

# Television Service Manual

Models  
180 181 182 183



Allen B. Du Mont Laboratories, Inc.  
Passaic, New Jersey

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**DU MONT TYPE 180**

Twenty-two Tube, AC, Superheterodyne, Television Receiver

**GENERAL FEATURES**

No expense has been spared in the production of these receivers and every up-to-date television and radio development has been incorporated. These receivers are classed as "Electrostatic and Direct Vision." Electro-static indicates that the entire deflection system is electrostatic and since the picture is viewed direct, without the use of a mirror, lens or other device, it is referred to as Direct Vision. The latter ensures clarity, brilliance and the widest angle of vision. Steady, clear cut, black and white pictures that are large enough for all the family to enjoy at one time are secured by the use of a fourteen inch cathode-ray tube which furnishes a picture eight by ten inches

A separate high fidelity section brings superb reproduction of the sound channel which is associated with the picture. A single control tunes both the sight and the sound channels so the receiver is no more difficult to operate than an ordinary broadcast receiver, To the above features add its compact size, minimum number of controls and simple straight forward layout and you will have an idea of the first commercial television receiver which we believe you will find easy to install and service in spite of the apparent complexity of the subject Television.

**TECHNICAL INFORMATION**

Frequency Ranges – Four Television Channels provided, present alignment as follows:

STEP	STATION	SIDEBAND	AUDIO CARRIER	VIDEO CARRIER
A	NBC	Single	49.75	45.25
B	CBS	Single	55.75	51.25
C	.....	.....	.....	.....
D	NBC	Double	49.75	46.5

**Power Ratings**

Power supply 110 to 120 volts, 50 to 60 cycles, 250 watts.  
Audio output, maximum 4.25 watts.

**MECHANICAL SPECIFICATIONS**

**Cabinet Dimensions**

Height .....	24 inches
Width .....	15 ¾ inches
Depth .....	25 inches

**Chassis Dimensions**

Height .....	20 ¾ inches
Width .....	13 ¼ inches
Depth .....	24 ¼ inches

**CONTROLS**

Operating Controls.....	6
Adjustment Controls.....	7

**Types 181, 182, 183**

These receivers have the same operating controls as the type 180 and therefore will not be covered separately

**TUBE COMPLEMENT**

Type	Purpose
1853 .....	R.F. Amplifier
6J5M .....	R.F. Oscillator
1852 .....	1 <sup>st</sup> Detector
1853 .....	1st Video I.F. Amplifier
1852 .....	2nd Video I.F. Amplifier
6H6M .....	2 <sup>nd</sup> Video Detector
1851 .....	1st Video Amplifier
6V6G .....	Video Power Amplifier
6J7G .....	1 <sup>st</sup> Sound I.F. Amplifier
6J7G .....	2 <sup>nd</sup> Sound I.F. Amplifier
6Q7G .....	2 <sup>nd</sup> Sound Detector and Amplifier
6V6G .....	Sound Power Amplifier
6J7G .....	Horizontal Synch Separator
6AD5G .....	Horizontal Sweep Oscillator
6R6G .....	Horizontal Sweep Amplifier
6J7G .....	Vertical Synch Separator
6AD5G .....	Vertical Sweep Oscillator
6R6G .....	Vertical Sweep Amplifier
2Y2 .....	4100 Volt Rectifier
5X3 .....	1600 Volt Rectifier
5Z3 .....	350 Volt Rectifier
114-9-T .....	Cathode-ray Tube (14")

## CIRCUIT ARRANGEMENT

A simple straight line layout is used in these receivers that should prove extremely helpful to the serviceman. Viewed from the front, the video receiver is on the left side of the chassis and the sound receiver is on the right. Fig. No. 1 shows the front controls and the sound receiver while Fig. No. 2 shows the rear adjustments and the video receiver. The top portion of the chassis contains both sweep circuits along with the modulating circuit of the cathode-ray tube. To prevent confusion each side is considered separately, half appearing in Fig. No. 1 and the remainder in Fig. No. 2. The seven auxiliary controls shown in Fig. No. 2 are provided for the use of the installer and serviceman. These controls are necessary to make the final alignment of picture size and positioning when

the receiver is installed under the operating conditions imposed by the earth's magnetic field, and the power supply line voltages. Once properly set these controls do not need adjustment and since they were not provided for the owner's use we suggest that the dealer or serviceman seal the back of the cabinet as it is not possible to tamper with the controls when the back is in place. The use of the parts and tubes shown in Fig. No. 1 and Fig. No. 2 can be checked by comparing the "V" numbers, etc., with the schematic drawings which are furnished in the back of this manual. Four separate schematic drawings have been provided which, due to their size, will be found more readable than a single drawing.

## CAUTION AND WARNING

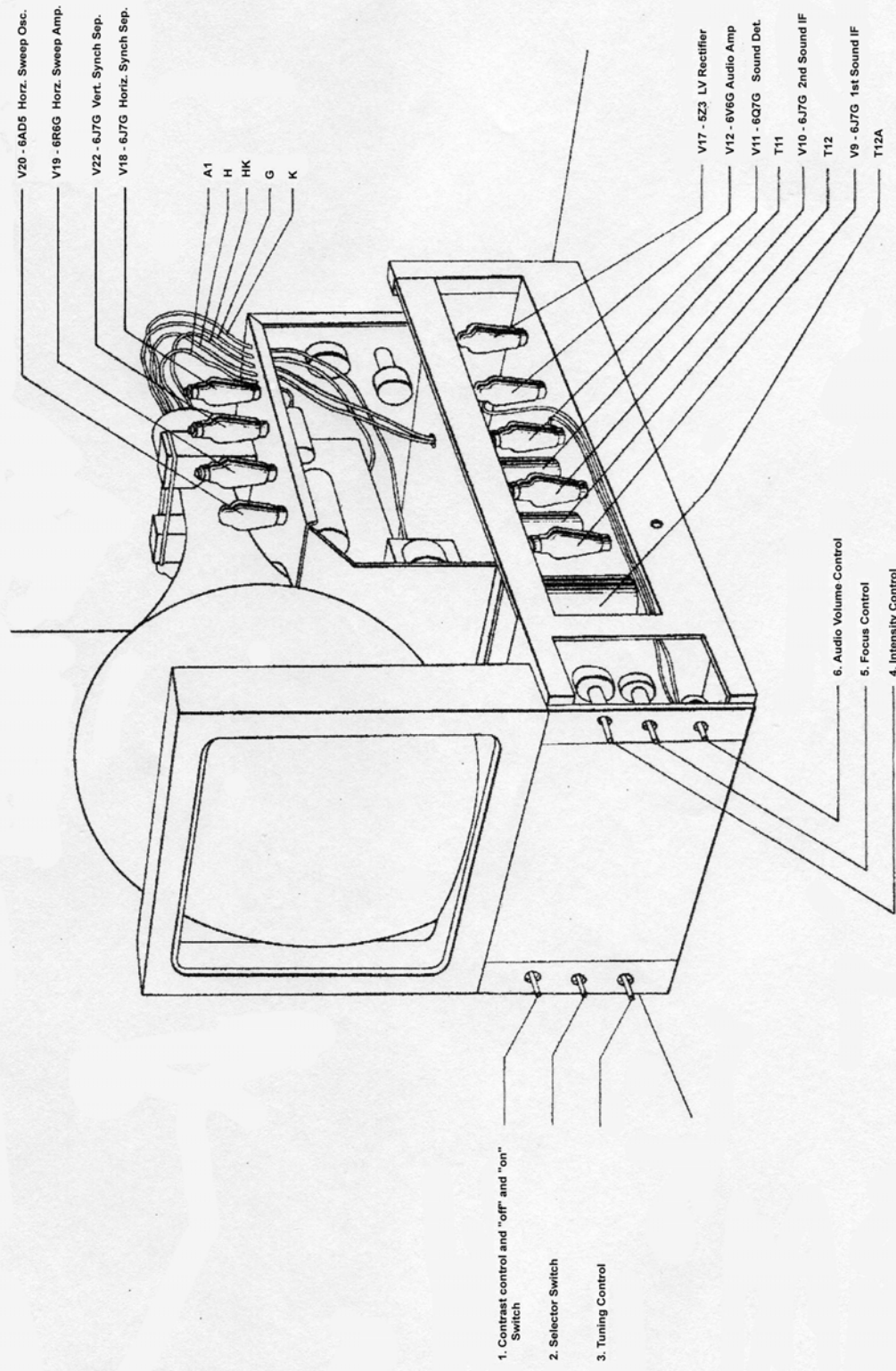
**The set is equipped with a safety switch which automatically opens upon the removal of the back of the cabinet. This protects the operator from dangerous high voltages which would otherwise be exposed.**

**The serviceman that is engaged installing or servicing television receivers is urged to take all precautions and run no unnecessary risks. The high voltages that are necessary with this type of equipment are very dangerous and should not be approached in a careless manner.**

**It is better to shut the set completely off between adjustments than to suffer a painful or even a dangerous burn.**

Large cathode-ray tubes operate at high-voltages and hence are evacuated to a very high degree of vacuum. Therefore the atmospheric pressure on the glass can run into tons depending on the size of the tube. A collapse therefore is as bad as an explosion and all cathode-ray tubes should be handled with care. The Du Mont Laboratories have gone to great expense to provide a cathode-ray tube that is safe for the home and the structural design results in its ability to stand tests nearly twice as severe as usually employed. The serviceman, however, should observe the following rules as he will probably be the only one to handle the average tube.

