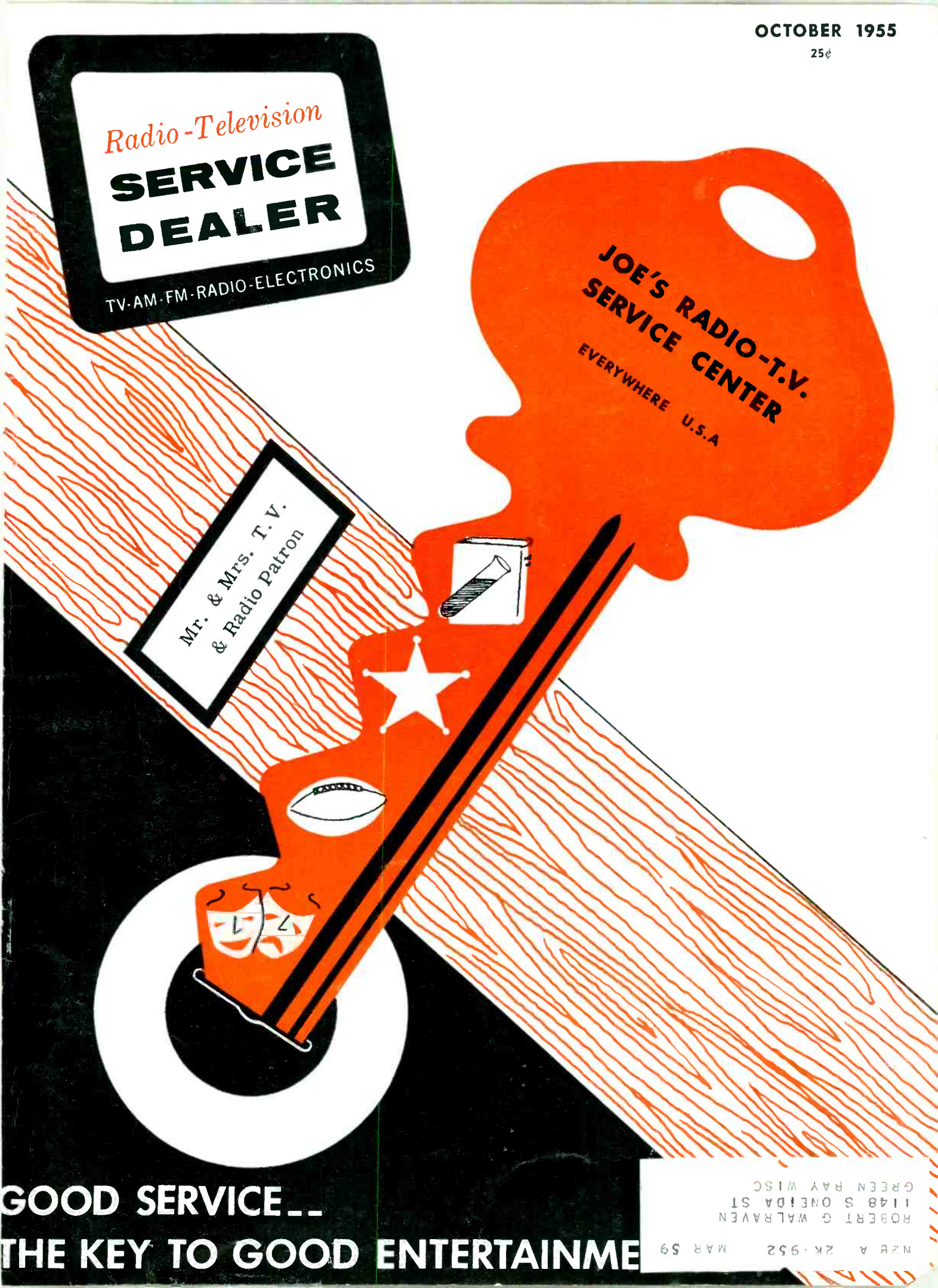
OCTOBER 1955
25¢

Radio-Television SERVICE DEALER

TV-AM-FM-RADIO-ELECTRONICS



GOOD SERVICE--
THE KEY TO GOOD ENTERTAINME

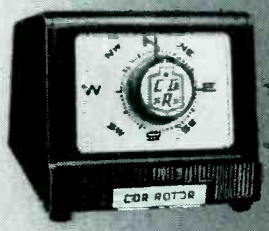
setting new selling records everywhere

C·D·R TV antenna ROTORS

the COMPLETE line
A Model for Every Need

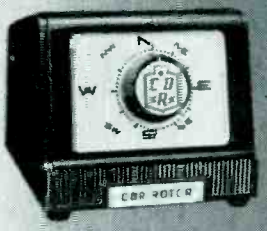
AR-1

The completely AUTOMATIC rotor, powerful and dependable, with a modern design cabinet. Uses 4 wire cable.



AR-2

Completely AUTOMATIC rotor with thrust bearing. Handsome cabinet, uses 4 wire cable.

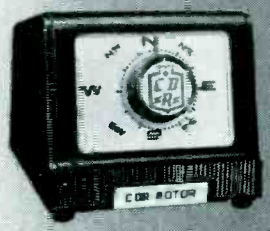


TR-4

The heavy-duty rotor complete with modern cabinet with METER control dial. Uses 4 wire cable.

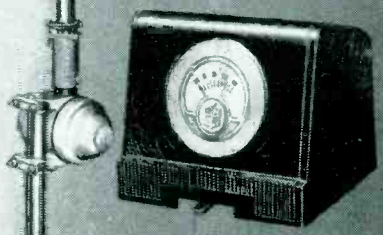
AR-22

Here is the completely AUTOMATIC version of the famous TR-2 with all the powerful features that made it so famous.



TR-11

The ideal budget all-purpose rotor with new, modern cabinet featuring meter control dial. Uses 4 wire cable.

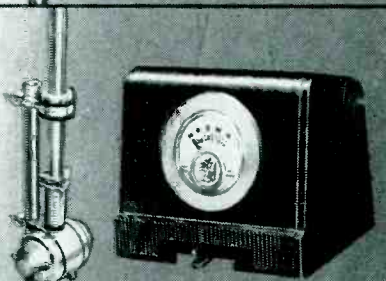


TR-2

The heavy-duty rotor with plastic cabinet featuring "compass control" illuminated perfect pattern dial. Uses 8 wire cable.

TR-12

A special combination value consisting of complete rotor with thrust bearing. Handsome modern cabinet with meter control dial, uses 4 wire cable.



CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

THE **RADIART** CORP.
CLEVELAND 13, OHIO

VOL. 16, NO. 10 OCTOBER, 1955

FEATURE ARTICLES

CIRCUIT AND SERVICE FORUM

DEPARTMENTS

RADIO-TELEVISION SERVICE DEALER is published monthly by Cowan Pub. Corp., 67 West 44th St., New York 36, N. Y. Subscription price: $1.00 per year in the United States, & U.S. Poss. Elsewhere $1 per year additional. Single Copies 25c. Second Class mail privileges authorized at New York, N.Y. Tel.: MU 7-2080.

POSTMASTER: SEND FORM 3579 TO RADIO-TELEVISION SERVICE DEALER, 67 WEST 44th ST., NEW YORK 36, N. Y.

Hycon

...where accuracy counts

MODEL 617
3" OSCILLOSCOPE

The general purpose scope that gives you most for your dollar... has *flat face* CRT for usable trace edge to edge. It combines laboratory accuracy with ruggedness and compactness that makes it ideal for field service...

VERTICAL AMPLIFIER
Frequency Response: 6 cps to 4.5 mc ±1 db
Sensitivity: .01 v/in rms
Input Impedance: 1 megohm, 35 mmf (±2 mmf) over entire range of attenuator

HORIZONTAL AMPLIFIER
Frequency Response: 6 cps to 500 kc ±3 db
Sensitivity: .075 v/in rms
Input Impedance: 1 megohm

SWEEP RANGES
15 cycles to 100 kc
Television V & H frequencies
60 cycle, variable phase

CALIBRATION
Internal 60 cps square-wave 0.05 to 150 volts peak-to-peak ±5%

SYNCHRONIZATION
Internal, external, positive, negative or AC line

POWER REQUIREMENTS
115 volts, 60 cycles, 100 watts

SIZE... WEIGHT
8½" x 11" x 10¾"... 22 lbs.

MODEL 616
COLOR BAR/DOT GENERATOR

...for adjusting and testing color receivers and transmitting equipment by manufacturer, station or serviceman. Features: Seven output forms of bars, dots, cross-hatch, phase and color-difference signals, including NTSC color bars. Panel presentation shows actual color and sequence of generator output...

SIGNAL OUTPUTS:
Composite video... either phase ... adjustable 0 to 1.5 volts peak-to-peak across 75 ohms
RF... 10,000 microvolts fixed level ... optional channel 3 or 4... crystal controlled... modulated sound carrier
Sync in or out

TYPES OF SIGNAL:
Vertical bars... variable from 15 to 20
Horizontal bars... variable from 10 to 15
Cross-hatch... variable as above
Dots... variable as above
Color Bars:
"A"... NTSC colors (Phase accuracy ±5°... luminance and chrominance amplitude held to ±10%)
"B"... G-Y at 90°... R-Y... B-Y... Black... R-Y and B-Y within ±1° of quadrature
"C"... Black... I... Q... Black ... I and Q within ±1° of quadrature

PHYSICAL CHARACTERISTICS:
Power: approximately 125 watts
Size: 8½" x 11" x 10¾"
Weight: approximately 22 lbs.

MODEL 622
5" OSCILLOSCOPE

A new oscilloscope concept...*automatic triggered sweep.* Simplifies adjustments, makes synchronization positive. Special CRT has flat face for usable trace edge to edge. One of today's most advanced TV servicing aids...

VERTICAL AMPLIFIER
Frequency Response: 6 cps to 6 mc ±3 db; down less than 0.5 db @ 4 mc
Sensitivity: 10 mv rms (28 mv peak-to-peak) per inch
Input Impedance: 1 megohm, 40 mmf (±2 mmf) over entire attenuator range

HORIZONTAL AMPLIFIER
Frequency Response: 1.5 cps to 500 kc ±3 db
Sensitivity: 75 mv rms (210 mv peak-to-peak) per inch
Input Impedance: 100k, 25 mmf

SWEEP CHARACTERISTICS
Usable writing speed... 0.03 sec/in to .3 μsec/in
Ranges...
a. 10 cps to 300 kc
b. Preset V & H television @ 7875 and 30 cps
c. 60 cps, variable phase line
Type... automatic triggered or straight triggered (by switching)

SYNCHRONIZATION
Internal, external, positive, negative or AC line

CALIBRATION
Internal 60 cps square-wave .05 volts peak-to-peak ±3%

POWER REQUIREMENTS
115 volts, 60 cycles, 175 watts

SIZE... WEIGHT
13⅝" x 10½" x 18¾"... 32 lbs.

MODEL 614
VTVM

Convenience at unprecedented low cost sums up this rugged, serviceable instrument. It's lightweight, versatile. Probes stow inside case, ready for instant use...

RANGES
DC: 0-1.5, 5, 15, 50, 150, 500, 1500 volts
AC: 0-1.5, 5, 15, 50, 150, 500, 1500 volts rms (with associated peak-to-peak scales)
Ohms: 0-1000 megohms in seven ranges

INPUT IMPEDANCE
11 megohms

FREQUENCY RESPONSE
Direct Probe: 30 cps – 3 mc
Crystal Probe: 50 kc – 250 mc

INDICATOR
6½" meter

ACCURACY
DC and ohms: 3%... AC: 5%

POWER REQUIREMENTS
115 volts, 60 cycles, 6 watts

SIZE... WEIGHT
8½" x 11" x 7½"... 10 lbs.

You can find Hycon electronic test instruments at your local parts jobber.

Hycon Mfg. Company
2961 EAST COLORADO STREET
PASADENA 8, CALIFORNIA

Today's only rotator with all 3!

Plus a score of other profit-building features that make the better-than-ever JFD Roto-King today's outstanding rotator value. See your JFD distributor today.

1 TODAY'S MOST POWERFUL GEAR TRAIN!

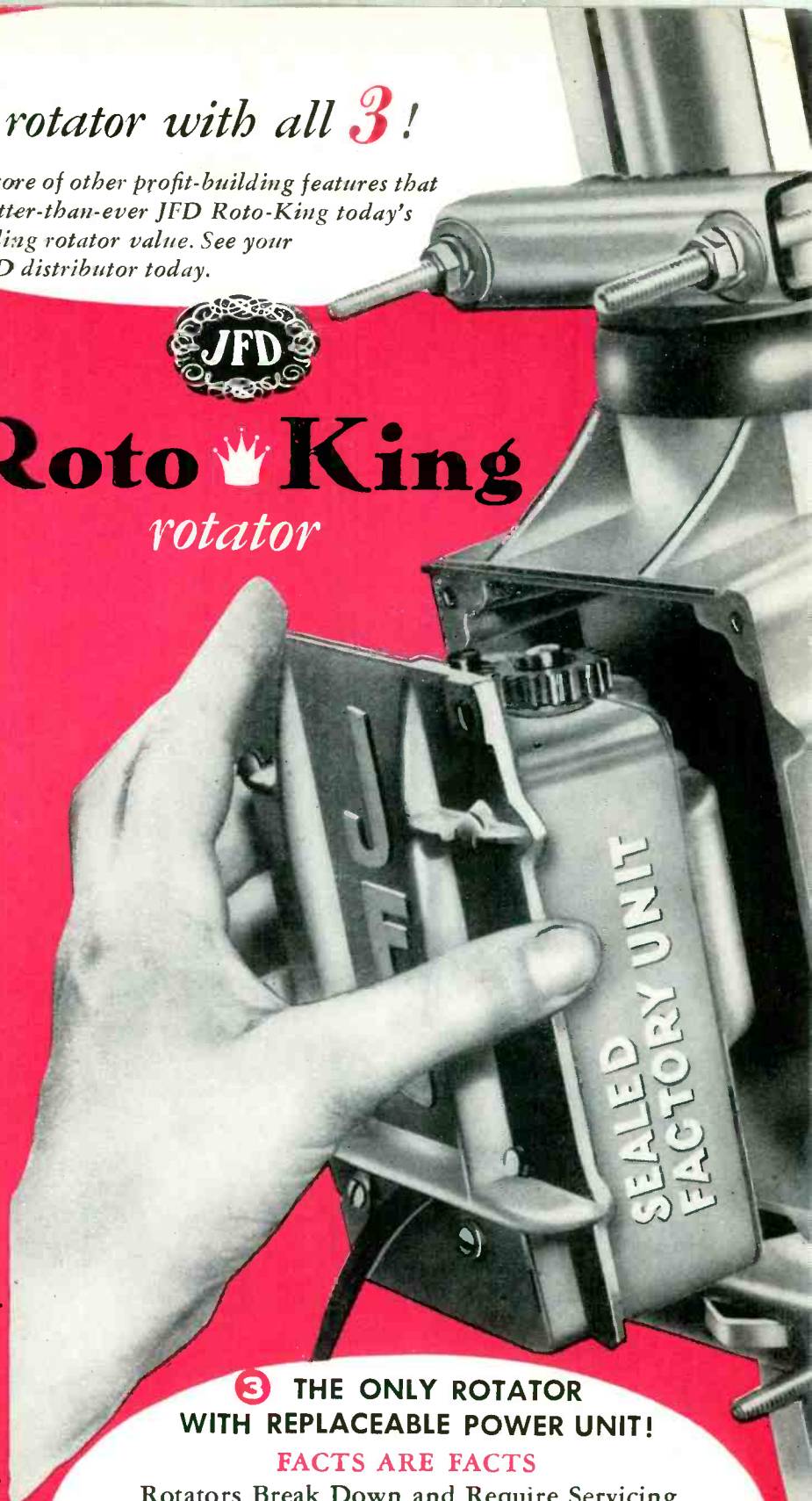
Compare these 6 large heavy duty close tolerance gears that develop smoother, greater torque. Yes, power capable of turning a 4-bay channel 2 Yagi.

2 CONTROL CASES IN 3 STRIKING DECORATOR COLORS!

Smartly styled console cases in glamorous color, to match milady's decor. The perfect complement to gracious living that TV set owners will go for.

JFD

Roto King rotator



MODEL	STYLE	LIST PRICE
RT100-M*	Mahogany	$55.95
RT100-IV*	Ivory	
RT100-EB*	Ebony	

*Featuring Constant Indicating Meter with Automatic Thermal Switch. Standard 60 cycle.

RT400-M**	Mahogany	$55.95
RT400-IV**	Ivory	
RT400-EB**	Ebony	

**Featuring Constant Indicating Meter with separate on-off switch for lower wattage TV receivers & amateur rigs. Standard 60 cycle.

RT500-M***	Mahogany	$49.95
RT500-IV***	Ivory	
RT500-EB***	Ebony	

***Featuring Constant Indication only when rotating antenna. Plugs directly into wall outlet. Less switches and automatic voltage regulation. Standard 60 cycle.

RT25C-M†	Mahogany	$52.95
RT25C-IV†	Ivory	
RT25C-EB†	Ebony	

†25 cycle for Canada and other countries.

3 THE ONLY ROTATOR WITH REPLACEABLE POWER UNIT!

FACTS ARE FACTS

Rotators Break Down and Require Servicing

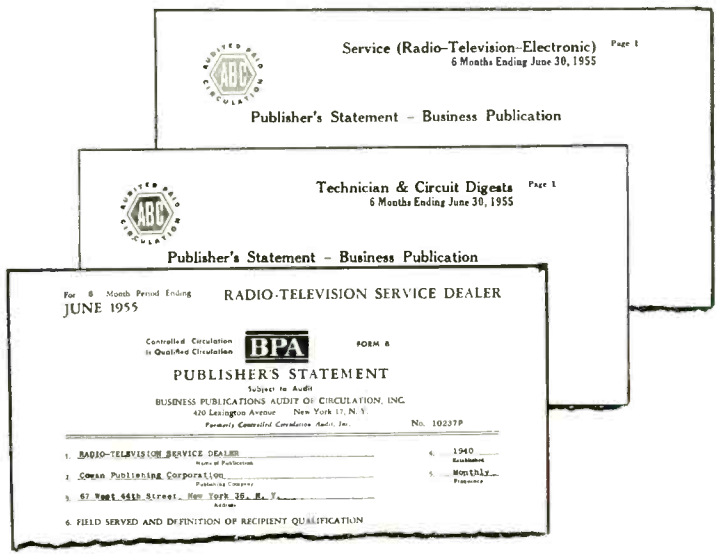
Dismantling and re-erecting a TV installation is an unnecessary and added expense, in time, labor and customer satisfaction. The JFD Roto-King with replaceable power unit, saves you these added expenses by effectively making your servicing simple, quick and easy. Just remove the power cartridge and install a new one.

JFD MANUFACTURING CO., INC., Brooklyn 4, N. Y.

Look To JFD For Engineering Leadership!

INTERNATIONAL DIVISION 15 MOORE ST. N. Y. C.

Compare the Latest Circulation Statements!



SERVICE DEALER—the only magazine which reaches, every month, the owner or manager of every firm in the USA that does radio-TV-electronics service work—now leads its nearest competitor by over 19,454 and the third magazine by over 26,080 in "service field coverage."

All circulation figures quoted here are taken from the latest ABC and BPA Statements.

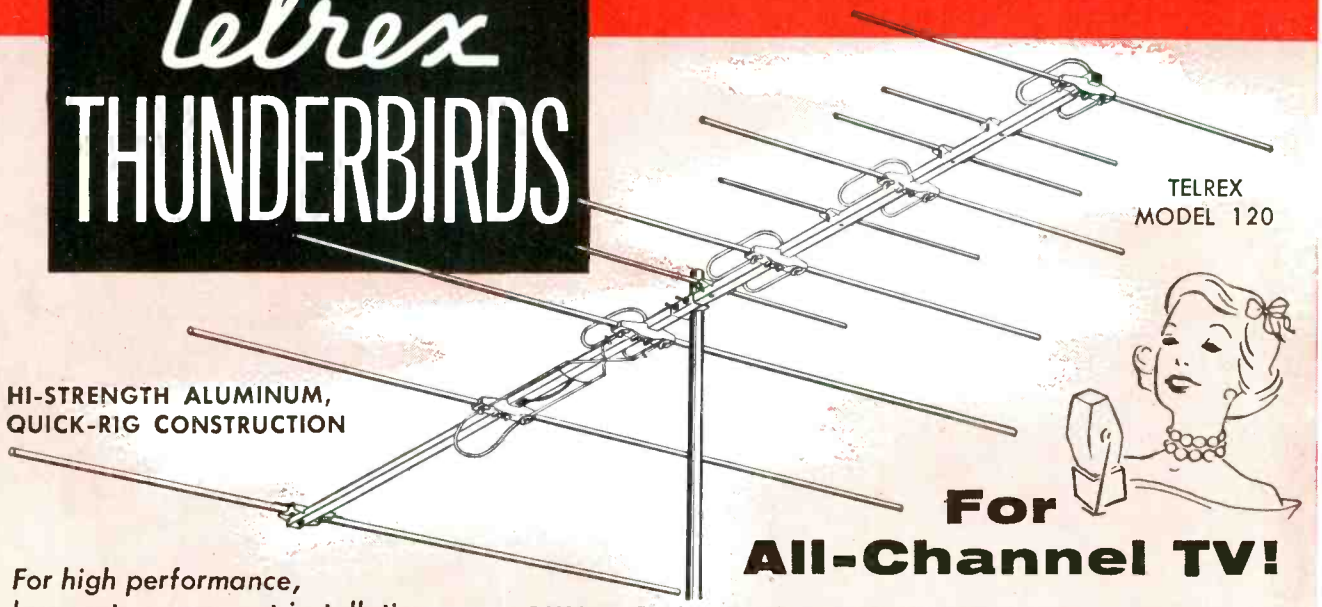
CLASSIFICATION	RADIO TELEVISION SERVICE DEALER	TECHNICIAN	SERVICE
1a—Radio-TV service firm owners & independent servicemen.	27,488	23,378†	26,952†
1b—Service managers employed by service firms.	372	202	280
1c—Technicians employed by service firms.	4,380	2,417	1,400
2a—Owners & managers of retail firms that operate service depts.	19,096	10,370	3,633
2b—Service managers employed by above service dealer group.	686	1,356	513
2c—Technicians employed by above service dealers.	3,308	3,693	1,414
3 —Firms that do industrial electronic servicing only.	1,731	*	*
4 —Part-time servicemen.	3,361	57†	†
5 —Distributors and their personnel.	1,553	1,048	703
TOTAL SERVICE CATEGORY CIRCULATION	61,975	42,521	34,895

† Both Technician and Service include in classification 1a all the part-time independent servicemen subscribers they serve
* Both Technician and Service include in classifications 1a-b-c the industrial electronic service firm subscribers served

The average total paid circulation for the 6 month period January-June 1955 of the respective publications was: SERVICE DEALER—46,218; SERVICE—50,271; TECHNICIAN—44,700. The average total monthly distribution for the same period was: SERVICE DEALER—70,832; SERVICE—56,191; TECHNICIAN—50,572.

telrex THUNDERBIRDS

CONQUERORS OF DISTANCE!



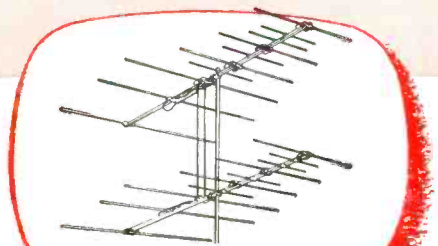
TELREX MODEL 120

HI-STRENGTH ALUMINUM, QUICK-RIG CONSTRUCTION

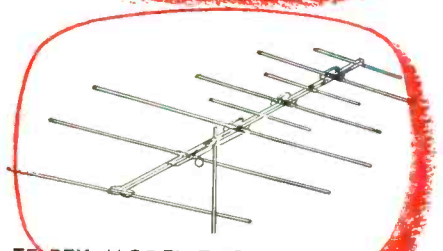
For All-Channel TV!

For high performance, low cost, permanent installation, choose a Telrex "Thunderbird"—

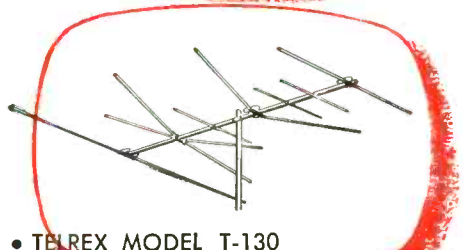
- **DUPLEXED ELEMENTS FOR MAXIMUM GAIN**
- **COMPENSATED "TROMBONE" MATCHING SECTIONS FOR MAXIMUM EFFICIENCY**
- **FULL VIDEO, AUDIO BANDWIDTH FOR MAXIMUM BLACK AND WHITE AND COLOR FIDELITY**



• TELREX MODEL T-122



• TELREX MODEL T-110



• TELREX MODEL T-130

The new Telrex "THUNDERBIRD" multi-element wide-band Beamed Power arrays are engineered for fringe and "sub-fringe" area reception, and for all receiving conditions requiring exceptionally good directivity and high sensitivity.

Super Thunderbird Model T-120 is the finest wide-band, multi-element array ever developed. A system of variable impedance phasing loops permit precision tuning and the duplexing of element functions to provide the equivalent of 6 operating elements on the LO channels; 13 elements on the HI channels. Element for element, they develop greater gain and directivity than many single channel arrays. **Model T-120** is accurately matched to 200-300 ohm transmission line for both HI and LO channels with compensated "trombone" sections to yield exceptionally high gain and optimum signal transfer efficiency. LO band gain averages better than 5.5 db; HI band gains exceed 12 db, while front-to-back ratios range to 25 db.

For brilliant, interference-free signals under toughest reception conditions, choose the Telrex **Super Thunderbird T-120!** Available also in 2 bay units—**Model T-122,** ¼-wave stacked for gain increases averaging 3 db on all channels; and **Model T-122S,** ½-wave stacked to provide gain increases up to 4.5 db on LO channels, over single bay units.

Thunderbird Model T-110 incorporates all the high-performance features of the **Super Thunderbird T-120** including variable impedance loop phasing, compensated "trombone" matching sections and in-line, low wind resistance configuration plus high strength, all aluminum, quick-rig construction for dependable, high performance, low cost, long lasting installations. Duplexed elements are equivalent to 5 effective elements on LO channels for average gains exceeding 5 db; and 11 operating elements on the HI channels for gains exceeding 10 db. Front-to-back and front-to-side ratios of better than 22 db minimize interference.

Available stacked ¼-wave, **Model T-112,** for all channel gain increases of 3 db; and ½-wave stacked, **Model T-112S,** for increased gains to 4.5 db on LO channels.

Thunderbird T-130 employs Conical Dipole and "V" Beam quadrature phased driven elements to achieve virtually flat, stepless gain characteristics on all VHF channels with minimum number of elements. **Model T-130** also employs variable impedance phasing loops, duplexed elements and Telrex compensated "trombone" matching sections. Four effective LO channel elements; 9 operating elements on HI channels, produce gains to 5 db on 2-6, and up to 11 db on channels 7-13. Special trap circuitry used in all Thunderbirds, attenuates interference arising outside the assigned TV bands to assure crisp, smear-free picture quality and full sound response.

Model T-132 stacked ¼-wave gives average gain increase of 3 db on all channels; ½-wave stacked **Model T-132S** provides up to 4.5 db gain on LO channels over single bay.

Producers of famous "BEAMED POWER" Communication Rotaries. Call or write for new catalogs on TV Antennas, Commercial Arrays or Amateur Rotaries.

telrex INC.
AMERICA'S STANDARD OF COMPARISON
"CONICAL-V-BEAMS"

ASBURY PARK 5
NEW JERSEY, U. S. A.
Tel. PRospect 5-7252

Canadian Distributor:
DELHI METAL PRODUCTS, LTD., Delhi, Ontario

"Conical-V-Beams" are produced under U. S. Patent No. 23,346, Canadian Patent No. 500,436 and British Patent No. 691,485 — other patents pending. Sold only through authorized distributors.

EDITORIAL...

by S. R. COWAN, PUBLISHER

You Asked For Them

During the summer months we asked nearly half of the 62,000 servicemen who read SERVICE DEALER a simple question: "What can we do to SERVICE DEALER editorially to make it more valuable to you?" The overwhelming answer was simply this: "Give us complete in one issue the TV schematics that cover all of the chasses in any given TV set manufacturer's line for that season." This was a tall order but we'll fill it starting with our next issue. The 12 complete sets of schematics we'll publish every year will most likely cover 90% of the sets made during that year.

Usually a TV set manufacturer's line for any year consists of 3 to 5 different basic chasses—ranging high, medium and low. These few chasses may cover 40 to 50 different models—but fundamentally—that's all there is to it.

For example, when our November issue arrives, it will have in it schematics on RCA's complete 1956 line of black and white TV chasses. Then in December SERVICE DEALER you'll find all the schematics on Motorola's new 1956 line. You asked for this service and we'll provide it.

John F. "Rider Speaks"

Recently, while chatting with Mr. Rider, I learned that his views concerning the fast-changing trends of radio-TV servicing and his outlook as to "what kinds" of electronic servicing will be commonplace 5, 10, and 20 years hence coincide with my own.

In this regard and at this time I will not delve too deeply into my personal beliefs about future servicing techniques except for one brief hint. Automation, for example! Make no mistakes about it, automation is a "comer." And I believe that while a single unit of automation equipment may in some instances in the future do the work formerly done by 40 or 60 skilled laborers, that single piece of automation equipment itself may require the full-time services of 10 or 15 thoroughly trained electronic technicians merely to keep it working perfectly. This is an electronic age—but it's still in its baby stage.

So, having heard Mr. Rider's views, I asked him to become a regular contributor to this magazine. He agreed. So, beginning with our November issue you'll find regularly a page or so titled "Rider Speaks." He will cover a myriad of timely and often controversial subjects. Mr. Rider's views, as expressed herein, may or may not coincide with my views as Publisher of this journal.

Uppermost in Mr. Rider's mind will be the betterment of servicing and the best interests of servicemen. So, there you have it! Starting in November, through this magazine exclusively, "Rider Speaks!"

Jury—What's Your Verdict?

There's a reason why the advertisement titled "Mr. Manufacturer" appears on page 28.

During July and August I called upon several manufacturers of items such as test equipment, parts, antennas and soldering irons whose advertising has been running consistently in magazines that reach parts jobbers, but who have not advertised in servicemen's magazines.

To my chagrin, several of the manufacturers I spoke to told me candidly that they believed that their first and most intensive selling effort should be done at jobber level—and that advertising to servicemen could be given consideration for a later date. These manufacturers stated that once they "sold" a jobber—that jobber in turn would "sell his servicemen" customers their products.

Now the questions I ask you servicemen are simple. Was I wrong in saying what I did to these manufacturers? Do you servicemen make up your own minds as to what brands you buy or do you rely to a large degree upon recommendations given you by your jobber? I'd like to hear from you! Tell me frankly—which influences you most in regard to your selection—your jobber or the advertisements you read in servicemen's magazines?

The manufacturers who advertise in SERVICE DEALER want servicemen's business and say so. I believe they are entitled to servicemen's continued support. That's why SERVICE DEALER favors them with Honor Roll Recognition. Meanwhile—I am awaiting your views as to where manufacturers should advertise.

Never before—an antenna with such utterly . . .

Fantastic front-to-back ratios

Low Band: from 20:1 to 50:1 relative VOLTAGE
(2500:1 relative *power*)

High Band: up to 13:1 relative VOLTAGE
(169:1 relative *power*)

"Super-sembled" — with Channel Master's trigger-fast Snap-Lock Action.

new

CHANNEL MASTER'S "K.O."

all-channel antenna

Knocks out venetian blinds and co-channel interference!

Channel Master's new "K.O." has the highest front-to-back ratios ever recorded for any TV antenna! The sensational "K.O." actually sets up an INVISIBLE BARRIER to signals coming in from the rear. Working with supreme efficiency on both VHF bands, it totally REJECTS rear signals, preventing venetian blinds and other picture problems caused by co-channel interference!

Spectacular High Gain!

Low Band, 7 to 9 DB, single bay; High Band, 8.5 to 10.5 DB, single bay. True Yagi performance, combined with completely independent High and Low Band operation for maximum efficiency.

Available 3 ways!

Broad Band model—model no. 1023
(includes HI-LO Matching Harness)

Low Band only—model no. 1026

High Band only—model no. 1073

Full descriptive literature available from your Channel Master distributor.

LICENSED BY KAY-TOWNES ANTENNA CO., ROME, GA.

CHANNEL MASTER CORP.
The World's Largest Manufacturer of TV Antennas and Accessories

WHAT

have you got that other TV-Radio servicemen haven't got?

