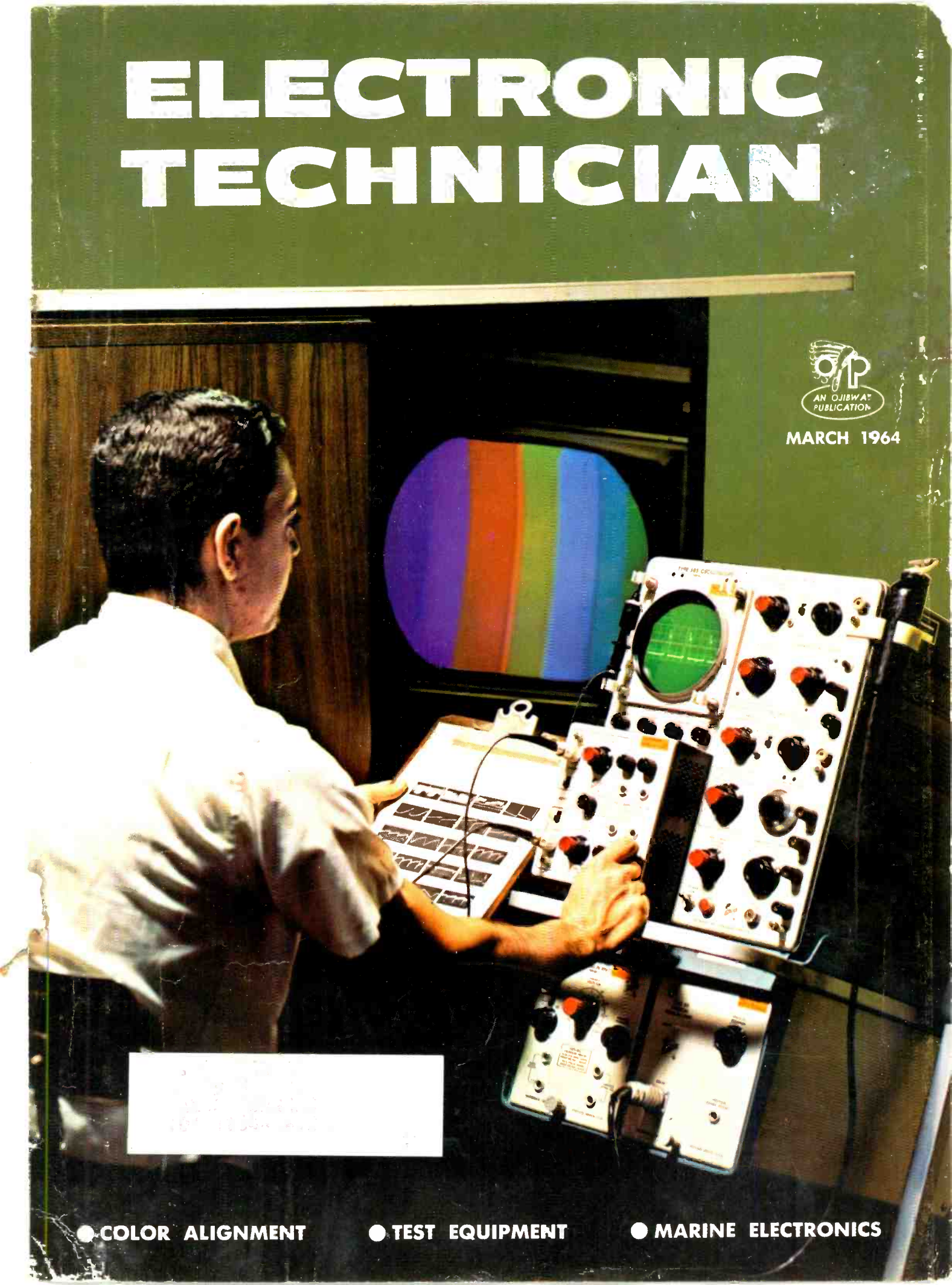
ELECTRONIC TECHNICIAN



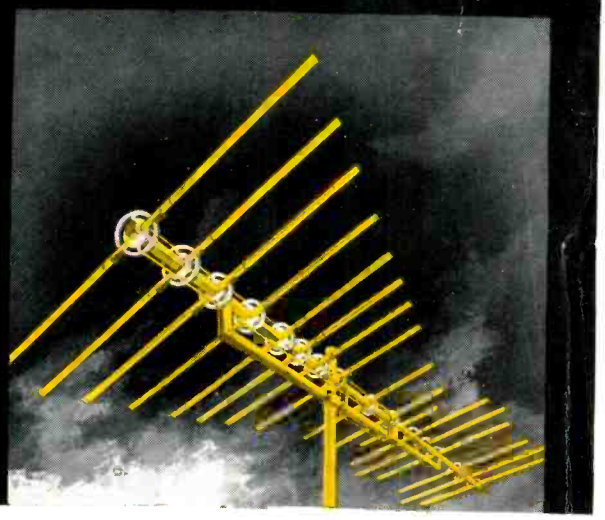
AN OJIBWAY PUBLICATION

MARCH 1964

● COLOR ALIGNMENT ● TEST EQUIPMENT ● MARINE ELECTRONICS

LIMA, O., SERVICEMEN SWITCH TO JERROLD PARALOG

. . . they weren't "snowed" by doubletalk!



Time and again, throughout the country, it's happening. Wherever we introduce Paralog antennas and ask servicemen to test their performance against competition, Paralog wins new supporters hands-down.

So it went in the difficult Lima (Ohio) reception area when our distributor, Allied Supply, presented the Paralog line to local servicemen. Shown here are a few of the Lima servicemen, previously dealers for other brands, who are now solidly behind the fabulous new Paralog. AND WHY THE SWITCH? Not because of trumped-up "gain charts" or gobbledegook. Simply because they've found that Paralog sells on its performance in all areas.

Have *you* tried the Jerrold-Taco Paralog side-by-side with its competition? Don't—unless you're ready to join the growing army of Paralog boosters.

RAY MAGER, MONTGOMERY WARD

"Paralog works better than any other VHF antenna ever made. We had 200 calls within two weeks. Some of our customers pull in Cleveland, over 160 miles away, consistently."

RALPH DEPALMA, RADIO HOSPITAL

"We insisted on a side-by-side, in-the-air field-strength-meter test. . . . Results proved Paralog superior. . . . This has been our first big boom in antenna business since the introduction of TV in 1951."

PHILIP NEWLAND, JR., OTIS & CO.

"Our company sold 68% of the color TV in our county in 1962. Obviously we have to use the best antennas, with the best front-to-back rejection. We've switched from Brand C to Paralog."

TOM LAMBERT and FRED ANSEL, VANGUARD ANTENNA SERVICE

"We've been installing antennas for 13 years. When Paralog hit Lima we found it outperformed Brand C, was built better, and we've been using it 100% ever since."

ROGER HEFNER, HEFNER TV

"As a set dealer who has antenna installations done by an independent installer, the only reception product I insist on is Paralog after seeing its performance in the tough Lima area."

For complete information, write Distributor Sales Division, Jerrold Electronics, Philadelphia, Pa. 19132.

JERROLD ELECTRONICS

- - - for more details circle 28 on post card

NOTES:

0 - 99 PARTS MOUNTED ON THE CHASSIS
100 - 199 PARTS IN VHF TUNER
200 - 299 PARTS ON IF CIRCUIT BOARD
300 - 399 PARTS ON SOUND-SYNC CIRCUIT BOARD
400 - 499 PARTS ON COLOR CIRCUIT BOARD
500 - 599 PARTS ON UHF TUNER
800 - 899 PARTS ON CONVERGENCE BOARD

ALL RESISTOR VALUES ARE IN Ω; K = 1000, MEG = 1,000,000.
ALL RESISTORS ARE 1/2 WATT UNLESS SHOWN OTHERWISE.
ALL CAPACITOR VALUES ARE IN μfd UNLESS MARKED μμF.
INDICATES POSITIVE DC VOLTAGE MEASUREMENT, TAKEN WITH AN 11 MEGOHM VTVM, FROM POINT INDICATED TO CHASSIS GROUND.
VOLTAGE MEASUREMENTS WERE MADE WITH NO SIGNAL INPUT.

THIS SYMBOL AROUND A PART NUMBER MEANS THAT THE PART IS MOUNTED ON THE CHASSIS, EVEN WHEN ITS POSITION ON THE SCHEMATIC SUGGESTS ANOTHER LOCATION.

THIS SYMBOL INDICATES THE TOP COIL.

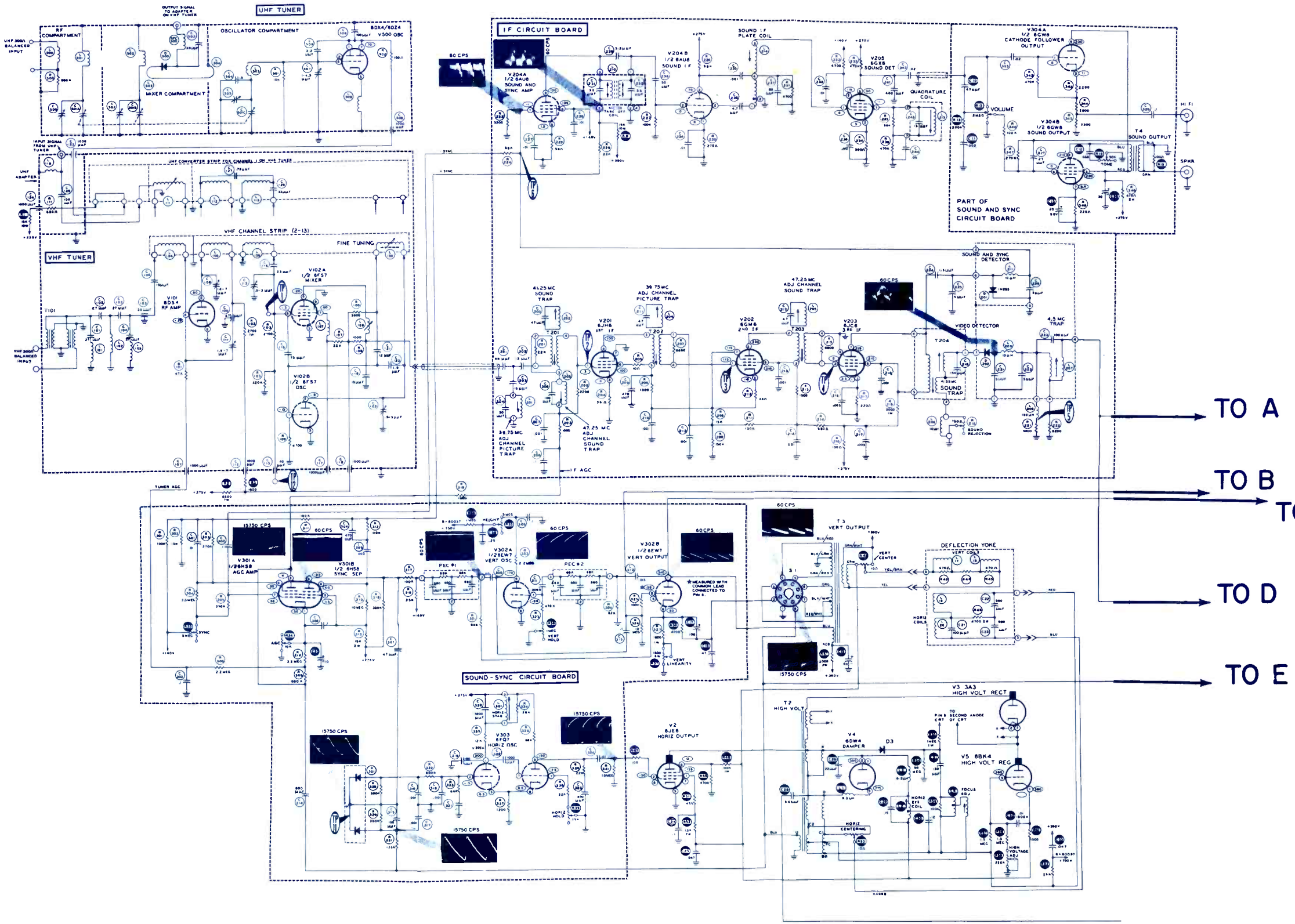
THIS SYMBOL INDICATES THE BOTTOM COIL.

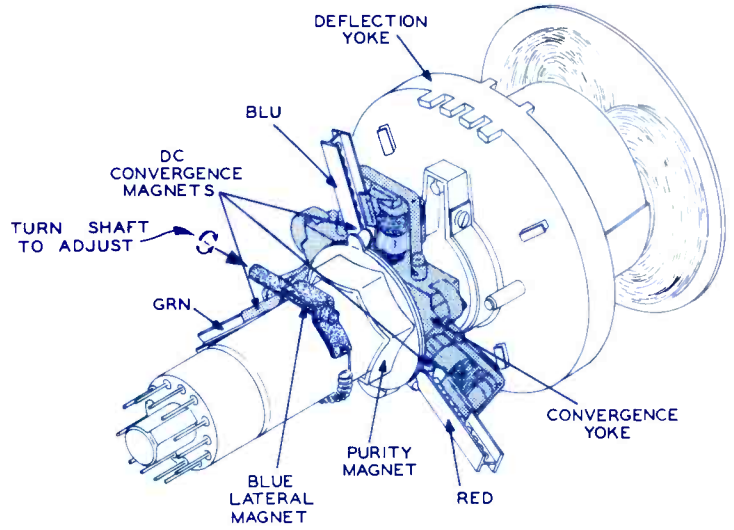
ELECTRONIC TECHNICIAN
TEKFAX
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR FIVE NEW SETS

839

HEATHKIT
Color TV
Model GR53

March 1964

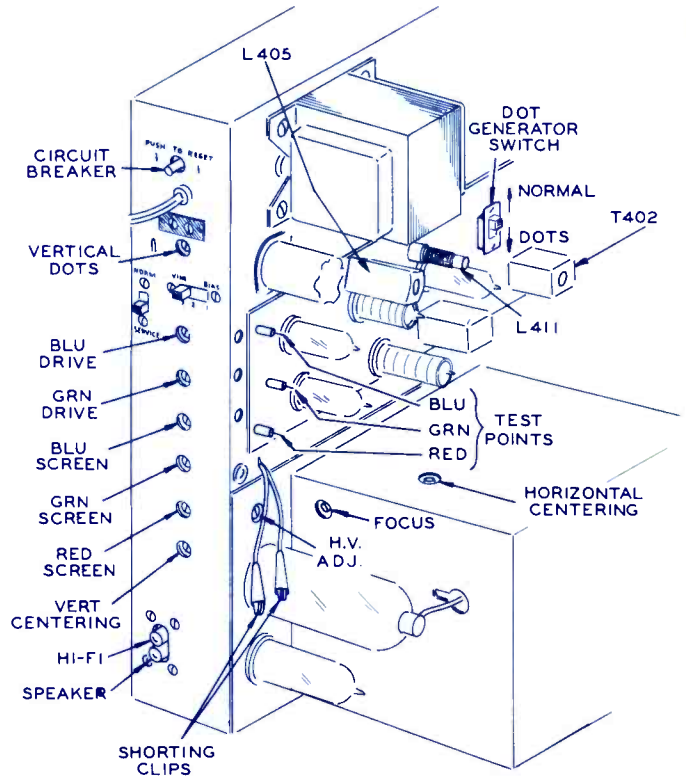


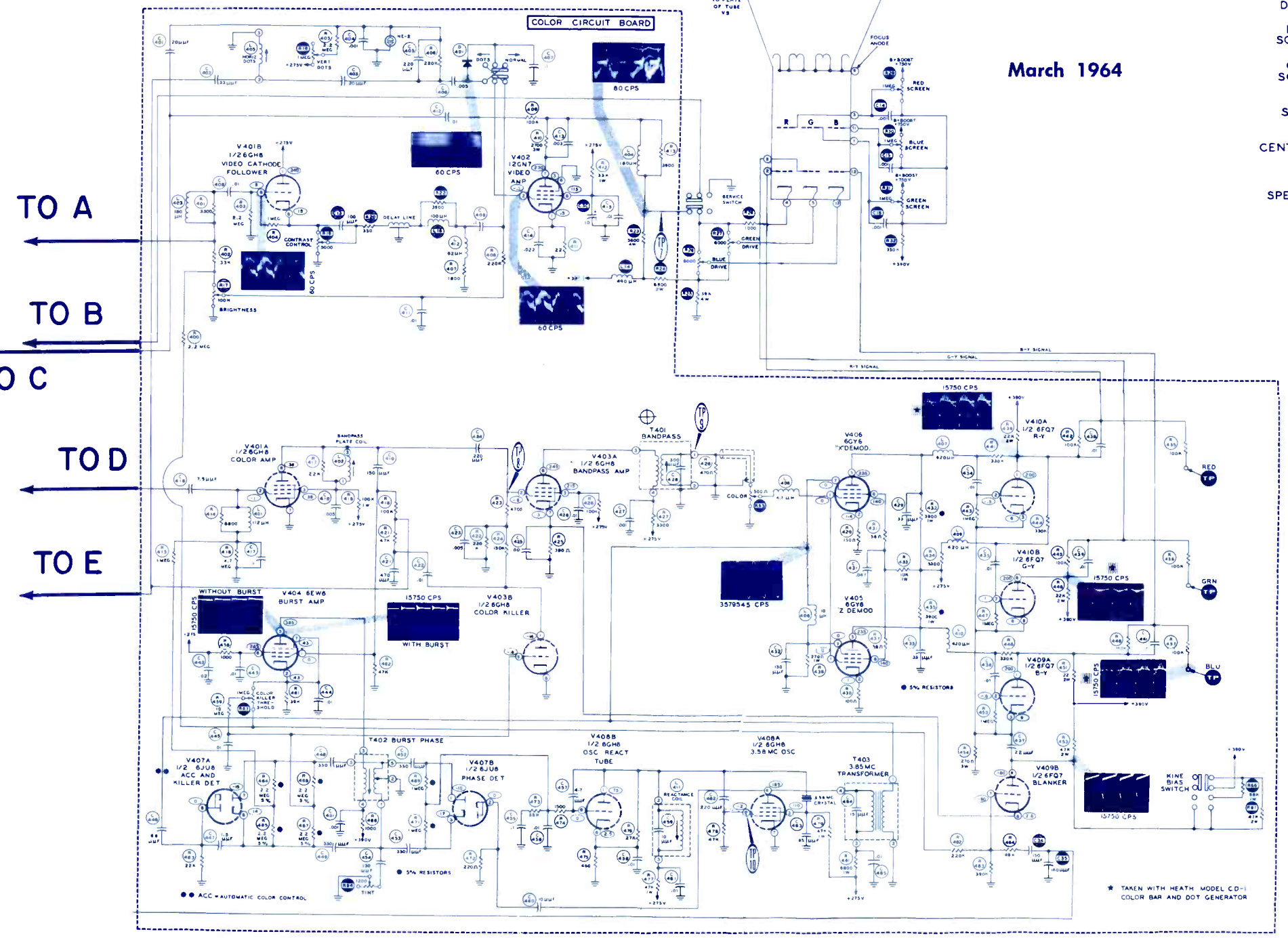


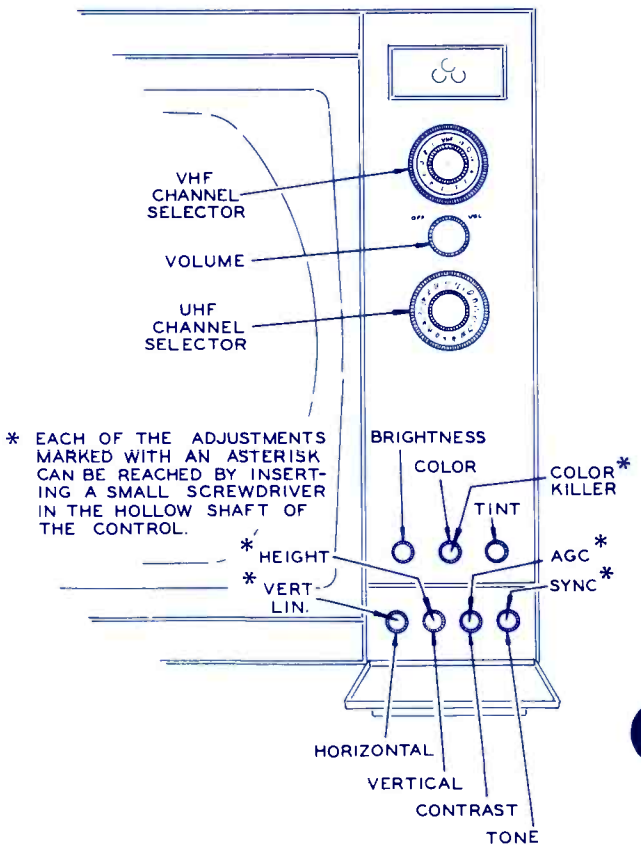
HEATHKIT
Color TV
Model GR53

ELECTRONIC TECHNICIAN
TEKFAX
839

March 1964







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

840

WESTERN AUTO
Tape Recorder
Stock No.
4DC7260A

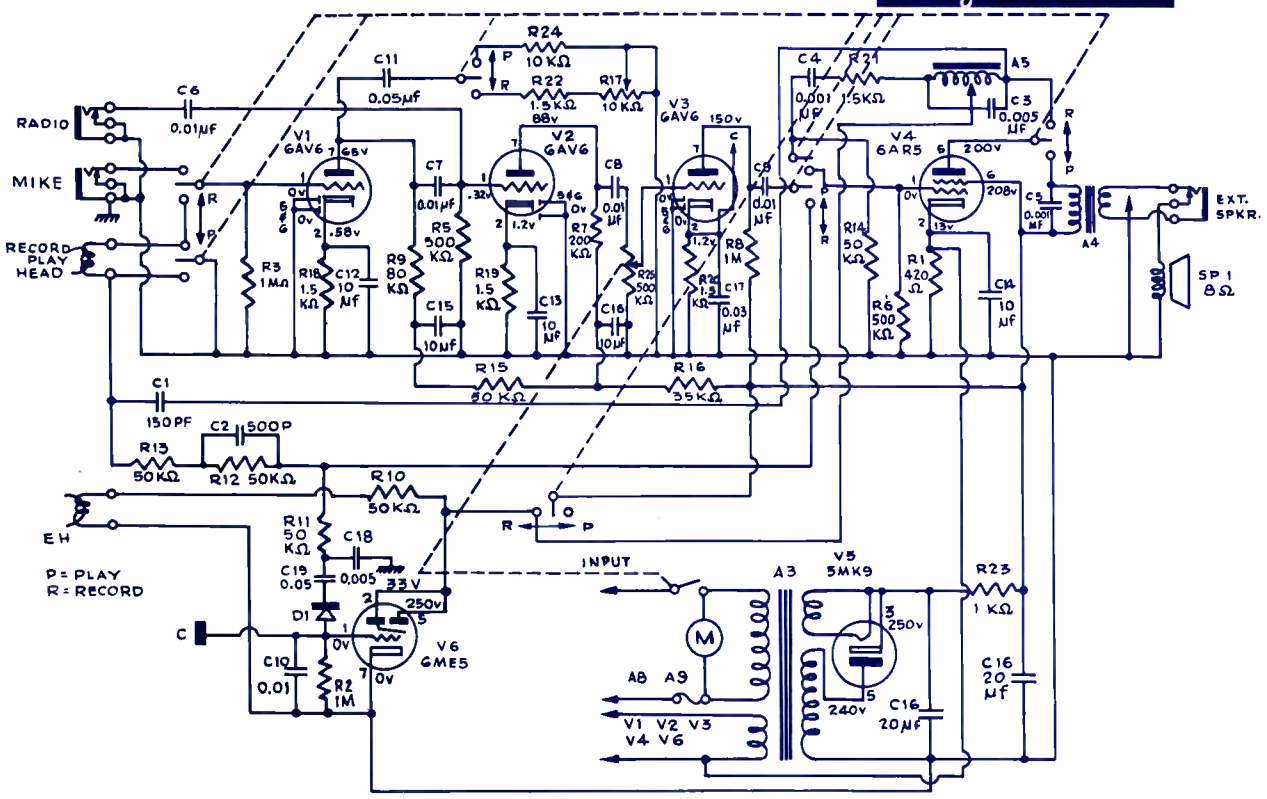
March 1964

ELECTRICAL TROUBLE CHART

SYMPTON	POSSIBLE CAUSE	REMEDY
Eye Tube does not indicate Record/Playback level.	Defective tube. (V-6).	Replace.
	Cold solder connection at slide switch.	Reheat solder connection.
	Defective Diode. (D-1).	Replace.
No output from Internal Speaker-Extension Speaker normal.	Extension Speaker Jack open at all times.	Check breaker contact to make sure contact is being made when no plug is inserted in jack. Replace if necessary.
Distortion. (Not contributed to Wow.)	Defective 6AV6. (V-1)	Test and replace if necessary.
	Defective 6AR5.	Test and replace if necessary.
	Defective Oscillator.	Check for proper voltage.
	Defective Play/Record Head.	Check signal at Head using signal tracer. Replace if necessary.
	Play/Record Head dirty.	Clean with alcohol.
	Play/Record Head magnatized.	Demagmatize with Head Demagnatizer.
Low Output.	Defective Microphone.	Check microphone and replace if necessary.
	Insufficient Bias.	Check output of oscillator coil.
	Pressure pads not making Sufficient contact.	Check felt pads, replace if worn. If insufficient tension, bend arm slightly until proper contact is obtained.
Loss of High Frequency	Mid-alignment of Head.	See "Adjustments".
No Erase.	Defective Erase Head.	Check with ohmmeter.
	Defective Slide Switch.	Check with ohmmeter.
	No B-plus Voltage.	Check all tubes, replace any found defective.
	Open 50K Resistor (R-10).	Check with ohmmeter.
Excessive hiss on Record and Playback.	Noisy 6AV6.	Substitute and check for noise.
	Magnatized Play/Record Head.	Demagnatize with Head Demagnatizer.
Playback but will not Record.	Defective Oscillator.	Test and replace if necessary.
	Defective Slide Switch.	Check circuit with ohmmeter.
Tubes will not light.	Defective interlock.	Check for proper contact.
	Defective fuse (A-9).	Check and replace if necessary.
	Defective Switch (R-25).	Check and replace if necessary.
	Defective 5MK9.	Test and replace if necessary.
No Playback or Record – No B-Plus. Loud Hum with volumn at minimum.	Defective filter capacitor.	Check and replace if necessary.

MECHANICAL TROUBLE CHART

SYMPTON	POSSIBLE CAUSE	REMEDY
Function Control does not lock.	Set screw loose.	Tighten locking nut (M-42).
Tape spillage when Stop Button is depressed.	Brake lining worn.	Replace (See Adjustments).
Take-up Reel does not revolve in forward drive position.	Broken spring (M-111).	Replace
	Motor loose on shaft.	Reposition and tighten mounting screw (M-50). (See Fig. 4).
	Capstan Drive Idler loose.	Check position and tighten set screws.
	Take-up belt broken (M-24).	Replace
Supply Reel does not revolve in Rewind position.	Defective Rewind Belt (M-25).	Replace.
Record Safety Lock inoperative.	Broken selector shaft Spring (M-83).	Replace.



BIAS VOLTAGE 72 V.A.C.
Measured in Record Position

ITEM	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	6A V6	380	1.8K	450	450	0	0	∞
V2	6A V6	500K	1.5K	450	450	0	0	0
V3	6A V6	8	1.6K	450	450	1MEG	1MEG	∞
V4	6A R5	500K	450	450	450	∞	∞	∞
V5	5M K9	∞	∞	∞	∞	500	∞	∞
V6	6M E5	1MEG	∞	500	500	∞	∞	0

RESISTANCE IN OHMS UNLESS OTHERWISE INDICATED. ALL MEASUREMENTS MADE IN "PLAY" POSITION.

1. DC VOLTAGE MEASUREMENTS TAKEN WITH VACUUM TUBE VOLTMETER; AC VOLTAGES MEASURED AT 100 OHMS PER VOLT.
2. SOCKET CONNECTIONS ARE SHOWN AS BOTTOM VIEWS.
3. MEASURED VALUES ARE FROM SOCKET PIN TO COMMON GROUND.
4. LINE VOLTAGE MAINTAINED AT 117 V FOR VOLTAGE READINGS.
5. NOMINAL TOLERANCE OF COMPONENT VALUES MAKES POSSIBLE A VARIATION OF ± 15% IN VOLTAGE AND RESISTANCE READINGS.
6. ALL CONTROLS AT MINIMUM, PROPER OUTPUT LOAD CONNECTED, NO SIGNAL APPLIED.

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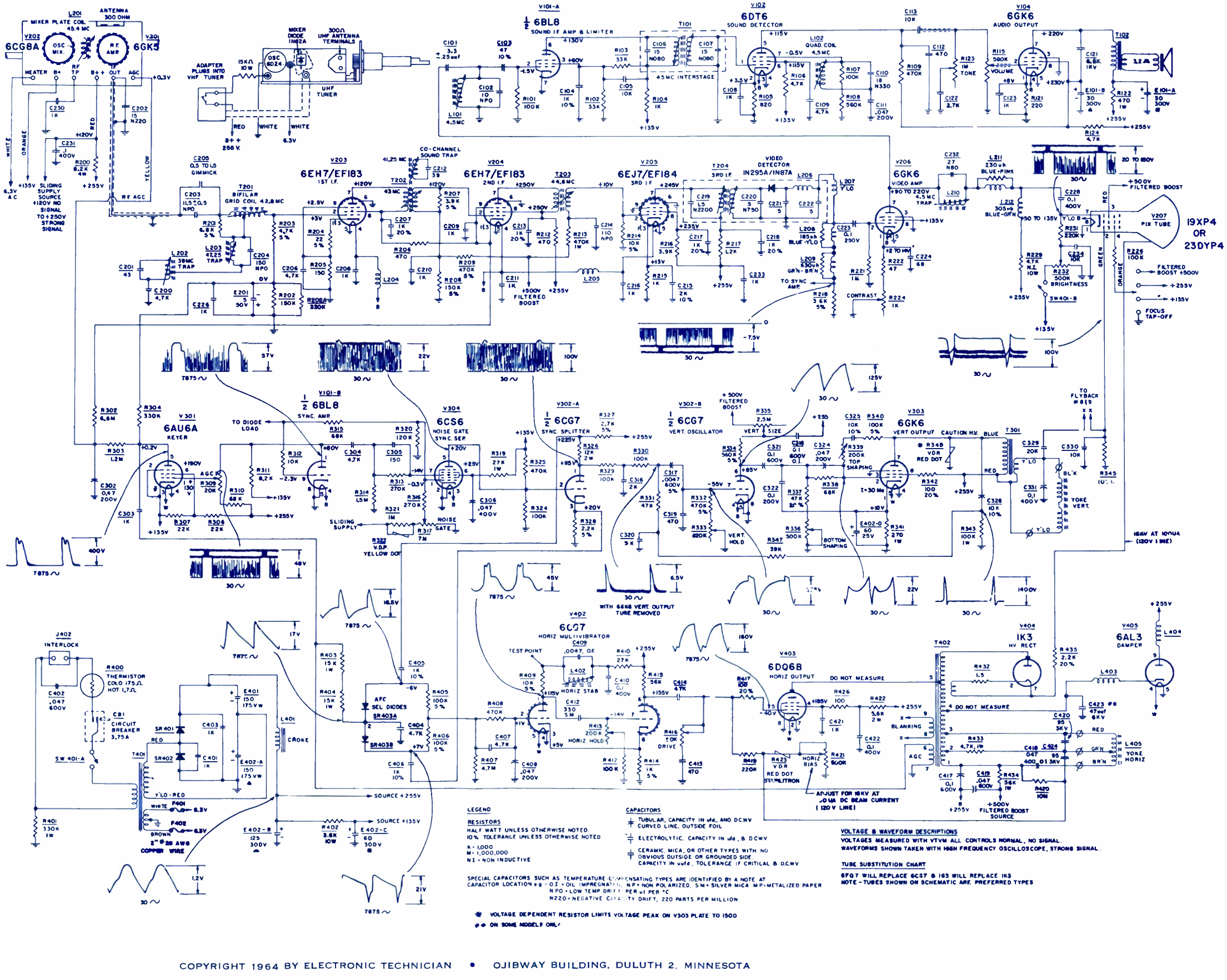
ELECTRO-HOME
TV Chassis
Models Chancellor TV, TV U, TV CU, Vermont MKII, MKIIU, MKCU, Beaucourt MKII, MKIIU, MKIICU.

