Input	300 ohms balanced to ground. . .		
Intermediate Frequency	41.25 mc sound 45.75 mc video		
RF Amplifier Tube	6HQ5	2HQ5	3HQ5
Oscillator-Mixer Tube	6GJ7	5HB7	5GJ7
Heater	6.3 volts	600 ma	450 ma
B Plus	125-145 volts dc.		

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when background noise is most predominant. It is said to reduce the noise level to almost inaudibility while doubling the dynamic range of the recorded material and to work equally well on symphonic music, chamber music, pop singers, bands and the spoken word. The ESP system senses the modulations on the tape, and when they stop, it automatically reverses the tape direction within ten seconds. The 666D also has an automatic shutoff that turns off the power at the end of the reel after a complete reverse cycle has been made. Other features include three motors



(two high torque spooling motors and a capstan drive motor); push-button operation; two VU meters for professional recording level control; stereo headphone jack; a scrape flutter filter (a special idler mechanism that eliminates tape modulation distortion); ultra high frequency bias; vertical/horizontal operation pause control; and a four-digit tape counter. The tape deck also has non-magnetizing heads; automatic tape lifter to protect heads from wear during fast forward and rewind operations; record interlock; two tape speeds — 7 1/2 and 3 3/4 ips.; four-track stereo or mono recording and playback; and up to 7in. reel capacity. Price less than \$575. Sony.

For more information on

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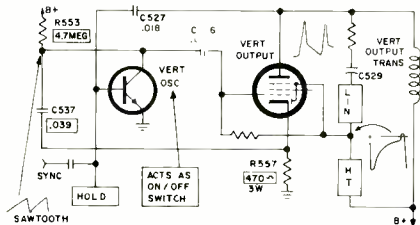


COLORFAX

RCA VICTOR

Color TV Chassis CTC36—Vertical Circuit Description

The vertical deflection circuit comprises a transistor oscillator stage and a pentode output stage. The pentode is a special type, having a diode plate which employs the common cathode of the pentode. This diode, in conjunction



with a resistance-capacitance network coupled in a feedback arrangement between the output and the input electrodes of the pentode, develops a feedback voltage which is added to the sawtooth waveform for vertical linearity and size control. Another feedback path to sustain oscillations, is from the output stage to the base circuit of the transistor oscillator. The base circuit is also the input electrode for synchronizing vertical sync pulses. Vertical hold circuitry (customer control) is arranged to adjust the triggering waveform component to the base of the oscillator. The height and linearity circuits operate in conjunction with the pentode stage.

The transistor oscillator stage (see simplified schematic of vertical sweep action) acts as an On/Off switch. A resistance-capacitance sawtooth generator circuit (R553, C537) coupled to the grid of the output stage is subjected to alternate charging from the B+ supply and discharging through the transistor in an operating cycle recurring at the vertical sweep rate. (The charging path for C537 is completed through the cathode resistor of the output tube.) The oscillator transistor conducts during retrace time to provide a discharge path for the sawtooth capacitor. The sawtooth voltage developed across the capacitor (C537) is coupled through C536 to the control grid of the output stage. This grid voltage waveform, which is substantially linear, causes plate current to flow in the output stage. The plate current variation of the output stage is coupled to the deflection yoke by means of a vertical output transformer.

During the trace portion of each deflection cycle, plate current increases causing plate voltage to decrease in a substantially linear manner. At the end of vertical trace time, a positive polarity synchronizing pulse is applied via a capacitor to the base of the oscillator transistor, driving the transistor into conduction. As the transistor conducts, the voltage across C537 decreases rapidly, driving the control grid of the output stage negative.

When the output stage is driven into cutoff, the plate voltage waveform in-

creases rapidly as a result of the energy stored in the deflection windings. The developed positive pulse, coupled through C527 to the base of the oscillator maintains the transistor conductive. Near the end of vertical retrace, as the positive waveform decreases, the oscillator transistor is turned "off." Capacitor C537 then commences to recharge, to initiate the next deflection cycle.

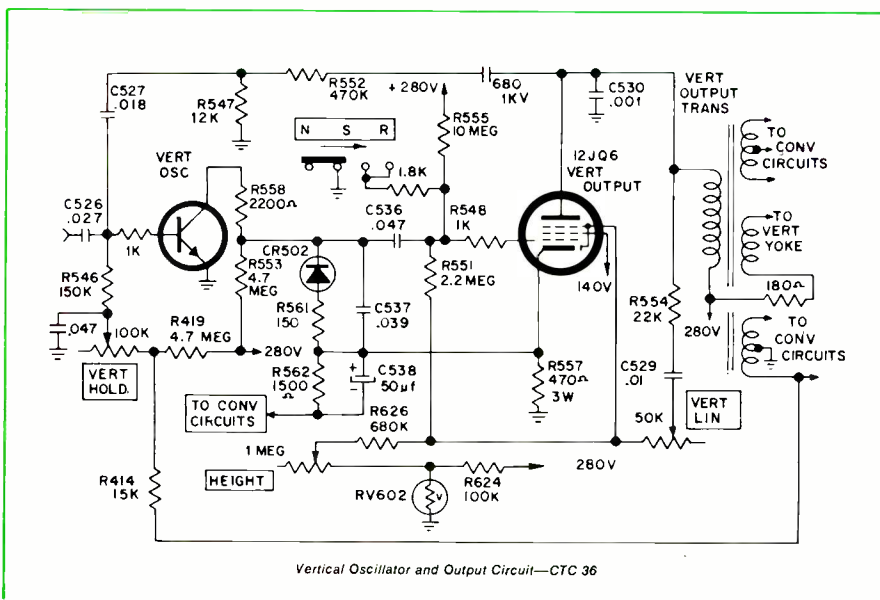
The linearity and height control circuits function in the following manner: During retrace time the capacitor (C529) in the linearity circuit is charged through the conduction of the internal diode. The discharging of this capacitor through the linearity and height control circuits during field scan provides the feedback waveform for linearity. The linearity control setting determines the amount of charge that C529 receives during retrace, thus the proper waveform for linearity can be attained. Adjustment of the height control, however, primarily determines the average dc of the waveform, and in so doing provides the bias control for proper picture height setting.

A detailed schematic of the vertical oscillator and output stages in the CTC36 can be used to point out several other features. The oscillator is provided with an additional triggering waveform component derived from the transformer secondary windings. The waveform is coupled to the base circuit of the oscillator via R414, the vertical hold control and R546. The dc base bias is provided from the B+ supply to the junction of the hold control and R414.

A diode (CR502) is coupled across the sawtooth forming capacitor C537. The purpose of this diode is to prevent an instability condition, because C537 would otherwise charge to cathode voltage potential during retrace; any disturbance in the output tube could then be regenerative and cause a severe jitter in the picture. With CR502 in the circuit, the voltage across C537 at the start of each cycle is substantially constant (namely the forward drop in the diode) independent of what the cathode voltage was in the preceding cycle. Thus, by guaranteeing that at the start of every cycle the grid drive on the tube always starts at the same point (for a given setting of the controls) the above mentioned instability is prevented.

A VDR (RV602) is located in the height control circuit to maintain substantially constant reference voltage to provide height "tracking" with line voltage variations.

The normal-service-raster switch grounds the grid circuit of the output tube through a 1.8K resistor when in the service position to collapse verti-



Vertical Oscillator and Output Circuit—CTC 36

generate



The **RCA WR-50B** RF Signal Generator with sweep features is versatile, portable, and exceptionally well suited for alignment and signal tracing of AM, FM, hi-fi and citizen's band receivers and trouble-shooting in nearly all sections of TV receivers. IT'S ONLY \$65.00.* Also available in an easy to assemble kit, WR-50B(K).



