JANUARY, 1952

Radio-Television SERVICE DEALER

The Professional Radio-TVman's Magazine

IN THIS ISSUE:

AM-FM-TV-SOUND

MERIT

TV full-line* Components For Improvement, Replacement, Conversion

SELL IMPROVED RECEPTION

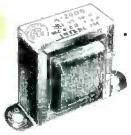
MERIT "TV" Kit No. 1000 consists of *matched* units for sharp, edge to edge focus — the MDF-70 Cosine Yoke, the HVO-7 Universal Flyback and the MWC-1 Width Linearity Control. Keep a MERIT "TV" Kit handy on service calls — when you spot fuzzy edge focus you'll get plus business and a reputation for real "know-how."

MERIT MDF-70 . . . original of the "cosine" series — low horizontal and high vertical inductance. Now used by such famous sets as Radio Craftsman, the cosine series will improve 10,000,000 sets now on the market!

MERIT . . .
HQ for TV Service Aids

MERIT'S new 1952 Catalog #5211 is now available . . . *introducing MERIT IF-RF Coils* and giving complete MERIT Coil and Transformer data and listings. Other MERIT service aids for TV improvement, replacement and conversion problems: TV Replacement Guide #404, September 1951 issue — covers 3000 models and chassis of 82 manufacturers; Cross Reference Data on IF-RF Coils, Form #14. Write: Merit Coil and Transformer Corporation, 4425 North Clark Street, Chicago 40, Illinois.

These three MERIT extras help you:



..... Exclusive: Tapemarked with specifications and hook-up data

- Full technical data packed with every item
- Listed in Howard Sams Photofacts

*Merit is meeting the TV improvement, replacement and conversion demand with a line as complete as our advance information warrants!

BURTON BROWNE ADVERTISING

the MOST POWERFUL TV ROTATOR on the market

CONSISTENTLY DEPENDABLE ROTATORS

TELE-ROTOR

Power When And Where You Need It...To Turn Any TV Antenna Array Under All Weather Conditions

When your customers want an antenna-turning device, it is YOUR RESPONSIBILITY to sell them one that will do the job best day in and day out... night in and night out! This covers considerable ground... but the TELE-ROTOR fills the bill! STURDY enough to hold any array... POWERFUL enough to rotate it under all weather conditions... DEPENDABLE because it offers long-lasting, uninterrupted service! Give them the best... they'll thank you for your recommendation!

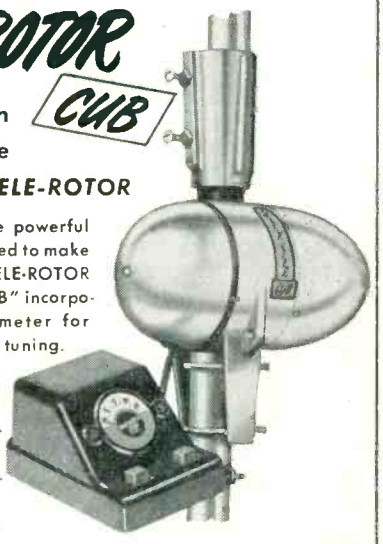
MODEL TR-2 ... complete rotator with "COMPASS CONTROL" cabinet having illuminated "perfect pattern" dial .... (uses 8 wire cable) **$49.95**

THE *RADIART* CORPORATION
CLEVELAND 2, OHIO

CORNELL-DUBILIER
SOUTH PLAINFIELD, N.J.

TELE-ROTOR CUB

Second Only In Power To The Heavy Duty *TELE-ROTOR*



Featuring the same powerful motor that has helped to make the 'heavy duty' TELE-ROTOR so famous, the "CUB" incorporates a sensitive meter for utmost accuracy in tuning.

MODEL 502B .... complete rotator with indicating meter control cobinet for "hairline" tuning ... (uses 5 wire coble) ... $44.95

EDITORIAL

by S. R. COWAN

About Servicemen's Associations

Three years ago we were privileged to address the Radio Servicemen's Ass'n of Luzerne County (Wilkes-Barre, Pa.). It must have been a hot meeting. (The building caught fire just as our lecture ended.) Shortly thereafter we received a nice but joshing letter from the Ass'n's secretary. He also said: "Our entire membership voted to subscribe to "*Service Dealer*" which accounts for the 26 subscriptions enclosed." Last year that same Ass'n's secretary sent us 42 orders representing the entire membership and the other day we were delighted to receive Wilkes-Barre's latest roster—this time 81 subscriptions.

We report this, not to brag about how nicely the W-B fellows support this magazine, but rather to show how much growth and progress the Radio Servicemen's Ass'n of Luzerne County has been able to make in 3 short years. The Ass'n's officers and members deserve congratulations. So do the set owners who are served by these men. Why? Because the record shows that W-B technicians earn slightly better than average national wages (for that type and size of community)—and more important: that the radio-television set owners of Wilkes-Barre and vicinity are subjected to much less racketeering and gypery than are those of most other communities. (Wilkes-Barre papers—please copy!)

In simple words—a good progressive servicemen's association benefits the members and the customers they do business with.

Californians Need Organizing

The RTA (Radio Technicians Ass'n of Southern California, Inc.) is comprised of 6 independent but inter-related chapters. Each enjoys growing membership and increased public acceptance. RTA members on the average earn much more than non-members, and their records for honesty and fair-dealing, according to the police, are positively a credit to the profession. But, because no single RTA chapter has a large enough membership to justify it to claim to represent the entire servicing profession for that particular community, all servicemen there are being subjected to some ridiculous laws or threats of same.

Frankly, most of the West Coast's legitimate service dealers and technicians are taking an undeserved beating from both unscrupulous competitors and politicos. Proper organizing would be the quickest and most efficient solution to the problem. Thus we urge every qualified technician in Southern California to contact and join RTA at once—and we urge the technicians of Northern California to affiliate with their southern brothers into an integrated State-wide organization.

Sanford R. Cowan
EDITOR & PUBLISHER

Samuel L. Marshall
MANAGING EDITOR

COWAN PUBLISHING CORP.
67 WEST 44TH ST.
NEW YORK 18, N. Y.

VOL. 13, NO. 1 **JANUARY, 1952**

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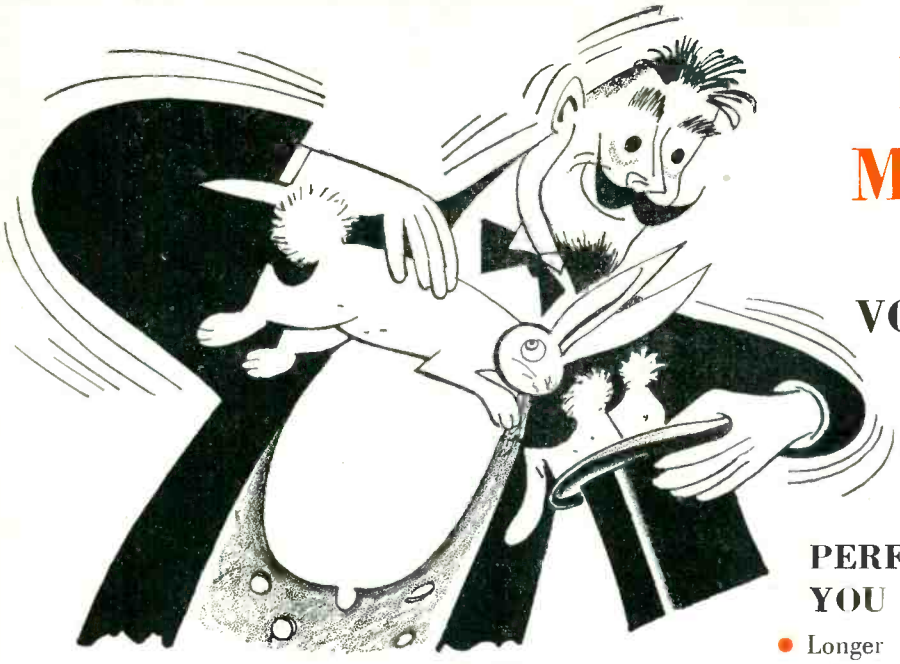
RADIO-TELEVISION SERVICE DEALER is published Monthly by Cowan Pub. Corp., 67 West 44th St., New York 18, N. Y. Subscription price: $2 per year in the United States, U.S. Poss. & Canada: elsewhere $3. Single Copies: 25c. Reentered as second class matter Sept. 25, 1950 at the Post Office at New York, N. Y. under the Act of Mar. 3, 1879.

It's no trick to make 'em fit . . . fast!



MALLORY MIDGETROL®

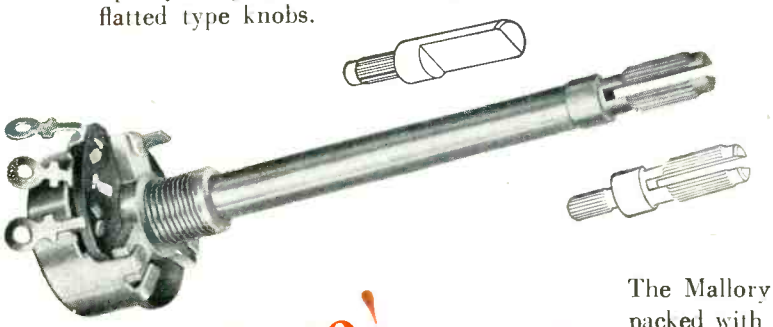
ROUND-SHAFT VOLUME CONTROLS

FAST, EASY INSTALLATION

- Because of the wide and easy adaptability of Mallory Midgetrols, it's easy to stock—or get fast from your distributor—just what you need to do your job.
- Round tubular shaft designed and built for fast, easy and accurate cutting.
- Factory-tested AC switch may be attached instantly without disassembling control.
- Speedy adaptability to both split-knurl and flatted type knobs.

PERFORMANCE YOU CAN COUNT ON

- Longer lasting resistance elements even in extremes of temperature and humidity.
- Better and more accurate taper curves resulting from precision processing methods.
- No pigtail connections to break, thanks to Mallory's exclusive sliding contact which gives EXTRA quiet operation.
- Minimum wobble with Mallory's exclusive 2-point shaft suspension.



So versatile are Mallory Midgetrols —both standard and dual—that they reduce by 40% the cost of inventory needed to service the 10 most popular makes of radio and TV sets.

The Mallory Midgetrol is shown with the two shaft ends packed with every control to permit easy use of split-knurl or flatted type knobs. The Mallory Midgetrol line, in addition to round shaft standard controls, includes dual concentric controls that offer fast, easy assembly in five steps *without* special tools. Front and rear sections are factory assembled and inspected. AC switch attachment is easy.

Make Sure!
Make it Mallory!

P. R. MALLORY & CO. Inc.

MALLORY

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS • RECTIFIERS • VIBRAPACK* POWER SUPPLIES • FILTERS

*Reg. U.S. Pat. Off.

APPROVED PRECISION PRODUCTS

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

TRADE FLASHES

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

RTMA Statistics

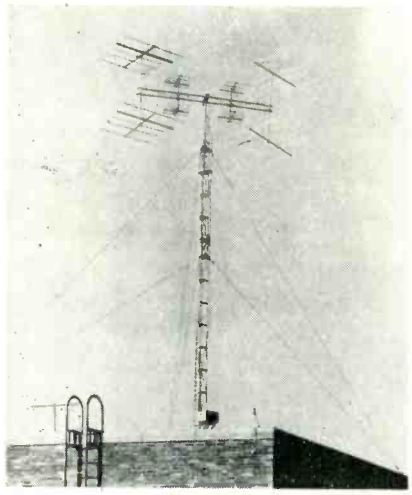
More than four million television receivers and 10.9 million radios were manufactured in the first ten months of 1951, the Radio-Television Manufacturers Association reported. RTMA pointed out, however, that this represented a decrease of more than 2 million of both radios and TV receivers under the production in the corresponding period of 1950.

Copper Saver

The National Video Corporation, manufacturers of television picture tubes, announces the development of a new black and white picture tube designed to save four to four-and-a-half thousand tons of copper a year. Advantages of the new tube include sharper focusing and better contrast between black and white by utilizing the principle of magnetic focusing. The new tube permits focusing without the use of a focus coil which is present in current sets. Co-inventors of the new tube are Edgar W. Morse, and C. V. Fogelberg.

Unusual Installation

This photo illustrates the use of Yagi antennas in a multi-channel area. This installation was made at Statler Hall, Cornell University for use on channels 12 (Binghamton), 6 (Rochester), and 5 (Syracuse). These channels are roughly 60, 80 and 40 miles respectively from Cornell,



and it is for this reason that only an array of Yagis such as this could expect to produce top performance. The two double-stacked Vee-D-X JC Yagis are for channel 6 and channel 5. The horizontal 4-stacked Vee-D-X JC Yagi is for channel 12. The whole set-up is supported by a 40 foot Vee-D-X sectional tower for extra height.

CBS-Columbia Expansion Program

Mr. David H. Cogan, President of CBS-Columbia Inc. announced a five million dollar expansion program with the purchase of approximately 275,000 sq. ft. additional manufacturing space for the production of television and radio receivers. He stated that this is the first step in CBS-Columbia's multi-million dollar expansion program.

With the company's present manufacturing facilities in Brooklyn, this new plant located in Long Island City, New York will make available a total of over 500,000 sq ft. of space.

Du Mont Original Replacement Parts Available To Servicemen

Replacement parts for Du Mont Telesets are being made available to servicemen through jobber channels, it was announced by Allen B. Du Mont Labs., Inc.

The Du Mont replacement items will be packaged individually and clearly marked for the serviceman's convenience as, "Original Television Parts." It is expected that the number of parts packaged will increase as the distribution plan widens in scope.

Jobbers carrying the line will be equipped with crossreference literature, point-of-sale promotions, and announcements to their serviceman customers.

Sylvania Receives Service Management Award

The National Alliance of Television and Electronic Service Associations recently presented its first annual "Friends of Service Management" industry award to Sylvania Electric Products Inc.

In a brief ceremony at Sylvania's executive headquarters, 1740 Broadway, New York, Frank J. Moch, President of NATESA, handed a plaque symbolizing the award to Sylvania President Don G. Mitchell. The in-

BUSS FUSES Sell Easier-

STAY SOLD...

Help You Make More Profit

USE THIS COUPON —Get All The Facts

Yes, BUSS fuses sell easier because they are better known. You never have to spend valuable time selling the BUSS brand — your customers know the name BUSS because it has been the accepted standard of unquestioned quality in fuses for more than 37 years. Fuses for industrial, commercial, farm, automotive and home use.

And, BUSS fuses stay sold... because every BUSS fuse is of uniformly high quality... every fuse is electronically tested... every fuse is checked for physical dimensions. That's why there are no "kicks" or "comebacks" with BUSS fuses.

These important safeguards build customer goodwill and confidence in your company.

Bussmann Mfg. Co.,
University at Jefferson,
St. Louis 7, Mo.
(Division of McGraw Electric Co.)

SD-152

Please send me bulletin SFB containing complete facts on BUSS small dimension fuses and fuse holders.

Name..... Title.....

Company.....

Address.....

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

Left to right: Frank Moch, Don G. Mitchell, B. K. Wickstrum and Terry P. Cunningham of Sylvania, and Russell G. Cummings V.P. of Alliance.

dustry award to Sylvania was voted at NATESA's first annual convention in Chicago last month.

"Treasure Chest" Booty For Servicemen

Russ Jimieson, of the Walker-Jimieson Company, RCA Tube Distributor in the Chicago area, receives one of the new custom-built tube and tool carrying cases, equipped with special dealer service aids, which are being offered by the RCA Tube Department in its current "Treasure Chest" promotion. Beaming approval is Max Branigan, Manager of RCA Renewal Receiving Tube Sales. Each dealer and serviceman who purchases 10 RCA kinescopes during the promotion will receive from his RCA Tube Distributor seven valuable service aids packed in the handy tube-and-tool carrying case.

RTMA Launches Education Program

A triple-pronged educational and information program designed to provide more trained service technicians to improve service practices in the radio-television industry has been launched by the Radio-Television Manufacturers Association.

