

ELECTRONIC TECHNICIAN

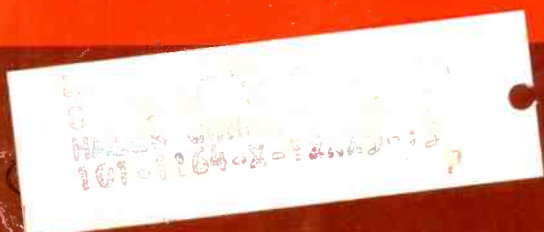
*what's **NEW** in new sets?*

TWO-WAY INTERFERENCE PROBLEMS

manufacturers' aids build technicians' image

does your town need a translator?

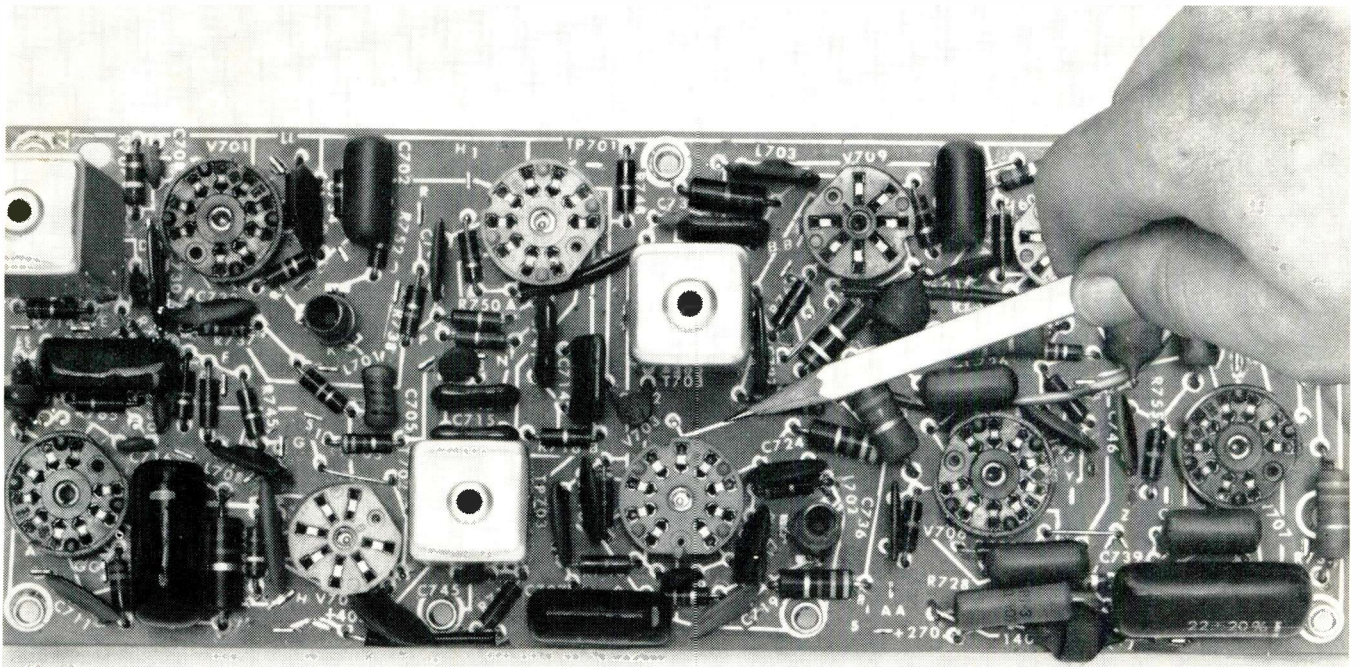
reading 'CONTINENTAL' schematics



electrolytic replacement

NOVEMBER 1963

From RCA Victor—another big advance in Space-Age Sealed Circuitry



RCA Victor Color TV Chroma Circuitry

You can see at a glance how new streamlined “road-mapping”
makes servicing faster, easier, surer than ever before

Pictured above is the “new look” in RCA Space Age Sealed Circuitry . . . the new precision-crafted boards that you’ll see in *all* 1964 New Vista Color and in most RCA Victor black-and-white television sets for 1964.

This new schematic diagram “road-mapping” consists of *straight white lines* that run *directly* from *point-to-point*. No confusion, no difficult paths. And the extra space gained has been used

to make the label markings larger. You can see and trace the circuits at a glance.

Here again RCA Victor has made a vitally important contribution to easier, faster and more accurate servicing. It is part of our continuing research program to offer the utmost in reliability with Space Age Sealed Circuitry.

See Walt Disney’s “Wonderful World of Color,”
Sundays, NBC-TV Network



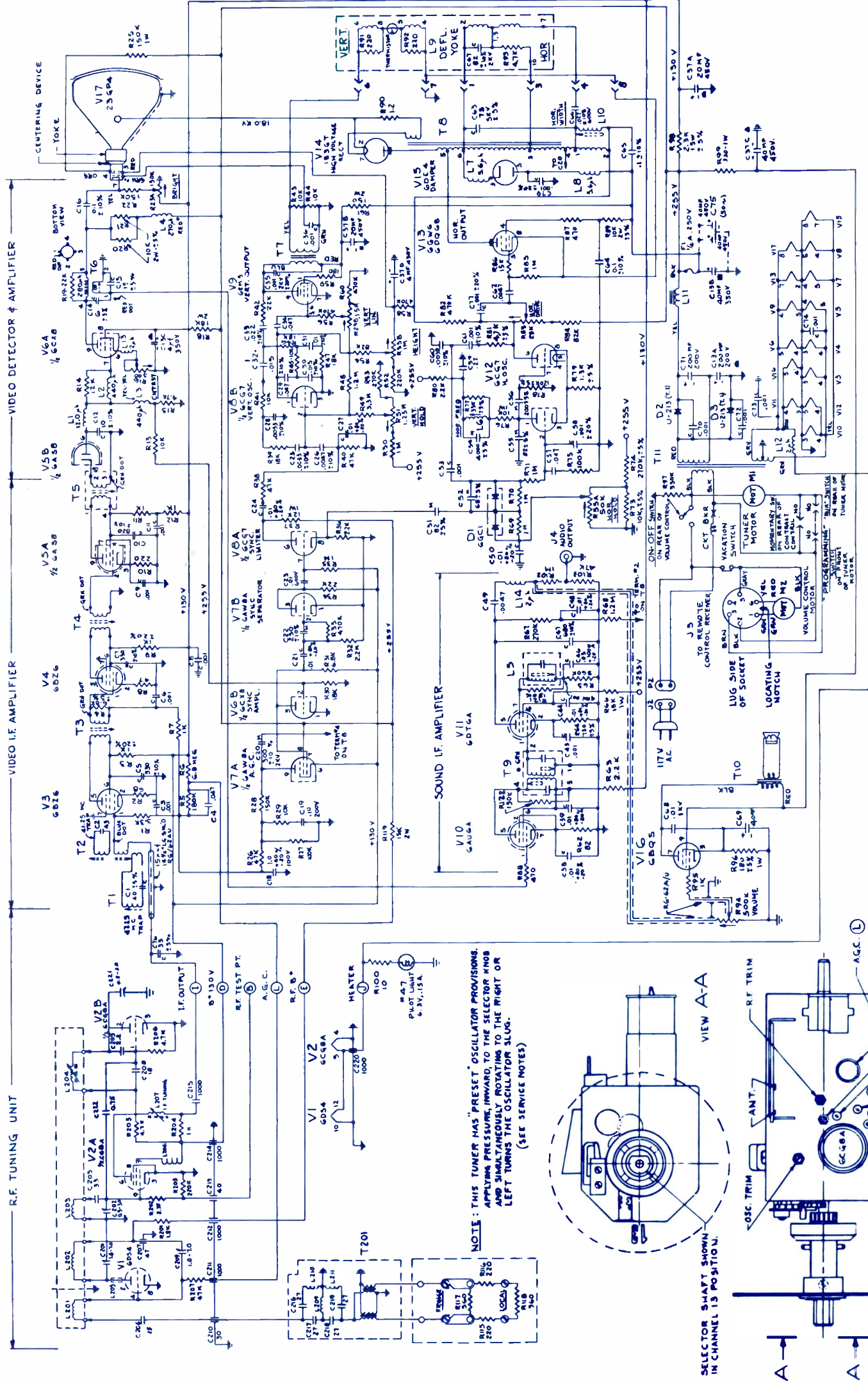
The Most Trusted Name in Electronics

Tmk(s)®

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

November 1963

More Data on Reverse Side



- NOTES:**
1. CAPACITOR SYMBOLS:
C - CERAMICA
M - MICA
 2. UNPOLARIZED CAPACITOR VALUES LARGER THAN (1.0) ARE MMF, (1.0) OR LESS ARE MF.
 3. ARROWS ON CONTROLS INDICATE C.W. ROTATION.
 4. ALL CERAMIC CAPACITORS ARE GMV UNLESS OTHERWISE NOTED.
 5. UNMARKED AND NON-POLARIZED CAPACITORS ARE PAPER, ±20%, 400V, EXCEPT AS NOTED.
 6. RESISTORS ARE 1/2 W, ±10%, EXCEPT AS NOTED.

TUNER-TERMINAL LOCATIONS

ELECTRONIC TECHNICIAN

TEKFAK

819

MOTOROLA
Color TV Chassis
TS-912A

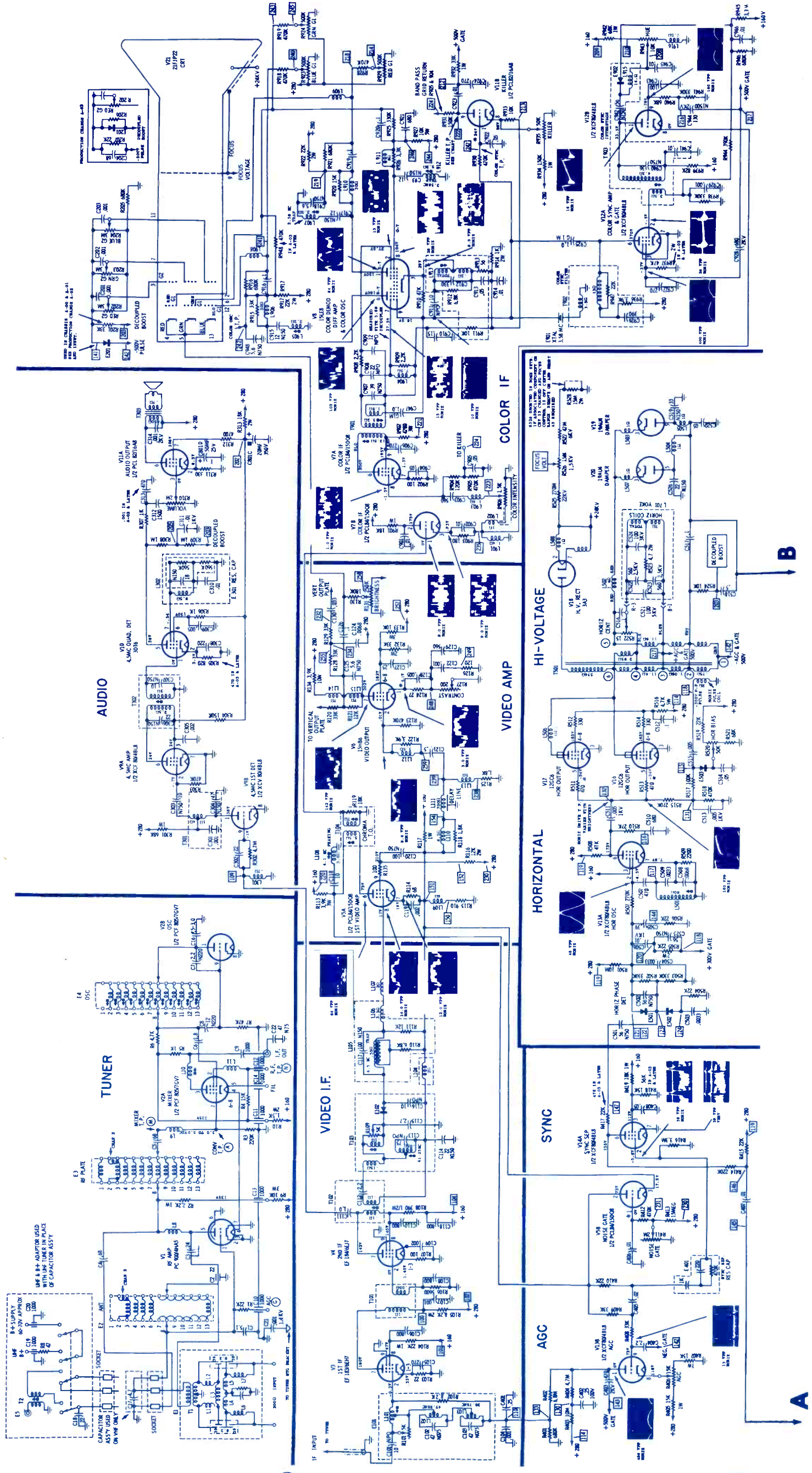
November 1963

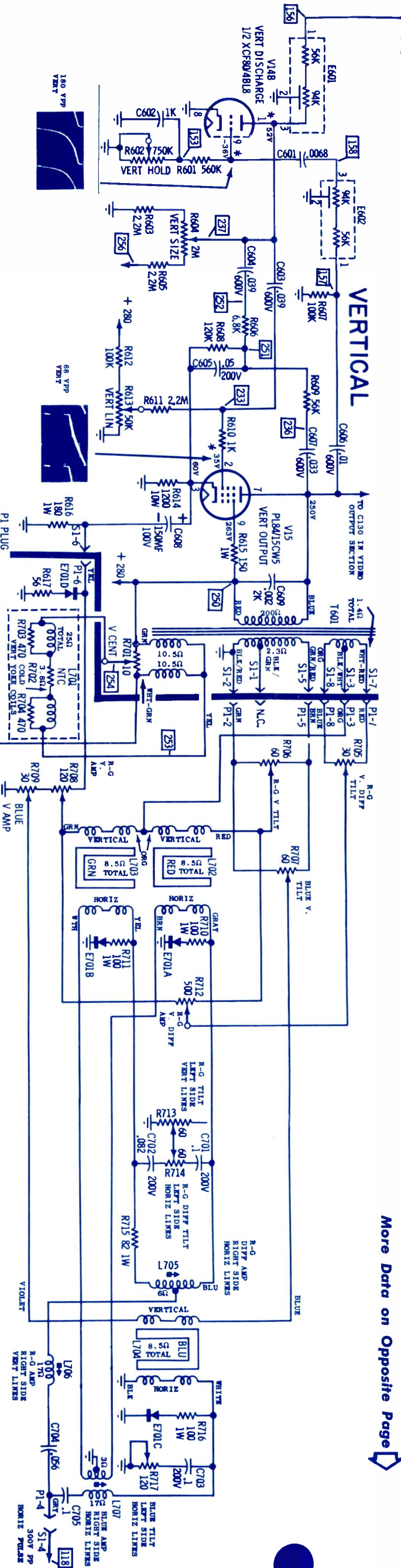
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR FIVE NEW SETS

More Data on Reverse Side

- NOTES:
- VOLTAGE AND RESISTANCE MEASUREMENTS: SEE CHART
 - TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM±20%
 - LINE VOLTAGE MAINTAINED AT 120V AC.
 - VOLTAGES INDICATED BY AN ASTERISK WILL VARY WITH ASSOCIATED CONTROL SETTINGS.
 - TAKEN WITH CONTRAST CONTROL AT MINIMUM AND ALL OTHER CONTROLS IN NORMAL OPERATING POSITION WITH NO SIGNAL INPUT.
 - TUNER ON CHANNEL 13 OR CHANNEL OF LEAST NOISE WITH ANTENNA TERMINALS SHORTED.

- WAVEFORM MEASUREMENTS
- TAKEN FROM POINT INDICATED TO CHASSIS WITH A WIDE-BAND OSCILLOSCOPE
 - OSCILLOSCOPE SYNCED NEAR SWEEP RATE INDICATED.
 - TAKEN WITH STRONG SIGNAL. CONTRAST CONTROL AT MAXIMUM; ALL OTHER CONTROLS IN NORMAL OPERATING POSITION.





November 1963

DYNAMIC CONVERGENCE

Vertical Dynamics

Obtain a red-green raster by turning blue G-2 to minimum. Use Figure 5, the convergence panel diagram, and observe the effect as illustrated at each control.

1. Adjust R-G vertical amp to converge the center vertical lines at bottom of screen (Step 1).
2. Adjust R-G vertical tilt to converge the center vertical lines at top of screen (Step 2).

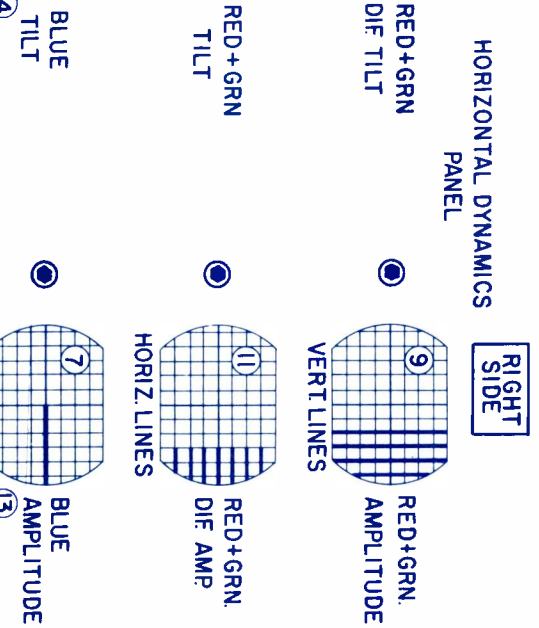
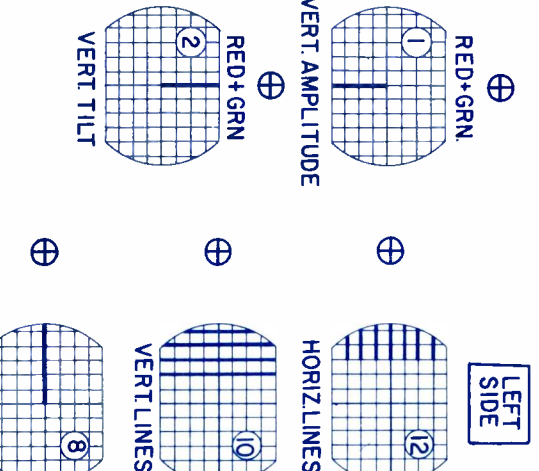
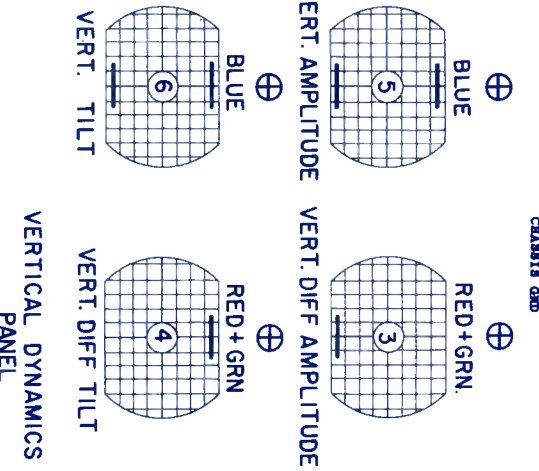
Alternately repeat Steps 2 and 3 for best convergence at top and bottom of center vertical line. Best convergence is obtained by superimposing the lines from the center outward. However, the proper adjustment of these controls may result in the red and green lines being parallel. If this condition exists, converge the lines by using the disc magnets.

3. Adjust the R-G vertical differential amp control to converge the center portion of the horizontal lines at the bottom of the screen (Step 3).
4. Adjust the R-G vertical differential tilt to converge the center portion of the horizontal lines at the top of the screen (Step 4).

If the horizontal lines in the center of the screen are misconverged, repeat Steps #3 & 4 for equally spaced horizontal lines from top to bottom of screen. Re-adjust disc magnets if necessary. Re-adjust the R-G vertical amp and tilt controls (Steps 1 and 2) for center vertical lines, if necessary.

5. Turn up the blue G-2 control. Adjust the blue vertical amp to produce displacement in the same direction of the blue horizontal lines at top and bottom of the screen (Step 5).
6. Adjust the blue vertical tilt control to produce equal displacement in the same direction of the blue horizontal lines with respect to red and green from the top to the bottom of screen (Step 6).

Alternately repeat Steps 5 and 6 for satisfactory convergence of the blue horizontal lines from top to bottom of screen along the center of screen, or for equal displacement to permit convergence with the disc magnets.



Horizontal Dynamics

7. Adjust the right blue horizontal line control to make the blue line at the right-hand center of the screen a straight line (Step 7).
8. Adjust the left blue horizontal line control for a straight blue line from the center to the left side of the screen (Step 8).

Turn off the blue G-2, leaving the red and green fields on the screen.

9. Adjust the right-side R-G vertical line control to make the vertical lines from the center to the right side converge (Step 9).
10. Adjust the left-side R-G vertical line control to make the vertical lines from the center to the left side converge (Step 10).

It may be necessary to touch-up Steps 9 and 10 above to compensate for any inter-action.

Re-touch the right and left R-G vertical line controls for best overall convergence of the vertical lines or for an error that lends itself to correction by the disc magnets.

11. Adjust the right side R-G horizontal line control to make the horizontal red and green lines at the right side converge (Step 11).
12. Adjust the left side R-G horizontal line control to make the red and green horizontal lines at the left side of the screen converge (Step 12).

It may be necessary to touch-up Steps 9 and 10 above to compensate for any inter-action.

Turn up the blue G-2. Re-adjust the right side blue horizontal line control to make the horizontal blue lines on the right side of the screen converge with the red and green lines (Step 13).

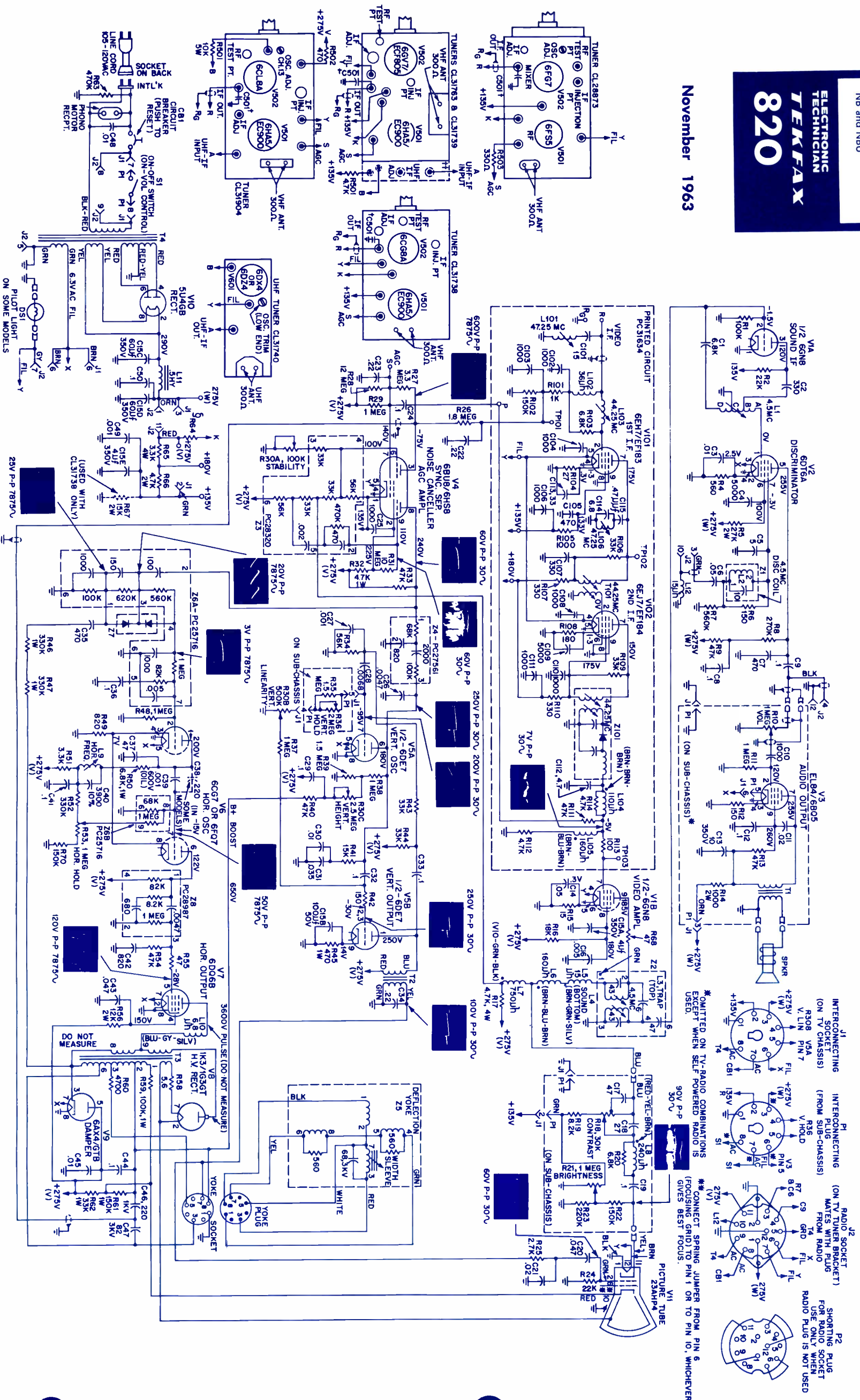
OLYMPIC
TV Chassis
NB and NBU

TEKFAK 820

November 1963

NOTES:
ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
ALL CAPACITOR VALUES LESS THAN 10 ARE IN MICROFARADS AND GREATER THAN 10 ARE IN MICRO-MICROFARADS UNLESS OTHERWISE NOTED.
ALL VOLTAGES ±1%, MEASURED WITH A VTVM, BETWEEN INDICATED POINTS AND GROUND WITH AN INPUT VOLTAGE OF 117V, 60 CY AND NORMAL SIGNAL INPUT WITH CONTRAST CONTROL SET TO PRODUCE 90V, P-P AT KINESCOPE.

TV SCHEMATIC - NB & NBU CHASSIS



† SOME SETS HAVE A 5UUF OR A 10UUF CAPACITOR OR BOTH IN PARALLEL.

†† SECTION SHOWN ----- OMITTED IN CL31739.

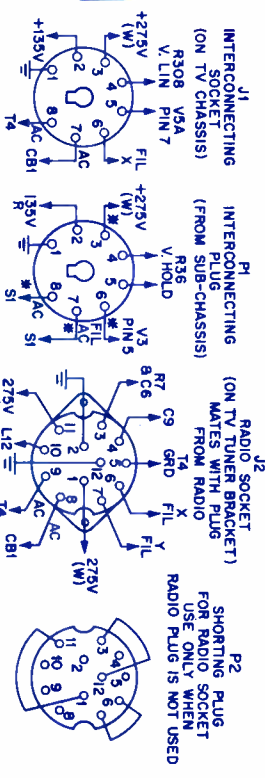
§ R64 - NOT USED WITH CL31904

1K, 2W WITH CL28873.

6.8K, 4W WITH CL31738, CL31739 & CL31763

* OMITTED ON TV-RADIO COMBINATIONS EXCEPT WHEN SELF-POWERED RADIO IS USED.

** CONNECT SPRING JUMPER FROM PIN 6 (FOCUSING GRID) TO PIN 1 OR TO PIN 10, WHICHEVER GIVES BEST FOCUS.



ELECTRONIC TECHNICIAN

TRIFAX

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

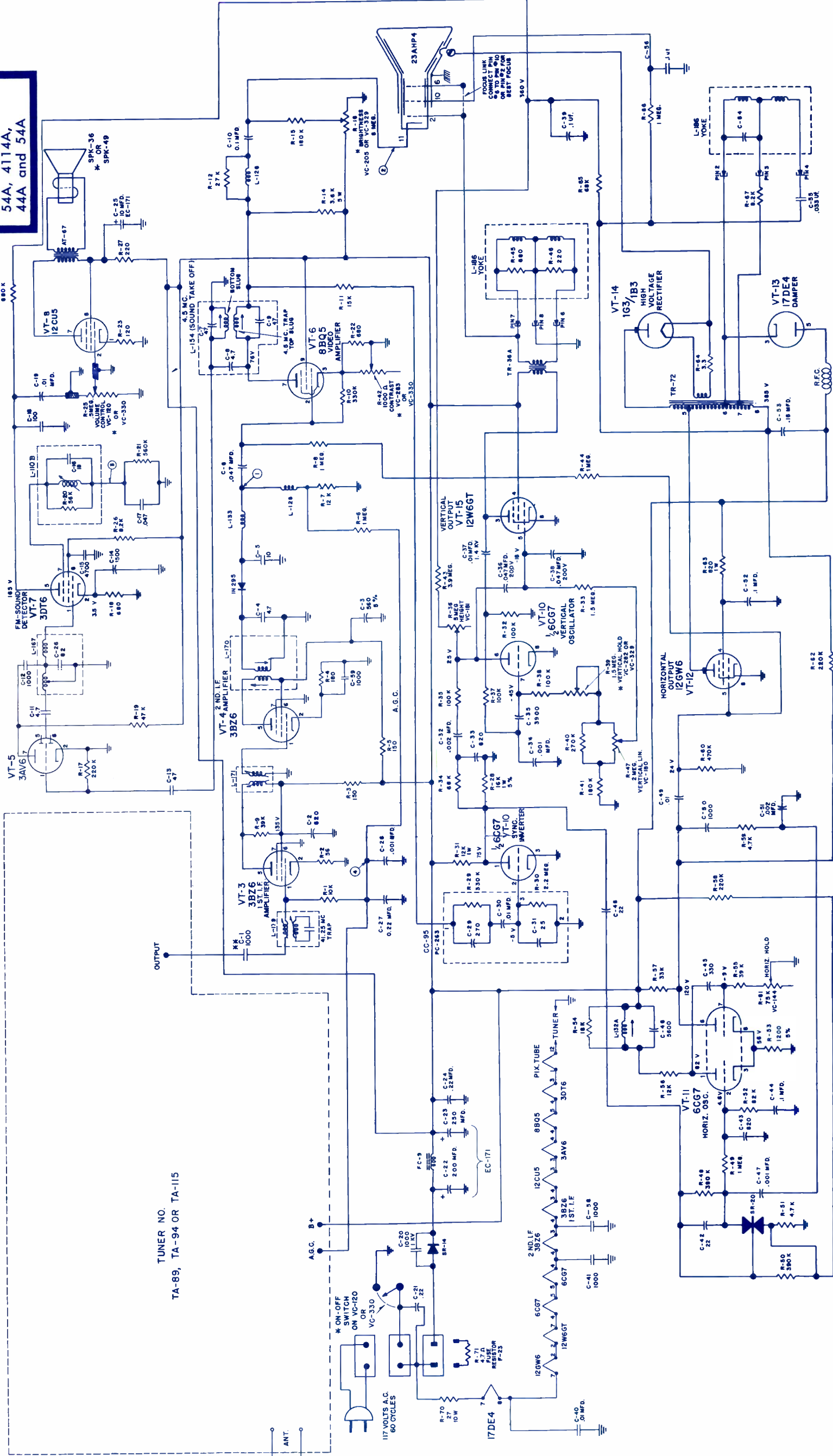
821

TRAVLER
TV Chassis
Models GTC-
3014A, B,
4014A,
3114A, 44A,
54A, 4114A,
44A and 54A

* MODELS GTC-3014A, GTC-3014B & GTC-4014A ONLY.
R-49 SPEAKER VOLUME
VC-205 BRIGHTNESS
VC-282 VERTICAL HOLD
VC-283 CONTRAST
* MODELS GTC-3114A, GTC-3114A, GTC-3154A, GTC-4114A,
GTC-4144A, & GTC-4154A ONLY
SPK-36 SPEAKER
VC-339 VERTICAL HOLD-BRIGHTNESS
VC-330 ON-OFF-VOLUME-CONTRAST
** NOT USED IN MODEL GTC-3014A