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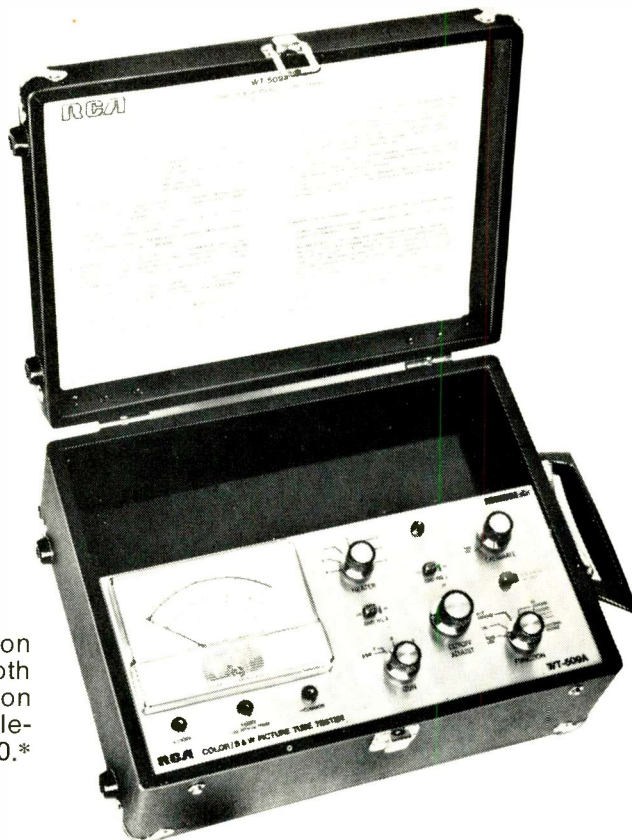
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color



The **RCA WT-509A** Picture Tube Tester is a precision instrument in the famous RCA tradition. It tests both color and black and white picture tubes for emission quality, interelectrode leakage, and shorted elements. It's all solid-state AND IT'S ONLY \$118.00.*



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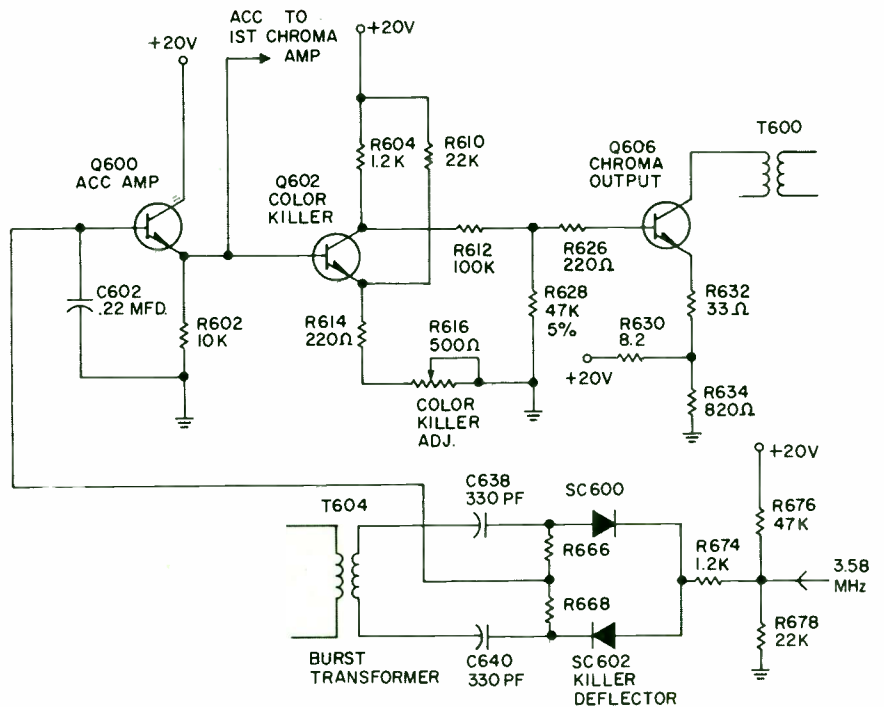
cal sweep for making color temperature adjustments. The function of the 1.8K resistor is to provide protection for the diode and transistor from picture tube "arcs."—COURTESY OF RCA VICTOR.

SYLVANIA

Color TV Chassis D12/D13—ACC and Color Killer Circuits

When color burst is received, it is gated by blanker transistor Q604, then fed through burst amplifier Q614. After amplification it is coupled through burst transformer T604, to the ACC and killer detector circuit. Opposite phases of the burst signal are coupled

at the emitter is used for two purposes: It serves as an ACC voltage for the 1st chroma amplifier and as "turn off" bias for the color killer stage. When the burst signal is absent, only the reference signal is applied to the ACC detector diodes and the voltage at the resistor junction is more positive (four to six volts). This voltage will bias "on" the ACC and color killer transistors, which causes the collector of color killer transistor Q602 to drop from 20v to about 5v. This provides about 1v to the base of the chroma output stage which biases it off completely and blocks spurious color channel signals. It should be noted that 1v applied to the base of the chroma output stage is sufficient to cut it off because the emitter is already positive due to the divider action of emitter resistor R634 and R630 from the 20v line.



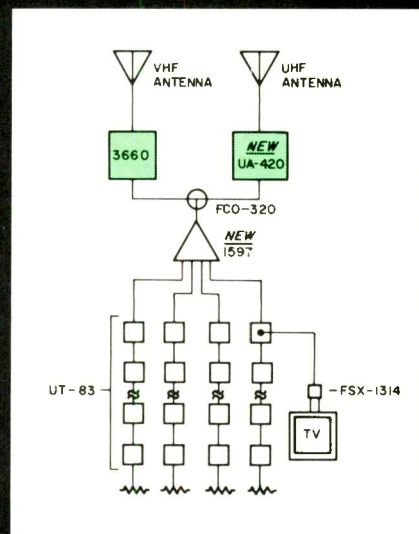
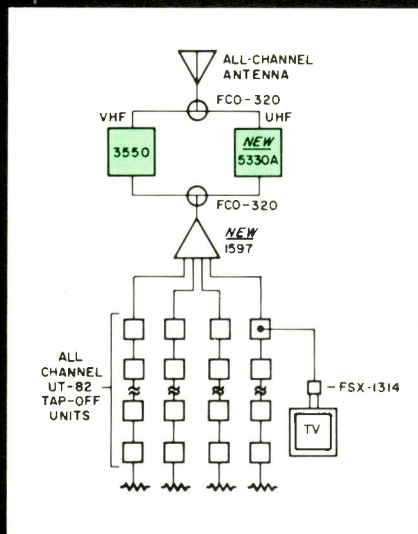
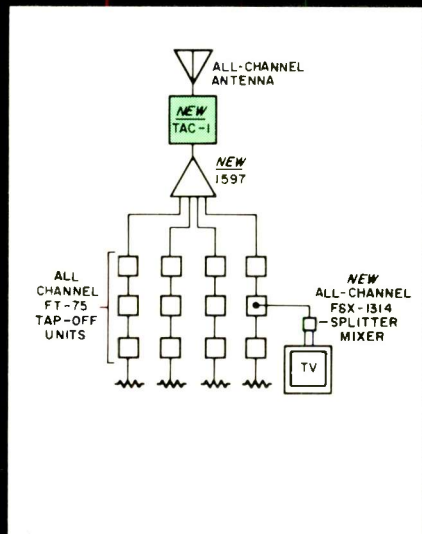
to the cathode and anode diodes SC600 and SC602. These two signals of opposite phase are compared in amplitude with a 3.58MHz reference signal. The reference signal is applied to the opposite anode and cathode of the diodes at all times.

During the presence of a burst signal, one diode conducts more than the other and produces a less positive voltage at the junction of R666 and R668. This less positive voltage is used to bias "off" ACC amplifier Q600 to produce a reduced output bias voltage at its emitter. The less positive voltage

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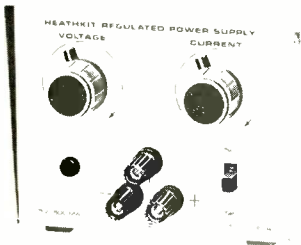
City _____ State _____ Zip _____

NEW PRODUCTS

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly

Power Supply 710

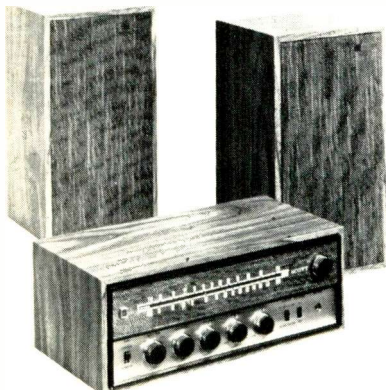
Introduced is the Model 1P-18, a 1-15vdc regulated power supply. Voltage is regulated to a 40mv variation, no-load to full-load; there is said to be less than .05 percent change in output



with an input change from 105-125vac. The unit is current limiting and continuously variable from 10 to 500ma. Ripple and noise are said to be under 0.1mv and the transient response time is 25 μ s. Output impedance is 0.5 Ω or less up to 100kHz. Can be programmed for either ac or dc (3ma driving current on dc). The all-silicon transistor power supply and circuit board construction make for easy, quick assembly and light weight. Price \$19.95. Heath.

