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I N S T R U C T I O N M A N U A L

Panoramic*
MAIN FRAME
MODEL MF-5

Serial No. _____
Instruction Manual No. 110-5044

SINGER
INSTRUMENTATION

Precision electrical and electronic instruments for measurement



THE SINGER COMPANY • METRICS DIVISION

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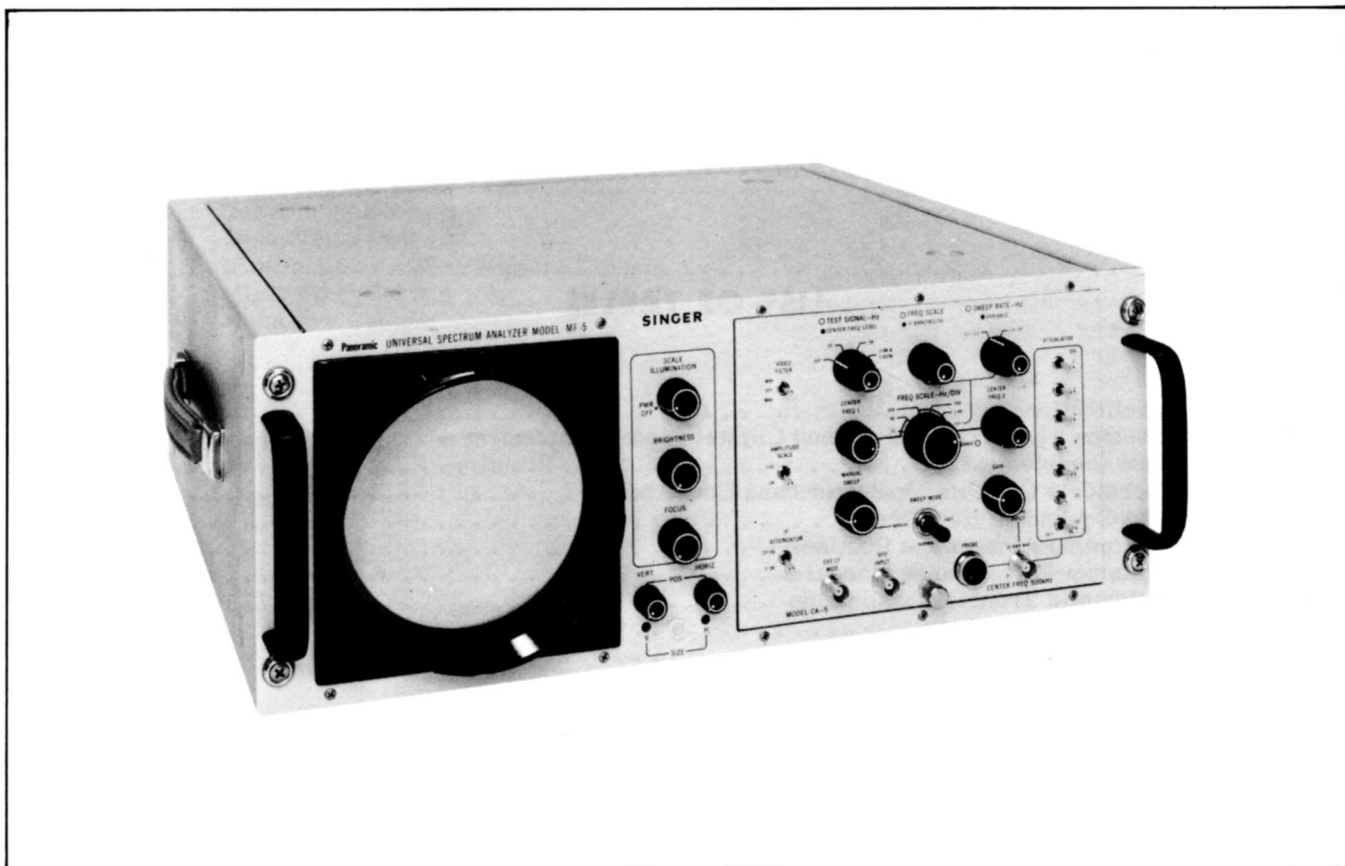


Figure 1-1. Model MF-5 Main Frame

SECTION I INTRODUCTION

1-1. SCOPE OF MANUAL.

1-2. This instruction manual provides operating and maintenance instructions for the PANORAMIC* Main Frame, Model MF-5 (hereafter referred to as the Main Frame), manufactured by The Singer Company, Metrics Division. Included in this manual are a general description of the Main Frame, installation and operating instructions, theory of operation, maintenance information and data, schematic diagrams and repair parts list. The Main Frame is illustrated in figure 1-1.

1-3. Although the purpose of this manual is to provide coverage on only the Main Frame, the description assumes that the PANORAMIC Model CA-5 Panalyzer is mounted within the frame. Thus, reference to displays produced on the Main Frame CRT assumes a thorough practical knowledge of the CA-5 functions. Coverage similar to that presented herein on the Main Frame is provided in the CA-5 instruction manual.

1-4. The information contained in this manual refers to the standard version of the Main Frame and is current only to the date of publication. Differences in equipment components, specifications, and performance resulting from The Singer Company's continuous production improvement program or individual customer design and application requirements are described in addendum sheets.

1-5. PURPOSE AND USE OF EQUIPMENT.

1-6. The Main Frame is primarily designed to operate with the CA-5 Panalyzer in the PANORAMIC Model SSB-50 Single Sideband Analyzer System to display the level versus frequency plot for input signals to the CA-5. The displays appear on a long persistence CRT with a calibrated overlay graticule contained in the Main Frame. (See figure 1-2.) The Main Frame also provides the CA-5 with the necessary mounting enclosure and operating power. A description of the integrated

operation and particular applications or the Main Frame are contained in the CA-5 instruction manual.

1-7. GENERAL DESCRIPTION.

1-8. The Main Frame contains deflection circuits, a CRT, and power supplies. In addition to providing voltages for the deflection circuits and CRT, the power supplies also furnish operating voltages for the CA-5. Since the majority of Main Frame circuits are transistorized, there is very little warm-up time required after turn-on. Solid-state design results in extraordinary display stability in addition to miniaturization.

1-9. The long-persistence CRT used for the Main Frame presentation provides a bright, sharply-focused display for convenient viewing. When permanent recording of the CRT presentation is required, the Polaroid Model SM-200 or GA-200 Oscilloscope Camera may be used. The 5-inch, round CRT used for the Main Frame display is equipped with a standard camera bezel, facilitating the use of the SM-200 and GA-200 cameras.

1-10. The Main Frame is designed to be mounted in a standard 19-inch rack. It operates from either a 95- to 130-volt or 190- to 260-volt, 50- to 400-Hz a-c source.

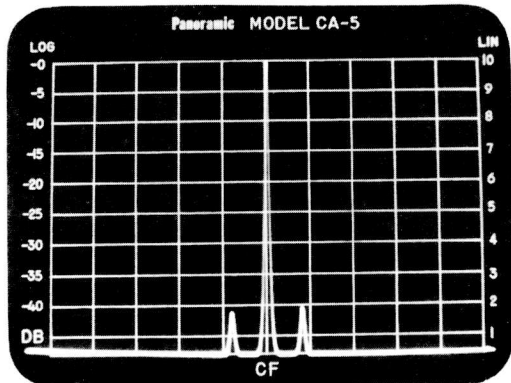
1-11. SPECIFICATIONS.

1-12. The electrical and physical characteristics of the Main Frame are listed in table 1-1.

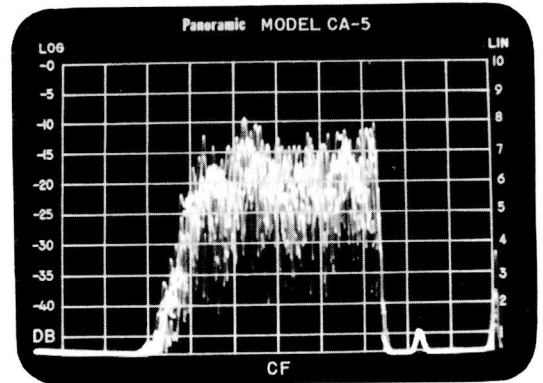
1-13. ELECTRON TUBE, TRANSISTOR, CRYSTAL DIODE, AND FUSE COMPLEMENT.

1-14. Table 1-2 lists all tubes, transistors, and crystal diodes used in the Main Frame and table 1-3 lists the fuse complement.

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A. Amplitude-modulated signal showing carrier at the center and two sidebands.



B. Single-sideband signal without carrier suppression.

Figure 1-2. Typical CRT Displays

TABLE 1-1. SPECIFICATIONS

Input Power Requirements:	95 to 130 volts, 50 to 400 Hz, single phase, or 190 to 260 volts, 50 to 400 Hz, single phase
Sweep Rate:	Determined by associated plug-in module
Power Consumption:	30 watts maximum
Operating Temperature Range:	0 to +55°C (32 to 131°F)
Physical Characteristics:	
Height:	6-31/32 inches
Width:	19 inches
Depth:	21-15/16 (Behind front panel)
Weight (with plug-in module):	35 pounds, approximately
Cathode Ray Tube:	5-inch round

TABLE 1-2. ELECTRON TUBE, TRANSISTOR, AND CRYSTAL DIODE COMPLEMENT

Reference Designation	Type	Function
Electron Tube		
V1	5ADP7	Cathode Ray Tube
A2V1	12AU7A	Vertical Deflection Amplifier
A2V2	12AX7A	Horizontal Deflection Amplifier
Transistor		
Q1, Q2	2N2152A	Push Pull Amplifier
Q3	2N2152A	Series Regulator
Q4, Q5	2N1971	Series Regulator
A1Q1, A1Q2	2N2270	Multivibrator
A1Q3, A1Q4	2N2270	Differential Amplifier
A1Q5, A1Q7	2N404	Emitter Follower
A1Q9, A1Q10	2N2270	Differential Amplifier
A2Q1	2N696	} Differential Amplifier
A2Q2	2N696	
A2Q3	2N3565	} Compound Connected Y-Buffer Amplifier
A2Q4	2N3638	
A2Q5	2N404	Sync Output Amplifier
A2Q6	2N3638	X-Buffer Amplifier
Diode		
CR1, CR2	10AG8 (Electronic Devices)	Rectifier
CR3, CR4	MR332R (Motorola)	Rectifier
CR5 thru CR8	1N4002	Rectifier
A1CR1, A1CR2	1N128	Steering
A1CR3, A1CR5	1N823A	Voltage Regulator
A1CR4	1N969B	Voltage Regulator
A2CR1	1N251	Limiter
A3CR1 thru A3CR4	EH300 (Electronic Devices)	Rectifier

TABLE 1-3. FUSE COMPLEMENT

Reference Designation	Type	Function
F1	3 amp (1.5 amp for 220 volt ac operation)	AC Primary Power
F2	3 amp	DC Primary

SECTION II OPERATION

2-1. GENERAL.

2-2. This section contains installation and operating instructions for the Main Frame. The Main Frame has been factory tested and adjusted and is shipped in a ready-to-operate condition. However, no attempt should be made to install or operate the unit until the operator is thoroughly familiar with the contents of this section. Figure 2-1 is an outline dimension drawing of the Main Frame.

2-3. INSTALLATION.

2-4. To install the Main Frame in a standard 19-inch relay rack, place the Main Frame in the position desired and secure the front panel to vertical members of the rack with four screws. Then, determine whether the supply voltage is 110 or 220 volts ac and set the 110 VAC - 220 VAC switch on the rear of the unit to the appropriate position. If the power is 110 volts

ac, fuse F1 should have a rating of 3/4 amperes (Delay). However, when a source of 220 volts ac is used, the 3/4 ampere fuse must be replaced by one with a 3/8 ampere (Delay) rating.

2-5. After the Main Frame has been installed in the rack, and power considerations have been accomplished, connect the appropriate power cable supplied with the SSB-50 system between AC INPUT connector J6 on the rear of the Main Frame and connector J6 on the rear of the Model MF-50 Main Frame. To operate the Main Frame directly from the a-c source, an a-c line cord should be connected between the a-c receptacle on the rear of the Main Frame and the power source. Before operating the equipment, make sure that a shorting plug P10 is placed over connector J10.

2-6. OPERATION.

2-7. OPERATING CONTROLS, INDICATORS, AND CONNECTORS. The operating controls, indicators,

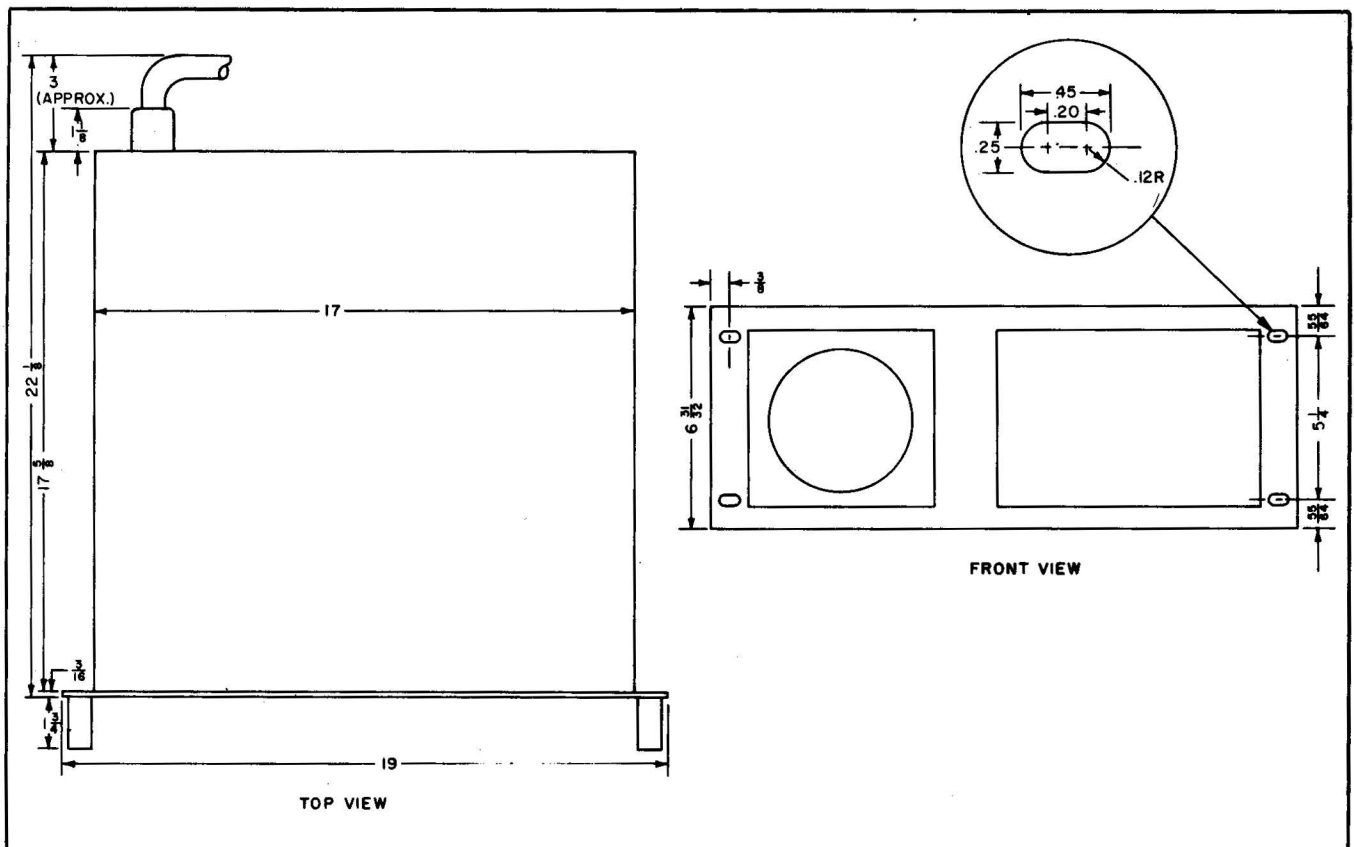


Figure 2-1. Outline Dimension Drawing, Main Frame

**Section II
Operation**

and connectors for the Main Frame are described in table 2-1 and shown in figure 2-2.

