SEPTEMBER 1956
25 CENTS

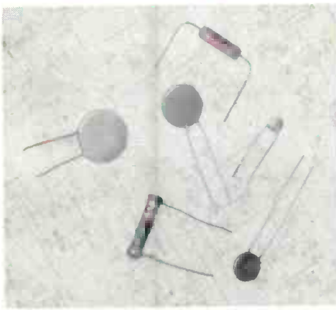
SAMS

PF PHOTOFACT® REPORTER

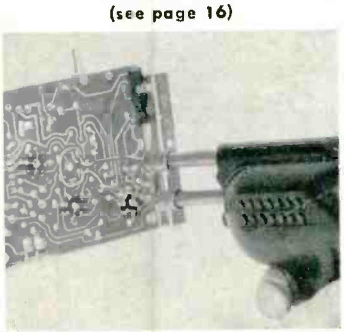
for the Electronic Service Industry

CABINET TOUCH-UP
(see page 24)

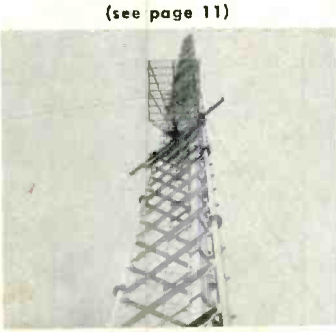
This Month's Highlights



DESIGN TRENDS IN CAPACITORS
(see page 16)



WORKING WITH PRINTED BOARDS
(see page 11)



LIFE ON A UHF ISLAND
(see page 14)

NEW MONTHLY FEATURE!
Beginning this month, Supplement to SAMS Master Index . . . . page 81

www.americanradiohistory.com

Preferred for modern set servicing

KNOBMASTER FIXED SHAFT
Q Control standard shaft is knurled, flatted and slotted—fits most knobs without alteration.

INTERCHANGEABLE FIXED SHAFTS
Exclusive IRC convenience feature—provides fast conversion to "specials", with FIXED shaft security. 15 types available.

1/4" LONG BUSHING
Accommodates all small sets, yet handles large set needs perfectly.

7 STANDARD TAPERS
Full coverage of all taper requirements is provided in the Q Control.

94 RESISTANCE VALUES
For TV, AM and FM coverage, 94 values of plain and tapped controls are furnished.

QUALITY APPEARANCE
The handsome professional appearance of IRC Q Controls lets you point to your work with pride.

CUSHIONED TURN
The smooth, quality of "feel" of a Q Control contributes to customer confidence.

TYPE 76 SWITCHES
Either of two type IRC switches attached as quickly and easily as a control cover—meets all your requirements.

Service technicians get greater coverage with less investment; more practical service features; and easier, faster installation with the IRC Type Q Control. Here's a dependable, basic control that is directly designed for modern set servicing. For appearance, performance and price . . . there's none better. So why settle for less? Tell your Distributor you want Q Controls . . . most servicemen do.

INTERNATIONAL RESISTANCE CO.

Dept. 363, 401 N. Broad St., Phila. 8, Pa.
In Canada: International Resistance Co., Ltd., Toronto, Licensee

Send me Catalog listing IRC Type Q Controls.

Name ____________________
Company ____________________
Address ____________________
City ____________________ State ____________

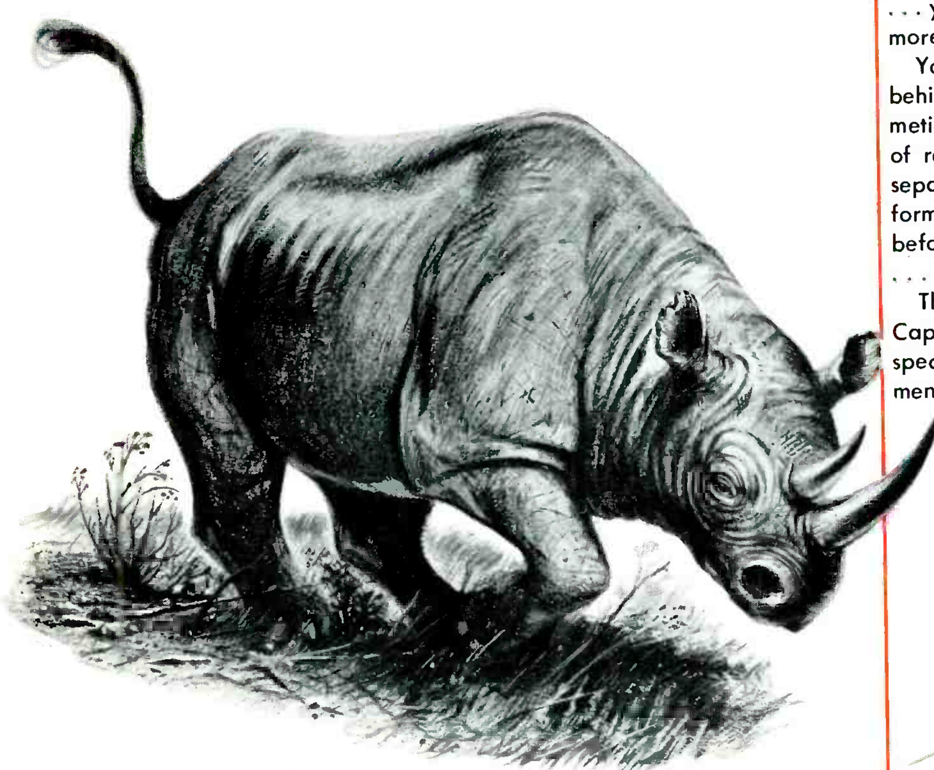
IRC

Wherever the Circuit Says

www.americanradiohistory.com

ASTRON "Staminized" CAPACITORS ARE rugged

ASTRON CAPACITORS HAVE THAT BUILT-IN "NO-CALL-BACK" CONSTRUCTION!



Only the very finest of raw materials pass Astron's "Selected Purchasing System". Astron's special production techniques build extra rugged capacitors that create complete customer satisfaction . . . your key to repeat business and more profit.

You can put your trust in Astron, for behind each Astron capacitor is the meticulous quality control that insures you of real staying power . . . over 10 separate production line tests are performed, plus a 100% final inspection before any capacitor is sent out by Astron . . . your guarantee of top performance.

There is an Astron "Staminized" Capacitor built especially to fill the specific, exacting replacement requirements of any job you tackle.

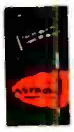
Safety Margin "SM"* Minimite*

Safety Margin "SM"* Twist Prong

Safety Margin "SM"* Cardboard Tubular

Blue-Point (R) Molded Plastic Paper Tubular

FREE Servicing Aid



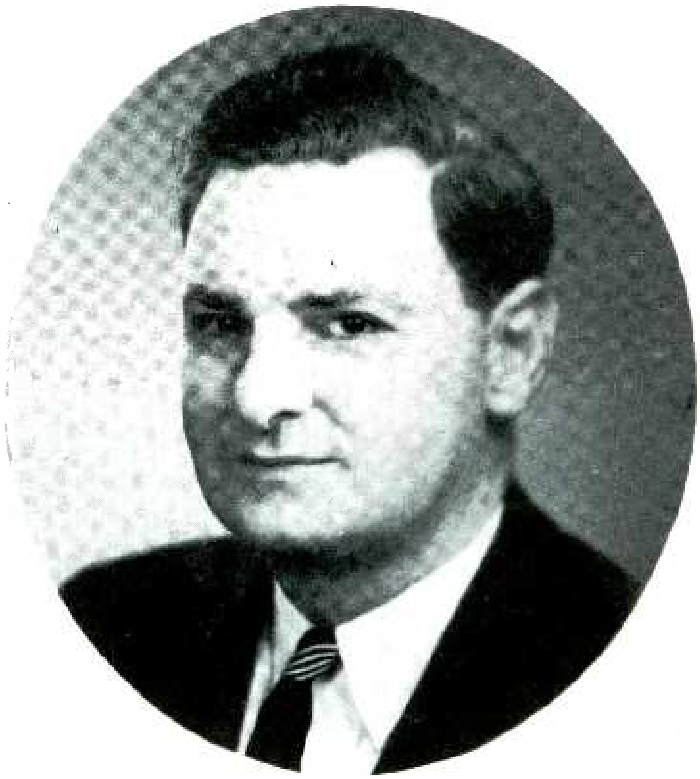
Save time, use handy Astron pocket-sized Replacement Catalogue and Pricing Guide (AC-4D) — **Write Today!**

ASTRON CORPORATION

255 GRANT AVENUE EAST NEWARK, N. J.

WEST COAST WAREHOUSE: 9041 WEST PICO BLVD., LOS ANGELES -EXPORT DIVISION: ROCKE INTERNATIONAL CORP., 13 EAST 40TH ST., N. Y., N. Y. -IN CANADA: CHARLES W. POINTON, 6 ALCINA AVE., TORONTO, ONTARIO

KEN PRICE, field engineer for the Sprague Products Company, has had years of experience in operating his own TV and radio service organization, as owner of an antenna manufacturing company and as a capacitor production engineer. With this intimate knowledge of both sides of the parts picture, he has won wide recognition for his helpful advice to service technicians.



AL COUMONT, now Assistant to the President of Sprague Products Company, has been well known in the industry for the past 25 years. His staff activities at RETMA, for which he received a national award, included management of its national training programs for service technicians in trade schools and through technicians' associations and groups.

These 2 Men Will Help You

KEEP UP-TO-DATE IN ELECTRONIC SERVICING

JUST ASK your electronic parts distributor. He's the key to your area being one of the first to take advantage of Sprague's new educational program.

Designed to keep you up to date on fast changing conditions in the electronic parts industry, this new program is a major expansion of Sprague's past educational efforts. Both Al Coumont and Ken Price will work closely with local service associations and vocational schools all over the country, giving sound advice on many of the problems which confront you daily.

In a simple straight-forward manner that pulls no punches, you'll get all kinds of information you just can't find in books but need to know for your day-to-day work. And, most important, you'll be able to ask questions on the problems that stump you.

Ken and Al are setting up their fall program of talks NOW. If your distributor or service association does not have them scheduled for your area, ask them to call Harry Kalker, Sprague Products Co., 105 Marshall Street, North Adams, Mass. It's a talk you won't want to miss!

don't be vague...insist on

SPRAGUE®

WORLD'S LARGEST CAPACITOR MANUFACTURER

www.americanradiohistory.com

VOL. 6 · No. 9

SAMS PF REPORTER

for the Electronic Service Industry

SEPT. · 1956

PUBLISHER
Howard W. Sams

GENERAL MANAGER
Mal Parks, Jr.

EDITOR
Glen E. Slutz

TECHNICAL EDITOR
Verne M. Ray

EDITORIAL STAFF
Leslie D. Deone — C. P. Oliphant
Robert B. Dunham — Paul C. Smith
Thomas A. Lesh — Calvin C. Young, Jr.
George B. Mann

EDITORIAL ASSISTANT
Gwen Bigham

ART DIRECTOR
Glenn R. Smith

PHOTOGRAPHY
Robert W. Reed

PRODUCTION
Douglas G. Bolt

THE COVER

The main cover photograph for this month pictures a TV technician doing cabinet touch-up work —something which more technicians should consider as a means of pleasing customers and of earning additional income. A complete photo coverage of the subject is presented on pages 24 and 25 of this issue.

BUSINESS DEPARTMENT

Joe H Morin, Sales & Circulation Mgr.
Billy Paul, Circulation Fulfillment Mgr.
Pat Tidd, Circulation Dept.

ADVERTISING SALES OFFICES

Midwestern: PF REPORTER,
2201 East 46th Street, Indianapolis 5, Ind.
Clifford 1-4531

Eastern: Paul S. Weil and Donald C. Weil,
39-01 Main Street, Flushing 54, New York.
Independence 3-9098.

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.

PUBLICATION INFORMATION

Published monthly by Howard W. Sams & Co., Inc., at Indianapolis 5, Indiana.

Entered as second class matter October 11, 1954, at the Post Office at Indianapolis, Indiana, under the Act of March 3, 1879.

Copyright 1956 by Howard W. Sams & Co., Inc. No part of the PF REPORTER may be reproduced without written permission. No patent liability is assumed with respect to the use of information contained herein.

A limited quantity of back issues are available at 35c per copy.

CONTENTS

Please enter my subscription to PF REPORTER for:

☐ 1 Year $3.00 — ☐ 2 Years $5.00 — ☐ 3 Years $7.00

In Canada: One Year $3.60 — Two Years $6.20 — Three Years $8.80

☐ Remittance Enclosed* — ☐ Bill Me

*Two extra issues if remittance accompanies order.

Name ______________________

Firm ______________________

Address ______________________

City __________ *Zone* ______ *State* __________

01 ☐ Independent Serviceman — 14 ☐ Part Time Serviceman
02 ☐ Dealer with Service Shop — 37 ☐ Student
38 ☐ Other ______________________

Give to your Electronic Parts Distributor or mail, with remittance, to PF REPORTER, 2201 East 46th Street, Indianapolis 5, Indiana.

www.americanradiohistory.com

YOUR ELECTRONIC PARTS DISTRIBUTOR INVITES YOU TO

Join the Weller OLD GUN ROUND-UP

PARDNERS, HERE'S YOUR CHANCE . . . round up that old soldering gun or iron. Regardless of brand, age or condition it is worth $2.00 TRADE-IN if you act now.

WANTED

all old soldering guns or irons
any brand or condition
$2.00 TRADE-IN REWARD
offer is limited . . . you must act now

REWARD

$2.00 trade-in allowance on a professional model D-550 gun
OFFERED
on every old soldering gun or iron
DEAD OR ALIVE
no matter what make or condition

CHECK YOUR GUNS

Get ready for the Fall service rush. Get this regular $11.95 value for only $9.95 AND SAVE $2.00.

PROFESSIONAL MODEL D-550

WELLER Soldering Gun

only **$9.95** dealer net
with trade-in of any old soldering tool

DUAL HEAT • 200/275 WATTS

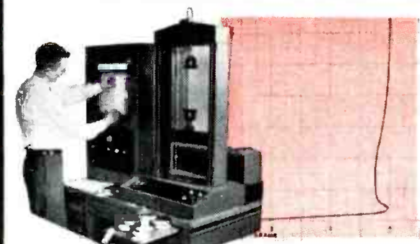
WELLER ELECTRIC CORP. • 601 Stone's Crossing Road, Easton, Pa.

www.americanradiohistory.com

RAYTHEON TUBES

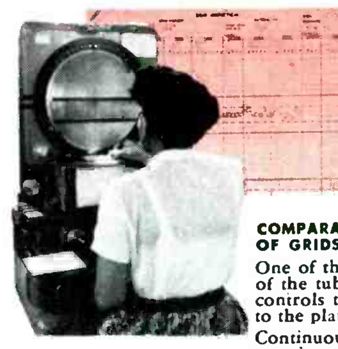
are the best you can buy...

HERE'S WHY



INSTRON WIRE TESTING

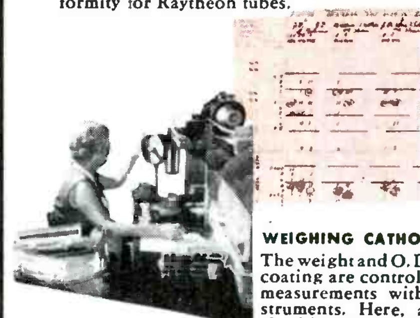
Testing of grid lateral and filament wire on the Instron Tester for specified physical properties as tensile strength, yield point, breaking point and proportional limit insures better tube quality and uniformity for Raytheon tubes.



COMPARATOR INSPECTION OF GRIDS

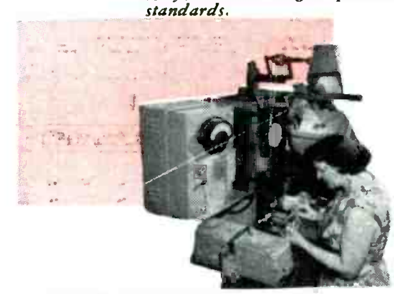
One of the most critical parts of the tube is the grid which controls the flow of electrons to the plate.

Continuous comparator inspection of critical parts such as the above grid (magnified 20x) *supplies information for better quality control and guards against deviations from Raytheon's high quality standards.*



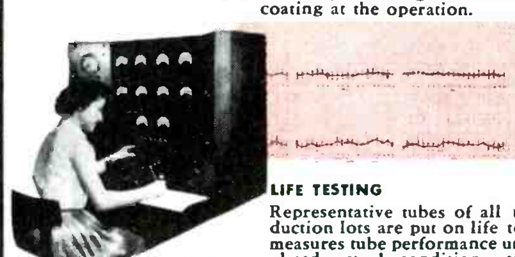
WEIGHING CATHODE COATING

The weight and O. D. of the cathode coating are controlled by periodic measurements with precision instruments. Here, an operator is checking the weight of cathode coating at the operation.



HEATER COATING CHECK

Heater wire must have uniform and closely toleranced coating thickness to insure short and uniform warm-up-time and durability. Raytheon makes continuous inspections of the heater wire coating to make certain of uniformity.



LIFE TESTING

Representative tubes of all tube production lots are put on life test which measures tube performance under simulated actual conditions to ensure original and continuing performance of Raytheon tubes.

1ST FINISHED TUBE TEST

All Raytheon tubes undergo a rigid 100% First Test where they must pass strict requirements on both physical and electrical characteristics.

These girls are testing tubes for excessive noise and microphonics, inoperative tubes, specified electrical characteristics and physical appearance.

ENGINEER CHECKS DESIGN CHARACTERISTICS

Behind all these quality activities stands a large group of experienced, capable engineers whose sole concern is maintaining and developing Raytheon tube quality performance. This engineer is measuring tube design characteristics with the purpose of developing a tube for a customer with special applications.

These and many other vital tests and checks add up to

UNIFORMITY OF CHARACTERISTICS THROUGH RIGID QUALITY CONTROL

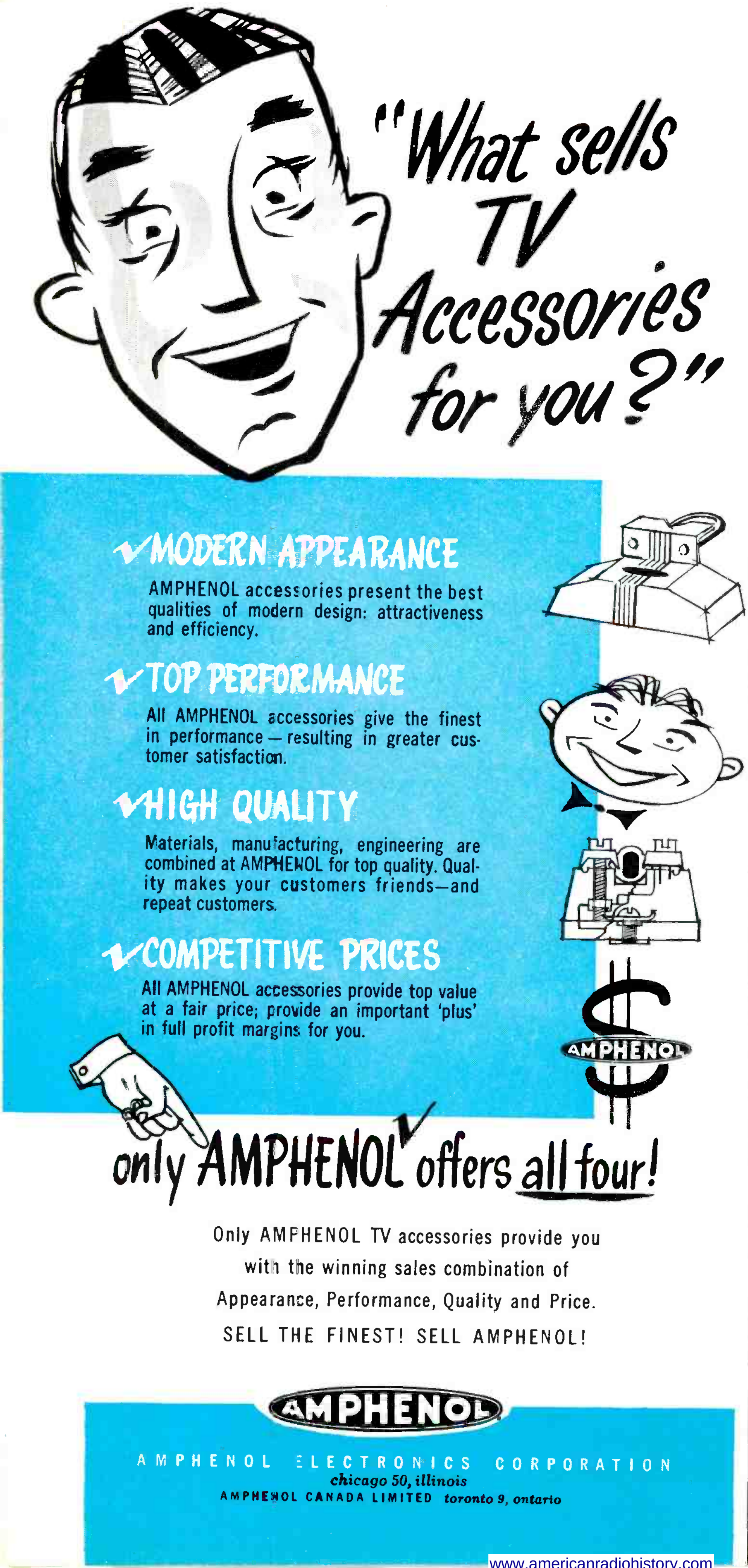
RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

Newton, Mass. • Chicago, Ill. • Atlanta, Ga. • Los Angeles, Calif.

Raytheon makes all these: Receiving and Picture Tubes, Reliable Subminiature and Miniature Tubes, Semiconductor Diodes and Transistors, Nucleonic Tubes, Microwave Tubes.

www.americanradiohistory.com



LETTERS to the EDITOR

Dear Editor:

Your article in the June 1956 issue, "Troubles in Vertical Sweep Systems," was a lifesaver to us. We had a set in the shop with symptoms as follows:

1. Loss of Sweep
2. Loss of Synchronization

With your article, we are all up to date on these troubles.

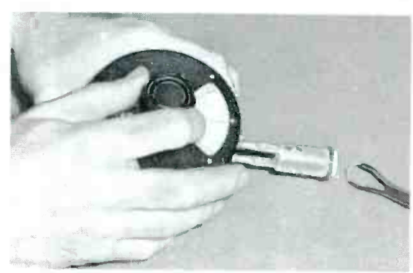
JOHN ROUSE
Center Radio and TV Service
Wallingford, Conn.

Dear Editor:

In your July 1956 issue, the article entitled "Antenna Troubles" mentions a continuity check for installations using an antenna that completes the DC path between the conductors. I would be interested in knowing if there is a test that can be used to check an installation when the antenna does not complete the DC path between conductors.

P. C. FAXEL
Chicago, Ill.

Yes, there is such a method, and an excellent one used for checking antenna lead-in was described in the "Notes on Test Equipment" column in the July 1954 issue. Briefly, this method entails the use of a grid-dip meter to measure the electrical length of the transmission line (see below).



If the transmission line is shorted, the meter will dip at frequencies at which the electrical length to the short is one-half wavelength or a multiple thereof. If the line is open, the meter will dip at frequencies at which the electrical distance to the open is an odd multiple of a quarter wavelength.

The distance to the short or open (which may be at the end of the line) can be calculated by using the following formula:

$$D = \frac{V}{2\,(f_1 - f_2)}$$

www.americanradiohistory.com

where

D = *the distance in feet,*

V = *velocity of propagation (VP* $\times$ *984),*

f_1 *and* f_2 = *two successive readings in megacycles.*

A field strength meter can also be used to determine if signals of sufficient magnitude are reaching the receiver end of the transmission line.—Editor

Dear Editor:

. . . your PF REPORTER magazine is becoming the most valuable periodical a TV man can buy. I hope you find a way to double its size and make it twice as valuable, even at twice the price.

L. W. VANSLYCK
Van's Radio and Television
Tampa, Florida

Dear Editor:

I have been having a run of unusual sync troubles in the TV sets I have been servicing lately, and I have an idea that some of these would be very interesting to the readers of the PF REPORTER. I haven't noticed any articles contributed by readers in your magazine, but I would like to write an article for you if you would be interested in printing it.

In case you could use it, please let me know. I am a service technician and have never written any magazine articles before, so I would appreciate some tips on how to prepare the article.

THOMAS WHITE
New York, N. Y.

We have available a booklet entitled "Author's Guide for the PF REPORTER*" which will give you full details about the kind of material we are looking for and how to write and submit that material for publication. For your copy, just send a postcard to Glen Slutz, Editor, PF* REPORTER*, 2201 E. 46th St., Indianapolis, Ind.—Editor*

Dear Editor:

I have heard from time to time of the danger of X-ray radiations from TV sets. How about an article giving us the true picture and the precautions we should take in handling the sets, especially on the shop bench?

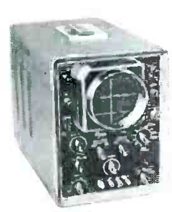
J. STEPHEN GOLD
Radio and TV Service
Glenside, Penn.

A very good suggestion, Mr. Gold, and one on which we are planning future coverage. We welcome suggestions and comments from our readers and look forward to hearing from you.—Editor

BEST FOR COLOR TEST!

There's just one way to test the new color TV sets . . . WITH NTSC COLOR PATTERN. That's what Hycon's Model 616 Color Bar/Dot Generator offers . . . *all* standard colors, sequences and patterns easily selected and graphically shown *in actual color* right on the control panel. For color TV, get ready . . . GET HYCON!

Another Hycon test help . . .



MODEL 622 5" SCOPE
with *automatic triggered sweep*, first really new scope development in years. Fewer adjustments, no sync problems.

"Where Accuracy Counts"
Hycon ELECTRONICS, INC.
A Subsidiary of Hycon Mfg. Company
321 SOUTH ARROYO PARKWAY
PASADENA, CALIFORNIA

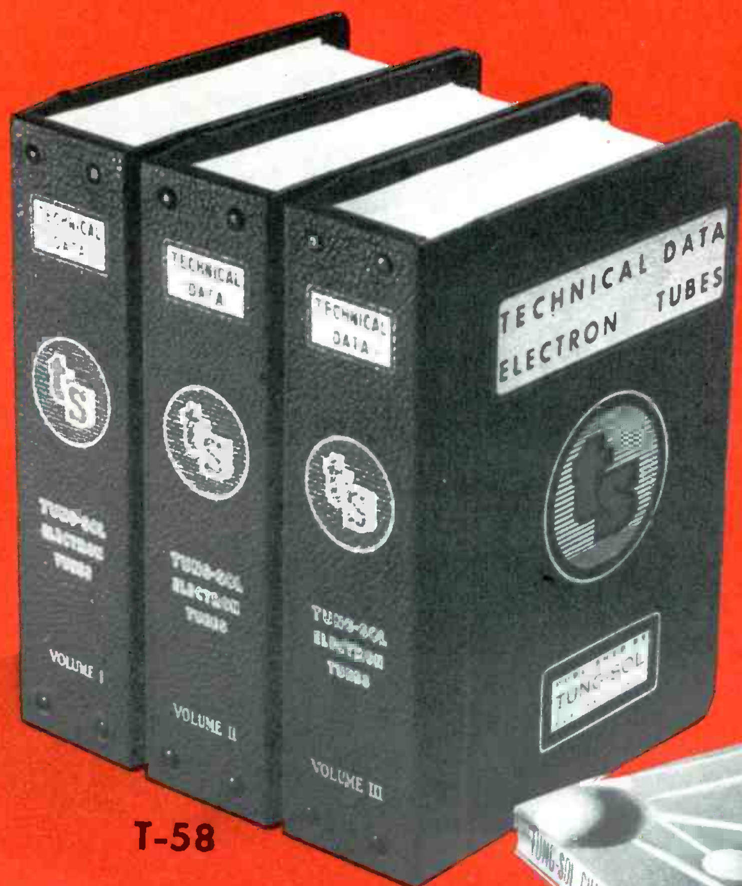
MAIL, please, for Catalogs 616 and 617

HYCON ELECTRONICS, INC. Dept. P
P.O. Box 749 Pasadena, California
Please send me the new model 616 and 617 catalogs.

Name__________
Address__________
City__________ State__________

www.americanradiohistory.com

TUNG-SOL® 1956 TECHNICAL DATA BOOKS



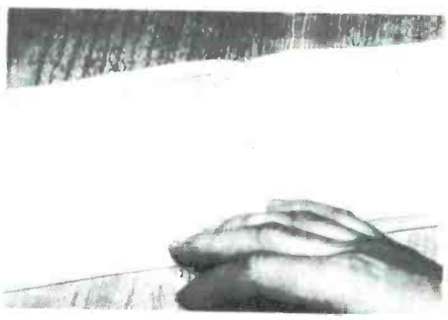
The new 1956 Tung-Sol Electron Tube Technical Data books are the most practical set of reference books in the entire industry. They contain all the information you need for everyday use. Clearly indexed and streamlined for fast reading, they open flat for rapid on-the-job reference.
Ask your Tung-Sol supplier how you can get your set.

TUNG-SOL ELECTRIC INC.
Newark 4, N. J.

Sales Offices: Atlanta, Columbus, Culver City, Dallas, Denver, Detroit, Melrose Park (Ill.), Newark, Seattle.

ALL THE INFORMATION . . . AT YOUR FINGER TIPS!

T-58 1250 pages—1000 tube types.



T-70 More than 250 pages of data on CR tubes, receiving and special purpose tubes and dial lamps.

T-31 Over 350 blueprint base diagrams for 1400 tube types.

MINIATURE LAMPS · SEALED BEAM HEADLAMPS · SIGNAL FLASHERS · RADIO AND TV TUBES · ALUMINIZED PICTURE TUBES · SPECIAL PURPOSE TUBES · SEMICONDUCTORS · COLOR PICTURE TUBES

www.americanradiohistory.com

TELEVISION CHANNEL FREQUENCIES

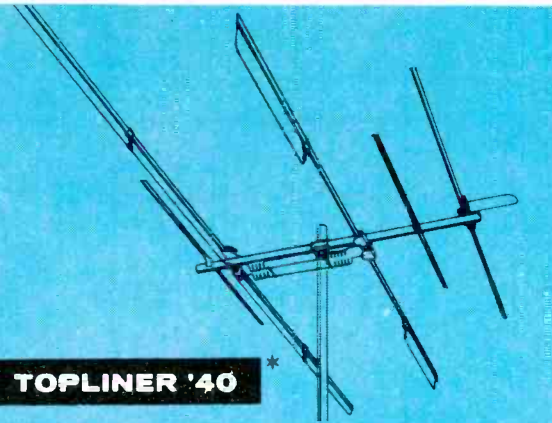
Knowledge of specific frequency allocations within the television spectrum can be most helpful to the technician, engineer and student. As a handy reference guide, the PF REPORTER staff has prepared this guide, which shows the frequency limits and carrier frequencies for channels 2 through 83.

P = PICTURE CARRIER FREQ. (MC)

S = SOUND CARRIER FREQ. (MC)

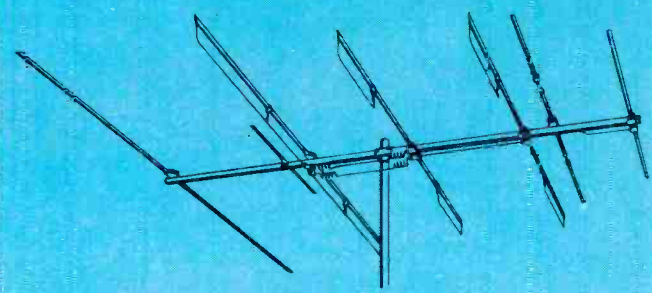
CHANNEL NUMBER	P	S	FREQ. LIMITS OF CHANNEL (MC)
2	55.25	59.75	54–60
3	61.25	65.75	60–66
4	67.25	71.75	66–72
5	77.25	81.75	76–82
6	83.25	87.75	82–88
7	175.25	179.75	174–180
8	181.25	185.75	180–186
9	187.25	191.75	186–192
10	193.25	197.75	192–198
11	199.25	203.75	198–204
12	205.25	209.75	204–210
13	211.25	215.75	210–216
14	471.25	475.75	470–476
15	477.25	481.75	476–482
16	483.25	487.75	482–488
17	489.25	493.75	488–494
18	495.25	499.75	494–500
19	501.25	505.75	500–506
20	507.25	511.75	506–512
21	513.25	517.75	512–518
22	519.25	523.75	518–524
23	525.25	529.75	524–530
24	531.25	535.75	530–536
25	537.25	541.75	536–542
26	543.25	547.75	542–548
27	549.25	553.75	548–554
28	555.25	559.75	554–560
29	561.25	565.75	560–566
30	567.25	571.75	566–572
31	573.25	577.75	572–578
32	579.25	583.75	578–584
33	585.25	589.75	584–590
34	591.25	595.75	590–596
35	597.25	601.75	596–602
36	603.25	607.75	602–608
37	609.25	613.75	608–614
38	615.25	619.75	614–620
39	621.25	625.75	620–626
40	627.25	631.75	626–632
41	633.25	637.75	632–638
42	639.25	643.75	638–644
43	645.25	649.75	644–650
44	651.25	655.75	650–656
45	657.25	661.75	656–662
46	663.25	667.75	662–668
47	669.25	673.75	668–674
48	675.25	679.75	674–680
49	681.25	685.75	680–686
50	687.25	691.75	686–692
51	693.25	697.75	692–698
52	699.25	703.75	698–704
53	705.25	709.75	704–710
54	711.25	715.75	710–716
55	717.25	721.75	716–722
56	723.25	727.75	722–728
57	729.25	733.75	728–734
58	735.25	739.75	734–740
59	741.25	745.75	740–746
60	747.25	751.75	746–752
61	753.25	757.75	752–758
62	759.25	763.75	758–764
63	765.25	769.75	764–770
64	771.25	775.75	770–776
65	777.25	781.75	776–782
66	783.25	787.75	782–788
67	789.25	793.75	788–794
68	795.25	799.75	794–800
69	801.25	805.75	800–806
70	807.25	811.75	806–812
71	813.25	817.75	812–818
72	819.25	823.75	818–824
73	825.25	829.75	824–830
74	831.25	835.75	830–836
75	837.25	841.75	836–842
76	843.25	847.75	842–848
77	849.25	853.75	848–854
78	855.25	859.75	854–860
79	861.25	865.75	860–866
80	867.25	871.75	866–872
81	873.25	877.75	872–878
82	879.25	883.75	878–884
83	885.25	889.75	884–890

www.americanradiohistory.com



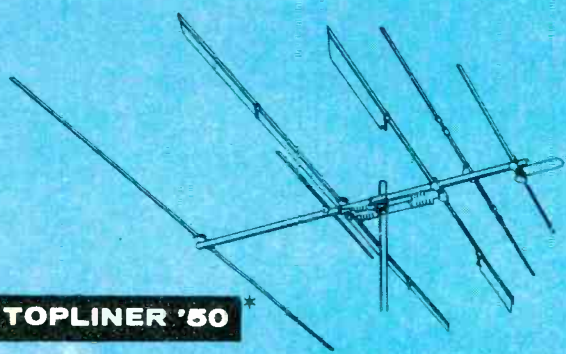
TOPLINER '40*

Cat. No. 2540. 3 working elements on low band. 9 working elements on high band.



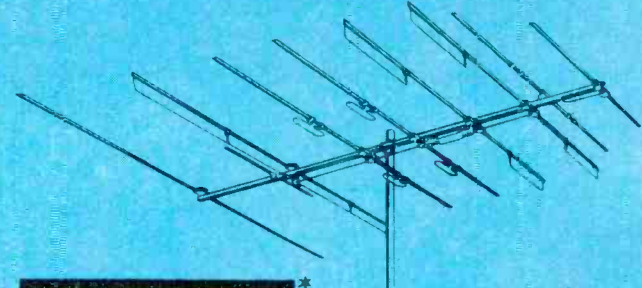
TOPLINER '60*

Cat. No. 2560. 6 working elements on low band. 13 working elements on high band.



TOPLINER '50*

Cat. No. 2550. 5 working elements on low band. 10 working elements on high band.



TOPLINER '70*

Cat. No. 2570. 8 working elements on low band. 19 working elements on high band.

Topliner antennas

Trade-mark

TOP 'EM ALL!

Taco again introduces an original antenna design, engineered for results. The Topliner represents better performance than any other antenna now on the market. And, best of all, you get this extra performance at no increase in cost.

TOPS IN GAIN PER DOLLAR!

TOPS IN DEPENDABILITY PER DOLLAR!

TOPS IN DIRECTIVITY PER DOLLAR!

RIGHT!

FOR COLOR AND BLACK & WHITE!

TACO TOP LINE FOR '57

TECHNICAL APPLIANCE CORPORATION, SHERBURNE, N. Y.

IN CANADA: Hackbusch Electronics, Ltd., Toronto 4, Ont.

* Pat. Pending

www.americanradiohistory.com

PRINTED WIRING BOARDS

PART 2

Unsoldering and Removing Components

by Calvin C. Young, Jr.

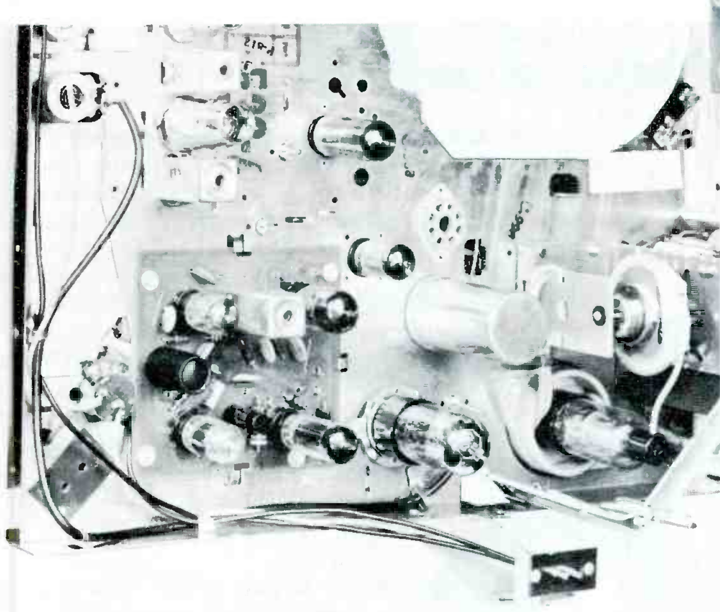


Fig. 1. Receiver in Which Limited Use of Printed Boards Is Made.

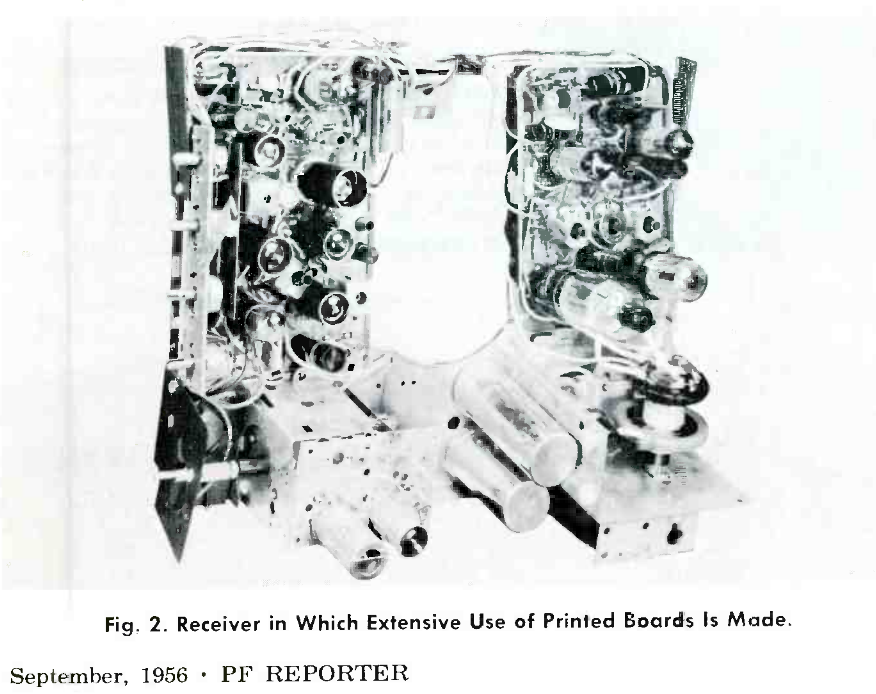


Fig. 2. Receiver in Which Extensive Use of Printed Boards Is Made.

