ELECTRONIC TECHNICIAN / DEALER

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AN OJIBWAY PUBLICATION

JANUARY 1968

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SERVICING COLOR HORIZONTAL CIRCUITS

AC AND DC SCOPES

we looked into your future, then created the "little corporal," a most remarkable CRT tester.

B & K has done it again . . . put you a "jump ahead" by looking into your future . . . your problems, *your* needs. This is the "Little Corporal," the CRT Rejuvenator and Checker, designed to provide maximum obsolescence protection by providing continuously variable voltages for all CRT elements. You can make the most accurate possible tests, even on future CRT types, because the heater voltage is metered and is continuously variable from 0 to 13 volts with any tube heater current. And, using the required adaptors, you can test and correct all tube, transistor or integrated circuit black and white and color picture TV tube troubles (including GE 11" color and imported color tubes) in a few minutes . . . in the home or on the bench . . . without removing tubes from the TV set.

You can give new life to weak or inoperative picture tubes—prove to your customers their need for new tubes.

The "Little Corporal," another product of B & K electronic innovation, carries the B & K Professional Servicing Equipment emblem, your assurance . . . your customers' assurance . . . that you use the finest equipment made.

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$9.75

EFFECTIVE 8/1/67

GUARANTEED

Nine-seventy-five buys you a complete tuner overhaul—including parts (except tubes or transistors)—and absolutely no hidden charges. All makes, color or black and white. UV combos only $15.

Guaranteed means a full *12-month* warranty against defective workmanship and parts failure due to normal usage. That's 9 months to a year better than others. And it's backed up by the only tuner repair service authorized and supervised by the world's largest tuner manufacturer—Sarkes Tarzian, Inc.

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Part #	Intermediate Frequency	AF Amp Tube	Osc. Mixer Tube	Heater
MFT-1	41.25 mc Sound 45.75 mc Video	6GK5	6LJ8	Parallel 6.3V
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

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SOUTH-EAST	938 GORDON ST., S. W. Atlanta, Georgia	TEL: 404-758-2232
WEST	SARKES TARZIAN, Inc. TUNER SERVICE DIVISION 10654 MAGNOLIA BLVD., North Hollywood, California	TEL: 213-769-2720

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You get 100% professional test equipment quality—and economy. EICO's uncompromising engineering-for-*value* makes it possible. Twenty-three years ago we started EICO to deliver "Laboratory Precision at Lowest Cost." Today, three million customers like us for it. Compare EICO products with *anybody's* at your local dealer. You'll see for yourself how you save up to 50% with EICO kits and wired equipment—and enjoy electronic excellence too!

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- Signal isolation floating ground.

NEW EICO 235 PROFESSIONAL VTVM

Feature-packed 6" professional VTVM brings you more in functional styling, convenience, and dependable performance for exacting measurements in solid state circuitry.

8 DC Ranges: 0-0.5-1.5-5-15-50-150-500-1500 (to 30,000 volts with optional high voltage probe). 7 AC Peak-to-Peak Ranges: 0-4-14-42-140-1400-4200. 7 AC RMS Ranges: 0-1.5-5-15-50-150-500-1500. 7 Resistance Ranges Covering: 0.2Ω to 1000MΩ. Frequency Response: 3 cps to 3Mc ±1db (up to 250Mc with optional PRF probe). Input Resistance: DC 11MΩ; AC 1M shunted by 60mmf. 1% precision multiplier resistors. 3% accuracy on AC and DC scales.

Kit 49.95
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Terrific time-saver! Only 1 probe performs all functions — a half-turn of probe-tip selects DC or AC-OHMS!

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The industry's greatest V-O-M values. Designed & manufactured to Eico's high standards of professionalism. Each complete with batteries & test leads. Backed 100% by famous EICO warranty.

30,000 Ohms/Volts Model 30A4 $19.95

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100,000 Ohms/Volt Model 100A4, $34.95
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The best buy in a bench-size multimeter. With AC sensitivity 12,500Ω/V, combines minimal circuit loading with wide-ranging functional utility. Double-jewelled ±2% D'Arsonval meter movement; full-view 4-inch mirror-back two-color scale eliminates reading parallax; matched pair of silicon diodes prevents accidental overload of meter movement. High-impact, custom-molded case protects against shock.

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NEW TUBE DATA AND SUESCRIPTION PLAN NOW AVAILABLE FOR ALL MODELS. Write To: EICO Tube Data Division, 1744 Rockaway Ave., Hewlett, N Y. 11557

Model 232 Peak-to-Peak VTVM. A must for color or B&W TV and industrial use. 7 non-skip ranges on all 4 functions. With exclusive Uni-Probe.® **$29.95 kit, $49.95 wired.**

New Model 567 VOM Kit $34.95 Wired $44.95
- 20,000 ohms-per-volt sensitivity
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- Silicon diode meter protection circuit

DCV: 0-0.25, 2.5, 10, 50, 250, 1000, 5000V. ACV: 0-2.5, 10, 50, 250, 1000, 5000V. DCI: 0-50 uA, 1 mA, 10 mA, 100 mA, 500 mA, 10 amps. —12 to +55 db in 5 ranges. RES: 0-2KΩ, 200KΩ, 2MΩ.

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Model 460 Wideband Direct-Coupled 5" Oscilloscope. DC-4.5mc for color and B&W TV service and lab use. Push-pull DC vertical amp., bal. or unbal. input. Automatic sync limiter and amp. **$109.95 kit, $149.95 wired.**

Model 369 Sweep and Post-Injection Marker Generator. For easiest, fastest visual alignment of color B & W TV and FM RF and IF circuits. Five sweep ranges from 3-220 Mc/S. Four marker ranges from 2-225 Mc/S. Crystal marker oscillator. Post injection of markers. **Kit $89.95. Wired $139.95**

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ELECTRONIC TECHNICIAN

WORLDS LARGEST ELECTRONIC TRADE CIRCULATION

JANUARY 1968 • VOL. 87, NO. 1

COVER
A modern two-way communications shop (see the article which begins on Page 57 of this issue).

TEKFAX • 16 PAGES OF THE LATEST SCHEMATICS • **Group 185**

AIRLINE: TV Model GHJ-14098A, GHJ-14148A, GHJ-14158A
CORONADO: TV Model TV2-7112A
PACKARD BELL: Color TV Chassis 98C17
PHILCO-FORD: TV Chassis 18L33
RCA VICTOR: Color TV Chassis CTC35 Series
SILVERTONE: TV Chassis 528.70370, 71

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LETTERS TO THE EDITOR

Likes 'Technical Digest'

I would like to take this opportunity to compliment you on your magazine. The articles have been most informative and interesting.

I like your "TECHNICAL DIGEST" section — but I have one problem. I would like to follow the circuit descriptions given in TECHDIGEST on a full schematic so I can see how the fault would interact with the rest of the TV circuitry. But since I do not have a full set of TEKFAX, would you be able to use more recent circuits?

AUSTIN FAULKNEY

Slade, Ky.

• *Most of the schematics used in* TECHDIGEST *are taken from recent, modern circuitry. Some are not, however, because this material occasionally deals with production runs and circuit changes which manufacturers have recently made in older sets. — Ed.*

Old Tubes

We have a reasonable supply of obsolete radio tubes on hand. List available upon request.

G. GOODWIN
Goodwin Radio

Rankin, Ill. 60960

Help Arrives

Here's a schematic and other pertinent information on the ACROSOUND stereo 20/20 amplifier for Mr. James B. Carter as per his request in letters to the editor, November 1967 ET.

C. W. WILSON
Leviton • Atlanta

Atlanta, Ga.

•*Thanks. We have forwarded the data to Mr. Carter. — Ed.*

European Tubes

We can supply the UM80 tube and most European designations — both receiving and special purpose/industrial.

RICHARD M. JENNEMAN
Brownville Sales Co.

Stanley, Wisc. 54768.

Soundex Radio

We have been a subscriber to your magazine for a good many years and would like some information. We have a Soundex auto radio in for repair which has no model number for ordering parts. We have written Soundex Radio Co., 146 Court St. Brockton, Mass., three times for information on this radio and they refuse to answer. Could you find out why?

J. W. BUNN

Kenoza Lake, N.Y.

• *We do not know how the manufacturer can furnish information on a radio without the model number. Perhaps if you made one or more good photos, a tube line-up and general description of the radio and sent these to the manufacturer, he may then be able to figure out what radio it is. — Ed.*

Double Zipperoo

The "Zipperoo" on page 26 of the October, 1967 issue now really becomes one. The second sentence of the letter by the manager, advertising and sales promotion, Sprague Products Co. states, "The correct P.O. Zip Code for North Adams is 01247."

Under his title it states, "North Adams, Mass. 02147." Never mind Hertz — let's go into zip — then nobody will get any service or deliveries and we can all go back to our favorite fishing holes instead of complicating our lives fixin' the push buttons that have made them so. I'm not trying to be critical — but I couldn't resist the temptation.

AL ZEBRAITES

Shenandoah, Pa.

• *Thanks, Al. It is, of course, North Adams, Mass. 01247 — like we sent it to the printers. But there's many a slip betwixt and between. — Ed.*

Needs Scope Schematic

Perhaps an ET reader can help me with this problem. I need a schematic and replacement parts list for a Triump, model 840 scope. This scope was used by the U. S. Army Signal Corps several years ago.

C. C. PERRY

2732 Connally Dr. SW
Atlanta, Ga. 30311

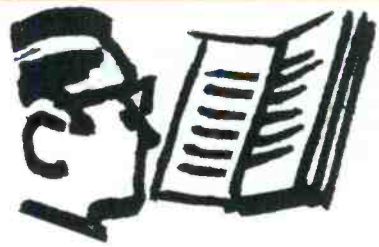
We're Understandable

I attend RCA Institutes in New York and read and study ELECTRONIC TECHNICIAN . . . It is a wonderful supplement to my electronics education. Your articles on solid-state have cleared up many points that I did not understand in the classroom and lab . . . And TEKFAX schematics have opened up a new adventure in my coming career . . . .

RICHARD SEMEGRAN

Somerville, N. J.

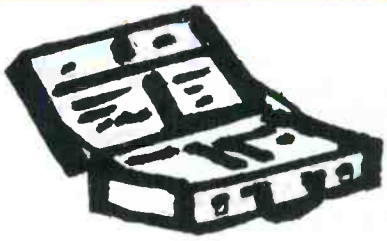
SOME SHOP OWNERS DO MORE BUSINESS THAN OTHERS BY DOING BASIC THINGS LIKE THESE:



1 Reading what's new in leading technical magazines.

2 Keeping their trucks ready to roll at a moment's notice.

3 Arranging to have their phones answered promptly.



4 Making sure their caddies are organized and properly stocked.

5 Keeping accurate track of their time on each job.

6 Smiling . . . often . . . both on and off the job.

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The world's finest
radial-lead capacitor

DIFILM® BLACK BEAUTY®...
Ultimate in molded tubulars

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These two great Sprague capacitors are expressly made for men who are in the TV service business to do business . . . as it should be done. Both feature the ultimate in tubular capacitor construction to keep you out of call-back trouble:

- Dual dielectric . . . combine best properties of both polyester film and special capacitor tissue.
- Impregnated with HCX® to provide rock-hard capacitor section.
- Because impregnant is solid, there's no oil to leak, no wax to drip.
- Designed for 105° C (220° F) operation without voltage derating.

DIFILM® ORANGE DROP®
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A "must" for applications where only radial-lead capacitors will fit. Perfect replacements for dipped capacitors used in most leading TV sets. No other dipped tubular capacitors can match them. Double-dipped in rugged epoxy resin for positive protection against extreme heat and humidity.

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LETTERS TO THE EDITOR

6DL4 Tubes Available

In going through the November, 1967 issue of your splendid magazine, I noticed one of your subscribers in the "Letters To The Editor" columns inquiring as to the possible purchase of some 6DL4 tubes for our UHF antenna boosters.

In reading your answer, I wish to comment that these tubes are available to this subscriber and anyone else by simply ordering them from the factory. Perhaps you can do your reader a service by informing him of this.

Thanking you in advance for your cooperation and again may I compliment you on your splendidly published electronics magazine.

MICHAEL ADAMCHAK
Manager — Field and Customer Service
Blonder-Tongue Laboratories, Inc.
9 Alling Street
Newark, N.J. 07102

article "Antennas — Sans 'Bafflegab' and 'Bushwa.' " . . . You say, "We've been asked by some, in effect, to tell the truth about antennas. This is no easy job."

In an article about the log periodic antenna in your March 1963 issue you tried hard to tell the truth and then had to follow it up with a correction in the May 1963 issue.

There's an old saying, "If you don't succeed at first, try, try again."

I have been and am still a subscriber to your magazine. As you can see, I read your articles and absorb them. I also renew my subscription.

JOHN DE AVILLA
New Haven, Conn.

. . . Your article "Antennas — Sans 'Bafflegab' and 'Bushwa' " seems to be no different from the "bushwa" and "bafflegab" you talk about. There is no mention of the true facts regarding antennas . . .

GRAHAM HOLZHAUSEN
New York, N.Y.

• *The correction which ran in May 1963, as you already know, concerned 1) three typographical errors 2) erroneous engineering information supplied to us by one antenna manufacturer and 3) clarifications regarding certain statements made in the article. The article, "Antennas — Sans 'Bafflegab' and Bushwa,' " was originally planned as a two-article series. Considering the letters we have received from readers commenting on the first article (the overwhelming majority were highly favorable), the series has been expanded to four articles, the second of which will appear in the March 1968 issue of ET. The first article which appeared in the September, 1967 issue can be considered only an introduction to the subject which will be covered thoroughly — technically and otherwise — in forthcoming 1968 issues — Ed.*

ERRATUM

The reference (see Fig. 6) which appears in line 25, column 3, page 64 of the November 1967 issue, should read (see Fig. 7).

MOVING?

Be sure to include your Zip Code number when sending a change of address notice.

RCA Announces two important new test instruments for service, industrial and lab applications.

All solid-state battery operated

VOLTOHMYST® WV-500A

Eliminate warm-up time! Eliminate zero-shift that can occur in tube-operated voltmeters! RCA's new WV-500A VoltOhmyst is an all solid-state, battery operated, completely portable voltmeter that is ideal for service, industrial and lab applications. Seven overlapping resistance ranges measure from 0.2 ohm to 1000 megohms. Eight overlapping dc-voltage ranges measure from 0.02 volt to 1500 volts (including special 0.5 dc volt range), ac peak-to-peak voltages of complex waveforms from 0.5 volts to 4200 volts, and ac (rms) voltages from 0.1 to 1500 volts. Input impedance of all dc ranges is 11 megohms.

All measurements are made with a sturdy, wired-in single-unit probe with fully shielded input cable. The probe is quickly adapted to either dc measurement or ac and resistance measurement by a convenient built-in switch. *And an accessory slip-on high-voltage probe is also available to make possible measurements up to 50,000 dc volts.*

Solid-state reliability and convenience for only $75.00*

WG-411A high-voltage slip-on probe. For use with WG-410A or WG-299D ac/dc ohms probes. Extends dc voltage range of VoltOhmysts to 50,000 volts when used with WG-206 multiplier-resistor. $13.50*

In-circuit / out-of-circuit

TRANSISTOR TESTER WT-501A

Completely portable and requiring no external power source, RCA's new WT-501A tests transistors both in-circuit and out-of-circuit, tests both low and high power transistors, and has both NPN and PNP sockets to allow convenient transistor matching for complementary symmetry applications.

The instrument tests out-of-circuit transistors for dc beta from 1 to 1000, collector-to-base leakage as low as 2 microamperes, and collector-to-emitter leakage from 20 microamperes to 1 ampere. Special low impedance circuitry assures reliable in-circuit testing.

Collector current is adjustable from 20 microamperes to 1 ampere in four ranges, permitting most transistors to be tested at rated current level. A complete DC Forward Current Transfer Ratio Curve can be plotted. The three color-coded test leads are provided for in-circuit testing, and for out-of-circuit testing of those transistors that will not fit into the panel socket.

Extra features . . . RCA reliability . . . for only $66.75*

**Optional Distributor resale price. All prices subject to change without notice. Prices may be slightly higher in Alaska, Hawaii and the West.*

Ask to see them at your Authorized RCA Test Equipment Distributor, or write RCA Commercial Engineering Department A46W, 415 South Fifth Street, Harrison, N.J.

RCA Electronic Components and Devices, Harrison, N.J.

The Most Trusted Name in Electronics

EDITOR'S MEMO

What's the Solution?

According to letters we have received, plus business survey data from government and private sources, electronic home-entertainment equipment service-dealers find it difficult to make a go at the business. The business-failure rate is high.

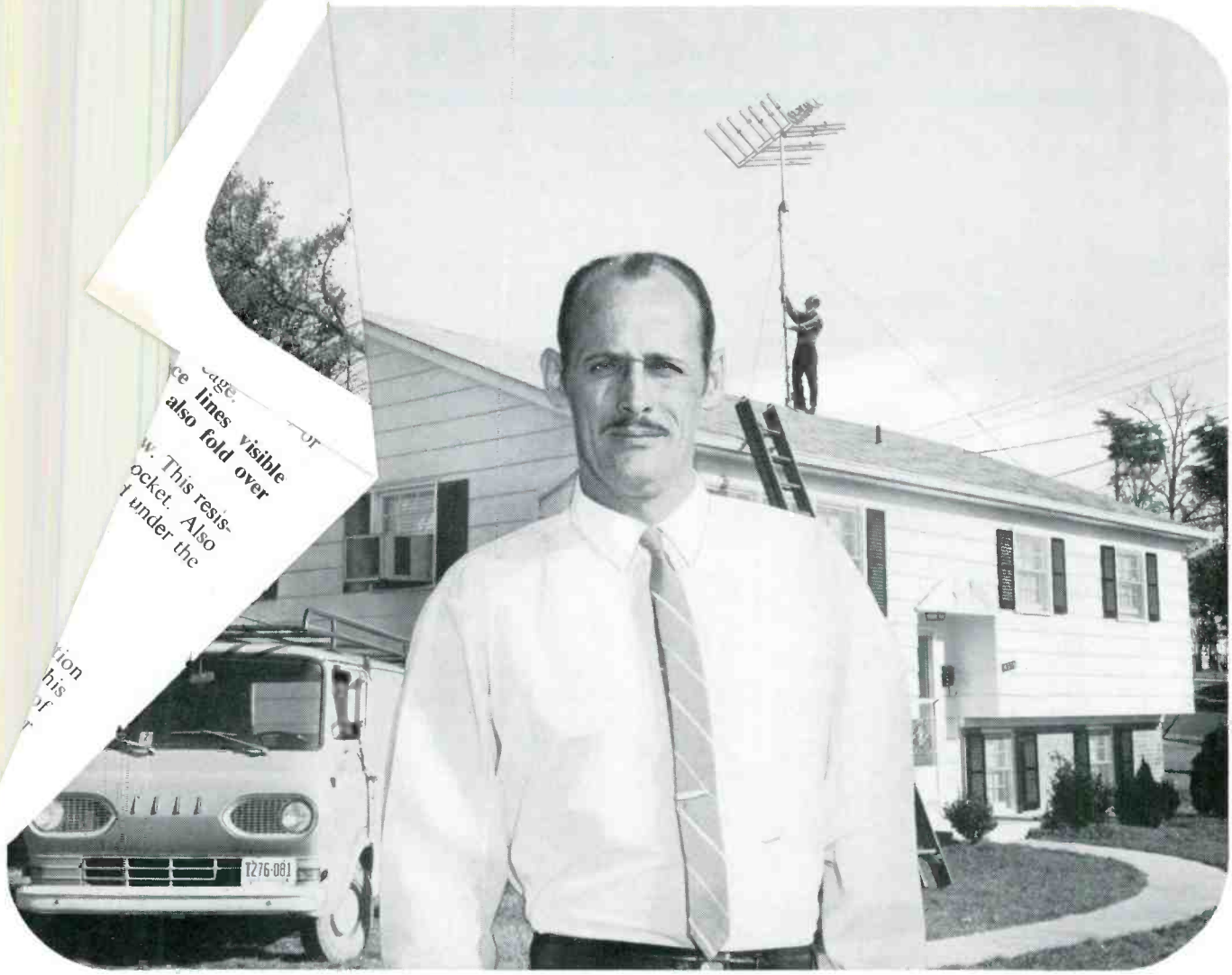
One reason given for this is poor management. Another reason given is lack of proper working capital. Still another reason is, for whatever cause, the inability of service-dealers to obtain technicians having adequate training and experience. In this connection, some technicians argue that the primary cause of the technician shortage in this area of the electronics field is the low pay scales offered. Some service-dealers counter that they cannot afford to pay more. We suggest that they run their businesses in such a manner that they *can* pay more.

As we all know, mergers of small companies in the electronics field are taking place at an accelerating rate. And we have observed that a number of one- and two-man service-dealer operations have gotten together, combining their financial resources, goodwill and experience into one organization. In these cases, one man is either made manager of the operation or an experienced service-technician-manager is employed.

Another approach to this problem is to raise service charges to a level where the operation can prosper. This is the approach now being taken by service-dealers in various parts of the country — particularly on the West Coast. Some service-dealers even offer stock in the company as an incentive to keep experienced men.

Technicians are being trained in trade schools all over the country, but the accelerated growth of industry swallows them up faster than the schools can put them out. Which still leaves us with the cold, hard fact that the technician shortage is here to stay — at least for a while, and we have to make changes to compensate for it.

In evaluating all of the reasons for service-dealer failures, one cannot say that it is simply a lack of management, money or men. We do know that we are in a rapidly advancing technical field and to keep up with the show we obviously have to employ new procedures. I read a short poem once that seems appropriate here. It goes something like this: "Give me the grace to accept the things I cannot change, the wisdom to change the things I can, and the understanding to know the difference."



"For my money, the best antenna for Color TV is the JFD Color Laser,"...

says Ronnie Morgan of Best Antenna Service, Arlington, Va.

"When we install a JFD Color Laser or Log Periodic, we *know* we can guarantee better *color* pictures than the customer ever had before. We get sharp directivity and high front-to-back ratios that clean up ghosts. And the JFD's wide bandwidth and flat gain give us good color registration on all VHF and UHF stations in the area. JFD's are well constructed and easy to install... They go up fast and stay up for good."

Mr. Morgan (who has been installing antennas for twenty years and counts his installations in the hundred of thousands) does most of his work in metropolitan areas where that extra sharp, ghost-chasing directivity is mighty welcome. His opinion of the JFD is typical of professional antenna installers from coast to coast.

And it's only natural because the Color Laser offers:

☐ **BRILLIANT COLOR**—flat (frequency independent) response across each channel, free from suck-outs or roll-offs. Keeps color vivid and alive.

☐ **PATENTED W-I-D-E BAND LOG PERIODIC DESIGN** — the most efficient ever developed—provides higher gain, better signal-to-noise ratios, needle-sharp directivity. Eleven patents cover its revolutionary space-age design.

☐ **MORE DRIVEN ELEMENTS.** Harmonically resonant capacitor coupled design makes dual-function elements work on both VHF and UHF frequencies. **Entire** antenna (not just part of it as in other log periodic imitations) responds on every channel.

☐ **LUSTROUS, ELECTRICALLY CONDUCTIVE GOLD ALODIZING** promotes signal transfer, protects against corrosion, enhances appearance.

PROFESSIONAL ANTENNA INSTALLERS KNOW—The Best Antenna for Color TV is The Color Laser by

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Now at your JFD distributor!

