MAY, 1952

Radio-Television SERVICE DEALER

The Professional Radio-TVman's Magazine

IN THIS ISSUE:

AM-FM-TV-SOUND

Total Distribution of This Issue: Over 35,000 Copies

JFD Electronics

originator

of auto antennas . . . .

is proud to

re-enter the field

with a complete line of

precision engineered

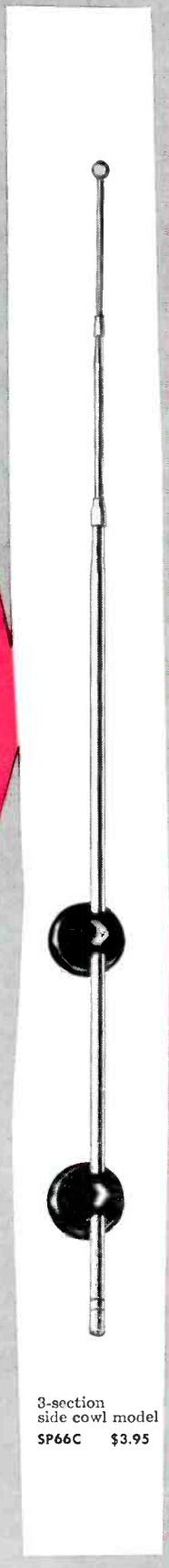
auto antennas

for all side cowl,

top cowl and

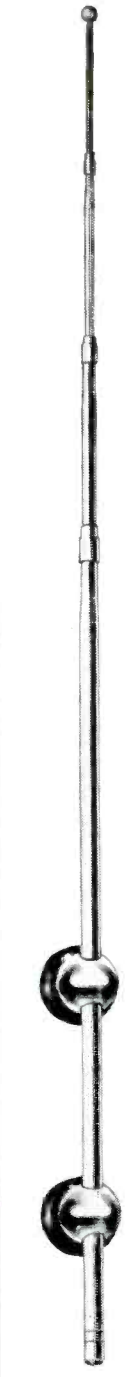
disappearing type

installations

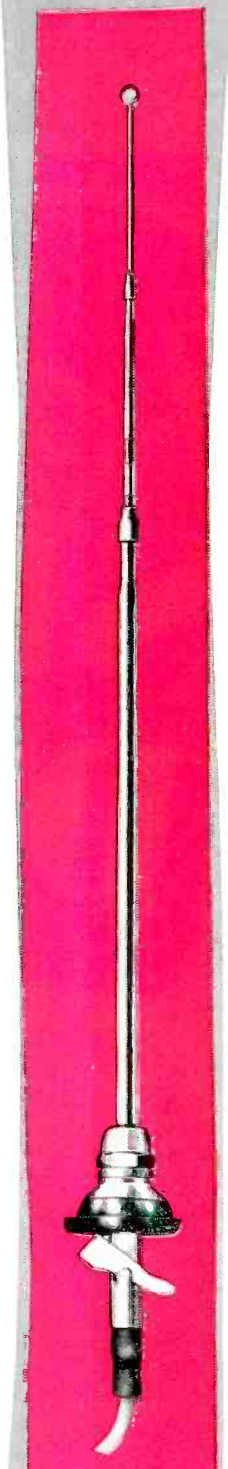


3-section
side cowl model
SP66C $3.95

3-section
side cowl model
3B66C $4.75



4-section
side cowl model
4B100C $6.65



3-section
top cowl model
3B4000 $4.95

3-section
disappearing model
3B5000 $7.65

write for free descriptive brochure

JFD Mfg. Co.

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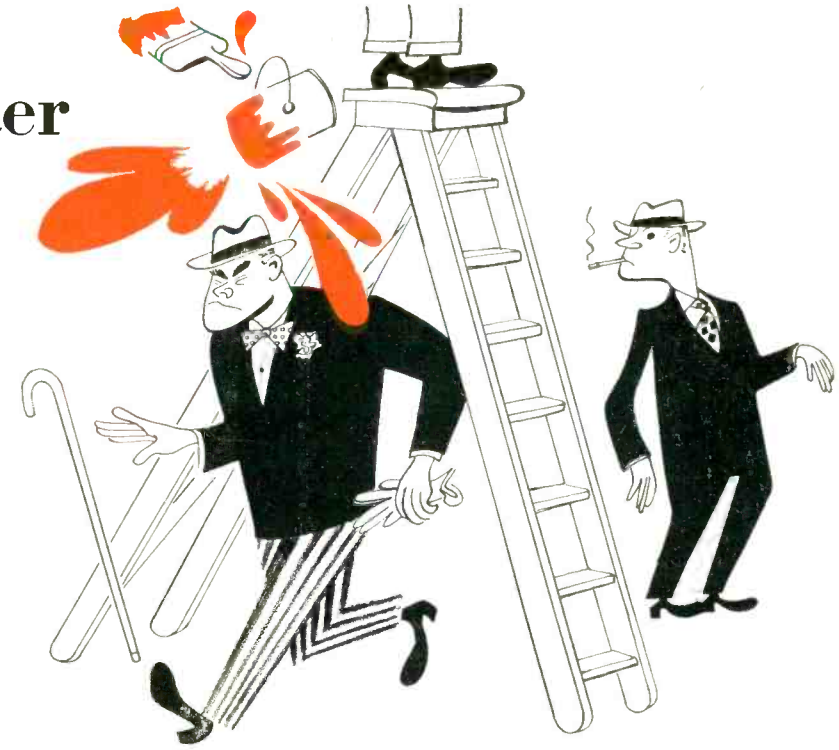
world's largest manufacturer of TV antennas and accessories

BEnsonhurst 6-9200

He'll know better next time . . .

When it comes to making your customers happy, there's no "next time". You have to do the job right the first time. That's why it isn't good business to order capacitors by rating alone instead of specifying rating *and* brand. You can avoid customer trouble when you order capacitors if you . . .



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You can build a reputation for dependable service and really satisfy your customers by specifying Mallory capacitors.

Rating-for-rating and size-for-size Mallory FP's give longer life even at higher temperatures and greater ripple current. You get trouble-free operation at 185°F. (85°C.). And Mallory FP's won't "die" on your shelves.

Mallory Plascaps† are the first completely engineered plastic tubular capacitors. They eliminate premature shorting . . . leakage . . . unsoldered leads . . . off-center cartridges. And Plascaps are priced right! Count on them as you do on Mallory FP's.

Mallory pioneered capacitor development . . . produced the first dry electrolytic capacitors . . . showed the way in making capacitors smaller, longer-lasting, more heat resistant, more uniform.

So, when you order capacitors, specify Mallory—always. Mallory capacitors are best for you . . . best for your customers. And they cost no more.

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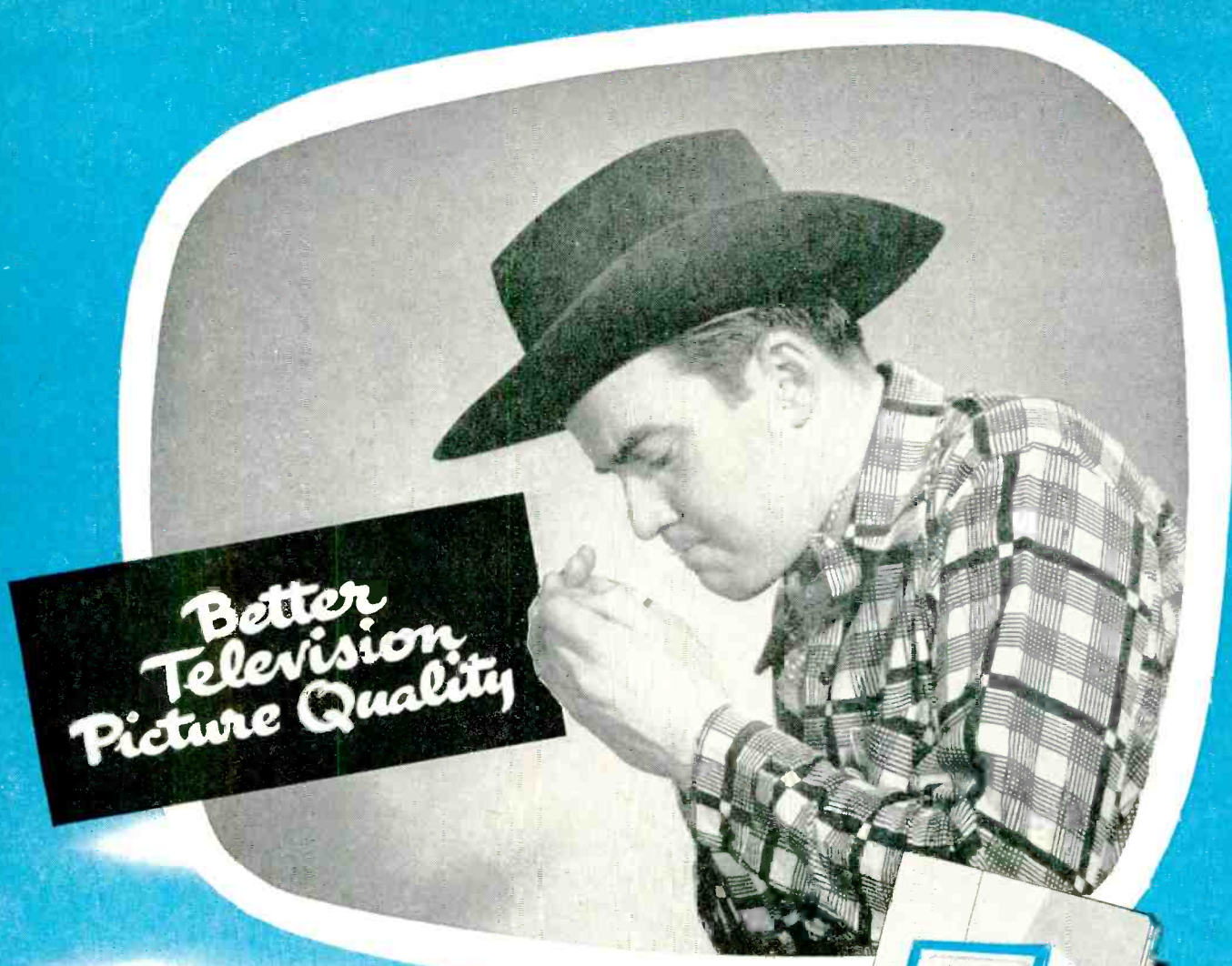

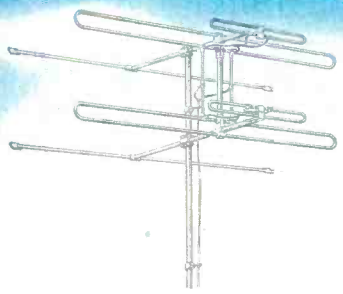

this Book

. . . contains information never before available in a concise, easy to read form. It presents a complete discussion of the various factors and conditions which affect television reception and the reasons for good TV pictures.

Featured in this book is a detailed comparison, complete with illustrations and graphs, of the various types of antennas, their characteristics and performance under given conditions. Presented in a clear, factual manner, the performance data and comparative information contained in this review has been compiled from the test reports and published literature of manufacturers of the various types antennas.

This book also reviews the problem of coordinating the antenna with the location, the use of rotators, television reception in the "fringe" areas and the advisability of installing lightning arrestors.

Your Authorized Amphenol Distributor has a free copy of this book waiting for you — ask for yours today!

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EDITORIAL

by S. R. COWAN

TV "Thaw"

Figuratively speaking, commercial TV was started in 1947. During the following 5 years it grew into lusty infancy—108 stations serving 16½ million set owners in 71 so-called market areas.

The "freeze" retarded TV's growth in size but at the same time it assured the baby of the finest possible health, We've had our baby illnesses, such as the color TV fiasco, but we found the remedy, patience. Today TV is still a baby in its diaper stage. Now the "thaw" permits TV to grow in a normal and practical manner. So, the next 5 years of TV's life may properly be called its youth, and during this period it is theoretically possible that 2,053 new stations authorized by FCC's frequency-allocations could come into being to serve 1,291 communities and upwards of 40 million families.

Actually the TV industry does not expect to reach full maturity for many years. In the next 5 years, for many reasons, it would be impossible for manufacturers to produce over 1,900 new transmitters.

We who are responsible for the installation and servicing of TV are in effect its parents, and it is our parental duty to know how to bring up our baby so it may become a credit to us and itself. Unfortunately some of us have been lax or careless parents and those who fall in that category must mend their ways. Others of us, especially the technicians situated where TV has not as yet made its presence felt, must prepare now learn how to be proper guardians for our new ward. In plain, blunt English, we've got to learn how to care for our baby.

Look at the TV Area maps shown on page 31 of this issue. The 1st shows how small a geographical segment of this nation is presently served by the existing 108 stations. The 2nd shows approximately how much area will probably be covered by TV transmitters 2 short years from now, while the 3rd shows how much of this country will probably be within TV range 5 years from now.

Figure it out for yourself. Where do you fit into this picture? If you now function as a serviceman in an area having TV, have you become truly competent from a technical angle, and are you operating your business in a genuinely practical manner? If you live in a section where TV is soon to make its advent, have you already started to learn all the technical ramifications of TV? Take my word for it, regardless of how many years of other experience you've had in pure AM or FM radio, it will be of but little use to you because TV maintenance is a new Art, and must be learned as such. To that end, "Service-Dealer" pledges itself to a continuing educational program that will help you to help yourself if you will avail yourself of our efforts by being a constant reader.

Sanford R. Cowan
EDITOR & PUBLISHER

Samuel L. Marshall
MANAGING EDITOR

COWAN PUBLISHING CORP.
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TRADE FLASHES

A "press-time" digest of production, distribution, and merchandizing activities

5 Year Production Statistics

Production of radios and television receivers from 1947 through 1951 totaled 75,117,262 and 17,002,169 sets, respectively, according to revised industry estimates released today by the Radio-Television Manufacturers Association. RTMA estimated the manufacturers' value of the five-year radio output at $2,175,936,597, while the TV value was placed at $3,166,986,300.

AEPEM Forms License Committee

A servicemen's liaison committee, to consider problems arising from movements to license radio-television service technicians, was named today by John H. Cashman, chairman of the Association of Electronic Parts & Equipment Manufacturers.

Howard W. Sams, of the Howard W. Sams & Co., Inc., Indianapolis, was named chairman of the committee, other members of which are Robert J. Arndt, of Crest Transformer, Chicago; Marvin Bruckner, Quam-Nichols Co., Chicago and J. G. Twist, Sangamo Electric Co., Springfield.

In naming the committee, Cashman noted the increasing number of efforts in various parts of the country to set up restrictive ordinances and licensing laws for servicemen. Cashman called for cooperative efforts on the part of various groups within the industry to evolve a program and campaign to cope with the situation.

Radio-TV Set Production Drops

Production of radio and television receivers in the first two months of 1952 decreased 43 per cent under the corresponding period of 1951, the Radio-Television Manufacturers Association reported today. The combined radio-TV set output totaled 2,206,178 units compared with 3,845,537 in the same 1951 period.

TV production amounted to 814,270 sets and the radio output was 1,391,908 receivers in the two-month period this year, according to RTMA's estimates which cover members and non-members of the Association.

Radios with FM circuits manufactured in the first two months of this year totaled 78,724 sets. In addition, 13,884 TV receivers with FM facilities were produced.

Pix Tube Replacement

If you own one of the nation's nearly 16 million television sets there's about one chance in 15 that you'll have a new picture tube in it by the end of 1952.

The odds, of course, will be shorter if your set is an old one and far longer if you own a late model receiver.

That's the prediction of the General Electric Tube Department which recently announced the completion of one of the broadest surveys ever made of the market for replacement tubes for television sets and home and car radios.

John T. Thompson, manager of G-E replacement tube sales, said the survey showed that about 1,100,000 picture tubes worth $44,000,000 and 110,000,000 receiving tubes worth $220,000,000 will be sold this year for television and radio replacement purposes.

Chicago Audio Fair

Display room space at the 1952 Audio Fair In Chicago, to be held at the Conrad Hilton Hotel May 23-24th, is being reserved at a record pace, and there is every prospect of a complete sell-out well in advance of the Fair dates, the Fair management said today.

First companies to be assigned rooms included Allied Radio; Rek-O-Kut; Altec Lansing; Ampex; Audio Devices; Audak; Bell Sound Systems; British Industries; Electro-Voice; G & H Wood Products; General Electric; Heath Co.; High Fidelity Magazine; Jensen Industries; Jensen Mfg. Co.; Magnacord; Newark Electric; Newcomb Audio; Oxford Electric; Pentron; Pfanstiel Co.; Permaflux; Pickering; Radio Craftsmen; Rauland-Borg; Howard W. Sams & Co.; Service Magazine; Standard Transformer; Stromberg-Carlson; Tape Master; Tung-Sol; United Transformer; University Loud-speakers; Weather Industries and Webster-Chicago.

The Fair, which is expected to attract an attendance in excess of eight thousand persons, will be open to the public. Exhibitors will include manufacturers and distributors of all types of high fidelity, audio, recording de-

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builds your business

A receiver fails and an upset customer scans the telephone directory. A sea of unfamiliar names — ah — here's a radio and television service dealer whose guarantee is cash-protected by a Bond. Result: another customer for a *Raytheon Bonded Electronic Technician.*

The Raytheon Bonded Dealer Decal on windows and doors; the Raytheon Creed Display; the Raytheon Bonded Dealer Certificate exert a similar influence on passers-by — wary customers choose you instead of the guy next door.

These are all part and parcel of Raytheon's *Bonded Electronic Technician Program* which costs you nothing yet gives you a mighty important advantage over your competitors.

Better ask your Raytheon Tube Distributor to show you how little it costs to use this exclusive business builder.

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RAYTHEON MANUFACTURING COMPANY

Receiving Tube Division

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

Excellence in Electronics

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • RADIAC TUBES • MICROWAVE TUBES

vices, speakers, microphones, cabinets and accessories. It is being held in Chicago for the first time, as part of Electronics Week, so designated by Chicago's Mayor Martin H. Kennelly.

Parts Show

The 1952 Electronic Parts Show, with 204 companies exhibiting in 164 booths in Exhibition Hall at the Conrad Hilton Hotel, and in 136 display rooms on the hotel's fifth and sixth floors, will open its doors officially at 10 A.M., Monday, May 19th, with traditional ceremonies ushering in four days of displays and a comprehensive series of seminars and conferences on sales, distributors, management, finance, inventory and priority problems.

The combination of a record number of displays and the most elaborate program of educational sessions is expected to bring an estimated eight to nine thousand persons to the Show from all parts of the United States and a score of foreign countries. Show hours, changed in some instances to accommodate the two day program of seminars on Tuesday and Wednesday, May 20 and 21st, will be from 10 A.M. to 6 P.M. on Monday; 1 P.M. to 9 P.M. on Tuesday; 1 P.M. to 6 P.M. on Wednesday and from 10 A.M. to 6 P.M. on Thursday. These hours apply to the Exhibition Hall and indicate the period during which watch service will be maintained in the display room areas.

Parts Show Funds Not To Combat Licensing

Three of the five trade groups cosponsoring the Electronic Parts Show have voted against using Show funds in a program to oppose legislation and ordinances licensing radio-television servicemen, Charles A. Hansen, president of the Radio Parts & Electronic Equipment Shows, Inc. (the Show corporation), announced recently.

Two of the three dissenting groups, while expressing approval of the objectives in the proposal as approved by the Show Board of Directors at its December meeting, felt that the present framework of the Show corporation did not permit such allocation of funds, and recommended that another vehicle be sought or set up to handle the problem. These were the Sales Managers Club Eastern Group and the Association of Electronic Parts and Equipment Manufacturers.

Sales Mgrs. Club Elects Officers

Bernard L. Cahn, General sales manager of the Insuline Corporation of America, Long Island City, N. Y., has been elected 1952 chairman of the Sales Managers Club, Eastern Divi-

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MULTIPLE CONDUCTOR CABLE

● You know what you are doing when you use Belden Multiple Conductor Cables — they're aptitude rated. They are designed to provide desirable electrical characteristics, and rigid control assures constant quality.

Specify Belden Radio Wires.

Belden Manufacturing Co., 4639 W. Van Buren St., Chicago 44, Ill.

FOR 50 YEARS *Wiremaker for Industry*

To You, Belden's Golden Anniversary Means

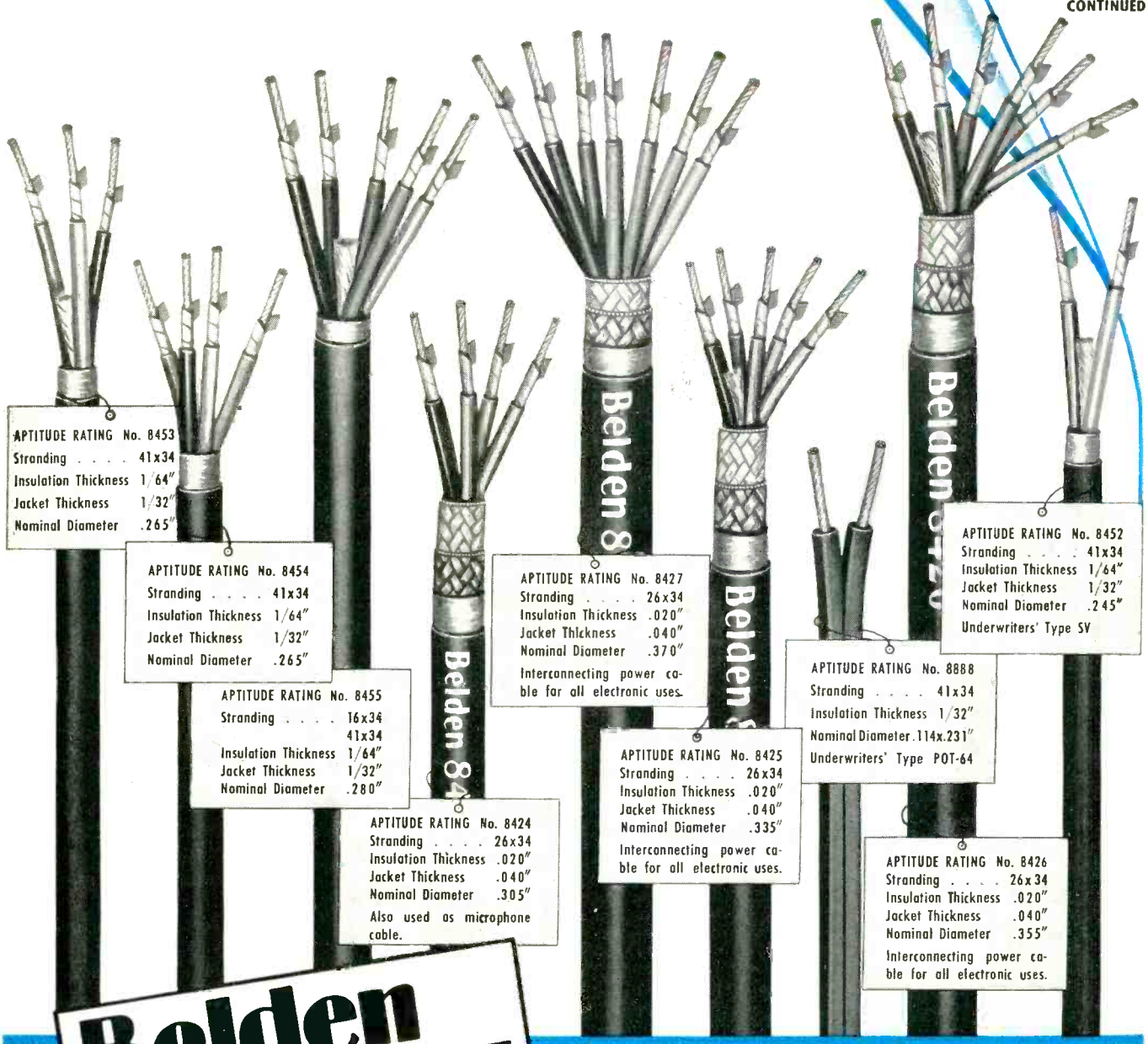
—product performance that can come only from a "know-how" that has grown through actual service since the inception of Radio.

—an ability to co-operate in pioneering new wires to meet or anticipate industry's growing needs.

In the years that follow

This Belden Program Is—

— TO BE CONTINUED



APTITUDE RATING No. 8453
Stranding 41x34
Insulation Thickness 1/64"
Jacket Thickness 1/32"
Nominal Diameter .265"

APTITUDE RATING No. 8454
Stranding 41x34
Insulation Thickness 1/64"
Jacket Thickness 1/32"
Nominal Diameter .265"

APTITUDE RATING No. 8455
Stranding 16x34
41x34
Insulation Thickness 1/64"
Jacket Thickness 1/32"
Nominal Diameter .280"

APTITUDE RATING No. 8424
Stranding 26x34
Insulation Thickness .020"
Jacket Thickness .040"
Nominal Diameter .305"
Also used as microphone cable.

APTITUDE RATING No. 8427
Stranding 26x34
Insulation Thickness .020"
Jacket Thickness .040"
Nominal Diameter .370"
Interconnecting power cable for all electronic uses.

APTITUDE RATING No. 8425
Stranding 26x34
Insulation Thickness .020"
Jacket Thickness .040"
Nominal Diameter .335"
Interconnecting power cable for all electronic uses.

APTITUDE RATING No. 8888
Stranding 41x34
Insulation Thickness 1/32"
Nominal Diameter .114x.231"
Underwriters' Type POT-64

APTITUDE RATING No. 8452
Stranding 41x34
Insulation Thickness 1/64"
Jacket Thickness 1/32"
Nominal Diameter .245"
Underwriters' Type SV

APTITUDE RATING No. 8426
Stranding 26x34
Insulation Thickness .020"
Jacket Thickness .040"
Nominal Diameter .355"
Interconnecting power cable for all electronic uses.

Belden *Radio* **WIRE**

The *Aptitude-Tested* **LINE**

sion. This is an association of executives of electronic parts and equipment manufacturers, dedicated to the improvement of industry relations. Other officers chosen for the year are Jerome Kirschbaum, of the Precision Apparatus Co., Inc., Elmhurst, N. Y., vice-chairman: Walter Jablon, of the Espey Manufacturing Company, New York, N.Y., secretary; and Vincent Ulrich, of the National Union Radio Corporation, Orange, N. J., delegate to the industry's show corporation board.

Two Way Radio Aids Flood Workers

Two way radio communications equipment is playing an important part in a desperate fight here to keep the flood swollen Missouri River from breaking through levees and inundating the homes of 30,000 residents of Omaha and the neighboring city of Council Bluffs, Iowa. Besides residential sections, the flood threatens to do millions of dollars of damage to the east Omaha industrial area that contains the city's major railroad, electric power, and manufacturing centers, as well as the municipal airport.

To provide constant on-the-spot communication between levee patrols and repair gangs, 55 portable radio "Handie-Talkie" units have been turned over to disaster crews by Motorola Inc., Chicago manufacturer of television-radio-electronics equipment.

Reps. Meet In Chicago

The Annual General Members' and National Delegates' Meeting of the Representatives of Radio Parts Mfrs., Inc., is scheduled for Tuesday morning, May 20, in the upper Tower Room of the Conrad Hilton Hotel.

It has been the custom in previous years to hold the National Delegates' Meeting on Monday. However, since the Schedule of 1952 Show Events calls for opening of the Exhibit Hall on Monday Morning, and *noon* on Tuesday, the Delegates' Meeting has been scheduled accordingly.

Please make sure that your chapter delegates and alternates are elected and their names reported to the national headquarters office by March 19. Notice of annual meeting is to be mailed to national delegates on March 20.

Stancor Forms Serviceman Advisory Board

A twenty-one member Serviceman Advisory Board, selected from among America's top radio-television servicemen to advise Standard Transformer Corporation on replacement transformer problems and to represent the

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RADIO COMPANY
PHILADELPHIA

We've been a Snyder PHILADELPHIA DISTRIBUTOR

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BECAUSE SNYDER GIVES

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- products with a "Market Edge"
- new products first
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- participation promotion planning
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- 21 years of know-how

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service industry in Stancor's product planning, was announced by Jerome J. Kahn, president of Stancor.

The members of the Stancor Serviceman Advisory Board, selected from all sections of the country on the basis of their standing and experience in the industry, include Thomas Ayoob, San Francisco; R. A. Beezley, St. Louis; Arthur M. Bullock, Kansas City, Mo.; Harold Chase, Detroit; Walter S. Cox, Oklahoma City; Lothar E. Dietel, Miami; John B. Donner, Brookline, Mass.; Sidney S. Fleischman, New York; Max Fleming, Portland, Ore.; Francis R. Gibb, Columbus, Ohio; Albert M. Haas, Philadelphia; W. J. Inman, Dallas; Irving J. Kaluzna, Chicago; George Kelso, Denver; Stedman Lidell, Staten Island, N. Y.; Joseph Martin, San Pedro, Calif.; Frank J. Moch, Chicago; James F. Pinto, Buffalo; Gerald Soroka, Los Angeles; William A. Steed, College Park, Ga., and Elmore S. Walter, Milwaukee.

Dr. W. R. G. Baker Receives I. R. E. Award

Dr. W.R.G. Baker, right, General Electric vice-president and general manager of the G-E Electronics Division, receives the medal of honor of the Institute of Radio Engineers from Dr. Donald B. Sinclair, I.R.E. president, as former Defense Mobilizer Charles E. Wilson, left, looks on.

Dr. W. R. G. Baker receiving I. R. E. medal.

The presentation was made at an I.R.E. banquet here, held in connection with the Institute's national convention. Mr. Wilson was principal speaker at the banquet, held here on Wednesday, March 5.

The medal of honor, one of the nation's highest professional awards and the highest award granted by the I.R.E., was presented to Dr. Baker in recognition of his "early technical contributions to the radio transmitter art, his long, sustained, and effective leadership of institute and engineering groups, and his outstanding service to the institute."

ASSOCIATION • NEWS •

Local, State, and National Associations are urgently requested to send in news of their activities so that we may print them in these columns.

Phila. Radio-Servicemen's Assoc. (PRSMA)

The March open meeting of the PRSMA was held on Tuesday, March 4th, 1952, in the studios of KYW. The meeting was presented by the Motorola Corporation under the sponsorship of the Motorola Phila. Co. It was remarkably well attended considering the poor weather. It was raining cats and dogs, no, I didn't step in any poodles.

The speakers, both of whom were excellent, were Al Fisher, Service Manager of the Philadelphia Motorola Co., and Harold Rich, Field Service Engineer, representing the Motorola factory. The talks were extremely clear and enlightening, and for the first time I have heard the "reasons" behind some of the engineering designs in Television receivers. The lecture was chiefly concerned with the recent model chassis introduced by Motorola featuring the electrostatic focusing type CR tube and the new procedures for setting up this type set and it is a bit different from the set up procedure on the "regular," type chassis. This portion of the lecture was ably covered by "Smiling Al" Fisher.

Our April 1st meeting P.R.S.M.A. will have Art Leischer of RCA-VIC speaking on "what you should know about TV Tuners." The place and time of this meeting will be announced by Post Card.

The meeting held jointly by the JERCS, P.R.S.M.A. and T.C.A. at the Franklin Institute, 20th and Parkway, March 12th, turned out to be a packed house with over 425 being present that made it necessary to place extra chairs down front. Many old timers were present at this meeting. Ed. Noll spoke on UHF and Color TV. That is the kind of meeting P.R.S.M.A. used to have and there is no reason we can't do it again. Let's all work together and help bring this about.

Four newly elected officers of the Florida Radio & Television Technicians Guild. (FR&TTG)
Standing (left to right): Thomas M. Middleton, Secretary; Miss Milne; Shan Desjardines, Vice Pres.;
Seated (left to right): A. Ed Stevens, Treasurer; Steven Petruff, Pres.

Television Installation Service Association (TISA)

March 26th, TISA held an Open Forum meeting on the problems of service shop operators. Fully ¾ of all service shop operators in the metropolitan Chicago area attended. The official registration showed 389 representatives by actual count.

Many problems, such as the service racketeers, fix-it-yourself book advertising, parts warranties, continued failure of some manufacturers and distributors to cooperate, factory operated service, licensing and unions were discussed. The report on the progress of prosecution of rackets received complete acceptance.

A secret ballot was taken on unionization and licensing. It appears that no concerted opposition toward unionization exists. On the subject of licensing, a strong vote was cast in favor of a state law based on the Medical Profession Bill. This bill would license both technicians and shops. The real push for such a law was created by the failure of many manufacturers and distributors, and particularly RT

You're top-man on our Totem Pole

...here's why:

You're in the *Radio Business.* So are we.

You're interested in promoting the sale and use of *radio products.* So are we.

If You prosper, so do we!

