

ELECTRONIC TECHNICIAN



60¢
JANUARY 1963

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- 2 to 18 times better dielectric strength than other tapes.
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... for more details circle 25 on post card

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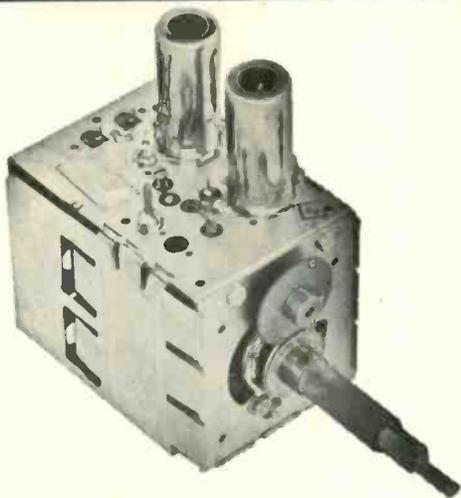
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Bloomington, Indiana

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(except tubes)
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ELECTRONIC TECHNICIAN and Circuit Digests, published monthly for Electronic Technician, Inc., Ojibway Building, Duluth 2, Minnesota. Single copies, 60c. Subscription rates: United States and Canada \$5 for one year; \$8 for two years; \$10 for three years. Pan American and Foreign countries, \$9 for one year; \$14 for two years; \$18 for three years. With subscription correspondence, include mailing label from most recent issue. Second-class postage paid at Waseca, Minn. and at additional mailing offices. Copyright 1963 by Ojibway Press, Inc., Duluth, Minn. Reproduction and reprinting prohibited except by written authorization of publisher. POSTMASTER: SEND NOTIFICATION (Form 3579) TO ELECTRONIC TECHNICIAN, 1 EAST FIRST STREET, DULUTH 2, MINNESOTA. If you have a change of address or a question about your subscription, write: ELECTRONIC TECHNICIAN, Circulation Department, Ojibway Building, Duluth 2 Minnesota. BE SURE TO SEND ALONG THE ADDRESS LABEL FROM YOUR MOST RECENT ISSUE.

January • 1963

Vol. 77 • No. 1

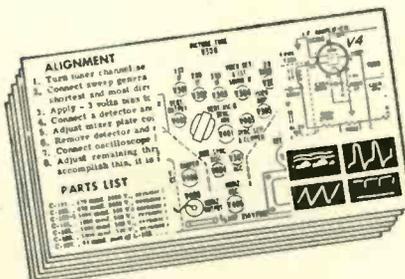
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CIRCUIT DIGESTS



PRECEDING BACK COVER

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- GENERAL ELECTRIC: AM FM Tuners, Chassis TU 220
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- SYLVANIA: TV Chassis 562, -3, -4, Models 23E01
- WESTINGHOUSE: TV Chassis, U- 2436



NEW VERSATILITY & COMPACTNESS in PROFESSIONAL TEST EQUIPMENT



AC VOLT-WATT METER #261

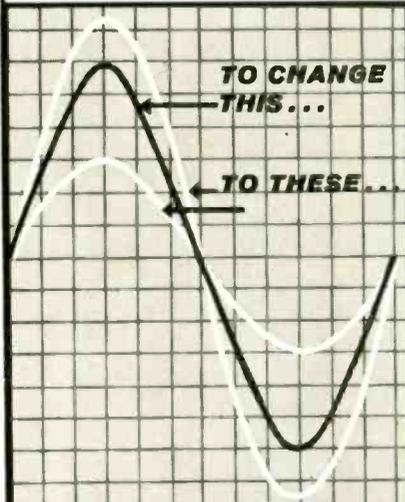
Formerly designated as #260
Kit \$49.95 Wired \$79.95



AC voltmeter and load-compensated audio-wattmeter of unique quality and accuracy. Measures AC voltage from 1 millivolt to 1000 volts in 11 ranges, and power from .015 milliwatt to 150 watts in 7 ranges, across standard loads from 4 to 600 ohms. The instrument incorporates a tapped power resistor load (4, 8, 16, and 600 ohms) to handle up to 80 watts of power on 8 ohms, and 40 watts on other taps. It may be switched to external load up to 150 watts. The meter is automatically compensated for any load selected, internal or external, to provide a single watt scale for all loads and ranges.

VOLTMETER: Ranges: .01, .03, .1, .3, 1, 3, 10, 30, 100, 300, 1000 RMS volts. Frequency Response: $\pm 0\text{db}$ 10c to 150kc, -3db at 500 kc. Input Impedance: 2 megohm shunted by 15mmf. Accuracy: $\pm 4\%$.

WATTMETER: Ranges: 15mw, 1.5mw, 15mw, 150mw, 1.5W, 15W, 150W. Frequency Response: $\pm 0\text{db}$ 10c to 100kc. Accuracy: $\pm 5\%$. Internal Loads: 4 (40W), 8 (80W), 16 (40W), 600 (40W). External Loads: 4, 8, 16, 600 (all to 150W).



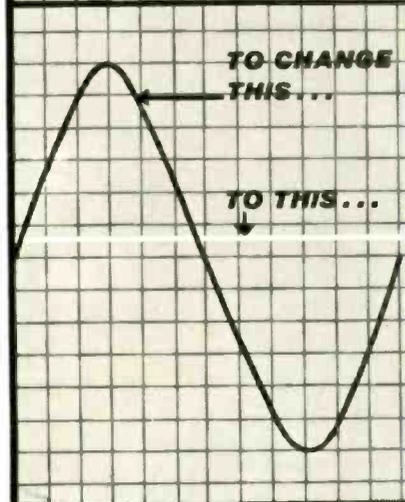
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METERED VARIABLE AUTO-TRANSFORMER AC BENCH SUPPLIES

1073 (3-amp rating)
Kit \$35.95 Wired \$47.95
1078 (7 1/2-amp rating)
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Connect to 60 cycle, 120 volt line and obtain any desired voltage between 0 and 140 volts. Highly efficient variable auto-transformer of toroidal core design gives you continuously variable output, linear versus rotation, with excellent regulation and negligible waveform distortion. Model 1078 permits either 50 or 60 cycle operation.



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Extra-Low-Ripple 6- and 12-Volt BATTERY ELIMINATOR AND CHARGER #1064

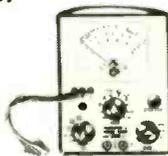
Kit \$45.95 Wired \$54.95

Connect to 60 cycle, 120 volt line and obtain highly filtered low dc voltage continuously variable over two ranges 0-8, 0-16 VDC. Heavy-duty pi-type LC filter is rated to take the full rated current output continuously (10 amps on 8V range, 6 amps on 16V range), reduces ripple as low as 0.3% at 2 amps on the 16V range. An essential instrument for servicing battery-operated equipment, including transistor or hybrid types, and an excellent battery charger.

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IN-CIRCUIT
CAPACITOR
TESTER #955
Kit \$19.95
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LETTERS TO THE EDITOR

There Should Be A Law . . .

Editor, ELECTRONIC TECHNICIAN:

Your July edition included the names and addresses of importers and supply houses of foreign transistor radios which you stated would help us as service technicians to obtain schematics and parts in order to service same.

Enclosed is a card from one of these importers refusing to furnish parts. Is this a sample of the service most of the suppliers of the foreign radios will give us? Is there not a law against selling a product such as this and not having available replacement parts for same? Please advise.

R. H. HUNT

Kennewick, Wash.

• We feel this problem can be solved best by close cooperation between distributor and service-dealer. Radios should not be sold to the public unless distributors and service-dealers can guarantee an easily available supply of replacements. —Ed.

Needs Scope Manual

Editor, ELECTRONIC TECHNICIAN:

I have been unable to locate an operating manual for a Du Mont scope, type 274. I need it very badly. They are out of print. Could any of your readers help me? I enjoy reading ELECTRONIC TECHNICIAN very much; especially the "Tough Dog Corner."

S. C. MACDONALD, JR.

Providence, R. I.

New Subscriber

Editor, ELECTRONIC TECHNICIAN:

I have been receiving ELECTRONIC TECHNICIAN for only a few months. I work on government equipment and also commercial work. I have found the schematics and articles to be very valuable in all my work. Since receiving my first copy of ET two persons in my shop have subscribed. I'm sure there will be more . . .

A/IC GRADY L. HARBIN

Mt. Home AFB, Idaho

Wants New Column

Editor, ELECTRONIC TECHNICIAN:

I enjoy your magazine very much. Could you in the course of time institute a "Theory and Law" column for FCC Commercial or Broadcast license holders? I believe it would help refresh our memories on electronic principles from

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Two outstanding products by the HIDDEN

600*

who plan for your future:



DIFILM[®] BLACK BEAUTY[®] CAPACITORS

molded tubular



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dipped tubular

TWO GREAT TUBULARS . . . TAKE YOUR CHOICE!

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- Sprague Difilm Capacitors can't be beat! Dual-dielectric construction combines the best features of both Mylar[®] polyester film and special capacitor tissue. And for additional reliability, Difilm capacitors are impregnated with Sprague's HCX[®], a solid impregnant which produces a rock-hard capacitor section—there's no wax to drip, no oil to leak!
- **BLACK BEAUTY Molded Tubulars** are actually low-cost versions of the famous Sprague high-reliability capacitors used in modern military missiles. They're engineered to withstand 105°C (221°F) temperatures . . . even in the most humid climates! And their tough, molded phenolic cases can't be damaged in handling or soldering.
- **ORANGE DROP Dipped Tubulars** are the perfect replacement for radial-lead capacitors now used by leading manufacturers of TV sets. Leads are crimped for neat mounting on printed wiring boards. Extremely small in size, they'll fit anywhere, work anywhere. And they're double-dipped in epoxy resin for extra protection against moisture.

*The "Hidden 600" are Sprague's 600 experienced researchers who staff the **largest research organization in the electronic component industry** and who back up the efforts of some 8,500 Sprague employees.

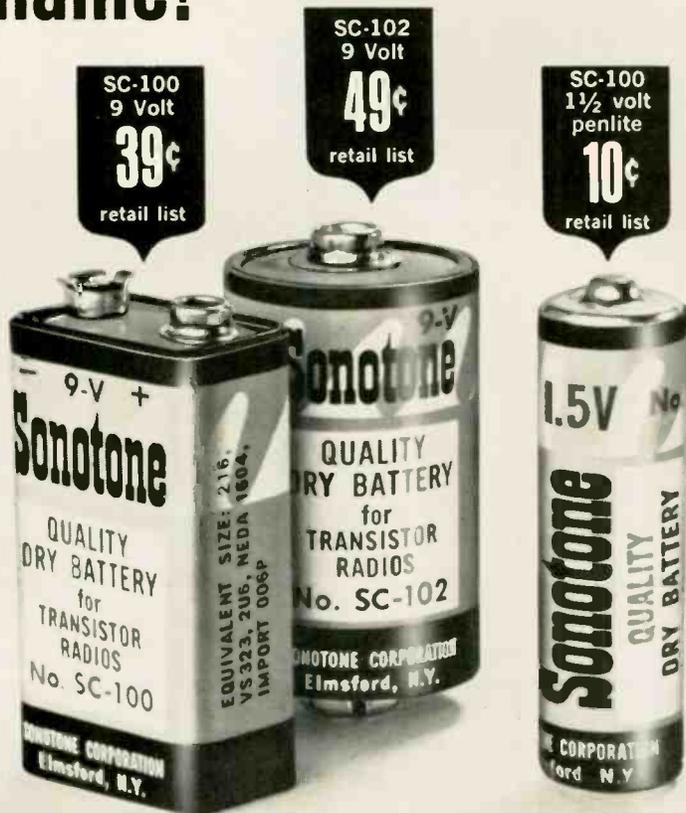
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famous
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They have a big edge on the wide variety of unknown, non-brand name imported batteries. Sonotone batteries bear our nationally advertised brand—assurance of built-in reliability and instant buyer response.

Put the two together—competitive price and nationally known brand name. It's the perfect combination to increase your battery sales and profits. The new Sonotone dry cell batteries are just in time for the holiday selling season. Contact your Sonotone distributor today.

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cartridges • needles • speakers • tape heads •
mikes • electron tubes • batteries • hearing aids

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LETTERS TO THE EDITOR

time to time and keep us up-to-date on FCC Laws and Regulations.

ROBERT E. LAWSON

Walker AFB, N. M.

• *Let's see what other ET readers think about this—Ed.*

Job Evades Technician

Editor, ELECTRONIC TECHNICIAN:

I have four years experience in military radar electronics, and experience in television servicing and electrical wiring. In spite of this, I cannot find employment. I have written numerous companies, and they either say I have the wrong kind of experience or they don't need me. I have an excellent record for the experience I have, including a military supervisor's letter of recommendation.

I have a straight "A" record for math through one year of college. I took a test when I finished high school when being considered for engineering school by an electric utility company. They recommended that I get into research—but didn't say how.

I often read about a shortage of electronics technicians, but I find it difficult to believe. I am wondering if I made a mistake in getting into the electronics field. . . . If my experience is insufficient, I feel sorry for the "green horn."

WILLIAM B. BRUBAKER

Iowa Park, Tex.

Needs Marine Instrument Specs

Editor, ELECTRONIC TECHNICIAN:

We have a complete electronics service department, three technicians, and repair anything in the electronics field. We have always experienced difficulty locating schematics for marine radio-telephones, fathometers, engine sync units, radio direction finders, etc. Any information along these lines would be appreciated.

GORDON F. FREEMAN

Bradenton, Fla.

• *Write to the equipment manufacturer for schematics and service data. If you do not receive it please let us know.—Ed.*

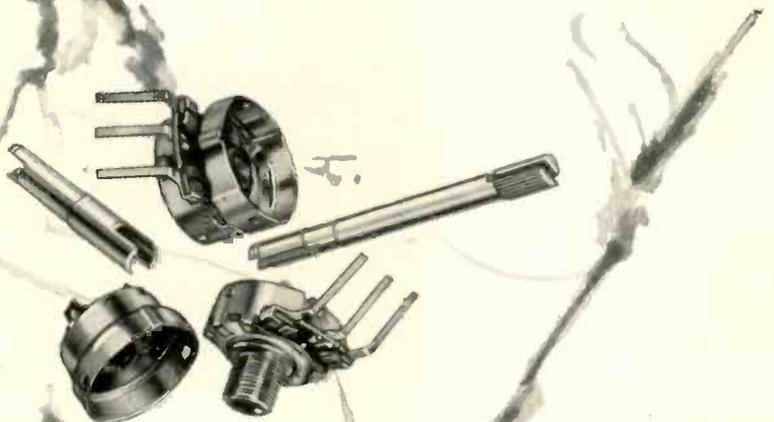
Disagrees With O'Kelley

Editor, ELECTRONIC TECHNICIAN:

I have read your fine November issue and ET VIEWPOINT with interest. I can't agree with Mr. O'Kelley on some subjects. I think the Distributors have

ELECTRONIC TECHNICIAN

you have this now...



you have this

10
SECONDS
LATER!

it's a **SNAP** *with* **CENTRALAB'S NEW FASTATCH® II**

B-6301

(see next page)

SARKES TARZIAN Silicon Rectifiers

are first choice among service technicians (according to nation-wide polls) for good and simple reasons:



Tarzian 400V and 600V "F" Series units in handy Ten-Paks, Doubler Replacement Kits, and in bulk



Tarzian 400V and 600V "H" Series units in handy Ten-Paks, Doubler Replacement Kits, and in bulk



- ★ They are immediately available from distributors throughout the nation
- ★ They are "handy-packed" in the quantities and sizes you need most
- ★ Their proven quality and dependability eliminates callbacks that waste your time and profits

A free Tarzian "Replacement Line" catalog is yours for the asking. It's your guide to replacement rectifiers with competitive prices, unsurpassed performance.

Write or call your nearest Tarzian distributor, or:

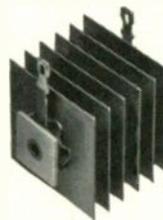


Tarzian's nine standard tube replacement rectifiers replace over 95% of all vacuum tube rectifiers

Tarzian M-500 and M-150 units in Conversion Kits and in bulk



Tarzian's four "condensed stack" selenium rectifiers fit small-size, high-efficiency applications



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— for more details circle 32 on post card

LETTERS TO THE EDITOR

done a great job but have brought on some causes for their failures. And they have hurt the service man by selling goods over the counter to anyone at wholesale prices. They even place large signs on the front of their business stating that they sell to anyone at wholesale. Now this has hurt us service dealers just as much as the drug store tube racket—not only the drug store but department store, hardware, grocery, and what-have-you stores. All have done their share in hurting service technicians. Some of the wholesale firms have served me well and I have good friends among them. Some have not served me so well.

Auto repair cannot be compared with TV-radio service. Here is what I mean. I was called on to repair a TV set that was dead. After replacing the fuse and checking for shorts, I made out a bill for \$5 for service, and 15 cents for a fuse. I handed the bill to the customer and left with a satisfied customer behind. On another call I noticed the fuse was missing from the set. After looking for some time around inside the cabinet, I started looking on the floor. There was the fuse—at the edge of the carpet. One of those lock-in fuses had come loose and bounced out without being noticed. I replaced it, handed the customer a bill for \$5 service, and left with another customer happy. Sometimes, though, a man spends quite a bit of time on a call and gets \$5. What has he made? He must sell some tubes to come out even.

I for one do not believe in service associations. They usually end up discriminating against the little man. They would be all right if run properly.

I don't think the profit on picture tubes is too high. I get from \$5 to \$7.50 for installing one. I would like to hear from some of your other readers on the subjects mentioned here.

O. R. HAYS

Sunnyvale, Calif.

Can Anyone Help?

Editor, ELECTRONIC TECHNICIAN:

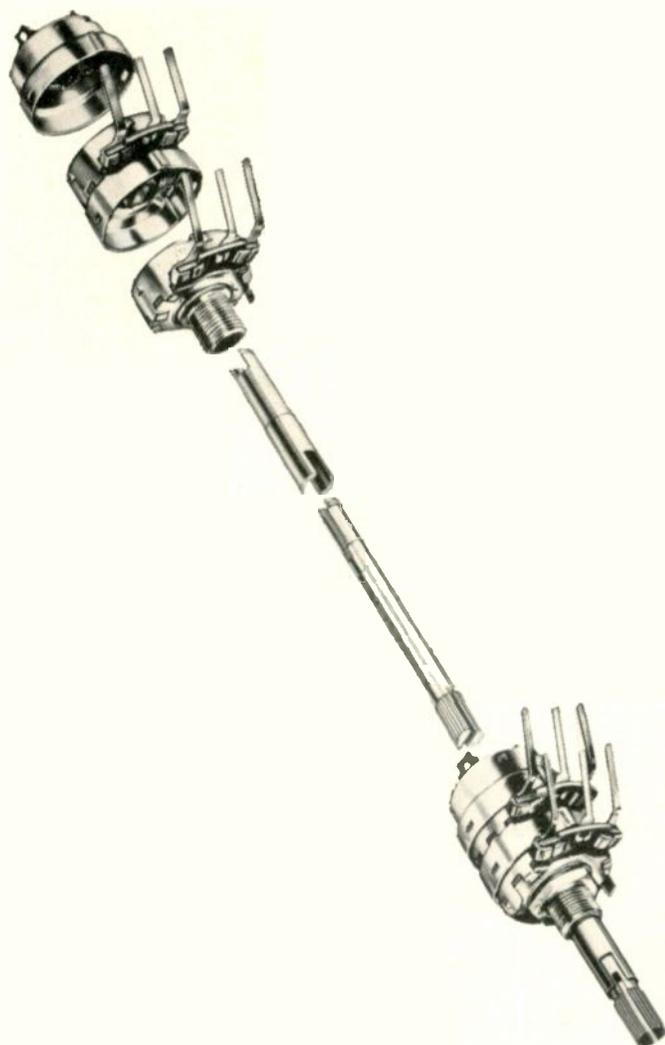
I am strictly a Marine and Industrial Electronics technician. I have worked on about every type of radar—commercial and government. I am a graduate of Ft. Bliss Surface to Air Missile School . . . I would like to know the name and address of the manufacturer and obtain a schematic for the cathode ray tube checker, marked "Hollywood Instrument Co., Model CRT-5A."

JOSEPH D. GUILLORY

Metairie, La.

• Can any reader furnish info on this equipment?—Ed.

Now in stock at your distributor



THE NEW FASTATCH® II

FROM CENTRALAB
GIVES YOU *complete instant exact replacement control coverage for dual concentric, single, and matched twin controls.*

Fastatch II gives you convenient and simple control assembly. Any control can be permanently assembled in seconds—no shaft cutting—no complicated alignment—no twisting. Just snap together and install. Your Fastatch II product will be identical to the manufacturer's original control. Check these FASTATCH II features:

- No shaft cutting . . . Exact replacement shafts are available for every application regardless of length or termination.
- Shaft won't loosen or pull out—permanent locking construction.
- Universal terminals replace all three types of printed circuit, wire-wrap and hole type terminals.
- No backlash on duals and twins.



NEW FASTATCH® II FRK-100 KIT

Everything needed to assemble an infinite variety of controls in seconds.

- 36 assorted front and rear controls in the 27 most popular resistance values
- 40 universal shafts
- 8 switches
- Current cross-reference guide
- Heavy-gauge steel cabinet.

B63C8

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TUNING IN

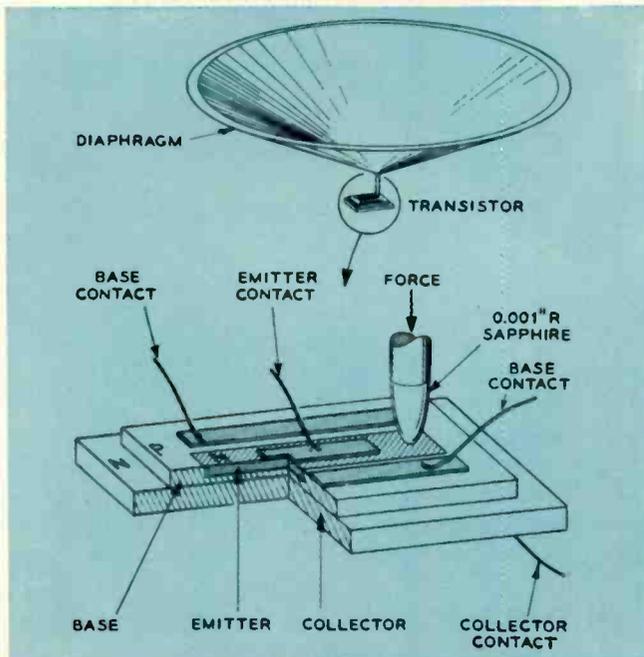
FACTORY SALES OF RADIO AND TV SETS in September were the highest reported for any of the first nine months of 1962, according to the EIA. Sales of radios, excluding auto radios, were 1,255,346 units, up from the 848,881 units sold in August. TV set sales numbered 731,100 units, up from the 518,000 of August. Sales of picture tubes also reached a nine-month high in September, when 866,512 tubes were shipped from factories. Sales figures for October will be released early this month.

REVERE CAMERA'S NEW MAGNETIC TAPE RECORDER, which can automatically play a stack of up to 20 stereo tape cartridges, will soon be marketed nationally. The recorder automatically plays the tape in each cartridge, rewinds it, drops the next cartridge into place and repeats the cycle. Each cartridge contains enough tape for 48 minutes playing time. Revere is a subsidiary of Minnesota Mining and Manufacturing Co.



"We're having a little trouble fixing your color set. Would you settle for three shades of gray?"

HIGHLY-SENSITIVE MICROPHONE

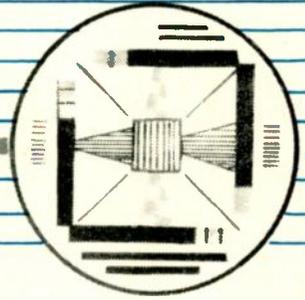


Bell Telephone Laboratories has announced a new type of microphone that acts as its own amplifier and is supposed to be at least four times more sensitive than the carbon telephone transmitter (the most sensitive microphone now in use). The new microphone uses no electromagnetic coils or carbon granules. Its main parts are a diaphragm, a sapphire stylus and a junction transistor. Acoustic energy is funneled through the diaphragm to the stylus, which transmits variations in pressure to the emitter surface of the transistor.