AM/FM/FM Stereo System 711

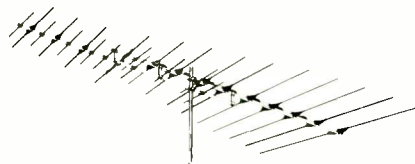
A compact AM/FM stereo system, complete with air suspension speakers is announced. The Scottie is small enough to fit on a night table or kitchen counter and can be operated from a 12v battery as well as from standard 110v house current. Complete component controls provide tape monitoring, speaker balance, front panel headphone jack and input switching to accommo-



date AM, FM, FM stereo, both monophonic and stereo phono, tape and tape cartridge. Internally, the system incorporates the same all-silicon circuitry with FET and IC's as is employed in the more expensive systems. Full complementary output stages, a new development, are said to provide virtually undistorted sound at even the lowest listening levels. The dimensions are 4 7/8in. height x 13 3/8in. length x 6 3/4in. width. Retail price \$199.95. For an additional \$59.95, an optional automatic turntable, complete with walnut base, magnetic cartridge and diamond stylus can be obtained. Scott.

Antenna 712

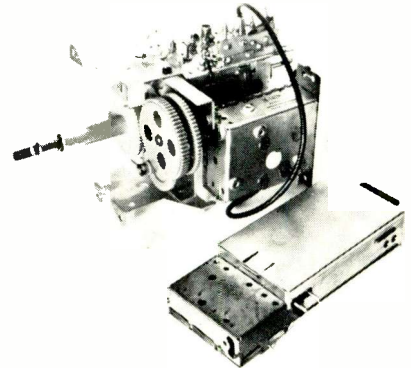
An all-channel VHF FM color antenna incorporating "Log Periodic Drive" is introduced. This Super Target (ST series) antenna is said to eliminate the need for two antennas for VHF FM color reception. It combines features of Log-Periodic and Yagi type



arrays. Mechanical features include all new fittings and special alloy aluminum tubing for added strength. Construction is said to reduce installation time. S & A Electronics.

TV Tuner 713

A new solid-state television tuner that is said to make precise selection of UHF color and B/W programs as simple and easy as tuning channels 2 through 13 (VHF) is announced. The new UHF tuner (for channels 14 through 83) is a companion to the solid-state VHF television tuner announced earlier this year by the company. Both of the new tuners employ specially developed varactor diodes that eliminate the mechanical switching of the conventional VHF tuner and the ganged capacitors (condensers) and gear mechanisms of the conventional UHF tuner. Fully compatible, the two tuners will be marketed by the company as a single package to provide preset, all-electronic



tuning across the full spectrum of commercial television programming. The all-channel varactor tuning package is much smaller than present-day combination UHF/VHF television tuners. The UHF varactor tuner is about the size of a penny box of matches; the VHF varactor tuner is about the size of a pack of 100-millimeter cigarets. Standard Kollsman.

Projection System 714

A complete CCTV projection system that projects either over-the-air TV programs (Channels 2 to 83) or closed circuit TV programs onto a screen up to 9ft by 12ft is announced. As an instructional tool the unit eliminates the need to disperse video monitors or TV sets throughout a large group. Thus, the attention of the group is focused on a single large screen and there are fewer chances of distractions. Depending upon the size of the room and size of the audience, Projecto-Vision can project a picture 4 1/2 x 6ft, 6 x 8ft, or 9 x 12ft. The electronic control portion of the unit is contained in a



compact portable housing with the optical portion in another housing. This permits the projection portion of the system to be mounted away from the control portion. The optical system can be ceiling mounted and can be remotely operated from the control unit placed on a desk or table. The projection unit can also be placed on the control housing and the entire system placed on a portable cart and wheeled from one location to another. The unit has 600 line resolution. Bright, sharp pictures reportedly can be projected under normal room light permitting note-taking in lectures, seminars or business briefings. The control unit uses loop-through feeding for running more than one projector at a time. It also has a standard video output, making it compatible with any video tape recorder. A remote control unit for operating the projector up to 400ft away is also available as an accessory. Price \$3000. GDC.

Digital Multimeter 715

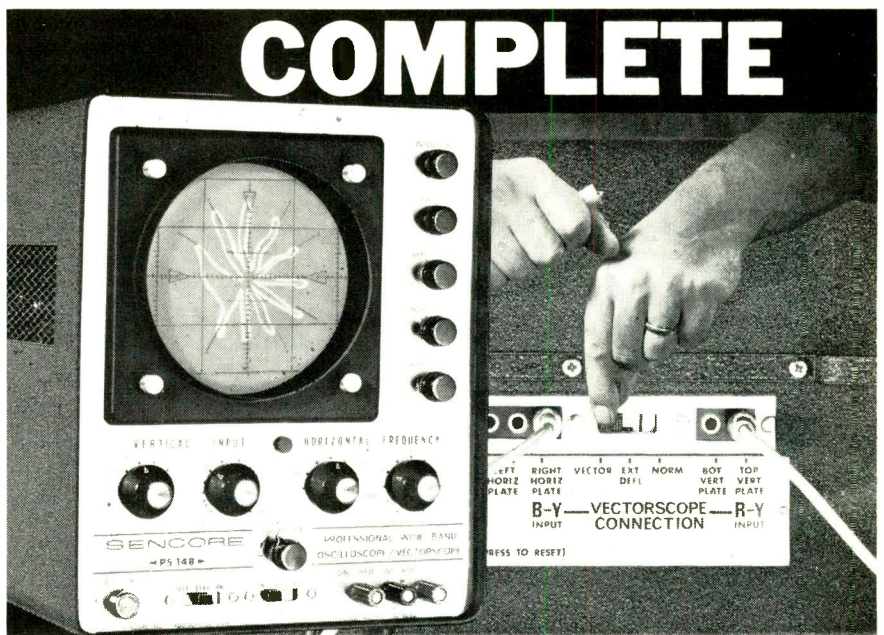
Announced is a digital multimeter designed to fill the gap between inexpensive VTVMs and high priced lab type DVMs. The model DM330 digital multimeter features pushbutton control of ranges and functions, .1% accuracy on dc, 1K, common mode



rejection of 100 db (from dc to 1kHz with 1K source imbalance) and optional ac volts (50Hz to 10kHz with 10M impedance). Reading speed is to be as fast as 10 readings per second. A carrying handle, which also functions as a tilt mechanism, allowing the unit to be tilted up or down, is provided as standard equipment. Because of its low price, small size, versatility and accuracy, the meter is reportedly suited for most VTVM applications such as voltage checks for general purpose laboratory measurements, production measurement applications, and radio/TV repair. Darcy.

Audio Connectors 716

Introduced is a new line of multi-pin adapters and cable assemblies designed especially for making those once impossible connections between foreign and/or domestic audio components. The new connectors and cable assemblies are said to mate with multi-pin outputs and inputs on tape re-



NEW OSCILLOSCOPE/VECTROSCOPE

With just the flip of a switch



A truly remarkable service scope; complete for every servicing test recommended by any and all TV manufacturers. For the very first time, here is a scope sensitive enough to view the IF tuner output but with adequate high voltage protection to view the plate of the horizontal output tube directly. Leave the rear view switches in their normal position and you can use the PS 148 to service color TV from chroma take off to the tri-color tube following the standard RCA "S" pattern approach. Flip the VECTOR switch on the rear and you have converted to a standard vectroscope . . . and for only \$20.00 more than the Sencore scope without vectors. Compare these specifications and you will be convinced that the PS 148 is the most complete, versatile, scope on the market today.