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15th Avenue at 62nd Street, Brooklyn, N.Y. 11219
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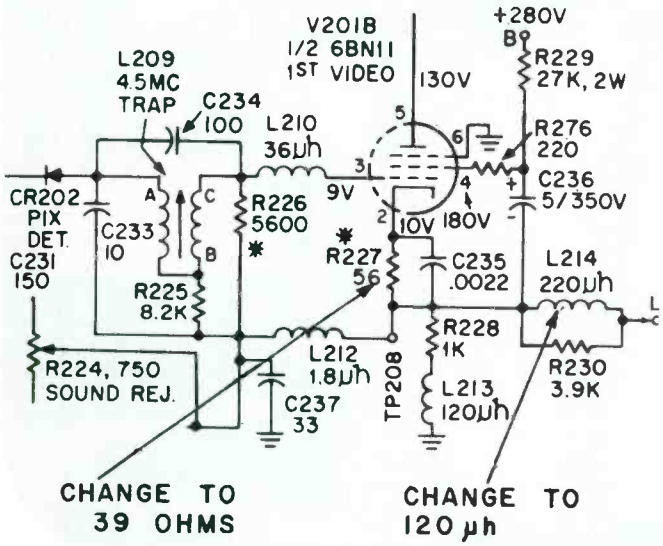
JFD de Venezuela, S.A., Avenida Los Haticos 125-97, Maracaibo, Venezuela

OLYMPIC

Color TV Chassis — Circuit Modifications

Chassis CTC19. **To improve picture quality, increase contrast and improve definition.**

Change resistor R227 from 56 Ω to 39 Ω 1½w and peaking coil L214 220 μh to 120μh (part # C13244345). Both are located in front of the V201 6BN11 tube. Chassis

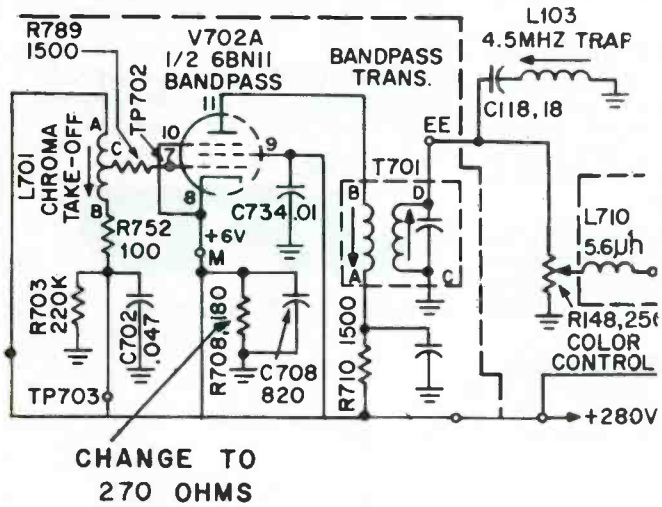


which already have this change will have the number 7 or 8 stamped on the upper left hand corner of the HV cage.

Chassis CTC20. **To improve picture quality and increase band width of video amplifier.**

Change resistor R117 from 10K to 5.6K 3w (part RE-32087-43). The resistor is located on rear control panel next to BLUE drive control. When making this change, check resistor R729 which must be 47K (not 100K as in earlier production). Its location is adjacent to T701 band-pass transformer.

Chassis CTC19/21. **To remove a red vertical bar on left side of picture caused by the burst signal passing through chroma amplifier.**



Change R708, 180 Ω resistor to 27(tor is located adjacent to V702, 6B which already have this change will hav 8 stamped on the upper left corner of the F

Chassis CTC19/21. **To remove retra at top of picture during certain programs, at top of picture.**

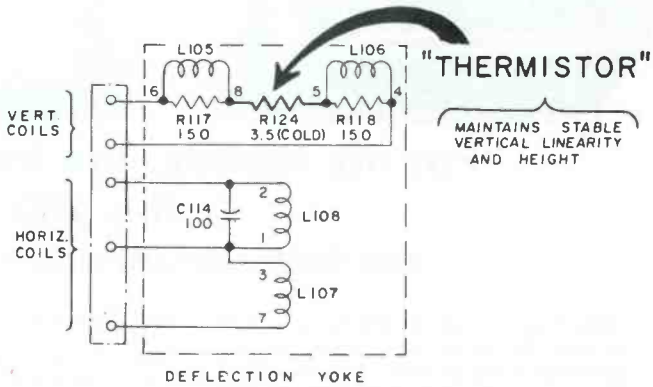
Replace resistor R252 (10K) with a 2.75 ½ tor is located adjacent to the 6LU8 tube s change R281 (560K) to a 330 K ½w — locate PC board near the 6LU8 tube.

RCA VICTOR

TV Receivers — Function of Yoke Thermistor

The resistance of the vertical windings in a deflec yoke increases as its temperature increases. Unless t condition is compensated for, the increase in resistance the vertical windings will decrease the height of the raste and adversely affect the vertical linearity.

To compensate for this undesirable condition, RCA Victor TV receivers use a thermistor (temperature compensating resistor) in series with the vertical windings of



the deflection yoke. A thermistor serves to compensate for the resistance changes that take place in the vertical windings of the yoke because of variations in temperature.

A thermistor decreases in resistance as the ambient temperature increases; placed in series with the vertical windings of the deflection yoke and positioned in proximity of the windings, it heats as the yoke windings heat. Since changes in the resistance of the "thermistor" and the yoke windings are opposite one another, the effective over-all resistance of the circuit remains constant.

Although few thermistors fail, keep in mind that an improperly functioning thermistor can affect picture vertical linearity and height.

ZENITH

Transistor TV Chassis 1Y21B55 — Horizontal Osc and Output Circuit Description

The horizontal oscillator circuit employing the TR19 transistor is similar to the typical sinewave oscillator used in present day tube receivers. The hold control coil

Industry Demanded - only Sencore delivered

AN ALL NEW IMPROVED COLOR CRT TEST

Simple - Fast - Accurate • Automatic Color Tracking!
No Time-Wasting Logging and Computing!

CRT manufacturers, set manufacturers, distributors, technicians — all demanded a better CRT tester than any available. This is it — the new Sencore CHAMPION — a winner on every count.

Separate G2 screen grid controls, just like the color circuit itself, enable you to set up each color gun, then **automatically** compare it with the others for tracking — exactly according to industry standards. **This check is important when claiming credit for a defective color CRT.** No time consuming logging of each color gun reading at every setting of the G2 control like competitive models. It's automatic with the CR143 Champion.

The **CHAMPION** also makes all the standard color and black and white CRT tests — shorts, emission, and life tests. Its Line Adjust control assures exceptional accuracy. Its exclusive three step Automatic Rejuvenation Circuit lets you save many a faulty black and white tube or equalize gun currents in color tubes.

The all-new **CHAMPION** is equipped with plug-in sockets for fast testing and easy updating. Rugged vinyl-clad steel case has spacious lead compartment.

For a sure thing, put your money on the champion — **the Sencore CR143 CHAMPION.**

CR143 CHAMPION

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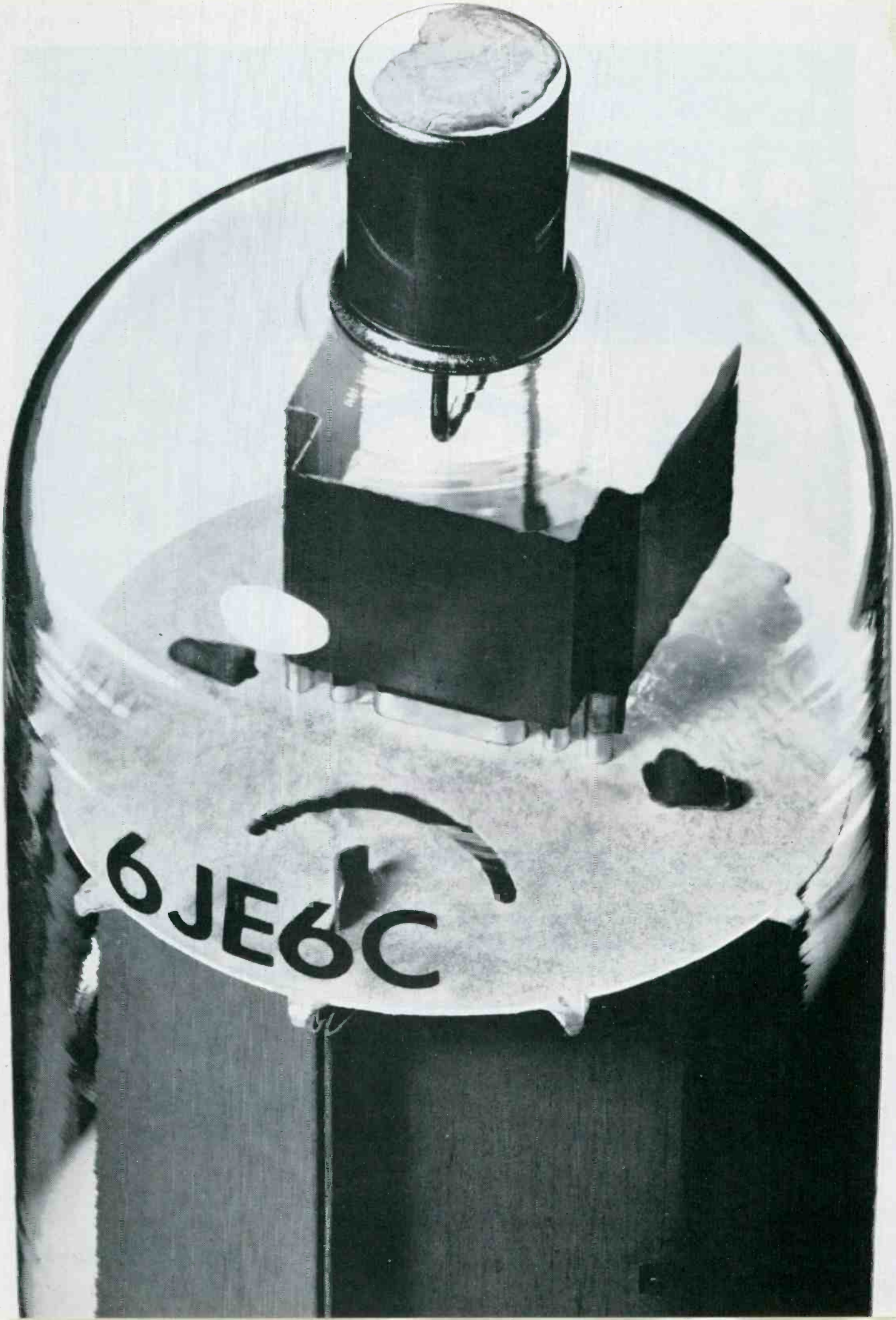

6JE6C

The cool new "C." It has more life.

When the horizontal deflection tube in a color TV set goes dead, chances are you've been replacing it with our 6JE6-A.

(You learn by hard experience what's best. Who needs callbacks?)

But this doesn't mean that what's best can't be made even better. At least it doesn't to Sylvania electronic engineers.

That's the reason for our third-generation 6JE6-C. (We skipped "B" altogether.)

The "C" is the new workhorse of color television.

We've given the plate wings.

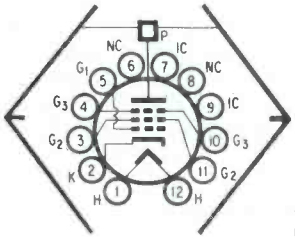
It's been so designed that it acts as a superior heat sink. It holds more heat. Radiates it out from a larger surface. Dissipates it more quickly.

The new tube runs cooler and has longer life.

And it still costs the same as the "A".

It should mean fewer replacement calls.

Try the "C" and see.



Big plate fins absorb heat and radiate it out of the tube.

SYLVANIA
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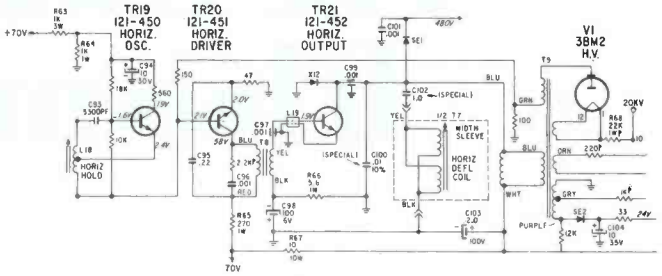
TECHNICAL DIGEST

L18 with the parallel capacitor C90 form the 15.75kHz resonant circuit.

The pulse output from the collector of TR19 is a series of positive going pulses. They are applied directly to the base of the horizontal driver transistor TR20 to amplify the power sufficiently to drive the horizontal output transistor TR21. Horizontal driver transformer T8 matches the impedance of TR20 collector to the base of horizontal output transistor TR21. With the transformer inversion the negative portion of this drive pulse is sufficient to drive TR21 into sharp cut-off and the positive portion saturates the horizontal output transistor during trace time.



During beam retrace and first half of the trace, transistor TR21 is cutoff. During the first half of the trace, the negative current required is supplied by the damper diode X12. During the second half of the trace, transistor TR21 is biased into conduction to supply the positive current required. The damper diode X12 suppresses the oscillation at the end of the retrace interval.

The horizontal section of the deflection yoke in series with the dc blocking and linearity correction capacitor C102 is connected across the output circuit of TR21 and also in parallel with the primary of the horizontal sweep transformer. Voltage from the 24v supply winding is a series of negative pulses (dc voltage being derived during the trace portion) that have the exact frequency and phase as the sweep generator output at the transmitter. These pulses cause a linear saw-tooth current to flow in the deflection yoke.

The pulses developed by the horizontal output transistor TR21 are stepped up and rectified by the HV rectifier 3BM2 to develop the high anode voltage for the CRT.

Diode SE1 is used to rectify the horizontal pulses to provide a positive 500v for one CRT focus adjustment and CRT G2 terminals. At the same time, this diode acts to prevent any high peak voltages from developing across the collector of TR21. The diode X12 serves as the usual damper at the end of the flyback portion of a series of negative pulses to provide the 24vdc needed for the tuner, IF and AGC circuits. X13 also rectifies during the trace time and provides the 1.5kv needed for the video output circuits. This winding also supplies the horizontal blanking pulses for the CRT.

ADMIRAL

Power Tuning Portable Radio Model YK367 — AM Weak or Intermittent

If you encounter a complaint of weak or intermittent AM section on this model, check the AM antenna. It is mounted by two aluminum clamps which apparently loosen up during transportation, allowing the antenna to shift and

Meet the number one swinger!

More antennas swing with Channel Master's Automatic Colorotor than any other automatic rotator in the country. That just goes to show that dealers and customers know a winner when they see one.

And everybody has been seeing a lot more rotator sales since color came into the picture. Color set owners usually want the best and research has proved that ghosting can be substantially reduced by a rotator even when all stations are in one direction!

Channel Master's Automatic Colorotor is the ultimate in convenience and performance! Aims the antenna within **one degree** of precise transmitter location—impossible to knock out of alignment by reversing direction. Built-in thrust bearing provides friction-free rotations under heavy loads. Resynchronizes smoothly and automatically merely by rotating the antenna.

Ask about Channel Master's unique dealer profit protection policy and instant replacement warranty!

CHANNEL MASTER

Color-Engineered Antennas and Accessories

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TECHNICAL DIGEST

rub against the brackets. If the wire has not been damaged, reposition the antenna so the rubber pads are under the brackets and pinch the bracket arms together. A few drops of all-purpose cement will prevent further shifting.

CANADIAN GENERAL ELECTRIC

Color TV Chassis 19 and 25in. — HV Transformer Replacement

The renewal parts department is supplying R8511 as a replacement for the 19 and 25in. color sets. To use this transformer as a replacement on earlier versions of the 25in. sets, terminals 5 and 6 have to be tied together, otherwise very poor linearity and loss of width will result. Terminals 5 and 6 of this transformer, when used on the later production sets, are connected to the horizontal centering control.

Terminals 1, 2, 6, 8 and 9 on the old transformer are blank. The new transformer has no connections on terminals 1, 2 and 9.

MOVING?

Be sure to let us know your new address. Please enclose a complete address label from one of your recent issues.

A LETTER FROM THE PUBLISHER

To the cover of this month's issue six letters have been added.

As a result, the title, "ELECTRONIC TECHNICIAN," which has for so many years identified this magazine, has become, "ELECTRONIC TECHNICIAN/DEALER."

These six little letters —D-E-A-L-E-R — give recognition to an evolution that has over the years brought about a complete revolution in our industry.

You, our readers, have become the greatest audience of its kind available anywhere in the world. And you have become also, the greatest force in the world in the recommendation and merchandising of the products with which you are concerned.

It isn't surprising that you have. The consumer just naturally gravitates to the source from which he gets the best service for the purchase of those products involved with that service.

To a degree, this is true with any product requiring service. It is particularly true with the products of our industry where product satisfaction on the part of the consumer can only result from proper installation and service. It has been inevitable, therefore, that you who read this page and your thousands of contemporaries have found the great opportunity for permanency in this industry through expansion into complete electronic home entertainment merchandising

You have thus become the great major force in the merchandising of electronic home entertainment products.

But yours is a different kind of "merchandising" than that used by more conventional outlets.

As service-dealers, your advice and recommendations are sought by consumers They expect more from you and for the most part, they're willing to pay more to get it. You, who make up the world's largest electronic trade audience, are no longer merely "troubleshooters," you have become in the very true sense, electronic technician/dealers.

With the change in name, we're simply giving recognition to what you truly are.

This is just part of a new program we are inaugurating in your behalf. We will continue to provide you with TEKFAX schematics, reports from our TEKLAB — all the technical information you need to keep abreast of technological advances. But with this issue, we are starting an enlarged program to provide you with information to help you sell more of the home entertainment equipment with which you are concerned.

As you've already learned, there are greater opportunities today than ever before in merchandising home entertainment and communications equipment. While retaining all of its technical features of the past, ELECTRONIC TECHNICIAN/DEALER pledges to give you, additionally, the help you need to thrive even better as a *dealer* — a merchandiser of electronic home entertainment and two-way communications equipment.

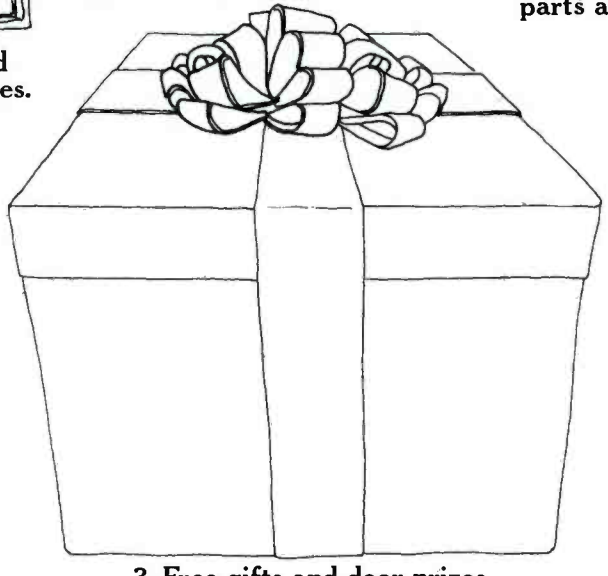
Scotty Wallace

HUGH "SCOTTY" WALLACE

If none of these things attracts you to the Parts and Service location at our Open House, there's always the free doughnuts.

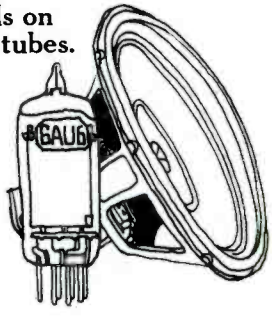
1. Free manuals and trouble-shooting guides.

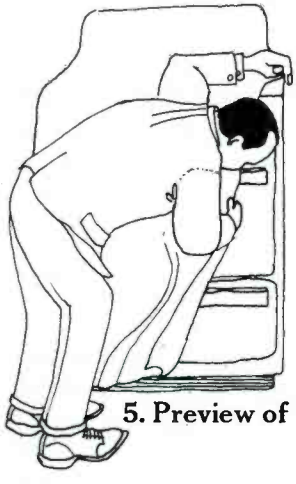
2. Training on new products.



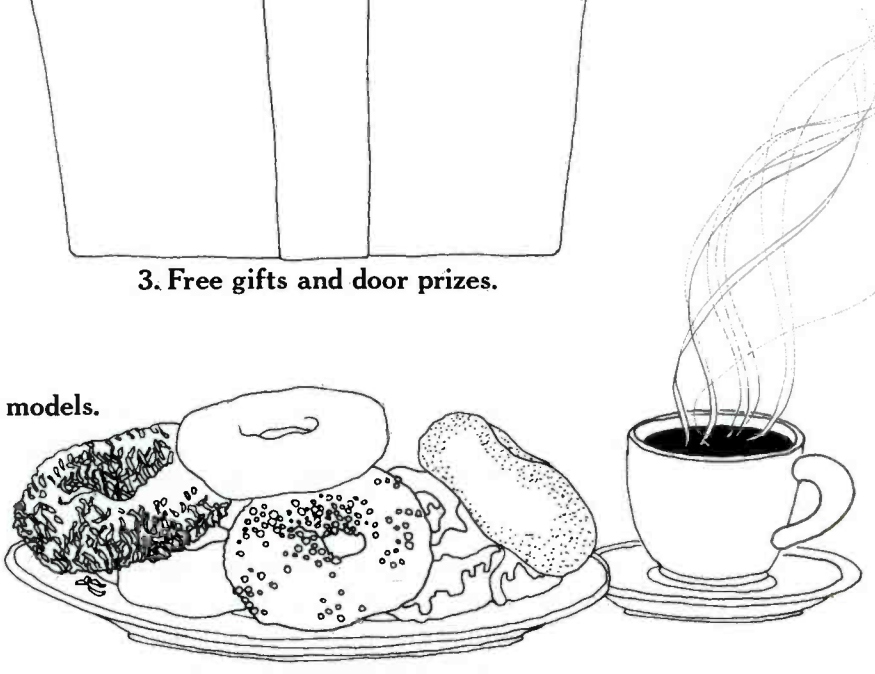
3. Free gifts and door prizes.

4. Specials on parts and tubes.





5. Preview of new models.



If you're feeling a little hungry during January or February, drop into our Open House at your Philco-Ford Distributor's or Parts and Service location.

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ELECTRONIC TECHNICIAN / DEALER

JANUARY 1968

Making a Go at Two-Way Radio

Learn the essentials involved in conducting a successful sales-service business

Part One of an In-Depth Series

■ This is the introductory article to an in-depth series covering the sale, installation, troubleshooting and repair of two-way communications equipment — including equipment used in public safety, industrial, business, land transportation, small-boat marine and other services. And at least one article in this series will be devoted to the specialized test instruments required.

Although aimed primarily at the professional already in the business — whether a service-dealer specialist or side-line operator — this series will contain much valuable information for service-dealers who may consider diversifying into this business and for experienced TV-radio technicians who would like to increase their general electronics knowledge sufficiently to enhance earning power.

You already know that the two-way radio communications business in all areas is a constantly growing segment of the electronics industry.

General Technical and Business Considerations

Before you can hope to succeed in this business — according to some experts who have been in it for years — you'll need 1) enough money to set up shop and purchase the necessary specialized test instruments; 2) you'll need a first- or second-class FCC telegraph or telephone license or sufficient working capital to employ one or more experienced FCC licensed technicians; and 3) enough potential customers in your locality to make the business pay.

You should also provide yourself with Volumes I, IV, V and VI of the FCC Rules and Regulations (available from the Government Printing Office, Washington, D. C.). You will be particularly interested in various "parts" of these volumes, especially Volume V, which includes Part 89, covering Public Safety Radio Services; Part 91, which covers Industrial Radio Services; Part 93, covering Land Transportation Radio Services and Part 95, in Volume VI, which covers the Citizens Radio Service.

Additionally, you will have to know all about narrow-band-FM (NBFM) transmitters and receivers. A NBFM transmitter, for example, is one which should not deviate more than ±5kHz when modulated 100 percent by a 1kHz tone. This is also called 16F3 emission,

2-WAY RADIO . . .

A modern, efficient two-way radio is a boon to the progressive businessman who needs direct communications with his trucks or salesmen. Photo courtesy Motorola.

Almost all modern truck delivery operations use two-way radios for effective operations under all conditions. Photo courtesy Motorola.

and the width of this channel is called 20F3.

