JANUARY, 1960 35 CENTS

PF REPORTER

PHOTOFACT

including Electronic Servicing

More Pleasure With Extra TV Speakers

•

Modular Component Replacement

•

Mastering the PC Board

•

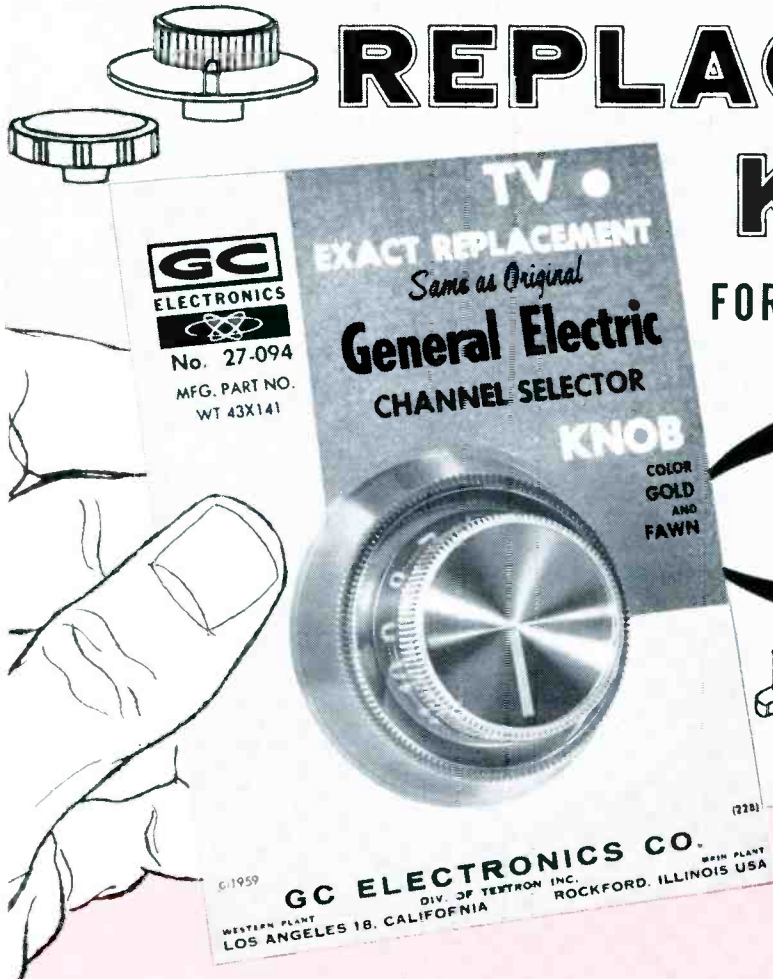
Rx for Interlace

CANON CITY COLO
113 RIVERSIDE AVE
M DAVIS
12606 635 8H 14

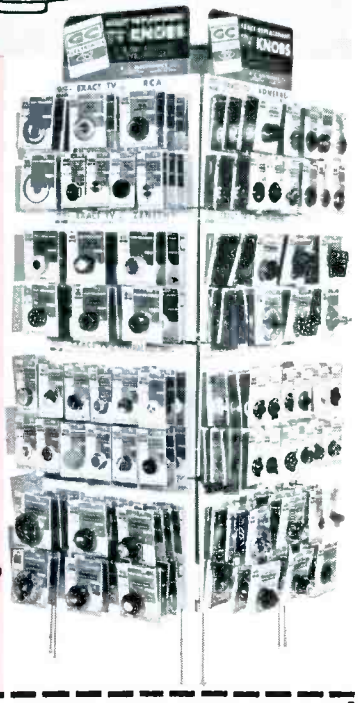
www.americanradiohistory.com

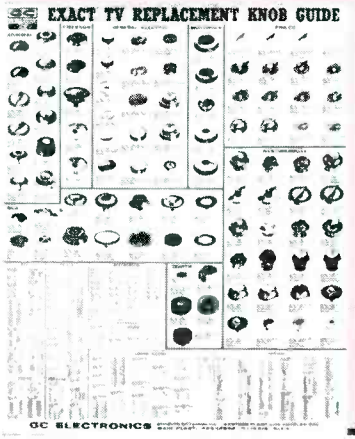
NOW...GET G-C EXACT TV REPLACEMENT KNOBS!

FOR ALL LEADING TV SETS



NEW... EACH G-C KNOB NOW IN PROTECTIVE SKIN-PAK ON INDIVIDUAL CARD

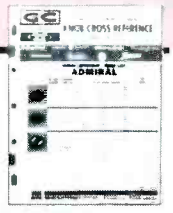




WALL CHART, TOO!

Now's your chance to pick up some extra money on TV set servicing. Choice of 97 different hard-to-get knobs lets you replace all broken or missing knobs. Modern skin-packaging, full identification and list price marking makes it easy and profitable, makes your trade happy too.

LOOK FOR THIS DISPLAY AT YOUR FAVORITE JOBBER!



CROSS-REFERENCE GUIDE tells you which knob goes with which set. Includes illustrations, set numbers, list prices, etc.

WRITE TODAY for complete details and literature, all free. Send postcard now.

GC ELECTRONICS

G-C ELECTRONICS CO.

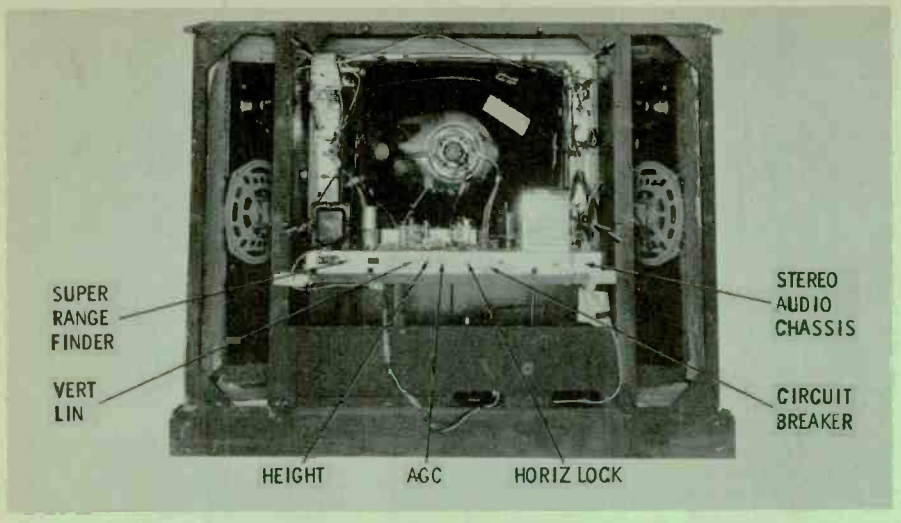
Division of Textron Inc.

West Plant: Los Angeles 18, California

Main Plant: ROCKFORD, ILLINOIS, U.S.A.

www.americanradiohistory.com

Admiral



Admiral Model ST24M72 Chassis 20H7 & 3S1

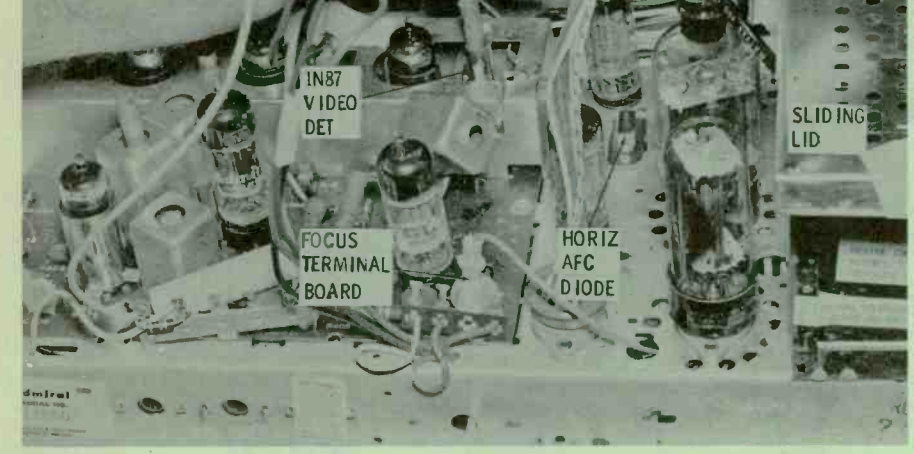
The twin speaker panels for this massive 23" TV-phono combination are dead giveaways to the fact that it's equipped for stereo operation. The picture tube has a laminated protective faceplate bonded directly to the glass. To the left of the screen is a push-push off/on switch and volume control, a balance control for stereo, bass and treble controls, and the function selector for TV, monaural, or stereo operation. Located on the right are the channel selector (with illuminated channel indicator), fine-tuning, vertical-hold, and brightness controls.

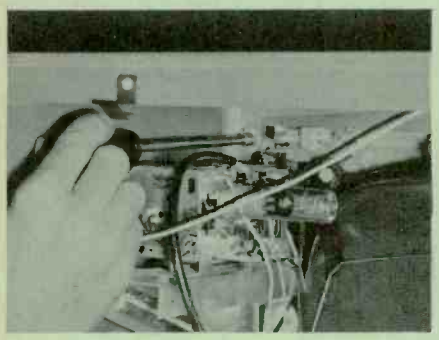
After removing the clip-on back, you'll see the transformer-powered, 17-tube TV chassis with VHF tuning, and a 3-tube audio and stereo-phono chassis. The one new type tube you should have on hand when servicing this chassis is a 6ER5 RF amplifier. The conventionally-wired part of this chassis, which is protected by a B+ circuit breaker and a #26 wire filament fuse, includes both sweep circuits and the low voltage supply. The remaining circuits are on a single printed board.

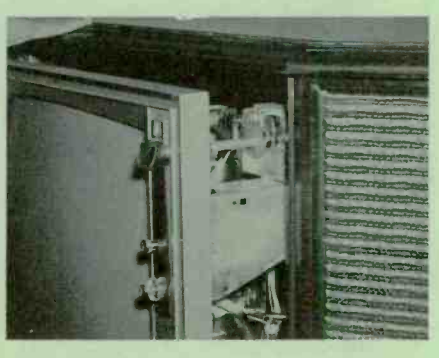
The high-voltage cage opens by means of a sliding, captive lid. Also, you can get to the video-dectector diode (a 1N87) by removing a transformer shield cover. You may have to unsolder the braided strap which holds this cover captive if it doesn't have enough slack. The diode itself is a pigtail type soldered to the coil terminals. Centered between the printed board and the high-voltage cage is a plug-in type horizontal AFC diode, as the photo shows.

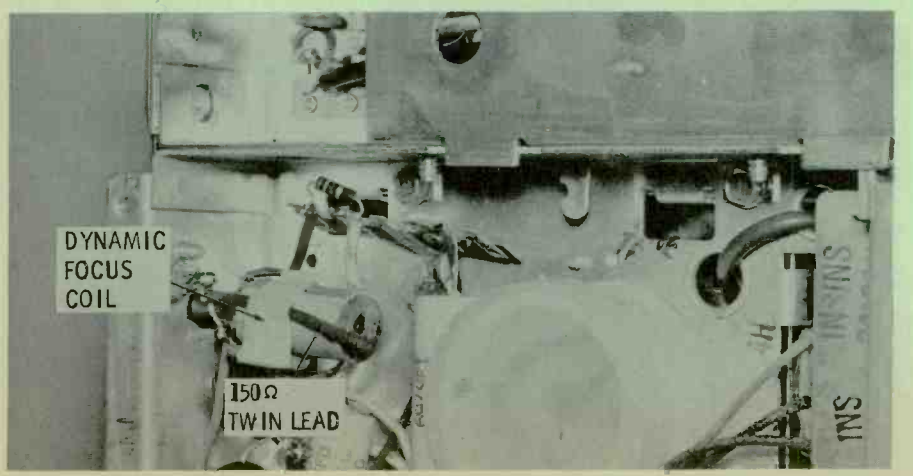
If the chassis has to be pulled, you'll need a long-handled ¼" nut driver or socket wrench to remove the four mask-retaining bolts. There are three 5/16" bolts holding the chassis from the bottom. (The front one is accessible when the phono has been pulled forward.) After disconnecting the speaker, phono, and power indicator lamp, the chassis can be removed from the front of the cabinet.

With the chassis removed, you may notice an odd-looking coil on the wiring side beneath the high-voltage cage. This is a dynamic focus coil to provide proper focus in the corners of the 23" tube. The 150-ohm cable connected to it acts as an arc suppressor. The coil itself connects between the flyback circuit and the focus anode of the picture tube. A center tap ties to the focus terminal board, which provides a choice of two boost values, a B+ value, or a ground potential for DC focusing.

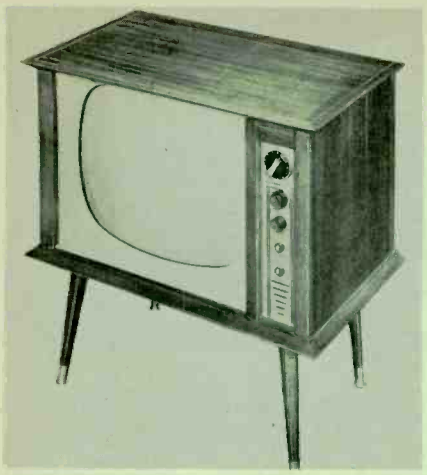








www.americanradiohistory.com



Curtis Mathes Model 1121

Here's one of the last sets to carry the name *Mathes*. From now on, receivers by this company will carry the trade name *Curtis Mathes*. This one is a wide, long-legged version of lowboy styling with a cabinet-mounted 90° 21" picture tube.

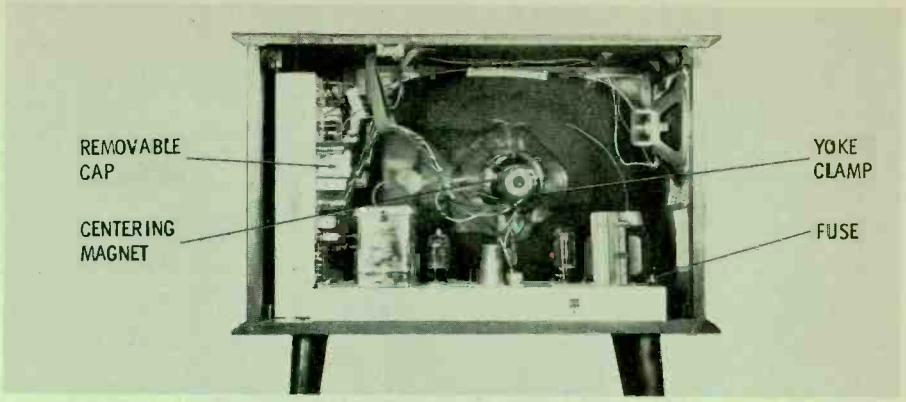
The chassis is a transformer-powered, 18-tube, VHF unit with an "L"-shaped design. Conventional wiring and dip-soldered terminal strips are employed. The video detector diode, a CK706A or 1N60 soldered-in unit, is accessible after removal of the top shield on the third video-IF transformer. A 6DE7 and an EL84/6BQ5 are the newest tube types used.

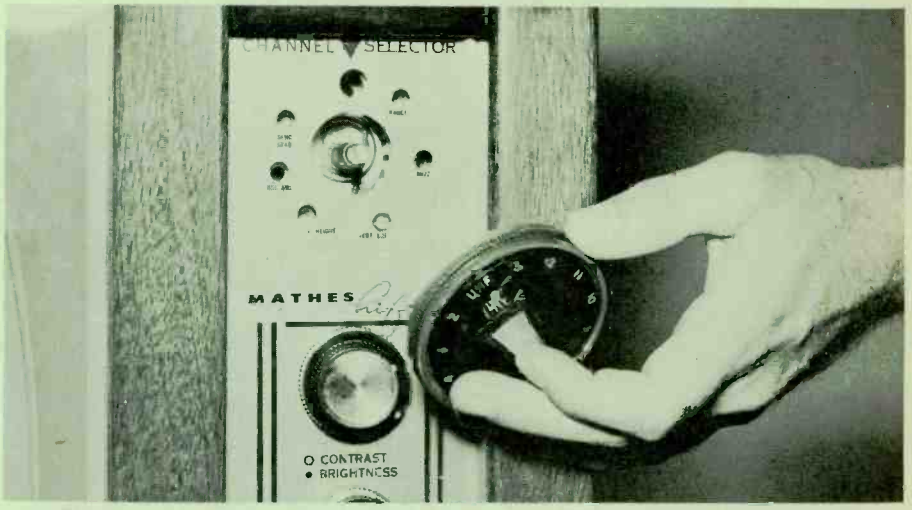
Front controls are located in a vertical line to the right of the picture tube. These include brightness and contrast, push-push type off/on switch in conjunction with the volume control, and horizontal and vertical hold. Some models also include bass and treble controls. Convenient is the word for service adjustments, which are located under the channel-selector and fine-tuning knobs. AGC range, buzz, vertical-linearity, height, VHF oscillator frequency, and sync-stabilizer adjustments are arranged around the tuner shaft, making all but the horizontal circuit adjustments accessible in one place. To adjust AGC range, tune in the strongest station, advance the control setting until the picture distorts or a buzz is heard in the sound, and then retard the setting until the symptom disappears. The sync stabilizer control is adjusted in the same manner.

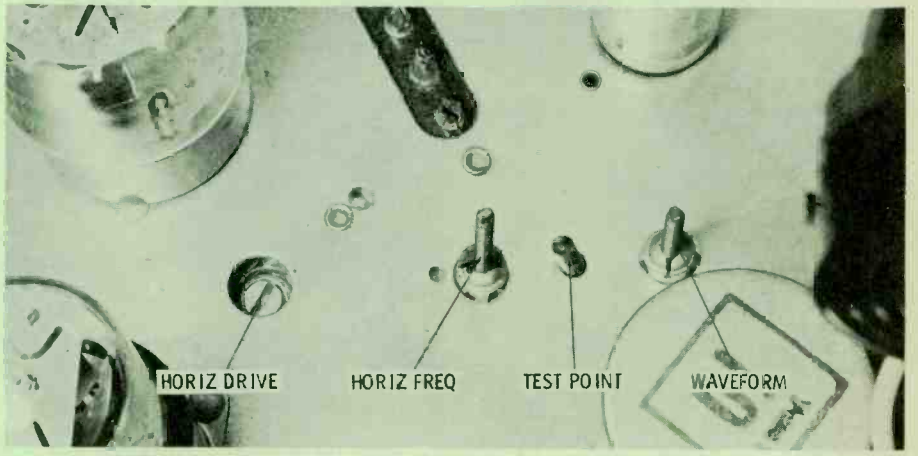
The horizontal circuit adjustments are all grouped on top of the base part of the chassis, just to the right of the 6SN7 horizontal oscillator. The 10K-ohm isolating resistor, used as a scope test point when adjusting the horizontal waveform, makes it possible to perform all horizontal sweep circuit adjustments without removing the chassis.

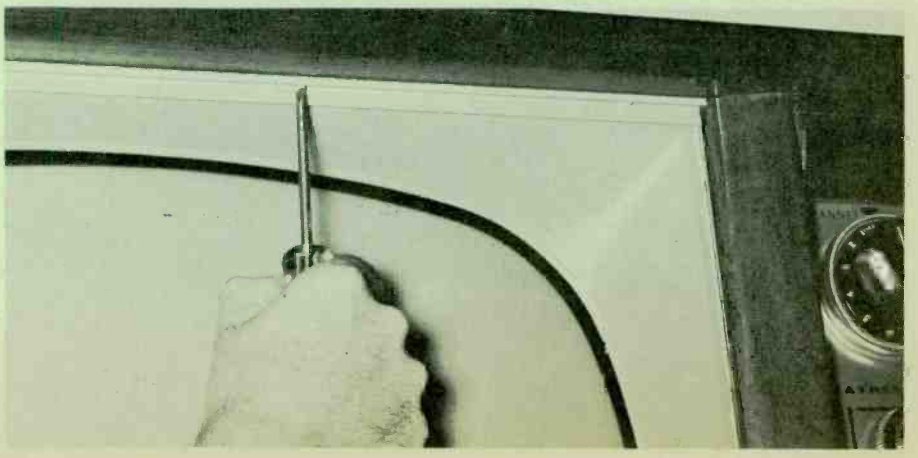
The B+ supply is protected by a 4/10-amp slow-blow fuse which is paralleled by a 100K-ohm resistor. Continuity for the B+ line is provided by a jumper between pins 6 and 7 of the yoke plug. If you have to take the chassis to the shop, a spring-type clamp makes the yoke easy to remove.

The safety glass is easily removed by taking out four Phillips-head screws holding the trim strip along the top. Tilt the glass out and lift up to clear the bottom retaining slot.



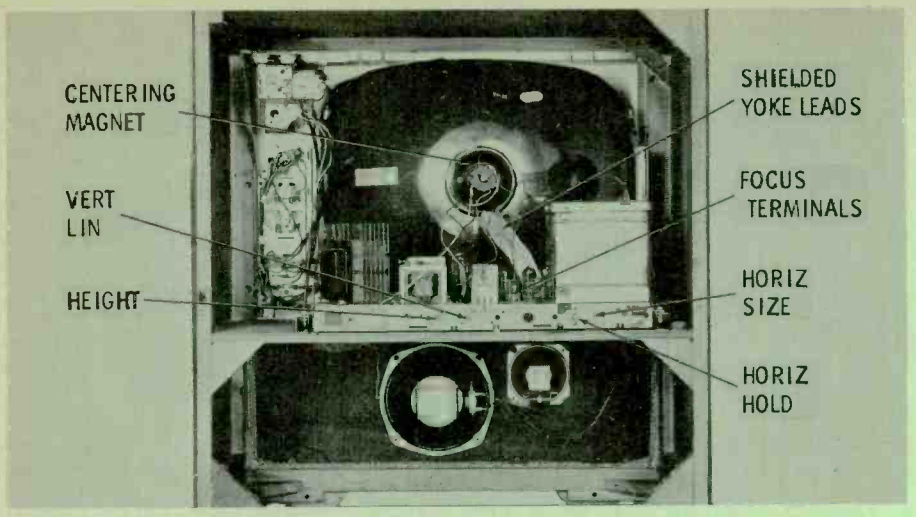


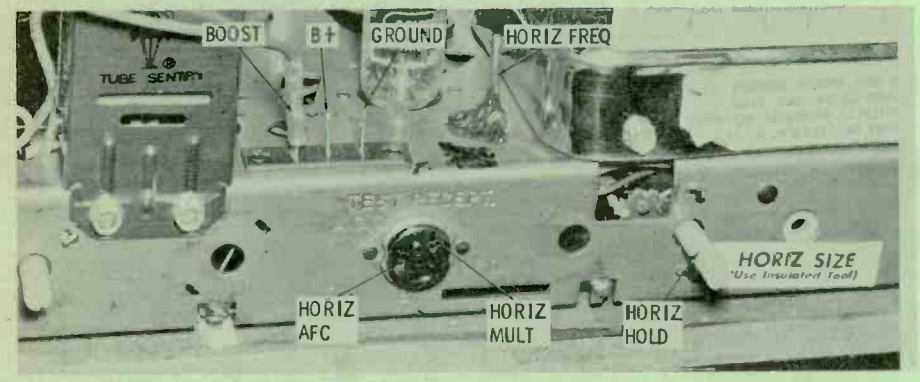


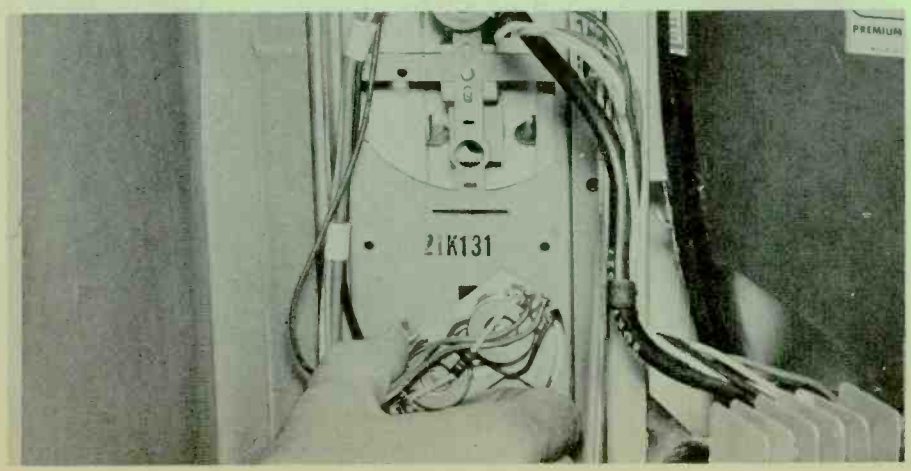


www.americanradiohistory.com

Motorola







Motorola Model 21K131CW Chassis TS-558

This 21" set has a power transformer and a 20-tube VHF chassis. To the right of the 110° picture tube, you'll find a channel-indicator window, channel selector and fine tuning, push-push off/on switch combined with volume and contrast controls, and a tone control. Brightness and vertical hold are adjusted through the use of the slightly protruding thumb-wheel knobs near the bottom of the escutcheon. In this particular model, it is necessary to pull the chassis to make RF oscillator adjustments.

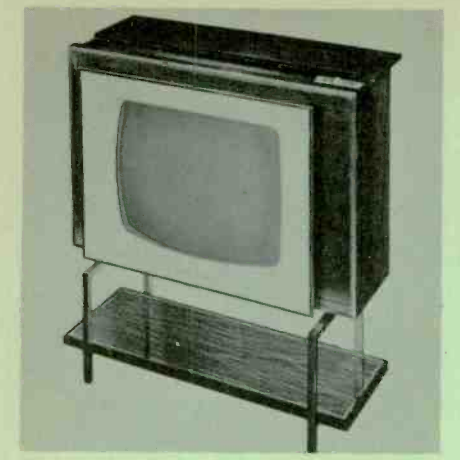
Going around in back, you'll see the 8" and 4" phased speakers mounted on a wooden baffle extending the length of the cabinet. On the back side of the chassis panel, you'll notice a label for the horizontal-size adjustment which states that an insulated tool should be used. This control is in the screen-grid circuit of the horizontal-output tube and is a "hot" control.

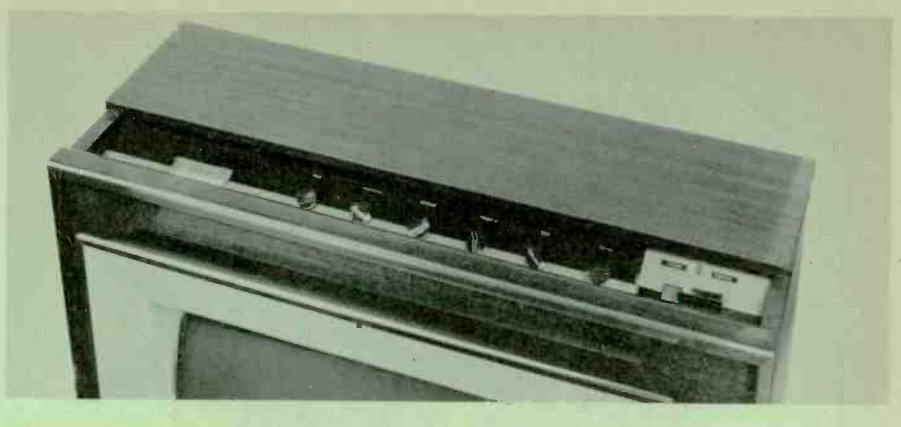
The tube-layout chart on the rear of the high-voltage cage will remind you that you should have some new types such as 6ES8, 6EU8, 6EW6, 6EX6, 6EY6 and 3A3 in the tube caddy. Right next to the cage, you'll see a well-cemented horizontal-frequency adjustment; a soldering gun may have to be used to free the core for adjustment. The focus terminals provide boost, B+ and ground terminals for the slip-over connector from pin 4 of the CRT; take care that you don't receive a shock.

The set is loaded with protective devices. We took out the 6EY6 vertical-output tube to expose the 5-amp fuse protecting the AC line, and the 5/10-amp slow-blow bayonet fuse in the low B+ line. The *Tube Sentry*, a thermal switch that allows the filaments to warm up prior to the application of B+ voltage, is shown in the foreground. In addition, a 2½" length of #26 wire directly below the power transformer protects all of the tube filaments except the two 5U4's.

If you must remove the chassis, you can take the picture tube and chassis (by removing four ⅜" bolts from the bottom) or the chassis only (by taking the four 5/16" bolts out of the top). You'll need the tuner and control panel, too. The brightness and vertical hold controls, with the thumb-wheel knobs, rotate 90° counterclockwise to allow this panel to be removed after taking out its four retaining screws.

www.americanradiohistory.com





Sylvania Model 23S24M Chassis 1-541-9

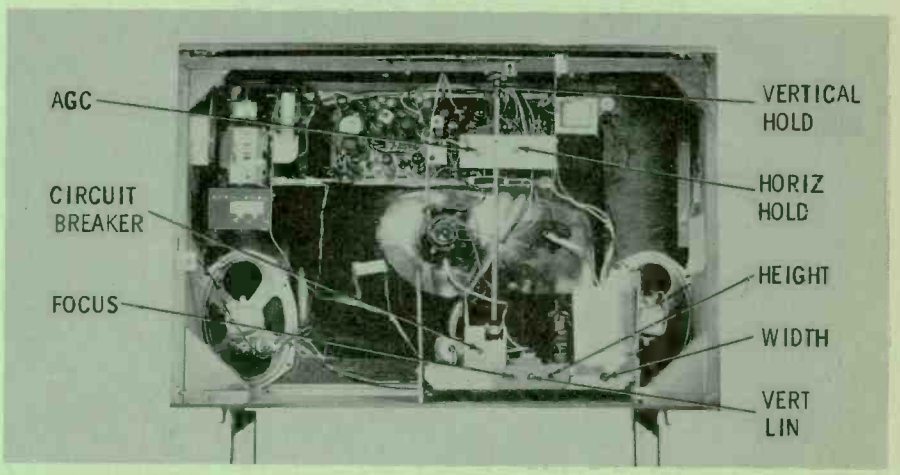
Here's one of the new 23" models with the ultra-thin cabinet design. Named the *Sylouette,* a personalized nameplate is provided to the owner on receipt of the warranty registration. The VHF chassis contains 17 tubes, two selenium rectifiers, and a 1N295A solder-in germanium diode. The picture tube has a laminated safety glass bonded directly to the front. If you have to take the unit into the shop, watch it, because it's very front heavy when removed from the base.

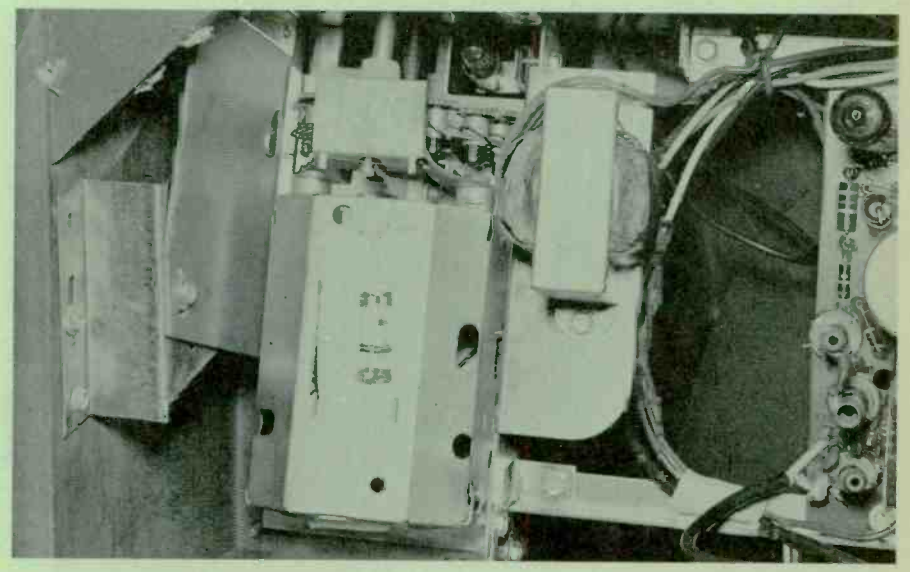
The entire top of the cabinet slides back to reveal the operational controls for *Halolight,* brightness, contrast, volume, tone, off-on, *Picture Prompter* (the fine tuning set-up knob), and a bar-lever type channel selector which ratchets up or down to change only one channel at a time.

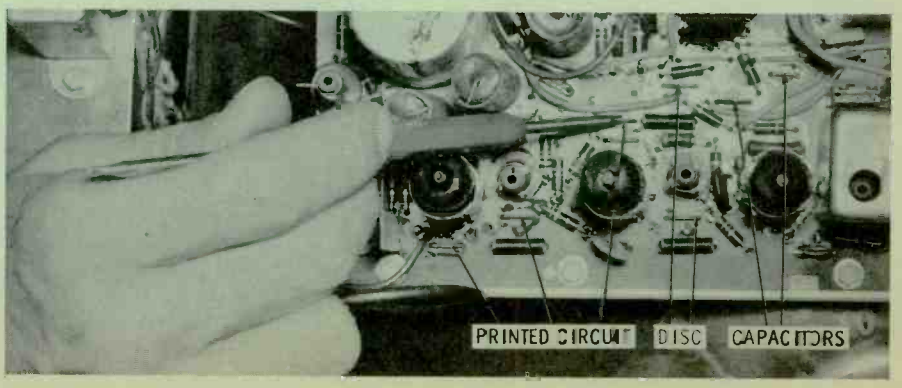
In the back, there is a nylon shaft coming out of a coil with no label. This is the width adjustment. There is also a focus adjustment, which is certainly a welcome service aid. The chassis itself is "hot" and is split into two sections. The bottom chassis contains the selenium-rectifier power supply (protected by a circuit breaker in series with the line), and the vertical and horizontal deflection circuits. It is interesting to note that temperature-compensating resistors are used to reduce frequency drift in the vertical circuits. The top chassis contains the remainder of the circuits on one large printed board. The two 6" x 9" coaxial speakers, phased and coded with colored dots and leads, use plug-in connectors.

Positioning of the tuner makes tube replacement a little tricky. Paying particular attention to the location of the blank pin as you remove a tube will give you a fair start at hitting the socket. This tuner also incorporates the "do-it-yourself" fine tuning adjustments for each channel. The *Picture Prompter* knob positions the individual screws which engage the fine tuning cam.

Referring to the printed board, this is the first application, other than tuners, in which we've seen soldered-in ceramic disc capacitors used. You can use a regular replacement for these units by making the connection to the board in a different location, or by bending the leads in opposite directions and soldering them directly to the printed strip.







www.americanradiohistory.com

See PHOTOFACT Set 434, Folder 1

See PHOTOFACT Set 434, Folder 1

Mfr: Philco **Chassis No. 9H25**

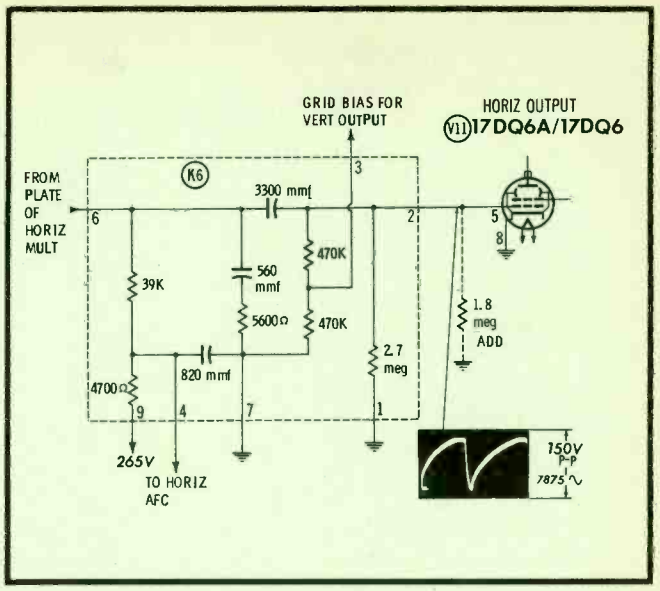
Card No: PH 9H25-1

Section Affected: Pix.

Symptoms: Horizontal drive line.

Cause: Grid circuit of horizontal output tube develops excessive DC bias.

What To Do: Shunt the 2.7-megohm grid resistor in component combination K6 with a 1.8-megohm, ½-watt resistor.



Mfr: Philco **Chassis No. 9H25**

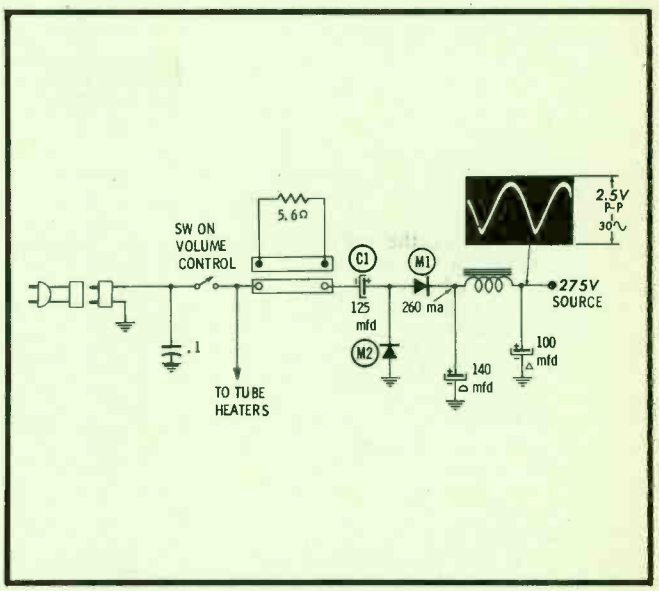
Card No: PH 9H25-2

Section Affected: Pix and sound.

Symptoms: No picture, no sound.

Cause: Low B+ caused by defective input capacitor in power supply.

What To Do: Replace C1 (125 mfd—200V) with new component.



Mfr: Philco **Chassis No. 9H25**

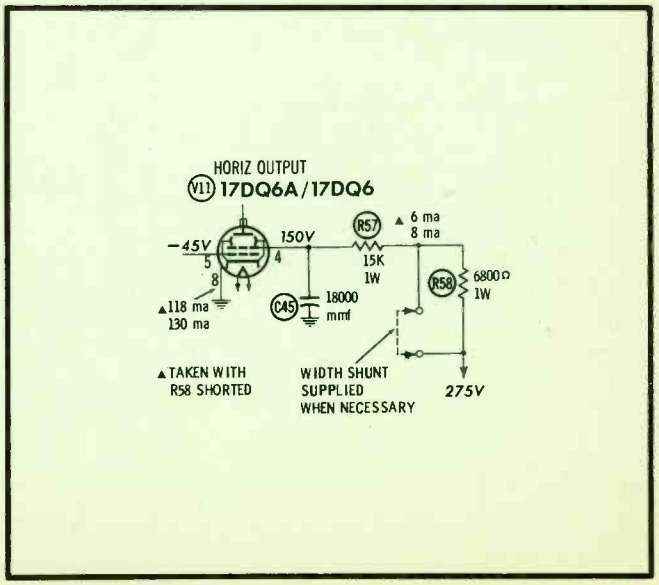
Card No: PH 9H25-3

Section Affected: Raster.

Symptoms: No high voltage. Horizontal output tube (17DQ6A) glows red.

Cause: Shorted screen-bypass capacitor.

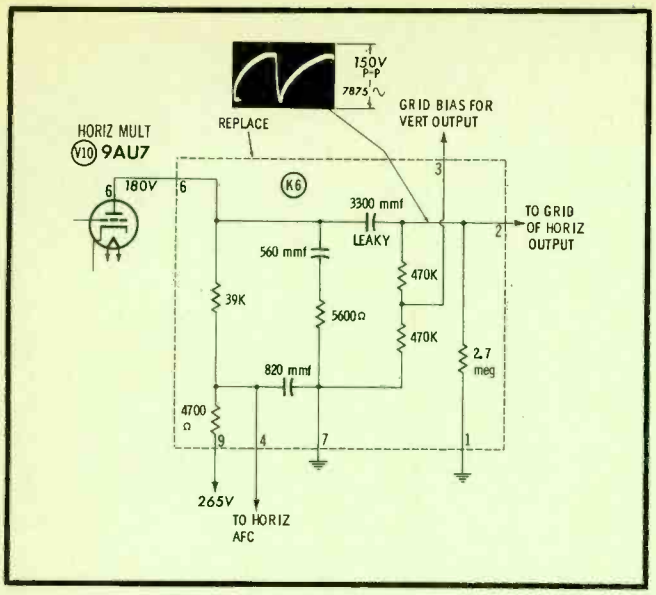
What To Do: Replace C45 (18000 mmf) with new component. Check R57 (15K ohms—1W)—also R58 (6800 ohms—1W) if not shunted by width jumper.



PF REPORTER for January, 1960, Vol. 10, No. 1. PF REPORTER is published monthly by Howard W. Sams & Co., Inc., 2201 E. 46th St., Indianapolis 6, Indiana. Second-class postage paid at Indianapolis, Indiana 1, 2 & 3 year subscription prices: U.S.A., its possessions, and Canada: $4.00, $7.00, $9.00. All other countries: $5.00, $9.00, $12.00. Current single issue 35c each; back issues 50c each.

www.americanradiohistory.com

See PHOTOFACT Set 434, Folder 1



See PHOTOFACT Set 434, Folder 1

Mfr: Philco **Chassis No. 9H25**

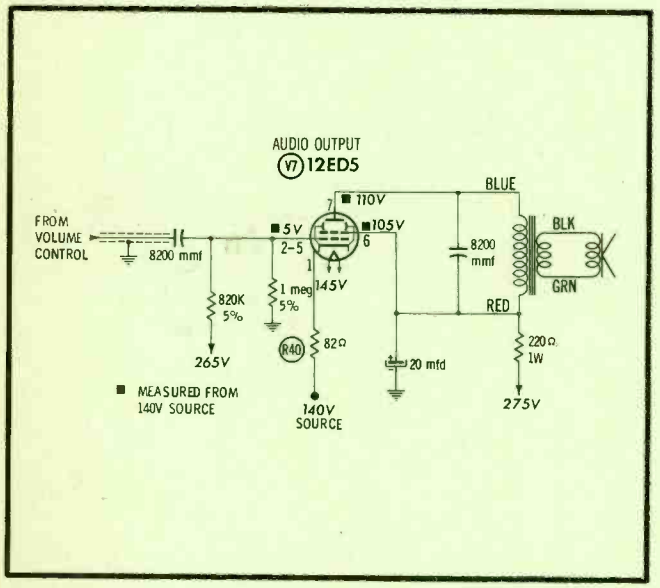
Card No: PH 9H25-4

Section Affected: Raster.

Symptoms: Insufficient horizontal drive, poor linearity.

Cause: Leaky 3300-mmf capacitor in component combination K6.

What To Do: Replace entire unit K6 (Philco part number 30-6526-2).



Mfr: Philco **Chassis No. 9H25**

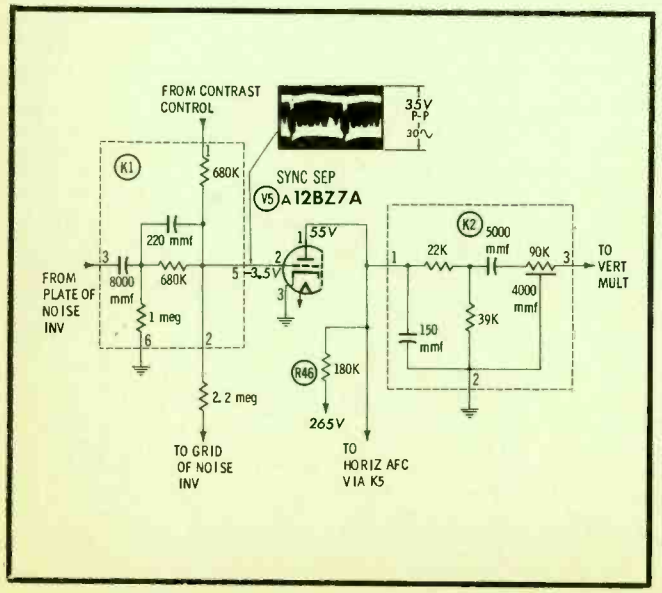
Card No: PH 9H25-5

Section Affected: Pix and sound.

Symptoms: Weak picture, distorted sound.

Cause: Cathode resistor of audio output tube increased in value (usually burned) due to gassy 12ED5 drawing too much current.

What To Do: Replace audio output tube V7 (12ED5) and R40 (82 ohms—½W).



Mfr: Philco **Chassis No. 9H25**

Card No: PH 9H25-6

Section Affected: Sync.

Symptoms: Poor vertical and horizontal sync.

Cause: Increase in value of plate-load resistor in sync-separator stage.

What To Do: Replace R46 (180K).

www.americanradiohistory.com

See PHOTOFACT Set 400, Folder 4

Mfr: RCA **Chassis No. KCS116B**

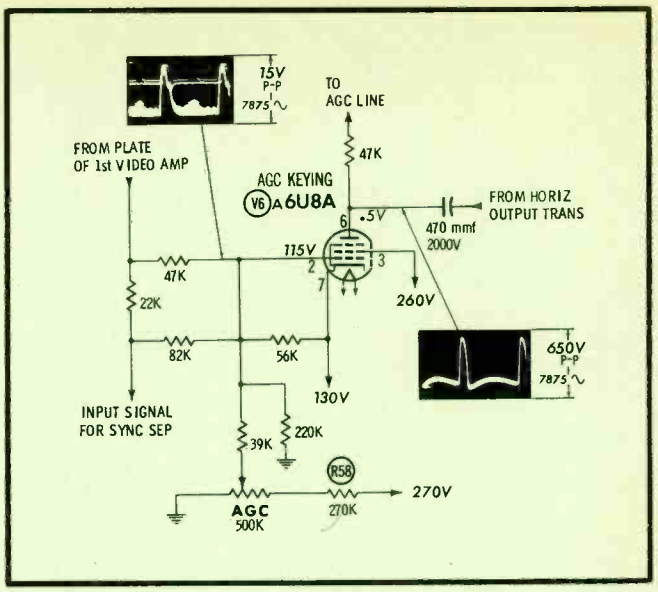
Card No: RCA 116B-1

Section Affected: Pix.

Symptoms: Picture gradually overloads (contrast becomes excessive).

Cause: AGC circuit resistor increases in value.

What To Do: Replace R58 (270K).



Mfr: RCA **Chassis No. KCS116B**

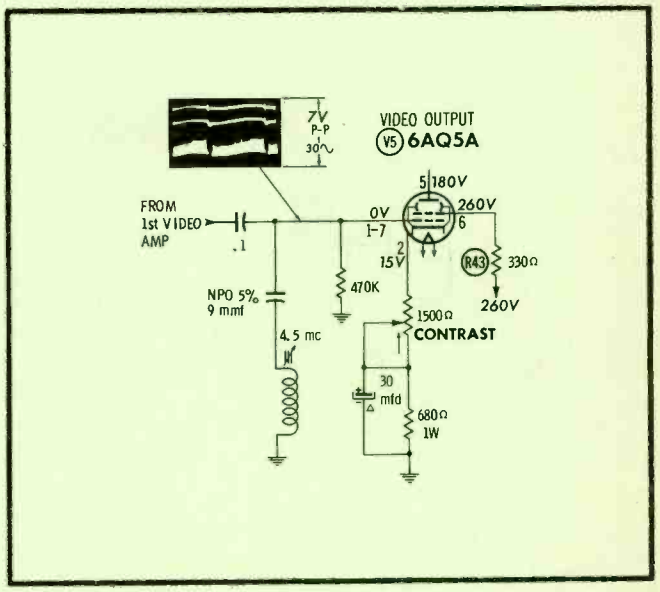
Card No: RCA 116B-2

Section Affected: Pix.

Symptoms: Video flashes on and off.

Cause: Screen resistor of video output tube burned; either increased in value or completely open.

What To Do: Replace R43 (330 ohms—½W) and check V5 (6AQ5A) for possible shorts.



Mfr: RCA **Chassis No. KCS116B**

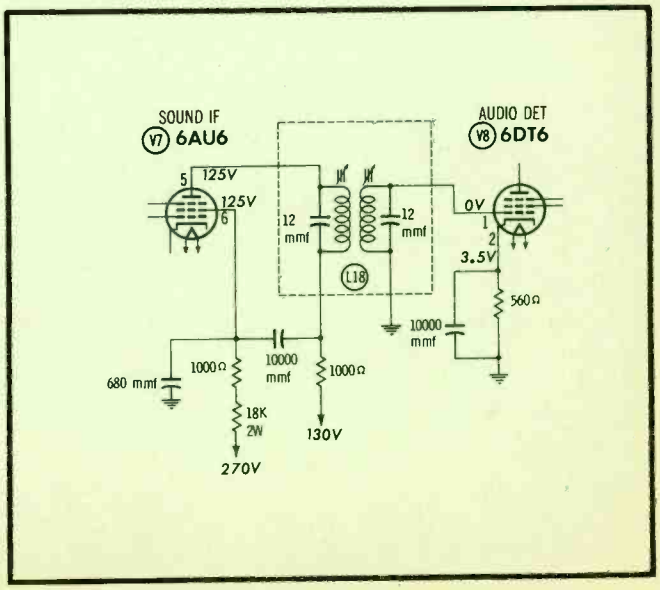
Card No: RCA 116B-3

Section Affected: Sound.

Symptoms: Sound fades on and off.

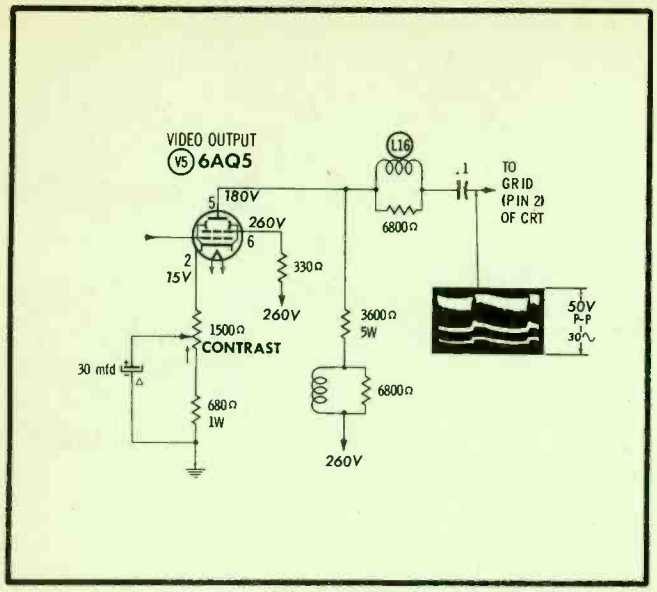
Cause: Terminals of sound-detector input transformer are not properly soldered to printed-circuit board.

What To Do: Resolder terminals of L18.



www.americanradiohistory.com

See PHOTOFACT Set 400, Folder 4



See PHOTOFACT Set 400, Folder 4

Mfr: RCA **Chassis No. KCS116B**

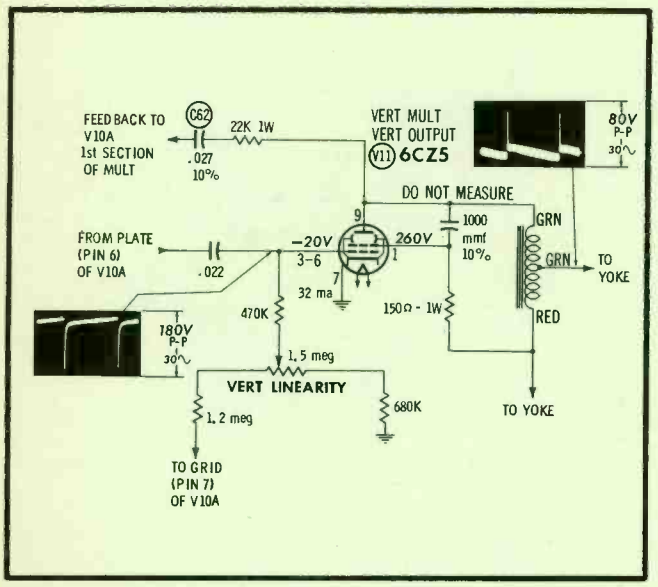
Card No: RCA 116B-4

Section Affected: Pix.

Symptoms: Intermittent smearing of video.

Cause: Open peaking coil in video output circuit.

What To Do: Resolder pigtails of L16.



Mfr: RCA **Chassis No. KCS116B**

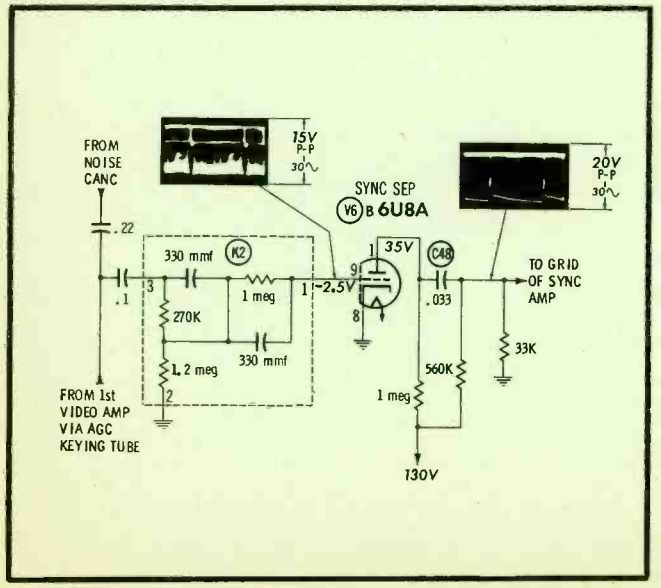
Card No: RCA 116B-5

Section Affected: Sync.

Symptoms: Vertical sweep frequency drifts out of range of hold control.

Cause: Leaky feedback capacitor in vertical multivibrator circuit.

What To Do: Replace C62 (.027 mfd).



Mfr: RCA **Chassis No. KCS116B**

Card No: RCA 116B-6

Section Affected: Sync.

Symptoms: Picture tears horizontally; vertical hold is poor.