- **Direct Peak to Peak Voltage Measurements.** Read the peak to peak waveform voltage directly from the vertical input controls. Faster and easier than a VTVM and extremely accurate.
- **Wide Band.** Vertical amplifier frequency response is flat from 10HZ to 5.2MHZ \pm 1DB.
- **High Sensitivity.** Vertical amplifier sensitivity of .017 volts RMS per one inch deflection. Ultra sensitive for transistor servicing and for viewing signals directly off a TV tuner.
- **Direct and Lo-Cap Probe** on one cable for maximum versatility. The Lo-Cap probe can handle high voltage signals up to 6000 volts peak to peak.
- **Extended Horizontal Sweep Frequencies.** Horizontal sweep ranges from 5HZ all the way to 500 KHZ in five overlapping steps; allows you to look at higher frequency waveforms. Sync is so positive you would think it has triggered sweep.
- **Exclusive Vectroscope Features.** Flick one switch at the rear of the PS 148 and you have an easy to use vectroscope. This new vector pattern greatly simplifies chroma trouble shooting and bandpass alignment.
- **Minimum Circuit Loading on Vectors.** Prevents distorted vector patterns due to lead capacity loading by having vectroscope connections on rear of PS 148.
- **Special Vectorgraph Screen.** Shows exact degree of chroma demodulation.
- **Provisions for intensity modulation and direct connections to CRT deflection plates on rear for forming lissajous patterns, etc.** Just a flick of two switches; no need to disconnect leads or make special connections.

PS 148
\$219⁵⁰



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ET/D NEW PRODUCTS

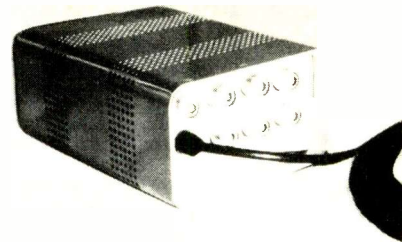
coders, cassette recorders, amplifiers, speakers, etc., from such manufacturers as Ampex, Norelco, Uher, Grundig, Sony, Korting and many others. The new line is made up of four basic types of connectors, with variations that expand the line to eight different connector options. The first of the con-



connector types, No. 330C, is an 8-in. stereo adapter cable with a European-type 5-pin cord plug (at 180deg) and two Switchcraft phono extension jacks. A black phono jack is wired to pin 3 on the connector, a red jack is wired to pin 5, while the shells of both jacks are wired to pin 2. The second connector type, No. 25DK32, is a 6ft Hi-Fi cable with a European-type 2-pin male cord plug and a Switchcraft phono plug intended for adapting two-contact female speaker connections or other receptacles where a phone plug termination is needed. A variation on this type, Nos. 32ZK86 and 32ZN86, Hi-Fi cable offers a European-type 2-contact female cord plug and two alligator clips with either 6 or 10ft of cable. This type is ideal for use as a quick connect-disconnect to speaker or other terminals. Also available is a speaker extension cable which combines a European-type 2-pin male cord plug to a European-type 2-contact female cord plug. The parallel cord of the connector cable is available in either 10ft (No. 32ZN36) or 15ft (No. 32ZK36) lengths. The last of the new types is a stereo Hi-Fi cable that has a European-type 3-pin male cord plug (at 180deg) and two color-coded Switchcraft phono extension jacks. The parallel cord of the stereo Hi-Fi cable is available in either 6ft (No. 33KK25) or (No. 33FN25) lengths. Switchcraft.

CCTV Video Switcher 717

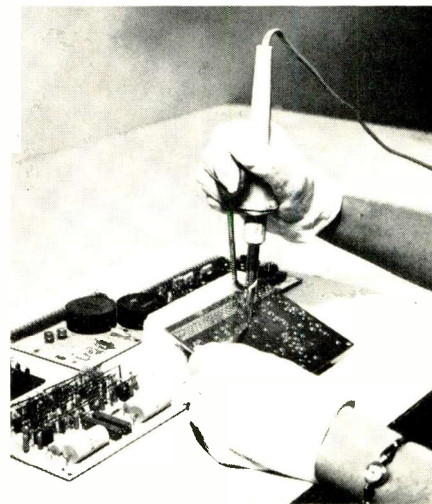
A new CCTV video switcher in the low price range is introduced. The transistorized Model SW3 features looping inputs, 800 lines horizontal resolution, high isolation and add-on capability for more inputs and outputs. Switching is done by combining diode bias action with video transistor switch-



ing. The remote control allows convenient location for optimum cable routing. The unit is designed for three inputs and one output. Included are UHF type connectors, terminating switches, push-button selector, remote cable and power supply. Price \$124.50. Alaun Engineering.

Desoldering/Soldering Tool 718

A new, desoldering/soldering iron, called TIP Solder Sniffer, created especially for quick and accurate repair of printed circuit boards where rework requires replacement of faulty solder joints or components, is introduced. The tool can be used on both encapsulated and unencapsulated circuit boards, thus it is important to use the



correct TIP size and design from the many available for every requirement. The unit should first be allowed to heat for 3 or 4 minutes before attempting to use it. For desoldering, the rubber bulb is depressed with the index finger. As the solder melts, a sudden release of the bulb will draw the melted solder into the reservoir. The old solder is ejected by rapidly compressing the rubber bulb. To replace the solder, the TIP is used as you would a conventional soldering iron . . . leaving the bulb alone, not depressing it. Thermal Industrial Products.

Cable Stripper 719

Announced is a new low-cost "Swivel-Blade" cable stripper for end or center stripping. The cable stripper

is said to permit easy, fast and accurate stripping of most types of common electrical cable. Simply insert cable in the stripping guide, rotate the tool for a circular cut, and then pull it along the cable for an axial cut. The swivel-blade automatically turns to the same direction in which the tool is moved. This eliminates repositioning of tool to perform separate "ringing" and slitting operations. It reportedly cuts the outer



sheathing neatly without damaging the inner insulation or conductor and can be used on coaxial and poser cables of approximately 5/16in. through 3/4in. o.d. The blade is adjustable to handle insulation thicknesses up to 5/32in. This tool is said to be ruggedly constructed to take a lot of abuse, yet it is sufficiently small (5 1/2in. over-all length) and light weight (3 oz.). Two models are available—with or without a utility knife. Both are furnished with an extra slitting blade, which is stored in the handle. Ideal.

Scope Cart

720

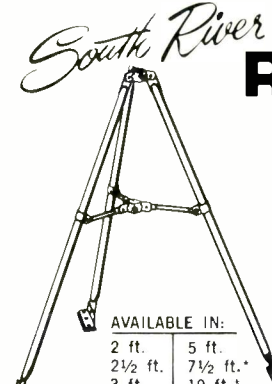
A versatile new scope dolly, Model LOW-8, is introduced. The top shelf of this new unit will take a large variety of instruments and can be adjusted to three positions for convenient viewing angle. The bottom shelf offers additional capacity. Both shelves are constructed of 3/4in. plywood laminated with a heavy metal. The shelves are nested in a framework of 1-in. square tubing. The cart is equipped with an outlet box with three outlets. Prewired and ready for use, the outlet box fea-



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*Exclusive swing-lock feature permits mast to be placed in sockets from side of tower

