UTILITY MONITOR

Type TM-2A, TM-2B

RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N. J.

IB-36076

TYPE TM-2A, TM-2B
UTILITY MONITOR
MI-26145, MI-26298

INSTRUCTIONS

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Radio Corporation of America
RCA Victor Division

Manufactured by
RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT
Camden, New Jersey, U. S. A.

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IB-36076

FIRST AID

WARNING!

Operation of electronic equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside the equipment with voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors, etc. To avoid casualties, always discharge and ground circuits prior to touching them.

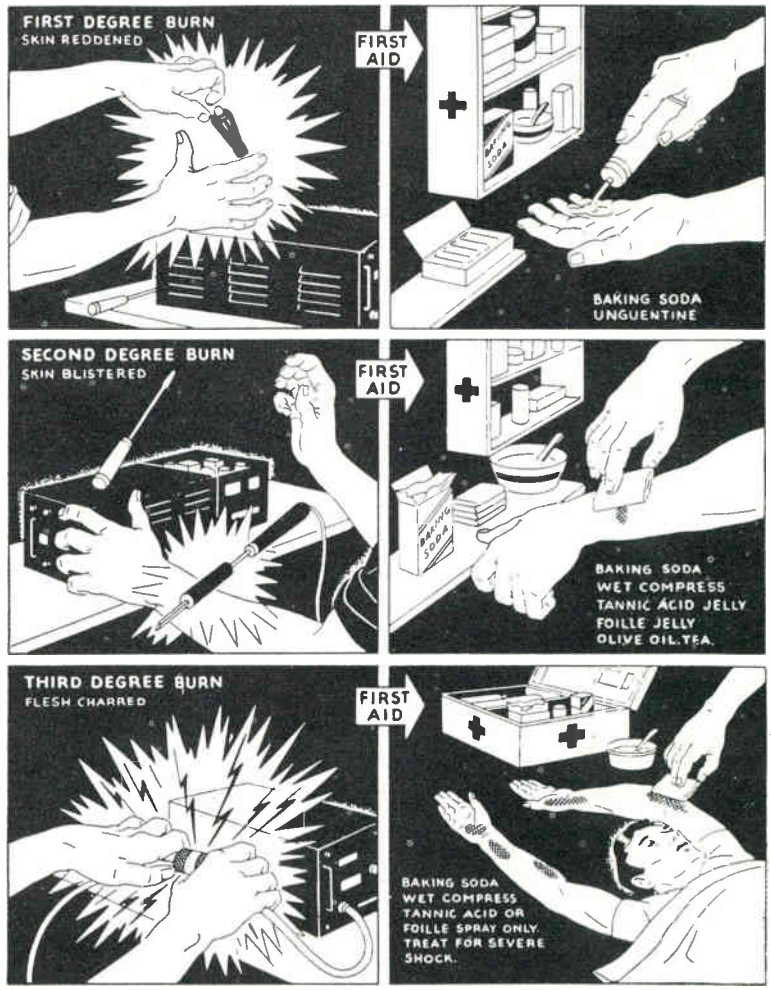
ABOUT FIRST AID

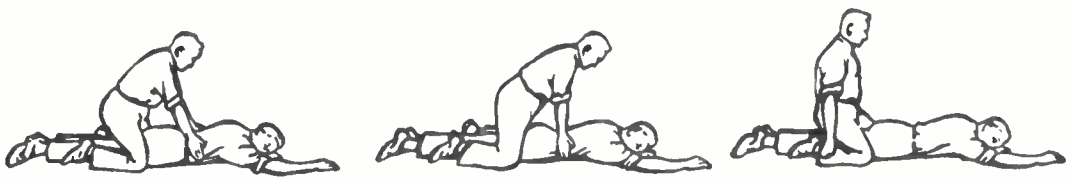
Personnel engaged in the installation, operation and maintenance of this equipment or similar equipment are urged to become familiar with the following rules both **in theory and in the practical application thereof.** It is the duty of every radioman to be prepared to give adequate First Aid and thereby prevent avoidable loss of life.

PRONE-PRESSURE METHOD OF RESUSCITATION

1. PROTECT YOURSELF with dry insulating material.
2. BREAK THE CIRCUIT by opening the power switch or by pulling the victim free of the live conductor.

DON'T TOUCH VICTIM WITH YOUR BARE HANDS UNTIL THE CIRCUIT IS BROKEN.





(A) (B) (C)

3. LAY PATIENT ON STOMACH, one arm extended, the other arm bent at elbow. Turn face outward resting on hand or forearm.
4. REMOVE FALSE TEETH, TOBACCO OR GUM from patient's mouth.
5. KNEEL STRADDLING PATIENTS THIGHS. See (A).
6. PLACE PALMS OF YOUR HANDS ON PATIENT'S BACK with little fingers just touching the lowest ribs.
7. WITH ARMS STRAIGHT, SWING FORWARD gradually bringing the weight of your body to bear upon the patient. See (B).
8. SWING BACKWARD IMMEDIATELY to relieve the pressure. See (C).
9. AFTER TWO SECONDS, SWING FORWARD AGAIN. Repeat twelve to fifteen times per minute.
10. WHILE ARTIFICIAL RESPIRATION IS CONTINUED, HAVE SOMEONE ELSE:
    (a) Loosen patient's clothing.
    (b) Send for doctor.
    (c) Keep patient warm.
11. IF PATIENT STOPS BREATHING, CONTINUE ARTIFICIAL RESPIRATION. Four hours or more may be required.
12. DO NOT GIVE LIQUIDS UNTIL PATIENT IS CONSCIOUS.

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REPLACEMENT PARTS
AND
ENGINEERING SERVICE

When ordering replacement parts, please give symbol, description, and stock number of each item ordered.

The part which will be supplied against an order for a replacement item may not be an exact duplicate of the original part. However, it will be a satisfactory replacement, differing only in minor mechanical or electrical characteristics. Such differences will in no way impair the operation of the equipment.

Replacement parts may be ordered through the local Broadcast representative, his office, or directly from the RCA Replacement Parts Department in Bldg. 60, 19th and Federal Streets, Camden, N. J. Emergency orders may be phoned, telegraphed, or teletyped to RCA Emergency Service, Bldg. 60, Camden, N. J. (Telephone: Woodlawn 3-8000 or Emerson 5-5330.)

Replacement tubes should be ordered from local distributors or the nearest RCA tube warehouse.

DEFECTIVE TUBES

To obtain replacement and/or credit for defective tubes, proceed as follows:

1. Request return authorization from

   Radio Corporation of America
   Tube Adjustment Department
   Harrison, New Jersey

   state the type and quantity of tubes to be returned for examination.

2. When authorization is received, return the tube(s) as directed.

   DO NOT RETURN ANY TUBES UNTIL AUTHORIZATION HAS BEEN RECEIVED.

   The authorization will include information as to how and where the tube(s) should be returned, together with a data sheet which must accompany the return.

3. Replacement tube(s) will not be shipped unless a specific order is placed with

   Radio Corporation of America
   Tube Department
   Harrison, New Jersey

4. Customer will be billed for all tubes ordered. Credit for defective tubes will be made on customer's account.

RCA field engineering service is available at current rates. Requests for field engineering service may be addressed to the local Broadcast Sales engineer or the RCA Service Company, Inc. Communications Service Division, Camden, N. J. Telephone: Gloucester 3-4560 during working hours; emergency service is provided through Woodlawn 3-8000.

TECHNICAL SUMMARY

ELECTRICAL SPECIFICATIONS

Input Power	117 volts, 60 cycles, 175 watts
Frequency Response	Flat +2 db to 6 megacycles
Picture Signal Input Impedance	High
Sync Signal Input Impedance	High
Picture Signal Input Range	0.5 volt peak-to-peak to 4.0 volts peak-to-peak
Sync Signal Input Range	3.5 to 5.0 volts peak-to-peak
Second Anode Voltage	approximately 10.5 KV

TUBE COMPLEMENT

Symbol	Type	Function
V1	6AG7	Video Amplifier
V2	6AG7	Video Output
V3	6SN7GT	Sync Amplifier and Sync Separator
V4A	1/2 6AL5	D. C. Restorer
V4B	1/2 6AL5	Limiter
V5	6J5	Vertical Oscillator
V6	6K6GT	Vertical Output
V7	6SN7GT	Horizontal Oscillator and Horizontal Oscillator Control
V8	6BG6G	Horizontal Output
V9	1B3GT	High Voltage Rectifier
V10	6W4GT	Damper
V11	5U4G	Power Rectifier

One of the following tubes is supplied in a separate package.