When you are a *Raytheon Bonded Electronic Technician*, the answer is simple. You have the exclusive tool, the *only* tool in the industry that creates customer confidence — *draws customers to your shop.*

Under the Raytheon Bonding plan, your work and parts guarantee is backed by a Bond issued through one of America's largest insurance companies. Customers appreciate the value of this extra protection and, all else being equal, give their business to the Raytheon Bonded Dealer.

If you can qualify for the Raytheon Bond, it won't cost you a penny. Call your Sponsoring Raytheon Tube Distributor today for the whole story.

RAYTHEON®

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

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

RAYTHEON MAKES ALL THESE:

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • SEMICONDUCTOR DIODES, POWER RECTIFIERS AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

AUTO RADIO

And Electronic Accessories

Servicing Auto Electronic Accessories Offers A Profitable Source of Income

by **STEVE TRAVIS**

ONE of the big mysteries in radio and electronics servicing is the discrimination practiced by servicemen against servicing certain pieces of electronic apparatus. For some reason car radios and mobile equipment have been ignored for the supposedly easier field of TV and home radio. Actually, mobile equipment installation and servicing, considered in the broad sense of car radios, transceivers, etc., is one of the more prosperous and consistent aspects of electronic servicing as only too few service companies appreciate.

Let's consider briefly the many electronic changes and new devices that will be encountered by those who hope to enter this sphere of electronic activity. These opportunities have been mostly ignored and yet are full of the promise of interesting, profitable service work. Regarding changes in automobile systems and radios, it will do well to look at these at the same time, noting their influence on mobile electronic servicing.

Automobile 12 Volt Electrical Systems

The addition of such features in modern cars as air-conditioning, signal seeking radios, headlamp dimmers, electric window controls and electric antenna extenders place a great drain on the electrical system of automobiles. Copper losses in the wiring of the 6 volt systems were found to be appreciable and the additional current load of the new devices caused a considerable voltage drop across the interconnection cables. This voltage loss at first may appear to be of little concern. However, after considering that it represents a large proportion of the available voltage it can be seen that it will bring about reduced voltage and therefore less efficiency in operation of the new accessories. Therefore a 12 volt system has been adopted in many of the new cars to add a little "muscle" to the voltage supply.

The Autronic-Eye

The Autronic-Eye (automatic headlight control), optional equipment for the more expensive automobiles, is an electronic unit that responds to the headlamps of approaching automobiles and automatically switches the headlights from bright to dim, or from high beam to low beam. Once the car travelling in the opposite direction has passed, the headlamps are switched back to high beam without the driver having to be concerned about making the beam changes. This inexpensive accessory item works very well and although it is slowly being received its acceptance seems assured.

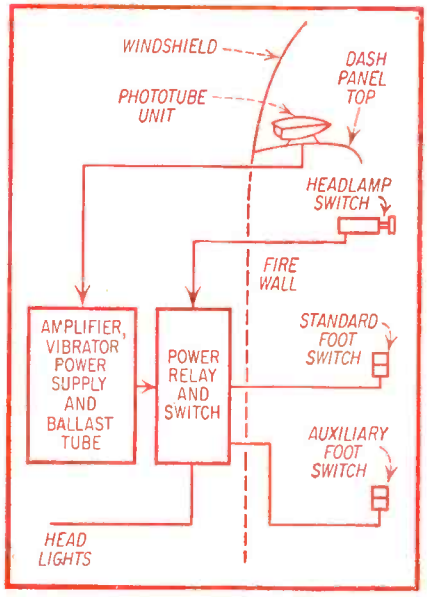


Fig. 1—Autronic Eye installation.

As can be noted in *Fig. 1* the Autronic-Eye is composed of four primary units, an amplifier, a power relay, a foot switch and a phototube unit. The schematic diagram for these units is shown in *Fig. 2*. The phototube unit consists of a lens that focuses the received light on a phototube inside. The phototube develops a signal as a result of the light intensity. This voltage, negative in polarity, is applied to the grid of the amplifier tube. When a large enough negative voltage is developed and applied, the tube current is reduced to the amount that will allow the sensitivity relay to release an arm, and the contacts of the switch are changed. The new connection allows battery voltage to be applied to the power relay making it draw the pole piece so that the headlamp contacts are changed from high beam to low beam.

When the headlight beams pass the car the negative voltage is removed, the sensitivity relay changes contacts, the power relay is open circuited and connection is made for the high beam. An auxiliary foot switch is provided as a means of physically switching to the upper beam when the Autronic-Eye is in control and has caused the low beam to be on. This is a desirable feature for such purposes as signalling to pass a car.

The phototube unit is generally installed on top of the instrument panel at the left side and is positioned 25 to 30 degrees to the left of the centerline of the car. Adjustments in sensitivity must be made for either tinted or clear windshields. The Autronic-Eye is designed to operate at about 400 to 500 feet from an approaching vehicle. Some states have traffic laws requiring the dimming of headlights with the approach of a car. When the distance is specified as 500 to 600 feet it is an easy matter to adjust the sensitivity to cause the unit to respond sooner.

Both the amplifier and power relay are usually mounted under the hood while the auxiliary foot switch is installed near the standard foot switch. The relay is of the special contact point variety having to switch heavy currents. The servicing of this unit is much simpler than repairing a TV receiver

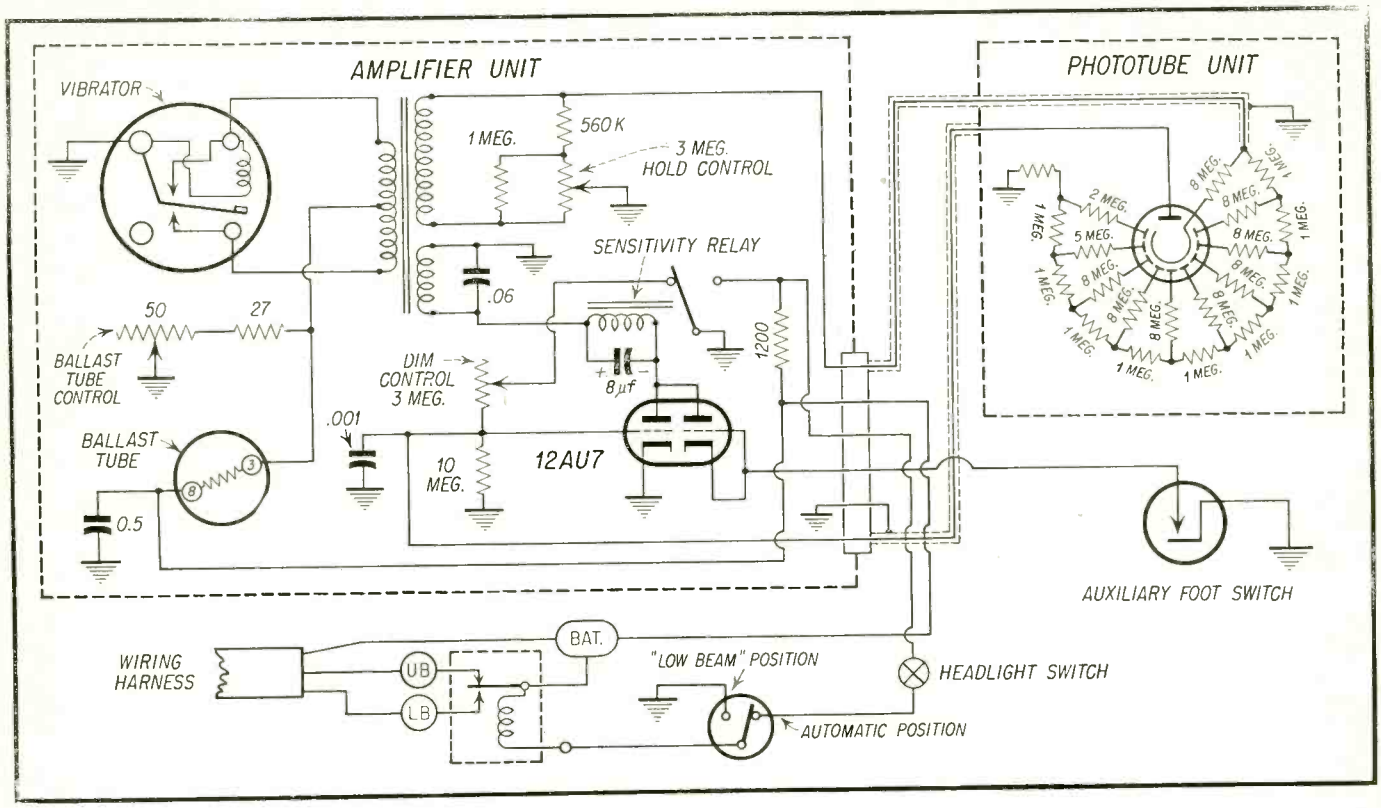


Fig. 2—Circuit diagram of Autronic Eye unit.

and will be found to be interesting. There are definite test procedures that make adjustments and repairs straightforward.

Electronically Controlled Garage Door Openers

An electronic operated garage door opener is rather unique and proves quite interesting to friends and neighbors. The unit is a means of opening or closing the garage door without getting out of the car. It is a neat trick and is accomplished through the use of a small transmitter operated at 27.255 *mc* in the Citizens Radio band. The pressing of a button in the car causes the transmitter to send out a signal that is received by a radio fixed-tuned to this frequency in the garage. The receiver then activates a relay, starting a motor. The motor does the physical work of pulling a chain or turning a gear mechanism as the case may be to lift or lower the door. When the door has reached the desired extent of travel a microswitch opens the circuit ceasing its operation. Along with this action another switch can be added to turn on the lights inside when the door is opened and off when the door is closed.

Of course, entering and exiting the garage when the car is inside without this equipment requires the lifting of the garage door. With the radio controlled garage door opener all that is necessary is to press a button positioned outside the garage or even inside the house. Naturally, it is desirable to have the garage door in view from the position of the button so as to not cause an accident. Thus, the garage can be opened or closed when entering or leaving the garage on foot. Those who house their autos in their own private garages can realize and appreciate the convenience this inexpensive unit offers not only for those occasions of inclement weather but for the general ease of accessibility to the garage.

The radio controlled garage door opener has achieved increased popularity and is an excellent sideline for the enterprising electronic serviceman. These units are commercially available and are straightforward installations in both the car and garage for 6 or 12 volt automobile power systems.

In the car the transmitter unit is usually mounted under the hood as shown in Fig. 3. Power in the unit is developed with a vibrator type of supply and selenium rectifiers are sometimes used in a voltage doubling arrangement for greater voltage. Most equipment commercially built has been designed so as not to cause interference to television receivers through the use of filters in the antenna and power leads. Servicing is not any more difficult than that of a table model radio. Conventional procedures are employed in locating any troubles that may develop. The measuring of voltages and resistances applies with these units as with other electronic gear. Checking the vibrator power supply and tubes is one of the first steps and, as a matter of fact, the servicing of these units is right down the alley of a good serviceman.

The operating range of the electronic

[*Continued on page 55*]

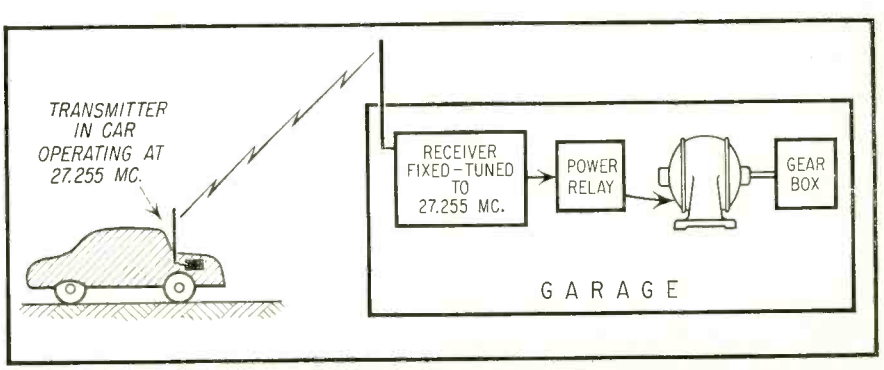


Fig. 3—Radio-Controlled garage door installation.

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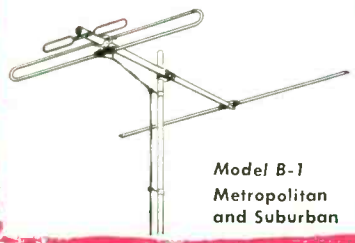
(pat. pend.)

BY FINCO®

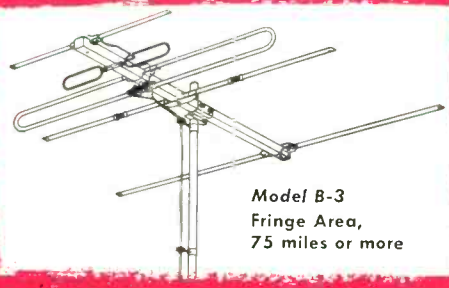
with exclusive Fidelity Phasing*

* *Dictionary: the highest degree of accuracy in the reproduction of a signal*

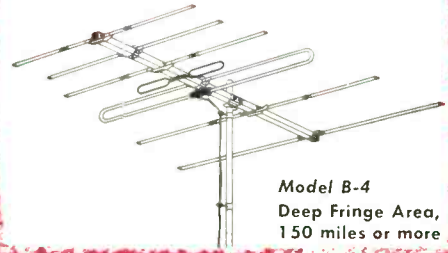


Model B-1
Metropolitan
and Suburban

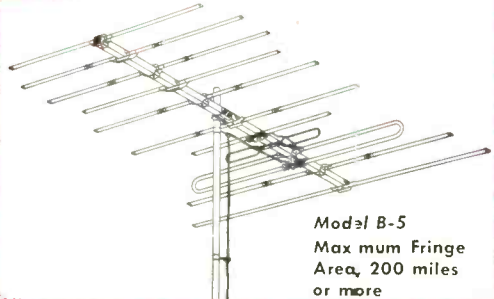
Model B-2
Suburban and
Semi-Fringe Area



Model B-3
Fringe Area,
75 miles or more



Model B-4
Deep Fringe Area,
150 miles or more



Model B-5
Maximum Fringe
Area, 200 miles
or more

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Troubleshooting Oscilloscope

by Harold White

THE Probescope is a new compact portable troubleshooting oscilloscope utilizing a 1CP1-one inch cathode ray tube. Its features include speed of operation, ease of handling and visibility of application. Patterns obtained are sharp, and bright enough to observe in daylight. Its frequency response (7 cycles to 70 *kc* at—3*db*) is adequate for routine servicing of TV receivers. It does not contain provisions for sweep alignment.

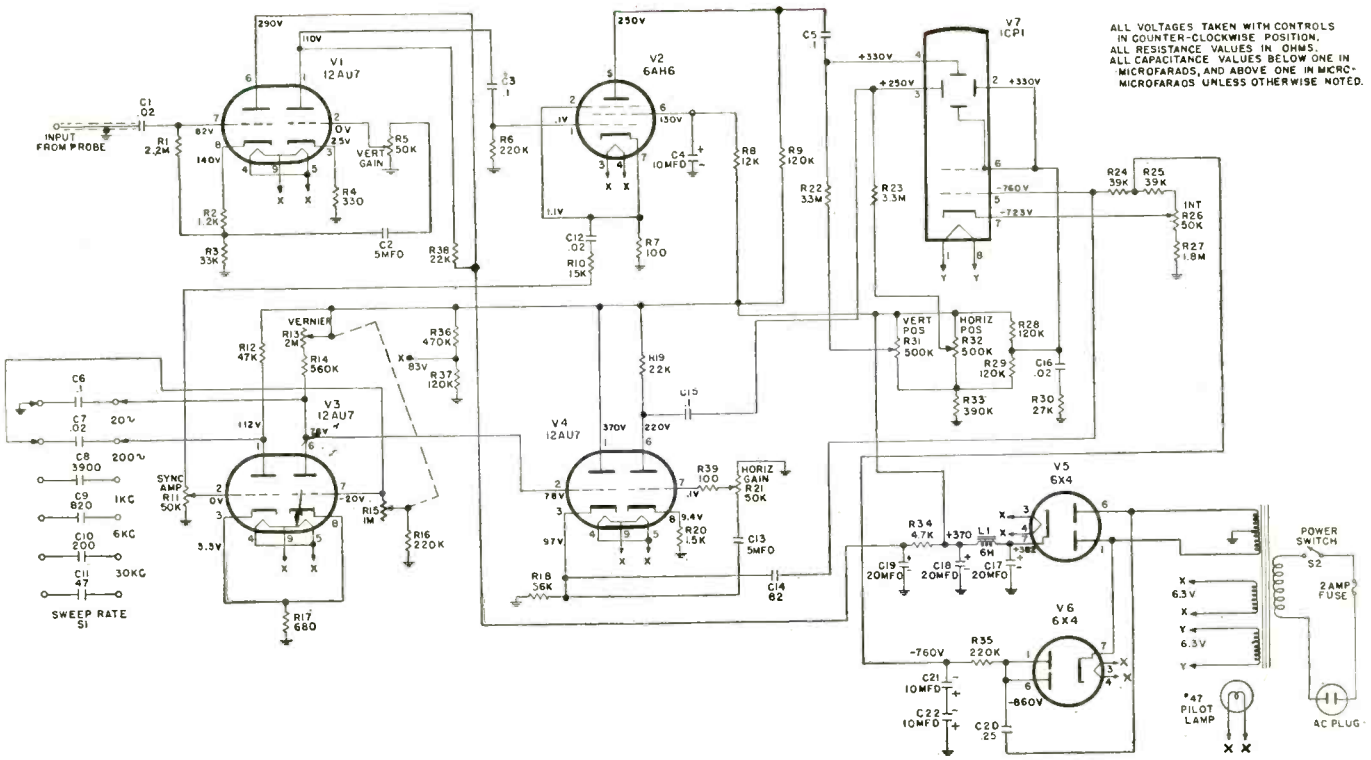
Applications

The scope has enough sensitivity to pick up a signal on the 1st video *if* tube for observation of the low frequency contents of the signal which include the horizontal and vertical sync pulses. If desired a detector may be inserted at the probe tip for visual observation of the demodulated video signal. In this manner it can be used to signal-trace the complete video *if* channel.

It also may be used as a signal-tracer in the sound *if* channel in conjunction with a detector connected to the probe tip. Visual observation of the audio signal following FM detection is straightforward; one merely applies the probe tip to the point where the signal is to be observed.

The video signal itself may be signal-traced from the video detector on to the picture tube in the same manner. The horizontal sweep of the scope in this case may be set at 15,750 *cps* for

[*Continued on page 48*]



SCHEMATIC DIAGRAM
PROBESCOPE MODEL PO-1

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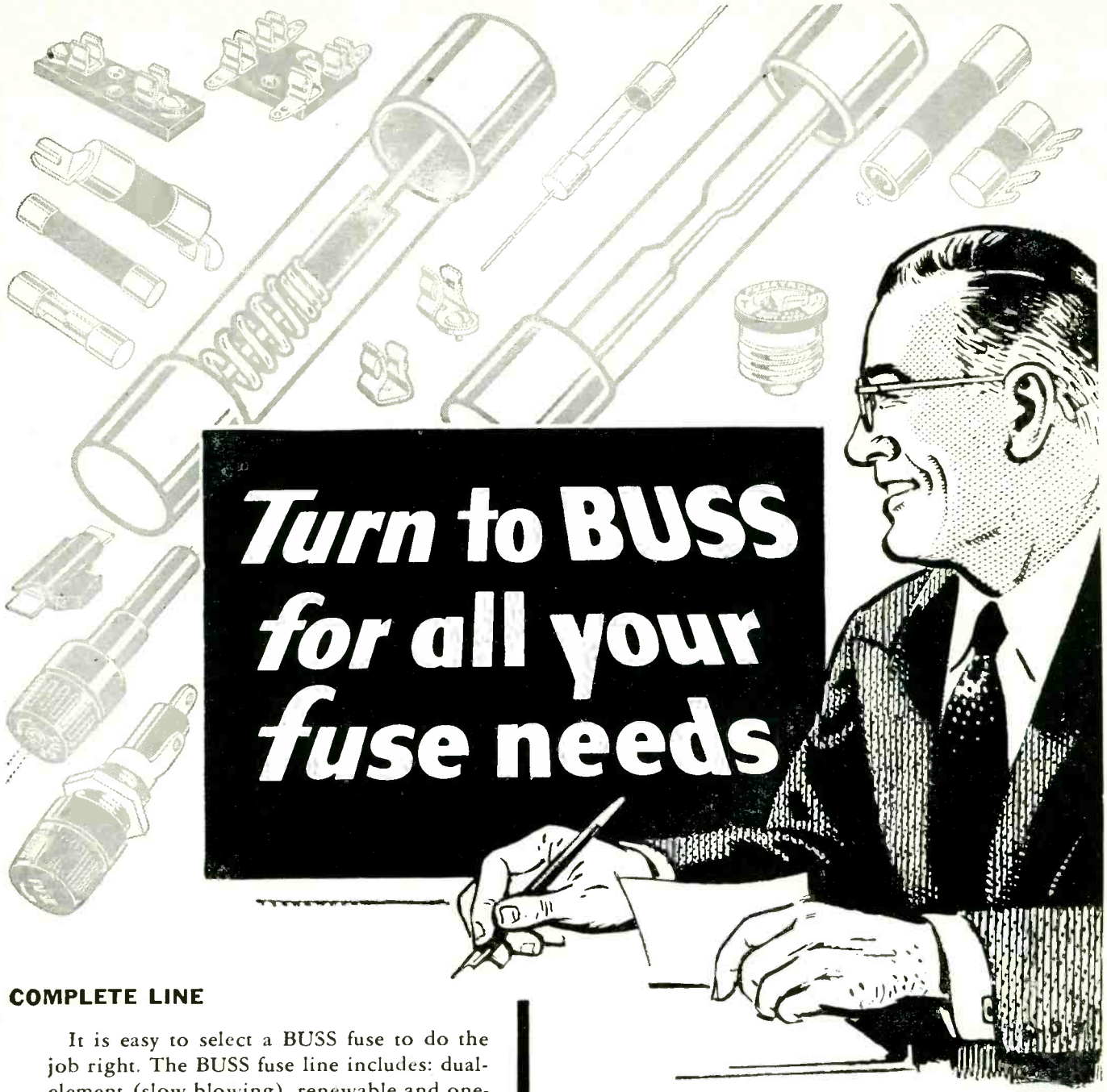
DELCO RADIO
DIVISION OF GENERAL MOTORS
KOKOMO, INDIANA

HERE'S THE COURSE OF STUDY — (1) Circuitry differences between home and auto radios. (2) Dead radio trouble-shooting procedure and lab. (3) Noisy radio trouble-shooting and lab. (4) Weak radio trouble-shooting and lab. (5) Distorted radio trouble-shooting and lab. (6) Intermittent trouble-shooting and lab. (7) Push-pull lock-up tuner lecture and lab. (8) Mechanical operation of Signal Seeking Tuner. (9) Electrical operation and trouble-shooting of Signal Seeking Tuner. (10) Autronic-Eye operation trouble-shooting procedure and lab. (11) Autronic-Eye installation and adjustment procedure. (12) Transistors and printed circuits.



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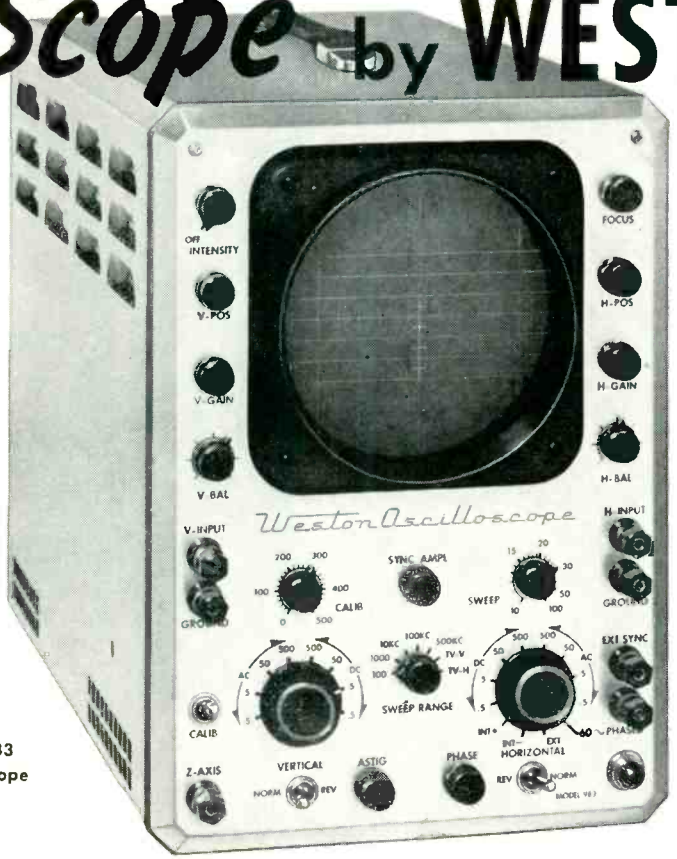
NOW...the All-purpose 'Scope by WESTON



Weston
Model 983
Oscilloscope

Model 983 is a high gain, wideband Oscilloscope designed to accurately reproduce waveforms comprising a wide band of frequencies. High sensitivity of 15 millivolts per inch RMS makes this "scope ideal for—SETTING RESONANT TRAPS...SIGNAL TRACING IN LOW LEVEL STAGES...AS A GENERAL NULL INDICATOR...for PHASE CHARACTERISTIC MEASUREMENT IN INDUSTRIAL APPLICATIONS...and for SWEEP FREQUENCY VISUAL ANALYSIS.

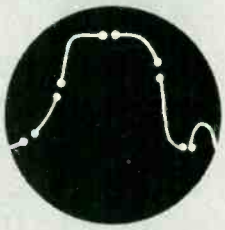
The 'scope contains identical vertical and horizontal push-pull amplifiers with a choice of AC or DC coupling without affecting either sensitivity or band width. Both amplifiers have compensated step attenuators and cathode follower input. *It has excellent square wave reproduction with overshoot of only 2 to 5%, with a rise time of 0.1 microsecond. The 'scope response is essentially flat throughout the specified range of 4.5 mc and is usable to 6 mc.*

The unit has provisions for internal calibration, internal phased sine wave, and Z-axis intensity modulation. Reversal of polarity of both horizontal and vertical signals is easily accomplished by means of toggle switching. *Tube replacements are non critical, and etched circuitry facilitates quick and rapid maintenance.*

The Model 983 Oscilloscope is now available through local distributors. For complete literature write WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

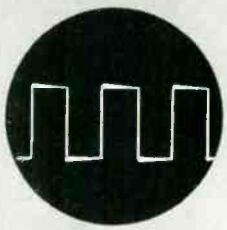
WESTON *Instruments*

WAVEFORM ANALYSIS



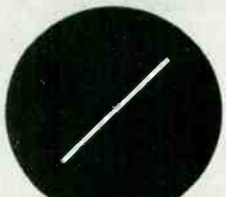
Response curves accurately displayed. Ideal for use with Weston intensity marker display. A fast, retrace sweep circuit with cathode follower output prevents pattern distortion.

SQUARE WAVE RESPONSE



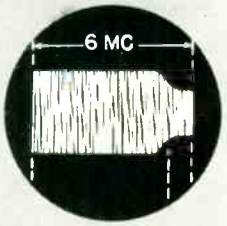
Overshoot is only 2 to 5%. Rise Time is 0.1 Microsecond. Square wave depicted 250 kc.

PHASE MEASUREMENTS



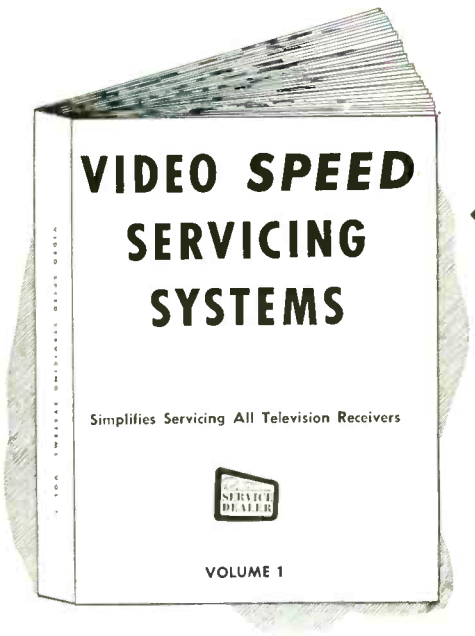
Phase shift between horizontal-vertical amplifiers, 0-500 kc-0°, to 1 mc within 2°; by internal adjustment with gain controls at max 0° phase shift possible on any specific frequency to 6 mc.

RESPONSE CHARACTERISTIC



Note flatness throughout specified range; to 3.6 mc down 1.5 db, at 4.5 mc down 3 db, at 6 mc down 6 db.

By popular demand, the serviceman's most-wanted book, Video *speed* Service Systems Vol. 1. is now also available in a low cost PAPER BOUND COVER EDITION



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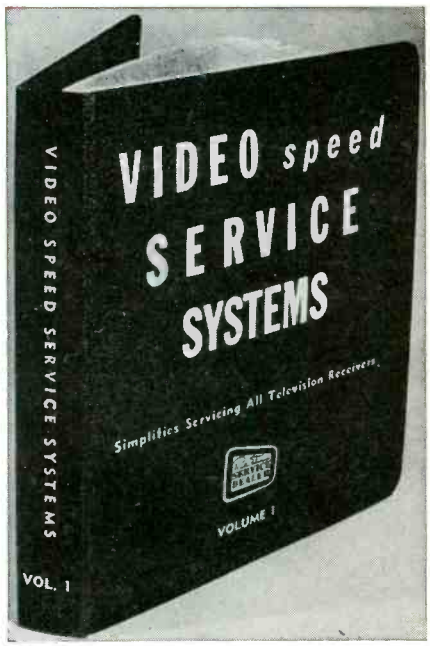

Facts About Video *speed* Service Systems:

CONTENTS:

A compilation of specific receiver service repairs, "bugs", chronic troubles, field circuit changes, manufacturers' production revisions, etc. The compilation enables the service technician to pin-point what is wrong with any given TV set and to correct the fault in the shortest possible time.

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The material was obtained directly from manufacturers, distributors' service departments, TV service organizations, and top TV Service-dealers throughout the country. Furthermore — all material has been checked carefully to assure dependability and accuracy.

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Reply Sales Manager • Merit Coil and Transformer Co., Chicago 40

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★C-2994	3	A-3130	2
★C-2995	3	A-3131	2
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A-2998	2	A-3133	2
A-2999	2	★P-3138	7
★A-3000	6	★P-3139	7
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BC-352	12	BC-546	14
BC-353	12	BC-547	14
BC-354	12	BC-548	14
BC-355	12	BC-549	14
BC-360	12	BC-550	14
BC-361	12	SW-600	14
BC-362	12	SW-601	14
BC-363	12	SW-602	14
BC-364	12	SW-603	14
BC-365	12	SW-604	14
BC-366	12	SW-605	14
BC-367	12	SW-606	14
BC-368	12	SW-607	14
BC-369	12	SW-620	14
BC-370	12	SW-621	14
BC-371	12	SW-622	14
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BC-375	12	SW-631	14

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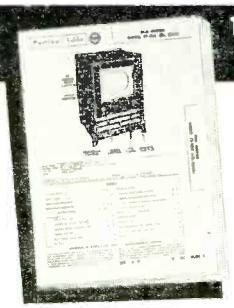

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7. Transformer winding resistances appear on the schematic.

8. Schematics are keyed to photos and parts lists.

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9. Exclusive photo coverage of all chassis views is provided for each receiver.

10. All parts are numbered and keyed to the schematic and parts lists.

11. Photo coverage provides quicker parts identifications and location.

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12. Complete, detailed alignment data is standard and uniformly presented in all Folders.

13. Alignment frequencies are shown on radio photos adjacent to adjustment number—adjustments are keyed to schematic and photos.