THE FUTURE OF THE SPEAKER industry looks "grim indeed" unless it develops products and programs better to serve its markets and takes steps to lift loudspeaker quality, William H. Bingham, of Hawley Products Co., told the EIA Fourth Loudspeaker Industry Conference recently. He said the current industry debate over a system for measuring and rating loudspeaker quality has laid bare three very important industry weaknesses: (1) lack of adequate testing equipment and facilities; (2) standard testing procedures; and (3) standards for measuring sound quality.

SYNCOM, TO BE THE FIRST HIGH ALTITUDE synchronous communications satellite, is undergoing final testing in preparation for launch early this year. Built by Hughes Aircraft Co. for the National Aeronautics and Space Administration, the satellite will go into an orbit 22,300 miles above the earth. At this altitude, the spacecraft's speed will match the speed of the earth's rotation, so Syncom will appear to hover above the earth giving uninterrupted service 24 hours a day. Hughes engineers are currently working on an

THE PICTURE



advanced Syncom which will have the capability of carrying 1200 two-way telephone channels or four TV channels.

TWO NEW COMPACT TRANSISTORIZED TV CAMERAS for closed circuit applications, have been announced by GE. Both models are 11½ in. long and 5½ in. in diameter, and weigh only 10 lb. The cameras' circuits are completely transistorized except for the vidicon pickup tube and a single sub-miniature tube in the video input section, according to the company. Video performance of the models TE-14 and TE-15 include center horizontal resolution of 650 lines, minimum; usable picture with scene brightness down to two-foot-lamberts; and high stability from regulated critical voltages and transistorization.

RADAR FOR SMALL CRAFT to detect landmarks, buoys and other vessels from as close as 30 yards out to 12 miles is being unveiled by Raytheon at the New York City Boat Show. The indicator unit uses a 7-in. picture tube and weighs 43 lb. It can be installed face

RCA GETS NATESA AWARD



RCA recently received the NATESA Friends of Service Management Award from Irving J. Toner, left, president of NATESA. The award, which cited RCA for "outstanding service in creating better customer relations," was accepted by Douglas Y. Smith, vice president and general manager of the RCA Electron Tube Div., and W. Walter Watts, and RCA group executive vice president.

CALENDAR OF EVENTS

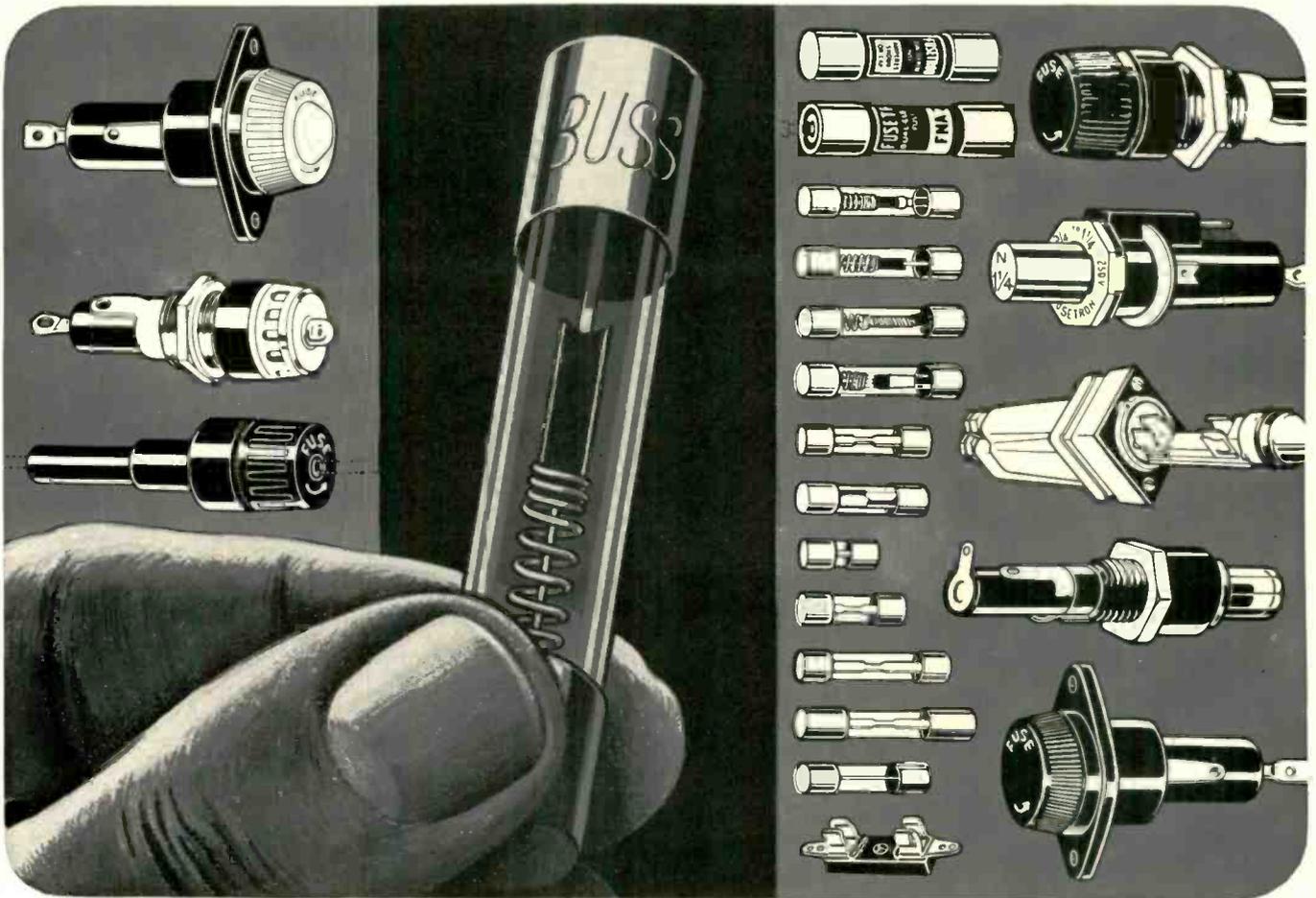
- Jan. 21-24: 9th National Symposium on Reliability and Quality Control, Sheraton Palace Hotel, San Francisco, Calif.
- Jan. 30-
Feb. 1: 4th Winter Convention on Military Electronics, Ambassador Hotel, Los Angeles, Calif.
- Feb. 4-10: Western Electronic Week, Shrine Exposition Hall, Los Angeles, Calif.
- Feb. 7-10: Pacific Electronics Trade Show, Shrine Exposition Hall, Los Angeles, Calif.
- Feb. 18-20: American Standards Association, Biltmore Hotel, New York.

up, vertically on a wall or inverted for overhead viewing. No complex waveguide is required to interconnect the indicator and antenna. Cost of the unit is less than \$2300.

BECAUSE OF THE TREMENDOUS GROWTH of CB radio in recent years, the FCC is preparing several rule changes which it hopes will better regulate the service. In 1962 alone, a total of 170,000 CB license applications were received by the FCC. Thus, the FCC feels it must tighten regulations to prevent the service from rendering itself useless. Some of the proposed changes are the shortening of time limits on conversations; prohibiting conversations concerning technical performance of equipment; communications to "any stations that might be listening"; and generally to spell out citizens band regulations by going into detail rather than rely upon general rules, which for the most part, now regulate CB.

DUE TO TECHNICAL DIFFICULTIES encountered during pilot production, RCA's Electron Tube Div. will be unable to deliver its new 90-degree round color picture tube as a commercial product this coming spring as originally planned. The notice, given to TV set manufacturers in December, said it will be another 9 to 15 months before reliability goals set for the new tube can be met. The 90-degree tube would considerably reduce the depth of color TV sets, which up to now use a 70-degree version.

THE FCC HAS SET APRIL 30, 1964 as the cutoff date, after which all TV sets shipped in interstate commerce, must meet the all-channel UHF requirements.



**For Every Electrical
Protection Need**
*there's a safe and
dependable BUSS or
FUSETRON Fuse!*

BUSS fuse engineers have consistently pioneered the development of new fuses to keep pace with the demands of the Electronic industry. Today, the complete line includes:

Single-element fuses for circuits where quick-blowing is needed;—or single-element fuses for normal circuit protection;—or dual-element, “slow-blowing” fuses for circuits where harmless current surges occur;—or indicating fuses for circuits where signals must be given when fuses open. Fuses range in sizes from 1/500 amperes up—and there's a companion line of fuse clips, blocks and holders.

**Save time and trouble
by furnishing only BUSS fuses**

It's more convenient to stock one line of fuses—stock handling, records and inventory problems are simplified. The unfailing dependability of BUSS fuses protects you against “kicks” or call-backs that might otherwise result from faulty fuses.

For more information, write for BUSS bulletin SFB.

**BUSS: The complete line of fuses and
fuse mountings of unquestioned high quality.**



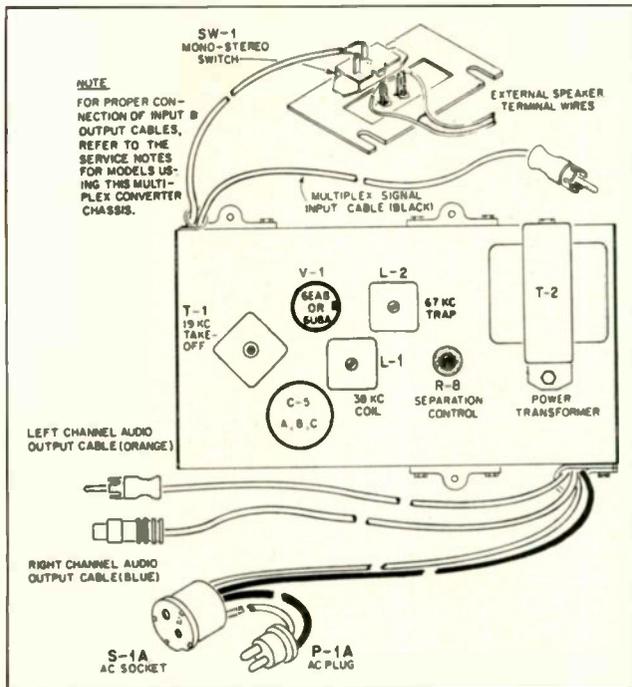
BUSSMANN MFG. DIVISION
McGraw-Edison Co.
St. Louis 7, Mo.

MANUFACTURERS TECHNICAL DIGEST

EMERSON

Multiplex Chassis 471362—Field Alignment

In the absence of stereo generator equipment in the field, the following procedure is recommended, and should be used only in instances where replace-



Tube and alignment point locations for Emerson Stereo Multiplex Chassis 471362.

ment of signal-carrying coils or transformers has been performed, or where the need for re-alignment has been definitely established.

1. Set audio signal generator at 67 Kc and align L-2 (67 Kc trap) for minimum scope output at the junction of C-9 and diodes X-3, X-4.

2. Inject a crystal-controlled or calibrated 19 Kc signal into the input of the adaptor and adjust top and bottom of T-1 and top of L-1 for maximum indication on scope.

3. The separation control is best adjusted by using a transmitted signal known to be modulated in only one channel. Connect the multiplex unit to the stereo FM tuner and the stereo audio amplifier and adjust the amplifier's audio balance control to give output only in the channel which should be silent. The separation

control (R-8) should now be adjusted for minimum signal in the unwanted channel.

GENERAL ELECTRIC

TV Chassis M597 Receivers—Tube Chart Error

Early sets in the M597 line have two errors in the tube location drawing on the cabinet back: At the bottom of the diagram is a reference to 5U4GB tube. This tube is not used but is replaced by silicon rectifiers. The 6EW6 3rd IF amplifier should read 6CB6. These errors have been corrected on later models.

MAGNAVOX

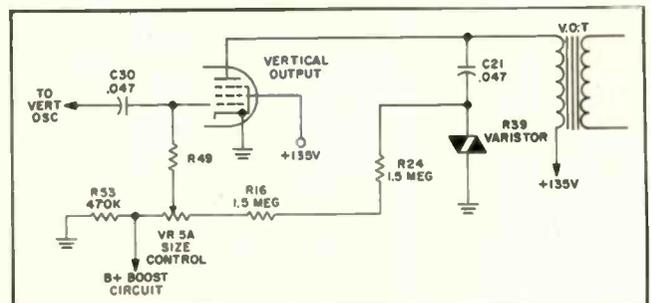
70-01 FM Multiplex Adapter—Reduction of Background Noise

70-01 FM Multiplex Adapter—Reduction of Background Noise R24 has been changed from 33K to 100K to eliminate background noise. Chassis incorporating this change are stamped 70-01-20.

PHILCO

TV Chassis 13G20—Varistor Damping

The varistor is a special fuse-resistor in the semiconductor family that decreases in resistance as the voltage appearing across it increases and vice-versa. This unique characteristic is used to: (1)—limit the maximum vertical pulse amplitude before application to the vertical output transformer, and (2)—adjust vertical drive to compensate for slight component value



The vertical size compensation circuit used in Philco 13G20 chassis.

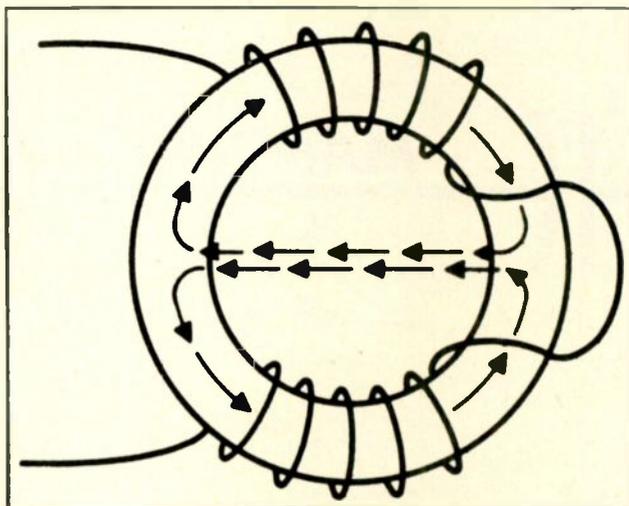
MANUFACTURERS TECHNICAL DIGEST

changes which occur as the set warms up.

The first of these functions, that of pulse limiting, is needed to prevent damage to the vertical output transformer caused by the extremely high amplitude vertical spike. It is accomplished as follows:

During pulse time, capacitor C21 connected to the plate of the vertical Varistor resistance decreases causing the capacitor C21 charging current to increase. Hence, the vertical pulse amplitude is reduced (damped) by the capacitor C21 and varistor R39.

However, during the time between pulses just the reverse situation exists. The potential appearing across capacitor C21 and varistor R39 is low. This low potential then causes the varistor resistance to increase. Hence the effect of the capacitor C21—varistor R39 shunt path is lessened resulting in no appreciable loading or damping of the sweep voltage during line time.

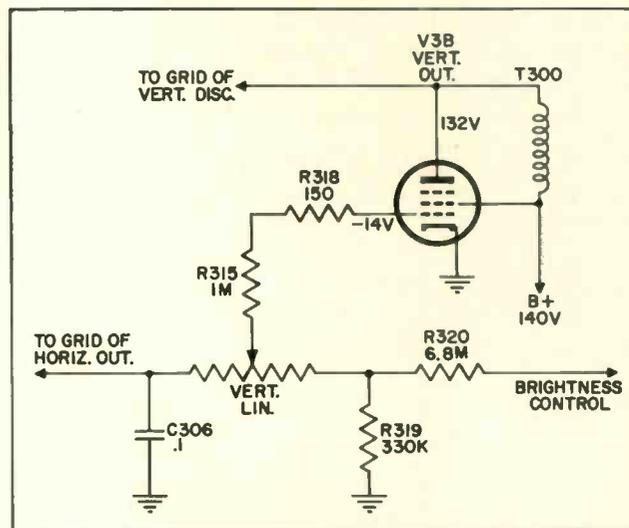


Method used to wind a toroidal coil.

WEBCOR

Model 2250 Tape Recorder — VU Meter Adjustment

The following procedure should be used to adjust the VU meter on this model: Remove the control knobs and control escutcheon assembly. Connect an audio signal generator to "Mic Input Ch. 1" jack (J2). Turn the tape recorder on and adjust vol. 1 control to at least $\frac{3}{4}$ of full clockwise rotation. Depress "Right Record Safety Lock" and move slightly to the right to lock in place. Rotate the "Monitor" control fully clockwise. Connect an a-c VTVM with at least 11 Mohms input resistance to "Ext. Amp. Ch. 1" jack (J5). Turn the meter selector control to "Ch. 1." Adjust the signal generator for 1000 cps and approximately 2 on the VTVM. Adjust the meter level control (R-28), on the mechanism chassis, until the VU meter reads 100 percent (0 db). Replace the control escutcheon assembly and the control knobs.



Vertical output circuit used in the Westinghouse V-2438 Chassis.

vertical output tube, one side of the vertical linearity control is connected to the grid of the horizontal tube. This bias makes the vertical output signal free from changes in amplitude and linearity when the vertical hold control is varied.

A 330K resistor and a .1 μ f capacitor filter the 14,750 component from the bias voltage.

WESTINGHOUSE

TV Chassis V-2438—New Vertical Circuit

A 17JZ8 compactron is used as a plate-coupled multivibrator in the V-2438 chassis with one part of the multivibrator serving as the output tube. The deflection yoke used in the chassis is not "saddle" wound as most yokes are. It is "toroid" wound.

The saddle wound vertical winding provides an L to R ratio of about 1 to 1 while the toroid vertical winding provides a higher ratio of about 2 to 1. By using a toroid type of winding, the higher L to R ratio makes the vertical winding less sensitive to heat. This in turn eliminates the previously-used thermistor across the vertical winding.

To provide a certain amount of fixed bias for the



"This little model tests volts, ohms, capacity, reactance, inductance, decibels, selenium silicon rectifiers, silicon and germanium diodes, has a built in signal generator and makes a good pot of coffee."

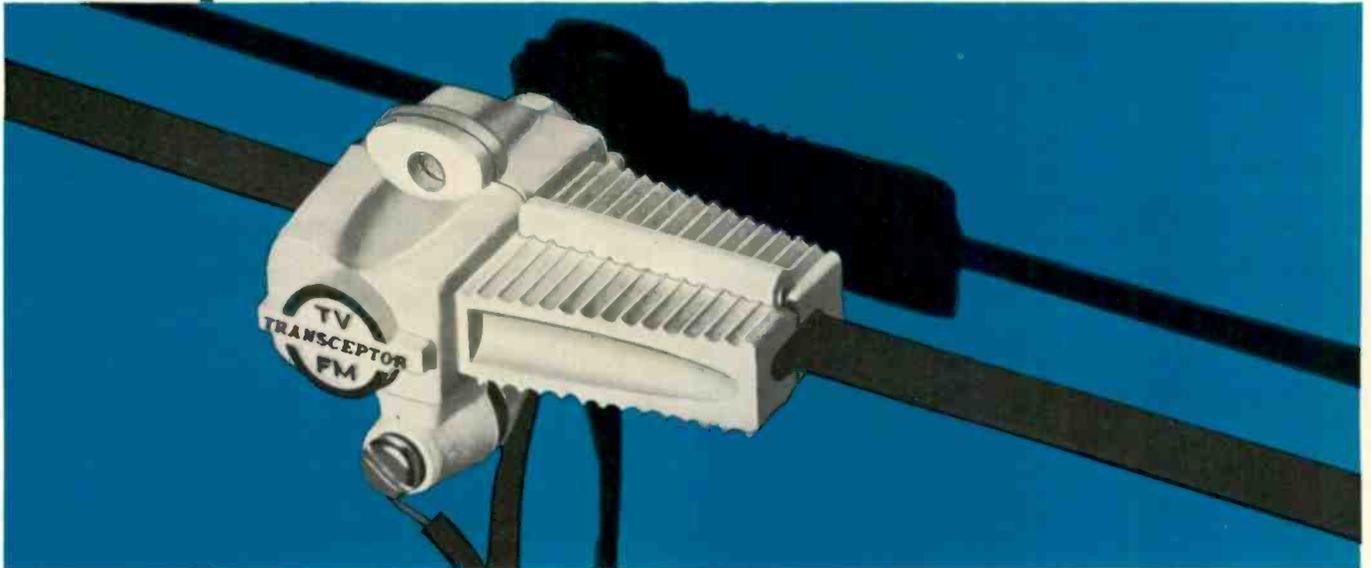


15,000,000 MULTIPLE-SET OWNERS NEED

TRANSCEPTOR®

THE HOUSEHOLD SET COUPLER

ANYONE CAN INSTALL IN SECONDS



- improves reception for additional TV, color TV, FM, stereo FM
- provides most efficient signal delivery
- automatically matches impedance
- proved in more than 50,000 installations
- snaps on without tools
- eliminates extra antennas, rabbit ears
- packaged and designed for consumer appeal
- more than 2 million new customers annually

Foolproof, simple, rugged TRANSCEPTOR was designed especially for the fifteen million multiple-set owners in this country. Now, with easy-to-install TRANSCEPTOR, they can run any combination of TV and FM sets — two or more, one at a time or all at once — *off one antenna* without amplification in normal signal areas. And, because TRANSCEPTOR uses electro-magnetic pick-up instead of resistance splitting of the signal, the line is not cut, there is minimum signal loss, and better set-to-set isolation.

Result: More customer satisfaction. More sales. More profits.

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LOS ANGELES 28, CALIFORNIA

**INSTALL
IN
SECONDS**



1. slide apart



2. slide on line

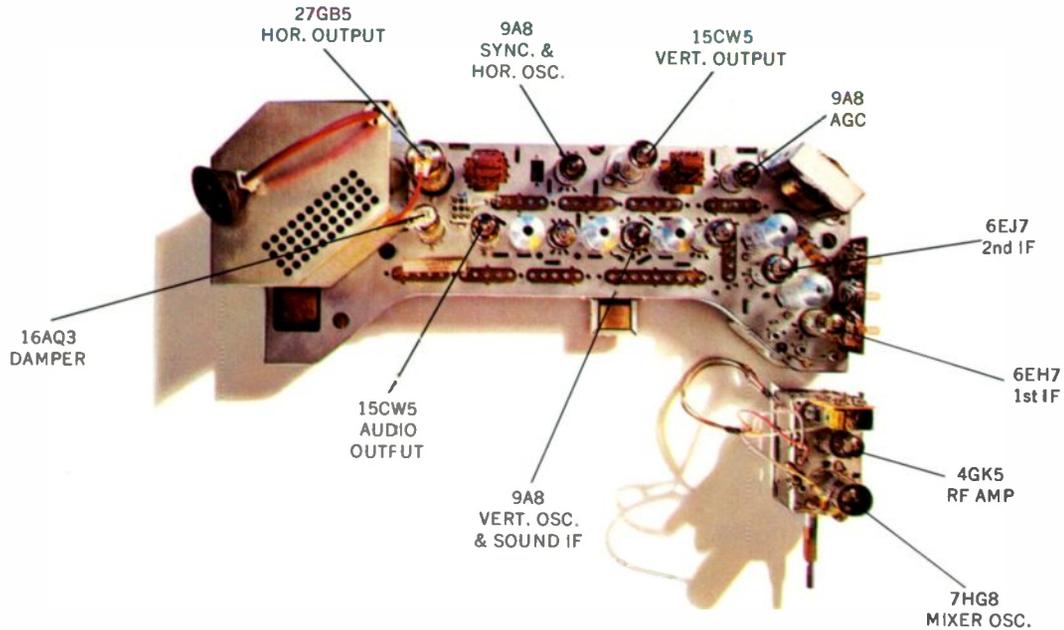


3. connect to set

--- for more details circle 10 on post card

Do you recognize this high-performance TV Chassis? Its design was made possible by the use of 11 Amperex tubes

IT IS USED IN EIGHTEEN DIFFERENT CURRENT MODELS



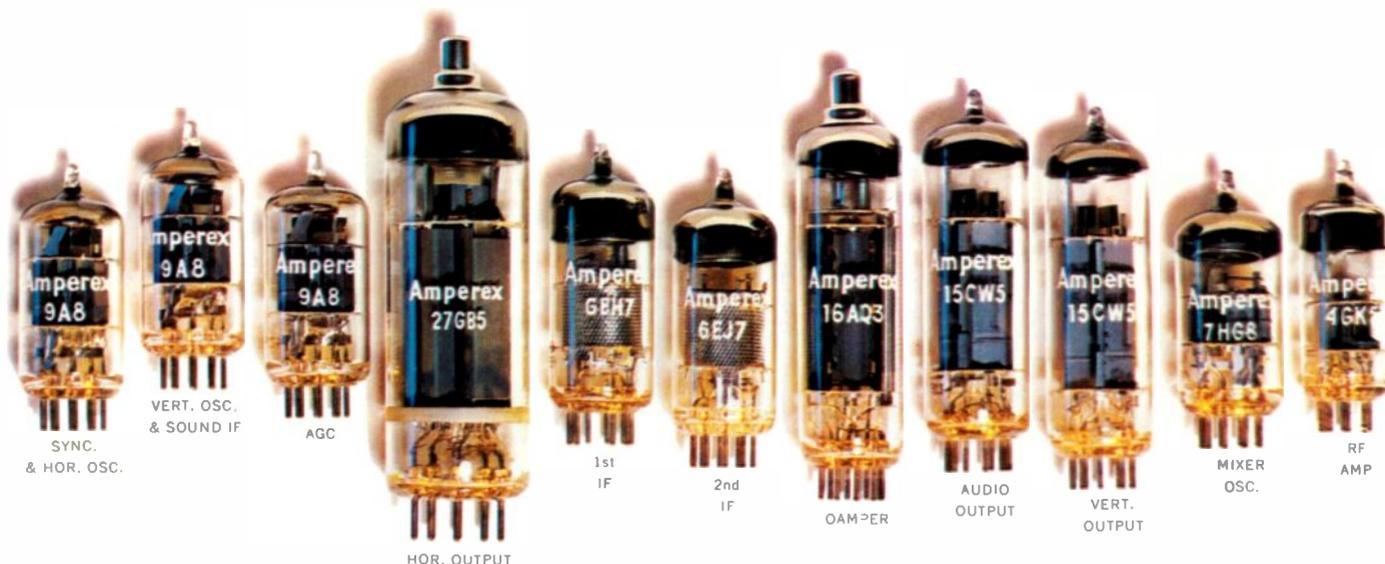
If you can give us the manufacturer's name and chassis number



you can win one of 10 model 23K95 Motorola Consoles

TURN PAGE FOR LINEUP OF AMPEREX TUBES AND
OTHER CLUES AND SIMPLE DETAILS OF CONTEST

These 11 Amperex tubes are found in the famous TV chassis shown on the reverse side of this page



Additional Clues:

Chassis uses total of 14 tubes plus 19⁺ CRT and 4 diodes in wired circuit.