That's why we are so anxious to *give you help* when you stock, sell and promote the *RCA Battery Line.*

That's why we continue to channel our principal battery distribution to You, the radio dealer-serviceman, thereby assuring *You* the repeat business for RCA RADIO BATTERIES.

That's why we advertise You, The Radio Service-Dealer, on national network radio and TV programs . . . and tell millions of listeners that *You are best qualified* to *sell and install* RCA RADIO BATTERIES.

We also help You advertise for repeat sales on the RCA Battery carton itself! Millions of volume-type RCA Batteries carry a printed message directing the user to *return to You* for replacements. Below this message is a space where you can stamp *your own name and address* with a personalized stamp which you may obtain from your RCA Battery Distributor.

We will continue to provide speedy, dependable service, backed by the *only* nation-wide warehousing and distribution organization geared to the needs of the radio trade.

With all this to back you, your best move is to stock, sell and promote *the RCA Battery Line.*

Remember: You're a *Radio Man.*
We're a *Radio Company.*
If You prosper, so do we!

That's why you're tops on our totem pole. And that's why *you'll do better . . . make more money . . .* with the RCA Battery Line.

So call your RCA Battery Distributor. Let's get started selling RCA Batteries together . . . *right now.*

RCA

RADIO CORPORATION of AMERICA

RADIO BATTERIES **HARRISON, N. J.**

MA, to take a cooperative stand in helping set up codes and conditions for legitimate operations. Heavily criticized also was the failure of the industry, in general, to educate the consumer in a proper attitude toward service. Philco, RCA, Motorola, Capehart, Westinghouse and Sylvania were commended on their stands on many subjects.

The dominant factor of the meeting which was not called specifically as a membership drive was the fact that a total of 38 new members was enrolled. Since the meeting, each day brings 3 new applicants. This new group more than doubles the strength of TISA. Attending this meeting were representatives of 3 entirely new chapters of TISA and representatives of TISA—Indiana, Wisconsin, Michigan, Tennessee and Iowa.

Nat'l Alliance of TV & Electronic Service Assoc. (NATESA)

The phony ads on these books are popping up in every TV market area. NATESA has sent out more than 75 telegrams to manufacturer BBB's, newspapers, magazines, TV and radio stations and the Underwriters Labs.

Our very conciliatory letter on the warranty situation which was sent to 'Top Brass' of each individual manufacturer on the recommendations of Mr. A. Coumont, RTMA Service Coordinator, thus far has received the same old pattern of stalling and ignoring. Except for Capehart, Philco, GE, Motorola and Belmont who came up with sensible answers, most manufacturers didn't answer yet. The Hallicrafter and Stewart-Warner answers are based on the idea that 'Poppa knows best and so take what we give you and shut-up'. They imply the great service they are rendering us by building sets which we can service. We should be patient and talk, talk and talk which we have done for 4 years. S/W implies that the only purpose of an association is to agree with the manufacturers 100%. This is another indication of the amount of cooperation we can expect from many set manufacturers. *Remember It.* A full report will be made later so that you can judge who your friends are.

Television Service Engineers, Inc. Of Kansas . . . Your President had the privilege of addressing the regional meeting of this Kansas affiliate. The affair was very splendidly handled by Wade Williams, Jack McDowell and the entire gang. The cooperation in this meet was great. Vince Lutz of ATSC of St. Louis and 'Rosey' Rosenberg of RSA-Wichita talked to the group. Wichita had a nice group to the affair. The ENGINEERS promo-

Radio-Television SERVICE DEALER

Yours for the Asking

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MAIL TODAY

YOU MUST BE A "SERVICE DEALER" SUBSCRIBER TO QUALIFY FOR THIS FREE CATALOG SERVICE.

ted a fine advertising job in the KANSAS STAR with the cooperation of local set and parts jobbers.

Ass'n Of Television Service Companies Of Greater St. Louis . . . Vince Lutz, President, announces another grand meeting to be held at St. Louis May 10-11-12. They will select a Miss TV and have gotten proclamations of TV WEEK from the Governor among other de luxe effects. This promises to be another big affair. Plan to attend.

Radio-Television Service Ass'n of Minneapolis . . . A fine mailing received from this affiliate unfortunately too lengthy to quote in full here. New officers for 1952 Charles Ecklon, President—John Hemak, Vice President—Alvin Enke, Secretary—Einar Duoos, Treasurer. The new Code of Ethics should reinforce customer confidence.

Radio & Television Servicemen Of New Jersey . . . J. Palmer Murphy, Executive Secretary, advises that licensing is being pushed in N. J. The association is watching the situation critically since certain factors mitigate against service people. They can be relied upon to prevent any action harmful to service. Incidentally, they approve the handling of the St. Louis situation.

From mail received, it appears that NATESA will have affiliates in 3 more states. Virginia, New Hampshire and yes, the State of Hawaii. We're growing - let's keep going.

Radio Technicians Guild Of Rochester . . . This affiliate, according to Retailing Daily, is doing a slam-bang job of keeping its house in order. More power to Harold Eskin, President, the other officers and members and certainly to Burt Lewis, NATESA Treasurer.

Rocky Mountain Radio TV Service Guild . . . President W. E. Young advises they have taken action on House Bill #6219 reported in previous bulletin. They're right on the ball, especially considering their newness to the fold.

Television Service Association (TSA)

Mr. Robert Laneve of Pittsburgh, Radio, Sound and Television Lab, was elected the first President of the Television Service Association at their regular meeting last week. Serving with him for the year 1952 will be: Vice President, Mr. Milton J. Reich of Allegheny Television Inc.; Secretary, Mr. Thomas Ulrich of Penn Television; and Treasurer, Mr. L. C. Reed of Moree Television Service.

Rounding out the slate of the Executive Board, the following Standing Committees were appointed.

[*Continued on page 60*]

For the clearest picture of campaign progress...

Rauland PICTURE TUBES

Man, what a year for TV—and TV service profits! The richest menu of regular attractions ever offered to viewers . . . PLUS the party conventions, the campaign, the elections and inauguration! When viewers need replacement picture tubes, they'll want them fast—*and good.*

So remember that Rauland alone offers these replacement profit advantages:

- The *most complete* line of replacement picture tubes . . . a far better supplement for your regular tube line than a second line of receiver tubes.
- The faster, *surer* installation adjustment made possible by the patented Indicator Ton Trap.
- The dependable, uniform *extra* quality that so many smart service men depend on for assured customer satisfaction.

• • •

Remember, Rauland research has developed more "firsts" in picture tube progress since the war than any other maker. And this leadership pays off . . . in your customers' satisfaction.

THE RAULAND CORPORATION

Perfection Through Research

4245 N. KNOX AVENUE • CHICAGO 41, ILLINOIS

TRADE LITERATURE

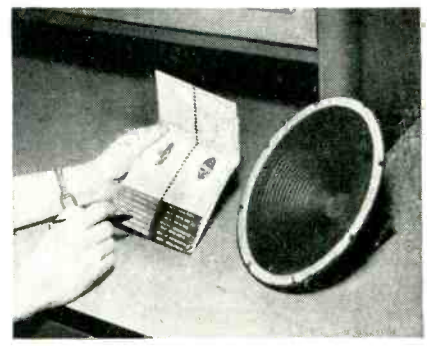
• • •

A novel *flip-type index,* designed to place basic electrical and mounting information on RCA radio and television speakers at the fingertips of radio service dealers, was announced today by the *RCA Tube Department.*

The handy, compact index, which is less than six inches square, will provide at the flip of an identification tab all data necessary for the installation of any one of 22 different RCA speakers. The index can be mounted on a wall or atop a service bench.

Each of the 22 speakers in the index is illustrated by a physical outline drawing, and a half-tone photograph. The necessary mounting information and such basic electrical data as voice-coil impedance, power-handling capability, resonant frequency, and magnet weight are also included for each speaker.

The index is available to radio service dealers and servicemen through their RCA electronic components distributors.



RCA's Flip-Type Index

Fretco, Inc., 1041 Forbes St., Pittsburg 19, Pa., makes available a *booklet, "Antenna Facts."* The information contained in this booklet has been prepared to help the TV technician solve many of the problems he may encounter in the field of antennas.

Hytron Radio & Electronics Co., a Division of CBS, Salem, Mass., makes available *Engineering Data sheets* on the following tube types: 21FP4A, 21EP4A, 5Y3WGT, 12BY7, 12BZ7, 12A4, and 12B4. The 21FP4A is a 21" low voltage electrostatic focus picture tube. The 21EP4A is a 21" cylindrical face rectangular all-glass picture tube. The 5Y3WGT is a full-wave rectifier. The 12BY7 is a video pentode amplifier. The 12BZ7 is a high-mu dual triode. The 12A4 is a medium-mu triode. And the 12B4 is a low-mu triode.

A new four page *brochure* has been released by *Ward Products* covering its line of mobile antenna rods, bases and springs.

The folder describes nearly 20 separate standard rods, plus many special designs for particular applications, roof-top and motorcycle models, as well as bases and springs to handle standard rods. The line described in the brochure is the most complete of its type in the industry, according to Ward, and is available through radio parts distributors everywhere.

A free copy of the folder, entitled Form 54-153, may be obtained from Ward distributors, or direct from Ward Products Corp., 1523 East 45th Street, Cleveland 3, Ohio.

A new three color auto aerial *catalog* has been released by *Ward Products,* timed, according to the Company, to be available well in advance of the spring and summer auto aerial season.

In addition to describing the "Eight-Ball, Phantom, Air King" and other models, the catalog introduces Ward's exclusive Elektran lead cable. It has been designed to serve not only as a catalog, but also as a sales promotion piece.

Free copies of the new Ward auto aerial catalog, including descriptions of sales promotion material available, are available at Ward distributors or from Ward Products, Corp., Division of The Gabriel Company, Cleveland 3, Ohio.

The James Vibrapowr Company announces the availability of a new and valuable *booklet,* entitled, *"Using Your Oscilloscope in Vibrator Maintenance."*

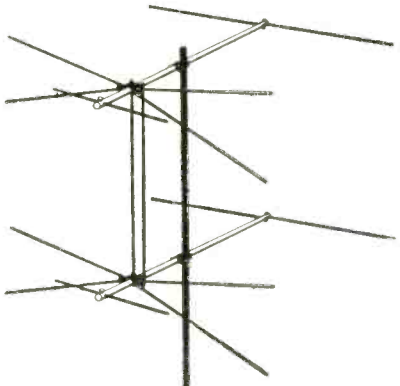
This new four page booklet outlines

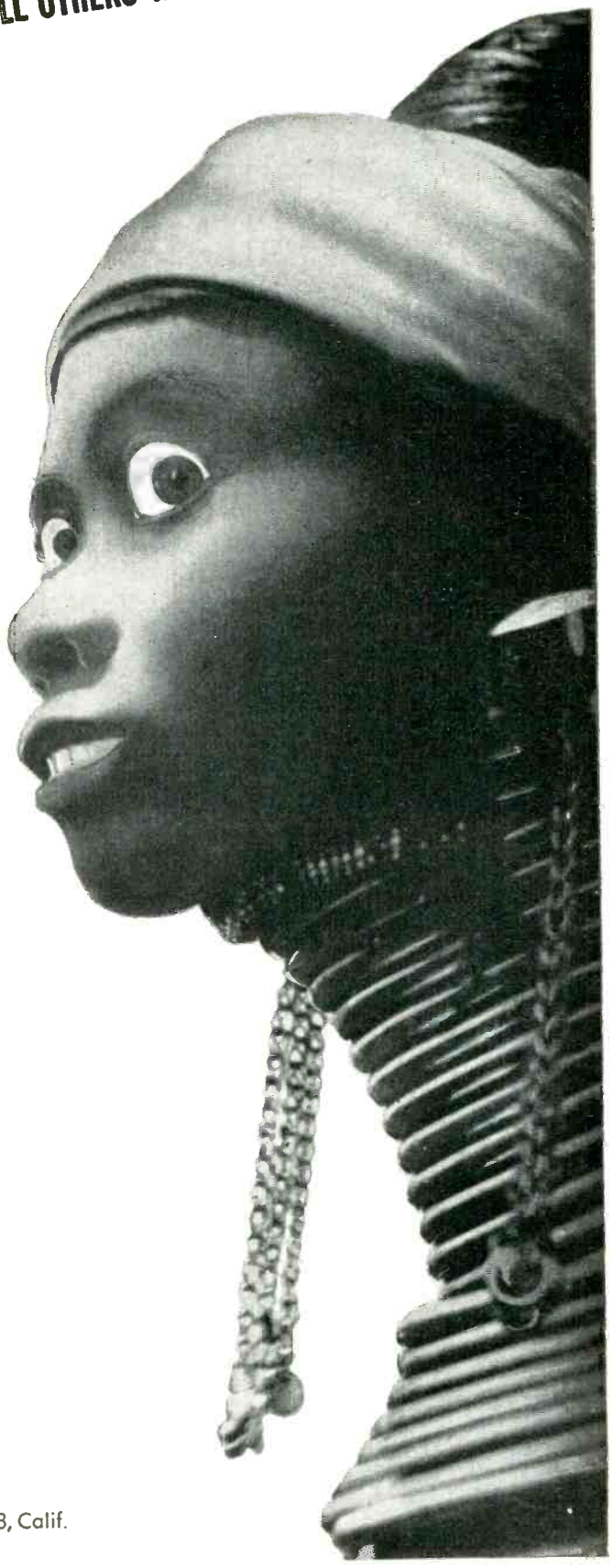
[*Continued on page 58*]

OOG BONGO WALSCO FRINGO

(Translation)

"WALSCO MODEL M ANTENNA OUT-PERFORMS ALL OTHERS IN FRINGE AREAS"





Almost *anywhere*, the WALSCO Model M Signal King will out-perform, out-last any competitive antenna. It's a fact... the Model M brings fringe areas closer to the TV transmitter... produces sharper, crystal-clear pictures.

And once you install...*that's all.* No costly call-backs that quickly eat up profit. Guaranteed sturdier, more dependable in *any climate*. Chromate-coated, magnesium cross-arms have a structural strength almost equal to steel, yet 1/3 lighter than aluminum. Positive corrosion resistance in severest weather. Elements are made of high-conductivity, super-strength aluminum alloy, reinforced with Swiss "Permalum." Here is quality you can trust *anywhere!*

WALSCO

Walsco quality *earned* its reputation

WALTER L. SCHOTT CO.

3225 Exposition Place, Los Angeles 18, Calif.

Branch: Chicago 6, Illinois

SYNC PULSES

by San D'Arcy

$1 "Fix It Yourself Books" currently being offered to TVset owners all over the country have caused a furore in the servicing industry. We're told upwards of a half-million of such valueless brochures have already been bought by the gullible public. Barnum was SO right! As we predicted editorially some months ago, it was to be expected that the public would fall for the high-pressure (misleading but most cleverly written) advertising that has been used to foist this type of book on those who naturally would like to save a buck and have the satisfaction of fixing their set themselves. But also, as we predicted, in time the books get the user so confused and fouled up that he has to call in a truly competent professional technician to undo the mess he finds himself in. Consequently servicemen have found themselves with $30 repair jobs that, had the TVset owner not butted in, would have been but $5 jobs at most.

The sale of "Fix It Yourself" books does not cause us real concern because there will always be a certain class of buyer for such tripe. It's too bad the public is willing to fall for misleading and sucker advertising and takes such a legal gypping. It's particularly bad that such book-buying suckers usually wind up blaming the service profession for their own stupidity in the first place. The great pity of it all is this: reputable newspapers and radio stations are almost morally obligated to accept such "Fix It" book advertising and thus contribute to the public's loss.

Many TV Associations have taken all steps at their command to try to persuade newspapers and stations to refuse all "Fix It" book advertising, but without avail, because of this nation's policy of the "free press" plus the old adage Caveat Emptor, meaning, "let the buyer beware." Be that as it may, we repeat what we said long ago, as technicians let us not waste more time trying to protect the public from itself. Let the suckers buy their "Fix It" books—let them learn the hard way that they've been taken for an extra buck at least, and in many cases, for many dollars because they themselves made a mountain out of what should have been a molehill.

Better Merchandising Tactics must be employed by service shops in the future if they are to succeed. Here's an actual case history to prove the point: In Cleveland recently the advertising manager of Ward Products Co., a manufacturer of antennas, decided to make a survey for himself as to the potential replacement market for TV antennas. So, he referred to the classified 'phone directory and at random picked out the names of service firms to call to ask, "Do you think I should have my antenna replaced? I've used it over 2 years now and the reception seems to be getting worse." In every single case the 28 service shops queried stated that quite likely better reception would be had if a new antenna were installed, BUT, only 1 shop of the 28 asked for the phone caller's name and address. The other 27 shops merely gave free opinions and did nothing about trying to ascertain whether or not there might be a job on which they might have made a profit, had this been a real prospect.

In like vein we know of hundreds of servicemen who always carry a kit of replacement phono needles in their tube-checker case, and being thus prepared, always inquire at every house whether or not there might be a record-player which could properly have a more efficient replacement needle put in. Such practice is typical of good, planned merchandising.

Service Charges Vary in divers parts of the country because of the law of economics and living standards. New York City newspapers carry many advertisements offering TV service for $1 plus cost of parts, while in Detroit and Cleveland the quoted fee is now $4. In Chicago the average is $3 while in Los Angeles, believe it or not, the great bulk of advertising stresses free estimates. Here and there one finds the "club service plan" being pushed.

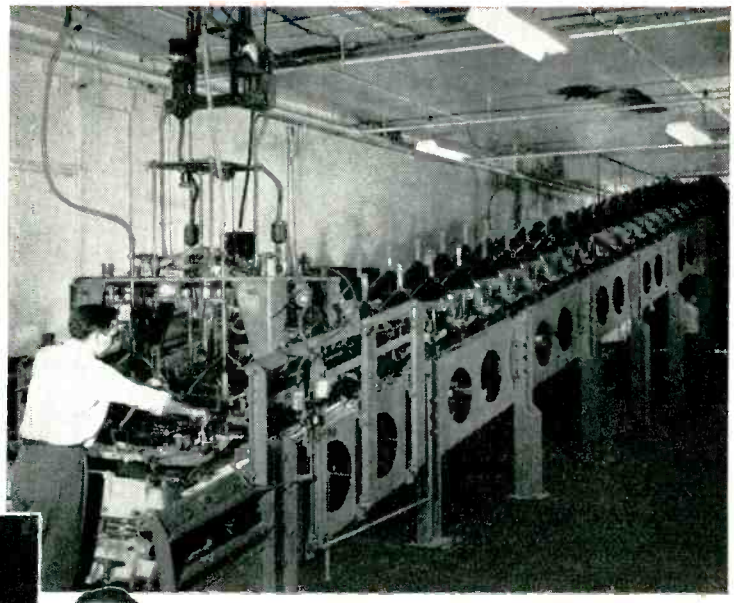
Experience proves that not one of these methods of sales promotion is the proper one to use for successful enterprise. You can discount all that hooey about "low charges accounting for a great volume of business and a small profit on each operation adds

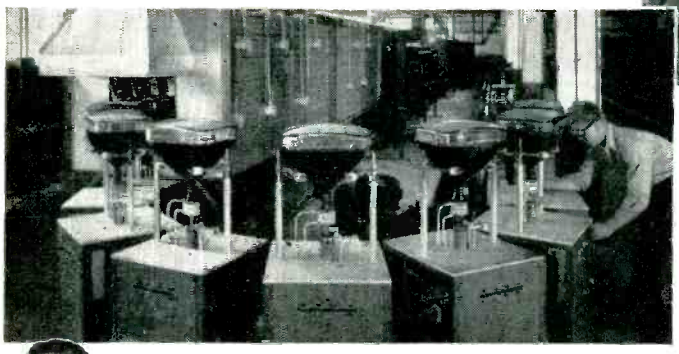
[*Continued on page 64*]

"Let Me Tell You How It Happened..."

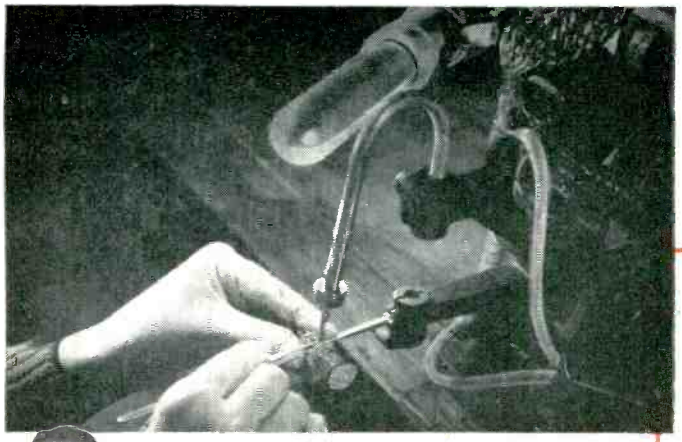
Carl Wineglass,
Al's Radio,
Lawrence, Mass.

"FOR YEARS I'VE BEEN BUYING TUBES...A LOT OF THEM CBS-HYTRON. But I didn't know too much about CBS-Hytron. Sure, I'd seen their ads. Read about their original rectangular tube. Their IX2A, 6BQ6GT, 12BH7, 12BY7, etc. Their handy service tools. (I just couldn't get along without my Soldering Aid.) Their Budget Plan. And so on.





"I like to know the fellows I buy from though. So last week I drove over to Salem. The CBS-Hytron gang, from President Bruce A. Coffin down, gave me a real welcome. Also the low-down on CBS-Hytron tubes, and what's behind them.



"First off, I discovered that CBS-Hytron is *big*... and getting bigger fast. I saw receiving tubes rolling out of their combined Salem and Newburyport plants at 300 a minute. With their new Danvers plant, it'll be 600 a minute! And their picture tubes run at 5000 a day! You may already know that CBS-Hytron is now a division of Columbia Broadcasting System, Inc.

"CBS-Hytron has a saying, 'Tubes are known by the company they keep.' In their shipping rooms, I saw tubes being rushed out to most of the top manufacturers and jobbers I ever heard of... and lots I don't even know.

"The reason for all the popularity wasn't hard to find. I never saw such painstaking manufacturing and testing in my life. From raw materials to finished tube. Every single tube gets the works.

"And is making tubes complicated! That ingenious machinery does everything but talk. The flying fingers of the girls assembling the tubes, though, are what caught my eye. I just couldn't believe you could get that watch-like precision with that amazing speed. And talk about engineers! I saw electronic, mechanical, chemical, metallurgical, production, industrial engineers by the score.

"I've read that CBS-Hytron's picture-tube plant is the most modern in the world. I believe it. It's really something the way that push-button, automatic plant handles those big bottles. And that new Danvers receiving-tube plant is more of the same. Floor space covers approximately five acres. Main production floor is longer (500 feet) than the longest home run ever hit by Babe Ruth. That plant has everything. They tell me the whole idea was to produce at economical top speed the finest receiving tubes in the world. To my way of thinking, they succeeded.

"Believe me, I'm glad I made that trip to CBS-Hytron. They're a real on-their-toes outfit. Before I never was too fussy what standard brand of tube I bought. But now I want CBS-Hytron, and that's that! You would, too, if you'd seen what I have."

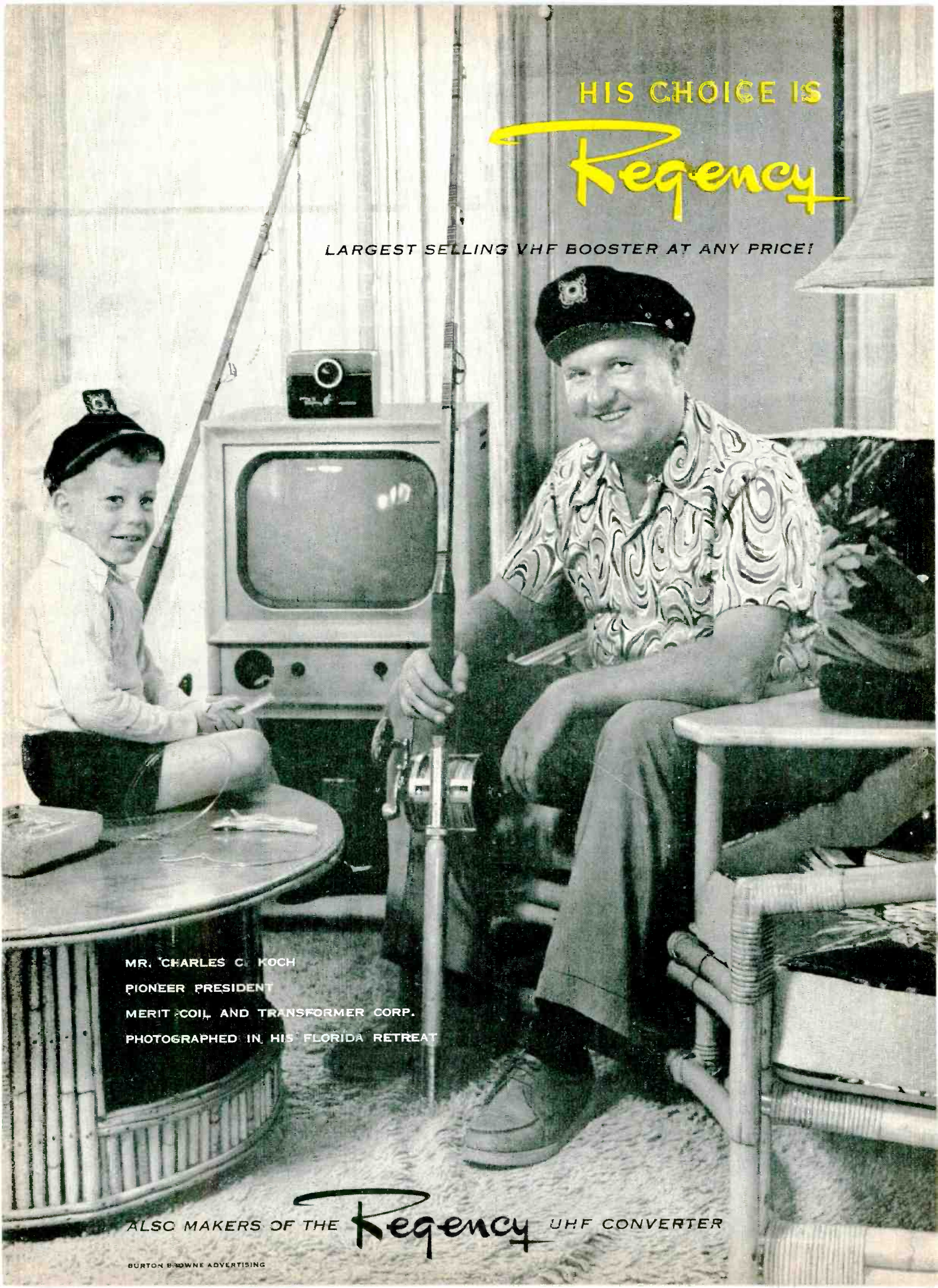
AN OPEN INVITATION...

to all service-dealers and their distributors. You are mighty welcome to drop in at CBS-Hytron any time. How about this summer?

CBS HYTRON RADIO TUBES

MANUFACTURERS OF RECEIVING TUBES SINCE 1921
HYTRON
RADIO AND ELECTRONICS CO.
A DIVISION OF COLUMBIA BROADCASTING SYSTEM, INC.

MAIN OFFICE: SALEM, MASSACHUSETTS


HIS CHOICE IS
Regency
LARGEST SELLING VHF BOOSTER AT ANY PRICE!
MR. CHARLES C. KOCH
PIONEER PRESIDENT
MERIT COIL AND TRANSFORMER CORP.
PHOTOGRAPHED IN HIS FLORIDA RETREAT
ALSO MAKERS OF THE Regency UHF CONVERTER
BURTON BROWNE ADVERTISING

CIRCUIT VARIATIONS *in* TV RECEIVERS

by **MATTHEW MANDL**
(Author: Mandl's Television Servicing)

Unusual circuit variations found in a number of commercial receivers. These include phase detector, video i. f., FM i. f., and horizontal output circuits. Understanding these variations makes servicing that much easier.

OFTEN the television technician will encounter circuits which are not of the conventional type in television receivers. At other times he will find slight variations of the more common circuits. Frequently these require an analysis of general function before servicing procedures can be attempted. With the unorthodox type, trouble shooting is always expedited if the technician understands the manner in which the circuit performs its specific duty. Common techniques may vary and often have to be adapted for the specific deviation to be found. Some typical variations are discussed herein and will serve as a guide for the serviceman on such occasions when these receivers come into the shop for repair.

Westinghouse Phase Detector

Most of the modern receivers utilize the Synchroguide horizontal lock system or the dual tube phase detector system. In a number of Westinghouse receivers, however, a single tube phase detector is used, which is somewhat unorthodox in design. This detector is used in Models H-633C17 series and late production Models H-629K16 series receivers. The circuit is shown in *Fig. 1* and as can be seen from this illustration a 6C4 triode tube is used for the phase detector. This provides the necessary automatic frequency lock for the horizontal multivibrator sweep oscillator.

The principle involved here is based on the manner in which a tube operates when grid current flows. Thus, the amount of grid current which flows is directly influenced by the potentials

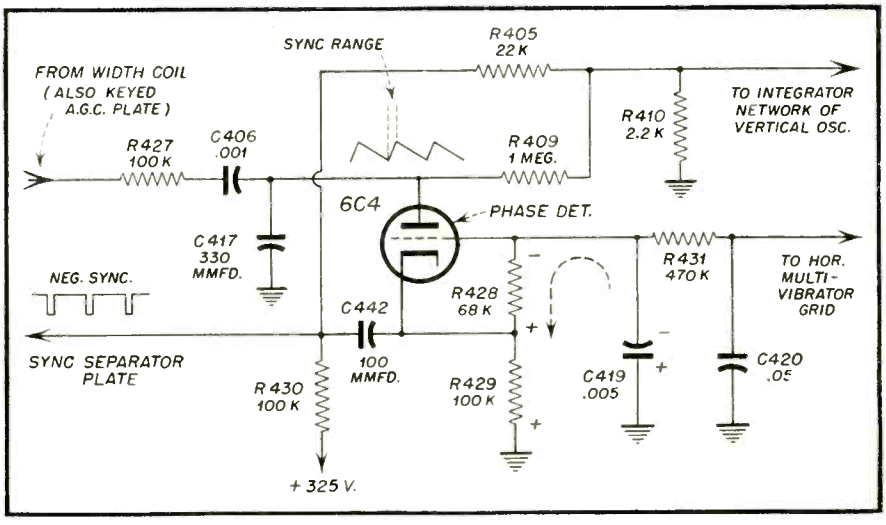


Fig. 1. Single triode phase detector.

on the plate of the tube, In other words, if the plate voltage is dropped to zero, a maximum amount of current will flow in the grid circuit. If plate voltage is increased, there will be a corresponding decrease in grid current.

In the circuit shown in *Fig. 1* a sawtooth signal is derived from the horizontal output and applied to the plate of the phase detector. This has a peak to peak amplitude of approximately 20 volts. Ten volt sync pulses are fed to the cathode as shown. *C419* has a bypass effect on 15,750 horizontal sync pulses. This establishes the grid at virtually ground for the sync. The negative-going sync pulses will, however, make the cathode more minus with respect to the grid. Since this is equivalent to making the grid plus, current will flow to the grid and charge *C419*. Between pulses, *C419* will discharge across *R428* and *429* as shown

by the dotted lines. This makes the grid minus with respect to ground.

The relationships between the sync pulses at the cathode and the saw-tooth at the plate will establish the amount by which a negative charge is built across *R428* and *R429*. This charge represents the correction voltage applied to the horizontal multivibrator. The correction voltage will shift the frequency of the horizontal oscillator if it should drift. Thus, if the sync pulse occurs when the saw-tooth is going negative, this zero or negative voltage at the plate will permit a maximum current flow in the grid. This will create a negative charge across *C419* and develop the highest negative voltage at the grid.

If the oscillator drifts, the saw-tooth will shift with respect to the sync pulse. This would mean that the sync at the cathode occurs when the saw-tooth is in the positive potential direction. This causes a reduction in grid current flow and reduces the correction voltage. As a matter of fact, the current flow through the cathode resistor (*R429*) will make the cathode positive and overcome the negative voltage developed by the sync. Thus, the correction voltage could become positive with respect to ground. Inasmuch as the correction voltage at the grid can vary from positive to negative depending on phase relationships between sync and saw-tooth, the voltages will balance out to produce a zero potential when the oscillator is perfectly synchronized with the incoming pulses.