Part I of this series, which appeared in the August 1956 issue of the PF REPORTER, presented some of the general history of printed wiring boards. The basic methods of construction and the materials used in printed wiring boards were also discussed.

This month, we will cover some of the basic service problems encountered with printed wiring boards; namely, the removal of components from the board. Included will be a discussion of considerations for soldering and some of the precautions necessary to avoid damaging the board during a soldering operation.

At the present time, the use of printed wiring boards in television receivers varies with the manufacturer. Fig. 1 and Fig. 2 show the two extremes which the service technician can expect to encounter. In Fig. 1 only a small portion of the receiver (the sound and

• *Please turn to page 61*

www.americanradiohistory.com

NEW

HICKOK

The 660 is ideal for the proper alignment of color TV receivers. It is accurate and unusually easy to use. Preset channels allow easy selection through a built-in switching arrangement. Provides either of the following patterns on any color TV receiver:

White Line Crosshatch; 20 vertical and 15 horizontal, less those in blanking.

White Dot (small size); 300 dots, less those in blanking.

Crystal Accurate Color Display Pattern; in a blended sequence of orange, red, magenta, blue, cyan, green.

CRYSTAL CONTROLLED
WHITE DOT-BAR—COLOR DISPLAY
GENERATOR

Model 660 **$239.50 Net**

The 660 features the necessary high degree of stability not found in variable white-dot generators. In the 660, the white dots are "locked" together to assure stability. This locking is achieved through the extremely stable (crystal controlled) timer circuit. Frequency of chrominance (color) signal is exactingly crystal controlled to reduce possibility of alignment errors. This feature permits increased accuracy over ordinary color generators which use a free running oscillator. RF output frequency is in preset channels, 2 thru 6, to allow easy selection through a built-in switching arrangement. Small dot and crosshatch size down to two lines in both horizontal and vertical planes. Ratio of sync to video is variable from 10 to 90%.

- **The circuit of the 660 is such that the instrument will be useable regardless of future color TV receiver design.**

TECHNICAL SPECIFICATIONS:

VIDEO OUTPUT: 0 to 4 volts Peak-to-Peak. 300 ohm output impedance. Black positive or negative. 300 white dots, less those in blanking. Crosshatch white lines, 20 vertical and 15 horizontal, less those in blanking. Sidelock color frequency crystal is 3.563795 MC output 1 volt Peak-to-Peak.

RF OUTPUT VOLTAGE: .05 volts maximum. .001 volts minimum.

RF modulated by all video outputs (60% modulation).

★ **The Model 660 is especially designed for Home service calls.**

★ **Light weight portable with detachable cover . . . weighs only 15 pounds.**

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
10566 Dupont Avenue • Cleveland 8, Ohio

www.americanradiohistory.com

Shop Talk

MILTON S. KIVER

Author of . . .
Servicing and Calibrating Test Equipment;
How to Understand and Use TV Test Instruments

Thinking About Schools?

Because of the writer's association with several school organizations at one time or another, letters are received periodically asking advice on schools and school training. These letters do not all come from men just breaking into the servicing field. Many are received from men who have been in the field for some time.

The chief concern of these letter writers centers about two questions: "Is school training worthwhile?" and, "Which is better, a resident or a correspondence course?" In answer to the first question, school training is desirable provided that (a) it is geared to your level, (b) it offers you the subject coverage that you want and need, and (c) it consists of an up-to-date course of instruction with modern equipment. If a course has all these attributes, then that course is worthwhile; otherwise, its benefits to you might be questionable.

Schools fall into one of two broad categories, either resident or correspondence. Some organizations operate both types within the same general business framework; but so far as the student is concerned, the course he is taking is definitely one or the other. There is a hybrid type that combines some of the features of both approaches, and we will discuss it presently.

In a resident school, the student attends a number of times a week or a month to receive group instruction and to perform laboratory work. In a correspondence course, the lessons are received and returned by mail. In short, the school and the student correspond with each other.

In answer to the question, "Which is best?", there is no simple answer. Each possesses advantages and disadvantages. The resident school has among its advantages the fact that you are meeting face to face with the instructor, and if he says something which you do not understand, you can stop him and question him further. You can even have him repeat the thought a number of times (if he is tolerant) and perhaps in different ways until you grasp the idea.

Personal contact and personal instruction are the chief advantages of the resident course. With a well-equipped laboratory, you also have access to good test equipment which can add considerably to your enjoyment and understanding of the course.

Among the disadvantages of resident training is the fact that you are forced to proceed at a certain rate, fixed in part by the average ability of the class and in part by the length of the course. If you are above average, you are penalized by not being able to advance as fast as you would like. If you are slower in grasping ideas, you are prevented from learning the material fully because of the necessity of keeping up with the rest of the class. Another disadvantage of resident training is the necessity of being at the school for a definite period of time on specified days. If you cannot attend every class, you will lose out on a certain amount of instruction which you may not be able to make up. To this extent, you will have lost some of the benefits of the course.

Now let us examine the advantages and disadvantages of correspondence courses. In their favor are the following: You can study when you want to and where you want to. The writer has known many correspondence students who did their studying at any odd hours that the opportunity presented itself. This may be on the train, during the lunch hour, in the middle of a sleepless night, and even in the bathtub. You set your own study hours, and work for as long as you wish. If you finish a six-month course in two months, you can proceed to the next level. On the other hand, you can stretch the same course out for a year if you happen to be busy and cannot devote much time to it. You are your own master and progress accordingly.

Many of the disadvantages of correspondence training centers on the word correspondence. If you have any questions which apparently cannot be answered by a study of your text, then you have to write to your instructor at the school. This necessitates a delay which can be particularly annoying if the reply is slow in reaching you, or if it is inadequate and requires additional inquiries on your part.

Such delays may be an even greater inconvenience when you have practical lessons to perform. An instructor right at your elbow can quickly correct poor wiring techniques, locate wiring errors, or help you interpret your results. The same difficulties can also be resolved by mail, but the procedure may be drawn out and protracted over a period of time. This need not happen, but it does occur often enough to be recognized as

• *Please turn to page 54*

www.americanradiohistory.com

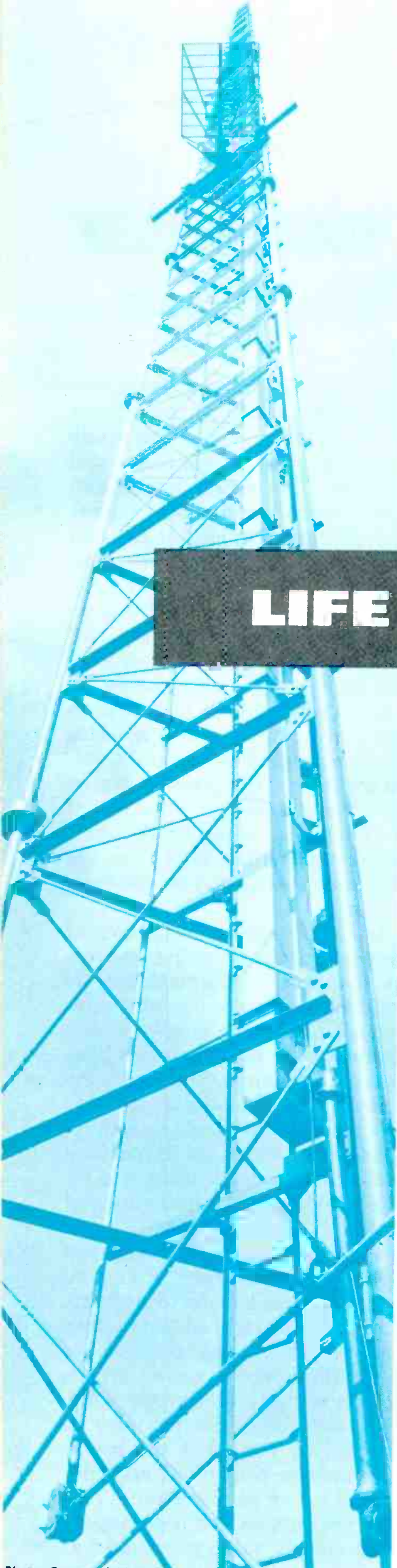


Photo: Courtesy WKJG-TV

FIELD REPORT FROM TOM & VERNE

One of the problems of being a serviceman is that, business being local, a man is pretty well tied down. Realizing this, staff members Tom Lesh and Verne Ray are traveling to various sections of the country gathering first-hand information on a number of subjects they feel serviceman themselves would like to explore, had they the time. Tom and Verne welcome suggestions from readers on subjects they would like to see covered in future installments of "Field Report from Tom & Verne."

LIFE ON A UHF ISLAND

Three years ago, the PF REPORTER printed a number of articles about UHF television. The field was new at that time, and the data presented dealt with the problems that were being faced by the pioneers in UHF broadcasting and servicing. Because of the recent F.C.C. discussions about expanding the number of UHF stations, and because operating experience and technical progress have brought about some changes since our original articles, we felt that the time was ripe for another look into the UHF situation.

The history of UHF television has been somewhat discouraging in many parts of the country. Many of the UHF stations which tried to compete with VHF stations have gone off the air, which is to some extent evidence that operation on the ultra-high band has serious disadvantages which have not yet been overcome.

In the few areas where UHF stations have exclusive coverage of a territory, they have been solidly successful. Here the broadcasters and the service industry have managed to build up an adequate service in spite of the special problems of UHF reception.

Although these UHF "islands" are not too numerous, we are fortunate in having several of them within a short distance of our editorial offices. The one we chose to cover is the Fort Wayne area in northeastern Indiana. Most of this region is without reliable VHF service. It is an important market area—the city of Fort Wayne itself has a population of 133,000. Telecasting service is provided by WKJG-TV on Channel 33, with a transmitter on the northwest edge of Fort Wayne, and WIN-T on Channel 15, with a transmitter near Auburn, Ind., approximately 20 miles north of Fort Wayne. Channel 33 has an omnidirectional antenna and puts out a video carrier of 270 kilowatts ERP. A directional, electrically-tilted antenna, beamed toward Fort Wayne, has just been installed by Channel 15. The ERP of the video carrier on this channel has an average value of 447 kilowatts. With this high power, the stations are able to cover an area with a radius of more than 40 miles. The terrain is nearly flat, and no trouble with large shadow areas has been reported.

Television never really clicked in Fort Wayne until the UHF stations started. Some receivers had been sold in the area prior to 1953, but reception was undependable

www.americanradiohistory.com

even with an elaborate collinear antenna. The nearest VHF station is Channel 3 at Kalamazoo, Mich., roughly 85 miles from Fort Wayne.

The extreme northern edge of the market is fairly well covered by Michigan VHF stations, but viewers in the rest of the Fort Wayne area depend on the local UHF stations for programs, which include those supplied by two major networks.

Huntington: A Fringe Area?

Although concentrating our coverage in the metropolitan Fort Wayne area, we also made a study of a city located some distance from the UHF transmitters, and for this reason, visited Huntington, Ind., which is 25 miles southwest of Fort Wayne. We had anticipated that this city would be in the fringe area of the UHF stations, but found that their coverage had been extended with the result that Huntington is now within the Grade A signal area of both stations.

We dropped in at the headquarters of a parts distributor in Huntington for our first interview, and were informed that clear reception could be had on both channels in most sections of town, and that even an indoor antenna was usable in some favored locations. Channel 15 had been snowy before the directional transmitting antenna was installed, but the new antenna cleared up reception in most locations.

We inquired as to which type of receiving antenna seemed to be most popular, and we were told that a unit having four stacked conical elements and a reflector had recently gained great favor in Huntington. Formerly, corner-reflector antennas were used almost exclusively, but installers have been finding that the four-stacked unit gives better results on Channel 15, which is more than 40 airline miles away. This channel is almost at the low end of the UHF band, and installers have reason to believe that the gain of the corner reflector falls off at this edge of the band.

Nearly all new sets sold in the area have been factory-equipped for all-channel reception. Some converters are still sold for use with receivers brought in from other areas or with older receivers used as second sets. The performance of converters was said to be as good as that of all-channel receivers—and even better in some instances. UHF converters are sold along with second-hand sets which do not have built-in UHF tuners. The converted sets perform as well as all-channel sets, but the latter are better sellers because of their greater convenience and better appearance.

The only major problem connected with UHF reception, according to the distributor with whom we talked, concerns UHF tuners—more specifically, the unreliability of UHF oscillator tubes. The average life of the 6AF4 oscillator tube, which is used in a good percentage of UHF tuners, has been found to be from six months to a year, and many fail sooner than that. A frequent complaint is that the UHF oscillator will operate on one channel and not on the other.

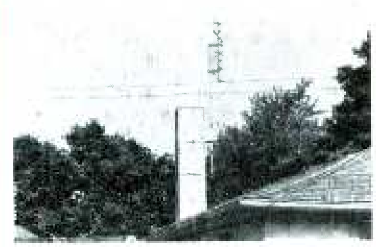
Before leaving Huntington, we talked with a few dealers. At a store in the downtown area, UHF pictures on demonstration sets showed a slight amount of snow. We were informed that this is common downtown because it lies in a river valley. The technicians at this store mentioned that an antenna ten feet above roof level is adequate for good reception in most residential areas.

The signals from the two stations arrive in Huntington from approximately the same direction, and one antenna without a rotor is usually sufficient for reception of both signals. This antenna is oriented midway between the optimum positions for the two stations. When Channel 15 came on the air in 1954, 10 months after Channel 33 began operation, there were some calls to turn antennas slightly so that the new station could be received. A field-strength meter is used by many shops when antennas are first installed—a roof is probed horizontally until the spot with the best signal is found.

The bench men confirmed what the distributor had told us about UHF tuners. There is little me-

· Please turn to page 67

Typical UHF Antenna Installations



www.americanradiohistory.com

New Styles in CAPACITORS

Look for These in Current Receivers

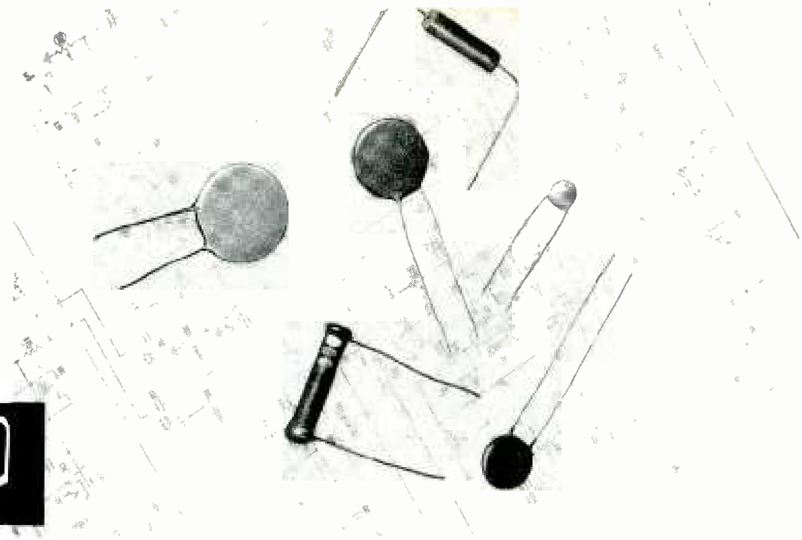


Fig. 1. Examples of Ceramic Capacitors Now Being Used in Radio and TV Sets.

by Leslie D. Deane

In the future, service technicians are destined to find radical changes in the outward appearance of fixed capacitors used in radio and television receivers and other electronic devices. Capacitors, like other essential electronic components, are continuing to be changed in design and to be improved in their characteristics. The motivating force behind these progressive design trends stems from a number of requirements and new developments within the industry. Printed-wiring assemblies and certain automation techniques are becoming well established in the art of radio and television manufacturing. Capacitors especially designed with these factors in mind are appearing on the market at an increasing pace. In addition, capacitors constructed to meet various adverse conditions such as dust, vibration, extreme temperatures, and high humidity are being developed and are finding use in more and more electronic equipment.

Miniaturization of radio and television receivers is another factor now governing capacitor designs to a great extent. The size and weight of individual components plays an important part in the over-all design trend toward the compactness and portability of electronic equipment.

In the following article, an effort has been made to bring to light a few of the new capacitor designs and to familiarize the reader with their present-day applications.

Ceramic Capacitors

During the past few years, a great deal of research work has been done by many of the leading capacitor manufacturers to uncover new dielectric materials and to improve the temperature characteristics of capacitors. Perhaps one of the most advanced steps taken has been the development of the molded ceramic unit. Capacitors are often designated according to the type of dielectric used in their construction; therefore, the ceramic unit has, as the name implies, a special ceramic insulating material between the two capacitor plates. This type of capacitor is generally produced by molding the ceramic material into a thin circular, rectangular, or cylindrical form. The form is then baked until the material becomes extremely hard, and a thin sheet of silver is coated on each side to form the capacitor plates. Connecting leads are soldered directly to the silver plates or to the terminals provided, and the complete assembly is then coated with a moisture-resistant material. Examples of a few ceramic capacitors are shown in Fig. 1.

The most popular ceramic capacitor now used in the manufacture of radio and television re-

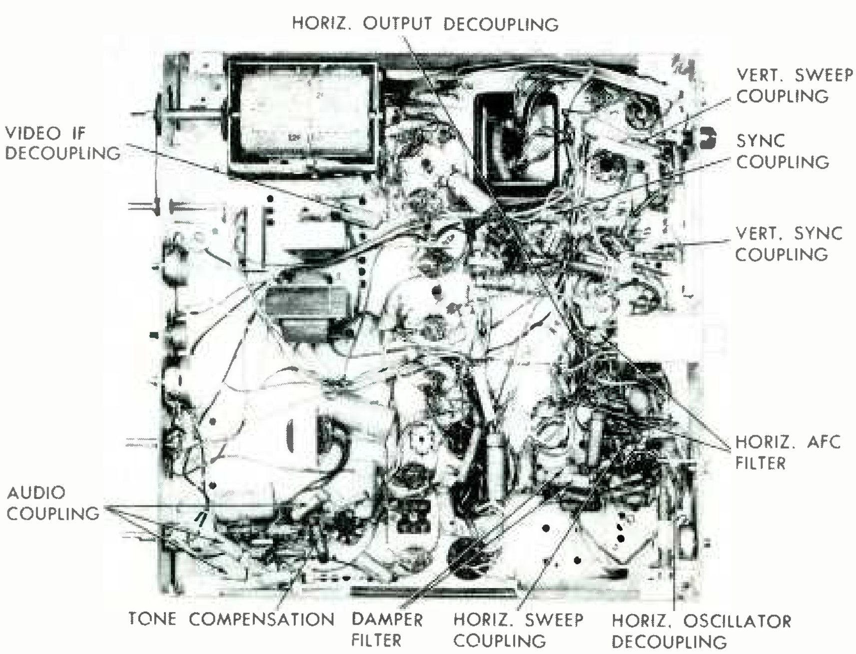


Fig. 2. Underchassis View of TV Receiver Built a Few Years Ago.

www.americanradiohistory.com

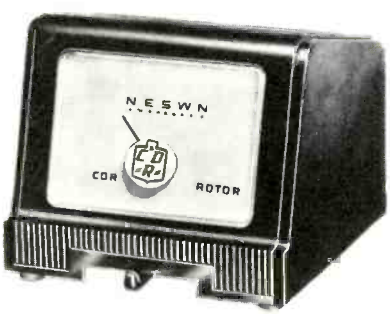
TR-12 a special combination value consisting of complete rotor, including thrust bearing. Handsome new modern cabinet with meter control dial, uses 4 wire cable.

TR-11 same as TR-12 without thrust bearing.

the complete line...

a model for every need

CDR ROTORS



TR-4 the heavy duty rotor complete with handsome modern cabinet with METER control dial, uses 4 wire cable.

TR-2 the heavy duty rotor with plastic cabinet featuring "compass control" illuminated perfect pattern dial, uses 8 wire cable.

CORNELL-DUBILIER South Plainfield, N. J. ®

The **RADIART** Corporation, Cleveland 13, Ohio ®

www.americanradiohistory.com

This combination of **CDR ROTORS**

and the **Biggest TV Spot Campaign**

in our history

PRE-SELLING your customers

opens the door

for you to

See reverse side for full line

www.americanradiohistory.com

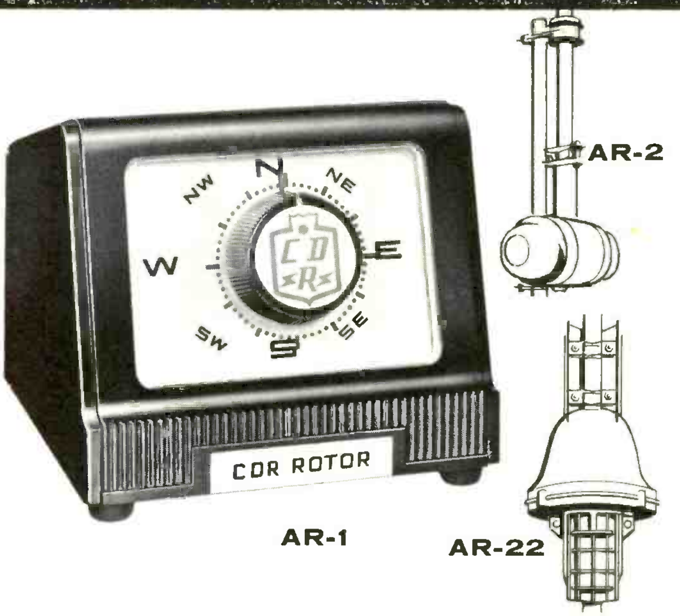
There's more in store for you . . . when you feature

CDR ROTORS

Proven the popular favorite

the complete line . . .

a model for every need!



featuring

CDR AUTOMATIC Rotors

An outstanding group of rotors . . . three proven and tested models . . . ALL 40% SHARPER TUNING than ANY other automatic rotor. Handsome cabinet . . . dependable performance . . . proven and tested by thousands and thousands of satisfied users.

www.americanradiohistory.com

www.americanradiohistory.com

ceivers is the disc style. These compact miniature units have unidirectional leads and low self-inductance features. A few years ago, some ceramic capacitors exhibited sensitivity with respect to temperature variations; this in turn somewhat limited their application. These components now have suitable temperature coefficients, and their stability permits them to be used in circuits requiring relatively close capacitive tolerances.

Although ceramic disc capacitors have been used in radio and television receivers for some time, the modern sets of today make greater use of these small units. When servicing a radio or television receiver, the average technician has at one time or another turned up a chassis and taken a quick check of certain capacitors in a circuit suspected of causing a particular trouble. If this procedure is followed when some of the more modern receivers are serviced, the technician may be slightly surprised by the large number of ceramic capacitors being used by manufacturers.

Fig. 3. Universal Ceramic Unit Capable of Providing Various Capacitances.

In order to illustrate this point, a television chassis produced just a few years ago and employing a large number of paper capacitors is pictured in Fig. 2. Molded ceramic units are being used in many modern television chassis in place of the units indicated in this photograph, and many radios of conventional design are using ceramic disc capacitors throughout (except for certain required electrolytic units).

According to reports from electronic-parts distributors, some technicians are concerned about the interchangeability of ceramic and paper capacitors. They sometimes hesitate to accept one type of capacitor in place of another. This situation should be clarified to a certain extent because radio and TV sets actually employ very few circuits that require exact duplicate capacitors as replacements. The physical make-up of a capacitor seldom needs to be considered from an electrical standpoint. For most coupling and bypass applications at least, the ceramic and paper tubular capacitors may be interchanged if one type or the other is not available. Keep in mind, however, that the ranges of values for the two types are not the same. The ceramic units in conventional radio and TV sets range from approximately 5 to 50,000 mmf, while paper tubular capacitors range from about .0001 to 1.0 mfd in value.

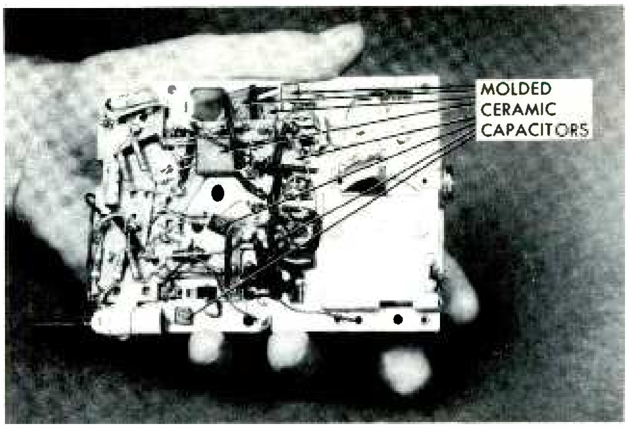


Fig. 4. Modern Transistorized Radio Utilizing a Number of Molded Ceramic Capacitors.

Working voltages of about 500 volts DC are usually adequate for most applications in radio and television receivers. The voltage characteristics of ceramic capacitors are conservatively rated and will remain at 500 volts up to an operating temperature of approximately 85° C. In the average television receiver, the ambient temperature (or temperature of the air surrounding chassis components) is approximately 40° C. From this, we can see that the present-day ceramic capacitor should not be adversely affected by heat generated within a conventional receiver.

Components of a universal nature have recently been developed in the field of replacement ceramic capacitors. One of these units is shown in Fig. 3. The body of the component in this illustration is 1 1/16" by ½" by ⅛" and comes with four unidirectional leads. One of these so-called universals will take the place of one of a number of capacitors ranging in value from 400 mmf to .015 mfd. A reference card packaged with each unit explains the proper connections to make in order to obtain the particular value of capacitance desired. The unit pictured in Fig. 3 provides twelve different values of capacitance ranging from .0004 to .0013 mfd with a tolerance of ±20 per cent.

The use of transistors and printed circuits continues to increase, and design engineers are using these devices to miniaturize receivers and to reduce their power consumption. Set manufacturers in turn are demanding components which are smaller, lighter, and more reliable. Ceramic capacitors seem to be playing a large part in filling this demand. The small radio chassis in Fig. 4 illustrates the number of molded ceramic capacitors now employed in a typical transistorized radio. The operating voltages in a transistor circuit are much lower than those found in receivers employing vacuum tubes. This fact permits the capacitor manufacturer to reduce the working voltages of units designed especially for transistor application. With the voltage requirements lowered, higher values of capacitance can be obtained in relatively small units. The average voltage rating of the capacitors in Fig. 4 is 25 volts DC, and the larger units have capacitance values of .05 to .1 mfd.

Tubular Capacitors

There have also been new developments in molded paper tubular capacitors. One example of this is the upright mounted unit

· *Please turn to page 50*

www.americanradiohistory.com

E-V Power-Point actually gives you more working capital by cutting, drastically, the number of different cartridges and different needles you need in stock to do an adequate replacement business. Power-Point *alone* replaces over 90% of all popular phono cartridges. You save valuable time, troublesome service calls . . . you can replace Power-Point in less time than it takes to read this sentence! Remember too, almost a million Power-Points are now in use, and the number is growing fast. Additional millions will be demanded by the replacement market!

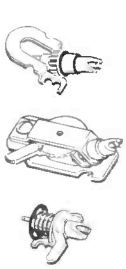
Four Power-Point Types, each $3.95 list

Model 51-1 (Red): two 1-mil sapphire tips.

Model 52-2 (Green): two 2-mil sapphire tips.

Model 53-3 (Black): two 3-mil sapphire tips.

Model 56 (Blue): turnover mounted 1-mil and 3-mil sapphire tips.



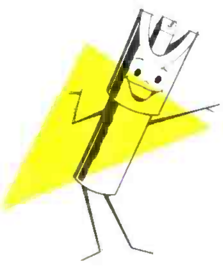
Three Mounting Mechanisms

Model PFT-1 Power-Point Fixed Mount, 50c list.

Model PT-1 Power-Point Turnover Mount, $1.00 list.

Model PT-2 Power-Point Turnunder Mount, $1.00 list.

What is Power-Point?



A nylon-encased unit combining ceramic cartridge and two jeweled* playing tips. A Power-Point cartridge can be changed in seconds, replaces virtually all popular phono cartridges, costs less than two needles alone. It has low inertia, superior tracking ability, wide range, low distortion, minimum needle noise and record wear. It is non-inductive, hum-free, unaffected by moisture or temperature. It actuates all changer mechanisms.

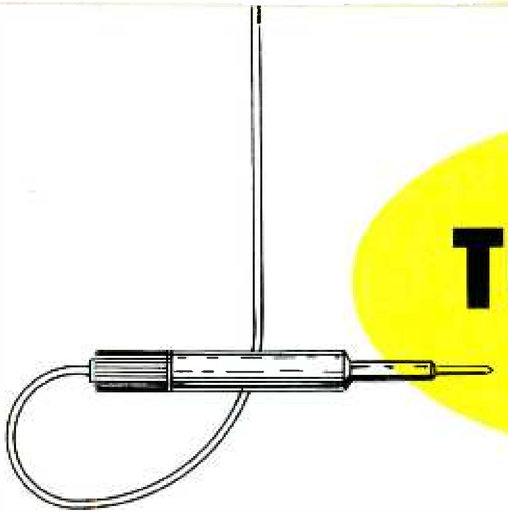
*Superior synthetic sapphire or natural diamond.

WRITE FOR COMPLETE INFORMATION ON ELECTRO-VOICE POWER-POINT SALES-AIDS, DISPLAY AND TECHNICAL SPECIFICATION SHEET R69.

Electro-Voice

ELECTRO-VOICE, INC., BUCHANAN, MICHIGAN

www.americanradiohistory.com



NOTES ON TEST EQUIPMENT

Latest Information on Application, Maintenance and Adaptability of Service Instruments

by Paul C. Smith

Writing Speed

A variety of terms are used by manufacturers to describe the qualifications of the equipment which they produce; some may be very familiar to the technician, others less familiar. In either case, the terms have been chosen because they convey much information to the prospective buyer or user of the equipment, assuming that he understands their meaning.

From time to time we have selected some of these terms which are perhaps less familiar to the technician or which may be of special interest to him and have discussed them in this column. Previous articles have dealt with "rise time" and with frequency response in decibels.

This month we have chosen "writing speed" as our subject for clarification. This is a term which is sometimes used in describing the rate at which the spot produced by the electron beam travels or "writes" across the screen of the cathode-ray tube of an oscilloscope. The meaning could be made more exact or specific if the term were changed to read "sweep writing speed," "signal writing speed," or "photographic writing speed." Each of these three terms has its own special meaning, but the first is the one which will usually concern the TV or radio technician.

Sweep writing speed means the rate at which the spot travels across the screen in a horizontal direction because of the action of the sweep generator and horizontal amplifiers. Two factors under the control of the operator have an effect on the sweep writing speed: (1) the horizontal gain and (2) the sweep frequency. If the maximum sweep width is the same for all sweep frequencies, then the highest sweep speed is obtained when the sweep frequency is highest. A reduction in either the horizontal gain or the sweep frequency would then decrease the sweep writing speed.

Speed, meaning rate of motion, always involves two factors— distance and time. These two factors can be expressed in any desired units. For example, we may say an automobile travels at a rate of of 60 miles per hour or one mile per minute; the speed of a rifle bullet is usually quoted as so many feet per second. The sweep writing rate of an oscilloscope is usually stated in number of inches per second or per microsecond, or it can be given in centimeters instead of inches. Sometimes the order is reversed, and the speed is stated in microseconds per inch.

What does all this mean to the user of the oscilloscope? Suppose that you contemplate buying an oscilloscope with a maximum sweep writing rate of 4 inches per microsecond. This tells you that, if you can synchronize a 1-megacycle signal at the maximum sweep rate, one cycle of this signal will be spread across 4 inches of screen. At the same rate, one cycle of the 3.58-mc color burst would cover a little more than 1 inch of screen; a horizontal sync pulse of 5-microsecond duration would be expanded to an equivalent of 20 inches of screen; and so on. In many cases, it is desirable to expand a response curve as much as possible in order that fine detail on the curve can be seen. This is especially true when the operator must view a large number of cycles of a particular signal which has a frequency that is much higher than that of the sweep.

If the sweep writing speed is listed, useful information is thereby added to the list of specifications for an oscilloscope. The same information can be obtained by calculation if the total width and the frequency of sweep are known. The example just given, 4 inches per microsecond, results when a sweep width of 40 inches is obtained with a sweep frequency of 100 kilocycles. It requires some use of arithmetic to convert these figures to speed in inches per microsecond. If the sweep writing speed is given directly in the specifications, the reader is spared this calculation; and it gives him a basis for determining how much expansion he can expect for the signals which he views on the oscilloscope.

Fig. 1. Seco Model SL-10 Monitron—A Signal Tracer and Intermittent Localizer.

Seco Model SL-10 Monitron

The Seco Model SL-10 Monitron (Fig. 1) has been designed

• *Please turn to page 71*

www.americanradiohistory.com

MARRED APPEARANCE

The cabinet shown here is in obvious need of extensive touch-up work. It was chosen to show all phases of the repairs which can be performed with the use of an inexpensive kit.

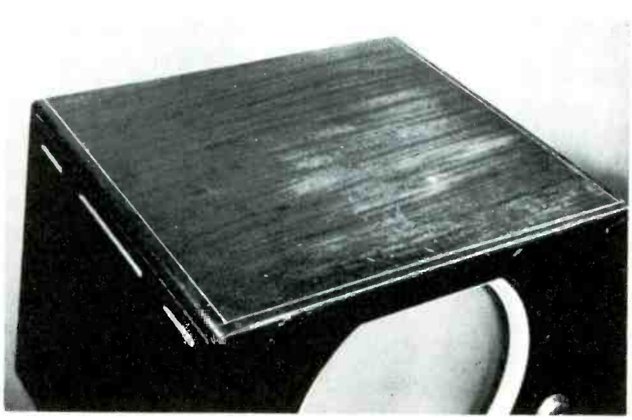
CABINET TOUCH-UP

From the customer's point of view, the outward appearance of a TV cabinet is just as important as the quality of the picture and sound. Yet very few service technicians take the trouble to polish the cabinet after repairing the receiver. Although many technicians feel that this type of service is not their worry, customers really appreciate it, and it can be of great help in getting repeat business.

Five minutes work can make cabinets which have a few scratches in them look like new; and most important, work like this can be a source of additional income.

Extensive knowledge of cabinet work is not necessary for the technician to become a proficient touch-up artist. Many times, a good job of simply cleaning and polishing will make a tremendous improvement in the appearance of a cabinet. In other cases, a few scratches will need covering up. The ultimate in touch-up work is filling in bad dents and gouges.

Inexpensive touch-up kits complete with directions can be obtained from most eletronic parts distributors. Such a kit was used in the presentation of this article.



CLEANING AND POLISHING

The finish on top of this cabinet has not been badly damaged; it has only a few spots and has some light scratches. A quick rubdown with a liquid scratch remover and polish gives a renewed finish to the top as evidenced by these before and after photographs.

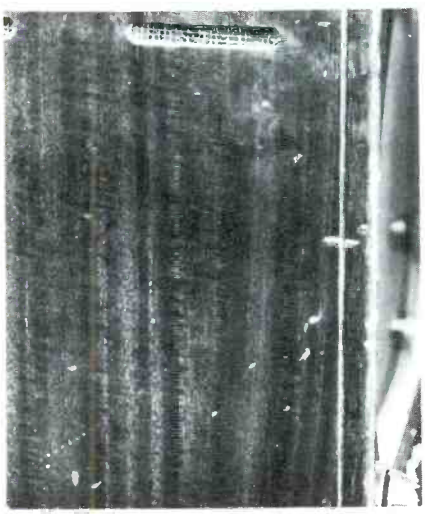
SCRATCHES AND NICKS

Scratches and nicks that are too severe to be removed with the liquid preparation can be filled in with a crayon filler. Crayons are available in various shades, and the one used should be chosen to match the cabinet finish. For deep scratches, the filled-in area should be gone over with the liquid scratch stain, such as is being done here with the use of a felt brush which contains the fluid.

www.americanradiohistory.com

FINISH RUBBED THROUGH

Application of the appropriate stain will do a lot to improve the appearance of unsightly rubbed-through spots in the cabinet's finish. The stain is more easily applied if the spot is sanded lightly beforehand.

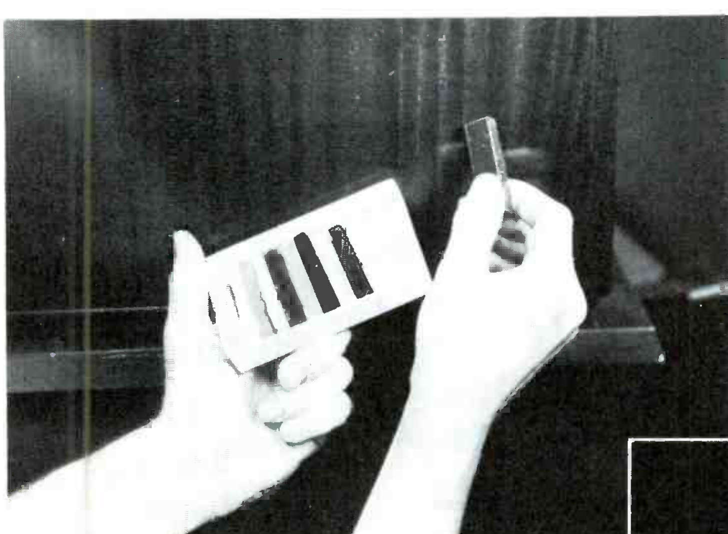


DENTS AND GOUGES

The side of this cabinet is dented and contains some deep gouges. The elimination of such defects involves using stick shellac. Since this operation involves some skill and practice, it is suggested that the technician try his hand on some old furniture before attempting to work on a good cabinet.

APPLYING STICK SHELLAC

An alcohol lamp or gas flame should be used to heat the spatula. Other fuels tend to smoke and darken the filler. A small amount of stick shellac is melted onto the heated blade and worked into the hole in the cabinet. The filler should be hot enough to fuse with the wood; otherwise, it will fall out. When the hole is filled, the hot blade of the spatula is used to feather the edges and to make the repair as smooth as possible.

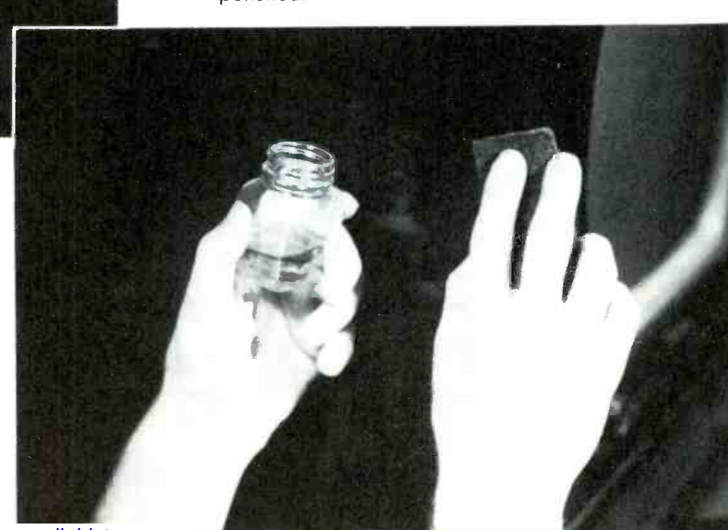


MATCHING THE FINISH

Stick shellac is supplied in various shades, and it is important to choose one which closely matches the cabinet finish. If an exact shade is not available, choose one which is a little lighter. Never use a darker shade because heat will darken it and nothing can then be done to make it lighter. A lighter shade, however, can be darkened with stain.

THE FINISHING TOUCHES

After a hole has been filled, rubbing fluid is applied with a felt pad. The area should be rubbed with the grain until smooth. To add the finishing touch, the entire cabinet should be cleaned and polished.



www.americanradiohistory.com

THOUSANDS OF SERVICE DEALERS SATISFY CUSTOMERS SAVE REPEAT CALLS

MAKE MONEY EVERY DAY *with* B&K

NET $109.95

Dyna-Quik 500. Easily portable in luggage-style carrying case. Size: 15⅞ x 14½ x 5¾ in. Weighs only 12 lbs. Has 7-pin and 9-pin straighteners on panel.

