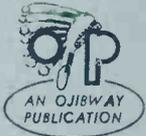
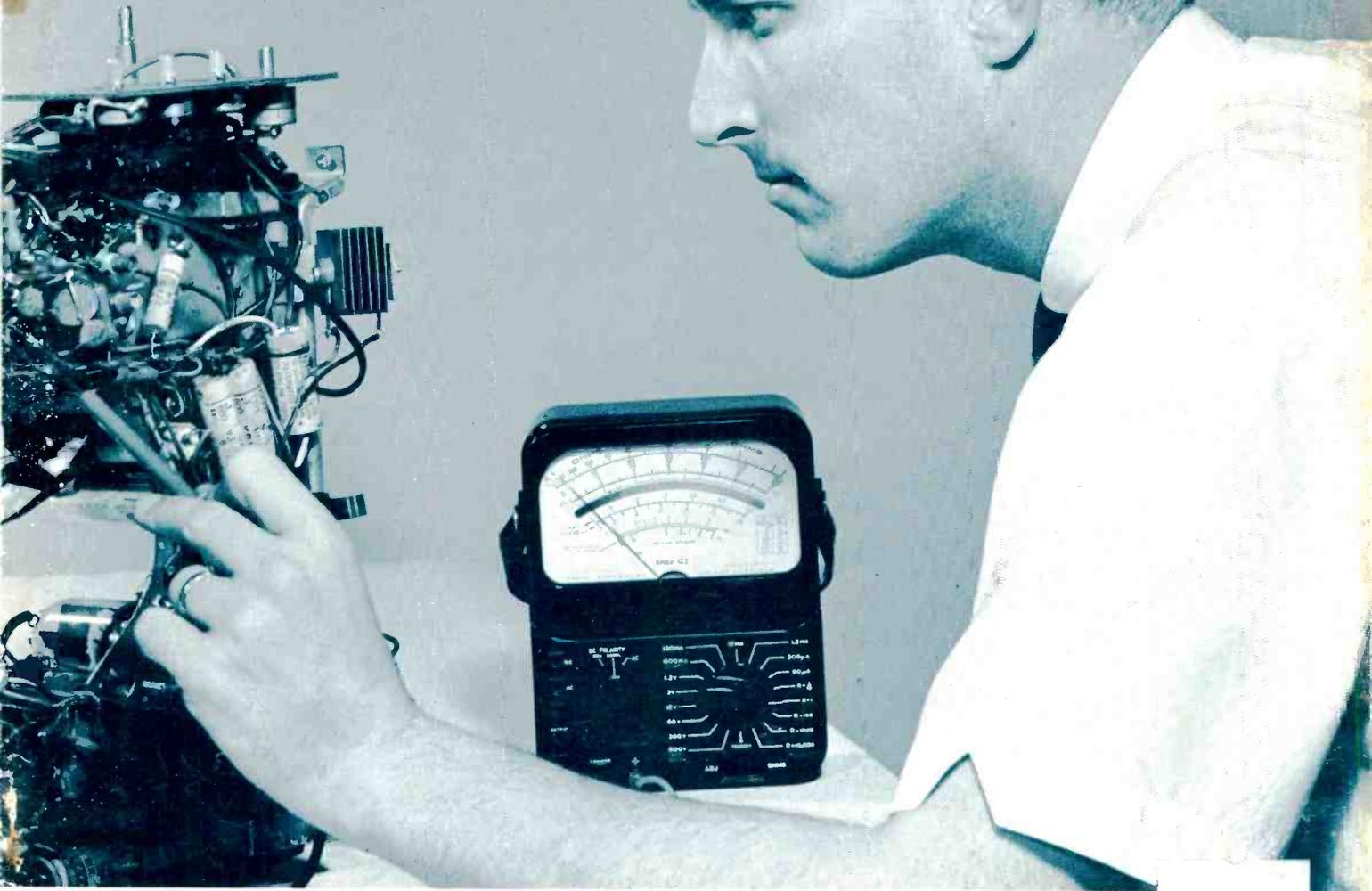


ELECTRONIC TECHNICIAN



APRIL 1964



Using Your VOM

Testing Transistors

Troubleshooting with VTVMS

114
114
CLEVELAND - X-9911-10
JAMES CORNERS, WISC
S. 69 W. 120th W. 69th S.
1964

Any type of TV lead-in...

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Your BELDEN distributor has it!



PERMOHM* 8285 . . . excellent for color TV. Gives stronger, clearer UHF and VHF signals under conditions of extreme salt spray, industrial contamination, rain, and snow. 300 Ohm.



WELDOHM 8230 . . . resists pulling, whipping, twisting. Weldohm has two and a half times the flexing life, and one and a half times the breaking strength of ordinary 300 ohm lead-in.



COAXIAL TRANSMISSION LINES—RG/U AND FOAM RG/U TYPES . . . low-loss signal transmission for multiple TV installations such as motels.



STANDARD 300 OHM LINE 8225 . . . low losses at high frequencies. Well suited for use with FM receiving antennas.

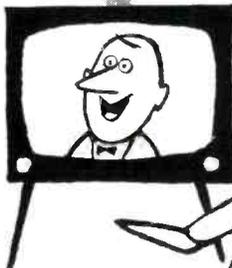


CELLULINE* 8275 . . . installs easily . . . no end sealing necessary. Has excellent resistance to sun, abrasion, and wind. Delivers strong UHF and VHF signals. 300 Ohm.



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8-9-3

cord sets and portable cables • electrical household cords • magnet wire • lead wire • automotive wire and cable • welding cable

- - - for more details circle 18 on post card

OPERATING AUTOMATIC OFF-ON TIMER

Some models are equipped with an automatic OFF-ON timer. The OFF-ON timer (at side of cabinet) can be set to turn television receiver "OFF" after a pre-selected time period, up to ten hours. The timer can also be set to turn receiver "ON" after a pre-selected time period, up to twelve hours. Models having an automatic OFF-ON timer, are listed in Model Identification Chart on front page.

IMPORTANT: Push-pull ON-OFF switch (at front of set) must be "ON" (pulled out) and timer must be in "ON" detent position for set to operate. Dial light is lit, when set is turned on.

Turning Receiver "OFF" Automatically

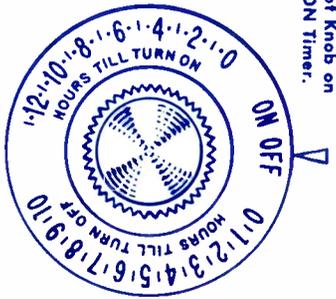
With television receiver operating, turn timer knob counterclockwise until time interval marking on knob, is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

Turning Receiver "ON" Automatically

For turning receiver "ON" automatically, set timer knob to "ON" detent position. Turn television receiver "ON" with push-pull ON-OFF switch at front of set. Tune in wanted channel and set volume control for desired volume level. Then, without disturbing receiver controls, turn timer knob clockwise until interval marking on knob is opposite indicator pointer. Set will turn off. However, when indicated time interval has elapsed, television receiver will automatically turn itself "ON". Sound (from television program), will be heard as indication that interval has elapsed and receiver is operating.

MODEL IDENTIFICATION CHART			
Model	Chassis	Model	Chassis
† P9731	D61-2	§ P9741	D61-4
† P9731	D610-2	§ UP9741	D610-4
† P9734	D61-2	§ P9749	D61-4
† UP9734	D610-2	§ UP9749	D610-4
† P9739	D61-2	** T9728	D61-1
† UP9739	D610-2	** U9728	D610-1

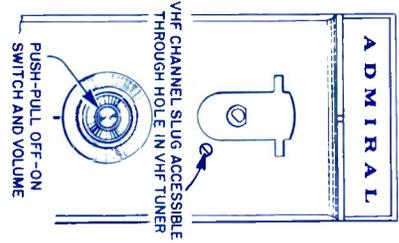
§ Model has dial light, tone control, earphone jack, carrying handle and built-in dipole antenna.
 † Model has dial light, tone control, earphone jack, carrying handle, timer clock and built-in dipole antenna.
 †† Model has dial light, carrying handle, and built-in dipole antenna. Does not have tone control or earphone jack.
 * Model has built-in monopole antenna. Does not have dial light, tone control, carrying handle or earphone jack.



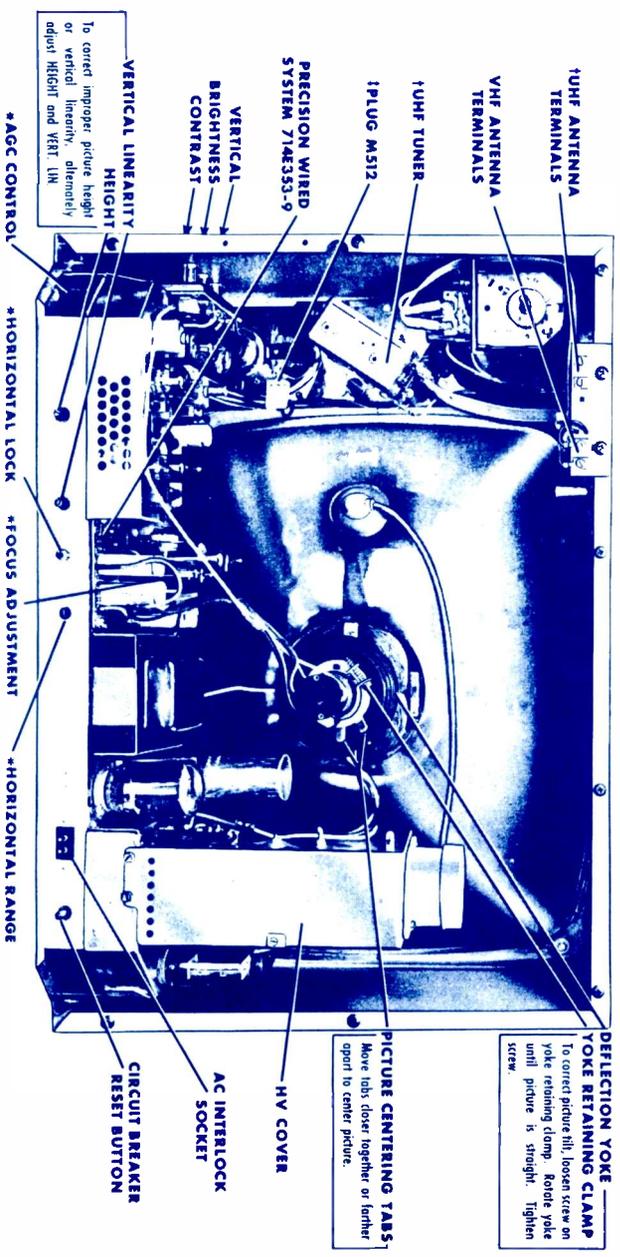
ADMIRAL
 TV Chassis
 D61-1, -2, -4
 D610-1, -2, -4

ELECTRONIC TECHNICIAN
TEKFAK
844

April 1964



Front View of Escutcheon, Channel Selector and Fine Tuning Knobs Removed.



† ONLY IN VHF-UHF CHASSIS.
 * ADJUSTMENT INFORMATION GIVEN ON OTHER PAGES.
 †† ONLY IN D61-4 & D610-4 CHASSIS.

More Data on Reverse Side

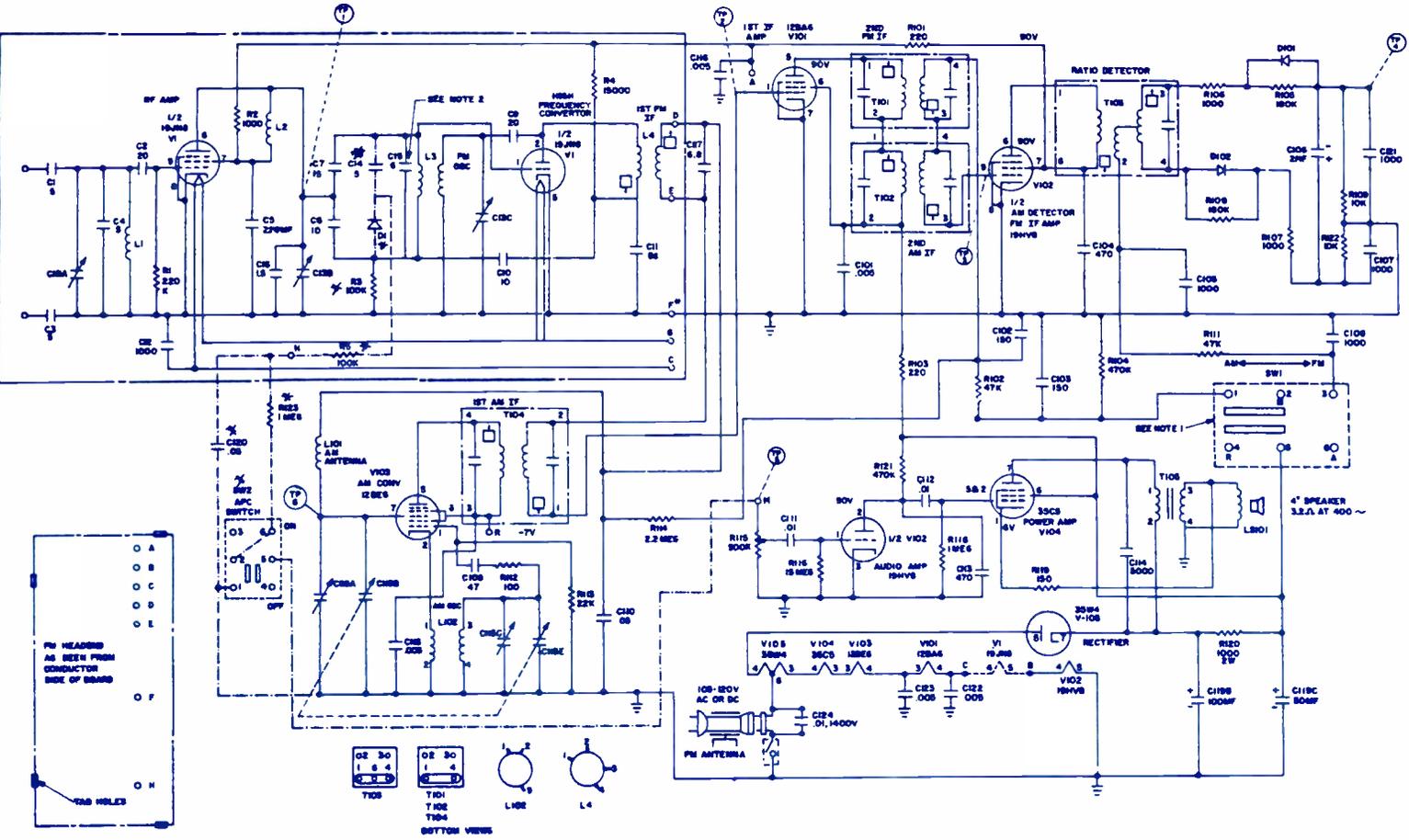
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845

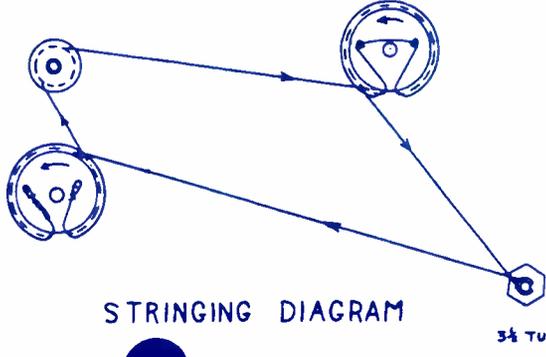
GENERAL ELECTRIC
 Radio
 Models 11R31, -33, T225A, -35A and -36A

ELECTRONIC TECHNICIAN
TEKFAK
 COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR SEVEN NEW SETS

April 1964



1. Band switch in AM position.
 2. C15 used on models 11R33 and T225A only.
- * Components used on models 11R31, T235A & T236A only.



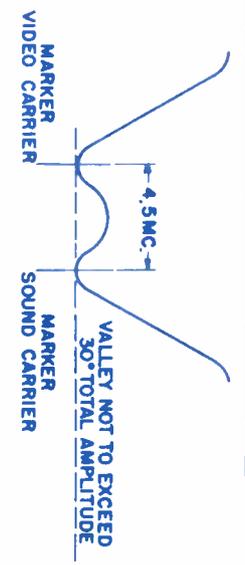
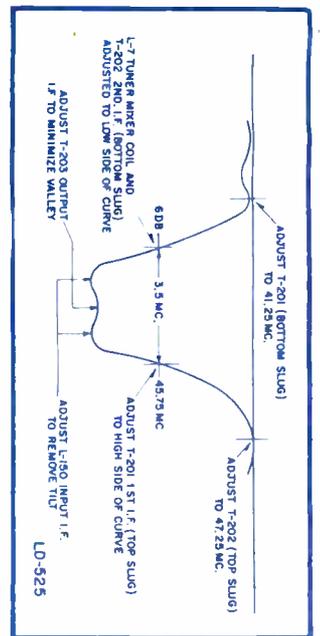
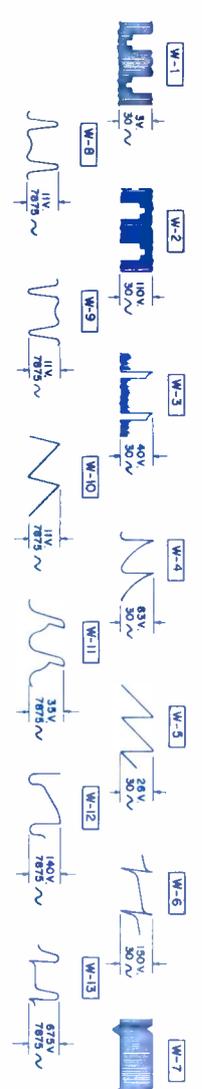
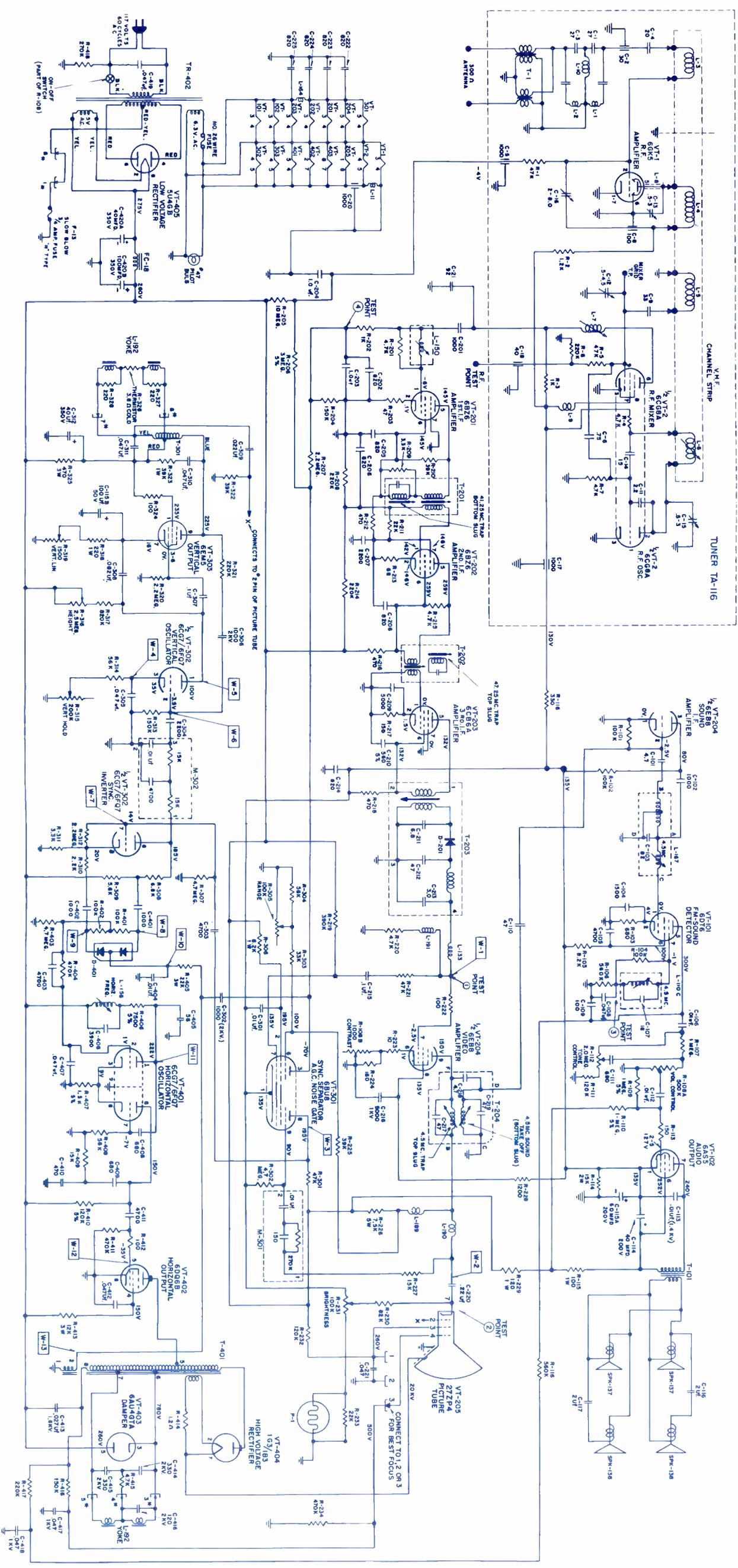
QUIBWAY BUILDING, DULUTH 2, MINNESOTA

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR SEVEN NEW SETS

AIRLINE
TV Chassis
10-116-254 and
-254U
Models GTC-
3914A, -44A,
-54A, GTC-
4914A, -44A
and -54A

April 1964

- VOLTAGE MEASUREMENT CONDITIONS -
- 1- LINE VOLTAGE 117 VOLTS A.C. 60 CYCLES
 - 2- D.C. VOLTAGES MEASURED WITH A VTVM FROM CHASSIS TO SOCKET TERMINALS
 - 3- VOLTAGE READINGS TAKEN WITH NORMAL SIGNAL INPUT USING A VTVM
 - 4- RANGE CONTROL SET FULLY COUNTERCLOCKWISE, AND ALL OTHER CONTROLS SET FOR NORMAL OPERATION



NOTE: * REFER TO YOKE PLUG AND SOCKET PIN NUMBERS

ELECTRONIC TECHNICIAN

TEKFAAX

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR SEVEN NEW SETS

Schematics No.	RCA	WESTINGHOUSE
ADMIRAL	844	848
TV Chassis	Record Player	
D61-1, -2, -4	RP-215-C1	
D610-1, -2, -4		
AIRLINE	847	850
TV Chassis 10-11-6-254 and -254U	Tape Recorder	
Models GTC3914A, -44A, -54A, GTC-4914A, -44A and -54A	Model 725	
GENERAL ELECTRIC	845	846
Radio	Radio Chassis	
Models 11R31, -33, T225A, -35A and -36A	V-2528-3	
MAGNAVOX	850	Model H-883N29
TV Chassis		
40-01-11, -01-21, -05-11, -05-21, -06-21 and -08-21		

GROUP
140

850

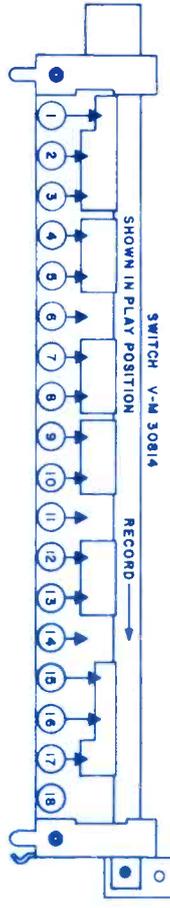
VM
Tape Recorder
Model 725

April 1964

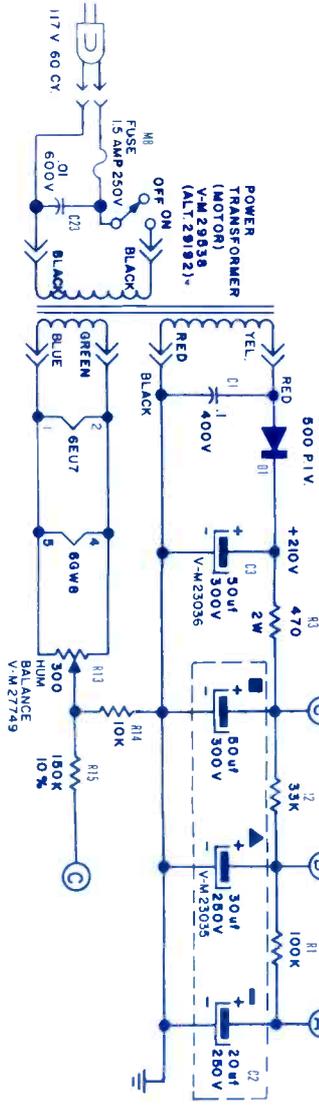
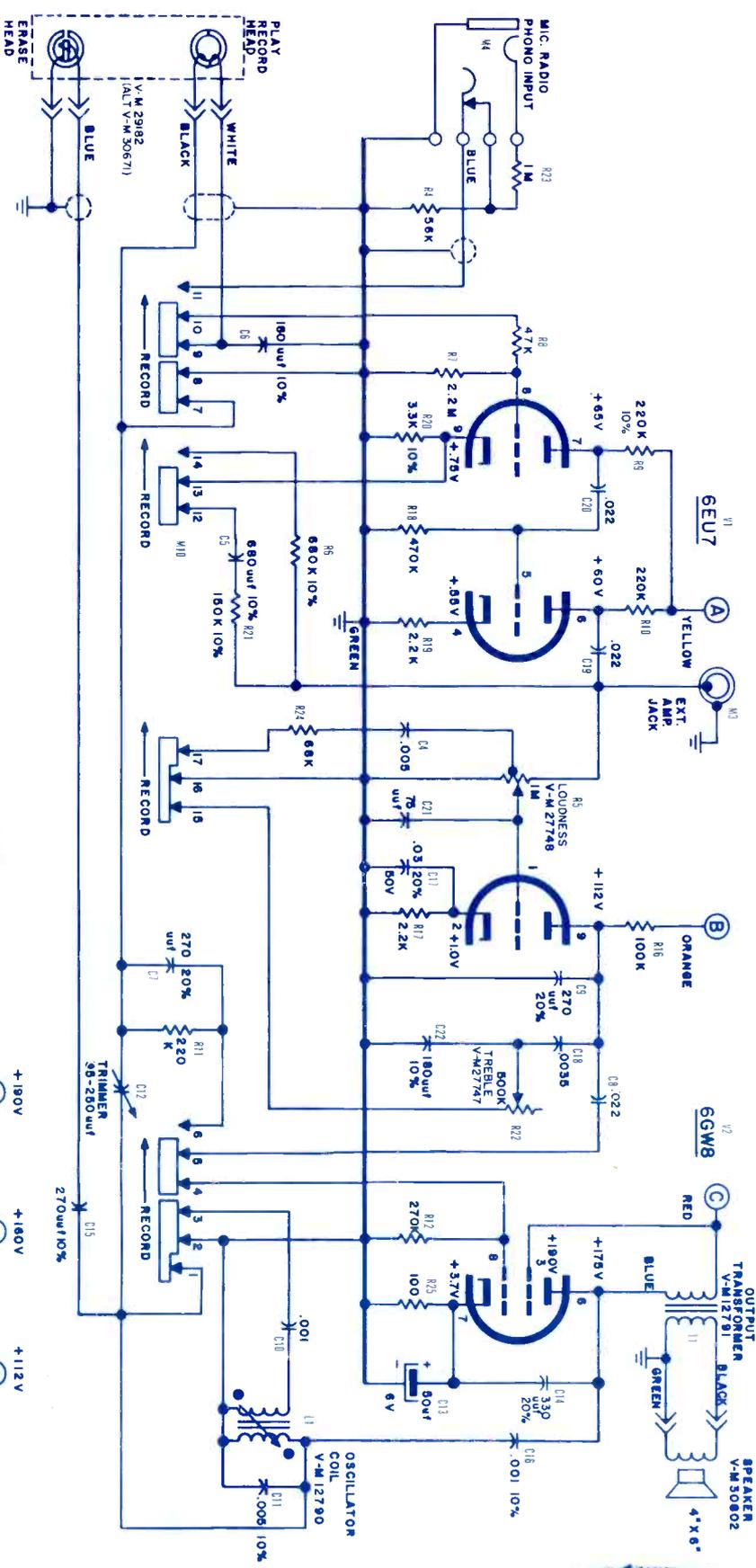
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TEKFAAX

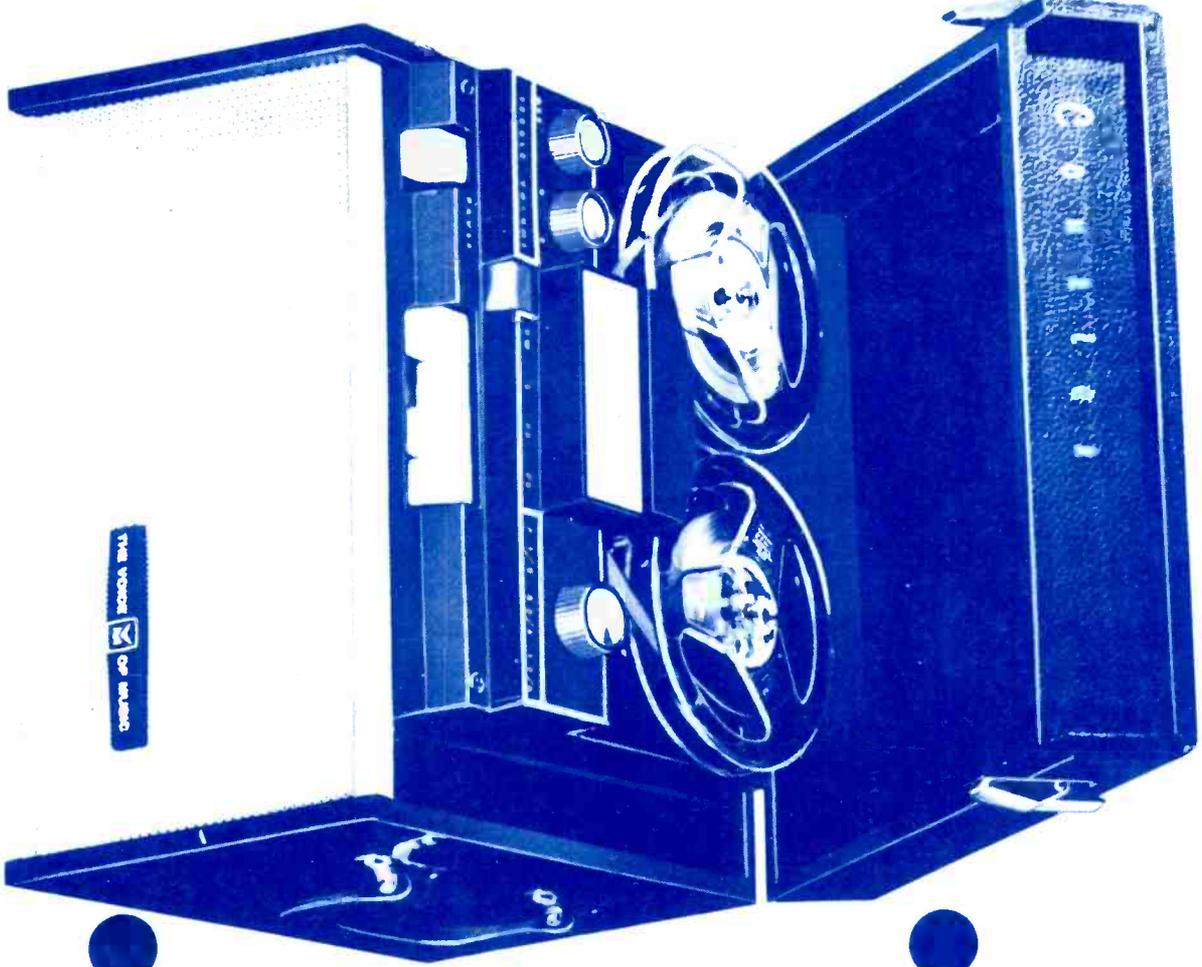
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR SEVEN NEW SETS



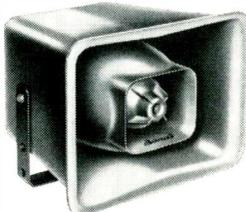
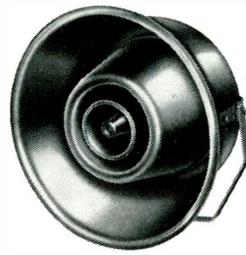
- NOTES
1. RECORD AND PLAY SWITCH SHOWN IN NORMAL POSITION.
 2. ALL RESISTORS IN OHMS, 1/2 WATT ±20%, EXCEPT WHERE NOTED.
 3. CAPACITANCE IN MFD, EXCEPT AS NOTED.
 4. CERAMIC CAPACITORS, 500 VOLTS, CAPACITY G.M.V., EXCEPT AS SHOWN.
 5. D.C. VOLTAGES MEASURED WITH I.M.E.G. V.T.M. IN PLAY POSITION.
 6. LINE VOLTAGE MAINTAINED AT 117 VOLTS FOR VOLTAGE READINGS.
 7. LEGEND - ♦ ELECTRICAL CONNECTION. + NO CONNECTION.

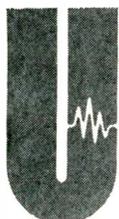


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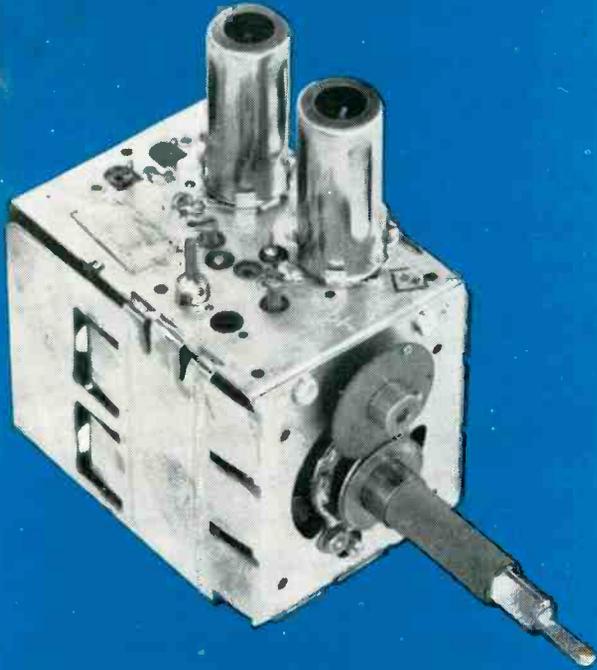
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When inquiring about service on other than Tarzian-made tuners, always send TV make, chassis and Model number. Check with your local distributor for Sarkes Tarzian replacement tuners, parts, or repair service. Or, use the address nearest you for fast factory repair service.