Service Notes

The saw-tooth waveform for the phase detector plate is derived from the width coil section of the horizontal output transformer secondary. This lead also feeds the keyed a-g-c detector plate. Thus, a defect in the width coil section of this receiver would cause horizontal instability as well as upsetting keyed a-g-c function. Thus, the loss of horizontal synchronization is often accompanied by an excessive contrast because of the removal of the negative a-g-c voltage from the r-f/i-f picture tubes of the receiver. For this reason it is important to check the peak to peak signals when trouble occurs. A calibrated oscilloscope can be used to ascertain whether or not both the saw-tooth and the sync signals are present and whether their amplitudes are correct. Defective tubes or components in the sync separator circuit will upset both the vertical and horizontal sweep because the vertical oscillator is fed by R405.

If proper amplitude sync pulses are present as well as saw-tooth at the plate, poor stability may be caused by a defective 6C4 tube. If replacement does not help, the component parts associated with this circuit must be checked. (Of course, horizontal sync instability could also be caused by defects in the horizontal sweep oscillator.)

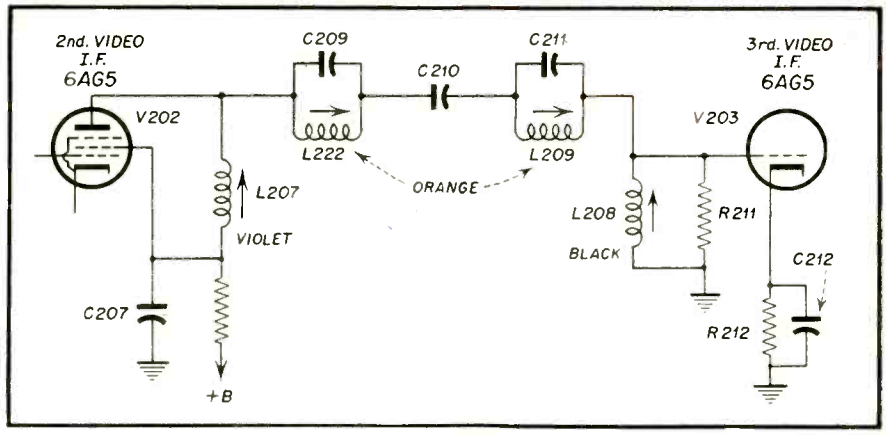


Fig. 2. Traps in video i.f.

Crosley Video I-F Coupling

Another circuit of somewhat unusual design is the coupling system employed by the Crosley Models 9-407 series television receivers between some of the stages of video i-f amplification. As can be seen from *Fig. 2*, several parallel resonant circuit sections are connected in series between the second video i-f amplifier and the third. Here, *L207* is the load impedance across which the amplified signal from the second video amplifier develops. This has an adjustable iron core slug and resonance is procured by a combination of this inductance and circuit capacity. *C210* is the coupling capacitor between the plate of the second video i-f stage and the grid of the third amplifier. This permits signal transfer and isolates the plus voltages at the previous plate from the grid of the next tube. The elaborate coupling network incorporates two parallel resonant traps. *L222* is resonant to 21.9 megacycles, while *L209* is resonant to 27.9 megacycles. *L208* provides for grid circuit resonance to the i-f frequency. The 21.9 megacycle trap is for the sound carrier, while the 27.9 trap is for the lower channel sound interference. While such coupling methods have been used by other manufacturers, the usual practice is to isolate the traps by distributing them singly among the various i-f stages. The inclusion of two series traps plus two resonant coil sections in one coupling circuit means that adjusting procedures must be strictly followed to minimize the influence of one trap setting on the other. When one trap is adjusted it will offer a high impe-

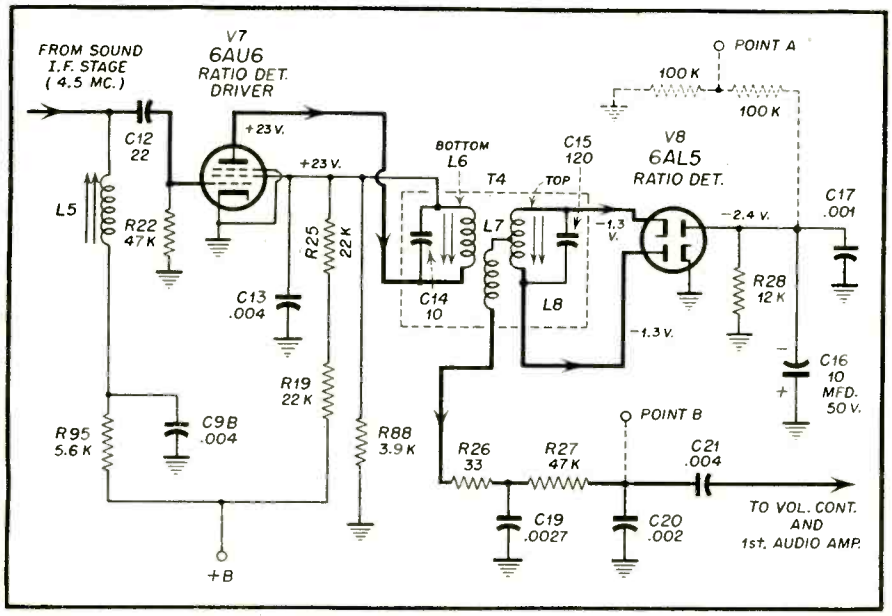


Fig. 3. Driver used with some ratio detector circuits.

dance for the signal current of the undesired frequency. The decline of this signal current will, to some extent, influence the entire circuit characteristics and also have some detuning effect on the other trap. Thus, when one of these traps is adjusted it should be retouched after tuning the other.

A misadjustment of the traps can cause poor picture quality. The misadjusted sound trap will produce horizontal sound bars on the screen, while the misadjusted adjacent channel trap will give diagonal line interference. Even in signal areas where no adjacent channel interference is encountered, the misadjusted traps can seriously affect performance. This is particularly true if they are detuned so their resonant range extends into the video i-f bandpass. Under this condition, portions of the video signal frequency range will be attenuated and thus give poor picture quality.

Bendix Sound Section

Usually the ratio detector type of FM demodulator requires no limiter preceding it as is required with a discriminator type of detector. This comes about because the ratio detector has a large filter type capacitor which absorbs amplitude changes and also noise bursts. This is usually a large capacitor and may range up to 10 microfarads, such as *C16* in Fig. 3.

For this reason, servicing technicians sometimes overlook the fact that a limiter type of circuit is occasionally employed with the ratio detector in intercarrier receivers. The circuit is not always readily identified as a limiter or capacitor because the term "ratio detector driver" is often given it. One such system is shown in *Fig. 3* for the Bendix. This tube, as with conventional limiter circuits, has a low d-c voltage applied to the plate and screen so that it saturates readily and clips the peaks of the incoming signal. Little amplification is realized in this circuit, but it is effective in reducing impulse noise interference as well reducing the possibility of intercarrier buzz.

Thus, if intercarrier buzz is abnormal in such receivers, the ratio detector driver tube should be replaced and the circuit components checked for off values. The function of this tube can be ascertained in similar fashion to conventional limiters by checking for the presence of voltage across the grid leak. The incoming signal drives the grid positive and draws current which charges *C12* the coupling capacitor. This in turn discharges across *R22* and establishes a negative potential at the grid. Lack of minus voltage here would indicate an open *C12* or defect in the ratio detector driver circuit. The voltage across the resistor can be checked with a vacuum-tube voltmeter set on the DC range.

Capehart Horizontal Output

Many modern receivers utilize the direct drive type of horizontal output system with the high efficiency horizontal output transformer. There are a number of circuit variations of this and a typical one is shown in *Fig. 4* which represents that used in the Capehart CX-33 series chassis. This transformer is not of the ferrous core type often used nowadays but is an air core type. As can be seen from the drawing, the horizontal output tube, the transformer, and the horizontal deflection coils are all in series. The damper tube shunts the deflection coils. This design puts a high positive potential on the cathode of the damper tube. Linearity can be controlled in the voltage boost system as in the older type circuits. In this instance, the width control is a variable resistor, *R305*, which influences the impedance of the output circuit.

In such a circuit, optimum operation is obtained if there is good balance between the drive signal applied to the grid of the horizontal output tube and the impedance relationships in the plate output circuit. Inasmuch as the deflection coils and damper tube are not isolated by a secondary winding, they comprise the direct load on the horizontal output tube. For this reason, best performance depends on the values of circuit components being held to within 10% of their ratings. Defects in picture width, horizontal linearity, high voltage, and brilliancy can all be caused by off-value components or defective tubes in these circuits. Adjustments of horizontal linearity, width, and drive are somewhat complementary and adjustments of one often entails readjustments of the other.

Horizontal drive should be kept at a minimum to prevent elongation of the left side of the picture and to prevent horizontal output tube overload. This is a factor which must be kept in mind if insufficient width is secured. Thus, if some defect occurs in the components of the width control circuit, an effort to increase width should not be made by increasing horizontal drive. While this may bring the width to that required, the excessive drive will materially shorten the life of the 6BG6 tube. If sufficient drive is encountered, check for off-value resistors and capacitors in the width control and associated component parts. Also check for proper voltage relationships because this can easily be upset by incorrect values or by defects in the low voltage power supply feed system. This receiver, as with a number of others (including almost all RCA models) does not run the cathodes to ground but applies negative voltages to them. These negative voltages in relation to the plus voltages applied to the plate and screen feed networks, establish the correct relationships between plate and cathode potentials. Deviations will result

[*Continued on page 63*]

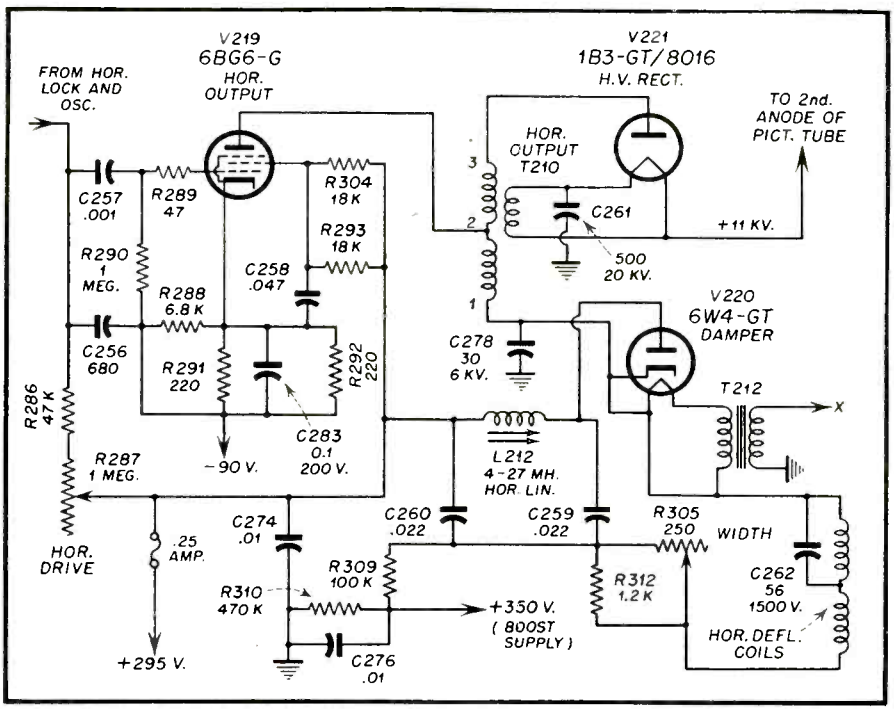


Fig. 4. Air-Core horizontal sweep and h-v system.

U-H-F ANTENNA SYSTEMS

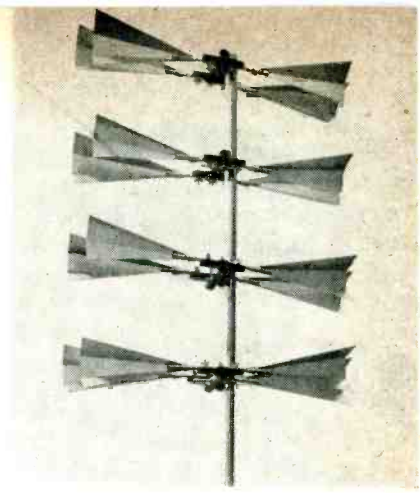


Fig. 4. Fan Dipole antenna

by **DOUGLAS H. CARPENTER**

This timely article coming on the heels of the recent "Unfreeze" describes the various types of UHF antennas. Photos are by courtesy of the La Pointe-Plascomold Corp.

WITH VHF telecasting pretty well standardized across the country, service technicians have been looking forward with interest to the end of the "freeze" imposed on UHF service by the Federal Communications Commission. With the lifting of the "freeze" the service technician must become thoroughly familiar with UHF principles and practices. It is safe to predict that he will have much to learn. This, of course, does not mean that service at these frequencies will start immediately, as a certain amount of time must elapse before applications pending before the FCC are processed, and actual construction permits issued. It is fairly safe to say that if progress continues at the present rate several UHF stations will be in operation by the end of the year, and television at long last will be a reality in sections that are not presently serviced. The impact of this decision upon the service technicians' business future should be tremendous, and it would be timely to review the basic equipment differences to be encountered in this new range, and to indicate present manufacturing trends.

Engineering Problems

When speaking of UHF it has always been the custom to refer to a definite limited range of transmission. There are several factors that limit the useful range of UHF transmission, and most of these are of a technical design nature. Vacuum tubes at this range exhibit high resistive loading characteristics, and high internal noise to gain. For this reason, crystal diodes have found wide application as mixers, and gain is usually achieved in the following i-f stages. Since it is difficult to realize a good selectivity response, the transmission line and antenna systems become increasingly important. Present 300 ohm line and lower loss versions will be used at these frequencies. Although fairly good when dry, the drawback to twin lead is the high loss characteristic when damp. Losses in the order of 20-30 db are not uncommon. Good coaxial line, although somewhat immune from moisture absorption, has a fixed loss of 9 db per 100 feet when dry. Unless future design in the transmission line field develops a markedly different line, it is safe to say that twin lead will be used. Receiver manufacturers have generally standardized UHF receiver inputs at this figure, and it is expected as with all electronic progress that better lines will soon be available.

The above problems are of an engineering variety, but there are others that may be considered to be more or less fixed. Tests have indicated that ground attenuation is much higher at UHF than at VHF. On the other hand a comparison over water does not show a great deal of difference. This means that extended range UHF transmission is quite practical over certain terrain. A much improved immunity to man made interference at UHF is noted when making a comparison between the two, suggesting reliable service in metropolitan areas now plagued by this problem. Fading is not nearly as pronounced at UHF as VHF, a definite advantage in extended range transmission. Finally, and most important, antenna dimensions are much smaller—making possible the use of super high gain arrays which tend to compensate for transmission line and front end losses.

Antenna systems for UHF will be quite a bit different than those now familiar to the service technician for VHF reception. The field of VHF antennae has been pretty well standardized, and the possibility of greatly improved design is improbable due to fairly large physical dimensions required, and the always present problem of covering two widely separated frequency bands. At UHF there is only one continuous range (470-890) with a frequency ratio of 2 to 1. Such a frequency ratio is not hard to cover with antennae of conventional VHF design. Stacking of additional bays for increased gain presents no problem as an almost indefinite number can be added before there is a physical support problem. This means that emphasis should be placed upon the quality of the UHF antenna in terms of gain and directivity both horizontal and vertical instead of price. The amount of material that is involved in the construction of UHF antennae should eliminate the competitive pricing that exists in the VHF field. The inherent problems of this high frequency range will necessarily demand a better understanding of comparative operation of antenna and accessory equipment. Where UHF assignments are made in metropolitan areas, the service technician will find almost the same problems as his fringe area brothers, due to the increased reflection problems at this frequency.

Design of UHF antennae as known today revolves around several standard types which have been described in engineering manuals for several years. Practical work in this field has been accelerated of late due to the impending use of these frequencies. Data on

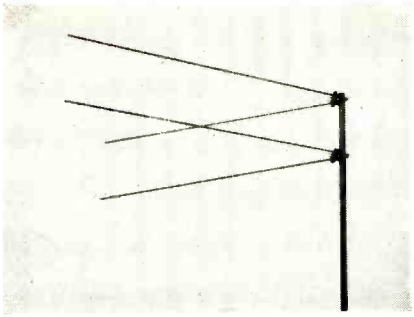


Fig. 1. "V" Antenna for UHF

gain is not that of theoretical calculation, but is the result of actual measurement of UHF signals from the Stratford, Conn., UHF transmitter.

"V" Antenna (Fig. 1)

The first family of antennae to be considered when dealing with UHF is the long wire V or "tilted" element types. The basis of operation of all antennae in this group goes back to the more familiar conical type used at VHF. A simple dipole of course will exhibit a fairly broad bidirectional pattern at its design frequency, with maximum radiation at right angles to the plane, and minimum off the ends. If we consider this same antenna at twice the frequency there are two major lobes angularly located in the plane of maximum radiation, and minor lobes appear. The major lobes are no longer at right angles to the antenna axis. To receive a signal at twice the design frequency it would be necessary to reorientate the antenna so as to shift the direction of one of the major lobes in the direction of the transmitting station. At three times the design frequency several lobes would appear making it again necessary to re-orientate for maximum signal pickup. The pattern gets more circular as we consider a higher frequency. What actually happens is that the impedance at the center of the dipole varies widely at each considered frequency and power gain and directivity deteriorate.

To overcome this inherent disadvantage the familiar tilt has been added to the straight dipole so as to superimpose the major lobes at the highest operating frequency to be used. At the lowest frequencies to be received the horizontal directivity pattern is somewhat impaired, but is still directional. The pattern becomes sharper as the frequency under consideration is increased with the result that we have an antenna which will cover a wide range of frequencies (about 3 to 1). The impedance match to the transmission line over a range of 2 to 1 (UHF) is not seriously disturbed. This represents a simple method of broad-banding an antenna element. To further reduce impedance variation at the transmission line feed point, the diameter of the tubular element of the dipole should be increased. One inexpensive method of accomplishing this is to fan out or add additional elements (as in the conical) which electrically simulates a flat sheet. Generally speaking the Q of the antenna element will be reduced resulting in a better average impedance match. The pickup area of the antenna has been increased resulting in greater signal gain.

The gain of any V antenna is dependent on correct super-imposition of the major lobes at the highest operating frequency, and the number of wavelengths composing the separate elements of the V. Power gain is directly proportional to length, and at UHF physical dimensions for good gain with the V antenna become practical. This basic form of broad band antenna should find wide use at UHF, as from a cost vs. performance standpoint it is hard to beat. It is not to be intimated that conicals or double V types presently used at VHF will work at UHF. The critical dimensions are such that they will exhibit an almost circular pattern in the high frequency range. There is one singular disadvantage to the simple V antenna, and that is minor lobes that will exist slightly to each side of the feed point at the back of the antenna proper. These, of course, are minor lobes that have not been superimposed by the tilting process. In metropolitan areas such lobes could be bothersome if reflections are encountered. The general characteristics for the V are indicated in *Chart 1.*

Rhombic Antennas (Fig. 2)

An extended version of the V type antenna is the Rhombic which has several advantages over this simple type. The Rhombic is essentially two V antenna with proper termination to cancel back reflection. If we consider a V and a Rhombic having the same number of wavelengths on a leg, the Rhombic will have an increased power gain of approximately 2.5 db. This means that the Rhombic (for the same amount of material) will compare with two stacks of V antennas. The additional advantage of the Rhombic over the two stack V is the absence of back lobes. By using elements in parallel the impedance of the Rhombic at the terminal feed points can be brought quite close to 300 ohms over a wide frequency range. The Rhombic type of antenna can be stacked for increased gain, the only limitation being the physical length of the elements composing the individual leg sections.

Yagi Antenna (Fig. 3)

The general desirability for a broad band antenna at UHF is somewhat clouded by the proposed UHF sectional frequency allocations. At VHF certain broad band antennas have become popular because of the large

TYPE	AVERAGE GAIN	BROAD BAND	COMMENTS
V	5 db (single bay)	Yes	Small back and side lobes. Sharp forward pattern.
Rhombic	9 db (single bay)	Yes	Excellent front to back.
Yagi	9 db (single bay)	No	Will find application in multi-element construction. Gain increase 3 db by doubling number of elements.
Colinear	14 db (4 stack at design freq.)	Yes	Will not cover entire UHF spectrum. Should find application in fringe areas.
Sheet Reflector	10 db (single bay)	Yes	Excellent all ground antenna. Should find wide application.
Slot Antenna	6 db	Yes	Compares favorably with fan dipole.
Fan dipole	6 db (double bay)	Yes	Simple to manufacture. Horizontal pattern slightly broad.
Helical	10 db (single bay)	Yes	Sharp horizontal pattern. Expensive to manufacture. Compares with Rhombic.

Chart 1. General characteristics of various types of UHF antennas indicating gain, bandwidth, and directivity.

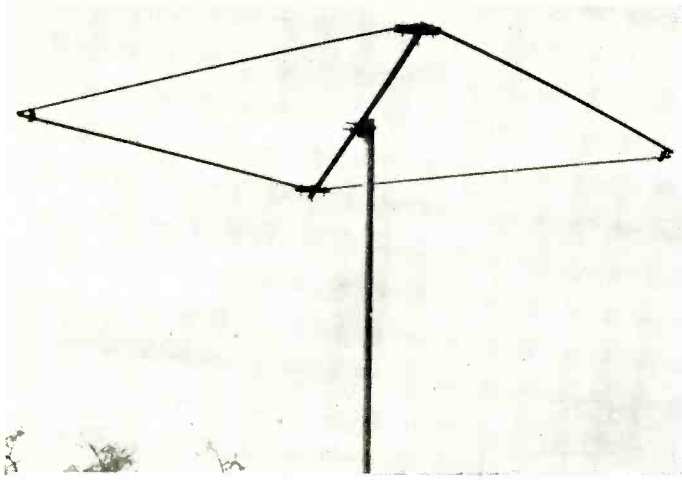


Fig. 2. Rhombic antenna

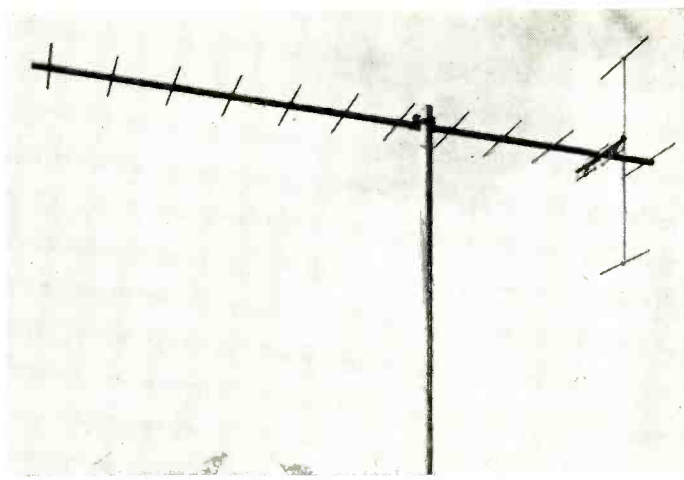


Fig. 3. UHF Yagi antenna

frequency ratio (4.1) they cover. It will be recalled that in certain areas there are low channel and high channel stations available. At UHF it is proposed to allocate the channels sectionally so that any specific area will have channels available separated by only 12 or 18 mc. from the next desired channel which is not a wide separation as far as UHF is concerned. This means that even sharply resonant antennas will find application at UHF. A yagi antenna which is considered extremely selective at VHF will probably find wide usage in several sections for UHF. At these high frequencies yagi antennas would not have to be restricted to the conventional 5 element types, but conceivably can be constructed with 15 or 20 parasitic elements to take advantage of the inherent high gain and directivity.

Fan Dipole (Fig. 4)

Another form of high gain antenna that may find wide use in the UHF field is the fan dipole. The antenna consists esentially of a tapered receiving element so designed to provide a smooth transformation of the essential impedance characteristic to the transmission line feed point. The physical construction is such that the dipole sections are in the form of a triangle. Electrically the same thing happens to the antenna performance as in the case of the conical. The large surface area vs. wavelength allows the center impedance of the antenna to remain fairly constant over the required 2.1 range. It is not necessary to tilt the elements forward as in the case of the conical, as sufficient bandwidth response is available due to the low Q of the triangular sheet. The antenna pattern is bidirectional (without reflectors) with comparatively high gain. This particular type lends itself to metal stamping techniques, and could be mass produced very economically. The only disadvantage of this antenna might be that of high wind resistance.

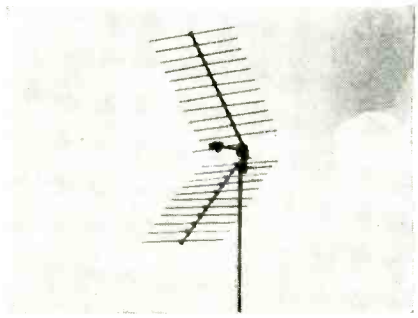


Fig. 5. Spaced element corner antenna simulating a sheet reflector.

Sheet Reflector Antenna (Fig. 5)

Another family of antennae that should become very popular at UHF fall into the sheet reflector category. The extreme value of a reflector of large area has always been known at VHF, but has never been utilized because of impractical physical dimensions. In much the same manner as the frequency response of the dipole element is increased by increasing surface areas, the effective action of a reflector may be extended. One method of accomplishing this action is to have several reflector elements at the proper radius from the dipole spaced less than .1 wavelength apart. The antenna is designed for the lowest frequency desired. With a large tubular element used as the dipole fairly flat response over better than a 2.1 range may be attained. A flat sheet reflector is practically as effective as the curved type over this range, and is a lot easier to construct. Back lobes are practically non-existent with this type of antenna, an extremely important feature in areas of heavy reflections. Comparatively speaking, the sheet reflector types will give higher gain per bay than any other type except perhaps an extended wavelength Rhombic. The horizontal pattern is sharp giving good back and side rejection to unwanted reflections and interference.

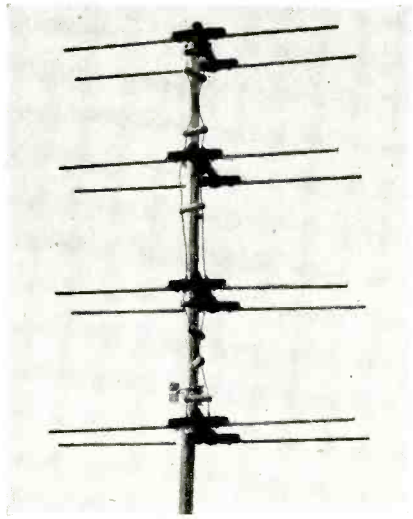


Fig. 6. Collinear antenna.

Colinear and Slot (Figs. 6 and 7)

Two other antennas that may find wide usage at UHF are the colinear and the slot antennas. The colinear has very high gain at its design frequency and will cover a fairly wide range. The full wave type consisting of stacked dipoles and reflectors has excellent front to back high gain and sharp horizontal directivity. When properly matched to the transmission line a frequency ratio of some 1 to 5:1 is realized with negligible loss of gain or pattern characteristic. A four bay colinear will give up to 15 db gain at the design frequency, and at UHF it becomes practical to consider

[*Continued on page 63*]

The Adventures of a 98c FIX-IT YOURSELF Mechanic

by W. D. HOUDE

We are more than happy to reproduce, without change of word, syllable or punctuation mark, the remarkable experience of a 98c "Fixit Yourself" mechanic.

Sanford R. Cowan
Editor And Publisher
Radio—TV Service Dealer

Dear Sir:

Hope you will excuse me for writing a personal letter with a typewriter but it spells better than a pencil

"A mechanic am I for less than a buck"

does and hope you will notice that I have added a new title to my busness, TV. and Repairman at Large.

I just thought you might be interested to know just how I have made out since I bought that there 98c book what tells all about how to fix TV sets in 5 minutes with a screwdriver. Well Sir, It was real funny the way my first job turned out, after my book come and I got my new screwdriver I got in my service car and drove to town, I won't say what town cause I don't want to embarass a service man there who took three days to fix a set I coulda fixed in 5 minutes. I just wandered around and wound up in a beer joint. I don't like the stuff but the pretzels is good and I was hungry.

Pretty soon in stomped a guy madder than all get out cause he had to come to the beer joint to see a programe, his set had gone on the fritz and it was after hours and he couldn't get no one to fix it. So I sounded off and told him I could do the job right now. And he says how do I know and I says mister I got my book right here and my tools in my pocket and my service car is right outside, I really bear down on that service car business since I got a lot of fancy signs on it, Well Sir, that really sold him. He says wait till that programe is over and we will go, I says no hurry Mister it'll only take 5 minutes when we get there.

Well pretty soon the programe it was over and we went. And while we was going I impress on this guy all I know about TV. and he was impressed and he told me how much he had been stung by this guy and that guy who he had called in in the course of his owning this TV set and its needing repairs.

Well we finaly got there and he showed me the defunct set, Well Sir, I turned it on and nothing happened, so I got my book and looked to see

"An Expert too, with signs on my truck"

what to do. And I did it, I took the works out very carefull sos not to mar up the cabnet and I set it gently on top. Its just a little old 22 tuber, so I tell this fellow it wont take long

now, and he says you said only 5 minutes and you been here an hour now. And I says only 5 minutes after I get the works out of the cabnet didn't I tel ya that? And he says no, and I says guess I forgot.

So I went back to work, and by gollies my book had a picture of this set in it, so it was easy to see what was the matter. Looked to me like a 5U4g tube was very discolored I looked at the picture and it was marked *Rect* whatever that means, I

"A big screw driver is all I need"

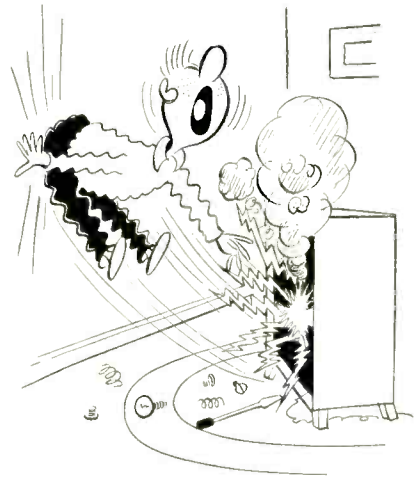
tried to wiggle it but it was plumb solid so I figured I'd just push the prongs a bit from the under side with my new screwdriver its got a insulated handle, so I did, there sure must a been something wrong with that set cause every light in the place went out and there was an awfull flash from that tube socket and for a minute I thought I wouldnt get my new screwdriver loose from it but I finnaly did. Things was in a haze for a bit and I guess the Excitement got the best of me cause the next thing I remember I'm comming to outside.

I figure it was real considerate of the guy to carry me out into the fresh air, well I head back in but the guy meets me at the door and seemed real nasty for some reason, I told him I would get the job done an another couple minutes and he said I'd done enough already and I said well if thats the case how about paying me and he slamed the door in my face I was going to kick it in and tell the cheapskate off but I thought of the dignity of our profession and of being a stranger in town and thought well next time I'll get an agreement about dough before I help another guy out like that.

Well being still hungry I went back to the beer joint for some more pretzels, when I sat down at the bar the barkeep looked at me real funny like. I figured he thought I used up to much pretzels, but finally he says brother what a shiner and whats that in your hand. You know—I still had the handle of my new screwdriver in my hand, and it looked like it had got kinda hot somehow, and the bar glass showed me I sure had a dinger of a black eye. Guess I done that when I yanked so hard getting my new screwdriver loose from that TV set and when she come loose I bopped myself in the eye.

After a comfortable nites sleep in my service car I thought I'd maybe go see that guy and at least get some gas money out of him but when I got to his place there was another service car there, it didn't have as many signs as mine, and a fellow was packing out a TV set and I seen it was the same one I fixed the nite before and I got to wondering what the guy had done to it now, but I didn't stop. I followed at a descrete distance this new fellow and found out where his shop was and then loafed around for and hour and drove up to his shop and went in.

He was one of them showey guys wants to let everyone know what hes doing. Got his bench right in the window so he saw me drive up and noticed the out of state license and he



"Wa hoppen here—'tis strange indeed"

welcomed me with open arms ya might say, had a real gabfest we did. I finally aimed the conversation around the TV set on his bench, and he showed me a shematic diagram he called it, we don't have to use them time wasters when we have a book, and showed me a mess of melted wire and stuff on the underside, there was one piece about 4 inches long and about an eight thick that didn't look like it belonged to any TV set. This brother artist told me from the mess this set was in he'd be lucky to get it out in a week.

Well to make a long story short I stuck around for a few days and the guy was very lucky he got her operating in three days, using old fashion methods, you know he soaked that poor owner 65 bucks for parts and labor. If that guy had let me finish my 5 minutes time I could a fixed that set proper. I couldn't do no more work around there right then cause I had to come home and get me a new screwdriver. I get them by the dozen they are cheaper that way. I had a little time on my hands so I looked up that

"That guy has a kick like an angry steed"

set in my book and printed right along side a wire running by that 5u4g was *4700 V pot* here, and a bit farther along was a funny looking jigger marked *trap*. Didn't look like it cause it had no springs nor jaws on but it sure had a bite enough to take off the bit of my new screwdriver.