1. Be careful in handling the tube.
2. Watch the use of tools near the tube.
3. Don't scratch the surface of the glass.
4. Don't stand the tube on a metal surface or in any other way cause certain parts to be quickly heated or cooled.



- 1. Contrast control and "off" and "on" Switch
- 2. Selector Switch
- 3. Tuning Control
- 4. Intensity Control
- 5. Focus Control
- 6. Audio Volume Control

Figure 1

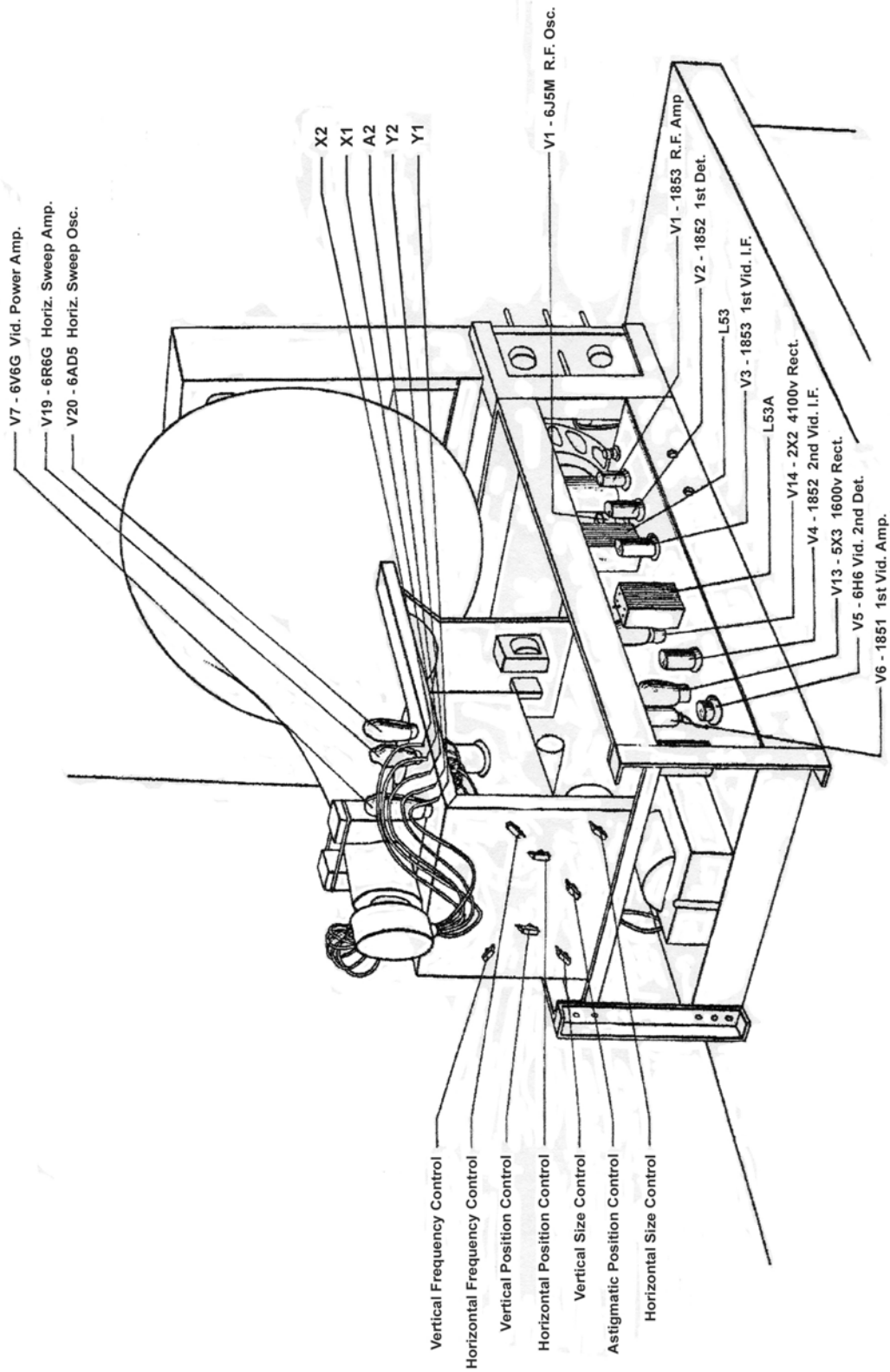


Figure 2

## INSTALLATION OF RECEIVER

### Antenna Installation

In the installation of television receivers the proper antenna is a necessity. Successful installations will result from attention to details, while slipshod and careless work will bring only poor customer satisfaction and repeat calls. There is nothing difficult about the installation of television aeriels, a little patience and experience is all that is required. Regular broadcast aeriels in the majority of cases will be found useless. Impress this upon the owner and make a satisfactory installation regardless of what other equipment he already has. Satisfactory picture reception is what both of you require for the completion of the installation.

### The Dipole Antenna

The Dipole form of aerial is generally satisfactory; it consists of two metal rods, each approximately five feet long and placed on a line with each other. Extreme accuracy in the length of these rods is usually not necessary and if the receiver is located very close to the transmitting station it may be found advisable to cut down the length of each rod. The simple dipole aerial is shown in Fig. No. 3.

### The Lead-In

The most popular lead-in from the dipole to the Television receiver will be a twisted pair as it is inexpensive and generally satisfactory in locations where the signal is strong. The length of this lead is usually not of extreme importance, It is best to get the Dipole located in the clear and as far from electrical interference as possible than to limit its location by using a theoretical exact length feeder, The twisted pair should be soldered to the lugs on the Dipole as a good connection is essential and necessary since several changes in the position of the antenna may be required for best results. The other form of lead-in is the coaxial line such as the Amphenol No. 72. This form of feeder should be used in installations where the length of the lead-in is too long for satisfactory work with the twisted pair and again where the installation is at an extreme distance and every bit of energy picked up must be delivered to the receiver.

### Polarization

If the dipole is mounted horizontally it is said to be horizontally polarized, and if vertical it is vertically polarized. Since the physical location materially effects the aerial no specific form can be advised and we can merely suggest that you start by using horizontal polarization and change if necessary to produce the best results.

### Location of the Antenna

Whenever possible the Dipole should be erected so that it is in line of sight with the transmitter. This does not mean that no signals can be secured where a direct view of the transmitter cannot be obtained. Surprising results are often secured on these high frequencies and no concise rules can be assigned to this work. If the location is on a street, having heavy traffic there may be considerable noise level due to automobile ignition systems. In this case, locate the Dipole to the rear of the building and away from the source of the noise as far as possible. In the case of electrical machinery over which you have no control, the same method can be employed along with the utilization of the directional effects of the aerial which will be covered later.

### Room Illumination

Whenever possible the receiver should be so placed in the home that a direct glare from either natural or artificial light does not fall upon the face of the cathode-ray tube. The received picture may be viewed under a variety of conditions where it is not always convenient to darken the room completely. Adjustments made to meet these conditions will not cause damage to the receiver. Viewing the pictures in as dark a room as possible is always at an advantage as it permits the setting of the Intensity and Contrast controls in a manner that will give picture tone values more correctly relating to those actually used in the studio from which the picture is transmitted.