March 1964

ELECTRONIC TECHNICIAN TEKFAX

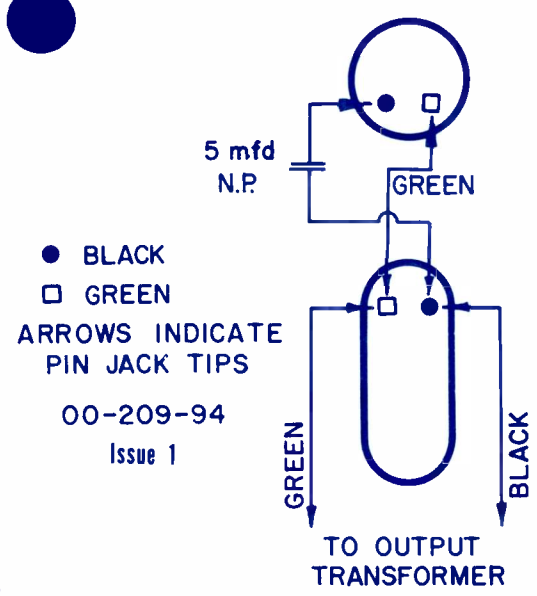
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR FIVE NEW SETS

More Data on Opposite Page

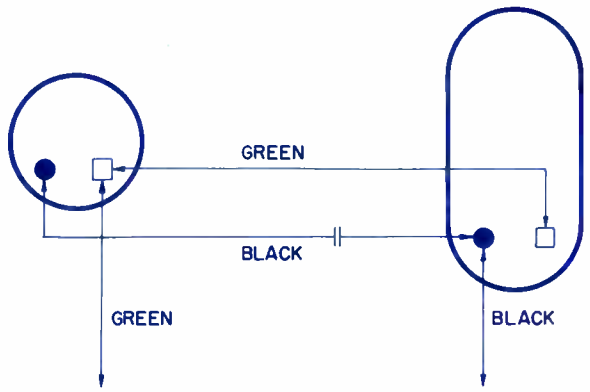


SPEAKER CONNECTIONS

CHANCELLOR TV

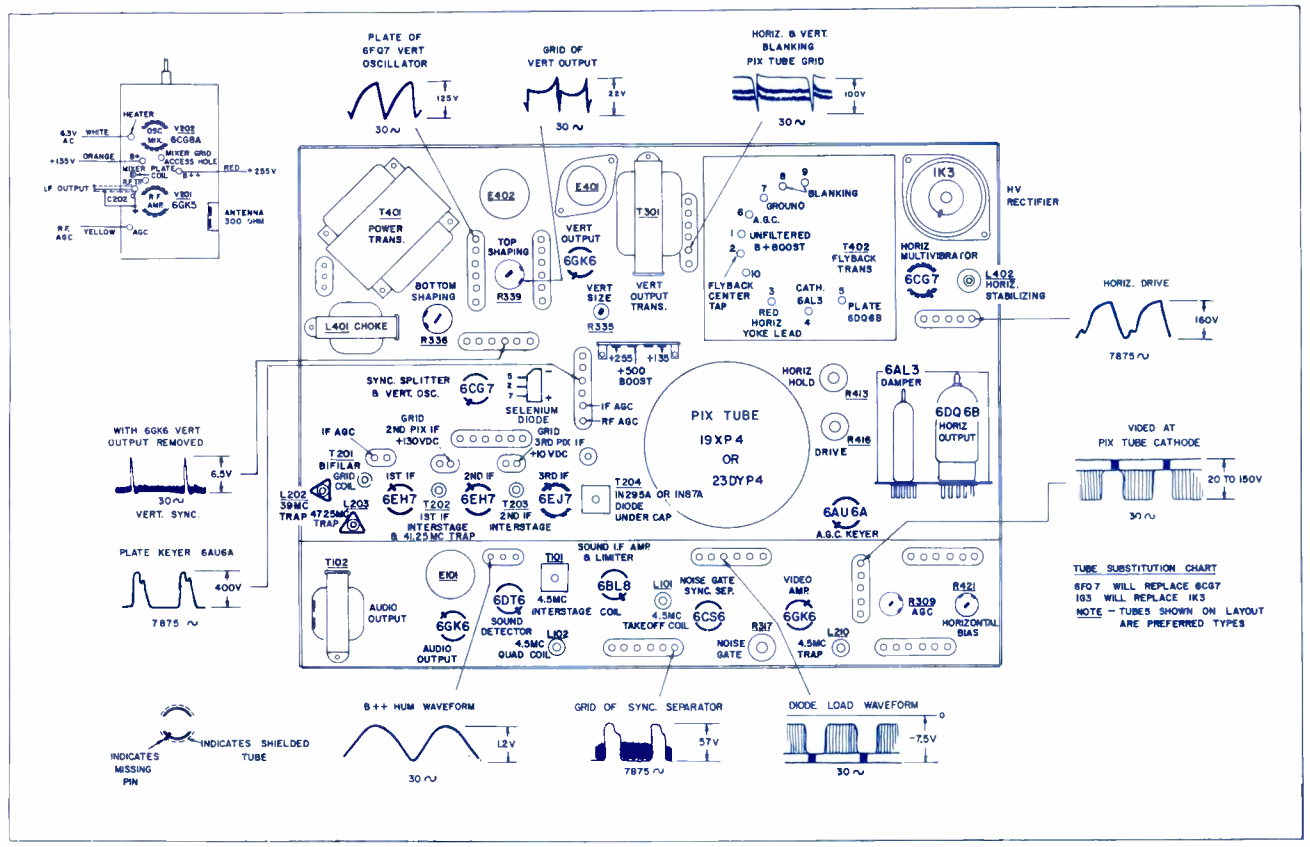


VERMONT MK II BEACOURT MK II

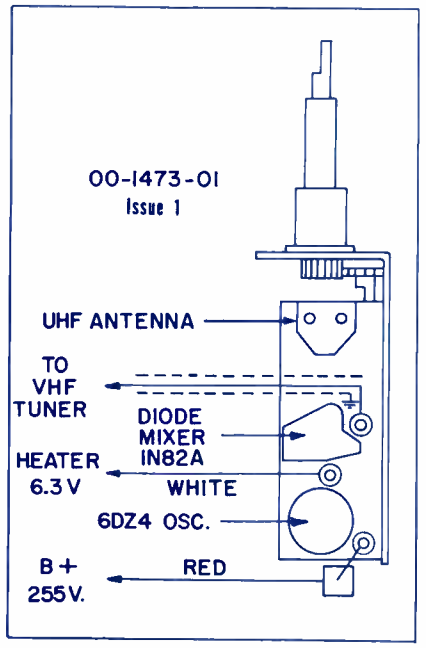


More Data on Opposite Page

TOP CHASSIS VIEW



UHF TUNER LAYOUT



ELECTROHOME
TV Chassis
Models Chancellor TV, TVU, TVCU, Vermont MKII, MKIIU, MKCU, Beaucourt MKII, MKIIU, MKIICU.

ELECTRONIC TECHNICIAN
TEKFAX
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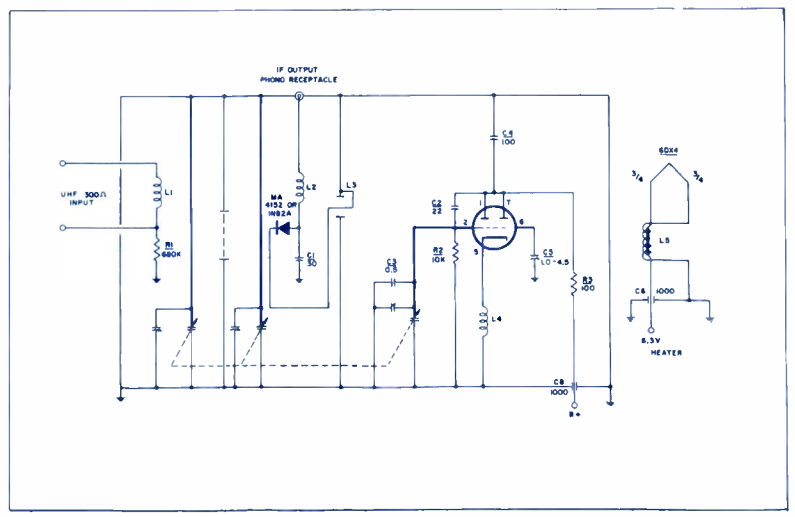
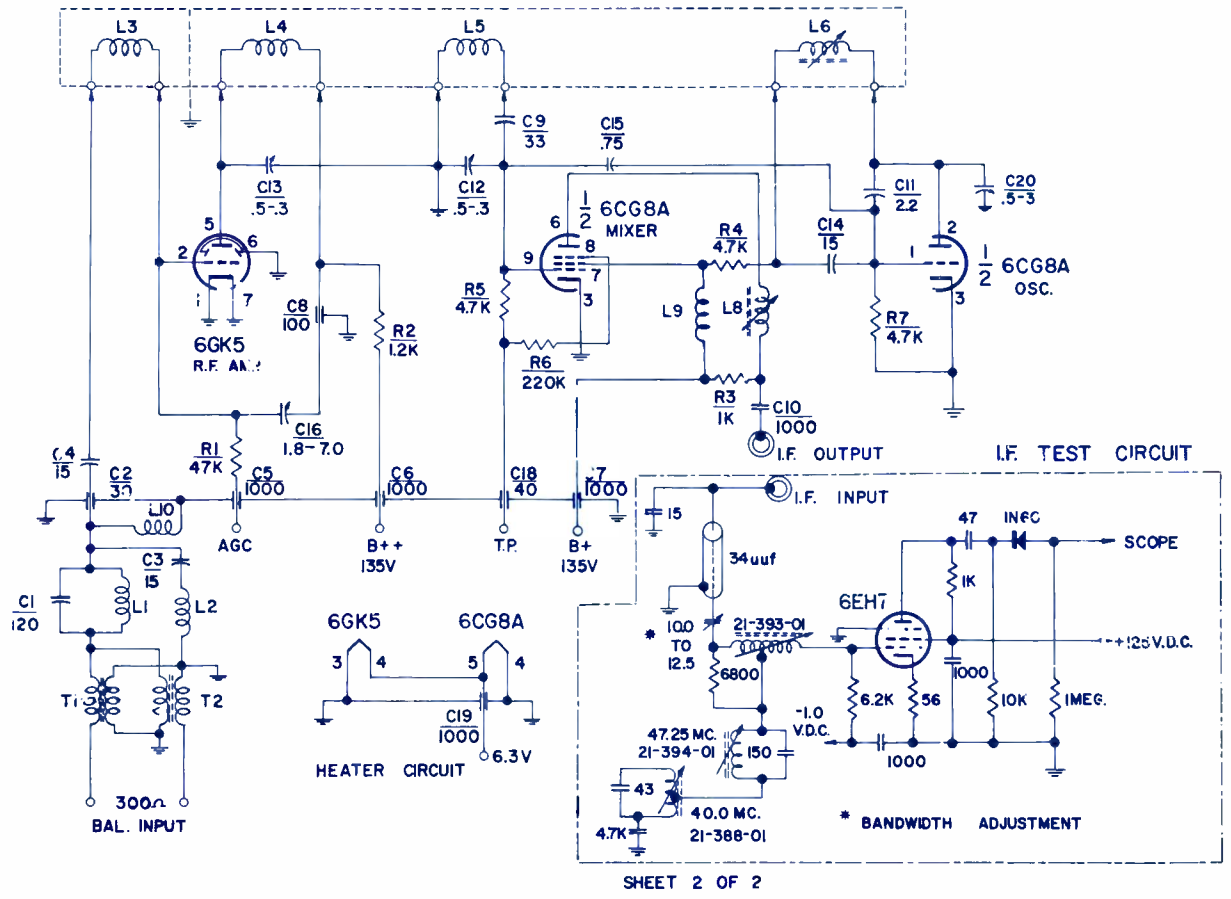
March 1964

UHF TUNER SCHEMATIC



TUNER SCHEMATIC



SHEET 2 OF 2

842

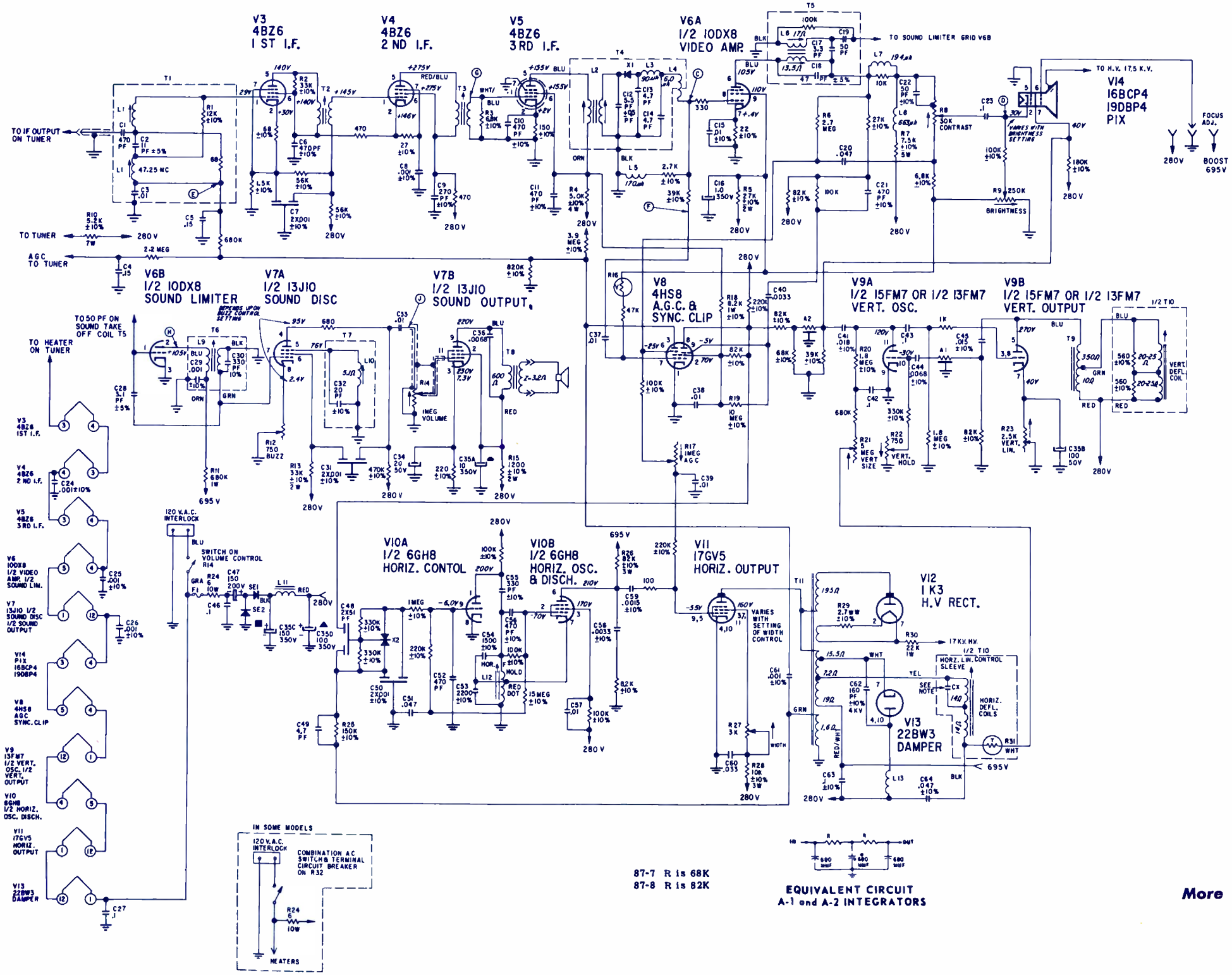
ELECTRONIC TECHNICIAN

TEKFAX

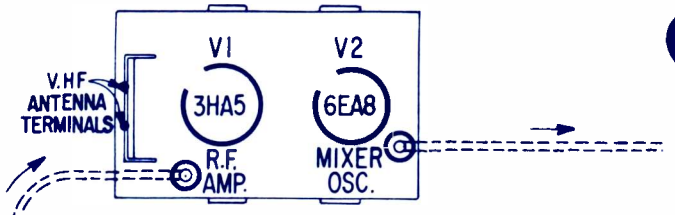
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR FIVE NEW SETS

March 1964

ZENITH
TV Chassis
14L20

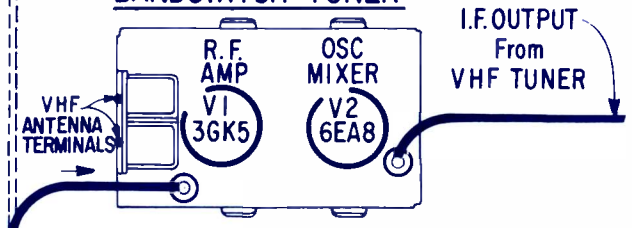


BANDSWITCH TUNER (SOME MODELS)



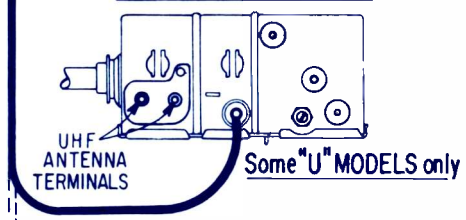
175-701 Thru 175-730 Incl.

BANDSWITCH TUNER

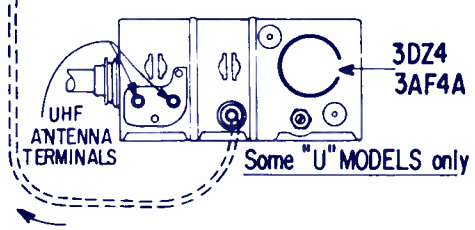


175-281 Thru 175-283 incl.
175-284

UHF TUNER 175-17



UHF TUNER 175-15



TUBE POSITIONING GUIDE
(KEYWAY)

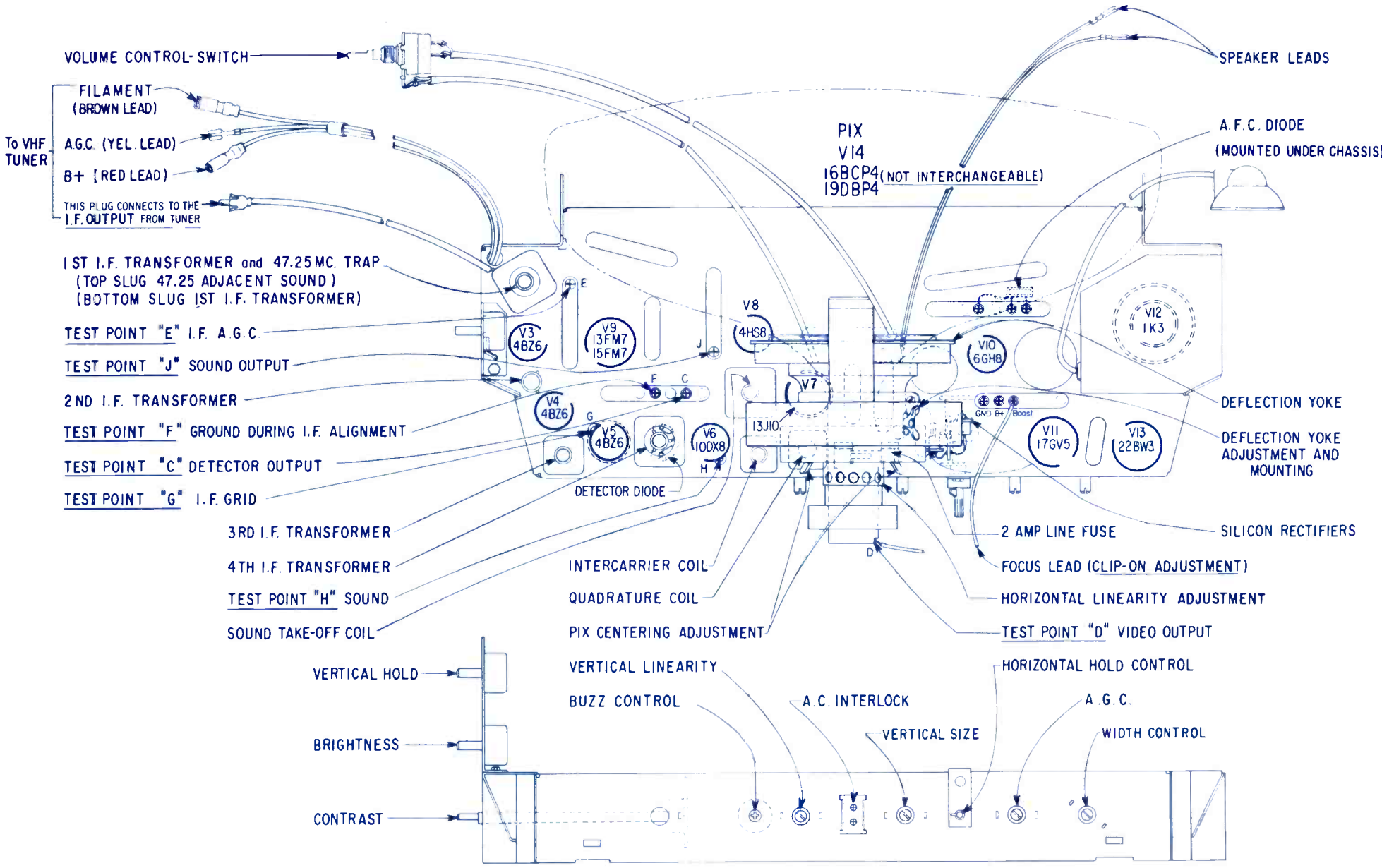
More Data on Opposite Page

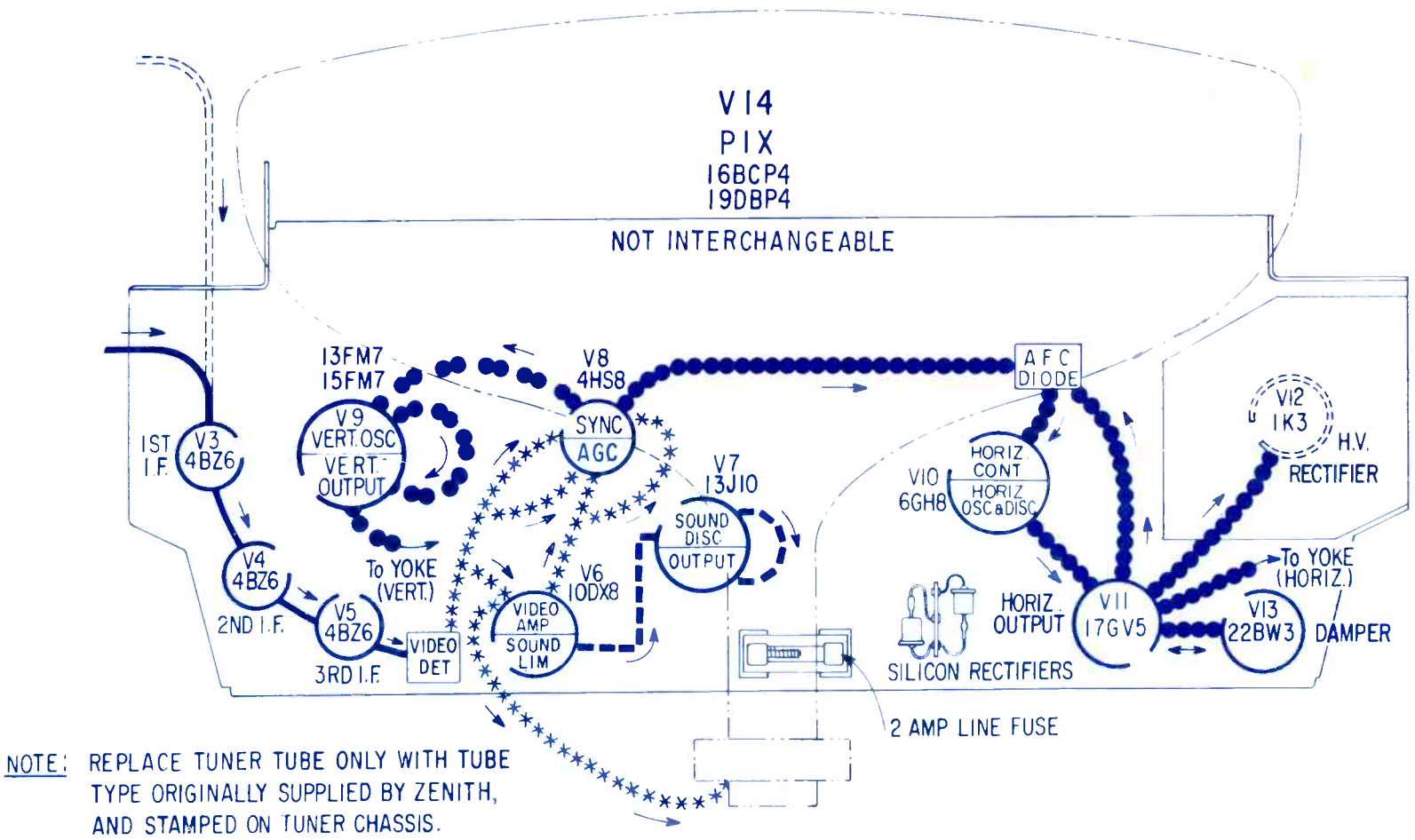
ELECTRONIC TECHNICIAN
TEKFAX
842

ZENITH
TV Chassis
14L20

March 1964

More Data on Opposite Page





NOTE: REPLACE TUNER TUBE ONLY WITH TUBE TYPE ORIGINALLY SUPPLIED BY ZENITH, AND STAMPED ON TUNER CHASSIS.

SOUND CIRCUIT ----------
COMPOSITE VIDEO **********
CYCLES 60 120 VOLTS

VERTICAL CIRCUIT ●● ●● ●●
HORIZONTAL CIRCUIT ●●●●●●●
INTERMEDIATE FREQUENCY ——

MODEL	WATTS	AMPS
14L20	155	1.45

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

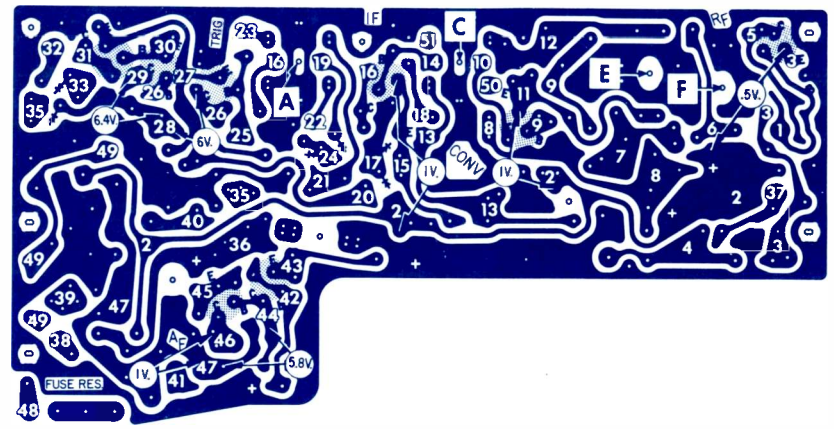
GROUP 139

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

843

DELCO
Cadillac Auto
Radio
Model 7286315

March 1964



SCHEMATIC
R. F. SECTION

NUMBERS ON PRINTED CIRCUIT BOARD CORRESPOND WITH NUMBERS IN CIRCLES ON SCHEMATIC DIAGRAM.

SCHEMATIC DATA

Voltages measured terminal to chassis with a volt-ohm meter —no signal and 12 volts applied to the radio. Use VTVM in Trigger Circuit.

Total battery drain 1.2 amps at 12 volts.

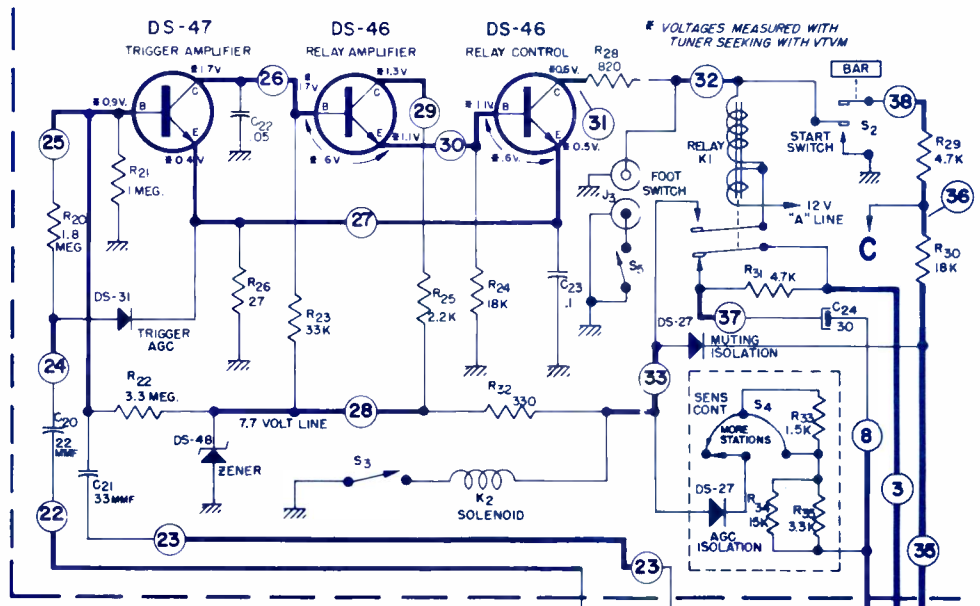
Tolerance on voltages ± 10%.

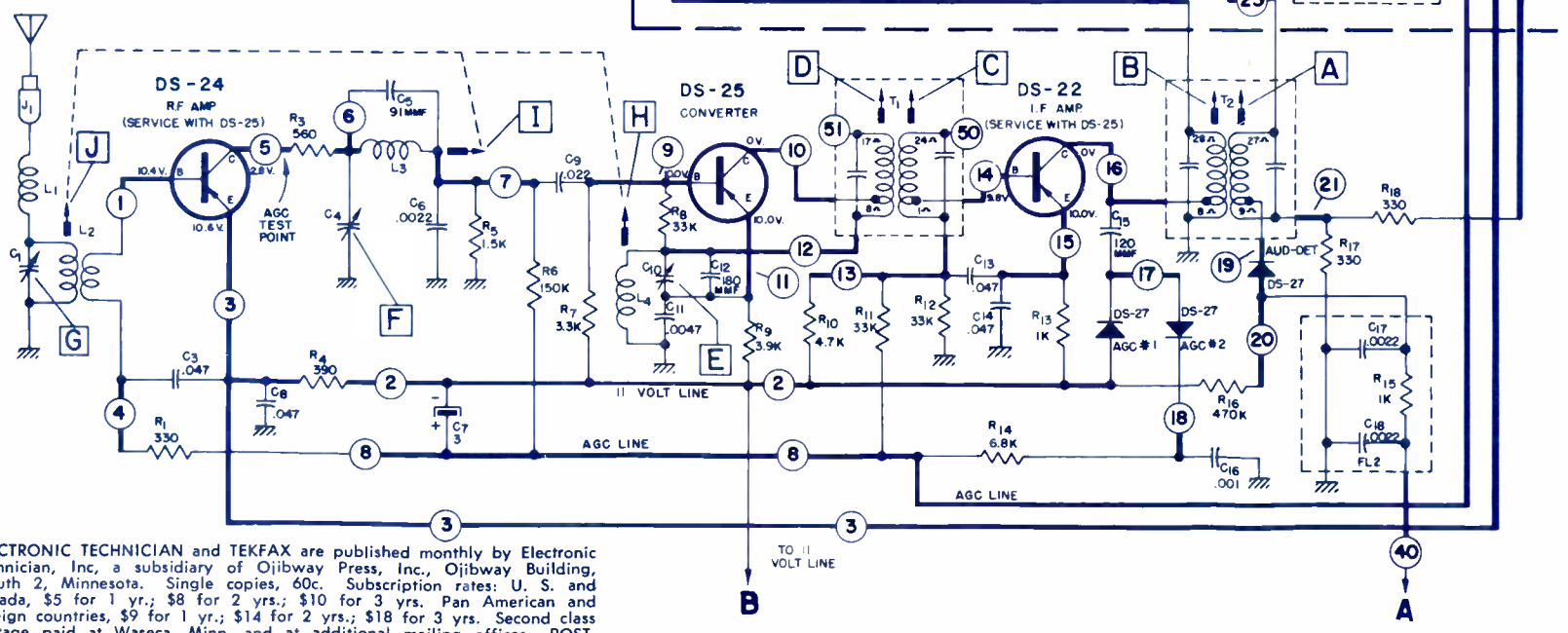
** Before measuring transistor voltage a 10 ohm speaker must be connected to the radio. If power transistor is replaced, adjust bias potentiometer to obtain proper collector voltage with 12 volts applied to radio. Voltage should be measured from power transistor case to ground.

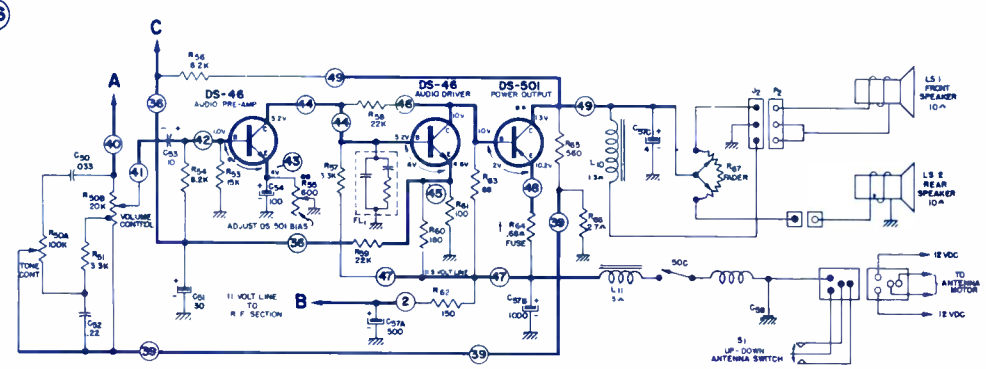
† Ill. #64 is a fuse resistor for the power transistor. Service with exact Delco service replacement.

Trigger voltages are read with a VTVM and with the tuner seeking. Use a Delco P-612 power supply or battery for proper tuner action.

TRIGGER CIRCUIT







SIGNAL INJECTION

ISLAND NO.	LOCATION	OUTPUT
46	Base of DS-501	Weak
44	Base of Audio Driver	Loud
42	Base of Audio Pre Amp	Very Loud
14	Base of I.F. Amp.	Louder
9	Base of Converter	Louder
1	Base of R.F. Amplifier	Very Loud

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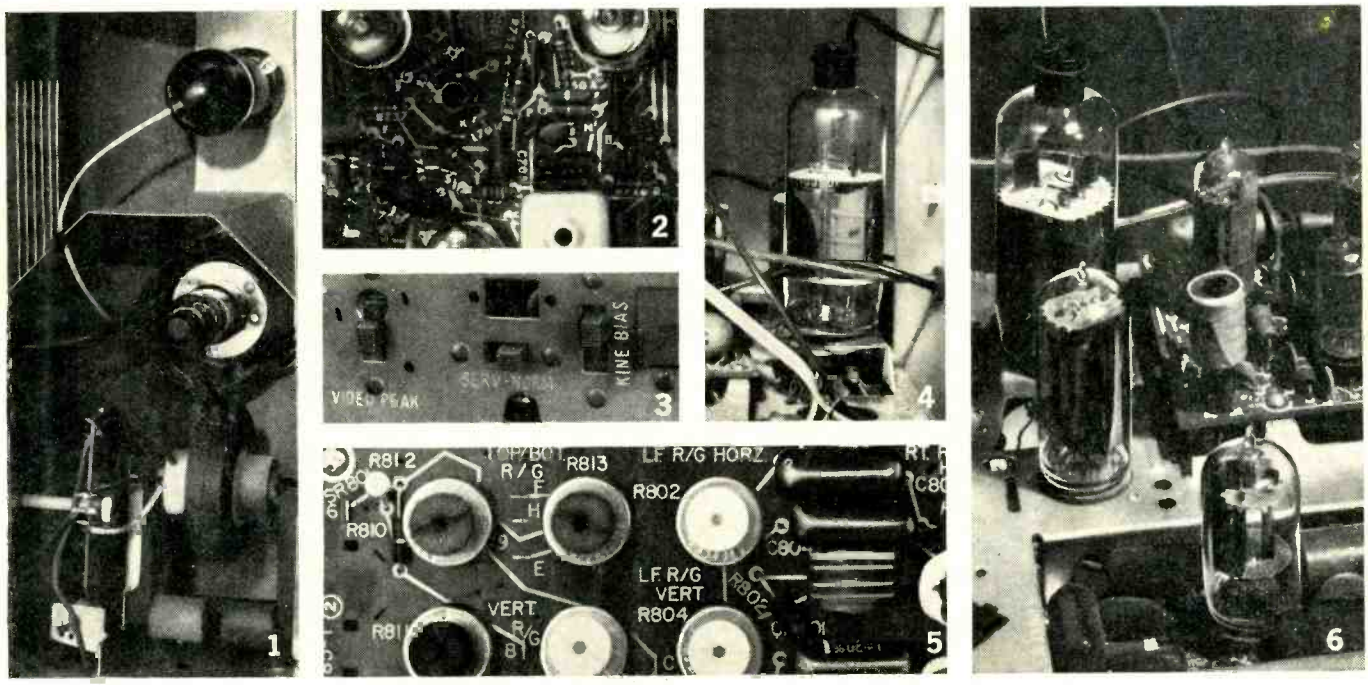
CTC 15 Color TV Chassis gives brighter, sharper picture; has greater reliability; is easier to service... than any previous RCA Victor Color TV Chassis!



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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)®

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

ELECTRONIC TECHNICIAN

MARCH • 1964 VOL. 79 • No. 3

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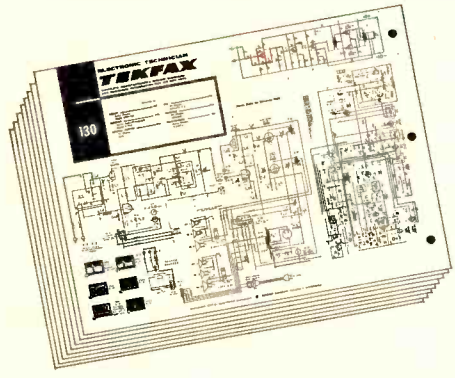
AUDITED PAID CIRCULATION ABC

COVER:
This month's cover showing Admiral's color TV was photographed for ET by Admiral Corp. Color television is no longer a multi-hued glint in 'egg-head' eyes. It has grown up and you're in the color-TV repair business—if you expect to stay in business. If your work has proven challenging in the past, you will find color even more fascinating. To help you participate successfully in this business we bring you a series of color-TV articles in this issue—beginning on page 45.