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APRIL

1964

VOL. 79

No. 4

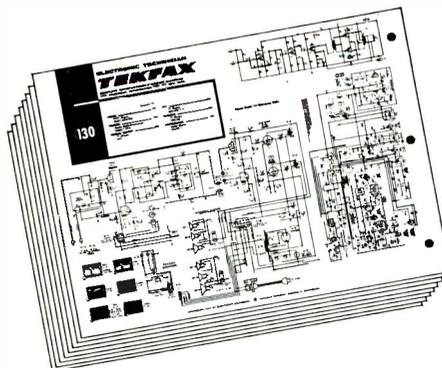
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TEKFAX 16 PAGES OF LATEST SCHEMATICS



ADMIRAL: TV Chassis, D61-1, -2, -4,
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AIRLINE: TV Chassis, 10-116-254 and
-254U Models GTC-3914A, -44A, -54A,
GTC-4914A, -44A and -54A.
GENERAL ELECTRIC: Radio, Models 11R31,
-33, T225A, -35A and -36A.
MAGNAVOX: TV Chassis, 40-01-11,
-01-21, -05-11, -05-21, -06-21 and
-08-21.
RCA: Record Player, RP-215-C1.
VM: Tape Recorder, Model 725.
WESTINGHOUSE: Radio Chassis, V-2528-
3, Model H-883N29

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LETTERS TO THE EDITOR

Intelligibility

Kudos to George Riley for his well written and interesting article on communications microphones in ELECTRONIC TECHNICIAN for January.

Because of the importance of the shaped frequency response characteristic to intelligibility of the transmitted signal, these considerations, we think, should be included. The "fricative" consonants are considered to be "t," "s," "ch" and "k." They contribute materially to intelligibility and depend upon the 3 kc range for their effectiveness. The "p" sound which George Riley includes, is an invoiced explosive formed by the lips, and is generally considered to be a labial like "m", "b" and "v," all of which contribute in an important, though somewhat lesser degree to clarity. The labials, however, require the 5 kc range and higher for proper transmission.

The point should be made that the 3 kc rise followed by cut off, as demanded in communications microphones, is a concession to the requirements of the radio equipment and the loudspeakers with which these microphones are employed. The radio pass band prevents the inclusion of the 5 kc range because of splatter and interference in adjacent channels, and most of the speakers used, especially reentrant horns, limit signal above the 3000-3500 cps point. Maximum intelligibility, without the limitations imposed by the communications radio pass band, and public address reentrant horns, prescribes that the energy rise include 5 kc according to authorities like Steinberg, Fletcher and others, and not solely at 3 kc as might possibly be imputed from the article.

HOWARD T. SOUTHER Dir. of Sales
The Astatic Corp.
Conneaut, Ohio

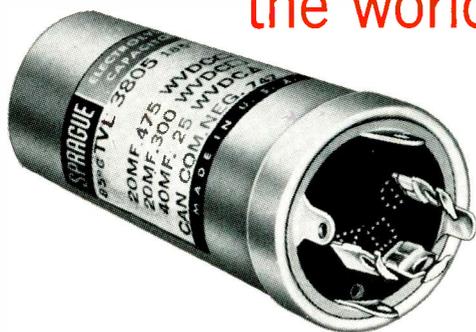
Patented Connector

I have subscribed to ELECTRONIC TECHNICIAN for approximately two years now and I enjoy your coverage of the electronics industry.

QUESTION: When it comes to electrolytic capacitors, why do more than half of the nation's Radio-TV Service Technicians prefer to do business with Sprague Distributors?

ANSWER: Because they don't want makeshift substitutions or multi-rating "fits-all" capacitors. They insist on exact replacements, which are always available through Sprague Distributors everywhere.

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We don't have to tell you that it's easier to service with exact replacements. And we don't have to tell you that it's better, too. When sets are designed, specific capacitance values are used for peak operation, so it takes exact replacements to restore original set performance.

And who better than Sprague knows which values and sizes are needed in the replacement market? Sprague, the world's largest component manufacturer, has the most complete specification file on original set requirements. That's why you're always right when you service with Sprague TWIST-LOK exact replacements!

GET YOUR COPY of Sprague's comprehensive Electrolytic Capacitor Replacement Manual K-106 from your Sprague Distributor, or write Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts.



WORLD'S LARGEST MANUFACTURER OF CAPACITORS

- - - for more details circle 55 on post card

Your article "Antenna Season" in the February issue was of interest, particularly the major causes of failure. Here in southern California 50 and 60 ft masts are not uncommon. Needless to say, de-telescoping one of these masts to reconnect broken lead-in terminals is quite a task. After having to perform this job a few times, I developed a permanent type connector that lasts the life of the lead-in and the antenna (U. S. Patent No. 3042892).

Some of these connectors are still in use that were installed over five years ago, and still performing well in desert winds and extreme temperatures, as well as coastal areas where salt air corrosion is a problem. To date there has not been a single failure.

Anyone wanting further information may get in touch with me.

LESTER HAYWORTH
45432 Kingtree Ave.
Lancaster, Calif.

Radio Craftsman C300

I need a schematic for a Radio Craftsman C300 equalizer-preamp-lifier—about 1963. It has 4-12AZ7s and 1-12AV6.

Would appreciate any help you can offer.

JOHN LEBLEY
Chicago, Ill.

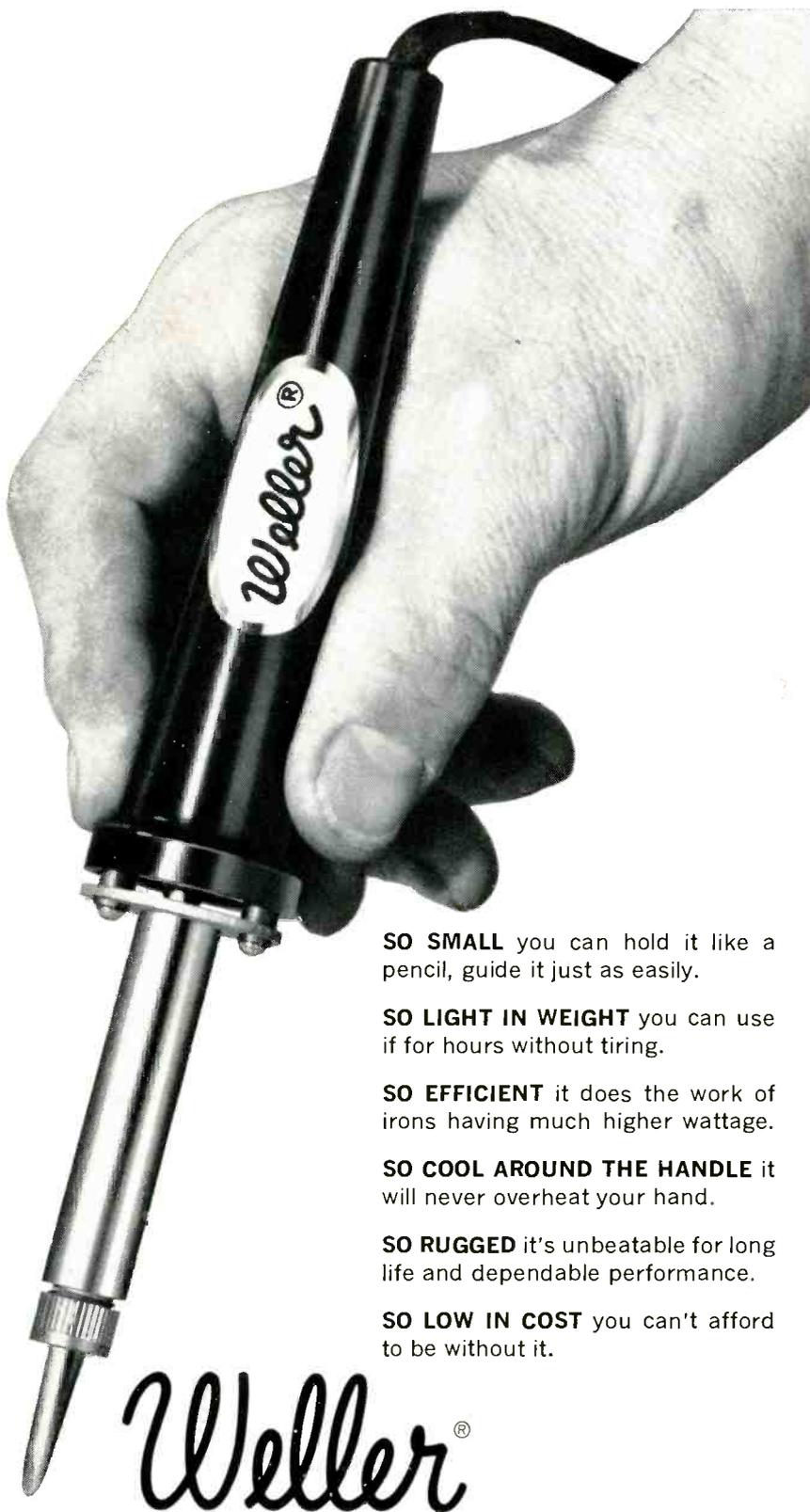
Hogwash!

Your February editorial and POPULAR MECHANICS MAGAZINE both indicate ignorance of today's service industry and of normal shop procedures.

I'm especially appalled that the editor of ELECTRONIC TECHNICIAN is totally unaware that while-you-wait service is not an economically sound practice unless a specialty is made of this service.

The industry to date has not applied the charges where they belong—on the technical service side of the bill. Four out of five sets come in with the tubes checked—and all the shop owner has to sell is his time.

The allegation that refusal to render immediate service is a criterion



SO SMALL you can hold it like a pencil, guide it just as easily.

SO LIGHT IN WEIGHT you can use it for hours without tiring.

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SO COOL AROUND THE HANDLE it will never overheat your hand.

SO RUGGED it's unbeatable for long life and dependable performance.

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"Pencil" Soldering Iron

A 25-watt, 115-volt iron that's ideal for miniature-type soldering.

Complete with tip and cord set. Screwdriver-shaped tips available in three sizes. Model W-PS. **\$5.20** list.

Buy Weller "Pencil" Soldering Irons at your Electronic Parts Distributor.

WELLER ELECTRIC CORP., 601 Stone's Crossing Rd., Easton, Pa.

- - - for more details circle 58 on post card

Quality is no gamble!



when you specify **ELMENCO** dipped Mylar* paper

Every time you make a call... service a circuit... change a component — you bet on the parts used. Make sure the odds are in your favor with miniaturized Elmenco Dipped Mylar-Paper (DP) capacitors. Over 100 million are in use now, because Elmenco DP capacitors give missile quality at commercial cost. Whether for radio-TV repairs, or critical industrial circuitry, reliable, dependable, rugged Elmenco capacitors eliminate profit-killing callbacks and customer complaints. Elmenco DP capacitors operate at 125°C without derating, are completely moisture proof, and are up to 50% smaller than comparable types. You can substitute values in a capacitor, but never virtues. Ask for Elmenco, and be sure you get it. Elmenco DP capacitors are available from stock only at authorized ARCO distributors throughout the U.S.A.

*Reg. Du Pont Trademark



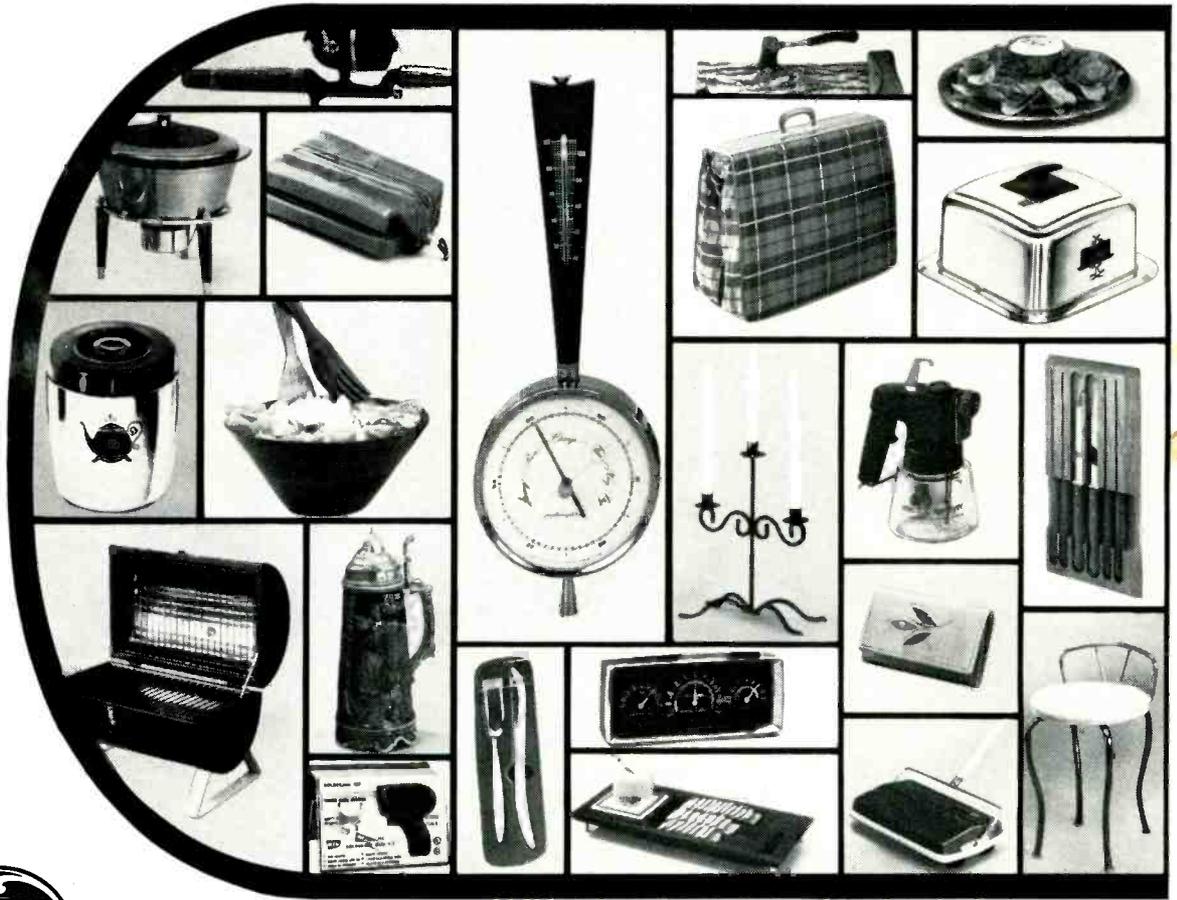
ARCO
electronics inc.

ARCO'S RESERVE WAREHOUSES

You can get your Elmenco (DP) capacitors in any quantity within 24 hours from coast to coast. They're stocked in depth at Arco's reserve warehouses serving authorized Arco distributors throughout the nation. Call your Arco distributor today!

Community Drive, Great Neck, N.Y. ☐ 516 HU 7-0500
Branches: Dallas 7 ☐ Los Angeles 35

- - - for more details circle 11 on post card



pleasure pak

**DISTRIBUTOR SALES
OWENSBORO, KENTUCKY**

Pleasure-Pak COUPON
EXPIRATION DATE: JULY 13, 1964

This Pleasure Pak coupon is valid for merchandise from this folder on the schedule outlined below when properly validated by your distributor.

3 Pleasure-Pak Coupons = 1 "B" Award
 2 Pleasure-Pak Coupons & \$3.00 = 1 "B" Award
 1 Pleasure-Pak Coupon & \$6.00 = 1 "B" Award

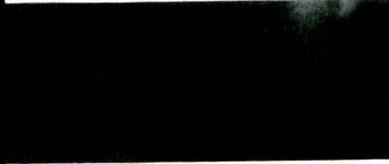
Keep this coupon and redeem it prior to the expiration date for your choice of Pleasure-Pak Awards.

This offer is void in any state, county or municipality where use is prohibited, taxed or otherwise restricted. Cash value is one (1) mill per certificate.

PLEASE SHOW

NAME _____
 COMPANY _____
 ADDRESS _____
 CITY _____
 STATE _____
 ZIP _____

THE FOLLOWING _____
 I ENCLOSE _____



**Get in on General Electric's
Pleasure Pak program**

The purchase of General Electric tubes makes you eligible to receive valuable merchandise during G-E's Pleasure Pak program. Imported musical steins, luggage, barbeque grills, tools, sporting equipment, carving sets and tableware and many other things can be yours at a tremendous discount or *even free*. All of these are well-known brand name products or special items that are not normally for sale.

**Make your own selections
from G-E Pleasure Pak books**

You're not limited to just one or two items. General Electric Pleasure Pak books contain 48 handsome "prizes," accurately illustrated and described. When you buy G-E tubes, you earn one of these books. Then it's *your choice* of the merchandise inside.

**Ask your G-E distributor
how to earn Pleasure Pak books**

Your General Electric receiving tube distributor has a supply of Pleasure Pak books. The back cover of each book is a certificate redeemable for the merchandise shown in the book. Ask your distributor how to get them. The Pleasure Pak program is limited to April and May, 1964. Better stock up on G-E tubes NOW!

GE Form No. 7 (REV. 6-2)

Pleasure Pak SELECTION FORM

GENERAL ELECTRIC Pleasure-Pak Headquarters
Forest Park Boulevard
St. Louis, Missouri 63108

SHIP AWARDS TO _____

NAME _____

ADDRESS _____

City _____ State _____ Zip _____

General Electric Pleasure Pak Award

DESCRIPTION	QUANTITY	DATE

Collector and \$ _____ for this order.

DISTRIBUTOR VALIDATION

DISTRIBUTOR NAME _____

ADDRESS _____

CITY/STATE/ZIP CODE _____

DATE RECEIVED _____

Progress Is Our Most Important Product

GENERAL  ELECTRIC

- - - for more details circle 32 on post card

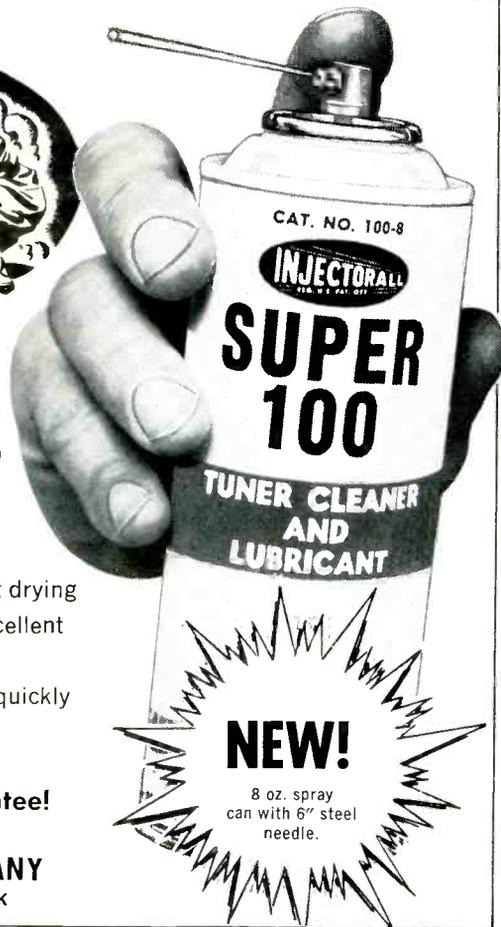


SAFE!
FOR NYLON SHAFTS AND
PLASTICS IN TUNERS!

SUPER 100 . . . is a fast drying cleaner and lubricant that is excellent for TV tuners. It cleans contacts sparkling clean and evaporates quickly leaving a lubricated coating.

Dealer Net . . . \$2.25
Money Back Guarantee!

Cat. No. 100-8
INJECTORALL COMPANY
BROOKLYN 14, NEW YORK



--- for more details circle 36 on post card

ADD STYLE TO PERFORMANCE . . .



**THE FIRST FULLY TRANSISTORIZED
ALL CHANNEL UHF CONVERTER!**

GAVIN is the pioneer in the development and production of Nuvistor and Transistor UHF products. The GAVIN UHF Converter offers not only high quality performance, but styling features such as a walnut-grained front panel, pilot-lite channel illuminator and easier tuning over all 70 UHF channels. The versatile line of GAVIN UHF Converters and Boosters satisfy every market need—metropolitan, fringe and translator.

GAVIN INSTRUMENTS
DEPOT SQUARE • SOMERVILLE, N. J.
AREA CODE 201 • PHONE: 722-6311

--- for more details circle 30 on post card

LETTERS TO THE EDITOR

of integrity and respectability is as fallacious as the tale of the moon being made of green cheese.

First-come-first-served is traditional, yet there are those that would have us teach electronics to the consumer at our normal service rates. To you, and the do-it-yourself magazine may I say—Hogwash!

EUGENE ORRICO

Whittier, Calif.

● *No one said those who asked for the set to be left were dishonest. It just happens that when the set is left, the chances of being cheated are greater. We still think that those shops who make it a policy of not looking at anyones set when it is carried in should re-investigate their policy. Even if you can't repair the set on a while-you-wait basis, it should lessen their suspicions of you.—Ed.*

COMING EVENTS

April 11-15: 46th Annual Convention, Nat'l. Assn. of Electrical Distributors, Sheraton-Park and Shoreham Hotels, Washington, D.C.

April 12-17: 95th Semiannual Technical Conf. and Equipment Exhibit, SMPTE, Ambassador Hotel, Los Angeles, Calif.

April 13-15: 3rd Symposium on Microelectronics, IEEE, Chase-Park Plaza Hotel, St. Louis, Mo.

April 27-May 1: Int'l. Conference, SPSE, Hotel Americana, N.Y.C.

May 18-20: The 1964 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago.

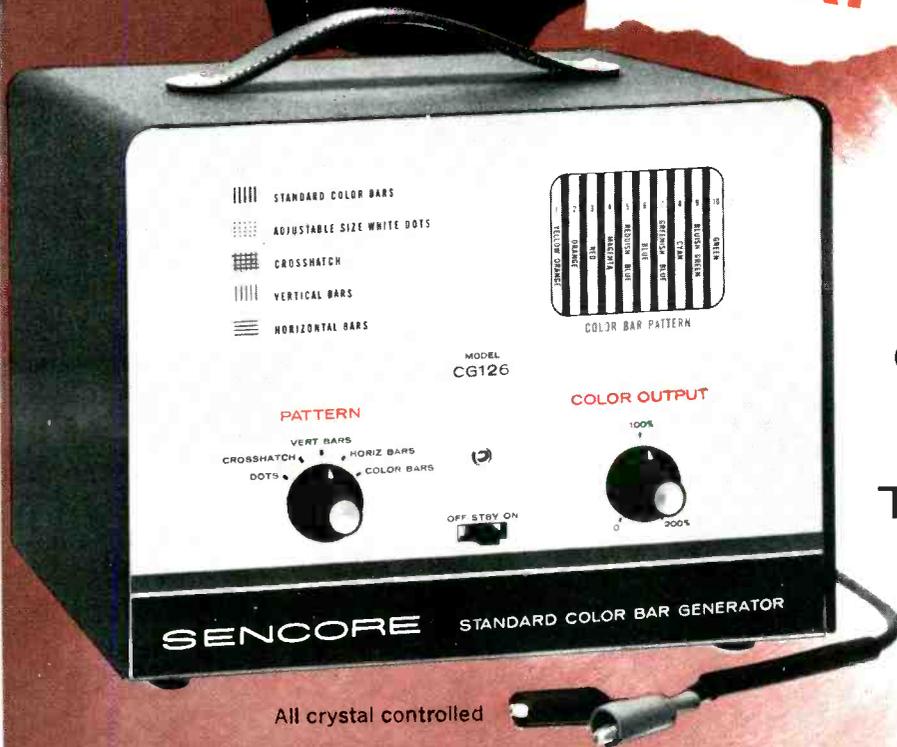


"It says here in small print, 'Don't expect to hear anything when your receiver is operating, space signals are inaudible to the human ear.'"

STOP!

LOOK!

SAVE!



All crystal controlled

A
STANDARD
COLOR BAR
GENERATOR

at **1/2**
THE COST OF
OTHERS

only **\$124⁵⁰**

the all new SENCORE CG126 STANDARD COLOR BAR GENERATOR

A standard color bar, white dot, crosshatch generator especially made for field service on color TV . . . and at a great savings to you.

Check these outstanding features and you will see why this generator belongs on the top of your list for color TV servicing.

All patterns crystal controlled offering "rock like" stability. You'll think the patterns are painted on the TV screen.

Simplified operation speeds up every servicing job. Just dial the standard keyed bars, white dots, crosshatch, vertical bars or horizontal bars and watch them "pop" on the screen. That's all there is to it.

Exclusive adjustable dot size. The white dots can be adjusted to the size that satisfies your needs by a screwdriver adjustment on the rear. No need to argue about dot size anymore. Just select the size that you like to work with best.

Pretuned RF output to Channel 4. Other low channels can be selected if Channel 4 is being used in your area by simple slug adjustment. Patterns are injected directly into antenna terminals, simplifying operation and saving servicing time.

Reserved output on color bars for forcing signal through defective color circuits. The color output control is calibrated at 100 percent at the center of rotation, representing normal output. A reserve up to 200 percent is available on the remainder of rotation.

Smaller and more portable. With color receivers weighing much more than black and white TV, portable equipment becomes essential for home servicing. The CG126 weighs less than 10 pounds and measures only 11" x 8" x 6".



Ten standard keyed color bars (RCA type) that automatically provide all colors at specified NTSC

phases . . . but without need of interpretation when servicing.



Stable white dots with new exclusive dot size adjustment in rear.



Stabilized crosshatch pattern for simplifying convergence adjustments.



10 thin white vertical lines for horizontal dynamic convergence adjustments . . . often missing on other generators.



14 thin horizontal lines for vertical dynamic convergence. Also missing on many high priced generators.

March into your local parts distributor and demand the CG126 Sencore color generator that sells at 1/2 the price of others. Don't let him switch you.

SENCORE

426 SO. WESTGATE DRIVE • ADDISON, ILL.

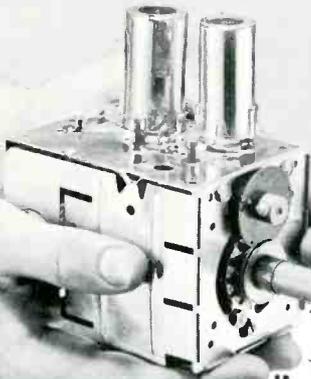
- - - for more details circle 53 on post card

GOOD NEWS FOR EASTERN TV SERVICEMEN...

CASTLE TV TUNER-EAST HAS MOVED TO NEW LOCATION WITH IMPROVED FACILITIES

In Long Island City near Postal Concentration Center to provide faster service by mail.

All other U.S. and Canadian Servicemen will get the same fast service from CASTLE-CHICAGO and CASTLE-CANADA.



**ALL MAKES
ALL LABOR
AND PARTS
(EXCEPT TUBES)*
ONE PRICE**

995

THIS ONE LOW PRICE INCLUDES ALL UHF, VHF AND UV COMBINATION* TUNERS

Simply send us your defective tuner complete; include tubes, shield cover and any damaged parts with model number and complaint. 90 Day Warranty.

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

*UV combination tuner must be of one piece construction. Separate UHF and VHF tuners must be dismantled and the defective unit only sent in.

Pioneers in TV



Tuner Overhauling

CASTLE

TV TUNER SERVICE, INC.

EAST: 41-92 Vernon Blvd., Long Island City 1, N. Y.
MAIN PLANT: 5713 N. Western Ave., Chicago 45, Illinois
CANADA: 136 Main Street, Toronto 13, Ontario

*Major Parts are additional in Canada

FREE LITERATURE

CB BASE STATION 300

Literature describes a 23-channel citizens band base station receiver and transmitter featuring broad and narrow selectivity receiver switching; transmitter compression amplifier and clipper-filter stage. Brown-Ing Laboratories.

AUDIO CENTER 301

Information details a radio and portable phonograph merchandising program that provides dealers with a long-term inventory finance plan and a low cost store display fixture offer called "Operation Exposure." Philco.

TRANSISTORIZED CONVERTER 302

Literature gives specifications on a transistorized converter for operation of ac appliances and tools from an automobile, boat or any 12 vdc source, GC Electronics.

REFERENCE GUIDE 303

Information covers a new two color 22 x 17 in. Filter Guideline Application Chart for TV-radio technicians. CDE.

SPEAKER SYSTEM 304

This technical sheet describes the Free-Piston speaker system that contains a woofer and tweeter and is said to have a frequency response from 38 to 18,500 cps. Fisher.

STEREO COMPONENTS 305

This sixteen page catalog describes a full line of tuners, amplifiers, receivers, tape decks and tape recorders. Bell Sound.

RESISTORS & SWITCHES 306

A twenty page catalog describes a line of wire-wound and carbon replacement resistors, pots, switches, etc. for service technicians. Clarostat.

CHANGEABLE SIGN 307

Information covers a changeable-copy store sign with four different letter sizes to choose from. Hanover Mfg.

HI FI CATALOG 308

A 2-color, 32-page catalog covers a complete line of stereo and monophonic Hi Fi equipment, test instruments, ham gear, CB radios and transistor radios, available in both kit and wired form. Eico.

COMING NEXT MONTH IN . . .
ELECTRONIC TECHNICIAN
REPLACEMENT CONTROLS, SPEAKERS,
CAPACITORS AND COILS

ELECTRONIC TECHNICIAN

← . . . for more details circle 21 on post card

CHECKS AND REJUVENATES ALL PICTURE TUBES
WITHOUT ADAPTORS OR ACCIDENTAL TUBE DAMAGE

Featuring Automatic
Controlled
Rejuvenation

The All New SENCORE CR125 CATHODE RAY TUBE TESTER

An all new method of testing and rejuvenating picture tubes. Although the method is new, the tests performed are standard, correlating directly with set-up information from the RCA and GE picture tube manuals.

Check these outstanding features and you will see why this money making instrument belongs on top of your purchasing list for both monochrome and color TV testing.

Checks all picture tubes thoroughly and carefully; checks for inter-element shorts, cathode emission, control grid cut-off capabilities, gas, and life test. Checks all picture tubes with well filtered DC just like they are operated in the TV set.

Automatic controlled rejuvenation. A Sencore first, preventing the operator from over-rejuvenating or damaging a tube. An RC timing circuit controls the rejuvenation time thus applying just the right amount of voltage for a regulated interval. With the flick of a switch, the RC timer converts to a capacity type welder for welding open cathodes. New rejuvenation or welding voltage can be re-applied only when the rejuvenate button is released and depressed again.

Uses DC on all tests. Unlike other CRT testers that use straight AC, the CR125 uses well filtered DC on all tests. This enables Sencore to use standard recommended checks and to provide a more accurate check on control grid capabilities. This is very important in color.

No adaptor sockets. One neat test cable with all six



All six sockets, including latest color socket, on one neat cable.



Checks Each Gun Individually In Color Tubes.



sockets for testing any CRT. No messy adaptors, reference charts or up-dating is required. The Sencore CR125 is the only tester with both color sockets. (Some have no color sockets, others have only the older type color socket.)

No draggy leads. A neat, oversized compartment, in the lower portion of the CR125 allows you to neatly "tuck away" the cable and line cord after each check in the home.

Model CR125 \$69.95

MODEL CR128
For the man on the go. Same as above but in all steel carrying case . . . \$69.95

PS127 DELUXE WIDE BAND OSCILLOSCOPE AT A SURPRISINGLY LOW PRICE

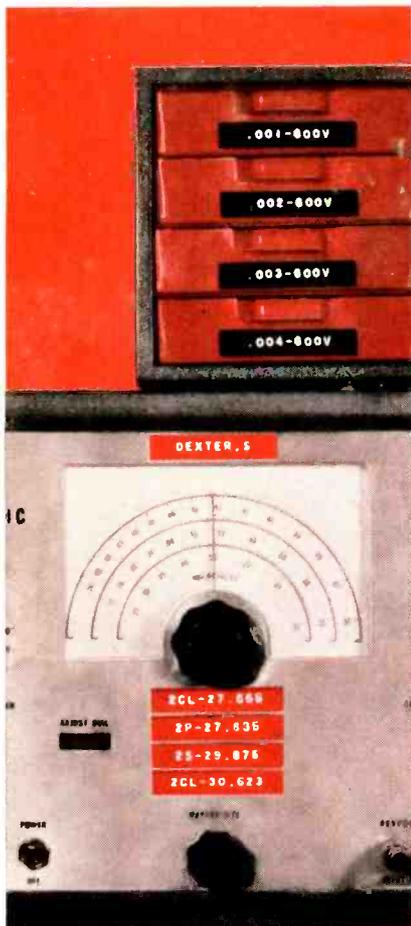
This all new 5 inch oscilloscope offers the finest in performance, portability and appearance. Vertical amplifier frequency response, flat within 1 DB from 10 CPS to 4.5 mc and only 3 DB down at 5.2 mc insures true waveform reproduction. Vertical amplifier sensitivity of .017 volts RMS for one inch deflection on wide band (without band switching) is found only on scopes costing hundreds of dollars more. High input impedance of 2.7 megohms shunted by 99 mmfd (or 27 megohms with 9 mmfd with built-in low capacity probe), insures minimum circuit loading. For the first time, waveforms can be viewed in TV horizontal and vertical output circuits with the low capacity probe that will withstand up to 5000 volts peak to peak. To top that, the vertical amplifier attenuator controls are calibrated directly in peak to peak volts for fast direct reading of all peak to peak voltages.

Horizontal amplifier extended sweep range from 5 to 500 kc in five overlapping steps and frequency response from 10 CPS to 1 mc within 3 DB insures linear sweep and positive sync. External inputs for horizontal sweep and sync, intensity modulation, and smart two-toned case and "designer" styled controls brands the PS127 a truly professional oscilloscope.

PS127 \$169.50



--- for more details circle 54 on post card



DYMO IDENTIFICATION SYSTEM

THE ELECTRONICS INDUSTRY IDENTIFIES ITSELF WITH DYMO! DYMO's M-55 TAPEWRITER makes raised-letter labels on-the-spot. Just dial letters, numbers, or symbols—and squeeze the handle. Letters come out crisp white on a colored background of self-sticking vinyl. Complete with round and square corner cutters, accessory wheels for technical symbols and vertical labels. With one tool, a complete system of identification. Always use DYMO tape!

Suggested Price **\$29⁹⁵**



FREE: Tape samples and full details. DYMO INDUSTRIES, INC., P.O. Box 1030, Berkeley, Calif. Dept. ET-4-55

NAME _____

COMPANY _____

STREET _____

CITY _____

STATE _____

Prices slightly higher in Canada

FREE LITERATURE

BATTERIES 309

This six-page brochure covers a line of sealed nickel-cadmium batteries for portable power use. Burgess.

HI FI SPEAKERS 310

A Hi Fi catalog details a line of Hi Fi speakers that have 12 oz. Barium Ferrite (ceramic) magnets and the capacity to handle more power. Quam-Nichols.

BASE STATION ANTENNAS 311

A fixed station catalog features several new antennas in the frequencies used for mobile communications. Includes antennas for the 136-174 Mc band as well as antennas serving the 25-148 and 450-470 Mc bands. Andrew Corp.

TOOLS 312

An 8-page catalog describes a complete line of tools and fixtures for assembly, testing, inspection and electronics servicing. Matrix Engineering Corp.

SPEAKERS 313

A 2-color, 16-page catalog fully illustrates and describes a line of general purpose and replacement loudspeakers with easy-to-read specification tables. Jensen Mfg. Co.

CB RADIO 314

A 4-page brochure describes the Model 310-A transistorized two-way CB radio that weighs 5 lb. Cadre.

CB EQUIPMENT 315

An 8-page communications brochure describes a line of SB two-way radios and accessories. The brochure includes mobile antenna systems, cable assemblies, crystals and a series of noise suppression kits for automotive use. Raytheon.

MOVING?

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

Mr. Serviceman! YOU NEED



ONLY ONE FORMULA

AND



ONLY ONE PROVEN

TUNER CLEANER

for

ALL TV TUNERS

including

THE NEW TYPE USING

PLASTIC PARTS



Don't be misled by the many varieties of so-called cleaners at your jobber's. The formula used by Chemtronics will not harm the OLEFORM, DELRIN and NYLON plastics used in today's new tuners. TUN-O-LUBE is fully guaranteed!

