PUBLICATION NUMBER: 1932-0005C
MAY 1984

HARRIS

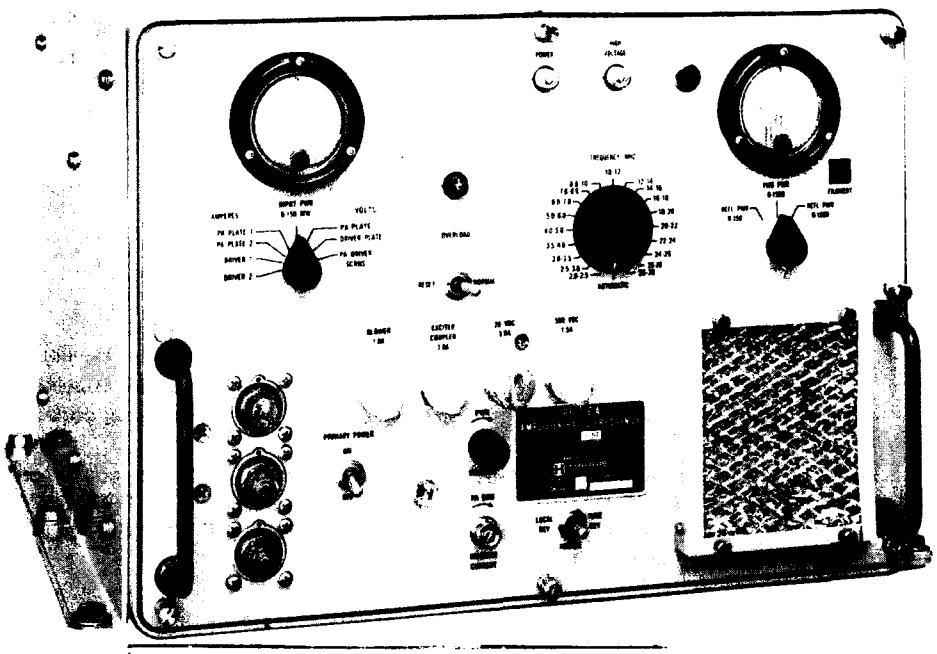
RF COMMUNICATIONS

L.R. SYS TEST

RF-110A

RADIO FREQUENCY AMPLIFIER

INSTRUCTION MANUAL



HARRIS

LIMITED ONE YEAR WARRANTY
HARRIS CORPORATION (RF COMMUNICATIONS GROUP)

FROM HARRIS TO YOU – This warranty is extended to the original buyer and applies to all Harris Corporation, RF Communications Group equipment purchased and employed for the service normally intended, except those products specifically excluded.

WHAT WE WILL DO – If your Harris Corporation, RF Communications Group equipment purchased from us for use outside the United States fails in normal use because of a defect in workmanship or materials within one year from the date of shipment, we will repair or replace (at our option) the equipment or part without charge to you, at our factory. If the product was purchased for use in the United States, we will repair or replace (at our option) the equipment or part without charge to you at our Authorized Repair Center or factory.

WHAT YOU MUST DO – You must notify us promptly of a defect within one year from date of shipment. Assuming that Harris concurs that the complaint is valid, and is unable to correct the problem without having the equipment shipped to Harris:

- Customers with equipment purchased for use outside the United States will be supplied with information for the return of the defective equipment or part to our factory in Rochester, NY, U.S.A., for repair or replacement. You must prepay all transportation, insurance, duty and customs charges. We will pay for return to you of the repaired/replaced equipment or part, C.I.F. destination; you must pay any duty, taxes or customs charges.
- Customers with equipment purchased for use in the United States must obtain a Return Authorization Number, properly pack, insure, prepay the shipping charges and ship the defective equipment or part to our factory or to the Authorized Warranty Repair Center indicated by us.

Harris Corporation
RF Communications Group
Customer Service
1680 University Avenue
Rochester, NY 14610, U.S.A.

Telephone: (716) 244-5830
Telex: 978464
Cable: RFCOM

Harris will repair or replace the defective equipment or part and pay for its return to you, provided the repair or replacement is due to a cause covered by this warranty.

WHAT IS NOT COVERED – We regret that we cannot be responsible for:

- Defects or failures caused by buyer or user abuse or misuse.
- Defects or failures caused by unauthorized attempts to repair or alter the equipment in any way.
- Consequential damages incurred by a buyer or user from any cause whatsoever, including, but not limited to transportation, non-Harris repair or service costs, downtime costs, costs for substituting equipment or loss of anticipated profits or revenue.
- The performance of the equipment when used in combination with equipment not purchased from Harris.
- HARRIS MAKES NO OTHER WARRANTIES BEYOND THE EXPRESS WARRANTY AS CONTAINED HEREIN. ALL EXPRESS OR IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY ARE EXCLUDED.

SERVICE WARRANTY – Any repair service performed by Harris under this limited warranty is warranted to be free from defects in material or workmanship for sixty days from date of repair. All terms and exclusions of this limited warranty apply to the service warranty.

IMPORTANT – Customers who purchased equipment for use in the United States must obtain a Return Authorization Number before shipping the defective equipment to us. Failure to obtain a Return Authorization Number before shipment may result in a delay in the repair/replacement and return of your equipment.

IF YOU HAVE ANY QUESTIONS – Concerning this warranty or equipment sales or services, please contact our Customer Service Department.

PUBLICATION NUMBER: 1932-0005C
MAY 1984

RF-110A

RADIO FREQUENCY AMPLIFIER

INSTRUCTION MANUAL

HARRIS

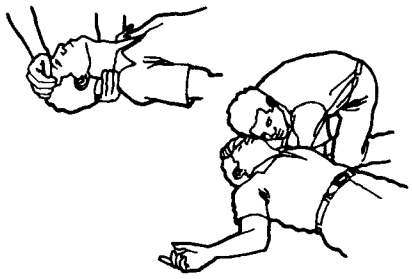
HARRIS CORPORATION RF COMMUNICATIONS DIVISION
1680 University Avenue Rochester, New York 14610 U.S.A.
Tel.: 716-244-5830 Cable: RFCOM: Rochester. N.Y. TELEX: 978464

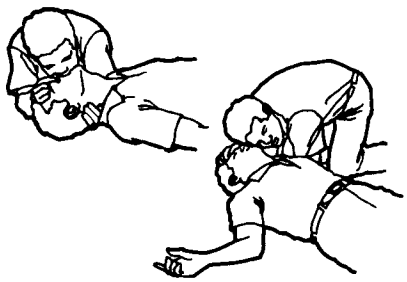
Equipment manufactured by Harris Corporation, RF Communications Group meets stringent quality and safety standards. However, high voltages are present in many radio products, and only a skilled technician should attempt to remove outer covers and make adjustments or repairs. All personnel who operate and maintain the equipment should be familiar with this page as a safety preparedness measure. Although this procedure is reproduced as a service to the personnel involved with this equipment, Harris Corporation assumes no liability regarding any injuries incurred during the operation and repair of such equipment, or the administration of this suggested procedure.

ELECTRICAL SHOCK: EMERGENCY PROCEDURE

The victim will appear unconscious and may not be breathing. If the victim is still in contact with the voltage source, disconnect the power source in a manner safe to you, or remove the victim from the source with an insulated aid (wooden pole or rope). Next, determine if the victim is breathing and has a pulse. If there is a pulse but no breathing, administer artificial respiration. If there is no pulse and no breathing, perform CPR (if you have been trained to do so). If you have not been trained to perform CPR, administer artificial respiration anyway. Never give fluids to an unconscious person.

WHEN BREATHING STOPS





FIRST, send someone to get a **DOCTOR**.
THEN, administer first aid to restore breathing (artificial respiration):

1 IF A VICTIM APPEARS TO BE UNCONSCIOUS
TAP VICTIM ON THE SHOULDER AND SHOUT, "ARE YOU OKAY?"

2 IF THERE IS NO RESPONSE
TILT THE VICTIM'S HEAD, CHIN POINTING UP. Place one hand under the victim's neck and gently lift. At the same time, push with the other hand on the victim's forehead. This will move the tongue away from the back of the throat to open the airway.
IMMEDIATELY LOOK, LISTEN, AND FEEL FOR AIR.
While maintaining the backward head tilt position, place your cheek and ear close to the victim's mouth and nose. Look for the chest to rise and fall while you listen and feel for the return of air. Check for about five seconds.

3 IF THE VICTIM IS NOT BREATHING
GIVE FOUR QUICK BREATHS.
Maintain the backward head tilt, pinch the victim's nose with the hand that is on the victim's forehead to prevent leakage of air, open your mouth wide, take a deep breath, seal your mouth around the victim's mouth, and blow into the victim's mouth with four quick but full breaths just as fast as you can. When blowing, use only enough time between breaths to lift your head slightly for better inhalation.
If you do not get an air exchange when you blow, it may help to reposition the head and try again.
AGAIN, LOOK, LISTEN, AND FEEL FOR AIR EXCHANGE.

4 IF THERE IS STILL NO BREATHING
CHANGE RATE TO ONE BREATH EVERY FIVE SECONDS.

For more information about these and other life-saving techniques, contact your Red Cross chapter for training
"When Breathing Stops" reproduced with permission from an American Red Cross Poster

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

LIST OF FIGURES (Cont.)

LIST OF TABLES

SPECIFICATIONS

Frequency Range	2.0000 MHz to 29.9999 MHz
Power Output	1 kilowatt PEP or average
Driver Power	120 milliwatts, nominal, into 50 ohms
Intermodulation Products	40 dB below full rated output
Primary Power	230 Vac, 50/60 Hz, single-phase power 115 Vac, 400 Hz, three-phase power 208 Vac, 50/60 Hz, three-phase power 440 Vac, 50/60 Hz, three-phase power
Power Consumption	4500 watts maximum at full output
Ambient Temperature, Operating	0°C (32°F) to 50°C (122°F)
Shock	In accordance with MIL-T-4807A (Air Force), MIL-S-901 (Navy) with optional shock mount kit
Input Impedance	50 ohms, unbalanced
Load Impedance	50 ohms, nominal; 4:1 maximum VSWR
Weight	95 pounds (43.1 kg)
Size	12.362 in. (31.4 cm)H x 17.375 in. (44.1 cm)W x 17.474 in. (44.4 cm)L

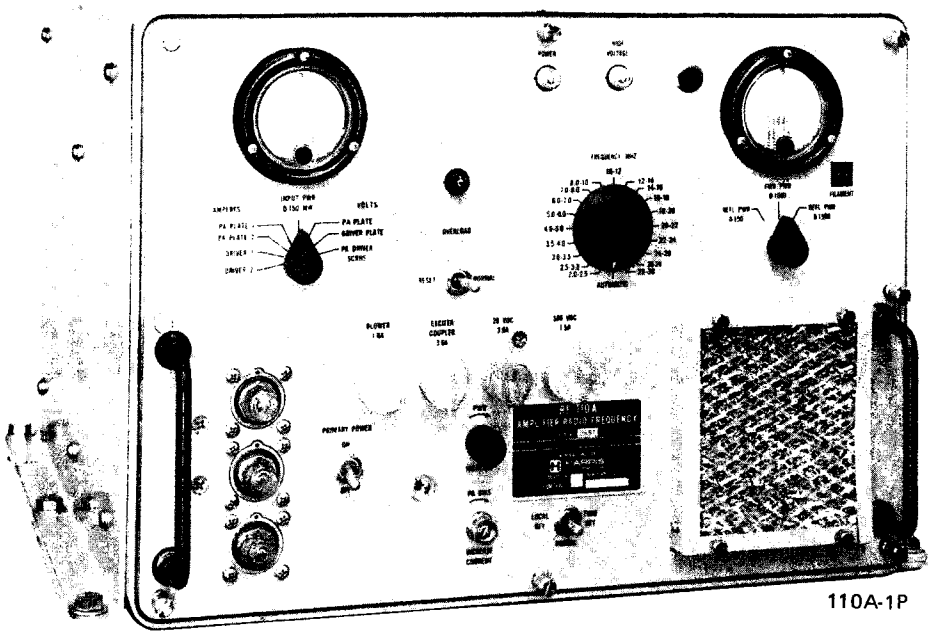
ABOUT THIS MANUAL

This manual provides comprehensive user information for the RF-110A Radio Frequency Amplifier. The manual is divided into seven sections. Section 1, General Information, provides introductory information that describes the RF-110A, and includes general application, potential use, and support information. Section 2, Installation, provides general and optional installation information for the RF-110A. Section 3, Operation, provides detailed functional definition of all RF-110A controls. Section 4, Functional Description, describes the interrelationship of the RF-110A component elements. The section provides adequate detail to permit logical understanding of the elements. Section 5, Maintenance, relies on the information presented in section 4 as the basis for troubleshooting. The section gives all maintenance and adjustment information for the unit and its assemblies, as applicable. Section 6, Parts Lists, provides a complete listing of the RF-110A parts in reference designation order. Section 7, Component Location and Schematic Diagram Data, includes complete component location and schematic coverage of the unit.

HARRIS
RF COMMUNICATIONS

RF-110A

RADIO FREQUENCY AMPLIFIER



RF-110A Radio Frequency Amplifier

SECTION 1

GENERAL INFORMATION

1.1 GENERAL DESCRIPTION

This manual provides complete user information for the RF-110A Radio Frequency Amplifier, shown in figure 1-1. The RF-110A was designed and manufactured by Harris Corporation, RF Communications Group, 1680 University Avenue, Rochester, New York, 14610, USA.

1.2 DESCRIPTION

The RF-110A is a 2-30 MHz linear power amplifier capable of producing a 1 kW (PEP or AVG) output into a 50 ohm load. The RF-110A can be operated continuously in any operating mode. The MTBF (Mean Time Between Failures) is 1200 hours, and the MTTR (Mean Time To Repair) is .5 hours.

The RF-110A will maintain the full rated output into antenna mismatches of up to 1.5:1, and will operate satisfactorily into much higher mismatch conditions. Internal protective circuitry will automatically reduce the transmitted output to the level required to protect the system if necessary. Drive requirements of approximately 120 milliwatts are needed to produce the full rated output. The transmitter can be setup to operate in a closed loop mode with the exciter. In this mode, APC (Average Power Control), and PPC (Peak Power Control) voltages are developed from an output sample, and fed back to the exciter for system power level control. These same voltages are used internally by the RF-110A for control and protection.

Table 1-1 lists optional and compatible equipment for the RF-110A.

1.3 MANUAL/AUTOMATIC OPERATING CAPABILITY

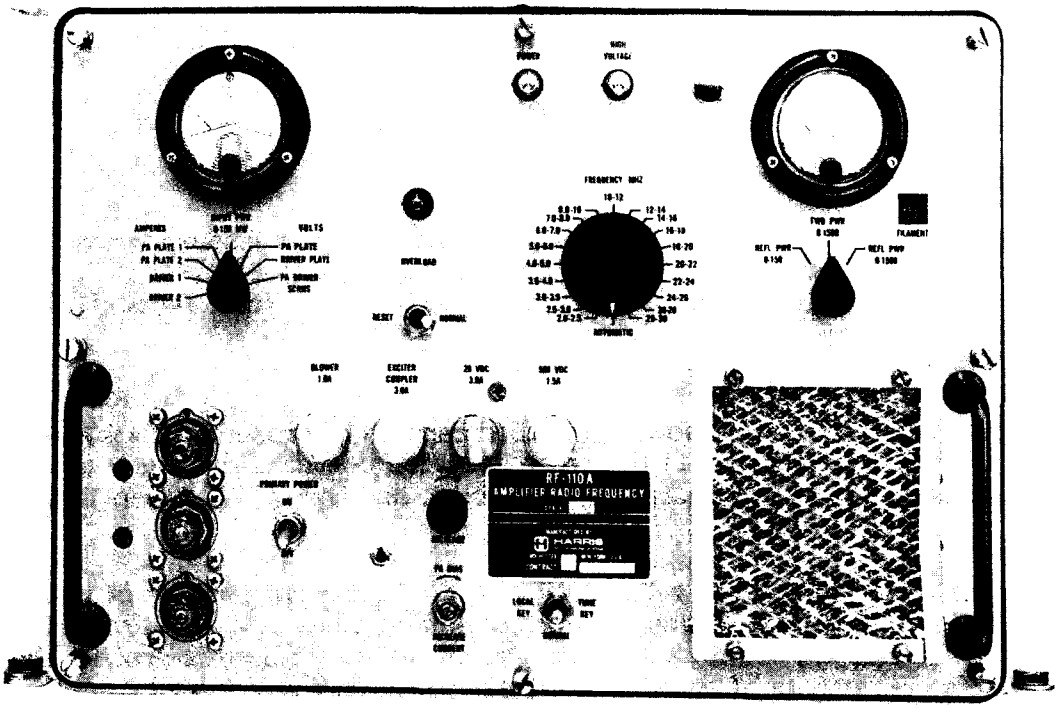
Broadband techniques eliminate the need for tuning the amplifier. The RF-110A divides the 2-30 MHz frequency spectrum into nineteen bands. These frequency bands are pretuned for optimum performance. The appropriate band is automatically selected when the RF-110A is operated with compatible equipment. The desired band can also be manually selected to accommodate special requirements. The RF-110A operates in response to a five-wire code input from a companion exciter. In RF-130 Systems for example, this code input comes from the RF-131 Exciter and will cause the RF-110A to automatically track any frequency set at the RF-131 front panel.

1.4 POWER SUPPLY OPTIONS

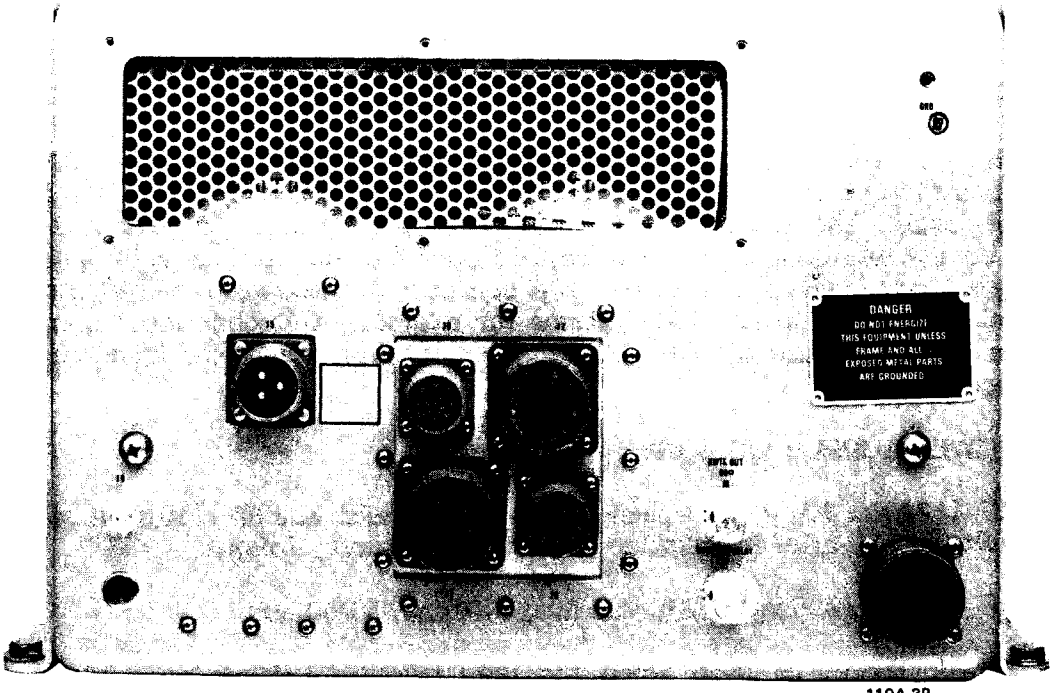
The RF-124, RF-112A, or RF-111A Power Supply is used with the RF-110A, depending on the available line voltages. A brief description of each power supply follows.

1.4.1 RF-124 Power Supply (230 Vac Single-Phase, 50/60 Hz)

The RF-124 Power Supply is used when the only primary voltage available is 230 Vac, single-phase, 50/60 Hz (refer to figure 1-2). The source voltage must be capable of delivering 4500 watts. The RF-124 can be stack or rack mounted with the RF-110A. The RF-124 requires the most vertical rack space of the three power supply options. See the installation section of this manual and the RF-124 equipment manual (8913-0003) for more information.



FRONT VIEW 110A-2(P)



REAR VIEW 110A-3P

Figure 1-1. RF-110A Radio Frequency Amplifier

Table 1-1. Optional and Compatible Equipment

Item	Description	Application Notes
RF-111A	Power Supply	For use with 115 Vac, 400 Hz, three-phase power sources.
RF-112A	Power Supply	For use with 208/440 Vac, 50/60 Hz, three-phase power sources.
RF-115	Shock Mounting Kit	For use in high vibration installations.
RF-124	Power Supply	For use with 230 Vac, 50/60 Hz, single-phase power sources.
RF-125	Noise Silencer	Reduces blower noise emissions.
RF-130	1 kW Transmitting System	RF-110A is standard component of the system.
RF-131	Exciter	Standard component of RF-130 Transmitting System. Also compatible with all RF-131 Remote Control Systems, such as the RF-784 Hardwire RC, the RF-790 Channelized RC, and the RF-794 Full Frequency Serial Digital Remote Control.
RF-142	Autotransformer	Permits operation of RF-112A from 380 Vac.
RF-180	1 kW HF/50 W VH Transceiver	This application makes the RF-110A compatible with the RF-280 equipment family.
RF-193	Synthesized ARQ System	Variety of applications.
RF-270-5A	1 kW Transceiver	The RF-270-5A uses the RF-110A and units of the RF-230 equipment family.
RF-601A	Antenna Coupler	Fully automatic, 1 kW Antenna Coupler, matches a 15-35 foot (4.6 to 10.7 meter) whip antenna to 50 ohms from 2 to 30 MHz. The unit will also match long wire antennas when the RF-625 Long Wire Adapter option is purchased.
RF-110A/RSK	Running Spares Kit	Contains operator-replaceable items. Refer to paragraph 1.7.1.
RF-110A/SSK	Site Spares Kit	Contains comprehensive maintenance repair parts. Refer to paragraph 1.7.2.

Table 1-1. Optional and Compatible Equipment (Cont.)

Item	Description	Application Notes
RF-110A/ARK	Assembly Repair Kit	Contains parts required to repair defective assemblies or subassemblies. Refer to paragraph 1.7.3.
RF-110A/MRK	Maintenance Repair Kit	Contains special parts unique to the RF-110A. Refer to paragraph 1.7.4.

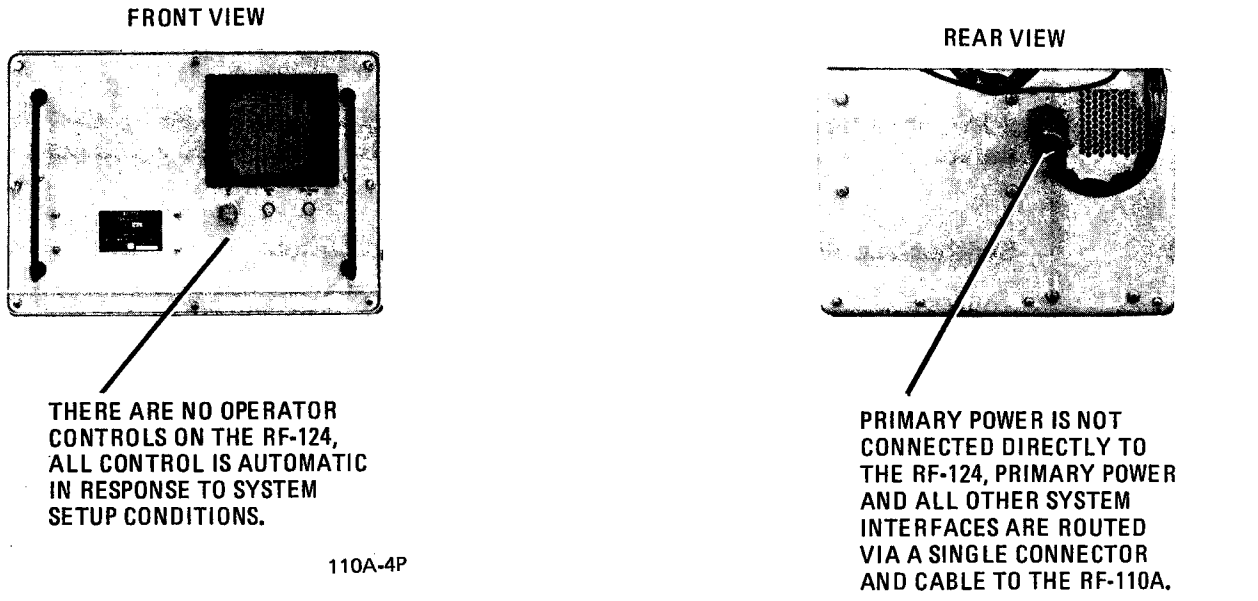


Figure 1-2. RF-124 Power Supply Interface Information

1.4.2 RF-112A Power Supply (208 /440 Vac, Three-Phase, 50/60 Hz)

The RF-112A Power Supply is used when the primary voltage available is 208 or 440 Vac, three-phase, 50/60 Hz (refer to figure 1-3). The source voltage must be capable of delivering 4500 watts. The RF-112A can be stack or rack mounted with the RF-110A and requires only 7 inches of vertical rack space. See the installation section of this manual and the RF-112A equipment manual (1932-0006) for more information.

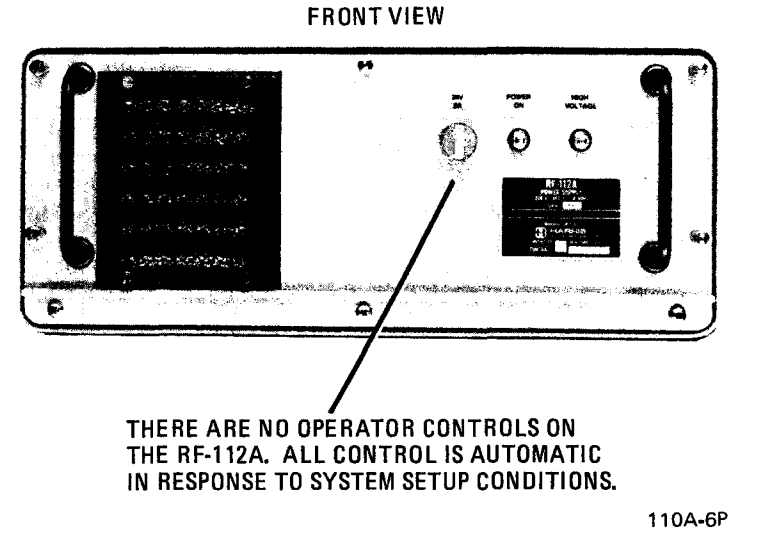


Figure 1-3. RF-112A Power Supply Interface Information

1.4.3 RF-111A Power Supply (115 Vac, Three-Phase, 400 Hz)

The RF-111A Power Supply mounts inside the bottom chassis of the RF-110A (refer to figure 1-4). It is used only for very specialized applications where 115 Vac, three-phase, 400 Hz is the primary source voltage. The source voltage must be capable of delivering 4500 watts. See the installation section of this manual and the RF-111A equipment manual (1932-0011) for more information.

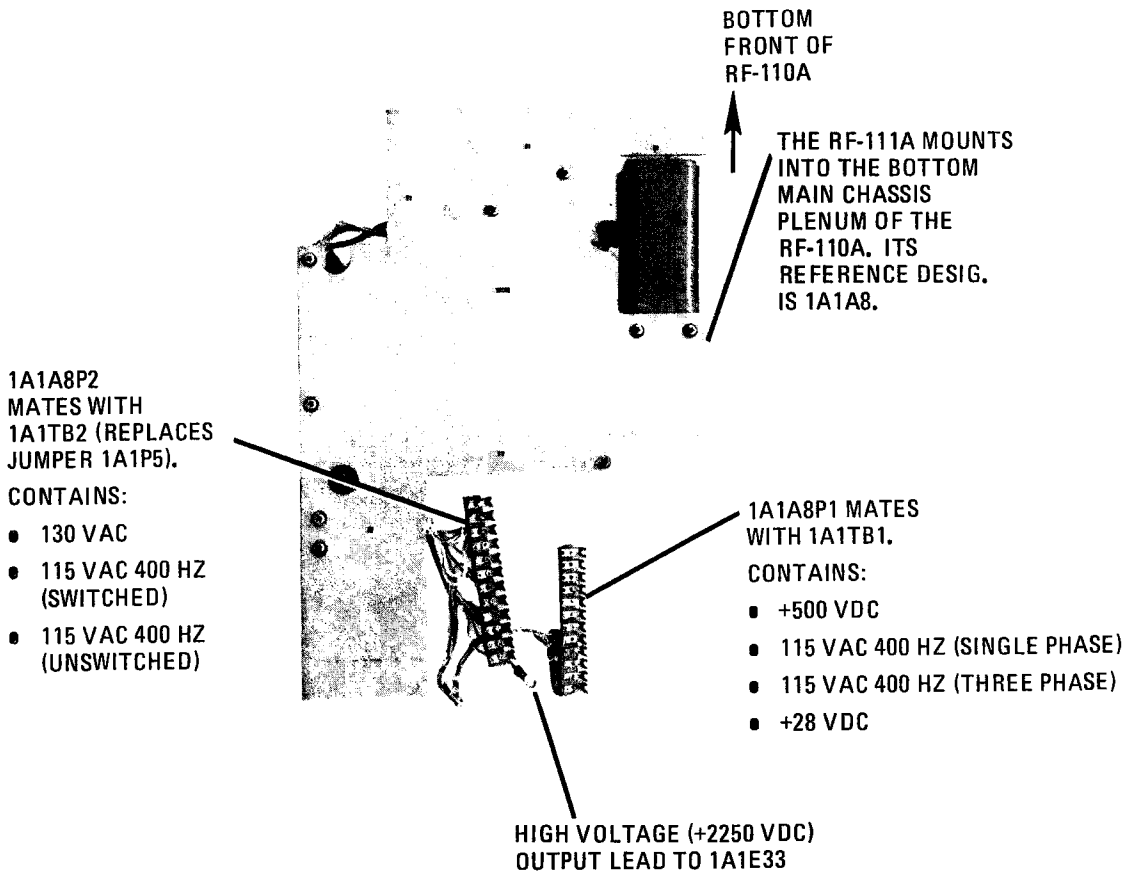


Figure 1-4. RF-111A Power Supply Interface Information

1.5 ANTENNA (RF OUTPUT) OPTIONS

The RF-110A has been designed to operate into a nominal 50 ohm antenna load with a VSWR of up to 4:1. Thus, it is possible to operate the RF-110A into conventional broadband antennas. When working into whip or random long wire antennas, it will be necessary to use an antenna coupler in order to permit operation over the 2-30 MHz frequency range. The coupler should match the antenna impedance to a nominal 50 ohms with a VSWR of 1.5:1 or better.

Many antenna options are available, including fixed resonant antennas (used at one frequency only) and broadband antennas (used for point-to-point communications).

Antenna couplers, such as the RF-601A, provide the best results for most mobile and tactical applications. Designed specifically for use with the RF-110A, the antenna coupler ensures optimum match of the system antenna to the RF-110A. Automatic all-band operation is also provided.

Detailed antenna information is provided in the installation section of this manual and in the associated system or equipment manual.

1.6 EQUIPMENT SUPPLIED AND ANCILLARY KIT INFORMATION

Table 1-2 lists the items supplied with the RF-110A, both as an individual unit and as part of an RF-130 System. Table 1-3 lists the ancillary kit contents.

Table 1-2. RF-110A Radio Frequency Amplifier
List of Equipment Supplied

Name/Description	Part Number	Qty
Cartridge Fuse (115 Vac, 400 Hz and 230 Vac, Three-Phase Units)	FNW-25	3
Cartridge Fuse (208 Vac Units)	FNW-15	3
Cartridge Fuse (440 Vac Units)	F10-0001-026	3
Technical Manual	1932-0005	1
Ancillary Kit	1932-6210	1
And if unit is part of a RF-130 System:		
W1 Cable Assembly	399-0026	1
W2 Cable Assembly	399-0026	1
W3 Cable Assembly	399-0027	1
Stack Mounting Kit (for RF-131)	759-0131	1
Stack Mounting Kit (for RF-124)	825-1124	1

Table 1-3. RF-110A Radio Frequency Amplifier Ancillary Kit, Part No. 1932-6210, Contents

Name/Description	Part Number	Qty
Fuse (250 V, 1-1/2 Amperes)	F020A250V1-1/2A	5
Fuse (250 V, 1 Ampere)	F02A250V1A	5
Fuse (250 V, 3 Amperes)	F02A250V3A	5
Time Delay Fuse (500 V, 7 Amperes)	F10-0001-026	5
Cartridge Fuse (500 V, 15 Amperes)	FNW-15	5
Cartridge Fuse (500 V, 25 Amperes)	FNW-25	5
Support Clamp	J08-0002-183	1
Support Clamp	J08-0002-203	2
Cable Clamp	J08-0002-243	2
No. 11 AWG Sleeving	E50-0001-012	60
Clear Sleeving	E50-0001-020	3
Connector (mates with J9)	UG-88E/U	1
Connector (mates with J3 and J4)	UG-21D/U	2
Connector (mates with J7)	10075-0446	1
Connector (mates with J6)	10075-0448	1
Connector (mates with J2)	10075-0513	1
Connector (mates with J5)	10075-0726	1
Connector (mates with J8)	10075-0766	1
Muffler (Air Cleaner Shroud)	1932-3004	1
Instruction Sheet (for Connector Sleeving)	1002-0010	1

1.7 SPARE PARTS KITS

As listed in table 1-1 there are four spare part kits available for the RF-110A. A brief description of each kit follows.

1.7.1 Running Spares Kit (RSK) RF-110A/RSK, Part No. 1001-0001-1, -2, or -3

This kit contains items readily replaced in field operation by the operator, including those which are used during equipment installation and setup. The typical complement of parts includes fuses, lamps, etc. Each RSK will generally support a single equipment for two to four years. The -1 kit applies to 440 Vac units. The -2 kit applies to 208 Vac units. The -3 kit applies to 115 Vac and 230 Vac units.

1.7.2 Site Spares Kit (SSK), RF-110A/SSK, Part No. 1001-0002

Site spares are those items which allow the equipment to be repaired at the highest practical level of assembly to minimize down time or off-the-air time. This type of kit includes a complete set of assemblies or subassemblies (if applicable); piece parts for those items which are impractical to repair by assembly replacement, including chassis and front panel parts; and a common hardware kit. With very little test equipment and some common tools, a technician should be able to replace one of these parts if they fail. Each SSK will generally support up to five pieces of equipment for a period of two to four years.

1.7.3 Assembly Repair Kit (ARK), RF-110A/ARK, Part No. 1001-0003

This kit contains all the parts required to repair defective assemblies or subassemblies. It supplements the Site Spares Kit to allow replaced assemblies to be repaired, as time permits, either at the equipment site or at a special depot facility. This kit can be properly utilized only with a well-equipped service shop and qualified technicians. Each ARK will generally support an SSK for a period of two to four years.

1.7.4 Maintenance Repair Kit (MRK), RF-110A/MRK, Part No. 1001-0031

In addition to the spares kits already mentioned, there is a kit that contains maintenance items unique to the RF-110A. The kit includes extender boards, extender cables, tuning tools, and other special items required for maintaining the equipment.

SECTION 2

INSTALLATION

2.1 GENERAL

The RF-110A is a systems-orientated power amplifier, frequently shipped as a component of a larger system. In systems applications (or where the intended use is known) the RF-110A is shipped with all appropriate cables. If purchased or delivered separately, the interconnecting cables must be fabricated to the appropriate length using the connectors supplied. (Refer to table 1-3 for a listing of connectors supplied.)

The RF-110A is tested and fused prior to shipping for the appropriate primary power source and power supply specified by the customer.

Inspection of the equipment against the packing list is recommended. The following paragraphs address most of the installation requirements.

If problems occur, contact the Customer Service Department as shown in the warranty at the front of this manual.