RTMA's program involves the recommendation of television servicing courses in the approximately 2,500 vocational schools and in as many

Be Sure of Your Installations Get the *Aptitude-Tested* RG/U TRANSMISSION LINE CABLES

● You know what you are doing when you use Belden RG/U Transmission Line 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-R W. Van Buren Street
Chicago 44, Illinois

APTITUDE RATING No. 8236		APTITUDE RATING No. 8237		APTITUDE RATING No. 8238		APTITUDE RATING No. 8239		APTITUDE RATING No. 8241		APTITUDE RATING No. 8240	
Frequency (Mc)	Attenuation per 100 ft	Frequency (Mc)	Attenuation per 100 ft	Frequency (Mc)	Attenuation per 100 ft	Frequency (Mc)	Attenuation per 100 ft	Frequency (Mc)	Attenuation per 100 ft	Frequency (Mc)	Attenuation per 100 ft
100.	2.65	100.	2.10	100.	1.90	100.	2.90	100.	3.75	100.	4.10
200.	3.85	200.	3.30	200.	2.85	200.	4.20	200.	5.60	200.	6.20
300.	4.80	300.	4.10	300.	3.60	300.	5.50	300.	7.10	300.	8.00
400.	5.60	400.	4.50	400.	4.35	400.	6.70	400.	8.30	400.	9.50

Belden *Radio* **WIRE** — **The** *Aptitude-Tested* **LINE**

adult educational schools as possible throughout the country.

To further this program RTMA has engaged the Radio Corporation of America Institute to write a three-year vocational high school syllabus on radio and television and a 10-12 months syllabus for adult educational institutions. The courses are being edited by Gilbert Weaver, Training Director of the New York State Board of Education.

H. L. Kunz Appointed Sangamo Gen'l Mgr.

Sangamo Electric Company, Springfield, Illinois, announces the appointment of H. Laurence Kunz as General Manager of the Capacitor Division, located at Marion, Illinois. He will make his headquarters at the

H. L. Kunz

Marion factory. Mr. Kunz has served as Sales Manager of the division during the past six years, and prior to that as Assistant General Sales Manager.

Howard W. Sams Announces Service Aid

Two major new steps to simplify and speed up the radio-television service technician's use of test equipment and his service work were announced as regular features of Howard W. Sams & Co.'s Photofact folders.

First, effective with Photofact Set. No. 154, soon to be in distributors' hands, reproductions of actual wave forms taken at representative points in television receivers will be included in standard notation schematics.

Secondly, voltage values will be incorporated in standard notations at the tube pins, Howard W. Sams, publisher, announced.

These two additional new features of Photofact folders are the direct

STOP! DON'T PASS THIS PAGE

...until you've read about SYLVANIA'S power-packed Service-Dealer Campaign

Talk about an exciting, sales-building Radio-TV Service Dealer campaign! Mister, this is it!

Featuring personal endorsements of some of the most glamorous and newsworthy people in the entire country, this campaign ties you in with big-space ads in *Life, The Saturday Evening Post, Collier's* and *Better Homes and Gardens.*

Just see what you get: . . . brilliant life-like cut-outs of the celebrated stars . . . counter cards, streamers, appealing mailers . . . also radio spot announcements, and reminder stickers. You pay only two cents per prospect per month for the mailers. The rest is FREE. Don't delay! Call your Sylvania distributor or mail coupon N-O-W!

SYLVANIA

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

Sylvania Electric Products Inc.
Dept. R—2801, Emporium, Pa.

I'd like full details about Sylvania's big 1952 Campaign for Service Dealers.

Name_____

Street_____

City_____ Zone____ State_____

result of a continuing survey on the part of the Sams organization in the technical field to keep the Photofact folder service abreast of the needs of its users, Sams pointed out.

Larry LeKashman Joins Electro-Voice

Appointment of Larry LeKashman as a Vice-President of Electro-Voice, Buchanan, Michigan, is announced by Al Kahn, President.

Former Advertising and Sales Promotion Manager of the Tube Department of RCA, Mr. LeKashman comes to Electro-Voice with a wide acquaintance and unique experience in the radio-electronics field.

Before his association with RCA, he was Vice President and General Manager of Radio Magazines, Inc., publishers of *Audio Engineering* Magazine and *CQ* Magazine. He was also for many years, Radio Editor of *Aero Digest*.

As an enthusiastic radio "ham", he has blazed many trails in this field. His call letters W2IOP are widely known, and he is the recipient of many awards in this field. He was one of the first to foster the establishment of the new Novice class ham license.

Metallic Rectifier Booklet

An Authoritative article entitled "Metallic Rectifier Design and Application," written by Julian Loebenstein of Radio Receptor Company, Inc., New York, has just been released in booklet form.

"Metallic Rectifier Design and Application" is available free upon request to Radio Receptor Company, Inc., Seletron Rectifier Division, 251 West 19th Street, New York 11, N. Y.

Halldorson Announces Stepped-Up Line

The greatest line of transformers in the history of the company is how the Halldorson organization describes its stepped-up line of transformers for the Radio and Television replacement market, in an announcement received from the president, Mr. P. J. Halldorson.

A new and comprehensive catalog-manual is now available, according to Mr. Halldorson's announcement. It includes not only a complete television and auto replacement guide, but also other useful information to make it an informative sales manual as well as catalog. Items have been re-numbered for quick selection and easy use.

A copy of the new catologue may be obtained from a Halldorson authorized distributor or by writing direct to the Halldorson Company, 4500 North Ravenswood Avenue, Chicago 40, Illinois.

Recent Promotions & Appointments

Hytron Radio & Electronics Co., A Division of Columbia Broadcasting System, Inc., Salem, Massachusetts, recently promoted George Deters to Sales Manager in the Midwest section.

The appointment of E. W. Merriam as service manager of the Radio and Television Division of Sylvania Electric Products Inc. has been announced by John K. McDonough, general sales manager of the division.

Fred H. Garcelon has been appointed Eastern Sales Manager for Hytron Radio & Electronics Co., A Division of Columbia Broadcasting System, Inc., Salem, Massachusetts.

Ralph R. Shields, formerly engineer for Sylvania Test Equipment Merchandising has been appointed Mer-

Ralph R. Shields

chandising Supervisor for the Television Picture Tube Division, according to an announcement by Raymond W. Andrews, Manager, Factory Sales.

Harold S. Stamm, member of the RCA Tube Department since 1945, has been appointed Manager of Ad-

Harold S. Stamm

vertising and Sales Promotion of the Department, succeeding Lawrence LeKashman, who resigned.

Rauland - the Original

LOW FOCUS VOLTAGE ELECTROSTATIC TUBE

Perfected in Rauland Electronics Laboratories, this tube that gives edge-to-edge sharpness of focus without coils and magnets is proved and ready as the materials pinch becomes painful

BETTER in all ways! Gives better over-all focus—hair-line sharpness from edge-to-edge—with NO critical materials for focusing . . . and STAYS SHARP under considerable variation in line voltages.

REQUIRES NO re-engineering of present television chassis . . . NO added high voltage focus circuit . . . NO added receiver tubes . . . NO additional components except an inexpensive potentiometer or resistor.

FOCUSES by using D.C. voltage already available in the receiver.

ELIMINATES focusing coils and magnets . . . saves critically scarce copper and cobalt.

• • •

This new Rauland development is now available in substantial quantities in 17 and 20 inch rectangular tubes. For further information, address . . .

THE RAULAND CORPORATION

Perfection Through Research

4245 N. KNOX AVENUE • CHICAGO 41, ILLINOIS

ASSOCIATION NEWS

National Alliance of Television & Electronic Service Associations (NATESA)

The following men were elected officers of NATESA:

Frank J. Moch, President; James O. Hustad, Secretary; Bertram L. Lewis, Treasurer; Russell J. Cummings, Eastern Vice-President; Milton McMillian, Central Vice-President; Klarsfeld, Eastern Secretary; Joe J. B. McDowell, Central Secretary; Joseph M. Robin, Western Vice-President.

New Associations.... The following associations affiliated with NATESA during the Convention:

Associated Radio & Television Service Dealers, Columbus, Ohio. Represented by J. P. Graham, Treasurer.

Television Service Engineers, Inc., Kansas City, Mo. Represented by Wade Williams, President; J. B. McDowell, Secretary; Ray Crawford, Treasurer; Donald Day; M. Thomason; Mac Metoyer; Walter Niswonger.

California TV Service Dealers Association, Inc., Hollywood, Calif. Represented by Joseph M. Robin, General Manager.

Certified Television Electronics Association, Baltimore, Md. Represented by Selman M. Kremer, Vice-President.

Radio Service Dealers Association of Kansas, Inc., Wichita, Kan. Represented by Bill Nichols, Chairman of Board; Ted Combs, President Wichita Chapter; W. A. Rosenberg, Executive State Secretary.

Radio Television Service Association, Minneapolis, Minn. Represented by John W. Hemak.

National Electronic Technicians and Service Dealers Associations (NETSDA)

At a meeting held in Washington, D.C., on Sunday Dec. 9, 1951, the following proposed code of ethics was submitted:

1. To, at all times perform my work to the best of my ability and knowledge. In addition, I will make a sincere effort to improve my knowledge of the technical and business requirements of my profession, thereby enabling me to render more competent service.

2. To use, whenever possible, original factory replacement parts, or when this is impracticable, to use parts of equal or superior quality.

3. To exercise special care in handling customers property.

4. To guarantee all service which has been performed, and parts which have been replaced by me for a period of 90 days unless otherwise specified.

5. To charge a fair and just price for all work and to prominently display these prices.

6. To refrain from unfair and unethical practices, misleading or untruthful advertising, unreasonable promises or statements, unjust or unfair criticism of other technicians or any conduct which might lead to lack of confidence in myself or in my fellow technicians.

Submitted by: James T. Daly

Federation Of Radio Servicemen's Associations Of Pennsylvannia, Chapter Activities

At the December meeting of the Federation which was held in Harrisburg in the Hotel Harrisburger the following officers were elected to head the Federation of Radio Servicemen's Association of Pa. for 1952:

Chairman—Dave Krantz of Philadelphia Radio Servicemen's Association.

Vice-Chairman—Milan Krupa of Luzerne Co. Radio Servicemen's Ass'n (Wilkes-Barre).

Corres. Sec.—Leon Helk of Lackawanna Co. Radio Servicemen's Ass'n (Scranton)

Rec. Sec.—Bill Lansberry of Blair Co. Radio Service Engineers (Altoona).

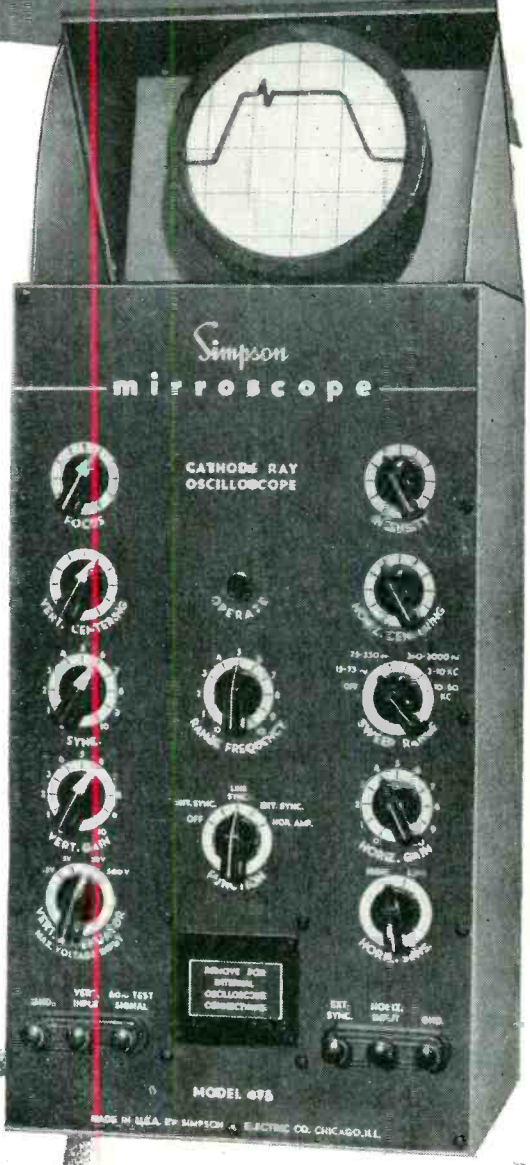
Treas.—Fred Schmidt of Mid-State Radio Servicemen's Ass'n (Harrisburg)

The Federation will sponsor and publish its own monthly news bulletin in order to keep each individual member of each Chapter fully informed of what progress the Federation and the individual Chapters are making in their behalf on the various issues that confront us daily. It will also feature stories by the various association heads, and technical information supplied by the various manufacturers

[*Continued on page 32*]

FRANK J. MOCH, president of the National Alliance of Television and Electronics Service Associations.

Frank J. Moch says— "there is no other OSCILLOSCOPE like the NEW Simpson MODEL 476 MIRROSCOPE"



Simpson's new and completely advanced type of oscilloscope—Model 476 MIRROSCOPE—is designed to eliminate certain inherent disadvantages found in the conventional type of oscilloscope by use of the "Mirroscope principle." In this kind of construction the 5-inch cathode ray tube is mounted in a vertical position, thus reducing bench space requirements to an area of only 9" x 8" thereby permitting better concentration of associated equipment for any type of test procedure. The cathode ray image is reflected from an optical type front surfaced mirror mounted in the adjustable cover at the top of the cabinet bringing the viewing surface of instrument near eye level when instrument is used on benches of normal height. The mirror angle is quickly and easily adjusted to any position of the operator. The cover with integral side wings forms an effective shield against external light sources or may be closed down for protection of the tube and mirror when the instrument is not in use. The upright construction permits location of controls and connections for maximum convenience and allows for internal cathode ray tube connections at the front of the panel instead of the rear.

SENSITIVITY:

Vertical direct.....12 volts rms per in.
Vertical amplifier.20 millivolts rms per in.
Horizontal direct.....14 volts rms per in.
Horizontal amplifier.....38 millivalts rms per in.

INPUT IMPEDANCE:

Vertical direct.....10 megohms, 15 mmf.
Horizontal direct...10 megohms, 15 mmf.
Vertical amplifier.300,000 ohms, 30 mmf.
Horizontal amplifier.....500,000 ohms, 15 mmf.

Horizontal trace expansion is over 4 times tube diameter. This makes it possible to examine minute portions of a response pattern for finer detail.

Linear Sweep frequency is continuously adjustable in five overlapping ranges from 15 cycles to 60,000 cycles. Internal, external or line frequency synchronization with variable amplitude is available.

Means for intensity or "Z axis" modulation is provided. Approximately 14 volts peak will blank a trace of normal intensity.

The vertical amplifier frequency response is within 3 DB from 20 cycles to over 300,000 cycles and is usable to well over three megacycles. Square wave slant and over-shoot is held to less than 5 per cent of amplitude. This response will be found adequate for all phases of television receiver service including observation and diagnosis of Sync. signals.

TUBE COMPLEMENT:

5UP4	Cathode Ray Tube.
4—6J6	Horizontal and Vertical Amplifiers.
1—12AU7	Vertical pre-amplifier.
1—6J6	Linear Sweep oscillator and Sync. injector.
2—6X4	High voltage rectifiers.

LINE VOLTAGE: 105-125 volts, 50 60 cycles.

SIZE: Height 16¼"; Width 9⅛"; Depth 8" over all

WEIGHT: 25 lbs.; Shipping weight 30 lbs.

Hight Frequency Crystal Probe...$7.50

DEALERS NET PRICE including operators manual $179.50

CONSERVE CRITICAL MATERIALS

SIMPSON ELECTRIC COMPANY
5200 W. Kinzie St., Chicago 44, Ill.
Phone: Columbus 1-1221
In Canada:
Bach-Simpson Ltd., London, Ontario

BURTON BROWNE ADVERTISING

REMEMBER THESE CBS-HYTRON TV FIRSTS?

16RP4
original *studio-matched* rectangular picture tube.

12BH7
twin-triode sweep amplifier with superior efficiency.

1X2A
compact, high-voltage TV rectifier.

6BQ6GT
25BQ6GT
extra-performance deflection amplifiers.

NEW 12BY7
Very-high-gain miniature pentode amplifier. Gives gains — within its power capabilities — equal to those of 6AG7. As video amplifier, provides better contrast in high-quality TV receivers. And in low-cost receivers, adequate amplification at low plate voltages.

NEW 12BZ7
High-mu, 9-pin miniature dual triode. Especially designed for sync. separators and sync. amplifiers, high-gain audio amplifiers, and gating circuits.

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Servicing

PICTURE TUBE INPUT CIRCUITS

by **MATTHEW MANDL**

(Co-Author: Television and FM Antenna Guide)

Three types of popular picture tube input circuits are described. Possible component failures in these circuits and their effects on the picture received are discussed as well as picture tube defects and their effects.