DYNA-QUIK MODEL 500

DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

Tests over 95%

OF ALL POPULAR TV TUBES*— *IN SECONDS*

It's easy and profitable to check all the tubes in a TV set with DYNA-QUIK—on every service call. Cuts servicing time. Creates more on-the-spot tube sales. Saves repeat calls, protects service guarantee.

DYNA-QUIK 500 *measures true dynamic mutual conductance*, completely checks tubes with laboratory accuracy under actual operating conditions right in the home.

Tests each tube for shorts, grid emission, gas content, leakage, dynamic mutual conductance and life expectancy. One switch tests everything. No roll charts. No multiple switching. Makes complete tube test in as little as 12 seconds. Large 4½-inch plastic meter shows tube condition on "Good-Bad" scale or in micromhos on scales calibrated 0-6,000 and 0-18,000. Used in home or shop, DYNA-QUIK is a proved money-maker!

*Including new 600 mil series tubes.

DELUXE—PORTABLE

CRT MODEL 400

Tests and repairs TV Picture Tubes

Quickly spots and corrects picture tube troubles right in the home, without removing tube from set. Restores emission, stops leakage, repairs inter-element shorts and open circuits. Life test checks gas content and predicts remaining useful life. Grid cut-off reading indicates picture quality customer can expect. Eliminates tube transportation, cuts service-operating costs. Also saves money on TV set trade-in reconditioning. Earns dollars in minutes—pays for itself over and over again.

NET $54.95

Deluxe CRT 400. With 4½-in. plastic meter. Weighs only 5 lbs. Luggage style carrying case. Size: 11 x 7¼ x 5".
Also available in economy model CRT 200 with 3-in. meter at $39.95 net.

Proved in Use by Servicemen Everywhere.

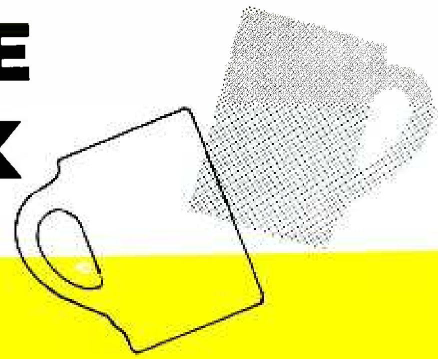
See your B&K Distributor or send for facts on "Profitable TV Servicing in the Home" and Informative Bulletins 500-104-R

B&K

B&K MANUFACTURING CO.
3726 N. Southport Ave. · Chicago 13, Illinois

www.americanradiohistory.com

COFFEE BREAK



by Verne M. Ray

Bud was irritated—no doubt about that. Tony could tell by the way he stomped into the coffee shop. He motioned with his hand and called, "Hey Bud! Over here."

Bud walked over, yanked back a chair, and sat down heavily. "Boy, some people have a lot of nerve," he blurted.

Tony had a hard time suppressing a chuckle. Bud could appear very comical when he was upset. "What seems to be the trouble, Bud?" he asked.

"Aw, it's that guy, Johnson," Bud began. "He came in with half-a-dozen tubes he wanted checked. As usual, he tried to pump enough information out of me to fix his own TV set. This do-it-yourself business has gone too far!"

"Now hold on, Bud. After all, it is Johnson's TV set—and if he wants to putter around with it, that's his business. He's not hurting us any. In fact, we should be glad he comes to us for his tubes and things. That way we'll keep his good will; and when he does get stuck, he'll probably call us for help."

"Yeah!" said Bud. "How do we know he'll call us? He'll probably end up buying the tubes he needs at a drug store or having somebody else fix his set. Yet he wasted 15 minutes of my time!"

Tony smiled. "Well, maybe not," he said. "If you impressed him and didn't openly object to his doing the job himself, he'll probably call on us to make any repairs he can't make himself."

"Well," Bud drawled, "I didn't discourage him, but I didn't offer him much help either. As far as I could determine, his set has no high voltage. I told him that special equipment might be required to locate the trouble. Evidently he has a voltmeter of some sort, and he feels he may be able to locate the trouble with that. I don't know why some people insist on messing with things they don't know anything about."

"Hey, wait a minute!" Tony interrupted. "How do you know what Johnson can or can't do? After all, he may be qualified to repair his own set. A lot of people are proficient at things which have little or no connection with their regular jobs."

"OK," Bud admitted reluctantly, "so Johnson might be able to fix his own TV. But supposing he goofs it up? Do we want the job of straightening the thing out?"

Tony's answer came back strong. "Sure we do! Business is business! Getting him to let us do the job is something else again. Suppose your attitude toward him a little while ago had been different; then later he may be ashamed to admit to us that he can't fix his set. His pride may not permit him to bring his problem to us, and he may take his business elsewhere. If that should happen, we might not only lose his business, but he wouldn't refer any to us either."

"Gosh!" Bud exclaimed, "I never thought of it that way. I sure hope we get a chance to help Johnson. Maybe we should call him later to see how he made out."

"Whoa, boy!" said Tony intently, feeling that his pitch had swayed Bud's thinking a little too far. "Let's not go overboard. Sure we'll try to help when asked, but let's not go out of our way to cut ourselves out of a repair job. After all, Johnson knows we're in business to fix sets. Supplying him with specific answers to his questions or checking the tubes he brings in is all right—within limits. Offering further information may lose us a job. Technical knowledge is our stock in trade. Let's not give it away so freely."

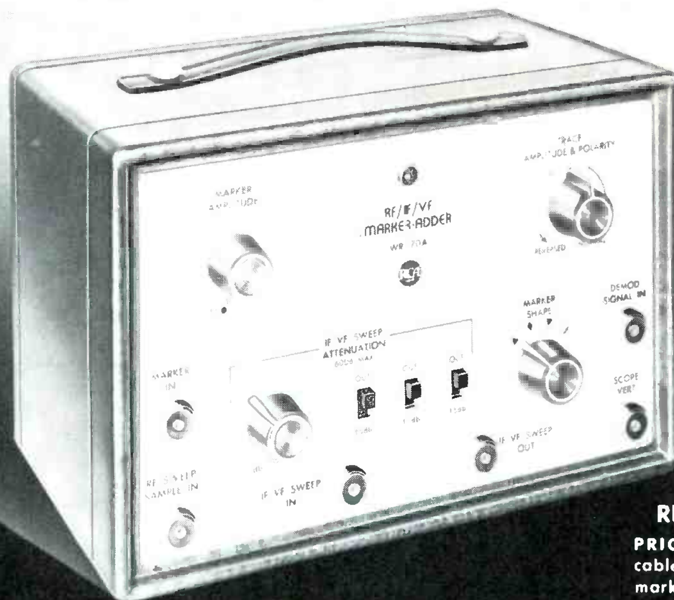
"I'm beginning to see the light," Bud said. "In other words, we should try to be helpful but not go out of our way to tell someone how to fix his own set."

"Well, something like that," said Tony, not quite sure if Bud understood. "The main thing is not to tell a do-it-yourself fan that it isn't his place to do it himself. Usually, a person like that is hard to discourage. He'll either fix the set or wind up at a dead end. In either case, we want to be of service. We can supply the parts or get the servicing job. Don't forget, anyone who walks through the front door is a potential customer for other goods we have to sell. Let's concentrate on getting people to come back. You can never tell what they might want later on."

As the pair left to return to the store, Tony added more to his previous advice. "Here's another point, Bud. Remember that we are in a business that entails dealing with the public. Every person with whom we come in contact should be treated with respect. Even if a person never buys a thing from us, he can still spread a good word for us to others." ▲

www.americanradiohistory.com

TV Alignment Is Easy



RCA WR-70A
RF/IF/VF MARKER-ADDER

PRICE . . . $97.50,* with four coaxial cables for connection to sweep and marker generators, and to oscilloscope.

. . . when you use the new

RCA WIDE-RANGE MARKER-ADDER

The RCA WR-70A Marker-Adder is designed for use in rf, if, and video sweep-frequency alignment of both color and black-and-white TV receivers. When used with alignment instruments such as the RCA WR-59C TV Sweep Generator, the WR-89A TV Calibrator, and an oscilloscope, the WR-70A produces narrow and distinct markers of high amplitude. Response-curve distortion is virtually eliminated, thereby simplifying trace-shape and frequency identification.

Note these important features:

- Front-panel control provides instant choice of four different marker shapes, permitting use of type of marker best suited to response curve being observed.
- Eliminates distortion of marker or of the sweep curve by the marker due to overloading of the TV receiver circuits because the marker is added to the sweep-response signal *after the sweep signal is taken out of the receiver*. The marker signal does not go through the rf, if, or vf channels of the receiver.
- Marker "suckout" by receiver circuits is eliminated —enables simple and precise alignment of traps.
- Provides very high-Q markers—high in amplitude, narrow in width.
- Front-panel control of marker shape, amplitude, and polarity; sweep-trace amplitude, and polarity—greatly simplifies black-and-white or color-TV alignment procedure.
- Electron-tube regulator circuit for all B+ voltages provides steady trace display on CRO.

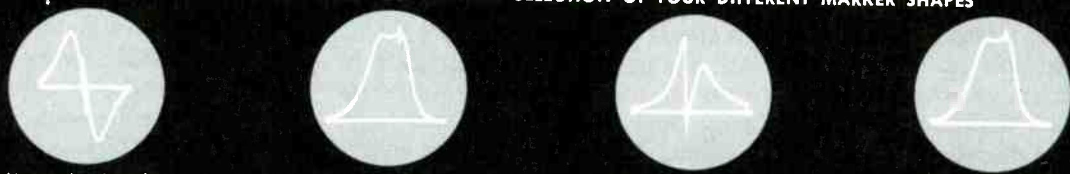
*user price (optional)

SEE YOUR RCA DISTRIBUTOR FOR DETAILS . . . NOW!

TEST EQUIPMENT

® Radio Corporation of America • Harrison, N. J.

FRONT PANEL SWITCH PROVIDES INSTANT SELECTION OF FOUR DIFFERENT MARKER SHAPES



Narrow-band marker for S-curve observation — Wide-band marker for tuner alignment — Negative-going marker for trap adjustment — Positive-going marker for peak alignment

www.americanradiohistory.com

Dollar and Sense Servicing

by *John Markus*

Editor-in-Chief, McGraw-Hill Radio Servicing Library

LEAD-GETTERS. Success of Lee Loumos Television & Appliances, West Newton, Mass., in using servicemen as lead-getters for air-conditioner sales, is featured in a recent issue of *Electrical Merchandising*. Of the 101 Loumos sales made in 1955, 40 came directly from such leads. The serviceman is paid 2% on each lead that brings a sale, which amounts to $7, since the sales average $350 per unit.

While working on the TV set, the serviceman mentions air conditioning and asks if the customer has had his home surveyed for cooling. If interest is shown, the serviceman makes a quick survey, looks over the wiring, and gives a few recommendations. There is no pressure selling and no mention of price unless asked. On departing, he leaves some literature along with his TV repair statement.

The next day Loumos calls the customer, asks how the TV set is working, then mentions the serviceman's air-conditioning survey and suggests an evening appointment when both husband and wife are at home. Two out of three leads result in sales when handled in this way. Many people say later that they were really sold by the serviceman because they felt that his survey and technical advice was more valuable than that of a regular salesman. In comparison, leads from newspaper, radio, or direct-mail advertising give Loumos only about one sale for every five inquiries.

In this shop, TV servicemen also handle air-conditioner installation and service, which keeps them busy through the ordinarily slow summer season. Loumos always tries to have the lead-getter handle the installation and servicing. This builds up customer confidence and often leads to sales of other items. It also builds up the serviceman's reputation, so that many calls come in asking for that particular man.

This same technical approach to selling can also be made to work for high-fidelity equipment and other home appliances. If a complete price including installation is quoted, and emphasis is placed on the technical quality of the installation, this selling technique can compete effectively with discount houses.

TRAFFIC RADAR. Having proved its value in trapping speeding motorists, radar is now being put to work helping traffic to move faster. On Connecticut's Merritt Parkway, a trial installation is wired up from a remote stretch to State Police Headquarters, where the speed of cars passing the radar unit is indicated. When traffic congestion occurs, it is immediately indicated. Police are then dispatched to clear up the trouble and get the cars moving again.

In cities, overhead Doppler radar units are taking the place of pressure or magnetic detectors set in the road for controlling traffic lights. Some engineers prefer radar because installation does not involve digging up the road.

At semi-actuated intersections, two such detectors count side-road approaches while the traffic signal is set to favor main traffic. At fully actuated intersections, four radar units count vehicles approaching from all directions and allocate green time to favor the heaviest traffic. In larger cities, one fully-controlled intersection often operates signals at nearby intersections as well.

It is estimated that over a thousand cities will have such electronic traffic-control systems within five years. Just as any other electronic unit, these need servicing, and the trouble-shooting problems are actually simpler than for black-and-white television, which makes it a potentially profitable field for TV servicemen. Keep an eye on it.

TV REPLACEMENTS. Though long since near saturation, the refrigerator business thrives on. Obsolescence does the trick, even though the average life of a box is around ten years. The number of total boxes now in use stays pretty constant.

Without color as a shot in the arm, TV would approach saturation by 1960 when 91% of all households should have TV, according to RETMA. With the figure at 75% today, this means about 3,000,000 new sales annually for the next four years. Balance of the new sets sold will be replacements, of which there were 2,366,000 in 1955.

If five years is the average TV set life, it'll be 1965 before replacements reach their maximum. Then, with around 50,000,000 sets in use (perhaps more because of second sets and an upping of the 91% saturation figure), a fifth of those or 10 million TV sets a year will be replaced. This is nice business, and something to look forward to.

What color TV will do to this picture is anybody's guess right now, but on a long-term basis it should be all for the good. If the launching of color causes people to stick with their old black-and-white set a while longer until they see whether color comes down further in price, they'll eventually have to catch up and buy a new set—color or black-and-white.

From a servicing standpoint, then, TV will be a good business for many years to come. Don't be discouraged if the growing pains of color TV make your own business momentarily poor. There's no real reason

• *Please turn to page 79*

www.americanradiohistory.com

Quicker Servicing

by Calvin C. Young, Jr.

Screw-Holding Screwdrivers

There are times during a repair job when it is very difficult to get a screw started. A considerable amount of time can be wasted if a hit or miss method is employed.

Some technicians have used a little wax from a paper capacitor to hold the screw to the screwdriver while inserting the screw and getting it started. This method works fine if a waxed paper capacitor is available. However, the bottom of the chassis is not always exposed when we need to start a screw, and a waxed capacitor is becoming rather hard to find in TV receivers since molded plastic units have become so popular.

There are several screw-holding screwdrivers on the market which will hold a screw in any position while it is being started. Four of these screwdrivers are shown in Fig. 1. The one at the left is made by Hunter Tool Co. of Whittier, Calif. Pushing on the handle causes the center section of the blade to rotate and wedge into the slot of the screw.

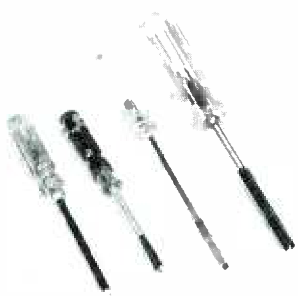


Fig. 1. Screw-Holding Screwdrivers.

Second from the left is a driver made by Kedman Co. of Salt Lake City, Utah. Pushing on the flared section just below the handle pulls the two sections of the blade together and wedges them into the screw slot.

Fig. 2. Trap Door and Escutcheon on Admiral Model 16R11 TV Receiver.

Third from the left is made by Vaco Products Co., Chicago, Ill. It has a piece of spring steel that fits between the blade of the screwdriver and the side of the screw slot. The spring action of the piece holds the screw to the blade.

The screwdriver at the extreme right is made by Xcelite, Inc., Orchard Park, N. Y. It consists of a standard screwdriver and a slip-over unit of spring steel. Pushing on the handle of the screwdriver forces the two halves of the tip apart and wedges them into the slot of the screw.

Any one of these units will greatly speed up the starting of screws in difficult places and should find a ready place in everyone's tool kit.

Trap-Door Replacement

Many television receivers have the seldom-used operating controls hidden behind a trap door in the front panel. The controls are hidden from sight to prevent tampering by small children and to improve the receiver's appearance. These doors are usually made of plastic or metal and are generally hinged and spring-loaded so that they will be held closed by spring tension.

There will be occasions when you will encounter a receiver with a missing or broken door. This greatly detracts from the appearance of the receiver and exposes the control knobs to the inquisitive inspection of small children.

If you have ever tried to replace one of these doors, you are probably well aware that it is not a simple task. However, there is a trick to getting the door in place and the springs and hinge pin installed all at one time, which makes the job considerably easier. Instead of just removing a broken door and then trying to fix the new door by a hit or miss proposition, you can save considerable time and minimize frayed nerves by studying the way in which the broken door is connected to the cabinet and by making a small sketch of the hinge arrangement.

As an illustration of this type of installation, the escutcheon and door from an Admiral Model 16R11 are shown in Fig. 2. Both the escutcheon and door are made of a plastic material, and the door also has plastic hinge pins extending from the bottom of each side.

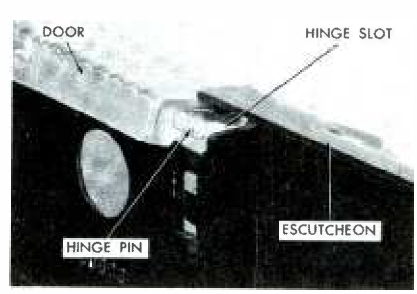


Fig. 3. Rear View Showing Hinge Slot.

These hinge pins slip into slots in the escutcheon, and a coil spring around each pin holds the door closed. It is possible to install the springs in such a manner that the door would be held open. It is important, therefore, when installing the springs, to make sure that they are exerting tension in the right direction.

To connect the door to the

www.americanradiohistory.com

escutcheon, slip a spring over the left hinge of the door. The short-end wire of the spring should rest in the slot provided in the door and the long wire of the spring should pass across the front of the hinge. With the spring installed, slip the left hinge into the slot on the escutcheon. This will leave the long wire of the spring protruding between the door and the escutcheon in the front. Hold the door open and slip the long wire of the spring around the ear on the escutcheon to hold the hinge in place. The door will have a tendency to spring shut from the tension exerted by the left hinge and spring. Expose the right hinge

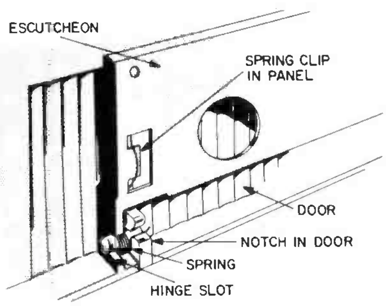


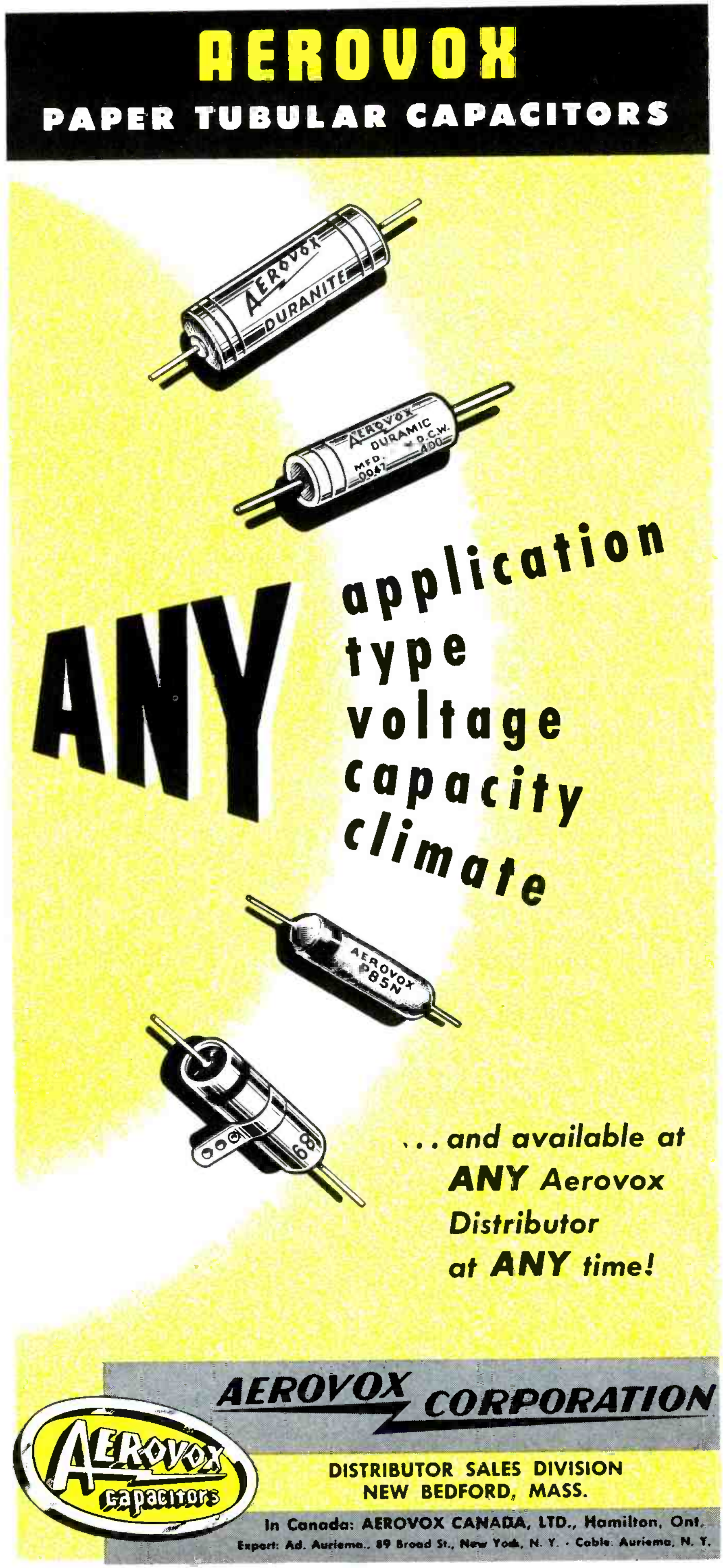
Fig. 4. Drawing of Hinge and Spring.

as shown in Fig. 3. Slip the other spring over the hinge with the short end resting in the slot on the door and the long wire passing across the front of the hinge and protruding between the door and the escutcheon. Fasten the long wire of the spring around the ear on the escutcheon to complete installation. Details of this installation are shown in Fig. 4.

Actually, this is a very simple method of holding a door in place and at the same time providing spring tension to hold the door closed.

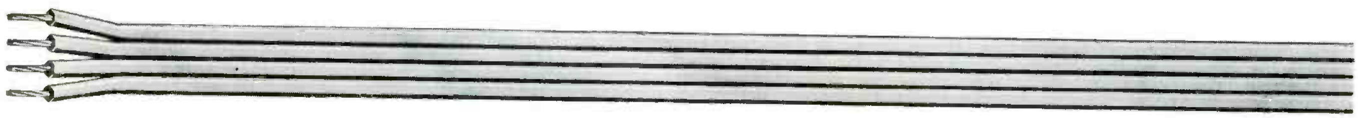
The simplicity of the installation is the factor that makes it a little tricky. There are other systems of hinging and providing spring tension to hold doors closed and in place. A little thought and careful study should enable any technician to replace them in a very short time.

As an example of the low cost of installing a new door, consider that both the door and the escutcheon in Fig. 2 cost less than $1.00 each. These are net costs, and it is apparent that you could easily realize a satisfactory profit on a repair of this type. ▲



www.americanradiohistory.com

If it's worth the cost of installation...



...it's worth the cost of engineered cable

Belden

TRANSMISSION LINES

•

ROTOR CABLES

Superior Cables engineered for the job—In a complete line for every requirement. Packaged for easy handling.

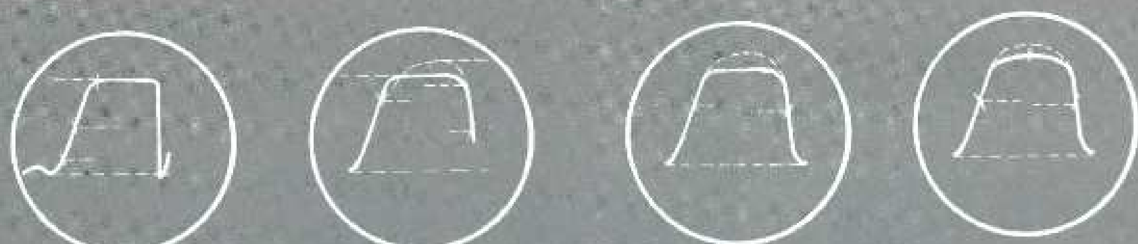
"More items from the Complete Belden Line"

Belden
WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

9-8

Magnet Wire • Lead and Fixture Wire • Power Supply Cords, Cord Sets and Portable Cord • Aircraft Wires
Welding Cable • Electrical Household Cords • Electronic Wires • Automotive Wire and Cable

www.americanradiohistory.com



NEW ALIGNMENT TECHNIQUES

Practical for Black-and-White Excellent for Color

By John R. Meagher*

Introduction

The conventional method of checking the over-all frequency response of television receivers has certain limitations which, while of little importance in servicing black and white receivers, are important in servicing color receivers.

Other methods are free from these limitations and have been used successfully for many years by receiver design engineers. One of these methods has been developed by RCA for use in servicing color receivers. It may also be used advantageously for checking the true over-all frequency response of black-and-white receivers.

Briefly, this method utilizes an RF signal which is amplitude modulated by a video sweep signal of approximately 0 to 5 mc. The resultant modulated RF signal is fed into the antenna-input terminals of the color receiver. The signal passes through the RF and IF amplifiers and is demodulated in the second detector. The modulation, which is the video sweep signal, appears across the second-detector load circuit. The sweep waveform at the output of the second detector represents the frequency-response characteristics of the RF and IF amplifiers modified by the response characteristics of the second-detector load circuit. The video sweep signal passes from the second detector through the luminance and chrominance channels to the cathodes and grids of the color picture tube. The sweep waveforms at the picture tube represent the over-all frequency response of the RF and IF amplifiers, the second detector and its load circuit, and the luminance and chrominance channels.

The video sweep modulated RF signal method, which for brevity in this article will be referred to as the VSM method, does not replace the conventional method of aligning RF and IF amplifiers. The VSM method does, however, make it possible to determine the true over-all frequency response of the receiver from the antenna-input terminals to the picture tube, and a method of this type is essential for correct adjustment of the tuned circuits in the chrominance channel.

The VSM method utilizes the same items of test equipment that

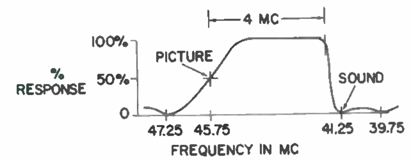


Fig. 2. Idealized RF and IF Response Curve.

are required for RF and IF alignment. A sweep generator (which must cover the video-frequency range), a crystal-calibrated marker generator, and an oscilloscope are required. Two accessory items are also necessary—a video Multi-Marker and an RF modulator.

Because a method of the VSM type is so important for correct adjustment of chrominance-channel response, the following detailed explanation has been prepared, starting with a review of the conventional method.

The Conventional Method

The conventional method of checking over-all frequency response consists of two main steps:

(1) Checking the response of the RF and IF amplifiers.

(2) Checking the response of the video amplifier or the luminance and chrominance channels.

* Mr. Meagher is a Television Specialist with the Tube Division of Radio Corp. of America, Harrison, N. J.

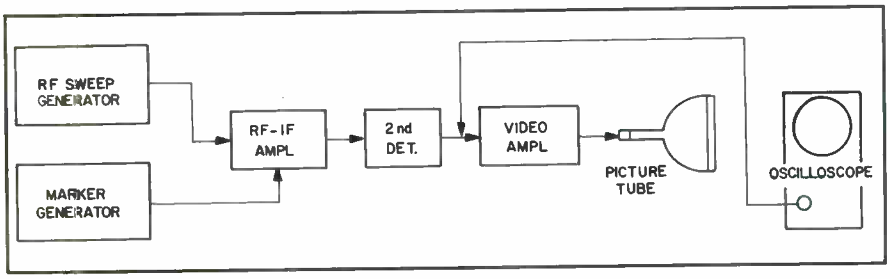


Fig. 1. Conventional Hookup for Checking RF and IF Response.

www.americanradiohistory.com

an easy out!

for all your transformer replacement problems

STANCOR

EXACT REPLACEMENT

TV TRANSFORMERS

- exact duplicates, electrically and physically
- no chassis or circuit alterations

There are over 200 TV transformers listed in the new Stancor TV Replacement Guide...140 of them are exact replacements. Write now for your FREE copy.

NEW STANCOR EXACT REPLACEMENTS *include*

A-8151 Vertical Output
for RCA 972448-1 and 970727-27

DY-18A Yoke
for Sylvania 100-0003/5/6/7

DY-19A Yoke for Sylvania 100-0009

DY-20A Yoke for Sylvania 100-0004

A-8283 Flyback
for CBS Columbia 12000841

EXPORT SALES: Roburn Agencies, Inc.
431 Greenwich St., New York 13, N. Y.

CHICAGO STANDARD TRANSFORMER CORPORATION

3503 ADDISON STREET • CHICAGO 18, ILLINOIS

www.americanradiohistory.com

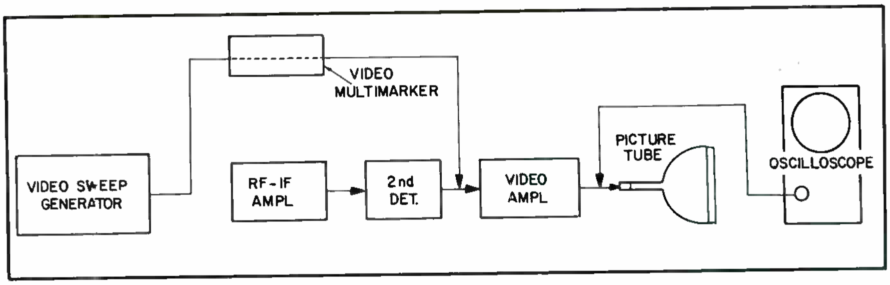


Fig. 3. Conventional Hookup for Checking Frequency Response of Video Amplifier.

Checking RF and IF Response

The frequency response of the RF and IF amplifiers is checked by connecting the test instruments as shown in Fig. 1. An RF sweep signal is fed into the receiver. An oscilloscope is connected to the second-detector load circuit to display the waveform of the sweep signal after it has passed through the RF and IF amplifiers and has been rectified in the second detector.

The RF sweep generator furnishes a constant-amplitude signal, the frequency of which increases and decreases (usually at a 60-cycle rate) over the range of the desired TV channel. A CW signal obtained from an RF or IF marker generator is also fed into the receiver to mark the location of the picture-carrier frequency and other frequencies on the response curve. An idealized RF and IF response curve is shown in Fig. 2.

The waveform of the rectified sweep signal at the output of the second detector represents the frequency-response characteristics of the RF and IF amplifiers. The rectified signal is a 60-cycle waveform roughly approximating the shape of a 60-cycle square wave with slow rise and fall times. It has no high-frequency components.

Published curves showing RF and IF responses as viewed at the second detector are usually identified in terms of the RF or IF frequencies which are represented by different points along the curve. Occasionally the curves are identified by the equivalent TV picture-modulation frequencies, with the picture carrier representing zero modulating frequency, and the other end of the curve representing 4-mc modulation. From such markings, some technicians may wonder why the rectified sweep signal at the output of the second detector cannot be used to check the frequency response of the video amplifier. It would seem that such a check would simply entail moving the oscilloscope probe from the second detector to the output of the video amplifier. It should be clearly understood that when an RF sweep signal is used, the rectified signal that appears across the second-detector load circuit is actually a 60-cycle waveform with no high-frequency components; therefore, it cannot be used for checking the frequency response of the video amplifier.

The low-frequency response of the vertical amplifier in the oscilloscope should be flat down to a few cycles per second in order that

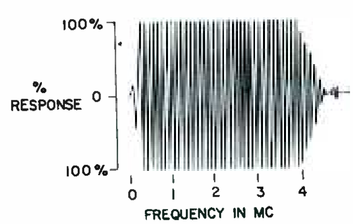


Fig. 4. Video Sweep Signal at the Output of an Idealized Video Amplifier.

false tilting of the flat top portion of the curve will not occur. The high-frequency response of the oscilloscope need not extend beyond a few kilocycles.

Checking Video Amplifier Response

The response of the video amplifier is checked by connecting the equipment as shown in Fig. 3. A video sweep signal is fed into the grid circuit of the first video amplifier. An oscilloscope is connected at the ouput of the amplifier to display the waveform of the video sweep signal after it has passed through the amplifier stage.

The video sweep generator furnishes a constant-amplitude signal, the frequency of which increases and decreases (usually at a 60-cycle rate) from zero frequency to 5 mc. In actual practice, the frequency of the sweep signal does not decrease to zero but to about 50 kc. A CW signal from a video signal generator may also be fed into the video amplifier to mark, the response curve at desired frequencies; but as explained later, it is preferable to use video frequency absorption traps rather than a generator. The waveform of the video sweep signal at the output of the video amplifier represents the frequency-response characteristics of the video amplifier.

The frequency of the sweep signal at the output of the amplifier increases and decreases between .05 mc and 5 mc. To observe this signal without modulating it, it is necessary to use a wide-band oscilloscope in conjunction with a low-capacitance probe. The response of the oscilloscope in this case must be flat to 4.5 mc. If the response of the oscilloscope tapers off or has hills and valleys, the observed video amplifier response curve will be altered by the frequency characteristics of the oscilloscope. Fig. 4 shows how the video sweep signal at the output of an idealized video amplifier would appear on a wide-band oscilloscope.

The sweep signal at the output of the video amplifier may be rectified or demodulated by a suitable diode probe on the oscilloscope input cable. The waveform of the resultant rectified signal shown in Fig. 5 is the frequency-response curve of the video amplifier. The rectified signal is a 60-

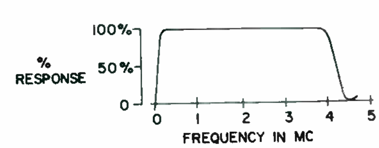
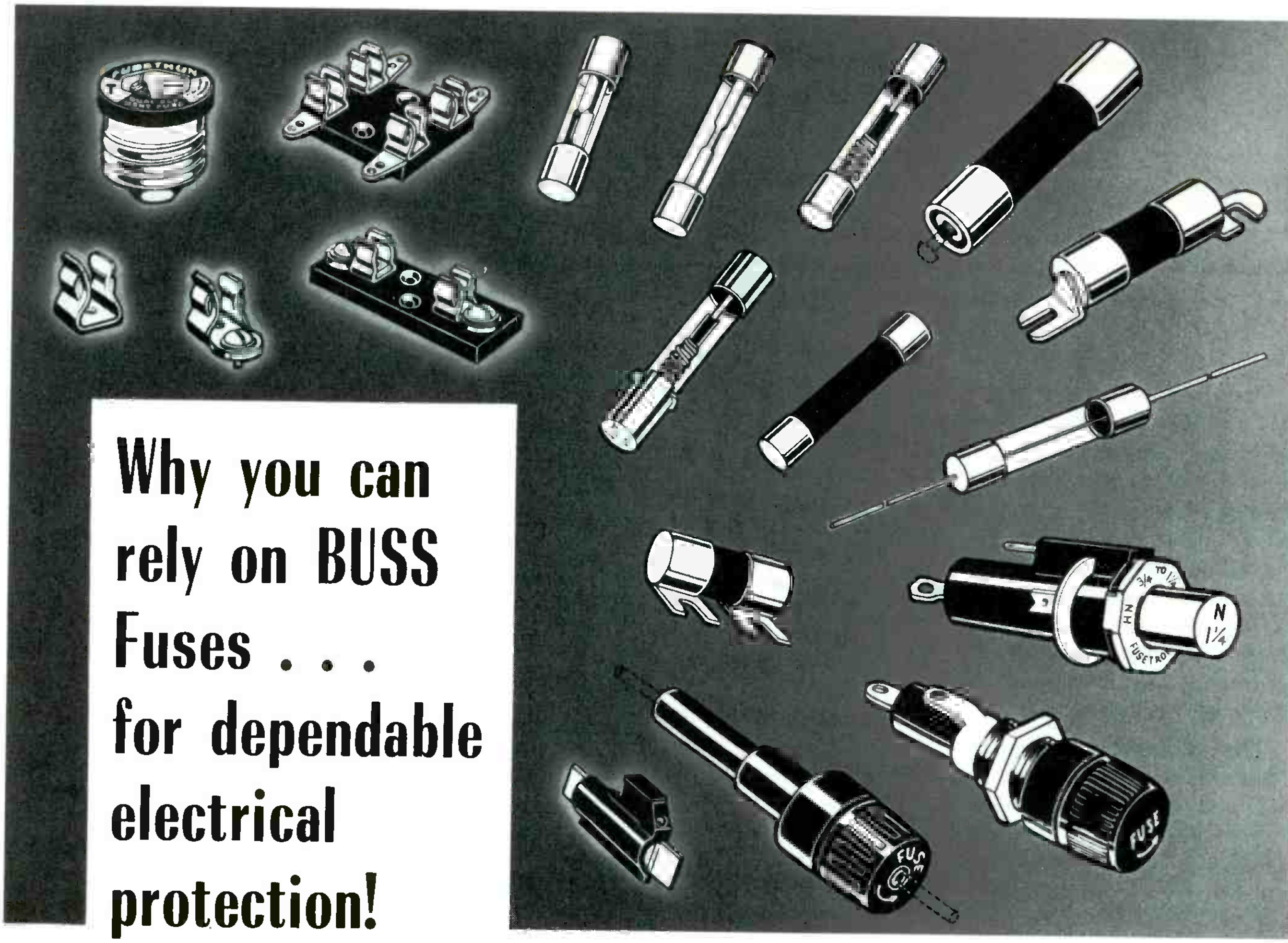


Fig. 5. Demodulated Video Sweep Signal At the Output of an Idealized Video Amplifier.

cycle waveform with no high-frequency components, and it may be observed on either a narrow-band or wide-band oscilloscope which is flat down to a few cycles per second. The waveforms in Figs. 4 and 5 show the same fre-

www.americanradiohistory.com



Why you can rely on BUSS Fuses . . . for dependable electrical protection!

To make sure of top quality and proper operation—BUSS fuses are tested in a sensitive electronic device. Any fuse not correctly calibrated, properly constructed and right in all physical dimensions is automatically rejected.

That's why BUSS fuses provide maximum protection to users' equipment against damage due to electrical faults . . .and help safeguard your reputation for quality and service. And just as important, BUSS fuses, by their unfailing dependability, help you avoid costly, time-wasting callbacks by eliminating needless blows.

To meet service needs, a complete line of BUSS fuses is available: standard types, dual-element (slow blowing), renewable and one-time types—in sizes from 1/500 amp. up . . . plus a companion line of fuse clips, blocks and holders.

BUSS fuses have ready customer acceptance . . .

Over the past 41 years, millions upon millions of BUSS fuses have been used in homes, industries and on farms. As a result, BUSS is the known brand of fuses—accepted by the trade and consumer as the finest available. This means sales are easier to make because BUSS quality is never questioned.

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

BUSSMANN MFG. CO.
(Div McGraw Electric Co.)
University at Jefferson St. Louis 7, Mo.

956

For information on BUSS and Fusetron small dimension fuses and fuseholders . . . Write for bulletin SFB.

www.americanradiohistory.com

quency response which, for this idealized case, is flat to 4 mc.

The Missing Link

In the idealized response curve shown in Fig. 2, the picture carrier has been placed at the 50% response point. The slope at the picture-carrier end has been made linear and covers the correct bandwidth. With such a response, the low-frequency components contained in both the upper and lower sidebands fall on the slope and add vectorially to produce approximately 100% output. The higher-frequency components contained only in the upper sideband fall on the flat top and also produce 100% response. Consequently, the response shown in Fig. 2 is

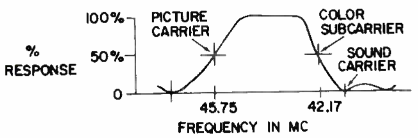


Fig. 6. RF and IF Response Curve of a Recent Color Receiver.

essentially flat for signals from the lowest frequency to approximately 4 mc. The video amplifier response shown in Figs. 4 and 5 is also essentially flat from zero frequency (if the amplifier is direct

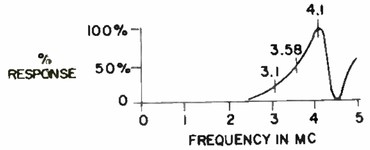


Fig. 7. Chrominance Take-Off Response Curve of a Recent Color Receiver.

coupled) or from some low frequency (if the amplifier is capacitively coupled) to approximately 4 mc.