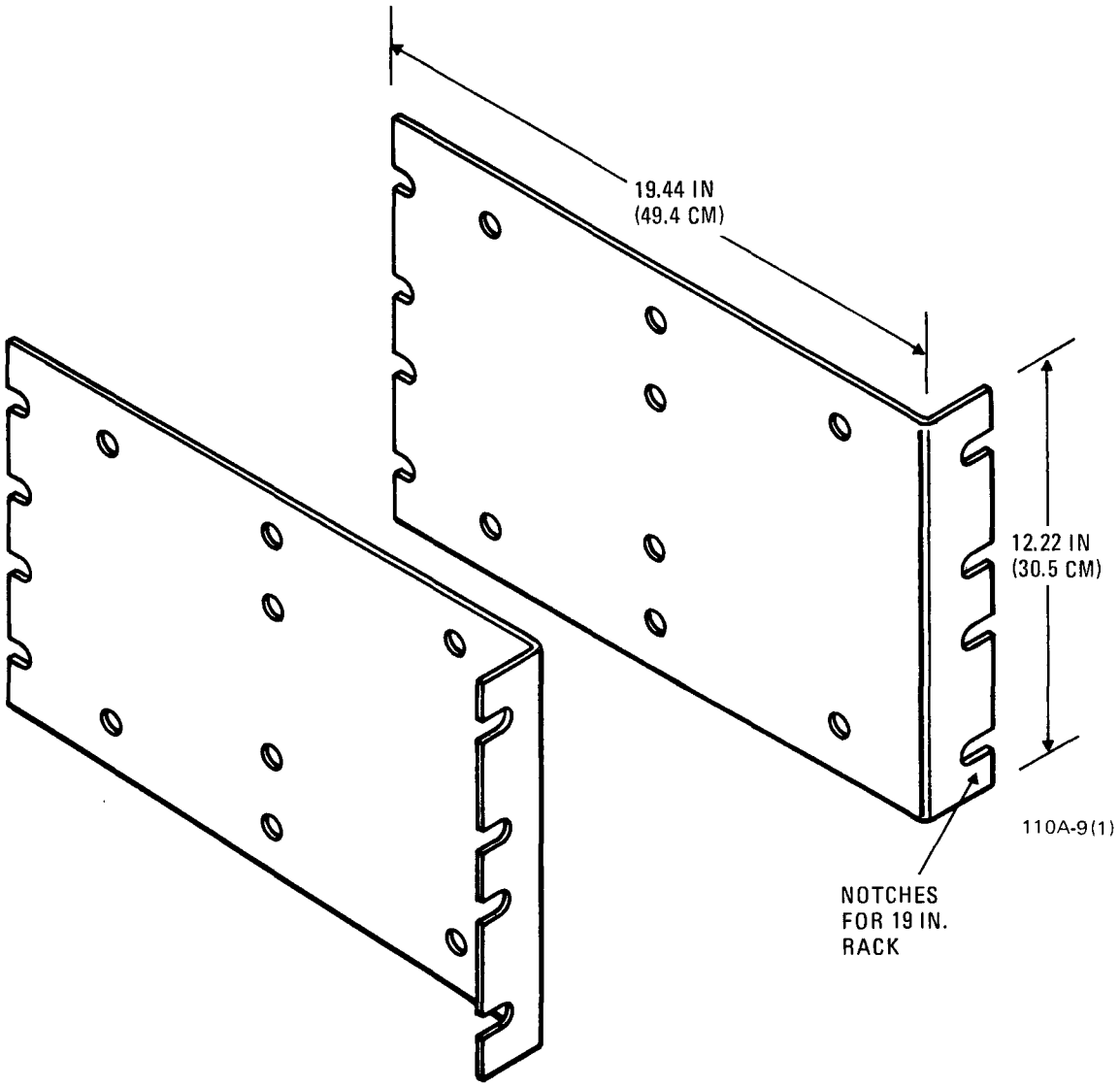
2.2 MOUNTING

The RF-110A can be stack or rack mounted. The RF-115 Shock Mount Kit may be used where shock and high-vibration environments are a factor. The kit also has sufficient capability to support the loading of other system components (such as a power supply and exciter). Stack and rack mounting details are given in figures 2-1 and 2-2. Figure 2-1 gives dimensional details for rack mount configuration. The brackets shown will fit a MIL-STD-188 Type 19-inch rack. These brackets provide rear support for the RF-110A. Figure 2-2 gives complete dimensional details and shows a typical stack mount installation. A typical power supply (RF-112A) and the optional shock mount kit (RF-115A) are shown.

2.3 PRIMARY POWER AND POWER SUPPLY CONNECTIONS

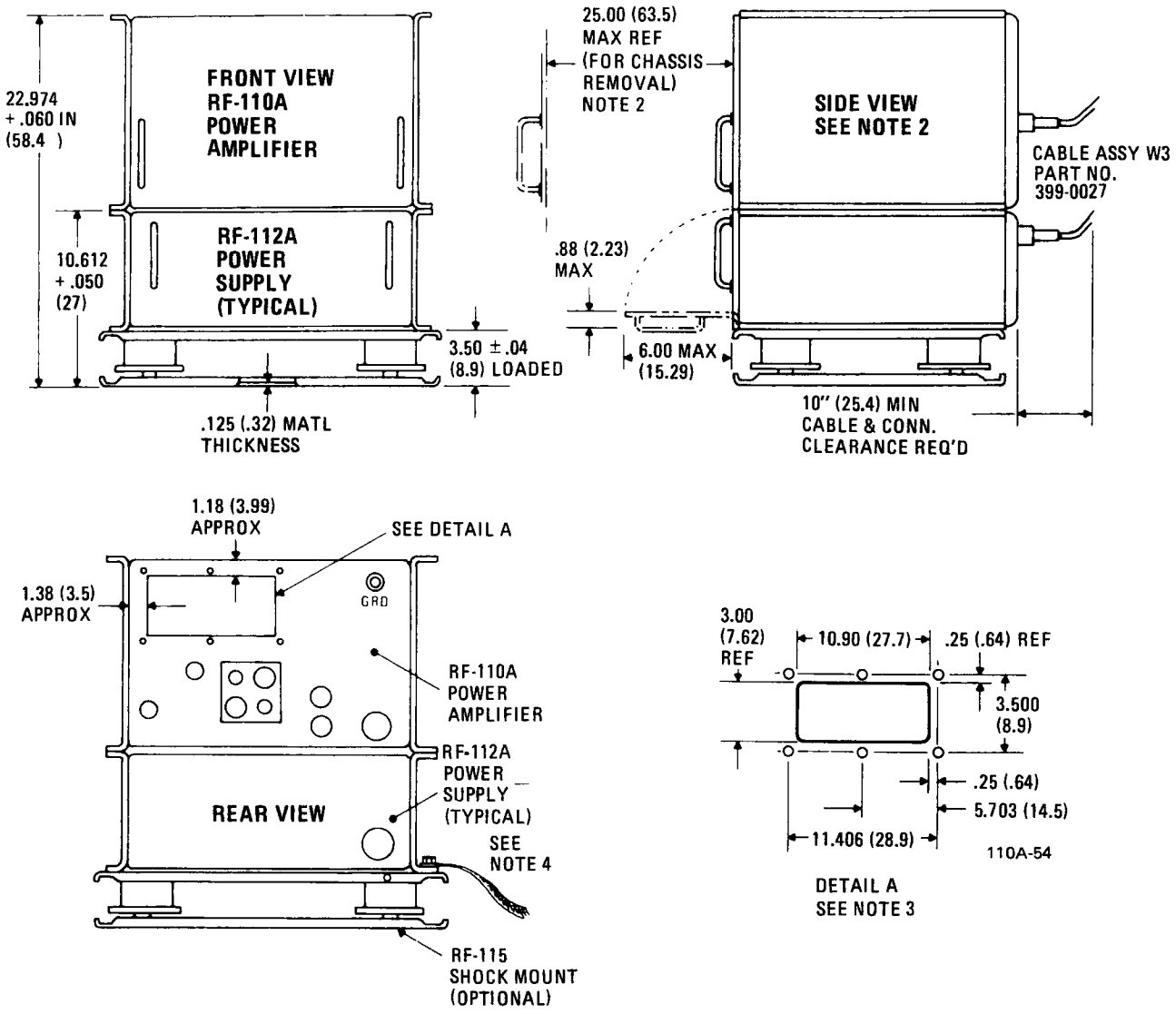
The four primary power options for the RF-110A are listed in table 2-1. All primary power is controlled and fused at the RF-110A. The RF-110A is supplied fused at time of manufacture for the primary power selected by the customer. Maximum input power loading for the primary power sources is 4500 watts.

Field conversion to a different primary power source can be accomplished by changing the fuses and jumper strips (see table 2-1), restrapping transformer 1A1T1 of the RF-110A (figures 2-3, 7-2, and 7-18), and (if necessary) changing the power supply. Primary power strapping data is shown in figure 2-3.



NOTE: THESE BRACKETS MAY BE USED WITH A RACK 25 INCHES (63 CM) OR MORE IN DEPTH.

Figure 2-1. RF-110A Rack Mounting Brackets, Part No. 0292-002, Details



NOTES:

1. ALL DIMENSIONS ARE IN INCHES, PARENTHETICAL DIMENSIONS ARE IN CENTIMETERS.
2. DIMENSIONS SHOWN ON SIDE VIEW INDICATE CLEARANCE NECESSARY TO REMOVE CHASSIS FROM THEIR RESPECTIVE CASES. CLEARANCE FOR WITHDRAWAL AND TILTING OF CHASSIS IS WITHIN THESE LIMITS.
3. DETAIL A REPRESENTS SIX NO. 6-32 TAPPED HOLES TO FACILITATE MOUNTING OF EXHAUST AIR REMOVAL DUCT IF REQUIRED. DEPTH OF SCREW PENETRATION .100 INCH MAXIMUM. FLOW RATE OF EXHAUST AIR FROM RF-110A IS 140 FT^3/MIN. EXTERIOR EXHAUST DUCT SHALL HAVE INLET PRESSURE NO GREATER THAN ATMOSPHERIC AT 140 FT^3/MIN (4 M^2/MIN).
4. EQUIPMENT CASES ARE BONDED TOGETHER THROUGH THE SIDE MOUNTING BRACKETS. CLEAN SURFACES BEFORE ASSEMBLY AND KEEP HARDWARE TIGHT. THE SYSTEM SHOULD BE GROUNDED TO THE NEAREST GOOD GROUND USING A SHORT, WIDE COPPER GROUND STRAP AS SHOWN.

Figure 2-2. Typical Stack Mount Outline and Mounting Information (Sheet 1 of 2)

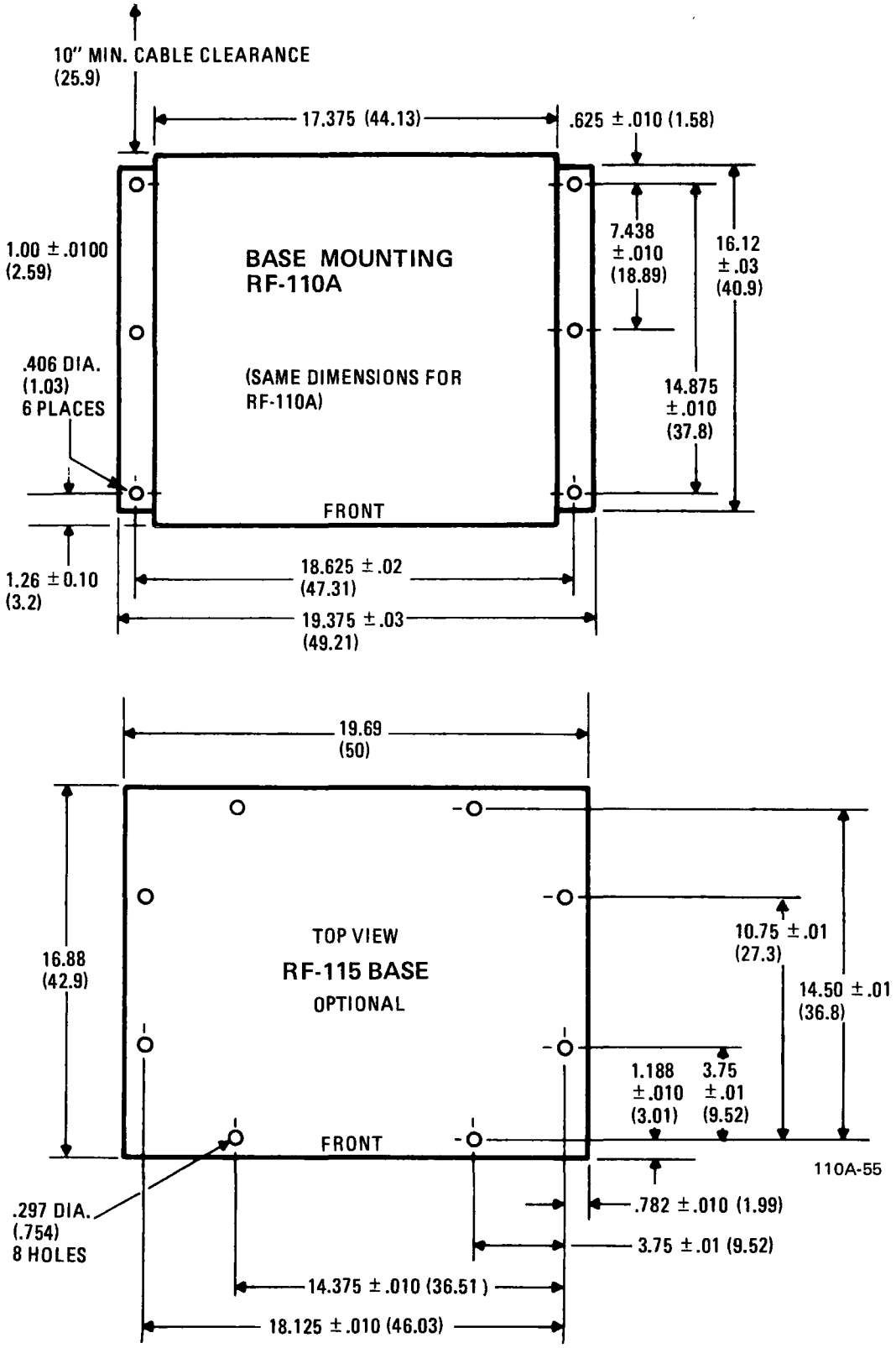


Figure 2-2. Typical Stack Mount Outline and Mounting Information
(Sheet 2 of 2)

Table 2-1. RF-110A Primary Power Source and Power Supply Data

When Desired Primary Power Is	RF-110A Configuration Description Is	Power Supply Data
440 Vac, 3-phase, 60 Hz	1A1T1 is strapped for 440 Vac; 1A1P5 is installed on 1A1TB2; 7 Ampere time delay fuses are installed in 1A1XF1, 1A1XF2, and 1A1XF3.	If RF-112A Power Supply is used, jumper 2A2P2 is installed on 2A2TB1.
208 Vac, 3-phase, 60 Hz	1A1T1 is strapped for 208 Vac; 1A1P5 is installed on 1A1TB2; 15 Ampere fuses are installed in 1A1XF1, 1A1XF2, and 1A1XF3.	If RF-112A Power Supply is used, jumper 2A2P1 is installed on 2A2TB1.
115 Vac, 3-phase, 400 Hz	1A1T1 is strapped for 115 Vac; 1A1A8P1 is installed on 1A1TB1; 1A1A8P2 is installed on 1A1TB2. High Voltage Lead is connected to 1A1E33; connector, Part No. 391-9040, is installed on 1A2J1. 25 Ampere fuses are installed in 1A1XF1, 1A1XF2, and 1A1XF3.	RF-111A Power Supply is used.
230 Vac, single phase, 50/60 Hz	1A1T1 is strapped for 230 Vac; 1A1P5 is installed on 1A1TB2; 25 Ampere fuses are installed in 1A1XF1, 1A1XF2, and 1A1XF3.	RF-124 Power Supply is used.

2.4 RF-110A INTERCONNECTION REQUIREMENTS

There are five basic interconnections required for the RF-110A to perform its intended function. These are:

- Primary power input connection
- Power supply unit connection
- RF input connection
- RF output connection
- External control connection

The RF-110A, however, can serve as a central interconnection point in complex installations involving remote operator positions, transmitter/operator switchboards, remote automatic antenna couplers, etc. Consequently, the actual number of interconnections will depend on user requirements.

A complete set of mating connectors is supplied in the ancillary kit. Tables 2-2 through 2-7 list connector pin number/function correlation data. Figure 7-23 shows the appropriate case assembly connector data. Note that most of the connections entering Transmitter Interface Connector 1A2J2 are jumpered through the RF-110A to Exciter Input/Output Connector 1A2J7, for use by an external exciter.

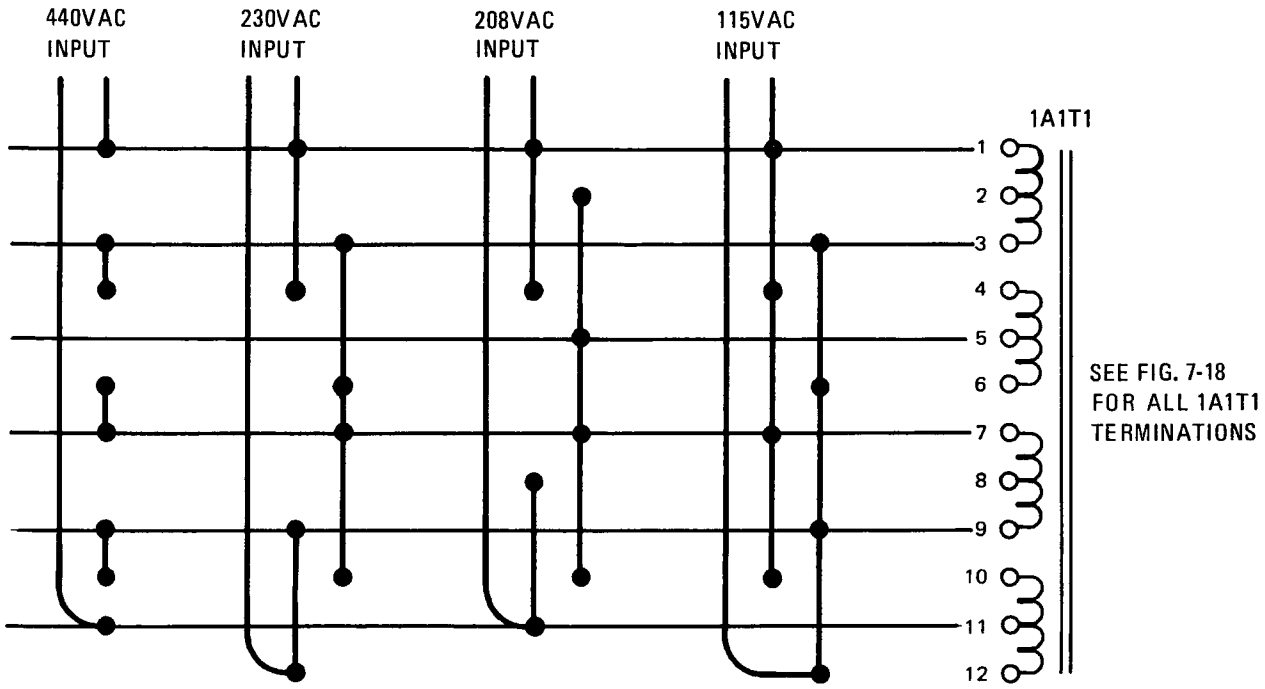


Figure 2-3. RF-110A Primary Power Strapping Data

Table 2-2. RF-110A Power Supply Connector 1A2J1
Pin Number/Function Correlation

1A2J1 Pin No.	Function	Remarks	Suggested Minimum Wire Size
A	Phase A Primary Power Input	Delivers Phase A power to Power Supply.	14
B	Phase B Primary Power Input	Delivers Phase B power to Power Supply.	14
C	Phase C Primary Power Input	Delivers Phase C power to Power Supply.	14
D	Phase B-T2 Primary Power Input	Used by Power Supply to develop blower power and 115 Vac for auxiliary equipment.	22
E	Phase A-T2 Primary Power Input	Used by Power Supply to develop blower power and 115 Vac for auxiliary equipment.	22
F	115 V Common	115 Vac from Power Supply for auxiliary equipment and bandswitch motor.	22
G	115 V Hot	115 Vac from Power Supply for auxiliary equipment and bandswitch motor.	22
H	24 V Switched	Jumpering J1-H to J1-J activates Power Supply inverter which provides RF-110A blower power. This is accomplished by the RF-110A standby relay. Inverter creates 115 Vac, 400 Hz at J1-K and J1-L.	22
J	24 V Hot	Jumpering J1-H to J1-J activates Power Supply inverter which provides RF-110A blower power. This is accomplished by the RF-110A standby relay. Inverter creates 115 Vac, 400 Hz at J1-K and J1-L.	22
K	115 Vac, 400 Hz Hot	From inverter in Power Supply to blower and time meter in RF-110A.	22

Table 2-2. RF-110A Power Supply Connector 1A2J1
Pin Number/Function Correlation (Cont.)

1A2J1 Pin No.	Function	Remarks	Suggested Minimum Wire Size
L	115 Vac, 400 Hz Common	From inverter in Power Supply to blower and time meter in RF-110A.	22
M	+500 Vdc	Driver plate and screen voltage from Power Supply.	22
N	Common Ground	High voltage ground return.	22
P	Power Supply Interlock	Goes to ground via Power Supply panel interlock switch and thermal switch.	22
R	+2250 Vdc	RF-110A tube plate voltage from Power Supply.	18
NOTE If an RF-112A or RF-124 Power Supply is used, Cable Assembly W3, Part Number 399-0027, pre-fabricated for use between the Power Supply and RF-110A, is available.			

Table 2-3. RF-110A Transmitter Interface Connector 1A2A1J2
Pin Number/Function Correlation

1A2A1J2 Pin No.	Function	Remarks	Suggested Minimum Wire Size
A	Chassis Ground	Chassis ground return.	22
B	Floating 12 Vdc (+)	12 Vdc source to transmitter interface. (12 Vdc when loaded)	22
C	Chassis Ground	Redundant ground.	
D	115 Vac Common	115 Vac common (spare when RF-111A Power Supply is used).	22
E	Reserved	Reserved, wired input (to 1A2A1J7-s).	22
F	Reserved	Reserved, wired input (to 1A2A1J7-j).	22
G	PTT +12 V Key	Push-to-talk +12 V from transmitter interface.	22

Table 2-3. RF-110A Transmitter Interface Connector 1A2A1J2 Pin Number/Function Correlation (Cont.)

1A2A1J2 Pin No.	Function	Remarks	Suggested Minimum Wire Size
H	115 Vac Remote	115 Vac hot line to transmitter interface via exciter (spare when RF-111A Power Supply is used).	22
S	CW/RATT Key	CW/RATT Keyline to exciter.	22
T U	Remote 600 ohm/ LSB Input	Balanced Audio input (LSB) to exciter.	22 Shielded pair
V W	Remote 600 ohm USB/AM/RATT input	Balanced Audio input (USB/AM/ RATT) to exciter.	22 Shielded pair
Z	Floating 12 Vdc (-)	12 Vdc Source to transmitter interface. (12 Vdc when loaded)	22
a	Ground Interlock	Coupler ground interlock (if used).	22
b	Ground Keyline	Ground keyline to/from exciter and coupler.	22
d	Keyline Interlock	Power amplifier keyline interlock.	22

Table 2-4. RF-110A Primary Power Input Connector 1A2J5 Pin Number/Function Correlation

1A2J5 Pin No.	Function	Remarks	Suggested Minimum Wire Size
A	Phase A primary power input	Filtered by line filter 1A2FL1.	12 (600 V)
B	Phase B primary power input	Filtered by line filter 1A2FL1.	12 (600 V)
C	Phase C primary power input	Filtered by line filter 1A2FL1.	12 (600 V)

Table 2-5. RF-110A Antenna Coupler Connector 1A2A1J6 Pin Number/Function Correlation

1A2A1J6 Pin No.	Function	Remarks	Suggested Minimum Wire Size
A	Chassis Ground	Ground return.	22
B	Keyline Ground	Grounding J6-B will key the driver and final amplifiers. (J8-B to D or J2-b to d jumper is required.)	22
E	Ground Pulse	Momentary ground used by antenna coupler (RF-601A) to initiate automatic tune cycle.	22
F	Tune Ground	Grounding J6-F will limit the RF-110A power output to 200 watts (with proper APC connections to external exciter).	22
G H I	Spares	Pins G, H, and I are wired spares.	22
J	Coupler Interlock	Grounding J6-J will inhibit RF-110A keying.	22
L M	115 Vac Hot 115 Vac Common	115 Vac, single phase auxiliary power for antenna coupler.	22

Table 2-6. RF-110A Exciter Input/Output Connector 1A2A1J7 Pin Number/Functional Correlation

1A2A1J7 Pin No.	Function	Remarks	Suggested Minimum Wire Size
A	Band Code Line 1	Determines the frequency band at which the RF-110A will operate.	22
B	Band Code Line 2		22
C	Band Code Line 3		22
D	Band Code Line 4		22
E	Band Code Line 5		22
G	CW/RATT Ground	Grounding Pin G will transfer final amplifier bias from class AB to class B, for CW or RATT operation. Averaging circuit is removed from the APC detector.	22

Table 2-6. RF-110A Exciter Input/Output Connector 1A2A1J7 Pin Number/Functional Correlation (Cont.)

1A2A1J7 Pin No.	Function	Remarks	Suggested Minimum Wire Size
H	Chassis Ground	Ground return.	22
J	+28 V Interlock	+28 V output except when keying is inhibited; used to inhibit exciter keying.	22
K	Ground Keyline	Grounding Pin K will key the driver and final amplifiers (jumper from J8-B to D or J2-b to d is required).	22
M	+28 V Standby and Operate	Applying +28 V to Pin M will turn on RF-110A filament and bias supplies.	22
N	+20 V Operate	Applying +20 V at Pin N will turn on all high voltages.	22
P	Ground Pulse	Momentary ground used by antenna coupler RF-601A to initiate automatic tune cycle.	22
R	115 Vac Hot	115 Vac , single-phase output for external exciter.	22 Shielded
S	115 Vac Common	115 Vac, single-phase output for external exciter.	22 Shielded
T	+20 V Carrier Insert	+20 V is present at J7-T when RF-110A front panel key switch is placed at TUNE KEY position, or when an associated antenna coupler (e.g., RF-601A) requests tune carrier. Used by an exciter to deliver a steady carrier Tune Signal for tuning an antenna coupler.	22
U	115 Vac Remote	115 Vac supplied to the transmitter interface connector from the exciter for auxiliary use.	22 Shielded
V	Reserved	Reserved, wired input (to 1A1J5-F).	22
X	Reserved	Reserved, wired input (to 1A2A1J2-J).	22
Z	Chassis Ground	Redundant chassis ground.	22

Table 2-6. RF-110A Exciter Input/Output Connector 1A2A1J7 Pin Number/Functional Correlation (Cont.)

1A2A1J7 Pin No.	Function	Remarks	Suggested Wire Size
c	CW/RATT Key	CW/RATT keyline to exciter.	22
d	APC	Average Power Control line from RF-110A.	22 Shielded
e	PPC	Peak Power Control line from RF-110A.	22 Shielded
f g	Remote 600 ohm LSB input	Balanced LSB audio from transmitter interface to the exciter.	22 Shielded
h	Shield Ground	Shield ground for APC line (d) and PPC line (e).	
j	Reserved	Reserved, wired to 1A2A1J2-F input.	22
k	PTT +12 V Key	Push-to-talk, +12 V from transmitter interface to the exciter.	22
n	Floating 12 Vdc (-)	12 V source to transmitter interface.	22
p r	Remote 600 ohm USB/AM input	Balanced USB/AM audio from transmitter interface to exciter USB/AM/ISB audio input.	22 Shielded
s	Reserved	Reserved, wired to 1A2A1J2-E input.	22

Table 2-7. RF-110A Accessory Connector 1A2A1J8 Pin Number/Function Correlation

1A2A1J8 Pin No.	Function	Remarks	Suggested Minimum Wire Size
A	Chassis Ground	Ground Return.	22
B	Ground Keyline	J8-B and J8-D (or J2-b and J2-d) must be jumpered in order to key the RF-110A.	22
C	+28 Vdc	+28 Vdc for accessory use.	22

Table 2-7. RF-110A Accessory Connector 1A2A1J8 Pin Number/Function Correlation (Cont.)

1A2A1J8 Pin No.	Function	Remarks	Suggested Minimum Wire Size
D	Keyline Interlock	J8-B and J8-D (or J2-b and J2-d) must be jumpered in order to key the RF-110A.	22
E	CW/RATT	Grounding J8-E will transfer PA bias from class AB to class B, for CW or RATT operation.	22

CAUTION

When the RF-110A auxiliary voltage outputs are used to power external equipment. Be sure that total current drain for all external equipments does not exceed the RF-110A capability. The total drain on the auxiliary outputs should not exceed the following:

115 Vac single phase	1.6 Amperes (185 watts)
28 Vdc	0.5 Amperes
12 Vdc	0.9 Amperes

Table 2-8 lists the four basic control functions needed by the RF-110A. These functions are intended to be supplied by the mode selector switch on the exciter with which the RF-110A is used. This type of interconnection will yield the simplest operating procedure for the overall system because operation remains essentially the same as it would for the exciter alone.

Table 2-8. RF-110A Control Function Data

Operation	Reaction
Apply +28 Vdc to J7-M	Places the RF-110A in a Standby condition. The following items become energized: all tube filaments, blower, bias supplies, 3-minute time delay relay.
Connect J7-N to J7-M through a 470 ohm, 2 watt resistor	If 3-minute delay mentioned above has expired, the RF-110A high voltage contactor closes. High voltage comes on and the HIGH VOLTAGE indicator lights.

Table 2-8. RF-110A Control Function Data (Cont.)

Operation	Reaction
Ground J7-K (J8-B must be jumpered to J8-D)	Blocking bias is removed from the driver and final tubes. All plate currents are at normal idle. Antenna relay energizes. Amplifier is now keyed and operable. (Can also be accomplished by the front panel LOCAL KEY switch.)
Ground J7-G (optional)	Causes a bias shift on the driver and final tubes which yields a higher operating efficiency with reduced linearity. Intended for modes not requiring high linearity such as CW and RATT.

If control independent of the exciter is more desirable, it can be obtained with a simple control box shown in figure 2-4.

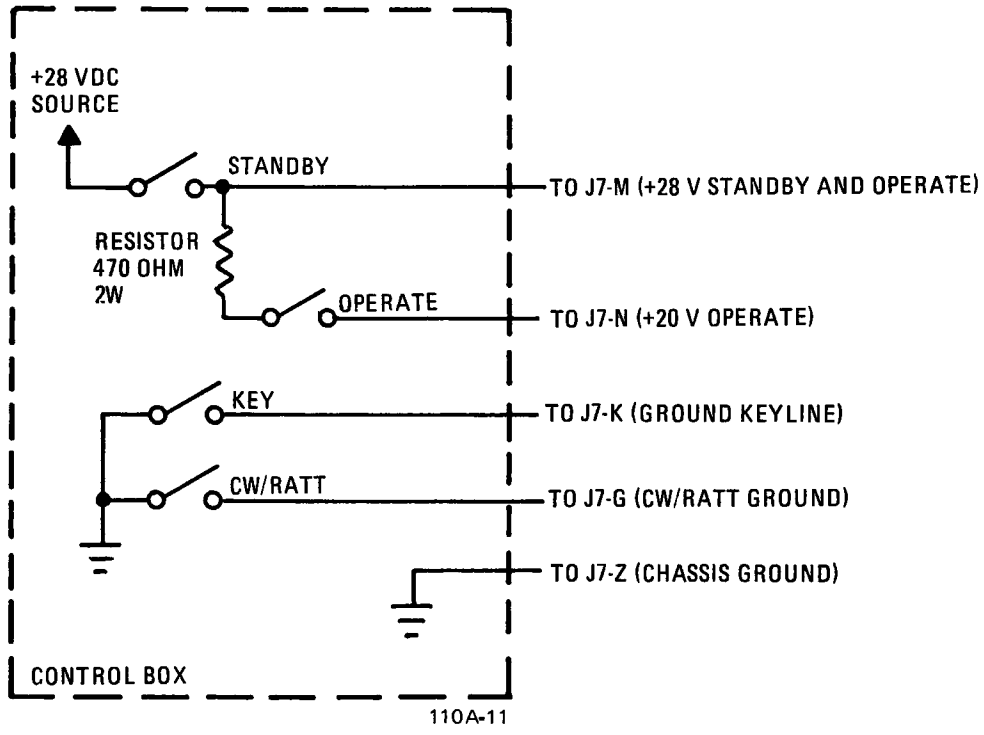


Figure 2-4. RF-110A External Control Box Details

Placing a ground on J7-K (normally accomplished by the exciter's push-to-talk circuit) energizes the antenna transfer relay and removes the blocking bias from the driver and final tubes. The time constant inherent in keying the bias is designed to prevent "hot switching" of the antenna transfer relay. That is, the tubes require about 0.2 seconds to reach full conduction after J7-K is grounded. This is more than enough time for the antenna transfer relay to properly energize. Therefore no special sequencing is required between the exciter and the RF-110A. The RF-110A may be keyed with normal RF drive present at the input terminals without damage.

NOTE

1. The RF-110A keyline is not intended to follow CW keying characters. The amplifier keyline must be held closed during CW transmission while the CW keying is accomplished at the exciter.

2. As supplied, the RF-110A has a series diode in its keyline circuitry which prevents the from being keyed externally unless FREQUENCY MHZ selector is placed in AUTOMATIC position. The diode (CR14 in figure 7-18) is short circuited when the FREQUENCY MHZ selector is in AUTOMATIC. Should it be necessary for an RF-110A to have local frequency selection and remote keying, the diode must be shorted out. Solder a short length of hook-up wire across its leads. The diode is found directly behind the front panel on the last wafer of the FREQUENCY MHZ selector.

2.5 RF-110A RF LOAD REQUIREMENTS

The RF-110A has been designed to operate into a nominal 50 ohm antenna load with a VSWR of up to 4:1. Thus, it is possible to operate the RF-110A into conventional broadband antennas. When working into whip or random long wire antennas, it will be necessary to use an antenna coupler in order to permit operation over the 2-30 MHz frequency range. The coupler should match the antenna impedance to a nominal 50 ohms with a VSWR of 1.5:1 or better.

2.6 INITIAL ADJUSTMENT DATA - APC AND PPC CIRCUITS

The RF-110A PPC and/or APC controls should be adjusted to suit exciter requirements at the time of installation. This is necessary to prevent overdriving of the RF-110A and also to keep the average "talk power" high during SSB operation. The PPC is a fast time constant, peak detection type circuit which senses the output RF envelope. Its output goes more positive with increasing power level and is available at J7-e. The sensitivity level for the development of PPC voltage is adjusted by 1A1R11. The APC is a longer time constant, averaging circuit that delivers a positive going output proportional to average RF level. The slope of the dc output versus power curve is adjustable with the APC ADJ control 1A1R12.

Since requirements differ for the various exciters which can be used with the RF-110A, no attempt is made in this manual to describe specific adjustment procedures. The PPC/APC voltages have the following characteristics:

- The PPC output has a minimum value of about +3.5 V. When the RF amplitude exceeds a threshold determined by 1A1R11, the PPC voltage increases linearly with RF voltage at a rate also dependent on 1A1R11. Maximum voltage available is about 9 V; however at about 8 V, internal PPC commences.

- APC output has a minimum value of about +4.4 V. When the RF amplitude exceeds a threshold, the APC voltage increases linearly with RF voltage; threshold and slope are determined by 1A1R12. Maximum voltage attainable is about +8 V. The averaging properties of the APC detector can be removed by grounding J7-G, which also places the RF-110A in the high efficiency mode (see table 2-8).

Normally, for exciters having a single gain control input, the PPC output is used as the controlling voltage. In general, PPC adjustment is as follows:

a. Set PPC control to minimum sensitivity. This is done by rotating the PPC ADJ control (1A1R11) fully CW.

b. With the RF output terminated in a 50 ohm dummy load, increase the drive level (steady carier) from the exciter until a forward power indication of 1 kW is obtained on the front panel meter.

c. Slowly rotate the PPC ADJ control CCW to point where further rotation causes a decrease in RF output. Carefully lock the adjustment at this point.