TUN-O-LUBE does NOT contain CARBON-TET.

AVAILABLE IN 3 SIZES

Cat. No. 1610-16 oz.	
Spray Can	\$2.98
Cat. No. 810-8 oz.	
Spray Can	1.98
Cat. No. 301-3 oz.	
Caddy Size	.98

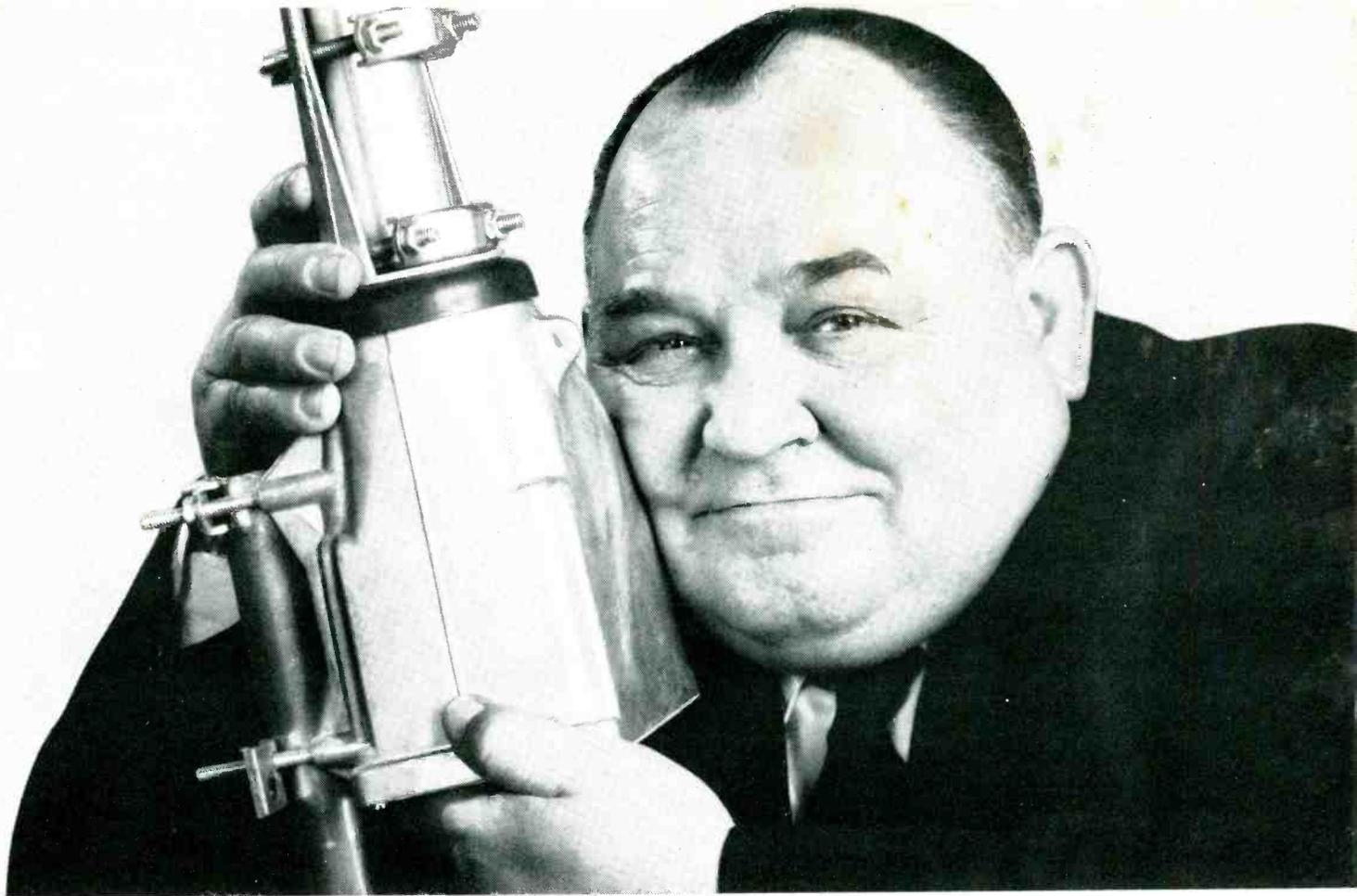


CHEMTRONICS INC.

1260 RALPH AVENUE,
BROOKLYN 36, N. Y.

in Canada Contact: Active Radio & TV Distributors
431 King Street W. Toronto 28, Canada

for more details circle 23 on post card
ELECTRONIC TECHNICIAN



Here's the only excuse you may have for not installing the world's best manual rotator at our **REDUCED PRICES...**

...you just don't use manual rotators in your area!

Say, on the other hand, you *do* sell them. And believe with all your heart in selling the very best. What else can you do then but go with Channel Master rotators? Especially when you can now get our manual model at reduced prices.

This is the one rotator, remember, that makes all others look like also-rans; because it alone has the high torque to turn the heaviest antenna array easily—plus the ruggedness to keep it on course in foulest weather.

For instance: In addition to simplest fingertip control, accurate repeatability, continuous instant direction indication, (and lots of other good features), only Tenn-A-Liners give you:

- Built-in *hard-steel* thrust bearings (not soft aluminum parts). So friction-free the Tenn-A-Liner will turn ice-loaded installations as heavy as 330 lbs.
- *Hard-steel* precision-machined gears (not stamped). So rugged that they won't strip or bind. Will continue to operate even in 70 mile gale winds.
- *Pushbutton* "On-Off" Switch (brand-new) that prevents reception interference caused by wind vibration.



model 9520

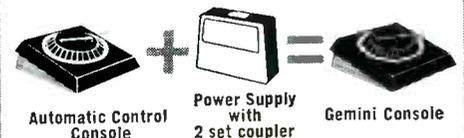
... **now** what's your excuse for not calling your nearest Channel Master distributor?

NEW! Unique Gemini Rotator/Amplifier.
... for fast, neat 2-in-1 installations that save you money 4 ways.

(A simple explanation of what the Gemini is—for those dealers who have heard about this product's terrific profit success story).



(Where's the booster? It's hidden in the rotator).



World's first all-in-one rotator-amplifier combination! Only 1 unit on mast—1 housing on set—1 transmission line.

Choice of 2 Models:
NEW! TV/FM Gemini, Model 9518.
"TV ONLY" Gemini, Model 9527
(includes Built-in FM Trap).

Tried our superb Automatic Rotators? There's nothing better. They're available at our regular prices.

CHANNEL MASTER ROTATORS

ELLENVILLE, NEW YORK

... for more details circle 22 on post card

NEW

SECO TUBE TESTER Model 98

**GUARANTEED TO GIVE ALL MODERN TV TUBES,
RADIO TUBES AND FILAMENT RECTIFIERS A
COMPREHENSIVE ANALYSIS...**

checks heater current
on series string tubes



A SECO PLUS! Replaceable socket chassis plugs into metering chassis. Can be economically replaced as it wears out or becomes obsolete. Available with special sockets upon request. Guaranteed up-to-date for all modern receiving tubes including novars, novistors, 10-pin types, compactrons and MAGNOVALS.

GRID CIRCUIT TEST detects faults such as grid emission, leakage and shorts—a rapid, reliable multiple-check developed and patented by Seco.

TUBE MERIT TEST indicates functioning ability of a tube by the quality of cathode emission.

HEATER CURRENT TEST reads on meter. Relies on heater resistance to show cold operation or improper voltage distribution in a series string of heaters.

SECO SELECTRO SYSTEM isolates or transposes tube circuits and controls test current—achieves laboratory precision and flexibility with dial-switch ease and speed.



NEW SECO MODEL 98
ONLY **\$99.50**
NET

This new test instrument is a complete tube tester that locates all tube faults quickly and accurately. It has a two-stage DC amplifier which isolates the rugged 1 ma meter from the tube under test, protecting the meter and permitting a wide range of load currents and test conditions. The new Model 98 tests more than 2500 different tubes. The entire unit is contained in a compact case with removable cover. The cover holds speed-indexed tube data cards, pin straighteners and condensed operating instructions. For complete information see your electronic supply dealer or write to Seco.



SECO ELECTRONICS, INC.

1211 S. Clover Drive, Minneapolis 20, Minn.

A DIVISION OF DI-ACRO CORPORATION

for more details circle 52 on post card

EDITORS' MEMO

On Slaying Goliath

Television is bread and butter for technicians. Unfortunately, we can't live on just bread and butter. Nor can we neglect it.

Diversification seems to be the key. But where to diversify? Unless you have a shop equipped to handle appliances—toasters, irons and such are definitely out. Special tools, special distributors and special knowledge are all requisites and this cuts into your bread and butter business.

But several areas which have great potential for sales and service are almost suffocating in some places and deserve your attention. You need no special equipment for service; you deal with your regular distributor and the facts you need are only an extension of what you already know. And the best part, you can work in these areas when the bread and butter gets scarce.

Public Address. Closed circuit TV. Intercoms. Burglar alarms (Intrusion alarms, I'm told, is the proper name). Annunciator systems. Garage door openers (and a host of other remote applications). The list is virtually endless.

I know, you say you can't compete with the "big boys" that just wired the new auditorium for sound or installed CCTV in the new power plant. And this is true. Right now, at least, you can't compete with the giants. But wake up! Lower your sights! You have an edge on the giants that they can't get around: They cannot compete with you for the *small* business deals. They cannot afford to sell a small PA system to the corner grocery store (or any other small retailer) unless he asks for it. But you can.

Every store you patronize is a potential customer. Other than the owner, who knows better what he needs than you—another merchant in the same neighborhood?

In talking with store owners you can probably think of many devices he can use. Maybe the grocery store manager would like to know how many customers are passing in front of the meat counter—a simple photoelectric counter would tell him. Although turnstiles are frequently used in such applications, the photoelectric device is a natural since the turnstile impedes traffic, but those passing a light beam rarely know it.

And your TV customers: on every call you make, you have the toughest part of every selling job finished for you. You're in the house—by invitation! You're then free to talk about garage door openers, timers or anything.

All you have to do is be alert to your customer's needs and use your head. If they truly need or want it, you won't have any trouble selling it.

Vic Beale

ELECTRONIC TECHNICIAN

WINT

THE FABULOUS INTERNATIONAL RECTIFIER 1964 'ROUND THE WORLD CONTEST!



**CONTEST OPEN TO ALL ELECTRONIC
TECHNICIANS AND ENGINEERS**
Enter As Often As You Wish!

MEET THE FAMOUS GEISHA GIRLS OF TOKYO!
SEE THE SINOUS TEMPLE DANCERS OF
BANGKOK! ENJOY THE EXOTIC NIGHT LIFE
OF NEW DELHI, INDIA! You are on your fun
packed way around the world by Trans World
Airlines, free for 28 days to enjoy the pleas-
ures of 9 countries on 3 continents. ■ As you
mingle with the friendly beauties of modern
Rome, watch the Folies Bergere in Paris, and
become acquainted with the legendary
English Bar Maid in London, you will know that
your life is richer by far for the never-to-be for-
gotten memories of your trip around the world.
■ So act today! Complete the entry form below
and send it to International Rectifier Corpora-
tion. You may be the lucky winner who can
choose between a 28 day trip around the world
for 1, or a 15 day trip to Europe for 2, with full
world wide accident insurance protection pro-
vided for duration of trip through Beneficial
Insurance Group.



INTERNATIONAL RECTIFIER 1964 'ROUND THE WORLD CONTEST RULES:

1. Add a fourth line to the limerick: (judging will be based on pertinence of your words, rather than their literary quality)
2. Answer all questions on form and sign it.
3. Remove label or box end from any boxed I.R. product, or draw a free-hand facsimile of the I.R. trademark.
4. Send completed entry form and I.R. label, box end, or trademark facsimile to INTERNATIONAL RECTIFIER CORP., 233 Kansas Street, El Segundo, Calif.
5. Answer as often as you wish. All entries must be postmarked on or before April 30, 1964. Winner will be selected and announced by International Rectifier Corporation on May 18, 1964. All entries become the property of International Rectifier Corporation.

--- ACT TODAY! ---
1964 'ROUND THE WORLD CONTEST
INTERNATIONAL RECTIFIER CORP. / 233 Kansas Street, El Segundo, California
Add a 4th line to this limerick:

OF ALL THE REPLACEMENTS Date _____
I'VE PUT TO THE TEST,
INTERNATIONAL RECTIFIER

(Please Print All Answers)

Name of my I.R. distributor _____
Distributor's address _____
City _____ State _____
My distributor salesman _____
My name _____
My address _____
City _____ State _____

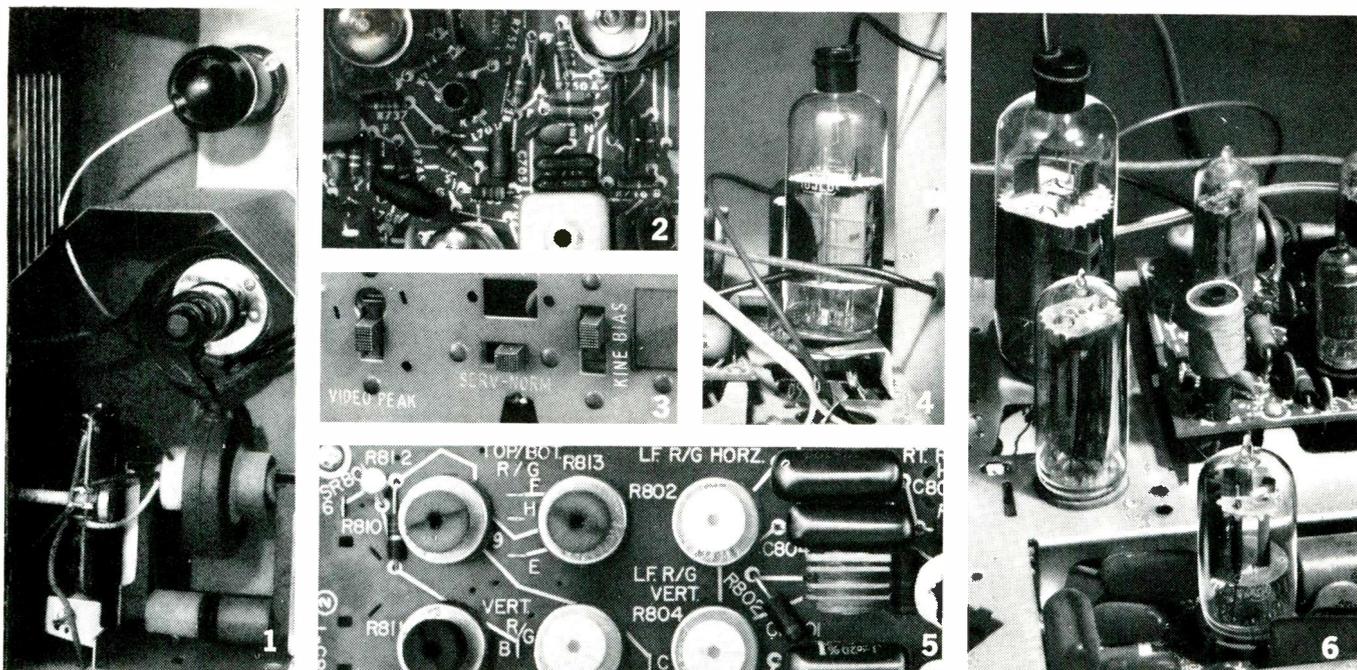
Additional entry forms available from all electronic distributors.



INTERNATIONAL RECTIFIER

--- for more details circle 37 on post card

CTC 15 Color TV Chassis gives brighter, sharper picture; has greater reliability; is easier to service... than any previous RCA Victor Color TV Chassis!



RCA Victor's new CTC 15 chassis keeps all the performance-proved virtues of the CTC 12 . . . but adds these engineering improvements that should please both you and your customers:

The picture is brighter, better. It's brighter because a new design in the high voltage section (1) gives 30% more current output at the same voltage. The picture tube circuits are designed for effective use of this higher power.

It's sharper because the picture tube screen voltages have been boosted . . . giving a smaller, sharper dot pattern with less blooming. The video amplifier has better phase response.

It's steadier because of substantially improved vertical hold circuits.

A new picture "tone control" . . . it's a video peaking switch (3) . . . offers three choices of picture quality: soft, normal and sharp. When snow and ghosts are your problem, use the soft setting for a smoother, more pleasing picture. When the signal is better, make the most of it with the normal or sharp setting.

Less color fringing results from a new clamp diode in the convergence circuit and rearranged controls are easier to use.

And UHF reception is improved by new circuitry that reduces snivets . . . those black vertical lines near the center of the picture.

Greater reliability . . . longer component life. Heat build-up has been reduced by housing the flyback transformer and the regulator tube in separate compartments.

The horizontal output tube (4) is placed on a raised "cooling shelf" outside the H.V. compartment. Its position allows free flow of air around its base. Three conventional tubes have been replaced by novars (6). They run cooler and last longer. One of them is the hardest working tube in the set—the horizontal output tube.

And dark heater tubes are used in all high-performance circuits.

To further increase life, the focus rectifier is specially designed for additional life expectancy.

Easier servicing. Circuit tracing is easier and faster . . . the new schematic solid-line roadmaps (2) go point-to-point, and component labels are larger.

It's easier to service the high voltage

compartment . . . it has a hinged cover and better arrangement.

Color setup has been simplified by the addition of a conveniently placed 3-position bias switch (3) which accommodates wide variations of picture-tube characteristics.

RG controls (5) on the convergence board have also been rearranged for your convenience. Now you use the entire top row to make adjustments according to the horizontal lines in a crosshatch pattern; the entire second row is for the vertical lines.

Color TV is the technician's big bread and butter business . . . for years to come. We stand ready to help in every possible way to make this fast-growing business a profitable one for technicians — and for dealers as well.

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ADMIRAL

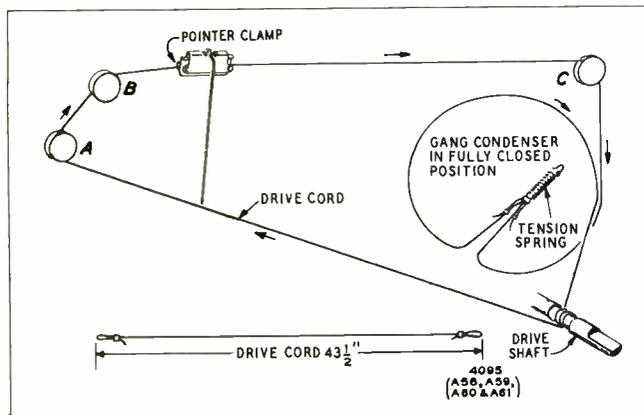
TV Chassis C21A1-1A, -1E and C21A10-1C Stamped Run 11—
Improving Focus

The CRT in these receivers uses electrostatic focus—with a 3-position focus adjustment consisting of a small plug-in type patch-cord and three receptacle pins shown as “A,” “B” and “C” on the manufacturer’s schematic. This is located at the bottom of the chassis near the horizontal range, vertical linearity and vertical height control mounting strip. To make the proper focus adjustment, connect plug-in focus lead to the receptacle pin that provides best focus at the center area of the CRT. Contrast and brightness controls should be set for a normal picture. Caution: *High B+ is present at the focus terminals. Use care and avoid accidental contact with these terminals to prevent electric shock.*

AIRLINE

AM/FM/Phono/TV Combinations, Models WG5914A, -6914A, -5944A, -6944A, -5974A and -6974A — Drive Cord Replacement

Drive cord replacement may be accomplished as illustrated here. Use a drive cord 43½ in. long. Install the string as shown, winding three turns clock-



Airline drive cord replacement schematic.

wise around the tuning shaft with the turns progressing away from the chassis front. After the cord is installed, rotate the tuning shaft several times to take up any slack in the cord.

DELCO

“Wonder Bar” Radios — Upside Down Operation

If a 1960 or 1961 automatically tuned “Wonder

Bar” radio is operated upside down, it is possible that the tuner will scan only a small portion of the band, rather than the complete band. If you have a case on the bench where the entire low frequency end of the band is completely “missed” by the tuner, check to see if the radio is lying in an upside down position. A portion of the band may also be missed when the radio is powered by a battery eliminator because of a sudden voltage drop when the solenoid “hits.” In fact, the tuner may just stick and never leave the high frequency end of the dial. It is important to use a heavy duty power supply capable of 20 amp intermittent current on the 12 v range and to set the eliminator at 16 v. Car batteries supplying only 12 v do nicely because their voltage does not drop when the tuner solenoid energizes.

GENERAL ELECTRIC

TV Chassis “MW” — Production Changes

In all 23 in. receivers coded 117MW and above the value of CRT cathode resistor R176 was changed from 180K to 150K to increase CRT beam current . . . In chassis bearing code 125MW and above, the HV rectifier tube was changed from a 1J3 to a 3A3. This change necessitated an additional two turns of filament winding on the flyback transformer and an additional series resistor in the filament circuit. Resistor R268 value is 3.6Ω, ½ w, wirewound. . . To reduce picture top bend, a 100 pf capacitor (C266) was added from pin 7 to the HO tube to the junction of R263 R264 in the 6DQ6B grid circuit and was mounted on the sweep circuit board. This change was made in 23 in. chassis bearing code 125MW and above and in 19 in. chassis with code 127MW and above. . . In chassis bearing code 128MW and above, the value of resistor R263 was changed from 820K to 560K. This change was made to avoid over dissipation of the 6DQ6 grid . . . To improve current distribution, the VHF tuner RF B+ supply circuitry was changed. Resistors R181 and R312 were deleted and the value of R180 was changed from 15K, 4 w to 2.2K, 2 w. This resistor (R180) is now connected from B+ 135 v to the tuner RF B+ input. To coordinate with this, the value of resistor R160 was changed from 15 to 16 MΩ. These changes are incorporated in chassis bearing code 129MW and above.

MOTOROLA

Color TV Chassis TS908 — High Voltage Regulator Adjustment

Measure the high voltage at the 2nd anode with

TECHNICAL DIGEST

an accurately calibrated voltmeter equipped with a high voltage probe capable of measuring 30 kv. Adjust R532 located on the left of chassis for a 2nd anode voltage of 24 kv. If a 30 kv probe is not available, adjust regulator as follows: Connect a VTVM across the high voltage regulator cathode resistor, R533. Set the brightness control to full counterclockwise position to extinguish raster. With raster extinguished, adjust control R532 to produce 1.2 vdc $\pm 5\%$ on the VTVM. Meter must be accurate to within $\pm 5\%$.

PHILCO

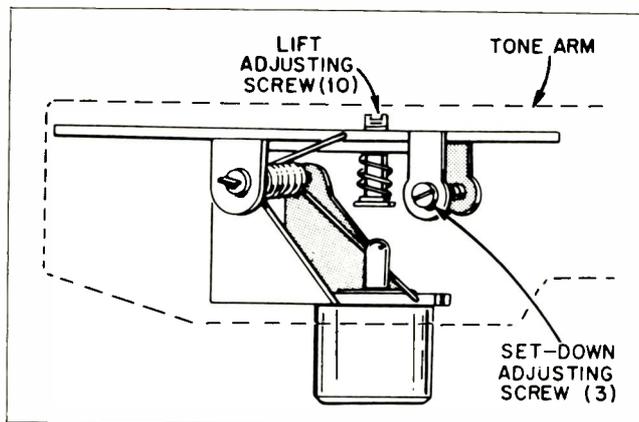
TV Chassis, All 1963 "L" Line — Checking Horizontal Phase Comparer Selenium Diode

When troubleshooting TV receivers where a defective dual selenium horizontal phase comparer diode is suspected, here's a fast and efficient method of checking them. A 20,000 Ω /v meter is used. With the meter set on the 10K scale and with the probes matching the diode polarity, the forward diode resistance should be a maximum of 6000 Ω . The ratio of the forward resistance of the diodes should be less than 2:1. With the meter set on the 100K scale and meter probes reversed to the diode, back resistance should be a minimum of 2M Ω . The phase comparer unit's diode center is common negative.

TRUETONE

Record Changer, Model 400B755—Set-Down Adjustment

Be sure the record changer is level. Place a 10-in. record on the turntable. Turn the reject knob to the "Rej." position momentarily and let it return to "On" to begin the automatic cycle. After set-down has begun, but before the needle has touched the record, turn the reject knob to the "Off" position so that the turntable will stop. Note: This step may be more easily performed while the changer is operated at 33 rpm. Place a ruler against the centerpost and measure the distance



Truetone record changer set-down adjustment.

between the near side of the centerpost and the needle. This distance should be between 4-10/16 and 4-11/16 in. The set-down point is adjusted with set-down adjusting screw (3). The tone arm will automatically set down properly on 7-in. or 12-in. records if the set-down adjustment is made correctly on a 10-in. record. The set-down adjustment screw is accessible through the hole in the left side of the tone arm. Turning this screw out (counterclockwise) moves the set-down point of the tone arm closer to the centerpost, and turning it in (clockwise) moves it away from the centerpost. When the 10-in. adjustment is correct, the needle should set-down between 5-19/32 and 5-22/32 in. from the near side of the centerpost on 12-in. records, and between 3-5/32 and 3-1/4 in. on 7-in. records. Check the set-down point with each size record. Touch-up the set-down adjustment until it has been optimized for all record sizes.

ZENITH

Royal 40 Transistor Portable Radio, Chassis 6KT50Z1—Component Replacement

Resistors and capacitors should be replaced by clipping out the old part and neatly soldering in the new. Heat the mounting lugs of larger components with a pencil type soldering iron and move lugs away from the soldered connection with long-nose pliers or metal pick. Continue heating lugs and brush away molten solder with a wire brush. Lift defective part off chassis. Be certain that lug holes are open and free of solder before mounting new component. Exercise care when replacing components.

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FOR FM—Model AP-320, twin nuvistor, takes up to 200,000 microvolts, input 300 ohm, output 300 ohm, \$39.95 list.

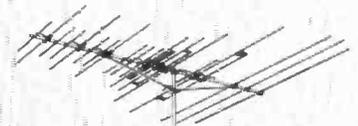
FOR FM—Model AP-375, twin nuvistor, takes up to 200,000 microvolts, input 300 ohm, output 75 ohm, \$44.95 list.

Write for technical data or ask your Winegard distributor.

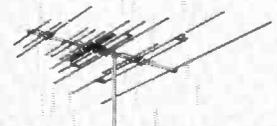
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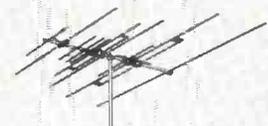
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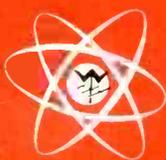


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EICO 955 IN-CIRCUIT BRIDGE-TYPE CAPACITOR TESTER Unique shunt-resistance balancing* provision, permits in-circuit short checks even in the presence of as little as 1 ohm shunt resistance. Sensitive open check down to 15 μf normally, adjustable to as little as 5 μf. Wien Bridge capacity measurements from 0.1 to 50 μf. Kit \$19.95; wired \$39.95 *Pat. applied for.



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EICO 369 TV/FM SWEEP GENERATOR WITH BUILT-IN POST INJECTION MARKER Feeds only the sweep signal to the circuit under test or alignment. A demodulator picks off the response signal and feeds it to a mixer stage where the markers are added before scope display. Thus, troublesome interaction effects are eliminated. Sweep generator has controllable inductor sweep circuit (all electronic) with no mechanical parts to wear and give trouble, and 5 fundamental ranges from 3.5 to 316 mc. Variable frequency marker provides output on 3 fundamental ranges from 2 to 60 mc., and 60 to 225 mc range on harmonics. 4.5 mc crystal supplied for rapid check of marker generator alignment. Kit \$89.95; wired \$139.95.

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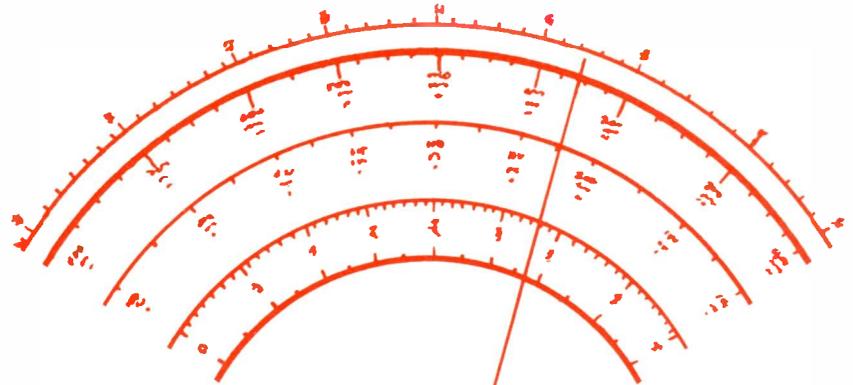


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*Speed servicing with a better understanding
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■ Many technicians take their test instruments for granted. As a consequence, they do not take time to learn to use them most efficiently. This is especially true with respect to that much-used instrument, the VOM.

Too often, when a new VOM is purchased, the instruction manual is filed and rarely seen again. This is a mistake; much time and effort is expended in manual preparation and the information it offers can help you learn more about your

VOM and about applications other than standard voltage, current and resistance measurements.

If we listed all the things your VOM can do, it would require a full-size book. Hence, we will review only some applications here.

Measuring Low Voltages

Most VOMs are capable of measuring dc voltages well below the normal lowest voltage range provided. The basic meter movement in a VOM is a current sensi-

tive device which—with the addition of series resistors—is capable of measuring virtually any voltage. To add lower voltage ranges, however, some knowledge of the basic meter movement is necessary. This information is available in your instruction manual.

A typical VOM meter movement requires a $50 \mu\text{a}$ current for full scale deflection and has an internal resistance of 2000Ω . For this movement the voltage drop across the meter at full scale is $50 (\mu\text{a})$ times $2000 (\Omega)$ or 100 mv . By using the meter directly, then, we have a 0 to 100 mv range available. To provide a 0 to 1 v range, the total resistance must be $20,000$ —or 1 v divided by $50 \mu\text{a}$. An $18,000\Omega$ resistor (see Fig. 1) must be placed in series with the meter for full scale deflection with 1 v applied. The lowest voltage that may be used accurately is limited by the meter's current sensitivity and internal resistance and the size of the meter dial or how well we can interpolate between scale divisions.

Measuring High Currents

Since the basic meter movement is a current sensitive device naturally we cannot add current ranges lower than the value of current that produces full scale deflection unless we use an amplifier. Higher current ranges than those available on your VOM may be added by employing shunt resistors on the meter.

To add a 25 amp dc range to our $50 \mu\text{a}$ $2000\Omega/\text{v}$ meter we must use a shunt resistor that will have

a 100 mv drop across it when 25 amp are applied. The size of the resistor then is 0.1 divided by 25 or 0.004Ω , which is then connected directly across the 2000Ω meter (see Fig. 2). The wattage rating of the resistor must be at least $(25)^2 \times 0.004 = 2.5 \text{ w}$. To make resistors of this small value a length of copper wire heavy enough to carry the desired current may be cut to the desired resistance. To make a more accurate shunt—one not affected by temperature changes—Manganin wire could be used.

Measuring High Voltages

A common requirement beyond the VOM's normal range is the need to measure high voltages in television receivers, scopes, radio transmitters and special industrial electronic equipment. Most VOM manufacturers offer high-voltage probe assemblies that extend the VOM's voltage measuring capability. In an emergency a VOM high voltage probe can be constructed in the shop if certain precautions are observed.

The probe assembly is nothing more than a high-value precision resistor matched to the VOM input resistance. Let's consider a VOM whose dc sensitivity is $20,000\Omega/\text{v}$. On the 2.5 vdc range the VOM's input resistance is 2.5 times $20,000$ or $50,000\Omega$. So, to measure $10,000 \text{ v}$, for example, the input resistance must be $10,000$ times $20,000$ or $200 \text{ M}\Omega$.

If we plan to use our probe in conjunction with the 1000 vdc range, (input resistance $20 \text{ M}\Omega$),

we will need a probe assembly with a resistance of $180 \text{ M}\Omega$. It is not necessary for the probe resistor to be a single unit. It may be made up of a number of lower valued resistors in series. What resistors are available will dictate the most practical types to use in the high-voltage probe.

Resistors to be used should be carefully measured as nearly as possible so the required resistance is obtained.

The voltage handling capability of the resistor or resistors used is another consideration. Remember, most of the voltage to be measured will be dropped across the resistance in the probe assembly.

Finally, we must consider the user's safety. Most commercial probes have ribs on the tip to prevent flashover from the voltage check point to the operator's fingers or the probe handle is extended so that the user may place his hand far back from the tip. These precautions are necessary; always use discretion when measuring high voltages.

To make high-voltage probes for ac the same procedure is followed if the frequencies at which measurements will be made are within the valid sensitivity range of the VOM. This information is readily available from the instruction manual.

Diode Testing

Germanium and silicon diodes can be quickly tested with the ohmmeter section of your VOM. If you want to know what the diode polarity is, it will be neces-

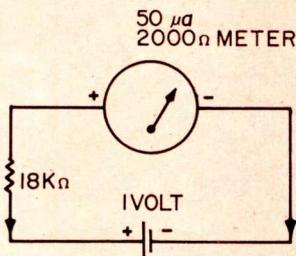


Fig. 1—Series resistor added to meter movement provides 0-1 vdc range.

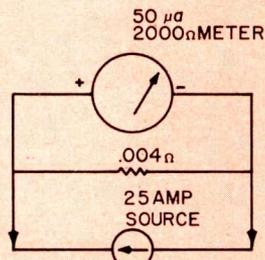


Fig. 2—Meter is shunted with low value resistor to add a 25 amp range.

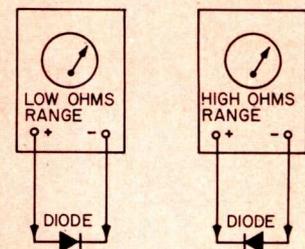


Fig. 3—Method used to check forward and back resistance of diodes.

sary to determine how the internal batteries are connected in the VOM. Again, the instruction manual contains this information.

Assume that the positive side of the batteries are connected to the positive terminal or jack of the VOM. A good diode will have a low resistance in the forward direction and very high resistance in the reverse direction. First set the VOM to the lowest resistance range and connect the positive lead to the diodes anode and the negative lead to its cathode (see Fig. 3). The meter should read between a few ohms and about 300Ω. Then set the VOM to the highest ohmmeter range and reverse the leads to the diode. The meter should read at least 100 times the forward reading depending on the type of diode. This test does not guarantee, however, that the diode will perform as required in its particular application.

Testing Batteries

To properly test a battery it must be loaded so it will deliver current just as it would in a circuit. Normally an "A" battery is rated at 150 ma. Therefore, to properly load a 1.5 v cell a 10Ω resistor would be placed across it (see Fig. 4), and the voltage measured. Most catalogs and battery data books specify the suggested current drain so that most batteries may be checked in this way. When battery voltage falls below 80 or 85 percent of its rated voltage it should be rejected for use in radios. Some applications, of course, require closer voltage tolerance.

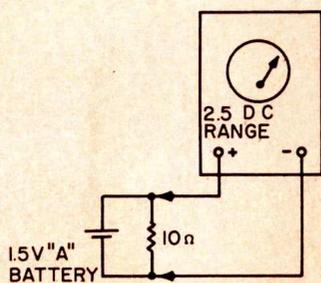


Fig. 4—For accurate test of batteries a load resistor is shunted across battery.