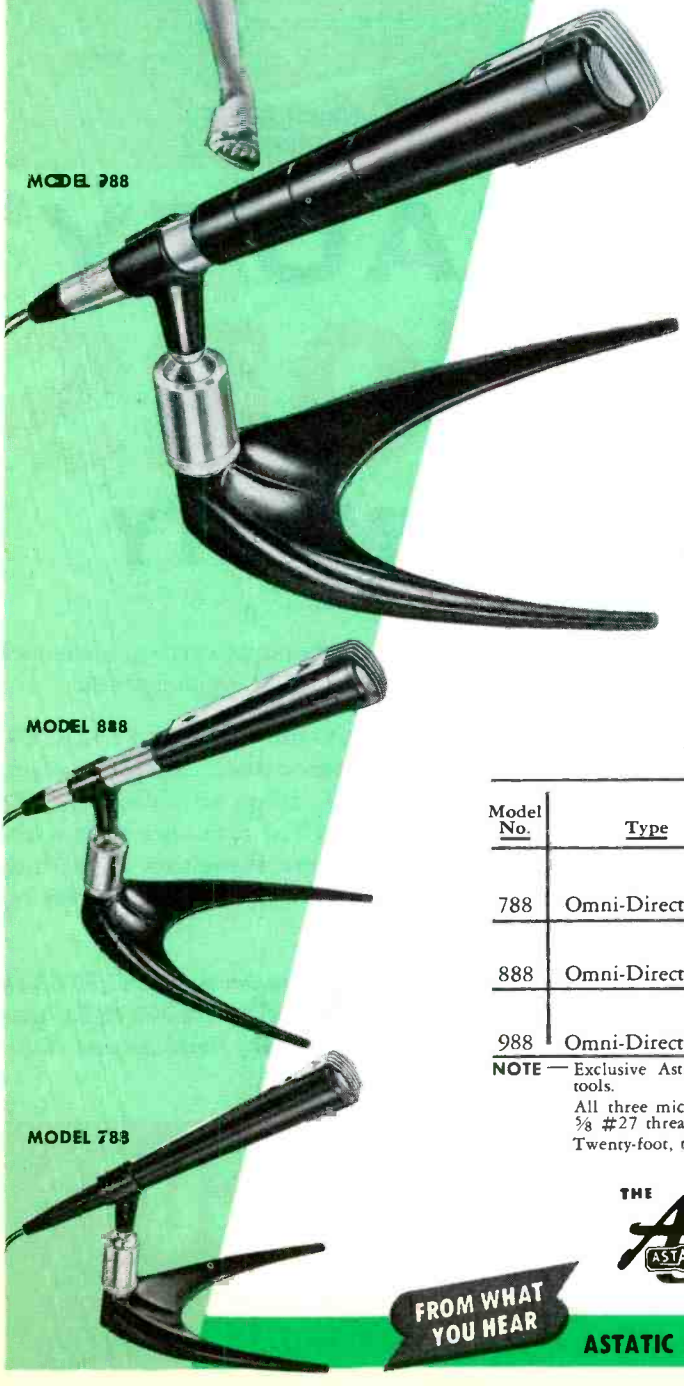
Cause: Leaky capacitor in plate circuit of sync separator.

What To Do: Replace C48 (.033 mfd).

www.americanradiohistory.com

FUTURA TRIPLETS...

three models... superbly styled... covering a wide range of applications



ASTATIC'S FUTURA SERIES DYNAMIC MICROPHONES

Most versatile performers in the microphone field are the Astatic Futura Series Dynamic Microphones—Models Metro 788, Tempo 888, and Vogue 988. Beautifully styled, encompassing the newest and most advanced principles in microphone engineering, each model is designed to outperform any other microphone in its price class.

Futura mikes are instantly convertible from hand to stand to lavalier use... offer many special features such as rugged, stable, fatigue-free Mylar diaphragm and, on the 888 and 988, the Cannon XLR-3 connector for instant detachment from cable ("Take the microphone to the cable.")

Model No.	Type	Response	Output	Impedance	Finish and Trim	Price
788	Omni-Directional	60-13,000 cps	-55 DB	Hi or 150	Black and Gold	$ 79.50
888	Omni-Directional	50-15,000 cps	-56 DB	50, 200, Hi	Black and Chrome	110.00
988	Omni-Directional	40-20,000 cps	-58 DB	50, 150, 250	Black and Gold	150.00

NOTE — Exclusive Astatic impedance selector permits instant choice of impedance without special tools.

All three microphones come complete with lavalier and belt clip, 360° swivel adaptor for 5/8 #27 thread.

Twenty-foot, two-conductor, shielded cable supplied with each microphone.

THE Astatic CORPORATION, CONNEAUT, OHIO

In Canada: Canadian Astatic Limited, Toronto, Ontario
Export Sales: Roburn Agencies Inc.
431 Greenwich St., N. Y. 13, N. Y., U.S.A.

FROM WHAT YOU HEAR

ASTATIC MICROPHONES ARE A SENSATION ON ANY INSTALLATION

www.americanradiohistory.com

DIFILM®

BLACK BEAUTY®
CAPACITORS
BEAT HEAT AND HUMIDITY

New DIFILM Black Beauty Capacitors lead the way in tubulars! The operating temperature range of these new capacitors goes up to 105 C (221 F) *without voltage derating.* Capacitance tolerance is held to ± 10%.*

- The new dual dielectric used in DIFILM Capacitors combines the proven long life of paper capacitors with the effective moisture resistance of polyester plastic film capacitors . . . to give you performance that can't be beat.
- Here's the kind of performance you can expect from DIFILM: very high insulation resistance, low power factor, moderate capacitance change with temperature, excellent retrace under temperature cycling, and superior long-term stability . . . *all at regular prices!*
- This high performance is fully protected by HCX®, an exclusive Sprague hydrocarbon material which impregnates the windings, filling all voids and pinholes before it polymerizes. The result is a solid rock-hard capacitor section. These capacitors are further protected by an outer molding of humidity-resistant, non-flammable phenolic.

For complete technical information on DIFILM Black Beauty Capacitors, write for Bulletin M-759 to Sprague Products Company, 105 Marshall St., North Adams, Mass.

*From .001μF up

The major capacitor improvements come from

SPRAGUE®
world's largest capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU

www.americanradiohistory.com

publisher
Howard W. Sams

general manager
Mal Parks, Jr.

editor
Verne M. Ray

associate editors
Leslie D. Deane
Thomas A. Lesh
Joe A. Groves

consulting editors
William E. Burke
Robert B. Dunham
George B. Mann
C. P. Oliphant
Paul C. Smith

art director
Don W. Bradley

advertising & editorial assistants
Georgeanna Caldwell
Margaret Spiegal

production manager
Robert N. Rippy

circulation fulfillment
Pat Tidd, Mgr.
Constance McCawley, Ass't.

photography
Robert W. Reed

advertising sales offices

Midwestern
John Groce, PF REPORTER
2201 East 46th Street, Indianapolis 6, Ind.
Clifford 3-6441

Eastern
Cliff Landis
Corning Glass Building,
717 Fifth Ave., New York 22, N. Y.
MUrray Hill 8-6350

Western
The Maurice A. Kimball Co., Inc.
2550 Beverly Blvd., Los Angeles 57, Calif.
Dunkirk 8-6178; and 681 Market Street,
San Francisco 5, Calif. Exbrook 2-3365

Address all correspondence relating to circulation and editorial to PF REPORTER, 2201 East 46th Street, Indianapolis 6, Indiana

Copyright © 1960 by Howard W. Sams & Co., Inc. PF REPORTER is a trademark of Howard W. Sams & Co., Inc. No part of PF REPORTER may be reproduced without written permission. No patent liability is assumed with respect to use of information herein. Acceptance of advertising does not in any manner signify the products, policies and services so advertised have been approved, endorsed or recommended by this magazine.

PF PHOTOFACT REPORTER®
including Electronic Servicing

VOLUME 10, No. 1 JANUARY, 1960

CONTENTS

ABOUT THE COVER

Our cover serviceman is in the process of using one of the many methods developed for circuit-tracing printed boards. While it makes for unusual photography, this procedure is being rapidly outmoded now that manufacturers are including circuit-tracing aids in their newest printed board designs.

(See story on page 34.)

www.americanradiohistory.com

Introducing ATR CUSTOMIZED Karadio

Can be installed in dash or under dash as desired!

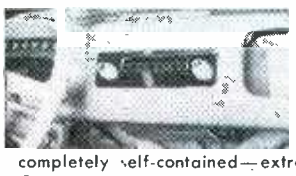
for small import cars and compact U.S. cars

There is a trim plate kit for YOUR CAR!

ATR CUSTOMIZED Karadio

• VIBRATOR-OPERATED with Tone Control

The ATR Customized Karadio is a compact, new, self-contained airplane-styled radio for small import and compact American cars. This economical unit is perfect for all small cars because it can be easily and inexpensively installed in-dash or under-dash on most any make or model automobile—and its powerful 8-tube performance provides remarkable freedom from engine, static, and road noises. ATR Karadios are built to look and fit like original equipment with sleek, modern styling and solid, single-unit construction. They offer many customized features and provide highest quality fidelity—yet cost far less than comparably designed units. The ATR Customized Karadio comes complete with speaker and ready to install . . . and is the ideal way to add fun and value to your small import or American automobile!



ATR KARADIO . . . is ideal for small import cars or compact American cars! Unit is completely self-contained—extremely compact! Can be mounted in-dash or under-dash—wherever space permits! For 6 volt or 12 volt!

SEE YOUR JOBBER OR WRITE FACTORY

• "A" Battery Eliminators • DC-AC Inverters • Auto Radio Vibrators

ATR AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA, U. S. A.

Letters to the EDITOR

Dear Editor:

As a dealer who likes your publication and owns nearly everything your company prints, I have generally agreed with the policies of PF REPORTER. However, I dislike the inclusion of advertising on Japanese products. We should discourage use of these products, which are manufactured under working conditions far below U.S.A. standards.

WARREN G. KUNKLE
Denver, Colorado

See statement of policy below.—Ed.

Dear Editor:

I think your covers are very informative, as well as amusing at times. With this business being as difficult and trying as it sometimes gets (and I've been in the electronics field for nine years), a little comic relief is often welcomed. Concerning the bee on the repairman's nose in the August cover, maybe Mr. Koutnik thinks a hornet on the neck would be better. This actually happened to me; I got stung three times. So, although the cover was amusing, it can also be taken at face value.

CURT BENTHAM
Willsboro, N. Y.

Dear Editor:

"All work and no play makes Jerry (Koutnik—November *Letters*) a dull boy." We hope, for his customers' sake, that he enjoys a good laugh at himself once in a while.

Personally, I love the humorous twist which some of your covers have portrayed on past issues. In fact, I feel somewhat let down when I find my fellow serviceman on a new cover looking all sober and serious—and even forbidding—when I expected a friendly, witty greeting!

PAUL RAKYTA
Torrington, Conn.

Dear Editor:

Your very amusing nontechnical covers never fail to relax me and get me off to a good start when reading your magazine. Just think how many times a serviceman finds himself in an amusing situation of his own making, let alone one he has no control over. We are tired of highly technical covers; yours have almost convinced my wife electronic people are human.

Even a serviceman should smile once in a while!

LES RUDOLPH
Phoenix, Ariz.

Dear Editor:

What does Jerry want us to be—bookworms? The pictures on your covers tell a human interest story with a laugh, and in this trade we can use quite a few laughs. Please don't go back to a strictly technical cover; let's be humane.

JOE DIMOND
Monroe, Ore.

Dear Editor:

You're so right about your covers—you edit the magazine for ALL your readers. Since this world is made up of all kinds of people, you've got to have a cover variety. As for myself, I like the cute girlie type; that always catches the eye.

What would this world be without some comic relief? Look how the humorous cards are selling at the corner drug store. In other words, "Eat, drink, and be merry, because tomorrow your picture tube may blow."

C. T. BOBULSKI
Granby, Mass.

We're happy to know that our past covers have been good for so many chuckles. Not to run a good thing into the ground, however, we plan to continue using a mixture of humorous and "straight-faced" cover subjects. We try to portray candid snapshots from the life of a serviceman—which, you'd hasten to agree, is not all smiles. But it does have its lighter moments, and we're glad you like to be reminded of them.—Ed.

Dear Editor:

I just received my October issue of PF REPORTER and I see you made Mr. John Standen very unhappy. A good full-time TV serviceman has nothing to fear from us part-timers.

I guess no one told Mr. Standen what makes a part-timer do well. Let me tell him then; just three reasons will be enough to start with.

1. Who operates a great number of

• *Please turn to page 19*

STATEMENT OF REPORTER ADVERTISING POLICY

We believe it is our responsibility to bring to our readers information on products and services available to them on the American market.

We will not knowingly accept advertising in PF REPORTER of foreign made products unless the country of origin is clearly stated.

Acceptance of advertising does not in any manner signify the products, policies and services have been approved, endorsed or recommended by this magazine.

We advocate support of products made in America by American workers available through electronic parts distributors.

Howard W. Sams

www.americanradiohistory.com

GET more! DO more! MAKE more!

PROFIT PROFESSIONALLY ON EVERY CALL WITH

NEW B&K LOW-COST PROFESSIONAL Model 550 DYNA-QUIK

DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

Model 550

NET $119.95

Every service-technician now can easily check tubes the B&K professional way! Only with a *genuine dynamic mutual conductance tube tester* can you make a complete and accurate test under the actual dynamic operating conditions of the TV set. The compact new "550" is not just an emission checker. *It completely checks more tubes faster*—with laboratory accuracy. And the cost is so amazingly low, it pays its way over and over again! Take a tip from thousands of professional servicemen—*use B&K Dyna-Quik*. There is nothing like it.

Get More for Your Money
—IN SPEED, ACCURACY, AND VALUE

Save Customers
—SAVE CALL-BACKS, SAVE COST

Sell More Tubes
—MAKE MORE MONEY PER CALL

MODEL 550 DYNA-QUIK TUBE TESTER

Tests Each Section of Dual-Section Tubes Separately

Great new value in professional quick-check at small cost. Provides **more** tube sockets to test **more** tubes faster. Accurately checks most of the TV and radio tubes usually encountered in everyday service work. Tests each section of dual-section tubes separately. **Measures true dynamic mutual conductance.** Checks tubes for shorts, grid emission, gas content, and leakage. Completely tests each tube in seconds, checks average TV set in a few minutes, in home or shop. One switch tests everything. Fast, convenient reference listings on socket panel. Patented circuit provides automatic line voltage compensation. 7-pin and 9-pin straighteners on panel. Handsome, luggage-type carrying case. Net, **$119.95**

MODEL 650 DELUXE DYNA-QUIK

Today's Finest Portable Tube and Transistor Tester

Accurately checks over 99% of the tubes most widely used in television receivers, plus popular home and portable radio tubes. Tests over 600 tube types. Lists over 125 most popular tube types, with settings, on socket panels for maximum operating speed. Complete listing in fast, index-type selector. **Measures true dynamic mutual conductance.** Tests each section of multiple tubes separately for GM, Shorts, Grid Emission, Gas Content and Life. Includes 16 spare sockets and ample filament voltages for future new tube types. **Transistor Section** checks transistors, diodes, and selenium rectifiers. Luggage-type carrying case. Net, **$169.95**

Model 650

B&K

B&K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

See Your Distributor or Send Now for Bulletin ST24-R

www.americanradiohistory.com

The Most Dramatic Guarantee In Picture Tube History:

The Quality Stays

Raytheon TV Tubes Work Fine . . .

www.americanradiohistory.com

Or Raytheon Pays!

Only Raytheon dares to make this offer:

No if's, and's or but's. If any Raytheon picture tube fails within one year of installation, the Bonded Service Dealer who installed it *will be reimbursed for the cost of his time in making the call-back.*

Of course, he also gets a new picture tube free, as provided by the warranty.

Raytheon distributors are authorized to issue a full $5 credit memo. All you do is fill out the form. The tube must work without a fuss, or you charge the call-back cost to us.

Raytheon makes this offer only because of the outstanding quality of its picture tubes, manufactured to meet strictest original equipment manufacturers' requirements. No other picture tube ever undergoes more torture tests, more inspections, more rigid, rugged double-checks before it comes to your shop.

That's why Raytheon, and only Raytheon, dares to make this offer. When you buy a Raytheon picture tube, you *know* it will perform, or we cover the call-back. Raytheon tubes are made to *last . . . and the price is right, too.*

RAYTHEON BONDED TV-RADIO SERVICE

A One-Year Call-Back Guarantee

This offer is made to Raytheon Bonded Dealers only, because of Raytheon's willingness to stand back of the integrity of its Bonded Dealers. See your Raytheon distributor and learn how *you* can become Bonded, too.

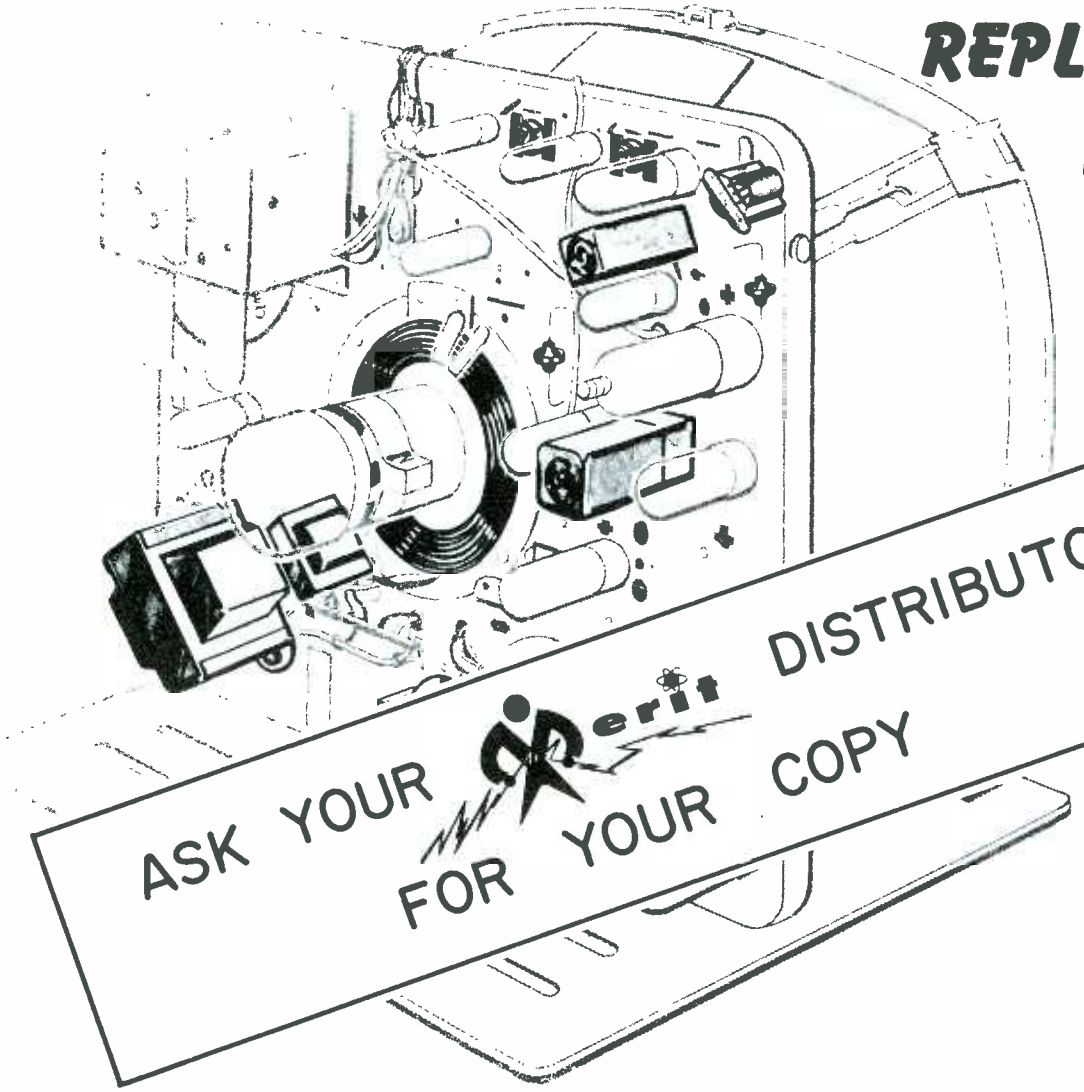
Or Our Money's On The Line!

RAYTHEON

www.americanradiohistory.com

over ... 6000 ... exact

MERIT



REPLACEMENT components in this GUIDE

ASK YOUR Merit DISTRIBUTOR FOR YOUR COPY

FORM NO. 7000

To find or install over 10,000 additional MERIT replacements with slight alterations call or see your MERIT DISTRIBUTOR who has the most complete and up-to-date Replacement Guide in the business today for service to YOU.

Merit Coil and Transformer Corporation

MERIT PLAZA - HOLLYWOOD, FLORIDA

www.americanradiohistory.com

PHILCO ...THE LAST WORD IN

THE FIRST NAME IN ELECTRONICS QUALITY

Because the Philco name is symbolic of quality, long-life Philco tubes are the FIRST CHOICE of quality-wise technicians. It will pay you to use them for all replacements—TV, radio and hi-fi. Their proven reliability protects your profits. In addition, the prestige of the Philco name builds customer good will. For top performance in receiving tubes as well as CR picture tubes and all other replacement parts, look to Philco—the first name in electronics...the last word in quality!

SEE YOUR PHILCO DISTRIBUTOR. Get the facts about the Philco Sweetheart Offer for Valentine's Day

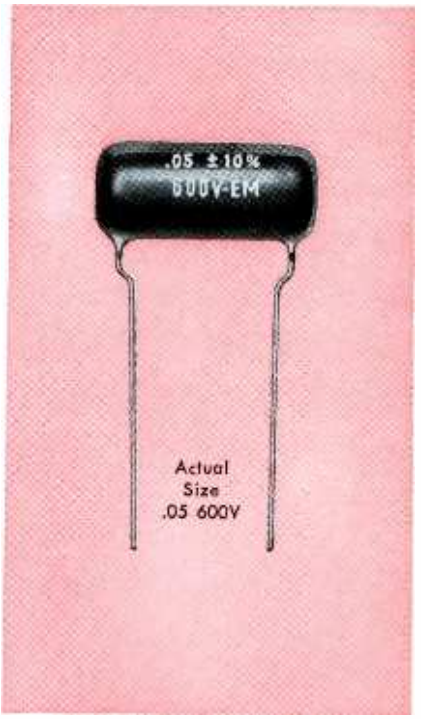
PHILCO Famous for QUALITY the World Over

PHILCO ACCESSORY DIVISION *WORLD-WIDE DISTRIBUTION*

Service Parts • Power-Packed Batteries • Universal Components • Long-Life Tubes • Heavy Duty Rotors • Star Bright 20/20 Picture Tubes • Long Distance Antennas • Appliance Parts - Laundry Parts • Universal Parts and Accessories.

www.americanradiohistory.com

the BIG SWITCH is to MINIATURIZED ELMENCO dp dipped mylar* - paper capacitors



The revolutionary LOW COST capacitor that puts an end to "Call-Backs"

RELIABILITY . . . Elmenco dp Mylar*-Paper Capacitors have achieved a reliability that meet missile and computer requirements. They are thoroughly and continually tested during production to insure outstanding performance. For example a 0.1 mfd. dp capacitor operated at full rated voltage and at 105° C will have a life expectancy of more than 7,168,000 unit hours.

MOISTURE-PROOF . . . Elmenco dp Capacitors are specially processed and vacuum dipped to obtain solid impregnation and a rugged moisture-proof coat designed to withstand *4 times more humidity* than the best molded capacitors used in the past.

MINIATURIZED . . . These capacitors are 50% smaller than other brands and can be used in printed circuit and transistor application. Thousands of service technicians are switching to Elmenco dp quality Capacitors. Why not see your Arco distributor today and get the best.

For full information write for Bulletin PJ60

Look for the Arco dp 5-PAK on the big blue and yellow display rack!

Each value packed 5 to a 5-PAK in transparent bag for your convenience.

* Dupont Trademark

ARCO electronics inc.
64 White St., New York 13, N. Y.
Branches: Dallas 19 • Los Angeles 35

www.americanradiohistory.com

Letters

(Continued from page 12)

the supermarket and drugstore tube testers? The full-time TV shop owners. They are making TV servicemen out of every set owner.

2. Just one week ago I received a call from an old lady. She told me a friend gave her my number. Her set was dead, and a full-timer said she needed a new picture tube. A 5U4 and readjustment of a tampered with ion-trap fixed it.
3. Two days later, another call from a new customer. Same deal—sound, but no raster. A full-timer said the picture tube was gone. Well, a new fuse fixed it.

I could list a hundred more cases just like these.

Keep up the good work, full-timers. Soon you'll be part-timers and us little "know-nothings" will be full-timers.

C. H. BOND

South Baintree, Mass.

Dear Editor:

In the May *Dollar & Sense Servicing* column, you mention a TV shop that uses the word "service" instead of "labor" on their invoice form. An admirable idea—I've used it for years with much success . . . until I came up with "tech service," which works even better.

T. A. EGAN

Beverly Hills, Calif.

Dear Editor:

I replaced an open brightness control on a Sylvania Model 326BU with an exact duplicate of the control which was in the set. The replacement heated up, but I could not find anything else wrong. Finally, I looked in PHOTOFACT Set 234—and my troubles were over. The brightness control was listed as a ½-watt, 1-meg unit. The one I found in the receiver was a 4-watt, 100-ohm pot! It was neatly soldered and looked as if it had been in the set for some time.

CLYDE WINTON

Anderson, Ind.

You were sure asleep at the controls on that one, Clyde!—Ed.

Dear Editor:

"Let's Talk About Vertical Sweep Systems (August issue) is worth a whole year's subscription. Let's have more along this line.

CHARLES F. UNGER

White Plains, N. Y.

We will.—Ed.

Dear Editor:

After reading the article "Servicing Electronic Organs" by Jack Beever (July issue), I would like to get more information about schematics and service data. Being a musician of long standing and also a radio and TV serviceman, I believe I should be able to combine my knowledge of both fields to my advantage.

JAMES J. SURMAN

Munhall, Pa.

A complete book on electronic organs

• *Please turn to page 24*

USE MINIATURIZED

ELMENCO

DISC CERAMIC CAPACITORS

Actual Size .01 ±10% 1000WV.

The Ultimate in Dependable Performance!

RELIABILITY . . . The use of special ceramic materials in Elmenco Disc Ceramic capacitors impart longer life and greater stability. Higher voltage ratings greatly improve reliability by providing extra reserve for resistance to surges and temporary overloads.

MOISTURE RESISTANT . . . Elmenco Disc Ceramics are processed with a rugged phenolic coating and high temperature wax impregnation which gives them a superior moisture resistance and physical strength.

SPACE SAVERS . . . Elmenco Disc Ceramics are smaller than comparable capacitors of the same value. The miniature size is designed to offer greater service convenience with complete safety of operation.

NEW PACKAGING . . . Now packed in durable, compact plastic boxes at no extra cost. Each box contains five disc ceramic capacitors of the desired rating. Leads are kept straight . . . capacitors are always factory clean.

Available at ARCO Distributors Everywhere

For full details write for catalog # P-115

ARCO electronics inc.

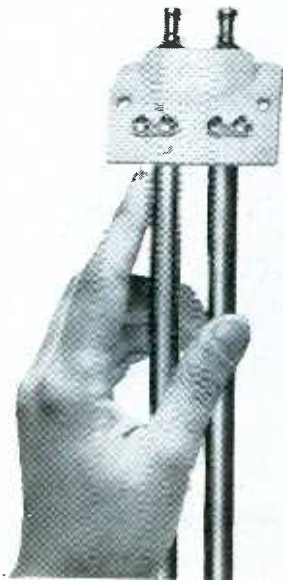
64 White St., New York 13, N. Y. • Branches: Los Angeles 35 • Dallas 19

www.americanradiohistory.com

50% OF ALL TV SETS MADE TODAY ARE PORTABLE AND TOTE-ABLE TYPES. THIS WILL ADD UP TO $3,500,000 IN EXACT REPLACEMENT ANTENNA VOLUME IN 1960 FOR FORWARD-THINKING DISTRIBUTORS AND DEALERS WHO PREPARE FOR IT TODAY! . . . WITH THE JFD EXACT REPLACEMENT ANTENNA MERCHANDISING PLAN.

Model TA359 List, $4.50
Exact Replacement for RCA, Motorola, Magnavox, 1956-7-8 Portable TV Sets

Model TA362 List, $9.75
Exact Replacement for GE Designer and Hotpoint "Flair" 1958 Portable TV Sets



Model TA369 List, $8.25
Exact Replacement for RCA 1960 Portable TV Sets

WHERE WOULD YOU GET **ANY** AND **EVERY** ANTENNA REPLACEMENT FOR PORTABLE AND TOTEABLE SETS?

JFD*

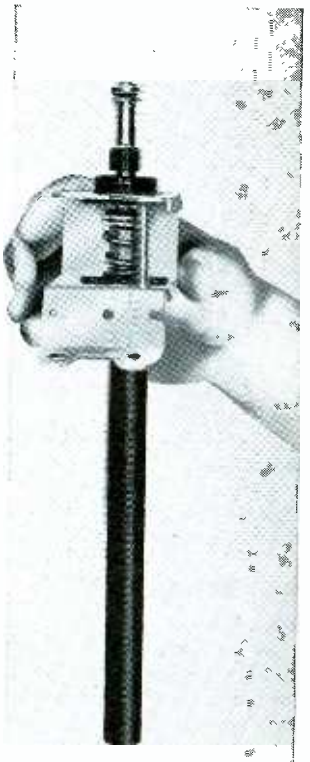
OF COURSE!

Only when you buy a JFD Exact Replacement Antenna do you get the original unit that JFD supplies to manufacturers for their TV portable or "tote-able" sets. And when you install a JFD Exact Replacement Antenna *you* make a *full* profit on the sale and the installation—bring customers back to *your* shop because only you are equipped to replace a broken antenna.

Only $11.95 puts you back in profitable indoor antenna business. That's all it costs for the No. PA500 JFD Exact Replacement Antenna Merchandising Kit that gets you started in this new multi-million dollar service market.

Remember, next to receiving tubes, the antennas of portable and "tote-able" sets require the most frequent replacement.

See your JFD distributor today for your PA 500 kit and any and every antenna replacement need.



Model TA370 List, $6.25
Exact Replacement for Admiral 1959-60 Portable TV Sets

Model TA360 List, $7.65
Exact Replacement for GE, Hoffman, Hotpoint & Emerson 1957-8 Portable TV Sets

*Beginning with set 467 in December, JFD Exact Replacement Antennas will be listed in SAMS PHOTOFACT folders for your service reference.

Pioneers in electronics since 1929

JFD ELECTRONICS CORPORATION

6101 Sixteenth Avenue Brooklyn 4, New York

JFD CANADA LTD.
51 McCormack Street
Toronto, Ontario, Canada

JFD INTERNATIONAL
15 Moore Street
New York, N.Y.

www.americanradiohistory.com

THIS SHOP IS MAKING MONEY

with

CLAROSTAT

PICK-A-SHAFT* CONTROLS

Maximum jobs per hour, *maximum* profit per job—that's what you get with Clarostat "Pick-A-Shaft" controls. Every Clarostat control works right the first time, minimizing reworks.

Clarostat "Pick-A-Shaft" controls include all popular values in 2, 3 and 4 watt wire-wound controls with or without factory-assembled SPST switch. Also in ½ watt carbon controls, all popular values and tapers, in single and dual, with the easy-to-do "Ad-A-Switch"*. And with every Clarostat "Pick-A-Shaft" control you get your choice of any one of 13 attachable shafts at no charge.

Always ask for CLAROSTAT!

CLAROSTAT®

COMPLETE CATALOG ON REQUEST—OR ASK YOUR DISTRIBUTOR

CLAROSTAT MFG. CO., INC.

DOVER, NEW HAMPSHIRE

In Canada: CANADIAN MARCONI CO., LTD., Toronto 17, Ont.

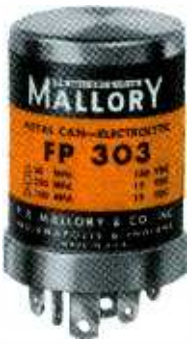
www.americanradiohistory.com

TV • Radio • Hi-Fi shop owner ELMER MAUTER says:

"MALLORY quality replacements keep customers happy"

"Courtesy in handling customer service has been one factor responsible for our growth . . . that's why I chose the name Courtesy for my business. We have always used only quality replacement products . . . that's why I use Mallory components. I know that I can depend on Mallory quality. The Mallory label on replacement parts reassures my customers; it's a name they know they can rely on for top performance."

When electrolytics need replacement, Elmer Mauter, like thousands of other service technicians, knows that Mallory FP's will stand up at the high temperatures common in the small cabinets now being built for TV and hi-fi. Even when they're mounted next to a hot rectifier or output tube, where ordinary replacement filters would wilt, the FP gives extra service. It's the original 85°C capacitor. Its combination of new shock-resistant construction with leakproof seal and etched cathodes, available without premium price only in the Mallory FP, assures long life and hum-free performance.



Whatever your component needs, Mallory supplies the widest line of quality products at sensible prices. See your Mallory distributor for a full selection of the parts you need.

Put an end to call-backs with these quality Mallory products . . .

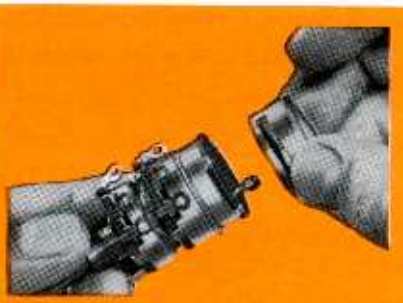
GEMS

5 rugged, moistureproof, Mallory "Gem" tubular capacitors in a handy dispenser that keeps your stock fresh and clean—easy to find—prevents kinks in lead wires. Unequalled for service in buffer, by-pass or coupling applications.

RMC DISCAPS®

Made by the world's largest producer of ceramic disc capacitors . . . long the original equipment standard, they are available for replacement in a handy 3" x 5" file card package . . . easy to stock, simple to use.

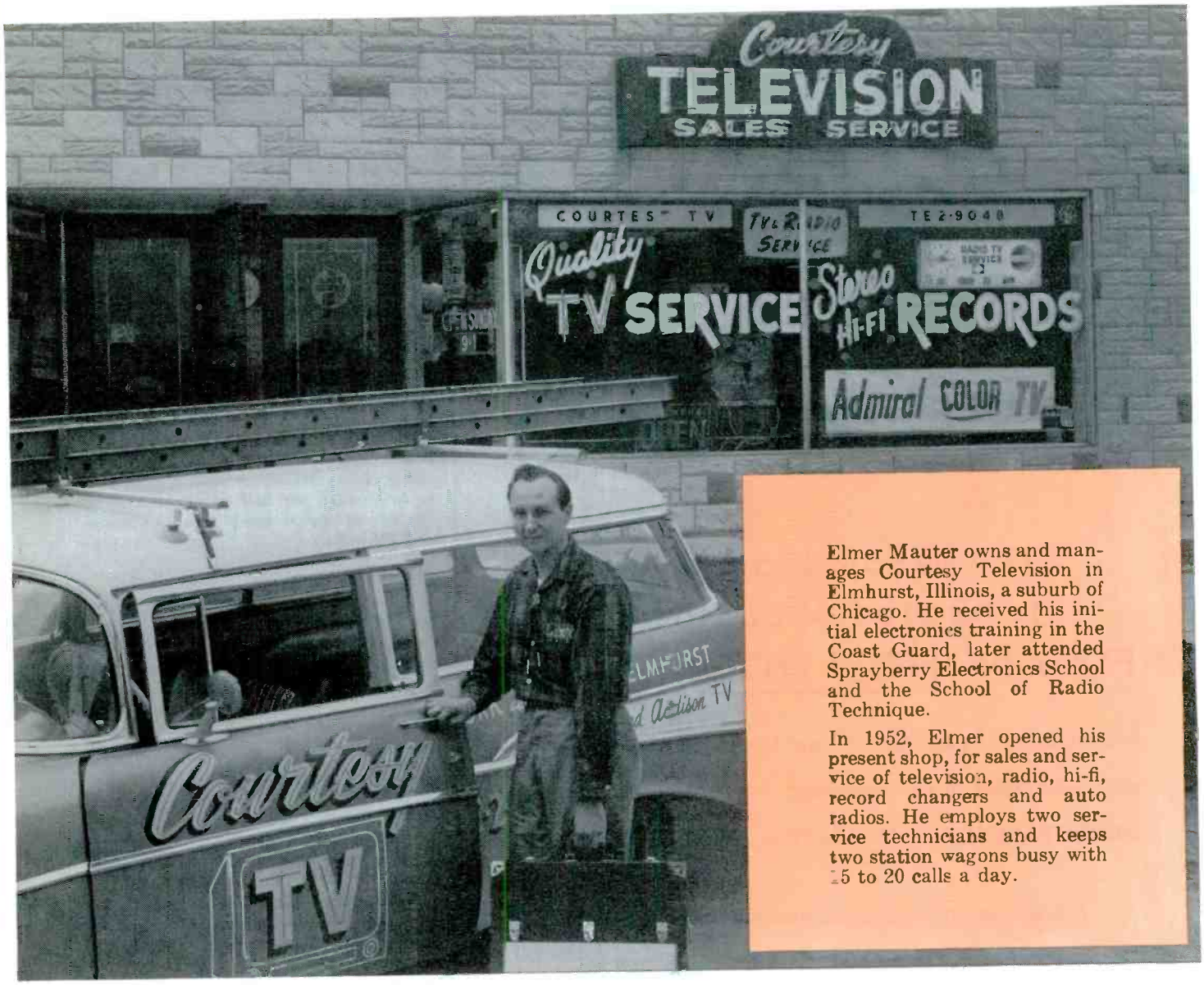
® *Trademark of Radio Materials Company, A Division of P. R. Mallory & Co. Inc.*



STA-LOC® CONTROLS

No more waiting for out-of-stock controls. Your distributor can custom build, in just 30 seconds, any of over 38,000 combinations. You can replace the line switch by itself, without unsoldering control connections.

www.americanradiohistory.com



Elmer Mauter owns and manages Courtesy Television in Elmhurst, Illinois, a suburb of Chicago. He received his initial electronics training in the Coast Guard, later attended Sprayberry Electronics School and the School of Radio Technique.

In 1952, Elmer opened his present shop, for sales and service of television, radio, hi-fi, record changers and auto radios. He employs two service technicians and keeps two station wagons busy with 15 to 20 calls a day.

Distributor Division

P.R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

GOLD LABEL® VIBRATORS

Sell the best in auto radio servicing; use Mallory Gold Label Vibrators every time. Exclusive buttonless contact design gives longest life, sure starts. The quietest vibrator ever made.

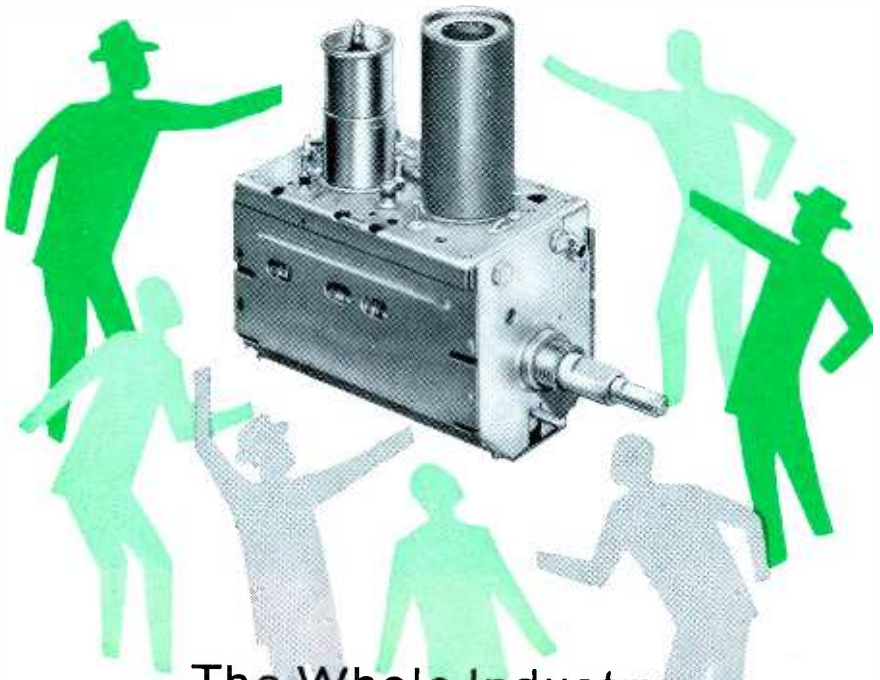
TC TUBULAR ELECTROLYTICS

Economically priced filter capacitors with a reputation for top performance. Proved in service and backed by years of Mallory experience. Also special TCX type available for —55°C.

MERCURY BATTERIES

Unequalled for long, fade-free life in transistor radios. Chosen as the "power package" in U. S. satellites. Virtually limitless shelf-life. Made by the world's largest manufacturer of mercury batteries.

www.americanradiohistory.com



The Whole Industry
Is Excited About the
TARZIAN "HOT ROD" TUNER

It's the finest . . . smallest . . . and lowest-priced tuner on the market today. It has everything:

PERFORMANCE . . . QUALITY . . . and LOW COST

Automation in production methods makes it possible to produce this precision-built, high quality unit in great quantities . . . and at lower cost to YOU.

Compare these features with all others:

Tetrode R.F. stage . . . high gain . . . low noise . . . 13 permanent positions . . . easily converted to UHF . . . adaptable for remote control operation . . . very low oscillator drift . . . individual oscillator front adjustment . . . small and compact . . . good resetability . . . and I.F. output tunable from the front.

Call or write for information

SARKES TARZIAN, INC.

Sales Department, Tuner Division
East Hillside Drive • Bloomington, Indiana

is due to be published by our book division within the next few months. Watch for an announcement in PF REPORTER, *or have your local parts distributor keep you advised of new Sams book titles.—Ed.*

Dear Editor:

Nothing compares with PF REPORTER when it comes to practical and useful information. I own and operate the only shop in a small rural town, and I'm called on to repair everything that has a cord on it. Your magazine provides many helpful ideas. Thanks!

HARVEY SAAR
Treynor, Iowa

What—no portable radios?

Your comments closely parallel the reports we have received from many other servicemen in rural areas. Knowing there is a sizable army of "jack-of-all-trades" independent servicemen has encouraged us to broaden our field of subject coverage to encompass more than just radio and TV.—Ed.

Dear Editor:

For my money, PF REPORTER is the best of the electronic servicing magazines, bar none! As Walter Winchell used to say, "orchids to you" and your staff for a wonderful magazine.

RICHARD P. BOYLAN
Brentwood, Mo.

As H. V. Kaltenborn says, "There's good news tonight."—Ed.

Dear Editor:

There are always a certain number of customers looking for something for nothing, but I try to let them know in advance that I carry no such thing in my caddy. In this business, it pays to have a good understanding of people in general, in order to spot a price-obsessed customer *before* performing a service for him.

FLOYD COX
Los Angeles, Calif.

No humane way has ever been invented of ridding the world of those who consider no values except rock-bottom price. However, there is one way to reduce your contacts with "discount hounds" to a minimum. That is to refrain from advertising cut-rate service-call charges in the first place, and to seek a clientele who will pay a fair price for services well rendered. Sometimes these wonderful people seem to be hard to find—but they're well worth looking for.—Ed.

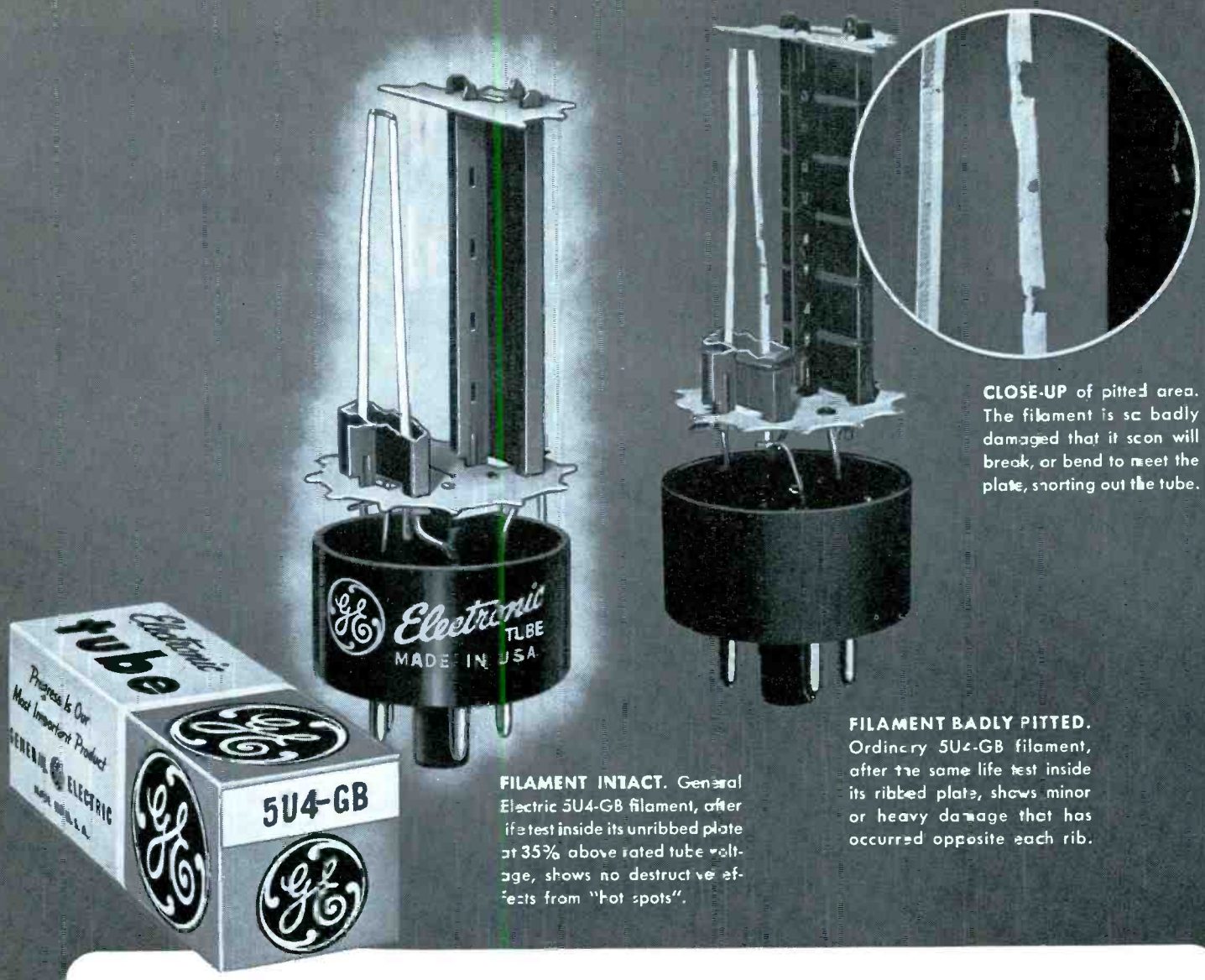
Dear Editor:

We have just been rereading the article by Melvin Cohen which was published in *TV Guide* on June 28, 1958 and reprinted by you. We are in entire agreement with the article except on two points.

Speaking of tubes which test "weak" on low-quality tube testers, the author says, "Usually they are good for many more years." This is a dangerous generalization. It might have been better to

• *Please turn to page 93*

www.americanradiohistory.com



CLOSE-UP of pitted area. The filament is so badly damaged that it soon will break, or bend to meet the plate, shorting out the tube.

FILAMENT INTACT. General Electric 5U4-GB filament, after life test inside its unribbed plate at 35% above rated tube voltage, shows no destructive effects from "hot spots".

FILAMENT BADLY PITTED. Ordinary 5U4-GB filament, after the same life test inside its ribbed plate, shows minor or heavy damage that has occurred opposite each rib.

Smooth Plates of G-E 5U4-GB Protect Filaments!

Service-Designed Tube is free from "hot spots" that damage filaments of less dependable 5U4-GB's with ribbed plates!

Install the rectifier tube with the smooth, unribbed plates—General Electric's Service-Designed 5U4-GB! No raised metal lips to collect contaminants! These build up into ridges which serve as sources of back emission, causing "hot spots" that melt and eventually destroy the filaments of ordinary tubes (see photographs above, right).

Dependable from the moment you install them Service-Designed 5U4-GB's mean fewer callbacks and less chance of a rectifier-tube short-circuit, with risk of transformer burnout—a costly possibility in many modern TV sets. See your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Ky.*

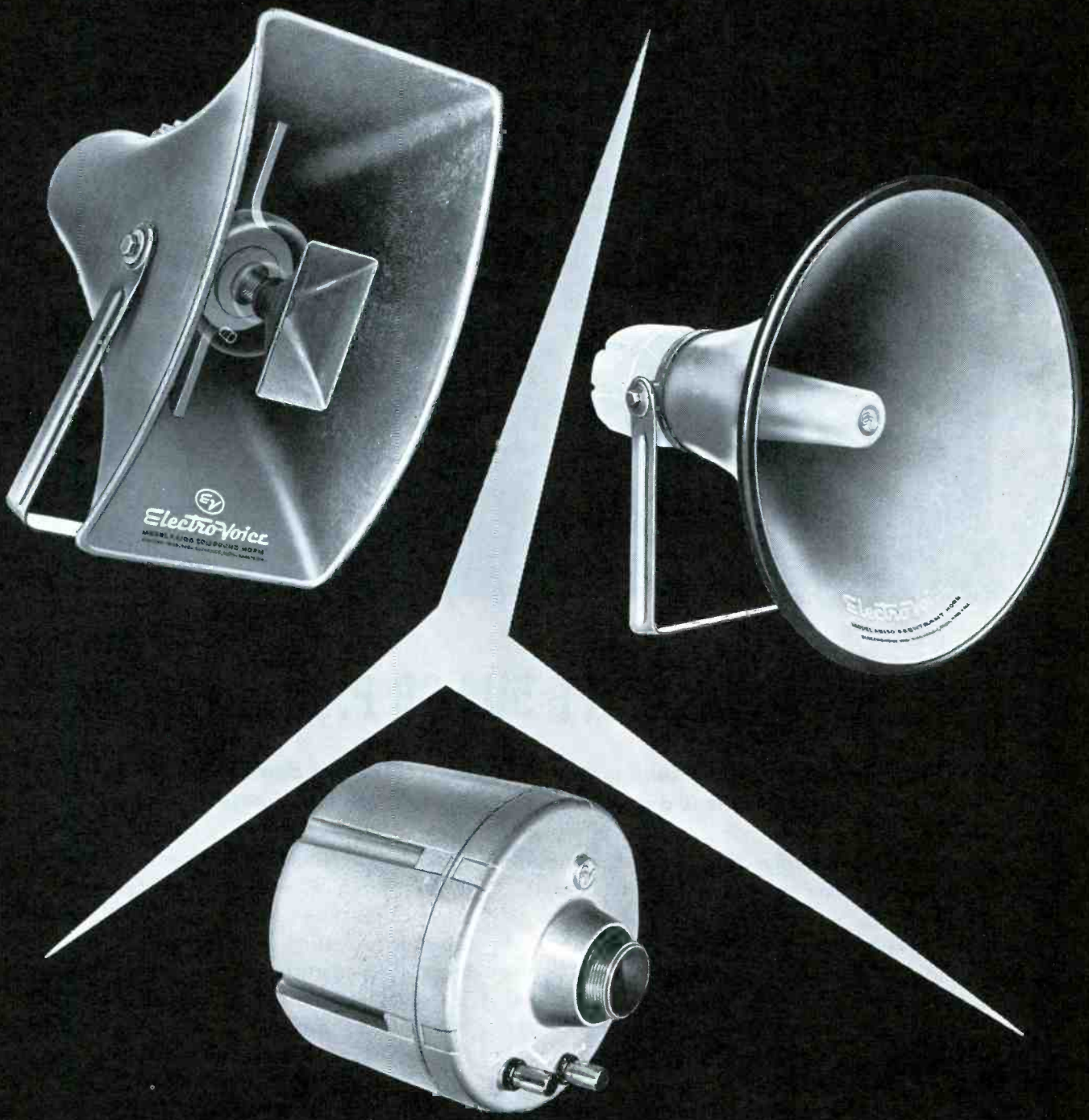
Install the picture-perfect pair: Service-Designed Tubes and Black-Daylite Picture Tubes!

GENERAL ELECTRIC

2-111-209

www.americanradiohistory.com

AT LAST...SOMETHING NEW
for better commercial sound!



3 major design improvements

www.americanradiohistory.com

CONVERTIBLE DRIVER

Only E-V offers a line of drivers suitable for every horn type. The *same* driver can be used on reentrant horns for maximum economy, or installed in compound horns for lowest distortion.

NEW CONVERTIBLE DRIVERS

Ideal for any horn type

- First with Ceramic Magnets
- First with Edge-Wise Wound Voice Coils
- First with Dual Concentric Centering

The new E-V convertible drivers have all the characteristics needed to satisfy critical sound jobs where excellent power handling, high efficiency and wide range must be combined *PLUS* the ability to be used interchangeably in compound or reentrant horns. This unusual versatility is accomplished without compromising the performance quality of any horn type. Tonal balance allows good musical reproduction while providing the rising frequency response necessary for clear, crisp voice projection. "Peaked" response is eliminated. Both the high and low frequency range is limited only by the horn design. The drivers are rugged, weatherproof and engineered to permit easy diaphragm replacement in the field on either type horn. Available with 16 or 45 ohm voice coils or with built-in 70.7 volt line constant voltage transformers. Engineered with careful attention to detail, these new drivers are easier to install with push-type polarized connectors plus a cable strain relief for highest reliability.

DC30A

30 Watts
150-10,000 cps
$27.50 List

DC30T

30 Watts
With 70.7 V.
Transformer
150-10,000 cps
$37.00 List

DC40

40 Watts
140-11,000 cps
$36.00 List

DC40T

40 Watts
With 70.7 V.
Transformer
140-11,000 cps
$46.50 List

DC50

50 Watts
140-11,000 cps
$47.00 List

DC50T

50 Watts
With 70.7 V.
Transformer
140-11,000 cps
$57.50 List

RING REFLECTOR

Conventional P.A. horns use smoothly rounded paths at both critical reentrant sections. This technique is satisfactory for small radius bends but only E-V uses the exclusive ring reflectors to increase output in the vital presence region by as much as 7db. Result — clearer speech — better balanced music.