Additional protection from overdriving is provided by the RF-110A internal PPC loop. This loop returns a controlling voltage to the driver amplifier. The threshold power level for the internal PPC loop is inherently set at a PPC voltage of about +8 V. Therefore, if the exciter is adjusted to control on a PPC voltage below +8 V, the internal control never reaches its threshold value, and so it serves only a precautionary function. If the exciter with which the RF-110A is used does not have an automatic gain control input, then the amplifier's internal loop should be adjusted to begin limiting at 1 kW. The procedure is exactly the same as given above.

2.7 GROUNDING

The RF-110A must be grounded to ensure that all system elements are at this same reference, and to a physical ground that brings the input power (and all other conductive material that might be simultaneously contacted) to the same neutral potential. In shipboard installations, the ship's hull normally provides an excellent ground system. In nonshipboard installations, especially in environments involving other electronic devices, it may be advisable to bond all equipment together to create a common ground using short, wide ground straps.

2.8 VENTING

Exhaust vent air from the RF-110A cooling fan is only a few degrees warmer than the inlet air and does not require ducting. Ducting may be desired, (4.5 kW input minus the 1 kW output equals 3.5 kW of room heat).

SECTION 3

OPERATION

3.1 GENERAL

This section describes and defines the RF-110A controls and indicators, and contains general operation information.

3.2 DESCRIPTION/DEFINITION OF CONTROLS AND INDICATORS

Table 3-1 lists and describes all front panel controls and indicators. Figure 3-1 shows the location of all front panel controls and indicators.

Table 3-1. RF-110A Control and Indicator Functions

Figure 3-1 Number	Control, Indicator, or Connector	Function, Description, or Indication
1 2	Multifunction Selector (1A1S5) and Multifunction Display Meter (1A1M1)	The Multifunction Display Meter displays the driver and amplifier and final amplifier parameters selected by the Multifunction Selector. The meter display/selector position correlation is as follows: Multifunction Selector Position — Multifunction Meter Displays DRIVER 2 - AMPERES — Cathode current of driver amplifier tube 1A1A1V2 (keyed = 200-280 mA) DRIVER 1 - AMPERES — Cathode current of driver amplifier tube 1A1A1V1 (keyed = 200-280 mA) PA PLATE 2 - AMPERES — Cathode current of final amplifier tube 1A1V2 (keyed unmodulated = 200-280 mA) (keyed modulated = less than 700 mA) PA PLATE 1 - AMPERES — Cathode current of final amplifier tube 1A1V1 (keyed unmodulated = 200-280 mA) (keyed modulated = less than 700 mA)

Table 3-1. RF-110A Control and Indicator Functions (Cont.)

Figure 3-1 Number	Control, Indicator, or Connector	Function, Description, or Indication	
1 2	Multifunction Selector and Multifunction Display Meter (Cont.)	Multifunction Selector Position	Multifunction Meter Displays
		INPUT PWR 0-150 mW	RF level applied to 1 kW PA by the Exciter (keyed 25 to 125 mW)
		PA PLATE - VOLTS	Dc voltage applied to plate circuit of final amplifier tubes (+2250 Vac ±225 Vdc)
		DRIVER PLATE - VOLTS	Dc voltage applied to plates of the driver amplifier tubes (500 Vdc +100 Vdc -50 Vdc)
		PA - DRIVER SCRNS - VOLTS	Dc voltage applied to screen grids of final and driver tubes (290 ±50 Vdc)
		Meter display ranges are 0 to 150 mW, 0 to 1 A, and 0 to 3 kV.	
3	NORMAL/RESET Switch (1A1S6)	Allows the overload circuit to be reset after it has been tripped by an overload; switch is momentarily depressed to reset condition to restore normal operation.	
4	OVERLOAD Indicator (1A1DS5)	Lights red when an overload condition occurs in in the RF-110A.	
5	POWER Indicator (1A1DS2)	Lights when primary power has been applied.	
6	HIGH VOLTAGE Indicator (1A1DS3)	Lights when voltage has been applied to the plate circuits.	
7	FREQUENCY MEGAHERTZ Selector (1A1S7)	Allows selection of automatic or manual operation of the RF-110A. When the selector is placed at AUTOMATIC position, an external five-wire code is used to automatically tune the RF-110A to the selected band; when the selector is placed at any one of the other nineteen positions, a five-wire code is internally generated to automatically tune the RF-110A to the selected band.	

Table 3-1. RF-110A Control and Indicator Functions (Cont.)

Figure 3-1 Number	Control, Indicator, or Connector	Function, Description, or Indication
8 and 9	POWER METER Switch (1A1S8) and POWER METER (1A1M2)	Selects and displays forward and reflected power. Forward power: 0-1500 W; Reflected Power: 0-150 W and 0-1500 W.
10	FILAMENT Elapsed Time Indicator (1A1B3)	Indicates final amplifier tube filament on elapsed time.
11	500 Vac 1.5 A Fuse (and Fuseholder) (1A1F7 and 1A1XF7)	Protects the 500 Vdc circuit from overload damage; fuseholder lights when the fuse is open or missing
12	28 Vdc 3.0 A Fuse (and Fuseholder)(1A1F6 and 1A1XF6)	Protects the 28 Vdc power supply from overload damage; fuseholder lights when the fuse is open or missing
13	LOCAL KEY/NORMAL/ TUNE KEY Switch (1A1S3)	Allows keying of the exciter, when placed in the LOCAL KEY position; this switch is spring-loaded when positioned to the right and locked in place when positioned to the left. It is normally used for testing, and is usually left at the NORMAL position (keying from the exciter).
14	PWR Control (1A1R13)	Allows the RF output power to be reduced from normal (full output) to a lesser value without disturbing the automatic gain control functions; the control is normally adjusted fully clockwise; control range is from 1 kW down to 100 watts.
15	PA BIAS Control (1A1R10)	Allows adjustment of the bias voltage to the final amplifier tubes; this control should not be adjusted except during the applicable bias adjust procedure.
16	Exciter/Coupler 3.0 A Fuse (and Fuseholder) (1A1F5 and 1A1XF5)	Protects the 115 Vac, single-phase power output from overload damage; fuseholder lights when the fuse is open or missing.
17	BLOWER 1.0 A Fuse (and Fuseholder) (1A1F4 and 1A1XF4)	Protects the blower power supply from overload damage; fuseholder lights when the fuse is open or missing.
18	PRIMARY POWER Switch (1A1S4)	Applies primary power to the unit.

Table 3-1. RF-110A Control and Indicator Functions (Cont.)

Figure 3-1 Number	Control, Indicator, or Connector	Function, Description, or Indication
19	Primary Power Fuses (and Fuseholders) (1A1F1 thru 1A1F3 and 1A1XF1 thru 1A1XF3)	Three fuses (one for each phase of the primary power input) protect the primary power input from overload damage; fuseholders light when the fuses are open or missing.

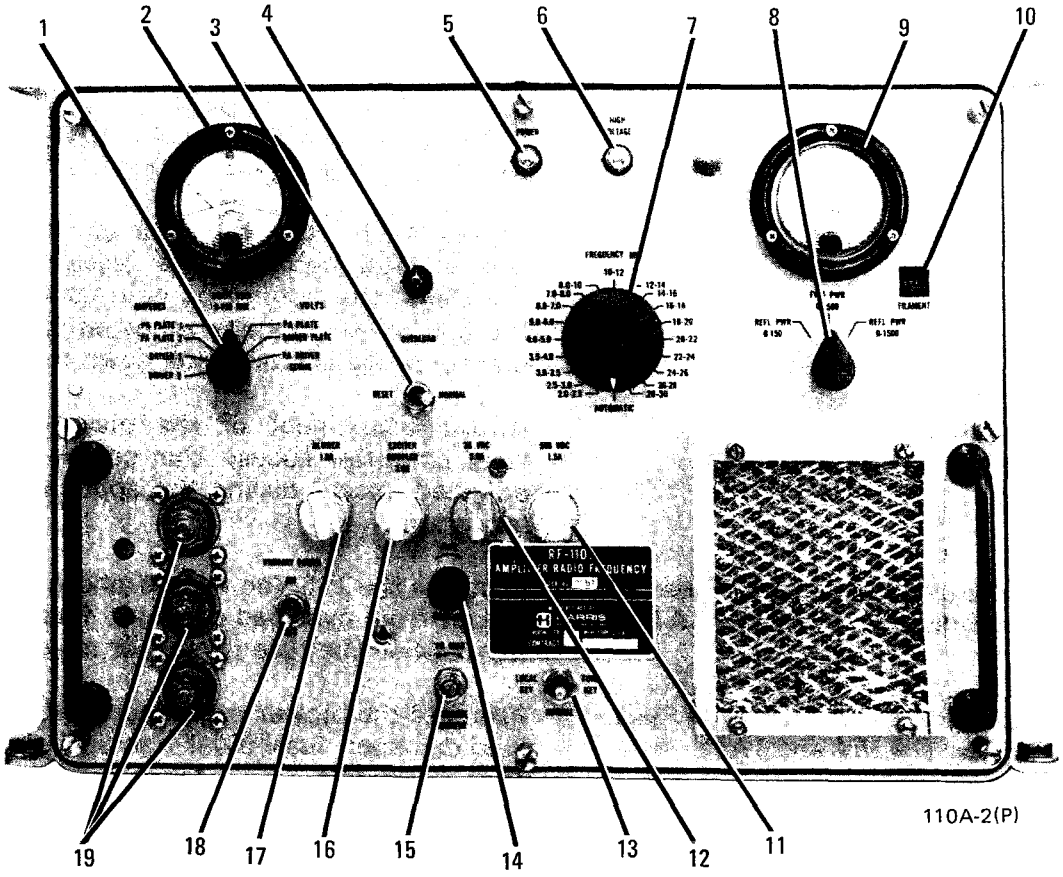


Figure 3-1. RF-110A Front Panel Control and Indicator Locations

3.3 GENERAL OPERATION PROCEDURES

The following procedure assumes that the RF-110A is driven from a simple low level RF source capable of delivering 25-125 mW of steady carrier into 50 ohms. It assumes the exciter does not have a PPC input. In actual operation, with a particular exciter, the operating procedure will probably be modified according the the particular installation (e.g., the amount of interfacing with external equipments). Sufficient logic and control input/output connections exist on the RF-110A for a large variety of installation possibilities with external exciters or antenna couplers.

Read through this entire procedure and become familiar with the content of tables 3-1 and 3-2 before equipment turn-on.

a. Place the PRIMARY POWER switch on the RF-110A front panel at ON. Using the exciter controls, put the RF-110A in operate mode (allow a 5-minute warm up period.)

b. Set the RF-110A FREQUENCY MHZ selector to the desired frequency range. If frequency selection is to be done remotely, set the FREQUENCY MHZ knob to AUTOMATIC position.

c. Place the multifunction selector to each of the positions specified in table 3-2. The readings should be as listed under the conditions specified.

d. With no RF input to the RF-110A, rotate the multifunction selector to PA PLATE 1 AMPERES then to PA PLATE 2 AMPERES position. Note the lesser of the two readings. Adjust the lesser to a value of 240 mA with the PA BIAS Adjustment. Now check the greater value. If the greater value exceeds 300 mA, the screen voltage should be adjusted (see section 5, of this manual).

e. Rotate the PWR control on the RF-110A front panel to full CW.

f. If the RF-110A is directly connected to a low VSWR load (see paragraph 2.5), increase the RF drive level from the exciter while observing the forward and reflected power levels on the front panel power meter. A forward reading of 1000 watts with a reflected reading of less than 40 watts which corresponds to an output VSWR of 1.5:1. The RF-110A is now ready for use.

Table 3-2. RF-110A Normal Multifunction Meter Indications (RF-110A Operating in Linear Mode)

Multifunction Selector Position	Multifunction Meter Should Display	RF-110A Condition
DRIVER 2 - AMPERES	200-280 mA	Keyed, with or without RF.
DRIVER 1 - AMPERES	200-280 mA	Keyed, with or without RF.
PA PLATE 2 - AMPERES	Less than 300 mA	Keyed, with no RF.
PA PLATE 1 - AMPERES	Less than 300 mA	Keyed, with no RF.

Table 3-2. RF-110A Normal Multifunction Meter Indications (RF-110A Operating in Linear Mode) (Cont.)

Multifunction Selector Position	Multifunction Meter Should Display	RF-110A Condition
INPUT PWR 0-150 MW	25-125 mW	At normal RF output.
PA PLATE - VOLTS	2250 ±225 Vdc	Unkeyed.
DRIVER PLATE - VOLTS	+500 +100-50 Vdc	Unkeyed.
PA - DRIVER SCRNS - VOLTS	+290 ±50 Vdc	Unkeyed.

SECTION 4

FUNCTIONAL DESCRIPTION

4.1 INTRODUCTION

Figure 4-1 is an overall functional block diagram of the RF-110A. Study this diagram prior to proceeding with the descriptions and analyses given in the subsequent paragraphs of this section.

The following paragraphs are arranged in a manner that will allow the quickest understanding of the circuits described. The general presentation sequence is:

- RF-110A power distribution
- RF Signal (path through the RF-110A)
- RF-110A Tuning Circuitry
- RF-110A Keying and Bias Circuitry
- RF-110A Protection and RF Power Control Circuitry
- RF-110A Multifunction Meter Circuitry

4.2 PRIMARY POWER SOURCES AND DISTRIBUTION

Refer to figure 4-2. With primary power connected to the RF-110A and with standby Relay 1A1K2 energized, transformer 1A1T1 on the main chassis will provide the following voltage outputs:

- 16 Vac to Dc Power Control PWB 1A1A5, for development of the floating +12 Vdc and -12 Vdc power sources
- 32 Vac (center-tapped) to Dc Power Control PWB 1A1A5 for development of the +28 Vdc, +20 Vdc, and +11 Vdc power sources
- 6 Vac to the final amplifier tube filaments
- 13.5 Vac to the driver amplifier tube filaments
- 115 Vac to the APC-PPC-PWB 1A1A6 bias power supply

NOTE

For explanatory purposes, the RF-112A Power Supply will be referenced in all subsequent text in this section.

The power supply will supply the following voltages:

- 115 Vac, single-phase, 400 Hz to operate blower 1A1B1 and Filament Time Meter 1A1B3
- 115 Vac, single-phase, 60 Hz to operate bandswitch motor 1A1B2
- +500 Vdc to Driver Tube Assembly 1A1A1 tube plates
- +500 Vdc to Zener Diode Protector Assembly 1A1A9 and Final Amplifier Tube Screen Circuit, which develop the driver and final amplifier tube screen voltages
- +500 Vdc to Meter Resistor PWB 1A1A7
- +2250 Vdc to the final amplifier tube plates
- +2250 Vdc to Meter Resistor PWB 1A1A7

The development of voltages in the RF-112A is described in detail in the RF-112A technical manual, publication number 1932-0006. The same information for the RF-124 Power Supply is contained in publication number 8913-0003.

4.2.1 Standby and Operate Signals

After the RF-110A PRIMARY POWER switch 1A1S4 is placed on, and a +28 Vdc Standby Command, from the systems exciter, the Standby Relay 1A1K2 will energize.

After a 3-minute delay time relay 1A1K4 closes. Assuming that no overload condition exists the operate relay driver transistor (1A1A5Q7) is turned on by a +20 Vdc operate signal from the system exciter. The +28 Vdc operate relay enabling voltage (from 1A1A5 via 1A1A6) must also be present.

As shown in figure 4-2, key interlock transistor 1A1A5Q4 requires a +20 Vdc operate signal to turn on, sending +28 Vdc to the system exciter. This operate signal will not be present if:

- A low (ground) from the coupler interlock is present
- A low from the NORMAL/RESET switch 1A1S6 is present
- An overload condition exists
- Bandswitch motor 1A1B2 is operating

4.3 DC POWER CONTROL PWB 1A1A5 LOW VOLTAGE POWER SUPPLIES

The 11 Vdc, 20 Vdc, 28 Vdc, and $\pm$12 Vdc floating power supplies of Dc Power Control PWB 1A1A5 provide low dc voltages for operation of the control circuitry of the APC-PPC PWB 1A1A6. The $\pm$12 Vdc floating power supply output is routed to transmitter interface connector 1A2J2 for external use. Refer to figures 4-3 and 7-21 during the following descriptions.

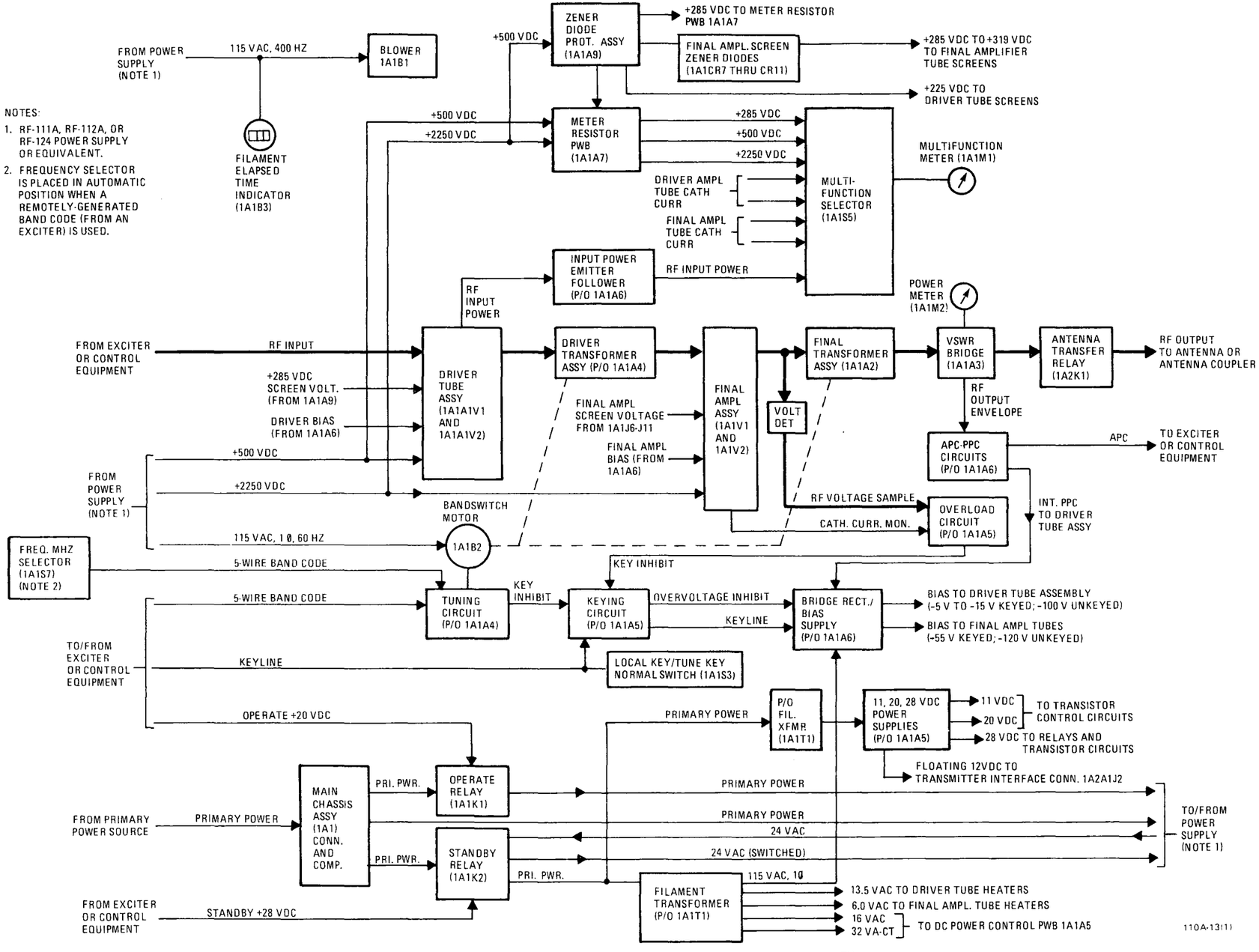


Figure 4-1. RF-110A Radio Frequency Amplifier Overall Functional Block Diagram

WITH PRIMARY POWER CONNECTED TO THE RF-110A, AND WITH STANDBY RELAY K2 ENERGIZED, T1 ON THE RF-110A MAIN CHASSIS WILL PROVIDE OUTPUTS AS FOLLOWS:

1. 115 VAC TO 1A1A6 BIAS POWER SUPPLY
2. 13.5 VAC TO DRIVER AMPLIFIER TUBE FILAMENTS
3. 6 VAC TO FINAL AMPL V1 FILAMENTS
4. 6 VAC TO FINAL AMPL V2 FILAMENTS
5. 32 VAC (CT) TO 1A1A5 FOR: +28 VDC, +20 VDC, +11 VDC
6. 16 VAC TO 1A1A5 FOR FLOATING 12 VDC

SEE NOTES AT LEFT

SEE SCHEMATIC FOR JUMPER DETAIL (115/208/230/440 VAC) (RF-110A MANUAL)

P/O RF-110A

P/O 1A1

CASE

P/O RF-112A POWER SUPPLY

P/O TB2

P/O 1A1J14

P/O 1A1J12

P/O TB1

T1 SHOWN SETUP FOR 208 VAC OPERATION SEE RF-112A SCHEMATIC

CR4-CR7 ARE CONFIGURED AS A FULL-WAVE BRIDGE TO PRODUCE APPROX. 24 VDC FOR T1 PRIMARY

A1 T1

Q1/A2 400 HZ SWITCHING RATE ESTABLISHED BY C3 & R1/R2 TIME CONSTANT

INTLK S2

INTLK S1

WITH S4 ON AT THE RF-110A, ALL T2 RELATED VOLTAGES WILL BE PRESENT.

DS1 POWER ON

+28 VDC STANDBY AND OPERATE FROM EXCITER

RF-110A CASE J7

1A1 J14

K2 STANDBY RELAY

S10

S11

S4 PRIMARY POWER SHOWN IN ON POSITION

RF-110A CASE J5

208/440 VAC 50/60 HZ PRI INPUT MAX LOAD WATTS = 4500

FL1

F1

F2

F3

+28 VDC TO EXCITER

+28 VDC FROM EXCITER VIA 1A1A6P1

OPERATE RELAY DRIVER Q7 IS TURNED ON BY THE +20 VDC OPERATE SIGNAL FROM THE EXCITER, ASSUMING THAT 3 MINUTE DELAY TIMER K4 IS CLOSED AND THAT NO OVER LOAD CONDITION EXISTS. THE +28 VDC OPERATE RELAY ENABLING VOLTAGE MUST ALSO BE PRESENT (1A1A5Q8 AND Q4 ON).

K1 OPERATE RELAY

1A1A5 Q4 REQUIRES +20 VDC OPERATE SIGNAL TO TURN ON. THE OPERATE SIGNAL WILL BE NEGATED BY A LOW FROM

- CPLR INTLK GND
- RESET (1A1S6)
- OVERLOAD
- 5-WIRE CODE CHANGE

P/O 1A1A5

Q8 KEY SWITCH

Q7

Q4 KEY INTLK

NOTE

CR33 10 V

R19

CR1

R21

+20 VDC OPERATE FROM EXCITER

RF-110A CASE J7

1A1 J14

P/O 3 MIN DELAY TIMER K4

1A1S1 AIR VANE INTERLOCK

1A1S9 HV INTERLOCK

OVER CURRENT AND OVER VOLTAGE SENSE INPUTS.

T1

CR2

CR1

CR3

2250 VDC

500 VDC

DS2 HIGH VOLTAGE

S3

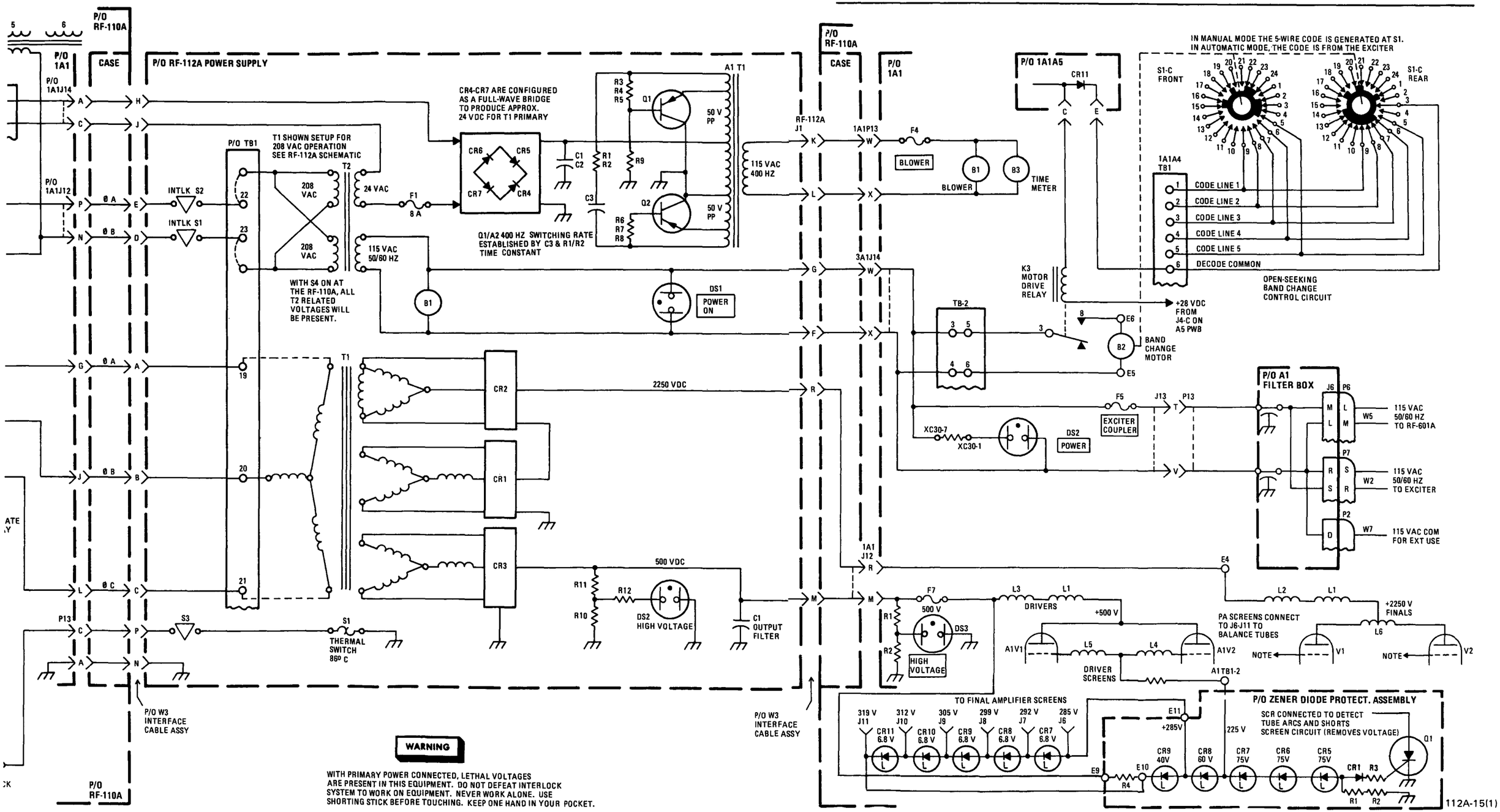
S1 THERMAL SWITCH 86° C

P/O W3 INTERFACE CABLE ASSY

P/O RF-110A

WARNING

WITH PRIMARY POWER CONNECTED, LETHAL VOLTAGES ARE PRESENT IN THIS EQUIPMENT. DO NOT DEFEAT INTERLOCK SYSTEM TO WORK ON EQUIPMENT. NEVER WORK ALONE. USE SHORTING STICK BEFORE TOUCHING. KEEP ONE HAND IN YOUR POCKET.



WARNING

WITH PRIMARY POWER CONNECTED, LETHAL VOLTAGES ARE PRESENT IN THIS EQUIPMENT. DO NOT DEFEAT INTERLOCK SYSTEM TO WORK ON EQUIPMENT. NEVER WORK ALONE. USE SHORTING STICK BEFORE TOUCHING. KEEP ONE HAND IN YOUR POCKET.

112A-15(1)

Figure 4-2. Simplified RF-112A Integrated Control Diagram

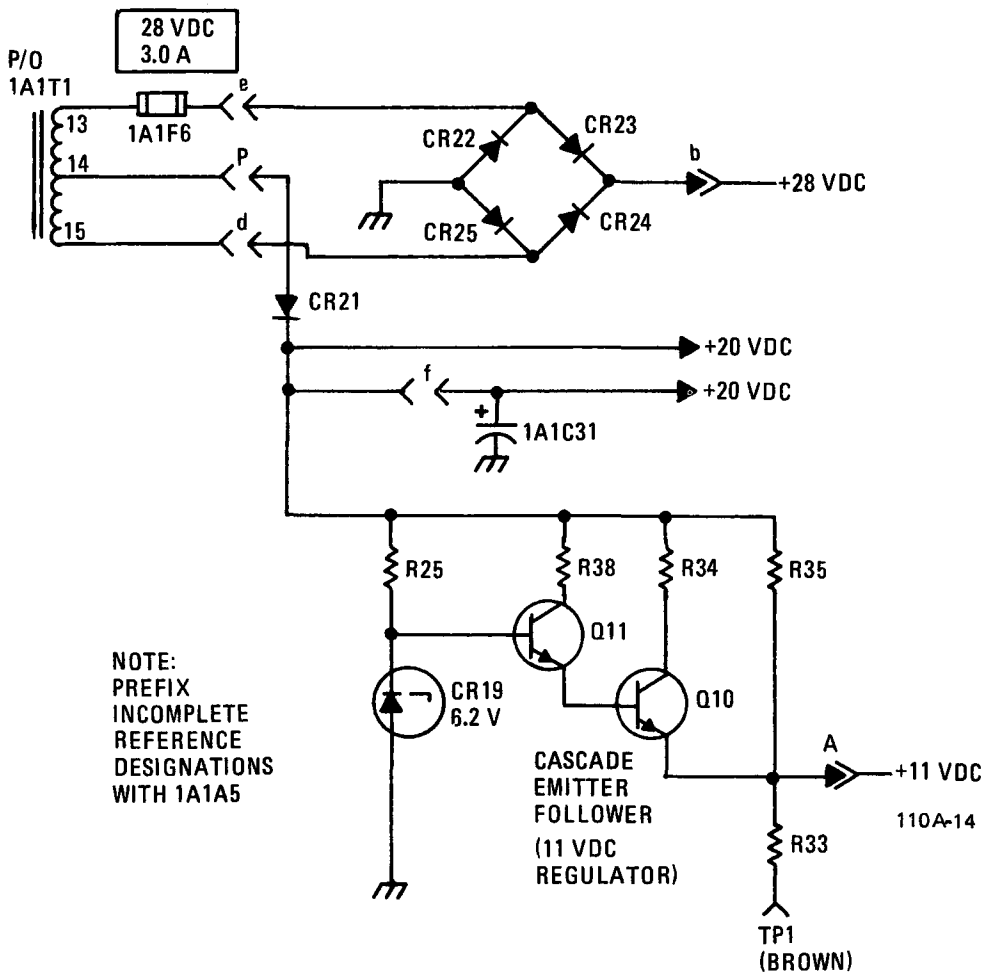


Figure 4-3. Dc Power Control PWB 1A1A5 11, 20, and 28 Vdc Power Supplies Simplified Schematic Diagram

4.3.1 +28 Vdc Circuit Description

The output of secondary winding 13-14-15 of low voltage transformer 1A1T1 (activated when standby relay 1A1K2 is energized) is full-wave rectified by diodes CR22 through CR26, producing an unfiltered dc output with an average value of 28 Vdc.

4.3.2 +20 Vdc Circuit Description

Because one side of the secondary winding of transformer 1A1T1 is always grounded through CR22 or CR25 during any particular half-cycle of ac output from the winding and the other side is always positive with respect to the grounded side, a positive voltage equal to one-half the voltage across the full secondary is present at the center tap. Diodes CR23 and CR24 are not part of this circuit, since only CR22 and CR25 in the ground return path are required for full-wave rectification. The positive full-wave rectified output from the center tap of the secondary winding is routed through isolation diode CR21 to charge capacitor 1A1C31. The isolation diode allows the capacitor to charge to the peak value of the voltage from the center tap, which is about 20 volts.

4.3.3 +11 Vdc Circuit Description

In addition to being applied to some of the control circuitry, the 20 Vdc is also applied to the 11 Vdc regulator. Voltage divider R25-CR19 provides a stable reference voltage at the base of the first emitter follower Q11. By emitter follower action, the voltage at the emitters of Q11 and Q10 must remain fixed with relation to the voltage at the base of Q11, regardless of changing load conditions. Q11 and Q10 provide current gain to allow a relatively large current to be controlled by the low current zener diode regulator at the base of Q11. The output of the 11 Vdc supply is taken through two current paths, consisting of R34-Q10 and R35 in parallel. The excess of the 20-volt input voltage is dropped across R35 and the combination of R34 and the collector-base junction of Q10. The dynamic resistance in Q10 changes with load current and input voltage variations to maintain regulation of the output voltage. R35 is connected in series with Q10 so that the entire voltage drop of about 9 volts does not take place in Q10, thereby reducing the power dissipation in the transistor. Resistor R35 is used so that with minimum load current, very little current is drawn through Q10. This provides a further reduction in transistor power dissipation.

4.3.4 Floating 12 Vdc Circuit Description

The floating 12 Vdc power supply consists of a full wave rectifier (CR26 through CR29), filter (1A1C30), and a two-stage current amplifier regulator circuit (Q12, 1A1Q1) and their associated components. This circuit provides a floating regulated 12 Vdc for external use.

The output from winding 18-19 of transformer 1A1T1 is full wave rectified by diodes CR26 through CR29, filtered by capacitor 1A1C30, and applied to the voltage reference circuit (R26, R27, CR30, CR31). Zener diodes CR30 and CR31 provide a stable 12.4 Vdc reference for two emitter followers (Q12 and 1A1Q1) which constitute the 12 Vdc regulator. Capacitor C2 filters the current for Zener diodes CR30 and CR31 so the reference voltage will be essentially ripple-free. This assures low ripple at the regulator output.

The floating 12 Vdc power supply must be loaded at least 10 mA (10K ohms, 1/2 W resistor) to be measured accurately.

4.4 RF SIGNAL PATH THROUGH THE RF-110A

4.4.1 General Description

The exciter generates an RF signal with a nominal level of 100 milliwatts during normal operation. Refer to figure 4-1. This signal is applied to the input to the RF-110A in which it is successively amplified by two linear amplifier stages:

- a driver amplifier stage
- a final amplifier stage

4.4.2 Driver Amplifier Circuit General Description

The Driver Amplifier Circuit consists of two electronic tubes (1A1A1V1 and 1A1A1V2) and their associated components (Driver Tube Assembly 1A1A1), an interstage transformer assembly (Driver Transformer Assembly 1A1A4), and various other complementary components. Refer to figure 4-4. The driver amplifier adds approximately 20 dB gain to the nominal 100 milliwatt (+20 dBm) input from the exciter, to produce an approximately 10 watt (+40 dBm) drive level to the final amplifier. The amplifier output is routed via Driver Parasitic Suppressor 1A1Z1 to Driver Transformer Assembly 1A1A4 and on to the final amplifier stage.

4.4.2.1 Driver Amplifier Circuit Detailed Analysis

The RF input from the exciter is applied to a nominal 50 ohm load network (C16, L2, and R6) which compensates for the input capacitance of the two electron tubes and provides a VSWR of 1.3:1 or less over the entire operating frequency range. Refer to figure 4-4. The RF input is also routed through a voltage doubler detector circuit (CR1, C18, CR2, and C17) to APC--PPC PWB 1A1A6. From the input load, the RF input signal is coupled by capacitor C1 to control grids of the two driver electron tubes. The two parallel connected electron tubes are operated as a class A linear amplifier stage which provides a nominal power gain of 20 dB. One of nineteen broadband tuned circuits is used to provide the required selectivity and to couple the RF output from the driver amplifier to the input of the final amplifier.

The nineteen tuned circuits of Driver Transformer Assembly 1A1A4 are mounted on a motor-driven bandswitch assembly which selects the proper one automatically according to the operating frequency. Each wired circuit above 8 MHz consists of a double tuned circuit which uses capacitive top coupling. This type of circuit provides a wide, flat-response passband with very sharp skirts (broadband tuning). Below 8 MHz, conventional single tuned circuits are em- ployed.

The voltages developed across cathode resistors R1 and R2, due to screen and plate current drawn through the resistors and the cathodes, are applied to the metering circuit for monitoring and measurement (Meter Resistor PWB Assembly 1A1A7).