November 1963

CHASSIS NO'S.
1089-24, 1094-24, 1094-24U
10-115-24, 10-115-24U



TUNER NO.
TA-89, TA-94 OR TA-115

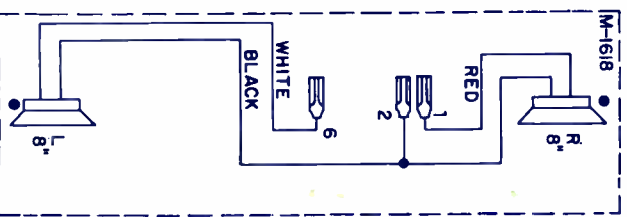
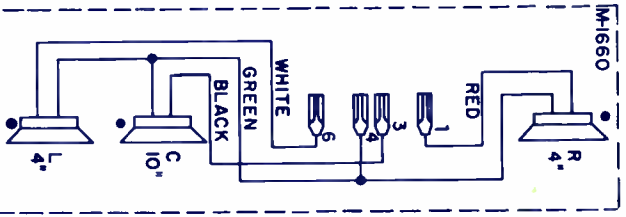
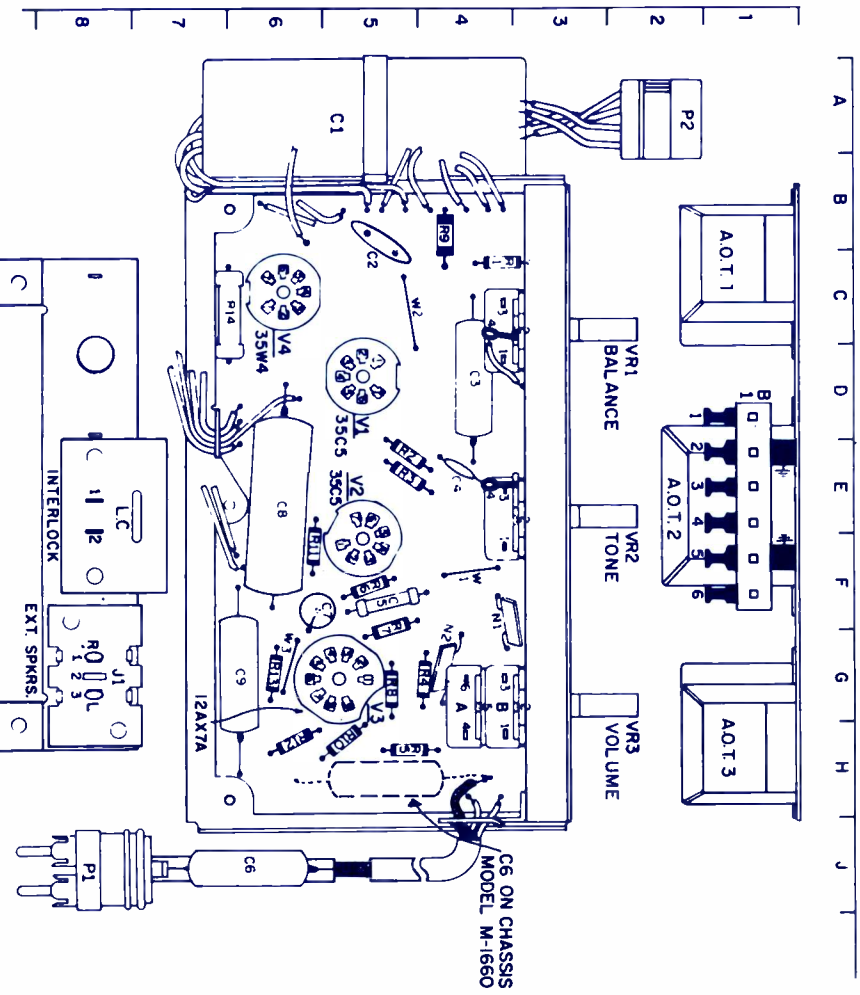
ELECTRONIC TECHNICIAN

TEKFAAX

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

GROUP
135

Manufacturer	Model	Schematic No.
ANDREA	TV Chassis VTT-323-5	818
MOTOROLA	Color TV Chassis TS-912A	819
OLYMPIC	TV Chassis NB and NBU	820
PHILCO	Stereo Phonograph Models M-1618 and M-1660	822
TRAVLER	TV Chassis Models GTC-3014A, B, 4014A, 31114A, 44A, 54A, 4114A, 44A and 54A	821



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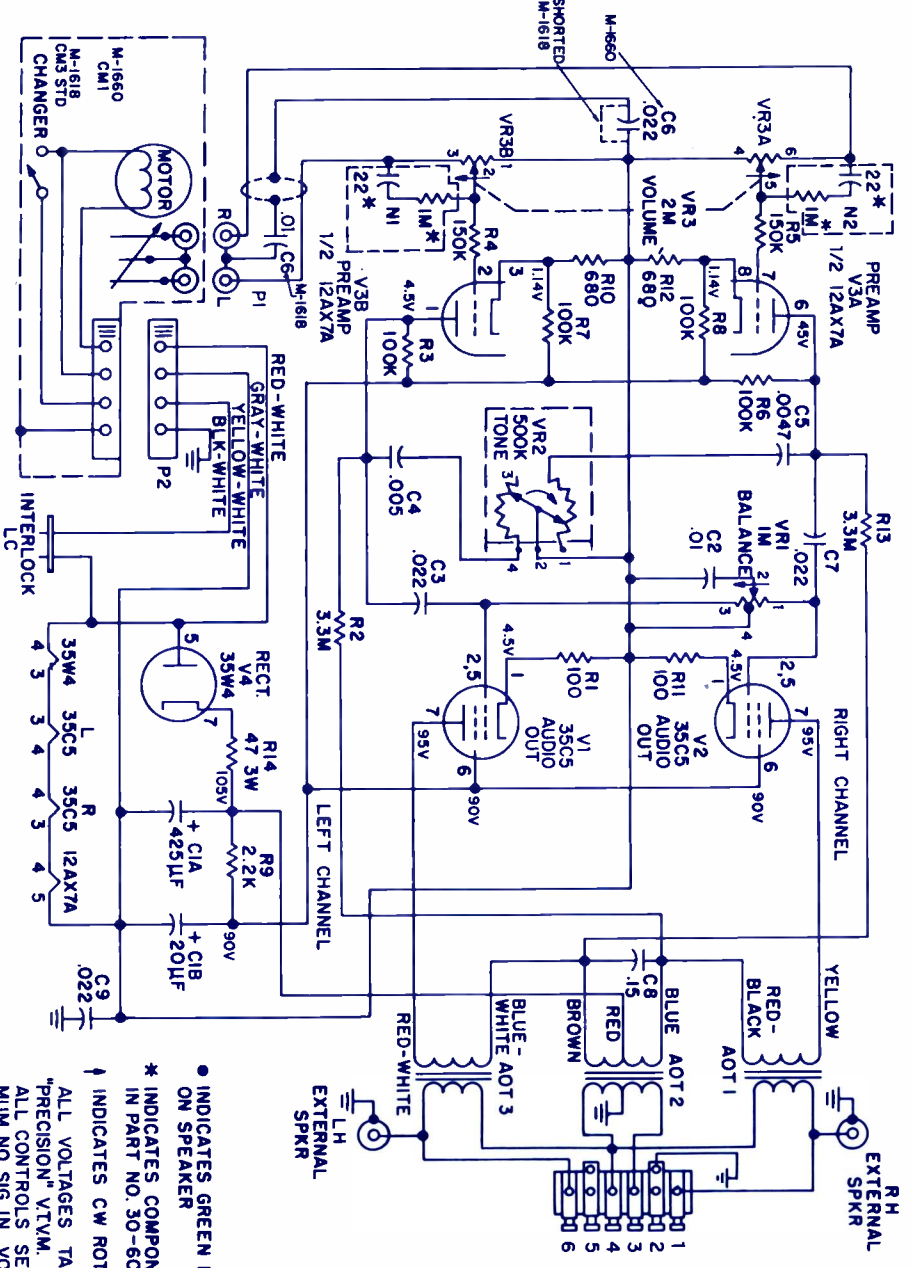
TEKFAAX

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
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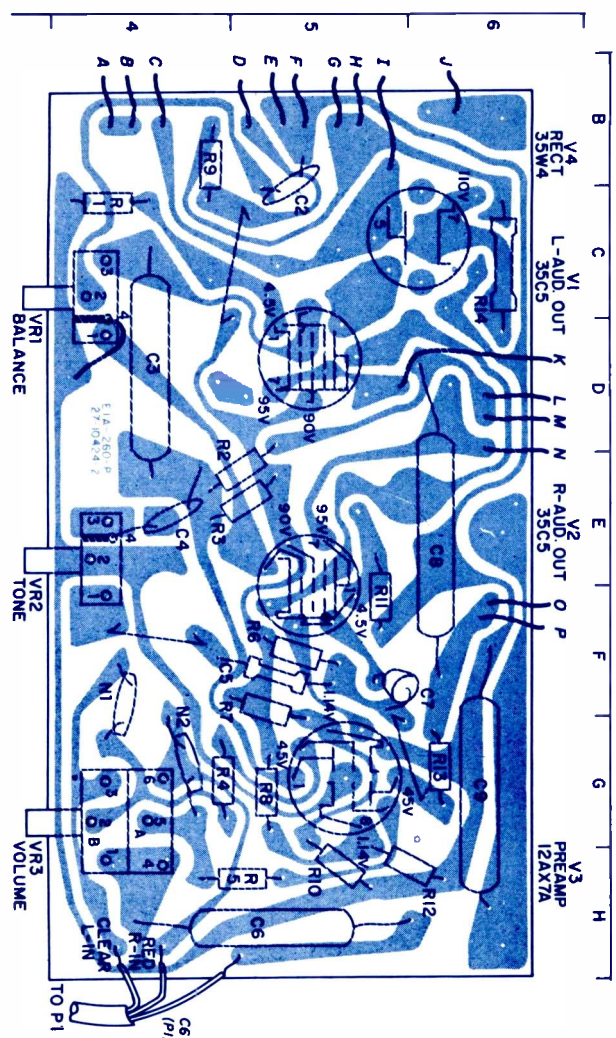
PHILCO
Stereo Phonograph
Models M-1618
and M-1660

822

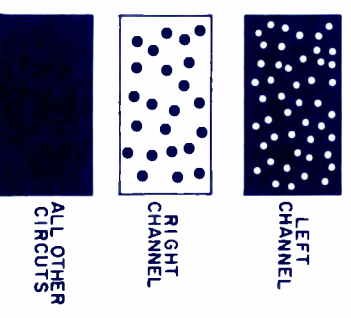
November 1963

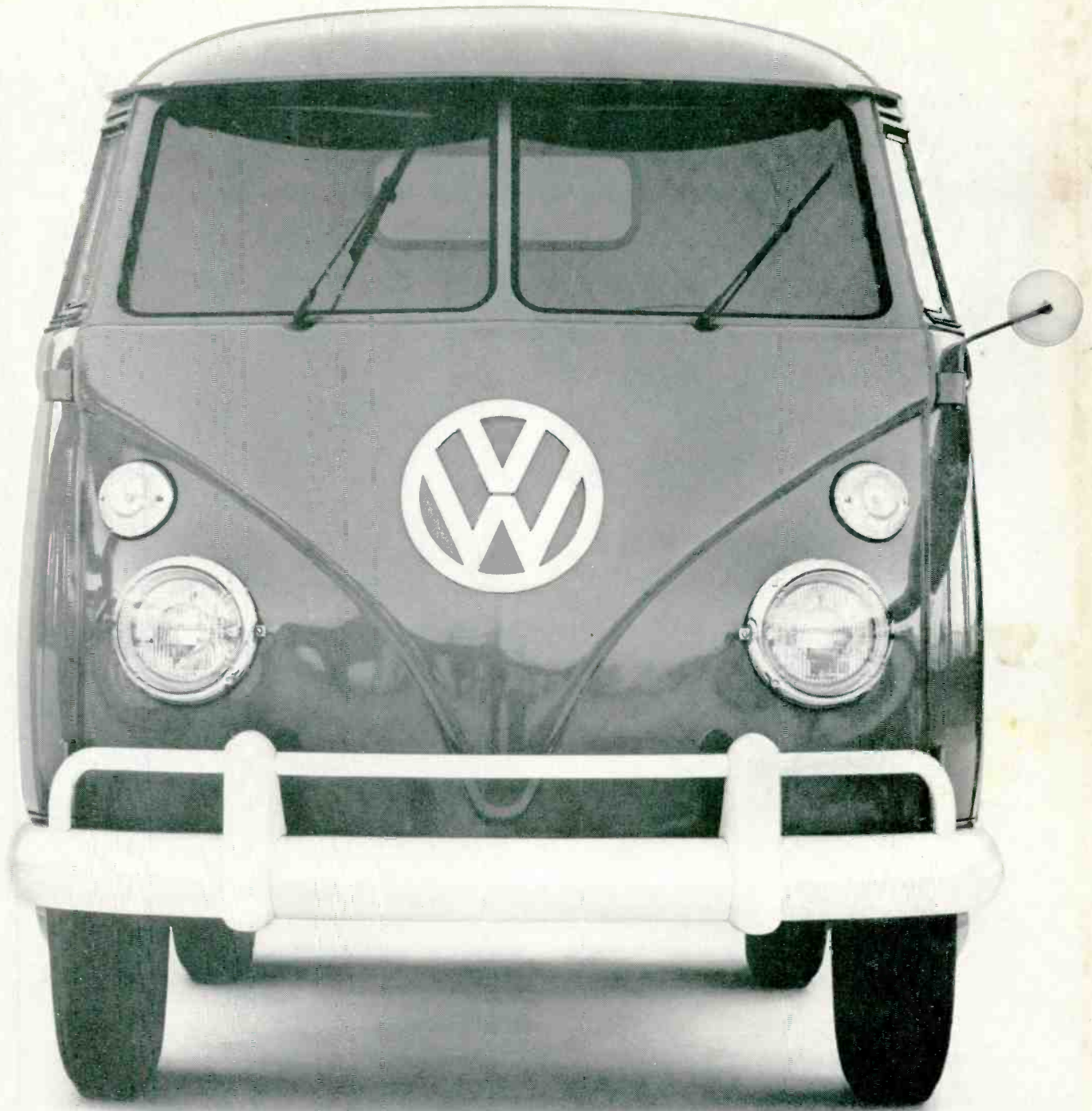


● INDICATES GREEN DOT ON SPEAKER
* INDICATES COMPONENTS IN PART NO. 30-6039-8
↓ INDICATES CW ROTATION
ALL VOLTAGES TAKEN WITH "PRECISION" VTVM, MODEL "88". ALL CONTROLS SET AT MINIMUM, NO SIG. IN. VOLTAGES MEASURED FROM B-.



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Save 3½¢. Buy a Volkswagen.

We save you that on every mile.

Most trucks cost about 6¢ a mile to run. Ours works for 2½¢.

You put the difference in your pocket.

Owners who do 24,000 miles a year say the VW only takes \$300 worth of gas.

Against \$600 for their former truck.

Tires last about 35,000 miles where

most trucks only get 20,000.

You save another \$100 there.

Parts? A rear corner panel costs \$22.15.* The same panel on a similar truck would run about \$70.00.

A difference of \$47.85.

Even our new engine saves you money. It's 25% more powerful than last year's,

yet it burns about the same gas.

(You should get 20 mpg on regular or better.)

Surprisingly, the 2½¢-a-mile Volkswagen only costs \$1995† in the first place.

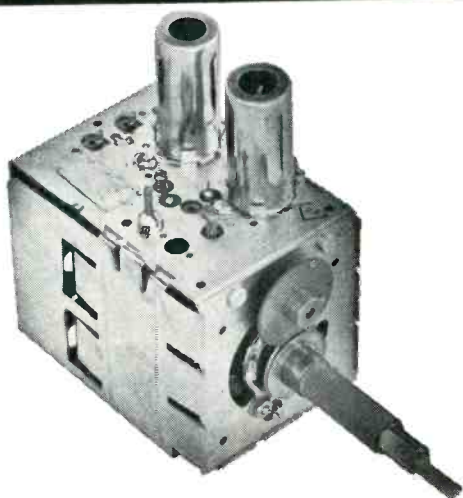
So you're a few hundred ahead before you drive an inch.



... for more details circle 40 on post card

Prices effective January 1, 1963

Tarzian offers
**FAST, DEPENDABLE
TUNER REPAIR
SERVICE (ALL
MAKES)**



It just makes sense that a manufacturer of tuners should be better-qualified, better-equipped to offer the most dependable tuner repair and overhaul service.

Sarkes Tarzian, Inc. pioneer in the tuner business, maintains two complete, well-equipped Factory Service Centers—assisted by Engineering personnel—and staffed by specialized technicians who handle **ONLY** tuner repairs on **ALL** makes and models.

Tarzian-made tuners received one day will be repaired and shipped out the next. Allow a little more time for service on other than Tarzian-made tuners.

Tarzian offers a 12-month guarantee against defective workmanship and parts failure due to normal usage. And, compare our cost of \$9.50 and \$15 for UV combinations. There is absolutely no additional, hidden charge, for **ANY** parts except tubes. You pay shipping costs. Replacements on tuners beyond practical repair are available at low cost.

Ⓢ Tarzian-made tuners are identified by this stamping.

When inquiring about service on other tuners, always give TV make, chassis and Model number. All tuners repaired on approved, open accounts. Check with your local distributor for Sarkes Tarzian replacement tuners, replacement parts, or repair service.

 **SARKES TARZIAN, INC.**
Bloomington, Indiana

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ONLY
\$9.50
INCLUDING

ALL PARTS
(except tubes)
and LABOR

24-HOUR SERVICE
1-YEAR WARRANTY

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TO SERVE YOU BETTER**

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address nearest you for fast fac-
tory repair service**

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**WORLD'S LARGEST
ELECTRONIC TRADE
CIRCULATION**

ELECTRONIC TECHNICIAN

NOVEMBER • 1963

Vol. 78 • No. 5

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AN OJIBWAY
PUBLICATION

OJIBWAY PRESS, Inc.

Ojibway Building
Duluth 2, Minn.

AREA CODE 218 727-8511

Sales Offices:

NEW YORK: Ron Kipp, 480 Lexington Ave., New York 17, N.Y. AREA CODE 212 TN 7-0011

CHICAGO: William Klusack, 221 N. LaSalle St., Chicago 1, Ill. AREA CODE 312 CE 6-1600

CLEVELAND: Arnold T. Suhart, 6207 Norman Lane, Cleveland, Ohio AREA CODE 216 YE 2-6666

LOS ANGELES: Boyd B. Garrigan, 1145 W. Sixth St., Los Angeles 17, Calif. AREA CODE 213 HU 2-2838



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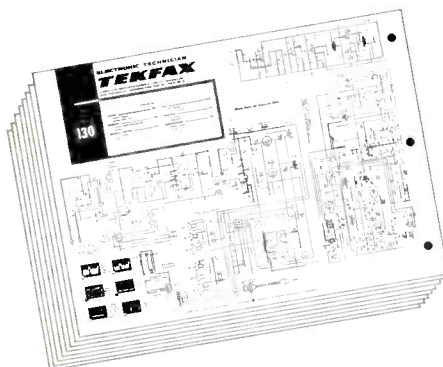
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TEKFAX 16 PAGES OF LATEST SCHEMATICS



ANDREA: TV Chassis VTT-323-5

MOTOROLA: Color TV Chassis TS-912A

OLYMPIC: TV Chassis NB and NBU

PHILCO: Stereo Phonograph Models M-1618 and M-1660

TRAVLER: TV Chassis Models GTC-3014A, B, 4014A, 3114A, 44A, 54A, 4114A, 44A and 54A

make extra dollars with Eico scopes

An oscilloscope gives a visual picture of what is happening in a circuit, something no other test instrument can do. This very feature makes a good scope a money maker for your shop. It saves you time, analyzes those intermittent faults, and makes routine servicing easier than ever. Once you start using a scope regularly you'll never be without one.

You've pulled a set with a buzz in the sound. Is it 60-cycle hum or 60-cycle buzz? A quick look with the scope and you'll know. You'll either see a 60-cycle sine wave caused by heater-cathode leakage or there'll be a vertical deflection sawtooth probably resulting from a defective bypass capacitor.

I.f. alignment required? A scope is a must. Set it up along with your EICO post injection sweep generator, and you have only to adjust transformer and sound trap slugs to finish the job. Same thing for setting up the 4.5-mc sound takeoff network.

Losing the signal somewhere in the video circuits? Hook up the scope and see where it's going astray. There's a good chance you'll spot the bad component at the same time.

But when you go to buy a scope, what do you look for? Large screen, high sensitivity, frequency response, attenuators, synchronization, calibrator? All of these are important and are included in the design of any professional scope intended for the service technician.

Large screen: You can get by with 3 inches, but take the 5-inch screen of the EICO 460. Get a close look at what's happening. It's got an edge fit calibrated bezel too. **High sensitivity:** The 460's vertical amplifier delivers 25 mv per cm. All you'll ever need and more. **Frequency response:** EICO makes it flat from dc to 4.5 mc

in the 460. Ideal for color and black and white as well as industrial production and research, audio testing and experimenting. **Attenuators:** The vertical attenuator in the EICO 460 is a 4-step frequency compensated network. Can't beat this kind of design. **Sync:** Any signal reaching the screen is fully synced — automatically. And for special purposes you can inject your own external sync signal. **Calibration:** Accurate peak-to-peak voltage calibrator is built right into the 460.

All this adds up to the top scope for TV service. You can get it as a kit for \$89.95 or completely wired for \$129.50.

If you don't need so elaborate an instrument, take a careful look at the 427 dc to 1 mc scope or the new 3" General Purpose scope, the EICO 430 (kit, \$65.95; wired, \$99.95). The new 430 does everything bigger and more expensive scopes do. Vert amp/flat from 2 c to 500 kc, —6 db at 1mc. Sensitivity 25 mv/cm. Horiz amp. flat from 2 c to 300 kc. Sensitivity .25 V/cm. Flat face 3" tube; mu-metal shield eliminates effects of external fields.

There are plenty of accessories for EICO scopes too. An Electronic Switch to put two different signals on the scope screen at the same time (EICO 488; kit, \$23.95; wired, \$39.95). Voltage Calibrator for the less expensive 427 and 430 (EICO 495; kit, \$12.95; wired, \$17.95). Three accessory probes-demodulator, direct and low capacitance types.

Whether it's scopes, tube testers or VTVM's you get the best for less with EICO. Save money by building your instruments from kits, or buy them factory-wired at a substantial savings. See your distributor. Write for complete 28 page catalog. Dept. ET-11 *Add 5% in west*



EICO

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— for more details circle 21 on post card

LETTERS TO THE EDITOR

Apolec

I have an Apolec RA-11 4 transistor tape recorder in for repair and nowhere can I find who the manufacturer or distributor is so that I can get a schematic for it. Can someone help me out?

EDWARD BALCER

Rumson, N. J.

Tips

I wish to speak out against a practice that has long been established by my contemporaries. That is, the degrading practice of soliciting and accepting "tips."

I bring this subject up now because many times I hear friends and fellow technicians gripe in meeting each other of how the customer is always watching over their shoulder, and in what low esteem they are held by the customer. And I have tried to tell them that as long as they have their hand open like a porter, they must expect to be treated like a porter. In all my years of being in business, and the years prior when I worked for somebody else, I have never accepted a tip, even when the money was shoved in my pocket, I would always leave it before I left the house. I believe that the refusal to accept tips, more than anything else, has helped me retain customers, and get new ones, even when a job "fell apart." Nobody expects to tip a doctor, lawyer, architect or any other professional person. I have achieved that status with my customers. They don't yell at me or get excited, and after all these years, they still call me Mr. I don't know any other way to get that kind of respect, and in my opinion the few dollars a week I give up is more than worth it. Take my advice, fellows, start acting like professional people, and you will certainly start being treated like one. Turn away the tip with respect and gratitude for the thought, and your customers will start looking at you in a new light.

LOUIS CYBULSKA

Brooklyn, N. Y.

● *This is a practice peculiar to some areas. We're all for seeing it put to rest.—Ed.*

WHY bother with makeshift twist-prong capacitor replacements?

When you substitute capacitor sizes and ratings, 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 use makeshifts when it's so easy to get the exact replacement from your Sprague distributor!

Get the right SIZE,
right RATING every time
with improved



**SPRAGUE
TWIST-LOK[®]
CAPACITORS!**

Over 1,690 different capacitors to choose from!

The industry's most complete selection of twist-prong capacitors, bar none. Greater reliability, too. Exclusive Sprague cover design provides a leak-proof seal which permits capacitors to withstand higher ripple currents.

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



WORLD'S LARGEST MANUFACTURER OF CAPACITORS

"Let's make more money with Eico tube testers"

Every TV service technician should consider the extra service income and convenience possible with additional tube testers. An extra tube tester can more than pay its way in extra servicing income. Start with the new Eico 667 Dynamic Conductance Tester. Use it to spot and replace all weak tubes in every set that comes into the shop. It will pinpoint bad transistors too. It will ease repair problems and cut down on callbacks by pulling out bad or weak tubes with a short life expectancy. A rapid moving roll chart gives set up data quickly and a series of push buttons and lever switches put the tube through its paces in a hurry. Avoid having to replace a single tube a couple of days after making a \$25 or \$35 repair. Keeps you from looking careless.

Second, you need a topnotch emission tester, the new Eico 628. Take it with you on every call. Find the weak tubes in every set. Let the customer know that while you can get the set working again by replacing only one or two tubes, you can only guarantee reliable operation by replacing all the weak ones. Show him the difference between the weak tube in his set and the new one in your caddy. A glance at the big 4½-inch 3-color bad-weak-good scale will be a sure convincer. Tell him that by replacing the weak tubes your Eico 628 has located he's saving the price of a service call later on. Finally, by advising your customer of the weak tubes—"mark them right on the bill"—you

protect yourself against a callback, should one of these tubes go the very next day.

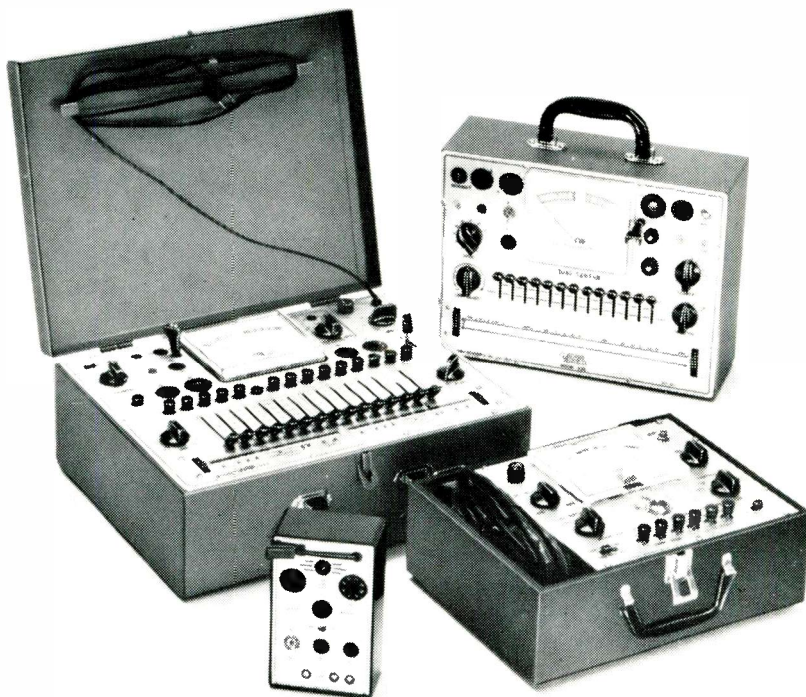
Finally, you should have an Eico 612 Filament Tester. Makes it easy to find the open heater in a series-string set without going out of your mind. The simple go-no-go indicator on the Eico 612 can't be misread. If the tube is bad, the indicator lamp won't light. Best of all, once the customer knows that tubes aren't at fault, you've got a service job. And at this point, the customer is already figuring on your pulling the set, no need to waste time explaining why.

Another convenient tool, is the new Eico 632 CRT Tester and Rejuvenator. It will show you and your customers when a new picture tube is needed. No question whether set or tube is bad. In many instances will add months of life to an aging picture tube. This will keep your customers happy and when the CRT does go, they'll come back to you for a new one.

PRICES: 667: kit \$79.95; wired \$129.95; 628: kit \$44.95; wired \$59.95; 612: kit \$4.95; wired \$6.95; 632: kit \$54.95; wired \$79.95. Add 5% in West.

Whether it's tube testers, VTVM's, scopes or any type of test instrument, you get the best for less with Eico. Save by building your instruments from kits, or buy them factory-wired at a substantial saving.

See your distributor. For complete catalog, write: ET-11



EICO ELECTRONIC INSTRUMENT CO., INC., 131-01 39th Street, Flushing, New York 11354
EXPORT: ROBURN AGENCIES INC., 431 GREENWICH ST., N.Y. 13, N.Y.

LETTERS TO THE EDITOR

Likes Profit

We have mixed feelings concerning the letter reproduced with the article (Sound, Slender Style in the ELECTRONIC TECHNICIAN September issue). We firmly believe in anyone having a strong opinion (perhaps the word is "conviction") on any given subject. We fully agree with his right to be heard.

I have jotted some notes around the paragraphs concerned.

"Your letter of 1 July received here with horror. We feel rather strongly about trying to make a little machine do a big machine's job.

● *An honest statement of opinion. So Far OK—but what's wrong with trying?*

"It takes a locomotive to pull the train . . . The 'compacts' were enough to the audio art and the 'thin-lines' are even worse.

● *The locomotives are more efficient than they used to be. Outside dimensions aren't equated to horsepower.*

"One cannot force function to conform to shape. Function must dictate shape and size. Have you ever seen a thin-line grand piano or airplane?

● *If the grand piano doesn't fit in the living room, I'll do without a piano, or buy a spinet!*

"So many frauds have been perpetuated on the public for so long by self-appointed experts and 'anything for a buck hucksters' that it is a wonder John Q hasn't stopped buying.

● *Shame on the manufacturers of spinet pianos, compact cars, portable radios, etc. Could it be that all those people are "con men?"*

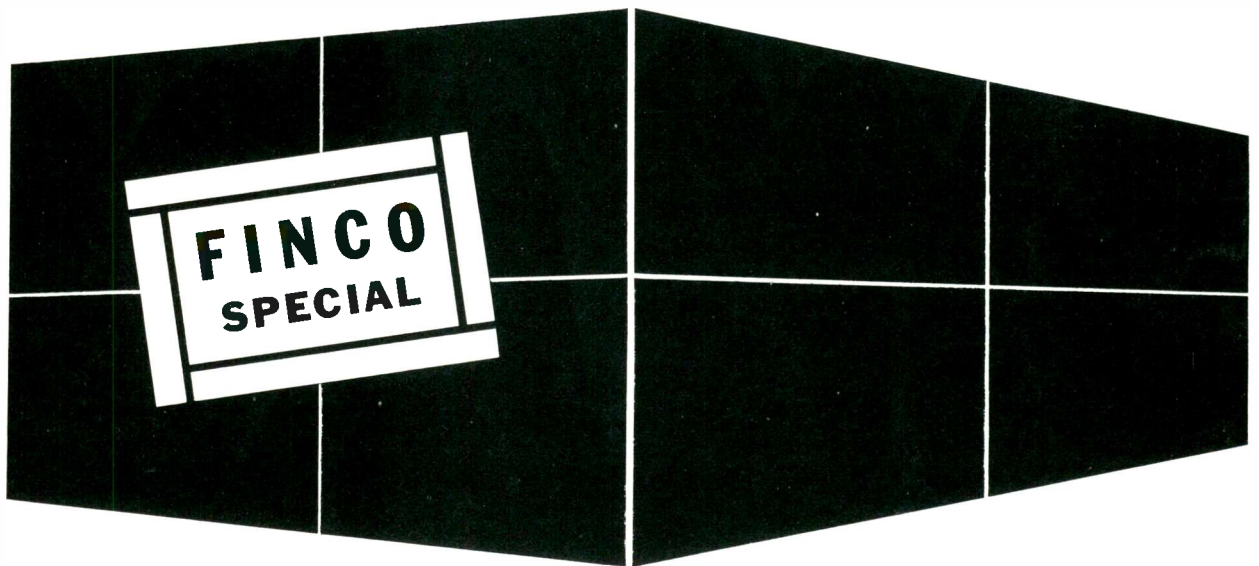
"Needless to say, we do not manufacture a thin-line speaker. The idea of a small cone frantically flailing away in a minute enclosure revolts us."