Because the response of the RF and IF amplifiers and the response of the video amplifier are both flat to 4 mc, it might be assumed that the over-all response of the receiver in this case is also flat to 4 mc. This assumption, however, is not necessarily true because the conventional method of checking response fails to reveal the effect that the frequency-response characteristics of the second-detector load circuit contributes to the over-all response of the receiver.

When the conventional method of checking response is used, the frequency characteristics of the second-detector load circuit represents a missing link in the receiver chain.

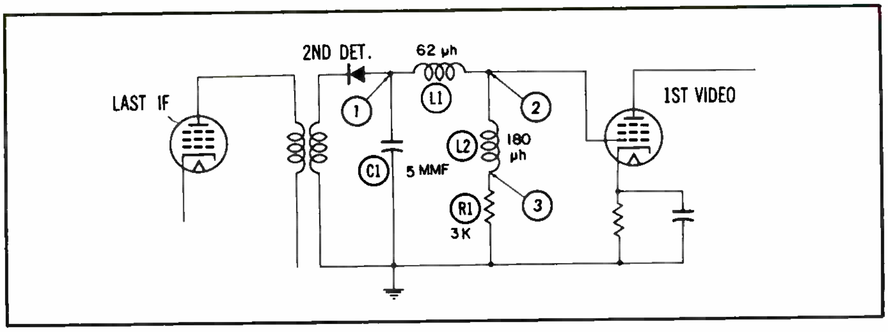


Fig. 8. Representative Second-Detector Load Circuit.

The effect of this missing link is of little practical importance in servicing black-and-white receivers because the frequency response of the video amplifier and the second-detector circuit is fixed. There are no tunable components in the video circuits of conventional black-and-white receivers. Minor differences in video-frequency response, resulting from the normal tolerances in the values of components, have only a slight effect on the reproduced picture quality.

Missing Link is Important in Color

In color receivers, the effect of the second-detector load circuit is important for several reasons. The chrominance circuits, including the band-pass filter and the demodulator circuits, are tunable and must be tuned to obtain the correct over-all frequency response. This response is directly affected by the response of the second-detector load. In recent color receivers, the RF and IF response is adjusted so that the color subcarrier will fall at the 50% response point as shown in Fig. 6. The response of a portion of the chrominance circuit must be adjusted to compensate for this slope. Fig. 7 shows the proper response curve of the color take-off transformer in the chrominance channel of a receiver of this type. The complementary response (equal but opposite slopes) is necessary in order to obtain equal gain, or a flat over-all response, for the upper and lower sidebands of the color subcarrier.

The frequency-response characteristics of the second-detector load circuit directly affect the over-all response of the chrominance channel. The conventional method of checking response fails to reveal the effect of the second-detector load circuit; hence, it is necessary to use a different method in order to adjust the tuner circuits in the chrominance channel for correct over-all response.

Why Second-Detector Response is Missed

It may be helpful at this point to explain why the conventional method of checking response fails to include the effect of the second-detector load circuit. A representative second-detector load circuit is shown in Fig. 8. The load in this circuit consists of a small IF bypass capacitor C1, two video-frequency peaking coils L1 and L2, a load resistor R1, and the stray wiring and input capacitance of the first video-amplifier grid circuit.

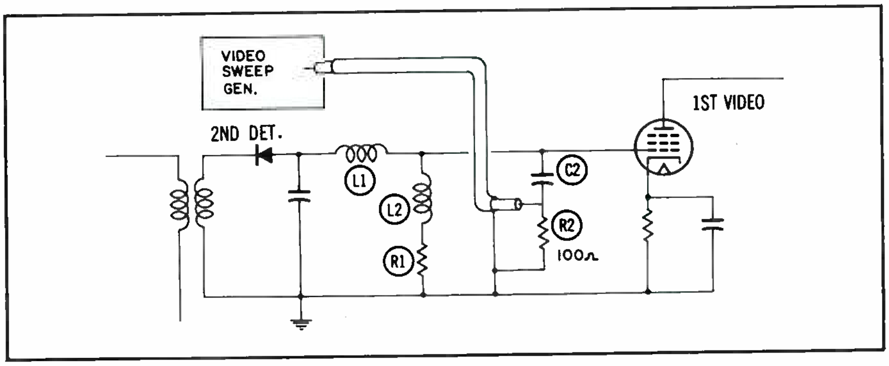


Fig. 9. Cable Termination at the Grid of the First Video Amplifier.

www.americanradiohistory.com

. . . another
MALLORY
service-engineered
product

You'll go for
MALLORY GEMS
—the new plastic tubular capacitors

For replacement of paper tubulars, you can't beat new Mallory "Gems." Compare these value features—yours *without* premium price:

- **Locked-in leads** can't loosen from soldering iron heat or vibration.
- **Real humidity protection,** using a high grade mica-filled bakelite case, ends possibilities of premature shorts.
- **Uniform quality** of each capacitor is assured by true-center construction, which protects the element from damage during assembly.

Try Mallory "Gems"—and you'll never settle for less. Get your stock now, from your local Mallory distributor.

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

- Capacitors
- Vibrators
- Resistors
- Power Supplies
- Mercury Batteries
- Controls
- Switches
- Rectifiers
- Filters

As mentioned previously, the frequency of the RF sweep signal varies from the low-frequency end of the TV channel to the high-frequency end, and back to the low-frequency end, at a rate of 60 times per second. Most sweep generators have provisions for blanking (reducing the output signal to zero amplitude) during the return sweep in order to provide a zero-output reference line on the oscilloscope. Hence the rectified sweep signal, or response curve, at the output of the second detector is traced at a rate of 60 times per second.

Because the rectified sweep signal is a low-frequency signal, with no high-frequency components, the response characteristics of the second-detector load circuit are not represented in the shape of the observed response curve. For this reason the oscilloscope may be connected to point 1, point 2, or point 3 in the second-detector load circuit of Fig. 8, and no difference in the shape of the response curve will be observed. In fact, the peaking coils L1 and L2 may be shorted out without changing the shape of the response curve. For the same reason, either a low-capacitance probe or a direct cable is suitable for connecting the oscilloscope to the second-detector load circuit. The added capacitance of the plain cable will have no noticeable effect on the shape of the curve. It is evident from these facts that the characteristics of the detector load circuit do not show up when using the conventional method.

For a different reason, the same thing is true when the conventional method is used for checking the frequency response of the video amplifier. The video output cable from the sweep generator is connected across the grid circuit of the first video amplifier as shown in Fig. 9. The cable is terminated in a resistor which has a value of about 100 ohms (R2). In addition to terminating the cable, the function of this resistor is to "swamp out" or nullify the frequency-response characteristics of the circuit to which the cable is connected. Connection of the sweep cable to a circuit will in any case alter the frequency-response characteristics of the circuit. By

www.americanradiohistory.com

using a low-value terminating resistor on the cable, the response of the circuit is made to be flat over the video-frequency range.

C2 is a blocking capacitor connected in series with the sweep output lead to prevent a possible short-circuit across the grid-bias supply used for the first video amplifier in some receivers. Compared with the value of the terminating resistor, the value of the capacitor is high enough to have negligible reactance at the lowest video frequency of .05 mc. Because the reactance of the blocking capacitor is negligible, the 100-ohm resistor is effectively shunted across the second-detector load circuit.

The low-value resistive loading of the sweep cable completely eliminates any effect from the frequency-response characteristics of the second-detector load circuit. For instance, the two peaking coils, L1 and L2, may be shorted out while the response of the video amplifier is observed; and there will be no change in the shape of the video amplifier response curve.

From these facts, it is evident that the frequency-response characteristics of the second-detector load circuit do not show up when the conventional method is used to check the response of either the RF and IF amplifiers or the video amplifier. But we know that the response of the second-detector load circuit does affect the over-all response of the receiver. It is interesting to note that in many receivers, the second-detector load is intentionally peaked at about .75 mc in order to improve the picture quality.

Receiver Engineers Use Other Methods

For many years television receiver design engineers have been using methods which take into consideration the effect of the second-detector load circuit upon the over-all frequency response. Such methods are considered essential for determining the true over-all frequency response of the luminance and chrominance channels in color receivers and for correct adjustment of the tuned circuits in the chrominance channel. Consequently RCA has developed one

...another MALLORY service-engineered product

to prevent "middle age hum"

use capacitors with ...

Etched Cathode

Etched Cathode construction

is standard in *all* Mallory FP's, and in popular Mallory metal and cardboard tubular electrolytics . . . *at no extra cost!*

Your Mallory distributor can tell you why this *extra* performance feature is important to you and to your customers.

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

• Capacitors • Controls
• Vibrators • Switches
• Resistors • Rectifiers
• Power Supplies • Filters
• Mercury Batteries

www.americanradiohistory.com

WHEN IT RINGS...

IS IT A CALL-BACK?

...OR IS IT NEW BUSINESS?

Thorough servicing is profitable servicing. That's why business-minded servicemen insist on the **best** in test equipment, **best** in technical "know-how", **best** in components. And those **dependable** Clarostat controls and resistors certainly round out those stay-put, profitable, good-will-building jobs.

• Ask your Clarostat distributor for latest catalog.

CLAROSTAT ®

CONTROLS—RESISTORS

CLAROSTAT MFG. CO., INC. • DOVER, N.H.

In Canada: Canadian Marconi Co., Ltd. Toronto 17, Ont.

www.americanradiohistory.com

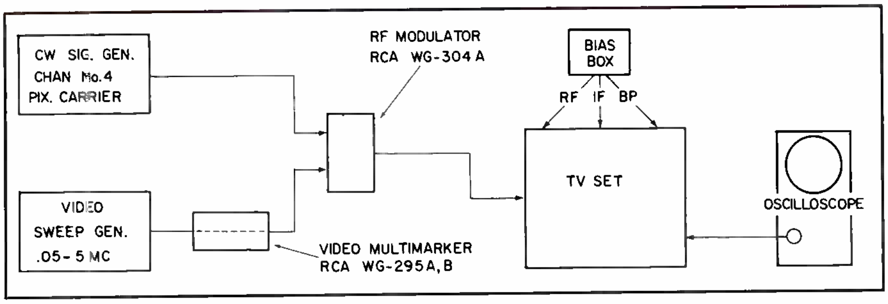


Fig. 10. Test Equipment Hookup for the VSM Method.

of these methods for use in servicing color receivers, and has also developed and marketed a small accessory item of test equipment, an RF modulator, which is required in applying this method.

The VSM Method

The equipment hookup for the VSM method is shown in block-diagram form in Fig. 10. A CW signal is obtained from a crystal-calibrated marker generator that produces fundamental-frequency output rather than harmonic or beat-frequency output. Beat-frequency generators often have numerous components of different frequencies in the output signal. The measured output voltage of the combination may appear to be sufficiently high, 0.1 volt rms or more, but the amplitude of the desired frequency component may be only a small fraction of the total measured output.

A video-frequency sweep signal, sweeping the range of approximately .05 mc to 5 mc, is obtained from a suitable sweep generator. It is necessary to mention here that some sweep generators do not cover this range and are not suitable for the VSM method.

Marking is accomplished by feeding the sweep signal through an RCA WG-295A or WG-295B video MultiMarker. This device contains a number of high-Q traps, each tuned to a different frequency in the video range. Each trap absorbs energy and causes a reduction, or notch, in the amplitude of the sweep signal as the signal sweeps through the resonant frequency of the trap. The traps are factory-tuned to the specific frequencies that are necessary in marking the response curves of color receivers. The marker frequencies needed for checking the over-all response curves of black-and-white receivers are also provided.

The equipment hookup is such that the trap markers will always be present on the response curves observed at various points in the receiver. In narrow-band circuits, only the pertinent markers appear. Each marker can be easily identified by touching a corresponding contact on the Video MultiMarker, which reduces the amplitude of the marker and causes it to shift slightly lower in frequency.

Because all of the markers are always present on the video-sweep signal, this type of marking is much faster and simpler than the method which utilizes a video-signal generator. A signal generator must be tuned repeatedly from one desired marker frequency to another, and the presence of harmonic and other spurious markers creates serious uncertainties when working in the lower-frequency video ranges.

The appearance of the marker notches may be observed by feeding a video sweep signal of .05 mc to 5 mc into the MultiMarker and connecting an oscilloscope to the output. Fig. 11 shows this signal as displayed on a wide-band oscilloscope. Fig. 12 shows the same signal as displayed on either a narrow-band or wide-band oscilloscope used in conjunction with a diode probe.

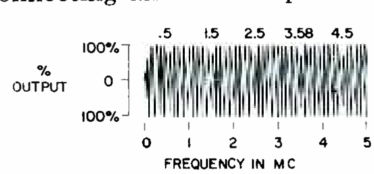


Fig. 11. Video Sweep Signal With MultiMarker Notches.

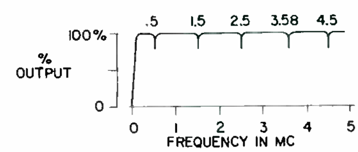
New RF Modulator Unit

The CW signal and the marked video sweep signal are fed into a specially-designed diode circuit that has recently been developed and marketed by RCA—the WG-304A RF modulator. The CW signal is amplitude modulated by the video sweep signal in this diode circuit. The circuit is arranged to minimize feed-through of both the CW and the video-frequency sweep signals. It is factory-neutralized at 67.25 mc, the picture-carrier frequency of channel 4. If desired, the user can adjust the WG-304A for operation on channel 3, as explained later.

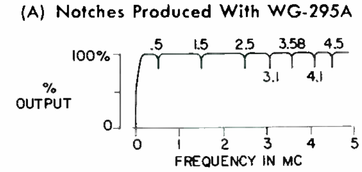
Applying the Signal

The CW signal is accurately tuned to 67.25 mc, the picture-carrier frequency of channel 4. The receiver also is tuned accurately to channel 4. Information on this point is given later.

The bias voltages specified for over-all RF and IF alignment are applied to the receiver.



(A) Notches Produced With WG-295A



(B) Notches Produced with WG-295B

Fig. 12. Demodulated Video Sweep Signals With MultiMarker Notches.

The VSM signal from the RF modulator is applied to the antenna terminals of the receiver.

The signal passes through the RF and IF amplifiers and is demodulated in the second detector. The amplitude modulation, which is the video sweep signal from 0.5 to 5 mc, appears across the second-detector load circuit, and is fed into the video amplifier. In black-and-white receivers, the video sweep signal passes through the video amplifier to the grid or cathode of the picture tube.

In passing through the RF and IF amplifiers, the amplitude of the signal is directly affected by the frequency-response characteristics of the RF and IF amplifiers. Consequently, the waveform of the video sweep signal that appears across the second-detector

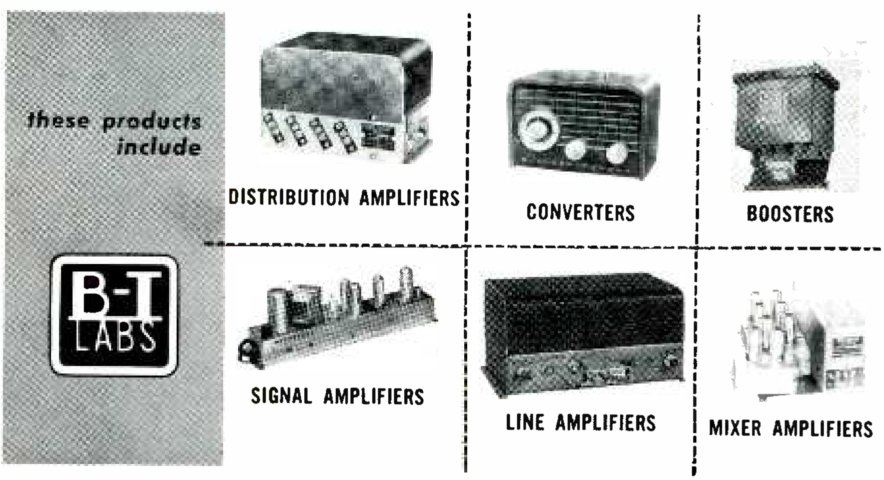
www.americanradiohistory.com

What About Color TV?

There has been much talk about Color TV — and about whether or not available TV equipment is suitable for Color TV reception. Whatever other conditions prevail — one thing is certain . . .

ALL B-T LABS TV PRODUCTS ARE
ENGINEERED for COLOR

Every piece of Blonder-Tongue equipment ever built, sold and in use — or ever to be used — is designed with color in mind . . . with the flat, broad output required for color.



. . . and all B-T impedance matching devices, equalizers, couplers, attenuators, connectors and tap-offs.

For example:

The 2-SET COUPLER

Model TV-42

is the only type approved by engineers for color — with a flat response from 0 to 900 mc.

Every B-T LABS Master TV System now in operation is designed to meet the exacting demands of Color Television . . . today and tomorrow.

Keep abreast of the Latest Developments. Apply for your **FREE** subscription to the **B-T BULLETIN**.

B-T LABS Write today, to Dept. 0 J-13

BLONDER-TONGUE LABS., INC. Westfield, New Jersey

In Canada: Telequipment, London, Ontario

The largest manufacturer of TV Signal Amplifiers, UHF Converters and Master TV Distribution Systems.

load is the response curve of these amplifiers, modified by the frequency characteristics of the second-detector load circuit.

Note the basic difference between the conventional method and the VSM method. In the conventional method, the signal that appears across the second-detector load is a 60-cycle waveform with no high-frequency components, and the shape of this signal is not effected by the response characteristics of the second-detector load. In the VSM method, the signal that appears across the second-detector load is a video sweep signal covering the video range from .05 to 5 mc, and the envelope waveform of this signal is directly affected by the frequency characteristic of the second-detector load circuit.

In passing through the video amplifier, the amplitude of the video sweep signal is directly affected by the frequency characteristics of the video amplifier; hence, the waveform of the video sweep signal that appears at the driven element of the picture tube is the frequency-response curve of the entire receiver. This includes the RF amplifier, the IF amplifier, the second detector and its load circuit, the video amplifier, together with the capacitive loading effect of the picture-tube input circuit.

In this way, it is possible to obtain a true picture of the over-all frequency response of the receiver from the antenna-input terminals to the picture tube with no missing links.

Applying VSM Method to Color Receivers

The procedure outlined above is followed in applying the VSM method to color receivers, but in order to check the chrominance channel it is necessary to operate the bandpass amplifier with the correct fixed grid bias voltage as specified by the receiver manufacturer because of the absence of color-burst signals.

In color receivers, the video sweep signal which appears across the second-detector load is fed through the luminance channel to the picture tube and also through the chrominance channel to the picture tube.

www.americanradiohistory.com

High reliability manufacturing of miniaturized paper tubular capacitors-- hermetically sealed in metal cans

SEPARATE FACILITIES are maintained for the exclusive processing and manufacture of high reliability capacitors. Only specially trained, highly skilled operators, who wear special clothing to prevent any possible source contamination, work here.

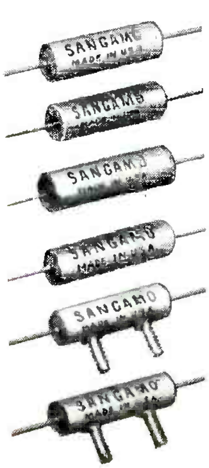
To produce subminiature paper capacitors free from any possibility of latent defects, for use in the most critical applications, the Sangamo Electric Company has recently intensified its high reliability program of fabrication and inspection methods.

Incoming materials for these capacitors are rigidly inspected to meet stringent high reliability standards and are stored in areas where temperature, humidity and dust are controlled at all times.

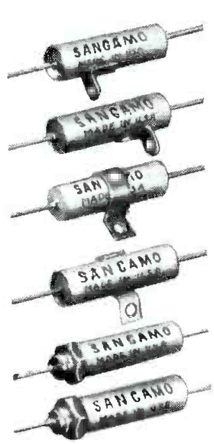
Complete production histories are kept on the basis of small capacitor lots. X-raying of individual units, heat tests, vibration tests, altitude tests, and total destruction tests of a given percentage of all finished units assure components with an extremely low AQL. Testing facilities and resultant performance characteristics are far in excess of military specifications. Specify these high reliability capacitors for your critical applications.

Mail the coupon below for Sangamo's *NEW Engineering Catalog TS-105A.* It contains full information, including an easy-to-follow cross reference showing each variation listed in MIL-C-25 versus the comparable Sangamo unit.

OIL-FILLED CAPACITORS are subjected to vacuum under elevated temperatures, then are individually examined to insure complete hermetic seal.



For your design convenience, an exceptionally wide choice of styles — twelve in all — is available with regard to tolerances, circuit assembly, lead styles, mounting brackets, insulating sleeving, and inductive or non-inductive sections.



SC56-7

SANGAMO ELECTRIC COMPANY

Capacitor Division

SPRINGFIELD, ILLINOIS

Please send me your NEW Engineering Bulletin TS-105A.

Name____________________

Company____________________

Address____________________

City__________ Zone_____ State________

www.americanradiohistory.com

LOOK FOR THIS RACK

at your Jobber . . .

In this rack you will find
The Biggest Service Help
The Largest Value
In These Perfect Partners

Dave Rice's Official Pricing Digest —a quick check for over 60,000 prices—revised 4 times every year. Pocket sized
and
Dave Rice's Official TV-Radio Service Order Book which provides separate listings for picture tubes, receiving tubes, parts and components, serial numbers, labor and state and local taxes. 5½x8½ —50 sets of triplicate orders—carbons bound in.

ELECTRONIC PUBLISHING CO. INC.
180 North Wacker Drive   Chicago 6, Illinois

When the VSM method is to be used for its present primary purpose of adjusting the tuned circuits in the chrominance channel, it is first essential to check the over-all response in the conventional manner. If necessary, the RF and IF circuits should be aligned on channel 4 to obtain the over-all response curve specified by the receiver manufacturer. If this is not done, the chrominance circuits may be adjusted incorrectly to compensate for misalignment of the RF and IF circuits. As mentioned in the introduction, the VSM method does not replace the conventional methods of aligning these circuits.

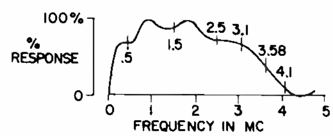


Fig. 13. VSM Response Curve at the Cathode of the First Video Amplifier (RCA 21-CT-660 Series).

Observing the Signal

When the VSM method is used, the response may be checked at the second detector, at the video amplifier, at points in the chrominance and luminance channels, and at the grids and cathodes of the color picture tube. At the present time, the only circuits that need be checked are those for which specific response curves (obtained by the VSM method) have been published by the receiver manufacturer.

For instance, the service data for all RCA color receivers show VSM response curves at points in the chrominance channel, because the VSM method is necessary for correct adjustment of the tuned circuits in this channel.

Two VSM response curves for the RCA 21-CT-660 series color receivers are shown in Figs. 13 and 14. Fig. 13 shows the response at a point in the cathode circuit of the first video amplifier, while Fig. 14 shows the desired over-all response at the plate of the demodulator driver and at the plates of the R-Y and G-Y demodulators. The color take-off transformer, the bandpass transformer, and the demodulator-driver transformer are adjusted to obtain the response shown in Fig. 14. The tilt in this response curve is intentional in order that optimum color picture quality may be obtained in these receivers. These curves can be observed with the use of a diode probe in conjunction with either a wide-band or narrow-band oscilloscope.

The connection of an oscilloscope to a video circuit places additional capacitance across the circuit. The added capacitance reduces the relative amplitude of the higher-frequency components of the video-sweep signal and consequently alters the true shape of the response curve. Low-capacitance probes usually have an input capacitance of about 10 to 15 mfd. The input capacitance of a suitable diode probe may be only 2 mfd. For this and other reasons, it is generally preferable to use a suitable diode probe in conjunction with either a narrow-band or a wide-band oscilloscope when checking frequency response in video circuits including the chrominance and luminance channels and the second-detector load circuit.

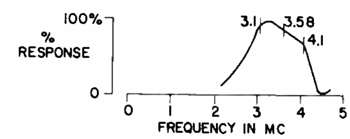


Fig. 14. VSM Response Curve at the R-Y or G-Y Demodulator Plate (RCA 21-CT-660 Series).

For trouble-shooting purposes, such as tracing the color-burst signal or tracing color-bar signals through the chrominance circuits, it is necessary to use a wide-band oscilloscope with a low-capacitance probe. The response of the oscilloscope and probe should be flat to 4.5 mc.

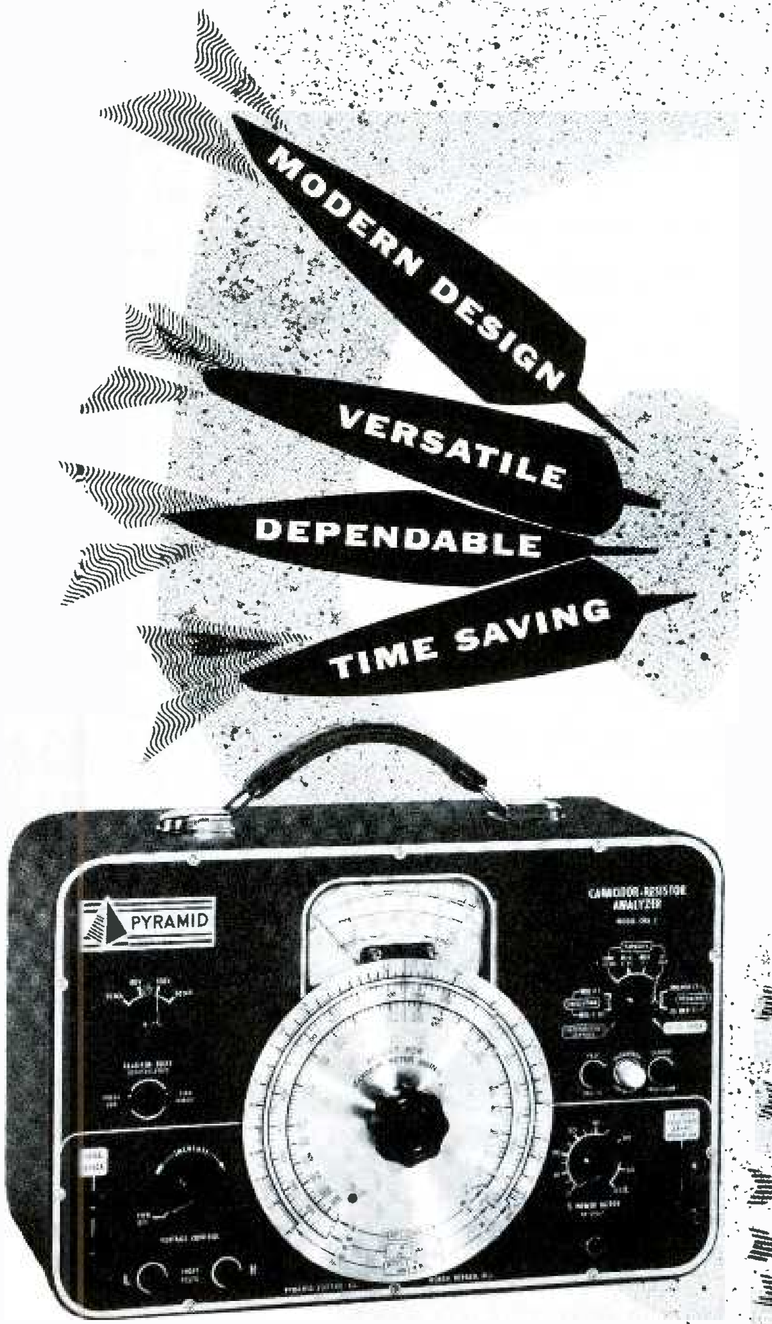
Adjusting Signal Levels

As in other methods, it is necessary to adjust the input-signal levels to prevent overloading of the receiver and to obtain correct modulation in the RF modulator. The levels are adjusted as follows:

Connect the test equipment as shown in Fig. 10. Apply the specified bias voltages to the RF and IF amplifiers. Tune the CW signal generator accurately to 67.25 mc. Tune the receiver accurately

www.americanradiohistory.com

Bull's-eye every time!



Burton Browne/New York

Examine it today

Being introduced by leading Electronic Parts Distributors

We hit the target again . . . with this new, modern version of the most wanted service-test instrument.

Pyramid introduces the CRA-2 Capacitor-Resistor Analyzer, a versatile, up-to-date, moderately priced test instrument. The CRA-2 is the perfect multi-purpose analyzer for the technician, serviceman and engineer, in industrial and military electronics, black and white, and color television, and all related fields.

The guesswork has been removed from circuit trouble shooting. When making leakage-current measurements, the values are read directly from the meter while the rated operating voltage is applied to the capacitor. A vacuum-tube ohmmeter circuit displays accurate insulation-resistance values on the meter for many types of capacitors. The extended range calibrated power factor control permits power factor measurements of electrolytic capacitors rated as low as 6 volts DC working and as high as 600 volts DC working. This special "QUICK CHECK" circuit performs rapid "IN CIRCUIT" test for short, open, intermittent high RF impedance and high power factor without removing or disconnecting the component from its operating circuit.

FEATURES

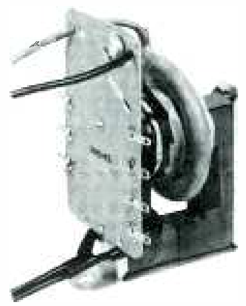
- "Quick Check" in circuit test for Open Circuits. Short Circuits. Intermittents. High RF Impedance. High Power Factor.
- Speedily and accurately checks: Capacitance. Power Factor. Resistance. Insulation-Resistance. Leakage Current.
- Precision meter for accurate readings of leakage current, applied voltage and insulation resistance.
- Combination Wien and Wheatstone bridge.
- Accurate vacuum-tube meter circuit.
- Parts of the highest quality are used. Wire and wiring meet military specifications.

PYRAMID ELECTRIC COMPANY

1445 Hudson Blvd., North Bergen, New Jersey

www.americanradiohistory.com

MERIT, first in exact and universal replacement transformers, yokes, coils —the only manufacturer of transformers, yokes and coils who has complete production facilities for all parts sold under their brand name.



HOV-42 FOR EXACT REPLACEMENT IN CBS-COLUMBIA. Another in the complete MERIT line of exact and universal replacements —the only single source for all your transformer and coil requirements.

Merit

MERIT COIL & TRANSFORMER CORP.
4427 NORTH CLARK STREET
CHICAGO 40, ILLINOIS

to channel 4. Connect a VTVM across the second-detector load circuit. Turn the sweep amplitude to zero. Adjust the CW generator to obtain a voltage equal to or slightly less than the voltage produced across the second-detector load by a TV signal of average strength. Depending on the particular model of receiver, this voltage is usually more than 1 volt and less than 5 volts. Disconnect the VTVM and connect the oscilloscope across the second-detector load through a diode probe. While observing the resultant pattern on the oscilloscope, gradually increase the amplitude of the video sweep signal until the shape of the pattern starts to alter and indicates overload. Reduce the sweep output slightly below this point.

In a few models of receivers in which the second-detector load is returned to a point that is above ground for video frequencies, it may be necessary to connect the oscilloscope to an observation point in the first video amplifier as specified in the service data for the receiver.

Determining Bias Voltages

When aligning the RF and IF circuits or the chrominance channel, it is necessary to apply the correct value of fixed negative bias voltages to all of these circuits. The required voltages are usually obtained from an external source. In using the VSM method, it is advisable to apply the same values of RF and IF bias voltages that are specified by the receiver manufacturer for over-all alignment.

If the service notes for the receiver are not readily available, the required values of external bias voltage may be determined as follows:

With an antenna connected to the receiver, tune in a TV signal of average strength. Using a VTVM, measure the developed bias voltage on the RF AGC bus and on the IF AGC bus. Tune in a color program and measure the developed bias on the bandpass amplifier. Set the external bias voltages to these same values when using the VSM method.

While measuring the bias voltages, also measure the DC voltage produced across the second-detector load by the TV signal. When using the VSM method, adjust the amplitude of the CW signal to produce the same value of DC voltage across the second-detector load circuit while the RF and IF circuits are biased correctly.

Tuning The Receiver To Channel 4

The WG-304A is factory-neutralized for operation on channel 4. When the VSM method is used, the receiver must be accurately tuned to channel 4. There are several methods for doing this, one of which follows.

Determine the correct frequency for the RF oscillator in the receiver on channel 4. In receivers with a picture IF of 45.75 mc, the correct frequency for the RF oscillator is 113 mc. Tune the crystal-calibrated marker generator to 113 mc, and turn the crystals off. Loosely couple a lead from the RF input terminal of the heterodyne detector in the generator to the local RF oscillator in the receiver. Slowly turn the fine-tuning control on the receiver until a beat is heard in the loudspeaker on the generator. The receiver will then be tuned accurately to channel 4, and the fine-tuning control should not be disturbed until all response checks and necessary adjustments have been completed.

Adjusting Sweep Width

It has been mentioned that the sweep generator should be adjusted to cover the range of .05 mc to 5 mc. When the response of the relatively narrow-band chrominance circuit is to be checked, the sweep width and center frequency of the video sweep signal may be changed to cover a range above and below 3.58 mc and cause the response curve to spread out.

Adjusting WG-304A for Channel 3

If desired, the user may adjust the neutralization in the WG-304A for operation on channel 3 instead of 4. Such a change may possibly be required in a few locations where a strong nearby channel-4 station rides in on the response curve.

Connect the equipment as shown in Fig. 10. Turn the sweep output to zero. Tune the marker generator accurately to 61.25 mc,

www.americanradiohistory.com

Versatile! V-M Hi-Fi Manual Phonograph

The Single Unit with Multiple Applications

It's compact, practical, convenient . . . and it'll open new markets for you! Sell it to schools, clubs, church groups and hi-fi enthusiasts.

V-M MODEL 156,
$99.95*

Four-Speed Control to play records of all four speeds—78, 45, 33 rpm plus the 16 rpm "Talking Book" speed.

Mixer Control can impose voice over music when using as a public address system. Also, it's excellent for blending music and voice when recording or when explaining slides.

Microphone Input Jack permits adaptation to public address system use.

Dual Output Jack provides for separate amplifier-speaker system or separate speakers only.

Two Speakers in Detachable Lid can be placed in the best room location. 6″ x 9″ woofer and 3.5″ tweeter give high-fidelity reproduction.

New Amplifier provides plenty of power to cover large rooms; offers extended-range high fidelity.

V-M Styling is good to look at. Two-tone gray leatherette is scuff-resistant and water-repellent.

See your V-M Representative . . . today!

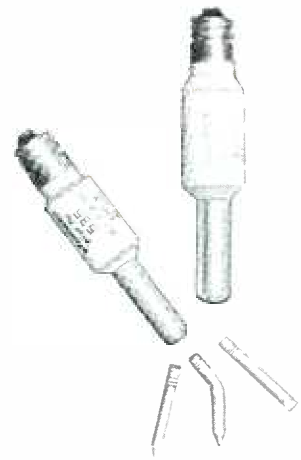
*Slightly higher in the West.

the Voice of Music®

V-M CORPORATION, BENTON HARBOR 7, MICHIGAN

WORLD'S LARGEST MANUFACTURER OF PHONOGRAPHS AND RECORD CHANGERS

www.americanradiohistory.com



THE UNGAR...ESPECIALLY DESIGNED FOR PRINTED CIRCUIT REPAIR AND PRODUCTION LINE SOLDERING

The famed Ungar Pencil soldering iron with its series of 16 interchangeable tips has been especially designed for printed circuit production and repair.

Tip temperature can be controlled simply by changing tips.

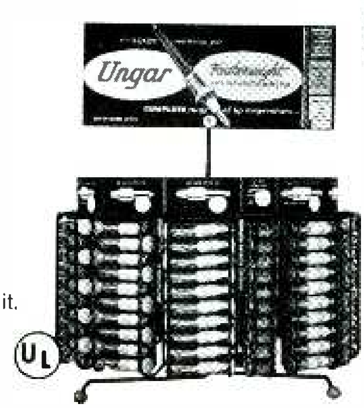
For printed circuit service heating Unit No. 535 with tiplet is recommended. This unit provides a 650° tip temperature at 23½ watts.

For operators well skilled in printed circuit soldering, heating Unit No. 1235 with tiplet drawing only 37½ watts delivering 750° tip temperature is recommended.

For heavy duty chassis service, an Ungar Super Hi Heat tip at 47½ watts delivering 1000° tip temperature is used.

Ask your parts distributor about the
Ungar PRINTED CIRCUIT MANUAL.

Better jobbers everywhere handle this Ungar iron and display it with 16 interchangeable tips and tiplets in this counter dispenser. Look for it.



Ungar ELECTRIC TOOLS, INC. 4101 Redwood Avenue, Los Angeles 66, Calif.

the picture-carrier frequency of channel 3. Use AF modulation, and adjust the generator for fairly high output. With an oscilloscope connected to the second-detector load circuit, observe the AF modulation pattern and adjust the generator output for maximum amplitude without overloading. Adjust trimmer capacitor C2 in the WG-304A for minimum output on the oscilloscope.

The WG-295A and WG-295B Video MultiMarkers

The RCA Video MultiMarker designated as WG-295B, contains seven traps at the following frequencies: 0.5, 1.5, 2.5, 3.1, 3.58, 4.1, and 4.5 mc. It also includes a switch for disconnecting the traps so that the unit may be left permanently connected. The WG-295A, however, does not have a switch and must be disconnected when the IF ranges of the generator are used. This unit contains five traps, tuned to 0.5, 1.5, 2.5, 3.58, and 4.5 mc. When using the VSM method, it is desirable to have markers at 3.58 mc plus 0.5 mc or 4.1 mc, and at 3.58 mc minus 0.5 mc or 3.1 mc. Two of the traps in the WG-295A can be altered to provide these frequencies.

Summary

The VSM method is not only essential for correct adjustment of the chrominance-channel in color receivers, but it offers many advantages for quickly determining the true over-all frequency response of both black-and-white and color receivers.

When observed with the VSM method, the over-all frequency response of some receivers will be a far cry from the idealized textbook response. In this connection, it must be remembered that frequency response is not the sole criterion of picture quality. Phase response is equally important. Receiver design engineers adjust the frequency and phase response to obtain the best compromise for optimum picture quality.

To serious technicians who are now or who will be engaged in color servicing, the VSM method will prove valuable. It is for this reason that we have presented as much practical information as possible in explaining the VSM method. ▲

OH! MISTER . . .

WONDERFUL!

new, exciting

WARD Silveramic®

CHROME FIBERGLAS

AUTO AERIAL

THE MOST AMAZING NEW DEVELOPMENT IN THE AUTO AERIAL INDUSTRY

WARD again leads the way with another new product. A Fiberglas auto aerial with a chrome finish — LOOKS like chrome, FEELS like chrome, SOUNDS like chrome and has all the revolutionary characteristics of fiberglas. Proved resistant to chemicals and water.

This finish is *not* a surface paint, but an *exclusive* method developed *only* by Ward.

SILVERAMIC PASSED THESE *THREE* SEVERE TESTS:

1. 30 DAYS EXPOSURE to sea water, gasoline, acids, alkalis, toluene and ethyl alcohol.
2. 3000 HOURS of salt spray at 98° F. This is equivalent to over 20 YEARS OF DRIVING.
3. IMPACT RESISTANT to 160 inch-pounds.

◀ **Model TGF-1 CHROME**

38″ long—54″ lead cable. Famous "8-Ball" mounting. Individual shipping weight: 1 lb. List price: **$5.95.**

In Canada: Atlas Radio Corp., Ltd., 50 Wingold Ave. W., Toronto

also—**Dura-ramic**

IN FULL COLOR!

Six complementary colors to mix or match—with the same flexible, indestructible fiberglas features.