Each of the power supply input lines (bias, screen, and plate) is filtered to provide RF decoupling. Capacitors C2 through C12 and C19 are local RF bypasses. Network 1A1Z1 is used for parasitic suppression.

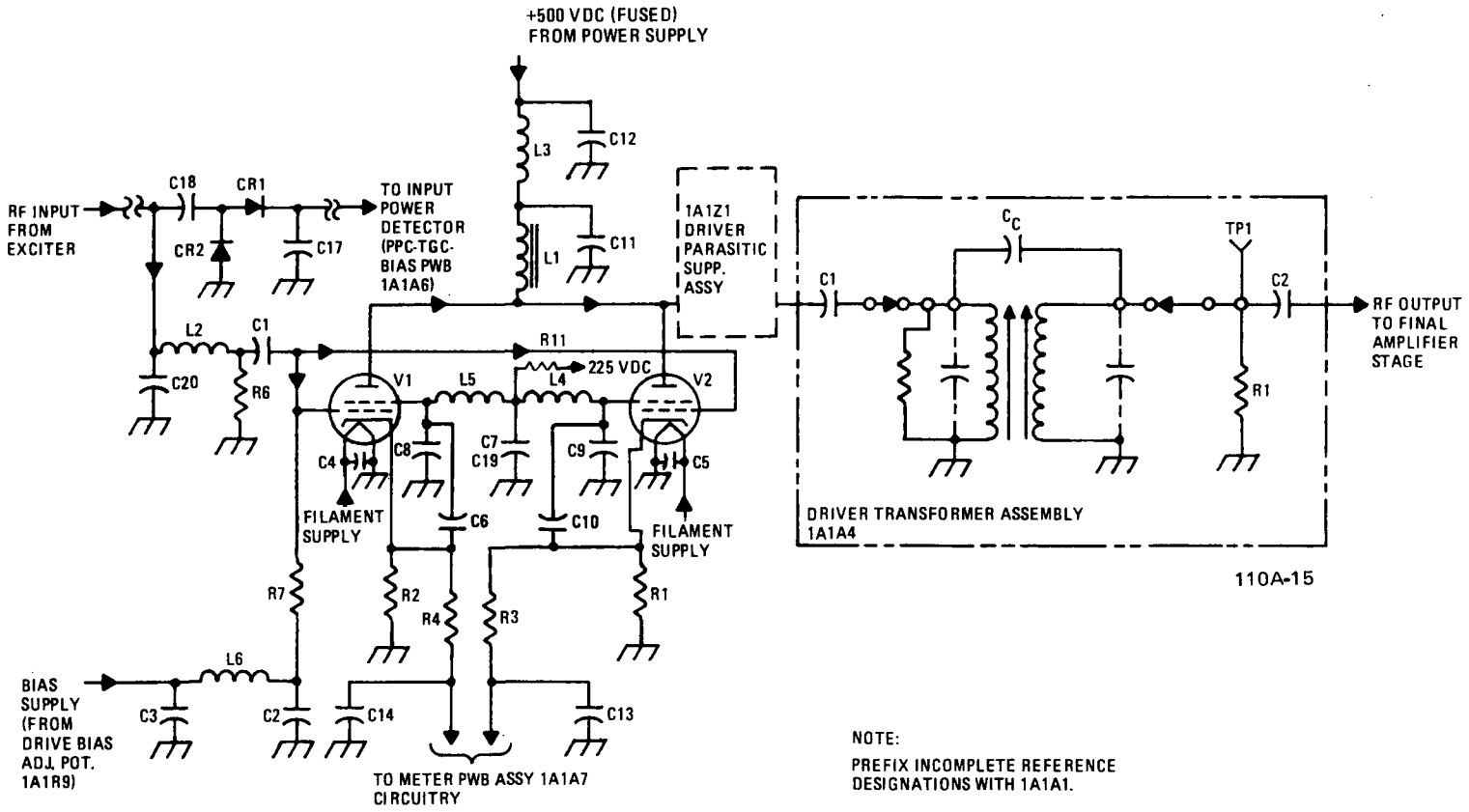


Figure 4-4. Driver Amplifier Circuit Simplified Schematic Diagram

4.4.3 Final Amplifier Stage General Description

The Final Amplifier Stage circuitry consists of two electron tubes (1A1V1 and 1A1V2), Final Transformer Assembly 1A1A2, and various other complementary components. The final amplifier adds an additional +20 dB gain to the approximate +40 dBm input from the driver amplifier to produce the nominal 1000 watt (+60 dBm) final output level. The operating mode of the final amplifier is automatically switched from linear to class B for operation in CW and RTTY modes.

4.4.3.1 Final Amplifier Stage Detailed Analysis

The RF output from the Driver Amplifier circuit is applied through parasitic suppressors R16 and R17 to the grid of electron tube V1 and through parasitic suppressors R18 and R19 to the grid of electron tube V2. Refer to figure 4-5. The two parallel connected electron tubes operate as a Class AB_1 linear amplifier. One of twelve broadband output transformers is used to provide selectivity and couple the RF output from the Final Amplifier stage to the antenna. The voltage at the input of Final Transformer Assembly 1A1A2 is also applied to the overload circuit of Dc Power Control PWB 1A1A5 for monitoring.

The 12 transformers are mounted on a motor-driven bandswitch assembly which is switched according to the operating fequency to automatically connect the proper transformer into the signal path. Each transformer consists of a double tuned circuit which uses capacitive bottom coupling. Each secondary winding is tapped such that the top of the secondary winding and the secondary tuning capacitor form a series resonant circuit to trap second harmonic frequencies. The taps couple the tuned circuit to the 50 ohm output.

The voltage drops developed across cathode resistors R25-R26 and R27-R28 by the screen and plate current drawn through the cathode circuits are applied to the metering circuit (Multifunction Selector 1A1S5 and Meter 1A1M1) for monitoring and measurement, and the overload circuit for monitoring. Each of the power supply input lines (bias, screen, and plate) is filtered to provide RF decoupling. The cathode resistors are bypassed by capacitors C_A-C_B amd C_D-C_C. Parallel connected resistors R5 and R6 provide grid loading to swamp the nonlinear input impedance of the electron tubes, thereby preventing distortion. Inductor L6 and resistor R21 serve as a parasitic suppressor. L6 presents a high impedance to VHF parasitics and R21 swamps L6 to prevent its resonance from causing oscillations. Capacitors C10 and C20 are RF bypasses for the tube heaters. Plugs P6 and P7 allow the screen voltages to be selected independently at the screen regulator to balance the idling currents of the two tubes.

4.4.4 VSWR Bridge 1A1A3 Circuit Description

The VSWR Bridge (figure 7-18) consists of a toroidal transformer and various voltage divider, detector, and filter networks. The function of this circuit is to provide outputs to power meter 1A1M2 proportional to the forward and reflected power on the output transmission line. In addition, a single output related to both reflected and forward power is applied to the APC-PPC circuits.

The center conductor of the output transmission line passes through the center of toroidal transformer T1 and constitutes its single turn primary. The walls of the assembly serve as the shield for the transmission line. The short shield around the center conductor, grounded at only one end, does not serve as a part of the transmission line, but merely prevents undesired capacitive coupling between the center conductor and the secondary winding on the toroid.

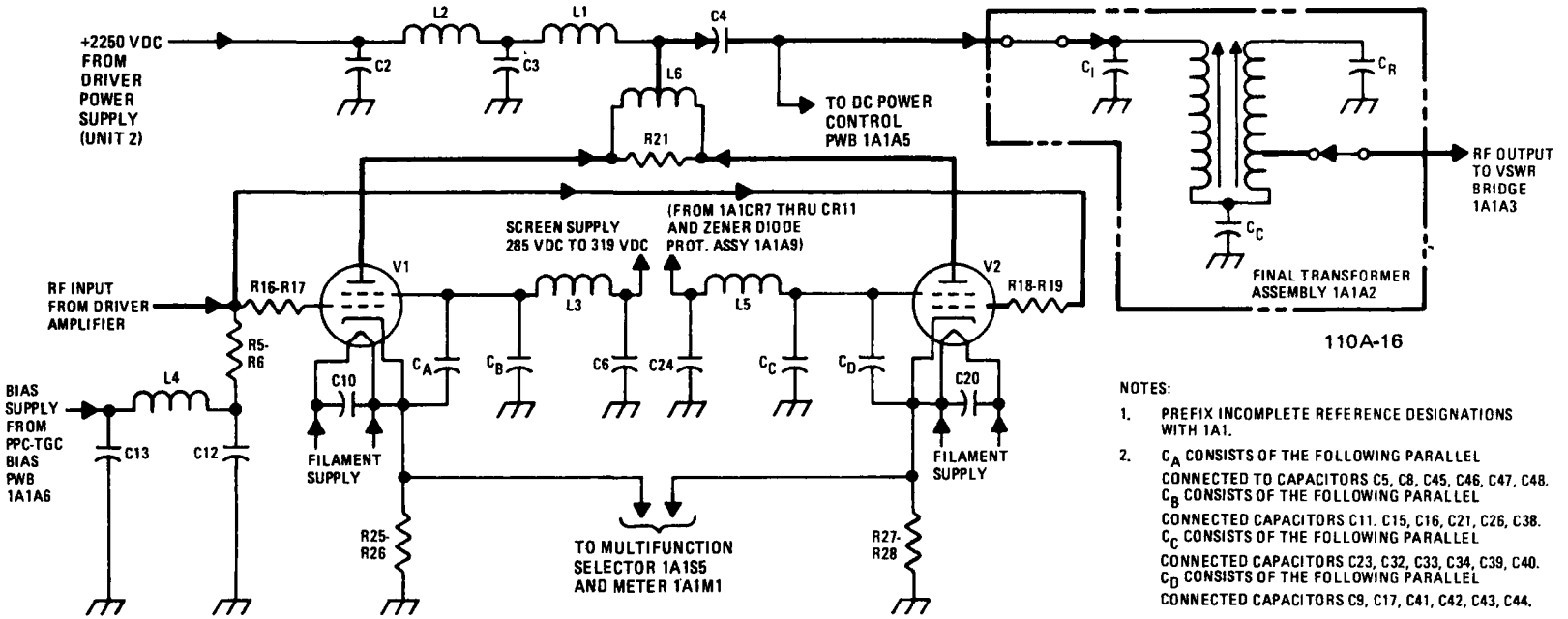


Figure 4-5. Final Amplifier Stage Simplified Schematic Diagram

Current through the transmission line induces equal voltages in the two parts of the center tapped secondary winding. One voltage is in phase with the line current and the other 180 degrees out of phase with the line current. Voltage divider C6-C1 provides a reference voltage at the center tap of toroidal transformer T1 that is in phase with the line voltage. When the load on the transmission line is 50 ohms resistive so that there is no reflected power, the line voltage and current are in phase. Trimmer C6 is adjusted so that the reference voltage is equal in magnitude to the induced voltage when the load on the transmission line is 50 ohms resistive. Therefore, the vector sum of the voltages between terminal 3 of the transformer T1 (reflected power side of the bridge) and ground is zero, since the induced voltage is equal in magnitude and 180 degrees out of phase with the reference voltage. As the load changes to something other than 50 ohms resistive, causing reflected power on the line, the two voltages no longer exactly cancel and output is produced at terminal 3 of transformer T1. This level is peak detected by diode CR1 and capacitor C2, and applied through calibrating resistor R7 to contact 2 of power meter switch 1A1S8. It is also applied through calibrating resistor R8 to contact 4 of power meter switch 1A1S8. Either range of reflected power can then be selected by the power meter switch for application to power meter 1A1M2 for measurement or monitoring.

Similarly, the voltage at terminal 1 of transformer T1, the reference voltage and the induced voltage across resistor R2 add vectorially to produce a signal related to forward power. This voltage is peak detected by diode CR4 and capacitor C5, and applied to voltage divider R4-R14. Potentiometer 1A1R14 allows the power meter to be calibrated for a known amount of peak forward power (normally 1 kW). The output from the voltage divider is applied through resistor R3 to contact 3 of power meter switch 1A1S8. Inductor L1 provides a dc path to ground from the center tap of toroidal transformer T1. Resistor R9 is a dc pull-down resistor that prevents the coupling capacitor in final transformer assembly 1A1A2 from holding a charge due to static electricity buildup on the antenna from precipitation.

The signal at terminal 1 (forward power side) of transformer T1 is detected by diode CR3 and applied through isolating resistor R6 to the APC-PPC circuit. This output is, in essence, the envelope of the RF output from the RF-110A, and is used to derive the automatic peak and average power control voltages. Any output from the reflected power side of transformer T1 is detected by diode CR2 and applied through resistor R5 and diode CR5 to the APC-PPC circuit. The value of resistor R5 is chosen so that little or no control voltage will be generated by the APC-PPC circuit due to reflected power, until the reflected power levels reaches approximately 360 watts (4:1 VSWR at 1 kW forward power). As the VSWR, and therefore the reflected power, increases above this point, the additional input to the APC-PPC circuit results in an increased output from the APC-PPC circuit to reduce the output from the RF-110A. Therefore, the equipment is protected against over-dissipation that would result from excessive VSWR on the transmission line. When the tune line is grounded, diode CR6 grounds out the bottom of resistor R5, preventing reflected power limitation during tuning. Diode CR5 prevents resistor R6 from being grounded by the tune line. At high frequencies, the leads of C1 will be inductive. Inductor L2 is used to provide a corresponding amount of inductive reactance in series with capacitor C6, so that the output of the capacitive voltage divider will not be frequency sensitive.

4.4.5 Antenna Transfer Relay 1A2K1 Functional Description

The antenna transfer relay (figure 7-18) connects the antenna to the receiver input or the transmitter output depending on the condition of the system.

One side of the relay coil is connected permanently to 28 Vdc. The other side is connected to the system keyline. The system can be keyed (keyline grounded) from 1A2A1J7-K (exciter), 1A2A1J6-B (antenna coupler) or with the front panel key switch 1A1S3. When the system is keyed, RF output from the VSWR bridge is applied through connectors 1A1A3J2, 1A2P4, and 1A2P5, the contacts of relay 1A2K1, and connectors 1A2P6 and 1A2J3 to the antenna. Whenever the keyline is not grounded, the antenna is connected to receiver input connector 1A2J4 through connectors 1A2J3 and 1A2P6, the contacts on relay 1A2K1, and connector 1A2P7.

4.5 TUNING CIRCUITS

The RF-110A tuning circuitry consists of a decoder, encoder, two bandswitches, a motor, a motor relay, a gating circuit, and various other complementary components. This circuitry positions the bandswitches in Driver Transformer Assembly 1A1A4 and Final Transformer Assembly 1A1A2 according to the selected operating frequency.

An open-seeking circuit that employs a five-wire, 19 position coding scheme is used to automatically position the bandswitch assemblies in the Driver and Final transformer assemblies according to the selected operating frequency. Nineteen bands are used to cover the 2.0 to 30.0 MHz frequency range, and therefore nineteen different five-wire codes are required for tuning as shown in table 4-1.

Table 4-1. RF-110A Frequency Control Tuning Code Chart

Frequency Band (MHz)	Code Line Logic				
	1	2	3	4	5
2.0 to 2.5	0	0	0	0	1
2.5 to 3.0	0	0	0	1	1
3.0 to 3.5	0	0	1	1	1
3.5 to 4.0	0	1	1	1	1
4.0 to 5.0	1	1	1	1	0
5.0 to 6.0	1	1	1	0	1
6.0 to 7.0	1	1	0	1	1
7.0 to 8.0	1	0	1	1	1
8.0 to 10.0	0	1	1	1	0
10.0 to 12.0	1	1	1	0	0
12.0 to 14.0	1	1	0	0	1
14.0 to 16.0	1	0	0	1	0
16.0 to 18.0	0	0	1	0	0

Table 4-1. RF-110A Frequency Control Tuning Code Chart (Cont.)

Frequency Band (MHz)	Code Line Logic				
	1	2	3	4	5
18.0 to 20.0	0	1	0	0	1
20.0 to 22.0	1	0	0	1	1
22.0 to 24.0	0	0	1	1	0
24.0 to 26.0	0	1	1	0	0
26.0 to 28.0	1	1	0	0	0
28.0 to 30.0	1	0	0	0	0

Note: "0" is open
"1" is ground

The code is generated either externally (FREQUENCY MEGAHERTZ selector S7 set at AUTOMATIC position) by an exciter, or internally by an encoder switch wafer in selector 1A1S7 (FREQUENCY MEGAHERTZ selector 1A1S7 set at one of 19 MHz positions). In either case, a series of opens and grounds are applied to the five-code lines through which the code is connected to decoder switch deck 1A1A4S1-C. This establishes a ground path through contact 3 of 1A1A4S1-C Front, terminal 6 of 1A1A4TB1, and diode gate 1A1A5CR1 to pin 6 of motor drive relay 1A1K3.

Therefore, relay 1A1K3 energizes, completing the 115 Vac circuit through bandswitch motor 1A1B2. The motor rotates the decoder switch and the two bandswitches until the decoder code is the complement of the code generated by the encoder. At this time, the ground path to relay 1A1K3 is broken, deenergizing motor 1A1B2.

Both the encoder and the decoder consist of a master section and an image section. The image section is the mirror image of the master. The image sections are required to complete the ground path in certain combinations of encoder decoder positions.

Detail A of figure 4-6 shows the circuit tuned for an operating frequency in the 2.0 to 2.5 MHz band. This can be seen by noting that decoder master 1A1A4S1C pattern (1,1,1,1,0) is the complement of encoder master 1A1S7-1 pattern (0,0,0,0,1). Suppose, however, that the RF-110A had previously been tuned to the 2.5 to 3.0 MHz band (one position clockwise), and FREQUENCY MEGAHERTZ selector 1A1S7 has just been set at the 2.0 to 2.5 MHz band (Detail B of figure 4-6). In this situation, contacts 3 and 7-8-9 of the decoder master are connected, but this does not complete the ground path to motor drive relay 1A1K3 since code lines 1 through 3 are not grounded by encoder 1A1S7 master. Instead, the ground path is provided through the image decks: from 1A1S7-1-20 Front to 1A1S7-1-2 Front to 1A1A4S1C-5 Rear to 1A1A4S1C-6 Rear to 1A1S7-1-2 Rear to 1A1S7-1-3 Rear to 1A1A4S1C-7 Front to 1A1A4S1C-3 Front to terminal 6 of the relay. Therefore, the relay energizes and motor 1A1B2 turns the decoder and bandswitches. The masters and images ensure that there will always be a ground path for any combination of encoder and decoder positions until the decoder reaches the unique position corresponding to that of the encoder. The same process

NOTES:

1. WHEN S7 IS SET AT AUTOMATIC POSITION, S7 IS CONTROLLED BY EXTERNALLY-GENERATED BAND CODES. IN ALL OTHER POSITIONS, S7 GENERATES THE BAND CODES INTERNALLY.

2. THIS IS CONTROL GROUND FOR ALL INTERNALLY-GENERATED BAND CODES. IN THIS SETUP, THE GROUND PATH TO BANDSWITCH MOTOR 1A1B2 IS: VIA S7A-1 (MASTER) TO TB1-5; THRU S1-C-5 AND -6 CONTACTS (IMAGE) BACK TO TB1-4; TO S7A-2 (IMAGE) BACK OUT ON THE -3 CONTACT: THRU TB1-3 TO SIC-7 (MASTER) AND OUT ON SIC-3 TO TB1-6; FROM TB1-6 TO J4-E ON THE 1A1A5 DC POWER CONTROL PWB INPUT; THRU CR1 (THE PATH THRU CR2 IS TO INHIBIT KEYING DURING THE TUNING OPERATION) AND OUT J4-C TO 1A1K3. THIS GROUND WILL BE REMOVED WHEN SIC (IMAGE) IS DRIVEN ONE MORE POSITION SO THAT THE -5 TO -6 CONNECTION IS OPENED (AS SHOWN).

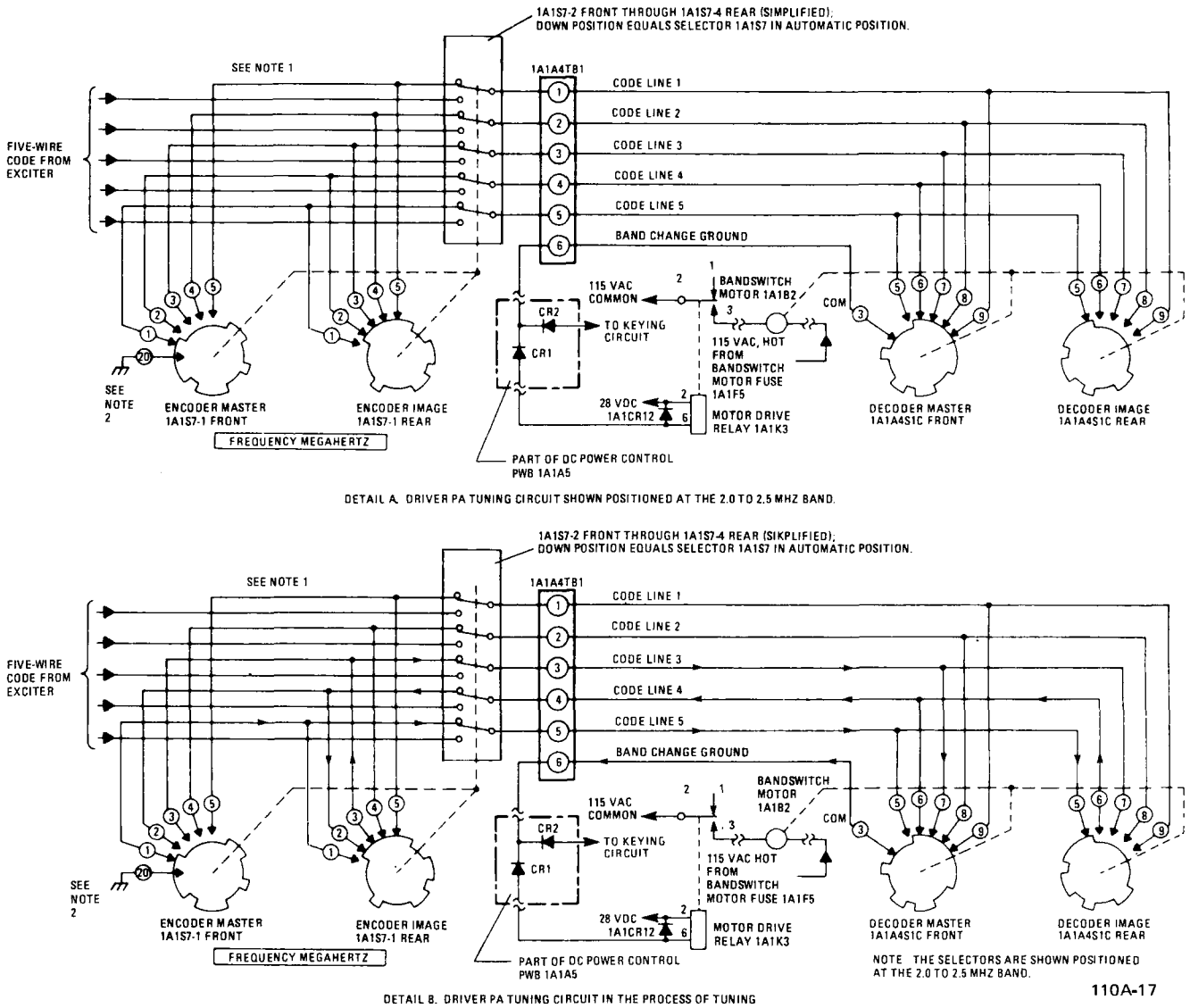


Figure 4-6. Tuning Circuit Simplified Schematic Diagram

occurs when FREQUENCY MEGAHERTZ selector 1A1S7 is set to AUTOMATIC, except that an encoder switch wafer in the exciter performs the function of 1A1S7-1 Front and Rear. When FREQUENCY MEGAHERTZ selector 1A1S7 is not set to AUTOMATIC, section 4 Rear sends a ground signal to the exciter logic that opens the keyline path between the exciter and the RF-110A.

While the bandswitch motor is energized, an inhibit signal is applied to the keying circuit to prevnt keying. The power for driving the motor is 115 Vac, 60 Hz sine wave.

4.6 KEYING CIRCUITS

The keying circuit (figure 4-7) consists of a key interlock, a key driver, a keying stage, a 28 Vdc switch, and various gates and switches. The function of this circuit is to cause the bias power supply to lower the bias voltage for the four electron tubes in the RF-110A from a cutoff to an operate level when the keyline is grounded. The 28 Vdc switch controls an external interlock circuit located in the exciter. Keying will be inhibited if:

- An overload exists
- NORMAL-RESET switch 1A1S6 is held in RESET position
- The bandswitch motor is energized
- A ground is placed on Antenna Coupler Control Connector 1A2A1J6-J from an external source

When a ground is applied to the cathode of CR11 (system is keyed), one end of R16 in voltage divider R12-R28-R16 is grounded. This drops the voltage at the base of Key Driver Q5 below the voltage produced by voltage divider R13/R14 in the emitter circuit, causing Q5 to conduct. Turning on Q5 will also turn on Keyer Q6, shorting out resistor 1A1A6R8 in the bias circuit. This reduces the bias on the driver and final tubes, permitting them to conduct.

When an inhibit (ground) is placed on one of the inputs to the base of Key Interlock switch Q4, Q4 will shut off clamping the base of Key Driver Q5 to about +11 V, turning it off. Diode CR12 provides an auxiliary cutoff to the bias circuit. Diode CR34 prevents the base of Q5 from being pulled too positive by the 20 Vdc through R17.

28 Vdc switch Q8 will normally conduct (i.e., when Q4 is saturated), providing 28 Vdc through CR35 and the emitter and collector of Q8, as an interlock voltage for the external exciter. When an inhibit cuts off Key Interlock switch Q4, the base of Q8 rises to +28 V, turning off Q8 to interrupt the 28 Vdc.

When the unit is in Standby mode, the exciter does not supply the +20 V Operate Voltage. Since all base bias current for turning on Key Interlock transistor Q4 comes through R10 from the +20 V Operate Line, it follows that in Standby mode all keying in both the exciter and the RF-110A is inhibited.

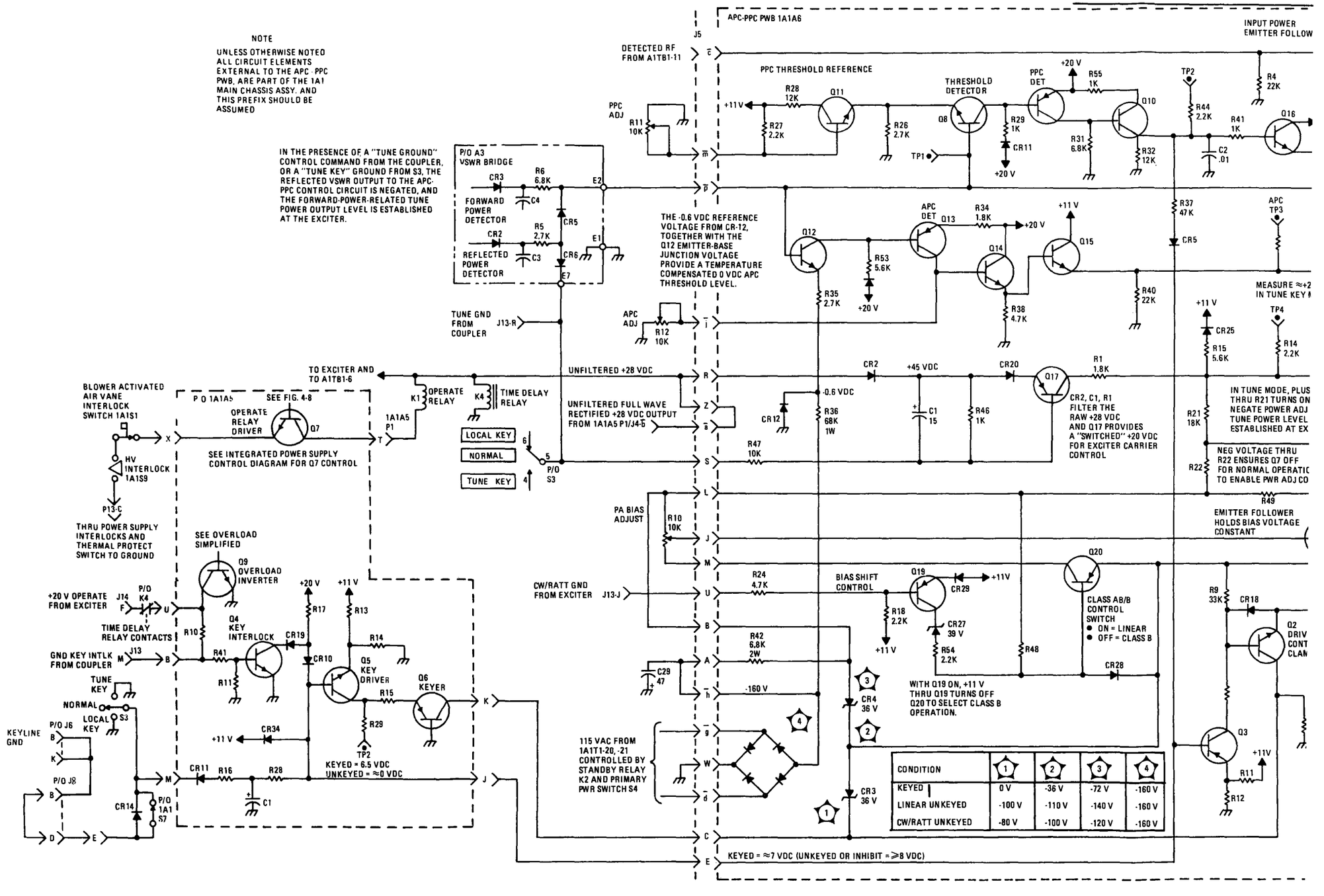
When the FREQUENCY MHZ switch 1A1S7 is not set at AUTOMATIC position, diode 1A1CR14 prevents the RF-110A from being keyed from the system keyline. In this condition the RF-110A can be keyed only with Key switch 1A1S3.

4.7 BIAS CIRCUITRY

The bias power supply (figure 4-7) consists of a full-wave bridge rectifier and filter, a voltage regulator and divider, and various switching circuits. The function of this circuit is to provide the required grid bias voltages for operation of the electron tubes. Until the system is keyed, the outputs from the bias power supply are at the correct level to bias the electron tubes beyond cutoff. When the system is keyed, the bias voltages change to the values required to establish proper plate currents in the electron tubes according to the mode of operation. That is, the final amplifier bias is changed to the value required for class AB_1 operation of the tubes during voice operation or to the value required for class B operation during CW or RATT operation. The value of driver bias is such that the tubes operate class A. However, the driver bias can be controlled by the PPC circuit according to the RF-110A power output requirements (internal PPC).

The output from winding 20-21 of transformer 1A1T1 is full-wave rectified by diodes CR14 through CR17, filtered by capacitor 1A1C29, and applied to a voltage regulator and divider circuit consisting of current limiting resistor R42, Zener diodes CR4 and CR3, and resistor R8. When the system is keyed, transistor 1A1A5Q6 of the keying circuit shorts out resistor R8, grounding the bottom side of the voltage regulator. In any mode of operation except CW and RATT, switch Q20 is saturated (due to resistor R48), connecting the bottom of PA BIAS potentiometer 1A1R10 to -36 volts. Therefore, PA BIAS control 1A1R10 can be adjusted between -36 and -72 V which covers the normal class AB_1 range of operating bias for the final amplifier tubes. The output from PA BIAS control 1A1R10 is applied through transistor Q21 to the final amplifier tubes by emitter follower action. During CW or RATT operation, a CW/RATT ground at P1-U turns on Q19, which turns switch Q20 off. With Q20 cut off, the adjustment range of the PA BIAS control is insignificant, causing the full output from the regulator driver circuit (-72 volts) to be applied by the emitter follower action of transistor Q21 to the final amplifier tubes. Emitter follower Q21 is used to allow grid current to be drawn by the amplifier tubes without losing regulation. If emitter follower Q21 were not used, this current would create a voltage drop across PA BIAS control 1A1R10, thus destroying the regulation and biasing the tubes further toward cutoff. However, with emitter follower Q21 in the circuit, the grid current is now drawn through the small collector-emitter resistance of the transistor resulting in essentially no shift of the bias voltage. During normal operation, PPC amplifier Q3 is conducting sufficiently to saturate clamp Q2. Therefore, the one end of driver bias adj 1A1R9 is clamped to ground through transistors Q2 and 1A5Q6. In this condition the potentiometer can be adjusted over the range of 0 to 24 Vdc, which covers the normal range of class A operating bias for the driver amplifier electron tubes.