TUBE PLACEMENT CHARTS

14. Top and bottom views are shown. Top view is positioned as chassis would be viewed from back of cabinet.

15. Blank pin or locating key on each tube is shown on placement chart.

16. Tube charts include fuse location for quick service reference.

TUBE FAILURE CHECK CHARTS

17. Shows common trouble symptoms and indicates tubes generally responsible for such troubles.

18. Series filament strings are schematically presented for quick reference.

COMPLETE PARTS LISTS

19. A complete and detailed parts list is given for each receiver.

20. Proper replacement parts are listed, together with installation notes where required.

21. All parts are keyed to the photos and schematics for quick reference.

FIELD SERVICE NOTES

22. Each Folder includes time-saving tips for servicing in the customer's home.

23. Valuable hints are given for quick access to pertinent adjustments.

24. Tips on safety glass removal and cleaning.

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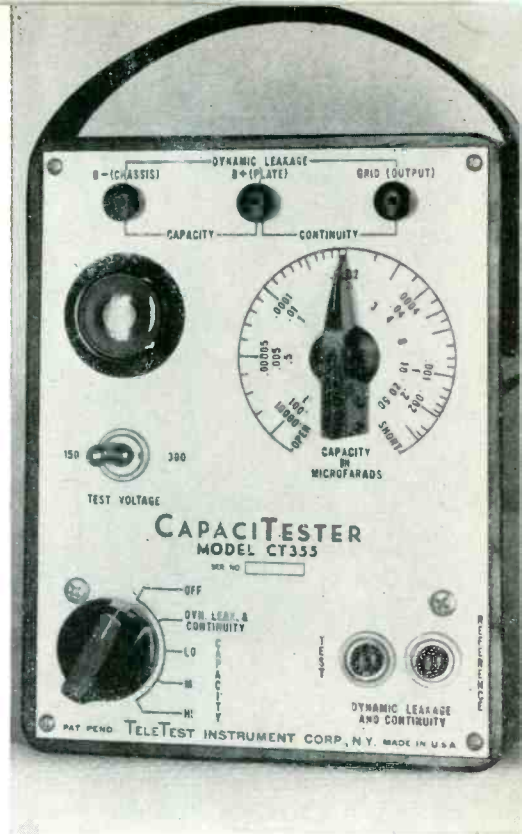
The CapaciTester

by Sol Heller



BUSY servicemen to whom time is money will be interested in a new piece of test equipment that measures capacitance and permits coupling condensers to be tested for leakage without disconnecting them from their circuits. This instrument manufactured by the Tele Test Corp. of New York is called the CapaciTester. Besides a saving in time, the following additional advantages are provided: Grid Current effects that tend to make voltage tests of leaky couplers hard to interpret are avoided (since the receiver is off when the tests are made.) This is an advantage the CapaciTester enjoys over a voltmeter. Its superiority to an ohmmeter check for a leaky coupler lies in the fact that voltages similar to those present in normal receiver operation are applied to the condenser under test, causing leakages that exist only under such "hot" conditions to appear and be detected.

The leakage testing section of CapaciTester employs a unique test set-up that is interesting enough to warrant description. This set-up is shown in simplified form in *Fig. 1*. A "magic-eye" 6AF6 tube is used as an indicating device in conjunction with the condenser circuit under test. This circuit is shown in *Fig. 2*. Here point A corresponds to the B+ Jack Connection of *Fig. 1*; point B corresponds to the Grid Jack Connection; and ground corresponds to the B– Jack Connection. If the grid return of the stage does not go directly to the ground, the B– Jack lead connects to the "low" side of the grid resistor. Changes in the shadow-angle of this eye-tube are produced when leakage exists in the component under test.

Two pushbutton switches, labeled TEST PUSHBUTTON and REFERENCE PUSHBUTTON, respectively, are employed. When the TEST PUSHBUTTON is depressed, a pulse of current flows from the power supply of the CapaciTester (represented by the battery in *Fig. 1*) through *C-1* and *R-1*. This charging current causes a momentary positive voltage to be developed between the top of *R-1* and ground. Since the grid of 6AF6 is connected to the top of *R-1*, the voltage across *R-1* also appears between grid and ground. The resultant change in bias of the magic-eye causes the shadow-angle to narrow. Following the surge of current, *C-1* becomes fully charged almost immediately (if the condenser under test is normal), and the current through *R-1* consequently drops to zero. This restores the bias of the 6AF6 to its original (zero) value and the shadow-angle returns to normal. The effect of testing a normal condenser, thus, is to produce a momentary narrowing of the shadow-angle in the eye-tube.

On the other hand, when the condenser under test is leaky, the voltage drop across *R-1* does not drop to zero since current continues to flow through *C-1* and *R-1*. In this case the shadow-angle becomes narrower and stays narrower. To help the serviceman judge whether or not the angle has actually narrowed, a reference setting is needed. Such a setting is provided by the REFERENCE PUSHBUTTON.

Let's assume that a circuit under test contains a leaky condenser. In our first operation after connections are made the REFERENCE PUSHBUTTON is depressed (at the same time that the TEST PUSHBUTTON switch is kept closed.) Since *R-1* is short-circuited, the grid of the 6AF6 is shorted to ground, and the eye opening assumes a certain reference angle. Releasing the REFERENCE PUSHBUTTON restores the positive bias due to the leaky condenser, causing the shadow-angle to narrow. If the condenser under test is normal the grid-to-ground voltage will be zero before and after the REFERENCE PUSHBUTTON is depressed, and the shadow-angle will be unchanged. Changes in the shadow-angle thus provide a positive indication of leakage. The amount of leakage present is not measured, but this is unimportant, since the serviceman will want to change a leaky condenser whether the leakage is small or large (provided this leakage is abnormal.)

The CapaciTester may be used, not only for testing condensers in coupling circuits, but in some other circuits as well. It may also be employed for checking unconnected components — such as a condenser that has been taken off a shelf. The instrument may additionally be used to determine whether a "hot" or short is present between two transformer windings, or between two contacts on a socket.

In a few circuits a resistor is connected in parallel with the condenser under test. If the condenser is checked for leakage, the shunt resistor will prevent an accurate test from being made. A simple ohmmeter test will readily reveal whether a considerable amount of leakage is present in such a condenser. If the leakage is not appreciable enough to

[*Continued on page 47*]

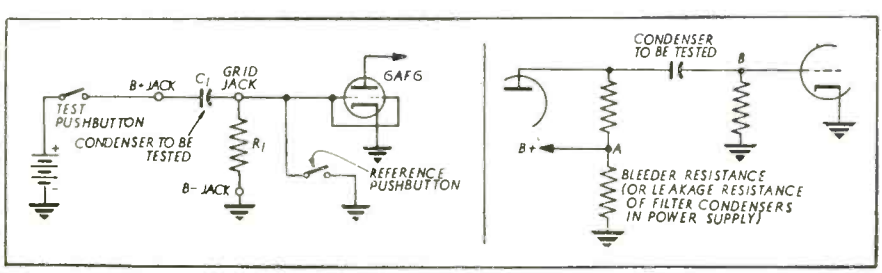
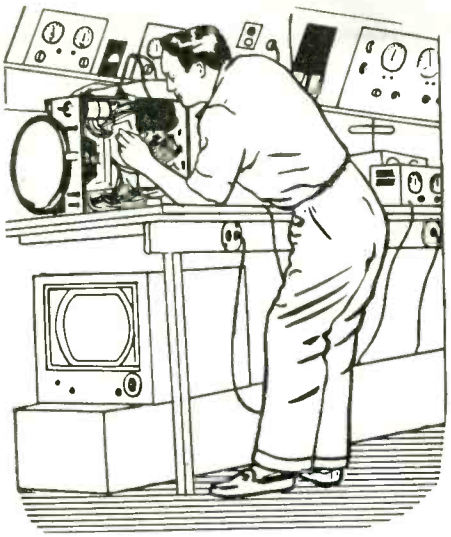


Fig. 1 (left)—Simplified schematic of testing with CapaciTester.
Fig. 2 (right)—Equivalent circuit of coupling condenser in receiver.



The Work Bench

by PAUL GOLDBERG

This Month:

FILTER CONDENSER PROBLEMS

THE following installment deals with three filter condenser problems. These problems can be dealt with easily with a small amount of equipment when proper diagnosis is given. The following case histories are typical examples.

Zenith 21J21

The receiver was turned on and a faint vertical white line was observed down the center of the cathode ray tube face. The high voltage fuse was checked and was found to be okay. Only a small arc could be drawn off the 1B3 filaments. This indicated of course, inefficient high voltage. The horizontal deflection coils *L16* and *L17* were next measured for continuity and were found to check correctly. The high voltage transformer section A to B was next measured for continuity. It also checked correctly. *L19*, the width control also was found to measure okay. It seemed that the only possibility was C74, 20 μf. C74 was therefore bridged with a new 20 μf condenser and immediately the raster appeared and the receiver functioned normally. C74 was obviously open.

In looking back on this problem, it can be seen that if the 6W4 were defective, there would be no high voltage. Thus no white line could possibly be seen on the CRT face. If C78 or C73 were open the high voltage would not be affected to a great degree. Moreover, the raster though horizontally non linear, could nevertheless appear. An open horizontal linearity coil would also cause no high voltage. Therefore, the symptoms involved in this problem made it a rather easy one to solve.

Admiral 21J1

The receiver was turned on and it was immediately observed that two black bars blanketed the picture and a hum was heard in the sound through the speaker. The two black bars in the picture indicate low voltage power supply leakage. These two black bars plus the hum in the sound indicate what is usually a filter problem. As full wave rectifiers deal with both halves of the sine wave, leakage will cause a large amount of 120 cycle ripple. Leak-

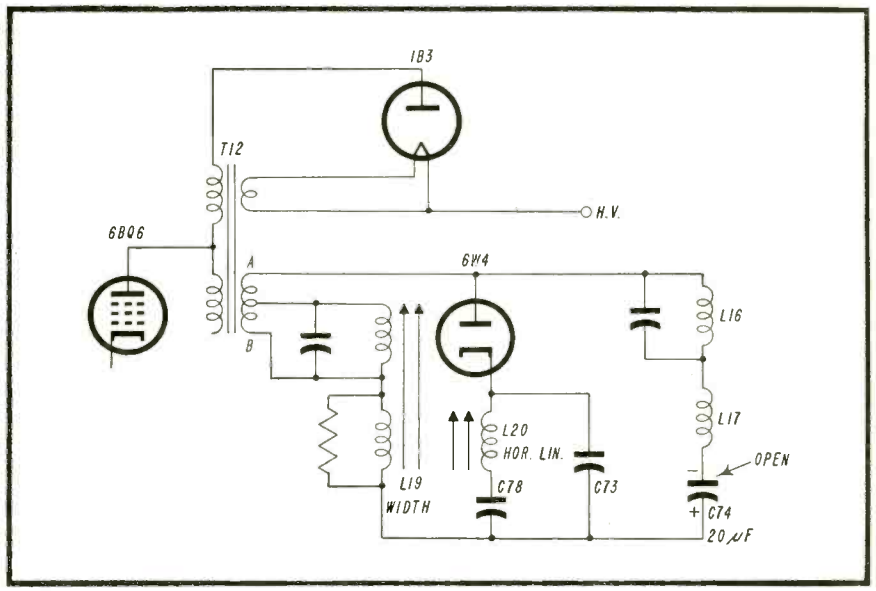


Fig. 1—Partial schematic of Zenith 21J21

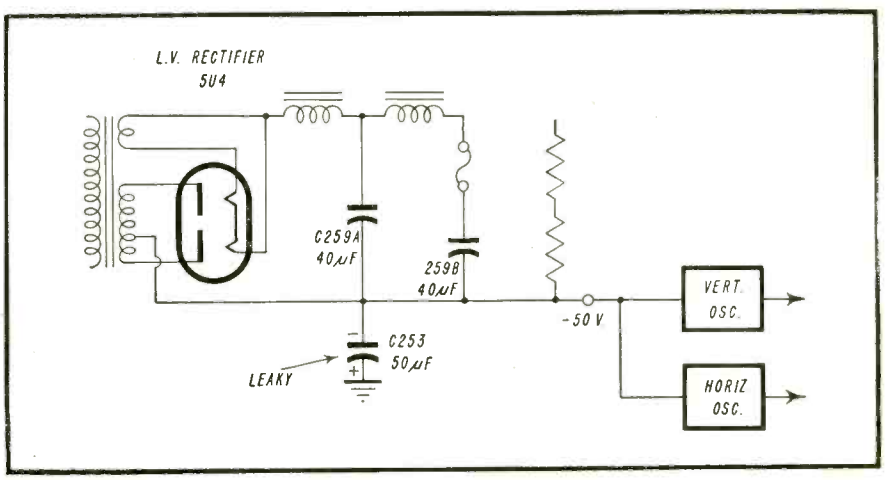


Fig. 2—Partial schematic of Du Mont RA-112

age in the half wave rectifiers would produce a 60 cycle ripple. This ripple or poor regulation causes the black bars in the picture. In the audio circuits this leakage produces a hum in the speaker.

Knowing these facts, all the filters were checked individually in the low voltage power supply. A new 80 μf filter was bridged across *C407C* but it had no effect. *C432* was bridged with a new 60 μf condenser and the trouble immediately disappeared. Thus a new *C432*, 60 μf was installed. We noted at this point, that some hum still remained in the speaker. The hum however, could not be heard when the volume was turned up. The filters were then checked once more for leakage. Bridging *C407C* with a new 80 μf condenser now removed the remaining hum. Thus we can conclude that *C407C* was only slightly leaky and affected only the audio while *C432* was leaking bad enough to cause not only the hum but the two black bars in the picture.

DuMont RA-112

The receiver was turned on and the picture was observed to be jittering vertically. It was noted also that when the brightness control was turned from maximum to minimum the left side became dark before the right side. This effect often indicates a filter problem.

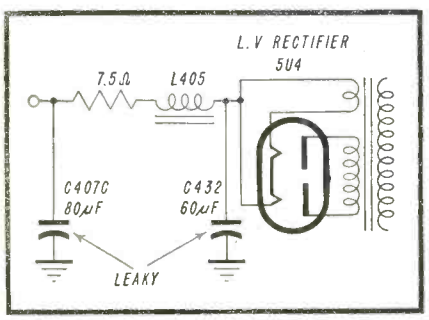


Fig. 3—Partial schematic of Admiral 21J1 chassis.

The diagram was studied in order to determine which filter condenser would cause the vertical jitter and dark left side. *C259A* and *C259B*, the main filters affecting the entire B+ system, if leaky, would probably cause a hum in the sound and possibly black bars in the picture. Thus, these two condensers were eliminated as possible trouble makers.

Most other filter condensers could probably cause this trouble. Therefore, at this point each filter was bridged individually with a new one. But the trouble remained. *C253*, 50 μf, off the −50 volt buss, however, had been over-

[*Continued on page 55*]

SCINTILLATION

This Second Installment On Radiation Principles Of The Scintillation Counter

by **Part 2**
Oscar Fisch

IN THE previous installment, it was mentioned that the two most commonly used types of radiation detectors are Geiger Counters and Scintillation Detectors. The principle of operation of the Geiger Counter has already been discussed and a circuit analysis of a very simple type of Geiger Counter was given in the September 1955 issue. Let us turn now to the "Scintillation Detector" or the "Scintillation Counter" as it is also known.

Scintillation detectors have two basic advantages over Geiger Counters. First, they are very much more sensitive. Some scintillation detectors are more than 100 to 500 times as sensitive as Geiger Counters. This makes them especially suitable, for example, for aerial or motor prospecting. The second basic advantage is that they have a much shorter "dead time" than Geiger Counters. This term "dead time" requires a little explanation. When the gas within a Geiger tube becomes ionized by an entering radioactive ray, a pulse of current flows through the tube. Since the tube is now a relatively good conductor (low resistance), the voltage drop across its terminals decreases. When the voltage drops sufficiently, ionization can no longer be maintained, and the flow of current stops. The tube voltage then rises again and the counter is then ready to "count" the next entering ray. This process takes a certain

(Courtesy DuMont)

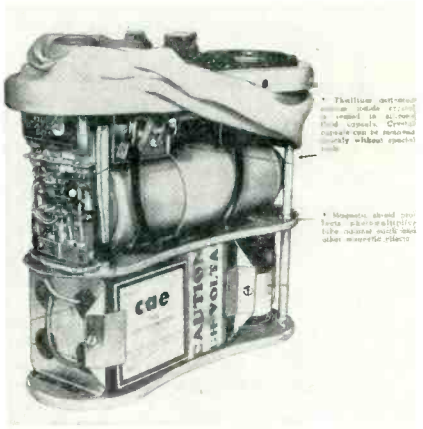
Fig. 1—Typical photomultiplier tubes commercially available.

definite time, and during this time the tube will be insensitive to any other radioactive rays which may impinge upon it. The terms "dead time" or "recovery time" are used in referring to this insensitive period. Typical values of "dead time" for GM tubes run from about 100 to 300 microseconds. Thus, when measurements are being made in high intensity radiation areas, there will be no difference in reading when the ionizing capability of the radiation is greater than the recovery time of the tube. Under these conditions the Geiger Counter will fail to count rays during the "dead time."

The scintillation detector, as we shall see has a "dead time" in the order of only a half to one microsecond. The advantage in the measurement of strong radiation is obvious.

Principle of Operation

When radioactive rays strike certain materials, they cause these materials to give off flashes of light or "scintillations." If the light thus given off were reflected to the window of a photoelectric cell, it would in turn cause the emission of electrons from photo sensitive surface of the cathode. The photo tube may be placed in a standard circuit containing a load resistor across which a voltage will be developed, with the size of the voltage depending on the amount of light received. An amplifier may then be used to build up this voltage and finally give an indication on a meter. The meter reading will be indicative of the number of flashes per second, and therefore it will also give a measure of the strength of radiation. These are the basic principles of operation of the "Scintillation Detector." In actual practice, however, there are a few refinements with which the serviceman must become familiar.



(Courtesy Tracer Lab)

Fig. 3 — Shielded photomultiplier is shown in this illustration.

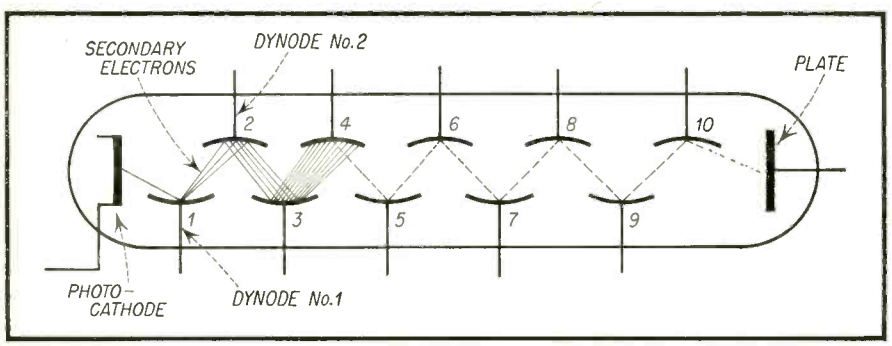


Fig. 2—Schematic representation of photomultiplier tube.

The Photomultiplier Tube

Instead of being an ordinary photo electric tube such as commonly em-

COUNTERS

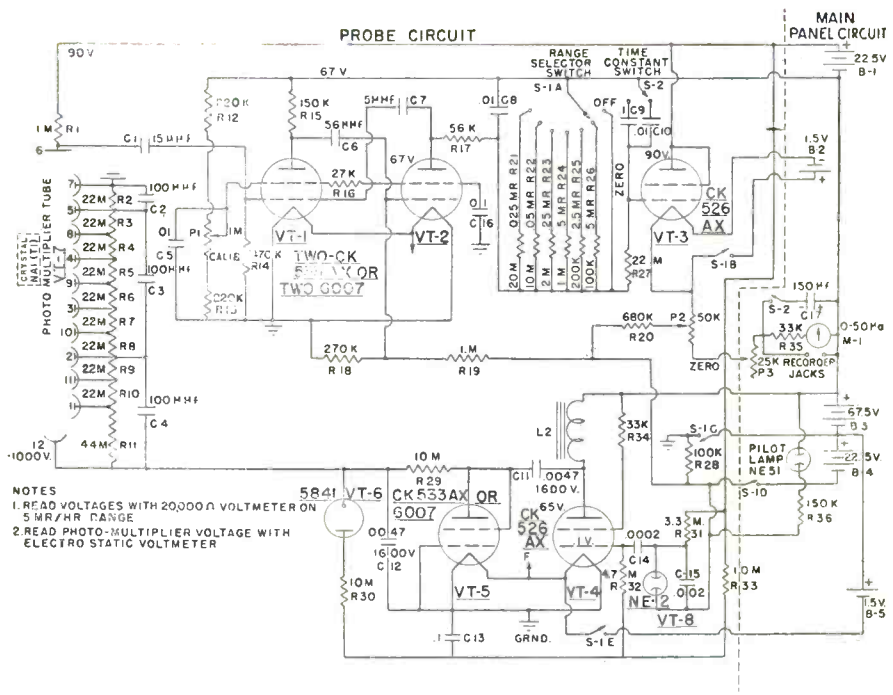
Detection Devices Describes The

As Used In These Instruments.

ployed for door openers, alarm systems, etc., a much more sensitive device called a photomultiplier tube is used in Scintillation Detectors. *Fig. 1* shows the photographs of a few representative types of photomultiplier tubes. *Fig. 2* is a schematic representation of this tube. It will be seen immediately, that this is somewhat different from the tubes that servicemen are usually concerned with. The cathode is at one end of the tube and is photosensitive, that is, it emits electrons when light falls upon it. The anode, at the opposite end, corresponds to the plate of an ordinary amplifier tube. The circuitry is arranged to make the anode positive with respect to the cathode by about 1000 volts. Spaced between the cathode and anode are a series of electrodes called "dynodes," usually ten in number.

Starting at the cathode, the dynodes are connected to progressively higher and higher positive potentials with respect to the cathode. When light strikes the cathode, electrons are emitted. Dynode No. 1 is about 100 volts positive with respect to the cathode so that these electrons are attracted to it. The dynodes are coated with a material which gives off a number of secondary electrons for each bombarding electrons. Dynode No. 2 in *Fig. 2* is at a potential of about 100 volts higher than dynode No. 1, so that the secondary electrons given off by dynode #1 are attracted by dynode #2. The construction of the dynodes together with applied potentials, is such as to cause the electrons given off by each dynode to be focused on the next one.

To illustrate the operation of the tube, suppose for example that a single electron striking a dynode results in the production of 5 secondary electrons. Each of these striking the next dynode would give rise to a total of 25 electrons. At the third dynode the electron stream would have swelled to 125. The process repeats until finally there would be well over a million electrons in the stream by the time the last dynode is reached. Amplification of over a million is readily obtained with present day photoamplifier tubes. In order to prevent defocusing of the electron stream between dynodes by the earth's magnetic field or by other stray fields, the photomultiplier tube is generally encased in a magnetic shield. In the photographs of *Fig. 3*, these magnetic shields are clearly visible.



(Courtesy Precision Radiation Instruments Inc.)

Fig. 4—Typical commercial scintillation detector circuit.

The Scintillating Crystal

Sodium iodide crystals are most commonly used for producing the flashes of light under the influence of radioactive rays. The presence of this crystal is usu-

[*Continued on page 46*]

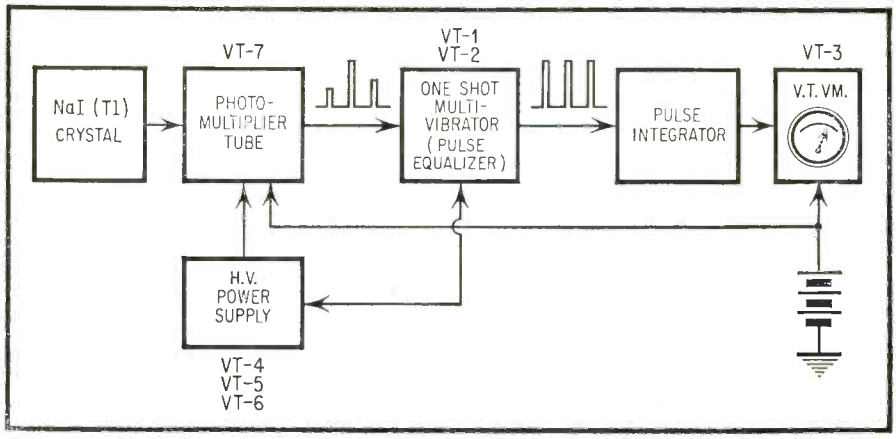


Fig. 5—Block diagram presentation of commercial unit.

trade

An extensive Color TV Training Course *being offered to all RETMA Accredited Technicians in the New York Area by the Certified Electronic Technicians Assn. which is composed of technicians who have proven their technical qualifications to the satisfaction of a Radio-Electronic-Television Mfg. Assn. Committee and have received industry accreditation. With the expansion of the RETMA Accreditation program to other areas of our nation, CETA is ready to charter Regional Chapters wherever the number of Accredited Technicians makes the formation of a chapter desirable.*

A $1,000 reward is offered by Sylvania Electric Products Inc. for information leading to the arrest and conviction of any individual or company fraudulently branding small radio and television receiving tubes with the Sylvania name, it was announced by D. W. Gunn, General Sales Manager for the company's electronic products. In his letter to dealers, Mr. Gunn urged each of them to take full advantage of the $1,000 reward offer. "Counterfeiting is injuring your reputation and your business now," he said, and asked that the dealers write to him if they have any Sylvania receiving tubes that appear counterfeit.

The nation's first substantial multiple installation *of color television receivers in hotel guest rooms has been completed at New York's Hotel Governor Clinton. Fifty 21-inch RCA Victor color sets were placed in various rooms and suites as part of the regular furnishings at no extra charge to guests. Seven hundred RCA Victor 21-inch black-and-white receivers also are in use and the hotel plans to increase the number until TV has been installed in all 1,200 rooms. Arrangements for the installation of the color receivers, as well as the black-and-white sets, were made by Wells Television, Inc., of New York.*

"The Finest TV Picture Ever Seen In The American Home," a sixteen-page, full-color cartoon book that presents the TV service dealer, his skill, his fair charging and his importance as a member of the community, is the new Tung-Sol sales promotion tool available to TV dealers for customer-prospect mailings. The story of the making and aluminizing the Tung-Sol Magic Mirror picture tube is also told in language the customer can understand. The integrity of service dealers and the reasonableness of their charges are stressed because Tung-Sol feels that keeping public opinion of dealers at a high level is just as important as providing them with fine tubes. It is felt that this cartoon book will help counteract the damage done by a slim few unscrupulous dealers whose actions make front page reading from coast to coast. Dealers may get free copies of this good-will and sales-building self-mailer from their Tung-Sol supplier or by writing direct to: Sales Promotion Department, Tung-Sol Electric Inc., Newark 4, N. J.

Retail sales of television receivers established new records in the first seven months of this year, reports the Radio-Electronics-Television Manufacturers Association. During the first seven months of this year 3,584,562 television receivers moved through retail outlets compared with 3,174,-394 sets sold in the same period last year. From January

flashes

through July, RETMA reported that 2,732,983 radios, excluding automobile sets, were sold at retail compared with 2,822,090 sets sold in the similar 1954 period.

***Upon recommendation of the Set and Tube Divisions,* the Board of Directors authorized General Counsel Glen McDaniel and the RETMA Legal Committee to take whatever steps are appropriate to obtain a reversal or modification of FTC Rules 9 and 12 having to do with the measurement of TV screen sizes and the labeling as "used" of any cathode ray tube in which a repossessed glass envelope is employed in the manufacturing process.**

A completely new Master TV Installation Manual *is available at no charge from Blonder-Tongue Laboratories of Westfield, New Jersey. The 12-page booklet discusses all types of multiple TV systems, Industrial TV Systems and the proper use of B-T Masterline equipment. Illustrated sections cover antenna and line installation, signal distribution, closed-circuit TV, system maintenance and trouble-shooting procedures. Simplified charts and tables, with specific examples, show how to calculate signal levels at any point. Blonder-Tongue amplifiers, converters, tap-offs and accessories are fully described, and the manufacturer offers free engineering assistance to all dealers and installers. Proposed system layouts may be sent to B-T's Sales Engineering Department.*

***J. M. Williams, RCA's Advertising and Sales Promotion Manager, states:* "We have planned our entire color television campaign for this Fall and Winter to integrate with the mounting public interest and excitement being generated by the vastly increased number of hours of color programming to be telecast by NBC and other networks."**

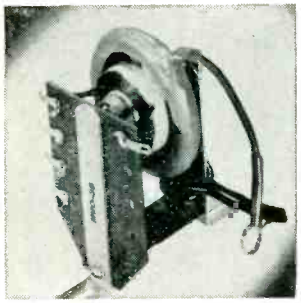
An unusual example of cooperation between commercial and educational TV groups and service dealers for civic improvement has been occurring in Detroit during the past two years. WTVS now is telecasting a test pattern on UHF Channel 56 several hours a day and programs will be on the air in October. The Detroit Educational Television Foundation during the past two years obtained funds for the erection of the transmitter and for equipment in three studios. In an area blanketed by four VHF commercial stations the problem of obtaining listeners for UHF telecasts is a major one. Indifference to UHF among dealers and servicemen is being overcome by the joint efforts of the educational groups, servicemen's associations, dealers and manufacturers. The Television Servicemen's Association of Michigan offered to aid the project. TSA members with other TV servicemen's organizations are getting prepared to handle the problems of UHF conversion and installation.

An assortment of gun-type soldering tips now being marketed by Electric Soldering Iron Co., Inc., of Deep River, Conn. It includes "the smallest soldering gun tip ever" . . . only 1/16" thick for soldering heretofore impossible-to-reach tight spots and deep chassis connections. A complete assortment of these new tips, in varied sizes and shapes, has just been made available for servicemen's use through trade channels. *[continued on page 41]*

NEW COMPONENTS

In requesting more detailed information on these products, please check the code number of the product on the convenient coupon on page 53, and send it, along with your company letterhead or business card, to New Products Dept., SERVICE DEALER, Suite 510, 67 West 44th St., New York 36, N.Y.

CORRECTION: We wish to call the readers' attention to the correct placement of Merit and Superex Products which were incorrectly placed in last month's issue.

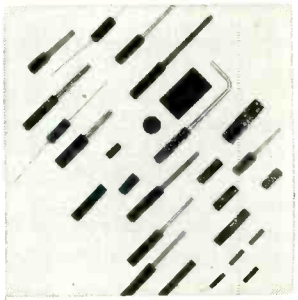


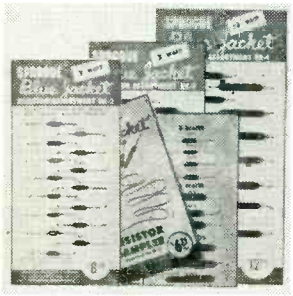
New Merit Transformers

Merit Coil and Transformer Corp. has announced the introduction of several additional exact replacement horizontal and high voltage output transformers. Newly introduced are the HVO-38 (illustrated) and the HVO-54 exact replacement for Admiral, the HVO-40, a replacement transformer for Silvertone and the HVO-37, a replacement transformer for Silvertone, Sentinel, Hallicrafters and the Crosley "Super V". For information, **check C118.**

Superex Core Kit

Replacements for almost 90% of TV cores are available in a new Ferrite Core Kit, from Superex Electronics Corporation. Containing 27 pieces and priced at only $2.25 net, this core kit will often enable servicemen to save the cost and effort of replacing coils and transformers in the horizontal deflection, sound and video portions of most TV receivers. For information, **check C119.**



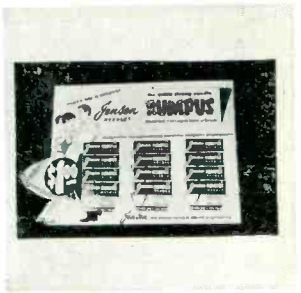


Sprague Sampler Assortments

The Sprague Products Company is now offering to service dealers sampler assortments of their popular "Blue Jacket" resistor series. Assembled in an attractive, legible fashion, these individual cards feature an assortment of wirewound resistors from the miniaturized Minohm three-watt units (assortment RK-2) through 5 watts (RK-3) to 10 watts (RK-4). For further information, **check C116.**

Jensen "Rumpus" Needle

The Rumpus, a "junior-proof" phono needle that's guaranteed not to bend or break, is the latest addition to the Jensen Industries line of all-speed needles. This is Jensen's answer to the demand for a really sturdy needle to be used by careless small-fry and overly enthusiastic teen-agers on their recreation room phonographs. The needles will sell for $1.00 each and are mounted by the dozen on smart, gaily-colored Rumpus display cards. For more information, **check C114.**



Beyland Anti-Noise Solution

A new product, called Quiet, is offered to dealers by the Beyland Engineering Co. By preventing static build-up, Quiet prevents the "pops" and "ticks" in microgroove records. Records are kept clean and lubricated by applying Quiet. Static, needle hiss, and surface noises are stopped, and record life is extended considerably. Each Quiet kit contains 5 oz. bottle of liquid Quiet, applicator, case, and needle brush. One bottle treats both sides of 200 ten-inch records. For further information, **check C113.**

IRC Nut Drivers

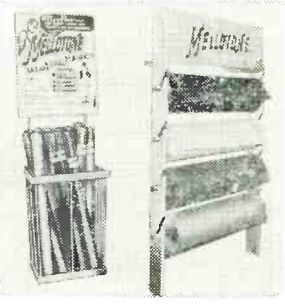
International Resistance Company has made available a Tension-Grip Nut Holding Nut Driver. Ideal for close work starting or removing in television and radio servicing, it has a tempered steel band that grips the nut or hexagon head screw automatically as it enters the socket, and will not drop it. The "tension-grip" has a spring action and is non-magnetic; handles brass and stainless steel nuts as well as regular types. Available individually in six popular sizes. For further information, **check C117.**

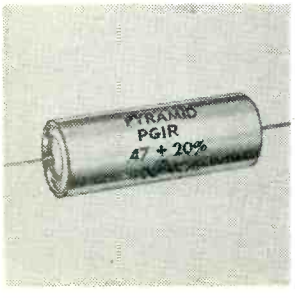
Clarostat Card-Kits

At your finger tips—a wide selection of resistance and wattage values—such is the purpose of the Series GK card-kits offered by Clarostat Mfg. Co. Each GK card holds a selection of power resistors by means of handy clips. Any resistor instantly slips off the card while its designation remains to facilitate reordering that particular value. There are six GK cards in all, covering the usual requirements of servicing. For more information, **check C110.**

Mellotone Grille Fabrics

To properly market the new MELLOTONE fabrics, a free display stand for square yard package has been developed. It enables the jobber to order the grille cloth by the square yard, and, with a small investment, to offer all Mellotone patterns. After he is assured of the demand for the material and determined the fastest moving patterns, the jobber may then order rolls and be provided with a roll display at no charge. For further information, **check C112.**



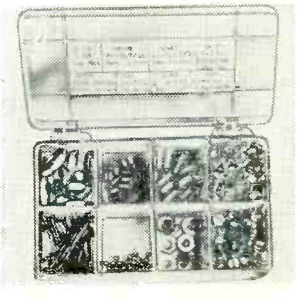


Pyramid Glasseal Capacitors

Sturdy capacitors capable of withstanding vibrational stresses and severe shock conditions are available in Pyramids solid dielectric glasseal capacitor line. The functional operating range is from −55°C to −125°C and the capacitors work normally under conditions of severe humidity. Capacitance Range is .001 mfd to 1.0 mfd; voltage range: 100 to 600 V.D.C. operating. The units can be provided to standard tolerance of plus or minus 20 per cent, or closer, and are available in both inserted tab and extended foil constructions. For further information, **check C115.**

Delco Parts Kits

Clear plastic, pocket-sized kits to hold small replacement parts for Delco electronic technicians, have been introduced by United Motors Service Division of General Motors. There are four different kits to cover the whole range needs, each divided into small compartments to carry an assortment of replacement hardware from tuner bearings to case screws. A chart on the cover names the part and part number for convenience when ordering refills, supplied in plastic bags. For information, **check C111.**



ASSOCIATION NEWS

by Samuel L. Marshall

NATESA

A survey of the just completed NATESA Convention reveals that a total of 1580 persons registered, representing 44 States, Canada, the Hawaiian Isles, Philippines and Cuba.