None-the-less, they're fair game for profits whether you like them or not!

Please classify us as the ones who like profits. We get the idea that dealers like them (profits, that is) too.—Ed.

AL ALTENHOF
Utah Electronics Corp.
Huntington, Ind.

**EVERYDAY
EVERYDAY**



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

THE FINNEY COMPANY

Bedford, Ohio



Pardon us while we change you into Santa Claus

Do your Christmas shopping early at your G-E Distributor's. He has lots of wonderful gifts that you can get with the purchase of General Electric tubes . . . gifts for your family, friends and favorite customers. And there're some you'll want for yourself . . . such as a tube caddy that

looks like fine luggage. You can also get Christmas cards designed only for service dealers . . . to mail to customers and friends.

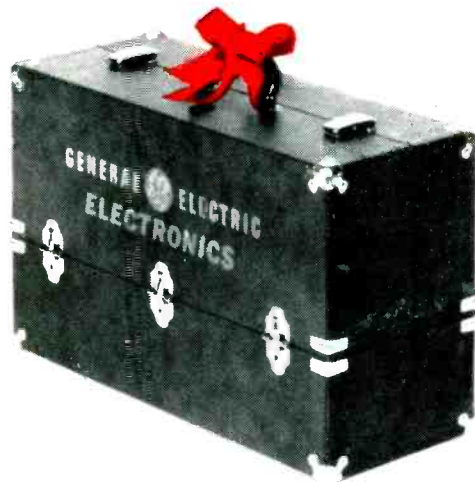
See your General Electric Distributor and start packing your bag *today*. You're going to be a sensational Santa!

Start packing your bag!

These Kodak Flashfun camera outfits include everything that young photographers need: Hawkeye camera, film, clip-on neck strap, batteries, flash bulbs and instruction manual. They're yours when you buy G-E tubes.



Be good to yourself this Christmas. You can get these Armor Clad® tube caddies when you purchase G-E tubes. They look like fine pieces of luggage and the special vinyl coverings are longer lasting. They are reinforced with nickel plate at all stress points.



These Dick Tracy Power-Jet Squad Guns by Mattel® will be a hit with any boys you know. They're automatic cap-firing guns that shoot a stream of water 35 feet . . . farther than any water guns ever made. Give one to any boy and then stand clear.



Little girls will go wild over these Mattel® Sister Belle talking dolls. They're 17" tall and have a rag body and plastic head. Each one says eleven different things that little girls like to hear . . . like "Let's play house," "Give me a kiss." No batteries needed.



These G-E electric carving knives will make a great gift for the lady of the house. They even slice through hot bread or hot meat with smooth precision. Get several from your G-E Tube distributor.



Get these Christmas cards . . . prepared especially for you. They're in color on heavy, high-gloss stock and show a cartoon of you adjusting a TV set to say "Happy Holidays." 50 cards and 50 envelopes to a box. Get yours now for early mailing.



ANOTHER ACCENT ON VALUE FROM G-E ELECTRONICS DISTRIBUTORS

Progress Is Our Most Important Product

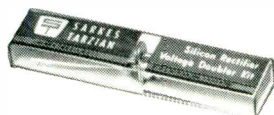
GENERAL  ELECTRIC

SARKES TARZIAN Silicon Rectifiers

are first choice among service technicians (according to a nation-wide poll) for the third year in a row



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



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



Preference high! Here's why:

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

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

Write or call your nearest Tarzian distributor, or:

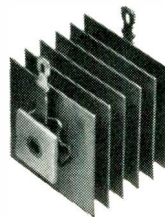


Tarzian's nine standard tube replacement rectifiers replace over 95% of all vacuum tube rectifiers

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



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



SARKES TARZIAN, Inc.

World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices
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- - - for more details circle 32 on post card

LETTERS TO THE EDITOR

Almost Perfect

I just received our copy of your September 1963 Electronic Technician, Stereo '64.

It's a handsome work, with one exception: On page 72, you show Sherwood's S-3000V component. It is thoroughly and positively identified as a receiver carrying a \$165.00 price tag. The only problem is that the component is a tuner.

SAM WALKER

Chicago, Ill.

Commendation

From my first copy to the last one I am really enjoying your magazine. It's a pleasure to read ELECTRONIC TECHNICIAN. I can't ask for a better magazine. I will surely renew my present subscription as soon as possible and I hope you will keep going with the good job forever.

VICTOR JUAN HIDALGO
Aruba, Netherlands, Antilles

Error

We notice in your September issue, on page 54, that you have listed our VM Model 1467 (combination tuner-amplifier) incorrectly. The listing refers to the 1467 as the Model 1267 which is not a VM model number.

CHARLES A. GREGORY
V M Corp.
Benton Harbor, Mich.

Far Away

. . . In the article "Substituting Deflection Yokes," page 44, under Case Histories, your author says "Triad shows a Y-60-2 as replacement. But Triad is not distributed in this area." To what area is he referring? Triad is distributed in all areas. . . .

NEWTON COOK
Triad Distributor Div.
Huntington, Ind.

Author Jay Shane says his nearest distributor of any TV parts is quite distant and in fact, no parts are readily available.—Ed.

TECHNICAL DIGEST

GENERAL ELECTRIC

TV Models M500X QX Chassis — Horizontal Pull or Weave

A few cases have been reported of a horizontal pulling or weaving which is not caused by a defective component or tube.

This complaint concerns the left side of the picture, and is characteristic of 60-cps hum in the horizontal sync circuits. The pulling is in the picture area with the raster edge remaining straight. A scope test on pin 10 of V8A will show a 60-cps hum. Pin 3 of V8B may read as low as 500 K to ground (caused by leakage). This 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

All TV Chassis — Safety Tests

As a matter of personal safety and protection of receiver circuitry, service technicians should always use an isolation transformer when working on chassis which are connected to one side of the power mains. Remember, depending on which way the line plug is polarized to the wall outlet, full line voltage may appear between the chassis and "earth" ground.

Make it a positive safety rule also, to protect the consumer from electrical shock, by testing every set serviced before it is returned to its owner. Test each chassis with the shunted ac voltmeter illustrated here.

The safety test is made by contacting one meter

probe to any portion of the receiver exposed to the consumer or operator such as the cabinet trim, hardware, control knobs, etc., while the other probe is held in contact with a good "earth" ground—a cold water pipe. Voltage indicated by the meter should not exceed 7.5 v. More voltage would indicate a potentially dangerous leakage path existing between the exposed portion of the receiver and "earth" ground. *Do not use a line isolation transformer when making this test and do not return a receiver to the customer which does not pass the safety test until the fault has been located and corrected.*

Make a double test of the exposed cabinet parts. The second test is made with the power plug reversed in the outlet. Remember, exposed cabinet parts include metal legs, mounting hardware under the cabinet, and metal base or stand that the cabinet rests on.

When making the safety test on receivers with external connections (remote controls and motorized tuners or any special accessories including indoor antennas), be sure all units are operating and functioning at the time of the test.

The safety test should be applied to all receivers, whether or not the design incorporates a power transformer with line isolating windings.

Receivers damaged by lightning, floods, accidents or other causes require careful examination of all the isolating components and circuitry to insure that they are in good condition.

Protect the meter movement by originating the test on the 150 v scale—then switch to a lower range.

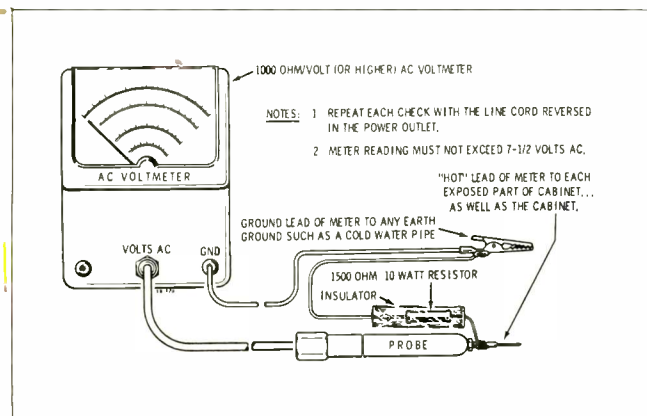
PHILCO

TV Chassis 13L80 — Height-Linearity Control Adjustments

It is possible through vertical linearity and height control adjustment to cause this TV receiver to exhibit vertical sync conditions inferior to normal capabilities. This is possible because of vertical feedback and varistor compensating circuitry characteristics. The vertical height control affects scan at the top and bottom. The linearity control affects the bottom portion primarily. Preferred sequence of adjustment is:

1. Reduce height control setting to underscan vertically.
2. Adjust vertical linearity control for linear scan.
3. Re-adjust height control to fill screen vertically (normal scan).

If the receiver still exhibits sub-standard or weak vertical sync after following this procedure, change the 6EM7 vertical oscillator/output tube.

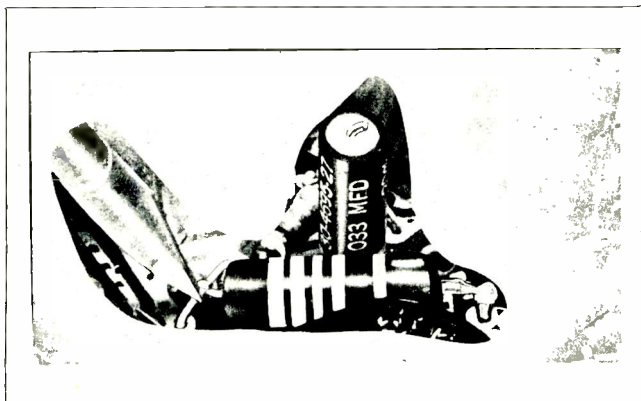


Voltmeter hook-up for making safety checks on all TV sets.

TECHNICAL DIGEST

Perma-Circuit Panel — Component Replacement

Although replacement of horizontally mounted components on the perma-circuit panel top-side is comparatively straightforward, a question arises when vertically



Replacing vertically-mounted capacitor on Philco perma-circuit panel.

mounted capacitors need replacement since one lead is often inaccessible for cutting.

Naturally, the capacitor can be desoldered from the copper plate and replaced. A more timesaving method is to confine all action to the panel top-side.

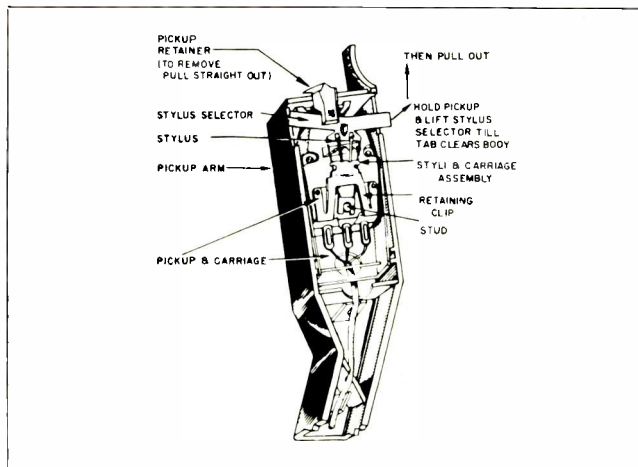
Clip the component lead close at the defective part. The new unit is installed by using the former pigtail lead and a circuit-junction as mounting points. The new capacitor, for example, is soldered in leaving the old unit disconnected but still "standing" as shown here.

RCA

RP217/218 Series Record Changers — Tone Arm Head

A "Feather Action" tone arm with ceramic cartridge is used in this record changer series with the exception of RP217A59.

The concept prevents scratch damage to records even if the arm is dropped on or dragged across a record. The design confines needle pressure to the weight of the cartridge itself. The cartridge is mounted with two small machine screws to a hinged aluminum



RCA "Feather Action" tone arm head.

bracket under the tone arm head, at the point where the arm tapers downward, as shown in the drawing. The pressure limiting device is made of a small "L" shaped plastic piece with a felt pad under the small "L" leg. The large "L" leg is fitted with a spring clip that holds it in a slot in the front edge of the tone arm head. In operation the felt pad on the pressure limiter is in contact with the record at all times. The free end of the cartridge assembly is kept from pivoting by the small leg on the pressure limiter. In addition to preventing record scratch, the felt pad on the pressure limiting device also cleans the record grooves ahead of the stylus. Older RP217/218 series models can be modified for "Feather Action" only by changing the tone arm assembly. The pressure limiter retainer assembly is a replaceable parts item stocked by RCA distributors.

WESTINGHOUSE

TV Tuner Replacement — Kit No. 6

Tuner 470V064H01 is used in conjunction with tuner replacement kit No. 6 to replace several other tuners which are no longer available. A revised tuner, 470V064H01W, is being used as a replacement for the older 470V064H01. The newer "W" type tuner has the filament connection in a different location than the original tuner. If the "W" type tuner is used, connect the filament lead to the last feedthru located at the extreme left rear of the tuner. The next feedthru forward and in the same line, has no connection.

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

Featuring Automatic
Controlled
Rejuvenation

The All New SENCORE CR125 CATHODE RAY TUBE TESTER

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

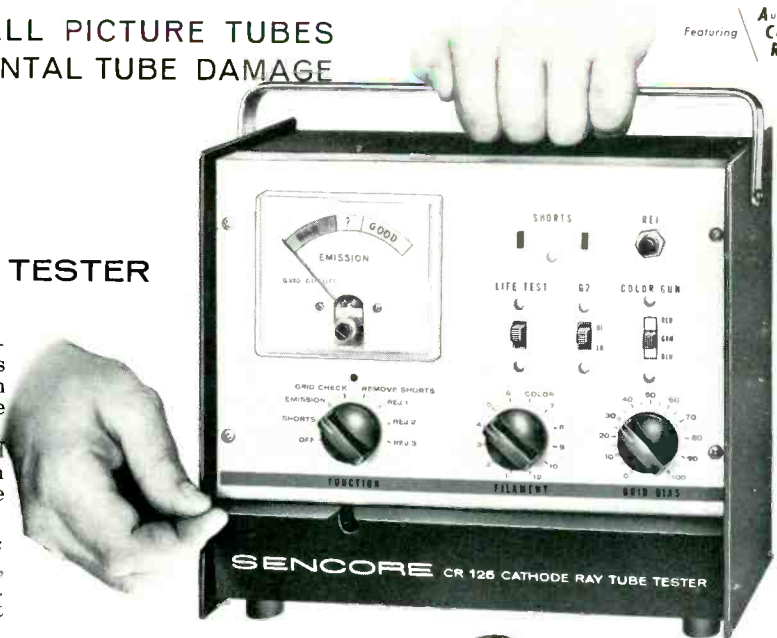
Check these outstanding features and you will see why this money making instrument belongs on top of your purchasing list for both monochrome and color TV testing.

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

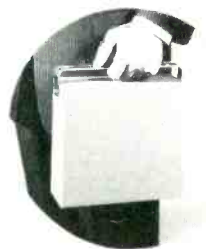
Automatic controlled rejuvenation. A Sencore first, preventing the operator from over-rejuvenating or damaging a tube. An RC timing circuit controls the rejuvenation time thus applying just the right amount of voltage for a regulated interval. With the flick of a switch, the RC timer converts to a capacity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

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

No adaptor sockets. One neat test cable with all six



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



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

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

Model CR125 \$69.95

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

PS127 DELUXE WIDE BAND OSCILLOSCOPE AT A SURPRISINGLY LOW PRICE

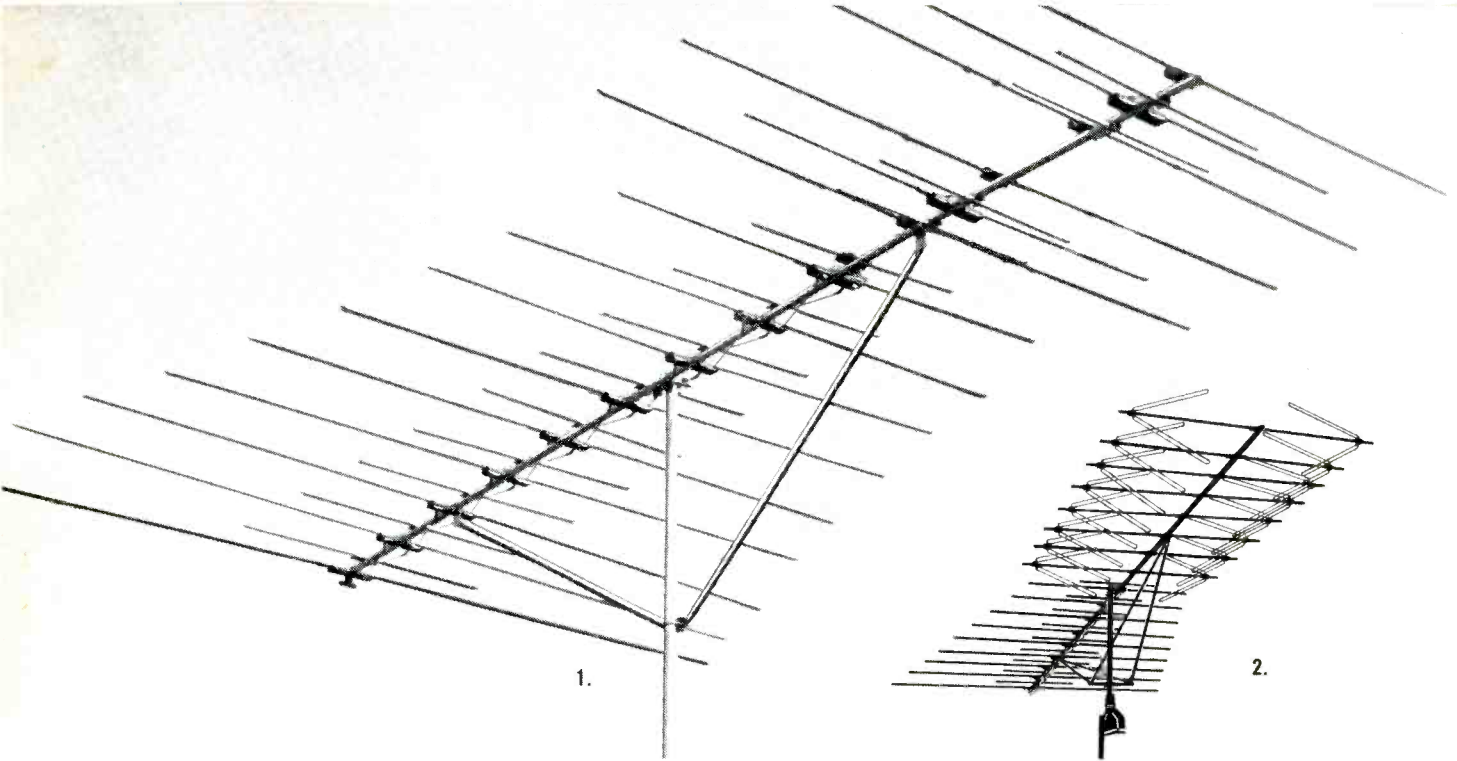
This all new 5 inch oscilloscope offers the finest in performance, portability and appearance. Vertical amplifier frequency response, flat within 1 DB from 10 CPS to 4.5 mc and only 3 DB down at 5.2 mc insures true waveform reproduction. Vertical amplifier sensitivity of .017 volts RMS for one inch deflection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

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

PS127 \$169.50



--- for more details circle 34 on post card



PICK YOUR MARKET! Nail it down

"CROSSFIRE"—MOST POWERFUL TV ANTENNA DESIGN IN THE FIELD!

1. GOLDEN CROSSFIRE 3600 Series

U.S. PAT. NO. 3,086,206 CONFIRMS AND PROTECTS EXCLUSIVE DUAL-DIPOLE SYSTEM—THE SYSTEM THAT STILL GIVES HIGHER, CLEANER GAIN (WITH LEAST BULK) THAN ANY COMPETITIVE ANTENNA! DOES IT AT LOWEST COST. EVEN INCLUDES FM! COMPETITIVE FRINGE ANTENNAS DON'T.

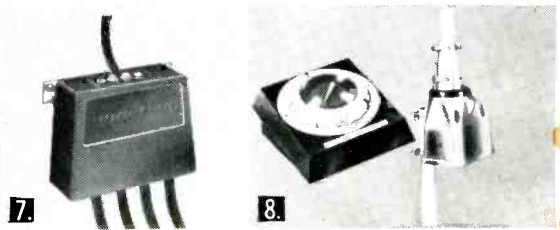
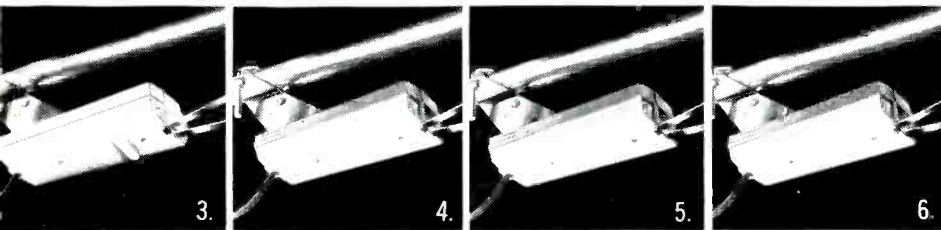
High-performance balance can be obtained only by using the right combination of both driven and parasitic elements. Only the Crossfire—with

its unique dual dipole system—has this power combination. The Crossfire patent protects this system—and no other antenna, old or new, can use it.

2. GOLDEN SUPER-CROSSFIRE Model 3607

The World's Most Powerful Antenna

1. Up to 48% more TV gain than 28-element Crossfire.
2. On FM Stereo... gives more gain than a 5-element yagi.



EXTRA-POWERFUL BOOSTERS THAT MEET EVERY NEED!

3. BRAND-NEW Nuvistorized "TV ONLY" TELE-VISTA Model 0026

YOUR MARKET: TELEVIEWERS IN AREAS WHERE BOTH TV AND FM STRONG SIGNAL OVERLOADING FROM NEARBY STATIONS IS A PROBLEM. The only "TV/only" Amplifier with the long-life "Duo Nuvistor" circuit... and a built-in coupler! Strong local TV and FM signals won't overload it.

4. BRAND-NEW Transistorized "TV ONLY" TELSTAR Model 0027 with Built-In FM Trap... plus 4-set coupler.

YOUR MARKET: TELEVIEWERS IN AREAS WHERE FM STRONG-SIGNAL OVERLOADING FROM NEARBY STATIONS IS A PROBLEM. Twice the TV overload protection of any other transistorized booster... thanks to Texas Instruments' brand-new EPITAXIAL MESA TRANSISTOR. Virtually eliminates possibility of local FM interference.

5. TV/FM TELSTAR WITH 4-SET COUPLER Model 0023A America's most outstanding, best-selling booster

YOUR MARKET: VIEWERS AND LISTENERS WHO WANT THE WORLD'S MOST POWERFUL BROAD-BAND AMPLIFICATION! Unbeatable Combination of High

Gain and Low Noise figure... plus built-in Lightning Resistance and other outstanding features.

6. TELSTAR FMX (for FM exclusively) WITH 2-SET COUPLER Model 0025

YOUR MARKET: THE EXPANDING NUMBER OF MONAURAL AND STEREO FM LISTENERS! Most powerfully stepped-up FM performance of all!

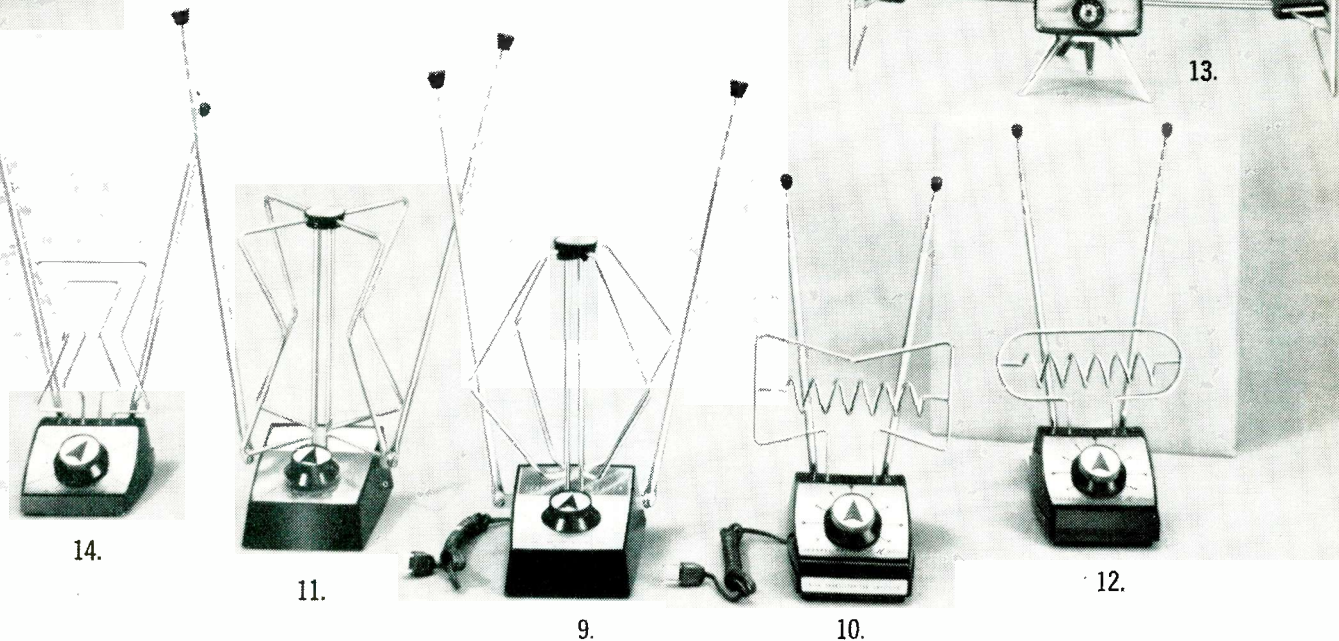
7. Improved! Higher Gain VUTRON II FOR TV/FM Model 0024

YOUR MARKET: THOSE WHO WANT THE BEST IN AN IN-THE-HOME SIGNAL AMPLIFIER AND COUPLER.

NOW FOR THE FIRST TIME... OUTSTANDING ALL-IN-1 ROTATOR AND TV AMPLIFIER!

8. GEMINI Model 9527

YOUR MARKET: THOSE WHO NEED AND WANT EXTRA POWER... PLUS DIRECTIVITY. Fast, neat installation saves money 4 ways! World's Finest Automatic Rotator (Tenn-a-liner)... plus Telstar TV booster. Built-in FM TRAP. Simple to Service. 2-set coupler.



With **CHANNEL MASTER**

WORLD'S MOST POWERFUL NEW INDOOR ANTENNAS

These beautifully-designed antennas open a whole new market ... because they work where only outdoor antennas could work before!

9. NEW! Revolutionary, Transistorized **APOLLO** Model 3721 (with Built-in Amplifier)

GETS CLEAR, GHOST-FREE, TV RECEPTION 15 TO 45 MILES OUT.

YOUR MARKET: SUBURBAN VIEWERS WHO WANT OUTDOOR ANTENNA POWER FROM AN INDOOR ANTENNA. Exclusive "Miraclick" Switch electronically adjusts to different signal strengths. Super-effective hidden amplifier gives extra pull-in power where needed.

10. NEW! World's First Transistorized **FM/STEREO INDOOR ANTENNA with Built-in Amplifier.** Model 3731

GETS POWERFUL FM RECEPTION 15 TO 60 MILES OUT!

YOUR MARKET: SUBURBAN LISTENERS WHO WANT TOP FM PERFORMANCE WITH EASY ANTENNA ADJUSTABILITY AND ROTATOR-TYPE DIRECTIVITY. Booster is peaked—dipoles tuned—for FM exclusively! Fidelity Switch.

11. Golden **CANAVERAL** Model 3720 (Non-Amplified)

YOUR MARKET: METROPOLITAN AREA VIEWERS WHO WANT TOP TV/FM RECEPTION UP TO 15 MILES FROM STATION. Same features as Apollo.

12. NEW! **FM/STEREO INDOOR ANTENNA** Model 3730 (Non-Amplified)

YOUR MARKET: METROPOLITAN AREA LISTENERS... WHO SEEK FM PERFORMANCE WITHOUT COMPROMISE! Same advance features as 3731.

13. Improved! **SHOWMAN** Model 3900 (Mahogany and Gold) Model 3901 (Blond and Gold)

YOUR MARKET: CUSTOMERS WHO WANT SOMETHING DIFFERENT! Beautiful ... improved ... priced to move! "Metro-Dyne" Variable Inductance Electronic Tuning. Like no other antenna.

14. NEW! **AURORA** Model 3718

YOUR MARKET: THOSE WHO WANT A LOW-PRICED LUXURY ANTENNA! Tops for the money! Magnificently styled. "Automagic" Clarifier Switch.

FREE GIFTS! SEE YOUR CHANNEL MASTER DISTRIBUTOR FOR FULL DETAILS ON INDOOR ANTENNA PREMIUM DEAL.



NEW! BEAUTIFUL, POWERFUL "VU-CON" UHF CONVERTERS

GIVE YOU THE EDGE IN EVERY RECEPTION AREA ... NOW AND IN THE FUTURE!

15. Model 6700. **YOUR MARKET:** FRINGE-AREA LISTENERS WHO WANT THE ULTIMATE IN RECEPTION. Capacitive tuning (no sliding contacts), 1 long-life Nuvistor, 1 oscillator tube. Prevents strong-signal overloading.

16. Model 6701. **YOUR MARKET:** FRINGE-AREA LISTENERS WHO WANT

TOP QUALITY AT A MODERATE PRICE! Inductive Tuning, 2 long-life Nuvistors.

17. Translator Model 6703. Same as above but covers only channels 70-83.

18. Model 6702. **YOUR MARKET:** METROPOLITAN AND SUBURBAN AREA LISTENERS WHO WANT TOP QUALITY AT A MODEST PRICE! Your most profitable UHF conversion market. Inductive Tuning, 1 long-life Nuvistor.

19. Translator Model 6704. Same as above but covers only channels 70-83.

EDITOR'S MEMO

Used Tubes:

Something for Nothing?

The use of rebranded and used tubes in our ranks is astoundingly wide spread. I would like to think that many of the users aren't aware of the tubes' poor quality. But even at that, technicians using these tubes should be severely criticized on the grounds that they should know more about what they sell. The adage that "you don't get something for nothing" is very meaningful here.

Tube sellers have been forced in some instances to avoid misleading advertising and this has "cleaned up" the market to a small extent. The fact remains, however, that you should not be buying and reselling used tubes. Where are your ethics? You should *know* the products you buy.

I recently encountered a man who had undoubtedly signed his association's impressive code of ethics and was one of the busiest technicians in town. But he was not satisfied with the average \$1.50 profit on a tube sale—he wanted to make \$2.50. He thought it was more profitable to sort through tube after tube, returning faulty ones for replacement and making return trips to replace tubes that didn't last a week in normal operation.

This same individual had the gall to make promotion mailings and display his windows and counters with dummy tube cartons using the name of a prominent tube manufacturer even though he only used brand name tubes when he was stuck without a "second."

Your basic profit should not be derived from parts (including tubes). Your technical ability is your primary business asset. In other words, most of your profit should come from your service, not from the sale of parts.

Since your service reputation is based on how well a set performs after you repair it, you can't afford to gamble on junk replacement components. Don't let this relatively small segment of your income dictate the future course of your major income source. The extra dollar you gain from selling a rebranded tube can be had easily by offering extra services and increasing your service charge. And the trouble you'll save with callbacks will save time too. Competition? You'll have it all over them with the extra service.

I imagine that the people who "need" the extra profit on parts are the same ones who are charging \$2 for "labor" and \$7.50 for a couple of resistors on the bench repair job. Your competition isn't going to let you coast along forever; it's way past time to wake up, gentlemen. And if you don't wake up soon, there may be no reason to. I hear that construction work is reasonably plentiful all year-round in Florida.

Vic Beale

ELECTRONIC TECHNICIAN



NEW SECO MODEL 88 TESTS PICTURE TUBES, TOO!

- Tests over 400 cathode ray picture tubes including 110° deflection types for
 - cathode emission
 - leaks and shorts
 - grid emission
 - gas error
 - filament continuity
 - cathode-to-heater emission
- Tests all receiving tubes including novars, novistors, 10 pin types, compactrons and magnovals for
 - cathode emission
 - leaks and shorts
 - grid emission
 - gas error
 - filament continuity
 - cathode-to-heater emission

Seco's patented Grid Circuit Test alone makes up to 11 simultaneous checks for tube faults. Tube Merit and Filament Continuity tests increase the test range even more—you locate those "hard to find" faults on your first try.