2-8. **TURN ON PROCEDURES.** To turn on the Main Frame, check that the equipment is set up properly in accordance with primary power requirements and that the CA-5 Panalyzer is properly inserted in the cavity; then turn the INTENSITY control fully counter-clockwise and the SCALE ILLUMINATION control clockwise until the CRT graticule illuminates. Operating voltages are now applied to all circuits of the Main Frame and associated plug-in module. The power indicator light should be illuminated. Wait 30 seconds, then slowly turn the INTENSITY control clockwise and observe a trace on the CRT. Adjust the INTENSITY and FOCUS controls to obtain the desired trace.

2-9. **OPERATING PROCEDURES.** Actual operation of the Main Frame is secondary to and dependent on the CA-5 Panalyzer; also the function to be performed. In general, to obtain a sharp, clear trace,

a thorough understanding of the functions of the controls on the Main Frame (table 2-1) will suffice.

2-10. PACKAGING INSTRUCTIONS.

2-11. The following packaging instructions provide information for short-term and long-term storage and shipment of the Main Frame.

2-12. **SHORT-TERM PACKAGING.** For short-term packaging, the Main Frame should be enclosed in a polyethylene bag and placed in a suitable carton for protection. The carton should be stored in a clean and moisture-free area. All accessories and literature should be securely fastened to the equipment in order to prevent loss.

2-13. **LONG-TERM PACKAGING AND PACKAGING FOR SHIPMENT.** Figure 2-3 illustrates the packaging procedure for the Main Frame.

TABLE 2-1. OPERATOR'S CONTROLS, INDICATORS, AND CONNECTORS

Index No. (figure 2-2)	Reference Designation	Control or Indicator	Function
1	V1	Cathode ray tube	Provides means for visually displaying information selected by the CA-5.
2	R3, S1	SCALE ILLUMINATION control	Combination switch and variable control. When turned clockwise from PWR OFF position (audible click can be heard), applies source power to operate unit. Further clockwise rotation increases brilliance of CRT graticule illumination lights.
3	R5	INTENSITY control	Controls brightness of display on CRT.
4	R7	FOCUS control	Controls sharpness and definition of display on CRT.
5	R8	HORIZ POS control	Controls horizontal position of display on CRT.
6	R9	H SIZE screwdriver adjustment	Controls horizontal size of display on CRT.
7	DS1	Power indicator light	Illuminates to indicate that power is applied to Main Frame and Module circuits.
8	R10	VERT. POS control	Controls vertical position of display on CRT.
9	R4	V SIZE screwdriver adjustment	Controls vertical size of display on CRT.

(Cont'd)

TABLE 2-1. OPERATOR'S CONTROLS, INDICATORS, AND CONNECTORS (Cont'd)

Index No. (figure 2-2)	Reference Designation	Control or Indicator	Function
10	J9	X OUTOUT connector	Provides sawtooth sweep from the CA-5 to external equipment.
11	J7	Y OUTOUT connector	Couples sync output (from companion modules having sync capability) to external equipment. The CA-5 does not have this capability.
12	J8	SYNC OUTPUT connector	Couples sync output (from companion modules having sync capability) to external equipment. The CA-5 does not have this capability.
13	J6	AC INPUT connector	Connector through which a-c power is applied to the Main Frame.
14	J10	Accessory output connector	Provides signals for application to auxiliary test equipment.
15	S2	110 VAC-220 VAC switch	Permits either 110 or 220 vac operation.

Section II
Operation

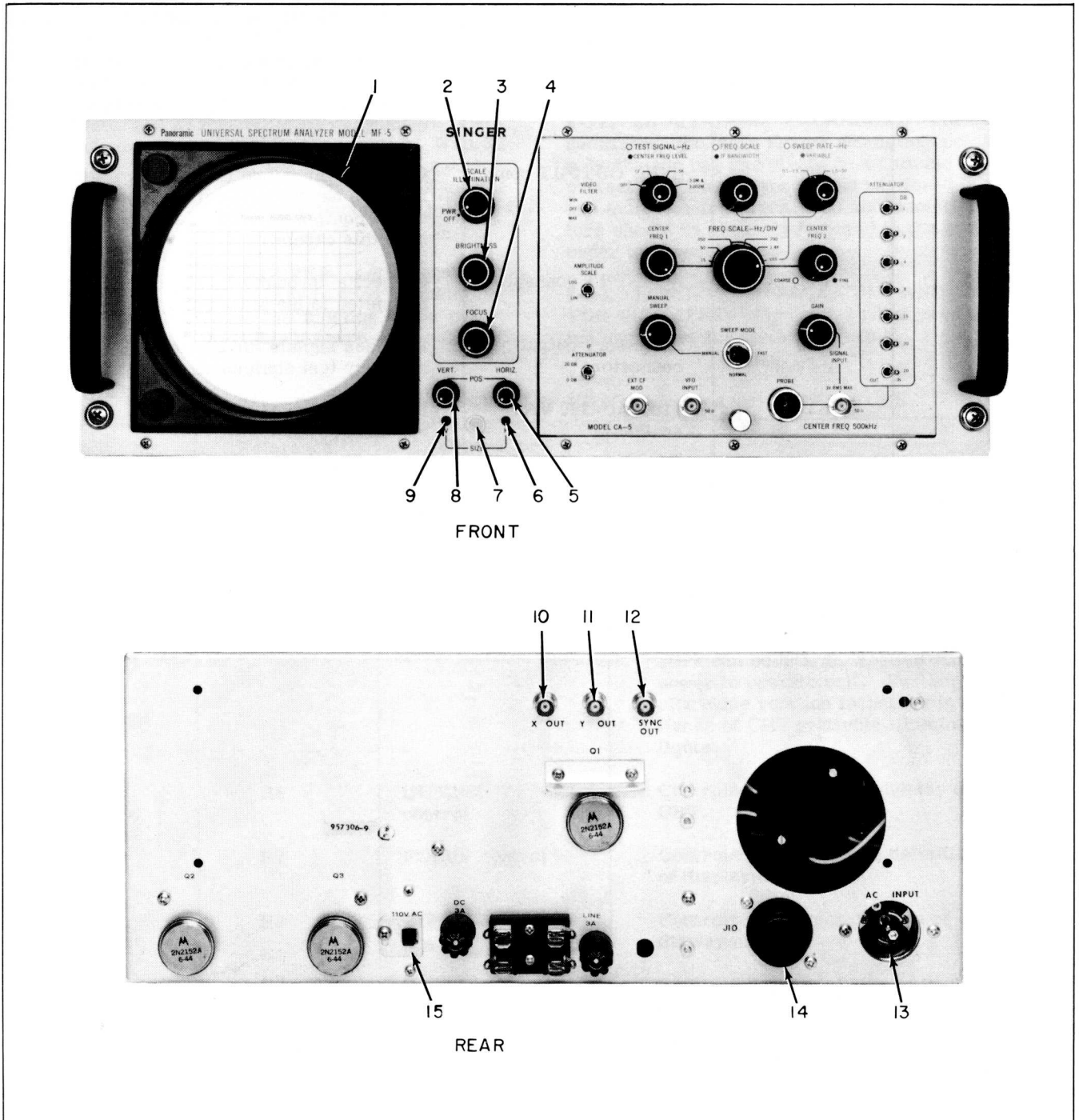


Figure 2-2. Operating Controls, Indicators and Connectors

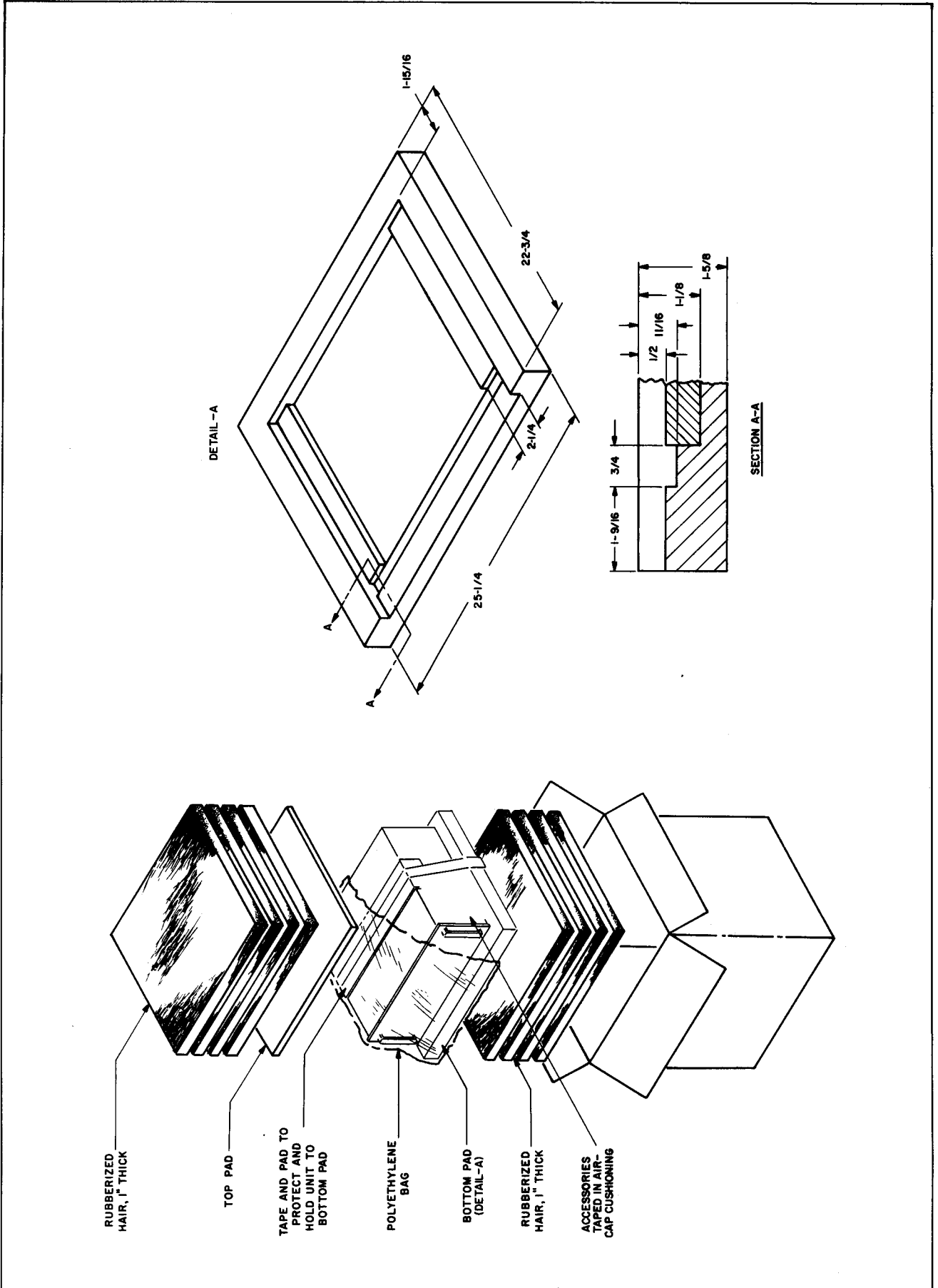


Figure 2-3. Packaging the Main Frame

SECTION III

THEORY OF OPERATION

3-1. GENERAL.

3-2. This section contains the theory of operation for the Main Frame. The Main Frame is an indicator with integral power supplies and deflection circuits. It operates in conjunction with the CA-5 Panalyzer plug-in module to display the level versus frequency plot for input signals to the CA-5. Operating power for the CA-5 is provided by the Main Frame.

3-3. BLOCK DIAGRAM ANALYSIS.

3-4. The horizontal and vertical deflection amplifiers (figure 3-1) provide the horizontal and vertical deflection for the CRT. The inputs to the horizontal deflection amplifier are a sawtooth sweep from the companion module through H SIZE control R9, and a dc level from HORIZ control R8 which controls horizontal sweep position. These two signals are amplified and applied to the horizontal deflection plates of CRT V1. The two inputs to the vertical deflection amplifier are the video input from the companion module through V SIZE control R4, and a d-c level from VERT POS control R10 which controls the vertical position. These two signals are amplified and applied to the vertical deflection plates of CRT V1. The horizontal and vertical deflection signals applied to the deflection plates of CRT V1 deflect the electron beam in such a manner as to provide a visual indication of the video signal from the companion module.

3-5. Main Frame also contains three buffer amplifiers. These amplifiers accept a sweep sync pulse, video, and a sawtooth sweep signal from the companion module. The signals are then amplified and furnished to output connectors J7, J8, and J9 as the Y OUT, SYNC OUT*, and X OUT signals, respectively. These outputs may be employed to drive external equipment used in conjunction with the Main Frame.

3-6. Input power of 110 volts or 220 volts ac is applied to the primary of power transformer T1. The secondary windings of transformer T1 are connected to the graticule lights, the +300-volt dc and +320-volt dc full-wave rectifier and filter, the filaments of CRT V1, and to the low voltage rectifier and regulator. The +320-volt dc full-wave rectifier and filter provides +300 volts operating power for the Main Frame vertical and horizontal deflection amplifiers. The input to the low voltage rectifier and regulator is rectified and regulated at +10 volts dc and coupled to

a multivibrator. The multivibrator applies its output to the push-pull amplifier which drives the primary of power transformer T2. The secondary windings of transformer T2 are connected to the high voltage rectifier unit, the -11-volt dc rectifier and regulator, and the +21-volt dc rectifier and regulator. The high voltage rectifier unit provides +2200 and -2200 volts dc operating power for the CRT. The -11-volt dc and +21-volt dc rectifier and regulators furnish operating power for the companion module and Main Frame components. BRIGHTNESS control R5 controls the intensity of the CRT electron beam. Astigmatism control A1R25 and FOCUS control R7 provide for proper focusing of the electron beam.

3-7. DETAILED THEORY OF OPERATION (See Figure 5-1.)

3-8. +320-VOLT DC RECTIFIER. The +320-volt dc rectifier consists of diodes CR1 and CR2. These diodes together with one of the secondary windings of transformer T1 form a full-wave rectifier. Capacitors C1-A and C1-B serve to filter the rectified output. Resistors R2 and R11 form a voltage divider which provides two filtered voltage outputs of +320 volts and +300 volts. The +320-volt dc output provides power for astigmatism control A1R25. The +300-volt dc output provides operating power for the two vacuum tubes in deflection unit A2.

3-9. LOW VOLTAGE RECTIFIER AND REGULATOR. The low voltage rectifier and regulator consists of diodes CR3, CR4, and transistors Q3, A1Q3, A1Q4, A1Q5. Diodes CR3 and CR4 with one of the secondary winding of transformer T1 form a full-wave rectifier. The output, a positive dc voltage taken from the center tap of the transformer secondary, is applied through fuse F2 to the low voltage regulator. Transistors A1Q3 and A1Q4 form a differential amplifier. Diode A1CR3 establishes the voltage reference for the base of transistor A1Q3. A voltage divider consisting of resistors A1R12 and A1R15 and +10-volt adjustment potentiometer A1R13 establishes the voltage at the base of transistor A1Q4. Any variation in the full-wave rectifier output is sensed on the base of transistor A1Q4. This change results in an increase or decrease in current through common emitter resistor A1R14 which in turn changes the emitter-base biasing of transistor A1Q3. This change is coupled to the base of transistor A1Q5 from the collector of transistor A1Q3. Transistor A1Q5 is an emitter follower which controls the output current passed by series regulator transistor Q3. The regulated +10-volt dc output of Q3 is applied to multivibrator A1Q1 and A1Q2 and to the base of push-pull amplifier transistors Q1 and Q2.

*Sync output signal available only from companion modules having sync output. CA-5 does not have this capability.

