Sydney Cramer

Instruction Book

&

Maintenance Manual

PARAMOUNT VIDEO-RECORDING RACK

DESCRIPTION

The Paramount video recording unit is an all electronic unit. designed to properly display a television image so that it can be recorded on 35mm motion picture film. Into it is fed an RTMA standard black negative picture signal.

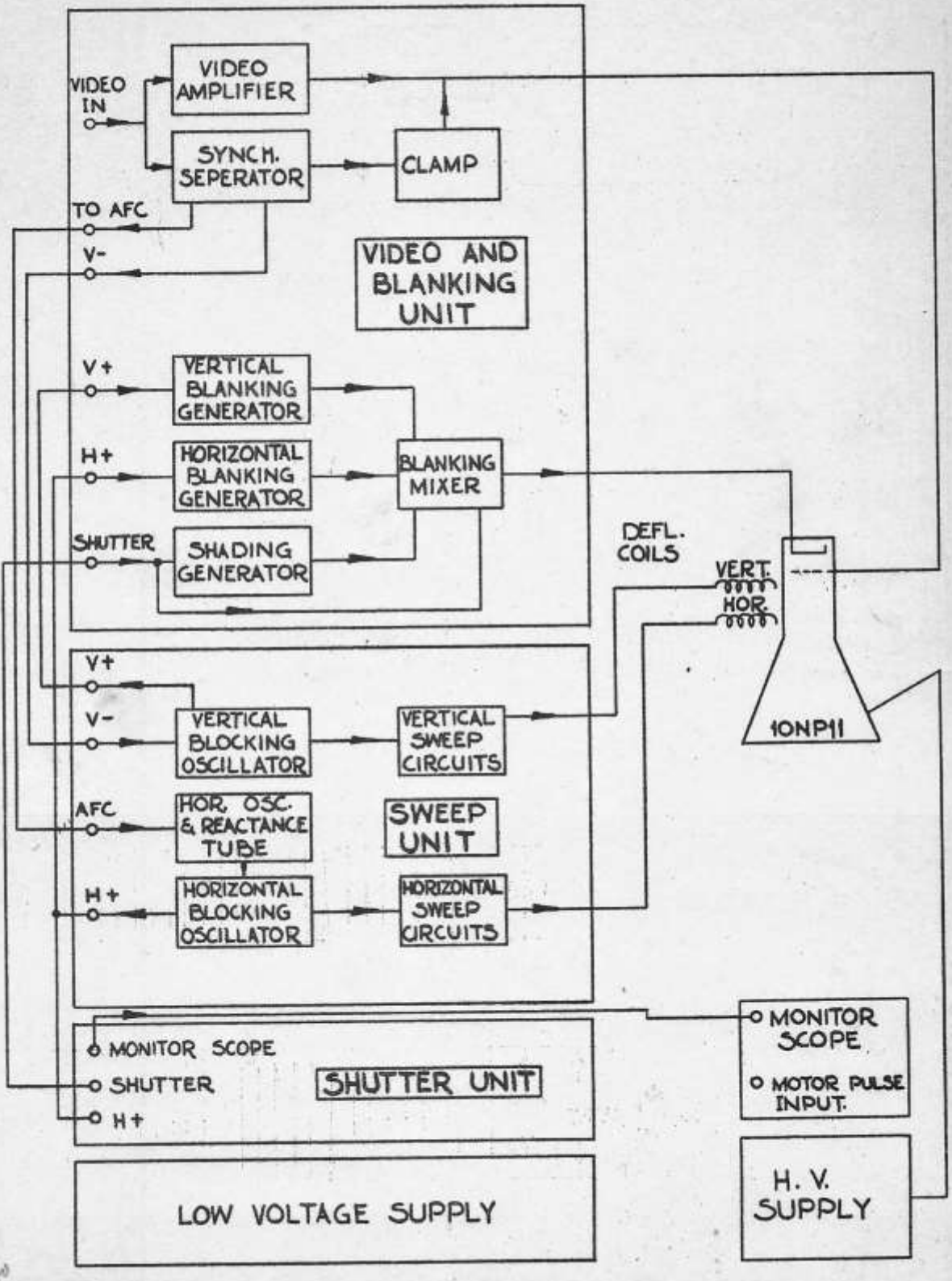
A video amplifier raises the signal level to the amplitude necessary for sufficient brightness on the tube. For theatre television purposes, the image on the tube is a negative one. Therefore, the picture on the developed film will be positive. As a result, the film can be washed, dried and transported into the theatre and shown immediately after it is photographed.

A block diagram of the system is shown in figure I. As shown here, the video signal is fed to the video amplifier and to the synchronizing separator. There is a video amplitude control for varying the signal applied to the first stage. The setting of this control is determined by running film with a test pattern, and determining the best setting by judging film quality. In general, this control will be adjusted for volts of video signal on the 10NP11 grid. Once having determined the setting for a given input voltage, the operator can log the position and use this data for future operation, provided he always uses the same input voltage and the film process is not varied.

As previously stated, the polarity switch will always be in the negative position so that the film picture projected to the theatre screen will be positive. The video amplifier has its output clamped for good d.c. restoration at the CRT grid.

As shown in the diagram, the synchronizing separator supplies pulses to the clamp circuit, as well as feeding them to the horizontal and vertical sweep oscillators. The blocking oscillators which drive the sweep

BLOCK DIAGRAM—VIDEO RECORDING RACK



—FIGURE 1—

stages also generate pulses which trigger the horizontal and vertical blanking multivibrators. These provide blanking signals for operation with negative picture output since the television blanking is now white instead of black and can no longer be used. The blanking controls are set so that the retrace lines do not appear in the picture. Mixed with the television blanking are the shutter blanking and shading. The shading control is set with a blank raster to yield the minimum shading at the join-up lines on film.

As for the sweep controls, these are most efficiently adjusted with a test pattern. The centering, hold, linearity and size control adjustment procedure is self evident when watching the test pattern.

The electronic shutter has no adjustments except for phasing. This will be discussed under the monitor scope adjustment procedure. The shutter is a specially generated pulse which blanks out the cathode ray tube during film pulldown.

On the low voltage power supply, two adjustments are required. These are merely setting the +210 and +310 regulator controls for proper output voltage. A line voltage regulator supplies regulated input to all filaments except those in the shutter and power supply. A high voltage power supply develops 18 to 20 kilovolts regulated power for the 10KP11 picture tube. This tube has a P11 phosphor which has high actinic efficiency.

For phasing the camera pulldown with respect to the electronic shutter blanking pulse, a monitor scope is provided. This scope has a horizontal sweep which is derived from the shutter pulse. On this sweep is displayed the camera motor pulse. ← VERTICAL INPUT TO SCOPE This pulse has a fixed time relationship to the camera pulldown. Therefore, once phasing has been deter-

mined by running film, the phasing adjustment in the future may be duplicated by adjusting the camera phase to yield the same scope picture as initially determined. The camera phasing adjustment is explained in the section on the camera and processing unit.

All control adjustments, including those not mentioned in the text, are shown in figure II.

FIGURE II

Control or Meter	Location	Adjustment
Video Amp.	video amplifier and blanking unit	Adjust for proper film brightness (about 10 μ Amp.) AFTER ADJ. BACKGROUND CONTROL TO 95uA.
Picture Polarity	"	Negative
Left Blanking	"	Adjust to remove retrace
Top Blanking	"	" " " "
Shading	"	" for best film shading on blank raster.
AFC sync.	Sweep Unit	
Vert. Hold	"	Adjust for best interlace
Vert. Lin.	"	Adjust with test pattern
Vert. Size	"	" " " "
Vert. Lin.	"	" " " "
Vert. Cent.	"	" " " "
HOR. Lin.	"	" " " "
HOR. Cent.	"	" " " "
HOR. Lin.	"	" " " "
Phase reversal	Shutter Unit	Adjust for proper phase
Shutter Phase	"	" " " "
B+ ON	Low Voltage Power Supply	B+ ON - OFF
Line volts	Meter Panel	No adjustment - 115 v.
+310 current	"	" " 150 ma
+210 current	"	" " 200 ma
CRT current	"	Adjust to 45 u Amp.
CRT current switch	Rack (Left side)	ON when reading CRT current
Vert. Gain	Monitor Scope	Adjust for 1½" Def.
Focus	"	Best focus
HOR. Gain	"	Adjust to maximum
Off - Intensity	"	Adjust for proper brightness
Sweep	"	12-v position

Focus	Back (Right side)	Best overall Focus
Background	" "	Adjust to 45 us (blank raster)
High Voltage	" "	ON - OFF
Video	Connector	Connect video line
Motor	Connector	" motor pulse
+210 control	Power supply (rear)	Adjust + 210
+310 control	" "	Adjust + 310
AC Main Switch	Rear of rack	AC (ON - OFF)
Counter	"	4715
Focus coil	"	Best focus
Deflection yoke	"	Level raster

PARAMOUNT VIDEO-RECORDING RACK

MAINTENANCE MANUAL

PARAMOUNT PICTURES CORPORATION

New York, New York

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I. THEORY OF OPERATIONS

1. Introduction

The Paramount Video-Recording Rack is essentially an all electronic device to convert 30 frame per second television information to 24 frame per second information that may be photographed and projected in standard motion picture projectors. The rack must be supplied with an RTMA standard video signal to provide the information to be converted, a pulse from the camera motor so that the rack can be phased properly with the camera, and 115 volt, 60 cps A. C. to provide power for the rack.

The rack is basically a high definition television monitor designed so that either a positive or negative picture may be displayed on the face of a cathode ray tube, and an all electronic shutter to convert the thirty frame television information to the twenty-four frame information required. A block diagram of the complete system is shown in Figure 1.

The following sections of the 'Theory of Operations' describe each of the major circuits shown in the block diagram. When looking for trouble in a particular circuit, only the description of that circuit need be read. It is suggested that the block diagram and circuit diagram be consulted when reading about a particular section.

This manual has been written on the assumption that the reader has an adequate knowledge of television and television circuits. Some books will be suggested that may help the reader obtain some fundamental information.

2. Video Amplifier (Chassis 1)

The video amplifier consists of three tubes; one type 6AC7, V101; one type 6AG7, V102; and one type 6V6, V103. An RTMA standard black-negative video signal of 2 volts peak to peak feeds the amplifier.

Tubes V101 through V103 are series and shunt peaked voltage ampli-

fier stages used to raise the video to the proper operating level. The output of V103 is fed directly to the grid of the cathode ray tube. However, the D.C. level of the output is automatically clamped to the proper level by the clamping circuit.

A positive or negative picture may be displayed on the face of the cathode ray tube by switching the polarity switch from one position to the other. This switch reverses the polarity of the video signal by applying it to the grid or the cathode of V101.

A manual gain control, marked "VIDEO AMP." is provided in the input circuit so that the picture brightness may be varied. A contrast control, marked "BACKGROUND," is provided in the bias circuit of the cathode ray tube so that the average brightness, or D.C. level, of the picture may be adjusted. This control is located on the right side of the rack, just to the left of the picture tube.

3. Clamping Circuit (Chassis 1)

The clamping circuit consists of one type 6AL5 tube, V104, which is driven by pulses obtained from the sync separator. It is a D.C. inserter used to clamp the D.C. level of the back porch of the video synchronizing pulses.