Delegates from 38 Affiliates met in official session. A new plan for creating new districts, which will create governors for districts, state chairman, and a new advisory council will complete the job of organization all the way down to the town level.

A plan to standardize on one name for all locals was voted and a target date of one year hence was set. The name to be Television Electronic Service Association, TESA for short. Thus NATESA will be truly the National Alliance of TESA's.

Elected to office were Frank J. Moch of Chicago, Pres.; Robt. Hester, Mission, Kansas, Secr'y Gen'l; Bertram Lewis, Rochester, N.Y., Treas.; Harold Eskin, Rochester, N.Y., Eastern V.P.; Russ Harmon, Cincinnati, East Central V.P.; Vince Lutz, St. Louis, West Central V.P.; Jim Failing, Greeley, Colo., Western V.P.; P. P. Pratt, Buffalo, N.Y., Eastern Secr'y; L. C. Stallcup, Nashville, Tenn.; East Central Secr'y; Joe Driscoll, St. Paul, West Central Secr'y, and Albert C. W. Saunders, Educational Director.

The spring Board of Directors meeting was voted to Omaha; the tentative date, April 22, 1956. The dates for the 1956 annual convention were tentatively set for August 19th with Chicago as the scene.

Unity Meeting Held in Pittsburgh

On Sunday, August 7th, 1955 representatives of ninety-four (94) Television Servicemen's Associations met in Hotel Sherwyn, Pittsburgh, Pa., to explore the possibilities of Unity within the Electronics Service Profession.

About twenty-eight (28) delegates together with members of the Trade Press were present, representing National and State groups, comprised of ninety-four Associations.

The morning session was devoted to the exploration of the possibility of Unity among the established associations. A Chairman and Secretary Pro-Tem were named to conduct the after-

[*Continued on page 47*]

MR. MANUFACTURER — *give this some thought!*

If, in attempting to "get your share" of the $2 billion radio-TV replacement market, you have concluded that Parts Distributors are your primary customers, CHANGE YOUR MIND QUICKLY!

Parts Distributors are merely middlemen between Manufacturers and the 53,000 Service Firms and Service Dealers who do 92% of the nation's radio-TV service work. These two service groups are actually the primary and basic customers of all Manufacturers who sell to the replacement radio-TV market. Distributors seldom influence Servicemen's selections.

When a serviceman, influenced through advertising, or some other medium, decides to buy and use any Product or Brand, HE'LL BUY THAT PRODUCT, and no Distributor's salesman can successfully "switch" him into some competitive Brand on a permanent basis.

Professional Servicemen realize that for many reasons no one Distributor can always stock all Brands or all items of every Manufacturer's line. Thus Servicemen usually deal with several Distributors.

Servicemen also know that they, and they alone, are the ones who are held responsible, by set-owners, for satisfactory performance of the tubes, parts and accessories they use in repair work. That's why Servicemen DECIDE FOR THEMSELVES what Brands they want to buy and use.

Once a Manufacturer has "sold" a Serviceman on the merits of his Brand he can rest assured the Serviceman will insist on BUYING and GETTING that Brand even when Distributors attempt to "switch" him to some other Brand.

MANUFACTURER—DON'T UNDERESTIMATE THE DECISIVE BUYING POWER OF SERVICEMEN AND SERVICE DEALERS. THESE GROUPS—*YOUR BASIC CUSTOMERS*—FAVOR AND BUY PRODUCTS ADVERTISED IN "SERVICE DEALER."

RADIO-TV SERVICE DEALER'S

Honor Roll

of Manufacturers Who Advertised This Year

The merits of the Manufacturers' Products have been defined to Servicemen. They are reputable, dependable Brands and are sold by leading Distributors. The integrity and advertising claims of these firms are above reproach. Servicemen should buy and use these Brands.

Acme Electric Corp.
Aerovox Corporation
Alliance Mfg. Co.
Allied Radio Corp.
American Microphone Co.
American Phenolic Corp.
American Scientific Devel. Co.
American TV & Radio Co.
Arco Electronics, Inc.
Astron Corp.
Atlas Sound Corp.
Audel Publishers
B & K Mfg. Co.
Barry Electronics Corp.
Belden Mfg. Co.
Blonder-Tongue Labs.
Bogen Co., Inc., David
Bussmann Mfg. Co.
CBS-Hytron, Div. of CBS
Cannon Electric Co.
Capcon, Inc.
Centralab Div. of Globe-Union Inc.
Channel Master Corp.
Chicago-Standard Transformer Corp.
Clarostat Mfg. Co., Inc.
Clear Beam Antenna Corp.
Columbia Wire & Supply Co.
Cornell-Dubilier Elec. Corp.
Delco Div. of General Motors Corp.
Dumont Labs, Allen B.
Eby Sales Co.
Electric Soldering Iron Co.
Electro-Voice, Inc.
Electronic Instrument Co.
Electronic Chemical Corp.
Electronic Test Instrument Corp.
Erie Resistor Corp.
Federal Telephone & Radio Corp.
Finney Co., The
Great Eastern Mfg. Co.
Hickok Elec. Instrument Co.
Hycon Mfg. Co.
Illinois Condenser Corp.
Industrial Eng. Mfg. Co.
Instruments for Service
International Resistance Co.
JFD Mg. Co.
Jensen Industries
Jensen Mfg. Co.
Jersey Specialty Co.
Jontz Mfg. Co.
Kenwood Engineering Co.
Krylon, Inc.
Littelfuse, Inc.
Lowell Mfg. Co.
Merit Coil & Transf. Corp.
Miller Co., J. W.
Mosley Electronics
Moss Electronic Dist. Co.
Mueller Electric
National Radio Institute
Oelrich Publications
Ohmite Mfg. Co.
Oxford Electric Corp.
Phaostron Company
Philco Corp.
Planet Mfg. Co.
Precision Apparatus Co.
Prentice-Hall Publications
Probescope Co.
Pyramid Electric Co.
Quam-Nichols Co.
Quietrole Co.
Radiart Corp., The
Radio City Products Co., Inc.
Radio Corporation of America
Radio Merchandise Sales
Ram Electronics Sales Co.
Raytheon Mfg. Co.
Raytronic Laboratories
Recoton Corp.
Rider Publisher, John F.
Sams & Co., Inc., Howard W.
Seco Mfg. Co.
Service Instruments Co.
Shure Brothers, Inc.
Simpson Electric Co.
Skysweeper, Inc.
Snyder Mfg. Co.
Sonotone Corp.
South River Metal Prods. Co.
Sprague Electric Co.
Standard Coil Products Co.
Superex Electronics Corp.
Tarzian, Inc., Sarkes
Tech-Master Corp.
Technical Appliance Corp.
Tele-Scopic Prods. Inc.
Tele Test Instrument Corp.
Telrex, Inc.
Transvision, Inc.
Triad Transformer Corp.
Trio Mfg. Co.
Tung-Sol Electric, Inc.
Turner Co., The
United Catalog Publishers
University Loudspeakers
Vaco Products Co.
Walco-Electrovox Co., Inc.
Walsco Electronics Corp.
Wen Products, Inc.
Weston Electrical Instru. Corp.
Winston Electronics, Inc.
Xcelite, Inc.
Yeats Appliance Dolly Sales Co.

CONVERGENCE PATTERNS

Analysis of the relative motion of the red, green, and blue beams under the influence of the various corrective fields that are applied.

by **Bob Dargan and Sam Marshall**

Part 2

from a forthcoming book entitled "Fundamentals of Color Television"

IN the following treatment we refer to Static Center Convergence as the adjustments involving beam convergence at the center of the screen with the permanent converging magnets only. Static Convergence refers to the adjustments of convergence at other points on the screen involving the same permanent magnets. Finally, adjustments involving Parabola and Tilt controls are referred to as Dynamic Convergence.

It will be recalled that in the initial Static Center Convergence adjustments involving radial adjustments of the red, green and blue converging magnets as well as lateral adjustment of the Blue Beam Corrector Magnet, the ultimate objective is to converge the beams at the center of the screen so that a resultant white dot is obtained. It will also be recalled that application of sweep power results in misconvergence of the beams at other points on the face of the screen, resulting in partially superimposed or individual color dots.

Static Center Convergence Pattern

On the completion of Static Convergence the ideal pattern shown in *Fig. 1* should be observed if the color tube is mounted so that the blue gun is positioned on top of the tube as shown in the insert. In the case where the blue gun is on bottom the dot pattern obtained will correspond to *Fig. 1* turned upside down. This applies to all of the patterns discussed in this installment.

From *Fig. 1* the red and green parabolic deformation of the beam traces, both horizontal and vertical, is readily apparent. While this is also true for the blue horizontal beam trace, it is not readily apparent for the blue vertical beam trace for reasons which will be discussed shortly.

Also, from *Fig. 1* it would appear that because the beam trace has a greater deviation from a horizontal line at its extremities than at its center, the corrective parabolic convergence fields should have a greater effect at the extremities than at the center in order to straighten out the dot array. While this is one method that may be employed to obtain an aligned array of dots, the practical method used is to move the belly of array in one direction and the ends in the opposite direction. Thus, when the corrective parabolic convergence voltage is increased, the maximum correction of the beam is at the center and the extreme ends, and the minimum correc-

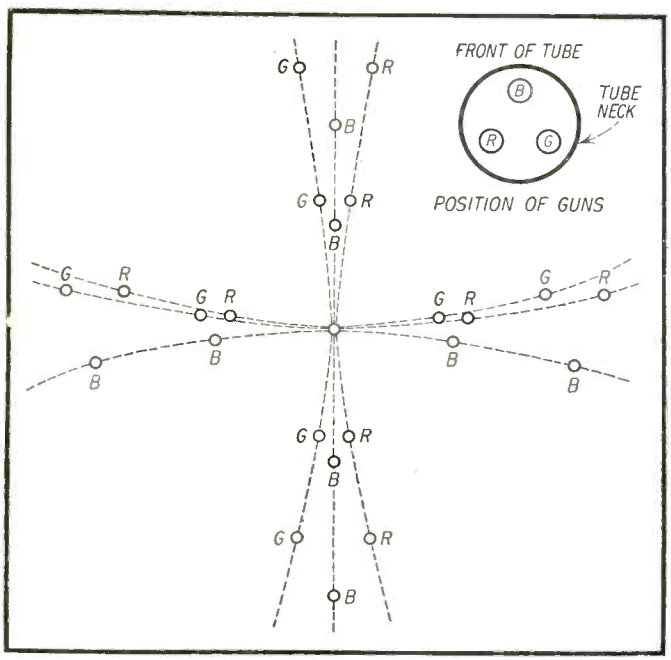


Fig. 1—Ideal pattern produced after correct Static Center Convergence adjustments are made on receiver. It is assumed that blue gun is positioned on top.

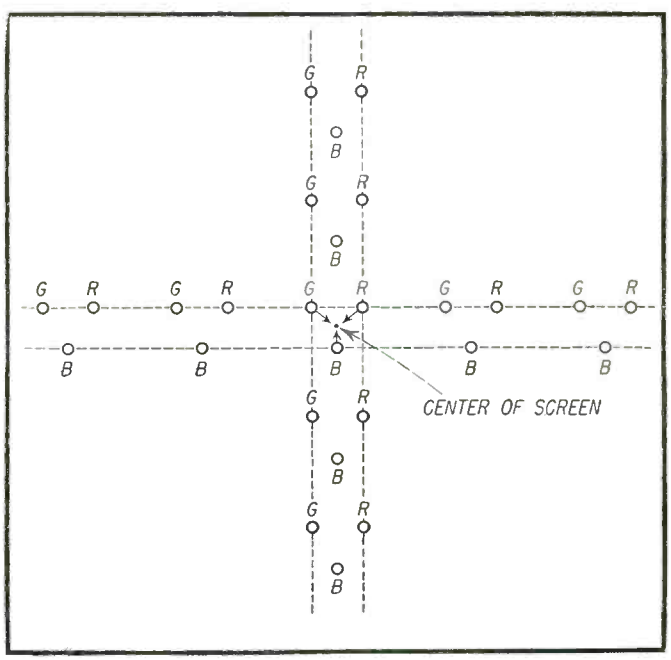


Fig. 2—Application of horizontal and vertical parabolic current aligns curved beam traces in straight line traces (symmetrical trios) for final convergence.

tion is at a point about 25% from the ends.

In pursuing this technique the various curved vertical and horizontal red, green, and blue beam traces, should align themselves in straight parallel lines as shown in *Fig.* 2. Following this, the individual trios of dots which are arranged in equilateral triangles may then be converged further by readjustment of the Static Convergence magnets.

For various reasons, practical convergence adjustments are not as straightforward as the description up to this point would lead one to believe. However, the reasoning presented in the previous paragraphs does form the basic background of the actual operations performed.

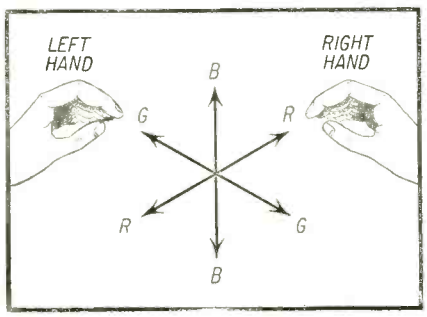


Fig. 3—To remember relative motion of beams remember that position of bent-over fingers of Right hand corresponds to motion of Red beam. The direction of the other two beams will then become self evident. Associate Red with Right by virtue of letter "R".

As an aid in remembering the relative *radial* motion of the green and red beams we include the illustration shown in *Fig.* 3. In this figure we associate "red" with "right," the clue being the letter "r" so that the direction of the "red" beam takes the direction indicated by the fingers of the "right" hand. Recalling that the radial motion of the blue beam is vertical only, all that remains is to associate the motion of the green beam with the direction in which the fingers of the left hand point. This memory device will be found very helpful in analyzing dot patterns for convergence.

Simplified Convergence Circuit

Magnetic fields which affect the position of the beam parabolically in its motion from left to right and from top to bottom may be obtained in a number of different ways. These will be discussed in the following installment. It must be kept in mind at the outset that these parabolic corrections must be applied to each of the three beams to achieve correction with regard to dot arrays horizontally as well as vertically. Thus, with each beam having separate horizontal and vertical parabolic adjustments there are generally six controls to take care of parabolic convergence strictly. These controls are:

1. Blue horizontal parabola
2. Green horizontal parabola
3. Red horizontal parabola
4. Blue vertical parabola
5. Green vertical parabola
6. Red vertical parabola

A simplified circuit showing how a pair of corrective currents (horizontal & vertical) may be applied to the convergence coils of any gun such as the blue gun is shown in *Fig.* 4. These currents are designed to set up magnetic fields which vary parabolically with time. How they do this will be discussed in the next installment. However, at this point let us assume that the corrective fields set up in the tube are parabolic, and that the amplitude of the voltages applied to the Blue Convergence core are controlled by *R1* for the Horizontal Parabola Coil *L1*, and *R2* for the Vertical Parabola Coil *L2*. Controls *R1* and *R2* in *Fig.* 4 are respectively called the Blue Horizontal and Vertical Parabola Controls.

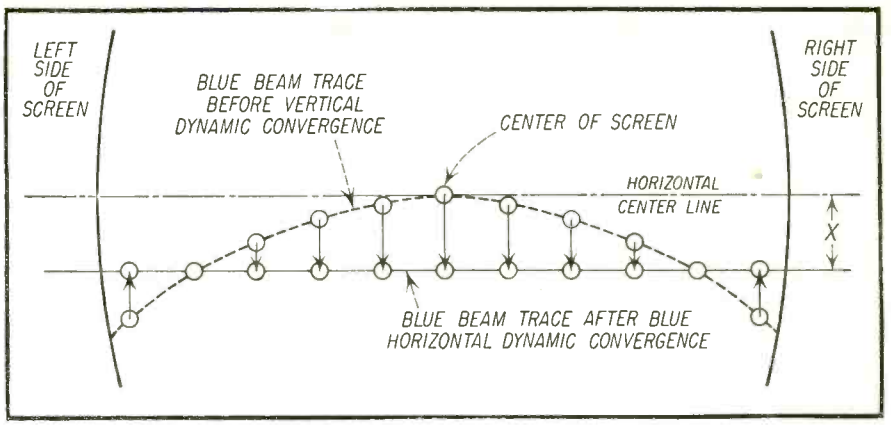


Fig. 5—Effect of applied horizontal Blue Parabola dynamic convergence field on blue beam trace. Distance, X, represents distance of new line of blue dots below center line of screen.

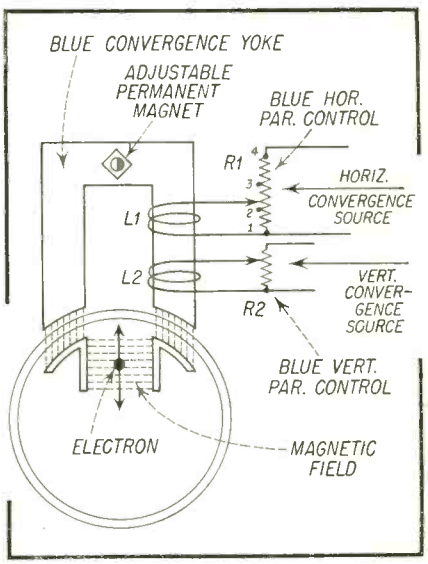


Fig. 4—Simplified schematic illustrating how convergence current may be applied to Blue Convergence Coils to set up parabolic fields in tube.

Blue Horizontal Parabola

A study of the manner in which the blue beam is influenced by the Blue

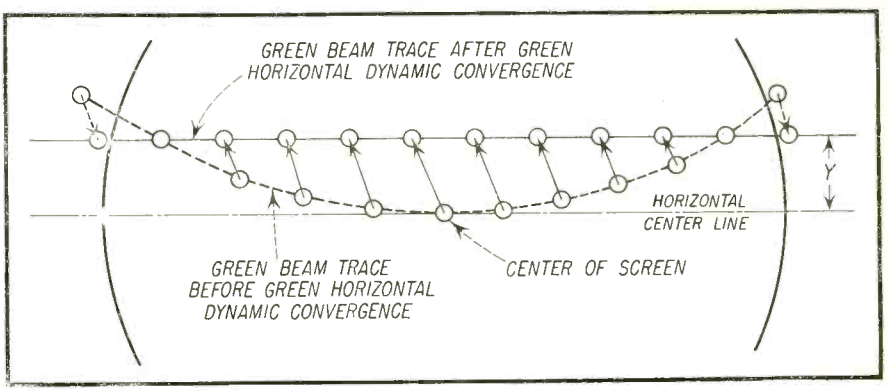


Fig. 6—Effect of applied horizontal parabola dynamic convergence field on green beam trace. Distance, Y, represents distance of new line of green dots above center line of screen. All arrows except those on extreme ends point in a 10 o'clock direction.

Horizontal Parabola field as the beam is deflected from left to right is shown in *Fig. 5*. Here we observe the sequence of blue dot positions in a single center horizontal line before and after dynamic convergence adjustments. Notice that the beam trace has an *initial* parabolic curvature in an upward direction due to misconvergence (see *Fig. 1*). Application of a corrective parabolic field is controlled by *R1*, the Blue Horizontal Parabola control in *Fig. 4*. In position *4* the full value of the convergence voltage is applied to *L1* the Blue Horizontal Parabola coil. As we rotate the control from positions *4* to *1* the applied convergence voltage is gradually decreased to zero.

Reference to *Fig. 2* indicates that our objective is to obtain a straight line of horizontal blue dots displaced somewhat below the center of the screen. This is done by applying a magnetic field to the blue beam. This is indicated as a number of arrows, which show corrected positions of the individual blue dots shown in *Fig. 5*. Notice that these arrows are all in a vertical direction, the maximum displacement being applied at the center dot in a downward direction. Notice also that in both directions from center the length of the arrows taper off to zero, and that at the extreme edges of the screen the direction of these arrows are reversed. This reversal of direction can easily be observed by rotating the Blue Horizontal Parabola Control in a receiver, and watching the relative movement of the blue dots at the extreme edges of the screen and in the middle. The waveform of such a distribution of arrows is a parabola. Its final effect on the blue beam trace is a straight line of blue dots displaced a distance X below the horizontal center line of the screen.

Green Horizontal Parabola

Reference to *Fig. 1* indicates the need for a dynamic convergence field that will push the belly of the green beam traces in an upward direction thereby positioning the green dots as shown in *Fig. 2*. The manner in which initial green beam trace is acted upon by the green horizontal parabolic corrective field is illustrated in *Fig. 6*. This field is indicated by the arrows shown in the figure. Notice that except for the extreme edges of the screen, the forces are in an approximate "Ten O'clock" direction, the maximum force being applied in the middle of the trace. The forces gradually taper off to zero near the screen edges and reverse their direction at the screen edges. The waveform of this distribution of forces is a parabola. The result of this parabolic corrective field on the initial beam trace is a straight

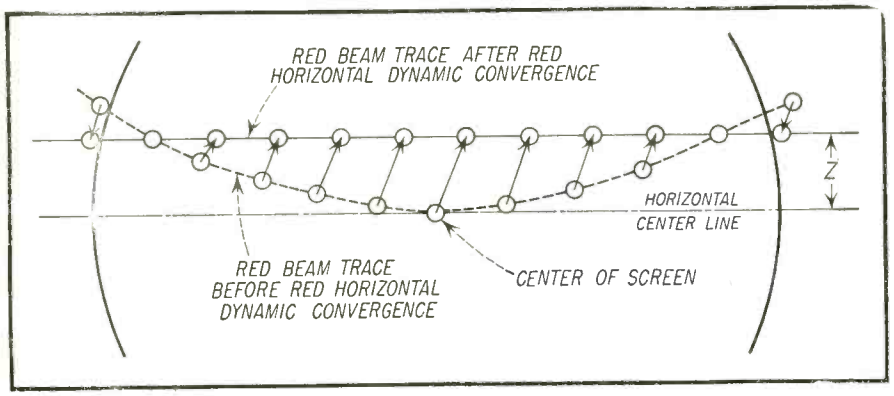


Fig. 7—Effect of applied horizontal red parabola dynamic convergence field on red beam trace. Distance, Z, represents distance of new line of red dots above center line of screen. All arrows except those on extreme ends point in a 2 o'clock direction.

horizontal line of green dots positioned, as in *Fig.* 2, and located a distance Y above the horizontal center line of the screen.

Red Horizontal Parabola

The manner in which the initial red beam trace is influenced by the red horizontal correction field is shown in *Fig.* 7. Except for the fact that the direction of the red dots is along an approximate "Two O'clock" line the same reasoning we employed in obtaining the final position of the green dots after correction may be applied to the red dots. Under ideal conditions a straight horizontal row of red dots will be obtained, all equally spaced from each other as shown in *Fig.* 2, and located a distance Z above the horizontal center line of the screen.

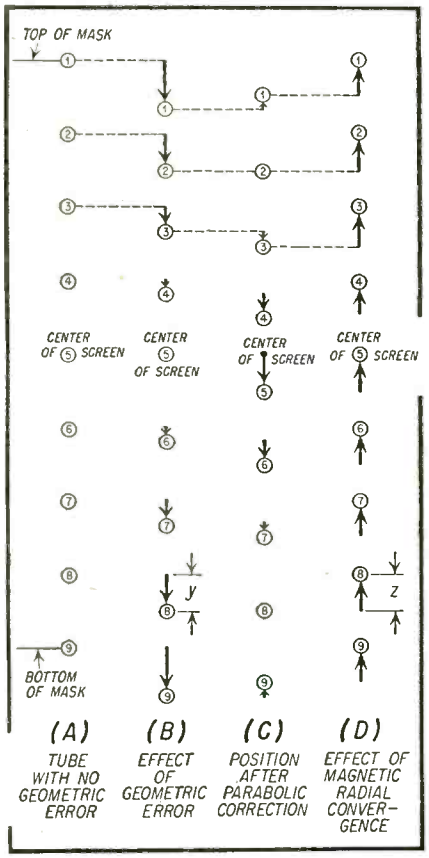


Fig. 8—Ideal blue dot positions on a single center vertical line before and after convergence adjustments. Arrows indicate vertical displacement of each dot for each of the steps from (A) to (D).

Blue Vertical Parabola

The manner in which the blue vertical correction voltage influences the vertical motion of the blue beam in a tube is illustrated in *Fig.* 8. Here we observe the sequence of blue dot positions in a single center vertical line before and after dynamic convergence adjustments.

In (A) we show the physical distribution of dots along this vertical line in a theoretically perfect tube, that is one in which no geometric error is present and therefore requires no dynamic convergence correction adjustment. Notice the equal spacing between dots. Our object is to try to make the blue dots line up in this manner.

Geometric error produced by the radius of curvature of the shadow mask and faceplate causes the blue dots to be displaced in the manner shown in (B) as the tube is swept horizontally and vertically. Thus, we observe that dot 8, second from the bottom, falls a distance "y" as it appears in position (B). Notice also that in position (B) the geometric convergence error is considerable at the extremities of the tube and zero at the center. The distance through which the dots are displaced from the top of the tube to the bottom varies as a parabolic function and the spacing between dots are no longer equal.

In (C) we show how the Blue Vertical Parabola Convergence adjustment is made to *effect equal spacing between dots.* Notice that this adjustment involves a further downward displacement of dots, except for the very ends of the screen where the direction of motion is reversed. Notice also that this displacement is greatest at the center and zero near the tube extremities. Thus, dot 8, whose progress we have been following undergoes no vertical change from (B) to (C). The sum total of this corrective convergence adjustment is that all the blue dots are now equally spaced again; however, they have all been shifted an equal amount in a downward direction with respect to (A). The position of the blue dots in (C) corresponds to the position of the vertical blue dots in *Fig.* 2

In (D) we illustrate the final positions of the dots after static convergence adjustment for the Blue Converging Magnet. Now all blue dots are raised an equal amount in a vertical direction and are in positions identical to the ones they occupied in (A). The amount of vertical displacement effected in this last adjustment is shown as "Z".

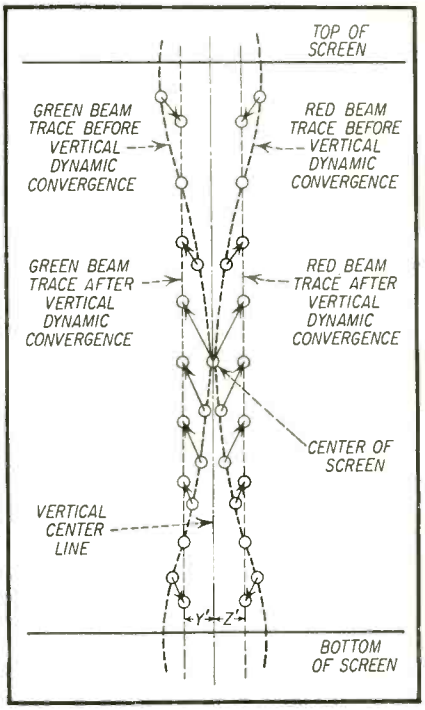


Fig. 9—Effects of applied vertical Green and Red Parabola dynamic convergence fields on green and red traces. Y' represents distance of new line of green dots to left of screen center line. Z' represents distance of new line of red dots to right of screen center line.

Green Vertical Parabola

Correction of the green vertical beam trace involves pushing the belly of the green beam trace from right to left as shown in *Fig.* 9. This requires the application of a parabolic correction

[*Continued on page 50*]

Mfr: DuMont **Chassis No.** RA-162

Card No. DM 162-1

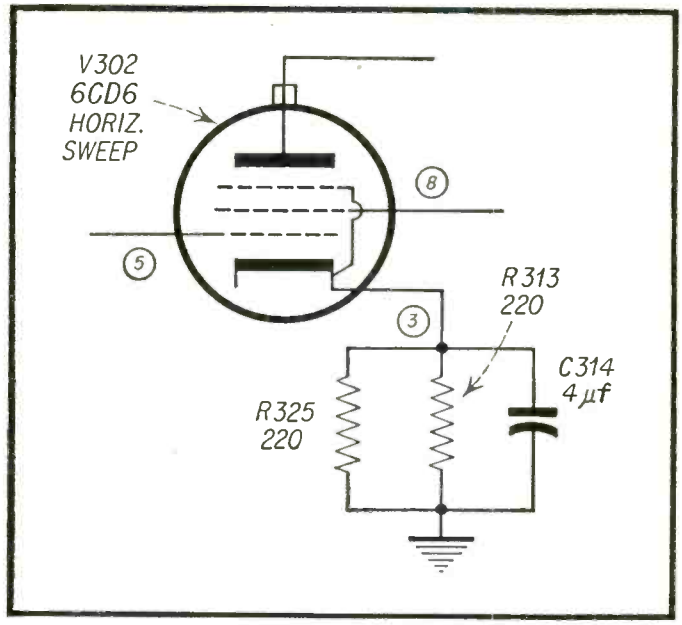
Section Affected: Raster

Symptom: Loss of horizontal and vertical size.

Cause: Defective condenser

What to Do:

Replace: *C314, 4 μf,* which is bad.



Mfr: DuMont **Chassis No.** RA-162

Card No. DM 162-2

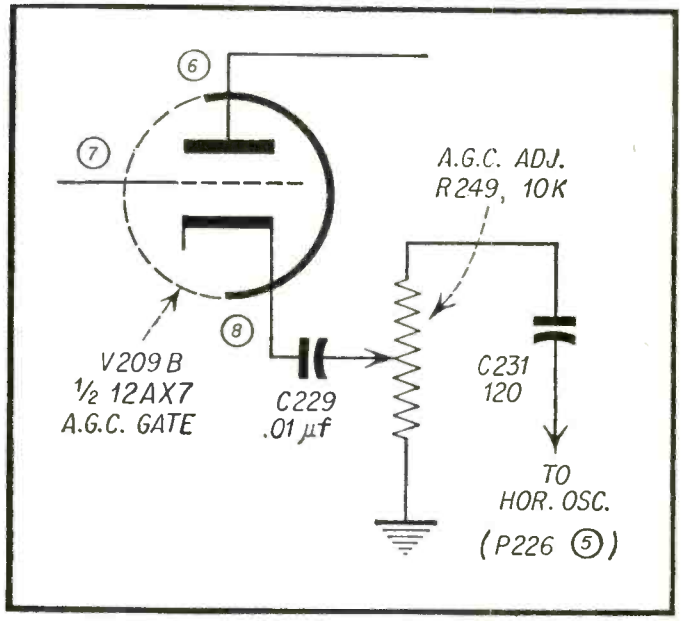
Section Affected: Raster

Symptom: No raster, no horizontal sweep

Cause: Defective condenser

What to Do:

Replace: *C231, 120 μμf,* which is shorted.



