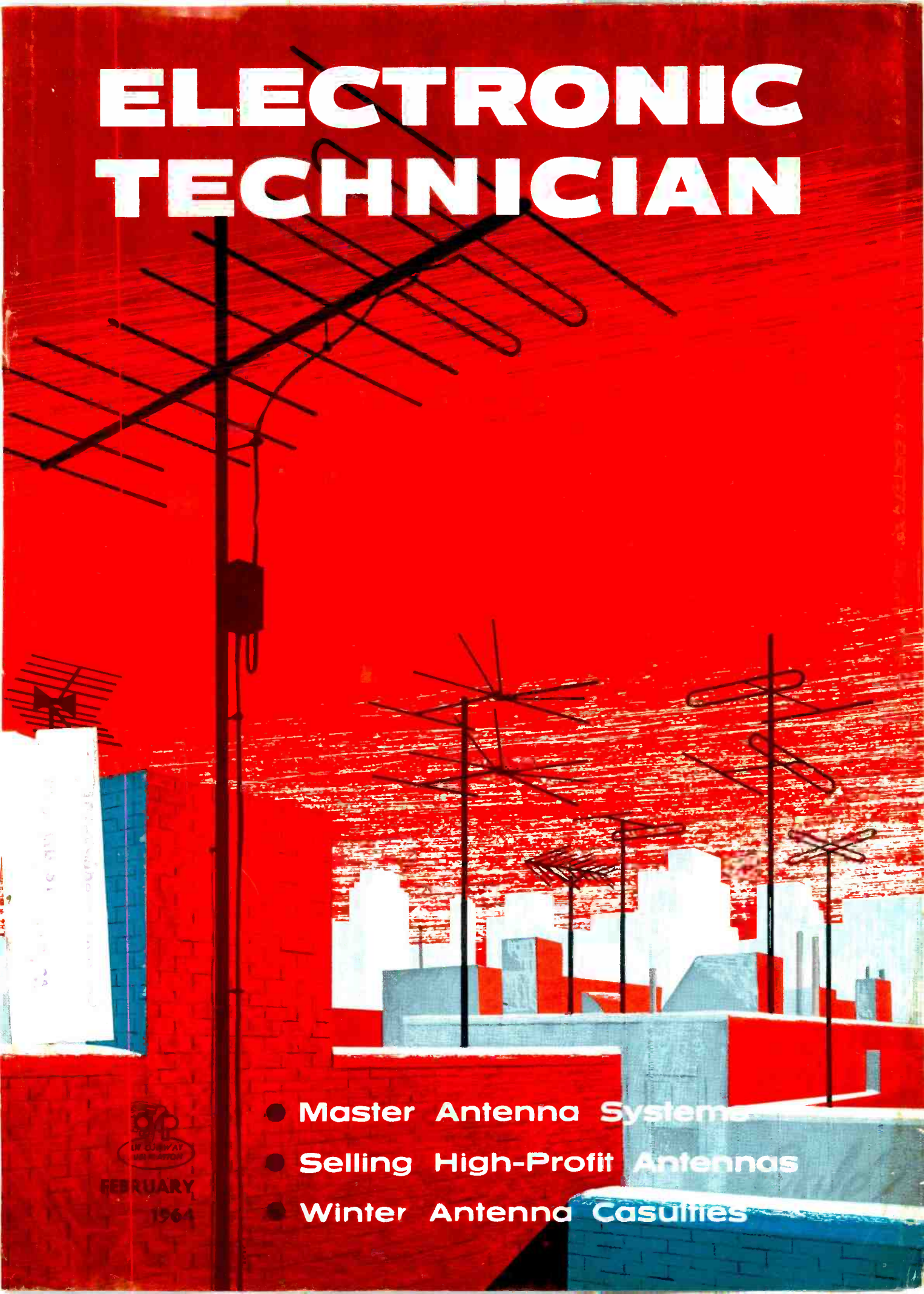
ELECTRONIC TECHNICIAN



- Master Antenna Systems
- Selling High-Profit Antennas
- Winter Antenna Casualties

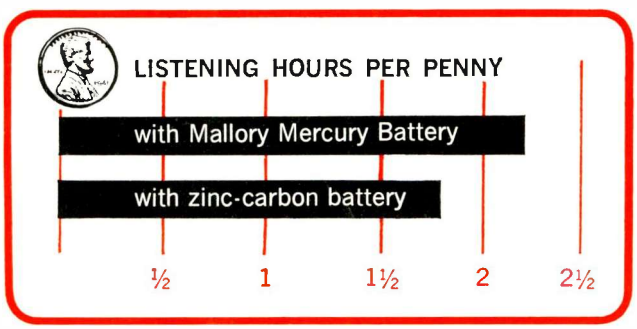
FEBRUARY 1964

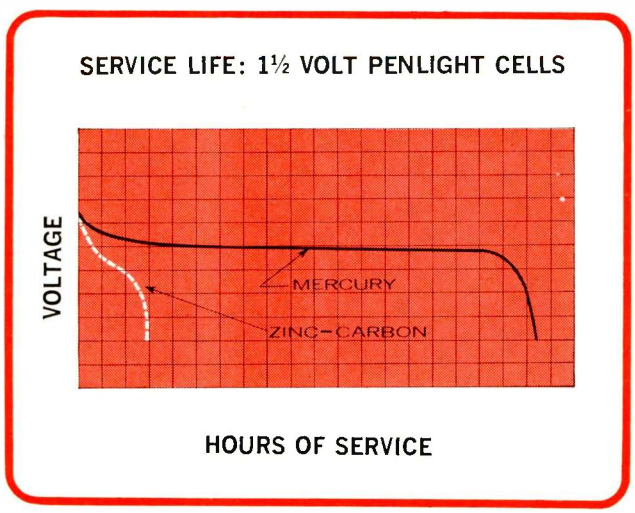
P. R. MALLORY & CO. Inc.
MALLORY

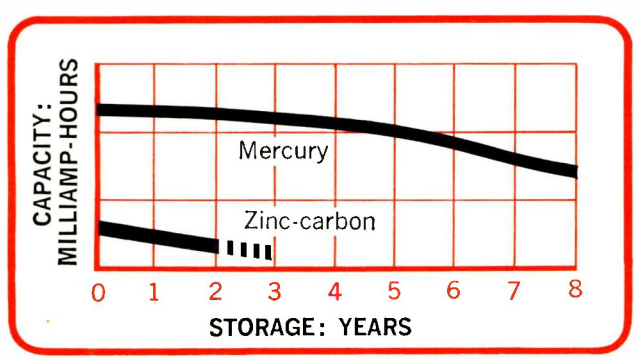
Tips for Technicians

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

Why Mallory Mercury Batteries work better in transistor radios







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

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

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

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

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

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

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

ELECTRONIC TECHNICIAN

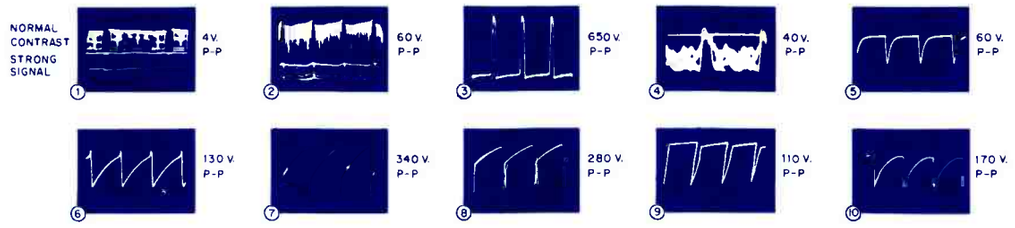
TEKFAX

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

834

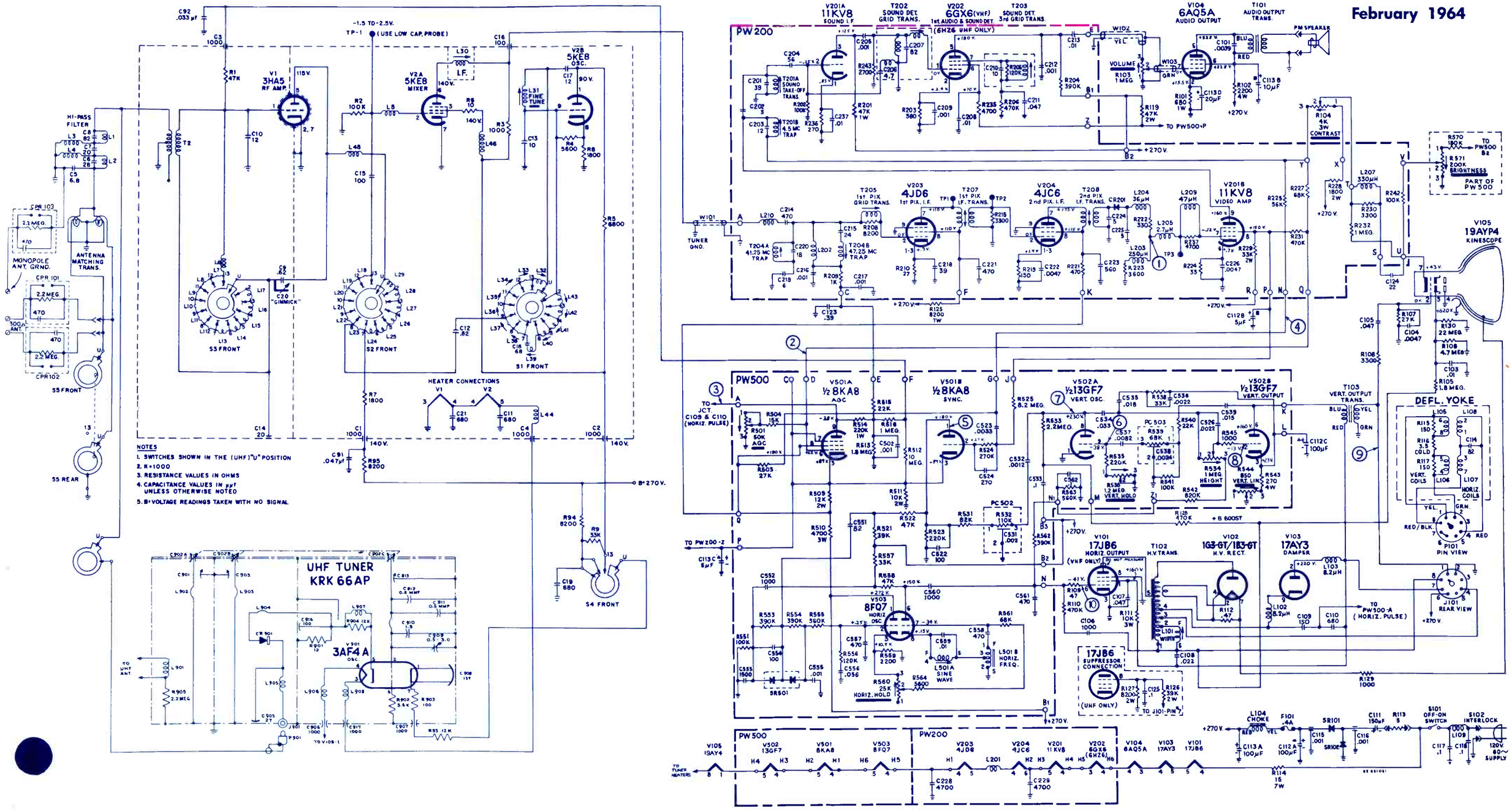
RCA
TV Chassis
KCS 142

February 1964

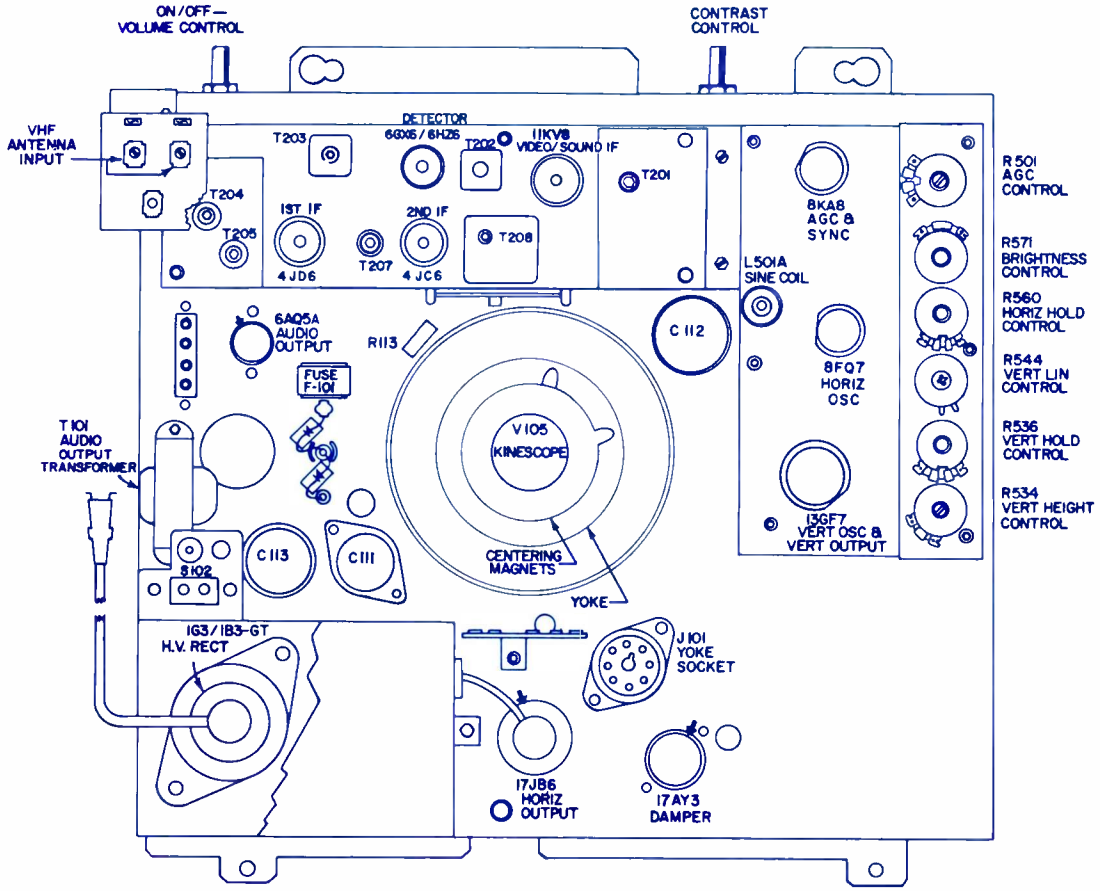


RESISTANCE VALUES IN OHMS. K=1000.
CAPACITANCE VALUES LESS THAN 1 IN MF. 1 AND ABOVE IN MMF. UNLESS OTHERWISE INDICATED.
DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION.

VOLTAGES MEASURED WITH "VOLTOHMYST" ® WITH NO SIGNAL INPUT AND SHOULD HOLD WITHIN ±20% WITH 120V.AC SUPPLY.
VOLTAGES MEASURED WITH 1 MEG. ½ WATT RESISTOR IN SERIES WITH METER PROBE.



More Data on Reverse Side



C502	A1	R515	A1
C522	B3	R516	A2
C523	B3	R521	B4
C524	B2	R522	B2
C526	B7	R523	B2
C532	C6	R524	A2
C533	B6	R525	A2
C534	A6	R531	C3
C535	B6	R533	C6
C536	A5	R534	C6
C537	A7	R535	B7
C539	A7	R536	C5
C551	B4	R538	A5
C552	B4	R540	A7
C553	B5	R541	A7
C554	A5	R542	C6
C555	A5	R543	B6
C556	A5	R544	C4
C557	A4	R545	B6
C558	A3	R551	B5
C559	A4	R552	B5
C560	B3	R553	B5
C561	B3	R554	A5
C562	B3	R555	A5
		R556	A4
L501	A3	R557	B4
PC502	C5	R558	B3
PC503	B7	R559	B5
R501	C1	R560	C3
R503	B2	R561	B4
R504	B1	R562	B3
R509	B3	R563	B3
R510	A3	R564	B4
R511	A3	R570	C3
R512	A2	R571	C3
R513	A1		
R514	A1	SR501	B5

PW500 LOCATION GUIDE

C201	F1	L210	A3
C202	G2		
C203	G2	R201	E2
C204	F1	R202	E1
C205	E2	R203	D1
C206	E1	R204	C1
C207	E2	R205	C1
C208	C1	R206	B1
C209	D1	R208	B3
C210	C1	R209	B1
C211	B1	R210	B2
C212	C1	R215	C3
C213	C1	R219	D3
C214	A3	R221	D2
C215	A2	R222	E3
C216	A2	R223	F3
C217	A1	R224	F3
*C218	B3	R225	G2
C219	B2	R227	G2
C220	B2	R228	G3
C221	B2	R229	F2
C222	D2	R230	G1
C223	D2	R231	G2
C224	E3	R232	G1
C225	E3	R235	C2
C226	F3	R236	F1
C228	B3	R237	F3
C229	D3	R242	G1
C237	F1	R243	E2
CR201	E3		
		T201	G2
L202	A1	T202	
L203	E3	T203	C1
L204	E3	T204	A2
L205	F3	T205	A3
L207	G1	T207	C3
L209	F2	T208	E3

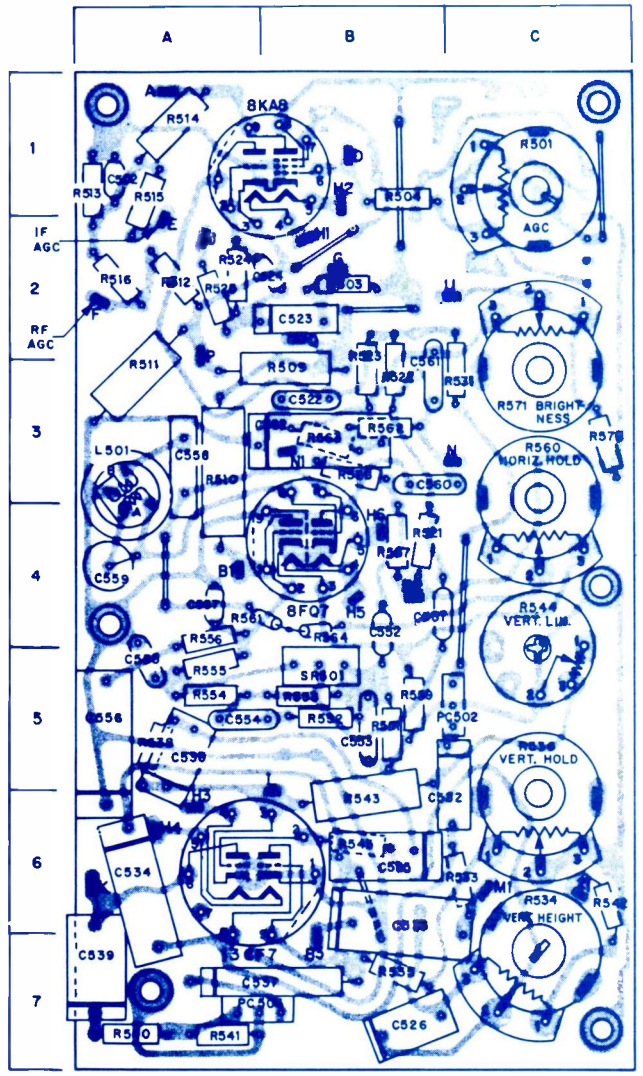
* Under Board — Not Shown

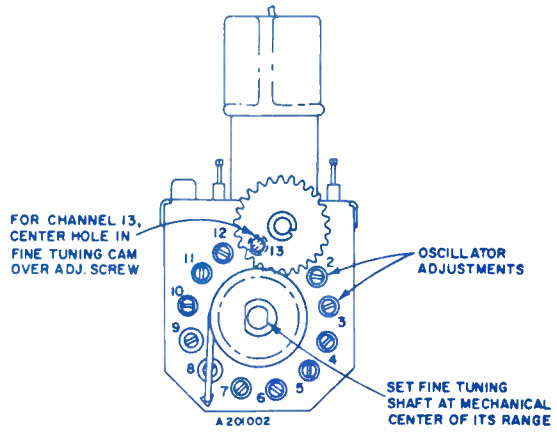
PW200 LOCATION GUIDE

RCA
TV Chassis
KCS 142

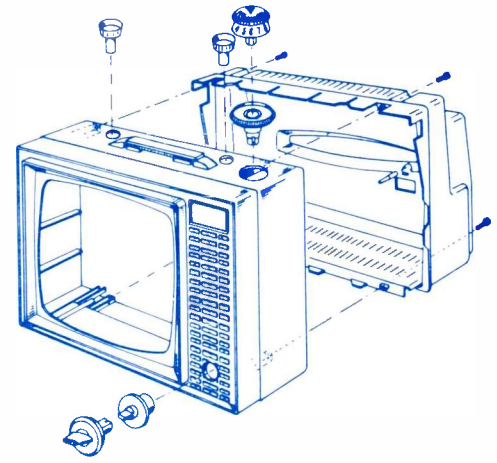
ELECTRONIC TECHNICIAN
TEKFAX
834

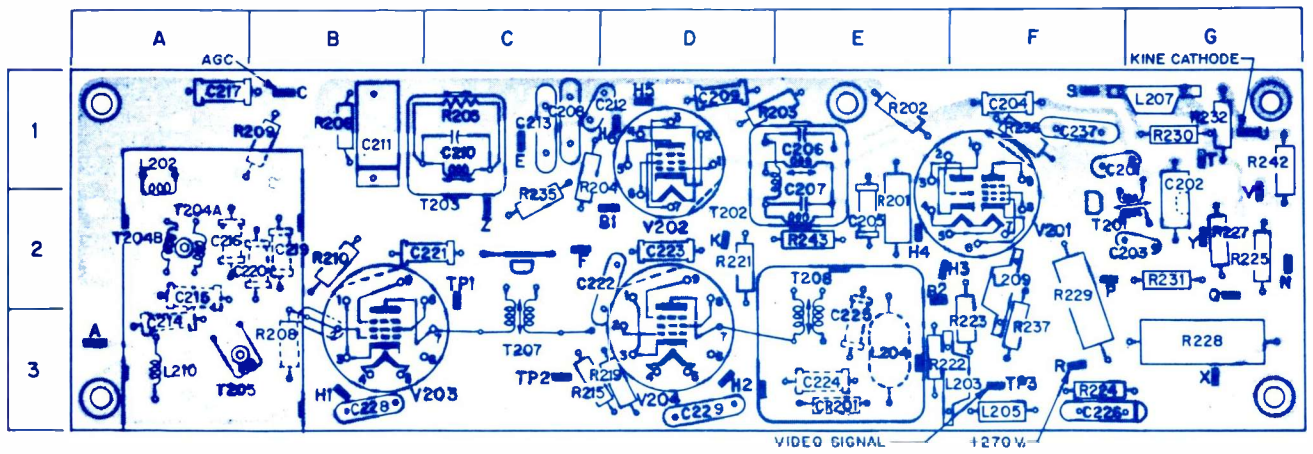
February 1964



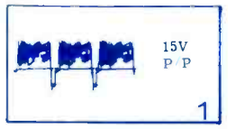


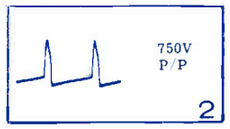
VHF Oscillator Adjustment





More Data on Reverse Side





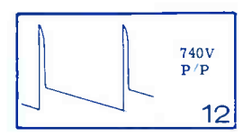
ELECTRONIC TECHNICIAN TEKFAX

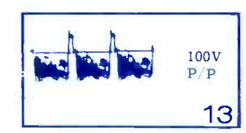
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR FIVE NEW SETS

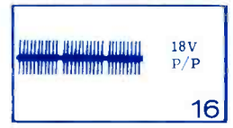
835

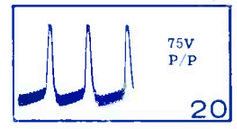
MAGNAVOX
Color TV
43 Series

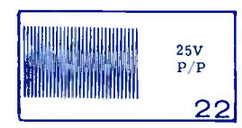
February 1964

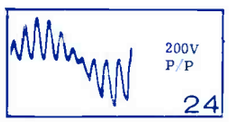


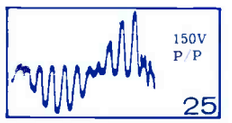


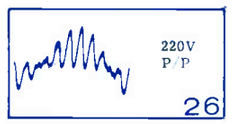










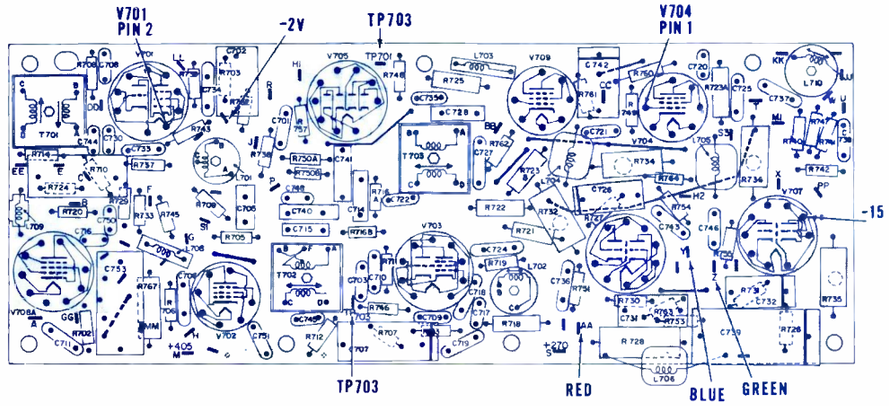


NOTES:

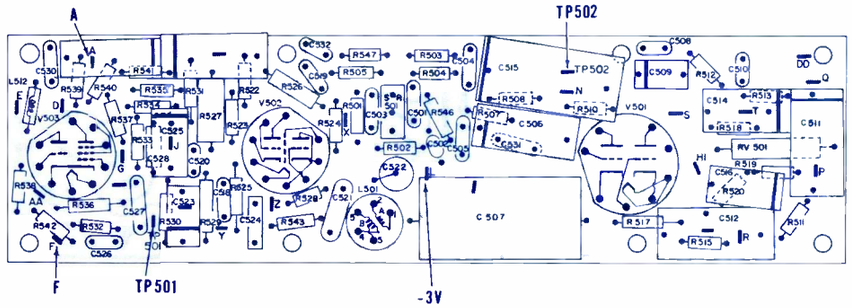
1. Capacitors having value of less than 1 are shown in mfd, and more than 1 in mmf.
2. All voltages measured with VTVM with no signal applied. Line voltage maintained at 120 volts AC. Voltage reading tolerance ±20%.
3. On some Chassis R531 is moved outside PW-500 and becomes R169 and is connected to 130V and R170 is added from pin 2 V104 to terminal TT on PW-700.

More Data on Reverse Side

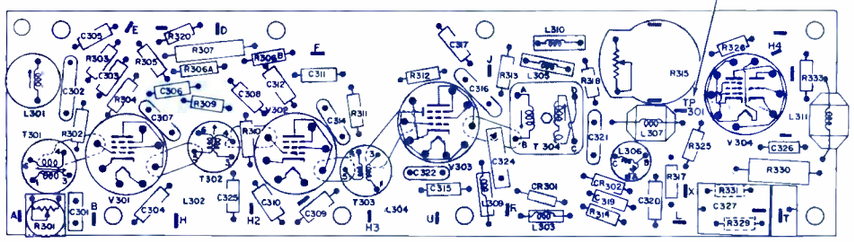
Chroma Board



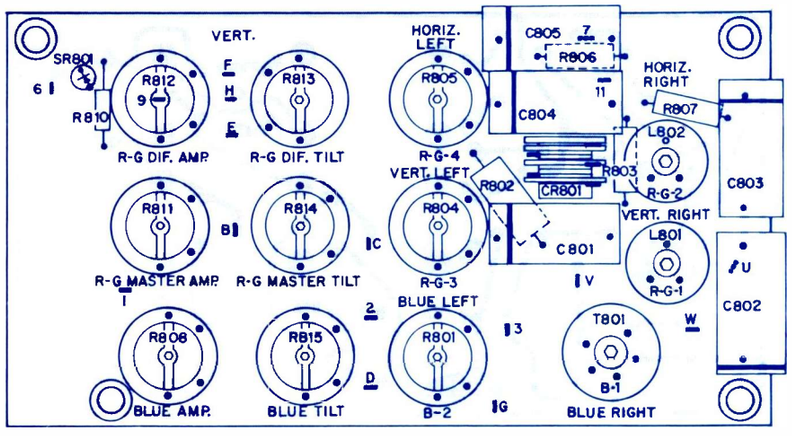
Deflection Board

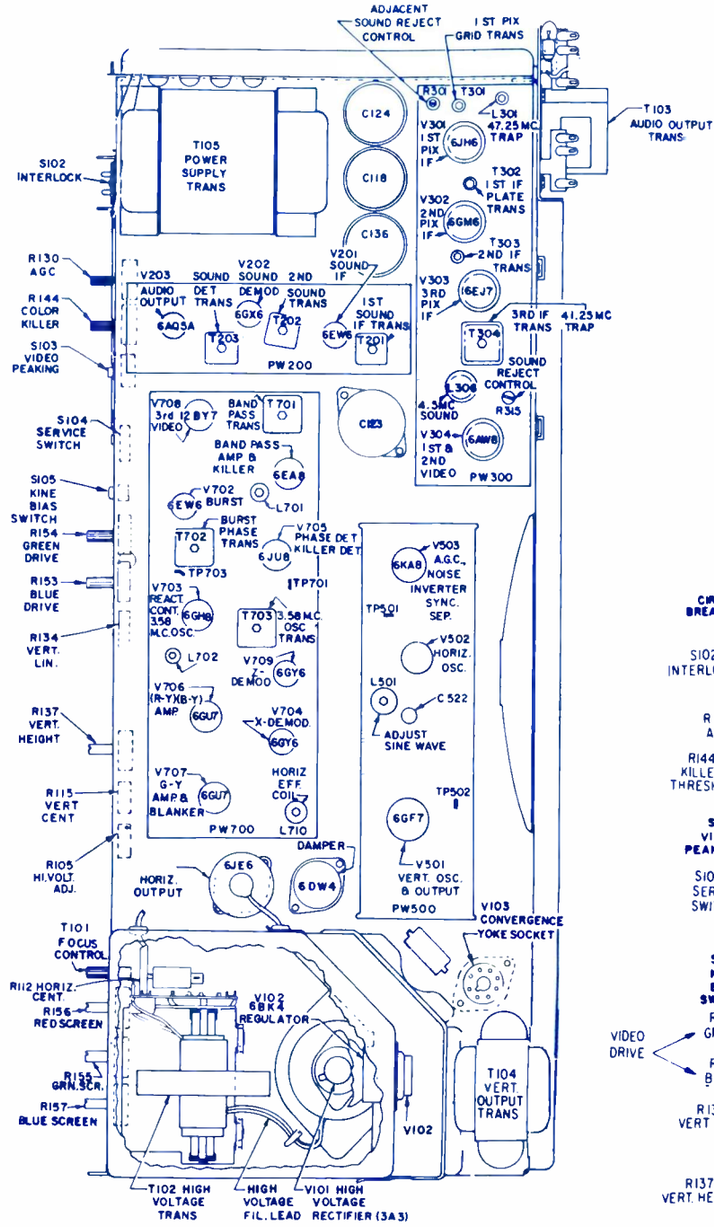


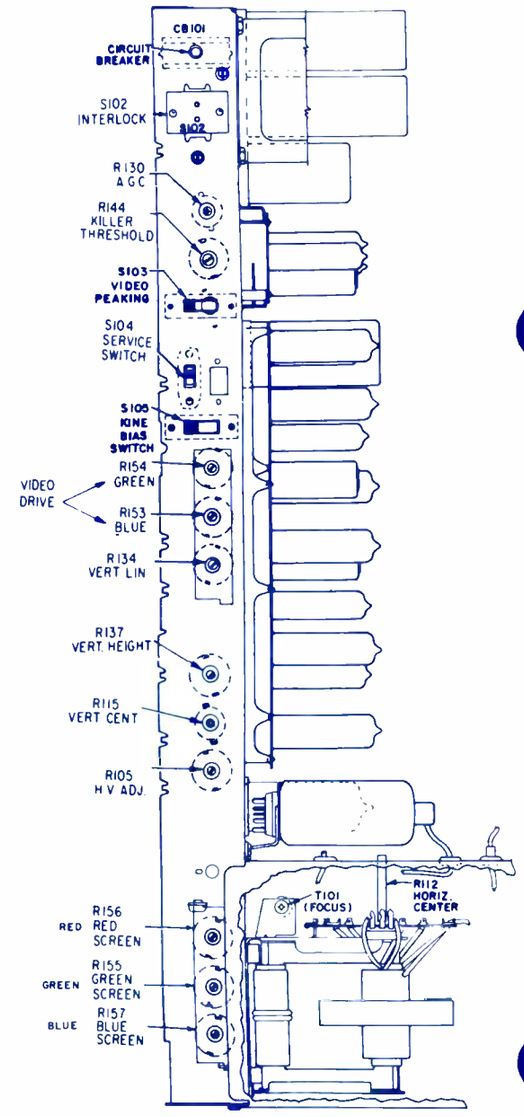
Video Board



Convergence Board







More Data on Reverse Side

MAGNAVOX
Color TV
43 Series

ELECTRONIC TECHNICIAN
TEKFAX
835

February 1964

ELECTRONIC TECHNICIAN

TEKFAX

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

836

GENERAL ELECTRIC
Stereo Receiver
Models T-3000A, B

February 1964

ADAPTER WAVE FORMS

2. Composite signal. Modulation (1,000 ~) appearing in left channel only. The sum signal (L+R) is equal to the difference signal (L-R).

3. Amplified composite signal with difference signal pre-emphasis.

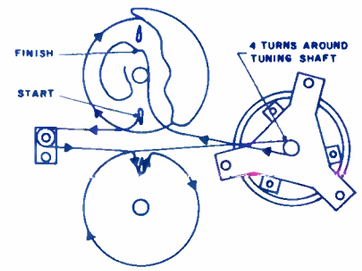
1. 19 KC Pilot voltage.

4. Reconstituted 38 KC sub-carrier (without modulation).

5. Addition of 38 KC sub-carrier (waveform 4) to "L" voltage peaks on composite signal (waveform 2) [with modulation]

6. Right channel output (unmodulated).

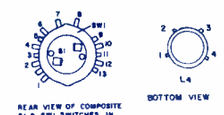
7. Modulated left channel output.