V12	RCA 10BP4-A	Kinescope
V12	RCA 12LP4-A	Kinescope

MECHANICAL SPECIFICATIONS

	12 1/2 Inch Monitor	10 Inch Monitor	12 1/2 Inch Monitor With Cabinet
Length	19-1/2" (Approx.)	18-5/8"	22-7/8"
Width	12"	12"	16"
Height	14-1/2"	12-5/16"	17-1/2"
Weight	47 lbs.	45 lbs.	55 lbs. (Approx.)
Finish	--	--	Gray fabricoid with dark umber gray trimming

EQUIPMENT

MI-26145

TM-2A Utility Monitor Chassis, including tubes in place, except kinescope (10 or 12 1/2 inch) which is packed separately.

MI-26298

TM-2B Utility Monitor and cabinet for 12 1/2 inch kinescope including tubes in place, except kinescope, which is packed separately.

The following accessories or spares may be obtained from RCA on separate order.

Description	RCA Reference
Cabinet for TM-2A Utility Monitor chassis (for use with 12 1/2 inch tube only)	MI-26519
Complete tube complement (spares) including 10 inch kinescope (10BP4-A)	MI-26699-1
Complete tube complement (spares) including 12 1/2 inch kinescope (12LP4-A)	MI-26699-2
Speaker kit for monitor cabinet	MI-26533
Rack mounting adapter kit (for Monitor with 10" kinescope)	MI-26524
Rack mounting adapter kit (for Monitor with 12 1/2" kinescope)	MI-26536
Monitor mounting kit for Program Console	MI-26534
10 inch kinescope	10BP4-A
12 1/2 inch kinescope	12LP4-A

DESCRIPTION

The Type TM-2A Utility Monitor is a general purpose, self contained, television picture monitor. Mounting kits, or a cabinet are available (on separate order) so that the TM-2A Monitor Chassis may be mounted as follows:

1. In the MI-26975 Program Console with a 10 inch kinescope.
2. In a standard rack with a 10 or 12 1/2 inch kinescope.
3. In an MI-26519 cabinet with a 12 1/2 inch kinescope.

The monitor may be mounted in a vertical or horizontal position. A bracket which supports the signal input coaxial connectors may be mounted either on the tube side or the rear apron of the chassis. This facilitates signal input connections regardless of the mounting position of the monitor.

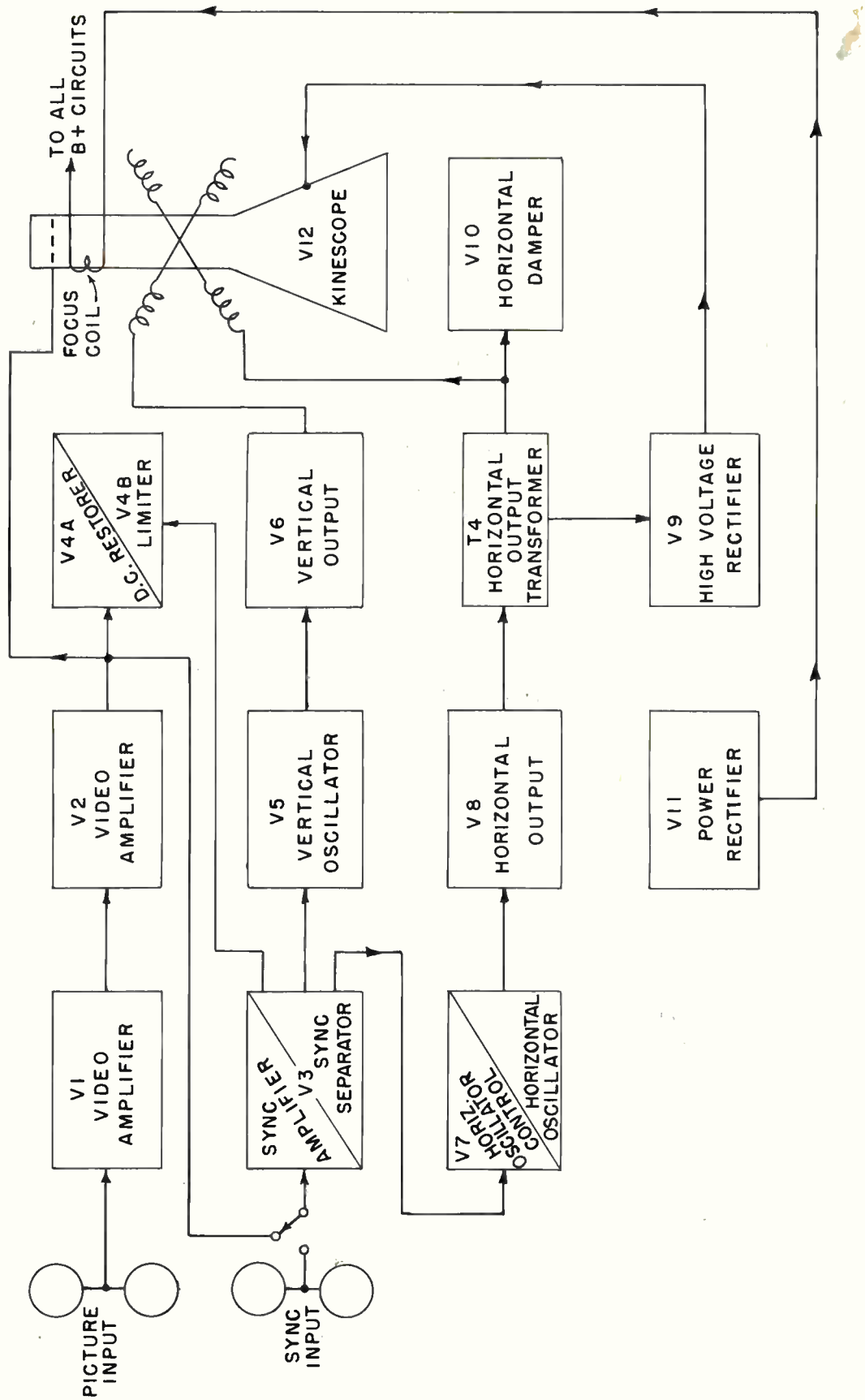

Figure 1. - Utility Monitor, Block Diagram

A picture inverter switch is provided so that the picture can be viewed either directly or mirror reflected.

The TM-2A will operate with separate picture and sync signals, or with a composite signal input. A link type switch at the rear of the chassis provides connections for the selected type of input signal. Picture and sync inputs are provided for by standard coaxial fittings, each input having two paralleled connectors to permit bridging the monitor or terminating the cable.

All the operating controls are mounted on a removable front panel and are connected to the unit by a cable approximately 32 inches long. This enables the controls to be mounted remotely, such as in the program console. The operating controls are: V (vertical hold), B (brightness), F (focus), C (contrast), and H (horizontal hold).

The circuits of the monitor have been designed in accordance with standard television practice. Horizontal a. f. c. circuits and a stable vertical blocking oscillator provide excellent sync stability. The high voltage circuit is of the pulse type. The horizontal deflection circuit is a high efficiency type using damper rectification which supplies boosted B+ voltage. The two stage video amplifier has a high input impedance and has a frequency response which extends to six megacycles.

The A. C. line and the horizontal deflection circuit are protected by fuses. The 117 volt A. C. line fuse is accessible from the top of the chassis. The horizontal deflection circuit fuse is mounted on clips inside the high-voltage compartment.

INSTALLATION

The Utility Monitor is shipped complete with all tubes in place except the kinescope (RCA 10BP4-A or RCA 12LP4-A). The kinescope is shipped in a separate carton. Carefully remove the monitor chassis from the shipping package, remove all packing material then inspect the unit for loose parts and any damage that might have occurred in transit.