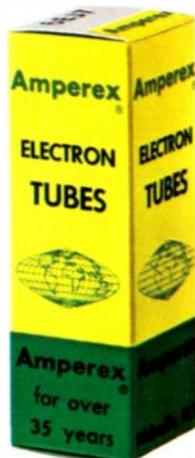
Manufacturer is famous Chicago producer of automobile radios as well as TV and Hi-Fi.

Suggested Reference Sources: "Previews of New Sets," PF Reporter, February, 1962; Sams Photofact Folder Set No. 577, May, 1962; December (1962) Circuit Digests, Electronic Technician.

10 Motorola TV Consoles and 100 Additional Valuable Prizes to be Awarded in First of Amperex Telequiz Sweepstakes!

- 1** Fill in attached entry card (or official entry card available from your distributor) with all information requested.
- 2** Remove card from magazine and mail. No postage necessary. Entries must be postmarked by January 19 and received by January 25, 1963. All entries with correct answers become eligible for drawing of prizes on January 28, 1963 in the offices of and under the supervision of the D. L. Blair Corporation, independent contest managers.
- 3** Telequiz Sweepstakes subject to Federal, State and Local laws and regulations. Winners will be notified no later than January 31, 1963.

Contest limited to TV service dealers and technicians.



Are you replacing top quality tubes with

low quality tubes? You can now carry the identical tubes that you find in most of the quality TV sets you're servicing.

For some time now, designers have been using many AMPEREX Frame Grid tubes in their quality TV chassis and we can tell you now that even more tubes originated by AMPEREX are being designed into more of the sets you'll be handling from now on.

We have decided that the simplest and most direct way

to bring this important information to you is through a series of interesting 'Telequiz' Sweepstakes Contests, with the world's most fabulous TV consoles ever built awarded as prizes.

If the Contest Reply Card has been removed before this magazine got into your hands, your AMPEREX distributor will provide you with an official reply card for your own use. Good luck and good servicing!

Good luck and good servicing!

Amperex Electronic Corporation, Hicksville, Long Island, N. Y.



FREE! ATTEND THE 1963 CAR RADIO SCHOOL IN YOUR AREA!

simply say **Delco**

Here's your chance to learn about the all-transistor 1963 car radios, including the new AM-FM models. At the free 3-day Delco Radio Training School soon to be held in your area, our engineers will teach you transistor fundamentals through interesting lab experiments. You'll learn voltage meanings. How to test Wonder Bar circuits and transistor portables. How to troubleshoot the new AM-FM car radios! Don't miss this opportunity to pick up the knowledge that'll make servicing the 1963 car radios a breeze. Be sure to check the schedule below. And to register for this school, see your United Delco distributor. Or contact Service Manager, Delco Radio Division, Kokomo, Indiana.



1963 Service Bulletins Now Available!

These service bulletin packs which describe the servicing of all 1963 GM car radios in detail are currently the only source for this information. You can get them through your distributor. Call him today!

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JAN. 21						SALT LAKE CITY
JAN. 28		MEMPHIS	CINCINNATI	CHICAGO	DALLAS (N)	
FEB. 4				MILWAUKEE		
FEB. 11			CLEVELAND		HOUSTON (N)	
FEB. 18	BOSTON	ATLANTA				LOS ANGELES
FEB. 25			PITTSBURGH	ST. LOUIS (N)		
MAR. 4	UNION, NY (N)			KANSAS CITY		
MAR. 11		JACKSONVILLE				SAN FRANCISCO
MAR. 18	PHILADELPHIA			OMAHA		
MAR. 25					DENVER	PORTLAND
APR. 1	TARRYTOWN, NY	NEW ORLEANS	BUFFALO			
APR. 8						
APR. 15				MINNEAPOLIS		
APR. 22	BOSTON				EL PASO (N)	LOS ANGELES
APR. 29		CHARLOTTE		WICHITA (N)		
MAY 6	WASHINGTON					
MAY 13				CHICAGO		
MAY 20	PHILADELPHIA (N)		BUFFALO			
MAY 27						
JUNE 3	ALBANY, NY (N)					

N-Night classes

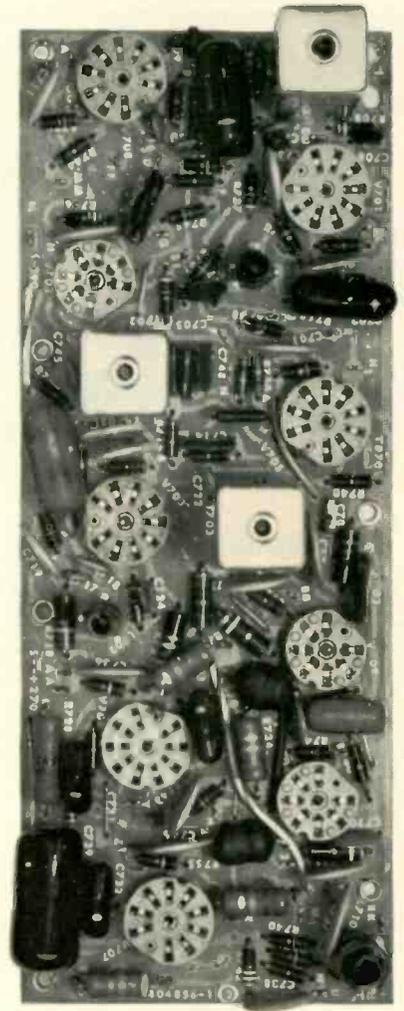
Delco Radio Automotive Radio Service Parts and Electro-Mechanical Devices are distributed nationally through **United Delco**

DELCO RADIO, Division of General Motors, Kokomo, Indiana





Old



New

Now, RCA VICTOR takes the tangle out of TV's toughest circuitry

The advantages of the new RCA Security Sealed Chroma Circuits are plain to see. The simple fact that they're Precision Crafted Security Sealed boards tells you most of the good news . . . clean; easy to get at; "road-map" tracking, and just generally a cinch compared to their old, hand-wired counterparts.

This newly developed RCA chroma board sets many more benchmarks. For example, the color bandpass amplifier circuit

operates near Class "A," providing linear amplification of chroma signals. Color video amplifier outputs are 100% DC coupled to reduce drift in color temperature set-up.

The chroma circuit also features two new multi-grid pentode color demodulators to improve color with better matrixing. No "short cuts"—this is full-function circuitry...demodulators *plus* amplifiers for extra color brilliance and stability!

This circuit is very stable, and tube change has almost no effect on performance of matrixing.

The new Precision Crafted Security Sealed Chroma Circuit board is part of RCA's continuing program for faster, easier servicing of today's fastest-growing home entertainment medium . . . Color TV.

See Walt Disney's "Wonderful World of Color" Sunday's, NBC-TV Network.



The Most Trusted Name in Television

Tmk(s)®

Are You Ready for '63?

Outstanding business and financial experts were unusually mute this last year-end. The vocal-few spoke softly and conservatively: "We see nothing on the immediate horizon," they said, in effect, "to indicate an important slide-off in business in the near future." Consensus predicts general business activity for the first half of 1963 at or near the average level for '62.

Whatever the future may bring, for TV-radio service-dealers and technicians, one thing is certain: *competition will be keener*. Some will not have the know-how and fortitude to continue operations—others will prosper. Your chances for prosperity will be determined largely by what you do and when you do it. Waiting to "see what happens" can be a major step in the direction of failure.

It is not too late to do the important things you never got around to last year. What happened to that resolution, for example, to organize your customers into an "auxiliary sales force?" Those who have tried it have re-discovered an old but formidable competition-stopper. It begins working for you when you begin giving your customers a little better service for the same dollar. It continues to work for you when you continue with consistent and courteous treatment. It grows when you

convince your customers by your actions that you are sincerely interested in solving *all* of their TV, radio and Hi Fi complaints. Don't leave the impression that you are eager to take their money and get rid of them.

And how about that decision you made, but never carried out, to diversify a little with CB radio? Well, the records indicate that citizens band equipment sales for 1962 will just about double those of 1961. Some service-dealers and technicians have reported lively business in CB equipment. It may repeat in 1963.

What happened to that rough plan you drafted for time studies on house calls, pick-ups and deliveries, shop work and other chores, including your own activities? Remember, you were going to beat the competition by higher over-all productivity through scheduling travel time, planning the service day in advance, and reorganizing the shop for more efficient operation. And that 1963 budget? Do you have it ready as a plan, a guide, a control—designed to help you achieve your major aim—a decent profit—for the new year? It's a little late but you can still get under the wire if you act fast.

If you act now and keep moving you won't have time to worry about over-all business conditions and the keen competition in 1963.

Our Stake in UHF

The Federal Communications Commission has finished preliminary tests on channel 31 in N. Y. City. The report reveals few, if any, technical facts that were not already known. UHF compares favorably with VHF and will take care of the nation's telecasting job. With simple outside antennas UHF proved to be better than VHF under certain standards. With indoor antennas New York's channel 2 and 7 proved slightly better than channel 31, according to the FCC.

Some sources have reported that the FCC found channel 31 inferior to VHF 2 and 7. This is, to paraphrase Voltaire, shaping the feet to fit the socks. But there is method in this news-distorting madness.

Despite the need for changes, one group would like to maintain the TV spectrum status quo. They have always argued that UHF is inferior to VHF in most respects.

Another group would like to grab a large portion of the UHF spectrum for temporarily solving their private problems. They have a very special argument

which has been handed to them ready-made.

Some years ago the FCC authorized and set aside 267 outlets across the country to be used exclusively for educational purposes. Most channels are in the UHF spectrum. Less than 100 of these ETV outlets have been activated—primarily because some backward-thinking educators and government officials have not recognized the dynamic potential of TV for rapidly up-grading our educational system. So, says the latter group, these channels should be released to someone who will use them!

UHF TV frequencies belong to this nation's news, entertainment and educational systems. VHF TV channels can be moved to the UHF spectrum. Frequencies from 54 to 216 Mc can thus be released. Industrial, business and other vital mobile services need these frequencies.

It is the FCC's duty to see that changes in the VHF/UHF regions are made in the nation's best long-range interest.

Two-Way Mobile

Transmitters

Continued



Marconi's Model 791D deviation meter.



DuMont's Fairco Mark III frequency meter covers citizens and commercial mobile bands.



Motorola's two-way mobile test set, S-1059A, has built-in transistorized deviation meter.

If it becomes necessary to adjust the transmitter's modulation deviation observe the signal on an FCC approved modulation deviation monitor and adjust the speech-level (modulation) control for a maximum of ± 5 kc for narrow-band, or ± 15 kc for wide-band units. In an emergency, another radio receiver can be used for approximate adjustment.

After making frequency and modulation checks, the next step is to check the multiplier stages. To check operation of these stages, take readings at J103, 4, 5, and 6 (Fig. 1) with a VTVM or a metering test set. If no reading is obtained at any of these jacks, trouble is probably caused by a blown fuse or failure in the power supply. If readings are obtained that do not agree with those called for in the set's service data, the trouble is probably in the stage feeding the grid at which an incorrect reading appears. Referring to Fig. 1, if a proper reading appears at J103 #4, but a low reading is indicated at #5, V103 tripler stage is weak.

Power Amplifier Checks

To check the power amplifier stage, connect the meter from J103 #7 to J103 #8. Normal plate current is about 0.15 amperes as indicated by a reading of 1.5 v. Lower values may be caused by low plate

voltage, a defective tube, improper antenna loading, or insufficient grid drive. To check the power amplifier's plate voltage, set the meter on the high range, connect the negative meter lead to the chassis, and the positive head to J103 #7. The meter should read 400 v or better. To calculate power input to the final stage in watts, measure the final amplifier plate current and plate voltage; use ohms power law, $P=EI$, to obtain approximate input.

Transmitter Alignment

The first step in aligning a two-way radio transmitter is to peak the 1st tunable coil in the frequency multipliers. In Fig. 1 this would be the first doubler (T1). This assumes, of course, that the transmitter's oscillator frequency is known to be accurate.

While observing the meter plugged between J103 #4 and ground, key the transmitter on and (with the tune-operate switch in the tune position) adjust the primary slug from the transformer bottom, for a maximum reading. Adjust the secondary slug from the transformer top for a maximum meter reading. Now repeat the primary and secondary for maximum meter reading. The circuit is tuned to two times the crystal frequency.

When tuning a two-frequency transmitter, it should be aligned on

the higher of the two frequencies employed. On completion of alignment, each output should be checked for proper performance. In specific cases where channel separations exceed 120 kc, and the lower frequency is used more often than the higher, it is preferable to align the unit on the lower frequency.

The next step in alignment is adjustment of the tripler (V103) stage. This stage multiplies the 1st doubler output frequency three times (6 times the crystal frequency). Again key the transmitter on and meter J103 #5 and adjust the primary slug of this stage from the transformer bottom (T2) for a maximum meter reading. Adjust the secondary slug from the transformer top for a peak meter reading. Repeat the primary and secondary.

After obtaining a satisfactory tripler reading, meter J103 #6 and adjust the primary and secondary slugs of T3 for maximum reading. This indicates that V104 is working properly. You will notice that while metering J103 #6 with the transmitter off a slight meter reading will be present. This is a fixed bias voltage designed to prevent the power amplifier from "running away" should the final amplifier plate voltage be applied with no drive from the double-driver V-104 available. If the transmitter is turned on with a dead stage preceding the final am-

plifier, the amplifier tube may well draw too much plate current and be destroyed. As long as drive is available, the bias is not utilized and is merely a safeguard. Since this bias is present on the final grid at all times, it must be taken into consideration when tuning. Proper alignment of T3 will be indicated by a *definite peak* on the meter.

To align the power amplifier (V105) insert the positive probe of the meter in J103 #7, and the negative probe in #8. Key the transmitter on and adjust antenna trimmer capacitor C-121 counter-clockwise for minimum coupling as indicated by a minimum meter reading. Turn the output coupling adjustment of L-2 counter-clockwise to decouple the dummy load, and adjust the power amplifier tuning capacitor C-120 for a "dip" (minimum reading) on the meter. When the meter has been dipped, place the

tune-operate switch in the operate position.

To align the output circuit, adjust the amplifier plate circuit coupling to the RF load by turning antenna trimmer C-121 until a maximum reading has been obtained on the meter. Couple the RF plate circuit to an RF wattmeter or a dummy load (50) ohms capable of dissipating 30 w). Couple the amplifier plate circuit to the antenna (or dummy load) for desired RF output by turning coupling adjustment L-2 clockwise until the transmitter is loaded to the desired RF power output as indicated on the wattmeter. (Do not exceed 125 ma plate current on the final while making these adjustments. Also, never allow the final to operate with more than 125 ma at any time, as this will shorten tube life.)

Readjust the antenna trimmer capacitor C-121 for a reading of about 30 w.

Now connect the antenna used in normal service to the set's antenna connector. Turn the coupling adjustment clockwise and adjust the amplifier's tuning capacitor C-120 through resonance. (Resonance is indicated by the lowest dip in the meter reading.) Now gradually increase the coupling to a point where there is only a slight dip in meter reading when tuning through resonance. This will indicate the point of maximum output.

If the transmitter is overcoupled to the antenna the plate current dip will disappear and actual power output will be below maximum value. Also, a false dip may occur which will not be coincident with maximum radiation.

To ascertain the correct point for maximum power output and best efficiency, an RF wattmeter should be used as described in the preceding paragraphs. ■

CB Rules and Regulations

■ Part 15 and part 19 of the FCC Rules and Regulations are being confused by both buyer and technician. It is strongly recommended that a copy of each be obtained from the FCC; in fact, for license holders, reading part 19 is a sworn requirement.

To clarify some of these rules, let's go over a few important points contained in these parts. Part 19 is of particular importance; it is sometimes referred to as the CB Commandments. Most of the rules are clear-cut. Others have been mis-interpreted and in some cases, law suits have been brought against the offenders. It shouldn't be your aim to try to get around these rules, so we will clarify them as law suits, and as certain FCC orders have shown, they were intended. These rules will undoubtedly be rewritten in the near future.

Under no conditions is working DX legal. If you're in Podunck, Fla. and hear an illegal CQ call from

California, forget it. You are not allowed to answer or solicit such communications even though certain skip conditions sometimes make such communications practical.

Operating a CB rig during the interim while a license is pending is not allowed. You must have a posted license anytime you operate a CB transmitter. Part 15 rules deal with limited radiation devices (under 100 mw) which do not require licenses but must be certified for proper maximum power.

The use of profane language is also prohibited. The same rules which apply to amateur and commercial radio operators apply here. Derogatory or inflammatory remarks against racial and religious groups are similarly prohibited.

You may not loan your license to another operator. This is true even if the other operator is licensed.

There is a definite time limit for all CB transmissions. You must give your call letters at the beginning and end of each of these five minute send and receive periods. After five minutes the channel must be cleared. After a reasonable period to allow someone else to use the channel, the other party may be contacted for another five minute period.

Abuse of these rules will only lead to tightening of CB regulations which may make it difficult or impossible for others to obtain a license. ■

Channel	Frequency
1	26.965 mc
2	26.975 mc
3	26.985 mc
4	27.005 mc
5	27.015 mc
6	27.025 mc
7	27.035 mc
8	27.055 mc
9	27.065 mc
10	27.075 mc
11	27.085 mc
12	27.105 mc
13	27.115 mc
14	27.125 mc
15	27.135 mc
16	27.155 mc
17	27.165 mc
18	27.175 mc
19	27.185 mc
20	27.205 mc
21	27.215 mc
22	27.225 mc

Transmitter crystal oscillator frequencies for channels 1 through 22. Channel 23 is a shared channel operating on the same frequency as 22. Receiver crystals are generally cut to 455 Kc higher than transmitter crystals.

The most likely cause would be a fault in the switching circuits at the antenna input and the transmitter tank coil. Normal hiss would be present from the mixer-oscillator and power out would be very low if, for example, a ground were present in the coil circuit.

Similar malfunctions are almost as prevalent as receivers. Using this type of analysis, you should not have trouble finding the faulty section. Working on the remainder of the receiver should offer no problems to the average technician

which he would not encounter in a table radio. Noise limiting and squelch circuits are the only additions.

Noise limiters are usually no more than a simple clipping circuit.

Squelch systems, often manually adjustable, frequently operate directly from the AGC circuit. A low agc voltage causes the squelch circuit to keep audio amplifiers biased off until a signal drives the agc above the present manual level. Several other squelch systems are used, however. The next most popular

Math Calculations for 'Two-Way' Techs

by Hulse Wismer

■ There is probably no one in the communications service field who doesn't know the significance of Ohm's law and how to use it for simple calculations. Unfortunately, that is often the full extent of the technician's working math ability. Math can make a real problem a routine matter in many cases. So sharpen your pencil and see how many times you could have used this information and how easy it is.

Let's see how some common formulas applicable to transmitter circuitry can be used. Table I

shows the meaning of the text symbols.

Self inductance can be computed by the same method used for calculating series and parallel resistors. The symbol L is substituted for R in the formula, of course. To calculate the coupled inductance, however, it becomes necessary to know the *mutual inductance*. This is easily found from:

$$M = \frac{L_a - L_o}{4}$$

With M known, coupled inductance

is found from formulas very much like self inductance formulas: For series aiding fields,

$$L_t = L_1 + L_2 + 2M$$

and for series opposing fields,

$$L_t = L_1 + L_2 - 2M$$

Parallel calculations follow the same familiar pattern. With fields aiding:

$$L_t = \frac{1}{\frac{1}{L_1 + M} + \frac{1}{L_2 + M}}$$

and with fields opposing:

$$L_t = \frac{1}{\frac{1}{L_1 - M} + \frac{1}{L_2 - M}}$$

Although we've all been through *resonance* and *reactance* formulas, it seems to be the hardest of the popular ones to keep in mind. Several different forms of this formula can be found, but perhaps the simplest to remember is:

$$f_r = \frac{1}{2\pi \sqrt{LC}}$$

It is frequently necessary to find the reactance of a capacitor or inductor. Reactance is easily found with these formulas:

Continued

is tone squelch which keeps the audio cut off until a tone resonates the squelch circuit allowing audio to pass. Of course, the transmitter must be tone modulated.

The "transmitter-only" portion of the receiver is relatively simple and shouldn't trouble the qualified FCC license holder. The only portion of the transmitter section which should concern the non-licensed technician is the microphone and preamp circuits. These are generally straight forward and likewise, should offer no unusual problems. ■

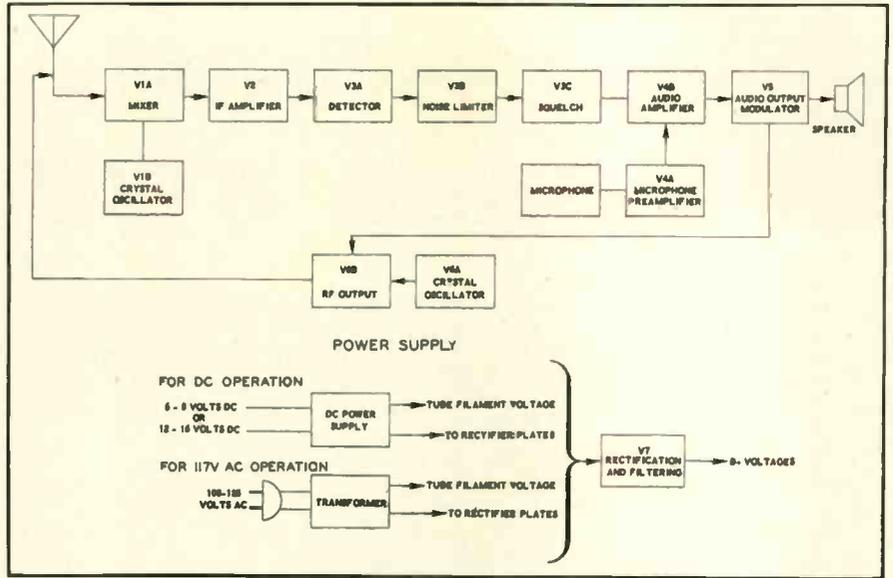


Fig. 1 — Block diagram of Heath's GW-12. Transceiver power supplies shown are external and optional. Switching components are not shown for clarity. One coil is employed for the antenna input and RF tank circuits.

$$X_c = \frac{1}{2\pi fC} \text{ and } X_L = 2\pi fL$$

The Q of a coil or capacitor is often given in replacement specifications. Finding out how this figure of merit is obtained will sometimes help understand complex circuitry. For any inductance, the Q can be found by:

$$Q = \frac{X_L}{R_L}$$

and for a capacitor:

$$Q = \frac{X_c}{R_c}$$

Wavelength and frequency relationships are often puzzling to the novice, but as time goes by it's hard to forget. For the benefit of those who don't like to interpolate between meters and cm or kc and Mc, the formula for each is given. To find the frequency (in kc) from wavelength:

$$f = \frac{3 \cdot 10^8}{\lambda}$$

or in Mc:

$$f = \frac{3 \cdot 10^4}{\lambda}$$

To find the wavelength from frequency, λ and f are simply interchanged for an answer in meters or cm respectively.