I sure learned one thing from that experience, from now on I'm carrying two screwdrivers with me so I wont have to go home so quick.

It's a long trip from up here in the northwest of Montana to a town where there is so much easy money picked up repairing TV sets. You can see I am very serious about this business as I am using the back of my lesson answer sheets for writing these days. No more of this time wasting study when ya got a book what will tell exactly how to fix 'em in 5 minutes.

I just spotted another new quick fix book and I'm going to get her and between the two of them I bet ya I'll clean up, I'll be able to fix 'em good then so you tell the boys to look out if they see that potbellied 6 foot-6er in town with his book and screwdriver that, he's there to fix TV sets.

Yours truly
Ira Cluck

F. C. C. *lifts* TV FREEZE

THE FCC in lifting the TV "Freeze" adopts a new national assignment plan; provides channels for use by education stations; prescribes station requirements; fixes July 1, 1952 as the date it will begin processing applications for new stations; and establishes priorities for TV-less and UHF-only communities.

Conclusion of the television proceedings was announced recently by the Federal Communications Commission in its Sixth Report and Order. In effect, the Commission's Sixth Report does these things:

1. Lifts the "freeze" on the authorization and construction of new television stations instituted on September 30, 1948.

2. Assigns 70 UHF channels (between 470-890 megacycles) in addition to the 12 VHF channels (between 54-216 megacycles) now in use.

3. Promulgates a new nationwide table of television frequency assignments making available 2,053 assignments in 1291 communities throughout the United States, its territories and possessions. The new combined VHF-UHF assignment table supplants the old VHF assignment table which made available about 400 channels in 140 metropolitan areas.

4. Provides opportunity for making changes and additions to the channel assignments adopted. Requests for such changes and additions will not be considered for a period of one year from the effective date of the table with the following express exceptions:

(a) Where the petitioner seeks the assignment of a channel to a community not listed in the table and which is not located within 15 miles of a listed community;

(b) Where the petitioner seeks the assignment of a non-commercial educational channel to a community listed in the table and no channel assigned to the community has been reserved for education;

(c) Where the petitioner seeks the assignment of an unreserved channel to a commu-

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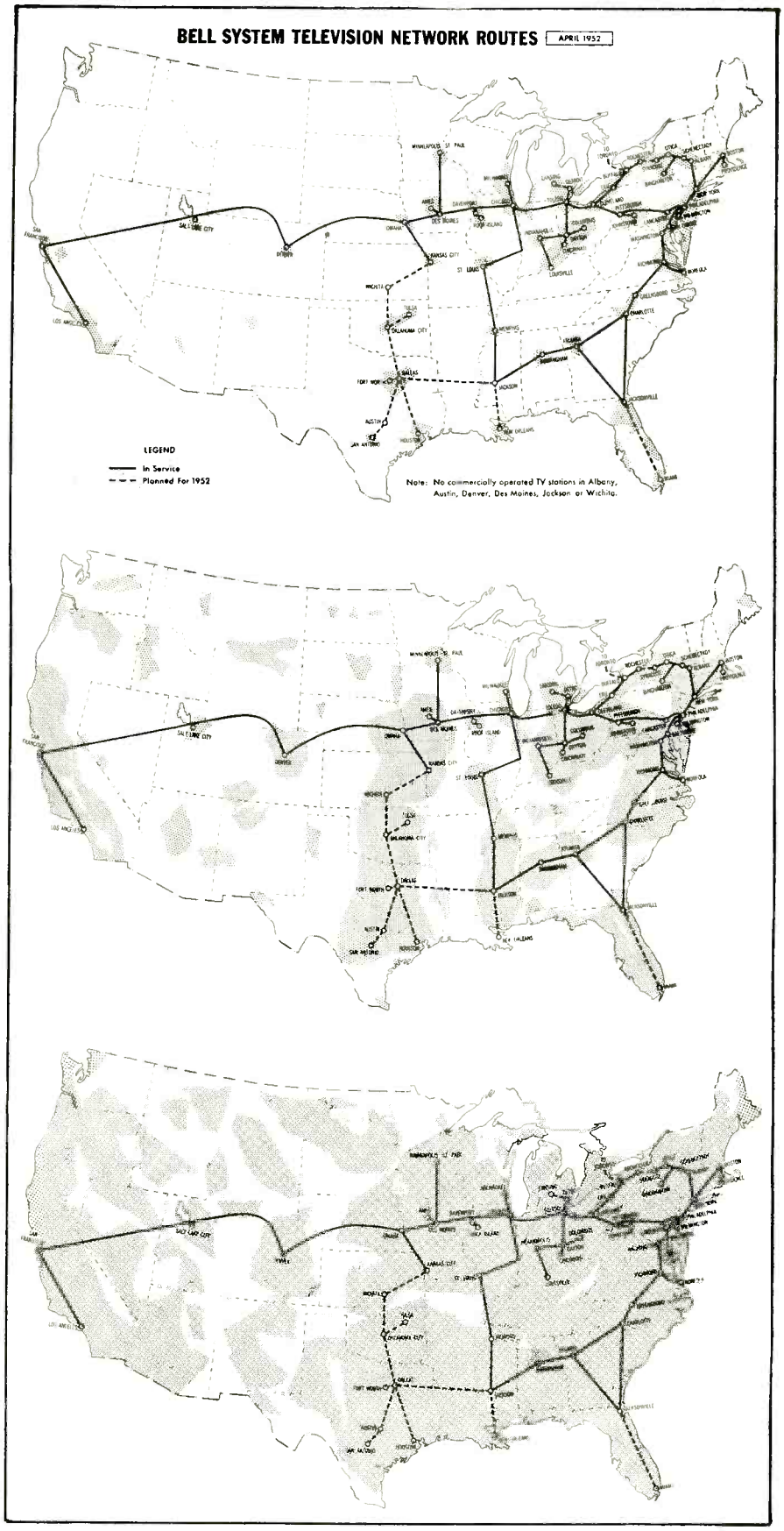

(Courtesy American Tel. & Tel. Co.)

Top map indicates present coverage of TV, shaded portions indicating areas covered. Dashed and solid lines indicate coaxial and microwave relay routes. Center map shows expected area covered by the end of 1954. Lower map reveals expected coverage by the end of 1956, at which time the greater part of the U.S. will be receiving TV.

RADIO-TV SER

TABLE OF VHF-UHF 54-216 mc

in the United States and its possessions, making available 2,053 assignments in 1,291 communities. Chan-

ALABAMA

	Channel No.
Andalusia	29
Anniston	37
Auburn	*56
Bessemer	54
Birmingham	6,*10,13,42,48
Brewton	23
Clanton	14
Cullman	60
Decatur	23
Demopolis	18
Dothan	9,19
Enterprise	40
Eufaula	44
Florence	41
Fort Payne	19
Gadsden	15,21
Greenville	49
Guntersville	40
Huntsville	31
Jasper	17
Mobile	5,8,*42,48
Montgomery	12,20,*26,32
Opelika	22
Selma	58
Sheffield	47
Sylacauga	24
Talladega	64
Thomasville	27
Troy	38
Tuscaloosa	45,51
Tuskegee	18
University	*7

ARIZONA

Ajo	14
Bisbee	15
Casa Grande	18
Clifton	25
Coolidge	30
Douglas	3
Eloy	24
Flagstaff	9,13
Globe	34
Holbrook	14
Kingman	6
Mesa	12
Miami	28
Morenci	31
Nogales	17
Phoenix	3,5,*8,10
Prescott	15
Safford	21
Tucson	4,*6,9,13
Williams	25
Winslow	16
Yuma	11,13

ARKANSAS

Arkadelphia	34
Batesville	30
Benton	40
Blytheville	64,74
Camden	50
Conway	49
El Dorado	10,26
Fayetteville	*13,41
Forrest City	22
Fort Smith	5,*16,22
Harrison	24
Helena	54
Hope	15
Hot Springs	9,52
Jonesboro	8,39
Little Rock	*2,4,11,17,23
Magnolia	28
Malvern	46
Morrilton	43
Newport	28
Paragould	44
Pine Bluff	7,36
Russellville	19
Searcy	33
Springdale	35
Stuttgart	14

CALIFORNIA

Alturas	9
Bakersfield	10,29
Brawley	25
Chico	12
Corona	52
Delano	33
El Centro	16
Eureka	3,13
Fresno	12,*18,24,47,53
Hanford	21
Los Angeles	2,4, 5,7,9,11,13,22,*28,34
Madera	30
Merced	34
Modesto	14
Monterey (see Salinas)	
Napa	62
Oakland (see San Francisco)	
Oxnard	32
Petaluma	56
Port Chicago	15
Red Bluff	16
Redding	7
Riverside	40,46
Sacramento	3,*6,10,40,46
Salinas-Monterey	8,28
San Bernardino	18,*24,30
San Buenaventura	38
San Diego	8,10,*15,21,27,33,39
San Francisco-Oakland	2,4,5,7,*9,20,26,32,38,44
San Jose	11,48,*54,60
San Luis Obispo	6
Santa Barbara	3,20,26
Santa Cruz	16
Santa Maria	44
Santa Paula	16
Santa Rosa	50
Stockton	13,36,*42
Tulare	27
Ukiah	18
Visalia	43,49
Watsonville	22
Yreka City	11
Yuba City	52

COLORADO

Alamosa	19
Boulder	*12,22
Canon City	36
Colorado Springs	11,13,*17,23
Craig	19
Delta	24
Denver	2,4,*6,7,9,20,26
Durango	6,15
Fort Collins	44
Fort Morgan	15
Grand Junction	5,21
Greeley	50
La Junta	24
Lamar	18
Leadville	14
Longmont	32
Loveland	38
Montrose	10,18
Pueblo	3,5,*8,28,34
Salida	25
Sterling	25
Trinidad	21
Walsenburg	30

CONNECTICUT

Bridgeport	43,49,*71
Hartford	3,18,*24
Meriden	65
New Britain	30
New Haven	8,59
New London	26,81
Norwalk (see Stamford)	
Norwich	57,*63
Stamford-Norwalk	27
Waterbury	53

DELAWARE

Dover	40
Wilmington	12,53,*59

DISTRICT OF COLUMBIA

Washington	4,5,7,9,20,*26

FLORIDA

Belle Glade	25
Bradenton	28
Clearwater	32
Daytona Beach	2
De Land	44
Fort Lauderdale	17,23
Fort Myers	11
Fort Pierce	19
Gainesville	*5,20
Jacksonville	4,*7,12,30,36
Key West	14,20
Lake City	33
Lakeland	18,22
Lake Wales	14
Leesburg	26
Marianna	17
Miami	*2,4,7,10,27,33
Ocala	15
Orlando	6,9,18,*24
Palatka	17
Panama City	7,*30,36
Pensacola	3,15,*21,46
Quincy	54
St. Augustine	25
St. Petersburg (see Tampa)	
Sanford	35
Sarasota	34
Tallahassee	*11,24,51
Tampa-St. Pete	*3,8,13,38
West Palm Beach	5,12,*15,21

GEORGIA

Albany	10,25
Americus	31
Athens	*8,60
Atlanta	2,5,11,*30,36
Augusta	6,12
Bainbridge	35
Brunswick	28,34
Cairo	45
Carrollton	33
Cartersville	63
Cedartown	53
Columbus	4,28,*34
Cordele	43
Dalton	25
Douglas	32
Dublin	15
Elberton	16
Fitzgerald	23
Fort Valley	18
Gainesville	52
Griffin	39
La Grange	50
Macon	13,*41,47
Marietta	57
Milledgeville	51
Moultrie	48
Newnan	61
Rome	9,59
Savannah	3,*9,11
Statesboro	22
Swainsboro	20
Thomasville	6,27
Tifton	14
Toccoa	35
Valdosta	37
Vidalia	26
Waycross	16

IDAHO

Blackfoot	33
Boise	*4,7,9
Burley	15
Caldwell	2
Coeur d'Alene	12
Emmett	26
Gooding	23
Idaho Falls	3,8
Jerome	17
Kellogg	33
Lewiston	3
Moscow	*15
Nampa	6,12
Payette	14
Pocatello	6,10
Preston	41
Rexburg	27
Rupert	21
Sandpoint	9
Twin Falls	11,13
Wallace	27
Weiser	20

ILLINOIS

Alton	48
Aurora	16
Belleville	54
Bloomington	15
Cairo	24
Carbondale	34,*61
Centralia	32,59
Champaign-Urb	3,*12,21,27,33
Chicago	2,5,7,9,*11,20,26,32,38,44
Danville	24
Decatur	17,23
De Kalb	*67
Dixon	47
Elgin	28
Freeport	23
Galesburg	40
Harrisburg	22
Jacksonville	29
Joliet	48
Kankakee	14
Kewanee	60
La Salle	35
Lincoln	53
Macomb	6
Marion	40
Mattoon	46
Moline (see Davenport, Iowa)	
Mt. Vernon	38
Olney	16
Pekin	49
Peoria	8,19,*37,43
Quincy	10,24
Rockford	13,39,*45
Rock Island (see Davenport, Iowa)	
Springfield	2,20,*26
Streator	65
Urbana (see Champaign)	
Vandalia	28
Waukegan	22

INDIANA

Anderson	61
Angola	15
Bedford	39
Bloomington	4,*30,36
Columbus	42
Connersville	38
Elkhart	52
Evansville	7,50,*56,62
Fort Wayne	21,*27,33
Gary	50,*66
Hammond	56
Indianapolis	6,8,13,*20,26,67
Jasper	19
Kokomo	31
Lafayette	*47,59
Lebanon	18
Logansport	51
Madison	25
Marion	29
Michigan City	62
Muncie	49,55,*71
Richmond	32
Shelbyville	58
South Bend	34,*40,46
Tell City	31
Terre Haute	10,*57,63
Vincennes	44
Washington	60

IOWA

Algona	37
Ames	5,25
Atlantic	45
Boone	19
Burlington	32,38
Carroll	39
Cedar Rapids	2,9,20,*28
Centerville	31
Charles City	18
Cherokee	14
Clinton	64
Creston	43
Davenport-Rock Island & Moline, Ill.	4,6,*30,36,42
Decorah	44
Des Moines	8,*11,13,17,23
Dubuque	56,62
Estherville	24
Fairfield	54
Fort Dodge	21
Fort Madison	50
Grinnell	46
Iowa City	*12,24
Keokuk	44
Knoxville	33
Marshalltown	49
Mason City	3,35
Muscatine	38
Newton	29
Oelwein	28
Oskaloosa	52
Ottumwa	15
Red Oak	32
Shenandoah	20
Sioux City	4,9,*30,36
Spencer	42
Storm Lake	34
Waterloo	7,16,*22
Webster City	27

KANSAS

Abilene	31
Arkansas City	49
Atchison	60
Chanute	50
Coffeyville	33
Colby	22
Concordia	47
Dodge City	6,23
El Dorado	55
Emporia	39
Fort Scott	27
Garden City	9,11
Goodland	31
Great Bend	2,28
Hays	7,20
Hutchinson	12,18
Independence	20
Iola	44
Junction City	29
Larned	15
Lawrence	*11,17
Leavenworth	54
Liberal	14
McPherson	26
Manhattan	*8,23
Newton	14
Olathe	52
Ottawa	21
Parsons	46
Pittsburg	7,38
Pratt	36
Salina	34
Topeka	13,42,*48
Wellington	24
Wichita	3,10,16,*22
Winfield	43

KENTUCKY

Ashland	59
Bowling Green	13,17
Campbellsville	40
Corbin	16
Danville	35
Elizabethtown	23
Frankfort	43
Glasgow	28
Harlan	36
Hazard	19
Hopkinsville	20
Lexington	27,33
Louisville	3,11,*15,21,41,51
Madisonville	26
Mayfield	49
Maysville	24
Middlesborough	57,63
Murray	33
Owensboro	14
Paducah	6,43
Pikeville	14
Princeton	45
Richmond	60
Somerset	22
Winchester	37

LOUISIANA

Abbeville	42
Alexandria	5,62
Bastrop	53
Baton Rouge	10,28,*34,40
Bogalusa	39
Crowley	21
De Ridder	14
Eunice	64
Franklin	46
Hammond	51
Houma	30
Jackson	18
Jennings	48
Lafayette	38,67
Lake Charles	7,*19,25
Minden	30
Monroe	8,43
Morgan City	36
Natchitoches	17
New Iberia	15
New Orlea	*2,4,6,20,26,32,61
Oakdale	54
Opelousas	58
Ruston	20
Shreveport	3,12
Thibodaux	24
Winnfield	22

MAINE

Auburn	23
Augusta	10,29
Bangor	2,5,*16
Bar Harbor	22
Bath	65
Belfast	41
Biddeford	59
Calais	7,20
Dover-Foxcroft	18
Fort Kent	17
Houlton	24
Lewiston	8,17
Millinocket	14
Orono	*12
Portland	6,13,*47,53
Presque Isle	8,19
Rockland	25
Rumford	55
Van Buren	15
Waterville	35

MARYLAND

Annapolis	14
Baltimore	2,11,13,18,*24,30
Cambridge	22
Cumberland	17
Frederick	62
Hagerstown	52
Salisbury	16

MASSACHUSETTS

Barnstable	52
Boston	*2,4,5,7,44,50,56
Brockton	62
Fall River	40,46
Greenfield	42
Holyoke (see Springfield)	
Lawrence	38
Lowell	32
New Bedford	28,34
North Adams	15
Northampton	36
Pittsfield	64
Springfield-Holyoke	55,61
Worcester	14,20

MICHIGAN

Alma	41
Alpena	9,30
Ann Arbor	20,*26
Bad Axe	46
Battle Creek	58,64
Bay City	5,63,*73
Benton Harbor	42
Big Rapids	39
Cadillac	13,45
Calumet	13
Cheboygan	4,36
Coldwater	24
Detroit	2,4,7,50,*56,62
East Lansing	60
East Tawas	25
Escanaba	3
Flint	12,16,*22,28
Gladstone	40
Grand Rapids	8,*17,23
Greenville	10
Houghton	19
Iron Mountain	9,27
Iron River	12
Ironwood	31
Jackson	48
Kalamazoo	3,36
Lansing	6,54
Ludington	18
Manistee	15
Manistique	14
Marquette	5,17
Midland	19
Mount Pleasant	47
Muskegon	29,35
Petoskey	31
Pontiac	44
Port Huron	34
Rogers City	24
Saginaw	51,57
Sault Ste. Marie	8,10,28,*34
Traverse City	7,20,*26
West Branch	21

MINNESOTA

Albert Lea	57
Alexandria	36
Austin	6,51
Bemidji	24
Brainerd	12
Cloquet	44
Crookston	21
Detroit Lakes	18
Duluth-Superior	3,6,*8,32,38
Ely	16
Fairmont	40
Faribault	20
Fergus Falls	16
Grand Rapids	20
Hastings	29
Hibbing	10
International Falls	11
Little Falls	14
Mankato	15
Marshall	22
Minneapolis-St. Paul	*2,4,5,9,11,17,23
Montevideo	19
New Ulm	43
Northfield	26
Owatonna	45
Red Wing	63
Rochester	10,55
St. Cloud	7,33
St. Paul (see Minneapolis)	
Stillwater	39
Thief River Falls	15
Virginia	26
Wadena	27
Willmar	31
Winona	61
Worthington	32

MISSISSIPPI

Biloxi	13,*44,50
Brookhaven	37
Canton	16
Clarksdale	6,32
Columbia	35
Columbus	28
Corinth	29
Greenville	21,27
Greenwood	24
Grenada	15
Gulfport	56
Hattiesburg	9,17
Jackson	12,*19,25,47
Kosciusko	52
Laurel	33
Louisville	46
McComb	31
Meridian	11,30,*36
Natchez	29
Pascagoula	22
Picayune	44
Starkville	34
State College	*2
Tupelo	38
University	*20
Vicksburg	41
West Point	8,56
Yazoo City	49

MISSOURI

Cape Girardeau	12,18
Carthage	56
Caruthersville	27
Chillicothe	14
Clinton	49
Columbia	8,16,22
Farmington	52
Festus	14
Fulton	24
Hannibal	7,27
Jefferson City	15,33
Joplin	12,30
Kansas City	4,5,9,*19,25,65
Kennett	21
Kirksville	3,18
Lebanon	23
Marshall	40
Maryville	26
Mexico	45
Moberly	35
Monett	14
Nevada	18
Poplar Bluff	15
Rolla	31
St. Joseph	2,30,*36
St. Louis	4,5,*9,11,30,36,42
Sedalia	6,28
Sikeston	37
Springfield	3,10,*26,32
West Plains	20

MONTANA

Anaconda	2
Billings	2,8,*11
Bozeman	*9,22
Butte	4,6,*7,15
Cut Bank	20
Deer Lodge	25
Dillon	20
Glasgow	16
Glendive	13
Great Falls	3,5,*23
Hamilton	17
Hardin	4
Havre	9,11
Helena	10,12
Kalispell	8
Laurel	14
Lewistown	13
Livingston	16
Miles City	3,*6,10
Missoula	*11,13,21
Polson	18
Red Lodge	18
Shelby	14
Sidney	14
Whitefish	16
Wolf Point	20

NEBRASKA

Alliance	13,21
Beatrice	40
Broken Bow	14
Columbus	49
Fairbury	35

VICE DEALER

ASSIGNED CHANNELS and 470-890 mc

nels 2-13 are VHF channels; channels 14-83 are UHF channels. Asterisk indicate Educational TV station only.

Falls City ... 38
Fremont ... 52
Grand Island ... 11,21
Hastings ... 5,27
Kearney ... 13,19
Lexington ... 23
Lincoln ... 10,12,*18,24
McCook ... 8,17
Nebraska City ... 50
Norfolk ... 33
North Platte ... 2,4
Omaha ... 3,6,7 *16,22,28
Scottsbluff ... 10,16
York ... 15

NEVADA

Boulder City ... 4
Carlin ... 14
Carson City ... 37
Elko ... 10
Ely ... 3,6
Fallon ... 29
Goldfield ... 5
Hawthorne ... 31
Henderson ... 2
Las Vegas ... 8,*10,13
Lovelock ... 18
McGill ... 8
Reno ... 4,8,*21,27
Tonopah ... 9
Winnemucca ... 7
Yerington ... 33

NEW HAMPSHIRE

Berlin ... 26
Claremont ... 37
Concord ... 27
Durham ... *11
Hanover ... *21
Keene ... 45
Laconia ... 43
Littleton ... 24
Manchester ... 9,48
Nashua ... 54
Portsmouth ... 19
Rochester ... 51

NEW JERSEY

Andover ... *69
Asbury Park ... 58
Atlantic City ... 46,52
Bridgeton ... 64
Camden ... *80
Freehold ... *74
Hammonton ... *70
Montclair ... *77
Newark ... 13
New Brunswick ... *19,47
Paterson ... 37
Trenton ... 41
Wildwood ... 48

NEW MEXICO

Alamogordo ... 17
Albuquerque ... 4,*5,7,13
Artesia ... 21
Atrisco-Five Points ... 18
Belen ... 24
Carlsbad ... 6,23
Clayton ... 27
Clovis ... 12,35
Deming ... 14
Farmington ... 17
Gallup ... 3,*8,10
Hobbs ... 46
Hot Springs ... 19
Las Cruces ... 22
Las Vegas ... 14
Lordsburg ... 23
Los Alamos ... 20
Lovington ... 27
Portales ... 22
Raton ... 46,*52
Roswell ... *3,8,10
Santa Fe ... 2,*9,11
Silver City ... *10,12
Socorro ... 15
Tucumcari ... 25

NEW YORK

Albany-Schenectady-Troy ... 6 *17,23,41
Amsterdam ... 52
Auburn ... 37
Batavia ... 33
Binghamton ... 12,40,*46
Buffalo (also see Buffalo-Niagara Falls) ... 17,*23
Buffalo-Niagara Fall ... 2,4,7,59
Cortland ... 56
Dunkirk ... 46
Elmira ... 18,24
Glens Falls ... 39
Gloversville ... 29
Hornell ... 50
Ithaca ... *14,20
Jamestown ... 58
Kingston ... 66
Malone ... 20,*66
Massena ... 14
Middletown ... 60
New York ... 2,4,5,7,9,11,*25,31
Niagara Falls (see Buffalo-Niagara Falls)
Ogdensburg ... 24
Olean ... 54
Oneonta ... 62
Oswego ... 31
Plattsburg ... 28
Poughkeepsie ... 21,*63
Rochester ... 5,10,15,*21,27
Rome (see Utica)
Saranac Lake ... 18
Schenectady (also see Albany) ... 35
Syracuse ... 3,8,*43
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Utica-Rome ... 13,19,*25
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NORTH CAROLINA

Ahoskie ... 53
Albemarle ... 20
Asheville ... 13,*56,62
Burlington ... 63
Chapel Hill ... *
Charlotte ... 3,9,36,*42
Durham ... 11,*40,46
Elizabeth City ... 31
Fayetteville ... 18
Gastonia ... 48
Goldsboro ... 34
Greensboro ... 2,*51
Greenville ... 57
Henderson ... 9
Hendersonville ... 52
Hickory ... 27
High Point ... 30
Jacksonville ... 15
Kannapolis ... 16
Kinston ... 59
Laurinburg ... 45
Lumberton ... 41
New Bern ... 21
Raleigh ... 13
Roanoke Rapids ... 5,*22,28
Rocky Mount ... 30
Salisbury ... 50
Sanford ... 53
Shelby ... 38
Southern Pines ... 39
Statesville ... 49
Washington ... 64
Wilmington ... 7
Wilson ... 6,29,*35
Winston-Salem ... 12,26,*32

NORTH DAKOTA

Bismarck ... 5,12,18,*24
Bottineau ... 16
Carrington ... 26
Devils Lake ... 8,14
Dickinson ... 2,4,*17
Fargo ... 6,13,*34,40
Grafton ... 17
Grand Forks ... *2,10
Harvey ... 22
Jamestown ... 7,42
Lisbon ... 23
Minot ... *6,10,13
New Rockford ... 20
Rugby ... 38
Valley City ... 4,32
Wahpeton ... 45
Williston ... 8,11,*34

OHIO

Akron ... 49,*55,61
Ashtabula ... 15
Athens ... 62
Bellefontaine ... 63
Cambridge ... 26
Canton ... 29
Chillicothe ... 56
Cincinnati ... 5,9,12,*48,54,74
Cleveland ... 3,5,8,19,*25,65
Columbus ... 4,6,10,*34,40
Coshocton ... 20
Dayton ... 2,7,*18,22
Defiance ... 43
Findlay ... 53
Gallipolis ... 18
Hamilton-Middletown ... 65
Lancaster ... 28
Lima ... 35,41
Lorain ... 31
Mansfield ... 36
Marion ... 17
Massillon ... 23
Middletown (see Hamilton)
Mount Vernon ... 58
Newark ... 60
Oxford ... *14
Piqua ... 44
Portsmouth ... 30
Sandusky ... 42
Springfield ... 16,52
Steubenville (see Wheeling, W. Va.)
Tiffin ... 47
Toledo ... 11,13,*30
Warren ... 21
Youngstown ... 27,33,73
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OKLAHOMA

Ada ... 50
Altus ... 36
Alva ... 30
Anadarko ... 58
Ardmore ... 55
Bartlesville ... 62
Blackwell ... 51
Chickasha ... 64
Claremore ... 15
Clinton ... 32
Duncan ... 39
Durant ... 27
Elk City ... 12,15
El Reno ... 56
Enid ... 5,21,*27
Frederick ... 44
Guthrie ... 48
Guymon ... 20
Hobart ... 23
Holdenville ... 14
Hugo ... 21
Lawton ... 7,*28,34
McAlester ... 47
Miami ... 58
Muskogee ... 8,*45,66
Norman ... 31,*37
Oklahoma City ... 4,9,*13,19,25
Okmulgee ... 26
Pauls Valley ... 61
Ponca City ... 40
Pryor Creek ... 54
Sapulpa ... 42
Seminole ... 59
Shawnee ... 53
Stillwater ... 29,*69
Tulsa ... 2,6,*11,17,23
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OREGON

Albany ... 55
Ashland ... 14
Astoria ... 30
Baker ... 37
Bend ... 15
Burns ... 16
Corvallis ... *7,49
Eugene ... *9,13,20,26
Grants Pass ... 30
Klamath Falls ... 2
La Grande ... 13
Lebanon ... 43
McMinnville ... 46
Medford ... 4,5
North Bend ... 16
Pendleton ... 28
Portland ... 6,8,*10,12,21,27
Roseburg ... 28
Salem ... 3,*18,24
Springfield ... 37
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Altoona ... 10,19,25
Bethlehem ... 51
Bradford ... 48
Butler ... 43
Chambersburg ... 46
Du Bois ... 31
Easton ... 57
Emporium ... 42
Erie ... 12,35,*41,66
Harrisburg ... 27,33,71
Hazleton ... 63
Johnstown ... 6,56
Lancaster ... 8,21
Lebanon ... 15
Lewistown ... 38
Lock Haven ... 32
Meadville ... 37
New Castle ... 45
Oil City ... 64
Philadelphia ... 3,6,10,17,23,29,*35
Pittsburgh ... 2,11,*13,16,47,53
Reading ... 55,61
Scranton ... 16,22,73
Sharon ... 39
State College ... *44
Sunbury ... 65
Uniontown ... 14
Washington ... 63
Wilkes-Barre ... 28,34
Williamsport ... 36
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RHODE ISLAND

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SOUTH CAROLINA

Aiken ... 54
Anderson ... 58
Camden ... 14
Charleston ... 2,5,*13
Clemson ... *68
Columbia ... 10,*19,25,67
Conway ... 23
Florence ... 8
Georgetown ... 27
Greenville ... 4,23,*29
Greenwood ... 21
Lake City ... 55
Lancaster ... 31
Laurens ... 45
Marion ... 43
Newberry ... 37
Orangeburg ... 44
Rock Hill ... 61
Spartanburg ... 7,17
Sumter ... 47
Union ... 65

SOUTH DAKOTA

Aberdeen ... 9,17
Belle Fourche ... 23
Brookings ... *8,25
Hot Springs ... 17
Huron ... 12,15
Lead ... 5,26
Madison ... 46
Mitchell ... 5,20
Mobridge ... 27
Pierre ... 6,10,*22
Rapid City ... 7,15
Sioux Falls ... 11,13,38,*44
Sturgis ... 20
Vermillion ... *2,41
Watertown ... 3,35
Winner ... 18
Yankton ... 17

TENNESSEE

Athens ... 14
Bristol, Tenn.-Bristol, Va. ... 5,46
Chattanooga ... 3,12,43,49,*55
Clarksville ... 53
Cleveland ... 38
Columbia ... 39
Cookeville ... 24
Covington ... 19
Dyersburg ... 46
Elizabethton ... 40
Fayetteville ... 27
Gallatin ... 48
Harriman ... 67
Humboldt ... 25
Jackson ... 9,16
Johnson City ... 11,34
Kingsport ... 28
Knoxville ... 6,10,*20,26
Lawrenceburg ... 50
Lebanon ... 58
McMinnville ... 46
Maryville ... 51
Memphis ... 3,5,*10,13,42,48
Morristown ... 54
Murfreesboro ... 18
Nashville ... *2,4,5,8,30,36
Oak Ridge ... 32
Paris ... 51
Pulaski ... 44
Shelbyville ... 62
Springfield ... 42
Tullahoma ... 65
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Abilene ... 9,33
Alice ... 34
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Amarillo ... *2,4,7,10
Athens ... 25
Austin ... 7,18,24,*30
Ballinger ... 25
Bay City ... 33
Beaumont-Port Art. ... 4,6,31,*37
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Bonham ... 43
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Breckenridge ... 14
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Brownwood ... 19
Bryan ... 54
Childress ... 40
Cleburne ... 57
Coleman ... 21
College Station ... *3,48
Conroe ... 20
Corpus Christi ... 6,10,*16,22
Corsicana ... 47
Crockett ... 56
Crystal City ... 28
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Dalhart ... 16
Dallas ... 4,8,*13,23,29,73
Del Rio ... 16
Denison ... 52
Denton ... *2,17
Eagle Pass ... 26
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El Paso ... 4,*7,9,13,20,26
Falfurrias ... 52
Floydada ... 45
Fort Stockton ... 42
Fort Worth ... 5,10,20,*26
Gainesville ... 49
Galveston ... 11,35,41,*47
Gonzales ... 64
Greenville ... 62
Harlingen (also see Brownsville-Harlingen-Weslaco) ... 23
Hebbronville ... 58
Henderson ... 42
Hereford ... 19
Hillsboro ... 63
Houston ... 2,*8,13,23,29,39
Huntsville ... 15
Jacksonville ... 36
Jasper ... 49
Kermit ... 14
Kilgore ... 59
Kingsville ... 40
Lamesa ... 28
Lampasas ... 40
Laredo ... 8,13,*15
Levelland ... 38
Littlefield ... 32
Longview ... 32,38
Lubbock ... 5,11,13,*20,26
Lufkin ... 9,46
McAllen ... 20
McKinney ... 65
Marfa ... 19
Marshall ... 16
Mercedes ... 32
Mexia ... 50
Midland ... 2,18
Mineral Wells ... 36
Mission ... 14
Monahans ... 9
Mount Pleasant ... 35
Nacogdoches ... 40
New Braunfels ... 62
Odessa ... 7,24
Orange ... 43
Pampa ... 17
Paris ... 33
Pearsall ... 31
Pecos ... 16
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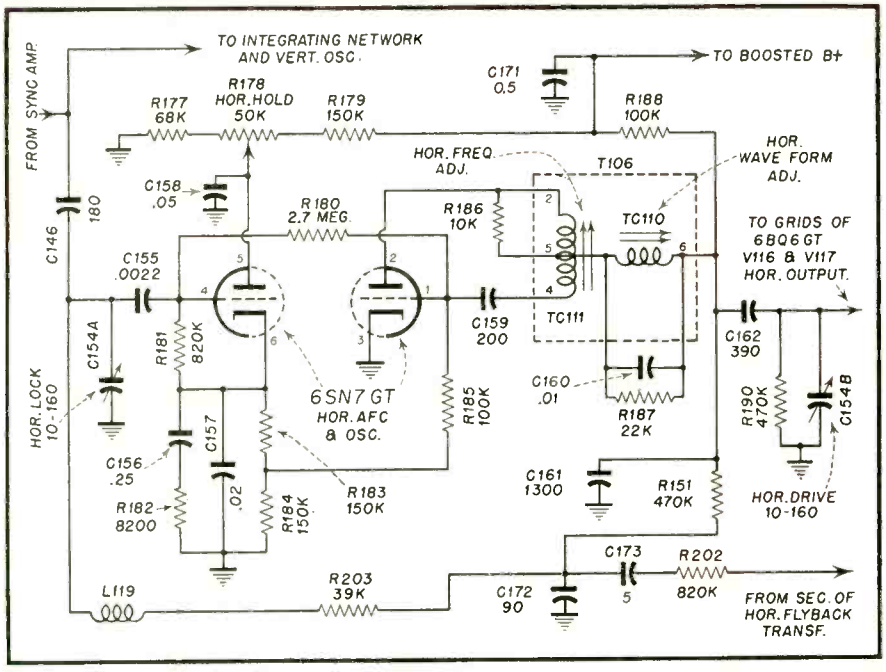


Fig. 1. Partial schematic of Crosley Model 10-421 MU, showing a-f-c and oscillator circuits.