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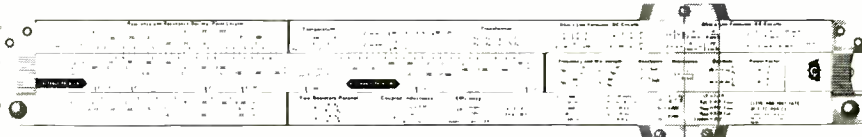
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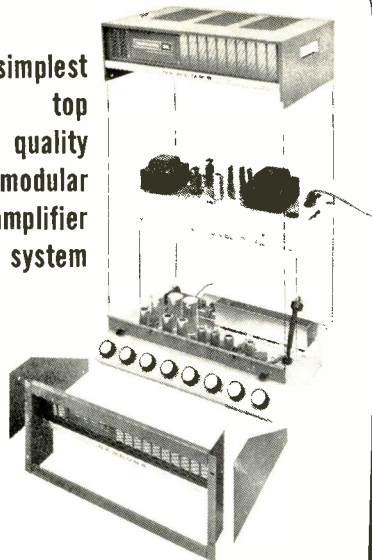
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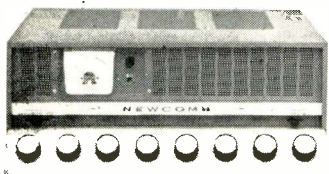
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Newcomb's finest, the Custom K Series is the climax of 30 years devoted to developing and producing the very best public address amplifiers. You quickly and simply get the combination of channels and power you need. A power output module is dropped into either a front-end or booster chassis. Two electrical plug-in connections; no soldering. Put a cover over the top or insert the chassis in a rack mount. You can plug in a transistorized VU meter accessory which has a sensitivity control and monitor jack for crystal headphones. The 4-channel models have provisions for a remote control accessory. There are 3 power amplifier modules: 40, 60, and 125 watts, and a power supply when you want to use a front end as a mixer-preamplifier only. There are three preamplifier modules: 3, 4, and 5 channels, and a chassis for making a booster amplifier out of any of the output modules. All in all, only 14 components permit 70 combinations. Performance is superb. Frequency response is ± 1 db 20-20,000 cps; distortion is extremely low. Custom K amplifiers run remarkably cool. Easy-to-trace, easy-to-service vacuum tube construction is used throughout. Colors are soft shades of gray-green. Write for Catalog K-15.

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ET/D NEW PRODUCTS

tures an on-off switch, pilot light and a panel-mounted fuse. It is rated at 15a, 130v continuous duty. The unit measures 34in. height x 19in. width x 31in. length and has rubber tired casters 3in. in diameter. Price \$79.50. Waber.

Zoom Lens 721

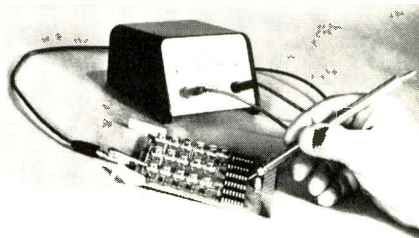
Announced is a new zoom lens for vidicon cameras. The model V6 x 16 has a focal length of 16mm to 95mm and a speed of F2.0. This lens is ideal for classroom, sales training, medical



and industrial use. It is available in several versions such as manual operation, motorized, with rear control rod and cable drive accessories. The addition of this lens to the line gives the company a wide assortment of zoom lenses including 25mm to 100 F1.8, 20 to 100 F2.5, 15 to 120 F1.3, 15mm to 150mm F2.8 and 15mm to 170mm F2.5. All lenses are available in all versions. Canon.

Continuity Tester 722

A new portable, battery-powered tester that is said to put less than 1ma into the circuit, eliminating damage to delicate electronic components, is introduced. It has a tone pitch that cor-



responds to the amount of resistance in the circuit. The probes are polarized for testing diodes, transistors and other semi-conductors. The Safetone Tracer, unlike conventional testers is currently limited to 1ma for circuit overload protection thus reportedly preventing burnout or degrading the reliability of expensive items such as integrated circuits, transistors and diodes; nor will it cause surface arc burns. Continuity is indicated by a pleasant tone whose

pitch changes over a 1K range. Higher resistance causes a higher pitch making it easy to identify defective parts or errors in wiring with complete eye freedom. The leads are removable and may be extended for two-man testing. Price \$19.50. Western.

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Tuner is cleaned, defective parts are replaced... then your tuner is aligned to exact factory specifications on all channels. Tuner is returned promptly with a 3 month warranty.

ALL THIS FOR THE LOW PRICE OF

\$9.95 (transistors, tubes and parts are extra)

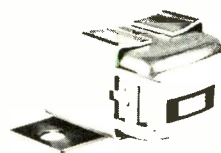
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Frederick Laraway Jones

FBI Seeks Navy Deserter

FBI assistance has been requested by U. S. Naval authorities to locate Frederick Laraway Jones, a long time absentee, who allegedly deserted the Navy in March 1965.

Jones was previously enrolled in a television and home study course and was reportedly a subscriber to an electronics magazine. Therefore, he may seek employment in some field involving mechanical or electronic equipment.

Jones, who has also used the aliases, Robert Alden, Robert Allen and Robert Laraway, is a white male, born April 19, 1942, Tondo, Manila, Philippine Islands. He is 5ft in height, weighs about 125 lb, has black hair and hazel or brown eyes, dark complexion, birthmark left middle forehead, and has what is reportedly described as an "evil eye," believed to be the left eye.

In the event you have any knowledge concerning the whereabouts of this individual, contact the nearest FBI office. The telephone number of FBI offices may be located on the first page of local telephone directories.

Motorola Introduces Solid-State HV Rectifier

Motorola stretched its lead over the remainder of the consumer electronics industry in solid-state color television technology with the introduction of a solid-state high voltage rectifier and a solid-state remote control system.

Both developments will be employed in selected models of the 1969 color television line of the consumer

products division of Motorola Inc., to be introduced in mid-June, according to George L. Mansour, corporate vice president and manager of television products.

With the introduction of the solid-state HV rectifier, Motorola has made possible all-solid-state color television receivers with no receiving vacuum tubes.

Motorola's solid-state high voltage rectifier is said to combine state-of-the-art silicon rectifier chips of excellent uniformity with a unique encapsulant to provide a humidity- and corona-resistant package with mechanical strength.

The company engineers have also introduced high-voltage module which can update existing Quasar model receivers. Besides providing an important service feature, this means that older receivers can be updated when significant technical advances occur.

With the solid-state remote control system for color television receivers, Motorola believes it has eliminated problems caused in existing remote controls by the mechanical coupling of a potentiometer to a small dc motor whose life often has been less than adequate and whose operation has tended to be noisy. Motorola's solid-state, all-electronic control system

Curved jaws that wrap around and really grab hold of round work such as pipe. Smooth, machined, undercut mating parts that can't slip (the tighter *YOU* grip, the tighter *THEY* grip). Long, slender handles that give you tremendous leverage. Slim design that noses into hard-to-reach spots. In short, all the "muscle" of a pipe wrench PLUS the fast, easy handling

of a plier . . . YOURS with CHANNELLOCK Curved Jaw Tongue and Groove Pliers.

Available in two sizes:
 No. 422, 9 1/2 inch, 1 1/2" jaw capacity
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CAUTION: Make sure you're getting the ORIGINAL, GENUINE CHANNELLOCK . . . look for the trade mark on the handle.

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Jerrold AIM-718 Signal Strength Meter

First signal strength meter designed with the diverse technical tasks of today's TV Professional in mind.

- All solid-state
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- Compact, lightweight design
- Long-life battery operation
- Audio output jack, crystal earphone provided
- Two built-in attenuators (20 dB on UHF; 20 or 40 dB VHF)
- Safety switch turns off power when cover is closed

Loaded with profit-making uses

Since it weighs only 4 lb. 6 oz., the AIM-718 can be used at the bench or taken right up on the roof to:

- Measure incoming TV signal strength—channel by channel
- Orient antennas for best reception
- Troubleshoot MATV and CCTV systems
- Measure loss in download and distribution lines
- Determine noise figure, S/N ratios of TV amps and preamps
- Make power and voltage gain checks
- Check output level of signal generators
- Signal trace TV preamps, amplifiers, and tuners

You'll satisfy more customers when you use an AIM-718. And satisfied customers will let the word get around about you. So do the job the professional way... the business-building way... the profitable way. With the Jerrold AIM-718 Signal Strength Meter. Price: less than \$200.

For further information on the AIM-718, write: Jerrold Electronics Corporation, Distributor Sales Division, P.O. Box A, Philadelphia, Pa. 19105.



Focusing on one thing... better reception

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ET/D NEWS OF THE INDUSTRY

employs a unique "memory module" which makes possible continuously variable function adjustment with the ability to stop and hold at any desired setting. The setting, thanks to the "memory," may be stored or held electrically.

The "memory module" includes a neon bulb which acts as an electronic switch, a special capacitor and an insulated gate field effect transistor (IGFET).

These devices in the "memory" circuit store the tuning information, retain and maintain it at a predetermined level even while the receiver is inoperative. When the receiver is again turned on, it should not be necessary to readjust the controls.