4. Synch Separator (Chassis 1)

The synch separator circuits consist of two type 6AC7 tubes, V105 and V106, and two type 6SN7 tubes, V107 and V108. The video signal is fed into V105 where it is amplified. Tubes V106 and V107 further amplify and clip so that only synch pulses remain. The output of V107A is used to monitor the horizontal automatic frequency control circuit. The output of V107B, V-, is used to drive the vertical sweep generator. It is also differentiated and further amplified and clipped by V108. The outputs from V108 A and B are used to drive the clamping circuit.

5. Vertical Sweep Generator (Chassis 2)

The vertical sweep circuits consist of four type 6SN7 tubes, V204 through V207. Mixed synch pulses from the synch separator, (V-), are differentiated and used to trigger the vertical blocking oscillator, V204. The frequency of this oscillator is adjusted by the control marked "VERT. HOLD." The grid of V204 is tied to the grid of V205A, the vertical saw tooth generator. The vertical saw tooth appears on the plate of V205A, and its size may be varied by the control marked "VERT. SIZE." Tubes V206 and V207 are tied in parallel and serve as vertical saw-tooth amplifiers. The potentiometer in the cathode circuit of tubes V206 and V207, as well as the rheostat from the plate of V205 to ground (through a 0.05 mfd. capacitor) control vertical linearity and both are marked "VERT. LIN." Since the linearity controls also affect vertical size, both the vertical size and the vertical linearity controls must be adjusted together to obtain a satisfactory picture.

The output of tubes V206 and V207 are fed through the output transformer to the vertical deflection coils. Vertical positioning is adjusted by the control marked "VERT. CENT."

6. Horizontal AFC (Chassis 2)

The horizontal AFC circuits consist of one type 6AC7 tube, V201; one type 6K6 tube, V202; and one type 6AL5 tube, V203. Tube V202 is a sinusoidal oscillator tuned to the horizontal sweep frequency, 15,750 cps. The output from the plate of this tube is used to trigger the horizontal sweep generator.

Tube V203 is used to monitor the oscillator. Superimposed on the output of the tuned transformer are horizontal synch pulses obtained from the synch separator. Any change in frequency of the oscillator is detected

by an unbalance in the rectified output of V203. This unbalance is due to a shift of phase of the transformer output with respect to the monitoring pulses. The voltage unbalance is fed to the grid of the reactance tube, V201. Depending upon the polarity of the unbalance, the reactance of the tube increases or decreases, correcting the drift in the oscillator frequency.

Tuning of the primary or the transformer is done by adjusting the control appearing on the sweep unit marked "AFC SYNCH." Phasing of the picture can be adjusted with the screwdriver control located on the back of the sweep unit chassis (Chassis 2) directly behind the primary control. This picture phasing is accomplished by tuning the transformer secondary.

7. Horizontal Sweep Generator (Chassis 2)

The horizontal sweep generator consists of two type 6SN7 tubes, V208 and V209; one type 6W4 tube, V210; and two type 6BQ6 tubes, V211 and V212.

The output of the horizontal AFC circuits is differentiated and used to trigger the horizontal blocking oscillator, V208. Positive pulses from the cathode of V208B, H8, are used to trigger the horizontal blanking generator, as well as to trigger the horizontal sawtooth generator, V209A. Tube V209B serves as a high AC impedance to tube V209A, making V209A a constant-current source greatly extending the linear range of the horizontal sawtooth. The output of the sawtooth generator is fed to the output tubes, V211 and V212, which operate in parallel. The output tubes conduct only during the latter half of the horizontal sweep time. The initial half of the horizontal sweep is derived from the energy stored in the deflection coils at the end of the sweep. When the sweep reaches its end, the output tubes are cut off. The deflection coil and output transformer circuits are tuned to resonance at a frequency which will cause the retrace

to occur in a very short time, on the order of 7 microseconds. The retrace occurs during the first half cycle of oscillation. To eliminate the oscillation after the first half-cycle, the damping tube, V210, is provided. This damps the oscillation, and provides the first half of the sweep.

The potentiometer in the plate circuit of V209A controls right-hand linearity and is marked "HOR. LIN." It is the control located on the right side of the lowest row of controls on the sweep unit. A variable inductance wired from the cathode of V210 to the primary of the horizontal output transformer affects center linearity. This is a screwdriver adjustment and is also found on the lowest row of controls on the sweep unit. This control is marked "HOR. LIN." too.

Horizontal size can be adjusted by changing the inductance tied across the secondary of the output transformer. This is another screwdriver adjustment and is marked "HOR. SIZE."

8. Vertical Blanking Generator (Chassis 1)

The vertical blanking generator consists of three type 6SN7 tubes, V109, V110, and V111. Tube V109A serves to amplify the Vϕ pulses obtained from the vertical sweep generator. The output of V109A is differentiated and drives the cathode follower stage, V109B. The output of V109B triggers a single-shot multivibrator, V110, which generates the blanking pulses. The blanking pulses are amplified and clipped by tube V111A, from where it is fed to the blanking mixer.

The resistance in the grid circuit of V110B can be varied to change the size of the blanking pulse. The control marked "TOP BLANKING" is used for these adjustments.

9. Horizontal Blanking Generator (Chassis 1)

The horizontal blanking generator consists two type 6SN7 tubes, V112 and V113. Hϕ pulses from the horizontal sweep generator are fed into a cathode-follower stage, V112A. The output of this stage triggers a multivibrator which generates the horizontal blanking pulses. The blanking pulses are amplified by V112B, which sends horizontal blanking pulses to the blanking mixer. The size of the blanking pulses may be varied with the potentiometer in the grid circuit of V113B. This control is marked "LEFT BLANKING."

10. Shading Generator (Chassis 1)

A shading generator consists of 6AG7 tubes, V116 and V117; and two type 6SN7 tubes, V114 and V115.

The shading generator consists of two type 6SN7 tubes, V114 and V115. Pulses from the shutter are fed into cathode-follower stage V115A. The output of this stage drive V114A, which is the shading sawtooth generator. The shading sawtooth is fed into a second cathode-follower stage, V114B. The output of this stage, combined with the blanking mixer output, is fed to the cathode of the cathode ray tube. T shading pulses are sawtooth in nature, and have a repitition rate the same as the shutter pulses, 24 cps. The shading serves to eliminate the effect of persistance at the shutter joinup. A control marked "SHADING" is provided to change the amplitude of the shading pulse.

11. Blanking Mixer (Chassis 1)

The blanking mixer consists of two type 6AG7 tubes, V116 and V117; and one type 7AK7 tube, V118. Blanking pulses from the vertical and horizontal blanking generators are mixed in V118. The output of the mixer is fed into V117. Pulses from the shutter are fed into V116. The cathodes of

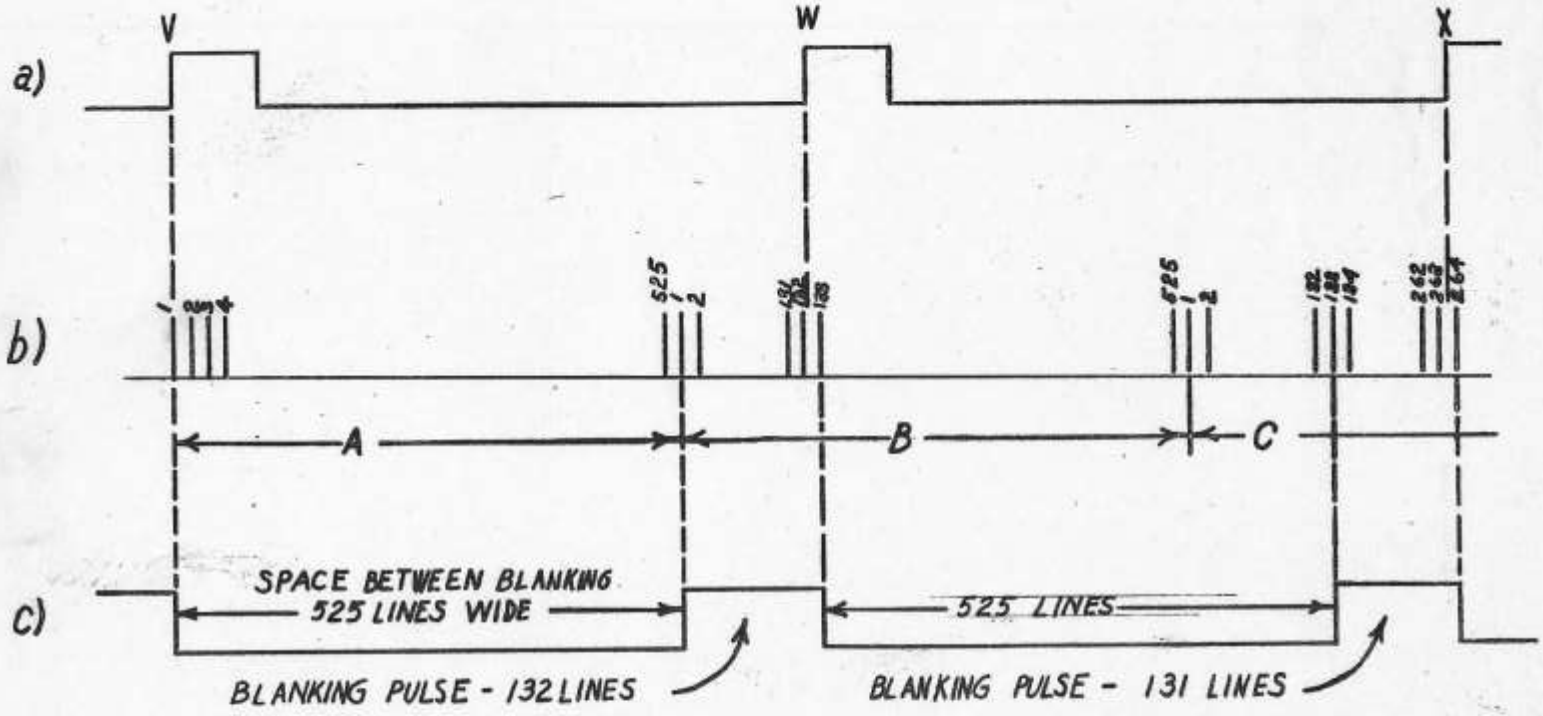
V116 and V117 are tied together, and the shutter and mixed horizontal and vertical blanking pulses appear at this point. This mixture of blanking pulses is fed to the cathode ray tube cathode.

12. Electronic Shutter (Chassis 3)

The electronic shutter is essentially a device to convert 30 f/s (frames per second) television information to 24 f/s information so that motion picture projectors can be used with Paramount Video-Recording equipment. Although this conversion of information could be accomplished by a mechanical shutter, better picture quality can be obtained with the electronic shutter.

Before describing the shutter circuitry, a discussion of what the shutter is to do will be helpful.