LOOKING for TROUBLE?

No. 9

by Cyrus Glickstein

YOU can join in servicing a TV receiver by answering the questions in this trouble-shooting quiz. A defective TV set is on the bench for repair. The questions below are based on usual servicing procedures. Answer each question before going on to the next, since the answers are generally indicated in the following question. If a question has more than one correct answer, note all correct choices. Answers and discussion follow.

Receiver: Crosley, Model 10-421 MU; transformer low voltage power supply; kickback high voltage system; intercarrier sound.

Trouble: Horizontal bending. Sound o.k., pix appears normal.

1. Horizontal bending indicates a possible fault in the:

(a) Low voltage supply
(b) Horizontal sweep section
(c) Vertical sweep section
(d) Sync circuits
(e) Video signal circuits (front end, video i-f, video detector, video amplifiers)
(f) Horizontal a-f-c (automatic frequency control) circuit.

2. Horizontal bending is either a defect in horizontal synchronization or a defect in the raster, and can originate in almost any section of the receiver. To help localize the trouble to the defective section, the following procedure(s) will be helpful:

(a) Rotate the channel selector switch to a blank channel and examine the raster
(b) Vary the controls (horizontal hold, vertical hold, brightness, contrast, channel selector and fine tuning) to obtain additional information.
(c) Use scope to check waveforms in sync, horizontal a-f-c and horizontal sweep circuits.
(d) Take voltage and resistance readings around the sync, horizontal a-f-c and horizontal sweep stages.
(e) Examine the nature and extent of horizontal bending in the picture on the screen

3. The bending is present on all active channels. All of the controls operate normally. The vertical hold control has the usual pull-in range, indicating good sync pulses coming in to the vertical oscillator. When the horizontal hold control is rotated, the amount of bending changes. Extreme rotation of the horizontal hold on either side causes the pix to go out of horizontal sync.

The channel selector switch is turned to a blank channel and the side of the raster is examined. The raster is normal, with a straight side, indicating no hum pickup in the horizontal sweep circuit. The indications point to a defect in the horizontal a-f-c circuit. New tubes are tried in the sync stages and the hor. a-f-c osc. stage, but no improvement is noticed. A scope is used to check waveforms around the horizontal a-f-c and horizontal oscillator stages, *Figs. 1* and *2*. Waveforms indicate:

(a) Defect in the grid circuit of the horizontal oscillator
(b) Defective input to the horizontal a-f-c tube—junction of *C-154A* and *C-155*
(c) Defect in the plate circuit of the horizontal oscillator
(d) Faulty *T-106*
(e) No abnormality in waveshapes

4. Voltage and resistance readings are normal. On the basis of all of the above checks, the most likely trouble is:

(a) *C-158* shorted (pin 5, plate, 6SN7)
(b) *C-156* open (from cathode, pin 6, 6SN7)
(c) *C-157* shorted (from cathode, pin 6, 6SN7)
(d) *C-159* open (from grid, pin 1 6SN7)
(e) *C-161* open (at junction of *T-106*, *C-162* and *R-151*)

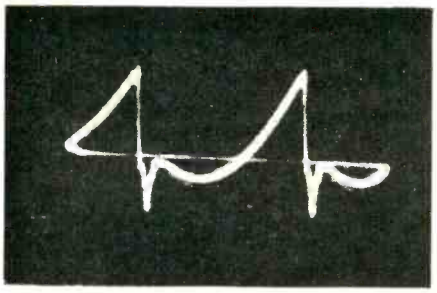


Fig. 2a. Junction of C154A and 155

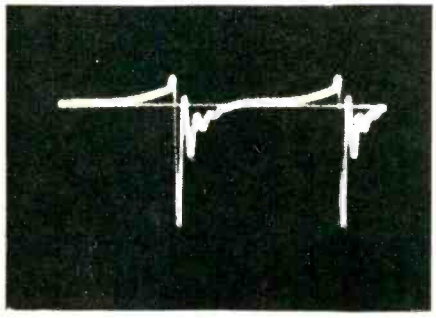


Fig. 2b. Grid of hor. osc. Pin 1

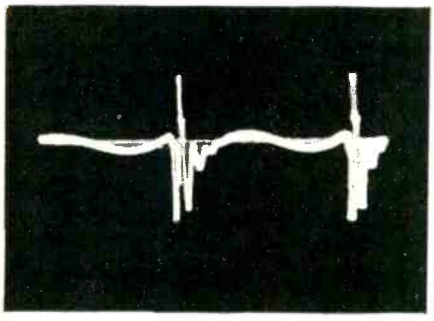


Fig. 2c. Plate of hor. osc. Pin 2

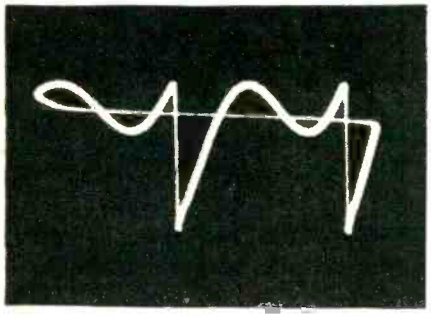


Fig. 2d. Terminal 5, T106

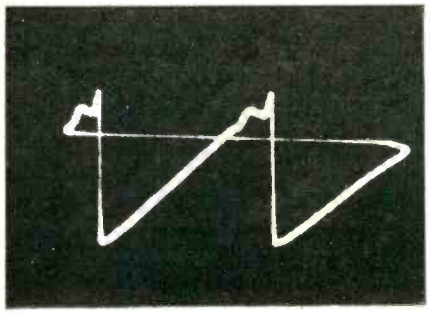


Fig. 2e. Input of hor. out. stages. Junction of C162, R190, C154B.

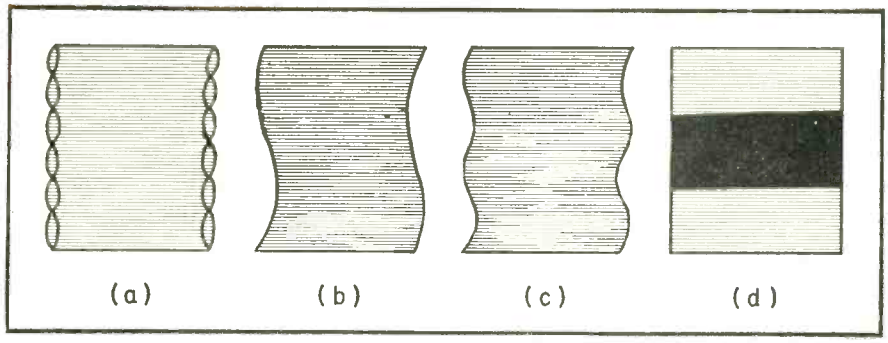


Fig. 3. Typical defects showing up in raster. (Channel switch on blank channel.) (a) hum pickup in horizontal sweep circuits shown along scalloped sides of raster, with vert. sweep unsynced. (b) 60 cycle pickup in horizontal sweep circuits. Vertical sweep synced at 60 cycles by means of vert. cont. (c) 120 cycle pickup in horizontal sweep circuits, with vert. sweep synced at 60 cycles by means of vert. cont. (d) 60 cycle pickup fed to control grid (or cathode) of CRT, originating in video detector or video amplifier. (Position of black and white areas may be reversed.)

Answers & Discussion

1. a, b, c, d, e, f

Horizontal bending, which develops in a previously normal receiver, may be caused by 1) faulty horizontal synchronization or 2) a fault in the raster which becomes superimposed on the picture when a picture is tuned in.

Faulty horizontal syncronization, in turn, may be due to: a) a defect in the size and/or shape of the horizontal sync pulses or b) interference signals which upset the proper action of the horizontal sync pulses.

If the bending is due to defective sync pulses, the trouble may originate in any of the video signal circuits (front end, video i-f., video detector, video amplifier, CRT), the sync section, or the horizontal a-f-c circuit. The sync signals on top of the composite video signal may be too small, too large, or distorted. This may be due to incorrect r-f or i-f alignment or a faulty component.

Defective horizontal synchronization can also be caused by interfering signals — either external to the receiver or internally, through some defect. Some possibilities are:

1. Heater-cathode leakage in any of the video signal tubes (r-f, i-f, or video amplifier stages). This can cause a 60 cycle modulation of the composite video signal, which has two results. A 60 cycle modulation appears on the sync pulses, causing horizontal bending. At the same time, there is a 60 cycle modulation of video information, producing black and white horizontal bars on the screen, *Fig. 3d.*

2. Heater-cathode leakage in the sync or horizontal a-f-c circuit. This would cause a 60 cycle modulation of the sync pulses but would *not* produce horizontal black and white bars on the screen, *Fig. 4.*

3. Defective filtering in the low voltage power supply. This usually shows up in several ways, including hum modulation of video information (horizontal black and white bars) and horizontal bending. However, there may be further effects on other circuits.

4. Diathermy or some other type of external interference which may appear at one or more points across the picture, *Fig. 5.*

5. Video information riding into the horizontal a-f-c system. This can be caused by defective operation of the sync section—especially the sync clipper circuits.

6. Vertical coupling into the horizontal circuit. This usually shows up as a small amount of bending at the top of the picture and might be caused by: a) vertical pulses riding through the horizontal a-f-c system. This can be caused by a change of value in some component in the a-f-c circuit. b) feedback from the vertical sweep to the horizontal sweep. This can occur through a common B plus supply (open filter condenser) or through the yoke (dressing the yoke leads too close to the horizontal circuit or to the antenna lead-in to the tuner).

As noted above, horizontal bending can arise from a defect in the raster itself. Such a defect is automatically transferred to the picture. Possible sources of this type of trouble are: a) hum pickup in the horizontal sweep section; b) magnetic fields around the CRT. A 60 cycle or 120 cycle pickup in the horizontal sweep would cause the horizontal saw-tooth to ride on the ripple, *Fig. 3a, b, c.* A magnetic field

around the CRT may distort the picture causing an apparent bend in it. A metal CRT cone, for example, may have a spot which has become magnetized.

2. a, b, c

Since defects causing horizontal bending may originate in almost any part of the receiver or even outside the receiver, they may seem to be very difficult troubles to find. Yet this is not true, as a general rule, simply because the defect usually affects the receiver *in more than one way*. The defect usually causes other symptoms in addition to horizontal bending. Furthermore, these other clues are much more specific concerning the section where the defect may be found. In other words, horizontal bending is usually a *secondary* clue. There very often is more important and valuable information available for the alert technician, which can help considerably in speeding up the location of the trouble.

The usual first step in any kind of TV servicing is to locate the defective section by examining the picture and listening to the sound and then checking the effect of varying the pertinent controls. In servicing cases of horizontal bending, this usual procedure is followed, but can be broken down into four parts:

1. Close inspection of the quality of pix information;

2. Inspection of the amount, type, and location of the horizontal bending;

3. Setting the channel selector on a blank channel to examine the raster;

4. Varying the controls to check their effect.

Once the defect has been localized to a comparatively small area in the receiver by the above checks, then the usual methods for finding a defective stage are used—tube substitution, signal tracing with a scope, etc. And once the defective stage is found, the faulty component, if it is not a tube, can then be found by voltage and resistance checks and by condenser substitutions, if necessary.

The preliminary steps mentioned above merit some discussion:

1. Close Inspection of Pix. Usually, the additional clues mentioned previously show up in the picture. For example, cathode-heater leakage in a video i-f stage modulates the i-f signal with a 60 cycle signal. This shows up as broad black and white horizontal bars in the picture, and there may be horizontal bending as well. That is, the 60 cycle interference becomes a video signal appearing on the screen as well as a signal mixed with the sync pulses which upsets horizontal syncronization. In the same way, poor low frequency response or poor high frequency response in the video i-f or video amplifier stages may affect the amplitude of the sync pulses and so affect syncronization. But they also have a characteristic effect on picture

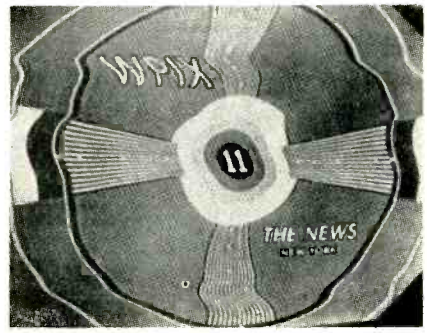


Fig. 4. Horizontal bending due to hum pickup. The latter probably is originating in sync section of horizontal a.f.c. or horizontal sweep circuits. Video strip is ruled out since intensity of pix information is not modulated by hum. (See Fig. 3d and discussion under answer #2.)

quality which is immediately recognizable. Bending accompanied by a smeared picture (poor low frequency response) or poor definition of fine detail (poor high frequency response) or too contrasty a picture (too strong a signal or overloading of one or more

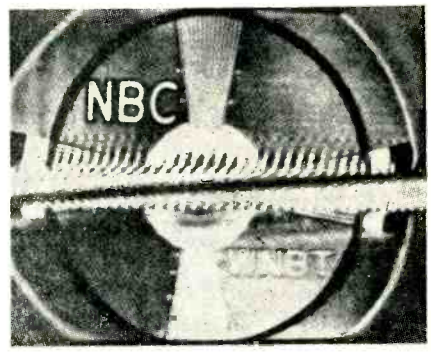


Fig. 5. Horizontal bend due to diathermy interference.

of the video signal circuits) all point to a defect in the video signal section.

2. Amount, type, and location of bending. It is important to note if the bending is small or large, fixed or weaving - that is, changing its position in the picture at different times. A small, fixed bend, for example, with the picture information normal and the horizontal hold and other controls acting normally would indicate magnetic distortion of the picture through the CRT. A small wavy bend at the top of the picture, with the rest of the picture o.k., suggests a 60 cycle interruption of horizontal sync at the beginning of each vertical sweep. This might be caused by some feedback from the vertical sweep or by vertical pulses riding through into the horizontal a-f-c system.

A picture with a sine wave bend along the sides suggests either hum modulation of the horizontal sync pulses or of the raster itself, *Fig. 4*. If there is also 60 cycle hum in the pix, then this modulation is arriving into the CRT from the video strip and is being passed along to the sync circuits. If there are no hum bars in the picture, then the hum modulation is originating in the sync, horizontal a-f-c or horizontal sweep circuits.

3. Set receiver on blank channel to examine raster. If hum bars are seen on the raster, *Fig. 3d*, then the hum is originating in the video detector, video amplifier, or the low voltage B plus supply feeding these stages. Hum caused by defective filtering in the low voltage supply may be either 60 or 120 cycles, depending on the ripple frequency of the supply. On the other hand, if hum bars are seen on the picture but not on the raster, this would indicate the hum is originating in the i-f or r-f stages. That is, the i-f stages, being tuned to a comparatively high frequency, will not pass along a 60 cycle signal by itself. However, when a video signal comes in the hum will modulate the signal and be passed along with it.

Further information can be obtained from the raster by using the horizontal centering control or other centering adjustment to view the right or left side of the raster. The side of the raster can be examined to check whether it is straight or bent. A uniform raster deformity at one point which does not change position even though the sweep circuits are unsynchronized with no signal coming in indicates an external magnetic field. A 60 cycle or 120 cycle hum originating in the horizontal sweep circuit would show up in scalloped sides of the raster, when the vertical sweep is unsynchronized, *Fig. 3a*. However, if the vertical hold is rotated, then it may be possible to sync the raster sufficiently to see the typical single sine wave or double sine wave modulation along the sides of the raster, *Fig. 3b* and *3c*. When this condition is observed, it can be assumed the hum is originating in the horizontal sweep circuit or possibly in the horizontal a-f-c or one of the sync stages. To rule out the other possibilities, the a-f-c tube is removed, where

this is possible, and the sides of the raster rechecked. A subsequent method of verification is checking waveforms around these circuits with a scope.

4. Vary the controls to check the effect. This has been mentioned in previous articles in some detail (*Looking For Trouble*, #7 and #8) and will be reviewed only briefly. The most important checks are:

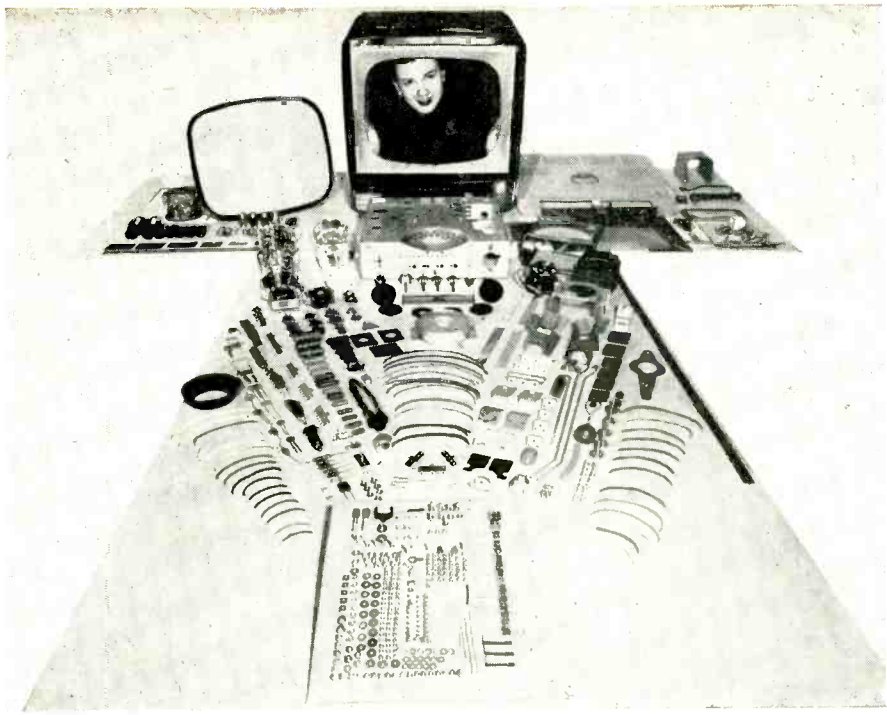
Horizontal Hold: This control is rotated to see if the lock-in range is normal, critical, or non-existent. This in turn indicates the amount of horizontal sync pulse or correction voltage coming into the horizontal oscillator circuit.

Vertical Hold: If this control acts normally, sync pulses are coming through the video stages, the sync amplifier and clipper stages, and the integrating network to the vertical oscillator. If the vertical hold is critical to adjust and there is horizontal bending as well, then trouble is indicated in the sync section or the video signal section. If the vertical hold operates normally, the trouble very likely is in the horizontal a-f-c circuit. This assumption can subsequently be checked by inspecting the amplitude and shape of the sync pulses. In some receivers, the amplitude of the sync pulses is very critical. If the sync pulses are a little too small or a little too large, the vertical sync may operate normally but horizontal pulling may result. The amplitude of the sync pulses should be carefully checked, when more obvious sources of trouble are ruled out. When pix information is normal and the amplitude of sync pulses is incorrect, the defect is usually in the sync section.

Contrast: Rotation of the contrast control should make the signal information—pix on the screen—vary from a very light shade to very dark. Some setting of the control, usually less than the maximum, should give adequate picture information. The operation of this control indicates whether the video signal circuits are operating properly.

Brightness: This control should vary the brightness from maximum to a point where the screen is blanked out. If the control cannot cut down the brightness, there is a fault in the CRT bias circuit which should be corrected first, since this is probably causing the loss of sync or bending.

Channel Selector and Fine Tuning: A check is made to see if the defect is present on all channels. If it occurs only on one, the cause may be defective transmission by the station, external interference, or a fault in the front end or antenna of the receiver. If the fault occurs on all channels, it is most likely in the receiver, although it might possibly be due to external interference riding through—either because the interference is coming in at the i-f frequency or because it is very close to the receiver. If there is any question about the possibility of interference, it is advisable to check other TV receivers in the same area, to see if they are having the same trouble.



To discourage tinkering with the family television set by the inexperienced, Admiral Corporation of Chicago shows all the components and individual parts for its new 20-inch TV receiver. Over 1,600 items, including tiny strips of wire, nuts, bolts, washers, screws, condensers and resistors, are required. During assembly, more than 2,000 soldered connections are made. The plastic table cabinet, largest of its type, weighs 33 pounds.

3. e

The waveforms appear normal in all respects for this type of a-f-c circuit - the pulse-width or syncroguide type. The waveforms at two points are particularly significant: a) at the junction of *C-154A* and *C-155 Fig. 2a* and b) at terminal 5, *T-106, Fig. 2d.*

The waveform at the junction of *C-154A* and *C-155* consists of three elements all added together:

1. a horizontal sync pulse coming from the sync amplifier;

2. a square wave fed back from the secondary of the horizontal output transformer;

3. a saw-tooth wave fed back from the horizontal saw-tooth condenser, *C-161.*

The placement of the horizontal sync pulse on the combined wave determines a) how long the a-f-c tube conducts; b) the amount of cathode voltage and voltage across *R-184* which is thereby developed. This positive voltage, then, bucking the negative voltage at pin 1, horizontal oscillator, helps determine the frequency of the horizontal oscillator. Any change of the horizontal saw-tooth with respect to the arrival time of the horizontal sync pulses will vary the amount of time the a-f-c tube conducts. The correction voltage across *R-184* is thereby changed so changing the frequency of the horizontal oscillator.

The broad and narrow peaks of the waveform at terminal 5, *T-106, Fig. 2d*, should be even. If the broad peak of the wave is lower than the sharp peak, then the noise immunity of the circuit is less and the picture does not hold as well horizontally as it should. If the broad peak is higher, the picture is overstabilized. The pull-in range is much narrower. *TC110,* the Horizontal Waveform Adjustment, controls the relative height of the two peaks. It is adjusted with the scope at terminal 5, *T-106*, using low capacity (unshielded) leads. While this adjustment is made, it is necessary to keep the pix in sync by adjusting the hold control, if the picture starts to go out of hori-

[*Continued on page 63*]

SHOP NOTES

Write up any "tricks-of-the-trade" in radio servicing that you have discovered. We pay from $1 to $5 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor."

TV Conversion Precautions

When converting 10" television receivers to accommodate larger size screens, or when installing projection package units, care should be taken with respect to leads carrying video signals. In particular, the cable which contains the signal lead from the last video amplifier to the picture tube socket should be as short as possible, with all slack taken up. When this lead is too long, or runs parallel to other leads or to the chassis for any appreciable length, considerable shunt reactance is introduced which will impair fine picture detail. For this reason, too, shielding of this lead is not recommended, for it increases capacitive effects to a considerable degree.

When one considers that the video signals, even though demodulated, contain frequencies up to 4 megacycles (4,000 kc), it can readily be seen that shunt reactance becomes sufficiently large to have a pronounced by-passing effect on the video signals. A capacity as small as 100 $\mu\mu$f will act as a shunt of less than 500 ohms reactance at the upper video frequencies, and lower values than this will be encountered with extended leads running close to ground wires or chassis.

Matthew Mandl
Trenton, N. J.

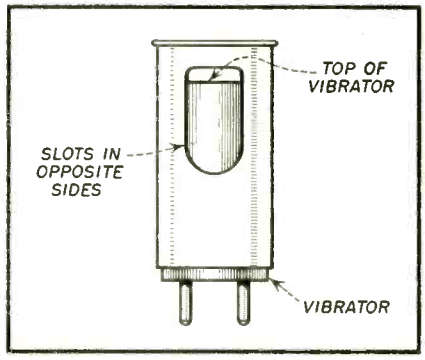
Judging Wire Size

Do you have several speaker fields and old transformer windings lying around intending to use the wire for coils, etc. but do not have a wire gauge to tell the exact wire size? You can tell the wire size by winding a one-inch length winding on a pencil, or screwdriver, etc., and counting the turns per inch. Referring to the "turns-per-linear-inch" column of a wire table will then quickly give you the wire size. Be sure to select the column giving turns for the type of insulation on the wire you are using.

Lewis Kanoy
Winston Salem, N. C.

Vibrator Puller

It's a hard job to remove vibrators with grooves at the bottom. Most of the sets now use vibrators with 1½" diameter and a useful vibrator puller can be made from a vibrator can with 1⅝" diameter. Slots are cut in two opposite sides through which fingers



Vibrator Puller

can be inserted to grasp the vibrator. When this can is slipped over the vibrator to be removed, the bottom edge spreads out the spring clips which hold the vibrator in its socket. The puller must be made to fit the vibrator snugly.

I have received lots of help from the shop notes in Radio-Television Service Dealer and I believe the readers of this magazine will find the above vibrator puller very useful in saving time and patience.

Wayne Storch
Beecher, Ill.

Polishing Plastic Cabinets

It has been noted that in one of your issues attention has been called to the damaging effects of carbon tetrachloride on plastic cabinets. In this connection I would submit a suggestion that has been proven in the shop where I am employed.

We, too, have had this same difficulty but in many instances a marred or scratched cabinet can be restored through the use of VZ 1090 Extra Fine Polishing Compound No. 45, a product of the Dupont Corporation.

Ellwood H. Weidenhafer
Phil., Pa.

Westinghouse-General Information—Corona and Arcing

Where high voltage sources are required, as in a television receiver, it is necessary to guard against possible corona or arcing. The following discussion should serve to assist in the isolation and suppression of corona conditions upon their occurrence.

In locations where the humidity is high, corona conditions become aggravated due to the lowered dielectric constant of the air surrounding the high voltage source. When the air contains a high percentage of moisture, ionization takes place and corona forms at points of small surface area which are subject to a high potential much more readily than under less humid conditions. Corrective measures involve increasing the surface area at the points where corona exists. Corona can also emanate from particles of grit or dust adhering to high voltage conductors and components which provide points of high potential and small surface area and may form a path for arcing.

Arcing occurs only when the insulation resistance between two points of high potential becomes lower than the critical insulation resistance necessary for the potential involved. Arcing, therefore, is corrected by increasing the insulation resistance between the two offending points, either by spacing or introducing a high dielectric material such as polyethylene sheet, etc.

CORONA: A blue or violet discharge emanating from H.V. sources, characterized by a hissing sound.

ARCING: Periodic or sustained breakdown between two points of different potential, characterized by a snapping and popping sound.

LOCATING CORONA: A darkened room will often prove to be of value when looking for corona, depending upon the magnitude of the corona discharge. In cases where the discharge is difficult to locate visually, it is often possible to detect the corona source by carefully probing points in question with a blunt rod of non-conducting material. When the blunt instrument contacts the corona source the hissing sound will change pitch or be interrupted. The magnitude of the corona discharge may be increased to facilitate location by using a Variac to increase the line voltage. Corona may occur at sharp solder points, around

[*Continued on page 62*]

VIDEO AMPLIFIERS

Part 1 **by LEONARD LIEBERMAN**

Beginning a 2-part article on video amplifiers, their how and why, and their idiosyncrasies; which naturally leads us into the most effective methods of servicing.

THE practicing serviceman might well ask while reading this article, "why bother about the design considerations of a video amplifier? That's O. K. for the engineer; but the only troubles I usually come across in a video amplifier is that a tube goes out and needs replacement; a condenser shorts, or a resistor burns out." This might be true if you as a serviceman haven't at some time or other run into one of the following situations:

1. You bring the set back from the shop and the customer says, "what did you do with it? The picture isn't as clear as it was before." (Believe it or not sometime they are right.)
2. Have you ever knocked yourself out working on an antenna trying to get rid of what seems to be a ghost in a location where no one else is bothered by one?
3. The customer tells you when you are making an installation that the picture doesn't seem to be as "crisp and sharp as the neighbor's picture." This turns out to be the case when you visit the neighbor to see their picture. How do you explain that one to the customer?
4. You spend hours at the bench trying to get rid of a "wriggle" across the top of the picture to find that replacement of the video amplifier or its plate load resistor does the job.

If all or any of the above has happened to you, it would pay you to become better acquainted with the video amplifier. In order to operate more efficiently and, therefore, more profitably, it would be advisable to have a better understanding of terms like: video amplifier bandpass response, transients, overshoot, etc. It is these that determine the only thing a customer knows about the set, namely, the picture quality.

You may have the best test equipment; and you may align the I.F.'s exactly as they appear in the manufacturer's service manual. Still you do not seem to get a picture as good as it should and could be. All this because you replaced the video amplifier load resistor with a *4.7K* instead of a *3.9K* called for, in order to get more "gain" or because at the moment you did not have a *3.9* available.

Just as when you work on a high fidelity audio amplifier, the tube and component characteristics are important, so it is with a video amplifier. The video amplifier in the TV set serves the fundamental purpose of amplifying the output of the video second detector. This amplifier signal is then applied to the CRT.

While there is a resemblance to an audio amplifier the frequency response requirements of the video amplifier are much wider than that of the audio amplifier. The difference can be seen in the fact that the finest high fidelity audio output response is calculated for 3 db rolloff at 200 kcs., whereas, even the poorest video amplifier must be flat out to be at least 3 mcs and the better amplifiers are flat to *3.8* or *3.9* mcs.

The video amplifier in addition can and often does perform other functions. Among these extra functions are the following: d-c restoration, noise clipping on sync pulses, supplying the sync take-off point; and in keyed a-g-c systems, the video amplifier is direct coupled to the keyed tube.

The response gain in the video amplifier is usually measured first as a function of frequency (called the gain in the frequency domain); second as a function of time (called the time domain) which is a measurement of the response of the amplifier to abrupt variation in frequency.

As in the audio amplifier, the response of the video amplifier is usually measured in three parts:

1. The response at the middle frequencies.
2. The response at the high frequency.
3. The response at the low frequency end.