You will need to know how to select, errect and install base-station and mobile antennas to provide efficent operation of the two-way equipment under various particular circumstances.

You will need to know all about single-side-band (SSB) transmitters and receivers and how they work. You will have to bone up on small-boat, medium-power marine-type AM transmitters and receivers. And, considering the booming growth of CB, you'll need to know about low power (5w input) AM citizens band transceivers and how they work. Last, but by no means least — again considering the increasing use of "selective calling" systems — you must be prepared to install and service this important accessory item.

It should be understood at the beginning, however, that it will take time to build your business — the same as with any other business — and before you can hope to get into a higher money-making bracket, you'll have to prove your capabilities. As every successful operator knows, this means establishing your reputation in a location where franchises and authorized service-dealerships are possible. Additionally, as every one already knows, too, your sales successes will depend to a great extent on the quality of your service, and likewise to the same extent, your service volume will depend on your sales volume. It is no longer a secret that sales and top-grade service go together and are inseparably interdependent — the same as in TV-radio and other electronic home-entertainment sales and service.

A Specific Maintenance Concept

To provide the kind of service that builds business — to give your customers efficient installations which result in complete customer satisfaction and ultimately in a large amount of invaluable word-of-mouth advertising — you must establish a special maintenance approach. Simply, this means that you must sell the concept of preventive maintenance.

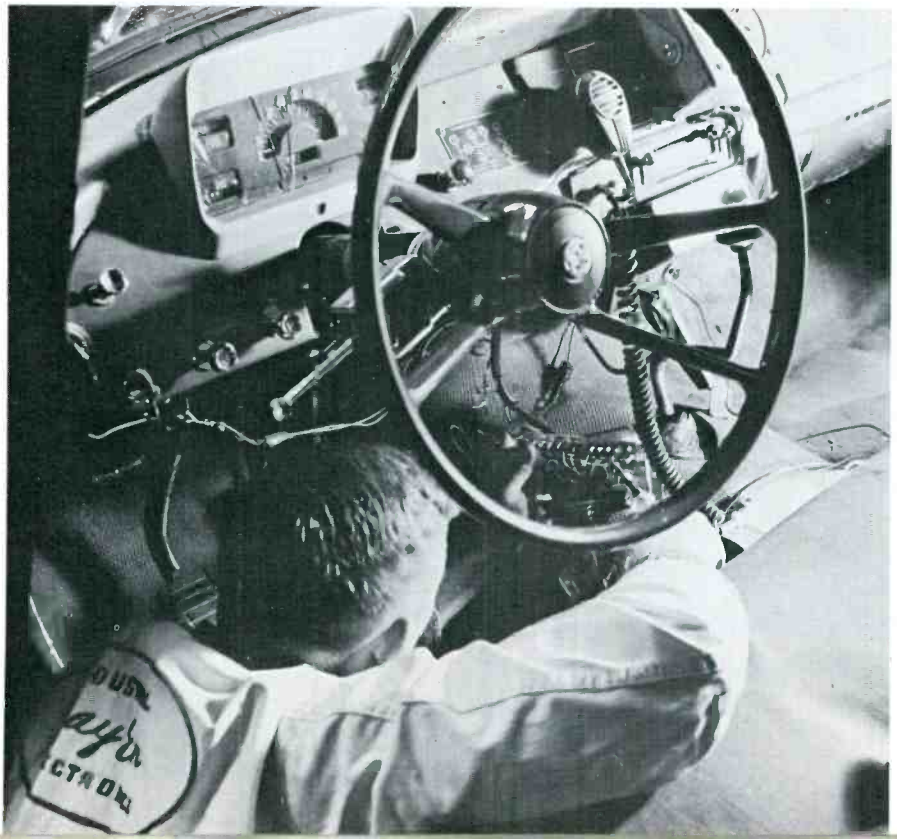
Some important and specific points involved in the preventive maintenance concept include regular and periodic "netting" checks, transmitter deviation, frequency and out-

A CB unit serves the yacht owner if he desires to contact the base station at his yacht club. Photo Courtesy Raytheon.

Many low-powered, hand-held units are employed by building construction crews, surveyors, excavation workers and others. This unit is a 2-w input job. Photo courtesy Raytheon.

Two-way communications technician installs control unit in a public bus. Courtesy G-E.

A two-way communications technician removes a mobile unit from truck for servicing. Courtesy JayEn.



put checks. Receiver sensitivity, ambient and ignition noise checks are also other points involved in the preventive-maintenance concept. In addition, vehicle batteries, generators and voltage regulator systems must be checked periodically. Finally, regular antenna checks must be made.

Forthcoming articles in this series will cover all of these points in detail, including practical trouble-shooting and repair techniques involved in successfully maintaining all types of two-way communications equipment with which we are concerned here. In the meantime, we suggest you read the article, "We Visit a Successful Two-Way Communications Operation," appearing under the DEALER FAX section this month. ■

AC and DC Oscilloscopes

Know what each instrument can do under similar test conditions

■ Not very long ago dc scopes were used almost exclusively for laboratory work. The primary reason for this was perhaps their traditional higher price tag. But technological advancement — new approaches to engineering design — have made it possible for practically every scope manufacturer, including kit makers, to produce inexpensive dc scopes. The dc instruments are still priced somewhat higher than ac scopes, but the prices of dc scopes have been within the test-instrument budget of professional TV-radio shops for quite some time.

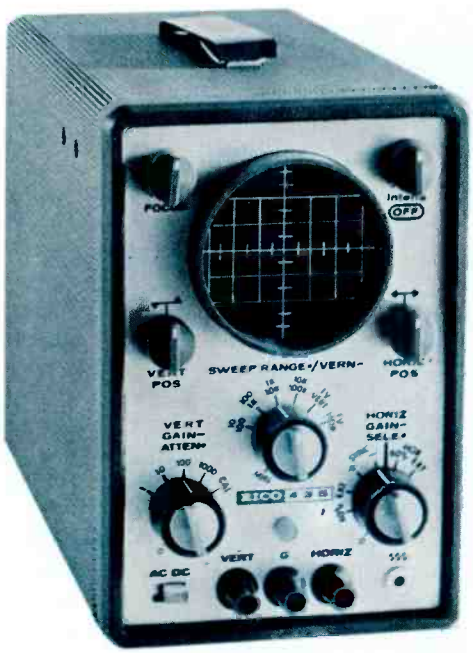
You are asking some questions. How much better is a dc scope than an ac-type scope? Is this just another "quick-buck" gimmick? Or, because of the higher cost, does the dc scope offer additional features that further increase its capabilities? Although no easy answers to these questions can be given here, we can discuss the differences between ac and dc scopes and you can draw your own conclusions.

Basic Differences

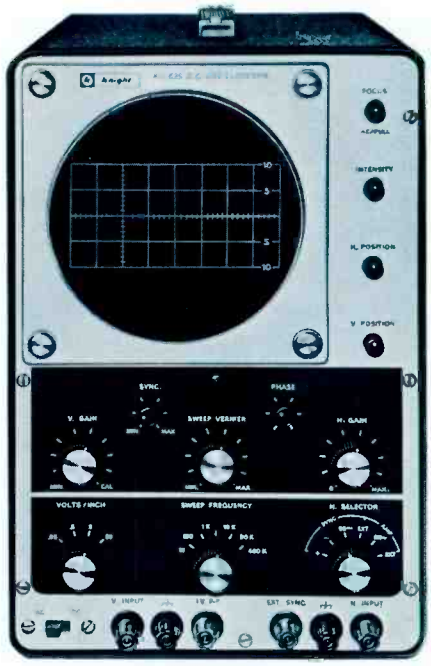
The basic difference between an ac and dc scope is in the input circuit. An ac scope has the usual blocking capacitor somewhere between the input terminal and the active input element of the 1st amplifier. This isolates the input amplifier from whatever dc that may be present in the circuit being checked, but permits the ac signal to pass to the scope's vertical plates. A conventional high-gain ac amplifier is used for vertical signal amplification.

In a dc scope, the input blocking capacitor is eliminated and the input terminal is connected directly to the input of the 1st amplifier. Both the dc potential and the ac signal appear as vertical deflection on the scope screen. Most dc scopes have provisions for an ac input. The input circuit has a blocking capacitor which can be shorted out by a front panel switch. When the capacitor is shorted, the dc mode is selected and both ac and dc voltages are passed to the amplifier. This feature can account for the higher price of a dc scope. Here's why.

The power supply of a dc scope must be regulated to a very close tolerance. Any slight variation in power supply voltage can cause the scope presentation to drift. (A dc amplifier can't tell the difference between a variation in input and a variation in the supply voltage.) The dc scope (even the best of



EICO model 435 dc wideband 3in. scope.



Knight KG-635 dc scope.

them) is more susceptible to drift since the input tube or transistor elements are not isolated from the supply as they are in an ac-coupled scope.

Now let's look at some waveforms from both ac and dc scopes and compare them.

Establishing a Zero Reference

You are always sure of an accurate zero reference when using a dc scope. You are never quite sure where zero is when using an ac scope. For example, if you remove all input signals to a dc scope, ground the vertical input terminal and set the trace to screen-center by using the vertical position control, the screen centerline then becomes zero. Any trace above the centerline is positive and the trace below the line is negative.

Assume you want to measure a sawtooth waveform which has a P-P amplitude of 25v and begins from exactly zero and rises to 25v. Both ac and dc scopes will permit you to measure the 25v value — but the ac scope will not tell you whether the vertical rise begins at zero or at some dc reference level. Also, it won't tell you what the true P-P voltage is.

When an ac scope is set for 10v deflection for each vertical division — with the zero reference at the screen center line — you'll get a waveform as shown in Fig. 1. The trace covers 2.5 vertical divisions to show the 25v P-P value. But there's no indication that the trace begins at zero. Not knowing where true zero is, you may assume that zero is at the center (reference) line. This could lead you to assume incorrectly that the sweep begins at 12½v negative — rising to 12½v positive.

A dc scope trace, with all conditions being the same as in the ac trace, is shown in Fig. 2. The trace begins from the reference line or zero and rises 2.5 divisions — indicating a 25v P-P value.

It is important to remember that the trace on an ac scope will center itself around the waveform's average voltage. This makes it even more difficult to establish a true zero point since the trace will reposition itself with changes in waveform shape. One-half the effective voltage of the waveform will always fall above the no-signal trace, and the other half will fall below.

For example, assume that the same 25v sawtooth signal is changed so two divisions exist between sawtooths — with a resting

Heath kit model 10-10 3in. dc scope.

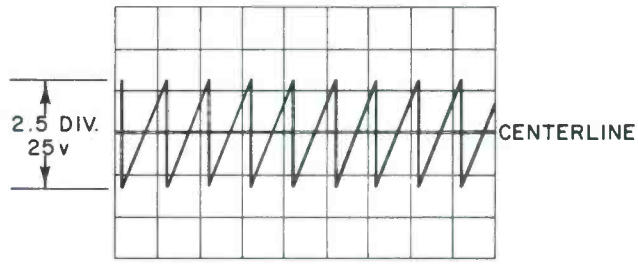


Fig. 1 — Sawtooth waveform on ac scope having 25v P-P amplitude. Note that the trace centers itself around the average waveform voltage.

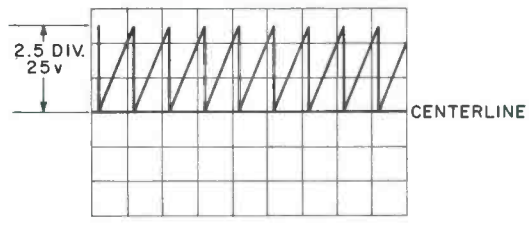


Fig. 2 — Sawtooth waveform on dc scope having 25v P-P amplitude. Note that trace begins at centerline (zero) and rises to 25v P-P.

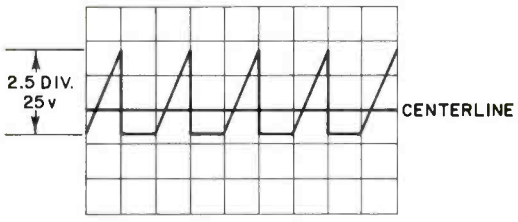


Fig. 3 — Sawtooth waveform having a "rest" period between cycles on ac scope. Trace shows correct 25v P-P but appears to begin at about −7v and rises to +18v — if you assume that centerline is zero. One-half the effective voltage appears above the no-signal trace (centerline), the other half below the line.

period (space) between cycles. On an ac scope the presentation will appear similar to that shown in Fig. 3. If you assume that the centerline is true zero, the trace seems to begin at about −7v and rise to about +18v. Although this gives you the correct P-P value of 25v, it gives no hint of the zero point.

On a dc scope, the same signal would produce a presentation similar to that of Fig. 4. Here, the trace begins from the zero reference line and rises 2.5 divisions to show 25v P-P.

Simultaneous Measurements

A dc scope can simultaneously measure the dc level and ac signal voltage in a circuit. Assume you want to measure and study the signal appearing at the base of an amplifier transistor, and at the same time measure the dc level at the same point. With an ac scope, you must use a meter for the dc level, and then use the scope to check the input signal waveform. With a dc scope, the signal waveform will be deflected vertically by an amount corresponding to the dc level.

As shown in Fig. 5 and 6, for example, note that a 1.5v sinewave signal is riding on top of 2vdc. In both cases, the centerline represents the no-signal trace position.

The ac scope waveform (Fig. 5) shows the positive half of the sinewave to be approximately 0.75 of a division above the centerline and 0.75 of a division below the centerline. Assuming a 1v/division scale factor, this correctly indicates a 1.5v signal — but no dc is indicated.

The dc scope waveform (Fig. 6) shows the entire sinewave trace has moved up 2 divisions, indicating a 2vdc level. The sinewave still covers 1.5 divisions, indicating a 1.5v signal. It can also be seen that the peak is 3.5 divisions from the bottom, indicating that positive peaks reach 3.5v above zero.

But this capability of measuring ac and dc simultaneously on a dc scope is not always an advantage. This will become apparent if the average dc voltage level and the signal amplitude are not within the same range. If they're not, you may not be able to see them both (or at least measure both accurately) without switching vertical gain or repositioning the trace.

Suppose you are measuring a 10v signal on a tube plate element having a potential of 100v. If the vertical gain is set to show 10v full scale, you will have to reposition the trace vertically to bring it down into view. Hence, the advantage of simultaneous measurement is somewhat limited because the ac signal must be within the same general range for accurate simultaneous measurement.

Low Frequency Cutoff Point

Any ac scope must have a low frequency cutoff point. This may be as low as 2 or 3Hz. But it still represents a fixed limit. As you approach this point, the input signal amplitude will be reduced. If the low limit

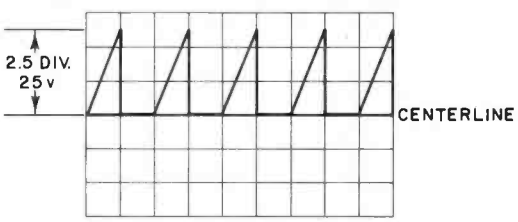


Fig. 4 — Sawtooth waveform having a "rest" period between cycles on dc scope. Trace shows correct 25v P-P and begins at centerline.

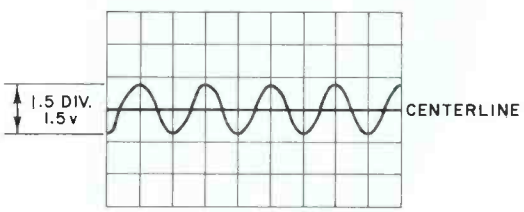


Fig. 5 — A 1.5v P-P sinewave presentation on ac scope rides on a circuit having a 2vdc level. No dc is indicated.

Hickok Model 770A dc scope.

is 3Hz, for example, you may notice some amplitude drop at 15Hz. Many manufacturers offset this condition by specifying the low limit in their ac scopes well above the actual cutoff point. Although this is good practice, it is possible that the user will not know the exact frequency of the signal he is measuring or will not remember the scope's low limit. Either way, you could have an error without knowing it.

Distortion

A dc scope is less likely to produce distortion, particularly at low frequencies. Whenever a waveform of long duration (low frequency) is displayed on an ac scope some distortion occurs. This distortion is caused by nonlinear charge and discharge rates of coupling capacitors in the vertical amplifier stage of an ac scope. Step voltages are a particular problem.

Amplifiers that are ac coupled do not respond correctly to step voltages of long duration because these waveforms are differentiated (like square waves, rectangular pulses and staircase waveforms, for example). After each initial vertical deflection (see Fig. 7), the display starts to slope exponentially toward the zero position according to the charge curve of the RC coupling networks.

In any amplifier, the coupling capacitors must be charged and discharged to pass each squarewave pulse (or similar pulse with a sharp vertical rise and fall). If the waveforms are short in duration (a few μs) as high frequency signals are, they would use only a short portion of the capacitor charge-discharge curve and would appear without distortion. As the signal duration lengthens, however, the natural curve becomes more apparent — affecting the waveform shape more noticeably. Since no coupling capacitors are used in the vertical deflection amplifier of a dc scope, this type of distortion does not occur — with either long or short pulses.

Some ac scope manufacturers try to compensate for this type of distortion by using a low-frequency boost network in the vertical amplifier. This causes the waveform to slope away from zero for some interval following each step and finally level off and slope back toward zero. Although this is helpful, some distortion still exists.

We have not suggested here that you toss your old reliable ac scope in the trash can. These scopes have been around for a long time and will probably continue to be here for some time to come. But if you are considering a new scope, look over the many dc scopes currently available. ■

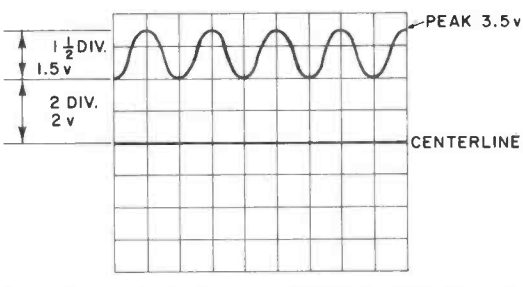


Fig. 6 — A 1.5v P-P sinewave presentation on a dc scope riding on a circuit having a 2vdc level. Both ac and dc levels are indicated.

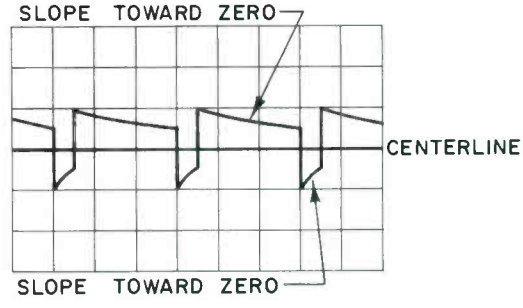
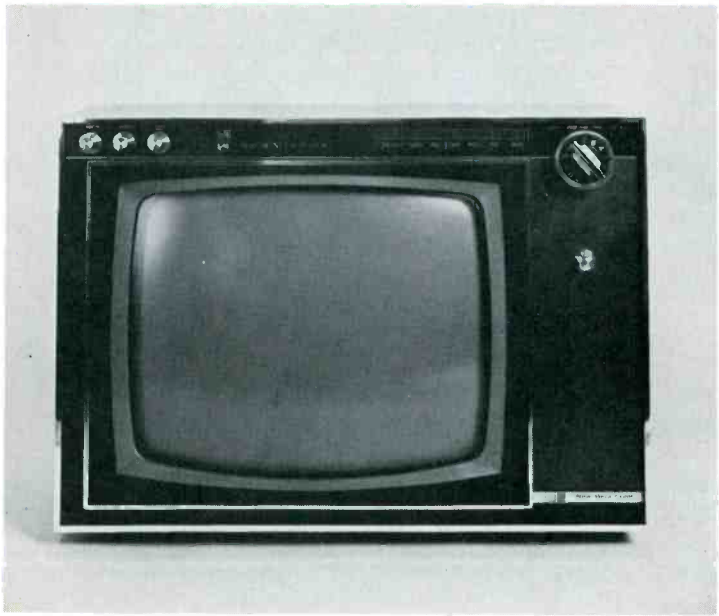


Fig. 7 — Presentation of a rectangular wave on ac scope showing low-frequency distortion caused by charge and discharge of coupling capacitors.

TEKLAB REPORT

A Technician Looks at RCA Victor's CTC22 Color Chassis



RCA Vicor Model EJ-507 color portable.

Understand the new weight- and space-saving circuits — you'll be seeing more of them

■ More portable color TV sets come on the market every year. And we seldom realize how much research and development was necessary to get these sets lightweight and compact. Power transformers are eliminated, tuners miniaturized, new type CRTs are developed, convergence boards are reshaped and relocated.

Both the 6BK4 voltage regulator and damper tube have been eliminated from this RCA Victor set. A new pulse regulator system is used in the HV system — replacing the shunt regulator. A novel diode clamp circuit is used to maintain steady bias on the three CRT grids. This new circuit allows the difference amplifiers to be RC coupled — making the background color temperature independent of demodulator and color amplifier characteristics.

The circuitry features an "instant" degaussing arrangement — making it unnecessary to wait for the "off time" interval normally encountered with ADG circuits used in larger sets.

A new CTC22 color chassis is employed in this company's portable color TV line. This lightweight color receiver weighs approximately 40 lb and is constructed in the following dimensions: 14½ x 19⅞ x 15¾ in.

We were anxious to dig in and pull the cover off the chassis to see how they managed to get this chassis so lightweight and compact. After the rear cover was removed, we noticed most of the components are easily accessible.

Another thing conspicuous by its absence was the power transformer. All tube filaments, with the exception of the CRT, are series connected. An isolating filament transformer is used to provide 6.3v for the CRT heaters. Looking a little closer we counted 20 tubes, including the 15LP22 CRT and a total of 6 circuit boards.

One interesting feature was the location, shape and control arrangement of the convergence board shown in Fig. 1. Circuit components are contained in a circular-shaped board, mounted directly to the neck of the CRT. This board also contains the dynamic convergence assembly.

Power Supply

A half wave voltage doubler is employed and is, in many respects, similar to the power supply circuitry used in B/W TV receivers (see Fig. 2).

Line protection is provided by a 7a fuse located in series with one side of the ac line to chassis ground. A thermistor provides surge protection and is connected in series with the B+ rectifiers. A special thermal reset circuit breaker is used which can be "tripped" by a combination of excessive current demanded of the low voltage power supply or excessive current through the horizontal output stage.

Color CRT and Circuitry

The CTC22 chassis employs a 15LP22 CRT with a number of unique features of its own. The phosphor dot screen uses a rare-earth, red-emitting phosphor, improved blue and green phosphor. According to the manufacturer, it is capable of producing 38 percent brighter highlights which was noticeable under bright light conditions.

The new CRT is designed so the blue gun is down — at 6 o'clock — providing optimum compromise of pincushion distortion at the top and bottom of the screen. The 15LP22 CRT does not require an external magnetic shield. Another important feature of the new CRT is an Einzel-lens focus system which is said to offer several advantages: It is less sensitive to HV variations, thus providing good focus even with variations in picture brightness. No need exists for an intermediate high voltage supply with the new simplified HV circuitry.