### Installation Process.

It is a good plan to proceed as follows with the installation,

1. Erect the Dipole antenna in the clear. Start by using horizontal polarization (mount the rods horizontal) and turn them until their plane is at right angles with the location of the transmitter
2. Adjust the receiver to produce a picture.
3. Return to the antenna and make final adjustments for best signal strength and removal of ghosts, etc.

### Ghost Effects

Where the picture appears to be duplicated and slightly displaced, the additional picture is referred to as a ghost. This effect is usually due to the reflection of the signals and can be cured by the slanting or rotating of the Dipole or the use of a reflector or reflectors. If after all possible positions have been tried, the ghost still exists it will be necessary to change the location of the antenna and try again.

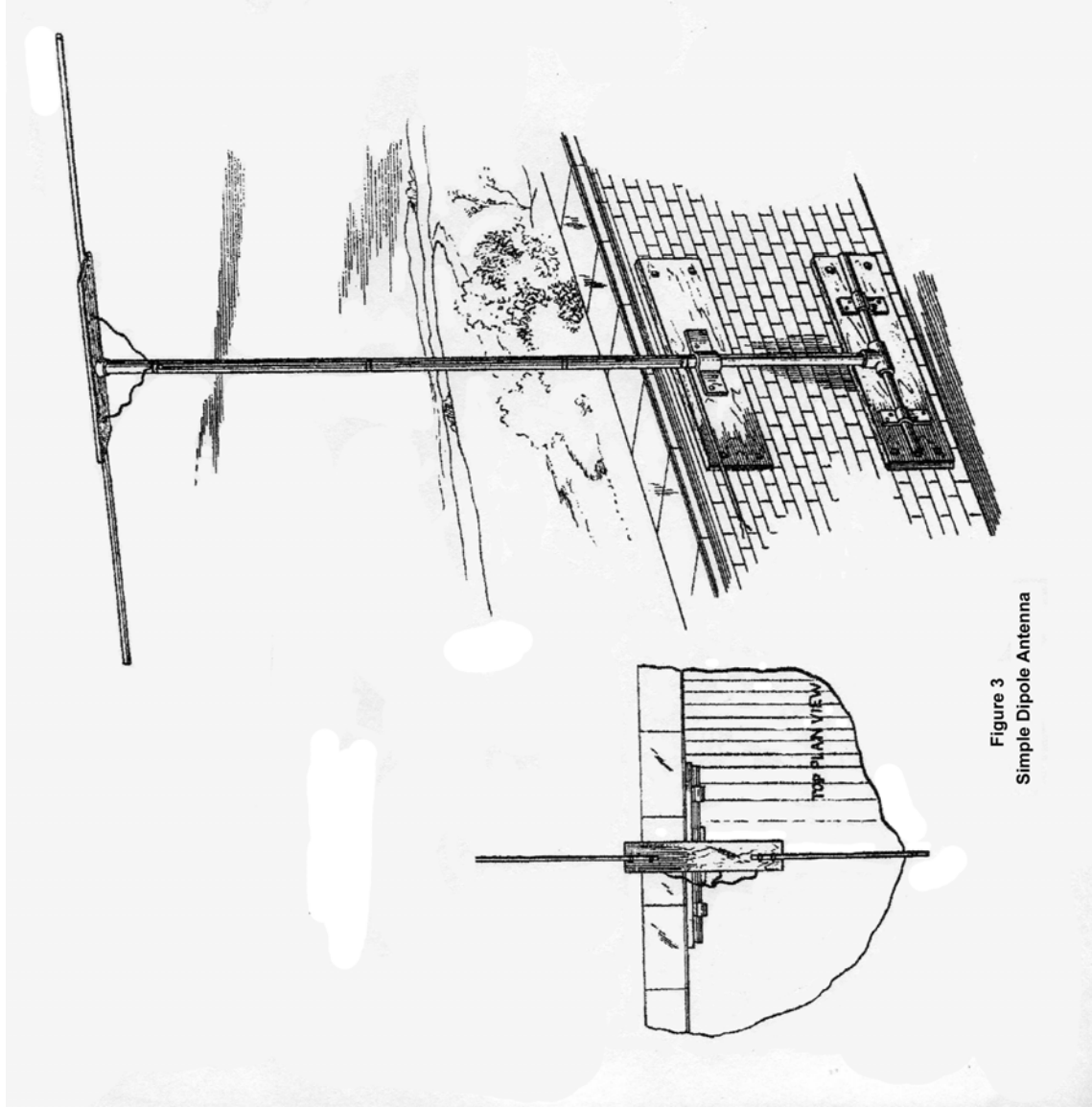


Figure 3  
Simple Dipole Antenna

## Directional Effects

In the simple Dipole, directional effects are not very pronounced, but it does have a rather sharp no-signal radius and it is possible in some instances to materially reduce interference by placing the offending source in this area. If the installation of the receiver is being made at quite a distance from the transmitter or if the signal level is very low due to local conditions it is well to consider the use of a reflector. This is done by placing a rod, about ten feet long, parallel with the Dipole and about 5 feet in back of it. The directional effect of the Dipole remains the same, namely at right angles to the plane. Signals coming from the front will be greatly increased. In using reflectors it is well to bear in mind, however, that any signal approaching from the rear (where the reflector is located) will be greatly attenuated. Fig. No. 4 shows reflector added to the simple Dipole.

### Operating Controls of the Receiver (Front)

First, become familiar with the controls on the front of the receiver. Since the receiver has been tested before shipment, probably only a few minor adjustments will be necessary. Therefore before touching the adjustments in the rear attempt to operate the set according to the instruction sheet supplied the purchaser and make only the adjustments required. These instructions are repeated here to cover the possible loss of the sheet. Figure No.1 shows the front of the receiver with the controls numbered and the use and the purpose of these controls is as follows.

#### 1. Marked CONTRAST, ON and OFF

This is a power switch for starting and stopping a set. It also is the volume control of the picture signal. It should be adjusted in conjunction with the intensity control (No. 4) to produce a picture of pleasing contrast to the user. If the location is such that the signal received is very small it may be necessary to use the full gain of the control, while in a good location it may, have to be retarded considerably. If the picture is not satisfactory the rear controls must be adjusted as covered in a following section.

#### 2. Marked SELECTOR

This control is a four position switch provided for covering four television channels. The present alignment was given previously under the technical information section.

#### 3. Marked TUNING

Only one control is necessary to properly tune both the sight and sound channels. Simply adjust this control until the best reception of the sound is secured and at this point the picture signal will be correctly tuned.

#### 4. Marked INTENSITY

The intensity or brightness of the picture is controlled by this knob. It should be adjusted in conjunction with Control No. 1 to get the best picture. Note: it is a good plan to retard (turn to the left) this control when starting the set. If about 15 seconds is allowed to elapse before advancing this control it will prevent a small bright spot from appearing on the screen which might eventually darken the screen.

#### 5. Marked FOCUS

This control is used to sharpen the individual lines of the pattern and once set seldom requires further adjustment.

#### 6. Marked VOLUME

This volume control adjust the audio volume and has no effect whatever upon the picture

### Rear Controls of the Receiver

As previously stated the adjustment of these controls is necessary for the final alignment of picture size and positioning, as the earth's magnetic field and power supply line voltages vary with locations. The location of these controls is shown in Figure No. 2 and their use will be covered in numerical order. Proceed as follows: remove the wood screws holding in the back of the cabinet and pull out the back. The safety switch will open turning the set off and since it is necessary to have the set in operation while making these adjustments the switch can be made temporarily inoperative. (A large battery clip is convenient for this purpose.) Do not reach into the set with the voltages on. (See Cautions and Warning.) There is one adjustment that cannot be made by these controls, that of rotating the Cathode-ray tube to cause the picture to properly line up with the viewing opening. To remedy this, turn the set off, remove the elastic band that grips the rear support and rotate the tube by hand in the correct direction.

The function of the seven rear controls are as follows

#### 1. Vertical Frequency Control

This controls the frequency of the vertical sweep. If the picture is not steady and slips past at intervals, vertically, this control should be adjusted until a steady picture is secured.

#### 2. Vertical Size Control

If the picture is too narrow and out of proportion vertically this control will remedy the trouble.

#### 3. Vertical Positioning Control

As its name indicates, this Control will move the pattern vertically, allowing the picture to be placed directly in the center of the opening.