YELLOW • RED • BLUE • GREEN • TAN • WHITE

WARD PRODUCTS CORPORATION
DIVISION OF THE GABRIEL CO.
1148 EUCLID AVE. • CLEVELAND 15, OHIO

www.americanradiohistory.com

New Styles in Capacitors

(Continued from page 21)

shown in Fig. 5. This type capacitor is designed primarily for use in printed wiring circuits. The connecting leads extend from one end, thus reducing the required distance between contact points of the wiring pattern and also conserving mounting space on top of the board because of the upright position of the component.

In recent years, progressive strides have been taken to improve upon the wax-impregnated type of paper capacitor. Various molded phenolic and hermetically sealed units are now available to the electronics industry. Many different insulating and dielectric materials are now used in the construction of these new components. Mylar, for instance, has one of the highest dielectric strengths of any flexible insulating material known. It is moistureproof and has a very high resistance to various solvents and chemicals. The insulating characteristics of this material will remain relatively constant over temperatures ranging from −60° C to +150° C.

Teflon is another material often used in the production of capacitors because of its high-temperature dielectric qualities. Both Mylar and Teflon are easily formed into an adhesivelike tape which is ideal for insulating extended-foil capacitors.

Epoxy or styrene-polyester resins are now used in place of wax to seal many of the new tubular capacitors. These substances are semi-rigid materials which offer high electrical resistance under extreme temperature conditions and which protect the component against moisture, dust, and vibration. Most of the new advances made in the field of capacitor design have been for military applications; however, certain engineering developments achieved along these lines should eventually be reflected in the home radio and television receiver.

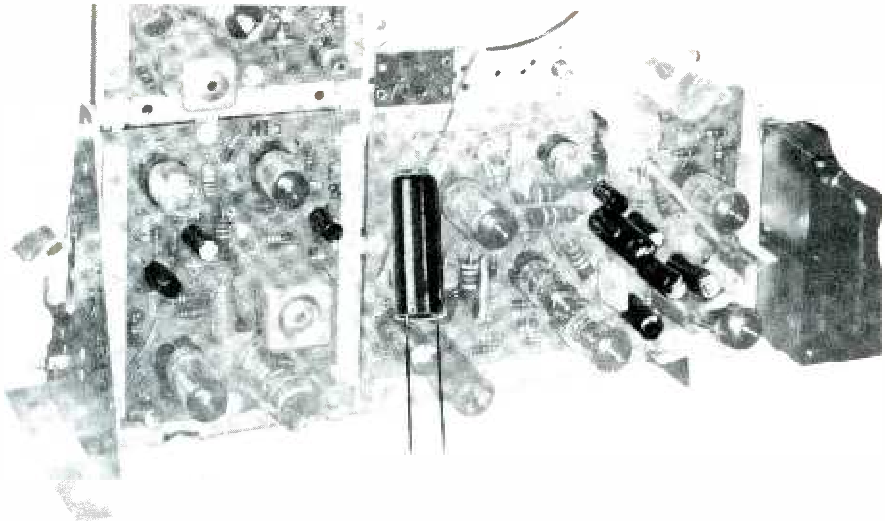


Fig. 5. New Single-Ended Capacitor Designed for Printed-Wiring Boards.

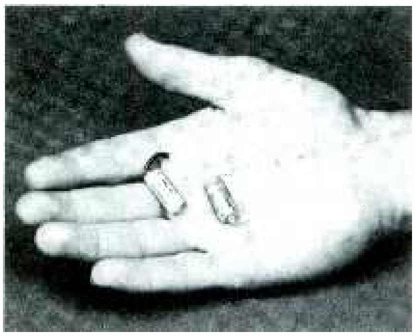


Fig. 6. Typical Electrolytic Capacitors Used in Miniature Electronic Equipment.

Electrolytic Capacitors

Transistorized radios, hearing aids, and other miniature electronic devices have given rise to extensive research in the design of new electrolytic capacitors. Since the transistor is ideal for miniaturized equipment, the new electrolytic capacitors must be suitable for use in transistor circuits.

In general, the capacitors used in transistor circuits require larger values of capacitance than those used in comparable vacuum-tube circuits; at the same time, the units must be small enough to conform to the compact design usually followed in such equipment. The average operating voltage of a transistor circuit is far lower than that of a conventional vacuum-tube stage. With less voltage insulation required in the construction of a capacitor, higher values of capacitance in a relatively smaller volume can be realized. This is exemplified in the photograph of Fig. 6. The two electrolytic units shown in this illustration are typical of the capacitors now employed in transistorized radio receivers. The molded type of component at the left of Fig. 6 has a capacitance value of 50 mfd and a voltage rating of 6 volts DC.

The aluminum-encased unit at the right also has a value of 50 mfd, but it is rated at 19 volts DC. The voltage rating of this type capacitor is generally between 4 and 10 volts DC. A somewhat smaller electrolytic capacitor is shown in Fig. 7 as it actually appears in one of the transistor circuits of a modern portable radio. The electrolytic capacitors now

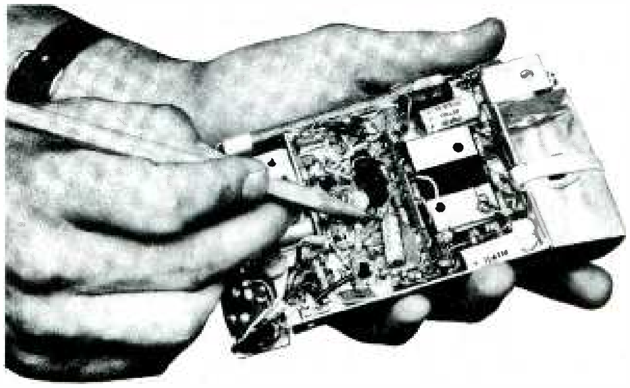
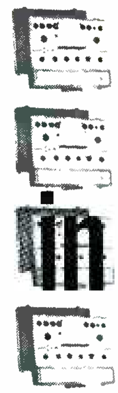


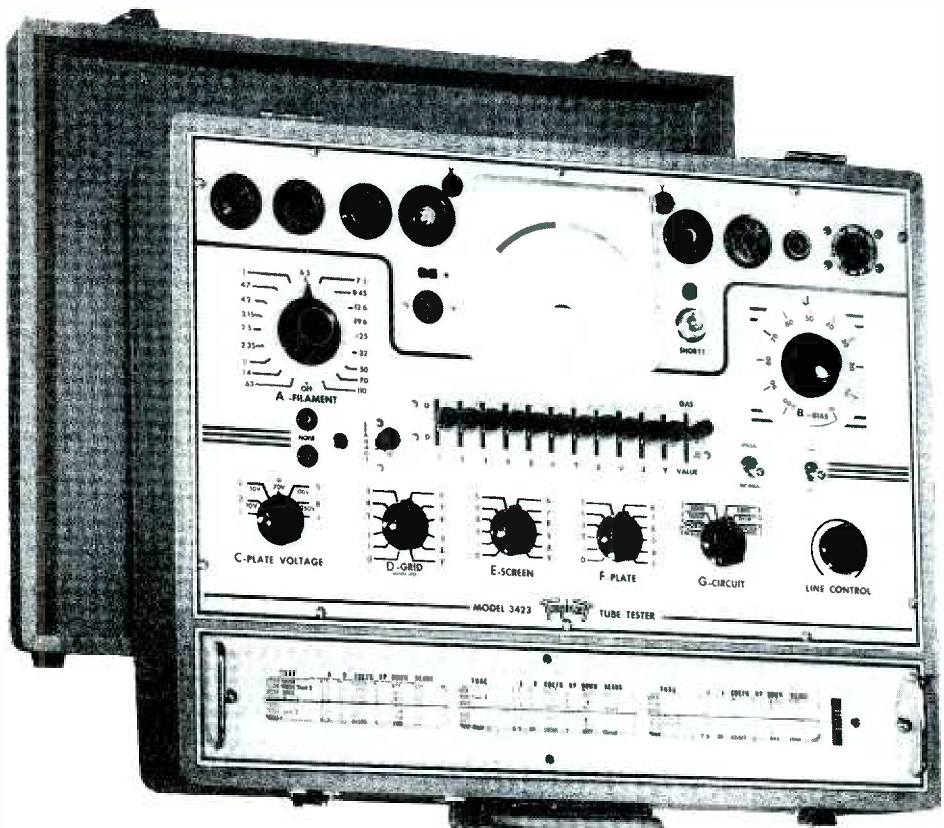
Fig. 7. A Small Electrolytic Capacitor As It Appears in a Typical Transistorized Radio.

www.americanradiohistory.com

4 in 1



- *mutual conductance tube tester*
- *transistor checker*
- *germanium diode tester*
- *selenium rectifier tester*



MODEL 3423 MUTUAL CONDUCTANCE TUBE TESTER $199.50

MODEL 3413-B . . . $79.50

The first low priced tube tester to provide

- ***dual sensitivity for short test***

Triplett model 3413-B combines provision for conventional short test (0.25 megohms) with high sensitivity leakage test (2.0 megohms) — will test series string tubes without adapter.

No one piece of equipment can do more for you. As the electronic field expands your tube tester must do more. TRIPLETT TUBE TESTERS meet this demand. More heater voltages including 3.15, 4.2 and 4.7 volts for 600 mill series string heaters. Quickly locating the bad tubes saves time. Tube sales can be a profitable business in itself.

Burton browne advertising

Here is the ultimate in a tube tester for today and tomorrow. A 4 in 1 value that checks for accuracy as the circuit demands depending on the tolerance of the circuit.

Model 3423 will give you no false readings to waste time. The patented circuit for the tube testing employs actual signal (4KC) for grid and DC bias voltage making it independent of line voltage hum. It also has a complete coverage of all tube types—six plate voltages (including 0-10 variable). Micromhos scales read 0-1800, 0-6,000, 0-18,000 and 0-36,000. Leakage measured directly on meter 0-10 megohms.

Quick development of new types of tubes can obsolete any tester tomorrow that does not have the multiple switching arrangement of Model 3423 which allows making any combination of tube connections. Ask your parts distributor to demonstrate the many other extra features of this foremost tube tester. . . . Triplett automatically furnishes revised, up-to-date roll charts regularly if you promptly return registration card. (Included with tester.)

TRIPLETT

TRIPLETT ELECTRICAL INSTRUMENT COMPANY • BLUFFTON, OHIO

www.americanradiohistory.com

Sarkes Tarzian®

"Time Proved"

HIGH DENSITY Rectifiers

Not New ---
But FOUR YEARS OLD

Better for you and better for your customers because hundreds of thousands have been **field tested** and proven during the past four years. **Don't be fooled** by offers of extremely small plate sizes and narrow spacings. We have found during four years of laboratory and field testing that there is a practical minimum cell size and spacing that are needed for maximum performance and minimum service call backs.

The Tarzian High Density Rectifiers are **Time Proved—don't be fooled** by unrealistic ratings and sizes.

SPECIFICATIONS

Model No.	Max. A.C. Input Volts	Max. D.C. Load Current	Plate Size	Overall Length	Replaces Model
250A	130	250	1.25" sq.	1 7/8"	200-250
300A	130	300	1.4 " sq.	1 7/8"	300
350A	130	350	1.6 " sq.	2 5/32"	350
400AD	130	400	1.8 " sq.	1 1/4"	400
500AD	130	500	1.8 " sq.	1 5/16"	500

All Sarkes Tarzian Replacement Rectifiers are truly universal and will plug-in on original set replacements on Motorola, Westinghouse, Arvin and Sylvania sets.

Send for your copy of the latest Replacement Guide. Address Dept. PF-3

Sarkes Tarzian, Inc., Rectifier Division
415 N. COLLEGE AVENUE, BLOOMINGTON, INDIANA

In Canada: 700 Weston Rd., Toronto 9, Tel. Murray 7535 • Export: Ad Auriema, Inc., New York City

employed in commercial transistor circuits may seem to the average technician to be the ultimate in miniaturization; however, recent developments along the lines of solid-state physics have produced electrolytic capacitors still smaller than those illustrated in this article.

A number of the leading capacitor manufacturers are now engaged in the development of tantalum subminiature electrolytic units. This type capacitor is hermetically sealed, and the positive plate is composed of a powdered tantalum metal. The electrolyte is a solid semiconductive material and not the usual liquid or paste. As a rule, electrolytic capacitors require some form of liquid or paste in their composition; these new units, however, operate more efficiently without any internal moisture whatsoever. The solid construction affords additional protection against severe shock and all atmospheric conditions. These subminiature units have already proved their performance in military equipment for which reliability and rugged design are essential. The extremely small size of these capacitors makes it rather difficult to identify their voltage and capacitance ratings. For this reason, some manufacturers are using special color-code markings to indicate the necessary values. In the not-too-distant future, the service technician will undoubtedly encounter some of these subminiature electrolytic capacitors in various transistor applications.

At the present time, one of the largest chassis components found in modern portable television receivers is the electrolytic capacitor. Perhaps, with the development of the new tantalum electrolytic capacitor and the progressive research now under way in solid-state physics, these relatively bulky units will soon compare in size with the many other miniaturized components now being used in television chassis. It is the author's belief that, in the small-screen portable television receiver of the future, we shall see the use of transistors, more printed wiring, and certainly new designs in capacitors and other major components. ▲

www.americanradiohistory.com

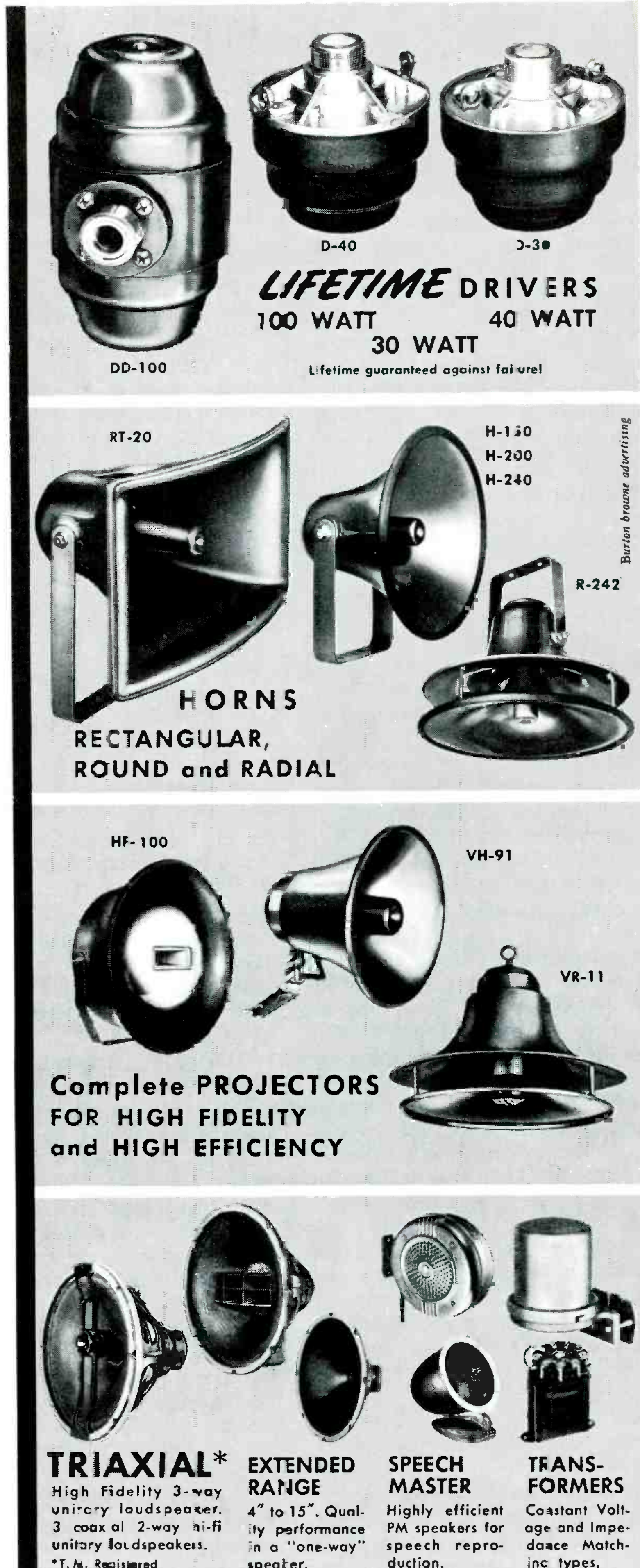
the new

Jensen

PROFESSIONAL SERIES

the complete line for INDUSTRIAL, COMMERCIAL and INSTITUTIONAL sound systems

. . . indoors or out — there is a JENSEN PROFESSIONAL SERIES loudspeaker that will do the job *better, more dependably and more economically* than ever before. Here is a *complete* new line of loudspeakers to meet every sound system need for both entertainment and efficient, effective communication. Catalog 1070 describes all of these new Jensen products. Send for your free copy today.



Jensen

MANUFACTURING COMPANY
6601 South Laramie, Chicago 38
Division of The Muter Co. • In Canada: Copper Wire Products, Ltd.

www.americanradiohistory.com

Shop Talk

(Continued from page 13)

an obstacle to this form of training.

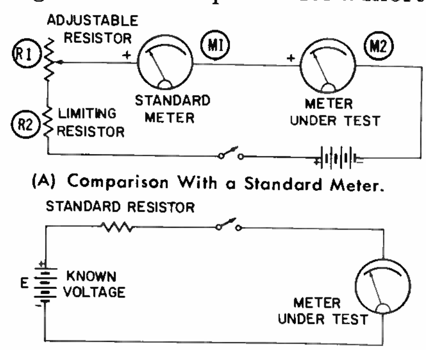
Finally, the very freedom which is so appealing in a correspondence course can be the cause of your downfall. Without someone pressing you along, it is easy to let things slide, and before you know it, so much time may have elapsed that all interest in the course evaporates. Some men require constant disciplining, at least in schooling. For these men, correspondence courses seldom prove successful.

Here then, are the two basic forms of schooling available in this country. Which is best for you must be governed by your own circumstances. If a good resident school is available in your locality and if it can be attended regularly, then this may be the most desirable training you can take. If such a school is not nearby or if your work prevents you from attending a school regularly, then consideration should be given to a correspondence school. In either event, check the available institutions carefully with respect to their over-all reputation and the quality and extent of their courses. Try to find men who are currently taking a course in each of these schools or who have recently completed such a course. A reputable school will usually be willing to furnish you with the names of a few of its students within your area. If the cost of the course is high, it may even pay you to make long distance calls to men not in the immediate area. A ten dollar investment in phone calls can sometimes save you several hundred dollars in lost tuition.

Another good source of information is your local Better Business Bureau. They may have information concerning the school that will be of interest to you. They also may be able to direct you to state or federal agencies where you can obtain additional facts concerning the school in question.

Men who need practical experience should make certain that the course under consideration offers laboratory assignments. These assignments may involve some form of kit building in correspondence courses. This is particularly important in beginning courses where the student is totally unfamiliar with the subject. If a choice exists between two similar courses, one with a practical section and the other without, then it is this writer's opinion that the more extensive one should be taken. You can never get too much practical experience.

Mention was made previously of a hybrid course, i.e., one which combines some of the features of both resident and correspondence courses. In most of these courses, the bulk of the material is given by correspondence, but the student has the privilege of attending the school in person for a short



(A) Comparison With a Standard Meter.

(B) Comparison With E/R.

Fig. 1. Circuits for Checking the Accuracy of Ammeters.

period when the home study has been completed. Usually, the resident stay is devoted mainly to laboratory work which provides the student with additional practical instruction.

This additional benefit is frequently worthwhile *if* the student is able to take advantage of it. Unfortunately, it has been our experience, plus those of others who have dealt with hybrid courses, that only about 10% of the students who complete the home study ever show up for the additional training. If you are considering such a course, make certain that you have the necessary free time plus the extra cash for traveling and lodging expenses before you let this feature sway you in favor of a certain school. The odds are 9 out of 10 that you will never take advantage of it. Actually, the odds are much greater because you must finish the correspondence portion of the course in order to qualify, and the drop-out rate in correspondence schools is usually fairly high.

Review

One subject of considerable interest to all service technicians is the accuracy of the test instruments he uses. Without knowing that his instruments are inaccurate, the technician may be working in the dark and forced to draw conclusions based on data which may be off just enough to mislead him. A wrong turn taken at the start of a service job can easily mean one or more hours of wasted effort.

To prevent this from happening, every test instrument you use should be periodically checked to insure that it is calibrated in accordance with the instructions specified by the manufacturer. An article that suggests a number of simple tests for this purpose appeared in the January, 1956 issue of the *C-D Capacitor.**

The article covers methods for checking the accuracy of such instruments as ammeters, voltmeters, ohmmeters, signal generators, sweep generators, and oscilloscopes. Thus, it deals with every commonplace unit found in the radio and television service shop.

Ammeters

The calibration of an ammeter can be carried out in two ways; by utilizing the indications of another ammeter known to be accurate or by employing a known voltage and a precision resistor. Fig. 1A shows the meter comparison method. The standard meter (M_1) must have a range which is similar to that of the meter under test (M_2). Both meters are connected in series, so that the same current will pass through each. A comparison of the two readings will indicate the accuracy of M_2. If an ammeter has several ranges, at least one check should be made on each range. The purpose of R_2 in Fig. 1A is to limit the circuit current to a safe value when R_1 offers zero resistance.

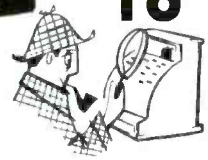
Fig. 1B shows the use of a calibrated resistor and a known voltage source. The calibration current is equal to $\frac{E}{R + R_m}$ where E is the source voltage, R is the calibrated resistance, and R_m is the

* The *C-D Capacitor* is published monthly at no charge by the Cornell-Dubilier Electric Corp., Hamilton Blvd., So. Plainfield, N. J.

www.americanradiohistory.com

WIN-TRONIX

ANALYZE YOUR WAY TO *Bigger Profits!*



NEW! INTERMITTENT CONDITION ANALYZER Model 828

Unique principle locates intermittents, detects borderline components Fast —

- No bells,
- No buzzers,
- NO WAITING!

$89.95 Net

Locate intermittent capacitors, resistors, coils, chokes, tubes, and other component and hidden wiring failures in minutes —without waiting. Exclusive Wintronix circuit using modulated special r-f test signal, immediately makes any radio or TV receiver super-sensitive to intermittents—gives both audible and visible indication so you can pin-point trouble right away. Reduces callbacks by detecting borderline components *before* they fail.

Dynamic SWEEP CIRCUIT ANALYZER

Model 820

A complete sweep circuit tester. Simplifies sweep circuit troubleshooting by signal substitution and component testing. Supplies 60 cps sawtooth and 15,734 cps sawtooth or square wave signals to TV deflection circuits. Restores raster to normal by substituting for defective stage. Tests all flybacks and yokes right in the set for continuity and shorts . . . Even tests 1-turn shorts. Completely self-calibrating—no chance for error.

SYNC PULSE ADAPTER

Model 915/960 Troubleshoot sync circuits by signal substitution. This unit with Model 820 injects (+) or (—) pulse voltages into vertical and horizontal sync stages. Locates defective sync separators, sync amplifiers, AFC, and vertical integrator circuits.

$14.95 Net

$69.95 Net

$79.95 Net

NEW! Dynamic AGC CIRCUIT ANALYZER Model 825

Takes the guess-work out of AGC troubleshooting for faster, far more profitable color and black-and-white TV servicing.

Here's all you need to test, analyze, service any television AGC circuit . . . all in one compact instrument. Saves you hours by quickly detecting obscure AGC faults before you look further. Requires only two test connections and a flick of a switch to: 1) Furnish standard, adjustable r-f test signal to antenna terminals; 2) Monitor AGC action; 3) Check for shorts and opens in AGC buss; 4) Measure action of gated pulse systems; 5) Clamp and supply AGC bias to correct AGC action and restore operation by substitution.

HERE'S ALL YOU NEED FOR COLOR SERVICING

RAINBOW GENERATOR Model 150

Align, adjust, troubleshoot complicated color TV circuits this easy way. Produces vertical color bars of all possible hues representing 360 degrees of phase sweep. Furnished with detailed instructions and illustrations to simplify color TV servicing in the home and in the shop.

$49.95 Net

NEW! COLOR CONVERGENCE DOT GENERATOR Model 250

$129.95 Net

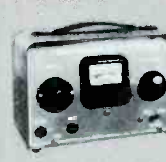
Here's a complete ultra-stable signal source for color convergence. Contains complete standard sync chain with AFC. Produces optimum white dots, cross hatch, vertical or horizontal bars for color or black-and-white servicing. Absolutely "jitter-free" regardless of picture tube size. Preset r-f frequency, variable 30 db. Highly portable, only 10½" x 7" x 6".

FLYBACK and YOKE TESTER

Model 810

Makes foolproof GO/NO-GO tests of *all* color and black and white flybacks and yokes right in the circuit. Checks 1-turn shorts — self-calibrating.

$29.95 Net



Dynamic SELENIUM RECTIFIER TESTER

Model 610

New dynamic pulsing principle tests rectifiers under actual surge loads for quality, opens, shorts, leakage.

$22.95 Net

Wide-Band FIELD STRENGTH METER

Model 330

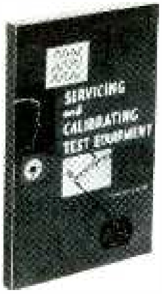
Reads true microvolts . . . Tests antennas and community systems . . . Checks color reception in absence of color transmission.

$129.95 Net

See your local parts distributor or write for free literature

WINSTON ELECTRONICS, INC., 4312 Main Street, Phila. 27, Pa.

www.americanradiohistory.com



NEW SAMS BOOKS

"SERVICING AND CALIBRATING TEST EQUIPMENT"
by Milton S. Kiver

This book shows you how to keep your test instruments in reliable working order. Tells you how to determine proper operation, how to avoid erroneous indications. Explains typical calibration procedures; gives method for performance record-keeping. Covers most frequently used equipment. Chapters: Pitfalls to Avoid When Using Test Equipment; Simple Ways to Check Instrument Accuracy; Keeping Instrument Operational Records; Preventative Maintenance Measures; How to Service Your Test Equipment. 145 pages; 5½ x 8½"; illustrated. Order today, postpaid only $2.75

"TV SERVICING GUIDE"
by Leslie D. Deane and Calvin C. Young, Jr.

This new book shows how to apply proper trouble-shooting procedures based on analysis of symptoms. Most trouble symptoms are illustrated by picture-tube screen photos, and possible causes for each symptom are given. Chapters cover: General trouble-shooting and isolating procedures; troubles in every section of the TV receiver circuit. Each chapter shows how to locate and eliminate trouble in the section covered. 132 pages, 8½ x 11"; illustrated
Order today, postpaid only $2.00

SAMS BOOKS keep you ahead in ELECTRONICS

USE HANDY ORDER FORM BELOW

Sams books cover every phase of Electronics for the service technician, engineer, student or experimenter. Listed below are a few of the many valuable Sams books available at electronic parts distributors and leading book stores.

USE THIS ORDER FORM

☐ SERVICING & CALIBRATING TEST EQUIPMENT $2.75

☐ TV SERVICING GUIDE $2.00

☐ **Color TV Training Manual.** Prepares the Technician for Color TV service work. Covers principles of the Color TV system; Color receiver circuits; installation and servicing sets. Includes color blocks outlining the use of color test equipment. 260 pages; 8½ x 11"; 300 illustrations. $6.95

☐ **TV Test Instruments.** Revised and enlarged to include latest data on instruments used in Color TV servicing. Tells clearly how to operate each type of test instrument used in TV service work. 180 pages; 8½ x 11"; illustrated $3.50

☐ **Key Checkpoints in TV Receivers.** Prepared by the Howard W. Sams engineering staff. Provides many applications for general TV service work, including time-saving information on how to make quick tests at key points to determine where trouble lies, and how to check overall performance of the receiver after repair, to insure against callbacks. 182 pages; 5½ x 8½"; illustrated $2.00

☐ **Analyzing and Tracing TV Circuits.** Presents a new approach to TV servicing. 168 pages, 8½ x 11" $3.00

☐ **Photofact Television Course.** Gives a clear complete understanding of TV principles, operation, practice. Used by thousands of students. 208 pages, 8½ x 11" $3.00

☐ **Radio Receiver Servicing.** Covers the basic receiver types—gives time-saving hints for solving basic troubles, such as dead set, weak set, noisy set, etc. 192 pages; 5½ x 8½" $2.50

☐ **Technical Dictionary.** Over 4,000 definitions of radio, television, electronic, electrical and radar terms. Includes valuable charts, graphs, diagrams and symbols. Flexible binding for "on-the-job" use. 160 pages; 5½ x 8½" $2.00

☐ **Tape Recorders—How They Work.** Explains recording theory, tape characteristics, motorboard mechanisms, drive motors, amplifiers, magnetic heads, volume indicators, equalization circuits—covers everything you want to know about recorders. 176 pages; 5½ x 8½". $2.75

☐ **Servicing AGC Systems.** Describes the operation and circuit variations of the various types of AGC systems and explains the servicing techniques that can be applied. Illustrated by actual case histories and photographs of symptoms. 132 pages; 5½ x 8½"; illustrated $1.75

☐ **Transistors—Their Application in Television-Radio-Electronics.** The first practical, complete book on transistors; explains circuitry, installation, testing techniques, theory and servicing. 100 pages; 5½ x 8½" illustrated $1.50

☐ **So You Want to Be a Ham.** Tells you what you need to know about getting your license and acquiring equipment. Covers such subjects as: Conquering the Code; Getting Your Ticket; Going on the Air; Electronics as a Career; etc. 196 pages; 5½ x 8½"; illustrated $2.50

☐ **Servicing TV Sweep Systems.** Describes the operation, circuit function and circuit variations of vertical and horizontal sweep systems common to most TV receivers. Tells how to analyze circuits; trouble-shoots for you. 212 pages; 5½ x 8½"; illustrated $2.75

There is an authoritative Sams book on virtually any Electronic subject in which you're interested. Check below for FREE Book List describing all Sams books.

☐ Send Book List

HOWARD W. SAMS & CO., INC.

Order from your Parts Jobber today, or mail to Howard W. Sams & Co., Inc., Dept. 3-J6, 2201 East 46th St., Indianapolis 5, Indiana.

Send books checked above. My (check) (money order) for $............ is enclosed.

Name..

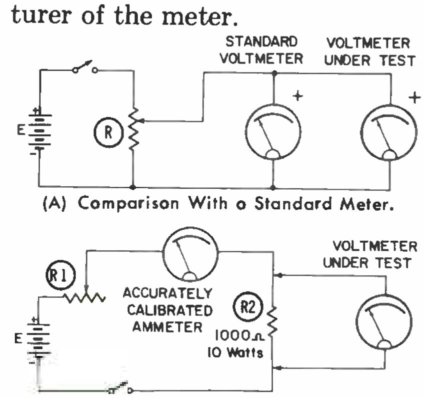
Address...

City.......................Zone.....State............

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

Look for SAMS BOOKS on the "Book Tree" at your Parts Distributor

internal resistance of the meter. R can be furnished by a precision decade resistance box. The voltage source recommended is a fresh cell or battery. It should be mentioned that actual battery voltages may vary more than 10% from the stated value under no load, and the deviation may be considerably greater with a heavy load; hence, a battery can be utilized only if its voltage will remain stable during the test. Certain mercury cells are useful in this respect if the current drain is not too high, or an accurate voltmeter may be used to measure the battery voltage under test conditions. The value of R_m can be obtained from the operating manual or from the manufacturer of the meter.



(A) Comparison With a Standard Meter.

(B) Comparison With IR_2.

Fig. 2. Methods for Checking the Accuracy of Voltmeters.

AC ammeters may also be checked by a similar means, except that an AC voltage source must be substituted for the battery. Here again accurate voltages are required, and these can be difficult to obtain. Power-line voltage generally varies throughout the day and consequently is not reliable unless it can be accurately measured with a voltmeter at the time the test is made.

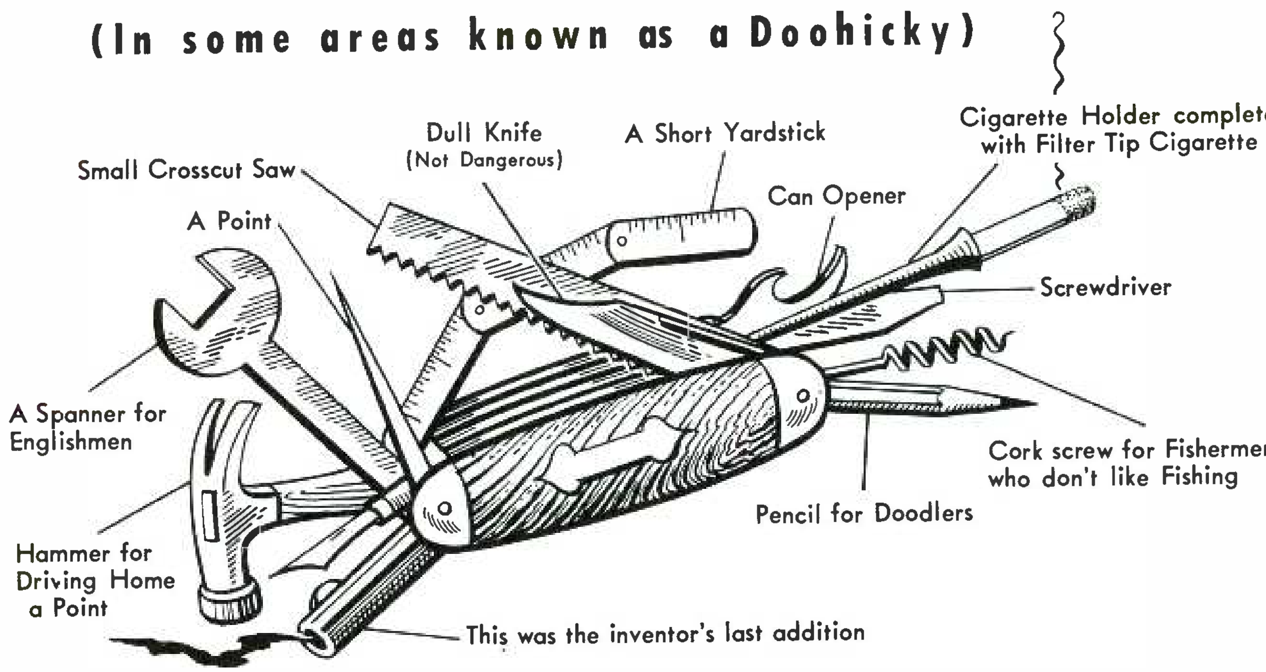
Voltmeters

Two possible calibration methods for DC voltmeters are shown in Fig. 2. Fig. 2A is self-explanatory and requires only the use of a reliable voltmeter. When such a unit is available, the accuracy of the voltage source is unimportant since it is the comparison of the two readings that are used to determine the accuracy of the meter under test. Again, where an instrument has several ranges, at least one suitable comparison should be made on each range.

www.americanradiohistory.com

This is a Watchit...

(In some areas known as a Doohicky)



... a Watchit does the work of practically everything!

There's no doubt about it, the Watchit is a boon to mankind. There's only one thing wrong, most people still want to use the *right* tool for a job. Carpenters, for example, still insist on buying a hammer or a saw, regardless of the fact that the Watchit can "replace" up to 173½ other tools. Alas, poor Watchit! It seems fated to go down into oblivion with the countless other "cure-alls." Just goes to prove what we've known all along . . . for ease of installation, for highest performance, you can always rely on Astatic Cartridges. The pickup cartridge is the heart of the phonograph; designed specifically for a particular unit...no "cure-all" is exactly compatible! *Always* replace with Astatic *original* and *direct replacement* cartridges.

ASTATIC IS THE WORLD'S ONLY COMPLETE LINE OF PICKUP CARTRIDGES!

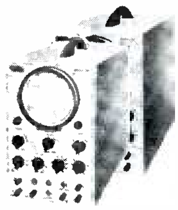
Leader with Originals, First with Replacements.

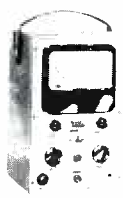
THE Astatic CORPORATION, CONNEAUT, OHIO
KNOWN THE WORLD OVER
ASTATIC
IN CANADA: CANADIAN ASTATIC LIMITED, TORONTO, ONTARIO
Export Sales Representative: 401 Broadway, N.Y. 13, N.Y. • Cable — ASTATIC, N.Y.

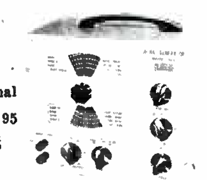
www.americanradiohistory.com

YOU BUILD EICO KITS IN ONE EVENING BUT THEY... LAST A LIFETIME AND YOU SAVE 50%


New #460 Color & Black-&-White Wide Band 5" Scope Kit $79.95 Wired $129.50


425K 5" Scope Kit $44.95 Wired $79.95
•
470K 7" Push-Pull Scope Kit $79.95 Wired $129.50

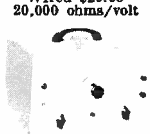

221K VTVM Kit $25.95 Wired $39.95


New... 324K RF Signal Gen. Kit $26.95 Wired $39.95

150 kc–435 mc; 6 fund. bands.


565K Multimeter Kit $24.95 Wired $29.95 20,000 ohms/volt

50 MODELS TO CHOOSE FROM! — THE INDUSTRY'S MOST COMPLETE LINE OF MATCHED TEST INSTRUMENTS


377K Sine & Square Wave Audio Gen. Kit $31.95 Wired $49.95

½-million EICO Instruments are now in use the world over! That's the proof of EICO's leadership in Value.
For latest precision engineering, finest components, smart professional appearance, lifetime performance and rock-bottom economy—see and compare the EICO line at your Jobber before you buy any higher-priced equipment! You'll agree with over 100,000 others that only EICO Kits and Instruments give you the industry's greatest values at lowest cost.


1050K Battery Elim. Kit $29.95 Wired $38.95


625K Tube Tester Kit $34.95 Wired $49.95
• Tests new 600 ma series string type tubes

Write NOW for FREE latest Catalog **PF-9**

Prices 5% higher on West Coast

EICO®
©56
84 Withers Street, Brooklyn 11, N. Y.

The method in Fig. 2B can be employed if an accurate voltmeter is not available, but a dependable ammeter is. Also required is a 1,000-ohm, 10 watt, precision resistor. The battery or other voltage source is connected into the circuit, and R_1 is adjusted so that different voltages will be produced across R_2. The readings of the

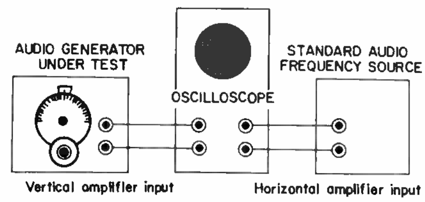


Fig. 3. A Means for Checking the Accuracy of an Audio Generator.

voltmeter can then be compared with computed values. The latter are obtained by multiplying the ammeter readings by the value of R_2. For accuracy, the internal resistance of the test voltmeter must at least be 10 times the value of R_2 and preferably greater.

Ohmmeters

Ohmmeters offer no problem in calibration checking because a wide variety of precision resistors are available and can be used as standards. When checking the accuracy of an ohmmeter, the technician should try to take measurements that will move the indicator within both the center and crowded portions of the scale. It will be found that the accuracy is better in the uncrowded portion of the scale, and this should be your guide to the extent of accuracy rather than the results obtained over the more crowded sections.

Signal Generators

Signal generators fall into two general categories, audio frequency and radio frequency. Audio generators may be checked against one or several accurately-known audio frequencies with the setup shown in Fig. 3. A fairly handy standard frequency source may be 60 cycles derived from the power line through a stepdown transformer. By means of Lissajou patterns, a considerable range of frequencies can be checked quite accurately.

For higher-frequency signal generators, accurate comparisons can be made by zero-beating the generator against broadcast-station carriers. The generator output should be coupled loosely to a broadcast receiver for this comparison. A satisfactory method of coupling is to connect the "high" terminal of the generator output to the antenna terminal of the receiver through a 25-mmf capacitor.

For spot-checking the generator frequency dial at numerous points on all except the extreme high-frequency ranges, a 100-kc crystal oscillator can be used with a germanium diode mixer as shown in Fig. 4. The beat-note detector may be headphones, an AC VTVM, or an oscilloscope. The frequency dial on the generator is tuned successively to zero beat at each multiple of 100 kc, or whatever the crystal frequency is.