Mfr: DuMont **Chassis No.** RA-162

Card No. DM 162-3

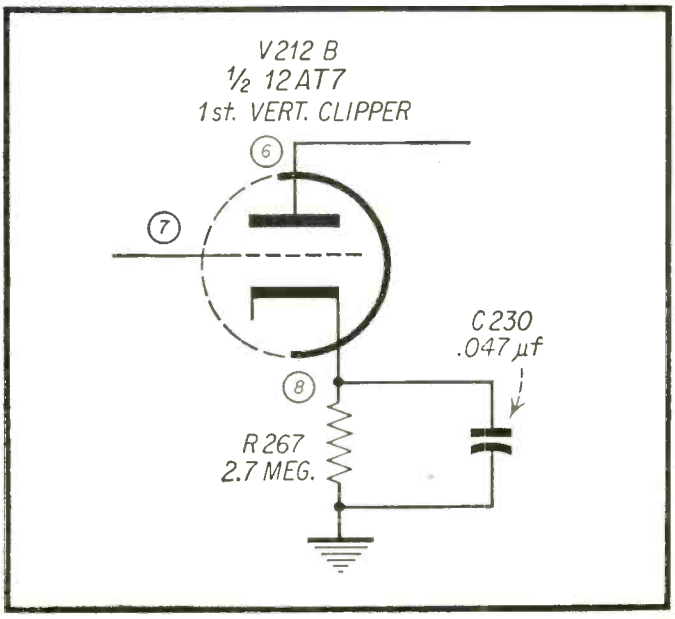
Section Affected: Sync

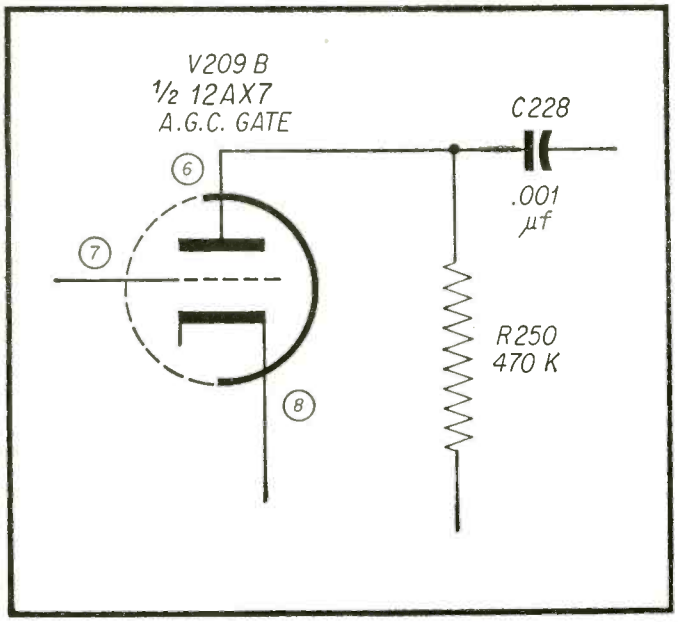
Symptom: Critical vertical hold

Cause: Defective condenser

What to Do:

Replace: *C230, .047 μf,* which is open.





Mfr: DuMont **Chassis No.** RA-162

Card No. DM 162-4

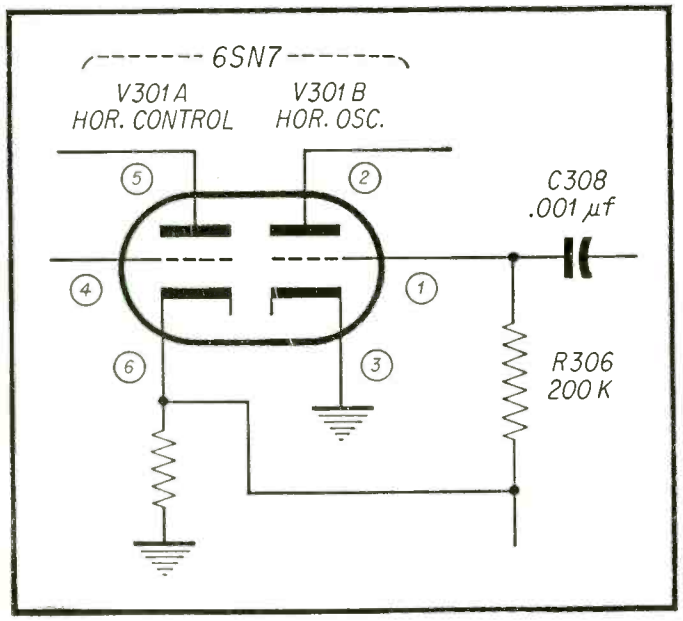
Section Affected: Pix

Symptom: Overload video

Cause: Defective condenser

What to Do:

Replace: *C228*, .001 *μf*, which is shorted.



Mfr. Dumont **Chassis No.** RA-162

Card No. DM 162-5

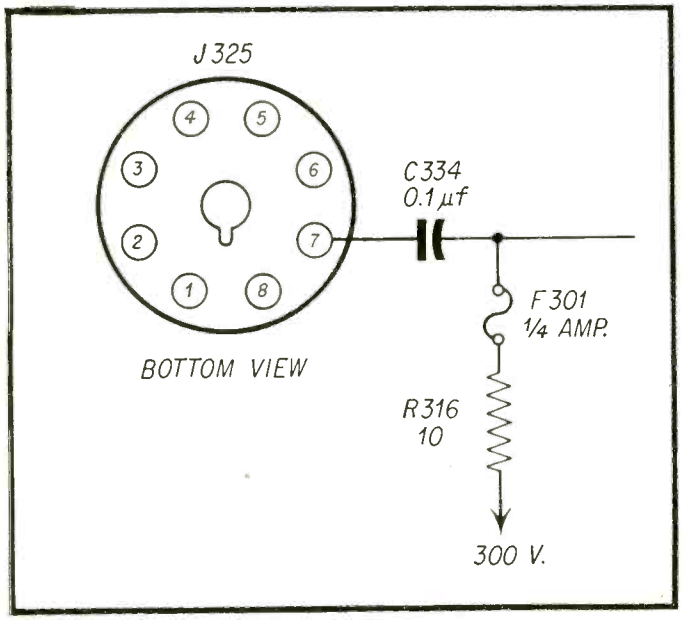
Section Affected: Sync

Symptom: Horizontal hold drifts repeatedly

Cause: Defective condenser

What to Do:

Replace: *C308*, .001 *μf*, bad.



Mfr. Dumont **Chassis No.** RA-162

Card No. DM 162-6

Section Affected: Raster

Symptom: Horizontal size decreases

Cause: Defective condenser

What to Do:

Replace: *C334*, .1 *μf*, which is leaky.

Mfr. Westinghouse **Chassis No.** CH-V-2175

Card No. WE 175-1

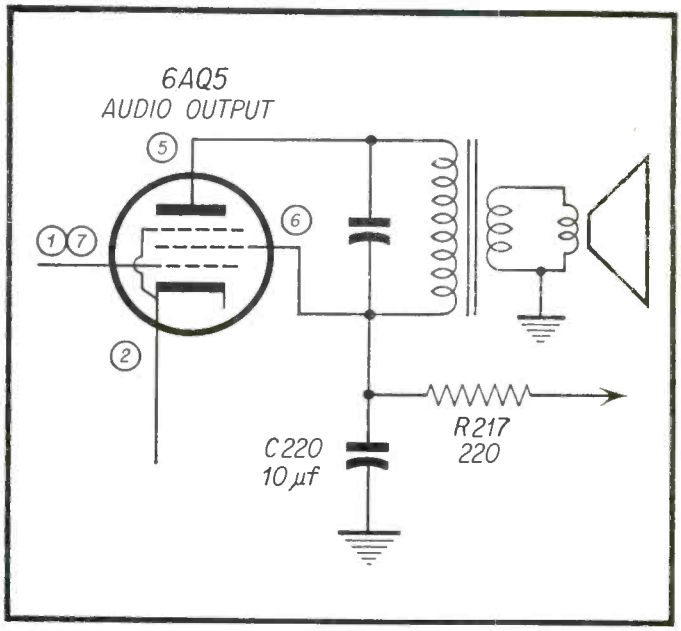
Section Affected: Sound

Symptom: Sound bars in pix and hum in sound

Cause: Defective condenser

What to Do:

Replace: *C220*, 10 *μf*, which is leaking.



Mfr. Westinghouse **Chassis No.** CH-V-2175

Card No. WE 175-2

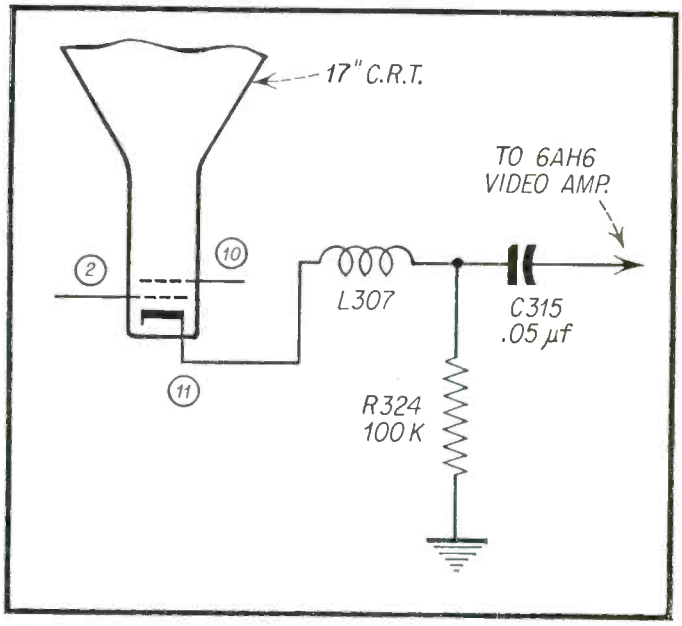
Section Affected: Pix

Symptom: No brightness

Cause: Defective condenser

What to Do:

Replace: *C315*, .05 *μf*, which is shorted.



Mfr. Westinghouse **Chassis No.** CH-V-2175

Card No. WE 175-3

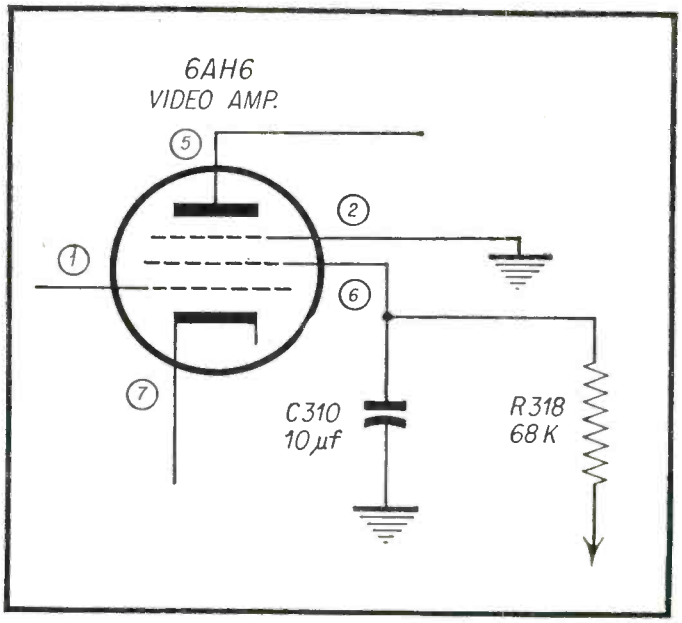
Section Affected: Pix

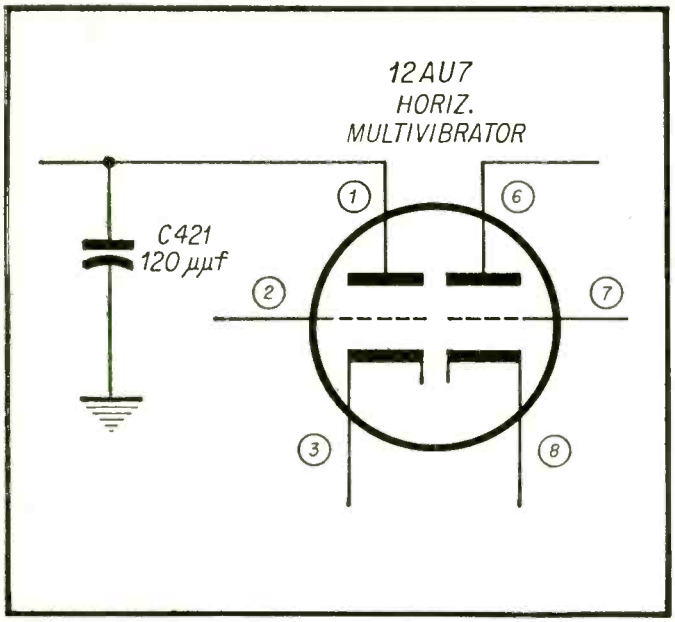
Symptom: No video

Cause: Defective condenser

What to Do:

Replace: *C310*, 10 *μf*, which is shorted.





Mfr. Westinghouse **Chassis No.** CH-V-2175

Card No. WE 175-4

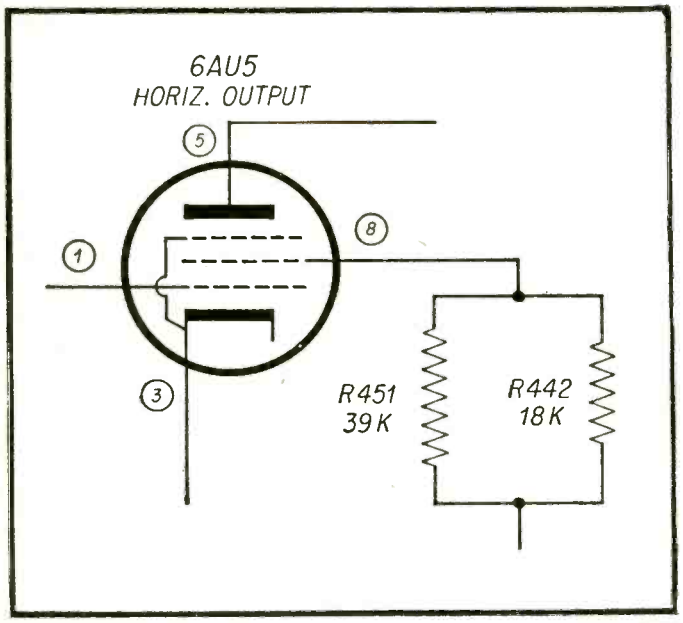
Section Affected: Raster

Symptom: No H. V.

Cause: Defective condenser

What to Do:

Replace: *C421*, 120 *μμf*, which is shorted.



Mfr. Westinghouse **Chassis No.** CH-V-2175

Card No. WE 175-5

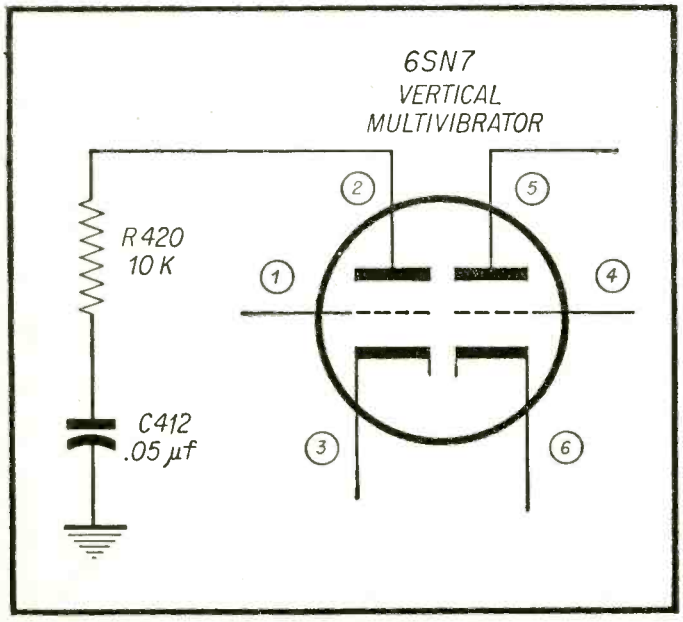
Section Affected: Raster

Symptom: Width shrinks intermittently

Cause: Defective resistors

What to Do:

Replace: *R451*, and *R442* that are changing value.



Mfr. Westinghouse **Chassis No.** CH-V-2175

Card No. WE 175-6

Section Affected: Raster

Symptom: No vertical sweep

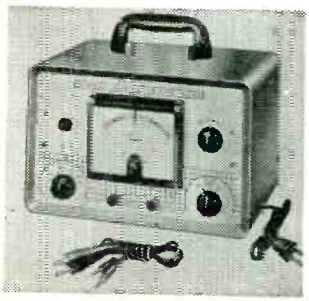
Cause: Defective condenser

What to Do:

Replace: *C412*, .05 *μf*, which is shorted.

NEW TEST EQUIPMENT

In requesting more detailed information on these products, please check the code number of the product on the convenien coupon on page 53, and send it, along with your company letterhead or business card, to New Products Dept., SERVICE DEALER, Suite 510, 67 West 44th St., New York 36, N.Y.

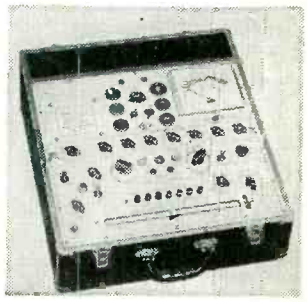


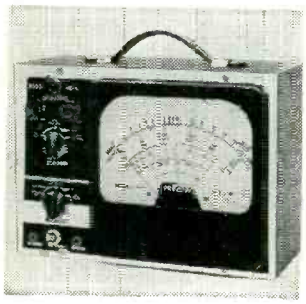
Simpson Leakage Tester

Simpson's new Model 383 In-Circuit Capacitance Leakage Tester actually shows the presence or absence of leakage in virtually all paper, mica, or ceramic capacitors while connected in the circuit . . . eliminating tedious disconnecting and resoldering. Checking is done at full rated working voltage, right in the circuit. Capacitors under test can be shunted by circuit resistance which is much lower (1% or less) than the value of the leakage resistance. For further information, check T112.

Hickock Tube Tester

A new field engineer's Dynamic Mutual Conductance type tube checker is now available in portable form. The Hickock Model 750 incorporates all the latest tube testing features to permit evaluation of any tube normally encountered in all phases of electronic work including the latest ruggedized types and the new series heater-string tubes. Manufacturer states that this instrument also tests germanium diodes and selenium rectifiers. For full information, check T116.



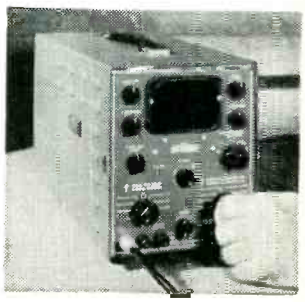


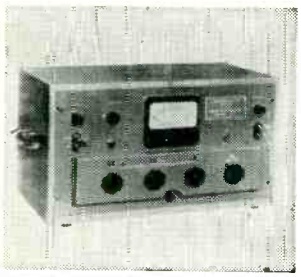
Precise VTVM

Precise Development has a VTVM Model 9071, selling in kit or factory wired form, which claims the distinction of having true voltage regulation, and features a 7½ in. meter, with a new type VR tube assuring true, accurate and stable readings. The unit also has a separate 5V AC scale; a 25 MEG input on DC; true zero center and is housed in a steel case, 11x8x5 in. It weighs 11 lbs. and comes with a 3-color "step by step" construction book. For more information, check T111.

Du Mont Oscillograph

A new, highly precise cathode-ray oscillograph called the Type 331, has been announced by the Allen B. Du Mont Laboratories. The instrument, only slightly larger than a shoe box, may be used as a time-measuring device for time intervals as long as 2.5 seconds and as short as the rise time of its signal amplifier which is 0.08 μsec. It also is an a-c/d-c electronic voltmeter with a range of 0.4 to 400 volts, full scale, with an upper frequency limit of 4 megacycles (30% down). For further specs, check T118.



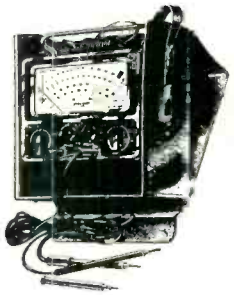


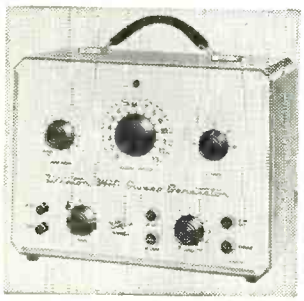
Decade Instrument Sweepalator

The Sweepalator, a new double-duty unit which will serve as a combined signal generator and sweep generator, has been announced by Decade Instrument Company. Claimed to have great accuracy, the unit features decade switching, crystal CW or center frequencies and wide range calibrated output. For detailed information, literature and prices, check T113.

Phaostron VTVM

A new vacuum tube voltmeter known as the "777" VTVM has been announced by Phaostron Company. It is completely self-contained, with all accessories fitting easily into its leather carrying case. Accessories include: A High-Frequency Co-Axial Cable, D.C. Probe and A.C. Line Card, and a 28 page illustrated Instruction Manual. . . . the A.C. Line Cord is easily reeled onto the handle. For specifications and price, check T115.



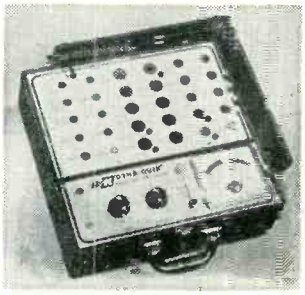


Weston Sweep Generator

Weston has announced their Model 984 sweep generator, for trouble shooting of sound and video IF circuits, associated trap circuits, TV tuners, video amplifiers and all-purpose visual alignment. RF output: Frequency modulated, TV channels 2 to 13 inclusive, complete FM coverage available by means of two preset selector positions. Frequencies are fundamentals of the oscillator frequency. For further information, check T110.

B&K Tube Tester

The Dyna-Quick Model 500, is a new portable, low cost, dynamic mutual conductance tube tester, announced by B&K Manufacturing Co., with which any serviceman can quickly, accurately and completely test for shorts, grid emission, gas content, leakage, dynamic mutual conductance and life expectancy under actual operating conditions. Dyna-Quik checks 90% of all tubes in use today, including the new 600 mil series tubes. For more information, check T114.

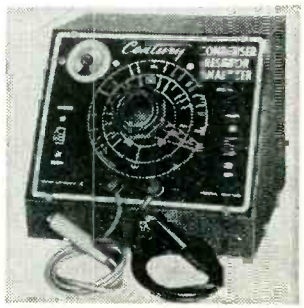


Tescon Rejuvenator-Tester

Tescon, Inc. has announced a CRT Rejuvenator-Tester, model RT-1, which will analyze performance characteristics of a CRT, locate and eliminate inter-element shorts, repair open elements, weld open filaments, and rejuvenate the tube, all without removing the tube from the set. For complete information, check T119.

Century Analyzer

The Century Electronics Company has marketed its Model 201 Condenser-Resistor Analyzer, which will test condensers and resistors for quality and value either in or out of the set. The unit checks condensers from 50 mmfd. to 150 mfd. for leakage (up to 10 megohms) as well as open, shorted or intermittent operation. Unknown capacity values are registered on the dial. For further information, check T117.



Dear Answerman:

I have noticed a condition of horizontal streaking in a Westinghouse chassis V2345. This streak is not there at all times and seems to be most prevalent on the weaker channels. I was wondering if you have any answer for this condition.

F. P.
Hicksville, N. Y.

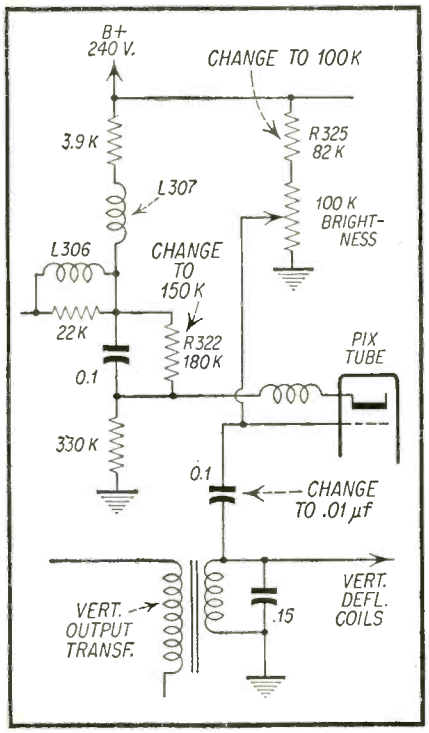


Fig. 1—Circuit changes in Westinghouse Chassis V2345, shown above, will aid in reducing horizontal streaking that might occur, and is only visible on white portions of the picture.

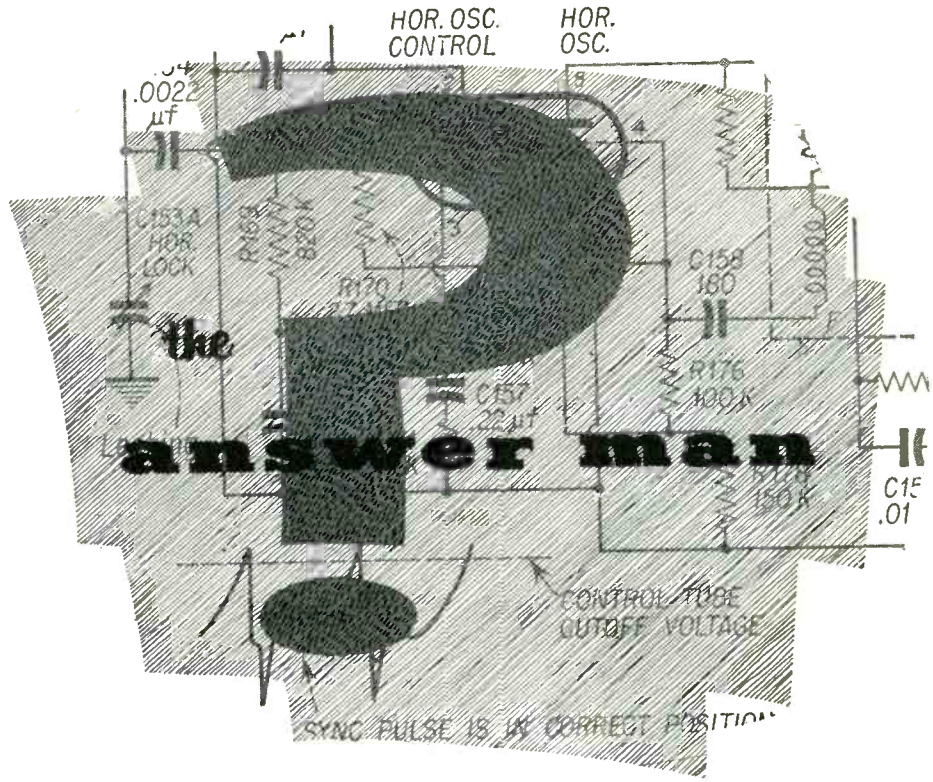
This condition of horizontal streaking that might occur is only visible on the white portions in the picture. Later production of these chassis have incorporated changes as shown in *Fig. 1* to prevent this from possibly occurring under any condition.

Dear Sir:

I have a Freed-Eismann chassis 700-121 in which the horizontal output transformer has been replaced. The original trouble was that the previous transformer had failed. With the new transformer I have high voltage but the picture syncs in very poorly and has a tendency to lock in with the horizontal blanking bar in the middle of the picture tube with the picture split. I have checked the *afc* circuit and can find nothing wrong.

Can you help me with this out of phase condition.

P. H.
Elizabethtown, Pa.



The condition has occurred several times previously to my knowledge. What is wrong is that the leads to pin #8 and #9 on the transformer require reversing. This may have been an error in wiring in the transformer but more than likely the leads coming out of the coil were inadvertently reversed when being connected to the transformer panel. With the circuit wired as it evidently is the incorrectly phased voltage is supplied to the phase comparing stage with the result that the picture has the horizontal bar out of phase and positioned in the middle of the picture tube.

This is a trouble to remember because it can occur in any of the receivers that use a pulse from the horizontal transformer for *afc* action. The schematic of the windings of the horizontal output transformer is shown in *Fig. 2.*

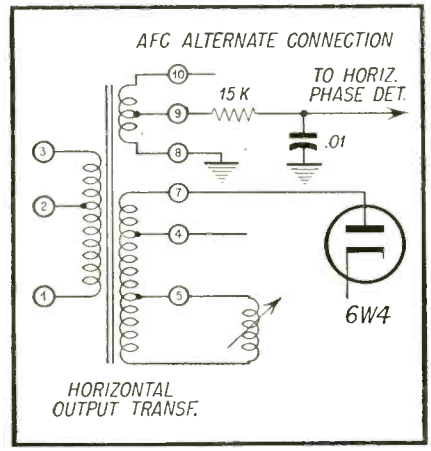


Fig. 2—Partial schematic of Freed-Eismann Chassis 700-121.

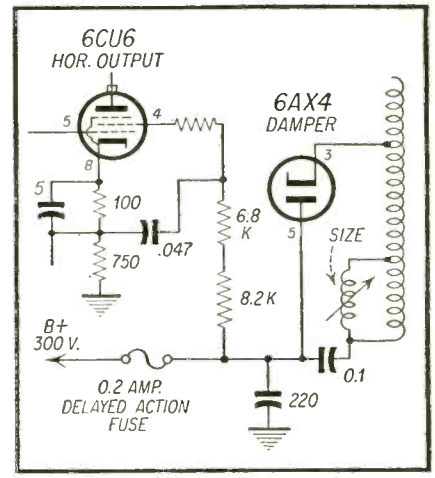


Fig. 3—Partial schematic of Stromberg-Carlson Model X21.

Dear Sir:

I have noticed in some of the Stromberg-Carlson model X21 chassis that the high voltage fuse on occasion opens. An inspection of the circuit reveals nothing wrong. A new fuse is installed and the receiver seems to operate quite normally. I'm generally suspicious of a receiver that opens a fuse but in these cases I can find no cause for it.

F. T.
Youngstown, Ohio

The delayed action type of fuse is preferable in these circuits as turning on the receiver allows more current to flow than when the receiver is in oper-

[*Continued on page 45*]

5 Megacycles Bandwidth
10 Millivolts per Inch Sensitivity
in the NEW *PRECISION* ES-550
5 inch OSCILLOSCOPE

Model ES-550 Deluxe: (Illustrated) In custom-styled, blue-grey ripple finished steel cabinet; 2 color satin-brushed aluminum panel and contrasting dark blue control knobs. Case Dimensions 8¼ x 14½ x 18½ inches. Complete with all tubes, including 5CP1/A CR tube. Comprehensive Instruction Manual.....**Net Price: $215.00**

Model ES-550 Standard: Electrically Identical to above but in standard black cabinet with black anodized aluminum panel. Case dimensions 8¼ x 14½ x 18½ inches. Complete as above.....**Net Price: $210.00**

MODEL SP-5 OSCILLOSCOPE TEST PROBE SET

for TV Signal Tracing, Alignment, Trouble-Shooting and Waveform Analysis

Engineered for use with all *PRECISION* Cathode Ray Oscillographs, Models ES-500, ES-500A, ES-520 and ES-550.

Model SP-5: In vinyl carrying case, complete with four different detachable probe heads, universal coaxial cable, and operating instructions.....**Net Price: $23.50**

Engineered to cover a wide range of modern electronic applications including MONOCHROME and COLOR TELEVISION

The Model ES-550 is the ***PRECISION*** answer to laboratory, industrial and technician requirements for a rugged, dependable instrument for broad coverage of modern electronic oscillograph applications, INCLUDING COLOR TV. It provides a new and unparalleled standard of high sensitivity with single, overall wideband frequency response, plus other special performance features—at most sensible selling price.

★ **Push-Pull, Wide-Band Vertical Amplifier:** 10 MV/inch sensitivity.
Input Characteristics: 2 Megohms, 22 mmfd.
Response: One DB from 10 cps. to 3.5 MC—3 DB at 5 MC.
Attenuator: 3 step freq. compensated plus a continuously variable gain control in cathode follower circuit.