CHASSIS REMOVAL, OR INSTALLATION

To remove the monitor chassis from its cabinet proceed as follows:

1. Remove the knobs.
2. Remove the six screws located on each side of the base (at the bottom), then lift the cabinet hood off its base. This makes the tube side of the monitor chassis accessible.
3. For access to the wiring side of the monitor chassis, remove the four screws holding the chassis to the cabinet base.
4. To reinstall the chassis into its cabinet reverse the procedure just described.

INSTALLING THE KINESCOPE

CAUTION: DO NOT OPEN THE SHIPPING CARTON, INSTALL, REMOVE, OR HANDLE THE KINESCOPE TUBE IN ANY MANNER UNLESS SHATTERPROOF GOGGLES AND HEAVY GLOVES ARE WORN. PERSONS NOT SO EQUIPPED SHOULD REMAIN AT A SAFE DISTANCE WHILE THE TUBE IS BEING HANDLED. KEEP THE TUBE AWAY FROM THE BODY WHILE HANDLING.

The kinescope bulb is highly evacuated and, in view of its large surface, is subjected to considerable air pressure. For this reason, it is important that it be handled with extreme care.

The large end of the tube, particularly that part at the edge of the viewing screen, must be neither scratched, nor subjected to shocks or more than moderate mechanical pressure at any time. If the bulb fails to slip smoothly into place or any fittings stick or bind, investigate and remove the cause of the trouble. Do not force the tube or fittings.

All RCA kinescope tubes are shipped in special cartons and should always be left in the carton until ready for installation in the equipment. Keep the carton for future use.

To install a kinescope in the TM-2A Monitor Chassis, proceed as follows:

Note: Steps 1, 2, 3, and 4 apply only to the initial installation of a kinescope, or when it is desired to replace an existing kinescope with one of a different size.

1. Turn the monitor chassis so that it is resting on its left side with the power transformer towards the rear.

2. Measure the height of the adjustable bracket that supports the yoke and focus coil assembly. This measurement should be approximately 4 11/16 inches if a 10 inch tube is to be used. If a 12 1/2 inch tube is to be used the bracket height should be approximately 5 7/8 inches.

To change the height of the bracket, remove the screws which attach the bracket to the chassis and rotate the bracket to a position which provides access to the bracket height adjusting screws, then adjust the bracket height for the size of kinescope to be used.

3. Turn the chassis so that the tube side is up.

4. Attach the flat end of the kinescope holding strap (the end without the L bracket) to the hinged bracket on the left hand side of the chassis (as viewed from the front). The strap should be attached so that when it is perpendicular to the chassis, the rivet heads on the L bracket are on the right hand side. When using a 10 inch kinescope the two holes farthest from the end of the strap should be used. For use with a 12 1/2 inch kinescope, attach the strap with one screw, using the hole at the extreme end of the strap and the hole on the hinged bracket that is farthest from the chassis.

5. Loosen the two kinescope cushion adjustment wing screws, and slide the yoke and focus coil assembly all the way to the rear. See Figure 4.

6. Remove the kinescope from its carton, carefully slide the neck of the tube through the deflection and focus coils until the face of the tube rests on the rubber cushions on the chassis. The front face of the kinescope should not protrude beyond the control panel.

7. Rotate the tube so that the second anode contact is up and about 30 degrees to the left of center when viewed from the front, then connect the second anode lead to the tube.

8. Remove the wing nut from the hinged bolt at the right hand side of the chassis. Place the kinescope holding strap around the front edge of the tube, insert the hinged bolt through the hole in the L bracket and replace the wing nut. Hold the strap near the edge of the tube and tighten the wing nut.

CAUTION: THE STRAP SHOULD EXERT ONLY A MILD PRESSURE ON THE TUBE. DO NOT MAKE THE STRAP TOO TIGHT.

9. Move the yoke assembly forward until the kinescope cushion presses against the bell of the tube, then tighten the two wing screws.

10. Carefully slip the ion trap over the neck of the tube with the larger magnet towards the rear of the chassis and approximately over the two projections on the kinescope gun (ion trap flags).

11. Slip the socket into place on the tube pins.

This completes the installation of the kinescope. Should it be necessary to remove the tube for replacement, the procedure just described may be reversed. When the kinescope is replaced, the ion trap magnet requires readjustment as described under "Ion Trap Magnet Adjustment."

SIGNAL INPUT CONNECTIONS

Four input connectors and a sync selector switch (link type) are located at the rear of the chassis. Connectors J1 and J2 are for picture input, J3 and J4 are for sync input. Each pair of connectors is internally wired in parallel. Both inputs are of the high impedance type. See Figure 7.

When a composite signal input is used, the sync selector link should be placed in the INT SYNC position.

When using a picture signal input (without sync), connect a sync signal to J3 or J4, and place the sync selector link in the EXT SYNC position.

The second connector for each input may be used for bridging or terminating the line (if necessary). Two 75 ohm termination resistors are supplied with the monitor chassis.

PRELIMINARY TESTS AND ADJUSTMENTS

The monitor should be checked for operation, and preliminary adjustments made, before installation in a console, rack, or cabinet.

WARNING: THE MONITOR UTILIZES VOLTAGES THAT COULD PROVE FATAL IF CONTACTED BY THE HUMAN BODY. OPERATING PERSONNEL MUST TAKE EVERY PRECAUTION TO AVOID COMING IN CONTACT WITH EXPOSED CURRENT-CARRYING PARTS WHILE MAKING ADJUSTMENTS. BE SURE THE CHASSIS IS CONNECTED TO A GOOD GROUND. ALL SAFETY PRECAUTIONS AND REGULATIONS MUST BE OBSERVED.

Ion Trap Magnet Adjustment

To adjust the ion trap magnet proceed as follows:

1. Be certain that the larger magnet is towards the rear of the chassis and approximately over the two L shaped protrusions on the kinescope gun structure (ion trap flags).

2. Apply power to the monitor.

3. Turn the B (brightness) control to its maximum clockwise position. Allow two minutes for the monitor to warm up.

4. Adjust the magnet by moving it forward or backward and at the same time rotating it slightly around the neck of the tube until a position is found which produces the brightest raster on the screen.

5. Turn the brightness control counterclockwise until the raster is slightly above average brillance. Adjust the F (focus) control until the line structure of the raster is clearly visible.

6. Readjust the ion trap magnet for maximum raster brilliance. The final adjustment should be made with the B control at the maximum position with which good line focus can be maintained.

It is important that the ion trap be adjusted for maximum brilliance of the screen.

Operational Check

To check the operation of the monitor, proceed as follows:

1. Perform the signal connections as previously described.

2. Connect the power plug to an 105-125 volt, 60 cycle source.

3. Turn the B (brightness) control clockwise until a click is heard. Allow the monitor two minutes to warm up.

4. Adjust the ion trap magnet as described in "Ion Trap Magnet Adjustment."

5. Turn the V (vertical) and H (horizontal) controls to the center of their rotation. Turn the C (contrast) control to its maximum counterclockwise position.

6. Turn the B control clockwise until a raster just appears on the kinescope screen, then turn the C control until fragments of a picture appear.

7. Adjust the V control until the pattern stops vertical movement.

8. Adjust the H control until a picture is obtained. If the picture is inverted, operate the PICT INVERTER switch to its opposite position.

9. Adjust the B, C and F (focus) controls for a pleasing picture.

Deflection Yoke Adjustment

If the lines of the raster are not horizontal, loosen the deflection yoke adjustment wing screw (located on the top center of the yoke assembly as shown on Figure 4), and rotate the yoke until the desired condition is obtained, then tighten the wing screw.

Centering

Centering is obtained by mechanically orienting the focus coil with the three compression spring adjustment screws located at the rear of the yoke and focus coil mounting assembly as shown in Figure 4. Center the picture on the screen by adjustment of these screws. The focus coil should be concentric around the neck of the kinescope to prevent curvature of the raster.

Focus Coil Adjustments

If, after making the centering adjustments described in the previous paragraph, a corner of the picture is shadowed, it will be necessary to loosen the focus coil mounting screws (shown in Figure 4) and change the position of the coil to eliminate the shadow. Recenter the picture by adjustment of the centering screws. Recheck the ion trap magnet adjustment.