Section III Theory of Operation

3-10. **MULTIVIBRATOR AND PUSH-PULL AMPLIFIER.** The multivibrator and push-pull amplifier transistors A1Q1, A1Q2, Q1 and Q2 modulate or convert the +10-volt dc regulated output of the low voltage regulator to a-c. Transistors A1Q1 and A2Q2 form a free-running multivibrator. The free-running frequency is approximately 1400 Hz. Two 1400-Hz outputs, 180-degrees out of phase, are taken from the multivibrator. One output is applied to the base of push-pull amplifier Q1 and the other to the base of Q2. The regulated +10 volts dc is applied to the emitter of Q1 and Q2. Therefore Q1 and Q2 are switched alternately on and off at a 1400-Hz rate. The 1400-Hz alternating current output of transistors Q1 and Q2 is coupled to the primary of power transformer T2.

3-11. **+21-VOLT DC RECTIFIER AND REGULATOR.** The +21-volt dc rectifier and regulator consists of diodes CR5, CR6 and series regulator transistor Q4. Diodes CR5 and CR6 together with one of the secondary windings of transformer T2 form a full-wave rectifier. Resistor A1R16 and diode A1CR4 provide a reference voltage to the base of series regulator Q4 which increases or decreases conduction to offset the change. The output is a regulated +21 volts dc.

3-12. **-11-VOLT DC RECTIFIER AND REGULATOR.** The -11-volt dc rectifier and regulator consists of diodes CR7, CR8, transistors Q5, A1Q7, A1Q9, and A1Q10. Diodes CR7 and CR8 together with one of the secondary windings of power transformer T2 form a full-wave rectifier. Transistors A1Q9 and A1Q10 form a differential amplifier to sense any changes in the output voltage. These changes are amplified and applied to the base of emitter follower A1Q7 which controls series regulator Q5. The output is set to -11 volts dc by -11 V adjustment potentiometer A1R22.

3-13. **HIGH VOLTAGE RECTIFIER.** The high voltage rectifier unit consists of two half-wave voltage doublers. One voltage doubler, consisting of diodes A3CR1, A3CR2, and capacitors A3C1 and A3C2, produces a -2200-volt output for use by CRT V1. The other voltage doubler, consisting of diodes A3CR3 and A3CR4, and capacitors A3C3 and A3C4, produces a +2200-volt output for use by the CRT. Resistor R1 and R2 are high voltage bleeder resistors for the +2200-volt doubler.

3-14. **DEFLECTION CIRCUITS.** The deflection circuits comprise a horizontal deflection circuit and a vertical deflection circuit. The horizontal deflection circuit consists of dual triode A2V2. Triode A2V2 is a differential amplifier that amplifies the sawtooth sweep signal from the companion module developed across H SIZE potentiometer R9. The horizontal sweep position is determined by the setting of HORIZ POS potentiometer R8. The outputs of both halves of the dual triode A2V2 are applied to the horizontal deflection plates of CRT V1. The vertical deflection circuit consists of transistors A2Q1, A2Q2 and dual triode A2V1. Transistors A2Q1 and A2Q2 form a differential amplifier that amplifies the video from the companion module developed across V SIZE potentiometer R4. The vertical sweep position is determined by the setting of VERT POS control R10. The outputs of A2Q1 and A2Q2 are applied to the control grids of dual triode A2V2. The amplified outputs of both halves of the dual triode A2V1 are then applied to the vertical deflection plates of CRT V1.

3-15. **BUFFER AMPLIFIERS.** The buffer amplifiers consist of transistors A2Q3, A2Q4, A2Q5, and A2Q6. Transistors A2Q3 and A2Q4 form a unity gain amplifier that amplifies the video signal from the companion module and applies it to the Y OUT connector J7. Transistor A2Q5 is normally at cutoff and is driven into conduction by the negative sweep sync pulse from the companion module*. The amplified positive sweep sync pulse from the collector of A2Q5 is applied to SYNC OUT connector J8. Diode A2CR1 is a clamp that improves the shape of the applied sweep sync pulse. Transistor A2Q6 is an emitter follower that amplifies the sawtooth sweep from the companion module and applies it to X OUT connector J9.

3-16. POWER DISTRIBUTION.

3-17. Figure 3-2 is the operating power distribution diagram for the Main Frame. Both the regulated -11 volts dc and regulated +21 volts dc are coupled to the companion module connector to supply operating power for the companion module. In addition to the regulated -11 and +21 volts dc power, +300 volts dc is available to the deflection unit A2 and +320 volts dc is available to the astigmatism control located in regulator unit A1 from the +300/+320-volt dc rectifier.

* The CA-5 does not produce a sync output signal.

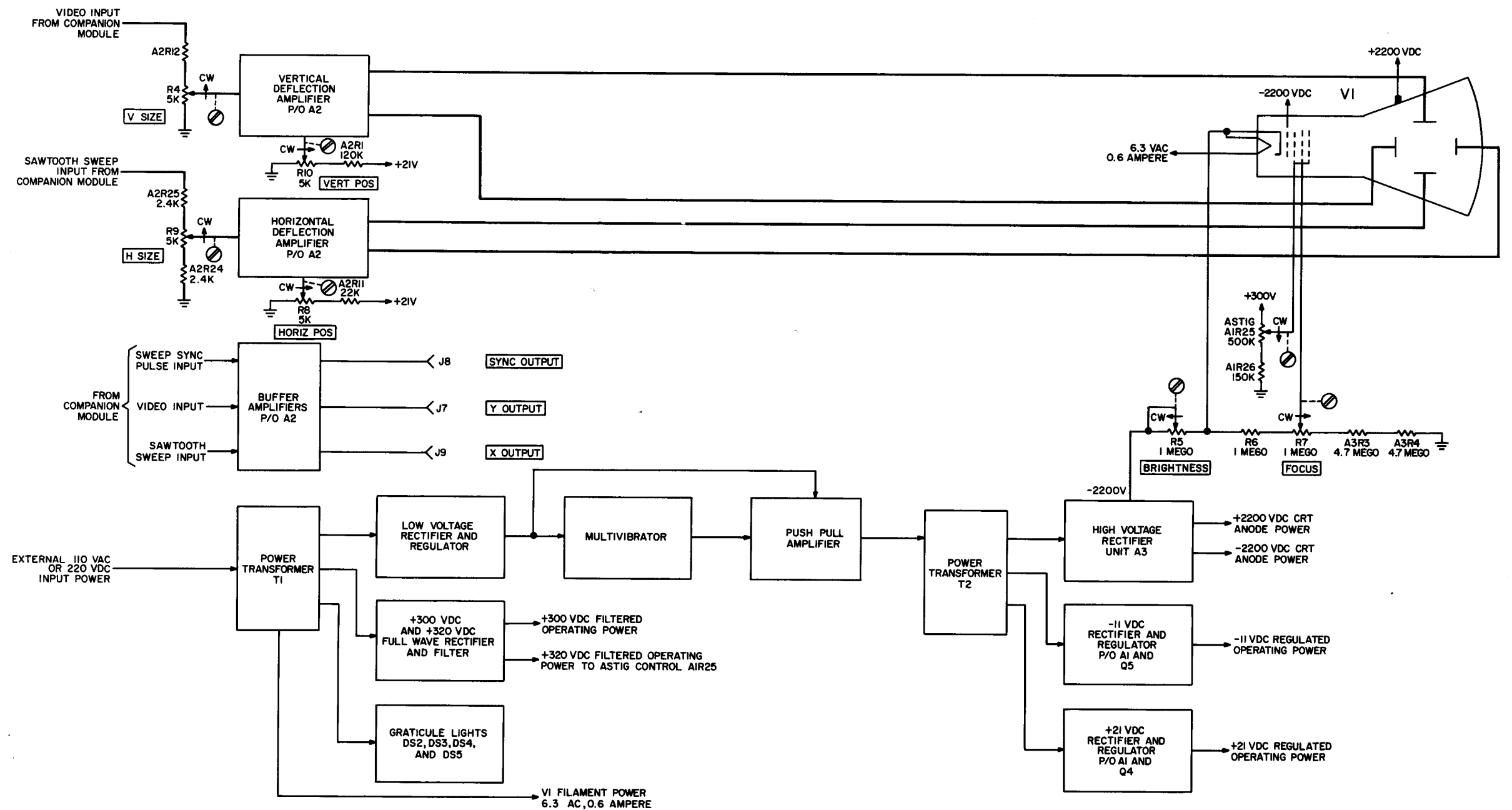
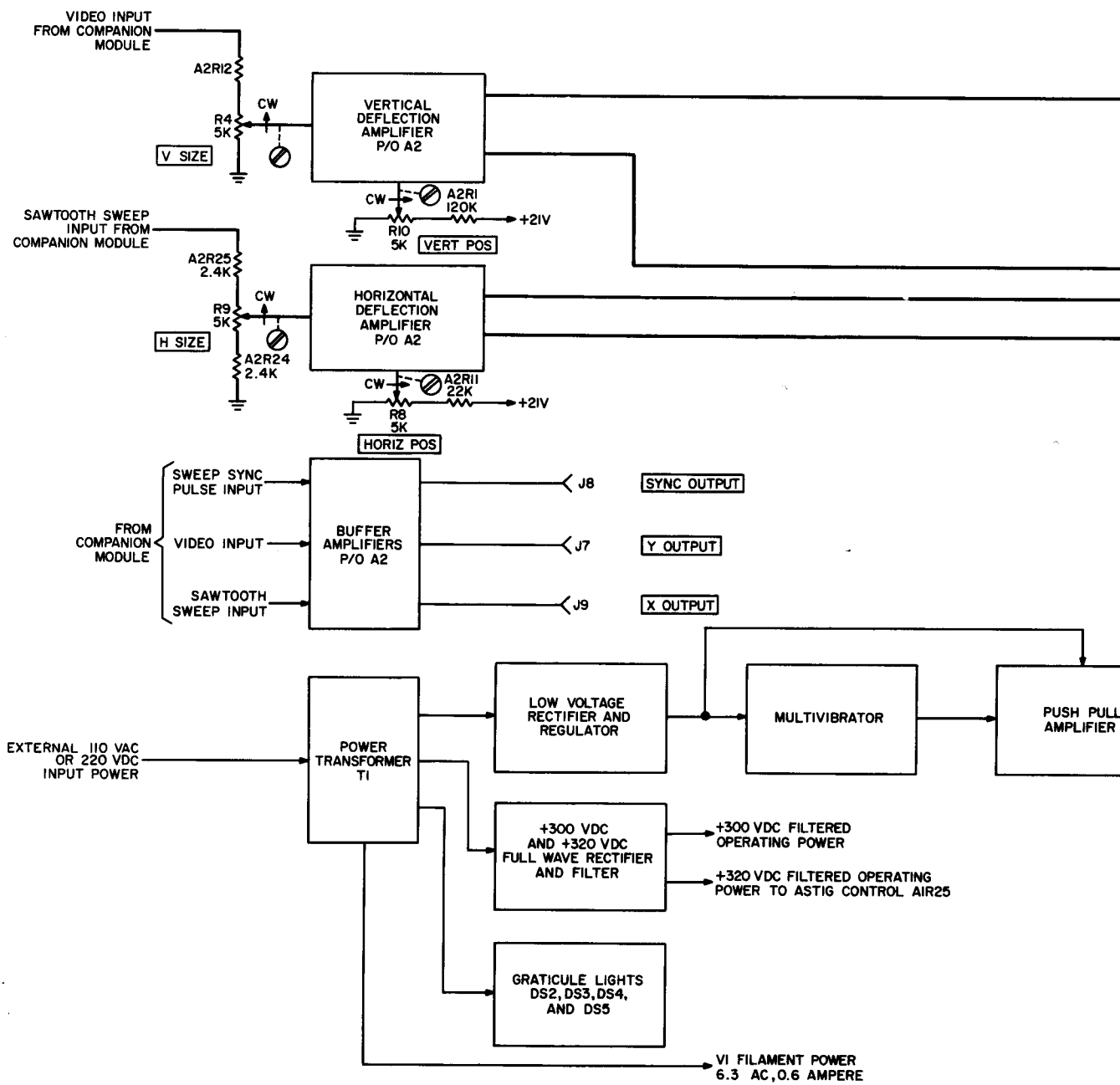