Two-wire open transmission lines are rarely used in mobile communications work, but for those exceptions it is included in the following formulas for both coaxial and open lead lines.

Attenuation of signal in db per ft of line for coaxial line:

$$db = \frac{4.6 \sqrt{f_m} (d_1 + d_2)}{(d_1 d_2) \log \frac{d_1}{d_2}} \quad (10^{-9})$$

and for open line:

$$db = \frac{0.0157 R_f}{\log \frac{2D}{d}}$$

Several other formulas are often associated with transmission line, but characteristic impedance is probably the most important. For coaxial line the characteristic impedance is found by:

$$Z = 138 \log \frac{d_1}{d_2}$$

and for open wire lines:

$$Z = 276 \log \frac{2D}{d}$$

Mastering these formulas will help you to speedier servicing through a better understanding of electronics. ■

Table I

M	= Mutual Inductance
L _a	= Total Inductance, fields aiding
L _s	= Total Inductance, fields opposing
L _t	= Total Inductance
L ₁	= Self Inductance of Coil 1
L ₂	= Self Inductance of Coil 2
f _r	= Resonant frequency in cps
L	= Inductance in Henrys
C	= Capacitance in farads
π	= 3.14
X _c	= Capacitive reactance in ohms
X _L	= Inductive reactance in ohms
f	= frequency in cps
Q	= Ratio expressed in figure of merit
λ	= Wave length in meters
R _s	= Resistance in ohms acting in series with capacitance
d	= diameter of conductor in in.
d _i	= Inside diameter of outer conductor
d _o	= Outside diameter of inner conductor
f _m	= Frequency in Mc
D	= Spacing between wire centers in in.
R _l	= RF resistance, in ohms, per loop
	$2 \cdot 10^{-8} \frac{\sqrt{f}}{d}$
	ft. of wire. (RF = $\frac{\quad}{d}$)

Aside from the pattern effect, the position of the loading coil greatly affects the antenna's strength. Bottom loaded coils are most popular, though they are usually incorporated because they are sturdy and comparatively inexpensive. The maximum current in the bottom loaded antenna is near the bottom. Since our effort is to propagate the signal from a maximum height, this is not the most desirable loading coil position.

The top loaded antenna propagates the most signal from the tip of the antenna. This is very desirable. The heavy loading coil located at the top of the antenna, however, causes some antenna rigidity problems and makes the antenna more expensive.

The center loaded antenna is a compromise. Its characteristics are half-way between the bottom and top loaded types. Its cost is similarly between the others.

Installation

Installation of mobile antennas is primarily determined by the type of antenna selected, the vehicle it is to be mounted on and the preference of the user. Manufacturers' instructions are usually quite explicit and should be carefully followed. A good ground to the base of the antenna is a must. Don't forget to scrape away the paint around the mounting hole or to clean the surface of unpainted mounts.

Running coax for the antenna feed is usually simplified by following the route of existing coil wiring. Base station antennas, because they are fixed, allow the installer to correct for many deficiencies found in mobile installations. A much greater height and more rigidity can be attained, for example.

FCC regulations should be consulted to determine restrictions for maximum height for the radio com-

munications to be used. For example, CB antenna heights are restricted to a maximum of 20 ft above existing structures. Some installations may be restricted in height because of the proximity of an airport. Others may require special lights atop the antenna. These regulations may be obtained by writing to the FCC in Washington, D. C.

Coaxial antenna runs should be limited to 100 ft if possible. Every ft attenuates the radiated power and the signal received. If an advantage can be gained, either better line-of-sight or more height, for instance, the increased length of the antenna's feed line may more than compensate for the loss.

Special antenna switches are available, or they may be made up from a coaxial relay to switch between non-directional and beam or between different beams. Some stations use a long wire for receiving

Continued on page 62

SALES UP ON 100 mw TRANSCEIVERS



■ Walkie-talkie type transceivers are enjoying an all-time high in popularity since CB radio became practical. When used with other low-powered units no license for operation is needed and there are no operating restrictions.

The range of use for these units is wide; TV technicians and antenna installers have found them helpful in adjusting antenna position, and at the other end of the gamut, sportsmen have found them valuable to keep in touch with one another and to quarry game (this practice is prohibited in some states). Obviously, the

sales and service potential for these units is very great.

Technicians with a second class FCC radio-telephone license are missing a relatively easy-to-learn addition to their income by not selling and servicing these units. Although the markup is not high compared to other electronic items, service rewards are good. In most cases, the only necessary equipment will be a good VTVM. Crystal control for both transmit and receive simplify alignment to one or two peaking adjustments.

An example of alignment simplicity is shown by the instructions in one manufacturer's service literature:

"Connect (a) dc milliammeter in series with the supply voltage and the units under test. Remove cover and extend the whip antenna to its full height. With a hex type alignment tool turn core of T6 counterclockwise until core is extended one-half its length from the coil form. Turn unit on. Press the PUSH-TO-TALK SWITCH to transmit position. Slowly turn core of T6 clockwise while observing milliammeter. Continue turning core clockwise until meter reads 22 ma. This completes the adjustment for the transmitter section.

The receiver adjustment is even simpler. A voltmeter is connected to a point in the unit and a coil slug is turned for a peak reading.

It's not too late to get in on the sales of these units if you haven't already done so. Transceivers now on the market range in price from less than \$10 to more than \$100; within the price range of anyone who can afford a pocket radio. It probably won't be too long before the TV and radio technician will be expected to service this equipment—and almost as frequently as he would a transistor radio. ■



Druggist Kessler gives instructions from his prescription department to delivery wagon via two-way radio.

Two-Way Radio Speeds Deliveries

Drug store up-grades customer service and increases prescription business with radio communications equipment

by Arthur Sokoloff

■ Many alert TV-radio and industrial electronic technicians will find this story "old hat." Others, with modest imagination, may find it possible to stretch this single idea into a thriving two-way radio business.

Some time ago, Paul Kessler, owner of the Village Pharmacy in Irvington, N. J., installed a two-way radio in his drug store and in his delivery wagon. He planned to offset competition from other drug stores in this area by offering faster service. Like many other two-way radio owners, Kessler is sold on the idea.

Besides the increase in prescription business which he estimates to be about 15 percent, the convenience has been well worth the cost of installation and maintenance.

"It's a simple matter," Kessler said, "to call my delivery man to pick up one or more prescriptions if telephone calls come in while he is out. This has boosted my service efficiency and resulted in many new customers."

"In addition," Kessler stated, "if problems arise while the driver is out, he can call the store for clarification or instructions."

Since more deliveries can now be made in less time, Kessler pointed out that his driver can spend more of his time helping in the store.

This same idea may be applied to

other businesses which feature pickups and deliveries. It offers possibilities to enterprising technicians for two-way radio sales and service.

A well planned and sustained promotional program may turn the trick. It does not have to be a "big deal" operation. A modest but attractive brochure, or a well written sales letter, can inform prospects of two-way radio advantages. Point out

clearly how the system can speed deliveries, provide continuous contact with the delivery vehicle, result in less mileage per delivery and less road time for the driver.

All this adds up to savings in operating costs, better customer service and improved customer relations.

Few salesmen would ask for richer business soil or for more fertile seed to sow in it. ■



Driver receives orders to pick up prescriptions at other locations after making drug delivery.

Association of basic faults leads technicians to trouble spot quickly

by Ben Allen

FIX THAT

■ Loss of sync or weak sync can develop from trouble in almost any part of the TV set. Even external interference or antenna problems can cause sync instability. Locating and correcting such problems requires a thorough understanding of sync pulse composition, its progress through the receiver and the set's sync requirements.

As we all know, the purpose of the sync pulse is to synchronize the receiver's vertical and horizontal scan rates with the scan frequency employed in the TV camera. Failure to obtain proper sync results in problems familiar to most all technicians: Rolling, tearing, piecrusting or christmas tree effects. Any of these terrorize the novice TV technician; usually because the fault is not the result of total component failure.

But the experienced TV technician has his share of difficulties with sync systems too. For the most part, possibly, from a lack of basic knowledge of the operation of sync amplifiers, clippers or separators, and special noise canceling circuits. And partly, from his disbelief that the sync pulse could be weakened or destroyed in the video portion of a receiver when an otherwise normal or good quality picture is present. Let's try to justify the cautions to check the video circuitry found in almost every text on sync system maintenance.

Sync Pulse Construction

Since both vertical and horizontal scans must be synchronized by sync pulses, two sets of pulses are required; one at the vertical rate, another at the horizontal rate. Both

oscillators are normally set to operate at a slightly lower frequency than their normal scanning rate. When the sync pulse is applied to the oscillator, it is "pulled in" to the proper frequency.

Additional problems arise, however, during vertical retrace time in such a simple system. To prevent the horizontal oscillator from running off frequency, horizontal rate pulses are superimposed on the vertical blanking and sync pulse. In the absence of these pulses, "hooking" or "flag waving" occurs at the top of the picture.

Interlace is accomplished by equalizing pulses inserted in the vertical blanking interval which maintain the exact starting time for the horizontal oscillator. A composite drawing of the sync waveform is shown in Fig. 1.

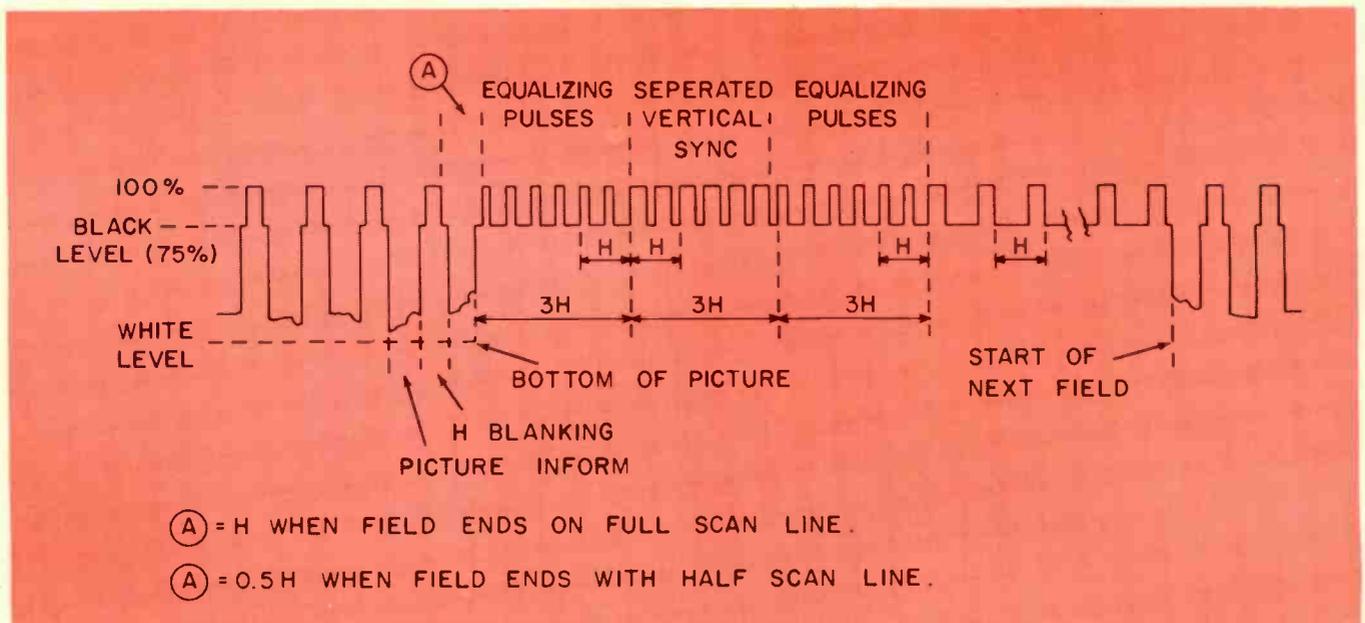


Fig. 1 — Sync pulse structure varies on odd and even scan fields. Equalizing pulses and the serrated vertical sync pulse maintain proper horizontal oscillator frequency during vertical blanking and sync time.

SYNC TROUBLE FAST

Since all of the pulses during the vertical blanking time are the same amplitude, an integrator is used to select the proper time for the vertical oscillator to begin. Equalizing pulses are too short to allow the integrator to develop a charge of sufficient amplitude to trigger the vertical oscillator. The vertical sync pulse is serrated, forming pulses about twice as wide as the equalizing pulses which allow the integrator to charge. When the proper level is reached at the integrator output, the oscillator begins conduction.

To maintain a perfect odd-line relationship between vertical and horizontal scans to allow interlace the sync pulses are generated from a common oscillator with divider circuits feeding separate sweep oscillators. This is illustrated in Fig

2. Since the relationship for 60 cps scan is odd (525 horizontal lines per frame) every other field is the same length; alternating between 262 and 263 scan lines. Each frame is composed of two interlaced fields.

Troubleshooting

Now, where does this information get us? It simply shows how complex a simple process can be. And what critical set areas to look at when a particular sync trouble develops. For example, suppose poor interlace (line pairing) is a problem. Where do you look? We know that the timing sequence which regulates the odd-line relationship between the horizontal and vertical scan rates causes interlace. Assuming the ratio at the station is normal, one of the triggering circuits in the set is at fault.

Basically, only one circuit determines this ratio: the integrator circuit. If the time constant of the integrator circuit changes, equalizing pulses may charge the integrator and trigger the vertical oscillator too early. The best method to locate an integrator malfunction is to change the integrator unit or each integrator part to eliminate it. Of course, an integrator malfunction can cause total loss of sync too.

On interlace problems it is wise to check all channels. Often lack of interlace is a station fault. Often turning the vertical and horizontal holds slightly sometimes corrects poor interlace.

If both the horizontal and vertical sections show a tendency to jitter, roll, tear or completely lose sync, the chances are good that a sync system malfunction is present.

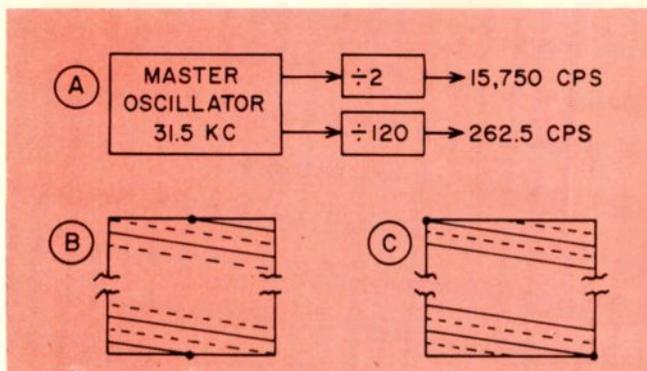
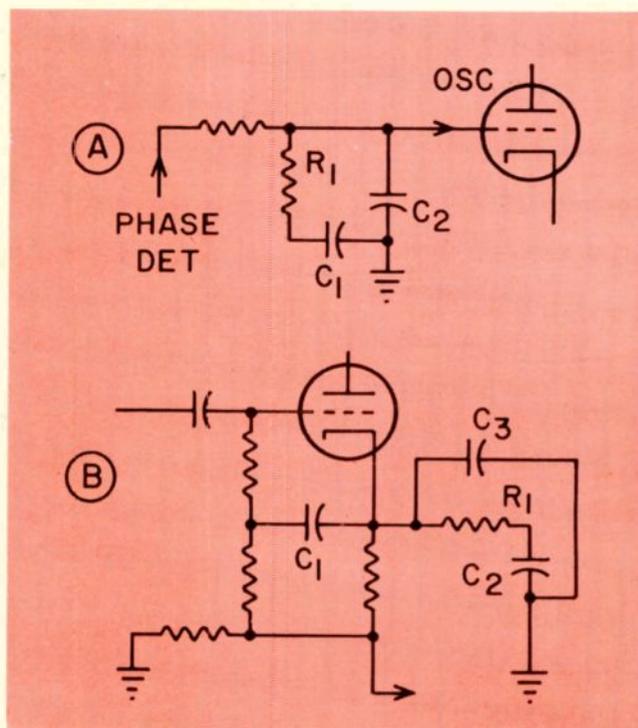


Fig. 2 (A) — Exact odd-line relationship between vertical and horizontal rates as maintained by divider circuits from a common oscillator. Odd ratio between rates causes scan to end on a half line on one field and a full line the next field. (B) — Beginning and end points of the half-scan line field. (C) — Beginning and end points of the field preceding or following the half line field.

Fig. 3 (A) — Anti-hunt components R_1 , C_1 , and C_2 should be suspected if pie-crusting is found. (B) — In pulse width detectors, the anti-hunt circuit components are R_1 , C_2 , C_1 , and C_3 .



Do not rule out this possibility, however, if only one section shows symptoms of poor sync. Most of you get this far on every sync troubled set without a hitch. The problem however, is what to do now!

The starting point is largely a matter of preference to individual technicians. Some start at the sync amplifier output, and some at the sync take-off point. It is probably best to start at the input to the sync separator unless you particularly favor another procedure. Starting at the input to the sync separator with a scope shows the condition of the composite signal and whether both of the sync pulses are present. This is simpler than starting at a point deeper in the sync system, say the sync amplifier, and then wondering whether the sync amplitudes are sufficient. Most always this followed by going backwards to the sync separator to check gains, etc.

Manufacturers' waveforms are usually given showing sync shape and amplitudes; these waveforms are very important. Care should be taken to assure that the amplitude and shape of the pulses are within tolerance of the waveform shown.

Suppose that the input to the sync separator shows that the sync pulses are almost totally absent. Where do we go from here? The most obvious answer is "backwards"—toward the IF. But how far to go and what to expect when you arrive there is the stopper.

Tubes in the path of the signal should, of course, be changed before extensive troubleshooting is begun. Generally, a tube tester is an adequate check for tubes in the

sync circuits but only substitution should be used in the IF strip. Gassy tubes are the most frequent offenders in this section and are difficult to detect with the average tube tester. If tubes are available, however, substitution is the best check in any section of the set. Since the problem may be several gassy or poor tubes, all tubes should be substituted simultaneously and then removed one at a time.

Any defect in the quality of the picture should be used as a clue to the sync difficulty. Except in stubborn cases the picture can be observed momentarily by careful adjustment of the hold controls. If this is not possible, the scope will have to be employed. This is another example of why it pays to be familiar with scope TV waveforms.

Finding the problem-stage is not usually difficult if a careful analysis is made of each wave form. At this point many technicians begin changing each part in the stage in an effort to correct the malfunction. This is time consuming and not very economical.

Pin-pointing the Fault

Once the area of fault has been decided upon, voltage measurements are the best checks available to the technician to help him pinpoint the faulty component or components.

Again, manufacturers' service literature is a must. When this is not available, the technician must

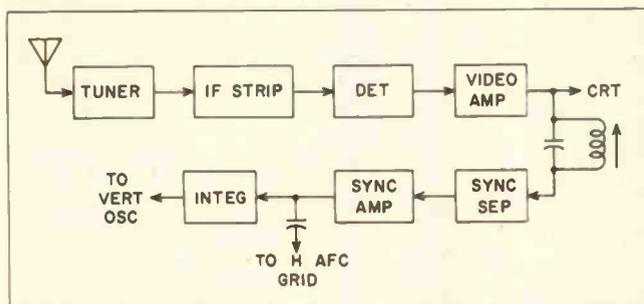
rely on experience and information he can gain from measurements of normal similar circuits or even normal operating configurations found in a tube manual. A word of caution here: Some tubes in the sync section of TV receivers are not operated in the linear portion of their characteristic curve. This is especially true in sync separator or clipper stages where the video falls in the cut-off portion of the curve while the sync pulses are passed and amplified.

Learning some causes of malfunction in sync systems and associating them with the problem at hand is often helpful. In most cases the symptoms won't be identical, but will help you find the problem areas by their similarity. Let's look at some of the common problems and see what can be learned from them.

Pie-crusting—A symptom which is easily recognizable by the shape found in vertical-line objects in the picture content. Basically, all vertical-line objects take on a horizontal dimension which may be as small as a fraction of an in. to more than 2 in. Both sides of the picture look like the edges of a crimped pie crust like mother used to make.

Pie-crust symptoms are generated because the horizontal oscillator is "hunting" between a range of frequencies on both sides of the exact frequency. The fault will be found in the anti-hunt circuitry in the AFC section of the receiver. Anti-

Continued on page 62



Sync flow path through most TV receivers. The sync separator clips video from the composite signal leaving only horizontal and vertical sync pulses.

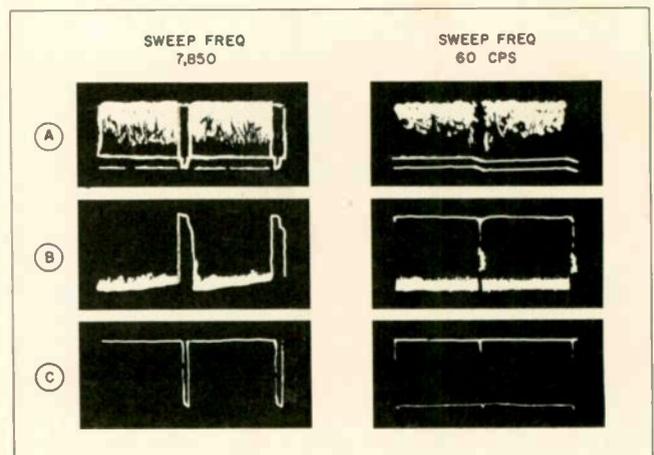
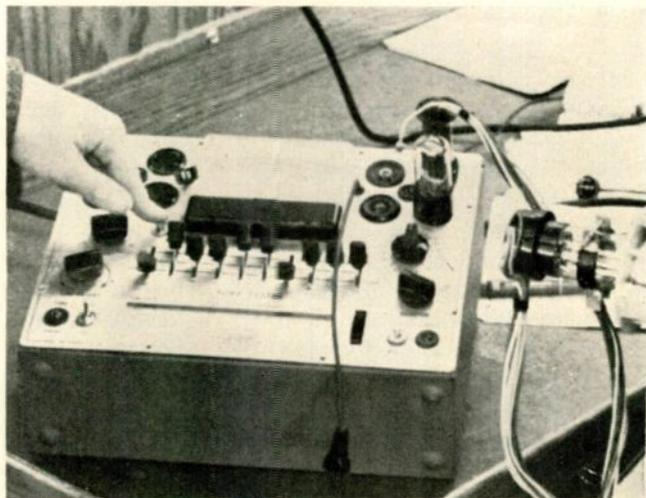


Fig. (A) — Horizontal and vertical waveforms at the input to the sync amplifier. (B) — After being processed in the first sync separator most of the video has been clipped and the pulse is amplified. (C) — An additional clipper removes all video from the sync.

TUBE TESTER REJUVENATOR

by E. J. Rice



Completed tester with rectifier tube plugged into the spare socket. The adapter cable is attached in the same manner as for CRT testing.

■ Emission tests and checks for shorts or opens can be made on CRTs with almost any free point switching type tube tester. At the same time, many multiple socket testers will test CRT emission and even rejuvenate CRTs.

Most commercial rejuvenators place 800 to 1000 v on the CRT grids with the negative side of this high voltage on the cathode. The CRT heater voltage is temporarily raised 20 to 50 percent. Thus, the cathode is heated above normal and emission is accelerated momentarily, effectively cleaning the cathode and making a more abundant supply of free electrons available. The aperture in the grid and anodes may also be burned open at this time; this permits greater emission when the tube is put back in use.

The circuit in Fig. 1 shows how high dc voltage can be obtained from a tube tester. The tester used is a low priced emission type, but the circuit will be the same for almost any unit. Merely locate the power transformer tap which gives about 250 vac and feed this to a half-wave voltage doubler. The doubler's dc output is applied to the CRT to be tested. When 250 v RMS is doubled and filtered, the dc output is about 700 v.