The repetition period in which 30 f/s information can be converted to 24 f/s information is the smallest time in which an integral number of frames of each occur. This is one-sixth of a second, equal to the time of five television frames, or four motion picture frames. To have uniform exposure through the entire picture, each frame of film must be exposed to an integral number of television frames. Since there are $1\frac{1}{4}$ television frames per motion picture frame, each film frame should be exposed to exactly one television frame. This leaves $\frac{1}{4}$ of a television frame out of each $1\frac{1}{4}$ tv frames in which the shutter must blank the picture, and the film be transported from one frame to the next in the camera. However, since $\frac{1}{4}$ tv frame is $131\frac{1}{4}$ lines, and it is desirable to have each blanking pulse equal to a whole number of lines, an average of $131\frac{1}{4}$ is maintained by having one pulse 132 lines wide, followed by three pulses 131 lines each. Figure 2 shows waveforms illustrating how the shutter



a) Initiating Waveform - 24cps b) H+ c) Shuutter Output

FIGURE 2

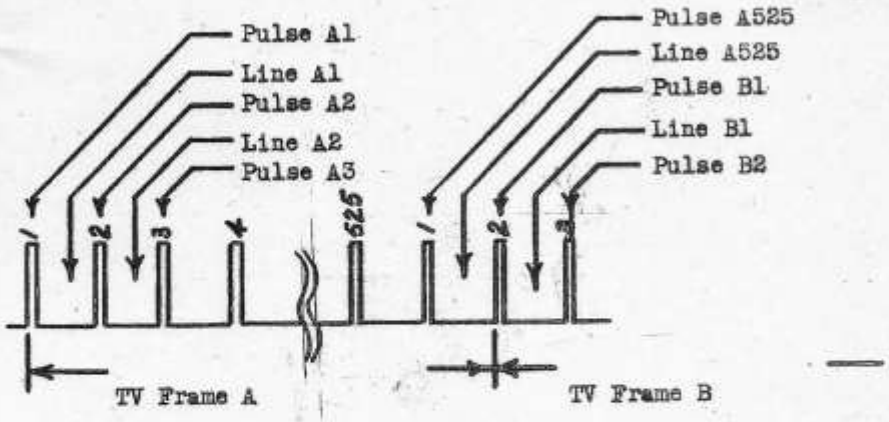

Pulse A1
Line A1
Pulse A2
Line A2
Pulse A3
Pulse A525
Line A525
Pulse B1
Line B1
Pulse B2
1
2
3
4
525
1
2
3
TV Frame A
TV Frame B

Figure 3

unit acts. 2 a shows a 24 cps pulse, which will be referred to as the initiating pulse. This is obtained in a multivibrator shaping and frequency dividing circuit from 60 cps line voltage. 2 b shows positive horizontal synchronizing pulses, and 2 c shows the shutter blanking pulse. The horizontal synch pulses are obtained from the blocking oscillator in the horizontal sweep generator, and the output shutter pulse is fed to the blanking mixer.

Assume that at time t=0, in figure 2, that the film has just moved into position and the preceding blanking pulse is about to end. The first horizontal pulse, A1, (see figure 3) following the wavefront of the first initiating pulse, V, terminates the blanking pulse and activates a counter, which counts that pulse, A1, as the first pulse. The counter counts 525 pulses (to and including A525). The next horizontal pulse, B1, erases the count on the counter and also initiates the blanking pulse. The blanking pulse continues until the wavefront of the next initiating pulse, W. Then the action repeats; that is, the first horizontal synch pulse following the wavefront terminates the blanking pulse and is the first pulse counted by the counter. Although all action during the cycle begins and ends at horizontal synch pulses, the wavefront of the initiating pulse determines at which horizontal synch pulse each cycle begins. Therefore, it is important to determine when the wavefronts of the initiating pulses come with respect to the horizontal synch pulses. First, assume that pulse A1 is practically coincident in time with wavefront V, although it actually comes a small time after the wavefront. The second wavefront, W, occurs 1/24th of a second later, or after 656$\frac{1}{4}$ television lines. Since there are 525 lines per television frame, this is one fourth of the way along line B132. But, the first horizontal pulse after W starts the counter

and ends the blanking, This pulse is B133. Since the blanking pulse began at B1, it was exactly 132 lines wide.

The counter, having been started with pulse B133, counts 525 pulses again, through and including pulse C132. The next pulse, C133, erases the counter and starts the second blanking pulse. This pulse continues until the first horizontal pulse after wavefront X. But X occurs 2/24th of a second after V, or after 1312½ lines. This is one half way through line C263. Therefore, pulse C264 starts the counter again and ends the blanking pulse. This makes the second blanking pulse 131 lines wide.

If this action is continued until wavefront Z is reached, it will be found that pulse F1 is the first pulse after Z, so that the action starts all over again as it did at wavefront V, followed by pulse A1, It will also be found that the third and fourth blanking pulses are equal to the second in width, 131 lines each.

The 24 cps initiating waveform is generated in the 'Shaper' circuit on the shutter chassis. This shaper circuit consists of five type 6SN7 tubes, and is located on the rear of the shutter chassis to the left of the three decade counters. The shaper circuit is supplied by 60 cycle line voltage through a transformer and phase-shifting network. The phase-shifting network allows the shutter phase to be shifted with respect to line phase. There are two controls, one marked "PHASE REVERSAL," which shifts phase by 180°, and the other, marked "SHUTTER PHASE," which is a continuously variable control.

Tube V304, a type 6SN7 tube, is used to provide feedback to the shaper circuit. The shaper output is differentiated and fed to the suppressor grid of tube V301, a type 7AK7 tube, which serves as a gating tube.

H$\frac{1}{4}$, from the horizontal sweep generator, is amplified by V310, a type 6SN7, from where it goes to V309, where it is further amplified and clipped. Positive H pulses from V309 are fed to the control grid of tube V301. The output of V301, which is the first H$\frac{1}{4}$ pulse after the wavefront of the initiating waveform, triggers the bistable multivibrator stage, V302 (6SN7). The output of tube V302A is fed to tube V308B, and is mixed with H$\frac{1}{4}$ pulses fed into V308A from V310. This mixed output from V308 is amplified and clipped by V307B, from where it is fed into the counter circuit.

The counter circuit consists of three identical decade counters. Each of the counters consists of four type 6SN7 tubes and a control switch. Note: These control switches are to be set and left in position reading 47. The shutter will not act properly in any other position.

The three counters count units, tens and hundreds, respectively. The units output [illegible] the tens counter, the tens output the hundreds counter, and the hundreds counter supplies the output pulse from the counter. This pulse is shaped by a circuit consisting of tubes V305 and V306, both types 6SN7. This shaped pulse is used to reset the counter, and is also fed to the suppressor grid of tube V303, a type 7AK7, which is also used as a mixer tube. The H$\frac{1}{4}$ pulses from V309 are fed to the control grid of this mixer, and the output is used to trigger the multivibrator stage, V302, returning it to its original state. The output of V302B is fed into the cathode follower stage, V304A. The output of this stage is fed to the monitor scope and to tube V307A, where it is amplified and fed to the blanking mixer.

Tube V311, a type 5U4 tube, is used as a full wave rectifier to supply +300 and +150 volts for the shutter unit. -105 volts is obtained through a dropping resistor from the low voltage power supply.

13. Monitor Scope

The monitor scope consists of five tubes; three type 12AV7 tubes, V1, V2, and V3; one type 6C4 tube, V4; and one type 902 tube, V5.

V5 is a two inch cathode ray tube used to display the motor pulse and a pulse from the shutter so that the camera and shutter can be properly phased with respect to each other's half-wave.

V4 is a rectifier used to obtain high voltage for tube V5.

Scope controls to adjust intensity, focus, vertical and horizontal positioning, and horizontal gain are provided, as well as an on-off switch, are provided and clearly marked.

Tube V1B serves as a vertical amplifier. The pulse from the camera motor is fed to the grid of this tube through an amplitude control. Note: This amplitude control only affects the motor pulse. It has no affect on the amplitude of the shutter pulse. It is marked "VERT. GAIN" and appears on the front panel of the scope along with the controls previously mentioned.

The output of V1B is fed to V1A.

The differentiated shutter pulse is fed into V2B which is cathode-coupled to tube V1A. The mixed output of V1A and V2B is used to drive the vertical deflection plates.

The differentiated shutter pulse is also fed into tube V2A, where the pulse is amplified and its polarity reversed. The width of this differentiated shutter pulse may be varied by adjusting the resistance in the grid of V2A. Varying this resistance has the effect of changing the position on the face of the tube. This control need be set once and forgotten

for long periods. Note: This control does not affect the relative phasing between shutter pulse and motor pulse. It only changes the location of the pulses on the horizontal sweep. This control is located on top of the scope chassis and has no identifying title. The output of V2A triggers tube V3B, which is a sawtooth generator. V3A amplifies the sawtooth, which is fed to the horizontal deflection plates.

14. Low Voltage Power Supply (Chassis 4)

The low voltage power supply consists of sources of +550, +310, +210, and -150 volts. The +550 volt source is obtained from a full wave rectifier consisting of two type 5R4GY tubes, V401 and V402. This is an unfiltered and unregulated supply, and is used only to supply the +210 and +310 volt sources.

+310 volts is obtained from a regulator consisting of seven type 6B4 tubes, V403 through V409; one type 6SL7 tube, V410; two type OD3/VR150 tubes, V411 and V412; one type OA3/VR75 tube, V413; and one type 6H6 tube, V414. The seven type 6B4 tubes, V403 through 409, are tied in parallel. The plates of these tubes are at +550 volts, and the tubes act as a variable resistance, changing resistance to correct for any change in voltage at the output terminals. The center tap of the filament transformer winding supplying the directly heated cathodes of these tubes serves as the +310 volt terminal. Tube V410 acts as a two stage DC amplifier, amplifying the change of voltage at the +310 volt terminal. The output of this amplifier is used to change the bias on the seven tubes, V403-V409, thereby changing the effective resistance of the tubes, and the voltage drop across them. Tubes V412 and V413, in series, are used to keep the cathode of V410B at -225 volts, and tube V411 keeps the cathode of V110A at -150 volts, both with

respect to the +310 volt terminal. Tube V414 is provided to prevent a surge of voltage and current appearing at the +310 volt terminal before the DC amplifier builds up sufficient bias voltage. Until this tube begins to conduct, a large bias is placed on the grids of tubes V403-409. To delay the time at which this tube conducts, a resistance is placed in series with its filament.

The output of this supply may be varied on either side of 310 volts, by varying the input to the DC amplifier. This control is found on the rear of chassis 4 and is labelled "310 V CONTROL."

The +210 volt source is similar to the +310 volt source. Tubes V415 and V416 are tied in parallel and their plates are tied to the +310 volt terminal. These tubes act as the variable resistance in the +210 volt supply. Tube V417 acts as the DC amplifier, and its cathodes are held at a fixed potential by tubes V418 and V419, respectively. A control marked "210 V CONTROL" is provided for adjusting this voltage.

The -150 volt supply is obtained from a separate rectifier. Selenium rectifiers are used, and their output is filtered and kept fixed at -150 volts by tube V420.

The negative terminals of the +550 volts and the +310 volt supplies, and the positive terminals of the -150 volt supply are common and labelled -310 volts. This is tied to ground through a rheostat in parallel with the focus coil. This rheostat varies the current through the focus coil, and is labelled "FOCUS." It is located to the left of the picture tube, just above the control marked "BACKGROUND." The negative terminal of the +210 volt is grounded.