Figure 3-1. Block Diagram, Main Frame



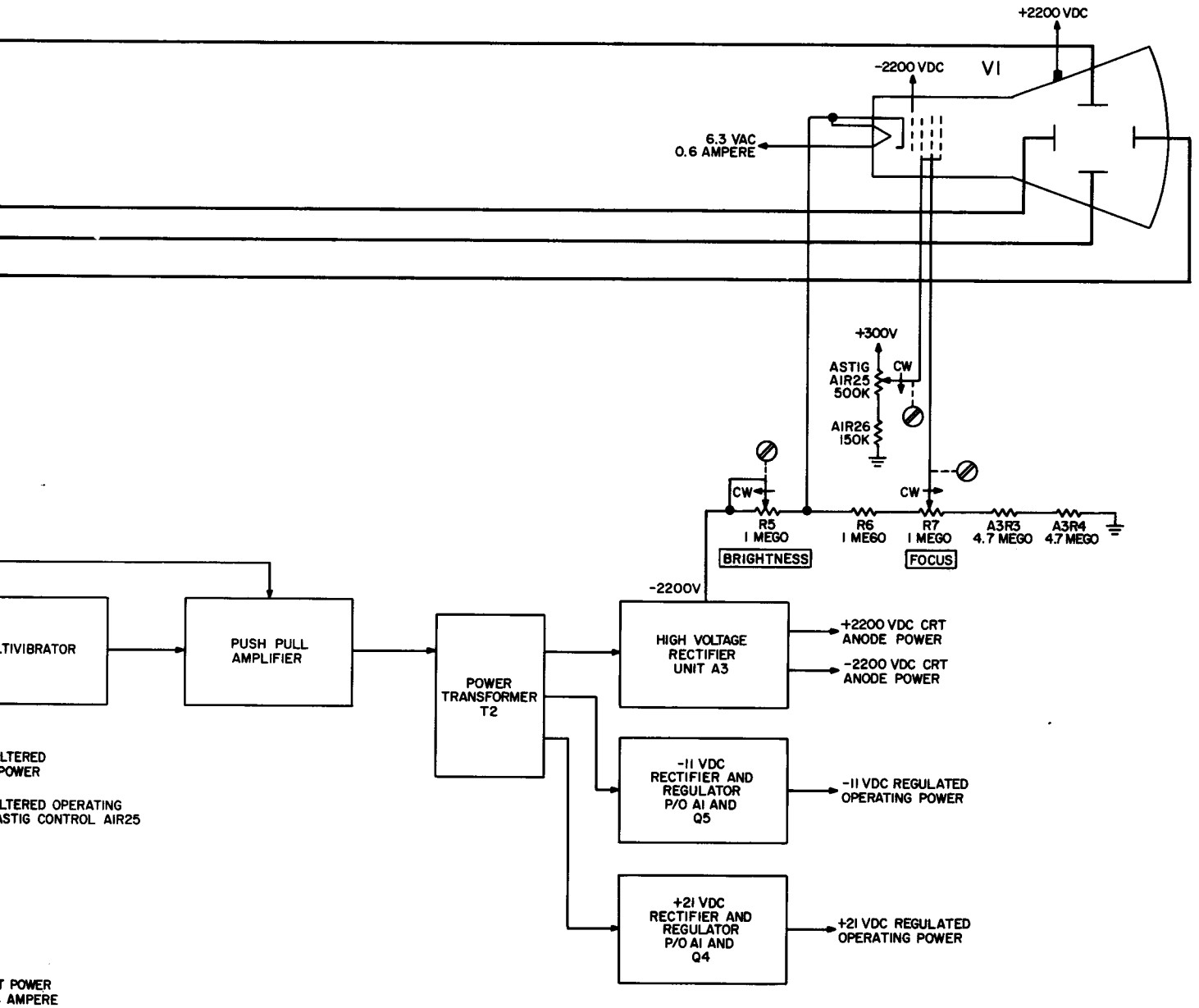


Figure 3-1. Block Diagram, Main Frame

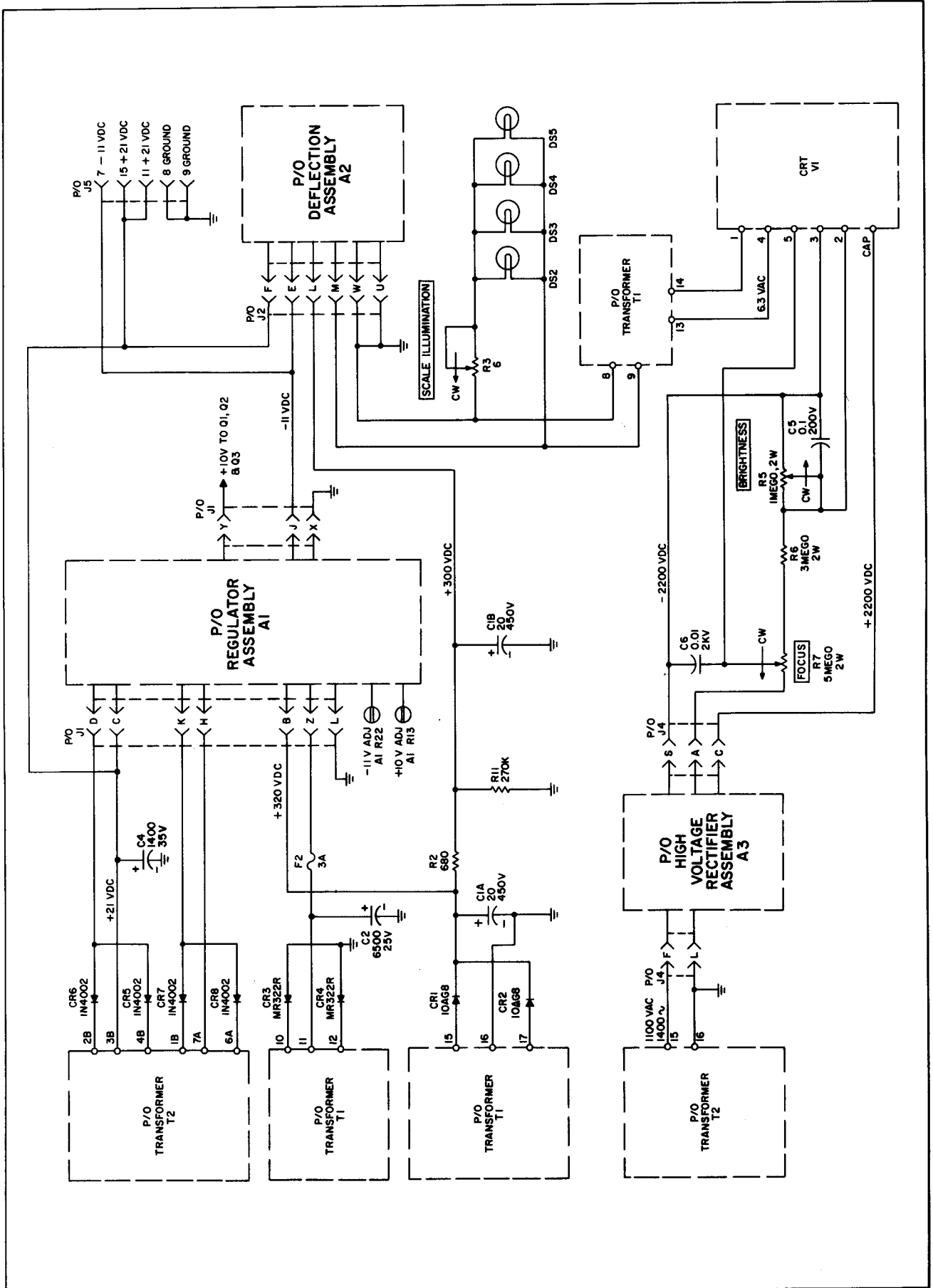


Figure 3-2. Operating Power Distribution Diagram, Main Frame

SECTION IV MAINTENANCE

4-1. GENERAL.

4-2. This section contains maintenance instructions for the Main Frame. No attempt should be made to repair internal components or make adjustments until the operator is thoroughly familiar with the information contained in this section. The performance of the Main Frame may be checked using the minimum performance standards checks provided to determine whether the equipment is operating properly. A systematic troubleshooting procedure to isolate troubles in the Main Frame and an adjustment procedure to restore the equipment to proper operating condition after the required repairs have been effected are also included in this section.

4-3. TEST EQUIPMENT REQUIRED.

4-4. The test equipment required for maintenance of the Main Frame is listed in table 4-1. Equipment having similar characteristics may be substituted for those listed in the table.

4-5. PRELIMINARY INSPECTION.

4-6. Preliminary inspection of the equipment is performed on the Main Frame without operating power applied. This type of check is designed to detect conditions that might otherwise lead to a breakdown. Frequent causes of premature failure are overheating due to improper ventilation, accumulation of dust and dirt and/or loose connections and fittings. Inspection is carried out with emphasis on finding evidence of these conditions.

4-7. COMPONENT LOCATION. The location of components mentioned in the inspection routines, adjustment and troubleshooting procedures are illustrated in figures 4-1 and 4-2. Since the component reference designations are screened on the printed circuit cards, no illustrations are provided.

4-8. INSPECTION ROUTINES. Table 4-2 lists the preliminary inspection routine for the equipment.

4-9. MINIMUM PERFORMANCE STANDARDS.

4-10. The minimum performance standards checks listed in table 4-3 provide a rapid, convenient means of determining if the Main Frame is operating

properly. These checks are performed with a CA-5 Analyzer plugged into the Main Frame. The quality of these checks presupposes that the CA-5 is operating within acceptable limits.

4-11. SYSTEMATIC TROUBLE LOCALIZATION.

4-12. Systematic trouble localization (table 4-4) utilizes symptomatic troubleshooting techniques to localize troubles within the Main Frame to a stage or group of stages. Since some of the component board assemblies encompass more than one functional circuit, trouble localization is restricted not only to the assembly, but to the stage or group of stages that could result in the malfunction. This procedure is performed with a CA-5 mounted in the Main Frame.

4-13. ADJUSTMENT PROCEDURES.

4-14. Adjustment procedures for the Main Frame are given in paragraphs 4-17 through 4-22. In addition, procedures for the removal of the dust cover and subassemblies, when the procedure is not obvious, are included.

4-15. DUST COVER REMOVAL. To remove the Main Frame dust covers, proceed as follows:

- a. Remove flat head screws securing top and bottom dust covers to chassis.
- b. Remove top and bottom dust covers.

4-16. SUBASSEMBLY REMOVAL. To remove the Main Frame subassemblies, proceed as follows:

- a. Remove high voltage rectifier A3 component board by removing one screw on rear of unit and withdrawing the board from chassis connector by pulling to the left.
- b. Remove regulator unit A1 component board by removing two screws on rear of module compartment wall, and withdrawing the board from chassis connector by pulling straight up.
- c. Remove deflection unit A2 component board by removing two screws from front chassis connector bracket and sliding connector forward to disconnect it from board. Slide board forward to withdraw it from rear chassis connector.

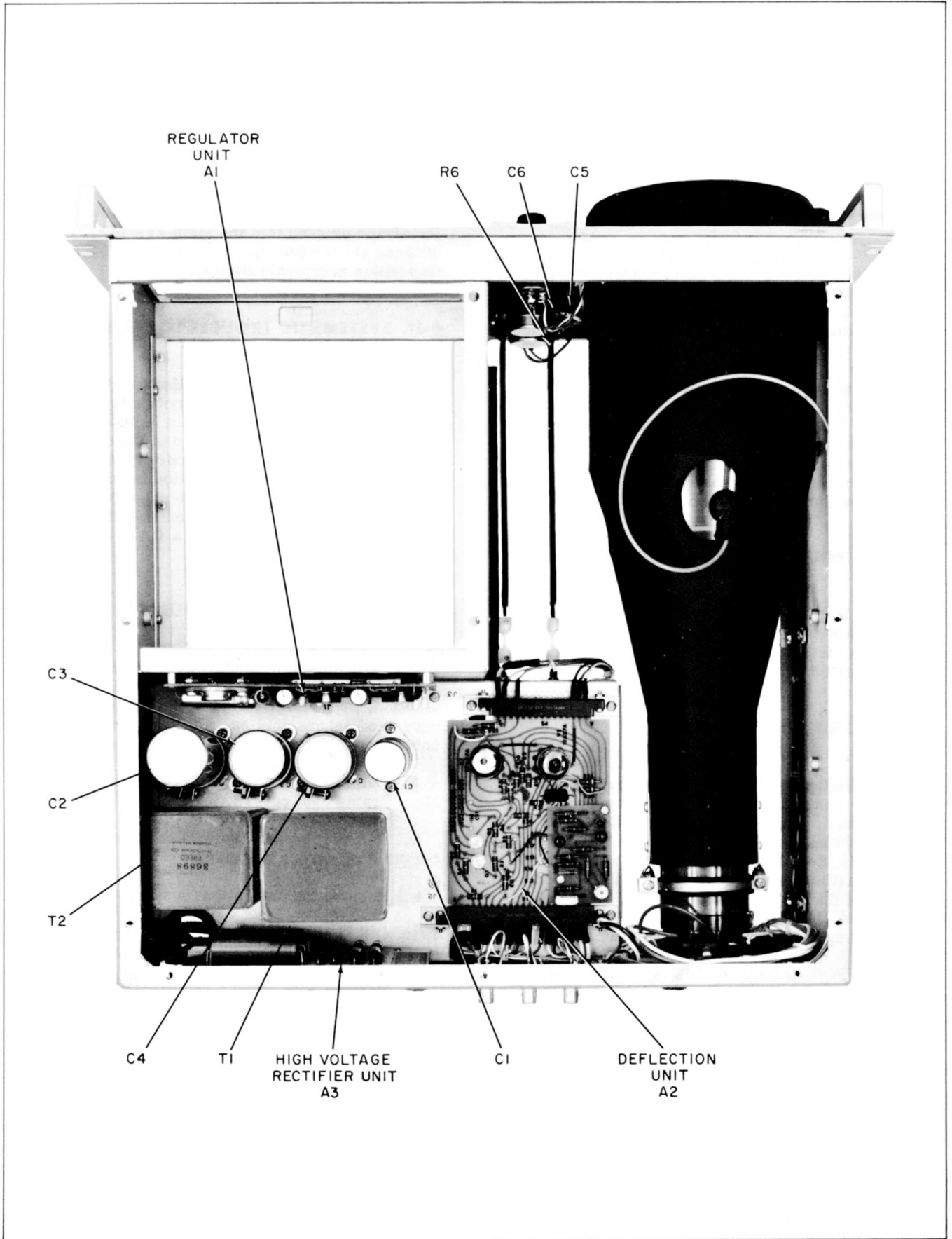


Figure 4-1. Main Frame, Top View

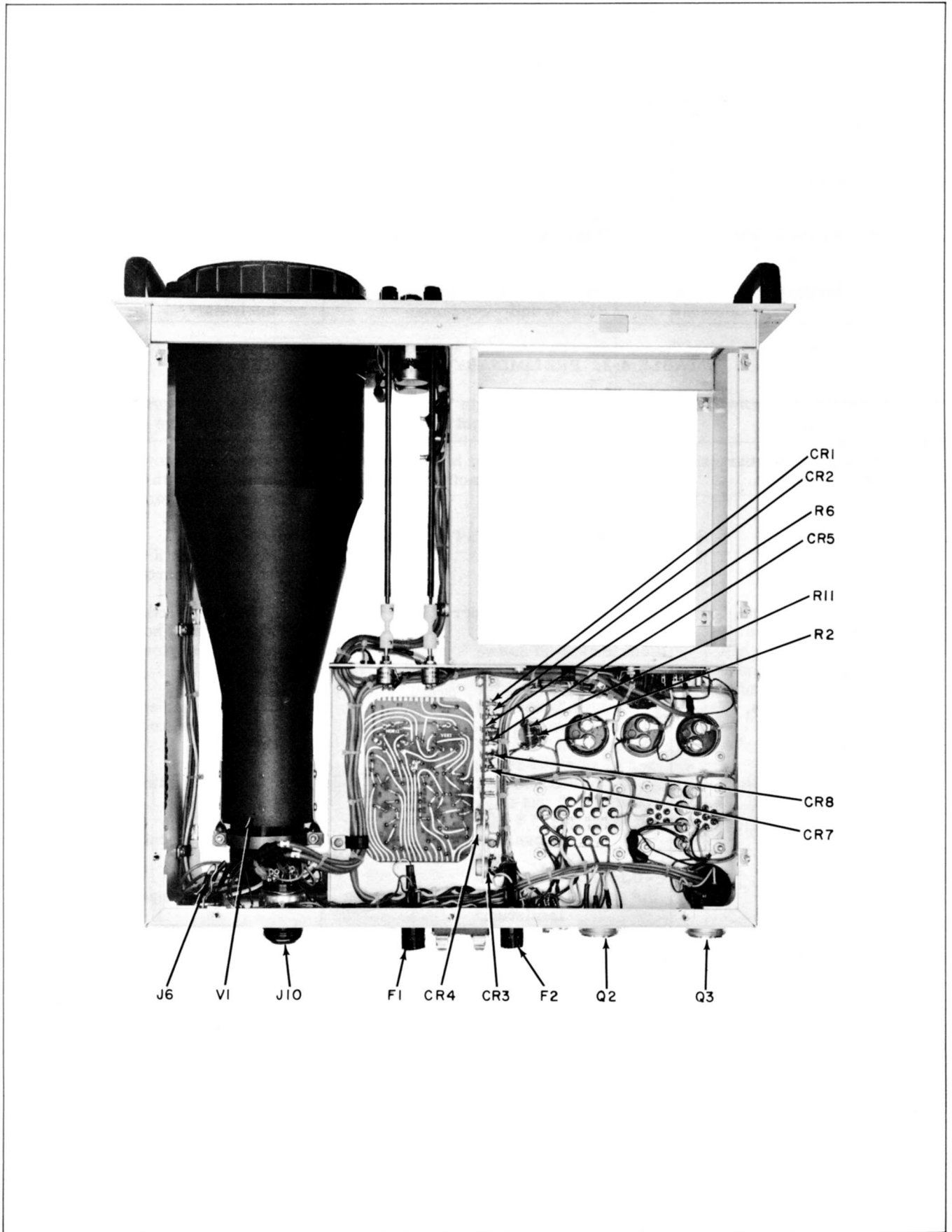


Figure 4-2. Main Frame, Bottom View

Section IV
Maintenance

TABLE 4-1. TEST EQUIPMENT REQUIRED

Type of Equipment	Recommended Mfr. Name and Model No.	Application
VTVM	Ballantine Model 320A	Voltage and resistance measurements
VOM	Simpson 260	Voltage and resistance measurements
Digital VTVM	Non-Linear Systems Series 4800	-11-volt regulator adjustment
Oscilloscope	Tektronix 531A with Type L Plug-in unit	General waveform analysis

TABLE 4-2. PRELIMINARY INSPECTION ROUTINES

Item	Inspect For	Corrective Action
Connector at rear wall of module cavity	Looseness, bent or corroded contacts, signs of arcing	Clean contacts with cloth moistened with cleaning solvent trichloroethylene or equivalent. Replace jack if damaged or deeply corroded.
Main Frame and front panel	Dirt and corrosion	Clean with cloth moistened with cleaning solvent trichloroethylene or equivalent.
Knobs, screws, connectors, clamps	Looseness	Tighten using appropriate torque so as not to strip threads.
Switches	Looseness	Tighten mounting screws or nut.
Wiring	Looseness	Resolder, recable, or reclamp.
	Frayed, worn, or missing insulation	Replace as required.
Solder joints	Loose or cold solder connections; corrosion	Clean carefully and resolder, using recommended soldering iron.
Printed circuit boards	Mounting looseness	Replace mating plug if required.
Resistors	Loose components Cracks, chipping, blistering, discoloration, and other signs of overheating	Resolder loose components. Replace with exact match of original.
		Note Ensure that overheating is not due to other defective components.