When the system is not keyed, 1A1A5Q6 cuts off, removing the short from across resistor R8. The voltage drop that appears across the resistor in this condition drives the bias voltages for the four electron tubes into the cutoff regin. Thus, the RF-110A is keyed on and off through the bias voltages applied to the four electron tubes. Resistor R46 is a pull-down resistor which prevents the cutoff bias applied to the driver tubes from exceeding the grid-to-cathode vol- tage rating. Normally, the APC-PPC output to the exciter maintains the output power at 1 kW, however, if there is a failure in the exciter APC-PPC circuits, the PPC voltage will rise beyond its normal level in an attempt to reduce the output power. This increasing level is applied through isolation diode CR5 to gradually cut off PPC amplifier Q3. As the voltage at the collector of PPC amplifier Q3 falls (becomes more negative), so also does the base voltage clamp Q2. By emitter follower action, then the voltage at the bottom of Driver Bias Adj. potentiometer 1A1R9 also falls, reducing the gain of the driver tubes until proper power output is obtained. Diode CR18 keeps any reverse base-to-emitter voltage at clamp Q2 from exceeding safe limits. Whenever the keying circuit interlocks, a key interlock signal is applied


NOTE
UNLESS OTHERWISE NOTED ALL CIRCUIT ELEMENTS EXTERNAL TO THE APC-PPC PWB, ARE PART OF THE 1A1 MAIN CHASSIS ASSY. AND THIS PREFIX SHOULD BE ASSUMED
APC-PPC PWB 1A1A6
J5
DETECTED RF FROM A1TB1-11
PPC ADJ
R11 10K
PPC THRESHOLD REFERENCE
+11 V
R28 12K
Q11
R27 2.2K
R26 2.7K
THRESHOLD DETECTOR
Q8
PPC DET
+20 V
R55 1K
Q10
R29 1K
CR11
+20 V
R31 6.8K
R32 12K
TP1
TP2
R44 2.2K
C2 .01
R41 1K
R4 22K
Q16
INPUT POWER EMITTER FOLLOW
IN THE PRESENCE OF A "TUNE GROUND" CONTROL COMMAND FROM THE COUPLER, OR A "TUNE KEY" GROUND FROM S3, THE REFLECTED VSWR OUTPUT TO THE APC-PPC CONTROL CIRCUIT IS NEGATED, AND THE FORWARD-POWER-RELATED TUNE POWER OUTPUT LEVEL IS ESTABLISHED AT THE EXCITER.
P/O A3 VSWR BRIDGE
CR3
R6 6.8K
E2
FORWARD POWER DETECTOR
C4
CR5
CR2
R5 2.7K
E1
REFLECTED POWER DETECTOR
C3
CR6
E7
THE -0.6 VDC REFERENCE VOLTAGE FROM CR-12, TOGETHER WITH THE Q12 EMITTER-BASE JUNCTION VOLTAGE PROVIDE A TEMPERATURE COMPENSATED 0 VDC APC THRESHOLD LEVEL.
Q12
Q13
APC DET
R34 1.8K
+20 V
+11 V
Q14
Q15
R53 5.6K
+20 V
R35 2.7K
R38 4.7K
R40 22K
R37 47K
CR5
APC TP3
MEASURE ≈+2 IN TUNE KEY
TUNE GND FROM COUPLER
J13-R
APC ADJ
R12 10K
+11 V
CR25
R15 5.6K
TP4
R14 2.2K
TO EXCITER AND TO A1TB1-6
UNFILTERED +28 VDC
CR2
+45 VDC
CR20
Q17
R1 1.8K
IN TUNE MODE, PLUS THRU R21 TURNS ON NEGATE POWER ADJ TUNE POWER LEVEL ESTABLISHED AT EX
BLOWER ACTIVATED AIR VANE INTERLOCK SWITCH 1A1S1
P/O 1A1A5
SEE FIG. 4-8
OPERATE RELAY DRIVER
Q7
K1 OPERATE RELAY
1A1A5 P1
K4 TIME DELAY RELAY
UNFILTERED FULL WAVE RECTIFIED +28 VDC OUTPUT FROM 1A1A5 P1/J4-5
-0.6 VDC
CR12
R36 68K 1W
C1 15
R46 1K
CR2, C1, R1 FILTER THE RAW +28 VDC AND Q17 PROVIDES A "SWITCHED" +20 VDC FOR EXCITER CARRIER CONTROL
LOCAL KEY
NORMAL
TUNE KEY
P/O S3
R47 10K
R21 18K
R22
R22 ENSURES Q7 OFF FOR NORMAL OPERATIC TO ENABLE PWR ADJ CO
R49
EMITTER FOLLOWER HOLDS BIAS VOLTAGE CONSTANT
HV INTERLOCK 1A1S9
P13-C
THRU POWER SUPPLY INTERLOCKS AND THERMAL PROTECT SWITCH TO GROUND
SEE INTEGRATED POWER SUPPLY CONTROL DIAGRAM FOR Q7 CONTROL
SEE OVERLOAD SIMPLIFIED
Q9 OVERLOAD INVERTER
PA BIAS ADJUST
R10 10K
CW/RATT GND FROM EXCITER
J13-J
R24 4.7K
BIAS SHIFT CONTROL
Q19
CR29
+11V
Q20
R18 2.2K
CR27 39 V
R54 2.2K
+11 V
R48
CLASS AB/B CONTROL SWITCH
• ON = LINEAR
• OFF = CLASS B
CR28
R9 33K
CR18
Q2 DRIV CONT CLAM
+20 V OPERATE FROM EXCITER
P/O K4
J14
F
U
TIME DELAY RELAY CONTACTS
R10
Q4 KEY INTERLOCK
CR19
R17
+20 V
+11 V
R13
R14
GND KEY INTLK FROM COUPLER
J13
M
B
R41
CR10
Q5 KEY DRIVER
Q6 KEYER
R15
R29
TP2
TUNE KEY
NORMAL
LOCAL KEY
S3
KEYLINE GND
P/O J6
P/O J8
CR34
+11 V
CR11
R16
R28
C1
CR14
P/O 1A1 S7
KEYED = 6.5 VDC
UNKEYED = ≈0 VDC
R42 6.8K 2W
C29 47
-160 V
115 VAC FROM 1A1T1-20, -21 CONTROLLED BY STANDBY RELAY K2 AND PRIMARY PWR SWITCH S4
CR4 36 V
CR3 36 V
WITH Q19 ON, +11 V THRU Q19 TURNS OFF Q20 TO SELECT CLASS B OPERATION.
CONDITION
1
2
3
4
KEYED
0 V
-36 V
-72 V
-160 V
LINEAR UNKEYED
-100 V
-110 V
-140 V
-160 V
CW/RATT UNKEYED
-80 V
-100 V
-120 V
-160 V
Q3
+11V
R11
R12
KEYED = ≈7 VDC (UNKEYED OR INHIBIT = ≥8 VDC)

NOTE

UNLESS OTHERWISE NOTED ALL CIRCUIT ELEMENTS EXTERNAL TO THE APC PPC PWB, ARE PART OF THE 1A1 MAIN CHASSIS ASSY. AND THIS PREFIX SHOULD BE ASSUMED

IN THE PRESENCE OF A "TUNE GROUND" CONTROL COMMAND FROM THE COUPLER, OR A "TUNE KEY" GROUND FROM S3, THE REFLECTED VSWR OUTPUT TO THE APC-PPC CONTROL CIRCUIT IS NEGATED, AND THE FORWARD-POWER-RELATED TUNE POWER OUTPUT LEVEL IS ESTABLISHED AT THE EXCITER.

THE -0.6 VDC REFERENCE VOLTAGE FROM CR-12, TOGETHER WITH THE Q12 EMITTER-BASE JUNCTION VOLTAGE PROVIDE A TEMPERATURE COMPENSATED 0 VDC APC THRESHOLD LEVEL.

IN TUNE MODE, PLUS VOLTAGE THRU R21 TURNS ON Q7 TO NEGATE POWER ADJ CONTROL. TUNE POWER LEVEL ESTABLISHED AT EXCITER.

NEG VOLTAGE THRU R22 ENSURES Q7 OFF FOR NORMAL OPERATION TO ENABLE PWR ADJ CONT.

CR2, C1, R1 FILTER THE RAW +28 VDC AND Q17 PROVIDES A "SWITCHED" +20 VDC FOR EXCITER CARRIER CONTROL

WITH Q19 ON, +11 V THRU Q19 TURNS OFF Q20 TO SELECT CLASS B OPERATION.

WITH Q3 ON, Q2 IS ON, AND THE DRIVER BIAS ADJ POT HAS A PATH TO GND THRU P1-C, AND CONTROL CIRCUIT AT 1A1A5Q6. WITH Q2 OFF, GND PATH IS OPEN, AND DRIVER BIAS RISES RAPIDLY TO APPOX. -36 VDC AND DRIVE IS BIASED OFF.

BIAS SUPPLY TEST VOLTAGES CAN VARY AS A FUNCTION OF MODE WHEN UNKEYED. SEE TABULAR INSET FOR APPROX. VALUES.

CONDITION	1	2	3	4
KEYED	0 V	-36 V	-72 V	-160 V
LINEAR UNKEYED	-100 V	-110 V	-140 V	-160 V
CW/RATT UNKEYED	-80 V	-100 V	-120 V	-160 V

Figure 4-7. APC-PPC-PWB 1A1A6 Simplified Schematic Diagram

to the base of PPC amplifier Q3. This cuts off transistor Q3, and clamp Q2. Therefore, the driver electron tubes will be biased at cutoff preventing operation until the interlock is removed. Resistor R6 and diode CR1 provide -30 Vdc reserved for use by an external exciter.

4.8 PROTECTION AND RF POWER CONTROL CIRCUITS

The RF-110A Protection and RF Power Control Circuits consist of the Overload and sampling circuitry of Dc Power Control PWB 1A1A5, the APC/PPC circuitry of APC-PPC PWB 1A1A6, and Zener Diode Protector Assembly 1A1A9. These circuits are described and analyzed in paragraphs 4.8.1 through 4.8.3.

4.8.1 Overload and Sampling Circuitry General Description

The overload circuit consists of an overload detector, a 20 Vdc switch, an overload indicator, an overload switch, cathode and sampling circuit, plate sampling circuit, and various gates. The function of this circuit is to monitor the cathode current of the two final amplifier electron tubes, the RF output voltage from the final amplifier, and the temperature of the RF-112A Power Supply. If any indications are abnormal, the overload circuit trips unkeying the RF-110A, energizing an overload indicator in the RF-110A, muting the exciter and preventing further operation until the fault is cleared. The overload circuit can be reset with the front panel NORMAL/RESET switch.

4.8.1.1 Overload and Sampling Circuitry Detailed Analysis

Refer to figure 4-8. Four inputs to the circuit are used to sense overload conditions as follows:

- The RF output voltages from the plates of the final amplifier electron tubes are sampled by capacitive voltage divider 1A1C35-C36 and detected by diode 1A1CR13. A dc voltage proportional to the RF output voltage is developed across base resistor R8. Resistor 1A1R20 completes the dc path for diode 1A1CR13 and 1A1C37 is an RF bypass capacitor.

- The dc voltage developed across the cathode resistor for final amplifier tube 1A1V1 as a function of the current drawn by the screen and plate is applied to base resistor R8 through decoupling network 1A1R7-1A1C27-C5 and diode CR15.

- The dc voltage developed across the cathode resistor for final amplifier tube 1A1V2 as a function of the current drawn by the screen and plate is applied to base resistor R8 through decoupling network 1A1R8-1A1C28-C1 and diode CR16.

- When the RF-112A temperature is within safe limits and cooling air is being circulated in the RF-110A, and the cover over the RF-110A final tube compartment is in position (holding interlock switch 1A1S9 closed), a ground is applied to the emitter of operate switch Q7. The ground is routed to Q7 via the RF-112A thermal switch and mechanical interlock, through interlock switch 1A1S9, through air vane switch 1A1S1, and through the RF-110A mechanical interlocks. When thermal time delay relay 1A1K4 is closed, 20 Vdc will be applied to the base of Q7 (through the relay) turning it on. The ground, through the interlock switches will be applied to operate relay 1A1K1. Also, conducting Q7 will prevent most of the 20 Vdc operate from the thermal relay from being presented to R21.

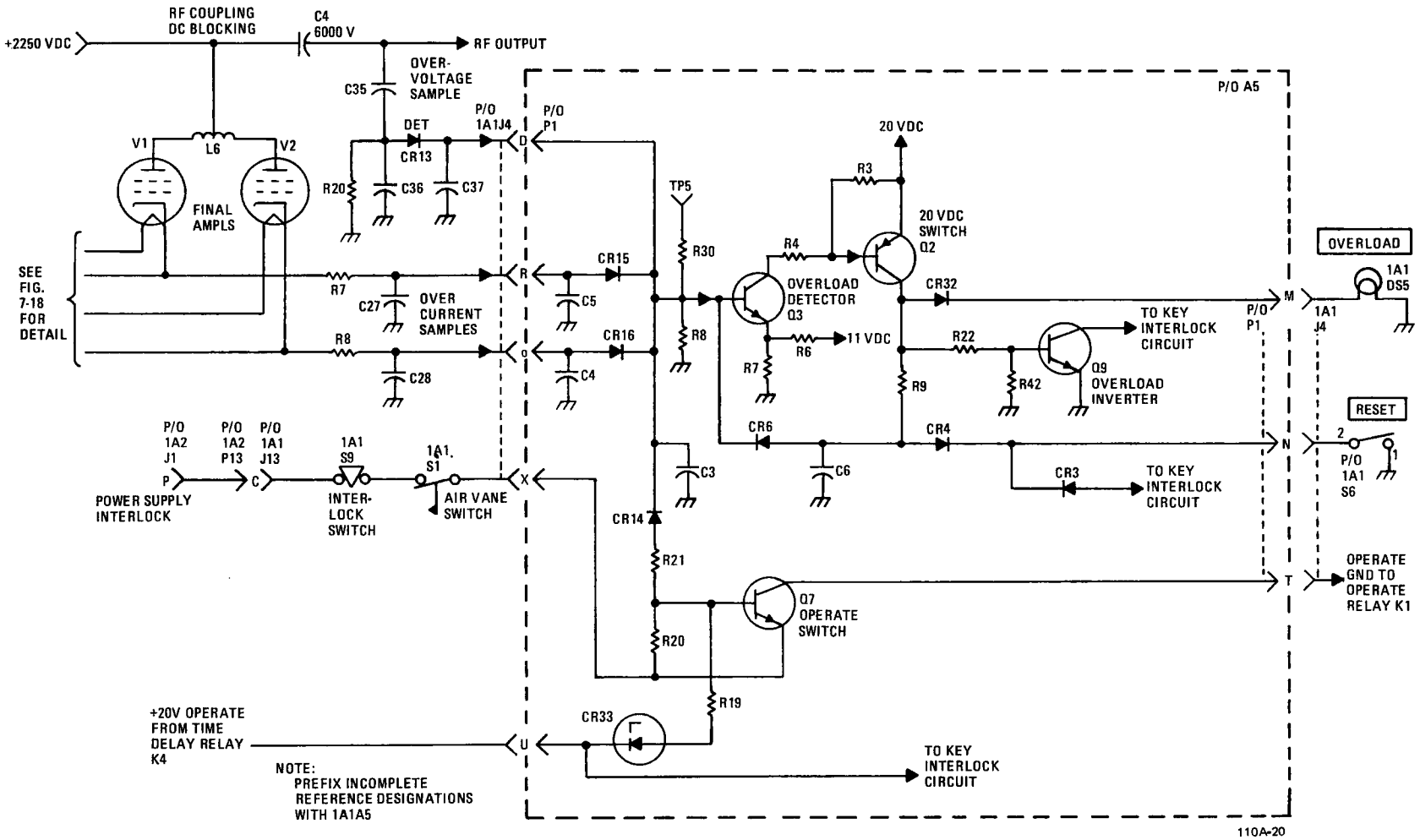


Figure 4-8. Overload Circuit Simplified Schematic Diagram

If any of the interlock switches is actuated, (or in cases like the air vane switch allowed to deactivate) the ground to the base of Q7 will be interrupted, and Q7 will be turned off. The 20 Vdc operate signal will then be applied through CR33, R19, R21, and CR14 to develop enough voltage across R8 to turn on overload detector Q3.

Overload detector Q3 also receives inputs from the final amplifier tube cathodes, and the high voltage detector, as well as the operate switch.

When the voltage on any one of the input lines exceeds the threshold voltage developed by resistors R6 and R7, overload detector Q3 is forward biased. This turns on 20 Vdc switch Q2. Resistor R3 maintains 20 Vdc switch Q2 at cut-off when overload detector Q3 is not energized. When 20 Vdc energizes, overload detector Q3 is locked on through diode CR6. Switch Q2 also turns on Q9 which prevents the RF-110A from being keyed. Also, 20 Vdc is applied through diode CR32 to OVERLOAD indicator lamp 1A1DS5. This energizes the indicator, providing an indication that an overload exists. Resistor R9 and capacitor C6 provide a millisecond delay in the latching of the circuit allowing extremely short overloads to pass without unkeying the system. Once energized, the overload circuit will remain on until primary power is removed or overload switch 1A1S6 is momentarily set at RESET. When Overload switch 1A1S6 is set at RESET, clamp CR6 is disabled. If the overload was of a momentary nature, the overload circuit will be reset, releasing the key interlock and allowing operation to be resumed. However, if the overload remains the circuit will again pick up and prevent operation until the overload is located and removed. CR3 maintains the system in an unkeyed condition while 1A1S6 is in the RESET position.

4.8.2 Zener Diode Protector Assembly 1A1A9 and Final Amplifier Tube Screen Regulator Circuit Description and Circuit Analysis

The Zener Diode Protector Assembly 1A1A9 consists of four Zener Diodes, current sampling resistors, a silicon-controlled rectifier (SCR), and three branch diodes for clamping the final amplifier tube screens to ground (refer to figure 4-9). The Final Amplifier Tube Screen Regulator circuit consists of Zener diodes 1A1CR7 through 1A1CR11.

An arc from the plate to the screen of either 1A1V1 or 1A1V2 would cause a sudden surge of current through plug P6 or P7, Zener diode string 1A1CR7 through CR11, Zener diode string 1A1A9CR5 through CR8, and resistors 1A1A9R2 and R3 to ground. The resultant voltage surge across the resistors would cause diode 1A1A9CR1 to conduct and gate drive current to be applied across SCR 1A1A9Q1. Under these conditons, the SCR would fire (operate). This would establish an alternate shunt current path from the tube screens through diodes 1A1A9CR2 and CR3 to ground.

The circuit protects the Zener diode string in two ways. First, the sudden surge of current initiated by the arc is limited by the series impedance of 1A1L3 (or 1A1L5), resistor 1A1R31 (or 1A1R32), and resistors 1A1A9R2 and 1A1A9R3. Second, SCR 1A1A9Q1 fires within 1 microsecond and shunts current around the diodes via 1A1A9CR2 (or 1A1A9CR3).

The screen circuits of the drive amplifier tubes are protected in a similar manner through resistor 1A1A1R8 and diode 1A1A9CR4.

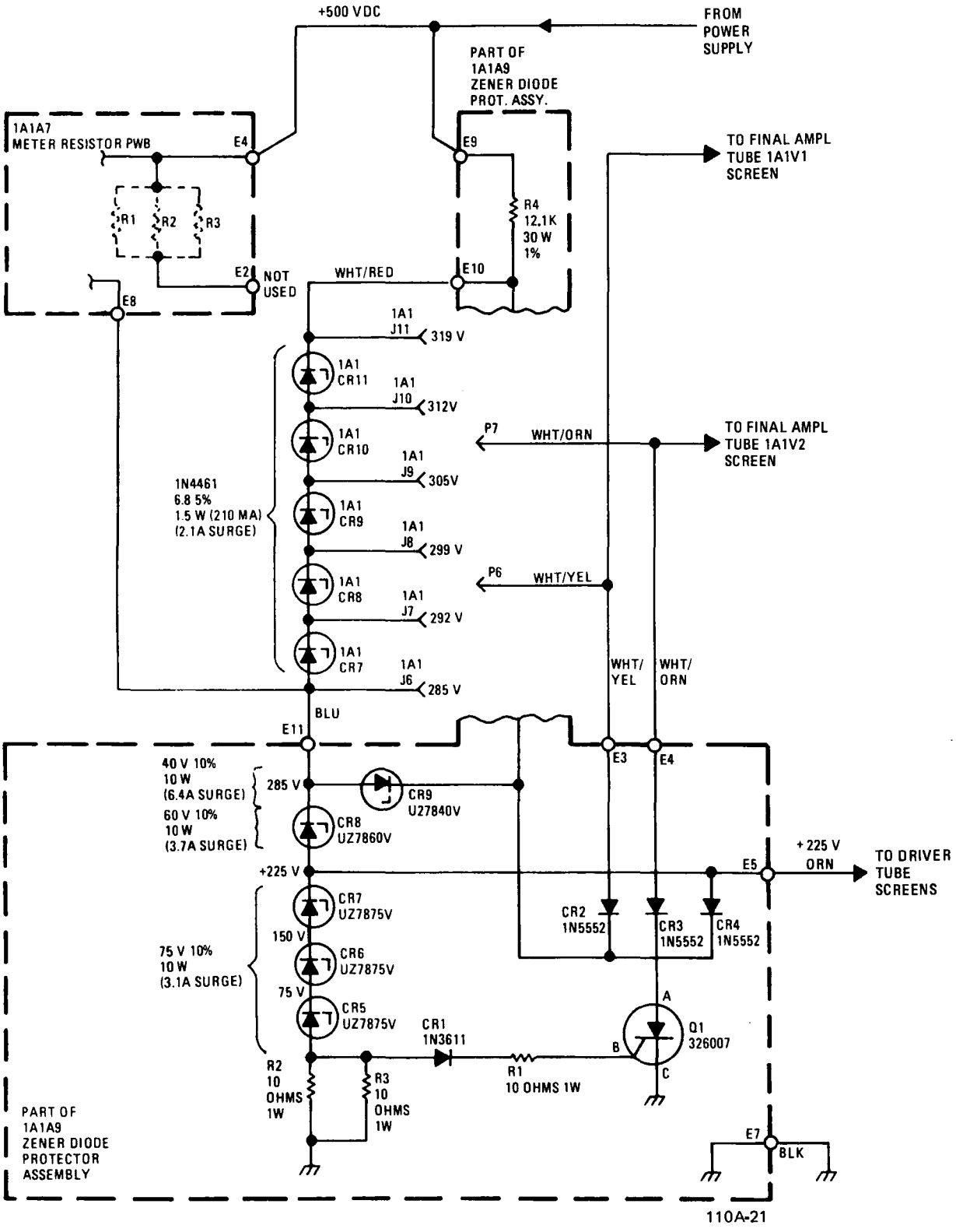


Figure 4-9. Zener Diode Protector Assembly 1A1A9 and Final Amplifier Tube Screen Regulator Circuits – Simplified Schematic Diagram

4.8.3 Average Power Control (APC) and Peak Power Control (PPC) Circuitry

APC-PPC PWB Assembly 1A1A6 generates control voltages th at are routed to the exciter and are used internally to maintain the peak and average power levels of the RF output from the transmitter at a constant predetermined value (refer to figures 4-7 and 7-22).

The output of the VSWR Bridge 1A1A3 RF power detector is developed across a voltage divider consisting of resistors 1A1A3R6 or 1A1A3R5 and 1A1A6R23, and PWR potentiometer 1A1R13, or transistor 1A1A6Q7. The voltage divider output, present at the top of resistor 1A1A6R23, is applied to PPC circuit transistor 1A1A6Q8 and APC input transistor 1A1A6Q12.

NOTE

The following description assumes that PWR potentiometer 1A1R13 has been set at maximum clockwise (maximum resistance) position, and is not a controlling part of the voltage divider at this time.

In the PPC circuit, no output PPC voltage will be present until the input voltage applied is at, or exceeds, the threshold reference level established by PPC ADJ potentiometer 1A1R11 and emitter follower 1A1A6Q11. When the output is at or exceeds this threshold rerference level, transistors 1A1A6Q8 and 1A1A6Q9 conduct, placing a positive voltage on the base of transistor 1A1A6Q10. The resulting PPC voltage at the emitter of transistor 1A1A6Q10 is routed to the internal PPC circuit (transistor 1A1A6Q3 and its associated components) to control the bias on the tubes of Driver Amplifier 1A1A1 reducing the amplifier's gain.

The PPC voltage at the emitter of transistor 1A1A6Q10 is also routed through resistor 1A1A6R41 to the base of emitter follower transistor 1A1A6Q16. The emitter of this transistor steers the PPC voltage onto the APC line, causing the exciter to reduce the RF drive level.

In the APC circuit, a signal applied to the base of transistor 1A1A6Q12 causes it to conduct, causing transistor 1A1A6Q13 to also conduct. Resistor 1A1A6R34 and APC ADJ potentiometer 1A1R12 form a resistive divider that controls the gain of the 1A1A6Q13 amplifier. Darlington pair transistors 1A1A6Q14-Q15 develop the APC voltage present at Pin V of connector 1A1A6P1. The APC or PPC voltage, depending on which is greater, is applied to the exciter to reduce the RF drive level.

When Tune RF power is requested (LOCAL KEY-NORMAL-TUNE KEY switch 1A1S3 is in TUNE position, or an associated antenna coupler requests Tune RF power):

- The ground at Pin R of connector 1A1J13 is routed through the VSWR Bridge (via Terminal E7) disabling the reflected power circuitry.
- The ground at Pin S of connector 1A1J5 causes transistor 1A1A6Q17 to conduct. The resulting voltage (developed from resistive divider 1A1A6R1 and R15) places a +20 Vdc Carrier Insert command to the exciter. The exciter will reinsert carrier, independent of the unit's operating mode, any modulation disabled, and RF output power is reduced to the selected Tune power.

- The positive voltage at the collector of transistor 1A1A6Q17 is routed, via resistors 1A1A6R1 and R21 to the base of transistor 1A1A6Q7, causing it to conduct, shunting the top side of PWR potentiometer 1A1R13 to ground. This action removes the PWR potentiometer from the circuit.

The negative voltage (stabilization voltage) applied through resistor 1A1A6R36 and to diode 1A1A6CR12 is a small negative voltage used for circuit temperature compensation of transistor 1A1A6Q12.

4.9 METERING AND MONITORING CIRCUITRY

The RF-110A Metering and Monitoring Circuitry consists of Multifunction Selector 1A1S5 and Multifunction Display Meter 1A1M1, peak-average RF input detector circuitry (Driver Tube Assembly detectors 1A1A1CR1 and CR2) Meter Resistor PWB Assembly 1A1A7, and various other complementary components.

4.9.1 RF-110A Metering and Monitoring Circuitry Description and Circuit Analysis

The function of the Metering and Monitoring Circuitry is to allow the significant parameters of Driver Tube Assembly 1A1A1 and the Final Amplifier Stage, and their associated power supplies, to be monitored and checked. These parameters include:

- The cathode currents of the two driver amplifier tubes (1A1V1 and 1A1V2)
- The cathode currents of the two Final Amplifier Stage tubes (1A1V1 and 1A1V2)
- The RF input power at the control grids of the two driver amplifier tubes (1A1A1V1 and 1A1A1V2)
- The dc voltages applied to the driver and final amplifier stage tube screens and plates

Refer to figure 7-18. When Multifunction Selector 1A1S5 is set at the DRIVER 1 - AMPERES, DRIVER 2 - AMPERES, PA PLATE 1 - AMPERES, or PA PLATE 2 - AMPERES positions, cathode currents of the respective amplifier tubes produce proportional voltage drops across the applicable cathode resistors. The voltages developed are applied selectively across calibrating resistors (in the driver amplifier and final amplifier RF circuits) to the selector and Multifunction Display Meter.

When Multifunction Selector 1A1S5 is set at the INPUT POWER 0-150 mW position, a sample of the RF input at the control grids of the driver tubes is peak-detected by input power detector 1A1A1CR1 and CR2. The detector provides a proportional dc voltage which is applied to current amplifier 1A1A6Q1 which operates the Multifunction Display Meter.

When Multifunction Selector 1A1S5 at PA PLATE - VOLTS, DRIVER PLATE - VOLTS, and PA DRIVER SCRNS - VOLTS positions, the +2250 Vdc, +500 Vdc, and 288 Vdc high voltages, respectively, are indicated on the Multifunction Display Meter. Current from those power supplies is applied to the meter through the appropriate calibrating resistors of Meter Resistor PWB 1A1A7.

Table 5-1. Test Equipment Required for Maintenance Procedures (Cont.)

Common Name/ Description	Manufacturer and Model	Required Characteristics
GENERAL MAINTENANCE EQUIPMENT (paragraph 5.4) (Cont.)		
RF Sweep Generator	Texscan VS-30	0-5 MHz sweep bandwidth with remote flattening, 1 to 35 MHz, 0.5 V RF output, multiple markers at 0.5, 1.0, and 5.0 MHz intervals
Oscilloscope	Tektronix 453 (or Tektronix 544 with 1A1 Plug in)	RF waveshape measurements from dc to 35 MHz, dual trace for VS-30 remote flattening display
Dc Supply		Variable dc power supply 01-5 Vdc at 3.5 amperes
1 kW RF Dummy Load	Bird 8894 or 8890 (2.5 kW, 50 ohm)	1 kW PEP and Avg. 50 ohm (Continuous Commercial Service)
Alignment Tool	JFD No. 5284	For small slotted or hexagonal tuning adjustments
ADVANCED MAINTENANCE EQUIPMENT (paragraph 5.7)		
Wave Analyzer	Hewlett-Packard HP-312A	Noise measurements at -85 dBm (12 microvolts)
Spectrum Analyzer	Hewlett-Packard 140T Display with 8553B and 8552A plug ins	2-30 MHz, 1M measurements at 70 dB below 1 kW
Resistance Capacitance Bridge	General Radio 1650A	Capable of 0-500 pF capacitance measurement and 0-1000 ohms resistance measurement; accuracy ±2%
NOTE Equivalent substitute test equipment may be used if a comparison with the quality and characteristics of the listed equipment shows that the substitute can perform the same tasks.		

SECTION 5

MAINTENANCE - TEST DATA AND ADJUSTMENTS

5.1 INTRODUCTION

This section provides RF-110A unit level maintenance information. Included are complete troubleshooting, adjustment, alignment, repair and replacement, and analysis information, arranged for two maintenance levels; general and advanced maintenance levels.

General maintenance, included in paragraphs 5.4, 5.5, and 5.6, provides maintenance data and procedures to be used by all qualified technical maintenance personnel. Advanced maintenance, included in paragraph 5.7, should be performed only by personnel experienced in the advanced maintenance techniques associated with rebuilding electromechanical assemblies.

5.2 TEST EQUIPMENT REQUIRED FOR MAINTENANCE PROCEDURES

Table 5-1 lists the test equipment required for use during performance of the maintenance procedures. Technically equivalent substitute equipment may be used.

Table 5-1. Test Equipment Required for Maintenance Procedures

Common Name/ Description	Manufacturer and Model	Required Characteristics
GENERAL MAINTENANCE EQUIPMENT (paragraph 5.4)		
Multimeter	Simpson 260-5	Ac and dc volts, 2.5 to 5000 V, current to 500 mA and 5 amperes, resistance to 20 megohms
Electronic Multimeter	Hewlett-Packard HP-410B	Ac volts, 1 to 300 V in 2 to 30 MHz range
T-probe Adapter	Hewlett-Packard HP-11042A	Coaxial feedthrough with "T" tap for probe of HP-410B
Audio Frequency Signal Source	RCA WA504A	1000 Hz signal
Two-Tone Generator	Singer Panoramic TTG-3	Separate tones A and B of 1000 and 1625 Hz plus A + B output, output level control
RF Signal Generator	Hewlett-Packard HP-606B	RF signal source for 2-30 MHz range

5.3 TROUBLESHOOTING INFORMATION

Table 5-2 is a list of likely RF-110A trouble symptoms and their possible causes. The table is not intended as a complete list of possible problems, but is a compilation of those symptoms and causes which might not be found through logical troubleshooting approaches. The main purpose of the table is intended to be as a quick-look aid to isolate a problem to a particular area.

Table 5-2. Troubleshooting Chart

Symptom	Possible Fault
OVERLOAD Indicator is lit.	a. Excessive RF at final amplifier plate
	b. Excessive final amplifier cathode current
	c. High voltage or air vane interlocks open
	d. RF-112A Power Supply temperature or mechanical interlock open
RF-110A standby power not present but exciter STANDBY pushbutton illuminated	a. RF-110A case interlock is open
	b. RF-112A Power Supply case interlock is open
High reflected power	a. Mistuned or damaged antenna system
	b. Open or shorted transmission line
Excessive final amplifier plate current	a. Mistuned transformer assembly in Final Transformer Assembly 1A1A2
	b. Final Transformer Assembly switch 1A1A2S1 not connecting correctly
	c. Open or shorted coupling capacitor in Final Transformer Assembly 1A1A2
	d. Power control circuits (APC or PPC) open or faulty
	e. Faulty grid bias circuitry

Table 5-2. Troubleshooting Chart (Cont.)

Symptom	Possible Fault
Low RF power output	a. Exciter's output at the wrong frequency b. Mistuned transformer assembly in Driver Transformer Assembly 1A1A4 or Final Transformer Assembly 1A1A2 c. Faulty or misadjusted APC-PPC circuits d. High VSWR at RF-110A output e. Open coupling capacitor in Final Transformer Assembly 1A1A2 f. PWR control 1A1R13 is not adjusted properly (not fully cw)
No RF output; final plate current increases with increased RF input	Short to ground or an open circuit in the Final Transformer Assembly 1A1A2
Essentially no RF output; no increase in final plate current with an increase in RF input	a. Driver Tube Assembly 1A1A1 not properly seated, or a fault exists in the assembly b. Driver Transformer Assembly 1A1A4 not properly seated or a fault exists in the assembly c. Open resistor in parasitic suppresor 1A1Z1
Dc short across the high voltage supply at the final amplifier plates	Shorted blocking capacitor in the plate circuit or bypass capacitor in the dc plate feed circuit
It is impossible to reach full output; driver current changes with an increased RF input	a. Defective or misadjusted APC-PPC circuit in the RF-110A or exciter b. Faulty screen regulator circuit components
Excessive RF output	a. Defective APC-PPC circuit (RF-110A or exciter) or misadjustment b. Defective VSWR Bridge 1A1A3 c. Oscillating RF-110A driver or final amplifier stage

Table 5-2. Troubleshooting Chart (Cont.)

Symptom	Possible Fault
Final amplifier plate currents equal at idle, but spread at RF-110A output	a. Unmatched or defective final amplifier tube b. Defective cathode resistors
Final amplifier plate currents are not equal or near equal at idle	a. Connectors 1A1P6-P7 not plugged into proper sockets b. Defective tube
Final Transformer Assembly 1A1A2 stops out of position	a. The coupling on Driver Transformer Assembly 1A1A4 has slipped b. Open, shorted, or miswired code line between Case Connector 1A2A1J7 and switch S1 in Driver Transformer Assembly 1A1A4 c. Faulty Selector Switch 1A1S7
The RF-110A cannot be keyed from an external exciter	Jumper missing between pins B and D of connector 1A2A1J8. FREQUENCY MHZ switch S7 not in AUTOMATIC position
System will not go to operate	a. Printed wiring board 1A1A5 and/or 1A1A6 not properly seated in the chassis connectors b. Faulty time delay relay 1A1K4 c. If overload trips, then air vane switch 1A1S1 high voltage interlock 1A1S9; or power supply interlock S3 or S1 may be faulty
Bandswitch Motor 1A1B2 does not deenergize	a. Shorted or miswired code line between case connector 1A2A1J7 and switch S1 in Driver Transformer Assembly 1A1A4 b. Coupling on Driver Transformer Assembly 1A1A4 does not pick up the mating coupling c. Shorted diode 1A1A5CR2 (if antenna coupler is connected) d. Driver Transformer Assembly 1A1A4 latch nut loose

Table 5-2. Troubleshooting Chart (Cont.)

Symptom	Possible Fault
Bandswitch Motor 1A1B2 does not energize	Code lines are improperly wired or not connected
RF-112A Power Supply 115 Vac, 400 Hz line is shorted to ground	Blower 1A2B1 rotated in its mounting so that its terminal strip touches chassis
Driver and final amplifier screen voltages decrease when unit is keyed	a. Excessive screen current in any of the four tubes b. Voltage dropping resistor 1A1A9R4 is the wrong value. c. Open phase in the primary of the Power Supply 500 Vdc supply d. Open rectifier in the 500 Vdc supply

Figures 4-2, through 4-10 and 5-1 through 5-3 show various RF-110A functional circuit groups isolated from the complete schematic diagrams. These diagrams show power, control, and RF paths along with significant voltage measurements.

Figures 5-4 through 5-11 show various detailed information for the RF-110A, and are included as an orientation and service reference for the technician.

5.4 GENERAL LEVEL MAINTENANCE

General level maintenance consists of the adjustment, alignment, checkout, repair, and cleaning and lubrication procedures of paragraphs 5.4.1 through 5.4.4.2.5.

5.4.1 Driver Tubes Bias Adjustment

When the plate current of either driver tube, 1A1A1V1 or 1A1A1V2, is greater than 280 mA or less than 200 mA while th RF-110A is keyed, the driver tube bias should be adjusted as follows:

a. Loosen the six captive screws that secure the main chassis to the case assembly.

b. Pull the main chassis out on its slides until it locks (detents) into service position, as shown in figure 5-4.

c. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

d. Defeat the two interlock switches (1A1S10 and 1A1S11) by pulling their plungers straight out, figure 5-8.