THE grid and cathode circuits of the picture tube in television receivers are critically designed. Defects in components give rise to many of the common troubles encountered as parts age or voltage differences occur. Symptoms include poor brilliancy, uncontrolled brilliancy, poor picture quality, incorrect background levels, intermittent operation, and noise streaks in the picture.

Additional symptoms can occur because of defects in the picture tube, though often the latter may produce symptoms which are similar to those which would occur if defects arise in the associated circuits. This comes about because the associated circuits involve several input sections including the brilliancy control, d-c restorer, and peaking coils, as well as the 4.5 megacycle trap. For this reason an understanding of the modern circuits involved with picture tube input systems and their common troubles is of particular value to the servicing technician.

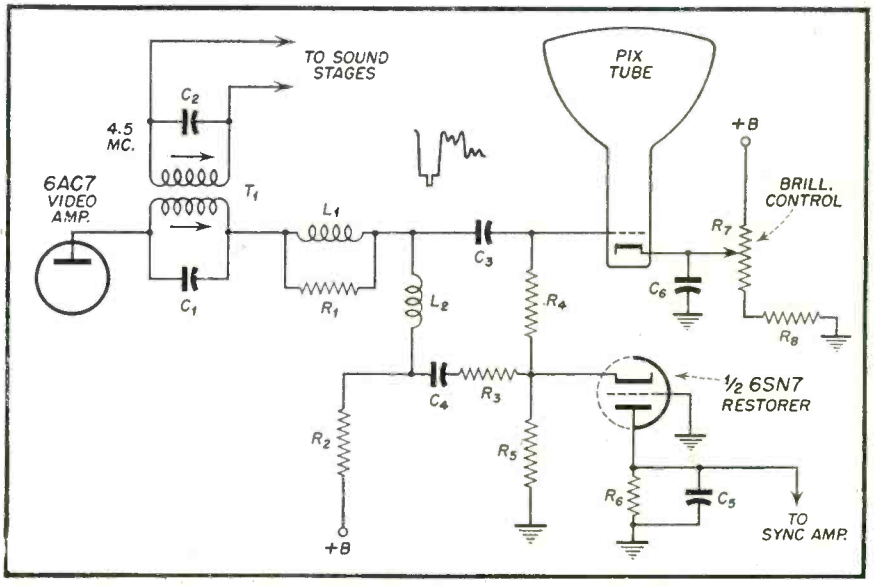


Fig. 1. Conventional capacity-coupling between video amplifier and picture tube grid.

Signal Input Methods

There are several input methods utilized in modern receivers and a typical one is shown in *Fig. 1*. This method is used by Garod in their Series 94 receivers. Here capacity coupling is used between the plate of the video amplifier and the grid of the picture tube. A combination 4.5 megacycle trap and sound take-off transformer is included in the plate circuit of the video amplifier as shown. L_1 is the peaking coil and R_1 is to reduce the Q of the inductance to prevent over-peaked high frequency response. L_2 is the shunt peaking coil which also improves high frequency response. R_L is the load resistor across which the signal information develops, while C_3 is the coupling capacitor to the grid of the tube.

The two series resistors, R_4 and R_5, are the grid leak for the picture tube. The cathode circuit has plus "B" applied to it by the variable potentiometer. Inasmuch as this determines the amount of bias between grid and cathode, it will control the intensity of the electron emission of the cathode and thus effect brilliancy. (The more plus the cathode is with respect to the grid, the more minus the latter is with respect to the cathode.)

When capacity coupling is used the d-c level of the picture signal must be restored by use of a crystal diode or vacuum tube restorer. This main-

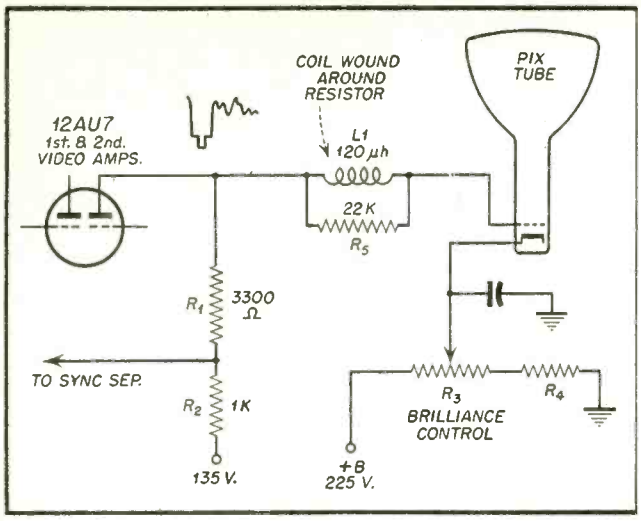


Fig. 2 Direct-Coupled grid injection of picture signal.

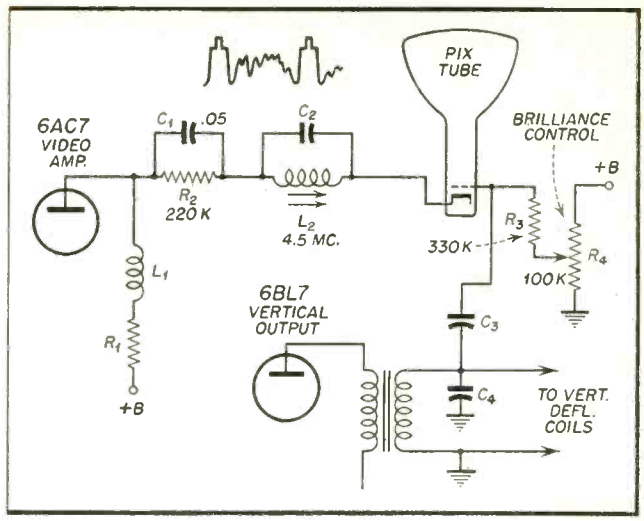


Fig. 3. Direct-Coupled cathode injection of signal.

tains the proper brilliancy for the transmitted scene and functions essentially as an automatic brilliancy control. (See "The D-C Restorer" May 1951 issue of Radio Service Dealer.)

Inasmuch as the blanking levels of the signal must reach the cut-off level of the tube, the video signal must be negative-going when the method of coupling shown in *Fig. 1* is utilized.

Figure 2 shows another type of input system used by Olympic in their 922 receivers. Here, direct coupling is used, that is, there is no intervening capacitor or transformer which would cause loss of the d-c level. For this reason no restorer circuit is required. Inasmuch as the grid must still be negative with respect to the cathode, however, provisions must be made to counteract the plus voltage furnished the plate and thus also appearing at the grid. This is done by increasing the cathode potential. By making it more plus than the grid, the latter will be minus with respect to the cathode. Again, a variable potentiometer permits regulating the amount of bias to the picture tube and thus the brilliancy.

Inasmuch as this receiver is not an intercarrier type, no 4.5 megacycle trap is used. On occasion, however, a 4.5 megacycle trap will be found in such receivers to minimize any heterodyning action which would occur between the picture and sound signals at the video detector. With properly adjusted sound traps in the video i.f. circuits, however, there would be little need for a 4.5 megacycle trap in the picture tube input circuit.

Figure 3 shows a picture tube input circuit in which the video signal is applied to the cathode rather than the grid. Inasmuch as signals to tube inputs are actually applied across both the grid and cathode, the method shown in *Fig. 3* requires a plus signal to the cathode so that the equivalent signal on the grid will still be minus. Inasmuch as this is an intercarrier receiver, C_2 and L_2 form a 4.5 megacycle filter. C_1 and R_2 is the coupling network and the resistor establishes direct coupling. Again, the d-c level is not destroyed and no restorer is necessary.

As with several other modern receivers, a portion of the vertical output sweep waveform is applied to the grid of the picture tube via C_3. This places negative-going vertical rate pulses on the grid and each time they occur they drive the grid negative and cut off the tube. This assures that complete blanking occurs during the vertical retrace and, therefore, is an automatic retrace eliminator circuit.

Inasmuch as plate voltage now appears on the cathode because of the direct coupling utilized, the grid potential is also made slightly plus so that proper bias relationship between grid and cathode are maintained. Depending on the type tube used, the brilliancy control should be capable of varying the bias from approximately zero voltage to fifty or sixty volts minus. The circuit shown in *Fig. 3* is the type used in the Bendix television receivers, Models 172 and C200. As with the circuits shown in *Figs. 1* and *2*, however, similar coupling methods are encountered in virtually all modern receivers.

Trouble Shooting

There are a variety of troubles which occur in the type of circuit shown in *Figure 1*. One of the most common defects is a leaky coupling capacitor, C_3. When this capacitor develops a high resistance leakage, some of the plus "B" from the plate of the video amplifier will appear at the grid of the tube and thus decrease the bias. This will give an excessively bright picture and at the same time reduces the effectiveness of the brilliancy control. Picture detail will also suffer, the amount depending on the degree of leakage. In checking for this condition a vacuum-tube voltmeter can be used to measure the potential difference existing between the grid and the cathode circuits. With the negative probe applied to the grid and the positive to the cathode, the brilliancy control should be varied and a considerable voltage range should be secured. Inability of the brilliancy control to develop a negative potential in excess of thirty or forty volts may indicate a leaky coupling capacitor. The actual leakage of the capacitor can be ascertained by disconnecting it from the circuit and taking an ohmic reading with the vacuum-tube voltmeter set on the R x 1 megohm scale. The ohmic value should be in excess of 500 megohms for proper operation.

The 4.5 megacycle trap can cause trouble if it is not tuned properly to resonant frequency. In *Fig. 1* both the primary and secondary sections have variable slug cores and adjustments of the primary section in the plate circuit will trap out this frequency from the picture tube grid because it offers a high impedance as a parallel resonant circuit. When the 4.5 signal is applied to the input grid circuit of the picture tube it can cause a multiple finely-spaced vertical line structure on the screen. Besides this, the high frequency signals can cause transient oscillations which could cause repeat lines to appear after any straight-edge vertical picture information. This is sometimes referred to as "ringing" or "echo" effect and resembles ghost reception somewhat.

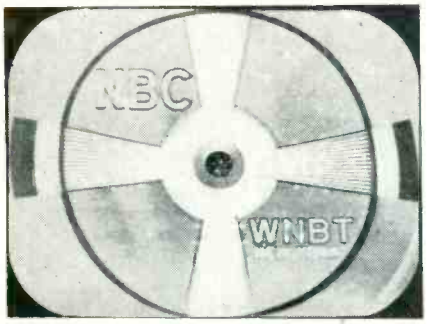


Fig. 4 Picture tube pattern with excess brilliancy.

except that the line displacement is very close.

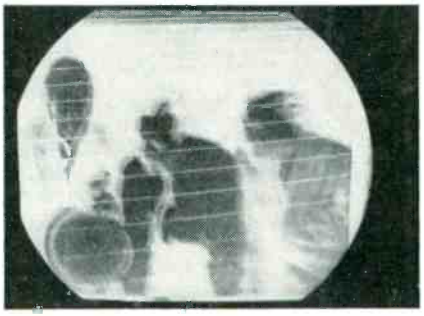
Improper adjustment of the secondary slug will reduce the sound output because a maximum transfer of energy will not be secured for the sound i-f frequency. When the secondary is properly tuned, not only does sound output increase, but more of the 4.5 megacycle signal is absorbed from the video amplifier circuit and in consequence, less would appear at the grid of the picture tube.

Defects in either the series peaking coil, L_1, or the shunt peaking coil, L_2, will impair picture quality. The series peaking coil is usually wound around the shunting resistor and when this coil becomes defective it should be replaced with one of identical value in order not to upset circuit performance. A common trouble here is that the coil opens because of the plate current which flows through it. When the shunt peaking coil opens the video amplifier will not receive plate voltage and there will be no output and in consequence no picture. (The raster would, of course, still be visible.)

A defective C_4 capacitor or R_3 resistor will affect restorer performance. The same holds true for the tube or R_6. R_6 provides a voltage drop for sync take-off purposes and defects in either R_6 or C_5 would also effect both the vertical and the horizontal sync stability. When d-c restorer function is lost the average background of the picture will not be true.

A defective brilliancy control can cause streaks in the picture if the control is noisy. An ohmmeter can be used across the movable arm and either side of the brilliancy control to check performance. The receiver should be shut off and the arm gradually turned. There should be a smooth rise and fall of the ohmmeter needle if the control is operating properly. A defective or open resistance will destroy the bias level and the picture will assume excess brilliancy which cannot be controlled by the potentiometer. In such an instance the picture detail will still be fairly good as shown in *Fig. 4*. This is in opposition to the loss of both picture quality and brilliancy control when the coupling capacitor develops a leak.

Coupling capacitor troubles do not, of course, occur in the circuit shown in *Fig. 2* because of the direct coupling feature. Bias troubles can, however, develop because of the changes in potential differences which could occur between the grid and the cathode. Thus, any change in power supply voltage or in the value of resistors R_1, R_2, R_3, and R_4, can change the two plus relationships of grid and cathode. When this happens the bias can be excessive which would give an overly dark picture or the bias could be too low and thus produce an overly bright picture. In either case the brilliancy control would be unable to provide a satisfactory variation in brightness. Again, a vacuum-tube voltmeter can be used to read the potential difference between the grid and the cathode while the brilliancy control is varied. Voltage checks can also be taken from grid to ground and cathode to ground in order to ascertain whether the plus voltages indicated on the service schematic are correct. In the circuit shown



Fiig. 5. Typical picture produced as a result of a negative image.

in *Fig. 2*, for instance, the plus "B" applied to the brilliancy control circuit should read 225 volts as against the 135 volts applied to R_2 of the plate circuit.

A defect in the peaking coil, L_1, would affect fine picture detail as previously detailed for *Fig. 1*. These coils usually open up and can therefore be checked with an ohmmeter. As shown in *Fig. 2*, the shunting resistor is 22,000 ohms but the resistance of the peaking coil is so small that it would indicate a closed circuit unless it were read on the lowest scale of the ohmmeter. It is better to disconnect the resistor when making this check in order to get an accurate reading.

In the schematic shown in *Fig. 3*, the 4.5 megacycle trap is not used as a combination sound take-off as with *Fig. 1*. For this reason a misadjusted trap will not effect sound, though it

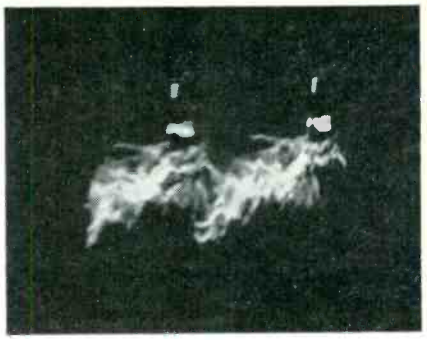


Fig. 6. Scope pattern of video signal.

would cause finely spaced vertical line interference. In most instances this trap can be adjusted while watching the screen and turning the slug until the line structure disappears. If the coil of this trap, L_2, opens, the average background will be lost because the d-c level will be destroyed. C_2 will still provide coupling and the picture would still appear on the screen. Again, an ohmmeter can be used to check this coil with the set turned off.

An occasional appearance of retrace lines would indicate that the capacitor C_3 has opened.

Picture Tube Troubles

Some of the symptoms previously listed could also occur if the picture tube is defective. A defective picture tube will, if slightly gassy, exhibit a tendency toward excess brilliancy. Before tube replacement is attempted, however, the brilliancy control and grid and cathode voltages should be checked as previously detailed. Poor picture detail could also occur if the picture tube is defective, though here again, peaking coils and other circuit components should be checked first.

Insufficient brilliancy may be caused by an improperly adjusted ion trap or by the wrong type trap for the tube in use. The bent gun tubes require a single ion trap, while the straight gun types usually call for a double magnet ion trap. Check with a tube manual to see that the proper trap is used for this can effect performance and incorrect usage can damage the tube. Rotate the ion trap while moving it forward and back to get maximum picture brilliancy. Never use the ion trap to eliminate corner shadows. If the ion trap must be placed virtually next to the focus coil for maximum brilliancy, it is usually an indication that the magnetic fields of the ion trap are deficient. When the permanent magnet type ion traps are used a new one should be procured. If the older type inductance traps are utilized, coil current should be checked and an ohmic reading taken to see

[*Continued on page 36*]

U-H-F CONVERTERS

by **ALLAN LYTEL**

Two other u-h-f converters are discussed in this installment. The G. E. features a crystal mixer (1N72) and adjustable tuned line circuits. The Zenith employs a separate u-h-f strip inserted in the regular v-h-f turret tuner of the receiver. Other unusual features are outlined in the text.