Raytheon Tubes for Imported Sets

Fulfilling an industry need as a source for replacement tubes used in popular television receivers and Hi Fi, recording and stereo set imported from Japan and in wide use throughout the United States, Raytheon Co.'s receiving tube operation has introduced a new line of 43 special tube types.

The Raytheon TFIS (Tubes For Imported Sets) series was selected to meet service dealers' replacement requirements for the following sets: Sony, Panasonic, Toshiba, Hitachi, Delmonico, Sharpe, Standard, Western Auto's Truetone, Sears' Silvertone, Gamble Skogmo's Coronado, Montgomery Ward's Airline, and J. C. Penney's Pencrest.

Boyd B. Barrick, manager of Raytheon's receiving tube operation, said the new tube types were not available from any other major supplier in the United States and represented a special availability for distributors. He said the 43 TFIS tubes will be offered to distributors in packages of five tubes each.

RCA To Train 400 Hard-Core Jobless

Radio Corp. of America will train 400 of the nation's hard-core jobless in four cities as skilled workers in the mushrooming electronics industry.

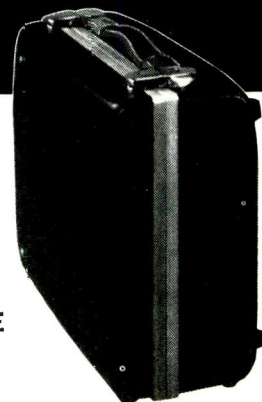
In a ceremony in Washington, D.C., RCA Service Co. President Edgar H. Griffiths and Asst. Secretary of Labor and Manpower Administrator Stanley H. Ruttenberg signed a \$2.5 million training contract. The 400 will be trained as television repairmen at RCA Service Co. facilities in Camden, Newark, Chicago and Los Angeles.

NEW!

- TUBE TESTER
- GRID CIRCUIT TESTER



- ✓ CHECKS B & W PICTURE TUBES
- ✓ CHECKS COLOR PICTURE TUBES



**MODEL
88A
IN NEW
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Complete coverage of all popular receiving tubes including novars, nuvistor, newest 10-pin types, compactrons, decal and magnovals — PLUS a black and white CRT Adapter and two COLOR CRT ADAPTERS. Patented Grid Circuit Test makes up to 11 simultaneous checks for leaks, shorts and grid emission — plus Tube Merit and Filament Continuity Tests. For 115 VAC operation. Complete with speed indexed setup data. Mounted in durable NEW MOLDED ROYALITE CASE. Dimensions: 9½" x 12½" x 5". Shipping weight 6 lbs.

MODEL 88A Complete with Adapters **\$89.50 NET**
Model 88A Less Adapters **\$84.50 NET**



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ELECTRONIC TECHNICIAN/DEALER

A substantial portion of the program's cost will be assumed by RCA. This will include administrative staff and attendant costs, training center facilities, and all office, classroom and laboratory equipment. RCA anticipates spending about \$1 million over and above the government's investment.

Griffiths expects that RCA's "Four Cities Program" will "help alleviate one of the most acute problems in the electronics industry—a shortage of from 50,000 to 75,000 technically trained service people."

The program calls for the training of 80 persons each in Camden and Newark and 120 each in Chicago and Los Angeles.

The training period will last 18 months, during which time the trainees will earn \$1.80 to \$2 per hour.

After training qualified graduates can progress through stages to \$3.45 an hour.

The RCA project is part of the TEST series of the president's JOBS program, aimed at mobilizing the resources of private business and the federal government to help find jobs and provide training for the hard-core unemployed in or near ghettos.

Two-Hour Cassette Offered By 3M Co.

The 3M Co., St. Paul, Minn., has announced a special introductory offer for the company's new two-hour magnetic tape cassette.

D. E. Denham, general sales and marketing manager of 3M's magnetic products division, in making the announcement, said, "for a limited time only we will offer the merchant 12 Scotch brand 60min cassettes free with every gross of our new 120min cassette ordered."

3M's new two-hour cassette features the company's low noise Dynarange tape which provides improved short wavelength (high frequency) response while offering complete compatibility with slow speed recording applications. The new two-hour C120 cassette also reportedly offers "a new and vastly improved shim material which offers total reliability while eliminating tape binding and jamming. The new shim material effectively reduces frictional drag and has the effect of increasing recorder battery life by nearly 25 percent."

The new cassette is packaged in a high impact plastic album style container.

NAB Asks FCC To Reject Proposal To Narrow Audio TV Monitor Range

The National Assn. of Broadcasters urged the Federal Communications Commission today to reject a proposal that would narrow the range of aural frequency monitors for television stations.

FCC rules for type-approved equipment now require a 3kHz range above and below assigned center frequency in aural frequency monitors. The FCC is considering a requested amendment to permit a minimum range of 2kHz plus or minus cycles.

Douglas A. Anello, NAB general counsel, said the association is "sympathetic" toward the petitioner's argument that the change would lead to design of a TV frequency monitor with digital readout, but added that it might present "difficulties" in determining correct performance of TV transmitters.

Mr. Anello noted that some manufacturers of AM and FM radio frequency monitors have sought approval of new equipment with an even wider range than is now specified by the FCC.

"In view of the difficulties which may be encouraged," he said, "...the NAB respectfully requests that the present FCC type-approved rules and regulations concerning the indication range of the aural frequency monitor for television stations be continued and the petition be denied."

Your next tuner cleaning job could cost somebody 15 bucks.

You.

You blow about 15 bucks every time you have a contact cleaning call back. Isn't it worth spending a few extra minutes to save that \$15 and your customer's good will? Then do the job right the first time with ContaCare Kit III. Unlike sprays that simply push the "gunk" around to dry and harden, ContaCare does a thorough cleaning and lubricating job. You just pour the special liquid cleaner on the lint-free cloth applicator and wipe away all film, dust and dirt. Then apply a little of our permanent lubricant to the contacts. The job's done—right. And you may have saved yourself \$15. ContaCare is non-flammable, non-conductive, and provides trouble-free results for both black & white and color sets. Properly used, ContaCare Kit III will provide you with over 100 cleanings. Available at parts distributors. Price \$1.98



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E.F. Johnson Co. Acquires Omnitronix, Inc.

The E. F. Johnson Co., Waseca, Minn., manufacturers of Citizens Band, business/industrial two-way radio communications equipment and electronic components, has acquired Omnitronix, Inc. of Houston, Tex., for an undisclosed amount of stock. Omnitronix is a specialized electronics company which designs and manufactures instrumentation systems for off the shelf delivery as well as special customer requirements. The product line includes peak readers, power supplies, recorder-testers, telemetry systems and auxiliary equipment for chromatographic analyzers, most of which are applicable to either manual or computer type operations.

General Instrument Introduces Field Effect Transistor

The General Instrument Corp. introduced an N-Channel dual insulated gate field effect transistor, known as MEM554.

The device, according to General Instrument, possesses characteristics

well suited for a wide range of RF applications from the broadcast band through 400MHz.

The unit features series gate construction which makes the device the equivalent of an integrated cascode amplifier. Gate 1 is normally used for the RF signal and Gate 2 is normally used for the gain control signal.

The outstanding characteristics of MEM554 include: low cross-modulation distortion characteristics, both as an RF amplifier and linear mixer; low feedback capacitance (typically .02pf, limited by package configuration) enabling large unneutralized stable gains to be obtained; large dynamic range with AGC (typically 500mv RMS) for 1db deviation from linearity; and high RF power gain and low noise (typical power gains are 18db at 200 MHz and 3.0db noise figure).

Wald Electronics Introduces New Coaxial Cable

Colorshield, a completely new 75 Ω UHF/VHF 59U-type coaxial cable with phenomenally low attenuation loss is introduced by Wald Electronics of Sun Valley, Calif.

The 82-channel cable is constructed of a solid copper conductor surrounded by a foam (cellular) dielectric in-

ulator with a double-sided aluminum sheath for 100 percent shielding and two braided copper drain wires. The cable is enclosed in an all-weather poly jacket.

Manufacturer's specifications indicate the following attenuation in decibels per 100ft: Frequency 57MHz, 1.9; 220MHz, 3.9; 450MHz, 6.1; 650MHz, 6.8; and 850MHz, 8.3.