Height and Vertical Linearity

Adjust the HEIGHT control, R29, so that the picture is of the desired height. Adjust the VERT LIN control, R32, for the best vertical linearity. Since there is interaction between these controls, adjustment of either will require readjustment of the other.

Width, Horizontal Drive and Linearity

1. Rotate the DRIVE adjusting capacitor screw, C20B, to the position at which further rotation causes the left side of the picture to stretch.

2. Adjust the HOR LIN (horizontal linearity) control, L6, to provide the best linearity.

3. Adjust the WIDTH controls, L10 and L7, to the desired picture width.

Note: If the maximum obtainable width is insufficient, disconnect the power plug, discharge the B+ and high voltage capacitors, then solder a jumper across the width coil, L10, (WIDTH A). Remove an existing jumper on L10 if the minimum width is too great.

Adjustments of the horizontal DRIVE control, C20B, affect horizontal oscillator hold and locking range. Check the horizontal oscillator alignment.

HORIZONTAL OSCILLATOR ALIGNMENT CHECK

To check the alignment of the horizontal oscillator, proceed as follows:

1. Check the position of the link on the sync switch. (See "Signal Input Connections").

2. Turn the H control to the extreme counterclockwise position. The picture should remain in horizontal sync.

3. Momentarily remove the sync signal, then reconnect it. Normally the picture will be out of sync.

4. Turn the H control clockwise slowly. The number of diagonal block bars will be gradually reduced, and when only three bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. At the extreme clockwise position, the picture should be out of sync and should show one vertical or diagonal black bar in the raster.

If the monitor does not pass the foregoing checks, or the picture is horizontally unstable refer to "Horizontal Oscillator Adjustment" in the Maintenance Section.

PLACEMENT OF INPUT CONNECTORS

The bracket on which the four input connectors, J1 to J4, are mounted, may be attached either to the tube side or the rear apron of the chassis. Attach this bracket in the position best suited to the individual installation.

Having completed all the adjustments, the monitor is now ready for installation into a program console, rack, or cabinet.

OPERATION

When in use the Utility Monitor requires very little adjustment on the part of the operator. To operate the monitor proceed as follows:

1. Turn the B (brightness) control in a clockwise direction until a click is heard. Allow the monitor to warm up for a few minutes.

2. Turn the C (contrast) control maximum counterclockwise, then turn the B control clockwise until a faint brilliance is observed on the screen.

3. Turn the C control clockwise until a picture or picture fragments are observed on the screen.

4. Adjust the V (vertical hold) control until the picture stops vertical movement.

5. Adjust the H (horizontal hold) control until the picture is synchronized and centered in the horizontal direction.

6. Adjust the B, F (focus), and C (controls) for a pleasing picture. The F control should be adjusted so that the lines of the raster are in sharp focus.

This completes the operation of the monitor. To shut the monitor power off, turn the B control counterclockwise until a click is heard. When operation is resumed, it should only be necessary to operate the B control, although slight adjustments of the C and F controls may be required.

MAINTENANCE

CAUTION: The voltages employed in this equipment are sufficiently high to endanger life. Every reasonable precaution has been observed to safeguard maintenance personnel. Power should be removed completely before changing tubes or making internal repairs.

Make certain power is off and capacitors are discharged before touching any component. Be very careful when touching tubes. A serious burn can result from carelessly touching tubes that have been in operation for a considerable length of time.

The Utility Monitor has been conservatively designed for continuous operation. With ordinary care a minimum of service will be required to keep the equipment in satisfactory operation. To avoid interruptions due to equipment failure during operation, a regular schedule of inspection should be established.

The monitor should be cleaned and dusted thoroughly during inspection periods. All cable connections should be checked periodically and tightened when necessary. Make certain all ground connections are tight.

When fuses are renewed, the fuse cartridge caps should be clean to insure good contact and to prevent fuse heating due to contact resistance.

Periodically check all tubes in the equipment, recording the tube tester readings on previously prepared forms. As far as possible, tube failure should be anticipated by keeping a log of tube life. Spare tubes should be available for immediate use in the event of an obvious failure.

TROUBLE SHOOTING

When faulty monitor operation occurs, check the fuses (one fuse is located in the high-voltage compartment), tubes, power and signal inputs. If these are found to be normal, observation of the kinescope screen may help in determining the probable circuit at fault. When there is a total lack of illumination on the screen, check the high voltage circuits.

The voltage and waveform chart, Figure 3, and the schematic diagram, Figure 7, will aid in isolating a defective component. Figures 4, 5, and 6 show the location of the component parts on the chassis.

HORIZONTAL OSCILLATOR ADJUSTMENT, METHOD I

Prior to performing any horizontal oscillator adjustments, place the monitor in operating condition and perform the sync check as described in the following paragraph.

Sync Check

To determine whether the horizontal oscillator is receiving the proper sync signal, remove the oscillator tube, V7, then check the waveform at pin 1 of the socket, X7, (see Figure 3 for the correct waveform). Replace the oscillator tube.

Horizontal Frequency Adjustment

To adjust the horizontal frequency transformer, T3, proceed as follows:

1. Turn the H control to the extreme clockwise position.

2. Adjust the T3 adjustment (under the chassis) until the picture is just out of sync and the horizontal blanking appears as a vertical or diagonal black bar in the raster, then adjust the horizontal lock-in range.

Horizontal Lock-in Range Adjustment

To adjust the horizontal lock-in range proceed as follows:

1. Set the H control to the full counterclockwise position. Momentarily remove the sync signal.

2. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

3. If more than three bars are present just before the picture pulls into sync, adjust the horizontal lock-in range trimmer, C20A, slightly clockwise. If less than three bars are present, adjust C20A slightly counterclockwise.

4. Turn the picture control counterclockwise, momentarily remove the sync signal and recheck the number of bars present at the pull in point. Repeat steps 3 and 4 until three bars are present.

5. Repeat the horizontal oscillator frequency and horizontal lock-in range adjustments until the conditions specified under each are fulfilled. When the H control operates as outlined under "Check of Horizontal Alignment" (in the Maintenance Section of this book), the horizontal oscillator is properly adjusted. If it is impossible to sync the picture at this point and the sync voltage at socket number 7 pin 1 is correct, it will be necessary to adjust the horizontal oscillator by Method II which follows.

HORIZONTAL OSCILLATOR ADJUSTMENT, METHOD II

Horizontal Frequency Adjustment

1. Check the sync signal as described for Method I. (Omit this step if the presence of sync at the oscillator grid has already been established).

2. With a clip lead, short circuit the coil between terminals C and D of the horizontal oscillator transformer, T3.

3. Turn the H control to the extreme clockwise position.

4. Adjust the T3 frequency adjustment (under the chassis) so that the picture is just out of sync and the horizontal blanking appears in the picture as a vertical bar. (The position of the bar is unimportant.)

5. Turn the H control approximately one quarter of a turn from the extreme clockwise position and examine the width and linearity of the picture. If picture width or linearity is incorrect, adjust the horizontal drive trimmer, C20B, the width controls, L6 and L10, and the linearity control, L111, until the picture is correct. If any of the three controls just mentioned needed adjustment, repeat steps 3 and 4.

Horizontal Locking Range Adjustment

1. Turn the horizontal hold control fully counterclockwise.

2. Momentarily remove the sync signal.

3. Slowly turn the H control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

4. If more than nine bars are present just before the picture pulls into sync, adjust the horizontal lock-in trimmer, C20A, slightly clockwise. If less than seven bars are present, adjust C20A slightly counterclockwise.

5. Turn the H control counterclockwise, momentarily remove the signal then recheck the number of bars present at the pull in point. Repeat the procedure until seven to nine bars are present.

6. Remove the shorting clip from terminals C and D of T3.

Horizontal Oscillator Waveform Adjustment

1. Turn the H control to the extreme clockwise position.

2. With a thin fibre screwdriver, adjust the oscillator waveform adjustment core of T3 (on the outside of the chassis) until the horizontal blanking bar appears in the raster.