FIGURE 1 is the General Electric Translator Model UHF-101 for UHF conversion. Connections to the television receiver may be seen in *Fig. 2*. As is common practice in VHF position, the standard antenna is connected directly to the receiver; in UHF position, the UHF antenna is connected to the input of the converter. Converter output at a frequency of 82 mc is fed into the receiver on either Channel 5 or 6. Frequency adjustments are provided for either channel to be used. *Fig. 1* is a schematic of this converter. Two adjustable tuned lines are ganged; the first being the tuned input and the second, oscillator tuning. The 6AF4 oscillator is capacitively coupled into the crystal mixer circuit. Type 12AT7 is used as a two-stage i-f amplifier whose output frequency may be adjusted. The first section of this tube uses a tuned cathode input with a grounded grid, and the second stage has the signal input to the grid with the output taken between plate and cathode.

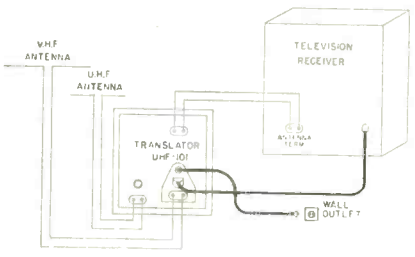


Fig. 2. Method of feeding u-h-f and v-h-f antennas into converter.

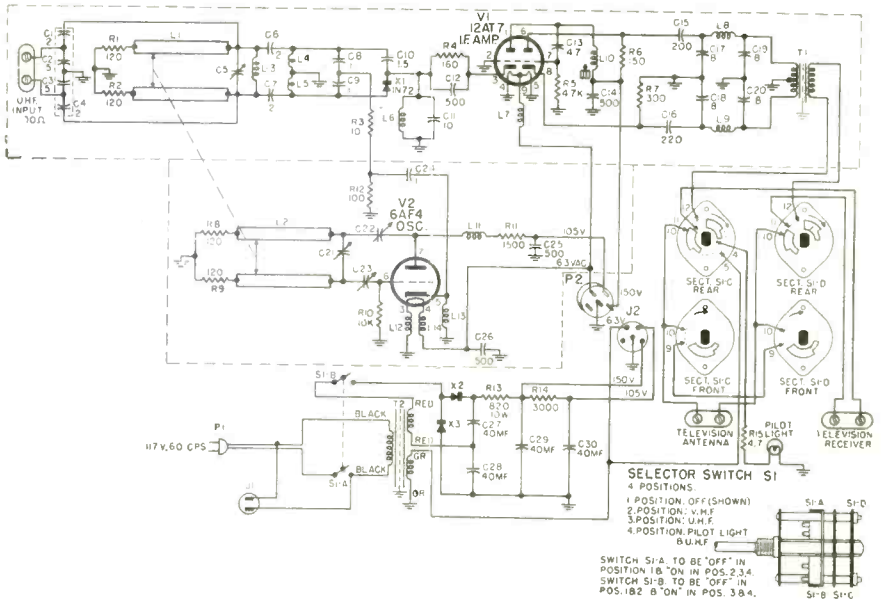


Fig. 1. Circuit diagram of General Electric Translator, Model UHF 101. Note use of 1N72 crystal mixer.

This unit has a self-contained selenium rectifier in a transformer type power supply. This allows the unit to be used independently of the receiver and it may thus be connected to any model television receiver.

Zenith UHF TV System

Rather than use a converter with a separate UHF oscillator, mixer and amplifier with the associated power supply, it is possible to actually use a UHF Channel Strip in the VHF TV Turret Tuner. This leads to the most direct, simple and least expensive method of using the VHF receiver for UHF Telecasts. Zenith Radio Corporation uses such a system which has been successfully demonstrated in the Bridgeport tests. The features of the VHF receiver must be understood first, since they are an important part of the operation of the UHF system.

Its local oscillator operates below the high channels and above the low channels which reduces the range required of the oscillator to cover all of the VHF Channels. In the 54 to

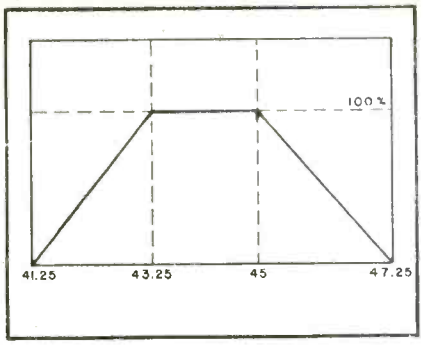


Fig. 3. Symmetrical i-f bandpass required by Zenith converter.

88 mc band the oscillator operates above by the i-f frequency and on the 174 to 216 mc band the oscillator operates below by the same i-f frequency. This type of local oscillator system is unusual and requires a symmetrical i-f pass band as shown in *Fig. 3*. The relative positions of the sound and picture carriers are reversed and the i-f pass band must have the same shape at both ends. Intercarrier sound is also used. This reduced oscillator range on the VHF band means that the oscillator has a smaller range to cover when used on the UHF band where the VHF oscil-

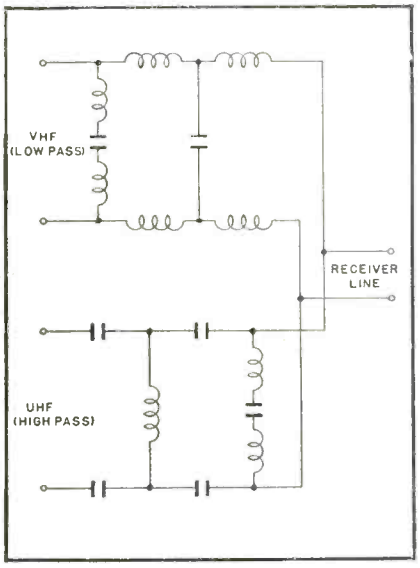


Fig. 4. V-H-F and u-h-f antenna filters used in converter.

lator is still the local signal source after being frequency multiplied in the channel strip.

A second problem involved in this system is the use of the VHF antenna. With a strong signal for the UHF station, the same antenna can be used for UHF as for VHF. Where it is needed, a manual switch can be used to allow a separate UHF antenna to be used on UHF stations and the regular antenna to continue to be used for the VHF operation. It is possible, by use of the high pass and low pass filter in *Fig. 4* to have both antennas tied in parallel. A single transmission line is used to bring both signals to the receiver input terminals through the filter. VHF signals pass through the low pass section, are presented by a high impedance by the high pass filter, and pass down the common line to the receiver. In the case of the UHF signals, they are passed only by the high pass section from which point they also use the common line to the receiver. In this manner, both antenna systems operate without interference from each other. *Fig. 5* shows the bottom view of this filter without the case.

The placement of the UHF strip in the Tuner is seen in *Fig. 6*. In the foreground may be seen the VHF local oscillator, mixer and r-f amplifier. By means of the contacts shown, the UHF strip uses the VHF tuner and converts this into the UHF tuner system. This strip contains a preselec-

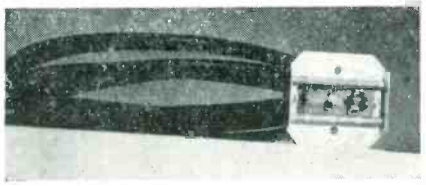


Fig. 5. Bottom view of antenna filters.

tor tuned circuit, a crystal frequency multiplier which obtains its signal from the VHF oscillator, a crystal mixer (or detector), coils which are used to change the input and output circuits of the r-f amplifier, and coils for changing the input circuit of the converter. The converter plate circuit remains unchanged. *Fig. 7* compares the VHF and UHF operation of this tuner.

Part A is the normal or VHF position where the 6CB6 is the r-f amplifier, the 6AG5 is the mixer, and the 6C4 is the local oscillator. Frequency changes are accomplished, as channels are changed, by the VHF channel

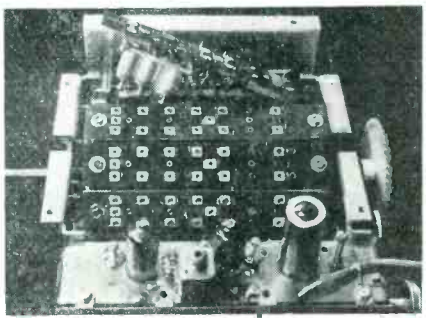


Fig. 6. U-H-F channel strip in place on the v-h-f turret tuner.

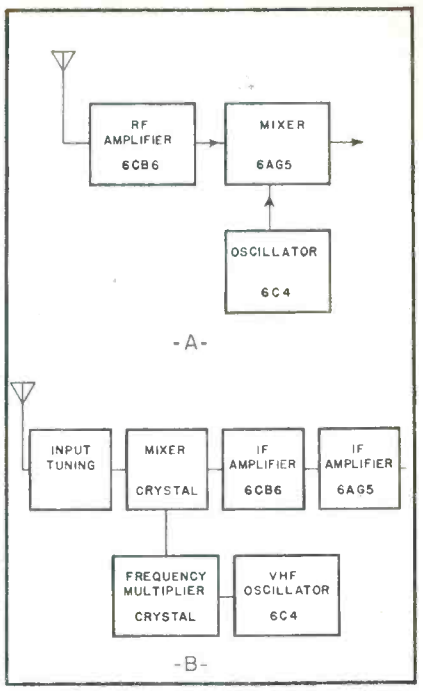


Fig. 7. V-H-F/U-H-F block diagram of turret tuner.

strips and the Fine Tuning Control which tunes the oscillator over a small range. In the UHF position, or where the UHF channel strip is used as in Part B, all of the above tubes are used. However, only the oscillator retains its original function. A crystal multiplier uses the VHF signal source (the local oscillator) and feeds a second crystal acting as a mixer.

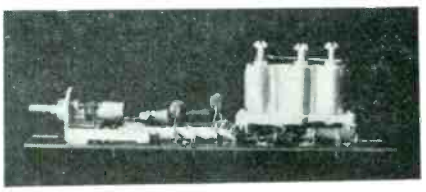


Fig. 8. U-H-F Channel Strip.

Since at this time there is no effective and inexpensive r-f amplifier for this UHF band, only a tuned input without an amplifier tube is used. The original r-f amplifier is changed into an i-f amplifier as is the original mixer. Thus the 6CB6 and 6AG5 tubes act as a two stage i-f amplifier.

Figure 8 shows the construction of the UHF channel strip; the casting at the right is the housing for the three tuned circuits for the mixer, r.f. and multiplier stages. These tuned circuits are small coils resonating with their distributed capacity and the capacity to the tuning screw shown at the top of each. Factory tuning of each section is thus possible over a wide tuning range.

Know "WHY" Ceramic Capacitors...

Here are the facts about Ceramic Capacitors — why they are the most permanent capacitors . . . why they do a better job . . . give a better performance . . .

Up until a few years ago, capacitor design was based on one idea — "the bigger the better." Paper and mica, etc., were cheap, readily available materials, and their use was the only known art for making commercial capacitors (or "condensers" as they used to be called).

Now don't misunderstand us . . . those old condensers were really OK as far as they went. *But today there's something more to talk about* . . . CERAMIC CAPACITORS.

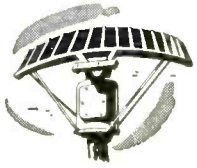
Actually, the idea of ceramic capacitors isn't new. They've been used as electronic components for more than 20 years. We call them new because it's only in the last few years that service-engineers have paid any attention to them . . . and because some of these modern ceramic capacitors really are new . . . with *new* higher voltages, *new* and better physical characteristics. So if ceramic capacitors were overlooked by service-engineers during the last few years . . . we feel it's because you didn't know about just how *good* they really are—or because what you needed wasn't available.

Let's take a look at modern ceramic capacitors and the story behind them. It was in the early 1900's when German scientists discovered the dielectric properties of ceramic materials. In the U.S.A., we had an abundant supply of mica and other materials, so U.S. research men never bothered with ceramics. Then came World War I, and ceramics became mighty important in European radio manufacture. Ceramics were a long way from perfected but they did the job . . . and continual improvement made them increasingly important in the electronic field. Meanwhile, at Centralab, we had started to investigate these new materials. It was soon found that U.S.A. had a bigger source of raw ceramic materials and that our stocks were of vastly superior physical and electrical characteristics.

Then one of our foreign representatives supplied us with a complete set of foreign-made ceramic components. Result — Centralab developed a ceramic research program. The program was big and thorough . . . and it's still going on.

In a few years, Centralab put on the market its first ceramic capacitors. With World War II, came tremendous developments in electronics. Radio, radar and other electronic equipment demanded the finest in component parts . . . and ceramic capacitors came into their own. *In fact, independent research has shown that during World War II, in some classes of military equipment, there was not a single known instance of a failure of a ceramic capacitor!*

Thus, through the lessons learned over a period of 20 years of intensive research — Centralab Ceramic Capacitors have today become the best capacitor buy for safe guaranteed servicing. For when you use CRL ceramic capacitors, you're using the benefits of hundreds of thousands of man-hours of research—experiments with over 20,000 different ceramic compounds!



That's why any ceramic isn't the best ceramic for the job. Each of those 20,000 ceramic mixes had definite physical and electrical characteristics . . . and when we say that Centralab today uses only 250 of those 20,000 tested compounds, you can be sure that those discarded did not perform to the exacting requirements of sensitive electronic circuits.

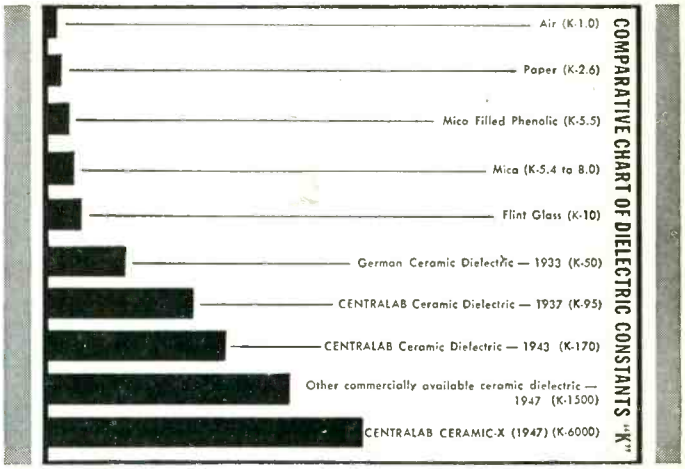
Yes, and if you compare the old-style paper and mica capacitors with modern ceramic capacitors . . . point for point, based on your own technical experience, you'll see why ceramics are vastly better . . . the safe, dependable way to assure a good service job.

For example, every serviceman is aware of the moisture absorbing quality of paper condensers . . . and how moisture can seep in along the leads on mica units. Compare these old designs with modern ceramic tubular and disc types . . . Centralab's Ceramic-X capacitor bodies are nonhygroscopic . . . moisture absorption being only .007% or less! That fact alone means Centralab Capacitors give you and your service customer the ultimate in reliability—even under severe tropically humid conditions.

Old-timers in the service field . . . yes, and young ones, too, will recall the bulky size . . . the difficulty of handling old-fashioned large size capacitors . . . when size seemed to be an important factor in design. Now, look at modern ceramic capacitors. They're less than 1/4 the size . . . you can fit them anywhere!

When you look at this chart of the development of capacitors using various materials . . . the tremendous improvement of the dielectric constant "K" with the entry of ceramics into the field is dramatically evident.

One of the most serious problems with old-time capacitors was that they broke down under high temperatures. Here again, ceramics have more than proven their superiority. 85° C. will not harm the modern ceramic capacitor. In fact, the ceramic body itself can easily withstand any temperature encountered in electrical apparatus. High capacity is



well maintained under wide temperature variation. What's more, the copper-silver electrodes are electro-bonded to the ceramic with a tensile strength of 30,000 lbs. per square inch — thus preventing any possible change of the relative position of the electrodes.

A typical example of the high degree of perfection and performance offered by ceramic capacitors is contained in CRL Hi-Vo-Kaps. These units are rated at 10 — 20 and 30 KV and are intended exclusively for TV. You'll find that practically the entire TV industry has standardized on these CRL units as original equipment for this most exacting application.