Riker Video Acquires JFD Electronics

Robert Dressler, president of Riker Video Industries, Inc., announced the acquisition of JFD Electronics, a major manufacturer of television and FM antennas, MATV equipment, precision capacitors and a broad line of electronic components. JFD is the fourth acquisition in 1968.

JFD, with facilities in New York and North Carolina, has sales in excess of \$20 million. This acquisition is the largest made by Riker and when concluded will nearly double the company's sales volume.

The transaction involved an exchange of stock. The purchase price was not revealed.

Albert Finkel, president, and the present management of JFD, will continue in their current capacities.

FIRST WITH

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- ★ 4 Crystal-Controlled Oscillators
- ★ Battery & AC Operation Standard



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KIT \$83.50 WIRED \$114.50

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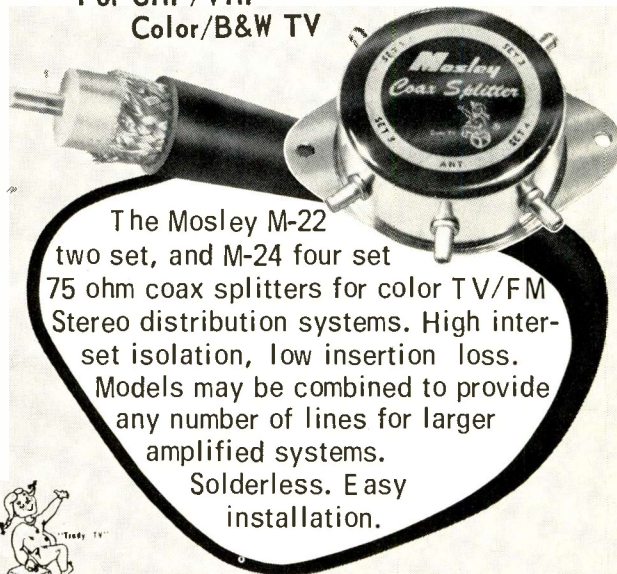
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NEW COAX LINE SPLITTER

For UHF/VHF Color/B&W TV



The Mosley M-22 two set, and M-24 four set 75 ohm coax splitters for color TV/FM Stereo distribution systems. High inter-set isolation, low insertion loss. Models may be combined to provide any number of lines for larger amplified systems. Solderless. Easy installation.



Write Dept. 159A for FREE detailed brochure.

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 ELECTRONIC TECHNICIAN/DEALER

Linear Integrated Circuit for Color Difference Signals in Color TV

A new linear integrated circuit designed to provide the color difference signals in a color television receiver is announced by the Sprague Electric Co. The integrated circuit is only 60 / 1000in. by 65 / 1000in. and contains 22 transistors, 26 resistors, two diodes, and one zener diode, all in an area the size of the letter "O" on a typewriter!

The integrated circuit color demodulator was developed at the company's R & D Center in North Adams, Mass.

The new Sprague Type ULX-2114K color demodulator employs two fully balanced quadrature detectors, operating simultaneously, to recover the blue and red information from the 3.58MHz chroma subcarrier.

To distinguish the blue from the red, each detector in the demodulator operates at a switching voltage of a proper phase derived from the transmitted color burst signal. The green information is derived internally by resistive matrixing. The gain and phase of the detectors have been chosen to match the chromaticity coordinates of the present sulphide phosphors, at the same time minimizing gamma distortion effects (Parker matrixing, 9300° K).

Operating from a 24v supply, the type ULX-2114K features 14.7v quiescent outputs with low thermal drift (typically 3mv/° C). Typical ac parameters are 10v P-P maximum B-Y swing and 5v P-P B-Y output for 350mv P-P of chroma injection. Color demodulators are packaged in a T0-100 case (10-pin T0-5). This unicircuit is capable of driving 3.3K loads at a power dissipation level of 300mw typ.

STATEMENT REQUIRED BY THE ACT OF OCTOBER 23, 1962, (39 U. S. Code, 4369) SHOWING THE OWNERSHIP, MANAGEMENT AND CIRCULATION OF ELECTRONIC TECHNICIAN DEALER published monthly at Duluth, Minnesota for November 1968.

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3. The known bondholders, mortgages and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

4. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was 83,599. Free distribution by mail, carrier, or other media: 1,365. Total distribution: 84,964.

(Signature) Dean Myhran
President

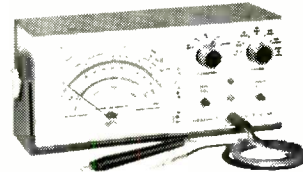
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**Heathkit IM-28
Bench Type VTVM**



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Wired
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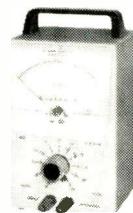
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Kit
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Wired
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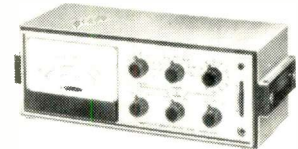
**NEW Heathkit IM-38
Lab AC VTVM**



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\$39.50
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- Features the Heath "New-Look"
- 10 AC volt ranges measure from 0.01 to 300 volts RMS full scale • Decibel range —52 to +52 total in ten ranges • Response 10 Hz to 1 MHz • 10 megohm input impedance • AC powered

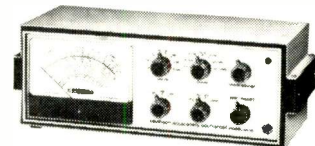
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Solid-State Volt-
Ohm-Milliammeter**



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Wired
\$115

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Solid-State
Volt-Ohm-Meter**



Kit
\$44.95
Wired
\$64.95

- 8 DC & AC volts ranges — 500 millivolts full scale to 1500 volts • 7 Resistance ranges measure from one ohm to 1000 megohms • 11 megohm DC input impedance, 1 megohm on AC • Battery or AC power

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Electronic Equipment

A new 338-page catalog of electronic equipment is released. The book lists over 200 lines covering all electronic requirements, and is designed to serve the needs of industrial, amateur, servicemen, dealers and sound systems users. It is indexed by item as well as by manufacturers' names. Eighty-four manufacturing companies are represented. Radio Products.

Tubes 400

A complete directory of electronic tubes is released. The directory lists some 5000 currently popular industrial, entertainment and military tube types listed in alpha numerical order with quantity discount prices for quick reference. In addition, it lists the manufacturers that make each type and their availability. Metropolitan Supply.

Rectifiers 401

A product review catalog provides an illustrated short form reference to the company's line of silicon and selenium rectifiers featuring fast recovery, high voltage, power and JAN types.

The catalog covers silicon rectifiers, bridges, plug-in tube replacements, oil cans, 20 types of JAN rectifiers and high voltage selenium rectifiers together with appropriate forward currents, peak inverse voltages and recovery times accompanied by outline drawings. Electronic Devices.

Electronic Equipment 402

A 1969 catalog of electronics equipment for industry and government is now available. This 600-page book is the largest issued by an electronics supply house and lists over 50,000 separate stock items from over 500 manufacturers for research and develop-

ment, production, communications, education, controls and entertainment. Listings show prices for purchase in various quantities of every type of component including integrated circuit devices, semiconductors, vacuum tubes, relays, timers, transformers, resistors, capacitors, connectors, coils, chokes, sockets, plugs, jacks, switches, fuses, batteries, clips, lamps, wire and cable.

Other sections show test instruments, two-way radios, recording equipment (including video-tape recorders), sound equipment, intercoms, FM monitors, power supplies, electronic counters, industrial silicones, epoxy material, chemicals, hardware, technical books, tools and soldering irons. Also included are selected high fidelity components, walkie-talkies and other Citizens Band units, TV sets for office and laboratories, outdoor antennas and towers, electronic accessories and test units for automotive use, car radios and stereo tape players. Allied.

Soldering Tools 403

Newly expanded, comprehensive literature details theory and benefits of temperature-controlled production soldering tools. A complete cataloging of these tools and a broad listing of selectable temperature sensing tips are included. The line of tools is suitable for most industrial electronic soldering applications. The compact, lightweight tools are available in various sizes for diverse workloads with most tip configurations and temperature changes accomplished by simply changing tips. Weller.

Antenna 404

Newly designed professional and Citizens Band radio antenna catalogs are available.