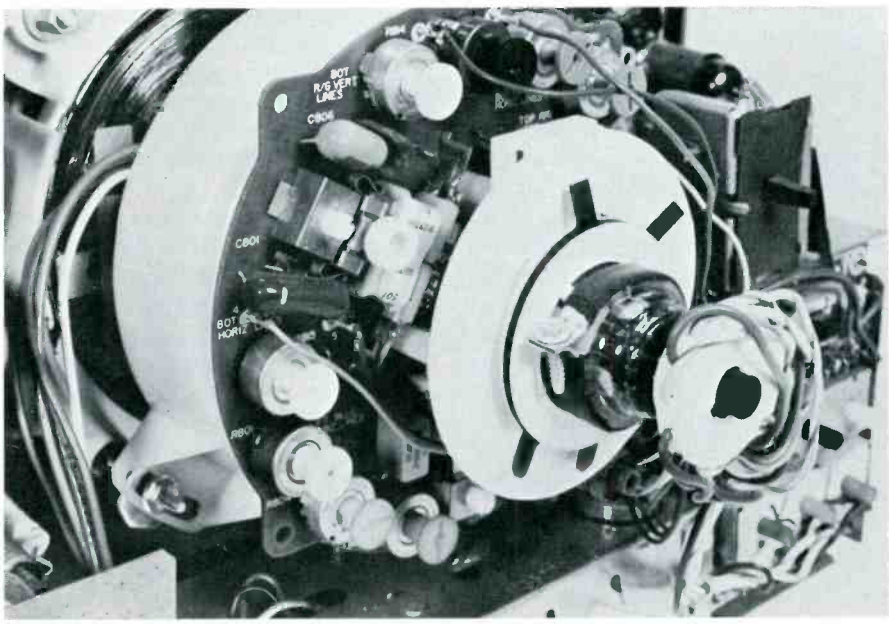


Fig. 1 — New circular-shaped convergence board mounted directly to the CRT neck.

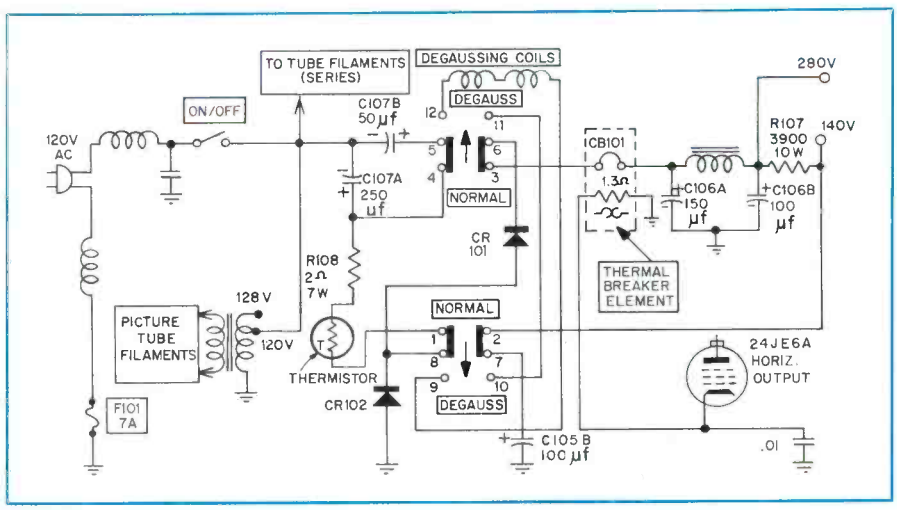


Fig. 2 — Simplified power supply and degaussing circuits.

Color Difference Amplifiers

The color amplifier stages have several very interesting features. The R-Y, G-Y and B-Y amplifiers operate in the grounded cathode mode, with grid bias taken from the blanker circuit. Only capacitive coupling is used from the output of the difference amplifiers to the CRT grids (see Fig. 3).

The dc reference level for the color grids is established by using a new circuit. Each grid (red, green and blue) has an associated clamp diode to provide the dc level for the grids of the CRT. All three amplifiers have symmetrical appearance up to and including the path to the CRT control grids. The cathodes are grounded and grid bias voltage is obtained from a divider network connected to the negative voltage at the blanker grid circuit. And the plate output circuit of each amplifier has basically the same configuration.

The dc clamp circuit operates as follows; A negative going pulse from the blanker plate is applied to the cathode of each clamp diode (see simplified circuit in Fig. 4). When the pulse is present, diode CR704 conducts — clamping the grid to approximately 140v.

During active scan time, C738 tends to charge toward 280v through R750. The circuit has a long time constant, however, (compared to 63.5μs horizontal rate) and the change in dc level during one horizontal scan is negligible.

Color Sync Stages

The 3.58MHz oscillator plays a very important part in the development of demodulator CW signal, supplementary control voltages for automatic color control (ACC) and killer actuation.

The burst amplifier receives composite chroma input and a hori-

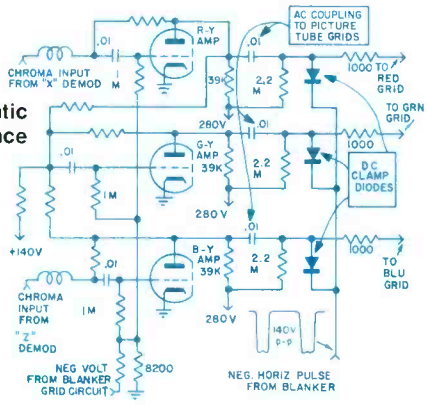


Fig. 3 — Schematic of color difference amplifiers.

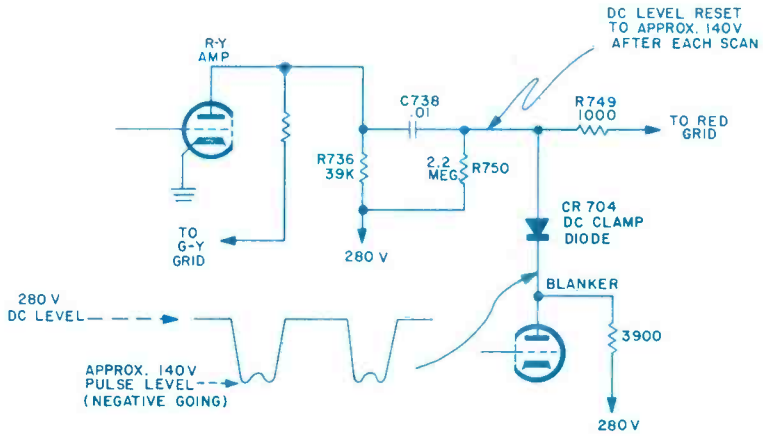


Fig. 4 — Simplified dc clamp circuit.

zontal keying pulse. Separated burst at the amplifier stage output is used to force the 3.58MHz oscillator in step with the incoming burst (frequency and phase) signal.

A dc voltage obtained from the 3.58MHz oscillator grid (from a doubler diode circuit) is used to control killer action and provide ACC bias to the chroma bandpass stage. ACC is accomplished by varying chroma bandpass amplifier gain during reception of color signal. The killer voltage functions to render the chroma bandpass stage inoperative unless color burst is being received from the station or if insufficient burst signal is received for any reason.

Without color, the oscillator grid voltage is approximately −5vdc. The cathode-to-grid section of the 5GH8 oscillator and CR703 comprise a voltage doubler circuit (two diodes). Any grid circuit voltage developed will be approximately doubled at the CR703 diode output. The −5v (no color) has approximately −10v at CR703.

This circuit has two functions: It developes voltage to control the color killer and voltages for ACC action — controlling the gain of the chroma bandpass stage, to keep color saturation reasonably constant during various reception conditions.

When the received signal includes a color burst component above the reset threshold level, the amount of 3.58MHz signal available at the oscillator grid is increased; with burst, typically −8vdc is developed at the grid. The voltage doubler diode CR703 rectifies the additional signal produced — approximately −16v output. The amplitude of the voltage is proportional to the amplitude of the incoming burst signal. The negative voltage from the diode is balanced by the connection (through a 10M resistor) to the positive voltage on the burst amplifier cathode. The ACC voltage is approximately proportional to the incoming burst amplitude.

The 3.58MHz oscillator has a variable inductor (L702) in the screen circuit to permit adjustment of the oscillator level. For optimum ACC operation (and proper operation of the color killer), the strength adjustment is set to provide −10v at the output of CR703 with no burst input. This adjustment is made as part of the total AFPC alignment and zero beat must be rechecked.

Horizontal Output and HV Circuit

A very interesting new horizontal output and HV system is employed (see the simplified schematic in Fig. 5). HV regulation is achieved by the following method: The familiar shunt regulator is replaced by a pulse regulator stage, using tube type 17KV6. The regulator tube acts as a variable load on the flyback pulse source. The horizontal output and HV transformer employed is new — a construction allowing the isolation of the HV winding for direct beam current control.

The damper function is performed by a silicon diode, which is shaped like a fuse and snaps into clips mounted on the sweep deflection board. A 24JE6A tube serves as the horizontal output tube and a 3A3 as the HV rectifier.

The pulse regulator is effectively shunted across part of the primary winding of the horizontal output transformer. This system has several advantages: the regulator tube (17KV6) operates at lower voltages (3kv), no X-ray shielding is required and space is reduced. The 3A3 conducts only on demand from the CRT, giving longer tube life.

The regulator maintains a substantially constant pulse amplitude in the primary winding of the flyback with changing loads on the HV supply, assuring a constant amplitude and a stepped-up pulse is applied to the 3A3 high voltage rectifier.

Regulator control is accomplished by sampling the CRT current through a special winding on the flyback and by using the resultant voltage drop (across a resistor) to control the regulator grid circuit.

During trace and retrace, the cathode of the 17KV6 pulse regulator tube is held to 280v. During the trace period the screen is biased at 100v, regardless of the beam current being drawn by the CRT. The control grid bias is determined by the voltage divider network, R411, R408 and R407.

A typical value of 300μa of beam

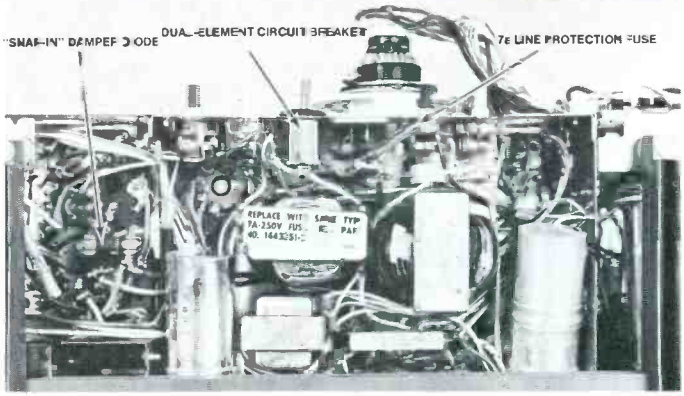
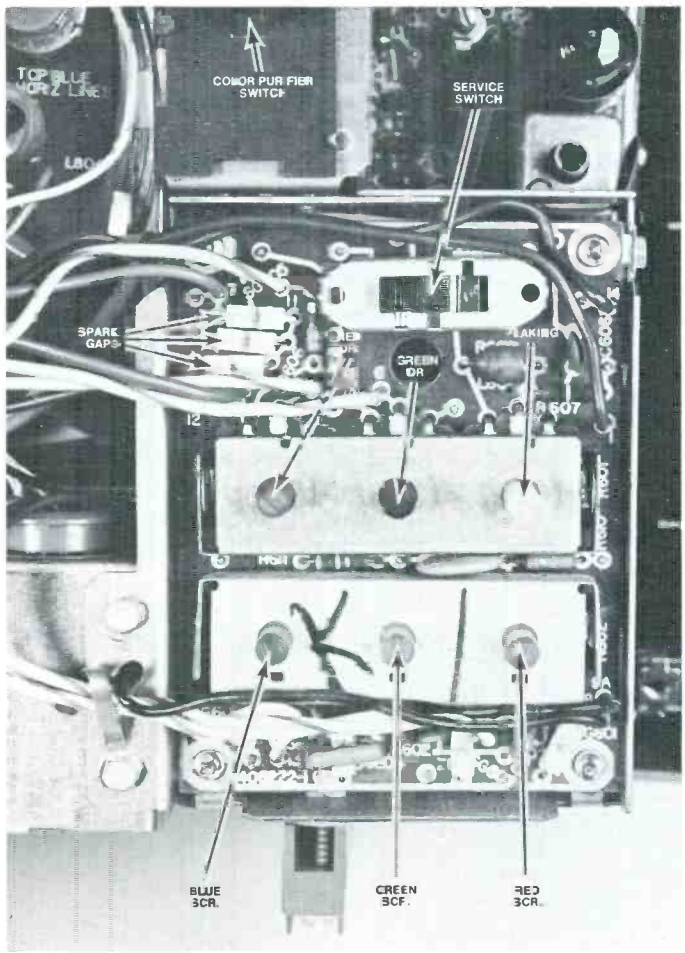
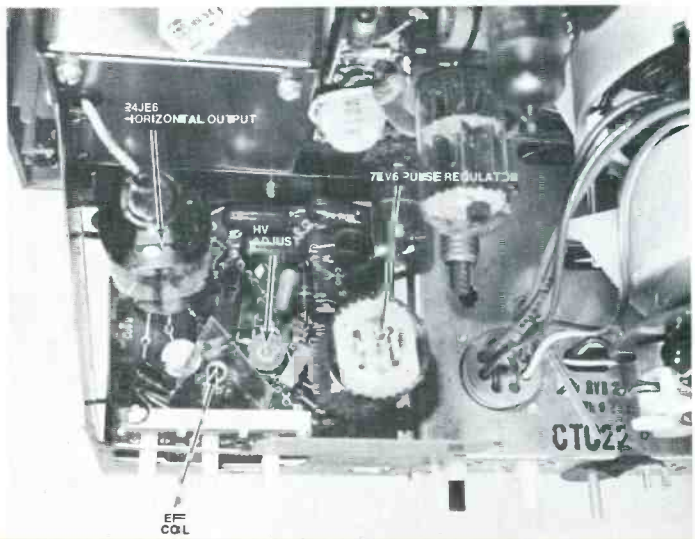


Photo shows circuitry and components are easily accessible under chassis.



Location of setup controls.

Horizontal sweep board.



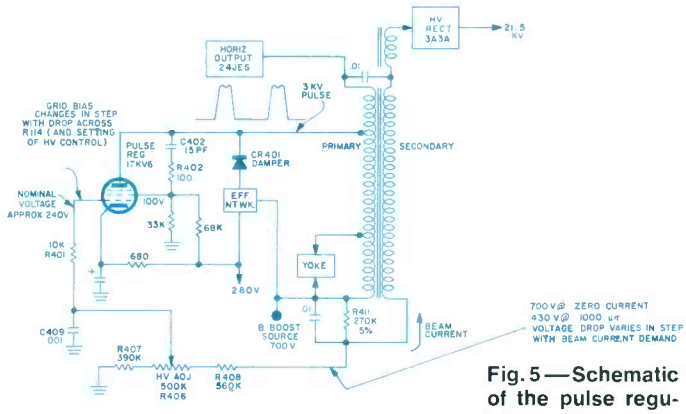


Fig. 5—Schematic of the pulse regulator system.

current would give a control grid bias of 240v. Also during the trace period the damper (CR401) is conducting, which holds the plate of the 17KV6 to 280v. With the plate-to-cathode potential at zero and the screen grid and control grid negative with respect to the cathode, the tube is completely cut off during the trace period.

At the start of the retrace period the damper becomes reverse biased and the voltage on the plate of the 17KV6 begins to rise. This increasing voltage is coupled to the screen grid through C402, R402 and to the control grid through the interelectrode capacity in the tube.

At the start of retrace the plate and the screen have both been driven positive with respect to the cathode; the control grid has become less negative with respect to the cathode and the tube begins to conduct.

The pulses impressed on the screen and control grid are short in duration. Thus, the screen is positive with respect to the cathode and the control grid is close to cathode potential for only a short time. The tube is driven into conduction for 2 to 4µs at the start of retrace and then cut off. As the beam current increases or decreases the voltage developed in the voltage divider network follows these changes and applies them to the control grid of the 17KV6 — decreasing or increasing its conduction — to keep HV constant. ■

Part One of a Two-Part Series

Servicing Color TV

To establish and maintain a solid relationship with your customers, you'll need to know

■ Color TV horizontal sweep systems differ from those used in B/W sets only to the extent that the color systems supply convergence pulses and focus voltage. The schematic of a B/W system is shown in Fig. 1 and a modern color TV sweep system is shown in Fig. 2.

You'll need up-to-date test instruments (a good P-P calibrated scope, for example), and the know-how to use them effectively. These test instruments, if used properly, together with schematics and other service data, will help you isolate the trouble fast and efficiently.

First Steps

The first step in shop procedure for color TV chassis servicing requires factory service information. Take a good look at the circuits on the schematic and become thoroughly familiar with them.

The next step calls for a complete scope check of the power supply to determine the percentage of ac ripple and a VTVM check to determine if the voltages are correct. Our experiences prove that these two checks on color TV chassis will turn up information that will help you solve many problems.

Trouble Clues

When the audio comes on before the raster appears, this is caused by the slower heating of horizontal sweep tubes. But if the audio is clear, you know the set's AGC keyer is OK, video information is present in the IF strip and the horizontal oscillator is functioning.

Allow the receiver to warm up 15 to 30 sec. Adjust the brightness control about two-thirds up, the contrast control at mid-range and adjust the volume control almost down. If the CRT screen fails to light, unplug the receiver from the ac power source and while it is cooling, substitute good tubes in the horizontal oscillator, horizontal output, damper, HV rectifier, regulator and blanker stages.

With your ear down close to the back of the set, switch the set on and listen for the soft "crackling" sound

Fig. 1 — Schematic of horizontal sweep section in Zenith B/W 14N26Z chassis.

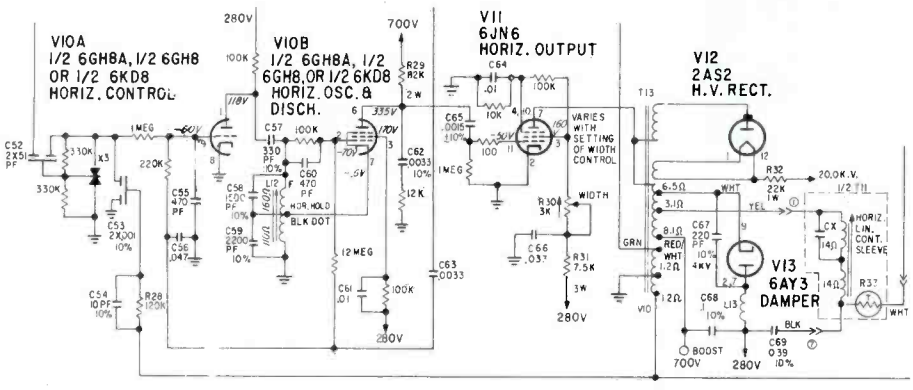
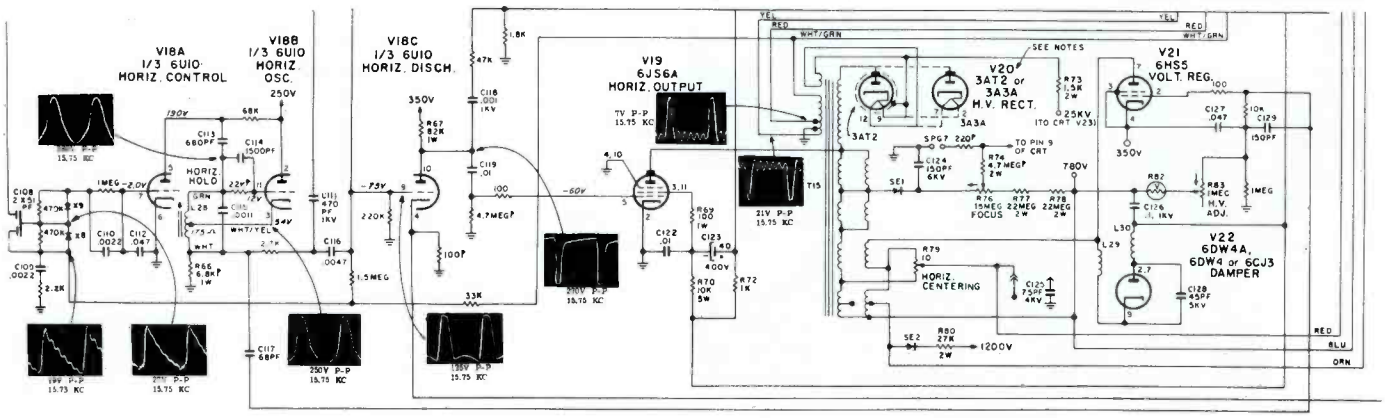


Fig. 2 — Horizontal sweep section of Zenith color chassis 23XC36.



Horizontal Sweep Circuits

how to quickly diagnose and eliminate troubles in color TV horizontal sweep circuits

that indicates high voltage is hitting the CRT. This crackling is the magnetic attraction of the metal shield holding the CRT in place, and it assures us that HV is being developed. If no crackling sound exists, then chances are tubes are not involved and the trouble exists elsewhere.

Leave the new tubes in the set until the problem has been solved and don't jump to the conclusion at this point that the flyback or yoke is faulty.

After the receiver has been on for several minutes (not over five), observe the horizontal output tube. If the plates have turned cherry red, then the problem is most likely caused by one of three things: loss of horizontal drive pulse, saturation in the sweep system or low B+ voltage.

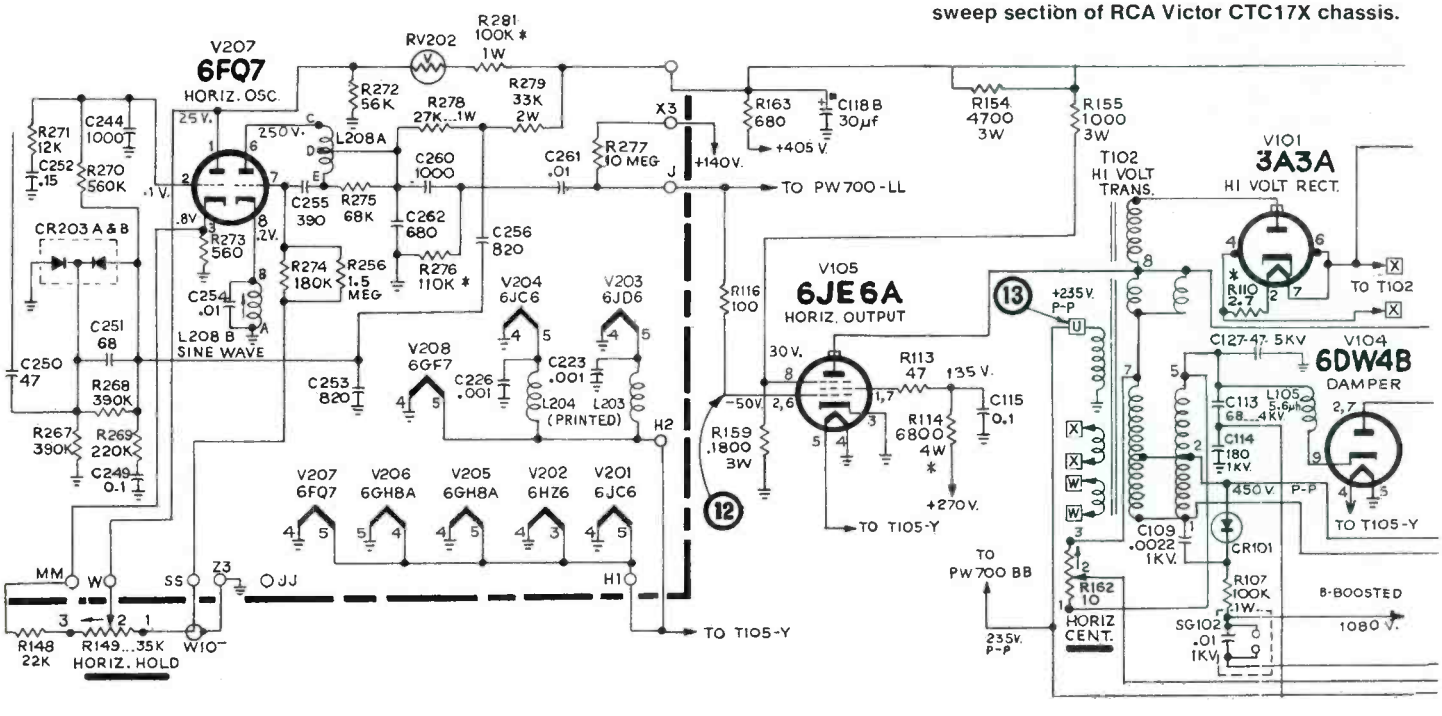
Like the B/W receiver, the color set's horizontal output tube will run red hot if it is underdriven. But unlike the B/W tube, it can be fully driven, have normal grid bias and still saturate. This is a major difference between color and B/W sets. Any loading in the flyback system of a color receiver will cause the tube to draw too much current — the grim reaper of both flyback and tube.