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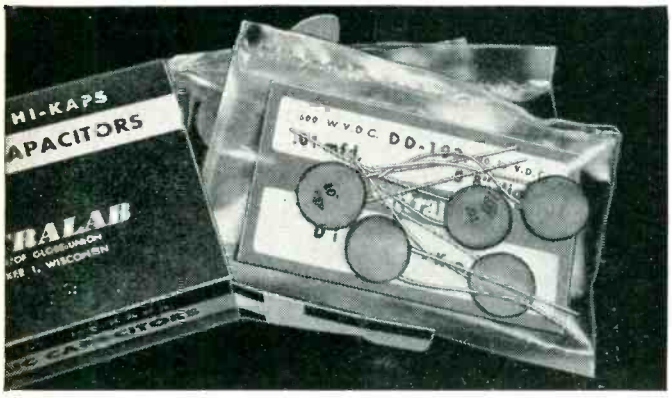

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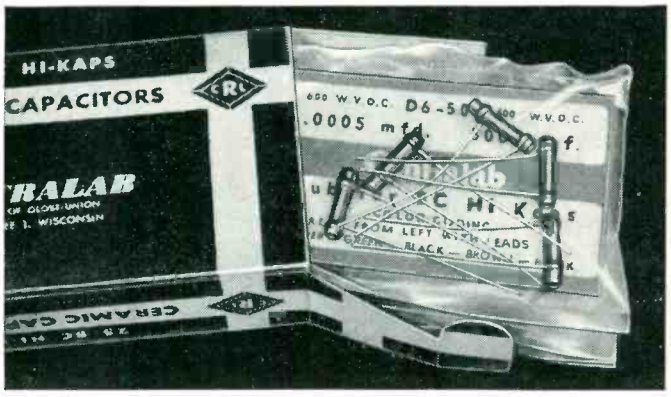

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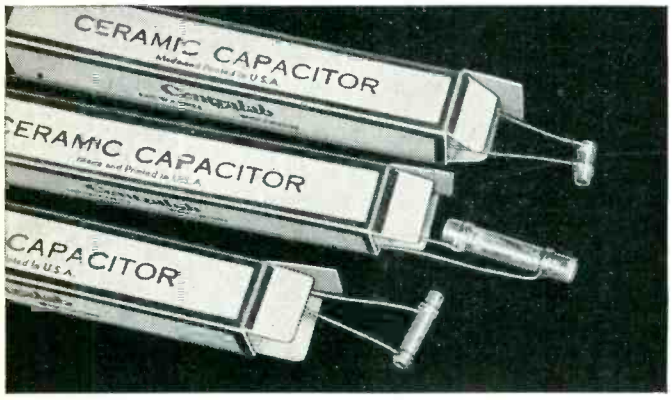

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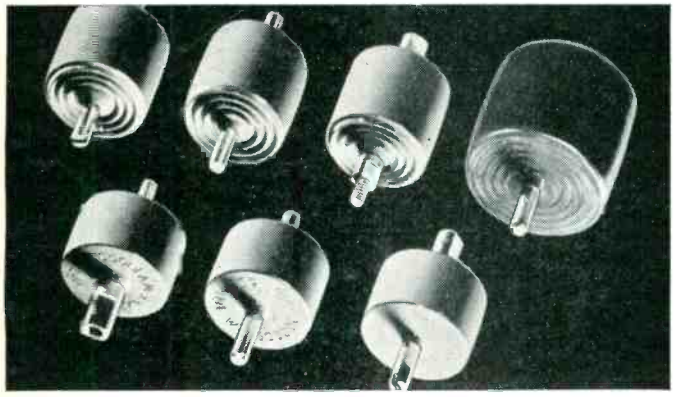

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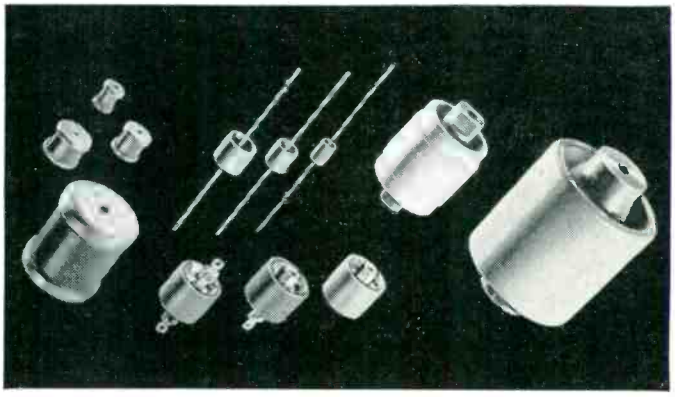

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SERVICING TAPE RECORDERS

by C. A. TUTHILL

PART 6

This installment deals with the General Industries Model 250 tape and disc recorder. In addition to the mechanical operation and adjustments, the electron circuitry and servicing procedures are also discussed.

THE unconventional design of the General Industries Model 250 combined tape and disc recorder mechanism is worthy of analysis. Mechanical adjustments should seldom be required for this unit, but, for the benefit of servicemen, corrective instructions are included here along with details of the mechanism. All reference numerals in parenthesis will be found in the sketches of *Figures 1 or 2,* identified by exponent number.

This unit was designed for either custom or conventional installation and thus is available as an unmounted chassis. It includes facilities for either *dual track* tape, or disc recording. The disc function, and a mercury switch both require a level and solid mount. The disc turntable platter doubles effectively as a stabilizing flywheel for tape recording. Both the tape and disc recorders are belt driven from a triple central pulley $(37)^1$ screw-bolted to the drive motor shaft (28).[1]

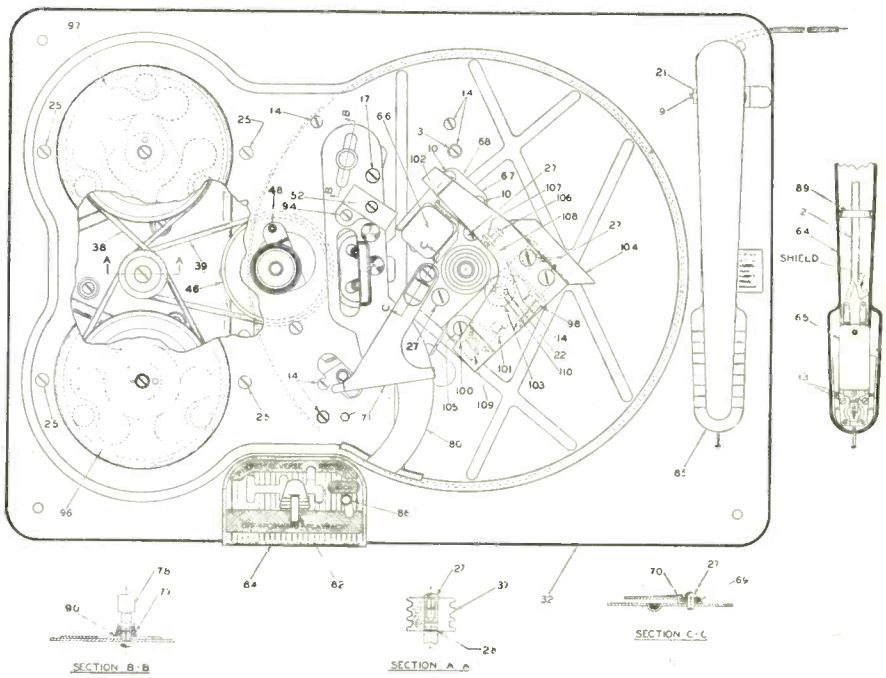

Fig. 1. Top view of General Industries Model 250 Tape and disc recorder. Section views are indicated.

Controls

Once the unit is properly mounted, the next step prior to operation is to connect one side of a 115 volt 60 cycle power line to one motor connector and the other side of the same line to the mercury switch $(76)^2$. This mercury switch is held in an *OFF* position when the control knob $(82)^1$ rests in its *OFF* position. While in this same *OFF* position, a cam section of function shift lever $(80)^1$ contacts the stud portion of mercury switch assembly which protrudes through baseplate $(32)^1$. The cam section tilts the mercury switch $(76)^2$ to such an extent that this switch is held in an *OPEN* position until control knob $(82)^1$ is moved to a new position.

When no tape is threaded around the capstan, operation is possible only in the *Phono, Reverse* or *Forward* positions. When control knob $(82)^1$ is positioned for either of the three above positions turntable rotation is effected as follows. By means of the function shift lever $(80)^1$ which is attached to control knob $(82)^1$, the switch actuator lever $(71)^1$ contacts the stud position of the mercury switch assembly. This in turn holds mercury switch $(76)^2$ in a *CLOSED* position thus applying voltage to the drive motor. Disc cutting and playback are executed in a manner familiar to any disc machine operator.

Tape Operation

For tape operation, a 3" or 5" diameter reel of either plastic or paper base recording tape is placed over the reel sleeve bushing in such a manner that it rests upon the rear reel pan with one inner slot of the reel engaging the locking key. The rear reel is rotated clockwise and the tape is

taken from its top rear side. A second and empty reel is placed and similarly keyed upon the front reel pan.

Threading

Be sure the control knob (82)[1] is in its *OFF* position before attempting to thread dual track recording tape. This avoids damage or accident. Threading is easily accomplished when about three feet of tape is run out manually from the supply or loaded reel. Make sure that the oxide or dull side of the tape is on the inner side in relation to the equipment as it leaves the supply reel. The reason for this is to have the coated or oxide tape surface directly contact the magnetic heads beneath the disc recording platter. The three foot end of slack tape is carried around and under the platter and thus introduced to the takeup capstan which is directly under and on the same shaft with the disc platter. The free end of tape is secured into the hub of the takeup reel and the remaining slack taken up by counterclockwise manual rotation of the takeup reel. Threading is completed when control button (82)[1] is slid along to alignment with the *Record* position, and is pushed forward while at the same time the record lock button (86)[1] is pulled toward the operator, thus securing full engagement of the control button (82)[1] into the *Record position*. This last combined action accomplishes several things.

(1). The tape is aligned with both the recording head (66)[1] and the erase head (52).[1] The latter erases the lower track only of the dual track immediately prior to travel of the tape across the recorder head (66).[1]

(2). The function shift lever (80)[1] contacts the pressure pad and pinch roller assembly actuating spring (101).[1] This action brings the pinch roller (103)[1] in firm contact with the tape against the rubber driving capstan.

(3). The pressure pad (102)[1] is brought into contact with and holds the tape firmly in contact with the gap of the recording head (66).[1]

Tracking

Tracking of the tape through the recording head (66)[1] is controlled by tipping the tape capstan slightly with the two adjusting screws(27)[1] located under the mounting flange of the auxiliary shaft housing under the base plate (32)[1] of the machine. The capstan should be so adjusted that the tape tracks in the center or toward the top of the guide slot in the recording head (66)[1]—never toward the bottom of the guide slot.

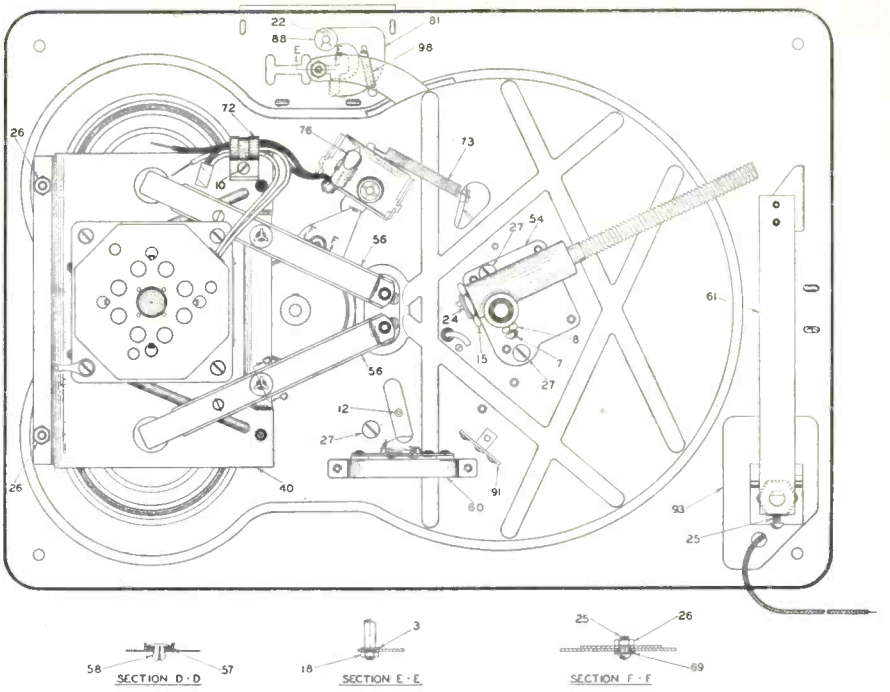

Fig. 2. Bottom view of General Industries recorder. Section views are indicated.

Pressure Adjustment

To adjust the pressure pad (102)[1] against the tape recording head (66)[1], it is necessary to remove the pinch roller cover plate (104)[1] to reach the lock nut (107)[1] on the pressure pad adjusting screw (106)[1]. To adjust the pad (102)[1] for proper pressure against the tape recording head (66)[1], set the speed shift lever (82)[1] in the *Record* position. Turn the adjusting screw (106)[1] in against the pressure pad spring (102)[1] until the pressure pad just contacts the recording head (66)[1]. Then turn the screw one-half to three-quarters of a turn clockwise and tighten the lock nut (107)[1].

When the drive motor is started, as previously explained, constancy of driving capstan speed is stabilized by the large 10" disc turntable serving as a flywheel. Due to this flywheel and the fact that the recorder head is very close to the driving capstan, flutter and now are held to a minimum. A normal speed of 3.75 inches per second is used for tape recording or tape playback while a single disc speed of 78 rpm is employed.

Fast Rewind and Fast Forward Control

A fast rewind or fast forward takeup speed approximates a ratio of 20:1 over the normal tape recording or playback speed of 3.75 inches per second. This is accomplished when the control button (82)[1] is properly positioned. When positioned for either *Reverse* or *Forward* the control button moves the function shift lever (80)[1] in such a manner that springs (101)[1] and (98)[1] cause the release of the pinch roller and pressure pad assembly from physical contact with the recording tape. Positioned for *Reverse*, the control button (82)[1] also causes the function shift lever (80)[1] to depress one end of lift lever (56)[2]. This lever in turn lifts the front reel takeup assembly free from the takeup clutch. This action removes any restraining force from the front reel clutch and consequently the rear reel can rewind tape very rapidly. When positioned at *Forward*, the function shift lever (80)[1] depresses the rear lift lever (56)[2] which disengages the rear reel from its clutch assembly. This permits the front reel to rapidly take up tape in a forward direction for purposes of editing or selection of material within the roll of recorded tape.

Adjustment of Lift Lever and Control of Reel Pan

Adjustment is easily made in the forward and reverse positions. In the forward speed position, the rear reel pan must be raised to the position that it clears the clutch spring. At the same time the front pan must be lowered to contact the clutch spring and the lift lever must clear the lower end of the reel pan shaft by approximately 1/32" to 1/16". The adjustment of the lift lever (56)[2] is made by bending the short unflanged section of the lever immediately under the reel pan shaft. To adjust in the reverse speed position, the opposite of the above condition is true. In the record and playback positions the lift lever (56) must clear both reel pan shafts so th both the pans will contact the clu springs (96-97)[1].