★ **Direct Reading, Peak to Peak Voltage Calibrator**

★ **Vertical Pattern Reversal Switching Facility**

★ **Push-Pull, Wide-Range Horizontal Amplifier:** 100 MV/inch sens.
Input Characteristics: 2 Megohms, 25 mmfd.
Response: One DB from 10 cps. to 1.0 MC—3DB at 2 MC.
Attenuator: 3 step, freq. compensated, plus a continuously variable gain control in cathode follower circuit.

★ **Linear, Multi-vibrator Sweep Circuit:** 10 cycles to 100 KC plus automatically synchronized 30 cycles and 7875 cycles sweep for TV sync-pulse analysis. Amplified sweep retrace blanking.

★ **Amplified Auto-Sync Circuit** active on all internal sweep ranges

★ **Four Way Sync. Selector Switch** provides for Internal Negative, Internal Positive, External and Line Synchronization.

★ **3,000 Volt Intensifier Power Supply** assures utmost visibility of 'scope traces. Essential to high frequency and pulsed waveform analysis.

★ **"Z" Axis Input Terminal** for blanking, timing and marking.

★ **Built-in 60 cps Phasing and Blanking Controls** especially designed for more convenient FM, Monochrome and Color TV alignment and sync pulse analysis.

★ **All 4 Deflection Plates Available** with full beam centering facilities.

★ **Tube Complement:** 12AV7 "V" Cathode Follower-Amplifier. 6U8 "V" Amplifier-Phase Splitter. Two 6CL6 Push-Pull "V" Drivers. 6U8 "H" Cathode Follower-Amplifier. 6C4 "H" Phase Splitter. Dual 12BH7 Push-Pull "H" Driver. 12AV7 Linear-Sweep Multivibrator. 6BH6 Auto-Sync Amplifier. 12AU7 Sweep Retrace Blanking Amplifier. OA2 Voltage Regulator. 5V4 Low Voltage Rectifier. Two 1V2 High Voltage Rectifiers. 5CP1/A CR Tube.

★ **High Contrast, Filter Type, Removable Calibrating Screen**

*See the new Model ES-550 at your favorite Electronic Parts Distributor. Ask for new 1955 catalog describing the complete line of **PRECISION** Test Instruments for all phases of AM, FM, TV.*

PRECISION TEST EQUIPMENT — Standard of Accuracy

PACE — THE METER OF PRECISION

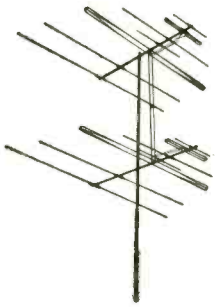
PRECISION **Apparatus Company, Inc.**

70-31 84th Street, Glendale 27, L. I., N. Y.

Export: 458 Broadway, New York 13, U. S. A. Cables: Morhanex
Canada: Atlas Radio Corp., Ltd., 50 Wingold Ave., Toronto 10

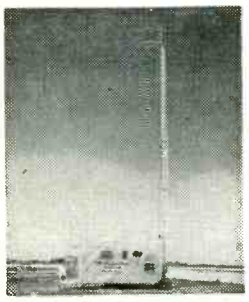
NEW ANTENNAS AND ACCESSORIES

In requesting more detailed information on these products, please check the code number of the product on the convenient coupon on page 53, and send it, along with your company letterhead or business card, to New Products Dept., SERVICE DEALER, Suite 510, 67 West 44th St., New York 36, N.Y.



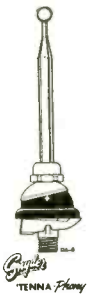
JFD Deep Fringe Arrays

JFD Manufacturing Company Inc. has developed two new Fireball in-line broad-band antennas for deep fringe VHF-UHF application. The FB500S-68 2-bay model is custom tailored for areas with co-channel and cross channel interference. The stacking harness of the FB500S-68 is particularly recommended to eliminate adjacent channel or co-channel disturbances on channels 7 to 13. The FB500S-96 model with 96 inch Low Band Boost Stacking Transformers is engineered to increase gain on channels 2 to 6, and recommended for areas where weak low channel signals are received. For further information, check A114.



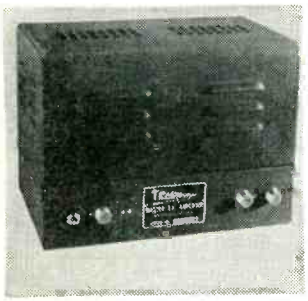
Holloway Broadband Antenna

Holloway Electronics Corporation announces production on their line of all channel EXPO TV antennas. EXPO is called an exponential antenna because its elements are curved in the form of an exponential curve. With these curved elements properly positioned with respect to each other, the antennas' upper frequency range is unlimited. Pictured here is their mobile research laboratory. For further information, check A113.



Snyder "'Tenna-Phony"

According to a recent survey, 12.1% of cars carrying antennas have no radios in them. This is particularly the case where the young motorist wants to be one of the crowd but cannot afford a radio. To meet this growing demand, Snyder Mfg. Co. is now producing a "'Tenna-Phony" for autos. For more information, check A112.



Transvision TV Amplifiers

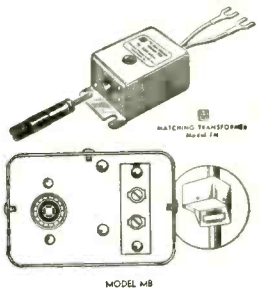
Transvision Incorporated has announced a new line of Low Cost TV Broadband Amplifiers for TV Master Antenna Systems. Eight different types are available, each designed to handle particular problems encountered in installing Master Systems in Communities and Buildings. Features include built in "Cable Loss Equalizers" for repeater amplifiers, "Dual Outputs" for systems requiring more than one main line, and choice of low band only, high band only or low band—high band amplifiers. For further information, check A116.

Ward Fiberglas Antenna

Fiberglas auto antennas have been marketed by Ward Products Corp. which exhibit several advantages over the conventional chrome plated brass antenna: They will take an extreme bend and return to its original position without any "set" taking place; The color is "inbuilt" into the rod, and not affected by salt air, humidity, heat or cold; Performance remains constant because antenna is of fixed length; No need for collapsing, clears overheads; Matches or complements color of car. For more information, check A110.

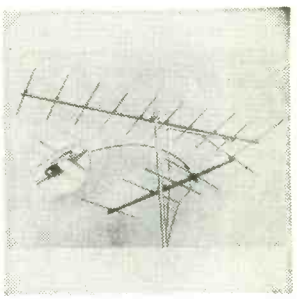
Blonder-Tongue Transformers

Blonder-Tongue Laboratories announces two impedance matching transformers: The MB Balun, an outdoor model for antennas or amplifiers, and the TM TV which mounts directly on the TV receiver. Both provide good 75 to 300 ohm match over the entire VHF range. The MB features a bracket with strap for mast or pole mounting. It greatly improves directivity of 300 ohm balanced antennas when connecting to 75 ohm coax cable, and increases gain by up to 3 db. The Model TM cable is easily connected or disconnected thru a built-in plug and jack. For further information, check A115.



Taco Highlander Yagis

The Technical Appliance Corporation has announced their Highlander series of wide spaced yagi antennas, with high gain, good front-to-back ratio and a sharp forward pattern. Directors, reflectors and driven elements are all constructed in the new Mono-Lock construction which is extremely fast of assembly and positive in locking. Each element is easily flipped into position where it is accurately positioned. For further information, check A111.

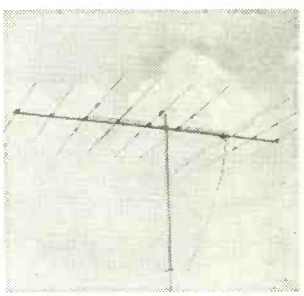


Fretco "Dimension"

Fretco, Inc. has announced the high-gain all channel antenna called the "Dimension." It features the Foto Phased element which makes possible the broad banding of Yagis which up until now were single channel narrow band antennas. In the Foto phase design, signal loss through wet or dirty points is precluded. The Foto Phased element is supported at the po.nt of low voltage and high current thereby retaining the "Q" on all channels with equal performance. For more information, check A118.

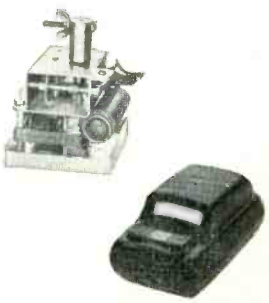
Channel Master "Lancer" Series

Two new all-channel VHF antennas, the Lancer and Super Lancer, have been announced by Channel Master Corp. They are said to provide more elements and more power than existing similar types. The Lancer, Model No. 333, has one additional Low Band Director, gives 1½ DB more Low Band gain. The Super Lancer, Model No. 334, has four additional parasitic elements, and gives 1½ DB more gain than similar types. Both are entirely "Super-Sembled," requiring no hardware, tools or tightening. For more information, check A117.



LaPointe Attic Installation

LaPointe Electronics Inc., Rockville, Connecticut, announces the Rotenna —an indoor antenna of outdoor design for attic installation, with a built-in rotator. Available in two types, Model RO-283 for all channel UHF/VHF, and Model RO-213 for VHF only. Both feature a reversible 24-volt rotator built into the boom of the antenna and a modernistic control unit in pale green or mahogany. The antennas, which feature snap-construction, are attached to an attic beam by an adjustable mast. The antenna hangs down from the beam and rotates in a 56-inch radius. For further information, check A119.



TRADE FLASHES

[from page 25]

The FCC has been asked to close down *television reradiators in the Northwest. Milton J. Shapp, of Jerrold Electronics Corp., stated that the continued operation of reradiator transmitters in the Northwest is delaying the spread of television to fringe areas. Reradiators pick up a channel, amplify the signal, and retransmit it on the same frequency. FCC has expressed fear that this means of transmission causes interference, not only with the station being boosted, but also with other TV stations on the same channel. Shapp maintains that only community antenna systems can provide high-quality, low-cost reception for fringe areas. These systems pick up station broadcasts on master antennas, amplify the signals and distribute them over coaxial cables — strung along utility poles—to the community. There are 165 systems in the Northwest states. When the first reradiator was erected in Bridgeport, Washington, last fall, FCC inspectors warned they were illegal. However, a Commission cease and desist order was ignored. As a result, other illegal reradiators have sprung up throughout the Northwest.*

A colorful new Bulletin No. 211 illustrating and describing the new E-V line of Do-it-Yourself High Fidelity Speaker Enclosure Kits has just been issued by Electro-Voice, Inc., Buchanan, Michigan. This bulletin tells how easily one, at low cost, can build his own speaker enclosure with simple tools. Every piece in each E-V kit is precut, ready to assemble. Finished kits are comparable to the Electro-Voice factory-assembled enclosures. Seven kit models are listed, covering the Electro-Voice Patrician IV, Georgian, Centurion, Regency, Empire, Aristocrat and Baronet. Finishing Kits for fine furniture finish, and Decorative Trim Kits are also listed. Simple step-by-step instructions are supplied with each kit or may be obtained separately at nominal cost. With E-V kits service dealers can open new vistas in custom Hi Fi sales to their customers. For a free copy of Enclosure Kit Bulletin No. 211, write to Electro-Voice, Inc., Buchanan, Michigan.

The new "Geomatic" TV antennas now being marketed by The Finny Co. of Cleveland combine the famous collinear high band Finco patents with exclusive Fidelity Phasing to produce startling gain on low band—all made possible through newly created physi-

cal design and electronic circuits which also eliminate the complicated and fragile phasing harness. Twin driven models for troublesome "front-to-back ratio" problem areas are also now available. All models are designed for use with stacking harness. Also, for the first time Finco will produce a series of models to fit all needs ranging from metropolitan models through suburban, semi-fringe, fringe, and deep fringe units, each featuring specific gains best suited for the reception of desired stations.

Price advances on television antennas have already or will shortly be announced by the majority of V antenna manufacturers, according to Elliott March, president of Tescon TV Products Co., Springfield Gardens, N.Y. He attributed the general price rise to increased costs of aluminum, steel and copper materials required for the production of TV antennas.

Increased cost of labor and materials, ranging from 7½% to 20%, with an artificial scarcity that currently prevails in the metals market. "Improved production design," Mr. March said, "partly offsets the increase in raw material and labor costsMby providing antennas of improved quality and design for today's TV signal conditions. This means that the TV set owner's purchasing power is protected—because he is able to enjoy much better TV reception with only slightly increased antenna cost."

Admiral Corporation has held 109 television training schools *since printed circuit wiring was introduced in the company's television receivers in June, 1954, according to Max Schinke, national service manager. The schools acquaint dealer service men with the newest advances in printed circuits and automation and provide them with the latest information on circuit details of the Admiral TV chassis.*

A new concept in television antenna masting **has been introduced by Jones & Laughlin Steel Corporation. It enables a television serviceman to assemble in a few minutes on the job a "custom-made" telescoping antenna mast in heights up to 50 feet. The new idea involves the use of J&L's Perma-Tube, the high-strength, corrosion-resistant, electricwelded steel tubing. Perma-Tube will be furnished to distributors in five different sizes, all in 10-foot lengths, with 10 pieces of each size to a carton. The sections range in size, in quarter-inch gradations, from the largest with an outside diameter of 2¼ inches, down to the smallest with an OD of 1¼ inches. The 2-inch size fits inside the 2¼-inch**

size, the 1¾-inch inside the 2-inch, and so on. These mast sections will have one end expanded and the other end reduced. Slots and holes are provided to receive the hardware fittings. The serviceman may buy the Perma-Tube from his distributor in as many sizes as the job requires. In assembling the mast at the job site, the serviceman merely telescopes the tubing to the length he desires and applies the joint fittings. The mast is then raised to the roof for attachment and guying.

The appointment of Jack M. Gutzeit as National Sales Manager for Rogers Electronic Corp., New York City, has been announced by Louis Rogers, President.

In addition to directing Roger's sales force, distribution policies and promotion programs, Mr. Gutzeit will institute a national program of servicemen technical forums. He will personally conduct the forums and endeaver to make the company's resources of experience and technical knowledge available to service technicians.

All advertising and sales promotion of the technical products manufactured by Allen B. Du Mont Laboratories, Inc., are now under direction of Jacob H. Ruiter. He will also supervise all promotional effort by the company's Transmitter, Mobile Communications, and Technical Sales Advertising Departments. Mr. Ruiter is the author of a number of books and articles dealing with Cathode Ray Instruments and with Television. He is a member of the Institute of Radio Engineers, Montclair Society of Engineers and past president of the New Jersey Chapter of the National Industrial Advertisers Association.

Precision Radiation Instruments Inc., *Los Angeles, California, announced September 7 that it has acquired Radio Craftsmen, Chicago manufacturer of hi-fidelity components and equipment. President Leslie M. Norman of Precision announced that their Chicago firm will be operated as a subsidiary under executive management of Precision and will continue to increase output of amplifiers, tuners, filters, and equalizers.*

General Electric has started production of a five-transistor pocket radio which will have a suggested list price of $49.95. Shipments of the miniature receivers are expected to be made within a few weeks with advertising and sales promotion aimed at the Christmas market. The G-E transistor portable will be available either in ivory or ebony cases. Both station selector and on-off-volume control may be operated with one finger. The set is equipped

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with both a loudspeaker and a jack into which a hearing-aid type earphone may be attached. Actual overall dimensions of the new G-E portable are 5⅝ inches long, 3 3/16 inches wide and 1½ inches deep. Complete with battery, the receiver weighs 15 ounces.

Columbia Wire & Supply Company, Chicago, announces that all Columbia 300 ohm Permaline Television Transmission Line is now sold with a written guarantee. The 50 mil will be backed by a 15-year guarantee and the 80 mil by 25 years. Extensive research on Permaline has shown that it will far outlast other types of television transmission line in average use today, based on reports of one of the largest testing laboratories in the country, according to Columbia.

A plane-load of Detroit technicians *recently visited the Taco plant at Sherburne, N. Y., to get acquainted with the peculiarities of UHF reception. When educational Station WTVS (Channel 56) Detroit goes on the air, one of the most aggressive and thorough UHF conversion campaigns will swing into high gear. Information transmitted to the service organization representatives who visited the Taco plant will be passed on to other members at meetings to be held in and about Detroit during the coming weeks.*

Kay-Townes Antenna Co. of Rome, Ga., this fall is announcing the Super Rear Guard, a new directional television antenna that rejects signals from both the rear and sides.

ANSWERMAN

[*from page* 38]

ation. At this period in the operation ordinary fuses can open up. The delayed action or slo-blow fuse handles this extra current without opening for a short period of time but still provides protection to the circuit.

In the case of the Stromberg-Carlson receiver it is suggested that a delayed action type, 0.2 amperes fuse be installed after which most probably no further trouble will be encountered. The circuit diagram for this portion of the chassis is shown in *Fig.* 3.

Dear Mr. Answerman:

I have been wondering if there is any reason for the numerous failures of the 5U4 power rectifier tubes that I have been running into. I know that the high heat and humidity caused a number of components to fail this past summer but I think that an abnormal

number of 5U4 tubes have also gone bad in the relatively new receivers.

Do you know of any reason for this.

A. S.
Chicago, Ill.

The tube situation is becoming involved and more complicated than years ago when a 5U4 tube was a 5U4. Nowadays, there is the 5U4G, 5U4GA and 5U4GB. These tubes do not differ radically except in one aspect. The original 5U4 tube is designed as a 225 *ma* rectifier while the 5U4GA and 5U4GB tubes are rated for 275 *ma* rectifier operation.

What evidently is happening in a number of cases is that instead of using the proper tube for the receiver, the old 5U4 tube is put in with the result that failures occur very early in the tube's life.

The tube replacement aspect of TV servicing requires caution. There are many places where exact tube designation is imperative; as an example, in replacing tubes in a series filament circuit that employs tubes of the controlled heater type. Indiscriminate tube substitution cannot be practiced without poor results.

SCINTILLATION COUNTERS

[*from page* 23]

ally indicated on a schematic by its chemical formula, *NaI*. By adding a small amount of phallium to the sodium iodide crystal, the frequency (color) of the light given off is changed to one which is more effective in operating the photomultiplier tube. The crystal is then called a thallium activated sodium iodide crystal which is indicated by the symbol *NaI (Te)*.

The photograph of *Fig.* 3 also indicates the position of this crystal. Note that the crystal is sealed in an airtight container. This is necessary because sodium iodide absorbs water vapor very easily, and if left exposed to the air it would soon become useless.

Typical Circuit

Figure 4 is a schematic of commercial Scintillation Detector which will be used for purposes of illustration and circuit discussion. Notice the representation of the photomultiplier tube and the scintillating crystal at the left hand side. *Fig.* 5 is a block diagram of the unit and will be helpful in our preliminary discussion.

The sequence of operations is as follows. When radioactive rays strike the sodium iodide crystal, it gives off flashes of light. These flashes enter the photomultiplier tube, and produce voltage pulses at the output. It is important to note that the voltage pulses are of varying amplitudes, depending on the strength of the flashes of light responsible for them.

It is desired to have the meter reading represent the *rate of occurrence* at the ionizing rays. For this reason the pulses at the output of the photomultiplier tube are fed into the "one shot" multivibrator. VT-1 and VT-2 of *Fig.* 4 are used for this multivibrator. The multivibrators used in TV receivers are of the continuous running type, that is, just one of the tubes conduct while the other is cut off, and then the conditions reverse. This is true whether a synchronizing signal is present or not. In a one shot multivibrator, such as used here, the operation is very similar except that one tube remains cut off while the other conducts continually. The circuit remains in this condition until a triggering pulse is fed in. At this time the circuit will go through one cycle of an ordinary multivibrator action and then return to its original condition, resulting in a single pulse at the output. By using this arrangement all the output pulses are of equal amplitude, re-

gardless of the size of the triggering pulse.

The equalized pulses are then fed to the block indicated as the pulse integrator. This consists of a resistor-condenser network, the purpose of which is to develop a voltage corresponding to the average value of the incoming pulses. The final stage along this signal path is a vacuum tube voltmeter arranged to give a reading which will be determined by the average value of the incoming pulses. Since the input voltage to the VTVM depends on the scintillation rate, which in turn depends on the strength of the radioactive rays, the meter reading will indicate the strength of these rays. The units used for these measurements will be discussed later.

The remaining stage of this unit is that concerned with the development of the high voltage required by the photomultiplier tube. A unique circuit in this stage produces a voltage of about 10,000 volts from the low voltage batterys used to power this device. A detailed circuit analysis of these stages will be taken up in the next installment.

CAPACITESTER

[*from page 19*]

be readily revealed by an ohms check, it will in all probability not be great enough to introduce symptoms. This is so because the shunt resistor is equivalent to leakage in the condenser. If the circuit can tolerate the shunt resistor it can tolerate the effective change in its value produced by a small amount of leakage in the condenser.

In capacitive-coupled circuits where a coil alone returns a grid to ground, the *dc* resistance of the coil is so small that a leak in the coupling condenser will not cause an appreciable *dc* voltage to be developed between grid and ground. The grid voltage applied to the Capaci-Tester's indicator will be inadequate under such conditions, making an accurate leakage test difficult. Leakage in such a coupling condenser will, when appreciable, cause overheating of the plate resistor to which one side of the coupling condenser generally connects, and may be detected in this way. The CapaciTester will function normally, however, in circuits where the "low" end of a grid coil returns to an *age* line.

ASSOCIATIONS

[*from page 27*]

noon business session. B. A. Bregenzer, President of the FRSAP was named Chairman Pro Tem and Gordon Vrooman of Syracuse, Secretary of the Empire State Federation of Electronic Tech. Assn. Inc., Secretary Pro Tem.

After luncheon, the afternoon session brought forth concrete results. All in attendance agreed that UNITY was of prime importance in the Electronics Service profession, and it was proposed that further steps toward UNITY would go forth under the banner of the Electronic Service Council, and to hold another meeting October 9th, 1955 in the Sheraton Lincoln Hotel, Indianapolis, Ind., to which all Associations would be invited.

Groups present and concurring in the movement were National Alliance of TV and Electronics Service Assn's. National Electronic Tech. & Service Dealer Associations, Federation of Radio Servicemen's Association of Pa. Empire State Federation of Electronic Technicians Associations, Inc. and Minnesota TV Service Engineers Inc., Minneapolis. Truly a memorable day, and as one National Editor said, "I sincerely believe the conference will go down in history as the real dawning of a new day for Electronic Service as a business."

FRSAP (Penna.)

The August 21st meeting of FRSAP took place at the Hotel Harrisburg, in Harrisburg, Pa. Guests at the meeting were Mr. Hogan and Mr. Lowell of Continental Insurance Company, Mr. Parkinson and Mr. Miller of GE. Topics brought up at this meeting were group insurance, the impact of a certain company's advertisement of $1.00 radio

repair charge and distributors who sell at retail to anyone. The Unity meeting at Indianapolis, Indiana to be held on October 9, 1955 was unanimously approved.

Radio-TV Technicians Association of Orange County, Calif.

Ole Prez sends us a letter addressed to technicians in general in which he points up the evils of tube selling by super markets, chain drug stores, liquor stores and gas stations. He also points up the fact that distributors are generally on the side of servicemen in this new threat to the serviceman's pocket. A concerted stand is being planned by RTTA to combat this situation.

PRSMA (Phila., Pa.)

PRSMA open meetings started September 6, 1955 with Weston Electrical Instrument Corporation presenting William R. Hartz, Chief Engineer of Test Equipment, speaking on "How to Save Time and Money in Aligning a Television Receiver." The place was Franklin Institute, 20th Street and the Parkway.

It is planned by PRSMA to hold an open meeting the first Tuesday of each month at the Franklin Institute. Announcements of future meetings will be made soon.

Radio & TV Association (Springfield, Ohio)

The regular monthly meeting of the RTA Inc. was held Friday, September 9th, at Carpenter Union's Hall, 240 Ludlow Ave. The members resolved the adoption of the STANDARDS OF PRACTICE FOR TELEVISION AND RADIO REPAIR ADVERTISING, set up by the Chicago Better Business Bureau. These standards form a Code of Ethics, preventing misleading and bait advertising.

Marvin Miller and Wade Campbell have been elected to represent the RTA at the national convention of Service Associations to be held in Indianapolis October 9th where the establishment of a nationwide Congress of Electronic Service Associations will be attempted.

OSCILLOSCOPE

[from page 12]

observation of a horizontal line or 60 *cps* for observation of a vertical field.

In the sync section the various horizontal and vertical sync signals may be observed with enough sharpness and detail to enable the operator to pinpoint circuit breakdowns. Naturally,

because of its limited frequency response sharp rectangular pulses containing very high frequency components will be somewhat rounded. However, this will in no way hide troubles if they are present.

On the high voltage side of the receiver it becomes necessary to use a high voltage probe in conjunction with the CRT probe provided with the instrument. In this manner the various waveshapes present in this portion of the receiver may also be observed.

Circuit Analysis

The circuit diagram of the Probescope Model PO-1 is shown in Fig. 1. The input from the probe is fed into the first half of V1 which is a cathode follower feeding the second half of V1, a triode amplifier. The vertical gain control *R50* has a comparatively low resistance which in conjunction with *C2* (5 *uf*) helps in maintaining a satisfactory frequency response. The output of this triode feeds V2, a high gain pentode which in turn provides a high gain signal to the vertical deflection plates of the CRT.

A Potter type multivibrator circuit in conjunction with V3 is used as the horizontal oscillator. The ganged vernier control compensates the oscillator tube for the various horizontal operating frequencies so that its amplitude remains constant. The output of this oscillator is directly fed into the first half of V4, the output of which is cathode coupled into the second half of V4. A .1 *uf* condenser (*C15*) couples this amplified horizontal sweep signal into the plates of the CRT.

Two power supplies are used. One provides a positive potential of 330 volts and the other a negative potential of −760 volts for a total of 1090 volts. The use of this high voltage reduces the required beam current and consequent possibility of tube burning. The net effect is a high intensity beam.

Servicing of church, banquet hall and theater amplification systems is made easy with the use of the Probescope. Waveforms can be picked up from the output of a crystal pickup or microphone and traced right through to the speaker output. Hum and distortion troubles normally difficult to find are easily traced.

Additional use for the Probescope will be found in servicing of mobile equipment. Receivers and transmitters in boats and cars are usually difficult to remove and when brought into the shop, power for 12 volt and 24 volt equipment is not always available. A Vibrapack power supply separately packaged is available to operate the Probescope at these voltages and servicing of mobile equipment can be made without removing the equipment.

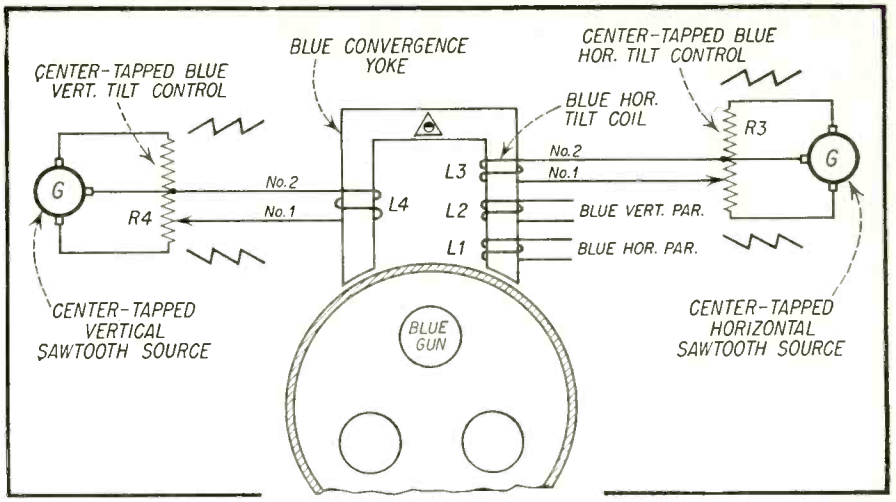


Fig. 10—Simplified circuit illustrating how Blue Horizontal and Vertical Tilt currents are obtained.

field, and will result in a beam trace which is a vertical line displaced by a distance Y′ from the vertical center line. Notice that the green dots are directed upward in an approximate "Ten O'clock" direction except for the extreme ends where the directions are reversed. The locations of the green dots after dynamic convergence will, under ideal conditions, correspond to the locations of the vertical green dots in *Fig.* 2.

Red Vertical Parabola

Correction of the red vertical trace involves pushing the belly of the red beam trace from left to right as shown in *Fig.* 9. The same reasoning used in the green vertical trace, when applied to the red vertical trace, indicates that the new vertical line of red dots will be displaced from the center vertical line by a distance Z′. This new vertical line corresponds to the vertical line of red dots in *Fig.* 2. Notice that the movement of the red dots is now in the approximate "Two O'clock" direction except for the extreme ends where the directions are reversed.

At this point it might be observed that the reversal of direction of the corrective fields at the extreme ends of the beams has been a common characteristic of the corrective dynamic convergence fields for all of the guns, both horizontal and vertical. Close examination of the end results, which are straight line traces, reveals that unless this reversal of direction were included in the corrective field it would be impossible to obtain straight lines at the beam extremities. Electrically, this reversal is merely the effect of the correcting field wave form as it passes through zero and reverses phase.

Tilt

Due to production tolerances in color tubes, seldom if ever do the beam traces take the exact patterns indicated in *Fig.* 1. after Center Static Convergence, or *Fig.* 2 after dynamic convergence. This is particularly true of the extremities

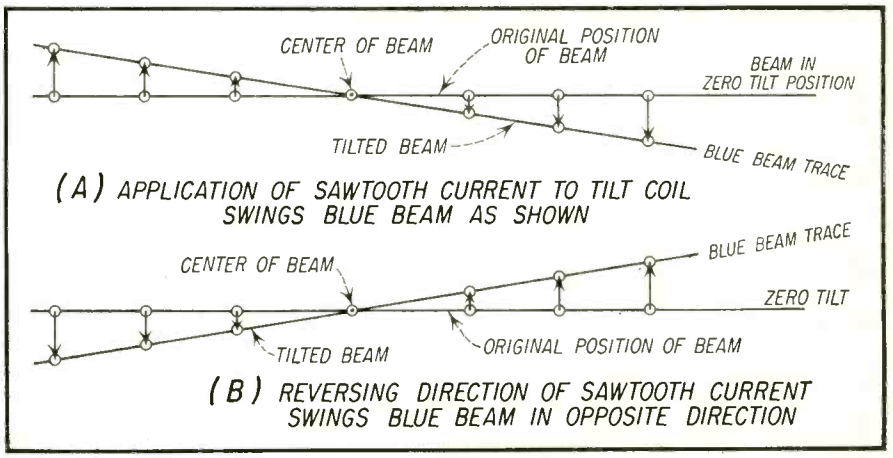


Fig. 11—Motion of blue beam trace under influence of saw-tooth voltage applied to convergence coils.

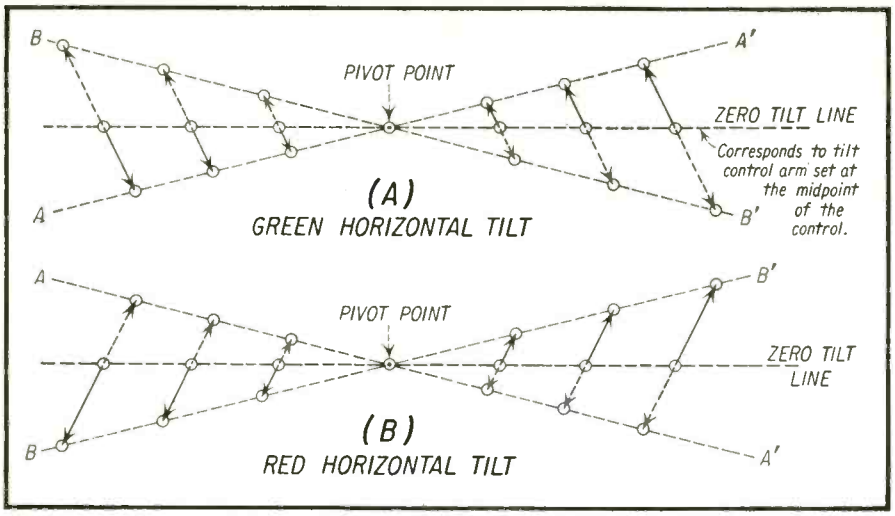


Fig. 12—Effect of horizontal tilt voltages on green and red horizontal beam traces. Solid lines indicate rotation of controls in one direction, and dashed lines indicate rotation in other direction.

of beams where the deviation from the ideal is considerable. It will be found that these deviations are not symmetrical; that is, the dots on one side may have to be moved in either direction more than the dots on the other side. For this reason it becomes necessary to introduce additional fields which will provide more flexible control of the convergence adjustments at these extremities.