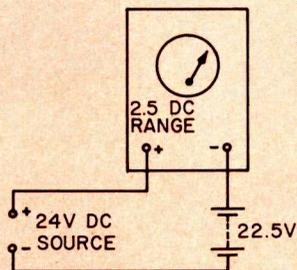


Fig. 5—'Expanded scale' allows detection of small variations in voltage sources.

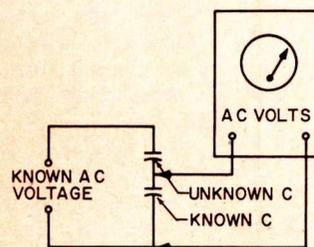


Fig. 6—Your VOM can be used to determine an unknown capacitance value.

Expanded Voltage Scale

An expanded scale is one that covers only a portion of the voltage you are measuring. This is useful for detecting small variations in voltage sources. For example, if it were necessary to observe variations in a 24-v source, we could, by adding a bucking voltage of 22.5 v, use the 2.5 v range instead of the 50 v range (see Fig. 5). By this method it is much simpler to observe small changes that might go unnoticed on the higher voltage range.

Measuring Capacitance

The instruction manuals for many VOMs contain explicit instructions for measuring capacitance. The method used may vary for different VOMs but a simple method that works with all VOMs will be shown here. Connect the unknown capacitor and a capacitor whose value is known in series across a known ac voltage source (see Fig. 6). Measure the voltage across the known capacitor, subtract this reading from the known applied voltage. The ratio of the capacitors is then the inverse of the voltage ratios. For example, if a 0.05 μf capacitor was used as the known unit, the 115-v line as an ac voltage source, and the measured voltage was 50, then to find the unknown capacitor's value, we would use the relation

$$\frac{C}{0.05} = \frac{50}{65}$$

or C is 0.039 μf. Do not use this method for measuring electrolytic

capacitors. They would be damaged by the applied ac. Also, be careful that the capacitors being checked have a high enough voltage rating to withstand the test voltage.

Measuring Power

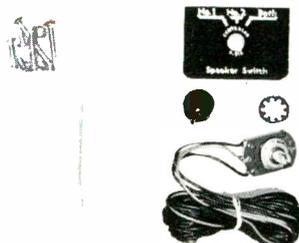
Measuring the power dissipated in a dc device with a VOM is a simple matter. First measure the current through the device then the voltage drop across it. The power dissipated in watts is the product of the current in amperes and the voltage in volts. A slight error may result because of inserting the ammeter in the circuit, with the added resistance due to the VOM the current may drop slightly. In this case use the highest current range that will give an accurate reading since the internal resistance is lower on the higher current ranges.

Power may be measured in ac circuits in the same manner except that the result will be in volt-amperes unless the power factor is unity. To determine ac power in watts the power factor must be known.

These are only some of the added uses for your VOM. In general service work the VOM with all its ranges is a valuable tool in itself. However, familiarity with your particular tester and some experimentation is sure to lead to many more uses for your VOM.

Understanding your test equipment is one very important step toward speedier service and higher profits. ■

EXTRA PROFITS WITH



Many easy-to-install speaker kits are on the market. This one has a Front, Rear or Both switch; faders are also available.

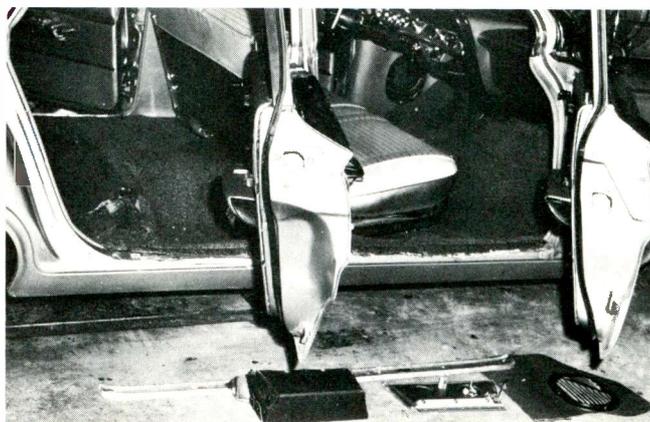
You can tap extra profits by installing rear seat speakers. Many technicians harbor the opinion that rear deck speakers are difficult or bothersome to install; nothing could be farther from the truth. They're simple, easy, take less than an hour to install and are loaded with extra profit. This is especially true if you schedule them during slow periods.

The only extra hand tools needed which you may not already have are a 1 in. chassis punch and a $\frac{3}{8}$ in. drill bit with a $\frac{1}{4}$ in. shaft if you have a standard $\frac{1}{4}$ in. drill.

Because all late model cars come with speaker mounting holes already stamped in the rear deck these tools are needed only on the older cars.

If an older car comes in just punch three or four 1 in. holes close together and mount the speaker over them.

The photos and captions show details of the eight easy steps to extra profits. The car here is a 1962 Chevrolet but is typical of most installations.



STEP 3

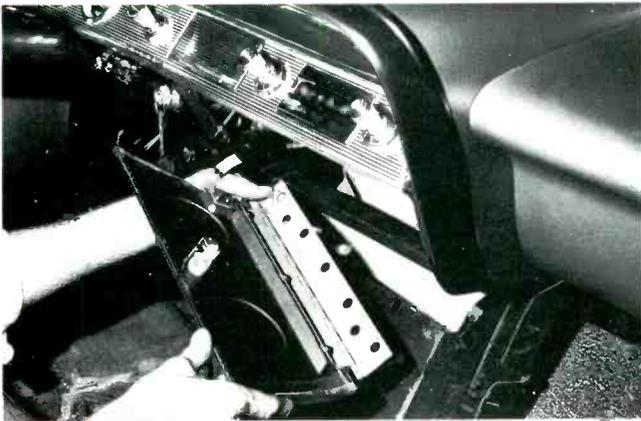
Door stripping and back seat are removed.



STEP 6

The cardboard top of the rear deck, is cut to the shape of the stamped speaker mounting holes.

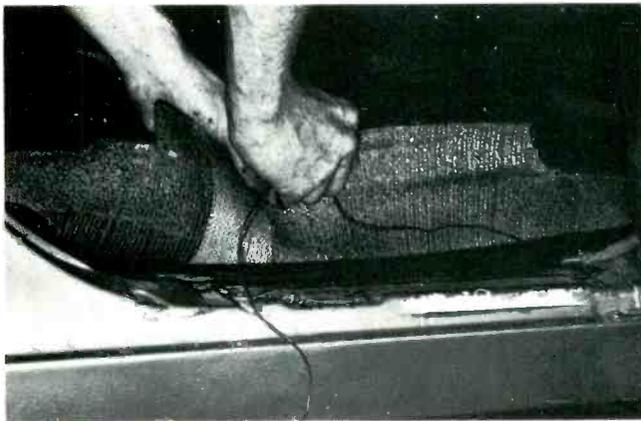
REAR SEAT SPEAKERS



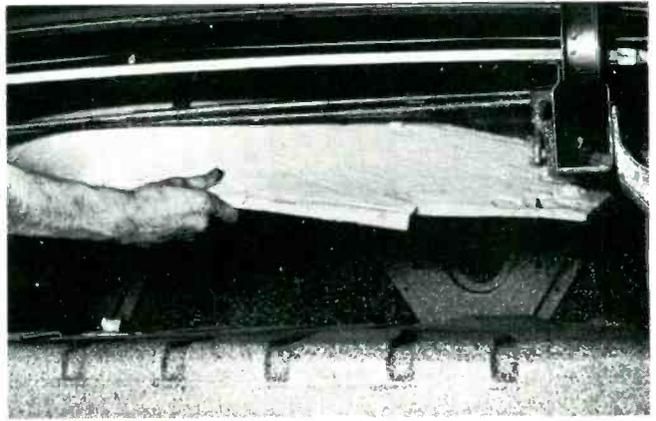
STEP 1 The glove box is removed to get at the speaker wires.



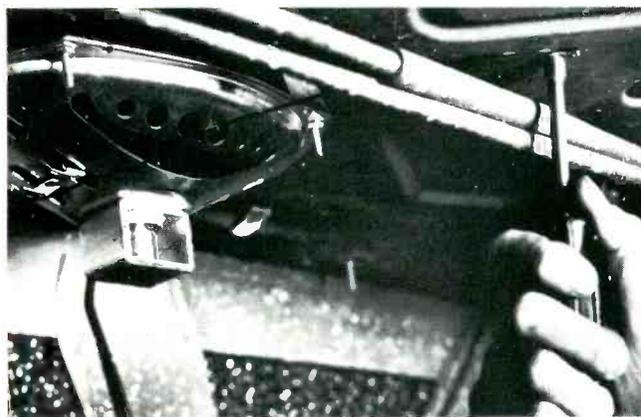
STEP 2 Remove the side panel, right side, front seat, so the wires can be run in behind. This one is held in with two screws.



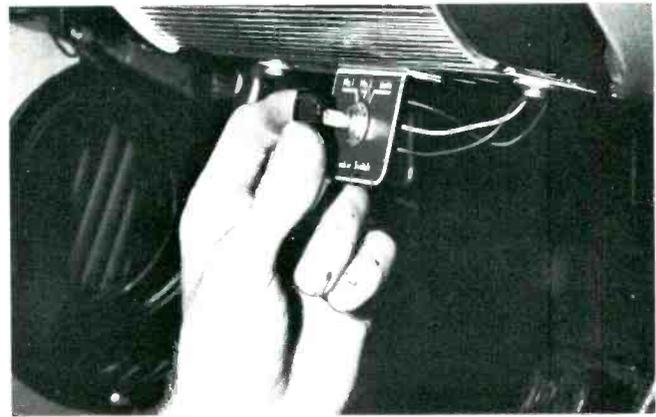
STEP 4 Speaker wires are routed under the carpet.



STEP 5 The sound insulating material is taken from under the rear deck in the trunk. A few clips hold it in. Reinstall it after the speaker is mounted.



STEP 7 The speaker is mounted and ground wire is put on. Drill a $\frac{1}{8}$ in. hole in any metal part of the car body and put a lug on a self-tapping screw and tighten.



STEP 8 Speaker switch or fader is mounted under the dash. Over the transmission hump is usually best. All panels are replaced. You pocket the profits.

AVOIDING PITFALLS IN TRANSISTOR TESTING

Know the important facts about semiconductor characteristics and get efficient service from your transistor and diode test equipment

by William Orloff

American Electronic Laboratories, Inc.

■ Transistor and diode specification sheets usually contain maximum information about a particular unit. This information is especially valuable to TV-radio technicians when testing, troubleshooting and selecting replacement units. And if you know how basic test equipment circuitry operates and how it is used, you'll eliminate a lot of your semiconductor testing problems.

Unit Types

Entertainment type transistors and diodes—those used in radios,

I_{CBO}
 h_{FE}
 V_{EBF}
 V_{CE}
 V_{CB}

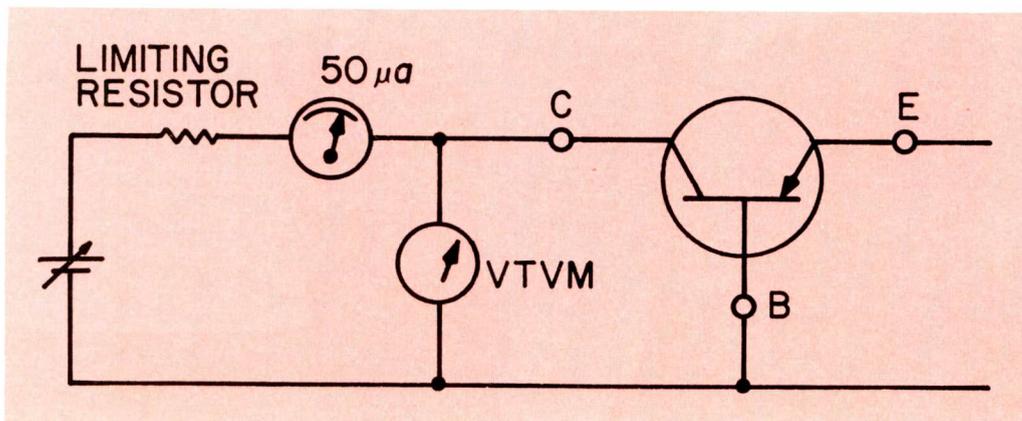


Fig. 1—Circuit for measuring I_{CBO} .

amplifiers, TVs, etc., can be broken down into five categories as follows: 1) low power, low frequency (audio); 2) medium and high power, low frequency (audio); 3) low power, high frequency (video, RF); 4) diodes and rectifiers; 5) zener (reference) diodes.

Certain basic characteristics—leakage measurements and forward voltage measurements—are common to all transistors and diodes, and these parameter measurements are considered of prime importance in detecting unit degradation.

Audio Types

Two important transistor characteristics in this group are I_{CBO} and h_{FE} . I_{CBO} is the dc collector current which flows when a specified voltage is applied between the collector and base electrodes of the transistor and the emitter is left open circuited. The small-signal, short-circuit, forward-current transfer ratio, commonly known as the common emitter current gain of Beta, is the ratio of the ac output to the ac input current, with zero as output voltage. When measuring low frequency units, this measurement is made at a frequency of 1 kc.

Typical Test Circuitry

The schematic of a basic circuit I_{CBO} measurement circuit is shown in Fig. 1. An adjustable dc constant voltage power supply is used as a power source. If the power supply can deliver a maximum of 100 ma

at 30 v, it can be used for all measurements specified here. The negative terminal of the power supply is fed into a series limiting resistor. The series limiting resistor prevents damage to the meter and transistor if the incorrect polarity is inadvertently applied to the transistor. A 0 to 50 μ a meter is placed in series with the limiting resistor and the collector electrode. The base of the transistor is then returned to the positive side of the power supply. A VTVM with an input impedance of 10 M Ω is placed across the collector to base electrodes. The series resistor can be chosen from Ohm's Law:

$$R = \frac{V}{I}$$

where V is the specification voltage and I is the full scale meter movement or 50 μ a.

The method of measurement is as follows:

1. Insert the transistor to be tested in the socket.
2. Adjust the supply voltage until the VTVM reads the specification voltage at which I_{CBO} is to be measured, then read I_{CBO} on the 0 to 50 μ a meter.

h_{FE} Measurement

A schematic of a typical h_{FE} measurement circuit is shown in Fig. 2. A 1 kc signal generator is used to supply the signal source to the transistor. R_1 is a constant current resistor. L_1 offers a high im-

pedance to the 1 kc signal and a low resistance return for the common base dc bias. SW1 is a switch used to calibrate the jig for a $h_{FE} = 1$ condition. R_2 is a constant current resistor which, in conjunction with the constant voltage supply V_1 , delivers a constant emitter current to the transistor. C_1 and C_2 are capacitors used to bypass the 1 kc signal to ground. M_1 is a 0 to 10 ma meter and is used to set the emitter current to a specified dc operating point. R_3 is a sensing resistor used for the current gain measurement. Constant voltage source V_1 supplies the specified dc collector to base or collector to emitter voltage. The VTVM shown across R_3 should have millivolt sensitivity; if it doesn't, almost any audio amplifier can be used to amplify the 1 kc signal appearing across R_3 so it can be properly read.

The method of measurement is as follows:

1. Without a transistor in the socket and zero voltage applied, close SW1 and adjust the amplitude of the 1 kc generator until a 0 db reading appears on the VTVM. Open SW1. As small a signal as possible should be used to prevent clipping when the transistor is inserted in the socket. The test jig is now calibrated and should not require calibration unless the amplitude of the 1 kc generator is changed.

2. Insert the transistor to be

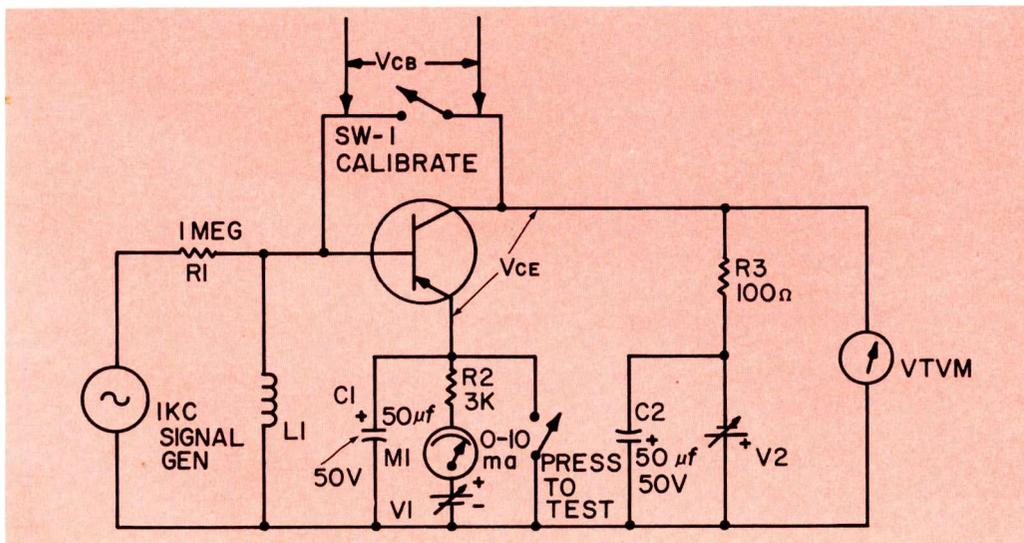


Fig. 2—Circuit for measuring h_{FE} at 1 kc.

PITFALLS IN TRANSISTOR TESTING

Continued

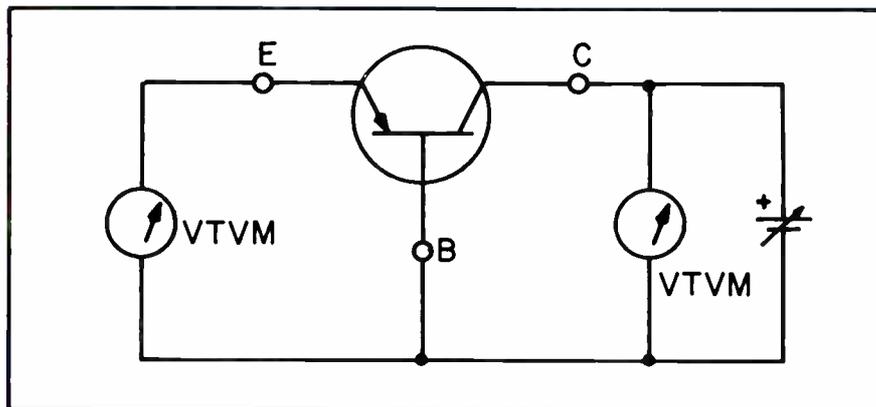


Fig. 3—Circuit for measuring V_{EBF} .

tested in the socket and adjust the variable constant voltage source V_2 to the specified V_{CE} or V_{CB} as read on a VTVM.

3. Adjust the variable constant voltage source V_1 until the specified emitter current is read on M_1 .

4. Press the PRESS TO TEST switch SW2 and read the current gain h_{FE} directly in db on the meter. The PRESS TO TEST switch is used so that the capacitor C_1 will not maintain a charge and damage another unit when it is inserted in the socket.

Audio—Low Frequency

Two transistor characteristics that have been selected as having primary importance in this group are I_{CBO} and V_{EBF} . V_{EBF} is the emitter floating potential and is that voltage appearing between the emitter and base junction (with the emitter and base open-circuited) when the collector to base junction is reverse biased with a given potential.

The same circuit configuration as that shown in Fig. 1 is used to make the I_{CBO} measurement. The only required changes are in the value of the meter and the limiting resistor. The meter should be changed to a value somewhat larger than that specified for the type of transistor to be tested and the value of the limiting resistor should be determined as for I_{CBO} .

The method of measurement is as follows:

1. Place the transistor in socket.
2. Adjust the supply voltage until the VTVM reads the specification voltage at which I_{CBO} is to be

measured, then read the I_{CBO} directly on the meter.

A circuit used for determining whether or not a transistor meets the V_{EBF} specification is shown in Fig. 3. The collector to base junction of the transistor is reverse biased by the constant voltage source V_1 . This voltage is shown being measured by a VTVM, however any voltmeter can be used to measure this voltage. VTVM is placed across the emitter to base terminal of the transistor. This meter must have an impedance of 10 M Ω to prevent loading down the transistor.

The method of measurement is as follows:

1. Insert the transistor in the socket.
2. Adjust the collector to base supply voltage to that as specified.
3. Read the emitter floating potential on VTVM No. 2. It should be lower than that voltage given on the specification sheet.

Video, RF Types

Two transistor characteristics that have been selected as having primary importance in this group are I_{CBO} and h_{FE} (1 kc).

The same circuit configuration as that shown in Fig. 1 is used to make the I_{CBO} measurement. Since these types of transistors have similar dc characteristics as those of the low power audio units, the I_{CBO} measurement is made in the same manner as previously described.

The same circuit configuration shown in Fig. 2 is used to make the 1 kc h_{FE} measurement. These types

of transistors also have similar low frequency characteristics as those of low power audio units and therefore the 1 kc h_{FE} measurement is made in the same manner as previously described.

Diodes and Rectifiers

Two diode and rectifier characteristics have been selected as having primary importance in this group. They are I_R and V_F . I_R is the current which flows in the anode and cathode terminals when a specified reverse voltage is applied between the anode and cathode terminals of the diode or rectifier. V_F is the voltage appearing between the anode and cathode terminals when a specified forward current is passed through the diode or rectifier.

The basic circuit configuration of Fig. 1 is used to measure I_R . The collector of the transistor should be replaced by the anode of the diode or rectifier and the base of the transistor should be replaced by the cathode of the diode or rectifier. The current range of the meter should be selected so that it is slightly higher than the I_R specification limit of the unit to be tested. The value of the protective resistor should be derived as previously shown for I_{CBO} . The method of measurement is also identical to the method previously described for I_{CBO} .

It should be pointed out that the I_{CBO} measurement is a dc measurement of the collector-to-base diode of a transistor and hence is treated in the same manner as any other diode.

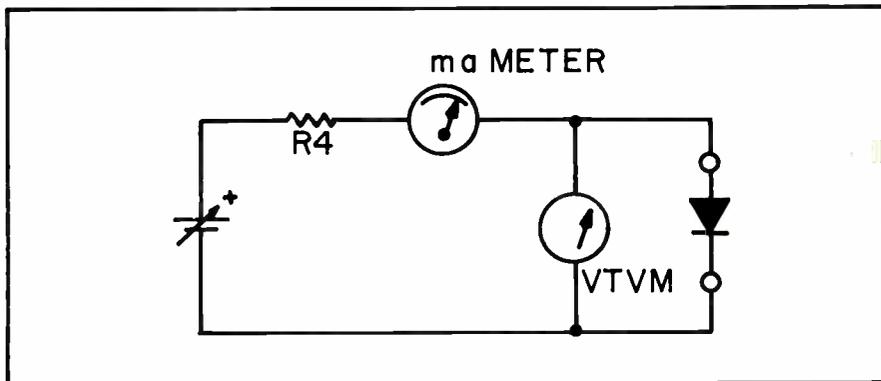


Fig. 4—Circuit for measuring V_F .

The schematic in Fig. 4 is used to measure the forward voltage with a variable constant voltage source. R_4 is a limiting resistor which protects the meter against shorted devices. Its value should be selected as previously described for I_{CBO} . Since the diode in the forward direction has low impedance, the VTVM could be replaced with a $20,000\Omega/v$ meter if desired.

The method of measurement is as follows:

1. Insert the unit to be tested in the socket with the anode and cathode as shown in Fig. 4.

2. Adjust the constant voltage supply until the specified current

read on the milliammeter flows through the unit.

3. Read the forward voltage directly on the VTVM.

Zener Diodes

The zener diode characteristic selected as having primary importance in this group is the reference voltage E_B . E_B is the voltage appearing at the diode terminals when a specified current is passed through the unit.

The same circuit configuration shown in Fig. 4 is used to make the reference voltage measurement. The meter's current range should be selected slightly higher than the

specified current. The protective resistor's value should be derived as previously specified for I_{CBO} .

The method of measurement is as follows:

1. Insert the unit to be tested in the socket.

2. Adjust the constant voltage supply until the specified current as read on the milliammeter flows through the device.

3. Read E_B directly on the VTVM and it should fall within the specification limits of E_B .

Results of these measurements can indicate unit degradation and either poor performance or failure can usually be detected. Many technicians today are using ohmmeters to determine whether or not a transistor is good or bad. This is a dangerous practice, for the conventional type multimeter can supply current as high as 150 ma and power of 50 to 60 mw on its lower ranges. When used on the higher ranges where the current is limited, it may be used as a go, no-go device. That is, it can be used to tell if a unit is open or shorted. The conventional type ohmmeter gives no indication of device degradation, however, and it is not recommended as an instrument which technicians would normally use for transistor testing. ■

SET UP AND DEAL

"I'm sorry ma'am, but I wouldn't recommend repairing this set. The repairs would cost more than the set's worth."

"Well, I'll talk to my husband, but I guess you're right. By the way, since you get to see so many types of TV sets at their worst, which would you recommend we buy to replace this one?"

How many times has this happened to you—you sell a new TV set but somebody else makes the profit—simply because you regard your job as "service only"?

Almost everybody would like you for a

dealer—and in most cases it's pretty easy to arrange. Simply contact the distributor of the set you'd like to handle! If there isn't a distributor in your area or if you aren't sure who he is, write the manufacturer directly.

If you now do "service-only," it would be worth your time to investigate selling new sets. In many cases you're there when the owner decides to buy a new TV. How many times have you been asked about "the best set" and stepped aside to let someone else make the sale?

TELEPHONE DIRECTORY

■ Many technicians and dealers violate the basic rules of salesmanship in the classified telephone directory.

You can see this simply by turning to the "Television Dealers and Service" heading in virtually any telephone book. Chances are you'll find an essential sameness in most of the ads. Prospects who are confronted by them, usually have no particular reason—other than whim—to choose one shop over another.

Buying habits surveys show that large and increasing numbers of people turn to the classified telephone directory when they are ready to buy or when they need service. *These studies indicate that the combined radio and television headings are referred to more often than any other classification in the book.* Content with a "share" of the business it attracts, many technicians and dealers fail to take full advantage of their advertising investment.

Another possible reason for lack of sales appeal in directory ads is that many advertisers fail to recognize the directory's "split personality." On the one hand, it is a number service that gives your regular customers quick and easy access to you when they need your services. This function is served primarily by listings under the brand names or headings that describe your products or services.

But it is also an advertising medium. Its larger units and display ads can be your last chance to convince the uncommitted ready-to-buy customer to call you rather than a competitor. Its job is not merely to give your address and telephone number and to list your brands and services, but to sell.

To make an ad that sells, keep this distinction between number service and advertising firmly in mind. Then, avoid these all too common seven deadly sins:

● **Sin #1—Letting George Do It:** Too many technicians and service dealers "take" an ad, rather than "make" one that sells. They turn over the job to a salesman, or an agency. Then they wash their hands of all responsibility for its effectiveness.

No one knows your business as thoroughly as you. If you can afford it, or if a service is offered free, take advantage of the know-how of professionals. But help them make a better ad by telling them the advantages your shop offers, and by insisting that your ad be designed to sell.

● **Sin #2—Selling Yourself, Not Your Services:** Your prospects don't give a hoot about your shop—only about what it offers them. So sell your services, not yourself.

Instead of approaching your ad with the idea the "we do this" or "we offer that," think in terms of "you'll get this" or "you'll enjoy that."

By speaking directly to your customer ("as you"), rather than of yourself ("as we"), you'll find that your advertising automatically will pack a more potent sales punch, even if the "you's" are implied, rather than stated.

Bear in mind, too, that the customer you want to attract is the one you don't have. Your present and past customers, and even those who are referred to you, are already largely sold. When they turn to the Yellow Pages, they want the most basic facts: your telephone number, your location, your hours and your name (if they have forgotten it momentarily). When new prospects turn to the Radio or Television Dealers and Service classifications, they want first to be sold. They want all the reasons why your service will please them. An advantage-full ad designed for new customers will reach and re-sell old ones as well, so it pays to make it a selling ad.

● **Sin #3 — Headlining Your**

Name: This most common sin is symptomatic of the "we" approach. The top spot in your ad belongs to a selling message. Your name alone will ring a bell only with customers who have been well served by you before.

Think how much more appeal you can get from a headline that emphasizes benefits, savings of time and money, speed and convenience. For instance: "The help you need is practically there. . ." "Fast TV Repair—Any Time, Any Day" . . . "No Extra Charge for Night Calls" . . . "Emergency Service—All Makes" . . . "Guaranteed Repairs" . . . "Save Money—Drop Off Your Set for Repairs"—or the old standby, "Save Time, Save Money."

These selling points and others like them appear in many ads. The trick is to make one or two of them dominant to catch the reader's eye immediately, then to sell him by backing up the headline with other advantages and facts.

Your name should be highly visible, of course. But unless it is an integral part of a selling headline, it should be relegated to a lower spot in your ad, along with your equally visible telephone number.

● **Sin #4—Putting all Your Eggs in One Basket:** Never try to sell every item in your shop and all of your services in one small space. Instead, focus your ad on specific services or sets that belong under the heading in which your ad appears. Selling radio sets or phonographs under the heading Television Dealers and Service is largely a waste of space—and money. If they are important enough to advertise, give them the space they deserve under the proper heading. If they are not, don't clutter your ad with facts that few customers would look for under that classification.

The wide variety of listings and ad sizes available for increasing

ADVERTISING

Eliminate your 'non-selling' ads by knowing the seven sins of Yellow Pages advertising

your opportunities to sell are limited only by your budget and your business goals. In some cases, plain or bold faced listings, and listings under trade marks, will do—especially in classifications having few or no competitive display ads. In others a small display ad or informational listing can do the job of attracting extra business for you. Your decisions should be guided by (1) how important the service or product is to your total business and (2) how strong your competition is under any heading.

● **Sin #5—Making Any Illustration Do:** An illustration will help to attract attention, but it should support your selling message, rather than compete with it. Some dealers and technicians seem satisfied with almost any illustration; chipmunks, monkeys, dwarfs and imps cavort in too many ads.

If your intention is to convey friendly, dependable service, a photo of yourself and your staff can personalize your appeal. If speed of service is a major appeal, your radio-equipped fully-stocked truck can be shown, if the photo is attractive and ties in with the message in your headlines. If your shop itself is especially inviting and you want to attract walk-in trade, you can show it, although this is among the weakest of visual appeals, symbolizing the "we" approach. The only value of a shop photograph is that it may remind customers that they passed your shop once before.

Check your local phone book before you decide on an illustration. If there are too many cartoons of ailing television sets or radios, forego this type of illustration. Make your ad stand out by its different and attractive layout, its strong sales appeal and the logic of illustration.

● **Sin #6—Playing "Hide and Seek" With Your Customers:** People turn to the Yellow Pages for help. Be sure you give it to them.

If you want them to come to you, tell them precisely where you are located, not only by including your address, but by adding other directional aid, such as "Across from City Hall," or "West Side Shopping Center." A small map showing your location in relation to main thoroughfares or other landmarks will also be a help to newcomers.

If you offer round-the-clock service or remain open at hours unusual for business in your area, say so with a line such as "Open Till 9 p.m. on Fridays," or "8 a.m. to 9 p.m., Mondays through Saturdays," or "24-Hour Service."

If you offer sales or service on all makes, say so. If not, list those you do handle. Or better still, show the trade marks if there are not too many. And tell them if you repair and install antennas.

It is surprising how much information you can get into a display ad without clutter if you "weight" your copy by using larger type for the most important items, and smaller, lighter type for the lesser elements. Again, your ad will be read to the last word if your headline has done its job well, and if everything in your ad is appropriate to the classification.

● **Sin #7—Letting the Phone Ring and Ring:** Many Yellow Pages users ask questions first, buy later. Don't let poor telephone habits limit your sale, or worse, turn them away.

Train yourself and everyone who answers your phone to be prompt, to be cheerful, to be helpful, to ask and use the customer's name, to mention special services and confidence-building guarantees, and to suggest other ways that you might serve them. Sales can start in the Yellow Pages, but it is up to you to turn first-time callers into regular customers. You can do this by avoiding these seven deadly sins—by working-up ads that sell. ■





By Gosh,

■ Bob looked up from a schematic he was studying just as his buddy walked into the shop. He burped a “Hi, Joe,” turned and propped his chin with his arm resting on the VOM near a TV chassis and stared into the set’s chassis.

“You look tired,” Joe mumbled, “it’s quitting time anyway, why don’t you close shop and have a beer with me at the Tavern?”

It was customary for the two boys to have “a beer” almost every night, so the question really wasn’t necessary. Normally when Joe appeared, Bob would methodically straighten the papers on a table near the phone, throw a couple of night-light switches, the main switch on his bench and without further hesitation head for the Tavern with Joe. Tonight it was different. . . .

Joe was still attending the local state college and was in his last year of hydraulics engineering. Bob had opened the TV shop right after graduation from tech school.

Joe could define a Farad or a Coulomb in precise terms but became lost rather easily in a schematic. He marveled at Bob’s ability to repair almost any TV set in a matter of minutes.

“Let’s go!” Joe prodded.

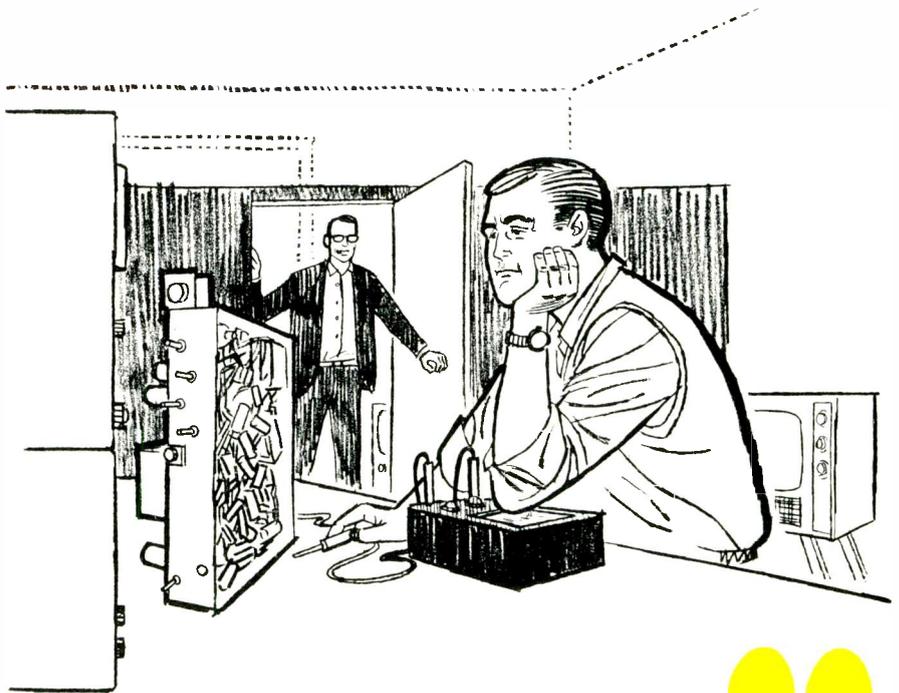
“Why don’t you go ahead and I’ll meet you there a little later?”

“What’s wrong, Bob, you stuck to that stool?”

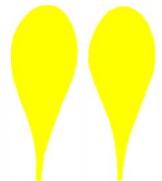
“No,” Bob laughed, “this Emerson’s got a real loose vertical hold that’s giving me fits. I’ve been at it almost two hours and I’m not any closer now than when I started.”