NEW RING REFLECTOR REENTRANT HORNS

Wide range with economy

Model AR-150
List Price $31.00 (less driver)

Revolutionary E-V ring reflector extends the high frequency range, increases intelligibility and provides more natural sound. New horn development gives this round horn maximum penetration over a larger area at lowest cost. Rubber damping ring eliminates resonances. Heavy spun aluminum bell, rugged aluminum die cast mounting plate plus precision die cast reentrant tubes assure long lasting performance. Accepts E-V or other standard drivers with 1⅜"-18 thread.

Model FR-150
List Price $37.00

An ideal reentrant horn for car-top installation or wherever a low silhouette is needed and where bass response cannot be sacrificed. Stacks easily for multiple speaker operations. For maximum economy, this low cost medium angle horn provides good coverage and smooth response. Rugged fiberglass horn has Mesa Tan color molded in. Adjustable mounting allows best coverage. Accepts E-V or other standard drivers with 1⅜"-18 thread.

COMPOUND HORNS

New designs expand the time-tested "CDP" for usefulness where wide-angle *OR* concentrated coverage is desired. Each horn can use concentrating or diffraction horn above 1000 cps for maximum versatility.

NEW COMPOUND HORNS THE FINEST SOUND AT ANY PRICE

Model FC-100
List Price (less driver) $47.50

E-V exclusive! Dual compound diffraction horns permit the widest range while reducing distortion far below any other projector design. Two diffraction horns give uniform wide angle coverage over the entire frequency range. Use any E-V Convertible Driver. Low-frequency horn cut off, 100 cps; air column length, 58"; sound distribution, 90° x 120°. Mesa Tan weatherproof fiberglass.
The FC-100 is available with 30 watt driver installed. This is the popular 848 "CDP" (not illustrated). Widely used where sound quality is critical. LIST PRICE — $75.00.

Model AC-100
List Price (less driver)
$44.50

A new compound horn in the famous E-V tradition but with round bell for maximum concentration. Offers extremely high efficiency for maximum penetration and longest throw. No attenuation of highs as in conventional directional horns. Compound design lowers distortion for highest intelligibility. Takes any E-V Convertible Driver. Low-frequency horn — cut off, 100 cps.

AND THAT'S NOT ALL . . .

Paging and
Talk Back Speakers

Model 847
List $47.00

Model 844
List $34.50

Weatherproof Full Range Speakers

Musicaster List $86.50
Musicaster II List $120.00

Virtually every sound job can be done better, easier and cheaper with the complete line of E-V compatible sound products. E-V's leadership in microphone and speaker design can assist you in the solution of your toughest sound problems.

all from Electro-Voice®

For complete information write Dept. 10R COMMERCIAL SOUND DIVISION
ELECTRO-VOICE, INC. BUCHANAN, MICHIGAN
better products for better sound

www.americanradiohistory.com

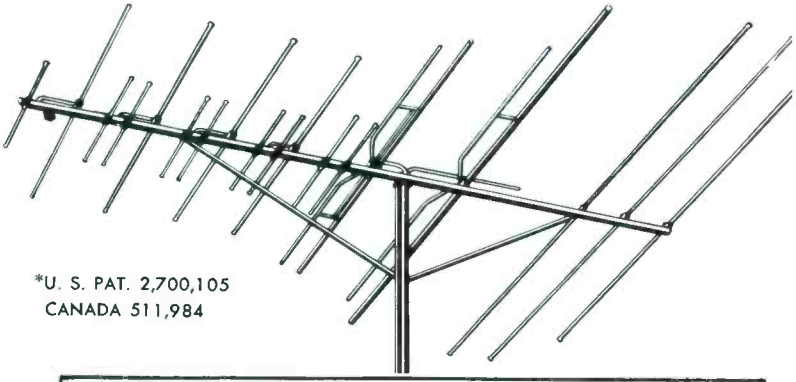
WINEGARD Antenna Dealers to Make 1960

Tune in Paul Harvey News, ABC Network, Monday through Friday 5:55 E.S.T., starting January 18. (Check local listings for time and station.)

PAUL HARVEY

Sells Winegard Gold Color'Ceptor Antennas on National ABC Radio Network

"I'll be telling your customers why the Winegard Gold Color'Ceptor TV antenna is America's best antenna buy. I suggest you stock up on Color'Ceptors now to take advantage of Winegard's advertising and make more profit in 1960."



*U. S. PAT. 2,700,105
CANADA 511,984

Profit with the Antenna Dealers have learned to trust

Winegard dealers make more money for three important reasons—

1. They have the best performing, easiest to install, best constructed and neatest looking antenna on the market in the Winegard Gold Color'Ceptor.
2. They have the only *written* Performance Guarantee in the industry that guarantees 100% customer satisfaction or full list price of antenna refunded by Winegard—and the dealer still keeps his profit.
3. They get the antenna industry's biggest advertising backing.

Three Color'Ceptor models meet all needs: CL-4, $29.95; SCL-4, $38.95; CL-4X (with power pack) $44.90

Winegard Gold Anodizing

Winegard's special 7 cycle bright gold anodizing inside and out (not a cheap flash finish) hardens the antenna surface, seals out corrosion and weathering, exceeds U.S. Gov't specifications in salt spray tests.

Winegard performance is protected by U.S. *patents, confirmed by leading consumer researchers, by millions of happy users, by prospering dealers everywhere. First with the advancements the public wants and sales-minded dealers can sell! Feature the leader and be one!

www.americanradiohistory.com

Get Biggest Ad Backing Biggest Profit Year Ever!

NOT here today and gone tomorrow . . . but ALL YEAR LONG!

Big Winegard Gold Color'Ceptor ads in the biggest consumer magazines . . . Paul Harvey on Network Radio . . . The Antenna Industry's biggest and most helpful advertising keeps hammering away, stronger and better than ever!

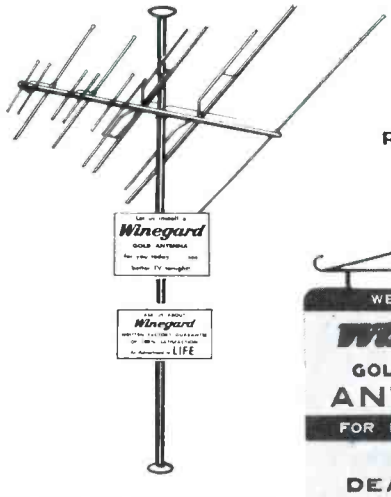
Giant 6-ft. 3-color metal road sign . . . with your name on it.

Balloons—With Winegard selling message—

DEALER SALES HELPS

to connect Winegard's ad powerhouse to your cash register. To use in your store, outside your store, and out where the sales begin. Get these sales helps (delivery prepaid) with FREE "PROMOTION BUCKS". One "Buck" goes with each Color'Ceptor you order. Use your "Bucks" to get the sales helps that will do *you* the most good.

Illuminated window and counter sign.



Gold anodized telescopic antenna display mast.

Truck decals, pressure-sensitive. No water.

Metal outdoor store sign with hanger.

Winegard

ANTENNA SYSTEMS

WINEGARD CO. 3009-1 Scotten, Burlington, Iowa

WINEGARD CO.
3009-1 Scotten, Burlington, Iowa

☐ RUSH full color brochure showing Winegard's new antenna dealer sales aids . . . and tell me how I can get them free!

☐ Send literature on Winegard's complete line of FM and TV antennas.

NAME_____

POSITION_____ FIRM_____

ADDRESS_____

www.americanradiohistory.com

FILLING in the MIDDLE for BETTER STEREO

by Thomas A. Lesh

What's behind all the talk about "three-channel stereo" and other innovations in the stereophonic hi-fi field? When you get right down to the facts, these new developments do not necessarily make stereo systems more complicated and costly; in some cases, the reverse is actually true.

New designs in stereo are aimed at heightening the illusion of "solid sound" by making a large area of the listening room appear to come virtually alive with sound. The original stereo setup of twin "left" and "right" speaker systems doesn't always accomplish this purpose. If the two systems are placed rather close together (say, less than four feet apart), there may not be enough separation between them to produce the desired dramatic effect. In other words, the listener will not get the full impact of the "stereo illusion"—the feeling that an entire orchestra is in the same room with him.

Moving the speakers farther apart helps to increase the sensation of closeness to the music, but it also brings up another problem which may be distracting to the listener. As speaker spacing is increased, the sound tends to divide into separate streams coming from two distinct spots in the room. Then, instead of relaxing and enjoying the music, the listener is likely to strain his ears trying to determine whether a particular sound is coming from the left or right. Stereo listening is not supposed to provoke such debates! The listener should be conscious only of the over-all effect of the performance. To provide the necessary smoothness of sound reproduction, various ways have been devised to fill the "hole in the middle."

Perhaps the best solution—but the costliest—is to install a third full-range speaker system midway between the right- and left-channel speakers. To achieve the proper effect, the signal fed to this extra unit should correspond to the sound which originates at "center stage." Since present stereo discs and tapes are limited to two channels, the required third signal cannot be supplied directly from a centrally-placed third microphone—but it can be derived electronically by mixing equal proportions of the left- and right-channel signals. Of course, a third power amplifier would be needed in order to operate the extra speaker system.

Such an arrangement is impractical for most installations, from the standpoint of both cost and space; therefore, a number of more simplified "center-fill" systems have been developed. Although purists may raise the objection that these are not *true* three-channel stereo, the fact remains that these simplified arrangements *do* remedy the "hole-in-

• Please turn to page 79

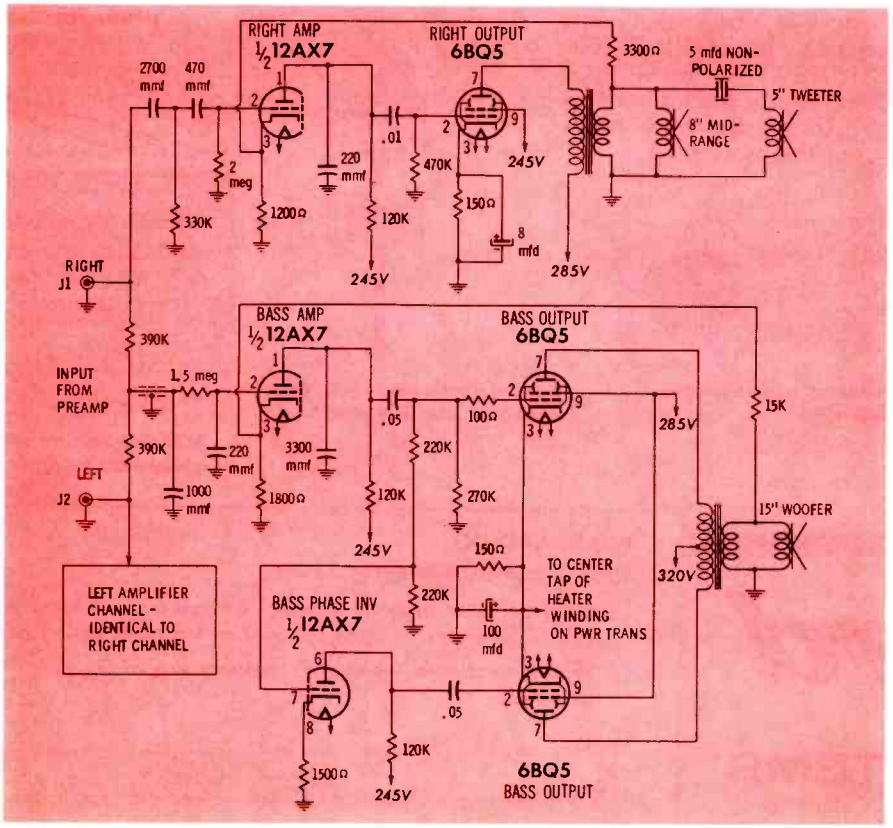


Fig. 1. Motorola employs separate push-pull amplifier to drive 15" woofer.

www.americanradiohistory.com

Hey... I've got new coil heaters!

(GOODBYE TO YOUR FRONT-END TROUBLES)

"All 6BQ7A's used to have folded heaters . . . and gave you plenty of trouble. Now, all of us CBS 6BQ7A tubes have new coil heaters for our new improved cathodes . . . and *you* don't have heater burnouts, shorts or slumping gain."

Yes, the new CBS 6BQ7A offers you *total reliability* . . . proved in performance by leading TV and radio set manufacturers. You, too, can profit from the *total reliability* of CBS tubes. Prove it to yourself. Replace with CBS.

TOTAL RELIABILITY...proved in performance

Old-style 6BQ7A folded heaters had seven folds . . . each fold a potential source of burnouts and shorts. The new CBS 6BQ7A heaters, because of the telescopic effect of coiling the heater, have only one gradually curved fold. The result is that CBS 6BQ7A's just don't develop those irritating, costly shorts and opens.

Receiving, industrial and picture tubes • transistors and diodes • audio components • and phonographs

CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

www.americanradiohistory.com

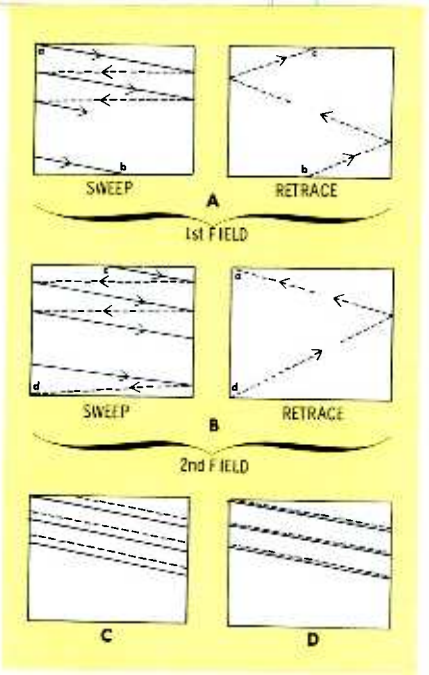


Fig. 1. Interlaced scanning patterns.

Rx for Interlace

A prescription to help you cure the vertical — interlace plague.

by Warren J. Smith

Vertical interlace problems are high on the service technician's list of aggravating TV troubles. Although poor interlace may pass completely unnoticed at times, it can produce very conspicuous and annoying symptoms like extensive loss of picture detail.

The normal scanning pattern, which results in correct interlace, is depicted in Fig. 1A. The first vertical field starts at *a* and ends at *b*. The electron beam moves back to the top of the raster during the first vertical retrace time *b* to *c*, and then traces out the second vertical sweep from *c* to *d*. The second vertical retrace occurs during the time interval *d* to *a*. Note that the first line of the first field starts at the upper left corner of the raster, and the first line of the second field begins at top center. This automatically produces uniform spacing between successive even and odd lines.

With defective interlace, the first field may begin at some point other than the left corner, or the second field may start at a spot away from top center (Figs. 1C and 1D). It is normal for the even and odd lines to wander over the raster somewhat, but if they pair off too closely or touch each other, a partial loss of interlace results. This condition (pairing of the lines with a black space in between) is especially noticeable on large screen receivers. In older sets which lack retrace blanking, the quality of interlace is readily judged by turning up the brightness control to observe whether the vertical retrace lines are evenly spaced or are more or less paired. A complete loss of interlace (Fig. 1D) results in very closely twinned or superimposed alternate lines. Picture detail deteriorates considerably, since the raster displays only the equivalent of 240 lines as compared to approximately 480 visible lines in a normal presentation. (The remainder of the 525 lines in the frame are blanked out during retrace time.) Contrast may also suffer as a result of lost interlace, as illustrated in Fig. 2. If adjacent lines in the two fields carry different video information—as may be the case when narrow horizontal or near-horizontal stripes are present in the picture—they will reproduce incorrect shades of gray when they merge. Besides distorting the image, this action tends to set up an intermittent flickering in the picture as the degree of interlace varies and as the scene changes. This distortion, known as *moire effect,* is particularly noticeable in the horizontal wedge of a test pattern.

A quick visual check for proper interlace can be made by turning the brightness up, and "rolling down" the picture with the vertical hold control to permit observation of the scanning lines in the area of the vertical blanking bar. If interlace is correct (or nearly so), one bright line will begin just below the blanking bar near the center of the raster and will remain in that position; if interlace is defective, the lines will appear to flicker and move because they are wandering over the raster and starting at different points.

Interlace impairment may be due to set-design deficiencies or transmission trouble rather than a defective component in the receiver. Continuously poor interlace on one channel, with normal operation on all others, is indicative of trouble at

• *Please turn to page 68*

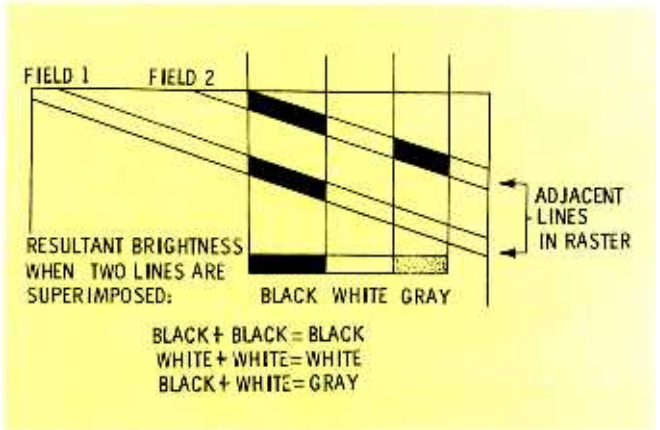


Fig. 2. Distortion of picture detail may result if two fields in raster are superimposed instead of interlaced.

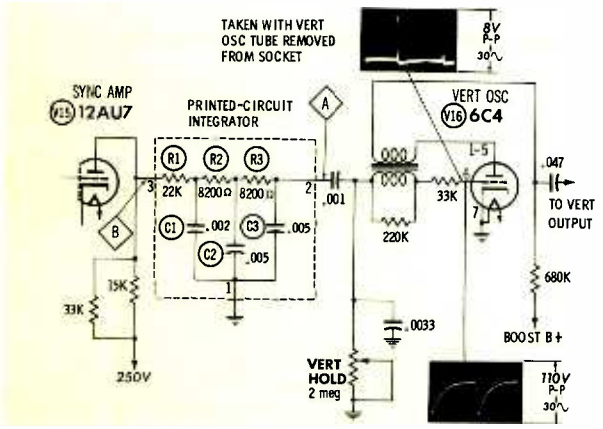


Fig. 3. Sylvania Model 175-18 has typical printed-circuit integrator unit feeding positive pulses to oscillator.

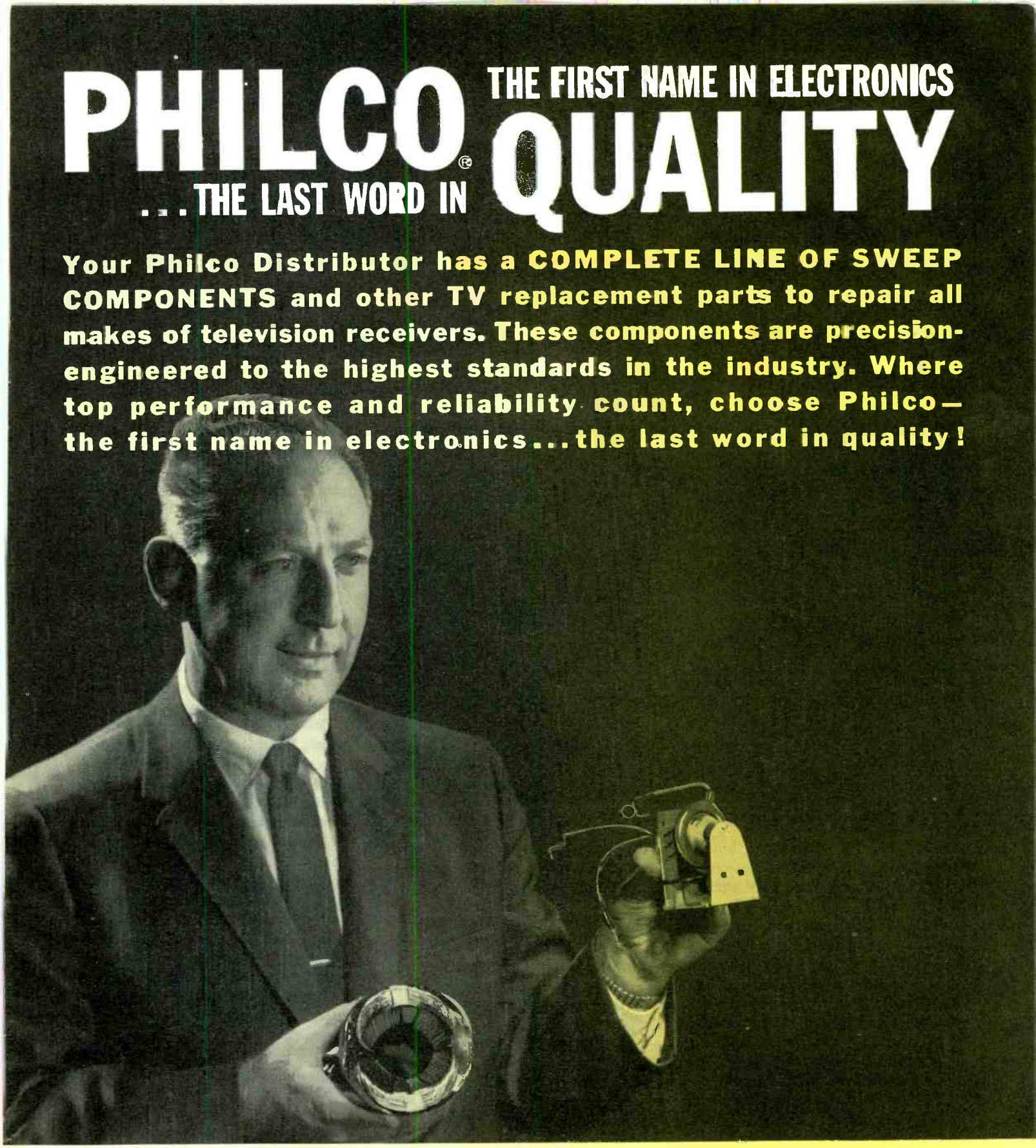
www.americanradiohistory.com

PHILCO®

THE FIRST NAME IN ELECTRONICS

...THE LAST WORD IN QUALITY

Your Philco Distributor has a COMPLETE LINE OF SWEEP COMPONENTS and other TV replacement parts to repair all makes of television receivers. These components are precision-engineered to the highest standards in the industry. Where top performance and reliability count, choose Philco—the first name in electronics...the last word in quality!



SEE YOUR PHILCO DISTRIBUTOR TODAY!

PHILCO ACCESSORY DIVISION

WORLD-WIDE DISTRIBUTION

Service Parts • Power-Packed Batteries • Universal Components • Long-Life Tubes • Heavy-Duty Rotors • Star Bright 20/20 Picture Tubes • Long Distance Antennas • Appliance Parts • Laundry Parts • Universal Parts and Accessories

PHILCO CORPORATION ACCESSORY DIVISION
ATTN. Carl Areschoug
P. O. Box 3635
Philadelphia 25, Pa.

If you service television and radio receivers and would like to receive valuable promotional mailings from Philco, attach this coupon to your Company letterhead and forward to above address.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

www.americanradiohistory.com

mastering the PC board

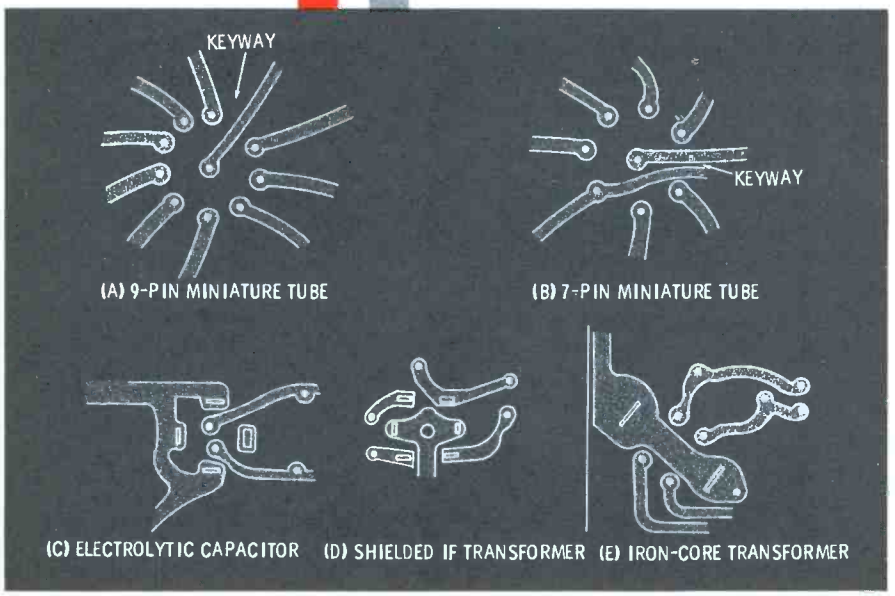


Fig. 1. Characteristic patterns of conductors surrounding major components.

Circuits on printed wiring boards go by a variety of names these days — but, whatever they're called, you're sure to find them in a majority of the late-model TV sets you service. Since their percentage of use is likely to go even higher in the future, the professional serviceman must learn to service circuits mounted on printed wiring boards if he is to stay in business. We have a number of suggestions for easing your present job of PC servicing.

It has long been our contention that printed-board servicing is not necessarily harder than repairing conventionally-wired circuits, even though we do agree it *is* different. This contention is not just some idealized fancy, but is based on first-hand experience with all phases of printed-board servicing. While we realize that some service jobs are complicated by the presence of a printed board, we have discovered that other jobs are actually easier for the same reason.

Component Location and Identification

In response to servicemen's pleas, several manufacturers have begun to mark printed wiring boards with helpful circuit-tracing information. RCA, Philco, and some models of Admiral sets for 1960 have the entire pattern of foil conductors reproduced in bright-colored ink on the component side of the board; General Electric sets have connections between components indicated by arrows; the board in a Motorola portable has color-coding applied to the conductor strips on both top and bottom surfaces; and the latest Westinghouse receivers have a *See-Matic* coding system in which the location of all components is indicated by schematic symbols on the foil side of the board. Several of these new troubleshooting aids have already been pictured in *Previews of New Sets* (see the coverage of the RCA Chassis KCS126A in last July's issue, the October story on the Motorola Chassis TS-433, and the November presentation of the Philco Chassis 10L43). More features of this type will soon be shown in *Previews*, and we are also planning a detailed report on how to use the new circuit-tracing systems most effectively for bench servicing.

Test-point information and component reference numbers are also stamped on the component side of some printed wiring boards to speed up identification of individual points. If this information is lacking, the various components can still be readily located by reference to the pictorial wiring diagrams in service data. We think you will agree that finding components on a printed board is much less of a problem than following the wiring pattern. For example, merely locating a resistor is usually not enough; you still must determine "which end goes where."

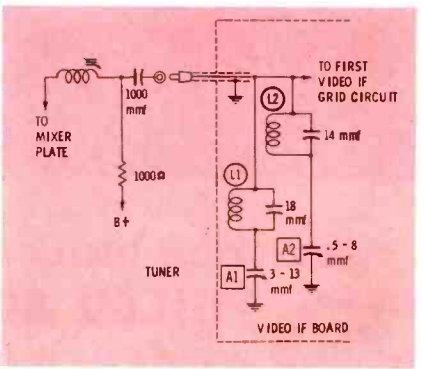


Fig. 2. IF input lead from tuner plugs into video IF printed wiring board.

www.americanradiohistory.com

Aids that save servicing time on printed - circuit designs.

by Calvin C. Young, Jr.

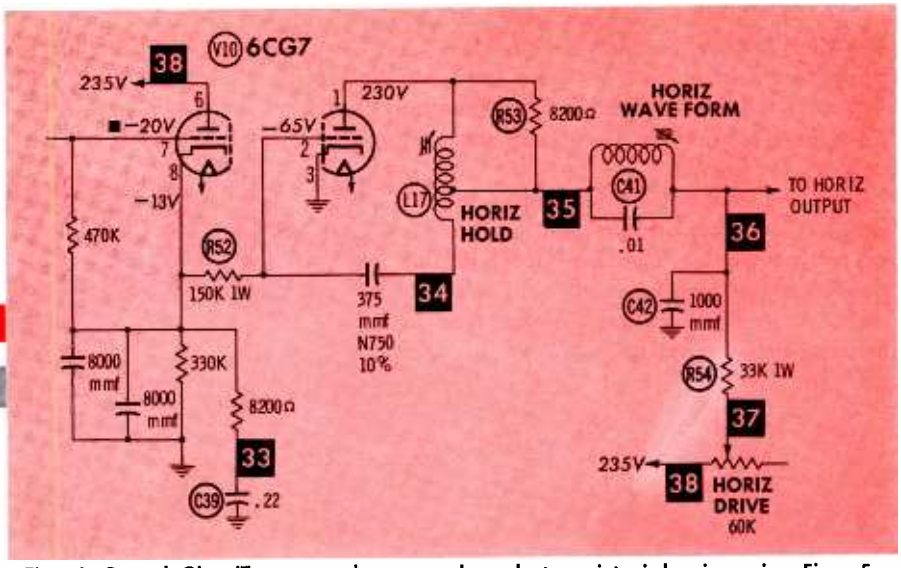


Fig. 4. Boxed *CircuiTrace* numbers are keyed to pictorial view in Fig. 5.

As yet, few receivers in the field are equipped with "built-in" circuit-tracing aids; thus, skill in finding one's own way around a printed wiring board is a definite asset in today's service business. Being able to determine the exact location of major components when viewing a board from the foil side can be most helpful in all troubleshooting procedures. For instance, voltage, signal and resistance checks are made from various reference points (B+, ground, the cathode pin of a tube, etc.) which are more easily located after major components have been identified.

Study the sample foil patterns (Fig. 1) typically associated with the mounting of major components. As you'll note in parts A and B of Fig.1, the spacing between successive pin connections of a miniature tube socket is uniform except for the definite gap between pins 1 and 9 or 1 and 7. This gap, even though it may be partially filled with a foil strip, can be easily recognized as the "keyway" for correct tube orientation. Looking at the "underside" of the board so that the keyway of a certain tube points down, pin 1 of this tube is on the left side of the gap. Of course, you can quickly tell whether the tube is a 7- or 9-pin type by simply counting the number of connection points.

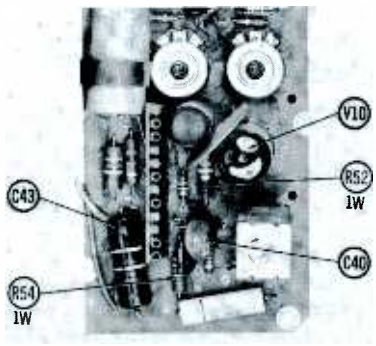


Fig 3. Unusual components, like large resistors, are keys to circuit-tracing.

Thus, when you are circuit-tracing to or from a tube element, the easiest point to locate is the tube-socket connection for the particular element involved. Even without looking at the schematic, you can recognize some components just by tracing from the tube socket. For example, if you were searching for a grid-load resistor and had located the foil strip connecting to the grid terminal of the socket, you could logically expect to find one end of the resistor connected to this conductor. (Naturally, if more than one resistor were connected to the same grid terminal, you would have to refer to the schematic diagram as a guide in pinpointing the correct component.) This method of circuit tracing can be used when you are attempting to locate any component. Familiarity with other foil patterns commonly associated with various major components can also be helpful during troubleshooting or circuit-tracing. A few of the most distinctive ones are pictured in Figs. 1C thru 1E.

Circuit Tracing

Even the new "guide systems" don't show *all* possible test points, alignment points, etc.; so the ability to circuit-trace a printed-board network can come in handy when any set is being serviced. The first step in the procedure, which saves time in the long run, is to establish a reference or starting point. If you wish to trace the signal path from the tuner to the grid of the 1st video IF, you should locate the point where the signal leaves the tuner, as well as the IF-input terminal on the main chassis. You can logically proceed by assuming the video IF tube nearest the tuner is the first stage. By reference to either a schematic or a tube manual, determine which pin of this tube is the control grid. When this point has been positively identified on the board, you are ready to trace the circuit and locate the desired test or alignment point.

In some cases, as illustrated in Fig. 2, a plug-in shielded cable is used to couple the signal energy from the tuner to the video-IF board. This greatly simplifies the location of any point in the IF input network. For example, the two trap networks A1 and A2 in Fig. 2 can be readily located by simply tracing from the point where the shielded line connects to the board. The frequencies to which the traps are tuned can be determined from the alignment instructions, while exact identification of the traps can be determined by noting the different values of capacitance used to shunt the coils and checking this information against the schematic.

Another useful circuit-tracing aid has to do with the physical sizes of various resistors and capacitors. Valuable information can often be obtained by examining the actual equipment (or a pictorial layout) before studying the schematic. In

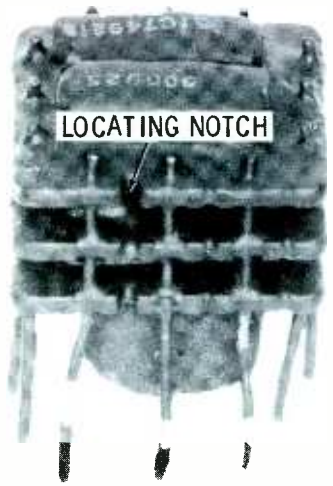
• *Please turn to page 73*

www.americanradiohistory.com

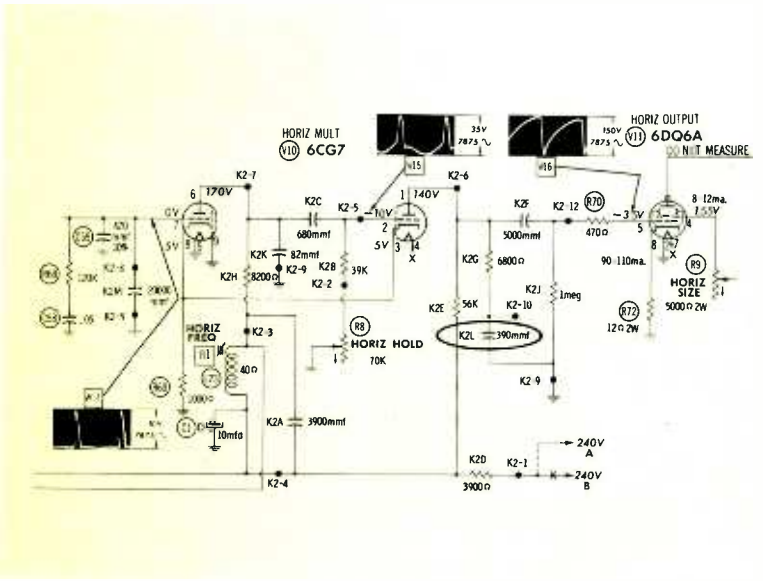
Modules made their first appearance in 1955. That year's August and October issues of PF REPORTER introduced them to the servicing industry. Since that time, modules have been used in some Motorola radios, as well as in their '59 and '60 TV lines. Emerson used these components in some of their '58 and '59 TV sets.

Servicing has been made easier by the grouping of all capacitors and resistors for an entire circuit into one small package. This story describes techniques that will help you make most effective use of your time in modular-circuit servicing.

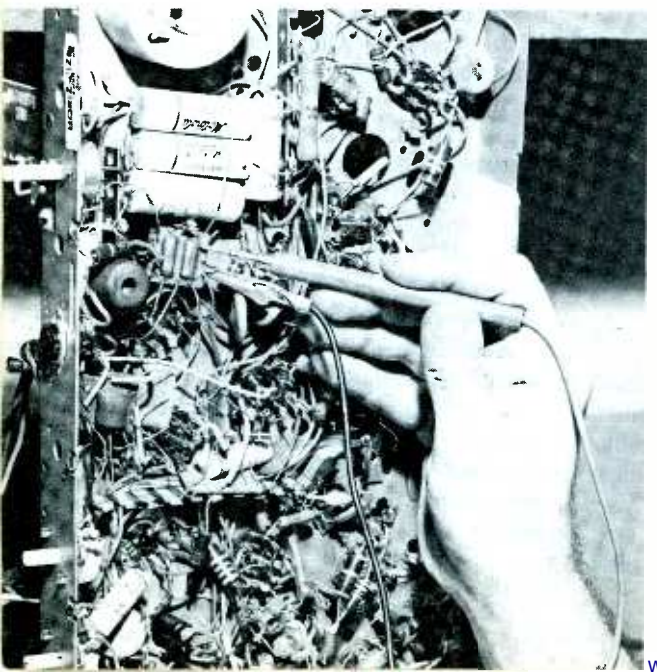
MODULAR



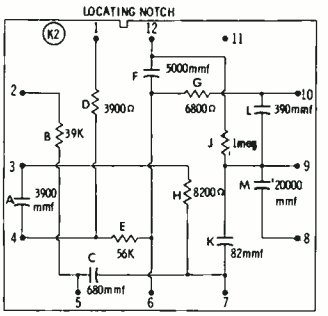
The locating notch in the side of the module provides the key to terminal identification. Viewed from the base, the terminals are numbered in a counter-clockwise direction, which is exactly opposite to the numbering for tube pins.



Schematics show the terminal-number connections as well as the values for each component in the module. In this particular example, twelve components are contained in a single modular unit, which confines circuit troubleshooting to a very small area.



Conventional servicing procedures—which include comparisons of waveforms, voltages, and resistances—are used to analyze the entire circuit. Individual components within the module are checked by connecting test instruments to the appropriate terminals. The photo shows ohmmeter leads being applied at terminals 9 and 10 to check K2L, a 390-mmf capacitor, for leakage.

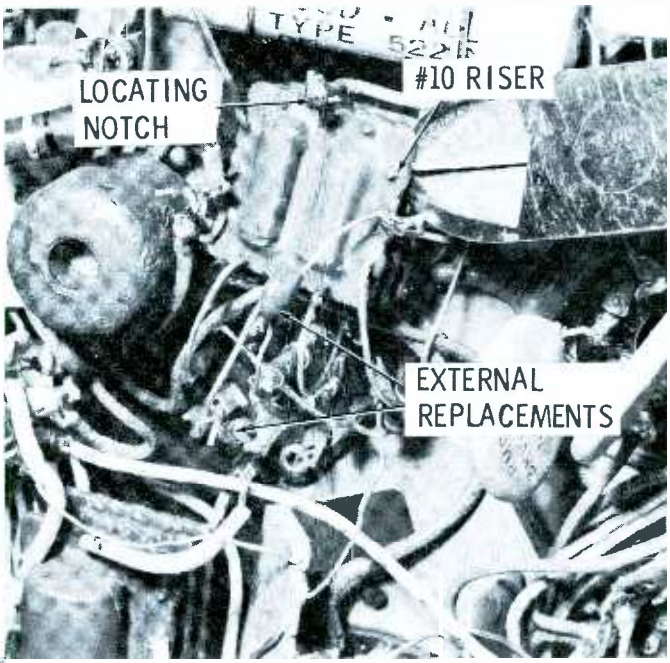


After determining that a component within the module is defective, a study of the module diagram shows what other components are connected to the same terminals. It can then be decided if the module must be replaced or a substitute component can be used to effect a repair.

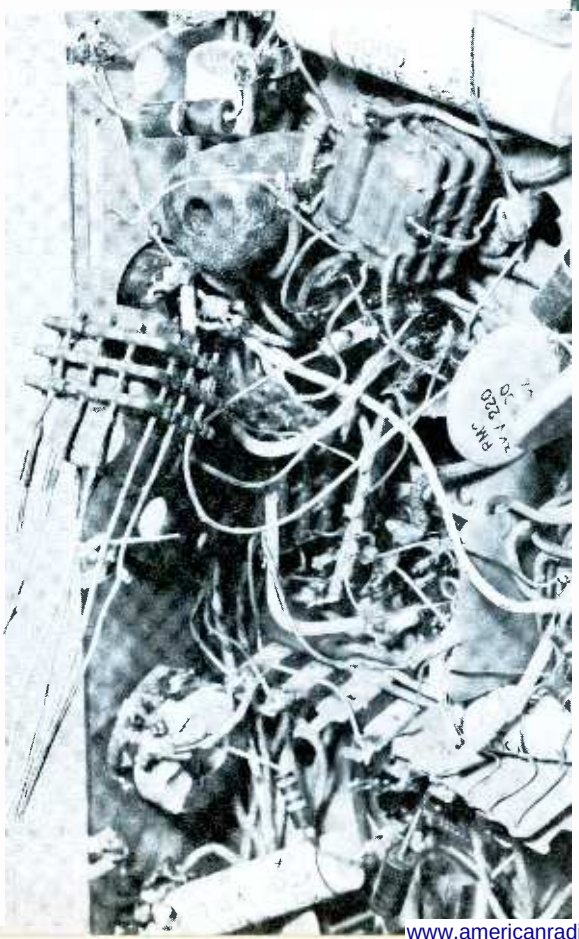
www.americanradiohistory.com

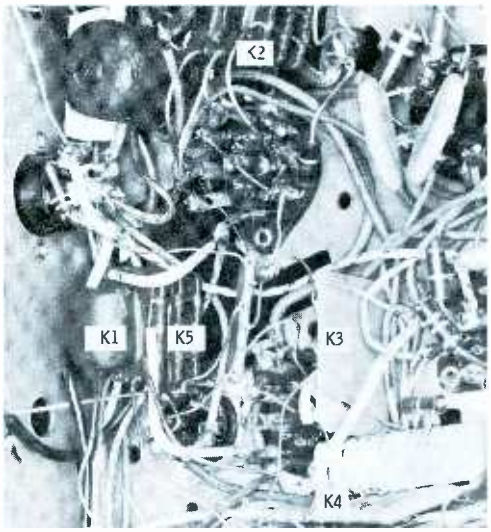
Component Replacement

Assuming the circled cap K2L has been found defective, all sections of the terminal 10 riser can be cut to isolate the components connected to it. These (K2G and K2L) are then replaced with external standard units to complete the repair.



If the number of components to be replaced make the repair more costly than replacement of the entire module, a completely new unit can be obtained for around $2.00. To avoid confusion when installing a new unit, the old one can be left in place while lead-for-lead connections are made.





Combination-component units, as shown here, are taking many forms in today's radio and TV receivers. Using the techniques outlined on these pages to isolate and correct component troubles will save much time and effort.

www.americanradiohistory.com

ShopTalk

Scoping VIDEO and

by Milton S. Kiver

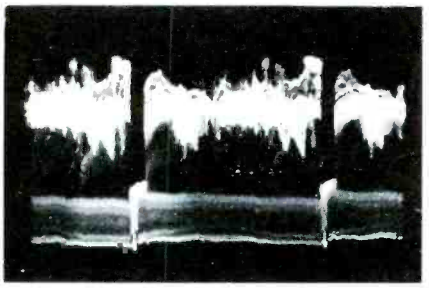


Fig. 1. Output signal of video detector, viewed at 30-cps scope sweep rate.

In my November column, techniques for isolating power-supply and audio-system troubles were outlined. This month we'll learn how use of an oscilloscope quickly pinpoints video-amplifier and vertical-sweep troubles.

The video amplifier furnishes signals to the picture tube, the sound system, the AGC circuit, and the sync section; thus, a video circuit defect can interfere with the operation of every major section of the receiver. The most common symptoms resulting from trouble in the video amplifier section are no picture, negative picture, smearing, dim picture, excessive contrast, unstable sync, and no sound. While any one of these symptoms can also be caused by defects in other sections, the important point to note is that each of them can sometimes be developed in the video stages. For example, take the symptom of no sound. Normally, the first place to look for the cause is in the sound section. This is true *provided* the lack of sound is the only malfunction that exists. If the picture is also missing, the sound section is *not* the best place to start.

Let us suppose that the symptoms found in a particular set lead you to suspect that the trouble lies in the video amplifier section. This immediately raises two questions. First, how can you tell if the video section is functioning properly? Second, if malfunctioning is indicated, how can you pinpoint it? The test instrument which can most readily help you with answers to both questions is the oscilloscope.

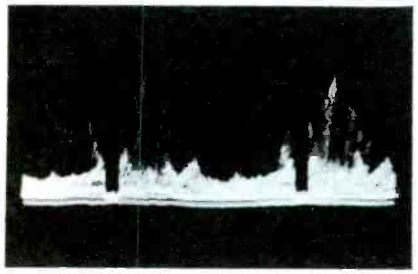
The vertical input of the scope is connected to the ungrounded end of the video-detector load resistor. (A low-capacitance probe should be used to prevent undue capacitive loading.) The ground input terminal of the scope connects to the receiver chassis. It is usually best to set the scope sweep to 30 cps in order to observe two complete fields of video signal information. With the receiver tuned to a station, the typical observed pattern should be as shown in Fig. 1. The normal

Fig. 3. Negative picture indicates extreme overloading of video circuits.

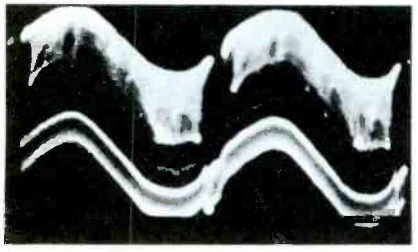
polarity of the detector-output signal in most sets is as indicated in this waveform. An upside-down pattern may indicate a wrong setting of the scope's polarity-reversal switch, or possibly an odd number of stages in the vertical amplifier of the scope. In any event, your first concern is the *presence* of the signal—not its polarity.

Your next step is to study the signal pattern. If it is normal, at least you know that an undistorted signal is being fed to the video system. If not, there is obviously no reason to check further in the amplifier stages.

With a clean input signal, the next step is to check the signal where it enters the picture tube. If it is still undistorted and much greater in amplitude, the video system is functioning satisfactorily. If it is missing or distorted, there is some malfunc-



(A) Sync pulse compression.



(B) Strong 60-cps hum.

Fig. 2. Distortions of video signal.

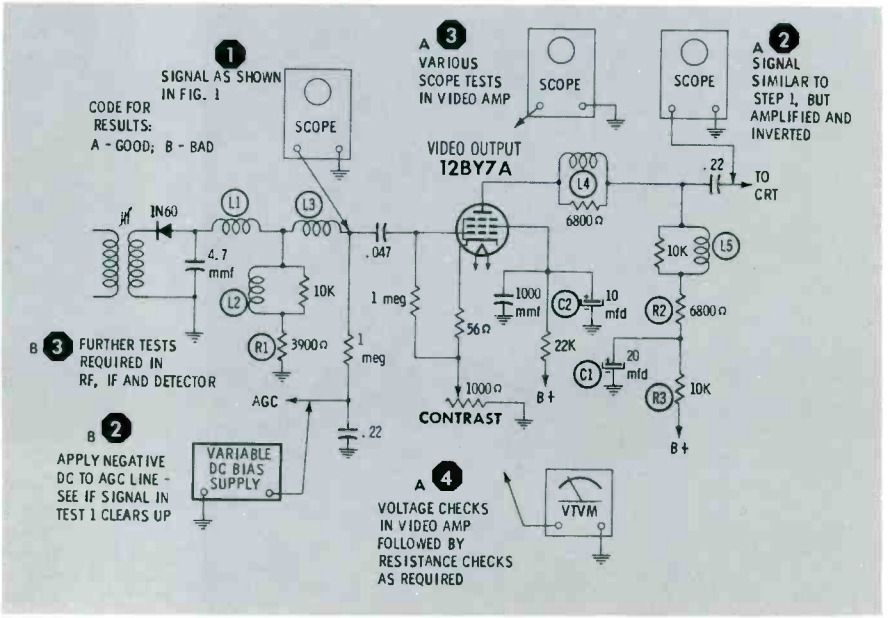


Fig. 4. Suggested steps in troubleshooting typical video-amplifier stage.

www.americanradiohistory.com

VERTICAL Troubles

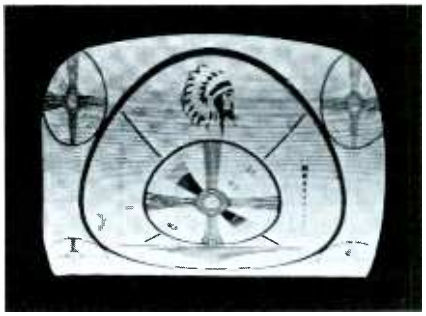


Fig. 5. Raster nonlinearity due to decreased bias on vertical output tube.

tion in the video-amplifier section and further localization is in order.

The foregoing approach is direct, quite reliable, and quickly performed. It will reveal sync-pulse clipping or compression (Fig. 2A), the presence of hum (Fig. 2B), and other distortions.

At this point, mention should be made of the AGC line and the role it plays. In every set, the AGC voltage depends on the signal at the video detector (or beyond) and controls the gain of the tuner and IF strip. Hence, a defect in the video section can affect the signal (through the AGC line) *before* it reaches the video detector. A distorted input signal applied to a defective video amplifier just makes matters worse than ever. To get around this "dog-chasing-its-tail" situation, the AGC line can be clamped with a DC source equal in value to the normal voltage. The DC source may be a battery or a special low-voltage rectifier. The only precaution to observe in the latter instance is to make sure it has a low-impedance output. (All commercial AGC voltage sources meet this condition.)

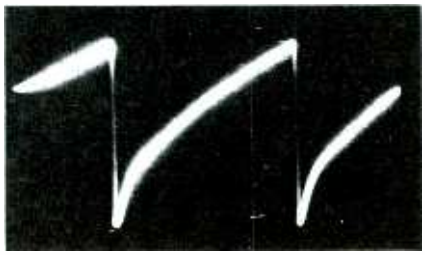
If clamping the AGC line returns set operation to normal, the AGC circuit may be at fault. This possibility will be considered more fully in a later article.

If the foregoing oscilloscope checks indicate that the trouble does lie in the video-amplifier section, the signal can be traced from the detector to the grid and plate of the amplifier (or amplifiers, if there are more than one) until it disappears or becomes distorted. At this point, voltage and resistance measurements are called for.

Pay particular attention to the grid-to-cathode voltage (bias), because a discrepancy here will have a far greater effect than a much larger error in plate voltage. Too much negative voltage on the grid, or excessive positive voltage on the cathode, will lower stage gain and lead to reduced contrast. On the other hand, excessive contrast (where the picture is quite dark and lacks intermediate gray tones) can be due to insufficient bias. The latter condition may come from a leaky coupling capacitor, a shorted cathode-bypass capacitor, or a gassy tube.

A negative picture, shown in Fig. 3, is actually a further aggravation of the conditions that lead to excessive contrast. In this case, the amplifier is greatly overdriven, and the grid is no longer in control. The effect is that the tube reacts as though it were cathode driven, and the result is that no phase inversion of the signal takes place. Your first scope check, of course, would send you looking ahead of the detector, most probably to a defective AGC circuit.

Comments were made previously (in connection with audio amplifiers) concerning the effects on stage gain of either an open screen-grid bypass capacitor or a change in load resistance. Those statements apply equally well here.



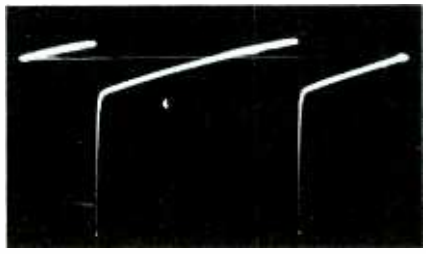


Fig. 7. Two examples of normal drive waveforms on vertical-output grid.

Fig. 6. Fault in either oscillator or output stage could cause no sweep.

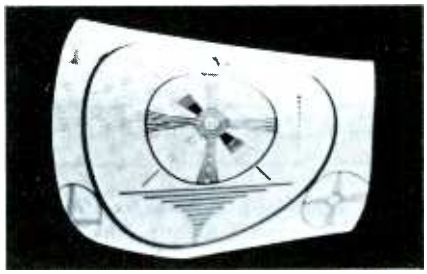


Fig. 8. Keystoning is almost always caused by a partial short in the yoke.

Video amplifiers also possess low- and high-frequency compensating features, and a malfunctioning component in one of these networks will affect picture quality. This poses a special troubleshooting problem, since the fault may not be detectable on the scope waveform. Fortunately, the culprit can often be detected by voltage or resistance measurements. The following discussion will show why this is so.

A typical commercial video amplifier is shown in Fig. 4. High-frequency compensation is provided by L1, L2, L3, L4, and L5, plus the use of low-valued load resistors R1 and R2. Low-frequency compensation is achieved with an additional RC network in the plate circuit (consisting of R3 and C1), a high-valued bypass capacitor in the screen-grid circuit (C2), and an unbypassed cathode resistor.

Some of the high-frequency peaking coils are shunted by a resistor to prevent them from sharply increasing the amplifier gain at any specific resonant frequency. If a peaking coil such as L15 should open up, causing the high-frequency response to deteriorate, the circuit would still be completed through the parallel resistor; however, the plate voltage of the 12BY7A would decrease noticeably. The same thing would happen if coil L4 opened up. Hence, a simple voltage check will usually bring this defect to light. Of course, if L4 or L5 did not possess shunt resistors and they opened up, B+ could not reach the plate of V1—so the entire stage would become inoperative.

• *Please turn to page 88*

www.americanradiohistory.com

BY MELVIN WHITMER

AUTOMATIC - CONTROL

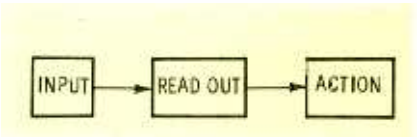


Fig. 1. Open-loop systems can initiate action, but cannot identify the action.

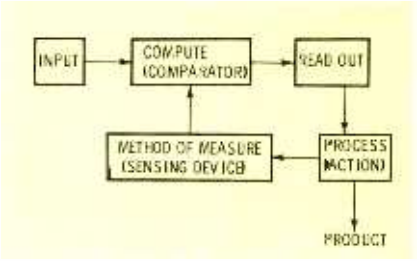


Fig. 2. Closed-loop control systems include a sensing device and comparator.

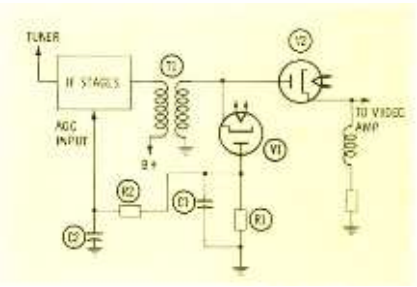


Fig. 3. AGC system used in TV sets is actually a simple closed-loop control.

Industrial processing uses many different control techniques. These can be grouped into two general classifications, open-loop and closed-loop systems. The first group includes switches, valves, and other simple devices which require adjustment by human operators. In the closed-loop category are many types of fully automatic, self-correcting systems, ranging from simple heating controls to entire "automated" production lines.