3. Connect the low capacity probe of an oscilloscope to terminal C of T3.

4. Turn the horizontal hold control one quarter turn from the clockwise position so that the picture is in sync. The pattern on the oscilloscope should be as shown in Figure 2.

5. Adjust the Oscillator Waveform Adjustment Core of T3 (on the outside of the chassis) until the two peaks of the waveform are at the same height. See Figure 2C. During this adjustment, the picture must be kept in sync by readjusting the H control if necessary.

6. Remove the oscilloscope lead and check the adjustment of the oscillator as explained in the following paragraphs.

Check of Horizontal Oscillator Adjustment

1. Set the H control to the full counterclockwise position.

2. Momentarily remove the signal, then slowly turn the H control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync. If three bars are present, no further adjustments are necessary.

3. If more than three bars are present just before the picture pulls into sync, adjust the horizontal lock-in trimmer C20A slightly clockwise. If less than three bars are present, adjust C20A slightly counterclockwise.

4. Turn the H control maximum counterclockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point.

5. Repeat steps 3 and 4 until three bars are present.

6. Turn the H control to the maximum clockwise position. The picture should be just out of sync to the extent that the horizontal blanking bar appears as a single vertical or diagonal bar in the picture. Adjust the T3 Frequency Adjustment until this condition is fulfilled.

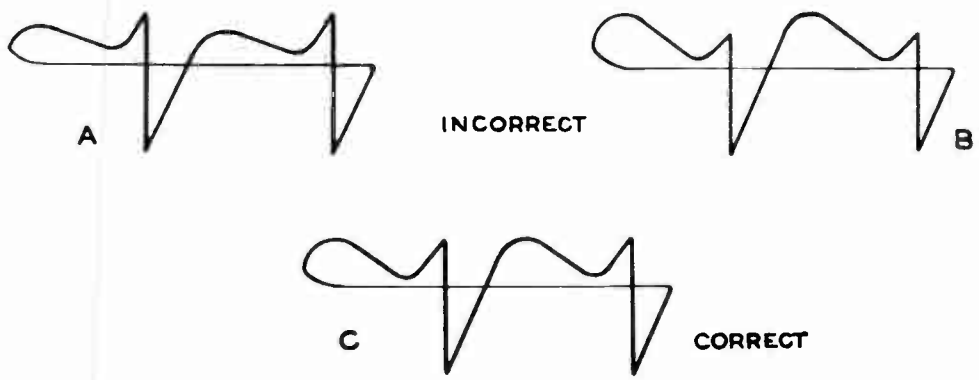

Figure 2. - Horizontal Oscillator Adjustment Waveforms

TYPICAL VOLTAGES AND WAVEFORMS

TUBE			GRID				PLATE				CATHODE				SCREEN	
			Voltage				Voltage				Voltage				Voltage	
Symbol	RCA Type	Function	Pin	DC	AC	Waveform	Pin	DC	AC	Waveform	Pin	DC	AC	Waveform	Pin	DC
V1	6AG7	Video Amp	4	0	2.0		8	255	25		5	10	0		6	225
V2	6AG7	Video Amp	4	0	25		8	260	96		5	7.5	18		6	220
V3A	$\frac{1}{2}$ 6SN7GT	Sync Amp	1	-2.9	24	*	2	135	150	*	3	0	0		-	-
V3B	$\frac{1}{2}$ 6SN7GT	Sync Sep	4	-100	125	*	5	300	0		6	1.6	15	*	-	-
V4A	$\frac{1}{2}$ 6AL5	DC Res	-	-	-		2	0	24	*	5	40	96	*	-	-
V4B	$\frac{1}{2}$ 6AL5	Limiter	-	-	-		7	-100	125	*	1	0	0		-	-
V5	6J5	Vert Osc	5	-50	650	*	3	160	160	*	8	0	0		-	-
V6	6K6GT	Vert Output	5	-0.1	140	*	3	310	750	*	8	38	0		4	310
V7A	$\frac{1}{2}$ 6SN7	Hor Osc Control	1	-7	22		2	160	0		3	9.5	0		-	-
V7B	$\frac{1}{2}$ 6SN7	Hor Osc	4	-60	480		5	195	250		6	0	0		-	-
V8	6BG6	Hor Output	5	-12	49		Cap			Do not Measure	3	8.7	7.0		8	295
V9	1B3GT	H.V. Rectifier	-	-	-		Cap			Do not Measure	2&7	10.5 KV			-	-
V10	6W4GT	Damper	-	-	-		5			Do not Measure	3	500	100		-	-
V11	5U4G	Power Rectifier	-	-	-		4&6	0	335 RMS		2&8	380	11		-	-
V12	10BP4A or 12LP4A	Kinescope	2	49	96	*	Cap	10.5 KV		Average Brightness	11	100	0		10	485

Input Signal 2.0 V p-p composite, average brightness and contrast on kine.
All dc voltages measured to ground with RCA VoltOhmyst, Jr.
Voltages used; line 115 V ac
* Peak-to-peak, 60 cycle sine-wave sweep

Figure 3. Utility Monitor, Typical Voltages and Waveforms

PARTS LIST

For ordering information see page 4

UTILITY MONITOR

Symbol No.	Description	Drawing No.	Stock No.
C1	Capacitor, 0.47 mfd ±20%, 200 volts	C-735715-33	73787
C2	Capacitor, 4 sections - c/o C2A/B/C/D	B-442900-53	93484
C2A	Capacitor, 80 mfd, 50 volts (Part of C2)		
C2B	Capacitor, 20 mfd, 450 volts (Part of C2)		
C2C	Capacitor, 10 mfd, 450 volts (Part of C2)		
C2D	Capacitor, 40 mfd, 450 volts (Part of C2)		
C3	Not Used		
C4	Capacitor, 0.047 mfd ±20%, 600 volts	C-735715-221	73800
C5	Capacitor, 270 mmf ±10%, 500 volts	P-727856-133	53644
C6	Capacitor, 4 sections - c/o C6A/B/C/D, same as C2		
C6A	Capacitor, 20 mfd, 450 volts (Part of C6)		
C6B	Capacitor, 80 mfd, 50 volts (Part of C6)		
C6C	Capacitor, 10 mfd, 450 volts (Part of C6)		
C6D	Capacitor, 40 mfd, 450 volts (Part of C6)		
C7, C8	Capacitor, same as C4		
C9	Capacitor, 0.1 mfd ±20%, 400 volts	C-735715-125	73551
C10	Capacitor, 0.047 mfd ±20%, 400 volts	C-735715-121	73553
C11	Capacitor, 39 mmf ±10%, 500 volts	P-727856-113	39618
C12	Capacitor, 100 mmf ±20%, 1000 volts	P-727876-23	75060
C13	Capacitor, 390 mmf ±10%, 500 volts	P-727856-137	39642
C14	Capacitor, 2200 mmf ±20%, 600 volts	C-735715-205	73803
C15, C16	Capacitor, 4700 mmf ±20%, 600 volts	C-735715-209	73550
C17	Capacitor, 4700 mmf ±5%, 600 volts	A-984080-291	73920
C18	Capacitor, same as C4		
C19	Capacitor, same as C9		
C20	Capacitor, 2 sections - c/o C20A/B	M-941157-3	74593
C20A	Capacitor, 3-35 mmf (Part of C20)		
C20B	Capacitor, 40-370 mmf (Part of C20)		
C21	Capacitor, same as C14		
C22	Capacitor, 0.022 mfd ±20%, 400 volts	C-735715-117	73562
C23	Capacitor, 0.22 mfd ±20%, 400 volts	C-735715-129	73794
C24	Capacitor, same as C4		
C25	Capacitor, 180 mmf ±5%, 1000 volts	A-984663-6	73102
C26	Capacitor, 3 sections - c/o C26A/B/C	B-442900-43	71432
C26A	Capacitor, 40 mfd, 450 volts (Part of C26)		
C26B	Capacitor, 40 mfd, 450 volts (Part of C26)		
C26C	Capacitor, 10 mfd, 450 volts (Part of C26)		
C27	Capacitor, 0.01 mfd ±5%, 600 volts	A-984080-292	73594
C28	Capacitor, 2200 mmf ±5%, 600 volts	A-984080-290	73595
C29	Capacitor, 560 mmf ±10%, 1000 volts	P-727876-141	74250
C30	Capacitor, same as C13		
C31	Capacitor, same as C23		
C32	Capacitor, 0.047 mfd ±10%, 600 volts	C-735715-271	73592
C33	Capacitor, 0.039 mfd ±10%, 600 volts	C-735715-270	73799
C34	Capacitor, 0.018 mfd ±10%, 600 volts	C-735715-266	74727
C35	Capacitor, 500 mmf, 15 KV	M-940173-3	74153
C36	Capacitor, 56 mmf, 800 volts (Part of L5)		54415
C37, C38	Capacitor, 0.01 mfd ±10%, 400 volts	C-735715-163	73561
C39	Capacitor, 2 sections - c/o C39A/B	M-449634-3	93485
C39A/B	Capacitor, 20/20 mf, 450 volts (Part of C39)		
C40	Capacitor, 330 mmf ±10%, 500 volts	P-727856-135	53113
F1	Fuse, 1/4 amp, 3AG	K-55544-27	72104
F2	Fuse, 3 amp, 3AG	K-55544-4	10907
J1 to J4	Connector, coaxial	P-255223-1	51800
L1	Peaking Coil, 62 microhenries ±10%	M-940144-12	93486
L2	Peaking Coil, 36 microhenries ±10%	M-940144-5	71793
L3	Not Used		
L4	Peaking Coil, same as L2		
L5	Deflection Yoke, includes C36, R36, and R37	P-970122-3	71777
L6	Coil, horizontal line	M-940185-1	71449
L7	Coil, width "B"	M-940188-2	71429
L8	Focus Coil	P-970973-1	74585
L9	Reactor	M-941688-3	73154
L10	Coil, width "A"	B-941635-2	74878