15. High Voltage Power Supply

The high voltage power supply consists of two separate supplies in parallel. The two supplies are identical. Each supply contains one type 6L6 tube, one type 6V6 tube, and two type 1B3 tubes. The type 6L6 operates as a continuous oscillator at about 28Kc. The plate winding of the transformer is connected as an autotransformer, stepping up the voltage to the order of 9Kv. peak. The two 1B3 rectifiers are connected as a voltage doubler, providing a voltage output of the order of 18-19 Kv. The type 6V6 tube is connected as a triode (plate and screen connected together) and serves as a voltage regulator. A separate winding of the transformer feeds the plate circuit of this tube, and its bias is determined by the current output of the supply. When little or no current is drawn from the supply, there is very little negative bias on the 6V6, and it absorbs much of the oscillator power output. As the current drain from the supply is increased, the negative bias on the regulator tube is increased, driving the tube towards cutoff, and decreasing the power it absorbs from the oscillator. As the tube approaches cutoff, the regulation of the supply begins to fall off.

The high voltage supplies receive power from a terminal marked "HV" on the sweep chassis (Chassis 2). This is derived from the 310 volt supply by the use of a dropping resistor.

A resistor is placed in series with each of the supplies before they are tied in parallel. These resistors insure relatively equal distribution of any load between the two supplies. A filter condenser and a high resistance bleeder are placed across the output before it is fed to the cathode ray tube.

IV. MAINTENANCE

The Paramount Video-Recording Rack is manufactured and tested under strict engineering supervision. However, after continuous use, tube replacement or other attention may be required. A description of measurements and adjustments that should be made after replacing a faulty tube or component is given in the succeeding paragraphs. Following that are a table of D.C. Voltages and a table of Waveforms that will be useful in trying to isolate trouble to a particular stage.

1. Power Supply Adjustments

When the rack is initially installed, and whenever tubes are replaced, the +210 and +310 volt outputs should be measured. If necessary, they should be adjusted. The controls are located on the rear of the power supply chassis (chassis 4) and are clearly labelled. Both outputs are fused, and the fuses are located on the rear of the meters labelled +210 current and +310 current, respectively. If either of these meters fail to indicate, these fuses should be checked for continuity. Both meters should read about 200 ma. under normal operating conditions.

The bias supply should be -150 volts. If it is off by more than 10 volts in either direction, tube V420 should be replaced.

2. Horizontal AFC Adjustments

When rack is installed, and after any change in components, the following adjustments should be made:

The DC Voltage across pins 2 and 5 of V203 should be adjusted to read zero. This adjustment is made on the front of the sweep

unit chassis (chassis 2), using the control marked "AFC SYNCH". The picture on the face of the tube should then be phased correctly, using the screwdriver control located on the rear of the sweep chassis just behind the AFC SYNCH control. After phasing, the DC Voltage across pins 2 and 5 of V203 should be checked again. It should still be zero.

3. Table of DC Voltages

Before checking these voltages, the video input to the rack should be disconnected, the picture polarity switch should be turned to the negative picture position, and the V+, H+ and shutter pulse cables disconnected from the sweep chassis (chassis 2). Also, the V+ input to chassis 2 should be terminated in 470 ohms.

Note: All D.C. voltage measurements made with a vacuum tube volt meter. These readings may vary by ±20%.

VIDEO AMPLIFIER

Grid Bias V101 - across 8200 ohms	1.2	volts
" " V102 - across 39 K ohms	5.5	"
" " V103 - across 47 K ohms	6.5	"
*B+ across 10K ohms to pin 8 V101	100	"
" " " " " " 8 V102	120	"
" " 1K " " " 3 V103	50	"
Pin 6 V101 to ground	100	"
Pin 6 V102 to ground	150	"

SYNCH SEPARATOR

B+ across 10K ohms to pin 8 V105	70	"
" " " " " " 8 V106	25	"
" " " " " " 2 V107	95	"
" " " " " " 5 V107	65	"
" " " " " " 2 V108	70	"
" " " " " " 5 V108	95	"
Pin 1 V107 to ground	4	"
Pin 4 V108 " "	4	"
" 6 V106 " "	45	"

VERTICAL BLANKING GENERATOR

Pin 5 V109 to ground	25	volts
Pin 3 V109 " "	3.5	"
" 3 V110 " "	19	"
B+ across 1K ohms to pin 5 V111	10	"

HORIZONTAL BLANKING GENERATOR

Pin 3 V112 to ground	3.5	"
" 3 V113 " "	19	"
B+ across 1K ohms to pin 5 V112	10	"

BLANKING MIXER & SHADING GENERATOR

B+ across 1K ohms to pin 2 V118	13	"
" " 22K " " " 5 V115	60	"
" " 10K " " " 2 V114	9	"
" " 10K " " " 5 V114	6	"
" to pin 6 V116	20	"
" " " 6 V117	20	"
Pin 5 V117 to ground	10	"

VERTICAL SWEEP GENERATOR

Across Vertical Centering Control	3.8	"

HORIZONTAL AFC

Pin 5 V203 to ground	2	"
" 6 V201 " "	70	"
B+ to pin 8 V201	60	"
" " " 4 V202	50	"
" across 1K ohms to pin 3 V202	12.5	"

HORIZONTAL SWEEP GENERATOR

Pin 3 V208 to ground	25	volts
" 2 V209 " "	150	"
" 4 V211 " "	120	"

SHUTTER UNIT

Note: All voltages taken from indicated pin to ground.

Pin 3 V301	135	"
" 2 V302	200	"
" 5 V302	250	"
" 3 V303	135	"
" 3 V304	20	"
" 5 V304	300	"
" 5 V305	100	"
" 2 V306	220	"
" 5 V306	220	"
" 2 V307	150	"
" 5 V307	150	"
" 2 V308	190	"
" 2 V309	90	"
" 5 V310	240	"