If a B+ problem is suspected, and the receiver uses silicon rectifiers, cut one end of each rectifier loose and bridge new rectifiers across. If rectifier tubes are used, substitute them. If B+ is still low, then bridge the input filter capacitor or voltage doubler capacitor. Still no results? Then let's move on.

The crackling sound that reveals HV will not necessarily indicate, for example, that the HV is decaying gradually. Remove the HV rectifier cap and try drawing an arc with an insulated handle screwdriver. *Do not touch the tool to chassis* as it may damage the flyback. If the arc is less than 1½ in., prepare to remove the chassis or, if the receiver has a bottom plate, tip up on one side of the cabinet.

Now, if the horizontal output tube does not turn a cherry red, use a high voltage probe on your VTVM to check for proper positive dc HV at the CRT anode. If this voltage is incorrect, the problem may be in the shunt and or pulse regulator or HV rectifier section.

The trick is to try to keep a cool horizontal output tube and here is how it's done. If the horizontal output tube is drawing too much current, check the horizontal drive pulses for correct frequency and amplitude with a good calibrated scope. A VTVM can be used to measure for correct drive, but a



sweep section of RCA Victor CTC17X chassis.

scope will reveal so much more information in a shorter time.

Troubleshooting

The first step in horizontal oscillator and sweep output troubleshooting consists of jumping the sinewave coil and adjusting the free running oscillator frequency. This assures that the oscillator is operating at the correct frequency.

The next step involves the simultaneous adjustment and monitoring of the horizontal output tube current, shunt regulator current and HV to obtain maximum efficiency and operation within the power dissipation rating of the output tube.

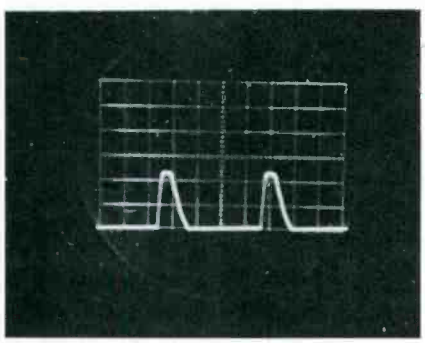


Fig. 4 — A scope check of the drive pulse at pin 2-6 of V105 showed the P-P value was much too low — about 120v.

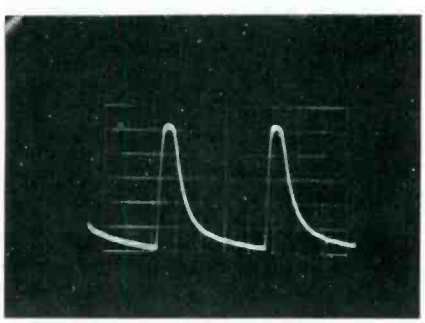


Fig. 5 — After the 0.01μf coupling capacitor was replaced, the P-P voltage rose to 200v at the 6JE6A grid.

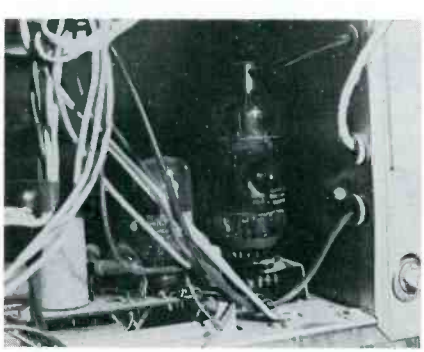


Fig. 6 — The glass bulb of this 6JS6A horizontal output tube became so hot that the side caved in.

The horizontal efficiency coil, when properly adjusted, assures maximum efficiency of the entire deflection circuit with minimum power dissipation in the horizontal output tube. To perform the efficiency coil adjustment, insert a milliammeter in the cathode circuit of the horizontal output tube. The efficiency coil is then adjusted for a current dip. (Consult service notes for proper adjustment.) The coil should be adjusted away from the dip to increase the cathode current by 3 or 4ma. The direction should also show an increase in the regulator current.

If the regulator current decreases, the coil is adjusted in the wrong direction from the dip. An incorrect setting will result in less efficiency, poor linearity and excessive power dissipation in the output stage.

Now adjust the high voltage control to obtain 25kv with the CRT at a minimum brightness. Under these conditions, the CRT current is minimum, regulator current is maximum. A dark picture permits you to measure regulator current as a check on the capabilities of the high voltage system.

With the high voltage adjusted at 25kv and brightness at minimum, the regulator current should be at least 960μa. Typical current is approximately 1.35ma. As the CRT current is increased (brightness adjusted up) the regulator current decreases by the same amount — maintaining a constant load on the high voltage supply.

After adjusting the high voltage control, the "dip" point in the cathode current through the horizontal output tube should be rechecked, and reset, if necessary.

Next, use a VTVM to check the boost voltage. Keep the probe on the test point while the set is warming up. The boost voltage may start to build up and then quickly collapse. If this happens, this is your clue that a capacitor across the efficiency (linearity) coil is shorting. If you check for boosted boost or focus voltages, use a high voltage probe because we're dealing with 1.1 to approximately 5kv.

Now disconnect the HV rectifier cap. See if the chassis in question is using a focus selenium rectifier or boost silicon diodes. No raster will appear if either of these diodes are open. And no HV will develop if either are shorted. Disconnect one end of each diode and check for an arc. If no arc or a very small arc appears, the diode is OK. Reconnect them.

Case Histories

The 6JE6 horizontal output in an RCA CTC17X color chassis was glowing red. The drive pulse at pin 2-6 of V105 (see Fig. 3) was checked with a scope. The potential here measured 120v P-P (see Fig. 4) which is much too low. The horizontal oscillator waveshapes were scoped and a VTVM confirmed that the oscillator section was functioning properly. The trouble was caused by a leaking 0.01μf coupling capacitor, C261, connected to the grid of the 6JE6A horizontal output tube. After the capacitor was replaced, we got a normal P-P reading of 200v at the 6JE6A grid (see Fig. 5).

A 6JS6A horizontal output tube in a G-E color chassis showed symptoms of heavy current flow. The glass bulb (see Fig. 6) had melted and caved in on one side. Chances are, when this occurs, no circuit defects exist — the cause is frequently a defective horizontal output tube. It could be caused by an inadequate drive pulse, a shorted 3AT2, improper screen voltage or some other heavier-than-normal load on the sweep circuits. Some set makers use a positive voltage on the suppressor grid of the 6JE6 or 6JS6 tubes to reduce snivets during UHF reception. The reason for the difference in circuit variations comes about because specifications vary widely in different runs of these horizontal output tubes. This positive voltage will sometimes cause this tube to draw heavy current and will cause premature tube failure. We have found it advisable, in certain sets and under certain circumstances, to remove this positive voltage and ground the suppressor grid.

The second and concluding part of this article will appear in a forthcoming issue. ■

The eighteenth article in a continuing series

Semiconductors from A to Z

Future servicing techniques will require an understanding of light-sensitive components

Fig. 1 — A series of these photovoltaic cells can be used to supply the electrical power for a transistor radio.

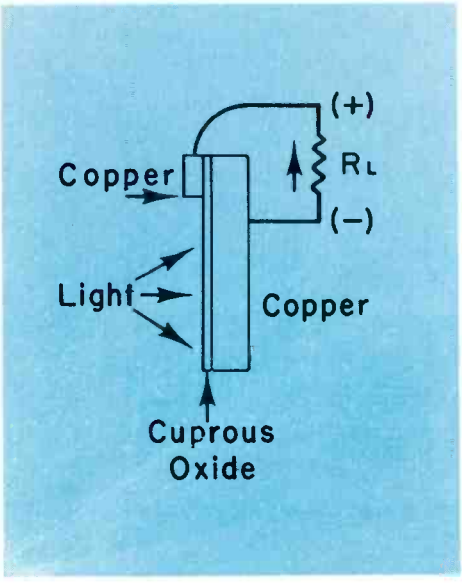


Fig. 2 — The substrate of a back-wall photovoltaic cell collects a negative charge when exposed to light.

■ The Technical Digest in the October 1967 issue of ELECTRONIC TECHNICIAN tells how a light dependent resistor is used to automatically adjust the brightness of a TV set. The varicap tuned receiver described in the last article of this series could be designed to tune remotely with a light coupled component designed to isolate the tuned circuit and reduce interference. One integrated circuit currently on the market is isolated with a solid-state optical coupling. The principles of photoemissive and photosensitive semiconductors must be thoroughly understood if their circuits are to be effectively serviced in the future.

Photovoltaic Cells

The photocells that have probably gained the greatest fame are the photovoltaic, or solar cells, that have been used to power small transmitters and other gear in space capsules. Large panels of these cells provide several watts of electrical power from the sun's light. Smaller batteries of these cells are currently being sold to power 9v portable radios with light. Some small relay stations use these cells to recharge their batteries. A photovoltaic cell (Fig. 1), like a diode, contains a junction of two types of material.

The photovoltaic cell in Fig. 2 consists of a thin layer of cuprous oxide on a copper plate. When light strikes the cuprous oxide, it drives off electrons which travel to the copper plate. A strip of copper secured

to the front surface of the photovoltaic cell acts as an electrode and allows electrons to return to the cuprous-oxide surface. Electrons can be more efficiently returned to the cuprous-oxide surface if an opaque copper screen is substituted for the single copper electrode. The current produced by the light flows in a direction opposite that of the current produced if the component is used as a rectifier in a power supply.

Copper can be deposited so thinly on the cuprous oxide surface that it is transparent (Fig. 3) though still a conductor of electricity. More of the electrons driven off the cuprous oxide by light flow through the transparent layer of copper (since the incident light at this junction is more intense) than through the copper backing (where the light intensity has been reduced by the cuprous-oxide material). The transparent copper surface therefore becomes more negative than the copper backing, and the current flows from the front terminal lead to the backing — the opposite direction that it flowed when the copper screen was used.

A similar photovoltaic cell contains a coating of selenium in place of the cuprous oxide, and a transparent layer of gold or platinum in place of the transparent layer of copper. When light strikes this cell, a current is produced like the one produced by the copper cell.

The most efficient type of photovoltaic cell currently on the market (Fig. 4) contains a junction of P- and N-type silicon. When light strikes this photovoltaic cell, electrons are driven from the P-type material and flow through the junction to the N-type material. Electrons flow through this cell as they do through the ones described in Fig. 2.

The curve in Fig. 5 indicates that the current produced by these photovoltaic cells corresponds more linearly to the amount of incident light when the load resistance is kept to a minimum. Low-impedance circuits are used with these photovoltaic cells in some cameras and light meters. These cells have the advantage of supplying their own electrical current for operating the meter or controlling the size of the camera iris. Other photosensitive semiconductors must be used, however, when a high sensitivity to light is required.

Photovoltaic cells have a nearly instantaneous response to changes in light intensity, but their output decreases as the frequency of the light fluctuations increase. Their output drops about 10 percent below their peak current at 5kHz and more than 60 percent below their peak at frequencies above 10kHz. Their nonlinear frequency response characteristics make these components undesirable for audio or high-frequency signal applications.

Photoconductive Cells

Photoconductive cells, sometimes called light dependent resistors, generally contain a thick film of photosensitive semiconductor material deposited on an insulating substrate with metallic leads attached to each end. This photosensitive material generally consists of cadmium selenide, cadmium sulfide or lead sulfide, with impurities of silvers, antimony or indium sometimes added to increase their light sensitivity. When light strikes this material, electrons are freed from their bonds and can flow through the material. The

Fig. 3 — The substrate of a front-wall photovoltaic cell collects a positive charge when exposed to light.

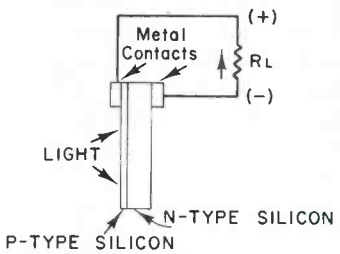


Fig. 4 — Today's more efficient photovoltaic cells contain a junction of P- and N-type silicon.

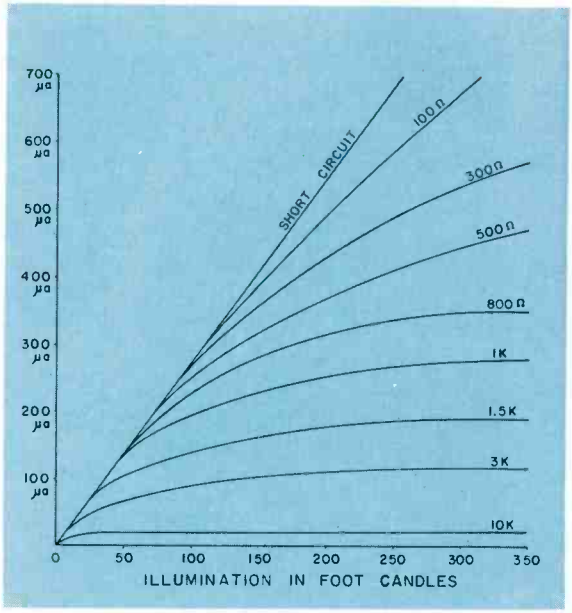


Fig. 5 — There is a more linear relationship between the electrical current from a photovoltaic cell and the incident light intensity when the load resistance is low.

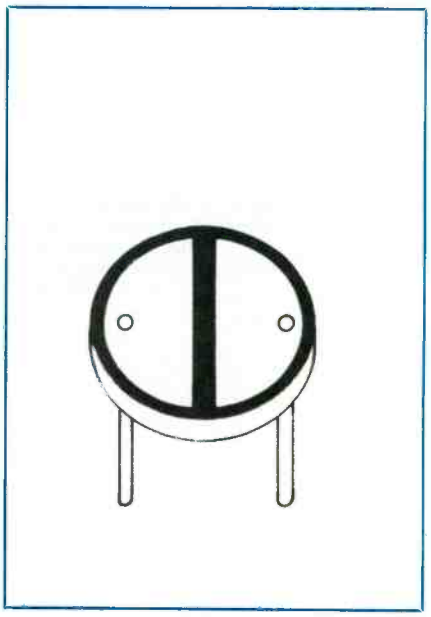


Fig. 6 — The electrons in some photoconductors are separated by only a narrow strip of photosensitive material. (Fig. 3 on page 61 of the July 1967 issue identifies a colored photograph of this component.)

amount of incident light determines the number of broken electron bonds and the resulting resistance of the material — the fewer bonds broken, the larger the resistance.

The manufacturer can determine the resistance and the wattage of a photoconductive cell by controlling the dimensions of the photosensitive material. In some photoconductors the electrodes are separated by only a narrow strip of photosensitive material (Fig. 6). For a large varying resistance, the electrodes in some photoconductors are separated by a relatively long strip of photosensitive material — twisted in a serpentine design to conserve space (Fig. 7). In still other photoconductors (Fig. 8), the photosensitive material is twisted between the two electrodes to form the largest possible surface contact between the electrode surfaces and thereby increase the component's current-carrying capacity.

The dark resistance of some cadmium-sulfide cells are 100,000 times greater than their resistance when illuminated. Other photoconductive cells are capable of carrying up to ½a of current. Because of these characteristics, photoconductive cells have the advantage of being able to control relays directly as light intensities change, without the use of amplifiers.

Photoconductive cells are probably the only semiconductor component a technician will encounter that does not contain a junction of P- and N-type material. Because of these junctions, most types of semiconductors must be connected only to dc bias supplies. This component, however, is not subject to such restrictions and will generally function with a lower noise level when connected to an ac bias supply.

Unfortunately, the resistance of photoconductive cells does not decrease or increase as rapidly as the changes in incident light intensity. This limits the frequency response of most photoconductive cells to between 750Hz and 1kHz, even lower than the frequency response of photovoltaic cells.

Photodiodes

Photodiodes, like photoconductive cells, contain a junction of P- and N-type material, but they are constructed on a much smaller scale — some being no larger than the head of a pin. The photodiode in Fig. 9 contains a thin deposit of silicon on a metal plate used as an anode. The silicon in contact with the point-contact cathode is chemically treated so that it is of P-type material while the balance of the silicon is of N-type material.

When no bias voltage is applied across the photodiode, a small electrical current is generated in the diode by the incident light in the same manner that it is generated in photovoltaic cells. The amount of current generated corresponds to the intensity of the incident light.

When the diode is reverse biased, an electron barrier is formed across its junction and virtually no current flows through the diode. When light strikes this junction, the electrons in the P-type material pass through the junction into the N-type material and the diode conducts a current that corresponds to the intensity of the incident light.

Pages 48 and 49 of the November 1966 article explain how the dimensions and reverse bias of a semiconductor junction limit the component's frequency response.

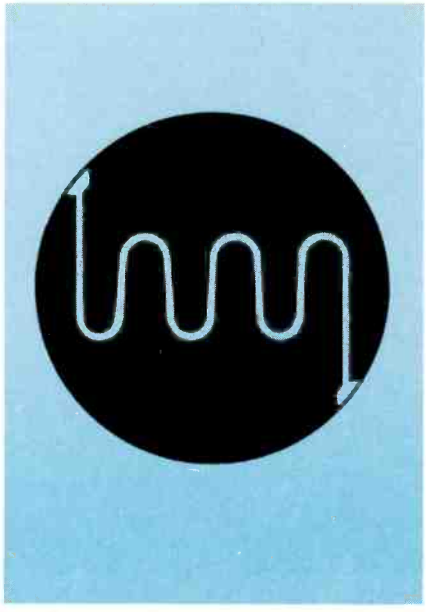


Fig. 7 — The electrodes in some photoconductors are separated by a relatively long strip of photosensitive material. (Fig. 8 on page 61 of the July 1967 issue identifies a colored photograph of this component.)

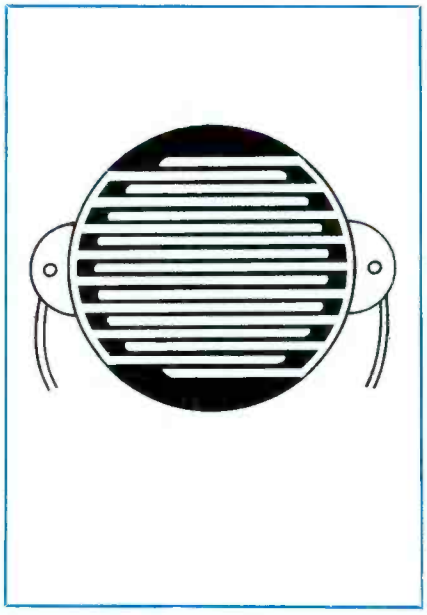


Fig. 8 — The photosensitive material in some photoconductors is shaped to permit the largest possible surface contact with the electrode surfaces. (From a distance this component looks like the one in the colored photograph identified by Fig. 3 on page 61 of the July 1967 issue.)

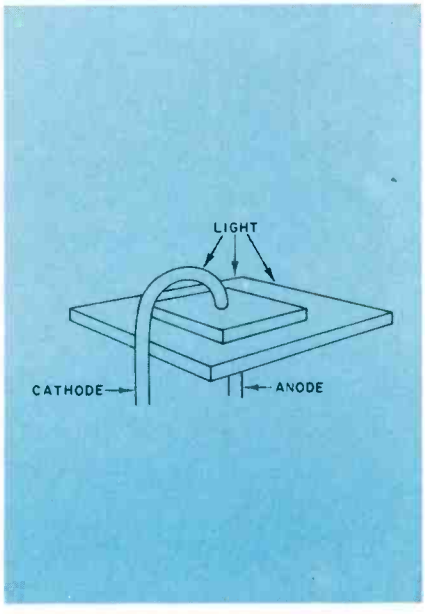


Fig. 9 — When no bias voltage is applied across this diode, incident light develops a positive potential at its cathode.

Partly as a result of their very small size, photodiodes have a very good frequency response. Some, when used in conjunction with a modulated laser beam, have had such a high frequency response that they have been able to carry the signals of several TV programs.

The very small dimensions of a photodiode limit the amount of semiconductor surface exposed to light and the current-carrying capacity of the diode. High reverse-bias voltages, for a greater signal, limit their frequency response. Because of the very small signal obtained from photodiodes, noise can become a problem.

Phototransistors

Phototransistors amplify the current that results directly from the incident light and therefore have a stronger output signal. With this greater output signal, noise is not as great a factor in these components as in the photodiodes.

The phototransistor in Fig. 10 contains a thin layer of silicon on a metal plate connected to the base lead. The silicon in contact with the point-contact emitter and beneath the collector lead is chemically treated so that it is of N-type material while the balance of the silicon is of P-type material.

As an NPN transistor, this component is normally biased as indicated in Fig. 6 on page 62 of the August 1966 article. The transistor's collector lead (Fig. 10) shields the collector-base junction from the light, while light can strike the emitter-base junction. When incident light strikes the emitter-base junction, electrons flow (like in the photodiode) from the P-type material to the N-type material, making the P-type base more positive and increasing the base current. Fluctuations in light intensity change the phototransistor's base current as though a signal had been applied to the base of the transistor for further amplification by the component.

The PNP transistor in Fig. 11 is assembled in a slightly different manner. The central portion of a small cylindrical piece of silicon is secured to a metal ring (Fig. 12), which is connected to the base lead. The top and bottom portions of the silicon cylinder have been changed to P-type material, while the portion within the disc is N-type silicon. The lower end of the cylinder is secured to a metal plate, which is connected to the collector lead, while a point-contact emitter is connected to the cylinder's other end.

As a PNP transistor, this component is normally biased as indicated in Fig. 7 on page 62 of the August 1966 article. As you may recall, the polarity of the PNP bias voltages are opposite those for NPN transistors.

When incident light strikes the end of the silicon cylinder, it penetrates the P-type material and electrons flow from the P-type material to the N-type material, making the N-type base more negative and increasing the base current. The resulting fluctuations in base current are amplified by the transistor.

The NPN transistor (Fig. 10) was designed for optimum frequency response, while the PNP transistor (Fig. 12) was designed for optimum power.

The next article will describe photosensitive FETs and light-emitting diodes. A review of basic lens principles will also be included the following month to help readers understand some modern semiconductor applications that may soon make their appearance in the shop. ■

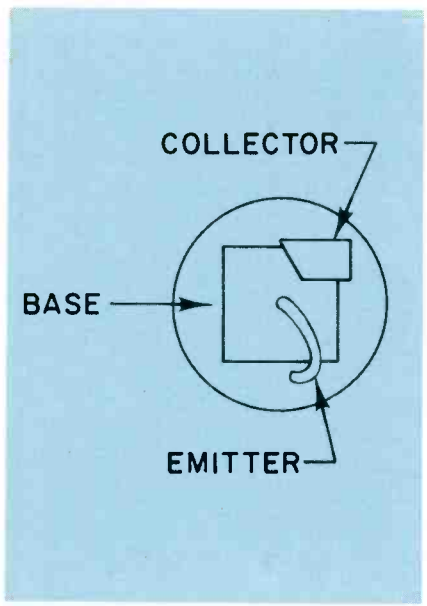


Fig. 10 — Light striking this NPN transistor makes its base more positive than its emitter. (Fig. 9 on page 61 of the July 1967 issue identifies a colored photograph of this component.)

Fig. 11 — This phototransistor has a sufficient signal output to drive a relay without any additional amplification.