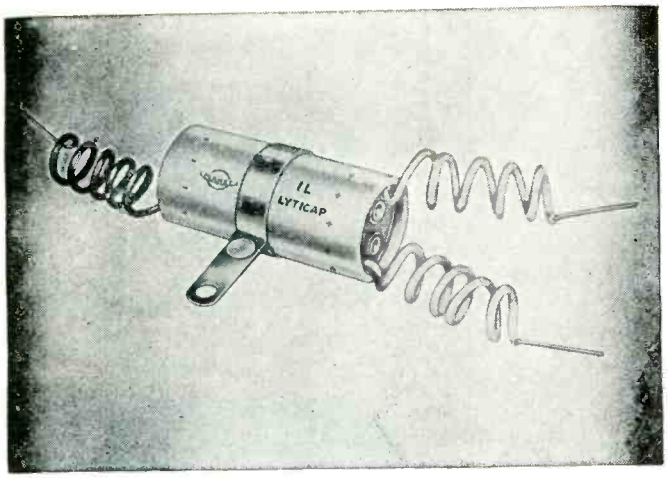
Such additional fields are obtained by adding sawtooth currents to separate convergence coils mounted on the convergence yoke. For the present we will consider that the various convergence currents are fed through separate coils. In practice it is possible to combine these currents on a single coil and thereby obtain net identical results.

It is necessary that these sawtooth currents be adjustable for control of amplitude as well as reversible in phase. This type of adjustment is indicated in *Fig. 10*. Thus, six additional currents are made to flow in the coils of the convergence assembly, three for the horizontal and three for the vertical coils. The fields produced as a result of these currents are called Tilt Fields, and their intensity and direction of flow are controlled by Tilt Controls. The tilt voltages producing these sawtooth currents may be applied to the convergence assembly from appropriate sources in the manner shown in *Fig. 10*.

Blue Horizontal Tilt

Referring to *Fig. 11* we observe that the blue horizontal beam in the zero tilt position may be rotated in either direction around the center of the screen as a pivot. The direction of rotation depends upon the phase of the sawtooth current flow in *L3*, this phase being determined by the position of the center arm of the Tilt Control with reference to the center tap of the control. Thus, a wide range of blue dot positioning in a vertical direction may be effected by means of the Blue Tilt Control.

Recalling that the Blue Horizontal Parabola adjustment provides considerable motion of the beam at the center and little near the extremities, the combination of both parabola and tilt provides us with enough control of the blue horizontal beam to effect satisfactory, if not exact, convergence of



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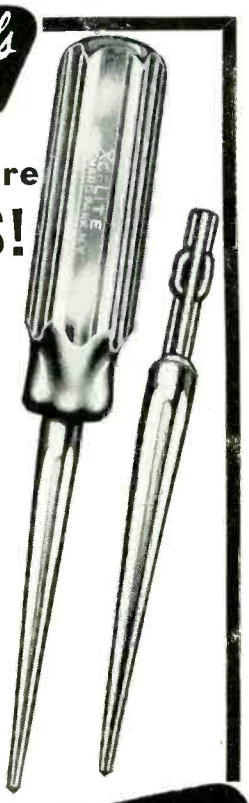

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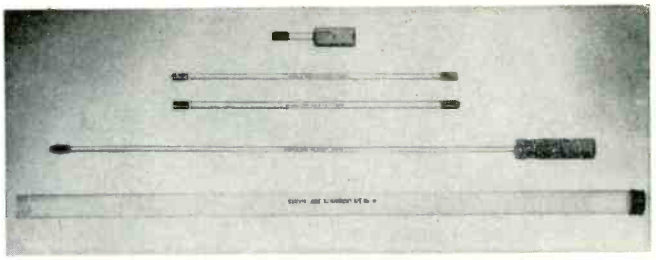

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(Signed) S. R. COWAN, Publisher

Sworn to and subscribed before me, this 19th day of September 1955.

HARRY N. REIZES, Notary Public

this beam with the others.

Green and Red Horizontal Tilt

The effects of the green and red horizontal sawtooth tilt fields on the green and red horizontal traces are shown individually in *Fig. 12*. In (A) we observe the effect of the Tilt Control on the green horizontal beam. Notice that when the arm of the tilt control is set at the midpoint of the control the applied tilt field is zero. Again, as in the previous field patterns, the arrows shown indicate the amplitude and direction of the corrective convergence field. In this case this field is contributed by the sawtooth tilt current in the green horizontal tilt coil. Solid arrows indicate the field forces set up with the tilt control arm in one direction *with respect to the midpoint of the control*. Dashed arrows indicate opposite field forces set up by the control arm being in the opposite direction. Notice that one half of a line of green dots have forces acting on them in one direction (10 O'clock) and the other half forces acting on them in an opposite direction (4 O'clock). Thus, the complete line of green dots takes different positions between A-A' and B-B' as it rotates around the central pivot point.

The red horizontal tilt field is shown in *Fig. 12 (B)*. The same principles applying to the green horizontal field applies to the red field except that now the forces are in directions corresponding to "Two O'clock" and "Eight O'clock." Different settings of the tilt control rotate the red beam around the pivot point between positions A-A' and B-B'.

Blue Vertical Tilt

The application of a vertical voltage that produces a sawtooth current in a coil such as *L4* in *Fig. 10* results in vertical non-linearity of the blue vertical beam trace. The reason for this is that the motion that can be imparted to the blue beam by the static or dynamic fields produced by the convergence assembly is strictly vertical. Inasmuch as the corrective dynamic voltage may be applied at opposite phases depending on the position of the blue vertical tilt control, the dots may be either pulled together or spread apart. Thus, an initial condition is shown in *Fig. 13A* where the blue vertical dots are equally spaced. The effect of the Blue Tilt Control is shown in (B) and (C) where the extreme dots are either moved together or apart depending upon which side of center the potentio-

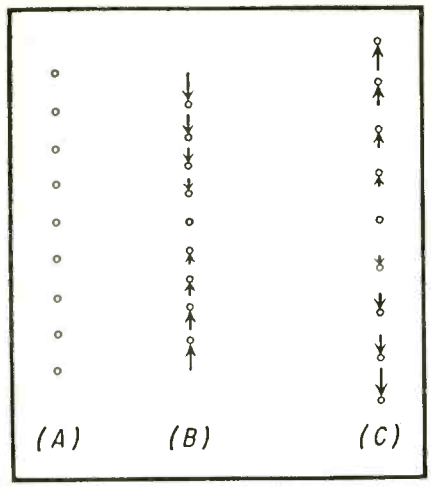

Fig. 13—Effect of vertical tilt field on blue trace. (A) Assumed initial direction of blue vertical dots to illustrate effect of vertical tilt control. (B) Effect of rotation of Tilt Control on one side of center-tap of control. (C) Effect of rotation of Tilt Control on other side of center-tap of control.

meter arm is placed.

Observe that in (B) and (C) the greatest effect of the corrective field on the beam is at the ends of the beam and that there is no effect at the center.

Green and Red Vertical Tilt

The production of green and red vertical sawtooth currents in the respective green and red tilt coils of the convergence assembly results in green and

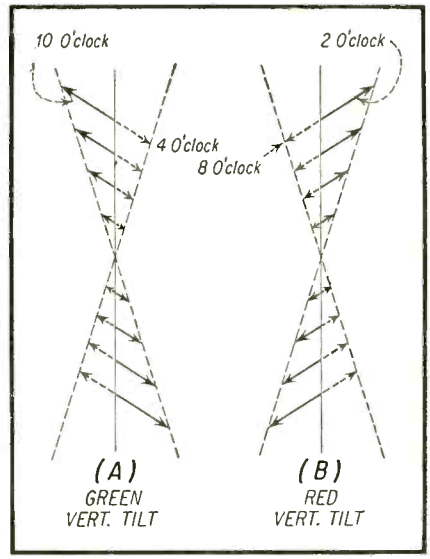

Fig. 14—Effect of vertical tilt voltages on green and red vertical beam traces. Solid lines indicate rotation of tilt controls on one side of center-tap of control. Dashed lines indicate rotation of tilt control on other side of the center tap.

red vertical tilt fields as shown in *Fig. 14*. The production of the tilt fields in the red and green guns is the same as that in the blue gun except that the direction of the fields are at the discreet angles that are characteristic of the motions of the green and blue dots. These angles are indicated in the figure.

Conclusion

The wide range of field control provided by the corrective parabolic and tilt fields provides us with whatever adjustments we require to effect dynamic convergence, and should enable us to obtain the dot pattern illustrated in *Fig. 2*. From this point the magnetic converging controls are utilized to effect Static Convergence.

AUTO RADIO

[*from page 10*]

door opener is around 50 feet. This is done to prevent closing or opening the door with a pet or child in a position where injury might be possible. If the transmitter unit is operated out of sight of the garage door accidents could very easily occur.

Use of this type of equipment requires the transmitter be registered with an FCC form 505. A class C Citizens Radio license is issued for type of radio gear. For further information the FCC's "Rules and Regulations Governing the Citizens Radio Service" is obtainable through the Superintendent of Documents, Government Printing Office, Washington 25, D. C. for 10 cents.

From the above overall picture of mobile electronics it is hoped that helpful suggestions has been brought to the attention of service companies who upon occasion have commented about the inactivity of TV servicemen at certain periods of the year.

WORK BENCH

[*from page 21*]

looked and when this condenser was bridged, the trouble disappeared. C253, was therefore replaced with a new 50 μf filter and the receiver now functioned normally.

Referring to the diagram, it can be seen that the vertical integrating network is tied to the –50 volt buss. Thus a leaky C253 would allow *ac* into the vertical sync circuits causing the vertical jitter. It can also be seen that the horizontal oscillator, 6SN7, and the horizontal deflection amplifier, 6BG6, are both tied to the –50 volt buss at their cathodes. *AC* entering the horizontal circuits modulates the saw-tooth so as to cause the left side to appear darker.

Advertising Index

RADIO-TELEVISION SERVICE DEALER
COMPLETE TV SERVICE INFORMATION SHEETS

Crosley

Chassis 466 & 467

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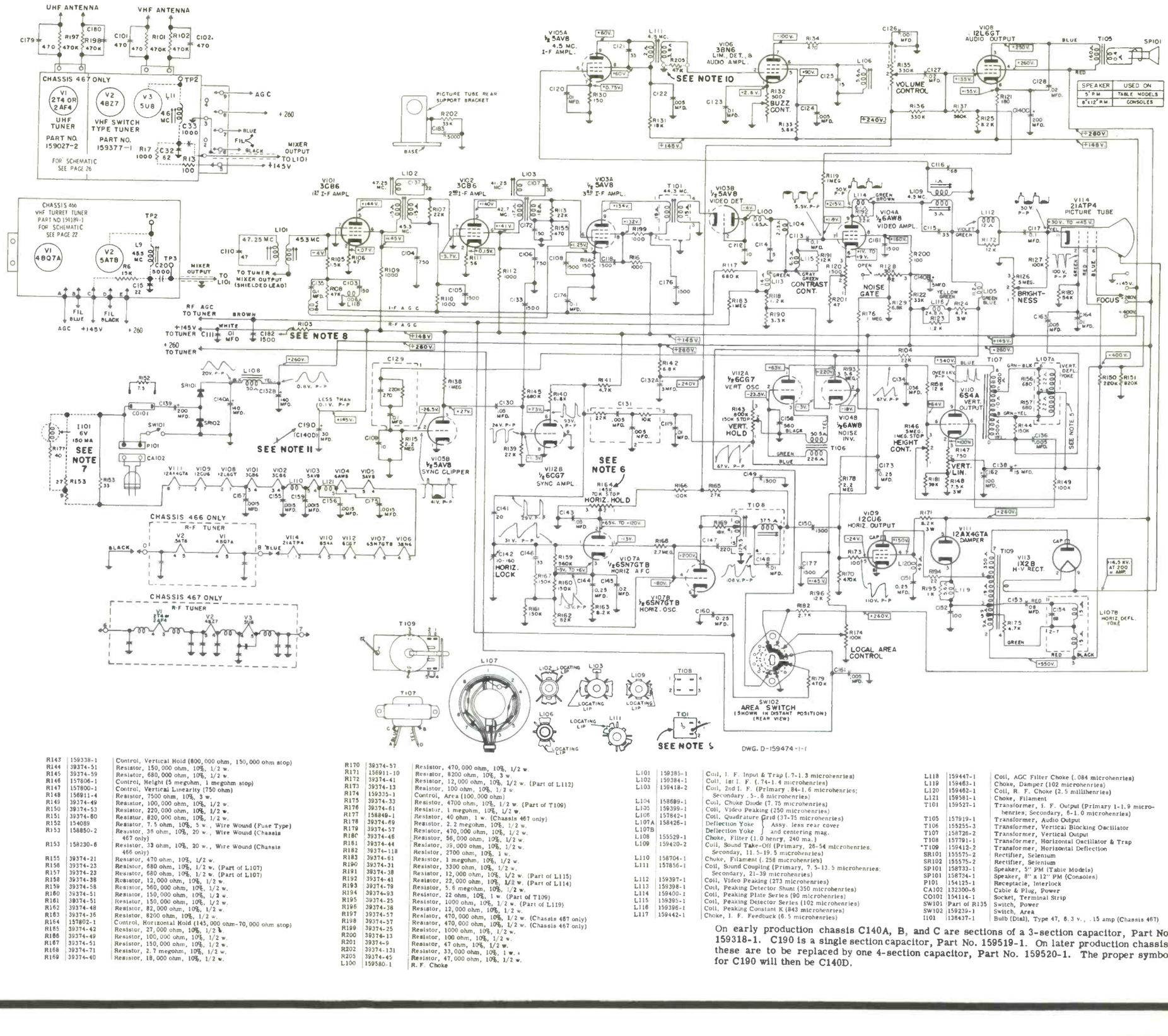
PARTS LIST

Symbol No.	Part No.	Description
C101	143223-14	Capacitor, 470 mmf., 1 kv., Mica (Chassis 467 only)
C102	143223-14	Capacitor, 470 mmf., 1 kv., Mica (Chassis 467 only)
C103	158215-35	Capacitor, 150 mmf., 10%, N750, 500 v., Disc Ceramic
C104	156201-5	Capacitor, 750 mmf., 500 v., Disc Ceramic
C105	144675-30	Capacitor, 1500 mmf., 500 vf, Disc Ceramic
C106	156201-5	Capacitor, 750 mmf., 500 v., Disc Ceramic
C107	137499-45	Capacitor, 30 mmf., 5%, NP100, Silver Mica (Part of L103)
C108	144675-30	Capacitor, 1500 mmf., 500 v., Disc Ceramic
C109	137727-135	Capacitor, 10 mmf., 10%, N080, 500 v., Ceramic
C110	137499-80	Capacitor, 47 mmf., 5%, NP100, Silver Mica (Part of L101)
C111	39478-47	Capacitor, 0.1 mfd., 800 v., Molded Paper
C112	137727-135	Capacitor, 10 mmf., 10%, N080, 500 v., Ceramic
C113	157906-1	Capacitor, 0.1 mfd., 150 v., Paper
C114	137727-103	Capacitor, 5 mmf., 10%, N030, 500 v., Ceramic
C115	137727-126	Capacitor, 33 mmf., 10%, N080, 500 v., Ceramic
C116	137727-133	Capacitor, 68 mmf., 10%, N080, 500 v., Ceramic
C117	39478-47	Capacitor, 0.1 mfd., 800 v., Molded Paper
C118	144675-30	Capacitor, 1500 mmf., 500 v., Disc Ceramic
C119	39478-41	Capacitor, .01 mfd., 10%, 600 v., Molded Paper
C120	39478-41	Capacitor, .01 mfd., 10%, 600 v., Molded Paper
C121	137727-126	Capacitor, 33 mmf., 10%, N080, 500 v., Ceramic
C122	144675-2	Capacitor, .005 mfd., 500 v., Disc Ceramic
C123	39478-41	Capacitor, .01 mfd., 10%, 600 v., Molded Paper
C124	144675-2	Capacitor, .005 mfd., 500 v., Disc Ceramic
C125	137727-43	Capacitor, 15 mmf., 10%, N080, 500 v., Ceramic
C126	158215-17	Capacitor, .001 mfd., 20%, 500 v., Disc Ceramic
C127	39001-80	Capacitor, .02 mfd., 600 v., Paper
C128	39001-80	Capacitor, .02 mfd., 600 v., Paper
C129	159383-1	Network, Sync Take-Off
C130	39001-17	Capacitor, .05 mfd., 600 v., Paper
C131	157812-1	Network, Vertical Integrator
C132A	159495-1	Capacitor, 5 mfd., 350 v., Electrolytic
C132B		Capacitor, 140 mfd., 350 v., Electrolytic
C133	144675-30	Capacitor, 1500 mmf., 500 v., Disc Ceramic
C134	39478-76	Capacitor, .056 mfd., 10%, 400 v., Molded Paper
C135	157906-1	Capacitor, 0.1 mfd., 150 v., Paper
C136	158215-34	Capacitor, .005 mfd., N750, 500 v., Disc Ceramic
C137	137499-59	Capacitor, 22 mmf., 5%, NP100, Silver Mica (Part of L102)
C138	159319-1	Capacitor, 15 mfd., 525 v., Electrolytic
C139	158557-1	Capacitor, 200 mfd., 200 v., Electrolytic
*C140A	159318-1	Capacitor, 140 mfd., 350 v., Electrolytic
*C140B		Capacitor, 5 mfd., 350 v., (Early
*C140C		Capacitor, 200 mfd., 200 v., Production)
*C140A	159520-1	Capacitor, 140 mfd., 350 v., Electrolytic
*C140B		Capacitor, 3 mfd., 300 v., (Later
*C140C		Capacitor, 200 mfd., 200 v., Production)
*C140D		Capacitor, 30 mfd., 200 v.,
C141	137727-61	Capacitor, 20 mmf., 10%, N220, 300 v., Ceramic
C142	157870-1	Trimmer, 10-160 mmf., Horizontal Lock
C143	39001-17	Capacitor, .05 mfd., 600 v., Paper
C144	157810-1	Capacitor, 0.25 mfd., 25 v., Paper
C145	39001-80	Capacitor, .02 mfd., 600 v., Paper
C146	137727-126	Capacitor, 33 mmf., 10%, N080, 500 v., Ceramic
C147	137499-58	Capacitor, 220 mmf., 10%, NPO, 1000 v., Mica
C148	148813-2	Capacitor, .01 mfd., 400 v., Paper
C149	137499-57	Capacitor, 1300 mmf., 10%, NPO, 500 v., Silver Mica
C150	144675-33	Capacitor, 1300 mmf., 10%, 500 v., Disc Ceramic
C151	39001-87	Capacitor, .25 mfd., 500 v., Paper
C152	158215-33	Capacitor, 100 mmf., 10%, N750, 3 kv., Disc Ceramic
C153	159439-1	Capacitor, .08 mfd., 10%, 200 v., Paper
C154	158215-3	Capacitor, 68 mmf., 10%, N1400, 3 kv., Disc Ceramic (Part of L-107)
C155	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C156	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C157	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C158	144675-32	Capacitor, 560 mmf., 10%, 500 v., Disc Ceramic
C159	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C160	157810-1	Capacitor, .25 mfd., 25 v., Paper
C161	144675-2	Capacitor, .005 mfd., 500 v., Disc Ceramic
C162	159316-1	Capacitor, 100 mfd., 150 v., Electrolytic
C163	158215-25	Capacitor, .005 mfd., 20%, 500 v., Disc Ceramic
C164	39478-41	Capacitor, .01 mfd., 600 v., Paper
C172	158215-35	Capacitor, 150 mmf., 10%, N750, 500 v., Disc Ceramic
C173	157810-1	Capacitor, .25 mfd., 25 v., Paper
C174	157906-1	Capacitor, 1 mfd., 150 v., Paper
C175	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C176	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C177	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C179	143223-14	Capacitor, 470 mmf., 1 kv., Mica (Chassis 467 only)
C180	143223-14	Capacitor, 470 mmf., 1 kv., Mica (Chassis 467 only)
C181	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C182	144675-30	Capacitor, .0015 mfd., 500 v., Disc Ceramic
C183	158215-4	Capacitor, 5000 mmf., 1000 v., Disc Ceramic
*C190	159519-1	Capacitor, 30 mfd., 200 v., Electrolytic
R101	39374-57	Resistor, 470,000 ohm, 10%, 1/2 w. (Chassis 467 only)
R102	39374-57	Resistor, 470,000 ohm, 10%, 1/2 w. (Chassis 467 only)
R103	39374-17	Resistor, 220 ohm, 10%, 1/2 w. (Chassis 467 only)
R103	39374-25	Resistor, 1000 ohm, 10%, 1/2 w. (Chassis 466 only)
R104	39374-41	Resistor, 22,000 ohm, 10%, 1/2 w.
R105	39374-27	Resistor, 1500 ohm, 10%, 1/2 w.
R106	39374-9	Resistor, 47 ohm, 10%, 1/2 w.
R107	39374-41	Resistor, 22,000 ohm, 10%, 1/2 w.
R108	39374-45	Resistor, 47,000 ohm, 10%, 1/2 w.
R109	39374-25	Resistor, 1000 ohm, 10%, 1/2 w.
R110	39374-25	Resistor, 1000 ohm, 10%, 1/2 w.
R111	39374-10	Resistor, 56 ohm, 10%, 1/2 w.
R112	39374-25	Resistor, 1000 ohm, 10%, 1/2 w.
R113	39374-43	Resistor, 22,000 ohm, 10%, 1/2 w.
R114	39374-15	Resistor, 150 ohm, 10%, 1/2 w.
R115	39374-69	Resistor, 2.2 megohm, 10%, 1/2 w.
R116	39374-25	Resistor, 1000 ohm, 10%, 1/2 w.
R117	39374-59	Resistor, 680,000 ohm, 10%, 1/2 w.
R118	39374-26	Resistor, 1200 ohm, 10%, 1/2 w.
R119	39374-61	Resistor, 1 megohm, 10%, 1/2 w.
R120	157804-1	Control, Contrast (1500 ohm)
R121	39374-104	Resistor, 180 ohm, 10%, 1 w.
R122	39374-219	Resistor, 33,000 ohm, 10%, 2 w.
R123	39374-26	Resistor, 1200 ohm, 10%, 1/2 w. (Part of L116)
R124	156911-9	Resistor, 4700 ohm, 10%, 3 w.
R125	39374-36	Resistor, 8200 ohm, 10%, 1/2w.
R126	157801-1	Control, Brightness (5 megohm)
R127	39374-49	Resistor, 100,000 ohm, 10%, 1/2 w.
R128	159037-1	Control, Noise Gate (90,000 ohm)
R129	39374-35	Resistor, 6800 ohm, 10%, 1/2 w.
R130	39374-15	Resistor, 150 ohm, 10%, 1/2 w.
R131	39374-40	Resistor, 18,000 ohm, 10%, 1/2 w.
R132	157955-2	Control, Buzz (500 ohm)
R133	39374-122	Resistor, 5600 ohm, 10%, 1 w.
R134	39374-21	Resistor, 470 ohm, 10%, 1/2 w.
R135	157803-1	Control, Volume (330,000 ohm) & Switch
R136	39374-55	Resistor, 330,000 ohm, 10%, 1/2 w.
R137	39374-58	Resistor, 560,000 ohm, 10%, 1/2 w.
R138	39374-61	Resistor, 1 megohm, 10%, 1/2 w.
R139	39374-41	Resistor, 22,000 ohm, 10%, 1/2 w.
R140	39374-35	Resistor, 6800 ohm, 10%, 1/2 w.
R141	39374-33	Resistor, 4700 ohm, 10%, 1/2 w.
R142	39374-35	Resistor, 6800 ohm, 10%, 1/2 w.
R143	159338-1	Control, Vertical Hold (800,000 ohm, 150,000 ohm stop)
R144	39374-51	Resistor, 150,000 ohm, 10%, 1/2 w.
R145	39374-59	Resistor, 680,000 ohm, 10%, 1/2 w.
R146	157806-1	Control, Height (5 megohm, 1 megohm stop)
R147	157800-1	Control, Vertical Linearity (750 ohm)
R148	156911-4	Resistor, 7500 ohm, 10%, 3 w.
R149	39374-49	Resistor, 100,000 ohm, 10%, 1/2 w.
R150	39374-53	Resistor, 220,000 ohm, 10%, 1/2 w.
R151	39374-60	Resistor, 820,000 ohm, 10%, 1/2 w.
R152	154089	Resistor, 7.5 ohm, 10%, 5 w., Wire Wound (Fuse Type)
R153	158850-2	Resistor, 33 ohm, 10%, 20 w., Wire Wound (Chassis 467 only)
R153	158230-6	Resistor, 33 ohm, 10%, 20 w., Wire Wound (Chassis 466 only)
R155	39374-21	Resistor, 470 ohm, 10%, 1/2 w.
R156	39374-23	Resistor, 680 ohm, 10%, 1/2 w. (Part of L107)
R157	39374-23	Resistor, 680 ohm, 10%, 1/2 w. (Part of L107)
R158	39374-38	Resistor, 12,000 ohm, 10%, 1/2 w.
R159	39374-58	Resistor, 560,000 ohm, 10%, 1/2 w.
R160	39374-51	Resistor, 150,000 ohm, 10%, 1/2 w.
R161	39374-51	Resistor, 150,000 ohm, 10%, 1/2 w.
R162	39374-48	Resistor, 82,000 ohm, 10%, 1/2 w.
R163	39374-36	Resistor, 8200 ohm, 10%, 1/2 w.
R164	157802-1	Control, Horizontal Hold (145,000 ohm-70,000 ohm stop)
R165	39374-42	Resistor, 27,000 ohm, 10%, 1/2 w.
R166	39374-49	Resistor, 100,000 ohm, 10%, 1/2 w.
R167	39374-51	Resistor, 150,000 ohm, 10%, 1/2 w.
R168	39374-71	Resistor, 2.7 megohm, 10%, 1/2 w.
R169	39374-40	Resistor, 18,000 ohm, 10%, 1/2 w.
R170	39374-57	Resistor, 470,000 ohm, 10%, 1/2 w.
R171	156911-10	Resistor, 8200 ohm, 10%, 3 w.
R172	39374-41	Resistor, 12,000 ohm, 10%, 1/2 w. (Part of L112)
R173	39374-13	Resistor, 100 ohm, 10%, 1/2 w.
R174	159335-1	Control, Area (100,000 ohm)
R175	39374-33	Resistor, 4700 ohm, 10%, 1/2 w. (Part of T109)
R176	39374-61	Resistor, 1 megohm, 10%, 1/2 w.
R177	158849-1	Resistor, 40 ohm, 1 w. (Chassis 467 only)
R178	39374-69	Resistor, 2.2 megohm, 10%, 1/2 w.
R179	39374-57	Resistor, 470,000 ohm, 10%, 1/2 w.
R180	39374-46	Resistor, 56,000 ohm, 10%, 1/2 w.
R181	39374-44	Resistor, 39,000 ohm, 10%, 1/2 w.
R182	39374-118	Resistor, 2700 ohm, 10%, 1 w.
R183	39374-61	Resistor, 1 megohm, 10%, 1/2 w.
R190	39374-31	Resistor, 3300 ohm, 10%, 1/2 w.
R191	39374-38	Resistor, 12,000 ohm, 10%, 1/2 w. (Part of L115)
R192	39374-41	Resistor, 22,000 ohm, 10%, 1/2 w. (Part of L114)
R193	39374-79	Resistor, 5.6 megohm, 10%, 1/2 w.
R194	39374-93	Resistor, 22 ohm, 10%, 1 w. (Part of T109)
R195	39374-25	Resistor, 1000 ohm, 10%, 1/2 w. (Part of L119)
R196	39374-38	Resistor, 12,000 ohm, 10%, 1/2 w.
R197	39374-57	Resistor, 470,000 ohm, 10%, 1/2 w. (Chassis 467 only)
R198	39374-57	Resistor, 470,000 ohm, 10%, 1/2 w. (Chassis 467 only)
R199	39374-25	Resistor, 1000 ohm, 10%, 1/2 w.
R200	39374-13	Resistor, 100 ohm, 10%, 1/2 w.
R201	39374-9	Resistor, 47 ohm, 10%, 1/2 w.
R202	39374-131	Resistor, 33,000 ohm, 10%, 1 w.
R205	39374-45	Resistor, 47,000 ohm, 10%, 1/2 w.
L100	159580-1	R. F. Choke
L101	159385-1	Coil, I. F. Input & Trap (.7-1.3 microhenries)
L102	159384-1	Coil, 1st I. F. (.74-1.4 microhenries)
L103	159418-2	Coil, 2nd I. F. (Primary .84-1.6 microhenries; Secondary .5-.8 microhenries)
L104	158689-1	Coil, Choke Diode (7.75 microhenries)
L105	159399-1	Coil, Video Peaking (250 microhenries)
L106	157842-1	Coil, Quadrature Grid (37-75 microhenries)
L107A	158426-1	Deflection Yoke } Assy. less rear cover
L107B		Deflection Yoke } and centering mag.
L108	155529-1	Choke, Filter (1.0 henry, 240 ma.)
L109	159420-2	Coil, Sound Take-Off (Primary, 26-54 microhenries; Secondary, 11.5-19.5 microhenries)
L110	158704-1	Choke, Filament (.258 microhenries)
L111	157856-1	Coil, Sound Coupling (Primary, 7.5-13.5 microhenries; Secondary, 21-39 microhenries)
L112	159397-1	Coil, Video Peaking (273 microhenries)
L113	159398-1	Coil, Peaking Detector Shunt (350 microhenries)
L114	159400-1	Coil, Peaking Plate Series (90 microhenries)
L115	159395-1	Coil, Peaking Detector Series (102 microhenries)
L116	159396-1	Coil, Peaking Constant K (843 microhenries)
L117	159442-1	Choke, I. F. Feedback (6.5 microhenries)
L118	159447-1	Coil, AGC Filter Choke (.084 microhenries)
L119	159463-1	Choke, Damper (102 microhenries)
L120	159462-1	Coil, R. F. Choke (2.5 millihenries)
L121	159581-1	Choke, Filament
T101	159527-1	Transformer, I. F. Output (Primary 1-1.9 microhenries; Secondary, 8-1.0 microhenries)
T105	157919-1	Transformer, Audio Output
T106	155255-3	Transformer, Vertical Blocking Oscillator
T107	158726-2	Transformer, Vertical Output
T108	157791-1	Transformer, Horizontal Oscillator & Trap
*T109	159412-2	Transformer, Horizontal Deflection
SR101	155575-2	Rectifier, Selenium
SR102	155575-2	Rectifier, Selenium
SP101	158733-1	Speaker, 5" PM (Table Models)
SP101	158734-1	Speaker, 8" x 12" PM (Consoles)
P101	154125-1	Receptacle, Interlock
CA102	132300-6	Cable & Plug, Power
CO101	154114-1	Socket, Terminal Strip
SW101	Part of R135	Switch, Power
SW102	159239-1	Switch, Area
I101	138437-1	Bulb (Dial), Type 47, 6.3 v., .15 amp (Chassis 467)

On early production chassis C140A, B, and C are sections of a 3-section capacitor, Part No. 159318-1. C190 is a single section capacitor, Part No. 159519-1. On later production chassis, these are to be replaced by one 4-section capacitor, Part No. 159520-1. The proper symbol for C190 will then be C140D.



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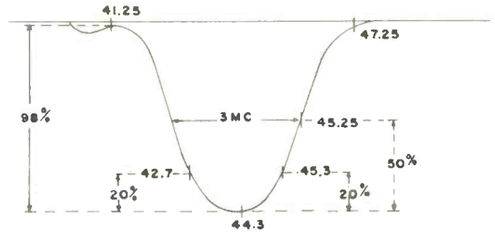
TO CHECK I.F. ALIGNMENT (with scope)

Excessive sweep input will overload the circuit and cause distortion in the wave form. Check for possible overload by temporarily increasing and decreasing the signal input level and noting any change in the wave form. Excessive signal from the marker generator will also distort the wave form. Be sure to keep the marker at the minimum usable amplitude.

NOTE: Be sure, when checking the I. F. alignment, to set the channel selector switch to a channel where moving the fine tuning control does not affect the shape or position of the I. F. response curve.

Sweep Gen. Connected to	Scope Connected to	Bias	Sweep Gen. Set To	Remarks
High side to ungrounded Aluminum Foil around 5U8(V3) or 5AT8(V2). Low side to grounded tube shield. (See Note 1 and Figs. below)	Junction of C113 and L115	Connect a 3 volt bias battery, negative lead to junction of R117 and C174 (I. F. AGC) and a 4.5 volt bias battery, negative lead to junction of R183 and brown lead going to Tuner (R-F AGC). Connect positive leads to chassis.	Sweep from 40 to 50 megacycles	Provide markers as shown on curve.  NOMINAL OVERALL I-F RESPONSE CURVE A slight deviation in response curve is tolerable, but if any great deviation is noted, the I. F. stages will have to be realigned.