(Cont'd)

TABLE 4-2. PRELIMINARY INSPECTION ROUTINES (Cont'd)

Item	Inspect For	Corrective Action
Capacitors	Leaks, bulges, signs of aging	Replace capacitor.
	Loose mounting bracket	Tighten nuts or screws holding bracket.
Switch contacts	Dirt, dust, and/or corrosion	Clean with cloth, aerosol spray, syringe or camel-hair brush using trichloroethylene or equivalent.
	Bent or broken contacts	Replace switch wafer or assembly.
Transistors	Looseness	Tighten clips and tension leads.
Cathode ray tube	Dirt, dust, or signs of arcing around high voltage lead	Clean with a dry cloth.
	Dirt or dust on scope face or graticule	Clean with damp cloth.

TABLE 4-3. MINIMUM PERFORMANCE STANDARDS

Check	Purpose	Test Procedure	Acceptable Indication
1	To check operation of power supplies.	Set 110VAC-220VAC switch on rear of Main Frame to 110VAC. Set the SCALE ILLUMINATION control fully counterclockwise. Connect Main Frame power cable to an a-c source of 90 to 130 volts and check that fuse F1 is of proper rating. Rotate SCALE ILLUMINATION switch fully clockwise.	Power indicator light and CRT graticule illumination lights illuminate. After approximately 30 seconds, a trace is visible on CRT.
2	To check operation of intensity control.	Slowly vary INTENSITY control through its entire range, then position to obtain desired intensity.	Brilliance of sweep on CRT varies, increasing with clockwise rotation.
3	To check operation of FOCUS control.	Slowly vary FOCUS control through its entire range, then position to obtain optimum focus.	Sweep can be focused to satisfaction.
4	To check operation of deflection circuits.	Slowly vary setting of VERT. POS. control through its entire range, then set to obtain desired vertical position of sweep.	Sweep moves up and down on CRT, moving upward with clockwise rotation.

(Cont'd)

TABLE 4-3. MINIMUM PERFORMANCE STANDARDS (Cont'd)

Check	Purpose	Test Procedure	Acceptable Indication
5	To check operation of deflection circuits.	Slowly vary setting of HORIZ POS control through its entire range, then set to obtain desired vertical position of sweep.	Sweep moves to left and right on CRT in same direction as rotation of control.
6	To check operation of deflection circuits.	Refer to the CA-5 manual to provide a test signal to Main Frame.	Test signal appears on sweep.
7	To check operation of remote display circuits.	Connect oscilloscope to X OUT connector on rear of unit.	Sawtooth waveform of at least 3 volts peak-to-peak appears on oscilloscope.
8	To check operation of remote display circuits.	Connect oscilloscope to Y OUT connector on rear of unit.	Test signal (1.4v, approx., for full scale) similar to that in check 7 appears on oscilloscope.
9*	To check operation of remote display circuits.	Connect oscilloscope to SYNC OUT connector on rear of unit.	Pulse (+3v min.) appears on oscilloscope.

* Sync output signal not available when CA-5 is operating in conjunction with MF-5.

TABLE 4-4. SYSTEMATIC TROUBLE LOCALIZATION

Step No.	Symptom	Test Procedure	If Indication Is Normal	If Indication Is Abnormal
1	Power indicator light and CRT graticule illumination lights do not illuminate.	Shut off power and check fuse F1.	Check switch S1.	Replace F1.
2	No trace or spot visible on CRT. Power indicator light is illuminated.	<p>a. Using voltmeter, check for presence of +14 to +18 volts dc between pin Z of J1 (plus lead) and chassis (minus lead).</p> <p>b. Using voltmeter, check for presence of +10 volts dc between pin K of J1 (plus lead) and chassis (minus lead).</p> <p>c. Using oscilloscope, check for 20 volt peak-to-peak square wave between collector of Q1 or Q2 and chassis.</p>	<p>Go to step b.</p> <p>Go to step c.</p> <p>Go to step d.</p>	<p>Check CR3, CR4, and F2.</p> <p>Troubleshoot A1Q3, A1Q4, and A1Q5 on regulator unit and also Q3.</p> <p>Troubleshoot A1Q1 and A1Q2 on regulator unit.</p>

(Cont'd)

TABLE 4-4. SYSTEMATIC TROUBLE LOCALIZATION (Cont'd)

Step No.	Symptom	Test Procedure	If Indication Is Normal	If Indication Is Abnormal
2 (Cont'd)		<p>d. Using voltmeter, check for presence of +21 volts dc (approximately) between pin 15 of J5 (plus lead) and chassis (minus lead).</p> <p>e. Using voltmeter, check for presence of -11 volts dc between pin 7 of J5 (minus lead) and chassis (plus lead).</p> <p>f. Using voltmeter, check for presence of +300 volts dc between pin L of J2 (plus lead) and chassis (minus lead).</p> <div data-bbox="687 995 940 1087" style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p>WARNING</p> </div> <p>EXERCISE EXTREME CARE IN PERFORMING STEPS G AND H. VOLTAGES DANGEROUS TO LIFE ARE PRESENT.</p> <p>g. Using voltmeter, check for -2200 volts dc (approximately) between clockwise end of INTENSITY control R5 (minus lead) and chassis (plus lead).</p> <p>h. Using voltmeter, check for presence of +2200 volts dc (approximately) between second anode connector CP1 (plus lead) and chassis (minus lead).</p>	<p>Go to step e.</p> <p>Go to step f.</p> <p>Go to step g.</p> <p>Go to step h.</p> <p>CRT V1 probably defective.</p>	<p>Troubleshoot series regulator Q4. Check CR5, CR6, and A1CR4.</p> <p>Troubleshoot Q5, and A1Q7, A1Q9, and A1Q10 on regulator unit.</p> <p>Check CR1 and CR2.</p> <p>Check A3CR1 and A3CR2 in high voltage rectifier unit.</p> <p>Check A3CR3 and A3CR4 on high voltage rectifier unit.</p>
3	Intensity or focus of CRT display cannot be controlled.	<p>a. Using voltmeter, check for presence of +320 volts dc between pin B of J1 (plus lead) and chassis (minus lead).</p>	Go to step b.	Check CR1 and CR2.

(Cont'd)

TABLE 4-4. SYSTEMATIC TROUBLE LOCALIZATION (Cont'd)

Step No.	Symptom	Test Procedure	If Indication Is Normal	If Indication Is Abnormal
3 (Cont'd)		b. Shut off power and check resistance of INTENSITY control R5, R6, and FOCUS control R7. Also check C5, C6, A3CR3, and A3R4.	CRT defective.	Replace defective component.
4	Trace cannot be positioned vertically on CRT. No vertical deflection on CRT (no video).	Turn off power and check resistance of R4, R10, and A2R1.	Troubleshoot A2-Q1, A2Q2, and A2V1 on deflection unit.	Replace any component found defective.
5	Trace cannot be positioned horizontally on CRT; or stationary spot on CRT.	Turn off power and check resistance of R8, R9, and A2R11.	Troubleshoot stage A2V2.	Replace defective component.
6	No sawtooth waveform at X OUT connector J9.	Turn off power and check resistance of A2R27.	Troubleshoot A2-Q6 on deflection unit.	Replace defective component.
7	No video at Y OUT connector J7.	Turn off power and check resistance of A2R15.	Troubleshoot A2-Q3 and A2Q4 on deflection unit.	Replace defective component.
8	No pulses present at SYNC OUT connector J8 when companion module employed has sync capability.	Turn off power and check A2C2 and A2R23 are not shorted or open.	Troubleshoot A2-Q5 on deflection unit.	Replace defective component.

4-17. PRELIMINARY PROCEDURES. To set up the Main Frame for adjustment, proceed as follows:

- a. Set all power switches to the off position and disconnect power from the Main Frame.
- b. Remove the Main Frame from the rack.
- c. Remove the Main Frame top and bottom dust covers following the procedure outlined in paragraph 4-15.
- d. Connect the companion module to the Main Frame by means of provided cable.
- e. Connect power to the Main Frame and turn on power switch. Allow 15 minutes for warm-up and stabilization before making adjustment.

4-18. +10V ADJUSTMENT A1R13. To perform the +10V adjustment procedure, proceed as follows:

- a. Connect the Simpson 260 Voltmeter between chassis ground (minus lead) and positive terminal of A1C5 (plus lead).

- b. Adjust potentiometer A1R13 to obtain a reading of +10.0 volts dc on the Simpson 260 voltmeter.

4-19. -11V ADJUSTMENT A1R22. To perform the -11V adjustment procedure, proceed as follows:

- a. Connect the Non-Linear Systems Series 4800 digital voltmeter between pin 7 (minus lead) of connector J5 and chassis (plus lead).
- b. Adjust potentiometer A1R22 to obtain a reading of -11.0±0.05 volts dc on the Non-Linear Systems Series 4800 digital voltmeter.

4-20. ASTIGMATISM ADJUSTMENT A1R25. To perform the astigmatism adjustment, proceed as follows:

- a. Display test signal on the CRT screen by means of the companion module.
- b. Adjust the FOCUS control for optimum focusing of the electron spot.
- c. Adjust astigmatism potentiometer A1R25 to obtain uniform focus of the complete length of the scan.

4-21. H SIZE R9. To perform the H SIZE R9 adjustment, proceed as follows:

a. Adjust H SIZE potentiometer R9 to obtain a trace extending approximately 1/8 inch beyond each end of the engraved graticule markings.

b. Readjust HORIZ POS potentiometer R8 as required to keep trace centered while adjusting size.

Note

For more accurate adjustments, refer to the CA-5 instruction manual.

4-22. V SIZE R4. To perform V SIZE R4 adjustment, refer to the CA-5 instruction manual.

4-23. TYPICAL VOLTAGE MEASUREMENTS.

4-24. Typical voltage measurements for the Main Frame are included in figure 5-1. These typical voltage measurements were obtained with a Simpson 260 voltmeter under the following conditions:

a. Associated plug-in module connected to the Main Frame and no signal applied to module.

b. All controls set to their normal operating points.

SECTION V
SCHEMATIC DIAGRAMS

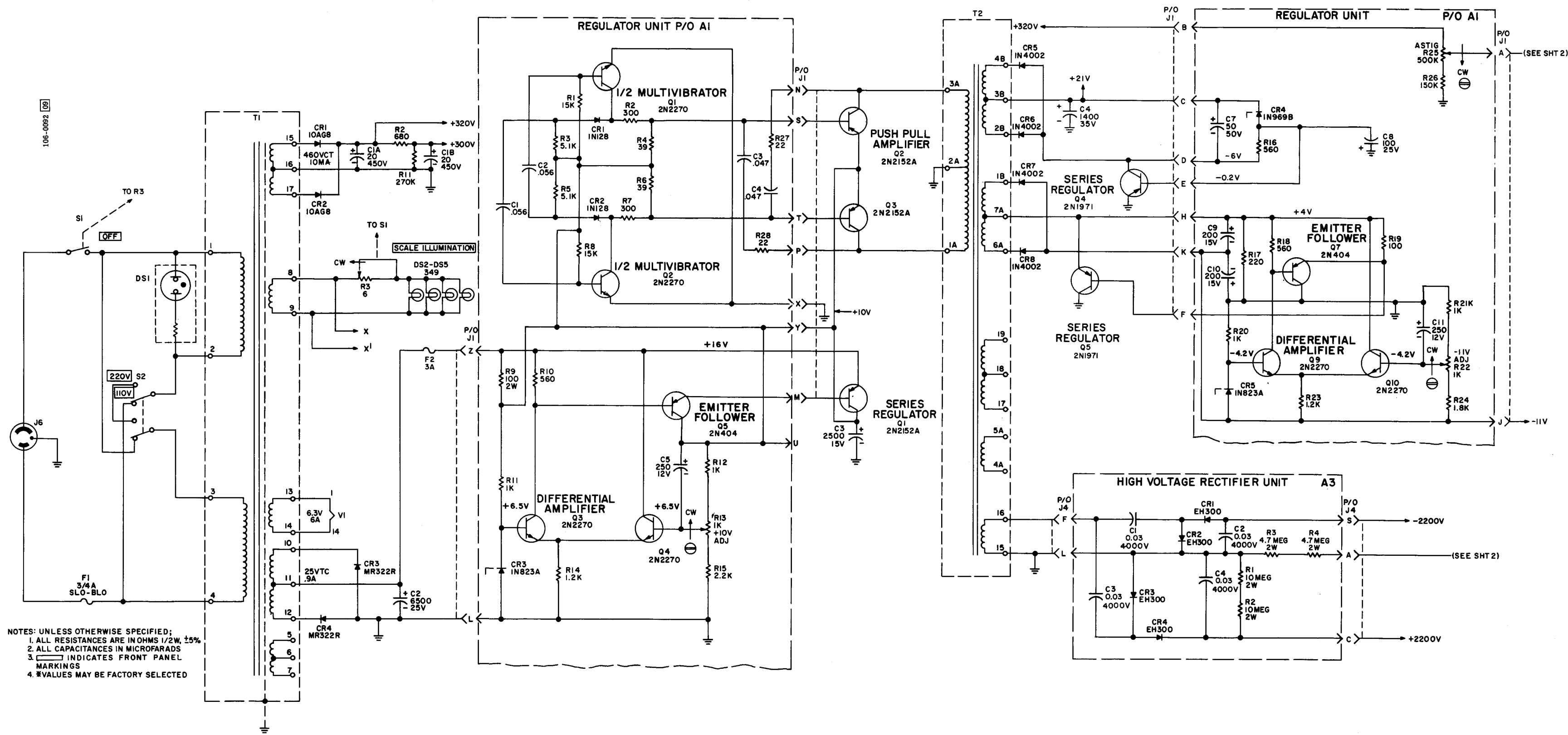


Figure 5-1. Schematic Diagram, Main Frame (Sheet 1 of 2)

