TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

RADAR SET ANITPS-25 (NSN 5840-00-082-4128)

HEADQUARTERS, DEPARTMENT OF THE ARMY

29 OCTOBER 1982

WARNING

HIGH VOLTAGE

IS USED IN THE OPERATION
OF THIS EQUIPMENT

DEATH ON CONTACT

MAY RESULT IF PERSONNEL FAIL
TO OBSERVE SAFETY PRECAUTIONS.

BE CAREFUL NOT TO CONTACT HIGH-VOLTAGE CONNECTIONS OR 120-VOLT INPUT CONNECTIONS WHEN WORKING ON OR NEAR THIS EQUIPMENT. WHEN WORKING INSIDE THE EQUIPMENT, AFTER THE POWER HAS BEEN TURNED OFF, ALWAYS SHORT-CIRCUIT THE HIGH-VOLTAGE CAPACITORS.

EXTREMELY DANGEROUS POTENTIALS

FIRST AID TREATMENT FOR ELECTRIC SHOCK

1. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY

Shut off the current. If this is not immediately possible, use a dry non-conductor (rubber gloves, rope, board) to move either the victim or the wire. Avoid contact with the victim. If necessary to cut a live wire, use an ax with a dry wooden handle.

2 ATTEND INSTANTLY TO THE VICTIM'S BREATHING

Begin resuscitation at once on the spot. Do not stop to loosen the victim's clothing. Keep the patient warm. Send for a doctor. Remove false teeth or other obstructions from the victim's mouth.

MOUTH-TO-MOUTH ARTIFICIAL RESPIRATION

1. TILT HEAD BACK

This movement should help relieve obstruction of the air passage by moving the base of the tongue from the back of the throat.

2. KEEP MOUTH OPEN

If the victim's jaw is clenched, air may still be blown through his teeth. If there is foreign matter visible in the mouth, wipe it out quickly with your fingers.

3. PINCH NOSTRILS SHUT

Nose must be closed to prevent the escape of air.

4. BLOW INTO MOUTH

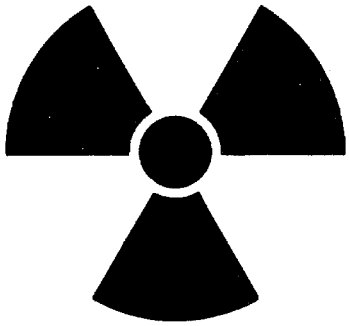
For an adult, blow vigorously at the rate of about 12 breaths per minute. For a child, blow relatively shallow breaths appropriate for the child's size, at the rate of about 20 per minute.

5. LISTEN FOR AIR

Remove your mouth, turn your head to the side, and listen for the return rush of air that indicates air exchange. Repeat the blowing effort. If the victim's stomach swells during resuscitation, air may be entering it. This may be corrected by gently pressing on the victim's stomach while blowing.

MICROWAVE RADIATION HAZARD

WARNING: Overexposure to radio-frequency (RF) energy is injurious to personnel. Avoid direct exposure in the radiated beam when the antenna is stationary. Exposure in the stationary radiated beam at a distance of 40 feet from the antenna should be limited to 10 minutes. Exposure at shorter distances should be limited accordingly or avoided, if possible. At a distance of 126 feet or more from the antenna, the radiation level with-in the antenna beam is not injurious to personnel. Limit direct exposure in the stationary beam at distances between 40 and 126 feet on the basis of a maximum of 10 minutes exposure at 40 feet. The antenna should not be installed within 126 feet of a fixed working area unless proper authorization has been obtained.



RADIOACTIVITY HAZARD

Electron tubes TU-1271, OA2WA, 6627/OB2WA, and 5783WA, used in this radar set, are radioactive. If one of these tubes is broken, dangers of poisoning from the radioactive materials contained in the tubes exist. For detailed instructions on handling, storing, and disposing of radioactive tubes, see TB SIG 225.

POISONOUS FUMES FROM SELENIUM RECTIFIERS

SELENIUM RECTIFIERS are used in radar receiver-transmitter RT-500/TPS-25. The failure of selenium rectifiers can result in the liberation of poisonous fumes and the deposit of poisonous selenium compounds. When a rectifier burns out or arcs over, a strong odor is produced. Provide adequate ventilation immediately. AVOID INHALING THE FUMES AND DO NOT HANDLE THE DAMAGED RECTIFIER UNTIL IT HAS COOLED.

TECHNICAL MANUAL

No. 11-5840-217-34-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 29 October 1982

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
RADAR SET AN/TPS-25
(NSN 5840-00-082-4128)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703.

In either case, a reply will be furnished direct to you.

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* This manual supersedes TM 11-5840-217-34-1, dated 18 January 1982.

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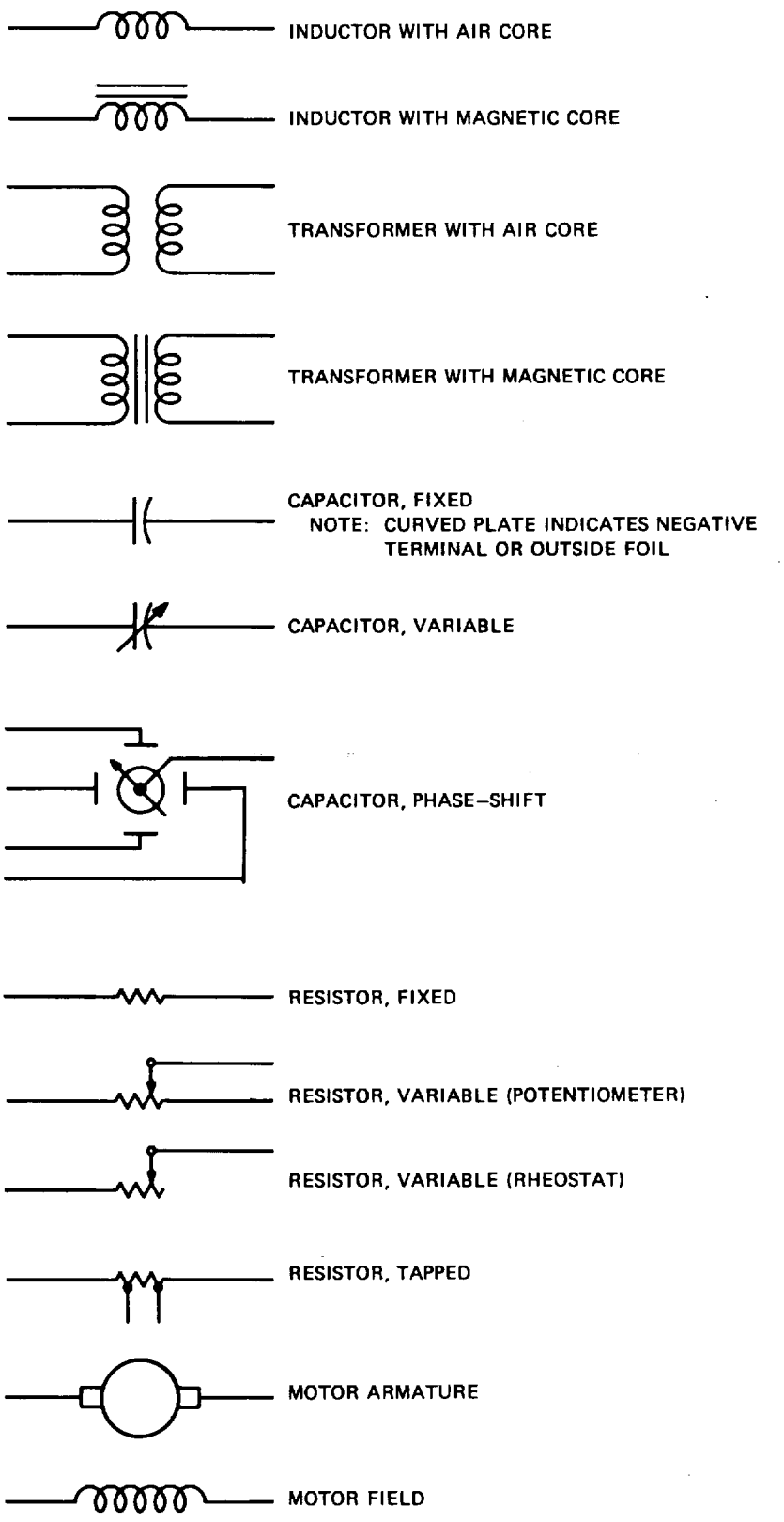
NOTES

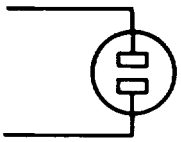
CHAPTER 1
SYMBOLS AND COLOR CODES

1-1. CONVENTIONAL SYMBOLS

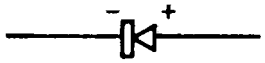


THERMAL RELAY

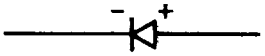
HORN



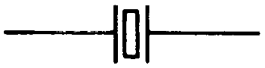
LINE VOLTAGE RECEPTACLE



CRYSTAL DIODE

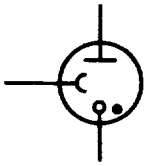


METALLIC OXIDE RECTIFIER

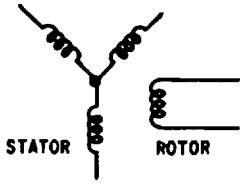


QUARTZ CRYSTAL

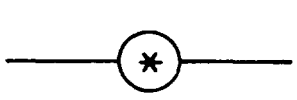
GAS–FILLED TUBE WITH COLD CATHODE



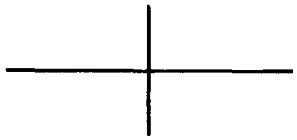
GAS–FILLED TUBE WITH CONTROL ELECTRODE AND COLD CATHODE



SYNCHRO



*INDICATES TYPE OF METER
MA–MILLIAMMETER
V–VOLTMETER
TT–TOTAL TIME METER



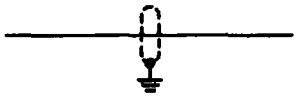
WIRES CROSSING–NO CONNECTION

WIRES CROSSING–CONNECTION

GROUND CONNECTION

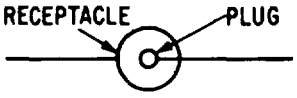
MECHANICAL CONNECTION

MECHANICAL CONNECTION



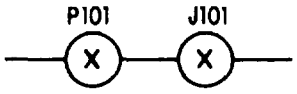
SHIELDED WIRE

COAXIAL CABLE

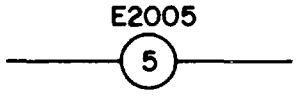


COAXIAL CONNECTOR

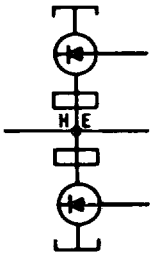
TEST JACK



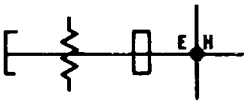
WINCHESTER PLUG AND JACK CONNECTION
NOTE: EXAMPLE INDICATES PIN X OF P101 MATES WITH X OF J101



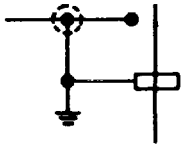
TERMINAL BOARD CONNECTION
NOTE: EXAMPLE INDICATES TERMINAL 5 OF TERMINAL STRIP E2005



MAGIC–T BALANCED MIXER
(SEE NOTES FOR EXPLANATION OF H AND E)

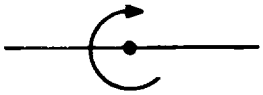


KLYSTRON MAGIC–T



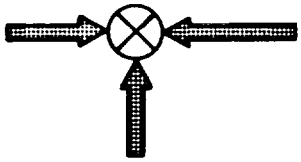
COUPLING FROM WAVEGUIDE TO
COAXIAL CABLE

VARIABLE ATTENUATOR



ROTATION

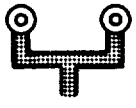
ELECTRICAL ERROR SIGNAL



GEAR DIFFERENTIAL

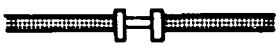
MECHANICAL DIAL

MECHANICAL LINKAGE

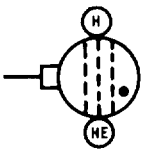


MECHANICAL DIALS

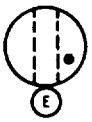
MECHANICAL LIMIT STOP



MECHANICAL SLIP CLUTCH



TR TUBE



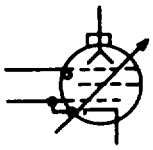
ATR TUBE

NOTES:

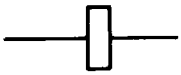
E INDICATES THAT THE PHYSICAL PLANE OF THE APERTURE IS PERPENDICULAR TO THE TRANSVERSE COMPONENT OF THE MAJOR E LINES: i.e., THE ORIFICE IS IN THE WIDER SURFACE OF THE WAVEGUIDE

H INDICATES THAT THE PHYSICAL PLANE OF THE APERTURE IS PARALLEL TO THE TRANSVERSE COMPONENT OF THE MAJOR E LINES

HE INDICATES ALL OTHER TYPES OF APERTURE COUPLING



REFLEX KLYSTRON

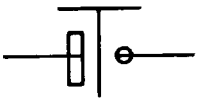


RECTANGULAR WAVEGUIDE

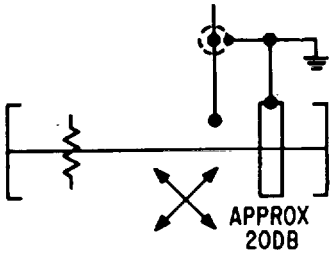
CIRCULAR WAVEGUIDE

ATTENUATOR
*TRANSMISSION LOSS

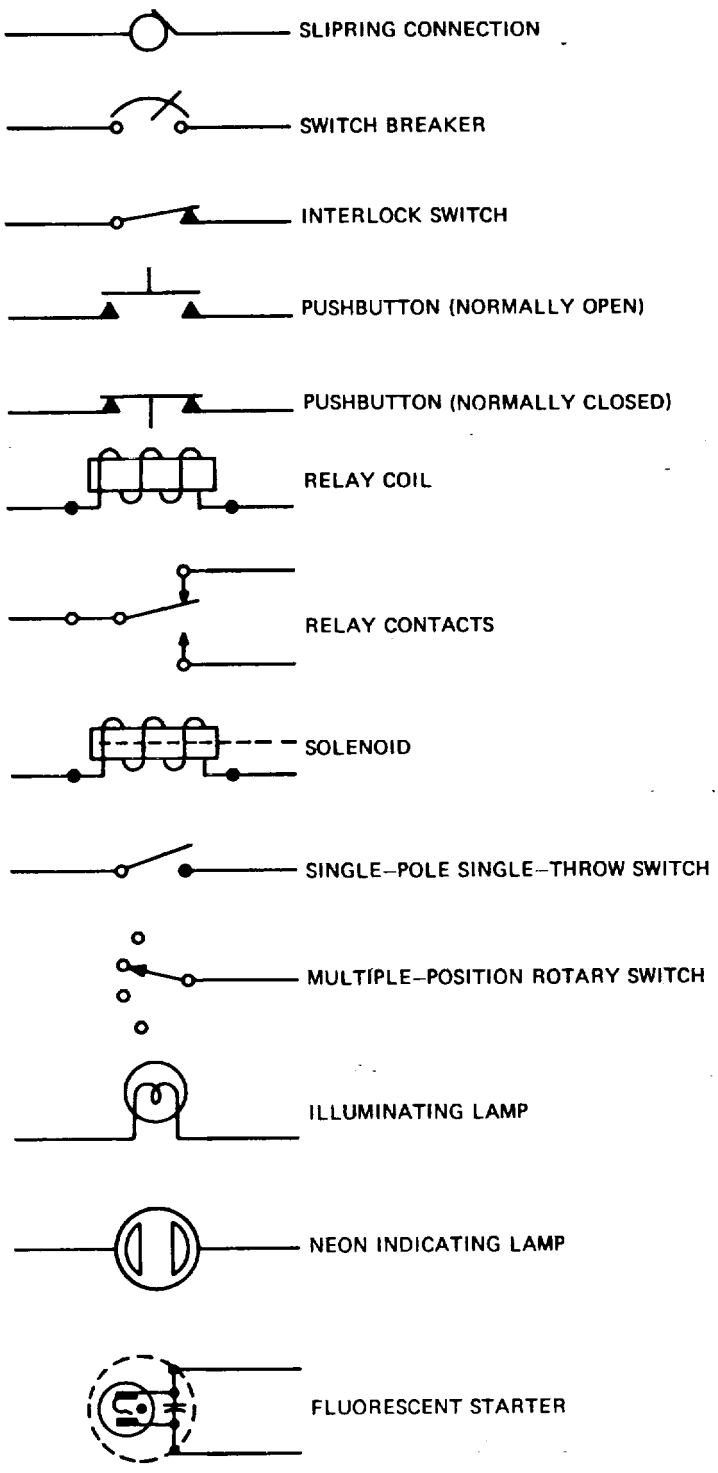
SHORTED TERMINATION



MODE TRANSDUCER, RECTANGULAR TO CIRCULAR WAVEGUIDE



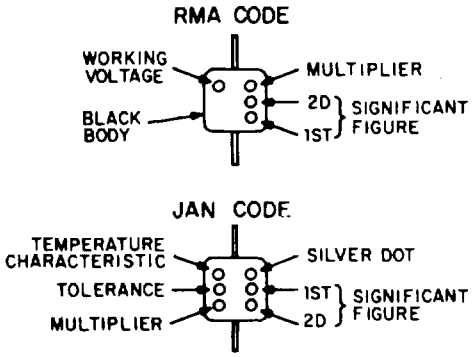
DIRECTIONAL COUPLER


SLIPRING CONNECTION
SWITCH BREAKER
INTERLOCK SWITCH
PUSHBUTTON (NORMALLY OPEN)
PUSHBUTTON (NORMALLY CLOSED)
RELAY COIL
RELAY CONTACTS
SOLENOID
SINGLE–POLE SINGLE–THROW SWITCH
MULTIPLE–POSITION ROTARY SWITCH
ILLUMINATING LAMP
NEON INDICATING LAMP
FLUORESCENT STARTER

1-2. COLOR CODING FOR CAPACITORS AND RESISTORS

TRANSFORMER COLOR CODE (RMA STANDARD)

COLOR OF LEAD	POWER TRANSFORMER	AF TRANSFORMER (ALSO LINE-TO-GRID AND TUBE-TO-LINE)	IF XFMR	LOUDSPEAKER FIELD	LOUDSPEAKER VOICE
BLACK	PRIMARY (COMMON FOR TAPPED PRIMARY)	GRID RETURN	GRID OR DIODE RETURN		START
BLACK AND RED	FINISH OF TAPPED PRIMARY			START	
BLACK AND ELLOW	PRIMARY TAP				
RED	HIGH VOLTAGE	B PLUS	B PLUS		
RED AND YELLOW	HIGH VOLTAGE TAP			FINISH	
YELLOW	RECTIFIER FILAMENT (CT-YELLOW AND BLUE)	GRID OR CENTER-TAPPED SECONDARY			
GREEN	FILAMENT NO 1 (CT-GREEN AND YELLOW)	GRID	GRID OR DIODE		FINISH
BROWN	FILAMENT NO 2 (CT- BROWN AND YELLOW)	PLATE OR CENTER-TAPPED PRIMARY			
SLATE	FILAMENT NO 3 (CT-SLATE AND YELLOW)	AND RED		TAP-SLATE	
BLUE			PLATE	PLATE	

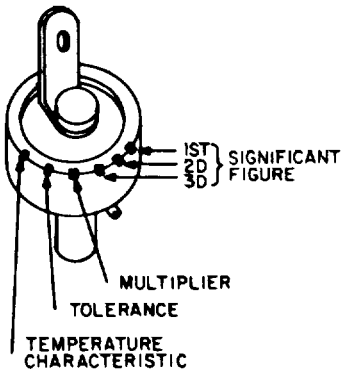


NOTES: CAPACITANCE IN μμF. VOLTAGE RATINGS EXPRESSED IN HUNDREDS OF VOLTS. VOLTAGE RATINGS OVER 900V EXPRESSED IN TWO-DOT VOLTAGE CODE.

MOLDED FLAT PAPER CAPACITOR COLOR CODES

COLOR	SIG FIG	MULTIPLIER	TOL	TEMPERATURE CHARACTERISTIC	WORKING VOLTAGE
BLACK	0	1	20	A	–
BROWN	1	10	–	B	100
RED	2	10^2	–	C	200
ORANGE	3	10^3	30	D	300
YELLOW	4	10^4	40	E	400
GREEN	5	10^5	5	F	500
BLUE	6	10^6	–	G	600
VIOLET	7	–	–	–	700
GRAY	8	–	–	–	800
WHITE	9	–	10	–	900
GOLD	–	0.1	5	–	–

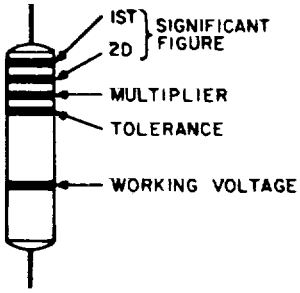
BUTTON SILVER MICA CAPACITOR COLOR CODE



COLOR	SIG FIG	MULTIPLIER	TOLERANCE PERCENT	TEMPERATURE CHARACTERISTIC
BLACK	0	1	20	A
BROWN	1	10	–	B
RED	2	10^2	2	C
ORANGE	3	10^3	3(RMA)	D
YELLOW	4	10^4	–	E
GREEN	5	–	5(RMA)	F(JAN)
BLUE	6	–	–	G(JAN)
VIOLET	7	–	–	–
GRAY	8	–	–	I(RMA)
WHITE	9	–	–	J(RMA)
GOLD	–	0.1	0.5	–
SILVER	–	0.01	10	–
NONE	–	–	20(OLD RMA)	–

NOTE: CAPACITANCE IN $\mu\mu$F.

MOLDED TUBULAR PAPER CAPACITOR COLOR CODE



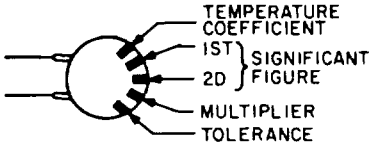
COLOR	SIG FIG	MULTIPLIER	TOLERANCE PERCENT
BLACK	0	1	20
BROWN	1	10	–
RED	2	10^2	–
ORANGE	3	10^3	30
YELLOW	4	10^4	40
GREEN	5	10^5	5
BLUE	6	10^6	–
VIOLET	7	–	–
GRAY	8	–	–
WHITE	9	–	10
GOLD		0.1	–

NOTES
CAPACITANCE IN pF.
VOLTAGE RATINGS EXPRESSED IN WUNDREDS OF VOLTS.
VOLTAGE RATINGS OVER 900V EXPRESSED IN TWO-BAND V CODE

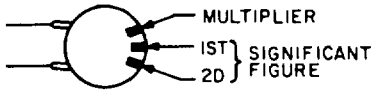
JAN JOINT ARMY-NAVY STANDARDS

RMA RADIO-TELEVISION MANUFACTURERS ASSOCIATION STANDARDS

5-DOT SYSTEM



3-DOT SYSTEM



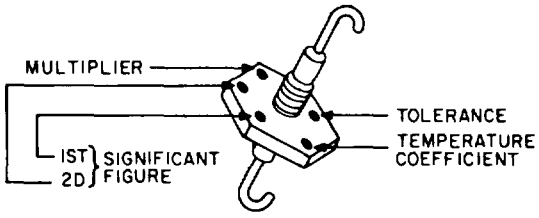
COLOR	SIG FIG	MULTIPLIER	TOLERANCE A	TOLERANCE B	TEMPERATURE COEFFICIENT
BLACK	0	1	2	20	0
BROWN	1	10	0.1	1	-30
RED	2	10^2	–	2	-80
ORANGE	3	10^3	–	2.5	-150
YELLOW	4	10^4	–	–	-220
GREEN	5	–	0.5	5	-330
BLUE	6	–	–	–	-470
VOILET	7	–	–	–	-750
GRAY	8	0.01	0.25	–	30
WHITE	9	0.1	1	10	120 to -750 (RMA) 500 TO -330 (JAN)
GOLD	–	–	–	–	100
SILVER	–	–	–	–	BYPASS OR COUPLING

NOTES: CAPACITANCE IN$\mu\mu$F
COLUMN A LISTS TOLERANCE IN$\mu\mu$F FOR VALUES OF 10$\mu\mu$F OR LESS.
COLUMN B LISTS TOLERANCE IN PERCENT FOR VALUES OVER 10$\mu\mu$F.
---PARTS PER MILLION PER DEGREE CENTIGRADE.

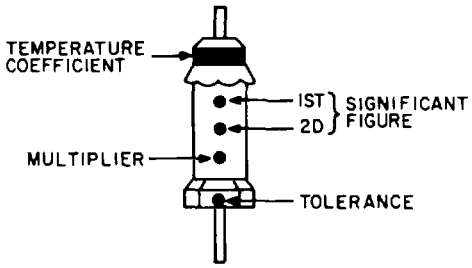
CERAMIC CAPACITOR COLOR CODES

SEE CODES AND NOTES FOR DISK-CERAMIC CAPACITORS

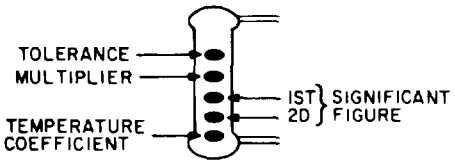
FEED-THRU TYPE



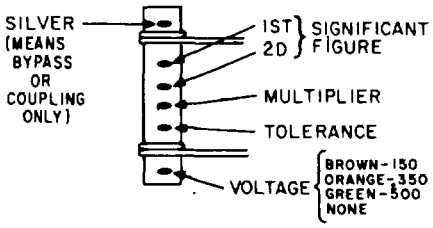
STANDOFF TYPE



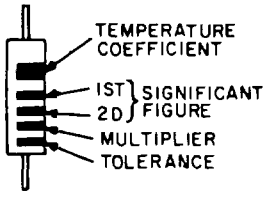
5-DOT RADIAL LEAD



6-DOT RADIAL LEAD

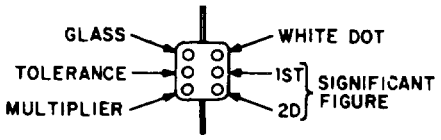


AXIAL LEAD

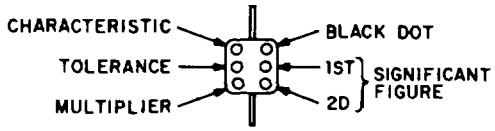


MOLDED MICA CAPACITOR COLOR CODES

RMA CODE



JAN CODE



NOTES: CAPACITANCE IN $\mu\mu$F. IF BOTH ROWS OF DOTS ARE NOT ON ONE FACE, ROTATE CAPACITOR ABOUT THE AXIS OF ITS LEADS AND READ SECOND ROW ON SIDE OR REAR.

COLOR	SIG FIG	MULTIPLIER	TOLERANCE PERCENT	CHARACTERISTIC
BLACK	0	1	20	A
BROWN	1	10	–	B
RED	2	10^2	2	C
ORANGE	3	10^3	3(RMA)	D
YELLOW	4	10^4	..	E
GREEN	5	–	5(RMA)	F(JAN)
BLUE	6	–	–	G(JAN)
VIOLET	7	–	–	
GRAY	8	–	–	I (RMA)
WHITE	9	–	–	J(RMA)
GOLD	–	0.1	S(JAN)	
SILVER		0.01	10	
NONE	–	–	20(RMA)	

STANDARD RESISTOR COLOR CODE

NOTES BAND NEAREST END IS FIRST FIGURE. SECOND BAND IS THE SECOND FIGURE. THIRD BAND IS THE NUMBER OF ZEROS OR THE DECIMAL MULTIPLIER IF GOLD OR SILVER. FOURTH BAND IS PERCENT TOLERANCE.

COLOR	SIG FIG	TOLERANCE PERCENT
BLACK	0	.
BROWN	1	–
RED	2	–
ORANGE	3	.
YELLOW	4	.
GREEN	5	
BLUE	6	
VOILET	7	–
GRAY	8	–
WHITE	9	–
GOLD	)-SEE NOTES	PLUS OR MINUS 5%
SILVER	)	PLUS OR MINUS 10%
NONE		PLUS OR MINUS 20%

Letter Prefix	Part Number	Letter Prefix	Part Number
B	Motor or synchro	L	Inductor
C	Capacitor	MG	Motor generator
Y	Quartz crystal	P	Plug
E	Terminal strip	R	Resistor
F	Fusc	S	Switch
G	Generator	T	Transformer
I	Lamp	V	Tube
J	Jack or receptacle	X	Tube socket and plug-in resistor
K	Relay	CR	Crystal rectifier
		Z	Filter network

1-3. FUSES AND THEIR FUNCTIONS

Low-voltage power supply unit.

F1801 LVPS, coordinator, radar set control (See page 41.)
F1802--receiver-transmitter and antenna
F1803--AC outlet
F1804--PS blower motor, -27 vdc, power supply filaments
F1805--+258, +250, -318, -108, +150

Coordinator unit.

F1001--scope HV
F1002--blower motor, filaments
F1003--computer power supply
F1004--magnetic amplifiers
F1005--computer +220 and 28 vac and antistick voltage
F1006--azimuth, elevation, X, Y, Rho servoamplifiers

Radar set control unit.

F1601--blower motor, X, Y, and range servomotors, sector scan motor, and auto range motor (located in coordinator)

Modulator unit.

F501--blower motor, filaments (See page 44.)
F502--transmitter HV

Receiver-transmitter and antenna unit.

F401--power supply, magnetron current adjust
F402--blower motor, azimuth and elevation synchros, azimuth and elevation motors and beam switching motor
F403--azimuth and elevation brakes
F404--AC outlet

1-4. CONTINUITY CHECKS

As an aid to troubleshooting all resistance checks of tube sockets, were measured with cables connected and the chassis as ground.

CHAPTER 2

PREOPERATIONAL ADJUSTMENTS AND START-STOP

2-1. GENERAL

The adjustments to be made by the operator include only those necessary for tactical operation of the set. It is assumed that the maintenance man will have previously adjusted the radar for tactical employment; however, the operator will be required to make various visual checks to insure that the equipment is operating properly. If these checks indicate equipment malfunctioning, the trouble is to be corrected or repaired by qualified maintenance personnel before operation of the equipment. The operator is to perform the preoperational adjustments and start-stop procedures exactly as they are prescribed in paragraphs 2-2 through 2-4.

2-2. PREOPERATIONAL ADJUSTMENTS

a. At the radar set control, set the controls as follows:

INTENSITY	Midrange
FOCUS	Midrange
VERTICAL	Midrange
SCOPE GAIN	Midrange
VOLUME	Midrange
PANEL light	Midrange
RCVR GAIN.	Midrange
MAP SCALE	1:25K or 1:50K, depending on map used
AUTO-MAN selector	MAN SEARCH (pos 3)
SECTOR WIDTH	360
RANGE handwheel	Arbitrary
MAP ZERO	Operate position (toward bottom of radar set control)

b. At the power supply, set the power switch to the OFF position.

c. At the shelter power distribution box, check to insure that the MAIN, RADAR, and SHELTER circuit breakers are set at OFF and that the FANS, LIGHTS, and HEATER switches are set to OFF.

d. At the receiver-transmitter front panel, set the meter switch to MAG CUR (20 MA FS) and the PANEL LIGHT switch to OFF. Close the shutter dimmer on each of the four level lights (turn the shutters clockwise).

e. At the engine generator, check to be sure that the OUTPUT SEI,ECTOR switch is set at 120V, 1PH position.

f. Make sure that the air intake and exhaust ports on the coordinator, power supply, modulator, receiver-transmitter, antenna, and radar set control are open.

2-3. STARTING PROCEDURE

a. After a suitable warmup period, check the no-load reading of the voltmeter on the engine generator. The voltmeter should read 115 volts + 5 volts.

b. At the shelter power distribution box, set the MAIN circuit breaker to ON (upper position). Place the SHELTER circuit breaker to ON. If shelter lights are required, throw the LIGHTS switch to ON. If ventilation is required, place FANS LEFT-RIGHT switches each to the ON position. Throw the RADAR circuit breaker to ON.

c. Set the power switch on the power supply to ON.

d. After 3 minutes, push the RADIATE switch on the radar set control to ON.

e. Adjust the RANGE, ELEVATION, and SCOPE GAIN controls on the radar set control until a presentation is obtained on the A-scope.

2-4. STOPPING PROCEDURE

a. Press the RADIATE switch to OFF.

b. Set the AUTO MAN switch to position 3.

c. Set the power switch on the power supply to the OFF position.

d. Set the MAIN circuit breaker on the shelter power distribution box to OFF.

e. Shut (down the engine generator as prescribed in TM 5-6115-2571-14.

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CHAPTER 3

SYMPTOMS COLLECTION PROCEDURES

3-1. TROUBLESHOOTING THE AN/TPS-25A RADAR SET

a. General. Troubleshooting should normally be performed in the following three steps.

(1) Symptoms collection. Use built-in indicators and test equipment to assist in isolating a malfunction to a specific channel or area within the channel.

(2) Signal tracing. Use the test equipment that is provided to measure voltages and monitor signals within the suspected area to isolate the malfunction to a stage (by using the detailed circuit diagrams).

(3) Component troubleshooting. Use test equipment that is provided to find the specific component that is causing the malfunction.

b. Symptoms Collection Checks and Block Diagrams. The symptoms collection checks and block diagrams are designed to aid the troubleshooter in the first two steps of troubleshooting, with the greatest emphasis on symptoms collection (a(l) above).

(1) Isolation to a system. The overall block diagram (fig 1) is divided into nine systems. By performing the systems checks in the order in which they are presented in paragraph 3-3, a troubleshooter can isolate a malfunction to a specific system. A check that does not produce the correct result indicates a malfunction in a particular system. References presented after the correct results (para 3-3) indicate the pages on which the system checks and block diagrams of the various systems are presented. When the troubleshooter has isolated a malfunction to a specific system, he then turns to the referenced page to find the system checks and block diagram for that particular system.

(2) Isolation to a specific stage. The system checks for each system consist of a list of conditions indicating malfunctions in specific circuits and the key points that the troubleshooter is to test to aid him in locating the specified circuits. Page references given for each key point indicate the pages on which the detailed circuit diagrams for the various circuits are presented. The troubleshooter checks the conditions listed (in the order in which they are presented) until he finds those conditions that most nearly correspond to the symptoms noted in the radar. He then tests the key points listed to isolate the malfunction to a specific stage.

(3) Signal tracing. To test a key point, the troubleshooter refers to the applicable detailed circuit diagram (on the page referenced for the key point) and signal traces in the circuit until he notes an indication of a malfunction. Using the test equipment issued with the radar, he then makes voltage checks and/or resistance checks to locate the defective or malfunctioning component.

3-2. SYMPTOMS COLLECTION EXAMPLE

Assume that the operator of an AN/TPS-25A radar has reported that the A-scope is blank and the RADIATE light is on.

a. Perform the overall systems checks in the order in which they are presented in paragraph 3-3. Each check must produce all the correct results listed; therefore, the first check that does not produce the correct results is check 6. Since the A-scope is blank, the radar does not produce the second result listed for check 6. (Audio can be present without a sweep.)

You now turn to the page referenced after result b of check 6 (page 29). Presented on pages 29 and 30 are the system checks and block diagram for the transmitter and RF systems; therefore, you have isolated the malfunction to these systems.

b. Now you must isolate the malfunction to a specific stage within the transmitter and RF systems. To do this, you check the conditions listed in paragraph 3-8 (in the order in which they are presented) until you find the conditions that most nearly correspond to the symptoms noted in the radar—the last conditions presented in paragraph 3-8. You then test each of the key points listed for these conditions.

c. Using the detailed circuit diagrams on the pages referenced (pages 35 and 58), you signal trace until you find the malfunctioning stage. Then, using the test equipment provided with the radar, you make the necessary voltage checks and/or resistance checks to locate the defective or malfunctioning component.

(1) Upon verification of a symptom, perform symptom collection checks on the AN/TPS-25A overall block diagram. Perform these checks in order, starting with check one until a bad indication is found.

(2) Go to the block diagram of the bad system or channel noted in step (1). Make checks in the order given until a good indication is found. This will tell you the channel that is malfunctioning.

(3) Using the key points associated with the circuit being checked and the page reference, go to the detailed circuit and signal trace in that circuit until a bad indication is found. At this time you should be able to locate the bad stage or component with the test equipment issued with the radar.

d. Following is an example of general symptoms collection: SYMPTOM: AN/TPS-25A operator reports that the A-scope is blank and the radiate light stays on.

(1) Perform all check number steps on the overall systems checks until you have reached step 6 which is labeled RADIATE switch to the ON position. Perform all check number sub-steps to get complete symptoms. (Audio can be presented without a sweep. Check number sub-step 6b is the first adnormal indication and refers to page 29.

(2) You are now using the block diagram for the transmitter and RF control circuits. Select the conditions that most closely correspond to the symptoms and perform the key point tests by going to the page shown to the right of the selected key point. When you find a fault indication, stop and go to the detailed circuit. (All conditions in the check column must be met). Blank scope is any scope that does not have a horizontal sweep.

(3) Begin signal tracing on the detailed circuit diagram until you get a bad indication, using the KEY POINTS that are provided. When a bad check is noticed, signal trace down to the stage. Once the stage is found, determine what is causing the stage to malfunction. Use the test equipment that is provided with the AN/TPS-25 radar.

3-3. OVERALL SYSTEMS CHECKS

Check number	Action to be taken	Correct results	Refer to page
1.	Set the ON-OFF switch S1801 to ON.	a. Power supply pilot light will come on. b. Line voltage meter M1001 will read red line. c. All cabinet blower motors will operate.	21
2.	Turn the ELEVATION handwheel to its clockwise (cw) and counterclockwise (ccw) limits.	a. The ELEVATION WARNING light will come on when the antenna approaches its upper or lower limit and will go out when the antenna is moved away from the limit.	26
		b The ELEVATION counter will indicate the antenna elevation. c. The RANGE counter will move when the ELEVATION handwheel is moved from its cw to ccw limits.	28
3.	Turn the AZIMUTH handwheel to its cw and ccw limits.	a. The AZIMUTH WARNING light will come on when the antenna reaches an azimuth limit and will go out when the antenna is moved away from the limit.	26
		b. The AZIMUTH counter will move cw or ccw, depending on the direction in which the AZIMUTH handwheel is turned. c. The plotting board arm will move through 3, 200 mils (only if arm is engaged).	
4.	Turn the RANGE handwheel from its ccw limit to its cw limit.	a. The RANGE counter will move from the minimum range to the maximum range.	28
		b. The X and Y counters will move.	
5.	Make the following coordinates checks: Set the AZIMUTH counter to 0, the ELEVATION counter to 0, and the RANGE counter to 5000.	a. The X counter will indicate the easting coordinate of the radar site.	28
		b. The Y counter will indicate the northing coordinate of the radar site plus 5, 000 meters.	
	Set the AZIMUTH counter to 1, 600 mils, the ELEVATION counter to 0, and the RANGE counter to 5000.	a. The X counter will indicate the easting coordinate of the radar site plus 5, 000 meters. b. The Y counter will indicate the northing coordinate of the radar site.	
6.	Press the RADIATE switch to the ON position and release the switch.	a. The RADIATE light will come on and stay on.	31
		b. Sweep will be present on the A-scope.	30
		c. Range gate and video will be present on the A-scope sweep. (Note: For intermediate video or no video, refer to page 34.)	36

Check number	Action to be taken	Correct results	Refer to page
	Turn the RANGE handwheel from its ccw limit to its limit (minimum to maximum range) and observe range gate and video on the A-scope sweep.	a. Video will move in and out of range on A-scope. b. Audio will be heard when moving target is moved into range gate.	35 36
7.	Move the AUTO-MAN switch to the following positions:		
	AUTO SEARCH (position 1)	a. AZIMUTH counter will move cw and ccw b. Plotting board arm (if engaged) will move in azimuth. c. Range gate will move on A-scope sweep. d. X and Y counters will not move.	26 35
	AUTO RANGE (position 2)	a. AZIMUTH counter will stop moving. b. Range gate will continue to move. c. X and Y counters will not move.	
	MAN SEARCH (position 3)	a. Range gate will stop. X and Y counters will move immediately to a null when the switch is moved to MAN SEARCH.	
	MAN TRACK AUDIO (position 4)	a. The A-scope sweep will be lost momentarily when the switch is moved from position 3 to position 4. b. Horizontal sound bars will appear on the A-scope.	61 and 62 36
	MAN TRACK VIDEO (position 5)	The A-scope sweep will be normal.	

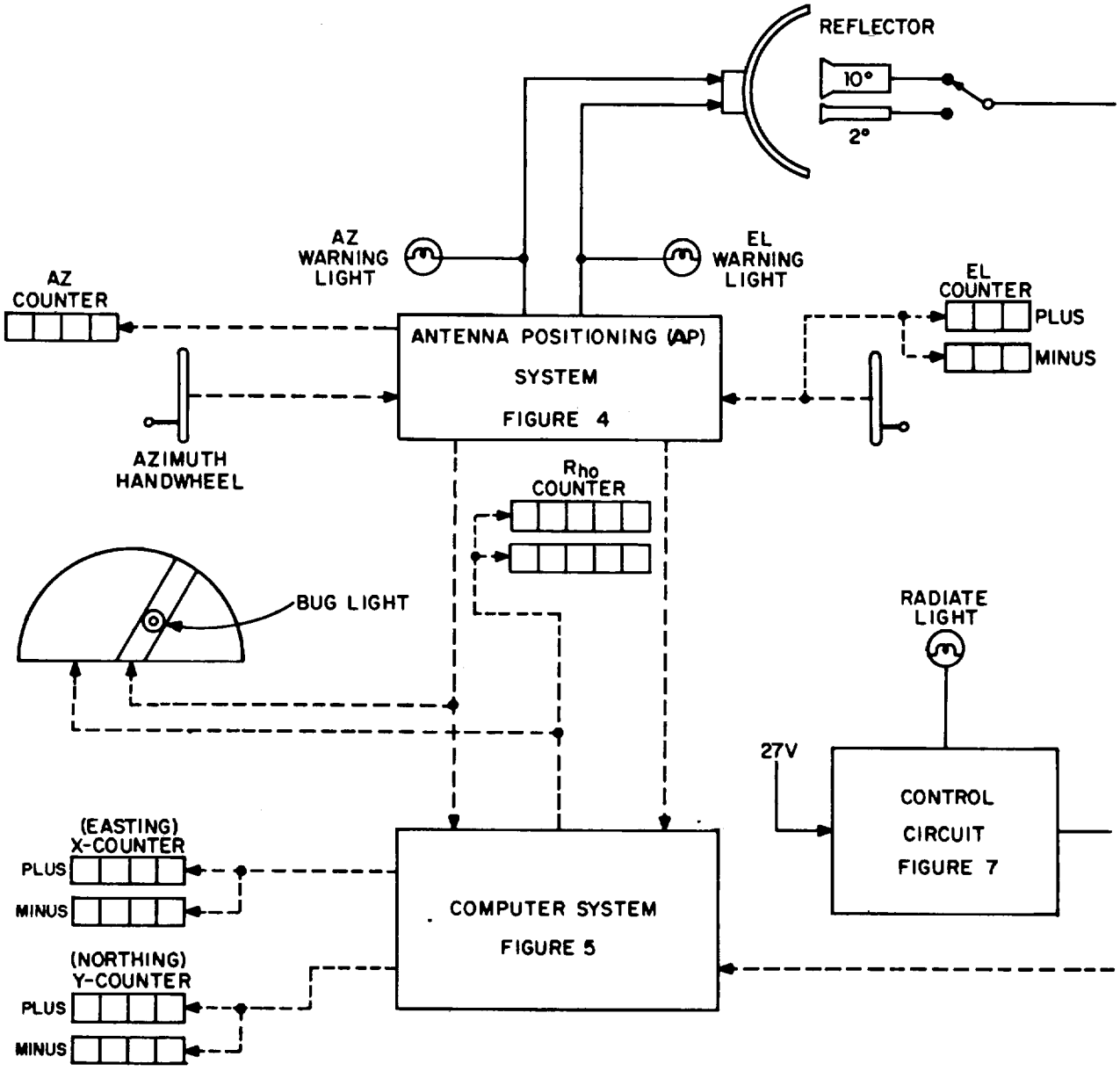

Figure 1. AN/TPS-25 block diagram.

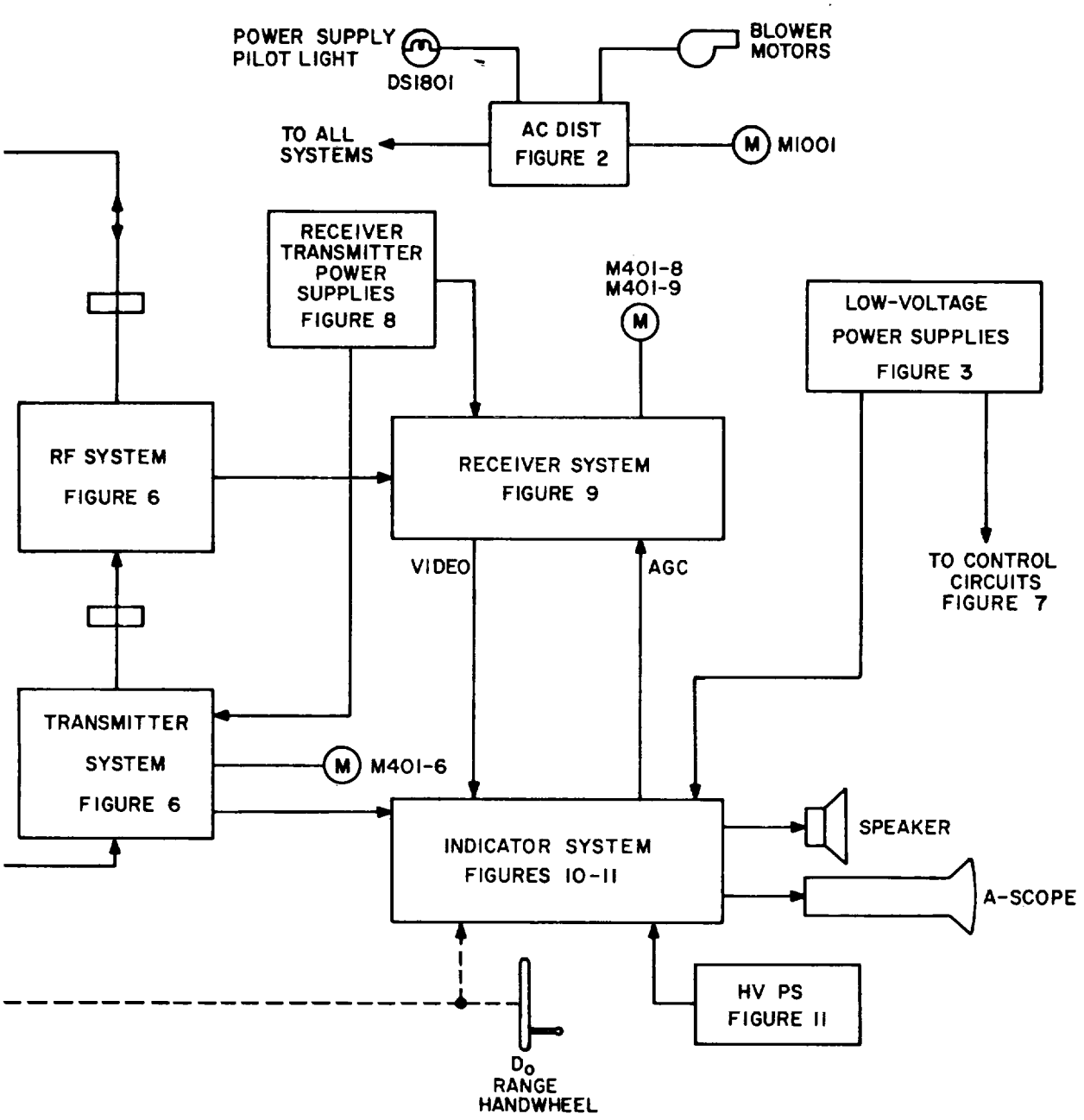

Figure 1. AN/TPS-25 block diagram--Continued.

3-4. AC DISTRIBUTION CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
Power supply pilot light does not come on, M1001 does not read red line, and blower motors do not operate.	AC distribution	a. S1801 b. F1801	41
M1001 does not read red line, blower motors do not operate.	AC distribution	a. S1001B b. S1802	42 41
M1001 does not read red line, only coordinator cabinet blower motor operates.	AC distribution	S1101B	43
Modulator and receiver-transmitter blower motors do not operate, transmitter will not fire, antenna will not move in azimuth or elevation, and no beam switching.	AC distribution	a. S802B b. S1801 c. F1802	42 41 41

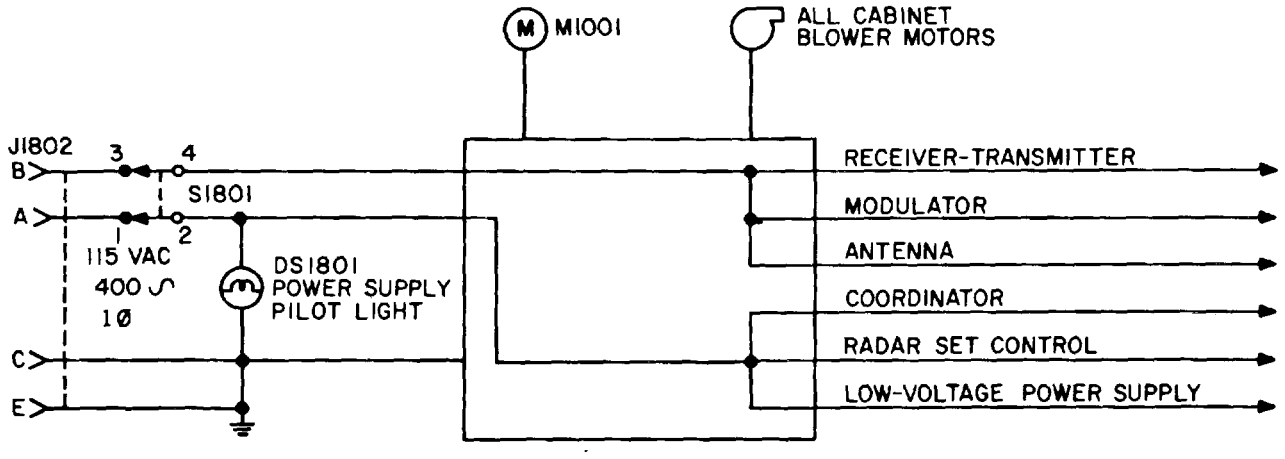

Figure 2. AC distribution block diagram.

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3-5. LOW-VOLTAGE POWER SUPPLY CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
Blank A-scope; antenna will not move in azimuth or elevation; X, Y, and RANGE counters do not move; and no audio.	AC distribution	a. T1802, 1-2 b. F1805	52 41
Blank A-scope, antenna will not move in azimuth or elevation.	+258 rectifier	a. TP1801-H b. V1807 c. T1802, 8-9-10	51 52
Antenna will not move in azimuth or elevation.	+258 regulator	a. TP1801-F b. V1808 c. TP1801-H	51 52 51
Blank A-scope, no audio.	-108 power supply (PS)	a. TP1801-D b. V1810 c. CR1806 d. CR1805	51
Blank A-scope; X, Y, and RANGE counters do not move.	+250 power supply	a. TP1801-G b. V1801 c. V1806 d. T180Z, 3-5-7	51 52
Blank A-scope, no audio.	+150 power supply	a. TP1801-E b. V1805	51 52
RADIATE light does not come on, transmitter will not fire.	-27 power supply	a. TP1801-A b. F1806 c. CR1803 d. T1801 11-12	51
No audio, no AGC action on A-scope. No video.	-6. 3 power supply	a. TP1801-C to B b. CR1801 c. T1801-8-9-10 d. V621 (fig 11)	51 36

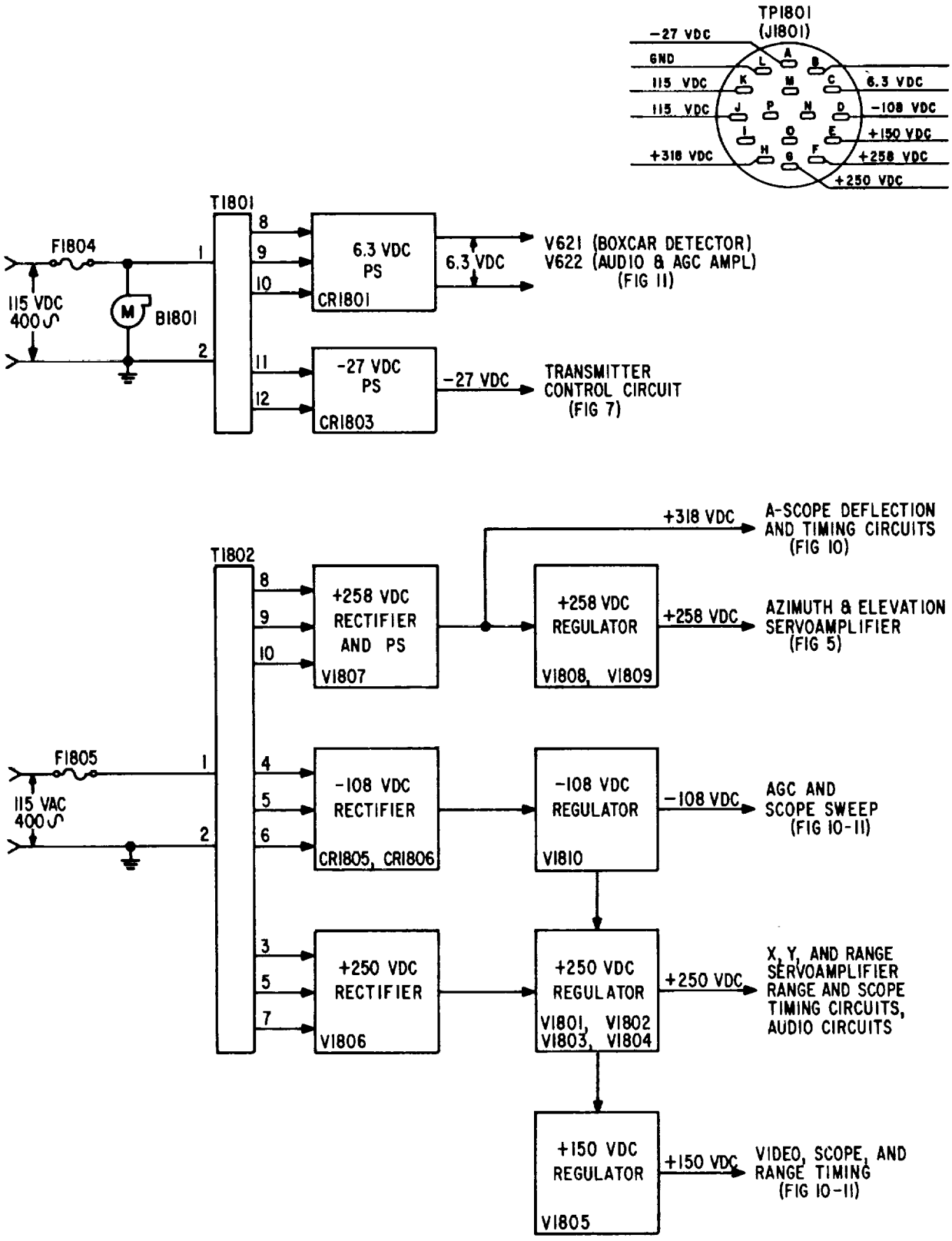


Figure 3. Low-voltage power supplies PP-2166/TPS-25 block diagram.

3-6. ANTENNA POSITIONING SYSTEM CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
ELEVATION WARNING light does not come on when antenna approaches one or either limit. (Handwheel must be moved to view test points.)	Elevation servoamplifier	a. B1906, 4 b. TP802 c. TP801	106 108 107
ELEVATION WARNING light comes on and stays on when antenna is moved away from the limit.	Elevation servoamplifier	a. B1905, R-1 b. BI201, R-1 c. TP801 d. TP802 e. B1906, 2 & 4	106 105 107 108 106
AZIMUTH WARNING light will not come on in one or both limits when handwheel is turned to cw and ccw limits.	Azimuth servoamplifier	a. B1903, 1 b. TP807 c. TP805	100 102 101
AZIMUTH WARNING light comes on and stays on when handwheel is turned away from the limit.	Azimuth servoamplifier	a. B1902, R-2 b. TP805 c. TP807 d. B1903, 2 & 4	100 101 102 100

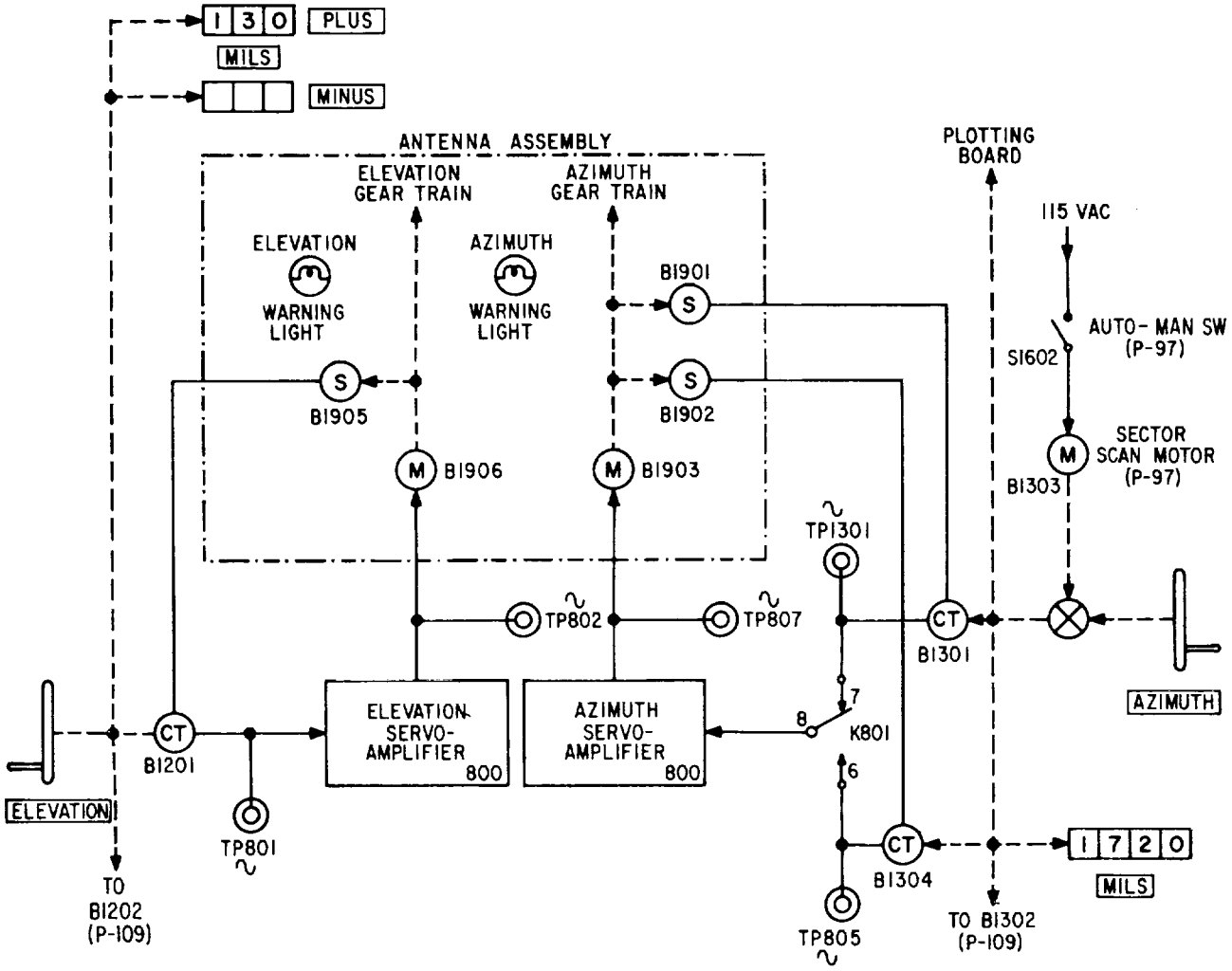


Figure 4. Antenna positioning system block diagram.

3-7. COMPUTER SYSTEM CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
RANGE counter does not move. and range servoamplifier	Elevation isolation amplifier	a. TP812 b. TP811 c. TP1403 d. TP1404	116 115 112
ELEVATION handwheel fails to drive RANGE counter.	Range servo amp, range servo motor B1401	a. TP811 b. B1401 c. TP812	115 111 116
RANGE counter drives in or out.	Range feedback	a. TP1405 b. TP811 c. TP81Z	112 115 116
RANGE and ELEVATION handwheels fail to drive X and Y counters.	Azimuth isolation amplifiera.	B1302, S1	117
X counter does not move.	X servoamplifier	a. TP1502 b. TP803	118 119
Y counter does not move.	Y servoamplifier	a. TP1552 b. TP809	118 121
X counter drives in or out.	X servo feedback	a. R1503 b. TP1501	118
Y counter drives in or out.	Y servo feedback	a. R1553 b. TP1551	118

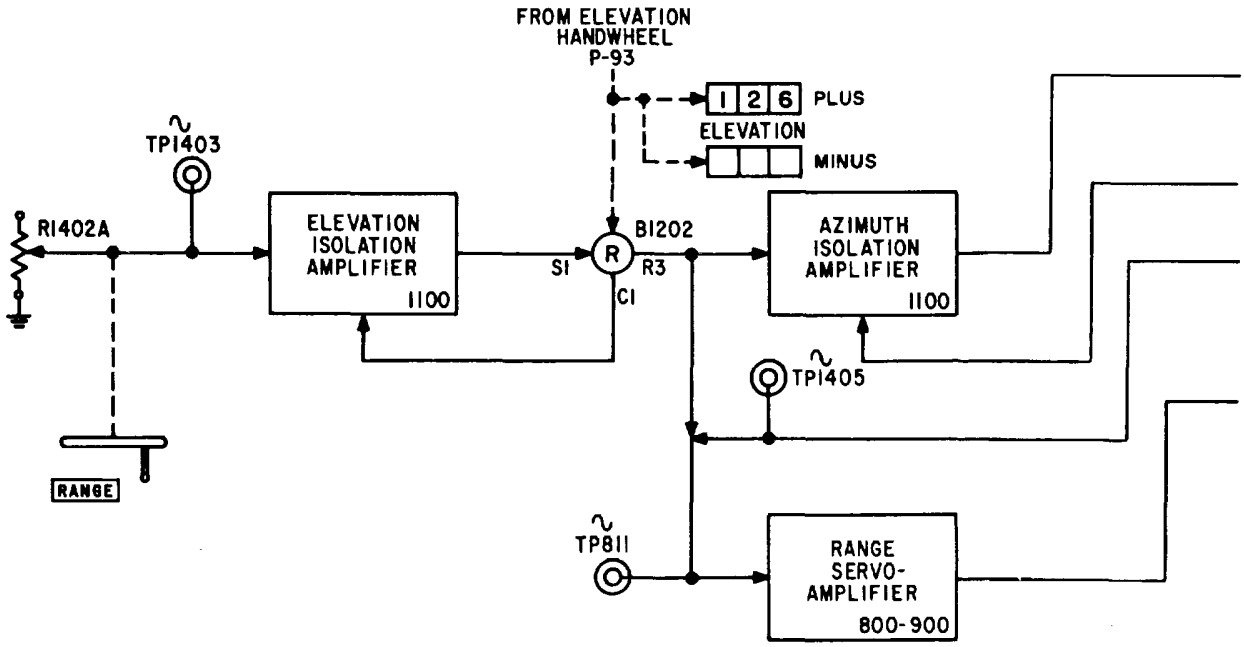


Figure 5. Computer system block diagram.