And now this same tester handles picture tubes, too. Merit test operates at half of rated cathode current—no possibility of damage if filament voltage is correct. Indicates leakage, gas, shorts and grid emission—tapping the tube neck shows up intermittent shorts. Even handles 110° deflection models with universal socket adaptor.

This *COMPLETE* tester saves you time and trouble—does more jobs quicker and better. New Model 88 comes to you with speed-indexed setup data, pin straighteners and 12-pin picture tube socket on a 3-foot cable. Guaranteed up-to-date—new tube data mailed periodically at no charge to all registered owners.



MODEL 88 - - - \$74.50 NET

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- - - for more details circle 33 on post card



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Your customers will appreciate it, too, because they know ITT's international

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ITT can provide this "extra value" of finest quality at higher profit margins because ITT products are available from 154 factories and laboratories in 24 countries. Brands without these world-

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ITT Distributor Products Division, International Telephone and Telegraph Corporation, Box 99, Lodi, New Jersey.

ITT

...for servicing and upgrading hi-fi and stereo phonograph, radio and television sets

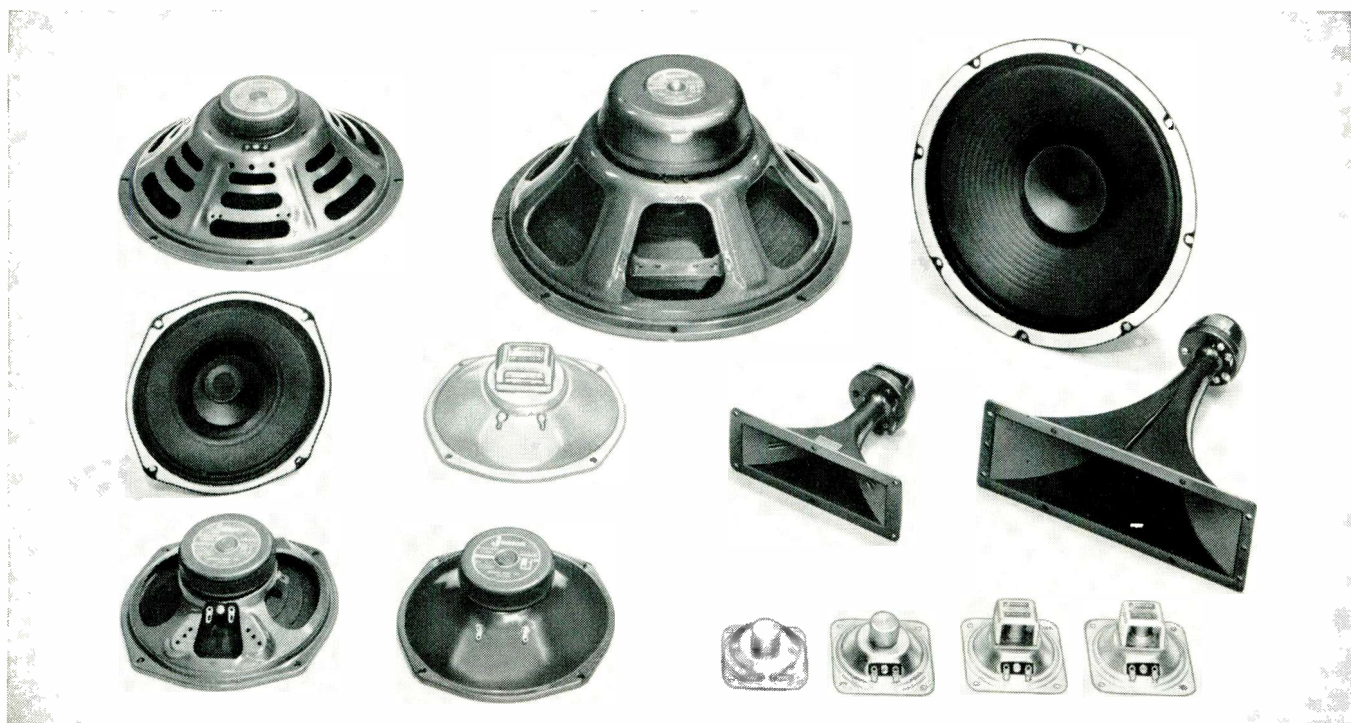
Here's the **NEW** Jensen **Concert Hi-Fi Replacement Series**

Everything we have learned from years of engineering the world famous JENSEN High Fidelity loudspeakers . . . all of our design and production experience as suppliers of superior hi-fi speaker systems to makers of fine home entertainment equipment . . . all of this know-how has been brought to the new Jensen Hi-Fi Replacement Series.

This series offers for the first time full-range, woofer, midrange and tweeter units in sizes and types that simplify the service problem; many are available nowhere else.

It will pay to concentrate on Jensen, the most experienced producer of high fidelity loudspeakers. And the customers will be pleased, too.

Get the full story—send for Catalog 1090 today.



MODEL NO.	TYPE	SIZE	FREQUENCY RANGE	IMPED. OHMS	POWER RATING†	LIST PRICE
D-8R8	Full Range, Dual Cone	8"	50-14,000	8	12	\$14.65
D-12R8	Full Range, Dual Cone	12"	40-13,000	8	14	18.25
W-8R8	Woofer	8"	45-2,000	8	20	13.65
W-12R8	Woofer	12"	35-2,000	8	25	17.75
W-15N8	Woofer	15"	30-2,000	8	30	56.25
M-8U8	Midrange, Closed-Back	8"	600-4,000	8	25	7.65
M-8R8	Midrange, Closed-Back	8"	600-4,000	8	30	14.00
T-3K78	Direct Radiator Tweeter	3"	2,000-15,000	8	15	4.95
T-35K78	Direct Radiator Tweeter	3½"	2,000-15,000	8	15	5.25
T-35W8	Direct Radiator Tweeter	3½"	2,000-15,000	8	15	5.50
T-35V8	Direct Radiator Tweeter	3½"	2,000-15,000	8	15	5.95
T-107	Compression Horn Tweeter	—	2,000-16,000	8	25	16.50
T-109	Compression Horn Tweeter	—	1,000-16,000	8	25	18.50

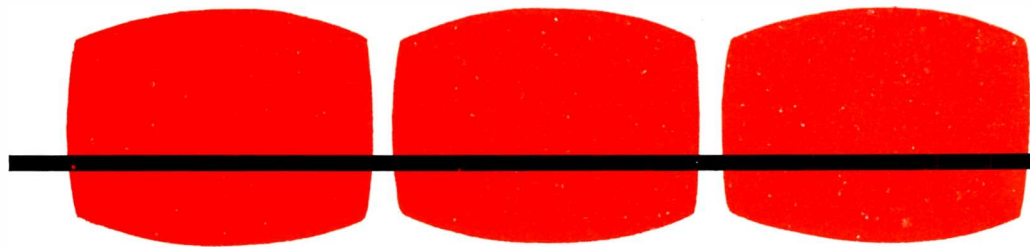
†Program rating. Peak power is twice the indicated figures.



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- - - for more details circle 28 on post card

WHAT'S NEW



IN NEW TV?

New TVs have range of exterior styles and service features but electrical changes are slight

■ Although new TV sets boast many improvements this year, there are few innovations that technicians won't welcome. New circuitry has been kept to a minimum and physical changes seem to be the order: swing-down chassis, service controls accessible from the front (even on the color sets), schematics printed on PC boards, circuit breakers in place of line fuses, top-of-the-chassis test points, removable bottom covers and many more. While all these features aren't new to the industry, more manufacturers than ever before are using them.

Several TV makers have gone to the two-tube IF strip using new frame grid tubes. The output is about the same as with three of the tubes previously employed. At least two companies went the frame grid route, but still employ three tubes in their IF strips. The engineering VP of one company maintains they get better results with the additional tube and want the customer to have the benefit of this improved tube type.

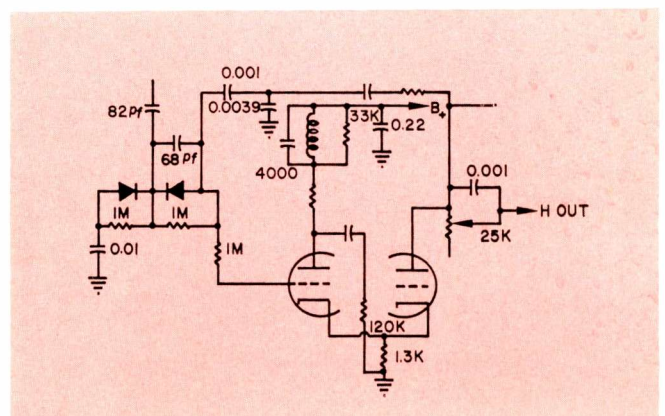
Almost every one offers some sort of Hi Fi with their top line and

at least one company offers a hybrid system employing transistors in the audio Hi Fi section. All the Hi Fi systems are a far cry from what they were a few years ago when they were little better than the kids' 45.

One manufacturer offers remote control on every TV in the line including portables. And every manufacturer has an almost unending and dazzling line of cabinets.

So whether you sell and service

New phase detector and multivibrator circuit used in Andrea sets.



Multiplier Prefixes

■ More today than ever before the need exists for stating electronic terms in values larger and smaller than conventional unit terms.

The farad, for example, has never been a significant value to the average technician. To compensate for unwieldy terms, prefixes have been assigned to the unit figure which increase or decrease their size in steps of three decimal places. Most of these terms are in common usage but some may be confusing.

In an effort to familiarize technicians with these prefixes, they are reproduced here with their multiplier in powers of ten, their decimal notation and the symbol used by Electronic Technician Magazine.

Example of prefix usage:

1000 cps = 1kc	0.001 sec = 1 msec
1000 kc = 1 Mc	0.001 msec = 1 usec
1000 Mc = 1 Gc	0.001 μ sec = 1 nsec
1000 Gc = 1 Tc	0.001 nsec = 1 psec

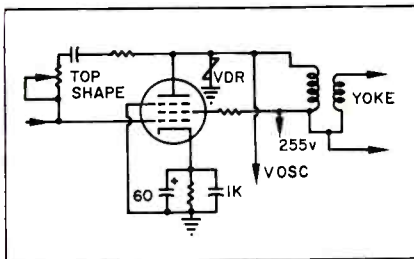
Combinations such as $m\mu$ (milli micro) should be avoided since other prefixes can be used. In this example, nano is correct. ■

feature found on more models this year—"See-Matic" PC board failure is protected by unique guarantee; new set is given to owner in event of board failure. Swing-down chassis featured on all except portables.

Zenith—Silcon rectifiers are being used in all models this year. The fringe-lock control is now automatic and uses a VDR to control the circuit. The "Gold Guard" tuner is *the* big feature this year and will take top billing in the company's promotion.

All the manufacturers not only boast of increased reliability this year, but are giving it too. Service calls on models now being sold are going to be fewer than ever before—but when they do come in for service, they will be easier than ever before to repair.

Set prices will be lower this year because smaller screened sets are in demand and new tube types have lowered B+ requirements. (Even the largest common CRTs can be swept with tubes supplied from a straightforward half-wave rectifier.) Compactrons have also lowered the cost of set production by reducing total tube costs and the number of tie-points required for a given circuit.



Voltage dependent resistor used in Electro-home chassis limits vertical output tube plate excursion to about 1500 v.

ELECTRONICS

in the 'Continental Manner'

A glossary of English-German words to help you repair German-made electronic equipment

by Jack Darr

■ Imported electronic equipment has brought some new problems to U.S. technicians—not that they didn't have enough to begin with. Equipment quality is mostly good, but the difficulty has been with the service data. One big problem is "translation" of schematics drawn with different symbols. Most European schematics use CCIR (Comite Consultatif Internationale de Radio) standard symbols which are different from those used in Britain and the U.S. To make things even more upsetting, many of the diagrams (you'll seldom see the word "schematic" which is apparently a U.S. invention), will be lettered in German!

German isn't really too difficult, especially for English-speaking peoples, because of similarity in sound and spelling. "Kontakt" for "contact;" "keramik" for

"ceramic," and so on. Different symbols used in German, French and Italian radio diagrams, plus their U.S. equivalents beside them for comparison, are illustrated here.

Many "Continental" symbols are actually much faster to draw and more "understandable" than those we use, but that's beside the point. While they represent the same things, they do it in a "different language." So, here's a "glossary of symbols" for you.

Technical German (Technischer Deutsch)

Technical German's not hard to understand. The only novelty, to us, is the German habit of piling-up-wordslikethis. When a German wants to describe something, he simply keeps on adding words until he

GERMAN GLOSSARY FOR ELECTRONICS

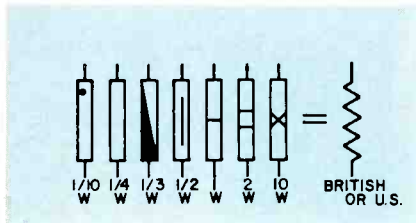
Alternating Current
Amplifier
Amplitude
Amplifier Tube
Anode Voltage (Ep)
Antenna
Attenuation
Audio Frequency
AVC

Baffle
Bass
Capacitor
Carrier Frequency
Choke (coil)
Circuit
Color-code
Contact
Control Grid
Contrast Control
Coupling
Crystal Diode
Current
Diagram
Direct Current
Earth (Gnd)
Efficiency Diode (Damper Tube)
Electron Tube

Wechselstrom (Abbr. AC)
Verstärker
Amplitude
Verstärkerrohre
Anodenspannung
Antenne
Dämpfung
Niederfrequenz
Automatische Lautstärkereglung (A. L. R.)
Schallwand
Bass
Kondensator
Trägerfrequenz
Drosselspule
Leitung
Farbkennzahl
Kontakt
Steuergeritter
Kontrastregler
Kopplung
Kristalldiode
Strom
Schema
Gleichstrom (Abbr. DC)
Erdverbindung
Spardiode
Hochvakuumrohre (Elektronrohre)

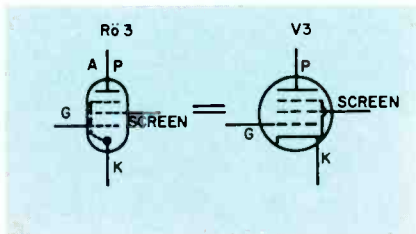
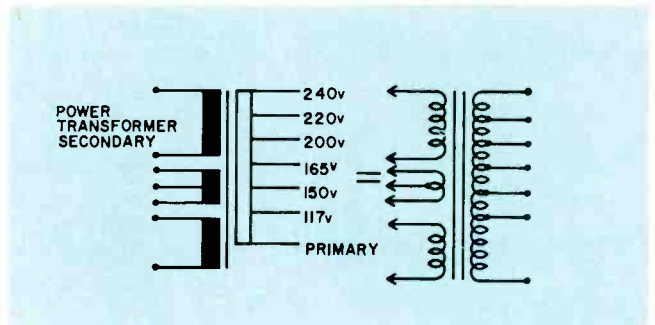
gets a complete description! For an example, television is "fernsehen"—"far-seeing"—a very descriptive term. Color-TV adds the word for "color" in front—"farbfernsehen." If you'll just separate these into their individual parts, you'll have no trouble.

The Dutch word for a speaker-baffle is "klankbord," and in some cases, this could be quite descriptive. So, if you run across a "funny one," check the part to see



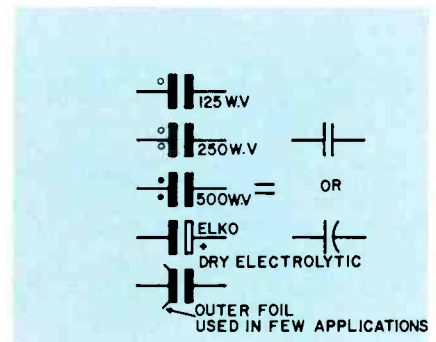
Power transformer symbols.

Resistor symbols used in continental schematics. Ohmic values are marked alongside—as in our system. These are schematic symbols only—you won't find these markings on resistors.



Continental electron tube symbol.

Continental capacitor symbols. Watch out for numerical values: most will be given in 'nanofarads'; and nanofrad is 1,000 pf (1.001 μ f).



Feedback
Feedback Circuit
Filament
Filament Voltage
Filter
Frequency Modulation (FM)
FM Detector
Focus Coil
Frequency Response Curve
Fuse
Gain
Gain Control
Grid
Grid Voltage
Grounded-grid (circuit)
Harmonic
High Frequency
High Voltage

Rückkopplung
Rückkopplungsnetzwerk
Heizfaden
Heizfadenspannung
Netzfilter
Frequenzmodulation
Frequenzmodulationsdetektor
Fokussierspule
Frequenzkennlinie
Sicherung
Verstärkung
Verstärkungsregler
Gitter
Gittervorspannung
Gitterbasisanschlaltung
Oberschwingungsfrequenz
Hochfrequenz
Hochspannung

Lamp
Lead-in (Antenna)
Level
Limiter
Line Output Tube (Our horizontal output tube)
Line-sync (Our horizontal sync)
Linearity
Load
Load Impedance
Loudness
Loudspeaker
Low-frequency
Megacycle

Röhre, or Lampe
Einführung
Pegel
Begrenzer
Zeilenausgangsröhre
Zeilensynchronisierung

gerätlinigkeit
Anhaufung
Abschlussimpedanz
Lautstärke, Lautheit
Lautsprecher
Niederfrequenz
megaHertz (mHz) ("Hertz," abbr. Hz, is used where we use cps.)
Mischgerät
Eintritt
Babbeln
Rauschpegel
Oktalfassung
Widerstandsmesser
Betriebspannung
Schwingerserzeiger, or Oszillator
Aussehenantenne
Ausgang
Überladung

(You'll find the abbreviation HT—high tension—used for our HV)

Inductance
Input
Insulation
Iron-core Inductance
Jack
Junction Box
Knob

Induktivität
Eingang, or Eingangschaltung
Isolation
Induktanz mit Eisenkern
Klinke
Anschlussdose, or Kabelkasten
Knopf

Mixer
Negative
Noise
Noise-level
Octal Base
Ohmmeter
Operating Voltage
Oscillator

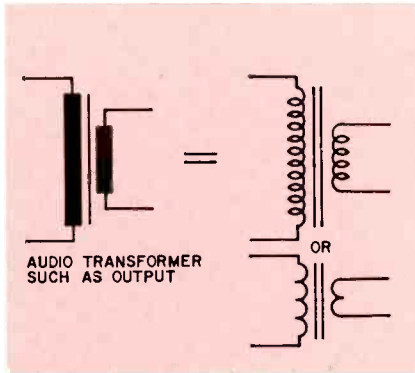
Outdoor Antenna
Output
Overload

ELECTRONICS

'Continental Manner'

Continued

Continental audio transformer symbol.



Schematic symbols for ground connections.

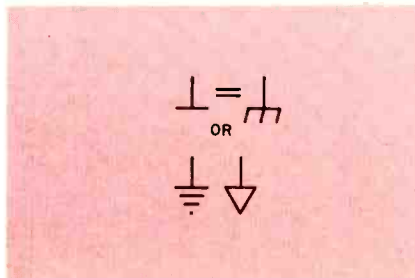
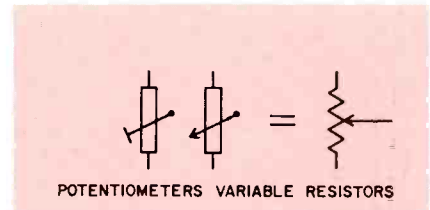


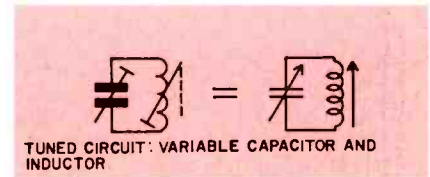
TABLE II

black	schwarz
brown	brun
red	rot
orange	orange
yellow	gelb
green	grun
blue	blau
violet	veilchen
grey	grau
white	weiss
gold	gold
silver	silber
pink	rosa

Potentiometers and variable resistor symbols.



Tuned circuits—variable capacitance and inductance.



Overload Indicator
Pad
Passband
Peak Current
Peak Voltage
Phase Distortion
Phase-Inverter (Tube)
Pickup (Phono)
Picture Carrier
Picture Signal (Video)
Picture Tube
Plug
Playback
Pole Piece
Power
Power Amplifier

Power Supply
Preamplifier
Primary (Circuit)
Push-pull (Circuit)
Push-pull Amplifier
Receiver (Radio)
Rectifier
Relay
Resistance
RMS (Value)
Rotor
Sawtooth (Voltage)

Übersteuerungseiger
Verlängerungsleitung
Durchlassigkeitsbereich
Spitzenstrom
Spitzenspannung
Phasenverzerrung
Phasenumkerrohre
Tonabnehmer
Bildtrager
Bildsignal
Bildrohre
Stecker
Wiedergabe
Polschuh
Leistung
Leistungsverstärker, or
Kraftverstärker
Stromversorgung
Vorverstärker
Primärkreis
Gegentaktschaltung
Gegentakt Verstärker
Empfänger
Gleichrichter
Relais
Widerstande
Effektivwert
Läufer
Sagenahnspannung

Screen-grid
Screen-grid Voltage
Shield
Soldering Iron
Soldering 'tag' (Lug)
Sound Channel
Sound Recording
Superheterodyne
Switch
Television
Television Channel
Television Receiver
Television Transmitter
Terminal Lug
Test Equipment
Tuning
Tuning Capacitor
Valve Voltmeter (VTVM)

Variable Capacitor
Variable Resistor
Video Detector
Voltage
Voltage Divider
Voltage Doubler

Voltage Drop
Zero

Schirmgitter
Schirmgitterspannung
Abschirmung
Lotkolben
Lotose
Tonkanal
Schallaufnahme
Zwischenfrequenzempfänger
Schalter
Fernsehen
Fernsehschicht
Fernsehkanal
Fernsehempfänger
Fernsehsender
Kontaktstift
Prüfsmesser
Abstimmung
Abstimmungskondensator
Röhrenspannungsmesser, or
Röhrenvoltmeter (Abbr.
RVM)
Veränderbarer Kondensator
Veränderbares Widerstände
Bildgleichrichter
Spannung
Spannungsteiler
Spannungsverdopplungs-
schaltung
Spannungsabfall
Null

Improved Electronic OHMMETER

Upgrade the accuracy and reliability of your electronic ohmmeter with a transistor voltage regulator

by Herbert O. Smith

Western Electric Co., Inc.

■ A regulated supply replacement for the 1.5-v battery in most VTVM ohmmeter circuits can greatly increase their accuracy. A simple circuit is shown in Fig. 1. The output of the regulator is adjusted to 1.5 v by R3, a 100-ohm potentiometer. The output voltage changes less than 30 mv from no load to full load and less than 10 mv as the input is varied from 5 to 8 v. This results in improved accuracy at the low resistance ranges, and worry about battery drain and replacement is gone forever.

The regulator draws less than 20 ma when not in use or when the probes are open circuit. The maximum current delivered to the load is 150 ma when the probes are shorted with the range switch set to RX1 for most meters. No drop in the B+ voltage or the filament voltage of the VTVM was detected with the maximum ohmmeter load on the test meter.

Circuit Description

Since the filament winding of most VTVMs have one side grounded, a halfwave rectifier circuit was used. Capacitor C1, consisting of two 200 μ f 10 v capacitors, provides filtering.

The three-transistor regulator circuit is quite conventional. Q1 is a series regulator driven by two amplifier stages, Q2 and Q3. The size of R1, the 100 K resistor, may require changing depending on the beta of the transistors used. R1 provides the current to initially actuate Q2 which, in turn, switches on Q1.

An increase in load or a decrease in input voltage—either of which would tend to decrease the output voltage—will reduce the base drive

to Q3; this will drive Q3 toward cutoff, increasing the voltage at the collector of Q3. The increased Q3 collector voltage increases the base drive to Q2 which drives Q2 toward cut on. As Q2's resistance decreases, as it does with increased base drive, the base drive to Q1 is increased, which in turn decreases Q1 resistance which causes a rise in output voltage to compensate for the tendency of the output to decrease. Thus, the output is held very near constant for input voltage and load changes.

Construction

The regulator was built on a 1 1/4 x 2 in. phenolic board with a bracket for the 100-ohm pot. A second bracket mounts the regulator to the voltmeter chassis with the same hardware and in the same place formerly occupied by the

battery clip. The terminal strip used for the ac power tie points is also fastened to the regulator bracket. A suggested regulator board and mounting bracket arrangement is shown in Fig. 2.

The rectifier and filter capacitors were mounted on a 1 1/4 x 2 1/2 in. board mounted under one of the meter mounting screws, using a large solder lug for a bracket. This will have to be varied, of course, with some meters. ■

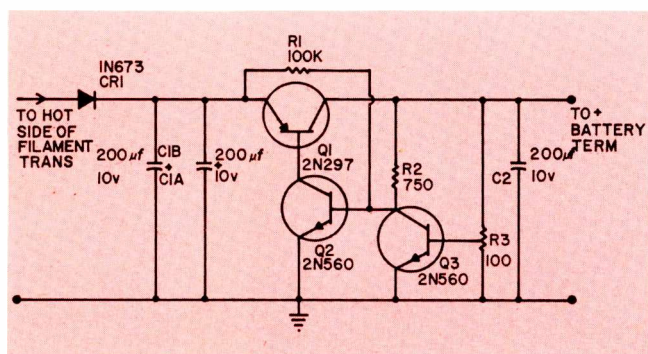


Fig. 1—Schematic of 1.5 v regulated power supply for VTVM ohmmeter function.

Parts List	
C1	— 2 x 200 μ f @ 10 v
C2	— 200 μ f @ 10 v
CR1	— IN673
R1	— 100 k Ω \pm 5% 1/2 w
R2	— 750 Ω \pm 5% 1/2 w
R3	— 100 Ω pot
Q1	— 2N297
Q2, Q3	— 2N560

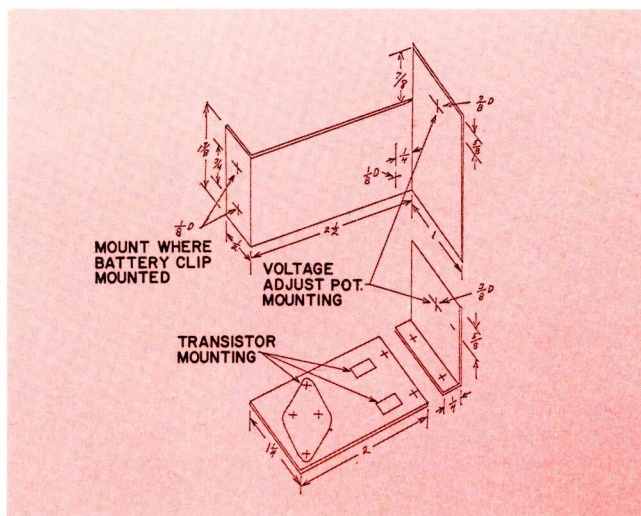
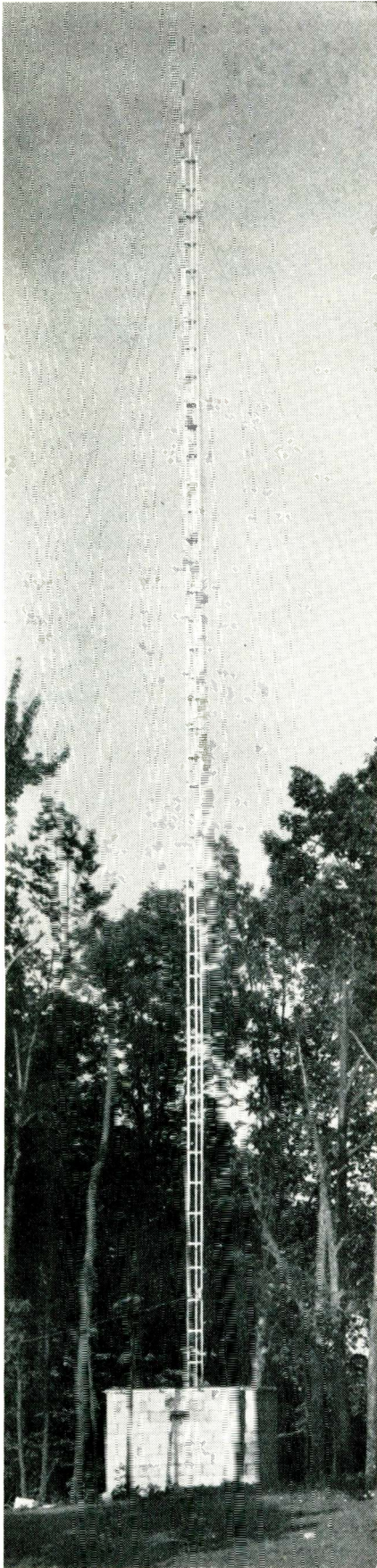


Fig. 2—Regulator mounting.



The translator's antenna tower is located in the best position to serve the entire county. Guyed at six points with $\frac{1}{2}$ -in. steel cable, it requires minimum service.

Does Your Town Need

How one persistent Kentucky service-dealer made the people happy in his town, increased his own business and his competitors' business too

by Carl Henry

■ The majority of the country's TV shops are in cities with less than 50,000 population, and more than half are in fringe-reception areas.

Compared to normal reception, fringe-area conditions place the "monkey" squarely on the backs of TV technicians. To satisfy customers in fringe areas, TV sets must be in perfect condition. Even the slightest defect—unnoticed in normal TV reception areas—causes customer dissatisfaction.

Somerset, Kentucky is a fringe-area town. But it has a persistent TV service-dealer with ideas.

Some time ago, Hobart "Hobe"

Withers thought a low power VHF translator would benefit Somerset's people and local TV service-dealers too — even though a cable distribution system was in operation. He decided to install a TV-translator to receive Channel 27, WKYT, from Lexington—but he ran smack into trouble.

The FCC would not allow direct competition with the cable system — even though it served less than thirty-five percent of the city. This caused complications and additional expense for Hobe but his persistence paid off. He finally installed the translator and placed it in operation—much to the pleasure of



"Hobe" Withers pauses from adjusting a GE mobile radio in the service section of his shop. He finds that the normal test equipment used in his shop is adequate for translator servicing.

a TV-Translator?

almost all Somerset citizens.

FCC regulations covering translator operation — sections 4.701 to 4.790 — are now in a state-of-flux. There are about 1200 authorizations (800 VHF and 400 UHF) with about 300 applications pending. This situation makes it difficult to obtain a license, and more difficult to know what to apply for.

Hobe's Translator

The translator is located on a 150-ft hill about a mile and a half southeast of Somerset. It has a 100-ft well-guyed tower supporting a vertical co-linear antenna for retransmission of channel-12's signal. Channel-27's signal is received with a two-stack yagi, located at the tower's 60-ft level. A mast-mounted preamplifier boosts the received signal, which is then fed down the tower on coaxial cable.

Translator components are housed in a concrete-block building at the tower base. The building was also constructed by Hobe and his son, Hobart Withers, Jr., his partner in Hobe's Radio & TV Serv-

ice. An old model TV set is used as a station monitor.

How It Works

Signals from the tower-mounted preamp are fed to the translator preamp. This is a low-noise, single-channel amplifier, tuned to channel 27. It has a gain of about 65 db. Traps following the preamp clean up the received signal. Then a crystal-controlled converter changes the channel 27 signal to a channel 12 signal. The signal now goes through a "channel" amplifier to boost the signal for input to the power amplifier, and prevent spurious signals. The output amplifier is designed to deliver 1 w to the transmitting antenna. All equipment is FCC type-approved.

A second output from the channel amplifier is fed to the identification unit. This is a multi-function control circuit that switches off the transmitter if the received-signal strength drops too low for good translation. It also supplies station identification automatically every half-hour.

Transmitter output-power is fed to the co-linear antenna through a low-loss gas-filled coaxial cable. Effective radiated power (ERP) from the antenna is 3 w. Although the FCC limits antenna input power to 1 w, recent changes in the law (section 4.735) allow each of several communities to be served with 1 w. For example, if a translator operator who serves a particular county wishes to add several towns in the same county, separate yagis supplied with 1-w power can be pointed at each town. It is possible to get up to 10-w ERP from some yagis with 1-w input. The FCC does not limit antenna ERP.