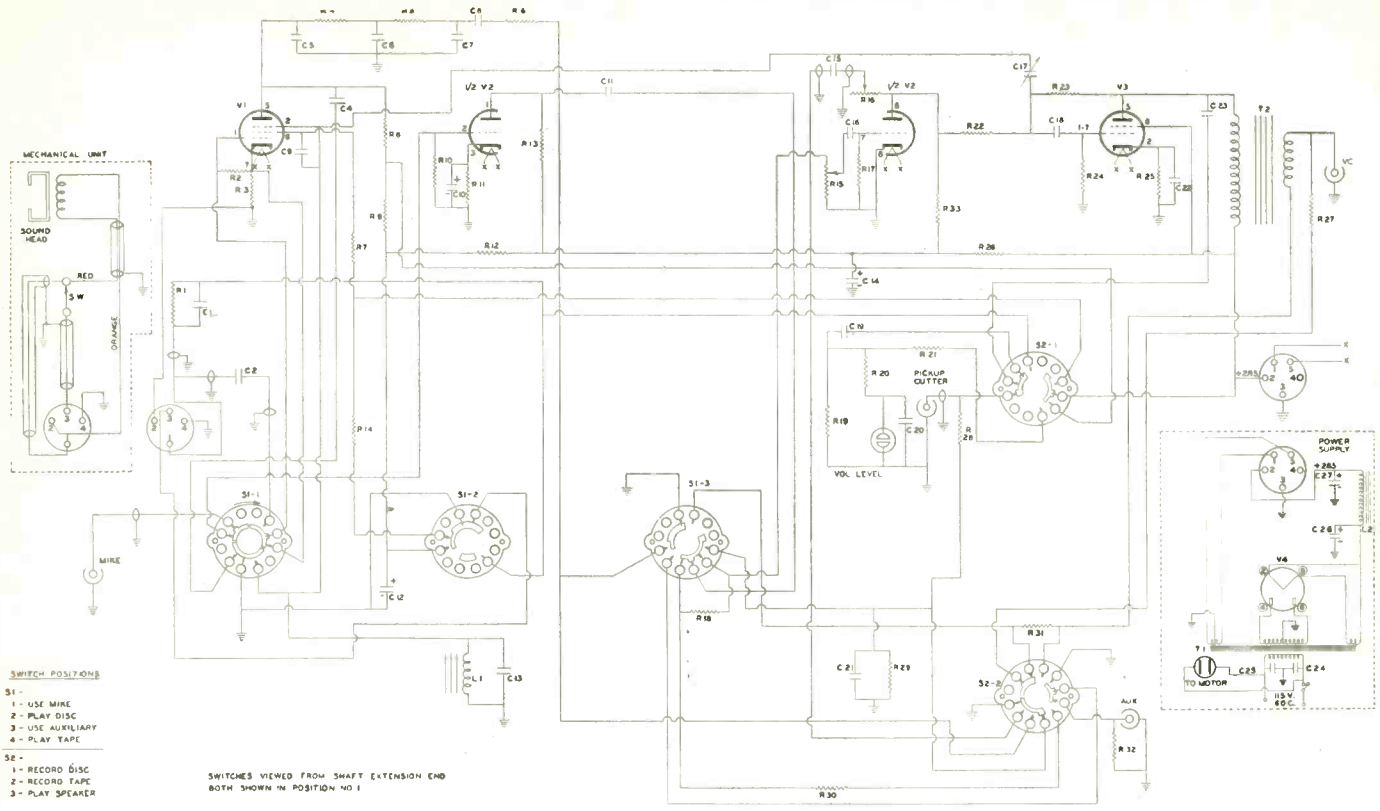

Fig. 3. Recommended amplifier circuit for G.I. Model 250 Tap-Disc recorder.

Playback of Tape Records

Positioned for either *Playback* or *Record* the control button calls for tape transport from the rear supply reel to the front takeup reel. Only the lower track of the dual tracks is recorded or played back. If there be further recording and reproduction desired from the second track, it is necessary to remove the front reel, invert it, and then place it on the rear reel platform. Next, of course, it is necessary to transpose the empty reel from the rear platform to the front platform where it serves for takeup. Threading for playback is identical to threading previously described for recording. Through use of the dual tracks, one full hour of recording or playback time is available for one 5" reel of tape.

Playback of Disc Records

The playing of standard 78 rpm phonograph records is very simply accomplished on this machine. When the control knob (82)[1] is positioned for *Phono*, the function shift lever (80)[1] presses both the front and rear lift (56)[2] thus disengaging both the d rear tape reel clutches. Un- ndition there is no driving The only function per- ble rotation. The only y is to depress the ickup arm (89)[1] layback needle (65)[1]. Tight- ening of a thumbscrew holds the needle in position.

Electronic Section

The following is an analysis of the electronic circuits recommended for, but not marked by, General Industries Co., the manufacturer of the above unit. The basic schematic appears in *Fig. 3*. High and low frequency equalization is included during playback only and the method incorporated here is based on a frequency discrimination feedback circuit. A small amount of plate voltage from the second section of dual triode V-2 (12AX7) is fed back to the plate circuit of V-1 (6AU6). Thereby harmonic distortion is greatly reduced.

Equalization

To this point we merely observe a normal case of inverse feedback 180 degrees out of phase. However, adjacent to the plate of V-1 in *Fig. 3*, we find discriminating networks in the feedback loop and these networks function as equalizers. The *R4, R5, C5, C6* and *C7* network has a tendency to short out or minimize the flow of low frequencies which otherwise would be fed back to the plate of V-1. The *R6, C8* series combination impedes the normal feedback of high frequencies to the plate of V-1. Only the middle sector of the spectrum is fed back, thereby attenuating the gain for that sector in the first half of the V-2 stage by the amount of feedback voltage. Since no low or high frequencies are fed back, the full gain of the amplifier is realized for those extreme frequencies while the middle sector of the spectrum is appreciably attenuated. The resultant equalization, due to these networks, is very nearly the conjugate of the recording characteristics of a magnetic tape. A flat playback response is obtained. Since disc recording employs similar corrective networks, this same equalization serves satisfactorily for reproduction of disc records.

Inputs

Microphone inputs are applied to the grid of the first section of V-2, a dual triode 12AX7. The amplified signal is applied to the second section of V-2 which drives the output stage, V-3. This constitutes a three stage amplifier for recording with microphone pickup. When recording from a phonograph or other higher level auxiliary pickup, the input signal is introduced to the grid of the second section of V-2. In this case only one stage precedes the output stage.

The earlier V-1 stage (6AU6) is only used as an amplifier when, due to equalizer and other losses, the higher gain of four stages is required for tape reproduction. Otherwise V-1 functions as a bias oscillator during tape recordings. Its supersonic output signal is applied through variable ca-

[*Continued on page 34*]

A.G.C. *in* TV

Part 1

by Leonard Lieberman

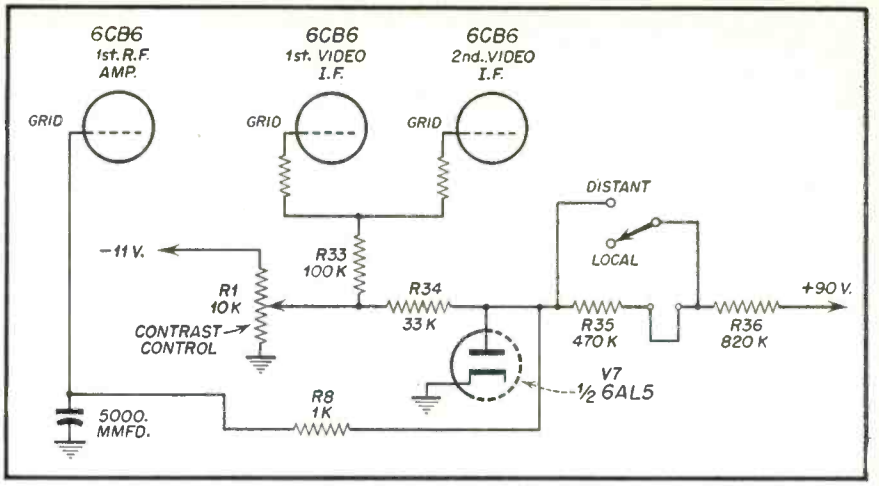

Fig. 2. Contrast control system used in Andrea Model CVL-16 which allows for distant and local reception.

Automatic Gain Control circuits in TV receivers are important in maintaining steady pictures under varying reception conditions. Faulty a-g-c gives rise to difficult servicing problems.

AUTOMATIC gain control (a.g.c.) is a means whereby a bias voltage, which is directly related to the strength of a signal is applied to either the i-f amplifiers, or the r-f amplifiers, or both.

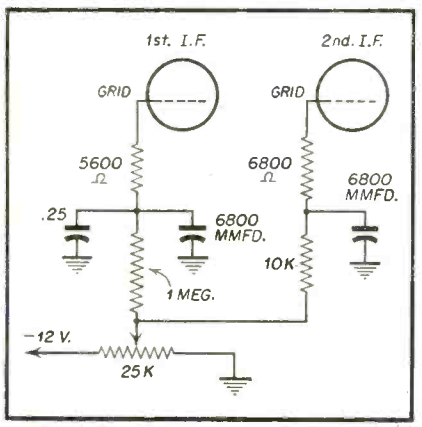

Fig. 1. Manual method of gain control used in early TV receivers.

In television we employ this system for two reasons. The first is to maintain a constant contrast level in the presence of several transmitters of varying signal strength outputs. Without an a-g-c system, the customer would have to adjust the contrast control after each change of station. The second reason is for the purpose of stabilizing the sync system so that the input to the sync stages is relatively constant.

Manual Gain Control Systems

Early post-war TV receivers controlled gain in the set by bringing the grid return of the r-f and i-f stages to the arm of the contrast control which was in the negative return system of the set. (*Fig. 1*).

An interesting method of adapting the manual contrast control to varying reception areas is shown in (*Fig. 2*) as it is used in the Andrea Model CVL 16.

In the *"Local"* position of the *Local-distance switch* the current flows through the arm of R1 (10K) contrast control, R34 (33K), R35 (470K), R36 (820K). The voltage from +90 to —11 divides itself across the bleeder network resistors so that there is approximately, —7v at the arm, with the contrast control set to the center.

In the *"distant"* position of the switch, *R35* is shorted out. As a result of the reduced resistance, the voltage at the junction of *R36* and *R35* goes more positive, and if the control is left in the same position, the negative voltage at the arm is reduced. This results in a reduced bias for fringe operation.

In a strong local signal area the jumper from *R35* to *R36* is removed, this removes the delay voltage from the arm of the contrast control. The r-f amplifier is fed from the less negative side of *R33*. The diode *V7 (½6AL5)* is in the circuit to prevent the voltage on the bias bus line from ever becoming positive.

The use of manual control system as shown in *Figs. 1* and *2* resulted in the two faults mentioned above, namely, customer inconvenience and poor sync response to variations in signal carrier levels. The use of average type

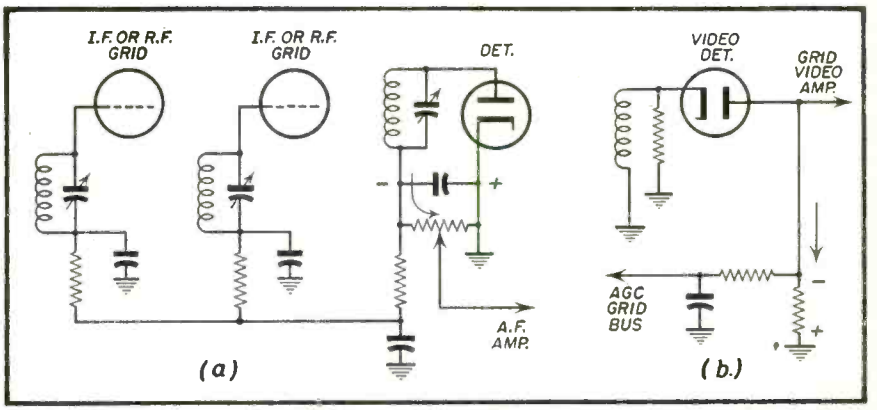

Fig. 3a. Typical a-v-c system in AM receivers. Fig. 3b. Basic average-type a-g-c system.

a-g-c systems put an end to this.

Average Type A-G-C Systems

Early systems of a-g-c were an attempt to adapt the method used in AM radio to get a.v.c. *(Fig. 3a)*. This system is called average-type a.g.c., an example of which is illustrated in *(Fig. 3b)*. In this system the entire video detector voltage is applied to the filter network *R1, R2* and *C1*. Since the load resistor of the detector is connected so as to apply a negative going signal to the following video stage, the voltage appearing at *R1* would be negative. Operation of such a system, can be shown as it is applied practically in *(Fig. 4)*.

In this circuit, with no signal present, the detector does not conduct because both plate and cathode are at ground potential through *R1* and *R2*. When the negative half of the carrier envelope appears across *R1* in the video detector cathode circuit, the plate starts to conduct. It conducts through *L1, L2* and *R2*. Since the current path is through the resistor to ground, the voltage on the ungrounded side of the resistor is negative. This negative voltage appears across *R3*. *C1*, which in the no-signal state was at ground potential, now discharges through *R4, R3* and *R2* to equal the negative voltage across *R3*. *C2* discharges through *R5*. Since there is a smaller voltage drop across *R5*, the resulting voltage at *C1* is more negative than that at *C2*.

The RC time constants of both arms are such that the voltage remains relatively constant and does not respond rapidly to changes in scene level. Thus, *R3, R5, C1* and *C2* act as a form of a-c filter network, and *R4* is equivalent to a bleeder resistor. The full a.g.c. voltage is applied to the i-f grids and the reduced a.g.c. to the r-f amplifier grid.

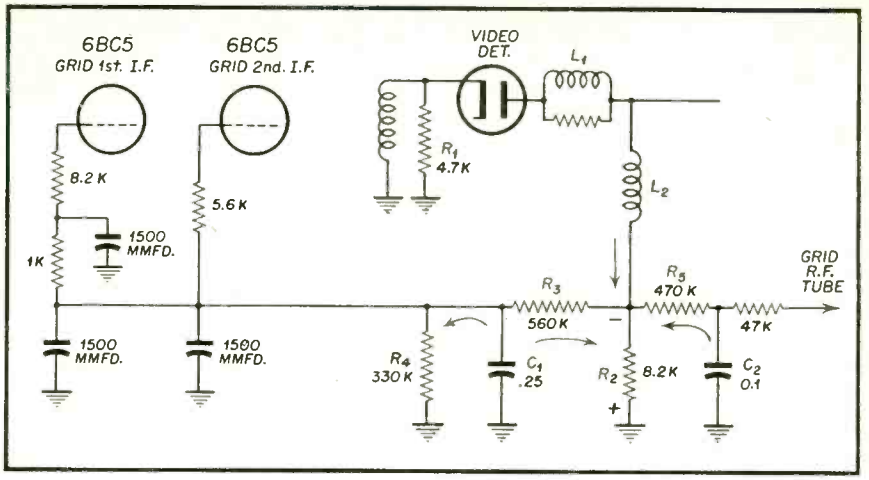

Fig. 4. Typical average-type a-g-c network used in later types of TV receivers.

Linear A-G-C Control

Some interesting variations on the average-type a-g-c system are shown in *(Figs. 5 & 6)*. In these two examples the approach is to try to overcome one of the weaknesses of the average type of a.g.c. This fault is that the developed bias is often insufficient to control the tubes in a linear manner. To overcome this defect the two designs shown make use of d-c amplifiers. As a result, they develop an amplified negative d-c which has sufficient range to control the i-f and r-f tubes over a wide variation of signal inputs.

In the Starrett *"Gotham" (Fig. 5)* the detector current path is through *L18, L19, R45 (3.9K)* and *L16. V11(a) ½ of a 6SN7* is connected in the following manner: The cathode is tied to a voltage divider consisting of *R66 (6.8K), R1 (10K)* contrast control, *R64 (5.6 ohms)* from B(-) to ground. The grid is connected to the negative side of *R45*, the detector plate load resistor. The plate is connected to B+.

C7 (50 μf) is tied to the cathode as the a.g.c. filter condenser. Its RC time constant combined with the network is such that the a.g.c. is stable and well filtered.

The reason that the cathode of the detector is connected to the top of the contrast control is that a delay voltage can be applied to the a.g.c. system for operation in weak or strong signal areas.

This delay operates in the following manner: Since the plate and cathode of the detector are tied together directly and not through ground, in the no signal state they are at the same potential. Therefore, the detector will start to function on the negative cycle of the i-f signal output.

However, let us now look at the situation at the amplifier cathode. Here we have a negative voltage as a result of the bleeder network, the amplitude of which is determined by the relationship of *R1* and *R66*. By varying *R1* we can make *V11* cathode more or less negative. This negative voltage as will be shown below will determine the extent to which *V11a* will amplify.

Therefore, it can be seen that by adjusting the contrast control in weak signal areas *V11a* will not operate until a certain level of a.g.c. is first developed, thereby permitting the set to operate in these areas with a minimum bias. *R64* and *R65* insure that

[*Continued on page 33*]

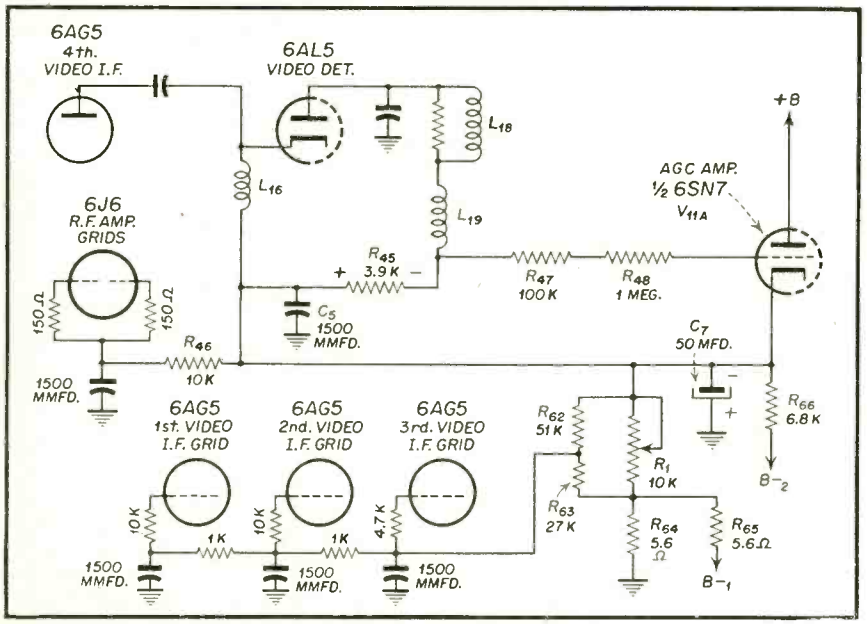

Fig. 5. Amplified a-g-c system used in Starrett "Gotham" model TV receiver.