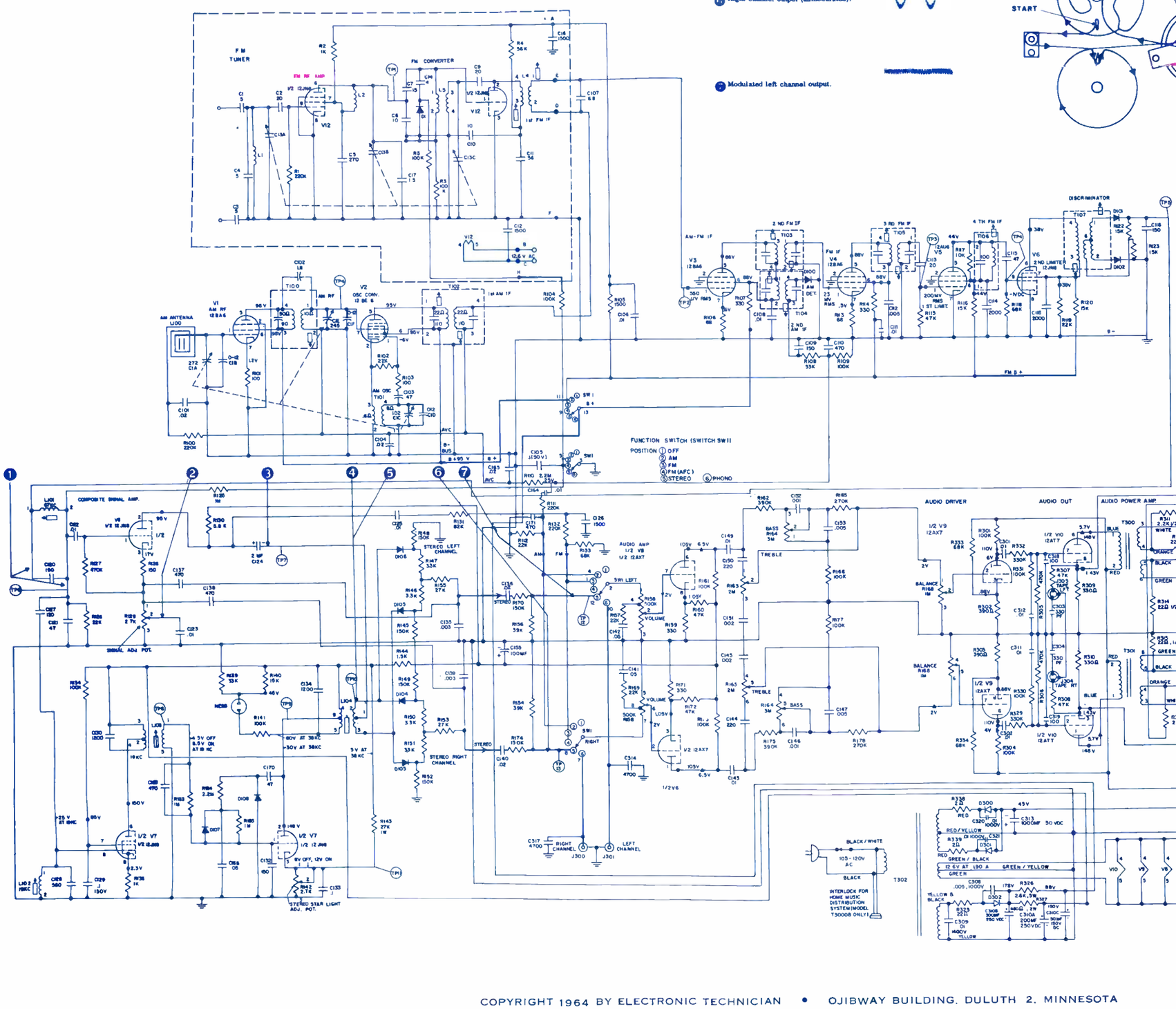


STRINGING DIAGRAM
(VIEW OF LOWER LEFT CABINET WITH FRONT PANEL REMOVED)

POWER TRANSISTOR PIN DIAGRAM

NOTE:
1. ⊕ DC VOLTAGES TAKEN IN FM POSITION.
2. ⊕ 1KC RMS. AUDIO VOLTAGE READINGS (ASSUMING .2V RMS AT 1KC INPUT SIGNAL TO PINS 2 & 7 OF V8).
3. ⊕ FM IF VOLTAGE READINGS (ASSUMING TYPICALLY 550 μ V. RMS AT 10.7 MC UNMODULATED INPUT TEST SIGNAL TO PIN 1 OF V3).
4. UNLESS OTHER WISE NOTED, CAP. MORE THAN 1+MMF AND CAP. LESS THAN 1+ MF.
5. ALL TRANSISTORS MUST BE MATCHED. USE EITHER ALL RS-3858-1 OR ALL RS-3858-2 TYPES.





837

WESTING-HOUSE
TV Chassis
V-2444-1, -2, -3, -9, -10

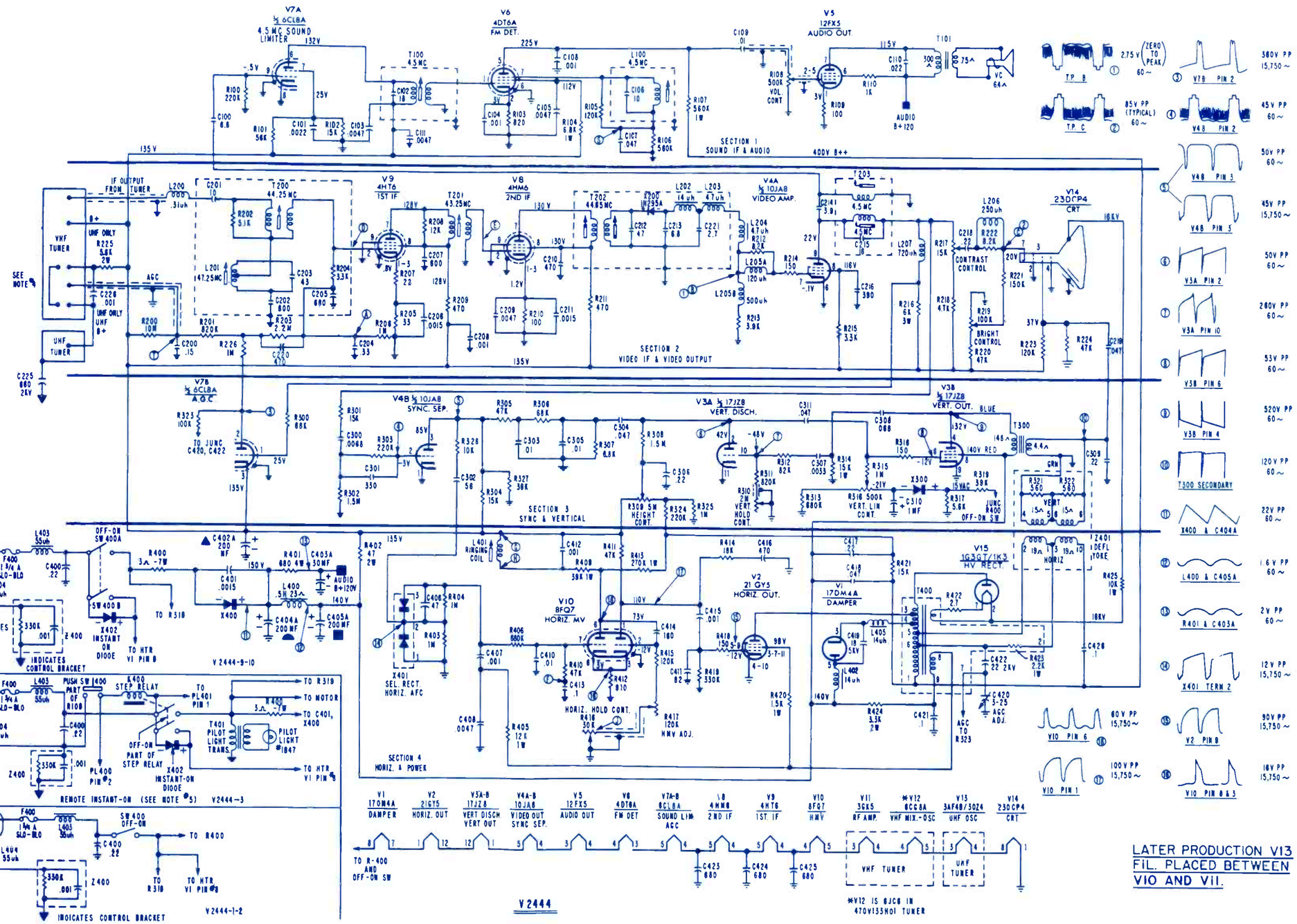
ELECTRONIC TECHNICIAN TEKFAX

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR FIVE NEW SETS

More Data on Opposite Page

February 1964

NOTES:
1. ALL CAPACITOR VALUES LESS THAN 1 ARE IN MFD., AND VALUES GREATER THAN 1 ARE IN PF(MICROMICROFARADS) ALL RESISTANCE VALUES ARE IN OHMS 1/2 WATT UNLESS OTHERWISE INDICATED.
2. DC VOLTAGES ARE MEASURED FROM POINT INDICATED TO CIRCUIT GROUND WITH A VTVM. LINE VOLTAGE AT 120 V.A.C., NO SIGNAL APPLIED.
3. WAVEFORMS WERE TAKEN WITH CONTROLS SET FOR A NORMAL PICTURE. C-420 WAS SET FOR 2.75V (ZERO TO PEAK) AT T.P. ①.
4. SWITCH MAKES CONTACT ON UHF POSITION ONLY.
5. FOR REMOTE OPERATION ON CHASSIS V2444-3, REFER TO THE REMOTE RECEIVER CHASSIS, V2418-4

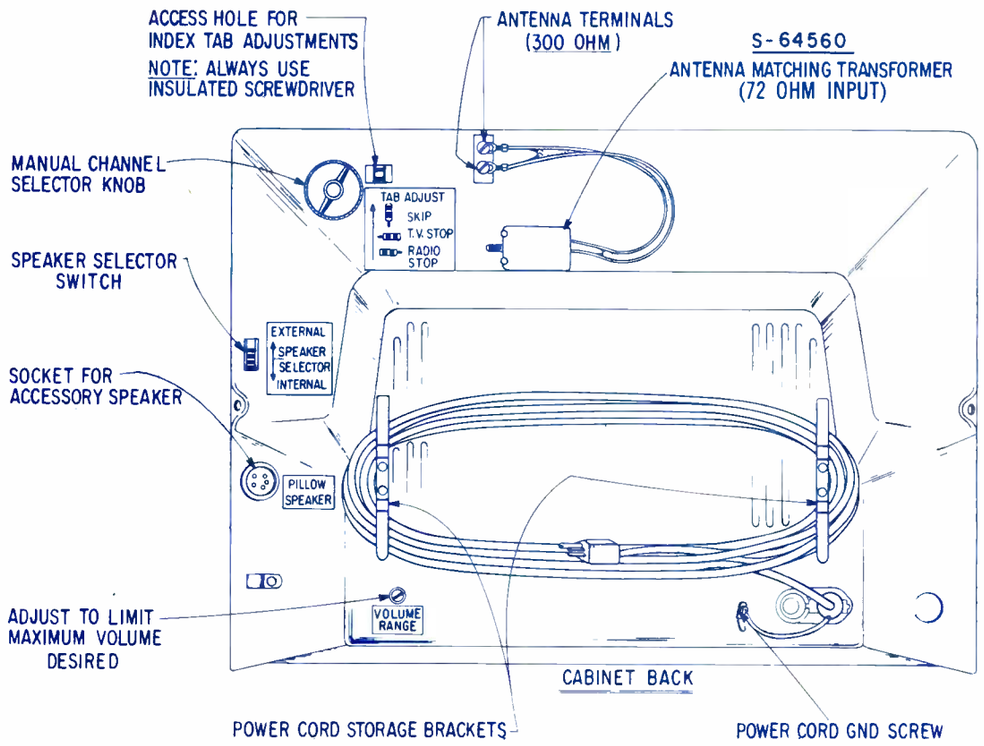


ELECTRONIC TECHNICIAN
TEKFAX

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR FIVE NEW SETS

GROUP 138

Schematic No.



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INTERNAL-EXTERNAL SPEAKER SELECTOR SWITCH

AN *INTERNAL-EXTERNAL* speaker switch is provided at the rear of the cabinet to allow use of either the regular internal receiver speaker or the external pillow speaker unit, when used.

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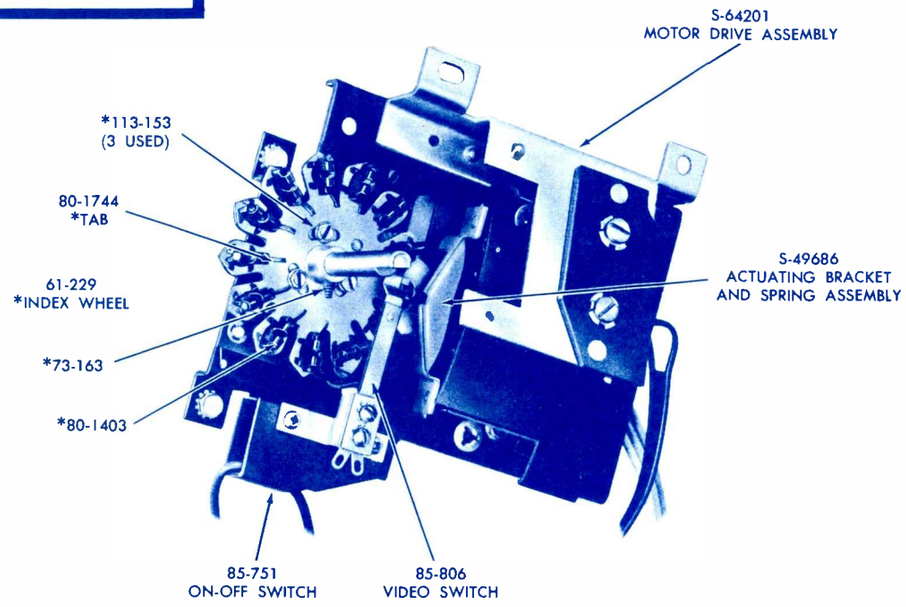
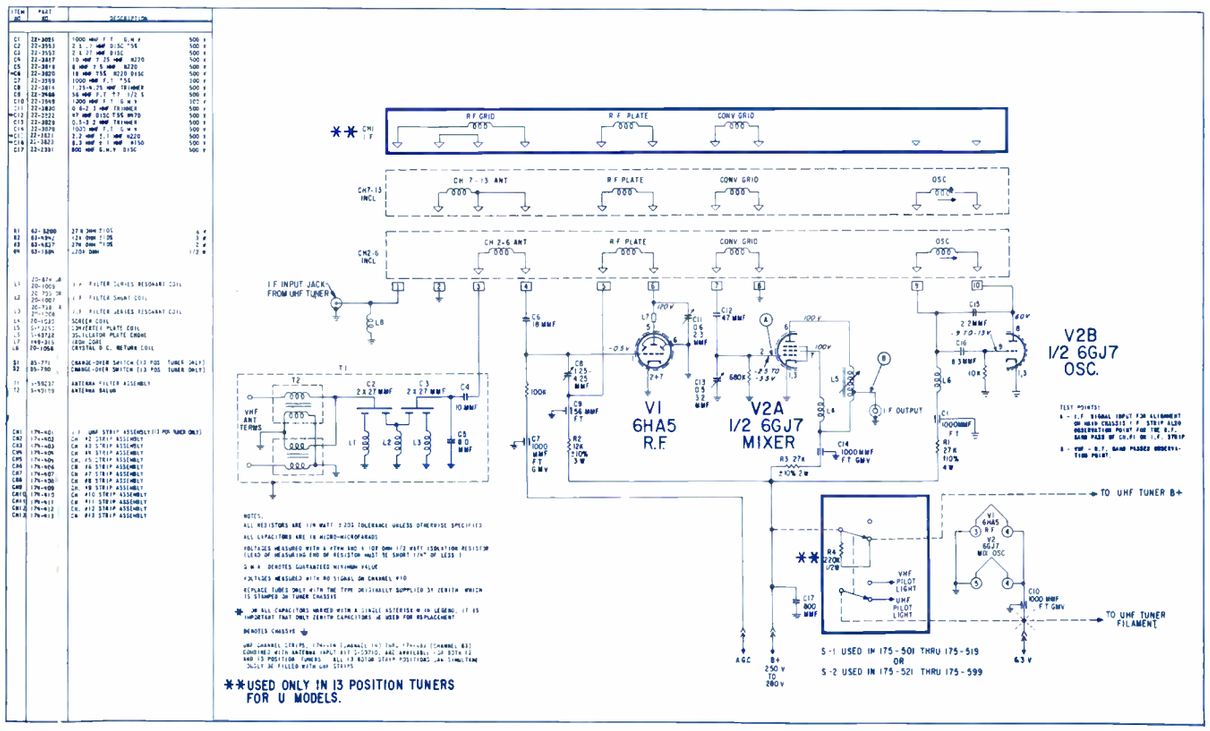
ELECTRONIC TECHNICIAN
TEKFAX

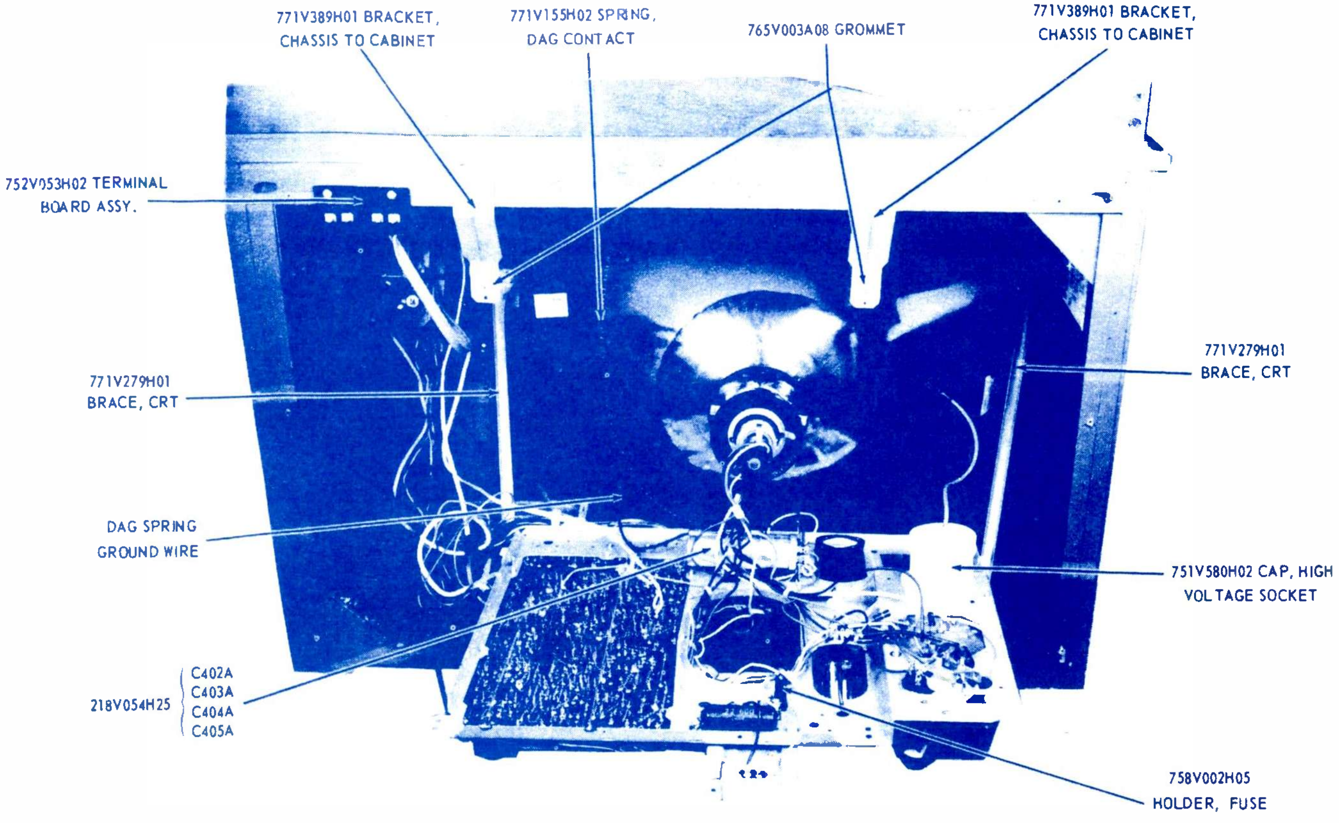
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR FIVE NEW SETS

ZENITH
Remote TV
Model H2200F, L
Chassis 14L25

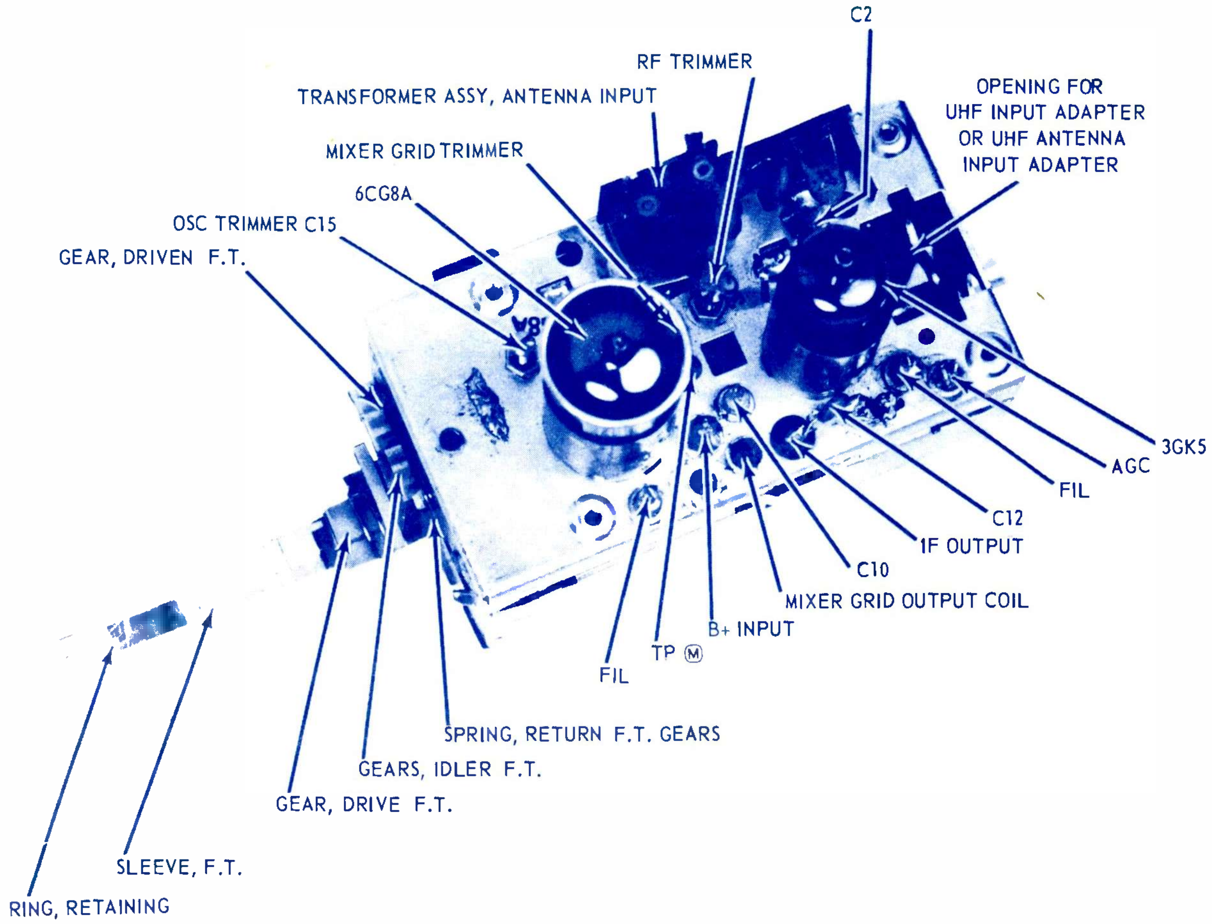
February 1964

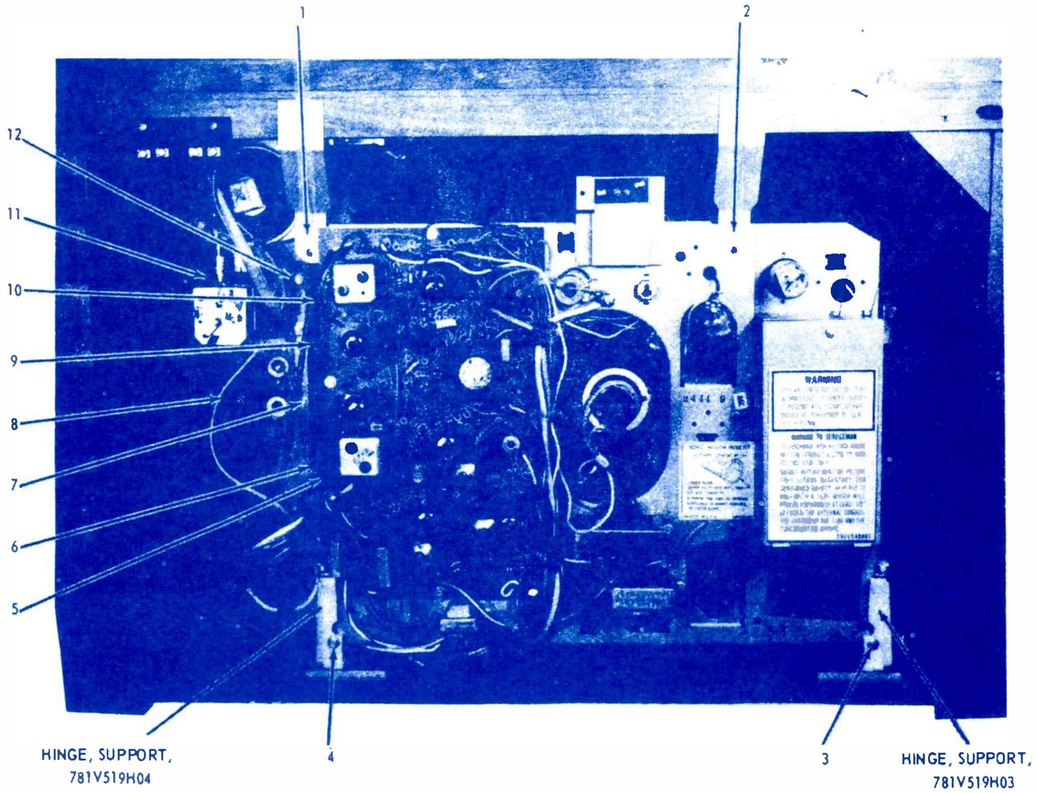






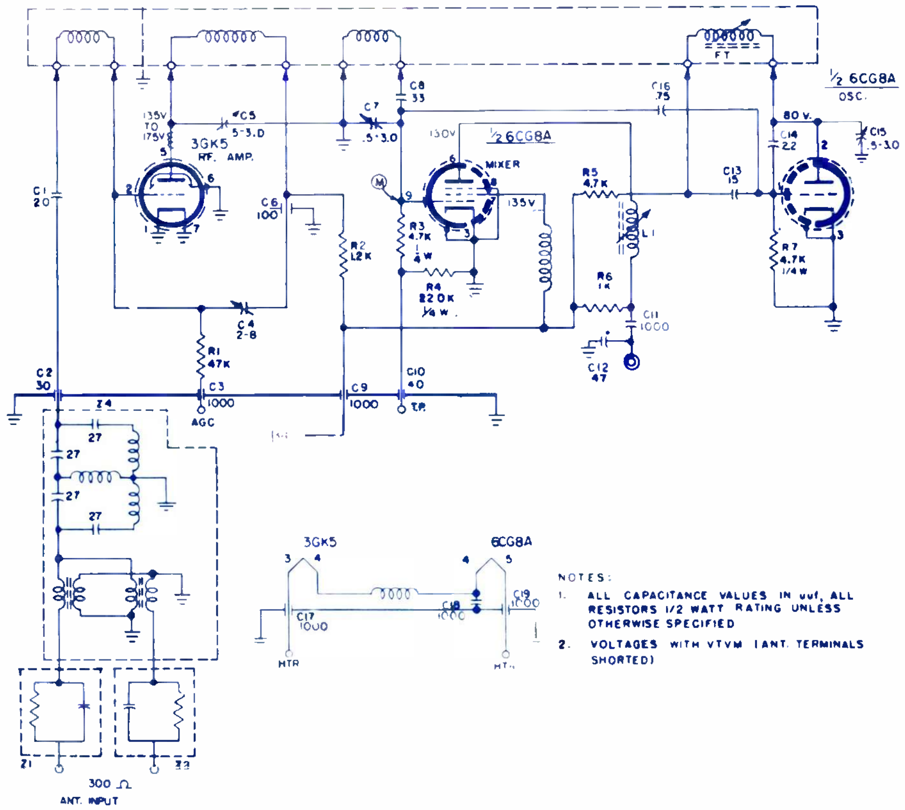
Rear View, with chassis tilted down.





Rear View of Chassis, showing location of screws for chassis removal.

More Data on Opposite Page



WESTINGHOUSE
TV Chassis
V-244-1, -2, -3, -9, -10

ELECTRONIC TECHNICIAN
TEKFAX
837

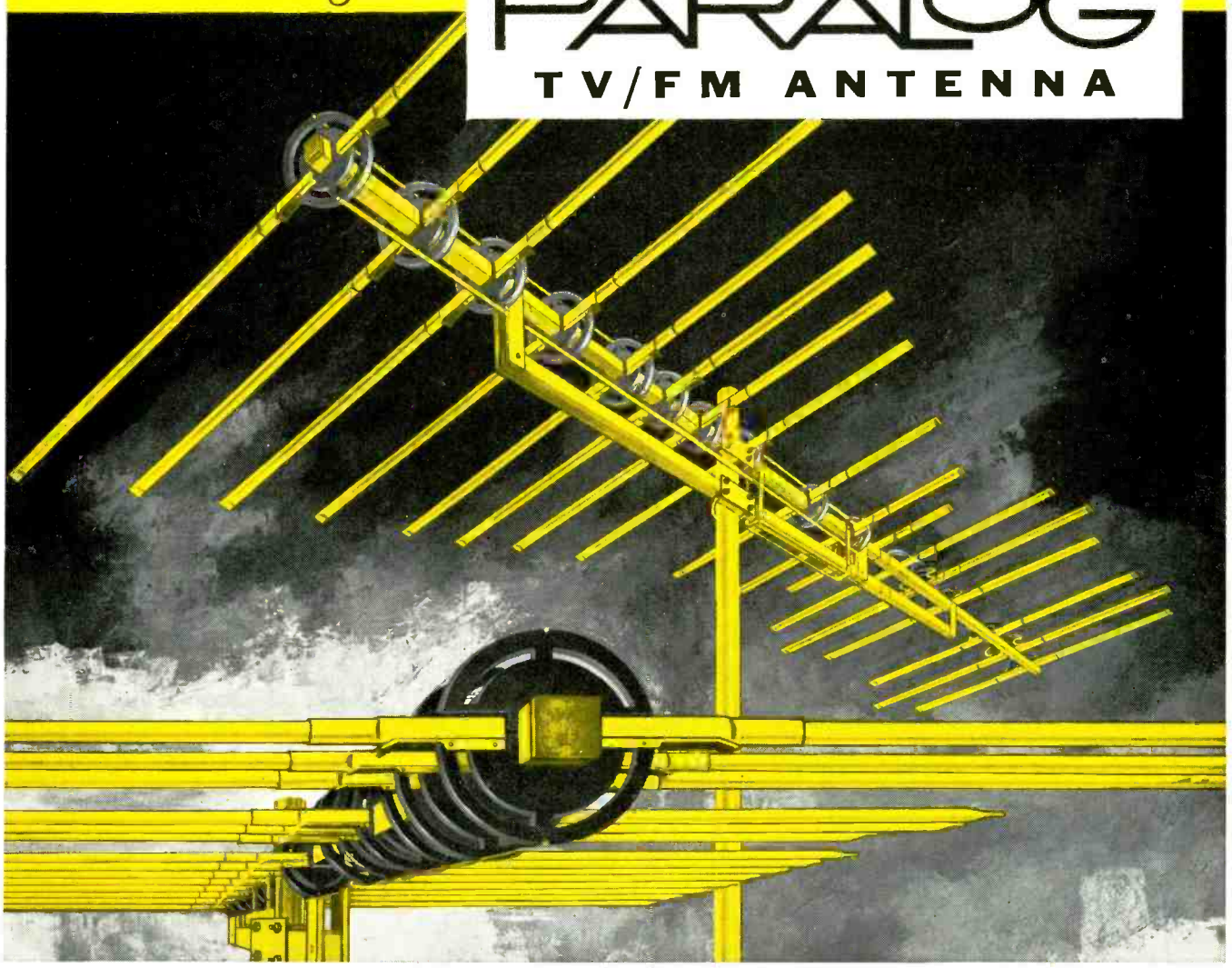
February 1964

THE SAME ENGINEERING, SAME PLANT THAT PRODUCES AMERICA'S GREATEST SATELLITE-TRACKING AND TELEMETRY STATIONS, HAS CREATED

the revolutionary new

PARALOG

TV/FM ANTENNA



...Unparalleled performance because it has ALL 5:

- **HIGHEST GAIN**
- **EXTREMELY LOW VSWR**
- **SHARPEST DIRECTIVITY**
- **BEST FRONT-TO-BACK RATIO**
- **RUGGED CONSTRUCTION**

HERE IT IS—the space-age TV/FM antenna from the only manufacturer with actual experience in making space-probing antennas!

All new, the PARALOG is the first home antenna that really comes through with log-periodic design plus a unique parasitic-element system for maximum all-channel gain and pinpoint directivity. Exclusive Cycolac insulating mounts assure constant impedance, eliminate troublesome cross-feed design. Extremely rugged construction.

JERROLD
TACO

There are fourteen PARALOG antenna models, listing from $19.95, including four electronic PARALOGs with Super Powermate preamplifier, and three special FM stereo models. See your Jerrold-TACO distributor now, or write Jerrold Electronics, Philadelphia 32, Pa.

- - - for more details circle 33 on post card

for every High Quality Speaker need...

LOOK IN THE NEW JENSEN GUIDE TO LOUDSPEAKERS

We'd like you to have a copy of our new 1090 speaker guide describing the new Concert, Viking and Weather Master Series loudspeakers. It's the largest catalog of its kind, fully illustrated with complete descriptions and easy-to-read specification tables.

Included to name only a few are: a new group of Electronic Musical Instrument speakers; a new complete range of circular and oval general purpose units; Miniatures; special Automotive types; an augmented Viking series for inexpensive replacements; Weather Master outdoor speakers; Hi-Fi replacements; Concert Fidelity speakers and components; Intercom and Communication/Aircraft types. And there is an interesting discussion of magnetic materials.

Write for your free copy of CATALOG 1090 today!

JENSEN LOUDSPEAKERS

JENSEN MANUFACTURING COMPANY / DIVISION OF THE MUTER COMPANY / 6601 SOUTH LARAMIE AVENUE, CHICAGO 38, ILLINOIS
Canada: Radio Speakers of Canada, Ltd., Toronto • Argentina: Ucoa Radio, S. A., Buenos Aires • Mexico: Fapartel, S. A., Naucalpan, Mex.

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WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

ELECTRONIC TECHNICIAN

FEBRUARY • 1964 VOL. 79 • No. 2

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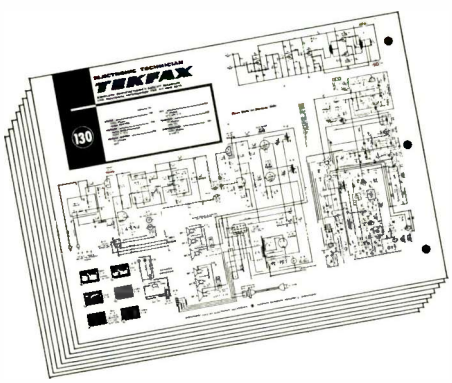
FEATURES

DEPARTMENTS

TEKFAX ..... 16 PAGES OF LATEST SCHEMATICS



GENERAL ELECTRIC: Stereo Receiver Models T-3000A, B.

MAGNAVOX: Color TV 43 Series.

RCA: TV Chassis KCS 142.

WESTINGHOUSE: TV Chassis V-2444-1, -2, -3, -9, -10.