A 25Z6 is plugged into the spare socket which is wired for the 25Z6 in a voltage doubler circuit. Doubling can also be accomplished with under-the-panel silicon rectifiers.

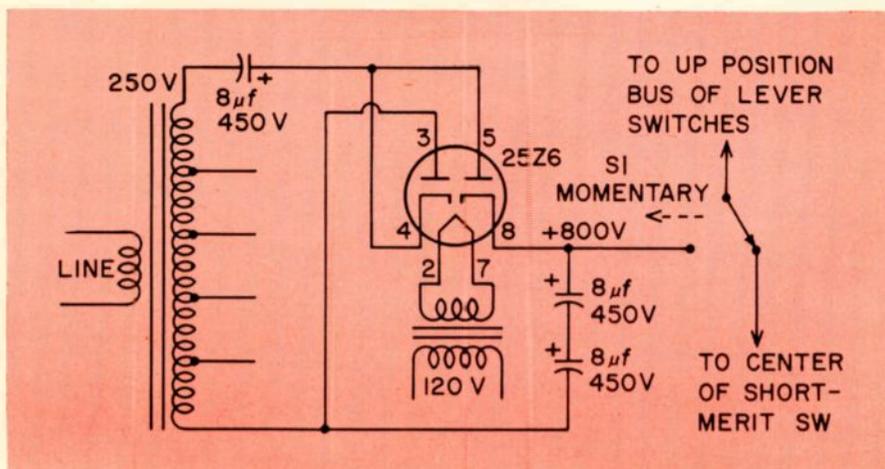
When a CRT requires rejuvenation, the 25Z6 is plugged into the specially wired socket and the regular set up for CRT testing is carried out. After reading the emission, the filament voltage is increased and S1 is pressed for 2 to 5 seconds applying the dc to the grids. S1 is a SPDT push button (Mallory 1013, or similar type) which is mounted on the tube tester panel.

Filament voltage for the 25Z6 must be obtained separately because of the high voltage on the output cathode. A 25 v filament transformer is mounted under the panel (a Stancor P6496, or comparable type) and the electrolytic capacitors needed in the voltage doubler are

mounted beneath the tester's panel.

This circuit is adaptable to most tube testers and gives good results. If desired, a rotary switch can be inserted between the voltage doubler and the power transformer taps for selection of lower voltages. This would permit a "gentle treatment" for quick responding CRTs.

The same care is necessary in using this rejuvenator as with any other. Do not over-do it. A series of short shots with emission tests in between is best. Increase the heater voltage one step at a time as needed. Return the heater voltage to normal when testing for emission. If the emission fails to improve, it's time to recommend a CRT replacement. ■



Circuit modification to convert tube testers into rejuvenators.

■ Second to sync troubles, perhaps no other section in the TV receiver causes the technician as many headaches as the horizontal output system. It is difficult to draw a line showing where the horizontal output section overlaps or becomes a part of another section. For discussion, let us arbitrarily include the oscillator output circuitry, the horizontal output tube, the high voltage system and associated circuitry. The later, of course, includes the damper, yoke, flyback, high voltage rectifier and its component parts.

Functions of the aforementioned circuitry is no mystery to most technicians. A saw-type voltage is fed from the horizontal oscillator to the horizontal output tube where it is amplified and matched to the yoke's impedance through the flyback transformer. A by-product of the rapid flux change in the flyback transformer during retrace is a high voltage spike which is stepped up through an auto-transformer winding in the flyback. This high voltage spike is rectified and

fed to the second anode of the CRT.

The damper circuitry is employed to damp normal resonant yoke - flyback oscillations which form the left (first portion) of the sweep.

Insufficient width is the most obvious horizontal symptom. It is easy for many technicians to confuse other symptoms with the vertical or sync section of the set. Some of the rarer and less obvious symptoms are illustrated here. They include: The keystoneed raster, which has a trapezoidal shape; the "hour glass" or severe "coke bottle" effect; "S" bending; wrinkling and a thin vertical line.

Arcing and Bends

Malfunctions in horizontal output systems can cause almost every conceivable symptom that affects width (or modulation) of the sweep or the sweep's brightness. In some cases, it can affect sync, AGC or vertical stability. Arcing may cause sound and picture problems even in another TV set. And conversely, some circuit configurations may

allow a vertical or sound problem to kill the high voltage.

Inaudible arcing in the high voltage circuit often causes problems which are difficult to track down. Usually, the technician spends time in the video circuits before he gets on the right track. Arcing is generally evidenced by short black and white interference lines in the picture. Continuous arcing, however, may smear the picture giving it poor resolution with symptoms indicating poor IF alignment.

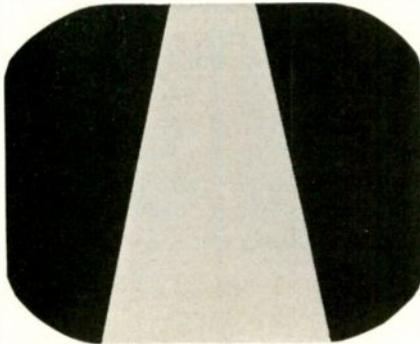
Arcing is sometimes difficult to detect. If it is suspected, the following procedure should be used: Listen carefully. Arcing sounds like a high pitched buzz. To localize such arcing, roll a piece of paper into a tube about one in. in diameter. With the tube placed next to the ear, move the end of the tube around the high voltage circuits. When the buzz is loudest, you have located the area of arc. Internal transformer arcing may be difficult to locate in this manner.

If the arc can not be located by listening, examine the high voltage

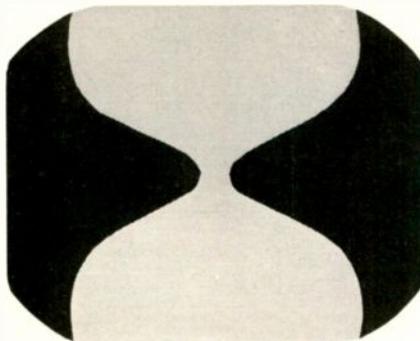
TV HORIZONTAL

Here's what to look for after

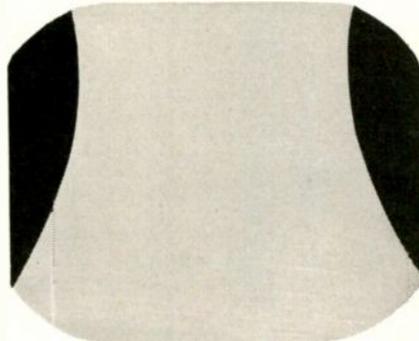
by Eln Niemi



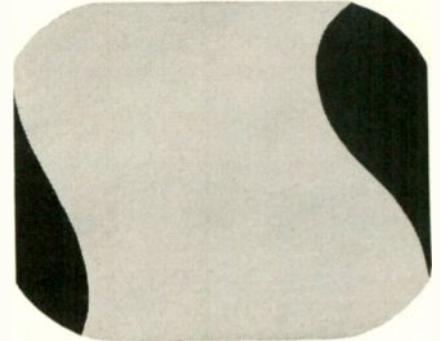
A keystoneed raster is usually caused by a short in the yoke.



"Hour-glass" raster distortion results from 60 cps ripple impressed on the horizontal output grid circuit.



Less severe form of "hour-glass" is usually called "coke bottle." Causes are the same as for more severe distortion.



"S" distortion unaffected by video content is frequently caused by a heater-to-cathode short in the output tube.

area in a darkened room. Some arcs deep inside the flyback can be seen as a tiny blue or orange light. Finally, after the set has operated for a short time, feel the high voltage components. Although most components will be warm, none should be hot. Heating of the flyback transformer is almost always caused by a faulty flyback transformer if the output tube drive is normal.

If both of these methods fail, a generous coating of anti-corona dope is sometimes effective.

Raster bending takes several forms. Three types are most common, however; "S" bending which is unaffected by the picture content; "S" bending which changes depending on the picture black and white ratio; and coke bottle or hour glass bending. The type of bending which is unaffected by picture content may move through the picture from top to bottom or vice versa. "S" bending is also sometimes incorrectly referred to as "flag-waving" or "hooking."

A scope is usually the fastest

way to find the cause in any type of bending. In many cases, the VOM or VTVM will show voltage and resistance measurements to be normal even though the cathode or grid elements of the output tube is being ac modulated.

Bends in step with video changes are always caused by a "leak" between some video stage and a horizontal circuit. Most frequently, it is caused by a partially open electrolytic or component value change in the sync or oscillator circuitry. This type of malfunction is not classified as a horizontal output problem.

The causes of constant bends, or bends which may drift through the picture, are usually found in the output system. Cathode to heater shorts are the most common cause of "S" bends — with electrolytics running a close second. A scope test will always show either the grid or cathode is being modulated by the supply voltage.

Shunting associated filters with an electrolytic of the proper value will usually locate the faulty com-

ponents and is often faster than methodical testing. After using this trial and error method, for a short time however, the time honored systematic approach should be used.

Some older sets biased the horizontal output tube with a negative voltage from the main power supply. Poor filtering in this circuit is often the cause of coke bottle or hour glass effects. Generally speaking, pinching from both sides of the picture is caused by grid modulation, while "S" type bends are usually cathode modulation problems.

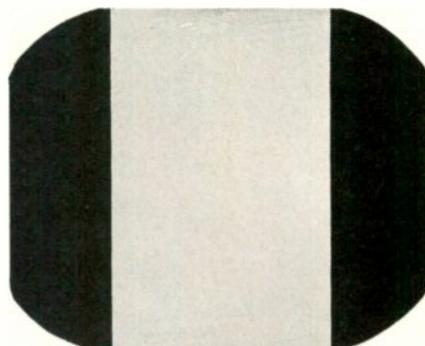
Wiring shorts should not be overlooked either. In series string sets, all tubes and their filament circuits should be thoroughly investigated, since a filament short in otherwise unassociated circuitry may cause horizontal symptoms.

Wrinkles and Insufficient Width

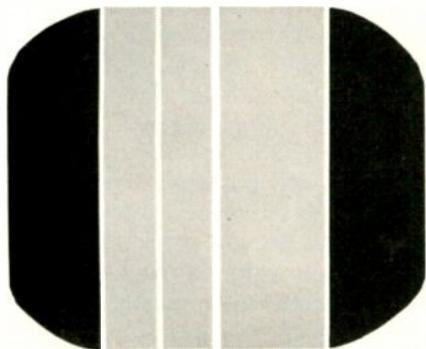
A wrinkled raster, or one which appears to be intensity modulated, often causes the best technicians to scratch their heads. Basically the two symptoms are generated

AND HV REPAIRS

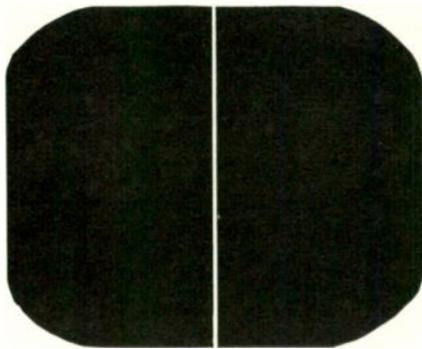
you've checked output tube current



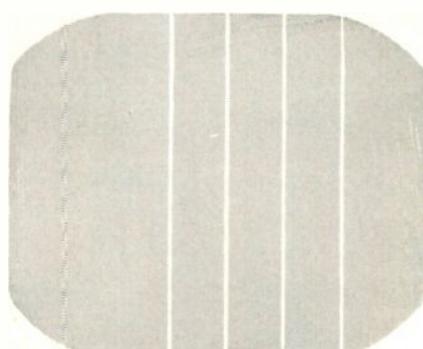
Insufficient width but with no foldover may be caused from aging of several components. This is most easily cured with "over-riding" circuit additions.



Pattern generated by a receiver having a shorted boost capacitor and with damper tube removed.



Open yoke winding sometimes causes a single vertical line and reduced high voltage. High voltage reduction may be insignificant.



Damper tube or yoke are most frequently at fault when light wrinkles appear in raster.

Horizontal and HV Repairs Continued

from the same type of malfunction. When a wrinkle or foldover develops, the beam is virtually stopped for some finite period or even reversed. A bright line or band superimposed on the raster indicates that the electron beam is slowed so the CRT phosphor is activated for an extended period.

Both of these problems are often found with insufficient width. Wrinkling is actually ringing which is caused by some form of mismatch or lack of damping in the horizontal output yoke circuits. The damper tube or its associated circuits are most often at fault, though frequently a linearity, width coil or yoke matching network component is at fault.

Changing tubes in these circuits before any other troubleshooting is imperative. Beyond that, substitution of suspected components is worthwhile. A leaky boost capacitor in some circuit configurations causes ringing or insufficient width.

One simple method to determine the area in which the fault lies is to note which side of the screen is most affected by the defect. If wrinkling or foldover appears on

the left side of the screen, the damper circuits are almost always at fault. One exception is Barkhausen oscillations. These oscillations appear after the horizontal output tube is cut off and are evidenced by one or more dark vertical lines at the left side of the screen. Changing or selecting a tube not susceptible to these oscillations is the best method to deal with them. Reducing the horizontal drive may also eliminate them.

Insufficient width is often a cumulative problem; one which has developed slowly and gone unnoticed until it finally pulled in and became objectionable. Since repairing this type of malfunction can be costly and time consuming, it is strongly recommended that an over-riding measure be taken. A small capacitor across the width coil is very effective, or in extreme cases, removal of the width coil. Similar success may be obtained by inserting a capacitor across taps on the flyback secondary.

A high voltage capacitor across the damper tube may be employed in cases where other modifications are ineffective.

Increasing the drive to the output tube, the screen voltage or B+ are also recommended. The technician should be careful, however, that the plate and screen current ratings of the output tube are not exceeded when employing these methods.

Blooming and Loss of High Voltage

Blooming and low voltage problems are one and the same. Low 2nd anode voltage causes the CRT electron beam to approach the screen more slowly, thus allowing the deflection coils to bend the beam further than normal.

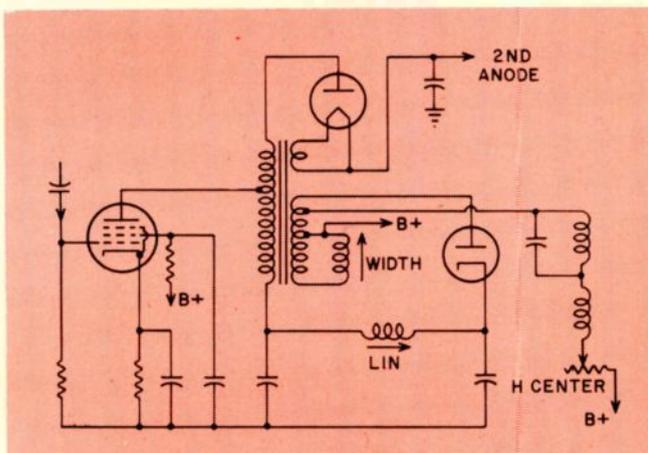
Drawing an arc from the output and rectifier tube caps is the old standby to determine the presence of high voltage. To the experienced technician, this can be a fairly accurate and effective method. However, a great deal of experience observing "normal set arcs" is necessary. The best and most accurate method is to use a high voltage probe and measure the high voltage. This should be measured both with the CRT connected and disconnected from the rectifier output. A gassy or shorted picture tube often gives the technician the impression that the high voltage or horizontal system is at fault.

Again, feeling components to detect abnormal operating temperatures and substitution are excellent troubleshooting methods.

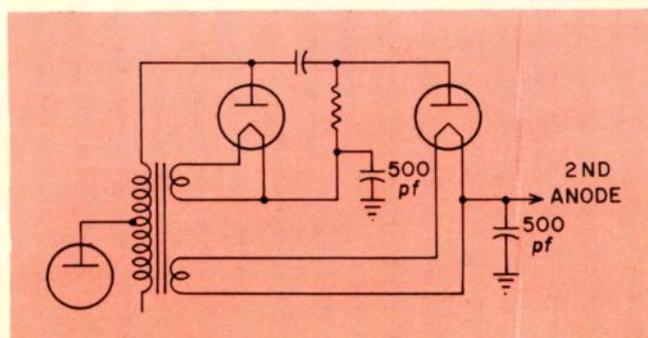
Since it is often impossible to stock all the necessary components, a flyback-yoke tester is a must.

A shorted boost capacitor can sometimes be easily detected with no test equipment. If no raster is present, pulling the damper tube will restore the sweep to a portion of its normal width if the boost capacitor is shorted. An ohmmeter may be used for a "cold" check to measure the resistance between pins three and five of the damper tube socket. Resistances below about 50 k Ω should be investigated. Normal resistances run as high as 250 k Ω .

In old RF powered high voltage systems and some new sets, an open yoke can present a vertical line. Newer sets with this symptom usually operate at a greatly reduced voltage with an open yoke winding. Depending on the yoke return used, the plugs or connecting yoke wire should be checked before substitution. ■



Typical Horizontal output system schematic.



Voltage doubler circuit found in some older sets usually increased voltage by no more than 20 percent.



EICO Grid Dip Oscillator, Model 710 K at \$49.95 wired, \$29.95 kit—We built this instrument from a kit. It went together easily, though in

GRID DIP OSCILLATOR

spots the wiring was a little tight. When the kit was finished, no calibration—sliding the dial, etc.—was necessary. The only problem encountered was a faulty phone jack which made contact intermittently and caused an erratic meter indication. The fault was corrected, however, by simply bending the jack contacts slightly so they remained normally closed.

A phone plug was inserted in the jack several times but no further trouble was noted.

All necessary coils were supplied pre-wound in a permanent container. With the eight coils supplied, the unit oscillates and detects from 400 kc to 250 Mc in overlapping ranges.

A sensitivity control and the tuning adjustment are located so the unit can be easily operated with one hand.

The unit may be operated as a grid dip meter by disabling the oscillator with the defeat switch located on the front panel. The phone jack located next to the meter disables the meter circuit and allows the operator to obtain accurate audio zero beats with other frequencies.

The unit is a good buy and certainly merits consideration by both radio and TV technicians. No other instrument is as versatile for power-off troubleshooting and alignment in tuned circuits.



TEST INSTRUMENTS for Bench and Caddy



Triplet Model 3432-A signal generator, at \$119.50. — A signal generator is basically a very simple piece of equipment. At the most, it seldom has more than three tubes and more frequently only two. Simplicity in most equipment is a difficult-to-achieve virtue — the 3432-A is simple.

Seven overlapping 160 degree scales are located on an easy-to-

read circular dial. A single r-f output jack is conveniently located at the center-bottom of the front panel and a modulation input is provided on the lower right corner. If external modulation is not necessary, the unit provides 400 cps internal modulation.

The generator range extends from 160 kc to 110 Mc on fundamentals and up to 220 Mc on har-

monics. We checked the units calibration after a few minutes warm-up against WWV and found it surprisingly accurate and easy to reset to the same frequency without signal reference after it had been shifted. Throughout its test (about 1½ hr.) the instrument's drift was not detectable with normal lab equipment. A cathode follower output provides good output stability. In addition to the off-on, mod and unmod control, a band selector a coarse and fine attenuator are provided.

The unit is handsomely housed in a ball cornered black hammertone finished case with a brushed aluminum control panel. If your shopping for a new signal generator, this should be on your check list. It would be a welcome addition to almost any lab or service shop.

Continued on page 63



Difficult Service Jobs Described by Readers

Hot Ground Connection

On a recent service on a General Electric 'S' chassis, the picture looked OK until the set warmed up, then the bottom slowly pulled up, anywhere from 1/2 to 2 in., for a few seconds, and then returned to a full picture. Seconds later it repeated with varying degrees of pull-up, until it established a regular slow moving cycle of up and down which only affected the bottom edge of the picture, the top remained stable.

I noticed that once it started this continuous slow moving cycle, that when the bottom was on the up swing it created a squeezed portion of about a 1-in. section across the screen. This squeezed portion would then slowly travel up, changing the linearity as it traveled to about two thirds of the way to the top of the picture and disappeared. At this point, the bottom of the picture, already up about 2-in., would slowly return to a full picture. Then the cycle would repeat continuously.

After making preliminary checks in the home, I brought the set to the shop. This 'S' chassis was made in early, middle and late versions, with

various differences in the vertical oscillator and blanking circuits. This particular "dog" was classified as the early version. These chassis have the dipped soldered pin terminal connectors. After exhaustive checking, the trouble turned out to be a poor ground connection on one of those terminal sleeve connectors crimped to the chassis.

Although the connector was electrically above ground, the filament of the 6BL7-GT which was connected to this terminal, was lit very bright and checked approximately 6-v. But a scope check revealed a beautiful 60-cycle sine wave on the ground terminal, until I soldered the sleeve to the chassis, bringing the set back to normal operation.—*Fredrick W. Hess, Cleveland, Ohio.*

Radiating Resistor

Recently, I was asked to remedy a problem noise in a CTC-5 RCA color receiver. At the owner's home, I noted the fault was present only when the antenna disconnected, the cracking sound was not present although no flashing was noticeable

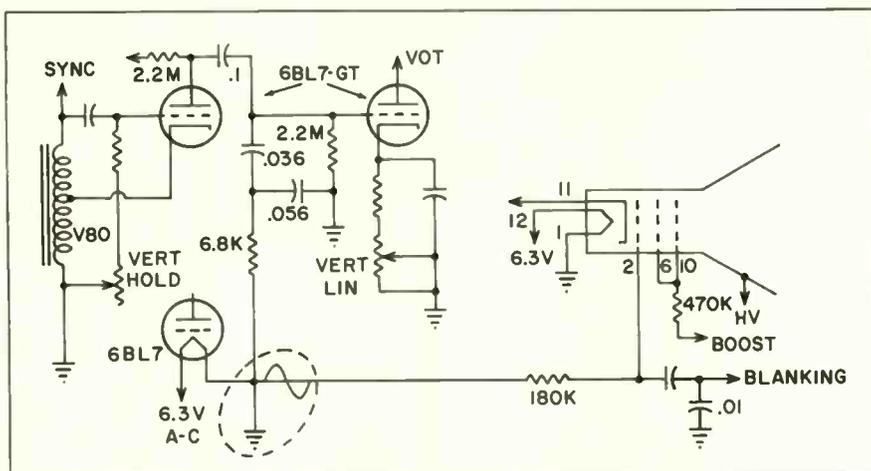
on the screen in either case. It was noted that a small ac/dc radio was also affected by the noise.

While wondering what to check, I saw the brightness was no longer present. I removed the back of the set to find the heater of the 6AW8, (first Video amp) was not lighted. When I moved the tube the heater came on once more. This indicated a bad tube socket or associate connections, so the chassis was removed from the cabinet to be taken to the shop. When we left the owner's residence, we decided the trouble could still be in the antenna system somewhere; the antenna was atop 75 ft of tower.

In the shop I replaced the before mentioned tube socket. While doing so, I noticed the case of a 2 w resistor, associated with the audio output stage, was cracked although it was not burned. I replaced this resistor. After checking out the chassis, I returned it to the owner.

Upon completion of the hook-up, including the lead-in wires, the cracking was no longer present.

The fluctuating voltages present in the audio circuitry evidently caused the cracked resistor to break down and radiate to other parts of the set and the radio.—*Paul Noel, Jr., York, Pa.*



Poor ground caused "cycling" foldover.

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.

SENCORE

SIMPLIFIES COLOR SERVICING

NEW! CA122

COLOR CIRCUIT ANALYZER

A simple approach to a complex problem

Here is an instrument that is designed to eliminate the guesswork in color TV servicing. A complete analyzer that provides all required test patterns and signals for testing from the tuner to the tri-color tube. Additional analyzing signals for injection at each stage including audio, video and sync, brings to life a truly portable and practical TV analyzer for on the spot service; virtually obsoleting other analyzers with the advent of color. Sencore's simplified approach requires no knowledge of I, Q, R-Y, B-Y, G-Y or other hard to remember formulas. The CA122 generates every signal normally received from the TV station plus convergence and color test patterns.

The CA122 offers more for less money:

TEN STANDARD COLOR BARS: The type and phase that is fast becoming the standard of the industry. Crystal controlled keyed bars, (RCA type) as explained in most service literature, offer a complete gamut of colors for every color circuit test.

WHITE DOTS: New stabilized dots, a must for convergence, are created by new Sencore counting circuits.

CROSS HATCH PATTERN: A basic requirement for fast CRT convergence.

VERTICAL AND HORIZONTAL BARS: An added feature to speed up convergence, not found on many other color generators.