Who Benefits?

Many translator systems are jointly financed by users or local civic groups. Some local Chamber of Commerce organizations help with the projects. But Hobe financed his own.

"What does a service-dealer get out of spending three or four thousand dollars on a translator installation," he was asked.

"I had to add a second truck to handle the extra business. Incoming business increases steadily."

Upkeep on the translator averages about \$500 a year. But this is less than many shops spend on advertising. Withers has competition from eight shops in this area. But by now few people in Somerset miss watching channel 12 — "Hobe's station." Advertising he has received from the translator-operation appears invaluable.

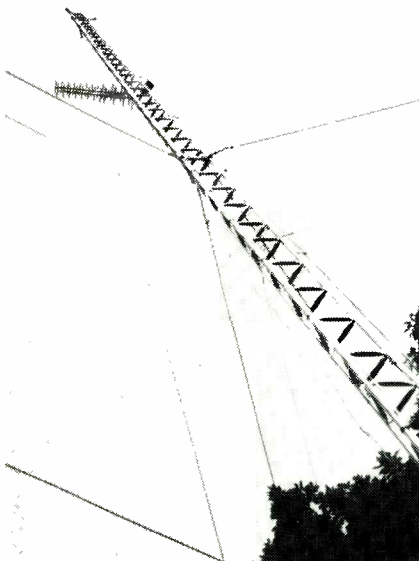
Kenneth Chestnut operates a shop in competition with Hobe. "The translator has given the cable TV system competition," he says, "but this is always healthy for any business. It has improved general business conditions here."

Another Withers competitor is Robert Perry, owner of Perry's Radio & TV. "I believe a UHF translator would have been better," he complained mildly, "but the present one is helping everyone's business. I don't believe it will hurt anyone."

Hobe Junior says, "We don't have to worry about monitoring the station against possible failure, we hear about it pretty quick from our neighbors."

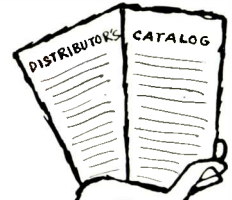


Hobe adjusts translator. Transmitter section must be adjusted only by FCC license-holder having at least a Second Class Radiotelephone Commercial license.



Close-up of antenna tower showing stacked receiving yagis.

Is Your Filter-Sense Showing?



A stock of 40 electrolytics
can handle 70 percent
of your filter problems

by Jay Shane

■ TV technicians have worries special to their craft. And one problem is "exact" replacements in power-supply filtering circuits. Perhaps technicians fail to fully understand practical electrolytic-filter tolerances

and that a distributor's catalog and cross reference data can almost always aid in easily solving replacement problems. Your competitor down the street may already know this and be giving TV set owners

quicker, more efficient service.

Cases

Let's take a current model portable that needed a new power supply electrolytic. This receiver uses

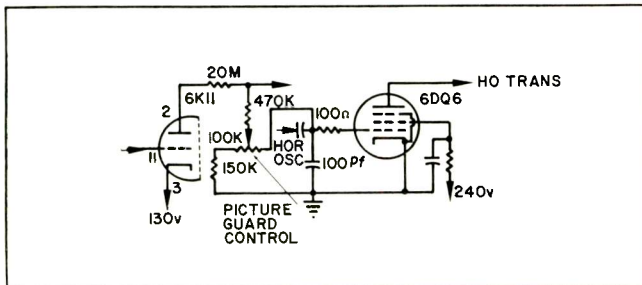


Fig. 1—Voltage doubler power supply in early color TV chassis.

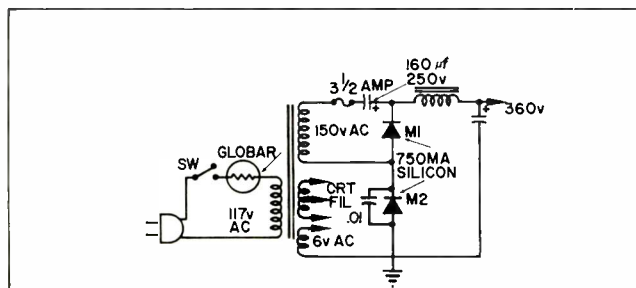


Fig. 2—Typical set with non-polarized electrolytic capacitor in boost circuit.

a high-capacity, minimum-space 250-200-10 electrolytic—all sections rated at 150v. We would have been forced to wait longer than we wanted to for an “exact” unit. By looking at a capacitor catalog we learned that two older type electrolytics could be used. One was a 250-200-10-25 @ 150/50 v job. The 25 μ f section was disregarded. Another was 200-200-60-30 replacement @ 175 v all sections. On this one you can tie the 60 and one 200 μ f section together. If the 30 μ f is used in place of the 10 μ f, no adverse effect will result.

Another set, a 16 in. portable, used extensively in motels in some areas, has a 40-100-50 @ 350 v filter. If the exact replacement is not available, you’ll find that nearly all capacitor manufacturers produce an 80-40-40-40 @ 450/25 v unit which will give fine results. We’re underrating two sections here, but staying within 30 percent. One of the 40 μ f sections is not used. If this capacitor isn’t quickly available others *are* which can be used by juggling the lug connections. One is a 40-40-80 @ 450/450/350 v.

One of the early color chassis has a 160 μ f @ 250 v in its doubler

circuit (see Fig. 1). When this receiver’s silicon rectifier (M2) “went west” three times within a week without blowing the 3½ amp fuse, it was finally determined that C1 was faulty. To save time, a quad 40 μ f @ 450 v was used—with all sections tied together to obtain 160 μ f. It worked fine.

Another brand TV with 16 and 19 in. chassis can also be handled without electrolytic replacement problems. The catalog lists a 10-80-40-100 @ 475/400/400/50 v electrolytic which is a perfect all-round replacement. An older type 10-60-30-125 @ 475/450/400/50 v can also be used. Either unit will serve for all three original manufacturer’s types—simply by ignoring the unneeded section—and all ratings fall within 30 percent.

We ran into an “interesting” problem on one set. A slight pulling and a smearing effect occurred about every 15 or 20 minutes—after the set warmed up. There may or may not be a residual hum present at the time. The 80 μ f section is usually partially open, or a slight leakage exists across the 40 or 80 μ f sections. Ripple upsets the 6K11 tube keying action in the “picture Guard” circuit (See Fig. 3).

Tech-Sense and Precautions

You can use many “tricks” to get effective filtering when necessity compels. But stay within a 30-40 percent capacity-range on the lower capacities. Over 200 μ f gives a greater tolerance range. A variation of up to 60 μ f will not violate good service practice. A capacitor substitution box, scope and VTVM can be used to prove this. Vary the capacity-range, check the output-voltage and observe the amount of ripple on the scope.

It should be understood that electrolytics can be used in circuits having lower voltages than the capacitor’s voltage rating. The section will “cure” downward. However, an electrolytic which has been used and cured in a low-rated circuit will break down if it is later used at higher voltages.

If it becomes necessary to use a tubular with a can type electrolytic, don’t just hang it there. Anchor it with tie-points. This makes for a neat and secure job.

Some sets have a two-ended capacitor in the doubler circuit. Instead of clumsily trying to hang a couple of 150 μ f tubulars somewhere in the set, why not put them in the 1-in. insulating shell supplied by all capacitor manufacturers for their 1 x 4 can-types? It’s so easy, and professional. Simply push the end of the insulating shell out, apply a little speaker-cone cement inside, and insert the tubular—positive end out—with both pigtails sticking out the same end. Replace the shell’s end-piece as a separator between the two capacitors’ negative ends and insert the second tubular—positive end out—with its two pigtails sticking out. Loops can then be made in the four pigtails and the red and black circuit-wires can be soldered to them. This makes a neat package that can be held in place with the original clamp.

A typical electrolytic-filtered boost circuit is shown in Fig. 2. Too many technicians overlook or disregard this *nonpolarized* unit’s characteristics. If a *polarized* capacitor is installed, it is riding at full B+ with reversed polarity for 11 to 20 sec during the set’s warm-up period. It won’t last long! Tie two 10 μ f tubulars together—negative to negative—and make your own nonpolarized unit.

Color-set electrolytics must be held close to manufacturers’ specifications because of the critical chroma circuitry. Absolute filtering, excellent bypassing and decoupling must be maintained, or a loss of tints can develop—even a complete color-fading condition may result.

Many technicians have shops located a considerable distance from supply houses. Even these houses do not stock a full supply of “exact” replacement parts. There’s a way around this problem, however.

A stock of one-each of about 40 electrolytic filter capacitors should handle about 70 percent of your problem-jobs. Get a capacitor catalog from your distributor and use it every day. When you run into an odd-ball filtering system, either staple the box tab to the set’s diagram or mark your schematic with the substitute number. With a little upgraded filter-sense you may be able to beat that competitor up the street at his own game! ■

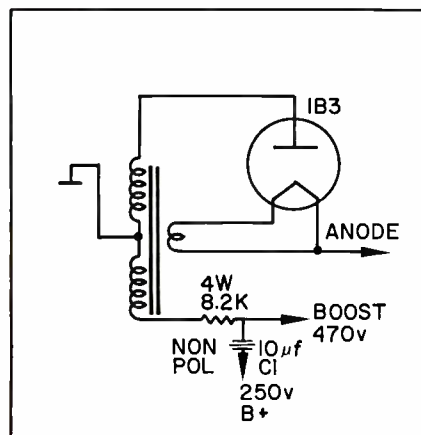


Fig. 3—Schematic of ‘picture guard’ circuit.

*Positive solution to noise suppression problems
employs noise blanking in vehicle radios*

TWO-WAY RADIO INTERFER-

■ Prevalent types of mobile two-way radio interference include: RF impulse noise, skip interference, intermodulation and desensitization. Each condition can be minimized in system design and, in many cases, by special, recently developed equipment.

Ignition Noise

The most common RF impulse noise source is vehicle ignition systems. This harsh static deteriorates radio message quality. Very often, when operating in weak signal areas, ignition noise blanks out radio messages completely.

Ignition noise is created by many vehicle elements. The most serious is caused by sparkplugs, coil and distributor. Sparkplug firing generates a very high amplitude ac pulse with harmonic content ranging from a few kcs to hundreds of Mcs. Noise amplitude is less at the higher frequencies. Consequently, the effects of ignition noise are greater in the low band (25-50 Mc) than in the high VHF (150-174 Mc) or UHF (450-470 Mc) bands.

Unfortunately, each sparkplug firing does not necessarily result in a single noise impulse. Actually, each firing may cause a burst of noise which may contain only a few impulses or, in the case of a very poor ignition system, hundreds of impulses. An automobile traveling at highway speeds has up to 15,000 sparkplug firings per minute (250 per sec). Thus, one car can generate 40,000 or more noise pulses per sec in intermittent bursts.

When nearby vehicle noise is

added to this, we can see that impulse rates up to 80 thousand or more per sec are attacking radio signals. Impulses with this repetition rate, however, come in the form of bursts. Sparkplug firing-time determines the burst duration.

The individual noise-voltage spike entering a typical radio receiver is usually about 0.1 to 0.2 μ sec in duration. The spike broadens while passing through the receiver's tuned coils. By the time the spike leaves the mixer, it is about 6 or 7 μ sec wide. When it leaves the high IF stages, it has broadened to 60 μ sec. Thus, the noise tends to become more continuous as it passes through the receiver.

Skip Interference

Skip interference is another form of disruption commonly experienced in VHF communications, especially in the 25 to 54 Mc band. The interference itself is simply radio signals broadcast on the same frequency as that used by a local system only the interfering signals originate from transmitters hundreds of miles away.

As may be inferred by the name, these signals skip or bounce off ionospheric layers. Depending on the time of day and the year, these layers provide reflecting surfaces for radio transmissions at great distances. Although skip interference varies because of the changing nature of ionospheric layers, signals over 14 Mc tend to skip more often during the day than at night and also more often during the winter than the summer.

Intermodulation Interference

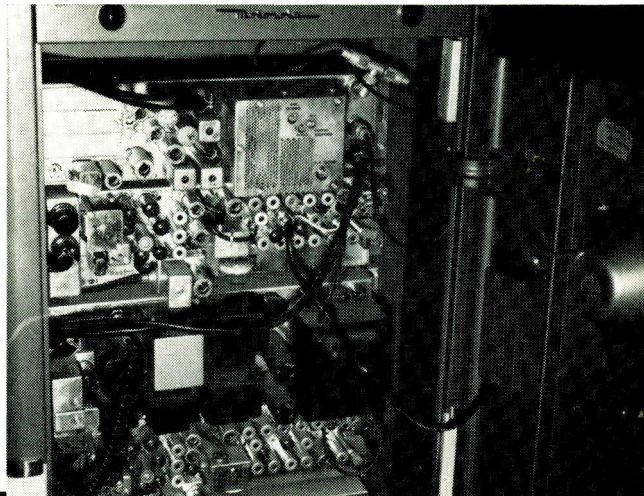
To understand RF intermodulation, it is necessary to briefly review the mechanism called mixing. Combining two signals in a nonlinear circuit (mixing) will produce, at the output, the two original signals, a sum signal and a difference signal plus harmonics of the original signals plus intermodulation products of the harmonics. The non-linear characteristics of the mixing circuit can produce additional harmonics of either signal and mix them with original signals to produce other sum and difference signals. The type of non-linearity determines, in part, the number and amplitude of the additional frequencies produced.

In VHF and UHF communications systems, the term intermodulation generally infers the mixing of signals from two or more channels which combine to produce an interference signal on another channel.

The interfering signal amplitude and the degree of interference is determined by many factors. Currently, only a few radio systems in large metropolitan areas have encountered appreciable intermodulation problems and then only in areas of overlapping strong signal coverage from transmitters with closely spaced frequencies. Chances are that the system outside metropolitan or frequency congested areas will have few intermodulation problems in the foreseeable future.

Signal mixing interference generally takes place in corroded metal joints near or on the receiving antenna and in the receiver itself.

'Extender' interference minimizer kit mounted on door of 60 w base station and wired to the receiver.



ENCE PROBLEMS

Corroded or imperfect electrical contacts between members of the receiving antenna or tower (and other similar conditions) can cause strong signals to mix and produce intermodulation products. It is extremely difficult to locate such conditions, thus it is fortunate that the amount of interference from this source is small. Another possible source of intermodulation generation is through high RF energy levels from one transmitter being fed back into the output stage of a second transmitter, the two signals mixing in the output stage to produce the interfering signal.

The most important source of intermodulation products is the receiver RF or mixer section. Although the receiver may be designed to produce uniform performance over an extremely wide range of input signals, it is virtually impossible to expect the RF amplifier to operate at the same point on its characteristic curves for different signal levels. Non-linear distortion, though small, will be present even at the optimum operating point and will increase away from this point. This distortion is capable of producing intermodulation products to some degree, though it may be small.

Desensitization

Closely allied to intermodulation and often associated with it is a type of interference termed "desensitization." Desensitization, however, requires only a single strong signal and produces different results.

A receiver may have adequate

selectivity to reject strong adjacent or alternate channel signals and prevent them from being heard at the speaker. In fact, many communications receivers today have selectivity expressed in terms of 100 db rejection at some point at the edge of or within the adjacent channel. However, this selectivity characteristic does not necessarily correct for desensitization—a type of interference which does not appear at the speaker.

Eliminating Ignition Noise

Two-way radio users can employ one of two available systems to minimize ignition noise.

Various suppressor types can be installed. But a really good job of ignition noise suppression on an engine is sometimes expensive. And this system does not eliminate noise generated in the radio by other cars.

A positive solution to noise suppression problems involves noise blanking *within the vehicle radio*. This is accomplished by a noise blanker, a circuit which detects noise impulses commonly generated by vehicular ignition systems. When a noise pulse is detected, the device generates a "blanking pulse" which quiets the receiver while the noise appears in the signal. The most efficient noise suppression is obtained when blanking is done at a point where the noise pulses are narrowest. Hence, it is advantageous to work on the noise near the antenna input.

A noise blanking circuit called "Extender" operates entirely in the receiver's RF stages. Incoming en-

ergy is tapped immediately after the antenna and amplified in the circuit, which is, in effect, a seven stage AM receiver. Noise pulses are detected and amplified into dc control pulses which are fed to the second RF stage of the regular receiver—gating out the noise and passing "clean" signals. A delay line between the 1st and 2nd RF stages of the regular receiver retards the signal through these stages establishing the timing so that the noise pulse and the blanking pulse reach the 2nd RF stage at the same instant.

The built-in transistorized circuit generates a blanking pulse approximately 5 μ sec wide. It has a continuous capacity of 40,000 pps and can handle noise-burst components repeating at 150,000 per sec.

Of course, there is another way to eliminate interference: operate on UHF frequencies. For example, the strength of ignition impulse interference decreases as the noise frequency approaches 450 Mc. Absence of UHF-band noise compares favorably with 25-50 Mc VHF systems where interference can reduce usable range up to 10 percent. Since this 10 percent loss in range is at system extremities, this is equivalent to a 19 percent loss in coverage area.

Since UHF signals have some light-wave characteristics, they tend to travel in straight lines and bounce off solid objects. UHF signals actually bounce off buildings and into tunnels and underpasses. In metropolitan areas, where UHF signals rebound throughout man-made canyons of tall buildings, usable com-

INTERFERENCE PROBLEMS *Continued*

munications are established in many locations which might be completely dead to lower frequency VHF band signals.

Skip interference cannot be eliminated in low frequency systems but it can be minimized too by operating on UHF frequencies.

Solving Intermodulation Problems

RF stage selectivity determines, in part, the amount of intermodulation either in the RF stages or the first mixer. By increasing the rejection presented to off-channel signals, the undesired signal strength available for intermodulation mixing is reduced. There are, however, limitations involved in this approach. Adding selectivity means adding tuned circuits ahead of the RF amplifiers which, in turn, means added circuit losses. A high degree of RF pre-selectivity results in relatively high losses and consequent low relative sensitivity of the receiver. To maintain the maximum operating range of a mobile radio system maximum sensitivity must also be maintained. Hence, the number of tuned circuits in the RF stages is a compromise between maximum range and maximum intermodulation protection. Filters can be used to reject undesired signals before they reach the final IF amplifiers and produce intermodulation.

Where intermodulation interference has become noticeable in system operation, tuned cavities can

be inserted between the base station receiver and the antenna for additional pre-selectivity. Available in several models to cover the conventional FM communications bands, cavities are manufactured in several versions. By using different input and output couplings loops, cavity selectivity can be chosen to meet system requirements. Insertion loss of the various versions is from 0.5 to 3 db depending on the degree of RF selectivity required.

The most effective method of countering intermodulation problems before they can occur is by judiciously selecting the system operating frequencies and antenna locations. As an example, one station alone producing a strong signal cannot cause intermodulation interference on another channel. However, if a second station is installed in the same area and produces a strong signal, the combined signals can produce intermodulation interference if the frequencies are such that a product will be produced on the desired channel. Locating a receiving antenna where the signal from another transmitter will exceed the receiver intermodulation threshold merits careful scrutiny.

Pre-planning is always better than late corrective measures. The investigation of strong signal areas of other transmitters should include not only those on the same services and on adjacent frequencies but all transmitters in the area, including particularly high powered AM, FM

and TV broadcast stations. Broadcast stations pose a problem because they operate continuously while communications stations normally operate intermittently.

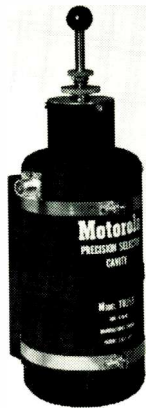
Proper frequency choice, proper geographical location, and good radio equipment selection, can reduce the possibility of intermodulation problems.

Approach to Desensitization

From a theoretical standpoint, desensitization could virtually be eliminated by placing all receiver selectivity ahead of amplification. All undesired signals would then be reduced to negligible amounts before encountering non-linearities of amplifiers, mixers and detectors. However, from a practical standpoint, the answer is not this simple.

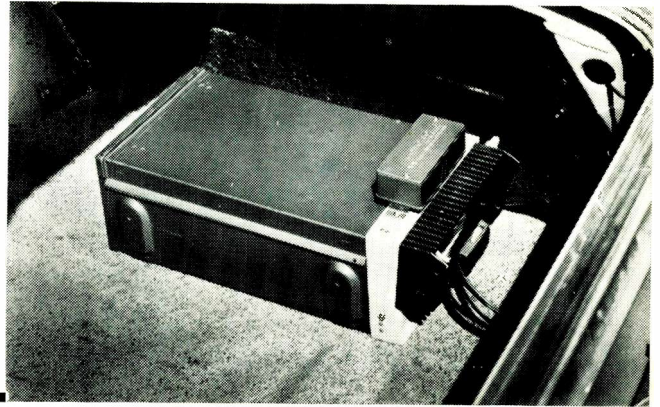
Each tuned circuit, even a high-Q tuned circuit, has finite loss. The sum of these losses, if all selectivity preceded amplification, would be great enough to reduce receiver sensitivity and s/n ratio to an unacceptable level. The large volume required for sufficient high-Q RF tuned circuits and their cost are also unacceptable. Hence, a compromise must be reached.

Optimum rejection of undesired signals must be provided in the RF stage. Amplification in the RF and high frequency IF stages must be maintained at a level sufficient to provide adequate sensitivity and signal-to-noise ratios but yet protect against desensitization and IM.



Tuned cavity for increasing pre-selectivity of base station receivers to aid in solving intermodulation interference problems.

Kit mounted on tube type two-way auto radio to minimize impulse interference in reception.



A receiver with all of its selectivity before the RF amplifier section is not now practical. Hence there is a possibility of strong undesired signals reaching the RF and IF amplifier stages and mixers, even in high quality receivers. This means that these signals can produce effects up to the stages where the major portion of the selectivity is realized.

Any electron tube amplifier subjected to excessive grid drive will draw grid current and undergo a shift in operating point which reduces gm. Depending on the circuit used, this grid current will produce a grid self-bias voltage. When a high bias voltage exists, it takes a correspondingly larger signal voltage to overcome the bias voltage before the tube can act as an amplifier.

Because a strong interfering signal cannot be wholly eliminated from the RF stages or even the high frequency IF stages, this signal can produce grid bias voltages which require stronger-than-normal desired signals to overcome the bias. This reduces the effective receiver sensitivity to the desired signal.

The effect is principally noted in the second mixer stage. When the desensitization threshold is exceeded by a strong undesired signal second-mixer gain is reduced to a degree dependent on the signal strength because of the signal amplification prior to the second mixer. As the undesired signal level becomes extreme, the first mixer is also affected.

Desensitization presents no problems where antenna sites are plentiful. Even in congested areas, there is no problem if power levels are not excessive and spacing between various systems antennas is adequate.

On a mountain-top in one of our western states, however, there are 28 separate radio transmitters ranging from 60 w VHF communications transmitters to 50 kw (effective radiated power) TV stations. On one tall building in a city on the eastern seaboard, there are now 21 antennas including several high powered TV stations. It is extremely difficult at both locations to find additional transmitter frequencies which will not produce spurious and harmonic interference, intermodulation interference and desensitization problems.

It is obvious that 250 w radiated from a transmitting antenna to a receiving antenna only a few feet away will have some effects even if the frequencies are widely separated. This relationship between transmitter power and receiver sensitivity represents a ratio of approximately 162 db. The undesired signal can enter the receiver through a number of channels: through the antenna lead-in, through the power input circuits and through the receiver cabinet and chassis.

The first principle to follow in avoiding desensitization, after choosing quality radio equipment, is choice of antenna location. Avoid

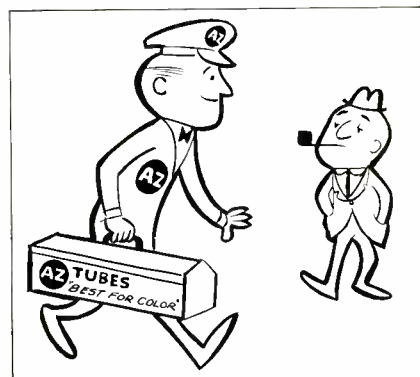
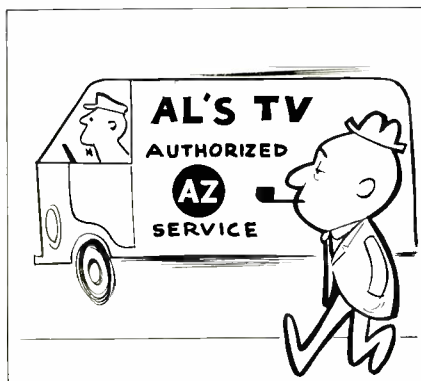
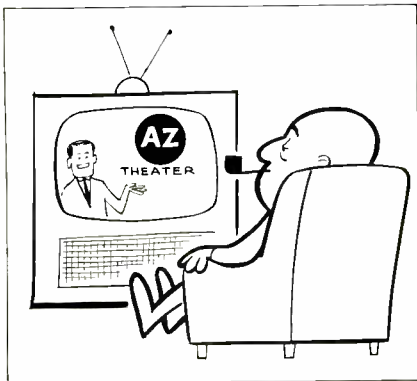
a receiving antenna location which receives undesired signals at levels above the desensitization threshold. As a rule of thumb, if the undesired signal at the receiver input terminal is 60 db or more above the desired signal sensitivity level, the possibility of greater spacing between antennas should be investigated. Although greater signals can be tolerated with little or no effect in a quality receiver, particularly at frequencies far from the desired frequency, the safety margin for adequate protection under unusually trying and adverse conditions is decreased.

Where an alternate location is an impossibility, additional selectivity can be placed in front of the receiver RF stages. A tuned cavity with only 0.5 to 3 db insertion loss can decrease the amount of desensitization by a considerably greater amount. In extreme cases, several cavities in series can be used.

A unique desensitization problem is encountered in some radio repeater systems. When a very weak signal (just sufficient to open squelch) is received, the receiver turns the transmitter on. However, if desensitization effects are present, the transmitter may desensitize the receiver so that the received signal is not heard, thus turning off the transmitter and initiating a "cycling function." ■

Information credit: Communications Division, Motorola, Inc.

TAKE ADVANTAGE OF MANUFACT-



■ TV manufacturers are helping TV sales and service businesses sell more sets, lower their operating costs, increase their service speed and make more profit. And it's a short-sighted shop owner who doesn't take advantage of all these assists.

One company plans a massive campaign for color TV during the rest of the year costing \$5.4 million and including 11 pages of color ads in national magazines, newspaper ads in 165 areas, and a mailing of 5 million copies of a 24-page consumer booklet. But how many of these ads have your name on them? How many tell the customer that, once he's sold, he should buy those excellent products in your store?

Of course, you can't get your name on national advertising, but you can—and should—take advantage of it in your area. Advertising cuts or mats are available from TV manufacturers or their distributors either free or at cost (usually only a few dollars). Obtain these mats and then have your local newspaper include your name and/or message

with the ad. Your potential customers then will see, in their local media, the same ad that they have been exposed to through nationwide advertising, but this time it will have your name on it! Thus, with just an inexpensive local ad, you put the full weight of international, multi-million dollar advertising behind your business.

Selling, however, is only one part of your business; the other is repair. As with any business, in order to make a profit your revenue must exceed your expenses. But your expenses are relatively fixed; that is, regardless of how much business you have (within limits, of course) your expenses for wages, rent, overhead, depreciation, property taxes, etc. remain fixed. About the only variable in your business is the speed with which you can service the sets brought to you for repair. Thus, the faster you can repair these sets, the more profit you will make.

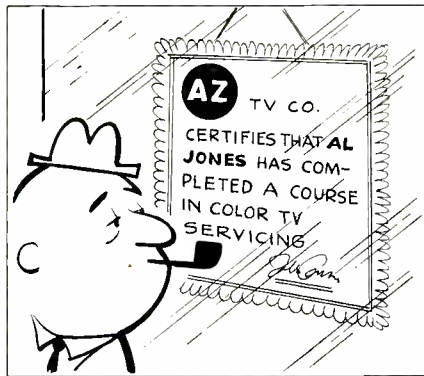
There are, of course, a host of service aids on the market which will help speed up servicing. But

they all cost money. The technician all too often overlooks assistance that is free. For example, many TV manufacturers will furnish schematics and service information free. Others hold regular seminars, clinics or training programs that you can attend free. Some companies and distributor shops welcome calls for free assistance on "dogs." To make sure that the customer's repair job is not held up for lack of a schematic, one company now tucks a schematic in the back of each new set it sells.

Manufacturers are not going to this expense and trouble out of philanthropy; rather, they want their customers to be happy, and they know that the sooner a customer gets his set back from the repair shop, the happier he will be. You benefit simply because more rapid repair means more profit.

To find out what service assistance you can get, merely drop a line to the appropriate manufacturer and let him know what you need. Chances are that you will get what you need, in many cases, free! ■

URERS' AIDS



Many manufacturer's aids are free—and they can make more money for you

Shining Up to New Customers

■ A TV shop owner in Skokie Valley is using a unique, personalized advertising medium to attract new customers. The medium used is an electric shoe polisher.



Fig. 2—Armin Massin and William Plath, owners of Skokie Valley Television, both feel that their shoe polisher performs a valuable promotion service.

Attached to the vertical control post of the polisher is a billboard approximately a foot square which invites prospective customers to "Hav-A-Shine" as a free service provided by the advertiser. As the prospect uses the polisher, he is face-to-face with the advertiser's message, not just for a second, but for a minute or longer, while he completes his shine.

Armin Massin and William Plath, who own Skokie Valley Television, 7935 N. Lincoln Ave. in Skokie, Ill. have found the polisher a perfect advertising medium for their TV sales and service organization. They have been in operation in Skokie for 12 years.

Both men believe strongly that advertising promotion is the foundation of a successful business operation. They advertise regularly in the

Continued on page 78

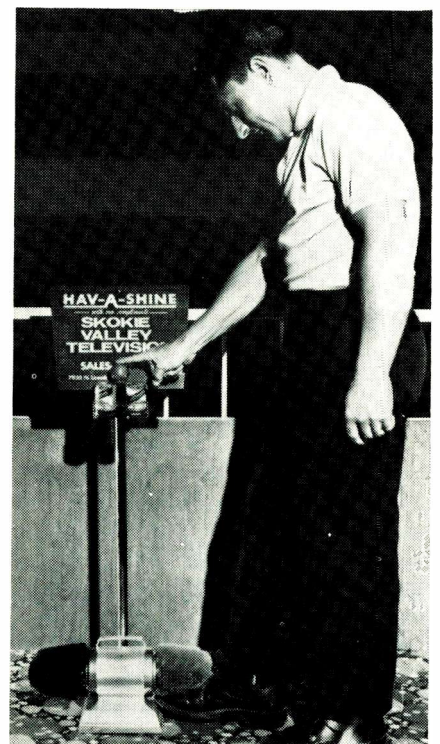


Fig. 1—The Skokie Valley Television store has a Demel shoe polisher installed at the Oakton Bowl bowling alley, where customers regularly use and enjoy the unit.

Your service policies can make or break you

A CRITICAL LOOK AT

by Phil Hiner

■ How many of your customers are dissatisfied with your home servicing efforts but don't call back to tell you so, becoming instead disgruntled ex-customers who next time go elsewhere for service?

A set brought back to the shop for repair may operate properly after you've "fixed" it, only to develop a different trouble after it's been left on for a while. Whether the second problem is a new trouble or just part of the one you thought you fixed is not as important as the fact that *you* see it but the customer doesn't.

You don't have that second chance with the sets you repair in the customer's home — you don't have the time to wait around for the set to act up again.

I recall an interesting case with an early 17-in. console. The complaint was unstable vertical deflection. A 6SN7, replaced in the home, appeared to do the job. The owner was a neighbor of mine, and by chance I ran into him the following evening. He had not intended to call me back on the set but our conversation revealed that its performance was still marginal. On the second visit I replaced a second 6SN7 and made some adjustments. Two days later I took the set to my shop. Vertical deflection was very nervous and I had to do a rather thorough circuit rebuilding before the gunslingers and medics once again had steady hands. But had this man not been a neighbor, I would have had an unhappy customer and would have been completely unaware of it!

Deciding when to service in the home, where a comprehensive performance check is not possible, and when to service in the shop presents a problem to all technicians.



Fig. 1—This technician has all the service aids he can profitably use on most home service calls: a VTVM, a tube and tool caddy and a drop cloth.