Open-Loop Control

In an open-loop system, there is no way within the system for determining whether an initiated action was completed or not. As an example, the common light switch used in home lighting systems is an open loop; the switch can be turned on, but a human observer must determine whether or not the bulb is actually lit. The light circuit can be made into a closed-loop system by adding an additional sensing device which will turn on a second light, or activate some sort of alarm, if the first one doesn't work.

An open-loop circuit can start a control action, but it cannot correct for a lack of action. Fig. 1 shows a block diagram of an open-loop design applicable to a great many circuits. Action is initiated and identified at the input. This corresponds to the switch in our home lighting system. The second block in Fig. 1 represents the unit which actually performs the operation.

Closed-Loop Control

The block diagram of a closed-loop system is shown in Fig. 2. Notice that two blocks have been added —the sensing device and a comparator. The sensing device measures some characteristic of the process and produces a signal representing that measurement. The comparator receives two signals, one from the sensing device and another from the input. If these two signals do not agree, the comparator generates a correction signal which changes the setting of the readout device.

A good example of closed-loop control is the home heating system. The wall thermostat serves as a control unit, sensing device, and comparator. The control input is obtained from the temperature dial, which is set at the desired temperature to provide a "set-point" reference signal. The sensing device is a bimetallic bar that changes position with changes in room temperature. If there is a difference between the thermostat setting and the actual measured temperature, the bar meets with a contact point, thus effectively closing a switch to start the heating plant. When the desired and actual temperatures are the same, the switch opens and the heating unit is deactivated. This is a closed-loop control, since no operator is needed to see that a constant temperature is maintained.

Another good example of closed-loop control is the AGC system used in television receivers. (See Fig. 3.)

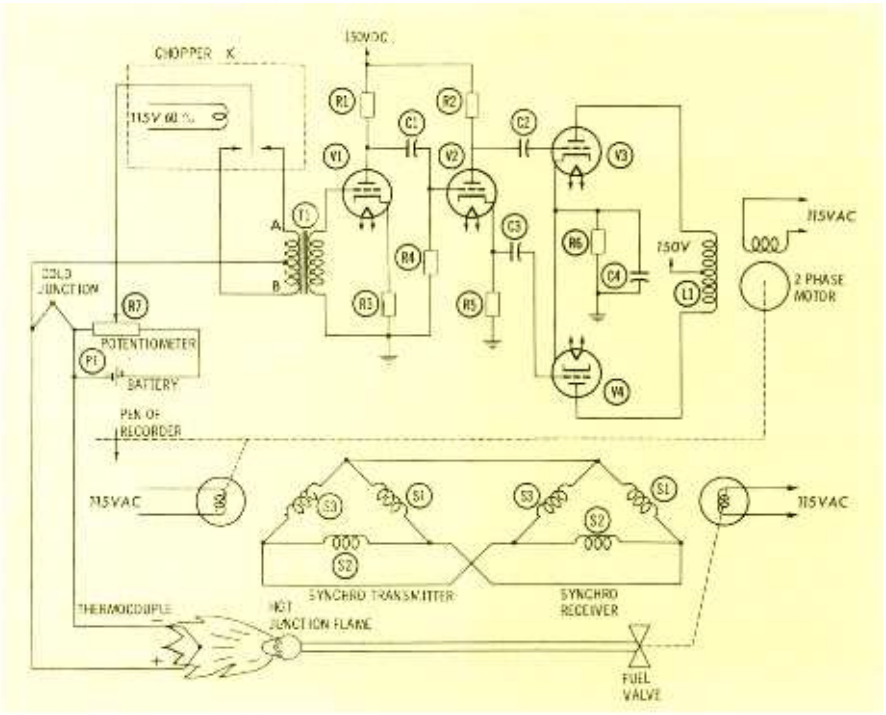


Fig. 4. Circuit for a recorder-control unit used to hold temperature constant.

www.americanradiohistory.com

SYSTEMS

The process to be controlled is IF gain, and the product is the composite video signal. Since the amplitude of the video signal must not vary appreciably from a predetermined value, a measurement of the blanking pulse amplitude is accomplished by diode V1 (sensing device). Transformer T1 couples the IF signal to the cathode of V1, and the negative half-cycles cause V1 to conduct and produce a voltage across R1 and C1. The network of V1, R1, and C1 comprise the measuring part of the closed-loop control. Any slight fluctuations in input-signal amplitude cause the output voltage of this network to shift, thus altering the charge on C2. The variable voltage across C2, applied to the grids of the IF amplifiers, serves to regulate the gain of these stages for nearly constant output.

Recorder-Controllers

In the November coverage on recorders, the potentiometer-type recorder was described as being capable of also providing a correction signal. This type of recorder uses a servo system (to control large amounts of power with small input power) for both pen movement and for generating correction signals. Fig. 4 shows the schematic of a recorder-control unit for a heating process. The closed loop begins at the set-point input, which is potentiometer P1. When the process is started, the dial of P1 is set to the desired temperature reading. This provides a reference voltage for the comparator, which consists of chopper K1 and transformer T1. Comparison is made between the voltage supplied by the thermocouple and the reference voltage. During the warm-up period, the voltage supplied from P1 is greater than the thermocouple voltage, so points A and B are alternately fed positive voltage pulses by the action of the chopper.

Although the input to T1 is essentially a square-wave voltage, the high-frequency components are attenuated in going through the amplifier. The output voltage, therefore, is more like a sine wave which agrees in phase with the AC line waveform. The two-phase motor rotates in either direction, depending on the phase of the amplifier output signal. When points A and B are positive, the motor rotates in such a direction that the fuel valve is opened and the pen is moved up the chart. Process control is thus accomplished by varying the amount of fuel supplied to the burner.

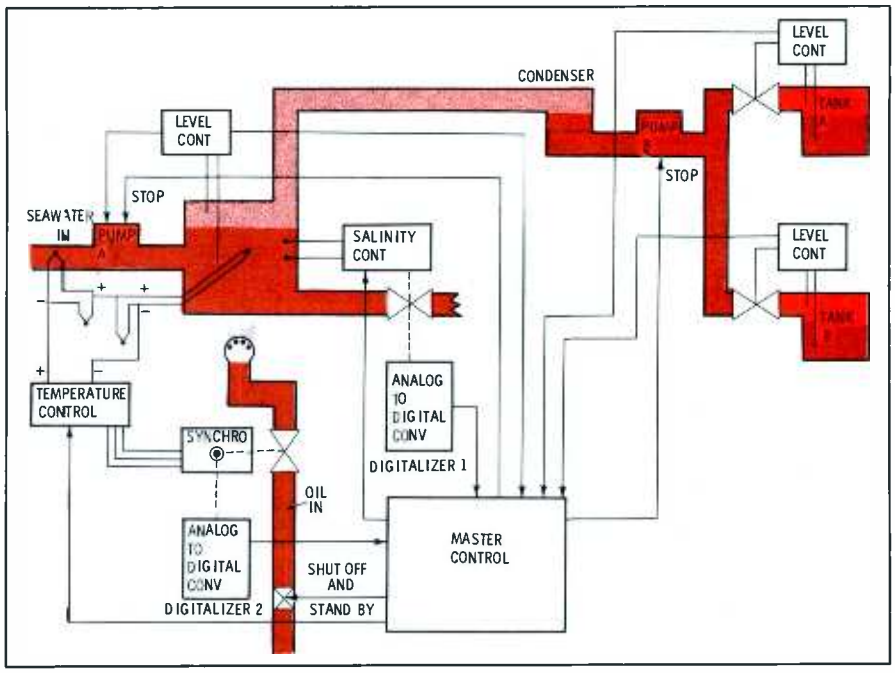


Fig. 5. Water-distillation system that works entirely automatically.

As the temperature increases, the thermocouple output voltage increases and eventually equals the voltage obtained from the potentiometer. At this point, the voltage being applied to points A and B is the same as the voltage at the center tap. Thus, no input voltage is applied to the amplifier, and the motor ceases to rotate. Any subsequent increase in thermocouple voltage results in the application of negative voltage pulses at points A and B. This, in turn, reverses motor rotation, and the system again seeks the

• *Please turn to page 76*

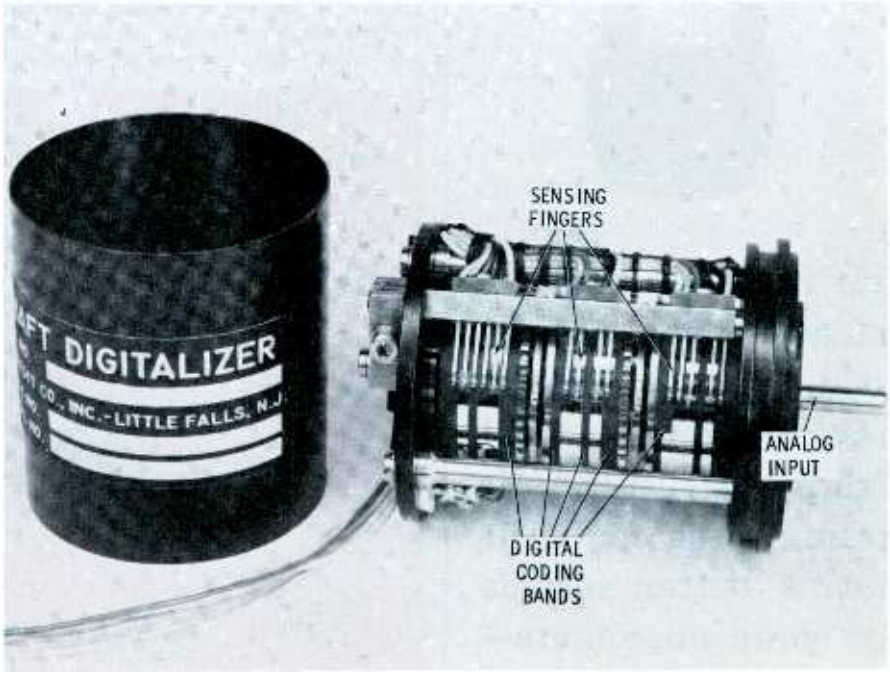
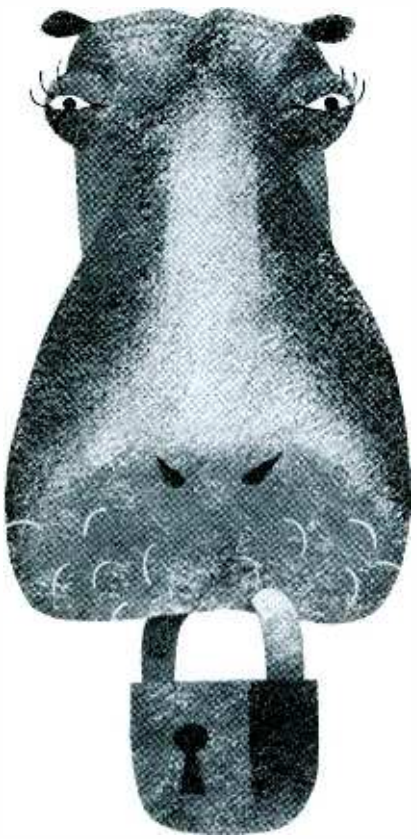


Fig. 6. Coding bands indicate rotor position in analog-to-digital converter.

www.americanradiohistory.com

WE'VE GOT A SECRET!



Our lips are locked . . . but not for long. You will soon learn about the new Standard Coil Products tuner program. Watch for it. It means better service for your customers—greater profits for you.

THE TROUBLESHOOTER

ANSWERS YOUR SERVICE PROBLEMS

Sick BU8

I am having serious AGC trouble with a Zenith Chassis 17Z30. When I ground the antenna terminals to chassis, I can get clear sound and a snowy (but steady) picture; but, if I connect even the simplest antenna to the set, both picture and sound disappear entirely. When this happens, I measure —20 volts at the grid of the video output tube, and full B+ (260 volts) appears on the plate. These voltages return to normal if the third IF tube is pulled.

I do not get —2.6 volts at TP-3 in the AGC circuit, as called for in the schematic. Under no-signal conditions, the actual reading is +0.5 volts. I have checked all components in the AGC, IF and video circuits without finding the trouble. Can you give me some information as to how the 6BU8-type AGC circuit in this set should operate?

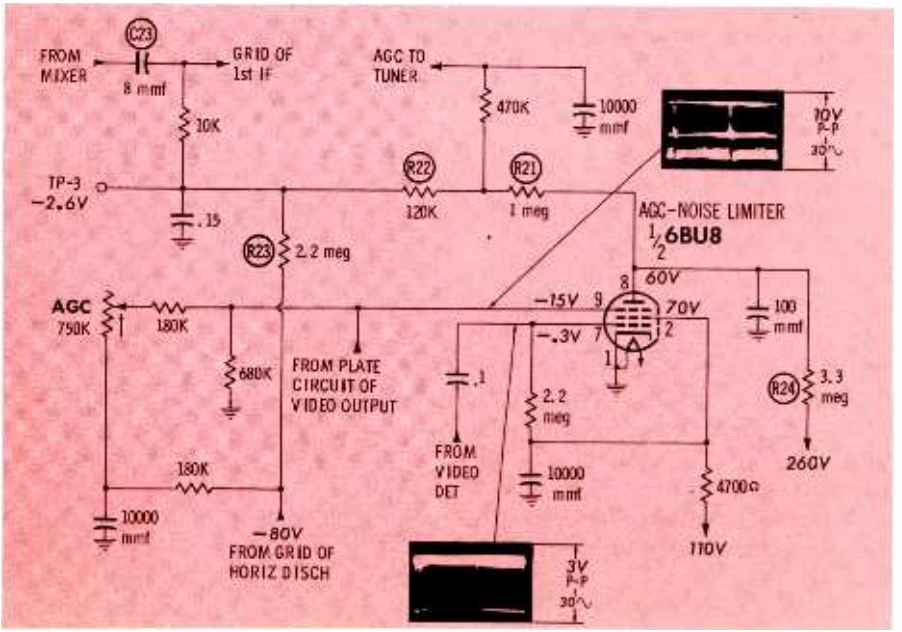
LEON THIGPEN
Tyler, Texas

The minus 20-volt reading at the grid of the video output tube is a result of too much signal amplification in the IF strip. The grid voltage is so negative that it completely cuts off the output tube; this explains the loss of video as well as the abnormally high plate voltage. Audio is also missing because the 4.5-mc sound IF signal must pass through the video output stage in this set. With conditions as they are, you have correctly diagnosed this trouble as an AGC fault.

Before further analyzing the 6BU8 circuit, it would be advisable to apply a clamping voltage to the AGC line. Connect a variable DC supply (maximum output of —6 volts should be sufficient) to TP-3 on the IF-AGC line. If this does not remedy the trouble, the first IF tube may be gassy, or there may be leakage from the AGC line to B+ through C23. On the other hand, trouble somewhere in the 6BU8 circuit is indicated if the clamping test gives positive results.

The +0.5-volt reading you noted at TP-3 is not necessarily abnormal if no input signal is present. The potential at this point is supposed to shift through a range of several volts when the AGC control is turned. As you will note, this potentiometer varies the DC bias at pin 9 of the 6BU8, thereby controlling the average level of tube conduction.

This set uses an early version of the 6BU8 circuit, which does not depend on keying pulses for its operation. The plate of the tube receives a positive DC voltage via R24, and the tube can conduct when-



www.americanradiohistory.com

1

number one of a series of
Cornell-Dubilier
50th Anniversary Deals!

CDE

MINIATURIZED
MYLAR

FOR THE PRICE OF PAPER

You read it right! Now you can get C-D's **miniaturized** 100% Mylar* film-wrapped capacitors at prices you'd normally expect to pay for paper-dielectric types! And these C-D Mylars—with their epoxy-anchored leads—are the universal types you use daily, especially for hard-to-get-at repairs. Not a dust-collector in the assortment!

HERE'S THE DEAL:

Quantity	Type No.	Capacitance (mfd.) ±10% Tolerance	Voltage (DCW)
10	WMF6S1	.01	600
10	WMF6S22	.022	600
10	WMF6S47	.047	600
10	WMF6P1	.1	600

All 40 pieces for only ~~$11.40~~ **$8.70**
(dealer net)

HERE'S THE PACKAGE: Typical of the quality C-D builds into **every** capacitor in their complete line, the assortment's sturdy, space-saving, clear plastic container fits easily into your tool kit. And, when the box is empty, it's perfect for holding small tools and parts you want at a moment's notice.

HERE'S HOW TO GET IN ON IT: First in a Series of C-D 50th Anniversary Deals, this limited-time offer is designed to save you money... help you do your job better, easier... keep your customers happy! Get the whole story —**and the deal**—from your C-D Distributor. Call him **today!** Get in on Cornell-Dubilier's 50th Anniversary Sales Celebration. (Also ask about C-D's complete capacitor line for industrial electronic maintenance.)

*Du Pont Reg. T.M.

CDE **CORNELL-DUBILIER ELECTRIC CORPORATION**
Affiliated with Federal Pacific Electric Company

www.americanradiohistory.com

The C-D brand name on a vibrator is your guarantee of dependable performance, long trouble-free service. Because C-D vibrators are built to last, you can use them with full confidence. That's why it pays to reach for a C-D when a vibrator replacement is called for.

Remember, too, that there's a C-D vibrator type for every make and model car on the road. And the C-D VIBRATOR REPLACEMENT GUIDE makes it quick and easy for you to select the exact type required. Ask your local C-D distributor for a free copy of VIB-3, or write to Cornell-Dubilier Electric Corp., S. Plainfield, N. J.

CDE **CORNELL-DUBILIER ELECTRIC CORPORATION**
Affiliated with Federal Pacific Electric Company

ever both signal grids (pins 7 and 9) are above cutoff. Plate voltage is somewhat hard to analyze; it may be within tolerance when no signal is applied, and yet it may not decrease in normal fashion as a progressively stronger input signal is fed to pin 9. You will probably find it necessary to leave the clamping-bias source connected to TP-3 while attempting to check the plate voltage, since this is the only way you can hope to obtain a normal input signal for the 6BU8.

The plate voltage is applied to one end of a series-resistor chain (R21, R22 and R23), and a fixed potential of —80 volts from the horizontal-discharge stage is applied to the other end of the chain. The three resistors form a voltage divider, with the intermediate points serving as the actual sources of AGC output voltage. Increasing the input-signal amplitude at pin 9 causes the tube to conduct more heavily, thus lowering the plate voltage and shifting the output voltages in a negative direction. Note that the ratio of values of R21, R22 and R23, as well as their individual values, must be correct within a reasonably close tolerance to insure normal operation.

If the 6BU8 does not seem to be conducting properly, check its input circuits. First, while applying a bias clamp to TP-3, see if the signal at pin 9 is normal as shown on the schematic. Also, see if the DC bias seems normal; if not, recheck the AGC-control circuit and the video-output plate circuit.

Also make some tests on the noise-limiter circuit connected to pin 7. If the signal amplitude here is somewhat greater than that shown on the schematic, or if the DC bias is abnormally negative, the 6BU8 may be driven into cutoff each time a sync pulse appears in the input signal. Of course, this will cause a drastic decrease in AGC output. A good, quick way to check noise-limiting action is to short pin 7 to pin 1 (the cathode) of the 6BU8. This simply disables the limiter circuit and prevents it from affecting tube conduction.

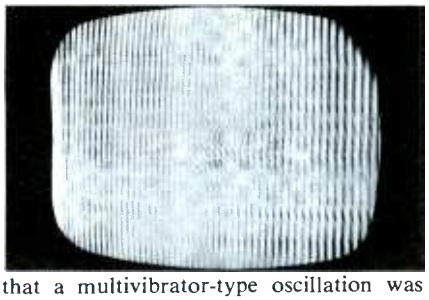
Corduroy

A customer brought in a Raytheon Model M1712 which displayed the odd symptom shown in the photograph. He emphasized that the trouble was not being caused by a tube, because *all* tubes had been tested!

Only the brightness control had any effect on the raster. The other controls —contrast, volume, horizontal and vertical hold—had little if any discernible effect. Since contrast-control action is not ordinarily disabled by sweep troubles, I decided to try a new video amplifier tube (a 12AT7) before digging into the sweep circuits. The smirk on the customer's face seemed to imply that I was just wasting time. To his complete, and my partial surprise, the trouble immediately cleared up and the set operated normally.

I don't know exactly what could have been causing the trouble, but I suspect

www.americanradiohistory.com



that a multivibrator-type oscillation was occurring in the old 12AT7.

ALLAN F. KINCKINER

Philadelphia, Pa.

Multivibrator action is the most logical explanation for this symptom. The 12AT7 is connected in a two-stage, RC-coupled video amplifier. All it needs to become a multivibrator is a feedback path from the plate of the second stage (pin 1) to the grid of the first stage (pin 7). This could be provided by leakage across the tube base, sagging of the above-named elements so as to cause greater capacitance between them, or internal leakage between elements. Since there are slightly more than 50 vertical bars on the screen, the frequency of oscillation must have been slightly higher than 50 times 15,750, or 787,500 cps.

Shook-Up Radio

I recently replaced the AR10 output transistor and the 12AD6 converter tube in a Mopar Model 848 auto radio. After the repair, the receiver checked out fine on the bench—so I returned it to the customer.

He came back a few days later, complaining that the radio had a tendency to change frequency as he drove. A short ride in his car verified this complaint. We consider the trouble to be a case of frequency drift because constant volume can be maintained by continual slight readjustment of the station-selector knob.

To date, we have rechecked the transistor bias adjustment, touched up the alignment of the set, changed the fixed capacitors in the oscillator circuit, tried five different 12AD6 tubes, and applied heat to the radio while on the bench. It will play all day long in the shop without drifting; when installed in the car, it will not act up until the car is actually driven.

PAUL GUERRERO

Half Moon Bay, Calif.

Operating conditions are altered in two different ways when the car is in motion. First of all, the radio is subjected to constant vibration or shaking, which can cause detuning of the RF circuits if there are any loose components. The movable tuning cores or associated mechanical parts are most likely to be at fault, but there are other possibilities—for example, loose elements in the 12BL6 RF amplifier. (This would interfere with frequency stability by varying the interelectrode capacitances within the tube.)

Something else to consider is the DC voltage applied to the radio when the car is being driven at various speeds. With the car generator turning at a fast rate, the source voltage may increase from 12 volts to 16 or more—and the various element voltages of the radio tubes will increase proportionately. Most auto-radio circuits can handle variations in supply voltage without drifting off frequency, but this particular radio may have developed some defect which makes it sensitive to DC voltage changes.

If the drifting is not due to faults introduced during repair, you are probably wondering why it was not noticed before the original failure occurred. Here's a thought: How long did the customer drive around with a dead radio before having it serviced? Many people tend to put off auto-radio repairs, and the frequency-drift trouble may have developed sometime after the power transistor went bad.

Bashful Ghosts

After curing a vertical-sweep defect in a Philco TV set, I bench-tested it and noticed some horizontal pulling in the picture. I then gave the set a thorough checking with a scope and VTVM, but nothing seemed to be wrong with it.

With my confidence somewhat shaken, I sat down and closely studied the screen while switching the tuner from channel to channel. Come to find out, the picture pulling occurred on only two channels. The pictures from both stations were good, but both had a slight ghost.

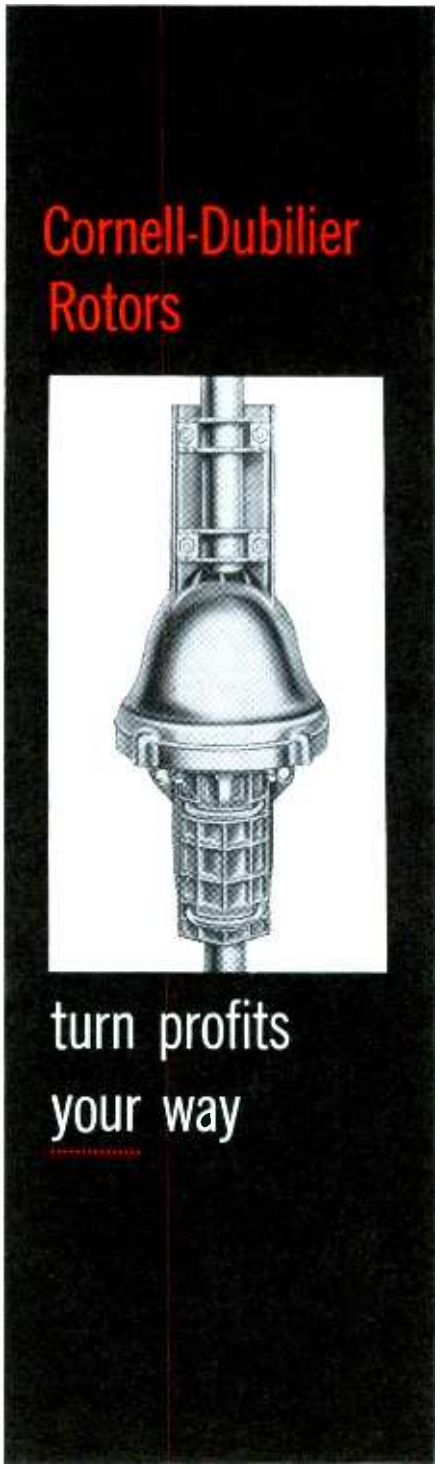
Remembering that I hadn't noticed any pulling when the set was in the customer's home. I checked my outside antenna (installed only recently) and found that its position had shifted. When I reset it to the correct direction, the set worked normally.

What puzzles me is why the ghost signal didn't show up in the scope waveforms, considering that it was strong enough to interfere with normal sync and cause picture pulling.

FRED A. HOFFMAN

Trenton, N. J.

Time is the key to answering your question. There would be a very short time lag between the main received signal and the ghost signal—probably only a few microseconds if the ghost image were quite close to the normal image. Even if you were using a scope sweep frequency of 7875 cps to observe details of the horizontal sync pulses, the ghost signal would still follow very close behind the original signal. The net effect on the waveform would probably be a general fuzziness or blurring, which could be mistaken for defocusing of the scope trace (or maybe a slight scope-sync difficulty). Of course, if you viewed the waveform at a sweep rate of 30 cps (vertical frame frequency), the phase difference between the original and ghost signals would become insignificant by comparison—so you wouldn't notice anything abnormal. However, the ghost could still cause sufficient interference to broaden or otherwise distort the horizontal sync pulse, and this disturbance would tend to cause pulling in some sets.



Whether you are after original installation business or replacement sales, you'll find the rotor best-suited for any job in the complete CDR line. Consider, the heavy-duty TR-4 recommended for areas where ice-storms, heavy snowfalls and strong winds impair the efficiency of antennas turned by ordinary rotors. Your CD Rotor distributor is ready to show you why the TR-4 and other CD Rotors are the easiest to install...most satisfactory in the long run. Write for catalog TVR to Cornell-Dubilier Electric Corp., S. Plainfield, N. J.

CDE CORNELL DUBILIER

Affiliated with Federal Pacific Electric Company

www.americanradiohistory.com

LATEST VOLUMES IN POPULAR SAMS SERIES BOOKS

"Servicing Transistor Radios" Vol. 4

Complete analysis of popular transistor radios produced in 1958-59. Includes special section on "Techniques in Servicing Transistor Circuits." All data based on actual lab analysis. You get famous Sams Standard Notation schematics with Circuit-Trace; full photo views of each chassis; alignment data; parts replacement information — all you need for time-saving, profitable transistor radio servicing. Cumulative index covers all volumes in series. 160 pages; 8½ x 11". *Only*..... $2.95

"Record Changer Manual" Vol. 12

Complete analysis of 62 record changers produced in 1958-59 including: Dual, Fairchild, Garrard, Lesa, Miracord, Perpetuum - Ebner, Silvertone, V - M, Webcor, Westinghouse, Wumo. Provides general description, operating instructions, exploded views, change cycle data, adjustments, trouble chart, parts list, etc. Includes index for all volumes in series. 160 pages; 8½ x 11". *Only*..... $2.95

"Tape Recorder Manual" Vol. 4

Full analysis of 21 tape recorders produced in 1958-59. Covers Bell & Howell, Bell Sound, Grundig Majestic, Knight, RCA, Revere, Sylvania, Telectro, Tower. Includes general description, operation data, trouble shooting and maintenance facts, diagrams, parts lists, etc. With special editorial section on magnetic tape recording. Has cumulative index. 160 pages; 8½ x 11". *Only*... $2.95

"Auto Radio Manual" Vol. 9

Covers scores of popular auto radios produced in 1958-59. Most complete data available: Schematics, chassis photos, voltages, resistance readings, parts lists and replacement data — everything you need to know for quicker, easier auto radio servicing. 160 pages; 8½ x 11". *Only*..... $2.95

HOWARD W. SAMS & CO., INC.

Order from your Sams Distributor today, or mail to Howard W. Sams & Co., Inc., Dept. AA-30, 1720 E. 38th St., Indianapolis 6, Ind.

Send me the following books:

☐ "Servicing Transistor Radios" Vol. 4 (TSM-4)
☐ "Record Changer Manual" Vol. 12 (RC-12)
☐ "Tape Recorder Manual" Vol. 4 (TR-4)
☐ "Auto Radio Manual" Vol. 9 (AR-9)

$_____ enclosed. ☐ Send Free Book List

Name_____

Address_____

City_____ Zone_____ State_____

(outside U.S.A. priced slightly higher)

Mad—because you made a service call just to plug in a line cord the set owner forgot to insert in the wall socket? Well, don't forget that the customer is disgruntled, too! He's sorely embarrassed at his failure to notice this obvious mistake; in fact, he feels like an idiot. So, even if you announce with a shrug and a smile that there is no charge for the call, you may lose his future business—for the simple, silly reason that he's ashamed to face you again.

And what kind of a scatterbrain would be so sensitive about your opinion of him? Exactly the same kind of scatterbrain who would overlook an unplugged cord in the first place!

Prevention is the best cure for this ridiculous situation. When someone phones in to report that his set is completely dead, ask him to check and see if power is available at the AC receptacle and if both ends of the TV line cord are firmly seated in their sockets. This precaution can save *you* a trip and *him* a mortifying experience.

$ & ¢

Upbeat. The TV manufacturing industry is entering the 1960's in what appears to be its healthiest condition since the "post-freeze" boom era of 1952-54. Have you noticed the magazine ads for new receivers? The stress is on fine-furniture cabinets, ultra-thin styling, and new technical features such as "squarer" 23" screens, stereo-TV combinations, and wireless remote controls. Price is deemphasized—and it is likely to be higher than in the past year. A $159.95 list price is low by today's standards, and this sum buys only a slim 17" portable with a 110° picture tube. The smaller screen sizes which helped make lower prices possible have virtually disappeared; even the 14" screen is obtainable in only a few brands of sets this year.

This is a far cry from the situation that existed only a few years ago, when almost everyone seemed to be concentrating on reducing set prices to the near-$100 level. The low point was reached in 1956 (with 8" and 10" portables). Since that time, the trend has been upward, away from the "absolutely rock-bottom" design concept.

The upgrading process has been wonderful news for the service industry. Just as a matter of simple mathematics, raising the price of the most inexpensive set means that a fair charge for service becomes a smaller percentage of the purchase price. This tends to make people think twice about having their old sets serviced, instead of just trading them in. Furthermore, the nightmarish situation of "expensive repairs on cheap sets" is being eased.

If anyone complains to you about the higher prices of the new models, take this opportunity to remind him that the average annual operating cost (including repairs) does not increase in proportion to purchase price. If anything, the new models will cost *less* to run, thanks to the increasing emphasis on better quality.

$ & ¢

Maxim of the month. "To be a success, don't stay awake all night—just stay awake in the daytime!" — *Tech Radio Newsletter.*

$ & ¢

Strayed From the Fold. Your service business can't grow if former customers don't remain loyal to you. Like some TV servicemen, however, you may not be keeping as many steady customers as you would like. Why is this? In many cases, it doesn't mean that you haven't done an adequate servicing job. More than likely, you just haven't convinced enough people that you really care about their patronage. Some of them drift over to your competitors — sometimes with a vague hope of getting better serv-

www.americanradiohistory.com

ice, but often for no particular reason at all.

One effective means of minimizing this "customer drift" is by use of a well-planned direct-mail advertising program. We've even seen postcards used successfully to bring back business which had just about been given up for lost.

Perhaps you'd like to try this latter technique yourself. Sometime, when weeding out your customer files, don't be hasty in discarding the names of people who haven't called in 12 months or so; send each one of them a card with a "We miss you" message. Imagine their surprise when they hear from you after such a long interval! If your appeal is direct and personal, they can't help being impressed by the fact that you still remember them. Thus, you stand a chance of hearing from some of them again.

We've received some postcards on this theme which are real tear-jerkers: "We can't believe you've gone this long without a checkup . . . certainly hope you haven't gone elsewhere for service." Oddly enough, you can go this far — if you're clever — without sounding insincere. It's all right to "ham it up" a little, since you want this last-ditch appeal to give the reader a little twinge of remorse at having forsaken such a friendly, loyal serviceman as yourself.

$ & ¢

Check Your Battery, Son? This is a good time of year to carry a few standard sizes of 1½-volt batteries in your caddy—not for servicing portable radios, but for rejuvenating Christmas toys that have run out of motive power. Although you won't be making any significant profits from the actual sales of these batteries, your customers will appreciate the little extra service and will get more satisfaction from your call.

$ & ¢

24 HOUR SERVICE

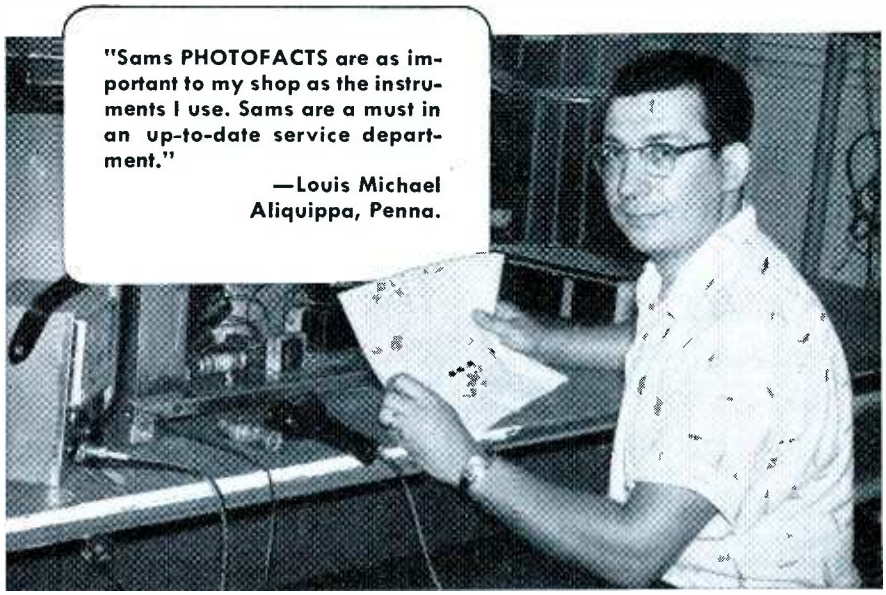
Doctors, they say, get most of the calls,
But you'll have to prove it to me.
All I can say is, "Doc, you'll get more
If you start repairing TV!"

PLEASE FIX OURS FIRST!

Hi-Fi, FM, and TV have we;
However, none are working.
Hubby's in the business, too,
But homework he is shirking!

—Phyllis Barlow

Service Technicians! YOU EARN MORE... YOU RATE with the public when you own the PHOTOFACT® service data library!



YES, if you are one of the thousands of owners of a complete PHOTOFACT Service Data Library, you are enjoying maximum earnings. It's inevitable, because no matter how expert you are, you can always *save more time* on *any* job, get *more* jobs done daily—EARN MORE, DAY IN AND DAY OUT...

Moreover—as the owner of a complete PHOTOFACT Library, *you* know your customers' sets *best*. You can actually show each customer you have the PHOTOFACT Folder covering his very own set. Result: You command public respect and acceptance which paves the way to more business and earnings for you...

HOW TO STAY AHEAD...

Today, the truly successful Service Technicians are those who own the complete PHOTOFACT Library, who can meet and solve any repair problem—faster and more profitably. And these men *keep ahead* because they're on a Standing Order Subscription with their Distributors to receive all new PHOTOFACTS as they are released monthly.

For **PHOTOFACT** Library Easy-Buy Plan details and Standing Order Subscription, see your Sams Distributor today, or write to Howard W. Sams...

"PEET" PROGRAM **BIG NEW PLUS!** *get the details*

If you now own a PHOTOFACT Library, you can apply for membership in the powerful new "PEET" program, designed to build prestige and business for the Service Technician who qualifies. Ask your Sams Distributor for the "PEET" details, or mail coupon today!

HOWARD W. SAMS & CO., INC.
1728 E. 38th St., Indianapolis 6, Ind.

☐ Send me full details on the new "PEET" Program. Include full information on the Easy-Buy Plan and Free File Cabinet deal.

☐ I'm a Service Technician: ☐ full-time; ☐ part-time

My Distributor is:_____

Shop Name_____

Attn:_____

Address_____

City_____ Zone____ State_____

www.americanradiohistory.com

by Calvin C. Young, Jr.

How's your SHOP POWER?

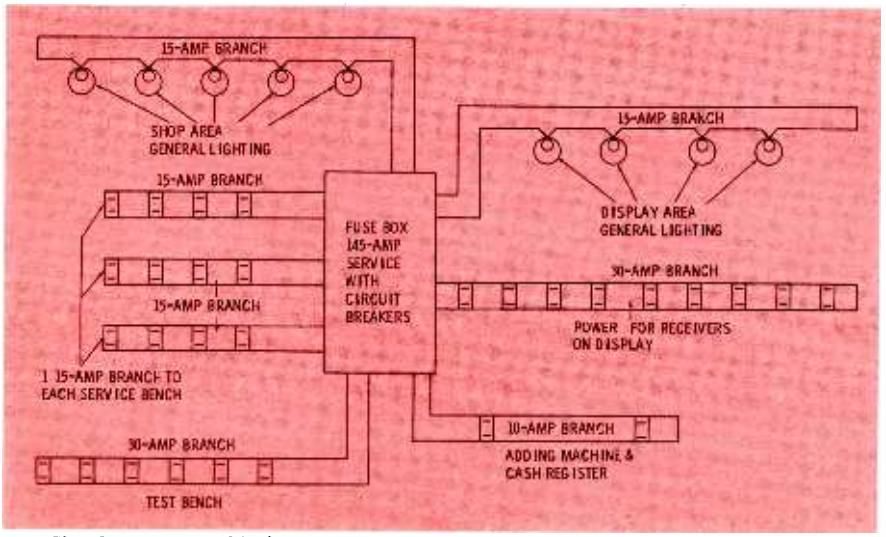


Fig. 1. Power and lighting circuits for radio-TV sales and service operation.

Chances are that you are well acquainted with the term *working voltage DC;* however, the term *working voltage AC* may mean little or nothing to you. In this case, we're not referring to the rating of some component in a TV or radio receiver, but rather to the rating of the AC power facilities of your shop. We are reminded of the campaign being carried on by the electric utility companies to make the public aware of the need for adequate AC power in the home—"Housepower" they call it. This need is even more important in commercial operations such as your own. The details given here will enable you to evaluate your present facilities and update your system to meet the needs of a progressive and expanding service shop.

The Basic AC System

To set up an example, let's suppose we have a service area—with three work benches plus a test bench—and a salesroom and display area. The electrical system needed to supply adequate power for such an establishment is shown in Fig. 1. As you can readily see, the total power required is 145 amps, consisting of 15-amp branches for each of the service benches, two more for general lighting in the shop and display areas, two 30-amp branches for test-bench and display-receiver power, and a 10-amp branch to handle such items as an adding machine and cash register. (Keeping these on a separate branch will prevent transmitted interference via the power line.)

Proper installation is just as important as adequate capacity, so unless you know the codes governing this type of work, it would probably be better to have an electrical contractor do the job to your specifications rather than to make the installation yourself. Besides, you can earn just about enough to pay for the installation by making calls or bench repairs while the electrician is doing the job. It would also be a good idea to have the contractor do the work on a day (two if needed) when you do not expect too great a shop load. This will minimize interference with your normal business procedure.

Lighting Details

Depending on the decor of your sales room, you may want to use recessed or indirect lighting with either fluorescent or incandescent lamps. A word of caution here: Fluorescent fixtures are a common source of electrical noise. However, a low-noise type is available—one that employs two 55-volt bulbs in series and operates without starters. This fixture is generally as noise-free as the standard incandescent variety.

Fluorescent strip lighting behind a valance located about a foot below a white 10′ ceiling gives a sales room an air of elegance, especially when augmented by a few decoratively-placed table and floor lamps. Avoid extremes that make the sales room look like either a hospital operating room or photo-lab dark room.

Fig. 2. Individual on-off switches and fuses for each bench are desirable.

Fig. 3. Use AC outlet strips for power at benches and demonstration areas.

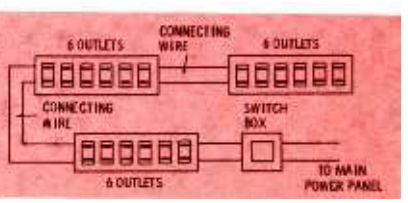


Fig. 4. Alternate bench hookup to operate all test equipment on one circuit.

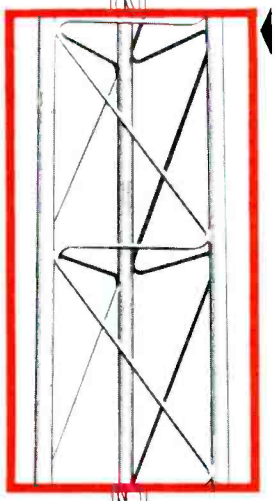
www.americanradiohistory.com

LOOK TO ROHN

for ALL TV installation needs!

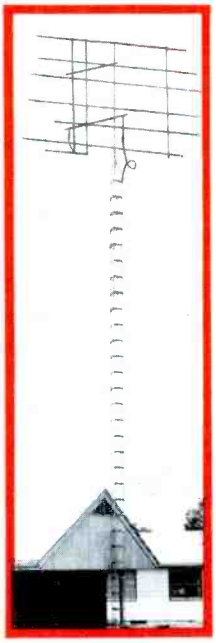
LOOK TO THE FOREMOST NAME IN THE COMPLETE LINE OF HOME TV, AMATEUR AND COMMUNICATION TOWERS, PLUS A COMPLETE LINE OF INSTALLATION NEEDS. You'll find that the ROHN line is *complete*. It gives you *better* products at a *better* price. Practically all ROHN products are available in the finest of finishes . . . *hot-dipped galvanizing!* Rely on the *dependable* name for ALL your needs —ROHN . . . today one of the largest manufacturers of a *complete* line of this type equipment.

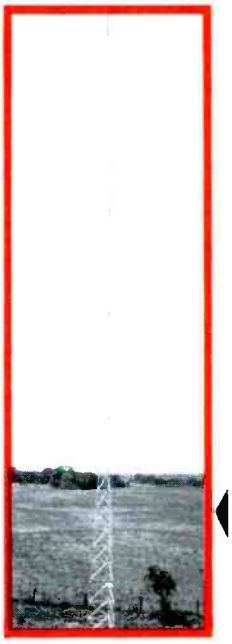
TOWERS



No. 25 The ROHN No. 25 tower is one of the finest ever designed . . . a full 33% stronger and more durable than "similar sized" towers. This is achieved by amazing zig-zag cross bracing design combined with highest grade steel and heavy-duty steel side-rail tubing. This superior strength means that this tower can ordinarily be installed self-supporting to 50 feet or guyed to 360! It is truly the *finest* tower of its kind for home television reception.

No. 6 This ROHN tower features the well-known "magic triangle", the cross-bracing construction that is unequalled in strength and durability. Also available self-supporting, or guyed to about 150 feet.



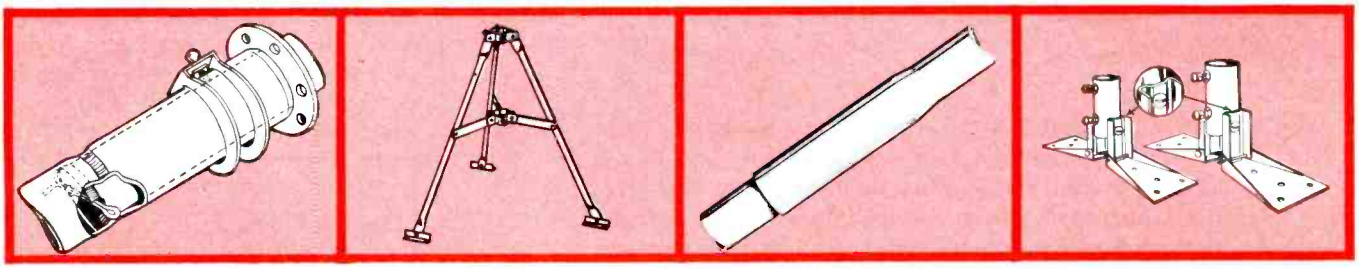


Fold-over The No. 25, as well as heavy-duty No. 40 communication tower, can be converted into "fold-over" towers for amateur use . . . the *only* tower of its kind. They let you work "on the ground!"

Communications FIVE complete lines of communication towers are available to fulfill *practically any need*, including a 130 foot true heavy-duty communication tower that is completely self-supporting and guyed models up to 630 feet!

Complete communications catalog sent on request!

PLUS ALL THESE ROHN DESIGNED ITEMS



Telescoping masts—Unexcelled in design, structure and strength, with several exclusive features! All popular sizes, heights and weights available.

Roof towers—Available in 10, 5 and 3 foot heights. Most of them are collapsible for easy shipping. Ideal in use—a ROHN "big-seller".

Tubing—Just what you want: 6" expanded end with ½" taper to form a solid locking joint! High corbon steel. Available 5, 10 foot lengths, 1¼", 1½" diameter, 16 and 18 gauge.

Bases—Wide variety of roof mount bases. Special locking feature. Also available is cast aluminum roof mounts and many other types.

Get the full and complete catalog from your ROHN representative.

ROHN *Manufacturing Company*

116 LIMESTONE, BELLEVUE
PEORIA, ILLINOIS

ROHN Manufacturing Company
116 Limestone, Bellevue
Peoria, Illinois

Please send me literature on full line of ROHN products.

Firm _____

Name _____ Title _____

Address _____

City _____ State _____

www.americanradiohistory.com

Bench Power Circuit

A most valuable feature for the power circuit of each service bench is a switch and fuse arrangement (Fig. 2). The switch should control power only for its own bench and should be rated to handle the maximum capacity of the branch. Physically, the switch should be located between the main power panel and the first outlet of the branch. Personally, I like to have this switch-fuse combination mounted at one end of the bench. The fuse rating should be equal to or less than the rating of the branch — never higher. I like to use a lower rating. This way a short or excessive load never blows the fuse in the distribution box. A slow-blow type fuse will prevent starting surges from needlessly blowing the fuse when a TV normally drawing 2 amps of current (but often double that amount in the initial surge period) is switched into a 15-amp circuit that already has a 12- or 13-amp drain.

Since several outlets are needed on a service bench, the strip-style arrangement shown in Fig. 3 is highly recommended. These strips offer great flexibility, since they may be run along the rear or the front of the bench, or both, as desired. I prefer to have about six outlets along the rear of the bench for test equipment, and four along the front to power sets under test, soldering guns, electric drills, and other temporarily-connected devices.

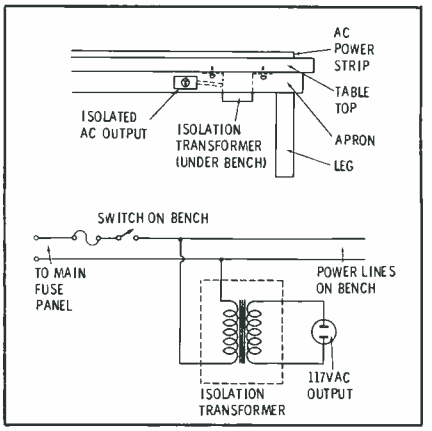


Fig. 5. Details for the installation of isolation transformers at each bench.

If it is your practice to keep your test equipment on standby, an alternate wiring method might be considered. This involves having the test equipment outlets for each bench connected in a single circuit controlled from a main switch. (See Fig. 4 for details.) Fuse trouble on this line can be avoided by installing fused plugs (Elmenco or equivalent) on each piece of test equipment.

In connection with the bench circuits, an isolation transformer should be installed in each position. I like to have the transformer fastened beneath the bench as shown in Fig. 5A. Notice that it feeds only a single outlet. This is important because it automatically prevents the operation of several items from one transformer, which could easily lead to its ruination. The circuit should be

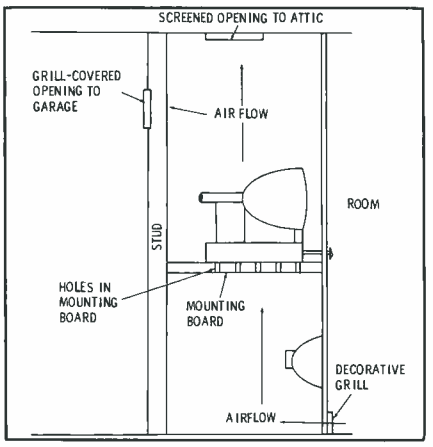


Fig. 6. How to provide adequate ventilation for built-in TV and hi-fi outfits.

the New

STANCOR

TV REPLACEMENT GUIDE

is always up-to-date

is available FREE to qualified servicemen

The new *loose-leaf* Stancor TV Transformer Replacement Guide is just off the press. Its new format makes it the easiest-to-read, easiest-to-use guide ever published. This valuable service reference now lists complete transformer replacement data on over 17,000 models and chassis of 151 brands. It is kept up-to-date by regular mailings directly from Stancor to each registered owner of the TV Guide.

There is no charge for it. Professional servicemen can get it free . . . through authorized Stancor distributors. Just ask your distributor for a Stancor TV Guide registration card, and mail it to us.

CHICAGO STANDARD TRANSFORMER CORPORATION

3503 WEST ADDISON STREET • CHICAGO 18, ILLINOIS

www.americanradiohistory.com

Fig. 7. Installing a socket by inserting it into the risers of the old one.

wired as shown in Fig. 5B. Some suitable transformers are listed in Table I.

Installation of the system we've been describing costs more than just a few dollars, but you'll never be troubled with those "bugs" that are first noticed when a set is operated in the shop — namely, cases of low B+ or narrow pictures that seem to defy solution. Your cause isn't helped a bit by low or fluctuating voltages due to an improperly wired or inadequate power system.

Built-in TV a Hazard

If adequate ventilation is not provided for built-in TV receivers, they can be a fire hazard. The cabinet of a TV set is designed to provide air circulation for proper heat dissipation in normal installations. However, if the chassis is mounted behind a wall or in a closet so that no consideration has been given to circulation, the lack of heat dissipation can result in a fire. Aside from this important aspect, the life span of tubes and components will be shortened considerably.

Table I—Isolation Transformers for TV Bench Installation.

MANUFACTURER	NUMBER	RATING
Acme Electric	T-10307*†	350 watts
Acme Electric	T-10308*†	500 watts
Chicago Standard	P-6415*	350 watts
Chicago Standard	P-6298	500 watts
Merit	P-3177*	350 watts
Merit	P-3172	500 watts
RCA	WP-25A*	275 & 500 VA
Standard Electrical	LR-5*	500 watts
Thordarson	23V19*	350 watts
Thordarson	23V28	500 watts
Triad	N-52M*	350 watts
Triad	N-57M	500 watts

* Adjustable. Better suited for bench-op mounting.
† Includes meter.

Adequate ventilation can be provided by installing a screen or decorative opening at the floor level, drilling holes in the chassis-mounting shelf, and providing for air passage to the attic or garage. (See the sketch in Fig. 6 for details.)

I strongly advise checking all such built-in facilities (hi-fi, TV and radio) on each service call. Your customers will appreciate your concern for their equipment.

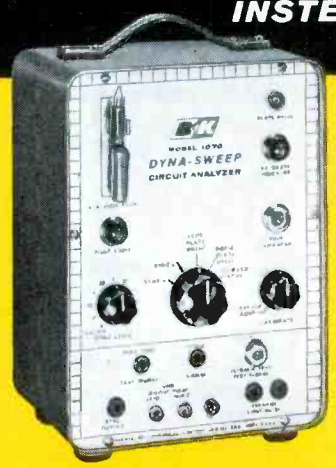
PC Socket Replacement

In printed circuits using wafer-type tube sockets, the pin contacts may pull loose when the tube is removed. When this happens, you can save yourself the trouble of replacing the socket. Break away the top phenolic wafer and insert the prongs of a new socket into the risers of the old one as shown in Fig. 7. A simple soldering job is all that remains to complete the repair.

We might mention that this also happens to the "do-it-yourselfer," and may account for set failure when everything checks OK by the time you get the set. ▲

Solve Rough Sweep Output Problems

IN MINUTES INSTEAD OF HOURS!

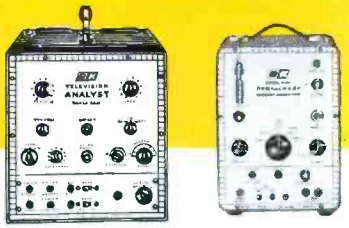


NEW B&K DYNA-SWEEP CIRCUIT ANALYZER

1. Provides composite synchronizing signals (negative or positive) to inject directly in each sync stage.
2. Provides plate drive signal to check complete vertical output circuit, including V.O. transformer.
3. Provides vertical yoke test signal to determine if vertical yoke windings are defective.
4. Provides horizontal plate driving signal to directly drive TV horizontal output transformer circuit.
5. Provides B+ boost indicator.
6. Provides unique high-voltage indicator.
7. Provides sensitive tests for each of the horizontal output components, including H.O. transformer and yoke. Immediately reveals their true condition, good or bad.

Quickly solves tough output servicing problems that have always plagued the TV serviceman. Provides horizontal and vertical sync and driving pulses that make it easy to check out every stage in the sync and sweep sections of a television receiver. Tracks down troubles in the horizontal and vertical output circuit, including defective output transformer and yoke. Checks for shorted turns, leakage, opens, short circuits, and continuity. Gives unique high-voltage indication. Eliminates trial and error replacements. Saves many hours of service work! Pays for itself over and over again.