4. TABLE OF WAVEFORMS

Synch Separator

Pin 4 - V107

100 v

Pin 2 - V108

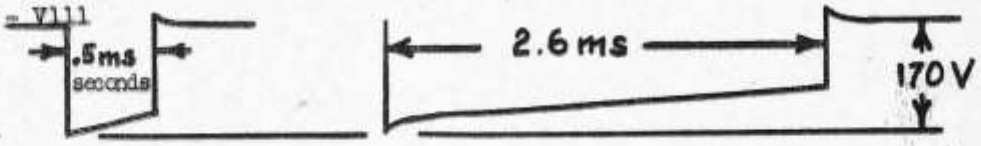
65 v

Pin 5 - V108

120 v

Vertical Blanking Generator

Pin 5 - V111

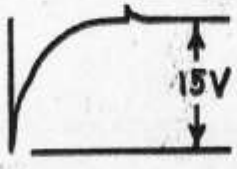


a) Minimum

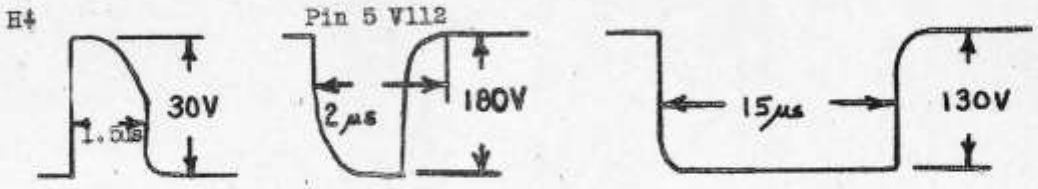
b) Maximum

V+

Pin 3 V109

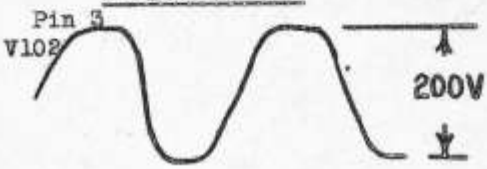


Horizontal Blanking Generator

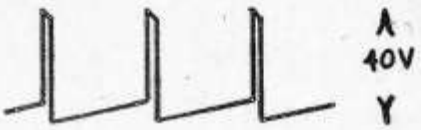


a) Minimum b) Maximum

Horizontal AFC



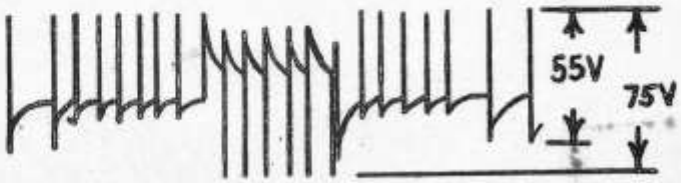