“I know what’s wrong even without looking at it,” Joe said seriously, “you’ve been hard at it all day and your mind isn’t working right. Come on and get a beer. With a fresh mind in the morning you can fix it in ten minutes.”

“‘A beer’ to you is a whole case. Really, Joe, this is a ‘dog.’ I just



You’re Right!



Bob demonstrates that even the best technicians run into an occasional ‘brick wall’ with vertical sync problems

need to concentrate on it a little longer.”

“Maybe I can help,” Joe volunteered. “I know basically how the vertical section works, and if you’ll straighten out some of the rough spots for me, maybe I’ll come up with the solution to your dilemma.”

“Four years of college hasn’t made you that smart,” Bob jibed, “but I’ll be glad to point out where most technicians go astray.”

Different Kinds of Sync Trouble

Bob knew that Joe understood a lot more about the operation of a TV set than he let on—he beat Bob in chess all the time too, so he had to be pretty smart. And reasoning so, Bob skipped the preliminaries and went right into the heart of the matter.

“There are several different systems used to sync the vertical sweep,” Bob started, “but they

all exhibit some basic symptoms when they malfunction. Of course, these symptoms should be used as clues to show where to look for the trouble.

"Anybody with half a brain will substitute tubes in the path of the signal before starting, so we'll assume that any problem I mention is a circuit problem."

"What do you mean by 'in the path of the signal'?" Joe queried.

"I mean just that—any tube that either the composite signal or the stripped vertical signal passes through should be held suspect until the tube has been substituted."

"Do you mean even an IF tube can cause loss of sync?"

"Right," Bob countered. "A little gas or a cathode-heater short in one of the IF tubes can, in rare instances, cause 60 cycle modulation upsetting the vertical without affecting the video, horizontal or sound signals. Generally, however, the video will suffer too."

"There are different kinds of sync trouble which require different kinds of treatment too."

"Sounds like double talk; elucidate."

"Well, first, there's the no-vertical-sync condition. The hold control slows the rolling down and will reverse the direction of the rolling or even stop it, but the vertical won't lock in. Then there's the condition that is usually an oscillator defect. The picture can be slowed but continues to roll in the

same direction. And, of course, there are intermittents. The worst kind is what you see here," Bob demonstrated with the controls on the Emerson that the set would lock in when the hold was carefully adjusted but that it still lost vertical hold rather easily.

"Maybe the slots around the edge of the picture tube aren't deep enough to hold the sync bar in tight," Joe kidded, "maybe it's the picture tube."

"Huh? Oh, I thought you were serious for a minute. But you know there are cases where a picture tube can cause sync trouble. And it's usually the last place a technician thinks of looking."

"Did you check the picture tube?"

"No, this set doesn't have a retrace circuit which can cause a trouble like that."

Bob pulled a large notebook off the shelf adjacent to the bench and leafed through a few Tekfax schematics. He stopped at a G-E schematic, partially shown in Fig. 1.

"Now here's one that can cause the kind of trouble I was talking about. You see, retrace blanking is actually accomplished by lifting the signal out of the primary side of the vertical output and applying it to the grid of the CRT. The negative pulse on the grid of the CRT cuts off the beam during retrace. As you can see, a short at the grid or gas in the CRT would be reflected in the vertical feedback circuit."

"It looks to me like you not only have to check tubes in the path of the signal to the vertical section but away from it as well. How in the world do you know which section is connected in some way to another section?"

"Well," Bob started slowly, "on some sets, you just know—you know because you've worked on enough others like it. If you're working on a stranger like this one, you've got to read the schematic."

Bob pulled the schematic out from under the edge of the TV chassis and motioned Joe over to his desk. Normally Bob used a discarded music stand to hold his schematics, but Joe noticed that it was near the bench at the opposite wall today. After moving a few articles on the desk, Bob laid out a Tekfax for the Emerson.

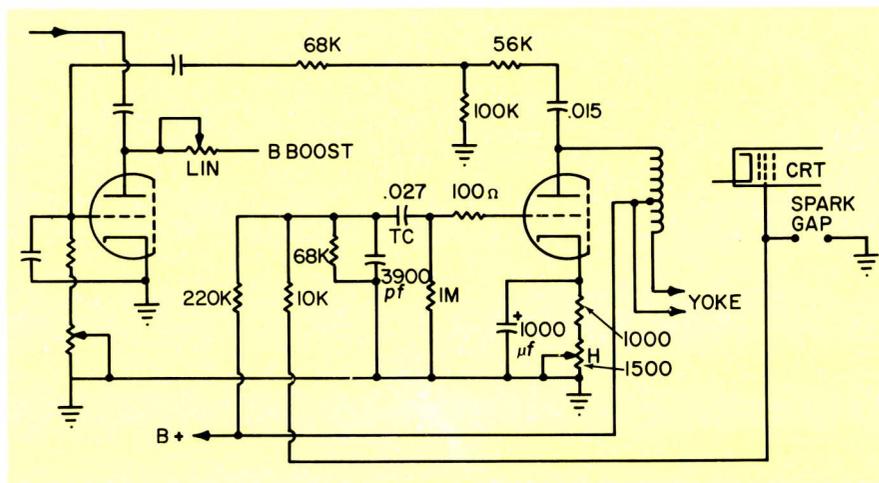
Common Circuits

"Let's look at some of the things the vertical section has in common with other sections of the set."

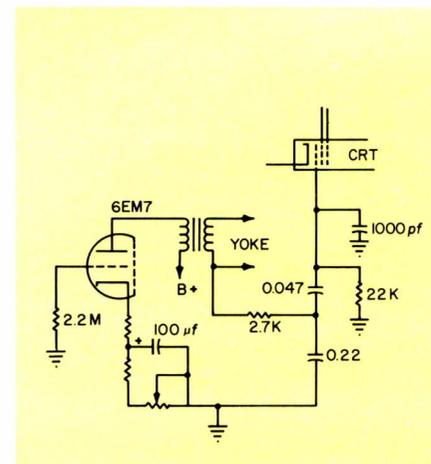
"You mean like B+," Joe injected.

"Right again. And this is a very good place to start looking. Since the vertical section's operation is critical, it may be the first to be affected by low B+. After you measure the voltage, however, it's always a good idea to scope the B+. Then if there's any modulation or ripple on it, you'll see it."

"Other than 60 cycle getting through from the line, what else can modulate the B+?" asked Joe.



CRT malfunction in this set can cause sync instability and a variety of other vertical problems.



Circuit employed in the Emerson for retrace blanking makes sync problems caused by retrace circuit unlikely.

"One of the worst offenders is the horizontal output tube. Each time the output tube conducts, the B+ is loaded and is modulated at the horizontal rate. This gets into the vertical section, tripping the oscillator slightly ahead of the sync pulse. This usually causes a rapid but spasmodic roll."

"Well, that's easy enough to understand. What else can goof up the B+?"

"What else draws heavy current intermittently?" Bob returned the question.

"How about the audio section?" Joe inquired.

"On the nose. When audio causes the output tube to draw heavy current, it can modulate the B+. I know what your next question is going to be; in almost every case, if the filter capacitor were in good shape, there wouldn't be any modulation problems. Does that answer your question?"

"Yes, Houdini. I think that covers it," Joe answered in mock disapproval. "How far have you gotten on this set?"

"After substituting tubes, I checked the B+ and then started scoping the vertical circuits. At first, everything looked perfectly normal, but when I went over it a second time, I found that the vertical pulse reaching the oscillator was a little shy of what the schematic shows is normal and a little too pointed."

"Then what?" Joe wanted to know.

"I checked all around the video amplifier," Bob continued, "but I still can't find anything wrong."

"I still say it's the picture tube," Joe kidded again. "Let's go get a beer."

Ignoring him, Bob started to check voltages on the video amplifier again. He shook his head in disgust when he found they were nearly exactly what the schematic called for. Bob hooked the scope probe on the grid of the oscillator with a decoupling probe and watched the oscillator feedback pulse slip by the sync pulse as if it weren't there. He held the probe tight with one hand and pulled off the picture tube socket with his free hand. The two pulses snapped together.

"By gosh, you're right!" Bob shouted. "It is the picture tube."

"I knew it all the time," Joe chortled, "haven't I been telling you?"

"I'm serious." Bob pulled Joe to the scope by his shirt sleeve. "Look."

Bob plugged in the CRT socket again with the scope still hooked to the oscillator grid. The tube started to warm up and the two pulses bumped together and pulled apart intermittently.

"You're slipping," Joe chided. "I thought you said the picture tube wouldn't cause a malfunction like that on this set."

"Anything is possible, Joe. Let's check the CRT and see what's wrong with it."

Bob pulled his new combination CRT tester and rejuvenator from a shelf where he kept equipment that was not used on every bench job. He worked quickly and silently.

"That's funny, no shorts."

Bob reset the tester and gently tapped the neck of the CRT this time as he watched the neon short indicator. Still no short indication. He flipped the function knob to test for emission.

"Emission's a lot better than the average picture tube," Bob mumbled.

For the first time Joe had become intent on the problem. Bob flipped the function knob on the tester to GAS.

"There's the answer," Bob announced. "That tube's so gassy it must be pressurized."

"You still haven't explained how the CRT could affect the vertical sync in this set. How about it?" Joe noticed that Bob had lost his worried look and imagined that he had figured out where he had strayed in his troubleshooting procedure.

"I overlooked a connection that's common to the sync and the picture tube in almost every TV set," said Bob. "When the sync take off point is beyond the video amplifier, a gassy CRT can cause sync compression at the plate of the video amplifier."

"There should be an easier way to check it than that," Joe blurted.

"There is. Quite frankly, when I had the scope probe on the oscillator grid, I didn't know what I was looking for. But when I pulled the socket on the CRT and saw the oscillator sync in, I knew it was the CRT."

"Normally, if the scope is connected to the video amplifier plate, like this," Bob connected the scope probe as he continued, "we can watch the effect the CRT has on the vertical sync pulse by connecting and disconnecting the CRT socket."

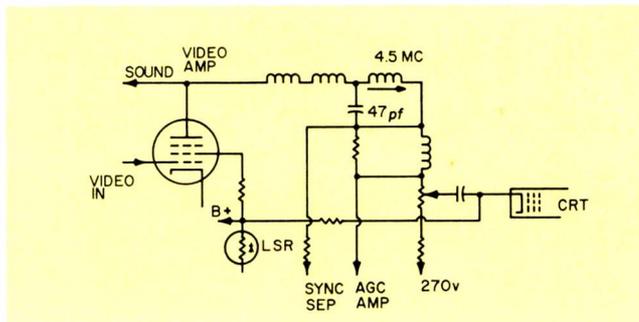
Joe watched intently as Bob pulled the plug off the CRT again. The sync pulse broadened and increased in amplitude slightly.

"OK, wise guy," Joe grinned, "what if the set is a series string job?"

"Very simple," Bob offered professionally. "You can plug in a series type booster into the CRT socket when you unplug the tube and the booster transformer will complete the circuit."

Bob had left the schematic on the bench and turned on the night lights as he spoke.

"Let's go!" Bob mimicked. "The boys at the Tavern may have the police out looking for us." ■



Gassy CRT caused intermittent vertical sync.



There's Money in

IDEAS

■ The primary and logical reason why you are in business is to obtain *more* money and certain personal benefits from your efforts that you could not get by working for someone else.

To justify your reasons for being in business, your business has to stay out of the red and it has to keep abreast of fast moving events in a rapidly changing society. To do this, you've got to compete! Really compete. And this means using your head—to generate ideas.

Now this wouldn't be a problem if you had a pile of 'moola' to buy TVs or parts in car-load lots; or pay for display advertising by the 'gobs.' But what one- or two-man shop can compete in this manner with some service-dealer organizations who *can* buy in job lots?

You *can* compete with *any* shop, however, regardless of size, with *ideas*. The right idea, or combination of ideas, can put thousands of additional dollars in your pocket. This isn't an exaggeration. Also this doesn't mean your idea has to be world shattering. More often than not the profitable idea is a warmed-over 'chestnut'—a new slant on an already existing concept. The idea can be for faster servicing, for merchandising or for increasing the number of service calls.

But what *is* a good idea? To answer this question we'll run through three ideas which are being used successfully by three different shops. Each shop uses its idea for a different purpose and as a result each

*Increase your business
and decrease costs by
acting boldly on simple ideas*

by Jack Brayton

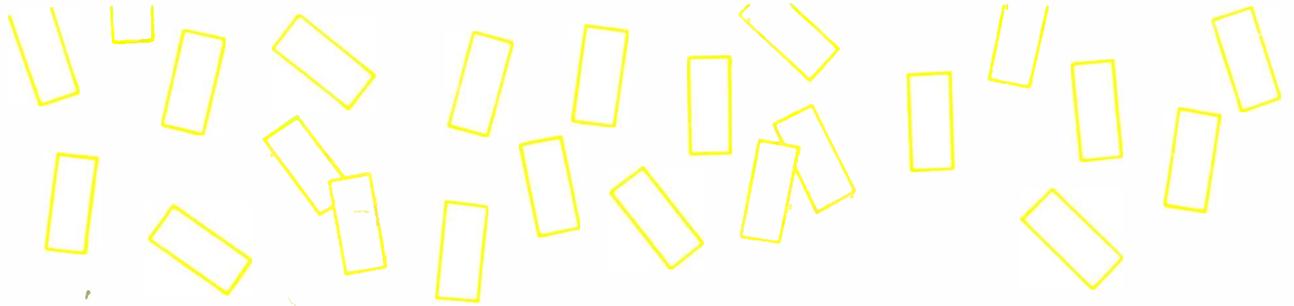
idea is tailored to a particular situation. Naturally, your needs will be different but the logic of each example shown here will be the same as that which you'll apply to your shop.

One 'Golden' Thought

National Television in Fort Lauderdale, Fla., found that it had all the work it could handle during the latter half of the week but on Mondays, Tuesdays and Wednesdays it had idle technicians. After much head-scratching the management came up with an idea. They ran the following ad in the local paper:

"ANY table model tube radio repaired for \$3.95. All parts, all labor included if brought in on Monday, Tuesday or Wednesday. Thirty day unconditional guarantee. Offer void if set has been tampered with."

The ad was run in the classified section under "Miscellaneous."



As wacky as you may think the ad sounded, it worked even better than National Television expected.

The offer drew about 10 customers per week—most of them new. The average cost of parts per radio was low enough to provide an additional income of \$30 per week—or \$120 per month. The ads cost about \$40 a month—leaving about \$80 a month in additional income for the shop. If this was all there was to the idea, it wouldn't have been so hot. But there was more to it.

First, the extra \$80 a month was taken in *without* an increase in the wages already being paid. Second, as an immediate result of the offer an average of two TV repair jobs came in each week which were directly traced to the radio repair offer. Third, over a period of several months an average of four more TV repair jobs came in from each 10 radios repaired. Fourth, at least one more TV repair job was brought in because of word-of-mouth advertising from one of the original 10 customers.

You can see that over a long period of time the idea has been responsible for an *average* increase of seven TV repair jobs per week or more than one per working day!

If you figure it out for a year, you will also see that this simple idea, costing \$40 a month for advertising, has produced literally thousands of additional income dollars for National Television. Of course, all this didn't happen overnight nor did it happen without hard work and patience.

A lot of shops would have figured out what they were making on the

radios alone and would have quit without giving the idea a chance; or they would not have wanted to bother with such a "low profit" item as the table radio in the first place.

Success with ideas depends, of course, on going out of your way to do a good repair job on the original radio—even if you actually lose money on that particular job.

To the customer, the offer presents an ideal and inexpensive way to "check" the quality of a shop's work. But most customers come in suspecting that somehow they're going to be "taken" and the importance of proving to them that you are going *to do no such thing* cannot be stressed too much.

And Another

Skory TV Service in Lansing, Mich., wanted to increase its sales but being a small shop, the owner couldn't compete against giants with new-set sales. Instead, he decided to concentrate on antenna and rotor sales and installations. Again, take note that this is a field often overlooked by shops but one where the little guy stands a chance.

Skory could have just advertised that he had antennas and rotors and would install them. But he didn't. He went one step further. Skory mounted a modified, self-supporting, 20-ft tower on the back bumper of his truck and rigged it so it would lay down over the top of the truck when not in use. Atop the tower he mounted an antenna and rotor—a packaged deal including installation which he changed every week or two. The installation was completed by running 100 ft of lead-in.

The one thing which Skory offered which no one else dared was a free *antenna demonstration*. He'd drive out to the customer's house, set up the antenna, run the lead-in and *show* them exactly how much his antenna and rotor would improve their reception. Granted, you can't get optimum results with a 100 ft lead-in nor with an antenna mounted only 20 ft above the ground but it usually provides enough improvement to convince the customer that he should have one. Only one customer out of 10 didn't buy. Skory averaged about five sales a week using this method. Not a bad *improvement* for a two man shop.

Figures to prove that this also increased his service business are not available, but I do know that if a customer is satisfied with *any transaction*, he will usually come back to the same shop when his TV or radio breaks down.

The reason that Skory changed his antenna special every week or two is so he could appeal to customers in every price range with both TV and FM antennas.

Auto Radio Bonanza

United Radio, Lansing, Mich., uses another idea. It sounds very similar to the first idea but it's different in a very important respect.

United Radio specializes in car radios—they don't repair anything else. They have a flat rate which is \$7.95 for repairing any car radio made in the United States. This includes all parts and labor.

The big difference between National Television and United Radio is that National Television used

There's Money in IDEAS

Continued

their flat rate only to *increase* TV service business—the *expected* TV service to follow radio repairs. But United Radio, specializing *only* in car radio repair, had to rely on their offer for their *entire* income. As a result, United Radio had to work at reducing the cost of a car radio repair. However, they *did not* try to do this by using cheap parts nor by just fixing the radio so that it would just play. They reduced repair cost by:

1. Specializing on one item all day, every day — becoming extremely fast and accurate.
2. Reducing to a minimum the tools, inventory and equipment required.
3. Keeping the shop small and hence the overhead as low as possible.
4. Having an exceptionally efficient car radio bench set-up.
5. Always having the right tool for the job.
6. Repairing almost all sets while the customer waits which eliminates "dead money" under the bench. Even such items as output, IF and power transformers are stocked, allowing United Radio to make repairs on the spot.
7. Handling a very large volume of car radio repairs United Radio can buy parts in large enough quantities to save an additional 10 to 15 percent on part costs.

Doug Smith, owner and sole operator of United Radio, after only six months in business, was making well over \$100 a week average. For a little one man shop not operating at its full capacity this is more than good.

As we've shown, an idea *isn't*

price cutting. These shops do compete with price but most of all they compete with customer service. All have found a way to *increase* business and *decrease* cost *without* decreasing the quality of work done. They all offer something no one else does. But they are not offering it just to handle more business. They're offering it to make more money. There's a difference.

Perhaps a well known example of this principle will make it clearer. Years ago Henry Ford wanted to put out a car within every man's reach in an age when manufacturers were making cars costing thousands of dollars. If he had simply cut his price, he would probably have been out of business in a week. But he didn't do this. Instead he got an idea—mass production, which enabled him to compete with car manufacturers several thousand times his size. Of course, we're not Henry Fords. But we are in a competitive business and one which will probably become more competitive as time passes. To remain in business and make it pay, we have to use our heads more today than in the past. We have to constantly "rethink" our business methods—"zero" in anew on our ultimate goal. And a simple idea can put us way out in front. ■

A road-side sign that paid off.
Courtesy Gernsback Publications.



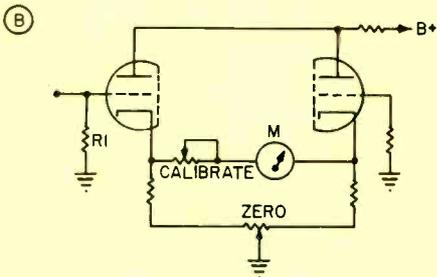
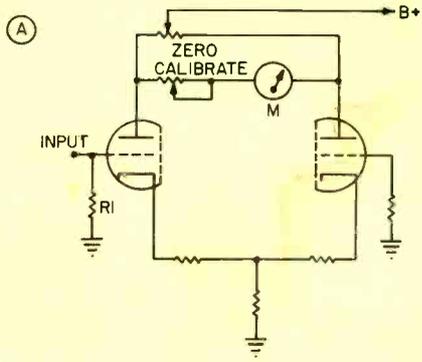


Fig. 1(A)—Plate balanced meter and (B)—cathode balanced meter used in most VTVM bridge circuits.

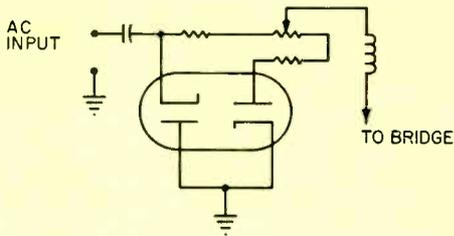


Fig. 2—Rectifier circuit used in many VTVMs to eliminate contact potential errors.

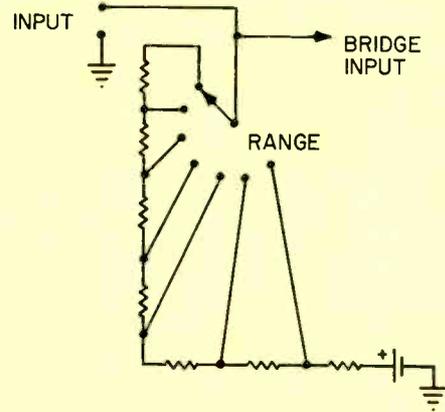


Fig. 3—Voltage divider circuit used in most VTVMs.

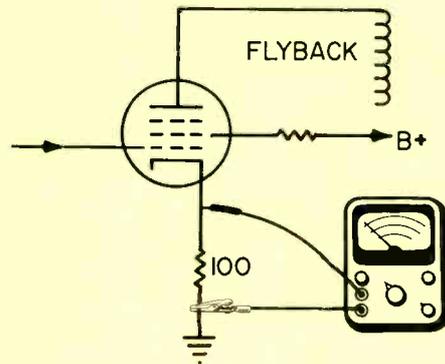


Fig. 4—Measuring current can be easily accomplished with a VTVM by using Ohm's Law and computing $I = E/R$.

TROUBLESHOOTING WITH THE VTVM

Learn to use your VTVM for signal tracing as well as for voltage, current and resistance checks

by Chuck Zackman

■ Many technicians think a VTVM was designed exclusively for measuring small voltages in grid or other high-resistance, low-voltage circuits where more than VOM sensitivity is required. Although a VTVM does a good job of this, it was designed to do other jobs equally well.

In fact, most VTVMs made today appear to be designed with many of the daily troubleshooting and measurement problems of technicians in mind. Wider frequency responses have been designed into them and P-P scales have been added to eliminate the need for using a scope in many troubleshooting jobs.

If the technician is given a choice of only one instrument, the VTVM is probably his best choice. But you can't measure current, you say? It's true you can't measure current directly, but it can be done—by interpolation. And the only time this method would probably become a problem would be in troubleshooting transistor circuits where voltage variations are slight and current measurements are extremely critical and all-important.

To understand why the VTVM can be the most valuable tool in your shop, let's look at how a typical unit operates. This should be helpfully revealing.

Typical Circuits

Most VTVMs are one of two general circuit types. At first glance the average VTVM schematic may appear to be a complex mass of wires and non-descript circuits which aren't worthy of understanding. For the most part this is a direct result of the fact that almost every connection and wire in the VTVM must be passed through a switch. A simplified diagram of two basic one-scale VTVM circuits are shown in Fig. 1. As you can see, both are bridge type circuits. As long as both sections of the tube remain balanced, the current through the meter is negligible. If a dc voltage is applied to one tube's grid, however, that tube section conducts more than the other and causes a current flow through the meter since the plates and cathodes would then both be at different potentials.

When measuring dc voltages, the basic circuit is all that is required. For ac voltages, however, the voltage must first be rectified. A common rectifier circuit is shown in Fig. 2. One half of the diode rectifier is a simple half-wave circuit. The other half is used to cancel out the *contact potential* of the diode. Contact potential exists between all tube elements and even in solid state rectifiers. Contact potential is a voltage which exists across the diode element even when no voltage is applied. By connecting two diodes in a bucking configuration with a series pot, the contact potential can be countered, however. While this potential is actually quite small, it could have considerable effect on the VTVM reading.

A voltage divider is usually employed at the input of the VTVM. This avoids the possibility of a breakdown between rectifier elements. You should note that the actual voltage which reaches the bridge is not important since it can be compensated by the ac calibration control. The ratio of the ac input to the dc output is very critical, however.

RF, IF and Video Troubleshooting

There is no difficulty in any section of the modern TV receiver that cannot be easily found by using the VTVM. There are instances, of course, where it is more logical to use another piece of equipment, but the VTVM is a logical choice in more cases than it is generally employed by many technicians and should find much more use in locating defects.

As an example, let's start with a set which has a raster but no audio or video. Assuming the tubes have been checked, the VTVM is the logical choice to localize this problem. (Many fine signal tracing and injection instruments are on the market and can be employed quite profitably for such malfunctions. It must be admitted here too, that the VTVM will give only a rough indication that a certain stage is malfunctioning. The video signal tracer-injectors, on the other hand, may even tell you the gain of the various stages.)

For the sake of argument (there are several theories), let's begin tracing at the tuner. Connect an AM signal generator to the antenna input terminals and set the generator to the desired channel. Be sure the tuner is also set to that channel.

First, the B+ and AGC should be cleared. If they are all right, check the bias on the mixer grid. If a good negative reading is obtained, the local oscillator can be assumed to be operating normally. A small negative voltage will be present here even if the oscillator is dead. This is a result of contact potential of the mixer grid (which was described earlier in connection with ac VTVM measurements).

The RF amplifier can be cleared while the VTVM probe is on the mixer grid by simply turning the generator on and off while observing the meter reading. A very slight increase in the voltage (between 0.05 and 0.1 v dc) should be noted when the generator is switched on with the RF amplifier operating. The generator should be set on a high output when making this test. If you are not sure of your generator, check the results on a normally operating set. The generator should produce very dark bars on the CRT when adjusted to simulate a strong signal.

This is only a rough check, but if the receiver has no sound or video, it is sufficiently accurate.

If the signal is verified to this point, the probe should be placed on the mixer plate. If a series resistor is found in the set, the dc at the plate should change slightly when the generator is switched on and off. (See "Use Your VOM," this issue for a description of expanded voltage scales which may be helpful in reading this small change.—Ed.) If no series resistor is present, an ac measurement with an RF probe will have to be made. Do not assume that when a voltage is present that the stage is operating. A residual voltage will be present even with no signal applied. Check for the *difference* in the voltage with and without the signal generator operating.

Next, check to see that the B+ and AGC voltages are normal in

Troubleshooting with the VTVM

Continued

the IF section. If these are normal, an RF probe may be used to localize the faulty stage employing the same methods as used in the tuner: Check each grid and plate with the generator on and off. When a stage is found with very little or no difference in signal with the generator either on or off, you've found the bad stage.

Peak reading probes are most useful in any stage beyond the detector, and troubleshooting procedures are the same as those used in the RF and IF stages.

Other Problems

One caution must be observed in TV sweep sections that is not normal in other sections of the TV set. Always use the high voltage probe to measure output plate voltages. These voltages have very high peaks and can do great damage to a meter without this precaution. In most cases it will be desirable to make peak reading measurements of the output. These are comparable to the scope waveform voltage shown on most schematics. If you're

not too smart on scope voltage measurements, use the VTVM while you practice. Although most meters are peak calibrated for a sinusoidal waveform, they will be sufficiently accurate for sweep waveforms as well.

Troubleshooting in the sound section of the TV set is not as difficult as some technicians make it. Generally speaking, the same procedure is used here that was used to check the video-sound IF. A P-P probe should be employed and careful measurements made at the grid and plate of each stage. Check the actual signal by turning the signal input on and off. Often a distorted audio malfunction can also be located in this manner since weak audio usually accompanies distortion.

Power supply troubles can often be easily located with a VTVM too. While dc measurements rarely ever turn up a malfunction other than a completely dead set, ac measurements with the P-P probe will often show up a faulty electrolytic.

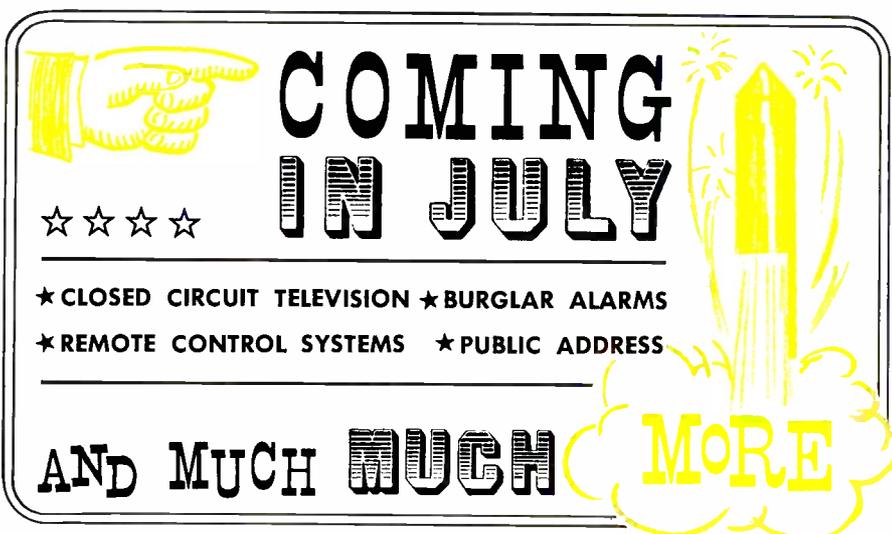
Current Measurements

The VTVM will measure current, but it should only be used as a last resort. If a VOM is available, it is a logical choice since it is designed to measure current. At least one instrument is available which combines the functions of a VTVM and a VOM.

If it becomes necessary to measure current with a VTVM, the procedure is simple and only a little knowledge of Ohm's Law is required. Normally, a circuit carrying the unknown current has some resistance in it. If we know what the resistance is, it is very simple to measure the voltage drop and then, by Ohm's Law, determine the current flowing through the circuit.

As an example, suppose you need to know what current is flowing in the horizontal output tube and all you have is a VTVM. A typical output stage is shown in Fig. 4. First never assume that a resistor is actually the value it should be. Measure it. In the circuit shown in Fig. 4 this is quite easy since the only connection to one end of the resistor is the tube's cathode. If the tube is hot, pull the tube to be sure you get an accurate reading. Let's say the resistor is 100 Ω . Now turn the set on and measure the voltage drop across the resistor after the set has warmed up. Suppose you measure 10 v. Then by Ohm's Law, to determine the current flowing in this circuit, you divide 10 (volts) by 100 (ohms). You should get 0.1 amp or 100 ma. This same system can be applied to almost any circuit and errors from meter insertion are eliminated.

Commonly, there is no resistor available in many circuits which can be used to measure the current flow. Again the horizontal output stage is a good example. Many horizontal output stages do not have a cathode resistor. The meter cannot be placed in the plate circuit because of the high voltage transients. But a low-value resistor can be placed in the cathode circuit, say 5 Ω , and the current can be computed in the same manner as before. A slight actual error will exist but it can be neglected in most cases. ■



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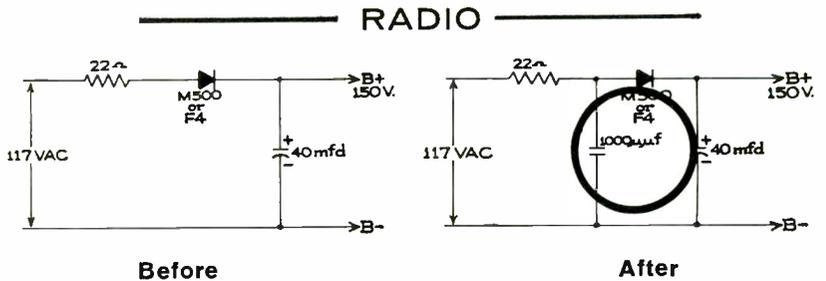
How to achieve trouble-free replacement of Selenium with Silicon Rectifiers

■ Substituting silicon for selenium rectifiers is highly desirable, but silicon units have extremely low impedance. When the rectifier conducts, a heavy pulse of current passes into the capacitor and through the power line. You can see this if you connect an oscilloscope across the surge limiting resistor. The strong pulse can cause interference by mixing with incoming video or radio signals.

Here are the symptoms you will notice, and here is the simple way to eliminate them.

POSSIBLE TROUBLE

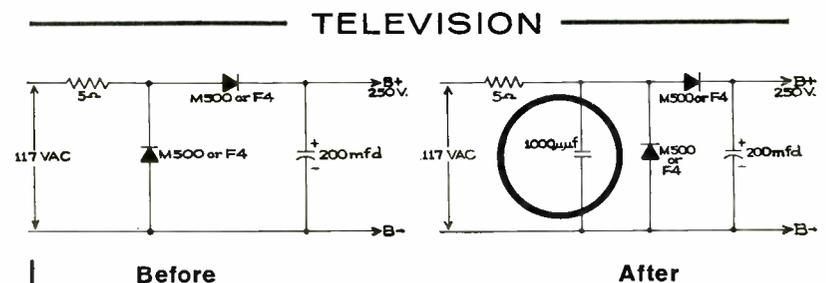
Objectionable hum in radio,
or,
TV picture brightness fluctuates during pulse,
A black or white horizontal bar is generated across the picture tube (and can be shifted from top to bottom of picture by reversing ac plug),
The bar may interfere with the sync signal and the picture will pull out of vertical synchronization.



SOLUTION

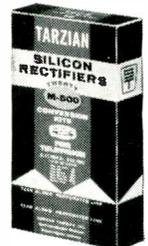
Install a 1000 mmfd capacitor between the resistor and the rectifier, from the rectifier end of the resistor to the negative line (see circles). The RC combination provides necessary filtering action.

You'll also notice a sharp reduction in rectifier failure formerly caused by transient voltages fed in off the line.



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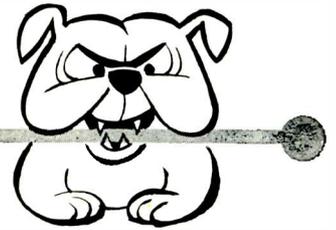
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Difficult Service Jobs Described by Readers

Loose Rivet

A General Electric Model 21C103 was brought into the shop with the complaint of intermittent loss of raster. Two weeks of operation in our shop failed to produce anything but normal operation. After thoroughly checking the picture tube and its associated circuitry; the high-voltage, damper, horizontal output, oscillator and vertical output circuits and replacing all marginal components, the set was operated for an additional two days and returned to the customer.