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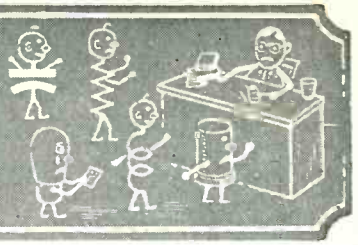


Sync Separator and Amplifier
G. E. 17C103

The sync signal is taken off across *R46 (4700 ohms)* and *R47* (220 Ohms) *(Fig. 1)* in the plate circuit of the *12AT7* video amplifier. It is fed to pin *4* of the *6SL7* video amplifier through *C76* (.022 μf) where it is amplified and fed through a double time constant network *R47* (470K) paralleled by *C77* (470 $\mu\mu$f) and *C78* (.01μf) to pin *1* of the second section.

The plate of the second section runs at a low voltage and the clipped sync signal appears across *R80* (47K) and is then fed through *C90* (139 mmf) and through the vertical integrator network to the vertical multivibrator.

The cathodes of both sections are grounded. The plate of the first section goes back to B+ through *R78* (22K). Bias on the first section is developed through the grid leak resistor *R77* (2.2 meg.).

The plate of the second section goes back to B+ through *R80*. The size of this resistor drops the plate voltage on this section to less than 150 volts, thereby, causing the tube to operate at a low plate current saturation level.

The grid of the second section is coupled by means of *R76* (1.5 meg.) resistor to the top of the contrast control.

The contrast control is in the video detector load resistor network. This network consists of *R42* (3.6K), *R40* (22K) and *R1* (2 meg) (contrast control), *C116* (5,000 mmf) and *C147* (5,000 mmf).

The voltage which appears across *R1* is the average a.g.c. The center tap of *R1* is connected to the a-g-c returns in the grids of *V2. V4, V5* and *V6*. These are the 2nd r-f, 1st, 2nd and 3rd i-f amplifiers, respectively. This voltage is a negative one which varies with the strength of the incoming signal. In this manner, the bias on the sync clipper will vary with the strength of the incoming signal.

The purpose of deriving the bias in this manner is to clip such noise pulses which might appear superimposed on the sync pulses in most signal areas. Thus, if a low strength signal is received, the amount of a-g-c bias voltage is reduced. This reduces the bias on the grid of the clipper section. The tube can thereby be more easily driven to plate saturation by the positive going sync signal.

This results in a clipping action which cuts off the tops of the sync pulses and such noise pulses which might appear on them.

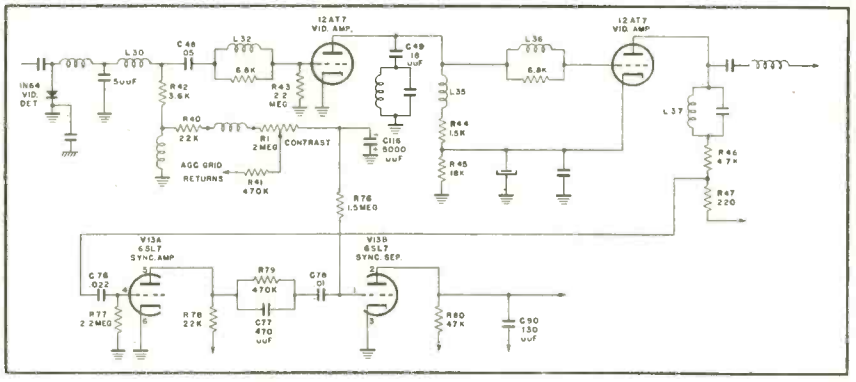


Fig. 1. G.E. Model 17C103 Sync Separator (partial schematic).

Clarion Model 16703 D. C. Restorer

In this circuit *(Fig. 2)*, the C.R.T. is cathode fed, through the network *L12* and *C26*. The C.R.T. cathode is grounded through *R131* and *R3* (brightness control).

The d-c restoration is performed in

[*Continued on page 32*]

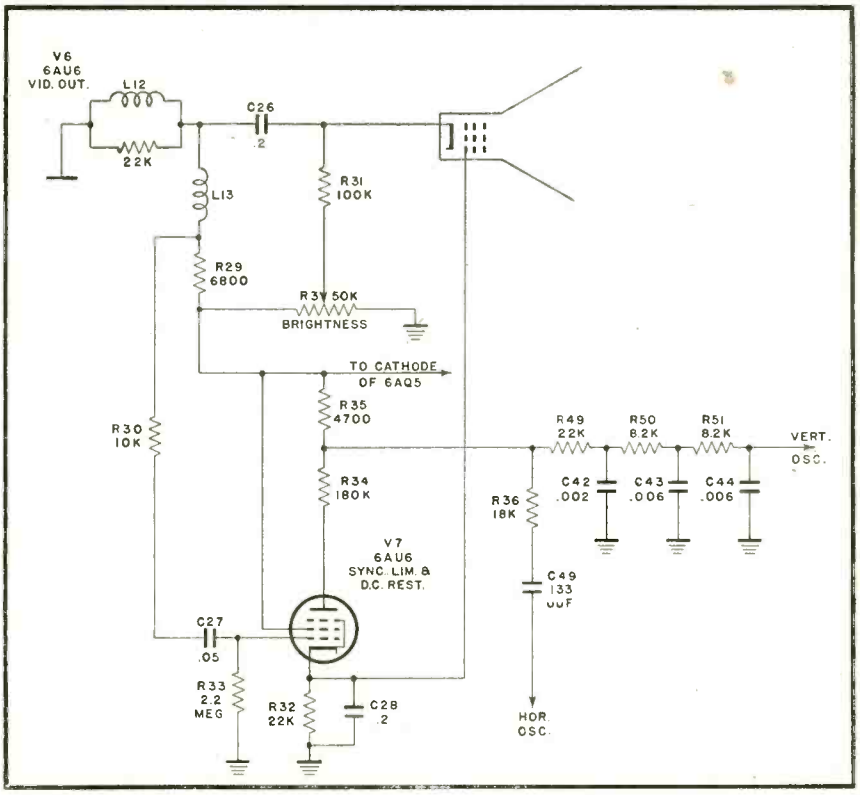


Fig. 2. Clarion Model 16703 D. C. Restorer (partial schematic)

HERE'S HOW & WHY

by **CHET JUR**

(Sales Engineer, Merit Transformer Corp.)

Width Coil With AGC Winding

VARIATIONS in signal level resulting from weak or strong video transmissions or in changes of received signal strength cause changes in picture contrast and necessitate frequent adjustment of the contrast control. In the early sets, this was done by manually adjusting the contrast control but it can easily be seen that this caused inconvenience and annoyance to the viewer.

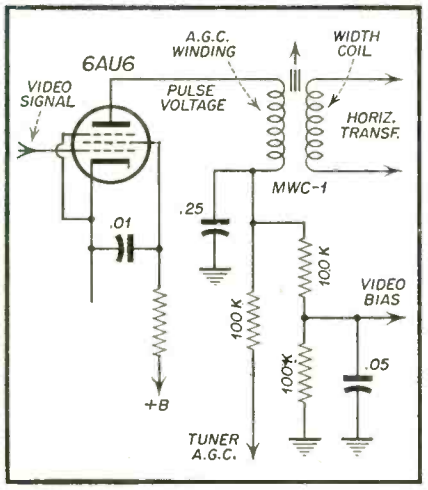


Fig. 1. Typical A-G-C system using width coil.

Then, the automatic volume control system from radio receivers was adapted to television to overcome this difficulty and was called automatic gain control AGC. While better than the manual system, its slow reaction time failed to respond to fast fading signals and, on the other hand, rapid noise signals (high frequency) caused decreased sensitivity.

These failings were overcome by gearing the AGC system to the horizontal pulse circuit with its faster reaction time. This system, most commonly used today, is known as "gated" AGC. The novel characteristic of this system is the use of horizontal

[*Continued on page 32*]

NEW PRODUCTS

HORIZONTAL FLY-BACK COMPONENTS

Standard Transformer Corporation, 3580 Elston Ave., Chicago today announced two new television components—a high efficiency deflection yoke and a high voltage fly-back transformer.

Deflection Yoke DY-10 and horizontal output and high voltage Transformer A-8131 are companion units used in direct drive circuits, G.C. Knoblock, general sales manager of Stancor said. The two new components have extensive applications and are exact replacements in thirty-four RCA TV models, thirty Emerson models and seven Capehart models, he added.

Stancor DY-10 is an anti-astigmatic yoke with cosine windings and nylon insulation, designed to provide a sharp, well-focused picture over the entire CR tube.

Specifications and a complete list of TV models for which these components are exact replacements are contained in Stancor Bulletin 389, now available.

NEW 17-INCH LOW-FOCUS-VOLTAGE METAL-SHELL KINESCOPE

Tube Department, Radio Corporation of America, Harrison, N. J. announces the 17TP4

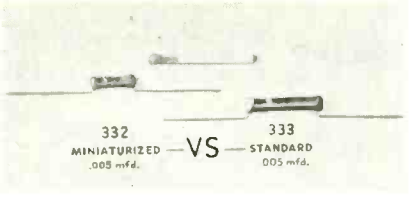
is a 17-inch, metal-shell picture tube utilizing Low-Voltage Electrostatic Focus—an achievement in picture-tube design which, in addition to eliminating the need for a focusing coil or magnet, makes it possible to obtain the focusing-electrode voltage from the low-voltage d-c supply of the receiver.

The focusing electrode in the 17TP4 has its own base-pin terminal to permit choice of focusing voltage for best results. Because the focusing electrode operates at low voltage, the focusing voltage can conveniently be obtained from a fixed or adjustable tap on the low-voltage d-c supply of the receiver. With either method, focus is maintained automatically with variation in line voltage and with adjustment of picture brightness.

Using a design in which the cathode is not connected to any other electrode, the 17TP4 retains the advantage of low input capacitance when employed in a cathode-drive circuit.

CERAMIC CAPACITORS

Announcement of a new line of miniaturized ceramic capacitors, under the trade name GP3 ceramicons is announced by Erie Resistor Corporation, Erie, Pennsylvania. These capacitors employ a high dielectric constant ceramic material especially developed in Erie Resistor's engineering laboratories. With this material, capacitance values as high as .002 mfd. are available on a basic ⅛" x ⅜" long tube, and .005 mfd. on a ⅛" x ⅝" long tube.



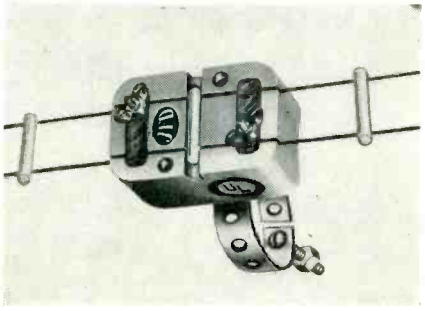
These GP3 ceramicons have been available on special order since 1949, and are now made in volume production quantities. Baked enamel, clear lacquer, dipped phenolic insulation or low-loss molded phenolic insulation are available.

Miniature GP3 ceramicons are flash tested at 1500 V.D.C., and are designed to withstand 700 V.D.C. life test at 850C for 1000 hours. Standard capacitance tolerance is + 80%, -20% and power factor is 2.5% maximum. Write for data sheet.

LIGHTNING ARRESTER

JFD Manufacturing Company of Brooklyn, N.Y. announces the development and assembly line production of an open line lightning arrester in the United States!

Named the "Open-Line", Model No. AT107, this JFD innovation will be marketed for use with open line installations all over the nation. This new JFD arrester will be a guarantee for owners of sets using long open wire



transmission lines against lightning and static hazards, which they have not been able to get heretofore.

21" TV PICTURE TUBES

Two new all-glass 21"rectangular TV picture tubes are now available from the Cathode-ray Tube Division of the Allen B. DuMont Laboratories, Inc., Clifton, N. J. The new tubes offer several important advantages over previous 21" designs.

The new tubes are designated as the Type 21EP4A and the Type 21KP4A. Both types employ the same all-glass bulb which results in a picture area of 242 square inches, larger than previous metal-cone 21" tubes. The screen face is made of filter-glass for minimizing reflections and improving contrast.

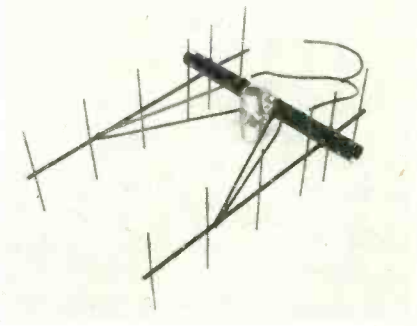
The Type 21EP4A employs the Du Mont bent-gun for electromagnetic focusing. A single-magnet ion trap is used. Type 21KP4A is one of the new Du Mont Selfocus Teletrons requiring no focus controls or circuitry. It provides absolute focus at all times. The 21KP4A may be used as a replacement for either electromagnetic or electrostatic focusing type tubes.

Both of these new tubes are available for delivery to either original equipment manufacturers or to the trade for replacement and conversion work.

U-H-F ANTENNAS

High gain and rugged construction are features of two new directional antennas for the 450-470 mc. band. They are designed and manufactured by the Ward Products Corp., Division of The Gabriel Co.

The model SPP-161 is a 12 element Yagi type antenna with a gain of 11 db. It is vertically polarized for commercial communications (with provision for horizontal polarization where necessary), matches 52 ohms with



VSWR of less than 2 to 1, and can handle up to 250 watts of power. This antenna is illustrated. Model SPP-172 is a 24 element Yagi of similar construction to the SPP-161, and has a forward gain of 14.5 db. Both units are supplied with matching harnesses.

Construction is of copper plated steel which is then painted. The antennas are shipped pre-assembled for rapid installation.

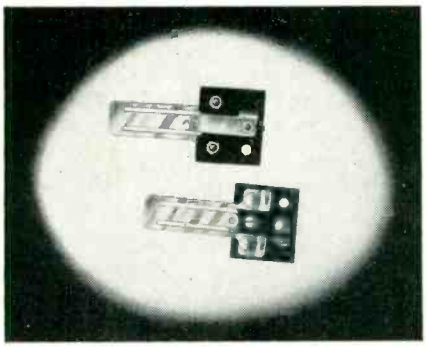
Models SPP-161 and SPP-172 are designed for point-to-point communications in the

broadcasting, railroad, petroleum - pipe - line, forestry, utility, and state police fields. The growing use of the 450-470 mcs. band requires new antenna designs: Models SPP-161 and SPP-172 fill that need.

A free descriptive bulletin can be secured from radio distributors or direct from the Ward Products Corp., Division of The Gabriel Co., 1523 East 45th Street, Cleveland 3, Ohio.
RSD 2 New Products

THERMAL SWITCH

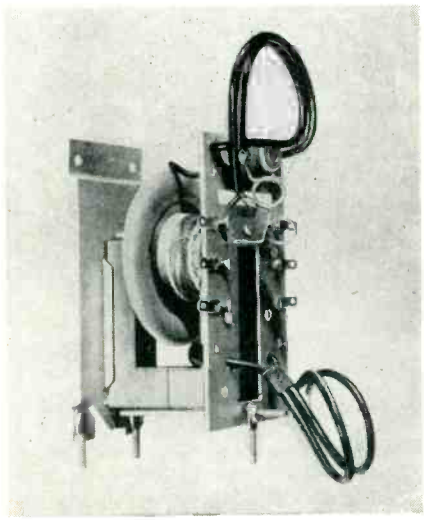
A Thermal Switch (Model SW-T-1) for remote on-off control of auxiliary electrical circuits is now being manufactured by the La-Pointe Plascomold Corporation. Switching operations in accessory circuits and appliances, such as TV boosters that are used closely with the TV receiver, will function reliably without manual aid, it was reported. Model SW-T-1 eliminates special wiring and switching equipment.