NOTE 1.
Cut aluminum foil to dimensions shown in Fig. 8. Wrap foil around the tube and take scotch tape and wrap around the foil to hold the foil in place and to insulate it from the tube shield as shown in Fig. 9. Replace the tube and tube shield. Connect the high side of sweep generator to the (ungrounded) foil extending from the top of the tube shield and the ground lead from sweep generator to tube shield.

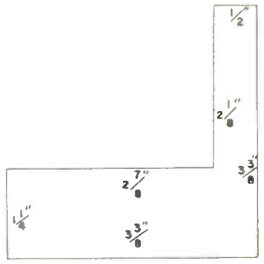


FIG. 8

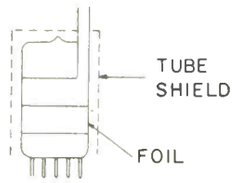


FIG. 9

SOUND ALIGNMENT

The 4.5 mc. trap (front of L109) must be aligned first, regardless of which procedure is used for the remainder of the alignment (Procedure A or B).

Step No.	Channel Set To	Adjust	Remarks
1.	Any unused channel	Connect a crystal controlled 4.5 MC., 400 cycle amplitude modulated signal (30% or greater) between pin 7 of V104 and chassis. Connect high side of scope through a detector probe to cathode of picture tube, low side to chassis. Adjust L109 (rear slug) for minimum 400 cycle indication on scope.	Remove signal generator and scope from the receiver.

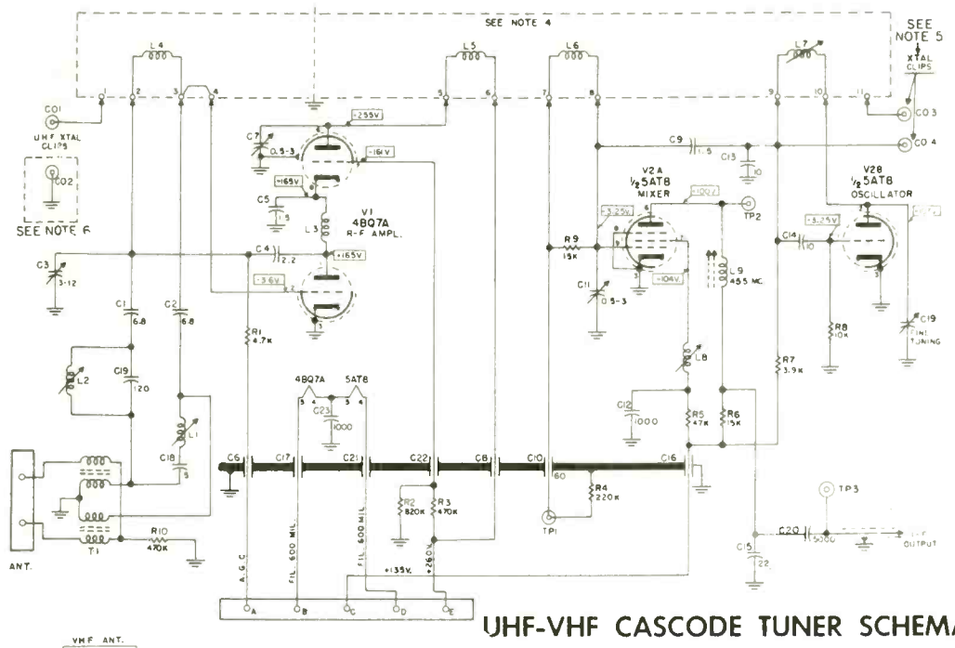
Proceed with the remainder of the Sound Alignment, using either a signal from a TV station as in Procedure A, or alignment equipment as in Procedure B.

PROCEDURE (with signal from station)

Step No.	Channel Set To	Adjust	Remarks
1.	Strong signal	L106 for maximum sound output.	Set Buzz Control (R132) approximately 90° from clockwise stop.
2.	Weak signal	L111 and L109 (front slug) for maximum sound output.	If the signal in the area is too strong to obtain these peaks, remove the antenna from the receiver.
3.	Weak signal	Buzz Control (R132) for minimum noise (hash).	This signal should be weak enough to allow noise (hash) to come through along with the sound.
4.	Strong signal	L106 again for maximum sound output.	Limit the volume control setting so that this peak can be heard.

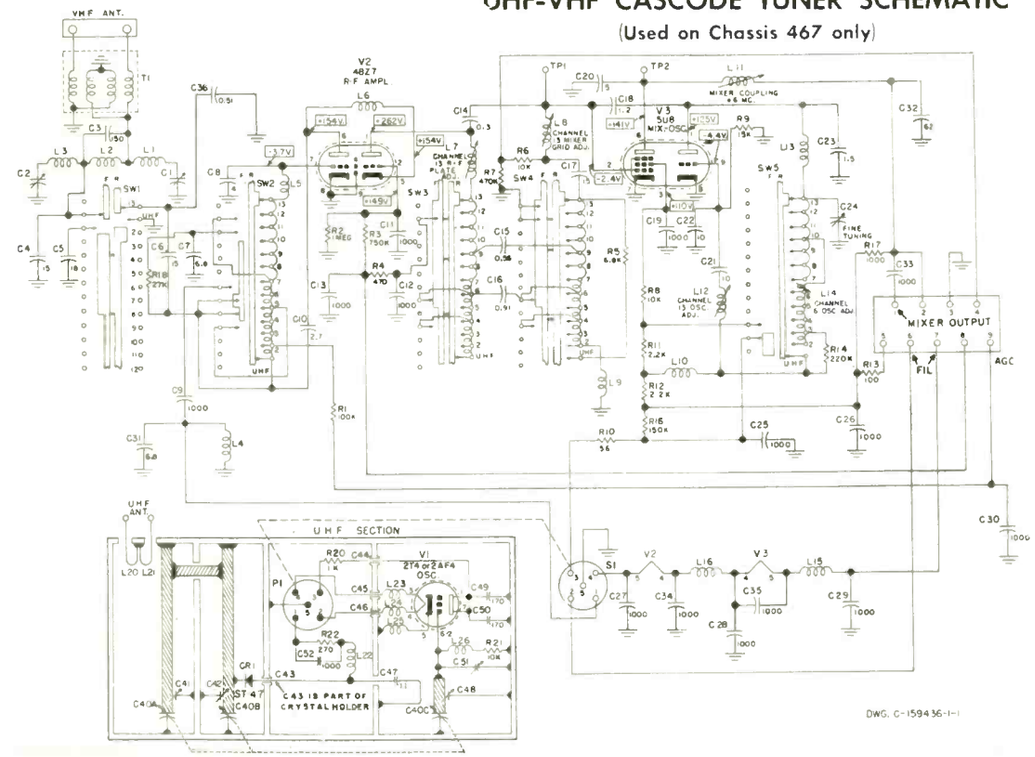
VHF TURRET TUNER SCHEMATIC

(Part No. 159189-1, used on Chassis 466 only)



UHF-VHF CASCODE TUNER SCHEMATIC

(Used on Chassis 467 only)



NOTES:
1. ALL CAPACITANCE VALUES ARE IN MMF. AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
2. K = 1000
3. FEED THRU CAPACITORS ARE 1000 MMF. UNLESS OTHERWISE NOTED.
4. FRONT AND REAR ROTORS OF SW1, SW3 & SW4 CONNECTED ELECTRICALLY.
5. CHANNEL SWITCH SHOWN IN CHANNEL 13 POSITION.
6. P1 AND S1 VIEWED FROM WIRING SIDE.
7. SOCKET VOLTAGE MEASUREMENTS TAKEN IN CHANNEL 3 POSITION. SEE NOTE 1 ON CHASSIS SCHEMATIC.

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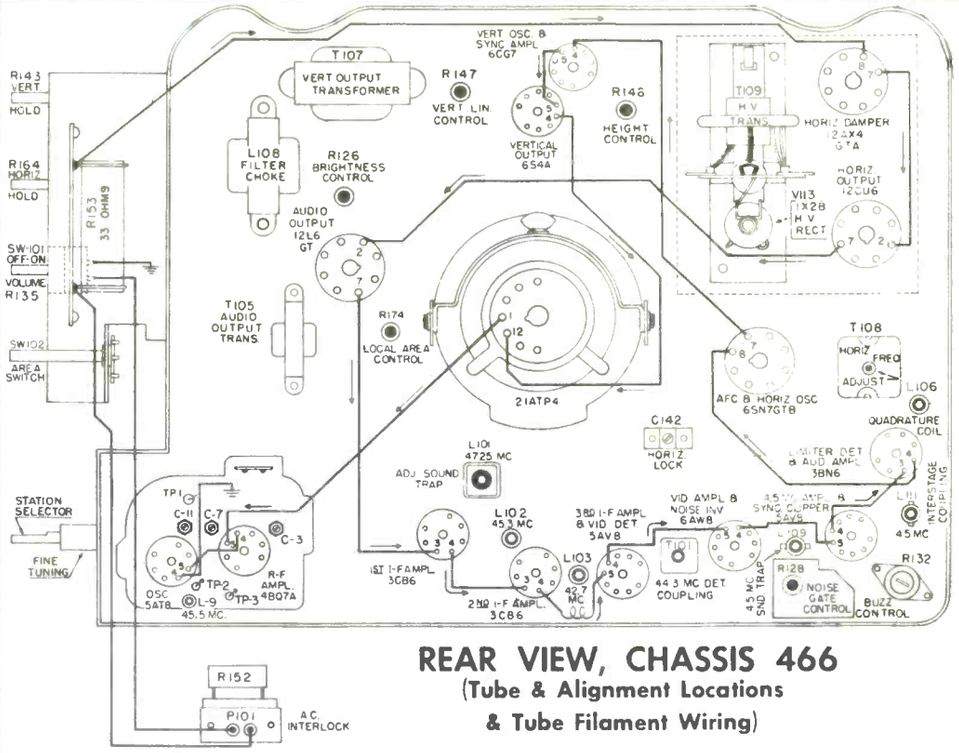
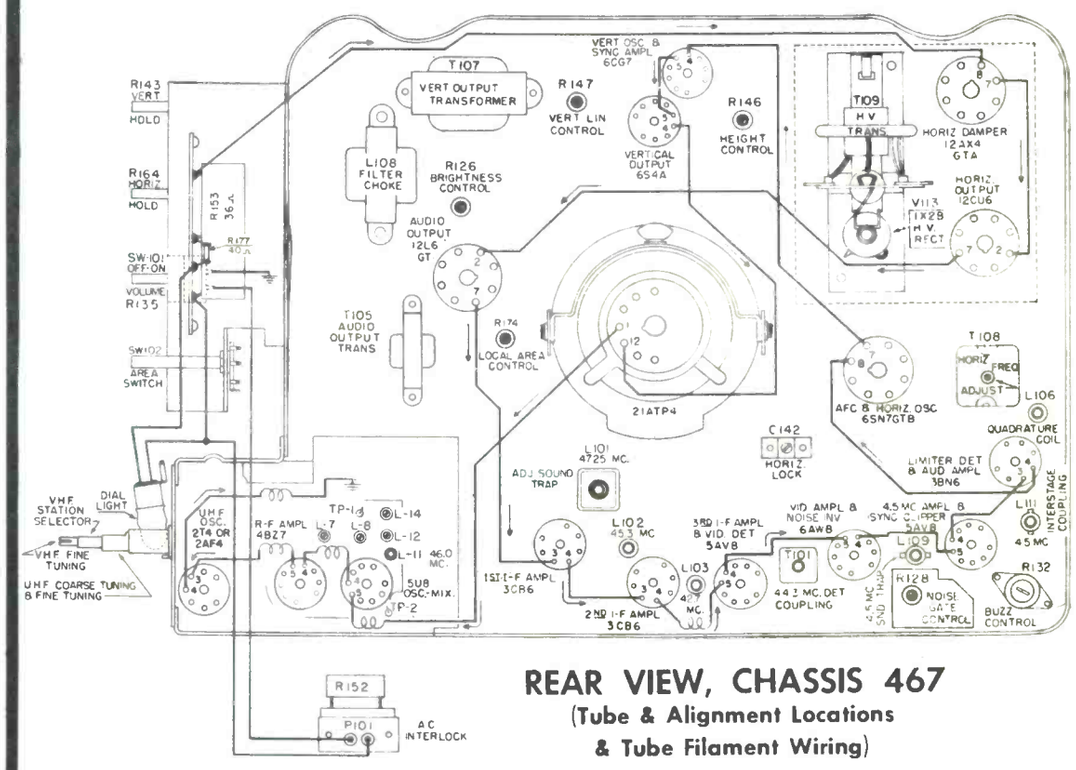


REAR VIEW, CHASSIS 466
(Tube & Alignment Locations & Tube Filament Wiring)



REAR VIEW, CHASSIS 467
(Tube & Alignment Locations & Tube Filament Wiring)

I. F. ALIGNMENT

All lead connections from the signal marker generator and sweep generator must be shielded. Keep exposed ends and ground leads as short as possible (about one inch). Always locate the ground lead connections as close as possible to their respective "hot" leads in the television receiver chassis. The sweep generator output, signal generator output, and contrast control must be kept low enough to prevent overloading the television receiver circuits.

CAUTION: One side of the chassis is connected to the power line. Therefore, test equipment should not be connected to the receiver unless an isolation transformer is used between the power line and the receiver. DO NOT GROUND THE RECEIVER CHASSIS UNLESS AN ISOLATION TRANSFORMER IS USED.

The front side of the chassis as referred to below means the side opposite the tubes.
The rear side of the chassis means the side on which the tubes are mounted.

VIDEO I.F. ALIGNMENT (with VTVM)

Step No.	Connect Signal Generator Through a .01 Capacitor	Signal Generator Freq. M.C.	Connect VTVM	Miscellaneous Connections and Instructions	Adjust
1.	Test Point No. 2, wire protruding from Tuner next to 5AT8(V2). (Chassis 466 only). Wire protruding from Tuner next to 5U8 (V3). (Chassis 467 only.)	44.3 mc.	Junction of C113 and L115 and chassis.	Connect a 3 volt bias battery, negative lead to junction of R117 and C174 (I. F. AGC) and 4.5 volt bias battery, negative lead to junction of R183 and brown lead going to Tuner (R-F AGC), positive leads to chassis.	T101 for maximum indication on meter, limit input to make peak -2 volts D.C. on VTVM. Use first peak from tinnerman clip end of coil.
2.	"	42.7 mc.	"	"	L103 (rear slug) for maximum. Use first peak from tinnerman clip end of coil.
3.	"	41.25 mc.	"	"	L103 (front slug) for minimum. First null when running slug into winding from open end is correct tuning point.
4.	Repeat steps 2 and 3.				
5.	Test Point No. 2.	45.3 mc.	"	"	L102 (rear slug) for maximum. Use first peak from tinnerman clip end of coil. Do not use more input than repaired for -2 volt D.C. indication on VTVM.
6.	"	47.25 mc.	"	"	L102 (front slug) for minimum. First null when running slug into winding from open end is correct tuning point.
7.	Repeat steps 5 and 6.				
8.	Test Point No. 2.	45.3 mc.	"	"	L101 (rear slug) for maximum. Use first peak from tinnerman clip end of coil.
9.	"	47.25 mc.	"	"	L101 (front slug) for minimum. First null when running slug into winding from open end is correct tuning point. Short L102 trap while adjusting L101 trap. Do Not Forget To Remove Short.
10.	Repeat Steps 8 and 9.				
11.	Test Point No. 1, wire protruding from Tuner next to 4BQ7A (V1). (466 Chassis only).	45.5 mc. (466 Chassis only)	"	Connect dummy load (consisting of 100 ohm resistor and 100 mmf capacitor in series) from grid of V101, pin #1, to chassis.	L9 on the Tuner for maximum. (466 Chassis only)
12.	Test Point No. 1. Wire protruding from Tuner above 5U8 (V3). (467 Chassis only).	46 mc. (467 Chassis only)	"	"	L12 on the Tuner for maximum. (467 Chassis only)

Crosley

Chassis 466 & 467

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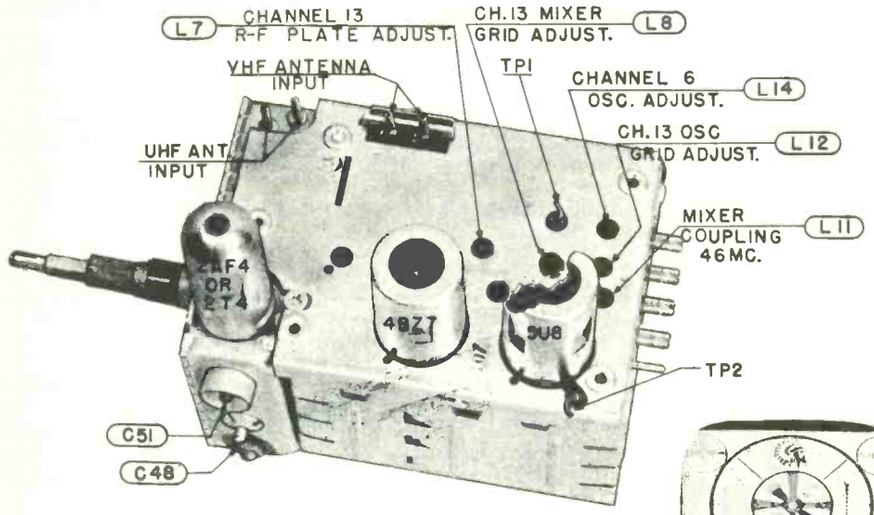
SPECIFICATIONS

POWER SUPPLY: 117 volts, 60 cycle, a.c.
POWER CONSUMPTION: 145 watts(VHF models)
145 watts(UHF-VHF models)
AUDIO POWER OUTPUT: 1.0 watt maximum.
ANTENNA INPUT IMPEDANCE: 300 ohms balanced.
FREQUENCY RANGE: 54 to 88 mc. & 174 to 216 mc. (Channels 2 thru 13)
UHF Models only - 470 mc. to 890 mc. (Channels 14 thru 83)
INTERMEDIATE FREQUENCY:
Video Carrier -- 45.75 mc.
Sound Carrier -- 41.25 mc.
Intercarrier Sound -- 4.5 mc.

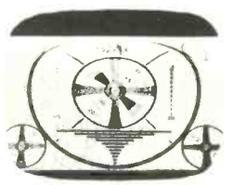
DEFLECTION: Electromagnetic.
FOCUS: Electrostatic.
ION TRAP: Single Permanent Magnet.
HORIZONTAL SCANNING FREQ: 15,750 c.p.s.
VERTICAL SCANNING FREQ: 60 c.p.s.
FRAME FREQUENCY: 30 c.p.s.
SCANNING: Interlaced, 525 lines.
SPEAKER: 5" PM, Table Models
8" x 12" PM, Console Models
VOICE COIL IMPEDANCE: 3.2 ohms @ 400 cycles.



UHF-VHF TUNER
(Tube and Alignment Locations)

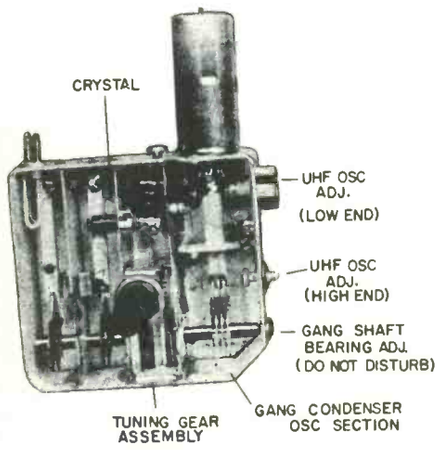
Misadjusted Height

HEIGHT CONTROL- This control increases the overall height of the picture. When making this adjustment it is sometimes necessary to also adjust the VERTICAL LINEARITY to obtain a picture that is correctly proportioned.



Misadjusted Vertical Linearity

VERTICAL LINEARITY CONTROL- This control increases or decreases the height of the upper portion of the picture.



FRONT VIEW
(UHF TUNER)

BRIGHTNESS CONTROL- Turn clockwise to increase brightness. To decrease brightness, turn counter-clockwise.

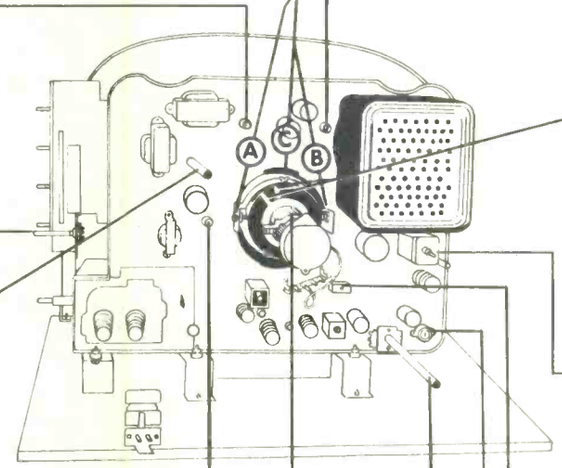
Note: The Brightness Control has an extended shaft that permits adjustment from the rear of the cabinet without removing the cabinet back.

AREA SWITCH - See Panel Controls.

LOCAL AREA CONTROL - This control, which is effective only when the AREA SWITCH is set to LOCAL, should normally be set for maximum gain (maximum tuner sensitivity). However, where extremely strong signals tend to cause overloading at this setting, turn the control away from maximum sensitivity to the position that gives the maximum picture sharpness without overload on the strongest signal. Should it be turned too far in this direction, it could adversely affect the reception of other local stations.

ION TRAP MAGNET -

REAR VIEW
ADJUSTMENTS



FOCUS ADJUSTMENT - On the terminal board located below and to the right of the deflection yoke, move the blue lead from one lug to another until the sharpest picture or sharpest horizontal lines are obtained. Note that the position of the lead may need to be changed if a replacement picture tube is installed.

DEFLECTION YOKE ADJUSTMENTS- The deflection yoke must be positioned as far forward as possible on the neck of the picture tube and centered around the picture tube neck at the same time. To make this adjustment, loosen screws "A" and "B" enough to permit the yoke bracket to be pushed forward. While holding the bracket in this position, tighten screws "A" and "B" If the picture is tilted as illustrated at right, loosen wing nut "C" on the top side of the yoke. Then, rotate the yoke to left or right as required to make the picture parallel with respect to top and bottom of window frame. Be sure to hold the yoke in position while tightening the wing nut.

Picture Tilted

CENTERING MAGNET ADJUSTMENT- If the picture is off center and/or has neck shadow as shown in the illustration at the right, rotate either or both centering magnet levers to the right or left until the picture is centered on the screen and the picture is free of all neck shadow. Then readjust the Ion Trap.

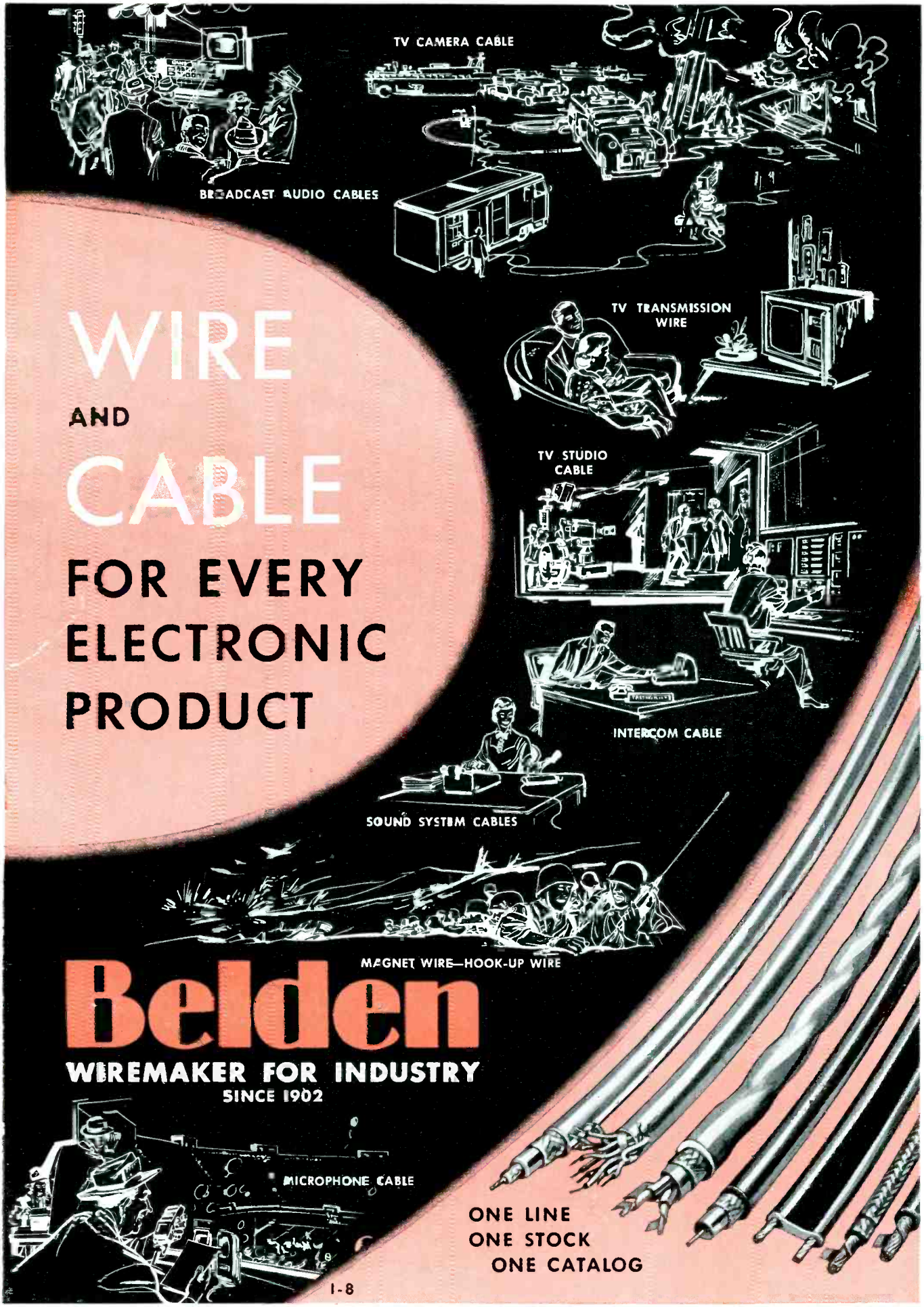
Off Center and Neck Shadow

HORIZONTAL FREQUENCY ADJUSTMENT- If the Horizontal Hold Control is insufficient to lock in a single stationary picture, the Horizontal Frequency Adjustment will require adjustment. See "Horizontal Blocking Oscillator Alignment"

HORIZONTAL LOCK- If the range of the Horizontal Hold Control is insufficient to lock in a single stationary picture the Horizontal Lock trimmer will require adjustment. See "Horizontal Blocking Oscillator Alignment"

BUZZ CONTROL- See "Sound Alignment"

NOISE GATE CONTROL- With this control, it is possible to obtain improved picture stability in the presence of electrical interference (noise). To adjust, first turn the control completely counter-clockwise, where its effect is minimized. Then advance the control clockwise only far enough to stabilize the picture. If the control is adjusted on a signal of one strength, it may require readjustment when a signal of different strength is received, or when the setting of the Area Switch is changed. The final adjustment of this control should be made on the strongest signal received. The limiting factor in this adjustment is the loss of sync stability or the introducing of buzz into the sound.



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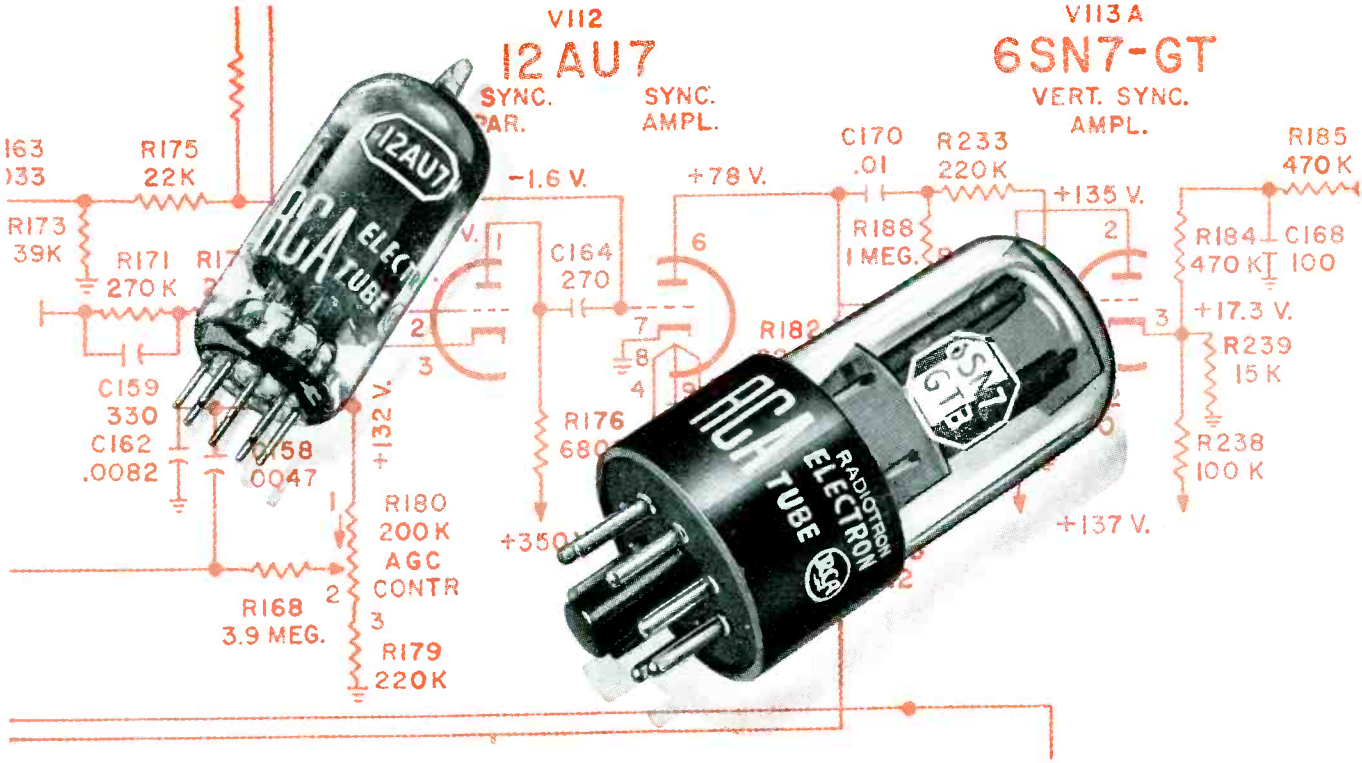
I-8

How to "tame" a TV Sync Circuit *FAST*



Use RCA Tubes with Built-In Quality!

For instance, RCA-12AU7's and 6SN7-GTB's are known for their close manufacturing tolerances. Microphonics are minimized. Plate current cutoff is closely controlled. Result: High tube stability—*even during variations in heater voltages!*

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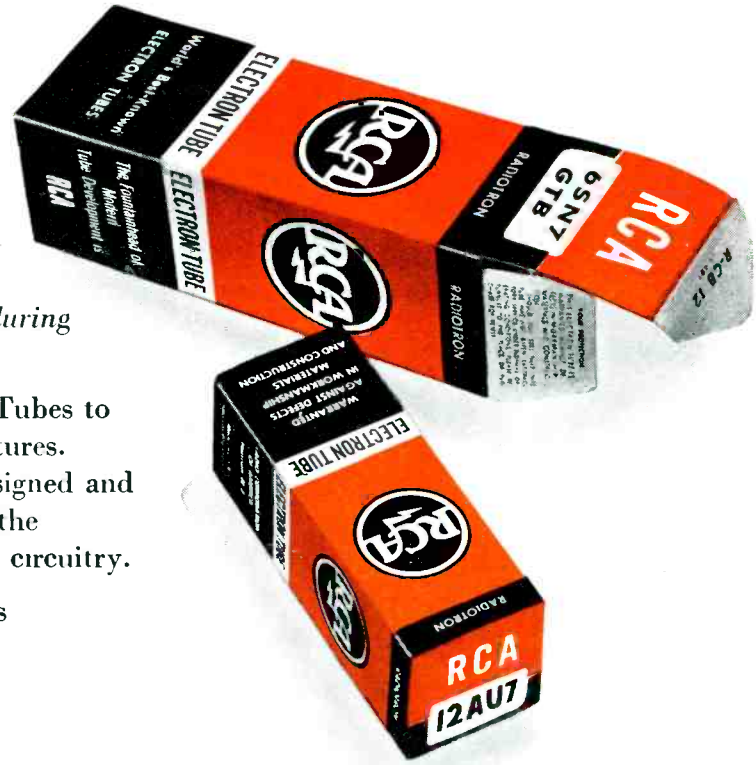

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