One factory service co. completes approximately 90 percent of its work in the home, and several recent magazine articles have elaborated on the merits of home television servicing. But servicing policies must always be considered from two interrelated standpoints: customer relations and shop profit. The amount of business you have depends significantly on customer relations, or in simple terms, on what the customer thinks of you. But you also must make a profit from this business. Profit depends on the relationship between the money you receive for a job and your costs of doing it. Both can be adversely affected by over-emphasis on living-room servicing.

Consider the quality of work.

Home servicing is not expected to be as thorough as shop servicing; we do it as a matter of expediency for both the customer and ourselves. It cannot be as thorough as shop servicing because: (1) no shop can afford to send its best technicians out on the road, where they waste 50 percent of their time behind a steering wheel; (2) work done in the home is often slow and inadequate for lack of the proper equipment, since a technician cannot always anticipate his needs; and (3) the set does not receive an adequate post-service checkout.

After repair, every set should receive an operating checkout of from one to two hours. Since this obviously cannot be done in the home, many of the minor ills that

HOME TV SERVICING



Fig. 2—Imagine lugging a load of equipment like this, plus the workbench, from house to house.

are annoying but not serious enough to recall a serviceman go unfixed, and the customer is unhappy with your service.

As to how you impress your customer on home service calls, let's face it; it's asking a lot of a customer to expect him to be impressed with a technician's professional status when the man spreads instruments and tools around the set like toys around a Christmas tree and then further clutters up the room with parts from the TV set!

One shop owner who strongly dislikes living-room servicing but knows that it is sometimes necessary fastens an 8 x 10 color print of his elaborate test bench on the inside lid of each outside serviceman's tool and parts kit. Custom-

ers usually see the picture as soon as the kit is opened, giving the outside man the opportunity to explain how the items of test equipment aid in improving the performance of TV sets. He says that the customer is always impressed by this display of electronic test equipment.

From strictly a profit standpoint, a number of considerations make it seem advantageous for the shop owner to consider a policy of predominately shop servicing. Heading the list is the economical use of the trained technician. Because he is at his test bench 100 percent of the time (less coffee breaks), he can service two to three times more sets per day than he could if he made home calls.

Perhaps of equal importance,

profit-wise, is the different service philosophy under shop conditions as opposed to that for home servicing. In the home, only the components that bring the sets back to life, and sometimes a few additional tubes, are replaced, even though the set may be afflicted with a half dozen minor, yet annoying, defects that the technician does not detect because he can't stick around long enough to find them.

In the shop, however, the philosophy is entirely different. First, all tubes in the set are checked. Next, the trouble is located and repaired. Finally, the set is given a careful visual inspection in order to disclose any incipient problems and then is left on for a few hours to see if the "fix" is permanent and to disclose any other troubles that were not immediately apparent.

The result of such a philosophy is not merely that the customer gets a better job, but that you make more money because you replace more parts and do more work. And after all, what better reason is there for being in business!

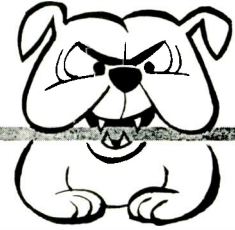
Another factor that favors shop servicing is the guarantee. Without giving each set a thorough inspection and replacing components that are in marginal condition, your guarantee callbacks may wipe out your profits on those sets.

The RCA Service Co. has made an interesting survey of its one-year full coverage television contracts. The results of this survey, according to Mr. L. G. Borgeson, vice-president, indicate the following:

Reason for Failure	Percent of Material Costs
Receiving Tubes	45
Kinescopes	35
Component Parts	20

The survey also reveals that receiving tube, kinescope and component

Continued on page 59



Difficult Service Jobs Described by Readers

Open Hue Coil

We recently had a tough dog to tame when a Zenith Color TV set chassis 29JC20 came our way. The complaint was intermittent loss of color.

The first call we made there was no color—all tubes in color section were replaced. This did not help, so the set was brought into the shop. In the shop, the set had perfect color for three days and was returned to the owner. For the next two weeks, the color was fine, but then the color disappeared again. When we went out this time, we took a 3.58 Mc crystal and when this didn't work, we adjusted the color osc coil and were happy to see the color come back.

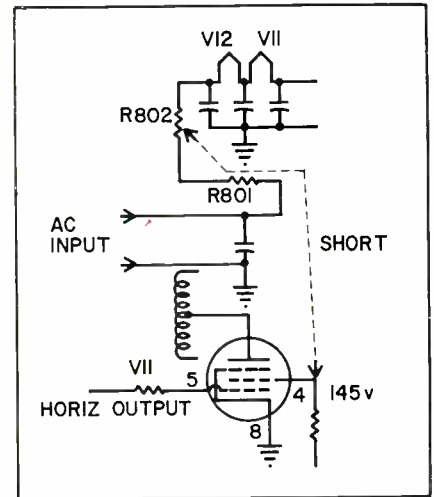
About three days later another call came in, same complaint: no color. We tried adjusting the coil this time but it didn't restore the color. The set was once again brought into the shop. It played fine, but before it was taken back, it acted up enough to take a few scope readings at the plate of the color burst amp, we had the correct waveform there, but it was missing at the center tap of the Hue

Coil. The capacitor directly to ground off this part was checked for a short. It was OK. A continuity check showed the center tap was open.—*Richard Wesley Basell, Yazoo City, Miss.*

Filament Modulates Horizontal

I recently repaired a TS542 Motorola TV. The picture was weak, and had a dark bar which was drifting from bottom to top, starting and stopping at will, and changing its size. At times it blotted out more than half the picture.

The vertical oscillator and vertical output tubes were replaced but the trouble remained. I suspected bad filtering and removed the chassis. All suspected capacitors checked good so I applied ac to the set for another bearing on the trouble. To my surprise, I found the set was functioning normally. I then assumed something was loose and that I had corrected it when removing the chassis. I replaced the chassis and when I turned the set on, the trouble reappeared. Once again I

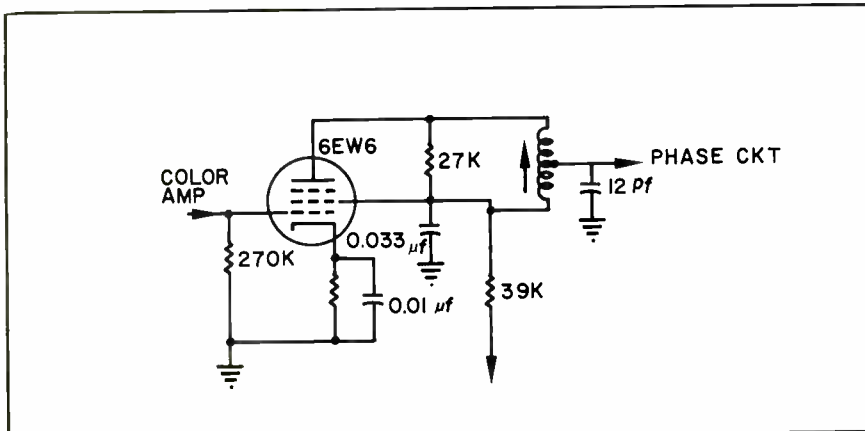


R802 shorted to lug 4 of HOT.

had to remove the chassis.

A further investigation at this period showed that the filament dropping resistor, R802, was very close to the horizontal output tube base and the least movement was causing it to be shorted to the tube's screen grid.

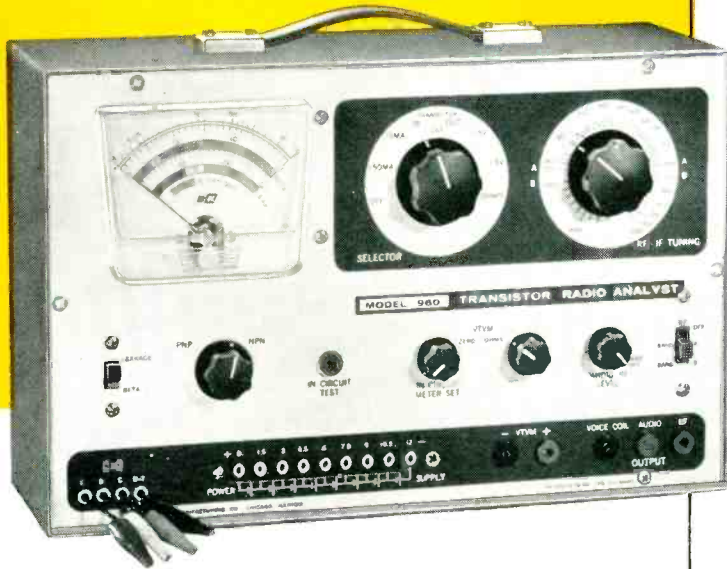
We replaced the resistor because it had been damaged through overheating. At the same time, the new resistor was placed and routed to prevent future trouble.—*Joseph A. Hughes, Atco, N. J.*



Intermittent open center tap connection on Zenith color TV hue coil caused color programs to disappear.

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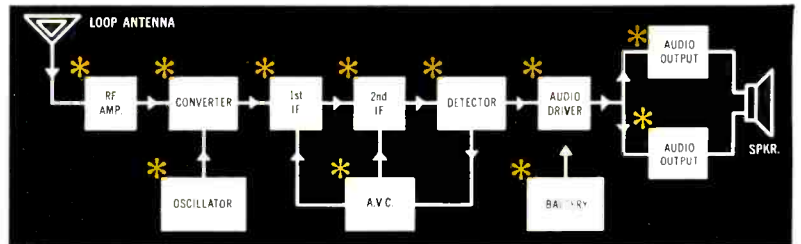
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SHOP HINTS

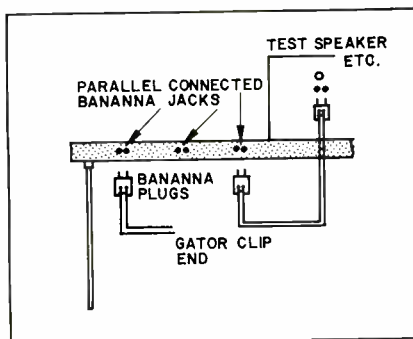
TIPS FOR HOME AND BENCH SERVICE

GE LX Drift

To cure horizontal drift in GE LX chassis we put the 910 pf capacitor in oscillator circuit underneath the pc board. Its present location is too close to the horizontal oscillator tube and when hot may cause the frequency to drift.—*Wes Valentino, Honolulu, Hawaii.*

Patch Jacks

I built parallel connected jacks into the front of my bench to allow patching of speakers, auto and TV



antennas, etc. from various points on the bench to my test speaker and antennas. This eliminates dropped cables over equipment and customers' sets. — *Anthony J. Fusco, Key West, Fla.*

Brushes Clean Contacts

I find electric shaver cleaning brushes are good to clean tuner contacts. Just dip one in contact cleaner and rub over the contacts. The brushes can be purchased 3 for \$.25 and last quite some time.— *D. Bernard Fritz, Reading, Pa.*

Emergency Plug

I recently needed a larger-than-phone-tip plug (like the ones on a tuner lead to antenna) for testing a GE portable.

I cut an empty metal ball point pen refill with a fine tooth hack saw to appropriate length; placed it upright in a nail hole in a block of wood and filled with solder. As

the solder was melted, the end of a wire was inserted. After cooling, I rounded off the bottom end with a soldering iron and sand paper. It was a perfect emergency plug.— *G. V. Wellman, Washington, D. C.*

Removing Solder

The fastest and easiest way I've found to remove components from a printed circuit is to heat each connection separately until the solder flows and blow it off the board with a blast of air from a compressor. This is especially good on PC boards with foil on both sides. Any solder which may be blown to nearby circuits will be cold and will not stick.—*Norris B. Cozart, West Plains, Mo.*

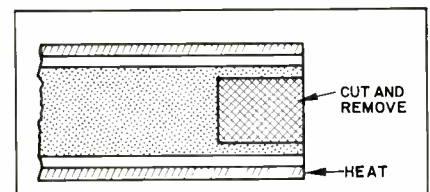
UHF 'Snivet' Suppression

Most Barkausen, or snivets, prevalent on VHF, result from sudden changes in horizontal output tube plate current. The problem has been eliminated in recent times by closer tube tolerance and improved circuit design. But radiations in the UHF frequency spectrum have a different origin, and must be suppressed by other methods. According to one theory, UHF oscillations are generated when space-charge electrons at the plate are attracted by the screen grid when the plate voltage is negative in respect to the grid. This phenomenon occurs during the period of greatest current flow and the oscillations show up as snivets on the right third of the CRT face. The ground-potential suppressor grid has no control over these oscillations. These oscillations can be eliminated or moved out of the TV frequency spectrum by operating the suppressor grid at a positive voltage. RCA UHF chassis have the suppressor connected to the 270 v bus through a dropping resistor and to ground through an RC decoupler. Voltage

value at the HOT pin 8 is about 40 v. In VHF models only, the suppressor grid is grounded.— *RCA Sales Corp., Indianapolis, Indiana.*

Stripping Aid

If you have trouble stripping twin lead, here is a solution: Cut the web of the lead-in to free the



two wires. Then just heat the two wires (insulation too) and quickly scrape the insulation off. Don't touch the hot insulation with your fingers. A soldering iron can be used to heat the lead in the shop or a lighter where a soldering iron is not handy.—*Harold Haberman, San Diego, Calif.*

HV Transplant

I connect the HV from a good chassis to the 2nd anode terminal of set under test; it shows up Keystone yokes, oscillator troubles, etc. very well. Be careful of ac polarity on non-transformer chassis.—*Allan W. Dodge, Roslyn Hts., N. Y.*

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.

... HOME TV SERVICING

Continued from page 55

part replacements comprise only about one-half the company's total service calls. The other half consists of calls for minor adjustments, touch-up, additional customer instruction, counselling with the customer, cleaning or relocating the receiver, correcting maladjustments by other members of the household, interference correction, and reorientation and/or minor repair of antennas.

Since television repair contracts for the most part cover new sets, the survey results suggest that most *new* sets can and should be serviced in the customer's home. These sets have not been operating long enough to experience the operational fatigue that causes component parts to become marginal and, therefore, do not require the thorough shakedown that is part of shop servicing.

The same argument does not apply to older sets, however, because many of these sets need other replacements, adjustments or the isolation of intermittents, none of which may show up while the serviceman is in the home.

What then is a profitable procedure for servicing television? How do we draw a clean line between home and shop servicing. You can't, but, as already indicated, it seems that certain categories of TV sets can be serviced in the home: (1) sets that are less than one year old and require only a tube, (2) sets that have recently been in the shop, (3) sets that require only picture centering or adjusting, and (4) calls of a miscellaneous nature—antenna, interference, instruction, etc. TV sets not included in these categories are probably best serviced on the work bench. ■

NEW BOOKS

PRACTICAL TELEVISION SERVICING. *Revised Edition.* By J. Richard Johnson. Published by Holt, Rinehart and Winston, Inc. 438 pages, hard cover. \$7.95.

This is an updated version of a

book published first in 1949—when TV mass-viewing was in its infancy. The first 10 chapters tell how TV works. Antenna and receiver installations are covered in Chapter 11. Trouble symptoms and receiver faults of each particular section of a TV set are outlined in Chapter 12. Chapter 13 covers troubleshooting. Wiring and Repair Techniques follow in Chapter 14. A series of case histories are outlined in Chapter 15. Chapter 16 is devoted to receiver alignment, and the final chapter concentrates on color TV. Review

questions which appear at each chapter ending are convenient for self-study. The book is adequately illustrated with photos, drawings, schematics and charts. Although essentially a text for the student, it will prove useful in the library of most professional TV-repair technicians.

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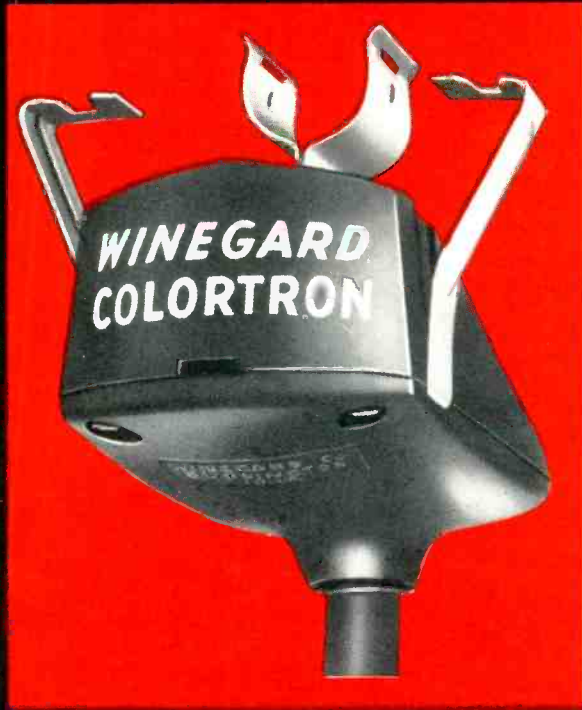
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put, too—up to 1,200,000 microvolts.

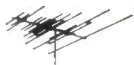
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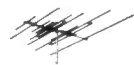
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GREETING CARDS 200

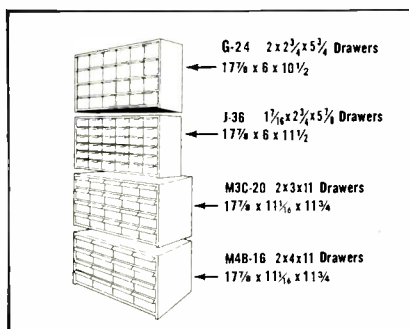
A deluxe assortment of greeting cards is being given free to television service dealers with the purchase of



TV brighteners. Birthday cards, get-well cards and anniversary cards, as well as cards for other occasions, are included in this special offer. Twenty-four cards along with envelopes are handsomely boxed and packaged with the brighteners. Perma-Power.

STORAGE CABINETS 201

Modular cabinets with drawers of various sizes have been developed for standardizing small parts storage. Modular storage combinations can be made in any available space, with a custom built-in look. They stand, stack, hang on the wall or fit existing shelving. They are complete, expandable storage centers. The welded steel frames with "See-



Thru" heavy molded drawers are standard "building blocks." Drawers of heavy wall clear styrene come in a variety of sizes. They can be divided into compartments with crosswise and lengthwise dividers. Stop-tabs prevent spilling. Self-stick labels for content identification are included. Cabinets are finished in baked-on silver gray hammertone and are available in units from 16 to 36 drawers. Akro-Mils, Inc.

COUNTER DISPLAY 202

A counter display for the point-of-sale purchase of popular color-coded phono plugs is announced. The D-70 display measures 11 x 16 in. and features 24 "see-through" plastic bags, each containing four color-coded phono plugs in various



color combinations of red, black and white. Switchcraft, Inc.

TV ANALYST 203

The model 1074 color television analyst reportedly provides a complete TV signal-generating source, with point-to-point signal injection. It supplies complete RF and IF signals, with pattern video and tone audio. Video signals are switch-selected.

The instrument provides an FM-modulated 4.5-Mc sound channel, with built-in 900-cps tone generator. The analyst also provides composite synchronizing signals and separate vertical and horizontal

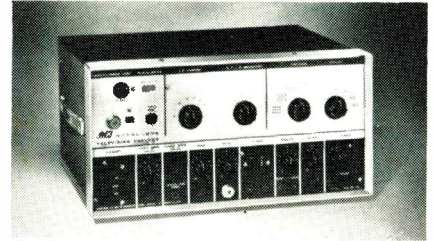
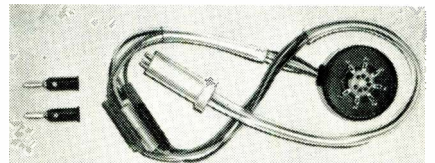


plate and grid driving signals to check the complete output circuit and interrelated components. The unit also provides dot pattern, crosshatch, vertical lines, horizontal lines, burst signal and individual colors (green, blue, B-Y, R-Y red, I and Q) one at a time on the TV set—all crystal controlled. Color phase angles are maintained in accordance with NTSC specifications. \$249.95 net. B & K Manufacturing Co.

HARNESS TEST ADAPTER 204

Three models of the Universal Harness Testing Adapter are available for testing current, voltage, resistance and video by extending all test points 24 in. from the chassis. The adapter reportedly eliminates unsoldering and resoldering connections, and the color-coded connections simplify current and in-circuit testing. Two combination phone tip-banana plug adapters are said to permit its use with all meters.



The test socket has extended test tabs with phosphor bronze contacts and heavy-duty molded phenolic base with easy-to-read socket connections. The current measurement connections are fully insulated, molded 0.080-in. phone tip plugs. The insulated plug fits either shielded or unshielded tube sockets. Three models are available for 7-, 8- and 9-pin sockets. \$14.95 net each. Pomona Electronics Co., Inc.



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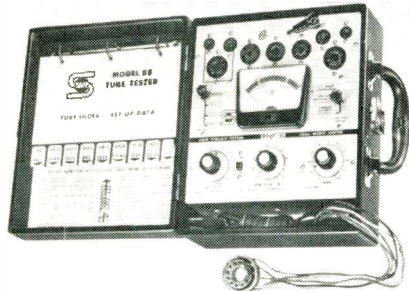
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NEW PRODUCTS

TUBE TESTER

205

In addition to testing modern TV, radio, industrial and foreign tube types, the Model 88 tester also tests

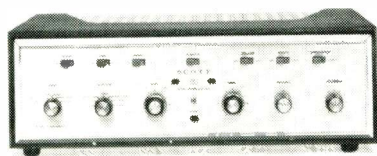


picture tubes. A merit test for cathode ray tubes is performed at half the rated cathode current. There reportedly is no possibility of damage if filament voltage is correct. A grid circuit test checks picture tubes for leakage, gas, shorts and grid emission. Over 400 types of cathode ray tubes, including 110-degree-deflection models, can be tested by use of the universal socket adapter. The unit is designed to test all receiving tubes including the new novars, nuvistors, 10-pin types, compactrons and magnovals. Its meter indicator reportedly reads grid emission and all common leakage and short faults in one reading step. Filament continuity and open elements are also indicated as well as cathode emission on a special low impedance circuit. A detachable cover contains indexed setup cards, pin straighteners and operating instructions. Seco.

STEREO AMPLIFIER

206

The Model 299D stereo amplifier, the latest version of the 299 series, incorporates a completely redesigned panel, knobs and lights, and features switched front panel headphone output for private listening without use of loudspeakers, powered center channel output and an 80-w output stage. Additional features include nonmagnetic electro-

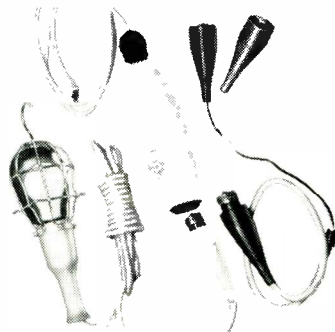


ytic aluminum chassis, level balancing system, large output transformers, individual tone controls for each channel, separate power switch and subsonic cutoff filter. \$229.95 net (east of the Rockies). H. H. Scott, Inc.

SERVICE LIGHT

207

A low-voltage service light doubles as a battery charger. The light operates on 12-v power, and an optional battery charge attachment is available. The service light operates from a 117-v line, and the transformer, which reportedly will not burn out if shorted, is potted and sealed into a plastic housing with a recessed pronged plug in the input side and a screw plug receptacle in the output side. The cords are 16-2 SJO yellow (power source

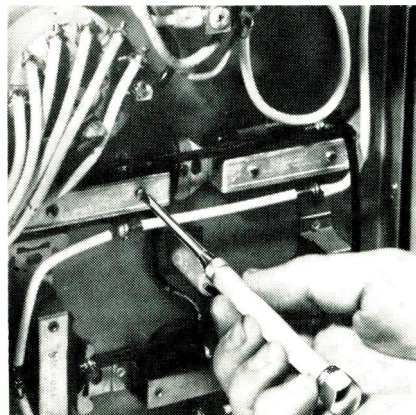


to transformer, 6 ft; service light and battery attachment cords, 25 ft). The battery clips are covered with vinyl plastic insulators. McGill Mfg. Co.

INSULATED SCREWDRIVER

208

A light-weight "electrician's" insulated screwdriver recently intro-



duced has a shock-resistant nylon handle, hex-head and a solid locking chuck nose which permits the blade to be removed and stored in the hollow handle. Moody Machine Products Co.

BATTERY DISPLAY BACK

209

A clear polystyrene slide rack displayer that lets customers see and buy "Eveready" No. 216 and No.



1015 transistor radio batteries has been announced. The rack gravity-feeds 24 No. 216 batteries and 48 No. 1015 batteries in four-packs. The unit is offered to retailers at no charge. Union Carbide, Consumer Products Div.

CERAMIC FILTERS

210

Five narrow-band ceramic ladder filters are reported to exhibit excellent selectivity-to-size relationships. The filters are standard models and have a 455-kc center frequency with the following 6-db

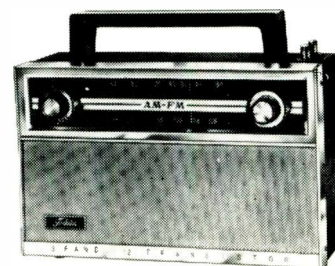


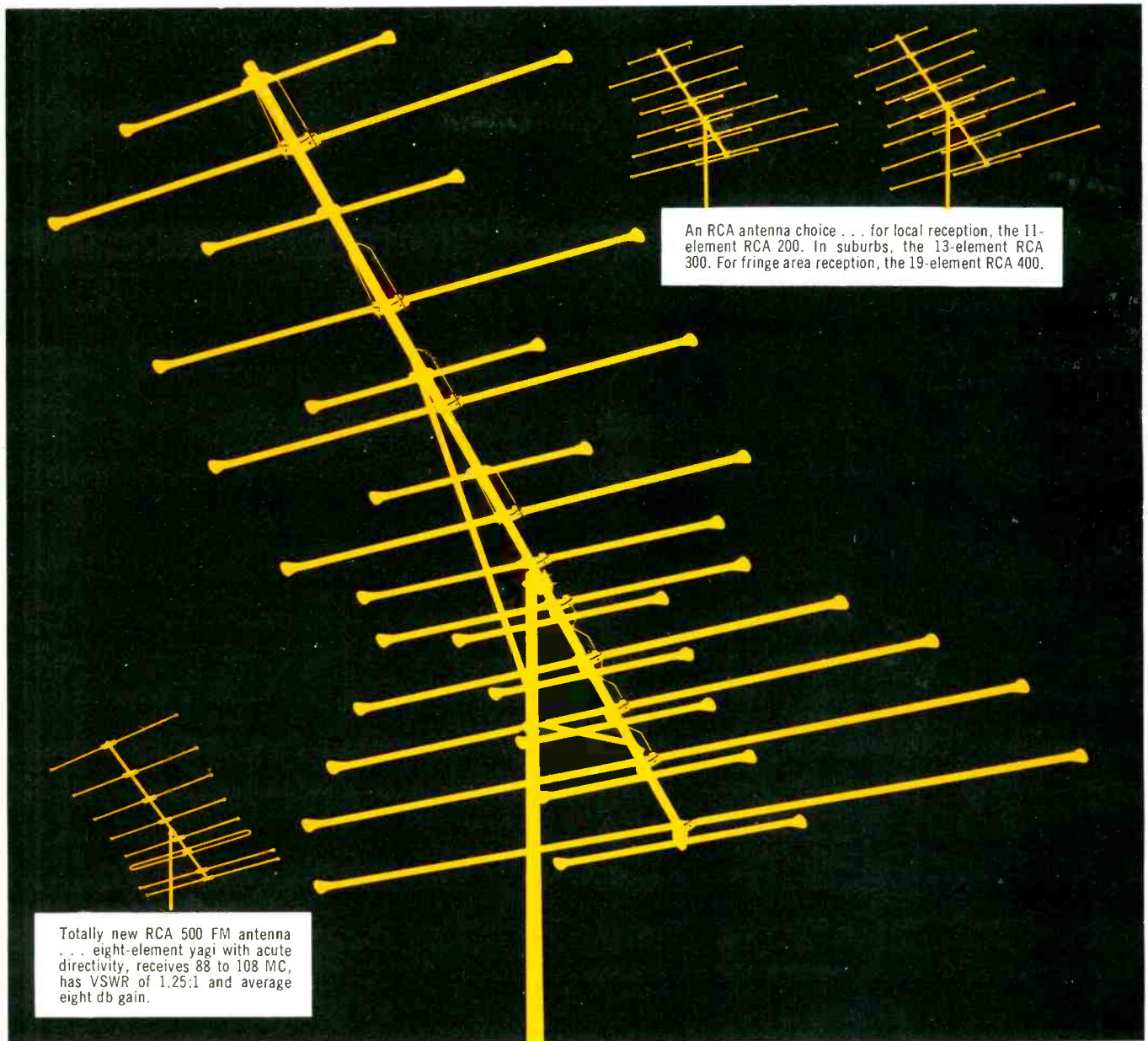
bandwidths: 2 kc, 4 kc, 6 kc and 10 kc. The new models have a 60 db/6 db shape factor of between 0.6:1 and 2.5:1, depending on bandwidth. The filters are said to provide 80 db stop-band rejection in a volume of slightly more than 0.1 cu in. Clevite Corp.

AM/FM PORTABLES

211

A 12-transistor portable radio covers the AM and FM bands as





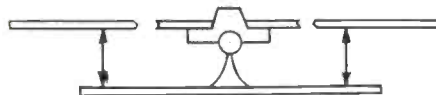
An RCA antenna choice . . . for local reception, the 11-element RCA 200. In suburbs, the 13-element RCA 300. For fringe area reception, the 19-element RCA 400.

Totally new RCA 500 FM antenna . . . eight-element yagi with acute directivity, receives 88 to 108 MC, has VSWR of 1.25:1 and average eight db gain.

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

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

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



CAPACITIVELY COUPLED

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

In addition to phasing low and high band directors for best high band performance, RCA and only RCA positions high band driven elements *directly below* low band driven elements.

Through capacitance thus existing, RCA antennas feed energy *directly* into the transmission line from high band driven elements. An RCA exclusive!

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

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

RCA PARTS AND ACCESSORIES, CAMDEN, N. J.



THE MOST TRUSTED NAME IN ELECTRONICS

Winegard

Dealer of the month



KEN CRANE'S Magnavox City LAWNDALE, CALIF.

Winegard congratulates this west coast dealer that has grown in 12 years to over \$1 million annual sales...and Figarts Radio Supply Co., its distributor.

From one small store, Ken Crane's Magnavox City has become a west coast giant, with three retail locations in Los Angeles, Inglewood and Lawndale, California. The company's service business, a huge operation in itself, is headed by George Parresol, Service Manager, and employs 20 full time men and a fleet of 6 trucks. Outside calls alone are made at the rate of about 250 a week!

"We are proud to recommend Winegard antennas to our customers because of the outstanding performance of the Winegard antenna to eliminate reflection in the many critical areas we service, their durability and appearance", says Mr. Parresol.

"Winegard advertising really helps sell the customer and the performance keeps them sold."



D3019-11 Kirkwood • Burlington, Iowa

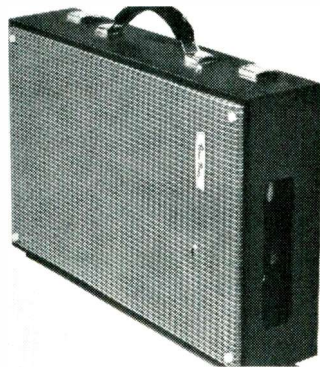
- - - for more details circle 42 on post card

NEW PRODUCTS

well as the 4-1 to 12-1 Mc short-wave band, AFC is provided for the FM band, and the unit has a 4-in. speaker. Complete with earphone and four D-cell batteries, it lists at \$79.95. Toshiba.

PUBLIC ADDRESS SYSTEM 212

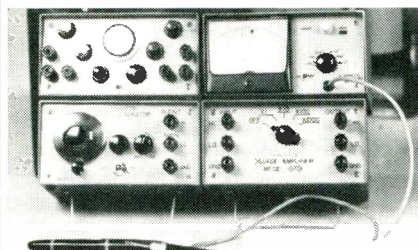
A complete public address system in an attache case, called the Diplomat, weighs 16½ lb and is



powered by 10 flashlight batteries. The unit reportedly is powerful enough to be used for audiences of over 500. The attache case contains an all-transistor 25-w amplifier, a 6 x 9 in. speaker and a dynamic omnidirectional microphone complete with lavalier cord and 10 ft of cable. In addition, 40 ft of cable is supplied to permit placement of the loudspeaker at a distance from the amplifier. The unit has two inputs and two outputs, so that it can be used with additional loudspeakers and auxiliary equipment. Accessory items are also available. \$119.95 list. Ampli-Vox Div., Perma-Power Co.