SEE SHT 1

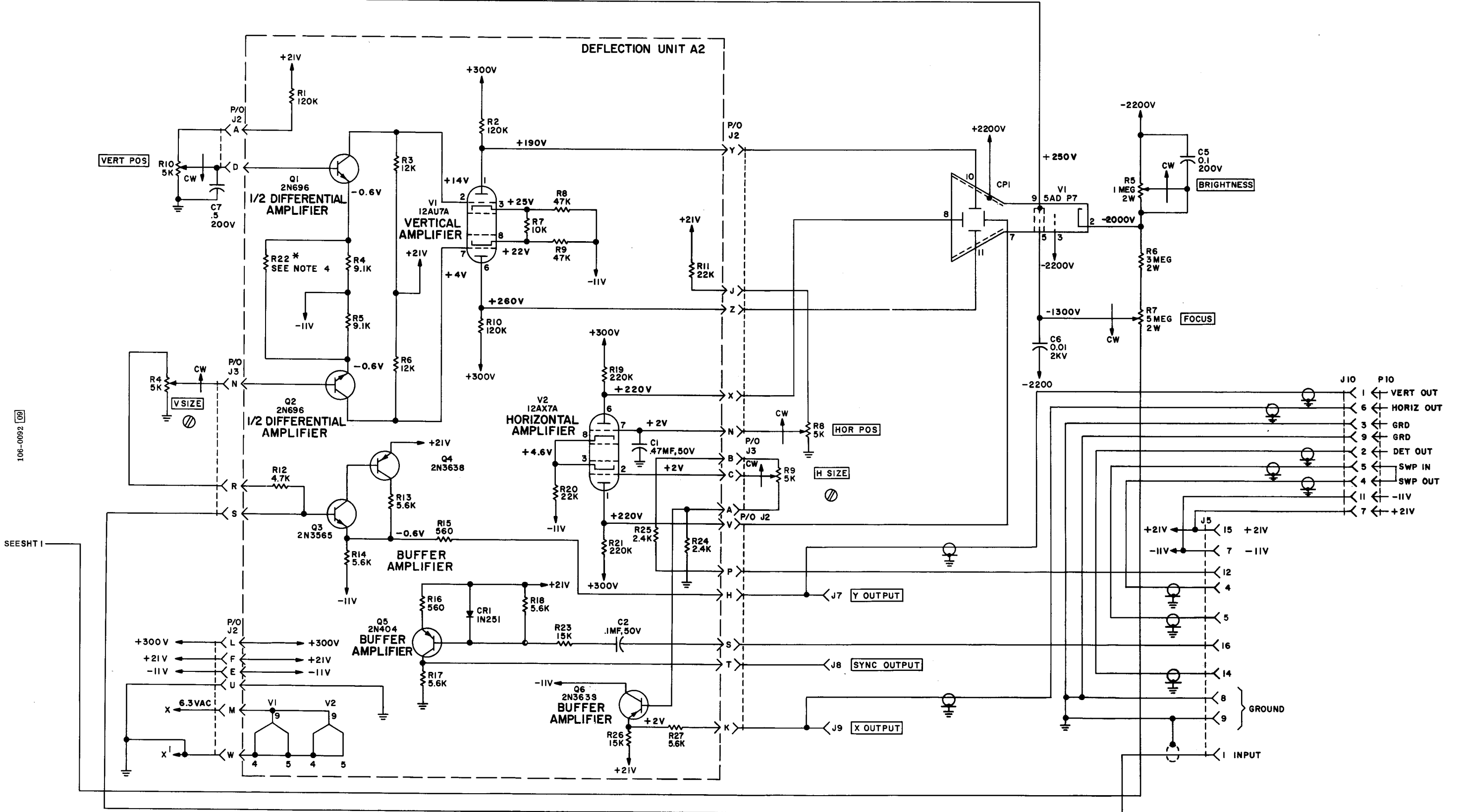
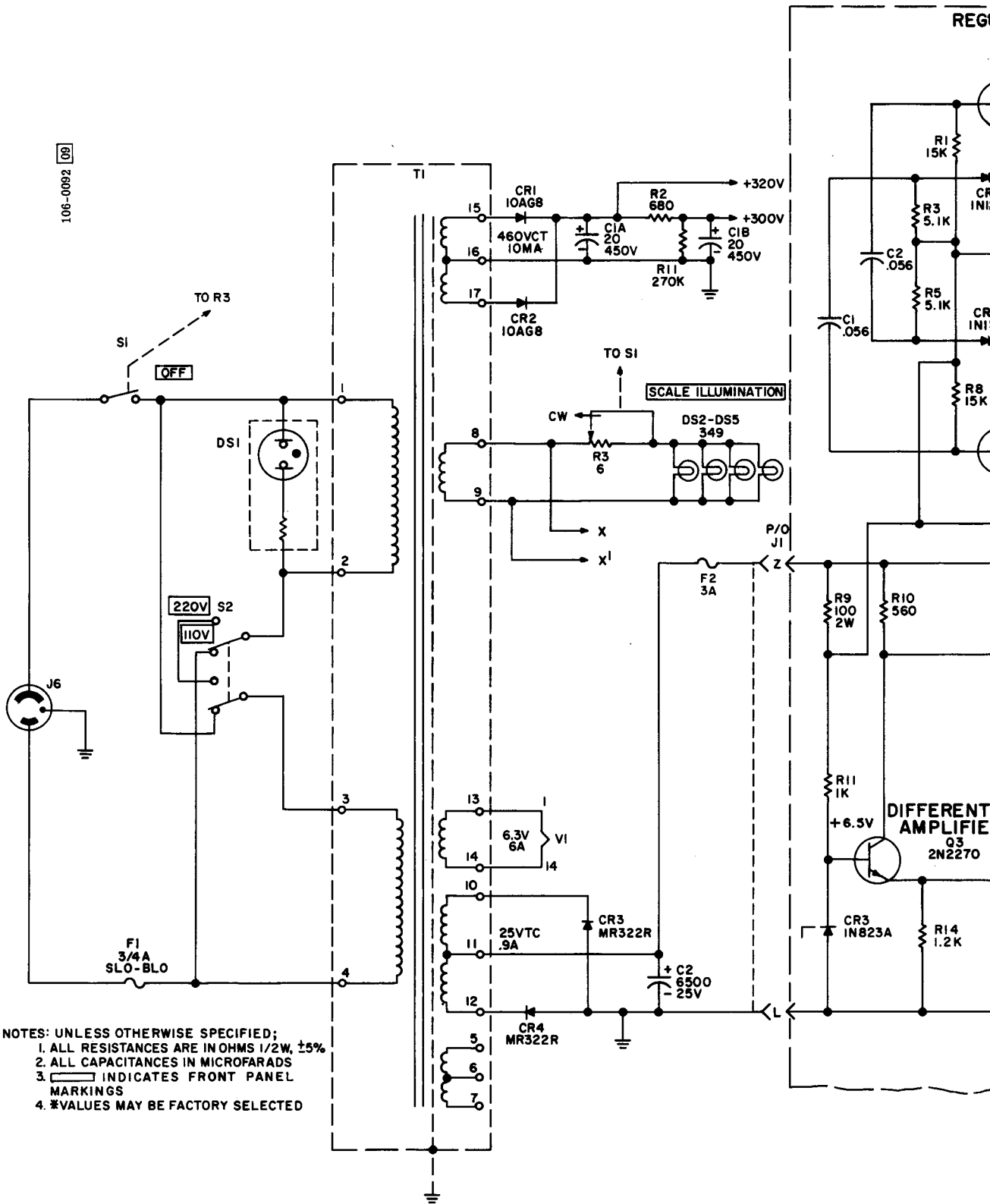
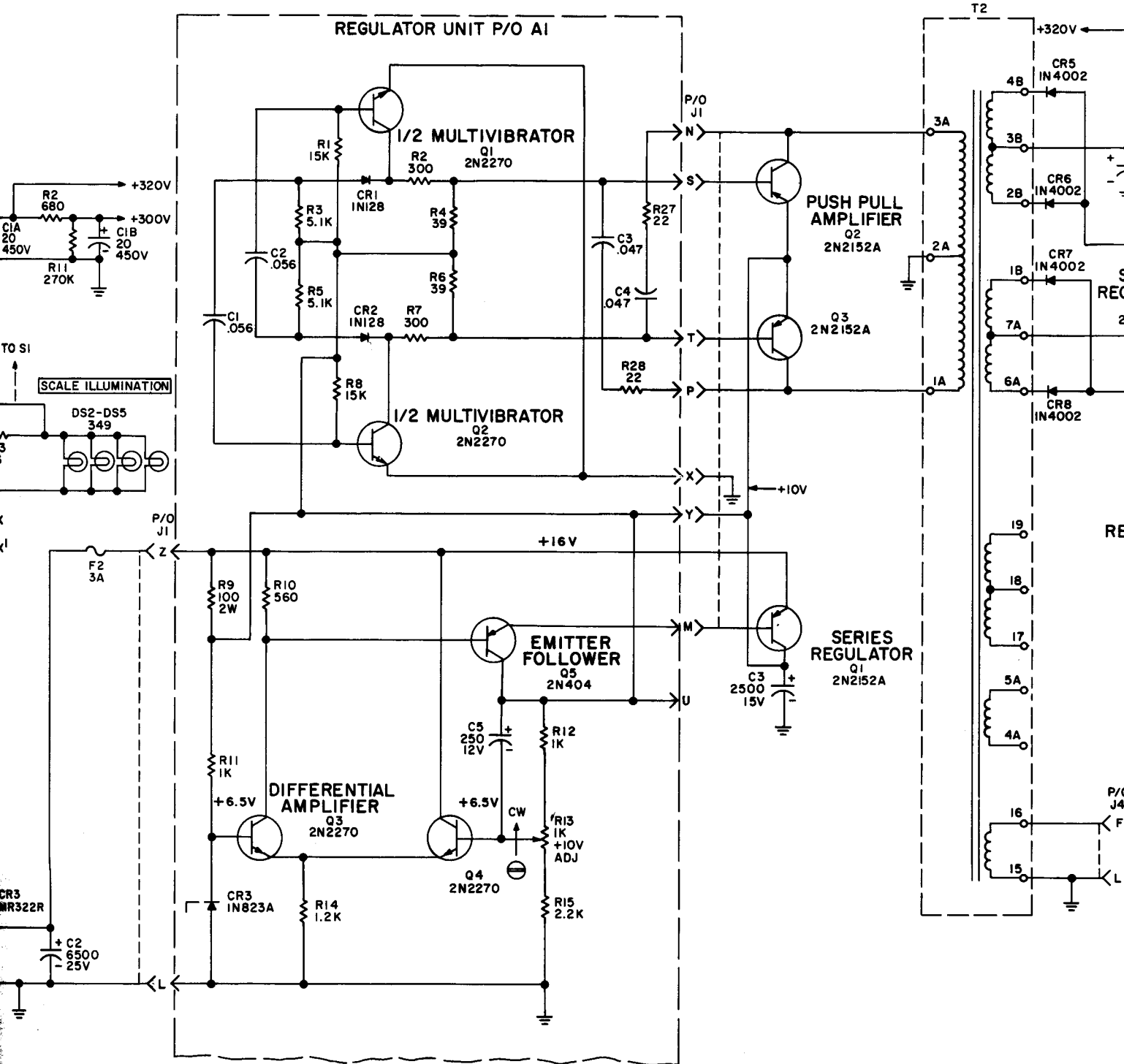


Figure 5-1. Schematic Diagram, Main Frame (Sheet 2 of 2)

106-0092 [02]



- NOTES: UNLESS OTHERWISE SPECIFIED;
 1. ALL RESISTANCES ARE IN OHMS 1/2W, ±5%
 2. ALL CAPACITANCES IN MICROFARADS
 3. [] INDICATES FRONT PANEL MARKINGS
 4. *VALUES MAY BE FACTORY SELECTED



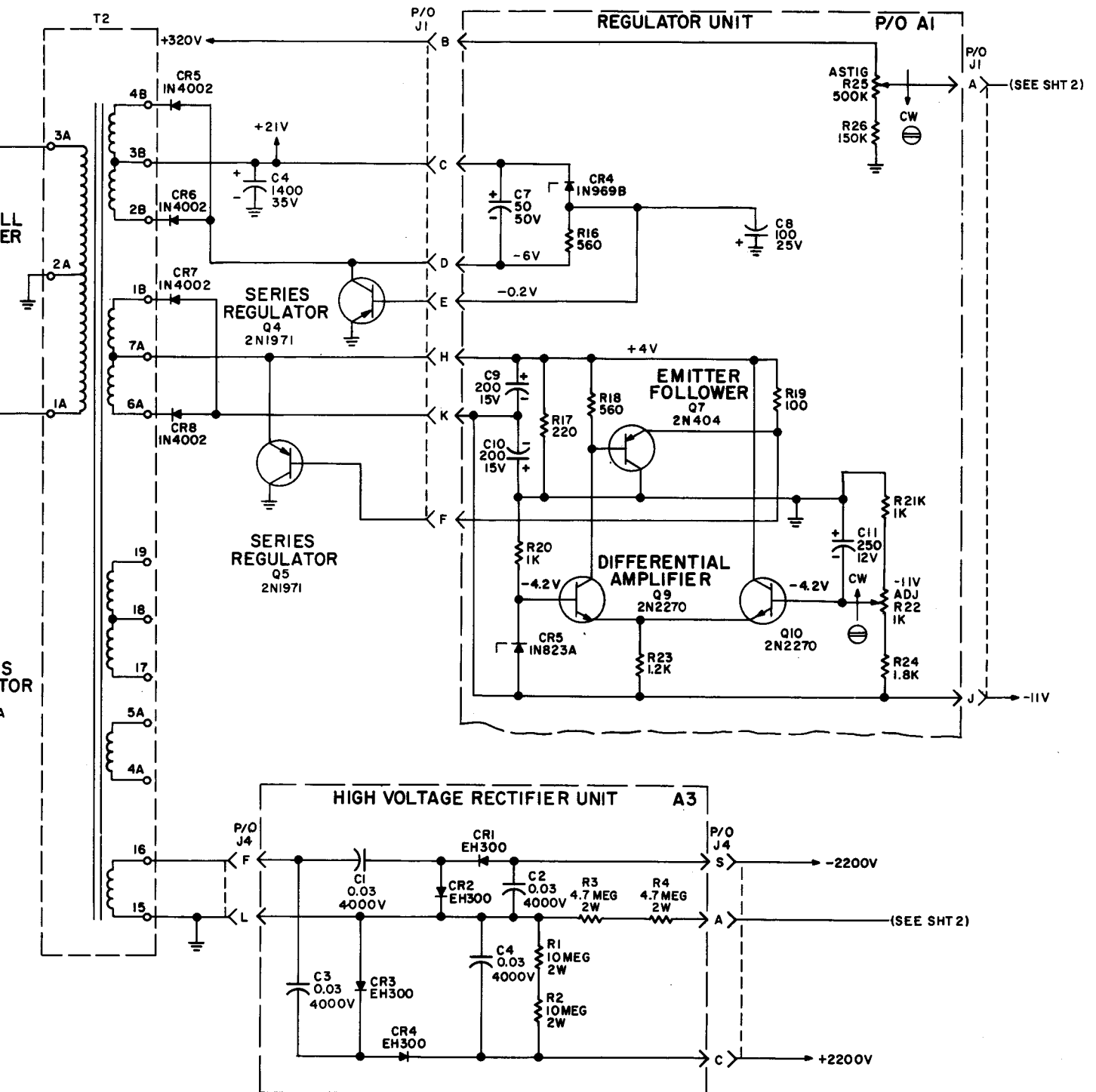
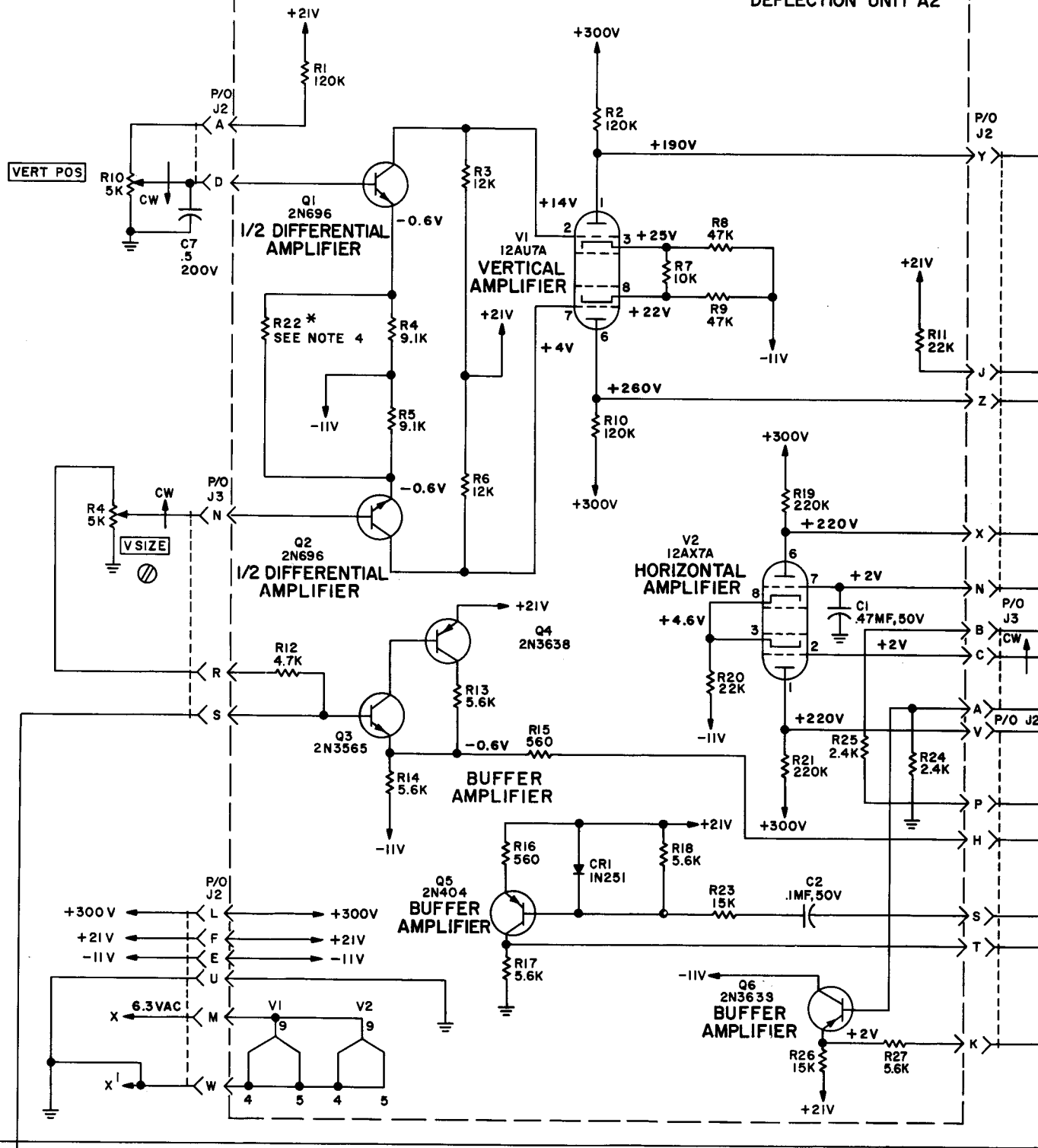