Model 1070 Dyna-Sweep. Net, $69.95



MODEL A107 DYNA-SWEEP CIRCUIT ANALYZER
for use with B&K Model 1075 Television Analyst

Functions like the Model 1070 above, but is designed as a companion unit for use only with B&K Model 1075 Television Analyst for driving source. Makes your Television Analyst more useful and valuable than ever. Net, $49.95

See your B&K Distributor or Write for Bulletin ST24-R

B&K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont. • Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

www.americanradiohistory.com

CUT BACK on CALL BACKS

AEROVOX MICA CAPACITORS

Why risk call backs when dependable Aerovox Mica Capacitors insure a stay-put repair job. Smart servicemen and technicians everywhere use and depend on Aerovox mica capacitors for "trouble-free" operation.

POSTAGE STAMP MICAS . . . for all those applications where only the smallest axial lead units will do. Perfect for horizontal and vertical oscillator requirements. All units color-coded and stamped.

HIGH VOLTAGE MICAS . . . designed especially for TV and low power transmitters. You'll find the highest voltages available in these small case sizes. Every unit is tested at twice the rated voltage to insure long-life. Units color-coded and stamped.

DIPPED-MICAS . . . superior in many cases to conventional molded units. High operating temperatures, excellent long-life characteristics. Perfect for printed-wiring assemblies. Smallest physical sizes with unsurpassed performance and stability features.

For "off-the-shelf" delivery on all your capacitor requirements see your local Aerovox Distributor.

AEROVOX CORPORATION
DISTRIBUTOR DIVISION
NEW BEDFORD, MASS.

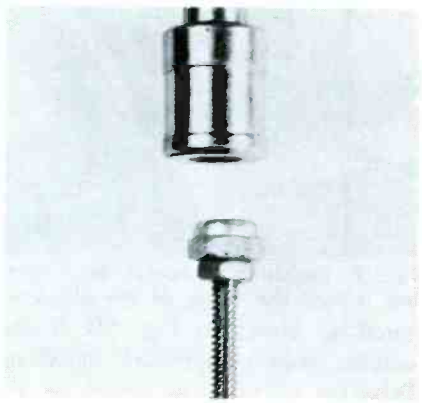
TIPS for TECHS

Prod Holder for Meter

A snap-on fuse holder screw-fastened to the top or side of your meter makes a good holder for test prods. Just drill a small hole in both the fuse holder and meter case, and use a short self-tapping screw. Snap the prods into the clips when they aren't in use.

Service Tool From Pen

When that retractable ball-point pen of yours runs out of ink, don't discard it. Instead, remove the ball from the cartridge by pinching the tip lightly with a pair of long-nose pliers. Insert a steel sewing needle into the tip of the cartridge and solder it in place. Then put the cartridge back into the pen. The resulting service tool is handy as a scriber, fine-pointed test prod, or opener for clogged aerosol spray can nozzles. Since you can retract the sharp tip, there's no danger of stabbing yourself when the tool is carried in your vest pocket.

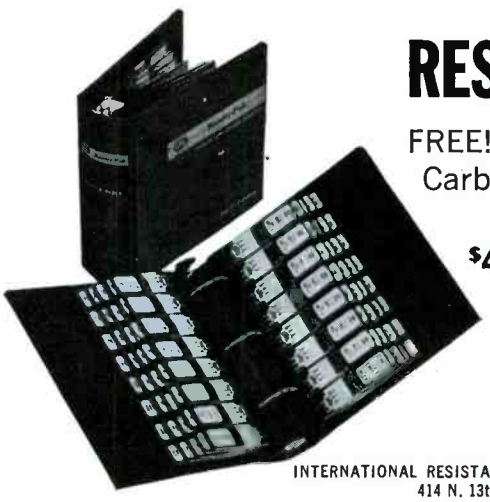


Repair Broken Slugs

Occasionally, the screwdriver slot in the threaded shaft of a slug-tuned coil breaks and you have to adjust the slug with pliers. This isn't the easiest job in the world and you don't always have a replacement slug of the needed size on hand. Next time this happens, hunt up a couple of nuts that will fit the shaft and screw them on just over the end. Tighten one nut firmly up against the other. This arrangement lets you use a nut driver to adjust the slug, which is much better than trying to use pliers.

Tightening "Rabbit-Ears"

If "rabbit-ear" indoor TV antenna sections telescope in and out too easily, pull the sections out to full length and pinch the bottom end of each section slightly with slip-joint pliers. This will provide a little more friction for good contact between sections. Dirty or corroded rabbit-ears should be cleaned with solvent, steel wool and a clean cloth.



RESIST-O-PEDIA

FREE! with any of 5 Handy-Pak Carbon Resistor Assortments 65 to 77 Values

$46.80 to $110.88 Dealer Net

Convenient "Book Shelf" storage in hard-back binder • Self-indexed

IRC

Order from your IRC Distributor

INTERNATIONAL RESISTANCE COMPANY • DISTRIBUTOR SALES DIVISION
414 N. 13th STREET • PHILADELPHIA 8, PA.

www.americanradiohistory.com

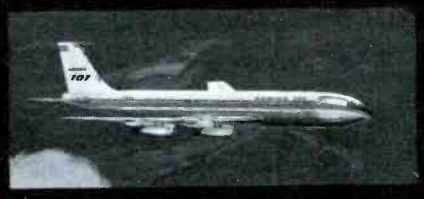
You asked for more!
Since introduction of the Duals, demand has been so great we've extended these famous speakers into 6"x9" and 15" sizes as well as the 8's and 12's!

MORE POWER PER POUND

in the ALL-NEW UTAH*

dual-diameter speakers

. . . Never before such *concentrated power!* The secret is in Utah's brand new dual-diameter magnetic circuitry and dynamic Uni-coils. By ingeniously combining two magnetic material structures into one, Utah has produced the greatest power per pound in a loud-speaker since the advent of Alnico V. See the all new Utah speakers now—8″ full range model **D8LA** and 12″ full range model **D12LA**—they're as "hot" as a Jet Airliner!



* These new Utah speakers were inspired by the fabulous new Boeing 707 Jet Airliner, now streaking coast to coast in just 4½ hours! Utah speakers, too, pack more power per pound, feature Jet Airliner slim-line design to meet modern demands for more compact Stereo and High Fidelity applications.

utah SPEAKERS

Utah Radio & Electronic Corp., Huntington, Ind.

www.americanradiohistory.com

NEW FROM SECO

DYNAMIC TRANSISTOR CHECKER

MODEL 100

DYNAMICALLY CHECKS WIDE RANGE OF TRANSISTOR TYPES EITHER "IN OR OUT" OF CIRCUIT!

This new low-cost checker uses an entirely new approach but a proven DYNAMIC principle for checking transistors. safely tests PNP and NPN transistors either "in or out" of the circuit. Covers wide range of types: small signal including "drift" types, medium power; and power types. Provides positive check for "opens," shorts, and gain—condition indicated by means of a visual indicator plus jacks for meter or scope. Also provides GO-NO-GO test at practical currents—and permits matching of similar transistor types. No set-up required—no further leakage tests necessary. Model 100 is compact, lightweight, complete, and ready-to-use . . . helps you cash-in on the big profits in the fast growing transistorized equipment servicing field!

MODEL 100—Wired and factory tested . . . . $19.95 NET

NEW FROM SECO

LOW COST, COMPLETE TUBE TESTER

MODEL 78

GRID CIRCUIT and TUBE MERIT TESTER

Complete test coverage of all modern TV tube types as well as all heater type radio tubes including hybrid types, using only 5 sockets. Incorporates patented Seco GRID CIRCUIT TEST plus a reliable CATHODE EMISSION test using new low impedance low test voltage circuit—also checks filament continuity and provides open element test. One easy-to-read meter indicates results for both Grid Circuit and Tube Merit Tests. Two-stage DC amplifier isolates meter from tube under test to protect meter—and makes it possible to achieve a wide range of load currents and test conditions. Complete with portable carrying case, pin straighteners, and flip-chart for quick set-up data.

MODEL 78—Wired and factory tested . . . . $69.50 NET

MODEL 107 TUBE TESTER

outstanding reliability, accuracy

Provides 3 important tests: amplifier types tested for gain by Dynamic Mutual Conductance method—power types tested for cathode current by Cathode Emission method—all types tested for shorts and grid error by Grid Circuit Test developed and patented by Seco. Dynamic Mutual Conductance Test pre-wired to eliminate elaborate set-up. Cathode Emission Test done by free point pin-selector method—will not be obsoleted. Completely self-contained in portable carrying case.

MODEL 107—Wired and factory tested $139.50 NET

MODEL HC-6 IN-CIRCUIT CURRENT CHECKER

positive, on-the-spot check of horizontal output current!

This new, low-cost current checker provides simple means for making a positive on-the-spot check of TV horizontal circuits. Can be placed into the circuit in seconds—*no unsoldering of circuit wiring*—immediately indicates whether horizontal tube cathode current is within manufacturer's recommended limits. Valuable as a fast, accurate indicating device when adjusting horizontal drive and linearity. Eliminates one of the most common causes of callbacks. Compact, inexpensive, easy to use.

MODEL HC-6—Wired and factory tested $12.95 NET

MODEL GCT-8 GRID CIRCUIT TESTER

fast check of critical "control grid" conditions

Model GCT-8 checks "control grid" condition of vacuum tubes faster, more accurately than any other tester! As many as eleven simultaneous checks—automatically! Quickly spots grid errors and leakage—stops guessing, substitution checking, and costly rechecks. Electron-Eye tube indicates faults at a glance. Truly portable. The perfect companion to any tester that employs only conventional gas and shorts test. Carry it on all calls.

MODEL GCT-8 Complete kit . . . $19.95 NET

MODEL GCT-8 Wired and tested . $29.95 NET

SEND FOR COMPLETE SECO STORY ON . . .

- ☐ Three Tube Testers
- ☐ In-Circuit Current Checker
- ☐ VTVM
- ☐ 100% Accurate Flyback Checker
- ☐ Dynamic Transistor Checker
- ☐ Battery Eliminator

Sold Only Thru Electronics Parts Distributors

OUTSTANDING RELIABILITY—TOP DOLLAR VALUE!

SECO MANUFACTURING CO.
5015 Penn Ave. So., Minneapolis, Minn.

NAME_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

Service Bench Pad

You'll find that a piece of thin foam rubber (the kind used for lining hi-fi speaker cabinets) is a mighty handy pad to keep on the service bench. When you have to tip a portable TV over on its face, the pad can be used to protect the front of the cabinet and the mask from scratches. It's also handy for all-around picture-tube padding. When you have to protect work that's placed in the vise, use the rubber pad for that, too.

Insulate Bare Electrolytics

Some subminiature electrolytics have a bare, uninsulated metal case. When such a capacitor is used for interstage coupling or a similar application, the case may be hot — depending on whether or not it is common to one of the terminals. In any event, it is desirable to insulate the case and avoid the possibility of shorts and shock hazards. Before installing such a unit, wrap it well with electrical tape and take pride in a job well done.

Rear-Seat Speaker Vent

When installing rear-seat speakers on the package deck, be sure you make a couple of vent holes between the trunk compartment and the inside of the car. Modern trunks are so air-tight that slamming the lid can rupture the speaker cone. A couple of ¼" holes drilled on both sides of the speaker will usually do the trick.

"Push" Screws Out Quickly

Here's how you can save a lot of time removing and replacing hex-head self-tapping screws. Buy an extra ¼" nut driver, saw off the handle, and chuck the driver in a spiral ratchet screwdriver. There is no faster or easier way to remove or install those hex-head screws.

www.americanradiohistory.com

Reduce callbacks to a trickle

If you've been showered with callbacks, get under an umbrella of Tung-Sol Blue Chip quality. You know a single callback will drown out the profit on the next three service calls. That's why it's a good idea to use Tung-Sol tubes for all radio, tv and hi-fi replacements. They're made to set manufacturers highest original equipment standards so that you can keep your service profits dry and high. Tung-Sol Electric Inc., Newark 4, N. J.

Tell your jobber you'd rather have

TUNG-SOL®

Blue Chip Quality TUBES • TRANSISTORS • DIODES

www.americanradiohistory.com

PROFESSIONAL technicians use Dave Rice's OFFICIAL ORDER BOOKS for every TV-RADIO service call

This is the businesslike approach to service record keeping. Triplicate forms serve as order form, invoice and office record, with spaces for complete information on every job. Separate listings for receiving tubes, pix tube, parts, serial numbers, labor and tax charges, signatures, etc. 75c a book, $6.50 for dust-proof box of 10. In stock at your distributor. Write for your *free* folder describing Dave Rice's OFFICIAL ORDER BOOKS, including an actual size sample copy of the handy order form.

* * * *

For customer's prices on every replacement part, plus flat rate and hourly service charge data, regional and national, Dave Rice's OFFICIAL PRICING DIGEST, listing over 63,000 items. $2.50.

ELECTRONIC PUBLISHING CO., INC.
180 N. WACKER DRIVE
CHICAGO 6, ILLINOIS

TELEX TV LISTENERS

ADD BONUS DOLLARS TO TV SERVICE CALLS

On your next service call suggest the Telex TV Listeners, Pillow Speakers or Earsets. The private listening advantages of these unique devices can mean extra profits for you.

TV listeners have volume control and are ideal for children and hard of hearing. Two can listen at same time. A switch controls TV speakers. Use to replace or supplement speaker. A 15 foot cord is included. One user says, "I bought a TV Listener to avoid turning the set on loud. I wouldn't part with it for $50!" Here is an item you can sell fast.

Order from your jobber today.

TELEX, Inc.
DEPT. 9900 TELEX PARK
ST. PAUL 1, MINNESOTA

by Jack Darr

More Pleasure with Extra TV Speakers

Increase your business by installing additional speaker systems for your TV service customers.

Time was when a family was perfectly happy with a table-model 10" TV set using a small 3" x 5" speaker. Next came the console set with its 8", 10", or 12" speaker; after that, larger screens and multiple speakers — all because of the consumer's desire for better and more comfortable TV viewing.

Today, there is a demand for something a little more — *personalized* TV listening. What it amounts to is that Mom or Dad wants to watch (and hear!) a certain program — but the room is full of noisy youngsters, or the hour is so late that comfortable listening under normal circumstances is impossible.

You can be prepared to help solve this problem, and at the same time increase your income, by installing some form of personalized TV speaker system wherever the situation warrants. Here are some ideas: Sell and install an earpiece—or "pillow"-type system for the comfort and use of late-hour or hard-of-hearing viewers. Add speaker-enclosure systems in rooms where better overall sound coverage is desired (a good idea for restaurants, bars, and other commercial establishments, incidentally). For the person who wants to shut out all other sounds, you can even install a cushioned-earpiece headset!

Recently, because it contained all the essential ingredients I needed for a particular job, I installed a system which utilized an automobile rear-seat speaker kit. Besides the 6" x 9" oval speaker, it contained a selector switch (or fader potentiometer) with mounting bracket and knob, and also a chrome-plated grille with the necessary grille cloth.

The simplest way to utilize this kit is to install it just as you would in a car. A typical hook-up including a selector switch is shown in Fig. 1. If there is a rug in the room, the connection between the TV set and the remote unit may be made with four-wire rotator cable, which will lie flat beneath the rug. An alternate scheme is to run standard audio-conductor cable or intercom hook-up wire around the baseboard.

One neat and simple way to mount the extension speaker is to fasten it, together with the switch, on a panel of plywood or any other suitable material. (See Fig. 2.) The whole panel may then be mounted between shelves of a bookcase, underneath the top of a table, or wherever else a convenient spot is found. For a more elaborate job, choose a standard speaker-enclosure of the size desired.

Of course, a number of variations can be made on this basic layout. For example, a low-resistance wire-wound fader potentiometer can be used to proportion the signals between the local and remote speakers, or else used as a simple volume control to regulate the output of one speaker. If you don't have a spare fader pot, any other wirewound control can be

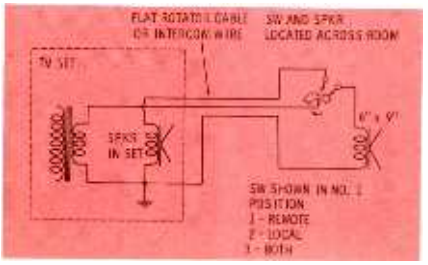


Fig. 1. How to connect a remote speaker and selector switch to a TV set.

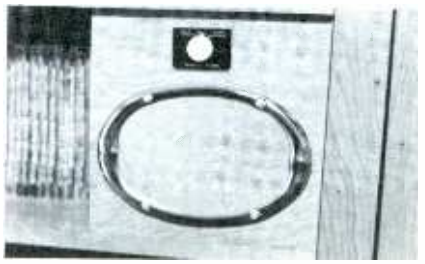
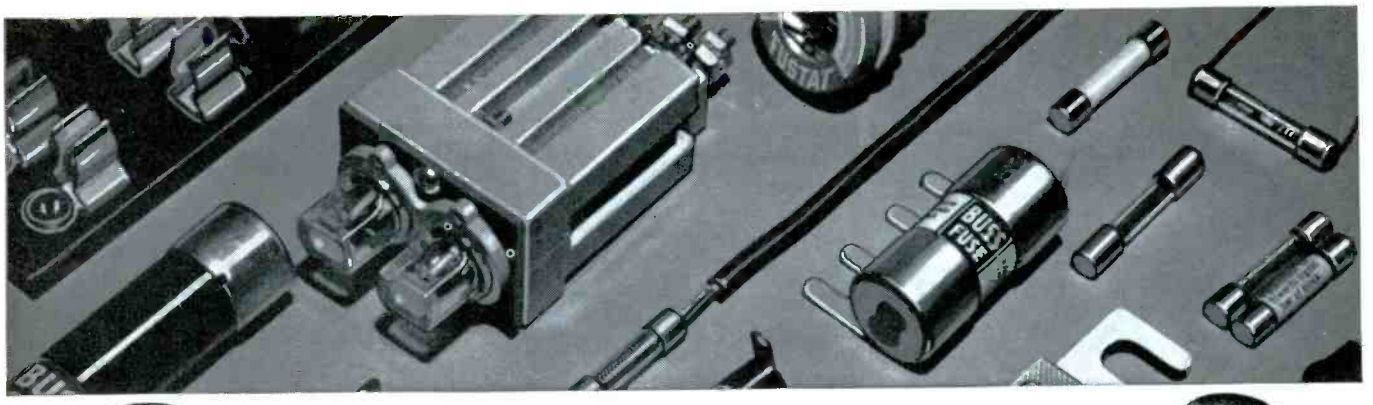


Fig. 2. An extension speaker mounted on a plywood panel to fit in bookcase.

www.americanradiohistory.com



Use BUSS Fuses!

Because dependable BUSS and FUSETRON Fuses help eliminate "profit-eating" service complaints.

Service complaints literally eat up your profits thru customer dissatisfaction and time spent on adjustments.

But — standardize on BUSS and you're on your way to winning satisfied customers, knocking out complaint losses.

BUSS and FUETRON Fuses give you maximum protection against damage due to electrical faults and maximum protection against wasteful shutdowns caused by fuses blowing needlessly.

To assure this, every BUSS and FUSETRON Fuse is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

For more than four decades, millions upon millions of BUSS fuses have been in service — telling proof that you and your customers can also depend on BUSS.

For the complete line of BUSS and FUSETRON fuses there is a companion line of fuse clips, blocks and holders.

It's no wonder the way to a profitable business in fuses is the BUSS way.

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

160

BUSS fuses are made to protect - not to blow, needlessly.

BUSS makes a complete line of fuses for home, farm, commercial, electronic, electrical, automotive and industrial use.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS
McGRAW EDISON

www.americanradiohistory.com

MAKE CONNECTIONS WITH
SWITCHCRAFT INTERCONNECTING CORDS
"for Extra Profits"

With this
SWITCHCRAFT INC.
Point-of-Sale
MERCHANDISER

NOW
INTERCONNECT
STEREO-HI-FI
WITH SWITCHCRAFT INTER CORDS

New—Beautiful 4-color
Sales-Producing Display of
"MOLDED"
INTER Connecting CORDS

For connecting tape recorders, extra speakers, record players to tuners and amplifiers, also for interconnecting musical and sound equipment.

Interconnecting Cords (Plugs, Jacks, Connectors molded to Cord) are a volume item especially for Stereo — Hi-Fi equipment.

Order Package Deal D-71 from your distributor.

Includes display and 17 of the most popular cords (individually packaged).

List $30.90. Regular dealer discount.

SWITCHCRAFT INC. 5573 N. ELSTON AVENUE CHICAGO 30, ILLINOIS

Canadian Rep.: ATLAS RADIO CORP., LTD., 50 Wingold Ave., Toronto, Canada

DOSS ELECTRONIC RESEARCH, INC.
820 Baltimore • Kansas City 5, Missouri

INTER-OFFICE MEMO

TO: Dave Doss
SUBJECT: Advertising

Have any ideas for January ads?

Jim Smith
Sales Mgr.

Yes! Have our future customers write in for Pioneer 250 TEST-INSTRUCTION MANUAL

FREE!
-D.D.

FREE! Pioneer 250 TEST-INSTRUCTION MANUAL

The whole story of how the Pioneer 250 troubleshoots the entire Horizontal Sweep Circuit... complete with diagrams and helpful hints on servicing Horizontal Sweep problems.

NAME.....

ADDRESS.....

CITY..... STATE.....

DOSS ELECTRONIC RESEARCH, Inc. – 820 Baltimore • Kansas City, Mo.

used, as long as its resistance is not more than about 200 ohms. We've used resistance values all the way from 20 to above 100 ohms, with very little distortion due to mismatch.

If the customer wants to get really elaborate, remote on-off control of the TV set can be provided. Fig. 3 shows a setup which includes a selector switch, volume control, and TV on-off switch—all enclosed in a compact control box at the remote speaker location. The TV receiver is plugged into an extension cord connected to the AC line through an on-off switch mounted on the volume control.

This kind of arrangement is often used for sickrooms or hospital rooms. The extension speaker employed in such systems is a "pillow speaker," which is placed under the pillow for use by one listener without disturbing others in the room. This unit is plugged into a phone jack on the remote control box.

Regular earphones can be connected to the remote-speaker hookup; however, since phones generally have a 600-ohm or higher impedance, they should be fed by a small step-up matching transformer. You can use a small 2,000-ohm audio output transformer connected "backwards," with the primary winding feeding the phones.

The number of variations on the "personalized speaker" setup is limited only by the ingenuity of the technician and the wishes of the customer. They are as easy to sell as they are to install, especially after you have put in two or three systems and given the customers' neighbors a chance to see and hear the speakers' performance. ▲

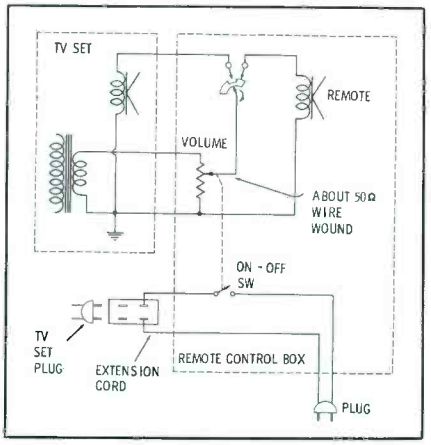
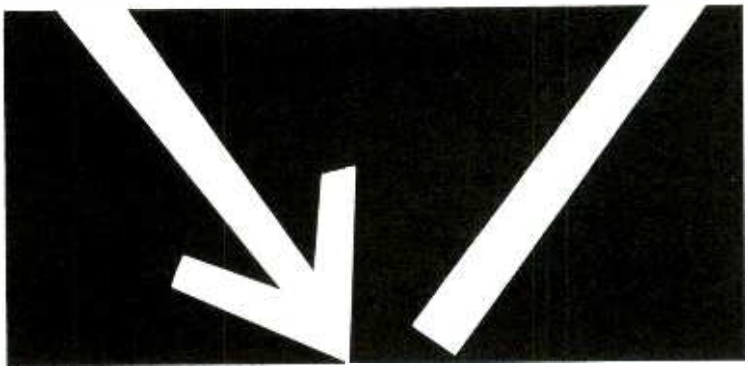


Fig. 3. TV line cord extension passes through remote box for on-off control.

www.americanradiohistory.com



HOW MUCH DO YOU KNOW ABOUT TRANSISTORS?

Attend the

Delco Electronics–One Week –Advanced Training School

No tuition charge
No laboratory fees
Textbooks supplied

Bring yourself up to date on transistors and other modern electronic equipment with personalized instruction at the Delco Electronic training school to be held soon at a General Motors Training Center near you. Classes are conducted by graduate engineers with special training in your field.

The Delco Radio diploma, awarded only to those who successfully complete the courses, will mean a great deal to you—*and* to your customers.

The Delco Electronics—One Week—Advanced Training Schools will be conducted in the General Motors Training Centers indicated below. One of them is near you. Register now through your local Delco Electronic Parts Distributor or write directly to Delco Radio Division, General Motors Corporation, Kokomo, Indiana, Attention: Service Manager.

COURSES OF STUDY OFFERED AT NO COST TO YOU:

❶ Transistor Fundamentals—complete coverage of transistor theory without the use of mathematics. ❷ Transistor Circuit Trouble-shooting—lecture and lab work analyzing defects in transistor circuits. ❸ Hybrid-type Automobile Radios—low voltage tube and output transistor circuits. Lecture and lab. ❹ Trouble-shooting procedures for dead or weak low voltage auto radios—factory developed techniques that are foolproof. ❺ Lecture and lab practice on "Signal Seeker" and "Wonder Bar" auto radio tuners and trigger circuits. ❻ Guide-Matic Headlamp Control (Autronic Eye)—lecture and lab. ❼ Twilight Sentinel Automatic Headlight Switch—lecture and lab. ❽ Garage Door Operators—lecture and lab work including the new Delco Radio all-transistor control units. ❾ Auto Portable Radios—lectures on circuitry of both 1959 and 1960 auto portable radios.

DELCO RADIO

DELCO ELECTRONICS TRAINING SCHOOL SCHEDULE

DATE	REGION 1	REGION 2	REGION 3	REGION 4	REGION 5	REGION 6
1-11	Philadelphia	New Orleans	Chicago			
1-18				St. Louis	Dallas	Salt Lake City
1-25		Atlanta	Detroit			
2-1	Union					
2-8				Omaha	Memphis	
2-15	Pittsburgh	Jacksonville				Los Angeles
2-22	Pittsburgh		Cincinnati			
2-29				Kansas City		
3-7	Tarrytown	Charlotte		Kansas City	Dallas	Portland
3-14			Cleveland			
3-21				Omaha	El Paso	
3-28	Boston	Atlanta				Los Angeles
4-4	Boston		Chicago	Minneapolis		
4-11				Minneapolis	Houston	
4-18	Union	Washington	Milwaukee		Houston	San Francisco
4-25		Washington				
5-2			Cincinnati	Omaha		Portland
5-9	Buffalo				Okla. City	
5-16		Atlanta	Detroit	St. Louis		
5-23						Los Angeles
6-6	Tarrytown		Chicago		Dallas	
6-13		New Orleans				San Francisco
6-20	Philadelphia			Denver		
6-27			Cleveland		Memphis	Salt Lake City

www.americanradiohistory.com

NOTES on test equipment

by Les Deane

Tube Tester with Power Tuning

Fig. 1. The 658 uses an elaborate array of both push buttons and controls.

A power-tuned tube tester? That's right! Jackson Electrical Instrument Co. of Dayton, Ohio has made available a power-driven roll-chart assembly as an accessory to their current line of tube testers. The details on this unique device follow this discussion of the Model 658 tester.

The 658 *Dynamic Output* tube tester shown in Fig. 1 is capable of checking over 1200 different tube types and comes complete with operating instructions and special tube-data booklets stapled inside the detachable lid.

Specifications are:

1. *Power Requirements — 100/125 volts, 50/60 cps; power consumption less than 8 watts in standby; line-calibration switch graduated in 2.5-volt steps; overload fuse and ON indicator provided on panel.*
2. *Shorts Test — shorts and leakage between tube elements indicated by glow of panel bulb; element selector switch and separate meter scale for grid-leakage test provided; short bulb also indicates heater continuity.*
3. *Dynamic Test — special plate conductance measurement indicated in relative micromhos on 4½" panel meter; voltage to each tube element connected by individual push-button switches; meter indicates only AC component of plate voltage; roll chart and booklet supply setup data.*
4. *Life Test — heater voltage automatically reduced with all other parameters remaining constant; life expectancy of cathode conduction indicated by reduction in plate conductance; separate switch provided.*
5. *Other Tests — heater current measurement for series-string tubes indicated on special meter scale; firing voltage and control range for regulator and reference tubes also indicated; checks 12-volt hybrid tubes and rectifiers up to 200 ma.*
6. *Panel Features — 9 test sockets grouped on replaceable panel; 3-column roll chart supplied, Power Chart available as accessory; filament selector provides heater voltages from .6 to 120 volts and up to 25 watts with accuracy of 3% or better.*
7. *Size and Weight — leatherette-covered case 21" x 13¾" x 7", approx. 22 lbs.*

The Model 658 is essentially a push-button instrument with two rows of sequence push-button switches located across the lower portion of its panel. The top row is used to make connections for the heater and cathode elements, while the bottom bank makes the plate and grid connections. The three next-to-last buttons toward the right in each bank are reserved for dynamic test functions, while the last one releases all buttons in its respective row.

The test sockets are all mounted on a separate replaceable panel and include 4, 5, and 6 prong types, as well as loktal, octal, 7- and 9-pin miniature and 7- and 8-pin subminiature bases. Near the socket panel, you'll also find a lead for use on double-ended or top cap tubes.

Another feature I noticed on the panel is the dual selector control for heater voltages shown in Fig. 2A. The large outer knob is used to select the voltage range, and the other has letter designations to provide 11 voltage steps within this range. Within the tester, the value switch selects various taps from the secondary of the filament supply transformer, while the lettered switch controls primary voltage to this transformer. Thus, a total of 231 different heater voltages are available.

The meter of the Model 658 is more than just a simple good-bad indicator. It has five separate scales as shown in Fig. 2B. The VR RANGE is a 0- to 250-volt calibration used in testing regulator-type tubes. The large GOOD-BAD scale, with coded areas of red and green, is employed as an indicator during the dynamic output test. This scale is also supplemented by linear calibrations from 0 to 130 which represent the relative percent of tube conductance.

The lower red and green arc labeled GRID LEAKAGE is employed in the special grid-leakage test. The circuit for this test makes use of a 6AV6 vacuum tube, and has a sensitivity of 80 megohms. You'll notice that the bottom scale is calibrated from 0 to 1000, which is a milliampere range for measuring heater current of series-string tubes.

The thing that impressed me most about this tester is the wide variety of tests it provided. Aside from a shorts test, grid-leakage measurement, and conductance evaluation, series-string tubes can be checked for proper heater current under standard voltage conditions. I found, too, that tuning-eye tubes are tested under dynamic conditions. Operating limits are determined from settings

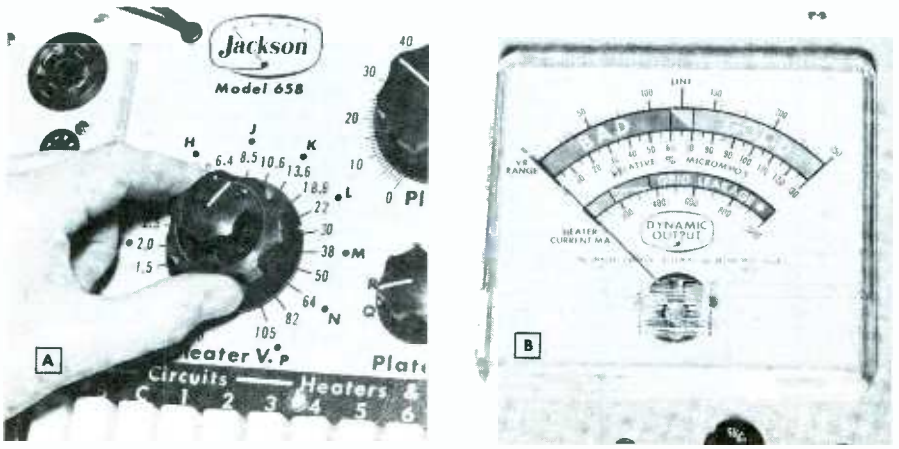


Fig. 2. Some of the panel features of Jackson's *Dynamic Output* tube tester.

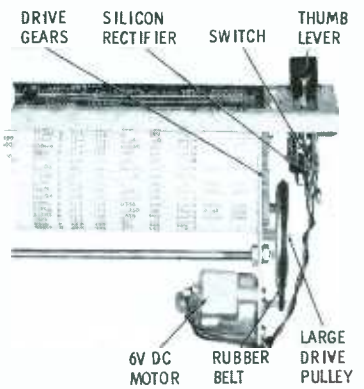


Fig. 3. 6SPC Chart for the Model 658.

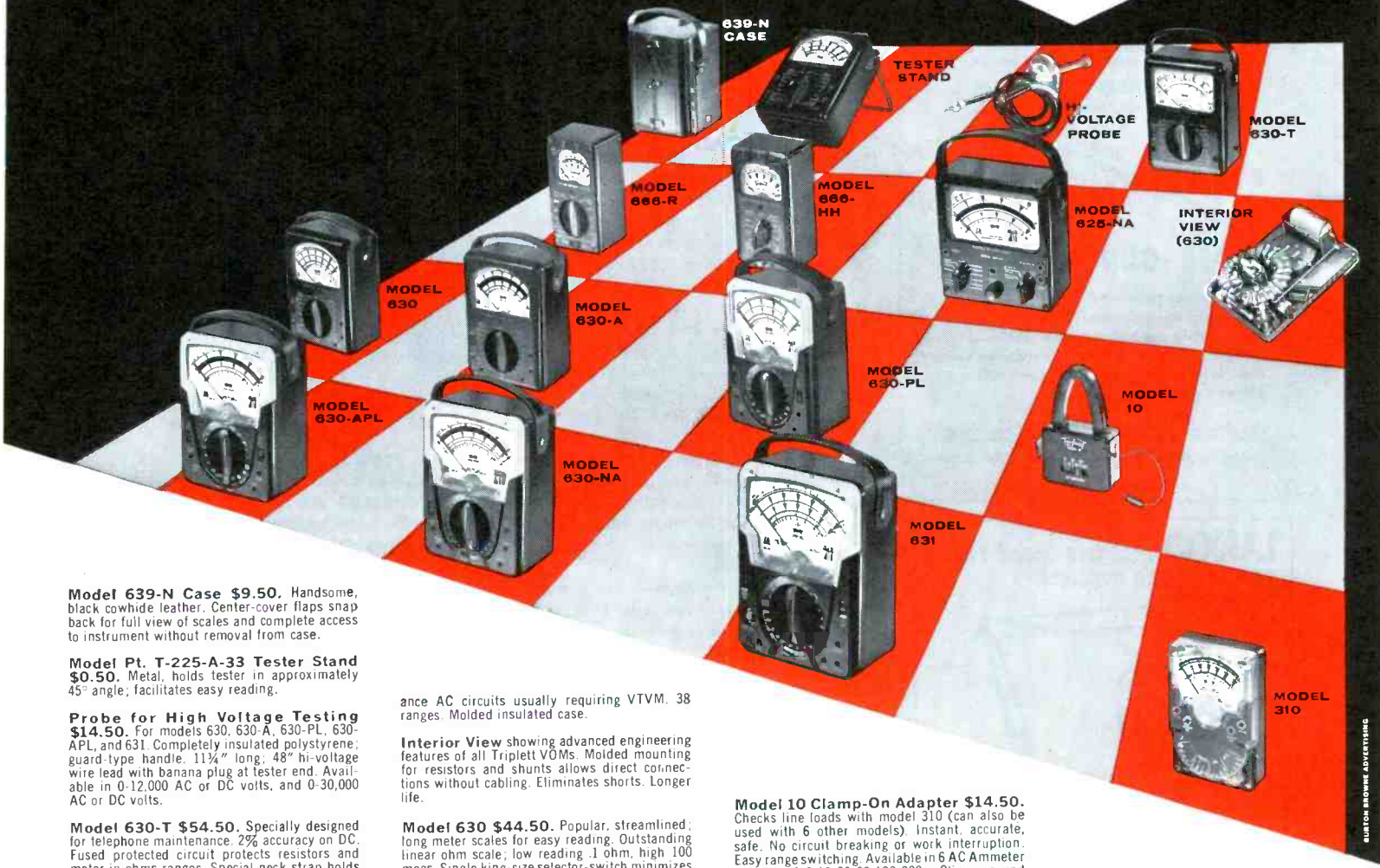
www.americanradiohistory.com

. . . the smartest move you can make

is to TRIPLETT VOMs

. . . the world's most complete line of VOMs for every purpose!

TRIPLETT
Quality. . .
First to last



Model 639-N Case $9.50. Handsome, black cowhide leather. Center-cover flaps snap back for full view of scales and complete access to instrument without removal from case.

Model Pt. T-225-A-33 Tester Stand $0.50. Metal, holds tester in approximately 45° angle; facilitates easy reading.

Probe for High Voltage Testing $14.50. For models 630, 630-A, 630-PL, 630-APL, and 631. Completely insulated polystyrene; guard-type handle. 11¾" long; 48" hi-voltage wire lead with banana plug at tester end. Available in 0-12,000 AC or DC volts, and 0-30,000 AC or DC volts.

Model 630-T $54.50. Specially designed for telephone maintenance. 2% accuracy on DC. Fused protected circuit protects resistors and meter in ohms ranges. Special neck strap holds instrument, freeing both hands. Banana jack connectors eliminate all shock hazard. Completely insulated case protects from ground.

Model 666-R Pocket VOM $29.50. Hand size, ideal for electrical maintenance. With recessed range knob it fits easily into case. AC rectifier pre-calibrated unit for easy replacement. Banana jacks at panel top prevent leads falling over meter dial. Single king-size selector switch minimizes incorrect settings, burnouts. 20 ranges. Molded case streamlined, fully insulated.

Model 666-HH Pocket VOM $27.50. Compact, hand-size, 3" meter integral with panel, adjusted to 400 microamperes at 250 millivolts. Only 3 jacks necessary for all ranges. 19 ranges.

Model 625-NA $54.50. Dual sensitivity for extra ranges; large mirror scale for super readability. 3-color meter scale 5" long. 6" instrument. 0-50 microamp. AC volts at 10,000 O/V for checking many audio and high impedance AC circuits usually requiring VTVM. 38 ranges. Molded insulated case.

Interior View showing advanced engineering features of all Triplett VOMs. Molded mounting for resistors and shunts allows direct connections without cabling. Eliminates shorts. Longer life.

Model 630 $44.50. Popular, streamlined; long meter scales for easy reading. Outstanding linear ohm scale; low reading .1 ohm, high 100 megs. Single king-size selector-switch minimizes incorrect settings, burnouts. High sensitivity: 20,000 ohms per volt DC; 5,000 AC. Molded, fully insulated case.

Model 630-A $54.50. Laboratory type; ½% resistors for greater accuracy. Long mirrored scale eliminates parallax. Banana jacks, low resistance connections; high flux magnet increases ruggedness. Single king-size selector switch minimizes incorrect settings, burnouts. Molded fully insulated case.

Model 630-PL $44.50. Instant-vision, wider spread scales; streamlined case; handsome modern design. Unbreakable window. Outstanding linear ohm scale; low reading .1 ohm; high to 100 megs. Single king-size selector switch minimizes incorrect settings, burnouts. 5 to 500,000 cps frequency response in AC measurements. DC Polarity Reversing switch. High sensitivity: 5,000 ohms per volt AC; 20,000 ohms per volt DC.

Model 10 Clamp-On Adapter $14.50. Checks line loads with model 310 (can also be used with 6 other models). Instant, accurate, safe. No circuit breaking or work interruption. Easy range switching. Available in 6 AC Ammeter ranges: 0-6-12-30-60-120-300. Clips around single wire to read AC. Amperes direct. Use with adapter 101 to instantly divide 2-conductor cords. Molded case fully insulated, black plastic with engraved white markings.

Model 630-APL $54.50. Laboratory type with ½% resistors, more accurate movement. Long mirrored scales eliminate parallax. Unbreakable window. Single king-size switch minimizes incorrect settings, burnouts. 5 to 500,000 cps frequency response in AC measurements. DC Polarity Reversing switch. High sensitivity: 5000 ohms per volt AC; 20,000 ohms per volt DC. Molded case fully insulated.

Model 630-NA $74.50. Super DeLuxe with 70 ranges—nearly double conventional types. Frequency compensated from 35 cps to 20 kc. Temperature compensated. Accurate within 1½% full scale reading on DC. Large open front meter easy to read. Unbreakable window. Mirrored scale. Meter protection against overloads. Molded fully insulated case.

Model 631 Combination VOM and VTVM $64.50. Two fundamental units at the price of a single tester. The No. 1 instrument for all electronic men. Battery operation assures VTVM stability and long life. Sensitivity PLUS. 1.2 volt (VTVM) range is equal to more than nine million ohms per volt. Large easy to read meter with unbreakable face. Single king-size selector switch minimizes incorrect settings, burnouts. Molded case fully insulated.

Model 310 $34.50. The only complete miniature VOM with 20,000 ohms per volt and selector range switch. Self-shielded against strong magnetic field. Rugged, high torque, barring instrument. Unbreakable plastic meter window. Converts to common probe—frees one hand—by fitting interchangeable test prod into top. Standard sensitivity 20,000 ohms per volt DC, and 5,000 ohms per volt AC. Accuracy 3% DC. Molded fully insulated case.

TRIPLETT
Quality. . .
First to last

TRIPLETT ELECTRICAL INSTRUMENT COMPANY
BLUFFTON, OHIO

www.americanradiohistory.com

DON'T GUESS . . .
KNOW THE TEMPERATURE OF YOUR SOLDERING GUN BEFORE TOUCHING PRINTED CIRCUITS AND LAMINATED WIRING BOARDS!

ESICO GUNCHOKE®
REDUCES TEMPERATURE OF YOUR SOLDERING GUN TO TWO CONSTANT HEATS - 500° OR 600°

- Assures correct temperature for soldering printed circuits and laminated wiring boards.
- No need to wait for a slow-heating iron — and still have doubtful temperature.
- Just plug into GUNCHOKE and GUNCHOKE into outlet.
- Small, compact, to fit in your tool kit.

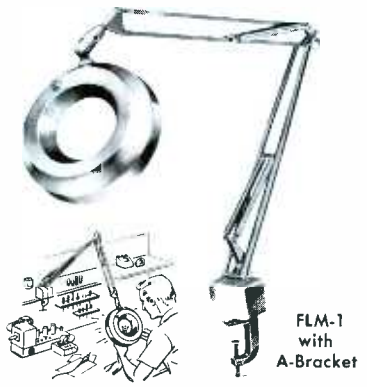
FOR ALL WIDELY USED GUNS
Get GUNCHOKE from your distributor

ESICO
LUGER GUN

Perfect balance permits delicate touch for most intricate work. Transformer built in handle eliminates tip heaviness. Long, thin tips simplify soldering connections inaccessible with other guns. LUGER is 150-watt capacity.

ELECTRIC SOLDERING IRON CO., INC.
559 W. Elm Street :—: DEEP RIVER, CONN.

LUXO . . . THE IDEAL LAMP FOR SHOP OR INDUSTRY!



The Luxo Illuminated Magnifier is ideal for visual accuracy on printed circuits and when reading parts numbers . . . its excellent magnification and cool, shadow-free light increases precision during intricate assembly operations and allows more effective inspection. Built into every Magnifier are the world famous Luxo features . . . Modern functional design, quality materials and craftsmanship, flexibility and portability. Luxo Lamps are also available in Incandescent, Fluorescent and Combination models.

All UL approved.

LUXO LAMP CORPORATION
San Francisco, Cal. • PORT CHESTER, N. Y. • Montreal, Que.

given in the test data, which relate to specific openings of the tuning eye. Another example is the test afforded voltage-regulator and voltage-reference tubes. Using the 0-to-250 volt scale of the meter, you can determine the voltage-control range and the actual firing point of such tubes. Special test considerations have also been given to 12-volt tubes employed in the newer hybrid auto radios.

The Jackson *Power Chart* accessory mentioned previously comes in different models for use with any of the tube testers in their current line. Installation is very simple, for it fits in the same space utilized by the original hand-operated assembly. Driven by a small concealed motor, the roll chart will turn in either direction and stops immediately when the thumb lever is released. The drive mechanism is pointed out in Fig. 3.

Sweep-Circuit Troubleshooter

Pictured in Fig. 4 is the Model SS105, a new test instrument developed by Sencore (Service Instruments Corp., Addison, Illinois). Relying on both signal and component substitution techniques, this Sweep Circuit Trouble Shooter helps isolate causes of symptoms ranging from poor sync to complete loss of either horizontal or vertical sweep.

Specifications are:

1. *Power Requirements — 110/120 volts, 60 cps; power consumption less than 10 watts without load.*
2. *Output Signals — horizontal or vertical drive pulse with fixed standard frequency and variable amplitude; oscillator* ON *indicator, output jack and vertical-horizontal selector switch provided on panel; separate output jack for horizontal yoke driving signal.*
3. *Dynamic Tests — horizontal deflection yoke substitute, flyback transformer check, horizontal and vertical oscillator substitute, and cathode current measurement for output tubes.*
4. *External Voltmeter — low sensitivity DC range from 0 to 1000 volts; separate test jack provided on panel.*
5. *Other Features — 2⅜" panel meter with three individual scales for cathode current, DC volts, and flyback test functions; roll chart giving typical operating data for various horizontal output tubes; panel adjustment for correct inductance of horizontal yoke substitute; three test leads and one adapter cable supplied.*
6. *Size and Weight — 7" x 6" x 3½", 4 lbs.*

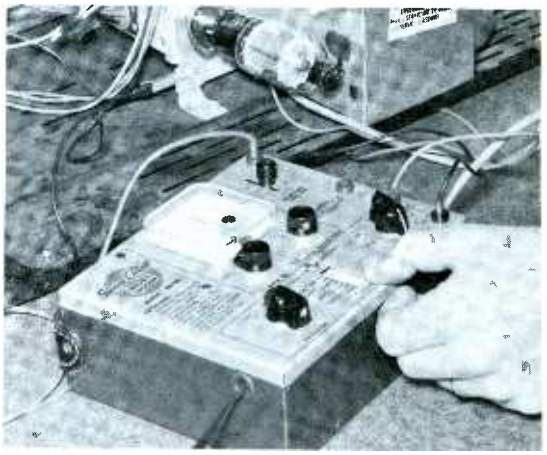
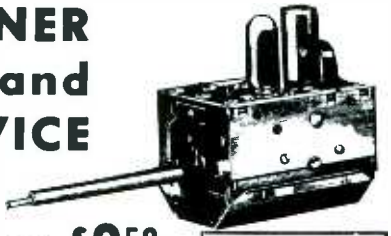


Fig. 4. Sencore SS105 isolates sweep trouble to oscillator, output or yoke.

You might say that the Model SS105 is a dynamic tester, since all tests are performed with power applied to the receiver. To enhance troubleshooting without removing the chassis from the cabinet, the instrument features a special tube-socket adapter, primarily for use in the horizontal sweep section. As pictured in Fig. 5, this adapter has small metal tabs extending from each pin contact, thus providing convenient test points on the tube side of the chassis. Although the instrument plus adapter has internal connections for automatically monitoring cathode current, the test tabs must be used when injecting drive signals or measuring output tube voltages.

To substitute for either sweep oscillator, the Model SS105 is connected and adjusted as illustrated in Fig. 6A. If you desire to inject the signal from the tube

24 HR TV TUNER REPAIR and ALIGNMENT SERVICE



VHF or UHF — *All Makes*

90 DAY WARRANTY ISSUED ON ALL TUNERS

DEALER NET PRICE

VHF Tuners $9.50
UHF Tuners .....
UHF Converters ....
UHF-VHF Combinations $17.95

F.O.B. EVANSTON, ILL. WE SHIP C.O.D.

THE ABOVE SERVICE & PRICES ARE FOR UNMUTILATED UNITS. Missing, broken & damaged parts, defective tubes charged extra at LOW net prices.

IMPORTANT: *SHIP COMPLETE. —INCLUDE ALL BROKEN PARTS. STATE MODEL & COMPLAINT. PACKAGE WELL TO AVOID TRANSIT DAMAGE.*

SPECIAL DISTRIBUTOR PRICES ON REQUEST

JW Electronics 2404 Bradley, Evanston, Illinois

www.americanradiohistory.com

Fig. 5. Special tube socket adapter of Model SS105 for in-circuit testing.

side of the chassis, you'll find that you can use the adapter socket in either sweep section as long as the output tube has a standard octal base. If sweep is restored when the substitute drive signal is fed to the grid of the output stage, the trouble is isolated to a preceding component or section. From the output grid, you can work back toward the oscillator and thus check various coupling components in the signal path.

If sweep is not restored in the vertical section when this test is made, remove the output tube or disconnect its plate lead and inject the signal into the high side of the output transformer. If the transformer and yoke are not defective, you should obtain approximately two inches of vertical sweep on the screen. The same test can be used to test just the yoke winding; however, you'll find that a good yoke will produce only about one-half inch of deflection.

In Fig. 6B, I have shown the basic setup for testing the horizontal windings of a deflection yoke. This is accomplished by substituting the variable 5- to 40-mh inductance within the Sencore unit for the yoke. The high side of the original winding is disconnected, and the instrument

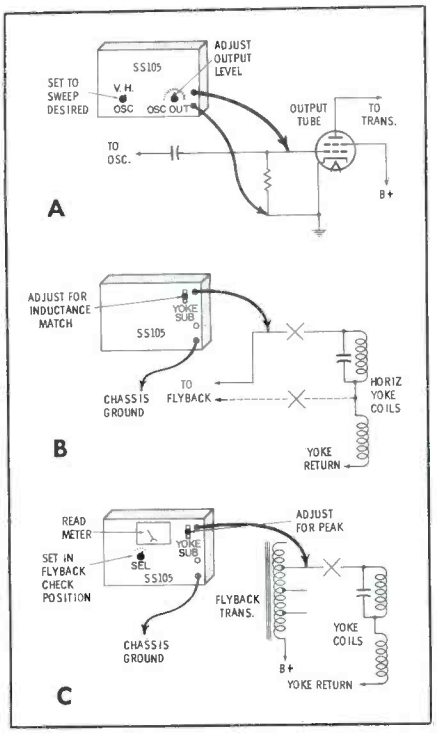


Fig. 6. Hookups for checking yoke, flyback, and output stage with SS105.

*MIRACLE MOUNT COMPLETE ANTENNA KITS

Clear Beam new Miracle Mount Antenna Kits install anywhere, allow you to pick the best, fastest and easiest to reach installation site on any home.

MOUNTS ON ROOF, WALL OR CHIMNEY

Everything you need for all types of installations in one complete low cost antenna kit which mounts anywhere . . . roof, wall or chimney.

LESS STOCK, MORE PROFIT

Carry Clear Beam Miracle Mount Antenna Kits with you on all service calls and be ready for any type of installation job. Install as service or sell outright to Do-It-Yourselfers. You stock less, sell more with customer approved Clear Beam Kits.

CLEAR BEAM ANTENNA CORPORATION
21341 Roscoe Boulevard • Canoga Park, California

www.americanradiohistory.com

3¢ will start you on a new road to additional profits and happy customers with speaker repair.

WALDOM RECONING

Attach this coupon to a Post Card and mail. We will send you the complete story.

Your Name _____
Company _____
Street _____
City _____
Send to WALDOM ELECTRONICS INC.
4625 WEST 53RD STREET, CHICAGO 32, ILL

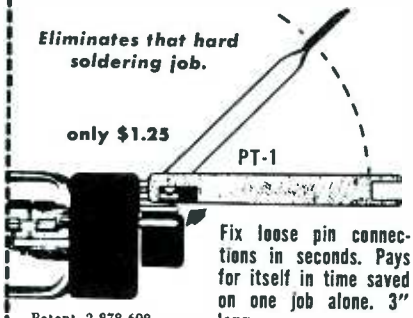
BERNS PERFECT PIN-CRIMPER

Picture-Tube Repair Tool

Eliminates that hard soldering job.

only $1.25

PT-1



Patent 2,878,698

Fix loose pin connections in seconds. Pays for itself in time saved on one job alone. 3" long.

Intermittent operation of picture tubes due to defective solder connections at socket pins is easily corrected through the use of the Berns Perfect Pin Crimper. Actually a 3-in-1 tool that can also be used as a channel-selector wrench and screwdriver, it serves to notch pins and element leads to provide solid electrical connections. Pin keeps its original form.

3 models: PT-1 for 3/32" pin diameter; AU-2 for 1/8" pin diameter and installing C rings; LC-3 for 5/32" pin diameter.

Available at your parts distributor.
Another fine product from:

BERNS Mfg. Co.
9853 Chalmers,
Detroit 13, Mich

For faster servicing bigger profits use your VOM

You probably use your VOM more than any other instrument. Yet do you know all you should about it—all it can do for you with just a little extra know-how? This new Gernsback Library book HOW TO GET THE MOST OUT OF YOUR VOM tells you how to get the VOM to work for you in new, different and more efficient ways in servicing and construction, what it will do—and what it won't, how to take care of it, repair it—extend its range—increase its accuracy. Describes commercial units and kits, tells you how to build your own. Get this book now and see how it helps you on your very next servicing job.

HOW TO GET THE MOST OUT OF YOUR VOM
—by Tom Jaski
224 pages.
Deluxe hard cover edition $4.60

HOW TO GET THIS BOOK FOR ONLY $3.35

Through the G/L Technicians' Book Club you can get this book and others equally valuable for only $3.35—a 27% saving!

HOW TO JOIN

- Fill in this coupon.
- SEND NO MONEY — we send you the book postpaid on approval.
- If you like it, send your remittance; if not, return the book.
- You receive a new book every three months on the NO-RISK approval plan.
- You need take only four books during the entire membership period. No time limit.
- You may cancel any time after that.
- Other books already published also available to members.

NO-RISK COUPON

Gernsback Library, Inc. PR-10
154 West 14th St., New York 11, N. Y.

☐ Enroll me in the G/L Technicians' Book Club. Send me my copy of HOW TO GET THE MOST OUT OF YOUR VOM.

☐ Send me more information on the G/L Technicians' Book Club.

Name.....
please print
Street.....
City.....Zone.....State.....

is connected between the flyback lead and chassis ground. If the horizontal yoke has three leads, it is recommended that the center one be disconnected, too. If the suspected yoke is defective, high voltage should be restored and a vertical white line should appear on the screen.