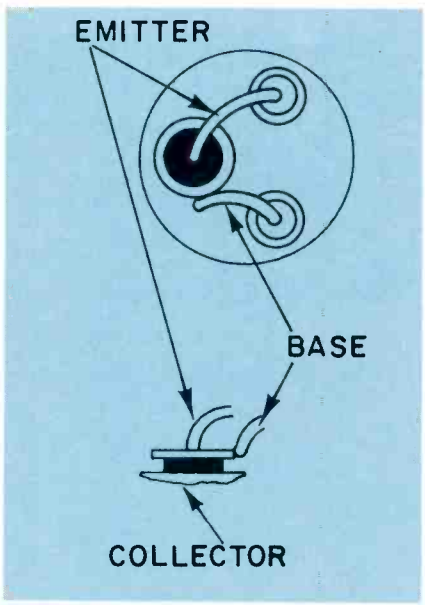


Fig. 12 — Light striking this PNP transistor makes its base more negative than its emitter.

Josef F. Nehring, founder of JayEn Inc. discusses preventive maintenance contract with customer.

We Visit a Successful Two-Way Communications Operation

Slow, but steady growth highlights the progress of this efficient sales-service organization

■ "I started as a one-man operation 13 years ago and worked out of the basement of my house."

We were listening to Josef Nehring, major stockholder in JayEn, Inc., a modest-sized two-way radio communications sales and service business located north of the city of Duluth, Minn.

"We service anything in two-way radio including audio-visual equipment," Mr. Nehring smiles.

Mr. Nehring has 30 years' experience in radio communications. He was once a ship's radio operator, and has worked with radio and navigational equipment for airlines.

"Business was very slow and gradual until the air base opened up here," Mr. Nehring says. "At that time I hired a part-time technician, Jerry Rock, an FCC-licensed man. This job became full-time only a few months later. Another licensed technician, Tom Zauhar, was added to the staff near the end of 1961.

JayEn company's new attractive steel building with drive-in bay and ample parking space.

Thomas Zauhar, sales engineer and customer relations man, designs a special communications system.

"In 1962," Mr. Nehring continues, "the business was incorporated and the two original technicians were taken in as stockholders.

"It is our feeling that officers and supervisors necessary for growth in a small organization must come from the ranks. The transition of a technician to such a position is difficult but necessary. These men understand over-all operation and when they own a part of the organization the incentive to push ahead with constructive ideas is much greater. This has been the case with our service and sales manager."

As the business expanded into new fields, an additional three men have been added.

The JayEn company has recently completed a new, attractive building (see this month's front cover) which is located in the growing industrial area on the main highway connecting Duluth with the iron-range cities where JayEn does considerable two-way radio and industrial controls equipment maintenance for mining companies. The business is also located near the air base where two-way radio and CCTV equipment is maintained for the U.S. Air Force.

"Most of our work in the immediate area comes from the Air Force, building contractors, trucking and transportation firms," Mr. Nehring explains.

JayEn's new building is 36 x 40ft, is all-steel designed and already developing growing pains. But it is designed for easy expansion and a 60ft addition is now being contemplated. It is also designed to cut maintenance time to a minimum, having a drive-in bay for two-way radio installations. A portion of the building is used for an office.

Secrets of the Trade

Our man wanted to know some of the "secrets" of developing a successful two-way communications business.

"I'd say the most important thing in this business is qualified technicians and top-grade test instruments," Mr. Nehring smiles. "At least," he continues, "these are two prerequisites if you want to become a franchised dealer or an authorized service station for manufacturers of top-grade equipment. You need the best test instruments to do the job accurately and efficiently and prove your ability.

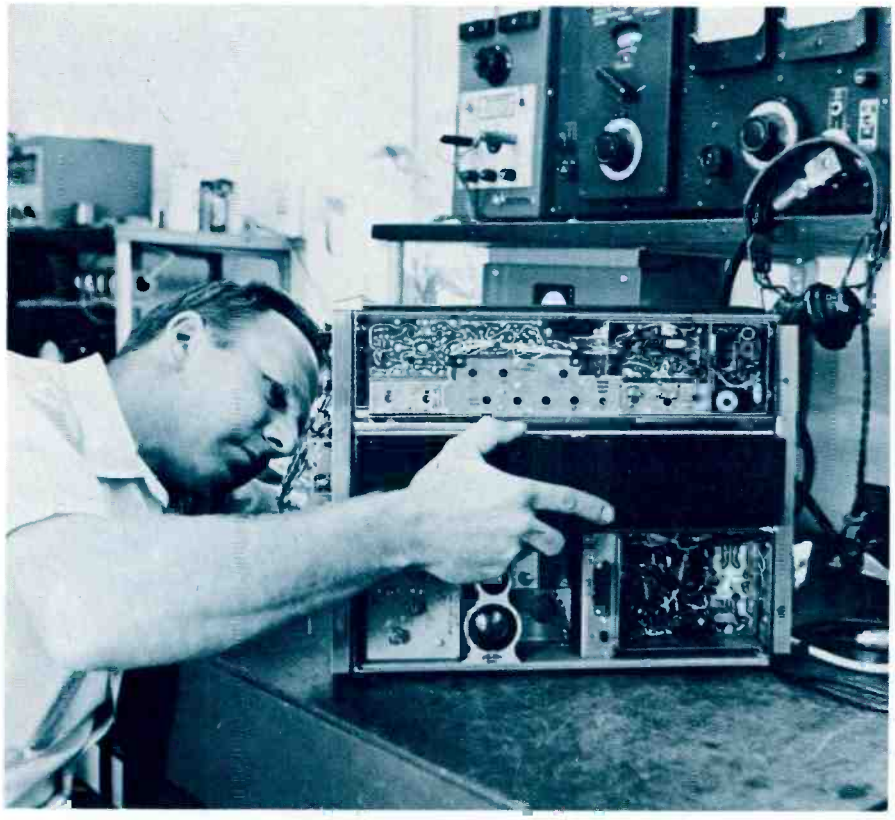
"We have the best test instruments available, including digital frequency meters. I consider this type equipment the least expensive 'tools' you can buy," Mr. Nehring says.

Mr. Nehring feels that good test instruments are essential. "If you don't have them," as he puts it, "you're dead before you start. If the men need more equipment, we buy more," he continues.

The JayEn operation is the largest authorized G-E two-way sales and service organization in Northern Minnesota.

Technicians and Service Operations

JayEn technicians all hold first class FCC telephone licenses and have had formal electronics training plus years of practical experience. Altogether their knowledge covers a wide area in the electrical and electronics field — including heavy-



Technician Glenn Liljegren, servicing G-E two-way communications equipment.

Service manager, Jerry Rock, uses recently purchased digital frequency meter.

Two-way radio installations are made in drive-in bay with all necessary parts needed stored in handy bins.

Service manager, Jerry Rock, checks two-way radio in a U.S. Air Force vehicle.

duty electromechanical equipment, telephone system and switchboard maintenance, carrier communications equipment, TV transmission and reception and design of specific industrial controls.

"We have been able to handle any situation when it arises in our area of the electronics field without having to call for help from others," Mr. Nehring says.

JayEn technicians service CCTV, industrial controls, TV translator stations and two-way radio communications equipment. They also service other gear, including microwave equipment and teleautograph units.

"We do factory-authorized service for G-E, RCA, Wabco, E. F. Johnson, Teleautograph and Sony," Mr. Nehring says.

Most of JayEn's service is done on a preventive maintenance contract basis. Regular service checks are made periodically to keep the equipment in top shape. These contracts are sold on a monthly basis and calls are made within a radius of 160 miles from home base.

"To save driving time and pro-

vide faster service, we have men stationed in Hibbing and Brainard with fully equipped trucks — including test instruments and two-way radios for rapid contact with home base," Mr. Nehring explains.

The first technician employed by the organization, Jerry Rock, is now service manager. He takes service calls, routes field-service technicians, does bench work and two-way equipment installations.

Test jigs are mounted on separate boards for various types of equipment and after being used are stored away — keeping the bench uncluttered. The jigs save time that would otherwise be lost looking for special cables.

"If we tackle a job that we are not thoroughly familiar with," Mr. Nehring says, "we do not charge the customer for on-the-job training time required. Our normal service charge is about $9 an hour for shop work."

Sales of new equipment was previously handled to a large extent by an independent sales agent but this did not prove satisfactory. One of the original members of the firm, Tom Zauhar, has recently been placed in charge of sales and customer relations.

"You have to be sold on a proven product and have confidence in what you're selling," Mr. Zauhar says. "Then, of course, you have to follow up the sale with top-grade service.

"With a lot of experience in the field you can help your customers with various problems and even design special systems to meet their particular needs," Mr. Zauhar concludes.

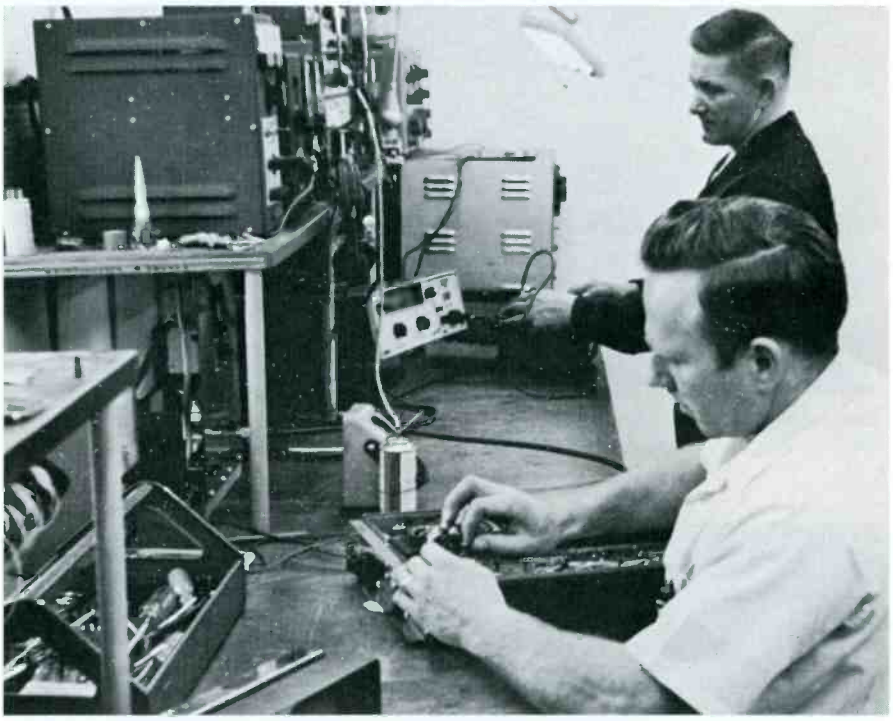
"Actually, all of our service technicians are salesmen and carry sales pads in their back pockets," Mr. Nehring says. "If a unit is old or beyond repair, we sell them a new unit. When our technicians make a sale, they are given 20 percent of the profit made on the sale," he emphasizes.

JayEn holds a monthly meeting which is attended by all personnel. Gripes, differences of opinion, in-house training and upcoming projects are thoroughly aired and discussed at these meetings.

"We have been able to hold our key technical men by giving them an opportunity to become stockholders in the company," Mr. Nehring points out. "In this way," he says, "they have the interest of the company more at heart."

Advertising and Promotion

JayEn spends about $100 a month on local radio station advertising. But word-of-mouth advertising plays a major part in the new business that comes to the company.



JayEn technicians all hold First-Class FCC telephone licenses and service with the best test instruments available.

"We have a number of approaches to other types of advertising," Mr. Nehring says. "We sponsor bowling teams, hand out scratch-pads with our company name printed on each sheet. Our men all wear clean, neat and attractive uniforms. And at night, a well-lighted sign on our building cannot be missed by people passing by."

The final pay-off regarding the success of JayEn seemed to be pinpointed by Mr. Nehring's last words:

"Because of our service policies, we've lost only one customer in the past ten years." ■

Who's Selling What, Where and How?

Old time 'Papa' and 'Mama' two-horse TV-radio operations have grown into hard-core home-entertainment equipment sales-service centers in thousands of surburban areas, medium-sized cities and small towns throughout the nation

■ Some success stories are more interesting than others. And the story of Willie Kocurek, Austin, Tex. (see the story "Money Is for Advertising," page 62, November 1967 ELECTRONIC TECHNICIAN), is an example of what we mean.

Besides starting in TV-radio the hard way (he had an auto service station in 1936 and got interested in TV in 1948), Willie Kocurek has some ideas on service which may prove interesting to some service-dealers.

Remember, Willie and Mrs. Kocurek operate the business (now approaching a half-million annual gross) by themselves — with the help of one full-time salesman, a secretary-bookkeeper and a delivery-setup man.

Our reporter was flabbergasted when it was discovered that the Kocureks had no service department.

"Don't you provide service?" our reporter wanted to know.

"Sure, we provide service," Mr. Kocurek replied, looking more surprised than our reporter.

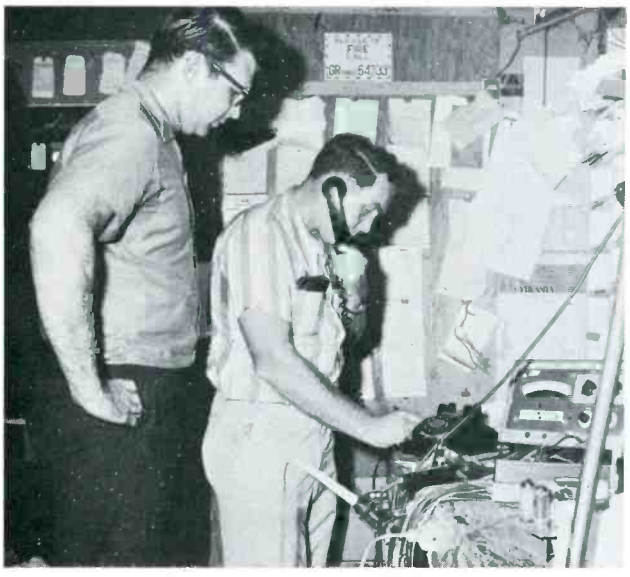
"We provide very good service — but we do it a little different from most service-dealers. We farm out all our service to three other local service-dealers. Each of these shops has five good technicians."

Mr. Kocurek assured us that this method provides the fastest possible service to his customers. Each of the three shops gets enough business from Mr. Kocurek to make his operation a *desired customer*. And they hurry their men along to finish his work.

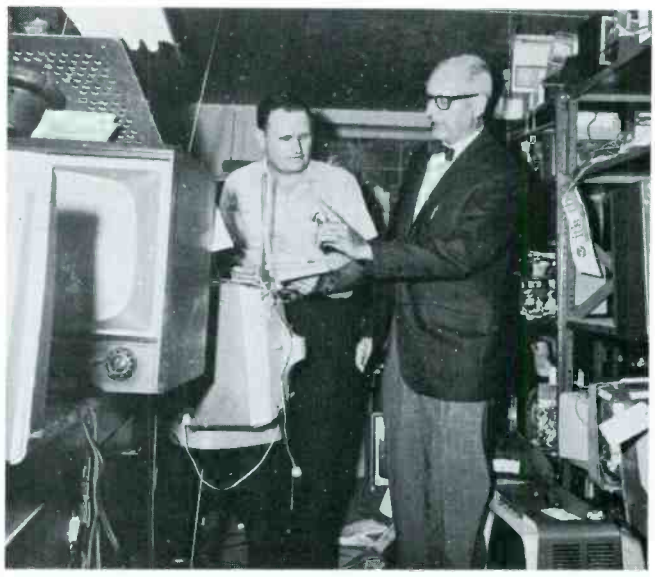
"If one repair shop is too busy and can't take one of our service calls," Mr. Kocurek says, "we pass the order on to the next shop who can do the work immediately."

In this way, peak loads are handled better, according to Mr. Kocurek. And the costs of providing service are spread more evenly.

"When business is slow, we don't have to worry about the salaries of technicians who would be working for us" Mr. Kocurek smiles.



"Speedy" Lynch and Bill Preshaw, owners of Jetts Radio and TV Service get their service assignments over the phone from Mr. Kocurek.



Mr. Kocurek drops in to check on the progress being made on his TV set repairs.

Mr. Kocurek pointed out still another benefit to his operation.

'We have no parts inventory and control system to worry about. And we can also use the space, which a service department takes up, for warehousing," he concludes.

• • •

And out in Antioch, Calif., a small 23,000-population river town, our man ran into another very interesting 'Mama' and 'Papa' service-dealer operation which has grown up over the years. (See the article "How To Upgrade Your Business in One Easy Step," page 60, November 1967 ELECTRONIC TECHNICIAN.)

Vern Green and Vi, his wife, have worked for 16 years to build their now prosperous business. And Vern Green, of Green's TV, sold the first color TV set in his trading area back in 1954. He's been aggressively pushing color ever since.

Like many small and medium-sized towns, however, Antioch's downtown area was "going to seed." Consequently, about a year ago Vern Green began spearheading a campaign for downtown improvement.

"At that time," Mr. Green says, "five stores were vacant and some five other retailers were talking about moving out to other locations. Today, three of the five empty stores have been leased and all talk of moving has stopped.

"All kinds of surveys had been made over the years which proved something had to be done," Mr. Green recalls. "But nothing was being solidly proposed, and in the meantime we were losing traffic."

Vern Green headed a committee to contact downtown property owners, many of whom lived outside the area. The owners agreed to cover half the cost of storefront modernizing and the merchants agreed to pay the other half.

Refurbished storefronts finished in redwood, marquees with shake roofs and Early American post lights give the refurbished downtown blocks a rustic look — appropriate to an oldtime river town.

"The total cost of modernization was $16,000 to $20,000 per block — the cost to merchants being pro rated on the basis of their front footage," Mr. Green says.

The basic program that's building business for Green's TV, Mr. Green concludes, is to use every means to build the traffic that leads to sales, then to back sales with a strong service identity that builds the repeat business.

Giving an in-home demonstration has always been a major sales technique for Green's. Mr. Green or the salesman who has contacted the prospect at the store goes out the same night to make the in-home demonstration.

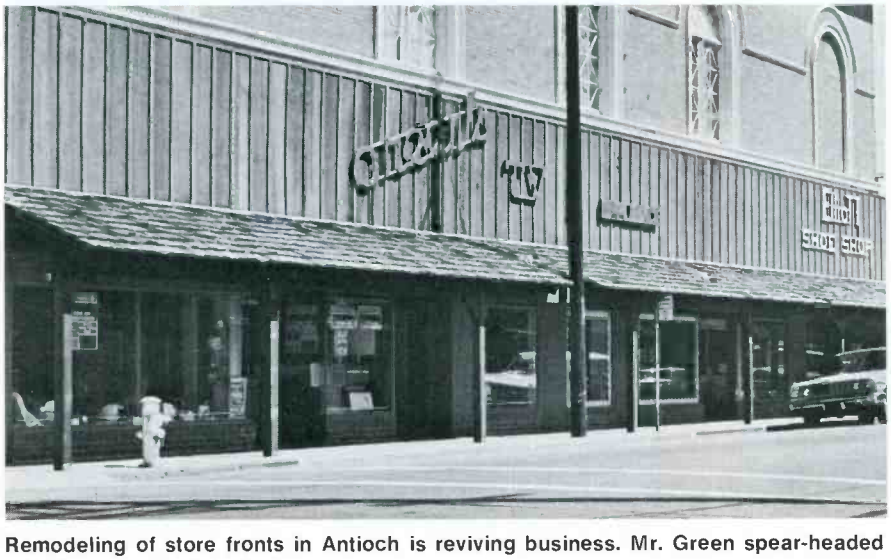
"In the old days," Mr. Green recalls, "we carried 16 different brands and we'd often have three or four sets delivered for comparison. Now with coaxial cable coming in, we really don't need comparison demonstrations any more. But many of our old customers still remember them and ask for them. This is building repeat business for us."

Another interesting thing our man learned from Mr. Green only emphasizes the "of-age" character of this small-town Mama and Papa operation. The Greens have worked themselves into the "second-color-set" stage by their advertising programs and by providing good service.

"We don't bother with B/W sets any more, except for small transistorized sets for children's rooms," Mr. Green says. "In fact," he continues, "we ended up a few months ago by giving all our B/W trade-ins to the local high school for their electronics classes.

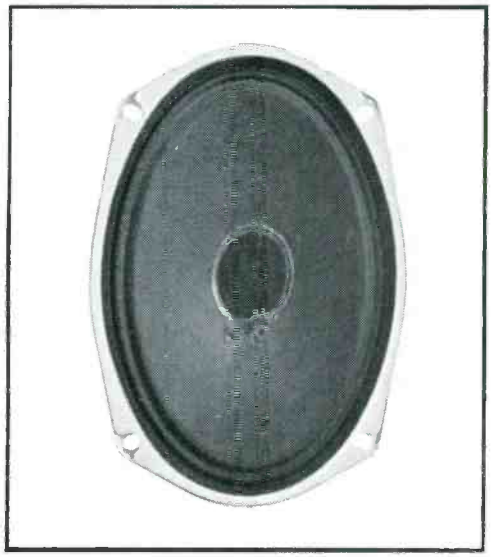
"This proved to be good public relations for us. Now, our policy is no longer to take in B/W sets as trade-ins. So far as we can determine, we're not losing any sales because of this policy," Mr. Green concludes. ■

Vi and Vern Green, husband-wife team, have worked together for 16 years to build prosperous business.



Remodeling of store fronts in Antioch is reviving business. Mr. Green spear-headed the modernization program.

This part speaks for the whole radio.



This box speaks well of you.

To the listener, the speaker is the most important part of the radio. Reason enough that it be of the highest quality and reliability. And when it says Delco on the box you can be certain you've got it: genuine OEM quality.

Delco Radio Parts are designed by engineers who specialize in automotive radios. Delco Radio speakers, for example, provide greater efficiency and sensitivity per ounce of magnet than any other speakers built. And since nearly half the cars on the road have Delco Radios as original equipment, you are assured of a vast pre-sold market.

Doesn't it make sense to stock the best for your customers?

They know Delco's reputation. So, the next time you reorder, remember your United Delco Supplier. He handles the most widely advertised, merchandised and recognized name in the parts business.

Why not let Delco Radio speakers say something nice about you?

Delco Radio, Division of General Motors, Kokomo, Indiana.

GM United Delco

MARK OF EXCELLENCE

COLORFAX

GENERAL ELECTRIC

Color TV Chassis KC and CB — Impurity Problems

A few reports have been received of both CB and KC sets which do not maintain purity. In most cases this is a very severe impurity conditon and is repetitive.

The impurity is corrected by manual degaussing, but if the set is allowed to cool thoroughly and then switched on, the impurity will return. The more times the receiver is switched off and on, the worse the impurity becomes.

This problem has been traced to the B+ power rectifiers which are used in a full wave bridge circuit. In every case reported an open rectifier or a cold solder joint has been found. This condition cannot be determined by measuring the B+ as it will drop only about 25-30v. The rectifiers should be checked with an ohmmeter and inspected for a cold solder connection on all terminals.

The problem results in unbalance of the bridge rectifier circuit and spurious pulses through the degaussing coil. Other minor defects may occur, but the impurity condition is the most pronounced.

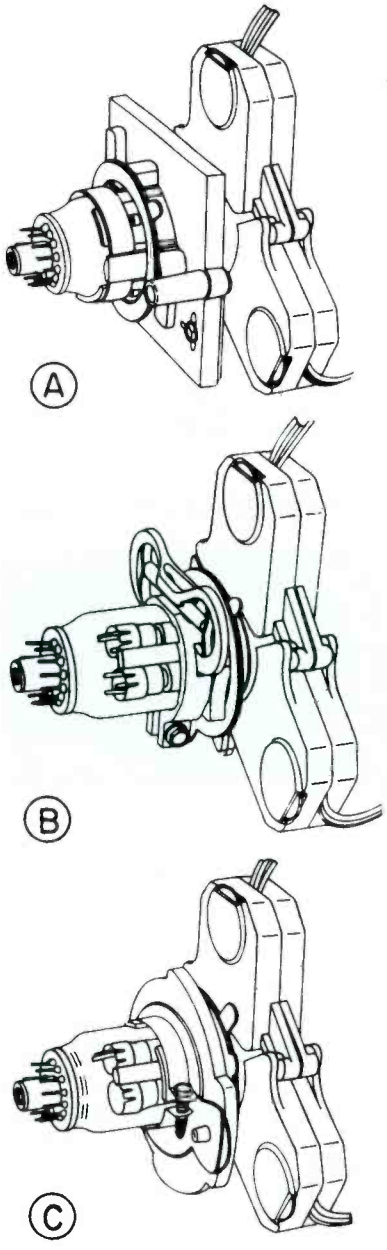
MAGNAVOX

All Color TV — Blue Lateral and Purity Devices

Several different types of devices have been used with rectangular CRTs from time to time to provide lateral positioning of the blue beam and for color purity adjustment. This has resulted in some confusion concerning the proper position of the different devices on the tube neck. The following describes the basic types of devices used and illustrates their relative location on the tube.