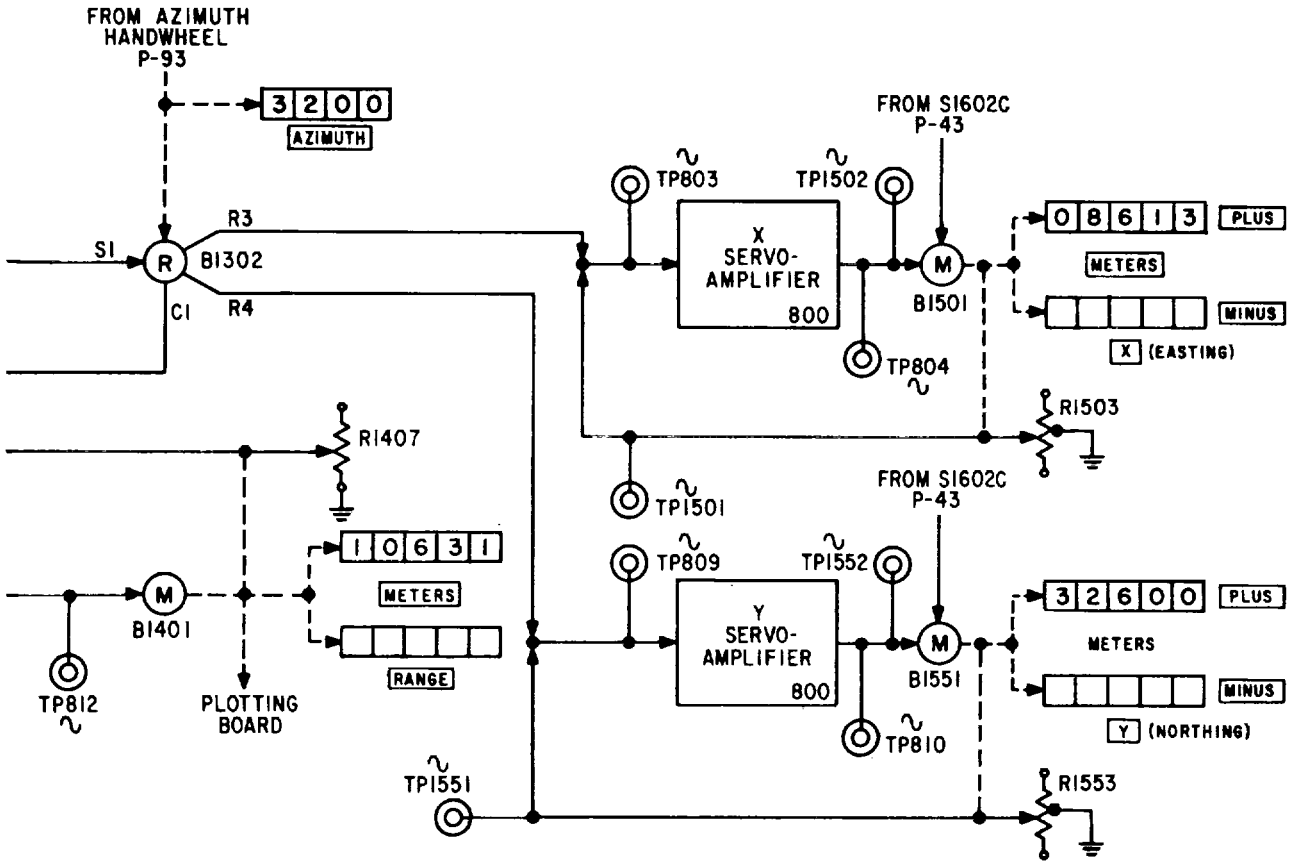


Figure 5. Computer system block diagram--Continued.

3-8. TRANSMITTER AND RF SYSTEMS CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
Transmitter will not fire, RADIATE light stays on. A scope is blank.	Transmitter	a. M401-6 b. TP501 c. TP502 d. M401 - Z (fig 8)	59 58 32
RADIATE light comes on, M401-6 moves slightly but returns to zero, RADIATE light goes out when RADIATE switch is released. A scope is blank.	Transmitter control circuits	Transmitter over-load circuits.	58
RADIATE light remains lit, A-scope is blank, no mag current.	Transmitter	a. TP601 (fig 10) b. M401-6 c. TP501 d. TP502	35 58 58 58

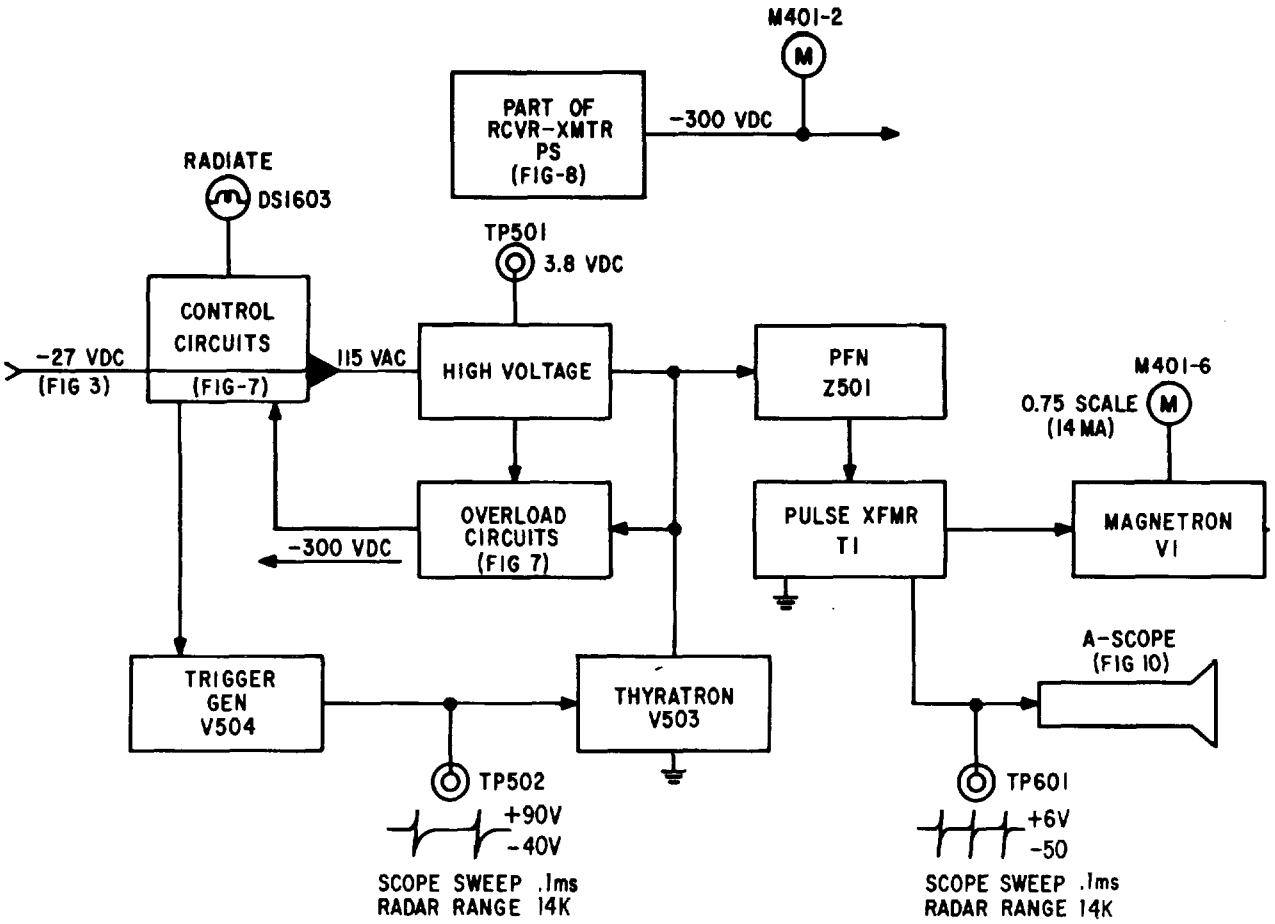


Figure 6. Transmitter and RF systems block diagram

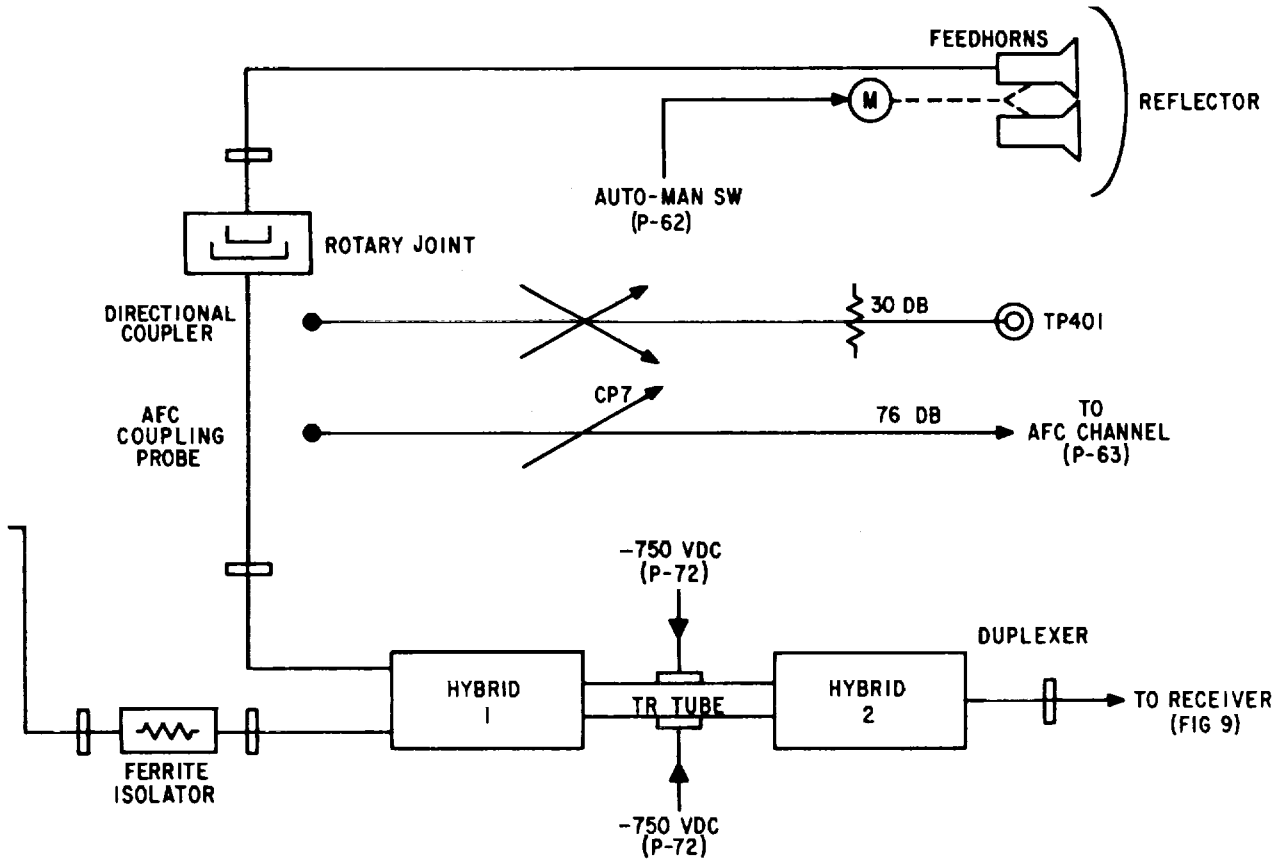


Figure 6. Transmitter and RF systems block diagram--Continued.

3-9. TRANSMITTER CONTROL CIRCUIT CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
RADIATE light does not come on, transmitter will not fire. Blank A scope.	-27 power supply	a. S1604 b. TP1801-A (fig 3)	48, 55 51
RADIATE light comes on but goes out when RADIATE switch is released. Blank A scope.	Transmitter control circuits	a. K502-4 b. K503-2 c. K504-7 d. K504-2-3	49, 55
RADIATE light comes on, M401-6 moves slightly but returns to zero, RADIATE light goes out when RADIATE switch is released. Blank A scope.	Transmitter control circuits	Overload circuits	56, 58

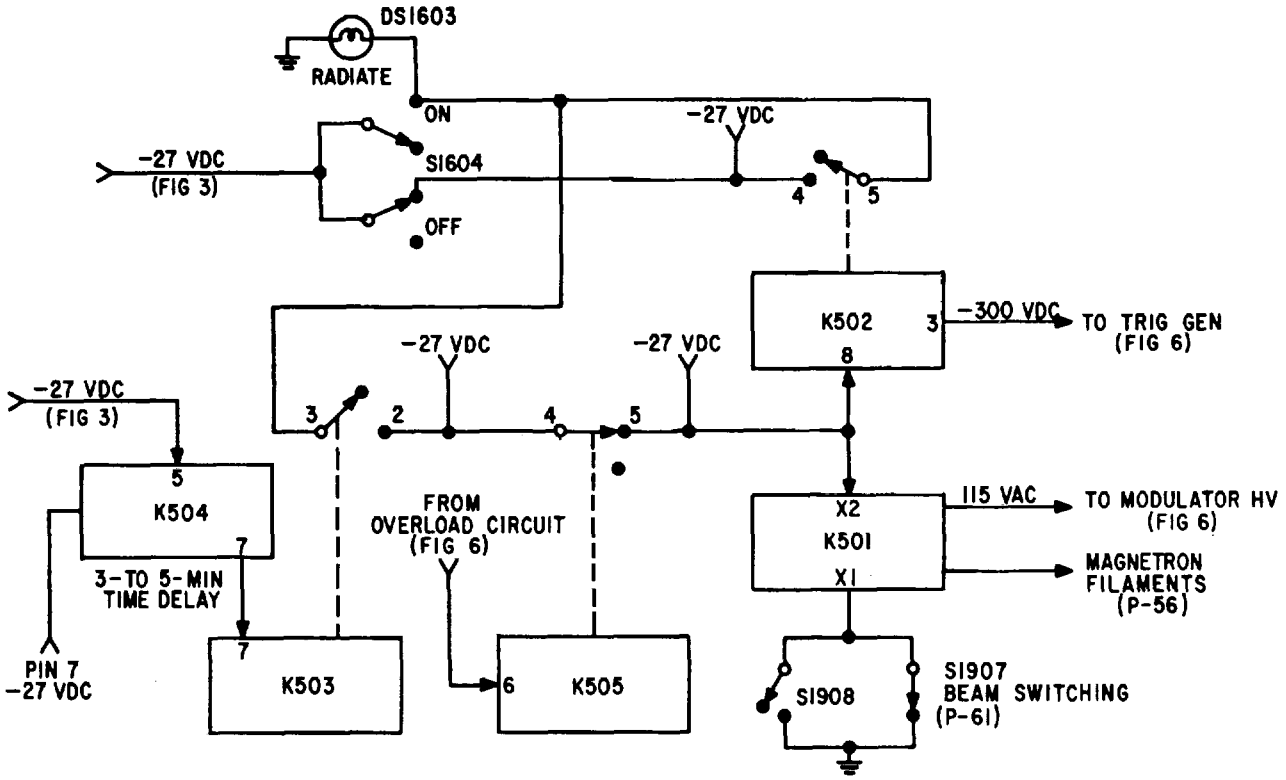


Figure 7. Transmitter control circuit block diagram

3-10. RECEIVER-TRANSMITTER POWER SUPPLY CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
When S404 is in position 4 (+150), M401 reads zero or low.	+150 power supply	a. M401-4 b. TB301-9 c. TB302-8 d. T301, 8-4-9	131 71
When S404 is in position 1 (-750), M401 reads zero or low.	-750 power supply	a. M401-1 b. TB302-3 c. T301, 3-4-5	131 71
When S404 is in position 2 (-300) M401 reads zero or low.	-300 power supply	a. M401-Z b. TB302-4 c. T301, 6-4-7	131 71
M401 reads zero in all positions of S404 except position 10 (-27V).	AC distribution	a. T 301, 1-2 b. TB301, 1-2 c. S402 d. F401 e. AC distribution (fig 2)	71 21

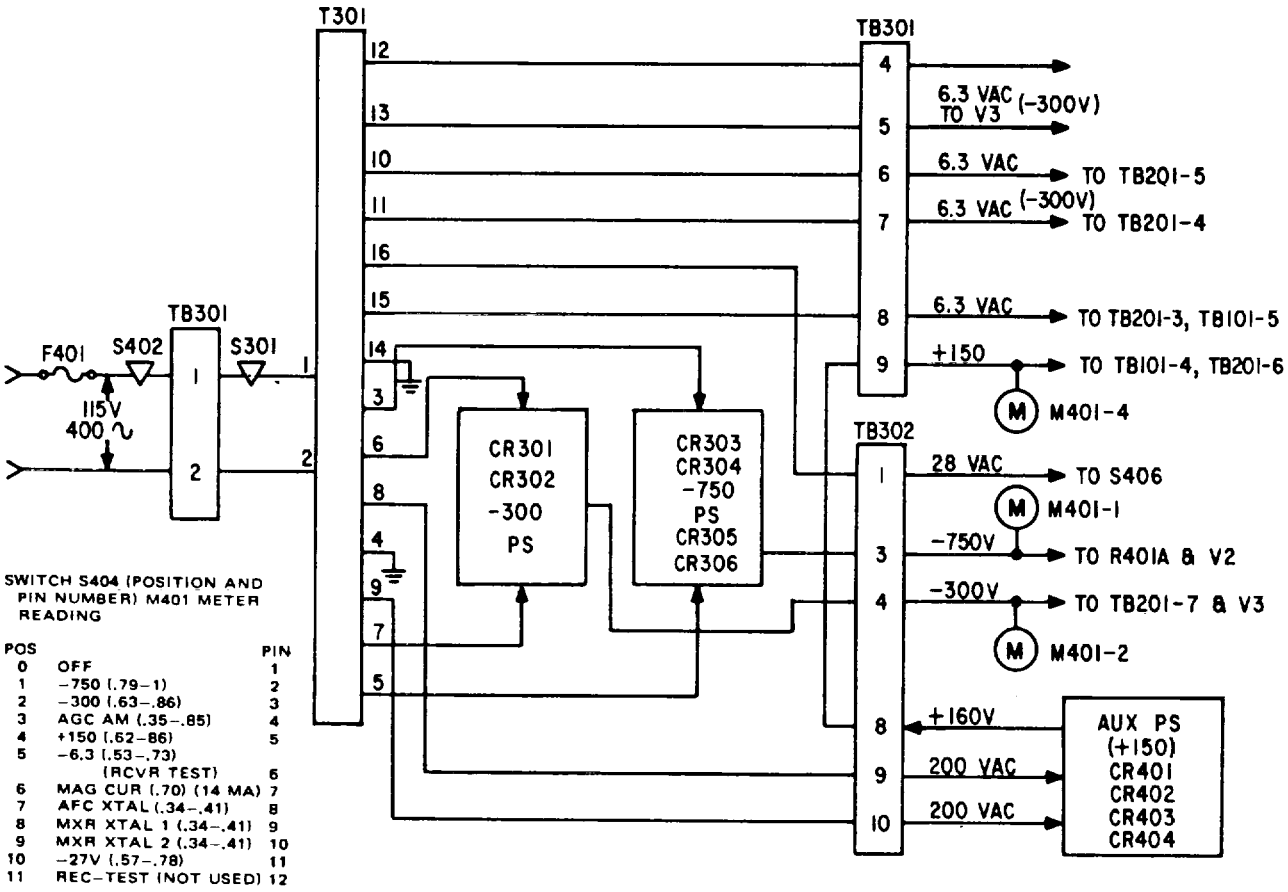


Figure 8. Receiver-transmitter power supply block diagram

NOTES

33

3-11. RECEIVER SYSTEM CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
No video, no audio. (Transmitter must be operating.)	IF circuits	a. J104 b. TB101-2 (fig 11) (AGC) c. TP101 d. M401, -8-9	68 36 68
Intermittent video and audio	AFC circuits (If oscillating signal is	a. TP201 present, tune local oscillator.) b. M401, 7	69
No crystal currents	Signal mixer and Klystron	a. V206 b. V3	70 65

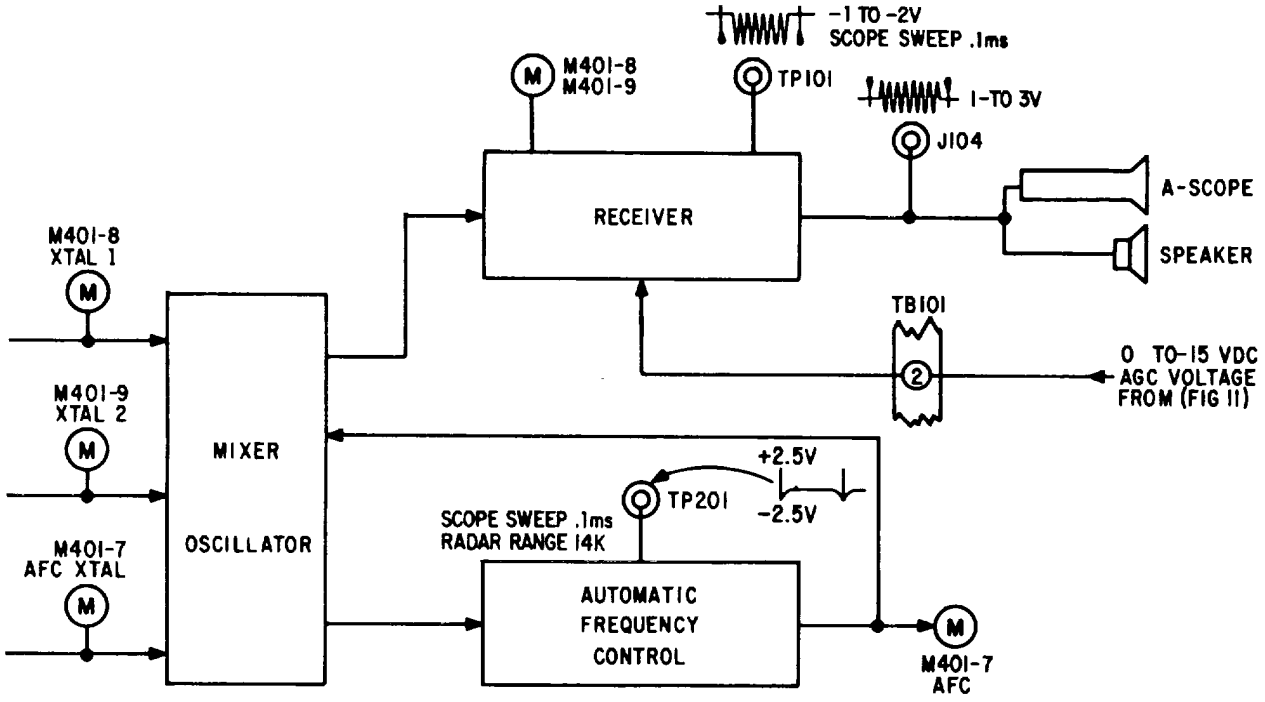


Figure 9. Receiver system block diagram.

3-12. SCOPE TIMING AND RANGE SWEEP CHECKS

CONDITIONS	CIRCUITS	KEY POINTS	PAGE
No range gate, no audio.	Range timing	a. V618-7 b. V615-2	80 79
No A-scope sweep, no audio.	Scope timing	a. V602-2 b. TP601	79
No A-scope sweep, no HV dot	HV	a. TP1601 b. V1601	92
No A-scope sweep, dot is present	Scope timing, and sweep circuits	a. V607-6 b. V607-1 c. V604-5	83 82 81

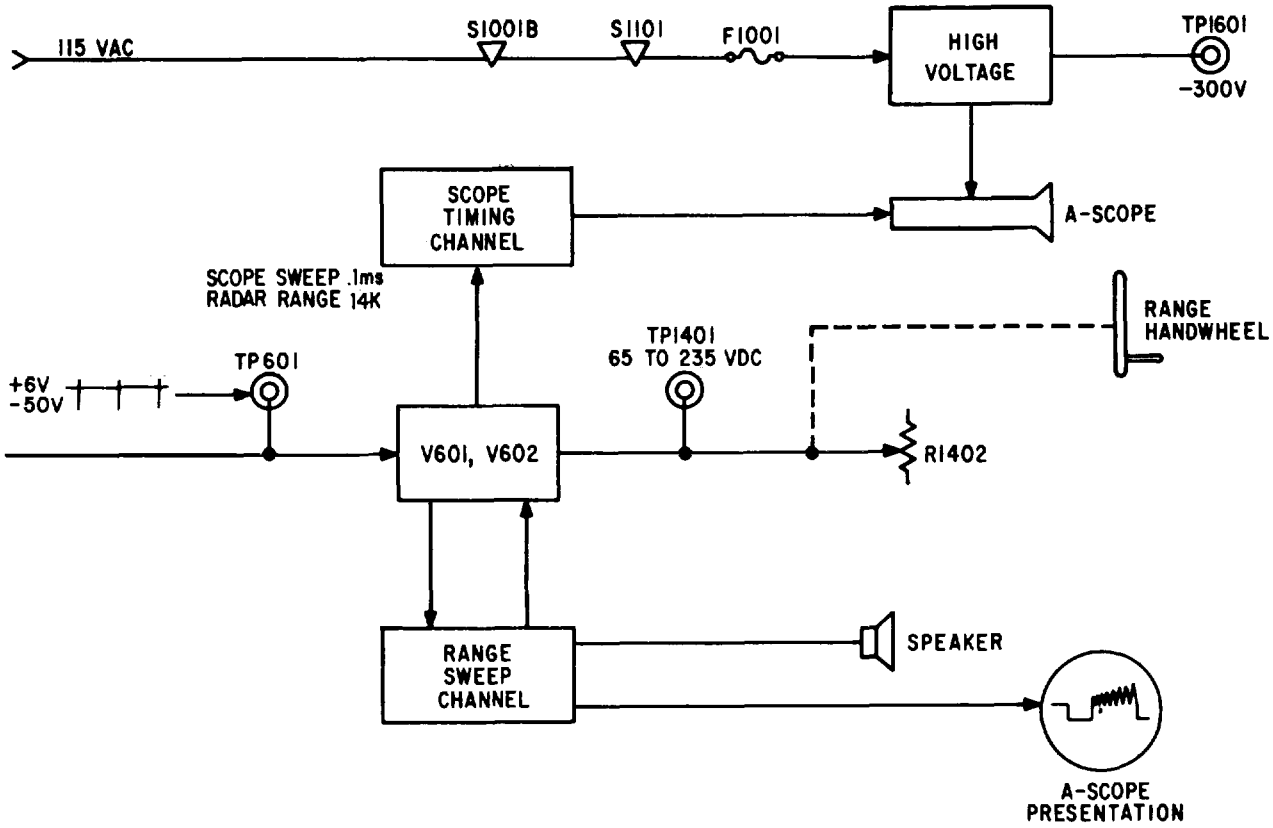


Figure 10. Scope timing and range sweep block diagram.

3-13. VIDEO, AUDIO, VERTICAL DEFLECTION, AND HIGH-VOLTAGE CHECKS

CONDITIONS	CIRCUIT	KEY POINTS	PAGE
No video, no audio.	Video amplifier	a. V612-6 b. TP602 c. J104 (fig 9)	85 34
No video, no range gate.	Vertical deflection circuits	a. V1105-5 b. TP603 c. V613-2	85
No audio.	Audio circuits	a. Speaker b. T605 c. V623-5	90 89
No AGC, no audio, no video.	Audio and AGC circuits	a. V622-6 b. V622-3 c. V621 d. TP604 e. V612-2	 88 87 88 88

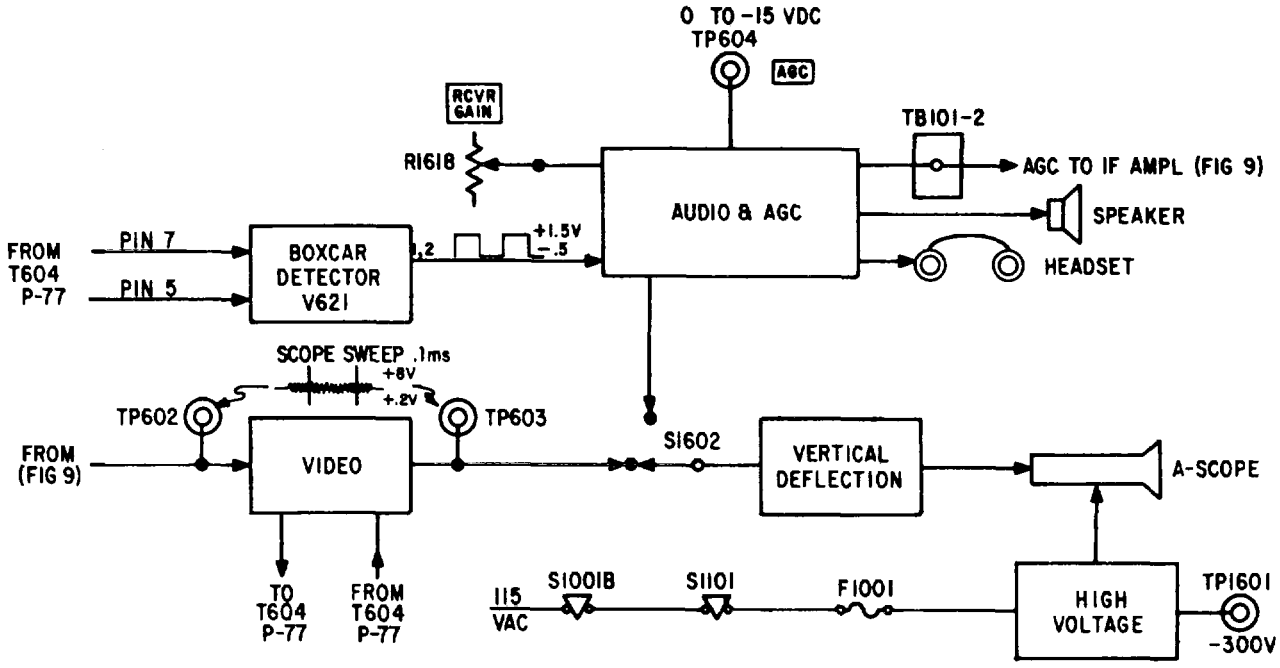
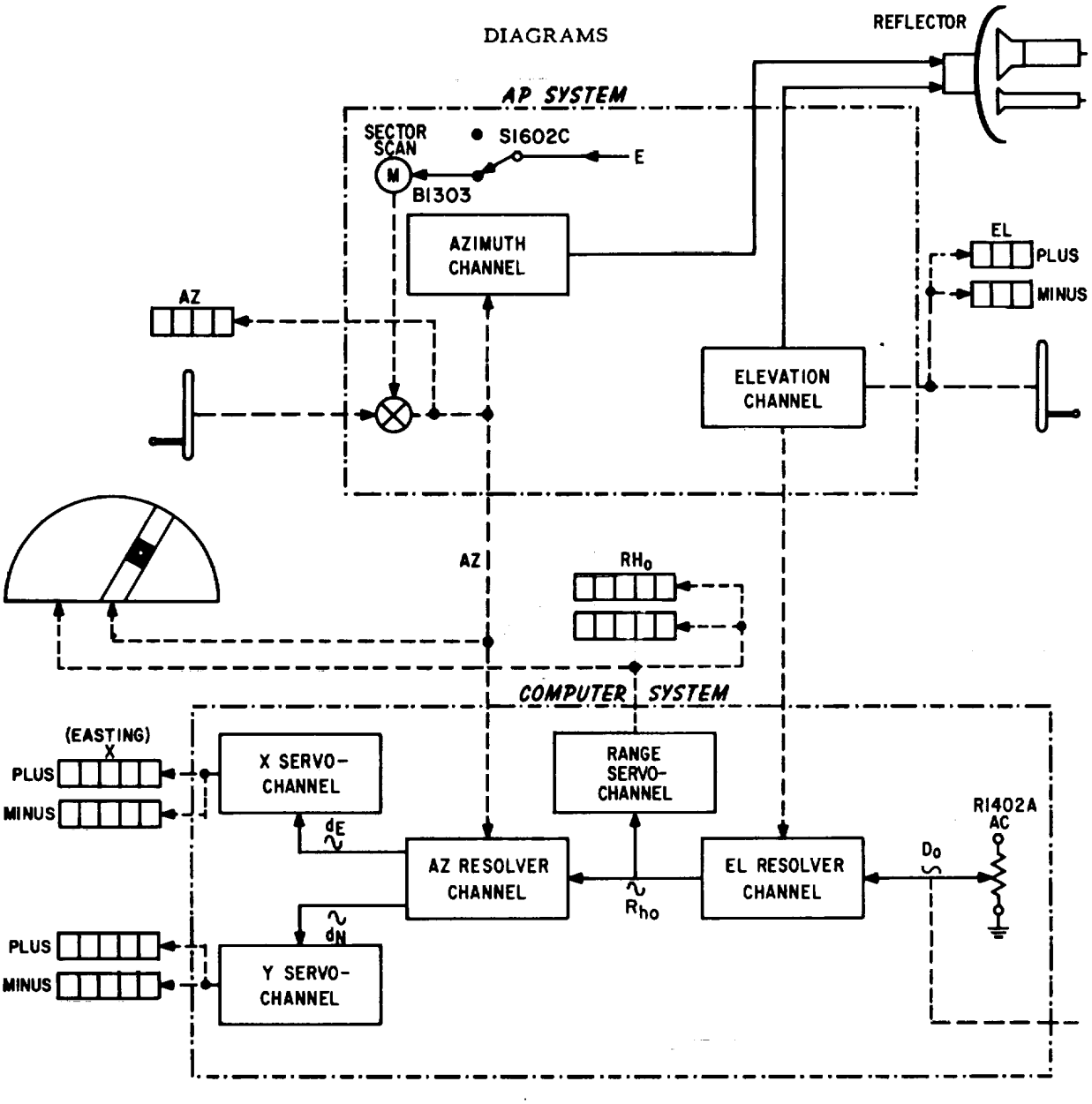


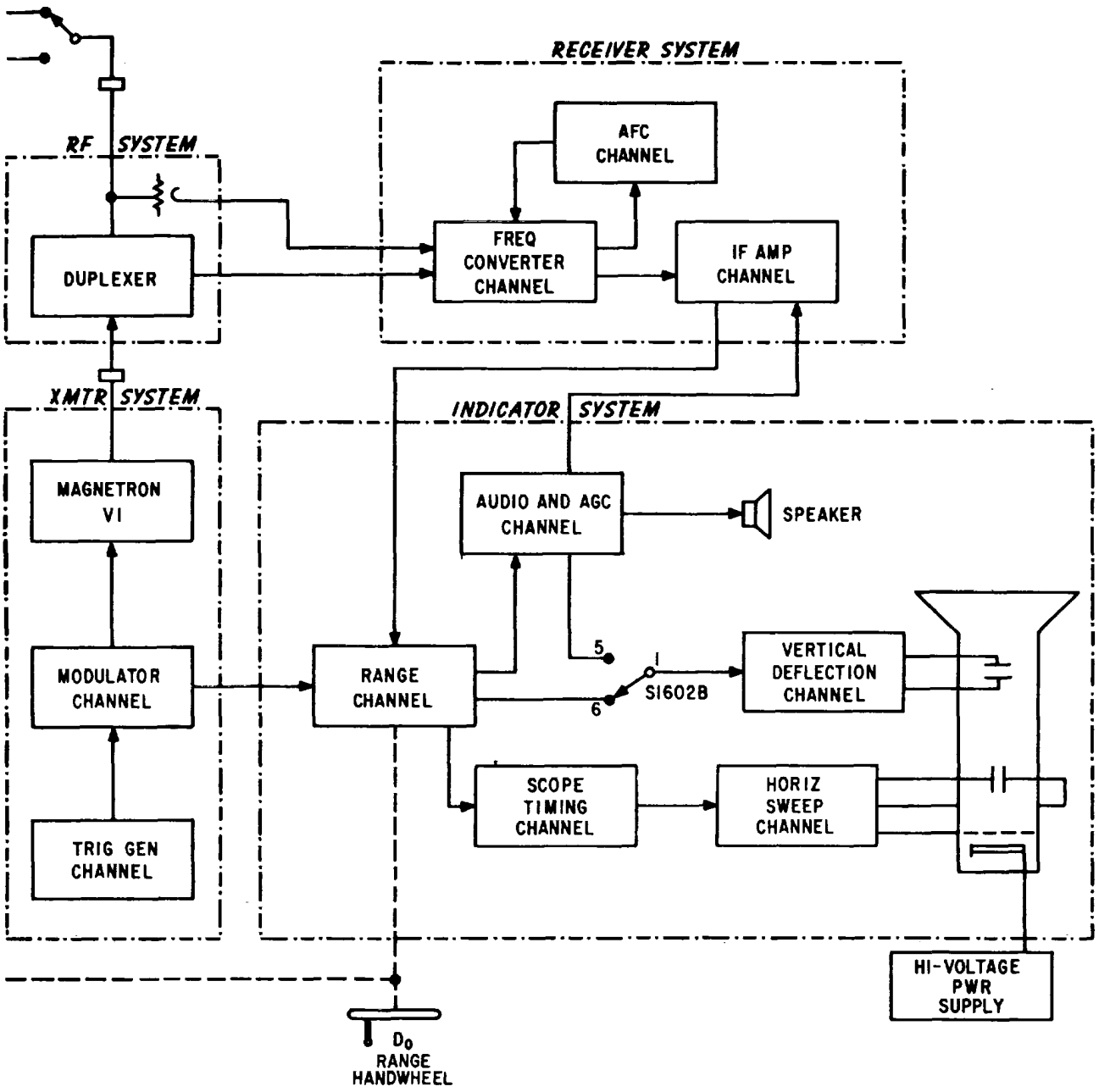
Figure 11. Video, audio, vertical deflection, and high-voltage block diagram.

CHAPTER 4

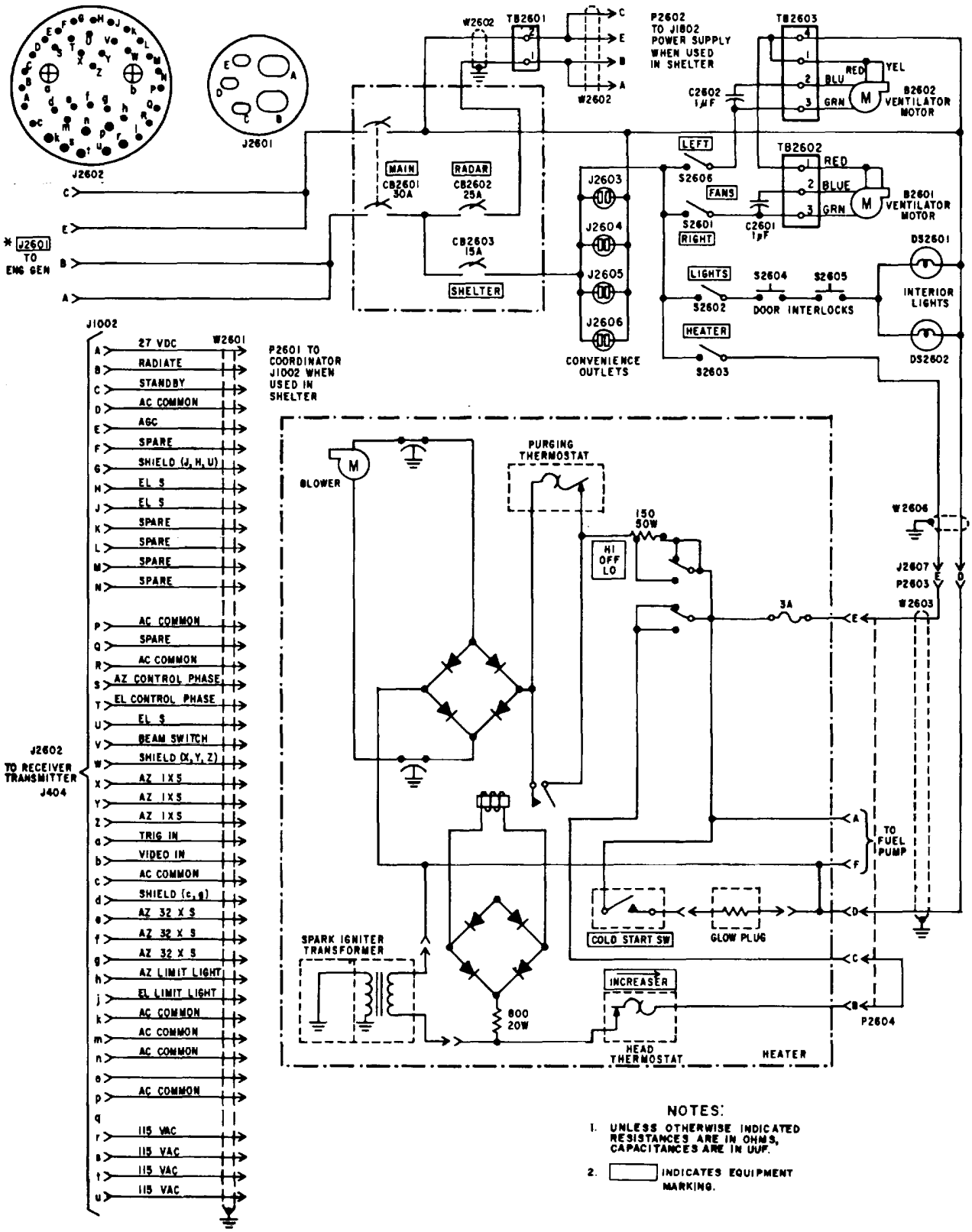
DIAGRAMS



AN/TPS-25 block diagram.



AN/TPS-25 block diagram--Continued.

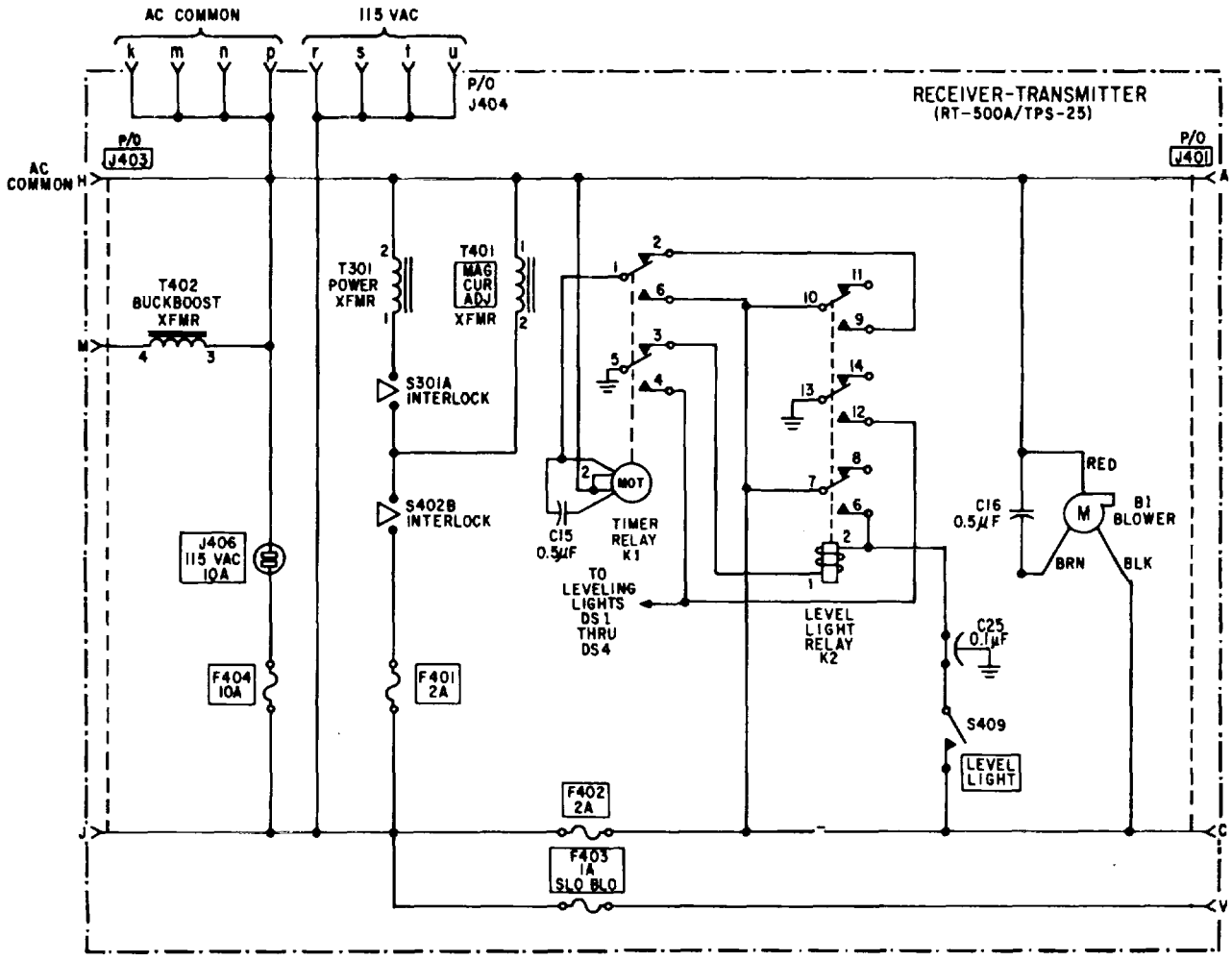


NOTES:

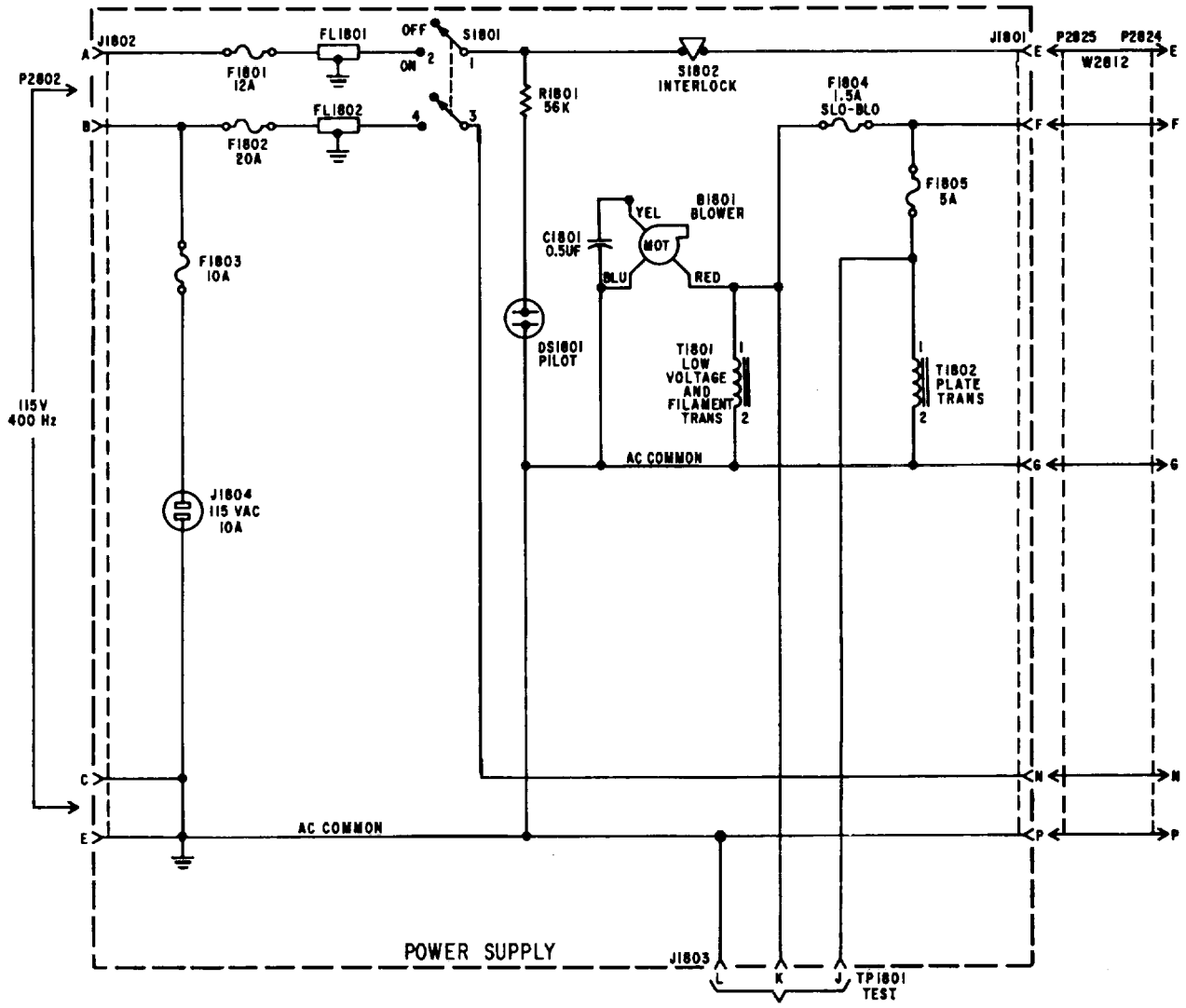
1. UNLESS OTHERWISE INDICATED RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. ☐ INDICATES EQUIPMENT MARKING.

*NOTE Refer to TM 5-6115-271-14, P 2-2 and 2-3, for generator electrical connection

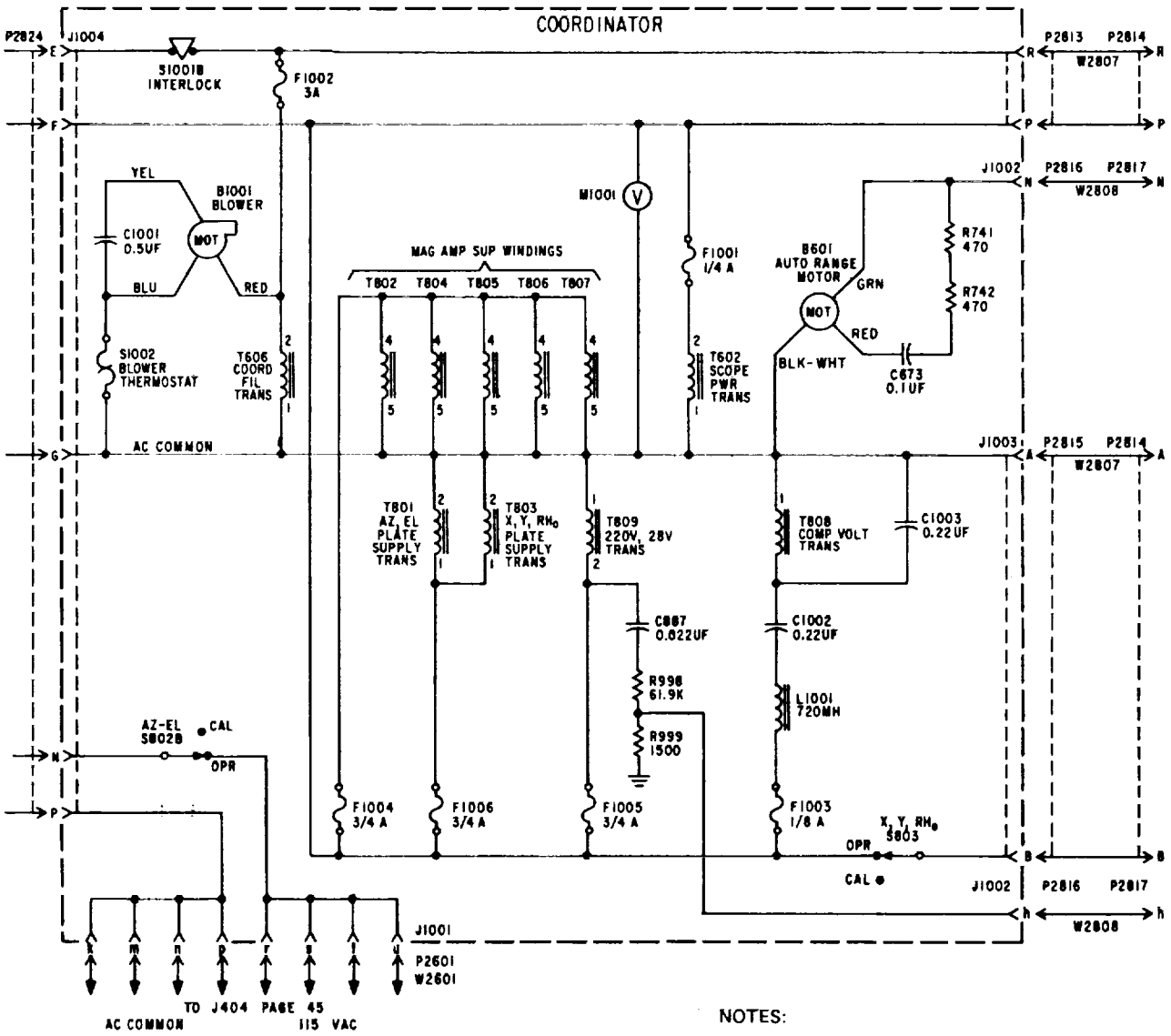
Equipment shelter AC power distribution box.



Level lights control circuit.



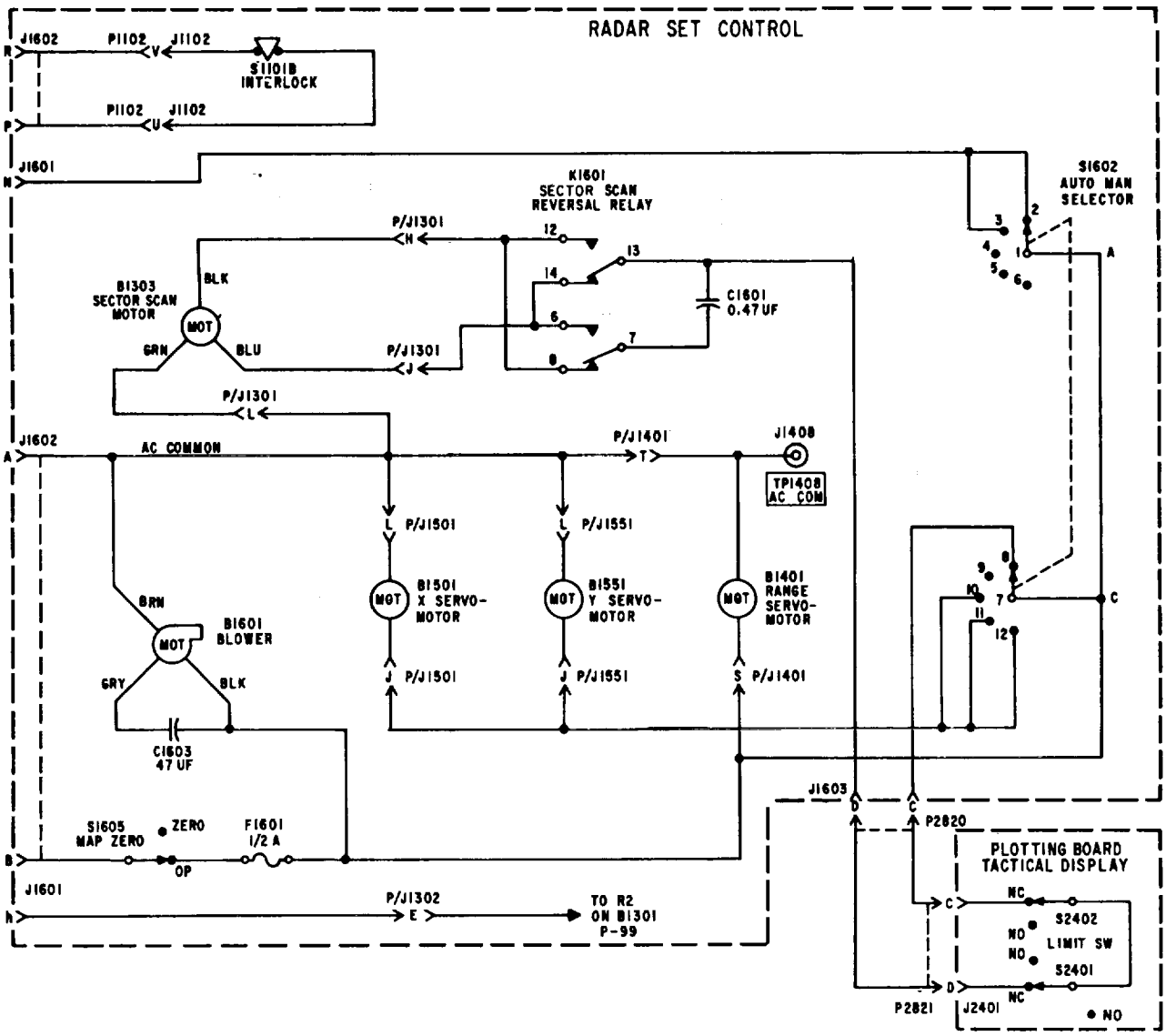
AC distribution circuit diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS AND CAPACITANCES ARE IN UUF.
2. WAFER SWITCHES SHOWN IN EXTREME COUNTERCLOCKWISE POSITION AND ARE VIEWED FROM FRONT, EXCEPT AS INDICATED. FRONT OF WAFER IS SIDE TOWARD CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. SEGMENTS OF WAFERS ARE IDENTIFIED BY X, Y, Z
3. ☐ INDICATES EQUIPMENT MARKING.

AC distribution circuit diagram--Continued.



NOTES:

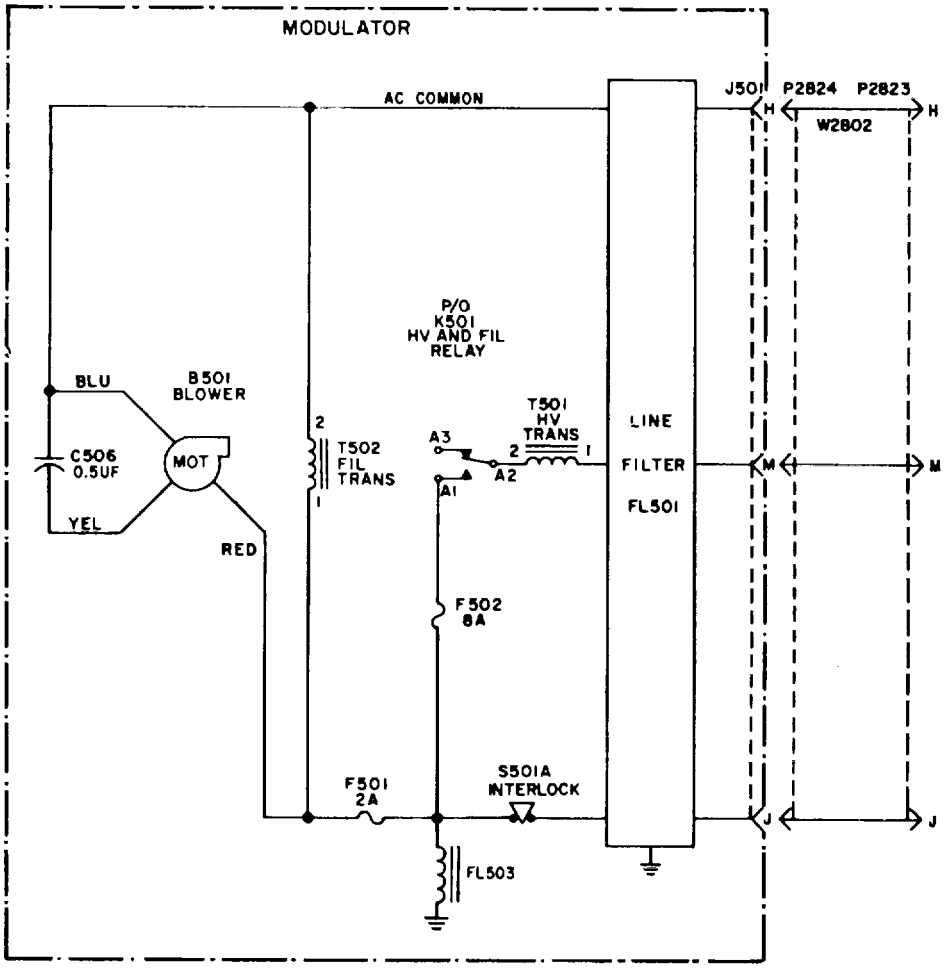
1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS AND CAPACITANCES ARE IN UUF.

2 WAFER SWITCHES SHOWN IN EXTREME COUNTERCLOCKWISE POSITION AND ARE VIEWED FROM FRONT, EXCEPT AS INDICATED. FRONT OF WAFER IS SIDE TOWARD CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. SEGMENTS OF WAFERS ARE IDENTIFIED BY X, Y, Z.

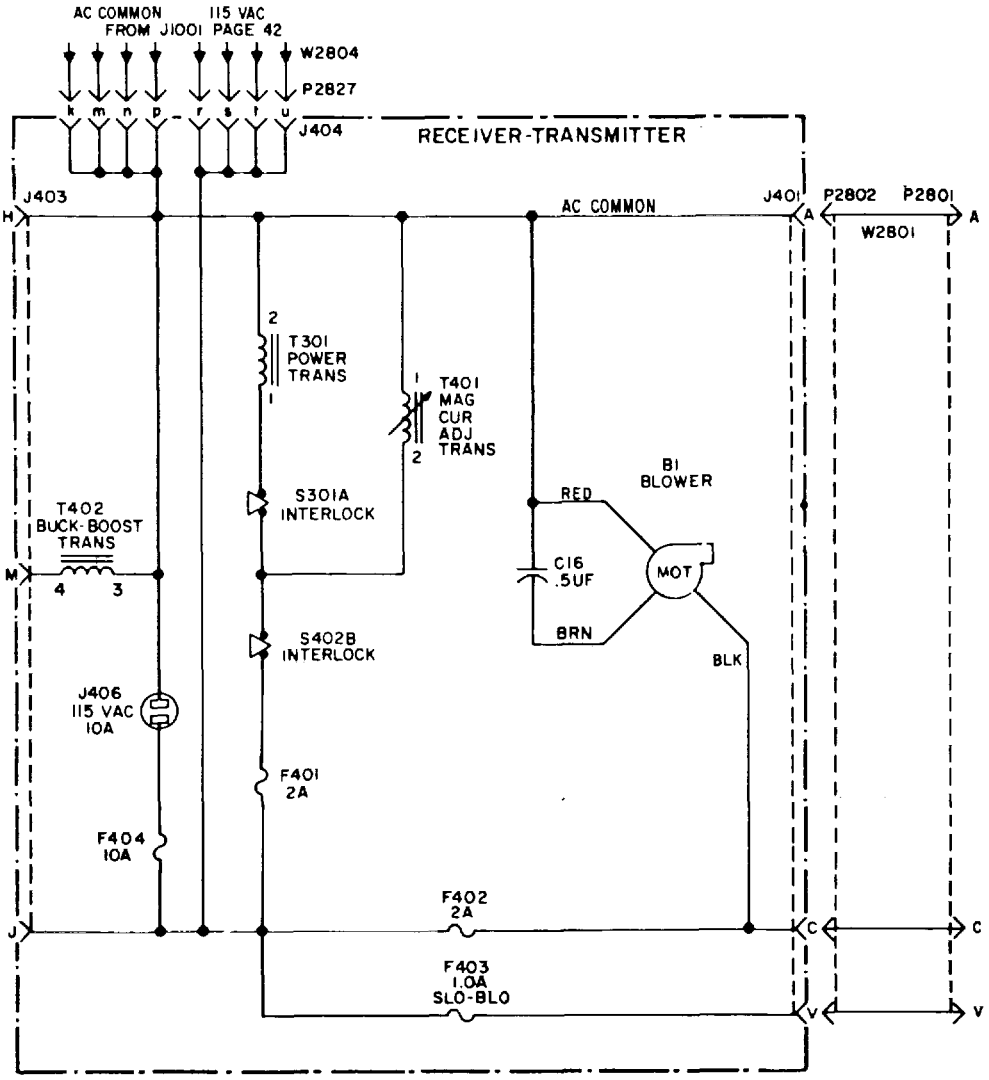
3. INDICATES EQUIPMENT MARKING.