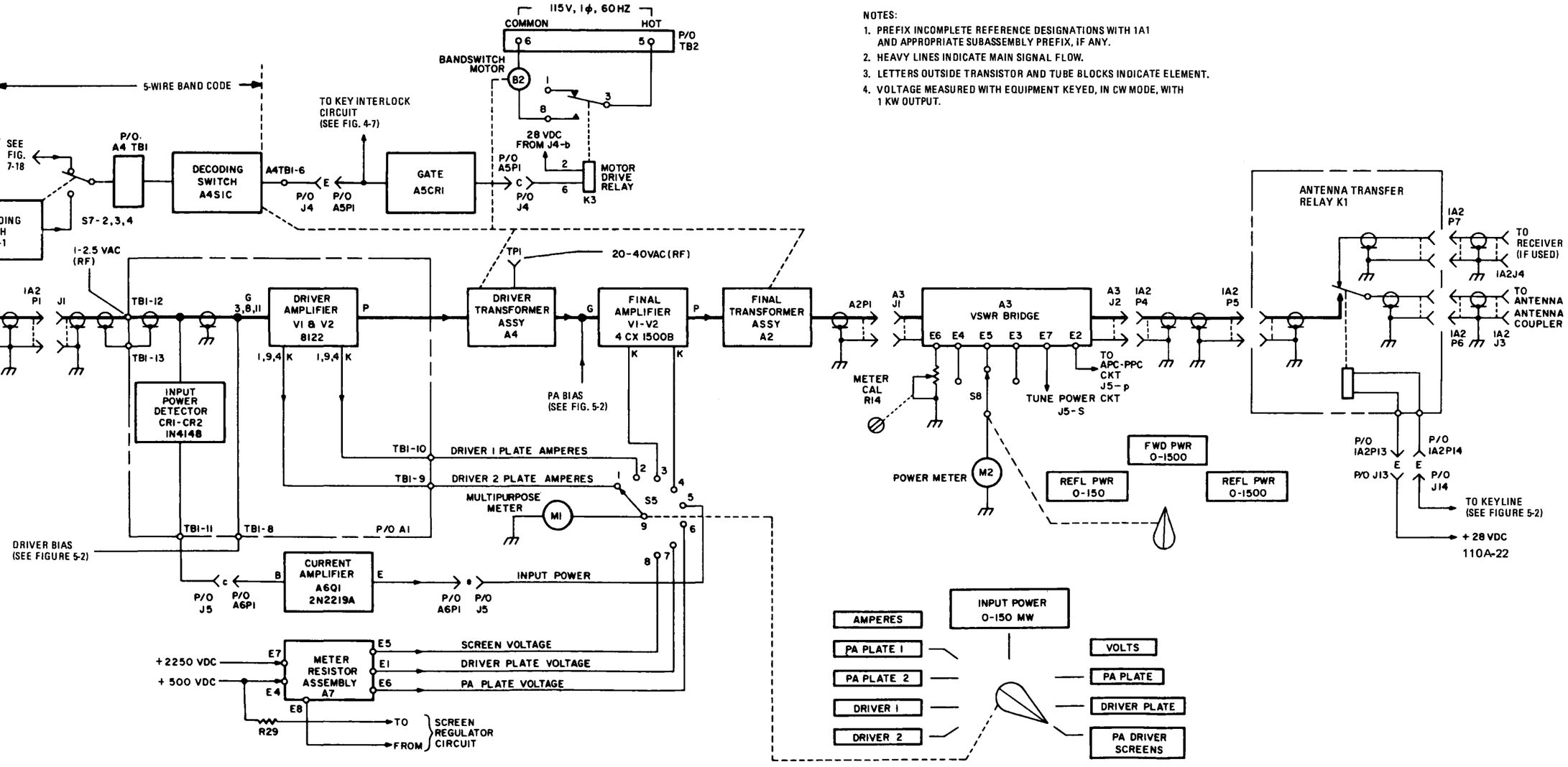
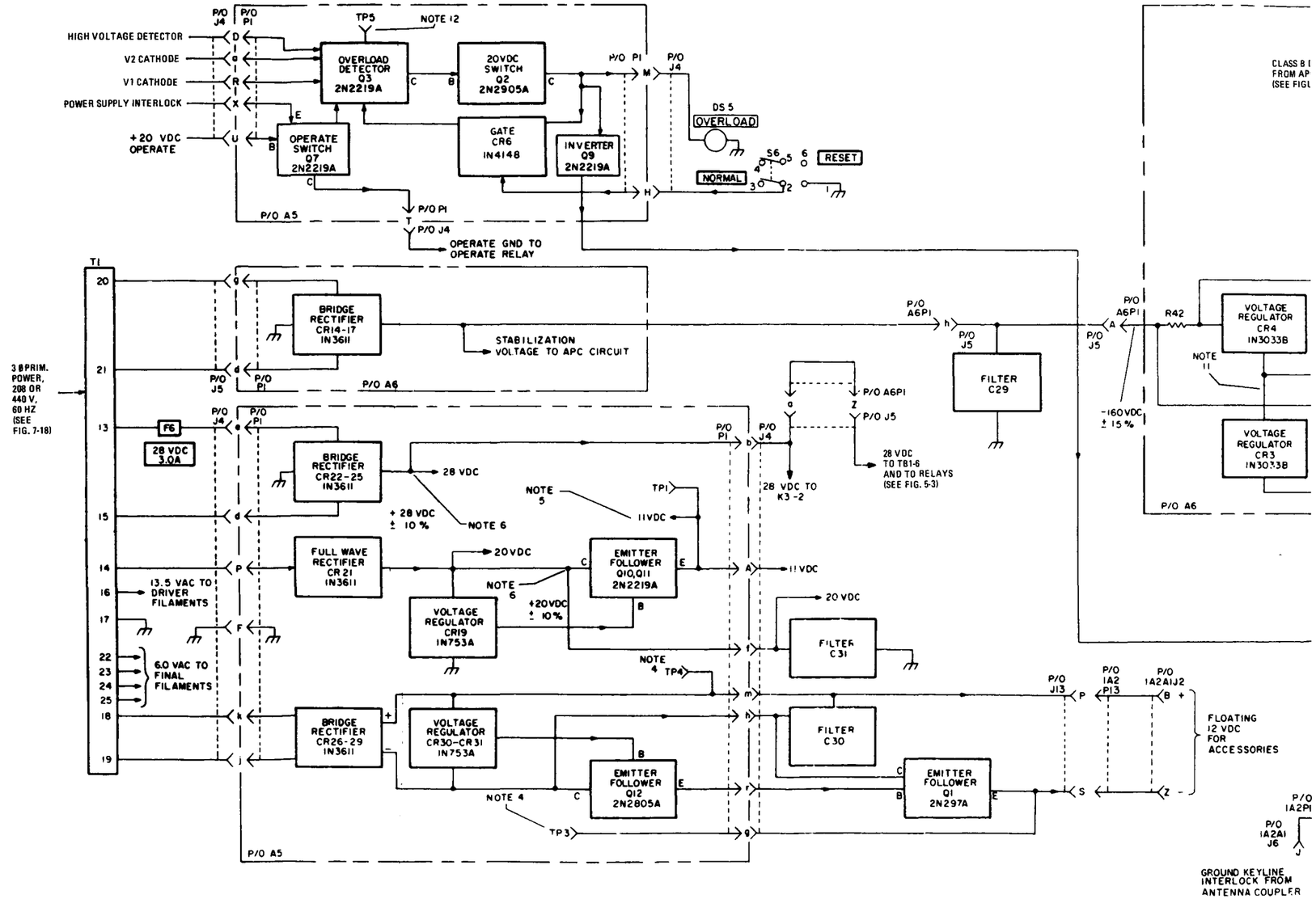


Figure 5-1. RF-110A Main Signal Flow Service/Information Diagram

NOTES:

1. PREFIX INCOMPLETE REFERENCE DESIGNATIONS WITH 1A1 AND APPLICABLE SUBASSEMBLY PREFIX, IF ANY.
2. LETTERS OUTSIDE TRANSISTOR BLOCKS INDICATE ELEMENT.
3. NUMBERS ON COILS AND TRANSFORMERS INDICATE TERMINAL NUMBERS.
4. OUTPUT FROM FLOATING 12 VOLT SUPPLY, RF-110A IN ANY OPERATE MODE, POSITIVE METER LEAD CONNECTED TO A5TP4, NEGATIVE LEAD CONNECTED TO A5TP3, 11.8 ± 0.5 VDC.
5. EQUIPMENT IN ANY OPERATE MODE, UNKEYED, 11 ± 0.5 VDC.
6. EQUIPMENT IN STANDBY OR ANY OPERATE MODE.
7. EQUIPMENT IN STANDBY OR ANY MODE: KEY UP, -130 VDC ± 20%; KEY DOWN, -72 VDC ± 5%.
8. EQUIPMENT IN STANDBY OR OPERATE, KEY UP, -90 ± 10 VDC; OPERATE, KEY DOWN -5 ± 2 VDC, DEPENDING ON SETTING OF R9; KEY DOWN, INTERLOCKED (MOTOR RELAY ENERGIZED, OVERLOAD CIRCUIT TRIPPED, COUPLER INTERLOCK GROUNDED, OR ALARM SWITCH HELD AT RESET) -33 ± 4 VDC.
9. EQUIPMENT INTERLOCKED (MOTOR RELAY ENERGIZED, OVERLOAD CIRCUIT TRIPPED, COUPLER INTERLOCK GROUNDED, OR ALARM SWITCH HELD AT RESET) 10 ± 1 VDC; EQUIPMENT NOT INTERLOCKED, 0.5 ± 1 VDC.
10. EQUIPMENT INTERLOCKED: BY ENERGIZING MOTOR RELAY OR GROUNDING COUPLER INTERLOCK ONLY, 0 ± 1 VDC; OTHERWISE, 27 ± 2 VDC.
11. EQUIPMENT IN OPERATE: KEY UP, -0.1 VDC; KEY DOWN, +4.5 VDC.
12. EQUIPMENT IN STANDBY OR OPERATE, UNKEYED, 0 VDC; KEY DOWN, IN ANY AM OR SSB MODE, NO SIGNAL, 1.0± 0.5 VDC; KEY DOWN, ANY MODE WITH SIGNAL, 1.0 - 4.0 VDC; OVERLOAD CONDITION, 9.9± 1.0 VDC.



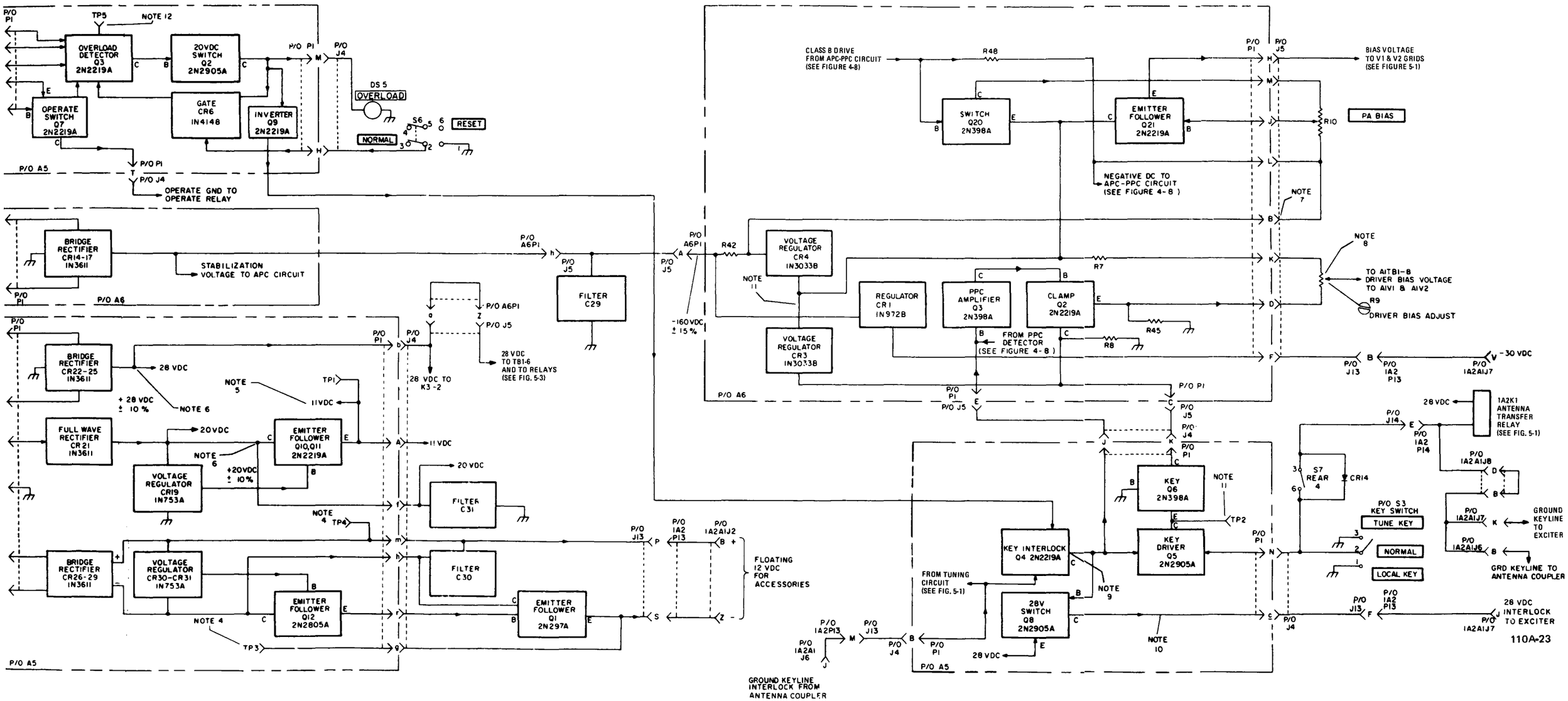
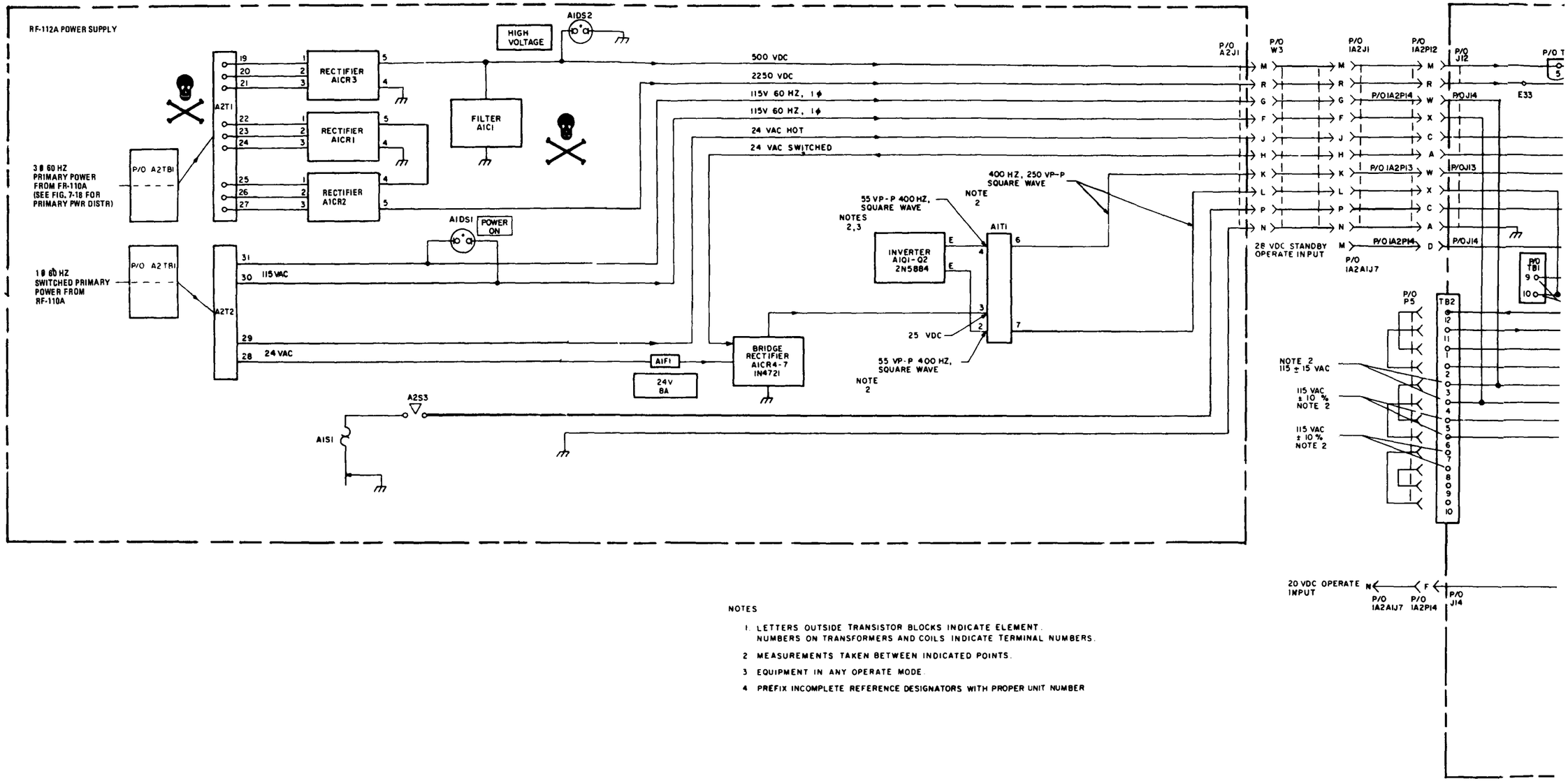
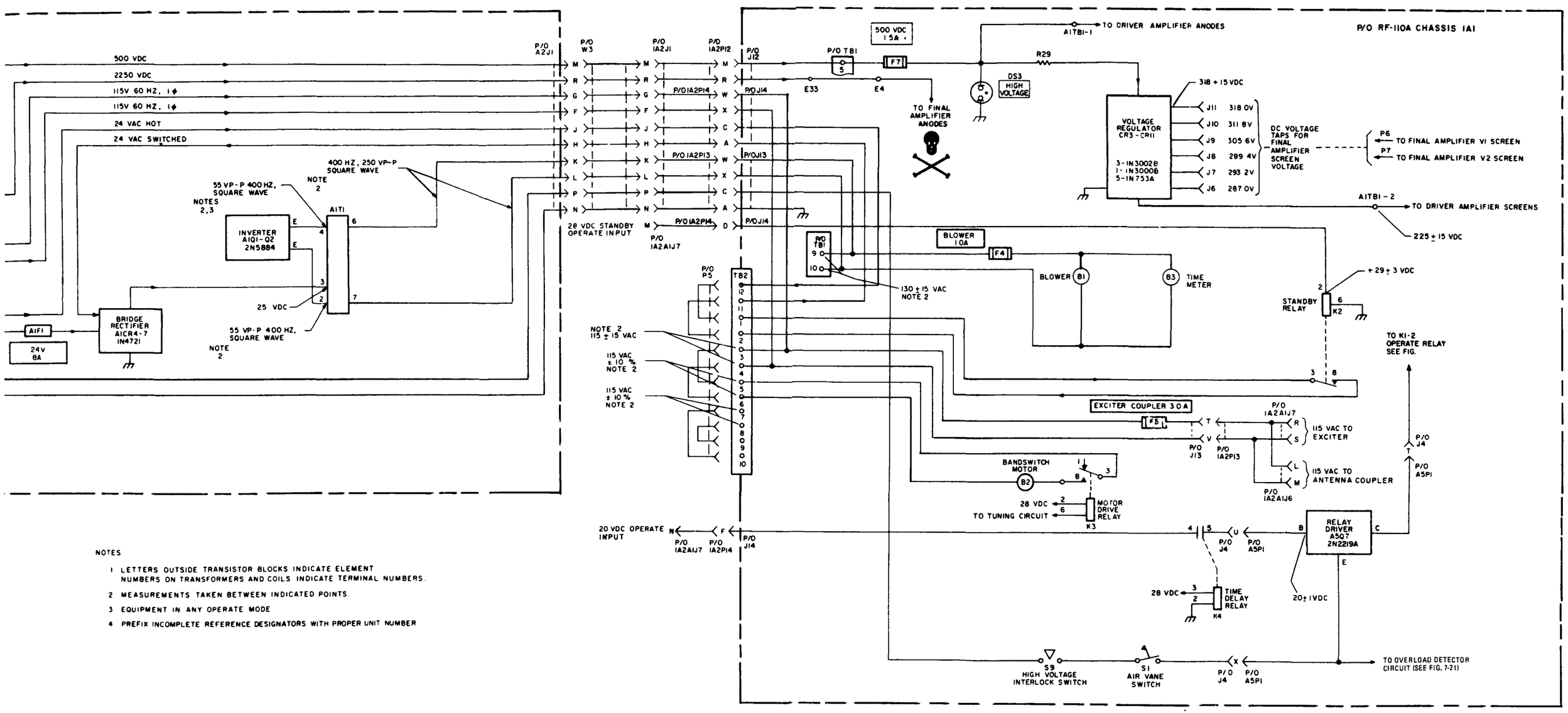


Figure 5-2. Dc Power Control Servicing/Information Diagram



NOTES

1. LETTERS OUTSIDE TRANSISTOR BLOCKS INDICATE ELEMENT. NUMBERS ON TRANSFORMERS AND COILS INDICATE TERMINAL NUMBERS.
2. MEASUREMENTS TAKEN BETWEEN INDICATED POINTS.
3. EQUIPMENT IN ANY OPERATE MODE.
4. PREFIX INCOMPLETE REFERENCE DESIGNATORS WITH PROPER UNIT NUMBER



110A-24

NOTES

1. LETTERS OUTSIDE TRANSISTOR BLOCKS INDICATE ELEMENT NUMBERS ON TRANSFORMERS AND COILS INDICATE TERMINAL NUMBERS.
2. MEASUREMENTS TAKEN BETWEEN INDICATED POINTS.
3. EQUIPMENT IN ANY OPERATE MODE
4. PREFIX INCOMPLETE REFERENCE DESIGNATORS WITH PROPER UNIT NUMBER

Figure 5-3. 60 Hz High Voltage Distribution Servicing/Information Block Diagram

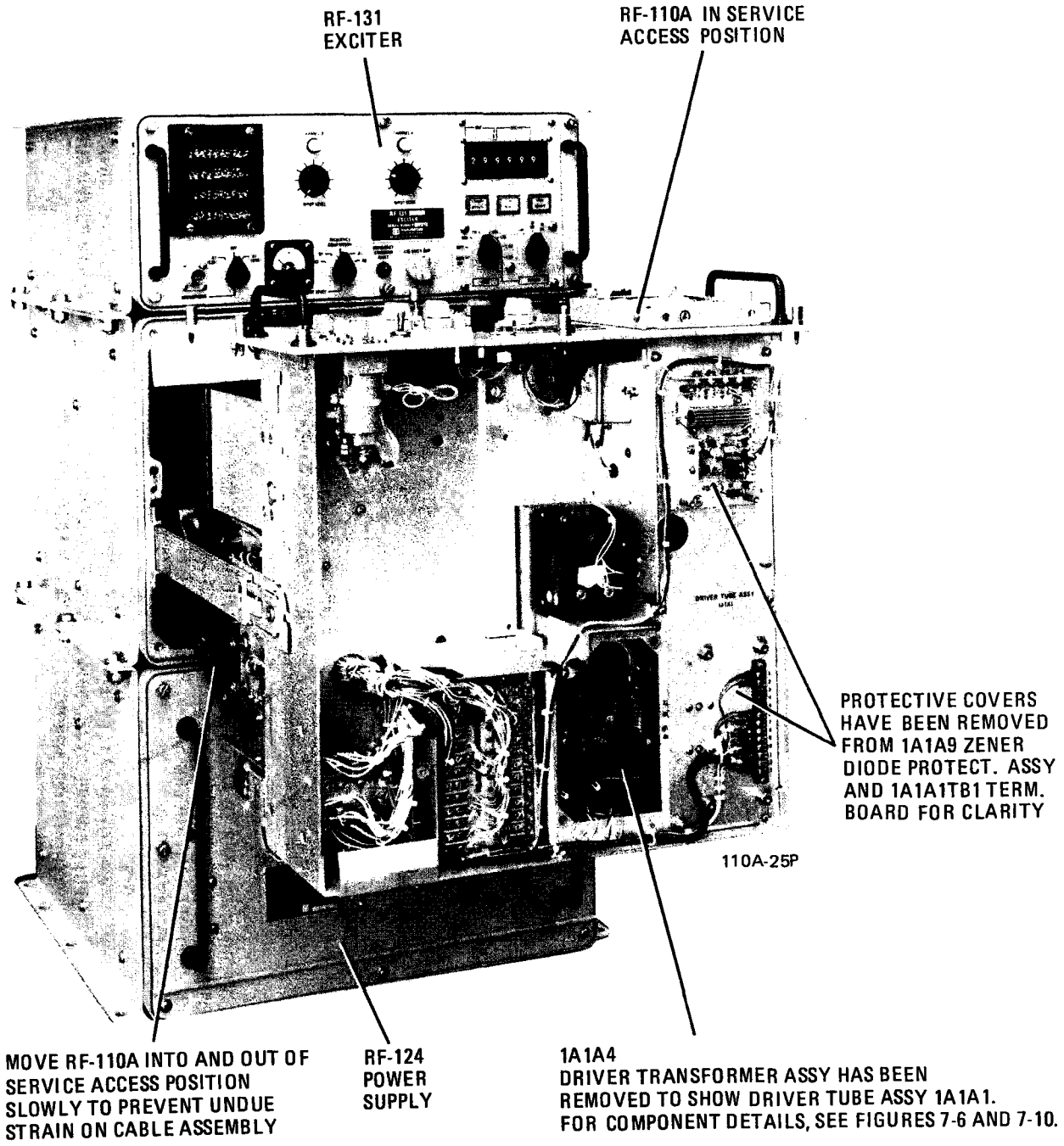


Figure 5-4. RF-110A Rotated to Service Access Position

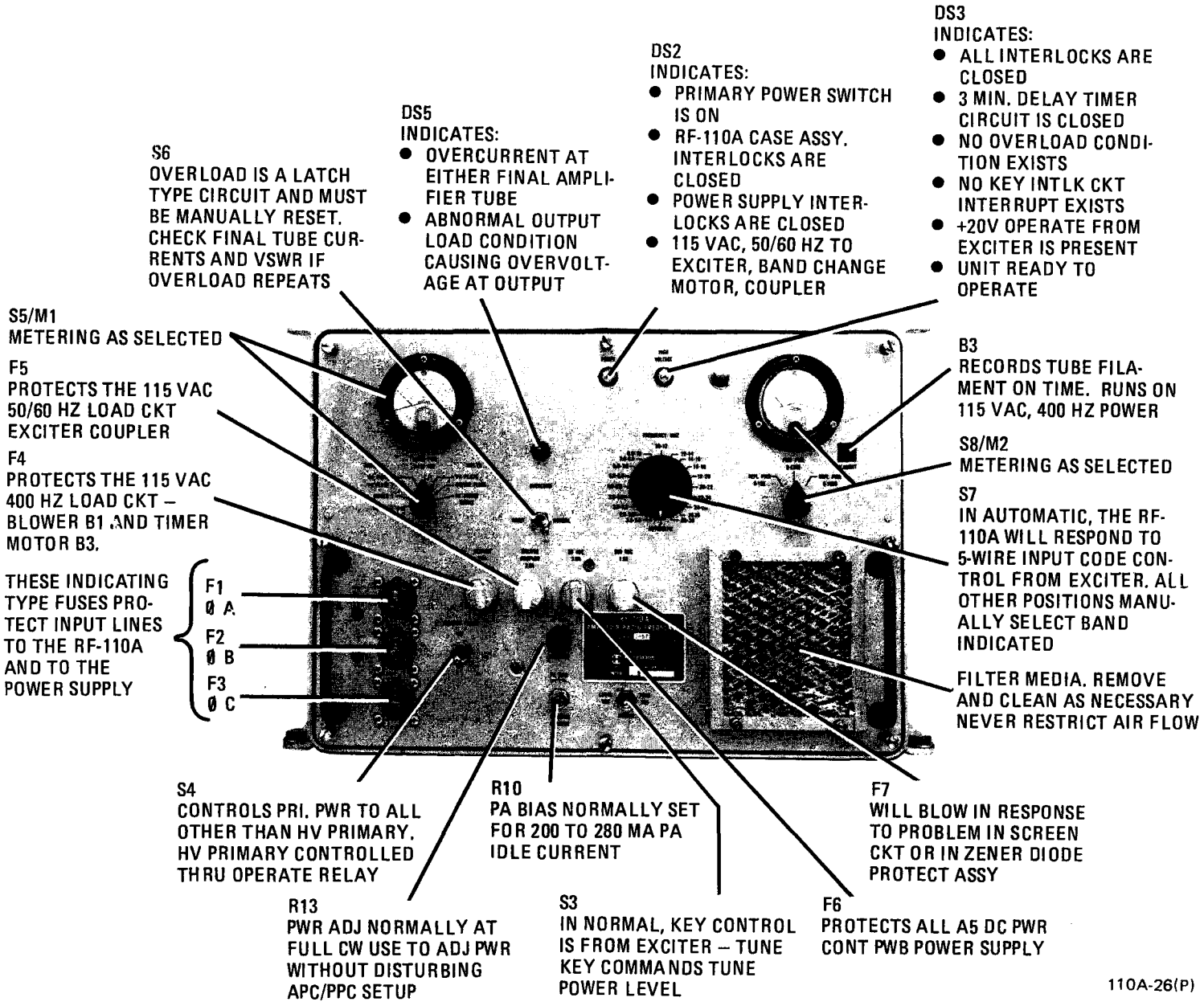


Figure 5-5. RF-110A Front Panel Controls and Indicators - Basic Information

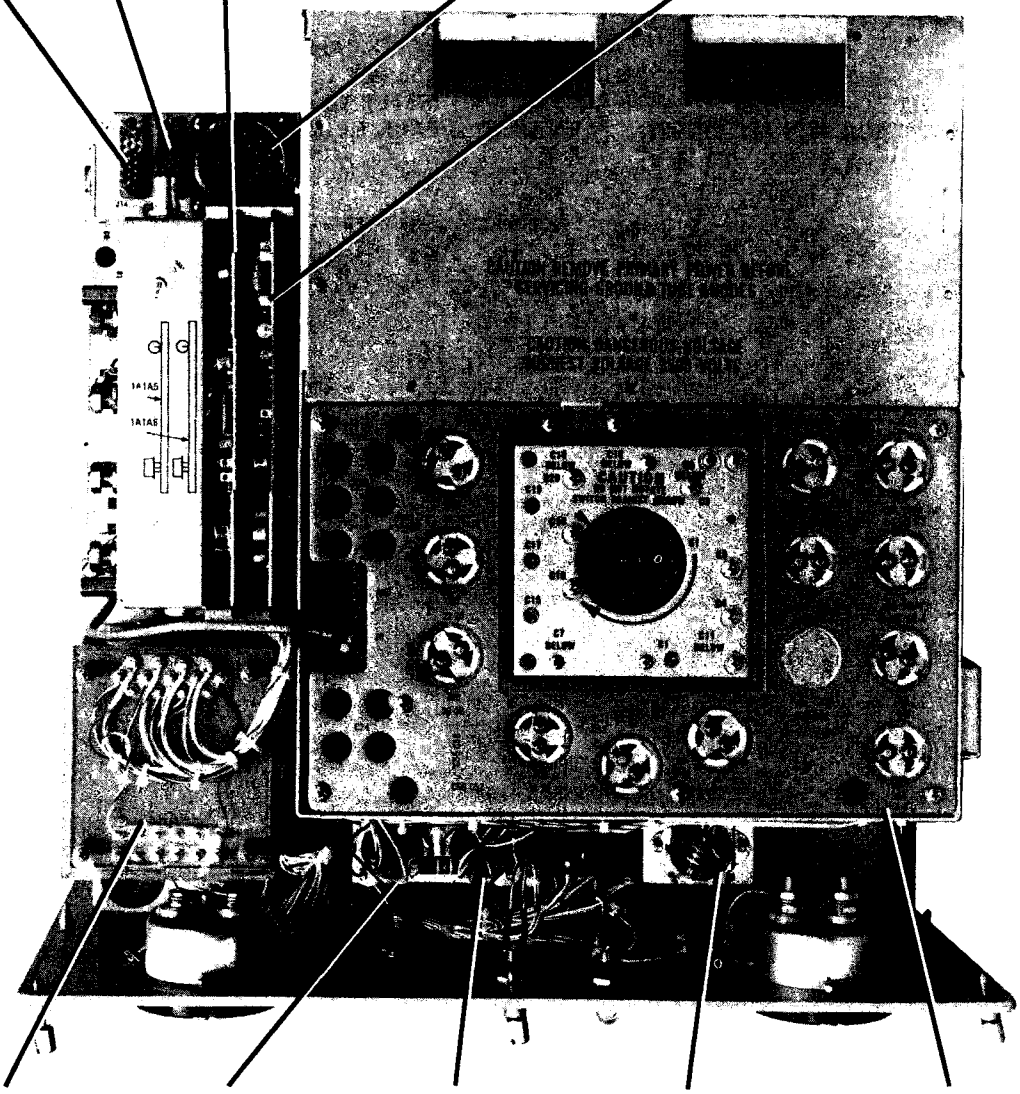


Figure 5-6. RF-110A Main Chassis Assembly Top View - Component Orientation and Technical Details

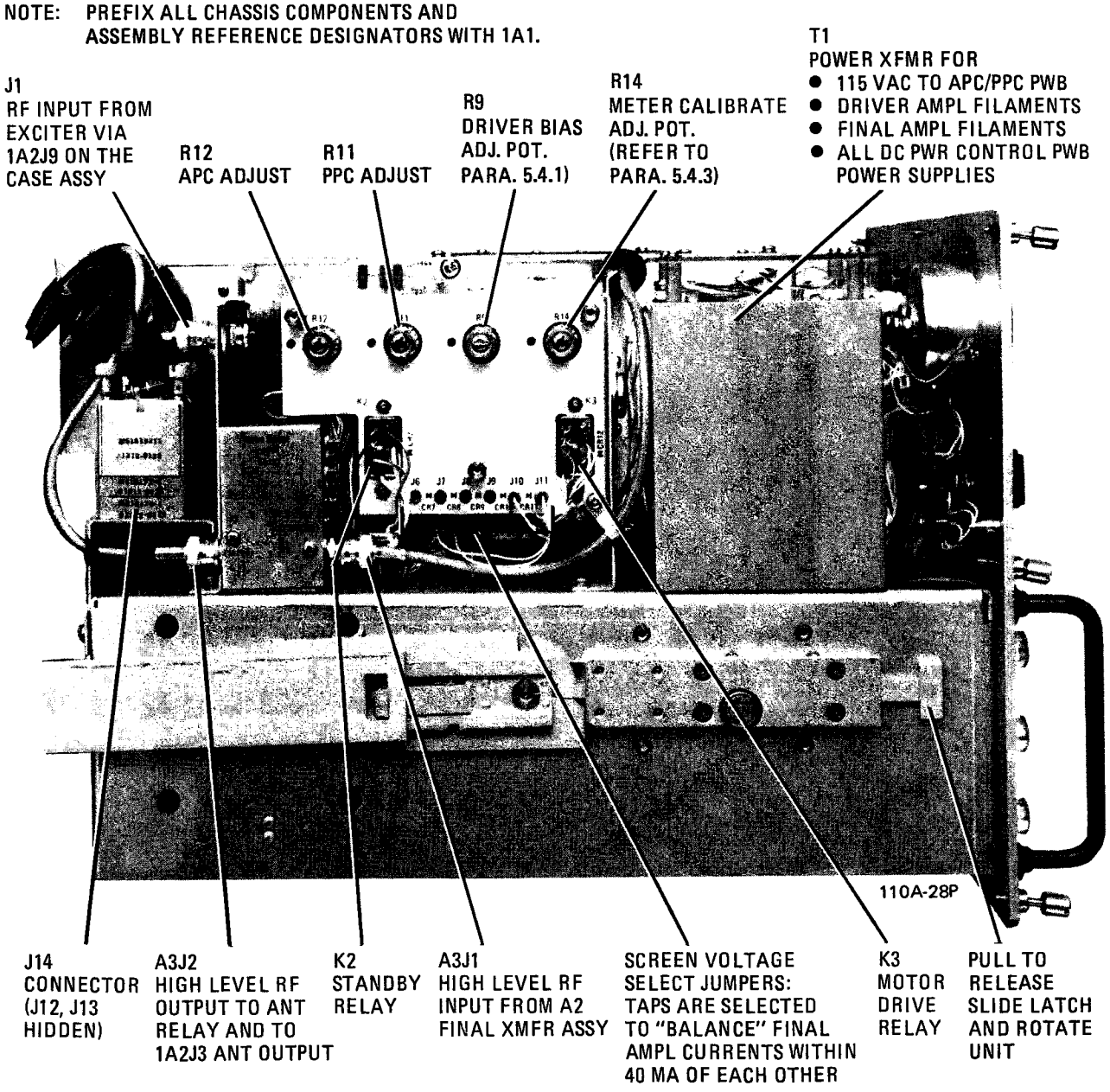


Figure 5-7. RF-110A Main Chassis Assembly Left Side View
Component Orientation and Technical Details