FEATURES

DEPARTMENTS

TEKFAX ..... 16 PAGES OF LATEST SCHEMATICS



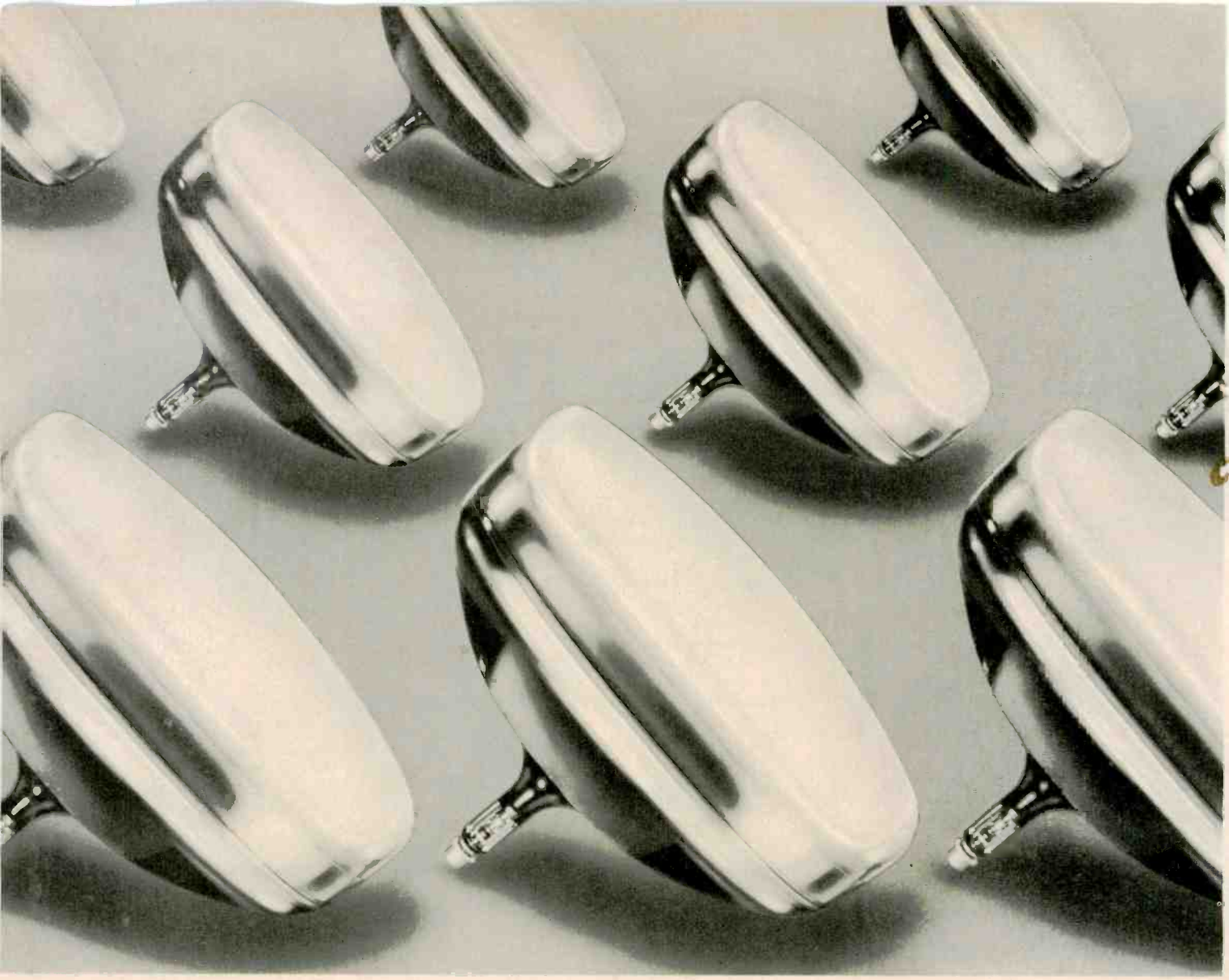
DELCO: Cadillac Auto Radio Model 7286315.

ELECTROHOME: TV Chassis Models Chancellor TV, TV U, TV CU, Vermont MKII, MKIIU, MKCU, Beaucourt MKII, MKIIU, MKIICU.

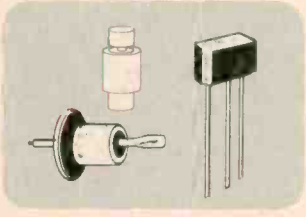
HEATHKIT: Color TV Model GR 53.

WESTERN AUTO: Tape Recorder Stock No. 4DC7260A.

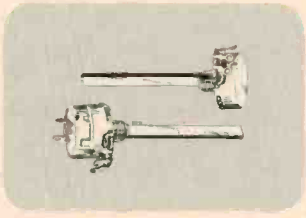
ZENITH: TV Chassis 14L20.



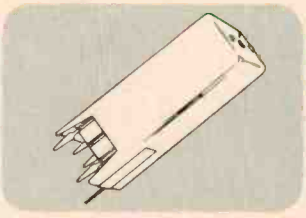
THE QUALITY OF YOUR SERVICE DEPENDS ON THE PARTS YOU USE...DEPEND



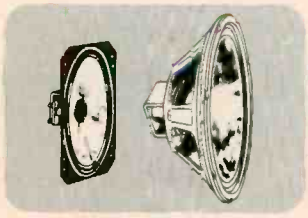
Diodes, Rectifiers, Condensers and Resistors
Complete variety for all makes and models.



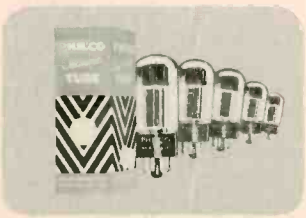
Universal Controls
With or without on-off switch. Standard taper, 3 inch shaft, half flat. 1 meg, 2 meg, 500 K. Complete selection. Fit Philco and other makes.



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

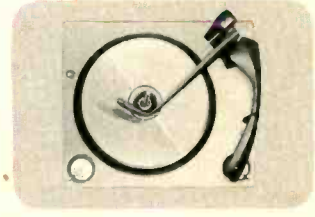
1. Philco has a nationwide network of Parts distributors—THERE'S one in your area.
2. Philco distributors are backed up by Parts Warehouses with millions of dollars in Parts inventory.
3. NEW Parts for NEW Philco models are shipped automatically along with the NEW products.
4. All Parts orders are handled 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.

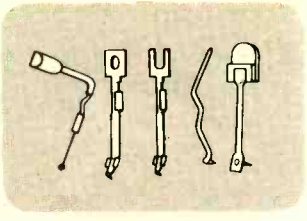
Customer Confidence Begins When You Use Genuine Philco Star Bright 20/20 Picture Tubes

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 • SPRAGUE Capacitors

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

- - - for more details circle 37 on post card

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

Definition

Two of your recent issues have carried several letters relating to the problem of estimates. In all these comments, a very basic point has been overlooked.

An estimate is an estimate, just that and nothing more. It is not intended to be a firm bid or quotation. Customers should be set straight on this from the beginning. The definition of the noun estimate in Webster's Unabridged Dictionary is as follows: "a valuing or rating in the mind; an approximate judgment or opinion as to value, degree, extent, quantity, etc.; a value determined by judgment where exactness is not sought or is not attainable."

In simple words, it is an educated guess, nothing more. The customer should be taught to think of an estimate as such, and not as a firm bid or contract price.

IRVING J. TONER
East Aurora, N. Y.

Farewell

I really do hate to say "Goodbye" to your interesting publication, but I have no time to read it, even if I did, I am not able to see well enough to derive any great amount of benefit from the reading. You see, the loss of the sight in one eye renders one 'monocular' and the perception of a third dimension is absent. It is no fun to poke a soldering iron into the innards of a TV and wonder if you are on a 400

"Would you prefer I fix it right away or fool around for the full half hour?"

WHY risk your reputation with "just-as-good" capacitors?

When you pay little or no attention to quality in tubular replacement capacitors, you leave yourself wide open for criticism of your work . . . you risk your reputation . . . you stand to lose customers. It just doesn't pay to take a chance on capacitors with unknown or debatable performance records when it's so easy to get guaranteed *dependable* tubulars from your Sprague distributor!

There's no "maybe" with these 2 great SPRAGUE DIFILM® TUBULARS!

The ultimate in tubular capacitor construction. Dual dielectric . . . polyester film and special capacitor tissue . . . combines the best features of both. Impregnated with HCX®, an exclusive Sprague synthetic hydrocarbon material which fills every void in the paper, every pinhole in the plastic film *before it solidifies*, resulting in a rock-hard capacitor section . . . there's no oil to leak, no wax to drip.

DIFILM® BLACK BEAUTY®
Molded Tubular Capacitors

The world's most humidity-resistant molded capacitors. Tough, protective outer case of non-flammable molded phenolic . . . cannot be damaged in handling or installation. Designed for 105°C operation with *no voltage derating*. . . will withstand the hottest temperatures to be found in any TV or radio set, even in the most humid climates.

DIFILM® ORANGE DROP®
Dipped Tubular Capacitors

A "must" for applications where only radial-lead capacitors will fit . . . the perfect replacement for dipped capacitors now used in many leading TV sets. Double-dipped in rugged epoxy resin for positive protection against extreme heat and humidity. No other dipped tubular capacitor can match Sprague Orange Drops!

For complete listings, get your copy of Catalog C-615 from your Sprague distributor, or write to Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts.

SPRAGUE®
THE MARK OF RELIABILITY

WORLD'S LARGEST MANUFACTURER OF CAPACITORS

6S-121-63

- - - for more details circle 42 on post card

MOVES YOU AHEAD WITH THE LOG-PERIODIC LPV-U®

$\frac{L_{(n+1)}}{L_n} = \tau$

TV ON CHANNELS 14 TO 83—PLUS 7 TO 13 VHF HIGH BAND PERFORMANCE!

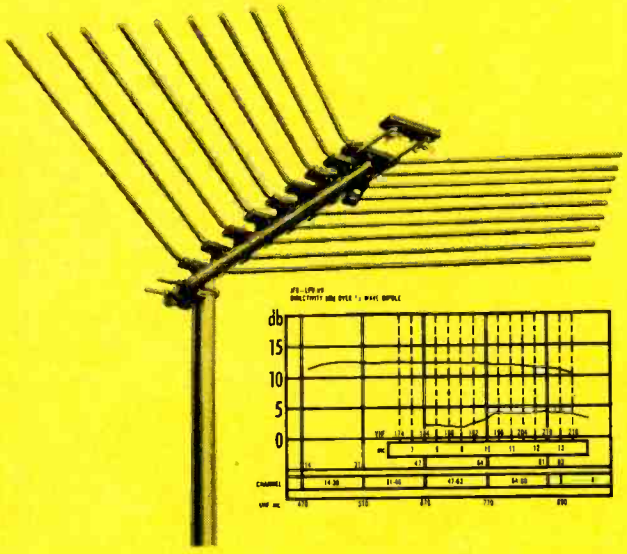
Development Laboratories of Champaign, Illinois . . .

Log-Periodic LPV formula of the Antenna Research Laboratories of the University of Illinois!

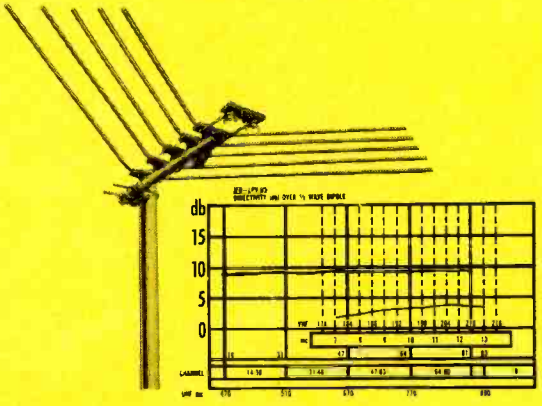
Formulated according to the **patented** geometrically derived **logarithmic-periodic** scale of the Antenna Research Laboratories of the University of Illinois, JFD UHF Log-Periodics give you a **custom**-antenna answer for any UHF reception problem. Four different models cover every location need . . . from the city to the fringes. Each is deluxe-constructed of Gold Bond Alodized aluminum in the same quality tradition of their famed VHF counterpart—the original LPV. Each delivers the same excellent values of gain, directivity, VSWR and impedance which are characteristic of JFD Log-Periodic performance.

TAME
Television Accessory Manufacturers Institute
KEEP TV FREE
FIGHT U-PAY TV

Model LPV-U9 For Local-Suburban Areas (up to 40 miles)



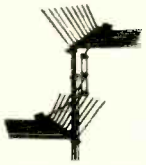
Model LPV-U5 For Local-Suburban Areas (up to 25 miles)



EXCLUSIVE FREQUENCY INDEPENDENT STACKING FOR + 3 db UHF GAIN AND + 1½ db. ch. 7 to 13 GAIN

Frequency independent Log Periodic stacking preserves the LPV-U's excellent impedance match and maintains constant gain and uniform operation.

No. J187 Stacking Transformer $3.00 List



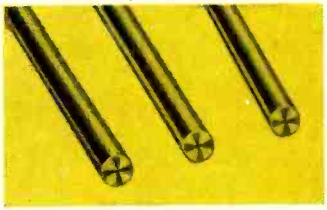
EXCLUSIVE DUO-ORIENTING STACKING — ELIMINATES NEED FOR ROTORS

Any two LPV-U's (same or different) can be oriented in different directions, when mounted together with special J185 special stacking transformer without a rotor.

No. J185 Duo-Orienting Stacking Transformer $2.50, List

SOLID ALUMINUM ALTERNATING FEEDER HARNESS

STAINLESS STEEL TAKE-OFF TERMINALS & STRAIN RELIEF



GOLD ALODIZED SOLID ALUMINUM ROD

MINIMUM WIND AND ICE LOADING AREA

- **30%** to **50% more effective** gain and directivity than corner reflectors and grid screen bowtie-reflectors.
- **Excellent front-to-back ratios** and 300 ohm impedance match maintain exceptionally **flat** response across **entire** UHF band.
- Also deliver superior reception on **VHF Channels 7 to 13**—an exclusive JFD feature.
- **Pinpoint horizontal beam sharpness** seeks out desired UHF channels—shuts out ghosts and interference.
- Elements made of indestructible **gold alodized solid aluminum** rod that knows no climate, stays like new.
- **Factory-preassembled—not a single screw to tighten**—just unpack and mount on mast in seconds.
- **Rigidized one-piece** construction — all parts are fixed in position.
- **Bantam-sized inline design** offers least wind and ice loading area.
- Can be stacked for **additional +3 db UHF** and **+1½ db Channels 7 to 13 gain where needed.**

JFD ELECTRONICS CORPORATION
15th Avenue at 62nd Street, Brooklyn, N. Y. 11219
JFD Electronics-Southern Inc., Oxford, North Carolina
JFD International, 64-14 Woodside Ave., Woodside 77, N. Y.
JFD Canada, Ltd., 51 McCormack Street, Toronto, Ontario, Canada- 401-144 W. Hastings Street, Vancouver 3, B.C.

- - - for more details circle 29 on post card

LETTERS TO THE EDITOR

v B+ or a ground terminal.

I can think of only one service ET could do for me. I'd like to get my equipment converted to cash. I would like to offer my equipment for sale.

H. VERNE ARNEY
P. O. Box 1195
Indianapolis, Ind. 46206

• *Thanks for the loyalty. Hope you have luck selling your equipment.—Ed.*

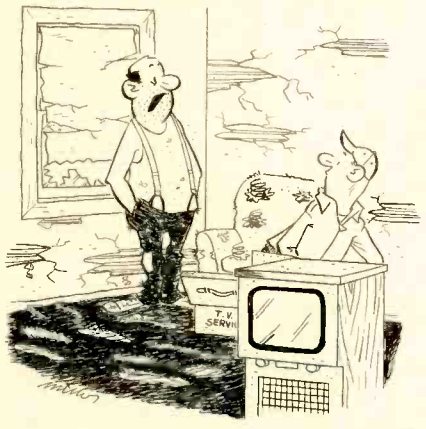
Wants "Industrial" Articles

I've been following ET with interest and appreciation for about two years now, and I think it's one of the best aids around for the independent technician. It's a morale-booster as well as an information source. But I do have one complaint.

I wish you'd do the same for the guy who also works on general and industrial electronic gear as you do for the fellow whose main business is TV, and whose main worry is that someone will ask him to fix a door-opener or burglar-alarm, or an off-brand ultrasonic cleaner made by somebody no longer in business. There's good profit in those sort of things (around this boating town, it's fathometers, direction-finders, etc.), and I think they're worth giving some thought to.

RONALD N. WALD
Northport, N. Y.

• *A primer on marine electronics is included in this issue. We will,*



"You accept personal checks?"

STOP! LOOK! SAVE!

All crystal controlled

A STANDARD COLOR BAR GENERATOR at 1/2 THE COST OF OTHERS

only $124.50

the all new SENCORE CG126 STANDARD COLOR BAR GENERATOR

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

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

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

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

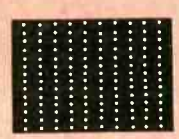
Exclusive adjustable dot size. The white dots can be adjusted to the size that satisfies your needs by a screwdriver adjustment on the rear. No need to argue about dot size anymore. Just select the size that you like to work with best.

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

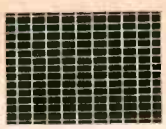
Reserved output on color bars for forcing signal through defective color circuits. The color output control is calibrated at 100 percent at the center of rotation, representing normal output. A reserve up to 200 percent is available on the remainder of rotation.

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

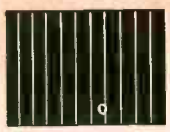
Ten standard keyed color bars (RCA type) that automatically provide all colors at specified NTSC phases . . . but without need of interpretation when servicing.



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



Stabilized crosshatch pattern for simplifying convergence adjustments.



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

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

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

SENCORE

426 SO. WESTGATE DRIVE • ADDISON, ILL.

- - - for more details circle 39 on post card

LETTERS TO THE EDITOR

in the near future, cover some of the others you mention. If it's in the best interest of ET readers, you can bet we'll cover it.—Ed.

Majestic Cabinet

I am trying to obtain a cabinet for a Majestic Portable Model 5M1. Can you or any of your readers give me any information as to where I may obtain a cabinet?

DELBERTO WYNTER
Bronx, N. Y.

Moblie Changer Manufacturer

In answer to a letter in your January issue: There is a mobile record player made by Norelco which plays only one record at a time. It is distributed by Royal Radio in Royal Oak, Mich. Also, an automatic unit, the Arc, that plays 14 records is available from

Norelco mobile record player.

M. G. Co. Inc., 15302 S. Illinois St., Paramount, Calif.

GENE ELLIS
Pontiac, Mich.

'Puffer-Uppers'

. . . I find ET very interesting and informative and for this reason I cannot afford to miss a single copy of my subscription.

CESAR T. JARQUE
Manila, Philippines

I have subscribed to and read other electronic publications, but none have approached ELECTRONIC TECHNICIAN.

G. V. WELLMAN
Washington, D. C.

FREE LITERATURE

POWER TOOLS **300**

Catalog covers electrical power tools and accessories. Detailed specifications of drills, roto-hammers, saws, planes, routers, sanders, etc. Includes battery-powered equipment and many other items. Skil.

TRANSISTOR TESTER **301**

A four-page brochure describes an in-circuit transistor tester. Discusses the method used to balance the effects of circuit shunting to provide a qualitative and quantitative evaluation of the transistor's condition. A circuit diagram and application notes are included. TEQUIPCO.

CB ANTENNAS **302**

A new 16-page catalog pictures and describes a complete line of antennas and accessories for citizens band radio. Includes electrical and mechanical specifications and prices

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

Featuring Automatic Controlled Rejuvenation

The All New
SENCORE
CR125 CATHODE RAY TUBE TESTER

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

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

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

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

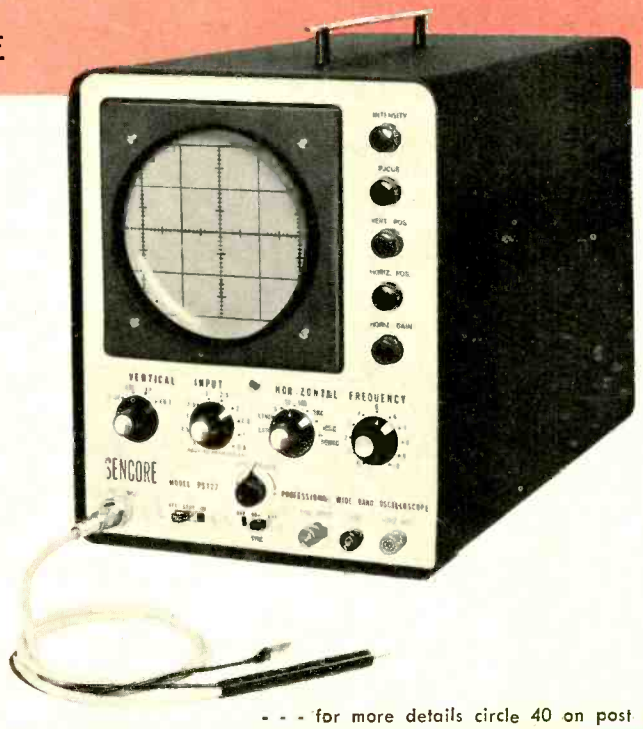
Checks Each Gun Individually In Color Tubes.

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 40 on post card

FREE LITERATURE

of base station and mobile antennas and accessories. Hy-Gain.

CARTRIDGE CATALOG **303**

Catalog No. 6801 covers the entire cartridge field. Includes snap-in cartridges and brackets, Dyna-points and brackets, standard cartridge line and complete cross reference. Jensen Industries.

RECORD/PLAYBACK COMPONENTS **304**

A brochure describes the technical features of record/playback components. Includes details and diagrams of tailor-made components for console or equipment cabinets. Also includes helpful hints on the care and evaluation of record/ playback systems and recommendations for a basic stereo record library. Empire Scientific.

CB TRANSCEIVER **305**

A two-page, multi-color specifications bulletin features CB transceiver system which uses double sideband reduced carrier. The transmitter and receiver portion of the system is fully described in detail. Regency.

LOUDSPEAKERS **306**

An article reprint by E. Villchur is titled "How To Get The Most From Your Loudspeakers." Presents simple principals and methods of setting up loudspeakers in a living room—placement, phasing, level adjustment, etc. Acoustic Research.

TOOL BOXES **307**

A full-color brochure shows finish-painted tool-boxes designed for do-it-yourself mounting on pick-up trucks of any year, make, model or color. Morrison.

ANTENNA ROTOR **308**

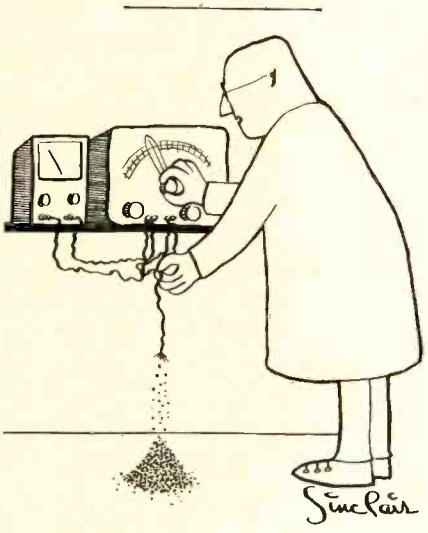
A brochure illustrates the electrical and mechanical specifications of a transistorized, automatic antenna rotor. Alliance.

CRYSTAL DIRECTORY **309**

Directory lists transmitter and receiver crystals for citizens band use. Lists CB set manufacturer, model, holder type, channels and crystal frequencies. Texas Crystals.

TEST INSTRUMENTS **310**

Catalog AP21 covers integrated analyst instruments for B/W and color TV and transistor radios; tube and CRT testers, plus other instruments for TV-radio technicians. B & K.



"Free-air resonance . . . 16 cycles per second."

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.*

IF PRODUCT OR PERFORMANCE DEFECTIVE • Good Housekeeping • GUARANTEES REPLACEMENT OR REFUND TO CONSUMER

CHANNEL MASTER

ELLENVILLE
NEW YORK

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NEW BOOKS

THE GENTLE ART OF MATHEMATICS. *By Dan Pedoe. Published by The Macmillan Co. 143 pages, hard cover. $3.95.*

Although there is nothing new about the "game-approach" to mathematics, this is a fresh variation of the "play school" concept. Even the book's title has a refreshing connotation. Chapter I is titled *Mathematical Games.* And it does explain some interesting games that can be played with numbers. But, essentially, it deals with aspects of the powers of ten, binary and ternary decimal notation, rational and prime numbers and Pythagoran theorems. Chapter II, *Chance and Choice,* reviews the laws of probability in simple and easy-to-understand terms. Another chapter explores number classes—transfinite, finite and infinite series, natural and positive rational numbers. Remaining chapters—nine in all—continue with the scheme of relating practical mathematical problems to games or to everyday familiar symbols with results that are thoroughly successful. The bitter pill that mathematics is to some is sugar coated in a way to promote the learning process and make it not only entertaining but thoroughly palatable to everyone.

TRANSISTOR SPECIFICATIONS AND SUBSTITUTION HANDBOOK. *By the Editorial Staff, TechPress Publications. 96 pages, soft cover. $1.95.*

This booklet contains specifications for over 4000 transistor types from all over the world. An introductory section tells how to use the book, details ten pitfalls to avoid in using power transistors; provides manufacturer codes; includes explanations of transistor symbols, transistor specifications and diagrams 98 transistor bases. The book can be used to accurately select transistor replacements by looking up the unit to be replaced and comparing its characteristics with those units in the immediate area. Information is compiled directly from manufacturer's transistor design sheets.

MARINE ELECTRONIC EQUIPMENT. *by Elbert Robberson. Published by John F. Rider Publisher, Inc. 206 pages, soft cover. $4.50.*

Every experienced marine electronic equipment technician who glances through this book will quickly recognize it as a well prepared work—done by a "shirt-sleeve" author with wide experience. This is no "ivory tower" rehash. Its 18 chapters cover every type of modern electronic equipment that technicians can expect to find made fast to present-day pleasure boats—14-footers, sailboats, outboards or inboard cruisers—that ply our sea coasts and inland waterways. Two-way radiotelephones, echo sounders, radio direction finders, automatic pilots, radar, Loran and Consol receivers—everything is here. And every tool and piece of test equipment you will need, in-shop and outside, for repairs and service calls, for installation and adjustment, are

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

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

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

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

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

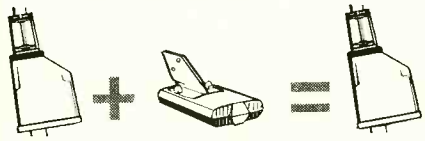
model 9520

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

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

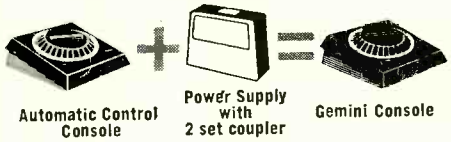
NEW! Unique Gemini Rotator/Amplifier.
... for fast, neat 2-*in*-1 installations that save you money 4 ways.

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



Tenn-A-Liner Rotator + Fringe-Area Booster = Gemini Rotator-Amplifier

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



Automatic Control Console + Power Supply with 2 set coupler = Gemini Console

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

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

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

CHANNEL MASTER ROTATORS

ELLENVILLE, NEW YORK

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NEW BOOKS

itemized. You are told how to make modulation percentage measurements, transmitter adjustments, how to install antennas and what types to use. One highly valuable chapter reveals the types of electrical systems found aboard boats. Powerboat antennas and grounds are detailed. Another covers radiotelephone installation and service. Chapters deal at length with Radio Direction Finder principles, DF Installation and Calibration, Echo Sounders, Automatic Pilots, Small-Craft Radar, Loran, Electrical Interference Suppression and other subjects. The book is well illustrated with photos, drawings and schematics.

COMING EVENTS

March 10-12: Spring Conference Electronic Industries Association, Statler-Hilton Hotel, Washington, D. C.

March 17-20: 11th Annual Spring Convention, Audio Engineering Society, Roosevelt Hilton, Los Angeles.

March 23-25: Annual Meeting, Institute of Printed Circuits, Barbizon Plaza, N. Y.

March 23-26: 1964 International Convention of the IEEE, Hilton Hotel and Coliseum, N. Y.

April 3-5: Great Lakes Division convention, ARRL, Statler Hilton, Detroit, Mich.

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

May 19-21: 18th Annual Armed Forces Communications and Electronics Association Convention, Sheraton-Park Hotel, Washington, D.C.

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3. Advertising Support—Year 'round advertising, publicity, public relations and promotional campaigns have established Lafayette and its franchised dealers as America's primary source for hi-fi and electronics.
4. Protected Territory—Yours will be the ONLY franchised Lafayette Radio Electronics Associate Store in your marketing area.
5. Marketing Guidance—Our program helps you set up a complete operation. We'll help you select the right location, or evaluate your present one, design your store for maximum profit and assist in selecting your inventory. We'll show you how to deal with customers, how to hold a loyal following, how to build a successful business and maintain it. We will always be available to help you in any way possible. In short, we want you to be a Lafayette Success Story.

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EDITORS' MEMO

3-D Television?

Recently, Look Magazine published a picture which may prove to be a boost for printing and advertising. The picture gives a third dimensional illusion on a flat piece of paper coated with an embossed plastic film.

But this may be more than a boost for the publishing business. In fact, at least on the surface, it seems that the principle could be applied to TV. Few will argue that TV's next logical step is to 3-D pictures and stereo sound.

Third dimensional TV pictures are not just a "blue sky" dream either. They are actually being used in science and industry. All systems to date, however, use a cumbersome dual camera and a dual CRT receiver which is viewed on a common plane through special glasses. Some industrial systems utilize one camera and monitor by splitting the image through a lens and mirror system at the camera and putting them back together at the receiver.

Why not use this system? Simply because it's incompatible and expensive.

The Eastman-Look printing process works like this: A special camera takes the picture through a screen which breaks the picture into hundreds of vertical parallel lines. The picture is then printed in the normal fashion. Then a special embossed plastic coating is added. The plastic focuses the light on the vertical picture lines and gives a 3-D illusion.

Now suppose the TV camera were aimed through a screen to break the picture into vertical lines. The plastic film could be secured to the CRT to give the desired 3-D illusion.

One problem is immediately apparent, however: The bandwidth of the TV set is not capable of the resolution required to reproduce the vertical picture segments. But this is not a good reason to junk the idea. The CRT is capable of very high resolution. Perhaps the information could be multiplexed.

There are many bridges to cross before compatible 3-D TV is a practicality. But in all, there are probably far fewer bridges to cross than there were for color TV. Width stabilization, linearity, and B/W-color compatibility are just a few.

The new printing process may not be the key to 3-D TV but you can bet that some sort of 3-D TV will be practical in the near future. Unless you only have one eye, don't knock it.

Until 3-D TV is here, however, we have to put up with the more mundane problems facing us. Some of the more pressing color problems are discussed in this issue. And, for the technician residing near a water recreation area, read the primer on marine electronics.

Vin Bare

WIN

THE FABULOUS INTERNATIONAL RECTIFIER 1964

'ROUND THE WORLD CONTEST!

CONTEST OPEN TO ALL ELECTRONIC TECHNICIANS AND ENGINEERS

Enter As Often As You Wish!

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

INTERNATIONAL RECTIFIER 1964 'ROUND THE WORLD CONTEST RULES:

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

ACT TODAY!

1964 'ROUND THE WORLD CONTEST

INTERNATIONAL RECTIFIER CORP. / 233 Kansas Street, El Segundo, California

Add a 4th line to this limerick:

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

Date_____

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(Please Print All Answers)

Name of my I.R. distributor_____

Distributor's address_____

City_____ State_____

My distributor salesman_____

My name_____

My address_____

City_____ State_____

Additional entry forms available from all electronic distributors.

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INTERNATIONAL RECTIFIER

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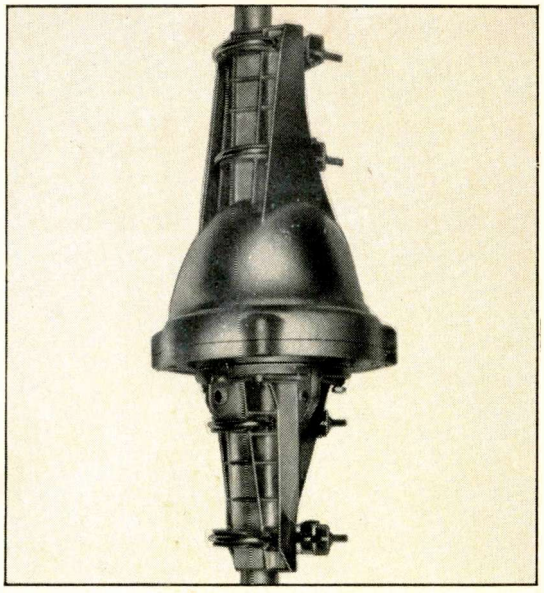
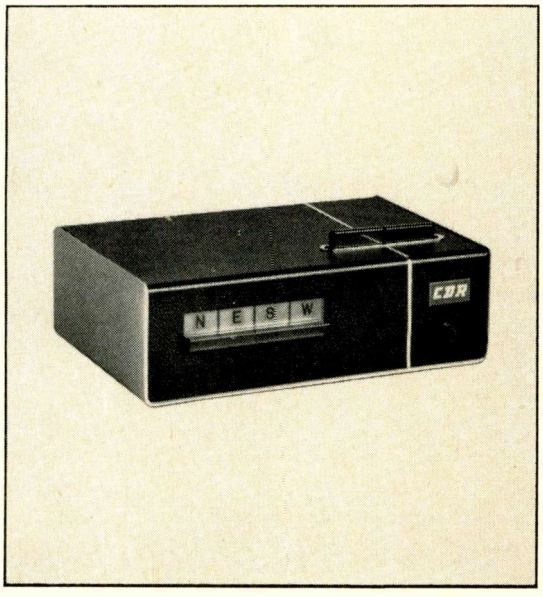


the best TV/FM Rotor on the market...



now has the best-looking control on the market.

Meet the new TR-2C

Cornell-Dubilier's new TR-2C manual rotor system combines the proven reliability of the CDR bell rotor with the clean, crisp good looks of a control box designed by Raymond Loewy/ William Snaith Inc.

The compact TR-2C control box (only 6¼x4¼x2⅜) blends with any decor. Its quiet elegance is highlighted by satin aluminum sides. The wraparound case of patterned black vinyl-clad steel is trimmed in silver.

Getting precise antenna direction with the TR-2C is a snap. Just give the control bar a feather light touch. The feel is decidedly positive. Muted lights make checking rotor position easy. For added safety, a red light indicates end-of-rotation.

Naturally, the heavy duty rotor delivers the reliable CDR features you expect: in-line, weather-proof construction; built-in 6½" ball thrust bearing; and more than four times the rotational torque of competitive rotors.

For a close look at the remarkable TR-2C rotor system, drop by your distributor. Or write us. Cornell-Dubilier Electronics, Division of Federal Pacific Electric Company, 50 Paris Street, Newark, New Jersey 07101.

CDE CORNELL-DUBILIER

INNOVATION WITH RELIABILITY

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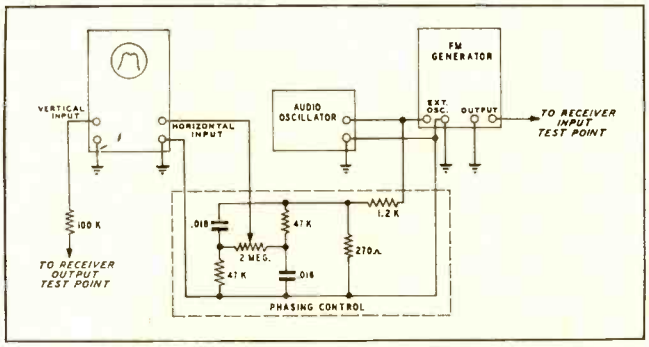
TECHNICAL DIGEST

AIRLINE

FM Section of TV Combination Models WG-5914-5944A; 5974A-6814A; 6944A-6974A—FM Alignment Setup

Set selector switch to FM position and apply the FM signal from the signal generator to the chassis and points indicated in the service instruction booklet.