SHADING BARS: Determines the ability of the video amplifier to produce shades (Y Signal) and to make color temperature adjustments. An important feature missing on other generators.

COLOR GUN INTERRUPTOR: For fast purity and convergence checks without upsetting color controls. Insures proper operation of tri-color guns, preventing wasted time in trouble shooting circuits when CRT is at fault.



A must for color . . .
a money maker for black and white TV servicing

ANALYZING SIGNALS: RF and IF signals modulated with any of the above patterns for injection into grid circuits from antenna to detector. IF attenuator is pre-set for minimum signal for each IF stage to produce pattern on CRT thus providing a check on individual stage gain. Sync and video, plus or minus from 0 to 30 volts peak to peak, have separate peak to peak calibrated controls for quick checks on all video and sync circuits. Crystal controlled 4.5 mc and 900 cycles audio simplify trouble shooting of audio circuits.

NEW ILLUMINATED PATTERN INDICATOR: A Sencore first, offering a rotating color film that exhibits the actual color patterns as they appear on color TV receivers. Locks in with pattern selector control.

You'll pay more for other color generators only.

Dealer Net 187.50

NEW! PS120 PROFESSIONAL

WIDE BAND OSCILLOSCOPE

A portable wide band 3 inch oscilloscope for fast, on-the-spot testing. An all new simplified design brings new meaning to the word portability . . . it's as easy to operate and carry as a VTVM. Though compact in size, the PS120 is powerful in performance: Vertical amplifier frequency response of 4 MC flat, only 3 DB down at 7.5 MC and usable to 12 MC, equips the technician for every color servicing job and the engineer with a scope for field and production line testing. AC coupled, with a low frequency response of 20 cycles insure accurate low frequency measurements without vertical bounce. Sensitive single band vertical amplifier; sensitivity of .035 volts RMS for one inch deflection saves band switching and guessing. Horizontal sweep frequency range of 15 cycles to 150 KC and sync range from 15 cycles to 8 MC (usable to 12 MC) results in positive "locking" on all signals. New exclusive Sencore features are direct reading peak-to-peak volts — no interpretation; dual controls to simplify tuning; lead compartment to conceal test leads, jacks and seldom used switches. Rear tilt adjustment angles scope "just right" for easy viewing on bench or production line.

Size: 7" w x 9" h x 11 1/4" d. Weight: 12 lbs.

Dealer Net 124.50
(with low cap. probe)

Kit 74.50



A must for servicing color TV in the home . . . lowest priced broad band scope. All hand wired — all American made

SENCORE, ADDISON, ILLINOIS

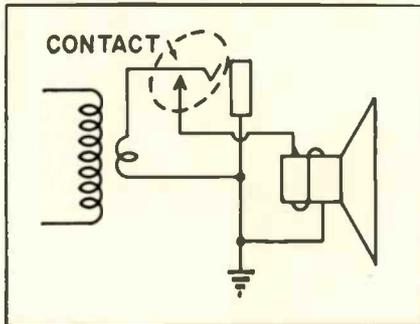
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SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

Open Jack Contacts

I have experienced the problem of phone jack n. c. contacts being spread from plugging and unplugging the ear phone.

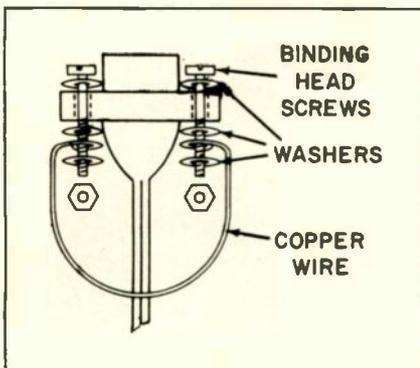


Open jack contacts cause faulty speaker symptoms.

This condition causes symptoms similar to an open voice coil (speaker inoperative, phones ok). Instead of taking sets apart to check them, it is wise to check these contacts first.—*George Warshower, Brooklyn, N.Y.*

Cheater Handle

A handle for cheater cords will prevent the cord from being pulled apart when unplugging them. I

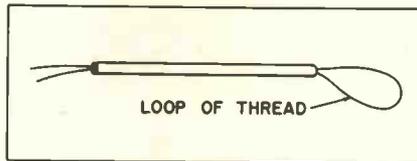


Wire handle on cheater cord increases cord life and makes removal easier.

bent mine from No. 10 or 12 copper wire as shown in the accompanying drawing.—*Lee D. Fortun, Viroqua, Wis.*

Skinny Fingers

A length of thread doubled through a piece of spaghetti makes a use-



Spaghetti and thread useful tool to hold small parts in cramped space.

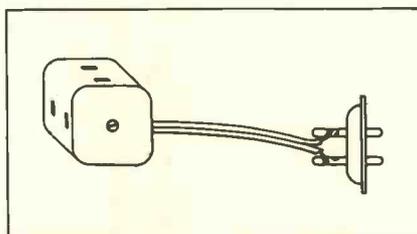
ful tool for inaccessible places. A tuner slug screw may be placed in the loop tension on two free ends holds screw firmly by shoulder; it can then be inserted through small opening in tuner housing to a position in front of alignment opening which is usually too small to admit the screw head. It is good for any place with limited room. Phono cartridges etc. Freeing one end of thread releases work.—*Albert S. Lombard, Windham, N. Y.*

Cheater Eliminates Tester Cords

I have removed the ac cords from the tube checker and Kine rejuvenator I use on house calls and installed a male interlock plug in their place. To use them I plug in the cheater cord which is already connected to the outlet. This saves unwinding and winding another cord each time.—*T. F. Edmonds, Blue Mound, Kan.*

Six in. Extension Cord

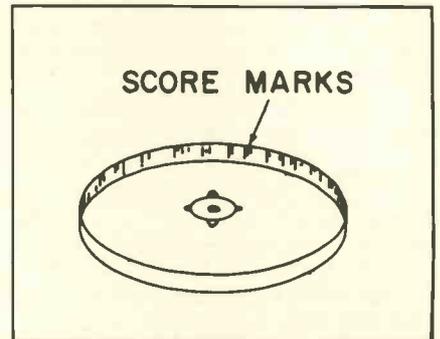
I carry a special adapter in my caddy consisting of a male cheater-type connector wired to a cube outlet. It can be plugged into the cheater cord and will power several instruments.—*Raymond J. James, Passaic, N. J.*



Adapter for cheater cord has outlets for several instruments.

Idler Slippage

On non-Hi Fi phonographs that drag and don't respond to the usual treatment of changing idler wheels or other drives and cleaning up the working parts, the following treatment always works: score the inside of the platter with a screw



Score marks and rosin improve platter traction on old phonographs.

driver or other sharp tool. Then rub rosin into the grooves. This gives good traction without changing the speed or damaging the idler wheel.—*Herman Schoenblum, Flushing, N. Y.*

Foil Kills Oscillator

To kill the oscillator in a superhet for alignment, place a piece of aluminum foil between the oscillator capacitor plates to short the rotor and stator without damaging the capacitor.—*Jay Prager, New York, N. Y.*

SHOP HINTS WANTED!

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to Shop Hints Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minnesota.

The new RCA MARK VIII 27-Mc 2-WAY RADIO



More Features • Improved Performance • AT A LOWER PRICE

Here is THE outstanding bargain today in a 2-way Citizens' Band radio: THE NEW RCA MARK VIII. Compact, dependable, simple to operate, it outperforms and offers more features than even the famous RCA Mark VII.

Look what this remarkable new unit offers you:

- 9 crystal-controlled transmit and receive channels
 - Tunable receiver for reception of 23 C-B channels; dial marked in both channel numbers and frequency
 - Exceptionally good voice reproduction—high intelligibility
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 - Electronic switching—no relay noise or chatter
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 - Light and compact—only 3½ inches high, weighs only 8 pounds with mike; fits easily under the dashboard of even a compact car
 - Improved Automatic Noise Limiter to reduce effects of ignition and similar interference
- plus many more features to increase its usefulness and efficiency.

The new low Mark VIII price **\$149⁵⁰****
puts 2-way radio convenience within reach of everyone

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Please! Rush more information on the new RCA Mark VIII 2-way Citizens' Band Radio.

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*Maximum plate input power to final radio-frequency amplifier stages as defined by FCC regulations

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NEW PRODUCTS

FOR MORE INFORMATION CIRCLE PRODUCT NUMBERS ON POST CARD

TWO WAY RADIOS 200

A full power family of mobile 2-way radios is called the "800" series. This series of transmitter/receivers delivers full



100 w output in the low band and 75 w in the high band. Despite the full-power output, the series is packaged in a compact, three-purpose control head and separate transmitter-receiver chassis. The units are designed to occupy minimum space, to require little service attention, and to sell at relatively low unit and systems prices, according to the manufacturer. The models are termed type MCA 825-A for the 25 to 45 Mc range with a rated output of 100 w, and type MCA 875-A for the 144 to 174 Mc range at an output of 75 w. Audio power output is 1.5 w with less than 10% distortion. Communications Dept., Allen B. Du Mont Labs.

STEREO AMPLIFIER 201

This stereo amplifier kit, SA-210, consists of two Class A amplifiers, two drivers, and two preamplifiers. It has six



inputs for magnetic phone or tape, and tuner or crystal pickup. A stereo-monaural switch allows unit to be used also as a 16 w monaural amplifier. The kit reportedly is uniquely designed for easy and enjoyable assembly. It features large pictorial illustrations and schematic drawings and easy to follow, step by step instructions. Price \$29.95, kit, and \$49.95 wired. Merrell Electronics Inc.

TAPE RECORDER 202

The "Continental 401" four-track stereo record and playback Hi-Fi tape re-

recorder is said to be completely transistorized and features the fourth speed of 15/16 ips for up to 32 hours of recording on a standard 7 in. reel. The unit uses four type AC107 transistors in its preamplifiers. The AC107 is said to be the only transistor specifically designed for tape recorders, having passed unusually stringent low noise requirements in design and manufacture. Being fully transistorized, the 401 requires no warm up period. The self-contained recorder includes two preamplifiers, two power amplifiers and two loudspeakers, one of which is in the removable cover to per-



mit realistic stereo separation during playback. Price: \$399.50. North American Philips Co., Inc.

DYNAMIC MICROPHONE 203

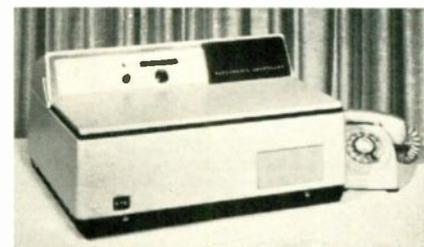
An omni-directional microphone, the Model 575 "Versadyne," reportedly features smooth response from 40-15,000 cps. It is styled in a rugged "Armour-Dur" body with satin anodized cap and stainless steel grill. Small and lightweight, the microphone is adaptable to hand-held, stand-mounted or lavalier use. The dynamic cartridge is said to be unaffected by temperature and humidity variations. The Model 575S features high impedance and high output for use with public address amplifiers where



only a moderate length of cable is required. The Model 575SB is a low impedance model designed for use in installations where long cable lengths are required or for use with transistor amplifiers where a medium or low impedance microphone is required. Both models feature a slide-to-talk locking switch. Price: \$24, Model 575S; \$21, 575B. Shure Brothers, Inc.

ANSWERING UNIT 204

A telephone answering set, the Model FP, is said to answer the telephone and record up to 240 incoming messages. The unit is the newest member of a family of telephone answering sets designed to meet the needs of any size business. The Model FP, styled by Raymond Loewy, answers the phone with a 20 sec message, tape-recorded in the businessman's own voice. A "beep" tone then tells the caller when to start his tape-recorded message, which may be up to 30 sec long. Incoming calls are recorded on a one-hour tape (120 messages). Two-hour capacity (240 messages) can be supplied at no added cost. The outgoing message

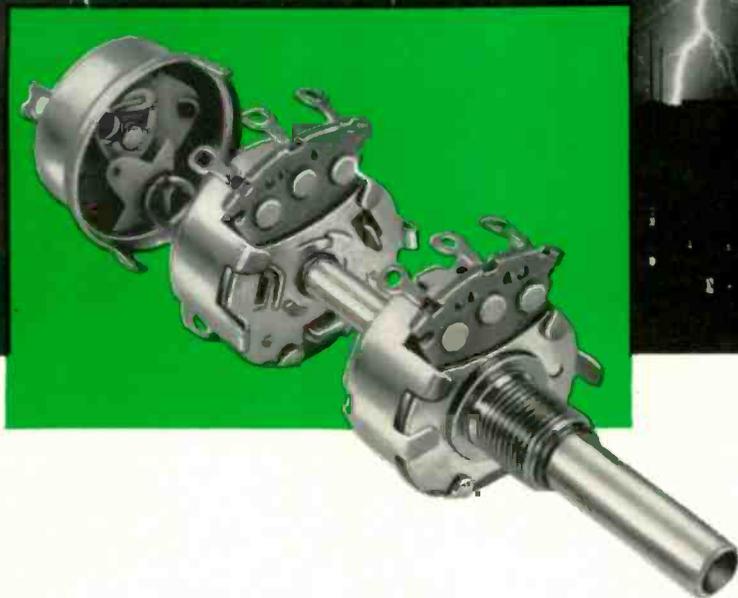


can be changed at any time through a microphone supplied with the unit. Automatic Electric Sales Corp.

TV CONSOLE 205

An educational television control console with "room for growth" reportedly has been developed to meet an expected surge in demand from school systems and other educational institutions. Designed especially for school districts which are just starting out with their own ETV setups, the new modular control console requires only one operator. Two units make up the basic control console which can handle two cameras. As need increases and more funds become available, an additional unit can be added to the console providing control for another camera for movies and slides to be projected through the ETV system. Of the 11 audio signal sources which the console is capable of controlling, eight are handled by four adjustable-gain mixing amplifiers and three are relay-

FAST



CLAROSTAT UNI-TITE CONTROLS

Lightning fast! Positive dependability too! Clarostat Uni-Tite field-assembled controls assemble in seconds, and stay put under the most rigorous service conditions. It's simply a matter of clicking in the proper shafts, inserting one shaft inside the other, a twist of the wrist and that dual is made automatically—for keeps.

Clarostat offers the most complete line of designed-for-service potentiometers. Write for complete details today . . .

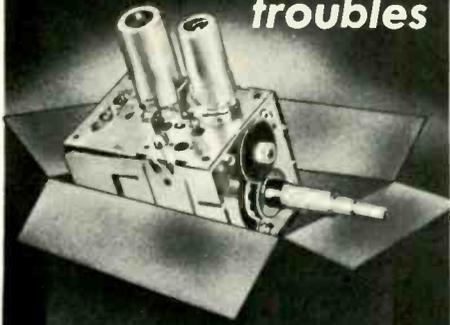
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Pack up your troubles



and send them to
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... do you have the time to fool around drilling, sawing, filing ... trying to make a "Universal" replacement tuner fit in place of the original? Do you have all the expensive instruments and equipment to complete the alignment so essential after each tuner repair or replacement? Can you spare the time repairing and adjusting your own TV tuners and can you charge enough to justify the time spent?

A Castle Overhaul eliminates every one of these problems.

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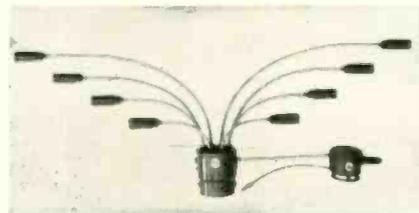
NEW PRODUCTS



switched to the mixer output bus. The audio level of any one of 11 signals is through a master gain control and is monitored by a VU meter. ETV Sales, General Electric Co.

SHIELDING 206

A "sound shroud" reportedly stops electrical interference at its source in marine and automobile engines to im-



prove the performance of all types of marine and mobile electronic equipment. The system wraps an insulating barrier around the entire engine ignition system complex. This positive shielding is effective immediately and eliminates the time consuming and technically difficult methods involving cutting-and-trying bypassing, and adding extra resistance. It is said to offer the additional benefit of water-proofing the entire ignition system. Price: \$115 to \$129.50 for most marine engines, \$119.50 for automobiles. Webster Mfg. Co.

MOTOR 207

Called the "Mart," this motor provides for reversible rotation, has a stainless



steel shaft, graphite brushes and sintered magnets and is designed to deliver up to 500 hr of service, continuous duty, at full load, according to the manufacturers. No-load speed is 7500 RPM operating load speed 5000 RPM and the motor produces a minimum of 0.125 oz in. of torque under operating load. Operating voltage may vary from 1.25 to 24 v and amp input is 0.75 (at 3 v) under operating load. Martronics, Inc. and up to 220 Mc on second harmonic.

COUPLER 208

The "ANTENNA +," a household coupler package that includes an inductive set coupler and 25 ft of twin-lead is used to connect any number of additional sets to an existing antenna line.

YOUR ANTENNA DOES DOUBLE-DUTY WITH ANTENNA +
RUN EXTRA SETS OFF PRESENT ANTENNA

TROUBLE FREE
INSTALL IT YOURSELF
\$3.99
INCLUDES
RECEPTOR
& 25 FOOT
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5 CORES

WETS FASTER **MELTS FASTER**

Solders Better

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Orbit Action



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EASIEST OF ALL CARTRIDGES
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New Euphonics Orbit Action Cartridges are exact replacements for millions of Euphonics Cartridges now in use, and all other ceramic cartridges. Rugged, trouble-free and easiest to install, Euphonics cartridges offer you these important advantages:

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- Eliminates twisting of lead wires
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Other Advantages: Unique mounting bracket permits fast, snap-in installation of cartridge • Low tracking force (2 grams) for minimum record and stylus wear • Stylus automatically retracts when arm is dropped • PZT ceramic elements eliminate magnetic hum and are impervious to heat and moisture • High compliance: 4 micro-cm per dyne • 4 terminals—complete with jumper for 3-terminal installation.

Complete with dual needles.

- U-8. .0007 Sapphire and .003 Sapphire
- U-9. .0007 Diamond and .003 Sapphire

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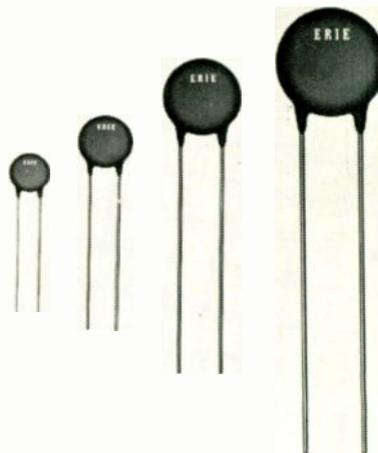
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NEW PRODUCTS

The unit is snapped on the main antenna line in seconds, without tools, and the twin-lead is connected to the additional set. Isolation factor between final set and any auxiliary set is 12 db (24 db between auxiliary sets). Loss due to placement on line with electro-magnetic operation is only 1/2 db for low-frequency channels and 1/4 db for high. Electrical qualities between main line and tap line are said to be automatically matched. Price: \$3.39. Aerogap.

CAPACITORS

209



Capacitors to 0.47 μ f, 25 vdcw, is offered in the "Transcap" line of ceramic capacitors. A new style offers 0.22 μ f in a case size of only 0.895 in. x 0.156 in. thick and 0.47 μ f in a case size of only 0.895 in. dia x 0.200 in. thick. Besides a very high capacitance per unit volume, another advantage cited for these capacitors is that the high resistivity

remains constant with increased voltage whereas the normal semiconductor type of capacitor exhibits a decrease in resistivity very rapidly with increased voltage. Price \$0.12 each, 0.22 μ f and \$.235, 0.47 μ f. Erie Resistor Corp.

SELF SERVICE TESTER

210



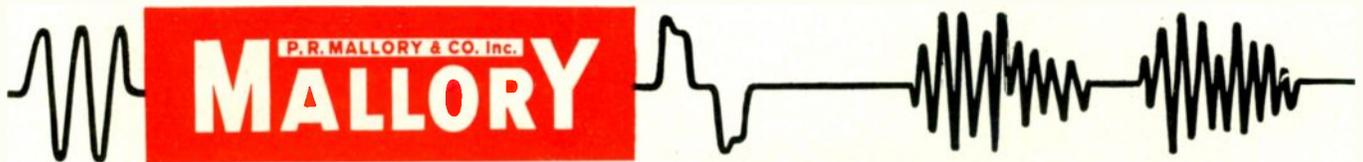
The Model 203-LB reportedly tests all tube types, including the latest Nuvistors, Novars, Compactrons and new 10 Pin Tubes. It also tests auto radio vibrators, batteries, fuses and pilot lights. The lo-boy cabinet design is finished in a light green, white and gold color combination. The

tube compartment has four sliding drawers with tube dividers and drawer sheets for automatic inventory control. The 63 phosphor-bronze beryllium sockets are said to assure positive contact and long life. Easy-to-read quick flip tube charts lists over 1200 tube types. The unique circuitry of the #203-LB allows it to accommodate new tube types as they are introduced. New tube charts are available periodically. Price \$254.50. Mercury Electronics Corp.

TOUCH CONTROL SWITCH

211

Designated "Touch Control Switch," this device operates by merely touching an antenna input wire to turn it on and touching another to turn it off. The circuitry of the switch has been designed around the "Dynaquad" — a PNP



Tips for Technicians

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

How to use temperature compensating ceramic capacitors

While an oscillating circuit is warming up, its frequency changes. Distributed capacitance in tubes and coil will drift in the "positive" direction—tending to decrease the resonant frequency. Unhappily, the tuning capacitor, if it is a conventional mica or paper unit, also drifts in this same direction . . . thereby adding to the downward frequency shift.

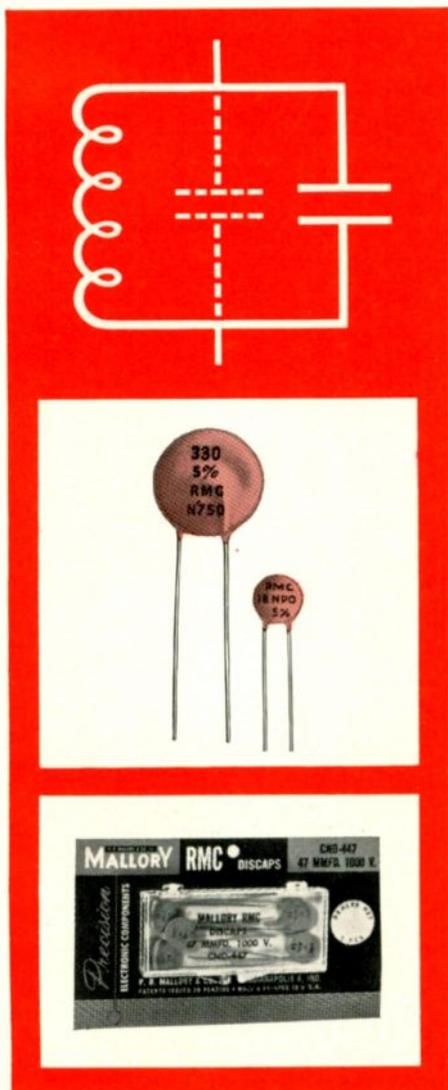
This can be a real nuisance. In the local oscillator circuit of a superhet receiver, it leads to constant readjustment of tuning as the set warms up. It may also introduce appreciable error in a ringing oscillator timing circuit in TV sets.

Here's where ceramic capacitors enter the scene. Unlike capacitors which have a "natural" material as dielectric, they use a man-made, rock-like material whose composition can be adjusted to just about any capacitance-temperature characteristic you want.

Some ceramic capacitors have a positive temperature coefficient: these are the kinds you'd use in bypass, coupling and buffer applications. Others have a zero temperature coefficient, remaining unchanged in the range from 25° to 85° C. And you can get 'em with a *negative* coefficient so that the capacitance change goes opposite to that of the other circuit elements, giving a constant LC product and substantially steady frequency during the warm-up period.

The usual negative temperature coefficient is 750 parts per million per degree C. But if you happen to need some non-standard coefficient to compensate your particular circuit, there's a simple way to calculate the parallel combination of zero and negative coefficient types that will do the job. Write to us and we'll give you details.

When you go looking for ceramics, be sure to ask for Mallory Discaps®. They're made by Radio Materials Company, a division of Mallory—world's largest manufacturer of ceramic capacitors. Your Mallory distributor has a complete stock, in the handy five-pack, mounted on a file card that's especially easy to keep on a peg board or in a file drawer.