Both catalogs have been sectionalized in a new way to facilitate the location of the particular antenna or accessory need with material indexed for quick reference. The catalog is loose leaf in format with a quick change plastic

slip-on binder for simplified updating.

For consumer distribution, mailing and counter use, there is also a new condensed catalog of CB antennas and accessories and a special catalog promoting its new line of monitor receiver antennas. Antenna Specialists.

Coils 405

A 180-page coil and choke catalog with comprehensive cross-reference guide for replacement coils is now available.

The catalog gives specifications and prices for over 3300 coils and components in the general section. More than 35,000 replacement items are listed in the cross-reference section. Miller.

Wire and Cable 406

A four-page catalog describes the firm's expanded line of Teflon-insulated wire and cable.

As part of an all-new high-temperature wire program, the corporation developed 50 new miniature Teflon hook-up wires, RG/U transmission line cables and Type E shielded, Teflon-jacketed cables with one to four conductors thereby tripling its Teflon capability.

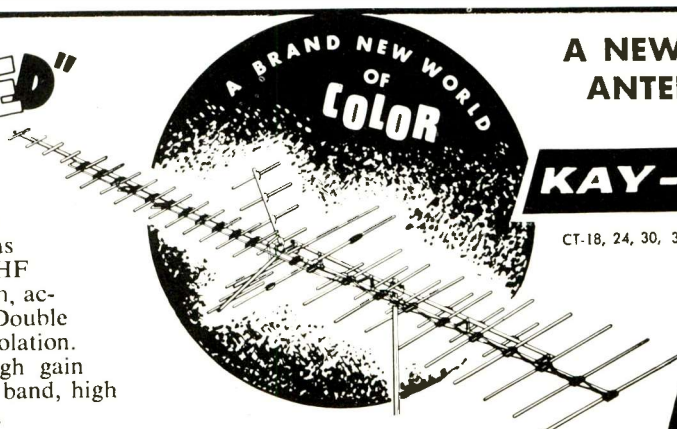
The two-color illustrated catalog describes basic specifications and accessory information for the company's Teflon-insulated products. Belden.

Soldering 407

An eight-page definitive "how to" booklet on the use of soldering irons is published. The publication eliminates the confusion concerning soldering by discussing such related items as solder composition, types of soldering and characteristics of soldering irons, including tip shape and size, construction and temperatures. Maintenance of the iron is also discussed along with factors affecting operator comfort and information regarding power supplies. Pictures, tables and graphs illustrate the various points made in the text. General Electric.

IT'S
"COLOR-TUNED"

Kay-Townes obsoletes the old "pass through" coupling system detrimental to color reception! Revolutionary, new design has high gain, 9 driven element UHF antenna coupled to VHF section, actually tuning the VHF section. Double stub VHF trap gives 100% isolation. Corner reflector doubles as high gain UHF reflector and broad, high band, high gain director on VHF channels.



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Antenna Systems 408

A flyer tells retailers how to increase sales with an 82 channel showroom system.

Available on request, this colorful flyer explains the advantages of a modern showroom system in demonstrating color TV, UHF (on channel), VHF and FM stereo, JFD.

Solid-State Multimeter 409

A four-page brochure with complete specifications on a solid-state multimeter with VTVM capabilities is available. It includes optional features, applications and pricing information. Non-Linear Systems.

TELEVISION FOR 1969...

continued from page 41

ferric-impregnated ring. The magnetic properties of this ring minimize pin-cushioning distortion and increase beam focusing over the deflection area. This feature is used in conjunction with the KCS171, 174 and 175 chassis.

SYLVANIA

Nineteen B/W television models in four screen sizes are introduced for 1969.

The B/W line includes four personal portable models featuring 74sqin. of viewable area. Two models feature 172sqin. of viewable area, and five have 184sqin. of viewable area. Eight models have picture tubes with 282sqin. of viewable area, including five consoles and three roll-about table-top models.

Each personal portable features a high-impact plastic cabinet; carrying handle; pre-set fine tuning; monopole VHF and bow tie UHF antennas; power transformer; DC restoration circuit; gated automatic gain control; horizontal blanking circuitry, and an all-transistorized UHF-VHF tuner. Two models feature 100deg shell bond picture tubes that allow for a more compact cabinet design. Options include a battery pack for remote operation with a carrying case, earphone, and a stand. Two models, also with earphone jack, have Sylvania's 90deg shell bond CRT.

Seven sets are included in the roll-about portable series in two screen sizes.

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Professional case included

B&K is proud to introduce Dyna-Probe, the new, longer, safer length, hi-voltage tester designed to give more accurate voltage readings. Servicemen carry Dyna-Probe to in-home jobs—adjust high voltage with greater accuracy, thus relieving customer fear of color TV X-ray radiation. Detachable meter is easy to read in "hard-to-reach" areas. Meter, on auto-tilt stand, direct-reads 0 to 30,000 volts. Dyna-Probe—another engineering breakthrough from B&K.

Model HV-30, \$24.95 user net



B&K Division of Dynascan Corporation
1801 W. Belle Plaine Avenue/Chicago, Illinois 60613
Where Electronic Innovation Is A Way Of Life

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The Deluxe Portable group includes two sets, each featuring a 17kv power master chassis and 114deg rim band CRT with 172-sqin. of viewable area.

The Custom Deluxe Portable group includes five sets. Each has a 114deg rim band CRT with 184-sqin. of viewing area. Roll-about stands and clock-timers for all of the units are optional.

Sylvania's 1969 line of 282sqin. sets includes eight basic models available in either Contemporary or Early American styles. Three units can be either table-top or roll-about models.

Five console models feature seven inch oval speakers. The units are available in either mahogany, walnut, or maple finishes.

ZENITH

Zenith's new 1969 line of color TV includes sets with an exclusive system of channel selection that brings to UHF the same "click-stop" tuning of VHF.

The Ultramatic tuning system is combined with AFC automatic fine-tuning control. This system assures precise tuning for color and B/W TV.

The tuning system lets the viewer automatically select as many as 18 pre-tuned channels which includes twelve VHF and six UHF channels. Channel selection is made with the touch of a finger at the set or on a remote hand control on Space Command "600" models.

The system can be programmed to tune any combination of six UHF channels in addition to VHF channels (two through thirteen) through a front panel adjustment of the tuner.

Adjacent channels can be tuned on either UHF or VHF frequencies. UHF channels may be pre-set in any desired sequence in the UHF spectrum.

Channels can be changed in two directions whether the set is manually or remotely controlled.

All color TV models in the company's fifty model line carry the new two-year color CRT warranty.

A three model series of 18in. diagonal screens feature a transformer-powered handcrafted chassis with 25kv of picture power, solid-state three stage IF amplification and a metal cabinet with a vinyl covering. ■

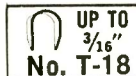


STAPLE GUNS



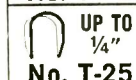
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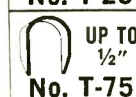


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No. T-75

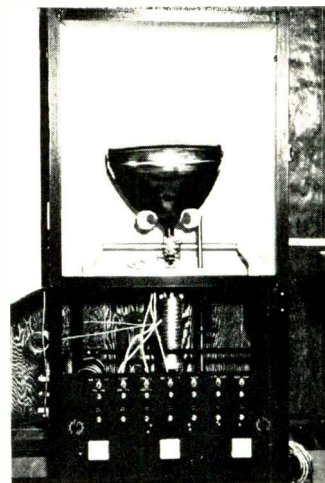
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ELECTRONIC TECHNICIAN/DEALER

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TEST AFTER TEST HAS PROVEN
COLOR LUBE

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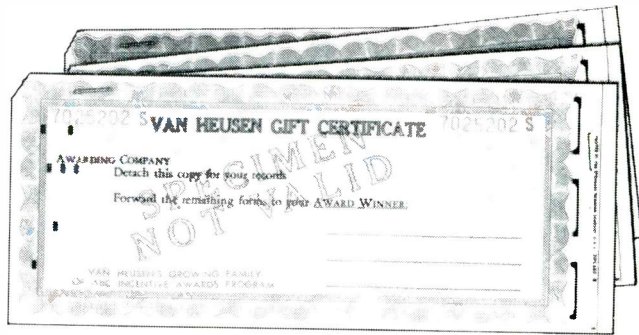
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