FOR ORDERING INFORMATION SEE PAGE 4

Symbol No.	Description	Drawing No.	Stock No.
P1 to P3	Connector, coaxial plug	K-252868-1	66344
R1	Resistor, 270,000 ohms, 1/2 watt	K-82283-91	30651
R2, R3	Resistor, 100 ohms, 1/2 watt	K-82283-50	34765
R4	Resistor, variable, "contrast", 5000 ohms, 2 watts	C-737829-8	51923
R5	Resistor, 12,000 ohms ±5%, 1/2 watt	K-82283-185	30436
R6	Resistor, 22,000 ohms, 2 watts	K-99126-78	72629
R7	Resistor, 1500 ohms, 2 watts	K-99126-64	53292
R8	Resistor, 2200 ohms ±5%, 2 watts	K-99126-167	34769
R9	Resistor, same as R1		
R10	Resistor, 390 ohms ±5%, 1 watt	K-90496-149	31388
R11	Resistor, 47,000 ohms, 1/2 watt	K-82283-82	30787
R12	Resistor, 3000 ohms ±5%, 2 watts	K-99126-170	46791
R13	Resistor, 10,000 ohms, 1/2 watt	K-82283-74	3078
R14	Resistor, 100,000 ohms, 1/2 watt	K-82283-86	3252
R15	Resistor, 1.0 megohm, 1/2 watt	K-82283-98	30652
R16	Resistor, variable, "brightness", 50,000 ohms, 2 watts	P-737829-6	93488
R17	Resistor, 100,000 ohms, 1 watt	K-90496-86	72635
R18	Resistor, same as R15		
R19	Resistor, 15,000 ohms, 2 watts	K-99126-76	68935
R20	Resistor, 3.9 megohms, 1/2 watt	K-82283-105	70249
R21	Resistor, 6800 ohms, 1/2 watt	K-82283-72	14659
R22	Resistor, 22,000 ohms, 1/2 watt	K-82283-78	30492
R23, R24	Resistor, 8200 ohms, 1/2 watt	K-82283-73	14250
R25	Resistor, 1.5 megohms ±5%, 1/2 watt	K-82283-235	31449
R26	Resistor, same as R14		
R27	Resistor, variable, "vert hold", 1.0 megohm, 2 watts	C-737829-9	52433
R28	Resistor, 2.2 megohms, 1/2 watt	K-82283-102	30649
R29	Resistor, variable, "vert height", 2.5 megohms, 2 watts	M-427471-33	54159
R30	Resistor, 220,000 ohms, 1/2 watt	K-82283-90	14583
R31	Resistor, 8200 ohms ±5%, 1/2 watt	K-82283-181	14250
R32	Resistor, variable, "vert lin", 5000 ohms, 2 watts	M-433196-18	52009
R33	Resistor, 1200 ohms, 1/2 watt	K-82283-63	30731
R34	Resistor, same as R28		
R35	Resistor, 6800 ohms, 2 watts	K-99126-72	45892
R36, R37	Resistor, 560 ohms, 1/2 watt (Part of L5)	K-82283-59	5164
R38	Resistor, 68,000 ohms, 1/2 watt	K-82283-84	14138
R39	Resistor, 820,000 ohms ±5%, 1/2 watt	K-82283-229	30161
R40	Resistor, variable, "horiz hold", 50,000 ohms, 2 watts	C-737829-10	51944
R41	Resistor, 2.7 megohms ±5%, 1 watt	K-90496-241	93489
R42	Resistor, 120,000 ohms, 1 watt	K-90496-87	72636
R43	Resistor, same as R23		
R44	Resistor, 150,000 ohms, 1/2 watt	K-82283-88	30493
R45	Resistor, 150,000 ohms, 1 watt	K-90496-88	31895
R46	Resistor, 100,000 ohms, 1 watt	K-90496-86	72635
R47	Resistor, same as R31		
R48	Resistor, same as R22		
R49	Resistor, same as R42		
R50	Resistor, 470,000 ohms, 1/2 watt	K-82283-94	30648
R51	Resistor, same as R15		
R52	Resistor, 2200 ohms, 1 watt	K-90496-66	71991
R53	Resistor, 47 ohms, 1/2 watt	K-82283-46	30732
R54	Resistor, 100 ohms, 2 watts	K-99126-50	48927
R55	Resistor, 6800 ohms, 2 watts	K-99126-72	45892
R56	Resistor, 56,000 ohms, 1/2 watt	K-82283-83	30650
R57	Resistor, 2.7 ohms, 1/3 watt	M-433001-118	74598
R58	Resistor, 1.0 megohm, 1 watt	K-90496-98	71993
R59	Resistor, variable, focus, 2000 ohms, 2 watts	C-737829-11	93487
R60	Resistor, 1100 ohms, 12 watts	B-449630-5	93490
R61	Resistor, 10 ohms, 1/2 watt	K-82283-38	34761
R62, R63	Resistor, 47,000 ohms, 2 watts	K-99126-82	44211
R64	Resistor, 0.04 ohm, 4 watts	A-8890668-11	93491
R65	Resistor, same as R14		
R66	Not Used		
R67	Resistor, 15,000 ohms, 1/2 watt	K-82283-76	36714
R68	Resistor, same as R2		
R69	Resistor, same as R6		
R70	Resistor, same as R13		
R71, R72	Resistor, 12,000 ohms, 1/2 watt	K-82283-75	30436

FOR ORDERING INFORMATION SEE PAGE 4

Symbol No.	Description	Drawing No.	Stock No.
S1	Switch, power (Part of R16)		
S2	Switch, D. P. D. T.	M-95559-5	93263
S3	Switch, terminal board	A-8830298-1	
T1	Transformer, vert. osc.	M-941129-4	74144
T2	Transformer, vert. out.	B-941632-1	74587
T3	Transformer, horiz. osc.	P-970920-1	73576
T4	Transformer, horiz. out.	P-970975-1	74588
T5	Transformer, power	P-970972-1	74586
X1, X2, X3	Socket, octal, saddle type	K-99390-1	54414
X4	Socket, 7-pin miniature	K-99370-1	54271
X5, X6	Socket, same as X1		
X7	Socket, octal, ceramic plate mounted	K-985567-1	73249
X8	Socket, octal	K-8898695-1	93232
X9	Socket, 7 contact	K-983472-8	71508
X10, X11	Socket, same as X1		
X12	Socket for V12	M-940189-14	74834
XF1	Fuse holder	K-82819-2	13526
XF2	Fuse holder	K-99088-1	48551
	MISCELLANEOUS		
	Connector, anode	B-942114-2	71789
	Magnet (Ion Trap)	K-986432-1	74148
	Resistor, terminating, 75 ohms $\pm$5%, 1 watt	K-90496-132	91942