The flyback test is very similar to the yoke substitution procedure, except that the panel meter of the Model SS105 is used as an indicating device. Circuit hookup is as shown in Fig. 6C. In this test, a certain amount of sweep energy is supplied from the substitute yoke circuit, rectified, and applied to the meter. A special scale, calibrated as to deflection angle, is provided for evaluating the efficiency of the transformer. Even though a reading of some sort may be obtained, I found that if a peak cannot be reached by varying the yoke substitute lever, the flyback probably has shorted turns.

In addition to the tests outlined in Fig. 6, the *Trouble Shooter* can be used to measure cathode currents and also as a conventional DC voltmeter. Using the special socket adapter, two panel switches to select the correct connections, and the milliampere scale of the meter, output-tube cathode current can be measured without the necessity for circuit disconnections. This current-monitoring technique can also be employed in other applications such as balancing push-pull output stages — provided, of course, the tube is an octal-base type.

Another feature not to be overlooked in the SS105 is the small built-in roll chart located at the bottom center of the panel. Pin numbers, typical operating voltages, and normal cathode current ranges are shown for most of the horizontal output tubes in use today. The chart is rotated by a thumb wheel as pictured in Fig. 4.

And Then There Were Seven

Simpson Electric Co. of Chicago is currently marketing a line of test adapters to be used in conjunction with either their 260 or 270 model VOM's. The new units, a few of which are pictured in Fig. 7, are merely attached to the base of the VOM to provide additional test instruments.

The *Add-A-Testers* include a transistor tester, DC VTVM, temperature tester, AC ammeter, audio wattmeter, microvolt attenuator, and battery tester. In each case, the combination VOM-adapter is self-contained and self-powered. This concept provides test facilities at a lower cost and in less space than separate instruments.

Specifications are:

Model 650 Transistor Tester

1. *Power Requirements — two self-contained size "D" 1.5-volt cells; battery adjust provided for voltage calibration.*
2. *Tests — beta and I_{co} for all* PNP *and* NPN *low- or medium-power junction transistors; special instruc-*

www.americanradiohistory.com

Fig. 7. Four of the seven Simpson Add-A-Testers now available to servicemen.

tions for checking power types given in manual; beta ranges from 0 to 10, 50, and 250; I_{co} ranges from 0 to 100 ma.

3. *Beta Accuracy — ±3% with adapter only; with Model 260 ±5% full scale; with Model 270 ±4% full scale.*
4. *I_{co} Accuracy — ±1% with adapter only; with Model 260 ±3% full scale; with Model 270 ±2% full scale.*
5. *Panel Features —* PNP - OFF - NPN *selector switch; meter zero adjust; one 4-element transistor test socket plus separate panel jacks for emitter, base and collector test connections; separate switch for adapter or direct VOM operation; VOM test jacks provided.*
6. *Size and Weight — 5 5/16" x 4 3/8" x 3 7/16", 12 ozs.*

Model 651 DC VTVM

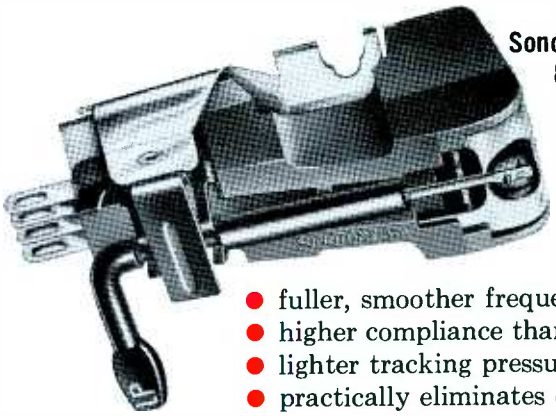
1. *Ranges — 0 to .5, 1, 2.5, 5, 10, 25, 50, 100, 250, and 500 volts.*
2. *Accuracy — adapter only, ±1%; with Model 260, ±3% full scale.*

Fig. 8. Adapters merely plug into VOM, are shaped to fit beneath meter case.

Now . . . from Sonotone—

4 Big Improvements

in the quality stereo cartridge



Sonotone 8TA cartridge replaces 8T as industry standard

The new Sonotone 8TA cartridge gives greater than ever stereo performance . . . has 4 big extras:

- fuller, smoother frequency response
- higher compliance than ever before
- lighter tracking pressure
- practically eliminates dust pile-up

ONLY $14.50*

Sonotone 10T unitized stereo at lowest price ever

New 10T cartridge sells at record low price of $6.45.* And it covers the complete high fidelity range. 10T's unitized construction makes it easiest to install, easiest to replace. Low price means more sales—more profits.

SPECIFICATIONS

	8TA	10T
Frequency Response	Smooth 20 to 20,000 cycles. Flat to 15,000 with gradual rolloff beyond.	Flat from 20 to 15,000 cycles ± 2.5 db.
Channel Isolation	25 decibels	18 decibels
Compliance	3.0 x 10^{-6} cm/dyne	1.5 x 10^{-6} cm/dyne
Tracking Pressure	3-5 grams in professional arms 4-6 grams in changers	5-7 grams
Output Voltage	0.3 volt	0.5 volt
Cartridge Weight	7.5 grams	2.8 grams
Recommended Load	1-5 megohms	1-5 megohms
Stylus	Dual jewel tips, sapphire or diamond.	Dual jewel tips, sapphire or diamond.

*including mounting brackets

Sonotone makes only 6 basic ceramic cartridge models . . . yet has sold over 9 million units . . . used in over 662 different phonograph models. For finest performance, replace worn needles with genuine Sonotone needles.

Sonotone® CORP. Electronic Applications Division, Dept. C10-10 **ELMSFORD, NEW YORK**

Leading makers of fine ceramic cartridges, speakers, tape heads, microphones, electronic tubes.
In Canada, contact Atlas Radio Corp., Ltd., Toronto

www.americanradiohistory.com

3. *Input Impedance — greater than 10 megohms for all voltage ranges.*
4. *Other Features — polarity reversal switch, zero adjust control, and special switch for either adapter or VOM operation provided on panel.*

Model 652 Temperature Tester

1. *Ranges — –50°F to +100°F and +100°F to +250°F.*
2. *Accuracy — ±2% (nominal).*
3. *Other Features — slide-rule computer, three individual lead positions, and special switch for either adapter or VOM operation provided on panel.*

Model 653 AC Ammeter

1. *Ranges — 0 to .25, 1, 2.5, 12.5, and 25 amps; six individual binding posts provided on front panel; maximum input 600 volts rms.*
2. *Frequency Response — essentially flat from 50 to 3000 cps.*
3. *Accuracy — adapter only, ±2%; with Models 260 or 270, ±3% full scale.*
4. *Other Features — slide-type switch for either adapter or VOM operation and two VOM jacks provided on panel.*
5. *Size and Weight — 5 5/16" x 4 3/8" x 3 7/16", 2 lbs.*

Model 654 Audio Wattmeter

1. *Internal Loads — built-in ranges of 4, 8, 16, and 600 ohms; panel selector switch provided; accuracy ±5%.*
2. *Power Ranges — 50 watts continuous, 100 watts for 2.5 minutes on 4- and 16-ohm loads; 25 watts continuous, 50 watts for 2.5 minutes on 8- and 600-ohm loads; all ratings at 77°F; voltage-to-wattage conversion scale provided.*
3. *Frequency Response — essentially flat from DC to 20 kc.*
4. *Accuracy — wattage reading ±10% full scale with Model 260; ±7% with Model 270.*
5. *Other Features — switch position provided for VOM operation; combined VOM and adapter input jacks on front panel.*
6. *Size and Weight—5 5/16" x 4 3/8" x 3 7/16", 1¼ lbs.*

Fig. 9. Slide-rule device used on three of the new Simpson *Add-A-Testers*.

Model 655 Microvolt Attenuator

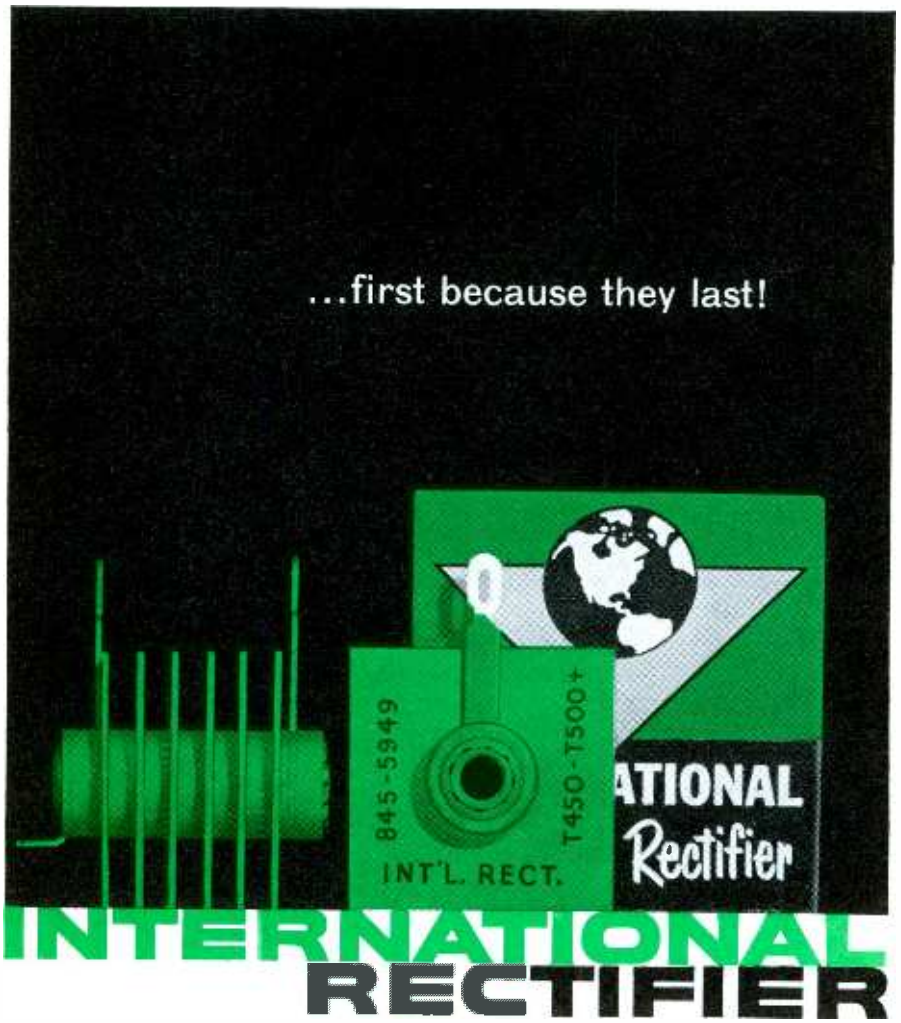
1. *Attenuation Ranges — 2.5 uv to 250,000 uv continuously variable in decade steps.*
2. *Frequency Response — DC to 20 kc.*
3. *Instrument Accuracy — ±1 db attenuation.*
4. *Other Features — internal-external load switch and full-scale output selector with special position for either adapter or VOM operation provided on panel.*

Model 656 Battery Tester

1. *Calibrated Ranges — 1.5-volt hearing-aid cells; "A" and "B" batteries of 1.5, 4.5, 6, 7.5, 9, 15, 22.5, 30, 45, 67.5, and 90 volts; test selector provided on panel; slide-rule scale converts meter reading to* GOOD-BAD-WEAK *or percent of rated voltage.*
2. *Accuracy — adapter only, ±2%, with Model 260, ±4% full scale, with Model 270, ±3% full scale.*
3. *Other Features — internal-external load selector and VOM-adapter switch provided on panel; setup data for over 65 different battery types given in manual.*
4. *Size and Weight—5 5/16" x 4 3/8" x 3 7/16", 1 lb., 3ozs.*

An adapter for any type of instrument or tool often becomes a big disappointment to its owner because of the time and effort required for a changeover, or because the combination can only be used for one express purpose at a time. From my personal experiences with the Simpson *Add-A-Testers*, I find that these two problems have been overcome completely.

In the first place, each adapter merely



INTERNATIONAL RECTIFIER

Selenium Radio-TV Replacement Rectifiers

Install them for trouble-free service. International Rectifier builds them that way with the advanced techniques and experience that have made us the world's largest supplier of industrial semiconductors. The price is the same as for ordinary rectifiers. The profits come in the call-backs that are eliminated.

INTERNATIONAL RECTIFIER CORPORATION

Distributor Sales Division: El Segundo, Calif.

In Stock at Better Dealers Everywhere

www.americanradiohistory.com

plugs into the lower test jacks of the VOM as indicated in the photo of Fig. 8A. Although not necessary for electrical operation, a special latch is also provided on the rear of each adapter case (Fig. 8B). The adapter thus becomes a rigid part of the meter and the combination can be carried by the meter handle or safely placed in any convenient position for servicing. Simpson VOM's produced prior to June, 1959, do not have a stud to accommodate this latch; however, special conversion kits are available from the manufacturer for these early models.

Another important feature of the *Add-A-Testers* is the fact that each permits use of any conventional VOM function without removing the adapter; VOM test jacks and a switching arrangement are found on the panel of each unit. Thus, changeover is simple, and yet the adapter does not affect regular use of the VOM.

One unusual thing I noticed about three of the *Add-A-Testers* is the slide-rule approach for converting meter readings into more direct indications. As shown in Fig. 9, for example, the Model 654 Audio Wattmeter makes use of a small slide rule to convert volts to watts. The slider is merely set to the voltage reading on the top scale and equivalent power in watts is noted on the lower scale which corresponds to the load selected. The other two instruments using this slide-rule principle are the Model 652 Temperature Tester and the Model 656 Battery Tester.

Having actually worked with four of these adapters in the lab — namely, models 650, 653, 654, and 656 — I can vouch for the above specifications and the usefulness of the units in servicing applications. ▲

CORRECTION NOTICE

In the November "Notes" coverage of the Simpson VOM, we stated that the Model 260 was a predecessor to the Model 270. We have since been informed that this is not the case. The 270 is a completely new instrument and supplements rather than replaces the Model 260. Also, in the picture caption for Fig. 9, the word "presents' should read "prevents." An "s" in place of a "v" actually reversed the meaning entirely.

Have a New Mailing Address?

If so, notify us by the 15th of the month to assure uninterrupted delivery of PF REPORTER.

Please be sure to give us both your old and new address, including your postal zone number. (Or better yet, enclose a current mailing label with your new address.) Send to:

PF REPORTER
Circulation Dept.
2201 E. 46th Street
Indianapolis 6, Ind.

NEW BLONDER-TONGUE VHF ANTENNA BOOSTER MODEL AB-2

for clear, sharp TV pictures in weak signal & fringe areas—more than 10 db gain on all VHF channels

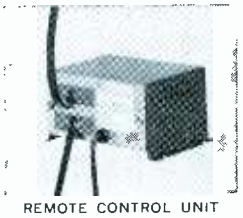
$53.95

NEW BLONDER-TONGUE FM ANTENNA BOOSTER MODEL AB-FM

for uperb FM listening pleasure in weak signal & fringe areas—more than 16 db gain over the FM band (88-108 mc)

$53.95

- new frame grid tube provides lowest noise figure for brilliant reception
- maximum signal-to-noise ratio—ideal for new receivers
- remote control via power supply at, or near receiver
- internal multiplex circuit – single lead line carries AC power 'up' and signal 'down'
- easy mast mounting close to the antenna boosts signal before line loss can develop
- swing-down chassis for easy service and maintenance
- no-strip terminals for speedy, secure installation –



REMOTE CONTROL UNIT

'NO-STRIP' TERMINALS

Available through parts distributors or write for details

BLONDER-TONGUE LABORATORIES, INC.
9 Alling Street • Newark 2, N. J. • Dept. PF-1

In Canada: Telequipment Mfg. Co., Ltd., London, Ont. **Export:** Morhan Export Corp., N. Y. 13, N. Y.
hi-fi components • UHF converters • master TV systems • industrial TV cameras • FM-AM radios

www.americanradiohistory.com

NOW THERE ARE 3 JACKSON DYNAMIC® TUBE TESTERS

DYNAMIC OUTPUT 658

Checks receiving tubes, voltage regulators, eye tubes. Shows heater continuity without warm-up. Reads heater current. Provides both shorts test and grid leakage test. Has 231 heater voltage combinations. An outstanding professional tube tester. **$189.95**

NEW LOW COST DYNAMIC 598

Provides convenient lever switching and time-proved Jackson Dynamic test principle. Has variable plate voltage and load controls. Shorts test has variable sensitivity to 2 megohms. Convenient roll chart and grouped tube socket sub-assembly. **$89.95**

WORLD FAMOUS DYNAMIC 648R

Features super-rapid sequence switching. The set-up time is less than the warm-up time of the tube. Twenty-three separate heater voltages. Line voltage control indicates actual line voltage. Famous for dependability the world over. **$129.95**

POWER CHART ACCESSORY

Here's a new addition! The Jackson Power Roll Chart—available in all three tube testers for those who require the extra. Roll the chart from one end to the other in less than 25 seconds with the touch of a finger. **$20.00 net**

SEE YOUR DISTRIBUTOR OR WRITE FOR LITERATURE.

Jackson

THE JACKSON ELECTRICAL INSTRUMENT COMPANY

16-18 SOUTH PATTERSON BLVD.
DAYTON 2, OHIO
In Canada: The Canadian Marconi Company

Rx for Interlace

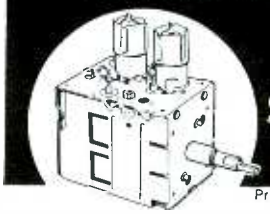
(Continued from page 32)

the transmitting station. Intermittent conditions are generally the result of random interference (static, automobile ignition noise, etc.) which disturbs the operation of the vertical oscillator, while a steady out-of-interlace condition can usually be attributed to other defects such as sync trouble.

Sync pulses which trigger the vertical oscillator are processed in the integrator, a low-pass filter network connecting the last sync stage to the oscillator grid. Fig. 3 shows a typical integrator circuit and the waveforms related to it. Most receivers employ a three-step printed-circuit RC network which is usually sufficient to obtain proper integration of the combined sync signal. The integrator changes the sync waveshape so that the horizontal pulses do not produce sufficient output to trigger the vertical oscillator. On the other hand, the vertical pulses are allowed to pass through. The action of the circuit is based on two factors—the difference in the repetition rates of the vertical and horizontal pulses, and the varying reaction of an RC network to pulses of different durations. The vertical sync pulse is made up of six segments, each about 27 microseconds long and about 5 microseconds apart. The horizontal pulses are very short compared to the vertical ones, being only about 5 microseconds long but repeated at only 63.5-microsecond intervals. The reaction of the integrating network to an incoming vertical sync pulse is shown in Fig. 4. As we shall see, correct operation of this circuit is very important in assuring proper interlace.

Incoming sync pulses charge shunt capacitors C1, C2 and C3 (Fig. 3) through R1, R2 and R3. The values of these components are such that the charge time is long compared to the 5-microsecond width of a horizontal pulse, yet short enough for the capacitors to effectively discharge during the full-line interval between horizontal pulses. These pulses therefore do not develop any appreciable signal voltage across the integrating network. However, each broad segment of the vertical sync pulse places a relatively heavy charge on the integrator capacitors. Furthermore, the 5-

TARZIAN Offers 48-Hour, Direct Factory Service on Tuner Repairs



only $8.50

Price Effective Jan. 1 1960

That's right. Net, $8.50 per unit and $15 for UV combinations, including ALL replacement parts. 90-day warranty against defective workmanship and parts failure. Tuners repaired on approved, open accounts. Replacements offered at these prices* on tuners not repairable:

VHF 12 position tuner	**$22.00**
VHF 13 or 16 position	**23.00**
VHF/UHF combination	**25.00**
UHF only	**15.50**

*Subject to change

Tarzian-made tuners are easily identified by this stamping on the unit. When inquiring about service or replacements for other than Tarzian-made tuners, always give tube complement . . . shaft length . . . filament voltage . . . series or shunt heater . . . IF frequency, chassis identification and allow a little more time for service. Contact your local distributor or use this address for fast, 48-hour service:

SARKES TARZIAN, Inc.
Att.: Service Mgr., Tuner Division
East Hillside Drive
Bloomington, Indiana

"Golden eggs, my foot!
This goose lays
JENSEN NEEDLES!"

www.americanradiohistory.com

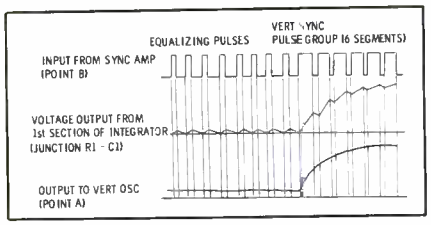


Fig. 4. Vertical sync pulse builds up charge on the integrator capacitors.

microsecond gap (serration) following each pulse segment is so narrow that the integrator loses only a small fraction of its charge before the next segment arrives. As a result, the charge is further built up as additional vertical-pulse segments are fed into the integrator.

As indicated in Fig. 1, vertical retrace begins at the bottom center of the No. 1 field. This means that a horizontal sync pulse occurs only ½ line ahead of the leading edge of the vertical sync pulse on alternate fields. Due to the shorter discharge time, a small charge may still be present when the vertical pulse arrives. At the end of field No. 2, however, vertical retrace occurs at the bottom right, coinciding with the initiation of a horizontal retrace period. Were it not for the fact that *equalizing pulses* (spaced ½ line apart) precede the vertical pulse, there would be a difference in allotted integrator discharge time. In most instances (depending on integrator design plus other factors), this difference would be just enough to make the vertical oscillator "fire" slightly out of phase on every other field; thus, the two fields which make up each frame would not be interlaced.

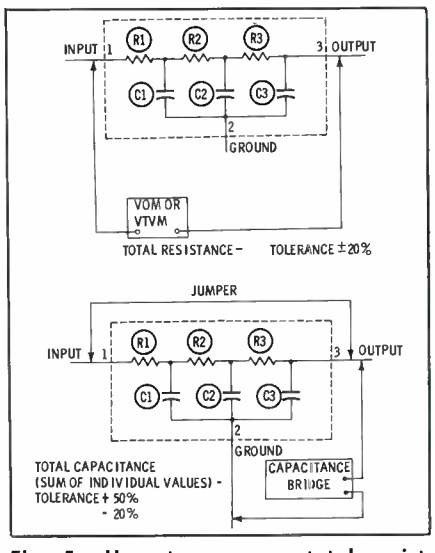
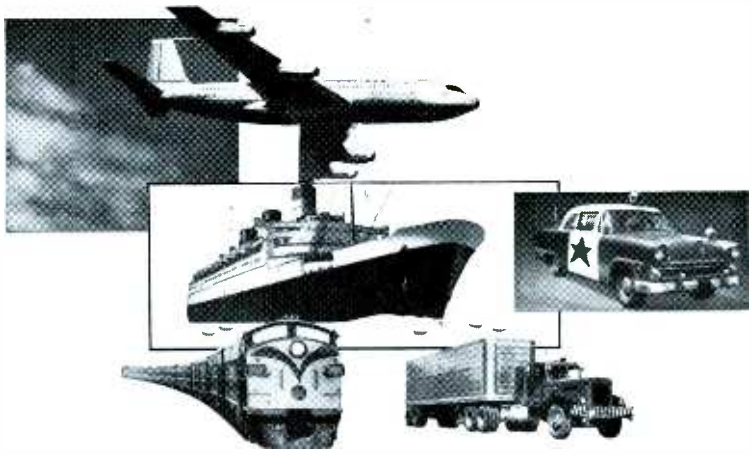


Fig. 5. How to measure total resistance and capacitance of an integrator.



REPLACE WITH THE BEST...

RCA POWER TUBES

for reliable radio communications

For top performance, reliability and long life in your two-way radio equipment, always replace with RCA power tubes from your local RCA Industrial Tube Distributor. RCA power tubes have set a standard of dependability with commercial radio, the military services and industry for more than a generation. And their typically long operating life stretches your tube dollar. You are assured of the most service for your money when you replace with RCA power tubes.

Your RCA Industrial Tube Distributor can supply a complete line of RCA tubes for fixed and mobile communications equipment. He'll give you prompt service anytime, anywhere. Call him for all your tube needs.

RCA

RADIO CORPORATION OF AMERICA

Electron Tube Division *Harrison, N. J.*

www.americanradiohistory.com

Troubleshooting Procedure

Troubleshooting defective interlace in the customer's home is limited to tube testing or substitution, the latter being preferred. A small amount of gas in the vertical oscillator or vertical output tubes may not show up on a tube tester, but it will still be enough to raise havoc with vertical interlace. The sync tubes should also be checked by substitution, as well as the video amplifier, detector, and video IF tubes; defective interlace could be due to sync compression in any one of these stages.

On the bench, scope checks of the integrator output and input waveforms (points A and B, Fig. 3) are the first order of business. To determine the true waveform and amplitude of the grid signal at A, the vertical oscillator tube must be removed or the plate shorted to ground. This is necessary since the vertical oscillator generates a feedback pulse, which "overshadows" the sync pulse and is often mistaken for a sync signal. In all commercial receivers in use today, the integrator output voltage reaches a high enough level to trigger the vertical oscillator into conduction when the fourth notch of the integrated vertical pulse arrives. (This time corresponds to the end of the fourth vertical-pulse segment, as shown in Fig. 4.) When troubleshooting, carefully check the amplitude of the pulse at point A. Too little or too much pulse amplitude will cause erratic triggering.

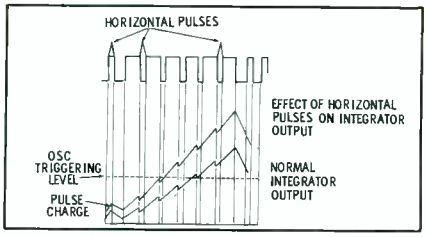


Fig. 6. Effect on integrator of spurious horizontal information in input.

A pulse of inadequate amplitude at A, but a normal signal at B (Fig. 3), may mean a defective integrator. Check this component as outlined in Fig. 5. Before replacing it, however, also check for a short or other defect in the vertical oscillator. An improper pulse at both points A and B may be due to a sync defect or trouble somewhere in the horizontal AFC circuit (for which an input is taken off at B in many receivers).

A distorted pulse at A, but a normal-looking waveform at B, may indicate any of the following troubles: Defective integrator, insufficient or excessive gain prior to the integrator, or improper sync-pulse limiting in the sync stages. Bad capacitors in the integrator are the most common cause of trouble. The loss of bypassing action allows some of the horizontal and equalizing pulses to pass through and trigger the vertical oscillator more or less at random, thus producing poor interlace.

Before concluding that the integrator is at fault, you should carefully check the amplitude of the pulse at point B to make sure it is correct. Either insufficient or excessive amplification in the sync stages ahead of the integrator network will result in abnormally high or low signal amplitude with a corresponding change in the pulse applied to the vertical oscillator. This will upset interlace to some extent, but it shouldn't be lost completely, since the sync amplitude remains stable.

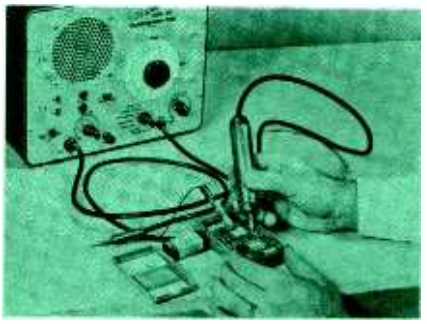
A distorted pulse at both A and B usually indicates trouble in the sync stages, or even farther back. Checking waveforms progressively

Transistor radio servicing

Problem or Profit?

You are in the transistor-age

Nearly 90% of the radios manufactured today are transistorized. Are you prepared to service this heavy volume of new business? The millions of radios now being sold means that your present customers own them and will expect you to service them . . . And, you must service them *profitably*.



Transistor radios can be service problems

Their compact, miniaturized components and printed circuitry are hard-to-reach for proper test • Transistors, still a little strange to many technicians, make checking difficult • Low price of sets force low servicing costs—troubles have to be spotted quickly and accurately to assure service profit • Conventional servicing techniques take too long and don't always work • Transistors and components can easily be damaged by excessive current from your VOM battery.

Low-cost tester provides the answer

HICKOK'S Model 810, a new Transistor Radio Tester permits high-speed signal tracing whereby elements can be checked right in their circuit—without slow disconnecting and resoldering "Guess-and-Bygosh" servicing.

The 810 is a THREE-IN-ONE Tester

★ A signal generator of RF, IF and audio.
★ A signal tracer covering RF, IF and audio.
★ A transistor tester.

Offers many special features

The signal tracing probe has a cathode follower input . . . No detuning or loading effect. The generator output is a cathode follower . . . Means low impedance to transistor circuits. Special AC line filter . . . Limits leakage current to a safe value in preventing overload damage to transistor circuits. The 810 is ideally designed for servicing 'hard-to-reach' auto radios and small AC-DC portables.

Complete . . . $119

The 810 is everything you need for profitable transistor radio testing. The 810 is Hickok-Quality, easy-to-operate and has repeatedly proven to pay-for-itself quickly through time saved in this 'New Business' of Transistor Radio Servicing for Profit.

See your distributor for a Hickok-810-demonstration today! The Hickok Electrical Instrument Company, 10566 Dupont Avenue, Cleveland 8, Ohio.

www.americanradiohistory.com

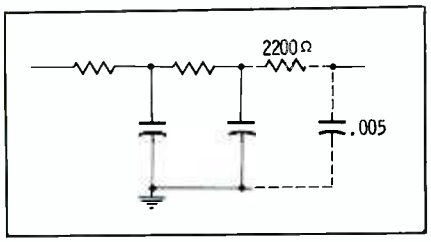


Fig. 7. Improving two-section integrator by adding third stage at output.

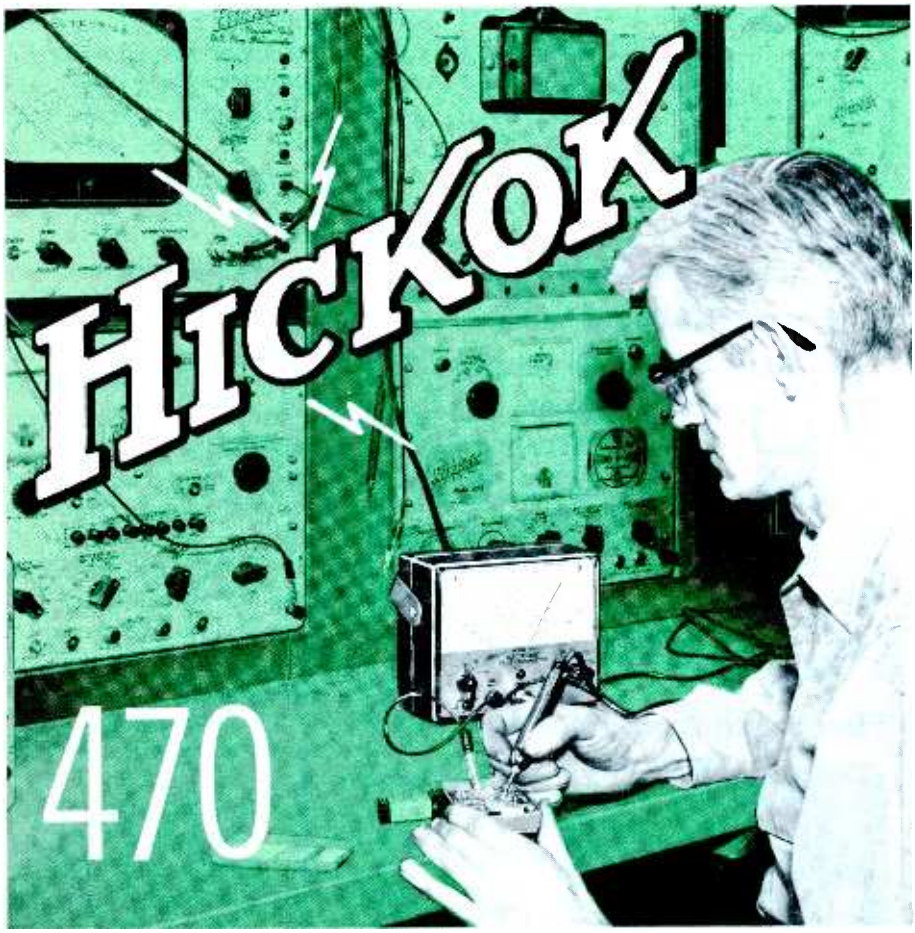
back through the sync stages, noise-immunity circuits, video amplifier, detector, and IF strip will quickly localize most sources of trouble.

Random fluctuations of interlace and a distorted pulse condition at point B may be produced by video in the sync circuits. This spurious information appears to the integrator as extra equalizing pulses, causing the output of the integrator to be incorrect. Video feed-through to the sync stages via the B+ line is often the trouble, stemming from a marginal or defective filter capacitor. Picture-signal information need not pass through the sync stages or integrator network to do its dirty work; it can upset interlace even if initially coupled into the vertical oscillator stage by the B+ or heater-supply circuits. In general, B+ feed-through is an indication of defective filtering; in other cases, however, it may be due to a deficiency in design. When this is indicated, the only solution is additional decoupling. Inserting a resistor of 1000 ohms or so in series with the B+ line and bypassing it with a .02- to .05-mfd capacitor should clear up the trouble.

Video feed-through can also occur through the heater circuit; as a rule, it can be cleared up with the addition of bypassing capacitors on the heaters of both the vertical oscillator and the offending video stage. Use the smallest-value unit (between .01 and .5 mfd) that will do the job. *Note:* Keep in mind that radiation from the video output tube or nearby wiring can induce video in the leads to the vertical oscillator, so check lead dress carefully before resorting to circuit changes. Shielding the vertical oscillator and video tubes, and redressing or shielding the leads is sometimes necessary to minimize video radiation problems.

Consistently poor interlace is very often the result of a horizontal sweep signal getting into the vertical oscillator through the integrator, B+, or heater circuits, or through stray pickup from the horizontal sweep system. The effect of horizontal information on the vertical pulse is illustrated in Fig. 6. Highly-peaked, spike-like pulses tend to fill in some of the vertical-pulse serrations. These horizontal pulses cause premature triggering of the vertical oscillator, with a resulting loss of interlace. A check of the B+ and heater circuits, integrator network, and lead dress, should disclose the trouble source. Shielding of the vertical and horizontal oscillators and additional filtering in the supply circuits may be necessary.

Horizontal-sweep signal feedback to the sync clipper is the most elusive culprit. This troublemaker may be fed from the sync stage to the vertical oscillator either directly through the integrator or (more commonly) through the stray capacitance from A to B across the integrator. Actually, stray capacitance *anywhere* between the vertical-oscillator grid circuit and the horizontal output stage or high-voltage rectifier circuit will cause interlace trouble. As a precautionary measure, make sure the high-voltage cage is well grounded. A check of horizontal



7-inch-Scale ELECTRONIC VOLT OHMMETER

FEATURES . . . High Sensitivity Transistor Bias Test (0 to 0.5 volt DC range)
. . . AC—OHMS—DC Single Unit Probe
. . . Phenolic Case Reduces Shock Hazard

$89.75

See your distributor for a HICKOK-Demonstration today!

DC VOLTMETER
7 ranges, plus and minus, 0-1500 volts.
INPUT RESISTANCE: 13.3 megohms.

OHMMETER
7 ranges, with excellent readability from 0.2 ohm to 1000 megohms.
DESIGN CENTER: 10 ohms.

AC VOLTMETER
RMS: 7 ranges, 0-1500 volts.
PEAK-TO-PEAK: 7 ranges, 0-4000 volts.
FREQUENCY RESPONSE: 50 cps to 2.5 megacycles.
INPUT CAPACITY: 10 megohms/150 mmf.

THE HICKOK ELECTRICAL INSTRUMENT CO. 10566 Dupont Ave. Cleveland 8, Ohio

www.americanradiohistory.com

NEW FROM HOWARD W. SAMS

"From Tinfoil to Stereo"

The Evolution of the Phonograph

by Oliver Read & Walter L. Welch

Here is the most complete history of the phonograph ever written—from the use of tinfoil to the revolutionary stereo record—the whole exciting story of the men and events responsible for the development of the phonograph!

You'll be fascinated by this masterful account of the evolution of the phonograph. Covers *everything:* man's earliest dreams of imitating sound; the Edison tinfoil phonograph and the development of the earliest prototypes; the patent struggles; the development of cylinders and discs; the coin-slot phonograph; the introduction of the internal horn; the beginnings of radio and its contribution to recording and reproduction; sound pictures and the phonograph; the war of the record speeds; growth of component systems; tape vs. discs—right down to today. Includes dozens of rare photographs. A wonderful book for every hi-fi enthusiast and phonograph connoisseur. 576 pages, 6 x 9", fully illustrated. Only **$9.95**

MORE NEW SAMS BOOKS

"101 Ways to Use Your Ham Test Equipment"

by Bob Middleton

A practical "how-to-do-it" book for amateur radio operators and service technicians who specialize in the repair of ham radio equipment. Gives concise applications for grid dip meters, antenna impedance meters, oscilloscopes, bridges, simple noise generators and reflected power meters. Each use is clearly described, with full data on connections required, proper test procedures and evaluation of results. 168 pages; 5½ x 8½"; illustrated. Only..... **$2.50**

"Servicing Hi-Fi and FM in the Customer's Home"

by Milton S. Kiver

Describes a wide range of quick, easy test methods for hi-fi amplifiers, AM-FM receivers, record changers, turntables and tape recorders. Includes several unusual new methods, such as the use of an AM detector probe to trace FM circuits. Methods are selected for their quick, practical application and their ability to locate actual and potential trouble spots in hi-fi equipment. Indispensable to anyone interested in servicing hi-fi. 160 pages; 5½ x 8½"; illustrated. Only.... **$2.95**

HOWARD W. SAMS & CO., INC.

Order from your Sams Distributor today, or mail to Howard W. Sams & Co., Inc., Dept. A-30 1720 E. 38th St., Indianapolis 6, Ind.

Send me the following books:

☐ "From Tinfoil to Stereo" (EPR-1)

☐ "101 Ways to Use Your Ham Test Equip." (TEM-6)

☐ "Servicing Hi-Fi in the Customer's Home" (SHK-1)

$..... enclosed. ☐ Send Free Book List

Name _____

Address _____

City _____ Zone ____ State _____

(outside U.S.A. priced slightly higher)

circuit lead dress and proper shielding is important. If such steps fail to provide a remedy, reducing the size of the coupling capacitor from the sync amplifier or clipper to the horizontal AFC stage will help to minimize feedback problems.

Correct waveshape and amplitude of signals at points A and B may indicate a defect in the coupling network between the vertical oscillator and output stage—or no defect at all! As pointed out earlier, poor interlace may be observed in some economy sets despite proper component values. This is due to a deficiency in design for which the service technician may or may not care to attempt a remedy. For instance, adequate integration will usually be obtained in a three-stage network, but at times even this doesn't do a good job of horizontal pulse filtering. On top of this, some sets use only one or two RC stages. Adding an additional stage to the output of the integrator (as illustrated in Fig. 7) will improve performance considerably.

Besides the above-mentioned causes and cures of defective interlace, you may find the following general information of practical use.

An effect which closely resembles defective interlace may result from degeneration in the cathode circuit of the horizontal output tube. The alternate scan lines are staggered by a form of jitter. If you find the screen-bypass capacitor returned to the cathode pin, reroute it to a B– connection and see if this remedies the difficulty.

To prevent horizontal-pulse feedback through the boost B+ line to the vertical oscillator, additional filtering is required. Insert a series resistor of approximately 5000 ohms, and bypass it to ground on the vertical-oscillator side with a .02- to .05-mfd capacitor.

Decouple an offending retrace-blanking network with a filter incorporating a series resistor of approximately 100K ohms shunted by a 560-mmf bypass capacitor.

While it is not within the scope of this article to prescribe cures for all the possible sources of interlace problems, we have covered the majority. By following the procedures and suggestions given, you should have little difficulty in curing interlace troubles. ▲

NEWEST BEST BUYS FROM EICO®

ripple at full load is only **0.005%**

with new **Model 1020 POWER & BIAS SUPPLY** (Pat. Pend.) **FOR TRANSISTORIZED EQUIPMENT**

Wired **$27.95** Kit **$19.95**

- **Checks All transistor radios.**
- includes power transformer, full-wave silicon diode rectifier circuit, electrolytic capacitor input filter followed by a two-power transistor (2-2N256) cascaded filter circuit providing extraordinary ripple rejection.
- output voltage: 0-30 VDC continuously variable, monitored by dual-range voltmeter (0-6, 0-30 VDC).
- continuous output current capacity: 150 ma @ 0-12 V; 200 ma @ 12-24 V; 300 ma @ 24-30 V.
- 0.5A fuse protects against short circuit.
- comparable in purity of output and in voltage & current capacity to transistorized supplies selling for several hundred dollars.
- ideal for laboratory, development & service work on transistors & transistorized equipment.
- rugged grey wrinkle steel case 5" x 4" x 5½".

SERIES/PARALLEL R-C COMBINATION BOX #1140

Wired **$19.95**

Kit **$13.95**

Exclusive with EICO—**1350** possible combinations! Switching facilities permit selection of any resistance or capacitance alone, or 1350 combinations of same in series or parallel. Standard EIA resistance values (1W) from 15 ohms to 10 megs in decade multiples of 15, 22, 33, 47, 68, 100; standard EIA capacitance values (most 600V) from 0.0001 to 0.22 mfd. All 10% accuracy. Open & short circuit positions provided. Convenient jack-top binding posts. Compact: 6¼" h, 5½" w, 2⅜" d.

FAST **TUBE & CRT FILAMENT TESTER #612**

Wired **$5.95**

Kit **$3.95**

Includes batteries

Fast filament checking of series string & all other TV & radio tubes (9-pin, octal, loctal, 7-pin); 14-pin, 12-pin, 8-pin CRTs; bayonet & screw-type pilot lamps; cartridge fuses. Just plug tube into tester socket, observe indicator lamp—no fiddling with controls or switches. Self-powered for convenience & safety. 7-pin & 9-pin miniature tube pin straighteners provided. Compact: 6¼" h, 3¾" w, 2" d.

Add 5% in West.

Compare these best buys at your neighborhood EICO distributor. For free catalog on 65 models of EICO test instruments, hi-fi & ham gear, write to Dept. PF-1

EICO® Electronic Instrument Co., Inc. 33-00 Northern Boulevard Long Island City 1, N. Y.

www.americanradiohistory.com

PC Boards

(Continued from page 35)

Fig. 3, notice that R54 and R52 are the only 1-watt resistors in this portion of the circuit. Close inspection of the schematic (Fig. 4) reveals that three key test points can be reached from the component side once you have identified these resistors. These points are the horizontal AFC cathode (one end of R52), the horizontal oscillator grid (the other end of R52), and the oscillator-output signal lead (one end of R54).

The *CircuiTrace* feature in PHOTOFACT Folders helps in the location of many key test points and component junctions on PC boards. Boxed-in numbers (white on black) are used to match physical points on the photograph (Fig. 5) to electrical points to the schematic (Fig 4). A few minutes' study of Figs. 4 and 5 will acquaint you with the time-saving aspects of this *CircuiTrace* feature. For example, the point numbered 35 is where the familiar sine-saw waveform may be obtained for scope alignment, and point 38 is a convenient B+ reference.

Signal, Voltage, and Resistance Checks

Isolating any trouble to a specific component or group of components is possible only through the medium of signal, voltage and resistance checks. In receivers that employ printed wiring boards, the right servicing technique can save much valuable time. Because the exposed leads on resistors and capacitors and the soldered connections on the board offer very little area to which a test lead may be clipped, it is advantageous to have a few special "gad-

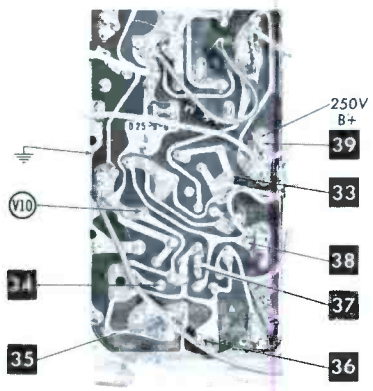


Fig. 5. Numbers in black squares indicate important component junctions.

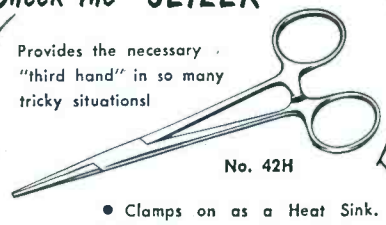
Choose ... XCELITE® Hand Tools ... the Professionals do!

You need the BEST TOOLS to do the BEST JOB . .

Your Radio, TV and Electronic Parts Distributor has them !

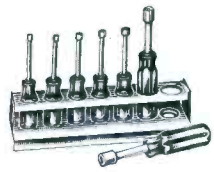
Check the "SEIZER"

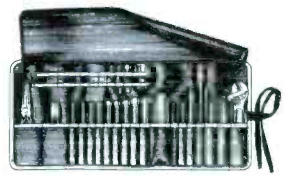
Provides the necessary "third hand" in so many tricky situations!



No. 42H

- Clamps on as a Heat Sink.
- Holds wires etc. while soldering.
- Holds dial cords when stringing them.
- Retrieves small items from awkward places.
- Out-reaches and out-holds needle nose pliers.





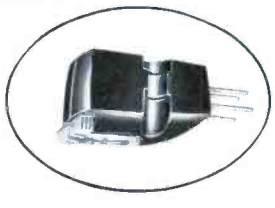
Select from the Complete Line of Quality Tools and Handy Kits . .

XCELITE, INCORPORATED
ORCHARD PARK, NEW YORK
Canada: Charles W. Pointon, Ltd., Toronto

XCELITE Quality Hand Tools PREFERRED BY THE EXPERTS

Mr. SERVICEMAN
You make more profits on Stereo pickups with PICKERING'S NEW Program!

Think of it!...you can make 100% or more in profit on Stereo conversions and installation of Stereo pickups for replacement!



Get into the profitable stereo high fidelity business where experienced and quality conscious technicians are needed. Pickering's NEW program makes it possible for you to buy the STANTON Stereo FLUXVALVE and the STANTON Stereo KableKit from your wholesaler so you make your full markup in addition to your service charges. Call your wholesale jobber today and take full advantage of this profitable business.

EVERYTHING YOU NEED FOR STEREO CONVERSION!

STANTON STEREO KableKits

FOR CONVERTING CHANGERS

FOR CONVERTING MANUAL TONE ARMS

NEW! Low cost stereo cable assembly for converting automatic changers and manual tone arms. **Prefabricated insulated and fully shielded harness assembly with all plugs and connector clips soldered . . . ready for instant installation!** No soldering required for normal installation. Harness length 4 feet, comes complete with cable retention clips.

Model 603 Stereo KableKit for three wire systems..$2.98

Model 604 Stereo KableKit for four wire systems..$3.98

ASK FOR PICKERING AT YOUR JOBBER ... EASIER TO SELL AND INSTALL.

PICKERING—for more than a decade—the world's most experienced manufacturer of high fidelity pickups . . . supplier to the recording industry.

"For those who can hear the difference" FINE QUALITY HIGH FIDELITY PRODUCTS BY
PICKERING & COMPANY, INC., Plainview, N. Y.

www.americanradiohistory.com

OXFORD -the Leader

Largest exclusive SPEAKER manufacturer in the world
6 factories located throughout the U.S.A.

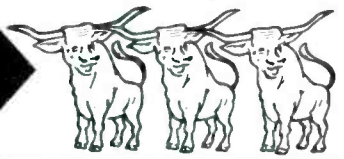
ONCE MORE UNTO THE BREACH, DEAR FRIENDS! When you are looking for replacement speakers on a par with original equipment, the prime source is Oxford. Oxford is the foremost name in original equipment speakers specified by manufacturers. We can supply you with exact replacement speakers which will be of the same high quality as that originally supplied. Oxford has a complete line for any and every appl cation.

OXFORD SPEAKERS . . .
Preferred for original equipment.
Proven for replacement.

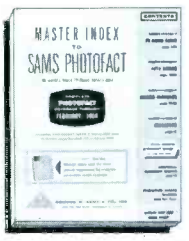
Our catalog is available upon request.

OXFORD Components,
A Division of Oxford Electric Corp.
556 West Monroe St., Chicago 6, Illinois

Oxford Speakers are available from recognized electronic parts distributors.



SAMS PHOTOFACT INDEX



sent direct to your shop

FREE

SEND FOR IT!

Yes, now you can have the valuable SAMS MASTER INDEX TO PHOTOFACT FOLDERS and Index Supplements sent direct to your shop at no cost to you! Just mail coupon below and you'll be sure to receive regularly your handy guide to the world's finest service data covering over 33,000 TV, Radio, Amplifier, Tuner Tape Recorder and Changer models. Send for it—it's FREE!

MAIL COUPON

Howard W. Sams & Co., Inc.
1720 E. 38th St., Indianapolis 6, Ind.

☐ Put me on your mailing list to receive the Sams Photofact Master Index and Supplements

☐ I'm a Service Technician: ___ full time; ___ part time

My Distributor is:

Shop Name: _____

Attn: _____

Address: _____

City _____ Zone ___ State _____

THANK YOU!

. . . for all our friends who entered our "Chance of a Lifetime" Contest, we extend our thanks and sincere appreciation for your wonderful entries and fine patronage of our products.

Winners of Workman TV "CHANCE OF A LIFETIME" Contest

Victor J. Gass (left)—
I. G. Tracy (right)

Winning Slogan—"Workman Outstanding Repair Parts Keep Man-hours At New Low"

Submitted by Mr. I. G. Tracy, Tracy Television Service, Tulsa, Oklahoma. First Prize New Volkswagen equipped with Jackson Test Equipment.

Radio Supply, Tulsa, Oklahoma (distributor for Tracy Television Service).

Second Prize—New Volkswagen. Victor J. Goss, Counterman at S & S Radio Supply whose name appeared on Mr. Tracy's entry: Third Prize, $250 U. S. Savings Bond.

WORKMAN TV PRODUCTS, INC.
Sarasota, Florida

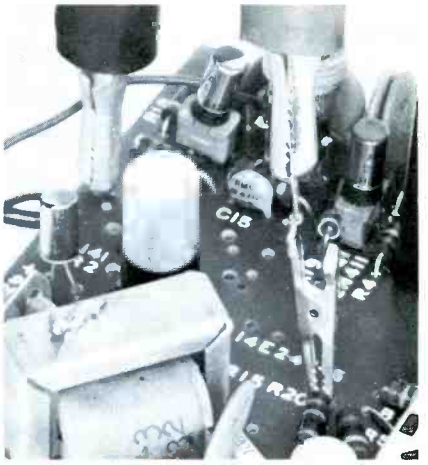


Fig. 6. Probe is connected to resistor through miniature alligator clip.

gets" on hand to make the job easier. Shown in Fig. 6, for instance, is a miniature alligator clip to which a small loop of wire has been soldered. The clip attaches easily to the small amount of lead exposed between the end of a resistor and the board. The regular alligator clip of a VTVM or scope probe can then be conveniently connected to the heavy wire. Connections to the bottom side of the board may be more difficult. If you have to fasten the return lead of a VTVM or scope to a ground bus for several checks, you would save time by soldering a short length of hook-up wire to a grounded foil strip.

Sharply-pointed test-prod tips are best for point-to-point resistance checks and various voltage measurements. The sharp points serve two purposes: They bite into the solder and prevent the tip from slipping, and they penetrate the protective resin coating sprayed on the surface of most boards.

Ground or B— is used as a reference point for practically all signal checks. For this reason, you may find it to your advantage to locate the various foil strips at ground potential and mark them for easy reference. A black grease pencil is handy for this job. Various test points, DC sources, and other key spots are already labeled or color-coded in some of the newest models of receivers; for sets not having any such feature, making your own notations (with grease pencils of various colors) can be very helpful. My advice is to code at least the principal B+ and ground terminals to provide handy starting points for circuit-tracing on all parts of the board.

www.americanradiohistory.com

Board Care

This is one phase of printed-board repair most servicemen tend to ignore. Once they manage to get the set operating, they hurry up and deliver it to the customer even if the surface of the board looks as if "Junior" had a hand in its repair. This practice, a prime example of shoddy workmanship, can only lead to further trouble in the form of mechanical or electrical failure. Such unnecessary trouble won't endear the service establishment to the customer.

Proper board care doesn't begin after the trouble has been found and cured, but before you even begin to apply the soldering iron or a tool to the board's surface. Once the board has been damaged, it's too late.

If you undertake the repair properly with the correct tools, and don't use the tools as if you were working on boiler plate, the board should be no worse for the experience. The procedure I recommend is as follows: (1) Using a chemical solvent, remove any silicone or plastic coating from the foil surface before unsoldering anything. (2) Use a miniature soldering iron of 50 watts or less and a tip no larger than ¼" in diameter—unless a specially-shaped tip is employed as directed for a specific job. Many of the newer boards can withstand the heat from a higher-wattage soldering gun, but it's not wise to assume that all boards have this capability. (3) Leave the soldering iron tip in contact with the work only as long as required to melt the solder at the junction; because of the small metal area present, heating time will be much shorter than for conventionally-wired junctions. (4) Use solder with a mixture of 60% tin and 40% lead. (5) Reseal the foil surface with the recommended sealer (plastic or silicone spray).

The right way to unsolder a component is to touch the tip of the soldering iron to the component lead until the solder bonding it to the board becomes molten. The iron should then be lifted away from the board, and the component lead should immediately be pulled out of contact with the foil strip. Or, if this is impossible, the molten solder should be brushed away from the junction.

When you follow this procedure, the thermosetting cement which bonds the foil to the board never becomes hot enough to lose its holding power. Furthermore, the heat applied to the component will not be sufficient to damage it.

Keep practicing your skills in servicing printed boards and join the ranks of professionals who have the respect of *all* their customers — whether their sets have printed boards or point-to-point wiring. ▲

"That's the best ladder I could find . . ."

Transistor Radio Servicing CAN be Highly Profitable

The ONLY Complete Transistor Radio Service Lab

Everything you need for less than $50

Check Transistors, Diodes, Rectifiers . . .

SENCORE TRC4 TRANSISTOR CHECKER

Accurately checks all transistors in hearing aids, radios and power transistors in auto radios. Tests for opens, shorts, leakage, current gain. Measures forward-reverse current ratio on all crystal diodes. Measures forward and reverse currents on selenium rectifiers. With set-up chart for accurate checking of each transistor. Size, 5x4½x2½". With batteries. DEALER NET..... 17.95

Replace Batteries During Repair . . .