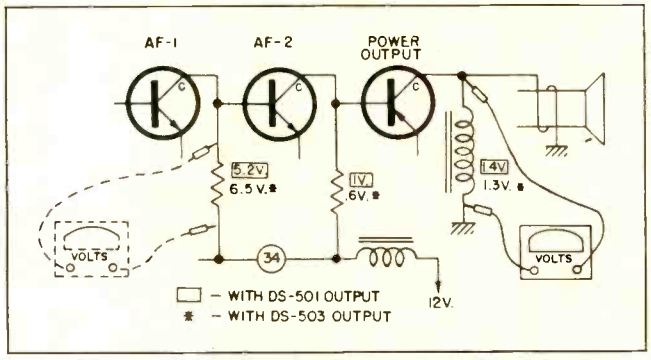
Airline FM alignment setup

Use each specified test-coupling as indicated. This equipment, including a phasing control and audio oscillator, is required as shown when the FM generator is externally modulated. Adjust the internal and external phasing control so that the pattern and retrace form a single figure on the scope. If a 10.7 Mc marker is available, all alignment adjustments should be made so that the 10.7 Mc marker appears in the center of the scope pattern.

DELCO

All 1964 Pushbutton and Manual Tuning Auto Radios—Dead Radio Checks

First, isolate the problem to either the audio section or the radio's "front end." If the front-end is OK, proceed as follows: Check the output transistor collector voltage. It should be about 1.3 v (depending on transistor type), with 12 v applied to the radio. If the output transistor collector voltage is normal, then AF-1 and AF-2 current flow is normal. If the output transistor collector voltage is very low, the transistor could be shorted, the .68Ω fuse resistor could be open, current of AF-2 could be low, or AF-1 current could be high. If the output transistor collector voltage is very high, the transistor could be leaky, AF-2 current could be high, or AF-1 current low. Current flow of audio transistors is checked by measuring voltage across the collector load resistance of each transistor (see illustration); the higher the voltage, the greater the current flow. Leaky AF-2 or open AF-1 causes high output voltage.



Delco auto radio transistor checks for dead radio.

GENERAL ELECTRIC

TV Chassis QX Models M500X—Horizontal Pulling

This may not be caused by a defective tube or component. The left side of the picture is affected and is characteristic of 60 cps hum in the horizontal sync circuits. The raster edge remains straight. Make a test with the scope on Pin 10 of V8A. If 60 cps hum is observed, check pin 3 of V8B with a VTVM to ground. A reading of 500K indicates leakage. This symptom is caused by a leakage path from pin 3 of V8B to the adjacent filament circuit copper pattern. This leakage is caused by a resin build-up, and should be corrected by scraping if necessary, then cleaning with alcohol. Be sure the entire area between the filament copper pattern and the pins of V8 is cleaned of excess resin.

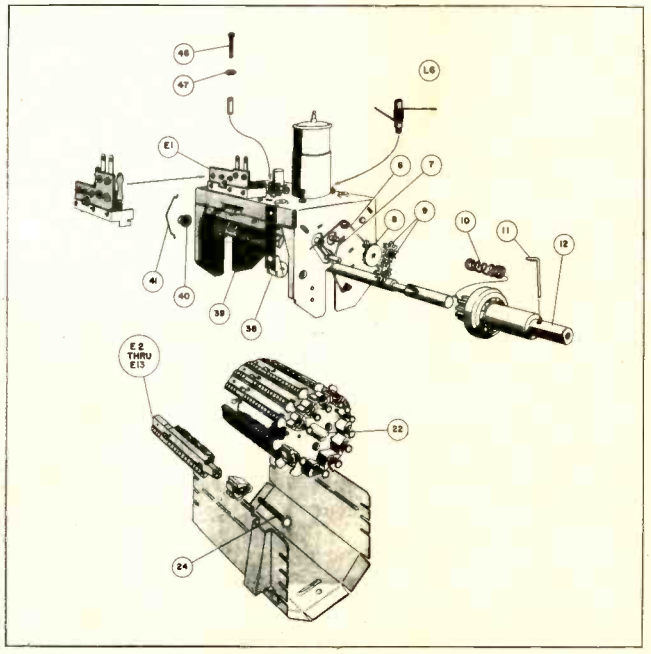
MOTOROLA

TV Chassis TS-908 Models 23CK37, 38, 39, 40, 42, 44 & 46—Tuner Disassembly

1. Remove tuner cover (23).
2. Remove the front shaft tension spring (7).
3. Remove the rear shaft tension spring (4) and shaft bearing (400).
4. Remove the shaft and strip support assembly (22).

All components are now accessible for replacement or repair. If parts are replaced, exact lead and

TECHNICAL DIGEST



Motorola tuner assembly.

parts placement, lead length and dress, should conform to the original in every respect. A pencil sketch noting layout and spacing is often helpful. Tuner alignment should be checked after repair work is finished. Tuner shield and all screws should be in place and tightened when checking tuner alignment. The turret contacts are silver with a gold wiped deposit for long trouble-free operation. Extreme care should be exercised when servicing to prevent touching or splashing solder on the contacts. Finger smudges on the contacts will cause corrosion which may result in noisy or intermittent operation. Reassemble tuner in reverse order of disassembly.

PHILCO

All 1963 "L" Line TV Chassis—Noise Control Setup (Where Used)

The "Noise Control" adjusts the noise inverter stage bias for optimum performance at all signal levels. The adjustment procedure follows:

1. Adjustments to be made with a weak signal.
2. Shunt the noise control with an 18K resistor.
3. Adjust the fine tuning control until a slight sound beat appears in the picture.
4. Adjust the noise control until the picture appears "watery." This condition is caused by the noise inverter stage passing some inverted sync signal.
5. Back off the noise control slightly until the picture is steady. Remove the 18K resistor.

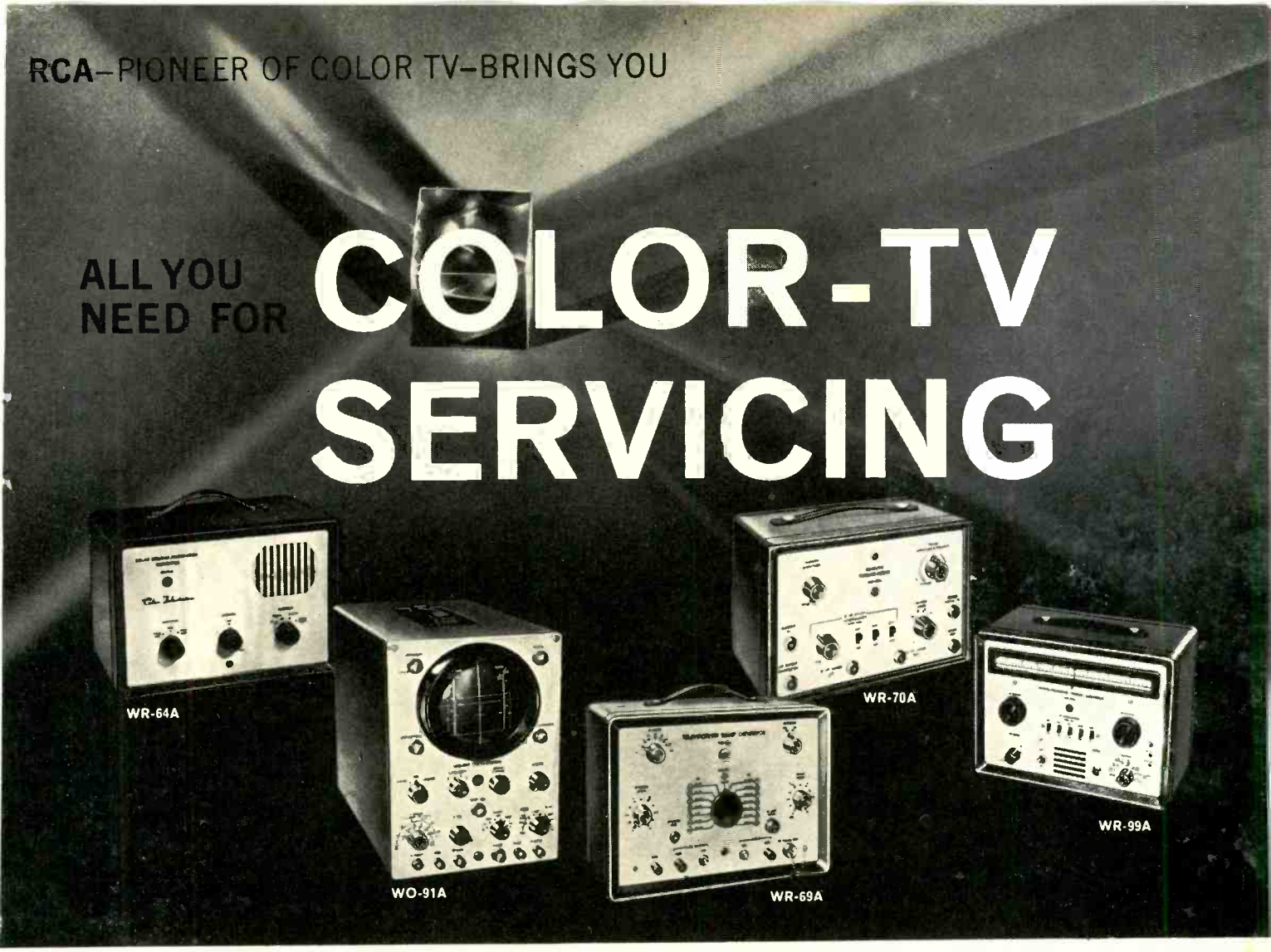
RCA

Some 1964 TV Models—UHF Tuner

Some models in the 1964 sets have a UHF tuner, KRK112. It uses either a 2DV4 or 6DV4 nuvistor oscillator tube. This tuner is very similar to the KRK 66, which is also used in 1964 sets. Since the alignment procedure and adjustments are so similar in each of these tuners, the service data including KRK 66 information may be used when a KRK 112 is found in a particular receiver. The low band tracking adjustment C58 (shown in service data drawings) and the B+ input terminal are relocated on the KRK 112. Also a more rigid oscillator inductor is used and the high band oscillator tracking tab, C62, is provided with a foam cushion to minimize microphonics. Both high band RF and mixer tracking adjustments are accomplished by air-gap capacitors C50 and C52 respectively. High band local oscillator adjustment is made by the placement of the tab, C62. Low band oscillator adjustment is made by C58 which is accessible from the outside of the tuner case. Because of its simple, sturdy construction and few components, this tuner is relatively service free. The tube, mixer crystal, and the comparatively straight-forward local oscillator circuitry should be checked carefully when servicing is required. Mechanical malfunctions can usually be found by simple visual inspection. The best method of checking oscillator action is by measuring crystal current or the injection voltage. This is measured across a 100Ω resistor connected from the center conductor of J50 to ground. Injection voltage should be between .07 and .30v.

RCA–PIONEER OF COLOR TV–BRINGS YOU

ALL YOU NEED FOR COLOR-TV SERVICING



RCA Color-Bar/Dot/ Crosshatch Generator

Low-cost, lightweight, portable instrument that provides all essential Color-TV test patterns. Simple to operate: only 3 controls. RF output leads connect directly to antenna terminals of receiver; no external sync leads required. Crystal-controlled signals assure rock-steady patterns, free from "jitter" and "crawl." Extra-wide-range chroma control. Generates:

- **Color-bar pattern**: ten bars of color, including R-Y, B-Y, G-Y, I and Q signals spaced at 30° phase intervals for checking phase and matrixing, and for automatic frequency and phase alignment. Permits accurate alignment of the "X" and "Z" demodulators which are used extensively in RCA Victor and many other makes of color TV receivers
- **Crosshatch pattern**: a grid-like pattern of thin sharp lines for adjusting vertical and horizontal linearity, raster size, and overscan
- **Dot pattern**: a pattern of small sized dots facilitating accurate color convergence adjustments

$189.50* with output cables.

RCA 5-Inch Oscilloscope for Color-TV

A wideband scope excellent for checking colorburst signals and general troubleshooting of wideband color circuits and other electronic equipment. Muilt-scale calibrated graph screen makes measurement of peak-to-peak voltage as easy as with a VTVM.

- New 2-stage sync separator assures stable horizontal sweep lock-in on composite TV signals
- Dual bandwidth: 4.5 Mc at 0.053 volt rms/in. sensitivity. 1.5 Mc at 0.018 volt rms/in. sensitivity
- Continuously adjustable sweep frequency range: 10 cps to 100 Kc
- 3-to-1 voltage-calibrated, frequency-compensated step attentuator for "V" amplifier
- Simplified, semi-automatic voltage calibration for simultaneous voltage measurement and wave-shape display
- Vertical-polarity reversal switch for "upright" or "inverted" trace display

$249.50*, including direct/low capacitance probe and cable, ground cable, and insulated clip.

RCA Television FM Sweep Generator

Specifically designed for visual alignment and troubleshooting of color and black-and-white TV receivers, and FM receivers. The RCA WR-69A has pre-set switch positions for all VHF TV channels, FM broadcast band, and TV video, chrominance, and IF frequencies. The WR-69A has these important features:

- IF/Video output frequency continuously tunable from 50 Kc to 50 Mc
- Sweep-frequency bandwidth continuously adjustable from 50 Kc to 20 Mc on IF/Video and FM; 12 Mc on TV channels
- Output level—0.1 volt or more
- Attenuation range: TV channels, 60 db IF/Video, 70 db FM, 60 db
- Return-trace blanking
- Two adjustable bias voltages on front panel

$295.00* including all necessary cables.

RCA RF/VF/IF Marker Adder

Designed for use with a marker generator (such as RCA's WR-99A) and a sweep generator (such as RCA's WR-69A), this instrument is used for RF, IF, and VF sweep alignment in both color and black-and-white TV receivers. In visual alignment techniques, it eliminates distortion of sweep response pattern. Important features:

- Choice of four different marker shapes provided by front panel switch for different types of sweep-response curves and for positive and negative sweep traces
- Provides very high-Q markers of high-amplitude and narrow bandwidth
- Complete front panel control of marker shape, marker amplitude, marker polarity, sweep amplitude, and sweep-trace polarity

$74.50* complete with cables.

RCA Crystal-Calibrated Marker Generator

Supplies a fundamental frequency RF carrier of crystal accuracy for aligning and troubleshooting color and B&W TV receivers, FM receivers and other electronic equipment in the 19-260 Mc range. Combines functions of multiple-marker generator, rebroadcast transmitter, and heterodyne frequency meter.

- Highly stable output
- May be calibrated at 240 separate crystal check points—accurate calibration provided at 1-Mc and 10-Mc intervals
- Matched-impedance pad-type attenuator and double shielding of the oscillator provide effective attenuation of all frequencies
- Most-used IF and RF frequencies are specially indicated on the dial scale
- Sound and picture carrier markers available simultaneously

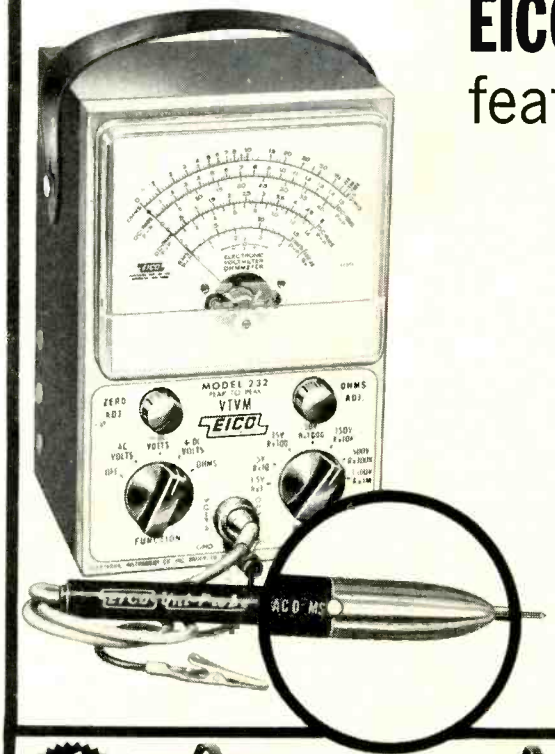
$242.50* complete with output cable and phone tip.

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

The Most Trusted Name in Electronics

*User Price (Optional)

BEST PROFESSIONAL VTVM VALUE



EICO 232 peak-to-peak VTVM featuring exclusive Uni-probe® (U.S. Pat.)

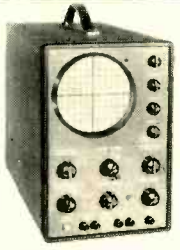
Deluxe VTVM for color & B & W

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.**

EICO KITS FOR 1964

BEST BUY SCOPES

EICO 460 WIDEBAND 5" SCOPE For color & black-and-white TV servicing. Easily reproduces 3.58 mc color TV synchronizing burst. Vert. amp. flat from DC to 4.5 mc, usable to 10 mc; 25 mv rms/inch sensitivity. Horiz. amp. flat from 1 cps to 400 kc; 0.6 v rms/inch sensitivity. Automatic sync. Sweeps from below 10 cps to 100 kc. Kit **$89.95**; Wired **$129.50.**



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.**

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

EICO 667 DYNAMIC CONDUCTANCE TUBE & TRANSISTOR TESTER Combines mutual conductance test with a peak emission test—gives a single reading of tube quality. Also spots bad NPN and PNP transistors by gain and leakage tests. New 1964 design has sockets and settings for the latest receiving types, including 5 and 7-pin nuvistors. Also tests novars, 10-pin miniatures, and compactrons, many low-power transmitting and special-purpose tubes, voltage regulators, electron-ray indicators, etc. Multi-circuit lever switch; 13 tube-element pushbutton switches. 4½" meter; roll-chart in snap-in window. Kit **$79.95**; wired **$129.95.**
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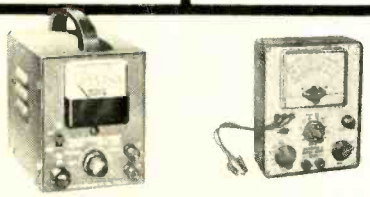
FOR COLOR AND B & W

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



TOP-NOTCH TRANSISTOR TESTING TEAM
EICO 1020 POWER & BIAS SUPPLY with 0.005% ripple. Continuously variable metered output voltage, 0-30 VDC at 150 to 300mA. Kit **$23.95**; wired **$29.95.**
EICO 680 TRANSISTOR & CIRCUIT TESTER Measures basic characteristics of signal and power transistors. Provides DC current, DC voltage (20K ohm/volt), and resistance ranges normally needed for transistor work. Kit **$25.95**; wired **$39.95.**

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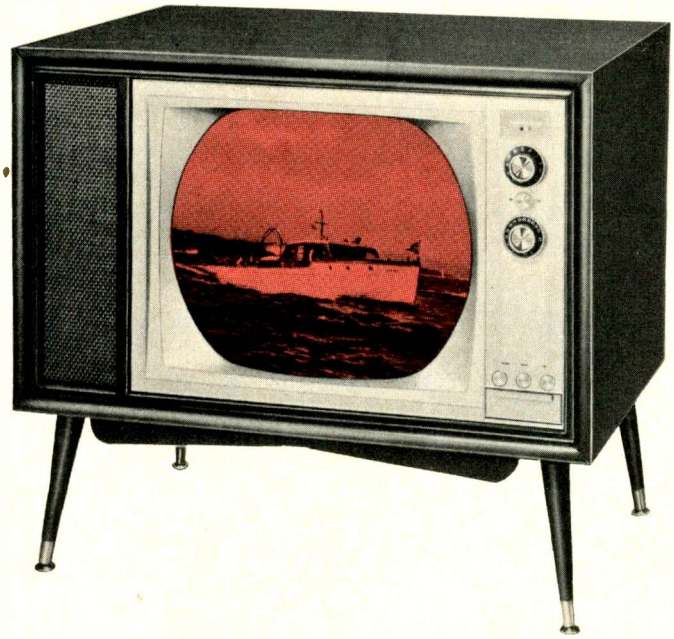
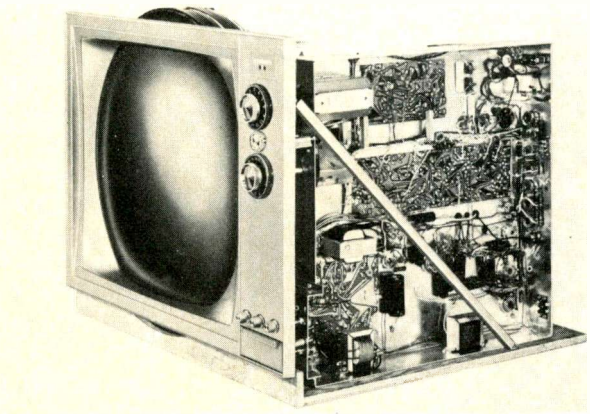


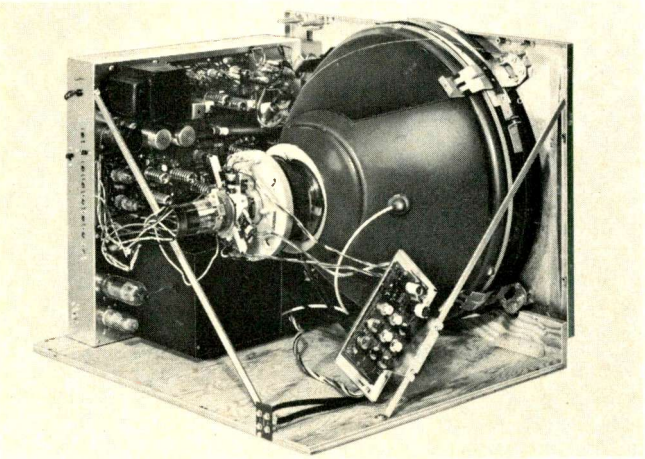
The Heathkit color set assembled and installed in the pre-built cabinet. This unit has the UHF tuner installed.



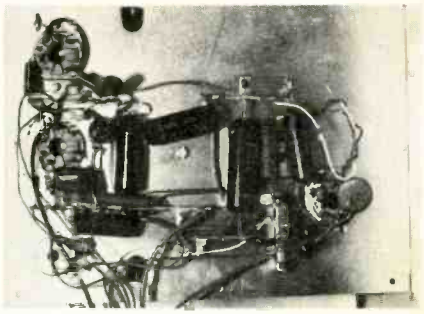
Bottom view of the chassis shows easy-to-service layout.

KIT BUILDERS Have Graduated!

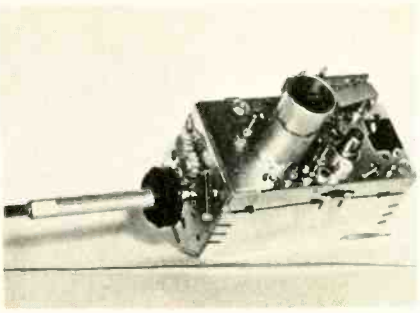
Kit builder interest has shifted to a new color TV kit. Don't let this set stump you the first time you're called on to repair it



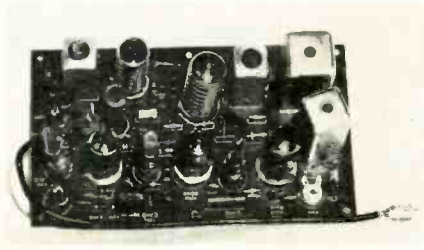
Rack mounted '63 model. Convergence controls are permanently mounted on brace as shown. The '64 models all employ the wall mount within the cabinet.

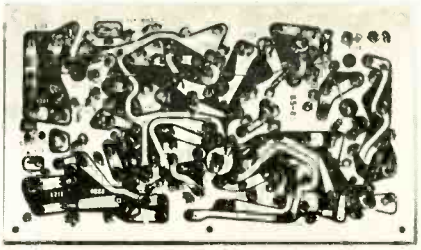


Horizontal and high voltage section comes assembled with a bundle of loose-ended wires.

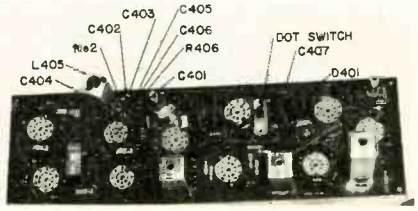


Standard Kollsman tuner employs a nuvistor. Fine tuning is accomplished by push-to-engage knob.

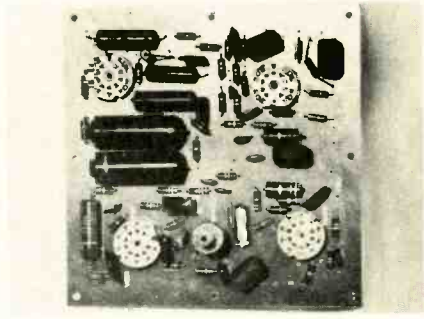


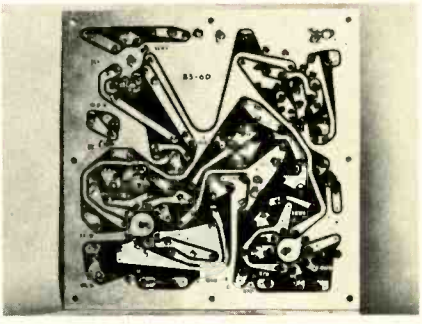


As is the tuner, the IF strip comes assembled and completely aligned. The tuner and IF are aligned together for optimum performance.

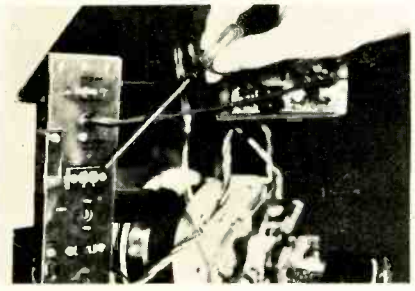


Before being wired into the set, the chroma section looks like this. Components shown with arrows are part of the dot generator.

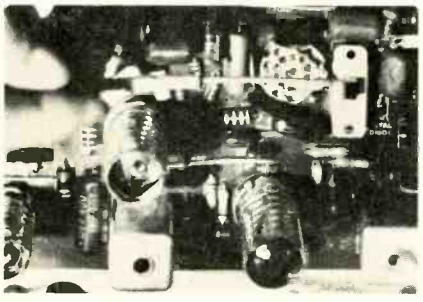




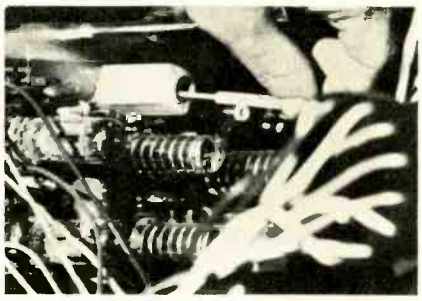
Sound-sync circuit board before installation on the chassis.



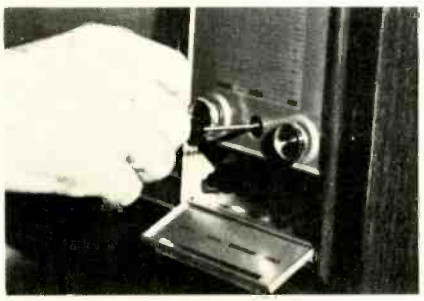
Terminal strip on rear of chassis is in series with filaments. When the link is opened, 13 amps are available to operate degaussing coil.



Video amplifier tube is removed to show dot generator 'normal-dots' switch on chroma board.



Ringing coil in dot generator circuit is adjusted for sharp, arrow "dots" while tuned to a strong signal.



Color killer adjustment is critical. It is best done on color programs. Adjustment is located under 'color' knob.

Electronic kit construction has reached the apex of complexity in home electronic equipment with the introduction of a color TV set which "anyone" can build. ELECTRONIC TECHNICIAN editors have constructed one and believe that *most* anyone *can* build it. It is obvious, however, that many of these sets will find their way into service shops to be turned on for the first time while others will be brought in in various stages of completion or destruction.

Even disregarding these distinct possibilities, since the construction of one of these kits does not make a TV technician out of a novice or kit-builder, these sets will be "brought in" for service in months and years to come. Since service literature for these sets is frequently not readily available except with the set, some of its idiosyncrasies are presented here. The entire schematic may be found in the Tekfax section this month.

From the average builder's viewpoint, the manual should be more than adequate to get the set properly assembled. The biggest headache you will encounter as a direct result of the builder's inexperienced labors

will be locating bad solder joints. There are hundreds of solder joints in the set and the layman may leave a few cold joints. If you are called on to repair one of these sets, you should not only repair the obvious fault but look for bad joints or other troubles which may cause future problems.

You should be able to get a manual from the set owner. It will be your most valuable tool in troubleshooting the set. The manual supplied with the kit has about 130 pages, only about 30 of which are actual assembly instructions. The remainder is devoted to theory of operation and alignment. In fact, if you are still hazy on color TV operation, the manual may be an interesting addition to your technical library. It is available from the manufacturer, Heath Co., Benton Harbor, Mich., for only $2.

The most unique feature about the set is its built-in test equipment. Simple circuitry generates a pattern which is more than sufficient to properly converge the set. Location of this circuitry is shown on the chroma board in the accompanying photos. Basically, the generator is a simple ringing circuit neon oscillator. The circuit output is clipped by a diode to sharpen the "dot" edges and is applied to the video amplifier input. A switch located on the chroma PC board defeats the oscillator for normal viewing.

The set's engineers used RCA's high voltage and deflection components and circuitry as well as an RCA preassembled convergence board. The R-Y, B-Y demodulator system was also used but the similarity ends here.

To employ an automatic color control (ACC), two stages of chroma amplification are used. Because of this an increase delay is necessary and a 1.2 μsec delay line is employed.

One of the new frame grid tubes is used in the video amplifier circuitry, a 12GN7, which has a Gm of 33,000.

The tuner and IF strip come preassembled and aligned in matched pairs and should not be suspected of trouble except as a last resort.

Audio circuitry employed is the same as that used in the manufacturer's B/W set. Though the deviation for a sound TV signal is only 25 kc, the amplifier is broadbanded to about 100 kc. A single ended output is used but about 12 db of feedback is employed to give good sound. For those that still want more, a Hi Fi output is available so the sound can be played through existing Hi Fi equipment.

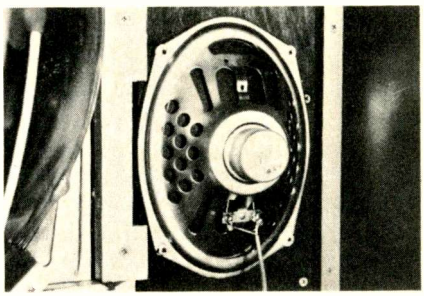
Early sets off the packaging line sold for $349, plus $20 for the UHF tuner, if desired; $49 for the cabinet and speaker kit, or $4 for the wall mount kit. The 64 model, available the first of April, however, must include the UHF tuner so other improvements were also included.

All sets sold after the FCC's April 1 deadline for UHF will be priced at $399. This includes the speaker kit, the wall mount kit which will be used in the cabinet as well and the UHF tuner. The new UHF tuner is transistorized. The cabinet price remains at $49.

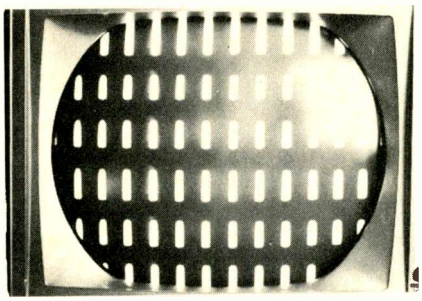
The new model will be much easier to service: the entire unit including the CRT can be pulled from the cabinet for maintenance.

Some sets had insufficient width where borderline voltages were

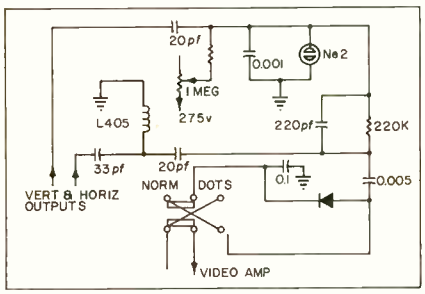
Continued on page 90



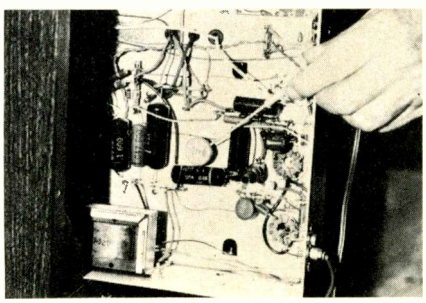
Special shielded speaker is used in cabinet model so convergence and purity are not upset by stray magnetic field.



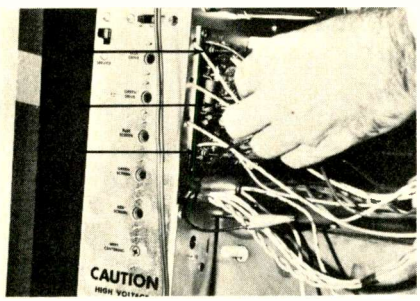
"Dot" pattern using the internal generator. Brightness and contrast control dot size which are shown at maximum.



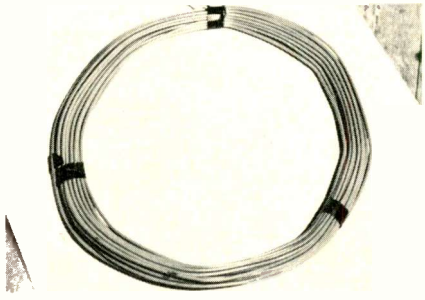
Circuit used in the built in dot generator is a simple neon oscillator triggered from horizontal and vertical pulses.



Insufficient width can be corrected by installing a capacitor across horizontal yoke above or below chassis.



Two permanently installed clip leads are used to kill CRT guns. Three 100K resistors pointed out by arrows are test points.



Degaussing coil supplied with kit is connected from terminal G on rear of chassis to ground with the filament link removed.

Know what you have to do when a color receiver requires alignment

■ It is generally assumed that a technician knows how to align a black and white TV set. But don't be among those who shudder at the thought of aligning a color receiver that is compatible with black and white.

To quote one manufacturer, ". . . complete alignment of the color receiver should seldom, if ever, become necessary. In most instances, an alignment check may be all that is necessary, or alignment of only a portion of the receiver . . . the alignment of a specific section of the receiver can be performed separately without interfering with other circuits."

We can rest assured that if alignment *does* become necessary, we need not fear disrupting something else. Portions of the color receiver are going to need this service from time to time and only one thing is pertinent—care must be taken to obtain the best possible results. The procedure, as we shall see, varies considerably from that of the monochrome receiver.

Alignment areas that we are primarily concerned with in color sets compared to B/W sets are: (1) Video IFs and traps; (2) color sync and demodulation; (3) color amplifiers; (4) horizontal sweep. Although the video IF section is common to color and B/W, together with tuner RE and sound sections, video IFs are included here because the alignment approach is somewhat different on color sets than on regular B/W.

Test Equipment

Equipment needed includes: (1) VHF, UHF sweep and marker generator capable of producing sweep and marker frequencies through the RF, IF and color amplifier ranges, with a sweep width variable up to at least 8 Mc to get display of the various response curves. The generator should include a crystal calibrator for accuracy. (2) Oscilloscope with a flat vertical amplifier frequency response to at least 3.6 Mc and a horizontal sweep of at least 100 kc. A detector probe is also needed for color amplifier alignment. (3) VTVM, with a high voltage probe capable of handling up to at least 30 kv. A VOM with 0-3 ma and 0-300 ma ranges. (4) Color-bar generator capable of producing signals in accordance with NTSC standards. (5) Bias box, variable 0 to 20 volts.