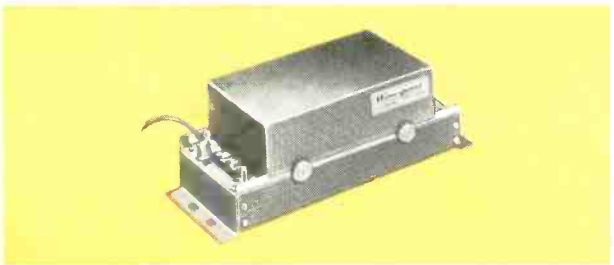
ZENITH: Remote TV Model H2200F, L, Chassis 14L25.

NEW TV and FM distribution designed specially

MODEL A-430
4-tube, 30 DB GAIN
distribution amplifier
$84.95 list

Operates 1-50
TV-FM outlets,
100 with preamp.

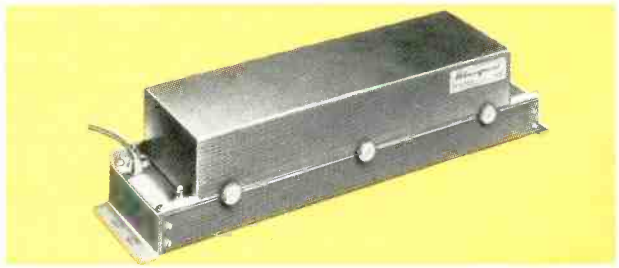
3 *New Winegard Distribution Amplifiers to Run 2 Sets, 200 or MORE*



MODEL A-215
2-tube, 15 DB GAIN / general purpose TV-FM Amplifier
$44.95 list

■ Provides 15 DB gain for home systems, small motels or apartment buildings. Drives up to 20 TV-FM outlets or line tap-offs . . . up to 40 with preamp. 30 volts AC is available by preamp switch at input jack to operate Colortron or Stereotron antenna directly from A-215 without extra power supply.

SPECIFICATIONS—Tubes: two 6HA5. **Gain:** +15db. **Bandpass:** 50-110MC, 170-220MC. **Response:** flat, ±.25db per 6 MC channel. **Noise Figure:** 3.7db lo-band, 5db hi-band. **Max. Signal Input:** 350,000 microvolts. **Max. Signal Output:** 2V. **Input Impedance:** 75 or 300 ohm. **Output Impedance:** 75 or 300 ohm. VSWR input and output better than 1.5 to 1. Two C-59 75 ohm connectors supplied. Blue Baked enamel perforated steel cabinet, 2⅞ x 9¼ x 3⅜". AC cord. **Switches: On-Off;** power to pre-amplifier. AC fuse. 117V 60 CPS 14 watts.



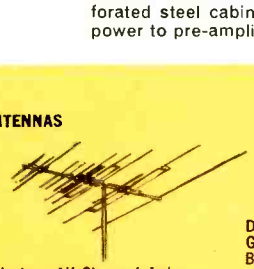
MODEL A-845
8-Tube, 45 DB GAIN / Distribution Amplifier $159.95 list

■ For large hotels, motels, hospitals, schools and apartments. Operates 1-150 TV outlets, 300 sets with preamp. 30 volts available by switch at input jack for operating Colortron or Stereotron preamplifier directly from A-845 without extra power supply.

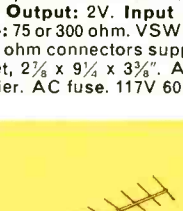
SPECIFICATIONS—Tubes: Six 6HA5; two 6DJ8. **Gain:** +45db. **Bandpass:** 50-110MC, 170-220MC. **Response:** flat, ±.25db per 6 MC channel. **Noise Figure:** 3.7db lo-band, 5 db hi-band. **Max. Signal Input:** gain control at max., .008V per band; gain control at min., .025V. per band. **Max. Signal Output:** 3.2V. **Separate Hi and Lo Band Gain Controls:** 0-10db; Separate hi and lo band tilt controls 3-6db. **Input Impedance:** 75 ohm. **Output Impedance:** 75 ohm. VSWR input and output better than 1.5 to 1. Blue baked enamel perforated steel cabinet. 2⅞ x 14½ x 3⅜". AC cord. **Off-On** switch. AC fuse. 117V. 60 CPS 48 watts.

A COMPLETE LINE OF WINEGARD MATCHED DISTRIBUTION SYSTEMS

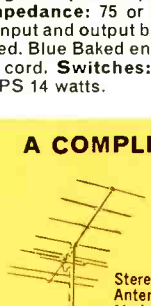
ANTENNAS



Colortron All-Channel Antennas
GOLD ANODIZED 4 models
$24.95 to $64.95.
Finest TV antennas made.



De Luxe Yagis
GOLD ANODIZED
Broadband and cut-to-channel.
Amplified or non-amplified.
High gain, rugged construction, channels 2 to 13, low band and hi band.



Stereotron FM Antenna
Model SF-8
$23.65
most powerful FM antenna, gold anodized.

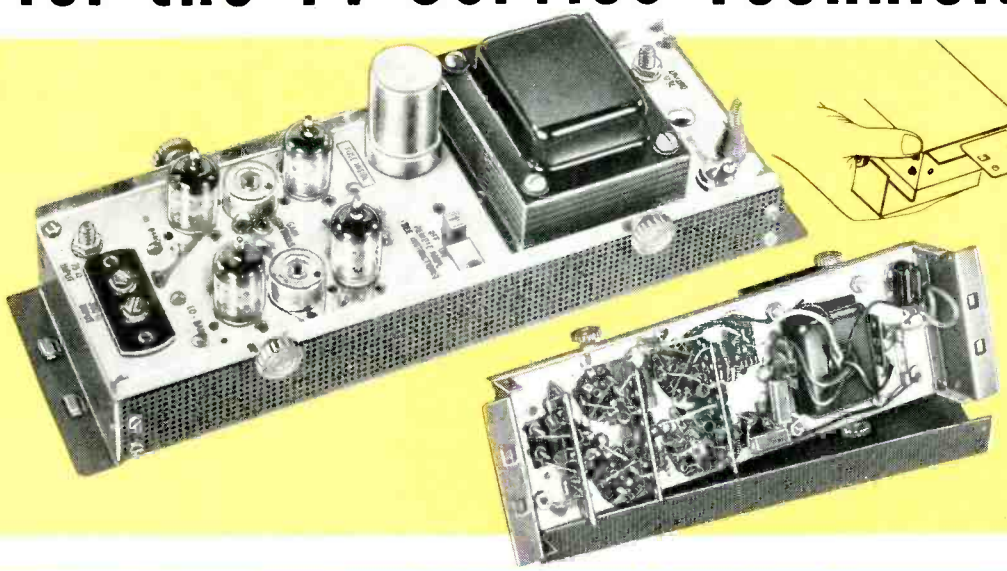
ANTENNA PREAMPLIFIERS

Colortrons—twin nuvistors
300 ohm Model AP-220N, $39.95. 75 ohm Model AP-275, $44.95
Drive 1-6 sets

Red Head RD-300 transistor preamplifier Drive 1-6 sets $29.95

Stereotron Preamplifier for FM. Twin Nuvistors Model AP-320, 300 ohm $39.95
Model AP-375, 75 ohm $44.95

system equipment by WINEGARD for the TV Service Technician



Exclusive wall hanger bracket for instant removal of amplifier.

MODEL A-430

SPECIFICATIONS—Tubes: four 6HA5. **Gain:** +30db. **Bandpass:** 50-110MC, 170-220MC. **Response:** ±.25db per 6 MC channel. **Noise Figure:** 3.7db lo-band, 5db hi-band. **Max. Signal Input:** gain control at max., .02V. per band; gain control at min., .1V per band. **Max. Signal Output:** 2V. **Separate Hi and Lo Band Gain Controls:** 0-10db. **Input Impedance:** 75 or 300 ohm. **Output Impedance:** 75 ohm. VSWR input and output better than 1.5 to 1. Two C-59 75 ohm connectors supplied. Blue baked enamel fully ventilated perforated steel cabinet, 2⅞" x 11" x 3⅜". AC cord. **Switches:** OFF-ON; power to preamplifier. AC fuse. 117V. 60CPS 25 watts.

BEST DISTRIBUTION AMPLIFERS MADE—HERE'S WHY

- **DESIGNED FOR COLOR AND FM STEREO** Flat frequency response, no phase distortion, full gain to top of FM band.
- **LOWEST NOISE** — Only amplifiers made that use all high transconductance, low noise triodes—no pentodes.
- **EXTENDED BAND PASS** — Allows cascading without clipping in end channels.
- **EASIEST TO SERVICE** — All jacks, controls, switches and connections accessible from top of chassis. Knurled thumb nuts for fast removal of dust cover.
- **FULLY VENTILATED TOP AND SIDES.** Perforated dust cover and chassis cover. Dissipate heat for extra long life.

With Winegard Equipment, any Good TV Technician Can Get Perfect Results with the First Installation

Winegard equipment has been engineered for the busy technician who doesn't have the time to do a lot of pre-planning and experimental work on the job. If you have been installing distribution systems, you will appreciate the way the engineering has been done in the factory to eliminate time on the job. If you haven't installed distribution systems, now you can get into this interesting, exceptionally profitable work in your area.

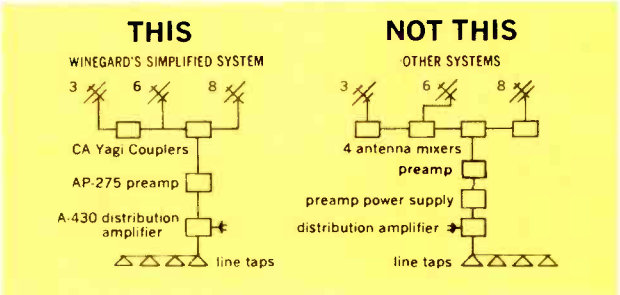
Every component of a Winegard distribution system is designed to match perfectly, from the antenna to the set . . . for installations in homes, apartment buildings, schools, hospitals, motels, hotels, trailer courts.

Practically every new public building today has a TV/FM distribution system, and systems are becoming standard equipment in new homes. You should be getting your full share of this profitable, interesting work. Winegard offers you the best equipment and free layout service. If requested, our engineers will be glad to check over your system or lay out a system for you. Same day attention will be given to your problems.

Example Winegard's Simplified System

For instance, an apartment house with 20 outlets; fringe area—stations 50 and 80 miles away—channels 3, 6 and 8 in 3 different directions.

Note the Winegard system uses only 4 major components to simplify the installation yet gives better performance as against other systems' use of 7 components.



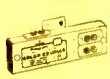
Write today for FREE Winegard layout guide and new book "How to Select and Use Master Antenna System Equipment".

Winegard Co.
ANTENNA SYSTEMS
3019-C Kirkwood, Burlington, Iowa

World's most complete line of TV & FM reception equipment.

ANTENNAS AND ACCESSORIES FOR EVERY INSTALLATION NEED

ANTENNA COUPLERS

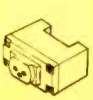


EC-230 Amplified 2 set Color Coupler Transistorized amplifies signal, $17.95, 10 set, 6 set, 4 set and 2 set couplers for 2 to 10 TV or FM sets.

Yagi Couplers—Couple any combination of Winegard cut-to-channel or broadband yagis.

TV-FM Coupler—couples TV and FM antennas, also can be used to split TV-FM signals.

LINE TAP-OFFS, TV/FM OUTLETS, LINE DROP TAPS, SPLITTERS



Flush or surface mount line tap-offs, 75 and 300 ohm models.

TV-FM outlets for both flush and surface mount Complete with outlet plugs—10 models

Line Drop Taps—Drop branch lines from trunk lines. Split line 2 or 4 ways.

- Matching Transformers,
- Pressure Taps,
- Attenuation Pads,
- TV-FM channel Traps.
- A complete line available for all purposes.

for more details circle 54 on post card

LETTERS TO THE EDITOR

Radiotone Schematic

I have been trying to locate a schematic of a Radiotone model HR-8 transcription center built in the '40's. Radiotone Corp. of Hollywood, Calif., who manufactured it, has been dissolved.

R. A. KERR, JR.
Placentia, Calif.

Worse Than We Thought

The article "Multipath Problems in FM Stereo Reception," page 50 of the September issue, states that "A signal traveling through a normal propagation medium has an elapsed time of 0.186272 μsec per mile." The numerical values and units used do not agree. The velocity would be 0.186272 miles per μsec and the time would be 5.3685 μsec per mile, or nearly 29 times that given in the article.

Since other calculations were based on this original error, the problem of phase shift caused by the elapsed time difference between a direct and a reflected signal is far greater than was indicated.

J. L. RITTERSKAMP
Charlotte, N. C.

Scope Schematic

Do you know where I can get the schematic for a Model 300, S/N 1654 oscilloscope made by Precise Development Corp.? I need the schematic to repair my scope.

W. S. ALEXANDER
Seattle, Wash.

Color Rebuttal

I read with dismay the letters from two gentlemen who wished to downgrade color TV in your October issue. I use the word "dismay" because their experience with color TV does not in the slightest correspond with my own.

My own set is some fifteen months old and it has been turned on every day since then; we have had not one service problem to this moment. Our only regret is that we didn't buy a color set earlier. While it is true that reception is not al-

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

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

SPRAGUE **TWIST-LOK**® CAPACITORS...

1701 different ratings and sizes...

the world's most complete selection of **EXACT** replacements!

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

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

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

SPRAGUE®
THE MARK OF RELIABILITY

WORLD'S LARGEST MANUFACTURER OF CAPACITORS

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LETTERS TO THE EDITOR

ways as good as we would like, this same situation existed during the years we looked at black and white TV, and takes nothing away from our complete enjoyment of color TV.

WALTER L. DRAUGHON
Fort Myers, Fla.

Pertaining to October letters to the Editor: My only comment is that Robert E. Lopes condemns the editor as being a judge, then in the same breath he sets himself up as a judge on what he feels customers should buy.

We can be thankful our forefathers did not think in the same manner as Robert Lopes and Ed. N. Hamber; we would still be riding and corresponding on the old stage coach.

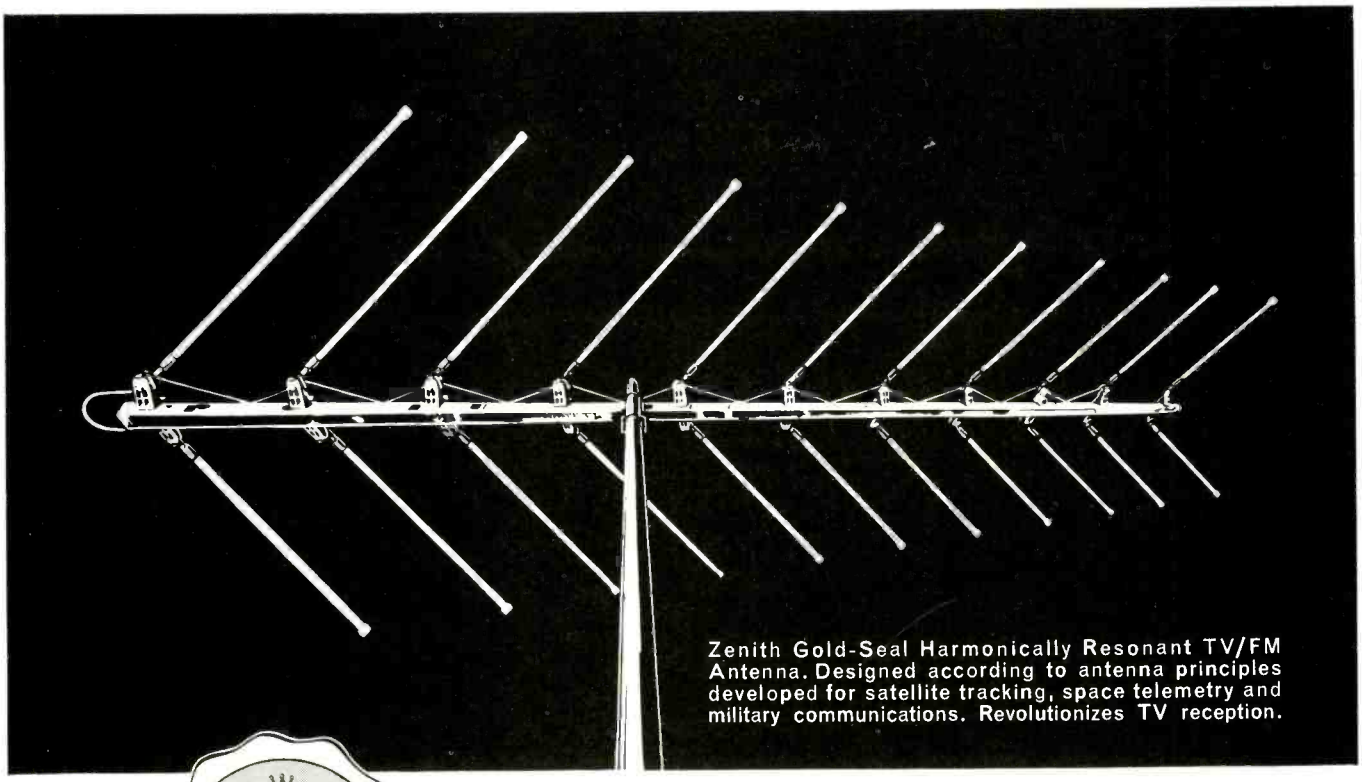
I sell and service color. The public wants it. The owners enjoy it. The reception is as good or better than B/W TV.

EUGENE BRACH
Amsterdam, N. Y.

I was very amused at reading Ed. N. Hamber's letter to the editor. He says not one customer, after having a color set for a year, is happy with its performance and ends up with a B/W set again.

Well, let me say I have been selling B/W TV for 12 years and color TV for about 2 years and have asked all of my customers who have color TV if they would ever

"I don't know what you did but thanks!"



Zenith Gold-Seal Harmonically Resonant TV/FM Antenna. Designed according to antenna principles developed for satellite tracking, space telemetry and military communications. Revolutionizes TV reception.

ZENITH Gold·Seal

QUALITY COMES TO INDOOR AND OUTDOOR

TV & FM ANTENNAS!

Now Zenith brings you a complete line of Stereo FM, Color TV, UHF and VHF quality antennas—easy to sell, easy to install, packed with profits! Zenith Gold-Seal Antennas cover every installation requirement, from super fringe to metropolitan areas. And you can offer your customers a wide selection of indoor and outdoor antennas, plus a complete line of exact replacements for Zenith instruments. Best for Color TV! Best for black-and-white TV! Best for FM and Stereo FM! Best for UHF! Zenith Gold-Seal Antennas are built to the highest Zenith quality standards to give you extra sales and profit opportunities!

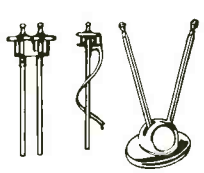
ZENITH QUALITY ANTENNAS FOR B&W OR COLOR TV • FM AND STEREO FM • REPLACEMENTS

Zenith Gold-Seal Broadband Yagi VHF Antenna (Channels 2 to 13)

Zenith Gold-Seal VHF Folded Inline Antenna (Channels 2 to 13)

Zenith Gold-Seal UHF Stacked Bow-tie Antenna (Channels 14 to 83)

Zenith Twin Driven FM Stereo Yagi Antenna (For FM frequencies 88-108 MC)



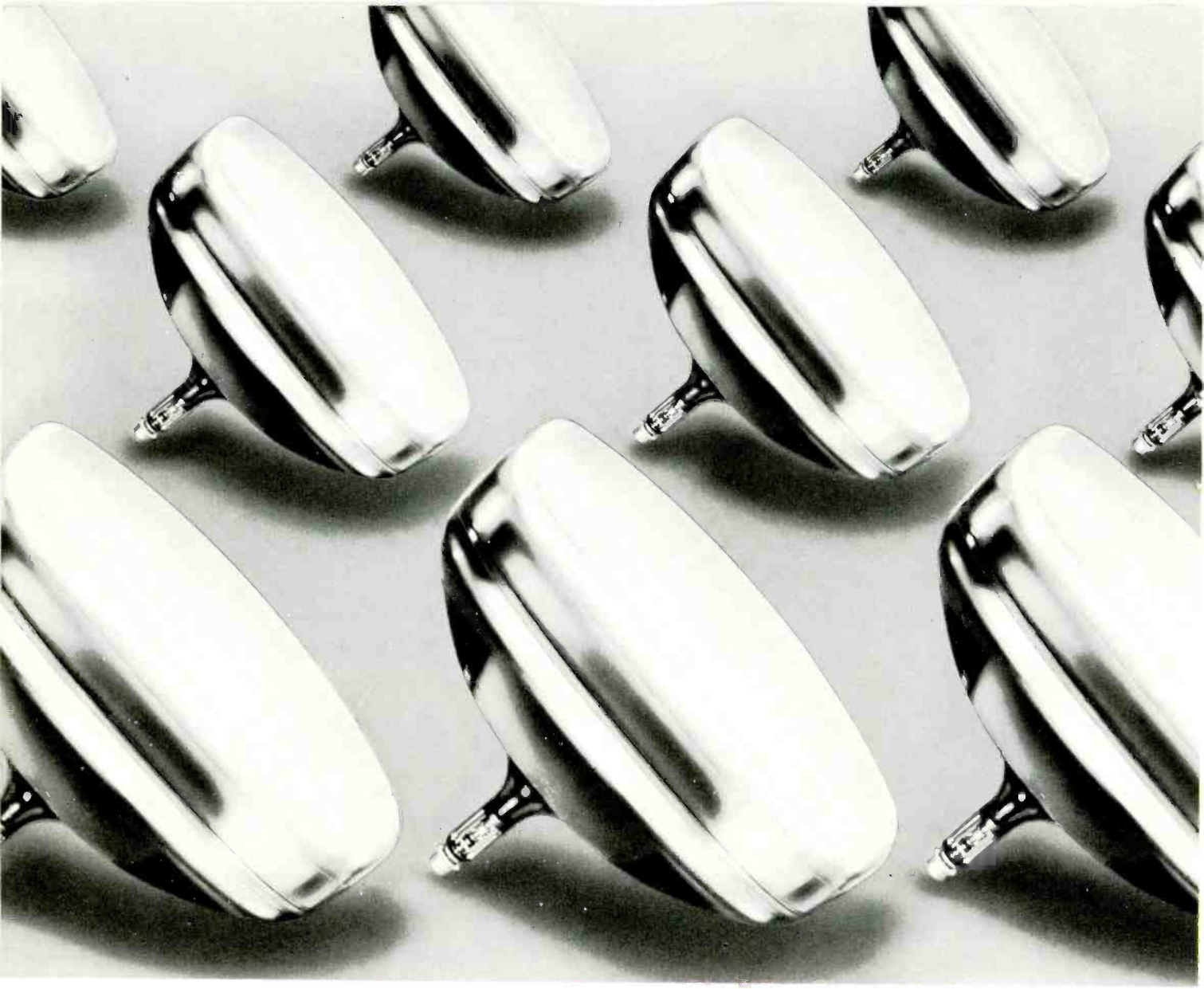
Zenith indoor TV antennas and exact replacements for Zenith instruments

BUILT TO HIGHEST ZENITH QUALITY STANDARDS!

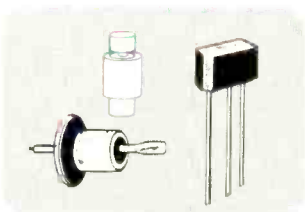
Contact your Zenith Distributor for further information or write: Zenith Sales Corp., Parts Sales Division, 5801 W. Dickens, Chicago 39, Illinois

Specifications subject to change without notice.

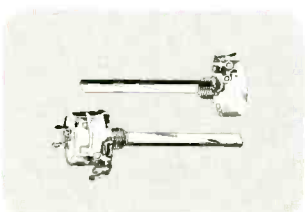
- - - for more details circle 56 on post card



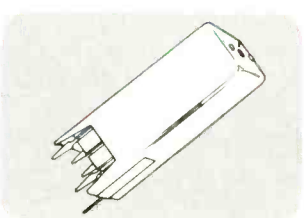
THE QUALITY OF YOUR SERVICE DEPENDS ON THE PARTS YOU USE...DEPEND



Diodes, Rectifiers, Condensers and Resistors
Complete variety for all makes and models.



Universal Controls
With or without on-off switch. Standard taper, 3 inch shaft, half flat. 1 meg, 2 meg, 500 K. Complete selection. Fit Philco and other makes.



I.F. Transformers
For printed circuits, 4 lug, 5 lug or 6 lug types . . . to fit Philco or other makes. Dependable Philco Quality.

Replacement Speakers
All sizes, round, oval or rectangular types. 3.2, 8, 16, 20 ohms. From tiny 1¾" to giant 15" sizes.

Philco Receiving Tubes
To fit any make, any model TV or radio, manufactured to exact Philco standards, thoroughly inspected. Original factory cartons.

Rotary Switch Antenna
High gain type with 6 position switch for best possible signal selectivity. 3 section brass dipoles. Padded cast iron base.

Contact Cleaner
Philco TV and Radio Contact and Control Cleaner, Lubricant in self spray can, complete with protective cap and spray nozzle.

Philco TV Yoke
Genuine Philco TV yokes, made to original factory specifications. Accurately wound and inspected. Packed in individual boxes, ready to install.

There's a Philco Fully Stocked Parts Center Near You!

IF YOU NEED A PHILCO PART...YOU CAN GET IT FAST...HERE'S WHY

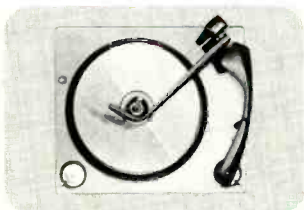
1. Philco has a nationwide network of Parts distributors—THERE'S one in your area.
2. Philco distributors are backed up by Parts Warehouses with millions of dollars in Parts inventory.
3. NEW Parts for NEW Philco models are shipped automatically along with the NEW products.
4. All Parts orders are handled by experienced Parts specialists.
5. ALL EMERGENCY orders are transmitted over the nation's largest industrial communications system and processed within 24 hours.

Whatever you need—whenever you need it—if it's a Philco Part just dial your Philco distributor. He has thousands of Philco Parts right now on his shelves. If the item you need is temporarily out of stock—he can get it for you FAST. You may DEPEND on your Philco Parts distributor.

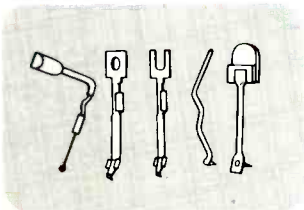
Customer Confidence Begins When You Use Genuine Philco Star Bright 20/20 Picture Tubes

Every CR Tube you replace represents a high-dollar service sale for you . . . and your customer. Play it safe with a brand that's known for Quality . . . PHILCO. All material and parts used in the manufacture of Philco Star Bright 20/20 Picture Tubes are new except for the envelope, which prior to reuse, has been inspected and tested to the same standards as new envelopes.

ON YOUR PHILCO DISTRIBUTOR FOR ALL YOUR PARTS AND ACCESSORIES



M62A 4-speed Record Changer
Intermixes all size records. Lightweight tone arm with retractable scratch protection assembly and famous Euphonics U8 cartridge. Changer ideal for built-in installations or "modernizing" record playing equipment. Template and instructions included.



Philco Phono Needles
A complete selection of types and numbers for Philco and most all other makes. Carefully made, attractively-packaged. ALL TIP TYPES and sizes, including Diamond. Special now available—"THE BIG 18 KIT." This attractive compact metal case contains 18 of the industry's fastest selling needles.

Your Philco Distributor Features These Famous Makes

PHILCO • PHILCO-Bendix • CROSLEY • EVEREADY Batteries and Flashlights • CAROL Cables • GOODRICH V-Belts • GC Products • AUDIOTEX • WALSCO Products • COLORMAGIC Antennas • PRECISION Test Equipment

Philco Parts are Available Through a nationwide network of Parts Distributors. Mail the Coupon Today for the Name of the One Nearest You.

PHILCO Factory-Supervised Service ®

PARTS AND SERVICE OPERATIONS

PHILCO®

A SUBSIDIARY OF Ford Motor Company

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Philco Parts & Service Operations
C & Tioga Streets, Phila. 34, Pa.

I am interested in receiving information about special Philco Parts offers, prices and facts. Please send me the name of the nearest Parts distributor.

Name_____

Address_____

City_____ Zone____ State_____

LETTERS TO THE EDITOR

want to go back to B/W. I have not had one say he would. Some of our sets have been going for 2 years without a service call.

These are facts.

BEN RHYMER
Kingston, N. Y.

About this talk in your October issue on color TV: I have had one since Dec. 1959 and still get a good picture on color and B/W. There has been only about 4 tubes put in the set since I have had it. People that knock color TV don't know anything about color.

CHARLES C. CALLEN
Pittsburgh, Pa.

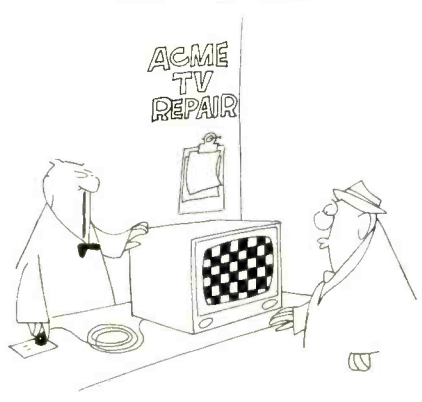
Dissenter

. . . I have seen color TV off the air in New York, Philadelphia, Detroit, have seen it on cable in Williamsport, Boulder, Col. as well as in Bradenton, Fla. In my opinion. . .TV color stinks.

I know that this letter has a poor chance of getting published for you do get your money from your advertisers of instruments and what not.

Frankly, I think that your editor's reply to both of the above mentioned letters was a bit on the high side. May I ask him for his background? Will I get an answer? Will this be published? Does he know an angstrom unit from a spectrohelioscope or is he just as I suspect, just a TV guy.

W. C. UMSTEAD
Williamsport, Pa.



"We couldn't fix the interference, so we made it neater."

FOCUS...on the new breed of tube leadership

The only receiving tubes that offer protected full profits.

It isn't just that Channel Master Premium Quality Receiving Tubes are top performers. The fact is no other tubes give you higher profits—plus **ironclad** protection. Because Channel Master sells only to legitimate independent dealers through distributors; **never** to cut-rate discount houses or drug store tube-testers. And don't forget our tube premium promotions: Truly outstanding gift values! (Your Channel Master distributor will be happy to give you full details on the latest.)

Now America's largest-selling replacement picture tubes.

Hard to believe, but—in two short years, Channel Master Replacement Picture Tubes have shot up to the No. 1 position in the replacement picture tube field. And for good reason. With Channel Master, you pick from the **most complete selection of tube-types in the industry.** (Especially important when you need a hard-to-come-by tube quickly—obsolete or modern.) And you get your tubes at the **lowest prices** of any national brand. The quality? Top-drawer. To be certain these longer-lived tubes stay brighter longer, we inspect each one 31 times.

Extra protection. Extra-dependable service. And extra profits. That's ***real*** *leadership. And that's why so many dealers are finding it pays to focus on Channel Master as their first choice in tubes.*

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CHANNEL MASTER

ELLENVILLE
NEW YORK

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LETTERS TO THE EDITOR

Polarity Reversed

In your article "Servicing Transistorized AM/FM Auto Radios" (December), I noticed the polarity for the NPN and PNP transistors in Fig. 4 is reversed.

DON NELSON
Stoughton, Wis.

Protos

Can anyone help me find a schematic for a Protos tape recorder, model BG-12. It is German made.

JAMES T. BRAY
San Diego, Calif.

Tekfax

I would like to make a constructive suggestion: The schematics in TEKFAX are a little too small. I would rather see fewer schematics, but larger . . .

SAMUEL SCHWARTZ
Silver Springs, Md.

● *The maximum schematic size is limited by the magazine size. Making a single large schematic fit on more than one sheet is not possible. —Ed.*

FREE LITERATURE

Crimp Tool **300**

A picture tube repair tool for repair of bad solder joints is described in a brochure. The tool is also said to be useful for repair of 5U4s, 6SN7s and other octal tubes. Berns.

Dolly **301**

Aluminum appliance dolly is described in a four-page brochure. Yeats.

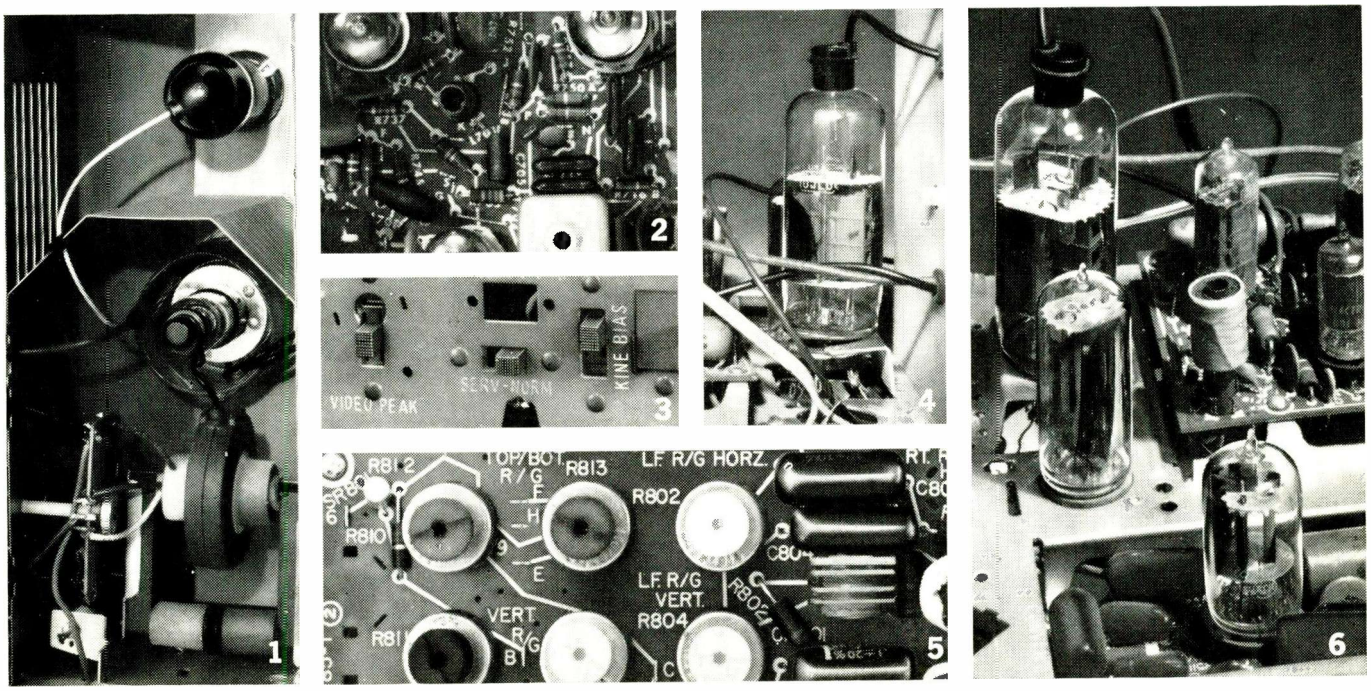
TV Forms **302**

Various forms for TV service shops including salesbooks, job tickets, etc. are detailed in a 32-page catalog. Oelrich.

Product Line **303**

As an aid to service dealers, a

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



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

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

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

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

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

Less color fringing results from a new clamp diode in the convergence circuit and rearranged controls are easier to use. And UHF reception is improved by new circuitry that reduces snivets . . . those black vertical lines near the center of the picture.

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

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

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

To further increase life, the focus rectifier is now a special long-life selenium type.

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

It's easier to service the high voltage compartment . . . it has a hinged cover and better arrangement.

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

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

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

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

"HIS MASTER'S VOICE"

RCA The Most Trusted Name in Television

Tmk(s)®

FREE LITERATURE

23-page catalog listing, in indexed form, entertainment products including radio-TV silicon and selenium rectifiers; entertainment diodes and transistors; silicon tube replacement rectifiers; electrolytics; molded and gold-dip mylar capacitors; tubular paper capacitors; and customer line UHF converters. The catalog carries a full description of all the products, type of packaging, characteristics, components which they can be used to replace, dealer net prices, etc. General Instrument Corp.