4. IF THE PLOTTING BOARD IS NOT UTILIZED J1603, PINS D AND C MUST BE SHORTED.

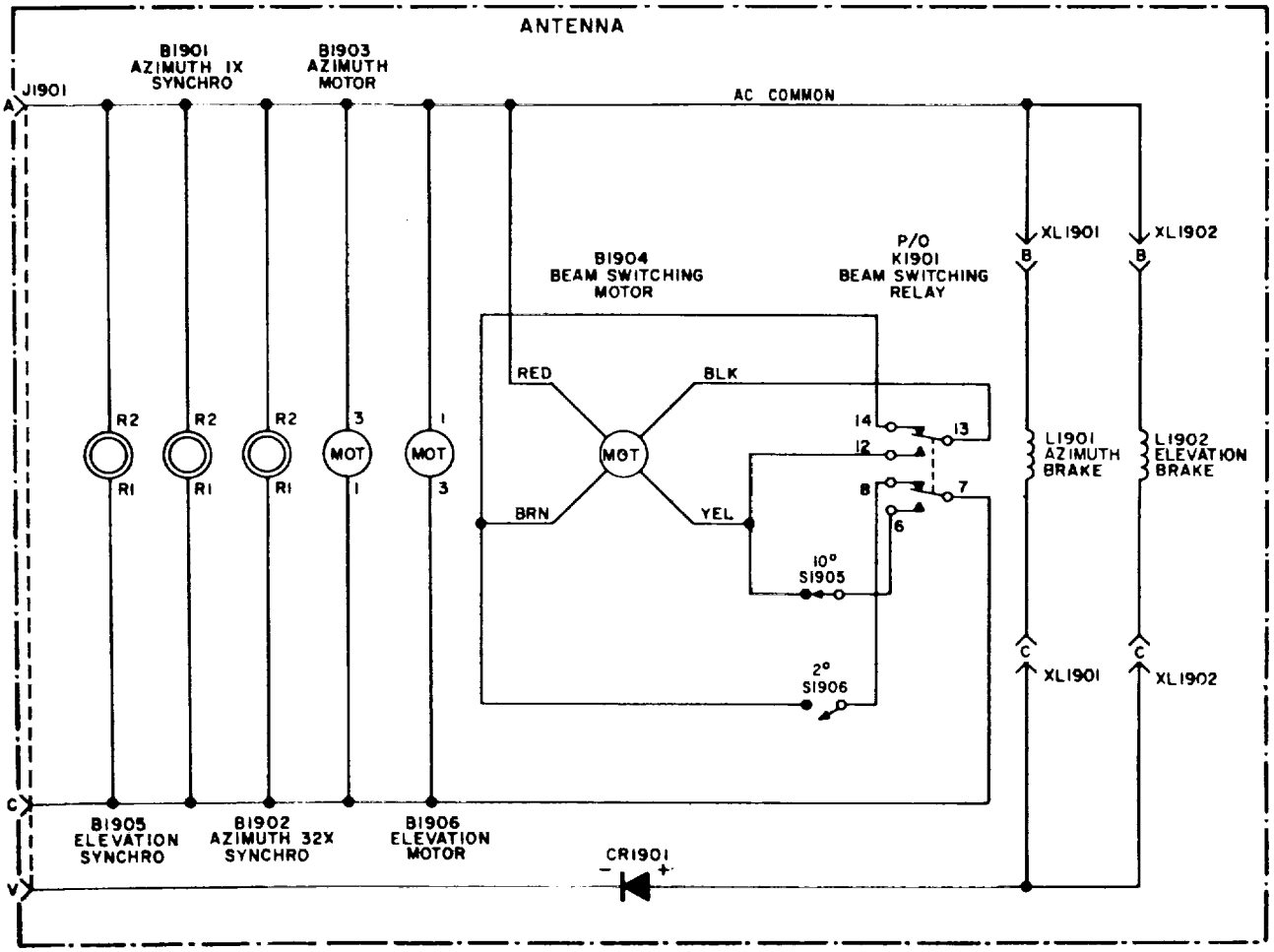
AC distribution circuit diagram--Continued.



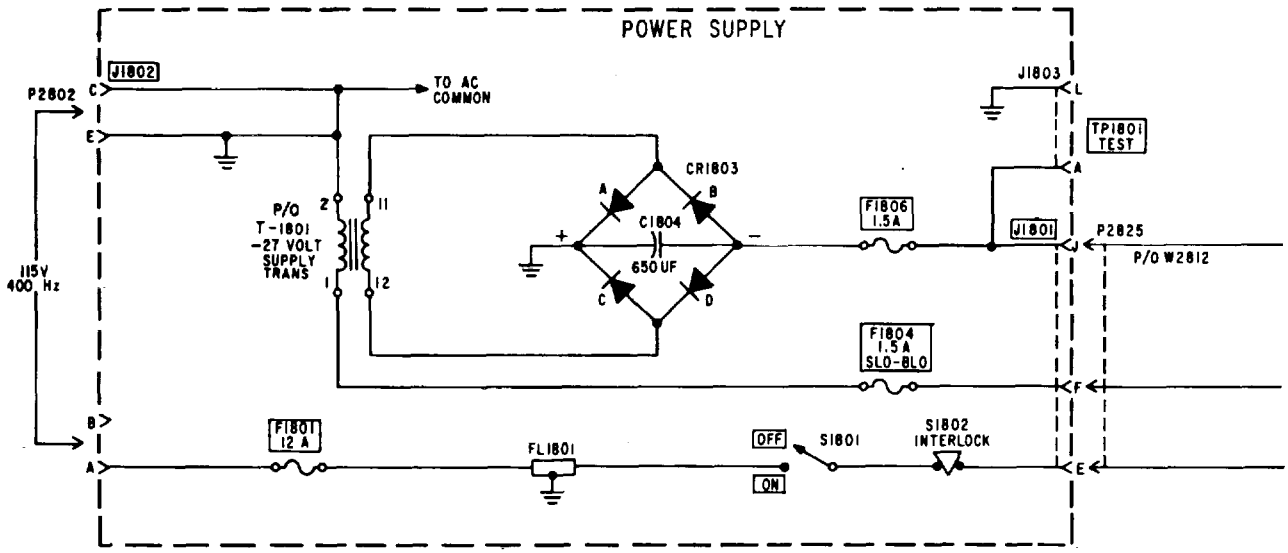
AC distribution circuit diagram--Continued.



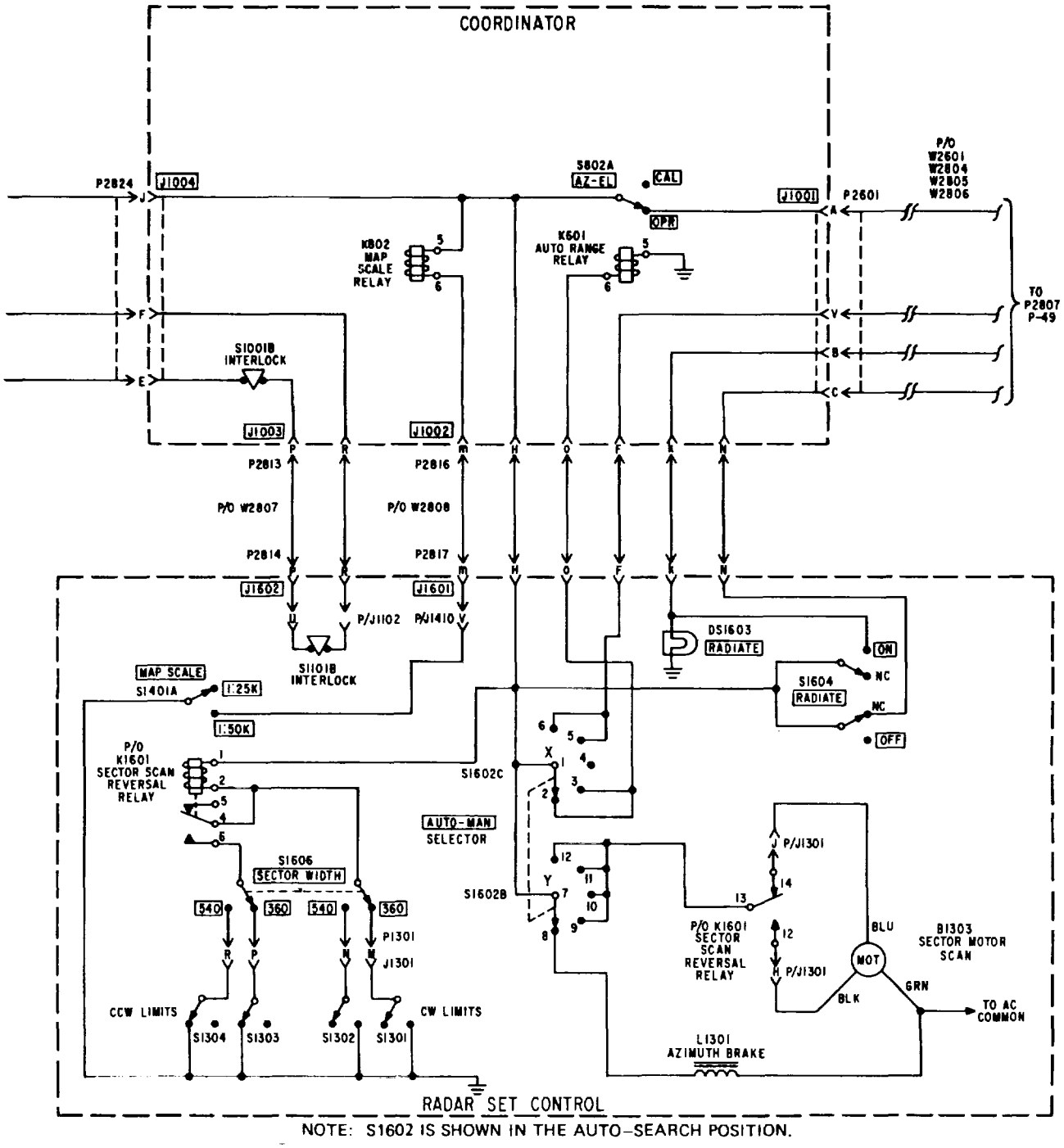
AC distribution circuit diagram –Continued



AC distribution circuit diagram--Continued.

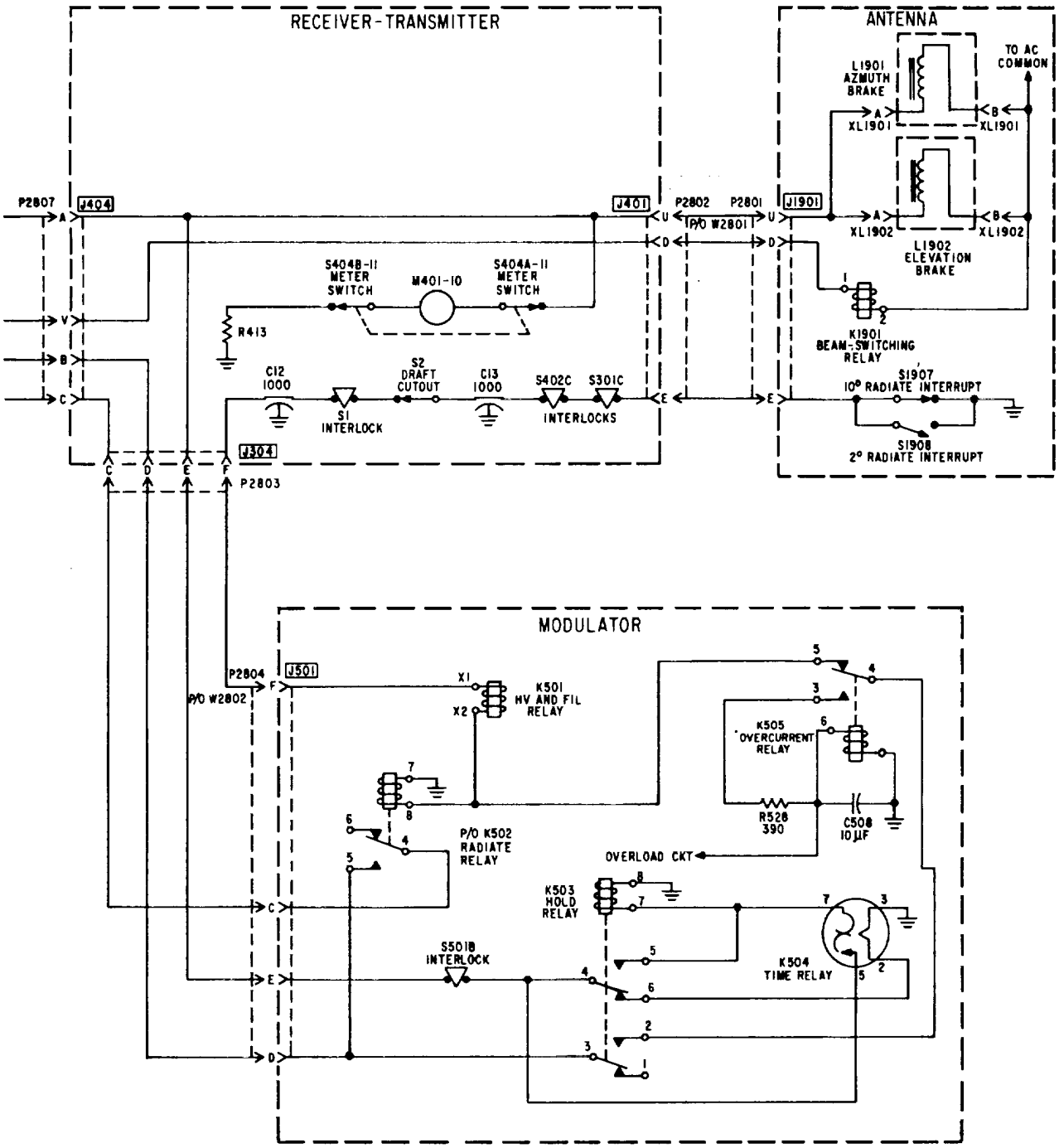


27-volt DC distribution.



NOTE: S1602 IS SHOWN IN THE AUTO-SEARCH POSITION.

27 -volt DC distribution –Continued.



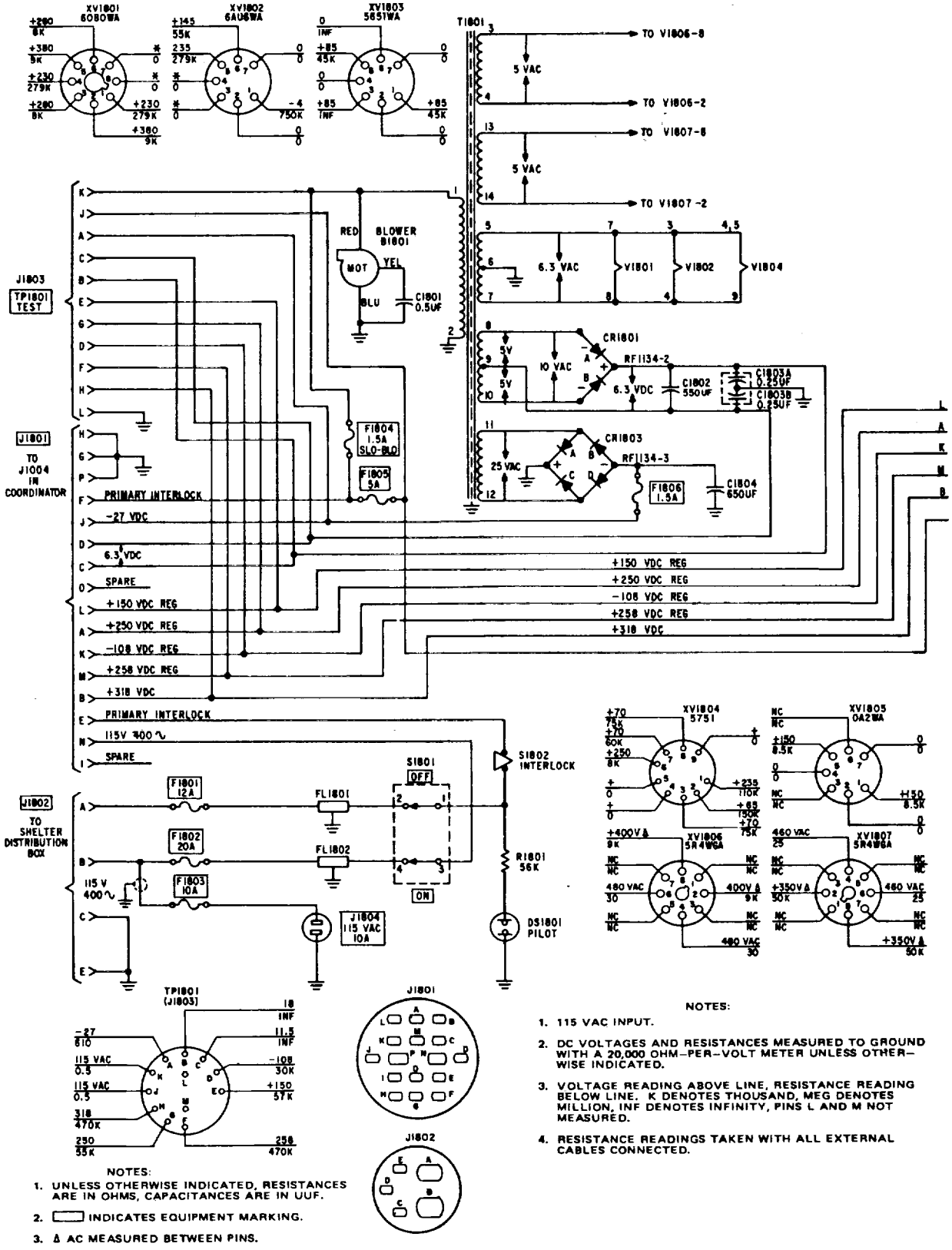
1. UNLESS OTHERWISE INDICATED., RESISTANCES ARE IN OHMS. CAPACITANCES ARE IN UUF.

2. [ ] INDICATES EQUIPMENT MARKING.

3. WAFER SWITCHES SHOWN IN EXTREME COUNTERCLOCKWISE POSITION AND ARE VIEWED FROM FRONT. FRONT OF WAFER IS SIDE TOWARD CONTROL KNOB. WA FER NEAREST CONTROL KNOB IS SECTION A.

27-volt DC distribution- -Continued.

NOTES



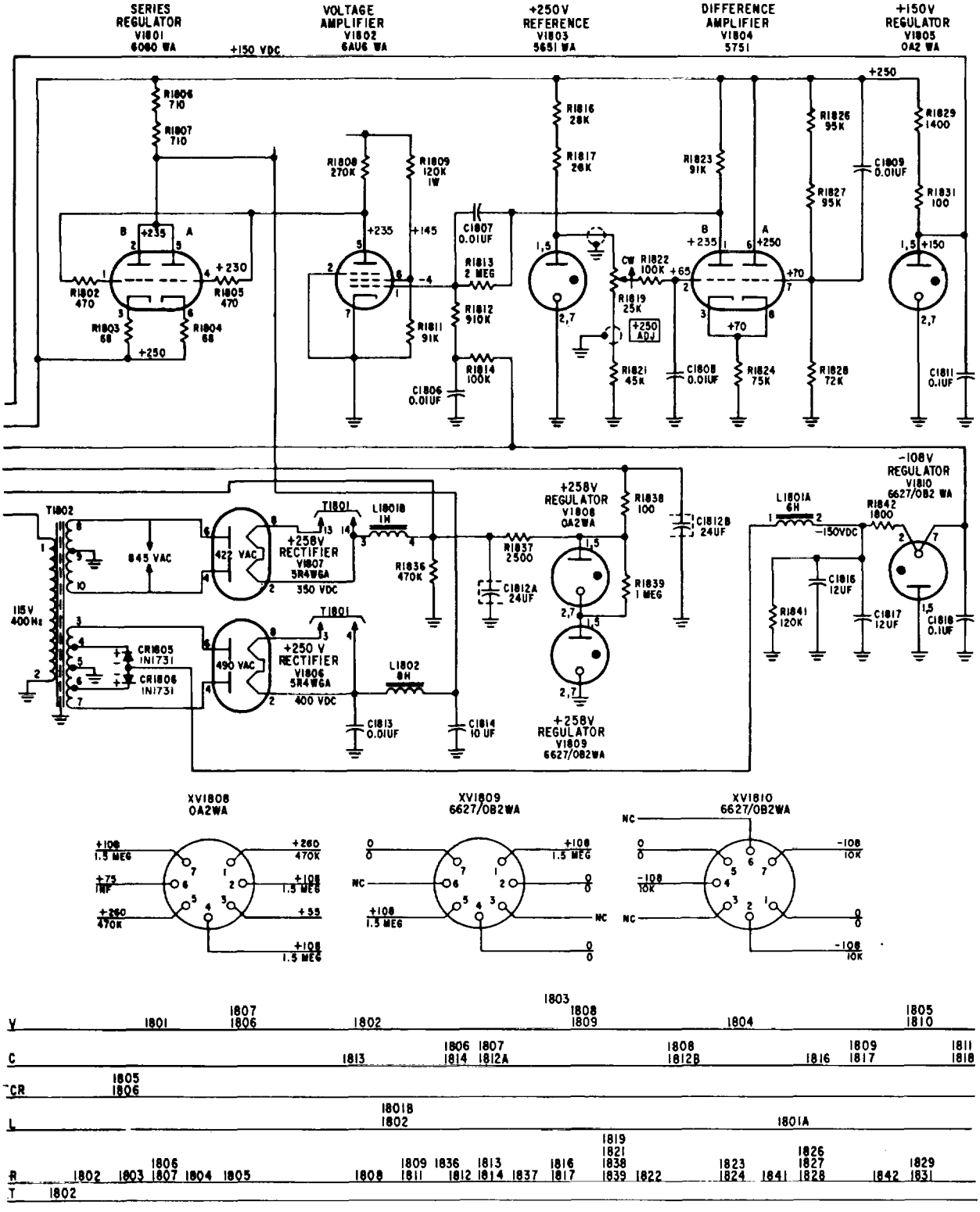
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. ▭ INDICATES EQUIPMENT MARKING.
3. Δ AC MEASURED BETWEEN PINS.

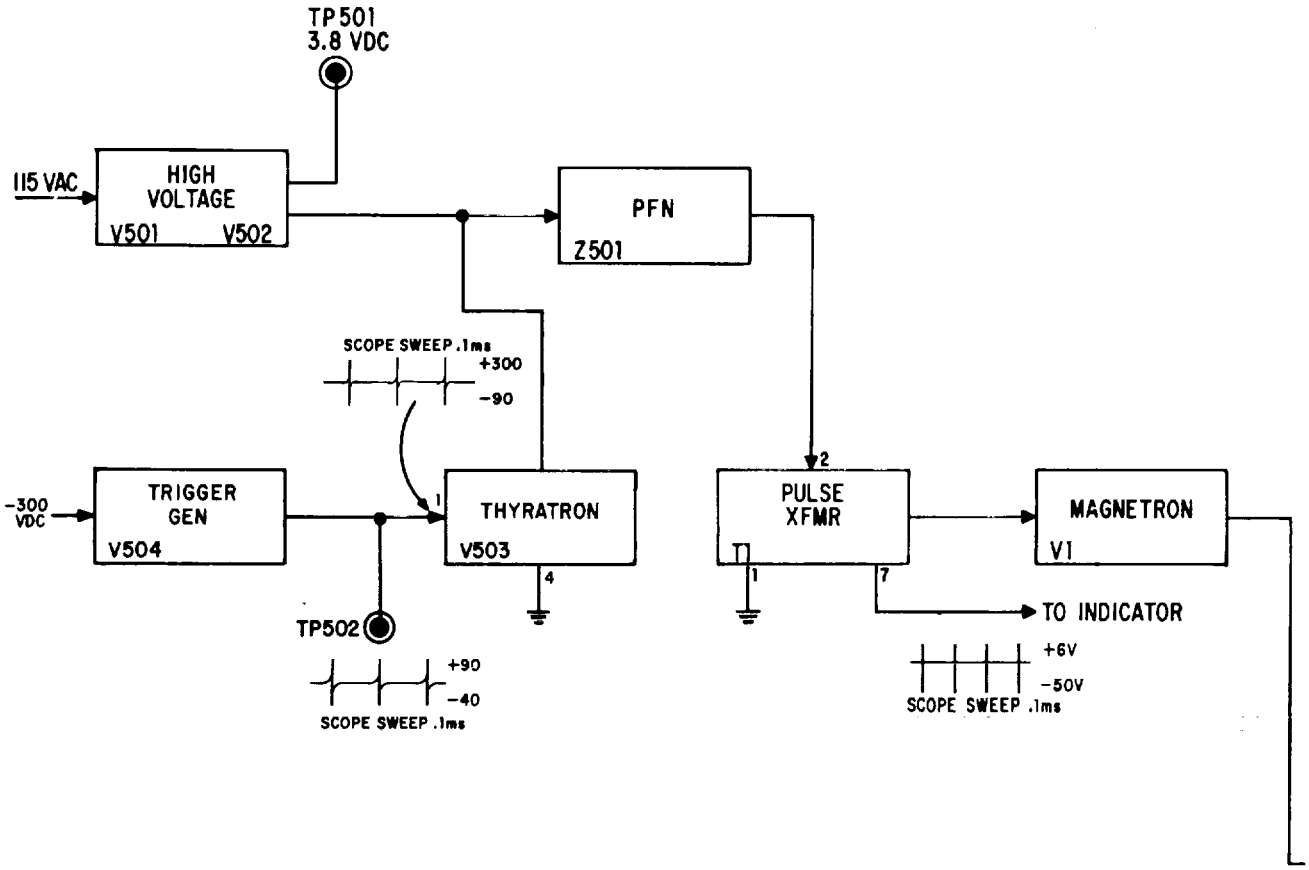
NOTES:

1. 115 VAC INPUT.
2. DC VOLTAGES AND RESISTANCES MEASURED TO GROUND WITH A 20,000 OHM-PER-VOLT METER UNLESS OTHERWISE INDICATED.
3. VOLTAGE READING ABOVE LINE, RESISTANCE READING BELOW LINE. K DENOTES THOUSAND, MEG DENOTES MILLION, INF DENOTES INFINITY, PINS L AND M NOT MEASURED.
4. RESISTANCE READINGS TAKEN WITH ALL EXTERNAL CABLES CONNECTED.

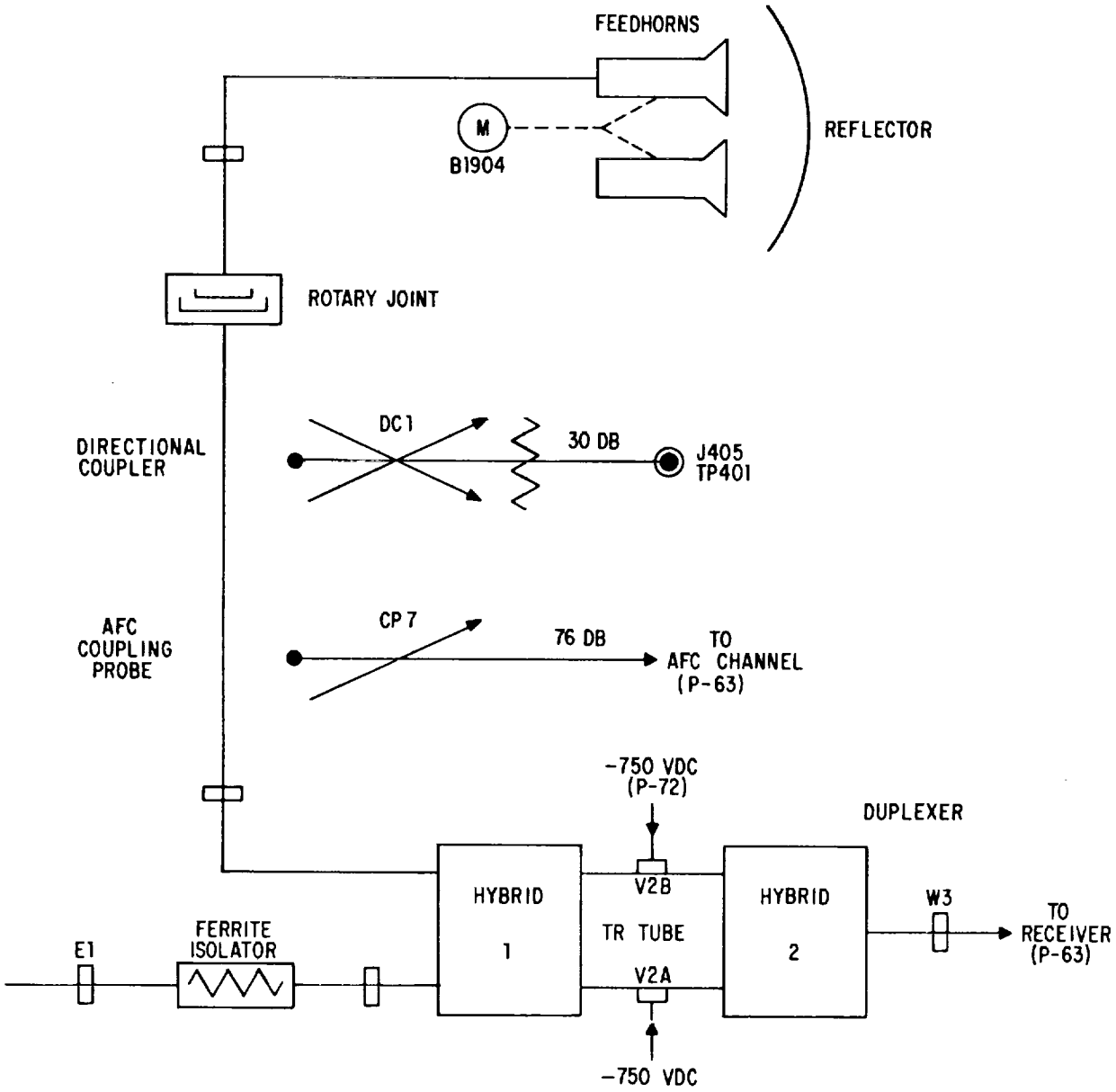
Low-voltage power supply PP-2166/TPS-25.



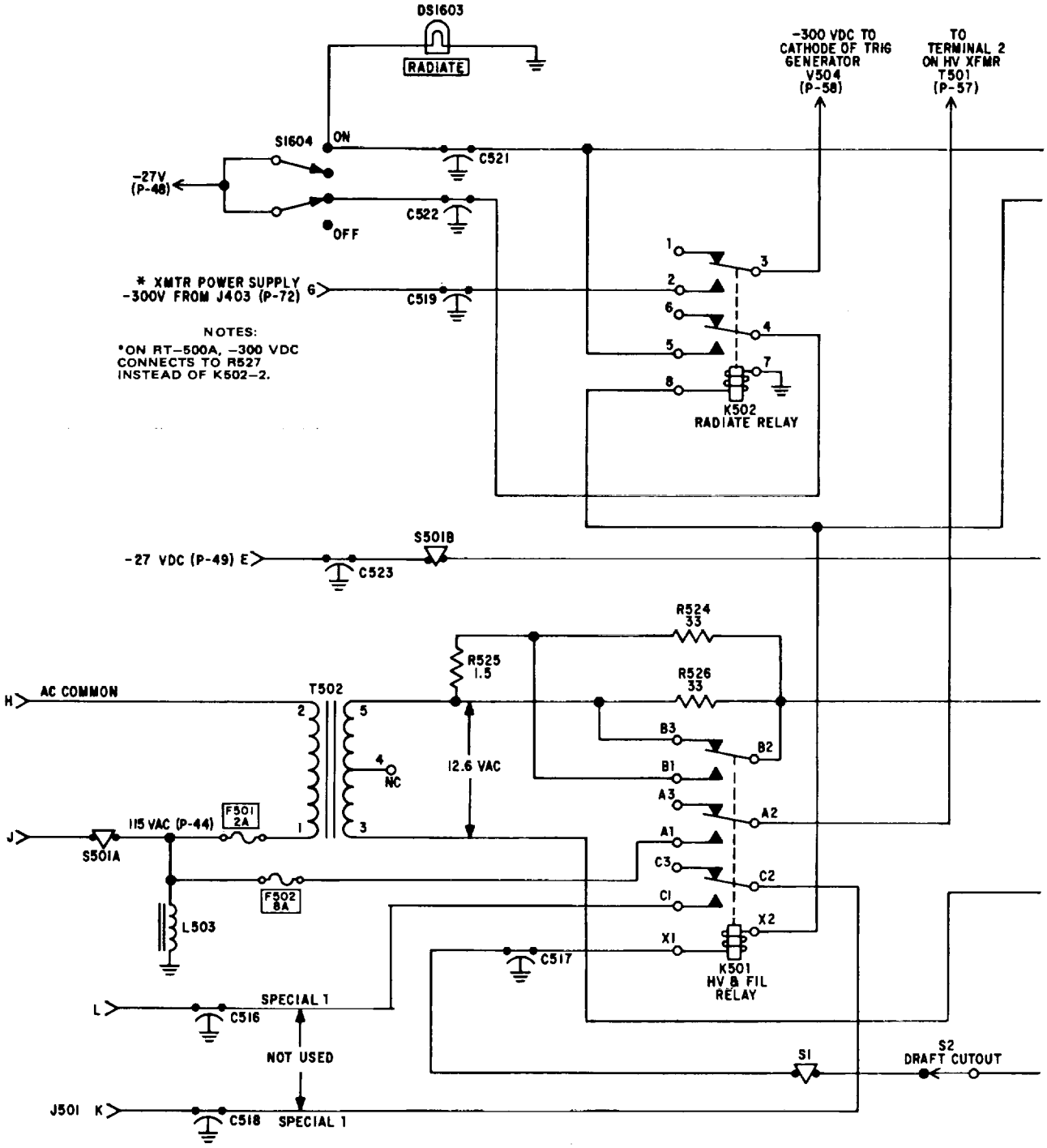
Low-voltage power supply PP-2166/TPS-25.--Continued.



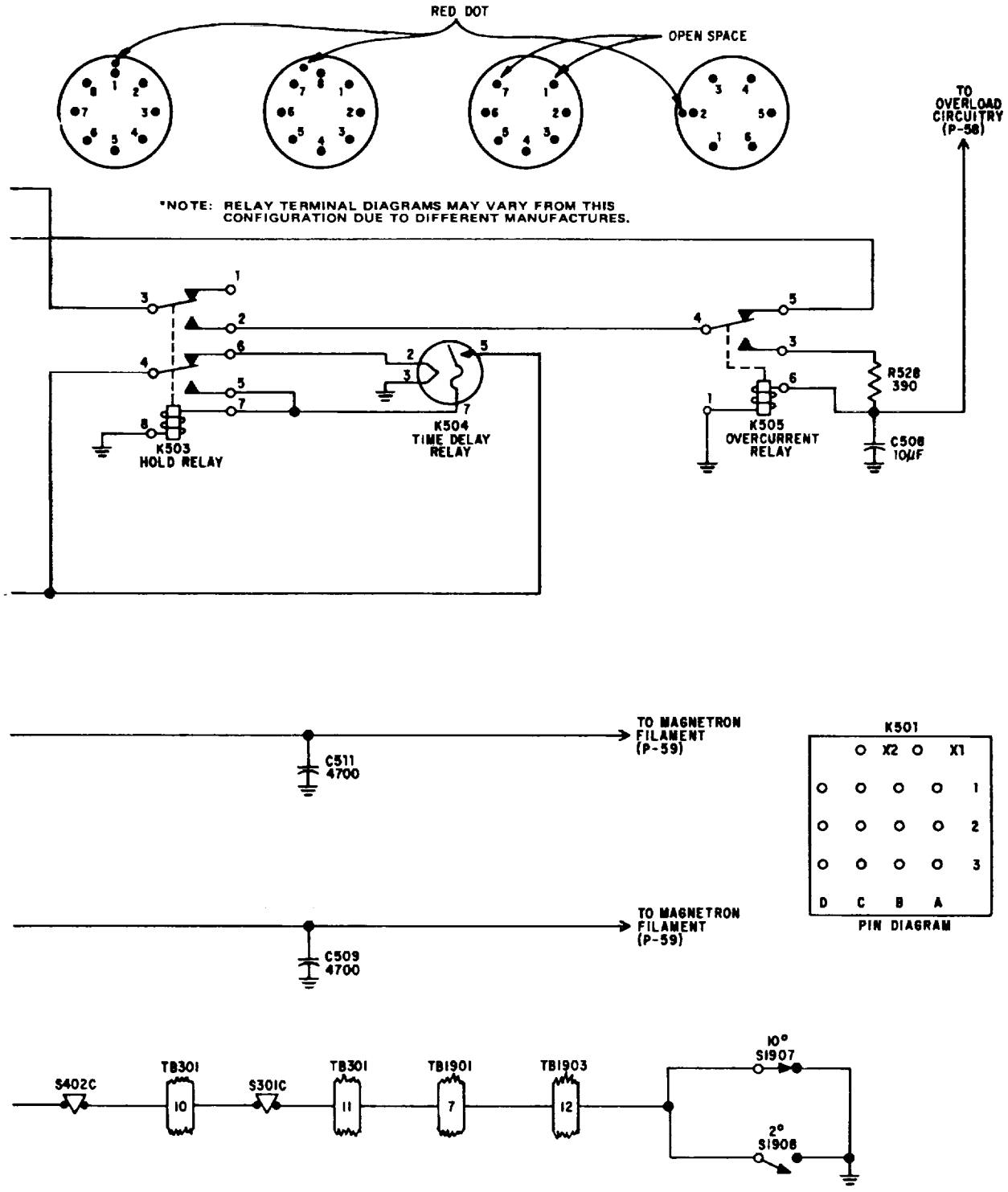
Transmitter and RF systems block diagram.



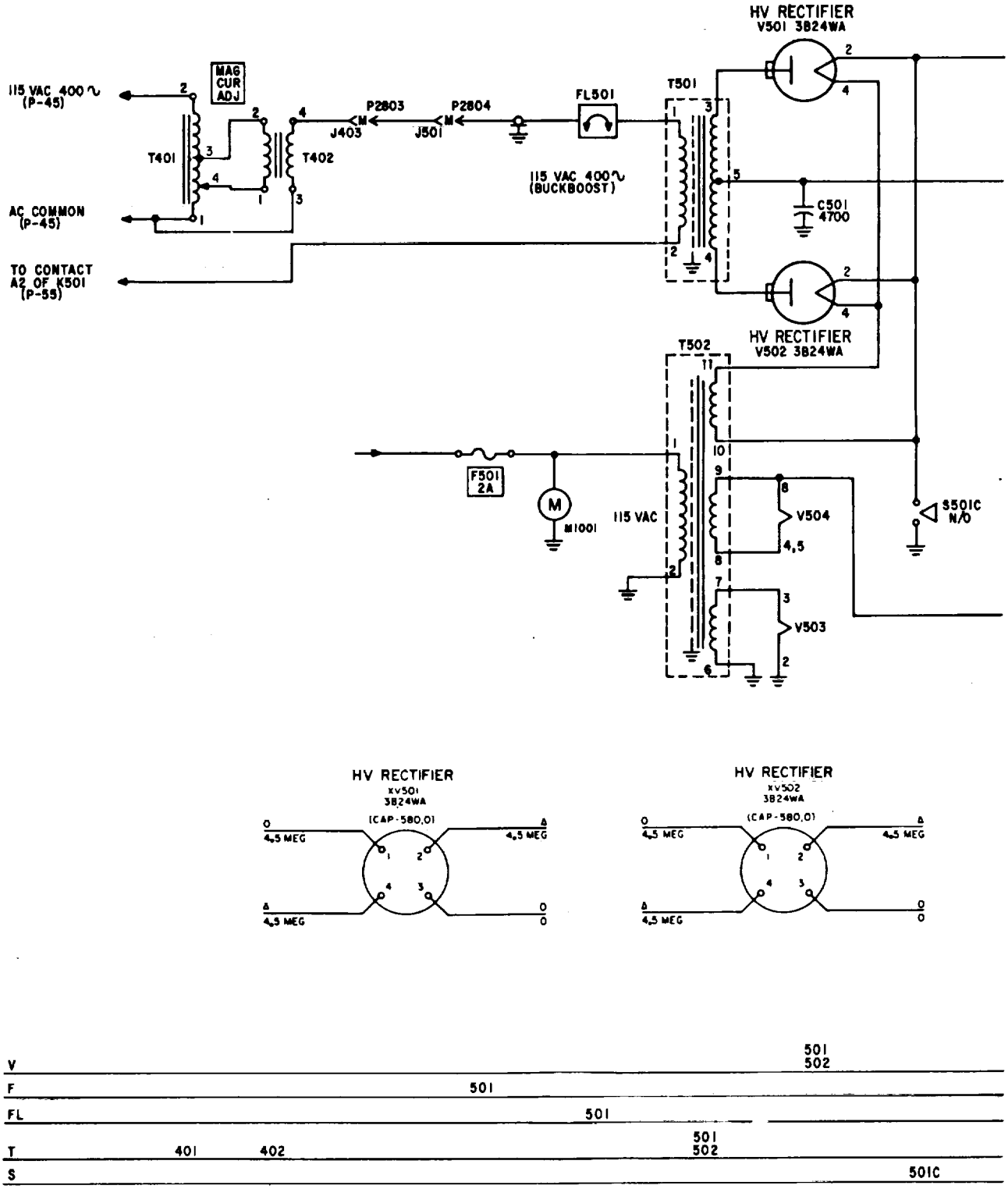
Transmitter and RF systems block diagram--Continued.



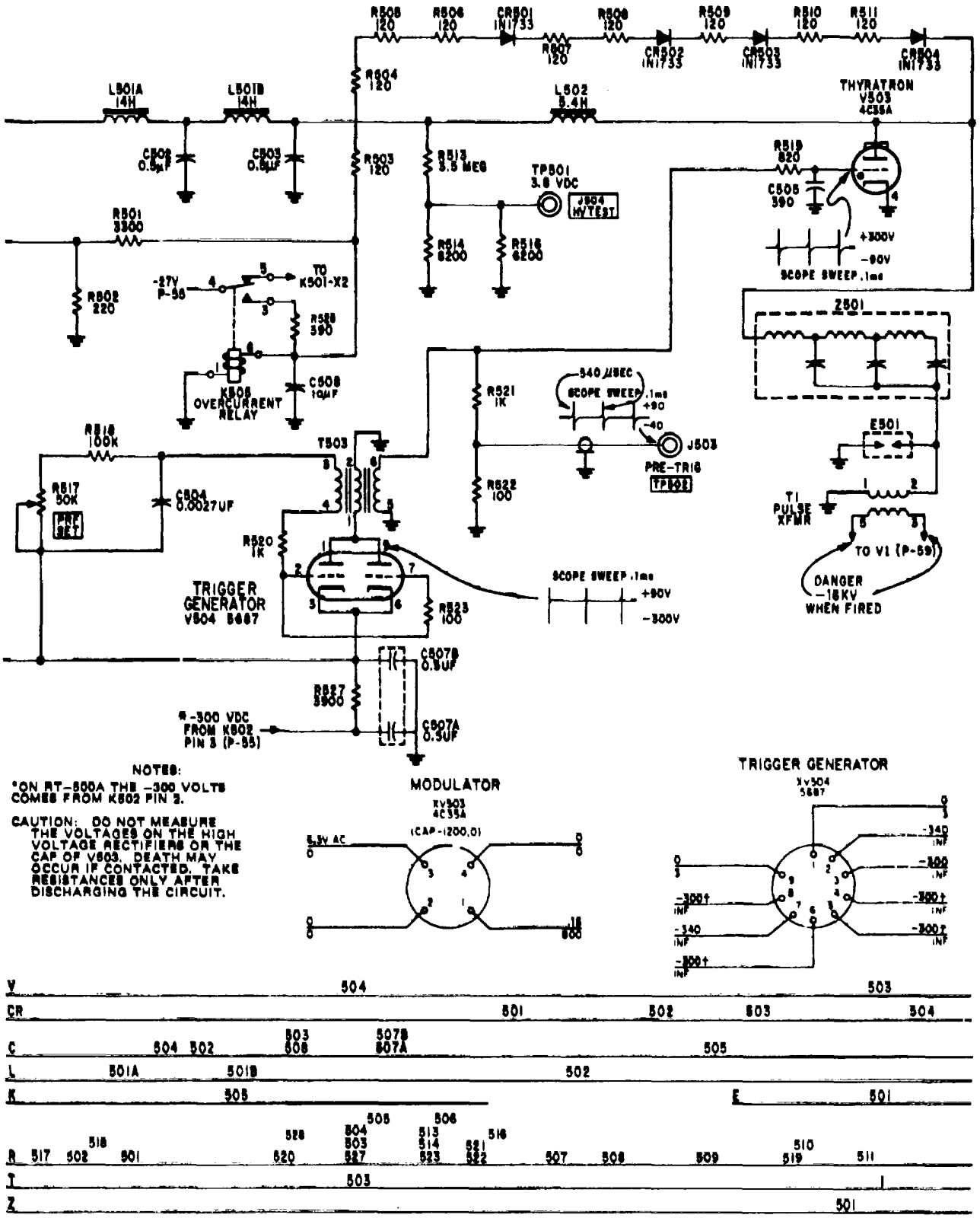
Transmitter control circuits, simplified



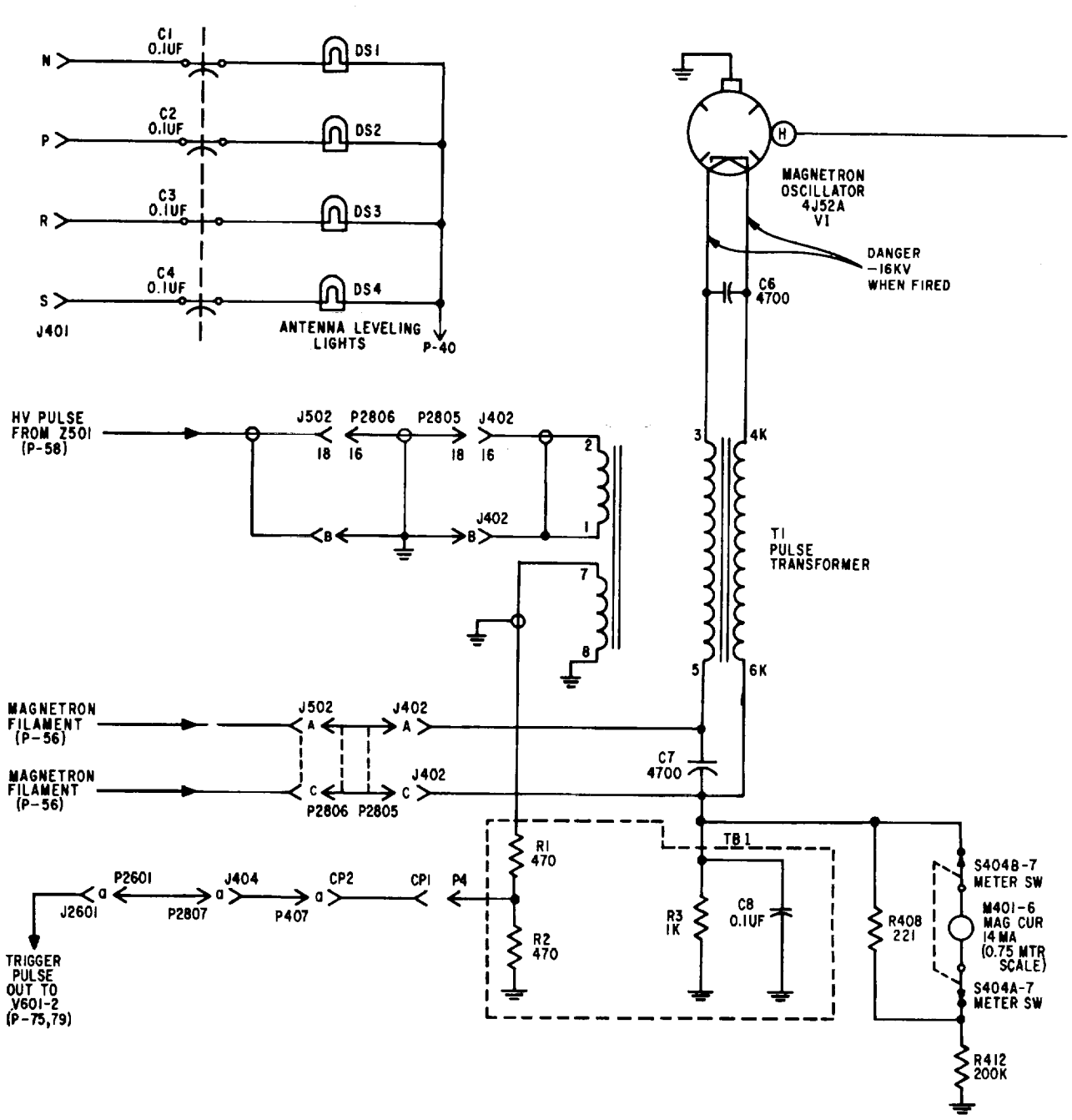
Transmitter control circuits, simplified—Continued



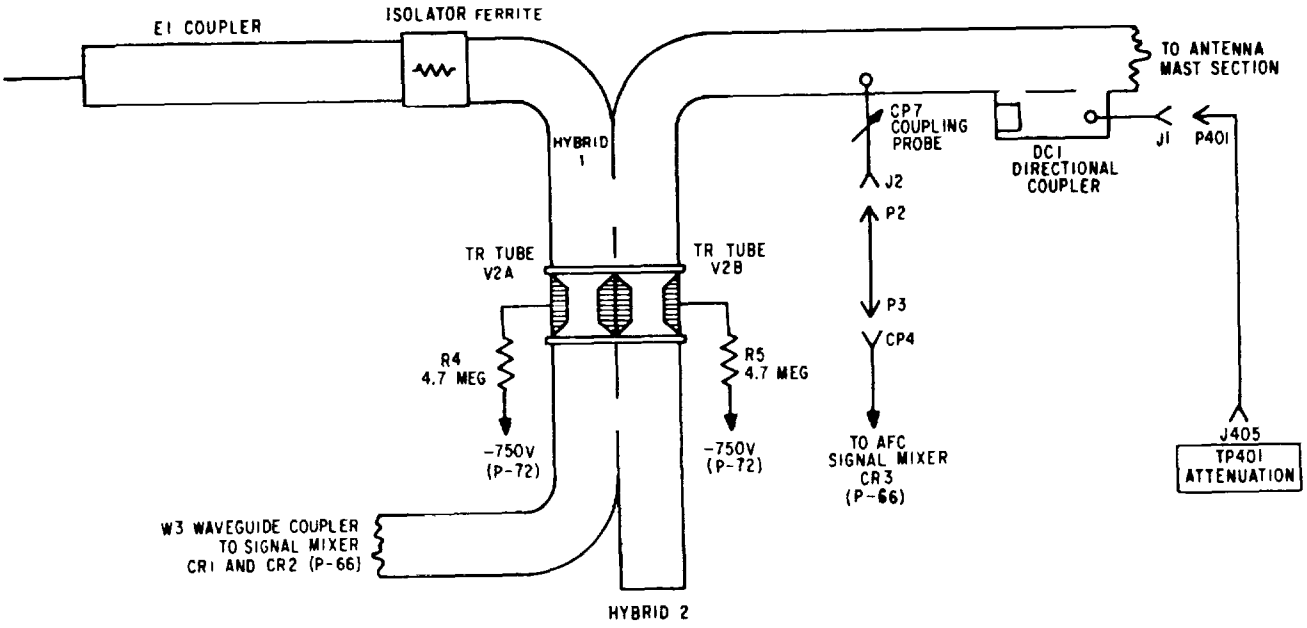
High-voltage, trigger generator, and modulator channels.



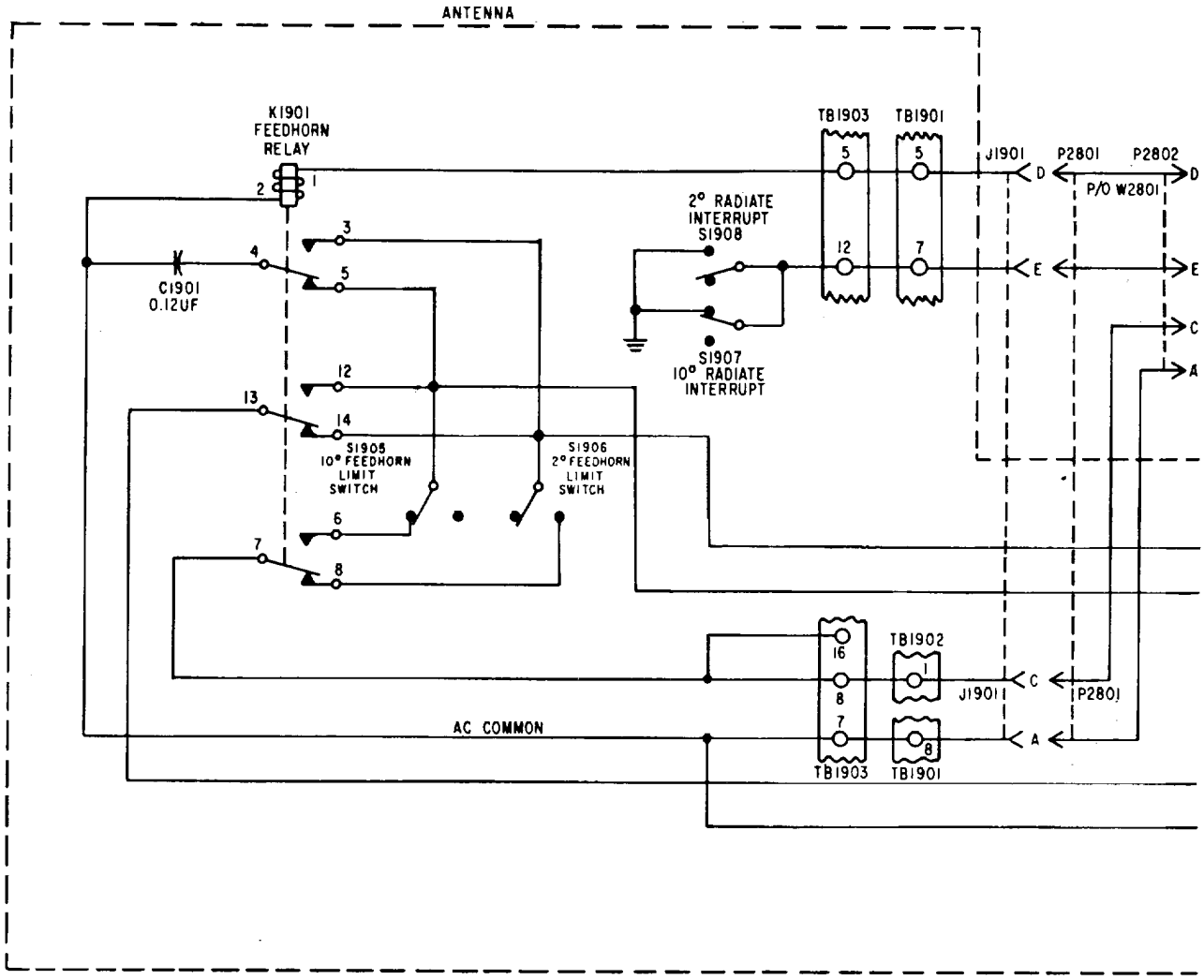
High-voltage, trigger generator, and modulator channels--Continued.



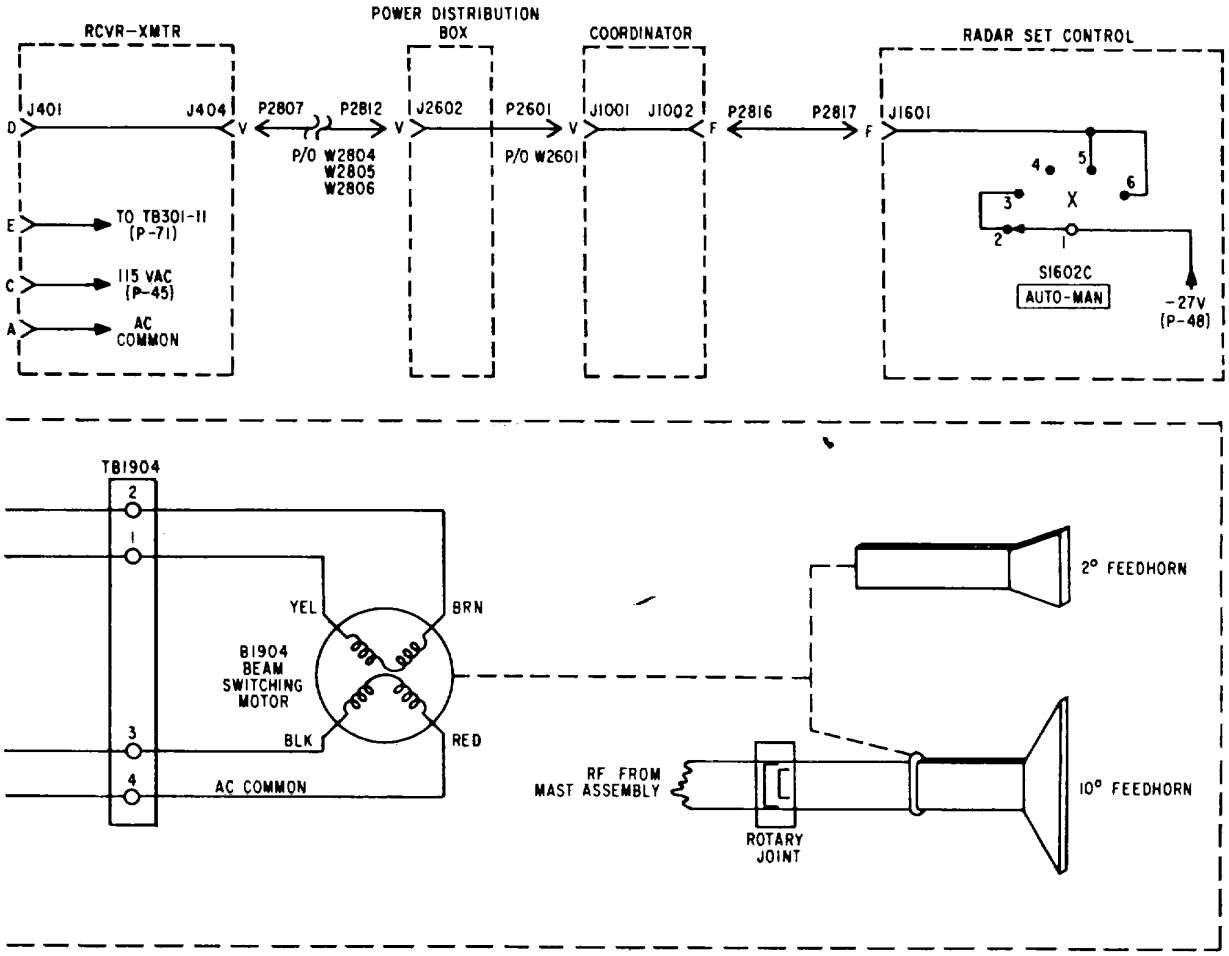
Transmitter and RF systems circuit diagram.



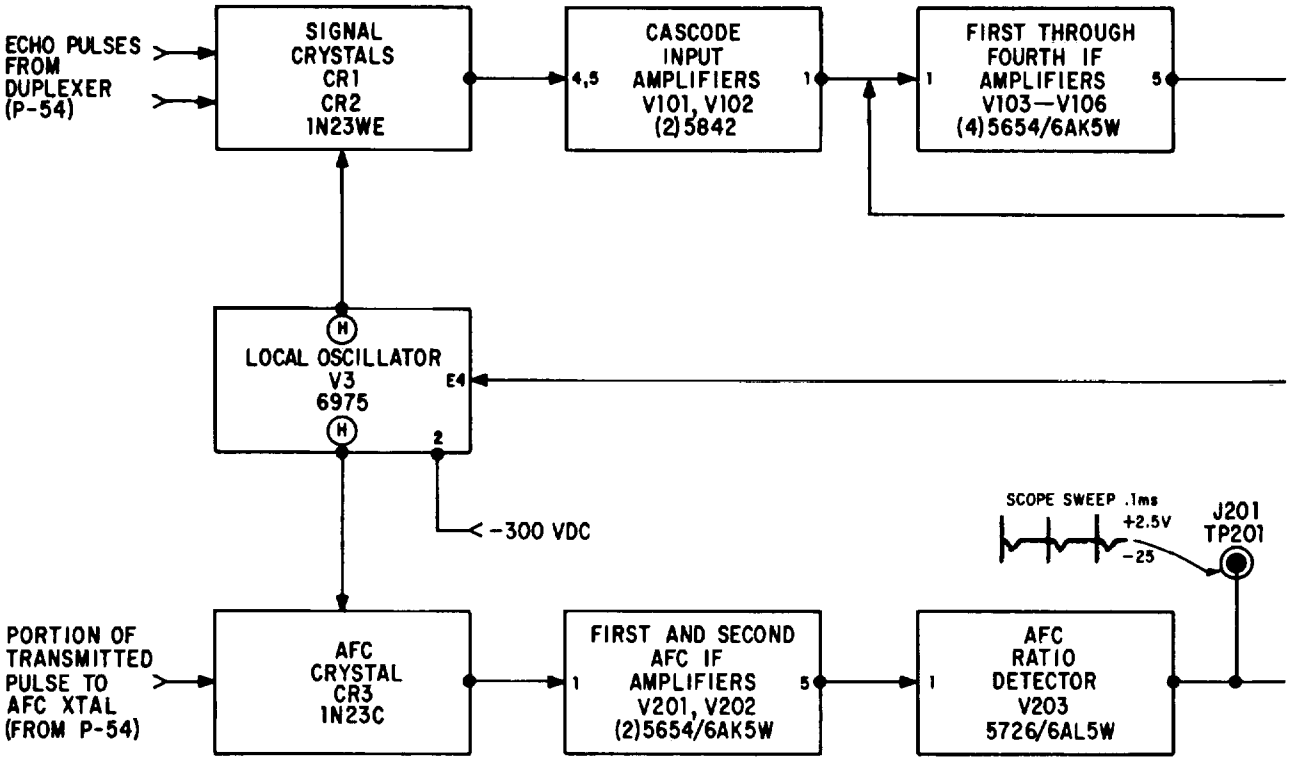
Transmitter and RF systems circuit diagram--Continued.



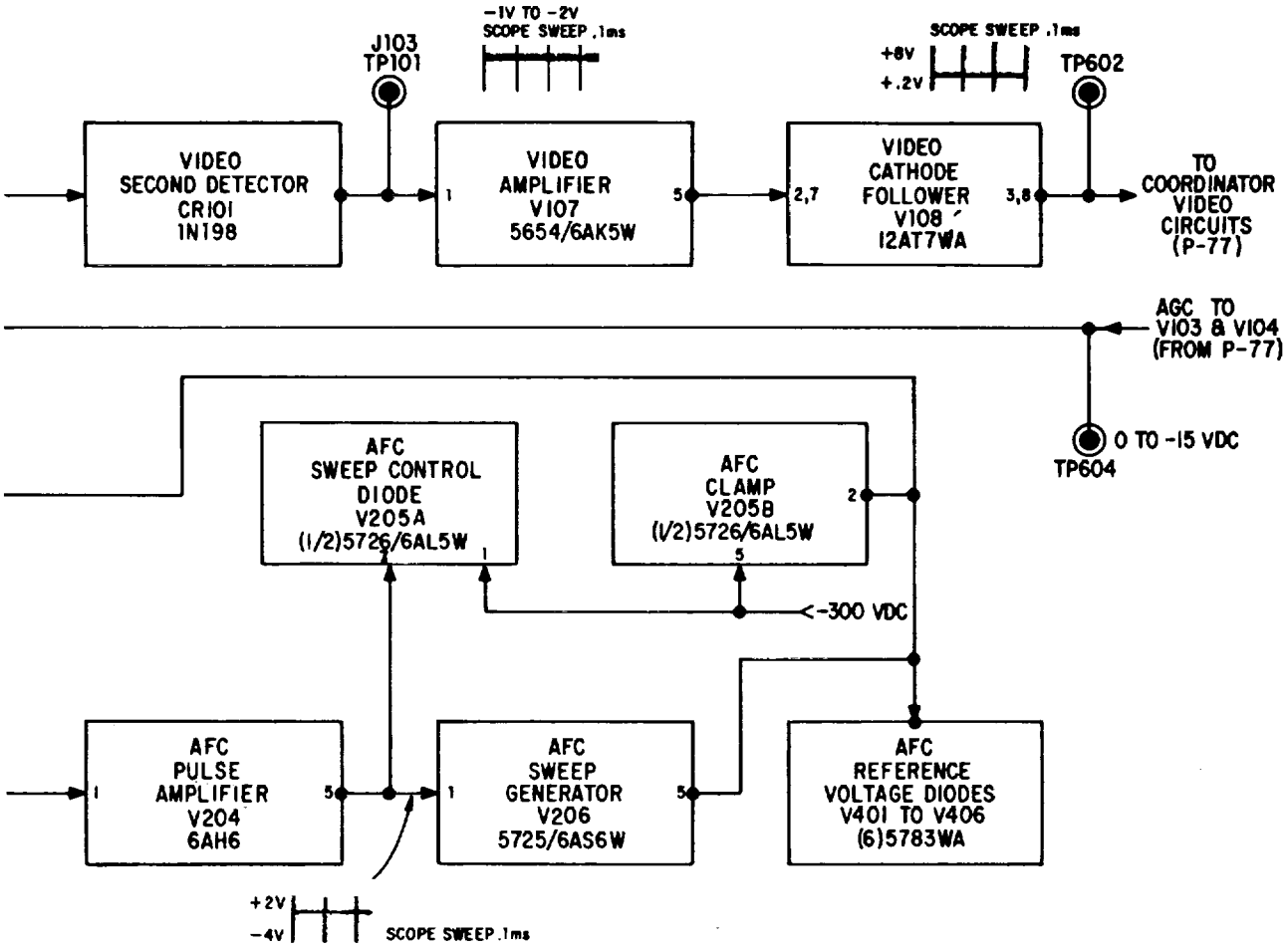
Feedhorn switching circuits.