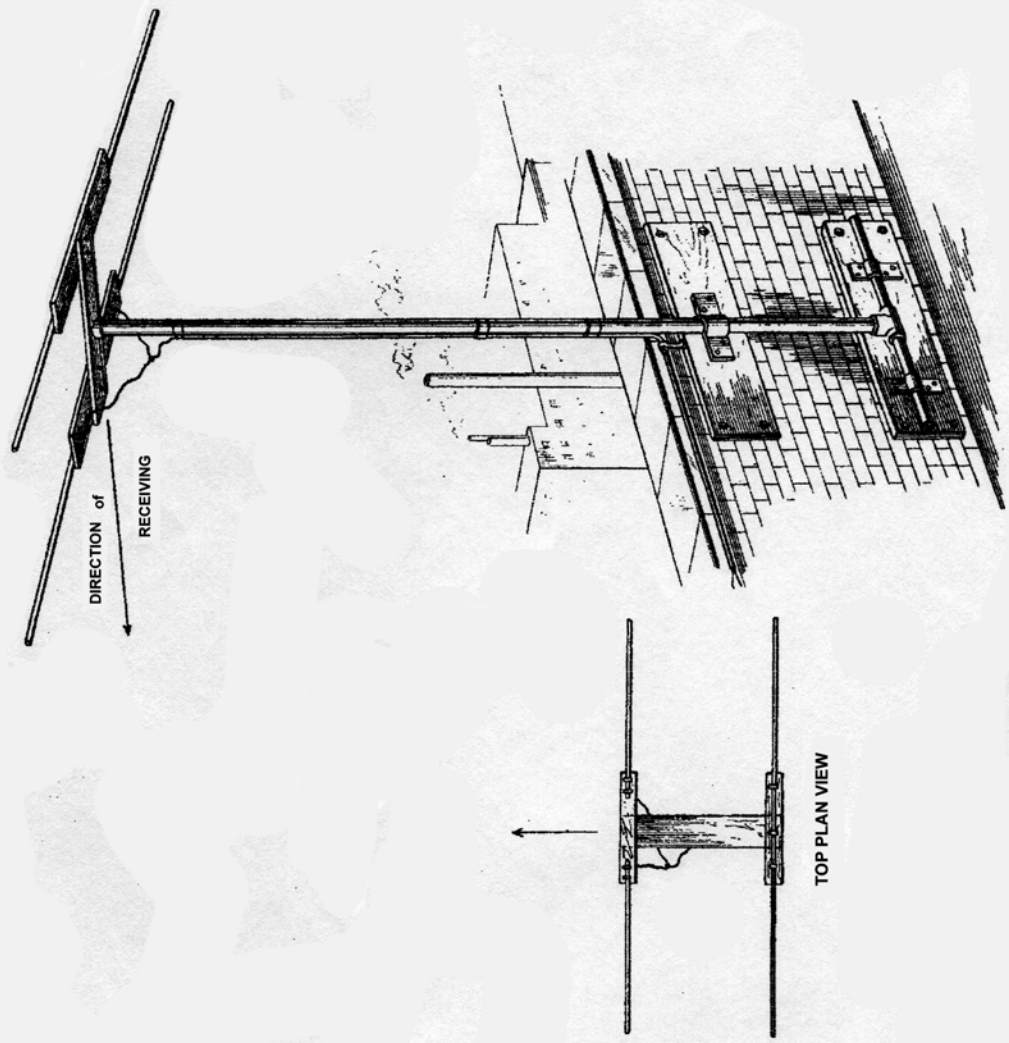


Figure 4  
Dipole Antenna with Reflector

#### 4. Astigmatic Positioning Control

This is adjusted in conjunction with Control No. 5 to give the best possible focus on the corners of the picture.

#### 5. Horizontal Positioning Control

This control positions the picture horizontally.

#### 6. Horizontal Size Control

The width of the picture is adjusted by this control.

#### 7. Horizontal Frequency Control

If no picture can be secured but modulation (dark and light spaces) can be seen on the screen, the setting of the horizontal frequency control is probably incorrect. Adjust this control until the picture forms.

With the adjustment of these controls the installation should be satisfactory. However, if the signal is weak or if ghosts or noise is present, return to the dipole antenna and make changes as previously suggested until the best position for it is secured.

## SERVICE

While the technique employed in servicing television receivers is similar to ordinary radio practice, there is a greater need for basic knowledge and the time will be well spent that is used to study the fundamental principles of television before attempting actual service work. For obvious reasons it will be impossible to include fundamental theory in this manual, however, since very little data concerning the form of sweeps used in these receivers is available, the following description may be helpful.

Fig. 5 is a schematic diagram showing synchronizing, signal separation and sweep circuits used in this receiver. The two 6J7G tubes (V18 & V22) function as the synchronizing signal separators. The outputs of the two plates are fed their respective synchronizing windings of the horizontal and vertical oscillation transformers. Linear sawtooth deflection is effected using a 6AD5G triode as an oscillator and a 6R6G triode as an amplifier. Oscillations are generated as follows:

Let us consider first the low frequency vertical circuit. Condenser C76 is charged from the power supply through the resistor consisting of R64 and R65. R65 functions mainly as an amplitude or size control, although it has some effect upon the frequency of operation. Condenser C76 charges to practically full power supply potential. As a result of previous oscillations, a charge on condenser C75 is held on the cathode, which gradually decreases to zero through R59 as C76 is charging. This charge on C75 is high enough to hold the tube at cutoff. The grid of the tube is at D.C. ground potential. As the cathode approaches ground potential due to the discharge of C75 the 6AD5G triode becomes conducting. As plate current flows C76 is discharged producing the return trace of the sawtooth. The surge of plate current through the winding of the oscillation transformer induces a voltage in the grid winding of proper polarity to drive the grid more positive, thereby reducing the plate circuit impedance and therefore the return trace time. At the same time that C76 is discharging,

C75 is charging to its initial value to cut off the flow of plate current. As this action takes place, the plate current surge decreases thereby applying less positive voltage to the grid and increasing its cutoff action. Ultimately, the tube is completely cutoff, the cathode is at its full positive potential, and the charging cycle again begins. Resistance R59 functions as both an amplitude and frequency control since it determines the breakdown potential and the frequency of recurrence of the oscillations in the plate circuit of the triode. Synchronizing pulses are injected into the grid of the oscillator tube through the winding of the oscillator transformer. These synchronizing pulses are polarized so that they drive the grid in a positive direction with respect to the cathode and therefore hasten the "breaking down" of the oscillator tube and effect synchronization. Since condenser C76 is charged to nearly full power supply voltage, the signal which is taken from the plate circuit of the triode is extremely non-linear. It is applied, however, to one plate of the deflecting pair in the cathode-ray tube. At the same time it is divided by a capacity-resistance network and is applied to the grid of the 6R6G triode. This triode section is so operated that its output is distorted in a manner opposite to that distortion introduced by the non-linear operation of the oscillator triode. The output of the 6R6G is applied to the other deflection plate of the pair and the deflection from this signal is such that the resultant deflection is linear.

Since the high frequency or horizontal sweep operates in the same manner it will be unnecessary to repeat the above description. The horizontal circuit is, however, a little more critical than the vertical and it is absolutely essential to keep the stray circuit capacities of the horizontal oscillator and amplifier at a minimum in order to keep the return trace time at a minimum. Therefore, if repairs are ever necessary on this circuit care must be taken not to increase the capacity of the circuit.

In Fig. 6 the use of a copper oxide rectifier and neon lamp can be explained as follows. The D.C. component necessary for background level, is introduced by the action of the copper oxide (Westector) V24. The neon lamp V23 is provided to protect the rectifier from high voltage surges when the equipment is first turned on.

Assuming that the controls are properly

set and handled, the first step will be to determine the location of the trouble and isolate the defective portion. In this you will be aided by the design of the receiver, for, as previously pointed out, the various sections are separately located.

The following brief outline, while by no means complete, will serve to point out possible causes and location.

#### **LOCATION OF TROUBLE POSSIBLE CAUSES**

#### **FAULT**

**No picture.**

1. Power supply trouble in any or all three sources.
2. Too much bias on modulator electrode.
3. Defective cathode-ray tube.

**No Scanning.**

1. Trouble in 1500 volt power source.
2. Poor connections to deflection plates.
3. Defective scanning circuits.
4. Defective cathode-ray tube.

**No modulation.**

1. Defective or shorted antenna.
2. Defect in video receiver.
3. Too much bias on modulator electrode.
4. Defective cathode-ray tube.