Preliminaries

Always, before alignment is attempted on any portion of a color receiver, the system involved should be thoroughly checked out. Any attempted alignment of a section of the set containing a faulty component will produce negative results and the whole process will have to be repeated when the cause of trouble is corrected. Usual and routine checks involve visual inspection to determine if any parts are overheating, location of defective tubes, loose shields, poor solder connections, incorrect voltages, and out-of-tolerance resistances.

If, after a careful investigation, alignment does become necessary, we must then check high-voltage regulation and focus, purity, convergence and tracking before performing alignment. This is not critical, but it will help in viewing results during alignment procedure. (Check specific instructions of set manufacturer.)

Some manufacturers recommend removal of the horizontal amplifier tube while alignment is in progress. In the field, it has been found that this is not near as practical as just removing the plate lead from the tube and temporarily taping it over during alignment. (Check specific instructions of set manufacturer.)

Procedure

Tuner alignment is conventional for both B/W and color. The usual response curve is shown in Fig. 1. Since color receivers are using "gated grid" RF tubes for high gain, there may be a "variable wire capacitor," or gimmick, in the circuit instead of a padder for neutralizing the RF stage. The IF response curve in color sets must be broad and accurately shaped to properly pass the color information located in both low and high ends of the color-frequency spectrum.

One of the most informative checks at the beginning is an overall picture IF response check. Following the specific manufacturers service instructions, this is obtained by injecting a sweep and marker signal at the first video IF grid. The scope is connected in the usual manner—across the video detector output load resistor. A typical video IF overall response curve is shown in Fig. 2.

If alignment is necessary, after investigating the response curve, then the normal alignment proced-

ALIGNING. COLOR RECEIVERS

by Fredric Jason

ure should be followed—checking the response curves of individual stages—from the last to the first stage. Only after this procedure is completed should the sweep-marker generator be fed through the mixer stage for final touch-up and to adjust the converter plate coil.

All manufacturers require disabling the AGC and using a bias box during the alignment procedure. To meet all set requirements this bias source should be variable and have an adequate voltage range. At least one manufacturer requires that the sync take-off be grounded at a point beyond the decoupling resistor after the video detector.

Manufacturers differ on what position the channel selector should be in. One says to select an unused channel, another wants it set on channel 2, while still another prefers the channel selector to be set "between" two channels to disable the local oscillator. This indicates that the manufacturer's service manual should be used as a guide in all instances.

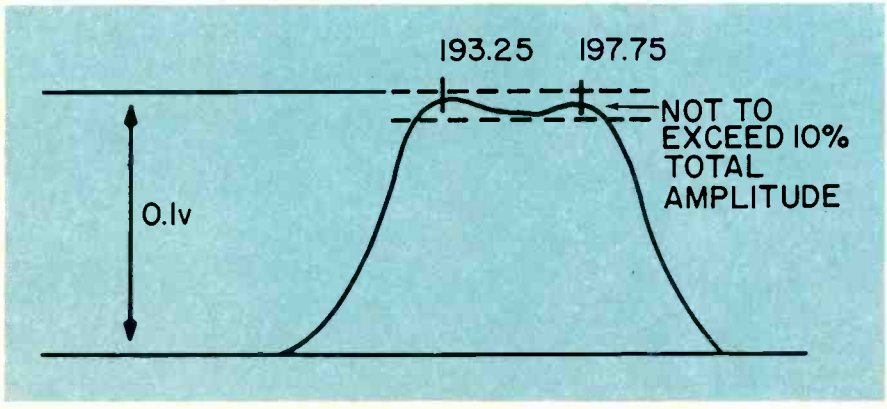


Fig. 1—Channel 10 RF response curve at the channel selector output.

Color Sync & Demodulation

To many technicians, this will be a brand new experience in alignment procedure. The color-bar generator, the VTVM and the scope are used here.

The color-bar generator is connected to the set's antenna terminals, with the audio carrier of the generator turned on. This allows for adjustment of the fine tuner to get a minimum 930 kc beat as seen on the screen.

Depending on the make of the receiver, there may be traps in the demodulators' screen circuit. These must be adjusted for minimum deflection of the VTVM at the trap frequency. The burst oscillator is adjusted for maximum VTVM deflection—with the probe at the phase detector plate or cathode. Either the demodulator—if traps are not in the screen circuits—or the color-killer will be disabled during the VTVM adjustments.

Color Amplifiers

The color amplifiers are, essentially, IF stages and their treatment is the same—adjusting one or more IF transformers to obtain a response curve like that in Fig. 3. There are 4.5 mc traps which are adjusted for a null against the 920 kc beat.

In any case, the chroma take-off or the color-killer must be disabled. Manufacturers' service manuals show how this is done. As in video IF alignment, the tuner is either placed between channels or turned to an unused channel. The marker-generator signal is injected at either a cathode follower stage or the last color-IF amplifier grid. The scope is connected—through a detector probe—either to the secondary of the color-IF output transformer or

to the R-Y demodulator tube's cathode.

Horizontal

Since there are several procedural methods suggested by manufacturers, a complete outline is not possible here. This check generally requires that voltage and current readings be made at the horizontal amplifier. It also involves current and voltage adjustments at the regulator tube and anode voltage measurements. The drive is checked and the horizontal efficiency coil adjusted while current measurements are made at the horizontal output tube cathode. This can be compared to horizontal linearity adjustment in a monochrome receiver. The adjustments are important in obtaining and maintaining good convergence.

Unless parts replacements have been made, controls changed or misadjustments have been made, this procedure is rarely necessary, and years of service can be obtained before this section of the color receiver needs serious adjustment.

The significant clues to horizontal sweep adjustment problems are changes in convergence over a period of a few days, or if the high voltage regulator tube runs a steady cherry red at normal brightness level. This is indicative of the tube drawing heavy current and lowering the anode voltage. The regulator may show a dull cherry glow at low brightness level, but not at any other brightness setting. It's always a good idea to check this on service calls. Lowering of life, or burn-out of the high voltage rectifier can result, as well as causing rapid depreciation to an expensive high voltage regulator tube.

The more critical you are with color receiver alignment, the better results obtained. No color set over three years old should leave the repair shop without an alignment check. ■

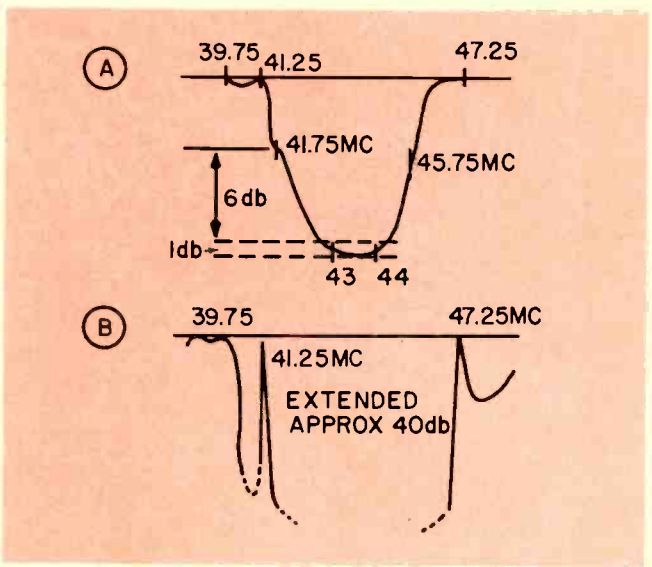


Fig. 2 (A)—Over-all IF response curve. (B)—Same IF response curve after increasing scope vertical gain.

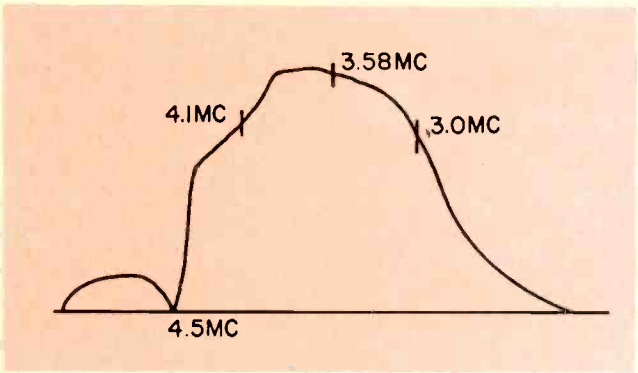


Fig. 3—Appearance of average color amplifier response curve.

B/W Color Adapter

Illinois technician may have answer to inexpensive color in near future

■ In an exclusive interview with ELECTRONIC TECHNICIAN, Carl Panosh, of Lisle, Ill., recently told of an adapter he and his son, Richard, invented which converts a standard B/W set to a color receiver. The adapter is only slightly larger than the standard B/W screen. Mr. Panosh and his son have reportedly been working on the system for seven years.

Principle advantages of the system, according to the inventors, is the great reduction in cost and increased brightness over present color TVs. The inventors feel that for only about $100 more than present black and white sets a good color set could be produced using the new system.

Uses Polaroid Filters

The system is unique in construction. A diagram shown in Fig. 1 shows the filter system: A rotating polaroid filter is edge driven and synchronized with a pulse from the vertical section of the TV receiver. Another filter, called a dispersion filter, rotates the polarized light and it passes through a third filter which rejects all light except that which is properly polarized relative to its position. The angle of light at any time, of course, depends on the position of the rotating polaroid filter.

Since various wavelengths of light are rotated different degrees by the dispersion filter, color will be seen at the output. Where the color appears, and what the color will be, of course, depends solely on the position of the rotating filter. In fact, with no color gate, a series of color strips about 20 percent the size of the picture tube would be painted horizontally across the tube alternately.

Sync and Gating

Sync for the wheel drive motor is obtained from the vertical sweep section of the TV.

Color gating is derived from the revolving wheel. At present, the gates for each color are turned on by the rotating filter with a motor-brush type action. When the filters are in a position that allow red information to come through, the red gate is opened. Any red information present then turns on the CRT gun. The same is true with the green and blue gate times.

Presently, Mr. Panosh is working on a system which will allow five color gates to be opened, thereby presenting truer colors. At present, rich colors cannot be produced on the system because only three colors are used and because of the small amount of red light emitted from the standard CRT which the system is being used with. It is Mr. Panosh's hope that the system can be developed to a point which will allow conversion of any standard CRT for color. While this could be done, by using red filters on the present system, the brightness would suffer.

Although some problems are still noticeable, Mr. Panosh, who says he is not a mechanic, feels a well equipped prototype shop could take the bugs out of it in short order.

One of the biggest problems in demonstrating the units is noise present in the audio. Mr. Panosh assured us that the noise is gener-

Continued on page 90

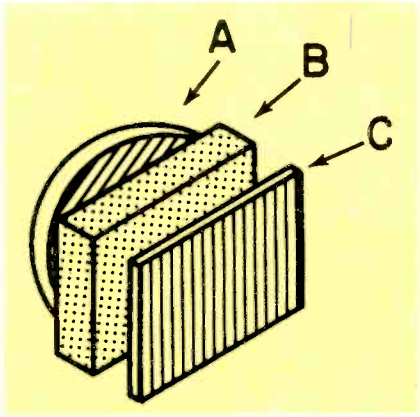
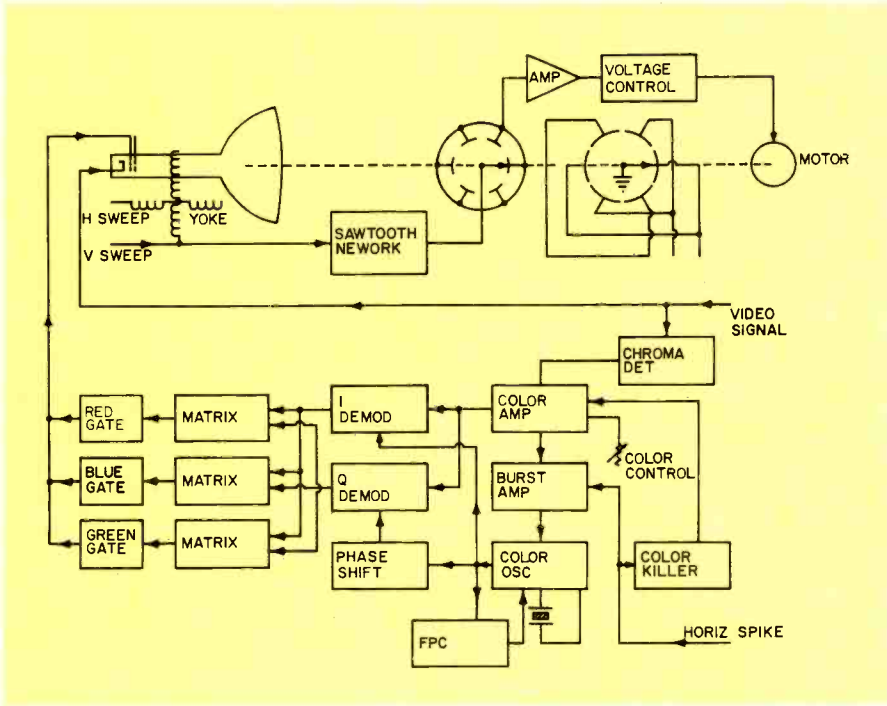


Fig. 1—Filter system shows rotating polaroid (A), dispersion filter (B) and the stationary polaroid filter (C).



Block diagram of color converter showing points where signal is taken from standard TV.

Annual sales continue steady rise and offer opportunities to alert, qualified technicians. Here's a few things you will

PLEASURE-CRAFT ELECTRONIC

■ Crowds attending the recent 54th Boat Show session at New York's Coliseum indicated that no let-up is in sight for the gradually rising wave of interest in pleasure boating. The nine-day public run, with more than 500 boats on hand, fully justified the show's theme — "The Wonderful World of Boats." And electronic navigational-aids and accessories attracted a substantial share of the attention. Reports from scores of other boat shows throughout the country in 1963 indicated that sales of this equipment continues to rise steadily.

Many service-dealers and licensed technicians are diversifying operations with pleasure-boat navigational-aid services. Some have gone into the business exclusively—generally in cooperation with established boat sales and service organizations. Shops have mushroomed next to boat clubs in cities and towns along the nation's inland waterways—on rivers, lakes, bays and protected sounds inside our rocky ocean shores.

In addition to regular citizens band communications equipment, many small-boat owners are buying regular marine-type radiotelephones, direction finders, depth- and fish-finders, loran A and C receivers, PPI display radars and other aids. Although work on radar and radiotelephone equipment requires an FCC license, the remainder including fuel vapor detectors, electrolysis indicators, etc. can be maintained by the average technician with no license or special knowledge. In most areas these instruments will generally require service in the spring, summer and autumn months. Along our gulf and Southern-Pacific shores, it is substantially a year-round business.

If you are not now qualified to service this equipment but have an established TV-radio-Hi Fi business in a favorable location, it may pay you to obtain an FCC first- or second-class license, a few good books on installation, maintenance and repair of small-craft navigational-aids, and contact equipment manufacturers for installation and service manuals.

Basic Knowledge Required

By the time you have your FCC license you should know all about storage batteries and dc generators. Depending on the individual boat, battery power supplies on board may be 6, 12, 24, 28, 32 or even 110 v. Batteries may be charged by the engine generator or by a separate generator, again depending on the craft. The charging source will be either dc or ac with a rectifier.

If you work on radar equipment, you will need to take additional material on your license examination to obtain a radar "endorsement." You will need to know about loran receiving equipment too. If you know your TV theory well, then radar and loran shouldn't give you too much trouble. But you will need more than a passing acquaintence with microwave transmitters and receivers, pulse modulators, video circuits, antennas, wave-guide transmission lines, servo-mechanisms, oscilloscope indicators, sweep and gating circuits.

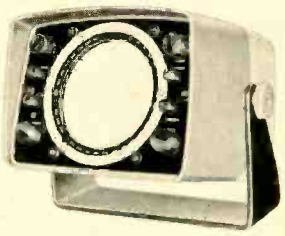
Direction finding equipment has certain basic characteristics you will need to know about. These include directivity characteristics of ferrite and air-wound loop antennas, carrier-metering and antenna current phasing.

Ultrasonic depth- and fish-finding equipment requires a knowledge of magnetostrictive and piezoelectric transducers and special graphic recording equipment.

Pierce gas fume detector can prevent explosions.

RCA Radiomarine Products 'Portagraph' depth- and fish-finder.

RCA Radiomarine Products' N3B radar.



Raytheon's portable radio direction finder operates from batteries.

need to know to get started in marine electronics

by Bill Kiley

It goes without saying that you should know all about low- and medium-power radiotelephone transmitters, receivers, AM modulators, peakclipper circuits, transmitting antennas and transmitter tuning.

How to work with special test equipment is also important. A frequency meter, a grid-dip meter, a pelorus for direction-finder calibration and a few other specialized devices will require your attention.

Service Equipment

In addition to specific technical know-how, you will need certain test instruments for outside service calls and for the shop. Test instrument manufacturers can help you with the job of selecting adequate devices. And some have published booklets covering basic fundamentals of navigational-aid-equipment servicing which may prove helpful.

Generally, for outdoor work, you should select substantial and rugged but small, easy-to-carry, light-weight test instruments. Two separate tool kits are desirable for outside work: one for installation work and one for service. These should be kept substantially intact and in a ready-to-move condition at all times. If you have enough tools and test instruments, try to avoid doubling-up on kit components to prevent scattering around the shop. It will save a lot of time when you have to take off in a hurry.

Your *installation* tool kit should include a small saw with replaceable wood- and metal-cutting blades. Various wrenches, including Allen, Bristo and one light-weight Crescent type. An electricians-type knife, a file, reamer and terminal swaging tool will also be needed in addition to a roll of tape, plastic bedding compound and solderless terminals. A ¼-in. battery operated drill, push-type wood drill and possibly a brace with a few bit sizes up to 5/8 in. and a dc-type soldering iron should approximate total installation kit requirements.

The *service-call* kit will need duplicates of small tools specified in the installation kit except saw, drills, brace and bits, Crescent wrench, file, reamer, plastic bedding compound and swaging tools. You will also carry tubes, a small supply of transistor replacements, resistors, capacitors and diodes.

If you are asked to calibrate a direction finder, or if you install one which needs calibrating, a local geodetic-type navigational chart will be needed, plus a pelorus for making sights. Plot the exact latitude and longitude location of all radio stations that may be used for DF calibrating in red ink on the chart.

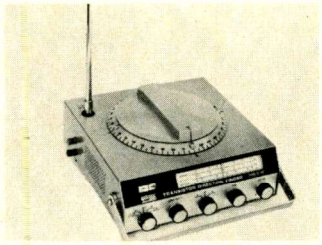
A VOM and neon-lamp tester will be a necessary part of your service kit. As you learn by experience you will find that a number of practical, small, light-weight test instruments can be built in the shop for cutting down on the amount of test instruments you will need in the service kit. A small oscillator, for example, with plug-in crystals, will be one such instrument which you can use for checking or making receiver alignments. A simple germanium crystal diode, tuning capacitor, plug-in coil device can be used with your VOM microampere scale for detecting transmitter harmonics, spurious radiations or as a field-strength meter. About the only other thing you will need shop-wise is a good frequency meter. You can get by without a modulation meter by using your scope.

Radiotelephones

To install a regular marine radiotelephone aboard a boat, the owner requires a Radiotelephone Station License from the FCC. He also

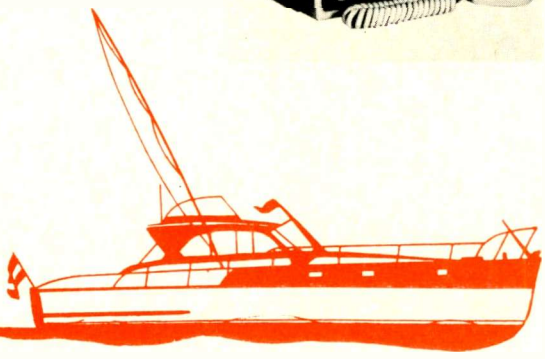
Heath marine radiotelephone kit model MWW-23.

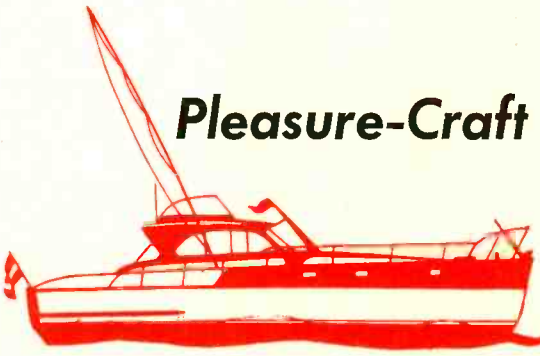
Pearce transistorized direction finder.



Apelco model AR-10 CB transceiver for boats has 10 crystals.

EQUIPMENT





Pleasure-Craft

Electronic Equipment

Continued

Raytheon's Raycom II CB transceiver aboard boat.

needs a Restricted Radiotelephone Operator's Permit to operate the station. Both should be in a conspicuous location near the radio telephone equipment. This equipment can be used for ship-to-ship or ship-to-shore communications. It can also be used to contact the U. S. Coast Guard in emergencies or for obtaining weather reports. Distress calls and station contacts are made on 2182 kc. After contact is made with a station, the transmitter must be shifted immediately to another frequency for sending messages. Transmitting frequencies for inland telephone messages depends on the location of the receiving coastal station. The ship-to-ship frequency is 2638 kc. Some equipment is designed to cover marine frequencies specified in the area from 2 to 5 Mc or from 2 to 22 Mc.

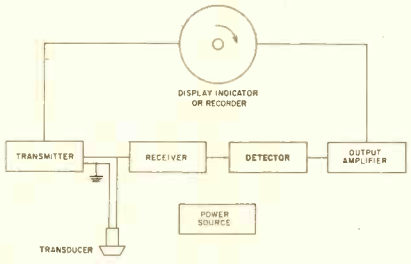
Some transceivers come equipped with only two crystals—distress and calling frequency and ship-to-ship frequency. Others may have up to 8 or 10 or more crystals. A copy of FCC rules and regulations (Part 8) should be aboard next to the radio telephone, along with a log book.

Marine-type transceivers are usually equipped to receive regular broadcast stations for weather and news reports. When the boat is underway, the receiver must be kept constantly tuned to the distress and calling frequency—2182 kc.

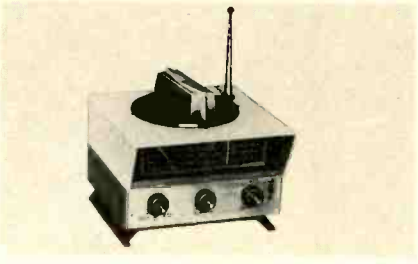
If you install a new radiotelephone or direction finder, you will probably have to do a regular noise suppression job on the boat's ignition and generator system—equivalent to that for interference suppression on autos.

Most of the up-to-date marine radiotelephones use transistorized receivers and tube transmitters. Transistorized power supplies are typical in low- and medium-power sets.

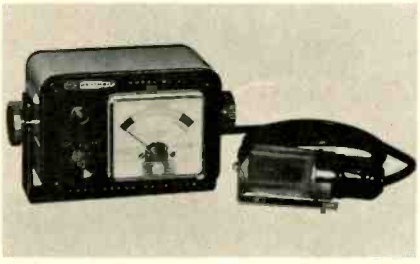
Some of the higher-powered and more elaborate units are equipped



Simplified block diagram of depth-finder.



Heath radio direction finder kit model MR-21.



Heath fuel-vapor detector kit model MI-41.

PPI indicator on Raytheon's model 1900 radar.

Technician installs radome on Raytheon radar antenna atop small cruiser.

Raytheon 'Holiday II' fathometer depth sounder.

with meter jacks to provide quick circuit checks, TUNE - OPERATE switches to reduce plate voltage and padders to dip tank circuits.

You will need to pay particular attention to providing grounds on both metallic and wooden or plastic boat hulls. The FCC has a rule on this. A clean direct ground to the hull and the transceiver is required on metallic hulls. A bare metal plate or strips of corrosion-resistant metal of at least 12 sq ft, attached to the hull below the water line, is required on wooden and plastic hulls.

Although modern type-approved equipment has second harmonic filters installed for 2738 and 2830 kc, when servicing any marine equipment you should pay particular attention to harmonic radiation on 5476 and 5660 kc.

Other Equipment

Depth- and fish-finders, fuel vapor, or gas detectors, and automatic pilots will probably be the only three pieces of equipment that you will need to "bone-up" on. The best material available are the systems' manuals.

The depth sounder employs an electro-acoustical system — something like sonar. An ultrasonic beam is radiated downward toward the lake or ocean bottom from a transducer. The beam "bounces back" to the transducer from the bottom, from fish or other submerged objects. The depth in feet (or fathoms) from the surface to the bottom, or to submerged objects, is indicated on a revolving motor-driven dial or graphic recorder. Most of this equipment is transistorized.

The fuel vapor detector is designed to detect an explosive condition in the engine compartment. They can be wired to trip off an alarm bell or red light, start blowers in the engine compartment or provide a meter indication at the explosive point. Basic parts are a platinum filament sensing device and a control head. The sensing device is housed in a glass tube. Explosive vapors cause a chemical reaction on the filament, increasing its temperature. The ratio of the explosive vapors to air determines the filament's temperature change. An increase in temperature causes the filament's resistance to change. The change is piped to the control head through a cable. The control head may contain a relay, transistorized circuitry, microammeter and voltage regulator (zener diode in some equipment).

If this equipment and the regular marine-type radiotelephones and CB transceivers and direction finders are not enough to keep you busy, remember there's additional work available installing and repairing automatic pilots, radars and loran receivers. ■

Pierce 'Islander 80' radiotelephone.

RCA Radiomarine Products' direction finder.

RCA Radiomarine Products' radiotelephone.

Sampling Demodulators For FM Stereo

Adequate FM stereo channel separation depends heavily on operation of sampling demodulator and proper tuning and adjustment of receiver and multiplexer

PART II

by Edward M. Noll

■ Part I of this two-part series described the basic principles of FM broadcasting systems, basic FM multiplexers, double-sideband modulation and basic sampling circuits. We are concerned here with a two-diode sampler.

Basic Two-Diode Sampler

When a two-diode sampler (Fig. 1) is used, it is possible to take samples of both the positive and negative alternations of an applied signal. The top diode demodulator responds to the positive peak variations of an applied signal; the lower diode responds to the negative peak variations. The four waveform examples illustrate demodulator operation.

In example 1, only the sampling wave is being applied. In this case the diode current flow occurs on the positive peaks of the sampling wave. The bottom diode, which is connected with opposite polarity, conducts on the negative peaks of the sampling wave.

Example 2 (Fig. 1) shows the circuit operation when the positive peaks of an applied signal vary. The variation is transferred to the output of the top diode. Since the negative peaks of the applied signal are non-varying, the diode peaks contributed to the bottom diode are of constant amplitude and no output results. Example 3 (Fig. 1) reverses the situation with the incoming signal varying in its negative peaks while its positive peaks are constant. In this case there is no output from the top diode and the signal variation appears at the output of the bottom diode.

Example 4 (Fig. 1) is very important because it shows how both alternations of an incoming signal can be sampled. The positive peaks key on the top diode time-coincident with the positive peaks of the applied input signal. The very same sampling waveform keys on the bottom diode time-coincident with the negative peaks of the incoming signal.

We now have a circuit that alternately samples both positive and negative variations of an applied signal and channels them into separate circuits with a minimum of interaction or cross modulation. Here we have a clue as to how a composite FM signal can be sampled and its left and right information channeled into separate L and R outputs.

Stereo Sampling

Before we cover the operation of a sampling type demodulator for FM stereo, let us first review the make-up of the FM composite signal for various left and right channel input signals. The examples

represent extremes that seldom occur during normal broadcasting. They can be set up, however, by using suitable stereo generators.

Example "A" of Fig. 2 demonstrates the make-up of the composite FM signal when the audio applied to the left and right channel inputs are of the same amplitude and phase. When the left and right signals are matrixed, there is an L + R output. In the matrix, however, the L and R components cancel in the L — R section and there is no L — R output. Thus, for this operating extreme, only an L + R signal is sent between the transmitter and each receiver. No subcarrier modulation exists because of the absence of L — R signal.

Example "B" is the opposite extreme for which there are L and R channel inputs of equal amplitude but opposite polarity. In this case there is cancellation in the L + R matrix channel and no L + R output. In the L — R section the left and right signals combine to produce an output. The L — R signal so formed is then applied to the subcarrier modulation system and is transmitted between the transmitter and each receiver as a subcarrier sideband signal.

Examples "C" and "D" represent two more signal extremes. In example "C" only a left channel signal is present; in example "D" only a right channel signal. For left channel activity there are both L + R and L — R signal components at the output of the matrix. In fact, the L + R and L — R signals are of equal amplitude and the same polarity. In this case the composite FM signal consists of both L + R and L — R components as shown.

Example "D" represents right channel only signal. As in example "C" there are L + R and L — R signals of equal amplitude. In this case, however, they are of opposite polarity.

Example "E" represents a more realistic condition for which there are unequal levels of signal in the left and right channels. When the resultant L + R and L — R DSB signals are combined, an irregular resultant occurs. Note that the positive peak variations are not the same as the negative peak variations in the composite resultant.

It is apparent in FM stereo broadcasting that the negative and positive variations of the modulation envelope of the composite FM signal vary continuously in frequency and magnitude in relation to each other as a result of the changing signal content in the left and right channels of the stereo system.

Practical Demodulator

A two-diode demodulator as used for the demodulation of an FM composite signal using the sampling technique is shown in Fig. 3. The 38 kc regenerated subcarrier appears across the full secondary of the input transformer. Thus the two diodes receive equal-amplitude but opposite-polarity switching waves. Since the diodes are connected with opposite polarity, they are switched into operation by opposite alternations of the subcarrier sine wave.

The composite FM signal arrives at the demodulator via the center tap of the transformer. Equal-amplitude and in-phase components are applied to the top and bottom diodes.

Let us first consider the activity at the demodulator for example "A" (Fig. 2). In this case, only an L + R signal is present at the demodulator input; there is no subcarrier sideband generated. For this condition the top and bottom diodes take alternate samples of the L + R signal at the subcarrier rate. Inasmuch as the subcarrier is continuous, there are samples taken in both channels in identical fashion but the output of the two demodulator diodes will be of the same magnitude and polarity. Example "A" activity for the stereo sampling demodulator are shown in Fig. 4. This is, in fact, the only condition for which there is no subcarrier sideband variation present.

For example at "B" of Fig. 2, there is L — R but no L + R. As you know the L — R signal is transmitted using the subcarrier technique. The resultant waveform is shown at "A" Fig. 2 and in "B"

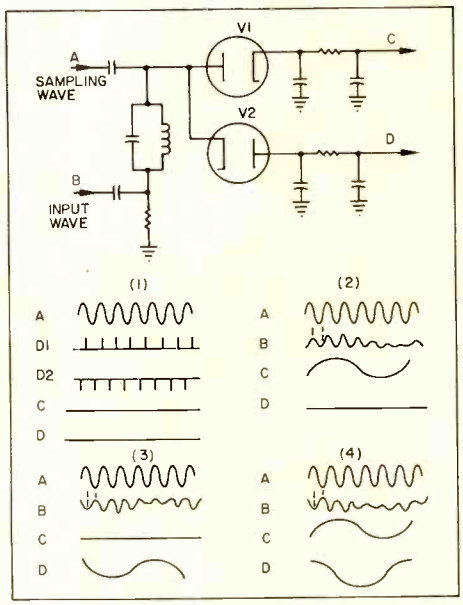


Fig. 1 — Functional diagram of two-diode sampler and waveform operation analysis.

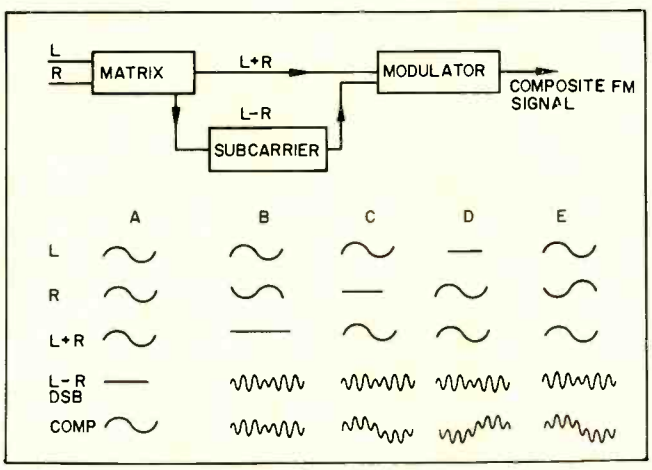


Fig. 2—Make-up of composite FM signal.

Fig. 4. The illustration at "B" in Fig. 4 is particularly significant because it shows the timing relationship between the subcarrier sampling waveform and the individual cycles that make up the L — R DSB signal. Notice that during the first segment (1) of the composite waveform, the positive alternations of the envelope cycles are time-coincident with the positive alternations of the E1 subcarrier. For the lower diode it is the negative alternations of the envelope cycles that are time-coincident with the positive alternations of the E2 sampling subcarrier. As a result the top diode follows the positive variation of the envelope; the bottom diode, the negative variation.

This condition changes for the second segment (2) of the composite FM waveform. As covered earlier in the double-sideband modulation process, there is a reversal in the phase of the cycles that comprise the modulation envelope after the 180 deg point. Hence, during the second segment the positive peaks of the sampling subcarrier at the top diode become time-coincident with the negative peaks of the envelope cycles. Oppositely, the positive peaks of the envelope cycles are time-coincident with the positive peaks of the E2 subcarrier.

It is this transition that changes over the double frequency sideband envelope to the original modulation. Since there are identical variations on both sides of the envelope there will be equal but opposite polarity left and right channel output from the demodulator.

Example "C" of Fig. 4 demonstrates demodulator activity for a left channel only signal. In this case both L + R and L —R DSB components are present, the composite waveform being a combination of both. During the first segment of the composite FM signal (corresponds to one alternation of the modulating sine wave), there are positive peak variations but no negative peak variations. The positive peak variations are time-coincident with the positive alternations of the regenerated subcarrier. The top diode conducts and follows this variation, tracing out one alternation of the original left channel sine wave.

At the bottom diode the positive peaks of the regenerated subcarrier are time-coincident with the negative peaks of the modulation. These negative peaks do not vary in amplitude, however, and there is no right channel output.

After the phase reversal point in the composite signal, the envelope cycles are of opposite polarity. Therefore the negative alternations of the envelope cycles are time-coincident with the positive peaks of the regenerated subcarrier E2; the positive peaks are time-coincident with the positive alternations of the regenerated subcarrier E1. In the FM composite waveform the positive peaks are now of constant amplitude while the negative peaks are varying. The top diode is now switched on during the negative peaks of the envelope and its output follows the negative peak variations. In the modulation envelopes the positive peaks are of constant amplitude. These are sampled but produce no output in the right channel. In this case the left channel output becomes a replica of the original left channel signal. As it should be, there is no output from the right channel.

Example "D" shows the other

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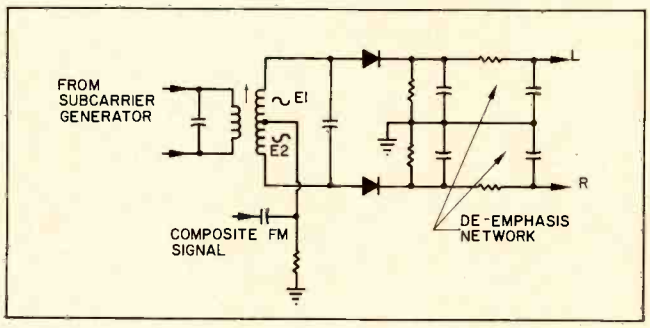


Fig. 3—Two-diode FM stereo demodulator schematic.