SENCORE PS103 BATTERY ELIMINATOR

All-new "Transi-Pak," twin to TRC4 Checker above. Provides variable DC voltage to 24 volts; 1.5-volt biasing tap (a"must" for servicing Philco and Sylvania radios). Metered current output, to 100 ma. Handles 200-ma peaks. Two 200-mfd electrolytics provide proper filtering and low output impedance. No hum or feedback problems. Ideal for alignment using station signal; adjust IF slugs for max. current, also ideal for charging nickel-cadmium batteries. Size, 5x4½x2½". DEALER NET..... 17.95

Find Defective Stage in a Minute . . .

SENCORE HG104 HARMONIC GENERATOR

New signal generator designed primarily for fast signal-tracing of transistor radio circuits. No need to unsolder all transistors. Provides RF, IF and audio signals *simultaneously*, drastically cutting service time. Traces from speaker to antenna. Clear 1000 cycle note signal is heard in speaker from all good stages. Signal weakens or stops at defective stage. Equally as effective for testing TV, hi-fi and other audio circuits also. Size, 3½x4½x1¾". With batteries. DEALER NET..... 9.95

Turn page for other SENCORE Time Savers

See your Parts Distributor NOW!

SENCORE

ADDISON 2, ILLINOIS

www.americanradiohistory.com

Automatic Control

(Continued from page 41)

balanced condition of equal reference and thermocouple voltages.

Fuel valve control is accomplished through the use of synchro motors. As shown in Fig. 4, AC voltage is applied to the single rotor winding of both the transmitter and receiver synchros. The stator windings are wound on axes 120° apart. When the axis of winding S2 is parallel to the rotor winding axis, equal voltages are induced in each of the three stator windings. Unequal voltages are induced at any other position of the rotor.

When the rotors of both transmitter and receiver synchros have the same relationship with their respective stator windings, the corresponding stator voltages are equal in phase and amplitude. In other words, the voltage across S1 of the transmitter synchro is identical to the voltage across S1 of the receiver synchro. The same is true of windings S2 and S3. Since the transmitter windings are connected in parallel with the corresponding receiver windings, no voltage exists between them and no current flows.

However, when the transmitter rotor is moved by the two-phase servo motor, the voltages are no longer equal. Now the voltage differences between the transmitter and receiver windings cause current to flow. These currents produce magnetic fields which tend to line the rotors up. However, since the transmitter rotor is held in place by the two-phase motor, the receiver rotor must move to line up with the transmitter rotor.

Only the DC resistance of the windings acts to limit current, so the resultant magnetic fields are quite strong. For example, with a difference of 1 volt between induced voltages in corresponding transmitter-receiver windings, and a DC resistance of 0.1 ohms, the circulating current is 10 amperes. This is enough to produce a magnetic field with sufficient strength to turn the fuel control valve. Readout of the closed loop is therefore the function of the two-phase servo and synchronized-position motors.

Automatic Distillation

Complete process control often requires more than one closed-loop system. One example is illustrated in Fig. 5, which shows a water-distillation system. Sea water is pumped into a boiler and heated by a controlled flame. The water turns to steam, which rises and passes into a condenser, leaving the salt behind. As the salt content of the boiler water gradually increases, the salinity control is activated to allow some of it to drain off. In the condenser, the steam is converted to pure water, which is then pumped into one of two tanks (A or B). When both tanks are full, the system is shut off until the level in one of the tanks is reduced.

Temperature Control

The closed-loop temperature control for boiler heat in the automatic distillation unit is similar to that used in Fig. 4, except that the sensing element is altered to provide an anticipation signal. Two thermocouples are connected so that the output voltage of the sea-water thermocouple subtracts from voltage of the boiling-water thermocouple. An increase in the total voltage of both thermocouples causes the oil flame to be reduced. Thus, a warmer sea-water temperature results in less heat from the oil flame. The oppo-

CRAFTSMANSHIP

. . . SECRET OF HOW CBS Ronette CARTRIDGES GIVE YOU TROUBLE-FREE PERFORMANCE

Like a fine watch, each CBS-Ronette cartridge is given individual attention by skilled hands and eyes. Built-in quality has made CBS-Ronette first choice of original equipment manufacturers the world over. Now CBS Electronics makes CBS-Ronette stereo and monaural cartridges available to *you.* And remember over 6,000,000 are in use in this country today . . . a ready-made and profitable replacement market for you. Insist on dependable quality. Always ask your distributor for CBS-Ronette, the world's most popular cartridge.

Ask for Catalog PF-285

CBS ELECTRONICS
Danvers, Massachusetts, U. S. A.
A Division of Columbia Broadcasting System, Inc.

Receiving, industrial and picture tubes • transistors and diodes audio components • and phonographs

www.americanradiohistory.com

site is also true; that is, a colder sea-water temperature causes less total output and more heat from the oil flame. By this method, a correction is made for a change in boiler temperature before its water temperature actually changes.

Readout for this control also includes an analog-to-digital converter. This device senses the oil-valve position and transmits a pulse code to the master control. Fig. 6 shows such a converter (Kearfott Company Inc.) with the cover off. As the shaft rotates, the coding bands pass under the sensing fingers. Wherever there is an opening in one of the coding bands, a finger makes contact with a plate and a pulse is sent to the master control.

Salinity Control

Salinity of the boiler water determines the resistance between two rods extending into the water chamber. A battery is connected between one rod and ground, while the other rod connects directly to the grid of an amplifier. Details of the amplifier, comparator, and readout sections are shown in Fig. 7.

Two triodes, having equal plate-load resistors and a common cathode resistor, are connected so that the difference in their plate voltages will operate the motor controlling the boiler outflow valve. As long as the grid voltages of V1 and V2 are equal, the potential across the motor will be zero. The voltage at the grid of V1 depends on the resistance between the salinity rods, and decreases with an increase in the salt content of the water.

Any change in the salinity causes the motor to alter the position of the outflow valve in a direction which will counteract the salinity change. However, there is a time lapse before the new setting of the control valve actually affects salinity. To reduce the rate of correction, the value of capacitor C1 is made large (exact value depends on the time lag desired). Salinity changes must cause C1 to charge or discharge before the valve opening is affected. The setting of P1, of course, permits a desired amount of salinity to be selected, and master control signals are again converted by an analog-to-digital unit.

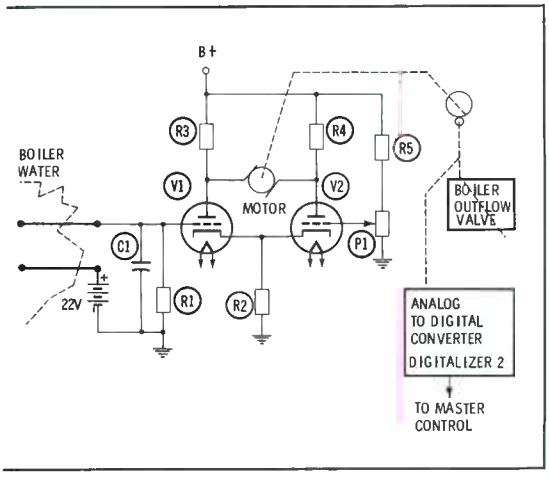


Fig. 7. Details of salinity-control circuit used in water-distillation system.

Level Control

All three level controls (for the boiler and tanks A and B in Fig. 5) function in a similar manner. Each senses the liquid level by two rods extending down into the chamber. In the two tanks, water comes in contact with both rods to complete a circuit and energize a relay. The relay circuit then closes a valve to stop the liquid input. One set of relay contacts also provides a signal for the master control. The level control for the boiler maintains a constant water level by starting

www.americanradiohistory.com

pump A the instant the water falls below the first rod.

Master Control

The heart of the complete process is the master control. Without this central unit, the various loops would operate independently without assurance that sea water was even being distilled. For instance, a completely closed salinity valve indicates a lack of steam production, which causes Digitalizer 2 (Fig. 5) to signal, through the master control unit, for an increase in the setting of the temperature control. The point of correction can be altered to provide a temperature increase before the valve is completely closed. When Digitalizer 1 indicates that the oil-flow valve is completely open, a signal is sent through the master control unit to the salinity control, reducing the volume of waste outflow. The action may be further altered to provide salinity-control correction even before the oil-flow valve is completely open.

If both conditions (completely open temperature valve and closed salinity valve) occur simultaneously, the system is shut down and an alarm rings to indicate a malfunction.

When both tanks A and B are full, the master control puts the system on "standby" operation until the level in one of the tanks falls below the upper sensing rod. Standby, for this process, is a condition in which the oil flame is reduced to a minimum, the outflow (salinity) control is closed, and pump B is shut off.

Fig. 8 shows a block diagram of the master control system. The minimum-senser relay circuit contains two sets of contacts, one of which can be adjusted to energize its relay at any setting of the salinity-control valve. This arrangement allows for temperature settings that will call for more boiler heat before the salinity valve closes completely. A similar arrangement is provided in the maximum-senser relay, wherein the salinity-valve control can be activated at any preselected valve opening. The safety feature is still present, since one relay in each block energizes when the minimum-salinity valve and maximum-temperature valve limits are reached. When both of these relays are energized, the shutoff relay is also energized. The remaining three blocks in Fig. 8 contain the relays necessary to set up the standby function.

Servicing such a control system requires techniques that are similar to those used in television servicing. However, some special test equipment is necessary for particular isolation procedures which, along with the general troubleshooting procedures, will be dealt with in the next installment of this series. ▲

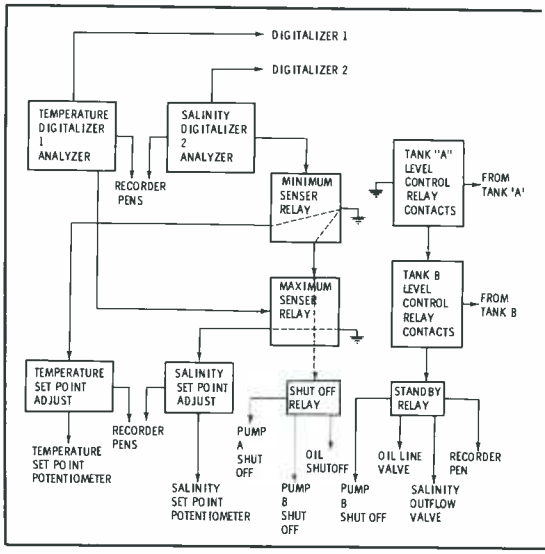
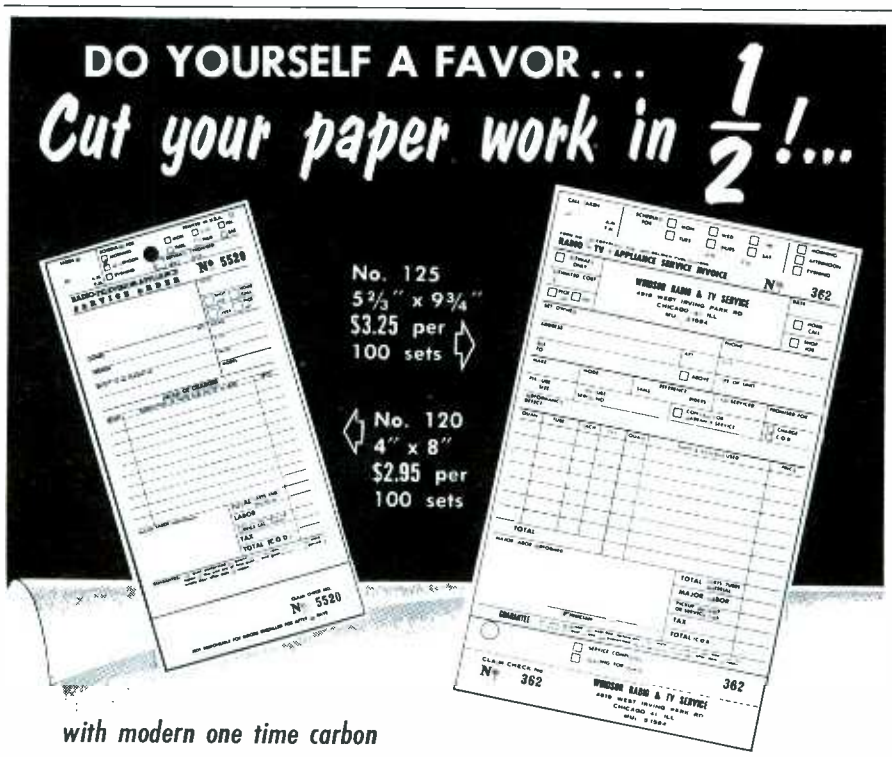


Fig. 8. Block diagram of master-control unit for distillation system.

DO YOURSELF A FAVOR... Cut your paper work in 1/2!...



with modern one time carbon

OELRICH SERVICE FORMS

Triplicate set with hard third copy.
•
Each with customer claim check section.
•
Available unnumbered or numbered consecutively.
•
Blank imprint for use with rubber stamp or with your 4 line imprint on special order.

The #120 and #125 Service Forms can do wonders for you to simplify and improve your billing and handling of service calls and shop jobs. The forms are impressive, expertly designed and are in use in thousands of shops throughout the U.S.A. They are carried in stock by parts distributors in every major city in all 50 states. You can buy them in any quantity from 100 up with blank heading for use with your rubber stamp or they are available with your imprint on special order on a 10 day delivery schedule at a slightly higher price.
Get started now with the Service Forms that mark you as a real professional.

take advantage of the special offer below:

Try before you buy!...
SEND 50c FOR TRIAL SUPPLY
Offer good only with this coupon

Oelrich Publications • 4308 Milwaukee • Chicago 41, Ill.
Please send trial supply of 20: ☐ No. 120 Service Forms. 50c enc.
☐ No. 125 Service Forms. 50c enc.
Also send FREE catalog and name of distributor in my area.

NAME _____
ADDRESS _____
CITY _____ ZONE ___ STATE _____

www.americanradiohistory.com

Better Stereo

(Continued from page 30)

the-middle" situation. To many listeners, they give much more pleasing performance than a conventional left-and-right stereo setup.

Good public acceptance is being reported for the numerous "center-fill" stereo phonographs introduced this season in the mass-market "package" field. The design of practically all of these units is based on the principle that the human ear cannot readily determine the exact source of low-frequency sounds. If the "woofers" in a stereo speaker system are moved to a new location (away from the midrange and high-frequency speakers), the listener will probably notice the change. However, if he cannot actually see the woofer, he will have difficulty in pointing to some particular spot and saying with certainty, "The bass is coming from there." For all practical purposes, then, the woofers may be located in other than the conventional "right" and "left" positions without loss of the stereo effect.

To be specific, they can be moved in toward the center line of the installation, while the higher-frequency units can be moved outboard to provide greater separation between right and left channels. Bass notes then seem to come from virtually the entire assembly, and higher-frequency tones "chime in" at each side to produce the desired directional effect. The final result is a massive "wall of sound" sensation, due to the blending of the outputs from all speakers.

Concentrating the bass speakers near the middle of a stereo console has definite advantages, the most important of these being greater

Fig. 3. Small portable units atop Philco H-1816 contain treble speakers.

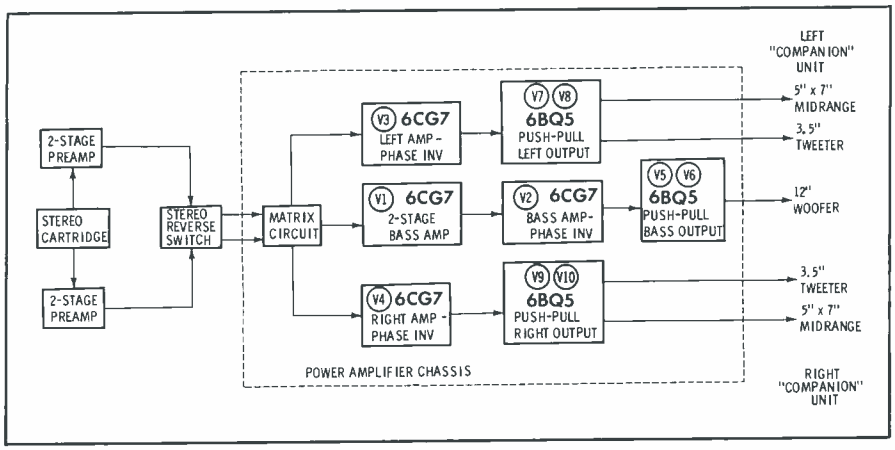


Fig. 2. RCA Model PS-16 has center-bass amplifier, two side channels.

Check TUBES, VIBRATORS —THE SENCORE WAY— FAST ACCURATE TROUBLE SHOOTING

America's Most Popular Tube Tester

more than 25,000 now in use

SENCORE LC3 LEAKAGE CHECKER

Whips those "tough dog" tube troubles . . .

Ask any serviceman who owns one . . . or try one for just one day of servicing in your shop. You'll see for yourself how much time the LC3 can save *you*. Checks for leakage between all elements, whether caused by gas, grid emission or foreign particles. Also checks leakage on all capacitors with voltage applied—including electrolytics. Provides instant filament checks in "Fil-Check" position—no need for a second filament checker. One spare pre-heating socket and new roll chart prevent obsolescence. New charts provided—no charge. Leakage sensitivity; 100 megohms, control grid to all other elements; 50,000 ohms, heater to cathode. Size, 7x6x3½". Wt., 3 lbs. For 110-120 volts, 60 cycle AC. DEALER NET **28.95**

NOW . . . checks 172 tube types—more than any other checker of this type.

NEW . . . replaceable Roll Chart prevents obsolescence.

Check Filaments of All Receiving Tubes and Picture Tubes

FC4 FILAMENT CHECKER

For fast, easy checking of all tube filaments, without pulling chassis. Neon light goes out if tube filament is good. Also acts as continuity and voltage tester. Neon lamp glows when 115 v. AC is applied by cheater cord, providing a check on power to TV set. Size, 3⅛x4x1". With leads. DEALER NET..... **2.95**

Check 3- and 4-Prong Vibrators . . . Faster, Easier

VB2 "VIBRA-DAPTOR"

Plugs into any tube checker; ideal for use with LC3 above. To check 6-v. vibrators, set for 6AX4 or 6SN7; for 12-v. vibrators, set for 12AX4 or 12SN7. Two No. 51 lamps indicate whether vibrator needs replacing. Instructions on front panel. Steel case. Size, 1½x1½x3" DEALER NET..... **2.75**

See your Parts Distributor NOW!

Turn page for other SENCORE Time Savers

SENCORE

ADDISON 2, ILLINOIS

www.americanradiohistory.com

compactness. Instead of requiring large twin bass enclosures—or a single huge cabinet as long as a davenport—the center-bass stereo rig can be obtained in a moderately-sized enclosure with portable or retractible "sidecar" units to accommodate the mid- and high-frequency speakers.

The center-bass idea is often carried to its full conclusion by feeding the combined low-frequency components of both left- and right-channel signals to a single large woofer in the center of the installation. The crossover frequency for the combined bass channel is usually about 300 cps, since the directional effect of sound waves on the human ear appears to fall off considerably below this frequency.

A general survey of 1960-model center-bass stereo systems will serve to illustrate present design trends in this field.

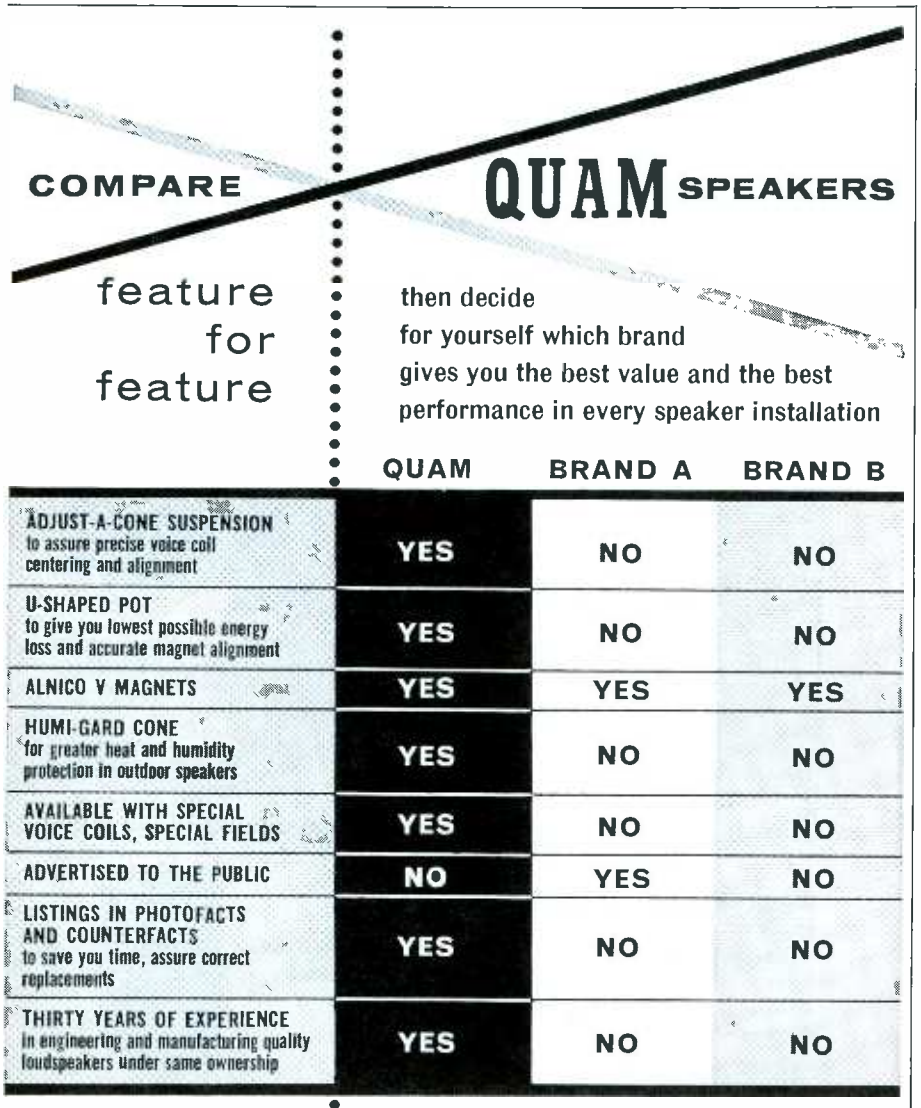
Motorola

Three-channel stereo units are produced by this manufacturer in a variety of styles. The single woofer in each model is driven by a special bass-channel amplifier which supplements the regular right- and left-channel circuits. Fig. 1 is a schematic of a typical Motorola three-channel power amplifier—the HS-768 used in several large console models. Input signals from a dual-channel, low-level preamplifier enter at J1 and J2. Bass frequencies are immediately separated from the rest of the signal by a group of filter circuits (trade-named the *Golden Audio Separator*) at the input of each channel. Equal portions of both input signals are applied to the bass amplifier through a low-pass network. The three-tube bass section in this chassis employs push-pull 6BQ5 power amplifiers to operate the 15″ low-frequency speaker. Narrow-band circuits, emphasizing the lowest audio frequencies, are used throughout; notice that larger-value capacitors are employed in the center channel than in the side channels. Also note the connection between the power amplifier cathodes and the heater circuit, intended to minimize hum.

The left- and right-channel amplifiers receive inputs through twin high-pass filters. Since the side channels furnish less output power than the center channel, and since they handle none of the low bass frequencies, they only have single-ended output stages. Thus, the Motorola three-channel output amplifier has the same tube complement as would be found in a conventional dual-channel amplifier with a driver, phase inverter, and push-pull output stage on each side.

The HS-768 and similar chassis are available in various types of cabinets. For example, two models (SK28 and SK30) have midrange and treble speakers permanently installed in the end sections of a one-piece cabinet. Another unit, the SK31, has free-standing left and right speaker enclosures which can be moved away from the center bass enclosure for greater channel separation. A more compact "package," the SK29, has side-channel speakers built into the thick double doors of the cabinet—which swing out into playing position. The hinges of each door are divided into two sections so that they can be utilized as electrical connections between the amplifiers and speakers.

Although the power-amplifier chassis is not equipped with controls



Write

for your free copy of the QUAM General Catalog, listing the full line of QUAM speakers for radio-tv replacement, public address, and high fidelity. QUAM speakers are completely manufactured in the United States of America.

QUAM-NICHOLS COMPANY

234 East Marquette Road • Chicago 37, Illinois

www.americanradiohistory.com

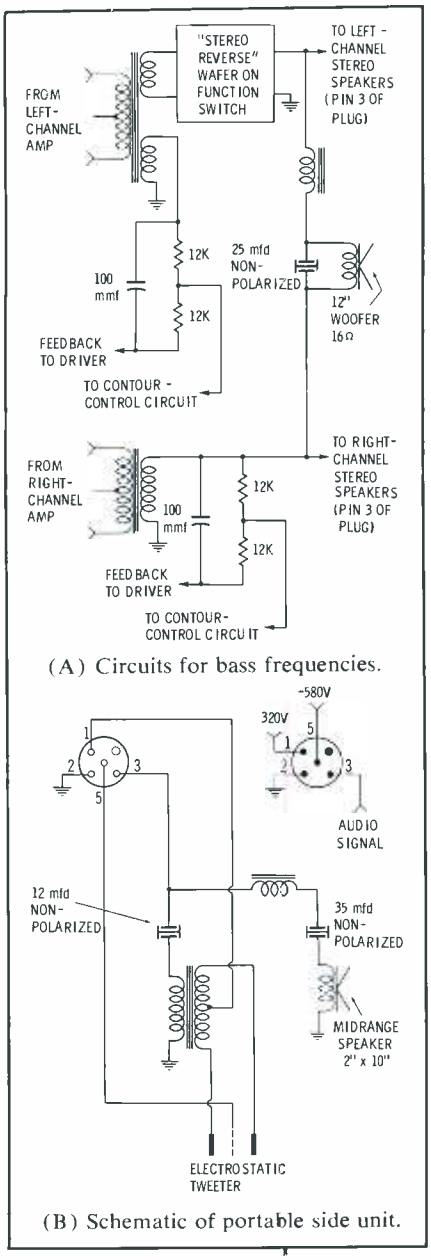


Fig. 4. Details of speaker and output transformer circuits in Philco sets.

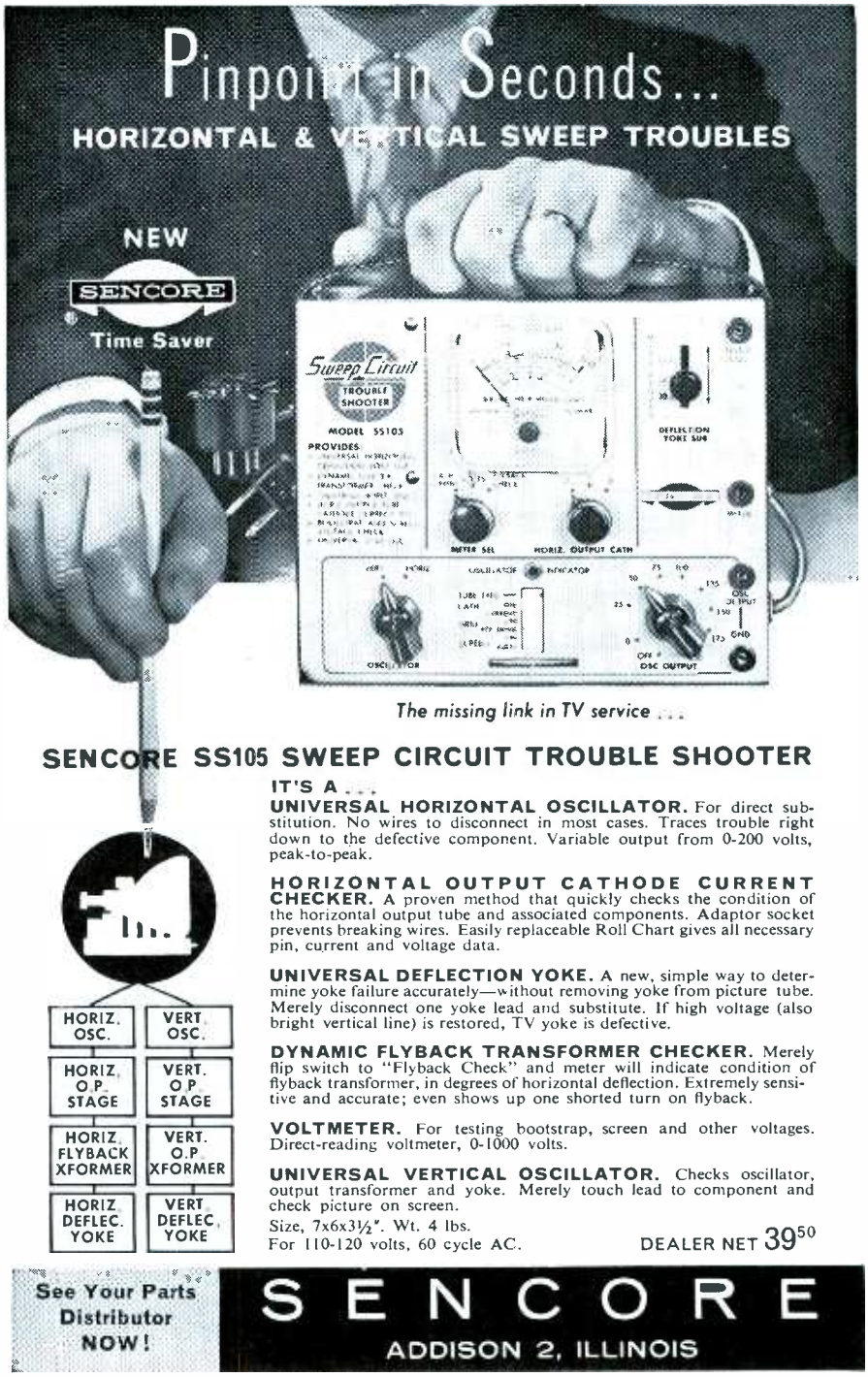
to adjust the relative gain of the center and side channels, the output signal amplitudes can be regulated just as well by adjustment of the various controls in the preamplifier section. Ganged pairs of bass, treble and loudness controls all affect frequency response, thereby increasing or decreasing the output of the center channel with respect to the right and left channels. A balance control, connected across the output terminals of the preamp, enables the user to equalize the strength of the right- and left-channel speaker outputs—or to make one louder than the other, if he so desires.

RCA

A few months ago, a center-bass *Mark XVI* unit was added to RCA's stereo phonograph line. This instrument consists of a moderate-sized wood console flanked by a pair of portable "companion" units which contain the mid- and high-frequency speakers. The side enclosures, connected to the main cabinet by 15′ cables, are self-supporting upright cylinders with tripod bases; in size and shape, they resemble pedestal-type ash trays. The speakers in each companion unit are conventional 5″ x 7″ oval and 3.5″ round types, both supported by a baffle board mounted vertically inside the cylinder.

The single 12″ woofer is driven by a separate bass-channel power amplifier with push-pull output (see Fig. 2). The independent right- and left-channel amplifiers also have push-pull final stages, but they contain fewer voltage amplifiers than the bass channel because of their lower power-output requirements.

Input signals enter the power amplifier through a matrix circuit, which consists of high- and low-pass filter networks somewhat like those in Motorola's three-channel amplifiers. In addition to the usual controls, the preamp section has a stereo-reverse switch that can be



www.americanradiohistory.com

VIS-U-ALL
BUSINESS BUILDING TEST EQUIPMENT FOR SERVICE DEALERS

NOW,
THE DYNAMIC
PORTABLE TUBE
TESTER THAT DOES
EVERYTHING

New V1003 tests 99% of all radio and TV tubes plus transistors and portable radio batteries!

No other tester like it at any price. Not only helps you do better, faster TV-radio servicing, but sells more tubes. Also checks all transistors and portable batteries under load (a Vis-U-All exclusive) Does all this with just 6 sockets, 3 knobs . . . simplicity unequalled! New and practical features galore!

ONLY **$129.00**

Write for Details

VIS-U-ALL
PRODUCTS CO.
643 EASTERN, S. E.
GRAND RAPIDS 6,
MICHIGAN

Two Fellows
who want to work for you.

VG-1 Voltage Gauge

Quickly tells you what the voltage is at the flyback transformer.

$1.98 Dealer Net

Model 50-A
Inductive Winding Tester

Tried and proved—the best transformer tester you can buy at any price.

$19.95 Dealer Net

B&M ELECTRONIC MFG. CO.
2516 Dodge Avenue
Fort Wayne, Indiana

used to compensate for accidental interchanging of the right- and left-channel signals in the program material (or in the equipment, for that matter).

Philco

Three phonograph models in the 1960 Philco line also have portable, plug-in treble speakers; but, unlike RCA's, they do not rest on the floor. As shown in Fig. 3, they are compact little devices which can be perched on top of the phonograph cabinet or oth. r furniture. The lower section contains a 2″ x 10″ midrange speaker, and the upper element is an electrostatic high-frequency reproducer which can be swiveled to and fro to find the best listening position. When not in use, the side-channel speakers (fondly named *stereophones)* can be stored in compartments in the lower section of the main cabinet.

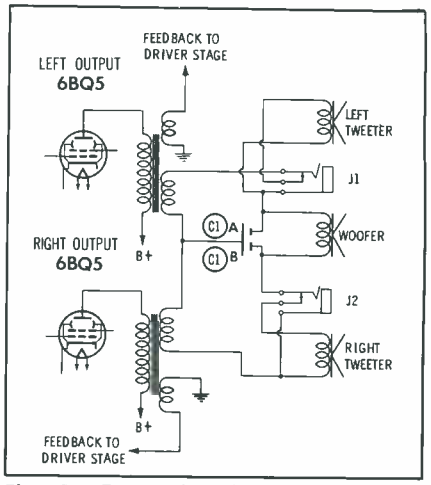


Fig. 5. External treble speakers can be plugged into Webcor Model 1065-1.

The largest of the three center-bass instruments (Model H-1916) has a separate woofer for each channel. In the other two models (H-1814, -6), a single 12″ woofer is connected in series with both output transformers (Fig. 4). Since the

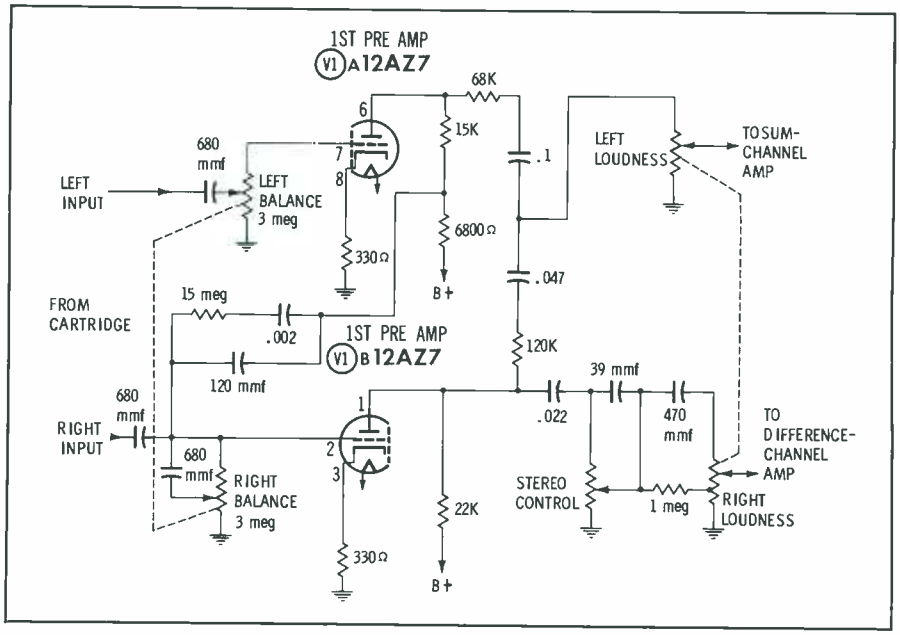


Fig. 6. Zenith set converts R, L inputs to sum and difference signals.

SARKES TARZIAN

RECTIFIER TUBE TYPES 6X4, 6063, 6202 with Tarzian Tube Replacement Silicon Rectifier S-5207

AVAILABLE THROUGH YOUR DISTRIBUTOR

- SMALL SIZE
- HIGHER EFFICIENCY
- SAFETY CONSTRUCTION

SARKES TARZIAN, INC.
SEMICONDUCTOR DIVISION
415 north college · bloomington, indiana

SEE OTHER TARZIAN ADS IN THIS ISSUE

www.americanradiohistory.com

low-frequency components of the right- and left-channel output signals are both substantially the same, the woofer voice coil is effectively driven in push-pull by the two signals. Note that a stereo-reverse switch is furnished for interchanging the connections of the left-channel transformer secondary.

The "feedback" connections indicated in Fig. 4 are sources of degenerative feedback voltage for application to the stage ahead of the power amplifier in each channel. The contour controls allow the operator to increase the treble response of the amplifier by progressively removing the higher-frequency components from the negative feedback signal.

Fig. 4B shows the circuit details of a *stereophone*, along with a diagram of the plug which connects it to the main chassis. (The circuits for the right and left sides are identical.) Besides a crossover network for dividing the audio frequencies properly between the midrange and tweeter units, the speaker assembly also has two DC power-supply connections to obtain operating voltages for the electrostatic tweeter. The movable diaphragm, which carries a potential of −580 volts, is sandwiched in between two fixed plates, and the positive 320-volt DC potential on the latter elements is modulated in push-pull fashion by the audio signal to cause vibration of the diaphragm.

Sylvania

Still another kind of portable side-channel speaker system is built into the Sylvania *Space Direction* consoles, Models 4706 and 4324. The midrange and high-frequency reproducers for the left and right channels are built into small "bookshelf" type enclosures which are finished to match the main cabinet. These are flush-mounted in receptacles in the sides of the cabinet. For operation, they can be left in place or else lifted out and rested on any convenient surface as far as 12′ from the console unit. A 12″ or 15″ woofer is centrally located inside the main cabinet.

Webcor

Side-channel speakers in the Webcor Model 1065-1 are permanently mounted in the cabinet, but

Precision cutting...a simple job with the new

Centralab SK-2 SHAFT-KUT TOOL

Now you can cut controls and control the cut . . . precisely and exactly. CENTRALAB's Shaft-Kut Tool is a precision instrument, *guaranteed* to make a really simple job of cutting shafts to the exact size you need.

With this tool you can cut any single or dual control . . . or switch shaft, and get cuts that are accurate to 1/64th of an inch! The tool and calibrated jig are made of case hardened tool steel, designed to last a lifetime.

You can't make a wrong cut with the CENTRALAB Shaft-Kut Tool! And the price is less than half what you'd expect to pay for a precision device of this kind . . . a low $4.95 dealer net. Ask your distributor to show you how easy it is to use this new tool.

Centralab B-5931

ELECTRONICS DIVISION OF GLOBE-UNION INC.
942A E. KEEFE AVE. • MILWAUKEE 1, WIS.
IN CANADA: 669 Bayview Ave., Toronto 17, Ont.

CONTROLS • ROTARY SWITCHES • CERAMIC CAPACITORS
PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

www.americanradiohistory.com

As "The Man on the Roof"
you would Prefer South River
for making better television antenna installations

Take CHIMNEY BANDING for instance...

Why take this?

The troublesome watchspring effect —Some servicemen have to put up with banding that has a tight spiral "set". Bands of this kind can easily be spotted by their reluctance to stay put. Placement around the chimney is difficult and time consuming.

You can have this

This is the "free-opening" South River Band. Remove the retaining tape and you'll see it naturally unwinds for easy placement around the chimney. That's South River's way of making things easier for the man-on-the-roof.

Make It Easy for Yourself . . . *Better for Your Customer*

Insist on mountings and accessories made by
South River METAL PRODUCTS CO., INC.
South River, New Jersey
PIONEER MANUFACTURER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTING ACCESSORIES
CANADA: LEN FINKLER & CO., TORONTO

PHONE
ED 9-9653

90 DAY
WARRANTY

$7.50
plus parts,
C.O.D. and postage charges

Precision Tuner Service

ALL TYPES T.V. TUNERS REPAIRED AND ALIGNED TO FACTORY SPECIFICATIONS ON CRYSTAL-CONTROLLED SWEEP GENERATORS
24-HOUR SERVICE ON MOST TUNERS
UHF - VHF COMBINATIONS — $13.50
See your local distributor or send to:
P.O. Box 272, 601 N. College
BLOOMINGTON, INDIANA
State make and model. Send all parts, tubes and shields

SARKES TARZIAN

Replace
RECTIFIER TUBE TYPES
866, 866A, 3B28
with Tarzian
Tube Replacement
Silicon Rectifier S-5130
AVAILABLE THROUGH YOUR DISTRIBUTOR
SARKES TARZIAN, INC.
SEMICONDUCTOR DIVISION
415 north college · bloomington, indiana

- DIRECTLY INTERCHANGEABLE
- LONG LIFE
- GREATER CURRENT CAPACITY
- SMALL SIZE
- HIGHER EFFICIENCY
- SAFETY CONSTRUCTION
- TEMPERATURE VERSATILITY
- NO WARMUP PERIOD

SEE OTHER TARZIAN ADS IN THIS ISSUE

phone jacks J1 and J2 (Fig. 5) are provided to permit connecting external speakers into the system. When plugs are inserted into the jacks, the internal speakers are automatically disconnected and the outputs shifted to the supplementary speaker systems. The "low" side of each treble circuit is completed through a capacitor—C1A for the left channel, and C1B for the right channel. Since these capacitors present a high reactance to the lowest bass frequencies, the bass circuit is a single large loop consisting of both output-transformer secondaries and all speakers in series. Webcor's center-bass arrangement is known as the *Bass Frequency Distribution (BFD) circuit.*

Zenith

Two different methods for achieving wide sound dispersion are utilized by Zenith. One, the *Radial Sound System,* is an optional feature which can be added to certain stereo phonograph models (at extra cost) to improve performance. As originally delivered, the basic instrument is a conventional dual-channel unit with a 12″ woofer and a 5″ tweeter on each side. To heighten the stereo effect, two small remote speaker assemblies can be plugged into the main console. Just as in the Webcor *BFD,* this causes the internal treble speakers to be disconnected from the output transformers. The *Radial Sound* setup has the advantage of using two independently-driven bass speakers, spaced fairly far apart; the dual speakers minimize any tendency toward losing the desired "wall-of-sound" effect in rooms with poor acoustics.

Zenith's second type of modified stereo system, called *Extended Stereo,* involves no center-channel components or portable extension speakers. The regular treble speakers are simply made to *seem* farther apart than they really are. This illusion is electrically produced by *exaggerating the differences* between the left- and right-channel signals as they pass through the amplifier.

The preamp section includes matrixing circuits which rearrange the "left" and "right" outputs of the stereo cartridge into two new signals —the "sum" (L + R) which represents the similarities between the two stereo channels, and the "difference" (L – R) which mainly

www.americanradiohistory.com

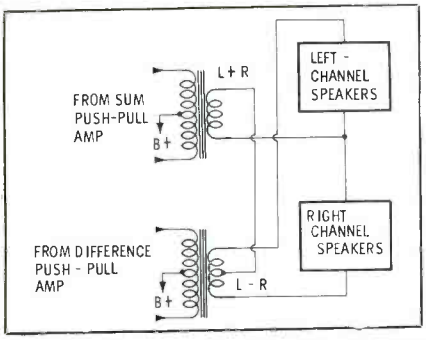


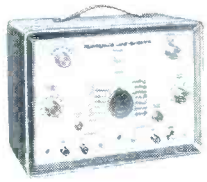
Fig. 7. This circuit recovers "right" and "left" signals for speakers.

represents those signal elements that appear in one channel but not in the other.

Fig. 6 shows the matrixing circuits of the *Extended Stereo* preamplifier (Chassis 2D30). The left-channel output of the cartridge is applied to section A of preamp tube V1, and the right-channel output goes to section B. The amplitudes of these two signals can be equalized with the ganged balance controls, which work in "seesaw" fashion—increasing the signal input to one channel while decreasing the input to the other. A portion of V1A's output is tapped off at the junction of the 15K and 6800-ohm resistors and is coupled over to the grid of V1B. The polarity of this "cross-channel" signal, since it has gone through one stage of amplification, is opposite that of the right-channel input signal being fed directly to V1B. Furthermore, the matrix circuit is designed so that the right-input and cross-channel signals reaching the grid of V1B will be practically equal in amplitude. Under these conditions, the two signals would completely cancel each other—if they had identical waveforms. But stereo systems are *not* identical; one channel contains a certain amount of information not found in the other. Therefore, only the *similarities* between the input signals are cancelled. The *differences* between them (actually the stereo-producing components of both signals) are amplified by V1B. The output is essentially a "right-channel minus left-channel" or R – L signal. When inverted by the following amplifier stage (not shown in Fig. 6), the difference signal simply becomes "left minus right" or L – R.

A sample of the output signal from V1B is coupled through a 120K-ohm resistor and a .047-mfd capacitor to the sum-channel input circuit, where it is combined with a

RCA TEST EQUIPMENT
"the professional's touch"



WR-69A TELEVISION/FM SWEEP GENERATOR

USE: for visual alignment and trouble shooting of TV rf/if/vf circuits and other electronic equipment. IF/Video frequency ranges 50 Kc to 50 Mc, TV channels 2 to 13, plus FM range—88-108 Mc. Sweep width 0-12 Mc or more. Output level—0.1 volt or more. Attenuation ratio 60 db or more below maximum output. $295.00* (including all cables, instruction book).

WO-91A 5-INCH COLOR-TV OSCILLOSCOPE

USE: high-performance, wideband oscilloscope ideally suited for color-TV black-and-white TV, and other electronic applications. Dual bandwidth (4.5 Mc, 0.053 volts rms/in.) (1.5 Mc, 0.018 volts rms/in.). Internal calibrating voltage and calibrated graph screen. Includes special direct/low cap shielded probe and cable. $239.50* (includes ground cable, insulator clip, instruction book).

WR-99A CRYSTAL-CALIBRATED MARKER GENERATOR

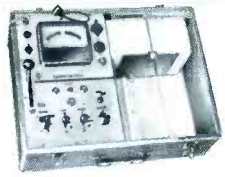
USE: to supply a fundamental frequency rf carrier of crystal accuracy for aligning and trouble-shooting color, black-and-white TV, FM receivers and other electronic equipment operating in 19 Mc to 260 Mc range. $242.50* (complete with output cable, two phone tips, instruction book).

WV-98A SENIOR *VOLTOHMYST*®

USE: for making accurate ac and dc voltage measurements as well as measuring resistances from 0 to 1,000 megohms. Measures peak-to-peak values of complex waveforms. Ruggedized, die-cast aluminum case. Large, easy-to-read 6½-inch meter! A fine VTVM for electronic technicians and engineers! Includes special dc/ac-ohms shielded probe and cable. $79.50* (complete with ground lead, alligator clip, instruction book et).

WR-70A RF/IF/VF MARKER ADDER

USE: To be used with WR-69A, WR-99A or similar electronic equipment. Eliminates possibility of waveform distortion during visual alignment techniques by adding markers after the rf signal is demodulated. $74.50* (complete with cables, instruction book).



WT-110A *AUTOMATIC* ELECTRON-TUBE TESTER

USE: especially for TV and general electron-tube service testing through automatic punched-card selection of correct test conditions on wide variety of tubes. Checks vacuum-tube rectifiers under high-current conditions. $199.50* (complete with 263 punched cards, 24 blank cards, card punch, instruction book).

WR-46A VIDEO DOT/CROSSHATCH GENERATOR

USE: a "must" for making color-TV static and dynamic convergence adjustments in the home or shop. Derives sync from station-tuned TV set and reinserts highly stable video dot, bar, or crosshatch patterns to picture tube grids or video amplifier grids. $179.50* (complete with cables, instruction book).

WR-49B RF SIGNAL GENERATOR

USE: for alignment and signal tracing of AM/FM receivers, low-frequency signal tracing and alignment of TV vf/if amplifiers. Six ranges—85 Kc to 30 Mc. Internal 400 cps modulation. Low rf signal leakage! DC blocking capacitors at rf and af output terminals prevent damage to instrument or external circuits. $79.50* (complete with shielded cable for rf and af output, instruction book).

WR-61B COLOR-BAR GENERATOR

USE: for checking overall operation of color-TV receivers and a "must" for adjusting and trouble-shooting color phasing and matrixing circuits. Generates signals for producing 10 bars of different colors simultaneously. $295.50* (complete with cables, TV-input adapter, instruction book).

PLUS a complete line of test equipment accessories—video multimarkers, TV isotaps and bias supplies, various probes and cables including high-voltage types. Add "the professional's touch" to your service—see RCA's full line at your Authorized RCA Test Equipment Distributor!

*User Price (Optional)

RADIO CORPORATION OF AMERICA
Electron Tube Division **Harrison, N. J.**

www.americanradiohistory.com

The Spotlight of Leadership is on...

arkay

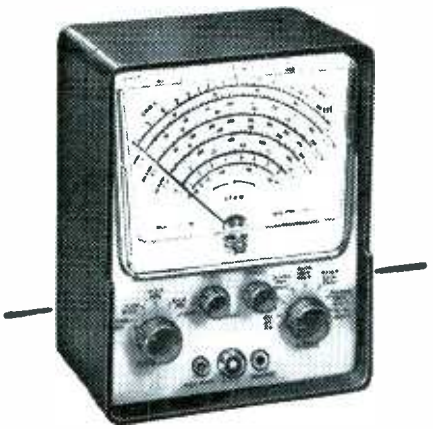
Kits and Wired

TEST EQUIPMENT

TODAY'S BEST QUALITY BUY

Comparison proves . . . you get so much more with Arkay! Advanced engineering • exclusive new features • outstanding performance • truly hi-precision professional quality at amazing low cost. Prove it to yourself—at your distributor now.

EXTRA-LARGE Easier-to-Read 6" METER!



ARKAY VT-10 6-INCH MULTI-PURPOSE VACUUM TUBE VOLTMETER

For faster accurate servicing, the ARKAY VT-10 VTVM has exclusive larger 6-INCH meter, edge-lighted, for easier reading. 400 ua meter movement within 2% accuracy. 1% precision multiplier resistors are used throughout the range switch. There are 7 AC (RMS) and DC ranges, 0 to 1500 volts; also 7 AC (peak-to-peak) ranges, 0 to 2000 volts. Resistance of 0 to 1000 megohms, db and other essential ranges also included. Circuitry features 12AU7 for DC ranges, 6A15 for AC, meter diodes rectifiers, and transformer operated selenium rectifier. Handsome durable plastic case. A sensational quality buy, unmatched at this price!

Wired and tested $47.95 Easy-to-build Kit $25.95

ARKAY AV-20 6-INCH AUDIO VTVM PRE-AMPLIFIER

An Audio Vacuum Tube Voltmeter of extreme sensitivity, engineered for accurate measurements of RMS voltages.

Easy-to-build Kit $29.95

Wired and tested $49.95

ARKAY AW-30 6-INCH DIRECT READING AUDIO WATTMETER

Measures Audio Power Output with speed and precision. 0 to 500 watts in 6 ranges. For laboratory and general use.

Easy-to-build Kit $29.95

Wired and tested $49.95

ARKAY CA-40 6-INCH DIRECT READING CAPACITY METER

Easy-to-build Kit $29.95

Wired and tested $49.95

ARKAY MT-50 6-INCH 20,000 OHMS PER VOLT METER

Easy-to-build Kit $29.50

Wired and tested $42.95

All prices 5% higher west of Mississippi.

See ARKAY completely wired Test Instruments at your dealer. Write for detailed specifications and catalog. Write Dept. PF

arkay

PACE

88-06 Van Wyck Expressway Richmond Hill 18, N.Y.

somewhat stronger signal from the plate of V1A. (Remember, this latter signal consists entirely of left-channel information.) The left-channel components of the two signals are out of phase at this point; but, since one is stronger than the other, only partial cancellation will occur. The final output is a right-plus-left (R + L) signal.

Both outputs, the R + L and R – L, are applied to amplifiers through ganged loudness controls. The *relative* amplitude of the two signals can be regulated by adjustment of a stereo control (actually an independent gain control) in the difference channel. As its name indicates, this control is able to increase or decrease the apparent stereo effect—just as though the right- and left-channel speakers were being moved physically farther apart or closer together.

Of course, the outputs of the sum and difference amplifiers are not suitable "as is" for driving the speakers. The output-transformer secondaries must be connected in a matrixing hook-up (Fig. 7), which greatly resembles the speaker circuit of the Columbia "two-way" stereo amplifier we described in the March, 1959 issue. The difference-channel output transformer has a center-tapped secondary in order to provide signals of two polarities for the two sets of speakers. Note that one-half of this split winding is placed in series with the sum-channel secondary to complete each of the speaker circuits.

To begin an explanation of the matrixing action, let's first assume that the signal in each half of the difference-channel secondary is the same strength as the sum-output signal. This condition corresponds to normal operation, in which the *extended stereo* feature has not yet come into play. In the left-channel speaker circuit, the sum and difference signals (which are equivalent to L + R and L – R at this point) have *in-phase* left-channel components which reinforce each other; however, the right-channel components are *out of phase* and are cancelled. This situation is exactly reversed for the right-channel speaker circuit, since the polarity of the difference signal is reversed into the form R – L.

If the *extended stereo* effect is de-

the indoor TV antenna of the FUTURE!