To simplify the method of calculating the frequency response it is cus-

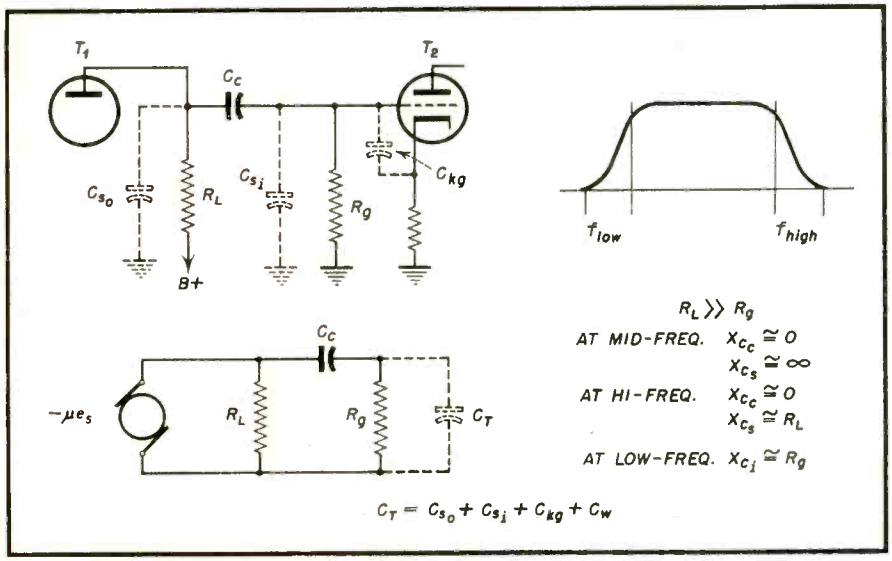


Fig. 1. Typical video amplifier and equivalent circuit.

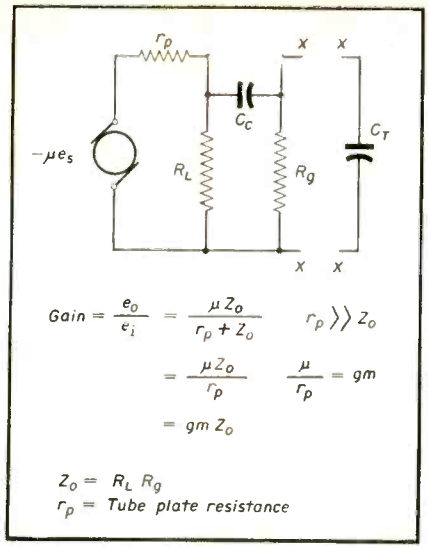


Fig. 2. Equivalent circuit at mid-frequencies.

tomary to replace the tube circuit itself with an equivalent circuit (*Fig. 1*). This equivalent circuit is one which takes into account all the tube and circuit parameters. By examining this equivalent circuit under varying frequency conditions, the response can then be calculated.

Let us first examine how the equivalent circuit operates. We assume the tube to be replaced by a signal source of a certain constant voltage or current. C_{so} and C_{si} are the output and input shunt capacities, respectfully, of the two circuit terminals. (C_{so} equals the plate to ground capacity of the output tube and C_{si} equals the grid to ground shunt capacity of the input tube.) C_w is the shunt capacity of the circuit wiring, the coupling condenser outside foil to ground, socket capacities, etc. C_c is the coupling condenser. R_l is the plate/load resistor of the first tube, usually between *3.3K* and *8.2K*. R_g is the grid leak resistor of the second tube. C_{so}, C_{si}, and C_w at the frequencies at which they are important are effectively connected from the same point to ground as will be shown later. Therefore, for convenience they can be lumped into one capacity which will be called C_t.

Component Frequency Response

Now let us see how these components react under various frequency conditions. At frequencies above *60* to *100* cycles, the reactance of C_c (which is usually at a value between .1 and .47 μf) drops off to the point where it is the equivalent of a short circuit. C_t is generally between 10 and 40 $\mu\mu$f. At the low frequencies and up to the high frequency cut-off point, its reactance is so high that in shunt with $R_L R_g$ it doesn't effect the response of the circuit. Therefore, at the mid-frequencies, the response of the network is determined by the parallel resistor network of $R_L R_g$ (*Fig. 2*). Since the load impedance is resistive there is no frequency or phase discrimination and thus the frequency response is uniform.

High Frequency Response

As the frequency rises past the mid-frequencies, the effect of C_t on the response starts becoming a factor in the gain curve. The reason for this can be seen in the formula for the reactance of a condenser.

$$X_c = \frac{1}{2\pi fc}$$

It can be seen as either f or c grow larger the value of X_c goes down. In the resistance coupled amplifier with C fixed by the tube and wiring capacities, therefore, when the frequency rises sufficiently the shunting effect of the reactance of C_t across the network of $R_L R_g$ starts to reduce the stage gain. The point where the gain drops off 3 db or 70.7% of the mid frequency gain is called the high frequency cut-off point.

As a result of the fact that the tube capacities are a major factor in determining the high frequency cut-off point, the choice of a video amplifier tube is limited. What is desired is a tube with high gain and at the same time low input and output capacities. The tubes usually used have output capacities ranging from 5 to 15 $\mu\mu$f. Their input capacities are also low. Wiring and lead dress shunting capacities are usually between 3 and 8 $\mu\mu$f if the dressing is done carefully.

Incidentally, when working in the video amplifier section of a TV set, the serviceman should make sure that

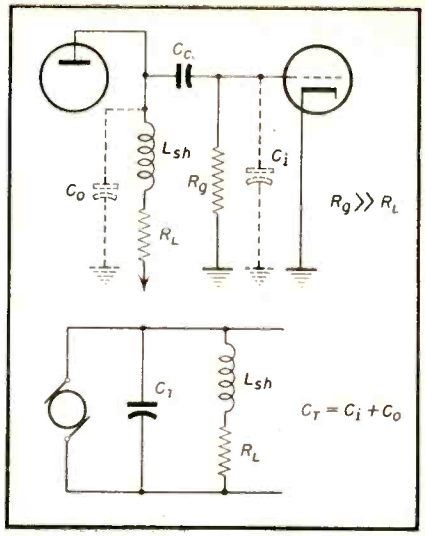


Fig. 4. Shunt peaking (top). Equivalent circuit below.

the lead dress, in reference to ground, when disturbed is redone as near to the original lead dress as possible. Component lead length should be as nearly as like that of the component being replaced. For example, if you are replacing a resistor in the video amplifier which has two very short pig-tails, do not replace it with a resistor whose leads have not been cut merely because this makes the repair soldering simpler.

High Frequency Peaking

The present F.C.C. standards call for a 4.0 mcs video amplifier response for a good definition of the received picture. The upper frequencies supply the sharp visual distinction between an adjacent black and white unit. To demonstrate this, let us assume a black and white checkerboard pattern was displayed on the transmitter screen. The voltage wave form at the camera amplifier output would look like

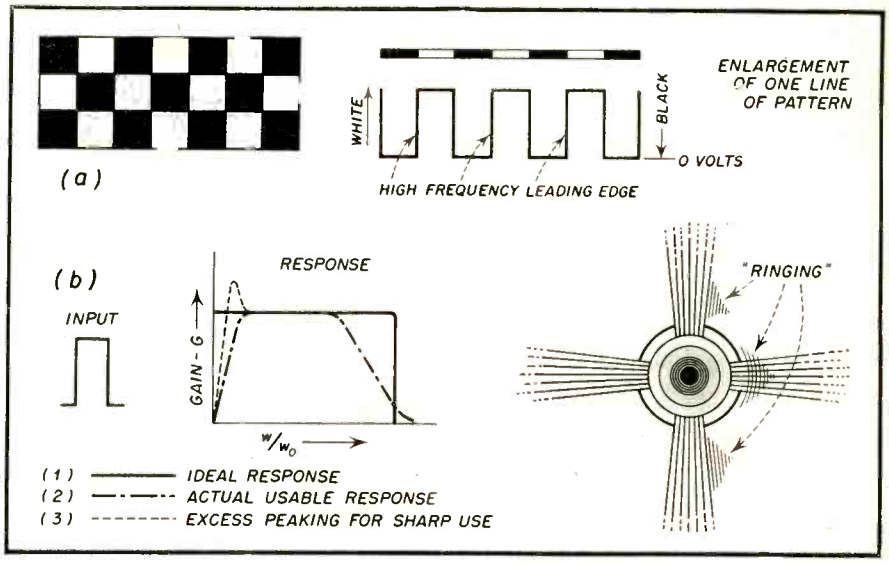


Fig. 3. Effect of amplifier response.

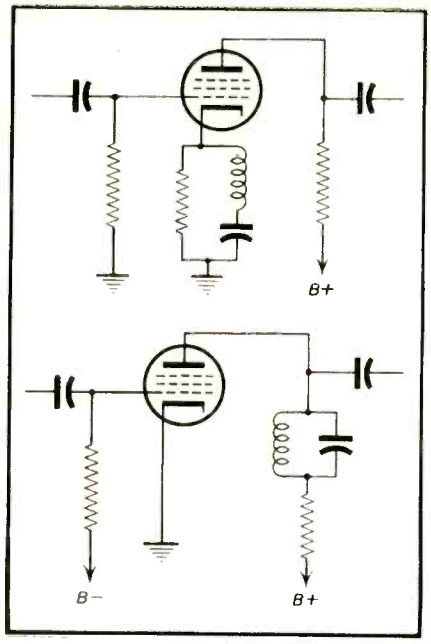


Fig. 6. Shunt peaking variations.

Fig. 3a. The steepness of the rising part of the curve is a function of the circuit high frequency response. The better the high frequency response of the circuit or network under consideration, the steeper this slope is. The steeper the slope, the sharper is the distinction when there is an abrupt change from the edge of a black image against a white background.

The response of a network to a square wave input can be represented, theoretically, by line *1* in *Fig. 3b.* In actual practice, a rise line such as line 2 is more than ample to provide a good response up to *4.0* mcs. In fact, due to the nature of networks, any attempt to get a faster rise time will result in an "overshoot" such as line 3 in *Fig. 3b.* In a TV video amplifier, with a complex sine-wave output, it is not possible to "trim off" this overshoot. The result of an overshoot in a TV video amplifier is a phenomenon called "video ringing" (*Fig. 3c.*). This is distinct from a ghost since the repeated lines do not follow the entire image line structure. They do follow any sharp change from black to white.

Because the value of C_t cannot be reduced below a certain minimum, the high frequency response of a non-compensated network would fall off 3 db considerably before the 4.0 mc point is reached. It has been shown in several theoretical articles that a constant gain output can be achieved out to almost any frequency. The limits are the high frequency limit of the tube used. In the case of the 6AK5 this theoretical limit is 160 mcs. In practice, however, the network components are so critical that with present methods, it is not practical or useful to achieve such limits. In view of the fact that the TV signal output requires a flat response to only 4.0 mc the design of the compensating network is much simpler.

Shunt Peaking

Figure 4a shows the method of connecting a peaking coil in series with the plate load resistor. This peaking coil shunts C_t thereby giving the circuit its name. *Fig. 4b* indicates the equivalent circuit. It can be seen that C_o is the equivalent of a short circuit at the high frequencies. R_g is very much larger than R_L so that the resistance of the R_L R_g parallel circuit is very nearly that of R_L. L_s is chosen so that it is expressed by the formula:

$$L_s = KC_tR_L^2$$

(K is a constant the value of which is less than one.)

L and C are chosen to resonate at a frequency which is 1.4 times the uncompensated cut-off frequency. When these values are used, the constant K is approximately 0.414. The result of the choice of these values are such that as the frequency approaches the high frequency cut-off point, the gain starts rising. As shown in *Fig. 5*, we sponse of this network at K = 0.414 is such that there is very little phase distortion at the input of the next grid. R_L is chosen so that the resonant frequency, $XC_t = R_L$. A number of variations of this type of shunt peaking are shown in *Fig. 6.* The same resonant frequency. The phase repeaking networks is that C_t deter- calculations basically hold for these variations.

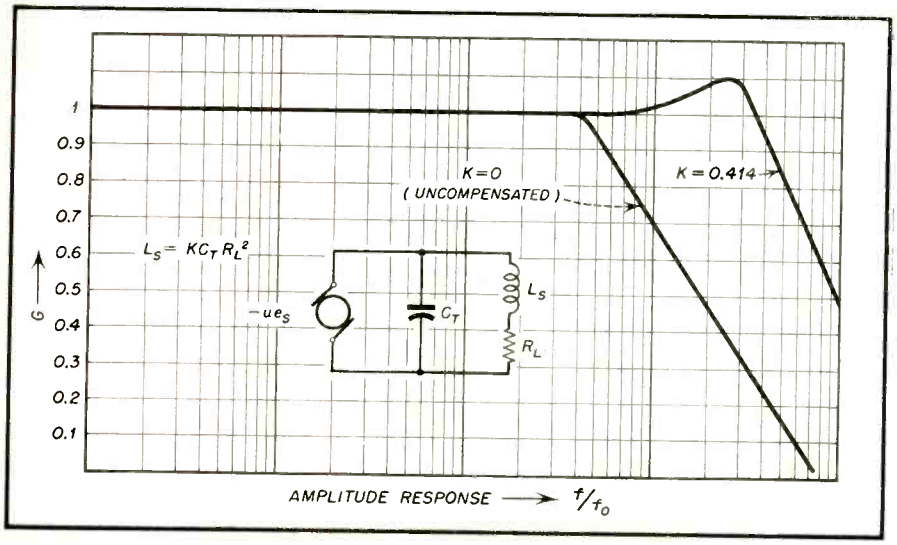


Fig. 5. Response curve for different values of K.

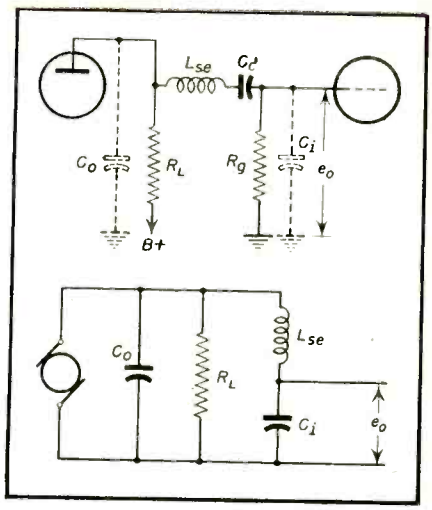


Fig. 7. Series peaking (top). Equivalent circuit below.

Series Peaking

One of the draw-backs of the shunt would get a peak as we approach the mines the resonant frequency of L_s and C_t and at that frequency $XC_t = R_L$. It was found that if it were possible to isolate C_o and C_t, two beneficial results could be achieved. First, the frequency of the LC circuit could be raised. Second, R_L could be made larger so as to permit more gain from this stage. This separation is achieved by what is known as series peaking. (See *Fig. 7.*)

In this network, the inductance is put in series with the input capacity. Since the input capacity is smaller than C_t, it is possible to resonant the L_sC_t combination at a higher frequency. As a result of taking the following tube's input from the junction of L_s and C_t as the frequency rises towards resonance, the voltage drop across C_t increases. The last statement may seem to be a contradiction since a series resonant network represents a low impedance at resonance. In fact it would be so if e_o were taken off be-

[*Continued on page 60*]

CIRCUIT COURT

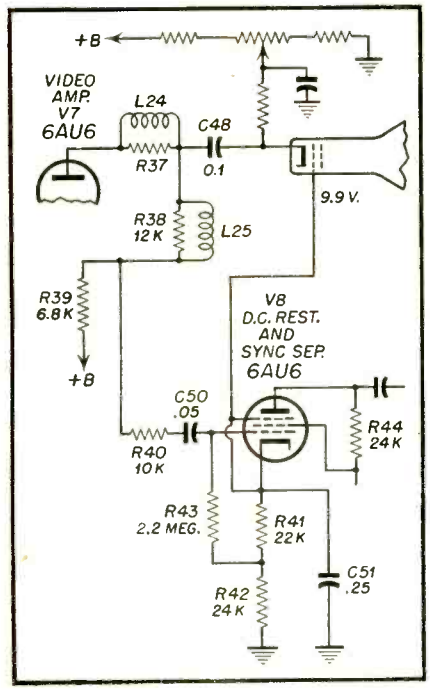


Fig. 1. Sparton partial schematic.

Sparton Model No. 5010 D-C Restorer

In the Sparton Model *5010* (*Fig. 3*), the d-c restoration is a function of the average voltage in the cathode of the sync separator. The entire video signal is taken off the plate of the video amplifier *V7* (*6AU6*) at the tap-down point between *L25* and *R39* (*6.8K*). It is fed into the grid of *V8* through *R40* (*10K*) and *C50* (*.05*). This tube operates at a cut-off bias which is determined by the average video signal amplitude. Thus only the sync pulses which are positive going start it into conduction. A positive voltage in the order of *10* volts is applied to the grid of *V20*, the CRT.

The bias network *R40*, *R42* and *C51* has a time constant of such an order that short duration pulses, i.e., sync pulses, noise pulses, etc., cannot cause it to change rapidly. Changes in the d-c level caused by variations in picture brightness, however, will vary the bias. This variation is then applied to the CRT grid. As a result, the bias on that tube changes, causing the brightness of the picture to correspond to that of the studio brightness.

The CRT which is cathode fed has its cathode at approximately +105 volts. Since the grid is at +10 volts, the d-c bias for the tube is established. It can be seen that any variation in the CRT grid voltage will, therefore, change the tube's bias level. The original bias or brightness level is set by the brightness control.

The d-c voltages in *V8* are developed in the following manner: The plate and screen are connected to B+. The cathode resistance of 46K develops a high bias voltage with very little current being drawn. The cathode-to-grid bias is established at the junction of *R41* and *R42*. The plate supply for *V7* is conventional.

Hoffman 638 Horizontal AFC

The a-f-c circuit is a very novel use of tube gating. As can be seen from the diagram of the circuit (*Fig. 3*) the plate of *V701* is connected to the a-g-c gating pulse point. Thus when the positive pulse from the width coil during retrace time is developed, it is fed to *V701* through *C703* (.002 μf). The network of *R703* (4.7K) and *C701*

[*Continued on page 62*]

ERRATUM

The incorrect diagram for *Fig. 2* was shown in the March, 1952 issue on page 41 of Circuit Court. Shown below is the correct diagram.

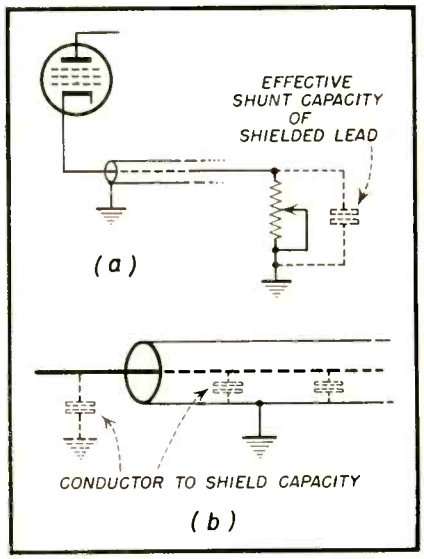


Fig. 2. Shunt capacitance of shielded lead in cathode circuit has little effect.

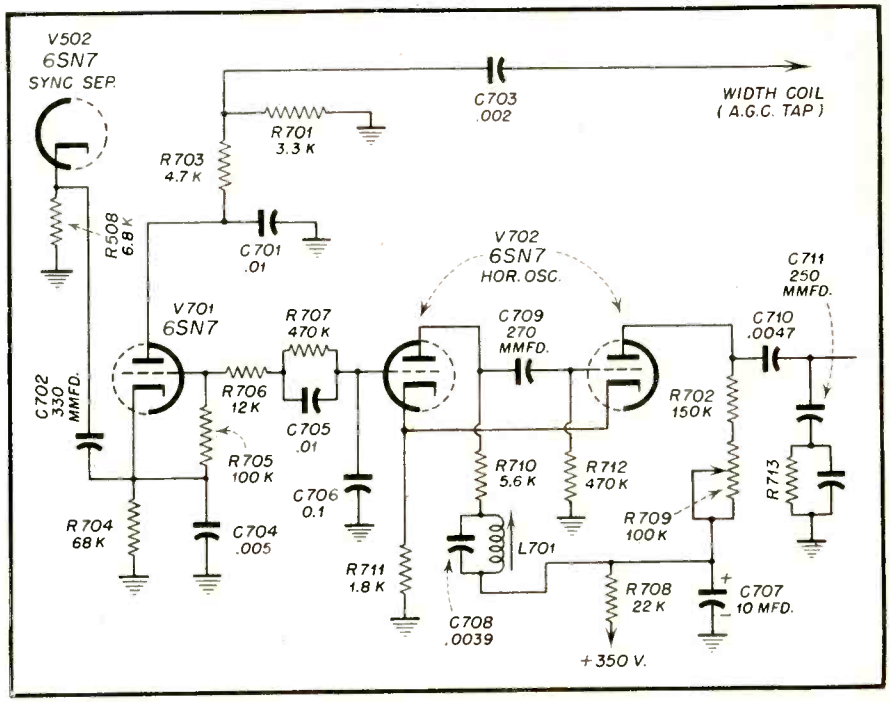


Fig. 2. Hoffman Model 638 partial schematic

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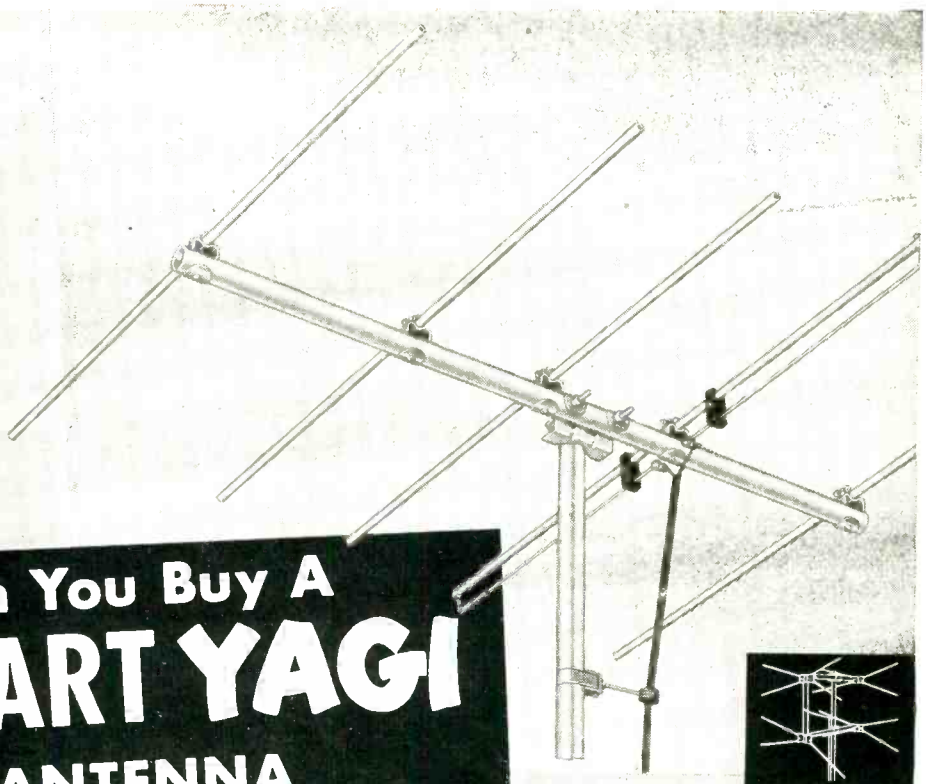
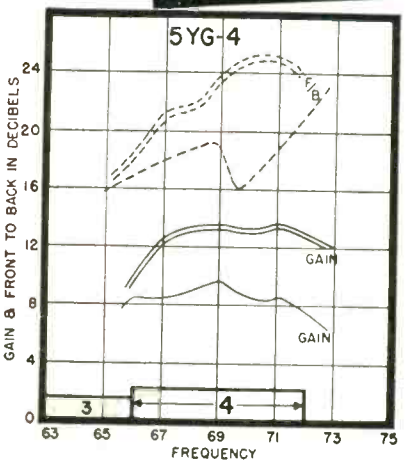
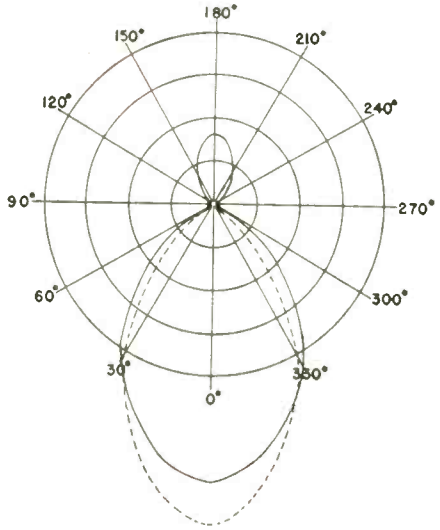


When You Buy A RADIART YAGI TV ANTENNA





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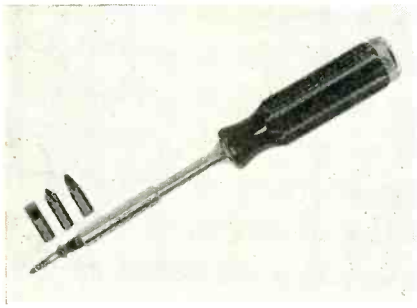
NEW PRODUCTS

MAGNETIC SCREWDRIVER

A new tool, designed particularly to meet the needs of TV-radio servicemen, has been announced by the Radio Tube Division, Sylvania Electric Products Inc.

The new tool is a magnetic screwdriver with three interchangeable bits for slotted and Phillips screws. A magnetized bit holder holds each bit with a force approximately ten times that normally needed to hold screws while they are being screwed into a TV or radio chassis. Three of the bits are carried in a convenient compartment in the green plastic handle. When no bit is in the holder, it may be used as a

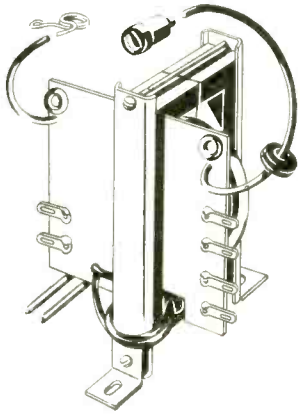


magnetized socket wrench for driving ½" hex head bolts or nuts.

The screwdriver will be offered to service dealers who purchase 100 Sylvania receiving type tubes or 4 Sylvania picture tubes from authorized distributors between April 1 and May 15.

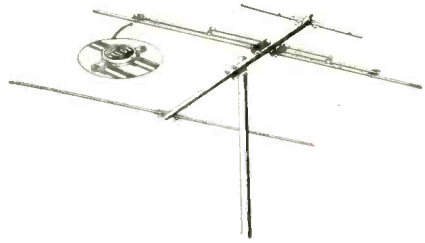
TV COMPONENTS

Fourteen new Stancor television replacement components, covering a wide range of applications, were announced by Standard Transformer Corporation, 3580 Elston Ave., Chicago.



The new components include six power transformers; two filament transformers; two horizontal deflection and high voltage transformers; two filter chokes; a vertical deflection output transformer and a width control with AGC winding.

Replacement recommendations for these units are listed in the new Stancor TV Replacement Guide and Catalog, which lists 2416 TV models and chassis.

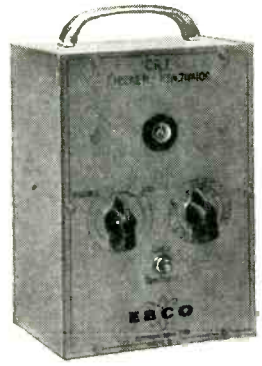


NEW VEE D-X ANTENNA

A printed circuit has been utilized as an integral part of The Vee-D-X "Q-Tee" antenna.

The driven element consists of a series of T-matched dipoles which ultimately provides a 300 ohm match on both the high and low channels. The Printed Circuit is incorporated in the matching system to prevent the detuning effect between the high and low channel elements while providing a driven element of extremely low Q. The close proximity of the high and low elements and the elimination of the adverse inter-action by the printed circuit results in an exceptionally broad band driven element. With the addition of a high channel director and a low channel reflector, the antenna has the desirable front-to-back ratio and gain characteristics of parasitic type antennas such as the Yagi.

Designed for all multi-channel areas from primary to super fringe, the "Q-Tee" may be used as a single bay antenna in metropolitan areas; double-stacked for suburban areas, and 4-stacked for the fringe reception of one or more metropolitan areas.



PIX TUBE CHECKER-REACTIVATOR

Electronic Beam Corp., manufacturers of Cathode Ray Tubes and Television Instruments, have introduced the latest addition to their line of products—the EBCO CRT Checker-Reactivator.

With this portable unit, the television servicemen can check picture tubes without removing them from the TV sets, or while they are still in their shipping cartons. Likewise, he can reactivate the tube without removing it from the set. The dim tube is virtually rejuvenated—increased brightness, improved definition—extending the useful life of the tube for as much as one more year. If necessary, the reactivation can be done right in the customer's home; the entire operation can be accomplished in less than 15 minutes on the average picture tube. However, the reactivation will not take place if there is a broken filament, broken glass, or shorted components.

For further information, write to the manufacturer: Electronic Beam Corp., 923 Old Nepperhan Ave., Yonkers 3, N. Y.

UHF OSCILLATOR TRIODE

A new miniature triode designed to operate as an oscillator in uhf television receivers covering the frequency range from 470 to 890 Mc has been announced by the RCA Tube Department.

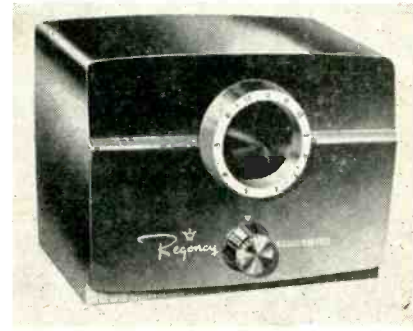
Designated as the 6AF4, this new tube features good frequency stability; a short mount structure with small elements to provide low interelectrode capacitances; short internal leads to reduce lead inductance and rf resis-

tance; silver-plated base pins to minimize losses caused by skin effect at ultra-high frequencies; and double base-pin connections for both plate and grid. The double connections are arranged so as to facilitate use of the 6AF4 with either series—or parallel-resonant lines and to offer greater flexibility in circuit connections.

NEW BOOSTER

A new exclusive circuit stabilizer for which patent has been applied, is the principal of 10 features in the new Regency television signal booster, made by Regency Division, I.D.E.A., Inc., 7900 Pendleton Pike, Indianapolis 26, Indiana. Designed for the new model DB-520, the stabilizer provides both inductive and capacitive neutralization to assure maximum stability on all 12 vhf channels.

Other features of the new model are ease of installation, with TV set plugging into the



booster and the booster into the wall outlet; an off-on switch of three ampere capacity, 120 volt AC; single tuning knob; push-pull triode in balanced circuit; link coupling for optimum impedance matching; improved circuit control for greater tracking accuracy; a compact

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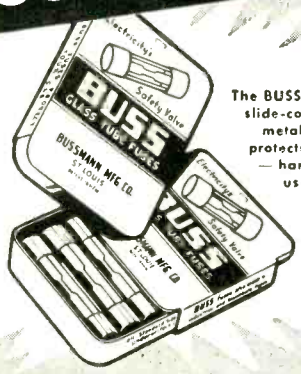


The BUSS slide-cover metal box protects fuses — handier to use.

The name BUSS represents over 37 years specializing in fuses.

Each individual BUSS fuse is tested in an electronic device to insure proper operation.

You can always be sure a BUSS fuse will open to protect—but will not open needlessly.

Complete TELEVISION FUSE LIST

Shows proper fuse to use
• How fuse is mounted • What fuse protects •

Division McGraw Electric Co.

ADMIRAL to CENTURY

CLARION to MAJESTIC

MAJESTIC to SENTINEL

SETCHELL-CARLSON to ZENITH

AUTO RADIO FUSE LIST

This complete fuse list helps Service or Counter men know what fuses are needed to service any T-V set — and helps storekeeper know what fuses he should stock.

BUSSMANN MFG. CO.
University at Jefferson St. Louis 7, Mo.
Division of McGraw Electric Company

Did You Get Your Copy of the *NEW* BUSS TELEVISION FUSE LIST?

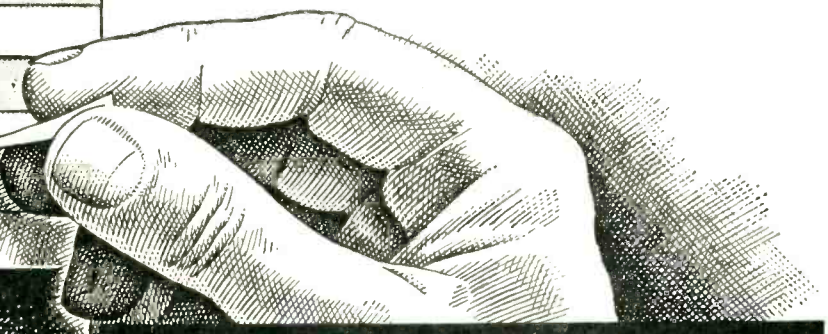
It's free!

The new BUSS Television Fuse List gives **complete** up-to-the minute information on all fuses used in today's T-V sets. Plus — the latest Auto Radio Fuse List.