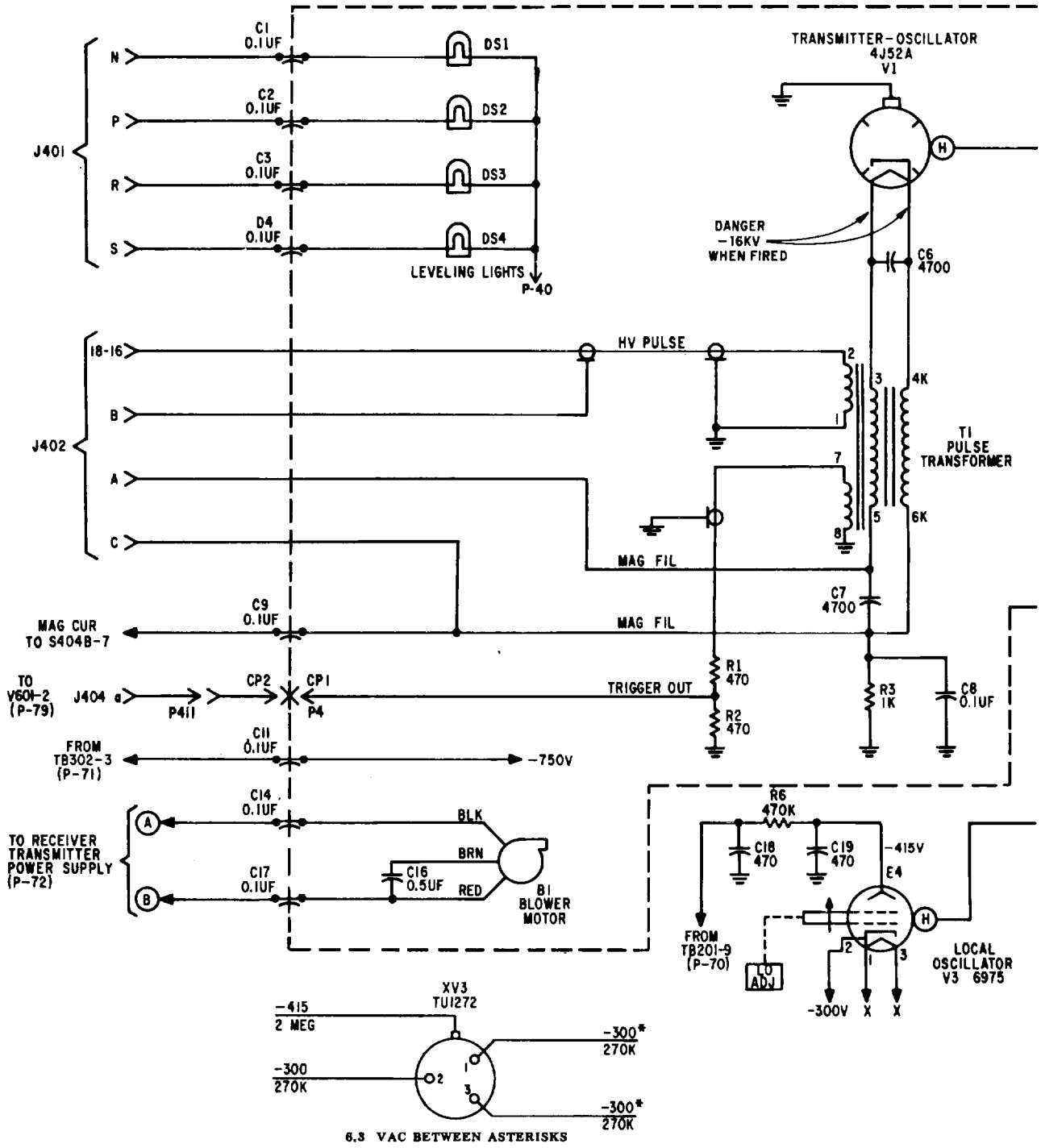
Feedhorn switching circuits--Continued.



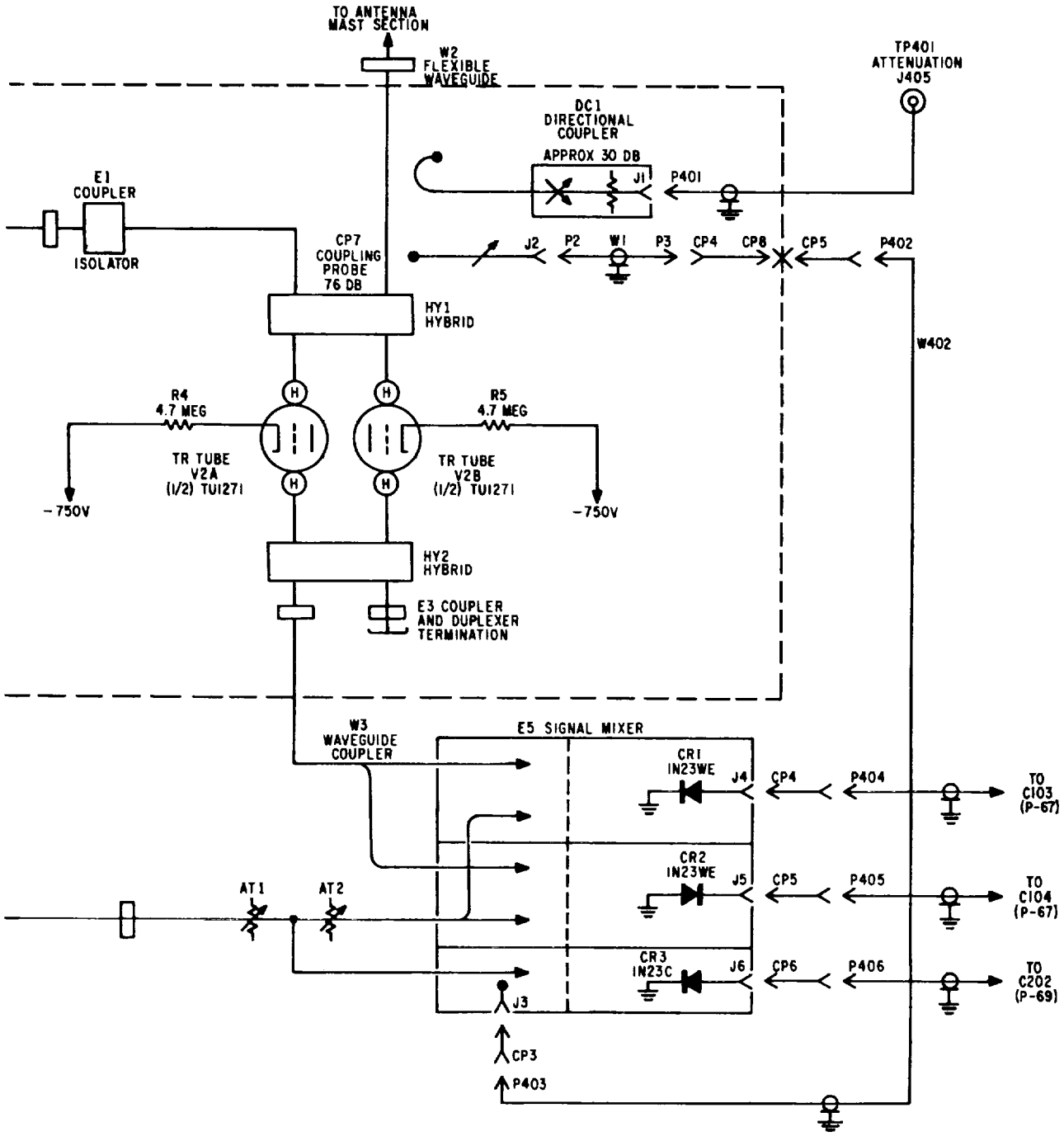
Receiver system block diagram.



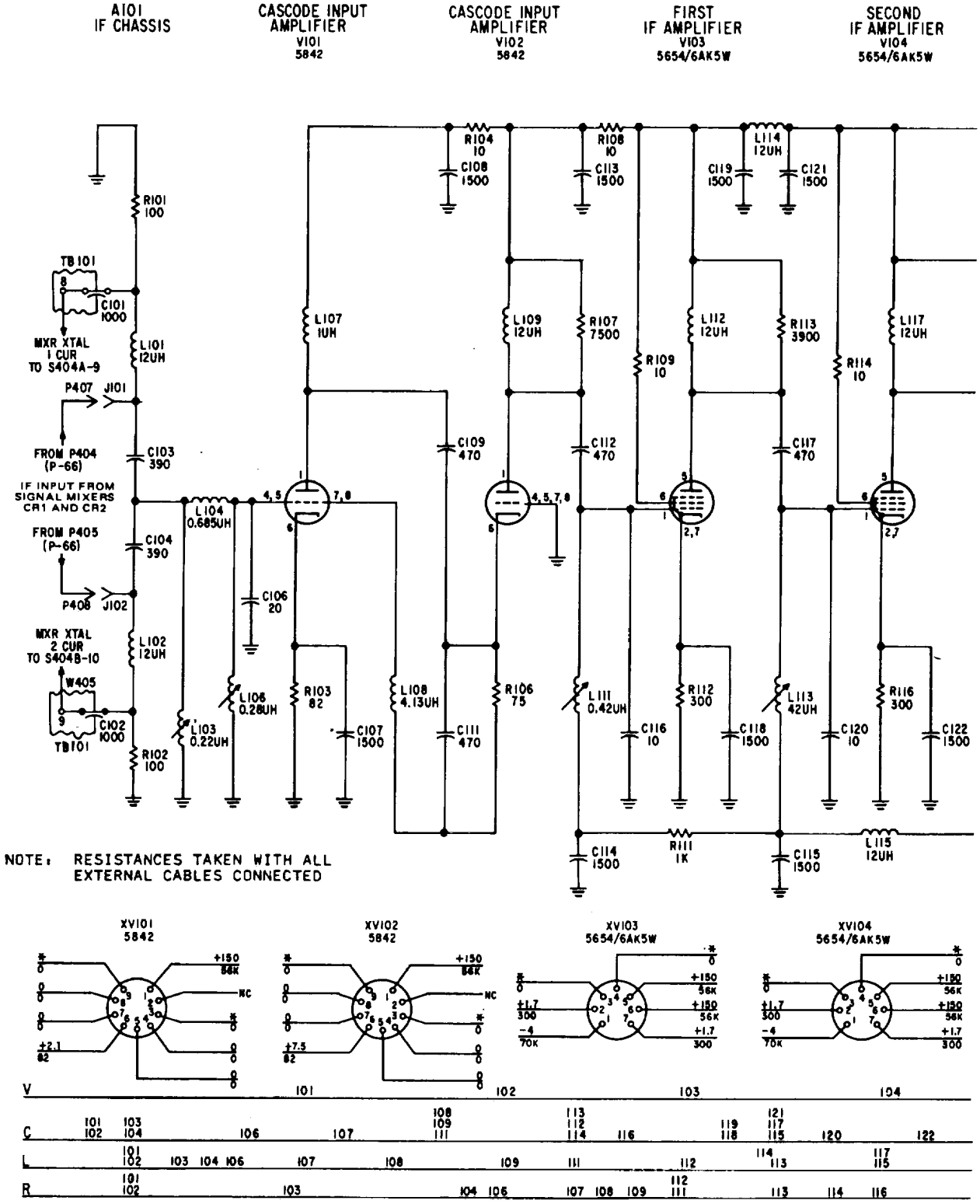
Receiver system block diagram--Continued.



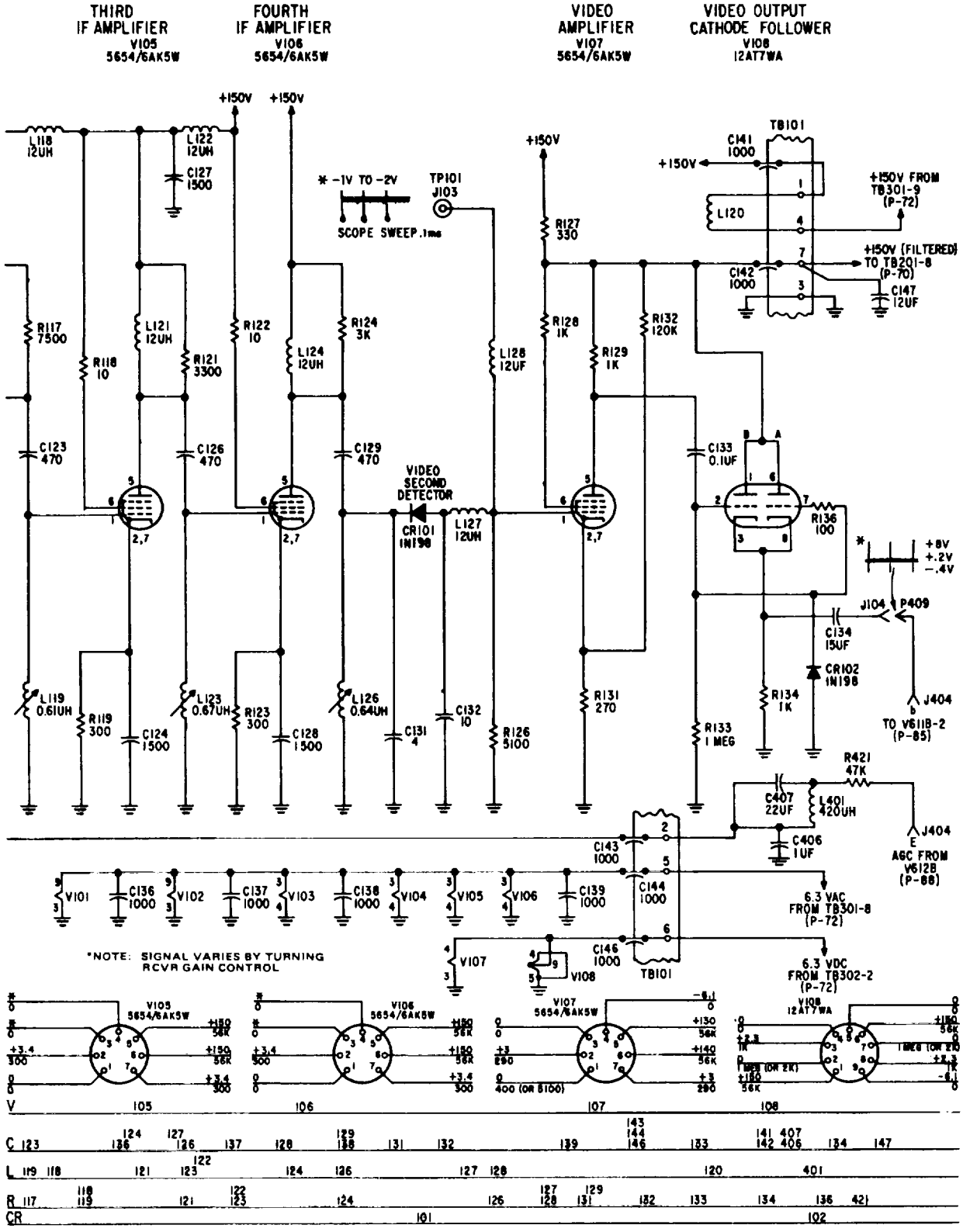
Transmitter, RF, and frequency converter circuits.



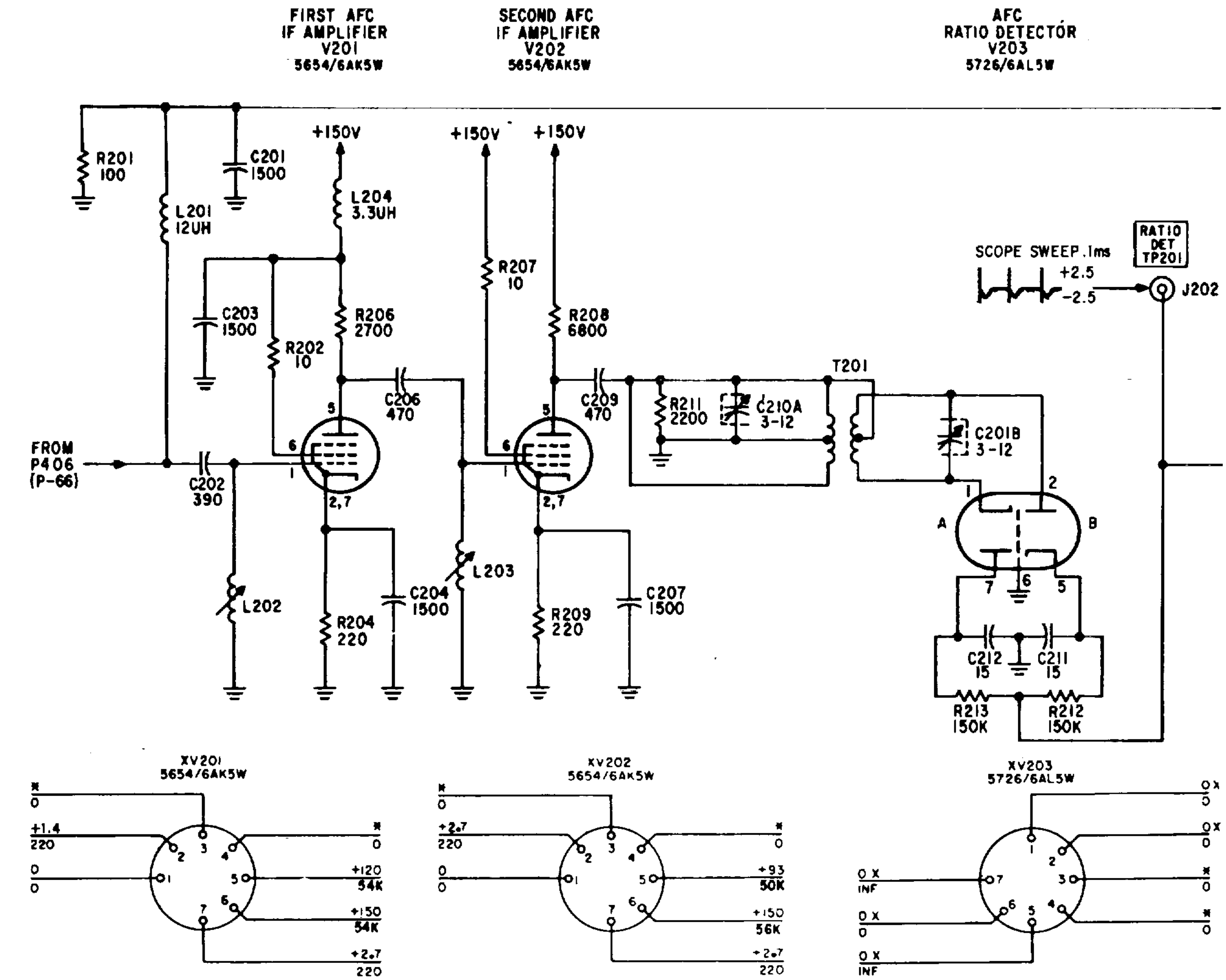
Transmitter, RF, and frequency converter circuits--Continued.



IF channel circuit diagram.

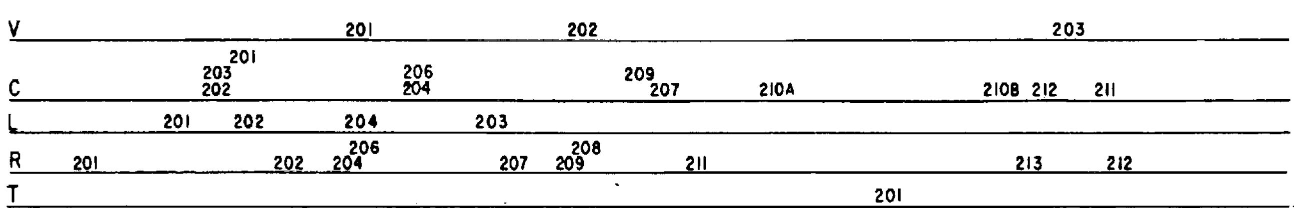


IF channel circuit diagram- -Continued.

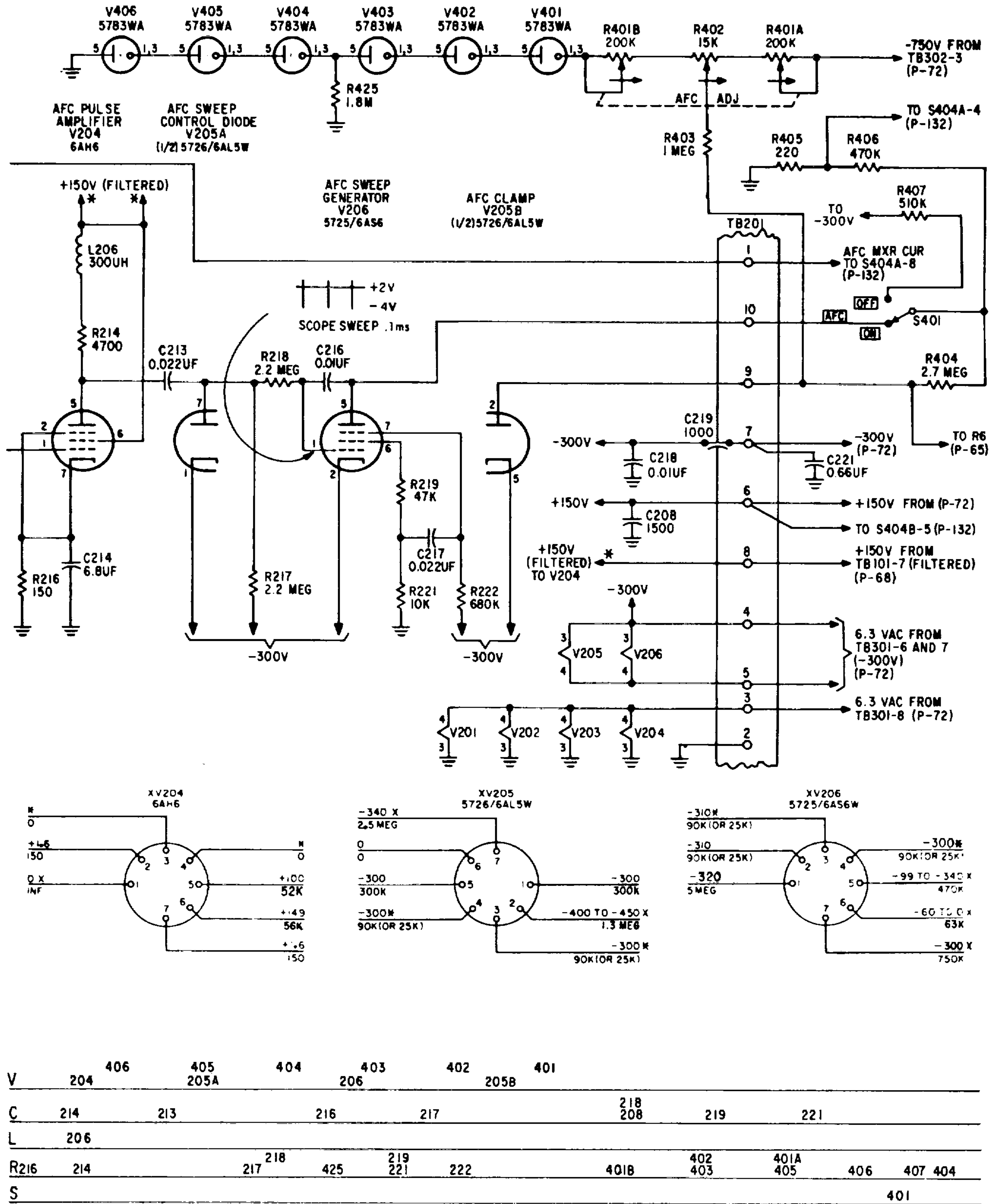


NOTES:

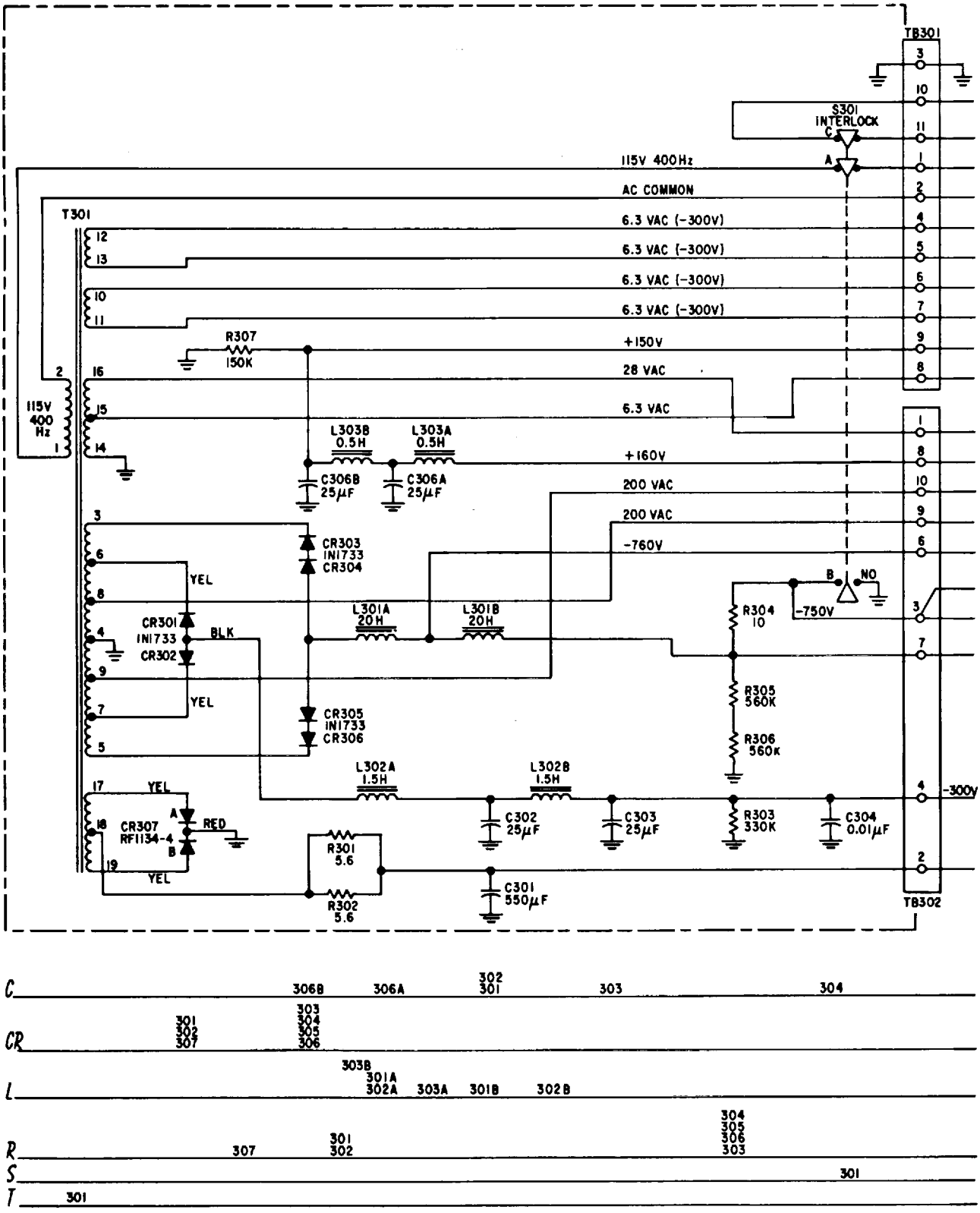
1. 115 VAC INPUT.
2. DC VOLTAGES AND RESISTANCES MEASURED TO GROUND WITH A 20,000 OHM–PER–VOLT METER UNLESS OTHER–WISE INDICATED.
3. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE, K DENOTES THOUSAND, MEG DENOTES MILLION, INF DENOTES INFINITY.
4. RESISTANCES READINGS TAKEN WITH ALL EXTERNAL CABLES CONNECTED.
5. X NEXT TO A VOLTAGE READING, INDICATES THAT THE VOLTAGE SHOULD BE MEASURE WITH A VACUUM TUBE VOLTMETER (VTVM–TS 505/U).
6. * INDICATES 6.3 VAC BETWEEN PINS SO MARKED.
7. TWO VOLTAGE READINGS INDICATE SWEEP VOLTAGE.
8. WHEN TWO RESISTANCES ARE LISTED TOGETHER FOR ONE PIN, THE VALUE IS DEPENDENT UPON OHMMETER POLARITY.
9. VOLTAGE READINGS TAKEN WITH NO SIGNAL INPUT.
10. AFC SWITCH IN ON POSITION.



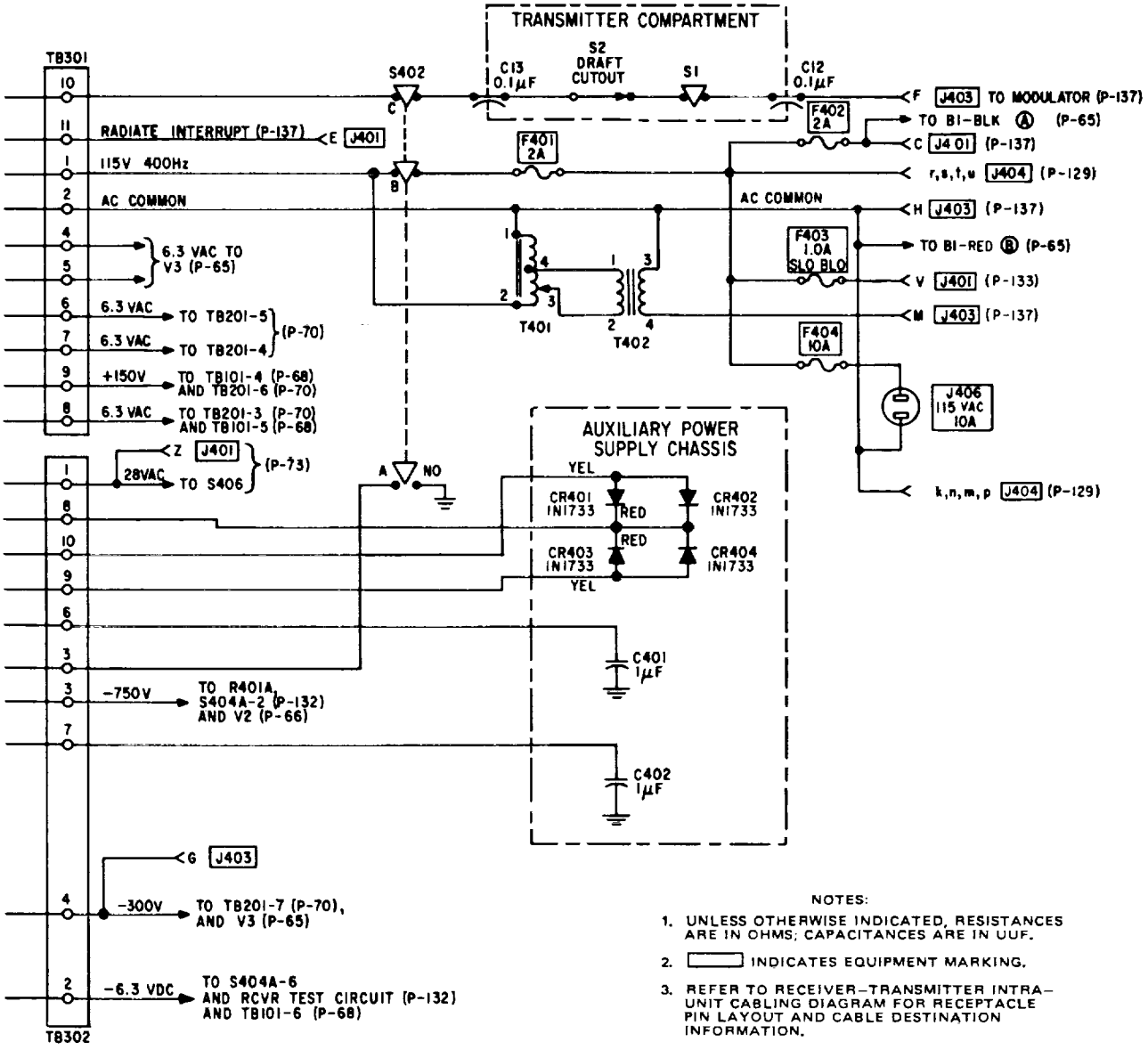
AFC channel circuit diagram.



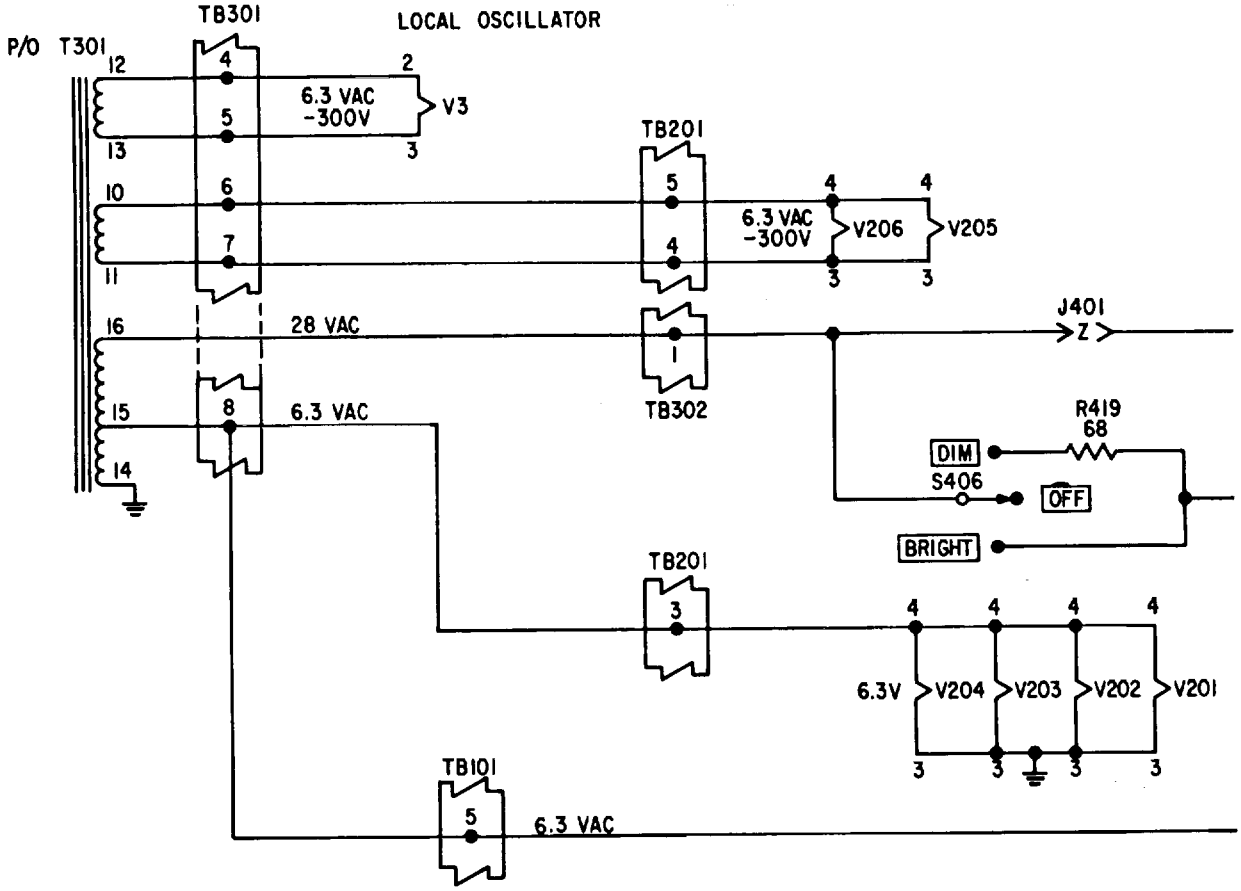
AFC channel circuit diagram--Continued.



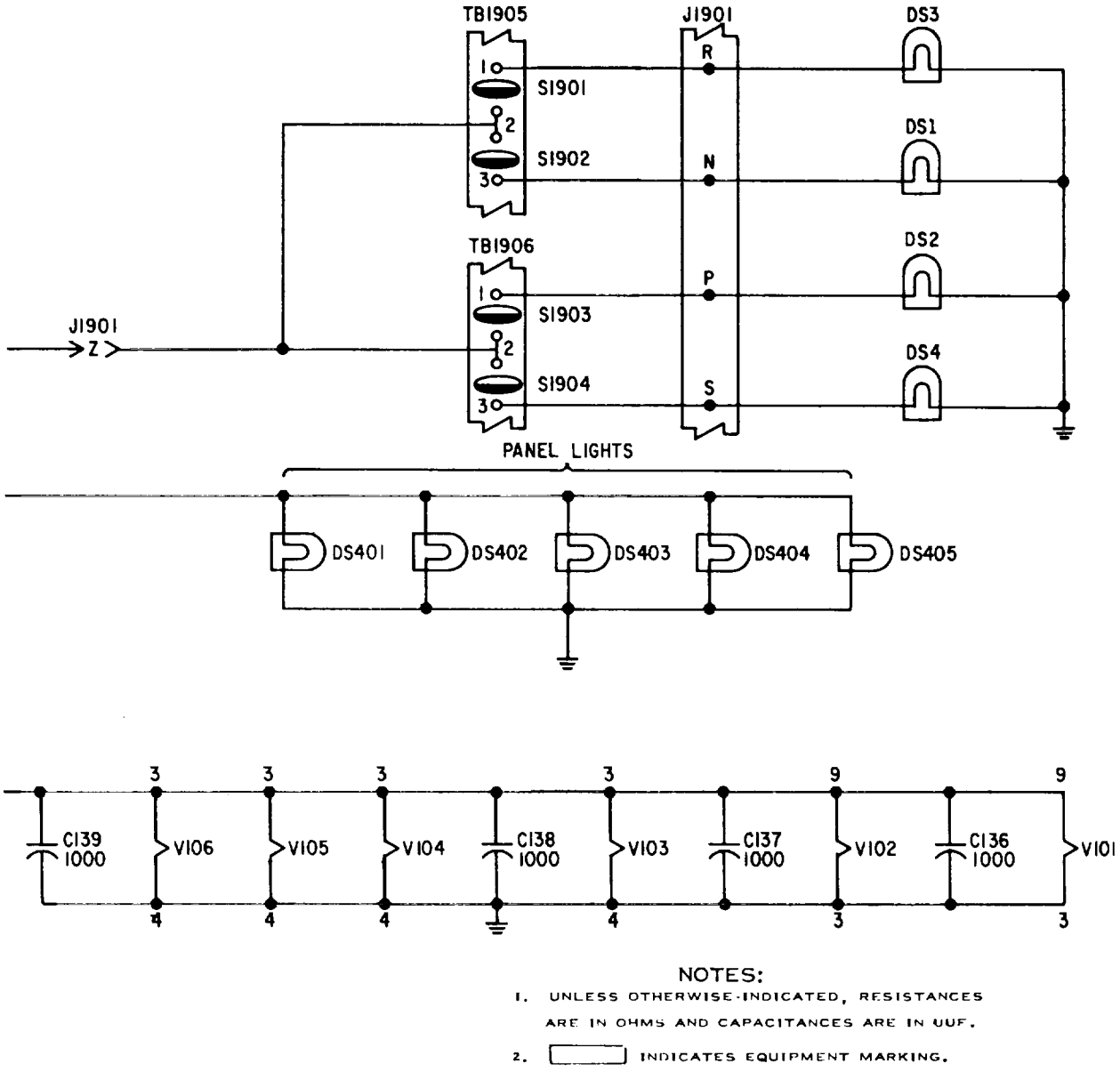
Receiver-transmitter power supply circuit diagram.



Receiver-transmitter power supply circuit diagram--Continued.



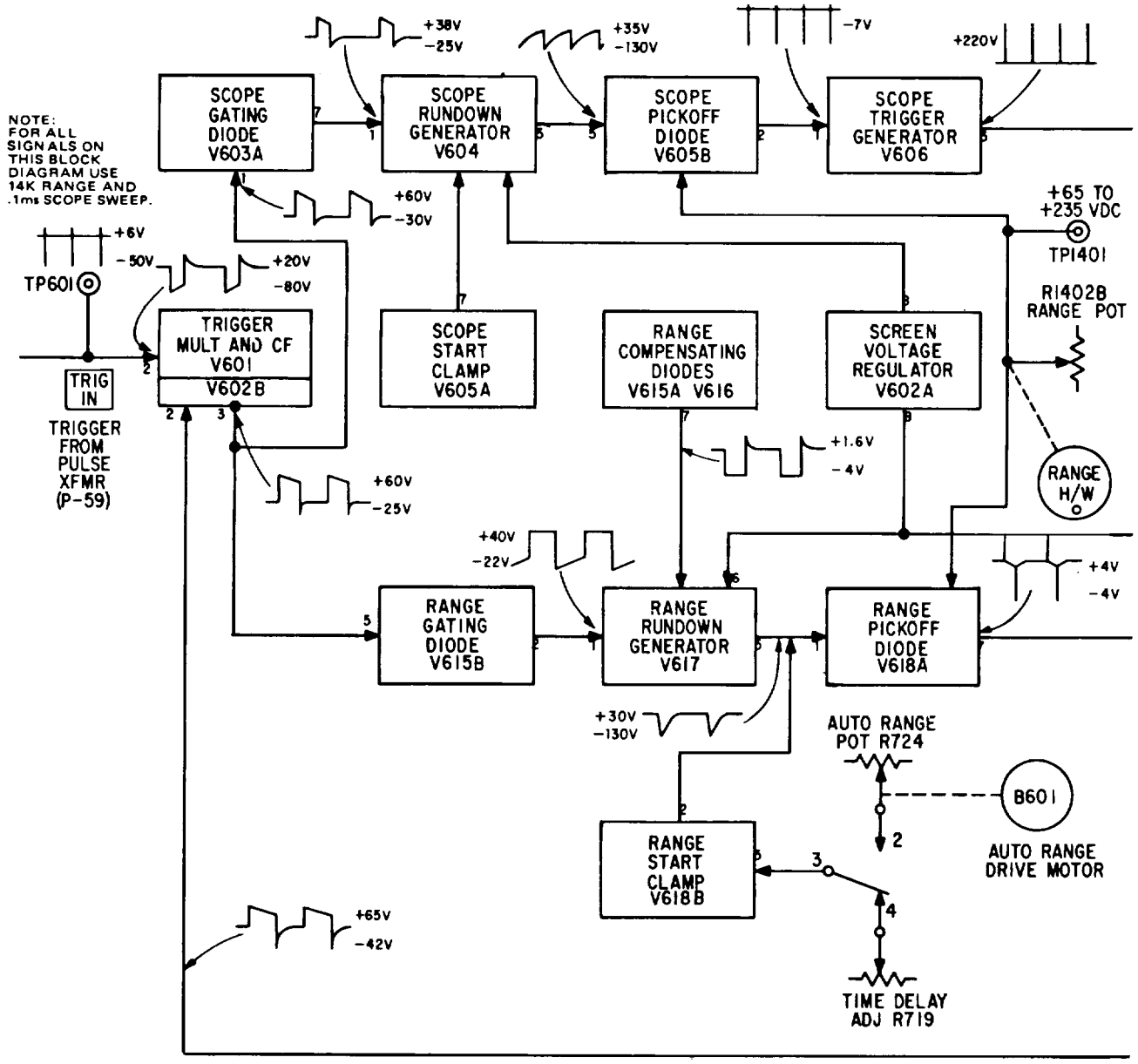
28-VAC distribution and receiver filaments.



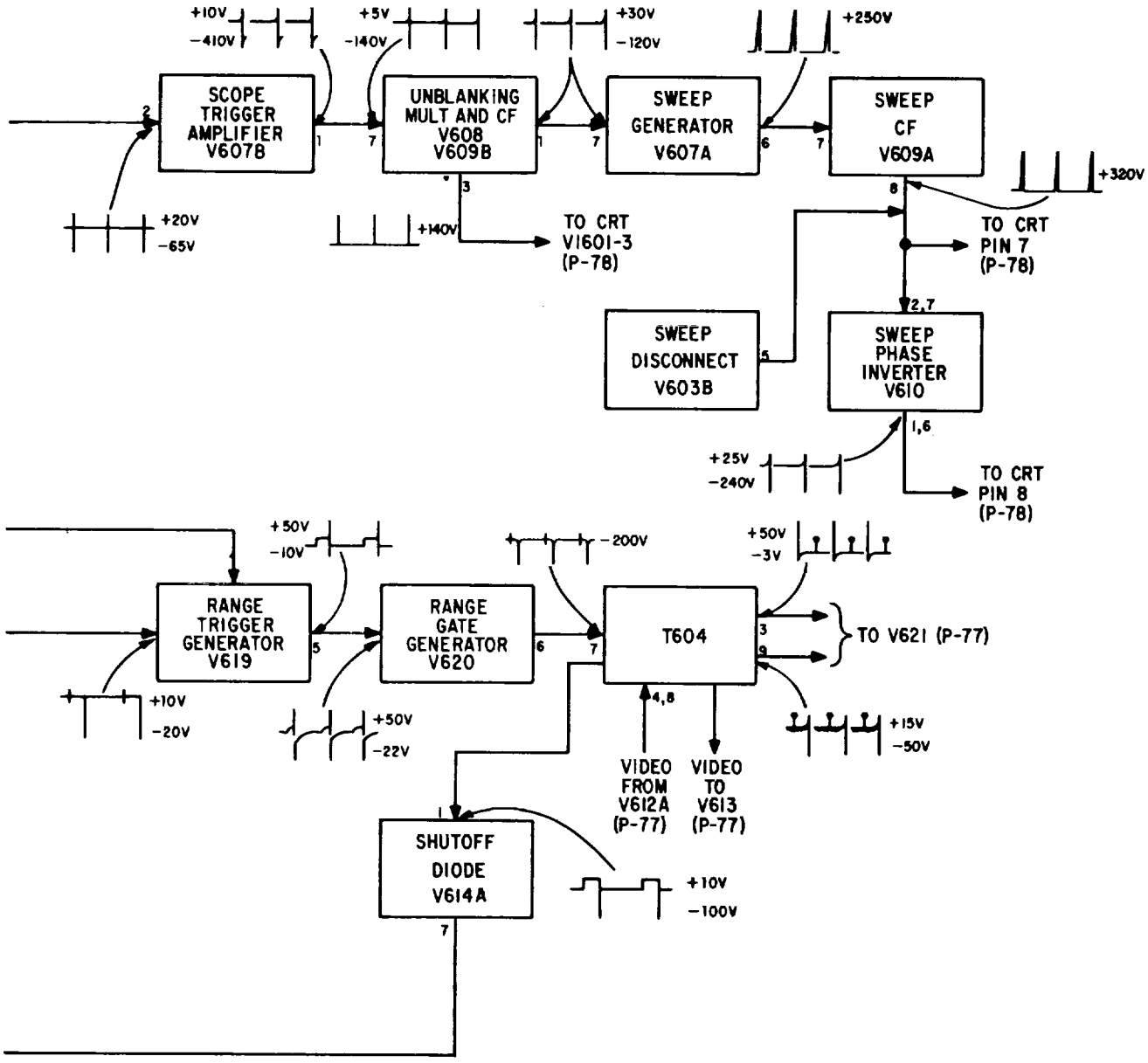
NOTES:

1. UNLESS OTHERWISE-INDICATED, RESISTANCES ARE IN OHMS AND CAPACITANCES ARE IN UUF.
2. [ ] INDICATES EQUIPMENT MARKING.

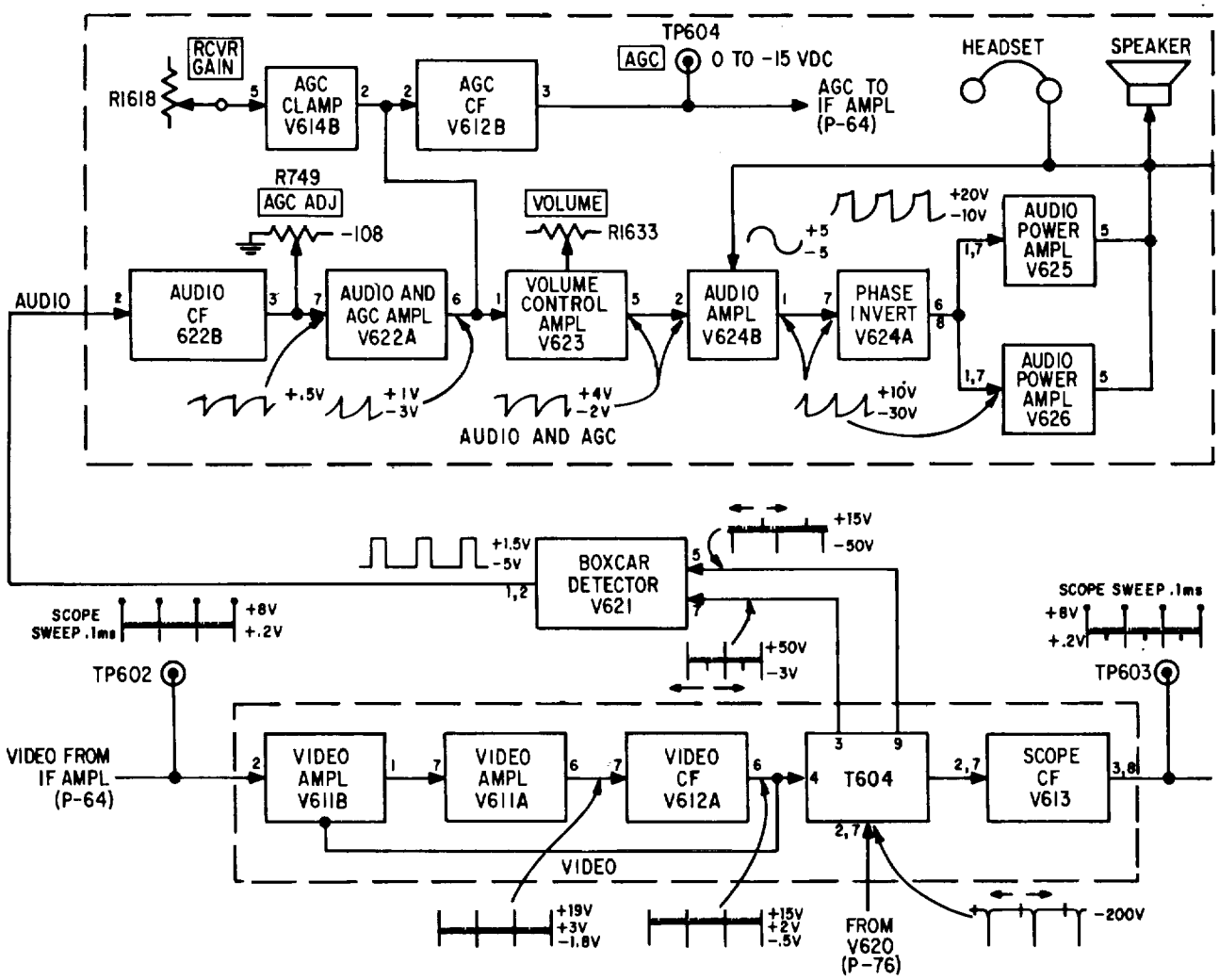
28-VAC distribution and receiver filaments--Continued.



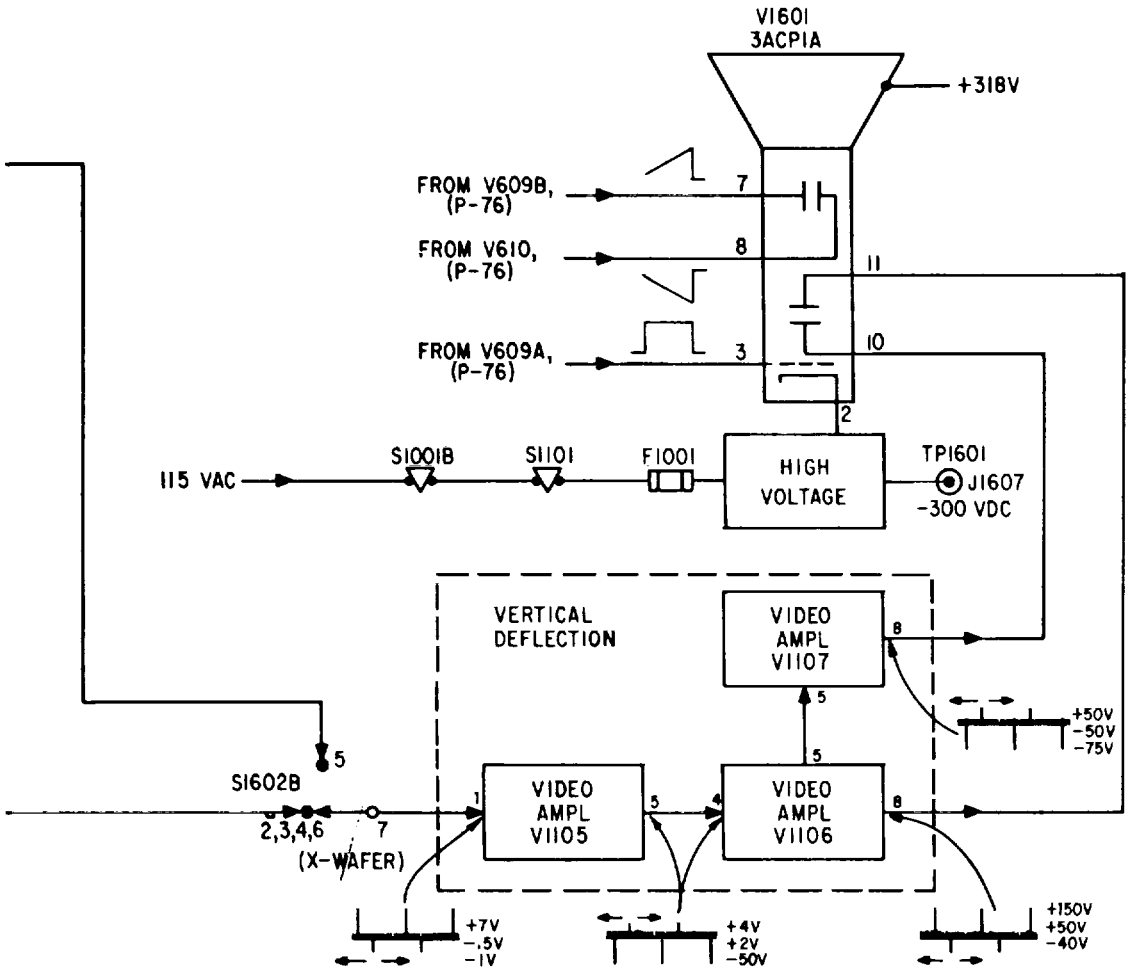
Range and scope timing block diagram.



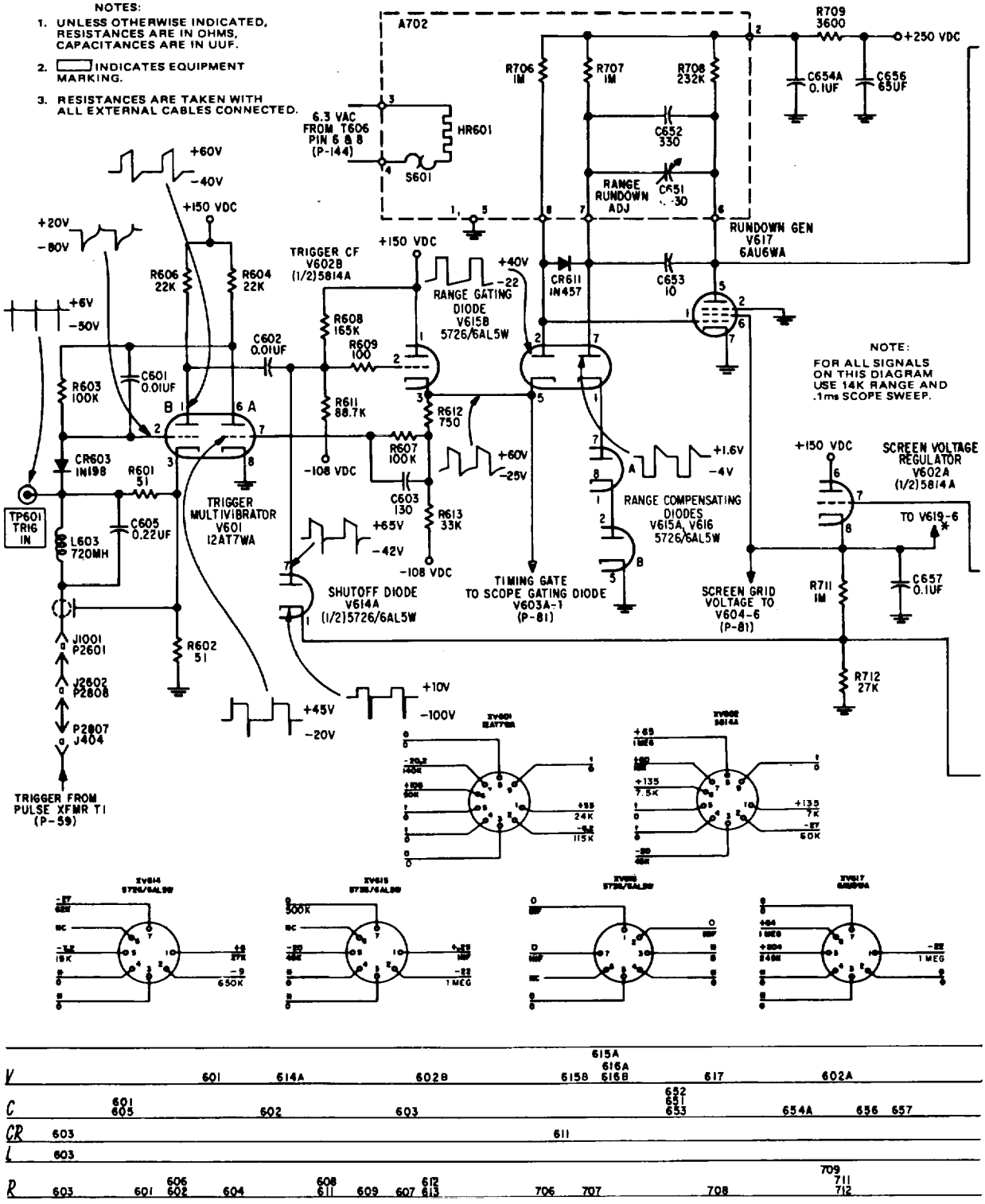
Range and scope timing block diagram--Continued.



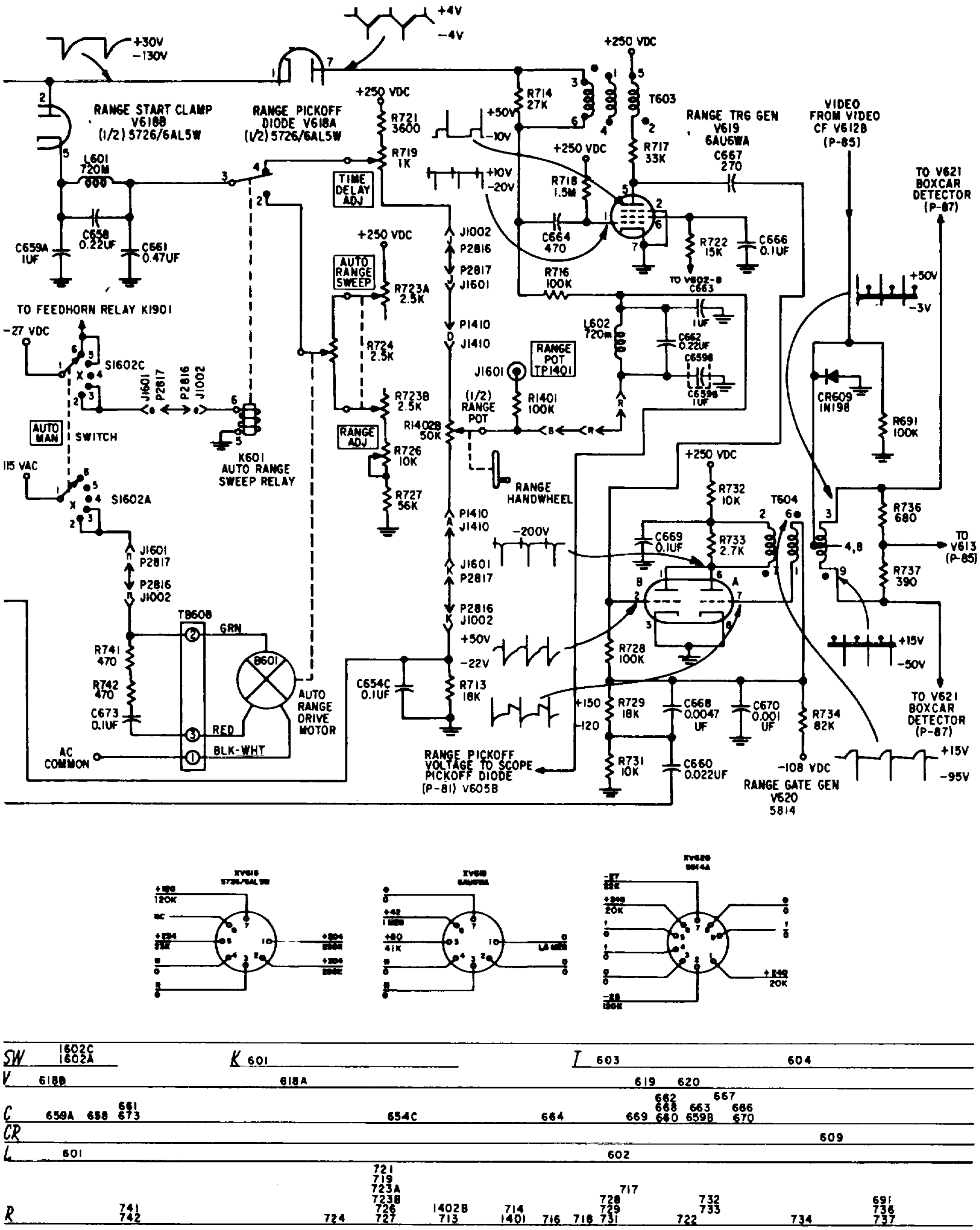
Video, audio, vertical deflection, and high-voltage block diagram.



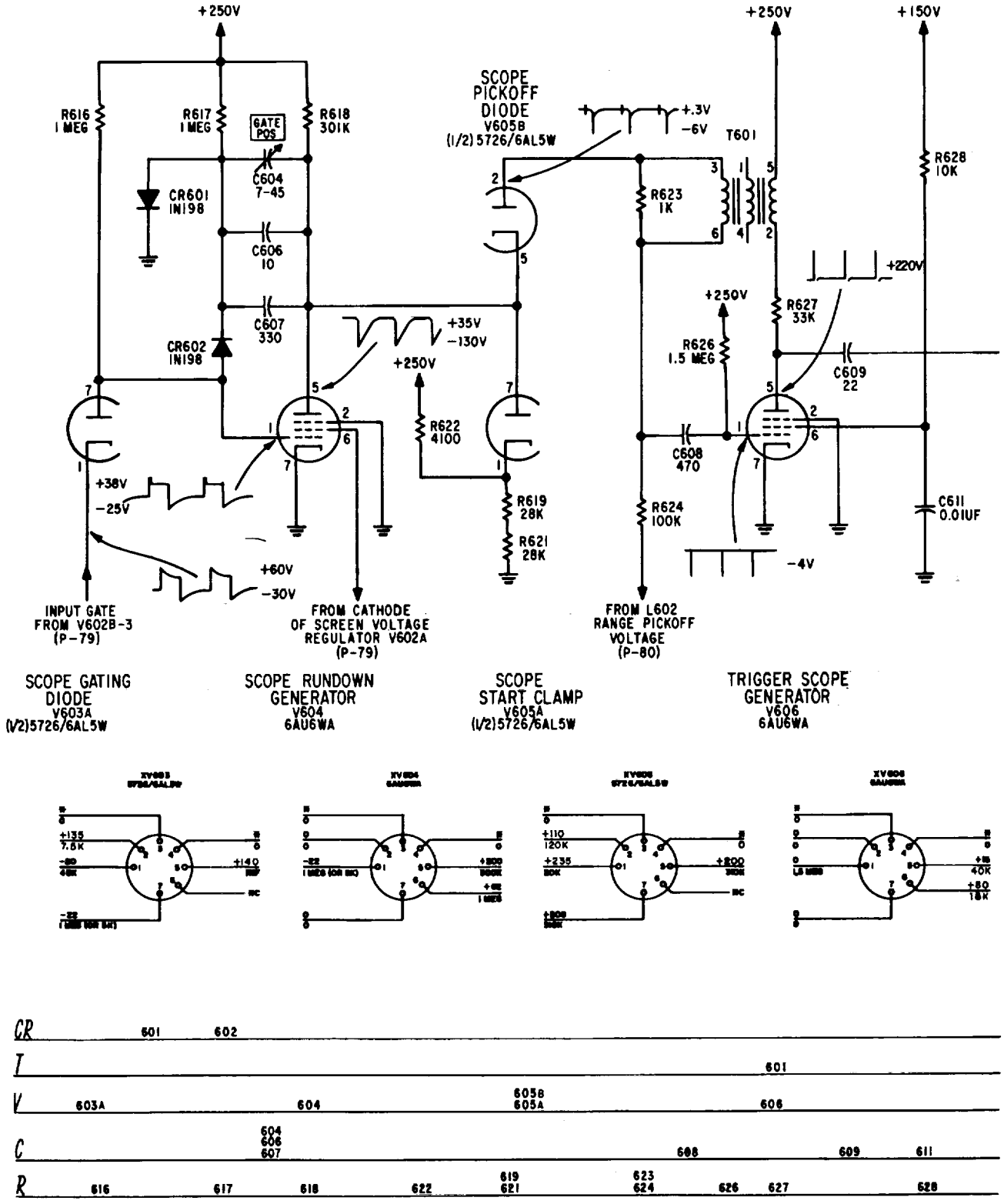
Video, audio, vertical deflection, and high-voltage block diagram—Continued.