AFC Input



Horizontal Sweep
Pin 1 V208

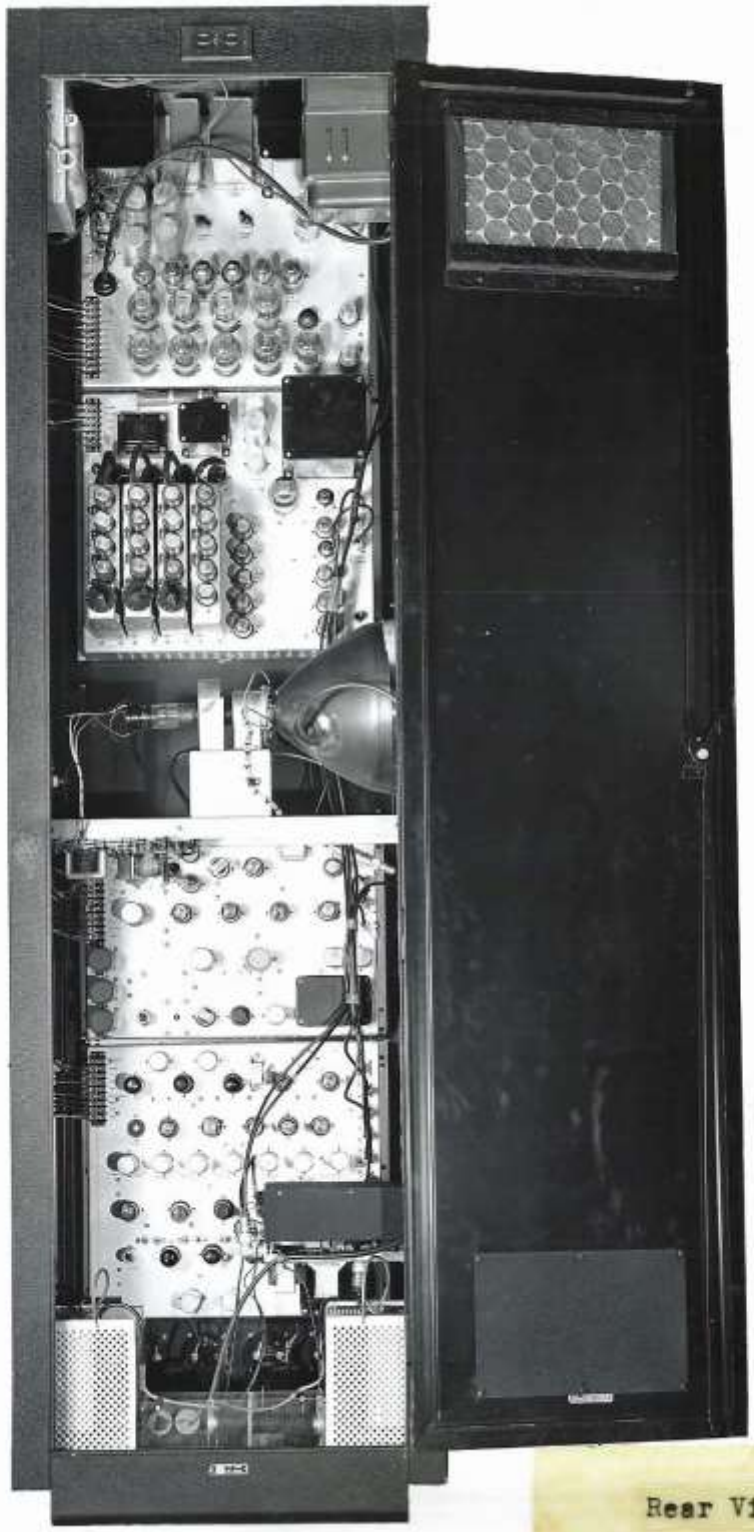
Vertical Sweep

Pin 1 V204

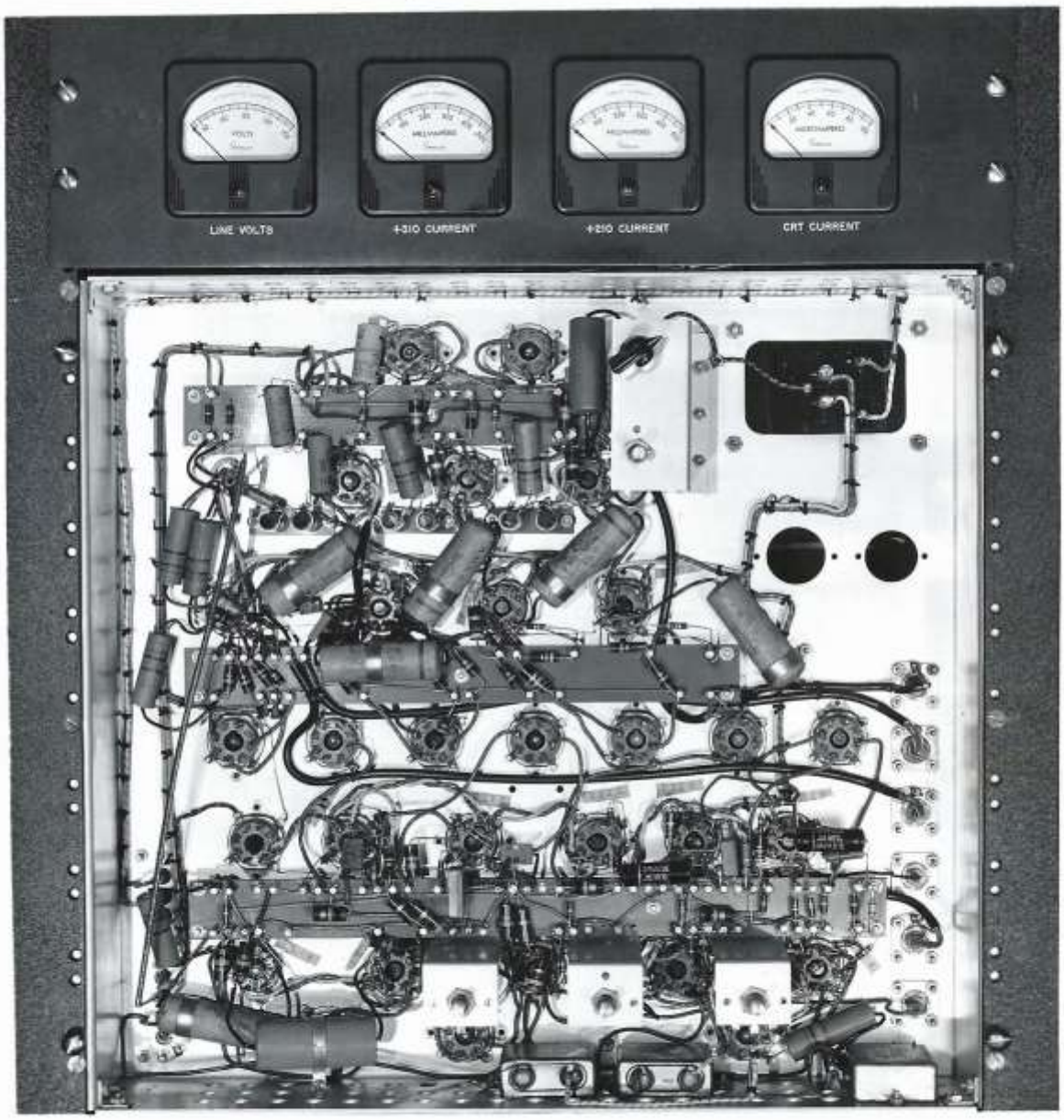


Front View

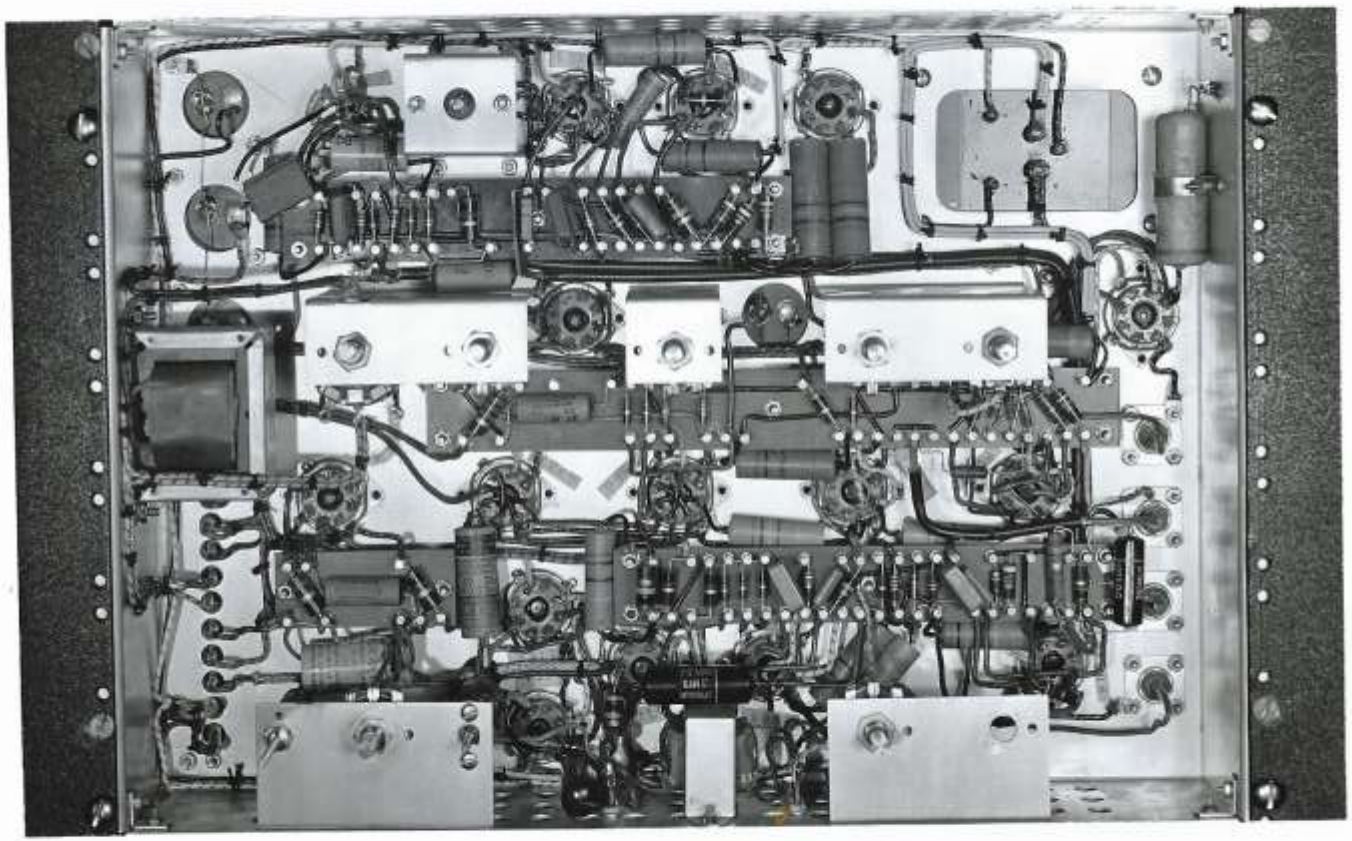
Right Side View



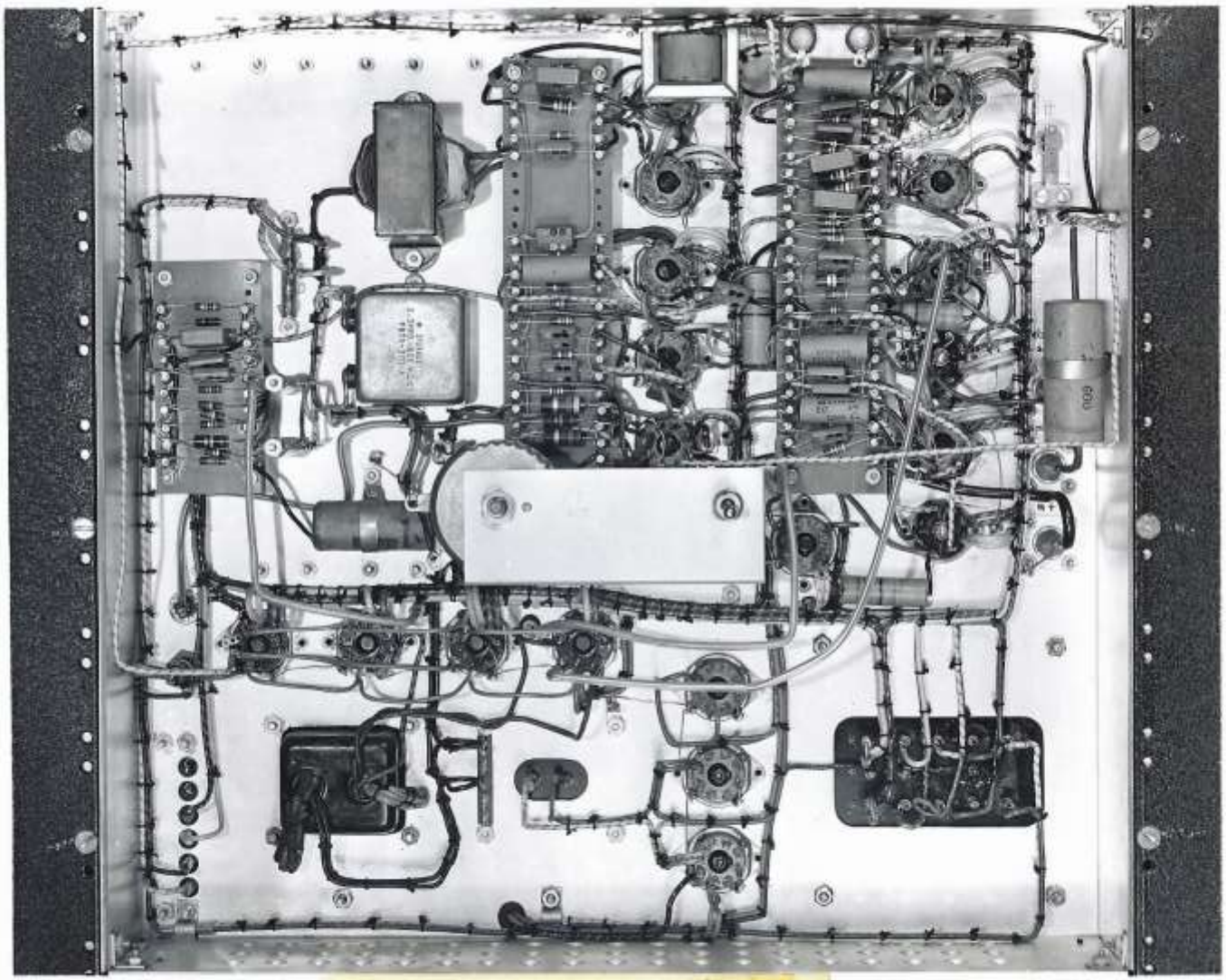
Rear View



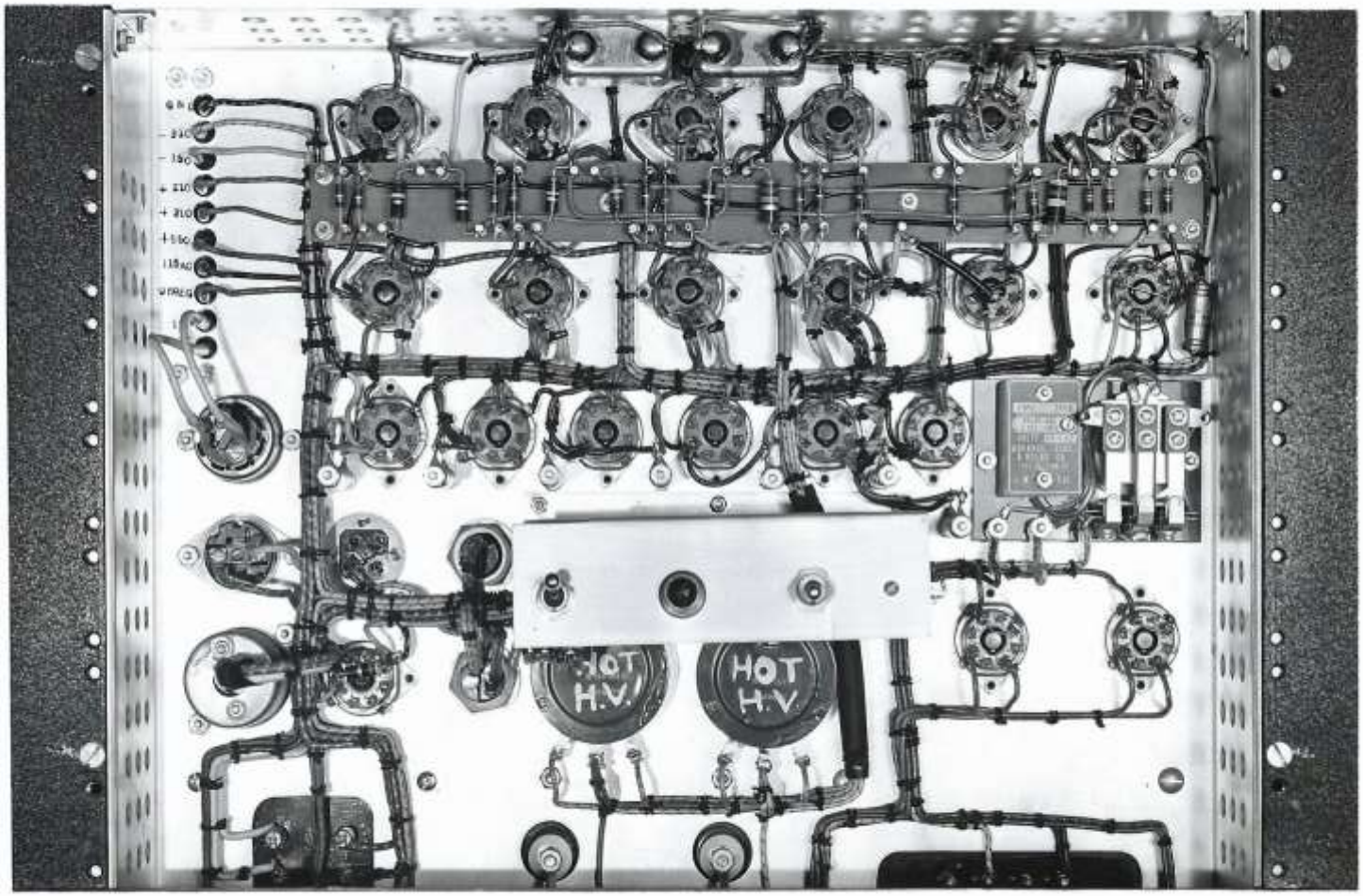
VIDEO AMPLIFIER & BLANKING UNIT (Chassis 1)



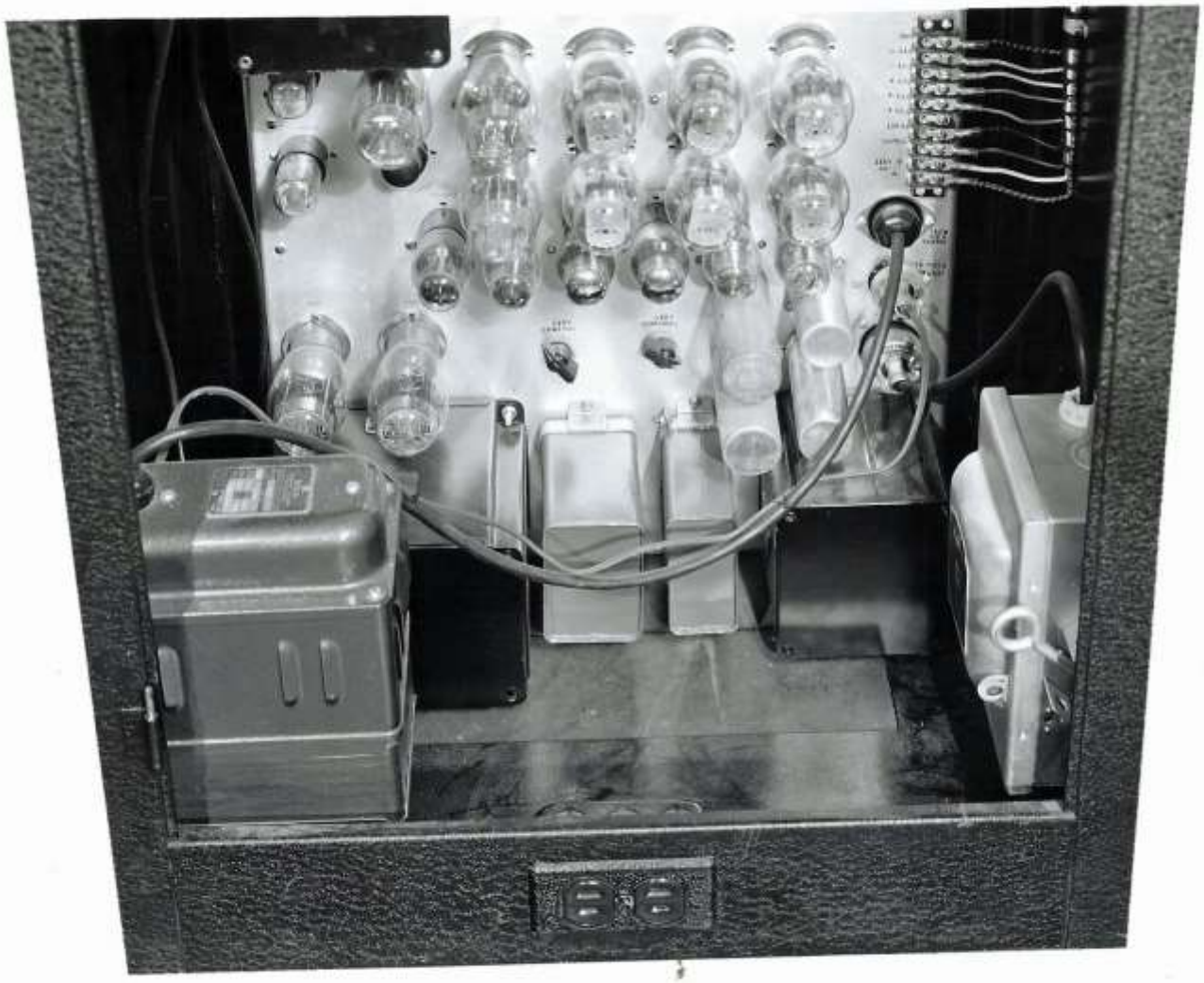
SWEEP UNIT (Chassis 2)



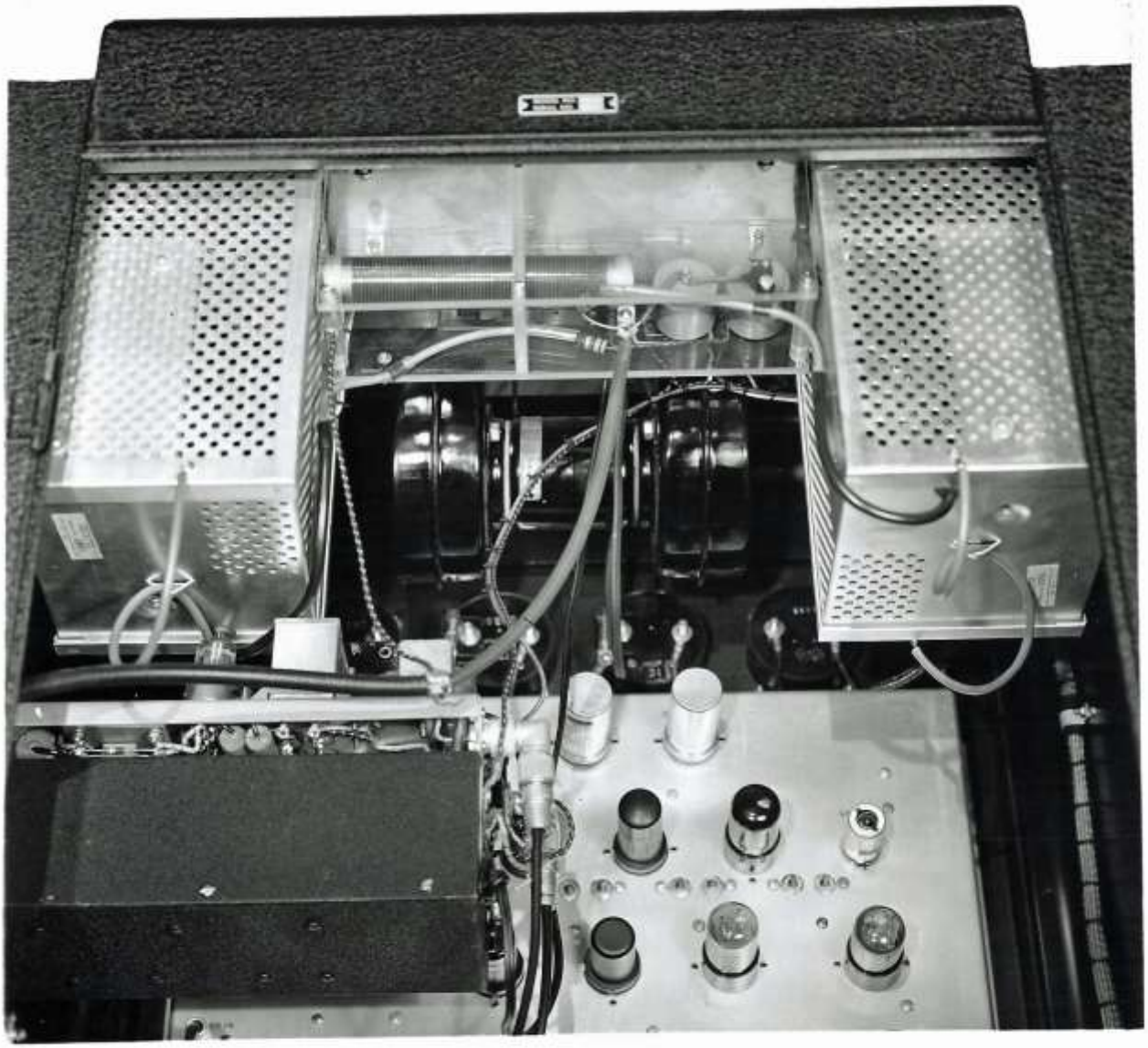
SHUTTER UNIT (Chassis 3)