Design features include small, compact size, easy installation, rugged construction, fast self re-cycling, pure silver-to-silver contact, mechanical stability. The maximum load of the SW-T-1 is 50 watts-actuating load minimum is 100 watts at 117 V-actuating load maximum is 500 watts at 117 V. Accelerated life tests show 5 years of operation without failure.

MERIT FLYBACK HVO-7 PROVIDES UNIVERSAL MOUNTING

A flyback which can be mounted above and below the chassis horizontally or vertically or on the side wall of the hi-voltage cage within the TV set is now being made by the Merit Coil and Transformer Corporation of Chicago.



The new flyback is a 77J-1 type and is in all other respects electrically identical to the popular Merit HVO-6. The additional advantage of the universal mountings offer greater versatility to the Serviceman.

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ASSOCIATION NEWS

[*from page 12*]

who have arranged for lectures and demonstrations through the Federation for its Chapters. It will also keep the individual member informed of who their friends in the industry are and of their efforts on our behalf.

This bulletin will be available only to the members of each Chapter. The Editor is Ed Lukas of Luzerne Co. Radio Servicemen's Ass'n.

Blair Co. delegates will have a full report on the individual company or manufacturer who has been voted by the State Chapter members as the one to receive the annual Federation Plaque at the January meeting.

HERE'S HOW & WHY

[*from page 29*]

rate pulses to key the AGC tube. So, on the plate of the tube, only the pulses appear. Therefore, the tube is on and then off at the horizontal rate. This horizontal pulse is taken from the horizontal output system in several ways.

First, some of the voltage from the secondary is fed back to the AGC system through a condenser. This is not commonly used because of the high voltage hazard and insulation problems. Second, a special winding is included on the horizontal output transformer and the pulses (voltage) developed across this winding. This, of course, means a special transformer at greater cost per unit.

Last, a secondary is wound on the width coil and, since this is part of the horizontal system, the AGC pulses (voltages) are developed in this winding and fed to the desired circuit. *Fig. 1* is a diagram of a typical AGC system using a width coil with a secondary.

The value of the last method is its adaptability and low cost in both installation and maintenance. For example, assume the AGC winding would open on a horizontal output transformer with a special winding. A low cost repair would be to remove the original width coil, substitute a width coil with an AGC winding and obtain the necessary pulse voltage from this source. Most servicemen will find the width coil cost a small fraction of the cost of a special horizontal output transformer.

CIRCUIT COURT

[*from page 28*]

the C.R.T. grid circuit. The C.R.T. bias is derived from the difference in voltage between the cathode and grid. If the grid is kept at a relatively constant voltage, any positive going a-c signal appearing on the cathode will cause the tube to operate in the same manner as if a negative going signal were to be impressed on the grid.

The grid is kept at this relatively constant level by feeding it off the top of the cathode resistor of *V7* (the

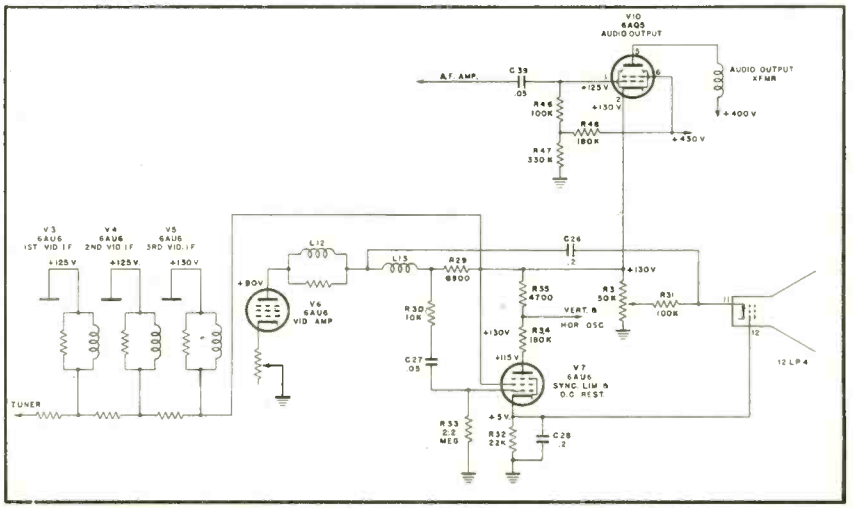

Fig. 3. Clarion Model 16703 B+ bleeder network (partial schematic).

sync limiter). The RC time of the cathode network *R32* (22K) and *C28* (.2μf) is such that the d-c level will remain comparatively constant.

The grid of *V7* is coupled to the output of the video amplifier *(V6)* by *R27* (6,800 ohms), *R30* (10K) and *C27* (.05μf). If the brightness level changes, the amount of current going through the cathode resistor will vary with the average d-c value of the input signal.

As a result of the RC network, this value of voltage which is applied to the C.R.T. grid will thus vary with the brightness level of the signal. This variation, which is in effect, a variation of the bias voltage relation between cathode and grid can thereby change the brightness level of the viewed picture.

The B+ voltage in this circuit is developed in the manner shown in *Fig. 3*. This voltage is developed using *V10* as a resistor in the d-c bleeder system.

The cathode ground return is the resistor used as a brightness control. The plate of the sync limiter is connected at the junction of this resistor and the cathode of *V10*. The voltage here is in the order of 130 volts. The plate of *V10* is connected + 400. Therefore, the cathode to plate voltage across *V10* is 270 volts.

The grid of *V10* is kept at a negative voltage relation to the cathode by means of the bleeder network *R47* (330K) and *R48* (180K) which goes from ground to the screen B+ point. This voltage is approximately 125 volts. The bias is, therefore, in the order of —5 volts in relation to cathode which is at 130 volts positive.

A.G.C.

[*from page 26*]

there is some bias present at all times.

Now to examine the operation of the amplifier. In the no signal state *V11a* will conduct due to the fact that with no bias on grid and a negative voltage on the cathode, the grid to cathode bias is effectively positive. The extent of this positive relationship is, as indicated in the preceding paragraphs, determined by position of the contrast control arm.

With the appearance of a signal across *L16* a negative voltage is developed across *C7 whose discharge* path is through *R62, R63* and *R64* to ground. The amplitude of this voltage on *C7* will again depend on the contrast control setting. At the same time the developed negative detector load voltage is applied to the grid of

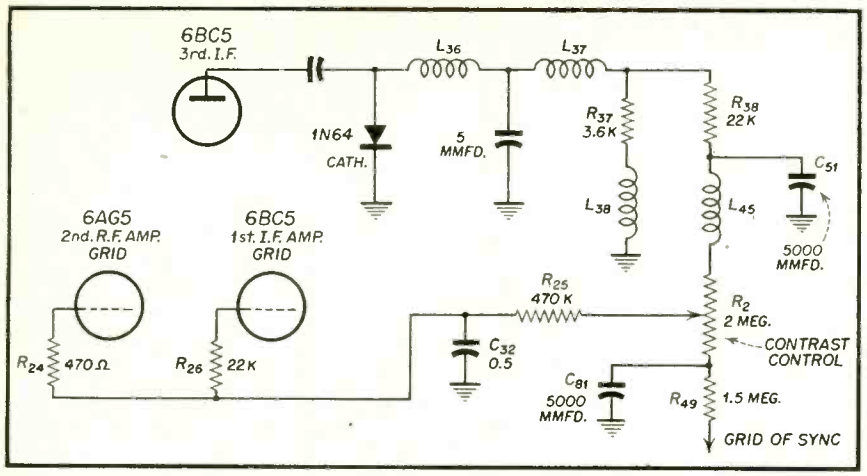

Fig. 6. A-G-C system used in G.E. Model 10C101 TV receiver.

V11a. This drives the plate current down, and by reducing the current through the cathode resistor, causes this to go still further negative. Since a cathode follower is an amplifier even though not a unity amplifier, we develop at *C7* an amplified voltage which due to the large filter value is effectively an amplified d.c. (By a non-unity amplifier, we mean that the amplification at the point the output voltage is taken off is not equal to the amplification we could get if it were taken off the plate working into the required plate load resistor). The r-f amplifier is fed the unamplified a.g.c. through *R46 (10K)*.

Another approach, in which the contrast control is used to set the A-G-C level, is shown in *(Fig. 6)* G. E. Model 10C101. This system consists of the network of C32 (.5μf), R25 (470K), C81 (5000 μf), R2 (2meg) contrast control, *L45*, *C51* (5000 μf,) *R38* (22K,) *R37* (3/6K) and *L38*.

C51 discharges through *R38* to the negative voltage developed at the junction of *L38* and *R38*. This causes a negative voltage to appear at the top of *R2*. *C81* then discharges through *R2*. The arm of the control can thus determine the average a.g.c. bias needed in a particular reception area by determining the point on the control which supplies the required bias. When this bias point is set *C32* discharges through *R25* to the values of *C32* in conjunction with the resistors. This furnishes the filtering necessary for proper a.g.c. operation.

TAPE

[*from page 24*]

pacitor *C-17* to the grid of the output tube where it is amplified simultaneously with the audio signal being recorded.

A highly resilient socket or rubber grommets must be used for the mount of V-1 (6AU6) in order to avoid microphonics. This is especially true if loudspeakers or mechanisms are close to the amplifier assembly.

Outputs

Connection between the driving amplifier and the mechanical recording

unit *(Fig. 3)* is established through the four pole plugs shown in the schematic. These connector leads should never be over four feet in length. Individual low capacity shielded connectors should be formed into a short cable for this inter-connection. Coaxial lead-in cable will serve well for the purpose. If the capacity between the conductor and shield becomes too great, the high frequency bias is effectively shunted out and it becomes impossible to deliver the 3 milliampere bias current required through the recording head.

With proper amplifier connections and adjustments it is possible to cut disc recordings from a recorded tape or from any other external source. Level adjustment appears under the section headed, "Levels."

Bias Adjustment

The establishment and adjustment of high frequency bias merely requires application of a 100 ohm carbon resistor and a vacuum tube voltmeter or good grade high resistance voltmeter. Insert the 100 ohm resistor in series with the lead from *point 2* (orange lead) of the recorder head plug. Switch the amplifier, *(Fig. 3)* to *Record-Tape* position (*S2* in Position *2*). Bias frequency is changed when the inductance of *L-1* is varied. This adjustment is not critical and may be established at any point between 30 kc and 50 kc. It is the bias current which must be carefully adjusted. When inductance *L-1* has a value of 100 millihenries and its adjusting slug is set to project 7/8 inch from the top mounting screw surface, the bias frequency will approximate 30 kc. This may be checked by connecting an oscilloscope across the 100 ohm carbon resistor and applying the voltage across it to the vertical deflection plate through the appropriate amplifier.

Next connect the amplified output of an audio oscillator to the horizontal deflection plate and adjust to obtain lissajous type figures on the scope. The frequency of the bias can be established against the known frequency of the audio oscillator.

To establish the proper bias current of 3 ma. through the recording head, it is merely necessary to adjust the variable capacitor *C-17* until a voltage of 0.3 is read across the 100 ohm resistor previously connected in series with the recording head.

Levels

Once the proper bias is established it is necessary to check for proper recording level. The neon volume indicator tube will just fire when a current of 0.25 milliamperes flows through the recording head. This value may be easily checked when the 6AU6 Oscil-

lator tube (V-1) is removed from its socket. Under this condition the bias source is eliminated and a voltage reading taken across the 100 ohm resistor should be 0.025 volts which represents a current flow of 0.25 milliamperes through the recording head. Use gain control *(R-15)* for level control.

Replacement of the oscillator tube (6AU6) will raise the reading across the resistor to 0.3 volts which indicates presence of the proper bias. Following this the 100 ohm resistor must be removed prior to operation.

Power

It is recommended that the power supply be confined to a chassis completely apart from that of the main recording amplifier. When, of necessity the two are combined, great care must be exerted to hold hum content to an absolute minimum. The chassis should be of aluminum or other non-magnetic material which will not give rise to eddy currents. For the components indicated in the amplifier schematic of *Fig. 3*, a plate source of 285 volts is required for the screen and plate of V-3 (6AQ5). An adequate supply for heaters and high voltage source is derived from one 5Y3GT driven by power transformer *T-1*. The 8 henry, 65 milliampere output choke *(L-2)* is filtered by two 20 μf 450 volt electrolytics.

Upon completion of a recording or playback of a tape reel, an automatic shut-off is provided. The threading and tension of tape during travel holds a mercury switch closed thus supplying power to the drive motor. When a reel runs out, or, at a time of tape breakage, the mercury switch opens and automatically stops the drive motor.

SERVICING PIX TUBE CIRC.

[*from page 17*]

that some of the turns are not shorted.

Another common symptom of a defective picture tube is a negative picture such as shown in *Fig. 5*. The usual symptom is that the contrast setting is very critical and as soon as the contrast control is turned up in an effort to get good contrast, the picture turns negative. This same condition could, however, occur because of an improperly adjusted a-g-c circuit or a defective a-g-c tube. Occasionally a defective tube in the video i-f stages or video amplifier stages could cause this condition. If, for instance, one of the video amplifier tubes burns out there may be sufficient signal transfer for strong stations through the interelectrode capacities of the tube. Thus, capacity coupling virtually exists between the stage prior to the dead one and the stage following. This would cause inversion of the signal information and upset the polarity of the video signal arriving at the picture tube. (Inasmuch as the signal changes phase across each stage, manufacturers must design the circuits so that the correct polarity appears at the picture tube grid in order to get a positive signal.)

A means for ascertaining this is to use an oscilloscope to check the polarity of the signal at the grid or cathode of the picture tube. For instance, the signal at the grid of the picture tube for *Fig. 1* should be negative-going. If this signal is positive-going because of a defective video amplifier tube it would cause the type of picture shown in *Fig. 5*. The same holds true for the circuit shown in *Fig. 2* which also requires a negative-going picture signal. In the circuit shown in *Fig. 3*, however, a positive signal must appear at the cathode as previously mentioned. If this signal is negative it will produce the negative picture shown in *Fig. 5*. Any oscilloscope could be used to make this check inasmuch as an indication of relative polarity only is required. The photograph shown in *Fig. 6* shows this type of pattern secured. Note the sync pulse tips which indicate the polarity of the signal. The cloudy section beneath the sync tips represents the picture information and as this varies line for line it will shift and change on the scope. This is unimportant, however, because relative polarity only is the required information.

The oscilloscope is also useful for checking the presence of the signal before and after the video amplifier in order to localize an open coupling capacitor or other components.

Commercial tube checkers are available for ascertaining picture tube performance, though a vacuum-tube voltmeter can be used to check the potentials at the various tube elements. Besides the grid cathode voltages previously mentioned, filament voltage can be read between *pins 1* and *12* of the picture tube or the socket can be removed and the filament of the picture tube checked for continuity. The tube base shown in *Fig. 7* is standard for most tubes and shows the pin connections for the various elements. *Pin 2*, grid *1*, should always be negative with respect to the cathode, *pin 11*. *Pin 10*, grid *2*, should be plus by several hundred volts with respect to the cathode. Grid *2* is sometimes referred to as the first anode of the gun and requires a plus voltage from the low voltage power supply. The second anode consists of the inner coat-

ing of the tube or the shell of the metal tubes. This voltage is usually in excess of 10,000 volts and should be measured while connected to the tube, using a high range voltmeter. The high voltage should never be shorted to ground in order to get a rough idea

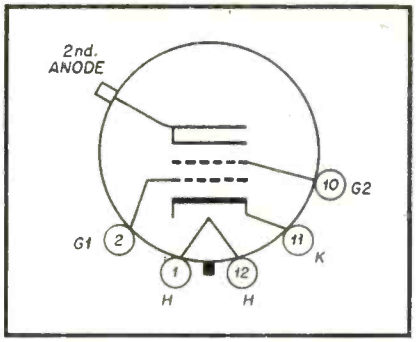

Fig. 7. Picture tube base connections.

of the voltage by the amount of spark produced. This overloads the high voltage supply and may ruin the emission of the high voltage rectifier.

If all checks have been made to the associated circuit first and final checks seem to indicate picture tube defects, the only recourse is to check performance by direct substitution of a new tube.

AD INDEX

1951 INDEX ★ RADIO-TV SERVICE DEALER

RADIO-TV SERVICE DEALER ★ 1951 INDEX

HERE'S HOW & WHY

(A Regular Department)

SHOP NOTES

SYNC PULSES

(A Regular Department)

TEST EQUIPMENT

1951 INDEX ★ RADIO-TV SERVICE DEALER

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TUBES

TUBE TOPICS

(A Regular Department)

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