An early type combination blue lateral magnet and purity ring (shown at "A") had the purity adjustment rings mounted on the rear of the blue lateral assembly. The blue lateral magnet is positioned over the center of the focus grid of the blue gun and this places the purity rings approximately in line with the control and screen grid elements.

Some later production models used a blue lateral magnet (shown at "B") with a separate purity ring assembly placed on the tube ahead of the lateral magnet. In this case, the blue lateral magnet is positioned over the focus element of the blue gun as before, but the purity ring assembly is located about half-way between the blue lateral magnet and the convergence yoke on the tube neck. This accounts for the term "post-purity" which infers that purity adjustment of the three beams takes place after beam focusing. This arrangement was used to provide improved spot focus on certain tubes and to eliminate "spot-tailing," a misshaping of the beam, which caused problems in obtaining good purity. This arrangement was a two-piece device with post-purity.



On later type devices (shown at "C") a combination blue lateral and purity device with post-purity accomplishes the same results as the two-piece post-purity arrangement previously described. Here the purity rings are a part of the blue lateral magnet assembly, but unlike the earlier combination device the purity rings are now mounted on the front of the assembly. The blue lateral magnet is positioned on the tube neck over the focus element as before and this results in the purity rings being located between the blue lateral and the convergence yoke as with the two-piece device.

This new combination device (Part No. 361292-1) is now being stocked at all Magnavox parts depots. It is suggested that where poor purity is experienced as a result of "spot-tailing" this can be corrected by replacing the original blue lateral and purity device with part No. 361292-1.

You are cautioned when replacing a color CRT to make note of the type device used for blue lateral adjustment and purity and to replace it in its proper position. As an example, you will not be able to obtain good purity if the two-piece device is replaced so that the purity ring is in the rear of the blue lateral magnet.

Instant Automatic Remote Control — Automatic Off and VHF Search Tune Circuit Description

The ac voltage across the VHF motor is applied through a resistor to D1 which rectifies the voltage and charges C107. The dc voltage is stabilized by the 26v Zener diode. Notice that "ground" is not chassis ground but the common side of the 120vac line.

The dc voltage is developed only when the receiver is searching for a station. The presence of a station is indicated by the arrival of the 45.75-MHz IF picture carrier and composite sync pulses. These two signals cause the search relay, K1, to energize momentarily and open the ac voltage to the tuning motor to stop the search cycle. The dc voltage is then removed from the transistors until the VHF or UHF search tuning function is started again.

The 45.75MHz picture IF signal is picked up from the discriminator coil on the tuner AFC board. A one-turn link is soldered to the lid of the discriminator shield and is positioned around the coil. The picture carrier is coupled to a tank circuit, L2 on the search board, and amplified by Q1. Another tank circuit, L3, serves as

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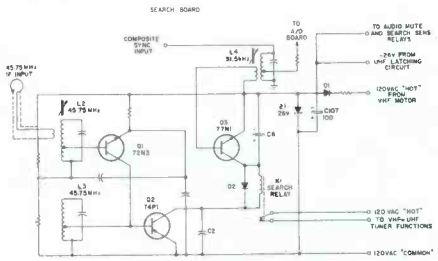
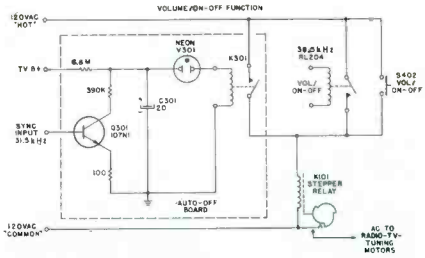
the collector load and the signal is applied to the base of Q2. Q2 conducts on the negative half-cycle and acts as a switch in conjunction with C2 to connect the end of the search relay coil to the ac common ground. However, Q2 cannot conduct until Q3 is switched on.

Both Q2 and Q3 are in series with the search relay coil and both transistors must be switched on before the relay will be energized. Q2 is switched on by the picture IF signal and Q3 is switched on by the composite sync signal. The sync signal is obtained from the output of the sync separator stage. The sync contains 15.75kHz horizontal blanking and sync pulses along with the 31.5kHz equalizing pulses which occur during the vertical blanking interval. To prevent interaction between the circuit on the search board and the sync circuits in the receiver chassis, the input circuit, L4, is tuned to the 2nd harmonic of the horizontal pulses. Because of the ringing action of the tank, the signal applied to the base of Q3 is a fairly good sinewave. Q3 becomes forward biased on the positive half-cycles and acts as a switch in conjunction with C6.

The sync pulses and picture IF signal are both present when the receiver is tuned to a station signal. Both Q2 and Q3 conduct and the search relay becomes energized. The relay contacts open and stop the tuning motor. Ac is removed from D1, the −26v supply is removed, K1 becomes de-energized, and the contacts close until the search cycle is repeated.

The −26vdc supply voltage that is developed during the search cycle is also applied to two relays. One relay is used to mute the audio during search time. The second relay is used to bias the IF stages during search time to reduce the gain of the receiver. The purpose of the reduced gain is to prevent the receiver from stopping on images that may appear on some channels. The amount of IF bias is adjustable with the search sensitivity control on the ear apron of the television chassis.





The automatic-off circuit is simply a relaxation oscillator. When the transistor is not conducting, C301 charges toward the B+ supply voltage through the 6.8M resistor. Since the values of the resistor and capacitor are quite large it takes a relatively long time for the capacitor to charge. When the capacitor becomes charged to about 80 or 90v, the neon lamp, V301, conducts and the capacitor discharges through the lamp and the relay coil. The relay contacts close and advance the stepper relay one step. The capacitor slowly charges again to the firing point of the neon lamp and the stepper relay is advanced again. This process continues until the stepper relay advances to the OFF position and ac is removed from the TV set. The time required for the auto-off circuit to turn off the receiver runs from 1½ to 3 minutes, depending on how many times the stepper relay must be advanced to reach the OFF position.

The circuit is prevented from oscillating when a station is tuned in. The sync pulses are coupled through the 31.5kHz tank circuit on the search board to the base of Q301. The transistor conducts and appears as a closed switch which places the 390K resistor in parallel with the capacitor. This prevents the capacitor from charging to the ionization point of the neon lamp.

The auto-off feature is also being used with the two-function remote system. The 31.5kHz transformer is mounted on the A/0 board since the search board is not used. When purity and color temperature adjustments are performed, or when the TV chassis is serviced, the six-pin Molex plug to the A/0 board should be disconnected to prevent the receiver from shutting off.

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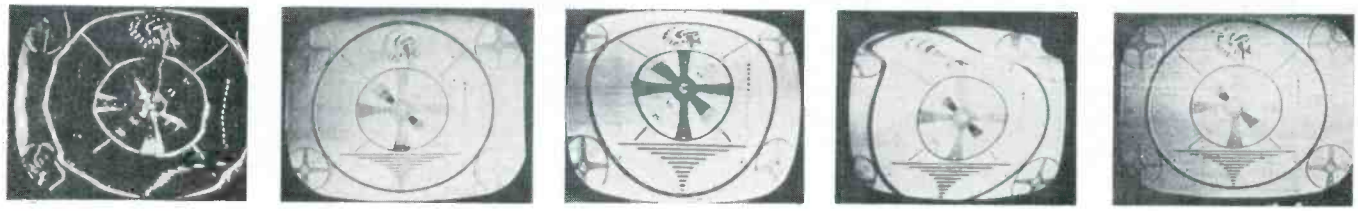

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NEW PRODUCTS

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

Universal Socket Wrench 700

Announced is a universal socket wrench that is designed to automatically fit size 4 to ¼ in. American hex

nuts, hex head screws and socket-head cap screws. The wrench reportedly can also be used with all British and metric sizes up to and including ¼ in. and 7mm respectively. Price $4.95. Torkall.

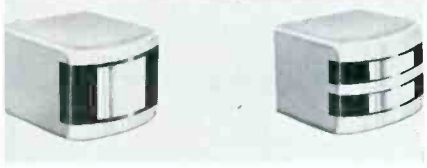
Inverter/Charger 701

A solid-state inverter/charger has been designed to produce 110 to 130-vac for standard ac appliances and equipment from a 12v battery. It is also designed to provide 12vdc for

charging batteries. Specifications indicate that it has a 55 to 65Hz, 200w squarewave output and contains four power transistors plus silicon diodes. Its case reportedly measures 4¾ x 8 x 8¼ in. Price $44.95. Allied.

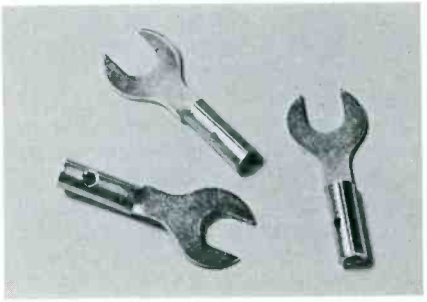
Audio Tape Heads 702

A series of audio magnetic tape recorder heads reportedly features deposited quartz gaps and laminated, lapped cores. The manufacture indicates that these heads can serve as fully compatible replacement heads for Ampex, Scully and TapeAthon professional model recorders. Nortronics.



Spade Lugs 703

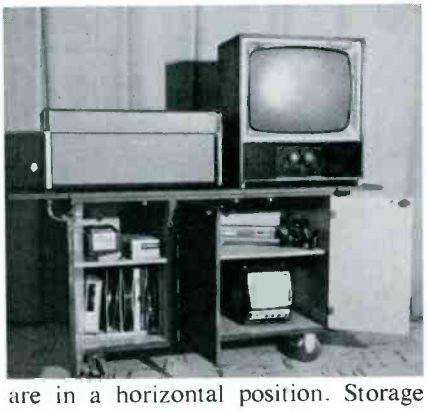
Announced is an uninsulated spade lug reportedly made of 0.050in. thick nickel-plated brass. Specifica-



tions indicate that the lug is 1$^{9}/_{32}$ in. long, accepts up to No. 10AWG insulated wire and has a 30a rating at 50°F. Birnback.

VTR Cart 704

Announced is a mobile video tape recorder cart designed to permit flexibility through unit portability. Each end of the cart reportedly has 9-in. folding shelves that can be locked in a vertical position to prevent the tape recorder and monitor from falling off the cart. Push bars, also located at each end, are designed to support the foldings shelves when they



are in a horizontal position. Storage areas are enclosed by three hinged doors. Specifications indicate that the cart rolls on 5in. rubber-tired wheels, is 32¾ in. high, 20⅝ in. wide, 46in. long, has a 46 x 20⅝ in. normal working surface and a 64 x 20⅝ in. extended working surface, 1cu ft tape storage area, 4cu ft tripod storage area, 3.75-cu ft camera storage area and weighs 120 lb. Video Engineering.

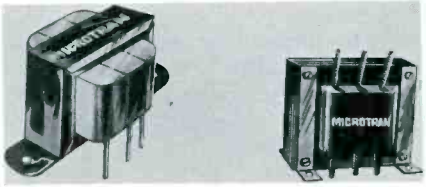
Continuity Tester 705

An instrument has been designed to produce an audio signal when connected to circuits having 50 Ω or less resistance. It is said that the circuit indicates an open circuit when there is a 2.5v potential across the probes and the probe current is only 6ma when the test circuit is shorted.

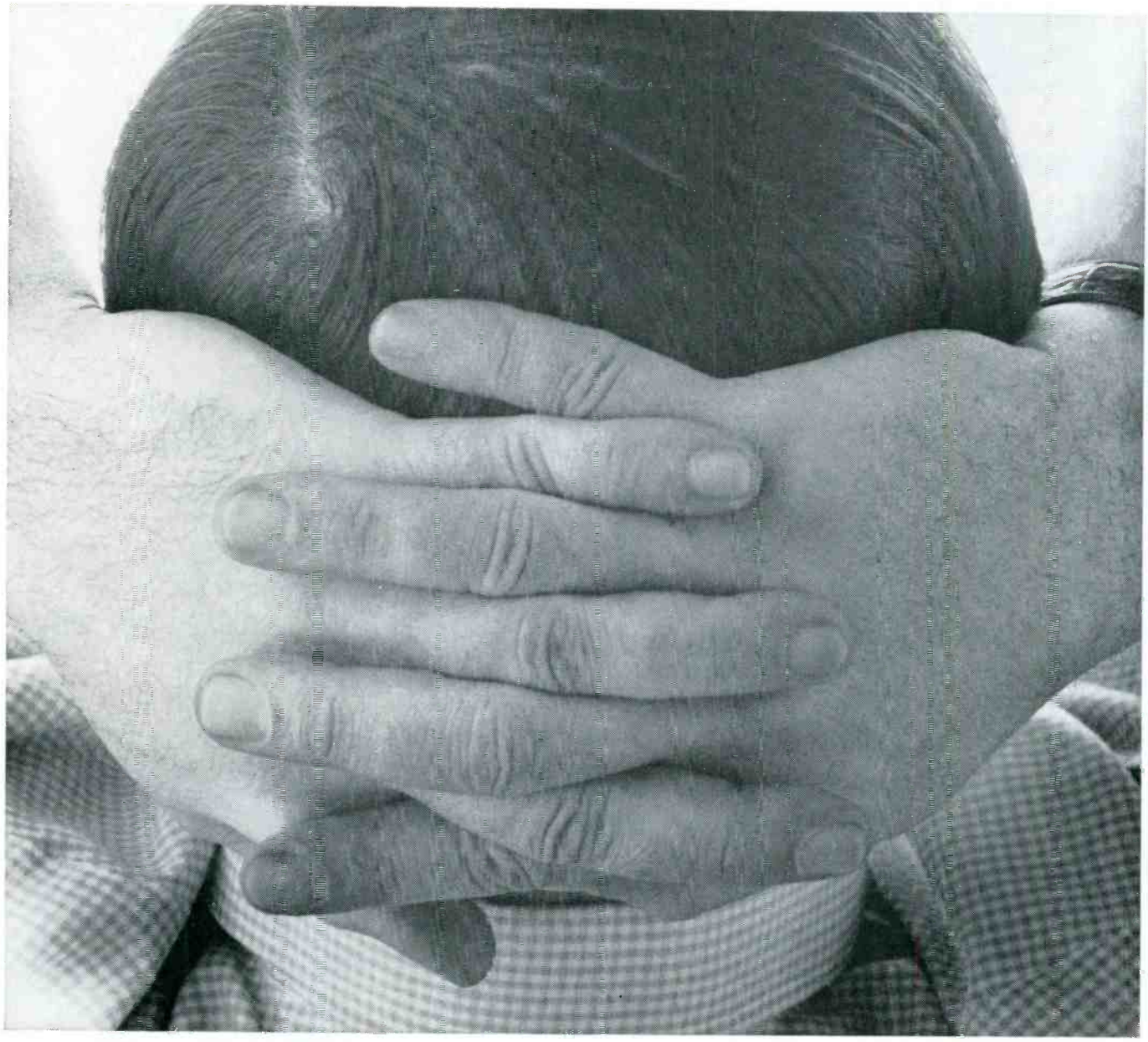
The instrument reportedly has 30in. probe leads, is inclosed in a 2¾ x 1 $^{3}/_{16}$ x 3¾ in. case and weighs 8½ oz. Price $9.95. CalComp.

Transformers 706

A line of 60Hz transformers and filter inductors is announced. The power transformer series is designed for use with low-voltage, solid-state circuitry or relay and filament applications. The isolation transformer series reportedly has center-tapped



secondaries to permit use in full wave or full wave center-tapped rectifier circuits. Specifications indicate that the filter inductor windings may be connected in series or parallel for a range of inductance and current ratings. Microtran.



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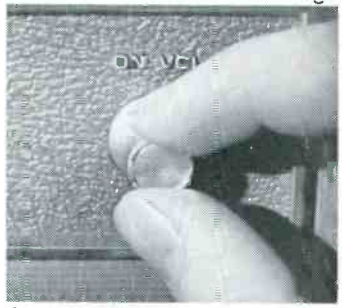


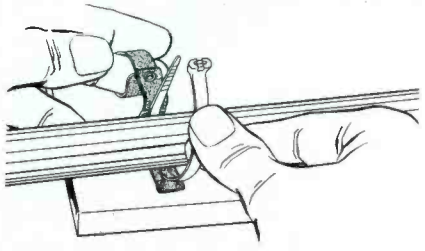
Color TV that fine-tunes itself when you turn it on. All you do is sit back and write the order.

RCA The Most Trusted Name in Electronics

NEW PRODUCTS

Finger Chute 707

A finger chute has been designed to speed the job of securing cables with plastic ties. For best results, the finger chute is worn on the ring finger of the hand that normally picks up the tail of the tie strap. Specifications indicate that the ring section is adjustable to fit any finger size



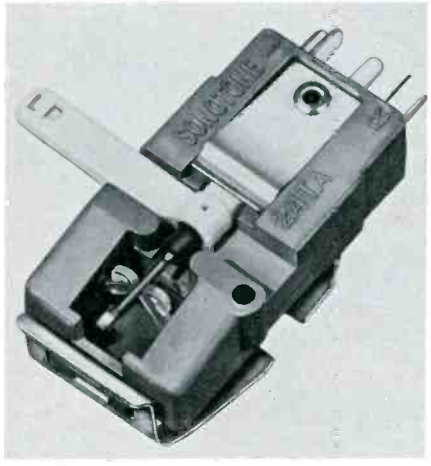
while the adjustable chute portion allows the operator to adjust the angle to the most comfortable position. The chute portion is placed under the bundle of wires on a harness board so that when the plastic strap is inserted into the chute guide under the bundle, the tail comes up in position, enabling the installer to perform the threading operation. Thomas & Betts.

FET VOM 708

A portable volt - ohm - milliammeter is announced that uses field-effect transistors instead of electron tubes. Specifications indicate that it has 0 to 1, 3, 10, 30, 100, 300 and 1kvdc full scale ranges with +3% full scale accuracy between 32° and 122°F, 30 to 50db ac rejection at 60Hz and a 15M input resistance shunted by a 14pf capacitance; 0 to 1, 3, 10, 30, 100, 300 and 1kvac and 0 to 2.8, 8.4, 28, 84, 280, 840 and 2.8kvac P-P full scale ranges with a flat frequency response between 25Hz and 1MHz or within 3db between 10Hz and 10MHz, ±5% full scale accuracy between 50° and 100°F, and a 10M input resistance shunted by a 29pf capacitance; 0 to 1K, 10K, 10M and 1G ohmmeter ranges with ±3% linear arc accuracy, and 0 to 100μa, 1ma, 10ma, 100ma and 1a dc current measurements with ±3% full scale accuracy and a 200mv internal voltage drop. The instrument reportedly requires one 9v battery and one 1.5v "C" cell. It is enclosed in a 5 x 7 3/16 x 3 1/16 in. case. Price $59.95. Sencore.

NEW PRODUCTS

Phonograph Cartridge 709



Announced is a phonograph cartridge that reportedly has a resilient synthetic rubber pad located between the cartridge body and the mounting bracket to reduce the effect of vibrations in the bracket. Specifications indicate that it has a 20Hz to 15kHz frequency response, 0.28v output, 25db channel separation at 1kHz, 4100pf capacitance and requires 4 to 7g tracking force. The manufacturer recommends a 250K to 1M high-impedance load. List price with a sapphire and a diamond needle combination is $14.65. Sonotone.

Digital Ohmmeter 710

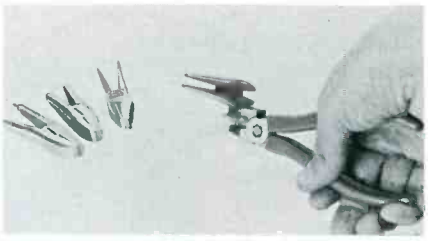
Announced is a direct digital readout ohmmeter designed for resistance measurements between 0.001 and 1000M in ten ranges. Specifications indicate that the instrument has a ±0.1% of full scale or ±0.1% of reading, accuracy capability. It reportedly applies only 1mw of power across the resistor under measurement. The manufacturer indicates that the instrument is enclosed in a 9 x 7 x 13in. cabinet and weighs 13 lb. Price $560. Hickok.

Nutdriver Set 711

Announced is an interchangeable, hollow-shaft nutdriver set featuring a drilled handle for speeding locknut and slotted screw adjustments is announced. By passing an 8in. or longer round shank screwdriver blade through the center of the drilled handle and hollow nutdriver shaft, an operater reportedly can set the combination locknut and screw adjustments found on rheostats and similar controls. According to the manufacturer's specifications eight interchangeable shafts with hex openings from 3/16 through 9/16in. are included in the set. Xcelite.

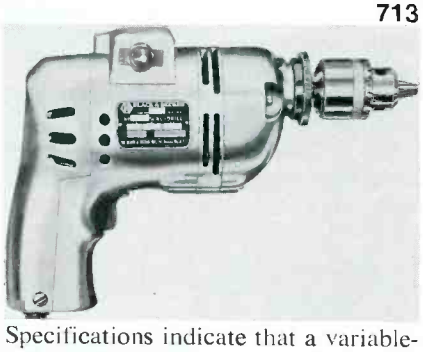
NEW PRODUCTS

Swivel-Head Pliers 712



Announced is a plier with interchangeble heads that rotate 360 deg. The tool is designed for access around corners and into blind spots. Specifications indicate that the set includes a long-nose head with serrations on the gripping surfaces, a shorter duck-bill head with serrations, a duck-bill head without serrations and a retainer-ring head with pins at the extreme ends. The pins on this last head reportedly measure 0.06in. diameter. Price less than $15. Jensen Tools.

Electric Drill 713



A portable electric drill has been designed which has a variable speed control that reportedly allows the operator to drill steel without center punching and curved surfaces without bit walking. Specifications indicate that a variable-speed, trigger switch allows the operator to accelerate the bit from 0 through 1000rpm. A toggle-type reversing switch is designed to permit the quick removal of screws or nuts in disassembly operations. Price $69. Black & Decker.

I dropped my stereo.

NEWS OF THE INDUSTRY

Paul L. Dorweiler Named Editor of ET/D Magazine

Dorweiler

Paul L. Dorweiler has been appointed editor of ELECTRONIC TECHNICIAN/DEALER magazine. Mr. Dorweiler has had a varied experience in electronics and publications, including four years as supervisor of technical publications for the E. F. Johnson Co., Waseca, Minn.

He spent several years in electronics with the U.S. Navy during the Korean conflict, and later attended Northwestern Electronics Institute, the University of Minnesota and Mankato State College. Mr. Dorweiler has also served as manager of aircraft electronic sales and service shops in Minneapolis and Waterloo, Iowa.

Certification Chairman Appointed By National Electronic Assn.

Howard Bonar of A-C Radio Clinic in Marshallton, Iowa, has become national chairman of NEA's Certification Committee.

The NEA Certification Committee is in charge of testing and registering television electronic service technicians in 19 states.

To qualify for NEA certification, a technician must show four years aggregate service or schooling time and pass a 125-question written exam administered by NEA. Successful applicants are awarded certificates and wallet identification cards, along with being permanently registered with NEA.