Two months later the culprit was once again brought in with the same complaint. When placed on the bench and fired up, the set produced what at first was thought to be a normal raster. Closer observation disclosed a slight ripple visible on the edges of the raster. All tubes in the horizontal and video section were replaced to no avail. Thinking the 60 cycle modulation and the intermittent loss of raster were related, the scope was brought into the game. Removing B+ from the circuit and using the direct probe, the search was on. The oscillator

checked out OK but lo and behold there was 2.5 v of 60 cycles on the cathode of the horizontal output tube. How could this be? The cathode is grounded in this model—or is it? Tracing the circuit we found the ground lead from the cathode ran first to the heater pin and then to a rivet type connection on the chassis. Here was the root of all the trouble. The rivet was making intermittent contact with the chassis. A low resistance contact had developed which was reducing the heater voltage and at the same time modulating the cathode with 60 cycles. The model has an aluminum chassis pan and the low resistance contact cannot be eliminated by the normal practice of reheating the ground terminal. To effect a permanent cure we ran a new lead from this terminal to the rear chassis apron which is galvanized sheet iron and is also used for grounding the heater winding on the power transformer. The set has been operating for some five months with no further complaint. —*Scott R. Commons, Lawton, Okla.*

Light Sensitive Ne2

A Sonar depth finder was received from a fishing boat in an inoperative condition. After repairs were made, it was given the usual shop check-out and worked perfectly. Later, the boat owner complained that it would not operate until he had been at sea for a couple of hours. During the period of darkness while the boat was heading for open sea, he could get no depth flashes on the scale. Shop voltage checks and operational checks showed the set to be working disgustingly well. The first real clue came when the owner said it would start working when he turned on the cabin lights. The neon bulb

(which had been replaced during the original repairs) would not fire unless some light fell on it. The ionization point on this particular neon was critical. A new Ne2 neon bulb provided a complete cure. A small cardboard box with a peep hole can be placed over these small depth finders to check neon firing under dark conditions. —*Larry Mings, Savannah, Ga.*

Hum

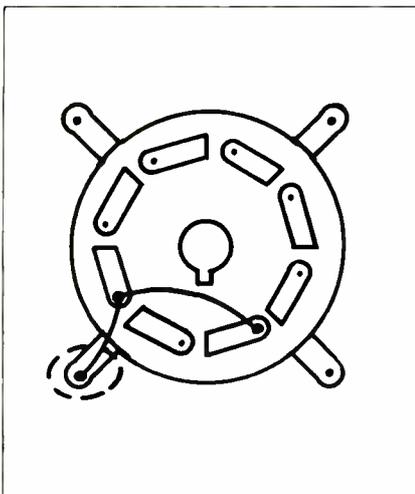
The outside technicians had brought in an RCA CTC5 color chassis that had been working well for many years. But it had now developed an annoying ac bar in the picture. The bar was not of great intensity but could be easily seen.

The outside men had tried tubes but nevertheless they were checked again in the shop. No luck. Next the chassis was pulled and filters were shunted. The bar stubbornly remained.

The ripple was localized with the scope to the luminance circuit. The ac could be clearly seen with the scope at the plate and cathode of the 6AW8 first video amplifier with the inputs from the IF disconnected.

While trying to trace where the ripple was originating, the set had been switched off and scope probe

Continued on page 82



Loose connection on ground lug tied cathode to one side of filament.

TOUGH DOGS WANTED

\$10.00 paid for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photographs are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minnesota.

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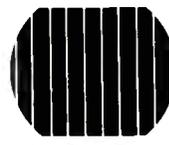
Provides Thinnest
Horizontal Line and
Smallest Dot Patterns
(one scanning line high)
for Easiest Convergence



Dot Pattern



Crosshatch



Vertical Lines



Horizontal Lines



Color Pattern

Here is an exciting new addition to the famous B&K series of Television Analysts—*designed to give every service technician a faster, easier way to service more TV sets!*

The compact "1074" gives you a complete TV signal generating source of your own. Using the B&K *point-to-point signal injection technique*, you can isolate and pinpoint any performance problem for quick correction.

By injecting your own signals, with a visual check on the TV screen, *you can easily signal-trace and troubleshoot any stage* throughout the video, audio, r.f., i.f., sync and sweep sections of black & white and color television sets.

It becomes much easier to find and fix "tough dogs," and troublesome intermittents, as well as to solve other general TV set troubles—to the satisfaction of your customer, and to your own profit. Net, \$249.95

Supplies complete r.f. and i.f. signals, with pattern video and tone audio. Video signals are switch selected for fast, visual troubleshooting. Provides FM modulated 4.5 mc sound channel, with built-in 900 cycle tone generator. Provides composite synchronizing signals. Provides separate vertical and horizontal plate and grid driving signals to check complete output circuit and interrelated components. Many other features.

Makes it Easy to Set-up and Service Color TV

Provides dot pattern, crosshatch, vertical lines, horizontal lines, burst signal and individual colors (Green, Blue, B-Y, R-Y, Red, I, and Q) one at a time on the TV set—all crystal controlled for maximum accuracy. Color phase angles are maintained in accordance with NTSC specifications. Thin lines and high stability assure fastest, easiest convergence and linearity adjustments. Color display makes demodulator alignment extremely simple.

Time-Saving, Money-Making Instruments Used and Preferred by Professional Servicemen Everywhere.



Model 375 Dynamatic Automatic VTVM



Model 360 V O Matic Automatic VOM



Model 700 Dyna-Quik Tube Tester



Model 850 Color Generator



Model 445 CRT Tester Rejuvenator

See Your B&K Distributor
or Write for Catalog AP21-T



B&K MANUFACTURING CO.

DIVISION OF DYNASCAN CORPORATION

1801 W. BELLE PLAINE AVE. • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.

Export: Empire Exporters, 253 Broadway, New York 7, U.S.A.

SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

Illegible Tube Numbers

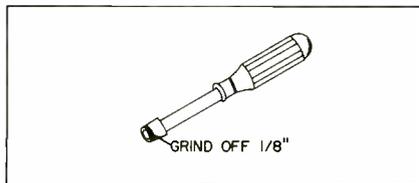
When type numbers on old tubes are so faint as to be almost completely illegible, put a little ammonia on a piece of cotton and dab it on the numbers. They will become readable when the ammonia dries.—*Henry Mullen, Cleveland, Ohio.*

Sometimes code numbers and letters on tubes can be difficult to read because of erasing due to heat and handling. Cleaning the tube and blowing gently on it to form moisture will in most cases make them readable.—*Erling Alstrup, Cumb Co., N.S., Canada.*

• *Still another method for solving this problem is to gently stroke the coded area on your hair. Usually, it will pick up enough oil to become legible.—Ed.*

Nut Driver Repair

When the contact surface of the nut driver has become rounded through use to the extent that it will



Grinding off tip removes damaged portion of nut driver.

no longer do its job, grind off approximately 1/8 in. thus exposing an unused surface that is practically as good as new.—*E. S. Broyles, Denver, Colo.*

Capacitor Test

This quick test for leakage in coupling capacitors in the audio circuit of many receivers avoids unsoldering any wires. Connect a voltmeter across the primary of the output transformer and short the plate of the driver tube to ground or B-. If the voltage across the primary decreases when

the plate of the driver is shorted, the coupling capacitor should be replaced. The rectifier tube of ac/dc sets won't be damaged by this procedure since the load resistor of the driver tube is very large.—*H. Josephs, Gardenville, Pa.*

Strobe Saver

The constant use of my cardboard Stroboscope caused the center hole to wear and fray so much that it became inaccurate. By gluing a plastic 45 rpm insert (spider) directly over the hole in the center, the strobe will last much longer and can be hung on a nail near the bench. Try this on new units and save yourself problems.—*Samuel Jacobs, Hyde Park, Mass.*

Short Detector

When determining the reason for burned out TV fuses, we use a 1/2 to 2 amp auto light bulb connected across the burned out fuse. Intermittent shorts will show up by jarring suspected components and watching for the bulb's brilliance to increase.—*H. Muller, Danboro, Pa.*

Mobile Hookup

In connecting a mobile unit power supply wire to the necessary ignition switch terminal of an accessory-loaded auto or truck, there are generally some problems. The blank fuse connections left on the fuse panel under the dash is more accessible than the ignition switch. By connecting the "hot" wire to a blank terminal on the panel, you save time and effort.—*Stan Clark, E. Bradenton, Fla.*

Screw Holder

When trying to put screws in those hard-to-reach places, wrap solder around the shaft of your spintite or screwdriver and then wrap around the shank of the screw.



Solder is used as an aid to hold screws.

After screw is started, the pull of the driver will straighten the solder and the screw can be tightened. Bonus: you always have solder on hand!—*William R. Skilling, Albany, N. Y.*

Scratches Mark Spot

It's not always easy to line up the control shafts and mounting bolts when returning a chassis to the cabinet. To prevent this difficulty, make scratches with a sharp pointed object at the two rear chassis corners before removing it. It is easy to line up the chassis corners with the scratches when returning it to the cabinet. This method is also useful for some speakers, tuners, CRT brackets, etc.—*David F. Jacobs, Bethel Park, Pa.*

SHOP HINTS WANTED

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to Shop Hints Editor, ELECTRONIC TECHNICIAN, Ojibway Building, Duluth 2, Minn. The hints published in this column have not necessarily been tried by ELECTRONIC TECHNICIAN editors and are the ideas of the individual writers.

NOW *EVERYONE* CAN QUICKLY Set up and Service Color TV



New! **B&K** Model 850 **COLOR GENERATOR**

*Most Complete, Most Versatile, Portable Instrument for Use in the Home and in the Shop
Makes Color TV Set-up and Service Easier, Faster than ever!*

Now every service technician can be ready to set-up and service color TV with amazing new ease and speed! New advanced design simplifies the entire operation, saves time and work in every installation. Eliminates difficult steps in digging into the color TV set. Gives you new confidence in handling color.

Produces Patterns, Burst, and Colors Individually—Provides dot pattern, crosshatch, vertical lines, horizontal lines, burst signal, and individual colors—one at a time—on the TV color set—for fastest, easiest check. Unique window-viewer on front of the instrument panel shows you each pattern as it should be—gives you exclusive display standard to use as a sure guide for quick, visual comparison.

Provides Accurate, Individual Color Display—Produces Green, Cyan, Blue, B-Y, Q, Magenta, R-Y, Red, I, Yellow, and Burst—one at a time. All colors are crystal-controlled and are produced by a precision delay-line for maximum accuracy. Each color is individually switch-selected—no chance of error.

Provides Accurate NTSC-Type Signal—Color phase angles are maintained in accordance with NTSC specifications.

Makes Convergence and Linearity Adjustments Easy—Highly stable crystal-controlled system with

vertical and horizontal sync pulses, assures the ultimate in line and dot stability.

Simplifies Demodulator Alignment—The type of color display produced by this instrument provides the ultimate in simplicity for precise demodulator alignment.

Provides Automatic Deconvergence—Eliminates the necessity for continual static convergence adjustments. The instrument automatically deconverges a white into a color dot trio without digging into the color set to mis-adjust the convergence magnets. It also deconverges a white horizontal or vertical line into red, green and blue parallel lines. This greatly simplifies dynamic convergence adjustments.

Provides Exclusive Color Gun Killer—Front-panel switch control makes it easy to disable any combination of the three color guns. Eliminates continuous adjustment of the background or screen controls, or connection of a shorting clip inside the receiver. The switch also selects the individual grids of the color tube and connects to a front-panel jack to simplify demodulator alignment.

Provides Switch-Selected R.F. Signals—Factory-tuned, for channels 3, 4, and 5—for open channel use in your area.

Model 850 also includes other features that make it invaluable for home and shop use. Net, \$199⁹⁵

See Your B&K Distributor
or Write for Catalog AP21-T



B & K MANUFACTURING CO.

Division of DYNASCAN CORPORATION

1801 W. BELLE PLAINE AVE. • CHICAGO 13, ILL.

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--- for more details circle 15 on post card

NEW PRODUCTS

FOR MORE INFORMATION CIRCLE PRODUCT NUMBERS ON POSTCARD FOLLOWING PAGE 98.

TUBE TESTER 200

This tube tester is said to have a simple test set-up procedure for checking emission, shorted elements,



and continuity. A 4½-in. meter has a 3-color REPLACE-WEAK-GOOD scale and 0 to 100 scale for matching. Tests 7- 9- and 10-pin miniatures, octal, loctal, 5- and 7-pin nuvistors, novars and compactrons. Types tested include series string, magic eye, VRs. Adapter available for testing all CRTs, both color and B/W. EICO

MULTI-BAND RADIOS 201

A line of four multi-band transistor radio portables includes the Marina, Y2587, which has eight transistors, two diodes and one thermistor, and will operate up to 425 hours on three size "D" flashlight cells, it is reported. In addition to the standard AM broadcast band, this radio has a shortwave band



covering 4 to 6 Mc marine broadcasts, and 6 to 12 Mc international transmissions. The third band covers 12 to 20 Mc broadcasts. An ac charger plug is optional. Admiral.

TUBE SHIELD 202

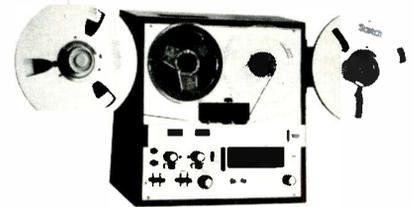
A tube shield is said to extend the life of KT88, 6336 and tubes with similar envelopes. The fin-type heat dissipating tube shield increases tube life approximately five times, according to the report. The shield body measures 2 x 2½ in. The crown piece measures ½



x 2¼ in. with contoured pressure tangs extending up ⅜ in. Radiating ¼ in. fins run the length of both sections. Cool-Fin.

STEREO RECORDER 203

The T-367 stereo tape deck/duplicator, providing facilities for four-track stereo tape recording, playback and tape duplicating, is introduced. The report indicated that a self-contained preamplifier permits recording, playback and tape duplicating without need for external amplifiers, yet provides preamplifier level output adequate to feed into a separate stereo system power amplifier. A unique feature of the new Tape Deck/Duplicator



is its ability to make copies of tapes without need for a second tape transport, simply by the addition of accessory motors which mount to the deck assembly housing, the report said. These motors also permit use of the larger 10½ in. tape reels to achieve increased recording and playback time on a single reel of tape. The tape deck may be operated either with or without accessory motors. Price \$369.95. Bell Sound.

MAGNIFIER 204

A 3-D slip-on binocular-type magnifier is introduced. It can be used when working with tiny fittings, thin wires, fine thread, to locate cracks in printed circuitry and while working on small portable electronic equipment. It was reported that normal vision is restored merely by lifting the head a little and without removing the



device. The unit is offered on a 30-day money-back guarantee. Price \$9.95. Fairchild Optical.

you get **PRODUCT PLUS** *from your Sylvania Distributor*

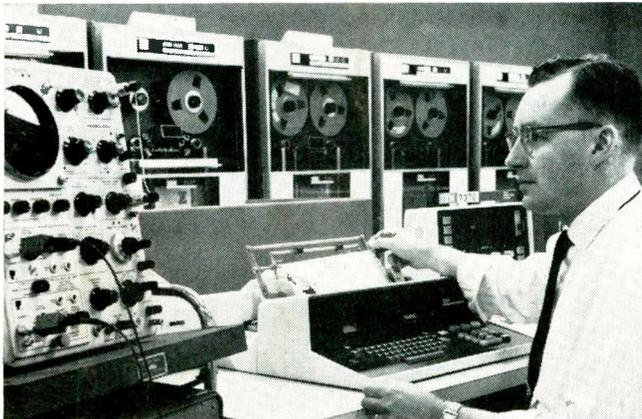


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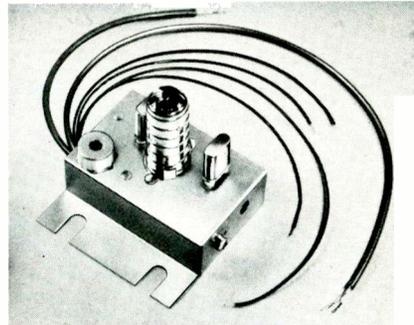
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NEW PRODUCTS

RAINBOW CONVERTER

205



An adapter that provides crystal-controlled keyed rainbow color display and more accurate horizontal synchronization for the Model 1076 TV Analysts in use prior to the

current 1076 Analyst is announced. The crystal-controlled circuit is already being incorporated in the current Model 1076 TV Analyst, according to the maker. The adapter is designed for easy conversion of all Model 1076 TV Analysts before Serial No. 425301 and from Serial Nos. 505001 to 506100 to provide a crystal-controlled keyed rainbow color display for better definition of each of the color bars on the pattern, particularly the R-Y and B-Y bars for best color demodulator alignment, it is reported. Price \$35.95. B & K.

BASE STATION ANTENNAS

206

The MK-30 series omnidirectional vertical base station antennas for the commercial two-way 27-50 Mc range is announced. The half-wave vertical radiator is voltage fed at the bottom high-impedance point through special quarter-wave Launcher-Matcher shorted stub, integral with feed cable.



There is no loading, the maker indicated. Physical length is an electrical half-wave at the operating frequency. Bandwidth is a minimum of 800 kc for 2.0:1 VSWR depending on the frequency, with power rating at 250 w continuous, it is said. Mark Products.

SERVICE BODIES

207

An expanded line of rear wheel chassis service bodies is announced. Four new models expand the range



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119 INDEPENDENT SERVICEMEN ASSURED THEIR LIFE'S FUTURE with the LAFAYETTE ASSOCIATE STORE PROGRAM

What Are You Waiting For--

You're in business for yourself, probably an independent serviceman like those other 119 businessmen. You have a basic knowledge of radio, television or electronics, and most of all you have ambitions to become a true success story—with your own profitable business, a respected place in your community, and security for your family.

You owe it to yourself, and your family, to investigate the Lafayette Associate Store Program.

This Is What We Offer You:

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4. Protected Territory—Yours will be the ONLY franchised Lafayette Radio Electronics Associate Store in your marketing area.
5. Marketing Guidance—Our program helps you set up a complete operation. We'll help you select the right location, or evaluate your present one, design your store for maximum profit and assist in selecting your inventory. We'll show you how to deal with customers, how to hold a loyal following, how to build a successful business and maintain it. We will always be available to help you in any way possible. In short, we want you to be a Lafayette Success Story.

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NEW PRODUCTS



of cab-to-axle dimensions from 48 in., up to 61 in. In addition to the

popular 1½ ton, there are now available stock dual wheel service bodies for ¾ ton, and a number of 1 ton chassis heretofore requiring special customizing. All-steel bodies are phosphatized and coated with a zinc chromate primer, inside and out, for maximum protection. Morrison Steel Products.

SSB MICROPHONES 208

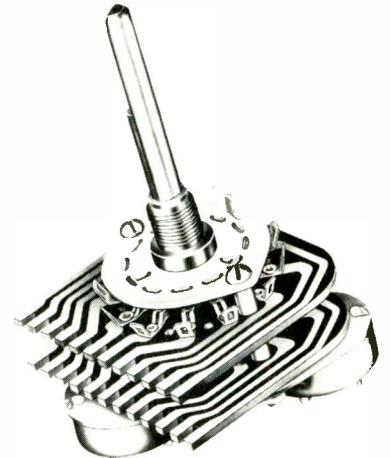
A single sideband-type microphone, model 454, for SSB CB and



amateur use, is announced. A choice of PTT or VOX, 300 to 3000 cps, -48 db on the 454X crystal and -52 db on the 454C ceramic model, is available. Both microphones have a coiled cord as standard equipment. When wired for PTT, the 454 features two switching arrangements — push-to-talk, and a Lever-Lock switch to hold the microphone live. \$26.50 list, \$15.90 amateur net. Turner.

PC SWITCHES 209

A line of printed-circuit rotary switches is introduced. Known as Type PB switches they are readily

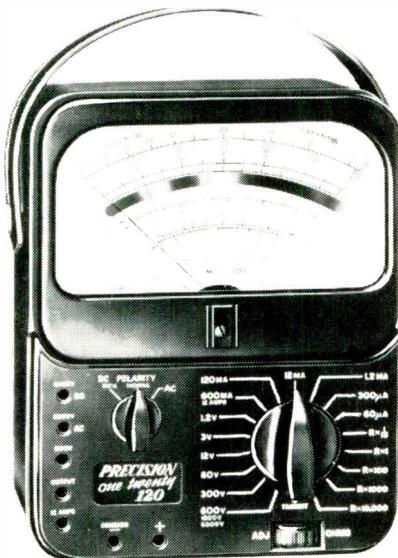


interchangeable with existing printed-circuit switches, it was said, and allows mechanical options and attachments identical to equivalent frames of hand-wired models. The switch accommodates up to 22 Type K insulated clips per section, 12 clips on one side, 10 on the other — all with 30-deg spacing; each also is adaptable to meet 45- and 60-deg functions, the maker announced. Oak.

ORGAN KIT 210

An all-transistor electronic organ, sold in assemble-it-yourself kit form, is announced. Called the Recital

PRECISION/PACO MODEL 120 V-O-M NOW WITH BUILT-IN METER PROTECTION AND STILL ONLY \$47⁹⁵



Model 120: Still only \$47.95!
Model 120M: Still only \$56.95!

Prevents damage to meter movement even with 1,000 times overload!

Precision/Paco's professional 120 and 120M V-O-M models—with more total ranges, larger meter size, a mirror scale included, and a longer guarantee—now have still another great feature: built-in meter protection against accidental overload—at absolutely no extra cost! Meter-movement will remain completely unharmed even by an accidental transient overload of 1,000 times or more!

Only Precision's Model 120 V-O-M with 15 years of proven acceptance has such a sensational economy feature!

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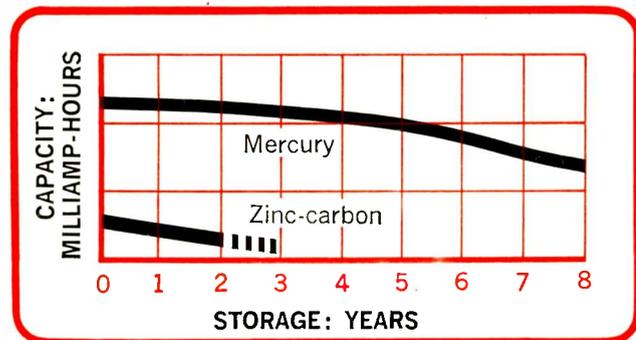
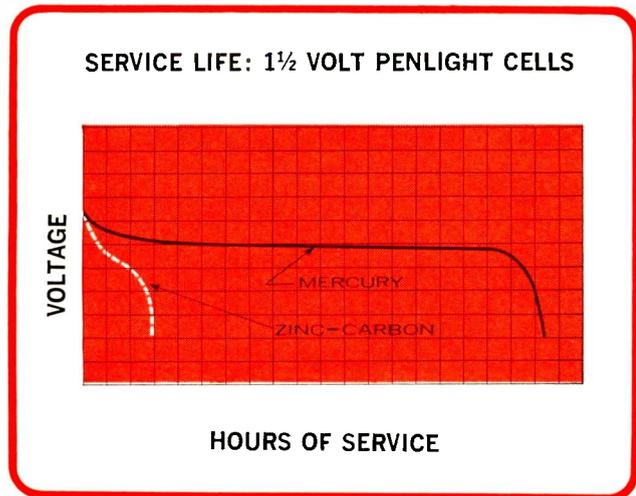
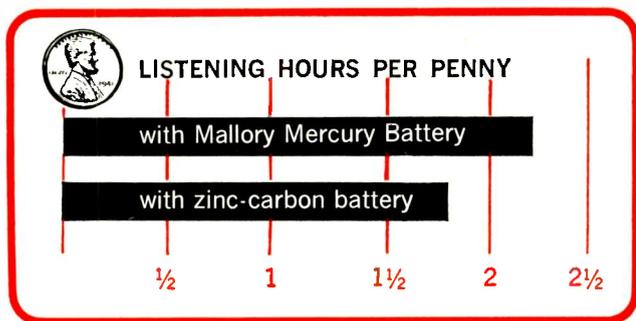


MALLORY

Tips for Technicians

Mallory Distributor Products Company
 P.O. Box 1558, Indianapolis 6, Indiana
 a division of P. R. Mallory & Co. Inc.

Why Mallory Mercury Batteries work better in transistor radios



There are a lot of good reasons why more and more people are using mercury batteries in their transistor radios. And the reasons boil down to this—they're a better value, and they give better performance.

To get a comparison between mercury batteries and ordinary zinc-carbon batteries, let's look at a typical transistor radio. This radio uses size "AA" penlight batteries and has a current drain of 15 milliamperes. The Mallory Mercury Battery is the ZM9 and the zinc-carbon type would be the NEDA type 815. The ZM9 retails for 75¢ versus 20¢ for the 815. Got the picture?

Here's where the fun begins. The ZM9 will operate the radio for 165 hours versus only 35 hours for the zinc-carbon battery. This means that for one penny you'll get 2.2 hours of listening pleasure using the ZM9 versus 1.75 hours for the zinc-carbon battery. In other words, it costs you 0.57 cents per hour to use the zinc-carbon compared to only 0.45 cents for the mercury battery.

We're not through yet. Let's get back to *listening pleasure*. The mercury battery has essentially a flat discharge curve. This means that it presents a more constant voltage to the transistors. Result: you don't have to keep turning the volume control up while you're listening AND the radio *sounds* better because there's far less distortion.

Had enough? There's one more important point. Suppose you put the batteries in the radio and use it only slightly. Those 20¢ zinc-carbon batteries go "dead" in a few months whether you use them or not. But the mercury batteries can be stored 2 to 3 years and still deliver dependable power. Plus the fact that Mallory Mercury Batteries are guaranteed* against leakage in your transistor radio.

We've used this "Tip" to illustrate the superiority of Mallory Mercury Batteries in transistor radios. But this superiority extends to *thousands* of other applications. So whether you're building test equipment, heart-pacers, or satellites, see your Mallory Distributor. He has a Mallory Mercury Battery that will do exactly the job you want done.

*We guarantee to repair the radio and replace the batteries, free of charge, if Mallory Mercury Batteries should ever leak and damage a radio set. Send radio with batteries to Mallory Battery Company, Tarrytown, New York.



5-CHANNEL MIXER-PREAMP, MODEL E-5P

NEWCOMB



10 WATT E-10B

PATHFINDER P.A.



20 WATT E-20

ECONOMY LINE



40 WATT E-40

PUBLIC ADDRESS



75 WATT E-75

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Please send immediately a free copy of your Catalog No. PF-7 describing in depth your Pathfinder P.A. line.

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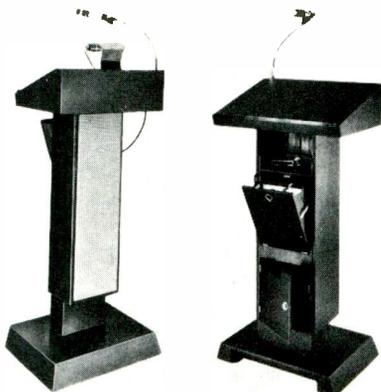
NEW PRODUCTS



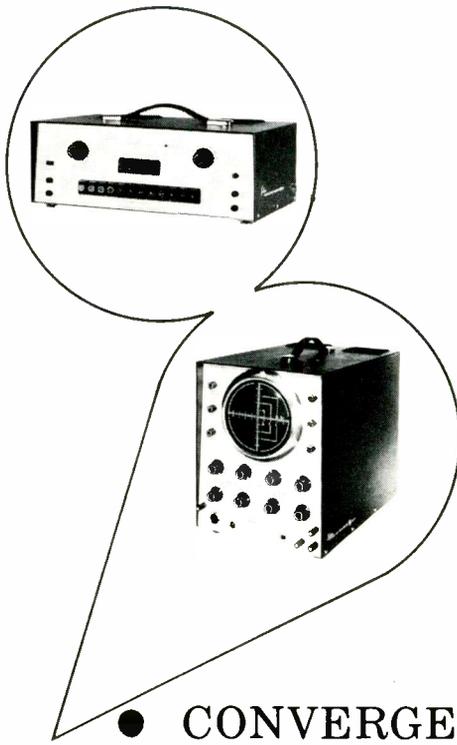
Organ, it is said the instrument offers realistic pipe tones combined with complete adaptability to any kind of music one may wish to play. The instrument represents a newly-developed concept in musical instruments—a full-size organ comparable in physical and musical qualities to some of the best two-manual pipe installations plus a unique “Library of Stops” (TM) feature which enables changing any or all 32 organ voices for completely different ones in literally a few seconds, the report indicated. Kit price, about \$1500. Schober.

LECTERN SOUND SYSTEM 211

A lectern that contains a complete high volume sound system is introduced. Called the Ampli-Vox



Sound Column Lectern, the unit is said to provide every professional audio feature. It was said the self-contained unit provides enough power for audiences up to 3000. A 25-w all-transistor, push-pull amplifier and six built-in speakers are used. A cardioid microphone is supplied. Power is derived from 10 flashlight batteries. The lectern is constructed of wood covered with



● CONVERGE ON YOUR TV PROBLEMS WITH TEST EQUIPMENT that has EXPERIENCE

Color bar-dot generator model 800

- EXCLUSIVE PUSH BUTTON PANEL - MAKES SEPARATE PATTERN OR COLOR SELECTION EASIER AND FASTER, CLEARLY MARKED FOR ERROR FREE SELECTION - STAND BY - ON-OFF - PATTERN - SOUND - CROSSHATCH - HORIZONTAL LINES - VERTICAL LINES - DOT PATTERN - EIGHT DIFFERENT COLORS
- CONVERGENCE IN 15 MINUTES - SIMPLE STEPS TO FOLLOW EASY TO SET UP - COLOR CODED CLIP-ON CONNECTIONS
- FRONT PANEL JACKS - ALLOWS EASY ACCESS OF VIDEO, SYNC OR COLOR DEMODULATOR SIGNALS
- VIDEO LEVEL CONTROL AND VIDEO OUTPUT JACK - PROVIDES EITHER POSITIVE OR NEGATIVE VIDEO INFORMATION
- COLOR GUN KILLER SWITCH - ALLOWS EASY SELECTION OF ANY COMBINATION OF 3 COLOR GUNS
- OPERATES ON TRANSFORMER - ISOLATED 117 VOLTS 50-60 CYCLE AC

DEALER NET \$239.95

5-inch wide-band high sensitivity oscilloscope model CRO-3

- WIDE BAND AMPLIFIER, FLAT WITHIN 1 DB FROM 20 CYCLES TO 4.5 MC
- TWO-RANGE VERTICAL DEFLECTION SENSITIVITY FROM 0.018 RMS VOLT-PER-INCH
- HIGHLY STABLE AMPLIFIER CIRCUITS - NO BALANCING REQUIRED
- POSITIVE OR NEGATIVE INTERNAL HORIZONTAL SYNC
- LINEAR SAWTOOTH SWEEP OSCILLATOR, 20 CYCLES THROUGH 50 KC
- INPUT CALIBRATING VOLTAGE, 10 VOLTS PEAK TO PEAK
- VERTICAL POLARITY REVERSAL
- HORIZONTAL SWEEP EXPANSION
- RETURN TRACE BLANKING
- Z-AXIS MODULATION - EXTERNAL OR INTERNAL 60-CYCLE
- DIRECT CONNECTIONS TO DEFLECTION PLATES WHEN REQUIRED

DEALER NET \$234.95

- ACCESSORY PROBES FOR THE JACKSON CRO-3
- LC2-IP LOW CAPACITY PROBE.....\$19.95
 - CLOIP HIGH VOLTAGE LOW CAPACITY PROBE.....7.95
 - DEMP DEMODULATION PROBE.....3.95

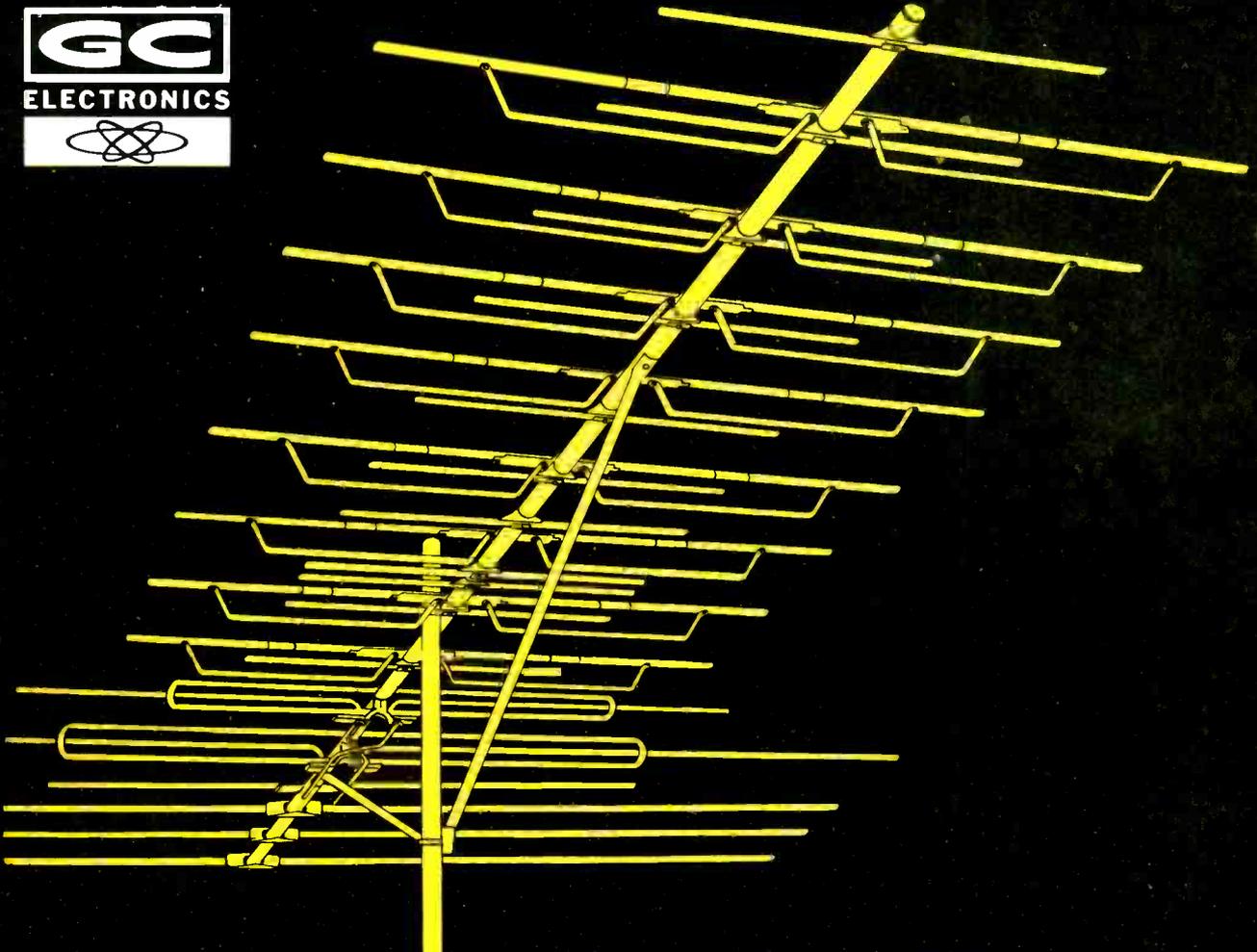


Jackson Electrical Instrument Co.

124 McDonough St. / Dayton, Ohio

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EXPERIENCE TECHNICAL



COLORMAGIC

Patent Pending

FHR

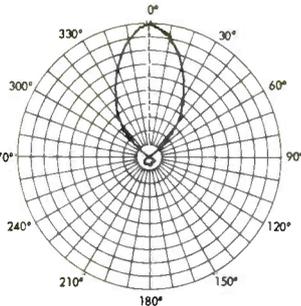
FUNDAMENTAL HARMONIC RESONANCE...GC'S EXCLUSIVE DESIGN PROCESS!

Colormagic elements resonate on the fundamental harmonics within both the high and low bands. Colormagic FHR outperforms the average second harmonic TV element by producing a tight, laser-linked directivity of signal...higher gain! It's in the elements!

GC "GOLD-GUARD" anodizing process guards against pitting, chipping, rust and corrosion...makes the Colormagic series the best protected, all-weather line available!

GC "SOLID-SEMBLED" construction insures quick, easy installation...rigid-lock elements snap securely into place!