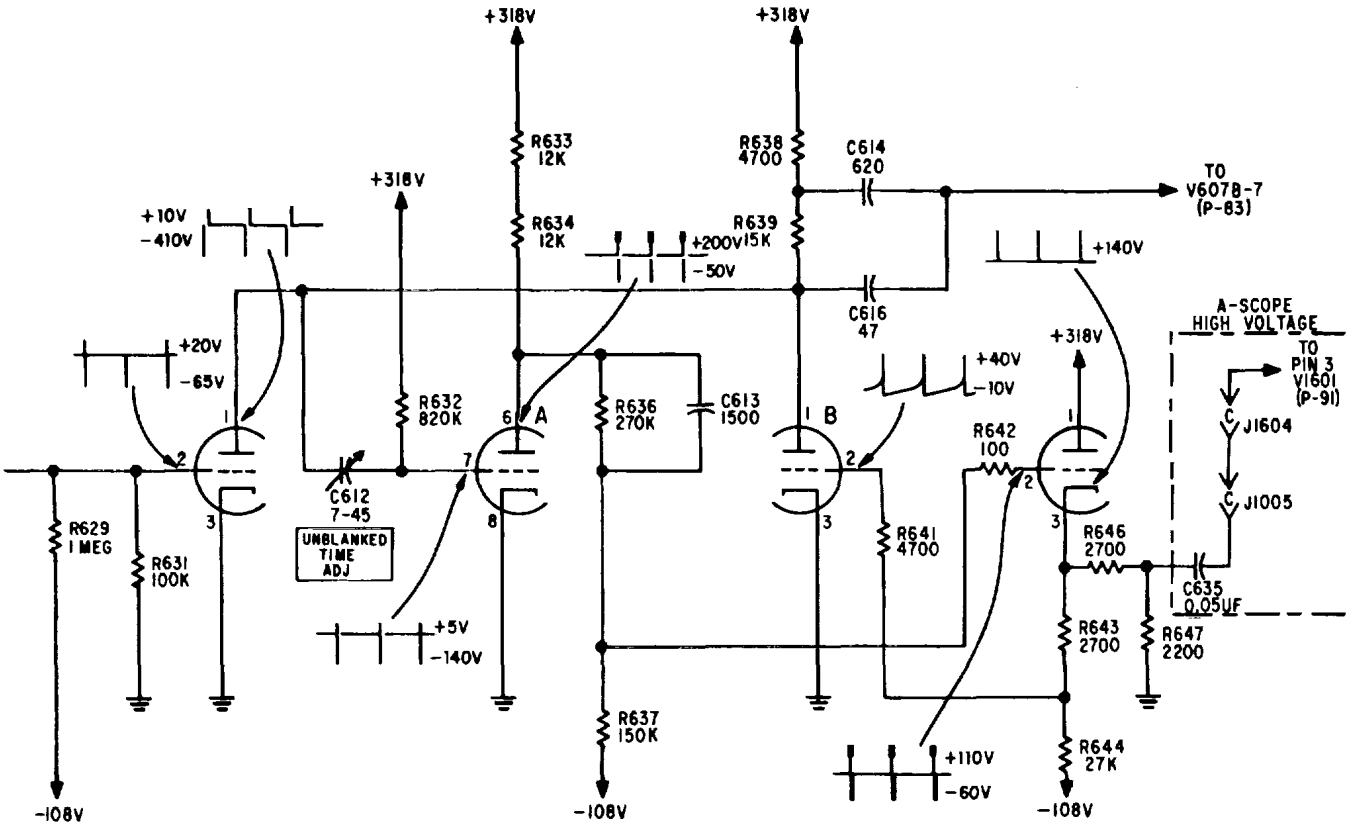
Range gate channel circuit diagram.



Range gate channel circuit diagram--Continued.



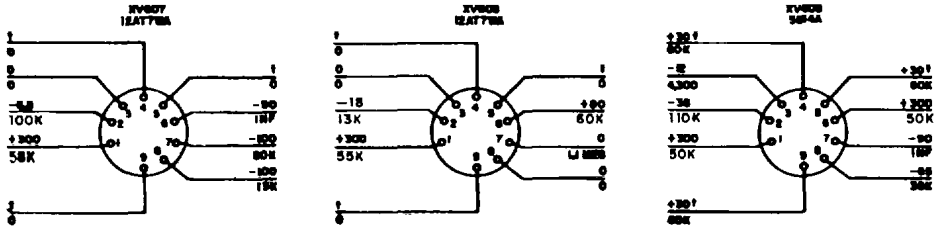
Scope timing channel circuit diagram.

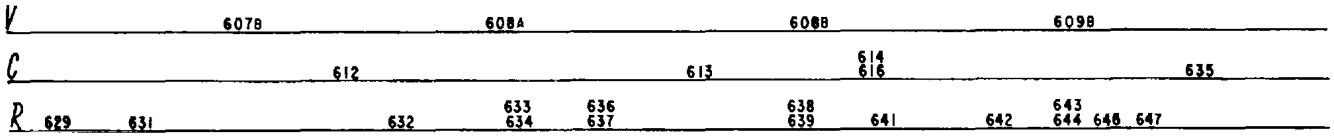


SCOPE TRIGGER AMPLIFIER
V607B
(1/2) 12AT7WA

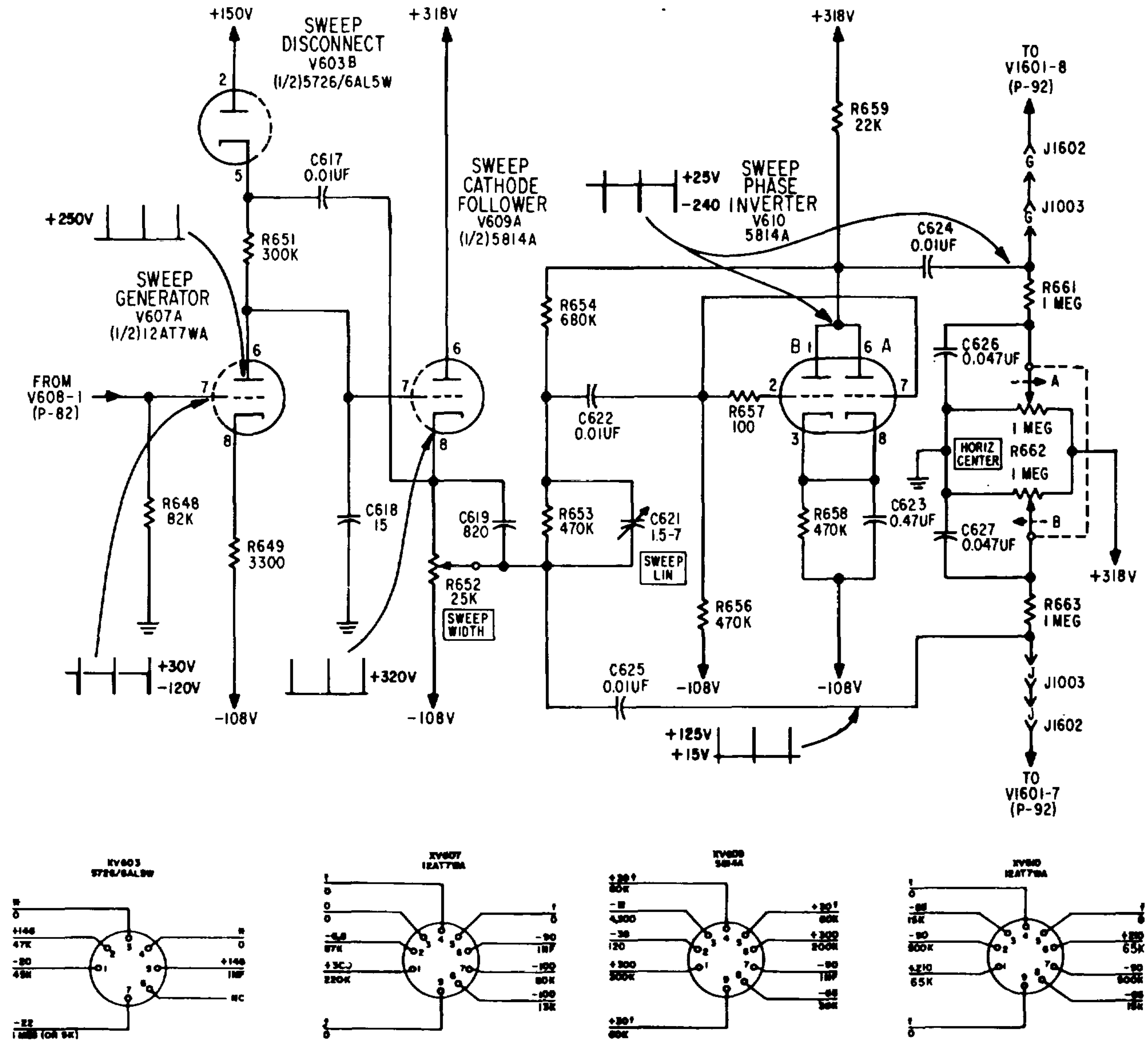
UNBLANKING MULTIVIBRATOR
V608
12AT7WA

UNBLANKING CATHODE FOLLOWER
V609B
(1/2) 5814A



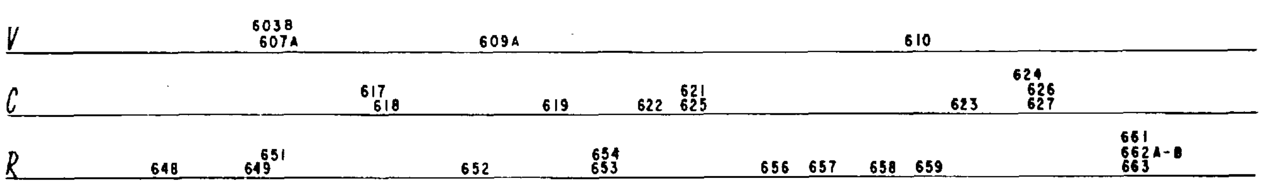


Scope timing channel circuit diagram--Continued.



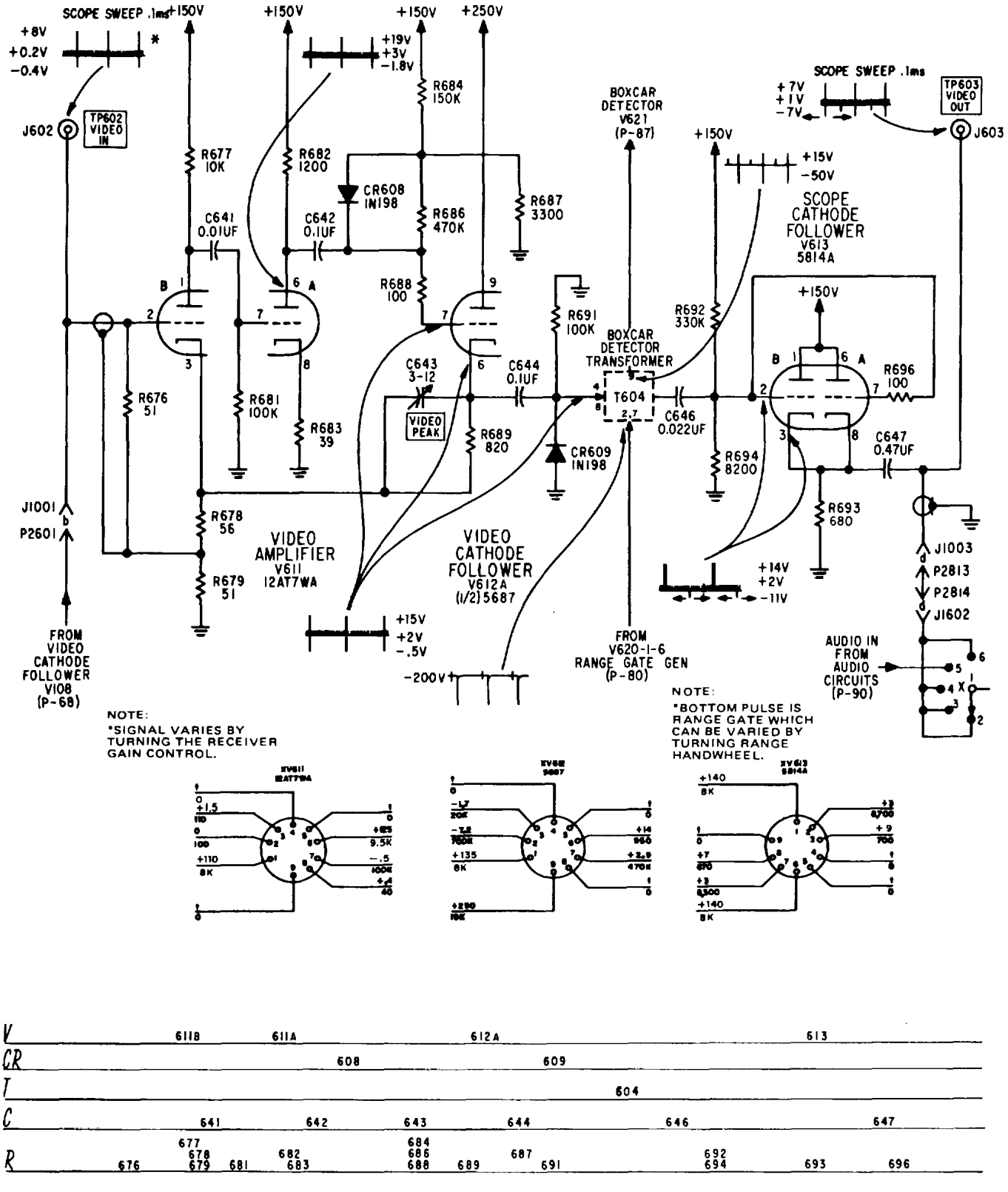
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS AND CAPACITANCES ARE IN $\mu\mu F$.
2. ☐ INDICATES EQUIPMENT MARKING.

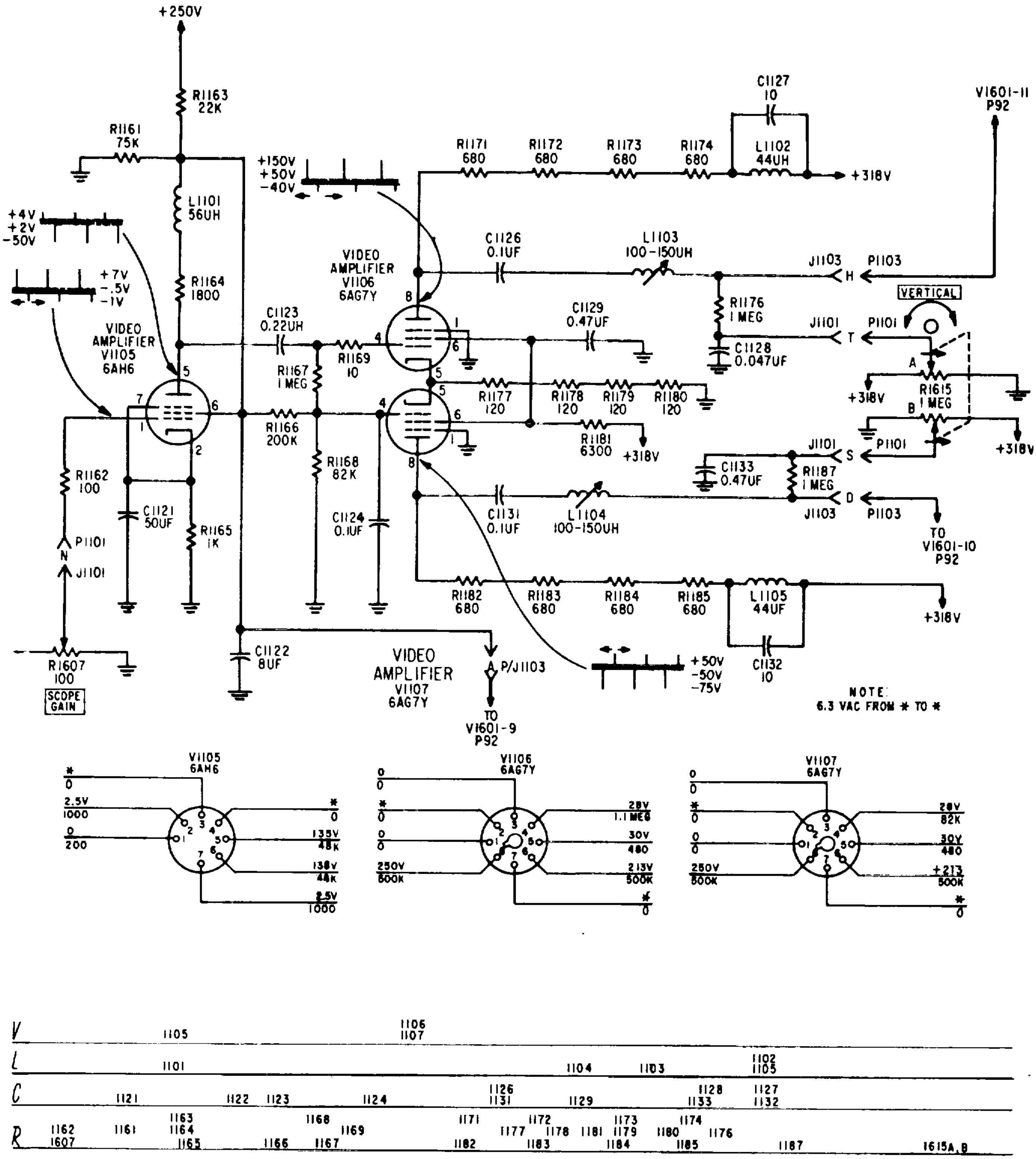


Scope sweep channel circuit diagram.

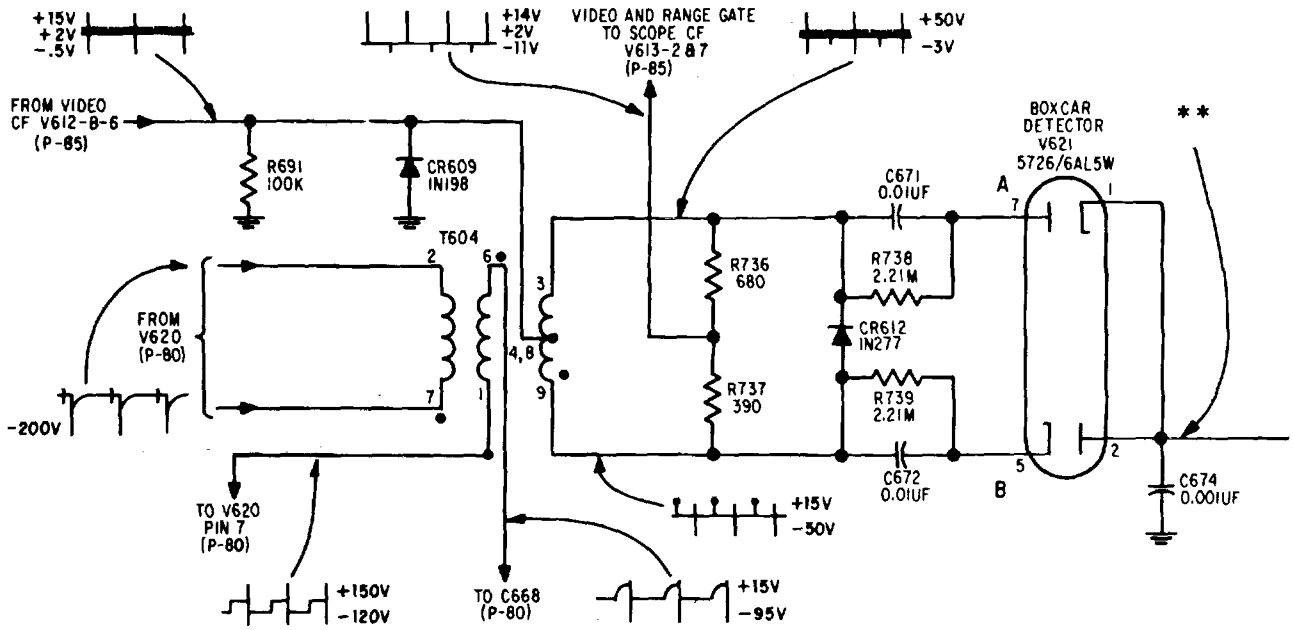
NOTES



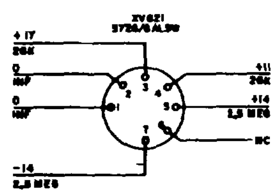
Video and vertical deflection channels circuit diagram.



<u>*Video and vertical deflection channels circuit diagram--Continued.*</u>



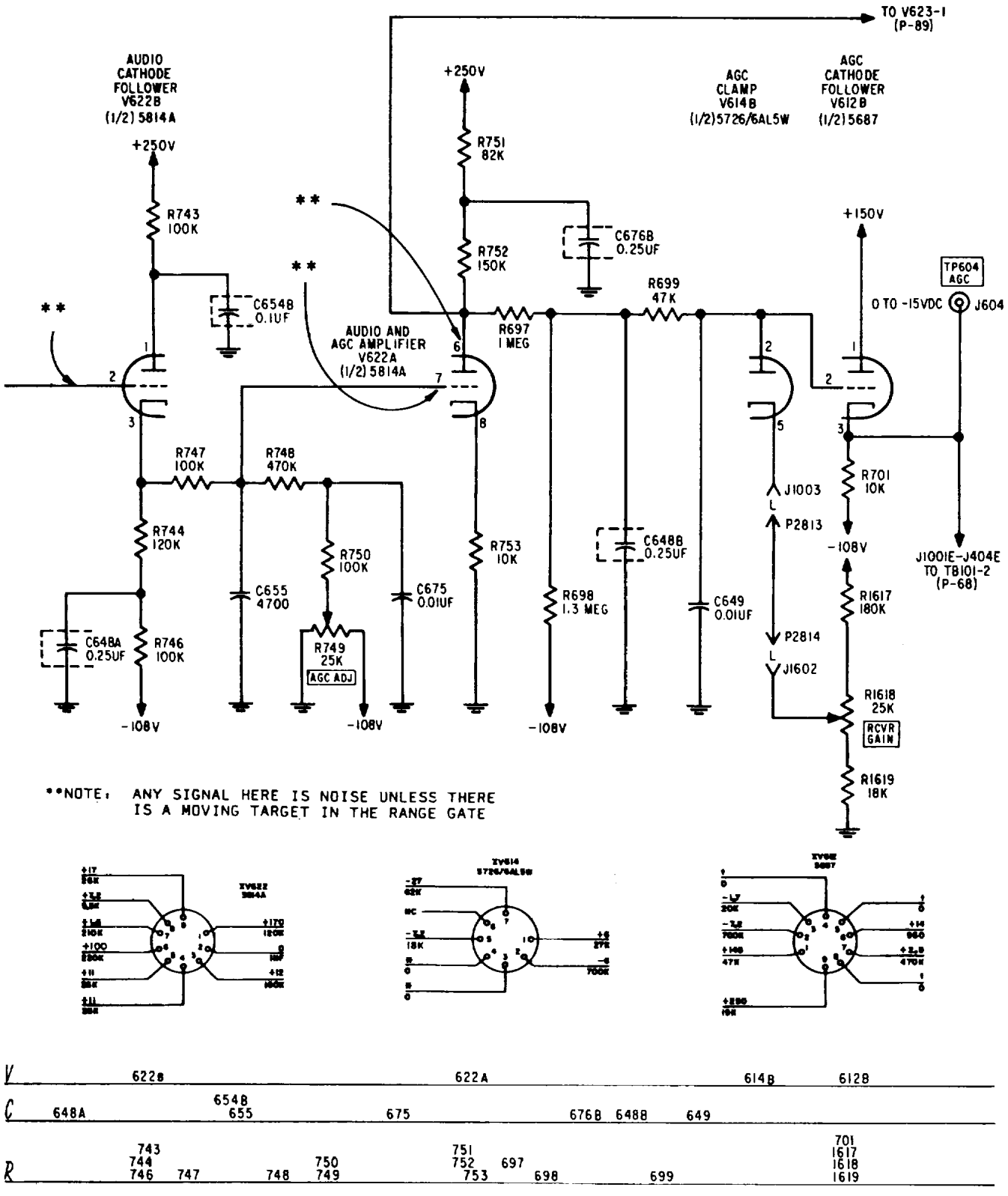
1. 115 VAC INPUT.
2. DC VOLTAGES AND RESISTANCES MEASURED TO GROUND WITH A 20,000 OHM-PER-VOLT METER, UNLESS OTHERWISE INDICATED.
3. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE, K DENOTES THOUSAND, MEG DENOTES MILLION, INF DENOTES INFINITY.
4. RESISTANCE READINGS TAKEN WITH ALL EXTERNAL CABLES CONNECTED.
5. WHEN TWO RESISTANCES ARE LISTED TOGETHER FOR ONE PIN, THE VALUE DEPENDS UPON OHMMETER POLARITY.
6. NC INDICATES NO CONNECTION.
7. • INDICATES 6.3 VAC BETWEEN PINS SO MARKED.
8. † INDICATES 6.3 VAC BETWEEN PINS 8 OR 9, AND PINS 4 OR 5.
9. VOLTAGE READINGS TAKEN WITH VOLUME CONTROL AT MIDRANGE.
10. RCVR GAIN CONTROL TURNED FOR MAXIMUM VIDEO PRESENTATION ON "A" SCOPE.
11. AUTO MAN SWITCH IN MAN SEARCH (POS 3).
12. RANGE CONUNTER READS 14,000 METERS ± 50 METERS.
13. RADIATE SWITCH ON.
*14. SIGNAL VARIES IN AMPLITUDE BY TURNING THE RECEIVER GAIN CONTROL.



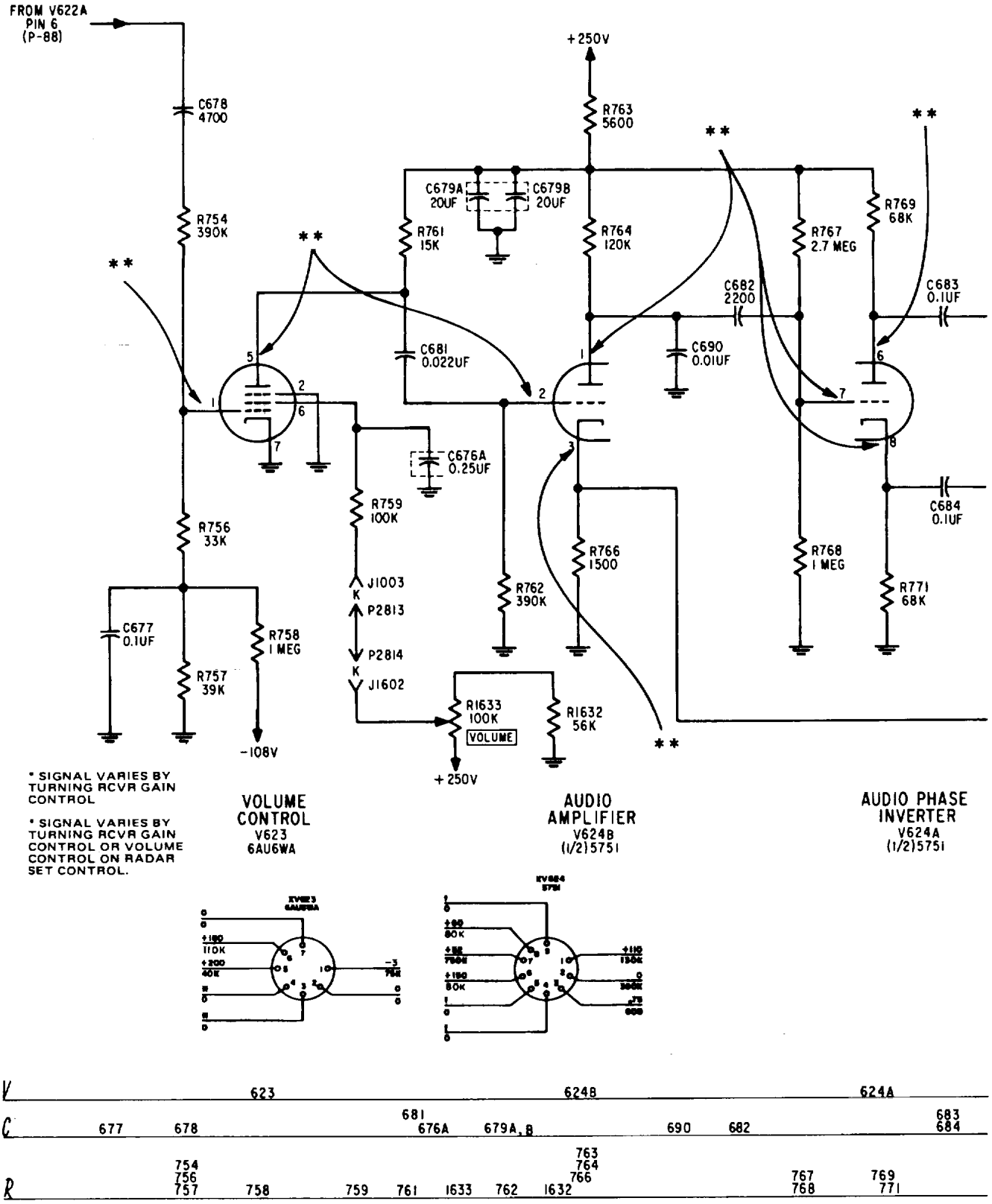
**NOTE: ANY SIGNAL HERE IS NOISE UNLESS THERE IS A MOVING TARGET IN THE RANGE GATE

CR		609		612	
T		604			
V					621
C				671 672	674
R	691		736 737	738 739	

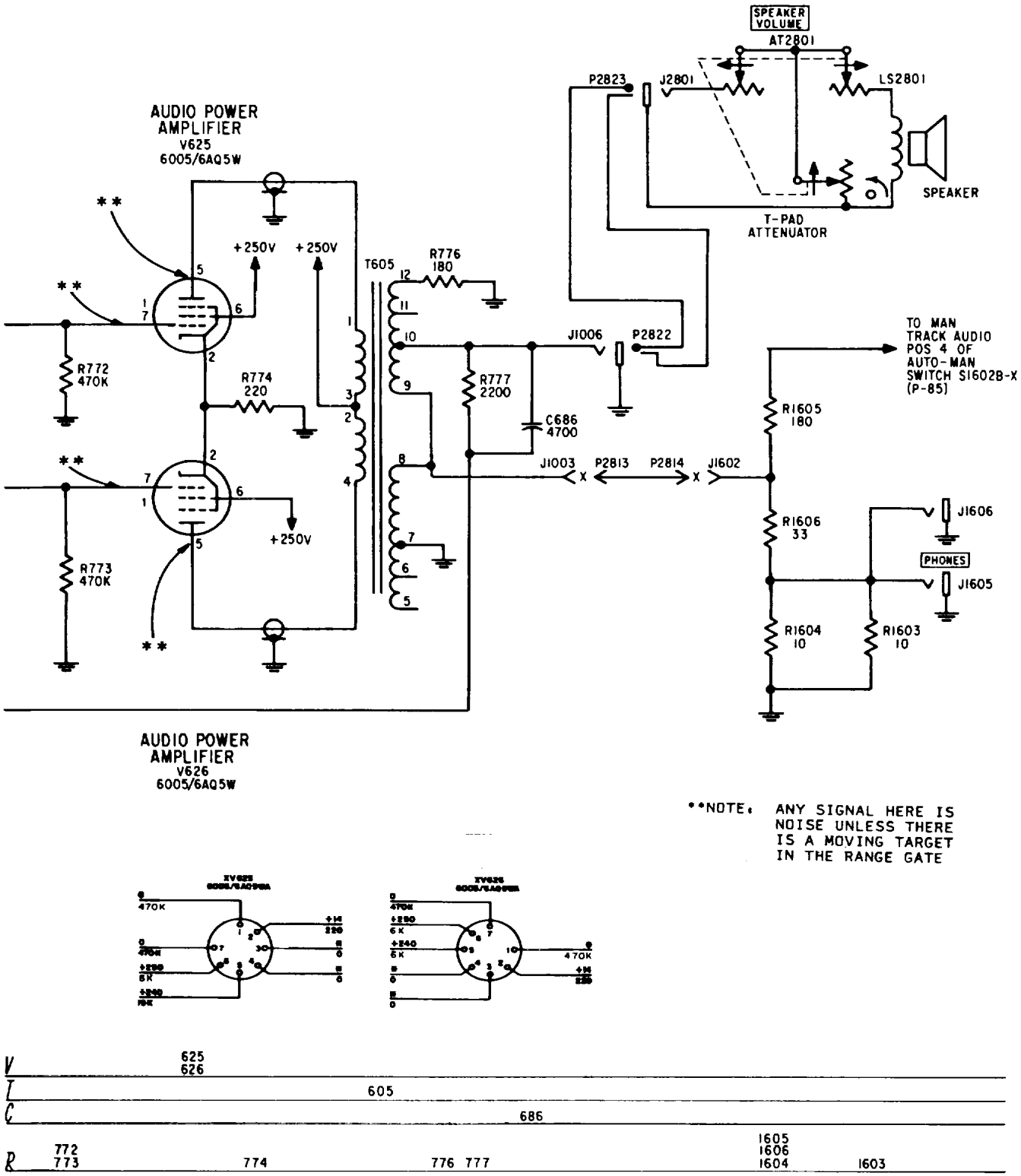
Audio and AGC channel I circuit diagram.



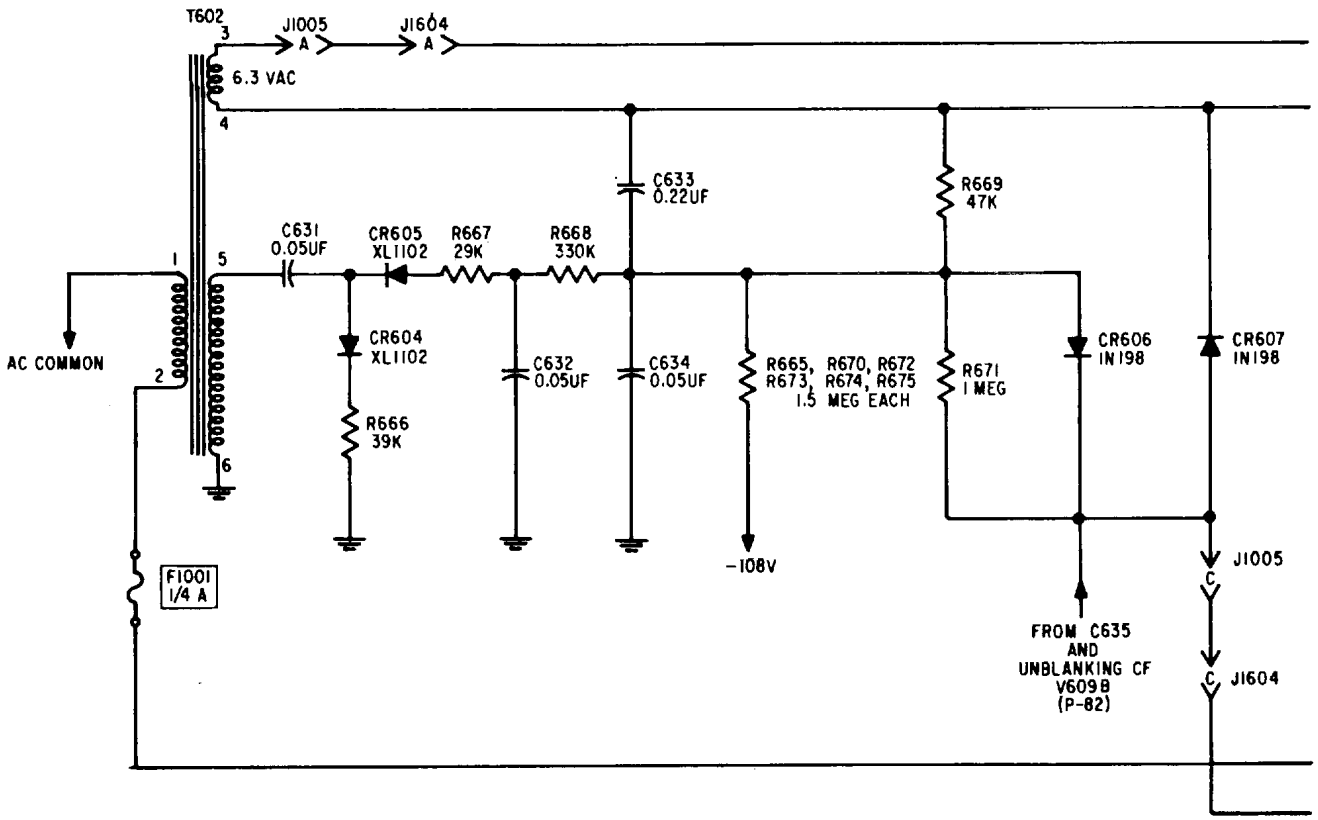
Audio and AGC channel I circuit diagram--Continued.



Audio and AGC channel II circuit diagram.

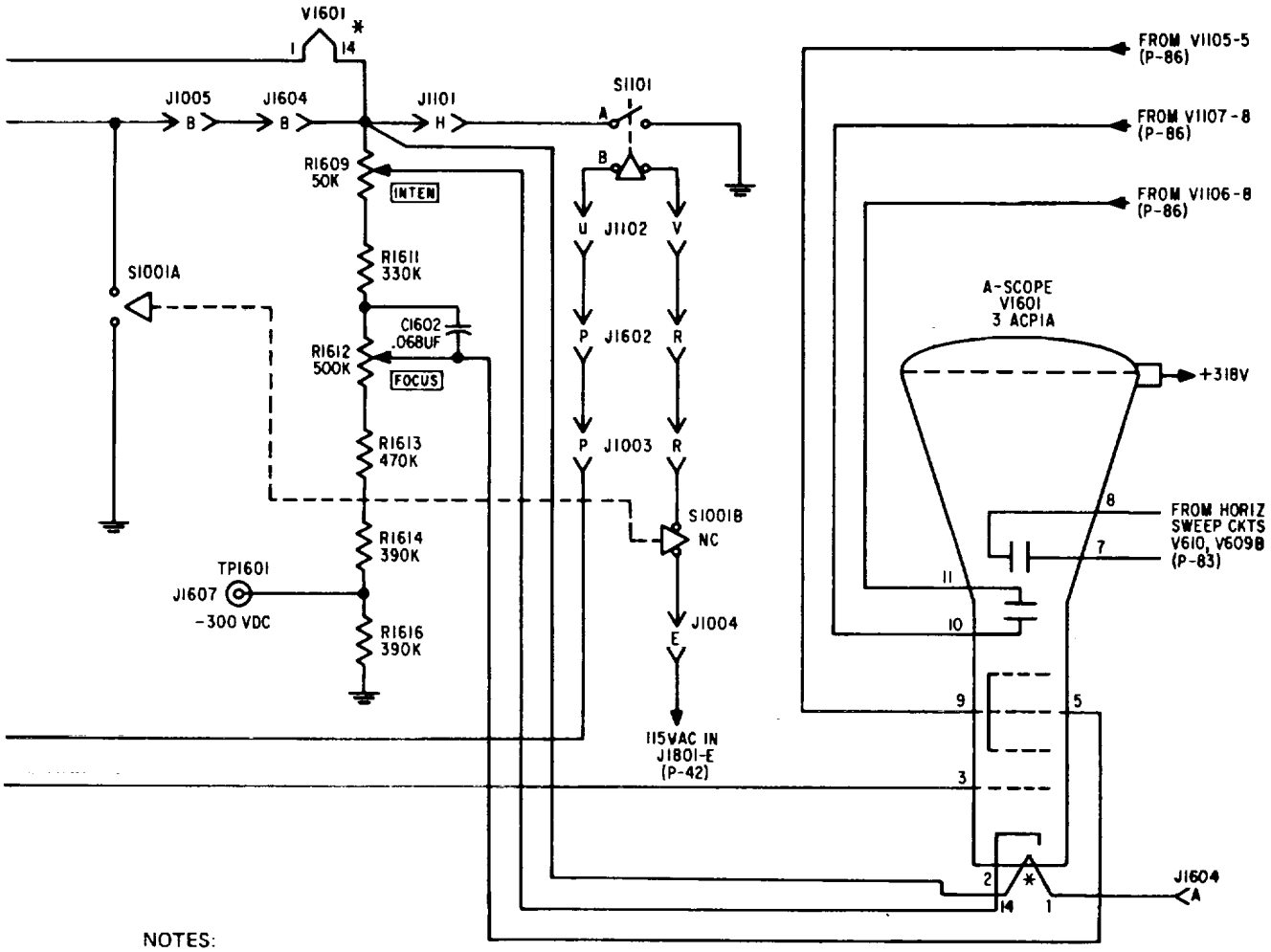


Audio and AGC channel II circuit diagram--Continued.



F 1001
T 602
CR 604 605 606 607
C 631 632 633 634
R 666 667 668 665 670 672 673 674 675 669 671

Indicator high-voltage channel circuit diagram.



NOTES:

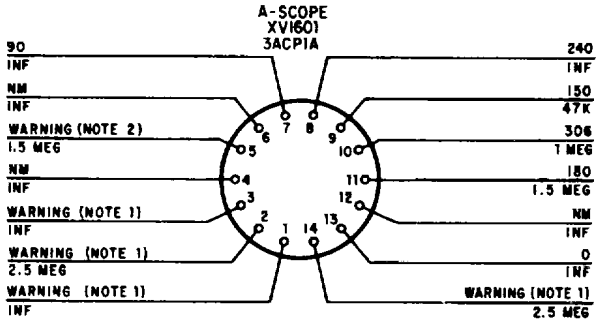
*1. HIGH VOLTAGE–1,650 DC

*2. HIGH VOLTAGE–1,200 DC

3. 115 VAC INPUT

4. DC VOLTAGES AND RESISTANCES MEASURED TO GROUND WITH A 20,000 OHMS–PER–VOLT METER UNLESS OTHERWISE INDICATED

5. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE, K DENOTES THOUSAND, MEG DENOTES MILLION, INF DENOTES INFINITY, NM INDICATES NOT MEASURED

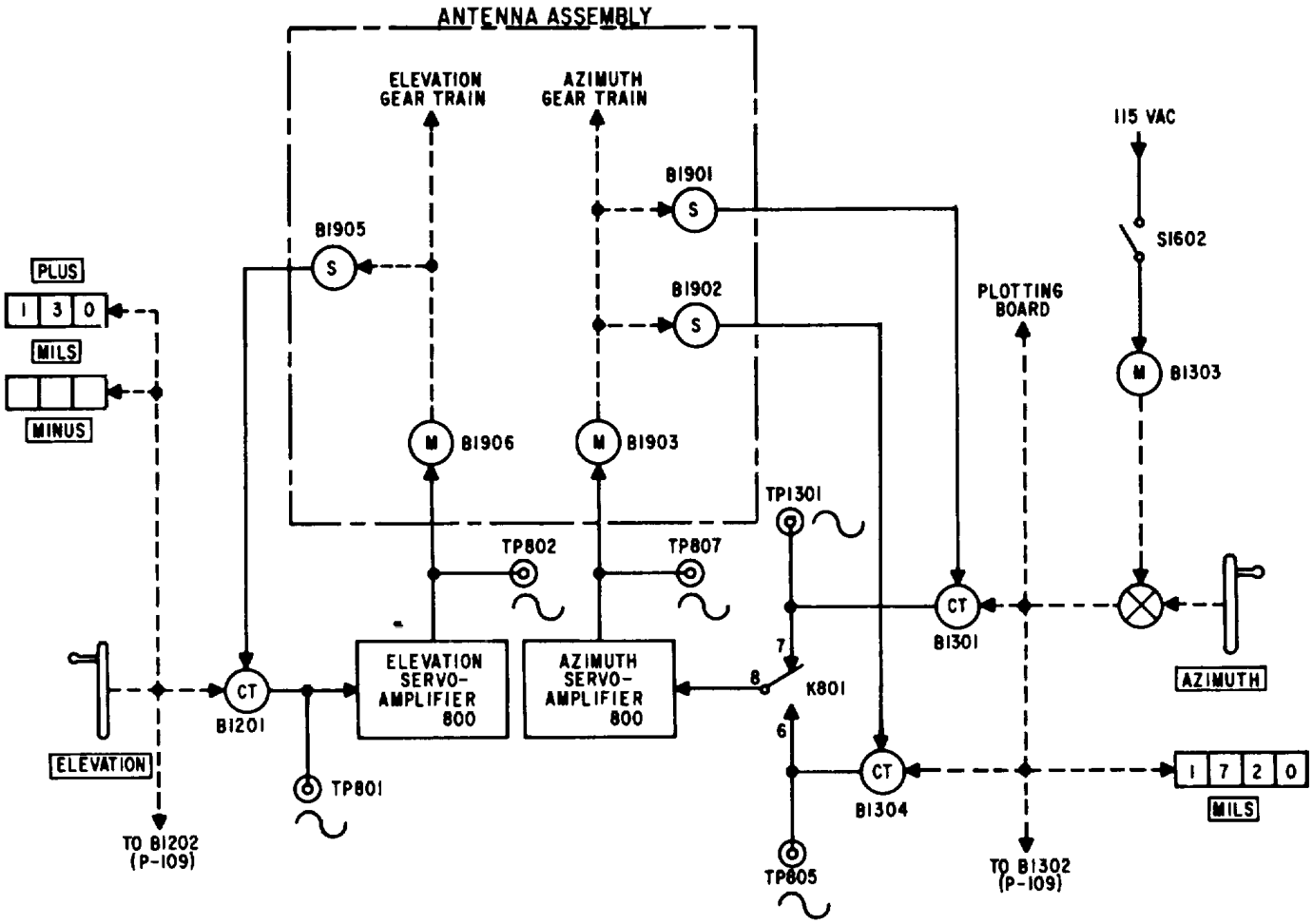


V — 1601 (FILAMENT) — 1601

C — 1602

R — 1609, 1611, 1612, 1613, 1614, 1616

Indicator high-voltage channel circuit diagram--Continued.



Antenna positioning system block diagram.

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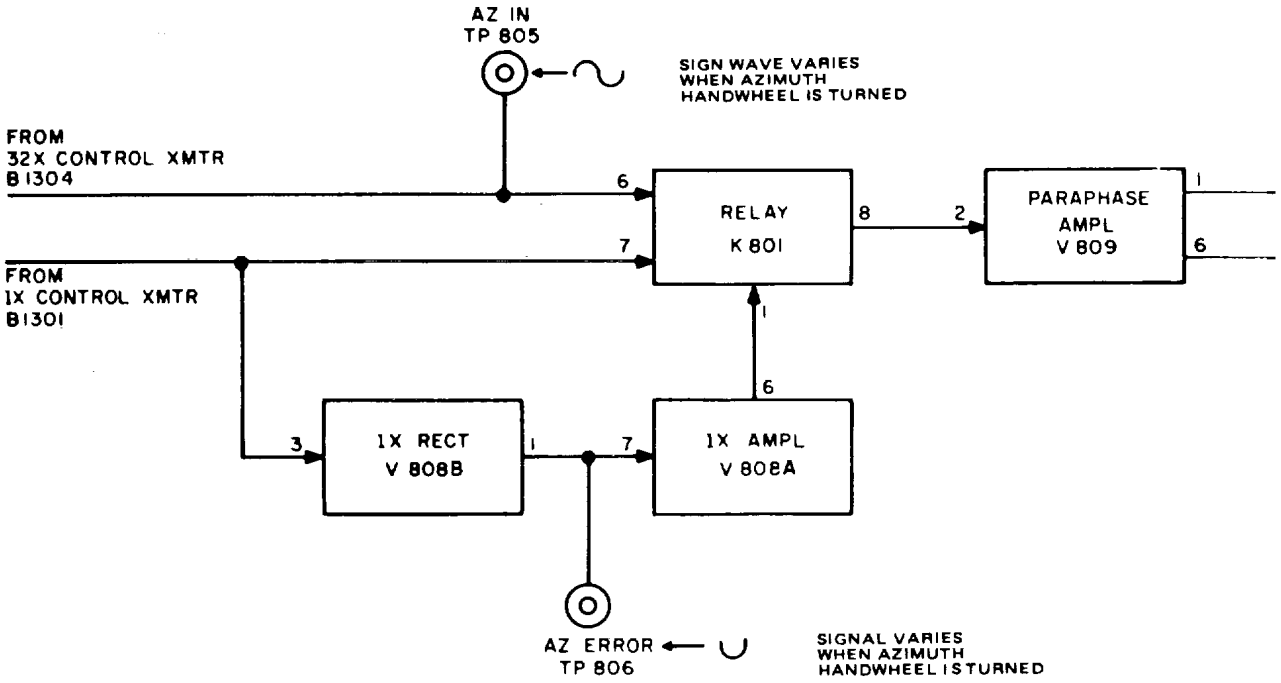
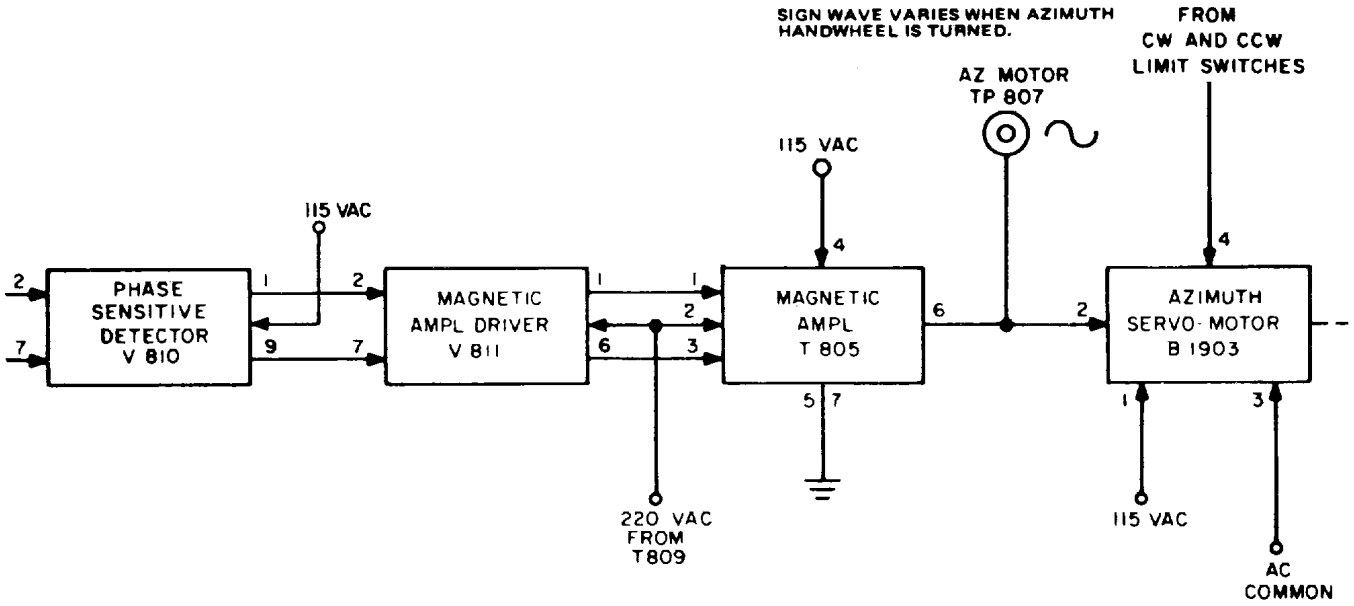
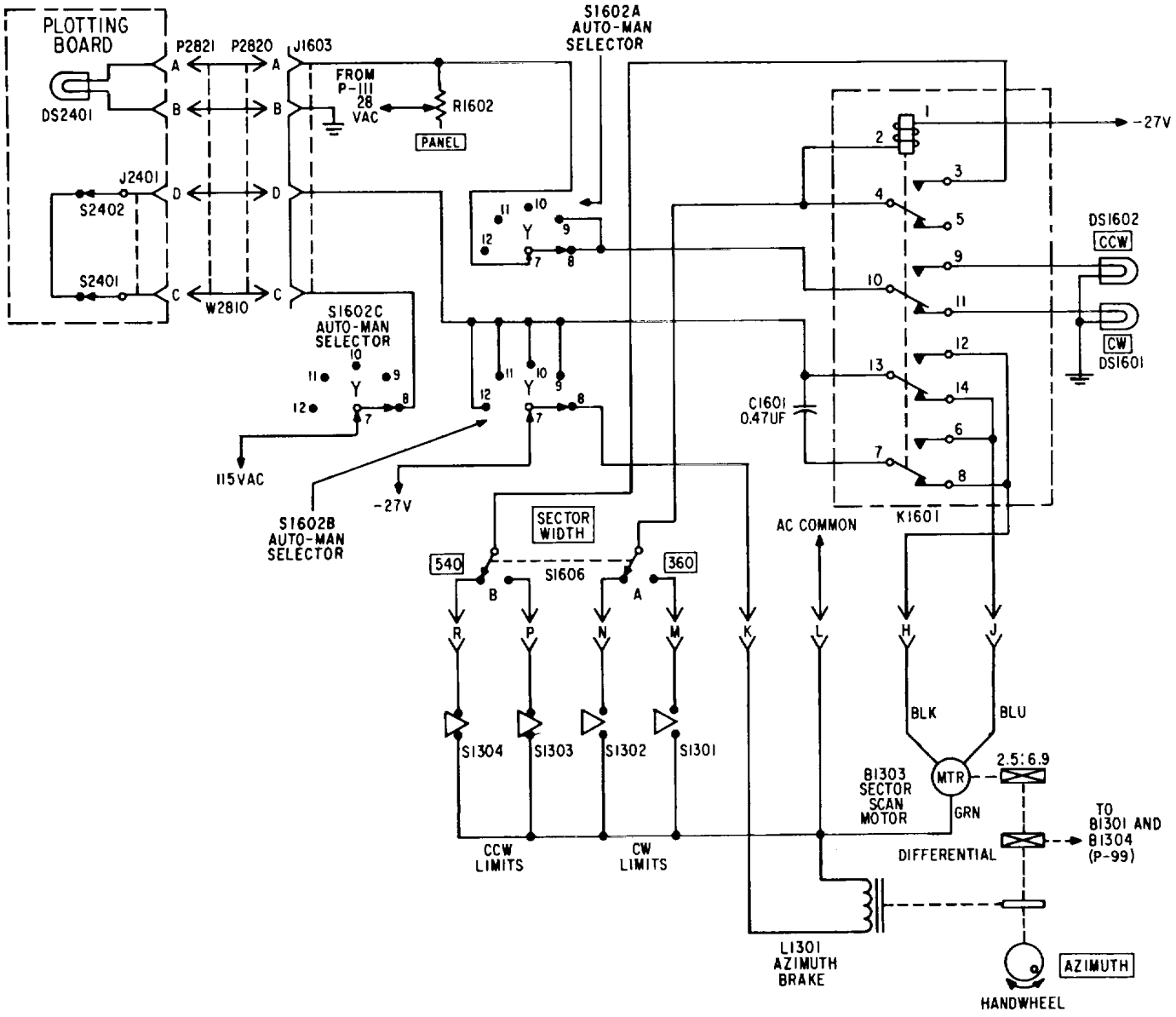


Azimuth servoamplifier block diagram.

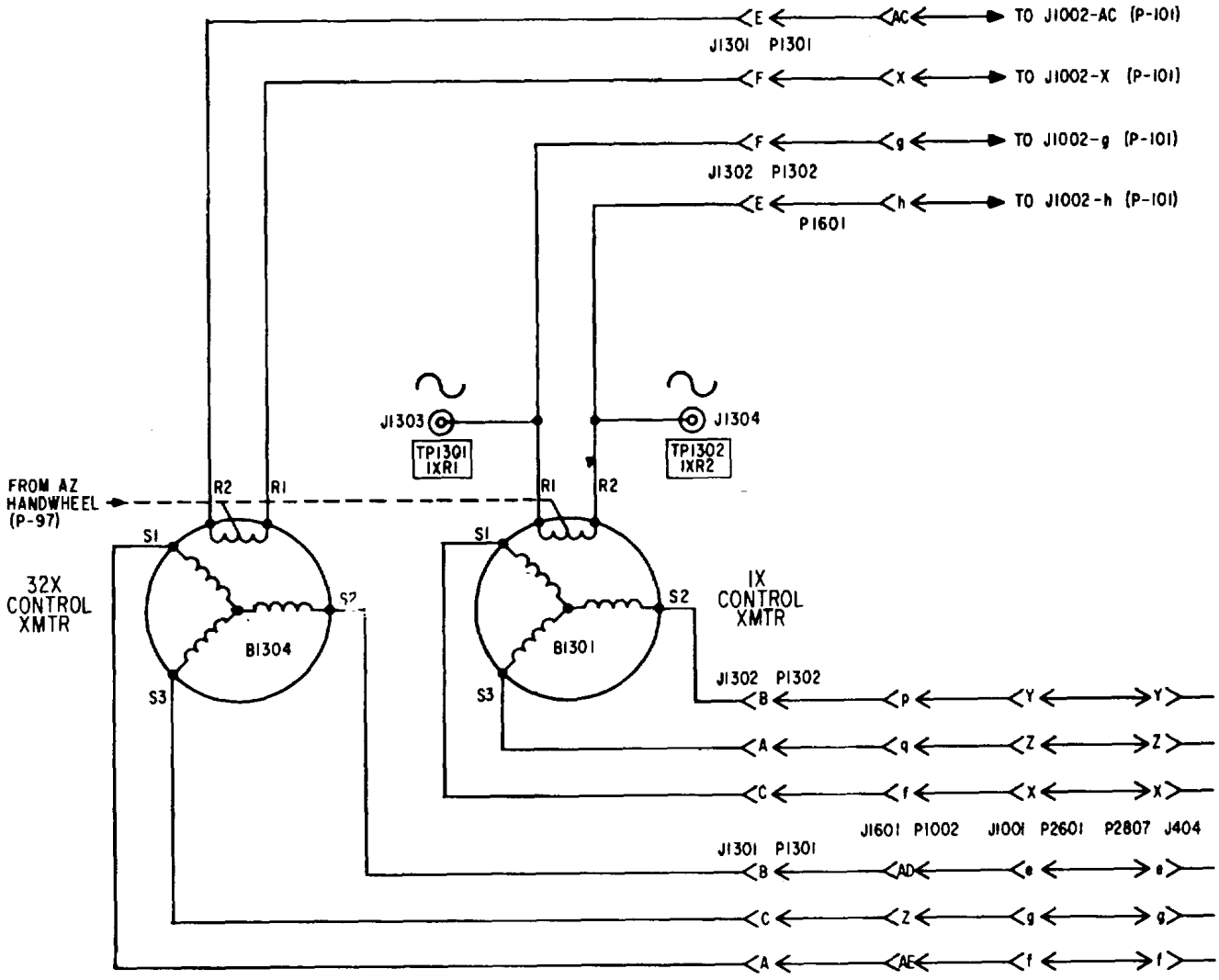


Azimuth servoamplifier block diagram--Continued.

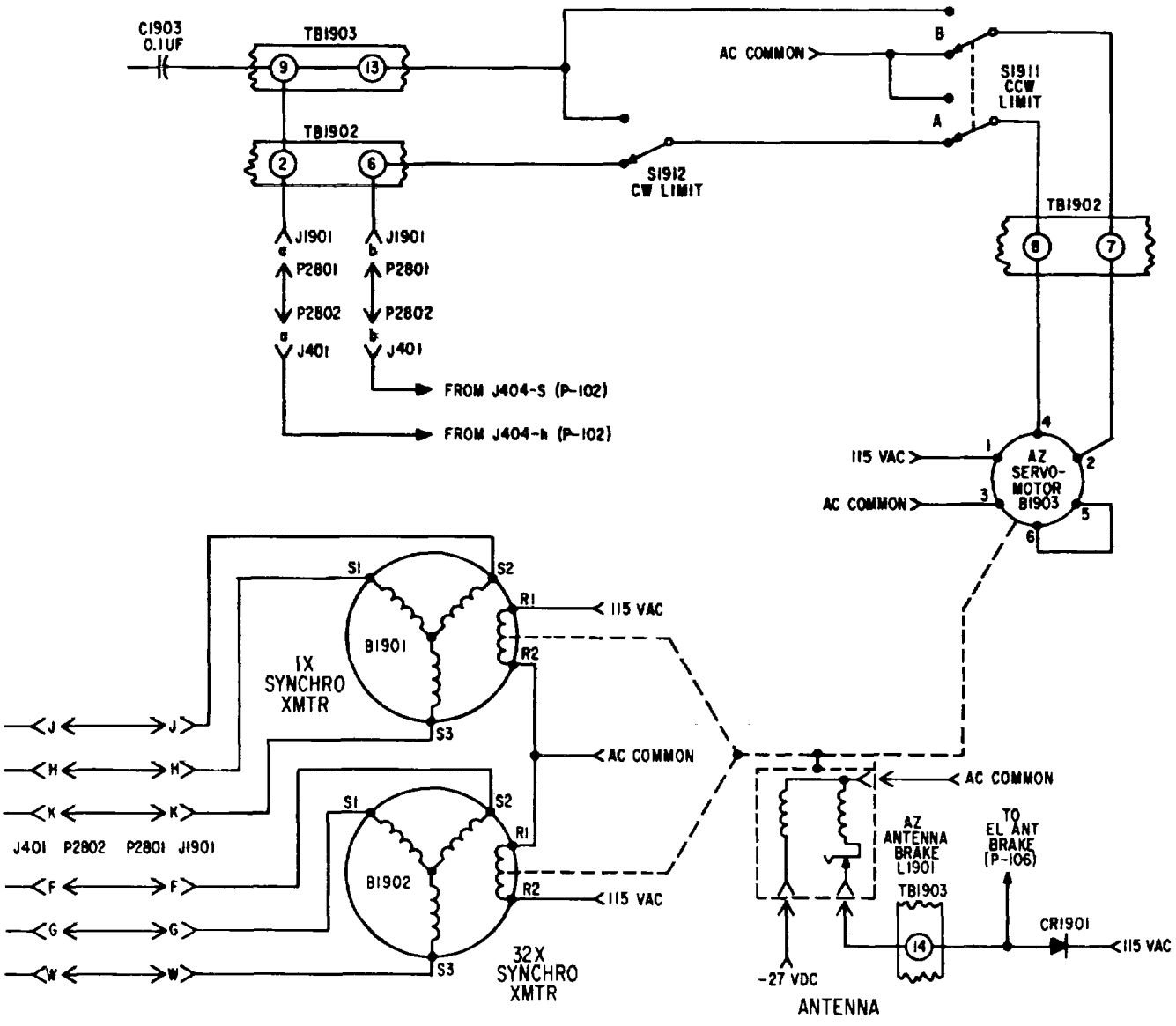


Sector scan circuits.