Figure 5-1. Schematic Diagram, Main Frame (Sheet 1 of 2)

DEFLECTION UNIT A2



106-0092 09

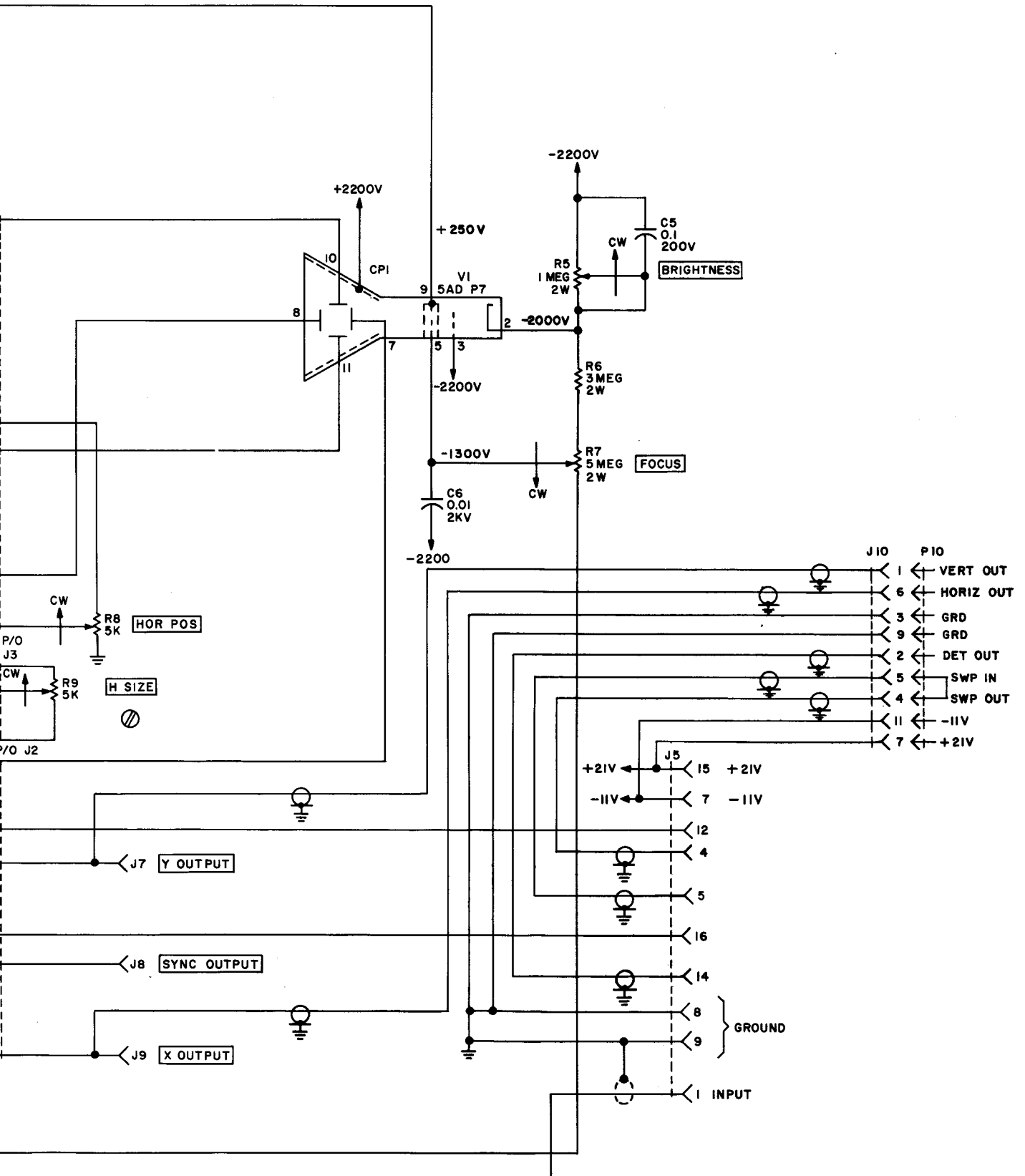


Figure 5-1. Schematic Diagram,
Main Frame (Sheet 2 of 2)

SECTION VI PARTS LIST

6-1. INTRODUCTION.

6-2. This parts list section includes all pertinent data necessary to locate, identify, and procure additional parts for the equipment. Parts are listed alpha-numerically by reference symbol and include all replaceable items such as electronic, electro-mechanical, and mechanical parts of the equipment. In some cases, values, ratings and manufacturer sources shown are nominal and variations may be found. Satisfactory replacement may be made with either the listed component or an exact replacement of the part(s) removed from the equipment.

6-3. ORDERING INFORMATION.

6-4. The following instructions will aid in ordering parts from the Parts Lists, table 6-2.

- a. Address all inquiries or orders to:

CUSTOMER SERVICE
Department 500-1
The Singer Company
Metrics Division
915 Pembroke Street
Bridgeport, Connecticut, 06608

- b. Include the following information:

- 1) Model and Serial Number of instrument.
- 2) Singer Part Number.
- 3) Reference Symbol Number.
- 4) Description (as shown on list).

6-5. HOW TO USE THE PARTS LIST.

6-6. Paragraphs 6-7 through 6-11 describe the use and meaning of the five columns included in the parts list (see figure 6-1).

6-7. REF SYMBOL COLUMN. The Ref Symbol Column (1, figure 6-1) contains an alpha-numerical listing of parts as they appear on equipment chassis, illustration, or schematic. The reference designation identifies the parts as to their component function in the instrument.

6-8. DESCRIPTION COLUMN. The Description Column (2, figure 6-1) contains the identification of component parts including all pertinent specifications and Singer part number. When the description column is used for a part which is identical to a part which has already been described; SAME AS (3) is used along with the reference symbol of the previously used part. In these instances, columns 3, 4, 5 are left blank. When the description column is used for a reference symbol for which no part exists; NOT USED (4) is placed in the column. In these instances, columns 3, 4, 5, are left blank.

6-9. MANUFACTURER'S PART NUMBER COLUMN. The Manufacturer's Part Number column (5, figure 6-1) contains the part number as designated by the manufacturer of the part.

6-10. MFR'S CODE COLUMN. The Mfr's Code column (6, figure 6-1) references the manufacturer by an assigned code number as listed in Federal Supply Code Handbook H4-2. For manufacturers not listed in H4-2, a letter code will be assigned. Table 6-1 includes the manufacturer and his code designation.

6-11. MAINT QTY COLUMN. The Maint Qty column (7, figure 6-1) contains the number of additional components recommended to keep the equipment at an optimum performance level. The recommended number of components in the Maint Qty column is based on 2000 hours of equipment operation.

Section VI
Parts List

SECTION VI
PARTS LIST

TABLE 6-2. PARTS LIST

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C109	CAPACITOR, ELECTROLYTIC, 20uf, MINUS 10PCT, PLUS 75PCT, 600V SINGER PART NO. 150-5004-001	D40690	56289	2
C110 THRU C124	SAME AS C109			
C125	NOT USED			
DS1	LAMP, INCANDESCENT SINGER PART NO. 160-6001-004	327	08806	2
R1 THRU R14	RESISTOR, FIXED COMP., 750 ohms, PORM 5 PCT, 1/2W SINGER PART NO. 151-1003-751J	EB7515	01121	1

Figure 6-1. Parts List Sample

TABLE 6-1. MANUFACTURER'S CODE

Number	Name	Number	Name
01002	General Electric Co. Capacitor Department Hudson Falls, N. Y.	71400	Bussman Mfg., Division of McGraw Edison Co., St. Louis, Mo.
01121	Allen-Bradley Co., Milwaukee, Wis.	71450	CTC Corp. Elkhart, Ind.
02777	Hopkins Engineering Co., San Fernando, Calif.	71785	Cinch Mfg. Co. and Howard B. Jones Div., Chicago, Ill.
04713	Motorola Inc., Semiconductor Products Div., Phoenix, Ariz.	72619	Dialight Corp., Brooklyn, N. Y.
08806	Sloan Co., Sun Valley, Calif.	73386	Freed Transformer Co. Brooklyn, N. Y.
12987	Adelphi Electronics Mineola, N. Y.	74545	Harvey Hubbel Inc., Bridgeport, Conn.
16665	The Singer Co., Metrics Division Bridgeport, Conn.	75915	Littelfuse Inc. Des Plaines, Ill.
19048	Amphenol Eastern Division of Amphenol-Borg Electrics Corp., Fairlawn, N. J.	81349	Military Specifications
19396	Illinois Tool Works Inc. Paktron Division Alexandria, Va.	83701	Electronic Devices, Inc., Yonkers, N. Y.
53021	Sangamo Electric Co., Springfield, Ill.	91418	Radio Materials Co. Chicago, Ill.
56289	Sprague Electric Co., North Adams, Mass.	91802	Industrial Devices Inc. Edgewater, N. J.
71279	Cambridge Thermionic Corp. Cambridge, Mass.	99120	Plastic Capacitors Inc., Chicago, Ill.

TABLE 6-2. PARTS LIST

Ref Symbol	Description	Manufacturer's Part Number	Mfr's Code	Maint Qty
CP1	CAP, ANODE/SINGER PART NO. 556023-079	118525	71785	1
CR1 CR2	AND RECTIFIER, DIODE/SINGER PART NO. 556118-029	10AG8	83701	1
CR3 CR4	AND SEMICONDUCTOR DEVICE, DIODE SINGER PART NO/556118-177	MR322R	04713	1
CR5 CR8	THRU SEMICONDUCTOR DEVICE, DIODE SINGER PART NO/556118-176	1N4002	81349	1
C1	CAPACITOR, ELECTROLYTIC, 2 X 20 UF, 450WVDC SINGER PART NO/556064-004	TVL-2755	56289	1
C2	CAPACITOR, ELECTROLYTIC, 6500 UF, 20WVDC SINGER PART NO/556166-029	539-2537-01	53021	1
C3	CAPACITOR, ELECTROLYTIC, 2500 UF, 15WVDC SINGER PART NO/556166-028	539-2532-01	53021	1
C4	CAPACITOR, ELECTROLYTIC, 1400 UF, 350WVDC SINGER PART NO/556074-183	539-2546-01	53021	1
C5	CAPACITOR, FIXED, METALLIZED, 0.1 UF, PORM 20PCT 200 V /SINGER PART NO. 556120-120	P12D	02777	1
C6	CAPACITOR, CERAMIC, 0.01 UF, 2000 V SINGER PART NO. 556060-062	2-KV-0.01UF-HI-K	91418	1
C7	CAPACITOR, FIXED, METALLIZED, 0.5 UF, PORM 20PCT 200 V /SINGER PART NO. 556120-128	P52DS	02777	1
DS1	LAMP, PILOT SINGER PART NO. 160-6006-004	2110-A4	91802	3
DS2 DS5	THRU LAMP, INCANDESCENT SINGER PART NO/160-6001-002	349	08806	4
F1	FUSE, DELAY, 3/4 AMP SINGER PART NO. 556146-897	313.750	75915	5
F2	FUSE, CARTRIDGE, 3 AMP SINGER PART NO. 556006-012	AGC3A	71400	5
J1 J2	AND CONNECTOR / SINGER PART NO. 556166-125	143-022-01	19048	1
J3	CONNECTOR, PRINTED CIRCUIT, 15 CONTACTS SINGER PART NO/556166-043	143-015-01	19048	1
J4	CONNECTOR, PRINTED CIRCUIT	149-0035-001	16665	1
J5	CONNECTOR, FEMALE /SINGER PART NO. 556166-046	26-190-16	19048	1
J6	CONNECTOR, RECEPTACLE, ELECTRICAL, 3 WIRE AC POWER, MALE, TWIST-LOCK SINGER PART NO/556010-003	7486	74545	1
J7 J9	THRU CONNECTOR, COAXIAL SINGER PART NO/168-4006-001	UG-1094/U	81349	1
J10	SOCKET, 11 PIN SINGER PART NO. 556146-703	78-S11	19048	1
P10	PLUG, 11 PIN, OCTAL TYPE SINGER PART NO. 556016-165	86-CP11T	19048	1
Q1 Q3	THRU TRANSISTOR/SINGER PART NO. 556166-026	2N2152A	81349	1

Section VI
Parts List

TABLE 6-2. PARTS LIST

Ref Symbol	Description	Manufacturer's Part Number	Mfr's Code	Maint Qty
Q4 Q5	AND TRANSISTOR SINGER PART NO. 556146-249	2N1971	81349	1
R1	RESISTOR, COMPOSITION, 100K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-104J	EB1045	01121	1
R2	RESISTOR, COMPOSITION, 680 OHMS, PORM 5 PCT, 1/2 W SINGER PART NO/151-1003-681J	EB6815	01121	1
R3	RESISTOR, VARIABLE, 60HMS WITH SWITCH S1	556056-001	16665	1
R4	RESISTOR, VARIABLE, COMPOSITION, 5K, 1/2W	151-0001-029	16665	1
R5	RESISTOR, VARIABLE, 1 MEGOHM	556146-221	16665	1
R6	RESISTOR, COMPOSITION, 3MEG, PORM 5 PCT, 2W SINGER PART NO/151-1005-305J	HB3055	01121	1
R7	RESISTOR, VARIABLE, 5 MEGOHMS	556146-222	16665	1
R8 R10	THRU SAME AS R4			
R11	RESISTOR, COMPOSITION, 270K OHMS, PORM 5 PCT 1/2W / SINGER PART NO 151-1003-274J	EB2745	01121	1
S1	NON REPLACEABLE PART OF R3			
S2	SWITCH	133-0015-001	16665	1
T1	TRANSFORMER, POWER/SINGER PART NO. 556020-218	36851	73386	1
T2	TRANSFORMER, POWER/SINGER PART NO. 556020-219	36898	73386	1
V1	ELECTRON, TUBE/SINGER PART NO. 556027-037	5ADP7	81349	1
XDS1	SOCKET, LAMP/SINGER PART NO. 556002-418	515-0050	72619	1
XDS2 XDS5	THRU SOCKET, LAMP, GRATICULE SINGER PART NO/556002-129	162-8430-09-602	72619	1
XF1 XF2	AND FUSEHOLDER/SINGER PART NO. 556006-015	342004	75915	1
XV1	SOCKET, CRT/SINGER PART NO. 556024-047	3B14	71785	1
A1	REGULATOR ASSEMBLY	103-0400-001	16665	1
A1C1 A1C2	AND CAPACITOR, FIXED, 0.056 UF, PORM 10 PCT, 50V SINGER PART NO/556120-190	MW-600	19396	1
A1C3 A1C4	AND CAPACITOR, FIXED, 0.047 UF, PORM 10 PCT, 50V SINGER PART NO/556120-191	MW-600	19396	1
A1C5	CAPACITOR, ELECTROLYTIC, 250 UF, 12WVDC SINGER PART NO/556166-113	TE-1138	56289	1
A1C6	NOT USED			
A1C7	CAPACITOR, ELECTROLYTIC, 50 UF, 50WVDC SINGER PART NO/556166-116	TE-1307	56289	1
A1C8	CAPACITOR, ELECTROLYTIC, 100 UF, 25WVDC SINGER PART NO/556166-110	TE-1211	56289	1
A1C9 A1C10	AND CAPACITOR, ELECTROLYTIC, 200 UF, 15WVDC SINGER PART NO/556166-115	TE-1164	56289	1