Shows what fuse to use — how fuse is mounted — and circuit fuse protects.

Chart can be hung on wall for ready reference — or — carried in pocket or tool kit when making service calls.

On back of chart are illustrations and dimensions of all fuses specified in listings, to be of added assistance in selecting proper fuse to use.



IF You Can Use a Copy... Send the Coupon Today

BUSSMANN Mfg. Co. (Division of McGraw Electric Co.) SD-552
University at Jefferson, St. Louis 7, Mo.

Please send a copy of the BUSS Fuse Application Chart.

Name _____

Title _____

Company _____

Address _____

City & Zone _____ *State* _____ 552

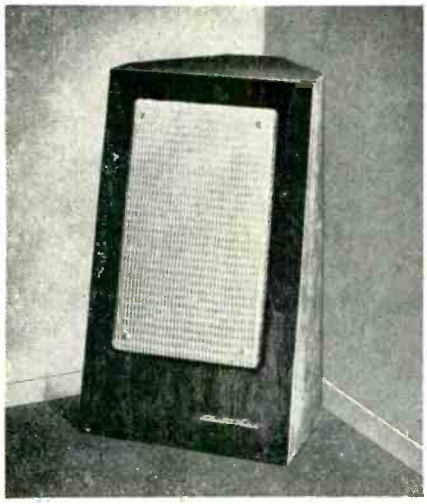
cabinet, and broad-band response which insures equal enjoyment of both video and audio on all vhf channels. The model is approved by Underwriters' Laboratories. List price is $32.50.

SCOPE CALIBRATOR

A new oscilloscope calibrator, light in weight and featuring direct meter readings is now being shipped by the Simpson Electric Company, manufacturers of test instruments and panel meters.

The new calibrator is Model 276 and is a companion piece for their Model 476 Mirroscope, the oscilloscope which features vertical mounting of the cathode ray tube. The calibrator is completely self contained and operates from 117v, 50-60 cycles and can be used with any oscilloscope.

The Model 276 calibrator has a sine wave output which is used directly on the 4½" meter. The meter is calibrated directly in RMS, Peak, and Peak to Peak values. Six ranges are provided with Peak to Peak full scale values of 1, 2.5, 10, 25, 100 and 250 volts with an accuracy of 3%. Each range is continuously adjustable from zero to full scale value.



FOLDED-HORN CORNER ENCLOSURE

A new contribution to economical high-fidelity sound reproduction has been made by Electro-Voice engineers in the development of the Baronet Folded-Horn Corner Enclosure for E-V SP8-B or SP8-BT 8" Loudspeaker or for any 8" Speaker.

The Baronet is conservatively modern in design with a graceful sloping front that is both pleasing and functional. All exposed surfaces of the veneers are hand-rubbed to a rich mirror-like finish. Attractive grille is formed of "Lumite"—Bronze for the mahogany and ecru for the blonde.

Dimensions: 23½" high; 14½" wide; 10½" deep at top and 14½" deep at bottom. The Baronet in Mahogany finish, without speaker, lists at $59.50, and in Blonde finish, lists at $63.00. For further information, write to Electro-Voice, Inc., Buchanan, Michigan.

DUAL-BEAM SCOPE

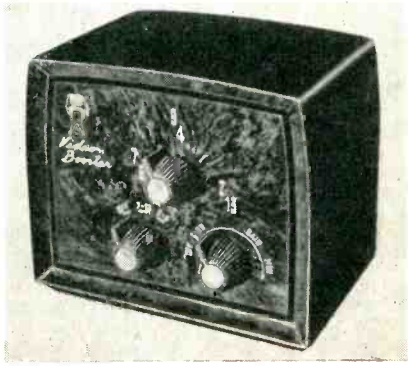
The Instrument Division of Allen B. Du Mont Laboratories, Inc., 1500 Main Avenue, Clifton, New Jersey, has announced a new dual-beam oscillograph, engineered specifically for general-purpose laboratory and industrial applications. Designated the Du Mont Type 322 Dual-beam Oscillograph, this compact instrument is essentially two Du Mont Type 304-H oscillographs in a single cabinet, and offers all of the features of the famous Type 304-H, with the additional advantage of dual-beam presentation on either common or individual sweeps, amplitude calibration of either axis of both channels, and conveniently centralized controls.

Driven and recurrent sweeps are continuously variable from 2 to 30,000 cps. Complementing the d-c response of the vertical axes, sweeps of extremely long duration can be made available by connecting an external capacitance to convenient front-panel binding posts.

A bulletin describing the new Type 322 and giving complete specifications is available by writing the Instrument Division, Allen P. Du Mont Laboratories, Inc., 1500 Main Avenue, Clifton, N. J.

TV BOOSTERS

Both a new pentode tube and a triode tube television booster are the most recent developments of RMS, New York manufacturer of TV antennas and other TV accessories.



The SP-6, a pentode tube booster, features external gain control which is simple to operate. External Gain Control gives this booster an ability to use the maximum possible gain.

The SP-6 External Gain Control Booster is therefore the unit which RMS is offering primarily for extreme fringe areas where every bit of power is needed to attain good picture clarity.

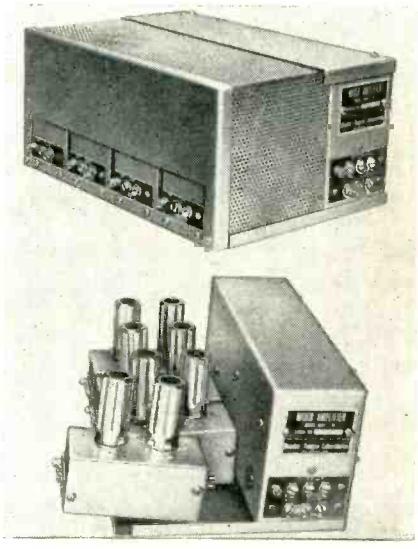
Companion to the SP-6 is RMS new duo-triode Booster, SP-6J. The unit features an extremely low Q. The close proximity of the SP-6J has a full six megacycle band width per channel.

Both Boosters are approved by Underwriters Laboratories, and carry a full year guarantee with standard RMA warranty on tubes and parts. The suggested list price for the new boosters is $29.90.

TV MIXER AMPLIFIER

The B-T Mixer-Amplifier, MA4-1, is, in effect, a complete, self-contained, Master Antenna System for VHF as well as UHF TV reception. Capable of dealing with any problem arising in multi-antenna installations, it eliminates all need for antenna rotators, separate boosters, UHF Tuners and other intricate elements. Simple screw terminals make installation quick, easy, and economical. Once connected, the MA4-1 is ready for instant use and long trouble-free performance.

One complete MA4-1 will handle signals from five different antennas, and mix and feed them through one output to any TV receiver or distribution system. Two or more of these units can be coupled to mix an unlimited number of antennas. Effective inter-channel isolation is assured. All terminals, input and output, are provided with both 75 ohm and 300 ohm connections.

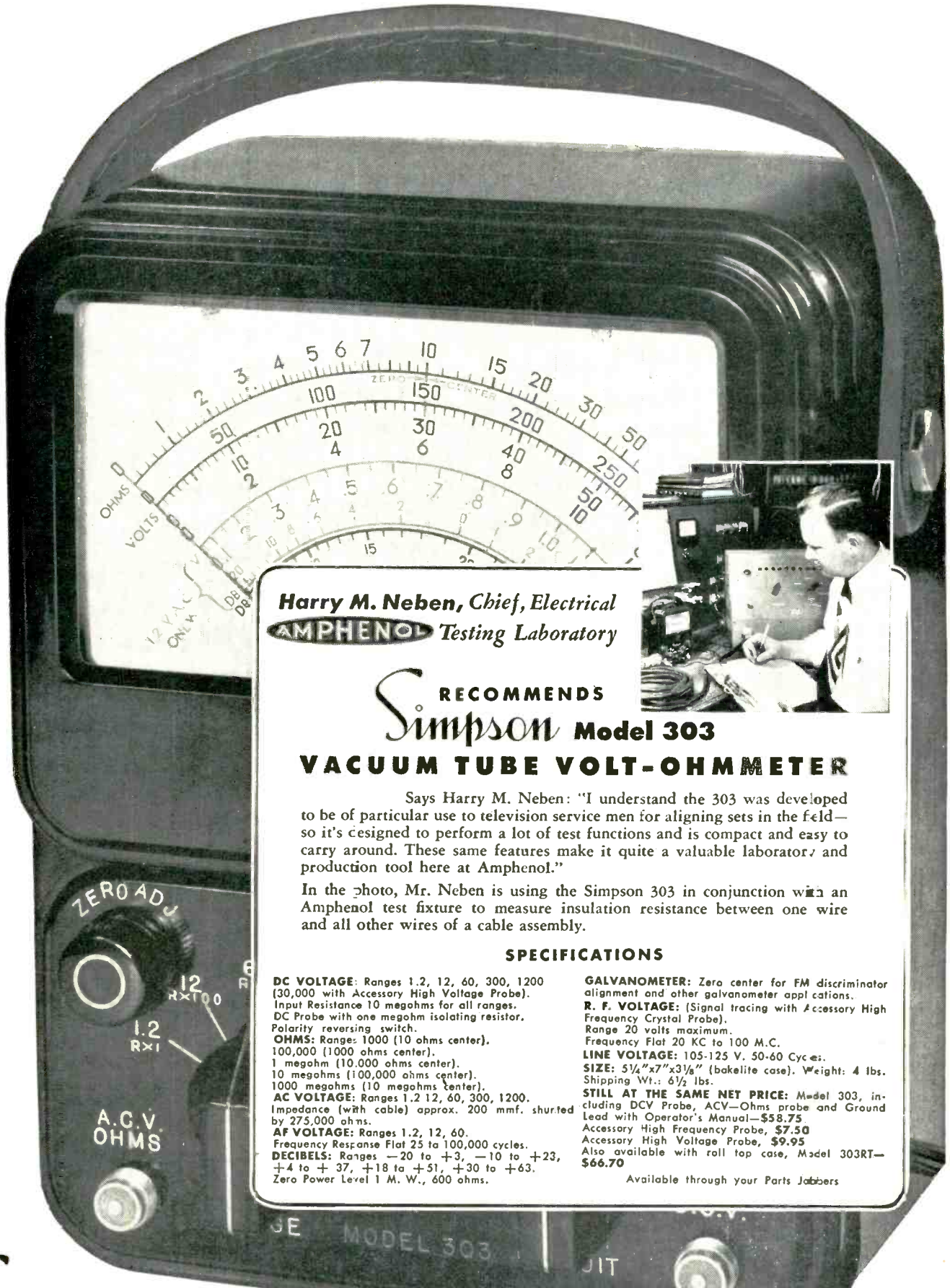


The MA4-1 lists $52.50. The plug-in Channel Strips list at $19.50 each. Standard discounts apply.

Information obtainable from local distributors or direct from Blonder-Tongue Laboratories, Inc., 38 N. Second Avenue, Mt. Vernon, New York.

SUPER TWEETER

For improving realism of sound reproduction, Jensen Manufacturing Company, Chicago, has developed a new high frequency unit which makes a 3-way system from any coaxial speaker, or a 2-way from a single unit direct radiator. The RP-302 "super-tweeter" is adapted from the h-f channel of the Jensen G-610 triaxial speaker. Installation is simple—unit sits atop cabinet or mounts flush on baffle or



***Harry M. Neben,** Chief, Electrical*
AMPHENOL *Testing Laboratory*

RECOMMENDS

Simpson Model 303

VACUUM TUBE VOLT-OHMMETER

Says Harry M. Neben: "I understand the 303 was developed to be of particular use to television service men for aligning sets in the field—so it's designed to perform a lot of test functions and is compact and easy to carry around. These same features make it quite a valuable laboratory and production tool here at Amphenol."

In the photo, Mr. Neben is using the Simpson 303 in conjunction with an Amphenol test fixture to measure insulation resistance between one wire and all other wires of a cable assembly.

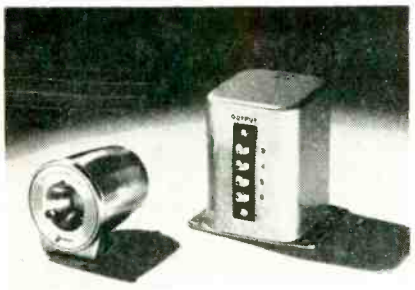
SPECIFICATIONS

DC VOLTAGE: Ranges 1.2, 12, 60, 300, 1200 (30,000 with Accessory High Voltage Probe).
Input Resistance 10 megohms for all ranges.
DC Probe with one megohm isolating resistor.
Polarity reversing switch.
OHMS: Ranges 1000 (10 ohms center).
100,000 (1000 ohms center).
1 megohm (10,000 ohms center).
10 megohms (100,000 ohms center).
1000 megohms (10 megohms center).
AC VOLTAGE: Ranges 1.2 12, 60, 300, 1200.
Impedance (with cable) approx. 200 mmf. shunted by 275,000 ohms.
AF VOLTAGE: Ranges 1.2, 12, 60.
Frequency Response Flat 25 to 100,000 cycles.
DECIBELS: Ranges −20 to +3, −10 to +23, +4 to + 37, +18 to +51, +30 to +63.
Zero Power Level 1 M. W., 600 ohms.
GALVANOMETER: Zero center for FM discriminator alignment and other galvanometer applications.
R. F. VOLTAGE: (Signal tracing with Accessory High Frequency Crystal Probe).
Range 20 volts maximum.
Frequency Flat 20 KC to 100 M.C.
LINE VOLTAGE: 105-125 V. 50-60 Cycles.
SIZE: 5¼"x7"x3⅛" (bakelite case). Weight: 4 lbs.
Shipping Wt.: 6½ lbs.
STILL AT THE SAME NET PRICE: Model 303, including DCV Probe, ACV—Ohms probe and Ground Lead with Operator's Manual—**$58.75**
Accessory High Frequency Probe, **$7.50**
Accessory High Voltage Probe, **$9.95**
Also available with roll top case, Model 303RT—**$66.70**

Available through your Parts Jobbers

Simpson ELECTRIC COMPANY
5200 W. Kinzie St., Chicago 44, Illinois Phone: COlumbus 1-1221
In Canada: Bach-Simpson, Ltd., London, Ont.
World's Largest Makers of Electronic Test Equipment

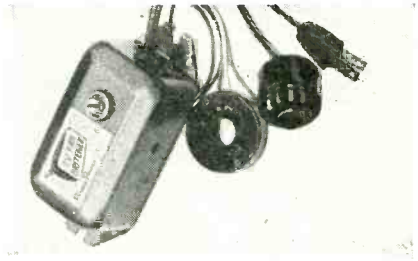
BURTON BROWNE ADVERTISING



panel in 1-11/16" hole. The RP-302 provides "highs" from 4000 cycles up, extending range to limits of audibility (approximately 18,000 cycles) with extremely low distortion. Small Hypex horn widely dispenses sound with useful coverage angle of 120 degrees in horizontal and vertical planes. Special plastic diaphram gives freedom from "break-up." Aluminum voice coil wire. Impedance is 16 ohms, maximum power rating, 30-10 watts speech and music signal when used with the Jensen A-402 Crossover Network. Jensen recommends the A-402 Network for best results, but unit can be connected (with 2 ufd condenser in series) across low impedance speaker line (up to 16 ohms, approx.). For complete information request form DZ. Jensen Manufacturing Company, 6601 South Laramie Ave., Chicago 38.

PIX TUBE BRIGHTENER

The New "TV Tube Brightener" features increased brilliance to any TV picture tube; isolates filament; relieves cathode-filament shorts; Fully automatic . . . no switching or wiring, goes on and off with on-off switch of any television set; takes 90 seconds for service-



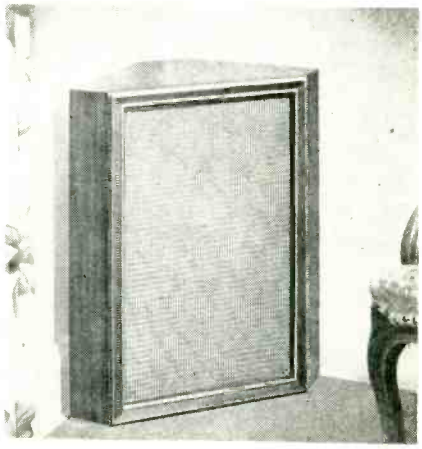
man to install; complete, simple instructions included with each unit; standard RMA warranty.

Suggested list price—$9.75—subject to liberal trade discounts. Shipped prepaid, shipping weight per dozen—approximately 15 lbs.

The TV Tube Britener is manufactured by Perma-Power Company, 4721 North Damen Avenue, Chicago 25, Illinois.

CORNER HORN ENCLOSURE

A new idea in baffling, the Corner Horn Enclosure for an eight-inch speaker is currently being marketed by Permoflux Corporation, 1900 West Grand Avenue, Chicago.



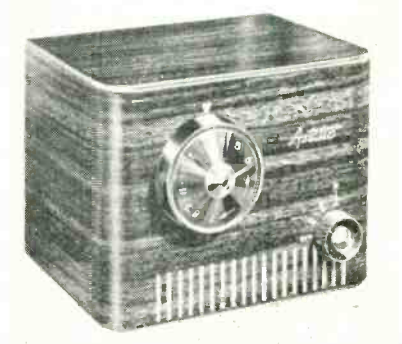
Two models are available. Model CH-8M in satin-smooth mahogany finish for traditional room settings and Model CH-8B in rich-grained blonde mahogany for modern furnishings.

Console stands 25" high and is 20" wide by 11" deep. Shipping weight is 20 pounds (less speaker). Recommended installation is that enclosure be set flush in corners or shoved up to at least two or three inches of the wall.

TV BOOSTER

Development of an improved new television booster by The Astatic Corporation, Conneaut, Ohio, has been announced by William J. Doyle, vice president in charge of sales.

Trade-named the Scanafar, the new Astatic Booster Model CT-1 is claimed to provide a lower noise figure and higher gain, whether



Now, The Plain Truth about easy tv servicing

Learn how official service data direct from the set manufacturer's own engineering and testing laboratories can solve the most difficult tv repairs, quickly and permanently!

No one knows his receiver better than the manufacturer.

Isn't it common sense that the men who design and build the receiver know the most about it? They are responsible for the receiver's performance and when a weakness is discovered, they are the first to determine the necessary permanent correction. The servicing information issued by the manufacturer's engineering department is certainly the most complete; because it contains not only the whole story on each model but includes *changes* in the receiver which the service technician must know in order to make a permanent repair!

For example: A major set manufacturer found that a capacitor overheated and broke down. A conventional replacement of the defective capacitor would mean repeat calls and customer dissatisfaction because the overheating and eventual breakdown would reoccur. So he developed a permanent cure—rearrangement of the circuit wiring. You couldn't possibly know that by looking at the original schematic. The only way you could repair this manufacturer's set containing this trouble would be to have the *complete* factory data! When faced with these facts, and there are many, many more, isn't it surprising that some servicemen are still not taking advantage of the wealth of data developed by the manufacturer?

How to get this vital information.

There are only two ways to get the complete unabridged manufacturers' servicing data: one way is to write the manufacturers direct. However, by doing this you run the risk of mail delay while your customer's set gathers dust, plus the difficulty of organizing the material once it's received.

The other way—the only practical way—is to buy this data in complete, easy-to-read published form. **THIS MEANS RIDER SERVICING DATA!** For 22 years Rider, and Rider alone, has been the only source for getting the whole story—the complete story, including all manufacturers' production changes—in accurate, organized, unedited form. You get large, easy-to-follow schematics . . . explanation of circuits . . . stage by stage alignment curves . . . page after page of trouble-shooting test patterns . . . waveforms . . . *complete* factory parts lists and values . . clear, enlarged chassis views . . . circuit changes . . . and much, much more, all guaranteed to match the set you're working on. This has made servicing *easy* for countless thousands of service technicians.

Rider servicing data designed to meet your needs.

Whether you are a part-time or full-time service technician — independent or employed — you can afford Rider servicing data; Because it's available two ways:

Rider Manuals. Volumes 1 through 9.

The greatest collection of manufacturers' servicing data ever published. Each volume covers all production runs for a certain period. The newest Rider Manual (TV9) contains servicing data for sets produced between October 1951 and February 1952. Each Rider manual contains an index listing the contents for all Rider manuals. The average volume contains more than 2000 (8½ x 11") pages bound in a permanent, heavy-duty binder. Perfect for shop use and permanent reference. Price **$24.00** each.

Rider Tek-File. Packs 1 through 56.

The newest way to get complete Rider servicing data. The *only* difference between Rider manuals and Tek-File is the package. In manuals you buy the data of many manufacturers in one volume. In Tek-File packs you buy the same data—but only for one, two, or a few manufacturers at a time according to your needs. Each numbered Tek-File pack contains standard file folders with all servicing data for the manufacturer's models printed on the pack's tamper-proof label. These folders are designed for house calls and easy bench use in the shop. Perfect for the specialist on certain brands of receivers . . . the part-time service technician . . . the engineer and the independent or employed serviceman. Price only **$2.00** per pack.

As an additional Tek-File service, many packs contain Tek-File Handies. These are 3 x 5" index cards giving manufacturer-tested trouble cures plus production changes made by the manufacturer's own engineering department . . . Each Tek-File pack contains a coupon, 15 of which, plus a small handling charge, get you a permanent manual binder for Tek-File shelf use.

DON'T BE SWITCHED!

There is only one Rider Tek-File. It is *not* the same as any other publisher's service. If your jobber doesn't carry Rider Tek-File DON'T BE SWITCHED . . . write us direct—we'll sell you! Please include your jobber's name.

Combat unfair press...combat national ads that say "fix your own set"! You can do this if you use Rider Manuals and Tek-Files because then you can tell your customers that you are using *factory-prepared, official, authorized, complete servicing information.*

TRY A PACK! Once you've tried Rider Tek-File we are convinced you'll never use any other service. Make this simple test. Use Tek-File for seven days—if you're not convinced, return it to us and receive full refund!

Free Rider Tek-File Index.

Rider Tek-File indexes covering all issued packs are available at your jobbers. If your jobber doesn't have Rider Tek-File Indexes —write us direct . . . it's free.

John F. Rider Publisher, Inc. 480 Canal St. New York 13. N. Y. West Coast office: 4216-20 W. Jefferson Blvd. Los Angeles, Calif.

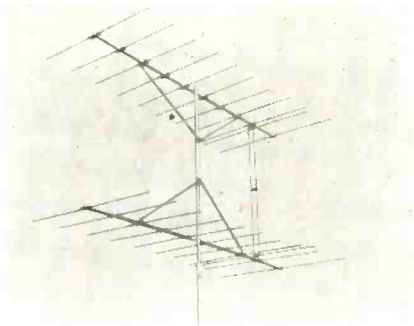
used with new or old style receivers. The circuit is described as a balanced, cascaded type, with a neutralized 6J6 tube driving a 6BQ7 (the widely publicized "quiet tube"). Both tubes are used over the entire TV frequency range.

Band width is over seven megacycles on all channels. Two control knobs operate the booster: one an on-off switch and low or high band selector, and the other a fine-tuning control. The metal cabinet is handsomely finished in simulated mahogany woodgrain and gold.

10 ELEMENT YAGI

Designed in the Channel Master Laboratories, the BIG 10 is an ultra-sensitive 10 Element Yagi which provides over 12 DB gain on the single bay.

The BIG 10 incorporates Channel Master's impedance-matching feature, the Z-Match system, and can be stacked to produce over 14½ DB. This is 78% more gain than the single bay and more stacking gain than any other long Yagi. Excellent 300 ohm match is achieved for the stacked array. Stacking bars are free.

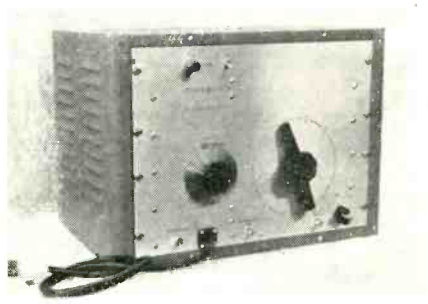


Two more exclusive features have been designed into the low band model of the BIG 10: In order to prevent crossboom "bounce", which causes picture flicker, this antenna is "boom braced." In addition, the serviceman need no longer contend with the awkward, longer crossbooms of the longer Yagis. The BIG 10's crossboom (on the Low Band) is a swaged, two piece unit which makes for a simplified stocking, handling, and installation. The BIG 10 is completely preassembled.

TV TEST EQUIPMENT

Three new precision test instruments are announced by the General Electric Electronics Division.

The instruments are a combination sweep and marker generator (Model ST-11A) designed primarily for factory use, and all-purpose five-inch oscilloscope (Model ST-2B), and a dual regulated power supply (Model ST-9A) intended primarily for laboratory use.



The ST-11A is a TV channel sweep combining sweep signal and markers for RF alignment of television head-ends and over-all systems. Its rugged, simple design (only two controls) makes it ideal for factory use. It features single knob selection of sweep/and from one to five marker frequencies simultaneously. A continuously variable capacitor type attenuator has a range in excess of 100 db. Output is one-quarter volt at 300 ohms balanced or 72 ohms unbalanced.

PRE-AMP COUPLER

The "Hide-Away" pre-amp coupler model EC-4 sells at a list price of only $44.50.

Four sets may be operated from each EC-4. Video signals are boosted by two r-f amplifier stages using the powerful, new 6BQ7 tubes. The result is a consistently brighter, snow-free picture with clear and true audio reception.

More information on the EC-4, "Hide-Away" pre-amp coupler may be obtained by writing the Advertising Department, JFD Manufacturing Co., Inc., 6101 16th Avenue, Brooklyn 4, N. Y.

NEW 4-WAY CONDUCTOR ROTATOR WIRE

Columbia Wire & Supply Company, Chicago, announces its new product, a 4-way conductor rotator wire. The twisted conductors make this new item a really compact cable.

It is suitable for all type of rotator antenna

Revolutionary VEE-D-X Super Power All-Channel Q-TEE

How the Q-TEE Functions

By Sydney E. Warner, VEE-D-X Chief Engineer

The Q-TEE is a new engineering approach to the all-channel TV antenna problem. Entirely new in design, this antenna incorporates a revolutionary feature, Electronic Channel Separators. The result is a unique antenna with better gain and directivity, higher front-to-back ratio, greater ease of assembly, increased mechanical strength and better appearance. Figure 1 shows the basic antenna assembly. On the low channels, elements (A-A) form a half-wave dipole, with elements (B-B) as the reflector. On the high channels, elements (C-C) form a full wave dipole with elements (E-E) as a half-wave director. Isolation filters (F-F) are anti-resonant at the center of the high channels (195 mc) and isolate the low channel dipole (A-A) from the high channel dipole (C-C). The center matching and phasing section performs a dual function and accounts for the unique operational characteristics of this antenna. In the high channels elements (D-D) are "T" match sections which tap the dipole (C-C) and provide a 300 ohm termination at (L-L). The high channel antenna

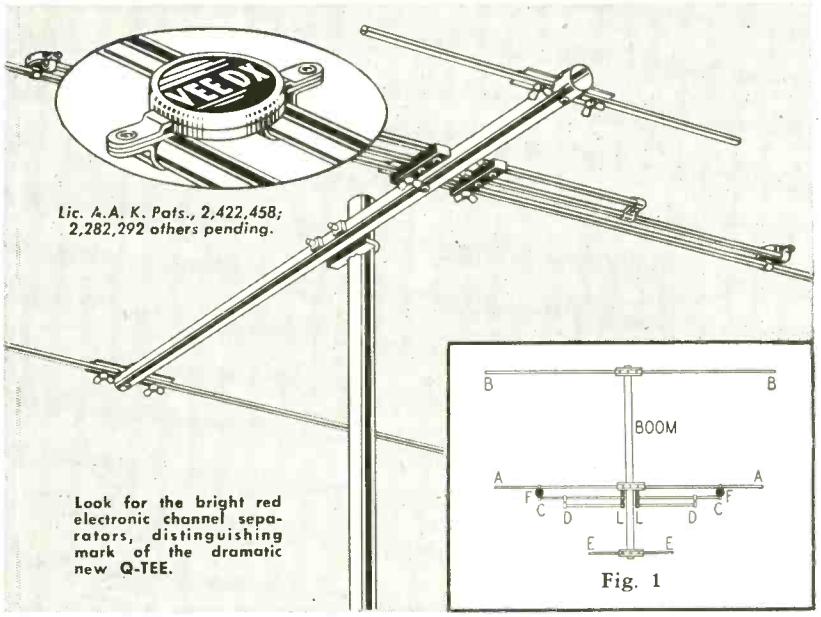


Fig. 1

Fig. 2

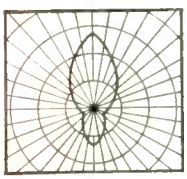
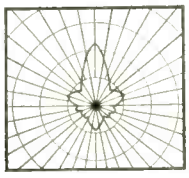


Fig. 3



is, therefore, a full wave antenna "T" matched, with a half-wave director. On the low channels the isolation filters (F-F) have a low impedance (inductive) since they operate below resonance. The high channel dipole (C-C) combined with element (D-D) form a double "T" match which taps dipole (A-A) to provide a 300 ohm termination at (L-L). The close proximity of (A-A), (C-C) and (D-D) provides a driven element with very low "Q". This low "Q" in effect represents a driven element of a large electrical diameter and which in turn accounts for the broad (all-channel) frequency characteristics of the antenna.

Figures 2 and 3 show the horizontal directivity pattern of the Q-TEE. Note that the directivity is quite pronounced. The front-to-back ratio on the low channels will run from 6 db to as high as 12 db. This is an important consideration in those areas where co-channel interference problems exist. On the high channels, the front-to-back ratio is as high as 8 db on the center of the band.

The directional characteristics of the antenna give less noise pickup since signals off the side and back are rejected to a much greater degree than they are in a conical type antenna. Conicals designed for good response on the high channels are poor on the lows, while those designed for the low channels are poor on the highs. Q-TEE does not have these limitations.

Featuring Patented Built-In

Electronic Channel Separators

VEE-D-X engineers have done it again! Here is the antenna that brings to all-channel reception the brilliant performance and clean design of the famous VEE-D-X single channel arrays, the "JC" and the "Long John". Patented Electronic Channel Separators plus amazing, newly engineered all-channel power give the Q-TEE better gain and directivity, higher front-to-back ratio, increased mechanical strength and better appearance. Light in weight, the Q-TEE has rugged VEE-D-X pre-assembled construction. It is ideal for all multi-channel requirements, easily adaptable for stacked arrays. The Q-TEE's pronounced directivity minimizes co-channel interference and results in less noise pickup. The Q-TEE has perfect 300 ohm match on all channels and a lower standing wave ratio than any other broadband antenna (maximum 1.15).

Q-TEE FEATURES

- All-Channel Performance.
- Ideal for Primary, Near Fringe and Fringe Areas.
- Higher Average Gain Than Other Broadband Antennas.
- Smaller, Lighter, Better Looking.
- Higher Uniform Gain Over All Channels.
- Better Front-to-Back Ratio.
- Perfect 300 Ohm Match on Both High and Low Channels.
- Lower Standing Wave Ratio Than Any Other Broadband Antenna.
- More Easily Installed and Stacked.
- VEE-D-X Pre-assembled Construction.

EASILY STACKED FOR FRINGE AREAS

SINGLE BAY *for primary areas.*

2-STACK ARRAY *for near fringe areas provides a gain increase of 40% or better.*

4-STACK ARRAY *for fringe areas provides a gain increase of 100% or better.*

Q-TEE is shipped pre-assembled and the elements fold open into position.

VEE-D-X

MAIL COUPON *for full information on the Q-TEE.*

THE LaPOINTE-PLASCOMOLD CORPORATION,
Windsor Locks, Connecticut

Gentlemen:

Send me full information on Q-TEE.

Name .....

Address .....

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

installation. This new 4-way conductor rotator wire is especially ideal for fringe areas.

The new wire is available in four and five conductors. This new product is typical of Columbia's efforts to provide the needs of the industry. Columbia will also introduce a number of additional products at the May Parts Show.

For further information, write Columbia Wire & Supply Co., 2850 Irving Park Road, Chicago, Illinois.

ANTENNA PHASING HARNESS

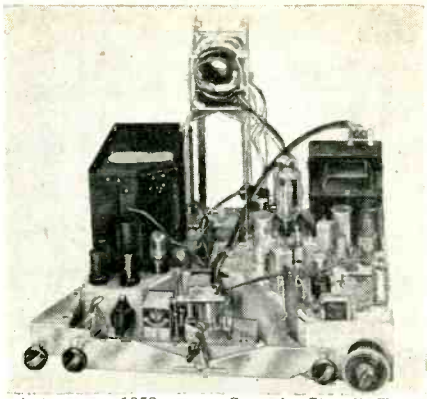
A specially engineered phasing harness (Model LJH) has been designed for stacking VEE-D-X Long Johns, the sensational new VEE-D-X 8-element Yagi, it was announced by Fred A. Hess, Sales Manager of The LaPointe Plascomold Corporation.