Universal Transistor **304**

A "universal" group of 10 transistors which can be used as replacements for most types used in radio and other entertainment products is being marketed. Replacement and Interchangeability Guide is now available indicating how these 10 transistors can be used as replacements for more than 500 JEDEC and manufacturers' numbers. General Instrument Corp.

Test Equipment **305**

A catalog showing their 1964 line is now available. EICO.

Transistors **306**

A replacement and interchangeability guide for transistors and diodes suitable for use as a wall chart is available. Semitronics.

NEW BOOKS

MODERN DICTIONARY OF ELECTRONICS. Revised Edition. *By Rudolf F. Graf. Published by Howard W. Sams & Co., Inc. 435 pages, hard cover. $6.95.*

You may or may not realize it, but you've been looking an information-explosion right between the eyes for the past few years. Among other things, one of the trying problems now confronting technicians is the job of information-retrieval. You can waste a lot of valuable time just looking for the

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

Was your name part of this hard-sell ad in TV GUIDE®?

If you took advantage of the offer, February 8th TV Guide tells every reader in your neighborhood that you are the expert on whether they should repair or replace their TV set. And a helpful free booklet titled "Fix or Buy?" is in your hands for distribution free to your customers. ■ National advertising in TV Guide, the booklet, plus a banner advertising the booklet for your store—a triple-barreled way to hit your very best prospects. ■ Specials like this are available regularly through your participating Sylvania Distributor. They show that he is sincerely concerned with raising your profits and your prestige—and so is Sylvania. ■ You can expect more than the highest-quality tubes when you deal with your PRODUCT-PLUS Sylvania Distributor.

SYLVANIA
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GENERAL TELEPHONE & ELECTRONICS

NEW BOOKS

simplest but essential-to-know information.

This book contains more than 12,400 electronics terms, including microelectronics, semiconductor devices, reliability, computers, data processing and programming. And in addtiion it gives valuable information on all the old stand-by terms that no one can keep constantly in their heads. The book begins with "A" for the angstrom unit abbreviation and continues through "Z" for impedance and zooms right on to "zoom lens"—focusing on everything in between. There are other more comprehensive electronics dictionaries and encyclopedias, of course, but they are rather expensive. Despite the rapid changes taking place in electronics, this dictionary should be adequate to fill the needs of most technicians for some years to come. It has many schematics and illustrations.

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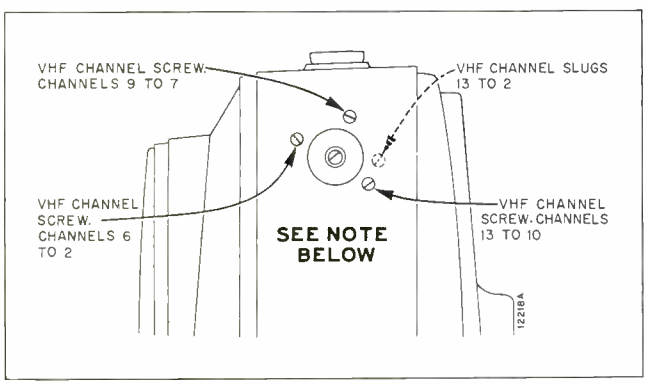
TECHNICAL DIGEST

ADMIRAL

TV Chassis Stamped Run 11 With Suffix "E"—VHF Channel Adjustment

All sets with suffix letter "E" after chassis and model number are provided with three channel adjustment screws. A channel screw covering channels 13



Side view of Admiral cabinet, channel selector and fine tuning knobs removed. Use adjustments in solid lines for sets with suffix "E" after chassis and model number. Use adjustment in dashed lines for sets with suffix letter "A" or "C" after chassis and model number.

through 10, one covering 9 through 7 and one covering channels 6 through 2 are located as shown in the drawing. Since adjustment on a higher channel affects all lower channels, make adjustment starting with the highest operating channel, then on each lower channel. Screws should be adjusted under the following conditions:

1. Turn receiver on and allow 15 min warm up.
2. Set channel selector at highest channel to be adjusted. Set fine tuning control at center of tuning range, by setting knob at mid-point between stops at extreme ends of rotation. Set other tuning controls for normal picture and sound.
3. Remove channel selector and fine tuning knobs.
4. Use a non-metallic adjustment screw-driver with metal tip blade, and carefully adjust channel screw for best picture. Note: *Sound may not be loudest at this point.*
5. Check adjustment on lower channels to be sure that good picture and sound can be tuned within range of the fine tuning control. If good picture and sound are not tunable on a lower channel, touch-up adjustment of the corresponding channel screw should be made on the lower channel, as a compromise adjustment to favor other channels.

MAGNAVOX

Series 75 AM/FM Tuners—FM Stereo Alignment Preliminaries

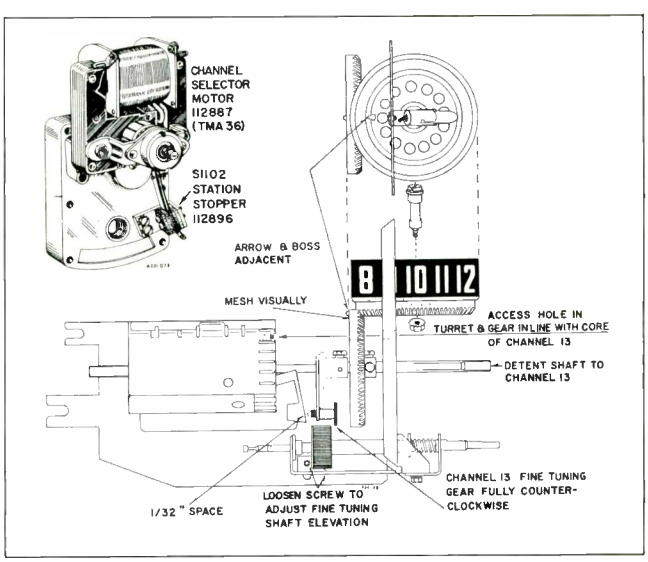
Alignment of the FM stereo section of these chassis requires a 19 kc crystal-controlled signal source. This 19 kc signal must be within ± 2 cycles (.01%). Also, a 67 kc and 71 kc signal source (audio generator) is needed. To complete the alignment an audio voltmeter should be available for setting the output of the generators to the low value required. If an audio generator, capable of covering the 67 and 71 kc frequencies is unavailable, then the traps 1601 and 1602 should be adjusted on an air signal; but only if the FM station is known to be transmitting storecast information. Before attempting to align the stereo section the actual transmission of the FM stereo signal should be checked on an instrument known to be operating properly. If it is then determined that alignment is required, disconnect the FM stereo indicator, if used, and proceed with step-by-step instructions furnished in manufacturers service manual.

RCA

VHF TV Chassis KRK 102-5, 107-8, 113 and UHF KRK 66, 112—Tuner Field Service

Preset fine tuning which employs a pull-out fine tune knob may develop one or more of the following problems:

1. Fine tune knob sticks in extended position.



RCA tuner field service adjustments.

2. Fine tuning ratchets or slips on one or more channels.
3. Fine tuning shaft resists momentarily while being pulled out.

The aforementioned problems may be corrected by following the illustration. The tuning assembly may remain in the cabinet. The fine tuning gear driver must be adjusted relative to the individual fine tuning turret gears by bending the fine tuning shaft bracket at the rear. Bend the bracket down for Problem 1 or 3 and bend up for Problem 2.

4. Channel selector motor labors.

Examine for broken or missing motor mounts (grommets). The detent shaft may be bent or rotor shaft dragging in bearings.

5. Electrical lead dress.

Because of the need to disturb interconnecting wires when making mechanical and electrical repairs, it is important to observe the original lead dress and the position of cable clamps before removing a tuner from the cabinet. It is imperative for UHF and color TV. The following procedure should be observed:

1. Dress all ac and AGC leads clear of the antenna transformer.
2. Dress UHF leads clear of VHF leads and separate the individual UHF leads somewhat (do not twist).
3. Replace the IF coupling link in its original position. If this is not known, position it experimentally and observe for possible interference patterns on the active channels. Late color instruments (CTC12 and CTC15) require that this link be suspended at the top left corner of the CRT shield.

Observe safety requirements and restore all covers, fish papers and hoods.

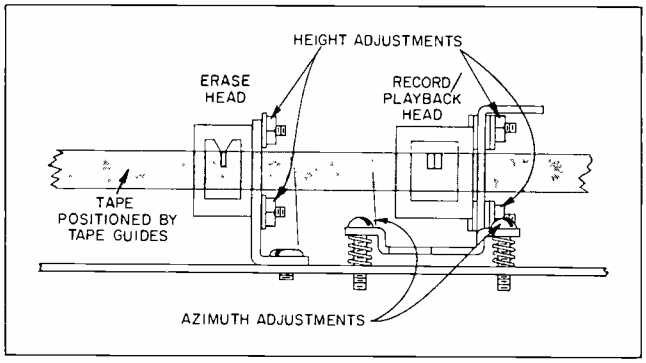
A replacement fine tuning coil is supplied complete with the core and return spring. If the tuner under service requires the core and spring only, the assembly may be removed from the new coil and inserted in the original coil eliminating the need for soldering of new leads. The coil, which remains, may be retained for future needs.

The fine tuning lever should not be bent to compensate for incorrect positioning of the fine tuning turret. To do so many change the effect of the spring loading or cause the lever to be obstructed in advance of its full travel. Late detent shafts are provided with a dimple which locates the set screw providing automatic positioning of the turret. This provision should be used in place of the measured orientation shown in the illustration.

WESTINGHOUSE

Tape Recorders Models H-21R, H-22RS, H-24RS, H-25R—Head Alignment

Improper head alignment may cause low output, poor high-frequency response and, in stereo recorders, overlap of adjacent sound tracks. The record/playback head must be in precise vertical alignment with the tape, and the gap line of the head must be at right angles to the edge of the tape.

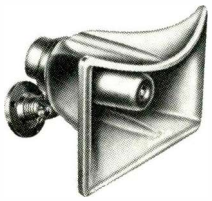
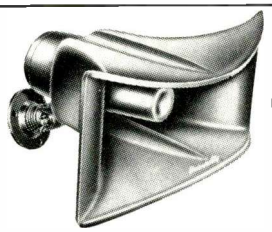
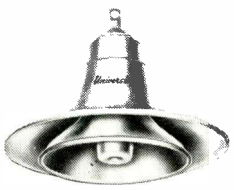


Westinghouse tape recorder head alignment for half-track monophonic heads.

The top edges of the pole pieces of both heads must be even with the top edge of the tape (see illustration). To adjust pole-piece height, loosen the hex nuts on the side of the head and raise or lower the head. After the height adjustment has been completed, tighten the hex nuts. To adjust the azimuth (angle of the gap line) of the record/playback head, play a standard alignment tape, one which carries a signal of at least 5000 cps.

Three adjustment screws are provided for azimuth adjustment. While the tape is playing, adjust the head for maximum output (as indicated on an oscilloscope, H-25R, output signal voltage may be measured on the play/record switch at the farthest terminal to the rear (terminal 18 of SW2). In Models H-21R, H-22RS and H-24RS, measure output signal voltage at the AMP jack.

Plan your paging/talk-back speaker installations around University ...the most complete line.

APPLICATION	REQUIREMENT	RECOMMENDED SPEAKER	SPECIFICATIONS
Complete coverage for small areas with low ambient noise levels. Spot coverage to assure uniform sound volume in large systems.	Wide dispersion. Good frequency response. Weatherproof. Compact size. *OLB	 UNIVERSITY MODEL MIL-A	7.5 watts 350-13,000 cps 120° dispersion 7 1/16" dia. 6 7/8" deep In 4, 8, and 45 ohm impedances.
Same as above and where overhead obstructions are encountered.	Same as above but with greater control of dispersion pattern, reducing reverberation and spill over. *OLB	 UNIVERSITY MODEL CMIL-A	7.5 watts 350-13,000 cps 120° x 60° dispersion 6 1/4" high, 9 1/2" wide, 8 1/2" deep In 4, 8, and 45 ohm impedances.
Coverage of sizeable areas with moderate ambient noise level. Amusement parks, warehouses, loading docks, portable P.A. systems.	High power handling capacity, high efficiency, greater low frequency response. Utmost reliability. Weatherproof. *OLB	 UNIVERSITY MODEL IB-A	25 watts 250-13,000 cps 90° dispersion 10 1/4" dia., 9" deep In 4, 8, and 45 ohm impedances.
Same as above and where overhead obstructions are encountered.	All of the above, but with exclusive University Wide Angle horn for reducing reverberation. *OLB	 UNIVERSITY MODEL CIB-A	25 watts 250-13,000 cps 120° x 60° dispersion 7 3/8" high, 14" wide, 12" deep In 4, 8, and 45 ohm impedances.
Ceiling suspension of speakers to cover wide area. Using minimum number of units. Factories, department stores, depots.	Uniform 360° sound dispersion. Built-in driver. High power handling capacity. *OLB	 UNIVERSITY MODEL IBR-A	25 watts 300-10,000 cps 360° dispersion 13" dia., 10 1/4" deep In 4, 8, and 45 ohm impedances.

*OLB - Patented University Omni-Lok Bracket directs and locks speaker in any plane with a twist of the wrist.

U-36

University paging/talk-back speakers offer high microphone sensitivity for reliable talk-back communications. Their rugged construction assures lifelong dependable operation. Above all, University "High A" (High Audibility) engineering assures a degree of intelligibility that has never been matched in speakers of this type. For free catalog, write desk ET2, LTV UNIVERSITY DIVISION, Oklahoma City, Oklahoma.

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EDITOR'S MEMO

Honest Service

The December issue of Popular Mechanics featured *Honest TV Service — And How To Get It.* The statistics brought to light by the Popular Mechanics editors are unfortunate but necessary. For those of you who missed it, here, in brief, is what it said. Seven out of 28 shops surveyed in a certain metropolitan area were dishonest.

The test was made like this: A 19 in. portable was put into top condition, including cleaning and replacement of all borderline parts. An audio tube was then removed and the filament was burned open; every part in the set was marked with paint which could only be seen under ultra violet light. The set was carried into 28 service shops with the same comment: "The set went out last night and hasn't played since." Bills for the set repair ran from "a substandard $4 to a very excessive $18."

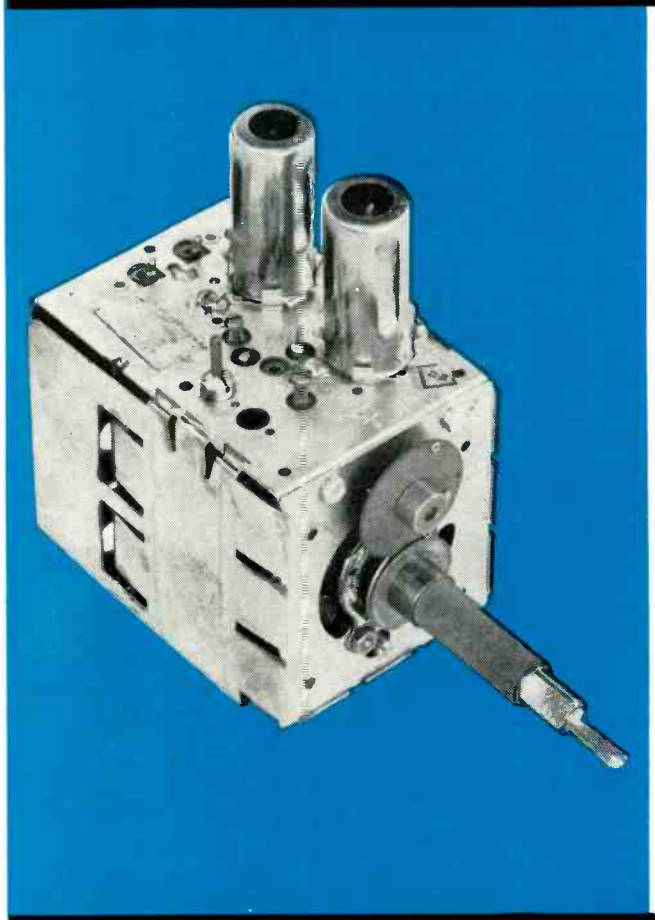
Popular Mechanics editors said the purpose of the test was not to find crooked TV technicians but to find out what dishonest technicians had in common that the honest technicians did not. In every case where the set was repaired in the presence of the "owner" an honest bill ranging from $4 to $5.25 was presented. This was the case 21 times. The remaining seven technicians said they replaced other parts although the paint check showed they did not. This seven also charged for such services as cleaning the tuner (which was already meticulously clean) and adjusting controls (which were painstakingly adjusted).

From the survey, these suggestions were made to potential TV service shoppers: If possible, bring the set to the shop yourself. Ask the technician to look at the set while you wait. If he says he is too busy, take the set to another shop. (The editors pointed out that this in itself does not mean the technician is dishonest, but it is something all of the dishonest technicians had in common.) Watch the technician remove the back and be sure he is familiar with his tools. If anything more than a couple of tubes are suggested, pay the estimate or bench charge and take the set to another shop. Rely on recommendations from friends who have had good service several times from one shop.

A large percentage of your customers will see the article in Popular Mechanics. It may be wise for honest shopowners to change some of their operating procedures — for example, it might be best if every set is at least looked at when it is brought into the shop. The one it will hurt most, however, is the dishonest shopowner. I think we should all be willing to go to a little extra trouble to help TV repair become a thoroughly respected profession.

Vin Bare

TUNER REPAIRS



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Sarkes Tarzian, Inc., largest manufacturer of TV and FM tuners, maintains two completely-equipped Service Centers to serve YOU. Both centers are staffed by well-trained technicians in this specialized field and are assisted by engineering personnel to assure you of FAST, DEPENDABLE service.

Tarzian-made tuners—identified by this stamping—received one day will be repaired and shipped out the next. A little more time may be required on other makes. Every channel is checked and re-aligned per manufacturer's specifications, not just the channels which might exist in any given area.

You get a 12-month guarantee against defective workmanship and parts failure due to normal usuage. Cost to you is only $9.50 and $15 for UV combinations, including all labor and parts except tubes. No additional costs. No hidden charges. All tuners repaired on approved, open accounts. You pay shipping. Replacements on tuners beyond practical repair are available at low cost.

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

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TUNER SERVICE DIVISION

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Deluxe VTVM for color & B & W

Never before such an outstanding instrument at such a low price! Calibration without removing from cabinet. Measure directly p-p voltage of complex & sine waves: 0-4, 14, 42, 140, 420, 1400, 4200. DC/RMS sine volts; 0-1.5, 5, 15, 50, 150, 500, 1500 (up to 30,000 volts with HVP probe, & 250 mc with PRF probe). Ohms: 0.2 ohms to 1000 megs. 4½" meter, can't-burn-out circuit. 7 non-skip ranges on every function. Zero center. Features EICO's exclusive UNI-PROBE: A terrific timesaver, performs all functions: A half turn of probe-tip selects DC or AC-Ohms! Kit **$29.95;** wired **$49.95.**

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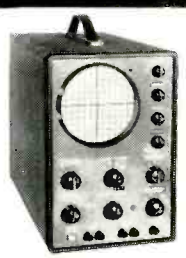

EICO 427 ADVANCED GENERAL PURPOSE 5" SCOPE High sensitivity scope has all the facilities and quality demanded for servicing audio, communications and industrial equipment. Vert. amp. flat from DC to 500 kc, −6 db at 1 mc; 3.5 mv rms/cm sensitivity. Horiz. amp. flat from 2 cps to 450 kc; 0.18 v rms/cm sensitivity. Automatic sync. Sweeps from 10 cps to 100 kc. Kit **$69.95;** Wired **$109.95.**

EICO 430 PORTABLE GENERAL PURPOSE 3" SCOPE Remarkably fine compact scope. Excellent for servicing audio, communications, and industrial equipment. Ideal as a ham shack monitor. Flat-face 3" CRT with mu metal shield eliminates affects of external fields. Vert. amp. flat from 2 cps to 500 kc, −6 db at 1 mc; 25 mv rms/cm sensitivity. Horiz. amp. from 2 cps to 350 kc, 0.25 v rms/cm sensitivity. Sweeps from 10 cps to 100 kc. Kit **$65.95;** Wired **$99.95.**

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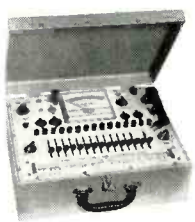

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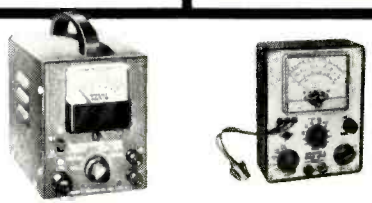

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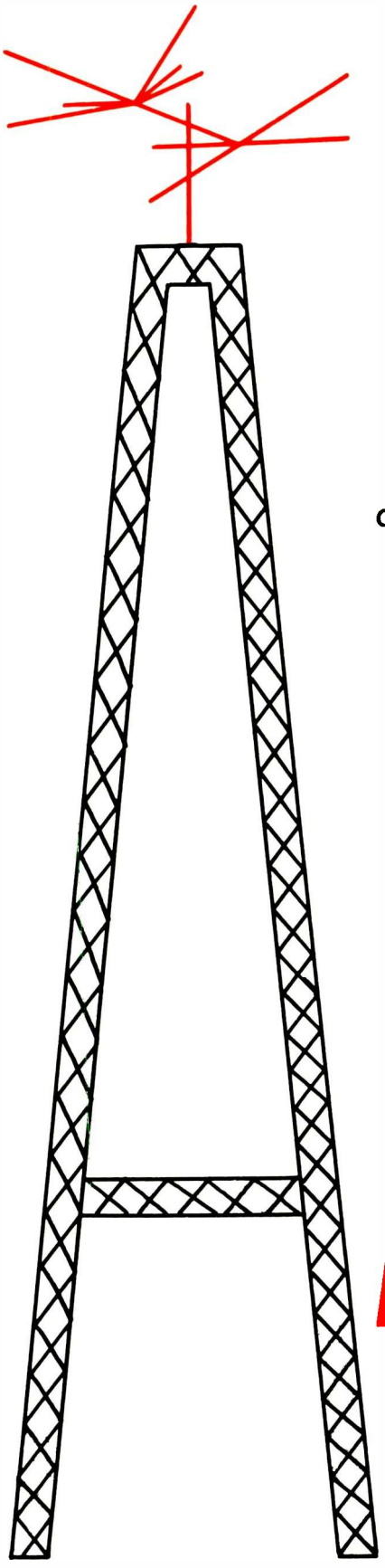


Now is the time for all technicians to take advantage of winter's havoc

NTENNA SEASON

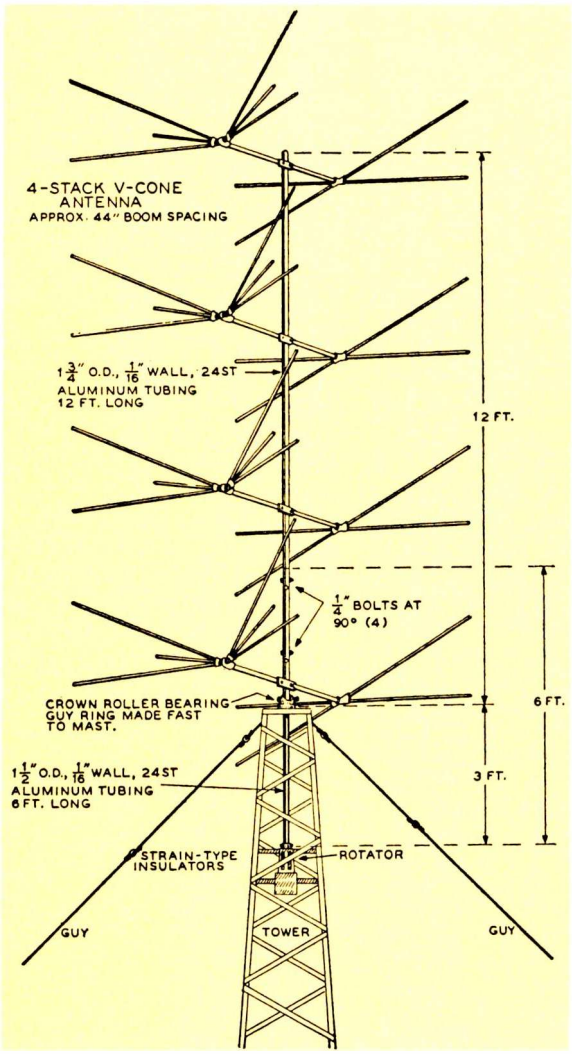
■ In most parts of the country the task of repairing winter-battered antenna installations and installing new or better installations is about to begin. March winds will put the finishing touches to old antennas—but mostly to installations which were improperly done in the beginning.

A cursory investigation of a few outdoor antennas will give you an idea of the most frequent faults existing in the average antenna system and show you where you should pay the most attention to your installations. Out of 10 faulty antenna systems we investigated, the following breakdown was obtained.

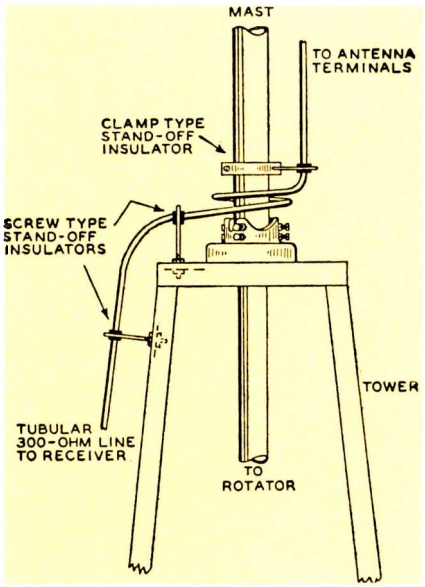
(A) Lead-in broken at antenna terminals: 4. (B) Lead-in broken somewhere other than antenna terminals: 2. (C) Antenna elements bent or broken: 2. (D) Insufficient guying causing mast to buckle in the middle: 1. (E) Broken guy caused mast to buckle at base and allowed antenna to collapse: 1. It

ANTENNA SEASON

Continued



Method of securing a large antenna when a rotator is used.



Lead-in should be looped around mast for rotator-controlled antennas.

can be seen that the most frequent offender (lead-in breakage) is the one technicians pay the *least* attention to, while the least frequent offender (guying; mast quality) in the ten installatons inspected is the part of the installation technicians are *most* careful with. And this is as it should be; it shows that careful consideration pays off in a lasting installation. But it should also show the technician where he has fallen down and where he should devote more time and energy.

Transmission Line

In most cases transmission line failure is not a fault of the transmission line. Although failure would have been delayed in some cases, if a higher grade of transmission line had been used, the end result would have been the same. Wind-lashing is the biggest single cause of failure but this is to be expected and no technician alive can stop the wind. Even if he could, there's a simplier way: Use the highest quality lead-in of the type you need for the job. The cost of lead-in is only a fraction of the overall cost for most jobs and should not influence your choice. Increase the number of stand-offs you use. Try to strike a happy medium here; too many are as bad for the signal as too few are for the lead-in—especially on UHF. Protect the lead-in at the antenna terminals by spraying them with a good plastic insulator. Tape them with a good grade plastic tape and spray again to prevent the formation of a water pocket.

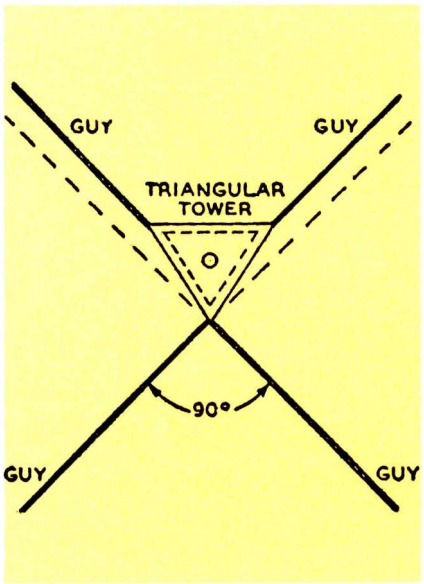
Make sure the lead-in is routed away from downspouts, gutters, masonry or other rough materials which would either affect the signal or damage the lead-in. Use at least an 18 AWG wire in the lead-in when a booster is installed. Voltage drop on small wire can cause poor booster operation. Some boosters even draw enough current to heat small diameter twin leads and cause permanent damage to the web installation. These few simple tips can save you more than half your antenna call-backs.

Properly installed, the lead-in should last the useful life of the average good antenna.

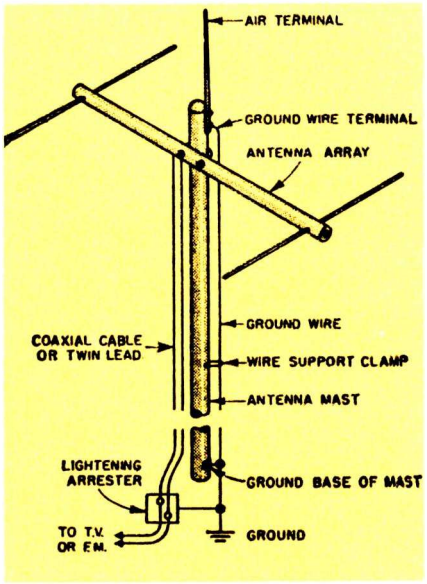
Guying

The best guy wire properly installed to a cheap mast won't hold the lightest weight antenna very long. With some of the heavier stacked antennas a cheap mast might not even give you time to collect for the installation. A simple way to get away from this is to use a tower. Although they are the most expensive, they are also the easiest to install and the most permanent. Simple local antennas do not merit such expense in many cases, however, and a regular chimney mount or gable mount is sufficient. But even when a simple mast is employed, guy wires should be used.

Masts and towers should be guyed at four points—even triangular towers. Fig. 1 shows how a triangular tower is guyed. When more than one set of guys are required, they should be anchored to the same points. Don't anchor



Towers and masts should be guyed to four equally spaced anchors.



Grounding antenna masts is a must in every area.

the guy wires to the house unless it is unavoidable. In some cases, a high wind could do severe damage to a house before the antenna is blown down.

Guy wire should be galvanized stranded type and should have no sharp bends—this will cause the galvanized coating to chip off. Where it is necessary to fasten the wire to sharp-edged guy rings a "thimble" should be used to prevent sharp bends.

Don't guy the tower or mast too low. This will only increase loading on the guy anchors and weaken the installation. The top guy should be fastened as close to the antenna as is practical. Where a rotator is not used it may even be wise to guy to the top of the antenna mast. Care should be taken, however, to assure that the guy wires will not snap against the antenna elements in a high wind. If this is not possible, use a nylon or oiled hemp rope for the top section of the guys. Connect the rope to the lower wire section with thimbles to avoid sharp bends in the wire.

Where guy wires run closer than 3 ft on high band antennas, or 12 ft on low band antennas, the guy wire in that area should be broken up with insulators. A suitable length for all channels is 40 in. The first insulator from the antenna should be half that distance, or 20 in.

When screw hooks or screw eyes are used to anchor guy wires remember to screw them in so the "pull" is to the side and not on the screw threads.

It is also advisable, particularly in ocean salt spray areas, to buy hardware from a marine shop; these components are usually zinc coated and last much longer. When the zinc is stripped from these components by cutting or filing, it is wise to coat the exposed area with zinc chromate and cover that with a good grade of outdoor aluminum paint.

Lightning Protection

TV antennas, sets and property can be readily protected from damage by lightning. This is most easily accomplished by installing an air terminal connected to the tower or mast which extends about 2 ft above the antenna. Where a mast is employed, it is usually simpler to lower the antenna on the mast by 2 ft so the mast projects above the antenna. It is believed that by capping the top of the mast with a metal ball or sharp spike it will become a more effective terminal for lightning. All sections of the antenna mast should be grounded on a common buss. If the mast is one piece, the top and bottom of the mast should both be connected to ground.

Twin lead should be connected to a lightning arrestor made for that purpose. It should be installed on the outside of the building as near the point of entry as possible. The lightning arrestor ground terminal should be connected to the mast and air terminal ground.

Grounds should conform to local and national electrical regulations which are used for household wiring. Generally, a 6 ft pipe driven well into the ground will suffice if the ground is moist. In dry grounds, a radial ground network should be buried.

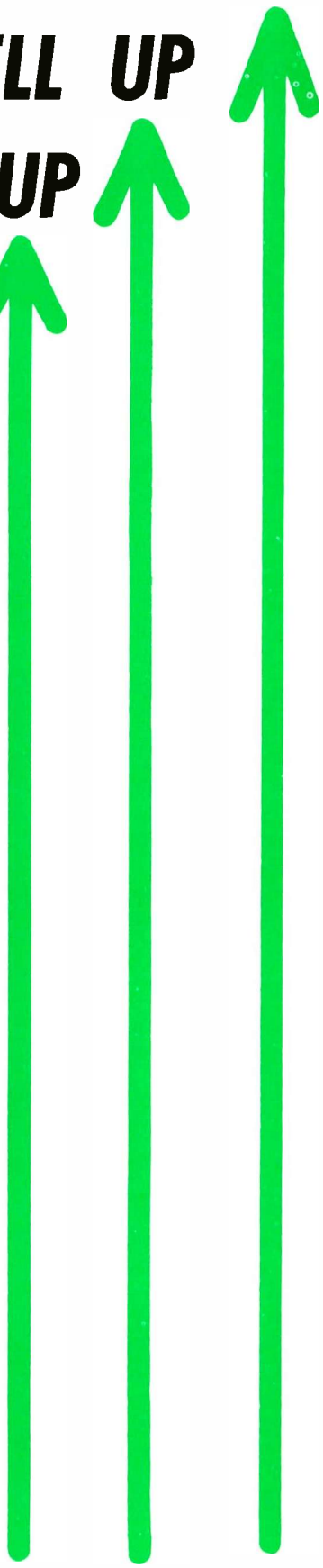
Wire size for grounding should never be any smaller than AWG 12. Even this would be vaporized if a lightning bolt of a moderate size and duration hit the antenna. The ground wire should also have no kinks in it. Where it is necessary to turn corners, do it gradually so a smooth bend results. Sharp bends offer high impedance paths to lighting.

Although some areas of the country are practically devoid of lightning strikes, no area is completely out of danger. It would pay for the technicians on the West Coast as well as those in Florida to use lightning protection on every installation.

It should be obvious that installing an antenna properly is not an inexpensive proposition. Many technicians have deliberately stayed away from this business because they felt it would be too difficult to justify a good job to the customer. This is not true, however. As a matter of fact you should explain that higher-than-might-be-expected expenses encountered are only for the owner's safety and to make the installation a lasting one.

Even if your customer has no complaint about the cost, it is still good business to explain why so much time is required, etc. Following the tips given here won't make you an antenna expert, in itself, but if you've been installing antennas for some time, apply these tips to your next installation and you'll be on your way to being the antenna expert in your area. Your customers will recognize the quality of your work by the way it holds up. *Illustration credit: Editors & Engineer Ltd.* ■

PUT UP!
SELL UP
THINK UP



Your full antenna sales potential cannot be realized by selling minimal installations

by
Daniel S. Roher
Channel Master Corp.

■ You should have had an outstanding antenna year in 1963. If you didn't, something was wrong. Six million TV sets were sold, including about 725,000 color sets; new home construction continued at high levels; people continued to move from one part of the country to another at the drop of a suitcase; FM stereo broadcasting helped spark record sales of FM receivers; and UHF began to produce tangible results at the retail counter.

Historians study the past in order to learn about the future. We can do the same, and profit by it, because it has been amply demonstrated that dealers doing the most profitable job in antennas today are those who, after becoming sufficiently familiar with the technical aspects of their work, have learned to devote more time to merchandising and promotion of products and services.