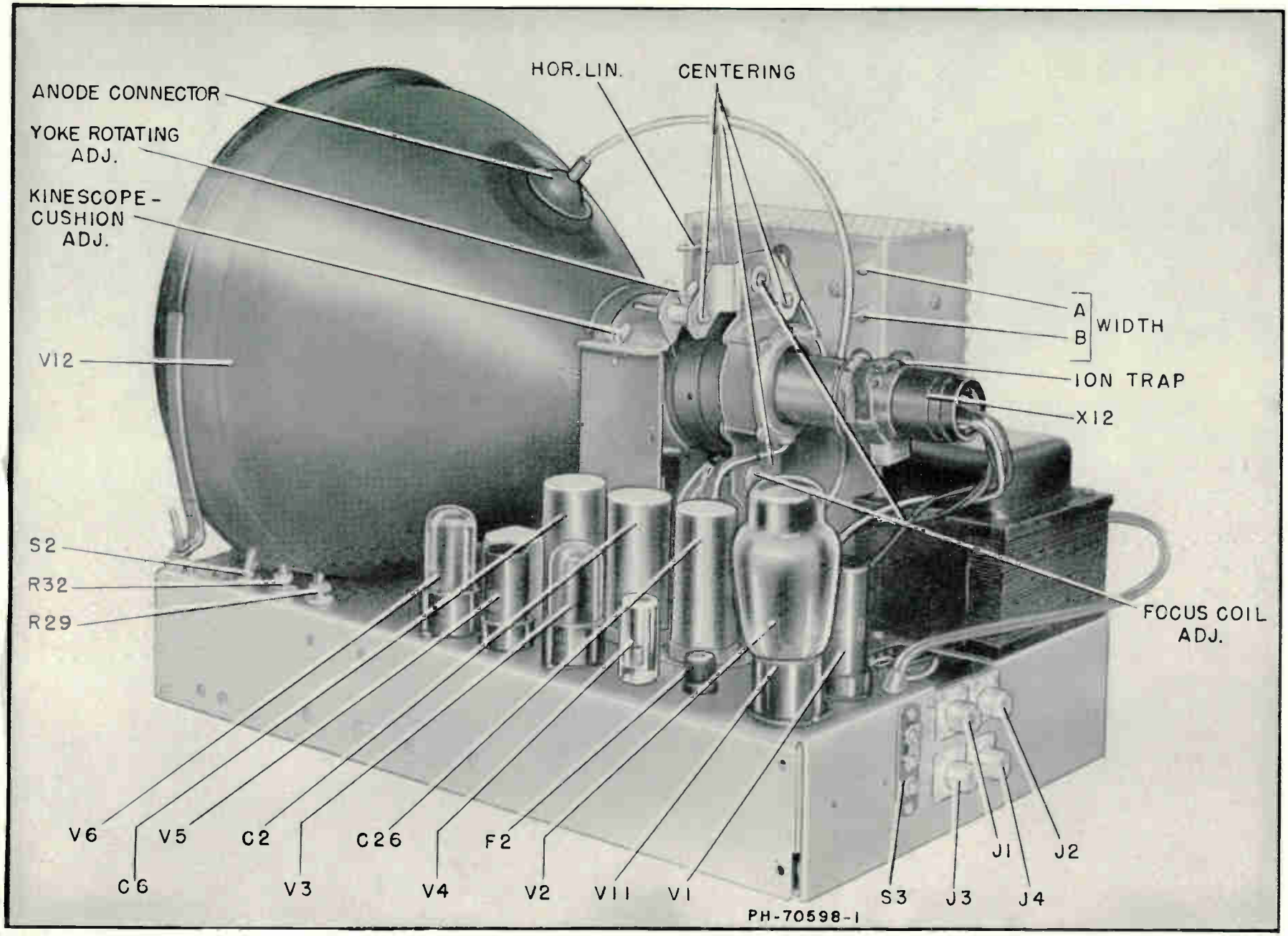

Figure 4. - Utility Monitor, Top Oblique View

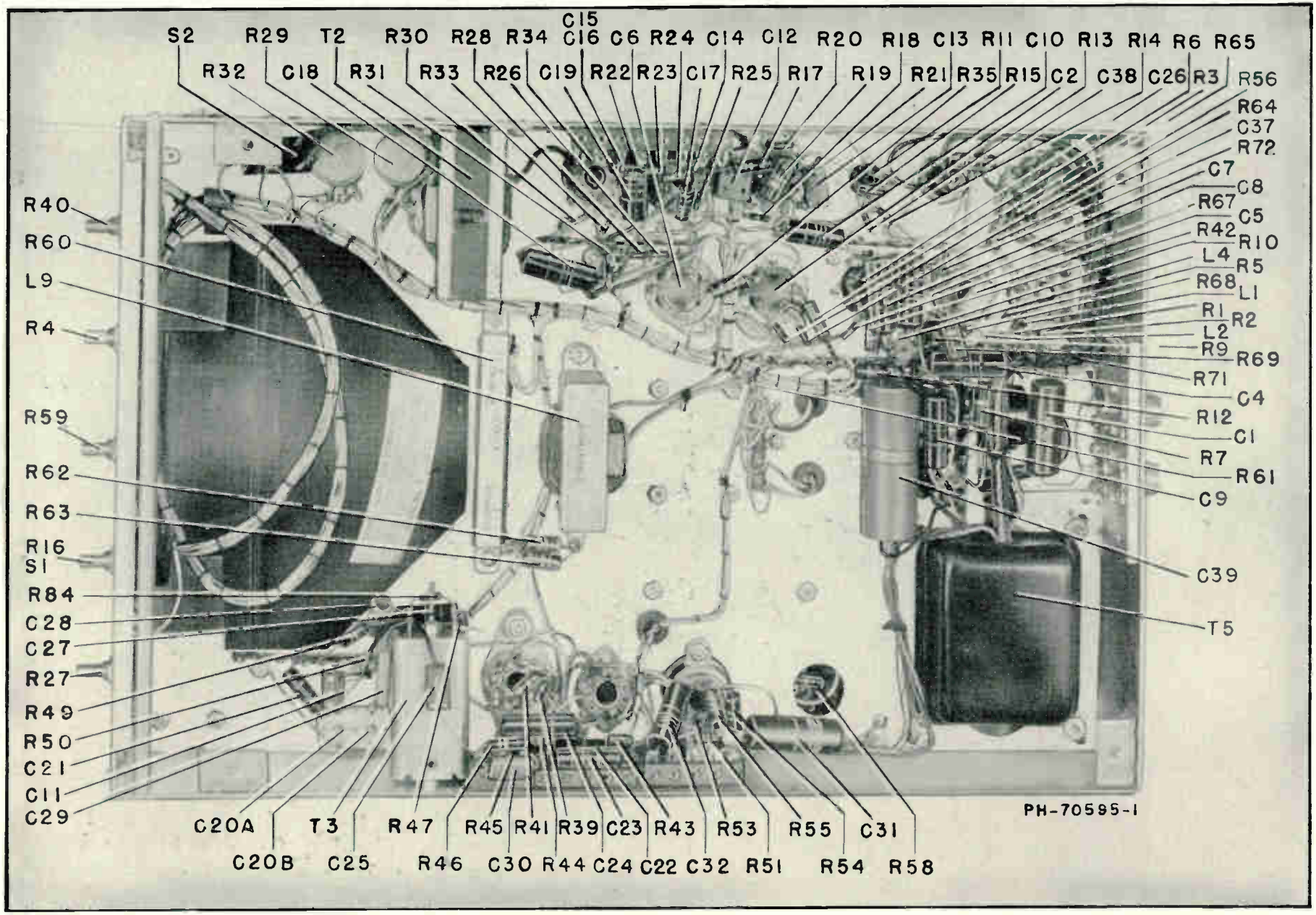

Figure 5. - Utility Monitor, Bottom View

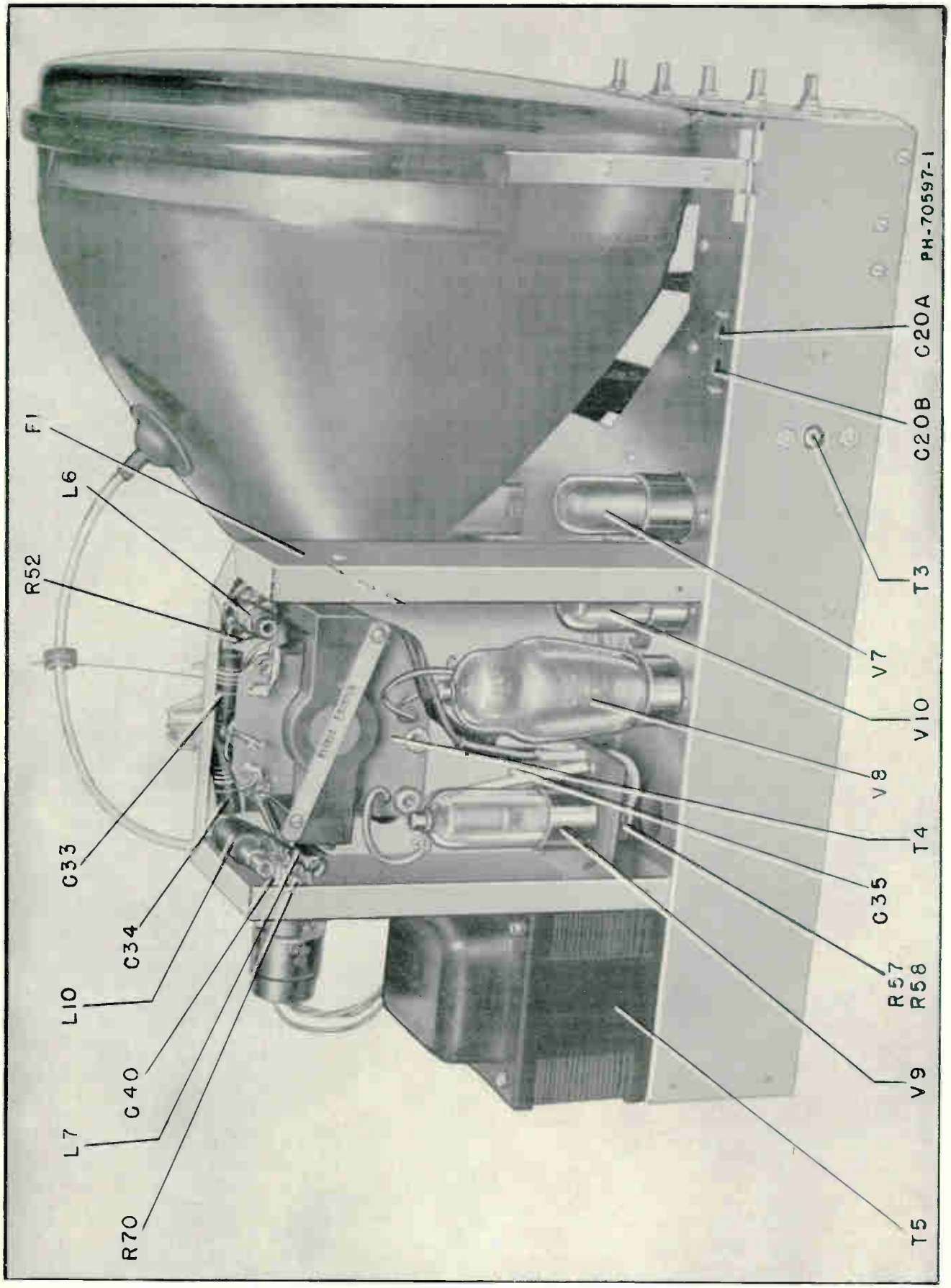

Figure 6. - Utility Monitor, Side