**Poor focus.**

1. Improper voltages supplied cathode-ray tube.  
(check entire divider circuit)
2. Defective video receiver.
3. Poor adjustments.
4. Defective cathode-ray tube.

**Uneven brilliance.**

1. Hum from power source.
2. Defective scanning circuits.
3. Scanning picked up by modulator circuits.
4. Screen burnt or discolored.

**Distorted picture.**

1. Poor synchronizing (circuit or adjustment)
2. Overloading (contrast control advanced too far)
3. Defective video receiver.
4. A.C. hum.
5. External interference.

**Unsteady picture or flickers.**

1. Poor synchronizing action.
2. Leakage.
3. Varying voltages to cathode-ray tube or receiver.
4. Unsteady receiver.
5. Antenna loose or shorting.

**Double image.**

1. Scanning circuits incorrectly adjusted.
2. Ghost images due to reflection of signals.

**Cathode-ray tube controls  
effect the picture and scanning.**

1. Cathode-ray tube defective, probably leaking and going soft.

**Superimposed pattern on the  
picture.**

1. Oscillation probably in the receiver.

**Streaks across picture.**

1. Usually local interference such as ignition or diathermy.

While no fast rule can be laid down, once the section failing has been decided on it will generally be found that a systematic check correctly interpreted will locate the fault. A voltage check of the suspected circuit along with the checking of the tubes employed will probably be the next step. Then, if the voltages are correct and cathode-ray oscillograph is available it can be used to trace the source of the trouble.

At this point several factors affect our procedure and it will be necessary for us to divide the service field into two classes which we will call the Field and the Laboratory. The factors in question are as follows: First, considerable special equipment will be needed. Second, not all of it is readily available. Third, due to the amount of investment required the division between Field and Laboratory must be decided by the service organization contemplating television work.

### Field Service

Most servicemen and dealers will come under this classification at present. Until improved methods and inexpensive equipment can be developed we advise this group to confine their work to the actions covered by this manual and not attempt adjustments of the critical circuits which require special equipment. It is quite probable that the majority of service problems will fall within this range in spite of this limitation, as the correct adjustment of the regular control knobs along with the replacement of tubes and parts will provide the answer to nearly all troubles. It is recommended that the adjustment of the trimmer condensers in all circuits be left to the laboratory group which should have the necessary equipment for a complete job.

### Equipment (Field)

Regular service tools.  
 Regular service oscillator.  
 Ohmmeter.  
 Voltmeter.  
 Oscillograph  
 Ultra High Frequency Oscillator.  
 Diode equipment for oscillograph or a vacuum tube voltmeter

### Discussion

In addition to the regular service tools the regular service oscillator will be found helpful in checking the audio I.F. if it covers three megacycles. Incidentally the audio receiver is so like the average high fidelity broadcast receiver little trouble should be experienced in servicing this section.

An Ohmmeter is convenient for checking the

size of various resistors and it should have a range that includes the high resistance values (see the component parts list).

A good voltmeter is also of value and it too should have a high range. The Weston Model 722 can be used, thus combining both of the above instruments. This meter is now equipped with safety prods (good insulation is a necessity where high voltages are checked). Sensitivity of 20,000 ohms per volt is provided along with a range of 5,000 volts which adds to the uses of the instrument. A unit called the Televerter is available to present owner's of the Model 772 which will provide the high voltage range and safe test prods.

Regarding the oscillograph, several models are available and no particular one will be stressed for this section. The matter of price is usually paramount with the field group and it is well to bear in mind that the more extensive the range the more uses to which the oscillograph can be applied.

Another useful piece of apparatus is the Ultra High Frequency Oscillator. It should have the following features in order to justify its purchase or construction. Calibration and reliability are just as important as its covering the entire band of television frequencies and fundamental frequencies (not harmonics) should be used. Provision for external modulation will be convenient, especially if it is capable of handling television frequencies. Internal 400 cycle modulation is essential. Battery (self contained) operation will aid portability and is an advantage. The Weston Model 787 will be found to possess these characteristics. The value of this equipment can be judged by the following uses. Being portable it can be set near the antenna and used to check the antenna and feeders for actual operation. Using internal 400 cycle modulation, the receiver can be checked on both the video and audio channels. The video modulation can be roughly checked using the internal 400 cycle source, but due to the fact that the modulation is sine in character the black bars produced will taper off gradually each side of the center. The use of a square wave signal applied externally will be necessary if even color, sharp cut bars are desired. This checks not only the modulation circuit but the sweep linearity.

Regarding diode equipment for use with an oscillograph or its substitute, the vacuum tube voltmeter, it is advisable to be sure that they will operate at the high television frequencies before purchasing. If usable, either of these units, will prove a valuable aid in locating the point where a signal is lost or diminished.

### Equipment (Laboratory)

In addition to the equipment recommended for the field group the following items are suggested.

Du Mont Type 202 Phasmajector Television Signal Generator.

Du Mont Type 204A Low Frequency Square Wave Generator.

Du Mont Type 204B High Frequency Square Wave Generator.

Du Mont Type 207 Modulated High Frequency Oscillator.

Du Mont Type 205 Oscillograph.  
Laboratory Type Signal Generator.

### Discussion

The Type 202 Television Signal Generator combined with a small oscillator such as the Weston 787 will provide a source of signals at all times, making work independent of the local television transmissions. A test pattern is therefore available at all times and for serious work it is superior to pictures.

The Type 204A Low Frequency Square Wave Generator has the following features. It provides an internal range of from 3 cycles to 8 kilocycles continuous. It can be driven externally over a range of from 3 cycles to 15 kilocycles. External synchronization is provided for and it also has a 60 cycle square and a 1260 cycle sine output. Impulses in connection with any square wave can be secured. The output is approximately 15 peak to peak volts at an impedance of 5000 ohms. Some of its many uses are as follows:

1. Testing the causes of horizontal tear-out.
2. Adjustment of vertical sweep linearity.
3. Testing synchronizing circuits in general.
4. Testing low frequency response of video amplifier.
5. Testing AVC circuits for time constant and general behavior.
6. Testing low frequency response of sweep output circuits

### CONCLUSION

The difference between completely equipped service laboratories and television development laboratories must of necessity be slight. Anything that will aid one will likewise be of value to the other. It is believed that data on the use or actual application of the instruments as outlined under the laboratory group should be supplied with the individual pieces of equipment. Therefore they will not be covered in detail here.

The Type 204B High Frequency Square Wave Generator has the following features. Two ranges of square waves generated internally or externally are provided. Range No. 1. 7 to 50 kilocycles continuous. Range No. 2. 50 to 500 kilocycles continuous.

Ranges can operate separately or simultaneously. A 1 to 10 megacycle continuous sine channel is provided.

Each channel can be synchronized externally or internally or locked with the 204-A unit. Impulse waves are available from any square wave. The output is approximately 10 volts peak to peak at an impedance of 5,000 ohms. Some of its many uses are as follow:

1. Testing overall frequency and phase response of a television receiver.
2. Testing ghost response.
3. Measuring resolution of cathode-ray tubes.
4. Adjustment of linearity of horizontal sweep.
5. Production of interlaced synchronization for testing interlace and rasters. Useful for controlling the Type 202 Television Signal Generator.
6. Testing synchronizing separator circuits.

The Du Mont Type 207 Frequency Modulated High Frequency Oscillator will be announced at a later date. Since the ordinary form of wobbled signal is of no value due to the wide band covered in television I.F. it is necessary to provide a special unit for getting these response curves.

The Du Mont Type 205 Oscillograph uses the intensifier type of cathode-ray tube which gives the added brilliance necessary for observation of fast television traces. The vertical amplifier has a range of from 5 cycles to 1 megacycle with a sensitivity of .1 volt RMS per inch. It is equipped with calibrated step and continuous attenuators and the input impedance is 1 meg ohm.

Regarding the laboratory type standard signal generator the selection is a matter of preference, and opinions vary in extent to such a degree that we do not feel we should specifically suggest types or makes.

We hope that this manual will help the average serviceman to successfully service the majority of receivers in spite of the limitations we have been forced to place upon him. It is possible that within the year equipment will be available that will remove these limitations and enable us to write more complete service instructions. In the meantime the service department will be glad to receive any suggestions that servicemen feel will add to the value of this manual.