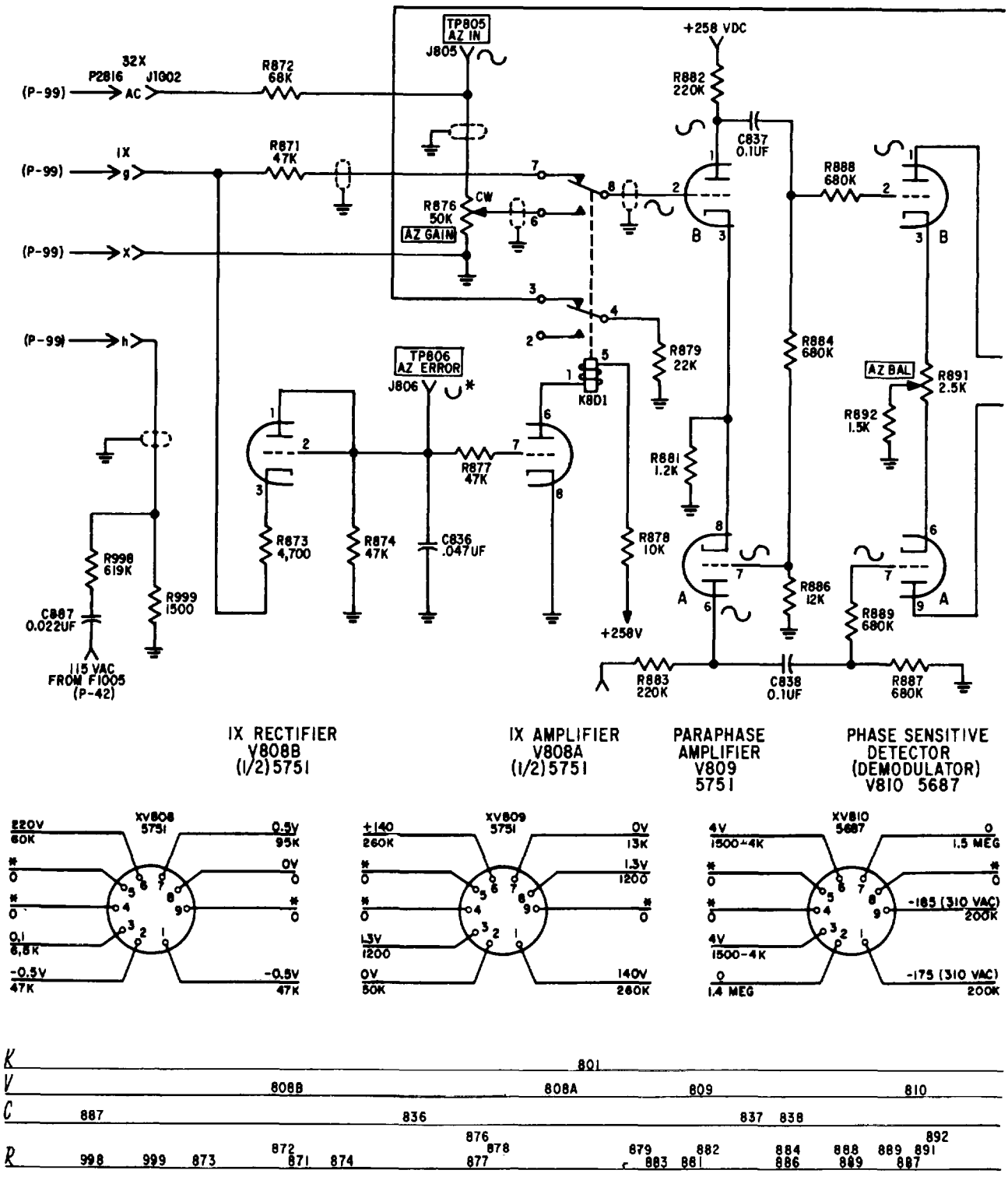
NOTES



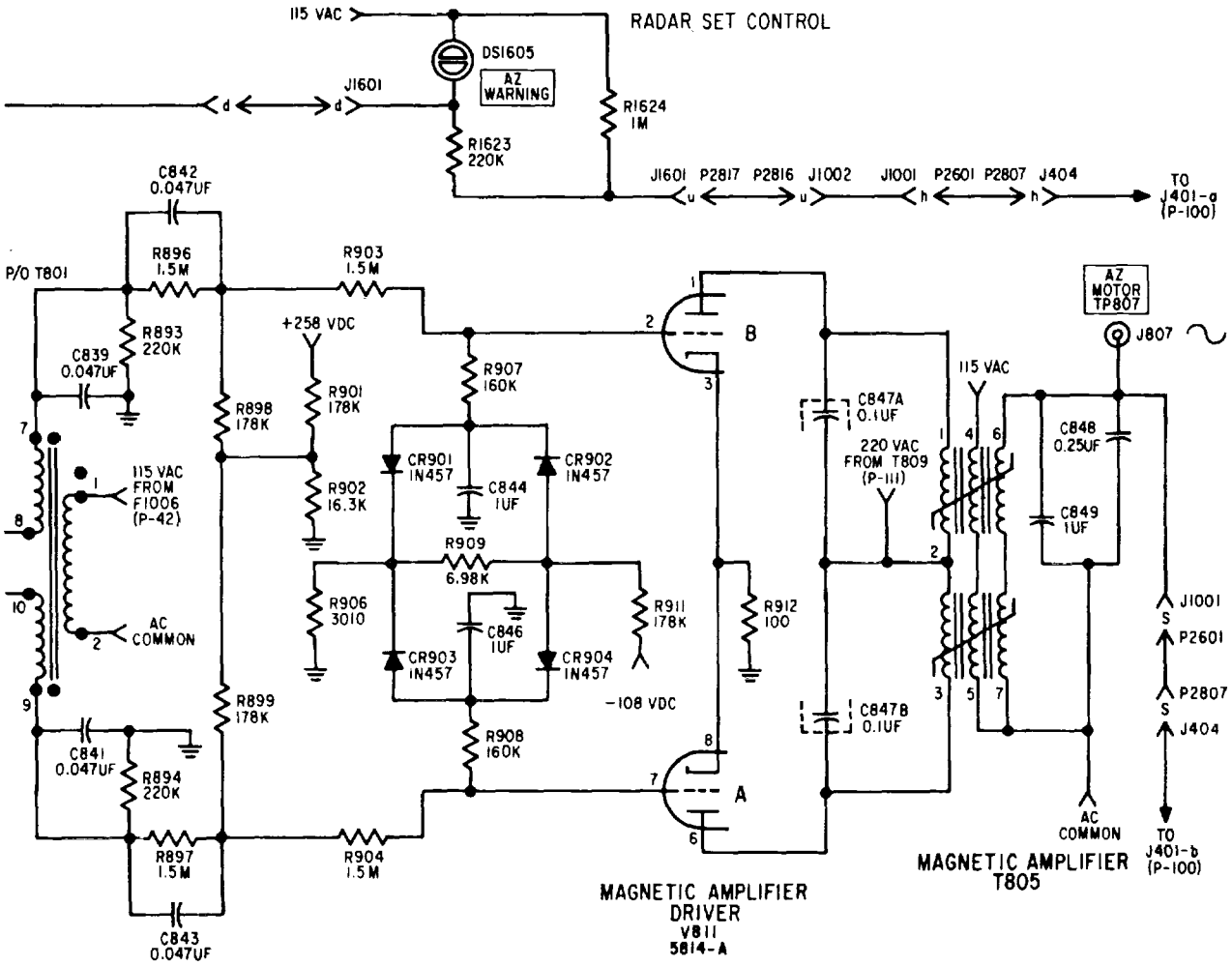
Azimuth synchros.



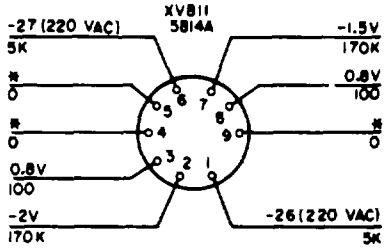
Azimuth synchros--Continued.

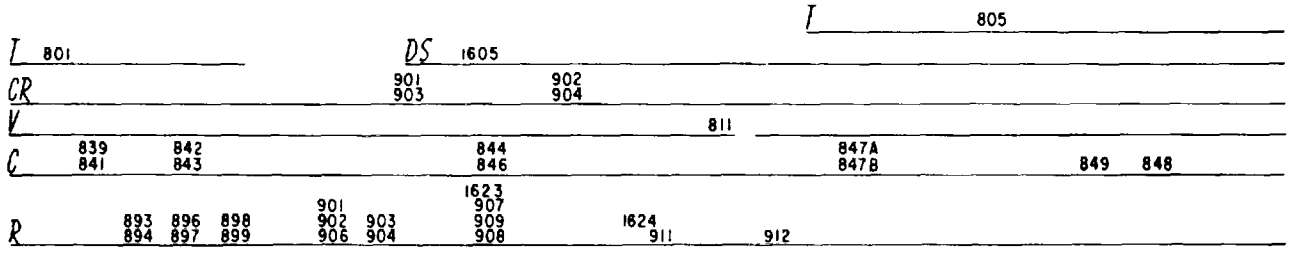


Azimuth servoamplifier circuit diagram.

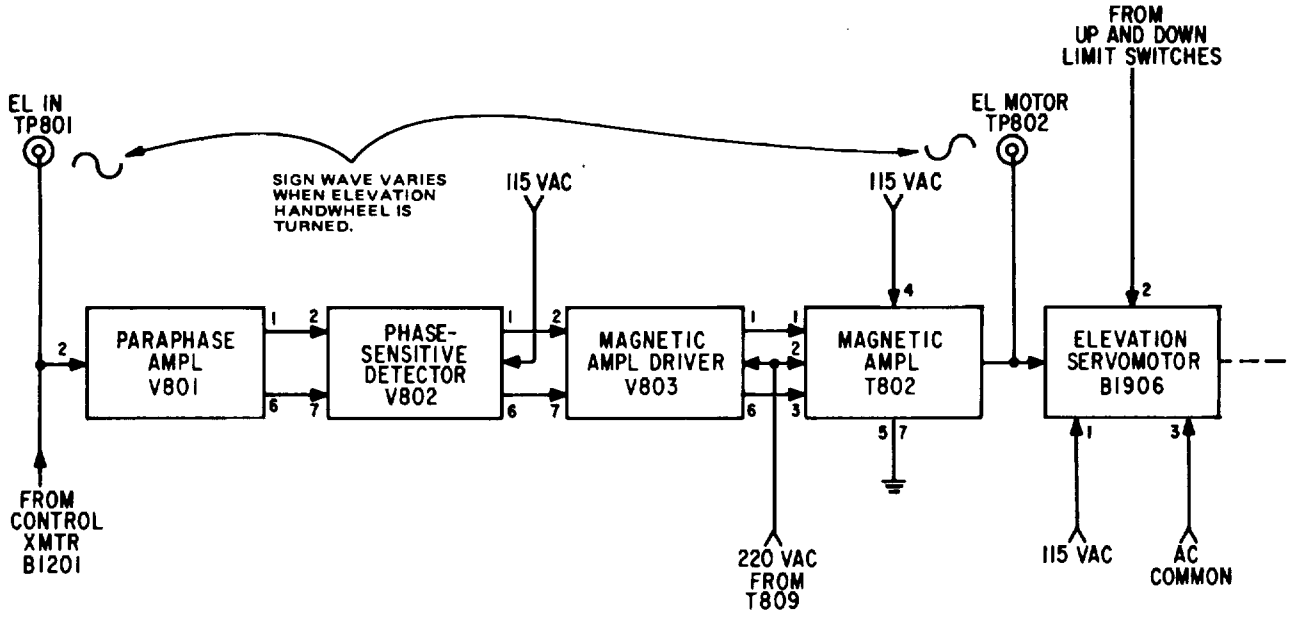


NOTE: THE SIGNALS IN THE AZIMUTH CIRCUITS VARY WHEN THE AZIMUTH HANDWHEEL IS TURNED.





Azimuth servoamplifier circuit diagram--Continued.



Elevation servoamplifier block diagram.

NOTES

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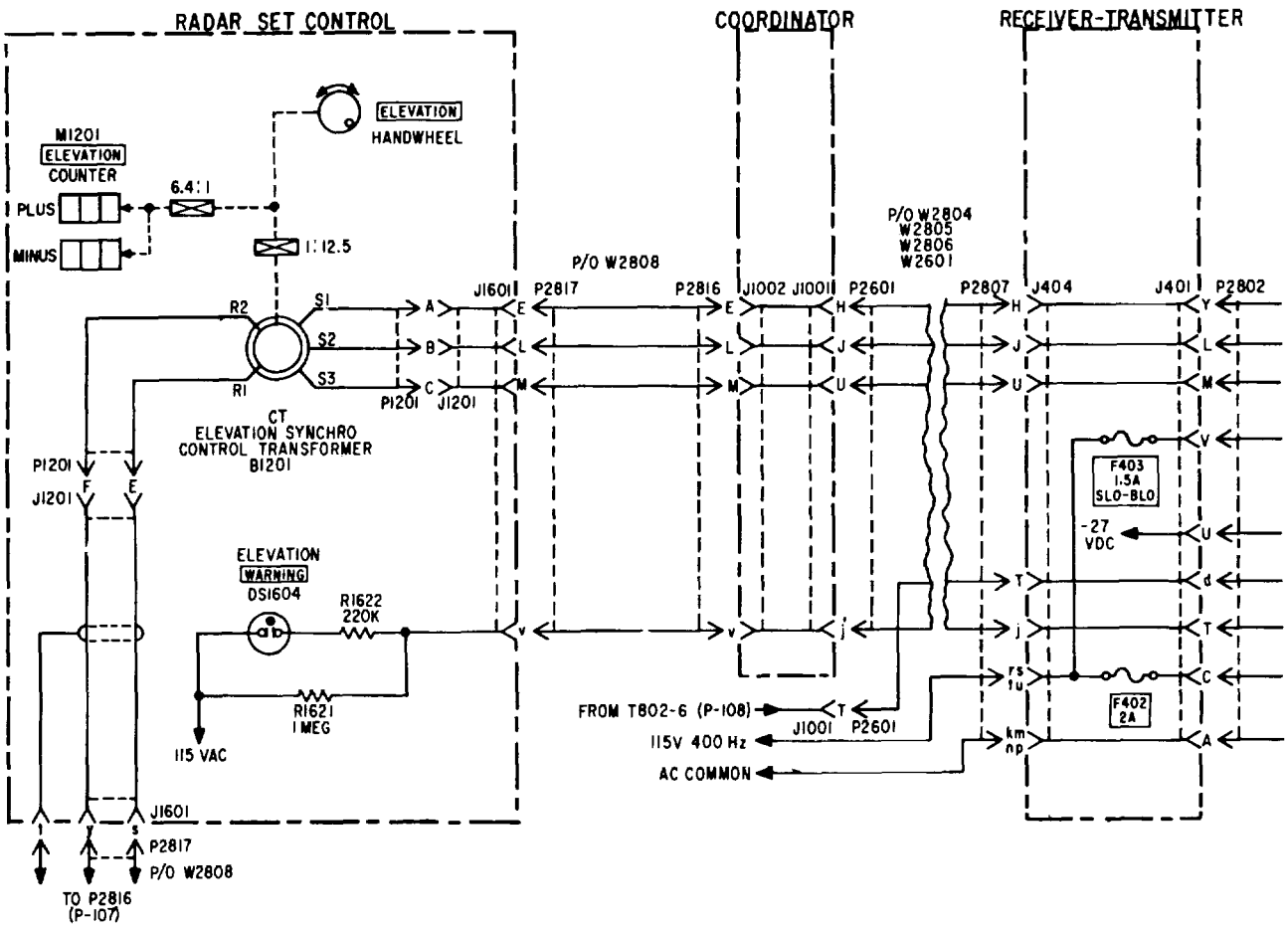
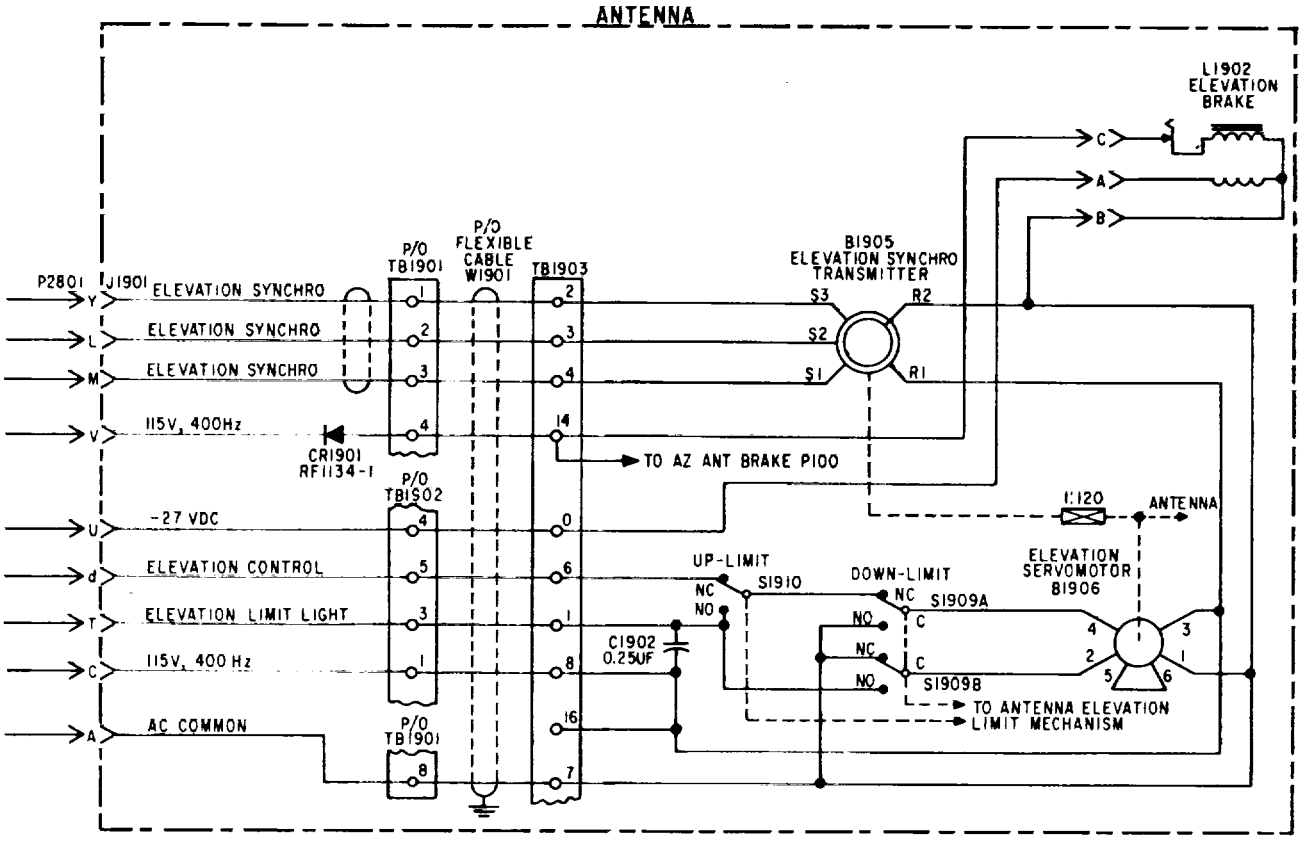
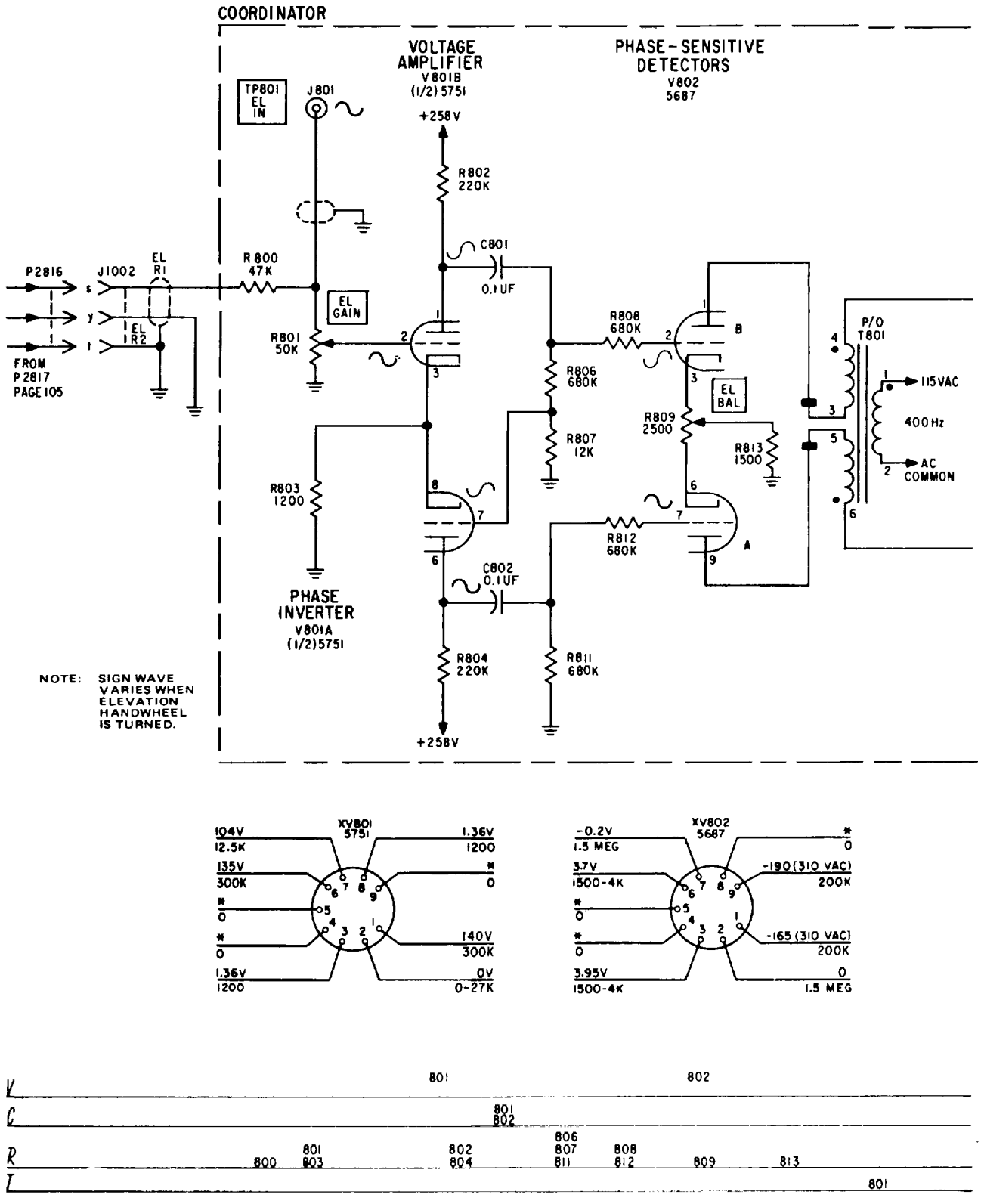


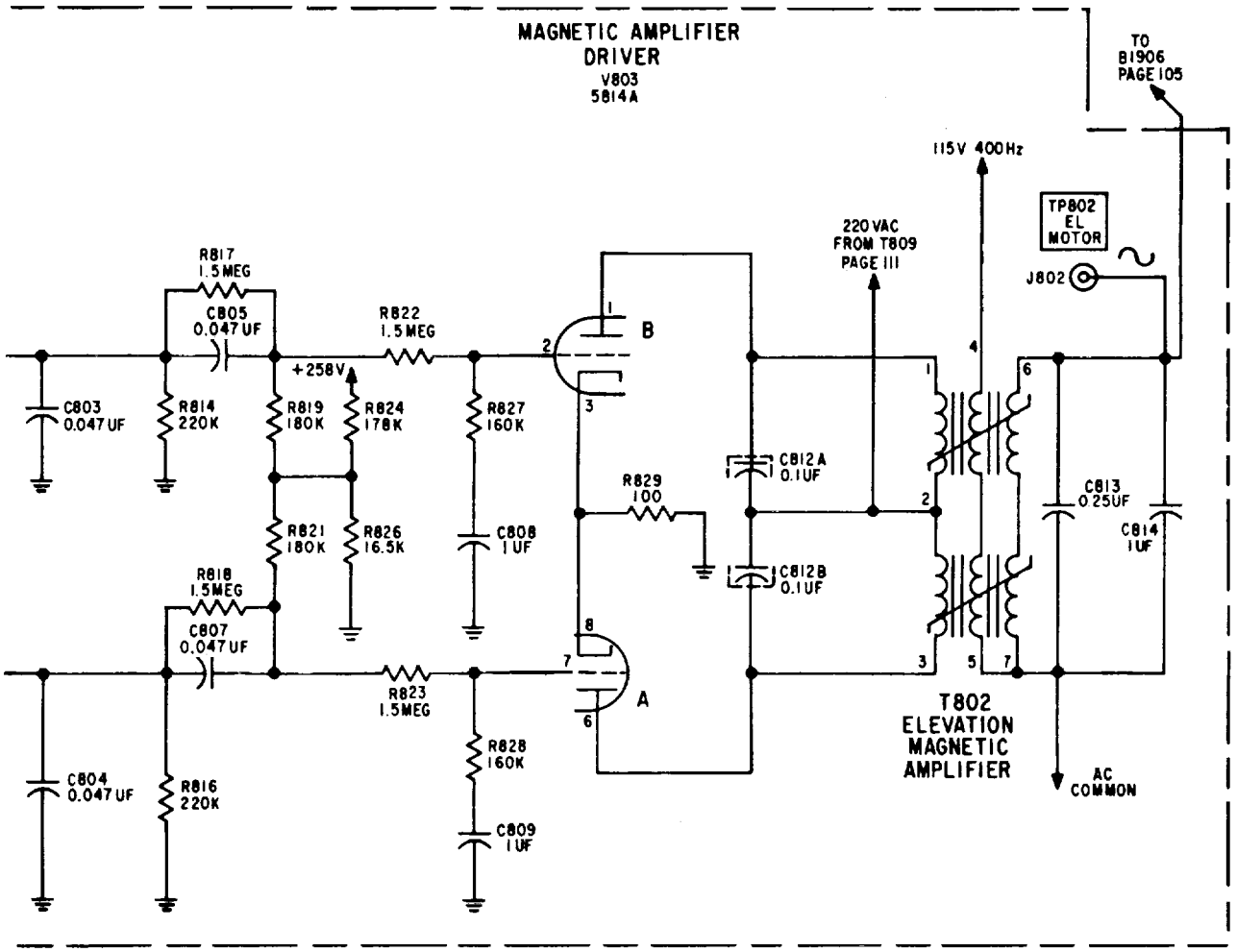
Elevation servo circuit diagram.

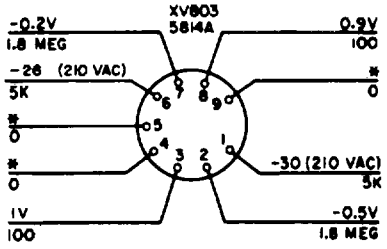


Elevation servo circuit diagram--Continued.

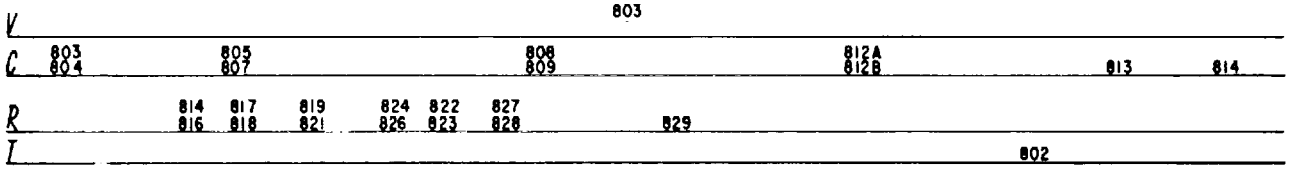


Elevation servoamplifier circuit diagram.

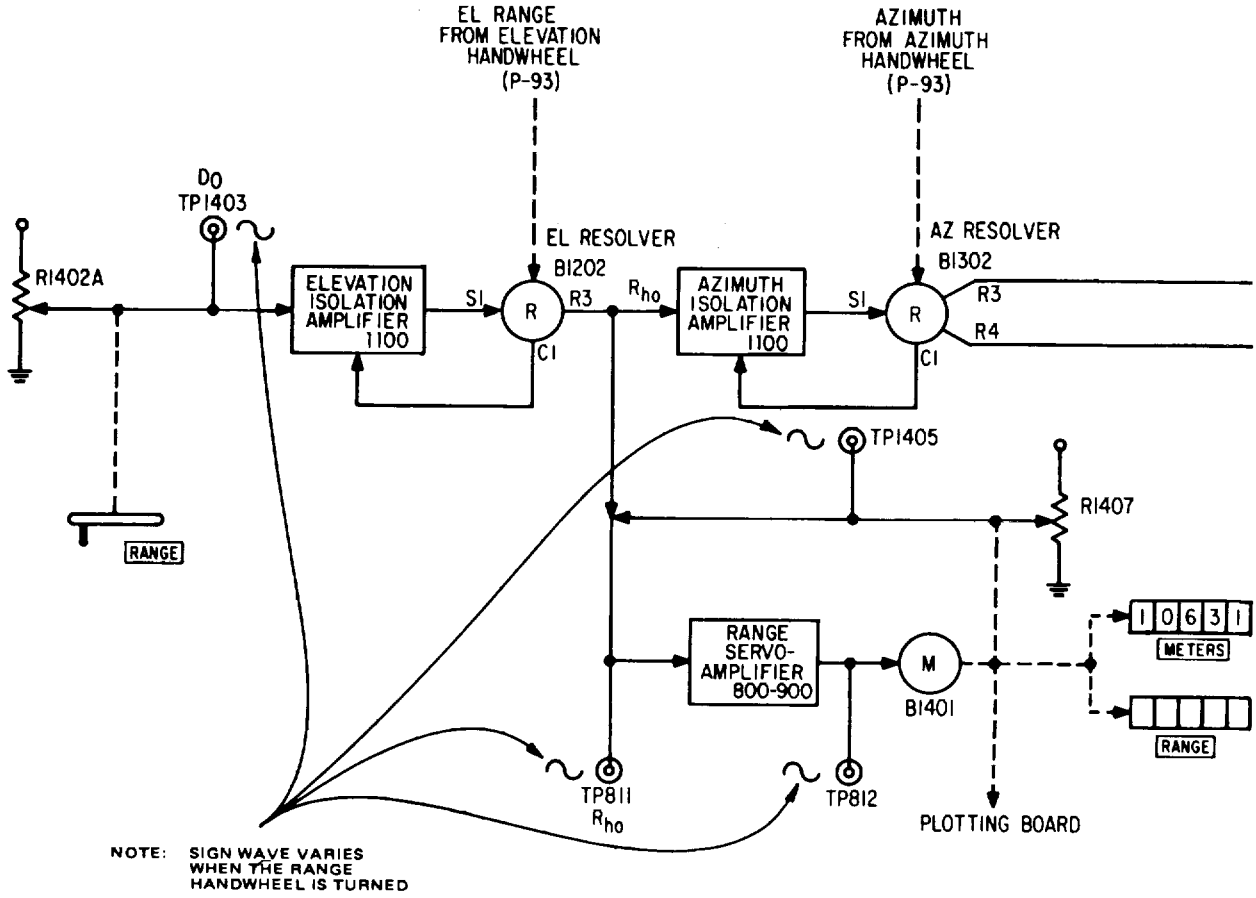




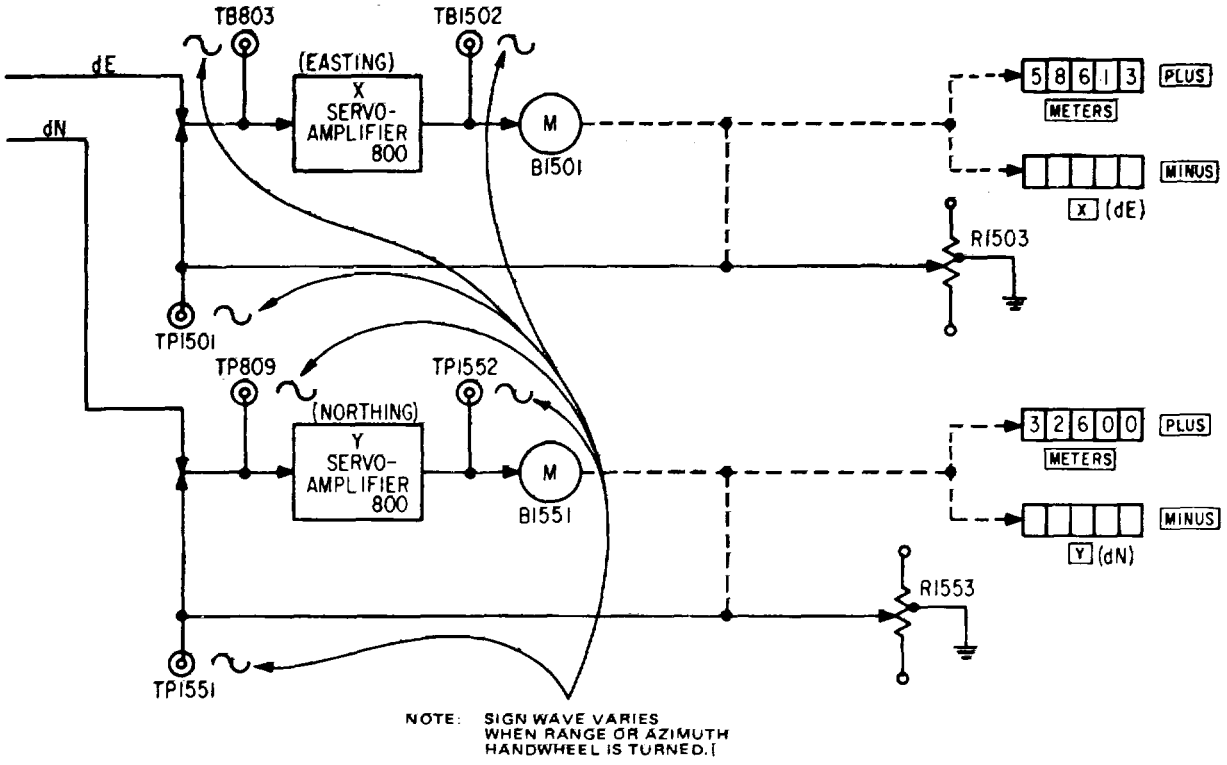
NOTE: SIGN WAVE VARIES WHEN ELEVATION HANDWHEEL IS TURNED.



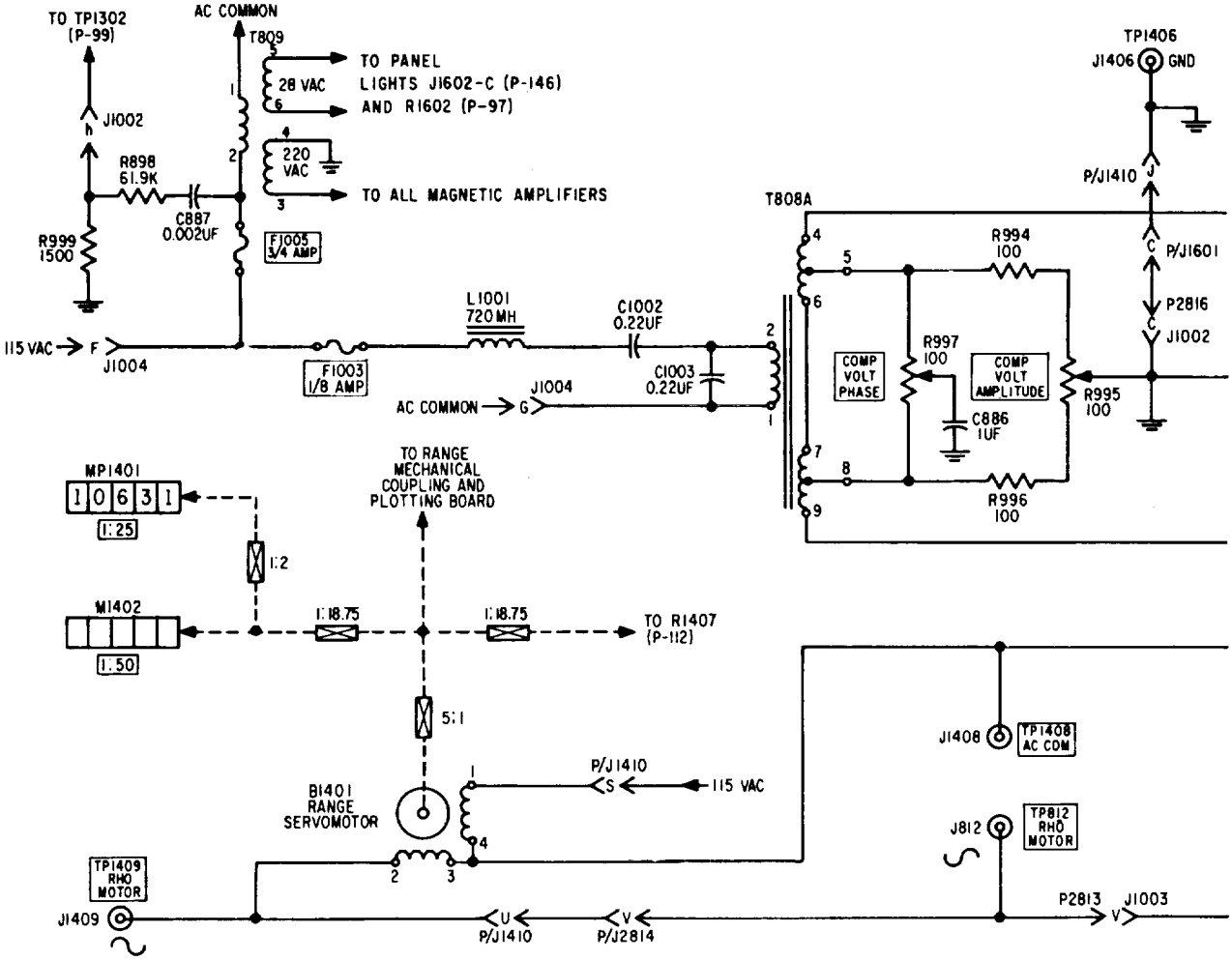
Elevation servoamplifier circuit diagram--Continued.



Computer system block diagram.

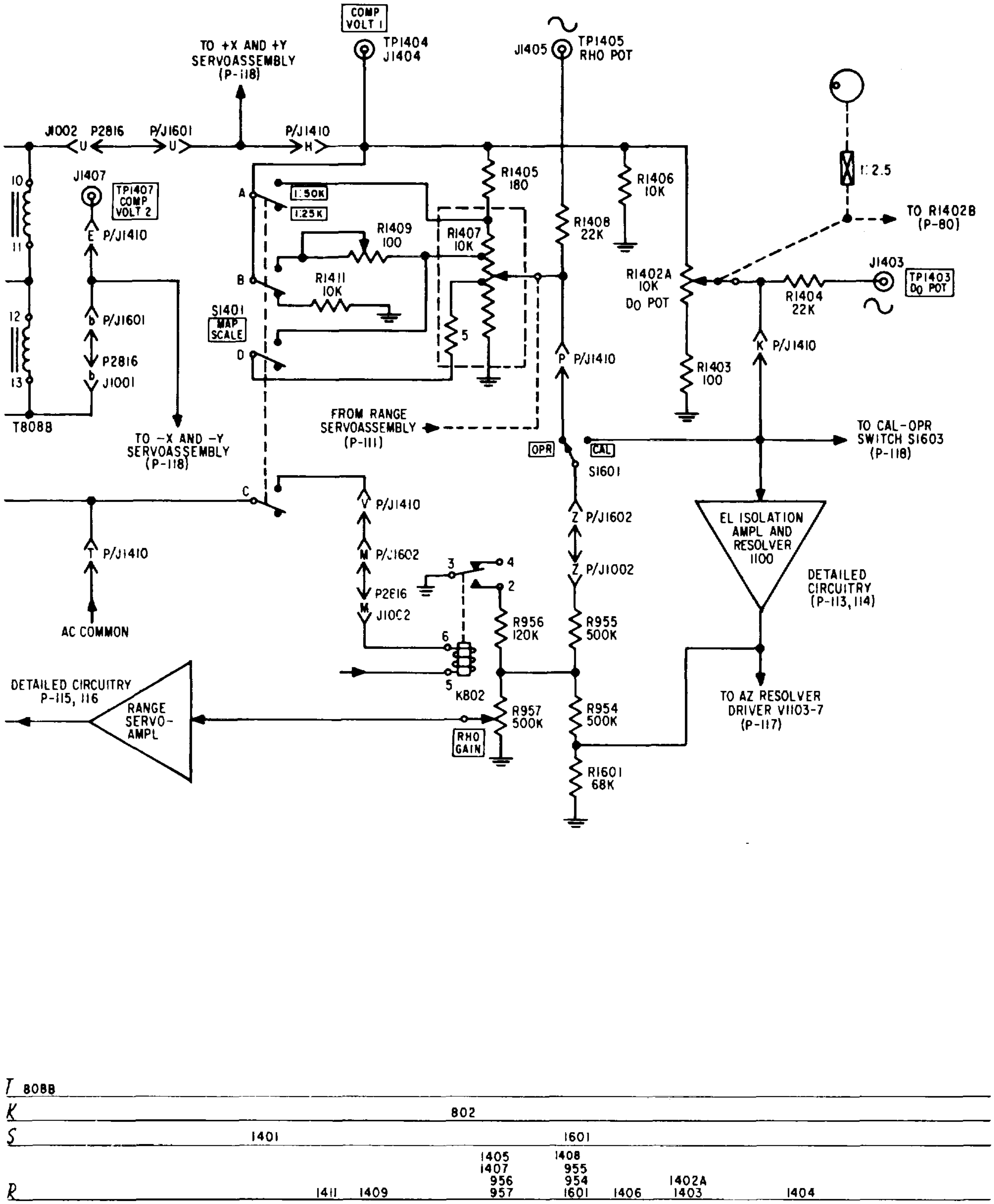


Computer system block diagram--Continued.

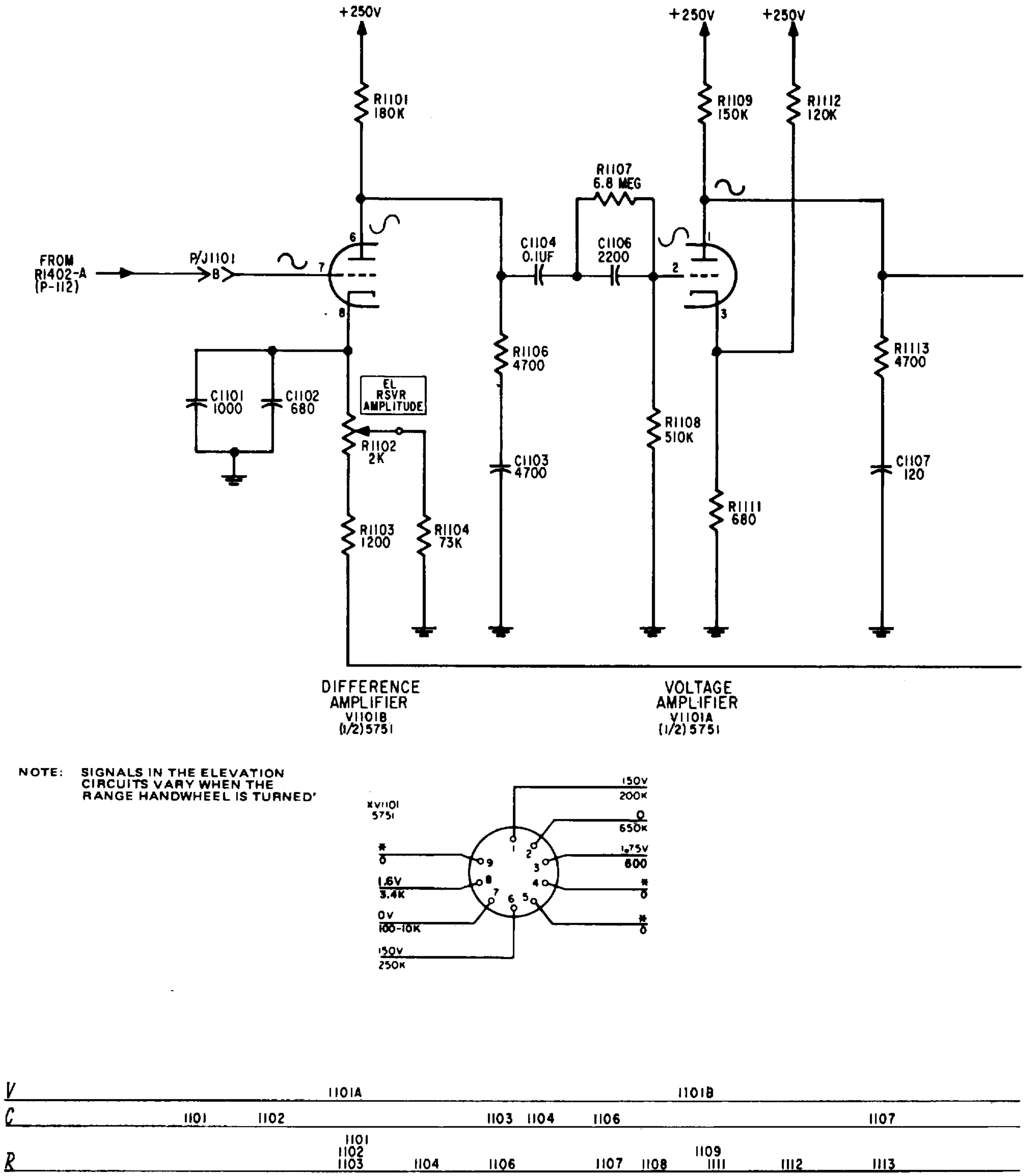


L	1001
MTR	1401
T	809, 808A
F	1005, 1003
C	887, 1002, 1003, 886
R	999, 898, 997, 994, 996, 995

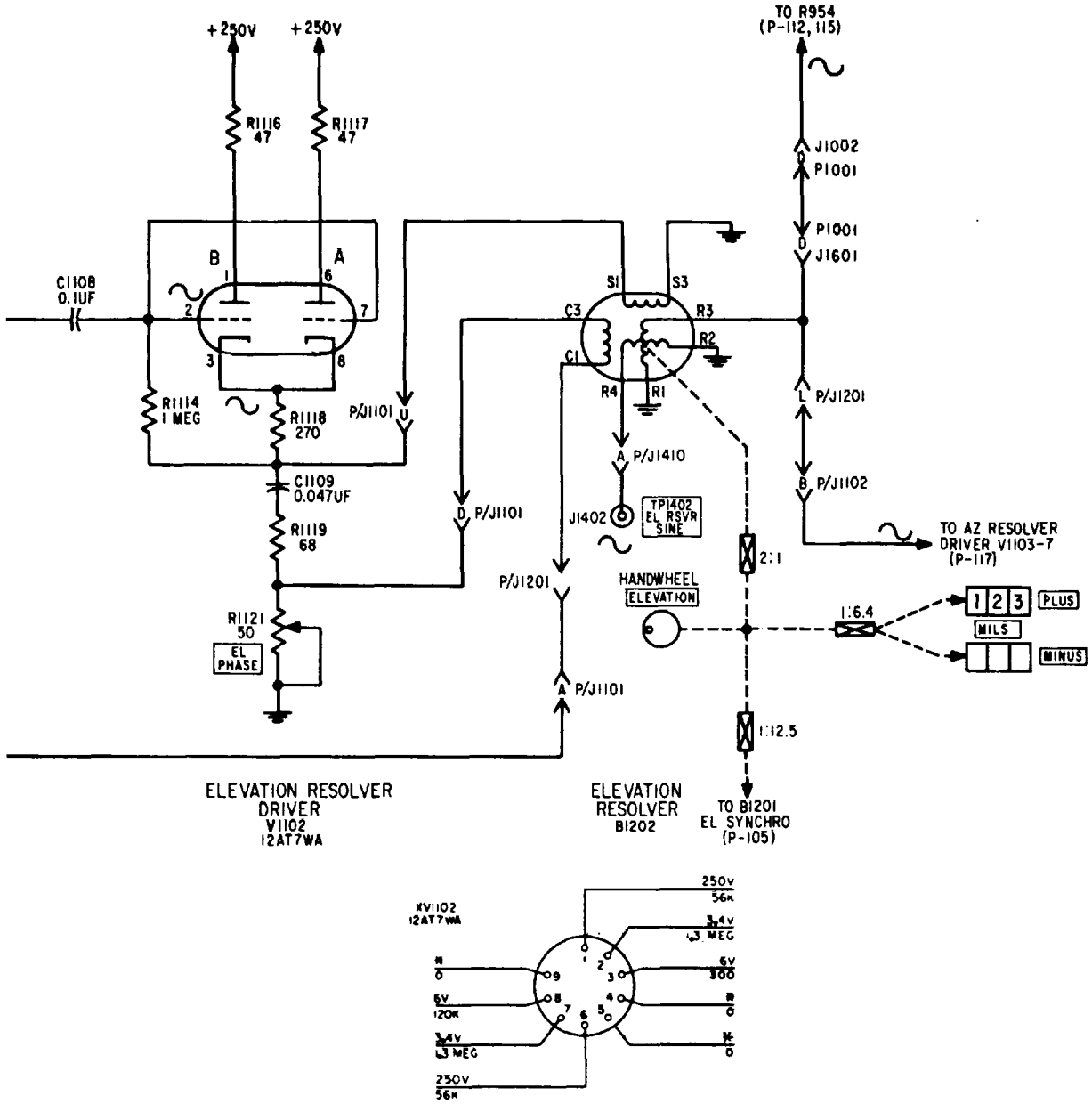
Computer power supply.



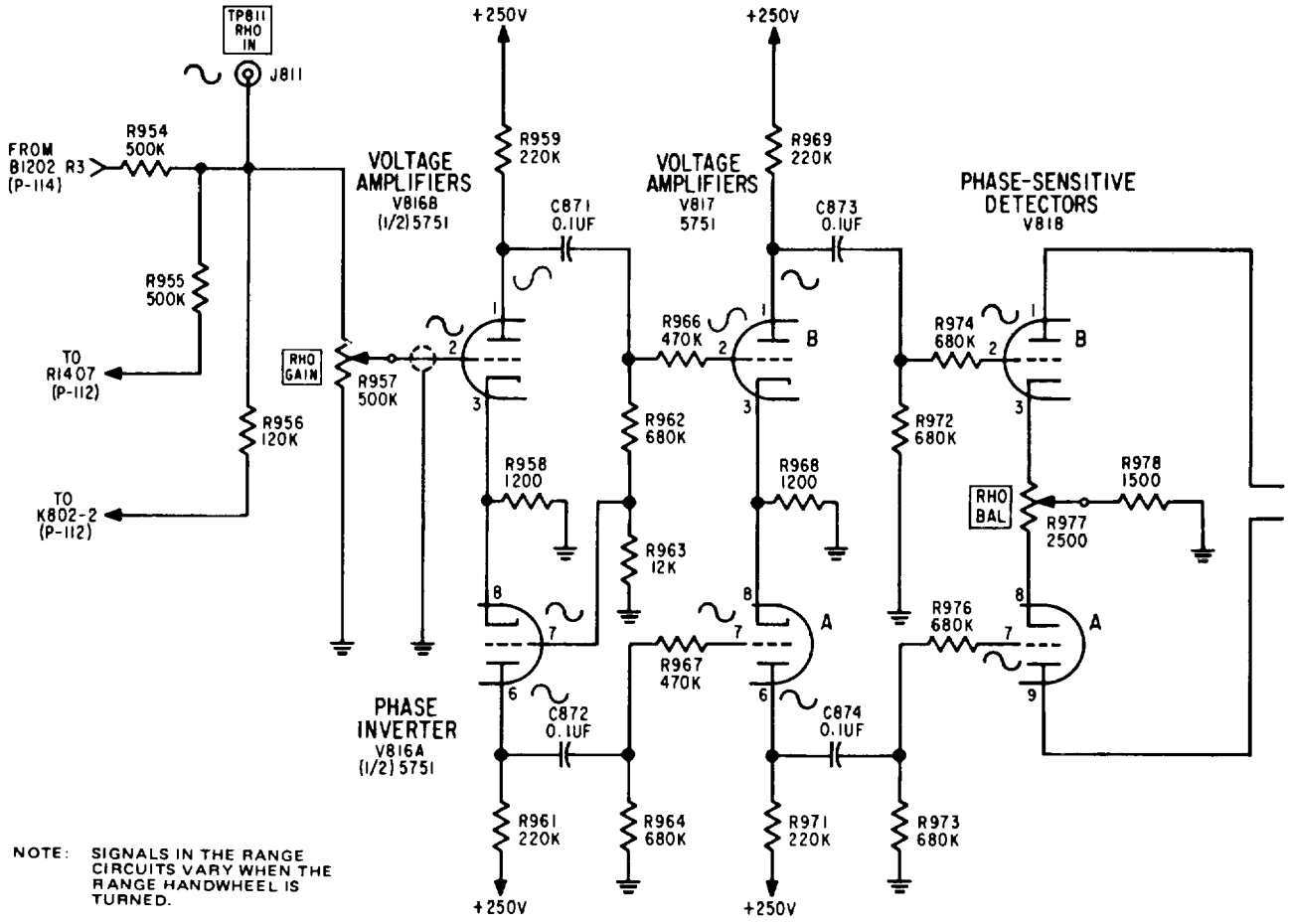
Computer power supply- -Continued.

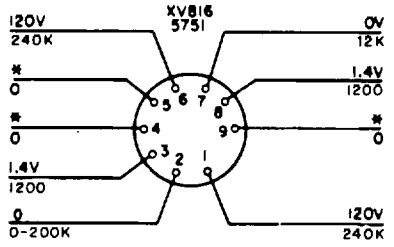


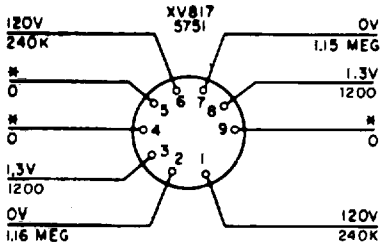
Elevation isolation amplifier circuit diagram.

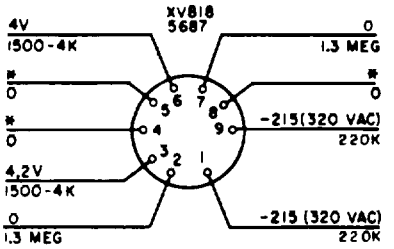


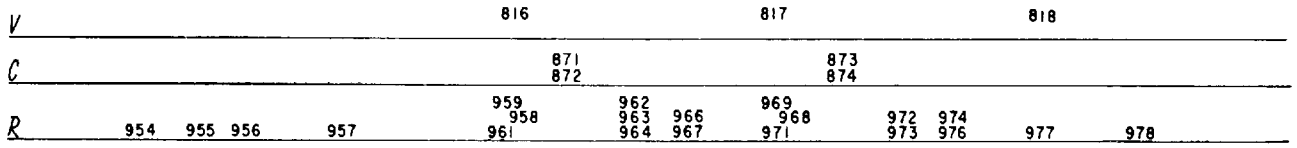
Elevation isolation amplifier circuit diagram--Continued.



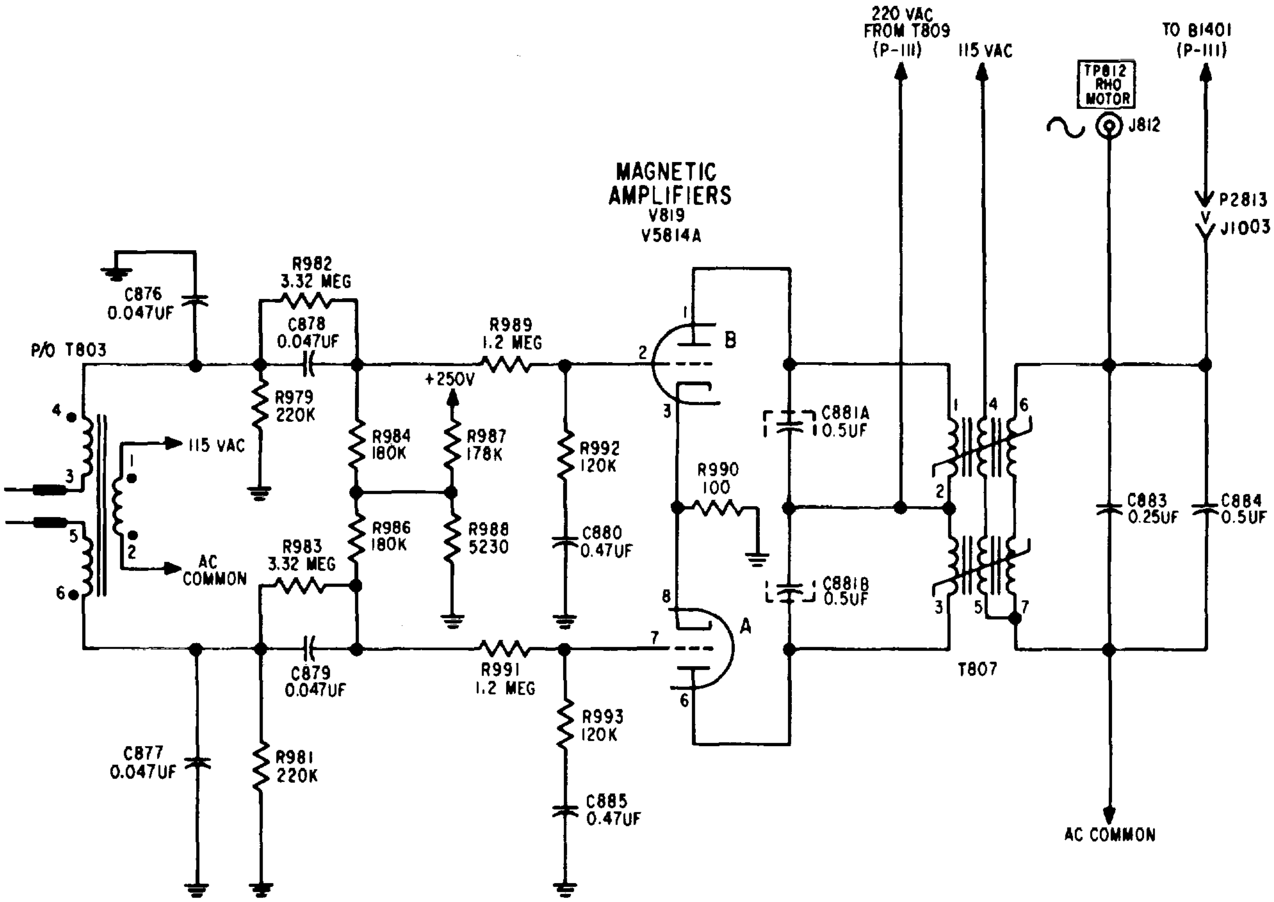


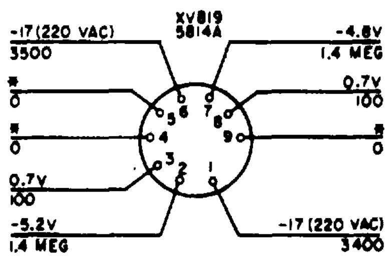






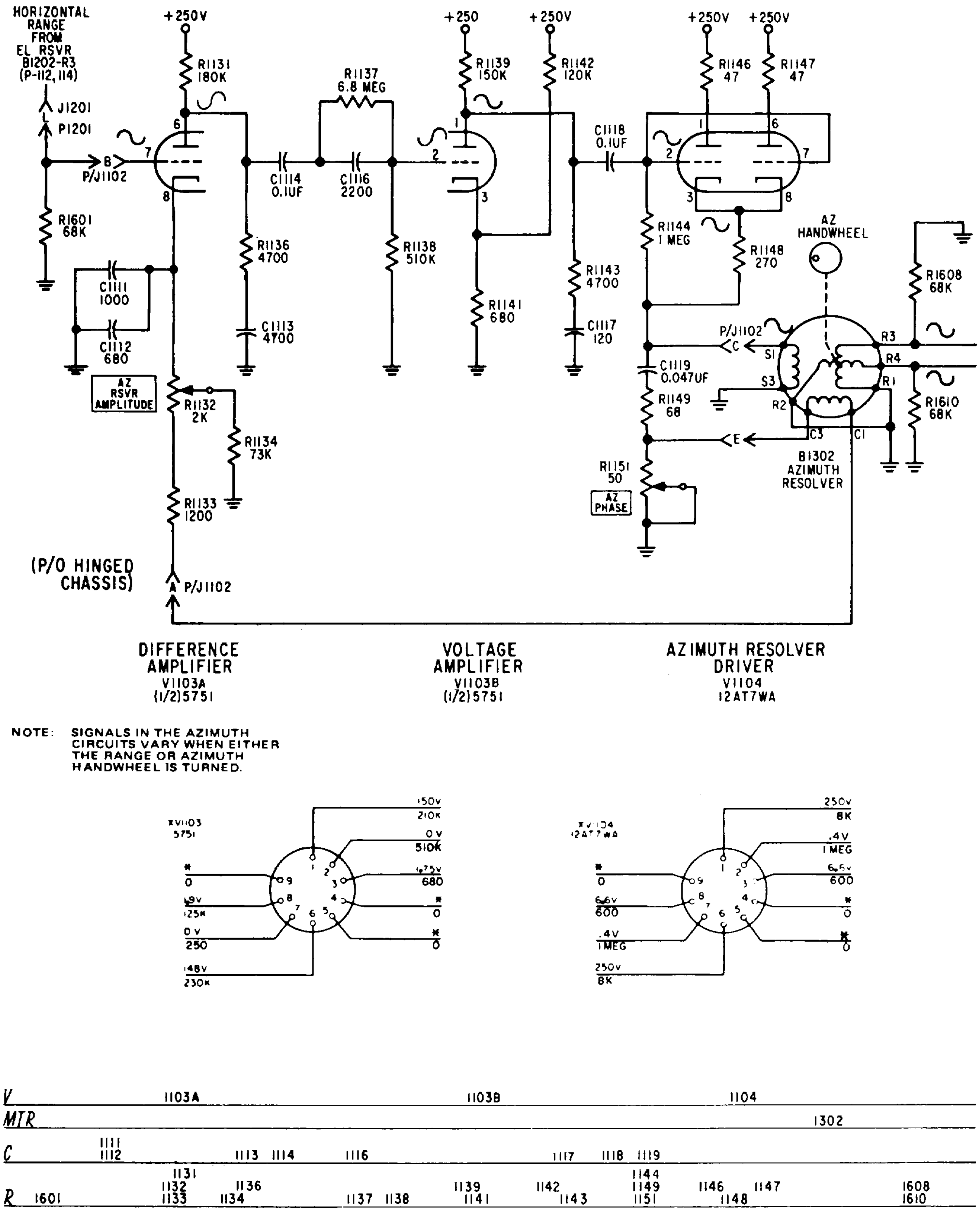
Range servoanplifier circuit diagram.



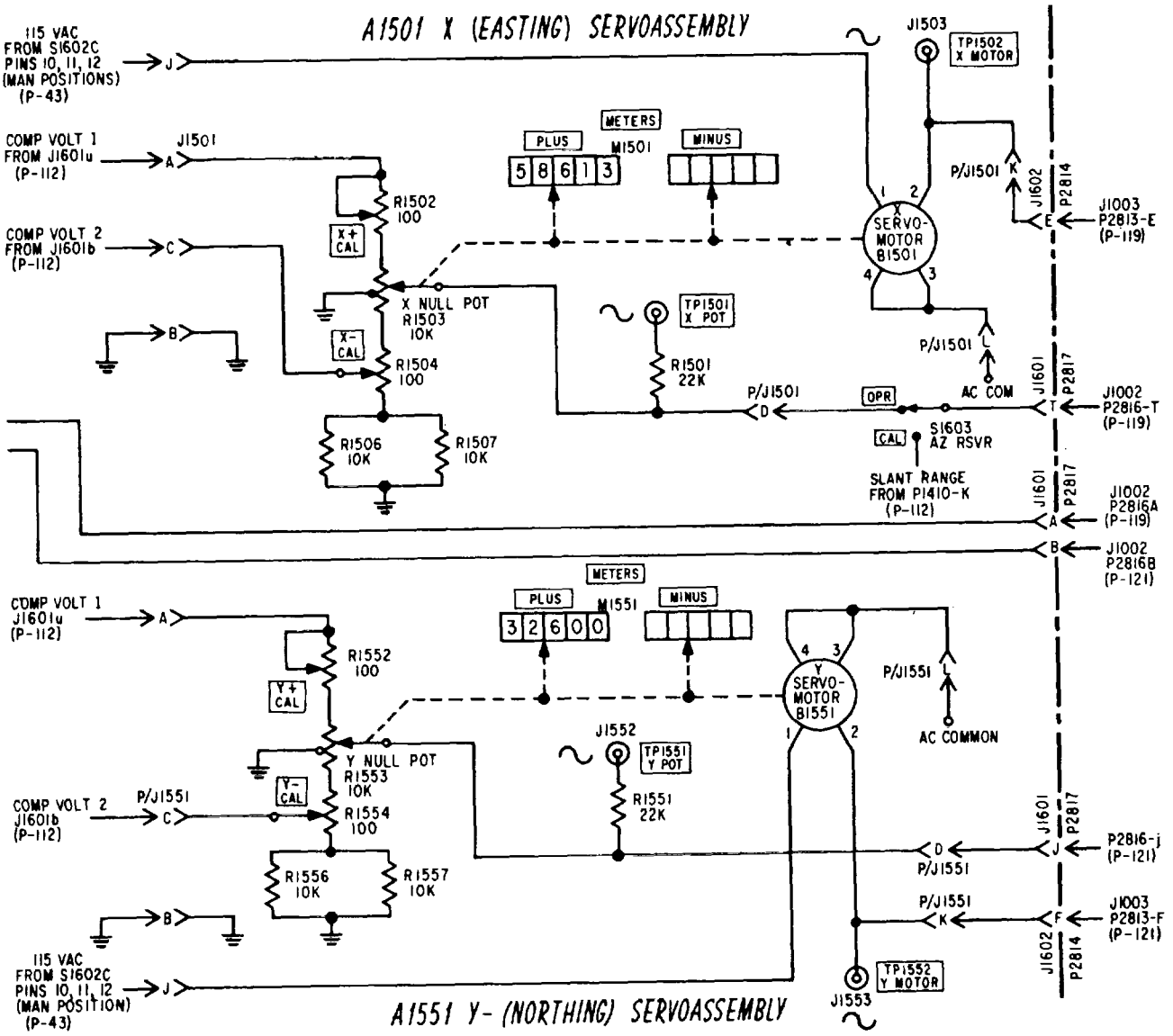


T	803							807
V						819		
C	876 877	878 879		880 885		881A 881B	883	884
R	979 981	982 983	984 986	987 988	989 991	992 993	990	

Range servoamplifier circuit diagram--Continued.