View, Left, High Voltage Compartment Cover Removed

NOTES AND SKETCHES

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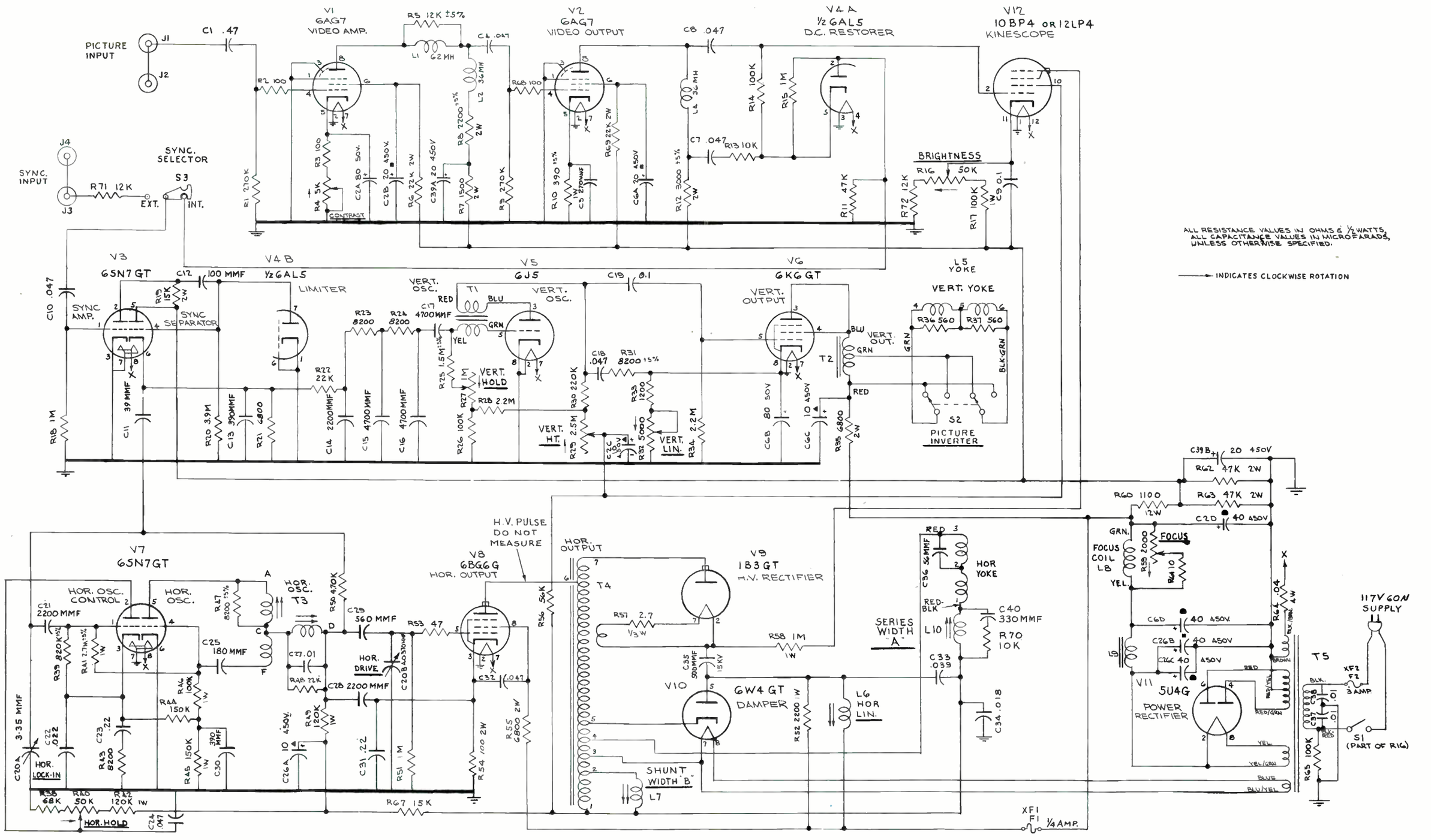

Figure 7.
Utility Monitor, Schematic Diagram

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