Selling Up

Experience shows that many dealers never realize their full antenna potential because they are frequently inclined to sell the *minimal* installation. There is some psychological justification for this. First, the dealer feels that he is in competition with other dealers and must try to come in with the lowest price. Secondly, the dealer frequently feels that the customer has already spent a couple of hundred dollars for a TV set and may possibly balk at the "extra" cost of putting up an expensive antenna. Of course, there are many situations in which the minimal installation is all that is needed. However, there are also many excellent opportunities for dealers to sell substantially higher priced installations which cannot only be easily justified to the consumer, but which may well earn the consumer's sincere gratitude! One illustration will suffice:

Salisbury, N. C. is served by channels 3 and 9, and by Winston-Salem's channel 12. It is noted that most sets around this area are sold with low-priced conicals which bring in one more channel, 7 from Spartanburg. In such installations the customer has spent perhaps $250 for his set plus about $35 for

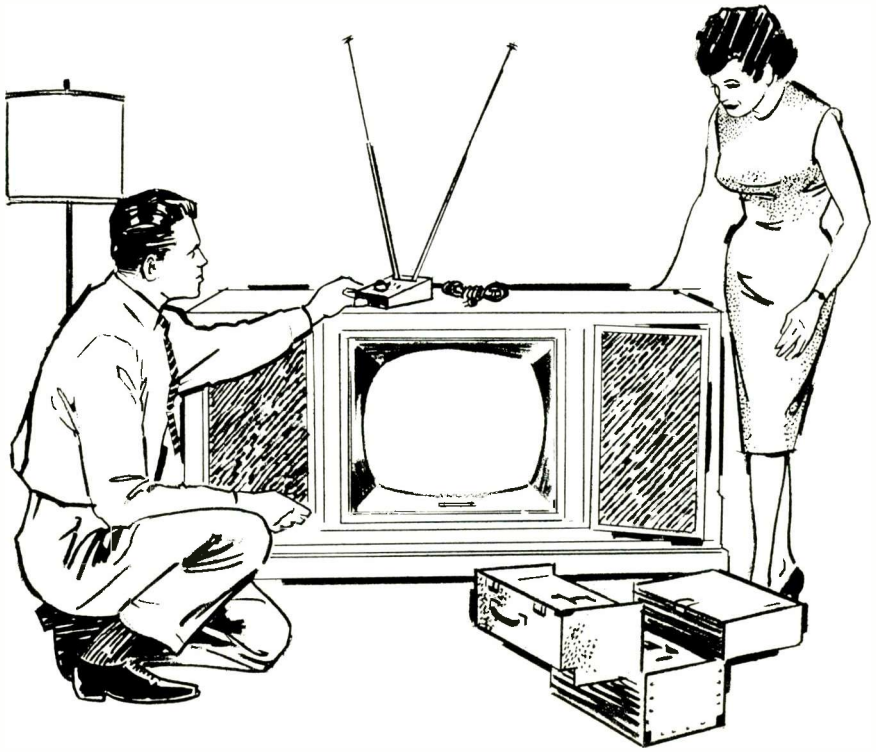
a low gain outdoor installation, for a total of $285.

Some consumers are probably satisfied with this arrangement, but others are not. One way of looking at this installation is that each channel comes in at a cost of $95. Now, some dealers in this area have learned that an "all out" installation consisting of a high gain antenna with booster and rotator, is capable of bringing in no less than 8 channels (3 and 9 locally, 13 from Asheville, 7 from Spartanburg, 4 from Greenville, 2 from Greensboro, 12 from Greensboro-Winston-Salem and 10 from Columbia).

If this "all out" installation were sold to a customer for $200 (which would provide the dealer with a good profit) the total cost of set plus installation would now be $450. But the customer now can receive no less than 8 stations, five of them coming in excellently, and 3 from fair to excellent depending on location. With this installation, the dealer has reduced the cost of each channel received to only $56. Usually, it is not necessary to use this form of arithmetic to sell higher quality installations because most consumers want as many stations as they can get, within reason. But it is a useful tool to keep in mind. If you sell sets, here's one further thought: The extra volume you generate by combining set sales with higher-quality antenna installations can help you beat cut-rate competition from other quarters.

Go After Special Situations

The residents of Long Island's north shore (New York State) can — for the most part — receive clear reception from New York City's seven channels with low gain roof or attic antennas. Nevertheless, this past fall saw the installation of hundreds of 40- and 50-ft towers, topped with big 10 element broadbanded "yagi" type antennas pointing northwest toward Hartford, Conn. Why? So that football fans could see the home games of the New York Giants which were blacked out on the New York City stations. This was a tailor-made opportunity to install high priced, high quality antennas in one of the highest income areas in the United States. And yet—a survey among hotel owners and private home owners who had installed these antennas revealed that in every case the antennas were installed at the initiative of the owner himself. Not one single case has turned up of a dealer—by advertising, direct mailing or telephone call—who took the first step to sell these profitable installations. Set owners with these big installations derived the additional side benefits of receiving channel 3 from New Haven (easily picked up by channel 8 antennas because of its high power and proximity to Long Island), and receiving late movies from channels 3 and 8 as well as special broadcasts not routed via New York stations. Blacked-out football games and other athletic events are commonplace throughout the country and offer service-dealers and technicians excellent opportunities for plus antenna business.



New Products

Technological advances have even created a new breed of antenna to provide unique profit opportunities for dealers in all areas —even those who have *not* been handling antennas. Transistorized indoor antennas for TV and FM now make possible quick and easy over-the-counter sales requiring no installation or labor. Set dealers in the suburbs and fringe areas who, for one reason or another, have been out of the antenna business (largely because they wanted to stay away from installation) now find they can sell a new kind of product where a market for indoor antennas simply did not exist before.

Up to now there was no indoor antenna made that had the necessary pull-in power in the "Golden Doughnut area," the population-packed markets from 15 to 45 miles out from the station. This is no longer true. At least one company guarantees its transistorized TV antennas to work up to 45 miles or the consumer gets his money back. Transistorized FM stereo antennas are guaranteed to work up to 60 miles out, with the same money-back guarantee. Antennas of this type, which require no installation, put any dealer into the antenna business easily and profitably.

Many dealers surprisingly refuse to handle outdoor antenna kits even though there is a gigantic do-it-yourself market for these items.

These dealers feel that since no installation is involved, there is not as much profit in selling an antenna over-the-counter as there is in handling the complete installation. These dealers, as others can tell them, are losing big business by default. Such an attitude on the part of service technicians has, in many cases, resulted in kits being sold in department stores and other outlets that by-pass the TV technicians.

The situation is comparable to what's happened to the marketing of receiving tubes, which are now found in drug stores, grocery stores and you name it. Giant mail-order companies sell millions of dollars worth of antennas which consumers want to put up themselves. It's a lot more profitable for the TV technician to utilize this concept than to fight it. Perhaps this is a good time to review your own attitudes about handling antenna kits. And, of course, as with everything else, handling the merchandise brings with it the need for properly promoting and merchandising it.

FM and UHF

As FM expands, and as UHF approaches a period of government-initiated boom growth, Mr. and Mrs. John Q. Consumer will—for awhile, at least—find themselves more confused than ever before. New products, new language and new concepts are going to have to be explained to the public. When questions arise, the public will turn to his first line of information on this subject—the TV service-dealer. Necessity will create an excellent opportunity for you to establish close professional relationships with your public. Fortunately, much help is available from the antenna and accessory manufacturers. But the dealer must take the initiative in using this material. How many dealers have accurate customer and prospect mailing lists? (See article *Update Your Mailing List,* August 1963 ELECTRONIC TECHNICIAN.) And of those, how many use them regularly? And yet, there is no more valuable asset to your business than a list of your satisfied customers to whom you can return periodically to sell replacement antennas, UHF converters, FM antennas and other merchandise.

Use Manufacturers' Aids

The next time your distributor salesman walks through your door, it would be a good idea to buttonhole him for a merchandising conference after he has finished his product presentation. Insist that he familiarize you with all of the mats, window streamers, point-of-sale displays, radio commercials, signs, banners and other promotional materials that most manufacturers make available to their dealers. Find out specifically what merchandising tools and gimmicks you can get.

For example, a dealer can obtain estimating forms that allow him to prepare detailed estimates for the customer in a neat, well organized, professional manner which has the added virtue of providing a legible permanent record of price information given to the customer. Door hangers are provided which should be placed on the door-knobs of homes in the immediate vicinity of a new installation. These door-knob hangers invite the prospect to examine the quality of TV reception in the home where the new antenna has been installed, and to compare it with his own. Today's business conditions *demand* that you learn more about going after the customer—because it becomes less and less likely that he's going to come looking for *you!*

And while you are thinking about *selling* up, it is a good idea to also *think* up about your own business, about the condition of your store. Is it clean and neatly laid out? Is the window clean and does it make a neat display of the merchandise and services you have for sale? Do you change it fairly often, to keep the interest level high among the passers by? Is your truck freshly painted? Do you feature signs and displays which show the leading brands that you are promoting? This is very important. The names of some antenna manufacturers are becoming well known, through advertising and promotion, to the consumer. And it benefits the dealer to associate himself with these well known names, in exactly the same manner as he does with set and appliance manufacturers.

As the TV and FM industry has matured, the caliber and technical skill of the service technician and service dealer has grown accordingly. But technical skill alone is not enough to assure the growth and financial health of a business. Dealers who have learned to think in merchandising and promotional terms find that these elements, when *joined* with their technical skill. creates an unbeatable business combination. ■

Troubleshoot TVs Logically

Common symptoms may be the clue to hard-to-find faults

by Ben Allen

■ Leading technicians use a logical approach to locate the defective stage in every TV set. It is surprising to learn that many technicians do not use a systematic approach when confronted with a malfunctioning TV set. The majority of technicians use a "special" approach ("because that was what was wrong with the last set") but at best it could only be called "hit and miss." A one man shop would logically use a different approach than a three or four man shop in handling incoming sets, but the basic method will be the same whether one person or a house call man, pre-bench inspection man and the bench man all apply it.

Classification

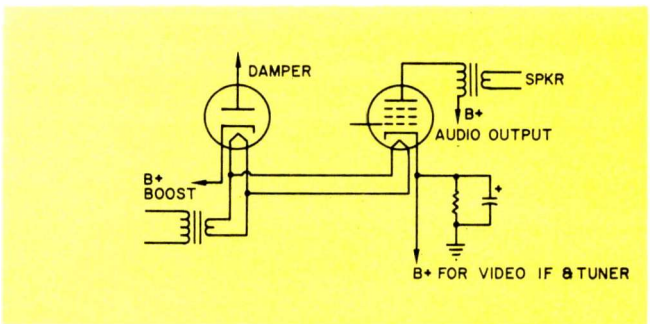
Since the TV set performs two basic functions, the manner in which these functions are operating can be classified quite easily. Any malfunction or combination of malfunctions will show up as picture or sound faults. For example, the sound may be dead, distorted or hum or buzz may be present with or without normal audio; the CRT may have a raster only, no raster or may have a distorted raster (bending, flag waving, pie-crusting, sweep failure, etc.). Of course, any combination of the two general classifications may be present.

Usually, it is obvious what the symptoms of an ailing set are. Since this is true, it is quite easy to classify the problem by sound and picture symptoms. These classifications should not be treated lightly but should be written down and studied. While this may not be necessary for simple symptoms (such as dead sets), it will prove especially valuable for more complex symptoms (buzz in sound, weak sync, etc.).

With more obvious failures, the experienced technician classifies malfunctions without even being aware of them. But when a more complex malfunction occurs, he is confused and doesn't know where to begin. Rigorous classification can eliminate this problem and make troubleshooting easier and quicker.

In the case of a dead set, for example, your mental process may first classify it as no raster, no audio or hum and then upon further inspection it may be found that no tubes are lit. Almost automatically most technicians realize they are confronted with an ac input malfunction. This is *the only common circuitry*. If the set were only apparently dead (no sound, no raster) but the filaments were lit B+ would be suspected since ac is obviously being supplied to the set and B+ remains *the only common circuitry*. Similar malfunctions can be more complicated: no raster, no audio with hum present. Such symptoms as these could be caused by several faulty components depending on the chassis. The hum, however, denotes that B+ is present.

The process of trying to find common circuitry should be used on all symptoms. A concentrated



Short between cathode and filament in the damper tube in sets using this circuit can cause excessive B+ to reach IF tubes.

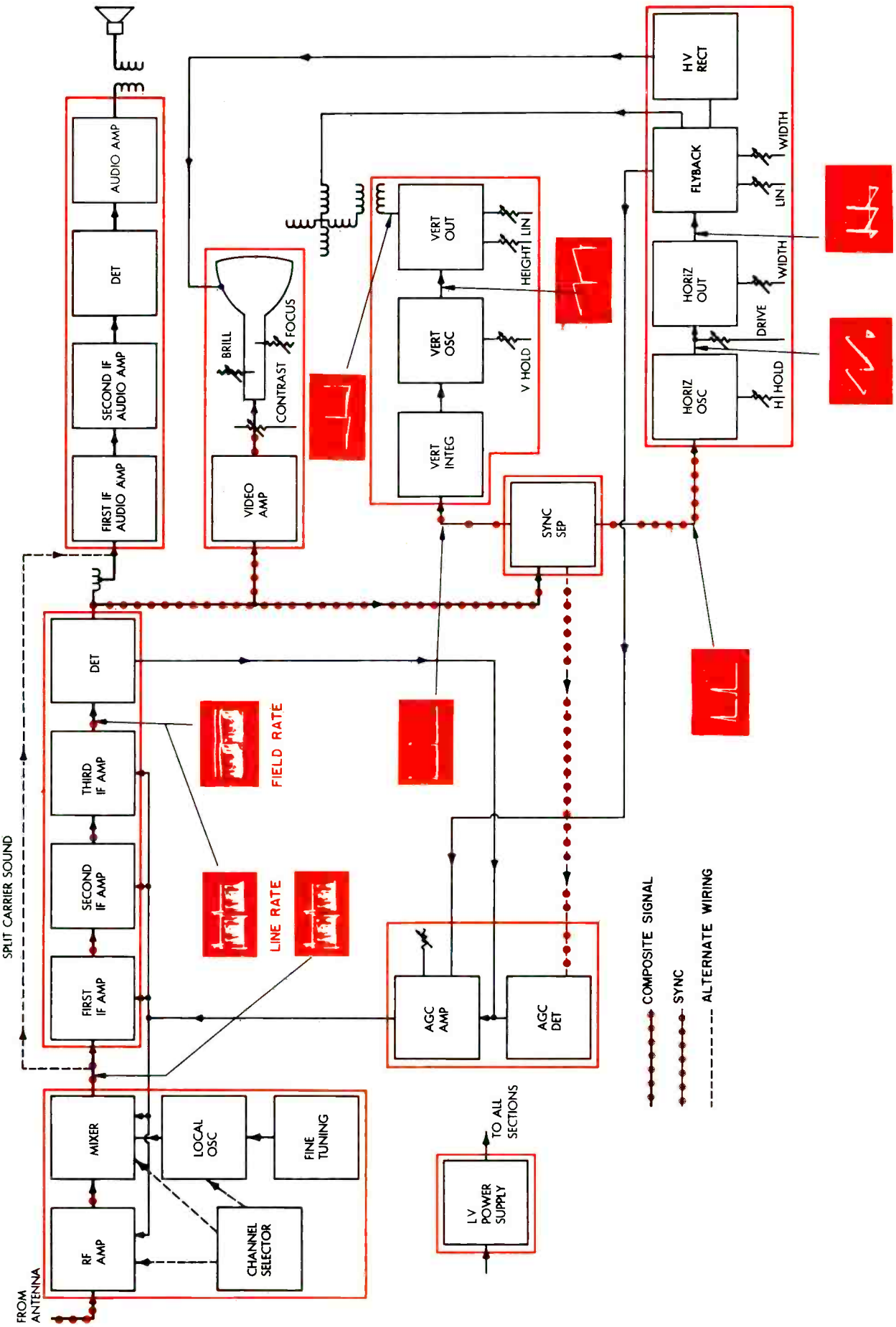
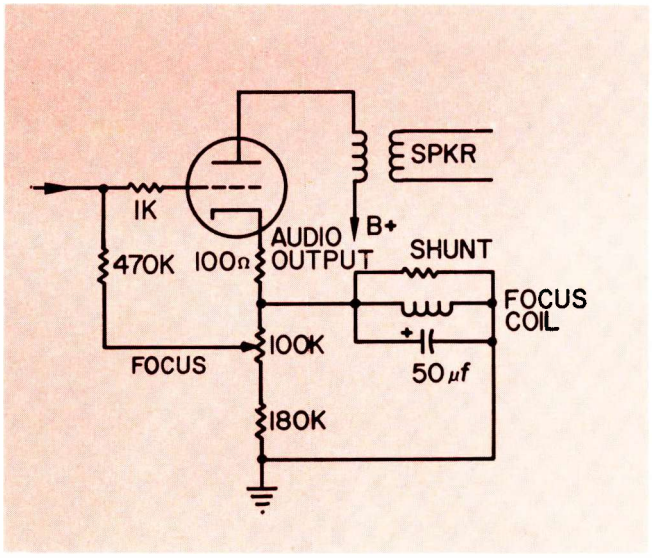
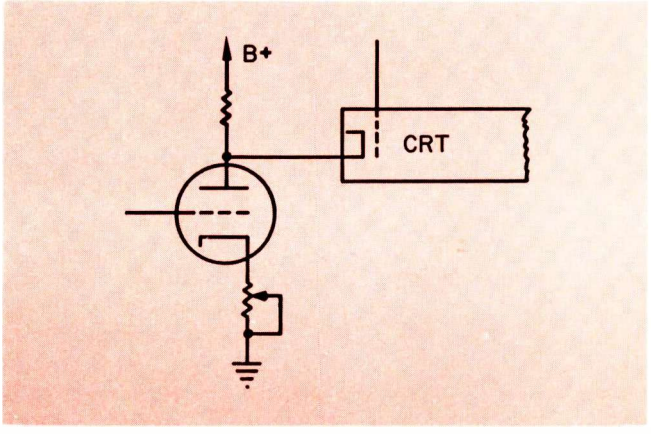


Fig. 1—Block diagram of a typical TV.

effort to locate the faulty stage with such reasoning will almost invariably pay off. In fact, the only time it will not prove beneficial will be when the logic is missapplied. That is, if you don't think distorted sound, weak video and insufficient height have anything in common, it may take you a long time to find the vertical fault tied to the sound through B+ which in turn supplies voltage to the tuner and IF strip in some sets.



One of the older GE sets that may cause you some trouble used a focus control in the audio output stage.



Defect in the video output stage may cause contrast control to operate like brightness control.

Using The System

If you do not keep a block diagram of the typical TV receiver in your mind, you should refer to Fig. 1. By memorizing such a diagram, you should be able to locate almost any defective section simply by observing the symptoms. In many cases the defective stage or part can be isolated before any tests are made.

Aside from the B+ there are other circuits common to almost every possible symptom. For example, the tuner and IF strip select and amplify the entire signal. In this process, the picture, sound and sync may be affected separately or in some combination. On the other hand, some circuits will only affect one function. An audio IF failure, for example, rarely causes trouble anywhere except in the sound section.

Just to try this system once, let's look at some symptoms and try to imagine what might cause them. Picture: weak, some double bending, dark horizontal bars travel through picture slowly, loses vertical sync frequently, vertical hold adjustment critical, insufficient width. Audio: light buzz, higher than normal hum even with volume turned all the way down.

The trouble in this case is more than likely the B+ input filters. Trouble in almost every section of the set indicates that, assuming one problem is the fault, something common to all of these sections is at fault.

Occasionally, more than one problem makes this system difficult to apply. Usually, careful questioning of the owner will show that one or more of the symptoms were present before complete failure. In fact this should be a part of every service call, snice it seems to be human nature to watch TV as long as the picture can be seen and the sound is clear enough to understand. Perhaps some of you have been called in where the owner sat in front of a blank screen listening to the audio or just watching the picture on a set with no sound (the fact that radio stations are still broadcasting seems to have temporarily slipped their minds).

Test Equipment

It would take more than an average technician to work profitably on TV using only logic and no test equipment. But logic is also necessary if test equipment is to be used profitably. In other words, if you suspected low B+ you wouldn't use a scope on the B+ line first. A comparatively clean presentation on the screen might lead you to believe that nothing was out of order. On the other hand, a test with a VOM might show that the B+ is only 100 v where it should be 300 v. This would account for a clean scope presentation even with a malfunction of such great magnitude. A scope, however, might show high ripple which could cause a meter to read low or normal even though the B+ was abnormal.

Further, it is of no use to measure the resistance of a speaker on a set with weak sound just because the

Troubleshoot TVs Logically

Continued

last set's speaker voice coil measured only half normal resistance. If you suspect the speaker, use a substitute. In fact substitution should be one of your most-used tools, either in the form of new parts or in the form of special test equipment designed to replace the tuner, IF, sound, sync and output sections. These are real time-savers.

Whether you have been given the go ahead on a set to "fix whatever's wrong with it," or just making an estimate or have been told to "keep the bill as low as possible," will also influence your procedure. For example, it would be a total waste of time for you to check every tube in a set if you were told to "put as little into it as possible." Instead you would let the symptoms guide you to the trouble area and test or substitute tubes there. On the other hand, if you were given a carte blanche, you might begin by testing every tube in the set even before the set is turned on. In many instances this will be all that is necessary to get the set into top working condition. When symptoms persist, however, go to the area indicated by the symptom and substitute tubes (whether they were just installed or not) before you dig in under the chassis.

When it comes time to remove the chassis from the cabinet, however, there is one method which can save you more time and is more frequently overlooked than any other; a thorough visual inspection. Drippy capacitors, burned resistors, shorts, etc. are often more quickly spotted with the eye than with the most elaborate test equipment. Don't pass up this opportunity to save yourself time and money—just because you didn't see anything wrong on the last two sets you worked on doesn't mean you won't save time on this one. Remember it only takes a minute or two and the time you save in the long run will more than pay off.

Another frequently overlooked technique is feeling all components after the set has been on for a short time. Most under-the-chassis components should be about the same temperature—usually a little on the warm side when they're enclosed. Power resistors are frequently designed to run hot and may actually be too hot to touch for more than an instant. This test will often show up fault areas which have not been present long enough to cause discoloration, etc.

Not-So-Common Cases

Some dual symptom sets can give the technician double trouble. One of the most confusing malfunctions frequently appears to be two independent difficulties. Trying to repair the wrong one first usually leads the technician far astray; Distorted sound, no raster.

In keyed AGC sets, the high voltage pulse from the flyback may be so misshapen or weak when high voltage is low that AGC filter circuits are unable to remove the ripple. Badly distorted sound is frequently the result. Start on the high voltage problem first; you'll probably find that once you have this licked, your sound problems will disappear.

Contrast and brightness interaction can also sometimes be difficult to trace. One circuit which can be particularly baffling, and is in common use, employs the contrast control in the cathode circuit of the video amplifier. Since most CRTs are driven through the cathode, any voltage variation in the video amplifier's plate voltage will tend to change the brightness. Consequently, any malfunction in the video amplifier which tends to reduce the plate voltage may be suspected. In this type of malfunction, when the contrast control is advanced, the bias on the tube is decreased and plate voltage decreases causing the CRT cathode to decrease and increase the CRT brightness.

Some dual symptoms are more subtle; background brightness changes with varying scenes; retrace lines noticeable in some pictures. The cause is invariably a faulty restoration network. Something that fortunately doesn't plague the TV serviceman in too many modern sets.

The list of malfunctions which could be presented here is limited by space and time as it would be almost endless. This is another reason why the diary approach to servicing TV sets is not practical; if it happened to the last set, the chances are just as good that it will happen to the next same-type set—but no better. Start fresh on each set and don't get into a rut by starting each repair job looking through your own or any one elses compendium of symptoms designed to lead you to the right resistor.

When you find yourself in a rut, then is the time to go to the books and find a similar symptom and its associated malfunction. Only in this manner will you ever free yourself from the slow laborious process of analyzing each malfunction in terms of the last one. ■

HOME MULTI-COUPLER SYSTEM

System combines TV-FM antenna outlets with built-in wiring for Hi Fi

by Robert Fleming

Winegard Company

■ TV-radio technicians and service-dealers are not flooded with a steady stream of acceptable sales items every day in the week. "Natural" merchandise comes now-and-then—with long waits in between. When a "hot" item does come along it is "snapped-up" quickly by alert servicers and taken with them on house calls.

One recent "idea" is called "Audio-Pix," a combination multi-set antenna coupler and home music distribution system. VHF, TV and FM antenna signals, plus Hi Fi music can be carried throughout a house on a single wire from a set coupler to wall outlets. This item should be well accepted and find good demand in a majority of your service customers' homes—if called to their attention energetically.

Disconnect-type wall outlets allow sets to be unplugged easily anytime it is desired to move them to another room or location. Twin lead is easily attached to disconnect plugs since pointed ends of pins pierce insulation and make contact with wires—eliminating the need to strip off insulation.

Two coupler-types are available: one for strong signal areas and one for weak, or fringe areas. The weak-signal-area type is transistorized to "boost" signals equally on all sets. This type can be used with up to six outlets.

It was said that the units are designed to give high isolation between coupler outputs (up to 13 db) to prevent interaction interference between sets.

The hookup shown in the block diagram illustrates how the coupler can be used as a music (phono, tape or radio) distribution system with an AM/FM diplexer, extension speaker or speakers. A special plug wired to the "EXTERNAL SPKR" outlet of the music source is plugged into an "Audio-Pix" outlet and can be picked up on another outlet in any other location.

Probably the biggest use-area is in the construction of new houses. Contractors, especially those in small towns, are quite easily sold on this particular idea which their competitors may not be able to offer. To a new home owner, the idea that he can enjoy Hi Fi in any of six locations and receive FM and TV at any remaining stations appears very attractive. ■

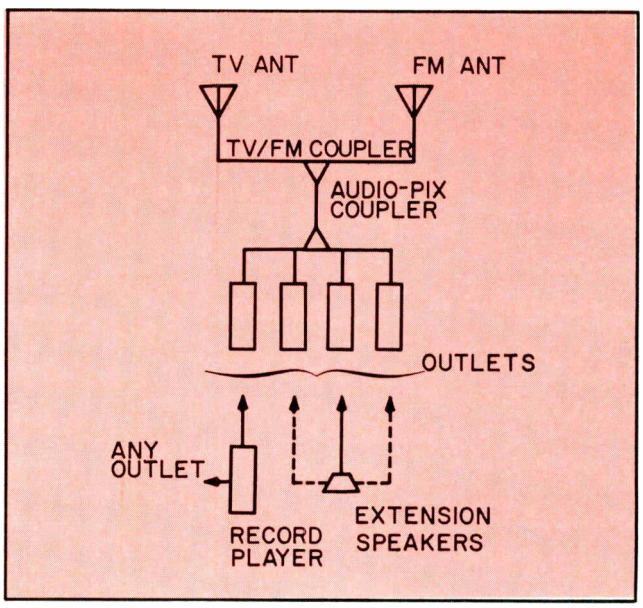


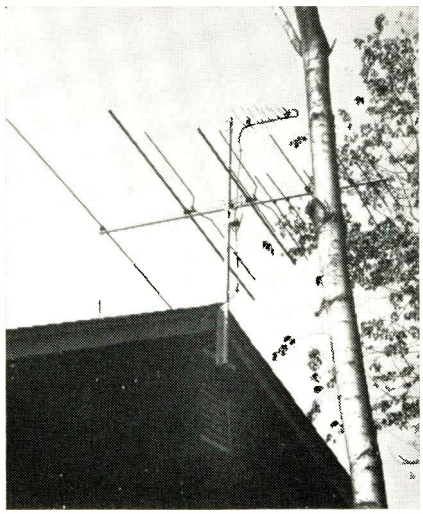
Diagram of Hi Fi music distribution system combined with Audio-Pix coupler system.

Winegard's Audio-Pix kit.

A lively market is developing in UHF antennas, converters and boosters

CASH IN On UHF

by Lon Cantor
Blonder-Tongue



UHF antenna can be mounted on same mast as VHF antenna. Signals are combined and sent down a single lead by using frequency-sensitive coupler.

Log periodic type UHF antenna is said to provide uniform gain over entire UHF spectrum.

■ The all-channel law, requiring TV receivers to have UHF goes into effect April 30, 1964.

This will mark the rebirth of UHF. UHF has been around since 1952. Many technicians recall with pleasure the first UHF boom. But by the end of 1953, it was already a bust.

The new UHF boom promises to exceed the early one. Many new UHF stations are expected to go on the air within the next few years. As of November 1963, there were 525 VHF stations, compared with only 117 UHF stations. By 1970, however, UHF is expected to skyrocket to 1000 stations (see Fig. 1). Recently, the FCC gave UHF even more impetus by ruling against VHF drop-ins in seven major cities. This means that strong new UHF stations, carrying major network programs, will be rushing on the air in Jacksonville, Fla.; Birmingham, Ala.; Knoxville, Tenn.; Johnstown, Pa.; Dayton, Ohio; Baton Rouge, La.; and Charlotte, N. C.

It is estimated that some 50-million VHF-only TV sets are in U. S. homes today. As UHF spreads and becomes more popular, these sets may turn out to be a gold mine for alert TV technicians.

Suppose, for example, that a good new UHF channel comes on the air in your area—with programming that almost everyone wants to see. Some people, of course, would trade their old sets in on new all-channel receivers. Many, however, would be unwilling to invest that much money. You'd probably have all the work you could handle for a while installing new UHF antennas and UHF converters.

Further, many of the new UHF channels will be educational. This means that TV technicians may be called upon to install and service systems in schools. Almost every new school being built today in-

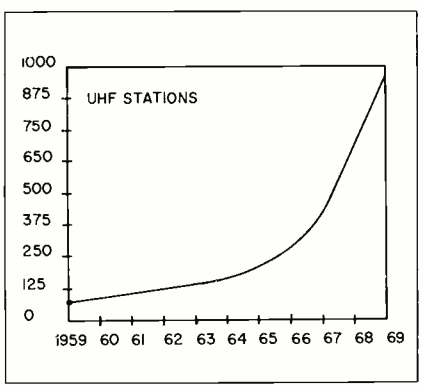


Fig. 1—UHF TV is expected to skyrocket to 1000 stations by 1970. There were 117 UHF stations near the end of 1963.

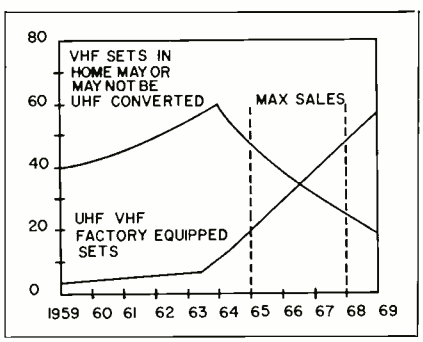


Fig. 2—Projected maximum sales for UHF converters, boosters and antennas during 1965, 1966, 1967 and 1968. Period between dotted lines based on increase in UHF channels while VHF-only sets are still in use.

cludes some provision for educational TV. And the older schools will find it difficult to avoid installing similar equipment.

To make the most of this situation, TV technicians must become salesmen. Sales volume in UHF converters, UHF boosters and UHF antennas will be substantial. Estimated maximum sales during 1965, 1966, 1967 and 1968 are projected in Fig. 2.

Maximum VHF power allowed by the FCC is 300,000 compared with 5 million watts for UHF. Therefore, if full power is used, UHF coverage may possibly equal that of VHF.

Despite this, UHF signals are more readily absorbed than VHF. In other words, VHF can more easily pass through such obstacles as trees and building walls. Thus, an indor antenna might be fine for VHF, but provide only a poor picture for UHF. You'll be selling more outdoor antennas for UHF.

There are already a number of UHF indoor antennas on the market. Most are the simple bowtie type with reflector, which works well at UHF in strong signal areas. Some companies are planning indoor antennas based on the log-periodic principle.

Conventional antenna designs have several drawbacks on UHF. For one thing, they are frequency sensitive. They do not provide uniform gain throughout the UHF spectrum, but peak to certain channels. This is satisfactory so long as there are only a few UHF channels in any one area, but these antennas may not be able to handle new channels efficiently.

Further, UHF signals are sensitive to antenna vibration. If elements vibrate with the wind, contacts—especially between dissimilar metals—may make and break, causing picture flicker. These problems are pretty well overcome by modern antenna designs.

Lead-In Wire

Except for indoor use, ordinary flat twinlead is not acceptable for UHF. Because of the frequencies involved UHF lead-in losses are much higher than losses at VHF. This can be aggravated by unsuitable lead-in wire. Losses of flat twinlead are initially low, but increase rapidly with age, dirt and moisture accumulation. In time, these losses may increase up to six times. This may easily mean a callback to a dissatisfied customer whose picture has gradually deteriorated.

Hollow tubular twinlead is better, but it can easily become filled with water if not installed properly. To prevent this, seal the top end of tubular twinlead and provide a "drip-loop" at the bottom end to allow moisture to escape.

Polyfoam type cable has very low loss. Although it costs more, it's worth the difference in preventing callbacks.

Lead-in splices should be avoided in UHF installations, and lines should be kept short. If available, use standoffs that do not encircle the twinlead—and use as few as possible. If you must use metal standoffs, do not squeeze them shut.

Wherever possible, keep the twinlead at least 6 in. away from all wires and metal surfaces.

Converters

How does your customer, with a VHF-only set receive that new UHF channel? He doesn't. There are two things you can do for him: (1) Install a tuner strip and (2) install an external converter.

Tuner strips should be used only in very strong signal areas. Even then, they are not always desirable, since each time a new UHF channel goes on the air, a new strip must be added. An external converter may be more satisfactory in the long run.