COMPACT SERVICE KIT 213

The kit consists of four instruments—audio generator, oscilloscope, vacuum tube voltmeter and gauss meter—that fit in an attache case 4½ x 12 x 18 in. The units



weigh 20 lbs. Sample specifications: Audio Generator, frequency range 4 cps to 15 kc; oscilloscope, vertical sensitivity 20 mv/cm with freq response from 20 cps to 5 Mc and sweep rate of 20 cps to 5 Mc; voltmeter input impedance 10 to 200 MΩ, usable dc to 5 Mc. Lunar Engineering Co.

TAPE RECORDER 214

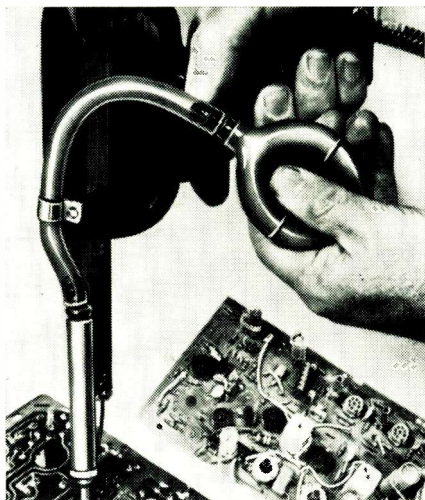
The "Retro-Matic" 220 tape recorder represents the manufacturer's entry into the "super-plus" tape recorder market. The unit is a two-speed, quarter track stereo tape recorder that features two-directional play-back. The capstan is placed between two playback heads so that the tape is pulled over the head in both forward or reverse playback. Automatic reverse playback is controlled by an adjustable, timed silence sensing device. The automatic reverse feature can also be switched to pushbutton-controlled playback. Pushbuttons control all tape motion either on the unit or on a remote



control center that plugs into the front or the rear of the receiver. Viking of Minneapolis.

DESOLDERING UNIT 215

A desoldering unit uses a twin valve vacuum system to draw molten solder from printed circuit boards and other electrical and electronic connections. The unit, called the Solder-Vac, fits all popular soldering guns. The complete unit consists of the tip, replacing the regular soldering gun tip, the stainless steel holding tube and the suction bulb. The unit is clamped to the body of soldering gun. The twin valve system reportedly creates the vacuum necessary to draw the molten solder into the stainless steel holding tube by expelling air from the top of the suction bulb, so that no air is expelled through the tip



to cool the molten solder or spray it over the working area. \$7.95 list. Oneida Electronic Manufacturing Co.

SOLID-STATE VOM 216

An all solid-state dc VOM is designed for precision measurement of voltages in 11 ranges from 10 mv to 1000 v, currents in 11 ranges from 10 μ a to 1 amp, and ohms in 8 ranges from 1 ohm to 10 megohms. Accuracy reportedly is ± 1 percent on voltage and current ranges and ± 3 percent of the ohms ranges. The unit is guaranteed by the manufacturer to perform accurately after such overload abuse as dead shorts across a 1000-v supply on the current and resistance ranges, and 5000-v overloads on any voltage range. It is said to withstand the equivalent of a 4-ft drop onto concrete without impairment of accuracy. Pushbuttons select functions, a rotary switch selects ranges, and only one probe is used for all functions. Voltage and current polarity are automatically switched and indicated with lighted "+" and "-" signs, and the polarity of the probe on "ohms" also is indicated.



NOVEMBER 1963

TELEVISION F. M. RADIO

CROSSWAY TELEVISION - RADIO

SALES - SERVICE

ANBURY ROAD

ILTON, CONN.

Customer's Order No. _____ Date _____ 196 _____

M. Cash

Address _____

SOLD BY CASH C. O. D. CHARGE ON ACCT. MUSE PAID OUT RETD.

QUAN.	DESCRIPTION	PRICE	AMOUNT
2	5U45B		4.20
1	6CD66A		5.75
1	6AF4A		4.-
	Label		5.-

Rec'd by _____ Tax 49

No. 002062 ALL claims and returned goods MUST be accompanied by this bill 1964

Now, put more profit in this

with this!



NEW SONOTONE VALUE LINE

How much of that figure called "total" is profit? Depends on the cost of the tubes. That's why the new Sonotone Value Line puts more profit into that bill: they cost much less! They're top quality, first-line tubes, too. Every one is thoroughly tested to meet Sonotone's rigid quality standards—no more extra callbacks. And Sonotone makes sure you can enjoy these

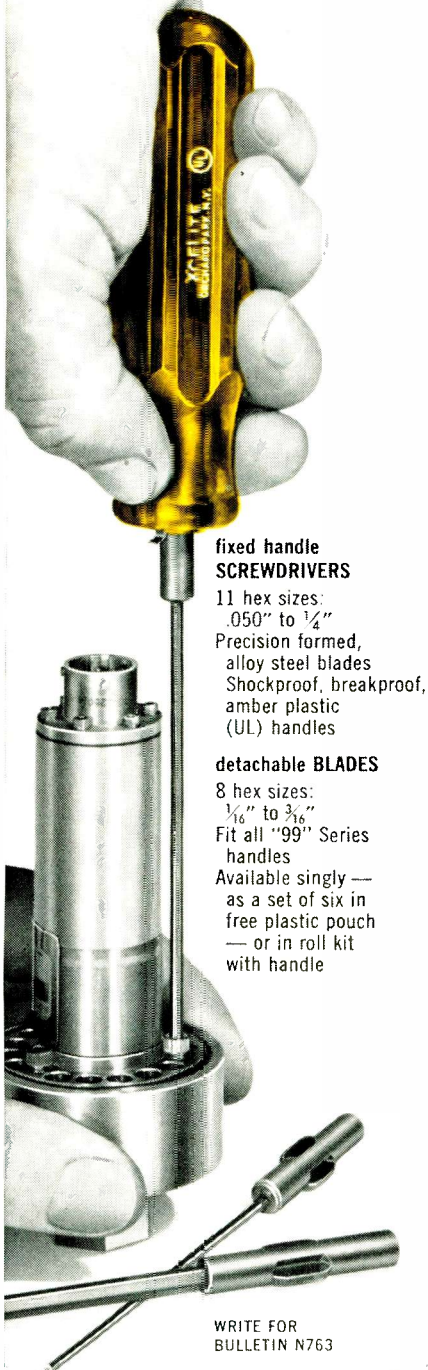
extra profits on all calls. The Value Line includes all the popular home entertainment types—the ones you're most likely to need. So ask your distributor for the Sonotone Value Line. Start making bigger profits tomorrow. Now your distributor has two great Sonotone lines—the new Value Line and the well-regarded Premium Line.

SONOTONE CORPORATION • ELECTRONIC APPLICATIONS DIVISION • ELMSFORD, N. Y.
Cartridges • Speakers • Tape Heads • Microphones • Electron Tubes • Batteries • Hearing Aids • Headphones

... for more details circle 35 on post card

new Allen hex screwdrivers

work faster, easier . . . reach where wrenches won't go



fixed handle SCREWDRIVERS

11 hex sizes:
.050" to 1/4"
Precision formed,
alloy steel blades
Shockproof, breakproof,
amber plastic
(UL) handles

detachable BLADES

8 hex sizes:
1/16" to 3/8"
Fit all "99" Series
handles
Available singly —
as a set of six in
free plastic pouch
— or in roll kit
with handle

WRITE FOR
BULLETIN N763

XCELITE

XCELITE, INC., 14 BANK ST., ORCHARD PARK, N. Y.
Canada: Charles W. Ponton, Ltd., Toronto, Ont.

--- for more details circle 43 on post card

NEW PRODUCTS

Repeatability is reportedly within 0.1 percent upon polarity reversal, and an internal standard is provided for checking amplifier and readout circuits. Keinath Instrument Co.

STEREO AMPLIFIER 217

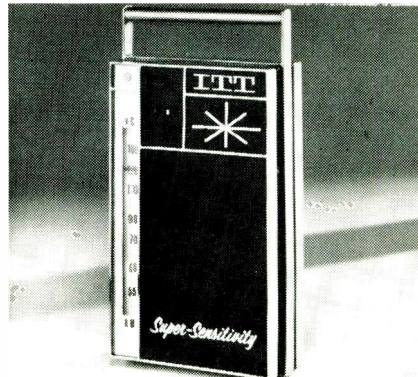
An all-transistor 100-w stereo amplifier uses 19 transistors and 8 diodes. New temperature control



convector keeps power transistors stable. Controls include pushbuttons to select the program source desired, stereo private listening headphone jack, two-position record-monitor switch, two phase switches, five pairs of stereo inputs (two with level controls), power transformer with line-voltage correction taps, circuit breaker and two convenience ac outlets. \$199.95 list, less case. Allied Radio Corp.

TRANSISTOR PORTABLES 218

A new line of five portable transistor radios has been announced. Model 6406 has 6 transistors and a 2-in. loudspeaker and is the size of a king-sized package of cigarettes. Model 6408 has 8 transistors, 1 thermistor and a 2 3/4-in. loudspeaker. Model 6409-A has 9 transistors, 1 diode, 1 thermistor and 2 3/4-in. loudspeaker. Model 6409-F is an AM/FM portable radio using 9 transistors, 5 diodes, 1 thermistor and a 2 3/4-in. speaker. Model 6421-FX is a portable AM/FM stereo



radio with swingout speakers that perform on battery or ac (optional) power supplies. It features 5 speakers, a stereo beacon and a balance meter. List prices: Model 6406, \$14.95; Model 6408, \$21.95; Model 6409-A, \$34.95; Model 6409-F, \$39.95; Model 6421-FX, \$169.95. International Telephone and Telegraph Corp.

ADJUSTABLE MICROPHONE 219

The Model 450 "Dispatcher" microphone features an integrated case-desk stand design which permits adjusting the height of the microphone to fit individual needs. The microphone has a push-to-talk switch bar in its base with an optional locking feature to operate independent microphone and relay circuits. An additional switch under the base provides selection of high or low impedance. The case is made



of "Armo-Dur" finished in a neutral gray. \$49.50 list. Shure Brothers, Inc.

TUNER-AMPLIFIER 220

A transistorized FM stereo, combination tuner-amplifier, the "IMPERIAL 1000," features an 80-w stereo transistorized amplifier, frequency response of 9 cps to 85 kc, 1M distortion less than 0.7 percent, harmonic distortion less than 0.25 percent and tuner sensitivity of 0.48 v @ 75 ohms, according to the mfg. The unit uses a fully-silver plated chassis, four-gang tuner, special limiters and four nuvistors in the RF section. Special inter-station noise muting has been incorporated as well as a stereo indicating meter claimed to be positive-acting and non-responsive to extraneous noise. Fuses protect the output transistors



from accidental speaker line shorts. The tuner, which is a plug-in assembly, may be removed at any time without affecting the amplifier operation. Users may purchase the amplifier portion initially and add the tuner section at a later date, if desired. \$529.95 consumer net. Bell Sound.

TWO-WAY RADIO 221

A two-way radio has a plate input power of 30 w, with a range reportedly up to 50 miles, and oper-



ates in the 25- to 50-Mc band. The Hallmark 3000 is FCC type approved for industrial service. It features an improved noise limiter and squelch circuit for quiet standby operation, and speech limiting for maximum modulation. It is available in 115-vac or 12-vdc models for mobile operation. The unit has a transistorized mobile power supply and class B transistorized modulator for low power drain. Hallmark Instruments.

PUBLIC ADDRESS AMPLIFIER 222

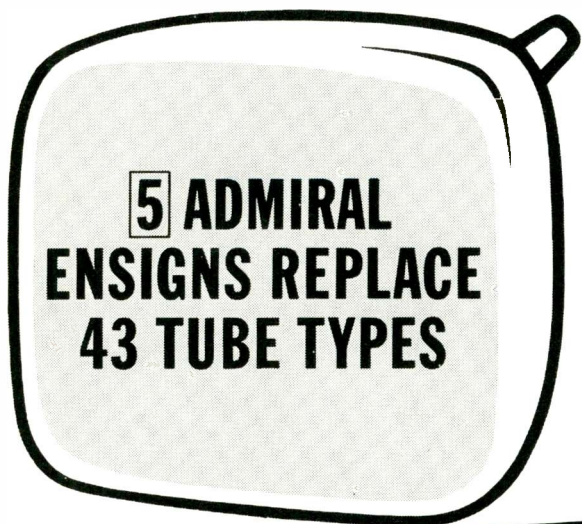
A new line of all-transistor public address amplifiers includes 15-w, 30-w and 60-w units. The 30-w Model 3000 includes an anti-feedback feature and three microphone channels for separate or simultaneous use of one, two or three high or low impedance microphones. (Low impedance input matching transformers are available as accessories and can be plugged directly into the amplifier chassis.) Two inputs permit the unit to be used with tuner, tape recorder or other auxiliary equipment. Controls are provided for master gain, individ-



ual microphone gain, auxiliary fader-type gain, tunable anti-feedback, bass and treble, rumble filter, scratch filter and power on-off. Output impedances are 4, 8, 16, and 500 Ω ; 25, 50, and 70.7v. \$272.50 list. B & K Manufacturing Co.

ONE-PERCENT VOM 223

A multimeter offers a complete range of both dc and ac voltage and current at an accuracy of ± 1 percent on dc and $\pm 2\frac{1}{4}$ percent on ac. It has polarity reverse button and is protected against overload by an automatic cutout with pushbutton reset. Rated at 20,000 ohms/volt, the unit reportedly is suitable for solid-state work, with dc ranges starting at 250 mv and 5 μ a and ac ranges of 2.5 v and 25



ENSIGN 17BJP4 REPLACES	17ATP4 17ATP4A 17AVP4	17AVP4A 17BUP4 17CBP4	17CLP4
ENSIGN 21AMP4 REPLACES	21ACP4 21ACP4A 21AMP4	21AQP4 21AQP4A 21CUP4	21BSP4
ENSIGN 21CBP4A REPLACES	21FLP4 21ALP4 21ALP4A 21ALP4B 21ANP4 21ANP4A	21ATP4 21ATP4A 21ATP4B 21BAP4 21BNP4 21BTP4	21CBP4B 21CMP4 21CVP4 21CWP4 21DNP4 21CBP4
ENSIGN 24CP4A REPLACES	24ADP4 24CP4 24QP4	24ATP4 24VP4 24VP4A	24XP4
ENSIGN 24AEP4 REPLACES	24DP4A 24YP4	24ANP4 24ZP4	

REDUCE INVENTORY! INCREASE SALES!

Save space, save dollars! Make more profit per sale with the Admiral ENSIGN "Big 5" as your basic tube inventory. All materials and parts used in the manufacture of these tubes are new except for the envelopes, which prior to reuse, have been inspected and tested to the same standard as new envelopes. Every Admiral ENSIGN tube is of fine/precision quality manufacture.



Call your ADMIRAL DISTRIBUTOR tomorrow.. start cutting inventory cost, pocketing new profits right away!

Be wise...standardize on

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REPLACEMENT PICTURE TUBES

Always Fine/Precision Quality

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DIG OUR CRAZY SALES HELPS

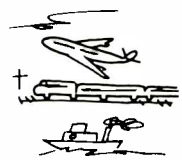
There's a whale of a lot of sales assistance for the A/S customer, says Bob Beebe, Antenna Specialists, Director of Sales.



First Folks . . . a quickie about quality design and construction of our antennas — like materials that cost us more but not you. Result: **Easiest installations and fewer service problems than any brand going — honest!**

Now . . . let's talk up a small storm starting with an important thought on pricing policy. With us, you order **only what you want and need**, all at the best price possible. Overloading is bad business for both of us. Right?

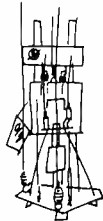
And speaking of orders — here's something no one else in the industry has . . . a whole bank of automatic order handling equipment that boils down the processing of your orders to just three days! (It took a bank to buy it too, but the **world's fastest service means more profit to you** as well as A/S!)



Holy Mackerel! Do we get the requests from CB clubs, hamventions and dealers for field assistance! Nobody — but nobody — travels as far to help you as much as our A/S field men.

Do we pre-sell your customers? You can't pick up a CB or amateur magazine without seeing one of our powerful ads — including the big electronic mags too. **Like more than 5,300,000 messages a year to the novice and "pro."**

Just can't help doodlin' with our **famous display stand** — only 2 sq. ft. of space, but it **sells antennas and accessories like crazy**. Yep — we've got loads of the most useful literature too! Like our five-section catalog — we had to put it in sections 'cuz there's over 400 models to choose from! Most complete line of communication antennas — by a country mile — all bands. You buy from **one source** and man, how that saves you trouble and expense!



I'm running out of space but you get the idea. We at Antenna Specialists are all out to help you sell, sell, and sell. **We're one big happy family, out for a "picnic of profits."** Won't you join us? Thank!

the antenna specialists co.

Antenna Division

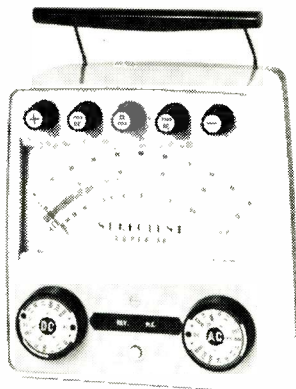


"Stripes of Quality" 12435 Euclid Ave., Cleveland 6, Ohio
Exp. Div.,
64-14 Woodside Ave., Woodside 77, N.Y.

Amateur, professional and CB antennas. ZEUS portable generators. ANZAC test instruments.

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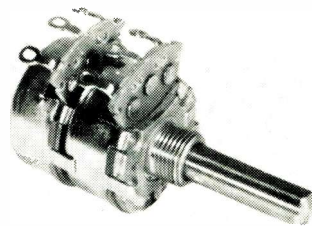
NEW PRODUCTS



ma. Its top range is 2500 v and 10 amp on both dc and ac. External shunts and transformers are available for extending ranges. Connolly & Co., Inc.

MATCHED DUAL POT 224

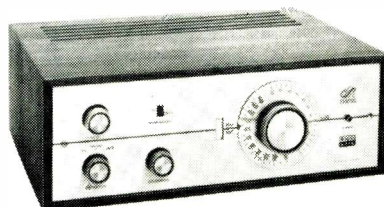
Matched dual potentiometers that provide rigid tracking characteristics for improved stereo control are



now available. The D47 series is a single-shaft, two-channel potentiometer assembly. Standard tracking is ± 3 db, but ± 1 db tracking is available on special order. The new dual assemblies reportedly provide equal residual resistance and rotational alignment of hop-off point. Attenuation range is offered to 90 db. Clarostat.

FM RECEIVER 225

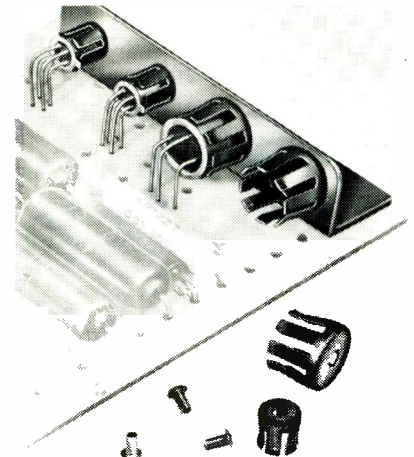
The unit is the standard model 2715 with a mic stage and relay for paging or other public address uses. A remote relay control switch at



the microphone permits silencing the program source for paging or announcements over the microphone. The mic level set, standard 5/8 in.-27 thread mic connector, and relay control socket are all at the rear of the unit. \$149.95. Eico.

TRANSISTOR RETAINERS 226

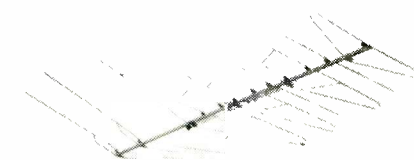
Retainers for TO-5 and TO-18 transistors are announced. Spring fingers of the units grasp and retain the transistor case firmly, yet allow a smooth press-fit installation. One size retainer fits all TO-5 size cases, while another size fits all TO-18 size cases. The retainers may be rivet- or solder-mounted directly to printed circuit boards, chassis, angle brackets or overhead heat sinks.



The retainers are made of beryllium copper. International Electronic Research Corp.

TV ANTENNA 227

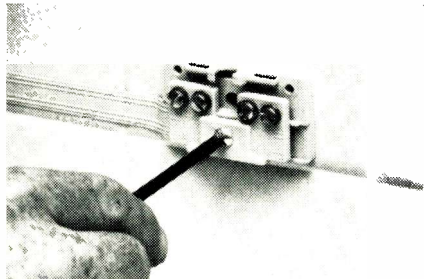
The Golden Color Royal antenna reportedly is treated to provide long lasting protection against the



elements. The antenna's surface coating is electrically conductive and replaces anodizing. The antenna provides three active elements on the high bands. Dyna Coil phasing, no-strip lead-in connector, three-point suspension, braced reflectors and Insta-Lok and Quik-Lok clamps. \$49.94 list. Trio Manufacturing Co.

Flat Cable System

■ A new pressure-sensitive flat cable system for signal, communications and control wiring is designed to overcome wiring installation problems where ceramic tile, concrete block or cinder block construction is encountered. The cable



No stripping of wires is necessary in the flat cable system. Binding posts are spliced to their proper wires simply by tightening the single screw that holds the connector plate to the terminal base. Terminal lugs are now ready for attaching phone cord, intercom system leads or other wiring.

and accessories, coated on one side with a high-tack adhesive, eliminate holes, screws, staples or other fasteners. The adhesive is said to stick to virtually any clean surface.

The system speeds wiring installation, makes it possible to run wire without defacing wall surfaces and provides a low, unobtrusive silhouette.

The system consists of the flat wire, terminals, connectors and cable corner covers, all of which are backed with double coated foam adhesive tape. The four No. 26 AWG solid round wires in the 9/16-in. wide flat cable are imbedded in vinyl insulation. No stripping of wires is necessary for installation. As the connector plate screw is tightened, the metal fingers of the connector cut through the insulation and grasp the conductors in a strong, electrically efficient joint.

A similar flat cable system soon will be on the market for home Hi Fi Applications. ■



COMING EVENTS

Nov. 11-13: Radio Fall Meeting, IEEE-EIA, Hotel Syracuse, Syracuse, N.Y.

Dec. 5-6: 14th National Conference on Vehicular Communications, Adolphus Hotel, Dallas, Texas.

Jan. 28-31: Fifth Annual Conference, Electronic Representatives Association, Fontainebleau Hotel, New Orleans.

NOVEMBER 1963

THIS IS THE NEW HALLMARK 3000

30 watt transceiver for Industrial Service

FCC TYPE ACCEPTED // COMPACT SIZE // RELIABLE, LONG-RANGE PERFORMANCE // RUGGED DESIGN

The sensational new Hallmark 3000 has been engineered and manufactured especially for business and industrial service where top performance in dependable, long-range communication is a must!

With crystal-controlled operation in the 25 to 50 mc band, the "3000" has an input power of 30 watts and a range of up to 50 miles!

Designed to take full advantage of the best features of tubes and transistors, the Hallmark 3000 uses a fully transistorized mobile power supply for low power drain. Its small, compact size allows easy installation for mobile operation in any vehicle.



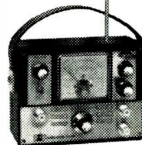
SUGGESTED LIST
\$269.50

The Hallmark 3000 features an improved noise limiter and unique squelch circuit for quiet stand-by operation. Receiver sensitivity is 0.3 μ v for 10 db S+N/N ratio. Transistorized modulator gives the Hallmark 3000 maximum transmit modulation and "talk power." Available in 115v AC and 12v DC models.

OTHER FINE PRODUCTS IN THE HALLMARK LINE

TRANSCIVER TESTER

Portable, crystal-controlled signal generator for transceiver installation and service.



HALLMARK 512
12-channel, crystal-controlled, dual power CB transceiver



Write for complete information

HALLMARK INSTRUMENTS
6612 Denton Dr. P.O. Box 10941 Dallas, Texas 75207 FL7-0184

... for more details circle 26 on post card

FOR
ADULTS
ONLY!



NEW CADRE C-75 CB TRANSCEIVER

The new Cadre C-75 1.5-watt, 2-channel transceiver is 15 times too powerful for youngsters (under 18 years of age) to operate, according to FCC regulations. Clearly, it's not a toy. It's designed for serious CBers who need "big set" performance that can be used anywhere.

The new C-75, weighing less than 2 lbs., provides clear, reliable 2-way communications up to 5 miles and more. All solid state design creates an extremely rugged transceiver to absorb rough handling, stays on frequency. Two crystal-controlled channels spell perfect communications contact everytime. Sensitive superhet receiver (1 μ v for 10 db S/N ratio) brings in signals in poor reception areas. Powerful transmitter has one watt output to the antenna. Adjustable squelch silences receiver during standby. AGC assures proper listening level. In a word, the C-75 has all the features you'd look for in a quality full size CB unit.

The C-75 has all the portable conveniences you'd want, too: operates on alkaline or mercury penlite cells (8-hour rechargeable nickel-cadmium battery available); earphone and antenna jacks; built-in retractable antenna; jack for base operation while recharging.

Use the Cadre C-75 anywhere in the field, for vehicle, office, boat or plane. Use it constantly too, because its all-transistor modular circuit (11 transistors and 2 diodes) is virtually maintenance free. \$109.95. Recharger and 2 nickel-cadmium batteries \$31.85.

Cadre also offers a complete line of 5-watt all transistor transceivers and accessories.
See your Cadre distributor or write

CADRE INDUSTRIES CORP.
COMMERCIAL PRODUCT DIVISION □ ENDICOTT, NEW YORK □ AREA CODE 607, 748-3373. Canada: Tri-Tel Assoc., Ltd., 81 Sheppard Ave. W., Willowdale, Ont. Export: Morhan Exporting, 458 B'way, N. Y. 13, N. Y.

- - - for more details circle 18 on post card

Ten 'Tight Money' Tips for You

You can't pay bills with old iron;
get cash, cash, cash for peace of mind

by Larston D. Farrar*

■ Millions of small businessmen (and some who are not so small) are faced with the problem of remaining liquid. (This has nothing to do with your supply of spirits, but a lot to do with your spirit.)

The problem is to keep on hand enough long green, cabbage, lettuce, spondulas—or whatever you call folding money — for foreseeable needs.

No one can tell another exactly how to handle money without knowing the individual's hopes, fears, obligations, assets and potentials. But there are some pointers that every businessman might keep in mind in these days of hard-to-get-adequate-credit-when-you-need-it-most. These tips are not given in order of importance—perhaps one man needs the last tip more than he needs the first, depending on his particular economic situation. But a thorough consideration of all these points—in the context of today's economic picture—may be useful to lots of small businessmen who are overlooking one point or another. Remember, the Small Business Administration warns that cash is vital in any business, and it is particularly vital in small businesses.

1.—**Soft-pedal credit sales in every legitimate and sound way.** Encourage your customers, by signs, by bill-slips, or in clerk-to-customer talks, to pay cash for sales and services. Some 65 percent of all retail business (all chain grocery business, for example) is done on a cash basis. The big

companies that offer unlimited credit may be able to afford to do so but for you, a small businessman who may be crimped for funds, it is certainly the time to encourage cash payments.

Incidentally, you might even build up a better and bigger business, everything considered, by "going to cash" in your sales. You can offer a cash discount, which is certainly warranted, to those who are hesitant about buying for cash. Sooner or later, the cash-paying public in this country is going to demand a cash discount on everything, anyway, for they realize that they are paying for their own purchases and helping carry the credit of credit-buyers.

2.—**If you are forced by competition to extend credit to some customers do the next best thing and bill promptly.** Let's say you have a customer who calls you for a repair job that costs \$60 but who is not likely to have that much cash between paydays. But you can't afford to carry him a day longer than necessary. Get all you can in cash and be sure that the bills go out on the first day of the month. I once had plumbing repair work done. The bill did not come for two or three months. A year or so later, I saw the fellow who had owned the plumbing company. He was working for someone else. He never realized that the *use of money* was the most vital part of a business. He failed to get his money in as fast as he could,

Continued on page 76

*Larston D. Farrar is famous as a business analyst throughout the western world. He is author of many books, including *Successful Writers And How They Work*.

TV MONITORS 300

Video monitors for continuous remote viewing of images from industrial or broadcast TV camera chains are described in a new two-color data sheet which lists monitor characteristics and dimensions of both cabinet and rack-mounted versions in 8-in. and 14-in. sizes. Cohu Electronics.

RELAY CATALOG 301

Catalog No. 763 describes the company's normal inventory of over 2,000,000 relays in approximately 40,000 types. This catalog reportedly is not just a listing of items available "on order" but an indication of in-stock items in whole units or in parts. In most cases stock is said to be sufficient to give immediate shipment of production quantities. Universal Relay Corp.

TV-FM RECEPTION AIDS 302

"TV-FM Reception Aids for the Home" (DS-CS-002), eight pages and two colors, illustrates a line of reception aids for improved home televiewing and listening. Photos, descriptions, specifications and prices cover a twin-transistor, mast-mounted TV preamplifier, an amplified TV coupler, splitters, extenders, multi-set couplers, mixing networks, filters, traps, matching transformers, isolation networks, a TV/FM broad-band amplifier and the TV-FM "Magic Carpet" antenna. Jerrold Electronics Corp.

REPRINT 303

A reprint is available of an eight page article by E. Villchur from the September 1963 *American Record Guide*, entitled "What the Consumer Should Know About Record Players." The article describes methods of evaluating record players outside of a laboratory and discussed some of the early concepts about turntables and arms. It also includes brief instructions on record care. Acoustic Research, Inc.

EXTENSION LAMPS 304

A four-page, two-color, fully illustrated bulletin gives complete descriptions and specifications on all currently available models of a shielded, portable fluorescent ex-

tension work light for use in heavy duty and hazardous operations. Included, in addition to the original 8-w model, are new 6-, 13-, 20- and 40-w models. Full details on the lamp's mechanical shock resistant and waterproof qualities are given. K & H Industries.

TEST INSTRUMENTS 305

A 26-page short form catalog is designed to provide a complete and ready reference to many types of electronic test instruments now available. Typical instruments listed include oscilloscopes, voltmeters,

oscillators, signal generators, power supplies, electronic counters, pulse generators, microwave equipment, event recorders, strip-chart recorders, X-Y recorders, impedance measuring instruments and equipment for digital data acquisition of RF measurement/control. Hewlett-Packard.

KINESCOPE REBUILDING 306

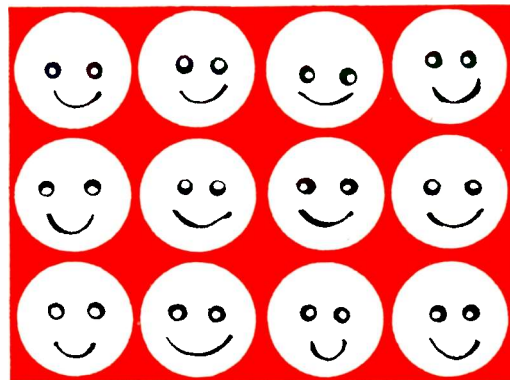
A booklet now is available describing the rebuilding of a TV picture tube, which reportedly is moving into the hands of the local TV dealer or serviceman because of the

look what happens when you
buy a
dozen
vu-brites...



You get the greeting card assortment free...

a beautiful selection for birthdays, anniversaries, get well wishes, etc. Yours free with the purchase of 12 Vu-Brites.



You get twelve happy customers...

because 12 CRT's will be given an extra lease on life, 12 households will enjoy TV more, thanks to the brighter picture you (and Perma-Power's Vu-Brite) have provided.

what a deal!

For a limited time, Perma-Power is offering you this wonderful gift absolutely free with the purchase of 12 Vu-Brites at the regular price. Vu-Brites are the Briteners that really do a job—on parallel or series sets (Model C401 for parallel; Model C402 for series). They come colorfully packaged in individual boxes... and are priced at \$9.95 the dozen, net.