Sweep Generators

In sweep generators, it is desirable to be able to check the frequency calibration and the sweep width. (It is also important to check the flatness of the output voltage over the range of the frequency swing. Ways of doing this effectively are described in the afore-mentioned book.) The frequency check can be made by turning the sweep-width control to zero and then feeding the signal being generated into a detector of

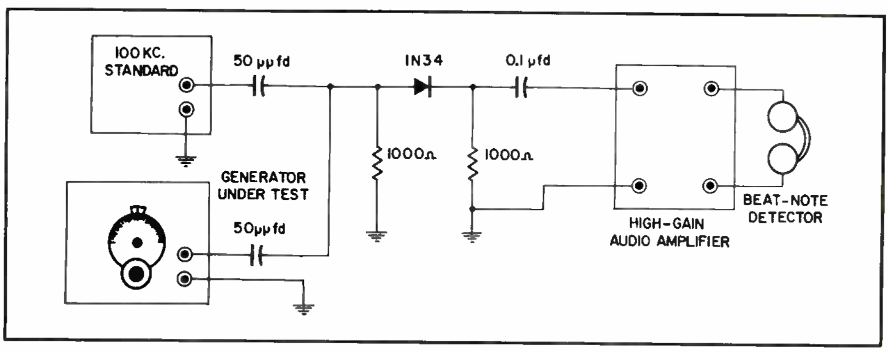


Fig. 4. A Circuit for Checking the Accuracy of an RF Signal Generator.

www.americanradiohistory.com

MONEYBACK GUARANTEE ON THE WORLD'S FINEST SERVICE DATA!

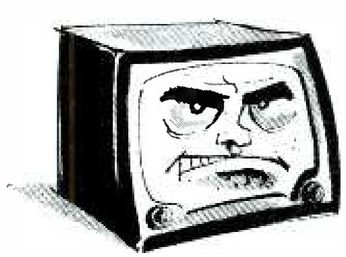
Howard W. Sams will prove to you that

PHOTOFACT will help you solve <u>any</u> service problem

FASTER, EASIER, BETTER, MORE PROFITABLY

GET THE PROOF...*DO THIS NOW:*

1. *Choose a "Tough Nut"*

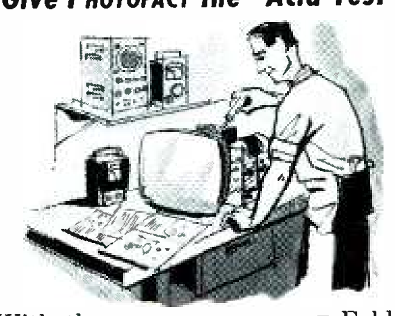


Pick a set that's been giving you plenty of trouble—the tougher the test, the better the proof. Get the make and chassis number of the set . . .

2. *See Your Parts Distributor*

Look up the set in the Sams Index to PHOTOFACT Folders. In just 60 seconds you'll find the applicable Folder Set. Buy it—take it back to your shop . . .

3. *Give PHOTOFACT the "Acid Test"*



With the proper PHOTOFACT Folder by your side, start solving your service problem . . .

THEN, YOU BE THE JUDGE:

If PHOTOFACT doesn't save you time, doesn't make the job easier and more profitable for you, Howard W. Sams wants you to return the complete Folder Set direct to him and he'll refund your purchase price promptly.

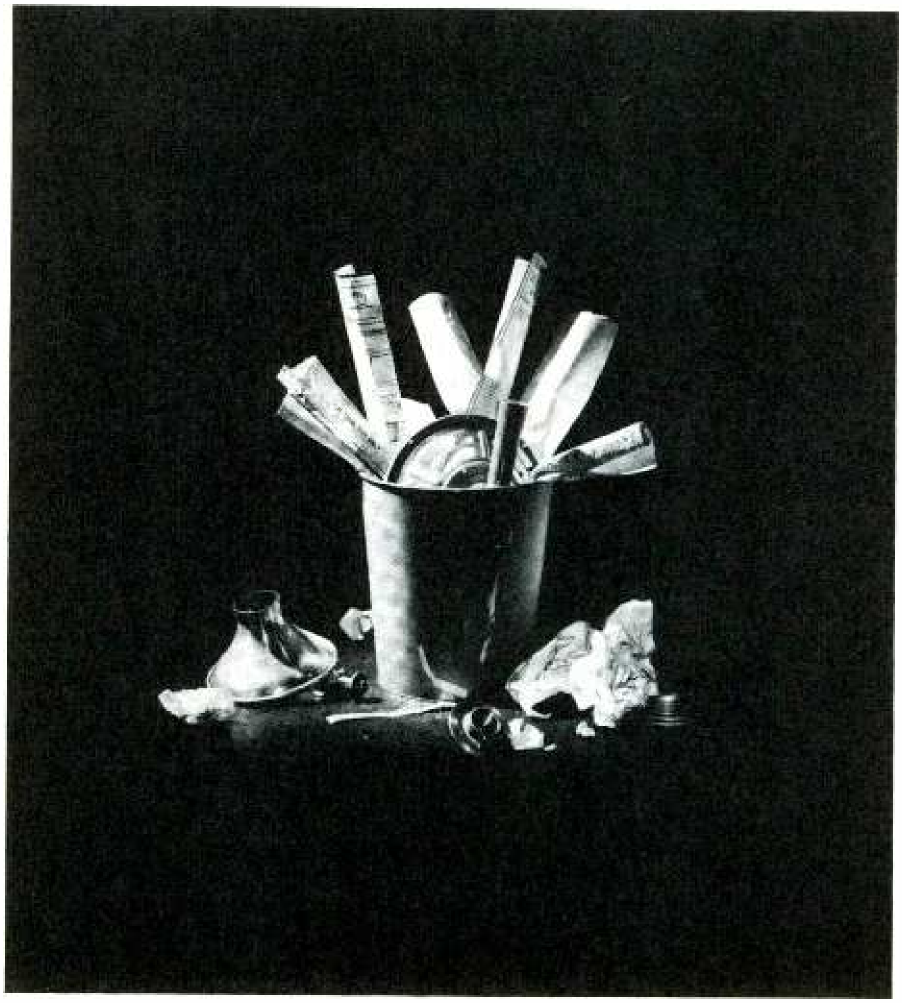
TRY THE PHOTOFACT MONEYBACK OFFER NOW

LEARN FOR YOURSELF HOW PHOTOFACT SAVES YOU TIME ON EVERY SERVICE JOB...

HELPS YOU EARN MORE DAILY

HOWARD W. SAMS, INC. • 2201 E. 46th ST. • INDIANAPOLIS, IND.

www.americanradiohistory.com



PROGRESS MAKES WASTE

It takes courage to discard plans and models . . . especially when they involved time and effort. Yet, we at University, do just that!

In our almost fanatic dedication to achieving perfection, we carry the development of new products to the highest degree possible. In this exacting process, things which do not meet our rigid requirements find their way into the waste basket. Actually *this* kind of waste makes *real* progress.

Too often items are rushed onto the market before they are ready. *We* introduce products only when they've conformed to traditionally high University standards (customers have always found them worth waiting for).

This philosophy of business has made us countless friends who look to *University* for the latest developments in loudspeakers. Today—University is the leading specialized speaker manufacturer. There are more satisfied users of University speakers than of all other speakers combined. *The University label on a speaker guarantees trouble-free operation and performance that conforms to specs.*

That's why University "sells on sound." Our engineering department will gladly consult with you on any technical requirement.

UNIVERSITY LOUDSPEAKERS, Inc., 80 So. Kensico Ave., White Plains, N. Y.

LISTEN *University sounds better*

the type shown in Fig. 4. The amplified signal from a local broadcast station or from a crystal oscillator is also fed into the same detector. The dial of the sweep generator is now rotated until a zero beat is obtained. Note that we are able to utilize this method of comparison because when the sweep width control of the sweep generator is turned to zero, the instrument is producing a single frequency for each dial setting.

Sweep width, or the range over which the frequency of the signal varies, is perhaps best checked by the following method. The signal output of the sweep generator is fed into a detector of the type shown in Fig. 4, and the sweep width control is set to its maximum position. The output of an AM signal generator is also fed into the same detector, and the detector output is applied to an oscilloscope. With both generators in operation, the AM generator frequency is slowly varied over the sweep range of the unit being checked. A marker pip will appear on the scope screen and move along the trace line as the AM signal generator frequency is varied. Two marker pips may appear on the screen when this test is performed. By rotating the phase control on the sweep generator, these pips will be made to coincide. If more than two pips appear, it means that spurious signals from either of the two generators or from some outside source are reaching the circuit. One half the difference between the two frequencies needed to place the marker pip at each end of the scale will represent the sweep width of the unit being checked.

The value obtained by the foregoing test may or may not agree with the markings on the sweep width dial. It is not unusual to find that the sweep width of the signal is less than that called for by the control markings. This does not necessarily indicate that the unit is defective. Generally, if the sweep width extends to at least 7 mc, the operation can be accepted as normal unless you learn from the manufacturer or someone else owning a similar unit that a greater sweep width should be obtained. ▲

www.americanradiohistory.com

Printed Wiring Boards

(Continued from page 11)

audio section) utilizes a printed wiring board, while in Fig. 2 almost all of the receiver components are contained on two printed wiring boards. In fact, only the tuner, low-voltage supply, and high-voltage supply are not using printed boards. One manufacturer is currently producing a tuner which uses a printed board for all of the wiring with the exception of the channel-selector coils. These are mounted in a turret-drum assembly.

If engineering practice continues to advance at the present rate, printed boards will soon be used in voltage-supply sections. When this step is reached, the technician can expect to see entire receivers constructed on printed wiring boards.

As a preliminary to the discussion on the removal of components from a printed board, we will first cover some of the basic mechanical and electrical characteristics which must be considered when servicing these units.

Mechanical Attributes

Most of us are used to pulling with some force on wires and terminals in a standard television or radio chassis, and most of the time there are no serious consequences. There are occasions when we may break a terminal strip or one of the lugs of a tube socket. These are annoying occurrences, but we can usually repair the damage without too much difficulty. The important thing to remember in dealing with printed wiring boards is that *you will get into trouble if you use force.* This trouble may be a broken board or an unbonded foil strip, either of which could mean that an entire board will have to be replaced.

Electrical Characteristics

If excessive flux is allowed to flow onto the board during the soldering process and remain there, some leakage may develop between the conductor strips. To avoid any possibility of this occurrence following a solder job, the board should first be thoroughly

It is hard to describe "sound." The picture above gives a pretty good idea of what a TINY-MITE looks like, but what it sounds like . . . that's not so easy.

If we used words like "beautiful," "sonorous," "rich-bodied," you'd conjure up some sort of mental auditory response. But at best it wouldn't be accurate. You have to actually listen with your own ears to know what "sound" really sounds like. You'd have to look twice to believe that the magnificent sound produced by the TINY-MITE was emanating from an enclosure only 21"h. x 15½"w. x 12"d.

It's no trick to achieve good results with a large enclosure, but realizing the great need for limited space enclosures, we set ourselves the goal of producing the finest small enclosure possible. . . . *This is it!*

JUST LOOK AT THESE FEATURES:

1. The *only* cornerless-corner enclosure for both 12" and 8" extended range speakers, employing highly efficient University horn-loaded phase-inversion principle.

2. Versatile design permits use in room and ceiling corners or along flat wall. *All* exteriors, including the back, are beautifully finished, permitting unlimited decorating possibilities.

3. Construction equals the finest cabinetry. Full ¾" wood used throughout, thoroughly braced.

4. Supplied with mounting board cut out for 12" speaker; adapter for 8" speaker with ample space for tweeter opening is available.

5. No more struggling to install speakers. Baffle board is easily removed at front of cabinet.

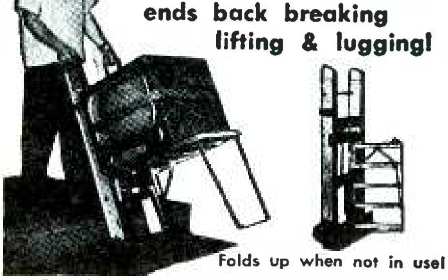
The TINY-MITE makes any speaker sound its best. Matching the superb quality of the TINY-MITE, University offers the largest selection of 8" and 12" 2- and 3-way Diffaxials . . . to meet any budget requirement. Visit your favorite Hi-Fi center and listen for yourself.

Mahogany $39.75
Blond 42.25
Unfinished .. 34.00

UNIVERSITY LOUDSPEAKERS, Inc., 80 South Kensico Ave., White Plains, N.Y.

LISTEN University sounds better HIGH FIDELITY

3 big reasons why QUIETROLE
Reg. U. S. Pat. Off.
is "The Choice of Better Service Dealers Everywhere"
1 MERIT
2 QUALITY
3 RELIABILITY
The original product for quieting noisy controls and switches . . . the universal lubri-cleaner for TV and radio . . .
Say "QUIETROLE" to your distributor . . . be sure you get it.
NO GUM! NO GOO! NO GRIME!
Carried by recognized jobbers . . . everywhere!
manufactured by
QUIETROLE COMPANY INC.
Spartanburg, South Carolina
IN CANADA: Active Radio & TV Distributors, 58 Spadina Ave., Toronto 2B, Ont.

NEW folding platform attachment fits all YEATS dollies
carries TV models & chassis ends back breaking lifting & lugging!

Folds up when not in use!
Attached instantly, this ingenious new aid to TV and radio repairmen ends second story service problems when removing TV table models or chassis. With this new attachment, YEATS dolly users can use the dolly for chassis and table models as well as consoles . . . enjoy all the famous YEATS handling conveniences: 30 second strap ratchet fastening, caterpillar step glide and on-a-dime turning. Folding Platform is 13½" x 24", priced at $9.95. Call your YEATS dealer today!
SEND postcard for full information on our complete line TODAY!
YEATS appliance dolly sales co.
2103 N. 12th St. Milwaukee 5, Wis.

cleaned and then sprayed with a protective coating of silicone resin or acrylic plastic to prevent the collection of moisture and dust.

The conductor strips on a printed wiring board are usually only .00014 inch thick; therefore, shorts can sometimes cause a conductor to "blow" or burn out in a manner comparable to that of a fuse element. A printed wiring board that has a section of conductor missing, as well as an unbonded terminal connection, is shown in Fig. 3. The pencil points to the area from which the conductor is missing. This, of course, is an extreme case and the damage can be repaired by using a short piece of hookup wire to jumper the blown spot. A word of caution—whenever a blown conductor is found, be sure to check and eliminate all short circuits before applying power to the circuit to prevent the conductor from being blown again.

If you should receive a printed-board unit for service and the trouble seems to be caused by a poor connection, an inspection of all of the eyelets should be made. Poor connections should be properly soldered before other checks are made.

Soldering Considerations

Since soldering is involved in most component replacements, it would be well to review some of the characteristics of solder and of the various soldering irons which may be employed.

The temperature at the tip of one of the available miniature soldering irons is 650 to 700° F, and the diameter of this tip is ⅛ inch. The wattage rating of the iron is relatively low (approximately 25 watts), but prolonged contact between the tip and any small area on the wiring pattern could still cause damage to the board. With this in mind, it is easy to understand why a large soldering iron or a solder gun is not entirely practical for servicing printed wiring boards.

If a solder pot is to be used to remove components from a printed wiring board, it is extremely important that the solder in the pot be at the right temperature before putting the board into contact

Fig. 3. Blown Conductor and Unbonded Terminal.

with the solder. The temperature of the regulating type of solder pot can be preset, and the correct solder temperature will then be maintained. If a temperature-regulating pot is not available, then a high-temperature thermometer should be used. The best temperature for the solder used in this application is approximately 450° F. At this temperature, the solder will melt fast, and bridging (solder shorts) between the conductor strips should not be a problem.

A printed wiring board that has been brought into contact with solder that was too cold is shown in Fig. 4. Notice how a mass of

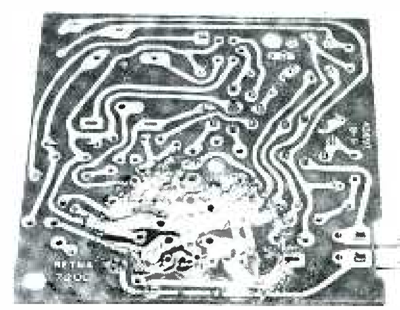


Fig. 4. Severe Case of Solder Bridging.

solder clings to the exposed area. The solder pot used in this experiment had been just hot enough to barely melt the solder (about 380° F). One other precaution which should be taken when using a solder pot is to set the board firmly on the surface of the pot until the component loosens, quickly remove the component, and then remove the board from the pot. The board should not be dipped in and out of the pot, as this may cause bridging to occur. It is important

www.americanradiohistory.com

that the board not be left in contact for longer than 10 seconds, since the foil could become unbonded if a longer exposure were permitted.

The solder mixture used in the pot is of prime importance. Only low temperature solder should be used because the melting points and working temperatures of other solder mixtures are so high that their use could damage the board. A eutectic mixture is the best since it has the lowest possible melting point. Solder that has a content of 63% tin and 37% lead is such a mixture. Solder that consists of 60% tin and 40% lead is also acceptable since its melting point is very close to that of the eutectic mixture.

The solder in the pot must be clean. Each time the solder is reheated and before each soldering operation, the surface of the solder should be skimmed off to remove any impurities which might have boiled out of the solder. The solder should be thoroughly stirred to insure that the tin-lead mixture is properly blended, and to help impurities rise to the surface where they can be removed. A small amount of activated rosin flux added to the solder each time it is heated will aid its condition. Before using the pot, the excess flux should be skimmed from the pot to prevent its collection on the board.

Removal of Components

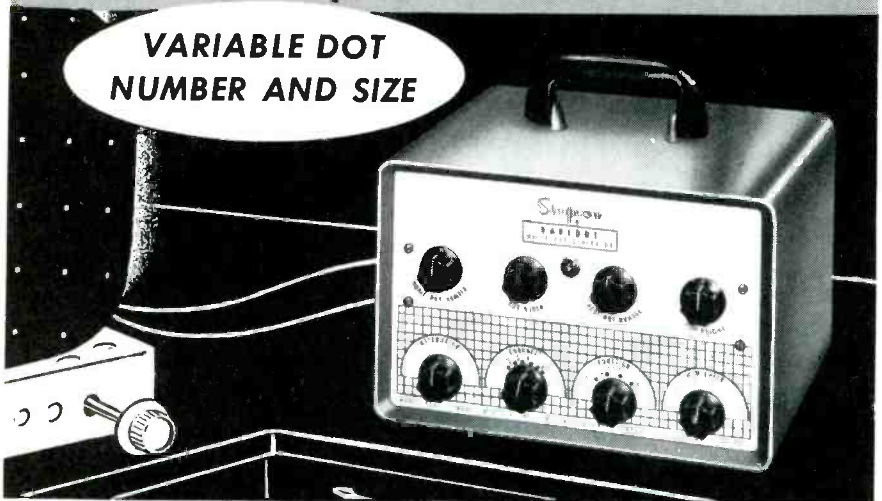
By far the most difficult problem encountered in servicing printed wiring boards is the removal and replacement of components. This is particularly true of large components and those having several leads or mounting lugs that pass through the board.

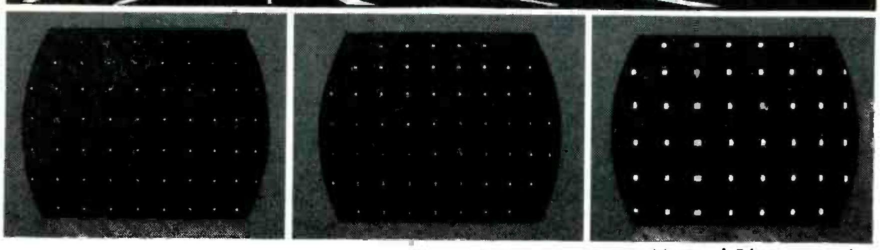
At the factory, all connections are soldered at the same time in a dipping operation. Prior to this operation, means are employed to hold the components to the board while the other components are being installed, and while other pre-solder operations are being performed. The component leads or mounting lugs are sometimes bent or twisted to accomplish this purpose and these must be straightened before the component can be removed from the

www.americanradiohistory.com

NEW!
NEW!
NEW!

Simpson
VARIDOT
WHITE DOT GENERATOR
model 434





(Actual Photographs)

Provides white dot patterns with VARIABLE dot size (from 1 to 8 scanning lines, with corresponding dot widths), and variable dot number from 6 to 12 horizontal dots, and 6 to 12 vertical dots. Modulated RF output is available, operating on fundamentals from Channel 2 to Channel 6.

THE ONLY WHITE DOT GENERATOR THAT LETS YOU MATCH ANY RECEIVER MANUFACTURERS' RECOMMENDATIONS

You can make convergence adjustments on color-TV receivers faster and better with the new Simpson Varidot. Use for linearity adjustments on *both* color and black and white.

Vertical and horizontal synchronization assures you of correct aspect ratio . . . ample attenuation . . . 300 ohm RF output.

Adjustable dot size provides a check of receiver transient response. Positive or negative video output is excellent for accurate and fast checking of transient response of video amplifiers.

Use the new Simpson Varidot for hum checking both color and black and white receivers—a rare feature in test equipment at this price.

Portable: Approx. 11½ lbs. Housed in Simpson gray case.

Complete with Output Cables and Operating Instructions **$147.50**

See Your Electronics Parts Distributor, or write

Simpson
ELECTRIC COMPANY

WORLD'S LARGEST MANUFACTURER OF ELECTRONIC TEST EQUIPMENT
5200 W. Kinzie St., Chicago 44, Illinois
Phone: EStebrook 9-1121
In Canada: Bach-Simpson Ltd., London, Ontario

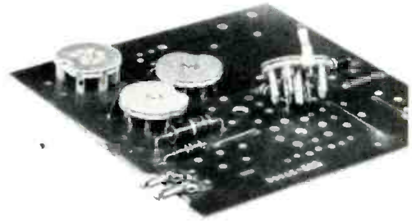


Fig. 5. Snap-In Type Tube Sockets.

board. It is essential that care be exercised when straightening these lugs since any undue strain could result in a broken board. If the component to be removed is a resistor or capacitor with wire leads, it may be desirable to cut the leads above the board in such a way that the new component can be soldered to these leads. Sometimes, this operation involves breaking the component body in order that the leads will be long enough to solder to. This procedure is especially useful when servicing small printed boards that have a large number of components, or boards that are used in sub-assemblies.

Tube sockets, transformers, filter capacitors, controls, printed couplates, and other large components having several leads or mounting lugs that pass through the printed wiring board are the most difficult to remove. This is true mainly because time and patience are required to successfully remove them without damaging the board.

Tube sockets are probably the most difficult to remove because they not only have numerous pins but may also have a center post soldered to the wiring foil. Tube sockets are fastened to the board

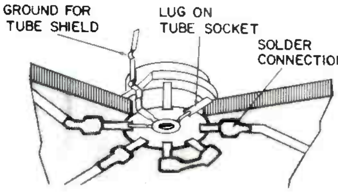


Fig. 6. Socket Solder-Bonded to Foil.

by several methods. The photograph in Fig. 5 shows a tube socket constructed so that the pins will snap into the mounting holes, thereby making a mechanical bond. The pins are also soldered to the foil for an electrical bond. Fig. 6 shows how a tube socket is

www.americanradiohistory.com

mounted to the foil with a solder bond which provides both the mechanical and electrical bond. Sockets of this type are usually installed by hand after the dip-solder operation, whereas sockets of the type shown in Fig. 5 are usually installed beforehand and are dip soldered with the rest of the components.

It is essential to determine whether or not a center post is used before attempting to remove any miniature tube socket. Pulling at a tube socket believed to be unsoldered but which has a soldered post could result in an entire section of conductor foil becoming unbonded and ripped from the board. One thing to remember is that the cost of a tube socket is relatively small, and the salvage of such a unit does not warrant taking any chance on the destruction of a printed board. Therefore, if there is any chance of damaging the board during the removal of a tube socket, a pair of cutters should be used to cut the mounting lugs so that the body of the tube socket will come free. The pins that remain in the board can then be removed individually with a small soldering iron.

Printed couplates or components that have several leads can be removed through the use of a solder pot. They can also be removed by cutting each lead above the board and then removing the leads individually with a small soldering iron. However, printed components rarely fail, and you should be sure that the component is defective before removing it. If necessary, the couplate or printed component can be isolated by disconnecting other parts of the circuit.

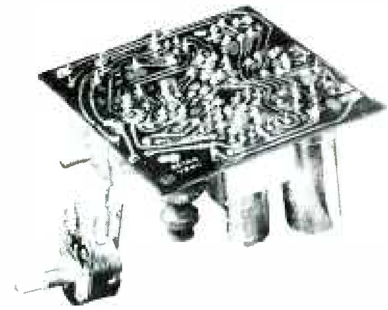


Fig. 7. Control Having Spear-Type Lugs.

For the most part, controls which are affixed to a printed wiring board are special units with rigid spear-type lugs that pass through the board. A control of this type is shown in Fig. 7. This control has six lugs; one to ground the metal case, three for the resistive element, and two for the AC switch. A solder pot was used to remove the control for this illustration, but if you had a control which was known to be defective, it could be removed by cutting each lug. Because of mounting considerations, exact replacement controls should be used on printed wiring boards.

Iron core transformers, chokes, and other large metal components mounted to a printed wiring board present a special problem. A large metal unit will conduct heat away from the soldered connections so rapidly that it is sometimes difficult to melt the solder with a small iron. There are two methods of mounting iron-core transformers to a printed wiring board; the metal strip that goes over the core material can be passed through a slot in the board and then bent and soldered, or the unit can be

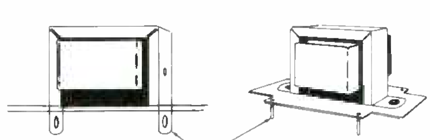


Fig. 8. Iron-Core Transformer Mountings.

(Advertisement)

latest JACKSON tube test data

TUBE TYPE	MODEL 648 FIL.	MODEL 648 CIRCUIT D.	MODEL 648 CIRCUIT E.	MODEL 648 PLATE TEST	MODEL 715/115/561 FIL.	X.	PLATE	YZ
4BX8	4.2	A123 A127	A45 A89	38V 38V	4.2	-	18 18	2LR 4NR
5CL8	5.0	A127 A123	AC689 AC45	82Z 65Z	5.0	-	40 18	4JNR 3KR
6BX8	6.3	A123 A127	A45 A89	38V 38V	6.3	-	18 18	2LR 4NR

MODEL 49

TUBE TYPE	SEC.	A.	B.	C.	D.	CATH. SHORTS	E.
4BX8	T T	4.2 4.2	4 4	X X	12 67	3 8	28 28
5CL8	P T	5.0 5.0	4 4	X X	679 12	8 3	28 28
6BX8	T T	6.3 6.3	4 4	X X	12 67	3 8	28 28

Latest Chart Form 648-16, 715/115/561-9, 49-3

now!

G-C STACKPOLE *Packaged* CARBON RESISTORS at your G-C Stackpole Distributor

The "New Look" in Carbon Resistors

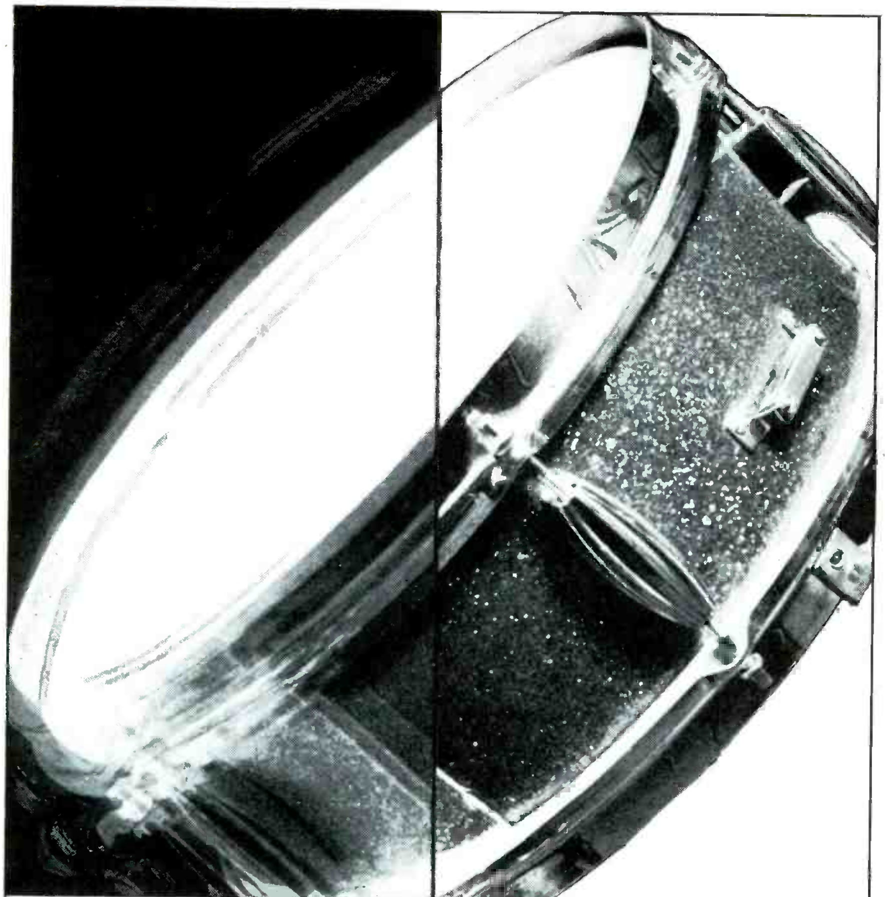
The same genuine Stackpole Carbon Resistors used everywhere are now packaged for greater convenience and protection. You'll find them in their handy plastic boxes at your G-C Stackpole distributor. Look for . . . insist on . . . exact replacement G-C Stackpole Carbon Resistors.

G-C ELECTRONICS MFG. CO.

Division of General Cement, Textron, Inc.
400 South Wyman St. • Rockford, Illinois

Go To The Distributor Displaying The G-C Stackpole Sign

www.americanradiohistory.com



DUOTONE IN LIFE...

The first and only big time door-opener in your field . . .

It's the big news of the trade—for Duotone is the first Company in the history of the needle business—the only Company in the accessory field to launch a full-scale, cross-country promotion in Life Magazine and five other national magazines.

Means you can count on people wanting, knowing, asking for Duotone by brand name. Over 21 million people, to be exact.

Cash in on this—Count on Duotone to help you open the door to new sales on service calls—it's a name people know and want. Open the door with Duotone—and

GET YOUR FOOT IN WITH THESE

The Duotone Company Inc. Keyport, N. J.

SPECIAL SERVICE MAN'S KIT The all-in-one needle repair kit with the famous four free extras. Includes free—one 50X microscope to check needle. Jeweler's screwdriver. Professional Tools. Plastic carrying case. 13 of the most used needles. List $25.00.

DUOTONE MAGIC RECORD CLOTH Over 00 million sold so far. The original, popular Magic Record Cloth—removes dust and electrical static. Protects record from damage. An extra sale on every service call.

DUOTONE T-V CLOTH An extra on every service call. New especially treated cloth that removes T-V Smog like magic. Gives brighter picture. Reduces reflection glare. Keeps dust from clinging. A quick wipe by servicemen inside and outside of protective glass and on picture tube. Sell one for home use to remove fingerprints—keep off dust.

FREE NEEDLE TESTER CARD Another extra from Duotone. Card is treated with special material. Customer can press needle into card at home—send card into you — and without having to make a special call, you can tell if needle is bad or good. Suggest they check regularly. Lets you know, without visiting them, whether the trouble is with their needle. Tester cards free from Duotone with Serviceman's Kit.

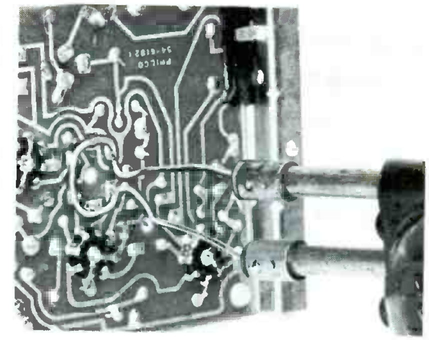


Fig. 9. Using a Solder Gun and Copper-Wire Loop to Unsolder a Component.

mounted to a metal plate having several mounting lugs which can be pushed through the board and soldered. The drawings in Fig. 8 show the details of both types of mountings.

There is one possible application in which a solder gun might be used in servicing printed wiring boards. As mentioned, it is difficult to apply enough heat to the mounting lugs of large metal components, and there are several mounting lugs which must be unsoldered simultaneously if such a unit is to be removed. By taking a length of #10 or #12 copper wire and fashioning a solder tip with a loop at the end, several connections to a large component could be unsoldered at one time. A tip of this description is shown in use in Fig. 9. Notice how the tip is bent to simultaneously make contact with six terminals. In using a tip of this type, it must be bent to touch each terminal or lug to be unsoldered. For each different component, the tip must be bent differently. A word of caution on the use of such a tip—it should make contact with the lugs or terminals on the component and not with the wiring foil. This will prevent damage to the foil from excessive heat.

About six inches of wire used as a tip will present a sufficient load to the gun's transformer. Tips of this length will reach operating temperature in 5 to 7 seconds and, as with standard tips, the duty cycle of the gun should not be exceeded.

Part III of this series will appear in a future issue and will present additional problems associated with servicing printed wiring boards. ▲

www.americanradiohistory.com

Life on a UHF Island

(Continued from page 15)

chanical trouble, but the tubes do not last long. The same thing was reported at another shop we visited, located on high ground on the north side of town. This dealer also mentioned that the less expensive models of UHF converters which were sold a few years ago did not hold up well and are no longer being sold.

We were curious about the use of indoor antennas at such a great distance from the transmitters, and brought up the subject. The north side shop said there are not too many indoor installations. Channel 15 used to be received only moderately well even with a roof antenna. In some cases, a usable picture could be received by one viewer but not by his neighbor. Huntington dealers anticipate that future antenna installations will be lower and more easily erected because of the increased signal strength from Channel 15.

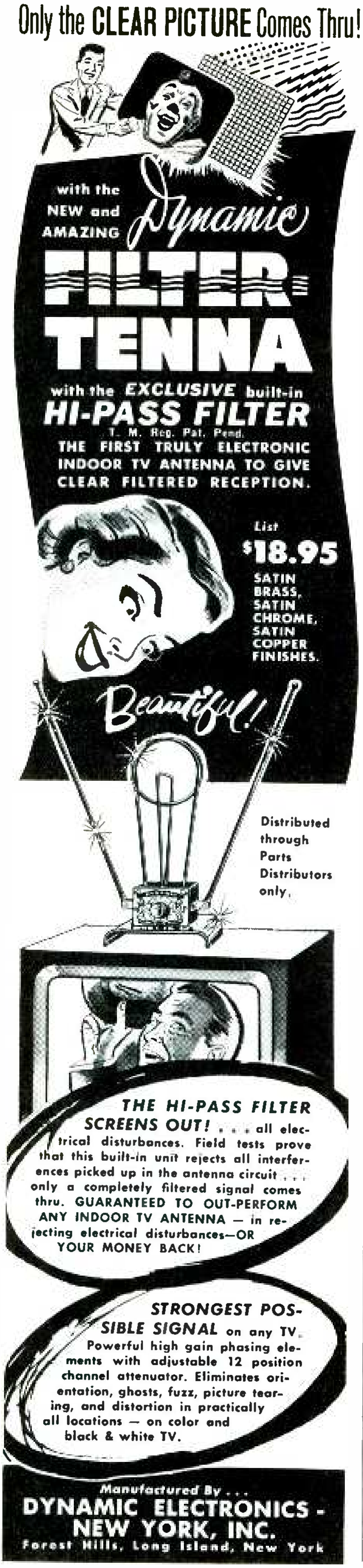
Fort Wayne: A Primary UHF Area

Our survey in Fort Wayne began by interviewing parts distributors who were able to provide a general picture of the conditions in the metropolitan area. Since the power of the stations is high and the terrain is reasonably flat, there has been no necessity to use high antennas or to do a great amount of probing in order to find a strong signal. The main problem in setting up antennas has been the elimination of ghosts, and highly directional antennas have become popular for this reason.

Indoor antennas are evidently providing an acceptable picture in many parts of the city, although distributors and dealers are not enthusiastic about them because they often give mediocre performance and create servicing problems. However, a large segment of the public likes indoor antennas because of their simplicity and low cost. These antennas must be oriented with extreme care for good results. In fact, a movement of a few inches often makes a tremendous difference in the picture.

The directivity of indoor antennas is not as good as that of outdoor types. We noticed that waves reflected from large moving ob-

www.americanradiohistory.com



jects like semi-trailer trucks caused fading similar to airplane flutter. As for ghosts, even the outdoor antennas have a difficult time in eliminating those which are very closely spaced. As a result, many of the UHF pictures have a slightly blurred or smeared appearance. This effect is not serious, however, and would be bothersome only to the most critical viewer.

Interference, other than the fading which has been mentioned, is practically nonexistent. Electrical disturbances due to thunderstorms, neon signs, ignition systems, and the like do not affect reception. The reason for this freedom from interference is that the objectionable signals are much lower in frequency than the UHF television signals and are therefore rejected by the tuned RF circuit of the receiver.

Distributors in Fort Wayne confirmed the reports of UHF oscillator trouble that we had encountered in Huntington, but the percentage of 6AF4 failures was said to be somewhat lower in the Fort Wayne area. This could be accounted for partly by the fact that the signals available in Fort Wayne are stronger than those obtained in Huntington. We received conflicting stories about the comparative performance of the 6AF4 and 6AF4A tubes. Many people do not realize that the latter is different from the former only in that it is lower in height. Technicians have been having trouble in pulling 6AF4A's out of the sockets in certain tuners because the tubes are too short to be gripped firmly. On the other hand, the UHF oscillator tube is mounted so close to the picture tube in some all-channel receivers that there is not sufficient clearance to insert the taller 6AF4. Technicians have been finding that the series-string 2AF4 tube has a noticeably lower failure rate than the 6AF4, but no explanation for this was given. The 6T4, another UHF oscillator tube, does not seem to be any more reliable than the 6AF4.

These tube troubles can be avoided by the use of the UHF channel strips in turret tuners, but strips have seldom been used except during the first rush of UHF conversions in 1953. More than one distributor reported that he was overstocked on strips. Service technicians in Fort Wayne are of the opinion that converters and all-channel sets are preferable to strips, particularly with respect to the gain factor.

The Stations

In attempting to get as complete data on UHF as possible, we visited the offices of the UHF stations with the aim of getting detailed information about the extent of their coverage. At WKJG-TV, we had a long interview with the chief engineer, who told us that the signal on Channel 33 reached farther than had been anticipated when the station was built. Usable signals are being provided in a territory within a radius of 40 to 50 miles. The station therefore has within its service area such cities as Marion and Wabash, Ind., and Van Wert and Defiance, Ohio.

The extensiveness of this coverage leads to a unique situation in the northwest part of the service area. Here the Fort Wayne area overlaps with another exclusively UHF service area. Three stations are in operation in the vicinity of South Bend, and they are on Channels 34, 46, and 52. In Warsaw, a person who has two antennas or an antenna with a rotor, can receive five UHF stations!

The Channel 33 engineer said there had been some complaints in the overlap area. When the sound carrier frequency of Channel 46 (667.75 mc) beats with the video carrier frequency of channel 33 (585.25 mc), a difference frequency of 82.5 mc is produced. The subharmonic of this frequency falls within the IF range of many TV sets and is capable of producing a herringbone pattern in the picture. Traps are sometimes needed to eliminate this condition. Adjacent-channel interference from Channel 34 in South Bend has not been a problem.

Because of the high-gain characteristics of the transmitting antenna, there are some so-called "shadow areas" in metropolitan Fort Wayne. The signal is stronger in some neighborhoods than in others, but there are no parts of town in which the station cannot be received as long as reasonable

www.americanradiohistory.com

care is taken when the antenna is installed. The signal is even picked up with an indoor antenna inside the steel-framed office building which houses the WKJG-TV studios in downtown Fort Wayne.

The RF signal is fed to the transmitting antenna through a waveguide, and the antenna is equipped with a de-icing device; therefore, bad weather does not interfere with transmission except during the heaviest sleet storms.