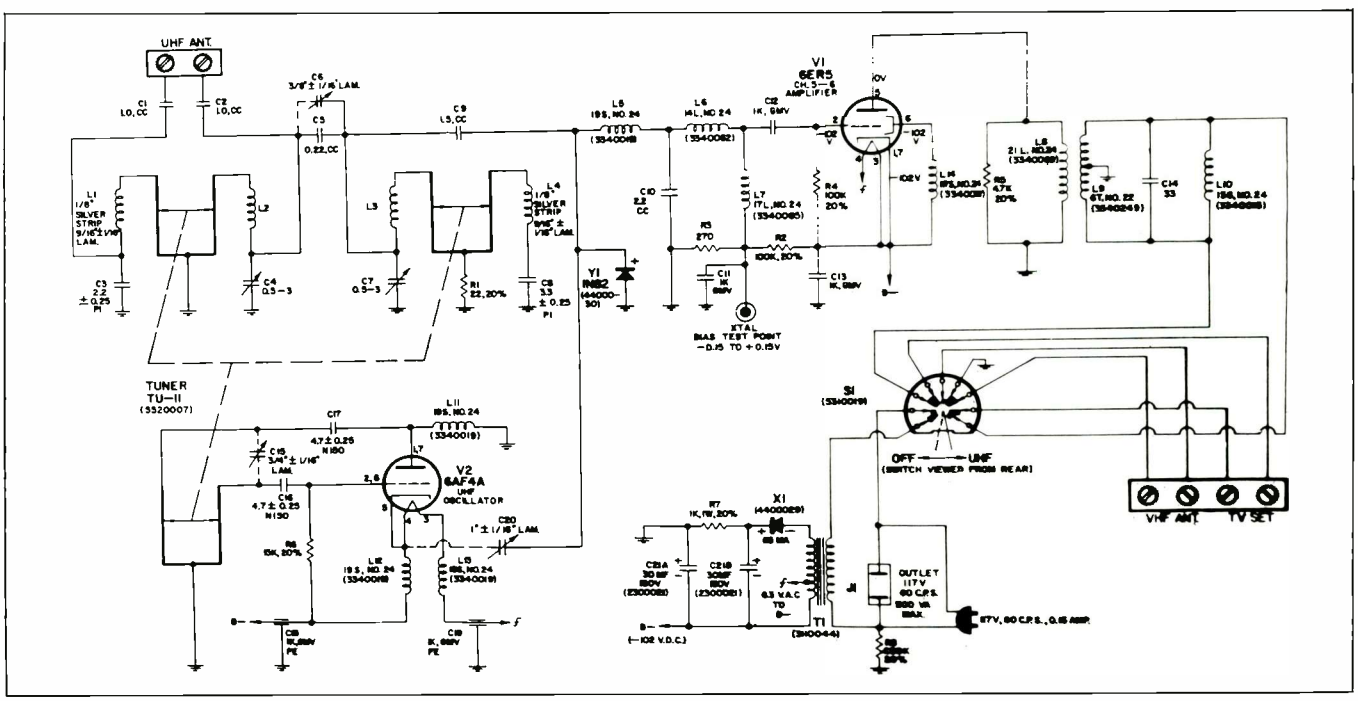
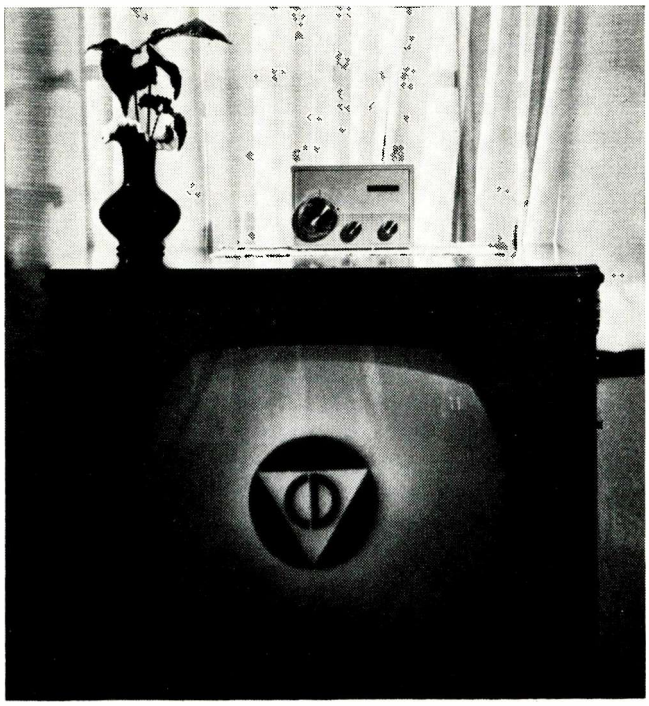


Fig. 3—Schematic of a typical UHF converter.



External UHF converter mounted on top of TV receiver.

The schematic of a typical converter is shown in Fig. 3. UHF signals are fed from the antenna to the converter terminals marked "UHF Ant." Tube V2 is a UHF oscillator. The frequency of this oscillator and that of the RF preselector stage, are controlled by tuner TU-11. Some converters omit the RF preselector stage, but this is not good practice because local oscillator energy is then coupled directly into the antenna and FCC radiation specifications are exceeded.

The local oscillator frequency is tuned approximately 82 Mc lower than that of the incoming signal. When these signals are mixed, the output is broad enough to cover both channel 5 (76 to 82 Mc) and channel 6 (82 to 88 Mc).

Some converters use a local oscillator frequency above that of the incoming signal. his results in inverted conversion. For black and white, inverted conversion is acceptable, but because the bandpass of a TV receiver is not symmetrical, color response can be distorted.

The 82 Mc output of the mixer is amplified by V1 and sent to the converter terminals marked "TV Set." Thus, the TV set channel selector can be set to either channel 5 or channel 6—whichever is unused in the area—to show the incoming UHF signal.

At present, there are two basic converter types on the market: single tubed units, consisting of an oscillator stage only; and two tube units with both oscillator and amplifier stages. It is certain that solid state converters will eventually be available.

UHF Boosters

The first UHF boosters appeared in 1961. They were rather expensive tube units. They were effective in bringing in weak UHF signals, but too expensive for the average pocketbook.

The next entry on the market was a tunable indoor UHF booster. This type unit, however, provides no better reception than a good all-channel receiver or two tube converter alone. Its usefulness is confined to installations with one tube converters or older TV sets in weak signal areas.

Most promising UHF boosters on the horizon are the new mast-mounted transistor units. These amplifiers are reasonably low in price, yet provide a dramatic improvement in picture quality. They should be mounted as close to the antenna as possible, to take advantage of the maximum signal-to-noise ratio available. For convenience, power is fed to the mast-mounted amplifier on the same twinlead that takes the signal down.

A UHF and a VHF antenna can be combined into a single downlead using a frequency sensitive coupler. In weak signal areas, the same type of coupler should be used to split the signals up at the converter, to avoid signal loss. In fringe areas, a mast-mounted booster will do wonders for picture quality.

How To Sell UHF

What happened when channel 34 went on the air in Los Angeles last year? Within six months, more than 50,000 converters were sold. Of course, a lot of people asked their favorite TV technician how to receive channel 34 and he made a sale. But the technicians who waited for this to happen got only a tiny percentage of the bonanza. Many retail stores sold converters and UHF antennas. The do-it-yourselfers didn't have much difficulty in handling UHF. As a result, fully half of the converters were sold over the counter.

Aggressive TV technicians, on the other hand, achieved phenomenal results. Recognizing channel 34 as an unprecedented opportunity, they went all out to promote their services.

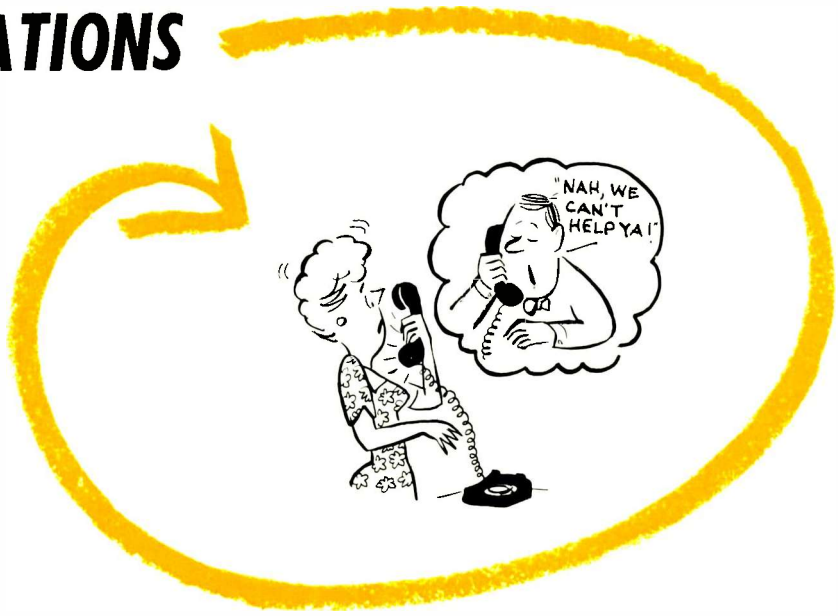
Experience in new UHF areas like Los Angeles, San Bernardino and Washington, D. C. has shown the way for TV technicians to cash in on the UHF boom. When UHF comes to your town, here's what to do:

1. Start early. Find out all you can about the new channel before it goes on the air. What kind of programming will it have? To whom will it appeal? You can probably get this information from the newspapers, your distributor, converter and antenna manufacturers or the channel itself.
2. Identify yourself as a UHF expert and your place of business as UHF headquarters. Use signs and window banners supplied by manufacturers or the TV channel. Discuss the new channel with all of the customers with whom you come in contact. Tell customers exactly what is needed to receive the new channel and what it costs.
3. As soon as a test pattern goes on the air, start making installations.

Continued on page 88

CUSTOMER RELATIONS

After you land a customer let him know you are grateful to have him with you



by John LaCerda

■ Did you ever walk into a store and receive discourteous treatment from a sales person?

Did a distributor you telephoned ever give the impression he didn't much care whether he got your business?

Did you ever receive, in response to a complaint, a reply that implied you didn't know what you were talking about?

If so, then you were the victim of faulty customer relations. You got the feeling that your business wasn't appreciated. You were offended, and rightly so.

Elimination of such customer-souring experiences should be a major concern of businessmen everywhere. Oddly enough, however, this isn't always the case.

Although millions are spent each year to create favorable business images and attract new customers, comparatively little is spent on a conscious effort to keep existing customers from drifting away.

Perpetuating Goodwill

Surveys show that relatively few firms do anything to cultivate and perpetuate the goodwill of customers already in hand. Service-dealers and technicians, for example, seldom have anyone specifically assigned to receive telephone complaints.

In Philadelphia, an organization known as the Customer Relations Research Foundation is doing something about all this. Endowed by business firms, and believed to be the only organization of its kind, this foundation is conducting original research into customer relations practices (and mispractices).

The foundation defines customer relations as the art of cultivating and perpetuating the goodwill of established customers. This means a "rifle" approach—a zeroing-in on specific customers and complementing the "shotgun" or general-image mission of public relations and advertising.

Basic studies of customer habits, and the reasons for business infidelity, show this standout fact: Indifference emerges, time after time, as the No. 1 customer killer.

The business relationship, it is apparent, must be constantly nurtured all year long, not just when the sales curve levels off.

Business transactions, it is clear, are significant only when they become something more than cold-cash deals. The customer is happier if he feels his money is going to someone interested in him as a friend.

The salesman becomes the contact-image of the company—and the distributor personifies the factory.

After you land a customer, says the Customer Relations Foundation, let him know you are grateful to have him with you. It's somewhat like romance; it pays to be attentive to the gal, even after you've sold yourself!

Handy Information

Some service-dealers and technicians get good mileage out of "new customer kits" containing facts about the company, its sales policy, its service policy and its repair parts policy. This information is particularly useful and appreciated when accompanied by something in handy form. Things like imprinted ballpoint pens, ashtrays and pocket calendar cards have been found effective.

Remember, in business you can win an argument and lose a friend. Always say "thank you." When the customer is in a rush, move faster. When the customer "knows it all," don't argue. Be courteous, tactful and enthusiastic.

Telephone manners, if faulty,

Continued on page 89

SUBSTITUTING FLYBACKS

How to make horizontal output transformer replacements quickly and eliminate waiting for 'exact' replacement

by Jay Shane

■ How many times have you looked into the high voltage cage and saw "goop" running from the flyback transformer? What has happened to cause this? It's obvious the transformer is "done." And then you discover an "exact" replacement is not available. Can it be substituted?

The answer in most cases is "yes," but it takes some knowledge of how a flyback works.

There is terrific force going into a horizontal transformer—something like 40 to 60 w of driving power. Despite this drive, flybacks take it in stride. They fail for various other reasons and these must be checked out.

Failure Causes

If the horizontal tube is underdriven it conducts heavily, runs too hot and draws heavy current. Flyback overheating takes place, with the heat dissipating into the secondary, causing the coating material to start flowing; corona forms, allowing an arc to develop—either externally or internally.

When the HOT draws excessive current, it can be attributed to several things—a weak oscillator tube, or maladjusted drive control.

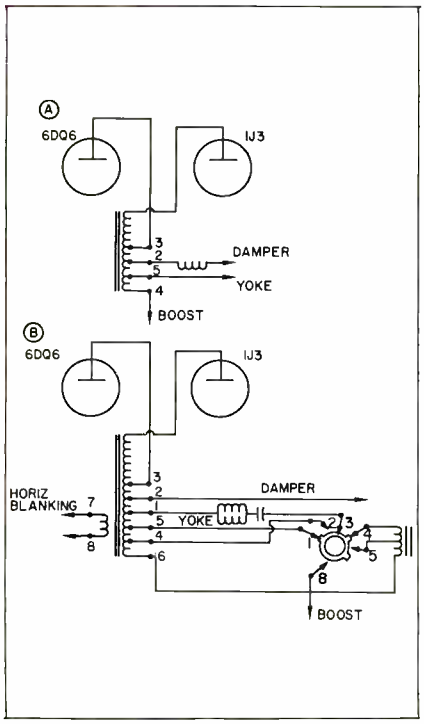


Fig. 1 (A)—GE M4 flyback circuit. (B)—M5 flyback transformer circuit.

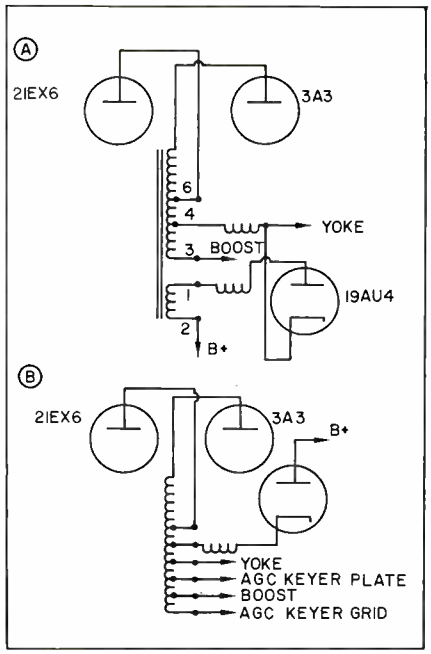


Fig. 2 (A)—Motorola PTS-546 flyback schematic. (B)—Flyback modification to Merit HVO-130.

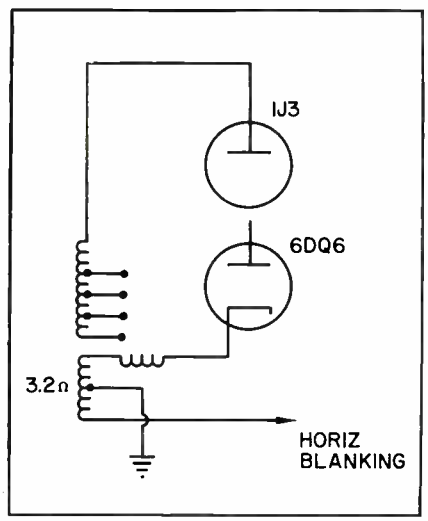


Fig. 3—Circuit employed in some flybacks to reduce "piecrusting" and "pinwheeling."

If no drive control is used, then the drive is regulated through an RC network consisting of a module or individual parts. If any of these components change value, improper drive develops. The technician should take a hint when HO tube life is shortened or the horizontal hold becomes sensitive or touchy when a telecast changes from commercials to pictures or vice versa.

The HOT screen voltage value is also important. If it is high, the tube conducts exessively. If low, the tube's conduction is lowered and we have saturation, and heat develops in the flyback. If a cathode resistor is used, it's value must remain the same as specified by the manufacturer.

Flyback Categories

There are three basic horizontal output transformer categories: the antiquated air-core type, the isolated and the autotransformer. The latter type is more commonly in use today.

With the number of makes and varieties of horizontal outputs available, we have a wide number from which to choose. For the average service job, we have only three things to consider—the impedance match of the flyback to the yoke, and the amount of high voltage and boost required. It doesn't take an engineer's degree to determine these factors. The basic information is either on the carton or a sheet of paper inclosed in the transformers box. If there are several taps on the replacement, we have only to use the ones which give proper yoke matching to obtain adequate sweep.

Case Histories

There will be times when you will run onto problems such as the two later GE models, known as the "M4" and "M5" lines. Both sets use a different flyback type, yet with some ingenuity, either can be replaced with the same "standard" replacement part.

The "M4" uses a flyback, GE #WT77X41. No "exact" replacement was found for this unit, but it was determined that Triad's D-164 would work as a replacement. It took 15 minutes to figure the tap numbers and cross them to the GE Nos. The cross-numbers are shown in Fig. 1.

The "M5" model was something else (see Fig. 1B). The mounting was the same, except again the tap numbers did not match and the "M5" has a width-switch as well as a horizontal blanking winding. This posed a problem. GE backordered the part and the customer was getting irate. Again Triad's D-164 came to the rescue. That was before Merit came out with an exact replacement, HVO-212.

It was found that by tying the yoke to the damper cathode tap and disregarding the horizontal blanking winding, the Triad did an excellent job. A jumper was soldered across the printed board lugs where the blanking leads were fastened. This completed the circuit for vertical blanking. The lack of horizontal blanking showed no adverse effects on the raster or picture.

Motorola PTS-546 has no listing for a "standard" replacement, but a Merit HVO-130 does a very nice job. The original had a tertiary winding through which the damper plate got its B+. The Merit replacement did not have this, so it was necessary to improvise (Fig. 2).

Instead of running the B+ through a winding of the flyback, it was tied directly to the damper tube plate. This left the needed AGC taps. The rest of the wiring was conventional. Since the 2.7 pf capacitor feeding the injector grid was now riding at boost pentential, it was changed to a 2000-v type of the same value.

Magnavox models CMV426-CE and 427-CE, 300 series, has no flyback replacement available. But in checking stock, it was found that a Philco replacement by Stancor, #8220, fit the prescription. The AGC/AFC taps were ignored. The physical mounting was different, but that was overcome by bending plumber's strap into angle brackets for the front, while the twist lug on the rear fitted into a slot already in the chassis.

Zenith's 17Z—, 16Z— and 17X — chassis use several different flybacks. It was discovered that any of the six different types used in these sets could be substituted by any one of the following: S-41196, S-23995, S-41906, S-40124, S-22451, S-23438 and Stancor #HO-271. In two instances the mounting bracket, held in place by brass twist lugs, has to be exchanged for the old one.

Later models of Zenith chassis also come in for substitutions, many of them not yet available in "standard" replacement fields. The 1957 models used an S-46564 flyback which is substituted by a later S-48197 unit.

Problems and Cures

The symptom of "piecrusting" or "pinwheeling," two conditions where the picture is filled with sharp sawtooth lines, or jagged raster edges can be caused by the flyback's core. The thin insulation where the two halves of the core are brought together has broken down, allowing a "shorting field" to develop. Opening the core and replacing the insulation may do the trick but isn't recommended.

Some manufacturers are designing their flybacks to prevent this problem. How one manufacturer returns the cathode of the HO tube through a tertiary winding is shown in Fig. 3. The Motorola PTS-546 ran the plate supply of the damper through such a winding.

Corona in the cage should never be ignored, and it should be eliminated quickly. Check all lead dress. High voltage plastic spray is good, and polyethylene can be purchased in sheets to make wraparounds for the rectifier tube and socket. "Balling" all solder joints is a *must* in high voltage cages. *Never* leave sharp solder points at any time. These serve as jump-off areas for corona. An added precaution is to use corona dope on all solder joints.

Never leave the cage off a TV receiver. Several states have laws governing this practice. If the customer should get hurt because somebody left the cage off, it can result in a bankrupting lawsuit.

As you can see, one of the prime tools to help locate an easy flyback replacement, is the manufacturer's replacement catalog and cross reference index. ■

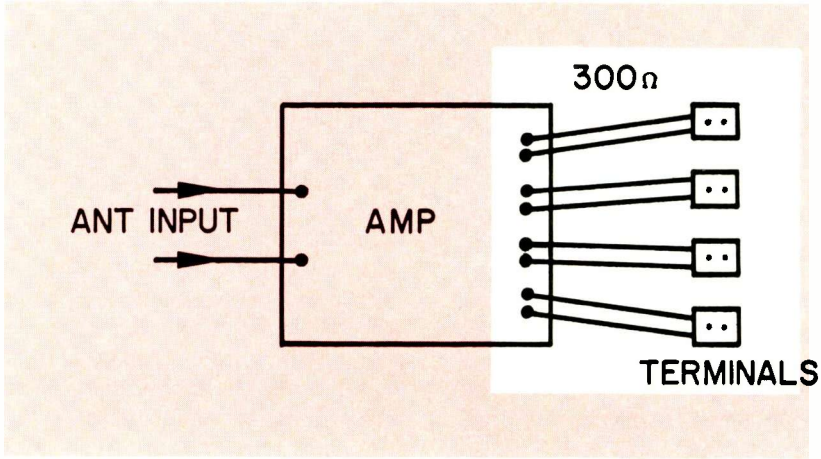


Fig. 4—A 4-outlet 300Ω TV distribution system for homes.

Homes and small apartment

Mastering

■ Progressive TV-radio technicians should become familiar with the master antenna TV business. A profitable market in MATV exists in custom homes, small apartment buildings and TV-radio dealer showrooms. The small systems' market is the starting point for profitable sales, installation and service, requiring only basic antenna distribution knowledge and a minimum of experience and test equipment.

MATV Needs

A master antenna system fills a need—a need common to the homeowner, apartment house tenant and TV-radio dealer—the need for good TV and FM reception, emphasized by the more critical signal requirements for good color TV and stereo FM performance.

The new homeowner requires the convenience of built-in TV (and FM) antenna outlets in all living areas. A minimum system would provide 4 TV outlets and the larger

OUTLETS

TYPE	IMPEDANCE	LOSS	TYPICAL USE
Terminal	300Ω	—	Home System
Terminal	75Ω	—	Home System
Tap-Off Dual	75Ω TV	11.5 db	In any coax system apartment, etc.
TV/FM	300Ω FM	(iso) 1.0 db (F.T.)	
Four Outlet Tap-Off	75Ω	13.0 db	In any coax system store, etc.
		(iso) 1.4 db (F.T.)	

RG-59 Cable Connector
300Ω Cable Adapter
Ivory Cover Plate
75Ω Terminating Resistor
75Ω Terminating Resistor

Fig. 3.—Typical outlet-types with useful information.

SPLITTERS

FUNCTION	LOSS
2-way	3.5 db
4-way	6.5 db
8-way	10.0 db

Fig. 2—Three common 75Ω splitter-types.

AMPLIFIERS

IMPEDANCE IN	IMPEDANCE OUT	GAIN db	MAXIMUM OUTPUT dbj	TYPICAL APPLICATIONS
300Ω	300Ω	6 (4 outputs)	—	Home TV Systems (4 outlets)
300Ω	75Ω/ 300Ω	20	40	TV/FM Home, Store, Small Apartment (20 outlets)
75Ω	75Ω	20	50	TV/FM Store, Apartment (40 outlets)
75Ω	75Ω	40	50	TV/FM Large Store and Apartment (50 to 100 outlets)

Fig. 1—Some typical amplifiers and useful specifications.

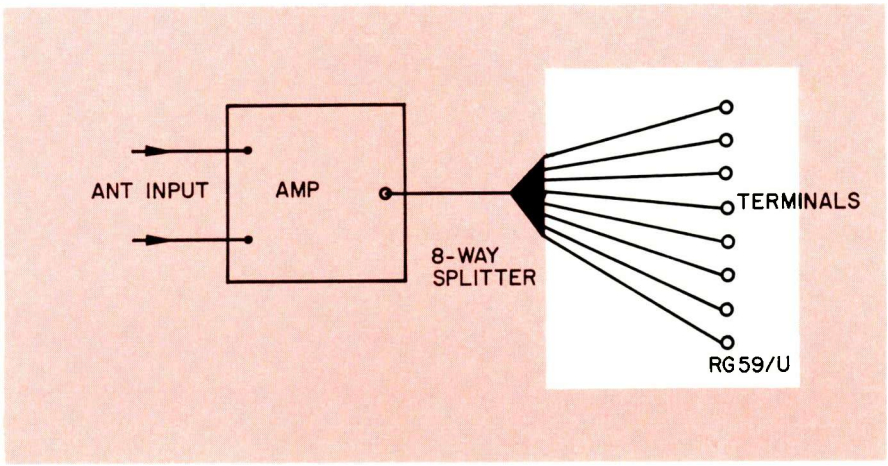


Fig. 5—An 8-outlet 75Ω TV/FM distribution system for large homes.

houses offer growing field for multi-outlet TV-FM antenna systems

Master Antenna Systems

by Marvin Thall
Jerrold Electronics Corp.

custom home could have anywhere from 8 to 16 TV/FM outlets.

The modern apartment building owner can satisfy his tenants' reception problems through a built-in antenna system with an outlet in each apartment—at the same time enhancing his property value. Since roof antennas are usually "verboten" on new multi-unit dwellings, the absence of a system would require each tenant to experiment with indoor rabbit ears, window antennas and under carpet antennas—devices which serve a purpose but cannot provide the reception quality possible with an outdoor antenna system.

The TV-radio dealer must demonstrate good reception in the store to sell sets. There is no substitute for an antenna system for the display area (with additional outlets readily provided for the service area). The equipment for these systems costs surprisingly little per outlet and can represent considerable added income to the enterprising dealer who makes the sale and installation.

System Components

Antenna systems for every application and pocketbook are assembled from the following components: receiving antenna; antenna preamplifier; main amplifier; splitters; outlets and transmission line.

Antenna—Since a large number of receivers will depend on one central antenna structure only the best quality antenna should be considered for a system. Where all VHF channels come from the same direction, use one of the newer wideband types, with flat response, high front-to-back ratio and good impedance match. These are available in models with anywhere from 6 to over 20 elements. For extreme fringe reception the addition of an antenna mounted *preamplifier* will produce substantial improvement in signal quality by removing "snow." This type of preamplified antenna lists for about $125 with similar unamplified models retailing in a $20 to $80 list price range.

Where stations lie in two or more different directions, either a combination broadband type with suitable coupling network, or cut-to-channel yagis with mixing networks can be selected for a specific area. The manufacturer will be happy to assist you on special problems.

Main Amplifier— Fig. 1 lists several typical amplifiers. Note the difference between the *gain* and *output capability* of an amplifier. Two amplifiers may have the same db gain spec and quite different dbmv or "dbj" output specs. The db number is, of course, the relative signal amplification in the unit; thus a 20 db gain amplifier provdies a 10 times voltage increase at its output relative to its input. The dbmv or "dbj" number is the actual undistorted output voltage measured with a signal strength meter. 0 dbmv or 0 dbj are common reference levels and mean 1 mv or 1000 μv at 75Ω. The 0 dbj level is the

Master Antenna Systems

Continued

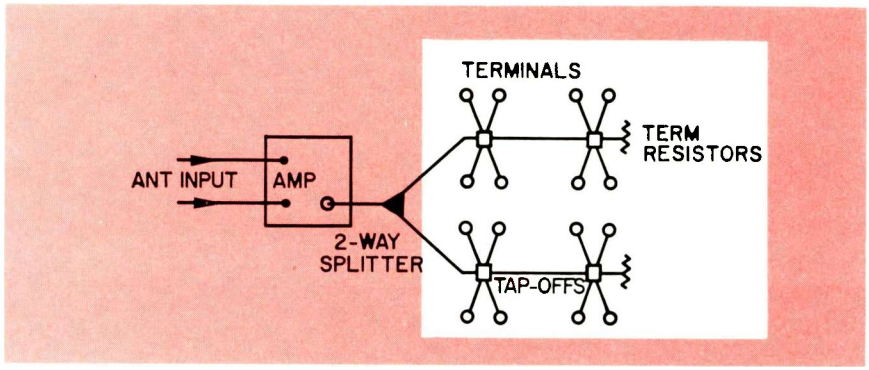


Fig. 6—A 16-outlet 75Ω TV/FM distribution system for small garden apartment houses.

minimum signal a master antenna system should deliver at the furthest outlet. The amplifier selected for a system layout must provide sufficient output (measured in dbj) to overcome total losses in distribution (db) and provide a 0 dbj minimum level at any outlet. Systems located very near the transmitters should provide a 10 dbj (3000) μv) mimimum level at any outlet.

Splitters— Fig. 2 lists three typical 75Ω splitters which can be used individually or grouped together to obtain anywhere from 2 to over 16 lines from the main amplifier output.

Outlets—Fig. 3 lists four different wall TV/FM outlets. Outlets designated as tap-offs contain networks which isolate receivers from the coaxial line and from each other. These networks are engineered to prevent receivers from loading down the line, and causing serious impedance mismatches in the system. A tap-off outlet has a fixed attenuation or isolation loss expressed in db. Each tap-off in the line also has a small db loss called its feed-through or insertion loss. In designing larger systems for high rise buildings at least three different value networks are used in the layout to insure equal distribution of signal to all receivers.

A "wall terminal" is simply an extension outlet, without isolation, which provides a convenient receiver plug-in point to a line from a remotely mounted amplifier, splitter or tap-off network.

Transmission line—75Ω coaxial cable, predominantly types RG-59/U and RG-11/U are used in wiring master antenna systems. The obvious advantage of coax over balanced lines is its shielding from extraneous noise and interference. Unlike regular 300Ω line, coax can be installed close to metal lathe and can be pulled through conduit. All 75Ω amplifiers and accessories should be provided with solderless RG-59/U connectors. Matching transformers should be used to take coax to 300Ω antennas and from 75Ω outlets to 300Ω receiver terminals.

For system loss calculations use cable attenuation figures at channel 13 which are 6.1 db/100 ft for RG-59/U and 3.0 db/100 ft for RG-11/U. Systems shown here use RG-59/U only. RG-11/U special pressure tap-offs are used for extended lines and the manufacturer or distributor should be consulted for details. Economy home installations use 300Ω twin lead (see Fig. 4).

System Layout—Using the components we have already described we can layout some "typical" block diagrams of distribution systems.

A 4 outlet 300Ω TV system for a home is shown in Fig. 4. Using a typical 4 outlet amplifier, a 6 db gain is obtained at each outlet. Dealer cost for all material (not including antenna) is less than $7 an outlet.

An eight outlet 74 ohm TV/FM system for a large home is shown in Fig. 5. A 4 stage amplifier and 8 way splitter provide 10 db gain at each outlet. Dealer cost for all material (less antenna) approximately $10 an outlet.

A 16 outlet, 75 ohm TV/FM system for small garden apartment units is shown in Fig. 6. The same amplifier used in Fig. 5 is combined with two-way splitter and four outlet tap-offs. Dealer cost for all material (less antenna) approximately $9 an outlet. Note: *antenna input signal of 2000 μv is desired to drive the amplifier. Use antenna preamplifier in fringe areas.*

A 40 outlet 75 ohm TV/FM system for TV-radio stores is shown in Fig. 7. A 20 db gain amplifier with high output capability drives the large system as shown. Dealer cost for all material approximately $6 an outlet (less antenna). Note: *antenna signal of 8000 μv is desired at amplifier input. Use antenna preamplifier or indoor preamplifier if needed in weaker signal areas.*

An 80 outlet 75 ohm TV/FM system for a five story apartment building is shown in Fig. 8. A 40 db gain high output amplifier easily drives the system in local or suburban areas (1000 to 2000 μv antenna signal desired). Dealer cost of all material (less antenna) approximately $7 an outlet. Note: *Dual TV/FM outlets used permit TV and FM receivers to be connected to same outlet.*

System Losses

Calculation of system losses: To properly select the amplifier for a

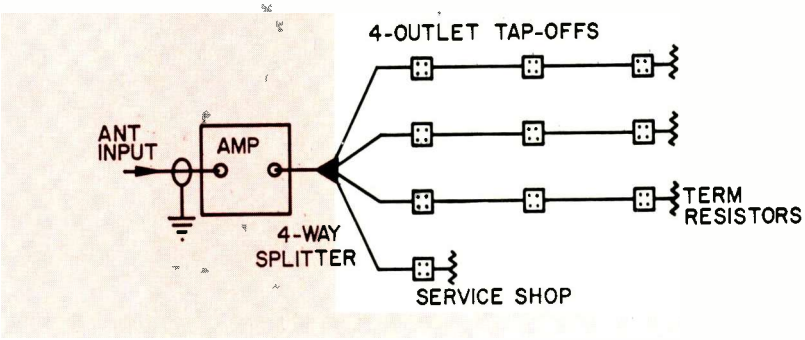


Fig. 7—TV-radio store 40 outlet 75Ω TV/FM distribution systems.

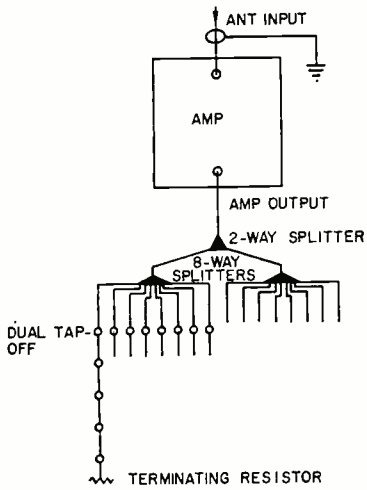


Fig. 8—TV/FM system for a five floor apartment building has 80 outlets.

system layout, we should first calculate the total signal losses in a system. Using the system diagram in Fig. 8 as an example, we select the longest signal path in the system (see Fig. 9) starting at the amplifier output.

Total Losses = −3.5 db −10.0 db −4.0 db −11.5 db −12 db = −41 db Output required from amplifier for 0 dbj at sets = +41 dbj amplifier gain = 40 db. Input required to amplifier = +1 dbj or approximately 1000 μv (In actual practice the amplifier could be driven with antenna signals of +6 dbj to +10 dbj and the output adjusted with the gain controls.)

Surely the equipment costs for the systems discussed should prove surprisingly modest to those not acquainted with this field.

Getting into the master antenna business itself it not difficult. Manufacturers and their distributors can give TV-radio technicians the details needed to enter this lucrative field. Many manufacturers, factory representatives, or distributors would be more than happy to discuss "taking on" MATV systems with you.

Such things as handling UHF channels, installation and service techniques, and using a field strength meter (the essential tool for real mastery of system techniques) could also be outlined for you. An inquiry to the manufacturers, in particular, should bring you a prompt response. This should be your first step in mastering antenna systems. ■

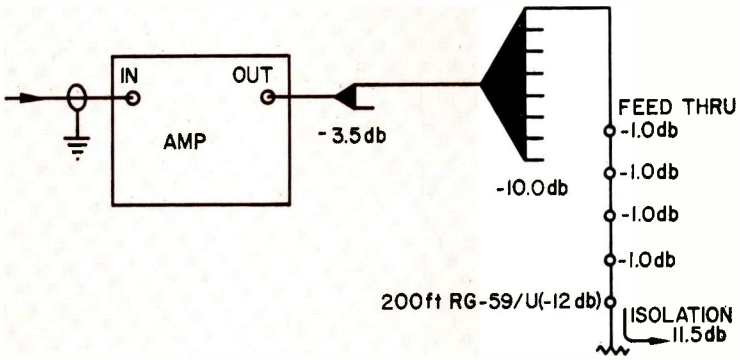


Fig. 9—To calculate total signal losses in a system, select the longest signal path.

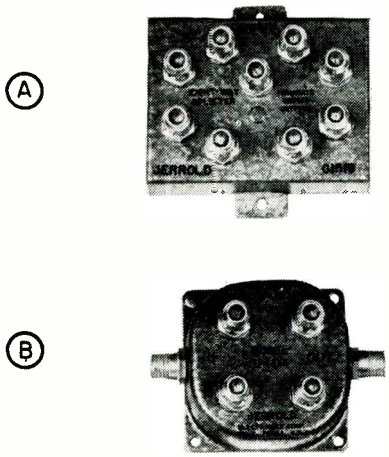
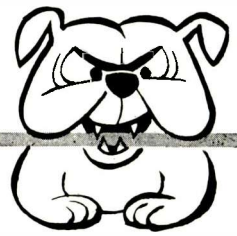


Fig. 10 (A)—Typical 8-way splitter. (B)—Four-outlet, 75Ω tap-off.

TOUGH DOG CORNER



Difficult Service Jobs Described by Readers

Shorted Filament

The other day a Silvertone TV Model 9102Gy came into my shop with no sound, no picture and a very weak raster. The customer stated that the set began smoking and he turned it off.