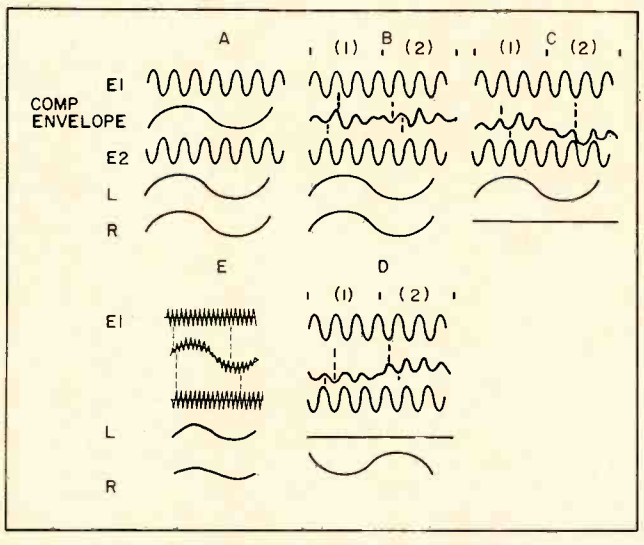


Fig. 4—Stereo sampling waveforms.

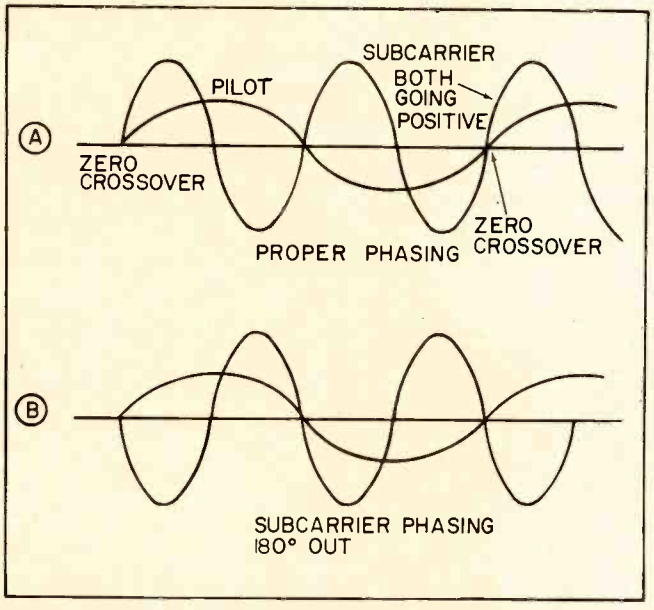


Fig. 5 (A)—Proper pilot frequency phasing. (B)—Proper subcarrier phasing.

CONFIDENCE

IMPORTANT TRAIT FOR TECHNICIANS

■ There are rich rewards in knowing just how good you are: job advancement, a peppy social life, a general feeling of getting someplace. If you'd like to become more self-confident, there is much you can do to master your insecurities, learn from your failures, and develop a positive attitude in your relations with others.

First, make a list of your qualities—the things that you are able to do well, the things about yourself of which you are proud. Don't commit the mistake of overlooking the virtues you have and assuming those you not only don't have, but don't need.

Ralph Waldo Emerson once wrote that a weed is a plant whose virtues have not yet been discovered. Likewise, if you don't find out what you've got, and respect it, and set it out where it can be seen, you might as well not have it at all.

Once you've formed a realistic conception of your abilities, concentrate on developing them to the fullest extent possible. Always keep your graces, not your flaws, in the showcase.

Psychological studies at Columbia University have shown the people who dress well, neatly and in good taste tend to have much better adjusted personalities—and consequently more self-confidence —than those who do not. Perfect grooming creates a good impression, makes you feel more comfortable.

Look at yourself honestly and answer these four questions:

1. What characteristics or habits of mine do I sincerely believe help me win other people's respect?
2. Which ones are likely to make people lose their respect for me?
3. What friend, or acquaintance, or opportunity have I lost because I did something which made the other person lose respect for me?
4. In what way did this incident show lack of respect for him?

Once you've pinpointed your mistakes and weaknesses in this area, you're on the road to improving yourself and your dealings with others.

Every person has three kinds of faults: the ones that aren't really faults at all, but unrecognized assets . . . the ones you can get rid of, and ought to . . . and the ones you're stuck with and have to live around. Concentrate on building the "faults" in the first category into recognizable assets. If you're not a ready conversationlist, for example, don't throw up a wall of insecurity when talking to people. You may be an excellent listener! And everybody likes to have people listen to them. This may prove especially advantageous when the customer is telling you about his TV troubles. After all, he knows a great deal more about it than you do.

If one of your faults is "crying over spilt milk"—constantly regetting the failures in your life—learn how to turn failures into footholds! Accept your failures and learn from them as well as from your successes. Occasional failure can help make you less cocksure and enables you to assess your abilities more realistically.

Lack of self-confidence, psychologists say, is usually based on insecurity or fear. "The insecure person is afraid not only of others, but also himself," according to Dr. George F. J. Lehner of the University of California. Plagued by feelings of doubt and distrust, the insecure individual is often hesitant to make even minor decisions because of his fears.

Here are three simple rules for mastering fear which may work for you:

1. *Illuminate your fears with facts.* Determine exactly what you're afraid of, then find out why you're afraid of it. Probably most insecure people fear they will not be able to live up to the commonly accepted "norms" of society. What norm or standard are you afraid of? What do you do—or what don't you do—that makes you feel you can't live up to that standard? Get the facts.

2. *Provide yourself with competent allies.* Now that you know what the problem is, turn to someone who is qualified to help you: your doctor, minister, a friend or pal whose opinions you value, a psychiatrist, or perhaps your mate —depending on the situation. Once you've taken someone into your confidence and asked for help, the problem is half solved.

Things, in addition to people, can be allies against your insecurities. If you're hard-of-hearing, one of the new almost invisible hearing aids may help you overcome this fear. If you can't remember the names of people you meet, try carrying a pen or pencil with you at all times to jot a name down on the spot.

3. *Wage a winning war.* Make up your mind to do something about the fear you're fighting. You've

Continue on page 91

A general review of transistor fundamentals, troubleshooting and repair techniques

SERVICING

Proper and accurate test instruments are necessary for troubleshooting and servicing transistorized equipment.

By Neil M. Ruffing

■ The next time a non-operating piece of transistor gear comes in for repair, remember—*don't panic!*

Remind yourself that transistors are as simple as electron tubes. Although you could use the sight of an exceptionally keen-eyed eagle or a good magnifying glass, all you really have to do is change a defective component or repair a defective circuit. The method used to locate that defect will be about the same you used before.

Fundamentals

A transistor, in essence, does the same job as a triode tube, differing only in the method of signal amplification. As you already know, transistors are current amplifiers and electron tubes are primarily voltage amplifiers.

Of course, it should be remembered that all references to positive bias, negative bias or voltage with respect to ground or supply when talking about an NPN transistor, for example, will be opposite to the same references in relation to an electron tube. And the supply voltage polarity is also reversed.

In a simplified way, a transistor consists of two diodes back-to-back, the two junctions being the transistor's base region. The input diode is forward biased, the output diode is reverse biased. Such being the case, here are four simple rules that apply to all transistors:

1. The battery polarity corresponds to the emitter material—negative to emitter on NPNs, positive to emitter on PNPs.
2. Forward bias is established by placing a small potential (about 0.2 for germanium transistors) between the emitter and base, polarity corresponding to base material.
3. As the base voltage is changed in the direction of the collector voltage, the transistor is approaching saturation.
4. As the base voltage is changed in the direction of the emitter voltage, current decreases. At the same voltage the transistor is at cutoff.

Under certain conditions, voltage readings can be very misleading in transistor circuits. In tubes, all elements are isolated from each other. That is not the case with transistors. Additionally, transistors will conduct when forward biased, whether or not the circuit is under power. So after checking the power supply, the VOM and VTVM should be placed aside temporarily until the ailing circuit is pin-pointed by other instruments.

Troubleshooting and repair

Signal tracing is the fastest and most efficient method of isolating trouble in transistor circuitry. A standard AM generator can be used, but a noise generator with a fundamental frequency of about 400 cps is faster. Harmonics from the generator serve in the RF and IF ranges. For audio circuits, where distortion and frequency attenuation are the most common problems, a square wave, or sine wave, generator and oscilloscope are the most useful tools.

After the defective circuit has been localized by signal injection, finding malfunctioning components involves techniques similar to those used in tube-type equipment. Although skilled technicians can easily check transistors in-circuit with a VTVM, it may be better to remove transistors from the circuit for static checks until you learn all the tricks involved in checking in-circuit back-to-back diodes.

Although more than 2000 transistor types are manufactured, most experts agree that a basic stock of about 12 PNP and 15 NPN types are all that are required to service a large majority of home entertainment type units. When substituting, a good rule is to replace an IF type with an IF type; and AF type with and AF type, and so on. It goes without saying that NPN and PNP types are not interchangeable.

A diagram of a Hi Fi transistor amplifier is shown in Fig. 1. By signal injection we have discovered that the first transistor stage is dead. That is, a signal injected beyond the stage is heard at the amplifier's output but one injected at the stage input is not heard at the amplifier's output.

A VTVM check on the transistor collector shows higher-than-normal operating voltage—the value being almost that of the supply voltage. Several things can cause this symptom which indicates that little or no current is flowing in the collector circuit. As in electron tube circuits, the bias may be too high, the transistor may be "open" or an emitter resistor may be open. One

TRANSISTORIZED EQUIPMENT

other possibility, rarely existing, is a collector resistor which has changed to a very low value. More frequently, a short develops between the voltage supply and the collector—around the resistor. This would cause heavy current to be drawn, perhaps burning out the transistor.

Let's assume that the resistance between the collector and the collector supply is normal. In this case the bias should be checked next. One way to check bias is by measuring the voltage difference between the emitter and the base. This can be done by measuring the potential between the two elements. The latter method is preferred since the meter will be easier to read—allowing less chance for error. In a circuit where proper voltages are unknown, bias is normally 0.2 to 0.4 v, and this voltage will be positive for NPN transistors and negative for PNP types. That is, the base will be positive or negative respectively in relation to the emitter. Since bias voltages are relatively small in transistor circuits, accurate measurements are essential if troubleshooting is to be meaningful. Suitable and accurate test instruments are essential also.

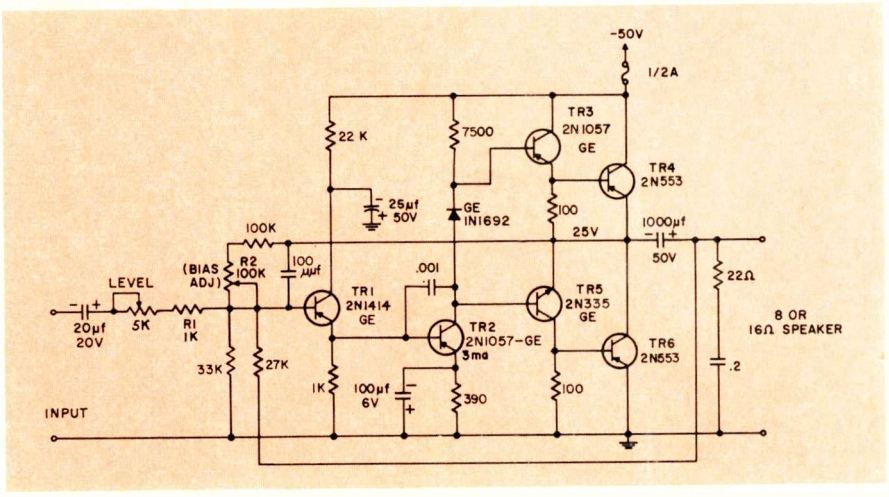


Fig. 1—Diagram of a transistorized audio amplifier.

With the symptoms described, a higher-than-normal bias will usually be found. And the cause of high bias could be a faulty transistor, an improper value bias resistor or a coupling component in some NPN/PNP circuits.

Continued on page 92

Closed-Circuit Color TV System

■ Eidophor is the Greek word for "image bearer." Color Eidophor is the name of a large screen, closed circuit TV projection system which was first demonstrated in New York last September. Its maker, Philips of The Netherlands, says it will project more than 4000 lumens of light on a large screen. It was made for Theatre Network Television, Inc., of Woodside, L.I., New York, its sole distributor.

Plumbicon is the name of a new color camera especially built for closed-circuit color work. The camera is about one-third the size of a regular image orthicon tube camera. It is said the camera requires only five minutes warm-up time and operates at a light level two-thirds less than previous systems. The camera is also manufactured and marketed by North American Philips Co., Inc.

Both projector and camera were demonstrated at the Pentagon building in Washington, D. C. last November. A report indicated that the system demonstrated the possibility of a wide range of CC-TV uses.

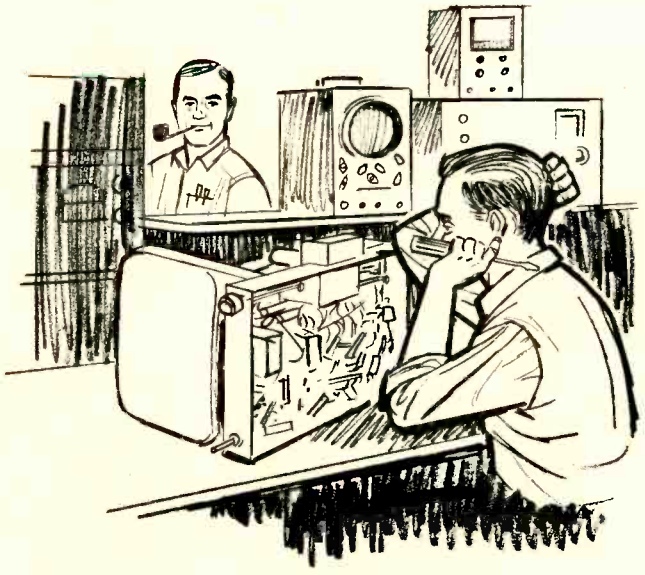
A model twirled a parasol that created a dramatic, rainbow effect in completely realistic colors. Art-work for fashion and cosmetic advertising came through with equally realistic flesh tone. A table covered with fruit demonstrated the kind of color quality which observers said was comparable to 35 mm color motion picture film. A tactical military situation was displayed against a map background. Alpha numeric characters and symbols were electronically generated to represent missiles, aircraft and other military units. Weather information was shown in appropriate colors on the map background.

A close-up of an eye being treated brought it to the medical viewer in color that showed the subtle differences and characteristics of the eye in complete detail. Topography of the moon, with craters outlined in sharp color, demonstrated the definition of the system.

It was claimed that the Color Eidophor projector solves three major engineering problems which have slowed progress in closed-circuit color TV communications: bright illumination, true color and clarity. ■

Howie gets a Lesson in SPEED SERVICING

by Frank Salerno



He learns how a little 'mental-switching' can simplify modern TV-set troubleshooting and repair

■ Howie put down the test probe and complained, "Boy, they're sure making them tough to fix nowadays." He eyed the portable set he was working on and turned to Fred, his boss.

"It seems the newer they are the tougher they get. I'm not getting anywhere with this one."

"I'll agree with you in some respects. They are getting tricky. But I wonder if you've seen one of the old 7-in. electrostatic jobs, or the 25- and 30-tube sets, or the old DuMont 101? They were a little before your time."

Fred lit his pipe and continued. "That DuMont 101 was a pip. It was long as a Cadillac and twice as heavy. It had a motor driven tuner mounted on a chassis with a strip of IF tubes a yard long. The audio circuits were mounted on a separate chassis, the sweep circuits on another. Both high and low voltage supplies had their own private little corners. Heaven help you if you had to pull it—couldn't fix it by changing a tube.

"Of course, this DuMont arrangement did have one advantage . . . if you just happened to have another 101 outside in the truck. If you were in doubt about which section the trouble was in, you could switch chassis until you were sure."

He puffed gently on his pipe and blew a couple of lop-sided smoke rings.

"Of course, it's much simpler when you do a little mental-switching instead. Look here. . . ."

Howie got up from his stool and walked over. Fred waved to the big RCA sitting in it's cabinet on the bench.

"Here's the one you brought in this morning. Remember what was wrong with it?"

"Sure. It was dead. No picture and no sound."

"Right," said Fred. "Let's see if we can't use a little mental-switching on this one. The first thing that comes to my mind, considering all tubes are lit, is no B-plus."

"Well, I checked the set's fusible resistor at the customer's house."

"I assumed you did," continued Fred, "so I'll pass that up. Look here, though. When I put the VOM probe to the selenium rectifiers, I get no output so we know we're on the right track. Since a selenium will give some output, no matter how weak, we can temporarily assume that they are both good. If the seleniums and the fusible are OK, it narrows things down a bit."

He reached for an electrolytic capacitor and a couple of short clip-leads and then clipped the capacitor between the fusible resistor and the junction of the two rectifiers. The sound and picture zoomed in.

"What happened?" shouted Howie.

"Simple. The doubler electrolytic is open. You would have found that out too, given enough time, but you could have repaired this one at the customer's house in minutes if you had remembered a little basic circuitry. All voltage doubler circuits have a doubler capacitor and this capacitor is always wired in between the fusible resistor and the two rectifiers. Many sets have the rectifiers as well as the fusible exposed

on the top side of the chassis. It becomes a very simple matter to check out the capacitor by switching in a new one even if we can't see the old one. Just be sure you connect the negative capacitor lead to the fusible and the positive lead to the rectifiers.

"Doubler capacitor values vary from set to set but they are not very critical. I keep a 200 μf, 300 v job in the tube caddy and it fills the bill nicely in every case."

"Well, how about that?" exploded Howie. "And once you mount down the new capacitor you close up the set."

"Precisely. Now let's look at your portable."

"Yes, let's," agreed Howie. "It's a Philco 11H25 chassis. It has a faint negative picture and turning the contrast control has no effect on what little picture there is. I've changed all the tubes but nothing seems to help."

Fred switched the set on and waited for it to warm up. The picture came on exactly as Howie described it. Fred glanced at the service manual momentarily.

"This set has an AGC system typical of those used some years ago. The contrast control center-arm feeds a negative voltage back to the first two IF tubes and to the RF amplifier tube grids. I guess you could say the control acts as a contrast and AGC control at the same time. It's easy to see how the slightest defect in an RF or IF tube can upset the bias and cause poor reception. But you've already checked out the tubes so we'll go on from there.

"The best procedure to follow here again involves a little mental-switching. What came first . . .? Loss of signal, loss of contrast or loss of bias control? Any one of the three 'losses' can cause the other, you know. The simplest way to attack this one is to switch an external bias into the receiver and eliminate the internal bias source."

Fred hooked up his AGC bias box to the point where the contrast control feeds the IF and RF tubes and varied the voltage from minimum to maximum. Somewhere in between a gray picture fought it's way through.

"This would indicate that our trouble is *not* in the AGC circuit since our external voltage does not help. Now let's see where the IF strip stands by observing a signal at the detector output, or thereabouts, on the scope."

With the external bias still connected, Fred again rocked its control between minimum and maximum voltage with the scope probe connected to the video amplifier grid. At that same voltage point where the picture fought to come in before, a perfect video display now appeared on the scope screen.

"Well," shouted Howie, "there's nothing wrong with that IF strip."

"Apparently not. Let's see what we get at the amplifier output."

Fred hooked the scope probe to the amplifier plate and now the perfect display was gone.

"Look. Nothing but a small distorted waveform."

Fred now clipped the VTVM negative lead to chassis and checked the 8AW8 plate voltage. It read zero.

"Aha," cried Howie. "You've got it cornered!"

"Not yet. We still have to find the culprit and replace him. Remember, you said yourself these new sets are tough to fix. Let's look through the service manual and see if we can't simplify the repair now that we've diagnosed the trouble area. The manufacturers have been getting real helpful in recent years by furnishing us with lots of pictorial information. We both suspect an open plate load resistor. If we can locate it, we can check it."

Fred opened the roadmap-like service manual and studied it. He pointed to a figure on the drawing marked R55. "Here it is. The schematic says it's a 1.5K, 1 watter. But the pictorial diagram shows it buried somewhere under the picture tube."

"Heck, now we'll have to dismantle the whole set and just when we were doing so well," Howie said.

"Hold on now. Remember what we did to the RCA a few minutes ago? You don't have to see a part to check it out if you know where it's coming from and where it's going. Look here. If you follow both ends of the resistor, you'll see that it's connected to two tie points on the printed circuit board, right alongside the 8AW8 socket. So, even if a resistor is located in an inaccessible spot physically, electrically it is as close as these tie points."

Fred connected the VOM leads across the tie points and the meter read infinity.

"You see, it's open."

"And you can solder a new resistor right across the tie points and repair the circuit," Howie beamed.

"Exactly. But we must observe

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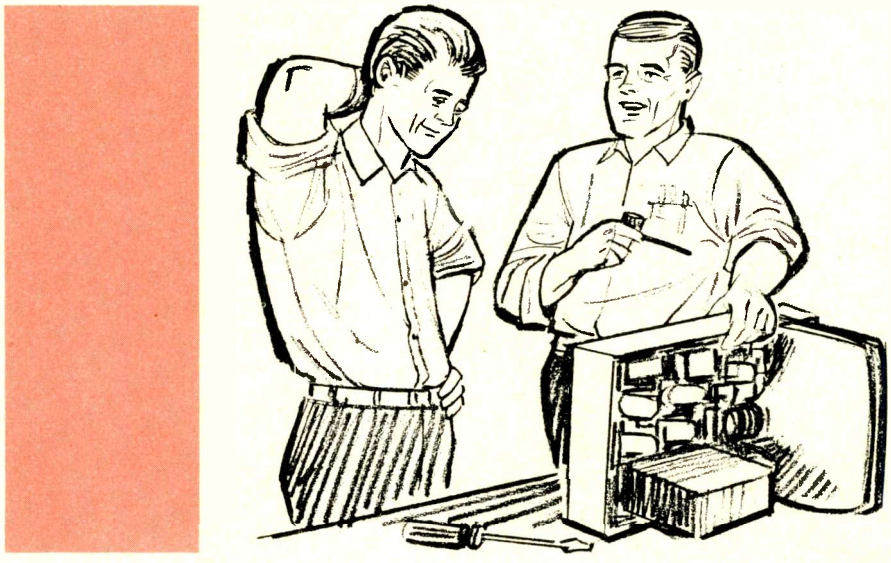

The color burst frequency can be adjusted accurately by using the NTSC type signal without additional equipment

Selecting and Using

■ With the renewed enthusiasm of TV receiver manufacturers, color is well on its way to being the number one source of income to the television service trade. The number of color receivers in use is expected to exceed four million before the end of 1965, at an average repair cost to the user of $30 per year. The amount of extra income to service technicians will exceed $120-million per year. Aggressive service-dealers and technicians would do well to consider getting their share of this extra income. With less than 15 percent of service-dealers and technicians now engaged in color servicing, color could suffer a serious setback if an extra 80 thousand technicians do not equip themselves to take care of this increase.

Getting Your Share

What must you consider to get a share of this market? It is really not as difficult as some would imagine.

The major purpose of any repair business is to keep the customer's product operating properly. This can be accomplished by selecting the proper type of color servicing equipment and by learning how to use it to full advantage.

Choosing the best instrument does not necessarily mean choosing the most expensive. What should you look for? First, it is necessary to have a generator that will give you a signal usable in your area, unhampered by local TV stations. By this we mean be sure you have a selection for RF channels. Second, look for a unit which gives a stable dot pattern. (Remember, the better the static convergence, the easier the entire convergence procedure.) Select a unit with selectable vertical or horizontal lines also for ease of convergence. Do not discount portability since most set-ups should be done in the customer's home and the unit must be rugged and portable.

Convergence

Much has been said about convergence; there are no short cuts to good convergence. Service technicians must realize that 100 percent convergence is practically impossible and, in many cases, 80 percent or less will have to be tolerated. Other considerations are good purity; it is impossible to obtain a suitable convergence job without first obtaining maximum purity. The manufacturer's instructions should be followed in all set-ups whenever possible. These instructions have been formulated for maximum ease and speed of convergence. Who should know better than the manufacturer how to converge his set?

Now, let's give some thought to color signals. Color programs from TV stations are not always present when a technician desires to check a color receiver's operation, so he must have a means of producing a proper color signal. We have two basic types of color signal generators. Probably the best known is the keyed rainbow, which is a pattern of the ten color bars of various colors displayed simultaneously on the screen. This display is adequate for determining whether the receiver is capable of reproducing all colors properly. However, adjusting phase angles of demodulators with this type of pattern may require a wideband oscilloscope and a demodulator probe.

The second type of color signal is the NTSC variety. This signal is usually displayed one color at a time. The color display can be maintained in strict accordance with the NTSC phase angles. (See Fig. 1.) This type also makes it possible to see if the receiver will reproduce all colors by selecting them individually. (There is really no advantage to seeing all colors at one time.) By also displaying the burst signal at the same time as the R-Y and B-Y signals, it is possible to accurately set the phase of the demodulators without using additional equipment.

Making Adjustments

Normal procedure requires the generator to be set on the R-Y position and adjust fine tuning. It is very important that the receiver be tuned properly. Set the tint control to center range and reduce color control to a low level. Set gun killer switch to blue so red and green guns are not operating. If the demodulator is adjusted properly, the center area of the screen will be the same brightness level as the two outside areas. (See Fig. 2.) By feeding R-Y signal only into the receiver, this signal should all go to the red gun. Since no R-Y signal should be at the blue gun, the center area is the reference signal and indicates no color signal. By adjusting so both areas of the screen are the same shade we would then have minimum R-Y signal present. The procedure can be repeated by using the B-Y signal and turning to red gun only to recheck receiver adjustment or to make B-Y demodulator adjustment in receivers which require separate adjustment of R-Y and B-Y signals.

Because demodulator R-Y and B-Y signals are referenced to the burst signal, a change in burst frequency will result in improper R-Y and B-Y output signals. Therefore, if the test equipment transmits a red signal and the receiver reproduces it at some other hue, this could indicate that adjustment of burst frequency is necessary. Burst frequency can be adjusted accurately by using

Color TV Test Equipment

by Bob Dunn
B & K Div.
Dynascan Corp.

the NTSC type signal without other equipment. This adjustment is easily made by shorting out the test point and allowing the burst oscillator to run freely without color sync and then adjusting the oscillator slug until the colors float by slowly.

Is the instrument to be used for troubleshooting? If so, it must have an output at video frequencies for injecting signals into the chroma circuits. This should be a high level signal capable of injecting signals directly into demodulators.

It is imperative that technicians gain some knowledge of basic color theory, perhaps by formal schooling. If this is not possible, many other ways and opportunities are offered willing technicians. Test equipment manufacturers are constantly striving to teach service technicians by offering free service seminars. TV receiver manufacturers also offer these meetings to their dealers. Willing technicians can also find correspondence courses available.

Customer Relations

A formidable problem confronting technicians is customer education. No secret formulas exist to aid in handling customers. This is the one phase of business where many service technicians fail.

Most color receivers sold and installed in the next two years will be to consumers who have seen little or no color before. It will require a lot of patience on your part, plus accurate operating instructions, to satisfy these color set owners. It should be explained to owners that no one can achieve 100 percent convergence, and that some slight edging of color on black and white pictures can be expected, particularly in some extreme edges of the screen. By viewing the set at the proper distance, the edging, in most cases, is not noticeable.

Proper setting of the controls is highly important, not only the color and tints, but the horizontal hold and contrast too. By showing the effects of improper settings to the customer, you can, in many cases, eliminate a callback. You will find it profitable to allow the customer to use all the controls and become accustomed to them. This should be done in your presence so the set can be restored to its proper condition, allowing the customer an opportunity to determine what happens when a control is misadjusted.

One other consideration is tints that may vary quite a bit from one station to another. This should also be explained. You must not forget that customers have personal preferences as to tints. A customer may prefer to watch a color telecast with fleshtones somewhat green. Remember, it's a matter of personal preference. And treat the customer courteously at all times.

Are you going to be one of the 80,000 technicians entering the color field within the next two

Continued on page 94

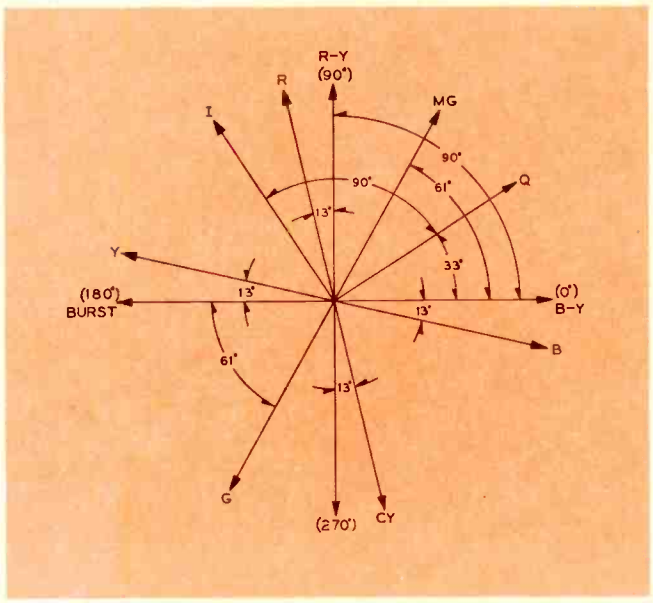

Fig. 1—NTSC phase angles.

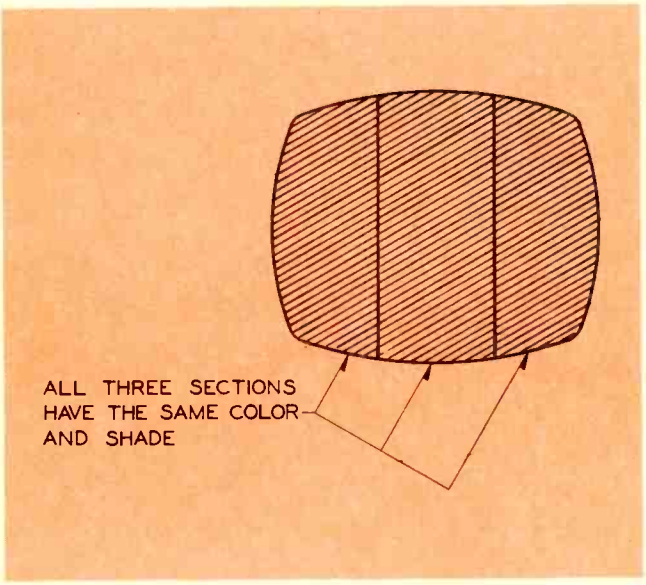

Fig. 2—Center area of screen will be the same brightness level as the two outside areas when the demodulator is adjusted properly.

TOUGH DOG CORNER

Difficult Service Jobs Described by Readers

Circuit Changes

A customer brought an RCA Mark VII CB transceiver to the shop with severe audio oscillation. This occurred only when the transmitter was operating. It was noted too that the trouble developed only when the switch on the *receiver* was in the crystal control receive position. Additionally, checks showed that the symptom varied considerably in intensity with different antennas. Tubes were first substituted. We checked lead dress around the 6EA8. (One half of this tube is the 2nd IF amp and the other half is the mike preamp.) We checked resistors and capacitors and everything was within tolerance. Another microphone did not help. Although we assumed that this set *did* work normal before the trouble developed and we do not believe in "doping up" circuits, we could not eliminate this problem without making the following circuit changes: The 0.005 μf screen bypass capacitor (C53) was changed to a 0.02 μf value. A 0.033 μf capacitor was shunted across R22, the 2.2K load resistor. The 47K screen grid resistor, R21 and the 0.01 μf capacitor C34 were positioned well away from the 6EA8 tube socket terminals 1 and 9 (mike preamp section).—*L. Boutin, Putman, Conn.*

Underrated Capacitor

This "dog" really had me cornered for a while. It was an RCA 21S363M, KCS83 chassis, and it came into the shop with no vertical sweep. The technician who made the house call substituted tubes without solving the problem. When I first switched the set on after connecting it on the bench, the vertical sweep was OK but the vertical hold wouldn't lock in. The vertical hold pot was intermittent and by applying slight pressure on the shaft, I could kill the sweep. This looked like an easy job—just a defective pot. After changing the pot, everything looked fine—for about 10 minutes—when the vertical sweep collapsed again. At this particular moment my scope and VTVM were being repaired. I checked the vertical output screen voltage with a VOM and found it normal. Bias at the control grid was low, however. I disconnected C97, a 0.001 μf capacitor, between plate and screen of the vertical output tube and checked it with a capacitor checker. No shorts or opens showed. I connected the capacitor back in the circuit and the set worked OK. This time I waited 15 minutes for a breakdown. While waiting, I checked the boost voltage going to the height control and found it low—and hence the vertical oscillator plate voltage was low, with no negative voltage on the screen grid. Then I thought about the vertical output plate voltage, which has a note on the schematic, DO NOT MEASURE. This voltage was lower than the screen and the tube was not conducting. I removed capacitor 97 between tube socket terminals 3 and 4 of the 6K6 vertical output and examined it. I noted its rating of 600 vdc. Service data indicated this capacitor was rated at 1000 vdc. I changed the capacitor and replaced it with a 1000 vdc rated type and the trouble was cured. Someone had previously put the 600 vdc capacitor in the set and it finally gave up.—*Howard Keilholtz, Ellicott City, Md.*

Intermittent Filament

A call came in on a Zenith television set, Model #D2315L. The set had no sound and no picture, but had raster. The owner said the set had been doing this for some time and that another technician had worked on the set before for the same trouble.

I made the call and switched the set on; there was no picture or sound. I removed the back from the set and connected the cheater cord and the set worked fine. I could find nothing wrong with the set and replaced the back. I asked the owner to call when the trouble

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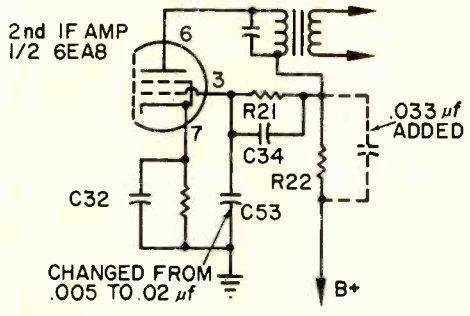

Circuit changes were required to stop oscillation.

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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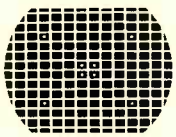
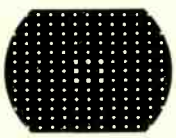


Enables you to troubleshoot and signal trace color circuits in color TV sets, or facilitate installation.



Generates white dot, crosshatch and color bar patterns on the TV screen for color TV convergence adjustments.

Generates full color rainbow display and color bar pattern to test color sync circuits, check range of hue control, align color demodulators. Demonstrates to customers correct color values.