We visited the offices of WIN-T, the Channel 15 station, and obtained some facts about the radiation pattern which is being produced by the new directional antenna. WIN-T had just completed a survey of their new coverage.

The antenna used previously was omnidirectional and developed a video ERP of 237 kilowatts. The figures for video ERP of the new antenna are as follows: 930 kw southward, 405 kw westward, 335 kw eastward, and 272 kw northward. The north and east areas of the radiation pattern are about the same as they were before the change, but coverage has been considerably strengthened and extended in the southwest direction. Most important is that the signal has been improved in Fort Wayne itself. In addition, the cities of Huntington, Bluffton, and Decatur have been brought within the Grade A or prime coverage area.

Fort Wayne Dealers

We visited several service organizations in Fort Wayne, and their answers to our questions followed a consistent pattern. The new receivers which are sold are almost always all-channel sets. The UHF oscillator tubes are a constant headache and usually require replacement within a few weeks to a year after installation, which results in a large number of free service calls being made for the replacement of oscillator tubes still in warranty.

We asked dealers if they were equipped for alignment of the UHF tuners. A few of them said that they had UHF sweep generators and they occasionally align a tuner if this service is obviously needed. Instead of repairing tuners themselves, however, they usually send them back to the

PRECISION

presents **the New Model DOT and BAR GENERATOR E-420**

for Color Convergence and Linearity Patterns

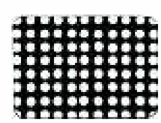
Compatible for COLOR and Monochrome TV

The one Dot and Bar Generator that offers at a reasonable price, every desirable feature for color convergence and linearity pattern testing.

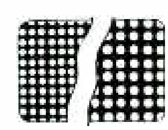
Model E-420 Deluxe (illustrated): In blue-grey, hooded steel cabinet and four-color, satin-brushed aluminum panel with dark-blue control knobs. 13 x 11½ x 6½". Complete with tubes, output cables and comprehensive manual. Shipping Weight: 19 lbs.
Net Price: $150.00

Model E-420 Standard: In standard black ripple finished cabinet. Shipping Weight: 19 lbs.
Net Price: $145.00

• *it's a* **WHITE DOT generator**

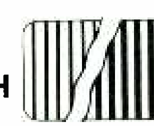


• *it has* **VARIABLE DOT SIZE and NUMBER**

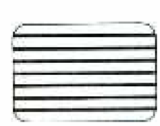


• *it's a* **VERTICAL BAR generator**

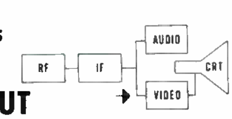
• *it has* **VARIABLE 'V' and 'H' BAR WIDTH and NUMBER**



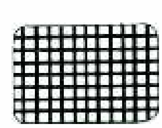
• *it's a* **HORIZONTAL BAR generator**



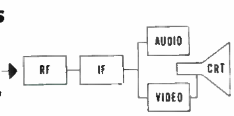
• *it provides* **DIRECT VIDEO OUTPUT**



• *it's a* **CROSS HATCH PATTERN generator**



• *it provides* **MODULATED TV CHANNEL OUTPUT**



PRECISION Apparatus Company, Inc.
70-31 84th STREET, GLENDALE 27, L. I., N. Y.
Export Division: 458 Broadway, New York 13, U.S.A. Cables: Morhanex
Canada: Atlas Radio Corp., Ltd., 50 Wingold Avenue, Toronto 10

PRECISION TEST EQUIPMENT — Standard of Accuracy
PACE — THE METER OF PRECISION

www.americanradiohistory.com

factory for replacement or major repairs.

Corner reflectors are the favorite antennas in the metropolitan area. The dealers don't recommend indoor antennas, but will install them on request. One prominent appliance store does not guarantee reception if an indoor antenna is used, but will give a guarantee if an outdoor installation is made. The usual—and frequently successful—practice in many sections of town is to put up a single corner reflector in an attempt to receive both stations. If a single antenna fails to provide reasonably good reception of both signals, a second antenna is added. A special harness which matches the two antennas to a single transmission line is widely sold throughout the city.

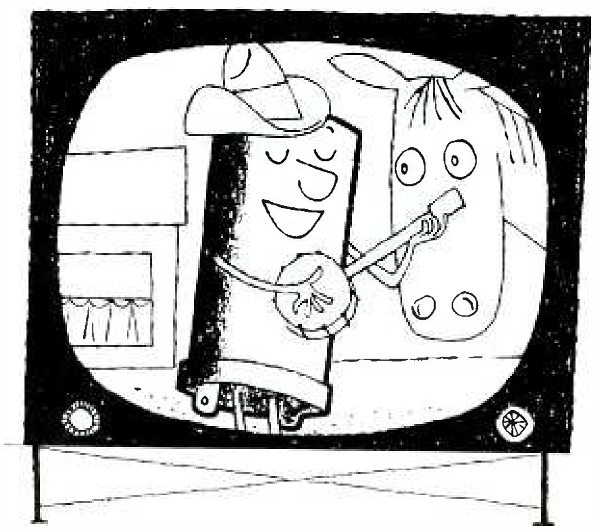
Installations are carefully made, using tubular transmission lines, drip loops, and long standoff insulators. As a result, the effects of bad weather are minimized. Antennas are out of service for perhaps one or two days out of the year during severe ice storms. A type of lead-in which has recently come into use is shaped like tubular line, but the interior space is filled with polyethylene foam which discourages condensation of moisture within the line.

Most of the dealers agreed that the problems of UHF servicing (apart from tuner troubles) are not overly troublesome. We had one dissenting comment from a dealer who is chiefly in the white-goods business but who handles TV as a sideline. He felt that the installation of a UHF antenna is a critical and unprofitable job, and complained that customers are displeased when they find that a UHF-equipped receiver costs as much as $30 more than the nationally-advertised list price. This latter complaint applies particularly to portable receivers, for which the low price is an important selling point. Another complaint was that the average viewer finds UHF stations more difficult to tune in than VHF, and that the new automatic tuning systems are not usable on UHF. Dissention of this sort was not encountered during any other visits in the area.

We made one call in the area north of Fort Wayne, visiting a service shop in a small town located approximately halfway between the two UHF transmitters. Reception conditions were found to be about the same as in Fort Wayne. In some cases, a single antenna can be oriented toward one station, and the other station can be picked up on the back side.

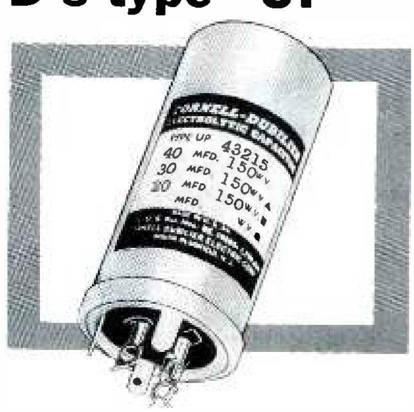
Summary

Both dealers and the public in the Fort Wayne area have a good attitude toward UHF. Since the ultra-high band is their only means of obtaining good TV pictures, they are grateful for the existence of the UHF stations, and are willing to take in their stride the extra cost and greater precision required in UHF installations. The experience in Fort Wayne suggests that if high-powered transmitters are used, and if truly reliable receiving equipment can be developed, UHF television can become more competitive with VHF. ▲



TV's most popular twist-prong electrolytic...C-D's type "UP"

Specified by the industry's leading TV set manufacturers—adopted by "service-wise" technicians, the C-D "UP" is first-choice for wide range twist-prong replacement service—rugged, dependable service-life under conditions of high temperature and high voltage surges. (With a special "UPE" unit for selenium rectifier circuits.) Stock and service problems are "down" with "UP". Ask your nearby C-D Distributor for catalog, or write Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



Cornell-Dubilier capacitors

® South Plainfield, N. J.; New Bedford, Worcester & Cambridge, Mass.; Providence & Hope Valley, R. I.; Indianapolis, Ind., Sanford, Fuquay Springs & Varina, N. C.; Venice, Calif., & subsidiary, The Radiart Corporation, Cleveland, Ohio.

www.americanradiohistory.com

Notes on Test Equipment

(Continued from page 23)

by Seco Mfg. Co., Minneapolis; Minn., as an aid to the service technician in locating those temperamental and hard-to-find intermittent troubles which have a way of refusing to occur while the technician is watching. It can also be used for signal tracing and for gain comparisons.

This model has two identical amplifier channels and can therefore be used to monitor two separate points in a receiver, or two separate receivers if desired. It provides 3 different types of monitoring action: (1) electron-eye indication, (2) neon-lamp indication, and (3) audio-signal indication. The operator can use any or all of these types of indicators at one time.

If the signal in either channel drops below a preset point which is under the control of the operator, the thyratron for that channel fires and actuates a multivibrator oscillator. The multivibrator oscillator. The multivibrator and the neon indicator lamp for that channel provide the audio signal for monitoring by ear. The audio signal is amplified by a 6AK6 before being applied to the speaker, and a volume control is provided for adjustment of the audio output level.

The operator can use the Seco SL-10 to check an intermittent receiver in the following manner. A source of steady signal is connected to the receiver, and the probes of the SL-10 are applied at two separate points in the signal path. The sensitivity control for each channel is adjusted to the point where the thyratron will almost, but not quite, fire when the alarm switch is turned to the ON position. When the sensitivity has been adjusted in this manner, a drop in signal strength will cause the thyratron to fire and operate visible and audible alarms. Once the thyratron has fired, the alarms will continue to operate until the alarm switch is turned off. In this manner, the operator can determine the channel in which the intermittent condition occurred even though the trouble may have disappeared in the meantime.

By shifting the probes to vari-

These 3 *New* Webster Cartridges

REPLACE 18 CURRENT MODELS

TO REPLACE RONETTE

Webster A160

A three-speed low output crystal cartridge that provides an exact replacement, even to mounting shaft size, for eight current Ronette models. Excellent response to 10,000 cps with 7 gr tracking pressure. Color coded orange for quick identification.

Webster A260

Same as A160 but for high output needs. Is an exact replacement for seven current Ronette models. Response to 6,000 cps with 10 gr tracking pressure. Color coded red for easy identification.

TO FIT V-M CHANGERS

Webster A103

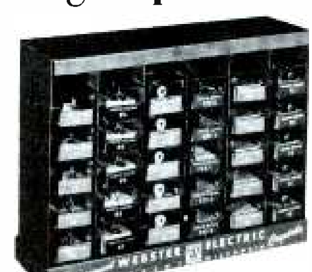
A three-speed low output crystal cartridge with special V-M mounting shaft, for exact replacement on V-M Models 565, 990 and 1285. Fine response to 10,000 cps with 7 gr tracking pressure. Color coded light green for positive identification.

Ask for your copy of the new revised YF-6 Replacement Chart

NEW Shelf-size Self-stacking Dispenser

FOR EASIER STOCK HANDLING

This new interlocking dispenser holds five each of six WEBSTER Cartridges. It's yours FREE with an order for 30 cartridges, any assortment. Be sure to include it on your next order.

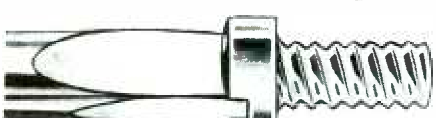


WEBSTER ELECTRIC
RACINE WISCONSIN

www.americanradiohistory.com

Perma-Power
GOLDEN C-BRITE TV BRITENER
Series or Parallel Booster!


At All Distributors
manufactured by
Perma-Power COMPANY
4727 N. Damen Ave., Chicago 25, Ill.
manufacturers of electronic equipment since 1928
Export: SCHEEL INT., Chicago

Grips the screw!
Drives it too!
Quick-Wedge
SCREW-HOLDING
SCREWDRIVER

2" to 14" blades, 4 bit sizes
Available with shockproof plastic covered tubing
Unconditionally guaranteed

ASK FOR IT AT YOUR DEALER
Kedman Co., 233 So. 5th W., Salt Lake City

ous points and using a little deductive reasoning, the operator can track down the source of the intermittent condition. The foregoing description illustrates just one of several ways in which the instrument can be used to find the source of intermittent troubles. The alarm response time varies with the sensitivity setting, and the slowest time is about 1/200 second.

The electron-eye tube gives an indication of the signal strength present at the probes and will continue to do so even though the alarm indicators are functioning. The width of the opening of the eye is proportional to the signal strength, and this width can be used as a basis for comparing gains or losses in a circuit.

The size of the Seco SL-10 Monitron is 8½ by 10¼ by 7⅝ inches, and its weight is 9½ pounds.

Hickok Model 675 Oscilloscope

One of the newest additions to the Hickok line of test equipment is the Model 675 oscilloscope shown in Fig. 2. This is a general-purpose 5-inch oscilloscope designed with the requirements for color servicing in mind. This design embodies high sensitivity and wide-band response of the vertical amplifier.

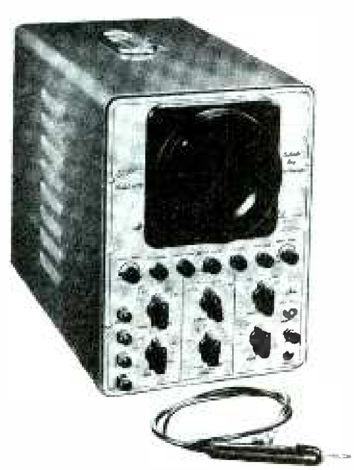


Fig. 2. Hickok Model 675 Oscilloscope.

The deflection sensitivity of the vertical amplifier is 20 millivolts rms per inch with the probe switch set for direct feed-through of the signals. When the probe switch is set at the low-capacity position, there is an attenuation factor of ten times, making the effective sensitivity of the vertical deflection system 200 millivolts rms per inch. The deflection sensitivity of the horizontal amplifier is 250 millivolts per inch.

The various input impedances are as follows: the vertical amplifier without probe, 1 megohm in parallel with 40 micromicrofarads; vertical amplifier with probe in HI position, 1 megohm in parallel with 80 micromicrofarads; vertical amplifier with probe in LO position, 10 megohms in parallel with less than 10 micromicrofarads; horizontal amplifier, 1 megohm in parallel with 25 micromicrofarads; Z axis, 2.2 megohms; external sync, 1,000 ohms.

The frequency response of the vertical amplifier is flat within 3 decibels from 1 cycle to 4.5 megacycles. The pulse rise time is .08 microsecond. The frequency-compensated step attenuator has decade steps with attenuation ratios of 1 to 1, 10 to 1, 100 to 1 and 1,000 to 1. A fifth position of the vertical attenuation switch provides a calibration signal of 100 millivolts peak to peak at line frequency.

The frequency response of the horizontal amplifier is flat within 3 decibels from 1 cycle to 450 kilocycles. A two-step attenuator provides attenuation ratios of 1 to 1 and 10 to 1. Both vertical and horizontal amplifiers have vernier gain controls.

The time-base generator covers a frequency range of 10 cycles to 100 kilocycles in 4 decade ranges. Each range is continuously variable by means of a sweep vernier control.

When the trace developed by the time base is fully expanded, it is equivalent to a 40-inch trace. Any portion of the expanded trace can be brought into view on the screen by means of the horizontal positioning control.

The dimensions of the instrument are 13 by 10 by 16 inches, and the weight is 35 pounds.

Radio City Products Model 325 Tester

The Radio City Products (RCP) Model 325 multi-conductance tube-transistor tester is shown in Fig. 3. The Model 325 tests tubes for shorts, plate con-

www.americanradiohistory.com

Fig. 3. Radio City Products Model 325 Tube-Transistor Tester.

ductance, and grid conductance. It also tests transistors for current gains between 0 and 50.

Among the tube types which can be tested with this tester are radio and television receiving tubes, television picture tubes (an adapter must be used), electron-eye tubes, subminiature tubes, ballast tubes, and others. Transistors of the p-n-p and n-p-n types can be tested.

Each tube element is set up for testing by means of individual lever switches. Other functions such as bias and filament voltages, meter shunts, and the like are selected by means of rotary switches.

The recommended procedure in testing a tube is to make a shorts test first; then the plate-conductance test; and if the tube passes these tests, a grid-conductance test. The plate-conductance test is sometimes called an emission test, and the grid-conductance test is sometimes called a mutual-conductance or g_m test.

In testing transistors, a battery supply is used. The instrument is first balanced so that the transistor will draw exactly one milliampere, then the base current is changed by exactly 10 microamperes. The current gain can then be read directly from the meter.

The instrument case is of steel and contains a compartment for storing the test leads and power cord when the instrument is not in use. Pin straighteners made of metal are conveniently placed on the lid of the storage compartment and will accommodate 7- and 9-pin miniature tubes.

The size of the instrument case is 15³⁄₁₆ by 13¾ by 5½ inches.

NEW AUTOMATION TV TUBE TESTER

CAN'T BECOME OBSOLETE

ONLY 3 SOCKETS!

to test all TV tubes!

Model DM 456 $125

Perfo SYSTEM

INSERT THIS CARD

Eliminates 25 switches and 30 sockets saves 80% of testing time

DynaMatic tube tester uses perforated plastic cards to automatically set up socket pin connections & test voltages

- PERFO Cards are made available to test all new tubes as fast as they appear in TV sets.
- No more multiple socket panels or roll charts that become obsolete when new tubes are introduced.
- Smallest and lightest Gm tube tester ever produced. Take it with you on ALL house calls.
- Permits full-complement tube testing which must result in increased tube sales.
- Lots of free advertising when customer sees his tubes tested on automatic equipment.
- DynaMatic is a dynamic mutual conductance tester—NOT an emission checker
- Shows percentage of rated mutual conductance on GOOD-BAD scale.
- Measures mutual conductance in micromhos on 2 ranges: 0-6000, 0-18000.

SEE IT AT YOUR JOBBER THIS MONTH

TELETEST

TeleTest Instrument Corporation
121-08 14th Road
College Point 56, New York

Gernsback Library books can help you

Get ahead in TV, Radio, High Fidelity

Basic Audio Course — Audio fundamentals from theory of sound to advanced techniques. No. 66. 224 pages.
☐ Paper cover $2.75
☐ Hard cover $5.00

NEW—Servicing Record Changers — Important steps illustrated with detailed line drawings. No. 59. 224 pages.
☐ Paper cover $2.90
☐ Hard cover $4.60

NEW! Maintaining Hi-Fi Equipment—Joseph Marshall explains hi-fi servicing techniques. No. 58. 224 pages.
☐ Paper cover $2.90
☐ Hard cover $5.00

The V.T.V.M.—How to use the V.T.V.M. to best advantage. No. 57. 224 pages.
☐ Paper cover $2.50
☐ Hard cover $4.60

NEW — High-Fidelity Circuit Design — By Crowhurst and Cooper. Includes Cooper's "Audio Feedback Design" series from RADIO-ELECTRONICS. No. 56. 304 pages.
☐ Hard cover only $5.95

Sweep and Marker Generators for Television and Radio—No. 55. 224 pages.
☐ Paper cover $2.50
☐ Hard cover $4.60

Probes—No. 54. 224 pages.
☐ Paper cover $2.50
☐ Hard cover $4.60

Radio-Control Handbook—How to build R/C systems. No. 53. 192 pages.
☐ Paper cover $2.25

The Oscilloscope—Get more out of your scope. No. 52. 192 pages.
☐ Paper cover $2.25
☐ Hard cover $4.60

☐ **Transistors — Theory and Practice**—For the practical man—theory and application in circuits. No. 51. 144 pages. Paper cover $2.00

☐ **TV Repair Techniques** — Practical hints save you hours of servicing time. No. 50. 128 pages. Paper cover $1.50

☐ **Radio & TV Test Instruments**—How to build 22 test instruments for modern servicing. No. 49. 128 pages. Paper cover $1.50

☐ **High-Fidelity—Design, Construction, Measurements** —How to achieve top performance! Amplifier construction details. No. 48. 128 pages. Paper cover $1.50

OTHER GERNSBACK LIBRARY BOOKS

Paper cover editions

☐ **Radio & TV Hints**—No. 47. 112 pages. $1.00

☐ **Television Technotes**—No. 46. 128 pages. $1.50

☐ **Radio Tube Fundamentals** — No. 45. 96 pages. $1.00

☐ **Basic Radio Course**—No. 44. Hard Cover. 176 pages. $2.25

☐ **Model Control by Radio.** No. 43. 112 pages. $1.00

☐ **High-Fidelity Techniques**—No. 42. 112 pages. $1.00

☐ **Practical Disc Recording**—No. 39. 96 pages. 75c

See your distributor or use this form

GERNSBACK LIBRARY, INC.
154 West 14th St.
New York 11, N.Y.

Enclosed is my remittance of $.................. for which send me postpaid the books checked above. PR-96
Prices 10% higher in Canada
Name .... (please print)
Street..
City.. State..................

www.americanradiohistory.com

Tele-Check Model CR-99

Telematic Industries, Inc., have made available the Tele-Check Model CR-99 picture tube and yoke assembly shown in Fig. 4. It consists of a 5AXP4 self-focusing picture tube, a universal yoke, and all necessary leads for connecting it to a television receiver. The assembly provides a convenient means for testing and servicing either in the home or at the shop.

The unit can be used in a number of ways, depending upon the service technician's particular needs. The tube and yoke can be used together, or the yoke from the receiver can be substituted for the yoke provided with the unit. Both the yoke and tube can easily be removed from the carrying case, and the tube can thus be used as a direct substitution for the one in the set. The Tele-Check unit will work with receivers which employ 52°, 70°, 72°, or 90° yokes. No ion trap is required for the 5AXP4 tube.

Fig. 4. Tele-Check Model CR-99 Picture Tube and Yoke Assembly.

Uses of the Sylvania 5AXP4 tube as a servicing tool were covered in an article, "A TV Receiver Check Tube," in the January 1955 issue of the PF Reporter. The advantages of the 5AXP4, as mentioned in that article, will apply to the use of the Tele-Check, in addition to which the Tele-Check has the added features of portability, tube protection, and a self-contained deflection yoke. The high-voltage lead and the picture-tube leads are completely detachable and can be used for general service work.

Fig. 5 shows the interior of the Tele-Check unit and the manner in which the yoke and tube are fastened in place. Two wing nuts hold down a wood block which clamps over the yoke. After these wing nuts and the block are removed, the tube and yoke can be lifted out of the case.

Fig. 5. Interior View of Model CR-99.

All the necessary leads for connecting the unit are furnished, and their length of 6′ should be ample for any bench or home set-up the technician is likely to encounter. All clip leads are pro-

SO SAFE!

let alone wire or cable!

ARROW STAPLE GUNS can't damage wire or cable because driving blade automatically stops staple at right height! That's why Arrow Staple Guns are proved safer on jobs all over the country. And Arrow staples have tremendous holding power because they're rosin-coated, have diverging points that lock into wood.

T-25 (shown) **for wires up to 1/4" in diameter.** (Hi-Fi wire, radiant heating, bell, thermostat, telephone, inter-com, etc.) tapered striking edge gets into tight corners. Uses 3/8", 7/16", and 9/16" staples, List $15
T-25B For burglar alarm wiring. Drives staples flush . . . List $15
T-75 For non-metallic sheathed cable, Romex cable or any other object (such as copper tubing) up to 1/2" in diameter. Uses 9/16", 5/8", and 7/8" Arrow staples . . . . List $15

ARROW FASTENER COMPANY, INC.
ONE JUNIUS STREET, BROOKLYN 12, N. Y.

1st COMPLETE LINE of ELECTRONIC TOOLS *ever offered the industry*

jobbers . . . Order your matched displays, today!
DISPLAYS THAT COMPLIMENT YOUR STORE

HUNTER Tools, originators of the TV Slug Retriever, now offer the only *complete* line of Electronic Hand Tools available.

Famous Hunter Tools . . .

- SLUG RETRIEVERS
- SCREWHOLDING SCREWDRIVERS
- NUT DRIVERS
- DURA TIP SCREWDRIVERS
- SPIN DRIVERS
- INSULATED DRIVERS
- BELT TOOL KITS
- HEX DRIVERS
- DRIVE ALL JUNIOR
- SMITTY (Allen Type) DRIVERS
- TENSION TWEEZIE
- HOT TUBE PULLERS
- ALIGNMENT TOOLS
- SEPARATELY OR COMPLETE KITS

SERVICE MASTER #100

SERVICE MASTER #500

Write for a free copy of our new complete catalog, today!

HUNTER TOOLS
Box 564
Whittier, California

ALL TOOLS IN SIZES TO FIT YOUR SPECIFIC NEEDS! TOOLS DESIGNED FOR THE ELECTRONIC INDUSTRY.

www.americanradiohistory.com

vided with flexible insulators and notches are provided in the side of the case so that the leads can be brought out and the unit operated with the case closed. This gives an added margin of safety, especially when the unit is operated in the home.

The yoke leads can be clipped to appropriate terminals in the receiver circuit, or they can be clipped directly to an insulated lead. Each yoke clip contains an insulation-piercing needle for the latter use, and each section of the yoke is fused for protection. When the 5AXP4 tube is in place in the carrying case, its face is protected from abrasion by a plastic disc.

Simpson Model 383A In-Circuit "Capacohmeter"

The Simpson Model 383 in-circuit capacitor leakage tester was discussed in this column in the December 1955 issue of the PF Reporter. Model 383 was designed to test leakages of capacitors and other components while they are still in the circuit. The Simpson Electric Co. has recently developed the Model 383A (Fig. 6) in-circuit "Capacohmeter" which will perform all the tests of the Model 383, as well as other tests such as the direct measurement of capacity and high resistances.

Fig. 6. Simpson Model 383A In-Circuit "Capacohmeter."

The pulse test for leakage is performed by application of a controlled pulse voltage to a suspected component and by observation of the meter for a change in indication. The pulse voltage is adjustable and may be as high as 900 volts. In order for a capacitor to be tested for leakage, it is recom-

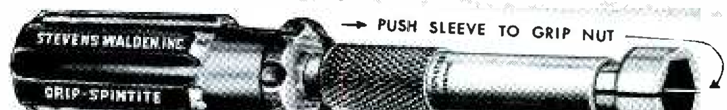
"GRIP" PRESENTING THE New SPINTITE® WRENCHES

PATENTS PENDING

FINEST QUALITY STEEL SHANK AND SLEEVE • BRIGHT PLATED FINISH • STRONG PLASTIC HANDLE

WITH THE EASY "FINGER-CONTROL"

GRIP AND RELEASE ACTION FOR THOSE HARD-TO-GET-AT PLACES —



SIZES 3/16" TO 11/16"

BY THE MAKERS OF THE ORIGINAL SPINTITE WRENCHES OVER 150 STYLES AND SIZES

ONE HAND OPERATION—

- GRIPS nuts or bolts of any material
- HOLDS firmly in any position
- TIGHTENS nut or bolt securely
- RELEASES at the pull of the fingers

Write for catologue

STEVENS WALDEN Inc.

500 SHREWSBURY STREET — WORCESTER, MASSACHUSETTS

MAKERS OF WORLD-FAMOUS HAND TOOLS FOR OVER 50 YEARS

CHICAGO STANDARD TRANSFORMER CORPORATION

3503 Addison Street • Chicago 18, Illinois

"Now let's see if you can remember to bring home those JENSEN NEEDLES tonight!"

www.americanradiohistory.com

mended that a pulse voltage equal to the rated voltage of the capacitor be applied. For breakdown tests, the voltage may be raised to 150% of rated voltage.

A narrow reference mark on the meter scale forms the starting point for a leakage test. The meter-adjust knob is turned until the meter needle lines up with this reference mark while the test leads are across the capacitor. The capacitor need not be removed from its circuit for these tests. The function switch is then turned to the PULSE position, and the PULSE VOLTAGE control is turned to the required test voltage.

When the capacitor is subjected to this pulse voltage, there are several possible results. If the capacitor is good, the meter needle will remain at the GOOD position. However, certain types of nonlinear leakage or unstable leakage will cause the meter needle to move off the GOOD portion of the scale into one of the BAD sectors.

A perfectly good capacitor will still have a leakage resistance which can be measured with a DC ohmeter, provided that the ohmmeter is sensitive enough to measure the high resistances involved, which may be several hundred megohms. Model 383A will measure resistances up to 1000 megohms. This test may be used not only for measuring the DC leakage of capacitors but other high-resistance measurements as well.

Direct measurements of capacity may be made with Model 383A while the capacitor is either in or out of the circuit. Five different ranges are provided for measurements up to 1000 mmf, 0.1 mfd, .1 mfd, 1.0 mfd, and 10 mfd. The accuracy of in-circuit measurements depends upon the value of any resistances which may be in shunt with the capacitor. The operator's manual lists the minimum shunt resistance which can be parallel with various values of capacitance in order for the error of measurement not to exceed 10%.

To test coupling capacitors in the circuit, a third jack is provided in addition to the two used for all other tests; therefore, a coupling capacitor test requires the use of three leads from the instrument. Coupling capacitors may be tested either for capacity or leakage. In cases in which a low impedance is effectively in shunt with a coupling capacitor being tested for leakage, the loading effect of the shunt impedance may cause an error in the meter reading. To offset this effect and to provide a more accurate indication of the capacitor condition, the meter sensitivity can be increased by means of a spring-return METER SENSITIVITY switch on the front panel.

In summary, the Simpson Model 383A "Capacohmeter" provides three important services which may be performed on components either in or out of circuit: (1) pulse testing for leakages in capacitors or other components, (2) a DC ohmmeter test up to 1000 megohms, and (3) direct reading of capacities up to 10 microfarads. Like Model 383, Model 383A is not designed to test electrolytic capacitors. The size of the instrument case is approximately 11⅜ by 7½ by 7 inches. ▲

Why "The Man On The Roof"

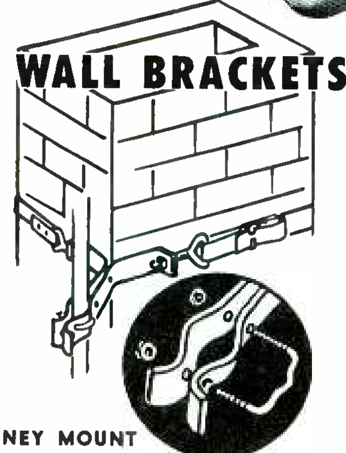
prefers South River

for making superior television antenna installations

Take "Snap-In" Type

CHIMNEY MOUNTS and WALL BRACKETS

for instance . . .



Unique U Bolts instead of two screws make for quick, simple, antenna installation. Spring tension on steel mast retainers holds antenna mast while Special U Bolts are inserted and tightened. Saves installer time — permits greater safety. Same features are included in Snap-In Wall Brackets.

SN-50 CHIMNEY MOUNT
(Two To A Set)

"Special U Bolt is far superior to two screws"

"Hot-Dip Galvanized for rust resistance . . . prevents ugly rust streaking"

"Need only *one* hand and spintite for securing mast"

"One hand can be used to hold on to the mast, ladder or mounting for greater safety"

"Saves time fumbling with screws and screwdriver. Only one man needed on roof"

Mr. Installer:

DON'T BE SWITCHED—IT'S *YOUR* TIME AND SAFETY

Your Distributor has these in stock or can order and receive them *immediately*. If your distributor does not handle South River products, please write us on your business letterhead. We'll see him at once and tell him the story of South River superiority.

Products made better by design — with the installer in mind

MAKE IT EASY FOR YOURSELF . . . Better for your Customers

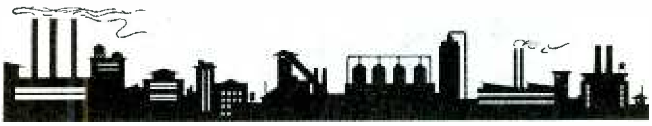
Insist on mountings and accessories made by

South River **METAL PRODUCTS CO., INC.**
South River, New Jersey

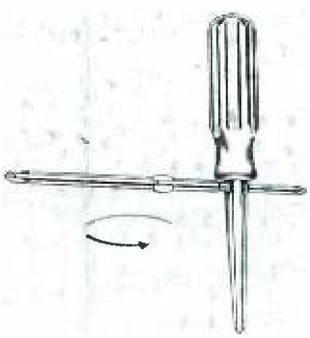
PIONEER MANUFACTURER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTING ACCESSORIES

www.americanradiohistory.com

Product Report



HAND REAMERS



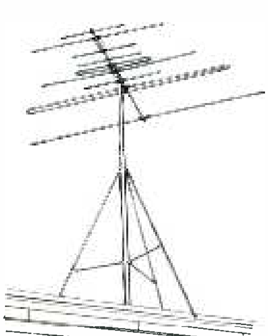
New ½″ capacity hand reamers (No. 39) produced by Xcelite, Inc., Orchard Park, N. Y., have a 3/16″ hole in the shank in which a 3/16″ screwdriver or pin may be inserted to provide T-handle leverage for heavy work. A conventional plastic handle is used for ordinary work.

The new reamers are available either fixed in a plastic handle or else detachable to fit the combination handle supplied in Xcelite No. 99 nut driver, screwdriver, and reamer kits.

COLOR SERVICE ACCESSORIES

A line of color TV service accessories has been announced by Telematic Industries, Inc., 16 Howard Ave., Brooklyn, N. Y. The line consists of four service extensions, a universal high-voltage cheater, a three-way bias supply, and a convergence adjustment grid switch. The four extensions are for the CRT socket, deflection yoke, convergence yoke, and second anode. The extensions and the cheater can be obtained separately in a kit designated as Model CR-114.

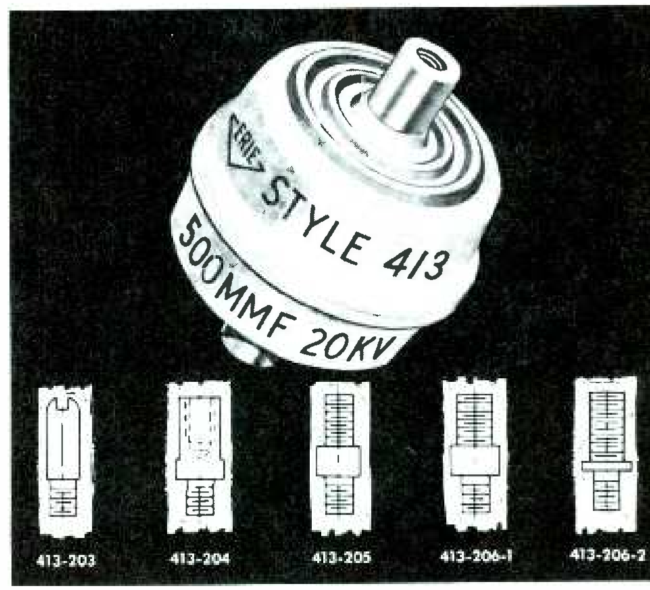
COMPLETE ANTENNA PACKAGE



All essential parts needed for an antenna installation are included in one package, the "Minute-Mount," now being produced by the Winegard Co., Burlington, Iowa. The package consists of a 10′ aluminum mast with a factory-assembled fold-out tripod base assembly, a high-gain antenna suitable for fringe areas, attached lead-in, seven insulators, a lightning arrester, ground wire, and a ground rod. List price is $37.50.

ERIE 413

HIGH VOLTAGE CERAMICONS®



THE REPLACEMENT for high voltage TV filter applications

The ERIE 413 High Voltage Ceramicon is an innovation in capacitor design and has had wide acceptance by servicemen everywhere.

Now, for even greater convenience, each body is individually packaged with 7 terminals in 5 different styles. With a minimum stock the serviceman is now able to supply the correct replacement terminals for practically any receiver rated at 20 KV or lower. Inventory is reduced, service time is reduced, profits are increased. The illustrations above tell the story.

ERIE components are stocked by leading electronic distributors everywhere.

ERIE electronics

ERIE ELECTRONICS DISTRIBUTOR DIVISION
ERIE RESISTOR CORPORATION
Main Offices: ERIE, PA.
Factories: ERIE, PA. • LONDON, ENGLAND • TRENTON, ONTARIO

www.americanradiohistory.com

XCELITE Hand Tools
PREFERRED BY THE EXPERTS

NOW!
any "99" parts
you need —
IMMEDIATELY!

You can now replace or add any part to your XCELITE 99-PR nut driver, screwdriver and reamer roll kit immediately because your supplier has this No. 699 Replacement Kit! It has backup stock to supply the hundreds of thousands of "99" kits now in use. If you've lost a handle — want that new ½" XCELITE 99-39 reamer — need a new plastic roll pocket kit — your distributor can supply you in a hurry. Ask him!

XCELITE INCORPORATED
Dept. Q.,
Orchard Park, N. Y.

In Canada — Charles W. Pointon Ltd., 6 Alcina Ave., Toronto, Ont.

For Originality
LOOK TO XCELITE

The Capacitor Package that means Quality

1 year service guarantee

When you see this package in the familiar red and black box, you know it contains "trouble-free" Planet capacitors—mechanically and electrically tested throughout manufacture. This rigid system of quality control makes our unconditional one-year guarantee possible. But making Planet capacitors correctly from the start means reasonable prices too!

PLANET MANUFACTURING CORPORATION

225 BELLEVILLE AVENUE
BLOOMFIELD, N. J.

PLANET

Write for Catalog listing specifications on stock items.

PRINTED BOARD KIT

Photocircuits Corp., Glen Cove, N. Y., has developed a complete kit for production of engineering models of printed wiring boards. A completely etched board ready for assembly may be finished in about 30 minutes, and at least a dozen circuits may be produced with the materials provided in one kit. Included in the kit are a newly developed drawing pen, etchant-resisting ink, etching powder, a drawing guide, 10 copper laminated Bakelite sheets, 10 tube sockets, and instructions.

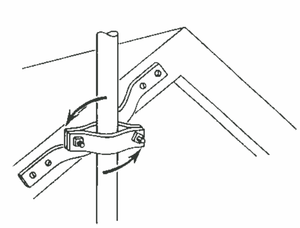
KIT OF FILES

Centralab, a division of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee, Wis., is now distributing a precision needle file kit (PF-7). Seven files, made in Switzerland of high-grade carbon steel, are included in each kit. All files are 5½" long and have No. 0 cutting surfaces. They are supplied in seven different shapes: round, half round, flat, square, oval, triangular, and knife edge. The files are packaged in a plastic tube.

POCKET MULTIMETER

A new 20,000-ohms-per-volt DC multimeter, compact enough to fit into a technician's pocket or tube caddy, has been introduced by Precision Apparatus Co., Inc., Glendale, L. I., N. Y. The new meter, Model 110, measures only 1$^{11}/_{16}$" x 3½" x 5⅜". It provides 6 DC and AC voltage ranges, from 1.5 to 3,000 volts full scale; 5 DC current ranges up to 600 ma; 3 resistance ranges; and 6 decibel ranges. Model 110 is priced at $32.50 net.

MAST MOUNT



Developed by South River Metal Products Co., Inc., South River, N. J., for use with push-up mast installations, the GU-3 mast mount is especially designed to be used for antenna masts which are installed from the ground up. The 3¼-inch capacity of the GU-3 is suitable for the base of a 50-foot telescoping mast and is adjustable down to 1¼ inches. List price is $5.85 a pair.

www.americanradiohistory.com

Dollar and Sense

(Continued from page 29)

why it should; in fact, those who are marking time with regard to buying a color set will be putting out more money than usual for service on their old set, if the law of averages on component failure holds up. WARNING: Don't get talked into price-cutting on service just because someone wants the old set to last only a few months longer; your work is worth regular rates regardless of why the customer wants it.

HOLDING CUSTOMERS. When planning promotion, never forget that a satisfied old customer is worth a lot more than a new one. If you spend all your promotion time and money trying to get new customers, there'll be none left to hold the old ones against promotional raids by competitors.

If you offer a special discount or a bit of free service to a new customer, let the old customers in on a special deal now and then, too. If you don't, someone else will.

Help the old customers to remember your name and phone number. Cards get lost, and in many towns the names of service shops are confusingly alike. Use repeated mailings to remind them that they are considered old customers of yours, and their sets will receive special personal attention because of this. Emphasize the reliability of your work—that they won't have to worry when their sets are in your hands. Don't knock competitive claims, but make sure each customer knows you can do consistently good work on his particular set because of your familiarity with it.

ARGUMENTS. You can't win both an argument and a sale; in fact, when you win an argument you'll invariably lose something—a prospect, a friend. But people can be convinced without getting into arguments, if the right approach is used.

Give the other fellow the benefit of the doubt and listen to him. Don't interrupt, no matter how witty a rebuttal you may have. Just listening is one of the biggest compliments you can pay him.