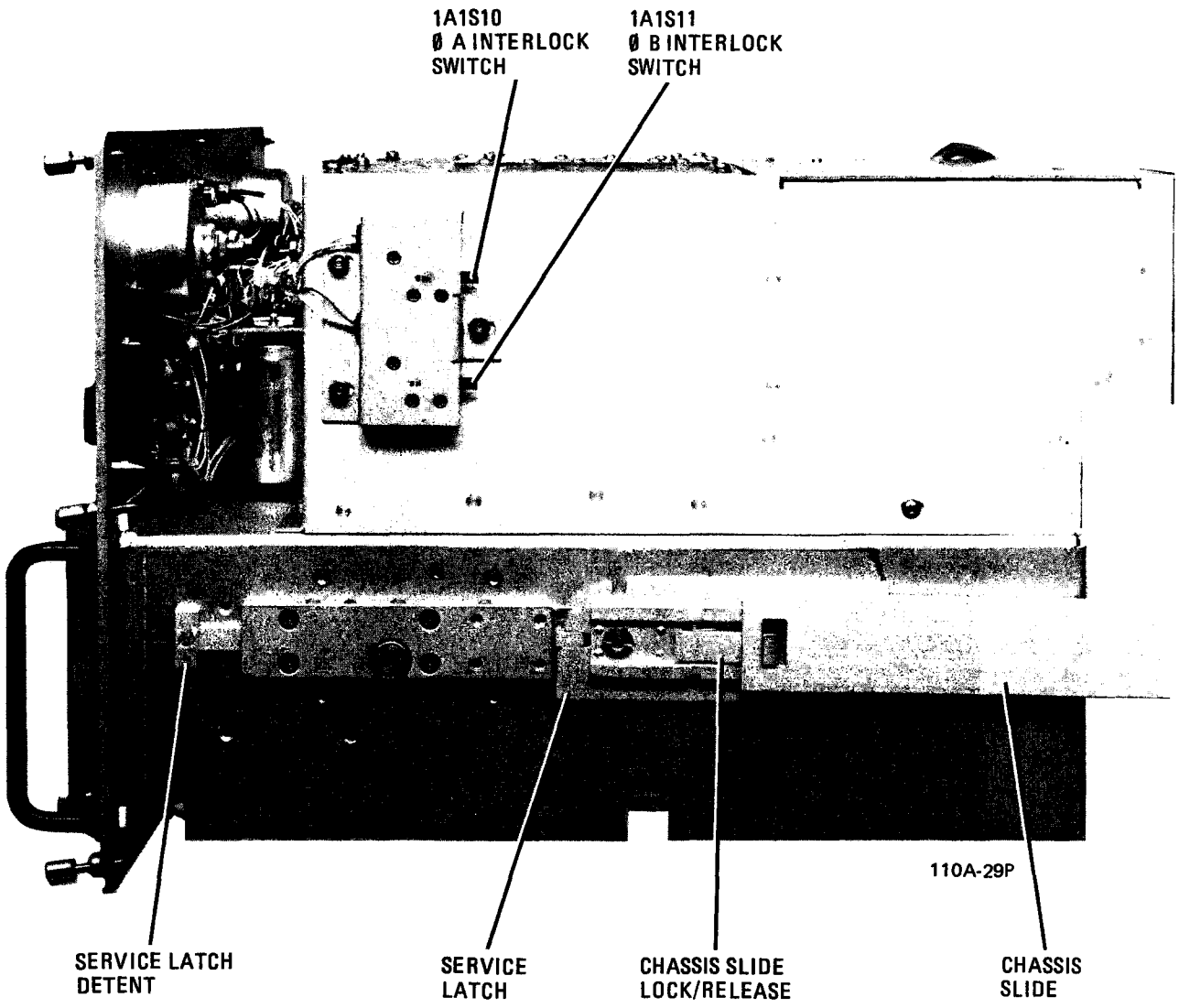


Figure 5-8. RF-110A Main Chassis Assembly Right Side View - Component Orientation and Technical Details

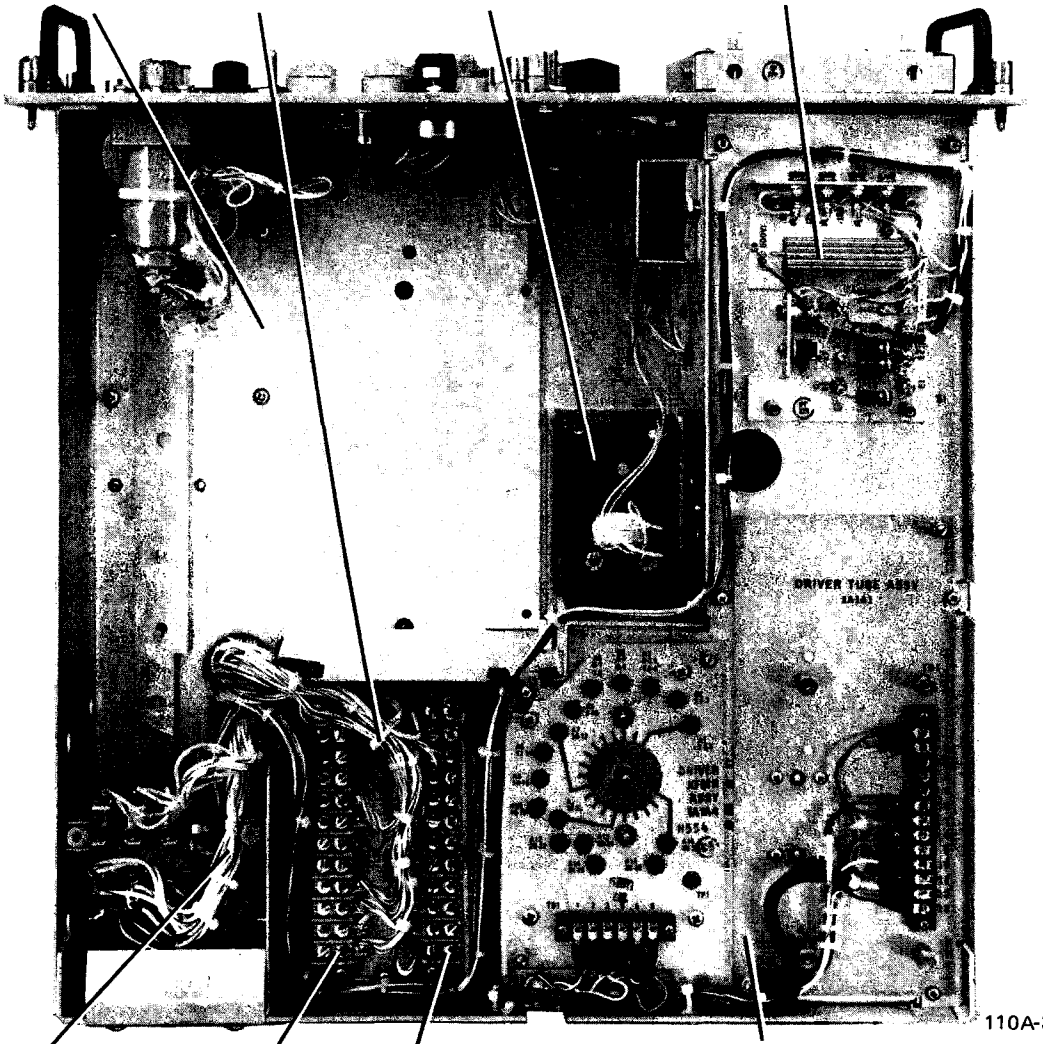


Figure 5-9. RF-110A Main Chassis Assembly Bottom View - Component Orientation and Technical Details

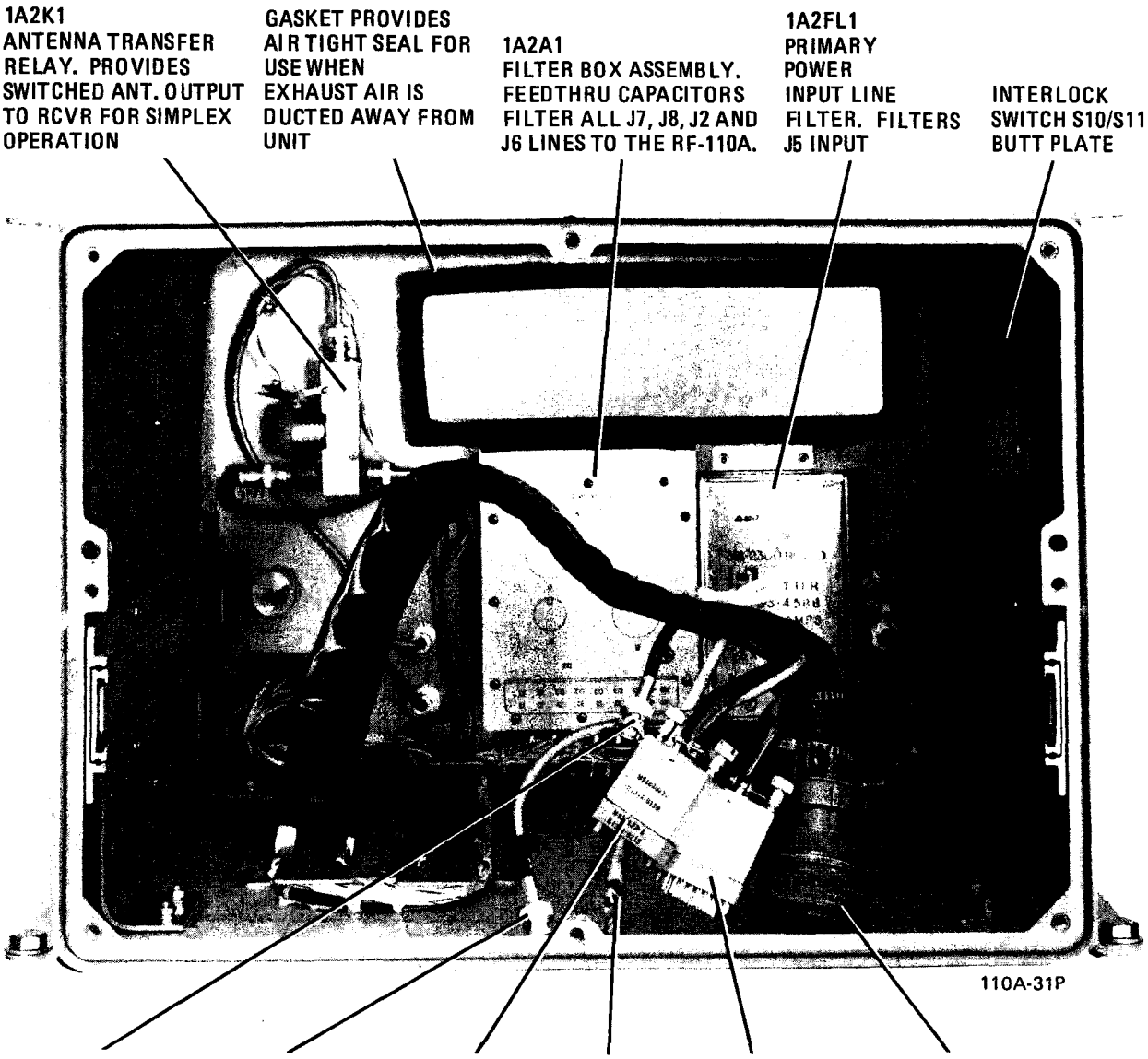
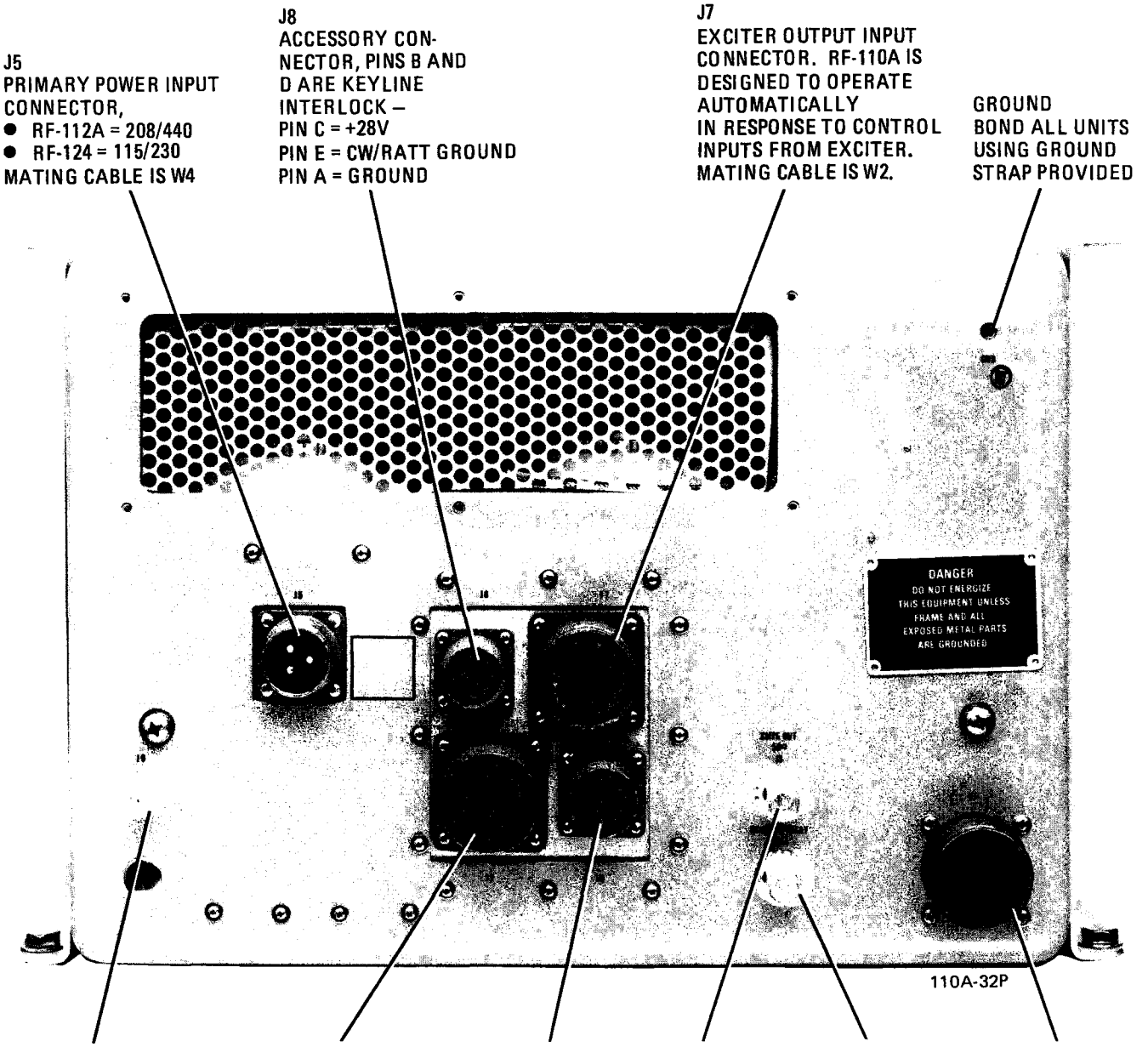


Figure 5-10. RF-110A Case Assembly Front View – Component Orientation and Technical Information



WARNING

ALWAYS PROVIDE FOR A FREE FLOW OF EXHAUST AIR – IF RESTRICTED, AN AIR-FLOW TYPE INTERLOCK SWITCH WILL OPEN THE OPERATE RELAY AND SHUT DOWN THE TRANSMITTER.

Figure 5-11. RF-110A Case Assembly Rear View Component Orientation and Technical Information

e. Loosen the lock nut on the DRIVER BIAS ADJ potentiometer 1A1R9 (figure 5-7) and rotate it maximum counterclockwise.

f. Place the PRIMARY POWER switch to ON position. Place RF-110A in Standby Mode using exciter controls.

g. After a three-minute time period (standby time) has elapsed, place the unit in Operate Mode.

h. Key the unit by placing the NORMAL-LOCAL KEY switch (1A1S3) in the LOCAL KEY position.

i. Place the multifunction selector at the DRIVER PLATE-VOLTS position. Verify that the multifunction display meter indicates +500 +1 -50 Vdc at nominal line voltage.

j. Place the selector at the PA-DRIVER SCRNS-VOLTS position. Verify that the meter indicates +290 $\pm$50 Vdc.

k. Place the selector first at DRIVER 1 - AMPERES and then at the DRIVE 2 - AMPERES position, while slowly rotating the DRIVER BIAS ADJ potentiometer (1A1R9) clockwise. Observe the plate current indicated on the meter for each tube.

l. Place the selector to the position that corresponded to the driver tube drawing the lowest plate current. Adjust the DRIVER BIAS ADJ potentiometer to obtain a 200 mA indication at the meter.

m. Place the selector to the position that corresponded to the driver tube drawing the highest plate current. The plate current indicated at the meter should be between 200 and 280 mA. If it is not, a tube is defective and should be replaced or there is a defect in the circuit. Tighten the lock nut on the DRIVER BIAS ADJ potentiometer and recheck indications.

n. Deenergize all equipment.

o. Press the detent button on the chassis slides and slide the unit back into the case.

p. Secure the unit to the case by tightening the six captive screws.

5.4.2 Final Amplifier Tubes Screen Voltage and Grid Bias Adjustments

The plate current on the final amplifier tubes 1A1V1 and 1A1V2 should not exceed 300 mA at idle, and no more than 700 mA with a difference of 40 mA or less at full power. In case the difference does exceed, compensating adjustments in screen voltages should be made to reduce the difference, in order to maintain equal load sharing between the two tubes.

WARNING

Lethal voltages exist within the RF-110A during operation. Screen voltage in excess of 300 Vdc is present at jacks J6 through J11.

a. Place the PRIMARY POWER switch to ON position. Place RF-110A in Standby Mode.

b. After a three-minute time period (standby time) has elapsed, place the unit in Operate Mode.

c. Key the unit in SSB Mode with no modulation by placing the NORMAL - LOCAL KEY switch (1A1S3) in LOCAL KEY position.

d. Place the multifunction selector at the PA PLATE - VOLTS position. Verify that the multifunction display meter indicates +2250 $\pm$225 Vdc at nominal line voltage.

e. Rotate front panel PA BIAS control 1A1R10 fully counterclockwise.

CAUTION

Excessive plate current will damage final amplifier tubes 1A1V1 and 1A1V2.

f. Place the selector first at PA PLATE 1 - AMPERES and then at the PA PLATE 2 - AMPERES position, while slowly rotating the PA BIAS control clockwise. Observe the plate current indicated on the meter for each tube.

g. Place the selector to the position that corresponded to the tube drawing the highest plate current. Adjust the PA BIAS control to obtain a 280 mA indication at the meter.

h. Unkey the unit.

i. Change the mode to CW and key the unit with full power output.

j. The plate currents should not exceed 700 mA or differ more than 40 mA. If these two conditions are not met go on to the next step.

k. Place the unit in Standby Mode.

l. Loosen the six captive screws that secure the main chassis to the case assembly.

m. Pull the main chassis out on its slides until it locks (detents) into service position.

n. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

o. Defeat the two interlock switches (1A1S10 and 1A1S11) by pulling their plungers straight out (see figure 5-8).

p. Locate screen voltage adjustment jacks J6 through J11 on the left side of the main chassis (figure 5-7).

q. Observe the position of two plugs coded P6 (brown) and P7 (red). These plugs are the screen voltage taps for tubes 1A1V1 and 1A1V2 respectively.

NOTE

Increasing the screen voltage will increase the plate current. Jacks J6 through J11 provide connections to a voltage divider network. Moving a screen voltage plug (P6 or P7) to a higher number jack will increase the plate current of that tube.

CAUTION

Damage to the tubes may result if screen plugs are left disconnected during operation.

r. Verify RF-110A is in Standby Mode, and then move the plug to adjust conduction of lower current tube toward desired range not to exceed 300 milliamperes. Change the plug to a new trial position.

s. Place unit in Operate Mode.

t. Readjust plate current as described in steps c through j. If current is not yet within the stated range (approaching less than 700 mA), return unit to Standby Mode and adjust appropriate plug as required to attain acceptable plate current. Return unit to Operate Mode and check results. Repeat this step until acceptable results are obtained.

u. Deenergize all equipment.

v. Press the detent buttons on the main chassis slides and slide the unit back into the case.

w. Secure the unit to the case by tightening the six captive screws.

5.4.3 VSWR Bridge Assembly 1A1A3 Balance Procedure

a. Disconnect the RF cable from RF input connector 1A2J9 on the RF-110A. Connect a 47 ohm, 2 watt resistor (or similar dummy load) to the end of the cable to terminate the exciter (if used). (See figure 5-12).

b. Connect the RF signal generator to RF input connector 1A2J9. Adjust the signal generator to provide a minimum output at 21 MHz with no modulation (CW output). Connect the 1 kW RF Dummy Load to 1A2J3.

c. Loosen the six captive screws that secure the main chassis to the case assembly.

d. Pull the main chassis out on its slides until it locks (detents).

WARNING

Lethal voltages are present in the RF-110A.

e. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

f. Defeat the two interlock switches (1A1S10 and 1A1S11) by pulling their plungers straight out.

g. Place the PRIMARY POWER switch to ON position. Place unit in Standby Mode.

h. After a 3-minute time period (standby time) has elapsed to place the unit in Operate Mode.

i. Place and hold Power Meter selector 1A1S8 at its REFL PWR 0-150 position.

j. Insert the alignment tool through the access hole in VSWR bridge assembly and carefully adjustt 1A1A3C6 (BAL TRIMMER) for minimum indication on Power Meter 1A1M2.

k. Remove the alignment tool from VSWR bridge.

l. Release power meter selector. (It will return to the FWD PWR 0-150 W position.)

m. Adjust Meter Calibration potentiometer (1A1R14-figure 5-7) to obtain true reflected power.

n. Deenergize all equipment.

o. Press the detent button on the main chassis slides and slide the unit back into the case.

p. Secure the unit to the cabinet by tightening the six captive screws.

q. Disconnect the test equipment from the RF-110A.

r. Reconnect the appropriate RF cables to connectors 1A2J3 and 1A2J9.

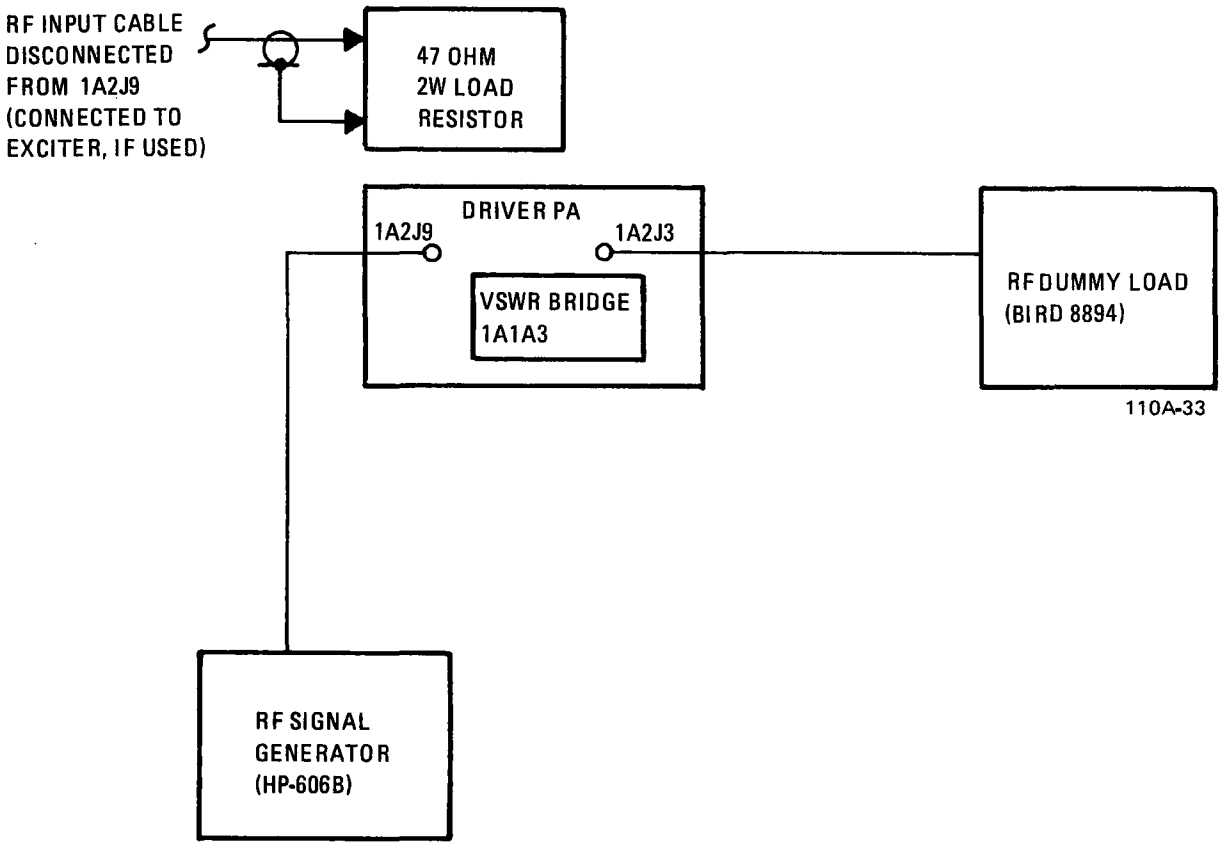


Figure 5-12. VSWR Bridge 1A1A3 Balance Assembly Setup

5.4.4 RF Tuned Circuits Alignment

Complete alignment of the RF-110A consists of tuning the driver and final transformer assemblies. These procedures must be performed whenever:

- Sufficient power output cannot be obtained from the unit, and other possible causes have been eliminated.
- Excessive plate current (not due to aging tubes or component failure) is noted at one or more of the frequency bands
- A transformer assembly (driver or final) has been replaced.

The critical parameters used to determine proper driver transformer and final transformer assembly operation are as follows:

- The maximum plate current of either final amplifier tube with a 1 kW output is 710 mA, at the band edges of each band.
- The maximum RF input required to produce 1 kW output is 100 milliwatts (2.24 Vrms) at the center and edges of each band in CW/RATT mode.

NOTE

The final transformer assembly has nore affect on plate current. The driver transformer assembly has more affect on the RF input.

The driver stage, operating as a Class A amplifier, does not provide a simple indicator of performance. However, after both driver and final transformer assembly alignment, no more than 100 mW (2.24 Vac) of drive should be required to obtain full 1 kW rated output at any frequency.

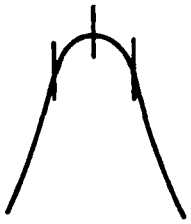
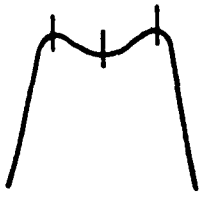
5.4.4.1 Driver Transformer Assembly 1A1A4 Alignment Procedures

The driver transformer assemblies for the nineteen frequency bands are arranged on sixteen coil forms. Figure 7-20 illustrates the schematic representation of the coils, while table 5-3 lists the frequencies covered by each band.

Table 5-3. Driver Transformer Assembly 1A1A4 Alignment Information

NOTE

Detuning the top slug (primary) of a double-tuned circuit will move the entire waveform with respect to the markers. Detuning the bottom slug (secondary) will skew the waveform so that one peak is more pronounced.

Band No.	Band Limits (MHz)	Adjust Tuning Slug or Slug	Waveform Information
1	2-2.5	A1	 SINGLE TUNED REQUIREMENTS ■ GOOD SYMMETRY OVER TOP OF CURVE ■ HIGH AND LOW MARKERS SAME AMPLITUDE
2	2-5.3	A2	
3	3-3.5	A3 bottom	
4	3.5-4	A3 top	
5	4-5	A4 top	
6	5-6	A4 bottom	
7	6-7	A5 top	
8	7-8	A5 bottom	
9	8-10	A6 top and bottom	 DOUBLE TUNED REQUIREMENTS ■ TOP SYMMETRY ■ HIGH AND LOW MARKERS EACH NEAR PEAK OF HUMP
10	10-12	A7 top and bottom	
11	12-14	A8 top and bottom	
12	14-16	A9 top and bottom	
13	16-18	A10 top and bottom	
14	18-20	A11 top and bottom	
15	20-22	A12 top and bottom	
16	22-24	A13 top and bottom	
17	24-26	A14 top and bottom	
18	26-28	A15 top and bottom	
19	28-30	A16 top and bottom	

The following test equipment is required to perform the Driver Transformer Assembly 1A1A4 alignment procedures:

- RF Sweep Generator, Texscan VS-30 or equivalent with remote flattening, 0-5 MHz sweep bandwidth, 1 to 35 MHz, 0.5 V RF output, multiple markers at 0.5, 1.0, and 5.0 MHz intervals.
- Dual Trace Oscilloscope, Tektronix 453.
- 1 kW RF Dummy Load, Bird 8894.
- Detector Test Fixture (fabricated per figure 5-13) (RF P/N 1001-0041).
- Alignment tool, 0.100 inch (.254 cm) hex each end, non-conductive, one end with undercut shank.

To align the coils of any one band proceed as follows.

WARNING

Lethal voltages exist within the unit during operation.

a. Loosen the six captive screws that secure the main chassis to the case assembly.

b. Pull the main chassis out on its slides until it locks (detents) into service position.

c. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

d. Disconnect the RF input to the RF-110A from the exciter. (Disconnect cable connector 1A2P1 from chassis connector 1A1J1 at the rear of the main chassis.)

e. Connect a 47 ohm, 2 watt resistor (or equivalent dummy load) to cable connector 1A2P1 to terminate the exciter.

f. Disconnect cable connector 1A2P4 (RF from VSWR Bridge Assembly 1A1A3) from connector 1A1A3J2 at the rear of VSWR Bridge Assembly 1A1A3.

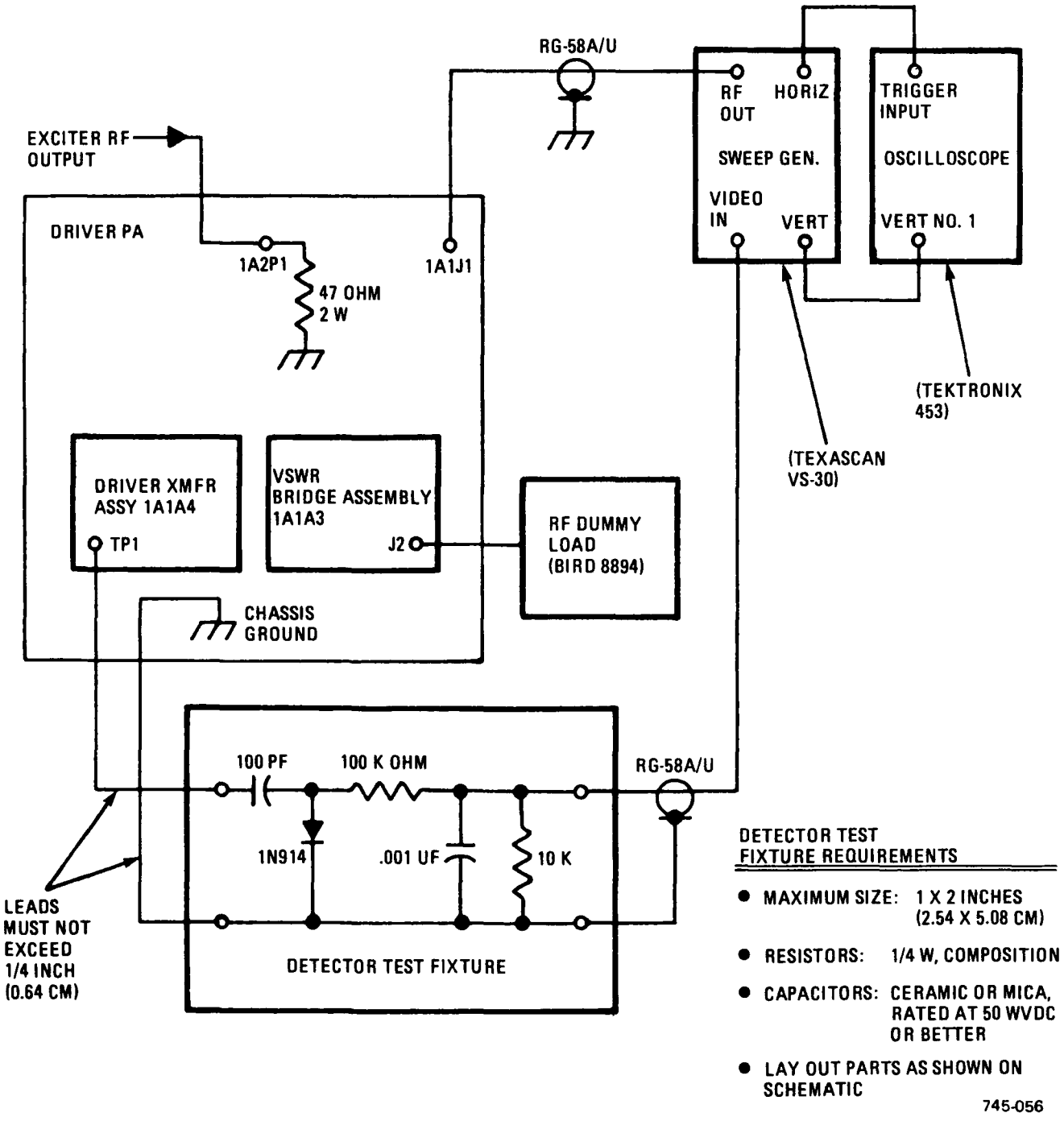


Figure 5-13. Driver Transformer Assembly 1A1A4 Alignment Test Setup

g. Connect test equipment with RF-110A to provide test setup illustrated by figure 5-13. Note that the detector test fixture is placed at Driver Transformer Assembly 1A1A4 so that very short (1/4 inch, .63 cm) leads are utilized. Shielded RF cables connect between sweep generator and RF-110A and between sweep generator and detector test fixture.

h. Record the positions of screen balance plugs P6 and P7 injacks J6-J11 at left rear of chassis (see figure 5-7). Unplug and ground plugs to disable the final amplifier stage.

i. Activate test equipment. Temporarily set the output level of the sweep generator to zero.

j. Defeat the two interlock switches (1A1S10 and 1A1S11) by pulling their plungers straight out.

k. Place PRIMARY POWER switch to ON position, place unit in Standby Mode, and allow a 15-minute period for equipment warmup.

l. After the warmup period has elapsed, place the unit in Operate Mode.

m. Place the multifunction selector first at DRIVER 1 - AMPERES and then at DRIVER 2 - AMPERES position. Observe the plate current indicated on the multifunction display meter for each tube.

n. Place the selector to the position that corresponded to the driver tube drawing the lowest plate current. Adjust the DRIVER BIAS ADJ potentiometer (1A1R9) to obtain a 200 mA indication at the meter.

o. Place the selector to the position that corresponded to the driver tube drawing the highest plate current. The plate current indicated at the meter should not exceed 280 mA.

NOTE

Omit subsequent steps p through s if the final transformer assembly is to be aligned (per paragraph 5.4.4.2).

p. Set FREQUENCY MEGAHERTZ selector at the frequency range corresponding to frequency of band being aligned.

q. Set the sweep generator to the sweep band being aligned (approximately 0.5 volts RF output) and insert markers for center, upper, and lower limits of this band (table 5-3).

r. For bands 1 through 8, adjust the appropriate slug as stated in table 5-3, which shows a single tuned response curve typical of bands 1 through 8 when properly aligned. Repeat steps p through r for each successive band alignment.

s. For bands 9 through 19, alternately adjust two slugs per band (top slug first) as stated in table 5-3 until the double tuned response curve, typical of bands 9through 19 is obtained with the peaks tuned to the band edges. Repeat steps p, q, and s for each successive band alignment.

t. Deenergize and disconnect all test equipment.

u. Reconnect screen balance plugs P6 and P7 at the positions recorded in step h.

v. Reconnect cable connector 1A2P4 to VSWR Bridge connector 1A1A3J2 and cable connector 1A2P1 to chassis connector 1A1J1.

w. Press the detent button on the main chassis slides and slide the unit back into the case.

x. Secure the unit to the case by tightening the six captive screws.

5.4.4.2 Final Transformer Assembly 1A1A2 Alignment Procedure

The final transformer assemblies for the 19 frequency bands are arranged on 12 coil forms (refer to figure 7-19). Frequency bands 1 and 2 (2.0 MHz to 2.5 MHz and 2.5 MHz to 3.0 MHz) use coil forms 1 and 2 (1A1A2A1 and 1A1A2A2) connected in series. Frequency bands 3 and 4 (3.0 MHz to 3.5 MHz and 3.5 MHz to 4.0 MHz) use coil forms 3 and 4 (1A1A2A3 and 1A1A2A4). The coils for the remaining 15 bands are arranged on eight separate coil forms, with two coils on each form providing a double-tuned circuit for each band. Seven of the eight coil forms serve two bands each. One coil form (1A1A2A10) serves only one band.

The adjustment slug on the top of each coil form is marked P, while the slug at the bottom of the coil is unmarked.

Alignment of the broadband transformers of Final Transformer Assembly 1A1A2 is very important to the overall performance of the RF-110A. Therefore, indiscriminate adjustment of the circuits without eliminating other possible causes of trouble or without proper test equipment should not be attempted. Before attempting an alignment to solve an operational problem, logical troubleshooting techniques should be employed to detect 1A1A2S1 switch finger contact problems or component failures in the assembly. In case of difficulty, consult the Factory Field Service Group for assistance.