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SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

Caddy Light

Have you ever worked on a TV set that was located in the darkest corner of the house—and tried to get that tuner tube back into place without being able to see properly? If you own one of the popular pencil soldering irons, which has screw-in elements, then invest in a 125-v, 6-w screw-base lamp. You now have a quick-fix iron and an electric light for your caddy and it will all fit into one empty tube carton. A convenience outlet could be fixed into the tube tester or use the wall outlet allotted for the TV set. I consider this an indispensable item in my caddy. — *William Geneau, Gypsumville, Manitoba, Canada.*

Drill Chuck Key

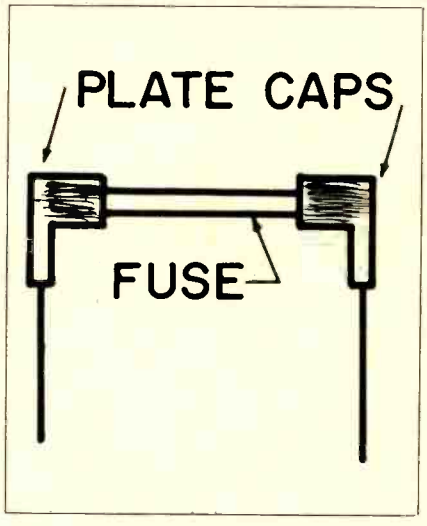
Accidentally starting a drill while tightening the chuck is dangerous. For extra protection tape the chuck wrench on the power cord as close to the plug as possible. This will make it difficult to tighten the chuck with the drill plugged into an outlet.—*Anthony J. Fusco, Buffalo, N. Y.*

Antenna Clip Adapter

Shop owners using clothes pin antenna connectors find it exasperating after removing the back of many sets to find insulated leads and nothing to clip on to. A TV ac interlock works well as the flat side may be adapted for use as well as the round side if the set leads are pushed into one side and the antenna clip to the other side. —*John M. Tomlan, Newton, Iowa.*

Fuse Clip

Whenever I junk out an old radio using grid cap tubes, or before I discard burned out flybacks, I always salvage the grid-caps and carry a few in my tube caddy. When I run into a job that has the fuse mounted under the chassis and soldered to a terminal strip, I run a pair of leads out to a convenient spot above the chassis, and attach a grid cap to each one and insert the new fuse. The next time fuse replacement is simple. — *Wm. Schlickbernd, Jr., Chadron, Neb.*



Salvaged tube grid-caps used to mount fuses above chassis.

Quick Color Antenna Check

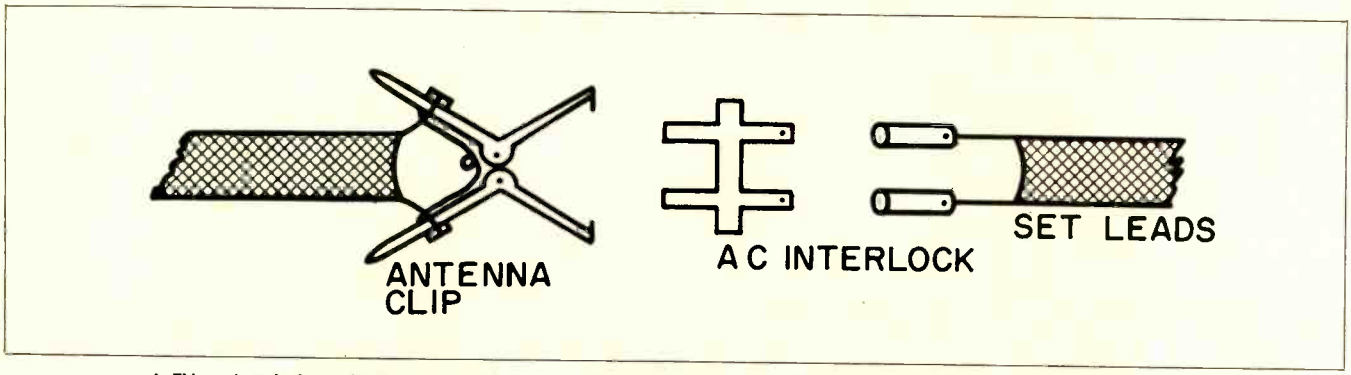
To quickly check an outdoor antenna when it is suspected of causing a no-color defect in a color receiver, disconnect the outdoor antenna lead-in and connect an indoor rabbit ears type. Orient the indoor antenna, if any hues or tints can now be seen the outdoor antenna or its transmission line is defective, improperly installed or is the wrong type.—*Robert Appel, Newark, N. J.*

Dial Cord Slippage

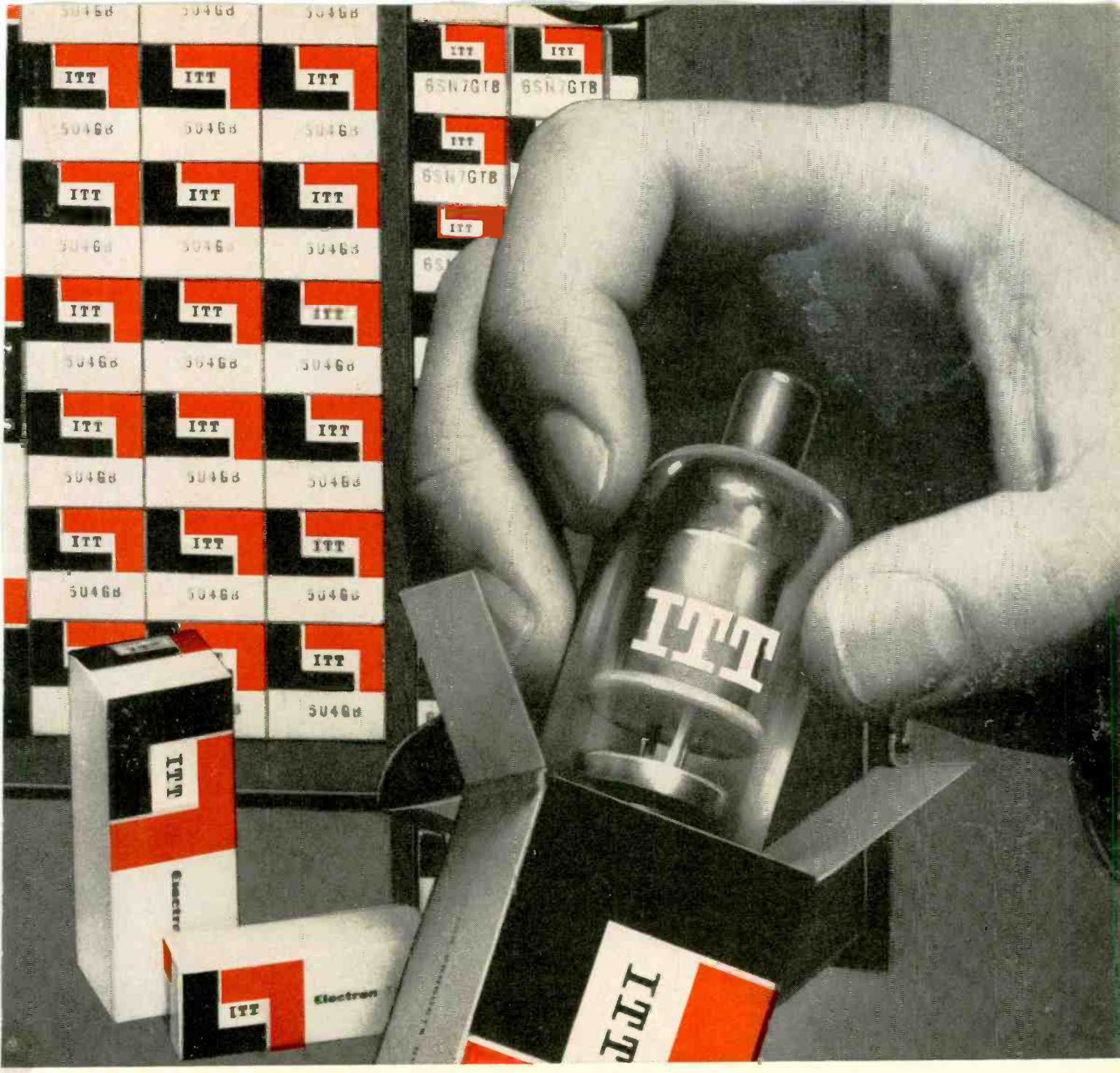
When the string starts slipping on the pulleys on TV fine tuning drives or radios that use dial cords, just spray them with tuner cleaner and this will usually stop the slipping.—*H. E. Cantrill, Jersey City, N. J.*

SHOP HINTS WANTED

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



A TV ac interlock works fine for clipping clothes pin antenna connectors to short set leads when back is removed.



There's more profit in your hands with ITT tubes

Yes, you can pocket extra profit when you stock ITT receiving tubes . . . with full confidence that you are giving your customers the finest replacement tubes money can buy.

Your customers will appreciate it, too, because they know ITT's international reputation for quality and leadership in electronics.

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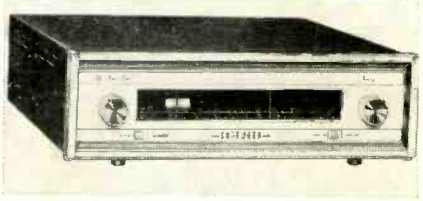
NEW PRODUCTS

FOR MORE INFORMATION CIRCLE PRODUCT NUMBERS ON POSTCARD FOLLOWING PAGE 94

IMPROVED STEREO TUNER 200

New tuning ease and accuracy have been added to the S-210011 FM Stereo MX/AM tuner it is



reported. A D'Arsonval meter is connected directly to the FM ratio detector in the tuner, providing a highly accurate "plus-to-zero-to-minus" reading of the FM detector, according to the maker. When the exact center point of the frequency band-width is reached, the meter will read "zero," and detuning in either direction of the frequency center point will cause the meter pointer to move off the zero indication, it was said. This feature is helpful in tuning when the component is placed some distance away from a speaker system, whether in the home or in a commercial installation. In a restaurant or motel for example, it is possible to tune visually with the volume turned down. The S-210011 tuner, with complete FM stereo circuitry, is priced at $209.50. A leatherette case is available at $7.50. Sherwood.

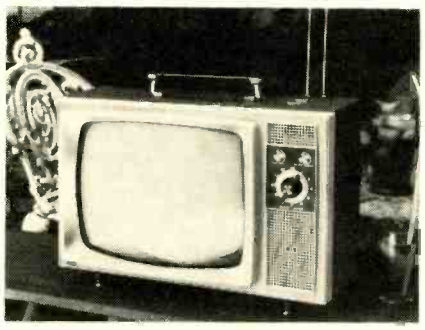
SPEAKER 201

An 18-in. woofer which is said to have a response down to 16 cps is announced. The 218MS is de-

signed to operate with the 10-in. 220MS speaker in the Concertmaster loudspeaker system. The two speakers are matched acoustically, and to eliminate any disassociation effect, they run together for two octaves on either side of the 550-cps crossover point, the maker said. The woofer may also be used with other tweeter-midrange combinations to provide optimized bass response. Price, $195. Harley-Luth.

PORTABLE TV 202

A 16-in. portable TV, model 6570, is said to have a super-sensitive chassis with 3 IF stages. It



has a seven section dipole telescoping antenna. Set has a LOCAL/FRINGE gain control and twin outlets for private earphone connection. The set carries a 90 day warranty against defective workmanship and materials, and a one year warranty on the picture tube. List, $139.95. Channel Master.

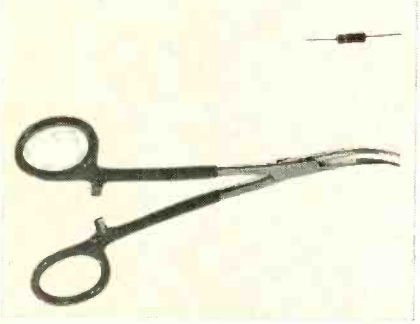
DYNAMIC MICROPHONE 203

A tamper-proof, dynamic microphone especially designed for permanently mounted installations is introduced. Called the Model 561, the unit has an attached cable and standard 5/8 in., 27 thread for direct mounting on flexible gooseneck of fixed pipe. The unit is 2-41/64 x 1-23/64 in. Recommended for language lab systems, paging applications, base-station communications and professional talk-back and cuing installations, the unit's low impedance permits

the use of unusually long cables without affecting response or level, it is said. Specifications gave frequency response as 40 to 10,000 cps with rising characteristic to 4500 cps; output level, -56.0 db (o db = 1 mw per 10 microbars); net weight: 5 oz. Price, $32.50. Shure.

LOCK-TYPE HOLDER 204

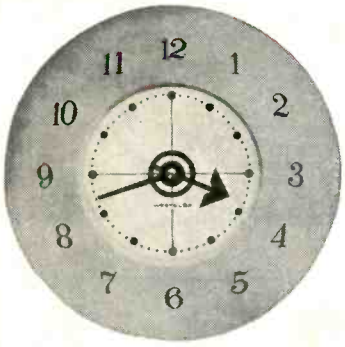
A Lock-Type Holder with a two position snaplock and insulated handle for safety in high-voltage applications is announced. It was said that the serrated jaws provide



an excellent heat sink and clamp for soldering transistors, thermistors and diodes or any application where heat would be detrimental to components. The device is available in straight or curved shape. Techni-Tool.

TUNER CLEANER 205

"Super 100" spray tuner cleaner and lubricant is a formulation that will not affect plastic discs used as channel holders in some television



Get a FREE cordless electric clock with the new Mallory battery assortment!

Sugg. List price	$93.00
Sugg. Dealer net	64.08
Your profit	$28.92
Plus free clock	$ 9.95

New BM12 profit-builder kit includes—

- Fastest moving Mallory Mercury Batteries. Three sizes fit 90% of all transistor radios!
- Fastest moving Mallory Manganese Batteries for photography and lighting!
- Compact counter merchandiser (9″ x 9″), merchandising aids and catalogs!
- PLUS—at no cost to you—a beautiful WESTCLOX transistorized cordless electric clock . . . Retail value $9.95!

The Mallory BM12 battery assortment really makes sense—and profits! It contains only the most popular and fastest moving batteries for transistor radios, photography, lighting, clocks, shavers, and the host of new electronic gadgets now on the market. And Mallory batteries are a better *value* for your customers. They cost far less *per hour* than ordinary batteries because they *last longer*—and you make up to 300% more profit in the bargain! See your Mallory Distributor today or write for the name of the Mallory Distributor nearest you.

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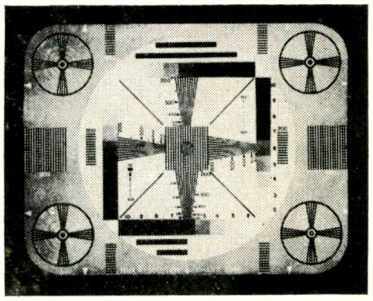
TV TIPS FROM TRIAD

NO. 22 IN A SERIES



Bill, the Senior PTM, pushed his chair away from the bench with finality. He had just finished wiring a new Triad hi-fi output transformer into a vintage audio amplifier. "Well, that's that," he informed his assistant, Joe.

Apprising the new, grey Triad S-156A gleaming in the durable period piece, Joe remarked, "What is this? Give the people more for their money week?"

Bill deftly grabbed the cue. "Old stuff with us. As you know, the frequency-limiting factor in most audio amplifiers is the output transformer. Too often the small, original part does not have enough iron and copper to prevent saturation. Also, the primary current capability is insufficient. Result—overheating and failure. Unfortunately, the customer never enjoys the full frequency range the rest of the amplifier and equipment can produce because of the output transformer bottleneck!"

Bill warmed into the second part of his oratory. "New materials such as grain-oriented steel, improved processing, and latest construction techniques in winding and stacking add up to greatly improved products nowadays. They enhance listening quality so much the customer immediately notices the improvement!"

"And there are other advantages," said Bill, reaching his finale. "The primary impedance can be matched closely to the new output tubes. Tapped secondary impedances of 4, 8, or 16 ohms are available to drive the newer high-impedance voice coils if the customer wishes to upgrade his speaker system. And the circuitry can be easily changed to screen-tap operation. Naturally, since you are saving the customer lots of money by making his old amplifier perform as well as many new models for only a modest investment, he will be happy to compensate you fairly!"

"You've convinced me," concurred Joe, "No one ever loses by giving a customer more for his money!"

MORAL: Overwhelm your customers with value beyond the call of duty. See your nearest Triad Distributor, or write for our latest Replacement Catalog TV 63/64. It lists a complete range of audio outputs from 2 to 100 watts for every purpose. **Triad Distributor Division,** 305 North Briant Street, Huntington, Indiana.

A DIVISION OF LITTON INDUSTRIES

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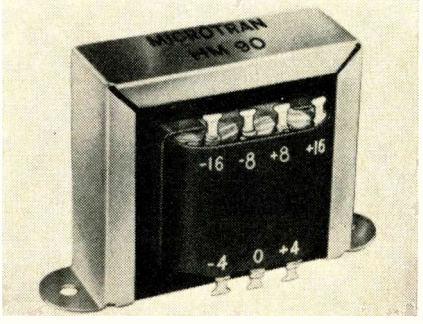
NEW PRODUCTS

tuners, according to the maker. It has a lubricant added to the compound which keeps contacts from becoming oxidized. Each can is equipped with a 6 in. steel needle. eight oz. spray can, dealer net $2.25. Injectorall.

MATCHING TRANSFORMER 206

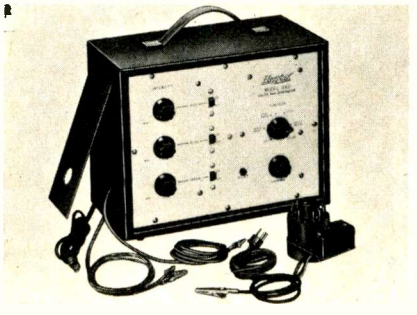
Announced is a matching transformer for mixing right and left channel signals from a stereo amp-



lifier to provide a monophonic output for an extension speaker. Net, $6.33. Microtran.

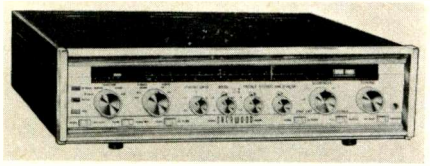
COLOR GENERATOR 207

An Installer's color TV generator is announced. Called the Model 662, the instrument generates a fine crosshatch pattern and the smallest dots available in anything but laboratory equipment, the maker said. A gated color-burst provides correct color alignment signals as well. Specifications indicated that the generator provides complete convergence signals — vertical bars, horizontal bars, crosshatch and dots —less than two lines wide and one line thick; a gun-killer for convergence and to facilitate purity adjustments; and a single-bar, crystal-controlled color-burst signal. Hickok.



TUNER-AMPLIFIER 208

The S-7700II AM/FM/FM MX receiver features a zero-center tuning meter and is said to be a highly sensitive and selective tuner with the power of a dual channel 80-w



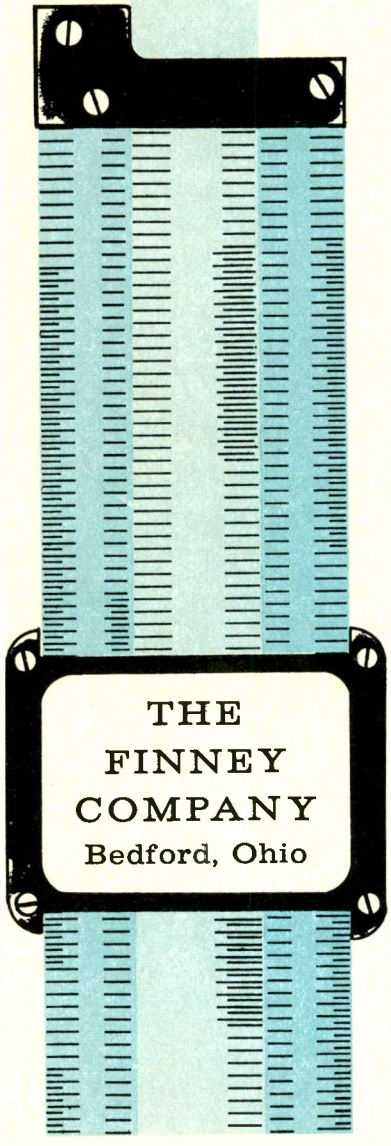
integrated amplifier. Specifications list sensitivity of the FM tuner section at 0.95 μv for 20 db quieting and 1.8 μv for —30 db noise and distortion (IHF); selectivity 200 kc at —3 db; capture effect of the component 2.4 db. Overall size 16¼ x 4 x 14 in. Price $374.50 as a chassis for custom installation. Walnut leatherette case optional at $9.50. Sherwood.

FM AUTO TUNER 209

An all transistor FM auto radio tuner is announced. The manufacturer says it is compact, is easily

installed under the dash and operates with the present AM auto radio and antenna simply by plugging it into the radio. In addition to 8 transistors and 5 diodes, the FM auto radio tuner is said to have a 3 gang tuner, full automatic gain control, 13 tuned circuits and covers the standard 88 to 108 Mc FM band. Automatic Radio.

As you read this ad . . .
A Finco Engineer is designing
A "special area" TV Antenna
Finco has produced 3,152 already
Each one is the best in its area
Want proof?
See your Finco distributor
Or write us.



NEW PRODUCTS

BATTERY MERCHANDISER 210

A 9 x 9 x 9½ in. battery merchandiser, furnished with an assortment of the most popular

mercury and manganese batteries for transistor radios, photoflash and lighting, is announced. The merchandiser is self-inventorying and includes space for back-up stock as well as a complete cross-reference guide. Also included are catalogs, battery replacement guides and price schedules. Each BM12 merchandiser comes packaged with a cordless electric clock, the maker said. Mallory.

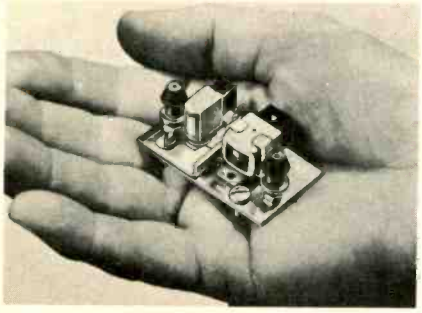
SWEEP-MARKER GENERATOR 211

A TV/FM sweep and post injection marker generator is announced. The sweep generator is

independent of the marker generator and has five ranges: 3.5-9Mc; 7.5-19 Mc; 16-40 Mc; 32-85 Mc and 75-216 Mc. All five ranges are fundamental; tuning to the desired center frequency is simplified by a 6:1 vernier dial and a 330 deg scale; both sections are non-interacting and the generator feeds only the required sweep signal to the circuit input being aligned or tested, according to the maker. The marker generator has four ranges covering 2-225 Mc on fundamentals and harmonics. A 4.5 Mc crystal is supplied with each generator. Kit $89.95; wired $139.95. EICO.

TAPE HEAD REPLACEMENT 212

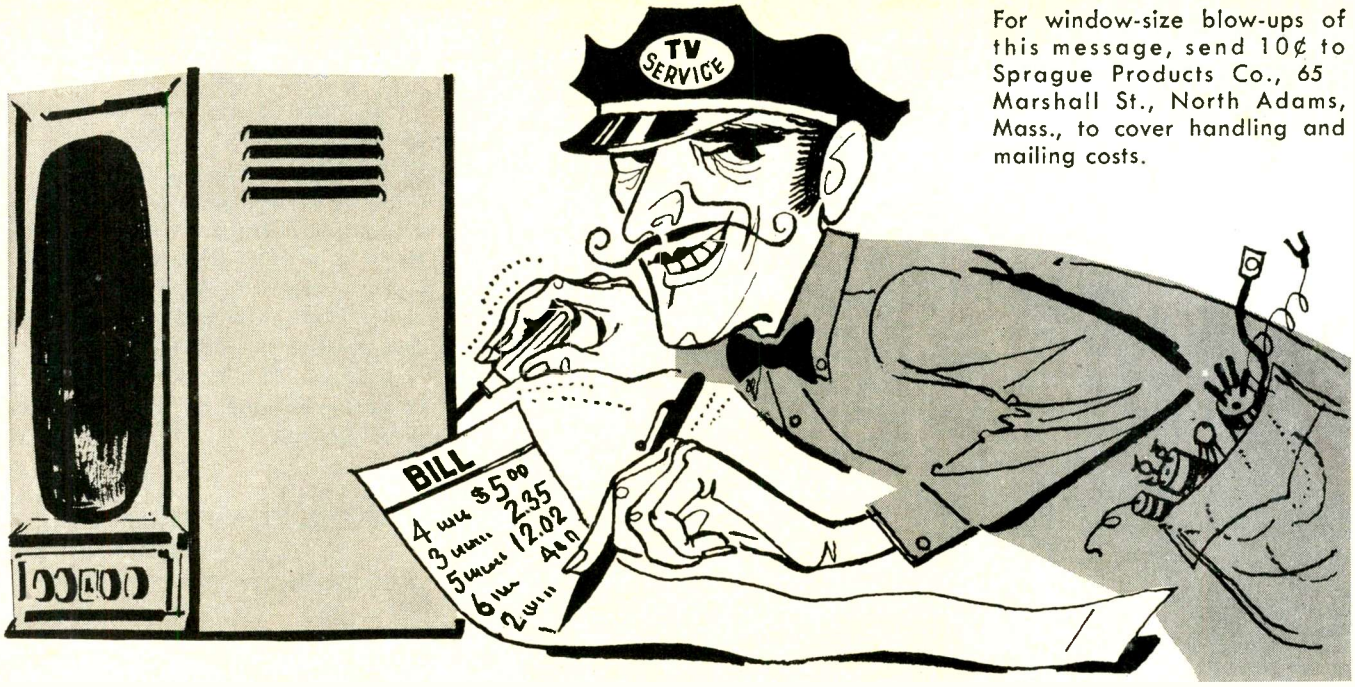
A replacement tape head for Bell & Howell and TDC tape recorders is announced. Tape recorders using old cylindrical style tape heads can be updated and upgraded by using a plastic connector plug which makes the installation effectively a snap-in job. Two screws remove the completed assembly from the recorder; allows replacement with a different assembly, or return of the removed assembly into perfect alignment and immedi-



ate use by simply plugging the head connector plugs into the matching plugs, the manufacturer said. Nortronics.

SPEAKER SYSTEM 213

A three-way loudspeaker system, model XP-10, is introduced. It is housed in a tightly-sealed infinite baffle. Specifications indicated that the high frequency speaker's moving mass is less than 1½ and the transducer consists of soft-cotton hemispherical dome, bonded to a light copper voice coil, and a low-loss quarter-section inductance-capacitance crossover network with continuously variable mid-range and tweeter level controls. Bass is reproduced by a rigid-cone 15-in. woofer with a 6-lb magnet assembly and open air resonant frequency



For window-size blow-ups of this message, send 10¢ to Sprague Products Co., 65 Marshall St., North Adams, Mass., to cover handling and mailing costs.

ARE TV SERVICE DEALERS GYPS?

Every so often, some magazine or newspaper sounds off about TV-radio service shops.

"Service technicians are a bunch of gyps," is the general theme. "They'll clip you if you don't watch out."

They might just as well write the same thing about doctors, lawyers, storekeepers, auto mechanics—or anyone else. There are gyps in every line of business. Actually the percentage in TV-radio is lower than in most.

The average service technician is a hard-working, straight-shooting individual. Rather than gyp customers, he is far more likely to spend more time on a job than he knows he will be paid for—simply as a matter of personal pride in doing things right.

We recently heard about someone's TV set going bad. A service technician called for it with his truck and returned it in good working condition within 48 hours. His bill came to $10 for service plus $2.68 for replacement parts.

The set owner argued that this was too much—yet he would never dream of complaining to the medical specialist who charged him $10 for a 15-minute office visit; the lawyer whose bill for writing a simple will was $75; or the garage man who laughingly admits that he charges $5 for "just raising the hood" of a car.

In one of our very large cities, the Better Business Bureau received fewer than 500 complaints about service in a year. Most of the complaints came from folks who expected first-class reception in doubtful fringe areas; who tried to operate their sets without suitable antennas; or who had bought sets "wholesale" at ridiculously low prices from cut-rate dealers who could offer little or no service.

Actually, it takes almost as long to become a good service technician as it does to train for any other profession. Beyond this, it calls for regular study to keep up with the constant stream of new developments. Also, it requires a surprisingly big investment in test instruments, manuals, and other shop equipment. The modern TV or radio receiver is by far the most intricate piece of equipment the average person ever owns or uses.

Service technicians are not fly-by-night businessmen—99 out of 100 run their businesses properly. The other one per cent—the gyps—can usually be spotted a mile away. Nine times out of ten, they are the shops that feature "bargain" prices and ridiculously liberal service contracts. And their victims are generally set owners who expect to beat the game by "getting something for nothing."

Good television sets or good TV service are not things to be bought on a "bargain counter" basis. Set owners who recognize this aren't likely to get gyped.

Instead, they'll find that they get more real value for their television entertainment dollars than for any other dollars they spend!

THIS MESSAGE WAS PREPARED BY SPRAGUE PRODUCTS COMPANY,

DISTRIBUTORS' SUPPLY SUBSIDIARY OF SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASSACHUSETTS, FOR . . .

YOUR INDEPENDENT TV-RADIO SERVICE DEALER

65-123-63

- - - for more details circle 43 on post card

NEW PRODUCTS

of 18 to 19 cps. Center portion of the audio spectrum is reproduced by an 8-in. speaker with a 5½-lb magnet structure. The unit was said to have a frequency response of 28 cps to well beyond audibility. Its nominal impedance is 8 ohms. The cabinet, styled to blend with any decor, is constructed of heavy, non-resonant flake-board. Size 30½ x 24-3/8 x 14-3/4 in. Weight 80 lb. Price $249.50. Fisher.

LINEAR AMPLIFIER 214

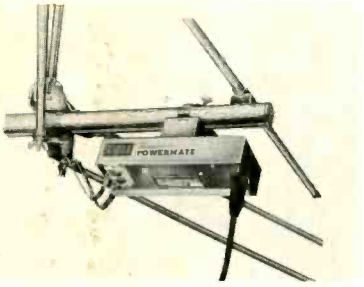
A linear amplifier that can boost the output of single sideband transceivers to a full kilowatt is introduced. The SB1-LA covers four bands: 80, 40, 20 and 15 meters. It was developed primarily for use with SB-33 transceiver but can be used with any single sideband unit. Its small size (11¾ x 5½ in.) makes it particularly appropriate for mobile use. The unit requires no input tuning. The amplifier operates as a Class AB-1 system for low distortion. It will be offered through electronic parts and communications equipment distributors at a suggested price of $279.50. Sideband Engineers.

PLASTIC CLEANER 215

An anti-static plastic cleaner, Surefire, both cleans and removes static charges, providing all plastics with a dust repellent surface, according to the maker. The cleaner may be used on the TV screens at the finish of every repair job. When used in combination with Surefire scratch removing compound, the result is a thorough, complete protective treatment for plastics, it is said. Comes packed in 8-oz and pint plastic refillable, self-dispensing containers. For greater economy, it is also available in plastic gallon jugs. Wilco.

ANTENNA PREAMPLIFIER 216

A 75Ω coaxial cable TV antenna preamplifier, Model SPC-103, is introduced. Designed for locations where spurious signals or interference problems arise, the preamplifier is said to provide optimum color reception in semi-fringe and fringe areas. The preamplifier has a built-in matching transformer and is contained in a metal weatherproof housing. The accompanying remote power supply contains a choice of outputs—either 75 or 300 Ω, selectable by a switch. According to specifications the unit has an average gain of 14.5 db with a maximum output of 700,000 μv in the low band channels, and 9.0 db gain with a maximum of 200,000 μv output in the high band channels. Price $47.95. Jerrold.

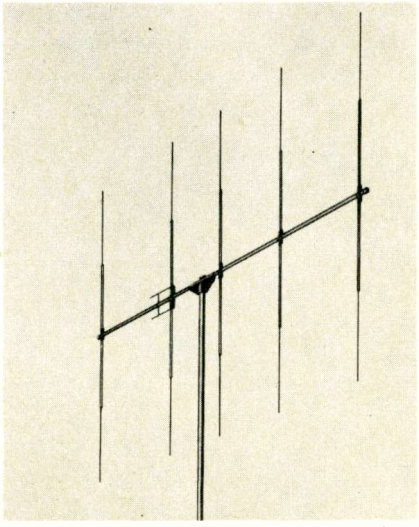


CB TRANSCEIVER 217

A multi-featured citizens band transceiver, Globe President VIII, designed and equipped for "ruggedness and readiness" is announced. The unit may be operated on any one of eight crystal controlled channels; a ninth channel is available by using the equipment's external crystal socket. The transmitter features a full 5-w input, the maker said. The microphone is push-to-talk relay operated from transmit to receive positions. The tunable receiver covers all 23 CB channels;

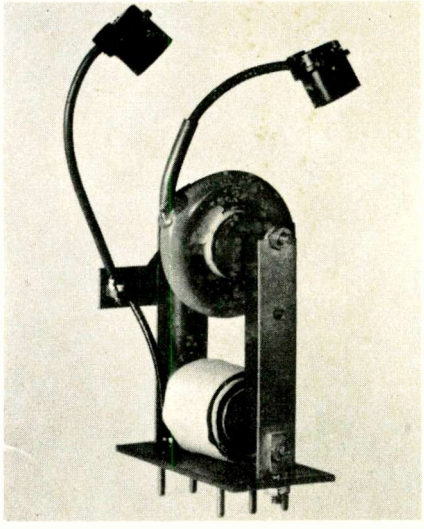
spot switch is included for exact frequency tuning. An illuminated "S" meter reads incoming signal plus relative output indications. Additional features include a built-in public address system, a tri-purpose supply, 117 vac, 6 & 12 vdc; adjustable squelch control. GC Electronics Co.

CB ANTENNA **218**



A 5 - element beam antenna for CB is announced. It multiplies the power of a CB transceiver 10 times, giving effective radiated power of a 50-w transmitter, the maker said. Designated model 115-B, the antenna develops 12.7 db forward gain over that of a tuned dipole, with front-to-back ratio, 25 db; front-to-side radio, 40 db, the maker asserted. Hy-Gain.

HOT REPLACEMENT **219**



A horizontal and high voltage output transformer, HVO-225, an exact replacement for Setchell - Carlson TWF - 90, TWF - 110, TWF - 110X, WF - 90, WF - 110 and others, is announced. No electrical or physical changes necessary, according to the maker. Detailed instruction sheet and schematic is packaged with each unit. Merit.

PAGING SPEAKER **220**

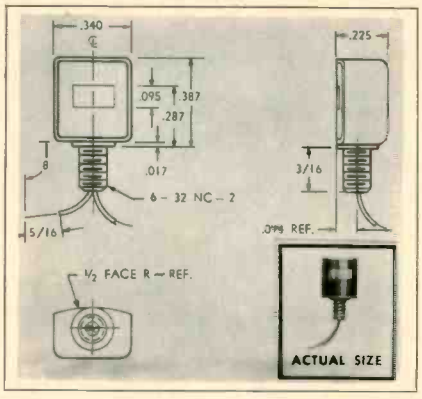
A 45Ω version of the model EC-10 paging and talk-back speaker is announced. Like the 8Ω version, this is a high efficiency loudspeaker, and adaptable for intercom systems which require 45Ω for proper

NEW PRODUCTS

operation, the maker reported. Specifications rate the unit's power input at 6 w and frequency response from 400 to 13,000 cps. Bell diameter 7½ in., overall depth 6-3/8 in. Price $25.25. Atlas Sound.

TAPE RECORDER HEAD 221

A small record/playback head opens up many new engineering possibilities for building miniaturized equipment in all fields of magnetic recording, it is announced by the manufacturer. Designated the

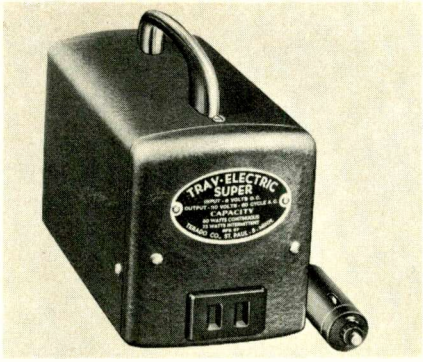


3K17, the head is especially designed for micro-miniature tape recording uses. The head is approx-

imately 3/8 x 3/8 x 1/4 in., offering space-saving advantages to manufacturers in original equipment, or for replacement purposes. It is a miniature size half-track monophonic record/playback head. Michigan Magnetics.