TABLE 6-2. PARTS LIST

Ref Symbol	Description	Manufacturer's Part Number	Mfr's Code	Maint Qty
A1C11	SAME AS A1C5			
A1CR1 A1CR2	AND SEMICONDUCTOR DEVICE,DIODE SINGER PART NO/556118-045	1N128	81349	1
A1CR3	SEMICONDUCTOR DEVICE,DIODE SINGER PART NO/556166-039	1N823A	81349	1
A1CR4	SEMICONDUCTOR DEVICE,DIODE SINGER PART NO/556166-037	1N969B	81349	1
A1CR5	SAME AS A1CR3			
A1Q1 A1Q4	THRU TRANSISTOR/SINGER PART NO. 556166-087	2N2270	81349	1
A1Q5	TRANSISTOR FACTORY SELECTED			
A1Q7	SAME AS A1Q5			
A1Q9 A1Q10	AND SAME AS A1Q1			
A1R1	RESISTOR,COMPOSITION,15K,PORM 5 PCT,1/2W SINGER PART NO/151-1003-153J	EB1535	01121	2
A1R2	RESISTOR,COMPOSITION,300 OHMS,PORM 5 PCT, 1/2W SINGER PART NO/151-1003-301J	EB3015	01121	1
A1R3	RESISTOR,COMPOSITION,5.1K,PORM 5 PCT,1/2W SINGER PART NO/151-1003-512J	EB5125	01121	1
A1R4	RESISTOR,COMPOSITION,39 OHMS,PORM 5 PCT,1/2W SINGER PART NO/151-1003-390J	EB3905	01121	1
A1R5	SAME AS A1R3			
A1R6	SAME AS A1R4			
A1R7	SAME AS A1R2			
A1R8	SAME AS A1R1			
A1R9	RESISTOR,COMPOSITION,100 OHMS,PORM 5 PCT, 1/2W SINGER PART NO/151-1003-101J	EB1015	01121	1
A1R10	RESISTOR,COMPOSITION,560 OHMS,PORM 5 PCT 1/2W SINGER PART NO/151-1003-561J	EB5615	01121	1
A1R11 A1R12	AND RESISTOR,COMPOSITION,1K,PORM 5 PCT,1/2W SINGER PART NO/151-1003-102J	EB1025	01121	1
A1R13	RESISTOR,VARIABLE,1K PORM 30 PCT,1/8W SINGER PART NO/556056-121	U201R102B	71279	1
A1R14	RESISTOR,COMPOSITION 1.2K,PORM 5 PCT,1/2W SINGER PART NO/151-1003-122J	EB1225	01121	1
A1R15	RESISTOR,COMPOSITION,2.2K,PORM 5 PCT,1/2W SINGER PART NO/151-1003-222J	EB2215	01121	1
A1R16	SAME AS A1R10			
A1R17	RESISTOR,COMPOSITION,220 OHMS,PORM 5 PCT, 1/2W / SINGER PART NO. 151-1003-221J	EB221J	01121	1

Section VI
Parts List

TABLE 6-2. PARTS LIST

Ref Symbol	Description	Manufacturer's Part Number	Mfr's Code	Maint Qty
A1R18	SAME AS A1R10			
A1R19	SAME AS A1R9			
A1R20 A1R21	AND SAME AS A1R11			
A1R22	SAME AS A1R13			
A1R23	SAME AS A1R14			
A1R24	RESISTOR, COMPOSITION, 1.8K, PORM 10 PCT, 1/2W SINGER PART NO/151-1003-182K	EB1821	01121	1
A1R25	RESISTOR, VARIABLE, 500K, PORM 30 PCT, 1/8W SINGER PART NO/556056-123	U201R5048	71450	1
A1R26	RESISTOR, COMPOSITION, 150K OHMS, PORM 5 PCT 1/2W /SINGER PART NO/151-1003-154J	EB1545	01121	1
A1R27 A1R28	AND RESISTOR, COMPOSITION, 22 OHMS, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-220J	EB2205	01121	1
A2	DEFLECTION ASSEMBLY	103-0401-001	16665	1
A2CR1	SEMICONDUCTOR DEVICE, DIODE SINGER PART NO/556118-046	1N251	81349	1
A2C1	CAPACITOR, FIXED, 0.47 UF, PORM 20 PCT, 50V SINGER PART NO/556146-273	GE6517AB-474	01002	1
A2C2	CAPACITOR, FIXED, MYLAR, 0.10 UF, PORM 10PCT, 50V SINGER PART NO. 150-4002-J104K	601-PE TYPE	84411	1
A2Q1 A2Q2	AND TRANSISTOR/SINGER PART NO. 556017-064	2N696	81349	1
A2Q3	TRANSISTOR/SINGER PART NO. 556146-254	2N3565	81349	1
A2Q4	TRANSISTOR/SINGER PART NO. 556146-255	2N3638	81349	1
A2Q5	SAME AS A1Q1			
A2Q6	SAME AS A2Q4			
A2R1 A2R2	AND RESISTOR, COMPOSITION, 120K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-124J	EB1245	01121	1
A2R3	RESISTOR, COMPOSITION, 12K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-123J	EB1235	01121	1
A2R4 A2R5	AND RESISTOR, COMPOSITION, 9.1K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-912J	EB9125	01121	1
A2R6	SAME AS A2R3			
A2R7	RESISTOR, COMPOSITION, 10K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-103J	EB1035	01121	1
A2R8 A2R9	AND RESISTOR, COMPOSITION, 47K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-473J	EB4735	01121	1
A2R10	SAME AS A2R1			
A2R11	RESISTOR, COMPOSITION, 22K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-223J	EB2235	01121	1

TABLE 6-2. PARTS LIST

Ref Symbol	Description	Manufacturer's Part Number	Mfr's Code	Maint Qty
A2R12	RESISTOR, COMPOSITION, 4.7K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-472J	EB4725	01121	1
A2R13 AND A2R14	RESISTOR, COMPOSITION, 5.6K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-562J	EB5625	01121	1
A2R15 AND A2R16	SAME AS A1R10			
A2R17 AND A2R18	SAME AS A2R13			
A2R19	RESISTOR, COMPOSITION, 220K, PORM 5 PCT, 1/2W SINGER PART NO/151-1003-224J	EB2245	01121	1
A2R20	SAME AS A2R11			
A2R21	SAME AS A2R19			
A2R22	SAME AS A1R9 FACTORY SELECTED			
A2R23	SAME AS A1R1			
A2R24 AND A2R25	RESISTOR, COMPOSITION, 2.4K OHMS, PORM 5 PCT 1/2W /SINGER PART NO. 151-1003-242J	EB2425	01121	1
A2R26	SAME AS A1R1			
A2R27	SAME AS A2R13			
A2V1	ELECTRON TUBE/SINGER PART NO/556027-171	12AU7A	81349	1
A2V2	ELECTRON TUBE/SINGER PART NO/556027-022	12AX7A	81349	1
A2XV1 AND A2XV2	SOCKET, ELECTRON TUBE SINGER PART NO/556024-339	9BC-B1	71785	1
A3	HIGH VOLTAGE ASSEMBLY	103-0402-001	16665	1
A3CR1 THRU A3CR4	SEMICONDUCTOR DEVICE, DIODE, SILICON SINGER PART NO/556118-179	426-EH300	83701	1
A3C1 THRU A3C4	CAPACITOR, FIXED, MYLAR, 0.03 UF, 4000 WVDC SINGER PART NO. 556146-609	LR-40	99120	1
A3R1 AND A3R2	RESISTOR, COMPOSITION, 10 MEG-OHM, PORM 10 PCT, 2W SINGER PART NO/151-1005-106K	HB1061	01121	1
A3R3 AND A3R4	RESISTOR, COMPOSITION, 4.7 MEG-OHM, PORM 10 PCI 2W SINGER PART NO/151-1005-475K	HB4751	01121	1

ADDENDUM

for

MODEL MF-5 (SSB-50) MAIN FRAME

I. PURPOSE.

To correct existing errors in the handbook.

II. ADDENDUM.

- a. In table 1-3, change F1 fuse type to read:

"3/4 amp delay (3/8 amp delay for 220 volt operation)"

- b. Page 4-8, table 4-4 Symptom for step 8 should read:

"No pulses present at SYNC OUT connector J8 when companion module employed has sync capability."

- c. Page 4-9, paragraph 4-21, delete note after step b and add step c.

"c. Adjust the CA-5 controls as directed in paragraph 4-11 of CA-5 manual. Perform step 1a of table 4-3 in CA-5 manual. Adjust H SIZE and HORIZ POS controls to display sideband pips at extreme left and right screen calibration marks."

- d. Page 4-9, paragraph 4-22 change to read:

"4-22. V SIZE R4. To perform V SIZE R4 adjustment, proceed as follows:

- a. Perform the adjustments of paragraphs 2-8a through c of the CA-5 manual.
- b. Connect the VOM between ground and the center conductor of Y OUT connector J7.
- c. Adjust the V SIZE control R4 and VERT POS control R10 until the spot on the CRT screen coincides with the baseline at 0 volts and with the 0 dB screen calibration at 1.4 volts. Adjust the GAIN control of the CA-5 to adjust the voltage at J7."

ADDENDUM

for

**MAIN FRAME
MODEL MF-5 (SSB-50)**

I. PURPOSE.

To correct existing errors in the handbook.

II. ADDENDUM.

a. On figure 5-1 (sheet 1) make the following changes:

1. Change voltage of C2 from "25 V" to "20 V"
2. Change A1C1 & C2 from " ± 5 PCT" to " ± 10 PCT, 50 V"
3. Change A1C3 & C4 from " ± 5 PCT" to " ± 10 PCT, 50 V"
4. Show A1Q5 and Q7 as being Factory Selected.
5. Show A2Q5 as being Factory Selected.
6. Change A3R1 through R4 from " ± 5 PCT" to " ± 10 PCT"

b. On figure 5-1 (sheet 2) make the following changes.

1. Change A2C1 from "0.47MF" to "0.47UF"
2. Change A2C2 from "0.1MF" to "0.10UF, 50V"

c. Make the following changes to the List of Replaceable Parts.

1. Add the following to table 6-1, Manufacturer Code:

<u>Number</u>	<u>Name</u>
95354	Methode Mfg., Co. Chicago, Ill.

2. Delete R1

3. Add the items noted below to the Parts List.

Ref Symbol	Description	Manufacturer's Part Number	Mfr's Code	Maint Qty
C2	CAPACITOR, FIXED, ELECTROLYTIC, 6500 UF, PLUS 150, MINUS 10 PCT, 20V SINGER PART NO. 556160-029	539-2537-01	53021	1
C4	CAPACITOR, FIXED, ELECTROLYTIC, 1400 UF, PLUS 150, MINUS 10 PCT, 20V SINGER PART NO. 556074-183	539-2546-01	53021	1
J3	CONNECTOR, PRINTED CIRCUIT, 15 CONTACTS SINGER PART NO. 168-3002-005	71-6015-1100 -00	95354	1
R5	RESISTOR, VARIABLE, 1 MEGOHM, PORM 20 PCT, 1/2W	556146-221	16665	1
R7	RESISTOR, VARIABLE, 5 MEGOHMS, PORM 20 PCT, 1/2W	556146-222	16665	1
A1R9	RESISTOR, FIXED, COMP., 100 OHMS, PORM 5 PCT, 2W SINGER PART NO. 151-1005-101J	HB1015	01121	1
A1R13	RESISTOR, VARIABLE, 1K OHM, PORM 30 PCT, 1/8W SINGER PART NO. 151-0021-003	U201R102B	71279	1
A1R25	RESISTOR, VARIABLE, 500K OHMS, PORM 30 PCT, 1/8W SINGER PART NO. 151-0021-012	U201R504B	71450	1
A2Q5	SANE AS A1Q5			

Addendum No. 530

ADDENDUM

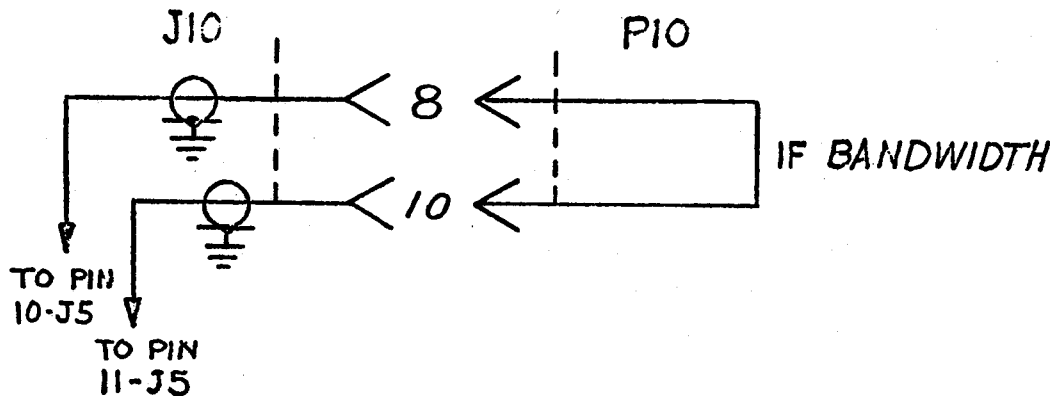
for

MODEL MF-5

(Effective on Serial No. U18048 thru U18121,
U18171 and Up)

Change Figure 5-1 as indicated below. This change does not effect operation of the SSB-50, SSB-50-1 or SSB-50/GD Systems. Wire connections to pin 8 of J10, pin 10 of J5, pin 10 of J10, pin 11 of J5, also pin 8 and 10 of P10 were made to make main frame capability with other plug-in modules used in this frame.

Add the following to Figure 5-1.



Addendum No. 545
(10 to 11)

ADDENDUM

for

MAIN FRAME MODEL MF-5 (USED AS PART OF THE SSB-50, SSB-50-1 and SSB-50/GD SPECTRUM ANALYZERS)

I. PURPOSE.

To correct existing errors in this manual.

II. ADDENDUM.

The following changes must be made to correct this manual:

- a. In table 1-3, fuse F1 rating should read, "3/4 ampere delay type for 110 volt operation or 3/8 ampere delay type for 220 volt operation".
- b. In the Symptom column of table 4-4, step 8 should read, "No pulses present at SYNC OUT connector J8 when companion module employed has synchronization capability".
- c. Insert the following in place of paragraph 4-22:

"4-22. V SIZE R4. To perform the V SIZE R4 adjustment, proceed as follows:

 - a. Perform the adjustments of paragraphs 2-8a through 2-8c of the Model CA-5 Panalyzer manual.
 - b. Connect the VOM between ground and the center conductor of Y OUT connector J7 on the Model MF-5 Main Frame.
 - c. Set the SWEEP MODE switch on the Model CA-5 Panalyzer to NORMAL position.
 - d. Set the TEST SIGNAL-Hz switch on the Model CA-5 Panalyzer to CF position.
 - e. Adjust the CENTER FREQ LEVEL on the Model CA-5 Panalyzer for a full scale marker pip on the Model MF-5 Main Frame CRT display with the AMPLITUDE SCALE switch on the Panalyzer in the LIN position.
 - f. Place the SWEEP MODE switch on the Model CA-5 Panalyzer in the MANUAL position.
 - g. Using the MANUAL SWEEP control on the Model CA-5 Panalyzer,

adjust the sweep so that a full-deflection spot appears on the Model MF-5 Main Frame CRT display (i. e., on the LIN 10 horizontal division of the CRT graticule). This spot should be centered on the CF horizontal division of the CRT graticule.

h. Alternately adjust the VERT POS and V SIZE controls on the Model MF-5 Main Frame until a shift of 1.4 volts dc on the VOM scale corresponds to a full-scale spot movement on the CRT display. The VERT POS and V SIZE controls interact and must be readjusted each time until the full-scale deflection is obtained.

NOTE

If adjusting the VERT POS and V SIZE controls on the Model MF-5 Main Frame does not obtain the required results, adjust the GAIN control on the Model CA-5 Panalyzer. If this does not correct the situation, there is a defect in either the Panalyzer or the Main Frame that requires maintenance attention.