**Allen B. Du Mont**

**Pioneer Cathode-Ray Tube Engineer**

*President and Founder of Allen B. Du Mont Laboratories, Inc.*

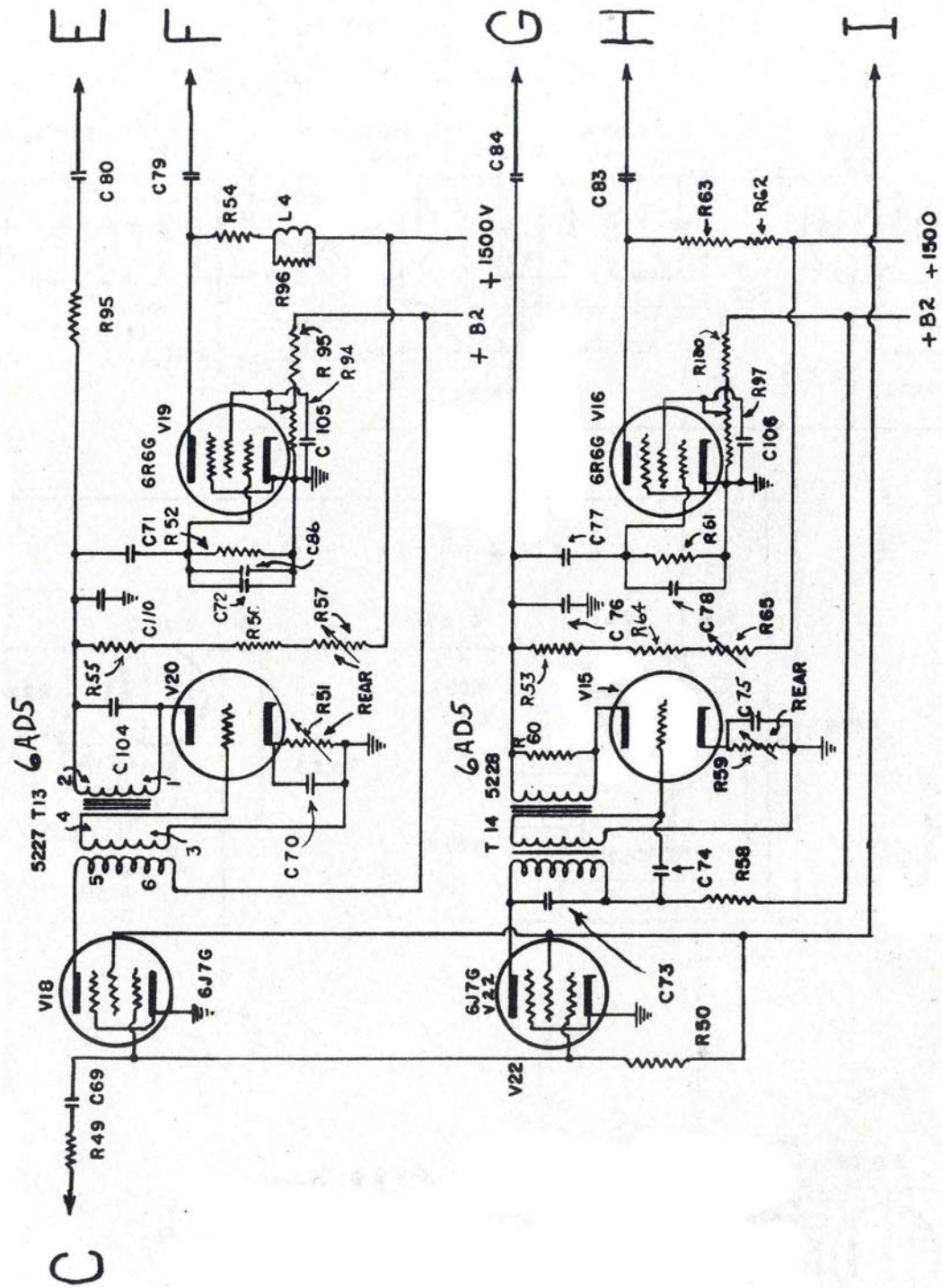


Figure 5 — Schematic Diagram, Separator and Sweep Circuits

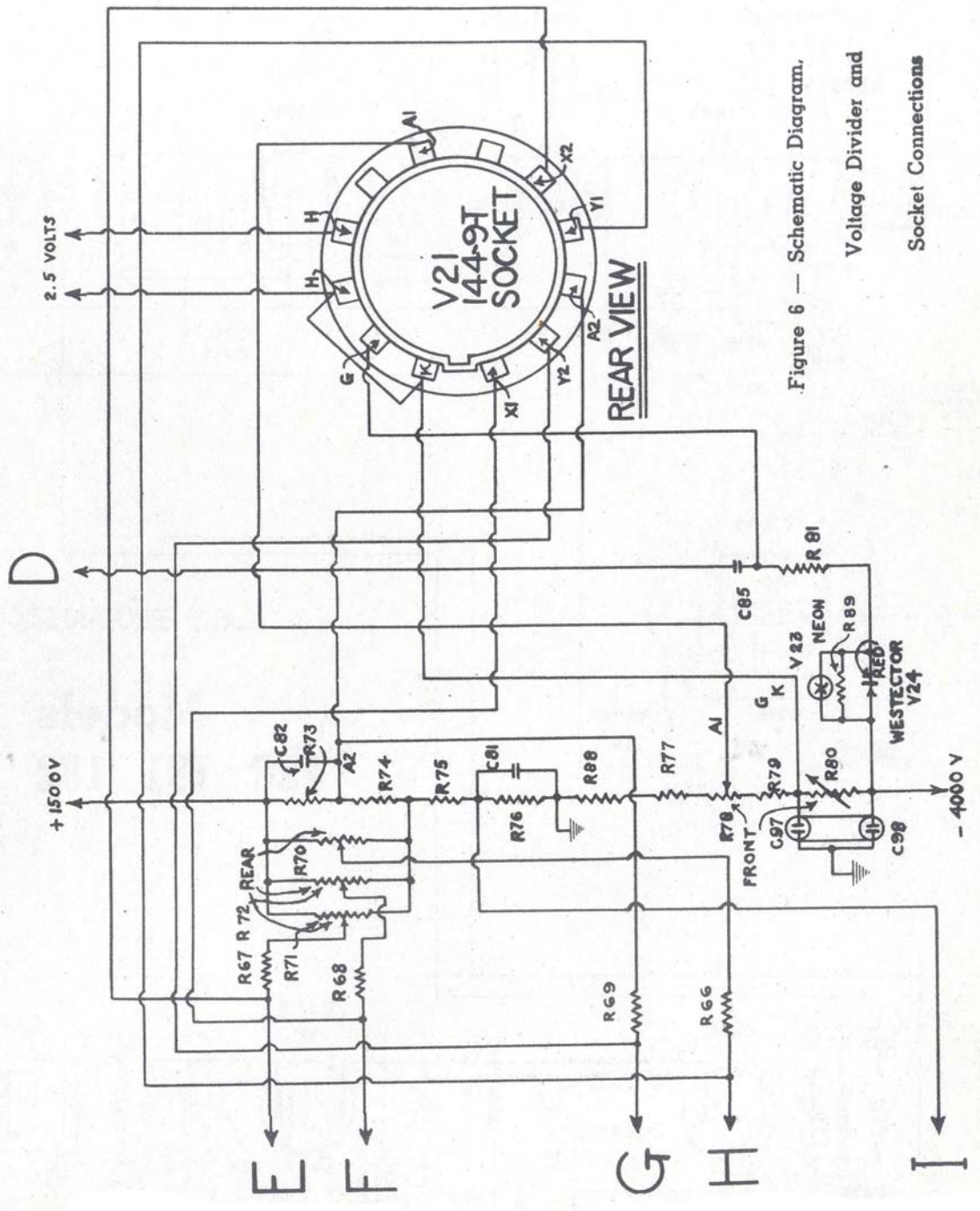


Figure 6 — Schematic Diagram,  