Compare! Colormagic Antenna Systems offer pencil-point polar patterns...laser-linked directivity...flat plateau response curve...no traps or peaks...excellent for color or black & white TV reception.



15 All-New Colormagic Combo-Couplers permit cross-direction reception of UHF-VHF-FM antenna combinations...each unit encased in high-impact polystyrene case...supplied with stainless Steel mounting strap. Complete sales program available.



See your GC Distributor! He'll fill you in on this "prestige" package. **CONSIDER THE ELEMENTS INVOLVED!** ...then GO COLORMAGIC! If not stocked locally, write us for name of Distributor nearest you.

GC ELECTRONICS CO.
Division of Textron Electronics, Inc.

Western Plant: 3225 Exposition Place, Los Angeles 18, Calif.
MAIN PLANT: 400 S. Wyman St., Rockford, Ill., U.S.A.

NEW PRODUCTS

scuff-proof Texolite and the base is equipped with retractable wheels. The unit weighs 40 lb. Price \$299. Perma-Power.



FRAME GRID TUBES 212

A family of multiple function, decal-base tubes in which high performance frame grid tubes are com-

bined with conventional grid types within the same envelope to make possible higher performance TV sets at lower cost is announced. The first four types are: 6X9, 6U9, 6W9

and 6V9. The 6X9 consists of a high- μ triode and a pentode. The 6U9 consists of a low- μ triode and a pentode. The 6W9 is a double pentode. The 6V9 is a heptode-triode. Detailed information as well as general applications assistance are available from the manufacturer, Amperex.

MICROPHONE CONNECTOR 213

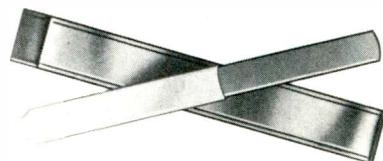
The Type ST-24 microphone connector (molded 2-pin) is announced. It is said the connector



cable assemblies are ideal for use on microphones, tape recorders, amplifiers, test equipment, computers and many other product applications. Construction features include complete shielding, 360 deg strain relief and integral molded plug construction which provides a superior strain relief, protection against moisture, minimization of noise and elimination of shorts, according to the maker. Switchcraft.

CONTACT BURNISHER 214

"Non-Residual" contact burnishing tool is said to leave no filings, grit, or dust on the contacts. This



heavy-duty burnisher has been developed for any type contact—silver, platinum, gold, palladium, tungsten, molybdenum, and all precious metal contacts. Blade is $\frac{1}{4} \times .010 \times 3\frac{1}{4}$ in. Trial package of 10, N318S-10, \$4.50. Neuses.

VTVM 215

The model 805 VTVM Tele-Volter is announced. It is said taut band suspension eliminates pivots and jewels, pivot friction and error due to pivot fall-over. The meter may be operated in any position without degrading performance and is four

easily service transistor radios...and make money!

B&K
Model 960



TRANSISTOR RADIO ANALYST

with Exclusive

Dyna-Trace Single-Point Probe and Built-in Metered Power Supply and VTVM.

Check all circuits - Pinpoint any trouble ... in minutes

This is the way to profit from transistor radio servicing. *There's no hit or miss, no waste of time and work.* The B&K "960" Analyst gives you a complete transistor radio service shop in one easy-to-use instrument. It provides signal-generator, power supply, milliammeter, VTVM, battery tester, ohmmeter, and both in-circuit and out-of-circuit transistor tester—all in one. Also speeds servicing of tube-type radios. Brings you new customers, and new profit.

Net \$995

Unique Point-to-Point Signal Injection

Easily enables you to troubleshoot any stage of any transistor radio—fast.

Built-in Metered Power Supply

Makes it easy to operate radio under test. Provides from 1 to 12 volts in $1\frac{1}{2}$ volt steps. Supplies bias taps.

Simplifies In-Circuit Transistor Test

Dyna-Trace single-point probe needs only the one contact to transistor under test. Gives fast, positive meter indication.

Built-in VTVM

Includes essential high-input-impedance vacuum-tube voltmeter for correct servicing.

Test All Transistors Out-of-Circuit

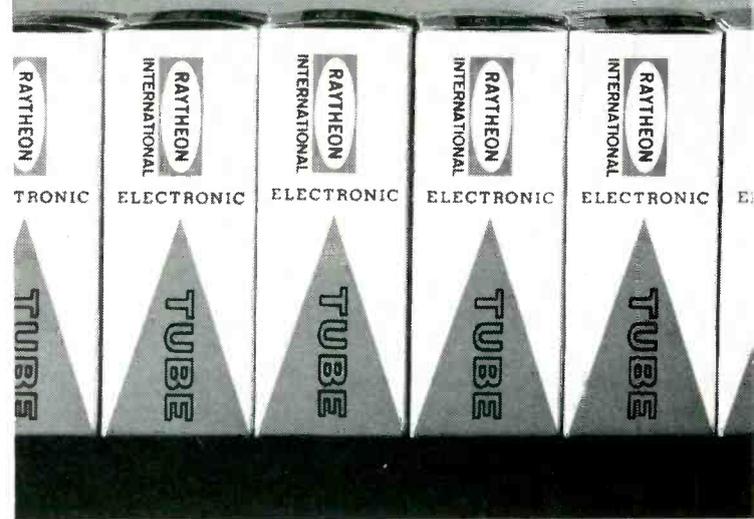
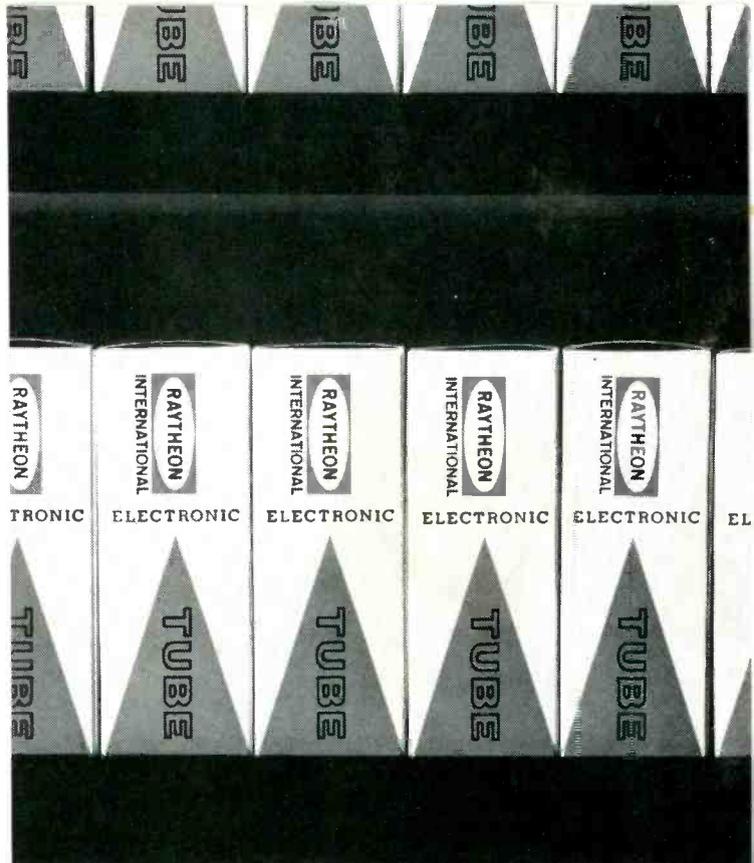
Meter has "good-bad" scale for both leakage and beta; and direct-reading beta scale. Also automatically—determines NPN or PNP. Meter is protected against accidental overload and burn-out.

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Distributor or
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Catalog
AP21-T



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Export: Empire Exporters, 253 Broadway, New York 7, U.S.A.

- - - for more details circle 16 on post card



why stock two?

Raytheon's International line puts high quality and high profits in one neat package — where they belong! Raytheon International tubes are designed, manufactured and tested by selected foreign producers in accordance with Raytheon specifications and U.S. industry standards. Characteristics are controlled for exact interchangeability and newer types are continually being developed to keep pace with your replacement needs. Right now, for example, 92% of all socket requirements

Raytheon gives you both in one carton

can be filled immediately by Raytheon International's 284 types.

Raytheon's 40 years of experience plus the Good Housekeeping Seal of Approval provide your customers with the finest warranty in the business. Add a good healthy profit margin for you and you have all the reasons for stocking and selling Raytheon's International line. See your Raytheon Distributor for complete details.



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NEW PRODUCTS

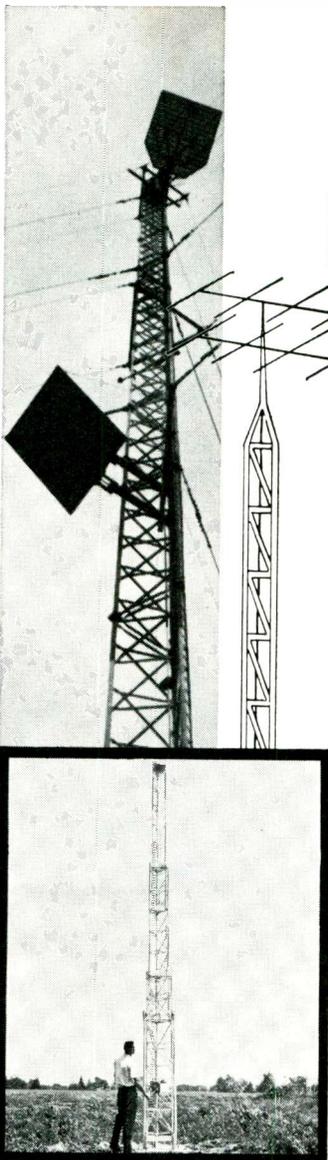


times more sensitive than conventional movements, it was reported. Specifications: 6 in. meter face; ac accuracy 5% of full scale; dc accuracy 3% of full scale; frequency 20 cps to 3 Mc; input resistance 10 MΩ. Ranges dc 0 - 1 - 5 - 10 - 100 - 500 - 1000; RMS 0 - 1 - 5 - 10 - 50 - 100 - 500 - 1000; P - P 0 - 2.8 - 14 - 28 - 140 - 1400 - 2800. Jackson.

INTRUSION ALARM 216
Announced is an attache-case-



size model ultrasonic intrusion alarm known as Mini-Guard. The 8-lb unit is designed for temporary or permanent protection of doorways, display cases, small offices or other rooms, hotel accommodations, closets, files, safes, etc. When plugged into a wall outlet and switched on, the unit emits inaudible ultrasonic waves. This high frequency "silent sound" saturates a zone extending to 12 ft in front of the unit. Or, if desired, the sensitivity can be adjusted so that the alarm will be tripped only by activity within a closer range. Walter Kidde & Co.



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when you insist on **ROHN TOWERS**

LARGEST FULL RANGE OF TOWERS—you can get anything from home TV and amateur radio towers to heavy-duty communication and micro-wave towers. Included are 500 foot self-supporting towers, 1,000 foot guyed towers, "fold-over," and crank-up towers. Regardless of your needs, ROHN can supply it.

UNQUESTIONED LEADERSHIP IN DESIGN AND MANUFACTURE—you get the latest in advanced tower engineering. All communication towers are engineered to EIA specifications, and are proved by thousands of installations. No other manufacturer can surpass the quality and fine reputation of ROHN.

QUALITY MATERIALS AND WORKMANSHIP—Only highest quality steel is used which fully meets the specifications for the job. ROHN towers are hot-dipped galvanized *after fabrication*—a feature ROHN pioneered!

SERVICE WHEREVER YOU WANT IT—ROHN representatives are world-wide. Complete erection service for communication systems, broadcasting, micro-wave, and other needs is available; also competent engineering service to help you.

Settle for the BEST in TOWERS—ROHN—today the world's largest, exclusive manufacturer of towers of all kinds!

Also available: Rohn Lighting Kits, Microwave Passive Reflectors, Tower Installation Service and Engineering Assistance. Representatives World-Wide to Serve You.

For your needs, contact your local ROHN salesman, distributor or dealer; or write direct for information.

SANDERS 217

It is announced that sanding belts and discs have been added to this line of hand power tools. Items



include: Paper back-garnet belts, 3 by 18-in. with extra fine #120 and fine #80 grit; three heavy duty cloth back aluminum oxide belts in fine #80, medium fine #60 and medium #50 grit. Three paper back aluminum oxide discs, open coat, 7 in./dia with 7/8-in. hole, come in extra fine #120, fine #80 and medium #50 grit. Same size aluminum oxide discs, except with fibre back for heavy duty sanding are available in four grits. The grits include, fine #80, medium #50, coarse #36 and extra coarse #24. The sanding discs are packaged 25 in a box. Wen Products.

STEREO SPEAKER 218

A "divergent lens" speaker system is said to allow the listener to enjoy the highest stereophonic music fidelity from anywhere in the room. A sound radius of 360 deg disper-

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PEORIA, ILLINOIS

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| <input type="checkbox"/> Micro-Wave Towers | <input type="checkbox"/> Government |

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SMART STYLING! RUGGED RELIABILITY!

The Hallmark 512 has been designed and manufactured to give consistent unexcelled performance even under the most severe conditions. It features dual-power, 12 channel crystal-controlled, push-to-talk operation. Sensitivity better than $0.3\mu\text{v}$ for 10 db S/N ratio. Selectivity better than 30 db. RF power over 3.2 watts. Audio power 3 watts. Top quality components in rugged hand-wired chassis. 26.965 to 27.255 mc. High-level modulation, improved low-noise front end. "S" meter and neon modulation indicator standard.

Now! from Hallmark

Most advanced transceiver tester available!



only \$49.50

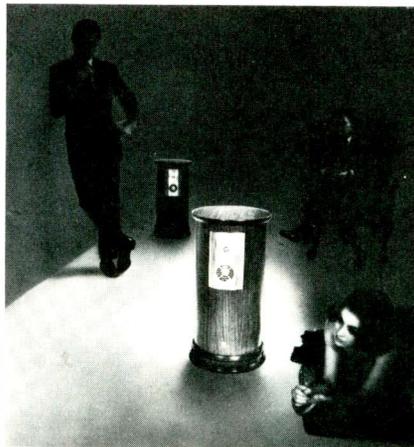
Here is the most versatile and reliable test instrument of its kind — a crystal-controlled signal generator for low power transceivers. It was specifically designed to assist the technician in installation and servicing of low power transceiver. Measures: RF power (absolute) 0 — 5 w.; 0 — 120% amplitude modulation; VSWR. Produces a 100 mw carrier (with or without amplitude modulation of a 1000 cps tone) for checking receivers. Use as a field strength meter.



HALLMARK INSTRUMENTS
6612 Denton Drive, Dallas 35, Texas

--- for more details circle 34 on post card

NEW PRODUCTS



sion eliminates the need for painstaking location and balancing of speakers, the report indicated. Known as the "Grenadier," specifications indicated the speaker can handle up to 100 w of music power; frequency response, 30-20,000 cps, nominal impedance, 8Ω , 12 in. woofer, mid-range and tweeter. Overall dimensions, $15\frac{1}{4} \times 29$ in. Weight 65 lb. Price \$180. Empire Scientific Corp.

DEFLECTION YOKES 219

Replacement deflection yokes with toroidal windings are announced. Three models are avail-



able for replacement of toroidal deflection yokes in several TV models. Instruction sheets containing technical and installation data are included with each yoke. Prices: \$9.50 for No. YT-101, \$9.80 for No. YT-102-2 and \$11.00 for No. YT-103-1. Triad.

UHF AMPLIFIER 220

A mast-mounted amplifier to cover the UHF band is introduced. Called the Able-U2, it has two



transistors to boost signal strength on all UHF channels, giving it prime utility in fringe reception areas, it was said, and can be used with any UHF-TV receiver or converter. Power is supplied by the remote power supply unit at 15 v, on the same twinlead that brings the signal down from the amplifier, the maker said. Blonder-Tongue.

TUBE SOCKETS 221

A line of noval and miniature tube stand-off printed circuit sockets for 1/16 in. boards is announced. The sockets are supplied in four types: general purpose black phenolic or mica-filled low loss phenolic, with or without center shields. Each has snap-in contact tails to

NEW PRICES from QUIETROLE

the oldest, most widely proved and sold radio and TV lubricant



2 oz. bottle with dropper	LIST \$1.49
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4 oz. bottle (brush-n-cap)	LIST 2.64
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Quietrole is your guarantee of the most effective, quick silencer of noisy radio and TV controls — the quality product that is a top value.

Get Quietrole at quality jobbers. Some territories still available for experienced representation.



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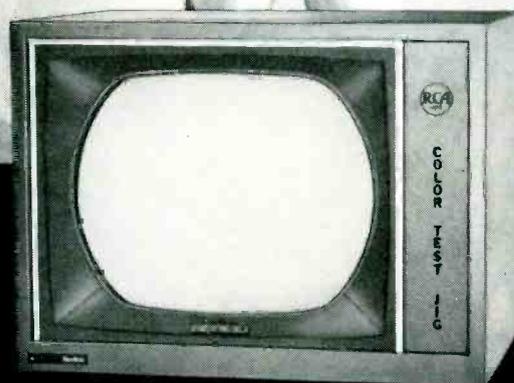
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ELECTRONIC TECHNICIAN

It used to take 2 men to pull
a color TV set into the shop...



BUT NO MORE



RCA COLOR TV TEST JIG

Cuts your manhours on Color-TV home service calls

Here is a real "must" for anyone servicing or planning to service color TV sets.

No longer must you send two men to a customer's home to pull in his entire color set. Now, one man can simply remove the chassis and bring it back to your shop for testing, troubleshooting and alignment in your RCA Color TV Test Jig.

Look at some of the extra advantages built into this money-saving unit:

- **Minimizes costly damage claims.** Pulling chassis eliminates possibility of scratching or damaging a customer's cabinet when transporting it to and from his home.
- **Saves time.** Eliminates need to reconverge a customer's set when chassis is returned. Convergence control panel on Test Jig provides static and dynamic convergence for CTC-10, 11, 12 and 15 chassis.
- **Versatile.** Can be used with CTC-4, 5, 7, 9, 10, 11, 12 and 15 chassis.
- **Safe.** Supplied with factory-installed safety glass and kine mask.
- **Complete components kit,** supplied with unit, provides all necessary service components and instructions for installing RCA Color Picture Tube.
- **Professional appearance.** Finish matches that of your other RCA test instruments.

The RCA Color TV Test Jig is available through your Authorized RCA Parts and Accessories Distributor. See him this week to find out how this versatile instrument can help you capitalize on the growing Color TV servicing market.

For information on where you may obtain the RCA Color Test Jig, and for additional specifications, fill out and mail the coupon below.

RCA PARTS AND ACCESSORIES, CAMDEN, N.J.



The Most Trusted Name in Electronics

RCA Parts and Accessories
P.O. Box 654, Camden, New Jersey

Please send me full specifications on the RCA Color TV Test Jig, Stock No. 11A1015A, and the name of the nearest distributor where I may obtain it.

Name _____

Company or Service Shop _____

Address _____

City _____ Zone _____ State _____

Winegard

Dealer of the month

Lloyd Shankle says, "The Winegard antenna is easy to install, well built for wind areas and out performs other types of antennas."



Winegard salutes
Shankles United TV
of Fort Collins, Colorado

Mr. Lloyd Shankle, known to customers as "Red", has operated a very successful appliance and service business for 12 years. Based at Fort Collins, he covers an area of 25 miles.

Fort Collins is the home of Colorado State University so Red Shankle has the advantage of employing part-time assistants who are students at the university. Mr. Shankle and his wife, Velda, run the business.

He reports outstanding performance from the Winegard C44-C43-C42 antennas. He says, "The Larimer County Hospital has a C44 with a booster and 70 outlets and we are getting good reception on all channels."

He adds, "The Winegard is easy to install, well built for wind areas and out performs other types of antennas. I have installed these antennas in homes, hospitals and hotels, also on Colorado State University buildings."

"The quality of Winegard equipment is good—which I feel is very important for any business large or small. I can stay in business by selling Winegard—top quality material."

Winegard Co.
Antenna Systems

D3019-D Kirkwood • Burlington, Iowa
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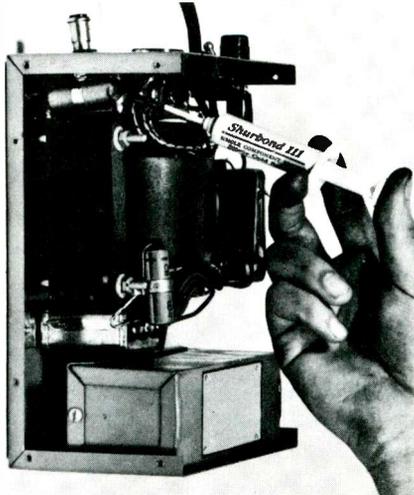
NEW PRODUCTS



provide mechanical retention prior to soldering. Center shields are of brass, hot solder dipped. Cinch.

EPOXY SOLDER 222

A one-component epoxy silver cold solder is announced. It is said to bond the most delicate electronic



devices without mess, heat or soldering irons. The all-in-one conductive compound comes already combined with the hardener, requires no heat or tools to apply and hardens at room temperature in 24 hours, the report said. Anchor Alloys.

PORTABLE RECORDER 223

A self-contained, portable, battery operated, transistor tape re-



recorder, model 101, is announced. It weighs 7 lb and uses "D" type flashlight batteries. Frequency response is 80-8000 cps, it is said. It can record from a radio, phonograph, or TV as well as the microphone by using a special input jack. The unit operates at 1 7/8 in./sec and will provide up to two hours playing time on a single 4-in. reel, according to the maker. The recorder measures 11 x 3 3/4 x 8 in. North American Philips.

TOOL CARRIER 224

A leather tool bag for TV-radio service, repair and maintenance work is introduced. Made of top-



grain cowhide, the upper section holds large tools, parts, meters, instruments, tubes, etc. Lower section has three sliding metal trays with a variety of divided compartments for small parts and tools. Available in black or ginger color. Outside dimensions: 17 x 11 1/2 x 5 1/4 in. Can be equipped with an outside pocket, for service books, manuals and papers. K. Leather Products.

STEREO ANALYZER 225

A portable FM servicing instrument, model MX129 is said to provide all of the signals generated by



the FM stereo station under crystal controlled conditions. A built-in meter, calibrated in db and P-P v, enables the user to set the left and right channels and 19 kc



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and costs me less*

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BOSTON— NEW YORK	20	5 hrs. 15 min.	\$1.80	\$2.10	\$2.30
LOS ANGELES— SAN FRANCISCO	28	9 hrs. 20 min.	2.10	2.45	2.80
DALLAS— SAN ANTONIO	10	7 hrs. 15 min.	1.90	2.15	2.45
CINCINNATI— LOUISVILLE	14	2 hrs. 40 min.	1.50	1.70	1.95

*Other low rates up to 100 lbs.



One of a series of messages depicting another growing service of The Greyhound Corporation.

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NEW

FROM

RCA!

5 TV

ALIGNMENT

PROBES

...for consistently accurate bandpass circuitry checks

At last . . . RCA puts into your hands complete equipment for overall alignment checks that pinpoint a faulty circuit accurately and rapidly in black-and-white or color receivers. No more temporary circuits with uncertain results. Use bandpass analysis easily on every job and cut out unnecessary component checks.

RCA provides you with five new clearly labeled alignment probes: (1) Video Detector Test Block (2) IF Test Block (3) Sound Detector Test Block (4) Mixer Grid Matching Pad (5) Tuner IF Input Head. All have "E-Z" Hook tips that practically eliminate accidental shorting of circuitry and simplify hook-up and disconnection. All are single unit construction, enclosed in a plastic case, with shielded leads.

RCA Alignment Probes . . . the essential service equipment! From your authorized RCA Parts and Accessories Distributor, or write RCA Parts and Accessories, P. O. Box 654, Camden 1, N. J.



The Most Trusted Name in Electronics

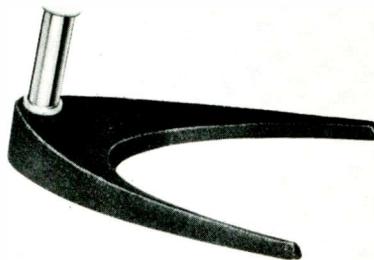
NEW PRODUCTS

pilot level, the report said. The meter can be used to read separation of the channels at the speakers or at other test points in the receiver. Price \$169.50. Sencore.

MIKE STAND

226

The model DS-14 microphone desk stand, designed to complement popular types of elongated micro-



phones, is announced. The desk stand includes a fine grain gunmetal shrivel finished base, styled in a contemporary motif, and a 3 in. polished chrome upright which terminates in a standard 5/8 in. - 27 accurately machined thread. Protective felt base pads prevent damage to table or desk surfaces, it was said. Atlas Sound.

... TOUGH DOGS

Continued from page 62

left connected to the plate of the tube. When the set was switched on the next time, the ripple was observed on the scope even before the circuit had warmed up to normal temperature.

This led to the solution of the problem. All the screws around the printed board were tightened and a couple of grounding wires were taken from the print ground to the main chassis for good measure.

The ac was completely eliminated.—*R. S. Bartlett, Windsor, Ont., Canada.*

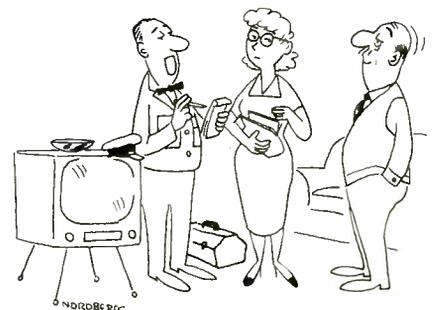
NEW BOOKS

CLOSED CIRCUIT TV SYSTEM PLANNING. By *Morris A. Mayers and Rodney D. Chipp.* Published by *John F. Rider Publisher, Inc.* 250 pages, hard cover. \$10.00.

Closed circuit TV installations continue to increase in factories, in offices, schools, hospitals, department stores and many other business and industrial areas. This book provides the information needed to decide intelligently where and how a particular organization can best use CC-TV. It discusses system concepts in detail. It is neither an engineering nor a technicians' text—especially written to give management the facts—but it can be used profitably by TV-radio technicians who sell, install and maintain CC-TV systems. The text is divided into three parts. Part I covers applications of CC-TV; Part II tells how CC-TV works and Part III deals with equipment. Everything you need to know for answering prospective customer questions will be found here. And you will find a lot of idea-triggering information to help you make a success of the business.

BASIC TELEVISION PRINCIPLES AND SERVICING. Third Edition. By *Bernard Grob.* Published by *McGraw-Hill Book Co., Inc.* 653 pages, hard cover. \$11.95.

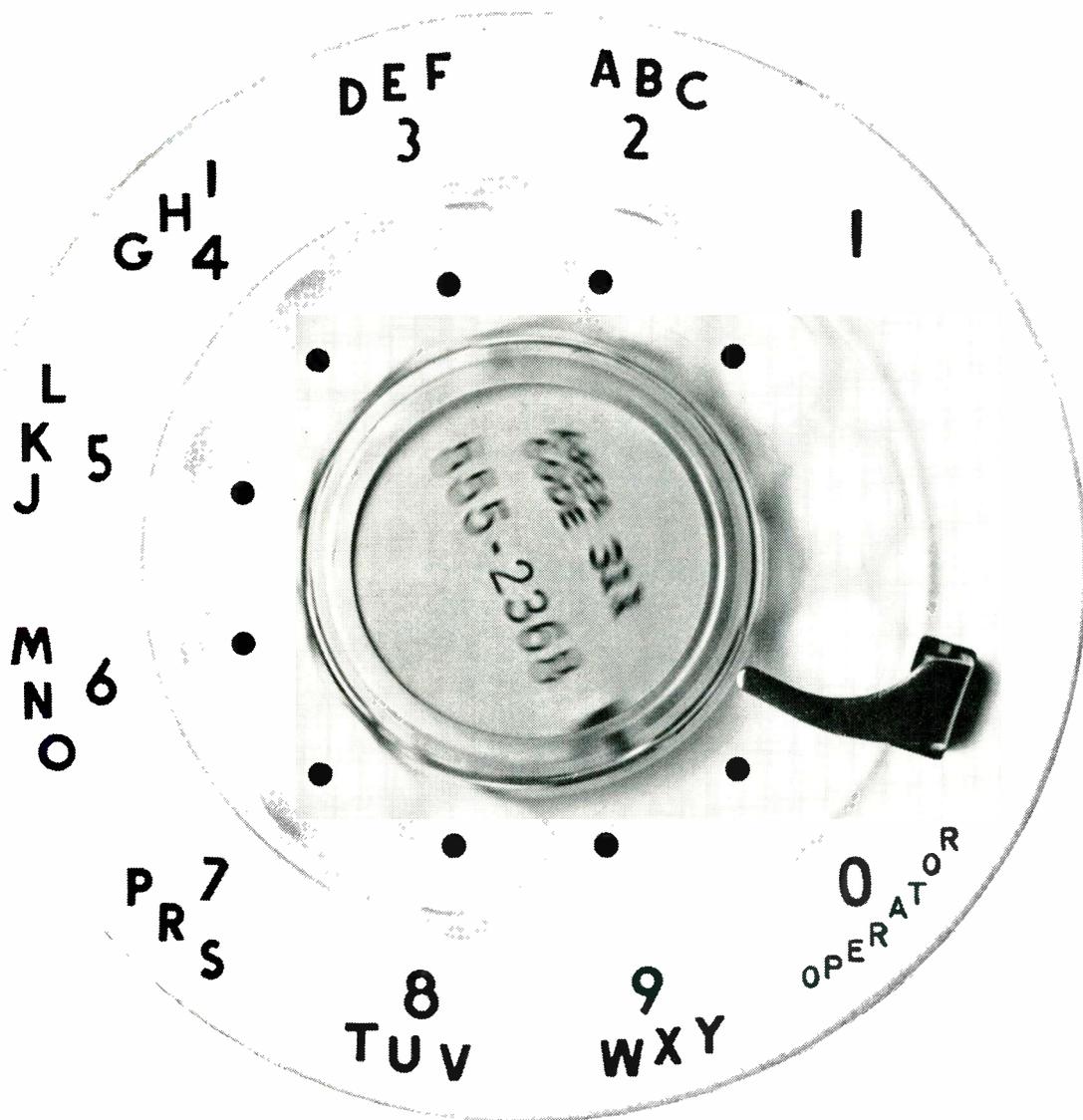
Fast-moving space-age developments have created a relatively long time-lag between the lab, the field and printed page. Hence, frequently revised and updated texts are necessary to pace new technological con-



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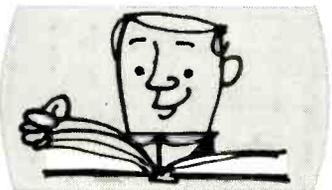
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*That's if you're in the Yellow Pages. If not, call your Yellow Pages man — he's in the Yellow Pages under ADVERTISING — DIRECTORY & GUIDE. - - - for more details circle 10 on post card

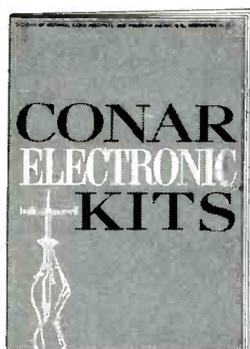
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NEW BOOKS

cepts. This is a thoroughly updated, revised and expanded edition of a book first published in 1949. Reflecting latest TV advances, this edition contains many pages of additional material. The color TV section is double that of the previous edition. New material covers VHF and UHF tuners and remote control equipment. The book is arranged clearly and logically, progressing from simple to more advanced concepts in a gradual, easy-to-understand manner. The 25 chapters are, in effect, a TV technical encyclopedia. The chapter on TV servicing gives symptoms followed by analysis steps. Brief summaries, self-examination and essay questions appear at each chapter ending. The book is designed to provide maximum aid for students and expert technicians too. It is profusely illustrated with photos, drawings, schematics and charts. A cursory review indicates that we can recommend it without reservation—despite some redundancy reminiscent of formalized writing styles pre-dating the space-age knowledge-explosion.

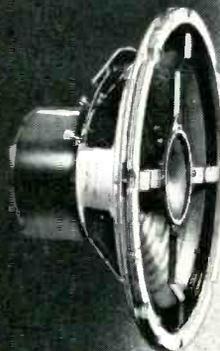
MARINE ELECTRONICS HANDBOOK. Second Edition. By *Leo G. Sands*. Published by *Howard W. Sams & Co., Inc.* 288 pages, soft cover. \$4.95.

This is a revised and updated second edition of a book first published in 1959. While technical in nature, it is not limited to the technician. The boat owner will find it very valuable. Of particular



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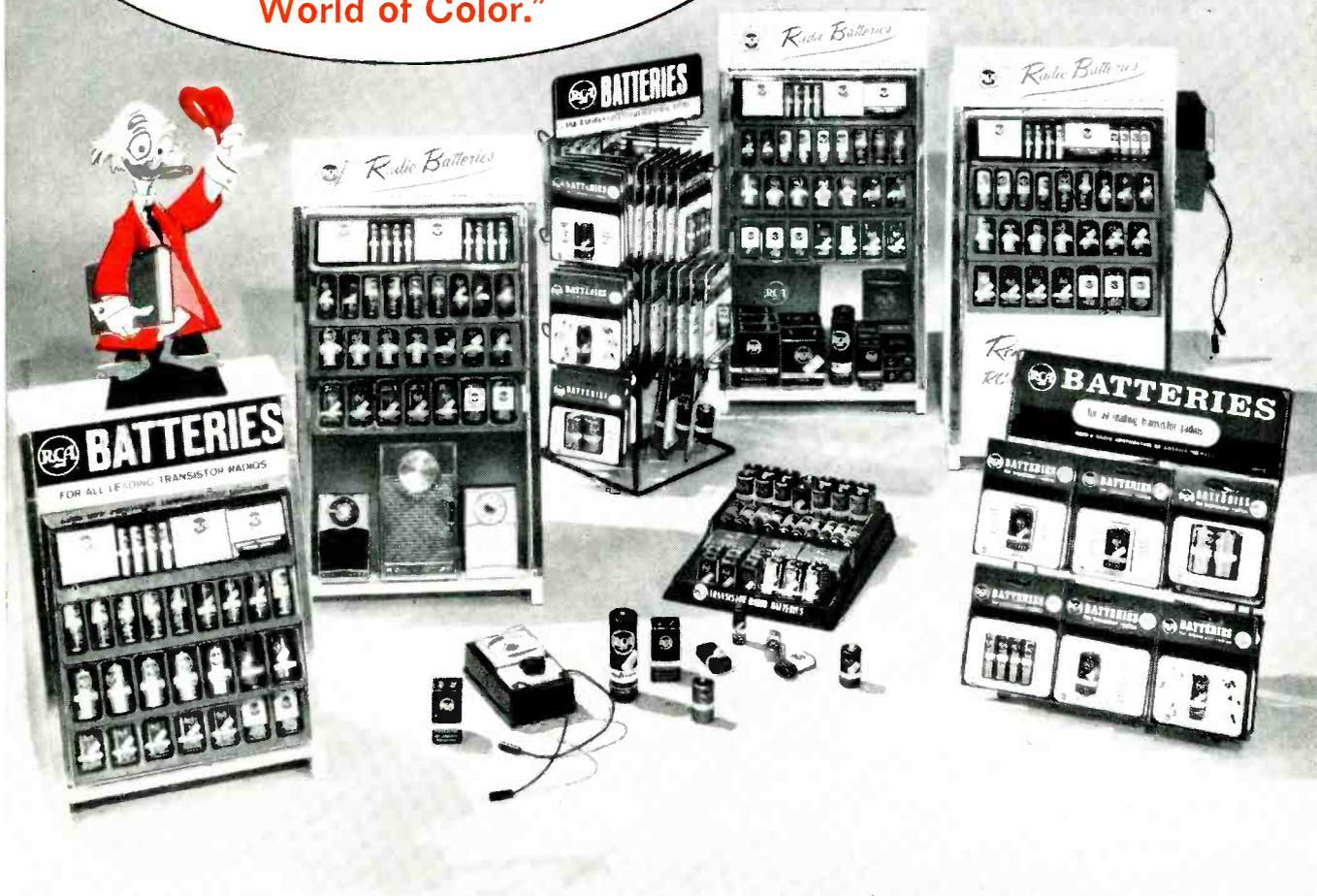
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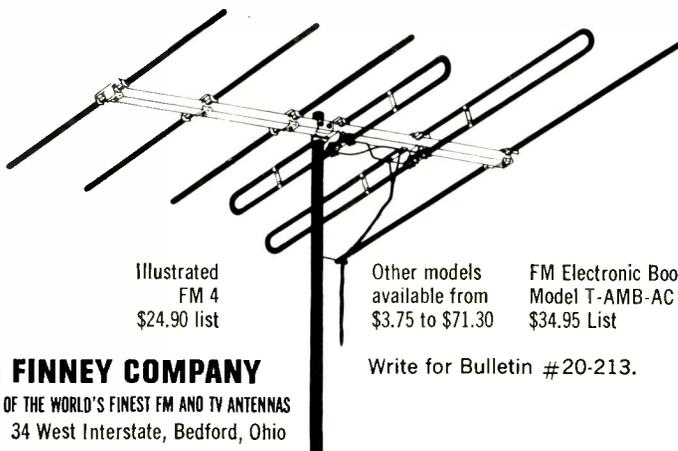
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interest will be the listing of Coast Guard Stations, monitoring the Safety and Calling frequencies, the stations transmitting weather and storm warnings and the listings of radiobeacon stations. The 10 chapters include those on MF/HF Radiotelephones, VHF Radiotelephones, CB Radio, Radio Direction Finders, Depth Sounders, Steering Devices, Rules and Courtesy, Marine Radar and others. The book is well illustrated with photos, schematics and drawings.