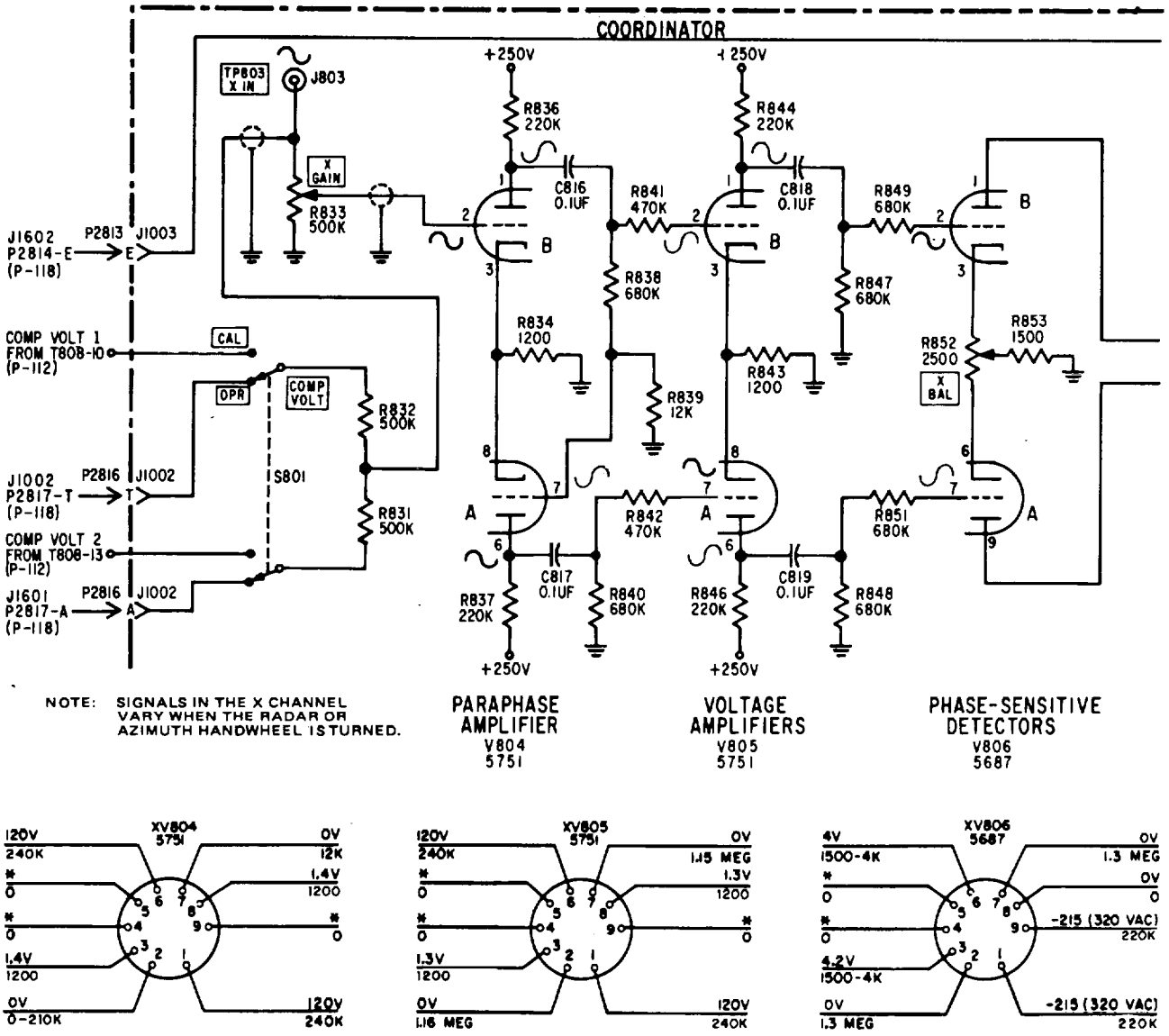


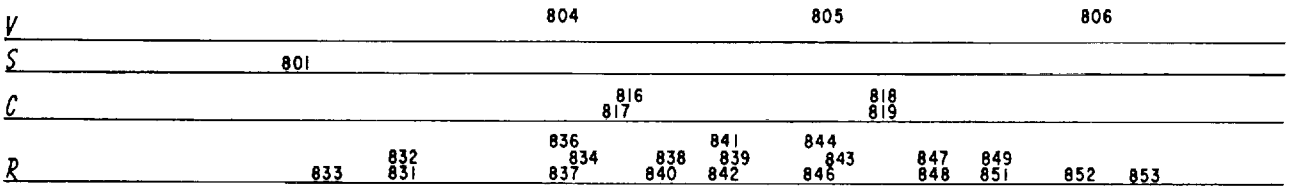
Azimuth isolation amplifier and null circuits.



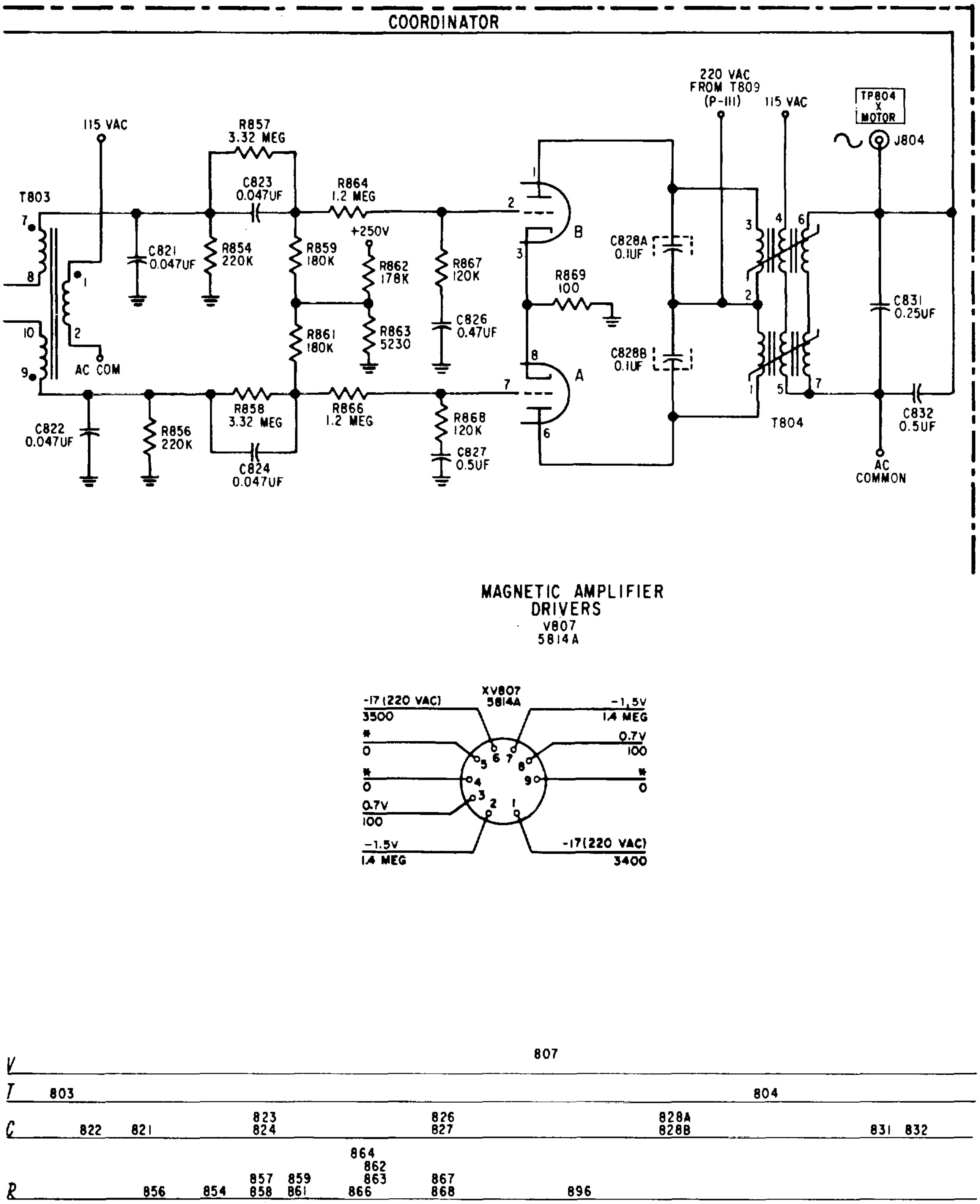
MTR											1551	1501	
R		1556	1506 1552 1553 1554	1502 1503 1504 1557	1507			1551	1501				

Azimuth isolation amplifier and null circuits.

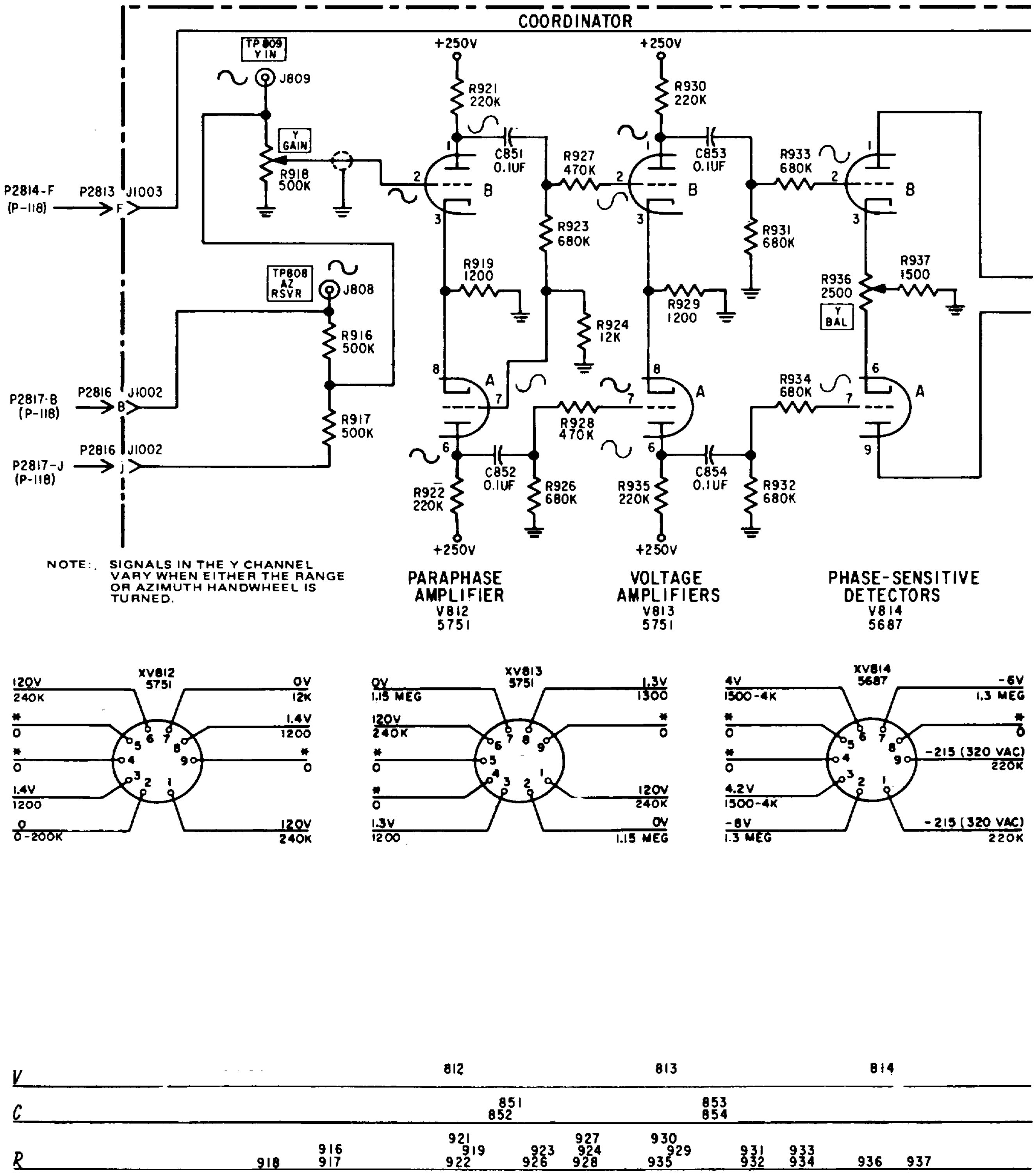




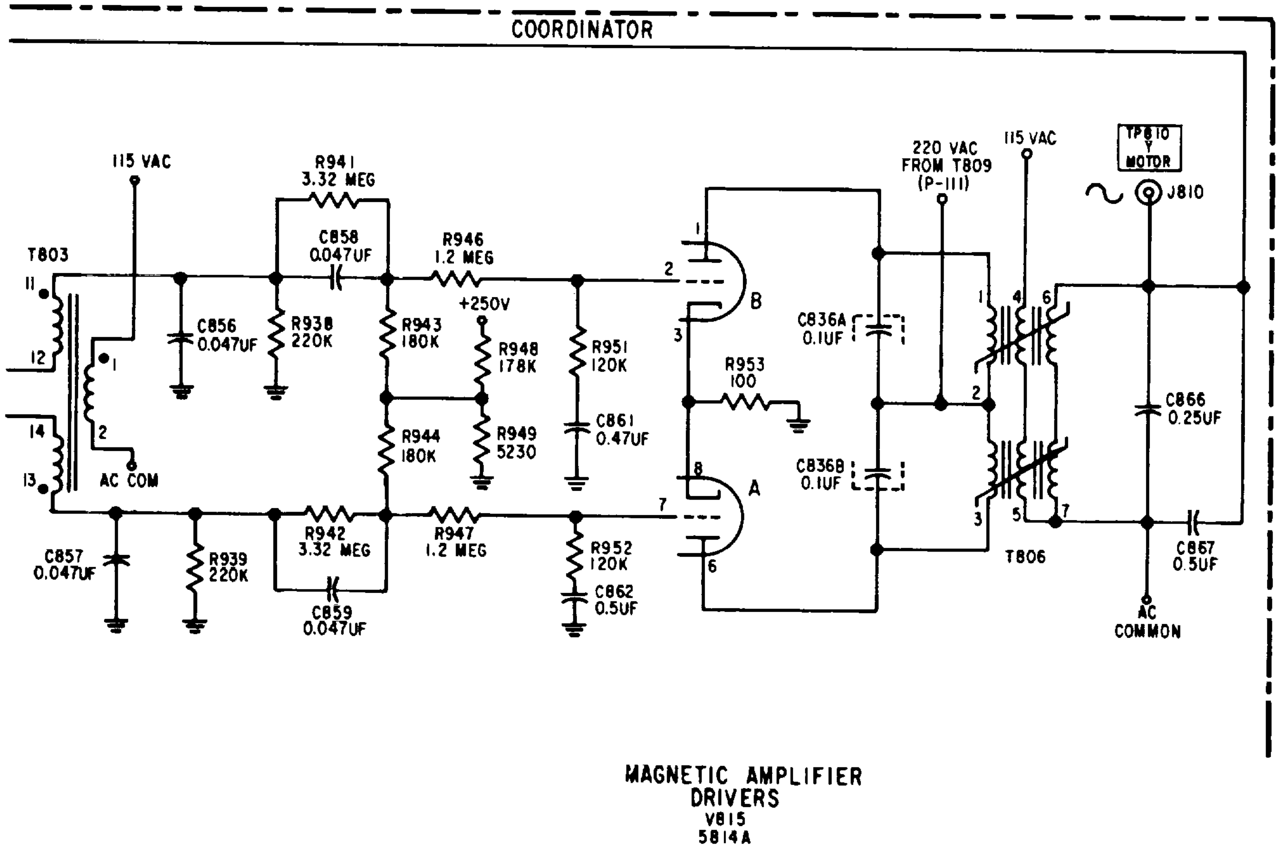
X (easting) servoamplifier circuit diagram.

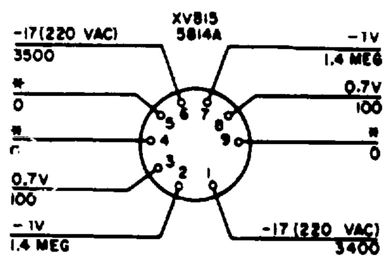


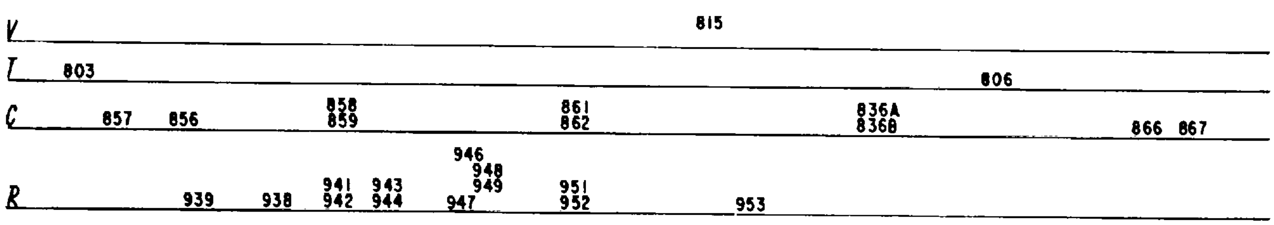
X (easting) servoamplifier circuit diagram--Continued.



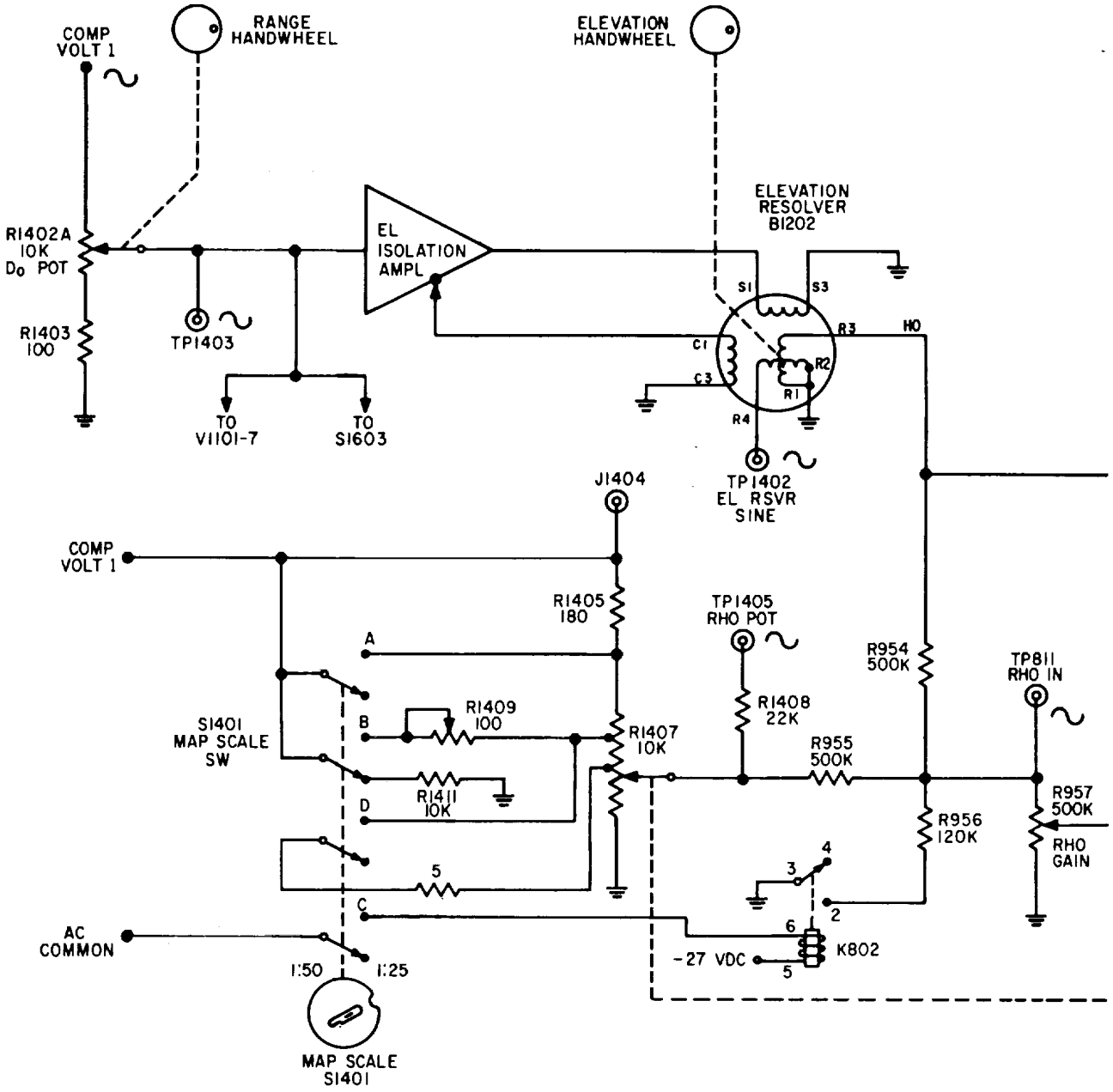
Y (northing) servoamplifier circuit diagram .



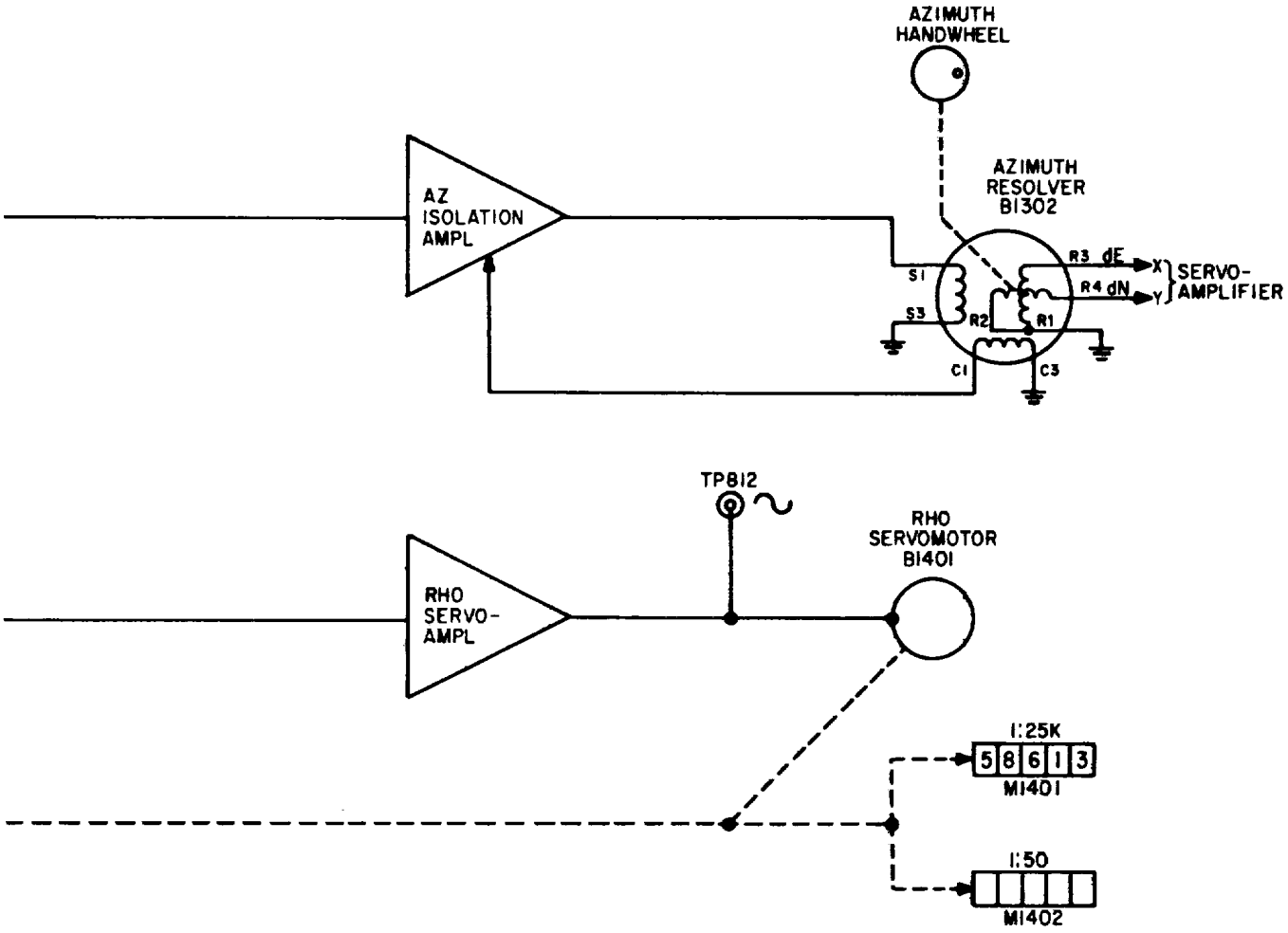




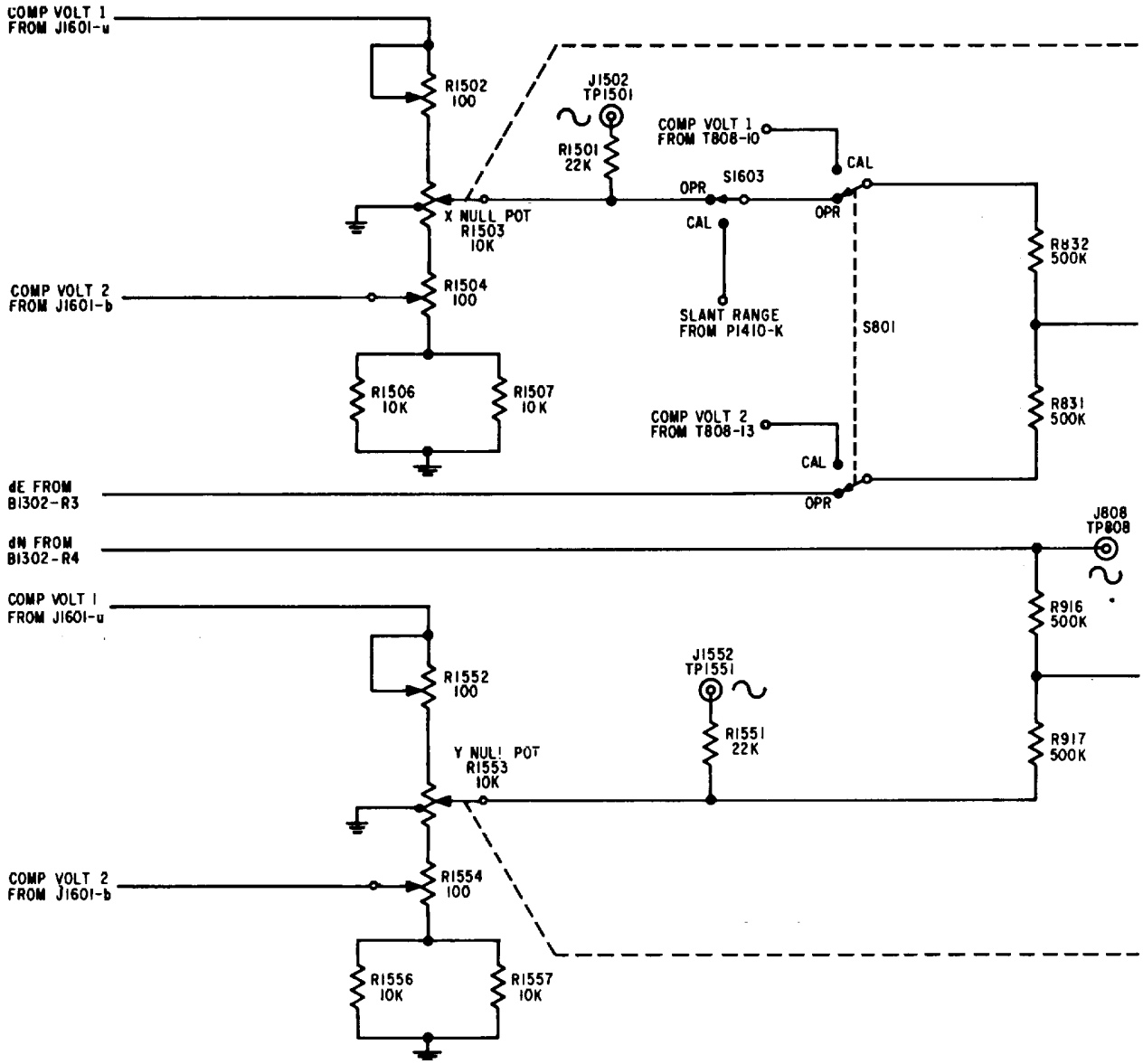
Y (northing) servoamplifier circuit diagram--Continued .



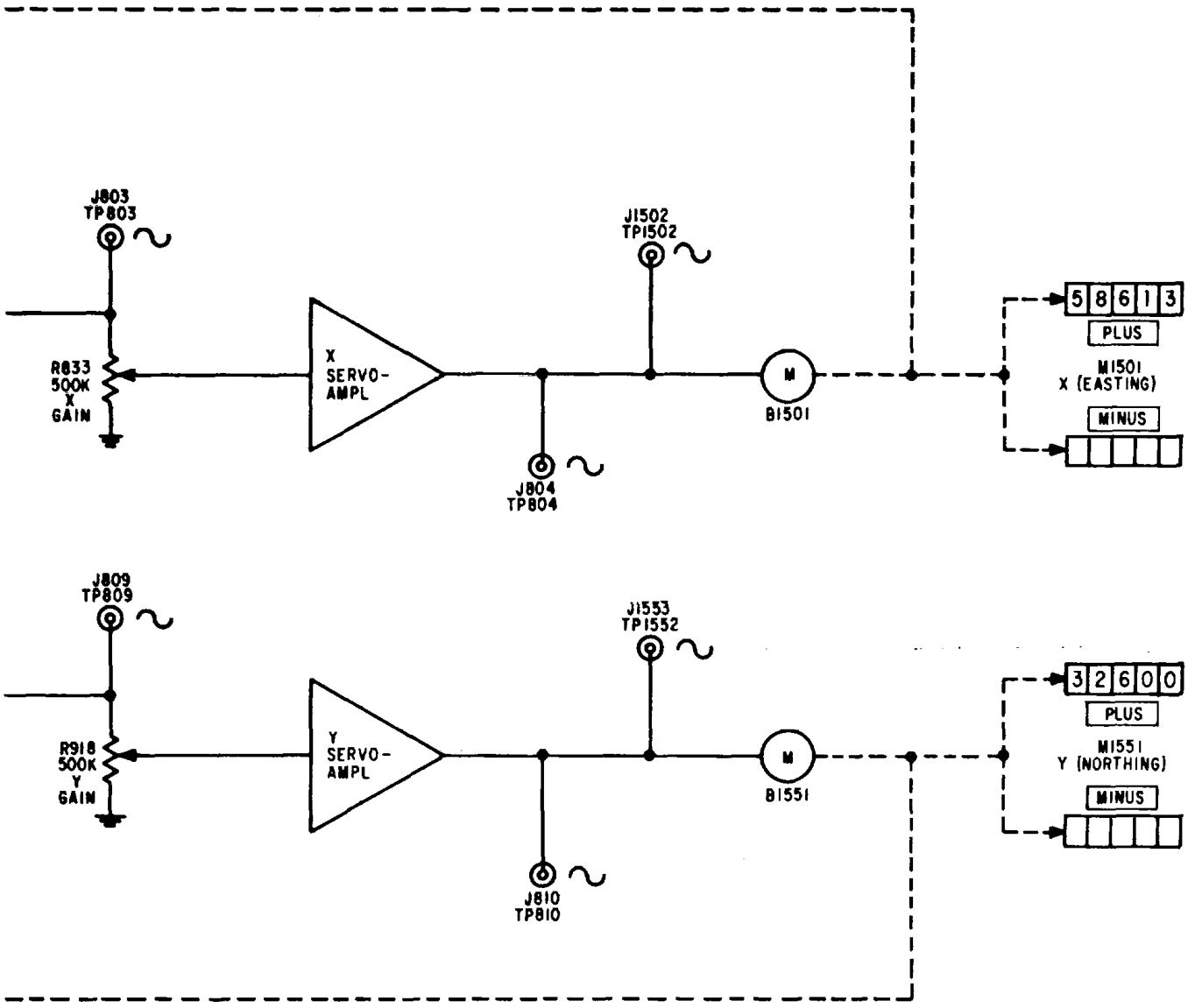
Computer data flow chart I .



Computer data flow chart I--Continued .



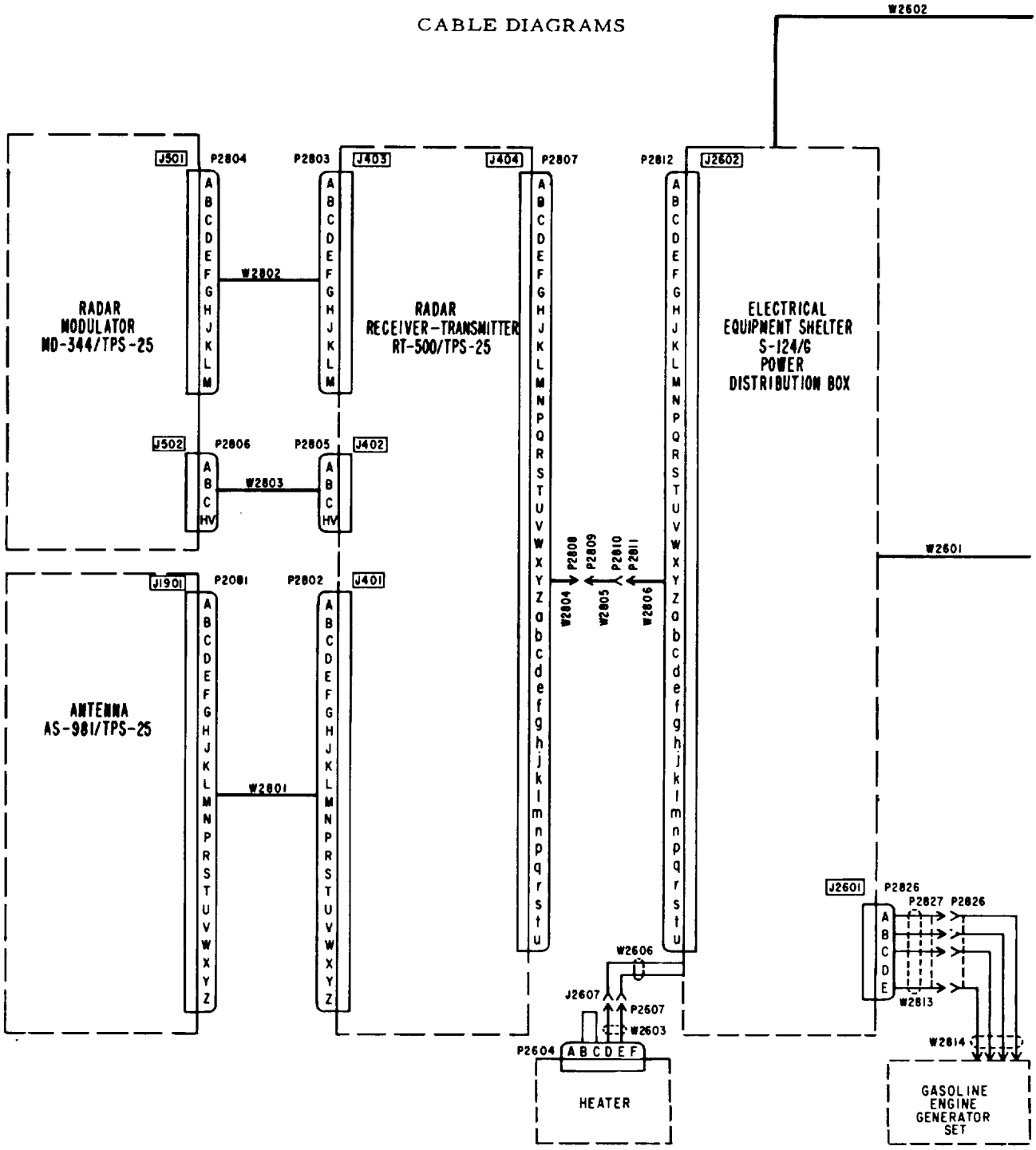
Computer data flow chart II .



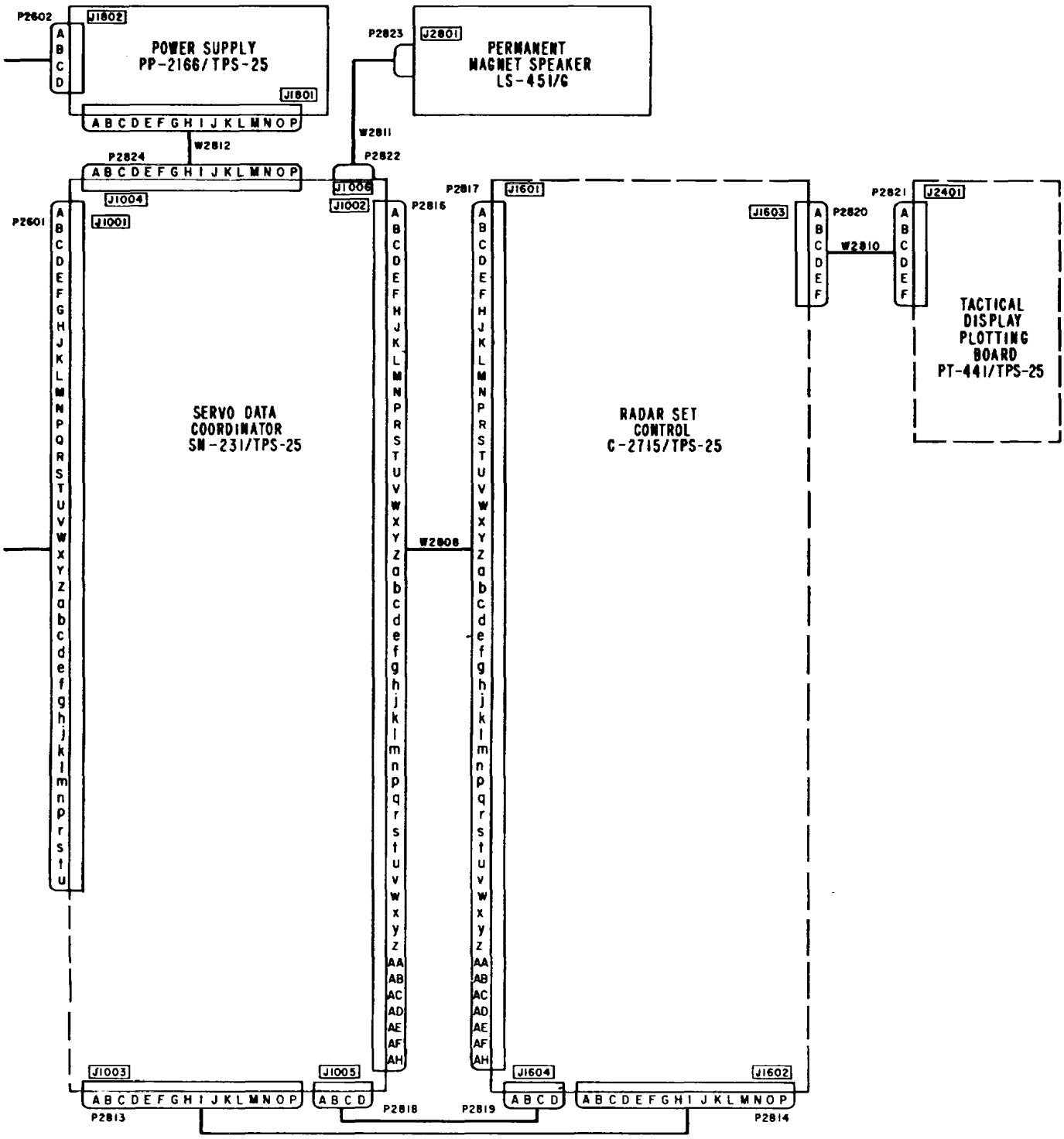
Computer data flow chart II--Continued .

CHAPTER 5

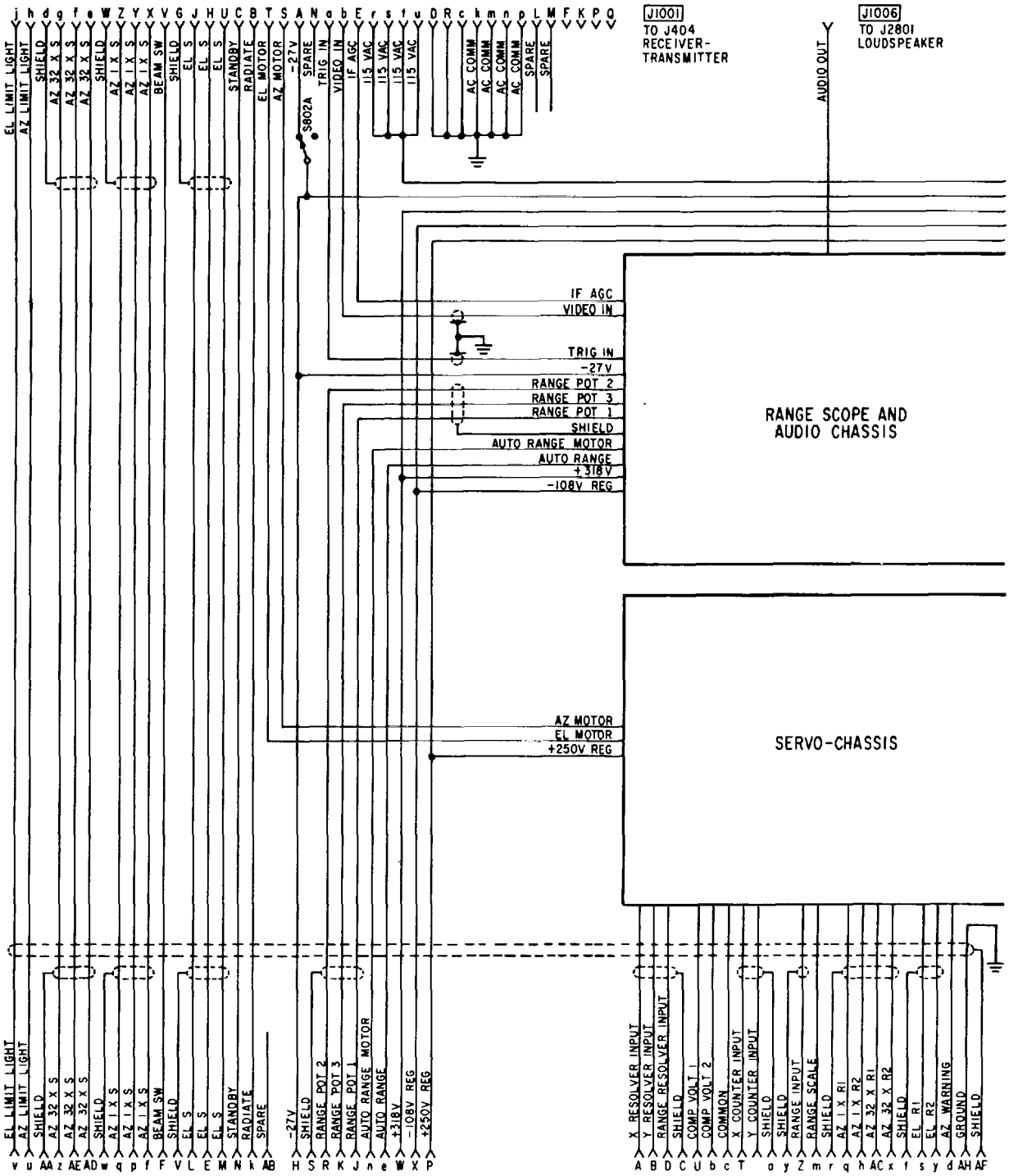
CABLE DIAGRAMS



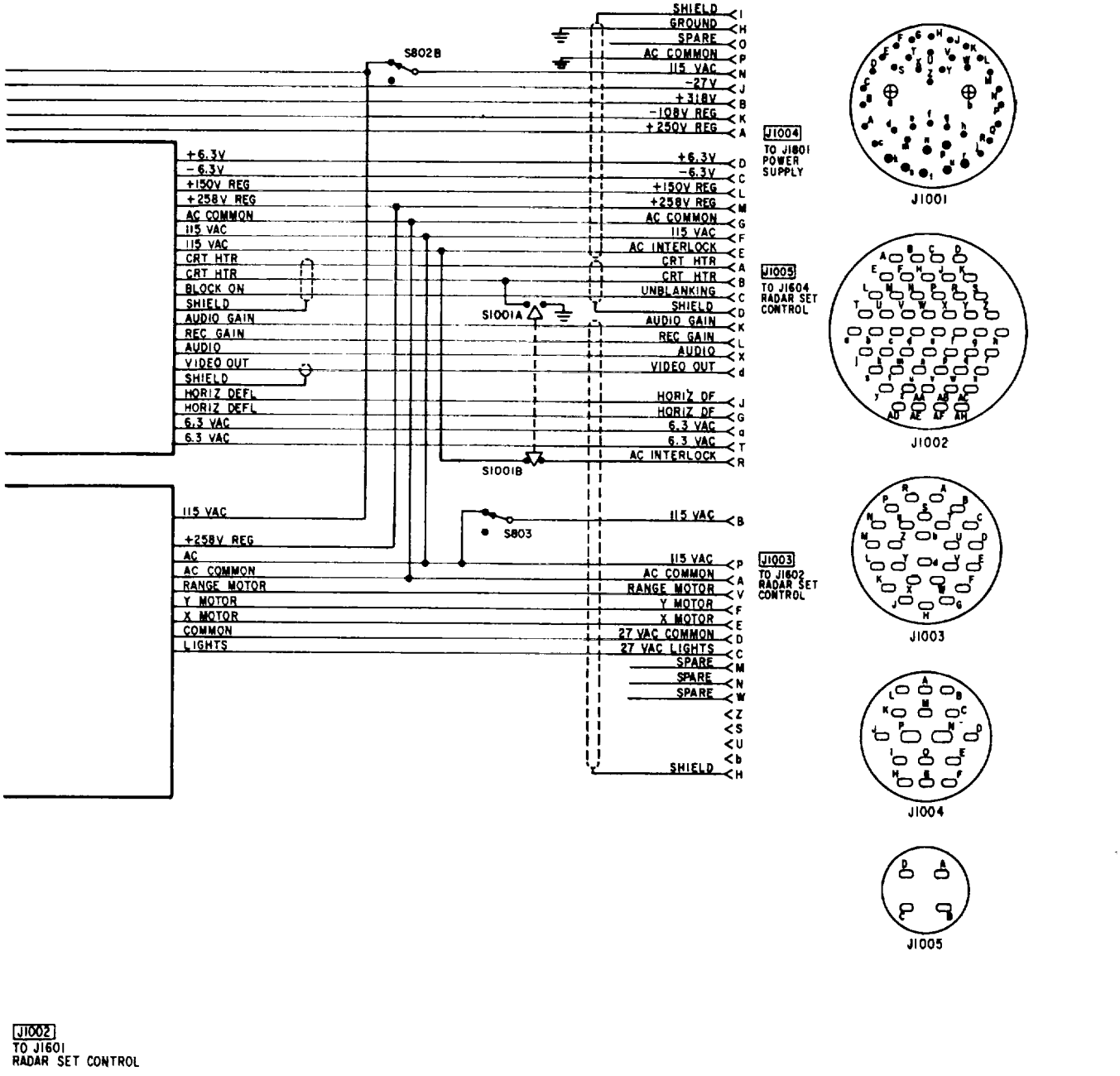
Intercabling diagram .



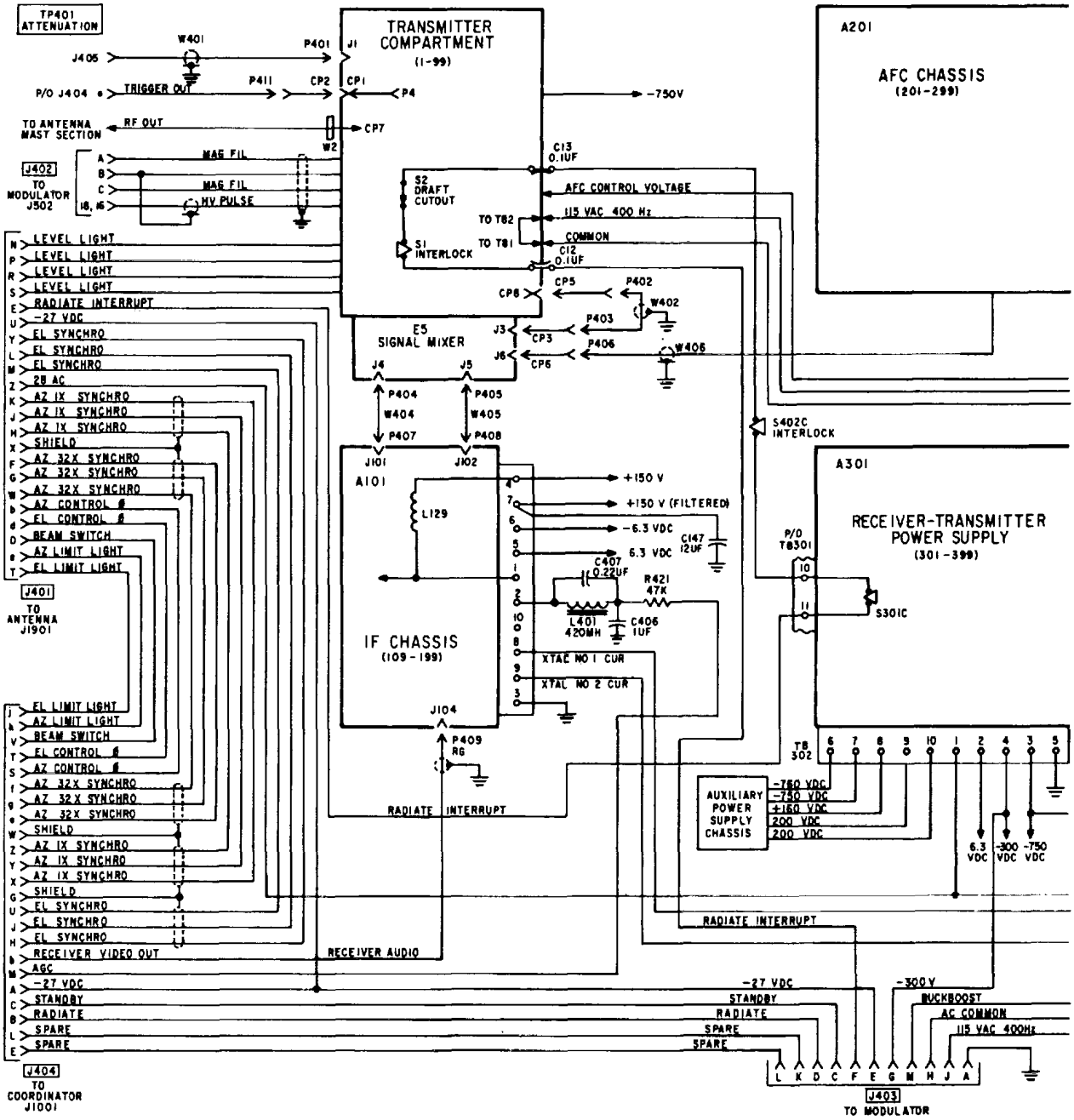
Intercabling diagram--Continued .



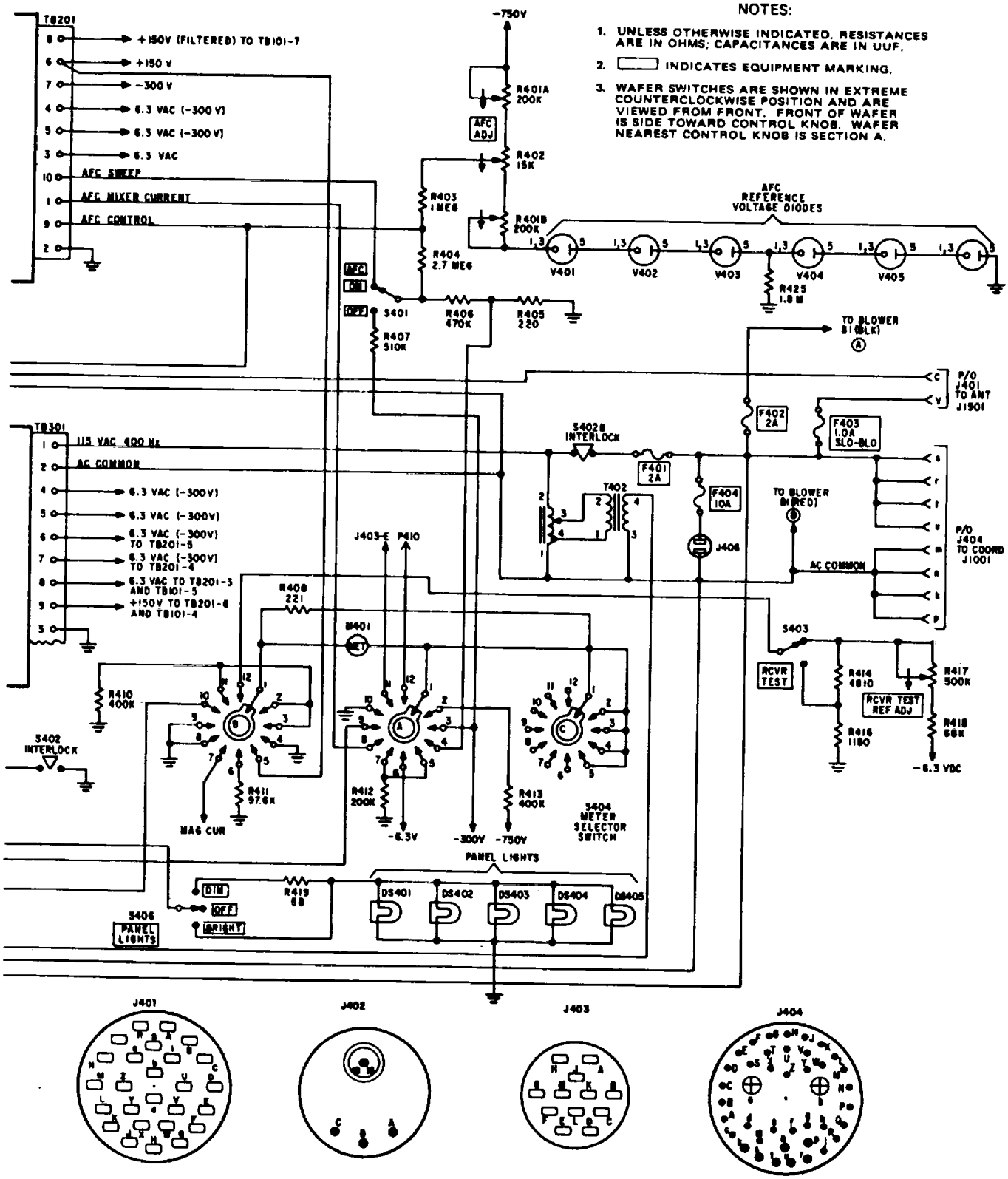
Servo data coordinator interwiring diagram .



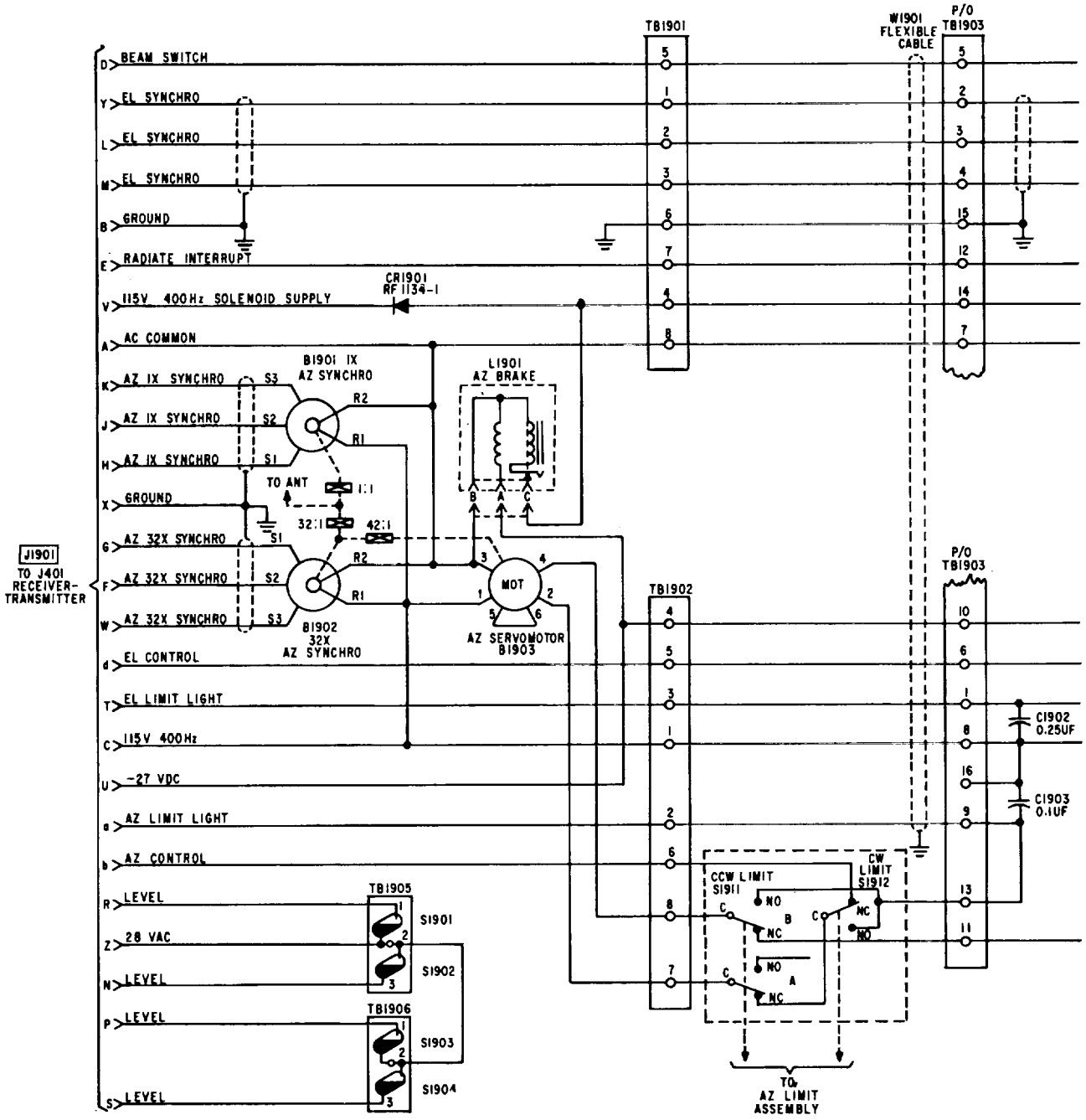
Servo data coordinator interwiring diagram--Continued .



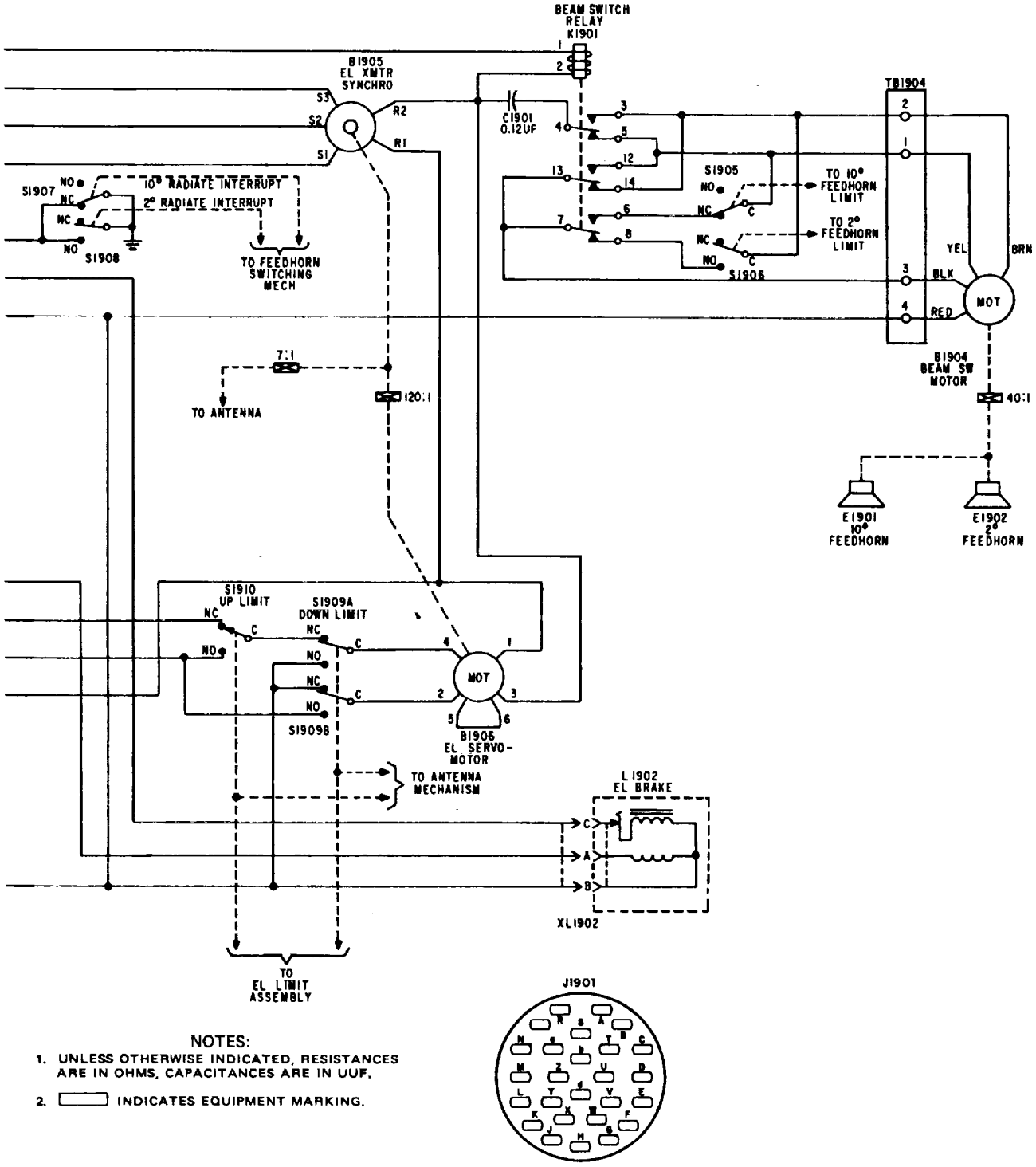
Receiver-transmitter interwiring diagram .



Receiver-transmitter interwiring diagram--Continued .