Voltage Divider and  
Socket Connections



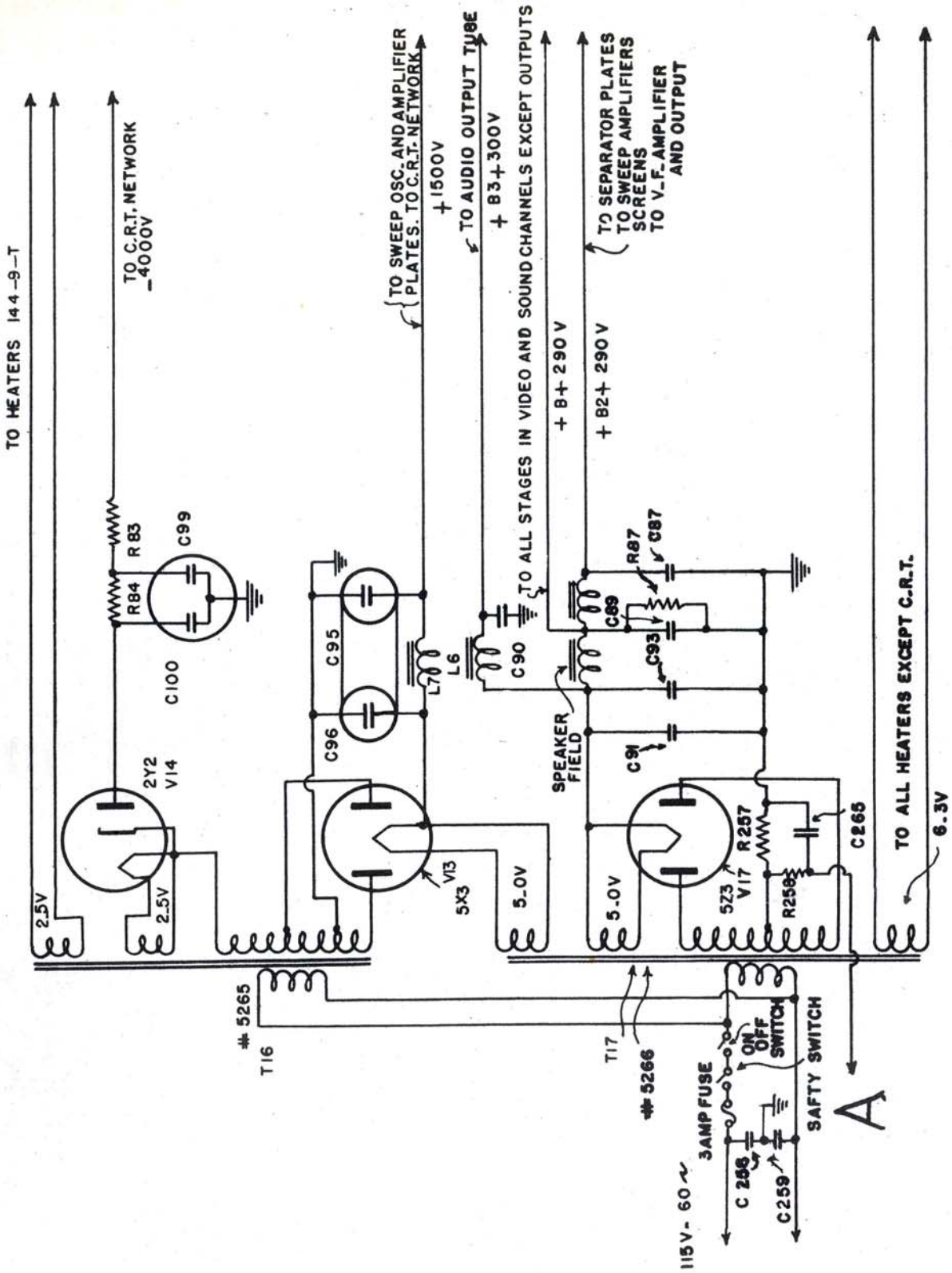
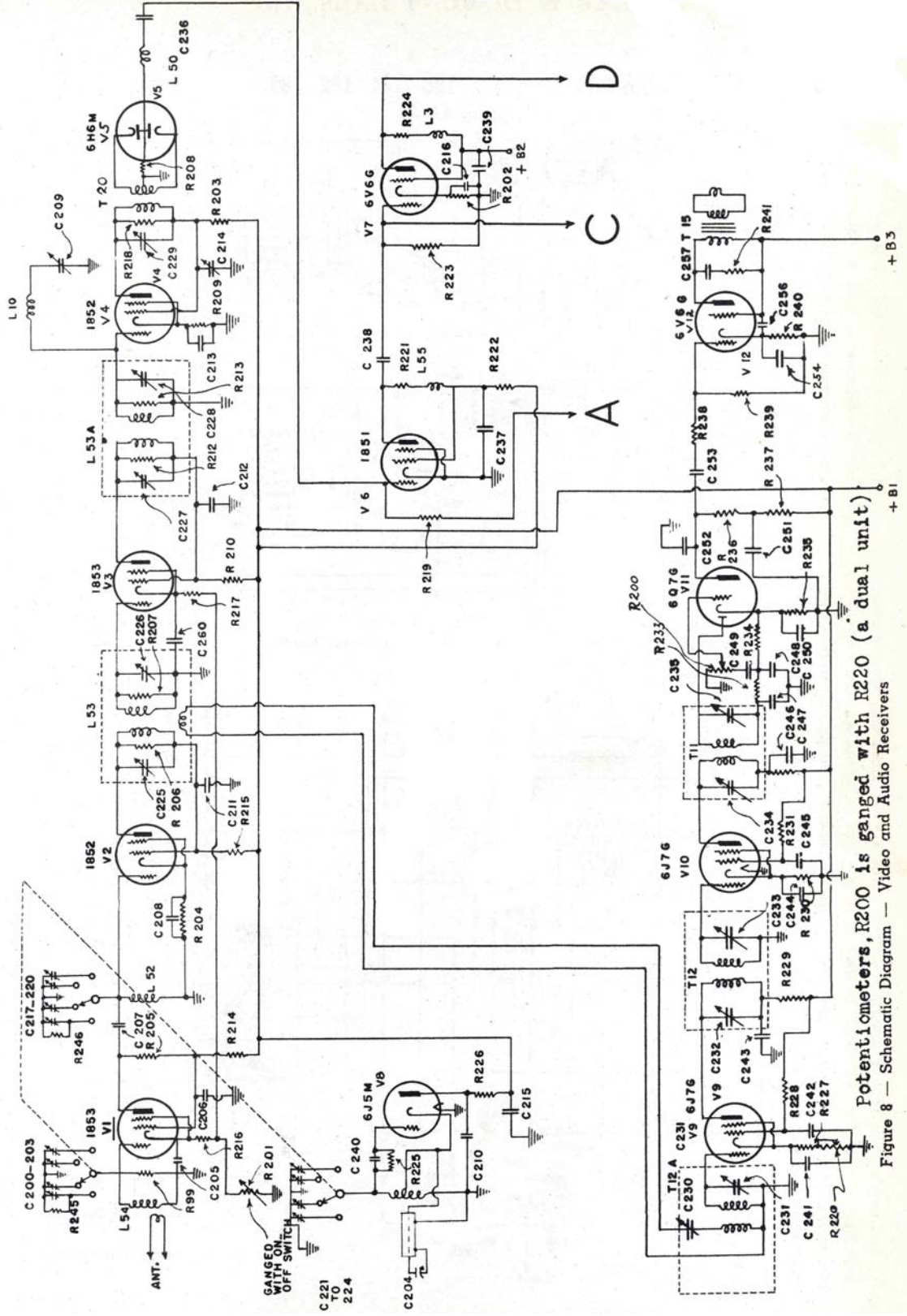


Figure 7 — Schematic Diagram, Power Supplies



Potentiometers, R200 is ganged with R220 (a dual unit)  
 Figure 8 — Schematic Diagram — Video and Audio Receivers