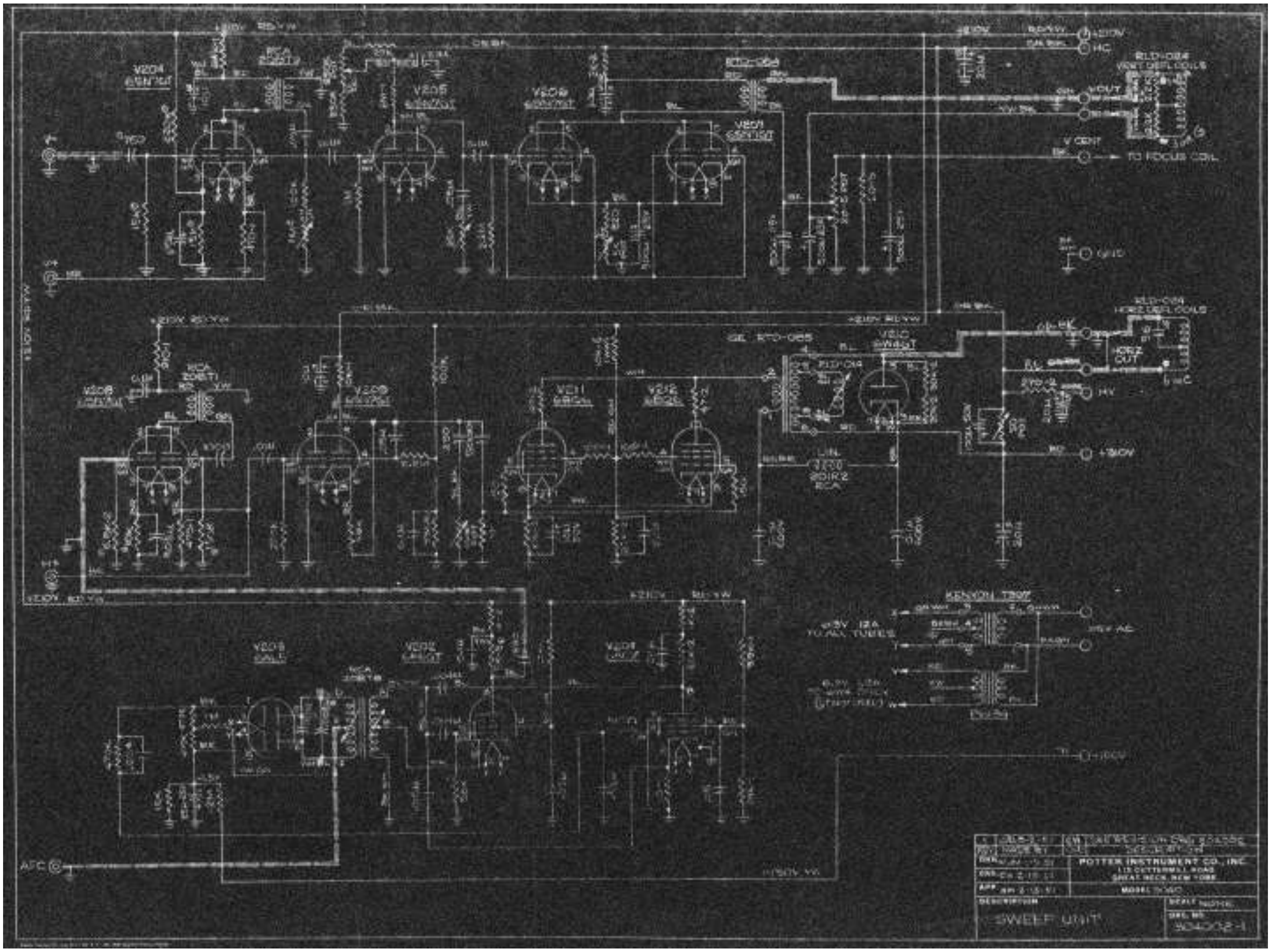
LOW VOLTAGE POWER SUPPLY (Chassis 4)