Channel King®

• Superior Reception on all VHF and UHF Channels
• Hands never touch Antenna Arms Extends to 42" --- Retracts to 0"
• Arms COMPLETELY retractable, flexible and indestructible!
• FAST SINGLE dial tuning and adjusting
• Very COMPACT attractive appearance
• AVAILABLE in Mahogany or Ivory

REGULAR RETAIL PRICE $12.95

FALL SPECIAL PRICE $7.95

See your local dealer or distributor, or order direct . . . cash, check or money order to:

(Money back if not completely satisfied)

MARJO TECHNICAL PRODUCTS CO.
1152 East Henry Street Linden, New Jersey

SARKES TARZIAN

Replace

RECTIFIER TUBE TYPE 5R4 with Tarzian Tube Replacement Silicon Rectifier S-5019 or S-5162

AVAILABLE THROUGH YOUR DISTRIBUTOR

SARKES TARZIAN, INC.
SEMICONDU[illegible]

415 north college · bloomington, indiana

• DIRECTLY INTERCHANGEABLE
• LONG LIFE
• SMALL SIZE
• HIGHER EFFICIENCY
• SAFETY CONSTRUCTION

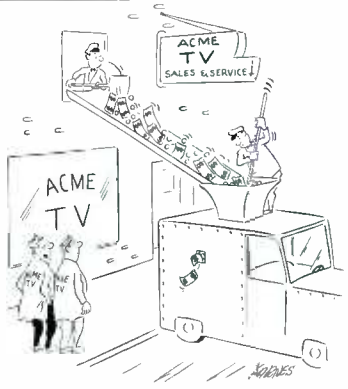
SEE OTHER TARZIAN ADS IN THIS ISSUE

www.americanradiohistory.com

sired, the stereo control is advanced to a higher setting in order to increase the signal output from the difference channel. Since the sum and difference signals are no longer equal in amplitude, their out-of-phase components do not completely cancel each other in the matrix circuit. Therefore, the left-channel speakers receive a small amount of right-channel information, which is 180° out of phase with the main signal fed to the right-channel speakers. Similarly, the right half of the installation is supplied with some reverse-polarity information having the same waveshape as the basic left-channel signal. These out-of-phase signals, when applied to the "wrong" sides of the stereo setup, help to fool the listener into thinking that the left and right speakers are farther apart than they really are. "Hole-in-the-middle" effect is not likely to develop, since the bass speakers are still fairly close together—and their output is not much affected by the increase in difference-signal amplitude.

Admiral

Our discussion of "filling in the middle" would not be complete without at least mentioning the *phantom third channel* in Admiral's current stereo line. You'll look in vain for an electrical cross-connection between the right and left amplifiers or speaker systems in these sets; in fact, the twin bass speakers haven't even been moved in toward the center of the cabinet. Strictly speaking, then, Admiral's phonographs are orthodox two-channel units. However, they have been carefully designed to eliminate the "hole in the middle" as effectively as if they had a center-bass arrangement. ▲



"Business is pretty good with us. How's it over at your place?"

FIRST TIME . . . a versatile

DUAL HEAT SOLDERING GUN

FOR ONLY $7.95 LIST
Model 8200K

. . . and best of all, it's a new Weller®

Here from Weller, long time leader in the soldering field, is the newest and finest soldering gun value on the market.

WELLER DUAL HEAT FEATURE saves time, gives greater convenience and greatly increases tip life. A touch of your finger on the Triggermatic control switches heat to high (125 watts) or low (90 watts) as your job requires. It adapts instantly to varying needs, and you use high heat only when necessary.

HIGH EFFICIENCY WELLERTIP utilizes copper for superior heat transfer and soldering efficiency, plus iron plating for durability. Flat cross-section design gives added strength and rigidity.

NEWEST DESIGN with sturdy plastic housing that resists hard knocks. Compact "feel" and comfortable balance aid precision soldering. Like all other Weller guns, this new model features instant heat, and a spotlight illuminates your work.

KIT INCLUDED

In addition to the Dual Heat Soldering Gun you get:

- **Wire Bristle Cleaning Brush**
- **Soldering Aid for opening old joints, twisting wires**
- **All-purpose Solder**

On sale now at your Electronic Parts Distributor

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

www.americanradiohistory.com

"Eliminates Soldering"

PERFECT Audio

"PIN-PLUG" CRIMPER

SLIP WIRE IN "PIN-PLUG" INSERT IN TOOL AND SQUEEZE JOB IS DONE

USE END OF BLADE AS SCREWDRIVER

AU-2

USE END OF TOOL TO PUSH ON GROUND CONNECTOR

Useful in making hi-fi, audio and sound, radio, phono, and TV equipment connections.

only $1.25

C -rings 1c each

Get the tool that makes solid electrical pin-plug connections without soldering or destroying pin form. Use one end for pin crimping, the other to push on C-ring clamp for braided-shield ground connection. Nothing like it anywhere.

3 models: PT-1 for 3/32" pin diameter; AU-2 for 1/8" pin diameter and installing C rings; LC-3 for 5/32" pin diameter.

Available at your parts distributor.
Another fine product from:

BERNS Mfg. Co.
9853 Chalmers, Detroit 13, Mich

AMPLIFIERS OF QUALITY

SIGNAL TRACER

Checks all stages from Antenna to Speaker or Picture Tube. Tests microphones, appliances, pickups, transformers, speakers, resistors, condensers, etc.

Model 202 (with AF Probe)..Net $37.50
Model A Probe (RF Demodulator) .....Net 4.50
Model B Probe (RF Demodulator, Amplifier) .....Net 7.50

VTVM KIT

Easily assembled! Solves numerous problems. Sensitive voltage measurements with negligible circuit loading. Accurate AC voltage ranges for checking line voltages, amplifier power output, frequency response. Positive and negative DC voltage ranges. Checks resistance. Radio, TV servicing; maintenance of electronic equipment; many other uses. Net $27.95.

PRECISION ELECTRONICS, INC.
9101-0 King Ave., Franklin Park, Illinois

Video & Vertical

(Continued from page 39)

In the video detector circuit, an open L2 could be discovered by a resistance check, while an open L1 or L3 would break the signal path and cause loss of all video.

Low-frequency compensation can be achieved in several ways. Many sets employ DC coupling between the video detector and amplifiers. In this case, special low-frequency compensation networks are *not* required, and are generally not used. Where AC (capacitive) coupling is utilized, then the additional compensation is inserted. As indicated, this includes R3 and C1 in Fig. 4 plus large bypass capacitors at the screen grid and sometimes the cathode. Defects in bypass capacitors can best be detected with a capacitor checker; but, if R3 becomes defective, this will immediately be reflected in the DC plate voltage of V1.

Before we leave video amplifiers, mention should be made of two additional probing methods that the reader may find useful. One method, the simpler and less expensive of the two, is carried out by *listening* to the video signal. Here is how this is done.

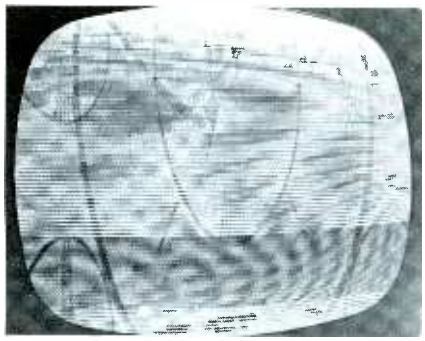


Fig. 9. Deflection produced by applying 6.3 volts AC across vertical yoke.

Prepare a lead containing a .01-mfd series capacitor and attach alligator clips at each end. Connect one clip to the volume control. Use the other clip as a signal-tracing probe to contact various points in the video system. Start at the point where the video signal enters the picture tube, and gradually work back to the video detector. Presence of a signal will be indicated by a loud rasping buzz in the speaker, caused by the vertical sync pulse in

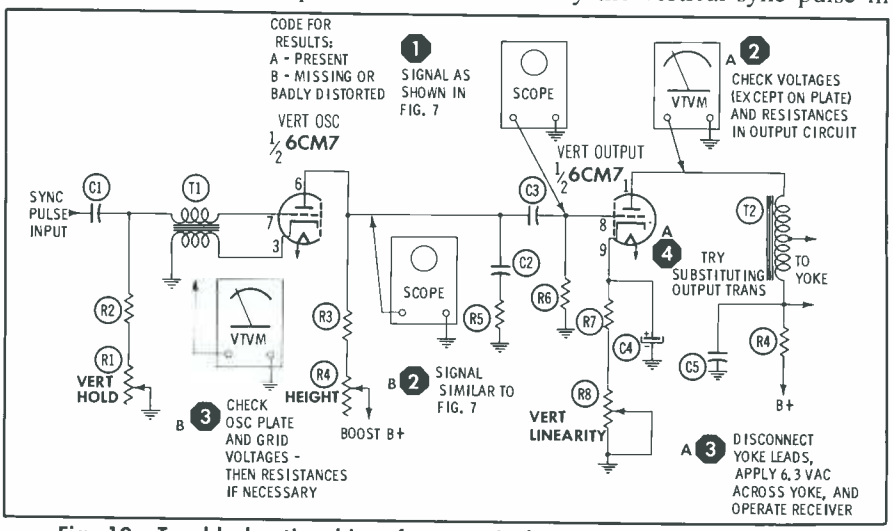


Fig. 10. Troubleshooting hints for a typical vertical blocking oscillator.

SARKES TARZIAN

Replace

RECTIFIER TUBE TYPES 816, 836, or 3B28 and 866 at reduced voltage with Tarzian Tube Replacement Silicon Rectifier S-5343

AVAILABLE THROUGH YOUR DISTRIBUTOR

SARKES TARZIAN, INC.
SEMICONDUCTOR DIV.
415 north college · bloomington, indiana

CAPACITY
• SMALL SIZE
• HIGHER EFFICIENCY
• SAFETY CONSTRUCTION

SEE OTHER TARZIAN ADS IN THIS ISSUE

www.americanradiohistory.com

the signal. If a buzz is not heard, the signal is absent.

This test method is easy to perform and requires no additional equipment. However, it is limited to those cases where the signal path is broken and nothing reaches the picture tube. Another approach is the injection of a 400-cycle note from an audio signal generator. This will produce a series of horizontal bars on the screen. It is best to work back from the picture tube, noting the point where the bars disappear. Again, this method is effective only where there is a complete circuit break or where the amplification of a stage has been reduced so drastically that it amounts almost to an open condition.

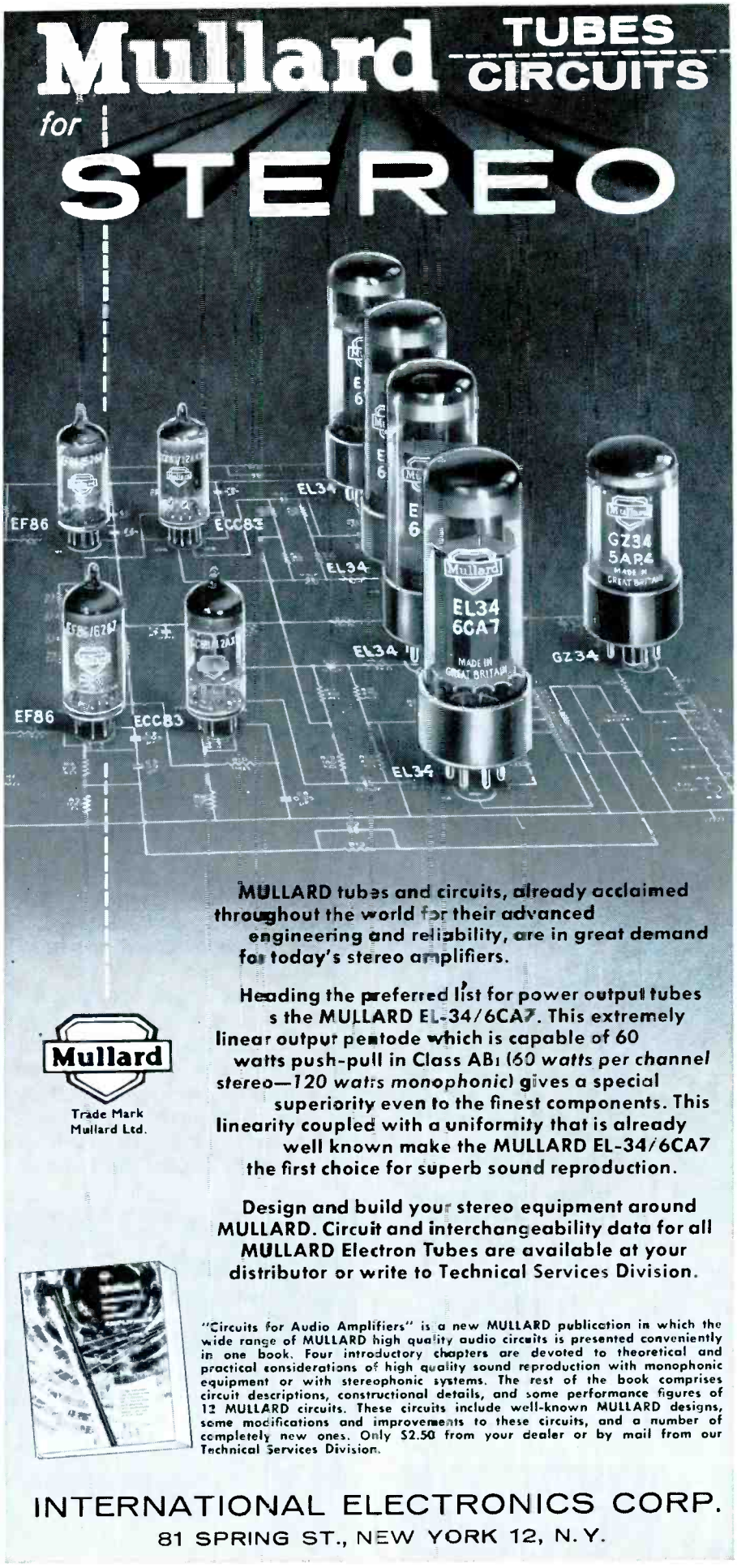
To summarize, video amplifier checking is best initiated by some form of signal tracing or signal injection. In this respect, the oscilloscope is perhaps the best instrument to use. Once the defective stage is located, voltage and resistance measurements are made. (See Table I.)

Vertical Sweep System

Trouble in the vertical system is indicated by vertical distortion (Fig. 5) or by insufficient or no vertical deflection at all (Fig. 6). Inability to remain in sync may stem from a defect in the vertical system, or from trouble in an earlier stage that prevents sync pulses from reaching the vertical oscillator. Occasionally, trouble will reach the vertical system by an obscure path, but this does not happen very often. For example, in one receiver the writer had occasion to work on, the vertical hold was unstable—yet none of the normal causes for this condition seemed to be responsible. It was eventually discovered that a wire carrying 60-cycle AC was lying on the grid terminal of the vertical oscillator. The presence of the 60-cycle field was sufficient to upset the timing of the oscillator. This, however, is a fairly rare condition.

Table I—Instruments for Isolating Video and Vertical Troubles.

SECTION	TEST METHODS		
	PRIMARY	SECONDARY	
		1.	2.
VIDEO AMPLIFIERS	SCOPE	VOM OR VTVM	LISTENING TEST OR 400~SIGNAL
VERT DEFLECTION SYSTEM	SCOPE	VOM OR VTVM	6.3 VOLTS a-c



MULLARD tubes and circuits, already acclaimed throughout the world for their advanced engineering and reliability, are in great demand for today's stereo amplifiers.

Heading the preferred list for power output tubes is the MULLARD EL-34/6CA7. This extremely linear output pentode which is capable of 60 watts push-pull in Class AB1 (*60 watts per channel stereo—120 watts monophonic*) gives a special superiority even to the finest components. This linearity coupled with a uniformity that is already well known make the MULLARD EL-34/6CA7 the first choice for superb sound reproduction.

Mullard
Trade Mark
Mullard Ltd.

Design and build your stereo equipment around MULLARD. Circuit and interchangeability data for all MULLARD Electron Tubes are available at your distributor or write to Technical Services Division.

"Circuits for Audio Amplifiers" is a new MULLARD publication in which the wide range of MULLARD high quality audio circuits is presented conveniently in one book. Four introductory chapters are devoted to theoretical and practical considerations of high quality sound reproduction with monophonic equipment or with stereophonic systems. The rest of the book comprises circuit descriptions, constructional details, and some performance figures of 12 MULLARD circuits. These circuits include well-known MULLARD designs, some modifications and improvements to these circuits, and a number of completely new ones. Only $2.50 from your dealer or by mail from our Technical Services Division.

INTERNATIONAL ELECTRONICS CORP.
81 SPRING ST., NEW YORK 12, N. Y.

www.americanradiohistory.com

"LESS WORK HOURS — MORE MONEY!"

TED MOTZ
AUDIO ENGINEER
CINCINNATI, OHIO

"In my business of designing and building Hi-fi equipment, I've saved many hours of work using E-Z-Hook Test Connectors.
NO MORE SOLDERING or unsoldering wires when I use E-Z-Hook Sub Connectors to connect component parts in experimental setups and bread boarding. They connect and disconnect so easily and I'm always sure of quick, positive connections.
WHEN CHECKING out circuits, I save lots more time, too, with E-Z-Hook Tips and Clips. Hooking up the Scope, Meters, Speakers, etc., with these self-holding connections, leaves my hands free. And, since they can't pull off, I don't have delays and aggravations caused by loose intermittent test connections that used to jump off and short. Believe me, the hours I saved put dollars in my pockets."

EXCLUSIVE E-Z-HOOK DESIGN!

EASY TO USE! GUARANTEED!

The self-adjusting stainless steel hook and nylon insulator clamps firmly in even hard-to-reach places. Eliminates loose intermittent connections and adjacent shorts.

AT YOUR FAVORITE PARTS DISTRIBUTOR
From 49¢ up

E-Z-HOOK TEST PRODUCTS — SAFE • FAST • SURE

ORDER THROUGH YOUR PARTS DISTRIBUTOR

E-Z-HOOK TEST PRODUCTS
Dept. K 1536 Woodburn Ave.
Covington, Ky.

Canadian Rep. Len Finkler Ltd., Toronto, Ont.

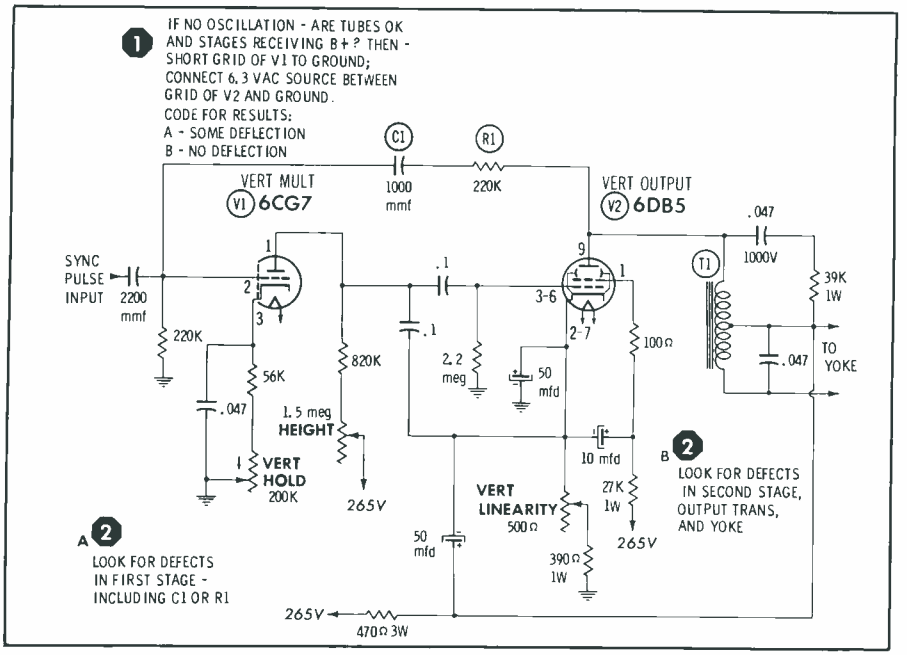


Fig. 11. Hints for curing loss of oscillation in vertical multivibrator.

Again, the best instrument for checking the vertical deflection system is the scope. A check of the waveform at the grid of the vertical output stage will reveal clearly the condition of the circuit up to this point. The signal should look similar to one of the patterns in Fig. 7—its exact shape depending on the particular drive requirements of the circuit being tested. If a normal wave is present here, the trouble lies in the output stage or the yoke. Peak-to-peak amplitude is important, too, but generally if the wave shape is correct, the amplitude will be normal as well.

In the output stage, assuming the tube to be good, voltages at the control grid, cathode, and screen grid should be checked. Do not measure the voltage at the plate—at least, not with an ordinary test probe—because this is a highly peaked wave and can easily damage the meter or the input circuit of an oscilloscope. The B+ voltage leading into the plate circuit can be measured, however.

The appearance of the image on the CRT will frequently help to pinpoint the trouble location for you. For example, a keystoning effect (Fig. 8) stems from a short circuit in the vertical windings of the deflection yoke. The nonlinearity shown in Fig. 5 will generally arise from a defect in the cathode circuit of the vertical output amplifier, or from a leaky coupling capacitor between the oscillator and the control grid of the output tube. Either of these defects will decrease the bias on the output tube, so their presence can be confirmed by measurement of grid and cathode voltages. The defect in the cathode circuit usually stems from a bad bypass capacitor; its condition can be checked by a capacitor tester or by substitution.

FIRST and STILL BEST!

QUIETROLE

the ANSWER TO NOISY CONTROLS and SWITCHES over 12 YEARS OF PROVEN SUPERIORTY

Costs Just Pennies more than the poorest substitute . . .

Supplied in Spray can and 2, 4, 8 oz. bottles

MFG BY QUIETROLE COMPANY, INC.
SPARTANBURG, South Carolina

SARKES TARZIAN

Replace
RECTIFIER TUBE TYPES 5AD4, 5AW4, 5AZ4, 5T4, 5U4, 5Y4, 5W4, 5Y3, 5Z4, 5931, 6087, 6106
with Tarzian Tube Replacement Silicon Rectifier S-5251 or S-5018

- DIRECTLY INTERCHANGEABLE
- GREATER CURRENT CAPACITY
- HIGHER EFFICIENCY

AVAILABLE THROUGH YOUR DISTRIBUTOR

SARKES TARZIAN, INC.
SEMICONDUCTOR DIVISION
415 north college bloomington, indiana

SEE OTHER TARZIAN ADS IN THIS ISSUE

www.americanradiohistory.com

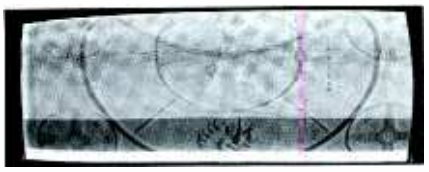


Fig. 12. Deflection produced by applying 6.3 volts AC to output tube grid.

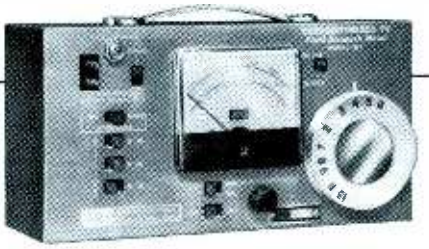
A complete lack of vertical deflection indicates an inoperative oscillator or a break in the signal path beyond the oscillator. Again, the check at the grid of the output stage will indicate if the signal has gotten this far. If it has, then voltage checks should be made on the output tube, remembering to keep away from the plate. If everything appears to be in order, we are faced with the conclusion that the output transformer is defective or else the vertical windings on the yoke are bad.

To check the yoke, disconnect its wires from the circuit and apply 6.3 volts AC to them. This can be obtained from the filament circuit or from an external filament transformer. If the yoke is good, vertical deflection of the picture will result. The image will possess poor linearity, and may overlap or fold back on itself (Fig. 9), because the driving signal is a sine wave and not a sawtooth. However, we are not concerned here with checking linearity; a simple indication of deflection is enough to reveal the yoke to be good. If it is, the trouble is most likely due to a defective vertical output transformer.

The key check point in the vertical deflection system is at the grid of the output tube. If the wave observed here is not correct—for example, if it is greatly distorted or missing—the preceding oscillator should be checked. It might be desirable to check the oscillator cir-

Now!

Checking Signal Strength *Anywhere* ...IS AN EASY ONE-MAN JOB!



JERROLD

MODEL TMT

Direct Reading

TRANSISTORIZED

FIELD STRENGTH METER

only **$135.** *net weatherprotecting leather carrying case, $12.95 net*

Now you can measure *exactly* how much signal is in the area, coming off the antenna, coming off the down lead and is at the set! Just 4½ pounds of rugged instrument, the radically new Jerrold TMT responds only to the TV sync signal to which it is tuned and is therefore immune to noise . . . carries its own power supply (4 simple "c" batteries). Tailor-made for the professional television serviceman and systems technician, the TMT:

- provides accurate (± 3 db) signal strength readings
- reads directly, not relatively in microvolts (100 to 2,000,000) in 8 switchable ranges
- for probing and orienting antenna signals and measuring distribution systems
- checks horizontal synchronizing frequencies in TV receivers

JERROLD ELECTRONICS CORPORATION, Distributor Sales Division

PD 190 The Jerrold Building, Philadelphia 32, Pa.

Jerrold Electronics (Canada) Limited, Toronto

Export Representative: CBS International, New York 22, N.Y.

www.americanradiohistory.com

cuit just prior to the coupling capacitor to make certain this component itself is not open. If the same indication is obtained, the capacitor is OK.

A waveform with a constant repetition rate, even if distorted, indicates that the oscillator is working. The most likely cause of distortion is trouble in the sawtooth-forming network (C2 and R5 of Fig. 10).

When no deflection wave at all is obtained at the plate of the oscillator, this circuit is probably not oscillating. If a new tube does not restore operation, then a voltage and resistance check will reveal the trouble in perhaps 80 percent of the cases encountered. In a simple blocking-oscillator circuit (Fig. 10), there is very little that can go wrong. If the resistances are normal, and the one or two capacitors in the circuit test satisfactorily, the oscillator transformer is probably defective.

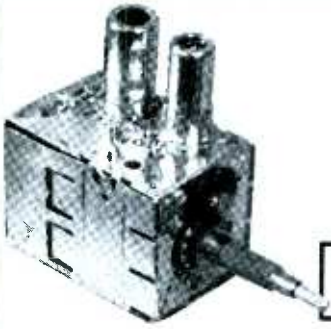
Multivibrator circuits are employed in the vertical deflection systems of many receivers. In some sets, a complete multivibrator feeds a separate output amplifier; however, it is now more common to find the output stage a part of the multivibrator circuit. One of the newest versions of this configuration is shown in Fig. 11. In a design such as this, the absence of oscillation could involve a considerable amount of testing before the culprit is uncovered. The following test procedure may serve to reduce this time.

Step No. 1 is to connect a short circuit from the grid of V1 to ground. This will incapacitate the first section of the multivibrator. Next, apply 6.3-volt AC filament voltage to the grid of V2. If the circuit from this point to the yoke is functioning properly, the deflection will be similar to that shown in Fig. 12. This will demonstrate that the output half of the multivibrator is operating, leaving only the first tube V1, its circuit, and the feedback network (C1 and R1) under suspicion.

Still remaining as a possible defect of the vertical system is sync instability. This difficulty can stem from the vertical oscillator or from the preceding stages. First, it should be determined whether suitable sync pulses are reaching the oscillator. To do this effectively, the vertical oscillator should be disabled so that the voltage it produces does not obscure the incoming sync pulses. If the tube filaments are wired in parallel, simply remove the oscillator tube from its socket. If the filaments are series-wired, either use a dummy tube (possessing an active filament only) or disable the plate circuit so that the stage becomes inoperative.

With the oscillator out of commission, check the incoming pulses. If these are not reaching the oscillator, trace back through the circuit until you find the point where the signal path is broken. If sync pulses of normal strength *are* reaching the oscillator, and instability is still present, make substitution or value tests of all components which help determine oscillator frequency.

In summary, the oscilloscope is the primary instrument for servicing video and vertical-sweep systems; the VTVM or VOM are supplementary aids. Also highly useful for test purposes is a 6.3-volt AC source. (See Table 1.) In our next discussion, we'll take up methods and equipment for troubleshooting other TV circuits. ▲



TV TUNERS
OVERHAULED
ALL MAKES AND MODELS

FAST SERVICE 48-hour delivery on many types

VHF OR UHF 90 DAYS WARRANTY

VHF OR UHF TUNER OVERHAULED $9.95 NET
UHF/VHF COMBINATION OVERHAULED $19.90 NET

Prices include labor and minor parts only, defective tubes and damaged major parts are extra at net prices.

Forward defective tuner complete with tubes, shield cover and any damaged parts. Quote make and model. We will ship C.O.D.—F.O.B. Chicago or Toronto.

Castle TV Tuner Service
5710 N. Western Ave.
Chicago 45, Illinois

Suppliers of rebuilt TV Tuners to leading manufacturers, distributors, technicians & service dealers, coast to coast. Original and Only Complete TV Tuner Service covering the North American Continent.

In Canada
136 Main St.
Toronto 13, Ont.

"Aw, Joe, you've got time for one beer! Here, I'll carry your tools."

www.americanradiohistory.com

have said, "Dependent on application, they may still be good for considerable service."

One other point: We are opposed to the changing of picture tubes on house calls. When a customer incurs a major expense such as this, he feels his troubles should be ended for some time; thus, one may expect demands for unrelated free service for a considerable period. After considerable experience along this line, we decided that we would change picture tubes only in the shop and that our charge would be our regular flat rate for pickup, shop labor and delivery. This service carries a 90-day parts and labor warranty on the CRT as well as a 30-day labor warranty on the entire set.

Since we adopted this policy, our callbacks after picture-tube installation have dropped to the same level as our general average callback rate—less than 5%—and customer relations have improved.

S. STEPHENSON
Newtonhill Industries Ltd.
Welland, Ont., Canada

Here's another man who "thinks for himself"!

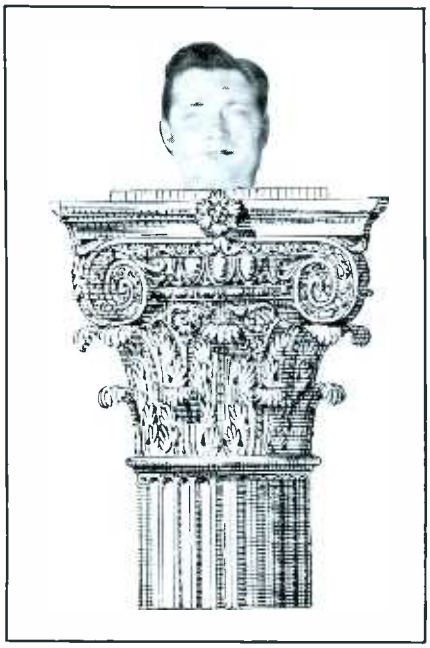
We didn't say we agreed with all of the fine points in Mel Cohen's article. Check October's "Quicker Servicing" column, entitled "Why Test Tubes in the Home?" for our suggestion regarding weak tubes.—Ed.

Dear Editor:

I think it would be very pleasing if we, your readers, could see your picture at the head of the "Letters to the Editor" column. I always read this section and get a big kick out of some of your answers. Would like to meet a man who can combine a sense of humor with business the way you do.

CHARLES N. BRAGG
Benton, Ark.

By popular demand (one letter), that's me you see peeking over the top of "a" column, which hides the jacket with long sleeves that tie in back.—Ed.



"OFFHAND, MADAM, I'D SAY YOU NEED A NEW NEEDLE"

Farfetched? Well, perhaps. But what a worn-out needle can do to fine discs — to say nothing of those expensive stereo platters — shouldn't happen to a dog. So be a No. 1 Hero — tell the uninformed the Webster Stereo-Ceramic cartridge not only plays the new stereos but standard LP's and 78's as well . . . plays them better than they've ever heard before. Recommend and install Websters every chance you get. They're satisfying — and profitable, too.

see it at your jobber —
NEW WEBSTER SERVICE CENTER

A new way to serve you better. Quick-reference replacement chart and display-stock case mean faster service, accurate replacement for nearly every phono cartridge.

ELECTRONICS DIVISION
WEBSTER ELECTRIC
RACINE · WIS
our 50th year

www.americanradiohistory.com

PRODUCT report

For further information on any of the following items, circle the associated number on the Catalog & Literature Card.

Aluminum Mast Sections (45L)

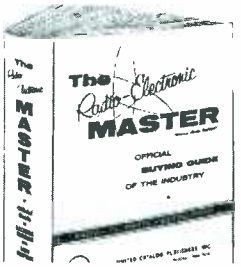
Lightweight, low-cost antenna-mast sections, made of .042" (19-gauge) aluminum tubing with 1¼" outside diameter, are being manufactured by JFD in 5′, 7½′, and 10′ lengths. The slip-fit joints between sections are locked in place by mating notches in the tubing. Both natural and gold - anodized finishes are offered.

FM Tuner (46L)

Permeability tuning, AFC, cathode-follower outputs (one suitable for feeding a multiplex adapter), and 2.1-microvolt sensitivity for 30 db quieting are among the features of the J.W. Miller Model 580 FM tuner. The complement of six tubes includes a tuned RF stage. Dimensions are 9" x 4" x 7", and price is $69.50.

Master Parts Catalog (47L)

The 1960 edition of the *Radio - Electronic MASTER* (now available) contains detailed descriptions, specifications and prices for over 170,000 standard stock items sold by parts distributors. Products of 330 manufacturers are listed in 28 separate categories or "product sections," each of which is arranged alphabetically according to manufacturers' names.



Silvered Mica Capacitors (48L)

The Sprague *MK-1 Sampler* kit holds 40 silvered mica capacitors of seven different values. Ten 100-mmf units are included, in addition to five each of the following: 220, 330, 390, 470, 680, and 1000 mmf. Each capacitor has ±5% tolerance and is rated at 500 WVDC. List price of the kit, including a compartmented, clear-plastic box, is $25.25.

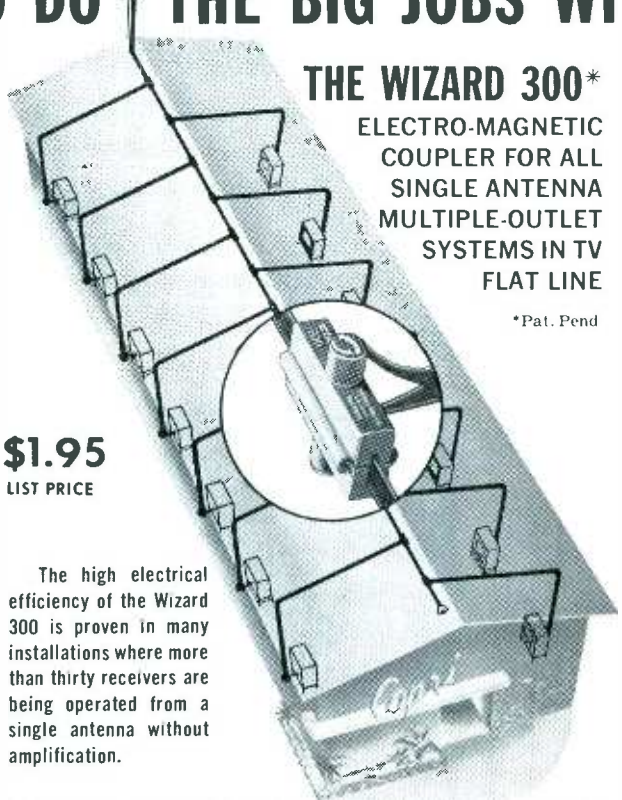
Tiny Fuses (49L)

A subminiature *Microfuse*, for use in extremely compact equipment, has been developed by Littelfuse. The case of this bead-type unit is only .205" in diameter and .270" long, with either solder-in or plug-in leads. Ratings range from 1/500 to 5 amps at 125 volts; all types are designed to blow within 10 seconds when current reaches 150% of rated value.

YOU CAN ALSO DO THE BIG JOBS WITH WIZARDS

HOME – 7 Outlets – One Antenna – No Amplification: Residence of Bob Barker, MC of the popular daytime NBC show Truth Or Consequences.

HOTEL – 120 Outlets–One Antenna–One Amplifier: The Montecito–6650 Franklin, Hollywood, California.



THE WIZARD 300*

ELECTRO-MAGNETIC COUPLER FOR ALL SINGLE ANTENNA MULTIPLE-OUTLET SYSTEMS IN TV FLAT LINE

*Pat. Pend

$1.95
LIST PRICE

The high electrical efficiency of the Wizard 300 is proven in many installations where more than thirty receivers are being operated from a single antenna without amplification.

Information on any of the above jobs and a brochure covering Wizard System installations is available. Write Dept. PF-10

CHARLES ENGINEERING, INC.
6053 Melrose Avenue · Los Angeles, California

HOUSING PROJECT – 2,549 Wizards Installed To Date: L.A. Housing Authority, Los Angeles, California.

APARTMENT – 39 Outlets–One Antenna –No Amplification: The Del Rio–10236 Old River School Road, Downey, Calif

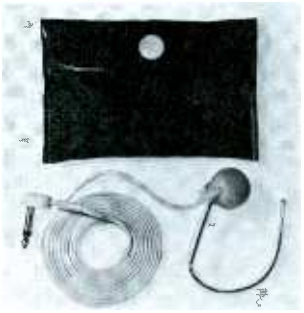
APARTMENT–48 Outlets–Two Antennas (24 Outlets each) – No Amplification: The Paramount Riviera – 12447 Paramount Blvd., Downey, California.

www.americanradiohistory.com

Speaker Cone Treatment (50L)

An application of *Flexicone* (a product of Porter & Dietsch, Inc. of St. Paul) permanently softens the outer edge of a speaker cone. This treatment allows the entire cone to move more freely, thus lowering the mechanical resonant frequency of the speaker by 10 to 50 cps. Three different liquids are applied in sequence to the cone edge. The $3 Flexicone kit includes an applicator brush, full instructions, and enough of each solution to treat one 15" or several smaller speakers.

Transistor-Radio Earphone (51L)



The *Private Listener,* a new addition to the Philco line of parts and accessories, is an earphone with metal earpiece and 39" cord. The right-angle plug fits phone jacks in Admiral, Arvin, Cavalier, Dewald, Emerson, Motorola, RCA, Regency, Roland, Raytheon, Trav-Ler, Zenith and various Japanese brands of transistor radios. Two impedances are offered: 15 ohms (Part No. 326-8003-2) and 500 ohms (No. 326-8006-2).

Lifetime Phono Needle (52L)

A newly-introduced Jensen diamond phonograph needle carries a guarantee against any kind of wear during the lifetime of the owner. The manufacturer states that the needle may be returned to the factory whenever necessary for inspection and free reconditioning or replacement. Needles to fit all models of hi-fi phonographs are said to be available—including combination diamond/sapphire units for use in turnover cartridges. Retail price for each diamond needle is $25.

Disc Ceramic Capacitors (53L)

A full line of *Elmenco* disc ceramic capacitors has been introduced by Arco Electronics. Standard Type CCD units cover a range of values from 5 to 30,000 mmf, all with ±10% tolerance and a voltage rating of 1000 WVDC. Types 3CCD and 6CCD are 3000V and 6000V units with ±20% tolerance. Two series of ±10%, 1000V temperature-compensating units are also supplied—NPO's (Type CCTO) in values from 2.2 to 100 mmf, and N750's (Type CCTN) from 5 to 300 mmf.

Auto Antennas (54L)

A strong stainless steel spring at the base of Telco's *Spring-Magic* auto radio antenna enables it to "give" when struck by an obstruction—then snaps it back into normal position as soon as pressure is released. Both two- and three-section styles are offered in either conventional or *ball-tenna* swivel mountings.

www.americanradiohistory.com

INDEX TO ADVERTISERS

CATALOG AND LITERATURE SERVICE

JANUARY, 1960

TUBE TYPE	MODEL 648 CIRCUIT FIL.	D.	E.	PLATE TEST	A.	B.	MODEL 598 FIL. C.	CONT.	D.	E.	F.	G.
2FH5	2.5	A234	A57	75Z	2.5	3	1Z	4	5	2	-	37
3FH5	3.0	A234	A57	75Z	3.0	3	1Z	4	5	2	-	37
6CM5	6.3	A123	AB569	26VW	6.3	2	13	7	0	5	1Y	18
6FH5	6.3	A234	A57	75Z	6.3	3	1Z	4	5	2	-	37
19CL8	19.	A127	AC639	82Z	19.	4	1Z	-	6	9	7	51
		A123	AC45	65Z		4	2Z		2	1		36

TUBE TYPE	SEC.	HEATER	H-K	CIRCUIT P-G	PLATE	MODEL 658 GRID TEST	HEATER CURRENT
2FH5	T	2.5	124	a57	24R	10WV.	A8.5K Z600
3FH5	T	3.0	124	a57	24R	10WV.	A8.5G Z450
6CM5	P	6.4	123	ab560	20R	85VV.	
6FH5	T	6.4	124	a57	24R	10WV.	
19CL8	P	18.6	127	ac649	32R	10WV.	
	T	18.6	123	ac45	32S	10WV.	

Latest Chart Form 648-22, 598-1, 658-2

ANTENNA SYSTEMS

1L. BLONDER-TONGUE — New B-24 merchandising kit includes free catalog sheets, ad mats, and window streamers. *See ad page 67.*

2L. CLEAR BEAM — Complete information on *Miracle Mount* antenna kits for mounting on roof, wall, or chimney. *See ad page 63.*

3L. JERROLD — Literature describing the new Model TX antenna-mixing networks includes illustrated applications (mixing or separating signals from various arrays and types of antennas) and detailed instructions for mounting and interconnecting TX units for VHF, UHF, and FM. *See ad page 91.*

4L. ROHN — Complete information on TV, amateur, or communication-system towers. *See ad page 49.*

5L. WINEGARD — Bulletin No. K-1483 on new type colinear UHF antenna describes two models, one for regular UHF channels 14-83 and one for UHF Translator channel 72-83. *See ad pages 28, 29.*

AUDIO & HI-FI

6L. ARKAY — Literature on amplifiers, preamplifiers, cabinets and cabinet kits, custom television receivers, electronic kits, loudspeaker enclosures and tuners, test equipment, tape decks, record changers and players, Citizens band transceivers and stereo-TV console systems. *See ad page 86.*

7L. CBS—Dealer help booklet entitled "Easy Steps to Profit in Stereo," for use in promoting the *Harmony* phono line. *See ads pages 31, 76.*

8L. FOURJAY—Catalog, list and net price sheet, and installation instructions on architectural speaker baffles for wall, ceiling and outdoor use.

9L. JENSEN — Brand-new *Jenselector* plus assorted sales aids. *See ad page 68.*

10L. PRECISION ELECTRONICS — Flyer describing the Grommes "Premiere Line" of high-fidelity sound equipment for quality industrial and commercial installations. Includes data on 20-, 30-, and 50-watt amplifiers, as well as deluxe preamps and booster amplifiers. *See ad page 88.*

11L. ROBINS—4-page folder describing tape-recorder accessories and tape-care kits, phono accessories, and patch-cord plugs and connectors for hi-fi and PA systems.

12L. SWITCHCRAFT—Illustrated folder describing line of "Mini-Mix" audio mixers. Also, catalog S-590 on molded cable assemblies, including adapters and connectors for audio and hi-fi systems. *See ad page 58.*

13L. TELEX — Catalog #381001A, with complete listing of listening devices, including earsets, pillow speakers, etc. *See ad page 56.*

14L. UTAH RADIO—New 6-page catalog describing complete line of wall baffles, public-address speakers, and matching transformers. *See ad page 53.*

COMPONENTS (MISC.)

15L. AEROVOX — 32-page 1960 edition of servicemen's Catalog, listing electrolytic, paper, mica, and ceramic capacitors, as well as filters, test equipment and accessories. *See ad page 52.*

16L. CLAROSTAT — Dual 100-ohm potentiometers and rheostats for many stereo applications. *See ad page 21.*

17L. GENERAL CEMENT — New 16-page catalog gives complete cross-reference data on line of exact replacement knobs for leading TV brands. *See ad 2nd cover.*

18L. HAMILTON-HALL—28-page catalog of resistor components, including list and dealer prices for 5-, 10-, and 25-watt wire-wound, 25 watt filament-dropping, and complete line of fusible resistors, plus information on 89-piece introductory dealer assortment priced at $18.95

19L. IRC—Form S-511 describing *Handy-Pak* resistor assortments for dealers. *See ad page 52.*

20L. INTERNATIONAL RECTIFIER—Fall edition of *Rectifier News*, containing two application articles on silicon zener diodes; Form JB-513, with information to help you specify rectifier diodes; Bulletin SR-260, incluling data on 1584 standard and intermediate voltage zener diode types. *See ad page 66.*

21L. SPRAGUE—Large 2-color *Ceramichart*, with circuit diagrams showing typical ceramic capacitor applications in radio and TV, plus color-code specifications for ceramic and molded mica capacitors. *See ad page 10.*

FUSES

22L. BUSSMANN—Small leaflet designed to fit pocket or tool kit shows you what to charge for every fuse shown in the BUSS TV Fuse Chart. *See ad page 57.*

23L. LITTELFUSE — Information on the *Fusemaster Display*, a handy wall-mounting rack that holds 300 fuses (60 boxes) for fast and easy inventory control in the shop. *See ad 4th cover.*

ORDER FORMS

24L. ELECTRONIC PUBLISHING — Detailed folder on Dave Rice's "Official Order Book" for combination order-office record-billing of service customers. Includes full-size sample page. *See ad page 56.*

SERVICE AIDS

25L. CHEMTRONICS — Flyers describing complete line of electronic servicing chemicals, including *No-Arc* high-voltage insulator. *See ad page 95.*

26L. E-Z-HOOK—Convenient reference sheet titled "How to Build the Five Most Useful Scope Probes," with schematics, mechanical component layouts, etc. *See ad page 90.*

27L. JW ELECTRONICS—Dealer leaflet outlining complete tuner repair and alignment service for all makes and models of UHF and VHF tuners. *See ad page 62.*

28L. YEATS — Complete literature on appliance dollies, padded appliance covers, and furniture pads. *See ad page 95.*

TECHNICAL PUBLICATIONS

29L. GERNSBACK—Descriptive literature on Gernsback Library books. *See ad page 64.*

30L. HOWARD W. SAMS — Literature describing all Howard W. Sams publications covering servicing of radio, TV, hi-fi., etc. Includes data on "Handbook of Electronic Tables & Formulas," Volume 7 of "Dial Cord Stringing Guide," and "Servicing Hi-Fi and FM in the Customer's Home." *See ads pages 46, 47, 72, 74.*

TEST EQUIPMENT

31L. B & K—Bulletin ST24-R gives helpful information on how to save time and work and make money with point-to-point signal-injection, direct viewing Model 1075 Television Analyst, Models 550 and 650 dynamic mutual-conductance tube testers, Model 675 automatic tube tester and Model 440 CRT cathode-rejuvenator tester. *See ads pages 13, 51.*

32L. B & M—4-page folder describes inductive winding tester and electronic switch. *See ad page 82.*

33L. DOSS—Information on the latest in test equipment, including the *Pioneer 250 Horizontal Systems Quantalyst*. *See ad page 58.*

34L. EICO—20-page 1959 2-color catalog describes 65 models of professional test instruments, hi-fi and "ham" gear in both kit and factory-wired form. Shows how to save 50%. Also, 4-page 2-color stereo hi-fi guide. *See ad page 72.*

35L. HICKOK — Literature describing new transistor radio tester, Model 810. *See ads pages 70, 71.*

36L. JACKSON — Flyer describing complete line of "Service-Engineered" electronic test equipment. *See ads pages 68, 96.*

37L. SECO—12-page booklet on using Model 100 dynamic transistor tester to troubleshoot transistorized equipment. Also, 12-page folder describing complete line of Seco test equipment and service aids. *See ad page 54.*

38L. SENCORE — 4-page brochure on complete line of time-saver instruments. *See ads pages 75, 77, 79, 81.*

39L. TRIPLETT—New test equipment catalog No. 39-T describes and illustrates many VOM and VTVM models; signal, sweep, dot-bar, and color-bar generators; appliance, tube and transistor testers; plus wide-band, high-sensitivity 5" oscilloscope. *See ad page 61.*

40L. VIS-U-ALL — Recommended tube inventory for field service calls. *See ad page 82.*

TOOLS

41L. BERNS—Data on the 3-in-1 picture tube repair tool and the new "Audio Pin-Plug" crimper that lets you make pin-plug and ground connections for shielded cables without soldering. *See ads pages 64, 88.*

42L. ESICO — Information on the *GUN-CHOKE*, a simple and inexpensive device that reduces tip temperature for soldering on printed-circuit or laminated boards. *See ad page 62.*

TRANSFORMERS & COILS

43L. CHICAGO STANDARD — Stancor 36-page General Catalog S-105 listing over 700 stock items. *See ad page 50.*

TUNERS

44L. STANDARD COIL—Literature on complete line of replacements, special mechanical parts, and 48-hour in-plant repair service for Standard Coil tuners. *See ad page 42.*

www.americanradiohistory.com

REDUCE DAMPER TUBE CALLBACKS

Here are some important facts about damper circuits

In the *transformer-coupled* circuit, Figure 1, the damper cathode is connected to the "low" (Boost) side of the sweep-output circuit. The voltage difference between cathode and ground is usually less than about 600 volts.

In the *direct-drive* circuit, Figure 2, and in the *auto-transformer circuits*, Figures 3 and 4, the damper cathode is connected to a "high" point in the sweep-output circuit. The peak voltage difference between cathode and ground may be several thousand volts.

Because the damper cathode is "above ground" by several hundred to several thousand volts, care must be taken to prevent voltage breakdown between heater and cathode in the damper tube. Two basic methods are used:

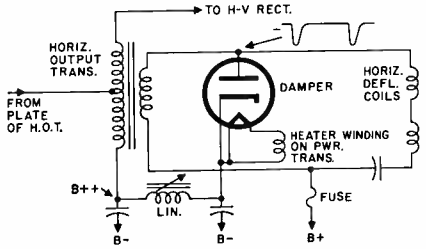


Figure 1. Transformer-coupled horizontal-output circuit. Note that the damper tube heater is connected to the cathode.

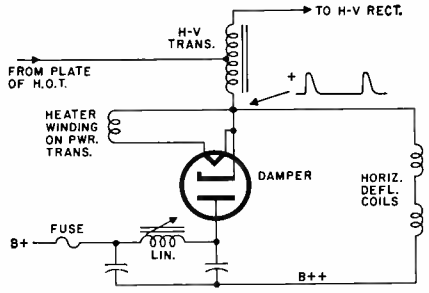


Figure 2. Direct-drive circuit. In some variations of this circuit, a capacitor is connected between heater and cathode in place of the direct connection. The capacitor serves to reduce the pulse-voltage difference between heater and cathode.

In one method, shown in Figures 1, 2, and 3, heater is connected to cathode. This connection eliminates voltage difference between heater and cathode, but it also makes the damper tube heater circuit "hot" with respect to ground. For this reason it is necessary to use a separate secondary winding on the power transformer just for the damper heater. This winding, and its connecting leads, must be insulated to withstand the peak voltage difference between cathode and ground.

In the circuits of Figures 1, 2, and 3, if the damper heater winding becomes grounded, or arcs to ground, high current will flow from B+ to ground through the damper tube, and the fuse will blow. Correction of this trouble usually requires costly and time-consuming replacement of the power transformer.

The second method, shown in Figure 4, takes advantage of the fact that modern damper tubes, such as the RCA-6AX4-GTA, 6AU4-GTA, and 6DE4, are designed to withstand high-amplitude positive pulse voltages between heater and cathode. These RCA tubes make it possible to ground the damper heater circuit, and for this reason, the damper heater may be connected to the regular 6.3-volt-ac grounded-heater circuit, thus eliminating the need for an additional high-voltage-insulated secondary on the power transformer.

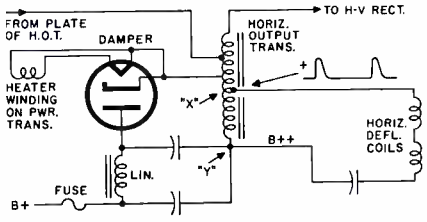


Figure 3. Auto-transformer circuit in which the damper tube heater is connected to the cathode. In some variations of this circuit, the heater is connected to a lower-voltage tap, "X" or "Y", in order to make the heater negative with respect to the cathode, and to reduce the shunting effect of the heater-circuit capacitance.

From a servicing viewpoint, the second method has definite advantages:

In the circuit of Figure 4, if the insulation between heater and cathode should break down, high current will flow from B+ to ground through the damper tube, and the fuse will blow, but the trouble can be corrected easily, quickly, and inexpensively by installing a new RCA damper tube. This is a lot easier and cheaper than installing a new power transformer!

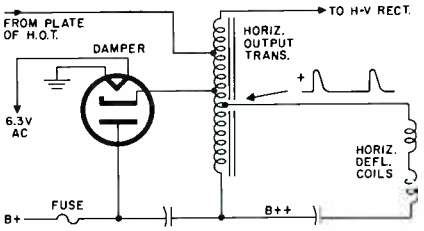
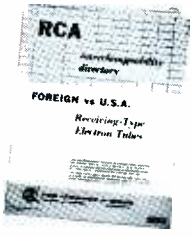


Figure 4. Modern auto-transformer circuit in which the damper tube heater is grounded. Tubes such as the RCA-6AX4-GTA, 6AU4-GTA, and 6DE4, which are designed to withstand high peak pulse voltage between heater and cathode, are required in this circuit.

Momentary arcing, or flashover, in a horizontal output tube or damper tube may be "self-correcting", that is, the flashover may not occur again. But the momentary flashover results in a heavy surge of current which will blow the conventional type of fuse. You can eliminate such unnecessary fuse failure by using RCA "chemical" fuses in the horizontal-output circuit. Three varieties, RCA Stock Nos. 104295, 105041, 105042, are available at your RCA distributor.

RCA damper tubes are designed to give long, dependable service—eliminate costly callbacks—prevent loss of your time and profits. Take for example the RCA-6DE4 and RCA-17DE4. These tubes can supply a peak plate current of 1100 milliamperes and withstand a heater-to-cathode potential of 5000 volts—with a 900-volt dc component! Assure your customers of this kind of performance by asking your distributor for RCA damper tubes.

Get your copy of RCA's Foreign-vs-U.S.A. Receiving Tube-Interchangeability Directory (ICE-197) from your authorized RCA Tube Distributor.



ANOTHER WAY RCA HELPS YOU IMPROVE YOUR BUSINESS

RADIO CORPORATION OF AMERICA

Electron Tube Division **Harrison, N. J.**

www.americanradiohistory.com

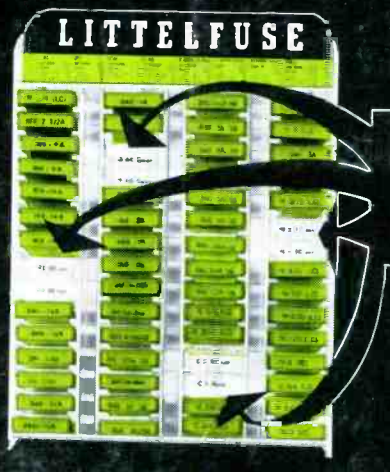
dealer-serviceman's fuse rack . . .

. . . for wall mounting

most needed

most wanted

. . . the FUSEMASTER!



dealer-serviceman's fuse requirements at a glance

www.americanradiohistory.com