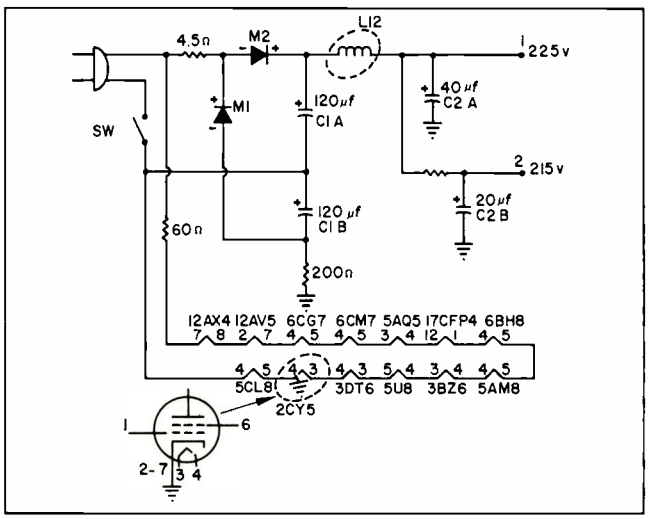
After pulling the chassis and plugging in the ac lead, it was observed that L12 started to smoke. The B+ lines fed by L12 were given a thorough continuity check to ground. The lines appeared normal. The set was again plugged in and the B+ measured. There were 160 v and 140 v at 1 and 2 respectively (see diagram).

All the tubes were checked for the second time to no avail. Knowing that series strings can cause some weird things to happen, it was decided to check filament continuity to ground, even though the tubes appeared to be lit.

Not only did this check prove that there was a short to ground in the filament string but on close observation it was learned that the 5CL8 (mixer) was not lit up.

Since the 2CY5 (RF amp) is next in line to the 5CL8, both the 2CY5 and the 5CL8 were again checked on my tube tester. Both checked good. I was about to send the tuner off and have a new tube socket installed when it was decided to check heater pin continuity in the 2CY5. This check revealed that the filament was broken near the pin 4 lead and was shorted to the cathode, pins 2 through 7.

Early in the investigation it was learned that L12 would not heat to the point of smoking when C2A and C2B were disconnected. Therefore, it is assumed that a filament current path was established through C2A, C2B (as well as the various voltage dividers utilizing the B+ lines) through L12, M2, M1, C1B to the other side of the line.



Shorted filament caused choke in B supply to overheat.

The reason L12 overheated was that the return path for B+ components was connected to the other side of the line through the short in the 2CY5.

Needless to say the insertion of a new 2CY5 restored the set to normal operation.—*L. E. Walker, Orlando, Fla.*

Yoke Clamp

A 10 in. Admiral portable TV came into the shop with a width problem. The picture began to shrink after about an hour of operation. This seemed to be a problem connected with power supply or horizontal output. It worked well when removed from the cabinet. Tubes were substituted in the horizontal section without improvement. All voltage checked OK, including the horizontal screen.

After covering the set with a drop cloth to get the heat build-up, the picture began to shrink again. I then decided to check the yoke. Upon inspection I noticed the yoke cores held together by a plastic tape which expanded when hot, allowing the cores to separate, thus reducing inductance.

A metal clamp from an old yoke was used to replace the tape. The result, enough width and twice the normal height as the controls had been turned up as far as possible. —*Paul H. Besler, St. Nornert, Manitoba, Canada.*

TOUGH DOGS WANTED

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

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SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

PCB Cleaner

To make a PC board look new after repairs, brush the board down with lacquer thinner by using a small stiff brush.—*Fred Harmon, Jr., Levittown, Pa.*

Nut Holder

By tearing off paper and using as a shim on one side of a nutdriver, the nut will hold and not fall out when it is necessary to tip the wrench down. — *Tom Ballentine, Ashboro, N. C.*

Ultor Insulator

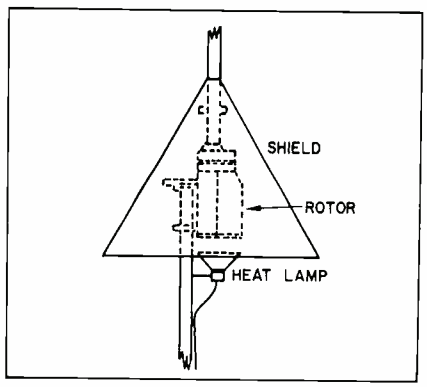
When it is necessary to operate a TV with the high voltage lead loose, I find this tip handy: Just insert the ultor connector into an empty, dry, soft-drink bottle.—*John Timm, Lamar, Colo.*

Emergency Continuity Test

An emergency continuity test is sometimes needed on a house call when an ohmmeter is not available. If a tube tester is handy, a 1B3 or similar tube can be put in the tester with the tester controls set to check the tube. The fuse, or other part to be checked can then be inserted between the plate cap of the tube and the connector on the tube tester. The tester's indication will show whether there is continuity or not. —*John M. Tomlan, Newton, Iowa.*

Rotator Thawer

We get some pretty cold weather in our area during which antenna rotators freeze; refuse to turn and result in poor TV images on the screen. To save unpleasant climbing by the owner or our serviceman we sell the idea of fastening a heat lamp in a protective shield to the antenna tower near the rotator. A weatherproof cord runs into the house. Switching the heat lamp on for a short time thaws the rotator.—*Henry Miller, Cleveland, Ohio.*



A shielded heat lamp installed with rotators will thaw frozen mechanisms quickly in northern climates.

Transparent Heat Chamber

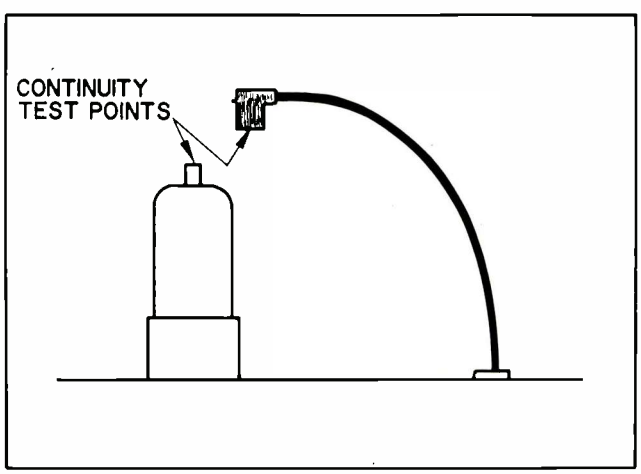
For intermittents that act up in the cabinet and not on the bench the difference may be in the heat due to poor ventilation in the cabinet. To generate that heat outside the cabinet use a sheet of transparent plastic like that used for storm windows and wrap it around the set on the bench. If the plastic touches a 5U4 or anything hot, it will melt and not catch fire. It is also a good insulator so the high voltage will not affect it either. After the set starts to intermit, you can put your hands and probes under the plastic work and see what you are doing. — *Tom Deedy, Wiscasset, Maine.*

Colored Lights

Many customers are delighted when dial lamp replacements of radios and TVs are colored. Coloring kits are available from jobbers or mail order suppliers at a very reasonable cost. Allow bulbs to dry thoroughly, for best results.—*Anthony J. Fusco, Buffalo, N. Y.*

Technical Library

A complete technical library including service data properly filed is not only a valuable asset, but a necessity, for efficient and profitable servicing—*RCA Service.*



Emergency continuity tests can be made with tube tester and some plate capped tubes.

SHOP HINTS WANTED

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

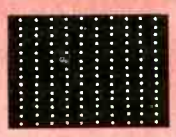
Exclusive adjustable dot size. The white dots can be adjusted to the size that satisfies your needs by a screwdriver adjustment on the rear. No need to argue about dot size anymore. Just select the size that you like to work with best.

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

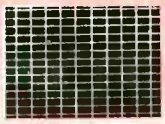
Reserved output on color bars for forcing signal through defective color circuits. The color output control is calibrated at 100 percent at the center of rotation, representing normal output. A reserve up to 200 percent is available on the remainder of rotation.

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

Ten standard keyed color bars (RCA type) that automatically provide all colors at specified NTSC phases . . . but without need of interpretation when servicing.

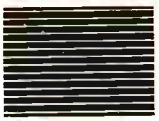


Stable white dots with new exclusive dot size adjustment in rear.



Stabilized crosshatch pattern for simplifying convergence adjustments.

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



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

March into your local parts distributor and demand the CG126 Sencore color generator that sells at ½ the price of others. Don't let him switch you.

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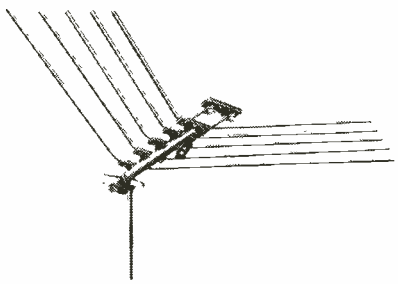
NEW PRODUCTS

FOR MORE INFORMATION CIRCLE PRODUCT NUMBERS ON POSTCARD FOLLOWING PAGE 92

UHF ANTENNA 200

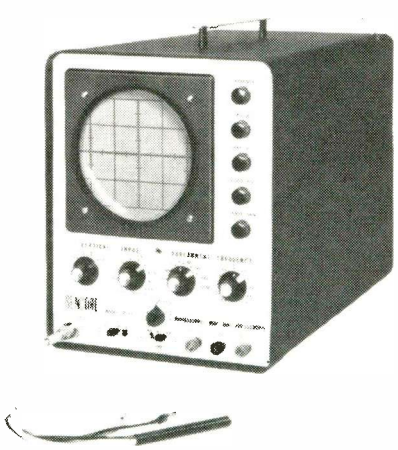
The model LPV-U5 (5 active cells), delivers a gain of 8 to 9 db on UHF TV bands, according to



the manufacturer. For deep fringe and special problem areas, stacking bars are available which maintain the enhanced performance of vertical stacks over the entire UHF band, and can also be used to couple several antennas beamed toward different directions, it was said. JFD.

SCOPE 201

A broadband, sensitive oscilloscope, model PS127, is introduced. The scope requires no narrow band due to the 0.017 v RMS sensitivity for 1 in. deflection on broadband, it is said. Specifications indicated Z axis modulation and direct plate connections on the rear; low frequency down only 3 db at 10 cps with 5000 v breakdown on the low capacity probe which enables the



user to check waveforms in high voltage circuits. Price $169.50. Sencore.

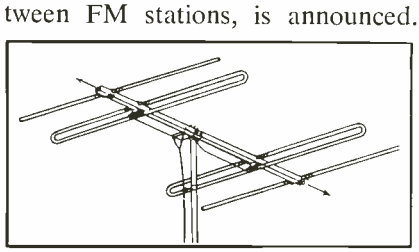
STEREO TUNER 202

Announced is the Allegra Model 105 FM/AM tuner which incorporates a magic bar tuning indicator with stereo sentry circuit to signal stereo broadcasts. The satin gold and desert bronze finished panel

with gold-swirl knob inlays is designed to fit into any high fashion decor. Grommes.

FM ANTENNA 203

T series of bi-directional FM antennas, for use in locations in between FM stations, is announced.



Designed for FM stereo reception, units are Gold Corodized, affording 100% protection against salt-air and weather deterioration, it was said. Available in 3 types for local, mid-range and fringe areas. List: $11.50, $16.50 and $28.95. Finney.

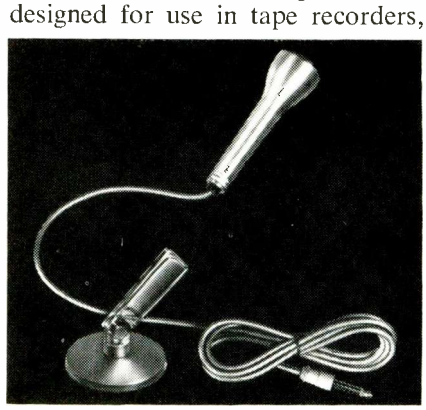
INDOOR ANTENNA 204

An indoor TV antenna, 3 D-X, is announced. The Directonic antenna features two circular phasing elements for clearer pictures and has two telescopic dipoles for better reception of semi-fringe stations, it was said. The antenna affords 12 adjustments for tuning and optimum

reception. The antenna switch is housed in a modern mahogany-patterned, plastic weighted base, packaged in a three-color corrugated carton, with a suggested retail price of $7.77. Snyder.

MICROPHONE 205

A combination package, microphone and matching table stand for the Hi Fi distributor and dealer markets, is introduced. The package, called the "Ceramik-Pak," contains either Model "CM-10A" or the "CM-11A" mircophone with matching table stands—known as the Models "CMC-10A" and "CMC-11A." It was said the two-in-one package permits convenient stocking for the distributor and dealer, since it utilizes less shelf space. The package is printed in gold and black, with an illustration of the microphone and table stand combination. The microphones are designed for use in tape recorders,



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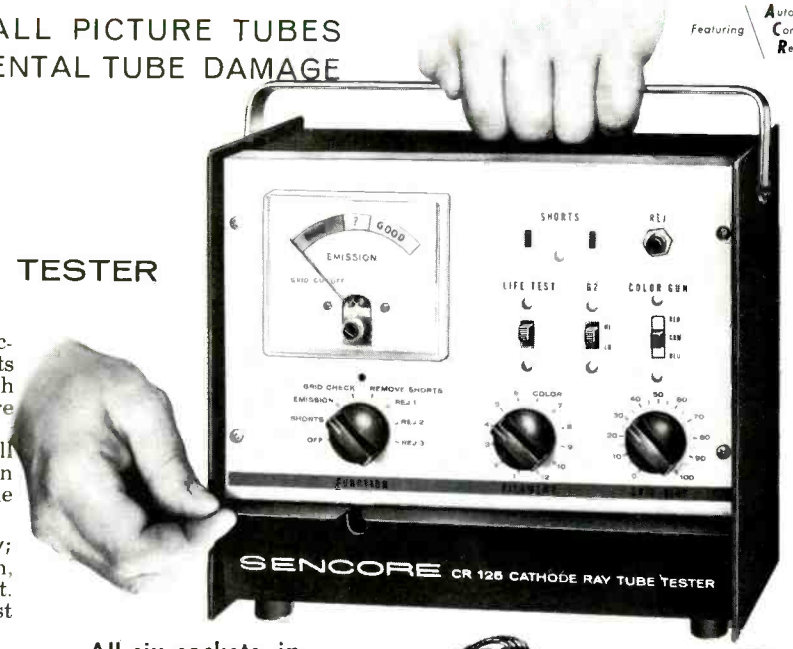


An all new method of testing and rejuvenating picture tubes. Although the method is new, the tests performed are standard, correlating directly with set-up information from the RCA and GE picture tube manuals.

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

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

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

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

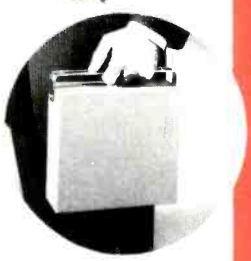
No adaptor sockets. One neat test cable with all six sockets for testing any CRT. No messy adaptors, reference charts or up-dating is required. The Sencore CR125 is the only tester with both color sockets. (Some have no color sockets, others have only the older type color socket.)

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

Checks Each Gun Individually In Color Tubes.

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

Model CR125 ..... **$69.95**



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

PS127 DELUXE WIDE BAND OSCILLOSCOPE
AT A
SURPRISINGLY LOW PRICE

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

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

PS127 ..... **$169.50**

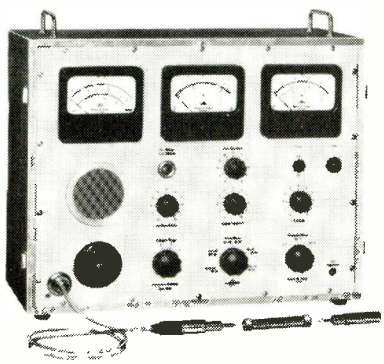
- - - for more details circle 49 on post card

NEW PRODUCTS

home movie equipment, PA systems, conference pickups and audio/visual labs. Both models list at $22.50. Sonotone Corp.

HETERODYNE VOLTMETER 206

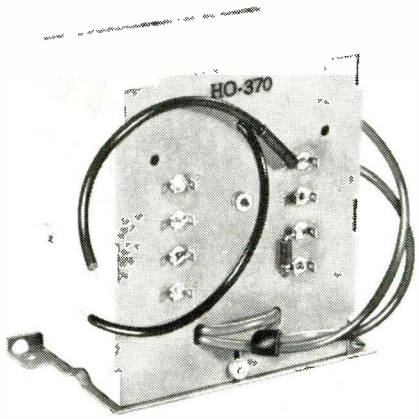
A heterodyne voltmeter, model 2008, for measuring selective voltages in any type of equipment that



uses a variety of carefully controlled RF frequencies, is announced. Frequency range of the instrument is 20 kc to 30 Mc, accuracy 2% to +2kc; and voltage accuracy is +0.5 db, according to the makers specifications. A built-in loud speaker simplifies precise frequency adjustment. A 0.5 in. dia high-impedance input probe contains a cathode-follower stage. It can be used with a removable capacitive attenuator to extend the voltage range. The widest use is in signal-tracing applications and the system need not be recalibrated each time frequency is changed, as may be the case with instruments using a tuned input circuit, it was said. Voltage ranges (full scale) are 15, 150, 1500 μv, 15 and 150 μv. By using the capacitive attenuator, the voltage range extends to 1.5 and 15v. Input impedance is 5 MΩ at 100 kc and 90,000Ω at 30 Mc, paralleled by 5.5 pf. When using the attenuator at lower frequencies, the input impedance exceeds 1000 MΩ paralleled by 2 pf, according to the announcement. B&K Instruments.

FLYBACK 207

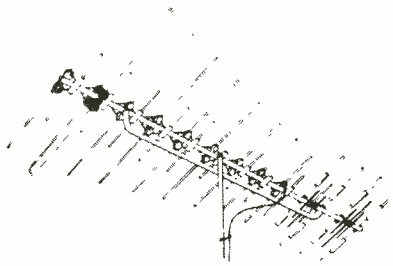
A replacement flyback, HO-370, has been added to this line of re-



placement transformers. It was said the flyback is an exact replacement unit for installation in 4 Westinghouse TV chassis and 28 models. Complete service data for installation is packaged with each transformer. Stancor.

TV/FM ANTENNA 208

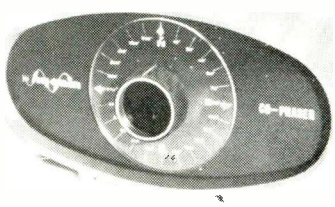
The Transpower'd TV/FM antenna has high gain, high front-to-back ratio, flat response for high and low band, with elements reinforced by 7/16 in. crimped slip-



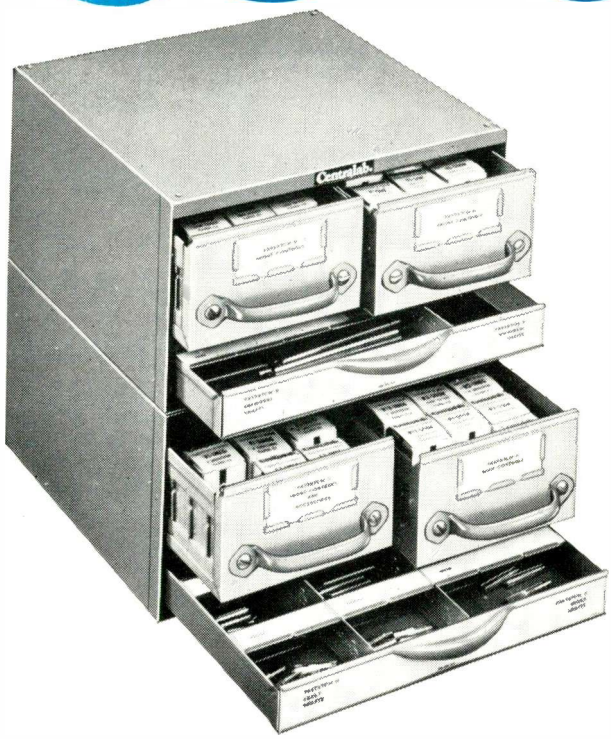
proof aluminum sleeves, high impact Styrene plastic insuulators, snap-lock element positioning, gold aluminum protective finish, and Quadro-Grip U-Bolt assembly to permanently attach the antenna to the mast, the manufacturer said. RMS.

CO-PHASER 209

A citizens band Co-Phaser, employed in conjunction with a phased array of collinear antennas, is introduced. It doubles the effective



Centralab



BRAND NEW
CENTRALAB
FASTATCH II®
FRK-200 KIT WITH
EXACT REPLACEMENT SHAFTS

Makes Control Replacement A SNAP!

- Centralab's new FRK-200 kit gives you the most convenient, most versatile, and simplest system for control replacement.
- Since it includes 13 sizes of exact replacement shafts, shaft cutting is eliminated on *all* the popular dual concentric controls and on almost 60% of all dual controls.
- The Fastatch II® Control System is a snap to use. Single and dual concentrics snap together without tools! Shafts plug in and are permanently locked. Assembled units can't loosen—shafts can't pull out.

JUST CHECK THESE EXCLUSIVE FEATURES:

1. Just one control system for dual concentric or single controls.
2. Universal terminals.
3. Plug-in, permanently locking shafts.
4. Rotary or push-pull (snap-on) line switches attach to both front and rear controls.

The FRK-200 kit is contained in two stacking Equipto steel cabinets with plenty of extra space for expansion. *All* your control needs, including push-pull, are at your finger tips.

THE FRK-200 KIT CONTAINS:

35 Exact Front Shafts (7 sizes)
30 Exact Rear Shafts (6 sizes)
5 Universal Push-Pull Shafts (1 size)
5 Push-Pull Line Switches
5 Twist-Tab Adapter Plates
2 3-Drawer Equipto Cabinets
27 Assorted Front Controls
9 Assorted Rear Controls
40 Assorted Universal Shafts for Single and Dual Concentrics
5 SPST on/off Switches
2 DPST on/off Switches
1 DP on/off Switch
Complete with current cross-reference guides.

Dealer Net $72.50
Less Credit for your old controls!

Centralab®

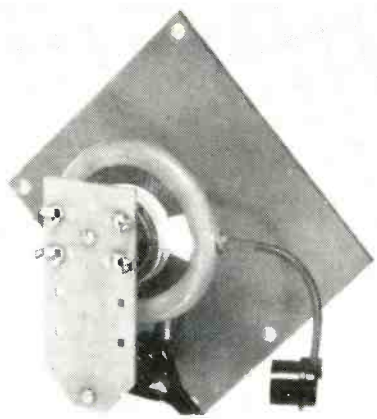
THE ELECTRONICS DIVISION OF GLOBE-UNION INC.
902A East Keefe Avenue • Milwaukee 1, Wisconsin
TWX: 414—731—8731
In Canada: Centralab Canada Ltd., P. O. Box 400, Ajax, Ontario
- - - for more details circle 19 on post card

NEW PRODUCTS

radiating power of a base station installation over that attainable with a single collinear antenna, and combines the natural optimum performance characteristics of two phased collinear antennas and discriminately directs their additional power to the specific directions in which it is wanted, the manufacturer indicated. With a flip of the compass the Co-Phaser was said to transfer the CB antenna from 3.86 db additional "broadside" gain to 4.5 db additional "end-fire" gain off either end of a phased array. The model PH-1 co-phaser is available from distributors CB net: $14.95. HY-GAIN.

FLYBACK **210**

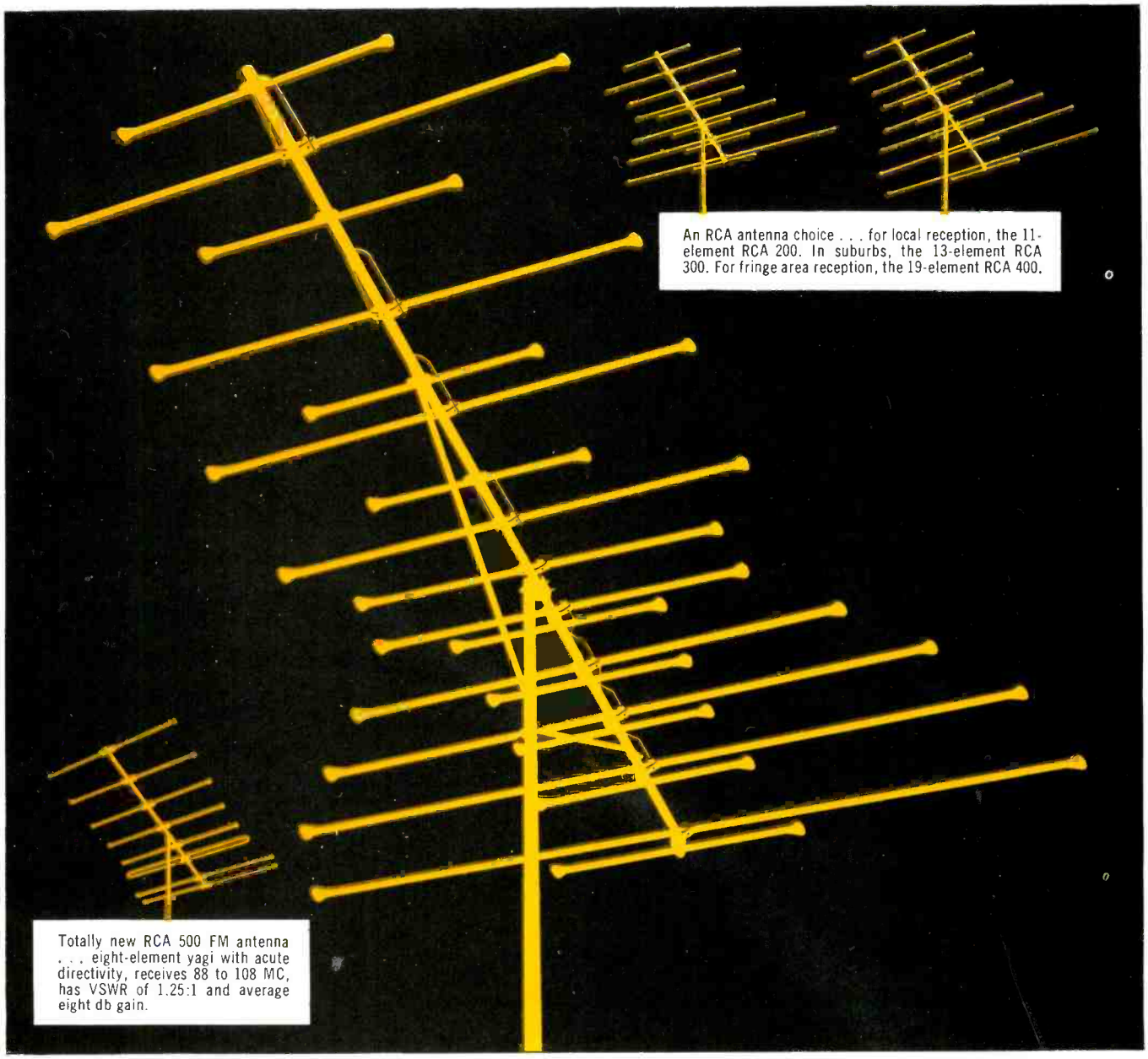
An exact replacement horizontal and high voltage output transformer for Motorola 24C65410A02-B-1,



24D65410A02, chassis STS-435, -435Y, TS-435, -435Y and WTS-435, is introduced. The manufacturer says that no physical or electrical changes are necessary. Detailed instruction sheet is packaged with each individual flyback. Net, $9.75. Merit.

RUBY CLOTH **211**

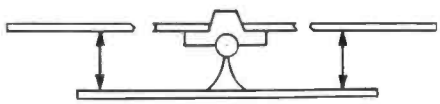
A CRT polishing cloth, said to eliminate the need for carrying liquid polishers and cleaners on service calls, is announced. Treated with a highly effective jeweler's compound, the Ruby Cloth has been designed to remove minor imperfections and scratches as well as cleaning and polishing picture tube shields, the maker said. The



RCA...Pioneer and developer of Color TV... Announces a new concept in outdoor antennas

Now the most trusted name in color TV brings you and your customers a whole new outdoor antenna line packed with top-value features. RCA puts together in a single line the best of all-channel yagi and multiple cross-driven element antenna types. You'll satisfy every customer's demand for sharpest color or black-and-white TV reception with this new RCA Series 200, 300 and 400 antennas.

RCA's electro-lens director system absorbs maximum incoming signal power, gives extremely high gain across



CAPACITIVELY COUPLED

the VHF band, offers excellent forward gain on the front end.

In addition to phasing low and high band directors for best high band performance, RCA and only RCA positions high band driven elements *directly below* low band driven elements. Through capacitance thus existing, RCA antennas feed energy *directly* into the transmission line from high band driven elements. An RCA exclusive!

A permanent gold *anodized* finish defends every RCA antenna's glossy finish from weather corrosion. Wrap-around mast clamp aligns antenna on mast, prevents boom crushing.

Just call your RCA Victor distributor. He'll tell you and show you all about new RCA 200, 300, 400 antennas and that's *plenty!* Call now—sell soon!

RCA PARTS AND ACCESSORIES, CAMDEN, N.J.

THE MOST TRUSTED NAME IN ELECTRONICS

- - - for more details circle 44 on post card

NEW PRODUCTS

cloth is also said to be useful for cleaning and brightening plastic cabinetry. Dealer net $.60. GC Electronics.

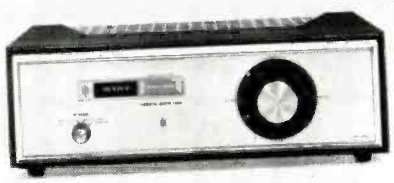
CB CHECKER 212

Said to perform 10 test functions, the model Ten-2 citizens band equipment tester measures 5-3/8 x

7-5/8 x 4-1/4 in. and weighs less than 4 lb. It is said that the checker will measure relative SWR, output power, percentage of negative and positive modulation, field strength, relative crystal activity and may be used as a signal monitor, crystal-controlled RF generator, audio generator and as a code-practice oscillator. Kit $25.95, wired $39.95. Knight.

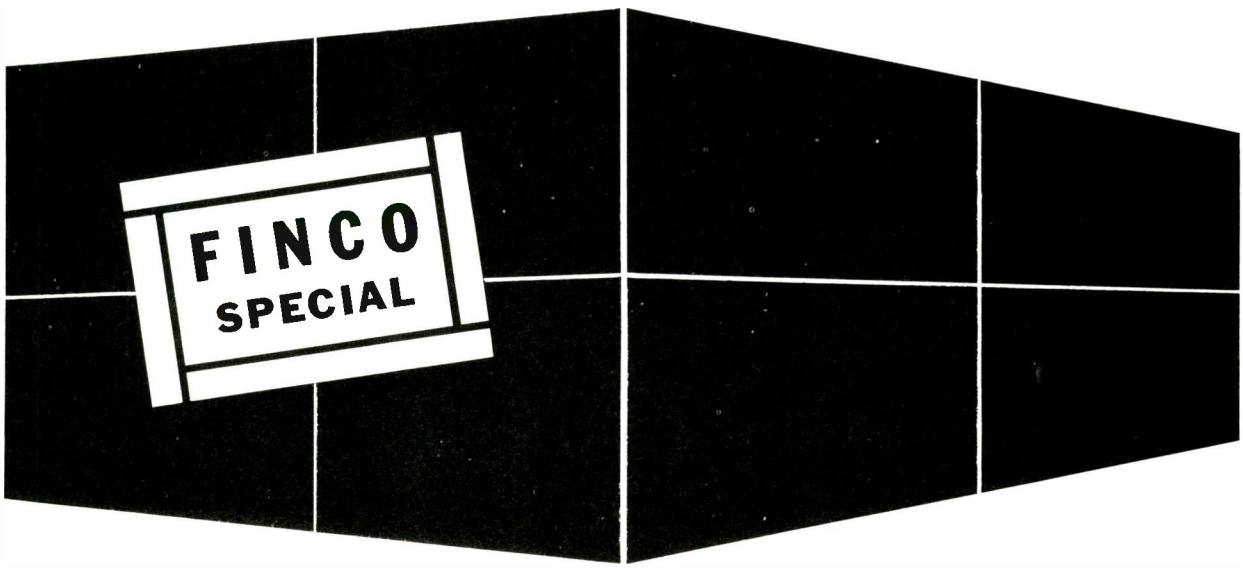
FM STEREO TUNER 213

A moderate priced FM tuner, Model 370B, is announced. Makers specifications indicated that the unit features new decorator styling, time-switching multiplex circuitry



for optimum frequency response, distortion and stereo separation. A "Sonic Monitor" for positive indication of FM stereo broadcasting, drift-free wideband design, and Compactron tubes which allow space-and-circuit-saving economies without loss of performance were also claimed. Additional features listed were: precision tuning indicator, non-magnetic electrolytic aluminum chassis copper-clad IF section, copper-clad tuning section, and FM cascode RF stage with a precision 3-gang tuning capacitor. Usable sensitivity was listed as: 3.5 μv; S/N ratio, 50 db; harmonic distortion less than 1.0%; drift, 0.02%; capture ratio, 6 db; selectivity, 32 db; spurious response rejection, 75 db and separation, 28 db. Dimensions, in accessory case, are: 15½ x 5¼ x 13¼ in. Price $159.95. H. H. Scott.

EVERYDAY EVERYDAY



not just once a year, **FINCO**® designs and ships a new "special area design" TV ANTENNA. We've shipped 3,152 already. Each antenna proved best in its own area. Got a Finco Special in your area? Want one? See your Finco distributor, or write us.

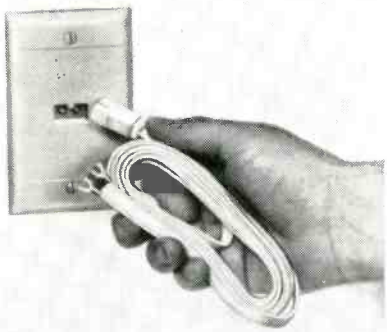
THE FINNEY COMPANY

Bedford, Ohio

NEW PRODUCTS

ANTENNA RECEPTACLES 214

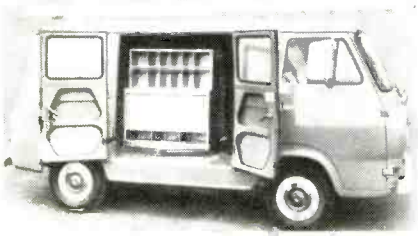
TV/FM antenna receptacles with wall plate and 8 in. cord set are now available in a wide selection of



one and two gang types, it was announced. The antenna receptacle is recessed into the one-piece wall plate and is polarized with a keyed slot, a matching keyed plug assures proper polarity, and may be used with any TV, FM, AM or rotary antenna, it was said. A variety of two-gang combination plates are also made. Design permits mounting in any standard one-gang box, or sectional box in homes, motels, hotels, hospitals, apartments, stores, offices or other locations where radio and television receivers are used, the maker said. Sierra.