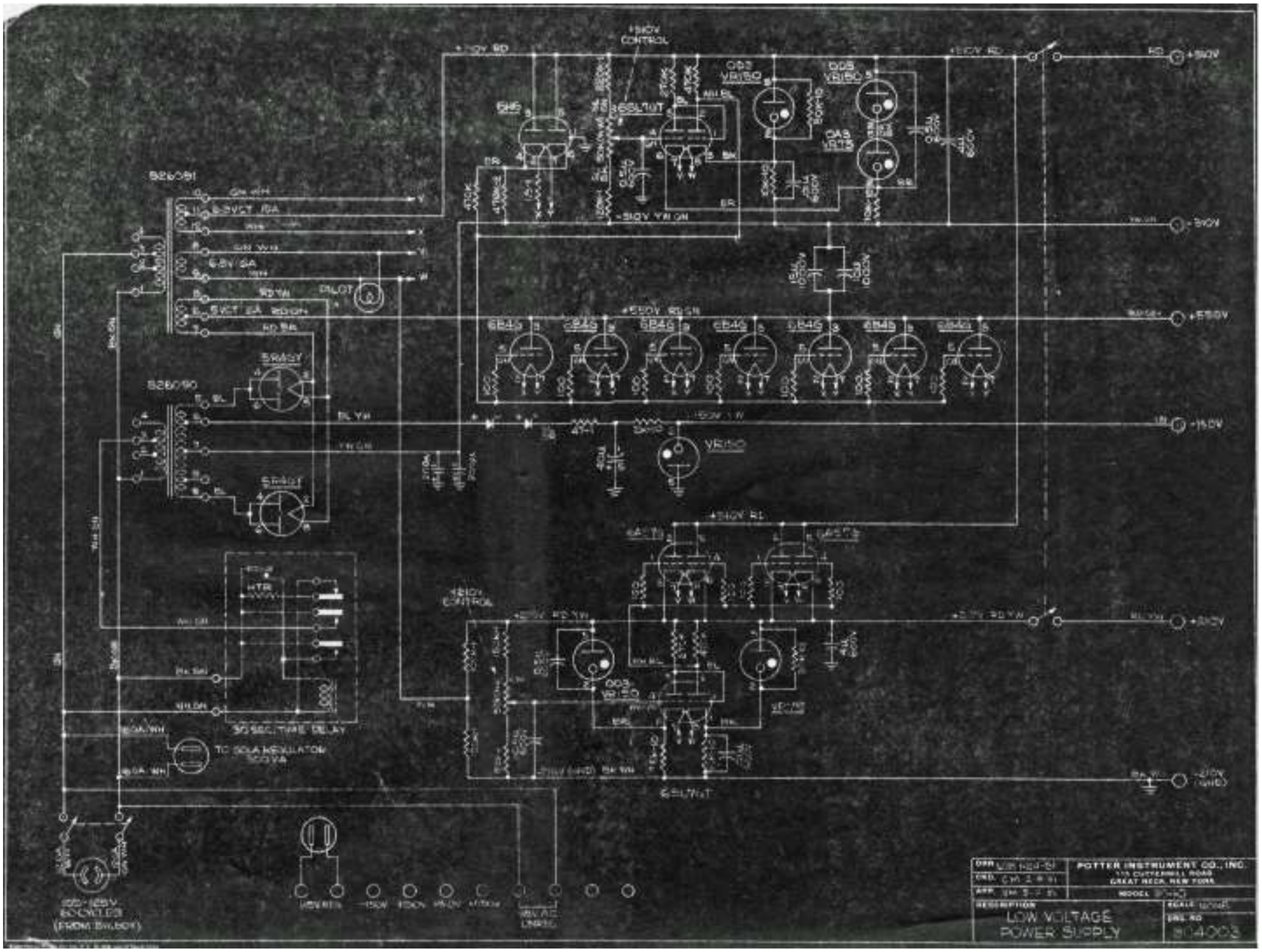


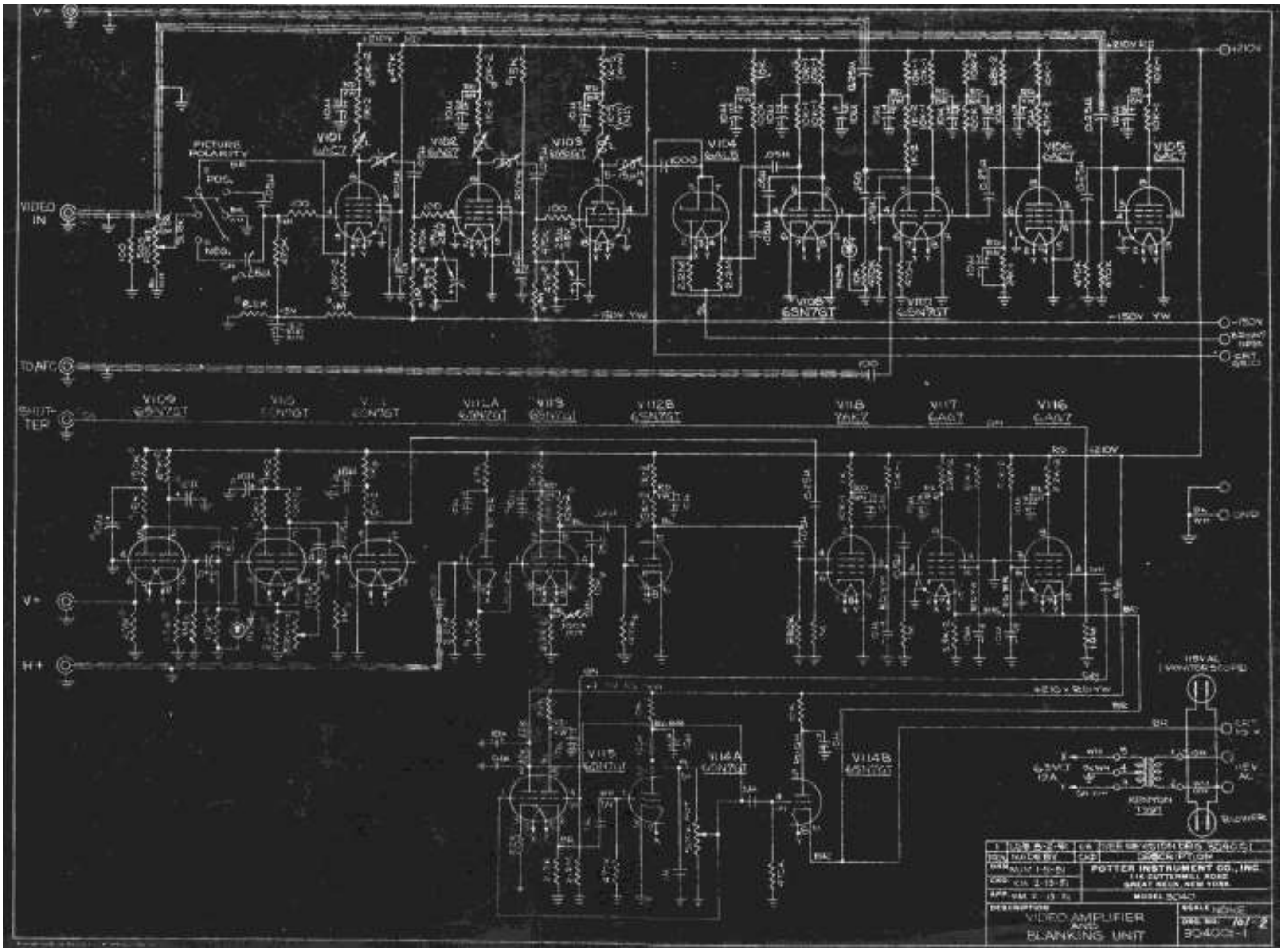
LOW VOLTAGE POWER SUPPLY - Rear View

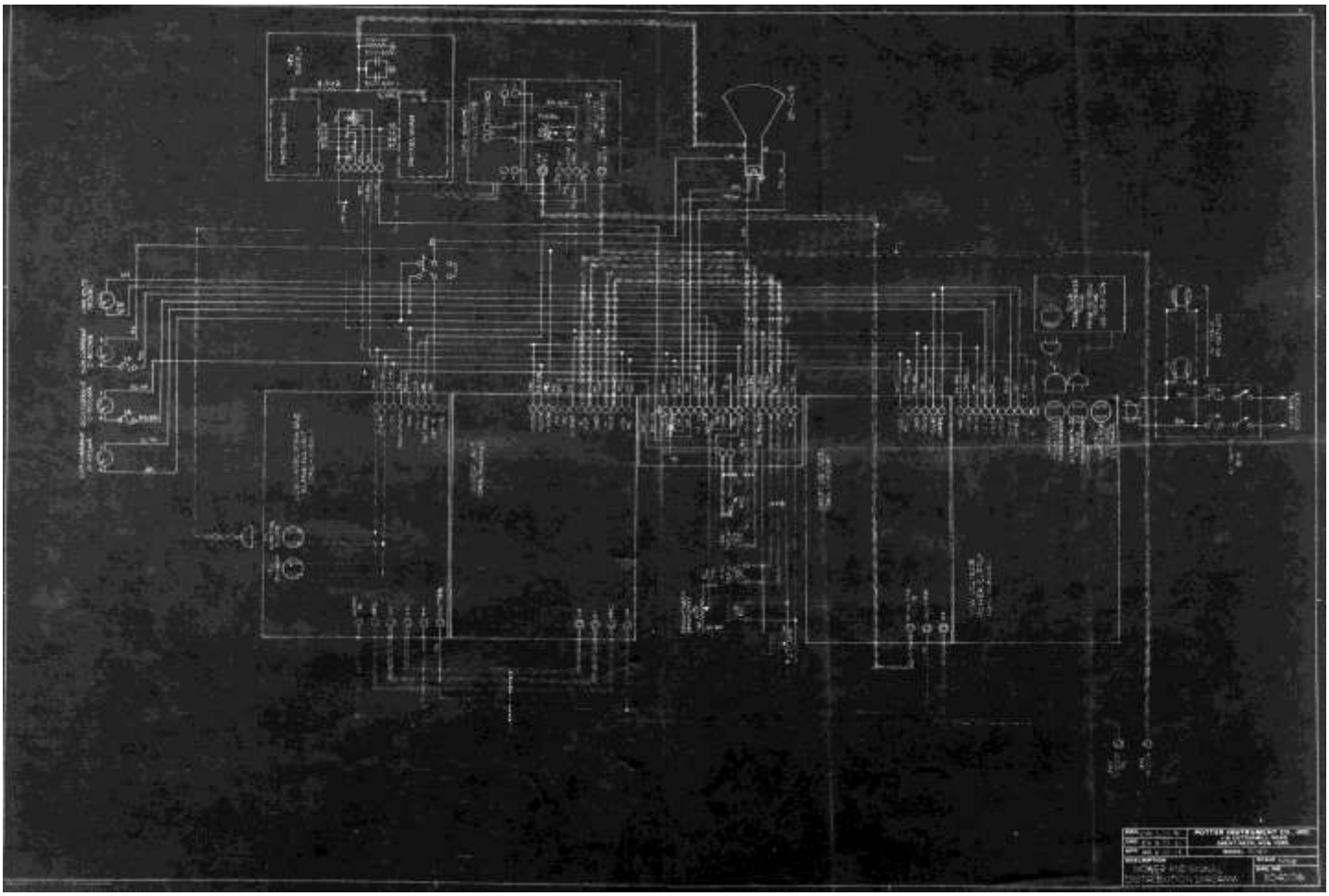


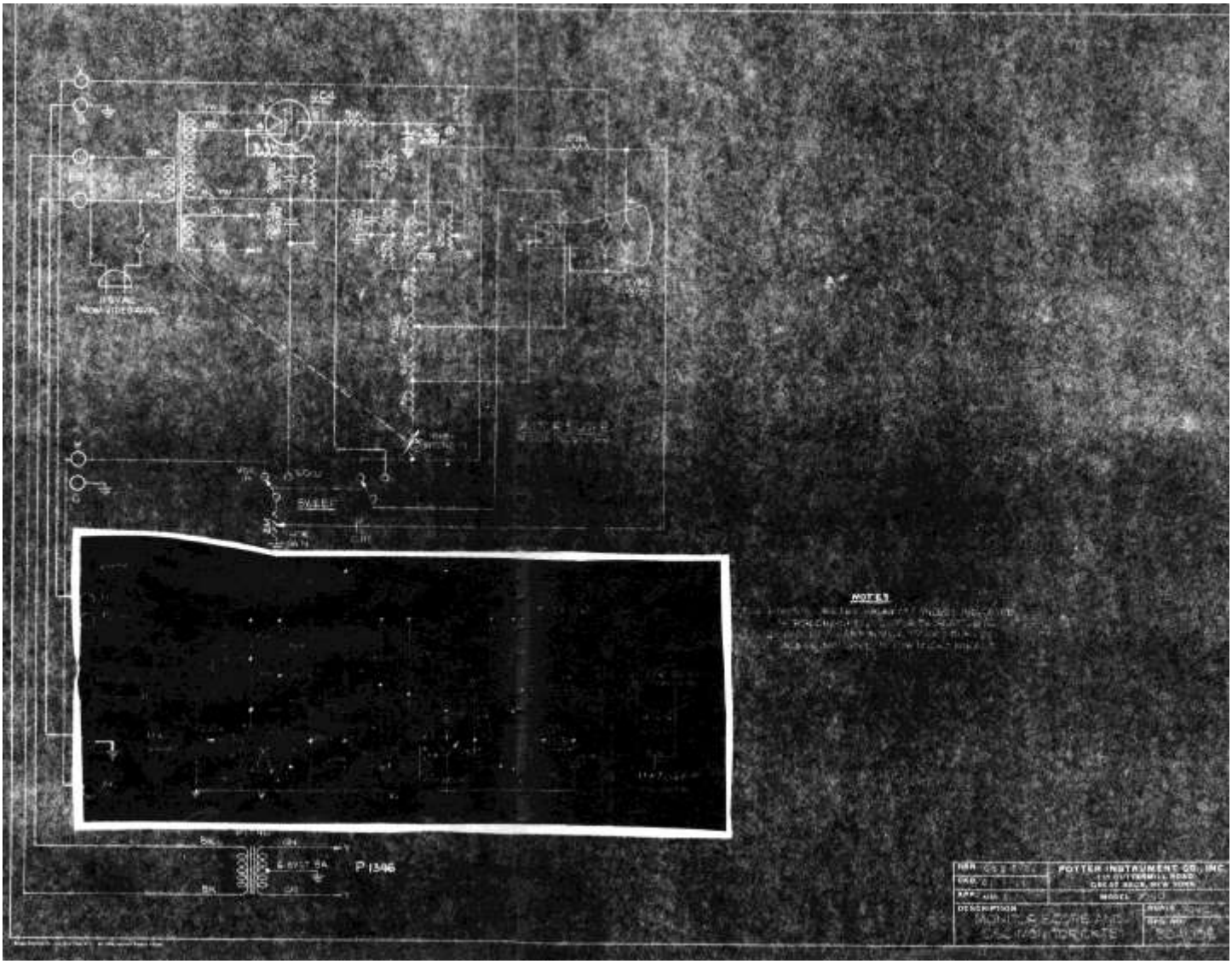
HIGH VOLTAGE POWER SUPPLY & MONITOR SCOPE


V204
6SN7GT
V205
V206
V201
RLD-024
VERT DEFL COILS
V OUT
V CENT
TO FOCUS COIL
RLD-024
HORIZ DEFL COILS
HORIZ OUT
+310V
V208
V209
V211
V212
V210
V203
V202
V201
KENYON T307
AFC
POTTER INSTRUMENT CO., INC.
GREAT NECK, NEW YORK
MODEL
DESCRIPTION
SWEEP UNIT
SCALE
DWG. NO.


+510V CONTROL
OD3 VR150
OA3 VR75
6SL7GT
6H6
5R4GY
6B4G
+550V
+510V
-510V
-150V
+210V
PILOT
HTR
30 SEC. TIME DELAY
TO SOLA REGULATOR
105-125V 60 CYCLES
POTTER INSTRUMENT CO., INC.
GREAT NECK, NEW YORK
MODEL
DESCRIPTION
LOW VOLTAGE
POWER SUPPLY
804003


V-
VIDEO IN
PICTURE POLARITY
POS.
NEG.
V101 6AC7
V102 6AG7
V103 6AG7
V104 6AL5
V108 6SN7GT
V107 6SN7GT
V106 6AG7
V105 6AG7
+210V
-150V
TO AFC
SHUTTER
V109 6SN7GT
V111A 6SN7GT
V112B 6SN7GT
V118 6AK7
V117 6AG7
V116 6AG7
V+
H+
V115 6SN7GT
V114A 6SN7GT
V114B 6SN7GT
6.3V CT 12A
KENYON T321
115V AC (MONITOR SCOPE)
115V AC
BLOWER
POTTER INSTRUMENT CO., INC.
114 CUTTERMILL ROAD
GREAT NECK, NEW YORK
MODEL 3040
DESCRIPTION
VIDEO AMPLIFIER AND BLANKING UNIT
SCALE NONE
30400-1




NOTES
P1346
POTTER INSTRUMENT CO., INC.
DESCRIPTION