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6-RMF (6 volts) 60 to 80 watts. Shipping weight 12 lbs. DEALER NET PRICE: \$33.00
12T-RME (12 volts) 90 to 125 watts. Shipping weight 12 lbs. DEALER NET PRICE: \$33.00
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For Demonstrating and Testing Auto Radios—TRANSISTOR or VIBRATOR OPERATED!

Designed for testing D.C. Electrical Apparatus on Regular A.C. Lines—Equipped with Full-Wave Dry-Rectifier-Type Rectifier, assuring noiseless, interference-free operation and extreme long life and reliability.

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MODEL 610C-ELIF . . . 6 volts at 10 amps. or 12 volts at 6 amps. Shipping weight 22 lbs. DEALER NET PRICE: \$49.95
MODEL 620C-ELIT . . . 6 volts at 20 amps. or 12 volts at 10 amps. Shipping weight 33 lbs. DEALER NET PRICE: \$66.95

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By every test ATR Auto-Radio Vibrators are best! . . . and feature Ceramic Stack Spacers, Instant Starting, Large Oversized Tungsten Contacts, Perforated Reed, plus Highest Precision Construction and Workmanship and Quiet Operation!

There is an ATR VIBRATOR for every make of car!
Ask your distributor for ATR's Low Priced type 1400, 6 volt 4-prong Vibrator; and 1843, 12 volt 3-prong; or 1840, 12 volt 4-prong Vibrator. THE WORLD'S FINEST!



ATR UNIVERSAL KARADIO

MODEL 600 SERIES
Easily installed in-dash or under-dash. Amplifier power-supply chassis may be separated from tuner chassis

for installation flexibility and easy servicing. Utilizes 6-tube super heterodyne circuit (2 dual-purpose tubes) with 8-tube performance . . . pulls in those distant stations with good tone and volume. Supplied with separate 5" x 7" speaker which is installed in original automobile speaker compartment for high fidelity performance. Neutral gray-tan baked enamel finish. Over-all size 4" deep x 6 1/2" wide x 2" high. Tuner Chassis; with Amplifier Chassis, 2 3/4" deep x 6 1/2" wide x 3 7/8" high. Shipping weight 7 lbs. WILL OUTPERFORM MOST SETS!

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Model 606—6 volt Dealer Net Price: \$31.96

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Extra-sensitive radio has 6 tubes (2 double-purpose), over-size Alnico 5 PM speaker for full, rich tone. Big, easy-to-read illuminated dial. Fingertip tuning control. Volume and tone controls, 33-in. stainless steel antenna. Neutral gray-tan enameled metal cabinet, 7 x 6 1/2 x 4 in. high over-all. Shipping weight 10 1/2 lbs.
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NEW PRODUCTS



semiconductor. Use of the Dynaquad reportedly has made possible a capacitance switch with a high order of reliability, low cost, small size and a wide range of operating conditions. Applications of the switch include: counting, sorting and switching in industrial control systems. In critical environments it provides a non-moving, non-arcing manual control which can be located at considerable distance from the switch mechanism. The switch works directly from 105-125 vac and can handle a load of up to 100 w. It is self contained in a plastic package 3 x 1 1/4 x 1 1/4 in. Six leads are brought out from the package: two for power, two for the load and two antennas for activating the switch. Tung-Sol Electric, Inc.

STEREO RECEIVER 212

A 30 w FM-AM stereo receiver, the Model RP230, is said to have a frequency response of ± 1 db 20 to 20,000



cps and an FM sensitivity of 0.85 μV per meter for 20 db of quieting. The model features the "Stereo-Minder" indicator which lights when the station is broadcasting stereo, electronic-eye tuning, a special tape recorder filter which eliminates beeps or whistles when taping off the air and a distinctive brushed gold panel. Price: \$249.95. Bogen Communications Div., Lear Siegler, Inc.

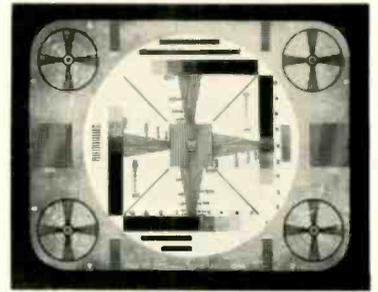
CAPACITOR CHECKER 213

The TE-44 capacitor checker features a tuning eye indicator and will check



TV TIPS FROM TRIAD

NO. 19 IN A SERIES



Bill, the Senior PTM, and Joe, his assistant, were working late.

Joe fired up the next set. "Hey, Bill," he said as he switched channels, "Barney's picture is on one channel, Fred's voice is on another, the picture is washed out, the sound buzzes, sync is critical, and the picture goes negative when I fine tune."

"Sounds like AGC trouble," said Bill. He removed the antenna clip. The sound and picture, although somewhat snowy, returned to normal.

"There are two general types of AGC systems," began Bill, "the simple or derived type, and the keyed system, usually using a pentode. This looks like a keyed AGC job. Notice that the additional width coil winding is used as a pulse voltage source applied to the plate of the keyer tube. This spike will always be positive and greater than the dc voltage on the screen of the keyer. Peak-to-peak voltages on the order of 400 to 500 volts are commonly measured at the plate. The AGC system can operate only if correct polarity and amplitude pulses are applied to the plate."

"Isn't a separate winding on the fly-back transformer used on some sets to obtain this same positive spike?" asked Joe.

"Right, and a capacitor is usually wired in series with this winding and the keyer plate. Always good practice to check this capacitor very carefully."

"Without AGC bias," Bill continued, "the IF strip and the tuner will overload severely, causing the symptoms we see here."

"Loquacious tonight, aren't we?" said Joe smiling.

"Let's check the width coil secondary," said Bill, ignoring the remark. He reached over and switched on the ever faithful VTVM. "Open," he said a moment later.

"I'm on my way to the parts shelf," said Joe.

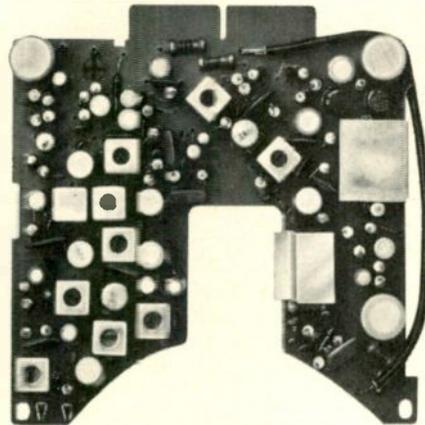
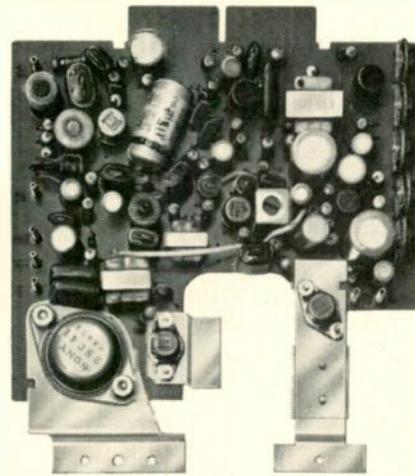
MORAL: Triad width coils are wound to produce the same polarity at the secondary (start of winding) as is applied to the primary (start of winding). Ask to see our rugged WLC-9 (and others) in the familiar red and white boxes at your favorite Triad distributor. A detailed instruction sheet is packaged with each part. Write Triad Distributor Division, 305 No. Briant St., Huntington, Indiana.

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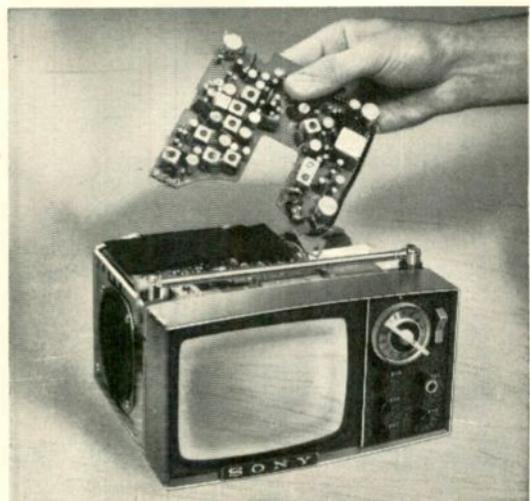
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MOUNTED ON
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BOARDS...**



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The new SONY Micro-TV is called the Television of Tomorrow. And this is especially true in servicing, for all components are mounted on two snap-out printed circuit boards, which permit inspection or replacement in a matter of minutes. Or, you could send the complete board right to SONY, and it will be expertly serviced and returned to you in a matter of days, at low cost. The 8-lb. Micro-TV, with 25 transistors, operates on its own rechargeable battery pack, 12v auto/boat battery and AC. List is \$229.95. Complete details are yours for the asking. Write today.



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NEW PRODUCTS

capacitors from 10 pf to 2,000 μ f for open or shorted conditions without unsoldering. It uses a 20-24 Mc frequency for "open test," and complete "eye" closure indicates capacitor is good. Partial closure indicates leaky component. If "eye" remains open, capacitor under test is defective. A 60 cps frequency is used for "short" test; complete "eye" closure indicates a good part. A shorted part is indicated when "eye" remains open. Comes complete with test leads and mounted in an attractive gray wrinkle-finish metal cabinet. Price: \$14.95. Lafayette Radio Electronics Corp.

DRY BATTERIES 214

Three dry cell batteries, the 9 v rectangular, the 1.5 v penlite and the 9 v round, are for use in such devices as portable transistor radios, portable tape recorders, flashlights, photographic units and toys. Full capacity is assured through a premium electrolyte while high output is made possible by a patented graphite-film process, according to the manufacturer. Quality insulation is said to provide long shelf life and freshness is controlled through dated stock. The batteries are supplied in self-display cartons along with point-of-sale promotion material



Price: \$0.39, 9 v rectangular; \$1.10, 1.5 v, and \$4.49, 9 v round (suggested retail). Sonetone Corp.

REACTANCE SLIDE RULE 215

The Reactance Slide Rule, has been re-issued by the manufacturer. Since it was first made available in 1943, over 300,000 Reactance Slide Rules have been distributed to technicians throughout the



world. The device is said to be a helpful, time-saving means for solving resonant frequency capacitive reactance, inductive reactance, coil "Q" and dissipation factor problems that cover a frequency range from 5 cps to 10,000 Mc. Price: \$1. Shure Brothers, Inc.

CB TRANSCEIVER 216

The "Messenger Two" is a complete 10-tube, including rectifier, crystal controlled transceiver for use on the Citizens Band. Basic circuitry has been patterned after that of the firm's



"Messenger," but includes a number of new features. The unit is designed for coverage of any 10 channels in the 23 channel band, has an illuminated channel indicator, and permits instant selection of any one channel by simply rotating the channel selector switch. The receiver section has been designed to offer increased sensitivity and high adjacent channel rejection. Transmitter circuitry has been designed for more than twice

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(formerly the IRE Show)

78

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take these boosters



in this caddy/pak



on every service call

NEW BLONDER-TONGUE CADDY/PAK BOOSTS BOOSTER SALES

TV Technicians — here's a bright new profit idea from Blonder-Tongue. Called the CADDY/PAK, it holds two indoor TV/FM boosters—one a transistor model, the other tubed — and fits easily in your tube caddy. The boosters are: the new all-transistor, model IT-4 Quadra-booster; and the industry's most reliable tubed model, the B-24c.

This combination makes it easy for you to give your customer the right booster for any reception situation. Remember, transistor boosters provide higher gain and are more rugged, but they have one problem — overload (windshield wiper effect, loss or sync). If you use a transistor booster in an area with one or more strong TV or FM signals — you may be buying too much booster. On the other hand, tubed boosters perform very well in these areas.

With the Blonder-Tongue CADDY/PAK you can demonstrate both tubed and transistor models in a jiffy, by con-

necting them to the terminals of the set. Either way your customer gets the finest indoor booster — a Blonder-Tongue.

The CADDY/PAK fits in your tube caddy. It's imprinted with the profit-producing words — "WANT A SHARPER TV PICTURE? ASK ME." You can place it on the set you are servicing and let it sell for you. And it reminds you and all your technicians to mention boosters on every service call.

You just can't help selling more — having more satisfied customers too — because they have the right booster. Today, see your Blonder-Tongue distributor and get details on how you can get a free CADDY/PAK booster demo kit—the sure-fire approach to boosting booster sales.

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Canadian Div.: Benco Television Assoc., Ltd., Tor., Ont.

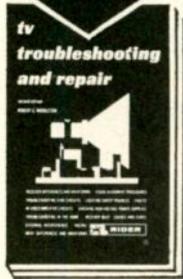
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reveals latest techniques to simplify servicing



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TV TROUBLESHOOTING AND REPAIR 2nd Ed. by Robert Middleton. Scores of the treasured trade secrets of professional TV service benchmen are packed into one, long awaited reference volume. This book places at your fingertips all the practical solutions to whip tough service problems, restore original performance quality to TV sets. It provides the most up-to-date techniques for troubleshooting. The first chapter describes TV receiver differences and waveforms. Each of the following chapters is devoted to troubleshooting techniques for specific circuit difficulties in Visual Alignment Procedures (Do you know how to check a front end's impedance?) . . . Troubleshooting Sync Circuits (Can you check for line pairing with a scope?) . . . Locating Sweep Troubles (Do you know how to determine when parasitic oscillations are affecting sweep width?) . . . Faults in Video-Amplifier Circuits (Can you make Y amplifier tests on color TV receivers?) . . . Checking High-Voltage Power Supplies (Know how to solve raster ringing problems?) . . . Troubleshooting In-The-Home (Short-cut tips to isolate defects quickly for in-the-home repairs, accurate repair estimates) . . . Receiver Buzz — Causes and Cures (Shows how to locate buzz origination fast) . . . External Interference (Can you compute the unknown interference frequency and correct the defect?) . . . Instrument Differences and Waveforms (Describes the applications and reading differences expected from various instrument types.)

Every TV technician — apprentice or experienced benchman — can profitably use this vital service tool. #296, \$3.95

BASIC OSCILLATORS by Irving Gottlieb, P.E.

At last, a book that takes all the mystery out of oscillator operation in receivers, transmitters and industrial equipment! This key circuitry — a major stumbling block to understanding electronics — is fully explained for the first time without resorting to bewildering mathematics. Complete descriptions of oscillator principles, so clear that only an elementary knowledge of electronics is needed, provide a firm basis for complete understanding of material discussed in following chapters. The book covers oscillating elements (LC circuits, crystals, transistors, tunnel diodes, thyratrons, etc.), oscillator techniques (switching, amplification, negative resistance, feedback, etc.), and numerous oscillator circuits in actual applications, using feedback, negative resistance or relaxation techniques.

This unique book, through its vividly clear oscillator theory and practice, gives such valuable guidance to design or service oscillators you don't have to memorize circuits or components. #255, \$4.50

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NEW PRODUCTS

the input power used on the Citizens Band for high reliability and extended component life. Price: \$169.95. E. F. Johnson Co.

EDUCATIONAL TV 217

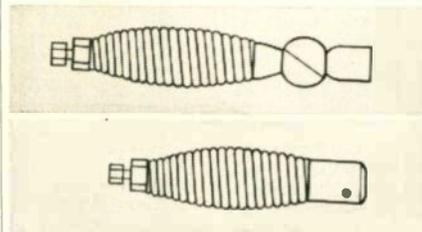
The demonstration center equipment is said to be designed for use with groups of 100 or more students, when the



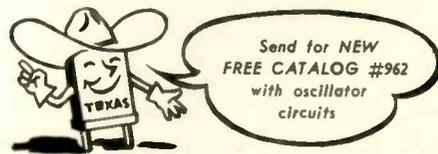
instructor is required to operate a number of displays from a single control center. This center also reportedly permits the instructor to select VHF, UHF or locally originated high resolution, closed-circuit television. The equipment includes: an 800-line picture closed-circuit TV; a central sound control from the tuner for speakers attached beneath the viewers and a choice of ceiling-suspended or pedestal viewer mounts. The viewers, equipped with 23 in. screens, are 24 in. wide, 22 high and 19 deep. Conrac Div., Giannini Controls Corp.

ANTENNA SPRINGS 218

Two newly-designed mobile antenna springs reportedly won't lose the whip. A special ferrule fitting is claimed to



give the user positive grip. Made of stainless steel, these non-corrosive springs adapt to the firm's Mobile VHF antennas and are rigid enough to resist wind but flexible enough to bend for low clearances. Both a standard base and a ball-joint to allow mounting on angular surfaces are available. G. A. M. Electronics, Inc.



Citizen Band Class "D" Crystals

CITIZEN BAND CLASS "D" CRYSTALS
3rd overtone — .005% tolerance — to meet all FCC requirements. Hermetically sealed HC6/U holders. 1/2" pin spacing. .050 pins. (Add 15c per crystal for .093 pins). **\$2.95 EACH**

All 23 channels in stock. 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225, 27.255

Matched crystal sets for ALL CB units (Specify equipment make and model numbers) **\$5.90 per set**

CRYSTALS IN HC6 U HOLDERS

SEALED OVERTONE

.486 pin spacing — .050 diameter — .005% tolerance
15 to 30 MC **\$3.85 ea.**
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From 1400 KC to 2000 KC
.005% tolerance **\$5.00 ea.**
From 2000 KC to 10,000 KC,
any frequency, .005% tolerance **\$3.50 ea.**

RADIO CONTROL

Specify frequency. .05 pins spaced 1/2"
(Add 15c for .093 pins) **\$2.95 ea.**

QUARTZ CRYSTALS FOR EVERY SERVICE



All crystals made from Grade "A" imported quartz—ground and etched to exact frequencies. Unconditionally guaranteed!

Supplied in:

FT-243 holders Pin spacing 1/2" Pin diameter .093	MC-7 holders Pin spacing 3/4" Pin diameter .125
CR1A/AR holders Pin spacing 1/2" Pin diameter .125	FT-171 holders Pin spacing 3/4" Banana pins

MADE TO ORDER CRYSTALS . . . Specify holder wanted

1001 KC to 1800 KC: .005% tolerance	\$4.50 ea.
1801 KC to 2800 KC: .005% tolerance	\$2.75 ea.
2801 KC to 9000 KC: .005% tolerance	\$2.50 ea.
9001 KC to 11,000 KC: .005% tolerance	\$3.00 ea.

Amateur, Novice, Technician Band Crystals

.01% Tolerance . . . \$1.50 ea. — 80 meters (3701-3749 KC) 40 meters (7152-7198 KC), 15 meters (7034-7082 KC), 6 meters (8335-8650 KC) within 1 KC FT-241 Lattice Crystals in all frequencies from 370 KC to 540 KC (all except 455 KC and 500 KC) — 50c ea. Pin spacing 1/2" Pin diameter .093

Matched pairs — 15 cycles	\$2.50 per pair
200 KC Crystals	\$2.00 ea.
455 KC Crystals	\$1.25 ea.
500 KC Crystals	\$1.25 ea.
100 KC Frequency Standard Crystals in HC6/U holders	\$4.50 ea.
Socket for FT-243 Crystal	15c ea.
Dual Socket for FT-243 Crystals	15c ea.
Sockets for MC-7 and FT-171 Crystals	25c ea.
Ceramic Socket for HC6/U Crystals	20c ea.

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ELECTRONIC TECHNICIAN

NEW BOOKS

THE ELECTRONIC MUSICAL INSTRUMENT MANUAL 4th Edition. By Alan Douglas. Published by Pitman Publishing Corp. 278 pages, hard cover, \$8.50.

The revised 4th edition of this book is, as the other editions, excellent. It contains a description for virtually every type of electronic instrument circuit commercially available. The technician planning to do service work in this fast-growing field should definitely read this volume. Complete schematics of popular instruments are generously included with circuit descriptions. Circuit insets include Hammond, Solovox Clavioline, Novachord and others. The author explains the relationship between electrical tone colors and their acoustic counterparts. No electronic musical instruments engineer or serviceman should be without a copy of this book for his library.

CB RADIO MOBILE HANDBOOK. By Jim Kyle. Published by Horizons Publications, Inc. Approximately 110 pages, soft cover. \$2.95.

Here's a basic CB mobile radio book that should be of great value to the CB user as well as the technician. Many tips are given on CB radio and antenna installation. Circuits of special interest are described, test equipment is discussed and CB regulations and procedures are outlined. Some of the noise problems encountered only in mobile work are described along with troubleshooting and procedures to locate and eliminate them.

SINGLE SIDEBAND FOR THE RADIO AMATEUR. Published by the American Radio Relay League. 224 Pages, soft cover. \$2.

This volume has been compiled by the editors of QST magazine from articles which have appeared in that magazine on the SSB equipment. It is a complete reference, and although written for the radio amateur, should interest the average technician engaged in communications service work or those contemplating two-way service work. History, construction, theory and practice are all well covered.

RADIOTELEPHONE LICENSE MANUAL. By Woodrow Smith. Published by Editors and Engineers Ltd. Estimated 200 pages, hard cover. \$5.75.

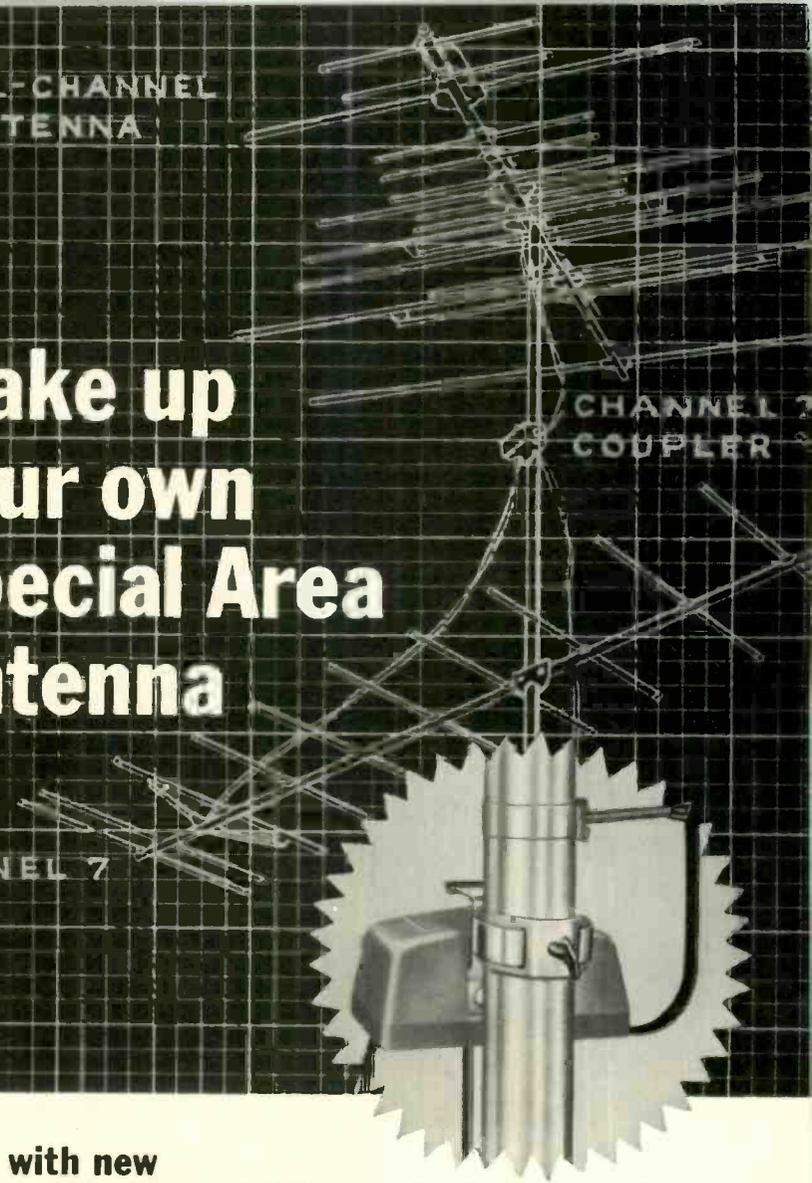
Those working for a radiotelephone license to expand the range of their business should definitely purchase one of the study guides available to prepare for the test. This manual is one of many on the market and will provide all the necessary information to anyone who possesses a basic knowledge of electronics. No additional books should be required to make any portion of the book clear. The book is written in a question and answer format and divided into sections starting with Basic Law, Basic Radiotelephone Theory, etc.