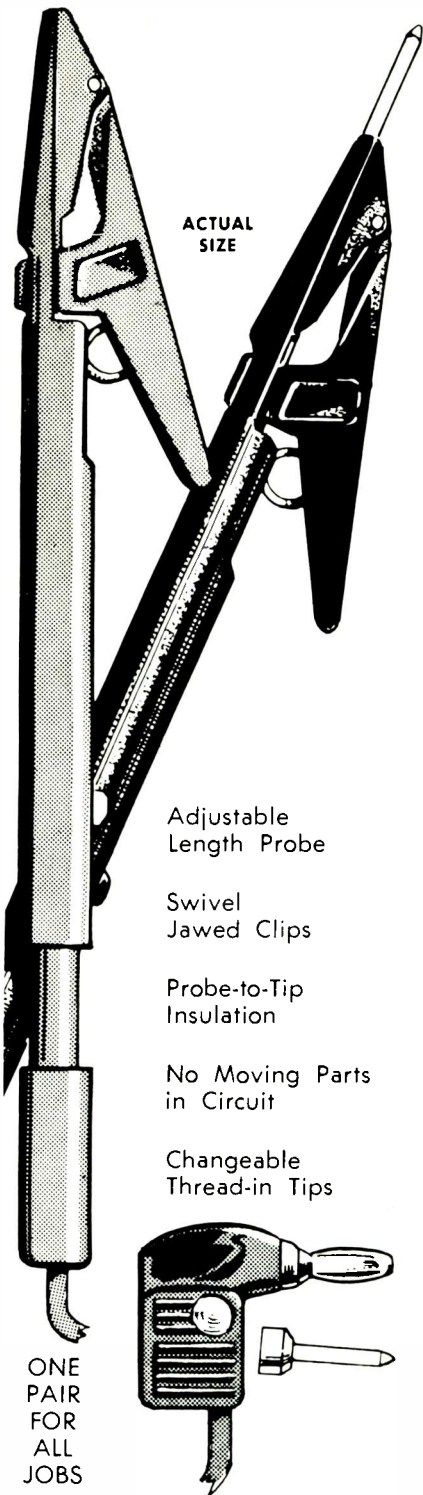
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Hurry—this special gift offer will end when current stocks are gone. Call your distributor today.

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About This New Product

GATOR-PROBE CORP.
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FREE LITERATURE

high cost of shipping duds and finished tubes. The low cost of getting into this business is said to make rebuilding profitable for service technicians. Windsor Electronics.

KIT CATALOG 307

A 100-page catalog describes a wide selection of professional-styled, professional-performing electronic kits. The product line includes stereo/Hi Fi, color and black-and-white TV, electronic organ, tape recorders, cabinets, portable table and car radios, short wave radios, amateur radio equipment, marine electronic gear, citizen's band equipment, automotive accessories and home, hobby, test and lab instruments. Heathkit.

TESTED BUSINESS BOOSTERS

■ The pre-holiday season offers many opportunities for building business and generating goodwill; All that's needed is a little common-sense imagination and advance planning.

Here's a few past-season ideas—proven by successful shop-owners who developed them.

One dealer offers a free Christmas tree for each TV or Hi-Fi purchase made between December 5 and 25. Newspaper advertisements announce that a free Christmas tree voucher will be issued for each new TV or Hi-Fi purchased.

Another dealer offers a \$10 certificate good for toy purchases at a local top store with each new TV or Hi-Fi purchased. A \$5 toy certificate is offered with each lower-priced item purchased; portable phono, AM/FM table radio, etc.

A "Forget-Me-Not" booklet specially printed and containing space to list names of persons slated for Christmas gifts is used by one technician. A list of several merchandise items suitable for gifts—including

portable radios, phonographs, etc.—is printed on the booklet's back cover. These booklets are mailed to each customer and are available to others for the asking.

The credit slip is always a good "puller." One dealer has a Christmas card showing a group photo of himself and staff and tucks a credit slip worth \$1 inside each card—good for credit on any purchase of \$5 or more including repair services. Cards are sent by First Class mail to avoid delay in the Christmas rush.

Another enterprising dealer in a high traffic area opens-shop at 6 a.m. "sharp" two days a week—offering free coffee to local office people and others who like to shop before "rush hours." His newspaper ads suggest: "Enjoy an early morning coffee break and do your Christmas-gift shopping before you go to work or begin household chores."

With a little imagination you can think up a variety of other business-boosting activities to fit your particular locality. But you have to plan now and move fast. ■



"It's just a board with knobs and dials for those guys who can't keep their hands off the floor models."

MOVING?

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



Note display of escutcheons mounted on walnut facing, with control switches below

COMPATIBLE COMPONENTS DISPLAY DEMONSTRATION CENTER OFFERS MORE WAYS TO Make MORE Sales... BIGGER Sales

While almost everybody else **promises** more profits with their line, V·M *delivers the special tools you need* to build better profits.

FOR EXAMPLE: this new display-demonstrator contains 15 separate V·M high-fidelity compatible components, has a big, bright header to gain attention, yet fits conveniently in minimum store space. Complete connections provided so you can demonstrate three complete VOICE OF MUSIC component hook-ups, and play each component series through any of three separate dual speaker systems.

All you or your salesman does is turn a switch to select component combinations. The sound does the selling! Prospects *hear* the difference in systems, realize at once why a few extra dollars more in an

amplifier or speaker or radio tuner is money well spent! By assisting selling people to trade up, their personal effectiveness is increased.

The new V·M display-demonstrator is available when you order components to stock it. Included in this component selection are the following items: Model 1428 amplifier; 1465-2 radio tuner; 1448 amplifier; 1467 tuner-amplifier combination; 1470 tape recorder deck; 1475 base; 1573 record changer; 1438 base; 1466 changer-amplifier combination; 2 Model "32" speakers; 2 Model "42" speakers; 2 Model "62" speakers.

ORDER TODAY!
 Your V·M distributor can provide full details.



V·M CORPORATION • BENTON HARBOR, MICHIGAN • RECORD CHANGERS, PHONOGRAPHS, TAPE RECORDERS AND HIGH FIDELITY COMPONENTS

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Troubleshoot, repair receivers and transmitters faster

basic radio repair

basic radio repair

VOL. I

VOL. II

- Two great volumes cover all phases of radio receiver servicing.
- Detailed coverage on transmitter servicing.
- Practical repair techniques as they would be done at the workbench.

There are other books that cover the subject of radio receiver repair. Some also cover transmitter servicing. But none of them make it easier to apply your knowledge of radio circuitry to the maintenance and repair of defective equipment. These books show you how to use the best and fastest approach to circuit troubleshooting and repair.

HIGHLIGHTS OF BASIC RADIO REPAIR

VOLUME I TEST INSTRUMENTS — Reveals the construction of the various radio servicing test instruments providing an understanding for both better use and maintenance.

COMPONENTS — Discusses often-ignored facts such as general replacement vs. exact replacement components, tolerances, working voltages, values, etc.

SERVICING PROCEDURES — Outlines methods of approach in servicing to make repairs in the fastest possible way.

SUPERHETERODYNE RECEIVERS — Treats each stage of a receiver in the same order most likely to be followed during actual servicing.

SERVICING PORTABLE RECEIVERS — Discusses circuits and problems peculiar to portable receivers, including 3-way portables.

SERVICING AUTOMOBILE RECEIVERS — Details this neglected but lucrative field. Includes such special circuits as the "signal-seeker".

VOLUME II SERVICING FM RECEIVERS — Includes a discussion of antenna requirements as well as complete coverage of the various detector circuits.

TRANSISTOR RECEIVERS — Covers best methods to service transistor receivers: transistor handling and testing; servicing printed circuits and transistor receiver circuits; hybrid auto radios.

SERVICING TRANSMITTERS — Discusses transmitter symptoms and checks before covering individual stages. Details servicing FM and single sideband circuits.

#233—2 vol. soft cover set, \$5.30; #233H, 2 vol. in one cloth binding, \$5.95.

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Saves time in locating the right replacement — saves money by cutting down the number of cartridges you need to stock. #288, \$2.00
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by Keats A. Pullen, Jr. Eng. D

It provides 4500 direct substitution both electrical and physical. #277, \$1.50

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by Jack Strong

Lists direct replacements for all current 45 rpm spindles. #321, \$2.00

1963 TUBE CADDY-TUBE SUBSTITUTION GUIDEBOOK
by H. A. Middleton

Covers direct receiving tube substitutions only — direct CRT substitutions. #299-3, paper 90 cents.

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... 'TIGHT MONEY' TIPS

Continued from page 72

and he couldn't pay his help. So he went into bankruptcy as a consequence.

If you are suffering with the shorts and are wondering why, you might find that the big reason lies in your credit extension practices.

3.—**If tight money is squeezing you, make up a true list of your assets.** Study this list at various times. Think about it again and again. Do you own a choice piece of property "extra"? Do you have two or three cars at home? Why not re-examine your list of assets to see which ones you can sell at the highest possible price? You may kill two fat birds with one stone by selling certain real estate or other properties you may own. You may also get rid of a continuing expense item (taxes, etc.) and you may better your present cash position to ease the pressure.

4.—**Study better methods of inventory control.** Remember, an item that sits on your shelves long enough to gather dust is like money in a sock, becoming mildewed, while you suffer a cash pinch. Put on a sale and jettison all the stuff that sat there so long. It is not only tying up shelf space, it is immobile money, maybe not a lot, but some. Besides, you should study your sales to be familiar with what is moving fast and what is dragging. Get more of the fast-moving items and get rid of the slow-moving ones.

If you are really squeaking for lack of grease, make an arrangement with the wholesaler or distributor to give you more frequent service. Don't keep too many of a specific item in stock. Keep close to the telephone, ordering the replacements you need. In this way you keep minimum capital tied up in parts. If a customer wants to pay and pick up the item in two days, don't hesitate to take the order. This is like money from home.

5.—**Put off paying your bills as long as you legitimately can without jeopardizing your credit.** If a bill is due on the 10th but you are given a 30-day grace period without penalty, then pay it on the 28th or 29th day of the grace period. This gives you a little more time to collect your own money to use,

and maybe even make more, before you *must* pay the bills. Many small businessmen have gone broke, boasting about how fast they paid their bills—before they ran completely out of cash! The important thing is to pay within a reasonable time and to stay in business. If you use the correct managerial policies on your accounts—those you collect and those you pay—you'll be able to squeak through when others fail.

6.—**Go over every phase of your business operation every month and lob off the fat.** If you are really tight for money, go over your home-bills with your good spouse and cut out the frills there, too. When you go over the outlays, take the small ones into account as well as the large ones. But don't be penny-wise and pound-foolish. A lot of small businessmen—who *should* read and think about business operations—actually start out economizing by cutting off subscriptions to business magazines. This is the height of shortsightedness, as any good businessman will verify. The amount of information you can get from reading is incalculable. Although it costs little, it is priceless. But you can still cut out items that return little or nothing for the sums invested. Of course, if you are still "carrying" employees who are costing you money by their own slovenly habits or their inability to make money for you while on the job, something will have to be done about that too. Poor personnel fritter away more money than they ever could be worth to many a small business.

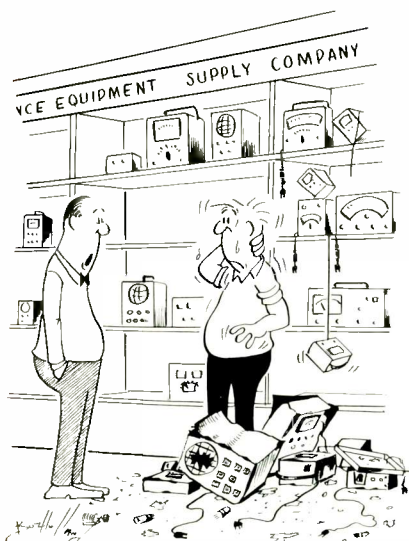
7.—**Make an inventory of your hours and work-habits as well as a list of your assets.** Are you getting as much out of a day as you should? If not, examine your own practices, with the view of getting more rest at night, going perhaps to fewer civic functions at noon and devoting more time and study to your business. *Time is money.* This is a bromide. But it is a lead-pipe cinch bromide that many a small businessman overlooks—to his peril. If you save some hours by sloughing off unproductive activities, you can make these "extra hours" count by using them to good effect, businesswise.

8.—**Sell all the time—at work, at play, at coffee-time, at rest, on the telephone and everywhere.** I

once played golf with a dentist. As soon as he met a foursome, he would go up and introduce himself, identify himself as a dentist and tell where he was located. I have never known him to want for a full house at his office. He is a rich man today. I know another dentist who played golf at the same course. He was as quiet as a mouse. You could play golf with him all year and never learn he was a dentist unless you asked him what he did for a living. Alas, he has never moved from the same poor neighborhood. He kept his profession a secret and, of course, he never found the secret of success, which is *selling all the time*. If you are suffering from "tight money," it probably means you are suffering from a lack of sales and service work. The way to remedy the situation is to sell more, and the way to do this is to learn how to sell all the time you are awake, in all phases of your activities.

Incidentally, if you don't like to sell and don't know enough of the techniques to learn how to sharpen them, what in the world are you doing in business, anyway?

9.—If, in going over your accounts receivable, you find lots of money owed to you that is overdue get in touch with those who owe



"Oh, don't be upset, Griggs . . . we can let you have those models wholesale. About \$457.00 or \$500.00."

**COMING IN DECEMBER
"MAKING MONEY SERV-
ICING TABLE MODEL
RADIOS . . ."**

and other interesting articles

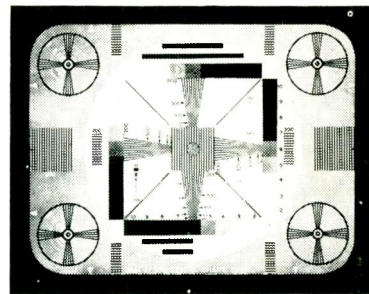
you and try to collect. If this is not possible on a reasonable basis, take their notes payable. With these receivable you may be able to go to the bank and get cash for them at a discount. Money owed to you that you can't collect immediately is the same as goods on your shelf that you can't sell. You would jettison the goods in a sale to get the cash back, wouldn't you? Well, do the same thing with the notes receivable. Let the buyer collect them over a period of time, while you *use* the cash. Just the opposite, if you have large bills that you know you cannot pay, then go to your supplier and tell him that you will sign a notes-payable. This is the businesslike way to do business if you are short. It indicates to him that you have no intention of skipping town or taking a last resort. You have confidence in your future. Your creditor likely will have more confidence in you because of your own confidence.

10.—**Watch more closely the expenses you can deduct for tax purposes.** In long years of advising small businessmen, I have observed that many seem to think that all men who do the same amount of business pay the same amount of taxes. Nothing could be farther from the truth. By carefully keeping a day-book, keeping account of all the little sums that dribble out from any businessman's pockets, some businessmen deduct literally thousands of dollars more each year than others who may seem even more extravagant. The reason is that little things mean a lot, and little expenses surely mean a lot. If you are at your place of business and someone calls you—on business—to come to his place of business, you have a right to deduct the trip, even if it is only a few miles. If you have to go to a post office 6 miles away to make sure a bill is paid on time or to mail out your bills, the trip is deductible. Keep account of all such things, writing them down each night after business.

If you'll follow these 10 tips, you'll get some other good ideas about how to husband cash. If you will just *think* about the problem every day, you'll come through "tight money" with cash to spare. The politicians can't keep a good man down, or boot him out, if he is *determined* to stay in business. ■

TV TIPS FROM TRIAD

NO. 23 IN A SERIES



Junior PTM Joe muttered exasperatedly as he contemplated the chassis on the bench, "Looks like another one of *those* sets!"

Bill responded with a raised eyebrow. "I checked this set out in the customer's home," clarified Joe, "and it had a bad case of streaky, tearing raster. Now that I've got it on the bench, it refuses to flicker!"

Bill thought for a moment, then silently reached for the Triad step-up and step-down transformer. He plugged in the cheater cord and carefully watched the meter on the transformer as he advanced the switch. As the needle reached 125 volts, the raster began to tear and arcing commenced at the point where the flyback high voltage plate lead extended through the metal shield can. "Praise the Lord for isolated transformers," he said reverently, quickly turning off the switch. He examined the lead and added, "Carbonized. Replace the lead plus a length of H.V. tubing for insurance?" "Well, how about that?" marveled Joe.

"Experience," acknowledged Bill modestly. "Often, the multiple covered high voltage lead won't reveal any external signs of trouble, so a visual inspection won't spot it?"

"You can say that again!"

"Obviously I won't have to. But we have proved a number of things. First, a variable input voltage source can be invaluable in preventing callbacks in areas where line voltage varies. Second, it's very advantageous for locating intermittents—those elusive gremlins that many servicemen find so costly and time consuming to track down. Finally, as we've just shown here, an isolation transformer minimizes shock hazard when working on line-connected equipment!"

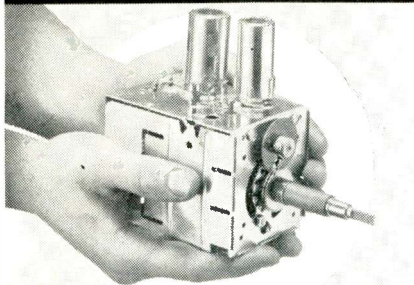
"Amen," said a wiser Joe.

MORAL: Save troubleshooting time and reduce callbacks—buy Triad N-52M for your bench. It's a very handy piece of test equipment. For a bonus, pick up a few more N-52M's and some N-56M's and display them in front; you'll find them profitable for both you and your customers in problem line voltage areas. Triad Distributor Division, 305 North Briant Street, Huntington, Indiana.

A DIVISION OF LITTON INDUSTRIES 

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THE BIG NAME IN TV TUNER OVERHAULING



**ALL MAKES
ALL LABOR
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ONE LOW PRICE INCLUDES ALL UHF
VHF AND UV COMBINATION* TUNERS

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

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

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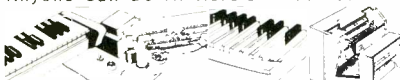


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The Original "Build-it-Yourself" Organ
sounds like a glorious pipe organ



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Mail coupon below, and receive absolutely FREE complete information on Artisan's new 1963 Organ-Building Kit! Illustrated instructions lead you through every step of this happy hobby as you assemble at-home a magnificent custom Artisan electronic organ — the best in tone and styling! No technical skill required and you save up to 70% of comparable ready built organ costs by skipping dealer profits and factory labor! You can play as you build and pay as you build! From \$1750 to \$7500. Write today!

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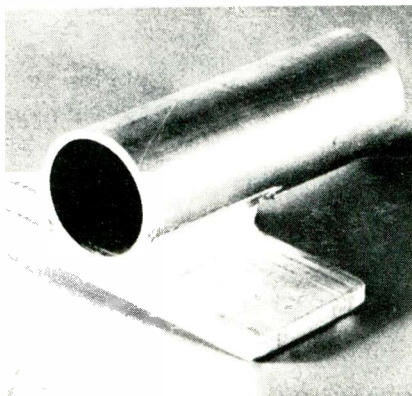
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New Aluminum Solder

■ A low melting-temperature solder, Formula 121, for aluminum and its alloys, has been developed.

The outstanding feature of this new solder is its ability to be applied with no flux. Parts to be soldered are simply heated and then "tinned" by rubbing the solder stick lightly on the surface of the aluminum, it was said. The solder may also be used on magnesium and its alloys and is useful in repairing blowholes and undersized machined areas in castings.

Formula 121, which has a melting temperature of 617°F, alloys into the aluminum or magnesium surfaces and forms a strong metal-



Jensen Tools' aluminum formula 121 was used to solder these two aluminum members. Solder does not require flux or pre-treatment of the aluminum.

lurgical bond. Corrosion resistance, always a serious problem with aluminum solders, is approximately

20 times greater than with tin/zinc or cadmium/zinc solders, the manufacturer has stated.

The solder is furnished in triangular sticks 15 in. long and about 3/16 in. on a side, as well as in thin "blowpipe sticks" of about the same length. ■

... MANUFACTURERS' AIDS

Continued from page 53

local papers and the phone book and frequently use co-operative ads with manufacturers.

Bill Plath says, "We've built our business on courtesy, prompt service and dependability. We back up what we do with a 100-percent guarantee. Knowing what we do about the importance of service, we were particularly pleased with our shoe shine promotion."

Bill and Armin were impressed by the exclusive, personalized, non-competitive way the polisher reaches their customers and potential customers. In most of their other advertising, their company message is thrown in with those of all their competitors. The shoe polisher reaches a specific market and offers a needed service which will be used and re-used. What's more, they can offer this service and obtain this advertising at a relatively low cost. ■

**COMING
IN DECEMBER
ELECTRONIC
TECHNICIAN . . .**

**Servicing Horizontal Sweep
Circuit Defects by Jack
Darr**

**Handling "Do-It-Yourself"
Problems by Art Margolis**

**Servicing Transistorized
AM/FM Auto Radios**

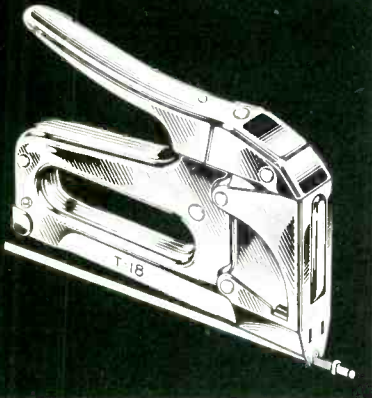
Watch for these and other important articles in the December issue.



"I don't know quite how to tell you this, Ed, but you've been traded to Mid-Town TV Service for a .015 capacitor and two 5U4's."

ARROW Staple Gun Tackers

SAVE YOU TIME AND MONEY!



SAFE!

Can't damage wire because staples automatically stop at right height! Won't even break 1/4" hollow glass tubing.

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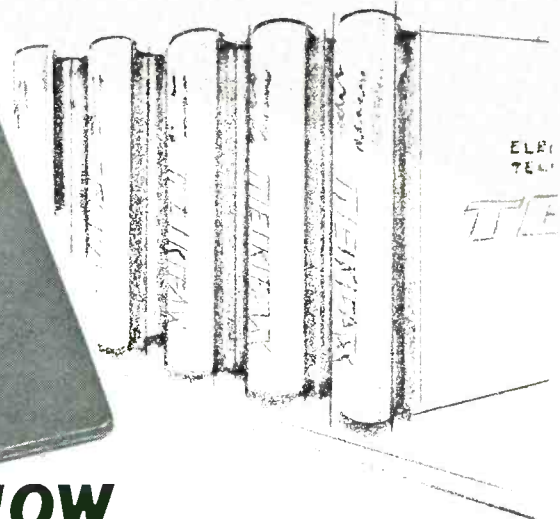
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Copies of the new Shure Audio Catalog for Sound System Specialists are available from Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. Please send all requests on your letterhead.

Ad Campaign Kickoff

Zenith Sales Corp. is reportedly launching the most powerful advertising campaign ever scheduled by the company in local and national printed media during the peak selling autumn season. Announcement was made by L. C. Truesdell, Zenith Sales Corp. president.

The program provides for multiple insertions of two-color and black-and-white national ads in over 240 newspapers throughout the United States, and is over and above the regular advertising normally scheduled by Zenith distributors and dealers in the Fall of the year, Truesdell said.

Kick-off newspaper advertisement in many markets appeared during the week of September 30.

Sales Drop Slightly in July

Distributor and factory sales of phonographs in July dropped slightly from those recorded for June, the year's record month, according to the EIA Marketing Services Department.

In July, 211,645 portable-table and 87,336 console models were sold by distributors, compared with the 215,036 and 100,007 recorded for June. Year-to-date totals were 1,334,370 and 724,081 against 1,102,415 and 619,572 reported for the first seven months of 1962. July 1962 figures were 214,007 and 78,293.

BUSS : the complete line of fuses ...

NEWS OF THE INDUSTRY

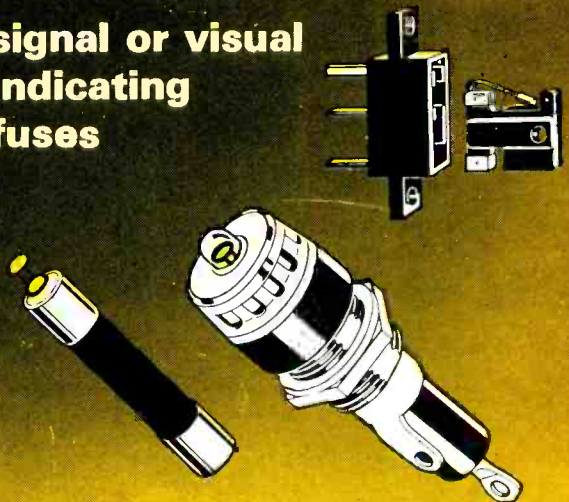
Television Breakthrough Announced

A new TV camera tube, called the Plumbicon, is said to produce unusually uniform color pictures free of dark "halos," color shadows and blurring. The new tube, produced by Norelco, features low dark current, freedom from smearing, low noise level, high sensitivity and a linear light transfer characteristic. The spectral response curve of the new tube reportedly coincides closely with human vision.

New Microphone Catalog

A new catalog contains 44 pages of detailed technical information on over 75 microphones and audio products manufactured by Shure Brothers, Inc. In addition to specifications for audio specialists, the catalog provides architects and their consultants a reference for specifying 24 microphones, or their equivalent, with performance characteristics covering a wide range of sound reinforcement applications. Other features of the catalog include an explanation of technical specifications frequency response curves, a simplified four-step guide to selecting the correct microphone for any application and a 3-page, heavy-stock microphone selection chart rating 27 of the company's most popular microphones for the most common microphone applications.

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695. In July of last year, 1,134,250 radios were produced.

Factory sales of television picture tubes and receiving tubes also dropped (to the year's lowest monthly totals) in July, the month during which many plants shut down operation for vacations.

Doubling Production Capacity

The Sprague Electric Co. is doubling the production capacity for electro-chemical process transistors at its Concord, N. H. plant in the light of recent announcements by the Philco Corp., a subsidiary of the Ford Motor Co., that it will discontinue the manufacture of this type of semiconductor for the electronics industry.

According to Neal W. Welch, senior vice president, marketing and sales, "The Sprague Electric Co. is committed to the production of electro-chemical transistors. Our customers tell us, and our market research indicates, that a substantial need will continue for these unique high-speed, high-frequency devices."

Enters Color TV

Setchell-Carlson, Inc. announces a new color television receiver incorporating the utilized concept. All maintenance control adjustments are accessible from the front of the receiver via the speaker panel and tinted safety glass is bonded to the tube face. If maintenance is required on the plug-in chroma unit, it may be removed from the chassis and the TV will continue to perform in black-and-white. The set has push-pull audio output and two matched speakers.

... of unquestioned high quality

At the factory, sales of 230,282 portable-table sets were reported along with 106,766 consoles, compared to the 305,946 and 149,253 in June. During the first seven months of this year, sales of 1,421,608 portable-table sets and 809,738 consoles were recorded. Last year during the same period, 1,155,663 and 722,115 were sold. Sales of portable/table sets and consoles in July 1962 were 220,196 and 90,197, respectively.

Both production and distributor July sales of radio and television sets dropped markedly from their previous record and near-record monthly totals in June.

It is reported that 448,441 television and 698,043 radio sets were sold by distributors in July, against the 541,810 and 811,923 recorded in June. During the first seven months of 1963, a total of 3,405,249 televisions and 4,633,713 radios were sold, compared to 3,173,566 and 5,721,663 respectively, in the same period last year. In July, 1962, there were 449,528 televisions and 921,089 radios sold by distributors.

Production reports showed that 384,291 television sets, including 75,589 all-channel sets, were produced against June totals of 665,004 and 107,500, respectively. Cumulative output totals were 3,844,212 TV receivers, including 508,928 all-channel sets, compared to 3,631,910 and 303,805, respectively, during the first seven months of 1962. In July 1962, total television output was 336,409, including 28,359 all-channel sets.

July radio production totaled 990,605 against June's 1,653,866 total. Year-to-date output stood at 9,575,843. Last year at the same time, the total was 10,398,-

Let BUSS Fuses Help Protect Your PROFITS

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STATEMENT REQUIRED BY THE ACT OF OCTOBER 23, 1962 (39 U. S. Code, 4369) SHOWING THE OWNERSHIP, MANAGEMENT AND CIRCULATION OF ELECTRONIC TECHNICIAN published monthly at Duluth, Minnesota, for November 1963.

1. The names and addresses of the publisher, editor and managing editor are: Publisher, Ron Kipp, Ojibway Building, Duluth 2, Minn.; Editor Victor L. Bell, Ojibway Building, Duluth 2, Minn.; Managing Editor, Jack Hobbs, Ojibway Building, Duluth 2, Minn.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.) Sole stockholder — OJIBWAY PRESS, INC., Ojibway Building, Duluth 2, Minn. Royal D. Alworth, Jr., 1605 Alworth Building, Duluth, Minn.; Robert L. Edgell, 1 East First St., Duluth, Minn.; Albert J. Forman, Woodbrook Drive, Springdale, Conn.; H. B. Fryberger, Jr., 712 Lonsdale Building, Duluth, Minn.; William B. Fryberger, 712 Lonsdale Building, Duluth, Minn.; C. E. Fuller, Jr., 711 Alworth Building, Duluth, Minn.; Verne D. Johnson, Jr., 302 East

Superior St., Duluth, Minn.; E. A. Kuefner, 1725 Vermilion Road, Duluth, Minn.; Shumer S. Lonoff, 11 Essex Road, Maplewood, N. J.; S. R. Mason, 212 Medical Arts Building, Duluth, Minn.; Arthur E. A. Mueller, Mueller Building, Wausau, Wis.; Robert E. Nickerson, 168 Mason St., Greenwich, Conn.; Jeno Paulucci, 200 North 50th Ave. West, Duluth, Minn.; Howard Reed, 174 Waverly Road, Scarsdale, N. Y.; Anita Reinig, 1 East First St., Duluth, Minn.; Fred W. Reinig, 177 K Street N. W., Washington, D. C.; Marshall Reinig, 1 East First St., Duluth, Minn.; Marshall Reinig as custodian for Janet Reinig, 1 East First St., Duluth, Minn.; L. M. Rosenthal, 330 West 49th St., New York, N. Y.; Estate of Homer Collins, 712 Lonsdale Building, Duluth, Minn.

3. The known bondholders, mortgagees and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was (This information is required by the act of October 23, 1962, to be included in all statements regardless of frequency of issue.) 82,250.

(Signature) Dean Myhran
Vice President

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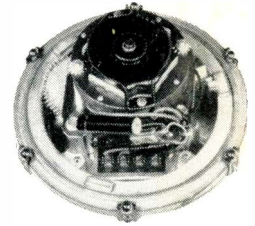
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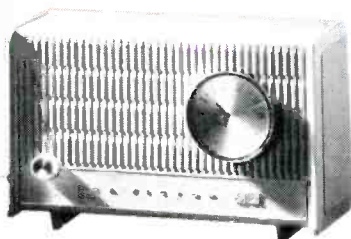


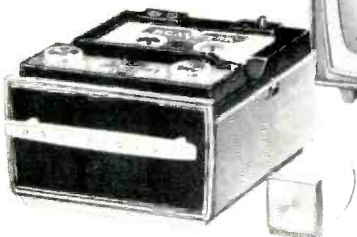
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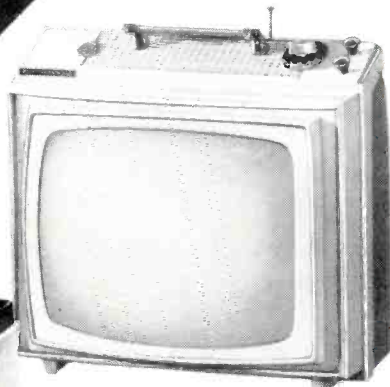
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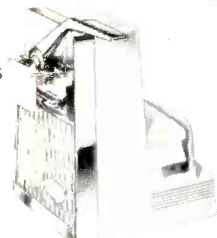
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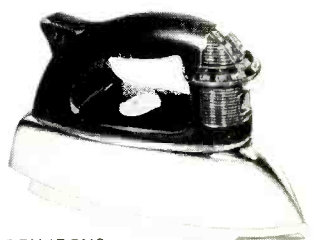
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