The usual half-wave spacing cannot be used with the LJ because of the excessive coupling effects between the 2 bays. In order to minimize this coupling effect and maintain 300 ohm match, it was necessary to design an entirely new type of harness.

Due to this unique phasing method developed by VEE-D-X engineers, a double-stacked Long John will produce 50% more gain than a single LJ. No other stacking method in any antenna, Mr. Hess stated, has never produced as high a gain increase.

630 TYPE CHASSIS

Mattison Television and Radio Corporation, 893 Broadway, New York 3, N. Y. announces the newest Mattison development . . . a 630 chassis with Tuneable Built-In Booster for better DX reception. The chassis is known as the "Mattison Silver Rocket 630 Chassis", and is the only chassis of its kind on the market today. Features of the new chassis are: In-

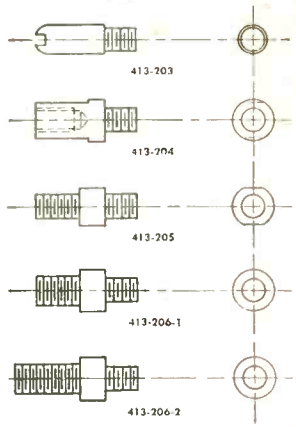


cludes new 1952 super Cascode Circuit Tuner with provision for UHF stations. Parallax Distortion corrected Deflection yoke for Razor-Sharp edge-to-edge focus. Tuneable Built-in Booster-Broad-bank pre-amplifier. Designed to increase the signal strength on all channels by a ratio of 10:1 without increasing noise or reducing picture quality. 14KV anode at operating condition. Full 4 megacycle over all video I.F. band width. Tube complement: 32 tubes. Will drive up to a 27" CRT.

Also available is the Mattison 630 Silver Rocket chassis without tuneable built-in booster. For complete information on the Mattison Television line write to 893 Broadway, New York 3, N. Y.

HIGH VOLTAGE CONDENSERS

Erie Resistor Corporation of Erie, Pennsylvania announces a new high voltage Ceramicon for TV sets which has been especially planned to answer the needs of the service man. The Style 413 Ceramicon, instead of the conventional terminals, has threaded sockets into which various types of terminals may be screwed to match the terminal combinations found in any of the various manufacturers' sets.



The Style 413 Ceramicon is insulated in a low loss thermosetting plastic which, the company states, provides a moisture seal of proven superiority. Ring convolutions are molded into the surface to provide a check against surface leakage often resulting from conducting deposits in ordinary handling. Descriptive literature will be sent upon request.

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See and hear Jensen's finest loudspeakers at the Audio Fair in Chicago, May 23-24, Conrad Hilton (Stevens) Hotel. Plan to attend the free "Jensen Silver Anniversary Sound Theatre," Tower Room, featuring the "Reproducer of the Future."

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PERSONNEL NOTES

Appointment of *William L. Parkinson* as Manager - Product Service of the General Electric Company's Receiver Department here, has been announced by W. H. Sahloff, general manager of the department.

A native of Philadelphia, Pennsylvania, Parkinson was graduated from Brooklyn Technical High School and Pratt Institute. He joined the General Electric Company at Bridgeport, Connecticut 12 years ago and within a year was promoted to Foreman Test and Inspection. He was later named Assistant Supervisor Test and Inspection and then Supervisor of Technical Service at Bridgeport. In 1947 he was transferred to Electronics Park as Supervisor of Technical Service. He has been in charge of receiver department product service since 1950 and until his appointment as Manager of that service.

Channel Master Corp., Ellenville, N. Y., has named three new District Sales Managers to intensify sales coverage of Channel Master television antennas, towers, telescoping masts, and accessories.

Edward S. Hill will call on distributors in the Southeast, *Sam R. Alexander*, the Southwest, and *Oscar K. Leisher*, the central Pennsylvania and Maryland territory.

Fred Miller, formerly Chief Engineer for Kaye-Halbert, has been promoted to the position of Director of Engineering and Research it was announced by Harry Kaye, President of Kaye-Halbert.

Joseph Holzman has been appointed industrial sales engineer for the Insuline Corporation of America, electronics firm. He will work out of the company's factory and main office in Long Island City, N. Y., according to Bernard L. Cahn, general sales manager.

Clifford E. (Skip) Bohmbach, Jr. has been appointed Vice-President and manager of the Sacramento Electronic Supply Company of 1219 "S" Street, Sacramento, Calif.

Irving Sarlin has been named manager of the New Jersey Factory Distributor, Allen B. Du Mont Laboratories, Inc., also announced was the appointment of *Ernest A. Marx* as Director of the International Division. A further appointment was that of *Lewis E. Pett as* Western District Manager for the Television Transmitter Division. Further appointments include *Lewis C. Radford*, Jr. who has been appointed eastern district sales manager for the Television Transmitter Division and *Robert I. Gaines* has been promoted to the post of Export Manager of the newly created International Division.

Milton "Mike" Roth, who has opened offices at 4397 Groveland Road, has joined the JFD Manufacturing, Inc. of Brooklyn, N. Y. as a sales representative. Mr. Roth, former national sales manager, jobber division, for Radiart, will cover western Ohio and Kentucky for JFD, offering all of the nearly 6,000 items manufactured by that organization.

Arthur E. Welch has been named assistant general manager of Bendix Radio-Television and Broadcast Receiver division of Bendix Aviation Corporation, Baltimore, Md., according to an announcement made recently by William A. Mara, general manager of the Division.

Stromberg-Carlson announces the following appointments: *Sidney R. Curtis*, former Vice President and General Manager of the Radio-Television Division, as Vice President in charge of government contracts; and *Clifford J. Hunt*, former General Sales Manager of the Radio-Television Di-

ANOTHER STANCOR "FIRST"


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San Francisco, Cal.


R. A. BEEZLEY
St. Louis, Mo.


ARTHUR M. BULLOCK
Kansas City, Mo.


HAROLD CHASE
Detroit, Mich.


WALTER S. COX
Oklahoma City, Okla.


LOTHAR E. DIETEL
Miami, Fla.


JOHN B. DONNER
Brookline, Mass.


SIDNEY S. FLEISCHMAN
New York, N.Y.


MAX FLEMING
Portland, Ore.


FRANCIS R. GIBB
Columbus, Ohio


ALBERT M. HAAS
Philadelphia, Pa.


W. J. INMAN
Dallas, Texas


IRVING J. KALUZNA
Chicago, Ill.


GEORGE KELSO
Denver, Colo.


STEADMAN LIDELL
Staten Island, N.Y.


JOSEPH MARTIN
San Pedro, Cal.


FRANK J. MOCH
Chicago, Ill.


JAMES F. PINTO
Buffalo, N.Y.


GERALD SOROKA
Los Angeles, Col.


WILLIAM A. STEED
College Park, Ga.


ELMORE S. WALTER
Milwaukee, Wis.

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The members of the Serviceman Advisory Board have been chosen from the best men in their locality. They have an average of 4½ years experience in TV servicing (except those in non-TV areas) and over 17 years of practical experience in electronics. Most of them are officers or active participants in local servicing organizations.

They know their business—and they know the serviceman's problems.

These men have been retained to help Stancor do a better job for you. They will work for you by advising Stancor on your replacement transformer problems. As we produce new components and publish new literature, the Serviceman Advisory Board represents YOU in our planning.

When new Stancor transformers are offered, they incorporate the practical suggestions of men like yourself, who are actively engaged in the servicing and maintenance of TV and radio equipment.

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vision, as General Manager of that division.

A. W. Keen has been appointed Manager of Application Coordination of Sylvania Electric Products Inc., it was announced recently. Also announced was the appointment of Donn F. King as East Central District Sales Manager of the Parts Division.

Milton J. Shapp, president of Jerrold Electronics Corp. manufacturer of Mul-TV master antenna systems, announced the appointment of *Robert J. Tarlton* to the post of Chief Field Engineer. Mr Tarlton succeeds *Caywood C. Cooley* who recently became the firm's sales manager.

At a recent meeting of the Board of Directors of Emerson Radio and Phonograph Corporation, *Mr. R. T. Capodanno* was elected Vice President in Charge of Engineering, in accordance with announcement made by Mr. Benjamin Abrams, President of the Company.

Appointment of *H. R. Letzter* as sales manager of the industrial division of Webster-Chicago Corp., manufacturer of record-changers, phonographs and magnetic wire and tape recorders, was announced by W. S. Hartford, vice-president in charge of sales.

A. M. Repsumer has been appointed television supervisor for the Baker Manufacturing Company, Evansville, Wisconsin, manufacturers of television fasts, towers and roof mounts.

A recent addition to the industrial sales staff of Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill. is *David Hughes*. Mr. Hughes formerly was director in the instrument school of the Industrial Training Institute, Chicago. Simpson's five plants in Chicago and Wisconsin make electronic and electrical instruments and testers.

Henry A. Browe has been appointed to the newly created position of sales manager for the radio division of Admiral Corporation, according to announcement by W. C. Johnson, vice president and general sales manager.

John J. Radigan, Jr., newly appointed Vice President in charge of Industrial Relations at P. R. Mallory & Co., Inc,, Indianapolis, assumed his duties recently.

In furtherance of Philco's expanding activities in electronic research and development, *Donald G. Fink*, one of the nation's leading electronic authorities, will join Philco Corporation on June 1st as Co-Director of Research-Operations, it was announced by William Balderston, president.

Thomas B. Kalbfus has been appointed general radio and television sales manager for the Westinghouse Electric Supply Company, it was announced recently by John F. Myers, president. In this capacity, he will be responsible for the distribution, sales, advertising, and promotion of Westinghouse radio and television receivers through the supply firm's 110 branches covering the United States.

Mort Barron has been appointed Assistant Sales Manager of CBS-Columbia, Inc., also announced was the appointment of Mr. George DiRado to the position of Assistant to the President. He succeeds Mr. Mort Barron, who was recently appointed Assistant Sales Manager for this company. A further appointment was that of Mr. Sidney Groves as a factory representative covering New York and Connecticut (with the exception of Metropolitan New York).

William Costello is the newly appointed manager of the Chicago sales region of the Capehart-Farnsworth Corporation, Louis J. Collins, the firm's director of sales, announced here recently. Also, Thomas D. Finley has been promoted to the position of field sales representative for the technical products division.

RMS Inc., New York manufacturers of television antennas and accessories announces the following new appointments to the company's production and engineering staffs.

Edward Cappucci is now Plant Superintendent for the firm. Under Mr. Cappucci is *Mr. Gene Reich* who heads the company's quality control section. He was formerly with the Magnavox Corporation. *Mr. Rubin Agdern* continues as Production Manager. Added to the sales engineering staff is Mal Greenberg who was formerly branch manager for Conlan Electric Corporation.

James A. Sullivan, better known as "Jimmy" throughout the industry, has recently joined the sales staff of Oxford Electric Corporation, speaker manufacturers. Mr. Sullivan will work directly under the vice-president and manager, Hugo Sundberg, who is now directing sales for the firm in addition to his other duties.

Milton J. Shapp, President of Jerrold Electronics Corporation, manufacturers of Mul-TV antenna systems and related products, announced the appointments of *Caywood C. Cooley* to sales manager and *Carl W. Schmelzle* to assistant sales manager. The appointments are a direct result of expanded sales activity.

TRADE LIT.

[from page 18]

the proper connections and adjustment of oscilloscopes in wave form observation of vibrators. There is also a complete chart of common wave forms and the interpretation of each.

This article will be of value to all service engineers and designers using vibrator power supply equipment.

The booklet is available at no charge through your James Distributor, or by writing directly to the James Vibrapowr Company, 4036 North Rockwell St., Chicago 18, Illinois.

John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. will list replacement parts in connection with service information in Rider Manuals and Rider Tek-File. This applies to TV, Radio and other equipment which will come into the hands of service technicians.

This program will commence with the servicing data being prepared for Rider Television Manual Volume 10 and with Tek-File beginning with TV Pack 57, which series will appear in May.

Standard Transformer Corporation's New Television Transformer Catalog and *Replacement Guide*, described as the largest and most complete TV guide in the industry, is now in the hands of distributors, Jerome J. Kahn, president, announced.

The new edition lists 2416 TV models and chassis made by 82 manufacturers, and lists 107 transformers in the catalog section.

Set up for easy reference, the guide lists manufacturers alphabetically. All models and chassis are listed in convenient numerical order and each replacement transformer is listed with the original manufacturer's part number for instant identification.

An initial printing of 50,000 copies is now in the hands of distributors where copies may be had without charge, or a copy may be secured directly from Standard Transformer Corp., 3581 Elston Avenue, Chicago.

Wirt Co., Philadelphia 44, Pa. has recently issued *Bulletin* #177 describing the company's complete line of wire wound potentiometers, wire wound rheostats, and slide switches, having a wide range of exacting applications in the electrical, electronic, appliance and test equipment fields.

P. R. Mallory & Co., Inc., Indianapolis, announces the completion of a *Product Index*, now available to provide specific information in condensed form concerning Mallory electrochemical, electromechanical, electronic and metallurgical products.

The catalog is not highly technical in nature but is designed to acquaint engineer and layman alike with basic data on available products. It includes brief descriptions of the specifications, features and applications of the complete line of Mallory batteries, capacitors, contacts, rectifiers, resistors, switches, vibrators, metals and ceramics, tuners and resistance welding supplies.

Copies of the Product Index can be obtained by writing P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Indiana.

The *second edition* of *General Electric's television receiver service guide* is now available to distributors, dealers and servicemen. With the first edition sold out within two months of its publication, additional information has been added to the 80-page publication which will increase its value in the field. The original 17 by 11 inch size, the fingerprint and dirt-resistant paper, and the binding, which allows the book to open flat, are features retained in the second edition.

Like the first, this new television service guide contains accurate information on 102 General Electric chassis, schematic diagrams with circuit symbol numbers, tube locations, top and bottom view and cabling diagrams of each model. It also supplies information on 10 RF tuners used in those chassis. The picture section, identifying every post-war GE television set, including the 24 inch, the resistor and ceramic and molded mica capacitor color code charts have been retained as valuable features of the publication.

As further information, two new charts have been added. One gives the channel frequencies and antenna dimensions for all VHF channels. The other gives I-F operating frequencies for all G-E television receiver models.

In addition, a new section has been added to the second edition, covering G-E's line of phono-accessories. This section contains complete specifications and prices for all G-E speakers, tone arms, cartridges, preamplifiers, styli and replacement styli for G-E variable reluctance cartridges.

The new edition of the TV Receiver Service Guide has been priced at $1.00.

Title: *Television Servicing.* Author: *Matthew Mandl.* Publisher: *MacMillan Company.* 421 pages, 295 illustrations.

Mr. Mandl's book should be of immense help to the operating serviceman. The reason for this is two-fold:

1. the theoretical analysis of television circuitry is clear and easy to follow.
2. the unique organization of the book's contents.

In reference to the first of these items, the writing is explicit and with a minimum of mathematics. The circuitry is not discussed in terms of an "ideal" theoretical set. The frame of reference used is the circuitry as actually utilized by TV manufacturers. The circuit diagrams are taken from the schematics the average serviceman runs into in his daily work. The point of the book, however, which most impressed the reviewer is the organization of the material. The first few chapters develop the various component sections of the TV receiver in their broad outline. This is followed by a Master Index of Troubles. This index lists various set problems and the chapter of the book in which these troubles are analysed. Thereafter the author proceeds to discuss a TV receiver unit by unit.

Mr. Mandl approaches each section of the TV set in terms of the troubles

which originate in that section. He discusses the circuit's general operation; the various approaches different manufacturers take on this operation; the service problems most likely to occur in the circuit and finally indicates the points in the circuitry which can cause these problems. He shows the effect of failure of various components in the circuit and how these failures show up in set operation.

FCC LIFTS FREEZE

[*from page 31*]

nity listed in the table and the only channel assigned to the community is reserved for education.

5. Authorizes a single class of commercial television station as contrasted with the three classes of stations (community, metropolitan and rural) previously authorized.

6. Makes channel assignments in 242 communities for non-commercial educational use. This compares with 209 educational assignments previously proposed. Forty-six such channels have been assigned to communities designated as "primary educational centers." Of the channels assigned for educational use, 80 are VHF and 162 are UHF.

7. Provides that television stations will operate in accordance with new tables of minimum and maximum power. Power can, however, vary with antenna height. Minimum effective radiated power is fixed at 50 kilowatts for stations serving a city with a population of one million or more; 10 kilowatts in cities with 250,000 to a million; 2 kilowatts for cities of 50,000 to 250,000; and 1 kilowatt for those under 50,000. Maximum effective radiated power on VHF channels 2-6 is fixed at 100 kilowatts; on VHF channels 7-13 at 316 kilowatts; and on UHF channels 14-83 at 1,000 kilowatts.

8. Establishes three geographic zones in the United States and the territories and possessions and assigns channels in accordance with minimum mileage separations designated for each zone. Co-channel assignment separations of 170 miles for VHF channels, and 155 miles for UHF channels, have been established for Zone I which encompasses the entire states of Massachusetts, Rhode Island, Connecticut, New Jersey, Maryland, Pennsylvania, Delaware, District of Columbia, Ohio, Indiana, Illinois, and parts of Maine, New Hampshire, Vermont, New York, Virginia, West Virginia, Michigan and Wisconsin.

Minimum co-channel assignment separations of 190 miles for VHF channels, and 175 miles for UHF channels, have been established in Zone II, which includes the territories and possessions, and the entire states of Kentucky, Tennessee, North Carolina, South Carolina, Missouri, Iowa, Minnesota, Arkansas, Kansas, Nebraska, Oklahoma, North Dakota, South Dakota, Utah, Idaho, Arizona, New Mexico, Montana, Wyoming, Nevada, Colorado, Oregon, Washington, and California, and parts of Maine, New Hampshire, Vermont, New York, Virginia, West Virginia, Georgia, Alabama, Mississippi, Louisiana, Michigan, Wisconsin and Texas.

Minimum co-channel assignment separations of 220 miles for VHF channels, and 205 miles for UHF channels, have been established in Zone III, which includes Florida and parts of Georgia, Alabama, Louisiana, Mississippi and Texas.

VIDEO AMPLIFIERS

[*from page 41*]

tween the top of L_2 and the bottom of C_4. This would be a result of the voltage across L and C being equal maximums and of opposite phase. However, if the voltage is taken off at the junction of L_2 and C_4 at resonance, the voltage taken off is only that across C_4. In the series peaked type of network, R_{L2} can be 50% larger than in the shunt peaking case for the same frequency response.

[*To be continued*]

ASSOCIATIONS

[*from page 16*]

Finance: Mr. Reed and Mr. Pete Stampo

Membership - Mr. Reich and Mr. Ulrich

Publicity - Penny Martin

Laws & Regulations - Mr. James Hershberg, and Mr. Ed Ross

Trade & Labor Relations - Mr. Paul Eisler and Mr. George Moreau

Member Cooperation - Mr. Morton Fredler and Mr. Robert Roetter

Below are listed many of the costs, seen and unseen, which go into the charges for your television service. When they are considered it is remarkable that the reasonable charges of capable and responsible service opera-

tors can be kept at such low levels as they are today. Every television owner ought to have this picture of costs every time he considers a television service bill.

Rent, heat, light.
Telephones.
Wages of non-productive employes.
Technical books and magazines.
Wages of technicians.
Mailing charges, postage.
Depreciation of trucks.
Public liability insurance.
Taxes and licenses.
Advertising.
Bad account losses.
Donations.
Holidays and other unworked time.
Social security tax.
Unemployment insurance tax.
Workmen's compensation insurance.
Association dues.
Depreciation of equipment and tools.
Loss of tools and equipment.
Truck insurance, including liability.
Call-backs.
Fire and casualty insurance.
Property damage.
Stationery and office supplies.
Cost of transportation.
Unproductive time.
Waste and spoilage allowances.
Non-productive supervisory time.
Miscellaneous.

Radio and TV Technicians' Guild of Florida

The Guild wishes to thank the Honorable Chelsie J. Senerchia, Mayor of Miami, for the timely talk on the past and future growth of Miami and the resultant possibilities this growth holds for the men engaged in our fascinating industry, the maintenance and preparing of the electronics equipment which has now become such a vital part of the life of this community.

Orchids to Sam Kessler and Mrs. Kessler for the grand job of arrangement. The turnout was one of which we can be truly proud. We also would like to toss a big bouquet to Charlie Pierce for the swell job he did at the G.E. Meeting. We were well represened there that night and it did us all a lot of good.

Mr. Roger Haines, newly elected Vice President of National Electronic Technicians and Service Dealers Associations, spent a brief vacation in our land of sunshine. He had to run back north after a few days in order to take care of business. While he was here he extended congratulations to the R&TTG for their work in this city. Let us hope that in the future all visiting radio men will be able to attend one of our meetings.

SHOP NOTES

[from page 38]

excessive rosin, sharp bends in wiring, etc.

LOCATING ARC: An arc can usually be located by visual inspection of the high voltage sources. A darkened room may be useful where the arc is very small. Increasing the arc by using a Variac to raise the line voltage may also be of assistance.

CORRECTING CORONA:

(1) Eliminate all sharp points, such as the junction of two components, by soldering connections heavily and forming smooth rounded joints free from sharp burrs and excessive rosin.

(2) If corona is emanating from insulating material, apply a coat of insulating varnish such as Westinghouse BT-2143 Tuffernell or equivalent. (It is imperative to use a varnish which will not form bubbles while drying.) Where necessary, several coats should be applied.

(3) Clear all H.V. areas of accumulated dust, grit, and residue. To wipe residue from connections and insulating surfaces, a cloth moistened with carbon tetrachloride is recommended.

(4) When corona appears at the termination of a wire, it may be suppressed by wrapping the wire-end with Scotch Acetate Woven Tape.

(5) Corona about an H.V. capacitor may be due to metallic paint on the capacitor. The paint should be removed with lacquer thinner or paint remover.

(6) Corona at tube pins and socket contacts (1V2, 1X2, 1X2A) can be corrected by filling tube socket contacts with "Lubriplate" and re-inserting tube.

CORRECTING ARCING: Arcing can usually be corrected by proper lead dress and spacing of H.V. leads and removal of dust and residue from insulators and components.

Materials used in correcting Corona and Arcing:

1. Scotch Acetate Woven Tape. (Minnesota Mining & Mfg. Co. 401 Broad St., Phila., Pa.)
2. Permacel Industrial Tape. (Industrial Tape Corporation, New Brunswick, N. J.)
3. Sheet Polyethylene V-8567 (18" x 20") (Westinghouse Electric Corp. Television-Radio Division, Sunbury, Pa.)
4. Irovolite Tubing V-6094-3 1/8" I.D., V-6094-6 1/4" I.D., V-6094-8 3/16" I.D., V-6094-10 5/16" I.D.)
5. "Tuffernell" Westinghouse BT-2143 or equivalent (1/2 pint)
6. "Lubriplate" (tube) (Fiske Bros. Refining Co. Newark, N. J.)

Admiral Service Dept.

CIRCUIT COURT

[from page 42]

(.01 μf) integrates the pulse to ground so that a saw-tooth voltage lasting through retrace time is developed. The tube will draw current during this time. As a result of a plate current flow a saw-tooth of voltage will be developed across *R704* the cathode resistor. The grid and cathode are tied together through *R705* (100K) so that effectively there is no grid bias.

The voltage at the top of *R704* is directly coupled through *R705*, *R706* and *R707* to the grid of V702 of the horizontal oscillator. *R707* (407K) and *C705* (.01) filter out any sharp noise pulses. The combination of *R707* and *C706* (.1 μf) will filter any 60 cycle interference from the circuit. *V702* is a sine-wave oscillator with common cathode coupling. This form of oscillator is comparatively steady. As in almost all horizontal oscillators the voltage on the oscillator grid is a determining factor as to when the oscillator will fire. *R709* is a vernier frequency control which governs the plate voltage of *V702B*.

The sync pulse is taken off the cathode resistor of V502, the sync separator. It is then fed to *V701* by *C702* (330 μμf). When the oscillator and sync pulse are in phase, the pulse will arrive in such phase relationship to the saw tooth being developed across R704 that their average d-c voltage when filtered out by *R704* and *C704* (.005 μf) will establish a d-c voltage on the grid of *V702*. This d-c voltage then becomes the reference point for proper operation of the oscillator. If the oscillator frequency is too high or too low, the average voltage developed will be greater or smaller. This in turn will cause the oscillator to fire either later or sooner whichever is required to bring the oscillator and the sync pulse back in phase. This following action of the oscillator and sync is critical in any set using keyed a.g.c. If the oscillator and sync are not in phase, the a.g.c. will be developed on the video information instead of the sync pulse Since the peak- to-peak value of the sync is at least 25% more than the maximum pix peak, the a-g-c output will drop considerably. This in turn causes the picture to over-drive to the point where it will usually cut the CRT off due to grid current flow.

TV CIRCUITS

[from page 25]

in decreased output which means insufficient width, decreased brilliancy, and poor linearity.

Other circuit variations will be found among the other stages of television receivers. Careful evaluation of deviations will usually indicate the particular servicing approaches necessary. A little time spent in circuit analysis will result in much time saved during servicing procedures.

LOOKING FOR TROUBLE?

[from page 37]

zontal sync. *TC111*, the horizontal Frequency Adjustment, and *C-154A*, Horizontal Lock Trimmer, are adjusted as part of the horizontal oscillator alignment, when this becomes necessary. This procedure is outlined in detail in the service manuals of all receivers having this type of a-f-c system.

A bad horizontal bending may indicate the picture is just on the verge of losing horizontal sync. This may be due to misalignment of the horizontal oscillator. The effect of rotating the horizontal hold control should be carefully noted. If there is misalignment, the hold is unusually critical, and a small rotation causes a complete loss of sync. In returning to the original position, the picture may fall into sync but have a bend. However, there is no further leeway in rotation to sync the picture further. That is, a bend which can be cured by alignment would most likely be indicated by the fact that the horizontal hold doesn't seem to have quite enough range to pull in the picture properly.

The waveform at the grid of the horizontal oscillator, *Fig. 2b*, is normal for this circuit. There is a damped train of oscillations of approximately 200 kc at the rate of 15,750 cycles. The first positive half-cycle of each train occurs while the tube is conducting, and encourages a fast discharge of the saw-tooth condenser, *C-161*.

4. b

Open condensers do not affect resistance readings and usually have no effect on voltage readings. Shorted condensers usually affect both. Since voltage and resistance readings are normal, the trouble is most likely an open condenser or one that has changed value. The trouble described points to a defect in the anti-hunt circuit - *C-156*, *R-182*. This circuit, together with *C-157*, acts to filter out the pulses of current through the a-f-c tube. An open *C-156* was the cause of the trouble.

C159, horizontal oscillator grid leak condenser, knocks out the operation of the horizontal oscillator completely when open. If *C-161*, the horizontal saw-tooth condenser opens, there usually is some horizontal saw-tooth production because of the associated capacity in the circuit, but the output is distorted.

UHF ANTENNAS

[from page 33]

12 and 16 bay arrays for fringe reception. See *Fig. 6*.

The slot antenna has promise at UHF because of its inherently broad band characteristic. Design trend will probably lean toward the cylindrical slot type, as this adapts itself to the use of tubular elements in the dipole sections. The slot antenna is essentially two large tubes joined at one point, and fed 180° away from the join. The

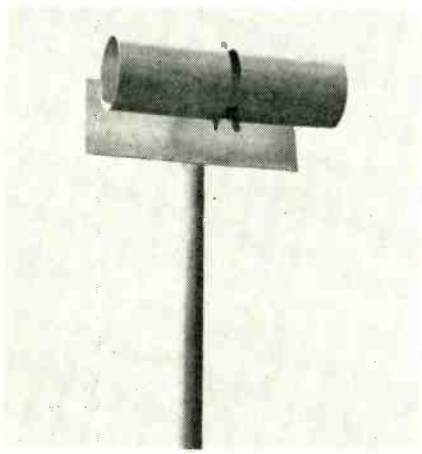

Fig. 7. Cylindrical Slot Antenna

ratio of the width of the join to the tubular circumference is critical, and determines the center operating frequency. With the proper reflectors this antenna will have a characteristic curve close to that of the corner reflector or sheet reflector types. Because the dipole element is of the low Q variety it adapts itself to stacking without resort to critical phasing harness arrangement. See *Fig. 7*.

Other accessory equipment will probably in the initial stages not prove

to be very successful at UHF. Lightning arrestors that are perfectly good high impedances to ground at VHF may cause line loading at the high range, although good at lower frequencies. Transmission lines as previously mentioned have a long way to go before being acceptable by VHF standards. The signal itself at UHF will usually exhibit a finer picture detail due to the immunity to noise pickup at these frequencies. Antennas will be much more critical to orientate, and what is probably more important, harder to properly locate due to the shading effect of terrain, buildings etc. In summation it looks like UHF will really be a big business when stations start telecasting in this range. High power transmitters coupled with intelligent receiving installations should come close to giving coverage equal to present VHF.

SYNC PULSES

[from page 20]

up to a substantial net." Experts know and can prove without the slightest equivocation that in each and every case of handling a radio or TV service job there are variables and factors which in themselves MUST determine what price that particular job must bring in order to show a profit for the operator. No fixed-fee basis can ever work out. Take the time-factor as a basis. If a technician gets paid a wage of $1.50 per hour his boss can not possibly send him out on a job that even requires 10 minutes travel time in each direction, plus 10 minutes inspection time at the job, for a basic service fee of as little as $3. Mathematically the boss only had a 75c labor cost on the job, but when the other factors such as overhead, taxes, insurance, social security allowances and justifiable markup are added, the boss will find that he wound up using a skilled technician's time for a break-even deal at best, whereas if he had not committed himself to do that estimate for a basic $3 he might have charged $4 and wound up with a small profit. The morale is simply this: portal-to-portal pay time must be calculated as part of any service job, and while the hypothetical job we mentioned only required 10 minutes to and from as waste, the boss (or independent operator) should have figured how much he or his technician could have earned had he been on the bench working that 30 minute period instead of merely travelling and estimating.

AD INDEX

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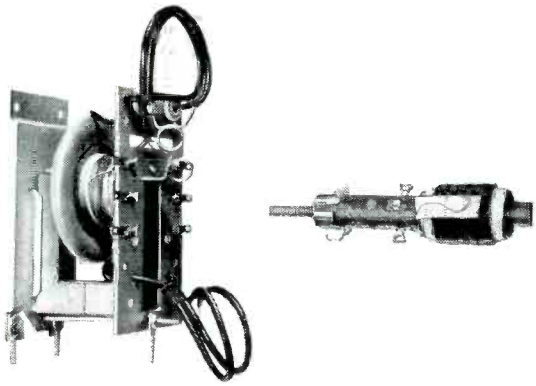

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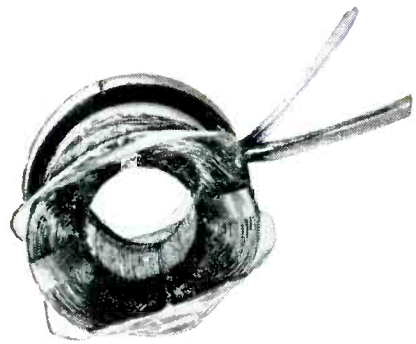

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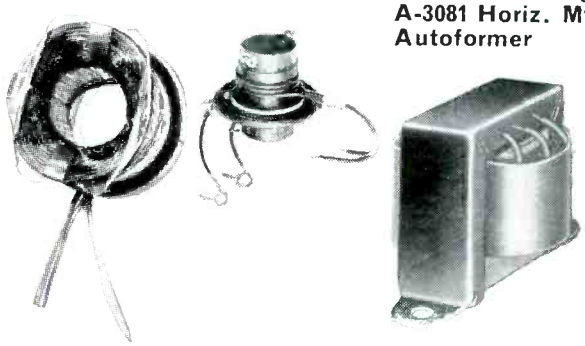

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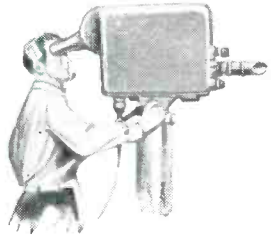

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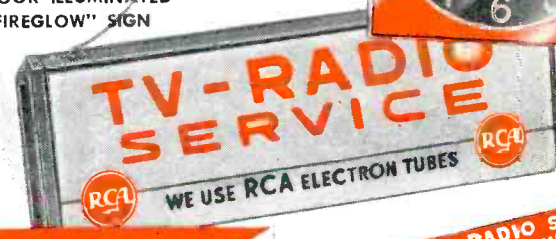

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