Low U.S. Tariffs Help Electronics Industry

There has been considerable discussion lately concerning a possible need for new tariff barriers. Recent statistics gathered by the Electronics Industries Assn's Marketing Services Dept. indicate that electronic industries in the United States are better off without these barriers despite the large influx of foreign portable radios and tape recorders.

While imports on electronic components totaled $90.7 million between January and June 1967, compared to $75.8 million in imports during this period a year ago; U. S. exports of components totaled $243 million during the same period, a $39 million increase over last year. Exports of electron tubes climbed 42.4 percent, and exports of semiconductors were up 25.7 percent.

More general import-export figures for electronic products are given in the following table:

Market	First Half 1966		First Half 1967	
	Imports	Exports	Imports	Exports
Consumer	$124.2	$ 19.1	$164.9	$ 19.9
Military, Industrial and Commercial	86.6	451.3	101.6	617.3
Components	75.8	204.2	90.7	243.0
Total	$286.6	$647.6	$357.2	$880.2

NEWS OF THE INDUSTRY

Electronic News Service Offered Manhattan Residents

An all-electronic news service for the home is being made available to almost 2000 CATV systems across the country. This new service, "Alphamatic News," was unveiled

by Television Presentations, Inc. and United Press International at Manhattan Cable Television.

At the heart of the system is a character generator manufactured by RCA Victor, Ltd. The character generator is designed to convert a telegraph signal to words that appear as sentences flowing across the TV set at an easily readable rate. Each line holds 42 characters. When 12 lines of copy are presented, the copy is erased (except for the bottom line) and the entire sequence starts again at the top.

In its application on the Manhattan cable system, subscribers receive the Alphamatic service on previously unused Channel 8. Early indications from subscribers reportedly indicate that they are attracted by the ease with which they can catch up on the news at any time by simply tuning in the channel.

Congressman Proposes Agency To Allocate Radio Frequencies

Rep. Torbert Macdonald (D-Mass.) has proposed a master federal agency to handle allocations of radio frequencies.

The chairman of the Communications and Power Subcommittee of the House Interstate and Foreign Commerce Committee said that the emergence of satellite communications would add to the "burgeoning problem" of frequency allocation.

"I believe that our solution to this problem may be the development of a Dept. of Communications or communications agency growing out of the current Office of Telecommunications Management."

Although the spectrum is crowded, Rep. Macdonald said, "No one, it seems, knows whether or not all the frequencies are actually being used.

"There is a great amount of speculation that many frequencies now are not, in fact, being used. . . and this is particularly true of frequencies assigned to the Dept. of Defense."

"If a new agency or Dept. of Communications is forthcoming, it may be that a complete realignment of our frequency allocations will be in order."

In his speech on "Political Ramifications of the Use of Satellites for Domestic Communications Purposes" Rep. Macdonald said domestic use is technically feasible but "politically awkward."

"This is true because it has long been accepted that sovereign nations own, or control, the air and space over their political areas.

"And, in order for synchronous satellites to function, they must be placed in orbit in the equatorial plane. This means, simply, that satellites used for a domestic communications system for the United States would have to be placed in orbit over Brazil and other countries.

"Obviously, while this perhaps could be worked out diplomatically through treaties or trade agreements, it automatically gives the domestic program an international connotation.

Rep. Macdonald called for aid from the electronics industry in solving problems of overcrowded orbital space, recovery of inoperable satellite and intersatellite interference.

New York City Library Receives $10,000 Gift of Magnetic Tape

A $10,000 gift of sound tape by Audio Devices Inc. is enabling the Rodgers and Hammerstein Archives of Recorded Sound at the New York City Public Library to preserve its collection of some 145,000 original and extremely rare recordings dating back to the 1890s.

The donation consists of 1,250,000-ft of 1½ mil Mylar base magnetic tape.

Many of the priceless sounds on old Edison cylinders, wire recordings, wax and "acetate" disks and other obsolete recording media are now reportedly in a fragile and deteriorated state. The project's administrators wish to preserve them through a transfer to magnetic tapes.

Included in the collection are early Metropolitan Opera performances, classical and American music, as well as the voices of Sarah Bernhardt, John Barrymore, George Bernard Shaw and others.

Several Types of Receivers Share Increase in September Sales

Color TV set distributor sales in September showed a 33 percent increase over the same month in 1966, the Electronic Industries Assn.'s Marketing Services Dept. reported. The 818,850 figures for color TV sets accounted for 56.5 percent of the total TV sales to dealers in September.

Total TV set sales to dealers for 1967 to Sept. 30, however, were 11.5 percent off the 1966 total for the same period. Color TV sets, coming on strong at 3,548,405 for the year-to-date, 14.4 percent over the 1966 performance, are narrowing the gap.

FM portable radios showed a September increase of 36.3 percent to 215,813 units sold to dealers, bringing the year-to-date figure up to 1,397,226 or 28.5 percent above the 1966 sales performance for the same time. FM auto radios also increased to 111,826 or a 37.7 percent increase over September 1966. These radios are now running 29.8 percent ahead of 1966 for the first nine months. This is all the more remarkable in view of generally unspectacular over-all radio sales performance for 1967.

U. S. Consumer Electronics Marketing Statistics For First Nine Months

Items Purchased	Year-to-date 1967	Year-to-date 1966
Color TV Sets	3,548,405	3,103,043
B/W TV Sets	3,895,606	5,306,485
Table, Clock and Portable Radios	8,423,904	9,677,815
Home FM Radios	2,770,801	2,593,358
Auto Radios	6,269,806	6,749,539
Portable and Table Phonographs	2,351,757	2,354,844
Console Phonographs	979,833	1,246,062

The information for this table was compiled by the Electronic Industries Assn.'s Marketing Services Dept.

International Rectifier Forms Automated Systems Division

International Rectifier Corp. (IR) has formed a new Automated Systems Div. that will seek to apply advanced labor-saving techniques of sensing, monitoring and controlling to a wide range of activities.

Forming a significant part of the division will be Dallons Instruments — producers of multipatient cardiac and intensive care monitoring systems for hospitals. The new division will seek to apply some of the systems technology Dallons has developed to fields other than medicine.

GT&E Begins Mexican Production Of Color TV Picture Tubes

The production of color TV picture tubes has been started in Monterrey, Mexico, by Sylvamex Electronica S. A., a subsidiary of General Telephone and Electronics International Inc.

An estimated 25,000 sq. ft. has been added to Sylvamex's 60,000-sq-ft plant to provide space for the production of 19 in. and 25 in. color CRTs for Mexican TV set manufacturers.

Color TV broadcasts already have begun in Mexico on a limited scale, and it is expected that additional color programing will soon be available. The Olympic Games to be held in Mexico City during October 1968 and the World Soccer Championship, which will be held in the Mexican capital in 1970, are expected to provide a further stimulus for color broadcasting.

An estimated 10,000 color TV sets made in Mexico have already been sold, and the market should increase to 20,000 in 1968, rise to 30,000 in 1969 and reach 50,000 by 1970.

DEALER SHOWCASE

Hi Fi System 714

A home entertainment system has been designed for AM/FM/FM stereo and tape listening. The receiver reportedly has sensitivity better than 4.0 μ v, while the amplifier is designed

for 40Hz to 18kHz frequency reponse with 25 db channel separation at 1kHz. Specifications indicate that the cassette tape recorder/player has the same frequency response as the amplifier with wow and flutter less than 0.24% and a signal-to-noise ratio better than 45db. Price less than $250. Concord.

Tape Cartridge Player 715

A new line of automotive tape cartridge players features a fast forward control that reportedly speeds the tape at triple the normal speed to any desired selection on the cartridge. A variable pitch control is designed to adjust audio to a preferred tonal pitch. Specifications indicate that player contains a direct drive dc

motor that eliminates any need for belts or pulleys, an all electronic speed control circuit, and zinc die-cast case construction for cooler operation. The FM receiver features AFC and stereo FM capabilities—the multiplex adapter being optional. Retail price $169.95. Lear Jet.

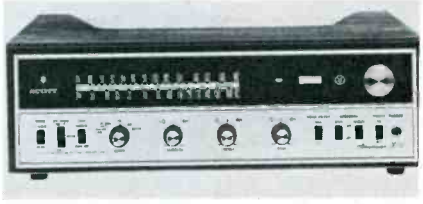
FM Receiver 716

Announced is a solid-state stereo FM receiver that reportedly has transformerless driver and output circuits. Specifications indicate that it has a 3μv usable IHF sensitivity, 30Hz to 15kHz ±1db frequency

response, less than 1.0% harmonic distortion, 3 db capture ratio, 80db image rejection, 30db AM suppression, 30db stereo FM channel separation and 50w IHF power output. The manufacturer indicates that the receiver measures 16 x 13½ x 14 in. Price without cabinet $149.95. Allied.

AM/FM/FM Stereo Receiver 717

Announced is a solid-state stereo receiver that reportedly features a variable bandwidth circuit designed to adjust the tuner bandwidth automatically for the quality of the incoming signal. The manufacturer indicates that with this circuit the bandwidth automatically narrows to eliminate



noise when receiving weak and distant stations, while automatically widening for full-frequency reception of stronger stations. The receiver has 2.2μv rated sensitivity with 80db cross modulation rejection. Price $339.95. H. H. Scott.

Radio/Phono Combo 718

A portable AM radio/phonograph combination has been designed to appeal to the more mobile youth market. Specifications indicate that

the combination weighs 4½ lb without batteries, operates from an ac adapter or six 1½v "D" cells, and plays 33 1/3 or 45rpm records of all sizes. A removable top covers the turntable and tone arm when the phonograph is not in use. The manufacturer indicates that the AM radio/phonograph combination is housed in a 11 x 9 x 2¾ in. blue and white cabinet. List price $39.95. Norelco.

Business Communications 719

A 30w, two-way radio, FCC Type Accepted and powered for the business and commercial operator, is announc-

ed. It is designed to operate at between 25 and 45MHz, and provides more usable channels and greater power input than Class D CB transceivers. Price $219.50. Courier.

CB Transceiver 720

A 23-channel CB transceiver reportedly includes a dual conversion superheterodyne receiver section with

0.8μv sensitivity. Specifications indicate that the 5w transmitter contains a tuned pi-network designed for maximum power output. Net Price $114.95. Lafayette.

Communication Amplifier 721

A fully transistorized amplifier is designed for public address and other communications systems. It has a 60w rated RMS power output, with a peak of 110w. Five low-impedance

Business is business.

Says who?

Says too many people.

You've probably heard it yourself many times. It's used to justify almost *anything.*

But how many times have you ever questioned this attitude or raised your voice in protest? An idea like this takes root just because not enough people do anything to stop it.

If you have ever asked yourself "Why doesn't someone do something about it?" you're talking to the right person. You.

It won't be easy. Sometimes you'll need encouragement. The kind you'll find in your place of worship.

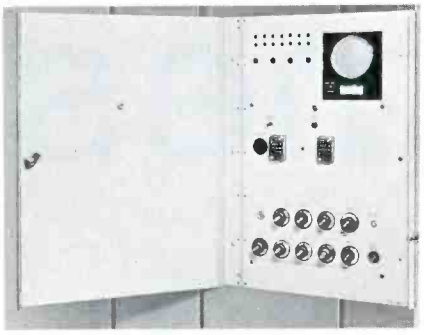
Here you'll discover you're not alone. That, in itself, can give you the strength to say "Says who?" once in a while when it needs to be said.

Religion in American Life

Published as a public service in cooperation with The Advertising Council

DEALER SHOWCASE

microphone and two auxiliary inputs are reportedly mounted on the rear bottom of the chassis, with one micro-



phone and one auxiliary input duplicated on the front panel. Specifications indicate that the amplifier is only 14¼ in. wide and 3¾ in. deep and that its mounting box fits into any wall with standard 16in. center or wider spacing. Bogen.

Vidicon Camera 722

A transistorized vidicon camera is announced that is designed to provide both video and modulated RF outputs. The RF output can reportedly be set for TV channels 2 through 6 and viewed directly on a conventional home receiver. Specifications indicate that the camera has 650-line resolution, employs a 525-line random interlace and has a contrast range of 10 full shades of gray. An automatic sen-

sitivity control is designed to permit the camera to operate over wide ranges of ambient light intensities without adjustments. The manufacturer indicates that the camera comes with a f/1.4 lens and measures only 4½ x 5⅝ x 10½ in. Price $600. Raytheon Learning Systems.

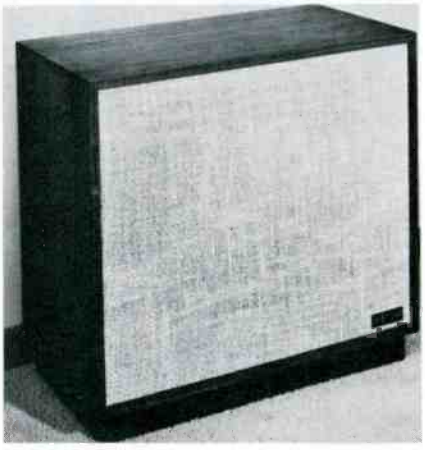
CB Transceiver 723

A 23-channel, solid-state CB transceiver is announced which reportedly carries a 10-year guarantee. Specifications indicate that the receiver section has more than 50db adjacent channel selectivity, and includes a signal indicator that is actuated when

receiving 10μv or stronger signals. The manufacturer indicates that the transceiver is enclosed in a 5¾ x 6¼ x 1⅞ in. case. List price $149. Courier.

Speaker System 724

Announced is a console speaker system that reportedly contains three electrostatic radiators for the treble and a dynamic cone woofer for the base. Specifications indicate that the radiators are matched to within



1db, while the cone is capable of ⅝ in. excursions without breaking or doubling. The system's frequency response is rated from 30Hz to beyond 30kHz. The manufacturer indicates that the oiled walnut cabinet measures 26¾ x 27½ x 14½ in. The speaker system is designed to be used with any amplifier rated at 20w or more. Suggested retail price $299.95. Neshaminy.

AM/FM/FM Stereo Receiver 725

Announced is a bookshelf size, solid-state, AM/FM/FM Stereo receiver designed to produce 25w of continuous power per channel. Speci-

fications indicate that it contains SCR protection circuitry to eliminate the danger of short-circuit output damage to transistors. Price $239.95. Sansui.

Portable Phonograph 726

A solid-state, portable, 4-speed phonograph reportedly features a removable cover with built-in 6 x 9in.

oval speaker and a 15ft. speaker extension cord. Specifications indicate that its 8in., 4-speed turntable, cushioned with polyurethane padding, accommodates 16, 33 1/3, 45 and 78rpm records. A swivel is designed to lock the tone arm in place between uses. The manufacturer indicates that the entire unit weighs only 20 lb and is enclosed in a case made of 3/8 in. plywood, covered in vinyl and reinforced at the corners with metal guards. McClure.

Tape Recorder Display 727

A standing floor display is announced for accommodating a manufacturer's line of tape recorders. Specifications indicate that it is made of charcoal laminated vinyl, walnut and glass; measures 68 x 36 x 16in., has an illuminated name plate; sliding glass doors and a locked storage cabinet; and is completely wired for demonstration. Dealer's price $25. North American Philips.

CATALOGS AND BULLETINS

Thyristor Selection Guide 400

Hundreds of silicon-controlled rectifiers are listed in a six-page folder. Included are thyristors, triacs, bilateral trigger diodes, unijunction transistors and four-layer diodes. These semiconductors are described with tables and illustrations. Motorola.

Stereo Equipment 401

A 12-page catalog lists a stereo cartridge player, phonograph, AM/FM/FM Stereo combination; a receiver with phonograph: and five receivers without phonographs. A stereo amplifier and two turntables are also listed. Tables at the end of the catalog contain specifications, features and prices. Bogen.

Speaker Systems 402

A six-page folder describes an assortment of large speaker systems designed for theaters, stadiums and large auditoriums. Altec Lansing.

Miniature Switches 403

A 52-page catalog describes momentary - contact push - button switches, up to 12 position multideck rotary switches, test clips, binding posts, plastic cases and header boards, stand-off insulators and printed circuit test jacks. Grayhill.

Coils 404

A 156-page catalog lists over 2800 coils and coil related items, and reportedly cross references over 50,000 exact and general replacement parts. J.W. Miller.

Antenna Sales 405

A four-page, two-color bulletin briefly describes a new antenna sales program called "Man behind the Stripes." Antenna Specialists

CRT Brighteners 406

A four-page, two-color catalog describes a full line of CRT brighteners for B/W and color TV sets, automatic voltage regulators and other related TV service products. Perma-Power.

Kit Catalog 407

A 108-page, 1968 catalog illustrates a selection of 300 electronic kits. Included are stereo/Hi Fi components, amateur radio equipment, test and lab instruments. CB transceivers, photographic aids, TV sets, electronic organs. AM, FM and SW receivers, intercoms and automotive kits. Heathkit.

Shop Equipment 408

Storage cabinets, hydraulic-lift hand trucks, steel drawers, loose-leaf catalog holders, pilferage reducing mirrors, parts racks and parts cabinets are listed in a 31-page catalog. Precision Equipment.

Soldering Iron Tips 409

A 24-page catalog contains 16 pages of mechanical drawings that illustrate the dimensions of soldering iron tips ranging in size from ⅛ to 1¾ in. Tables are included to supply additional specifications. Hexacon.

Zener and Reference Diodes 410

A cross reference and selector guide contains a 27-page listing of zener and temperature compensated diodes along with the manufacturer's equivalent components. The remaining portion of this 40-page guide contains tables and case diagrams as a further aid in selecting required semiconductors. Motorola.

BOOK REVIEWS

CITIZENS BAND RADIO HANDBOOK *By David Hicks. Published by Howard W. Sams. 192 pages, soft cover. $4.25.*

So much attention is currently given the Class D CB channels that few authors bother to mention the other CB classes. This book, however, is an exception to that practice. The first chapter describes the advantages, disadvantages and frequency allocations for Class A, B, C and D CB channels. The author briefly describes CB equipment currently on the market, mentioning related circuitry and servicing techniques. Some emphasis is placed on antenna limitations and signal radiation. Three pages are devoted to the Canadian General Radio Service (GRS), the Canadian equivalent to CB. From this information readers learn how U. S. CB license holders can obtain a one-year temporary license from the neighborly Canadian Dept. of Transportation for travel through Canada. (Unfortunately the FCC fails to provide a reciprocal arrangement.) FCC CB rules and regulations are listed in Appendix I. This book may prove too elementary for the electronic technician licensed to service CB equipment. It can be used, however, as a helpful aid when assisting a customer in the selection of equipment for an appropriate CB class.

KNOW YOUR SWEEP GENERATORS. *By Robert G. Middleton. Published by Howard W. Sams. 176 pages, soft cover. $3.25.*

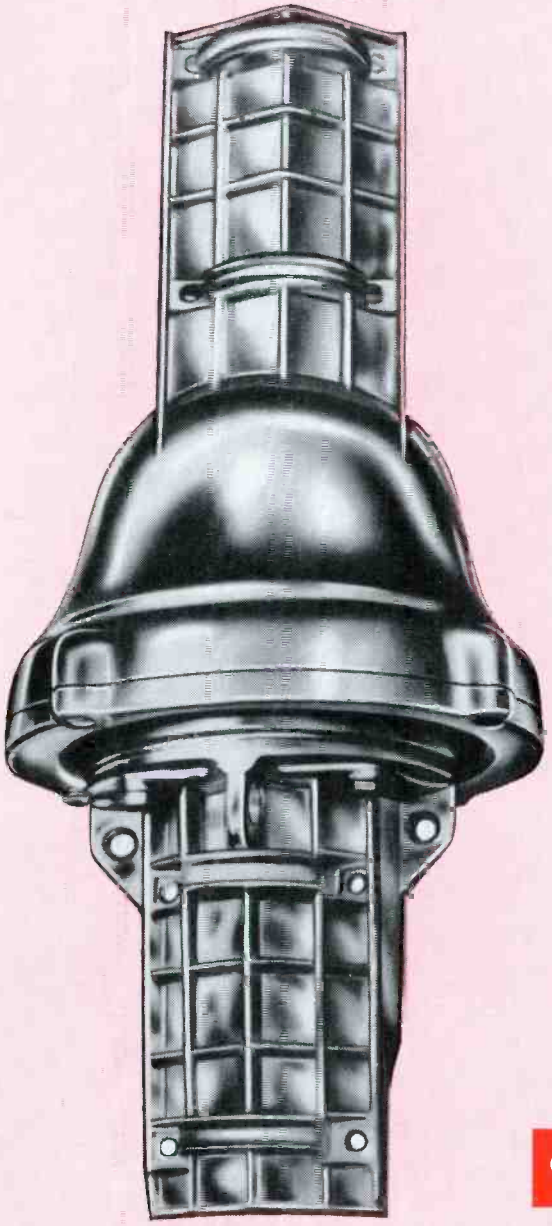
Beginning with the basic theory of capacitance and inductance phase shift, the author describes resonant-tuned circuits and their related bandwidth. The book indicates that as the frequency of the applied signal is rapidly changed (sweeps), the resulting signal amplitude is altered by tuned circuits. A diode can be used to produce a dc voltage that varies with the amplitude of the changing-frequency signal. By synchronizing a scope's horizontal trace with the generator's sweep rate, the varying dc voltage will appear on the scope as a steady trace corresponding to the characteristics of the tuned circuit. The tuned circuit is adjusted for the desired frequency response and resulting scope trace. We feel that this basic information is mixed with details so unnecessarily fundamental they would bore the experienced technician or so unnecessarily deep they would confuse the apprentice technician. Although clearly written, we feel that the scope of this book is too broad to serve any particular group of readers.

SERVICING TV RECEIVER CIRCUITS. *By the Editors of* ELECTRONIC TECHNICIAN. *Published by TAB Books, 224 pages, hard cover, $6.95.*

Many of the best articles, on both B/W- and color-TV set troubleshooting, were taken from ELECTRONIC TECHNICIAN and combined to provide an all-in-one reference source. Diagrams and waveforms are included to assist in the understanding of the circuits being repaired. The topics covered range from the importance of developing a logical and methodical approach when servicing, to a description of the more complicated circuits serviced in a color-TV set. This book should be of interest to the inexperienced technician, who needs to learn more about the basic principles of servicing, and to the veteran technician, who would like a valuable reference.

ADVERTISERS' INDEX

Never ask a lightweight rotor to do a heavyweight's job.



Selling your customer a lightweight rotor when he has a large antenna array just doesn't make sense. Especially since you can offer him an alternative: the heavy-duty "Bell Series" rotor, from CDE.

Available in both automatic and manual forms, this rotor is designed specifically for large, heavy antenna arrays... designed specifically for unmatched fringe-area reception... designed to give your customers the finest color TV reception possible. In fact, this is the *only* heavy-duty rotor available.

We call it the Bell Series because of its completely weatherproof, die-cast aluminum housing. You'll call it rugged because it has 4 to 5 times the stalling and braking torque of any other rotor! This means *any* antenna will turn, even under the most adverse weather conditions... and that your customers will get terrific color or black and white reception despite high winds or heavy icing. Great FM reception too!

The Bell Series rotor: one-of-a-kind built for one-of-a-kind performance!

CDE CORNELL-DUBILIER

... for more details circle 102 on postcard

We can't leave well enough alone...

...so we redesigned the RCA-6BK4A to improve its capability in shunt regulator circuits of high voltage power supplies in color TV receivers. Always the best tube to do the job, the RCA-6BK4B is now even better.

An improved plate provides highly efficient heat radiation and uniform temperature distribution...and permits a 40 W max. plate dissipation rating. This rating is especially important in present-day color receivers. An increased peak negative heater-cathode voltage capability of 450 V max. results from better heater insulation and tighter processing controls. A redesigned top cap reduces strain on dome of the glass envelope for greater strength and reliability.

Innovations and improvements that make your service operation more reliable, efficient and profitable are our constant aim. So see your local Authorized RCA Tube Distributor for quality RCA receiving tubes.

RCA Electronic Components and Devices, Harrison, N.J.

The Most Trusted Name in Electronics