If he brings up a point that you don't agree with and he wants your reaction, stall for time. Scratch your head, think carefully before answering, or even ask to sleep on it overnight so you can give his idea the full consideration it rates. This opens up both your minds psychologically, whereas arguing closes them to reason. With time for thinking, each sees some merit in the ideas of the other. Agreement then follows quickly, without argument.

If you can learn to follow this little argument-avoiding technique a few times a week, you've acquired valuable executive ability that will eventually pay off.

NEEDLES. New record changers select 33⅓ and 45-rpm speeds automatically, but this isn't enough. What changers really need is a 4-speed, 2-needle brain so you can put on any record and get the right setting. This may require some cooperation from record manufacturers, such as putting coded notches in the center hole of each record for setting up speed and needle. Who'll invent it?

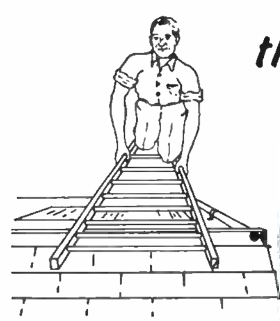
CORNISH

The symbol of good WIRE

TV LEAD-IN CABLES
ANTENNA CONTROL CABLES
INTERCOMMUNICATION CABLES
HOOK-UP WIRES • MICROPHONE CABLES
SHIELDED CABLES • TEST LEAD WIRES
COAXIAL CABLES • PORTABLE CORDS
REPLACEMENT CORD SETS

PREFERRED . . . since the earliest days of Radio . . . for absolute uniformity and superior quality.

CORNISH WIRE CO., INC.
50 Church Street New York 7, N. Y.



the "2nd" trip up . . costs YOU!

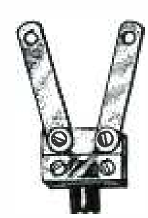
STOP Antenna Call-Backs due to broken leads *with*

TV installation profits vanish when you're called back to repair a wind-whipped lead-in connection!

Protect those profits — and your reputation — by using the Mosley "Y–TY" on each antenna you install.

A sturdy clamping member locks around the complete line . . . takes the strain off the fragile copper strands! The plated brass connecting straps bend and twist to fit any antenna type.

the mosley 'Y-TY'



No. 263 — Mosley "Y-TY"
NEW LOW PRICE! . . . $ .65

Another *Premium Quality* MOSLEY Product . . .
to help YOU make More *Installation Profits!*

At Radio and Television Parts Distributors, Coast–to–Coast.

MOSLEY ELECTRONICS, Inc.
8622 St. Charles Rock Rd., St. Louis 14, Missouri

www.americanradiohistory.com

PF REPORTER

INDEX TO ADVERTISERS

September, 1956

PF REPORTER CATALOG and LITERATURE SERVICE

valuable manufacturers' data available to our readers

1W. AEROVOX (Aerovox Corp.)

Auto-Radio Replacement Guide chart for electrolytic-capacitor replacements in auto radios which includes trade names, manufacturers' part numbers, AFH (twist-prong electrolytic) catalog numbers, capacitance values, voltages, sizes and list prices for every popular auto-radio on the market. *See advertisement page* 31.

2W. ASTATIC (Astatic Corp.)

Completely new cartridge cross reference manual. No. CRC6 and brand new pickup cartridge catalog. No. PCC6. *See advertisement page* 57.

3W. B & K (B & K Mfg. Co.)

Bulletin 1000 describes new DYNA-SCAN picture and pattern video-generator. Explains its use in servicing black and white and color TV and how it acts as a closed-circuit TV. Also Bulletin 750 describing new, low-cost, lab-type Test Equipment Calibrator Model 750 that checks instrument accuracy. *See advertisement page* 26.

4W. BUSSMANN (Bussmann Mfg. Co.)

Bulletin showing fuses and fuse-holders adapted to protection of TV and other electronic equipment (Form SFB). *See advertisement page* 36.

5W. BLONDER-TONGUE (Blonder-Tongue Labs., Inc.)

TV for motels, hotels and trailer courts, plus new VHF and UHF Equipment Catalog. *See advertisement page* 42.

6W. CLAROSTAT (Clarostat Mfg. Co., Inc.)

15/16″ diameter composition element controls; 0.5 watt; 500 ohms to 10 megohms, Form No. 753450. *See advertisement page* 40.

7W. DYNAMIC (Dynamic Electronics—New York, Inc.)

Complete catalog of TV and FM accessories. Also booklet entitled "How to Recognize and Remedy Your TV & FM Problems." *See advertisement page* 68.

8W. EICO (Electronic Instrument Co., Inc.)

Free 1956 12-page EICO Catalog shows you how to save 50% on your test instrument and Hi-Fi equipment costs: VTVMs, Scopes, Generators, Tube Testers, Amplifiers; 50 models to choose from. *See advertisement page* 58.

9W. ERIE (Erie Resistor Corp.)

LP-4 Corning Glass Resistors. *See advertisement page* 77.

10W. G-C (General Cement Electronics Mfg. Co., Div. of Textron, Inc.)

Coupon good for one free box of 60-line resistors with the purchase of the 60-line box from local Distributor. *See advertisement page* 65.

11W. GERNSBACK (Gernsback Publications, Inc.)

Descriptive literature on the Gernsback Library Books. *See advertisement page* 73.

12W. HICKOK (Hickok Electrical Instrument Co.)

Descriptive brochure covering new Electronic Volt-Ohmmeter Kit with 9″ meter. *See advertisement page* 12.

13W. IRC (International Resistance Co.)

Form S-035, DLR-56 Dealer Replacement Parts Catalog. *See advertisement 2nd Cover.*

14W. JENSEN (Jensen Industries, Inc.)

Wall Chart—New 1956, completely illustrated; contains all up-to-date replacement needle information, including point size, point material, cartridge number, list price. *See advertisement page* 75.

15W. MOSLEY (Mosley Electronics, Inc.)

Literature on new Mosley FM-TV Wave Traps. *See advertisement page* 79.

16W. RADIART (The Radiart Corp.)

F-904 Rotor Catalog illustrating complete line of rotators. *See advertisement pages* 17 *through* 20.

17W. TACO (Technical Appliance Corp.)

Technical data on Topline Antennas for color. *See advertisement page* 10.

18W. TELETEST (Teletest Instrument Corp.)

Literature covering DynaMatic tube tester and complete line. *See advertisement page* 73.

19W. WINSTON (Winston Electronics, Inc.)

Descriptive literature on Win-tronix Test Instruments. *See advertisement page* 55.

20W. XCELITE (Xcelite, Inc.)

Illustrated folder on new ½″ chrome plated reamers with leverage hole in shank; catalog on complete line of hand tools. *See advertisement page* 78.

www.americanradiohistory.com

SUPPLEMENT No. 101-A

SEPTEMBER 1956

SUPPLEMENT to SAMS MASTER INDEX No. 101

Use this Supplement together with the new 36-page SAMS MASTER INDEX for complete coverage.

For models and chassis not listed in this Supplement, refer to SAMS MASTER INDEX No. 101. If you haven't a copy, send for it today. It's FREE . . . just write to HOWARD W. SAMS & CO., INC. 2201 East 46th Street, Indianapolis 5, Indiana.

This Supplement is your handy index to new models covered in the latest PHOTOFACT Sets 328 through 331. It's your guide to the world's finest service data coverage of the current output of the new TV and Radio receivers, as well as models not previously covered in PHOTOFACT. It keeps you right up to date.

ALWAYS USE YOUR LATEST ISSUE OF THIS SUPPLEMENT WITH THE SAMS MASTER INDEX . . . TOGETHER, THEY ARE YOUR COMPLETE INDEX TO OVER 30,000 MODELS.

FILE WITH YOUR SAMS MASTER INDEX No. 101, DATED SEPTEMBER, 1956

Set No. — Folder No.

ADMIRAL
- Chassis 3D1B, 3D1C .... 321—1, 329—2
- ● Chassis 14UY3B, 14UY3C .... 330—13—S
- ● Chassis 20Y4H, HF .... 329—2
- ● Models L23B6, L23B7 (See Ch. 20Y4H)
- ● Models TS25B26, TS25B27 (See Ch. 20SY4F)

AIRLINE
- GAA-990B (See Model GAA-990A—Set 320-3)
- ● WG-5017A (See Model WG-4011A—Set 313-2)
- ● WG-5117A (See Model WG-4011A—Set 313-2)
- 2509 .... 328—2

AMERICAN MOTORS
- 8990378 (6MA) .... 329—3

ARVIN
- 954P1 (Ch. RE-389) (See Model 954P—Set 300-2)
- 8565 (Ch. RE-412) (See Model 954P—Set 300-2)
- Ch. RE-412 (See Model 8565)

BENDIX
- K2250, K2251 (Ch. T20, T20-1) .... 328—3
- T2150, T2151 (Ch. T20, T20-1) .... 328—3
- Ch. T20, T20-1 (See Model K2250)

CAPEHART
- 2P56 (Ch. CR-218) .... 330—2
- ● 3T216BD, -4, -5, 3T216MD-4, -5 (Ch. CX-38S) .... 331—2
- ● 6T216BD-4, -5, 6T216MD-4, -5 (Ch. CX-38S) .... 331—2
- ● 11C216BD-4, -5, 11C216MD-4, -5 (Ch. CX-38S) .... 331—2
- ● 16C216BD-4, -5, 16C216FD-4, -5, 16C216MD-4, -5 (Ch. CX-38S) .... 331—2
- 46TP56B, M (Ch. CA-239) .... 330—3
- 88P66BNL .... 331—3
- Ch. CA-239 (See Model 46TP56B)
- Ch. CR-218 (See Model 2P56)
- ● Ch. CX-38S Series (See Model 3T216BD-4)

CHEVROLET
- 987368 .... 331—4

COLUMBIA RECORDS
- 424 .... 331—5

DAVID BOGEN
- R710 .... 330—4
- RR550 .... 331—6

DEWALD
- K-701-A .... 329—5

EMERSON
- ● 1176 (Ch. 120292-P, -V) . 331—7
- ● 1177 (Ch. 120293-T, -X) . 331—7
- ● 1178 (Ch. 120292-P, -V) . 331—7
- ● 1179 (Ch. 120292-T, -X) . 331—7
- ● 1180 (Ch. 120292-P, -V) . 331—7
- ● 1181 (Ch. 120293-T, -X) . 331—7
- ● 1186 (Ch. 120299-V) .... 331—7
- ● 1187 (Ch. 120300-X) .... 331—7
- ● 1188 (Ch. 120299-V) .... 331—7
- ● 1189 (Ch. 120300-X) .... 331—7
- Ch. 120292-P, -V (See Model 1176)
- Ch. 120293-T, -X (See Model 1177)
- Ch. 120299-V (See Model 1186)
- Ch. 120300-X (See Model 1187)

FIRESTONE
- 4-A-131 (Code 1-5-3A7, U) 329—6
- ● 13-G-201, 13-G-202, 13-G-203, 13-G-204, 13-G-205, 13-G-206 (Codes 334-5-A61C/A, 334-5-A61U/A) .... 330—5

FORD
- FDR-18805-B .... 33—18
- FDR-108806-F .... 328—4
- FEF-18805-B .... 328—4
- 6BF (FDR-18805-B) .... 331—8
- 69MF (FDR-18806-F) .... 328—4
- 69MS (FEF-18805-B) .... 328—4

GENERAL ELECTRIC
- ● UHF-21C225, UHF-21C226, UHF-21C227, UHF-21C228, UHF-21C229, UHF-21C230, UHF-21C231, UHF-21C232, UHF-21C233, UHF-21T20, UHF-21T21 (See PCB 165—Set 328-1 and Model 21C225—Set 237-7)
- ● 14T016, 14T017, 14T018 ("Q" line) (See PCB 165—Set 238-1 and Model 14T007—Set 310-4)
- ● 17T025, 17T026 ("MM" line) .... 329—18—S
- ● 21C125, 21C126, 21C127 ("S" line) (See PCB 168—Set 331-1 and Model 21C110—Set 313-4)
- ● 21C137, 21C138 ("U" line) .... 328—14—S
- ● 21C160, 21C161, 21C162 ("U" line) .... 328—14—S
- ● 21C172 ("U" line) .... 328—14—S
- ● 21T045 ("S" line) (See PCB 168—Set 331-1 and Model 21C110—Set 313-4)
- ● 21T048 ("S" line) (See PCB 168—Set 331-1 and Model 21C110—Set 313-4)
- ● 21T050 ("U" line) .... 328—14—S
- ● 21T060, 21T061 ("U" line) .... 328—14—S
- ● 24C182, 24C183 ("U" line) .... 328—14—S
- 675, 676 .... 329—7

HARMAN-KARDON
- A-200 .... 328—5
- A-400 .... 330—6
- D-1100 .... 329—8

HOFFMAN
- ● B1011-U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● B1024, -U, -U2 (Ch. 319, -U, -U2) .... 328—6
- ● B1031, -U, U2 (Ch. 316, -U, -U2) .... 328—6
- ● B1041, -U (Ch. 318, -U) .. 328—6
- ● B1061, -U (Ch. 415, -U) .. 329—9
- ● B3001, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● B3021, -U (Ch. 318, -U) .. 328—6
- ● B3054, -U (Ch. 318, -U) .. 328—6
- ● K1011, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● K1024, -U, -U2 (Ch. 319, -U, -U2) .... 328—6
- ● K1061, -U (Ch. 415, -U) .. 329—9
- ● M1011, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● M1024, -U, -U2 (Ch. 319, -U, -U2) .... 328—6
- ● M1031, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● M1041, -U (Ch. 318, -U) .. 328—6
- ● M1061, -U (Ch. 415, -U) .. 329—9
- ● M3001, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● M3021, -U (Ch. 318, -U) .. 328—6
- ● M3054, -U (Ch. 318, -U) .. 328—6
- ● P1031, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● P1041, -U (Ch. 318, -U) .. 328—6
- ● P3001, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● P3021, -U (Ch. 318, -U) .. 328—6
- ● P3054, -U (Ch. 318, -U3 .. 328—6
- ● PT1144, U (Ch. 326, U) 329—18—S
- ● SG-1144, U (Ch. 326, U) 329—18—S
- ● W1031, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● W1041, -U (Ch. 318, -U) .. 328—6
- ● W3001, -U, -U2 (Ch. 316, -U, -U2) .... 328—6
- ● W3021, -U (Ch. 318, -U) .. 328—6
- ● W3054, -U (Ch. 318, -U) .. 328—6
- ● 7B125 (Ch. 195) (See Photofact Servicer Set 330)
- ● 7M124 (Ch. 195) (See Photofact Servicer Set 330)
- Ch. 195 (See Model 7B125)
- Ch. 316, -U, -U2 (See Model B1011)
- Ch. 318, -U (See Model B1041)
- Ch. 319, -U, -U2 (See Model B1024)
- Ch. 326, U (See Model PT1144)
- Ch. 415, -U (See Model B1061)

MAGNAVOX
- ● Chassis CMUA 435BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CMUA436BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CMUA437BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CMUA438BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CMUA465AA (650 Series) .... 317—7
- ● Chassis CMUA465BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUA466AA (650 Series) .... 317—7
- ● Chassis CMUA466BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUA469AA (650 Series) .... 317—7
- ● Chassis CMUA469BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUA473AA (650 Series) .... 317—7
- ● Chassis CMUA473BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUA474AA (650 Series) .... 317—7
- ● Chassis CMUA474BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUA478BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUA482BB, CMUA483BB, CMUA485BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUB470BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUD445AA (350 Series) (See PCB 162—Set 325-1 and Ch. CMUA455AA—Set 291-8)
- ● Chassis CMUD471BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUD486BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUE472BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CMUE484BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTA435BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CTA436BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CTA437BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CTA438BB (250 Series) (See PCB 168—Set 331-1 and Ch. CMUA435AA—Set 278-5)
- ● Chassis CTA465AA (650 Series) .... 317—7
- ● Chassis CTA465BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTA466BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTA469AA (650 Series) .... 317—7
- ● Chassis CTA469BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTA473AA (650 Series) .... 317—7
- ● Chassis CTA473BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTA474AA (650 Series) .... 317—7
- ● Chassis CTA474BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)

MAGNAVOX (Continued)
- ● Chassis CTA478BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTA482BB, CTA483BB, CTA485BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTB470BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTD445AA (350 Series) (See PCB 162—Set 325-1 and Ch. CMUA455AA—Set 291-8)
- ● Chassis CTD471BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTD486BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465BB—Set 317-7)
- ● Chassis CTE472BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)
- ● Chassis CTE484BB (650 Series) (See PCB 166—Set 329-1 and Ch. CMUA465AA—Set 317-7)

METEOR
- ● 4104-B (Ch. 528.45000, 528.45001, 528,45002, 528.45003) .... 328—7
- Ch. 528.45000, 528.45001, 528.45002, 528.45003 (See Model 4104-B)

MOTOROLA
- ● Y21K46, B (Ch. TS-530Y) (See PCB 167—Set 330-1 and Model Y21K38—Set 315-7)
- ● Y21K47B, M (Ch. WTS-534Y) (See PCB 166—Set 329-1 and Model Y21K37B—Set 312-8)
- ● Y21K50B, M (Ch. VTS-530Y) (See PCB 167—Set 330-1 and Model Y21K38—Set 315-7)
- ● Y21K51B, M (Ch. TS-534Y) (See PCB 166—Set 329-1 and Model Y21K37B—Set 312-8)
- ● Y21T29B, M (Ch. TS-534Y) (See PCB 166—Set 329-1 and Model Y21K37B—Set 312-8)
- ● Y21T30B, M (Ch. TS-530Y) (See PCB 167—Set 330-1 and Model Y21K38—Set 315-7)
- ● Y21T31B, M (Ch. VTS-534Y) (See PCB 166—Set 329-1 and Model Y21K37B—Set 312-8)
- 6M, 6M-12 .... 331—9
- ● 21K46, B (Ch. TS-530) (See PCB 167—Set 330-1 and Model 21K38—Set 315-7)
- ● 21K47B, M (Ch. WTS-534) (See PCB 166—Set 329-1 and Model 21K37B—Set 312-8)
- ● 21K50B, M (Ch. VTS-530) (See PCB 167—Set 330-1 and Model 21K38—Set 315-7)
- ● 21K51B, M (Ch. TS-534) (See PCB 166—Set 329-1 and Model 21K37B—Set 312-8)
- ● 21T29B, M (Ch. TS-534) (See PCB 166—Set 329-1 and Model 21K37B—Set 312-8)
- ● 21T30B, M (Ch. TS-530) (See PCB 167—Set 330-1 and Model 21K3B—Set 315-7)
- ● 21T31B, M (Ch. VTS-534) (See PCB 166—Set 329-1 and Model 21K37B—Set 312-8)
- Ch. VTS-530 (See Model 21K38)
- Ch. VTS-530Y (See Model Y21K38)

OLDSMOBILE
- 983334 .... 330—7

PHILCO
- D-579 .... 328—8
- D-590, D-591 .... 328—8
- D-717, D-719, D-726 .... 328—8
- ● 24D6126L, M (Ch. TV-444) 330—8
- ● 24D6320C, M (Ch. TV-444) 330—8

PILOT
- AA-905 .... 330—9

RCA VICTOR
- 6EY2 (Ch. RS-136J) .... 328—9
- 7BT10K (Ch. RC-1156) ... 329—10
- 7BX5F, HH, JJ (Ch. RC-1149) (See Model 6BX5—Set 299-7)

RCA VICTOR (Continued)
- 7HF3 (Ch. RC-1155 and RS-151A) (See Model 6HF3—Set 323-11)
- ● 21CS7815, U, 21CS7817, U (Ch. CTC5, A) .... 328—14—S
- ● 21S6055, U (Ch. KCS95) (See Model 21S6052—Set 322-11)
- Ch. CTC5, A (See Model 21CS7815)
- Ch. RC-1156 (See Model 7BT10K)
- Ch. RS-136J (See Model 6EY2)

RAYTHEON
- T-100-1, T-100-2, T-100-3, T-100-4, T-100-5 (Ch. 4RT1) .. 331—11
- T2500 (Ch. 7RT4) .... 329—11
- ● UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32) ... 331—12
- Ch. 4RT1 (See Model T-100-1)
- Ch. 7RT4 (See Model T2500)
- Ch. 21T32 (See Model UM-2186)

REGAL (TOK-FONE)
- ● 17C (Ch. Series 20—Codes 91, 93, 94) (See Photofact Servicer Set 328)
- ● 17T (Ch. 20 Series—Codes 91, 93, 94) (See Photofact Servicer Set 328)
- ● 20C (Ch. Series 20—Codes 91, 93, 94) (See Photofact Servicer Set 328)
- ● 20T (Ch. Series 20—Codes 91, 93, 94) (See Photofact Servicer Set 328)
- ● 21H20 (Ch. Series 20—Codes 91, 93, 94) (See Photofact Servicer Set 328)
- ● 2420 (Ch. Series 20—Codes 91, 93, 94) (See Photofact Servicer Set 328)

SCOTT (H. H.)
- 311-A .... 331—13

SETCHELL-CARLSON
- ● P61 (Ch. C100-Late) .... 329—12
- ● 611 (Ch. C200) .... 329—12
- Ch. C100-Late (See Model P61)
- Ch. C200 (See Model 611)

SILVERTONE
- ● 5161 (Ch. 528.39300) .... 330—10
- ● 5171 (Ch. 528.39300) .... 330—10
- 6025, 6026 (Ch. 528.40400) .... 328—10
- ● 6100 (Ch. 528.42900, 528.43500, 528.43501) .... 330—10
- ● 6101 (Ch. 528.38900, 528.38901, 528.38902, 528.42000, 528.-42001, 528.42002) .... 330—10
- ● 6106 (Ch. 528.43000, 528.43600, 528.43601) .... 330—10
- ● 6107 (Ch. 528.35001, 528.35002, 528.35003, 528.42300, 528.-42301, 528.42302) .... 330—10
- ● 6108 (Ch. 528.43000, 528.43600, 528.43601) .... 330—10
- ● 6109 (Ch. 528.35003, 528.42300, 528.42301, 528.42302) . 330—10
- ● 6110 (Ch. 528.43700, 528.43701) .... 330—10
- ● 6111 (Ch. 528.35303, 528.35304, 528.42100, 528.42101, 528.-42102) .... 330—10
- ● 6112 (Ch. 528.43800, 528.43801 and Radio Ch. 528.40300) .... 330—10
- ● 6113 (Ch. 528.42400) .... 330—10
- ● 6114 (Ch. 528.43800, 528.43801 and Radio Ch. 528.40300) .... 330—10
- ● 6115 (Ch. 528.35603, 528.35604, 528.35606, 528.42400, 528.-42401, 528.42402, 528.42403, 528.42404) .... 330—10
- ● 6115Y (Ch. 528.35605) ... 330—10
- ● 6116 (Ch. 528.43800, 528.43801 and Radio Ch. 528.40300) .... 330—10
- ● 6117 (Ch. 528.35603, 528.35604, 528.35606, 528.42400, 528.-42401, 528.42402, 528.42403, 528.42404) .... 330—10
- ● 6120 (Ch. 528.43900, 528.43901) .... 330—10
- ● 6121 (Ch. 528.37900, 528.37901, 528.42103, 528.42200, 528.-42201, 528.42202) .... 330—10

NOTE: PCB Denotes Production Change Bulletin. ● Denotes Television Receiver. S Denotes Schematic Coverage Only.

www.americanradiohistory.com

Set No. Folder No.

SILVERTONE (Continued)

●6122 (Ch. 528.39400, 528.39401, 528.39402, 528.44300, 528.-44301) **329**–13
●6123 (Ch. 528.39500, 528.39501, 528.39502, 528.42800, 528.-42801, 528.42802) **329**–13
●6124 (Ch. 528.39400, 528.39401, 528.39402, 528.44300, 528.-44301) **329**–13
●6126 (Ch. 528.43700, 528.43701) **330**–10
●6127 (Ch. 528.35301, 528.35302, 528.35304, 528.42100, 528.-42101, 528.42102) **330**–10
●6128 (Ch. 528.43800, 528.43801 and Radio Ch. 528.40300) **330**–10
●6129 (Ch. 528.35305, 528.35601, 528.35602, 528.35604, 528.-35606, 528.42400, 528.42402, 528.42403, 528.42404) .**330**–10
●6129A (Ch. 528.42400) ..**330**–10
●6130 (Ch. 528.35602, 528.35604, 528.43800, 528.43801 and Radio Ch. 528.40300) **330**–10
●6131 (Ch. 528.35305, 528.35601, 528.35602, 528.35604, 528.-35606, 528.42400, 528.42402, 528.42403, 528.42404) .**330**–10
●6131A (Ch. 528.42400) ...**330**–10
●6132 (Ch. 528.38700, 528.38701, 528.38702, 528.44100, 528.-44101, 528.44200) **329**–13
●6133 (Ch. 528.38600, 528.38601, 528.38602, 528.42600, 528.-42601, 528.42602) **329**–13
●6160 (Ch. 528.45500, 528.45501, 528.45600, 528.45601) .**330**–10
●6164 (Ch. 528.43800, 528.43801 and Radio Ch. 528.40300) **330**–10
●6165 (Ch. 528.42400, 528.42402, 528.42403, 528.42404) .**330**–10
●6166 (Ch. 528.43800, 528.43801 and Radio Ch. 528.40300) **330**–10
●6167 (Ch. 528.42403, 528.42404) **330**–10
●6170 (Ch. 528.44000, 528.44001) **330**–10
●6171 (Ch. 528.37300, 528.37301, 528.42500, 528.42501, 528.-42502, 528.42503) **330**–10
●6172 (Ch. 528.44000, 528.44001) **330**–10
●6173 (Ch. 528.42500, 528.42501, 528.42502, 528.42503) .**330**–10

Set No. Folder No.

SILVERTONE (Continued)

●6174 (Ch. 528.38500, 528.38501, 528.38502, 528.38503) **329**–13
●6174 (Ch. 528.44200, 528.44201, 528.44900. 528.44901, 528.-45000, 528.45001, 528.45200, 528.45201) **330**–10
●6175 (Ch. 528.38100, 528.38101, 528.38102, 528.42700, 528.-42701, 528.42702) **329**–13
●6176 (Ch. 528.38500, 528.38501, 528.38502, 528.38503) .**329**–13
●6176 (Ch. 528.44200, 528.44201, 528.44900, 528.44901, 528.-45000, 528.45001, 528.45200, 528.45201) **330**–10
●6177 (Ch. 528.38100, 528.38101, 528.38102, 528.42700, 528.-42701, 528.42702) **329**–13
●6184 (Ch. 528.38500, 528.38501, 528.38502, 528.38503) .**329**–13
●6184 (Ch. 528.44200, 528.44201, 528.44900, 528.44901, 528.-45000, 528.45001, 528.45200, 528.45201) **330**–10
●6185 (Ch. 528.38100, 528.38101, 528.38102, 528.42700, 528.-42701, 528.42702) **329**–13
●6186 (Ch. 528.38500, 528.38501, 528.38502, 528.38503) .**329**–13
●6186 (Ch. 528.44200, 528.44201, 528.44900, 528.44901, 528.-45000, 528.45001, 528.45200, 528.45201) **330**–10
●6187 (Ch. 528.38100, 528.38101, 528.38102, 528.42700, 528.-42701, 528.42702) **329**–13
●6190A (Ch. 528.45900, 528.45901, 528.47600, 528.47700) **330**–10
●6191 (Ch. 528.35305, 528.35601, 528.35602, 528.35604, 528.-35606, 528.42400) **330**–10
●6192 (Ch. 528.35602, 528.35604, 528.43800, 528.43801 and Radio Ch. 528.40300) **330**–10
●6192A (Ch. 528.45900, 528.45901, 528.47600, 528.47700) .**330**–10
Ch. 132.40500 (See Model 2014)
Ch. 528.35001, 528.35002, 528.-35003 (See Model 6107)
Ch. 528.35301, 528.35302 (See Model 6127)
Ch. 528.35303, 528.35304 (See Model 6111)
Ch. 528.35305 (See Model 6129)
Ch. 528.35601, 528.35602 (See Model 6129)

Set No. Folder No.

SILVERTONE (Continued)

Ch. 528.35603, 528.35604, 528.-35605, 528.35606 (See Model 6115)
Ch. 528.37300, 528.37301 (See Model 6171)
Ch. 528.37900, 528.37901 (See Model 6121)
Ch. 528.38100, 528.38101, 528.-38102 (See Model 6175)
Ch. 528.38500, 528.38501, 528.-38502, 528.38503 (See Model 6174)
Ch. 528.38600, 528.38601, 528.-38602 (See Model 6133)
Ch. 528.38700, 528.38701, 528.-38702 (See Model 6132)
Ch. 528.38900, 528.38901, 528.-38902 (See Model 6101)
Ch. 528.39300 (See Model 5161)
Ch. 528.39400, 528.39401, 528.-39402 (See Model 6122)
Ch. 528.39500, 528.39501, 528.-39502 (See Model 6123)
Ch. 528.40400 (See Model 6025)
Ch. 528.42000, 528.42001, 528.-42002 (See Model 6101)
Ch. 528.42100, 528.42101, 528.-42102 (See Model 6111)
Ch. 528.42103 (See Model 6121)
Ch. 528.42200, 528.42201, 528.-42202 (See Model 6121)
Ch. 528.42300, 528.42301, 528.-42302 (See Model 6107)
Ch. 528.42400 (See Model 6131)
Ch. 528.42401, 528.42402, 528.-42403, 528.42404 (See Model 6115)
Ch. 528.42500, 528.42501, 528.-42502, 528.42503 (See Model 6171)
Ch. 528.42600, 528.42601, 528.-42602 (See Model 6133)
Ch. 528.42700, 528.42701, 528.-42702 (See Model 6175)
Ch. 528.42800, 528.42801, 528.-42802 (See Model 6123)
Ch. 528.42900 (See Model 6100)
Ch. 528.43000 (See Model 6106)
Ch. 528.43500, 528.43501 (See Model 6100)
Ch. 528.43600, 528.43601 (See Model 6106)
Ch. 528.43700, 528.43701 (See Model 6110)
Ch. 528.43800, 528.43801 (See Model 6130)

Set No. Folder No.

SILVERTONE (Continued)

Ch. 528.43900, 528.43901 (See Model 6120)
Ch. 528.44000, 528.44001 (See Model 6170)
Ch. 528.44100, 528.44101 (See Model 6132)
Ch. 528.44200 (See Model 6132)
Ch. 528.44200, 528.44201 (See Model 6174)
Ch. 528.44300, 528.44301 (See Model 6122)
Ch. 528.44900, 528.44901 (See Model 6174)
Ch. 528.45000, 528.45001 (See Model 6174)
Ch. 528.45200, 528.45201 (See Model 6174)
Ch. 528.45500, 528.45501 (See Model 6160)
Ch. 528.45600, 528.45601 (See Model 6160)
Ch. 528.45900, 528.45901 (See Model 6190A)
Ch. 528.47600 (See Model 6190A)
Ch. 528.47700 (See Model 6190A)

SYLVANIA

●21C401, 21C403 Series (Ch. 1-532--1, -2) **328**–11
●21T101, 21T102, 21T104 Series (Ch. 1-532-1, -2) **328**–11
●24T101 Series (Ch. 1-532-1, -2) **328**–11
919 (Ch. 1-609) **329**–14
969 (Ch. 1-609) **329**–14
Ch. 1-609 (See Model 919)

TRAV-LER

●517-106, 517-107 (Ch. 520C5) **330**–11
●521-111, 521-112 (Ch. 520C5) **330**–11
●621-20U, 621-21U, 621-22U, 621-25U, 621-26U (Ch. 421E5, 421G5, 421M6) **331**–14
Ch. 421E5, 421G5, 421M6 (See Model 621-20U)
Ch. 520C5 (See Model 517-106)

TRUETONE

D2372 ....**329**–15
●2D1522B (Ch. 21T31) (See PCB 165 —Set 328-1 and Model 2D1520-A —Set **316**-15)
●2D1530A, B, 2D1532A, B **328**–12
●2D1633A **328**–12

Set No. Folder No.

TRUETONE (Continued)

●2D2530A, B **328**–12
●2D2530C (See Model 2D1530B—Set **328**-12)

WEBCOR

1655, 1656, 1659, 1660, 1662 ....**331**–15
1691 ....**329**–16

WESTINGHOUSE

●H-782K21, H-783K21, H-784K21, H-785K21 (Ch. V-2247-1) (See Photofact Servicer Set **330**)
●H-791K21, H-792K21 (Ch. V-2247-1) (See Photofact Servicer Set **330**)

ZENITH

HFY17E, R (Ch. 3Y02) **329**–17
●Y2671R, RU, Y2672E, EU (Ch. 22Y21, U) **330**–12
●Z1814R, Y (Ch. 16Z20) **330**–13–**S**
●Z1816C, E, R, Z1818C, E, R (Ch. 16Z21) **330**–13–**S**
●Z2222C, E, R, Y (Ch. 17Z21) **331**–16–**S**
●Z2247E, H, R (Ch. 17Z22) **331**–16–**S**
●Z2255E, R, Z2257E, M, R (Ch. 19Z22) **331**–16–**S**
●Z2258E, H, R (Ch. 17Z22) **331**–16–**S**
●Z2282E, R (Ch. 17Z22) **331**–16–**S**
●Z3000E, R, Z3004E, R, Z3006E, R, Z3008E, R (Ch. 17Z22Q) **331**–16–**S**
●Z3010E, H, R, Y (Ch. 19Z22Q) **331**–16–**S**
Ch. 3Y02 (See Model HFY17E)
Ch. 16Z20 (See Model Z1814R)
Ch. 16Z21 (See Model Z1816C)
Ch. 17Z21 (See Model Z2222C)
Ch. 17Z22 (See Model Z2247E)
Ch. 17Z22Q (See Model Z3000E)
Ch. 19Z22 (See Model Z2255E)
Ch. 19Z22Q (See Model Z3010E)
Ch. 22Y21, U (See Model Y2671R)

BELL

RT-75 ....**329**—4

PENTRON

T-90 ....**331**–10

WEBCOR

2611, 2612 ....**328**–13

NOTE: PCB Denotes Production Change Bulletin. ● Denotes Television Receiver. **S** Denotes Schematic Coverage Only.

September, 1956, brings you New Sams PHOTOFACTS 328, 329, 330, 331, with PHOTOFACT TV coverage on these manufacturers:

ADMIRAL	EMERSON	METEOR	SETCHELL-CARLSON	TRAV-LER
BENDIX	FIRESTONE	PHILCO	SILVERTONE	TRUETONE
CAPEHART	HOFFMAN	RAYTHEON	SYLVANIA	ZENITH

Plus Bonus TV Schematics on:

ADMIRAL	HOFFMAN	ZENITH
GENERAL ELECTRIC	RCA VICTOR	

For Specific Models and PHOTOFACT Set Reference Consult This Supplement

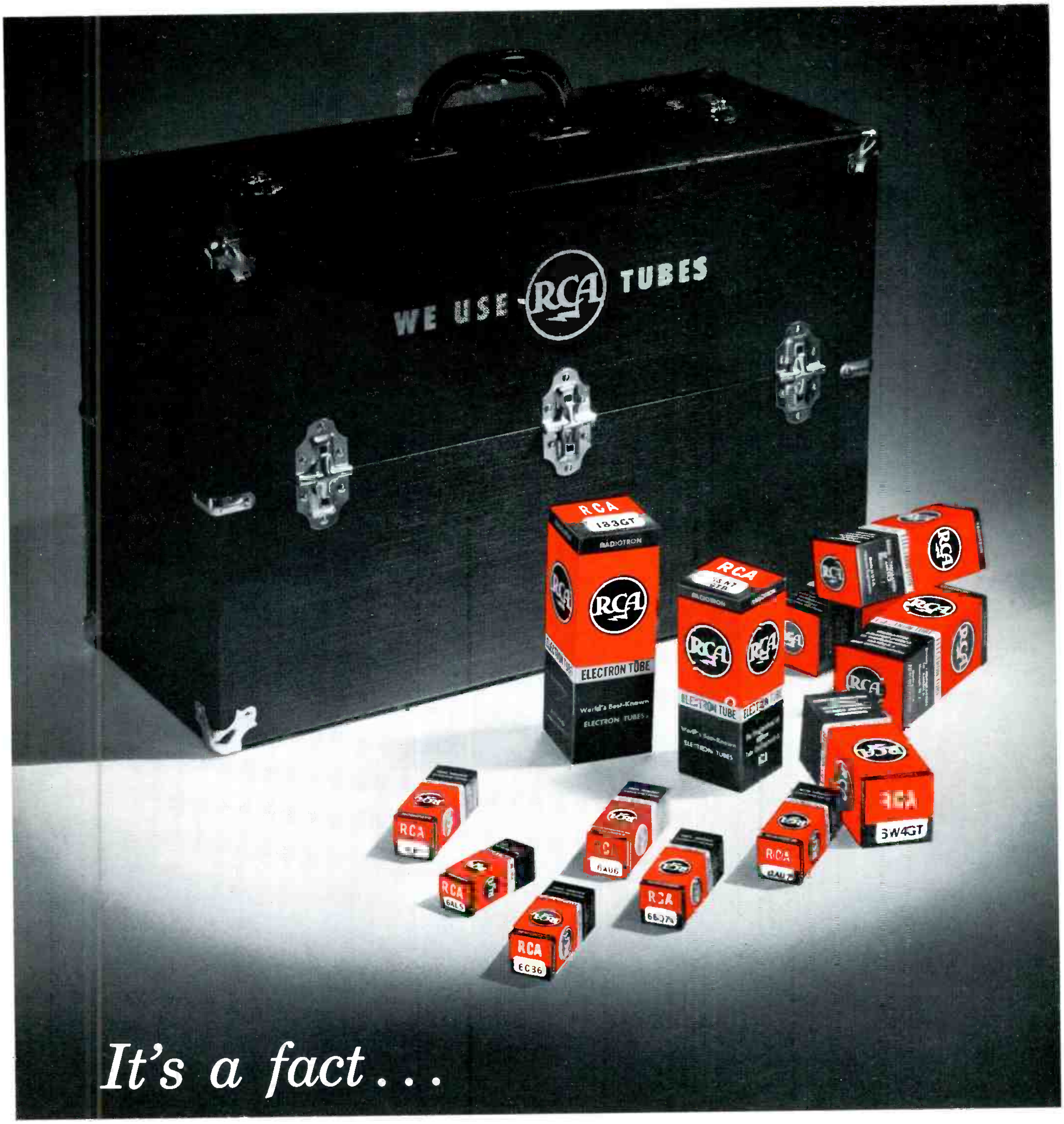
In addition to the above, you will find the PHOTOFACT SERVICER, PHOTOFACT coverage on Radio Receivers, Audio Amplifiers, Record Changers, Tape Recorders, and important Production Change Notices, too!

It's Sams PHOTOFACT for current up-to-date service data. If you do not already receive new PHOTOFACTS regularly each month, sign up with your parts distributor NOW for an automatic standing order for new Sams PHOTOFACTS published each month. It pays to keep your PHOTOFACT library up to date.

Watch the Sams "Book Tree" at your parts distributor's for these new Sams books released in September.

Calibrating and Servicing Test Equipment............(TEK-1) $2.75
Transistor Circuit Handbook............(CTB-6) $4.95

www.americanradiohistory.com



*9 of the 12 top-selling replacement TV tubes are original RCA designs.** Manufacturers of TV sets have given RCA tube-type leadership by using RCA-designed tubes in their equipment. Experience has shown these manufacturers that RCA-designed tubes are tops in performance. Service dealers know, too, that the company which knows how to design tubes knows how to build them BEST. So follow the lead of smart service technicians everywhere—say "RCA brand, only" on *all* your tube orders and get tubes that are tops in quality and performance.

RECEIVING TUBES
RADIO CORPORATION OF AMERICA, HARRISON, N. J.

*RETMA REPORT for year of 1955

www.americanradiohistory.com

Burton browne advertising

THERE'S ONLY ONE RIGHT WAY

A *fuse caddy* for your *tube caddy*. 18 individual compartments for fingertip selection. The fuse caddy is complete with the 15 boxes of fuses required to service 93% of all TV sets. Three spare compartments are provided for additional fuses of your own selection.

LITTELFUSE *Des Plaines, Ill.*

www.americanradiohistory.com