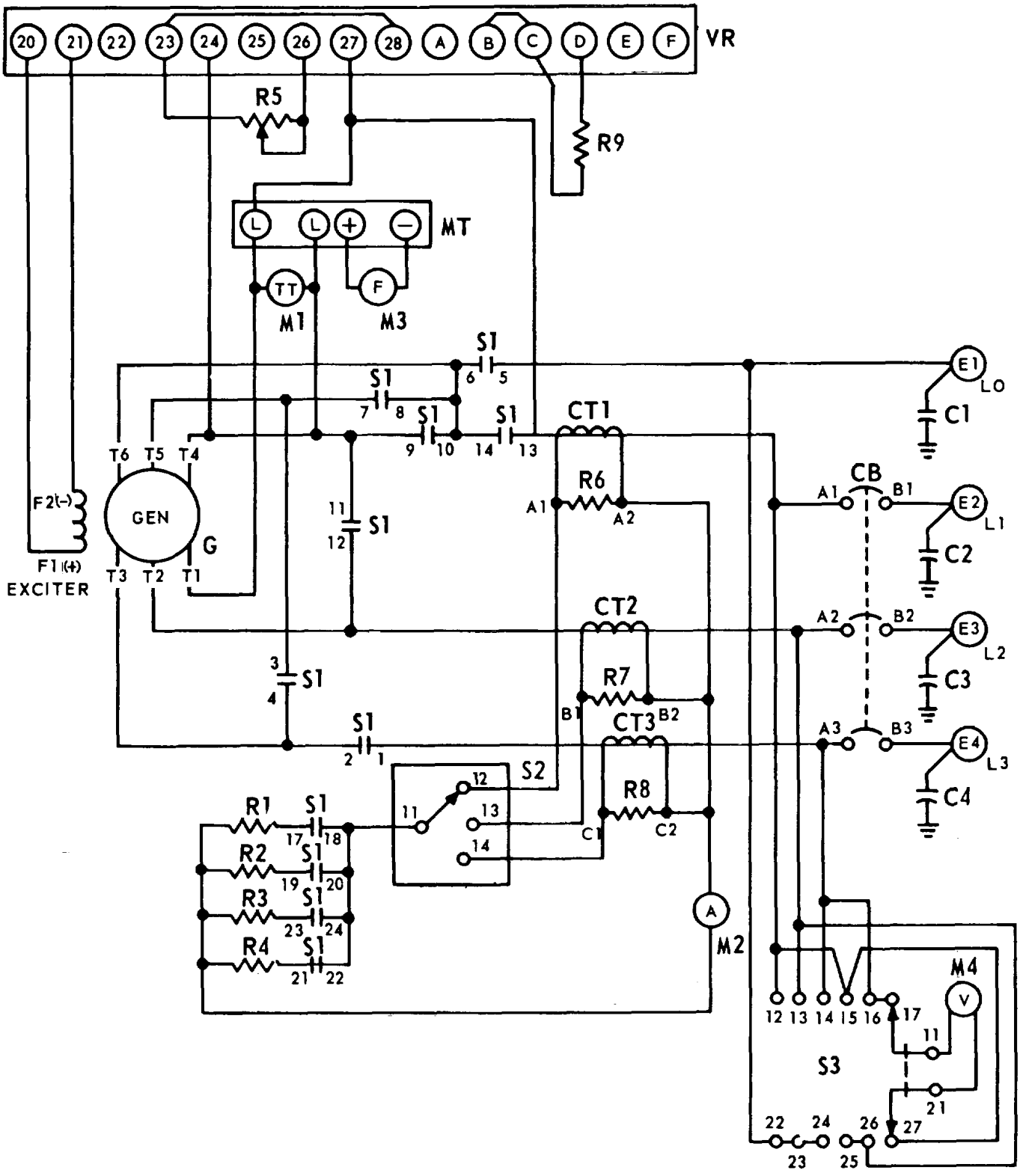
Antenna interwiring diagram .



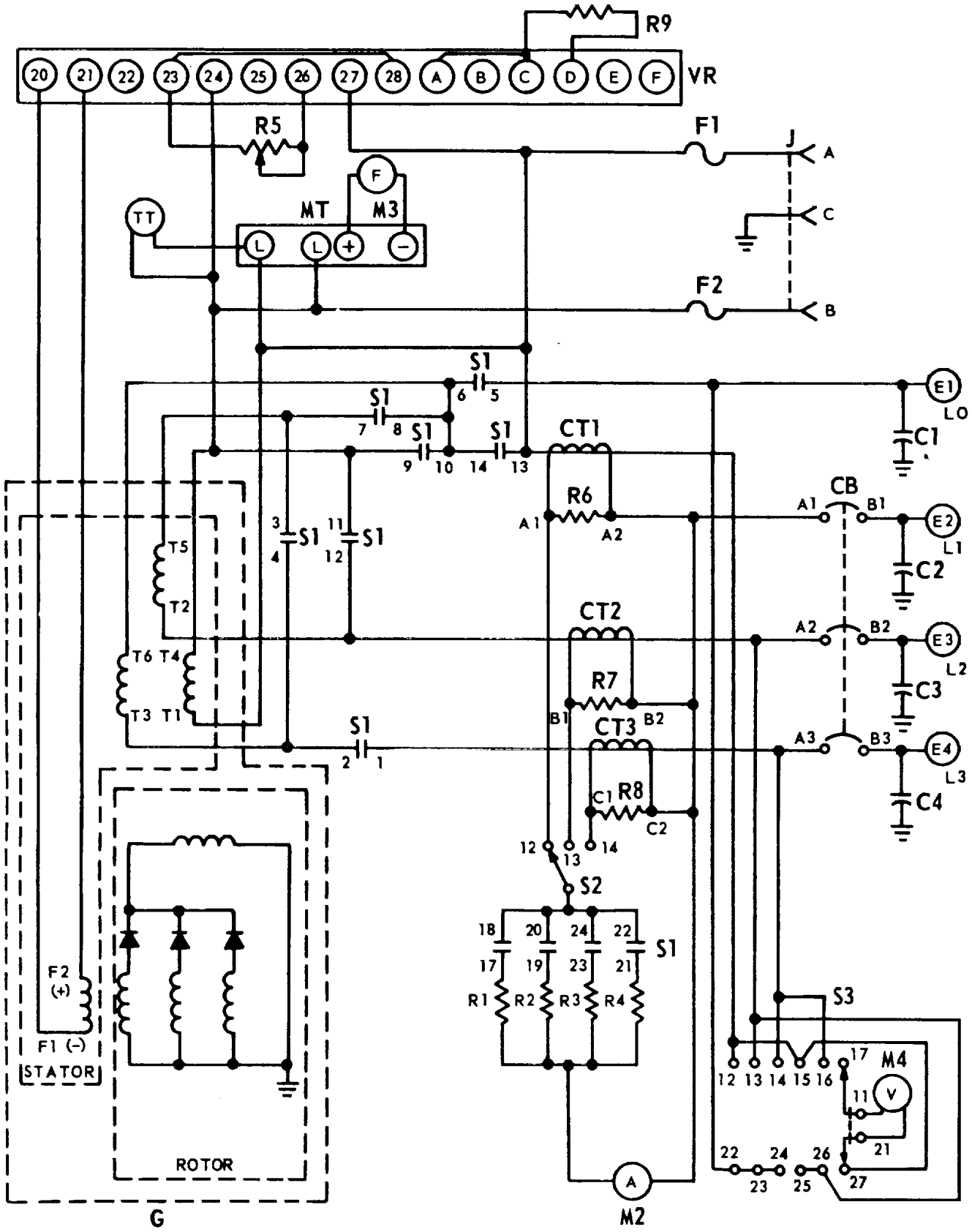
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. ▭ INDICATES EQUIPMENT MARKING.

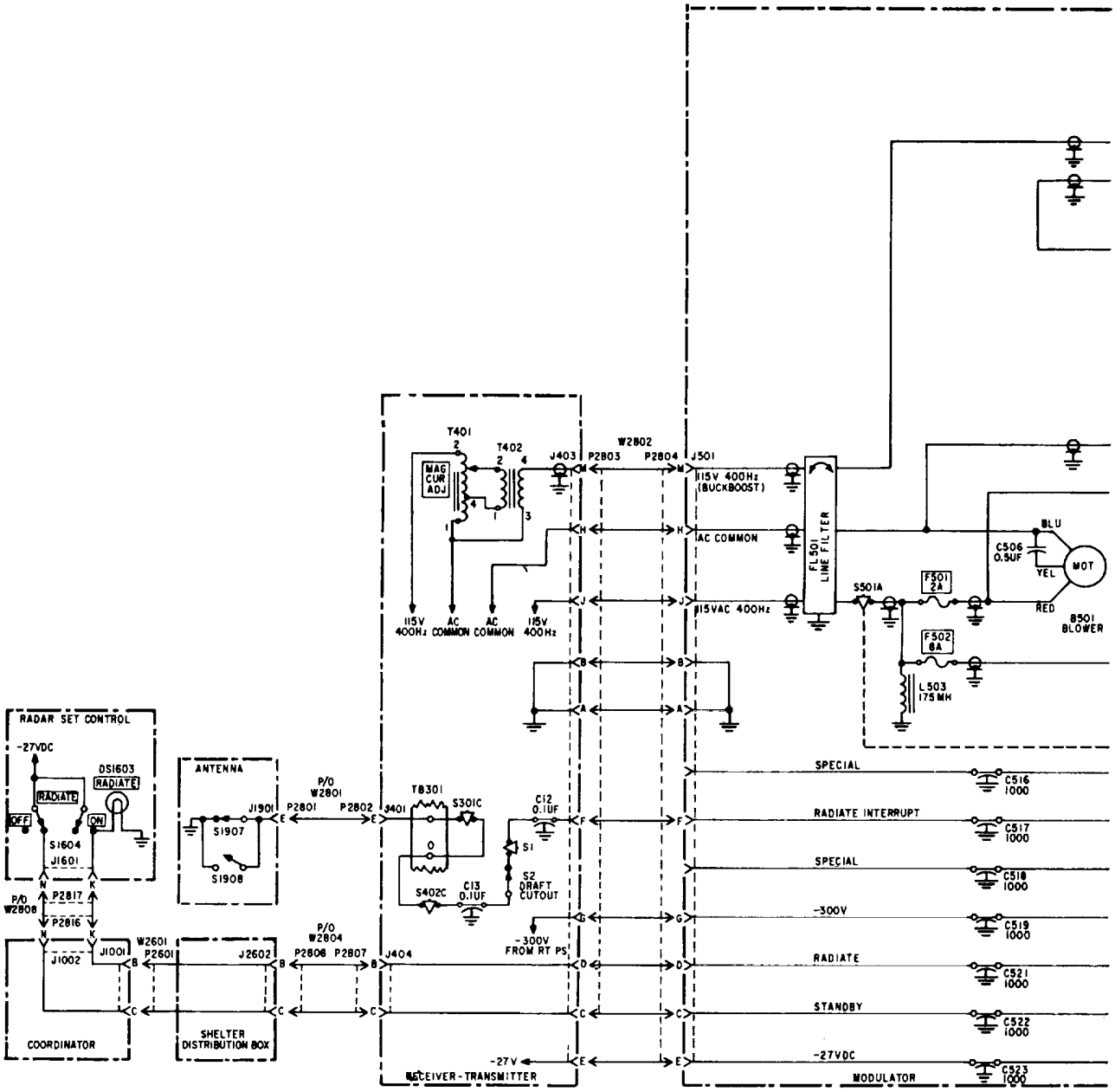
Antenna interwiring diagram--Continued .



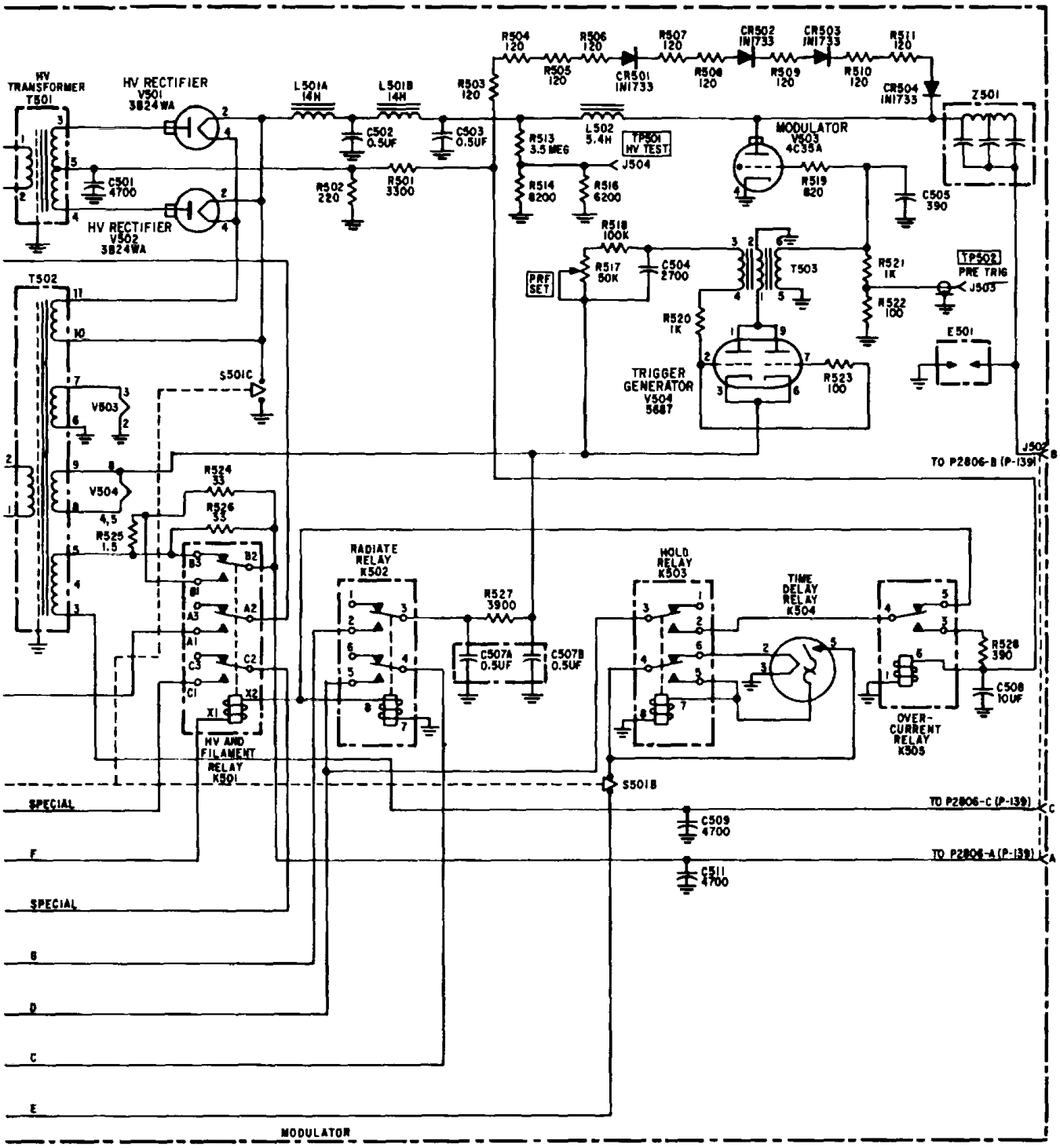
Generator schematic diagram 3KW, 60HZ, AC .



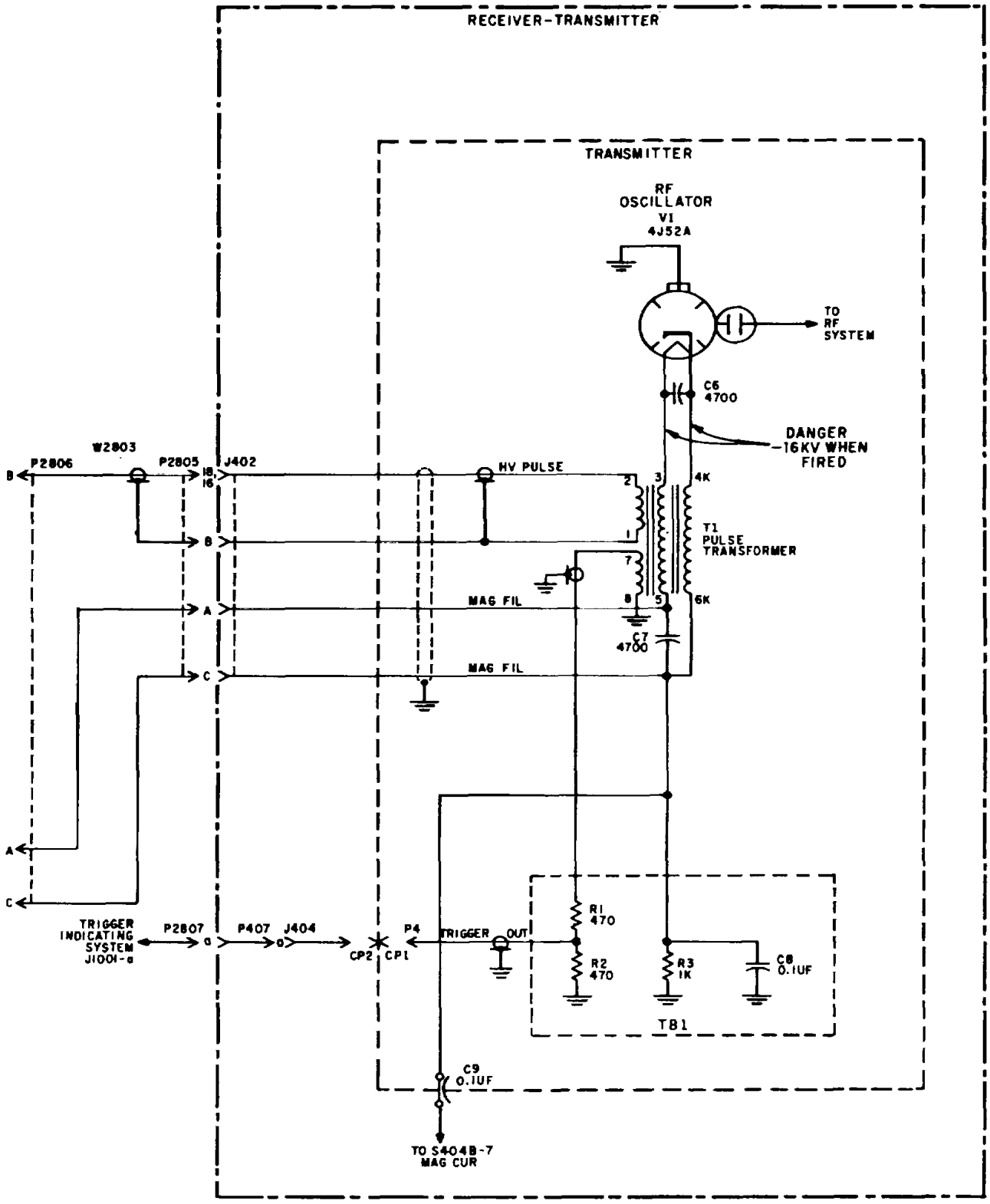
Generator schematic diagram 3Kw, 40uHZ . , AC (Model MEP-021AJ .



Transmitting system interwiring diagram .

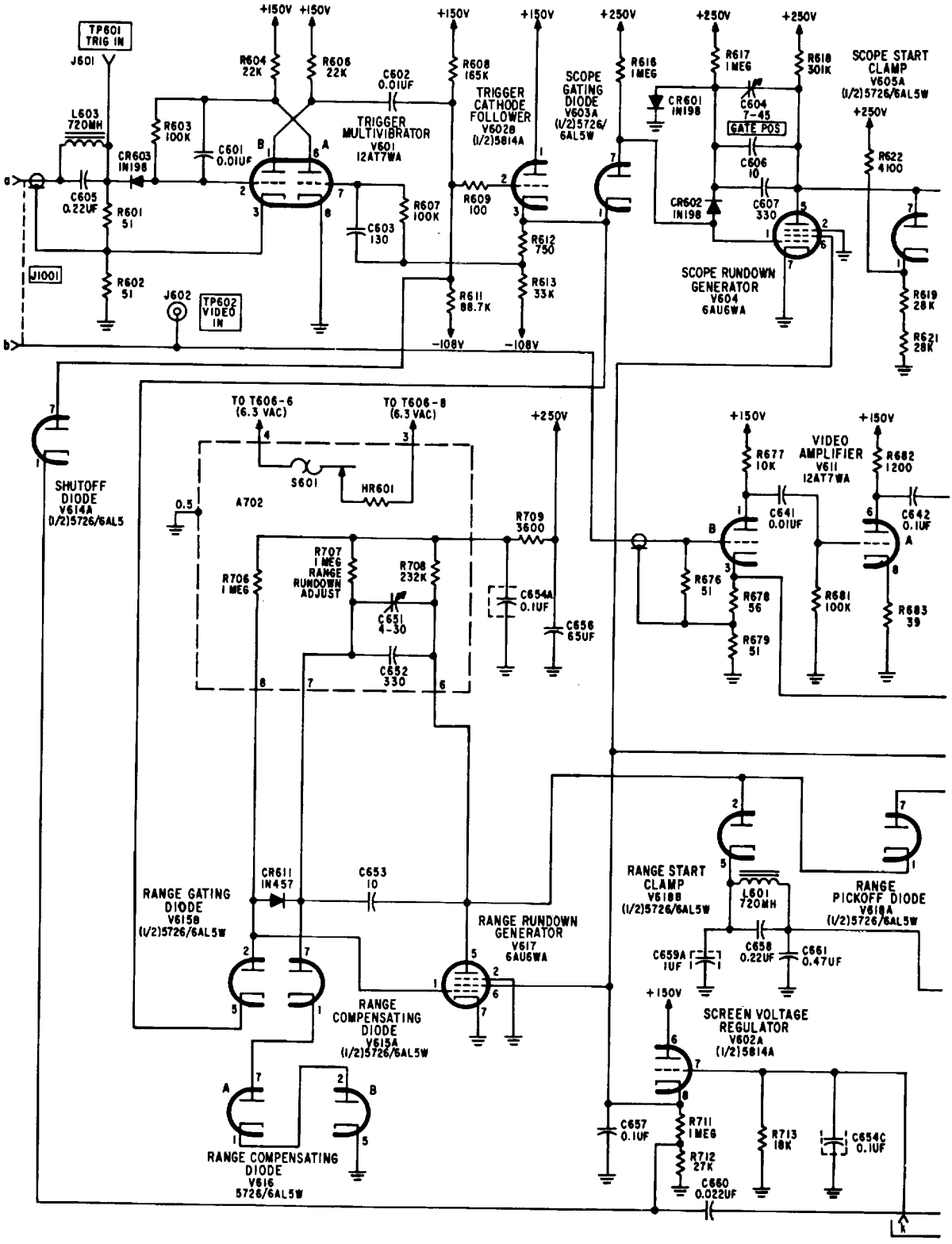


Transmitting system interwiring diagram--Continued .

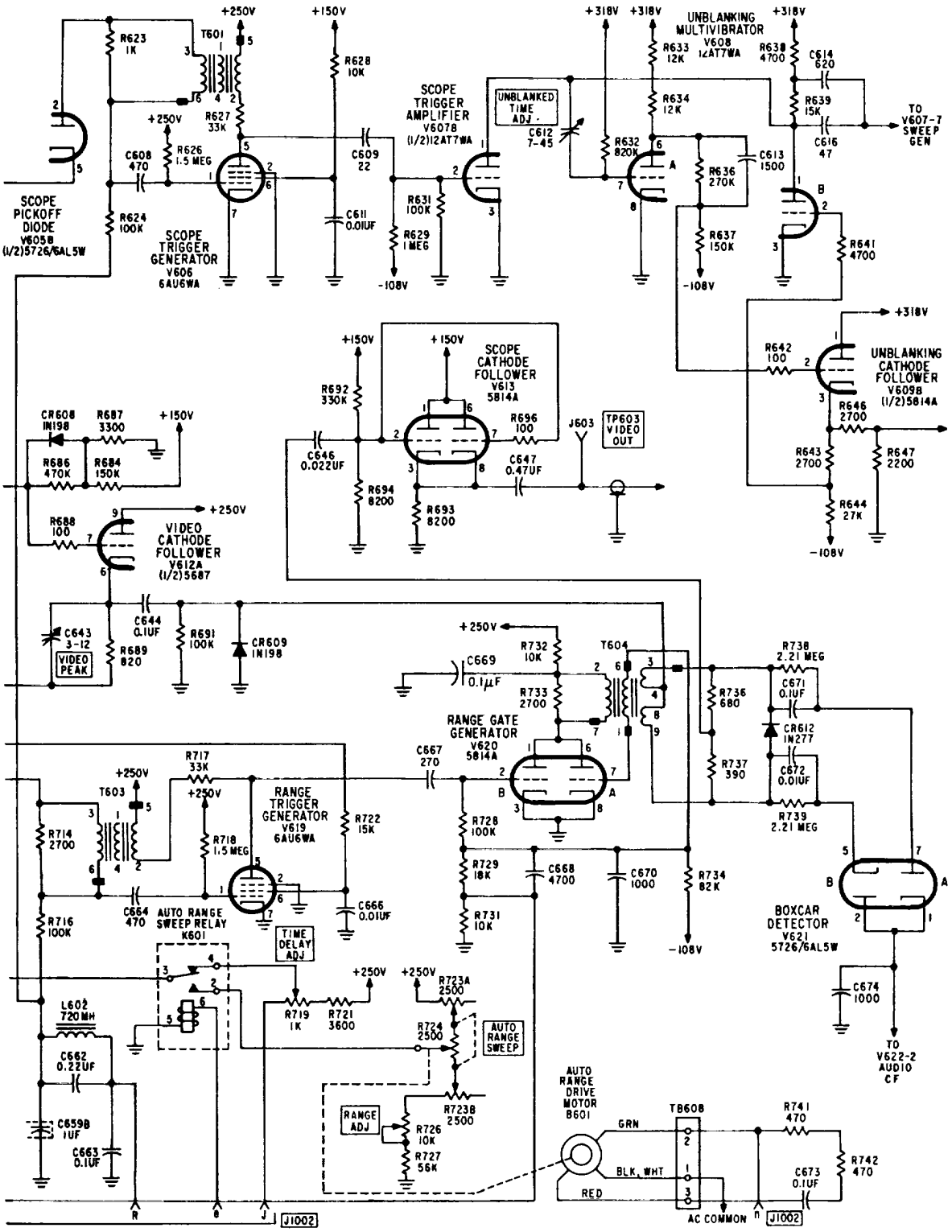


Transmitting system interwiring diagram--Continued .

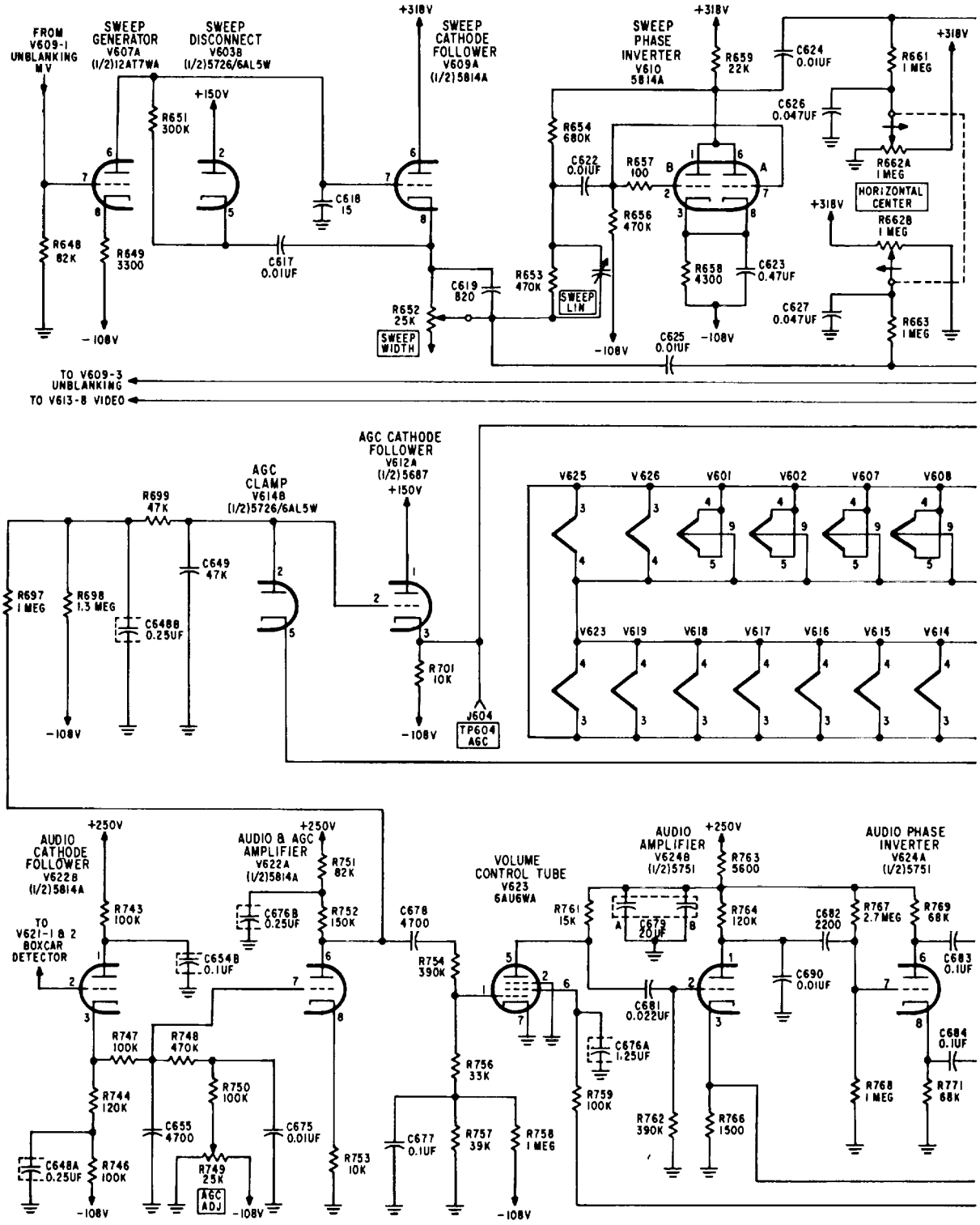
NOTES:



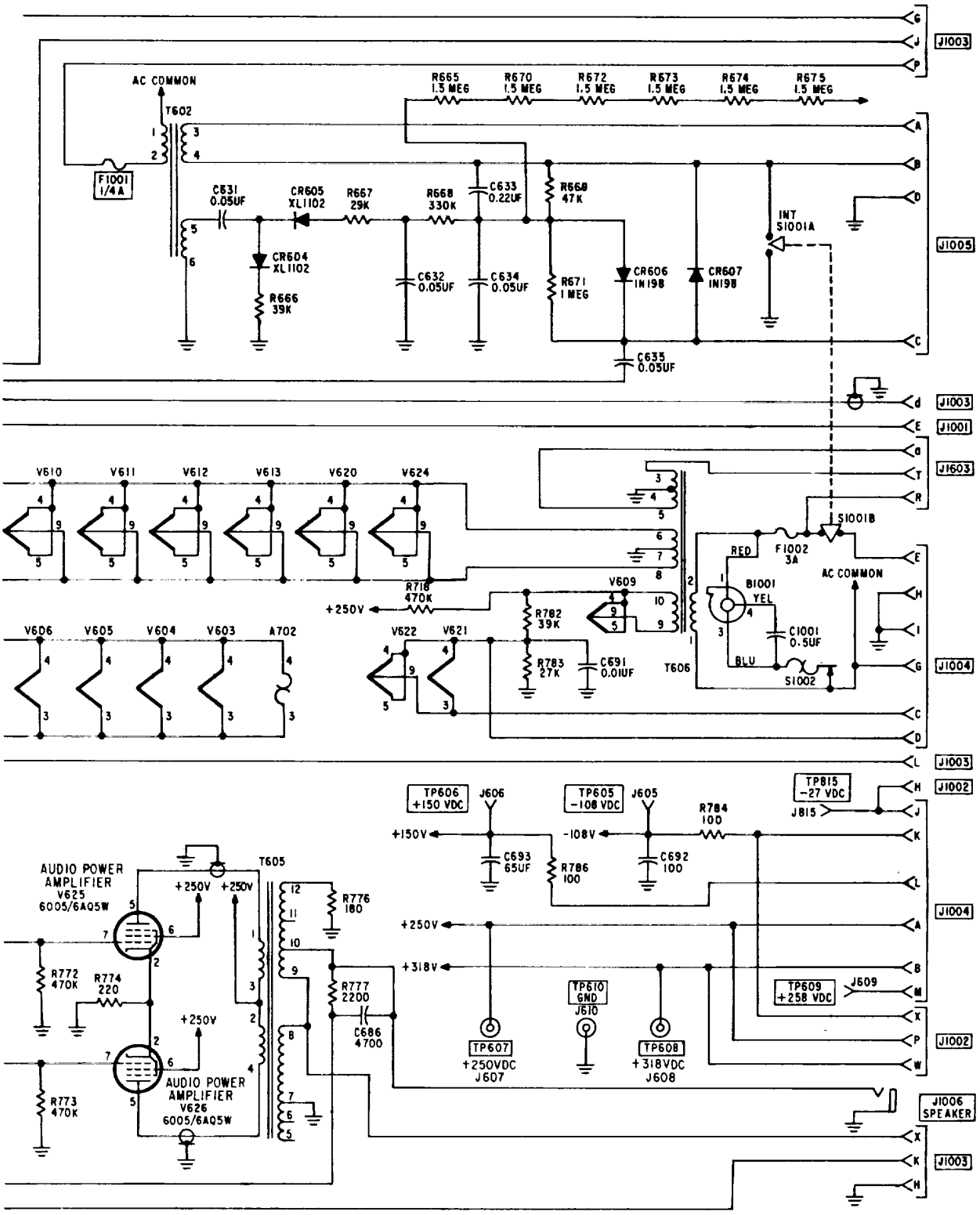
Range and scope timing circuits.



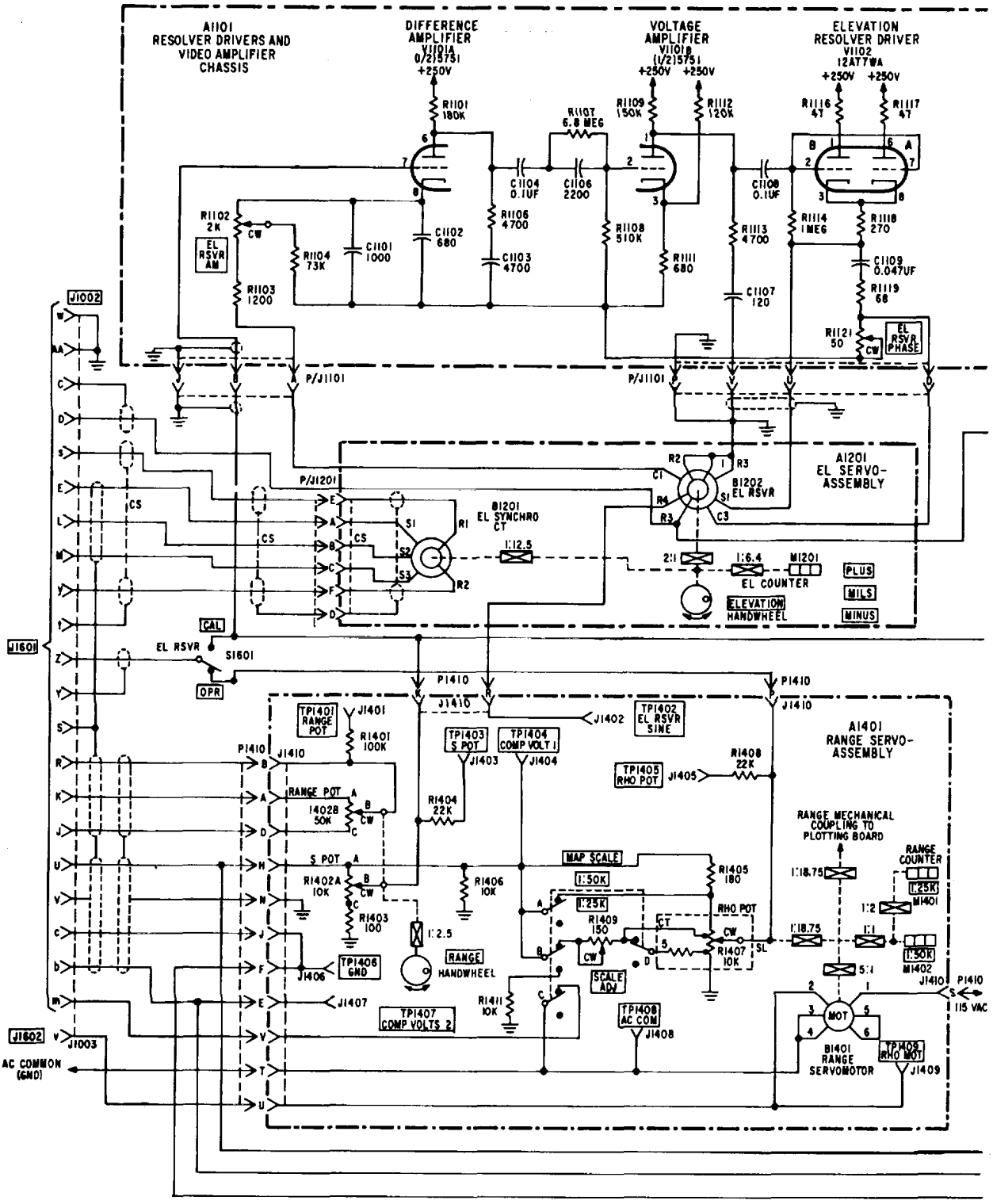
Range and scope timing circuits--Continued.



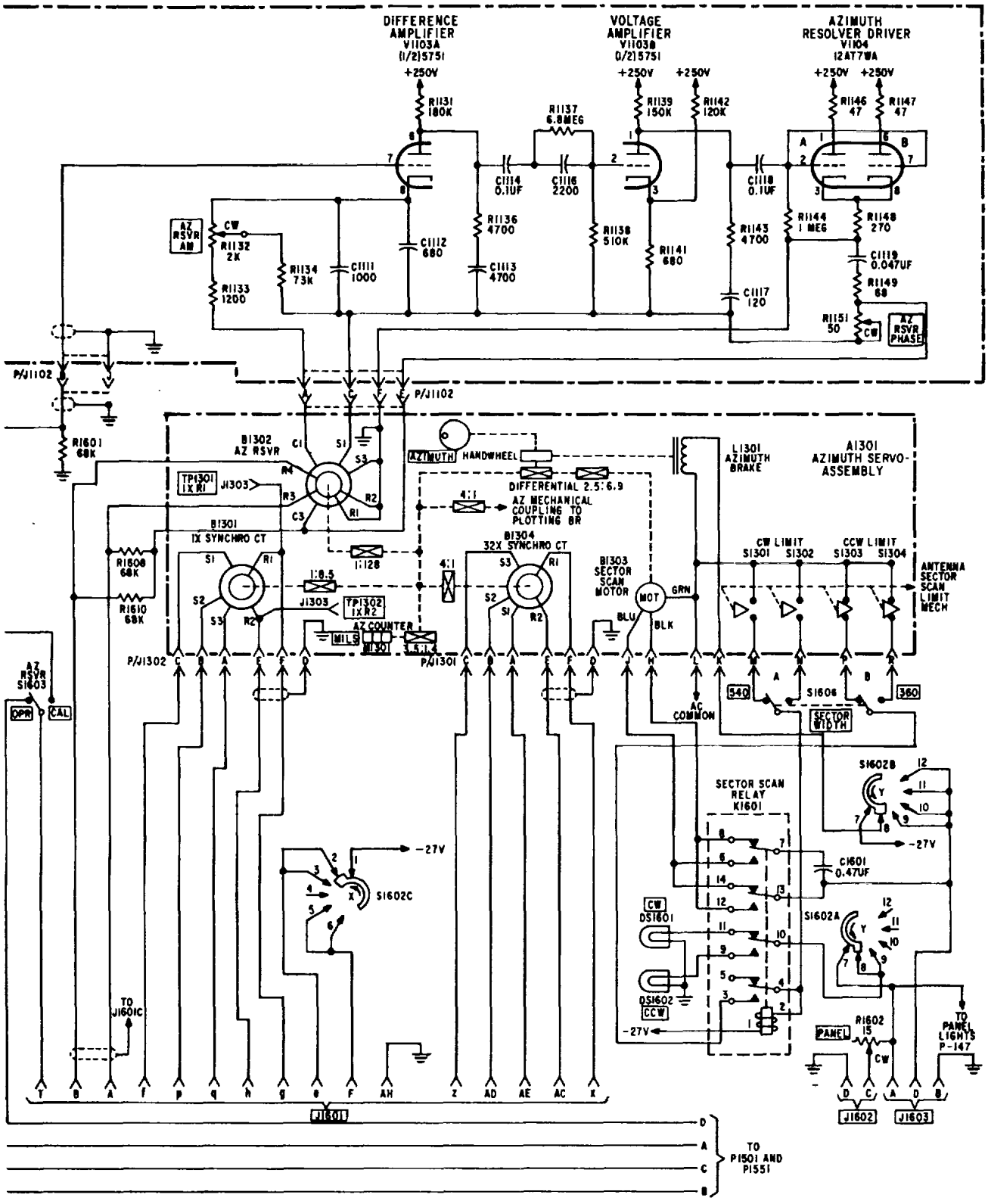
Sweep and audio circuits.



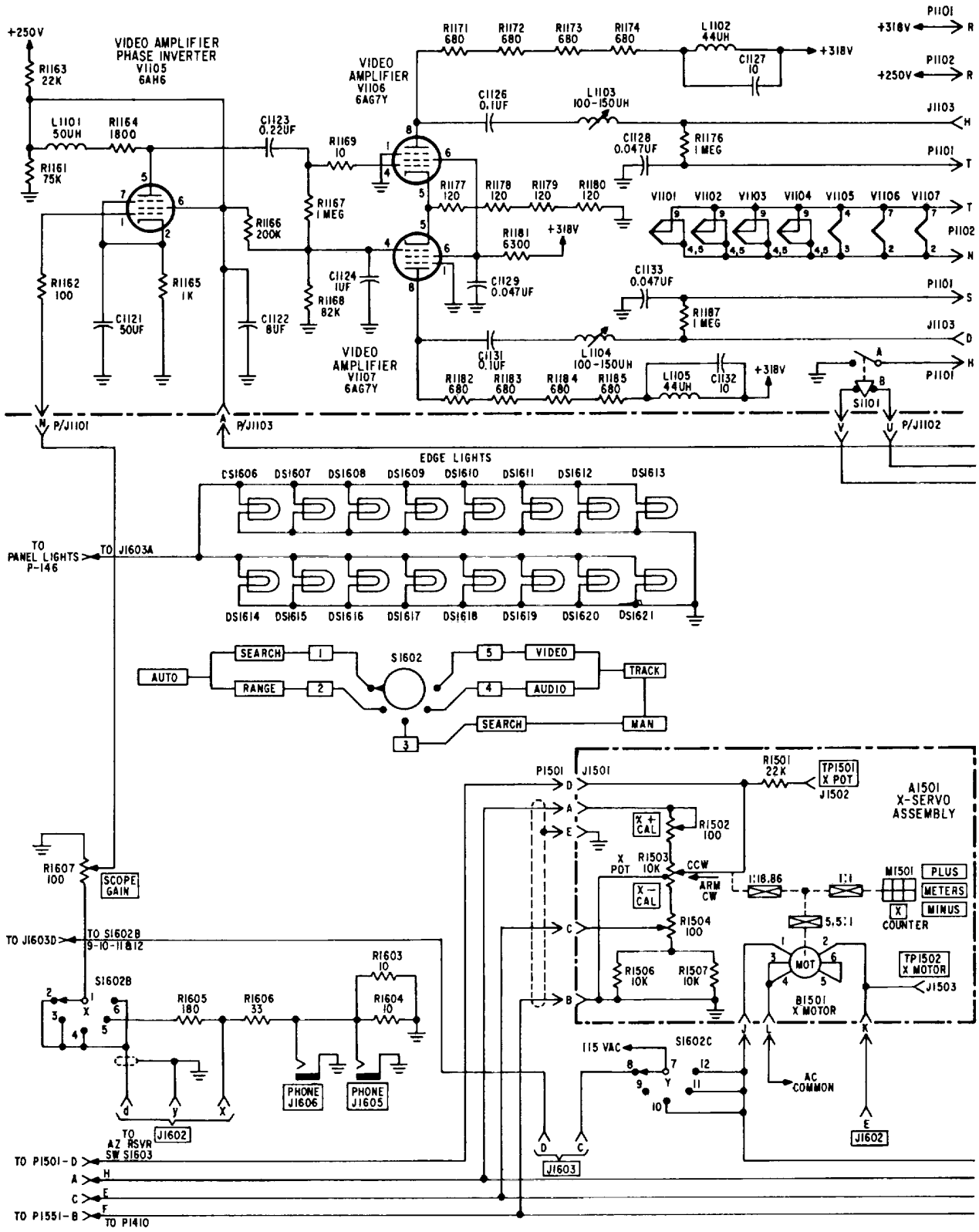
Sweep and audio circuits--Continued.



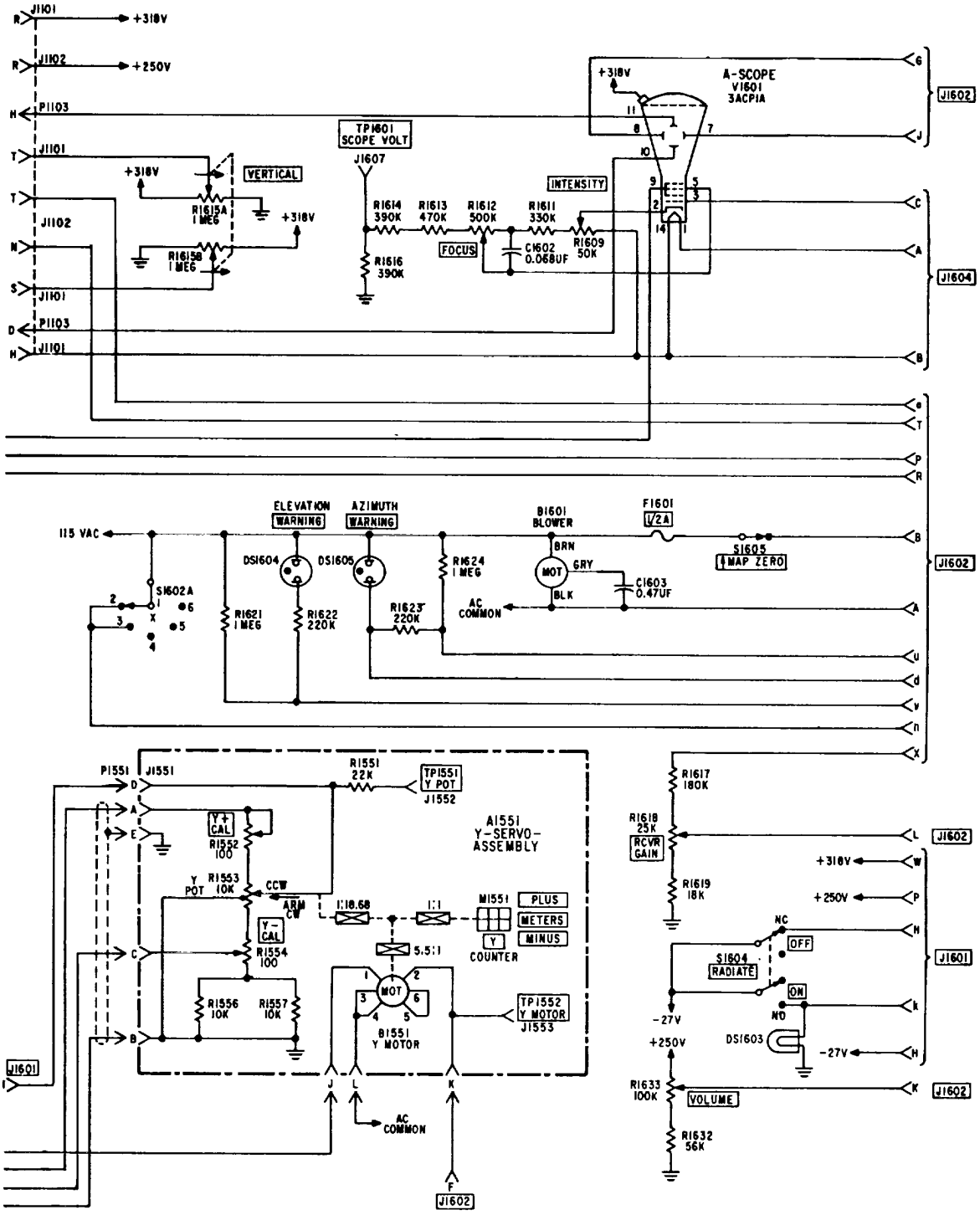
Radar set control I.



Radar set control I--Continued.



Radar set control II.



Radar set control II--Continued.

CHAPTER 6

FIELD ADJUSTMENTS

6-1. +250 VDC ADJUSTMENT

a. Connect the multimeter test leads to pin L(-) and pin G(+) of test point (TP) 1801.

b. Loosen the locknut and adjust +250 ADJ pot R1819 for a reading of 250 +2. 5 VDC on the meter.

c. Tighten the locknut and remove the test leads.

6-2. REP-RATE ADJUSTMENT

Note: Transmitter must be radiating when this adjustment is made.

a. Connect the oscilloscope test probe to PRE-TRIG TP502 and set scope time for . 1M **sec.**

b. Loosen the locknut and adjust PRF SET pot R517 for a period of 540 ;sec.

c. Tighten the locknut and remove the test leads.

6-3. MAGNETRON CURRENT ADJUSTMENT

Note: Transmitter must be radiating when this adjustment is made.

a. Place the meter switch in the MAG CUR position.

b. Adjust the MAG CUR ADJ knob for a reading of 0.7 (14 ma) on the meter.

6-4. RECEIVER TUNING

Warning: Extremely high voltages are present in these units when the transmitter is radiating; avoid any contact with the equipment.

a. Turn the LO ADJ screw fully cw and then ccw 4 1/2 turns.

b. Place the meter switch in the AFC AM position.

c. Turn AFC ADJ pot R402 to midrange.

d. Connect the multimeter (-500 VDC range) to TB201-9 and ground.

e. Loosen the locknut and, while holding the AFC switch in the OFF position, adjust pot R401 for a reading of -415 VDC.

f. Release the AFC switch and turn the LO ADJ screw one turn ccw. Crystal current should be indicated. If not, turn the ATTEN 1 ADJ screw cw.

g. Press the RADIATE switch.

h. Turn the LO ADJ screw cw until the crystal current stops sweeping. Continue turning the screw slowly until the crystal current peaks. At that time, the klystron should be locked on.

6-5. SWEEP WIDTH AND LINEARITY ADJUSTMENT

Adjust SWEEP WIDTH pot R652 and SWEEP LINEARITY capacitor C621 until the sweep extends the full width of the cathode ray tube.

Note: If these controls are not set properly, the range gate will not sweep the full width in AUTO.

6-6. GATE POSITION ADJUSTMENT

Rotate the RANGE handwheel from minimum to maximum range. The range gate should not move; if it does, adjust capacitor C604.

6-7. RANGE CALIBRATION

Note: These adjustments require two accurately surveyed targets at ranges of approximately 5, 000 and 1,000 meters.

a. With the target at a range of 1,000 meters gated in the trailing portion of the range gate, adjust TIME DELAY pot R719 for maximum audio with the RANGE counter indicating the exact range to the target.

b. With the target at a range of 5, 000 meters gated similarly, adjust RANGE-RUNDOWN capacitor C651 for maximum audio with the RANGE counter indicating the exact range to the target.

Note: These adjustments will interact and will have to be repeated at least three times.

6-8. AUTO RANGE SWEEP AND RANGE ADJUSTMENT

a. Place AUTO-MAN switch S1602 in the AUTO RANGE position.

b. Adjust RANGE ADJ pot R726 so that the range gate starts at the same place when the AUTO-MAN switch is in a manual position and when the switch is in an automatic position.

c. Adjust AUTO RANGE pot R723 so that the range gate sweeps 900 meters in range.

CHAPTER 7

COMPUTER SYSTEM ADJUSTMENTS

7-1. GENERAL

a. This chapter covers the procedures for all adjustments in the computer system. The adjustments are made in the coordinator and radar set control.

b. Before making any of the adjustments, place the POWER ON-OFF switch to the ON position and check the reading on meter M1001 for 115 VAC ± 5 VAC. Also check the +250 VDC REG at TP1801 and adjust if necessary.

7-2. SEQUENCE

To align the computer system, perform the following adjustments in the order listed:

a. Range servo amplifier gain and balance adjustments.

b. X servoamplifier gain and balance adjustments.

c. Y servoamplifier gain and balance adjustments.

d. Computing voltage phase and amplitude balance adjustments.

e. Range pot alinement.

f. RHO pot alinement.

g. Elevation resolver and counter alinement.

h. Elevation resolver driver amplifier adjustment.

i. Map scale alinement.

j. Azimuth resolver and counter alinement.

k. Azimuth resolver amplifier alinement.

l. X and Y counter alinement.

m. Plotting board light focus adjustment.

7-3. RANGE SERVOAMPLIFIER GAIN AND BALANCE ADJUSTMENTS

a. Connect the oscilloscope to RHO MOTOR TP812 and GRD TP813.

b. Loosen the locknut of RHO GAIN pot R957 and turn R957 to the maximum cw position.

c. Turn pot R957 ccw until the RANGE counter oscillations stop. Do not adjust beyond this point.

d. Rotate the RANGE handwheel throughout its entire range, stopping several times to observe for signs of oscillations on the oscilloscope or RANGE counter. If oscillations occur, reduce the gain slightly and recheck entire range. Lock pot R957 in position.

e. Place X-Y-RHO switch S803 to the CAL position.

f. Connect a jumper across RHO IN TP8II and GRD TP813.

g. Loosen the locknut of RHO BAL pot R977 and adjust for a null of not more than 7 VAC peak-to-peak.

h. Lock the pot and recheck the null.

i. Return S803 to the OPR position; remove the oscilloscope leads and jumper.

7-4. X SERVOAMPLIFIER GAIN AND BALANCE ADJUSTMENTS

a. Connect the oscilloscope to X MOTOR TP804 and GRD TP813.

b. Loosen the locknut of X GAIN pot R833 and turn R833 to its maximum cw position.

c. Turn pot R833 ccw until the X counter oscillations stop. Do not adjust beyond this point.

d. Rotate the RANGE and AZIMUTH handwheels throughout their ranges, stopping each handwheel several times to observe for signs of oscillations on the oscilloscope or X counter. (If the plotting board is used, declutch the azimuth coupling.) If oscillations occur at any range or azimuth, reduce the gain slightly and recheck entire range of controls. Lock pot R833 in position.

e. Set the X-Y-RHO switch S803 to the CAL position.

f. Connect a jumper across X IN TP803 and GRD TP813.

j. Loosen the locknut of X BAL pot R852 and adjust for a null of less than 7 VAC peak-to-peak.

h. Lock the pot and recheck the null.

i. Return S803 to the OPR position; remove the oscilloscope leads and jumper.

7-5. Y SERVOAMPLIFIER GAIN AND BALANCE ADJUSTMENTS

a. Connect the oscilloscope to Y MOTOR TP810 and GRD TP813.

b. Loosen the locknut of Y GAIN pot R918 and turn R918 to its maximum cw position.

c. Turn pot R918 ccw until the Y counter oscillations stop. Do not adjust beyond this point.

d. Rotate the RANGE and AZIMUTH handwheels throughout their ranges, stopping each handwheel several times to observe for signs of oscillations on the oscilloscope or Y counter. (If the plotting board is used, declutch the azimuth coupling.) If oscillations occur at any range or azimuth, reduce the gain slightly and recheck entire range of controls. Lock pot R918 in position.

e. Place the X-Y-RHO switch in the CAL position.

f. Connect a jumper across Y IN TP809 and GRD TP813.

g. Loosen the locknut of Y BAL pot R936 and adjust R936 for a null of less than 7 VAC peak-to-peak.

h. Lock the pot and recheck the null.

i. Return S803 to the OPR position; remove the oscilloscope leads and jumper.

7-6. COMPUTING VOLTAGE PHASE AND AMPLITUDE BALANCE ADJUSTMENTS

a. Set the X-Y-RHO switch to CAL.

b. Set COMP VOLT BAL switch S801 to CAL.

c. Connect the oscilloscope to X IN TP803 and GRD TP813.

d. Loosen the locknuts and adjust COMP VOLT AMPL pot R995 and COMP VOLT PHASE pot R997 for a null of less than 10 millivolts peak-to-peak as observed on the oscilloscope.

e. Tighten the locknuts on R995 and R997 and recheck the null.

f. Return S801 and S803 to the OPR position; remove the oscilloscope leads.

7-7. RANGE POT ALINEMENT

a. Set MAP SCALE switch S1401 to 1:25K.

b. Turn the ELEVATION handwheel so that the ELEVATION counter reads 0.

c. Rotate the RANGE handwheel to its maximum cw position.

d. Loosen the three clamps that secure pot R1402 to the range assembly.

e. Rotate the body of pot R1402 until the RANGE counter reads 18,288 meters. Permissible error is +20 meters.

Caution: When rotating pot R1402, do not exert undue pressure. Loosen the clamps further if R1402 does not turn freely. If the rear section of R1402 turns without an equal turning of the front section, replace the pot and realine the subassembly.

f. Tighten the three clamps and secure pot R1402 in place.

7-8. RHO POT ALINEMENT

a. Disconnect the lead attached to the cw terminal of R1407.

b. Turn the plotting board range coupling until the ccw stop on R1407 is reached.

Caution: To prevent damage to the pot, approach the stops on R1407 slowly and do not use force to turn the coupling.

c. Check to see that 1:25K RANGE counter M1401 reads 0 with R1407 at the ccw stop. If not, loosen the three screws mounting the clamps that hold R1407. Rotate R1407 with the range coupling (while holding the RANGE counter at 0), until the ccw stop coincides with zero range.

d. Connect the Wheatstone bridge across the cw and ccw terminals of R1407. Measure and record the resistance.

e. Turn the plotting board range coupling (observing the caution warning in b above) until the cw stop on R1407 is reached.

f. Measure and record the resistance across the cw and ccw terminals of R1407 with the Wheatstone bridge.

g. Select the larger of the two resistance readings in d and f above and record as $_{RA.}$
Compute for RB as follows:

RB = 0. 016 RA

h. Carefully set the bridge for RB (, above). Connect the Wheatstone bridge between the ccw and SL (slider) terminals of R1407. (Do not press the "read" buttons on the bridge at this time.)

i. Rotate the range coupling until the RANGE counter reads 300 meters. Slightly loosen the clamps that hold R1407.

j. Press the read buttons on the Wheatstone bridge and rotate R1407 for a null while holding the RANGE counter at 300 meters with the coupling. Tighten the clamps that hold R1407.

Caution: Do not rotate R1407 more than 45' in either direction during this procedure.

k. Press the read buttons on the Wheatstone bridge and recheck for a null by turning the range coupling. If the reading is not 300 meters + 5 meters, repeat the steps in i and i above.

l Reconnect the lead to the cw terminal of R1407.

7-9. ELEVATION RESOLVER AND COUNTER ALINEMENT

a. Connect the oscilloscope input to EL RSVR SINE TP1402 and GRD TP1406.

b. Rotate the RANGE handwheel to its maximum cw position.

c. Rotate the ELEVATION handwheel to zero elevation (ELEVATION counter reads 0).

d. Loosen the four mounting screws that secure resolver B1202 to the elevation assembly.

e. Rotate the body of resolver B1202 to obtain a null on the oscilloscope. Tighten the four resolver mounting screws.

Note: If the null cannot be obtained without rotating the resolver more than $^{45^{\circ}}$ in either direction, check the mechanical alinement of elevation resolver B1202 to ELEVATION counter MlZO1.

f. After obtaining the null point, rotate the ELEVATION handwheel to further reduce the null. The null should not exceed 100 millivolts peak-to-peak, with an ELEVATION counter reading of 0 + one-fourth mil.

g. If the counter reading is greater than 0 + one-fourth mil, repeat the steps in d, e, and f above.

Note: Use only the 400-hertz component of the waveform when observing the null.

7-10. ELEVATION RESOLVER DRIVER AMPLIFIER ADJUSTMENTS

a. With the ELEVATION and RANGE handwheels, set the ELEVATION counter to 0 and the RANGE counter to 14, 000 meters.

b. Set the following switches to CAL in the order given:

(1) X-Y-RHO switch S803.
(2) EL RSVR switch S1601.

c. Connect the oscilloscope to RHO IN TP811 and GRD TP813.
d. Loosen the locknuts on R1121 and R 10Z.

e. Alternately adjust R1102 and R1121 until a null of less than 25 millivolts peak-to-peak is observed on the oscilloscope.

f. Tighten the locknuts on R1102 and R 121 and recheck the null.

g. Return S1601 and S803 to the OPR position.

7-11. MAP SCALE ALINEMENT

a. Set MAP SCALE switch S1401 to the 1:25K position.

b. Turn the RANGE handwheel for a reading of 5, 000 meters on the RANGE counter.

c. Turn MAP ZERO switch S1605 to 0 (toward plotting table).

d. Turn the MAP SCALE switch to the 1:50K position. Range counter M1402 (1:50K) should read 10,000 meters ± 5 meters.

e. If M1402 reads less than 9, 995 meters or more than 10, 005 meters, align the RANGE counters.

f. Return S1605 to its original position.

g. Set the ELEVATION counter to 0 and the MAP SCALE switch to 1:25K; turn the RANGE handwheel for a RANGE counter reading of 14, 000 meters.

h. Place MAP SCALE switch S1401 to the 1:50K position.

i. Loosen the locknut on SCALE ADJ pot R1409 and adjust R1409 so that 1:50K counter M1402 reads 14, 000 meters.
j. Tighten the locknut and recheck the counter reading.

7-12. AZIMUTH RESOLVER AND COUNTER ALINEMENT

a. Connect the oscilloscope to AZ RSVR TP808 and GRD TP813.

b. Rotate the ELEVATION handwheel so that the ELEVATION counter reads 0.

c. Rotate the RANGE handwheel to obtain a reading of 1,400 meters on the RANGE counter.

d. Rotate the AZIMUTH handwheel to obtain a reading of 1, 600 mils on the AZIMUTH counter.

e. Loosen the four mounting screws that secure resolver B1302 to the azimuth assembly.

f. Rotate the body of resolver B1302 to a null on the oscilloscope.

Note: If the null cannot be obtained without rotating the resolver more than 45" in either direction, check the mechanical alinement of AZ RSVR B1302 to AZIMUTH counter M1301.

g. Tighten the four resolver mounting screws.

h. After obtaining the null point, rotate the AZIMUTH handwheel to further reduce the null. The null should not exceed 100 millivolts peak-to-peak, with an AZIMUTH counter reading of 1,600 mils + one-fourth mil.

i. If the counter does not read 1,600 mils + one-fourth mil, repeat the step in e, f, g, and h above.

Note: Use only the 400-hertz component of the waveform when observing the null.

7-13. AZIMUTH RESOLVER AMPLIFIER ALINEMENT

a. With the ELEVATION, RANGE, and AZIMUTH handwheels, set the ELEVATION counter to 0, the RANGE counter to 14, 000 meters, and the AZIMUTH counter to 1, 600 mils.

b. Set the following switches to CAL:

(1) X-Y-RHO switch S803.
(2) AZ RSVR switch S1603.

c. Connect the oscilloscope input to X IN TP803 and GRD TP813.

d. Loosen the locknuts on R1132 and R1151.

e. Alternately adjust R1132 and R1151 until a null of less than 25 millivolts peak-to-peak is observed on the oscilloscope.

f. Tighten the locknuts on R11 32 and R1151 and recheck the null.

g. Return switches S1603 and S803 to the OPR position.

7-14. X AND Y COUNTERS ALINEMENT

Check to see that the zero readings on the X and Y digital counters are properly oriented with the AZIMUTH and ELEVATION digital counters; reset X and Y counters if they are incorrect. Set the MAP SCALE switch to the 1:25K position, the ELEVATION counter to 0, the AZIMUTH counter to 800 mils, and the RANGE counter to 18, 000 meters. Check to see that both the X and Y counters read PLUS 12,728 meters + 140 meters; if not, adjust the counters as follows:

a. Set the ELEVATION counter to 0, the MAP SCALE switch to the 1:25K position, and the RANGE counter to 14, 000 meters.

b. Set the AZIMUTH counter to 0. Loosen the locknut and adjust the Y + CAL (R1552) control to PLUS 14, 000 meters on the Y counter; tighten the locknut.

c. Set the AZIMUTH counter to 3, 200 mils. Loosen the locknut and adjust the Y - CAL (R1554) control for MINUS 14,000 meters on the Y counter; tighten the locknut.

d. Set the AZIMUTH counter to 1, 600 mils. Loosen the locknut and adjust the X + CAL (R1502) control for PLUS 14, 000 meters on the X counter; tighten the locknut.

e. Set the AZIMUTH counter to 4, 800 mils. Loosen the locknut and adjust the X - CAL (R1504) control for a reading of MINUS 14, 000 meters on the X counter; tighten the locknut.

7-15. PLOTTING BOARD INDICATOR LIGHT FOCUS ADJUSTMENT

a. Remove the cover plate from the round access hole on the bottom of the plotting board (right side) by removing the eight screws that hold the plate in place.

b. Remove the Allen wrench from the clip attached to the cover plate.

c. Place a piece of masking tape on the Plexiglas directly above the indicator light.

d. With the Allen wrench, slightly loosen the two setscrews (90 degrees apart) nearest the lamp.

e. While observing from the top of the plotting board, move the lens up and down and roughly focus the light to obtain the smallest spot of light on the masking tape.

f. Tighten the two setscrews nearest the lamp base and slightly loosen the other setscrews (90 degrees apart) that are farthest from the lamp base.

g. Again, while observing from the top of the plotting board, slowly raise and lower the lens until the smallest spot of light on the masking tape is obtained; tighten the setscrews.

h. Rotate the carriage arm (through 180 deg.) by using the AZIMUTH handwheel on the radar set control unit. Be sure that the light does not touch the Plexiglas.

By Order of the Secretary of the Army:

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The Adjutant General

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