INVERTER **222**

An inverter to operate from a standard car battery, called the Satellite, model 50-138-3, is specially designed to operate small portable TV sets. It is designed to plug into the cigarette lighter or

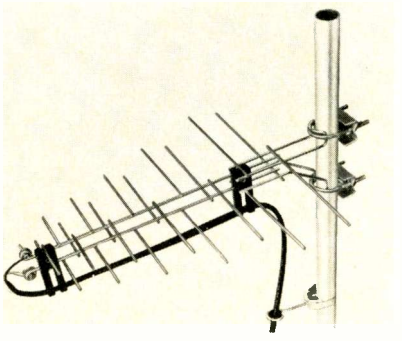


clip to the battery of the car, boat or plane. Also operates record player, radio, electric shaver and other small electrical equipment, the maker announced. Terado.

UHF ANTENNA **223**

A UHF TV antenna based on the periodic concept is said to provide more uniform gain than conventional antennas. Called the Golden Dart, the antenna uses unbreakable polypropylene insulators to maintain the proper distance between lead-in wire and the antenna. This minimizes standing wave ghosts resulting from faulty impedance match, the maker says. Thumb-

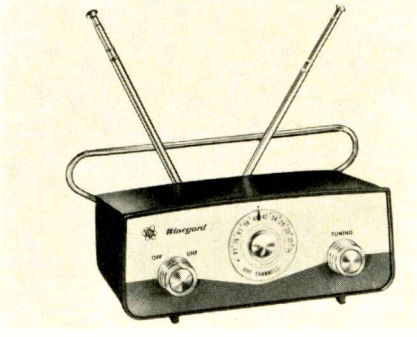
NEW PRODUCTS



tightened stripless screws for twin-lead connection and D-bolt mast mounting make installation unusually easy. The only tool required is a knife to split the twinlead. Price $5.95. Blonder-Tongue.

UHF CONVERTERS 224

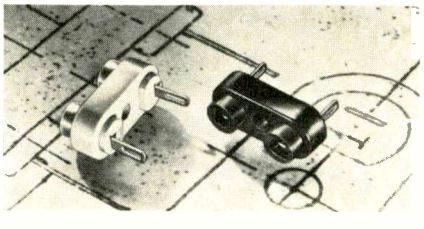
Regular and amplified UHF converters, with built-in UHF and VHF antennas are announced.



Models are also available without built-in antennas. All models are furniture styled in polystyrene cases in autumn brown trimmed with brushed gold and feature 3 gang capacitive tuning elements, 6DZ4 oscillator tube, isolated power supply with silicon rectifier, 1N82A diode and completely enclosed cabinets. Specifications indicate all models exceed FCC radiation requirements. Six models are priced from $29.95 to $69.95. Winegard.

CRYSTAL SOCKET 225

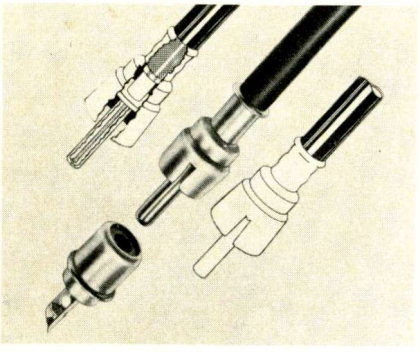
An all-molded crystal socket has



been introduced. The socket, No. 9748-16, is dimensionally identical to the TS0205C01 ceramic socket and accepts standard HC6/U crystals. It is suited for use where mechanical shock and vibration are problems, and is excellent for many commercial applications such as citizens' band transceivers, it is said. Dimensions are: length, 0.859 x 0.312 x 0.375 in. Contacts are spaced on 0.486 in. centers. A 0.125 in. hole is provided for mounting with a single screw. Eby.

PHONO PLUG 226

The model 46-C crimp-type phono plug is said to facilitate mechanical crimping to cable by



using a long neck plug shell with flared end. The long neck also provides grip for insertion and extraction from input connector without placing any strain on cable, the manufacturer said. National Tel-Tronics.

AUTOMATIC LIGHT SWITCH 227

Genie, an automatic switch for home, office and business use, is announced. The device fits into any

wall outlet and when lamps are plugged in, provides the home with automatic lighting. Lights are automatically switched on at night and off in the daytime, according to the maker. It can also provide automatic lighting for store windows, office, etc. Ramic.

LOOKING FOR A NEW LOCATION ?

PART I

Pick a spot to fit your business--sales-service, service or both

by John E. Mertes
University of Oklahoma
Professor of Marketing

■ Location is an important ingredient in the success of a service shop or a sales-service outlet. It often provides the operator with his most important business advantage.

In a static society, a store location may possibly retain its suitability forever; but in an economy which is growing as rapidly as ours has been since World War II, the deterioration of certain established retail sites is inevitable.

A maxim in retailing and service fields indicates that business moves *toward* the consumer. Hence, the en masse surge of urban population toward the outlying residential areas has necessitated the development of new retail sites. This exodus from the city has been accompanied by the building of through-way systems to augment the old road networks, which were designed for pedestrian and street-car traffic. The customer no longer walks to the store; therefore, it behooves the enterprising merchant to seek suitable spinner sites (locations adjacent to a major residential area and adequately served by one or more feeder roads) outside the central business district.

Business Types

Professional TV-radio and Hi Fi businesses may be classified into two broad types: (1) the *service shop,* concerned primarily with repair and maintenance of TV-radio sets and (2) the *sales and service outlet,* concerned primarily with selling new TV, radio and Hi Fi sets and allied merchandise, but also providing adequate installation and repair service.

The merchandise handled by a sales-service outlet, such as Hi Fi equipment, public address systems and magnetic tape recorders, may be classified as comparison goods—items possessing durability, high unit value (compared to the price of a loaf of bread, for instance), technical components, and characteristics of color, line and design. Since the consumer usually compares goods of this type before making a final decision to buy and is willing to make extra effort to obtain the best possible merchandise or service, loca-

tion of the shop need not be in his immediate neighborhood nor in the heart of the downtown shopping district. As a matter of fact, the owner of a service shop or a sales-service outlet has a choice of three locations: (1) around the outer edges of the downtown shopping area, (2) in the secondary shopping areas at the convergence of two or more major thoroughfares or (3) in isolated spots on the important street near the major residential areas.

The Downtown Area

Except in the smaller towns and cities, the service shop lacks adequate volume to justify high rents in the central business district; nor can the sales-service outlet afford such a location in the larger cities, unless it offers complete assortments of merchandise in every "sound" field—not only TV-radio sets, but also the many other allied lines. Thus, the best location for the sales-service outlet and the larger service shops to serve the total city or trading area is on the outskirts of the central business district. The site should be large enough to provide adequate parking for the shop's service trucks and customers' cars. Business will also come from pedestrian traffic created by people who work in the downtown area.

When locating in an area adjacent to the central business district, the shop can economically use the community newspaper and the local radio and television stations as advertising media that will reach most of the population in the trading area. Passersby will also become acquainted with the shop; and if it is properly "signed," they will patronize it when the occasion arises.

Unless the shop owner decides to provide complete assortments and services, location in the surrounding area is precarious. Habits of the downtown customer have changed during the past three decades. He no longer shops frequently for all types of goods; instead, he shops downtown only occasionally, and then only for merchandise not available in the outlying shopping centers or smaller suburban communities.

That sales have been relatively declining in the central business districts of our larger communities does not mean that the future of downtown operation is hopeless. In communities that have an active urban renewal program, a competent planning commission, a growing cultural center, and an alert merchants' association, the downward trend in sales may well be reversed. Since the opportunities in the downtown area lie chiefly in innovation and renovation, the operator of an electronics shop must keep abreast of the times and be constantly on the alert for new merchandising and service developments.

Secondary Shopping Areas

Secondary shopping areas may be classified as natural or planned. *Natural shopping areas*—those that develop without planning or control —rely on competitive forces to determine the number and kinds of retail businesses. First occuring at axial locations outside the central business district, these areas were so encouraged by the increased use of automobiles after World War I that they spread gradually into what are commonly called "string developments." Even though such areas often attract more traffic than their parking space can accommodate, they still occur in various communities and offer shop location opportunities.

In contrast, the *planned shopping center* is a community of shops and stores designed and developed as a complete retailing unit. A parking area to serve the entire shopping complex is an integral part of the center. In a large center each type of store is properly related to the others to maximize customer traffic and merchandise exposure. Generally, comparison goods traffic should be separated from convenience goods traffic. A location in a large planned center may not be economical for the service shop, but it will provide profitable possibilities for the sales-service outlet or the large appliance store. Even though a shop owner must subordinate some of his operating freedom to the over-all plans for the center, he will enjoy a continuous day-to-day traffic and will incur less risk than in other locations.

Before deciding to locate in a shopping center, the operator of a sales-service shop should carefully investigate the center from many angles. A list of the points to be

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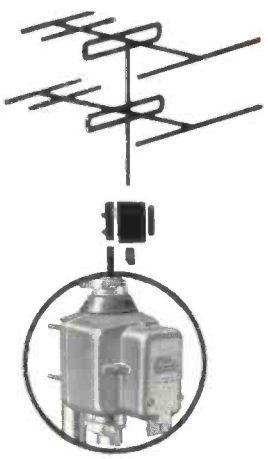

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considered in evaluating a shopping center location is detailed in Table I. Much of the necessary information can be obtained from an economic analysis provided by the developer of the center.

After learning as much as possible from the developer of the center and how the center is to be managed, the prospective tenant needs complete information on the trading area, the traffic patterns leading to and from the center, the composition of the market, the merchandise cohesiveness within the center, and other points listed in Table I.

The trading area for comparison goods, such as the merchandise carried by a sales-service outlet, extends to as much as 20 miles for a large regional shopping center. The developer of a center usually establishes the outer limits of a trade area by a time-distance factor: 15 minutes for a small center; 20 minutes for a larger center (community center); and up to 30 minutes for the largest center (regional center). In determining the extent of the trade area in this way, he considers traffic patterns, physical barriers, industrial areas and declining residential areas.

Properly situated centers are oriented toward the customers' shopping trips. The flow of traffic and its channelization from the residential areas are of interest to the shop operator. And the accessibility of the center from adjacent thoroughfares contributes greatly to the overall success of the center.

A majority of the suburban shopping centers which have developed since World War II appeal to the middle and upper-middle social class, consisting predominantly of married couples with growing children. Much of the shopping is done informally by the housewife during the day and by the entire family in the evening. The demands of these young families run the whole merchandising gamut. In the few areas consisting of older families, the merchandise lines are graded-up to appeal to higher income groups on a theme of fashion alertness or product quality. Only by knowing what types of customers compose the market can the shop operator determine merchandise policies and sources of supply suitable for that particular trade area.

Any small center—a cluster including only a food store, a drug store and the basic services such as a cleaning pick-up station and an automatic laundry, or a "minit" centerette, including only quick-service shops—might well be an excellent location for a service shop. By offering a variety of convenience goods and services, the small center of either type soon develops a continuing patronage.

Only the larger centers offer an opportunity to the sales-service operator and the large appliance dealer. In the largest, or regional, center a comparison goods complex dominates. Since adjacency to other stores within the center contributes toward the success of the sales-service operator, his site selection problem is one of locating along the flow of traffic which is primarily in the mood to buy his type of merchandise. He will probably choose a site within the general area of the men's wear, hardware, auto supply and sporting goods stores. An appliance dealer should also consider the degree of merchandise "scrambling" that occurs among the various stores. Unless the developer has allowed exclusive contracts, the operator should investigate the policies of major chains to determine if there will be excessive duplication rather than supplementation of merchandise lines.

Once the prospective dealer has ascertained that a center location is suitable for his type of business, he should select a site within the center and negotiate for a lease as soon as possible.

The Isolated Location

The operator of a service shop should seriously consider the isolated location. To discover a potential site that offers a good opportunity, he must acquire an intimate knowledge of the community by being alert to all events that concern traffic, real estate and retailing. Civic authorities are his best source of information. However, he can gain an overall picture of the city's growth and traffic flow by surveying the community, or obtain information of available sites by driving about town in a systematic manner.

Since an isolated location serves residents living nearby, information concerning traffic flow is necessary

to the prospective retailer. The best location is usually along the street that serves as the feeder road to the area or at the junction of two or more roads. By driving past the location, potential customers will become aware of the shop's availability. The site should be wide enough to be seen and recognized and deep enough to provide off-street parking in front of the shop. Other points to consider in evaluating an isolated site are listed in Table II (to be published in April).

A good location—whether in the downtown area, an outlying shopping area, or an isolated area—is not the sole attribute a dealer or service technician should seek for his business; for it can never substitute for good management, merchandising and promotion. Instead, a suitable location must be considered the "extra ingredient" necessary to the successful operation of the service shop or the sales-service outlet.

Table 1
Points to Consider in Evaluating a Shopping Center Location

The Developer

1. Who is the shopping center developer?
2. How long has the developer been in the business of developing real estate?
3. What are the financial resources of the developer?
4. With whom has the developer arranged for the financing of the center?
5. What is the reputation and integrity of the developer?
6. Who performed the economic analysis? Does the report cover both favorable and unfavorable factors?
7. What experience has the economic consultant had?
8. Has an architectural firm been retained to plan the center?
9. Has the architect designed other centers? Have they been successful from a retailing standpoint?
10. Who will build the center? The developer? An experienced contractor? An inexperienced contractor?
11. Has the developer had experience with other centers?
12. What is or will be the quality of management for the center?
13. Will the management have merchandising and promotion experience? (Some developers are large retailers rather than real estate operators.)
14. What per cent of the leases have been signed? Are they on a contingent basis?
15. Have you studied carefully every facet of the lease?

Trading Area

16. Has the trading area been determined by time/distance measurement? Has it been delineated by contour lines rather than a perfect circle?
17. Does the size of the trading area seem reasonable in relation to the size and type of shopping center?
18. What is the population of the trading area?
19. How many families live in the area?
20. What is the per capita income in the area?
21. Are the income sources stable?
22. What are the possibilities of population growth within the area?
23. What is the automobile population of the area?
24. What is the relationship of the center to competitive centers? Is this considered in the volume estimates projected in the economic analysis?
25. What are the current buying habits of the customers residing in the area? Where do they shop now? Was this explored by the proper use of marketing techniques?
26. Were the estimates made on the basis of different potential percentage shares of trade from the various sections of the trade area?

Merchandising Cohesiveness

27. In what respect(s) does the center dominate the merchandising scene of the trade territory?
28. What type of store is the anchor store? Supermarket? Variety Store? Junior Department Store? Department Store?
29. Does the complex of stores fulfill all the needs of those in the trading area in terms of the type and size of center?
30. Is there a proper balance between retail stores and services?
31. Are there regional or nationally known stores in the center to attract traffic?

32. Do the anchor stores advertise aggressively in the area?
33. Has the developer laid out a plan for the organization of tenant occupancy?
34. Has the economic analysis made a definitive projection of the potential sales volume for each type of store, using such data as consumption expenditures?
35. Has a careful survey of competitive stores and centers in the immediate trade area been made?
36. Are there enough independents in the center to provide the shopper with a choice (50 per cent or more)?
37. If a larger center, is the supermarket separated from the department store?
38. Has the proper amount of floor space been allocated for specific types of business?
39. Are the stores arranged to give each store an equal chance for customer traffic?
40. Are the stores properly related, each to the other, as follows?
    a. Men's Wear — Sporting Goods — Men's Shoes
    b. Women's Ready-to-Wear — Family Shoe Store — Children's Clothes — Department Store
    c. Candy — Gift — Books
    d. Bakery — Doughnut Shop — Supermarket (close to parking)
    e. Variety — Drug Store
    f. Barber Shop — Shoe Repair — Cleaners (close to parking)
    g. Offices
41. Are the tenants (planned or actual) experienced or of good management potential? Are they able to finance their operation?
42. Is the per cent of planned or actual occupancy high?
43. What is the relationship of the department store to the parent store? Is it to be a limited line branch store or a complete line store?

. . . WATCH NEXT MONTH FOR

TRAFFIC — PARKING — SIZE AND SHAPE — THE CENTER'S DESIGN POINTS TO BE CONSIDERED IN AN ISOLATED SITE.

. . . TOUGH DOGS

Continued from page 66

showed up again. That afternoon about closing time the owner called. I returned to the house and when I switched the set on it worked perfectly. I left and asked the owner to call if the trouble developed again.

The next day about noon another call came. This time the set would not come on. I removed the back and connected the cheater cord. This time the filament in the 1st IF tube was not lit. I replaced the tube, put the back on the set and started to leave. Before I could get away, the set blanked out. With the back off the filament in the 1st IF was out again. By moving the tube, the filament would come on. I removed the chassis and the ground side of the filament, pin four, had a bad solder joint, resoldered the joints and cured the trouble.—*Charlie Ferrell, Wilson, N. C.*

. . . KIT BUILDERS

Continued from page 47

encountered. To correct this, the manufacturer recommends installation of a 130 pf, 6 kv capacitor across the horizontal yoke. This adds about 1 in. of width to the picture and compensates for most difficulties.

Servicing the set should not be difficult for those who are familiar with other color receivers. Only two adjustments are found which are not a part of factory assembled units: the vertical dot control and the horizontal frequency of the dot pattern controlled by the ringing coil. In order to use the dot generator, the tuner should be set to tune in a strong station.

By virtue of the fact that the set was designed to be built without benefit of mass assembly tools and practices, the set lends itself particularly well to service. If you do encounter one of these sets which refuses to work after construction, use normal troubleshooting techniques first. It could be a tube in this set as well as in other sets. ■

MOVING?

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

. . . B-W COLOR ADAPTER

Continued from page 51

ated from the "brushes" on the rotating filter and that some simple mechanical corrections such as reducing the 3/64 in. spacing between contacts and electrical filters would eliminate it.

According to the inventors, the system has shown long-time sync stability and no problems have been encountered which could not be corrected in manufacture.

Filters

Both polarized filters were purchased by the Panoshes. To limit expenses, however, a popular brand of clear waffle syrup was used to fill the hollow plastic dispersion filter. The dispersion filter on the prototype is about 4 in. thick but Mr. Panosh says the replacement of the waffle syrup with a chemical having a greater rotation factor could bring the thickness down to about an inch at a reasonable cost.

The rotating polaroid filter is driven by the motor at 600 rpm by friction rollers.

It is the hope of the inventors to perfect the system to the point where it could easily be screwed on the front of any B/W TV. The adapter can be used with B/W CRTs of any type including the new wide angle deflection tubes.

B/W pictures are perfectly normal when viewing through the color filter. The only flaw that could be found with the color was a "more pastel" tendency than with conventional color tubes.

Mr. Panosh has been in the TV business "15 or 20 years" and "in radio since the late twenties." He reported that many local people had pestered him for demonstrations to the point that he had to refuse all late-comers. ■

. . . SAMPLING DEMODULATORS

Continued from page 58

extreme. In this case there is no left channel signal; only the right channel is active. This changes the make-up of the FM composite signal only with respect to phase. In the first segment there are now negative peak variations but no positive peak variations (compare the composite waveform of example "C"). During the second segment, the variations appear in the positive

peaks while the negative peaks remain at constant amplitude. All of this means that the sampling at the top diode occurs when the peaks are of constant amplitude. It is the bottom diode that now takes the samples during the peak current variations. Consequently, there will be right channel output but no left channel output. This again corresponds to the original signal condition.

Example "E" has signals in both channels with unequal amplitude; the left channel signal has been made stronger than the right channel signal. Consequently, the resultant FM composite signal is in the form of a subcarrier envelope with both positive and negative peak variations. Let us see how the demodulator responds to this type of signal.

During the first segment of the composite FM envelope the positive peak variations are greater than the negative. The top diode is sampling the positive peaks because they are time-coincident with the positive alternations of the regenerated subcarrier E1. The bottom diode, in turn, responds to the weaker negative peak variations. As a result there will also be some right channel output. In this case both channels are active, being sampled alternately by the demodulator. As in the previous example the envelope cycles reverse during the second segment of the composite FM signal. Consequently the positive peak variations now match the timing of the regenerated subcarrier E2. Again the stronger output will develop in the left channel because of the greater peak variation. The weaker output, as it should, results from the sampling of the positive peak variation which is smaller. Again the left and right information has been channeled separately, reproducing a strong left channel output and a weak right channel output corresponding to the original left right channel input.

Separation

It is apparent that the phase of the regenerated subcarrier is very important to the precise operation of a sampling circuit. The individual cycles of the regenerated subcarrier must be matched to the peaks of the envelope cycles. This lock-in of the phase of the regenerated subcarrier is handled by the incoming pilot frequency. In fact, proper phasing requires that the subcarrier cycles cross the zero axis with a positive slope simultaneously with each crossing of the zero axis by the pilot frequency, as shown in Fig. 5. If the phasing drifts to and fro from this point, there will not be clean sorting of the signals into the respective right and left channels. Some right channel signal will get into the left channel and vice versa.

This can be better understood if you consider the extreme case at "B" in Fig. 5. In this case the phasing of the subcarrier has drifted a complete cycle with respect to the pilot frequency. Were this to happen, there would be a complete change in the sampling operation shown in Fig. 4. In fact this circumstance would cause the right channel signal to be sent into the left channel and vice versa.

The precise timing indicated above emphasizes the importance of proper tuning and adjustment of an FM receiver and multiplexer. It also indicates the importance of delivering as strong a pilot component as possible to the multiplexer so as not to lose control of the subcarrier phasing. ■

. . . CONFIDENCE

Continued from page 59

thought about it; you've found an ally; now you need action. Make a list of three things you can do today which will help you overcome that insecurity—then set out to do them.

Develop a positive attitude toward those around you. If you "lose yourself" in others, in interesting work or hobbies, or in worthwhile causes, you develop your positive emotions at the expense of the negative ones (anger, hate, loneliness, discouragement, boredom).

Finally, remember that self-confidence is built up by a total pattern of successive experiences. It can neither be quickly developed nor quickly destroyed. Your self-confidence deserves to be carefully guarded because it is often the difference between success and failure. ■

to the New York World's Fair or $500 in cash. The number of times a technician can enter the contest is unlimited. A separate entry blank with a completed four-line limerick and a label or box end from any IR product or facsimile of the IR trademark are required for each entry.

Midget TVs

A brief tramp around the market places indicates that you will be seeing more nubbin-sized sets in your shop for repair as time passes. Some crystal-ballers say that a half-million will be produced this year in the 11-in.-and-smaller category. Admiral, Curtis Mathes, Emerson, General Electric and others are hitting the market with midgets. Delmonico has a 4½ in. transistorized job. Sony has a new 9 incher. Sharp expects a 6-in. set to be out shortly. No doubt the watch-makers loupe will soon become a standard tool in every TV-radio service shop.

Increases Line

Zenith has 23 different color TVs, ranging from a table model to a "home theater" three-way combination that lists for $1775, it was learned.

Sues For Patent Infringement

Channel Master Corp. of Ellenville, N. Y., a designer and manufacturer of television antennas, has filed suit for alleged patent infringement in the United States District Court for the Northern District

NEWS OF THE INDUSTRY

'Golf Champ' Promotion

A promotion campaign stressing the importance of professional TV set servicing is announced by Distributor Products of RCA Electronic Components and Devices. Golf champ Arnold Palmer is endorsing RCA's "Real Pro" program and will be featured in national and local advertising as well as on network television.

Round The World Contest

Sometime after May 18, 1964 an electronic technician in the United States is going to lay his instruments aside, stop 'triggering' his soldering iron and hang out the "Gone Traveling" sign, says International Rectifier Corp. He'll be off on a jaunt around the world as the winner of International's 'Round The World' contest. First prize is a 28-day solo trip around the world that will cover three continents and nine countries or, if the winner prefers, a 15-day trip for two to Europe. Entry blanks for the contest, which opened March 1 and closes April 30, are available at all IR distributors, who will share in the winning technician's good fortune. The salesman whose name is on the winning entry will receive a three-day trip

Withers Beseiged For Information About Translator

The accompanying item appeared in the *Commonwealth*, weekly Somerset, Ky. newspaper.

Hobe Withers, owner of Hobe's Radio and Electronics, is under siege from letter writers across the country. All are seeking information regarding Somerset's TV-Translator.

The letters to Withers started as a result of an article which appeared in the November issue of "Electronic Technician," a trade magazine.

A feature story, entitled, "Does Your Town Need A TV-Translator?" described the efforts made by Withers to obtain a translator in Somerset, and outlining the construction of the tower.

The article, written by former Pulaski Cduntian Carl Henry says that "Hobe's station" has increased television viewing in the area, and has boosted the sale of television sets here.

Flyback Windings

Rogers Electronic Corp. announced that they have made flyback "coil-only" replacements available for the first time. The company anticipates that this new concept will bring the cost of repairs down. A major promotion campaign is being prepared to acquaint dealers with the concept, the company said.

. . . New Developments in Electrical Protection

of Ohio, Eastern Division, at Cleveland, Ohio against Kay-Townes Antenna Co. of Rome, Georgia and Olson Electronics, Inc. of Akron, Ohio. The defendents are charged with copying Channel Master's patented Crossfire antenna covered by United States patent No. 3,086,206 as well as the TW antenna covered by United States patent No. 2,817,085.

Field Strength Meter

David Hughes, vice-president of marketing, announced that Hickok has a new VHF/UHF field strength meter. The model 235A reads absolute field strength; 10-100,000 μv VHF, 30-50,000 μv UHF; 75 or 300Ω input; battery operated and headphone output jack for audio monitoring, according to Hughes.

Wide-Angle Color Tube

Rectangular, 25-in. RCA color tubes will reach the retail market before the end of 1964, Raymond Saxon, President of RCA sales corporation, said recently. Limited quantities of the 90-deg tubes will appear first in the high end of the home entertainment line. They will be more expensive than round tubes.

Akron, Ohio Gets License Law

According to TSA Ohio News, TV-radio technicians in Akron, Ohio ". . . can no longer be common law technicians. . . . If you are to operate a service business, you must go to City Hall, register, state your qualifications, prove your ability, pay your fee, sign your name—now you're ready to go into the service business," the publication continued.

. . . TRANSISTORIZED EQUIPMENT

Continued from page 61

Most transistors which are employed in high quality, stable circuits are biased by a divider network. A single-resistor system, employing the transistor's base current to establish bias, is never used because variations in transistors are great enough to cause widely divergent areas of operation. This, of course, would allow variations in amplification at different frequencies and levels causing distortion and non-linear response in amplifiers. The divider network eliminates this by maintaining a relatively constant bias without regard to transistor characteristics. Small value-changes in this bias network can upset normal operation and resistors should be carefully checked with an accurate ohmmeter when trouble is suspected in this area. ■

. . . HOWIE GETS A LESSON

Continued from page 63

one precaution. We should remove the bad resistor from the circuit. It just might decide to heal itself intermittently at some future time and then we'll have another headache trying to find the cause of an erratic picture. If we clip this wire off the tie point, which we know goes to the resistor, that will remove it from the circuit permanently."

Fred clipped the wire, soldered in a replacement and turned on the receiver. The picture came in beautifully.

"Well, whatya know? We've fixed two sets without pulling them out of the cabinets. That's really shaving time off a repair. These new sets are sure getting easy to fix." ■

. . . COLOR TEST EQUIPMENT

Continued from page 65

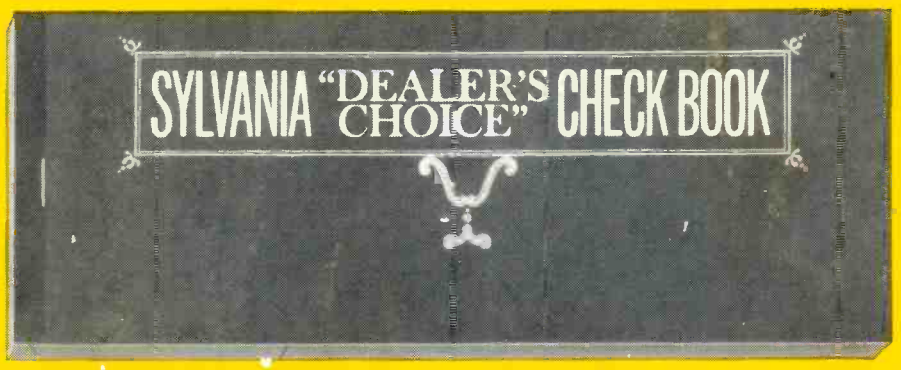
years? Don't forget, you have a share in that $120-million.

Color you green! That's the color of the money you'll make!

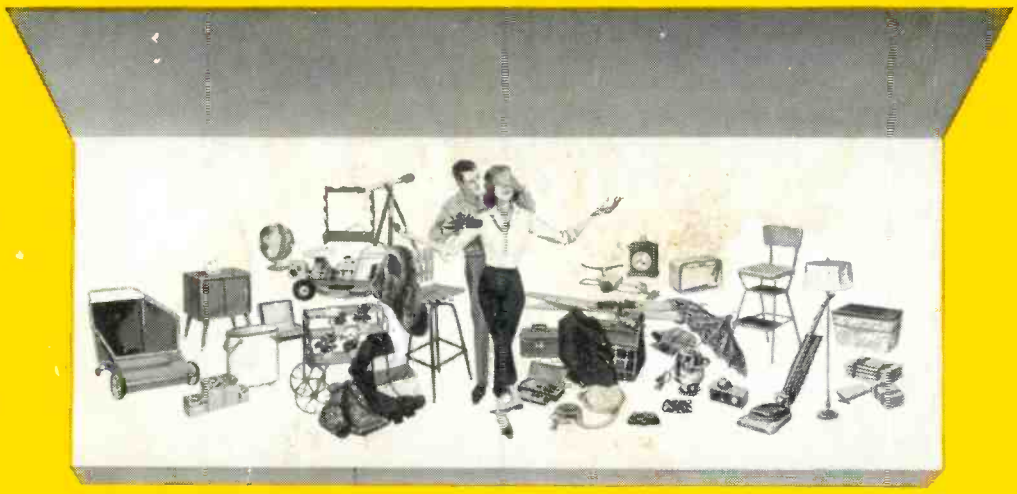
Don't want to take the plunge? Color you gone — you certainly can't continue for very long without color service and its additional income. ■

ADVERTISERS INDEX

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



—he's ready to write you the checks



—on your choice of over 400 valuable prizes

It's "Dealer's Choice" right now at your participating Sylvania Distributor. Ask him how you can get "Dealer's Choice" checks with your purchase of Sylvania receiving tubes. ■ With your first purchase pick up your copy of the "Val-U-Buy" catalog. It's filled with 473 wonderful prizes. Then pick the gift that's right for you...the one that satisfies a personal need or will surprise someone in the family. Choose from a wide assortment of tools, power equipment, housewares, hobby and sports items—even a fabulous mink stole. Every item is valued right. So you win twice. When you buy quality Sylvania tubes. And again when you redeem your "Dealer's Choice" checks. ■ It's another reason why we say you get Product **Plus** from your Sylvania Distributor.

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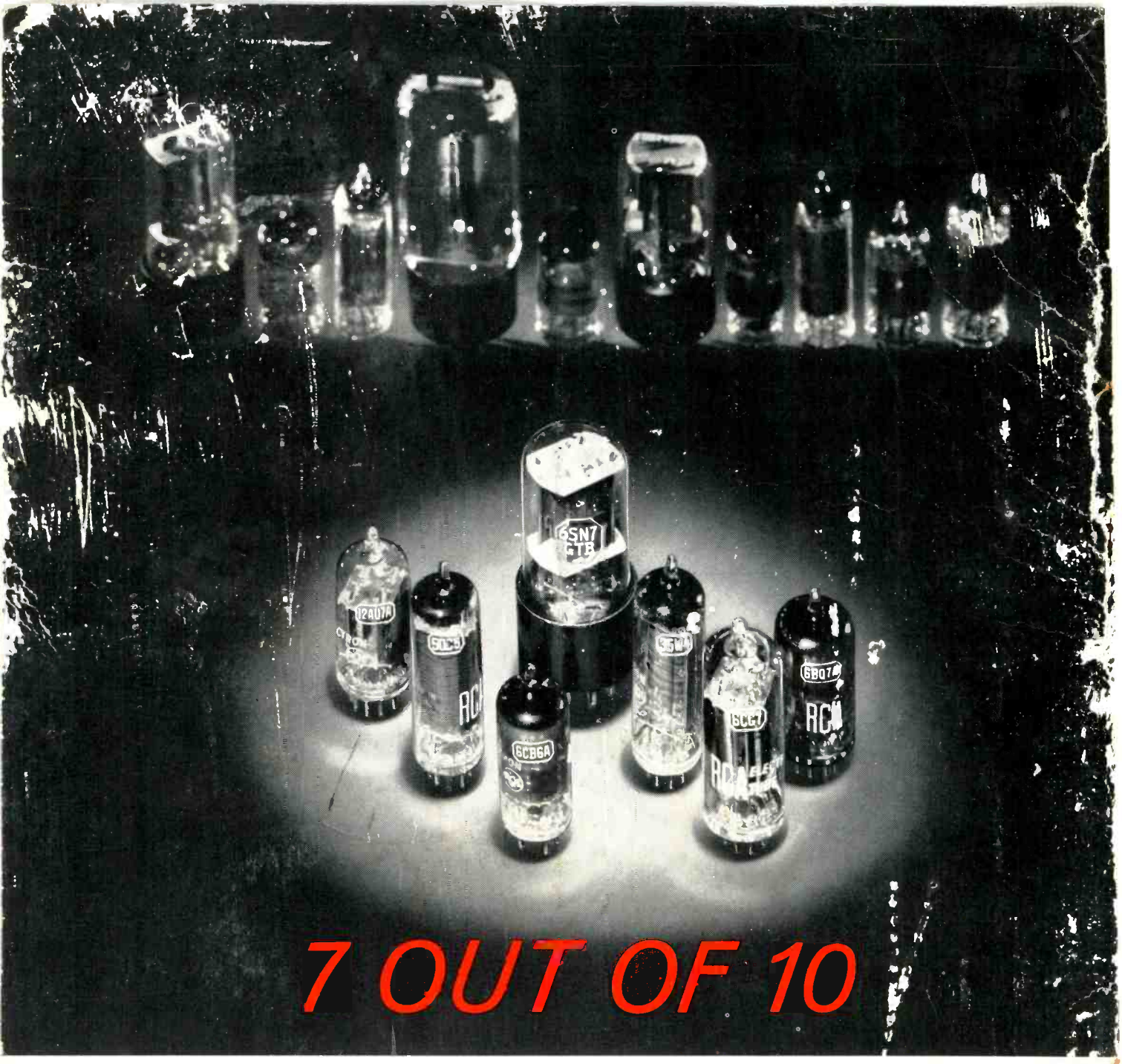

7 of the top 10 replacement receiving tube types* were developed by RCA!

This is RCA product leadership at work, creating tubes with great versatility to be used in a wide variety of applications.

As part of its constant search for new heights of tube performance, RCA continues to introduce improvements with new materials and processes. Developments in recent years include *N-132 Cathode Base Material* which offers exceptional uniformity of characteristics and therefore greater reliability; *S-311 Plate Material* which results in very effective heat dissipation; and the revolutionary *Dark Heater* which drastically reduces the chance of heater-associated tube failures. RCA's latest development, *the Bonded Cathode*, virtually eliminates cathode-peeling problems.

When you recommend and use RCA receiving tubes, you identify your business with the industry's product leader, RCA, the brand known for high quality standards and wide acceptance by industry and consumers.

Your authorized RCA distributor is ready to supply you with top-quality receiving tubes, produced by RCA, the Most Trusted Name in Electronics.

**EIA report of industry replacement sales for first 9 months, 1963*

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

RCA® **The Most Trusted Name in Electronics**