TURN-O-BINS 215

The Turn-O-Bin unit is the answer to a neglected problem for operators of compact panel trucks who require efficient space for carrying tools and materials to and from the job site, according to its maker. The unit rotates 360 deg, has compartment storage space on (2) sides and material hooks on both ends. The bins are accessible from the side door opening (curb side) and provide 25 cu ft of storage space. Installing at the center



TARZIAN RADIO-TV TIPS:

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

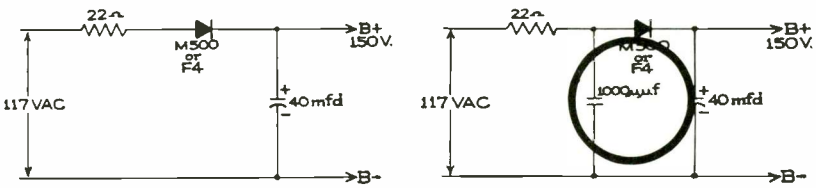
■ Substituting silicon for selenium rectifiers is highly desirable, but silicon units have extremely low impedance. When the rectifier conducts, a heavy pulse of current passes into the capacitor and through the power line. You can see this if you connect an oscilloscope across the surge limiting resistor.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

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

POSSIBLE TROUBLE

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

RADIO



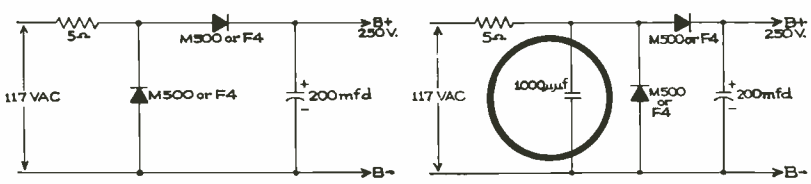
Before **After**

SOLUTION

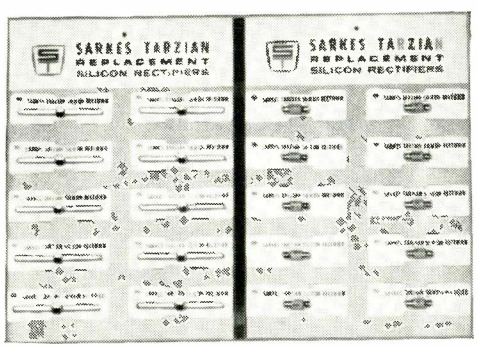
Install a 1000 mmfd capacitor between the resistor and the rectifier, from the rectifier end of the resistor to the negative line (see circles). The RC combination provides necessary filtering action.

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

TELEVISION



Before **After**



The Tarzian Replacement Line includes silicon rectifiers and conversion kits, tube replacement silicon rectifiers, and "condensed stack" selenium rectifiers. Immediately available from distributors throughout the nation, in the quantities and ratings you want most.

FREE CATALOG 61-DL-3 contains complete information on all Tarzian Replacement Line Rectifiers. Send for your copy today—be sure your files are up to date on the rectifier line voted first choice among service technicians throughout the United States.

SARKES TARZIAN Inc.

World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices

SEMICONDUCTOR DIVISION • BLOOMINGTON, INDIANA

Canadian Licensee: Marsland Engineering Limited • 350 Weber Street North, Waterloo, Ontario

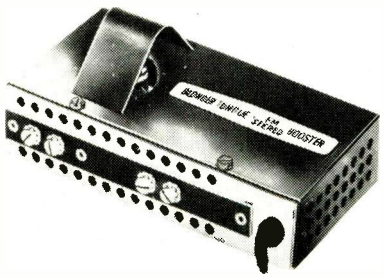
- - - for more details circle 46 on post card

NEW PRODUCTS

of the truck floor (3 bolts), the unit provides a better load disribution, and frees the rear body floor area for bulky materials or tools, it was said. Units install in Econoline, Corvan and VolksWagon panel trucks, the manufacturer indicated. Stahl.

FM BOOSTER 216

An indoor FM booster is said to offer an eight-fold increase in signal strength for FM radio receiv-



ers. Called the Stereobooster, Model FMB, it is reported to have a power gain of 18 db and an unusually low noise figure. The unit is especially effective with older tuners that do not have sensitive front ends, according to the manufacturer. $21.00. Blonder-Tongue Laboratories, Inc.

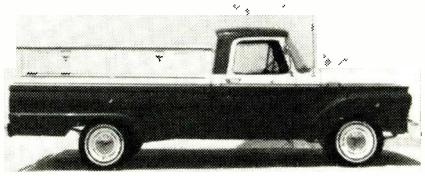
TUNER-AMPLIFIER 217

A single compact 70-w unit combines the features of the manufacturer's separate tuners and ampli-

fiers. The model 380 features new decorator styling, slide-rule tuning, front-panel low-level output for private listening, and circuitry which automatically switches to stereophonic or monophonic mode of operation depending on which type of broadcast is being received. Operating in conjunction with this circuitry is a signal which lights when stereo is being received, and is automatically extinguished when it switches to the monophonic mode. According to the manufacturer, other features are bandwidth selector for best reception of local and distant AM stations, precision illuminated D'Arsonval meter for pinpoint tuning of all signals and silver-plated RF circuitry. $459.95. H. H. Scott.

TOOL BOXES 218

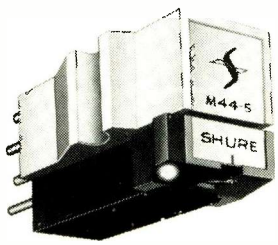
Tool boxes are mounted by the buyer and color-compliment his truck without match-painting. Pre-



drilled mounting brackets are included and the boxes are rust-proofed and finish painted inside and out according to the manufacturer. The finish coat of automotive enamel is matched to the trim-white of the wheel rims, bumpers and grills of most vehicles. The boxes are said to be theft-proof, weatherproof protection for parts and tools. The units are said to be key-locked, double-shell doors on "tamper-proof" hinges which form a workself. Sizes reportedly fit job requirements of all ½ to 1½ ton pick-up trucks. Collins Associates, Inc.

PHONO CARTRIDGE 219

A phono cartridge, the M44, is said to be an improvement over other models. Its frequency response is a "virtually flat" 20-20,000 cps; channel separation is greater than 25 db at 1000 cps and compliance is 25 x 10^{-6} cm/dyne with a 0.0005 in. diamond stylus, and 20 x 10^{-6} cm/dyne with a 0.0007 in. diamond stylus according to the manufacturer. It is reported that a scratch-proof, retract-



NEW PRODUCTS

able stylus that momentarily retracts whenever excessive forces are applied to the tone arm also. $49.50. Shure Bros., Inc.

ANSWERING DEVICE 220

A phone answering device, called the Phoneminder Secretary, greets your telephone callers in your pre-

recorded voice. Then the machine makes a tape recording of the caller's message and plays it back to you through any other telephone. To use the system, a phone call is placed to the shop. A cigarette-sized playback is placed against the mouthpiece, and a button is pressed. The messages are then heard as they were recorded. The control's signal is said to be coded so another party with a similar device cannot listen to your messages. Phonomatic Inc.

TAPE RECORDER 221

A battery/ac operated portable tape recorder, the FI-CORD 202, is said to deliver quality reproduction despite its small size and weight. It measures 9 x 6½ x 4½ in. and weighs 6¾ lb complete with batteries. The unit is a two speed recorder which allegedly has a frequency response of 50 to 12,000 cps ±3 db at 7½ ips and 50 to 8000 cps ± 3 db at ¾ ips. The unit has two inputs for professional low impedance microphones, two outputs, a VU meter, fast forward and rewind and a dig-

BASIC ULTRASONICS

by Cyrus Glickstein

A clear, definitive "pictured text" which discusses the ultrasonic process used in electroplating, textile bleaching, dyeing, homogenization and other industrial applications. Covers the application of ultrasound to solids, fluxless soldering of metals, welding odd-shaped holes and drilled slots in metals, glass and ceramics. Includes complete coverage of theory, equipment and applications. **144 pages, illustrated, paper — $3.50, cloth — $4.60.**

BASIC MATHEMATICS

by Norman H. Crowhurst

This well known Rider "picture-text" makes learning mathematics faster and easier than ever before! It utilizes the "utility of mathematics" approach and features at least one clear illustration on each page to reinforce learning. The complete four-volume course takes you in easy stages from simple arithmetic through algebra, geometry, trigonometry, and on to calculus. **4 volume set, 567 pages, illustrated, paper — $13.75, cloth — $14.50.**

BASIC AUDIO

by Norman H. Crowhurst

This fully illustrated course gives you a complete understanding of basic audio theory. The three volumes cover such vital topics as components, circuit values, distortion effects, phase-splitting circuits, feedback applications, shielding, audio transmission lines and much, much more. The material is written in clear, easy-to-understand form and covers every area of the audio field. **3 volumes, 368 pages, illustrated, paper — $8.70, cloth — $9.95.**

BASIC TRANSISTORS

by Alexander Schure

A comprehensive basic discussion on transistors, featuring many schematics, photo-diagrams, line drawings and cartoon illustrations. Covers transistor biasing, characteristics, conventional and power transistors, amplifiers, oscillators, and tetrode units. Each chapter concludes with review questions. **152 pages, illustrated, paper — $3.95, cloth — $5.50.**

BASIC RADIO

by Marvin Tepper

Here is the finest instructive material ever published on radio communications. This 6-volume "pictured text" contains more than 750 carefully prepared illustrations that make each idea completely understandable. The volumes cover DC electricity, AC electricity, electron tube circuits, AM and FM receivers, transistors and transmitters. **6 volumes, 756 pages, illustrated, paper — $13.85, cloth — $14.85.**

FILL IN TEAR OUT

MAIL TODAY

ENCYCLOPEDIA ON CATHODE RAY OSCILLOSCOPES AND THEIR USES

by John F. Rider and Seymour D. Uslan

Every practical research application where oscilloscopes can be used is covered in this monumental volume. Contains detailed material on maintenance, technical specifications, complex and square wave forms and a long list of other topics. More than 4500 illustrations are included, with up-to-the-minute material on many new types of oscilloscopes. **1356 pages, illustrated, cloth — $27.00.**

SERVICING TV AFC SYSTEMS

by John Russell

Discusses the trouble, location and repair of the major and minor type of TV AFC circuits in use today. You'll find crystal-clear information on theory, wave-forms, circuits, components, common faults and their diagnosis together with over 75 illustrations — to make the material completely understandable. **128 pages, illustrated, paper — $2.70.**

TV TROUBLESHOOTING AND REPAIR

by Robert G. Middleton

Newly revised and updated, this book reflects the rapid changes in TV technology. It covers new circuits, new tubes and the transistor, giving the latest troubleshooting methods and techniques. Covers visual-alignment, sweep troubles, video amplifier circuits, external interference, high voltage power supplies and much more. **216 pages, illustrated, paper — $3.95.**

CITIZENS BAND RADIO

by Allan Lytel

Describes the historical development, applications, classification and various types of CB equipment available. Coverage includes design features of different transmitting and receiving equipment, installation, repair, power supplies, antennas, single and multiple-channel units. FCC rules and regulations for CB users are also included. **160 pages, paper — $3.90.**

REPAIRING TRANSISTOR RADIOS

by Sol Libes

Presents methods and procedures especially developed for the repair of transistor radios. Includes basic transistor theory transistorized circuitry, design and superheterodyne radio receiver principles as applied to transistor radios. Servicing sections cover step-by-step procedures, trouble check points, charts, test equipment and tools for repairing transistor radios. **159 pages, illustrated, paper — $3.50.**

MARINE RADIOTELEPHONE PERMIT Q & A MANUAL — Third Class Operator

by Milton Kaufman

Prepares you with all the questions likely to be asked in the FCC examination for the third class radiotelephone permit; along with the answers and complete explanations. Categories include basic law, operating practice and types of radio telephones. The book also provides a list of FCC field offices. **48 pages, illustrated, paper — $1.35.**

BASIC TELEVISION

by Alexander Schure

Presents the basic theory, operation and circuitry of black and white television in a clear, thorough and accurate 5-volume "picture book" course. Individual volumes completely cover the transmitter, organization of the TV receiver and receiver circuit explanations. The text is supported by more than 500 informative illustrations that help you to visualize each individual concept. **5 volumes, 664 pages, illustrated, paper — $11.25, cloth — $12.75.**

HOW TO TROUBLESHOOT TV SYNC CIRCUITS

by Ira Remer

A practical, valuable book which covers the many variations in monochrome and color television sync circuits and possible troubles that might occur in them. Discusses fundamentals of sync circuits, takeoff, clipping, limiting, noise cancellation and time consultants. The section on output circuits includes integration and horizontal circuit signals. **128 pages, illustrated, paper — $2.90.**

HOW TO USE GRID-DIP OSCILLATORS

by Rufus P. Turner

Deals with the construction and use of this versatile instrument as well as its application to all kinds of radio and television receivers. Chapters include: Principles and Circuits; Grid-Dip Adaptors; Resonant Circuit Measurement; Capacitance Measurements; Inductance Transmitter Applications; Antenna and Transmission-Line Tests; Applications; Commercial Grid-Dip Oscillators. **112 pages, illustrated, paper — $2.50.**

BASICS OF FRACTIONAL HORSEPOWER MOTORS AND REPAIR

by Gerald Schweitzer

This book provides a working explanation of fractional horsepower motors and presents procedures for repairing and maintaining them. It fully explains the operation, troubleshooting techniques, and testing of electrical induction, split phase, capacitor, repulsion, shaded-pole, universal and three-phase motors. Each motor is accompanied by a troubleshooting chart. **176 pages, illustrated, paper — $3.90, cloth — $4.90.**

HOW TO SERVICE TAPE RECORDERS

by C. A. Tuthill

Gives you complete information on tape recorder repairs. Contains lucid discussion on the basic principles of magnetic recording, tape recording, mechanisms, circuitry and troubleshooting procedures. Explains the tape recorder and its operations with many fine illustrations. **160 pages, illustrated, paper — $2.90.**

HOW TO LOCATE AND ELIMINATE RADIO AND TV INTERFERENCE

by Fred D. Rowe

This completely revised and up-to-date book contains the latest techniques for locating and eliminating radio and TV interference. The latest electronic components are discussed at length, and their applications analyzed. Extremely practical in its approach, this book tells you what to look for, what to do and how to do it. **168 pages, illustrated, paper — $2.90.**

HOW TO INSTALL AND REPAIR MARINE ELECTRONIC EQUIPMENT

by Elbert Robberson

Provides you with a working knowledge of the unique circuitry and practices found in small boat equipment. Contains complete information on radio telephones, antennas, grounds, radio direction finders, echo sounders, automatic pilots, loran and many other considerations. A vital book for anyone considering this growing, lucrative field. **206 pages, illustrated, paper — $4.50, cloth — $5.95.**

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ital counter—located on the front panel. Battery cassettes and tape reels can be interchanged while the FI-CORD is being carried. $339; case, $34.95. Beyer-FI-CORD.

UHF CONVERTER **222**

A UHF Converter that utilizes a grounded-cathode Nuvistor circuit, Model G-4d, offers a 3 db improvement in gain characteristic plus improved noise factor, it is said. Features include pilot-lamp illumination of the channel selected, a convenient ac outlet, increased tuner stability, UHF/VHF coupler, and a "cold" chassis, according to the announcement. Improved channel selection with vernier tuning is further enhanced by more linear distribution of channels over the entire UHF range, the maker said. The contemporary cabinet is finished in a wrinkle beige, which contrasts with the walnut-grained and gold-appointed front panel. The unit weighs 2¾ lb and measures 8½ x 3 x 4 in. Price $39.95. Gavin.

RUST PROTECTOR **223**

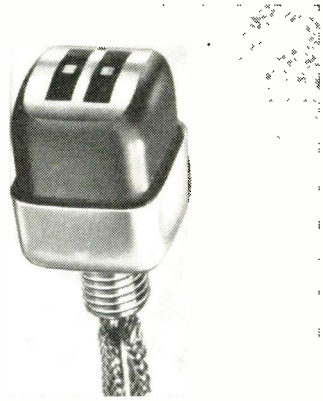
A liquid rust preventive spray, for machines, tools, gages and metal objects that are susceptible to rust, is now available. The spray displaces alkaline waters, including water-soluble cutting fluids, and

NEW PRODUCTS

protects workpieces immediately following machining. The spray also neutralizes fingerprints, making it particularly useful on micrometers and instruments that are frequently handled, according to the maker. Available in 12-oz aerosol cans and 1, 5 and 53 gal. DoALL.

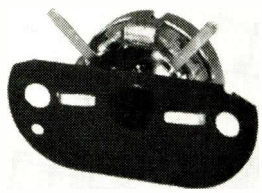
STEREO TAPE HEAD 224

A quarter-track stereo record /play head reportedly accepts all tape cartridges. The head, which has a rear stud mount, is said to have impedance ranging from a high of 500 mh to a low of 90 mh. Available with a metal or bakelite face, it is offered with or without mounting hardware. The 09P17 head, is also available in low impedance for transistorized circuits. The small size and concentric design, together with rear mounting, makes the head suitable for almost every use and mounting configuration according to the manufacturer. Michigan Magnetics.



WIRE-WOUND CONTROL 225

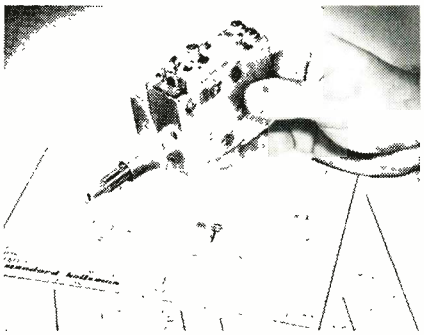
The first universal 2-w wire-wound control that permits application in any one of four manners is announced. The U39 is a shaftless potentiometer with the contact arm grounded to the housing. A fiber adapter plate is furnished with each control. It is available in many standard resistance values from 5 ohms to 5K. The unit meets the following requirements according to the manufacturer: Above chassis mounting, as a potentiometer or rheostat; printed circuit mounting, as a potentiometer or rheostat. The terminal layout meets the popular industry standards for size and location. Clarostat Mfg. Co.



TRANSISTORIZED UHF TUNER 226

A three-in. high UHF TV tuner, series UT, is announced. The chief performance advantages of the UHF tuner include: compactness, very low noise and drift, easy to mount in the TV receiver chassis,

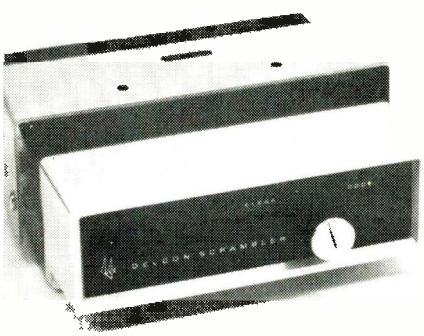
long life and maintenance free operation, according to the maker. The UT will fit all receivers using standard 43 Mc IF, it was said. According to specifications, the tuner has a low noise figure averaging 9 db; an image rejection of 35 db minimum; IF rejection 60 db minimum balanced and unbalanced; oscillator temperature stability +250 kc to 500 kc; is engineered for direct drive or planetary drives of single or dual speeds—with other drive ratio versions available to TV receiver manufacturers, the manufacturer said. The tuner is



approximately 1.18 x 3 in. and uses a single nut potentiometer type threaded bushing for easy and rapid chassis mounting. Standard Kollsman.

TWO-WAY SCRAMBLER 227

An electronic voice scrambler, which provides privacy for two-way AM and FM radio communications, is introduced. Compatible with standard two-way radios now in use, the lightweight scramblers electronically rearrange the sound of the spoken voice into totally unintelligible patterns. This gibberish is then broadcast and can be retranslated to the original clear message only by a similarly coded instrument on the receiver, the announcement said. The scrambling system includes both mobile and base station units. The mobile (model 214) weighs only 3 lb, 11 oz, operates on the vehicle's 12-v power supply

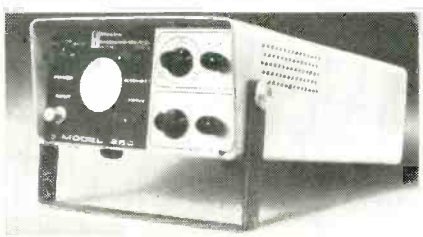


NEW PRODUCTS

and utilizes the radio's microphone. The base station scrambler (model 215) weighs just under 6 lb, and uses normal 117 vac power, it is said. Price, mobile model 214, $300, base station model 215, $400. Delcon.

TRANSISTORIZED SCOPE 228

Said to afford laboratory precision in portable form, the model 250 oscilloscope measures 3-5/8 x 6-7/8 x 12 in. and weighs 6-1/2 lb (less batteries). The instrument may be operated either from self-contained batteries or from 117 vac. Specifications listed frequency response up to 1 Mc with sensitivities ranging from 100 mv per division to 100 v per division. Sweep speeds are selectable from 3 msec per division to 1 μsec per division, it is said by the maker. The unit has a 2 in. CRT. $295, less batteries. Electro.



TELEPHONE AMPLIFIER 229

A telephone amplifier, enabling the user to speak and listen from anywhere in the room with both

hands free, is announced. The transistorized, and completely portable unit is designed for both home and office use. Price, $12.95. Gilwin.

PLASTIC REPAIR KIT 230

A plastic repair kit, "PLAS-T-PAIR," repairs cracked and broken plastic articles, including control knobs and cabinets. The kit consists of a quantity of powdered plastic and a liquid, which, when mixed together and applied to the broken item, form a permanent bond reportedly stronger than the original material. The product can also be used to fill in holes or make special plastic parts unavailable elsewhere. The kit may be used to bond metal, wood and other materials when the surfaces have been properly prepared. $1.75. Rawn Co.

. . . CASH IN ON UHF

Continued from page 58

This will give you needed experience in determining what type of equipment is needed in various areas.

4. Don't promote heavily until the channel actually comes on the air. UHF channel owners are incurable optimists. They never seem to anticipate all of the things that can delay going on the air. Consequently, many channels announce three or four "firm" on-the-air dates. If you're too enthusiastic, you can dissipate your efforts before you have a chance to succeed.

5. Time your big push to coincide with the actual channel opening. This is when excitement will have reached its highest pitch. Heavy publicity and advertising will have made almost everyone in town aware of the new channel. At this point, your promotional efforts will really pay off.

6. Display converters, preferably in operation and bringing in the new channel. In addition to your own store, you can arrange displays in bars, banks, local clubs, theater lobbies, etc. Have dignified cards made up for these displays, explaining to prospects that your shop will equip them to receive the new channel.

7. Go all out on a direct mail campaign. Make up packaged specials of converters and antennas. Write letters to all of your customers. Use pamphlets and bill stuffers supplied by manufacturers. Follow up the direct mail campaign by telephone. Your wife or a girl hired for the job can line up plenty of installations for you by phone during the first few months after the channel goes on the air.

8. Demonstrate UHF converters in the home. Take a converter with you on service calls. Hook it up to your customer's set after it has been repaired. A high percentage of demonstrations lead to sales in new UHF areas.
9. Leave UHF literature with your customer's neighors. The theme should be "Your neighbor is enjoying channel ____. Are you?"
10. Advertise in the local papers. Offer a complete package, installed and guaranteed to work. In some cases manufacturer's co-op funds will be available through your distributor. Take advantage of every merchandising aid available.

UHF *could* be the biggest thing that ever happened to you—*if you* make it so. ■

. . . CUSTOMER RELATIONS

Continued from page 59

can be readily corrected. The person who answers the phone shouldn't ask "Who's calling?" before telling the caller whether the boss is in. This, in effect, is making the caller justify himself as important enough to merit the privilege of conversing with Mr. Big.

It's better to answer, "Why yes, I believe Mr. Big is in. May I tell him who is calling?" If the "boss is too "big" to converse with a customer it's time for him to retire.

The old phrase, "The customer is always right," may be trite but is everlastingly true. Even a giant like Sears, Roebuck & Co. knows this, as witness the company's policy of not arguing with those who return merchandise, regardless of the reason.

Good customer relations, it is apparent, means performance not only of products of managerial methods and policies—all the many things that go into affecting attitudes toward a business or organization, from within and from without.

One trouble is that many business organizations frequently wait until it is in difficulty before worrying about customer relations. Businessmen are sometimes so preoccupied with the notion of selling things that they often fail to recognize developing customer relations problems until too late.

Many businesses have grown so large that unless a broad effort is made to humanize them, customers see the firms only as impersonal machines.

People admire efficiency, progressiveness, scientific achievements. But far more important in building good customer relations is simple, everyday courtesy. Courtesy is no substitute for efficiency, but it takes nothing away from it and adds to it enormously.

When any situation arises to prevent your doing what the customer expects, use appropriate mediums and methods to tell frankly and forthrightly why the situation exists—what you're doing about it, what you plan to do and what, if anything, the disappointed customer can do about it in the meantime. In short, put your cards on the table. You'll find customers will be reasonable and fair and will like your candor.

The whole idea can be summed up by this slogan:

"Never forget a customer—never let a customer forget you." ■

Raymond W. Saxon, RCA Sales Corp., forecasts 6.15 million B/W and 1.2 million color sets . . . Robert J. Theis, Sylvania, sees 6.8 million B/W and 1.2 million color receivers . . . Zenith's Clifford J. Hunt anticipates 6.5 million B/W and 1 million color sets . . . Consensus on color by the most optimistic forecasters ranges between 1.2 and 1.5 million.

Color Tube Delivery Slow

Robert Galvin, Motorola president, told a meeting of the New York Society of Security Analysts that "I can't stand here and tell you with full confidence that our color TV tube is out of the woods yet. The signs are encouraging, but I can't say we've got it made." Galvin indicated that Motorola's 23-in., 90-deg TV color tube supply was uncertain, although some 23-in. color sets are now being shipped. It was understood that Motorola will not begin to advertise color until the second half of this year. Motorola also indicated short supply on 21-in. color tubes. Some 23 in. sets are now being shipped.

Built-In Antennas

GC Electronic has released information regarding the addition of 28 new exact replacement TV antennas to its built-in line of indoor models, based on the most popular, in-demand antennas in use today. The manufacturer said that this expansion will enable distributors to offer a well-rounded catalog of exacts, in addition to a complete line of Colormagic and

NEWS OF THE INDUSTRY

Three-CRT Color TV

It is reported that Mitsubishi Electric, Japan, is introducing a 6-in. color TV receiver which has three CRTs. One green phosphor CRT faces forward with the faceplate halfway back from the set front. Two dichroic mirrors are in front of this CRT slanted 45 deg from vertical. One CRT is placed below each mirror with faceplate pointed up. The faceplate of the vertical red phosphor tube nearest the set front is below the blue phosphor CRT so that all three tubes' optical paths are equidistant from the viewer's eyes. It was reported that the screen is much brigher than shadowmask CRTs and can be viewed easily under outdoor lighting conditions.

TV Crystal Ballers

A representative group of TV manufacturing executives predict good times for TV sales in 1964. Larry Hyde, vp Philco consumer products div., sees 6.4 million B/W TVs and 915,000 color sets in the coming year . . . Admiral's chairman, Ross Siragusa, anticipates 7 million B/W and 1 million color sets . . . Edward R. Taylor, president, Motorola, estimates 6.6 million B/W and 800,000 to 1 million color sets . . .

Broadcasts began on a 1630 to 2230 UT schedule, with the biweekly silent periods (for routine maintenance) for each station continuing in effect. This reduction in service is being made as an economy measure in the face of limited operating funds alloted to the NBS.

EIA Requests Radiation Rule Extension

A request to extend present relaxed radiation provisions for UHF TV receivers for one year, was made by the consumer products division of the Electronic Industries Association to the FCC. The temporary rule ends April 30 and the request was made for an extension until April 30, 1965. No more than 1000 μv per meter radiation is allowed on UHF sets operating on frequencies between 470 and 1000 Mc. The EIA said that insufficient data is now available to determine what improvements can be made by using semiconductor devices.

TV Receiver Output

According to EIA figures, production of all TV set types increased 16 percent in 1963 over 1962. Approximately 8,075,000 sets were listed. In 1962, production was only 6,921,000 units, including color. Approximately 450,000 of this number were color sets. The EIA also reported that about 450,000 TV sets were imported from foreign countries, mostly from Japan, in 1963. This compared with 185,000 units imported from all countries in 1962.

...New Developments in Electrical Protection

Telco outdoor TV antennas now being manufactured. Models in this new group include 3 new Emerson replacements, 2 for Admiral sets, 1 Admiral/Motorola, 1 Admiral/Viking, 9 General Electric, 1 General Electric/Zenith, 2 Philco, 1 Wells-Gardner, 2 Olympic and 1 Zenith replacement.

FCC & CATV

The FCC appears determined to regulate CATV systems to the extent of solving problems arising between CATV operators and local stations. It has taken the position that CATV operators can render valuable service to communities but it also does not want the systems to drive local stations out of business.

Moch Hits Back-Door Sales

Frank M. Moch, executive director of the National Alliance of Television & Electronic Service Associations (NATESA), told a U. S. House of Representatives subcommittee investigating dual distribution that it is not unusual for a technician to be asked by a customer to use TV tubes which the customer had previously bought from a wholesaler which the technician may deal with.

New WWVB and WWVL Schedule

On January 1, 1964, National Bureau of Standards radio stations WWVB (60 kc) and WWVL (20 kc), Ft. Collins, Colorado, reduced their broadcast time from the present 24-hour service to 6 hours a day.

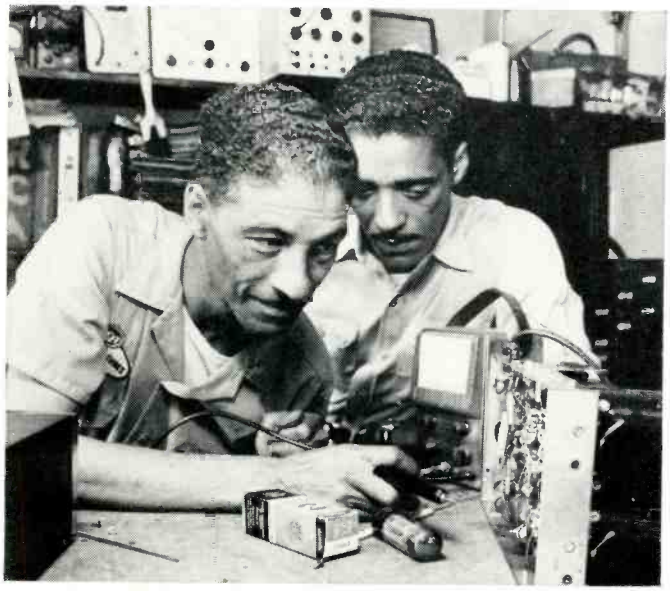
ADVERTISERS INDEX

"I'd say I get at least two new customers a week through the Yellow Pages Directory,"

says Theodore Grant, owner, Pete & Son TV Service, Chicago, Illinois

"As a matter of fact, most of our business—old and new—comes to us right over the telephone."

"Sometimes I ask people how they picked us, and they say they found us in the Yellow Pages."



"Give top service — use the best parts and advertise in the Yellow Pages. That's what works for us."

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Bell System **Yellow Pages**

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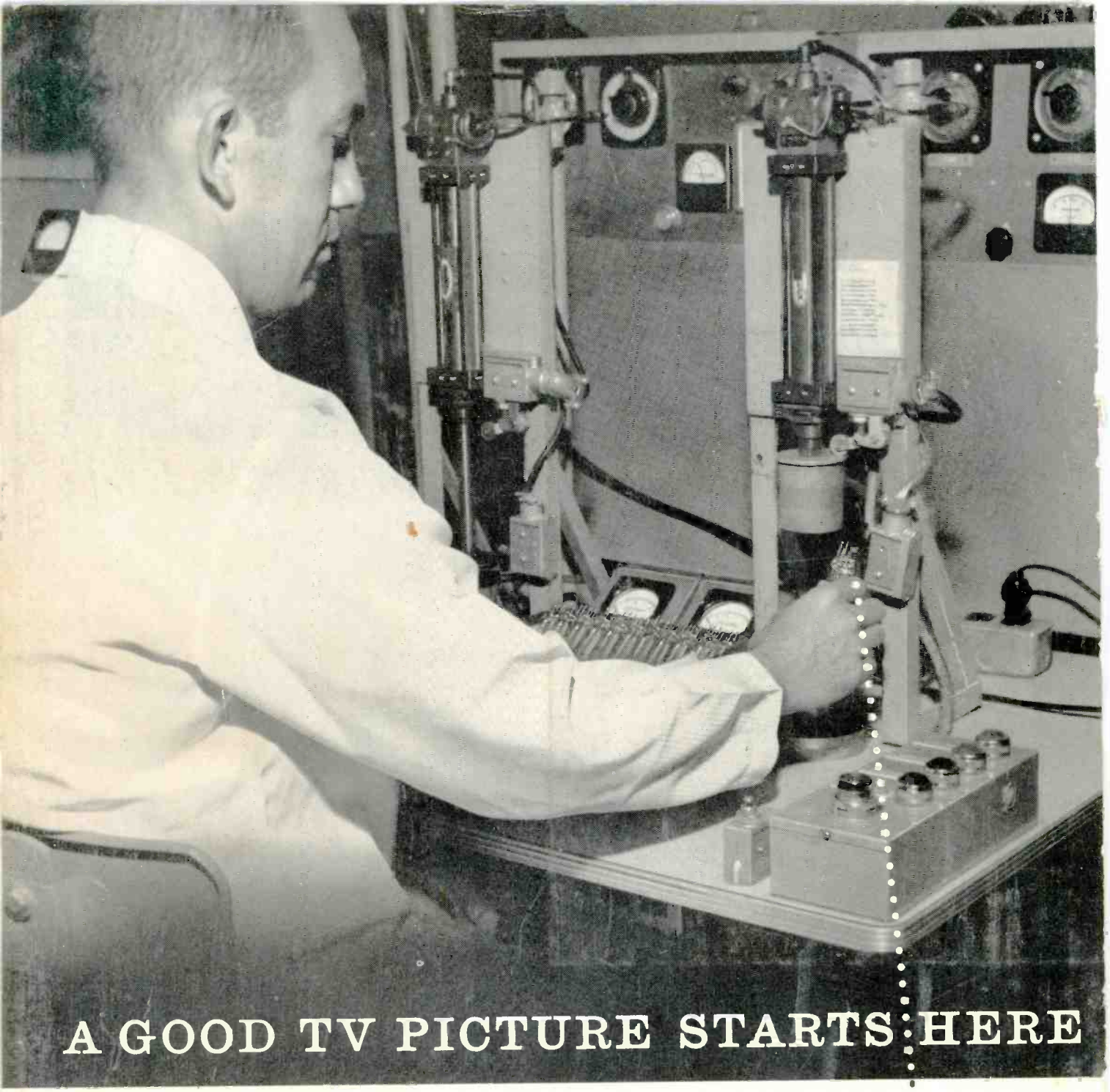


It Depends on a Leakproof Stem Seal

The slightest leakage of air weakens the high vacuum of a TV picture tube...resulting in a costly callback and a dissatisfied customer for you. This is why RCA takes extra precautions to maintain the vacuum in Silverama picture tubes.

Potential trouble spots are the glass-to-metal lead-wire seals in the electron-gun stem assembly (below). At RCA, stem assemblies are batch tested for leakage in a supersensitive leak detector *before* they go into electron guns.

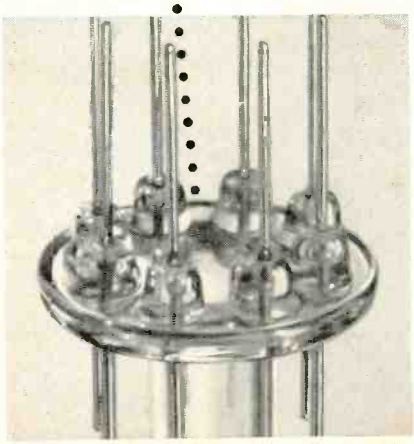
So sensitive is this detector that it can pinpoint a leak that would not affect tube performance for years...a leak so tiny that no other inspection method could hope to find it.

Yet the slightest sign of a leak is cause for rejection of a stem. This extra precaution is one more example of the care that goes into every phase of Silverama manufacture ...and one more reason why RCA Silverama should be your first choice in replacement picture tubes.

Silverama is made with an all-new electron gun, finest parts and materials, and a glass envelope that has been thoroughly cleaned and inspected prior to re-use.

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

The Most Trusted Name in Electronics



Stem assemblies are tested on a special high-vacuum leak detector. Detector is a helium mass-spectrometer, detecting passage of helium "tracer" gas through any of the glass-to-metal seals. A stem assembly passing this rigorous test is ready to become a vital part of an RCA Silverama® Picture Tube.