ALL-CHANNEL ANTENNA

Make up your own Special Area Antenna

CHANNEL 7 YAGI

CHANNEL 2 COUPLER



with new

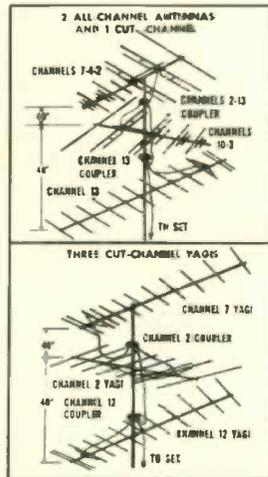
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NO ROTOR OR SWITCHES, "SPECIAL ANTENNAS" OR EXPENSIVE "MIXING NETWORKS" NEEDED!

Now Winegard yagi couplers give you unlimited flexibility in putting together any combinations of antennas on the same mast with only a single down-lead to the TV set or amplifier . . . without interaction, loss or mismatch. For example—you can couple two, three, four, or more cut channel yagis to each other or to any VHF broad band or all channel antenna. You can couple an FM antenna and a TV antenna. In fact, you can do any coupling job. You always use one coupler less than the number of antennas being coupled. It's inexpensive,

fast and eliminates need for rotors or mixing networks.

Winegard yagi couplers CA-2 through CA-13 are individually tuned to each of the 12 VHF channels. Coupler Model CA-213 will couple any 2 antennas, even all-channel antennas. Each coupler has 3 no-strip terminals for 300 ohm twin lead—2 antenna input terminals and one output terminal for connecting the down lead to another coupler, a TV set or amplifier. Coupler chassis is housed in high-impact polystyrene cover, tough, waterproof, won't short. A stainless steel strap is provided for fast installation. Coupler models list at \$5.50 each. Write for bulletins or ask your Winegard distributor.



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**NEWS
OF THE INDUSTRY**

Southland Sound Corp. is the new name of the former Commercial Sound Div., Kierulff Sound Corp. Thomas Hackett and Robert Foster, new owners of the public address, intercom and background music installation sales and service distributorship, are former managers. Kierulff Sound Corp. continues to operate as a Hi-Fi Component sales and service outlet.

Radio Corp. of America set all-time sales and earnings records for the first nine months of 1962, according to chairman David Sarnoff and president Elmer W. Engstrom. After tax earnings in the third-quarter increased 66 percent over the same quarter in 1961. Profits after taxes for the first nine months rose 44 percent to \$34,300,000 from \$23,800,000 in the first three quarters of 1961. This was achieved on record sales of \$1,265,500,000, up 16 percent from the \$1,090,100,000 in the comparable period a year ago.

Hi-Lo Mfg. Co., Chicago, purchased the TV antenna and accessories business of Amphenol-Borg Electronics Corp. The sale includes patents and all machinery and equipment for manufacturing the antennas and accessories. In marketing these products Hi-Lo will be free to use the name "Inline" formerly used by Amphenol-Borg. Identification with the name Amphenol will be dropped, however.

Olson Electronics opens a store in South Hills, Pittsburgh. This is the second Olson Store in the Pittsburgh area and bringing the total of stores open to 13. This store is completely self-service. There is no storage room nor back room. The entire floor area is devoted to open type display of everything from picture tubes to small parts. Herb Davis is the manager of the new store.

Oxford Electric announces the acquisition of all of the capital stock of Globe Tool & Die Co. and its affiliate, Globe Instrument Co. of Southbridge, Mass. The purchase price was not disclosed. It is stated that the present management at Southbridge will be retained and integrated with other Oxford operations.

Electronic Representatives Assn. will discuss, "Where is the Audio Industry Going?—What is the Future of Distributor Selling? — and Can You Teach an Engineer to Sell?" These are only a few of the over-all industry problems that will be taken up in workshop sessions at the 1963 ERA 4th Annual Convention to be held in San Francisco from Jan. 22 through the 25th.

Olympic Radio & Television Sales Corp., selects Garrett Distributors, Inc.,

Toledo, Ohio as distributors for north-western Ohio.

Tung-Sol Electric Inc., reports a receiving tube promotion in which it is offering, at reduced prices, a 3-piece set "Yogi Bear" "Boontonware" melamine dishes to purchasers of its receiving tubes. The non-breakable tumbler, bowl and plate, regularly a \$2.98 retail value, is available for \$1.75 and five Tung-Sol receiving tube carton flaps.

Entrol, Inc., manufacturers of community television systems and equipment, moves to expanded quarters in Montgomery Industrial Park, Silver Spring, Md.

Zenith Sales Corp. reports that more than one million Zenith television receivers have been produced and sold so far during 1962, the company's fourth successive million-plus TV set year. "As a result," according to president L. C. Truesdell, "Zenith will achieve in 1962 the greatest percentage of total industry sales in the company's history and further strengthen our position as number one in TV sales in the intensely competitive television industry."

Olympic Radio & Television Div. introduces a 19 in. portable television, said to be the first U.S. designed set to be produced in Japan for a major manufacturer. Model 9P21, "The Rosalind," follows by a few months delivery of the



GAM SPRINGS WON'T LOSE YOUR WHIP!

Special ferrule fitting on GAM springs gives you positive grip. Stainless steel constructed, this rust-proof spring adapts itself to all existing GAM mobile VHF antennas and is rigid enough to resist wind but flexible enough to bend for low clearances. SB1 and SB2 differ from S1 and S2 only in that the ball joint allows mounting on angular surfaces.

LIST PRICES

S1 (3/8" hole), S2 (1/2" hole)\$ 7.50
SB1 (3/8" hole), SB2 (1/2" hole)\$10.00

See your distributor or write GAM direct. Prices available for different combinations of Springs and Antennas.

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ON SPRINGS, MOBILE AND
FIXED STATION HIGH GAIN
ANTENNAS (VHF & UHF).**



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ELECTRONIC TECHNICIAN

first 19-in. table models produced for Olympic in Japan. Both models were designed by Olympic engineers in the U. S. for production by Nippon Columbia, Co., Tokyo. Model 9P21 features front-mounted speaker and controls, a 40 in. telescopic antenna, hand-wired 3 i-f chassis, 19,000 v picture power, adjacent channel trap and high-gain frame grid tuner. Price is \$129.95.

Electro-Voice, Inc., reports that although sales for the first six months of fiscal 1962-63 were nearly that of the same period of last year, expenses, particularly those in the areas of manufacturing and tooling, turned what would have been a profit into a small loss.

Sylvania International Div., General Telephone & Electronics International Inc., receives President Kennedy's "E" award for excellence-in-export and was cited for its 20-fold growth since World War II. The "E" award, revived last year is designed to honor American companies which have developed exceptional selling efforts abroad. Sylvania International was created shortly after World War II, and since then has increased its export business by 20 times. In the past two years, the division has doubled its export sales.

Matthew Stuart & Co., Inc., announces a national promotion on the "Phono Trix 88B." Matthew Stuart intends to spend over \$300,000 in the next six months to establish the "88B" as the standard for quality in the sub-miniature tape recording field, according to company officials.

Regency Electronics, Inc., announces the formation of a new subdivision of the **Electric Equipment Div.**, to handle consumer products private label manufacture. Until recently, the firm's activity was primarily concentrated on the engineering and manufacturing of its own products and for Armed Forces agencies. Regency reportedly is presently in full production on contracts for a large number of private label electronic receivers. The new subdivision will be headquartered at the Indianapolis plant.

Raytheon Co., announces that TV and radio service dealers will have an opportunity to earn toy road racing sets as Christmas gifts from Raytheon tube distributors. The electric toy sets, which are being sold nationally at \$29.95, will be offered as incentive prizes to service dealers with the purchase of Raytheon receiving tubes. Included in the **Strombecker International Road Racing Sets** are two scale model racing cars, a Jaguar and a Ferrari Testa Rosa, 13 sections of track that create a figure 8 cross-over, and individual throttle controls for two operators. Details on the racing car Christmas gifts are available from all the firm's franchised tube distributors.

Hickok-RD Div. appoints **Berndt and Associates**, 6322 N. Milwaukee Ave.,

Chicago 46, Ill. as representative for the **Hickok Electrical Instrument Div.** The Berndt firm's territory encompasses northern Illinois, northern Indiana and southern Wisconsin.

Sylvania Home Electronics Corp. appoints **Strawn Distributing Co.**, Knoxville, Tenn., as franchised distributor. The Strawn company will be responsible for the distribution of Sylvania television sets, radios, and stereophonic high fidelity phonographs in 16 Tennessee counties. **Robert C. Strawn** is president of the distributorship.

National Raido Co. announces the appointment of the **Harrison Electronics Corp.**, industrial electronics distributor

in New York City, as their authorized captive-hardware distributor. Harrison will carry National's complete line of stainless steel captive nuts and studs in depth for distribution to accounts in metropolitan New York City and northern New Jersey.

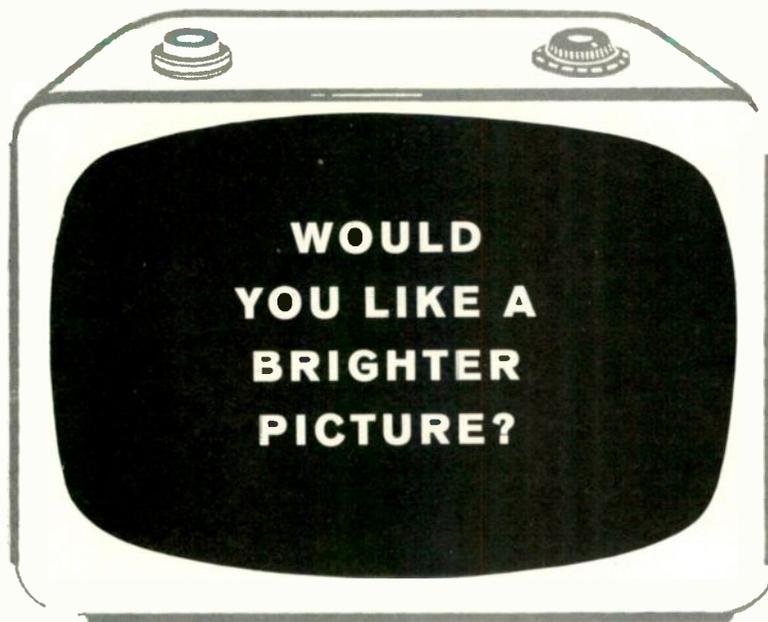
Olympic Radio & Television Div., Lear Siegler, Inc., names **Depot Merchandise Mart Ltd.**, Honolulu, as distributor for the state of Hawaii. Depot will handle Olympic's line of 1963 radio, television and stereo high fidelity products. Principals of Depot Merchandise include **George J. Fukunaga**, president; **Benjamin Fukunaga**, vice president; **Hideo Kimura**, secretary, and **Francis Sato**, treasurer.

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... MOBILE ANTENNAS

Continued from page 34

and a different antenna for transmitting. Automatic switching may still be necessary in transceivers, however. This is easily accomplished by connecting a coaxial relay to the transmitter function switch. In this manner the transmitting antenna will be connected to the unit while in the transmit mode to the receiving antenna when listening.

Base stations also have the advantage of being grounded. It is not only a good safe practice but in many cases will improve communications if the transmitter and receiver are connected to a good earth ground.

A final word of warning: Remember, you're not working with 60 cycle house current. Haywire setups, poor connections, and improper impedance matching can mean the difference between barely usable communications and a top notch system which fully satisfies your customer. ■

... SYNC TROUBLE

Continued from page 38

hunt components are shown in Fig.

3 for regular and synchroguide systems.

Vertical and Horizontal sync loss—If both vertical and horizontal sections are affected, the fault probably lies in the sync section. In most cases manipulation of the hold control should sync the picture momentarily. If rotation of the hold controls will not allow the picture to roll up and down, or in horizontal problems cause blanking bars to slant to the left and right, the oscillator is probably at fault.

Complete loss of sync in either or both sweep section can be traced to almost any point in the sync path. In most cases, however, if only one oscillator is out of sync the technician should concentrate on the input circuits of the associated oscillator.

Vertical jitter—This is usually a problem encountered in the vertical output circuit. If the output circuit has been relieved of suspicion, however, light capacitor leakage and the integrator circuit should be suspected.

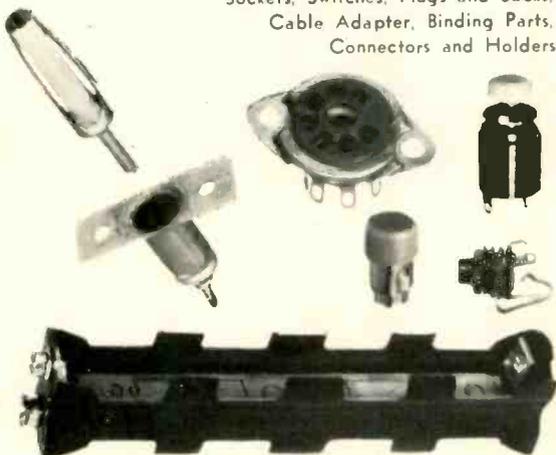
Horizontal jitter—Horizontal jitter can usually be corrected by careful adjustment of the ringing coil. Component values which have



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changed slightly should also be suspected. If all efforts fail, increase the value of the resistor in series with the ringing coil about 50 percent. On synchroguide systems, the circuit Q may be reduced by shunting a 27 K to 47 K resistor across the phase coil. (See Fig. 3.)

Critical horizontal sync—Almost any component in the horizontal sync or AFC section can cause critical sync. A careful component check is the easiest way out. Don't leave the phase detector diode for last—they are frequently at fault. If you have replaced these diodes, or suspect tampering, make sure they are not installed backwards. Often a set will sync in but only lightly when these diodes are reversed.

Critical vertical sync—Again, shift in the value of components in the vertical oscillator input circuitry or slight capacitor leakage is at fault. Sometimes the best method to locate these faults is to change the suspected components.

Christmas tree effect—Sometimes called optical effect, is the result of the horizontal oscillator operating far from its normal frequency. The AFC circuitry is a prime suspect in this type of malfunction. In some cases, however, loss of sync combined with improper adjustments will cause the christmas tree effect.

In any case careful, painstaking troubleshooting will lead you to the problem. ■

... TEST INSTRUMENTS

Continued from page 43

CRYSTAL CALIBRATOR

E. F. Johnson Crystal Calibrator, Model 250-38 at \$18.95—Here's an instrument that is very familiar



to amateur radio operators, but somehow hasn't gained much popularity with regular technicians. Ev-

ery shop, especially those engaged in two-way radio service needs an accurate frequency standard.

Amateurs use, in most cases, a 100 kc crystal oscillator rich in harmonics in conjunction with their receiver. The signals can then be heard every 100 kc as the dial is turned.

Technicians can use the crystal calibrator in a similar manner. Reasonably accurate test equipment—transmitters and receivers can be checked and calibrated with the aid of a beat frequency listening device—such as a grid dip meter, the re-

ceiver under test or an auxiliary receiver.

The unit comes completely equipped with a 100 kc crystal and a 6BH6 tube. If the unit is mounted in a receiver or existing test equipment, power is drawn from the existing equipment. Only 2 ma between 150 v and 300 v is needed for B+ and 6 v for filament power.

Special quick connectors are supplied with the unit to make the installation easier. The unit is very compact so its installation is simplified. It measures only 3 3/8 x 2 1/2 x 1 1/2 in.

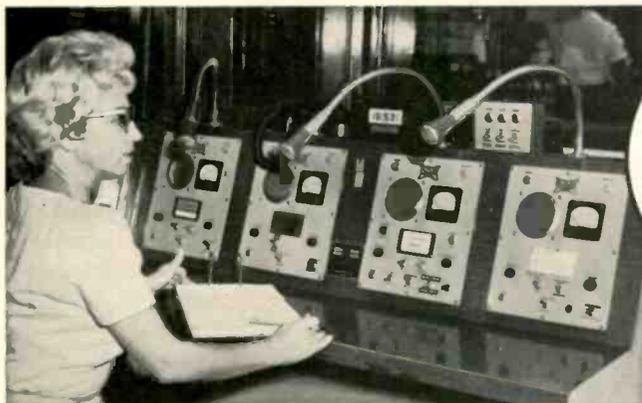


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MOTORCYCLE		
PORTABLE		
BASE		



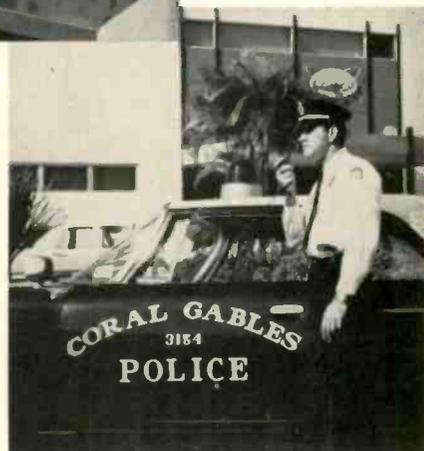
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PAST 15
YEARS

A SPECIALLY DESIGNED DISPATCHER'S CONSOLE PROVIDES EFFICIENT, INSTANT CONTROL OVER 4 RADIO CIRCUITS.

- 1) Police messages are dispatched to patrol cars, motorcycles, police boats, and other vehicles over a 150 Mc mobile relay system of advanced design. A 310 ft. antenna height on relay transmitter provides 40 mile car-to-car communications. Two-way or three-way versatility by selection at control console.
- 2) A Local Government frequency for fire trucks, rescue squads, electrical trucks, and other maintenance and official vehicles.
- 3) The Inter-City circuit on 155.37 Mc has special relay provisions permitting messages from other communities in Dade County to be simultaneously re-transmitted to Gables police vehicles enabling each mobile unit to receive direct county-wide broadcast.
- 4) A completely independent stand-by base station for Police and Local Government frequencies is located several miles from main repeater station.



This high performance system includes four base stations, 80 mobile units, three portable base stations. Eleven new COMCO Model 500 mobiles with all-transistor receiver will soon be added.

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Here is everything you want in self-service tube testers at down-to-earth prices. **MORE VERSATILITY**—Tests emission, shorts and gas of over 1200 tube types including the very latest NUVISTORS, NOVARS, COMPACTRONS, etc... Also tests fuses, pilot lights, 6 and 12 volt auto radio vibrators, all type batteries under load. **SMARTER LOOKING**—Modern cabinet design finished in a rich green and white color combination with gold trim... Eye-stoppers in any location—will attract do-it-yourself customers as never before and sell tubes in a big way. **MORE QUALITY FEATURES**—Completely self-service... Only two easy-to-use controls are required to test any tube... Easy-to-read quick flip tube charts list over 1200 tube types... Engineered to accommodate new tube types as they are introduced... Etched aluminum panel always retains its handsome appearance... 63 phosphor-bronze beryllium tube sockets assure positive contacts and long life.

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FREE LITERATURE

SEMICONDUCTORS 300

A quick Reference Guide lists this company's complete line of silicon rectifiers and both power and switching transistors. The guide gives electrical specification on all the different types. Included under silicon rectifiers are low current types from 500 to 750 ma in a standard JEDEC DO-1 outline and in cold-welded subminiature case construction; medium current types from 20 to 35 amp in JEDEC DO-5 outline and in pressfit construction; and high current types rated at 70 amp in a JEDEC DO-8 outline. Listings for transistors include audio, rf and computer switching types, and 5 amp and 15 amp power transistors. Tung-Sol Electric, Inc.

VIDEO TAPE 301

Tips on how to splice video tape for maximum recorder performance are presented in the latest of a series of semi-technical bulletins. Designed specifically for video tape editors and recorder operators, the new bulletin, entitled, "Video Tape Splicing," discusses the most common errors made when splicing video tape and how they can be avoided. Minnesota Mining and Mfg. Co.

EUROPEAN TUBES 302

More than 1200 available European tube types are listed in bulletin #15. The four-page listing contains types and prices representing all leading European tube manufacturers and suppliers. State Labs, Inc.

COMPONENTS 303

Components Catalog 200, a 16-page book gives full price ad product information on the firms distributor line of controls, switches, ceramic capacitors, and "PEC" packaged circuits. In addition to detailed replacement data on over 1815 components, the catalog includes full descriptions of the contents of 15 kits. The catalog also contains control taper charts, showing standard resistance curves and standard tapped resistance curves. The book is completely indexed for easy use. Centralab, The Electronics Div. of Globe-Union Inc.

EDUCATIONAL TV 304

A kit containing detailed information on an educational television operating console as well as additional equipment needed for a complete system is available. Included in a kit are a six-page technical brochure describing the console, a copy of a typical proposal for a complete ETV system, a capabilities sole, a copy of a typical proposal for a guide for estimating price, as well as other data. ETV Sales, General Electric Co.

TEST EQUIPMENT 305

This equipment catalog, a 20-page book, is done in two colors and measures 7 x 10 in. It lists features, specifications and prices of the complete line of the

firm's Test Equipment. Precision Apparatus Co., Inc.

PACKAGE EXPRESS 306

These publications outline a nationwide package express service. Specific data covered includes sample rates, shipping regulations and advantages. Grayhound Package Express.

SOLID LUBRICANT 307

The principal features and performance characteristics of "Moly-Spray-Kote," a new aerosol dispensed solid lubricant, are described in this bulletin. The bulletin describes the advantages of solid lubricants in difficult lubrication assignments including the elimination or reduction of galling, seizing, fretting and wear-in damage. Tables and graphs present test data on corrosion resistance and wear life, contrasting the performance of the new lubricant with seven competitive products. Alpha-Molykote Corp.

PICTURE TUBE GUIDE 308

A television picture tube interchangeability chart, includes 54 "universal" tubes which replace a total of 217 types. The guide contains the type number of the tube to be replaced, the number of the firm's tube that replaces it, and a key to the information needed to effect the replacement. The interchangeability guide can be used as a counter or wall chart, or may be folded into pocket size. Sylvania Electronic Products, Inc.

METERS 309

This 16-page brochure features over 1300 panel meters of various sizes, styles, types and ranges all carried in stock and available from electronic distributors. Voltmeters, ammeters and microammeters in sizes from 1 1/2 in. up through 6 in. are reviewed. Simpson Electric Co.

TERMINALS AND CONNECTORS 310

Described and pictured is an entire line of non-insulated single-grip terminals, insulated single-grip terminals, non-insulated double-grip terminals and insulated double-grip terminals. Also described and pictured are crimping tools. Various service kit assortments of connectors and terminals for automotive, appliance, electrical and general-purpose use are also shown. Vaco Products Co.

INDUCTORS 311

A 10-page folder outlines a series of air core inductors designed especially for the amateur rig or for prototypes of RF transmission equipment. The folder gives technical data on the coils which may be used for pi output circuits, conventional LC output circuits, interstage and oscillator circuits. Illumitronic Engineering Corp.

HI FI LOUDSPEAKERS 312

Catalog 165-H covers all technical and styling details of the line of high fidelity loudspeaker and headphone equipment. An introduction discusses the arguments for "slim" speakers as opposed to the normal bookshelf size. There also is a section on headphone accessory products. Jensen Mfg. Co.



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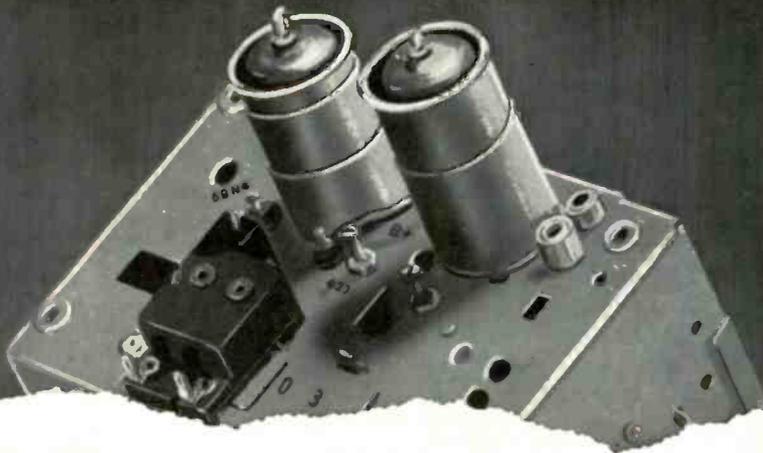
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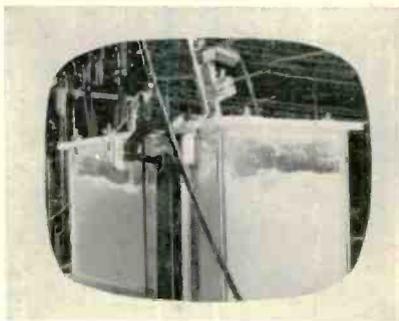
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