## RESISTOR VALUES

R - Regular

S - Special

W - Wire

R.	Ohms	Watt	Class	R.	Ohms	Watt	Class
49	10,000	½	R	200	500,000	pot	S
50	10 meg	½	R	201	2,000	pot	R
51	6,000	pot	W	202	150	½	R
52	1 meg	½	R	203	5,000	1	R
53	200,000	2	S	204	400	½	R
54	80,000	20	W	205	3,000	½	R
55	100,000	2	S	206	3,000	½	R
56	100,000	2	S	207	3,000	½	R
57	500,000	pot	S	208	3,000	½	R
58	15,000	½	R	209	150	½	R
59	6,000	pot	W	210	5,000	1	R
60	50,000	½	R	212	3,000	½	R
61	25 meg	1	R	213	3,000	½	R
62	1.5 meg	1	R	214	5,000	1	R
63	1.5 meg	1	R	215	5,000	1	R
64	200,000	2	S	216	150	½	R
65	1 meg	pot	S	217	150	½	R
66	5 meg	½	R	218	5,000	½	R
67	5 meg	½	R	219	1 meg	½	R
68	5 meg	½	R	220	100,000	pot	S
69	5 meg	½	R	221	1,500	1	R
70	2 meg	pot	R	222	5,000	1	R
71	2 meg	pot	R	223	1 meg	½	R
72	2 meg	pot	R	224	1,000	2	R
73	300,000	½	R	225	25,000	½	R
74	300,000	½	R	226	25,000	½	R
75	750,000	2	R	227	400	½	R
76	15,000	½	R	228	100,000	½	R
77	1 meg	2	S	229	4,000	½	R
78	1 meg	pot	S	230	1,000	½	R
79	750,000	2	R	231	100,000	½	R
80	100,000	pot	R	232	4,000	½	R
81	10,000	½	R	233	50,000	½	R
82	35,000	10	W	234	1.5 meg	½	R
83	100,000	1	R	235	2,000	½	R
84	100,000	1	R	236	50,000	½	R
87	100,000	2	R	237	10,000	½	R
88	1 meg	2	S	238	50,000	½	R
89	1 meg	½	R	239	250,000	½	R
90	50,000	½	R	240	180	1	R
94	250,000	pot	S	241	10,000	1	R
95	40,000	½	R	245	10,000	½	R
96	50,000	½	R	246	10,000	½	R
97	50,000	pot	R	257	20	1	R
99	3,000	½	R	258	500,000	½	R
100	200,000	½	R				

## CONDENSER VALUES

C.	Mfd.	Volts	C.	Mfd.	Volts
69	.1	400	214	.01	400
70	.05	400	215	.01	400
71	.000075	1500	216	.001	400
72	.0025	400	217	3-30	trimmer
73	.0025	400	218	3-30	trimmer
74	.005	500	219	3-30	trimmer
75	25.	50	220	3-30	trimmer
76	.04	1600	221	3-30	trimmer
77	.0005	1500	222	3-30	trimmer
78	.25	400	223	3-30	trimmer
79	.01	1200	224	3-30	trimmer
80	.04	1600	225	L53	
81	.1	400	226	L53	
82	.25	600	227	L53A	
83	.1	1000	228	L53A	
84	.1	1000	229	T-20	
85	.05	4500	230	T12A	
86	.0005	450	231	T12A	
87	16.	450	232	T12	
89	8.	450	233	T12	
90	8.	450	234	T11	
91	16.	450	235	T11	
93	16.	450	236	.04	400
95	4.	1500	237	8.	450
96	4.	1500	238	.04	400
97	.2	4000	239	.01	400
98	.2	4000	240	.000050	400
99	.2	4000	241	.02	400
100	.2	4000	242	.10	400
104	.0003	400	243	.25	400
105	.02	400	244	.02	400
106	25.	50	245	.10	400
110	.0002	1500	246	.25	400
200	3-30 mmf.	trimmer	247	.0002	400
201	3-30 mmf.	trimmer	248	.000050	400
202	3-30 mmf.	trimmer	249	.01	400
203	3-30 mmf.	trimmer	250	25.	25
204	3-5	variable	251	4.	450
205	.0006	400	252	.0006	400
206	.0006	400	253	.1	400
207	.0006	400	254	50.	25
208	.01	400	256	.0005	400
209	3-30 mmf.	trimmer	257	.01	400
210	.0006	400	258	.0006	400
211	.01	400	259	.0006	400
212	.01	400	260	.01	400
213	.01	400	265	25.	25

## TERMINAL VOLTAGES

Using Weston Model 772 20,000 Ohms per Voltmeter (with Televerter)

Tube	Plate	Screen	Grid (Control)	
V9	240	150	-4.3	
V10	240	155	-4.3	
V11	190	-----	-2.3	
V12	275	290	-11.5	Cathode to ground
V8	115	-----	-----	
V1	140	190	-2.0	Contrast on full
V2	190	190	-3.5	
V3	180	180	-2.25	
V4	170	170	-2.25	
V6	170	185	-2.0	Cannot be measured at the grid of V6. Should read -4 volts at center tap of 5Z3 high voltage winding to ground.
V7	140	225	-7.5	
V17	5Z3 filament to ground = 510 volts			
V13	5X3 filament to ground = 1600 volts (output after L7 = 1550)			
V14	2Y2 output = 3950 to 4200 (ground is positive) (output after R88 = 3800 to 4100 volts)			

The above measurements were taken with respect to ground, the following are point to point.

V21	From cathode to grid - 60 to - 160
	From cathode to first anode +800 to +1600
	From cathode to second anode +5000

## TELEVISION TERMS

**AUDIO** Pertaining to the sound section of the receiver.

**AMPLITUDE** A term synonymous with gain or size.

**AXIS** In television the horizontal plane is called the X Axis and the vertical the Y Axis.

**CATHODE RAY TUBE** An evacuated glass tube comprised of a structure for producing and focusing a stream of electrons upon an internal screen.

**COAXIAL CABLE (OR LINE)** A special cable for conveying television signals with as little loss as possible.

**CONTRAST CONTROL** A control on the receiver adjusting the contrast between high lights and shadows in the picture.

**DEFLECTION (MAGNETIC)** A system where the motion of the spot in producing the picture is controlled by magnetic fields.

**DEFLECTION (ELECTROSTATIC)** A system where the motion of the spot in producing the picture is controlled by the static action of the deflection plates.

**DEFLECTION (PLATES)** These plates are located inside a cathode-ray tube and provide for electrostatic deflection of the beam.

**DEFLECTION (COILS)** Coils mounted externally about the cathode-ray tube to produce magnetic deflection of the beam.

**DIPOLE** An aerial comprised of two separate rods.

**DOUBLE IMAGE** Where two images appear separately on the screen, one of the sweep circuits is adjusted to half its correct speed. If the horizontal is at fault the images will appear side by side, conversely if the images are vertically displaced the vertical sweep is at fault

**FIELD** In the RMA Television System there are two fields to each frame. In other words each picture is comprised of two fields scanning alternate lines.

**FRAME** One complete picture, thirty of these a second are thrown on the screen.

**FRAMING CONTROL** A control for centering the picture.

**FOCUSING CONTROL** A control on the receiver to bring out definition; it actually controls the width and sharpness of the individual lines on the cathode-ray tube.

**FOCUSING (ACTION)** This is the action of the gun of the cathode-ray tube which concentrates the stream of electrons to a small spot. (This can be accomplished by either electrostatic or magnetic methods.)

**GHOST** An unwanted image in the picture which is usually caused by signal reflection.

**GUN (CATHODE RAY)** The structure or mount inside the cathode-ray tube that produces, accelerates and focuses the electron beam.

**HORIZONTAL TEAROUT** This term describes the breaking up of the upper part of the picture, either to the right or left. The cause is usually poor low frequency response in the sweep circuits or video amplifier.

**INTERLACING** This refers to the technique of dividing the frame into two fields with displaced lines to eliminate flicker.

**INTERACTION** A term usually used by designers indicating leakage or the mixing of a signal into another circuit.

**LINE** A single line of the 441 comprising the television picture.

**LINEARITY** Means uniform rate of motion. This is required as the picture will be distorted in non-linear portions.

**MODULATION** A process of applying the video signal to the modulating or control electrode (or grid) of a cathode-ray tube so as to produce the lights or shadows of a picture.

**PARAPHASE** A term used in television and English books which is equivalent to the American "push pull."

**PHASMAJECTOR** A tube developed by the Allen B. Du Mont Laboratories, Inc. for generating television picture signals.

**REFLECTORS** Additional rod or rods placed near the antenna to reinforce signals.

**SAWTOOTH** A saw shaped wave of electric current or voltage employed to scan or sweep a cathode-ray tube.

**SCANNING** (See Sweep)

**SEPARATOR** The circuit used to separate the horizontal and vertical synchronizing pulses from each other and the video signal.

**SPOT** A visible spot of light formed by the impact of the electron beam upon the screen.

**SWEEP** The action of an electron beam in tracing lines across the screen.

**SYNCHRONIZATION** A process of producing synchronism between circuits.

**TELEVISION** A general term for the transmission or reproduction of visual images by radio.

**TELETRON** A receiving cathode-ray tube developed by the Allen B. Du Mont Laboratories, Inc.

**VIDEO** Pertaining to the picture section of the receiver or transmitter.