Color Song

Sing a song of color,
Red and blue and green —
Here's the worst convergence
My eyes have ever seen!
Dots to my left,
Dots to my right,
Doesn't seem to be a one
That looks as if it's white!

Sing a song of color,
Blue and green and red,
Ev'ry time I look at it
I wish I'd stayed in bed!
Twiddle with the amplitude,
Fiddle with the tilt,
Whoops! The slug's gone through
the coil —
The tool's up to its hilt!

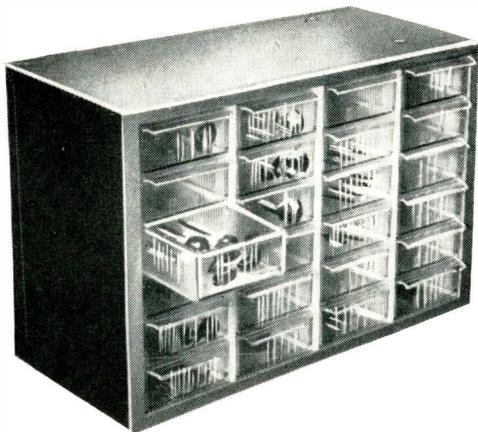
Sing a song of color
Red and green and blue,
Think I'll take it to the shop —
An overhaul is due:
Set the coils up inside,
Try the ones behind,
I hope it turns out fairly well . . .
Too bad I'm color blind!

Reg Bartlett

MOVING?

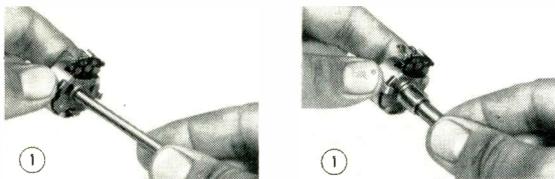
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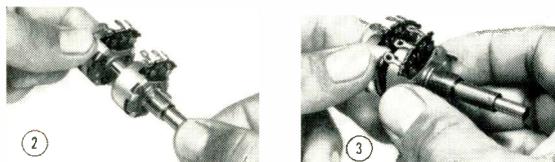


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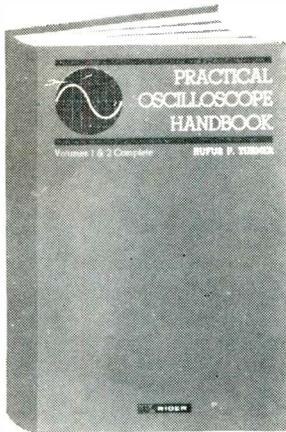
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VOLUME II considers the applications of the scope in industrial and scientific application. It gives unusually clear guidance in using the scope for specific tests and measurements covering such areas as measuring physical quantities (vibration, noise, acceleration, etc.); checking components (electronic and electrical); and checking performance of electronic and nonelectronic devices (from electrical generators to cameras and gas engines). While most of the tests described require relatively simple scopes, some require oscilloscopes having special features. Thus you have an excellent guide to the type of scope you will need for your work. #339 2 vols. paper, \$5.90; #339-H cloth, \$6.95.

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It Only Looks Like AGC

Three case histories show that classical AGC symptoms are frequently caused by other malfunctions

■ One of the more troublesome problems TV technicians encounter is in Automatic Gain Control circuitry. But time wasted in "running down" difficulties can be saved by learning to recognize the symptoms. Too often, what first appears to be AGC trouble, turns out to be an RF/IF component failure.

Case Histories

Take the case of a Zenith 19A20 chassis which came into

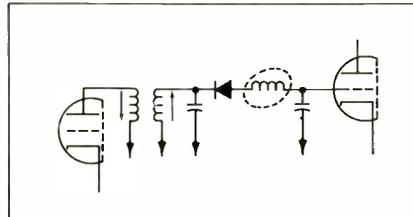


Fig. 1—Open RF choke caused a capacitor effect and cancelled out AGC.

the shop with a bad service history. The trouble looked like AGC—silvery picture, with loss of sync and a tendency to go negative. A cursory circuit check revealed no AGC, but with a good horizontal spike coming in.

When the AGC control was turned either way off center, the picture would come in faintly for a short time, then drift slowly back to the same symptoms. This indicated that the keyer wanted to go to work, but something was preventing it. The use of a bias box didn't help the picture, but it did apply AGC to the IF tubes and permit tracing video. There was a good signal to the detector, but nothing was coming out of the diode.

Digging a little deeper in this stage disclosed an RF choke running from the top end of the IF transformer and out the bottom of

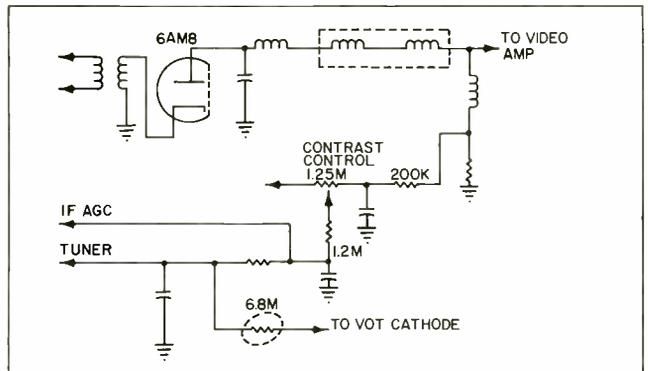


Fig. 2—Clamping resistor value changed with ambient temperature of set.

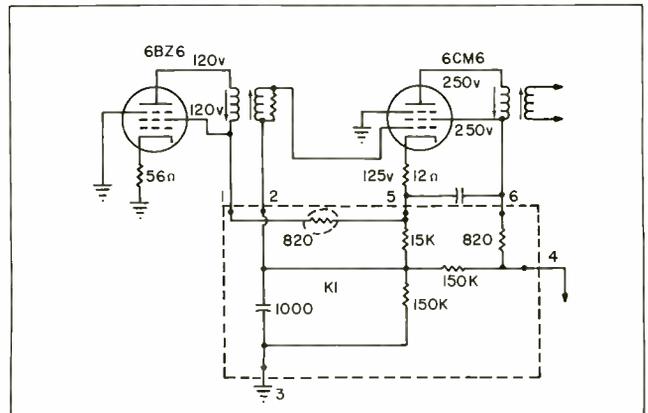


Fig. 3—Defective 820Ω decoupling resistor throttled AGC in this receiver.

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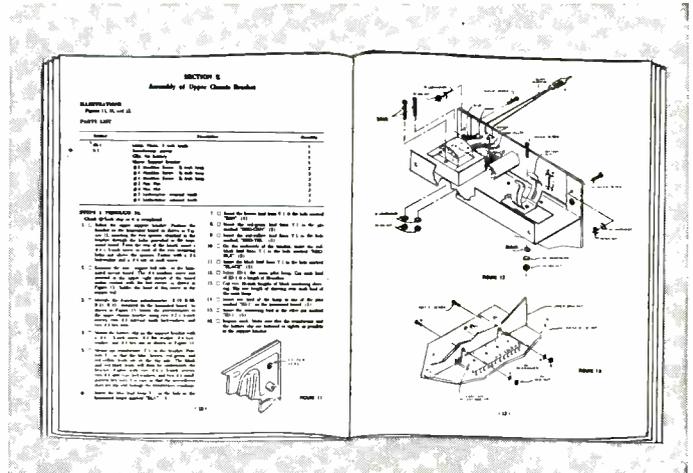
What's better about RCA test instrument kits?

Ease of assembly is one thing. Parts are clearly identified. Each assembly diagram appears on the same page as the step-by-step instructions for that section of assembly. There's no need to refer back constantly to other pages, which consumes time and increases the chance of error.

Ease of alignment is another thing. Each kit contains complete instructions for accurate calibration or alignment of the instrument. Where necessary, precision calibrating resistors are provided for this purpose.

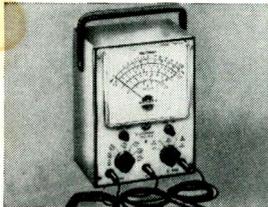
What does it mean? It means that with RCA kits you can get a professional V-O-M or VTVM for as little as \$29.95*. Or you can get a good oscilloscope (one of the most useful—but normally one of the most expensive—test instruments) for only \$79.50*

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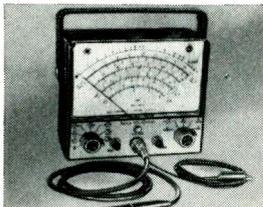


Each sub-assembly is described in a separate section with illustrations applying to that sub-assembly available at a glance. No cross referencing necessary.

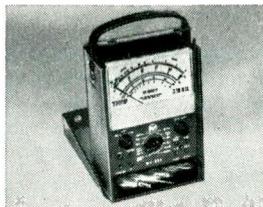
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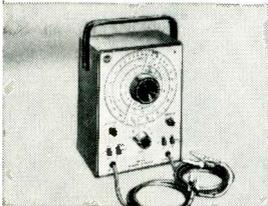
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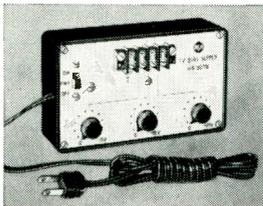
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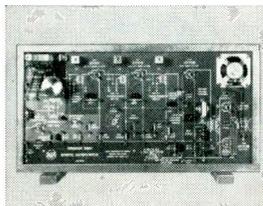
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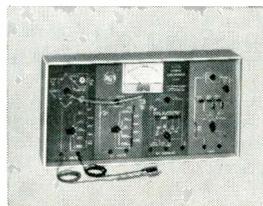
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the can to a tiepoint, then over to the video amplifier as shown in Fig. 1. The choke was open. Luckily, the end of the choke was showing just enough to latch onto and anchor it securely to the pig-tail. The receiver went right to work.

In another instance, a popular 19 in. portable (Philco 10H25 through 12J27 chassis) would play an hour or so and then suddenly go negative and develop a bad phase shift. This receiver group uses detected AGC and in check-

ing the schematic, Fig. 2, it was noted that a 6.8 MΩ ½ w clamping resistor went from the AGC line to the cathode of the vertical output tube. The resistor was changing value with the ambient temperature of the set. Replacing it resolved the problem.

Don't confuse this difficulty with a similar effect created by either the 12AZ7 or 6CG8, sync clipper and sound limiter, located on the lower panel just under the second video IF tube. When either of these tubes develops a partial

short in the sync section, there is a phase shift and an upset of AGC.

The circuitry of an RCA KCS-133A portable is shown in Fig. 3. The symptoms indicated AGC troubles on this set. It was a parallel heater receiver, so the keying tube was pulled. No change occurred in video response, contrast remained fair, but the picture had a tendency to pull and lose sync. The first IF grid has a minus 1½ v signal biasing. A bias box didn't change things.

Further checking showed this receiver's first two IF stages were cascaded. A voltage check disclosed that the first IF had only 50 v on the plate instead of the normal 120 v. The second IF had the normal 250 v. Its cathode, however, normally 125 v was only 75 v.

The coupling network for this circuit was a module (Fig. 3). In checking across points No. 1 and 5, it was found that the 820Ω decoupling resistor had greatly increased in value. By clipping out contact No. 1 of the module and soldering a new ½-w resistor from contact No. 5 to the PC board "button-hole" the set's operation was restored to normal.

This receiver had been in three other shops for the same problem. Giving the other shops the benefit of the doubt, maybe the resistor was changing in value; or the shop's line voltage (loaded down by other sets on the cooking bench), was too low to make the symptoms appear. But if the difficulty, as the customer explains it, doesn't show up in a couple of hours' running time, however, it's advisable to use a variable ac supply and force the problem to reveal itself.

Older Circuits

There are many receivers still in use which have an AGC amplifier. This circuit can serve a triple purpose, as an AGC amplifier for a weak source of AGC, a voltage inverter and a noise canceller.

If the second detector has a positive output, obviously this voltage will have to be inverted for AGC. In some instances this circuit may be nothing more than an ac coupled plate-follower and used *only* to invert. In any case, it comes under AGC problems and should never be taken for granted or ignored. ■

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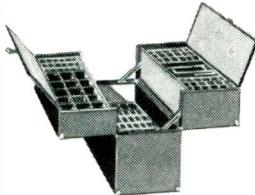
PART II LOOKING FOR A NEW LOCATION

Continued from March

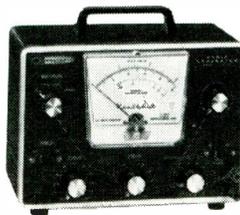
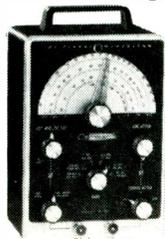
44. What is the road and highway pattern in relation to the shopping center location? What is the degree of accessibility from each direction?
45. What is the volume flow of traffic along the road network?
46. Does the traffic flow freely without congestion? What is the street's maximum traffic? Has it been reached?
47. Are there any physical geographic barriers in any of the trade area quadrants? Narrow roads? Lakes? Hills? Low speed areas? Will these discourage continuing patronage?
48. Will the cars entering and leaving the shopping center site impede traffic?

49. Is the site located away from the main intersection?
50. Is the site easy to enter? Is the traffic sufficient to require deceleration lanes? Are they being provided? Is the street or highway department cooperative in this respect?
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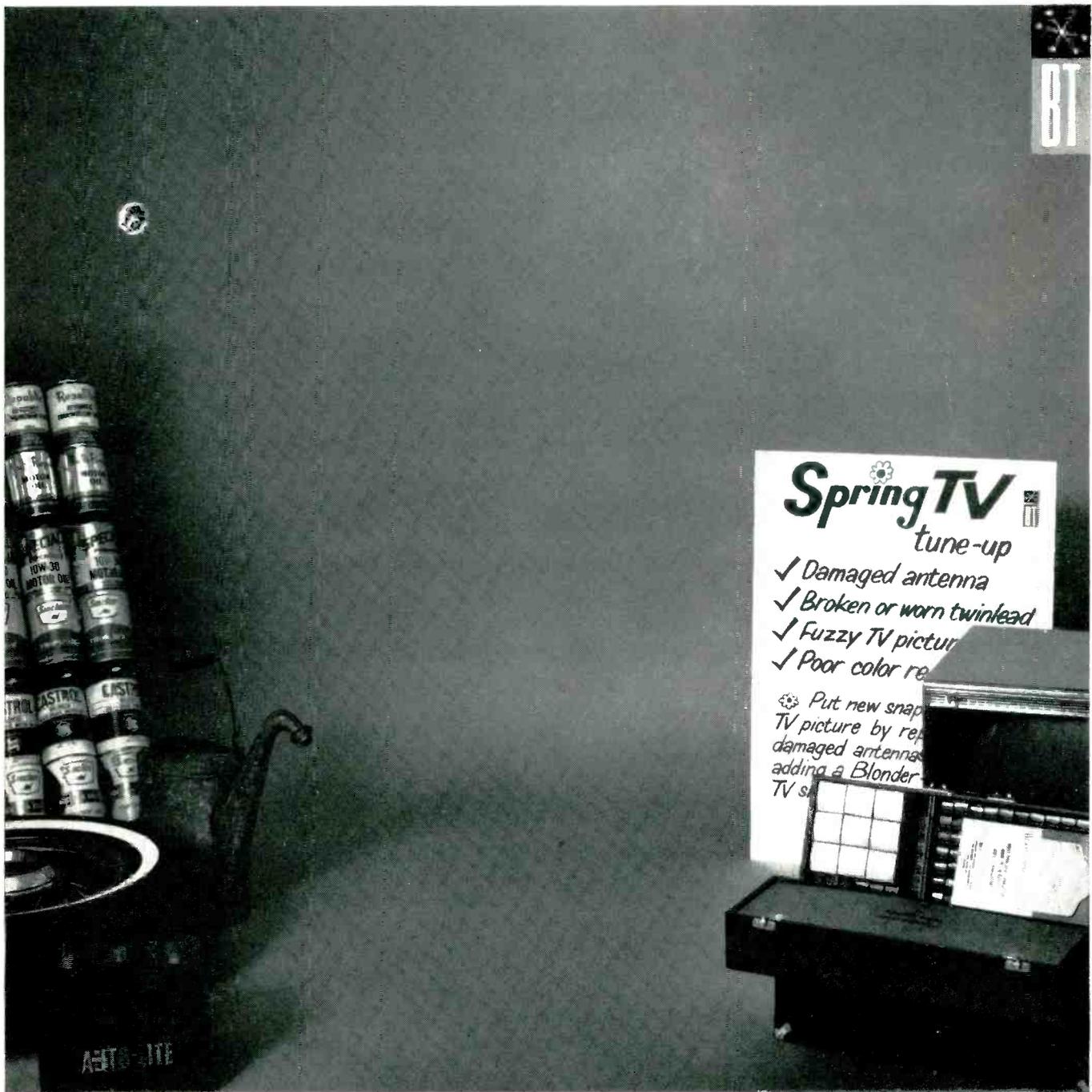
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55. Is the parking space designed so that the shopper does not walk more than 300 to 350 feet from the farthest spot to the store?
56. What is the angle of parking space? (90 degrees provides the best capacity and circulation.)
57. What is the planned or actual car turnover? (3.3 cars per parking space per day is the average.)
58. Is the number of total spaces adequate for the planned business volume? (Too many spaces make the center look dead; too few openly invite competition around the center.)
59. Does the parking scheme distribute the cars so as to favor no one area?
60. Is there an adequate number of ingress/egress roads in proper relationship with the arrangement of parking spaces?
61. For the larger centers, a ring road is preferable. Is this the case?

Size and Shape

62. Is the site large enough for the type of center?
63. Is the size sufficiently dominant to forestall the construction of similar shopping centers nearby?
64. Is the center of regular shape? If not, does the location of the buildings minimize the disadvantage of the site's shape?
65. Is the site sufficiently deep? (A depth of at least 400 feet is preferred; if less, the center



Gas Stations do a \$500,000,000 business by promoting spring tune-ups...

?

TV service dealers can do a multi-million dollar business by promoting **SPRING TV Tune-ups**. It's logical. Damaged antennas, worn twinlead, aging TV sets can use a freshening up after the long, hard winter. What better time than in the spring for the TV service dealer to promote a "Spring TV Tune up" special. Blonder-Tongue gives you a complete, straightforward promotion that means extra sales in antennas, twinlead, and profitable TV signal amplifiers. **It starts with a plan.** Sales aids, window streamer, local ad mats and business producing postcard for use by TV service dealers. **Then comes the most complete product line** in the

field; indoor and outdoor signal amplifiers—VHF, UHF and FM. For example, there's the new 2-transistor mast mounted UHF amplifiers (Able-U2) that really brings in all UHF channels. The lowest cost, full power two set TV signal amplifier for indoor installation (B-42) and the well-known outdoor transistor models (Able-2 and Able-1). **Add to this** a bit of your own energy, and you can rack up extra "Spring TV Tune-up" profits. Get details today from your Blonder-Tongue distributor or, write, wire, phone **BLONDER-TONGUE** 9 Alling St., Newark, New Jersey 07102 Canadian Div. Benco TV Assoc., Ltd., Toronto, Ont. home tv accessories/closed circuit/community tv/uhf converters/master tv



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City _____
State _____ Zip _____

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may look like a strip development.)

- 66. Is the site level? Is it on well drained land?
- 67. Does the center face north and/or east?
- 68. Can the center be seen from a distance?
- 69. Are there structures, such as a service station, located in the parking area? If so, do they impede the site's visibility?
- 70. Is the site a complete unit? (A road should not pass through the site.)
- 71. Are the buildings set far enough back on the site that the entire area may be seen?

The Center's Design

- 72. Is the layout of the center a strip, L, U, or mall?
- 73. Is the architectural design completely integrated?
- 74. Is the architectural style pleasing in appearance?
- 75. Will the design appeal to the type of customers in the trade area?
- 76. Does the design conform or harmonize with the styles of residential construction in the area?
- 77. Is the signing harmonious and controlled? Is there adequate signing to advertise the center as a whole?
- 78. What is the quality of construction?
- 79. Is there sufficient land area available for future expansion without encroaching on the parking area?
- 80. Are the buildings designed as continuous frontage, without setbacks? (If necessary, setbacks should be at the rear.)
- 81. Are the buildings designed on a modular basis of proper width? (Preferred width, 35 ft; depth, 100 to 150 ft.)
- 82. Does the design allow for flexible partitioning — to permit expansion of 17½ ft units to 35 ft units?
- 83. Is there a basement storage area?
- 84. Are the walkways covered with canopies?
- 85. Is there a driveway for package pick-up?
- 86. Have adequate landscaping plans been provided?
- 87. Are public restrooms and similar amenities available?

- 88. If the center is of mall design, can all the stores be seen from any one location?
- 89. Are all the stores readily accessible to each other, with none having an advantage?

**Table 2
Points to Consider in Evaluating
An Isolated Site**

- 1. Fast traffic or congested areas do not produce drop-in traffic. Traffic averaging 35 to 45 miles an hour is preferable. A feeder location would produce more potential customers than an arterial location consisting of fast, undelayed traffic.
- 2. A street where crossover is possible increases the number of directions from which a site may be approached. If the traffic speed or congestion is not great, a location on such a street is preferred.
- 3. The quicker the customer recognizes a site as that of a service or sales-service outlet, the better the chance of his stopping.
- 4. The site should be deep enough to allow adequate parking for peak customer use. If possible, a drive-around exit should be provided to service the building and allow the customer ease of exit.
- 5. An isolated site should be easy to enter and to leave. Ideally, the site should be free from curbs.
- 6. Parking space should be sufficient to allow ease of parking, turning around, and backing up.
- 7. Zoning regulations should permit the shop's sign to be seen.
- 8. A site along the traffic arteries where there is a high shopping trip frequency familiarizes the customer with the location and existence of the store. Knowledge of the retailer and his location is the first step toward the consummation of a sale.
- 9. Do not locate where traffic is congested as this affects the accessibility of the site.
- 10. Avoid locations adjacent to very fast, undelayed traffic.
- 11. Avoid areas which have a great deal of competition for customers from the same flow of traffic.

'Magic' Words FOR SUCCESS

Your courtesy and customer complaints can help build your business

■ No complaints? Maybe it's because you don't have enough business! And maybe the reason you don't have enough business is because you've been "serving" your customers with "half courtesy." Let's examine what this means.

Half Courtesy

Every electronic service shop owner knows that courtesy is an important part of his business. Too frequently only "half courtesy" is offered, however, and it produces the same results as a complete lack of courtesy. It is a habit we can slip into without realizing what has occurred.

"Half Courtesy" can be disastrous. Here, from a technician's viewpoint, are a number of "half courtesy" habits.

Talking too fast: It's easy to get into this habit which is not only annoying to many people but has a tendency to lead to misunderstanding.

Not paying attention: How often have we glanced aside at something else while a customer is saying we have heard a thousand times or which bores us stiff? It's a natural thing to do but it is still a "half courtesy" attitude.

Interrupting the customer: This one occurs most often when we are rushed or in a hurry and seek to deter a further "waste of time" in a conversation. Again it may be a small thing to us but it has major importance to that customer.

Gesturing wildly: Ever notice how annoying this is when practiced by a customer? "Thank heaven I never do that," one will say, but with the very next customer you'll start doing the identical thing!

Crowding the customer: Many people, particularly women customers, dislike the person who "crowds" them. Keep your distance with every customer.

Juggling: There are a lot of things which annoy customers. Juggling money or polishing glasses are definitely in that category. The man who, with hands in pocket, juggles coins, or does so with two or three he has in his hands during a conversation is practicing "half courtesy."

Failure to complete a service: No customer will ever tell us about this "half courtesy" and we will seldom realize that it is occurring unless we frequently check our actions for it. Such things as allowing a customer to pick up something we should have handed him or her, failure to completely package something, not holding a door open for the customer and overlooking a regular service routine fall into this group.

There are, of course, a great many other such "half courtesy" actions that decrease business possibilities every day. Constant examination of the things we do can help prevent them. Watching what others do also helps if the right approach is taken.

Customer Complaints

Every technician receives his share of complaints; some to his face, others to his employees and still others that his customers make to their friends and acquaintances.

It's natural that we want to minimize them; there has developed the idea that all is not well when complaints are being uttered by customers and a tinge of disgrace accompanies their existence.

This is far from true. The shop owner who has no complaints is the one doing the least business in town. Since no two customers are alike, it is almost impossible to develop a business system that will satisfy everyone and even the best system will show occasional weak spots. Customer complaints are the surest method we have of finding

these loopholes in our business structure.

Complaints should never be hidden. They should never be ignored. Most certainly the shop owner should never resent them.

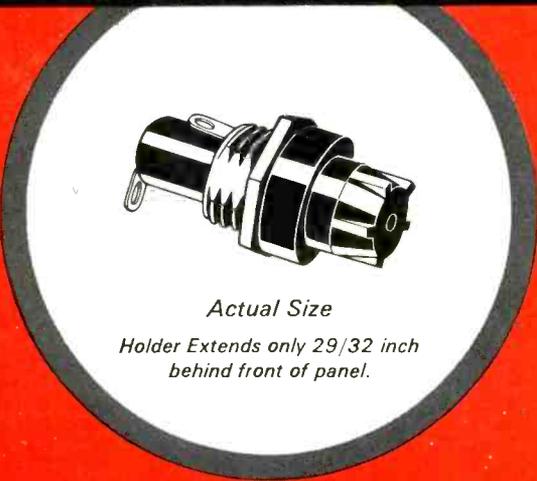
That's the advice given us by a number of successful shop owners with whom we have talked on the subject. All were emphatic in declaring that a complaint is our best opportunity to build customer friendship.

The shop owner who handles every complaint, no matter how trivial, with the maximum amount of sincerity and consideration, puts it to practical use in building a better business for himself. And, wise is he who profusely thanks every customer for his kindness and consideration in passing on the information. That is proof to the customer that we value his business and will do our utmost to satisfy him. Being resentful or obviously ignoring complaints (which in most cases are really suggestions) automatically tells that customer we care little for his business.

Most business today is on trust. The average customer seldom specifies in detail every purchase he makes; usually he orders service in general terms and leaves it to the shop owner to treat him fairly. Naturally he is going to be most on his guard when making first transactions; will be much more apt to criticize and complain about the kind of business he is patronizing.

"No businessman can ever really see the customers' side of their relationship," an executive told us some time ago, "because he is so engrossed in his side of it. Yet to be successful, he must know what his customers are thinking, how they react to his ways of doing business, what they think of the merchandise he has to sell. If he doesn't . . . well, then eventually he is lost." ■

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Actual Size

Holder Extends only 29/32 inch
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and Bud Weston, Commissioner Lee's engineering assistant, were also present. TAME plans carrying its fight to Congress and is arranging to appear before the committees headed by Sen. Magnuson (D-Wash.) and Rep. Rogers (D-Tex.).

Urges Licensing

NATESA executive director, Frank J. Moch, has urged state licensing for all TV-radio service dealers and technicians in Illinois, following a crackdown on one alleged 'gypping' service firm in Chicago by Illinois Attorney General William G. Clark. Moch said that licensing of the repair business "is the only sure cure and the only protection for the people and ethical businesses." The NATESA has tried four times to get a licensing law passed in the Illinois General Assembly but has been defeated each time.

New Office

Ojibway Press, Inc., business paper publishers and parent company of ELECTRONIC TECHNICIAN magazine, opens an office in San Francisco. Stearns R. Ellis is manager of all 26 Ojibway publications at the office.

Ups Color CRT Output

RCA announces that it will increase its production of color TV CRTs this year by more than 50 percent over 1963, but that it will have to continue allocating the supply to set manufacturers because output will still fall short of demand.

BUSS: 1914-1964, Fifty years of Pioneering...

NEWS OF THE INDUSTRY

Profits Rise

The Radio Corp. of America expects 1964 to be its third consecutive year of record earnings, Arthur L. Malcarney, RCA Group Executive Vice President, told the Cleveland Society of Security Analysts recently. Citing RCA's "rising curve of profitability over the past 18 months," Malcarney told the analysts that the company's 1963 operating earnings were up about 25 percent over those of 1962, on sales that increased by 2 percent. Subject to final audit, RCA's 1963 sales were about \$1,780,000,000 and its operating profits were about \$65,000,000.

TAME Meets With FCC

A delegation from TAME, Television Accessory Manufacturers Institute, met with members of the FCC in Washington for an informal exchange of ideas concerning the problems of CATV. Representing TAME were John Winegard and Robert Fleming, Winegard Co.; Morris L. Finney, Jr., Finney Co.; Sam Schlusel, Channel Master Corp. and Mort Leslie, JFD Electronics Corp., TAME's Acting Chairman. Present for the FCC were Commissioners Robert E. Lee and Kenneth Cox. A number of department heads

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Send us your requirements — we have the block you need or can engineer it for you.

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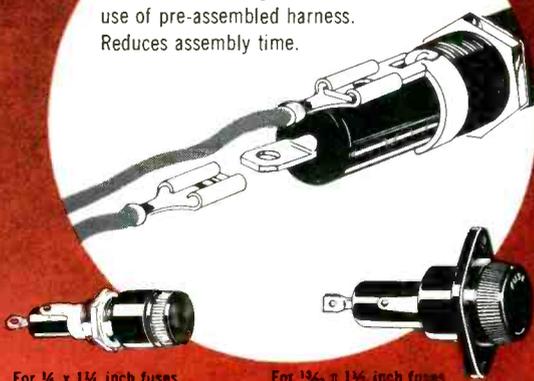
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Tongue Laboratories, Inc. Balash said that UHF offers the greatest profit potential to TV-radio dealers since the advent of TV. The sale of UHF converters and antennas alone during the period of changeover will create a 500-million dollar market, he estimated.

New Sales Record

The Radio Corp. of America announces that it established new all-time records in 1963 with sales of \$1,789,277,000 and after-tax profits of \$66,033,000. Earnings per common share for the year were \$3.61, compared with per-share operating profits of \$2.84 in 1962, the previous record year.

Chairman of the board, General David Sarnoff indicated that color TV became the most vigorous growth element in the consumer market and accounted for a major share of earnings from the company's consumer products. "No other investment in the company's history has more richly fulfilled our expectations, and we believe color's greatest period of earnings is ahead," General Sarnoff said.

JFD Sues

JFD Electronics Corp as plaintiff filed a complaint on January 28, 1964, against Channel Master Corp as defendant in the U. S. District Court for the Southern District of New York. The complaint charges that threats made by Channel Master with respect to the Log-Periodic antennas make it necessary for plaintiff to seek relief and have its rights declared.

...New Developments in Electrical Protection

Hoover Returns to EIA

William F. E. Long, director of the Electronic Industries Association's Marketing Services, announces that John S. Hoover has returned to the EIA's Marketing Services Department as manager of special projects and publications after serving one year as deputy executive director of the National Council of Architectural Registration Boards.

Publisher Expands

Supreme Publications is planning to enlarge its Chicago warehouse and incorporate required office functions there. Editorial work will continue to be performed at Highland Park, Ill.

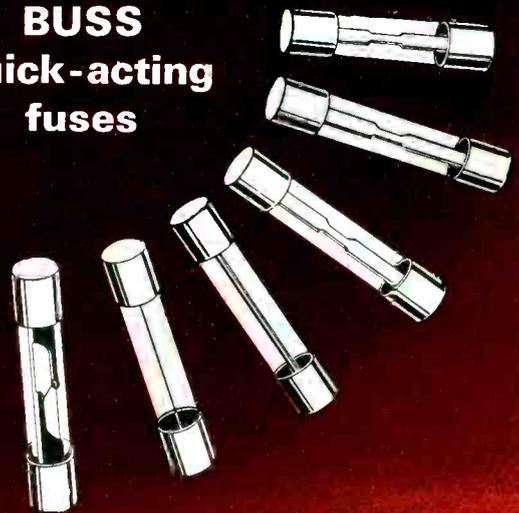
Retail Ad Program

The high fidelity products division of North American Philips Co., Inc., is unveiling a retail dealer advertising program for its line of Norelco tape recorders and accessories. Details of the dealer advertising program were outlined at a series of coast-to-coast meetings held by W. Semmelink, product manager, and J. Gerrity, sales manager, of the company's Hi Fi products division.

Predicts UHF Growth

By 1970 the number of U. S. homes being served by UHF television will be greater than those served by VHF, the annual conference of the National Appliance & Radio-TV Dealers Association was told by Jerry Balash, manager of home products for Blonder-

BUSS
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Quick Acting Fuses for protection of sensitive instruments or delicate apparatus—or normal acting fuses for protection where circuit is not subject to starting currents or surges.

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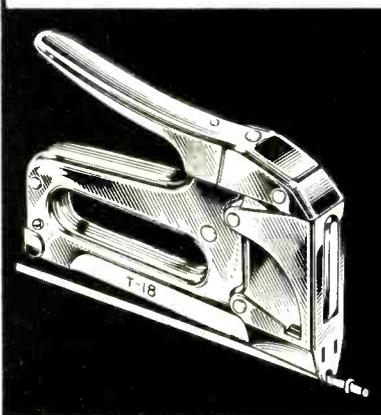
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by Allan Lytel

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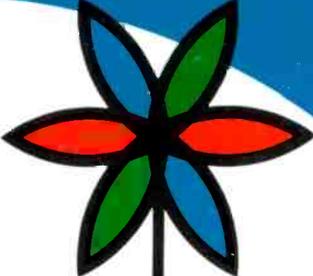
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