5.4.4.2.1 Test Equipment Required

The following test equipment is required to perform the Final Transformer Assembly 1A1A2 alignment procedures:

- Spectrum Analyzer system consisting of the following:

  Hewlett Packard Model HP-140T Display
  Hewlett Packard Model HP-8552B RF Section
  Hewlett Packard Model HP-8553B IF Section

- Tracking Generator for the Spectrum Analyzer system

  Hewlett Packard Model HP-8443A

- Reflectivity Bridge, RF Part Number 6802-5100

- Two resistors 1200 ohm ±5%, 2 W Carbon composition with alligator clips attached. (Do not use wire wound or film resistors); RF Part Number 6802-5110

Equivalent equipment may be substituted.

5.4.4.2.2 Prealignment Checkout Procedures

The object of the prealignment checkout procedures is to verify that alignment of Final Transformer Assembly 1A1A2 is required. Perform these procedures before any alignment is attempted.

For any frequency band that does not meet the return loss -14 dB specification, the following checks should be performed before an alignment is attempted.

a. Perform complete visual inspection for component failure, arcing, loose wiring, open switch contacts, or other abnormal conditions.

b. Measure total coupling capacitance and tuning capacitance capacitor values. When measuring capacitor values, bandswitch 1A2S1 must be rotated to a band which does not use the coil or capacitors being measured and does not short the coupling capacitors. In some cases, different combinations of coupling capacitors have been used from that which appears on the schematic. However, the total capacitance measured should fall within limits shown in table 5-4.

Table 5-4. Total Coupling Capacitance Values for the Transformer Assemblies of Final Transformer Assembly 1A1A2

Coil Assembly 1A1A2	Applicable Coupling Capacitor Reference Designators	Total Nominal Capacitance Value**
A1 and A2	C25, C26, C27	1370 pF ±5%
A3 and A4	C30, C31, C32	1860 pF ±5%
A5	C35, C36, C37	750 pF ±5%
A6	C40, C41, C42	810 pF ±5%
A7	C45, C46, C47	560 pF ±5%
A8	C50, C51, C52, C53*	580 pF ±5%

Table 5-4. Total Coupling Capacitance Values for the Transformer Assemblies of Final Transformer Assembly 1A1A2 (Cont.)

Coil Assembly 1A1A2	Applicable Coupling Capacitor Reference Designators	Total Nominal Capacitance Value**
A9	C55, C56, C57, C58*	311 pF ±5%
A10	C60, C61, C62, C63*	330 pF ±5%

* Some Final Transformer Assemblies may use four capacitors in place of the three normally used.

** When measuring capacitance, add 15 to 20 pF to values shown to account for stray capacitance.

c. Alignment of the Final Transformer Assembly may be indicated if following conditions are noted: (all of the following steps require that the RF-110A output be connected to a 50 ohm dummy load).

- Less than 900 watts of output power with more than 150 mW of input power
- Plate current in excess of 720 mA in CW/RATT mode at 1 kW output
- Screen notching (reduction of screen voltage) due to excessive screen current at any frequency within a band
- Replacement of final tubes 1A1V1 or 1A1V2
- A spare Final Transformer Assembly 1A1A2 is installed in the unit

d. Alignment of Final Transformer Assembly 1A1A2 is required if any of the following conditions have occurred:

- A coil slug is replaced, or adjusted more than five turns
- Any transformer assembly (1A1A2A1 through 1A1A2A12) is replaced
- Any rework has been performed which could have changed the lead dress on any of the coil assemblies

e. Turn on all test equipment (figure 5-14) and allow adequate warmup time.

f. Calibrate the test equipment as required (for example, the Spectrum Analyzer System).

g. Temporarily remove ac power from the unit or secure at source. Place the PRIMARY POWER switch off.

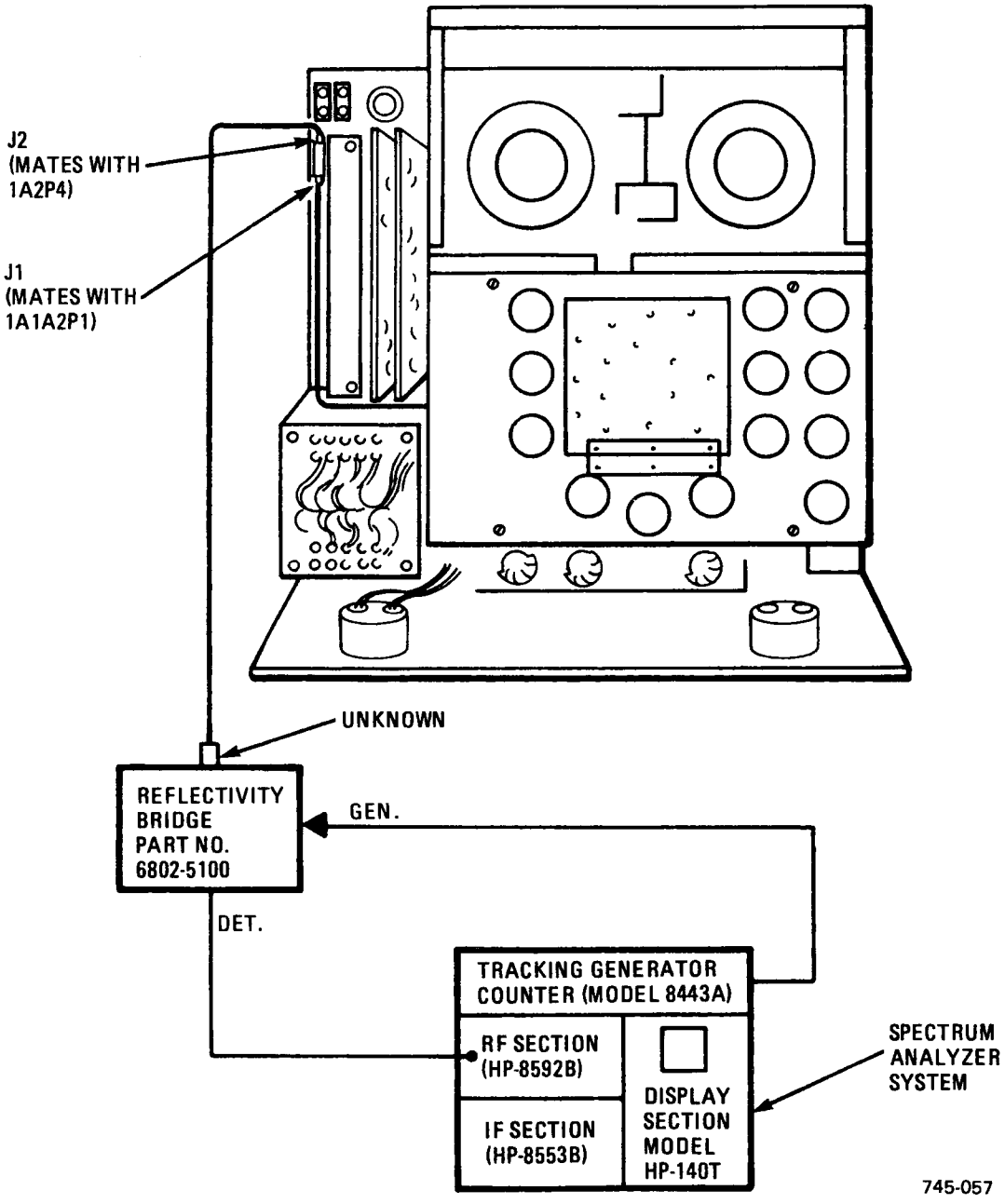


Figure 5-14. Final Transformer Assembly 1A1A2 Alignment Test Setup

h. Loosen the front panel screws and slide the chassis out until it locks.

WARNING

Lethal voltages exist in the vicinity of the input terminal of Final Transformer Assembly 1A1A2 and the anode of final amplifier tubes 1A1V1 and 1A1V2. Observe the following precaution. Before touching any component with bare hands, turn off power and then short to ground all terminals using a heavy screwdriver with insulated handle or a shorting stick.

i. Remove the Final Tube cover and install the two 1200 ohm resistors. (Part Number 6802-5110) between the tube cooling fins and ground, as shown in figure 5-15.

j. Connect the test equipment to the unit as shown in figure 5-14.

k. Set the Spectrum Analyzer System for continuous sweep, 100 kHz bandwidth, scan width per division to 0.5 MHz or 1 MHz per division as required, 10 dB log display, and input attenuation to 10 dB.

l. Set the Tracking Generator Section for maximum output (+10 dBm).

m. Defeat the unit chassis interlock switches 1A1S10 and 1A1S11 by pulling out on the switches.

n. Rotate the FREQUENCY MEGAHERTZ selector to the frequency band requiring alignment.

WARNING

In the following steps, do not go to Operate Mode or apply high voltage. Instant destruction of the two 1200 ohm resistors in the tube compartment and possible hazard to personnel will result.

o. Turn on the ac power and place the PRIMARY POWER switch on. The bandswitch disc located on the top of the Final Transformer Assembly should rotate to the desired band and stop. Place the PRIMARY POWER switch off.

p. Disconnect the cable to the unknown input of the reflectivity bridge. Set the spectrum analyzer display to the 0 dB reference at the top of the display. The step should be repeated each time a different band is displayed. Reconnect the cable to the unknown input of the reflectivity bridge.

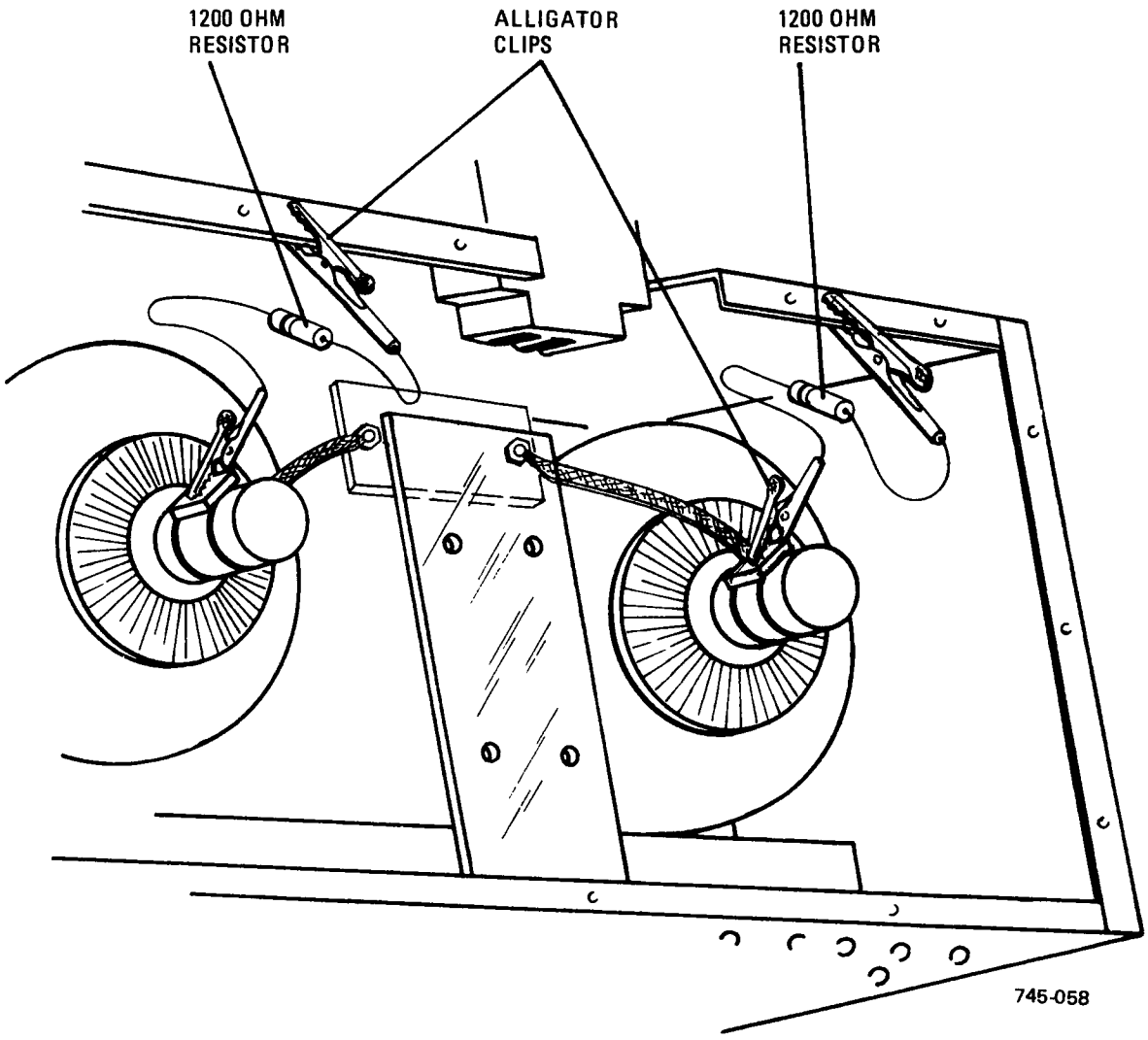


Figure 5-15. Installation of Two 1200 Ohm Resistors in Final Amplifier Assembly 1A1MP6

q. The passband response of the selected band should now be displayed on the analyzer. All points within the passband should be lower than -14 dB on the display. If the condition is not met, recheck the test equipment calibration. Failure to meet the -14 dB return loss requirement indicates an alignment is required. Proceed to the alignment procedure for the applicable frequency band.

In general, when tuning all of the bands, adjustment of the secondary inductance acts to center the passband, lower the midband response, and balance the band edges. Adjustment of the primary inductance acts as a coarse frequency adjustment and roughly determines the center frequency. Rotating the slug tuning screws clockwise raises the slugs, while rotating the slug tuning screws counterclockwise lowers the slugs. The frequency range of each band and the associated coil assembly (or assemblies) is shown in table 5-5.

NOTE

In the following procedures repeat steps m through q of paragraph 5.4.4.2.2 to select the frequency bands of the RF-110A.

Table 5-5. Final Transformer Assembly 1A1A2 Frequency Band/Applicable Frequency/ Applicable Transformer Assembly Correlation

Frequency Band	Applicable Frequency (MHz)	Applicable Transformer Assembly 1A1A2
1	2.0 - 2.5	A1 and A2
2	2.5 - 3.0	A1 and A2
3	3.0 - 3.5	A3 and A4
4	3.5 - 4.0	A3 and A4
5	4.0 - 5.0	A5
6	5.0 - 6.0	A5
7	6.0 - 7.0	A6
8	7.0 - 8.0	A6
9	8.0 - 10.0	A7
10	10.0 - 12.0	A7
11	12.0 - 14.0	A8
12	14.0 - 16.0	A8
13	16.0 - 18.0	A9
14	18.0 - 20.0	A9
15	20/0 - 22/0	A10
16	22.0 - 24.0	A11
17	24.0 - 26.0	A11

Table 5-5. Final Transformer Assembly 1A1A2 Frequency Band/Applicable Frequency/ Applicable Transformer Assembly Correlation (Cont.)

Frequency Band	Applicable Frequency (MHz)	Applicable Transformer Assembly 1A1A2
18	26.0 - 28.0	A12
19	28.0 - 30.0	A12

5.4.4.2.3 Transformer Assemblies 1A1A2A1 through 1A1A2A4 Alignment Procedure

To align Transformer Assemblies 1A1A2A1 through 1A1A2A4 (2.0 MHz to 4.0 MHz), refer to figure 7-19. At the first four frequency bands (Band 1 - 2.0 to 2.5 MHz; Band 2 - 2.5 to 3.0 MHz; Band 3 - 3.0 to 3.5 MHz; Band 4 - 3.5 to 4.0 MHz), Transformer Assemblies 1A1A2A1 and 1A1A2A3 are the primary windings at the frequencies specified. Transformer Assemblies 1A1A2A2 and 1A1A2A4 are the secondary windings at the frequencies specified. Each primary and secondary has two tuning slugs. Adjustment of the top slug (marked P) primarily affects the lower frequency band. Adjustment of the lower (unmarked) slug primarily affects the higher frequency band. Some interaction between these adjustments will occur, and alternate adjustment of the slugs will be required to balance the band adjustments. Proceed as follows:

a. Set the transformer coil slug to the position specified in table 5-6. (Figure 5-16 shows coil slug position measurement information.)

Table 5-6. Final Transformer Assembly 1A1A2 Subassembly Coil Slug Initial Positions Prior to Adjustment

Transformer Assembly 1A1A2	Top Coil Slug (Marked P) Position (A, figure 5-16)	Bottom Coil Slug (Unmarked) Position (B, figure 5-16)
A1	0.91 inch (2.3 cm)	1.10 inch (2.8 cm)
A2	0.51 inch (1.3 cm)	0.94 inch (2.4 cm)
A3	1.30 inch (3.3 cm)	1.18 inch (3.0 cm)
A4	0.87 inch (2.2 cm)	0.94 inch (2.4 cm)
A5	0.75 inch (1.9 cm)	0.59 inch (1.5 cm)
A6	0.87 inch (2.2 cm)	0.94 inch (1.5 cm)
A7	0.59 inch (1.5 cm)	0.59 inch (1.5 cm)
A8	0.67 inch (1.7 cm)	0.59 inch (1.5 cm)
A9	0.67 inch (1.7 cm)	0.55 inch (1.4 cm)
A10	0.59 inch (1.5 cm)	0.43 inch (1.1 cm)

Table 5-6. Final Transformer Assembly 1A1A2 Subassembly Coil Slug Initial Positions Prior to Adjustment (Cont.)

Transformer Assembly 1A1A2	Top Coil Slug (Marked P) Position (A, figure 5-16)	Bottom Coil Slug (Unmarked) Position (B, figure 5-16)
A11	1.20 inch (3.0 cm)	0.75 inch (1.9 cm)
A12	0.79 inch (2.0 cm)	0.98 inch (2.5 cm)

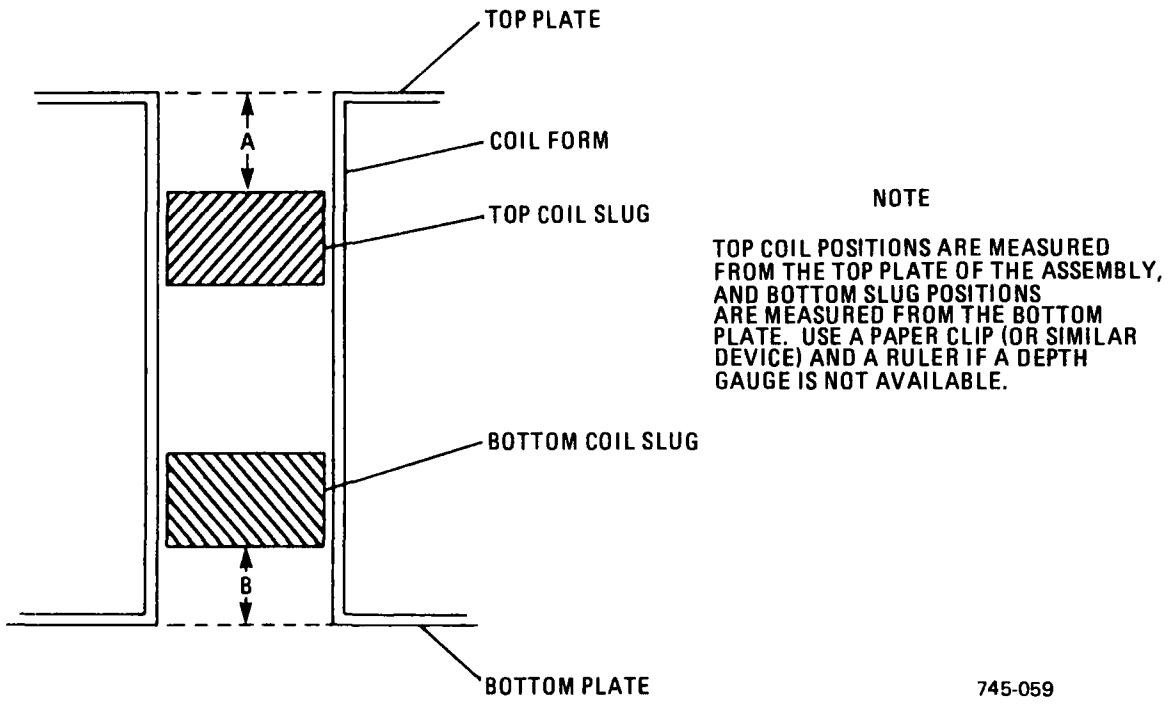


Figure 5-16. Transformer Coil Slug Measurement Information

b. Select the higher frequency band on the RF-110A bandswitch. Adjust the spectrum analyzer to display that band. Reset the spectrum analyzer to 0 dB reference. (See paragraph 5.4.4.2.2.p.)

c. Adjust the bottom coil slug of either Transformer Assembly 1A1A2A1 or 1A1A2A3 (see table 5-5) to obtain the correct center frequency.

d. Adjust to bottom coil slug of either Transformer Assembly 1A1A2A2 or 1A1A2A4 to center the passband and balance the band edges.

e. Select the lower frequency band on the RF-110A bandswitch. Adjust the spectrum analyzer to display the band. Reset the spectrum analyzer to 0 dB reference.

f. Adjust the top coil slug of either Transformer Assembly 1A1A2A1 or 1A1A2A3 (see table 5-5) to obtain the correct center frequency.

g. Adjust the top coil slug of either Transformer Assembly 1A1A2A2 or 1A1A2A4 to center the passband and balance the band edges.

h. Repeat steps b through g until the return loss meets or exceeds the -14 dB return loss requirement, across the frequency range of both bands.

5.4.4.2.4 Transformer Assemblies 1A1A2A5 through 1A1A2A12 Alignment Procedures

To align Transformer Assemblies 1A1A2A5 through 1A1A2A12 (4.0 MHz to 30.0 MHz), proceed as follows:

a. Set the transformer coil slug to the position specified in table 5-6.

b. Select the frequency band to be aligned on the RF-110A bandswitch. Adjust the spectrum analyzer to display that band. Reset the spectrum analyzer to 0 dB reference.

c. Adjust the top coil slug of the applicable transformer assembly (see table 5-5) to obtain the correct center frequency.

d. Adjust the bottom coil slug of either applicable transformer assembly to center the passband and balance the band edges.

e. Alternately repeat steps c and d until the -14 dB return loss requirement is met or exceeded throughout the passband.

f. Select the other band that is tuned by the same transformer assembly and repeat steps b through e.

g. Alternately repeat the alignment procedures for each band until both bands meet the return loss requirement.

5.4.4.2.5 Final Alignment Check

Perform a final alignment check as follows:

a. After the return loss alignment has been completed, disconnect all test equipment, remove the two 1200 ohm resistors from the final tubes, and replace all covers.

b. Connect a 50-ohm dummy load to the XMTR OUT jack (1A2J3) and verify proper operation in the bands aligned. (See paragraph 5.4.4.)

5.5 REPAIRS

The following paragraphs 5.5.1 through 5.5.2.7 describe general maintenance level removal and replacement instructions for the RF-110A.

5.5.1 Printed Wiring Board (PWB) Removal and Replacement

When using extractor levers to remove RF-110A printed wiring boards, use the levers simultaneously applying equal extracting force on both levers to prevent binding of the PWB's due to tilting. Binding may damage the board or its mating socket connections. Be careful not to damage the connector or break keys.

5.5.2 Part and Assembly Removal and Replacement

Subsequent paragraphs 5.5.2.1 through 5.5.2.7 describe access, removal, and/or replacement procedures for:

- Panel mounted parts
- Final amplifier tube sockets
- Driver and final amplifier tubes
- Driver and final transformer assemblies

5.5.2.1 Panel - Mounted Parts Access

Electrolytic capacitors 1A1C29 and 1A1C30, along with the RF-110A front panel parts, are more easily accessible if the front panel is loosened. This panel is secured by three screws on each side and one in the center. To allow some movement of the panel, remove the top two screws on each side plus the center screw. Loosen, but do not remove bottom screw on each side. The panel can now be tipped forward slightly to improve access to parts.

CAUTION

If all six panel screws are removed, the panel will hang by its interconnecting wires and chain. Damage to these items may result.

5.5.2.2 Final Amplifier Tube Socket Access

The following procedure describes how to gain access to the final amplifier tube socket assemblies (1A1V1 and 1A1V2) of the Driver PA final amplifier.

a. For repairs affecting the tube sockets, remove the final amplifier tubes (1A1V1/1A1V2) as described in subsequent paragraph 5.5.2.3.

b. Remove Driver Tube Assembly 1A1A1 as described in steps a through f of paragraph 5.5.2.4.

c. Remove Driver Transformer Assembly 1A1A4 as described in paragraph 5.5.2.6.

d. Remove the main chassis bottom plate (nine screws secure the plate).

e. Swing the bottom plate out of the way (the wires need not be unsoldered).

f. Capacitors 1A1C49 and 1A1C50 may be removed, if required, to gain access to desired parts.

5.5.2.3 Removal and Replacement of the Final Amplifier Tubes

To remove and replace either final amplifier tube (1A1V1 or 1A1V2) proceed as follows:

a. Loosen the six captive screws that secure the main chassis to the case assembly.

b. Pull the main chassis out on its slides until it locks (detents) into service position.

c. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

d. Remove the top protective cover from over the tubes (at the rear of chassis - 10 screws secure it).

WARNING

Lethal RF and dc voltages exist at the various tube termination and connection points. Before proceeding, check to ensure that the equipment is completely deenergized and secured at the source, then short all accessible terminals to chassis ground.

e. Use a shorting stick to short top terminal of tubes to ground.

f. Carefully release the tube clamp and lift it off of tube.

g. Without lifting, carefully rotate tube counterclockwise for approximately sixty degrees, until it is free in socket. (Further tube rotation will be prevented by a hidden pin on bottom of socket.)

CAUTION

When lifting the tube out of the socket, proceed slowly. If the tube catches, rock the tube gently to free it. Excessive force can damage the tube and the socket contacts.

h. Lift tube straight up and out of socket. Set tube aside.

NOTE

Before replacing tube 1A1V1 or 1A1V2, carefully inspect the tube, contacts, and the contacts of the tube socket for signs of damage, or for signs of arcing (which could indicate loose or improperly meshing contacts).

i. To start tube installation, observe the guide pin in the hole in base of the tube and orient the tube so that the guide pin mates with one of the slots in center guide post in the tube socket.

j. Gently lower the tube over the guide post and into the socket until tube touches bottom.

k. Carefully rotate the tube clockwise. The tube should rotate approximately sixty degrees, with moderate mechanial resistance as contacts mesh, until a hidden pin prevents further rotation.

l. Place the tube clamp over tube end, and lock it. Check the connection braid at both ends for tightness.

m. Replace the protective cover over the tubes and secure it.

n. Move plugs 1A1P6 and 1A1P7 (screen voltage connectors for tubes 1A1V1 and 1A1V2) to jacks 1A1J10 and 1A1J11. (See figure 5-7.)

o. Refer to paragraph 5.4.2 and perform the complete screen voltage and control grid bias adjustment for tubes 1A1V1 and 1A1V2.

p. Press the detent button on the main chassis slides and slide the unit back into the case assembly.

q. Secure the unit to the case by tightening the six captive screws.

r. If the tubes are being replaced after 1000 hours of operation as indicated by the elapsed time meter 1A1B3, note the present reading to determine when next replacement is due.

5.5.2.4 Removal and Replacement of the Driver Amplifier Tubes

To remove and replace either driver amplifier tube (1A1A1V1 or 1A1A1V2), proceed as follows:

a. Turn off the PRIMARY POWER switch.

b. Loosen the six captive screws that secure the main chassis to the case assembly.

c. Pull the main chassis out on its slides until it locks (detents) into service position.

d. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

WARNING

Lethal RF and dc voltages exist at the various tube terminations and connection points. Before proceeding, check to ensure that the equipment is completely deenergized and secured at the source; then short all accessible terminals to chassis ground with a shorting stick.

e. Remove the shield over terminal board 1A1A1TB1 on the bottom of the driver tube assembly.

f. Remove the wires from terminal board 1A1A1TB1.

CAUTION

When removing the driver tube assembly, avoid using excessive force to prevent damage to the spring contacts located between the assembly and Driver Transformer Assembly 1A1A4.

g. Loosen the two captive screws and carefully lift the Driver Tube Asembly out of the chassis.

h. Release the tube clamp on the tube to be removed.

CAUTION

Be careful to avoid damage to nearby capacitors.

i. Place a blunt tool against base of tube (through underside of socket) and push tube out. Prepare to catch the tube as it suddenly pops out (these tubes fit very tightly in their sockets).

j. To start new tube installation, orient the tube to properly align its pins with the socket. Push tube into socket.

k. Engage the tube clamp and lock it.

CAUTION

While installing the driver tube assembly, make sure that the spring contacts, located between the assembly and Driver Transformer Assembly 1A1A4, mate properly to avoid damage.

l. Carefully guide the driver tube assembly into position on bottom of main chassis and secure it. Ensure that edges of driver tube assembly mate properly with their slots in main chassis.

m. Reconnect wires to terminal board 1A1A1TB1 and replace its shield.

n. Press the detent button on the main chassis slides and slide the unit back into the case assembly.

o. Secure the unit to the cabinet by tightening the six captive screws.

p. Turn on the PRIMARY POWER switch.

q. Perform the driver tube bias adjustment procedure described in paragraph 5.4.1.

5.5.2.5 Removal and Replacement of Final Transformer Assembly 1A1A2

CAUTION

Rotating the final transformer switch backwards will damage it.

The following procedure describes removal and replacement of Final Transformer Assembly 1A1A2 for inspection, minor repairs, or replacement. Major repairs, such as switch or coil repair or replacement or switch coupling alignment require special procedures described in paragraph 5.7 (advanced maintenance). After repairing or when installing a replacement assembly, realignment must be performed with the assembly in the unit as described in paragraph 5.4.4.2.

a. Turn off the PRIMARY POWER switch.

b. Loosen the six captive screws that secure the main chassis to the case assembly.

c. Pull the main chassis out on its slides until it locks (detents) into service position.

d. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

WARNING

Lethal dc voltages may remain due to charged filter capacitors. Before proceeding, check to be sure that equipment is completely deenergized. With the final tube cover removed, short all accessible terminals to ground with a shorting stick.

e. Remove protective cover over the top of the final tubes 1A1V1/1A1V2 at rear of chassis (10 screws secure it).

f. Use a shorting stick to ground top terminal of tubes.

g. Disconnect plug 1A1A2P1 at the VSWR bridge and unscrew and free cable clamp at bottom of the left side plate adjacent to the VSWR bridge.

h. Disconnect the lead from the final tube compartment at the terminal on the contact block at the front of the compartment.

i. Insert a long screwdriver through each of four clearance holes in the top of the transformer assembly, and after carefully engaging the screwdriver in the slot of each captive screw (not caught on adjacent components), loosen each screw.

j. Loosen the two pan-head screws holding left and right hand L brackets.

k. Bend a piece of stiff wire to fabricate a pulling tool with hooks to insert into the two opposite screwdriver clearance holes. Lift the assembly straight out while freeing coaxial cable grommet on left side partition.

l. To reinstall assembly, orient it as shown in figure 7-2, carefully lower it into the compartment, and engage the locating pins.

m. Carefully reposition the assembly in the main chassis. Replace the cable grommet on the left side chassis position.

n. Replace the right and left hand L brackets and secure them with the two pan-head screws. The L brackets on each side should be positioned with one inside and one outside the partition as shown in figure 7-3.

o. Using a long screwdriver, secure the assembly to the chassis by tightening the four captive screws.

p. Reconnect the lead from the final tube compartment to the contact block at the front of the compartment.

q. Reconnect plug 1A1A2P1 to the VSWR bridge and secure the cable clamp to the bottom left side of the plate near the VSWR bridge.

r. Replace the protective cover over the final amplifier tubes.

s. If alignment is necessary, perform the procedures described in paragraph 5.4.4.2.

t. Press the detent button on the main chassis slides and slide the unit back into the case.

u. Secure the unit to the cabinet by tightening the six captive screws.

v. Turn on the PRIMARY POWER switch.

w. Rotate the FREQUENCY MEGAHERTZ selector several times, then place it at the AUTOMATIC position.

NOTE

The coupling pin on the transformer assembly will engage the coupling on the transmission assembly during the first full rotation of bandswitch motor.

5.5.2.6 Removal and Replacement of Driver Transformer Assembly 1A1A4

CAUTION

Rotating the driver transformer switch wiper backwards will damage the switch.

The following procedure describes removal and replacement of Driver Transformer Assembly 1A1A4 for inspection, minor repairs, or replacement. Major repairs, such as switch or coil replacement or switch coupling alignment require special procedures and are described in paragraph 5.7 advanced maintenance. After repair or when installing a replacement assembly, realignment must be performed with the assembly in the unit as described in paragraph 5.4.4.1.

a. Turn off the PRIMARY POWER switch.

b. Loosen the six captive screws that secure the main chassis to the case assembly.

c. Pull the main chassis out on its slides until it locks (detents) into service position.

d. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

WARNING

Lethal dc voltages may remain due to charged filter capacitors. Before proceeding, check to be sure that equipment is completely deenergized.

e. Disconnect the six wires from terminal board 1A1A4TB1 on the bottom of the assembly.

f. Loosen the two captive screws and carefully remove assembly.

CAUTION

Avoid using excessive force or damage to contact fingers on the side of the assembly may result.

g. To reinstall the assembly, orient it with the terminal board towards the rear of the chassis. Carefully set assembly in the chassis. As it slides into position, engage the two locating pins on the transmission assembly. Avoid excessive force to protect contact fingers.

h. Secure the assembly with the two captive screws.

i. Reconnect the wires to terminal board 1A1A4TB1 according to tags attached.

j. Refer to paragraph 5.4.4.1 if realignment is necessary.

k. Press the detent button on the main chassis slides and slide the unit back into the case.

l. Secure the unit to the cabinet by tightening the six captive screws.

m. Turn on the PRIMARY POWER switch.

n. Rotate the FREQUENCY MEGAHERTZ selector several times, then place it at the AUTOMATIC position.

NOTE

The coupling pin on the transformer assembly will engage coupling on the transmission assembly during the first full rotation of bandswitch motor.

5.6 CLEANING AND LUBRICATION

Cleaning procedures applicable to the RF-110A consist of cleaning the air filters. No lubrication is required.

5.6.1 Cleaning the Air Filters

WARNING

Make sure that the PRIMARY POWER switch is turned off.

a. Remove air filter by loosening four knurled screws on filter bracket on front panel.

b. Use forced air to blow the dust and loose dirt from filter.

c. Wash the dirty filter in hot soapy water, rinse it in clean water, and allow it to drain.

d. When the filter has dried, replace it in the unit.

5.7 RF-110A ADVANCED - LEVEL MAINTENANCE

The RF-110A advanced-level maintenance consists of the fabrication, disassembly, removal and replacement, repair, and alignment and adjustment procedures of subsequent paragraphs 5.7.1 through 5.7.3.7.

5.7.1 Test Equipment Required for Advanced Maintenance Procedures

The test equipment used for performing the advanced maintenance procedures is listed in table 5-1 with the exception of two special test fixtures. The use and fabrication of these test fixtures is described in paragraph 5.7.1.1.

5.7.1.1 Special Test Fixtures Preliminary Information

The RF-110A transmission assembly operates the band selection switches (1A1A4S1 and 1A1A2S1) of the Driver and Final Transformer Assemblies (1A1A4 and 1A1A2, respectively). Paragraph 4.5 describes the manner in which the code deck on band selection switch 1A1A4S1 controls the operation of bandswitch motor 1A1B2 on the transmission assembly for proper indexing of both band selection switches.

The band selection switches have no detent action, and their switch positions are only 15 degrees apart (each switch has 24 positions). If the switches do not index properly, RF voltages may arc between contacts (especially in the final transformer assembly) during transmission and damage the assembly. To ensure proper switch indexing, carefully constructed fixtures must be used to orient the couplings on the assemblies should their position be disturbed during maintenance or repair procedures.

5.7.1.2 Special Test Fixtures - Fabrication Information

Figure 5-17 lists the dimensions and other pertinent data for the two fixtures required to orient the couplings for the driver and final transformer assemblies during transmission assembly repair. Figure 5-18 lists the dimensions and other pertinent data for the fixtures required to orient the couplings on the driver and final transformer band selection switch shafts. In both illustrations, note that critial dimensions are listed to four decimal places. The given tolerances must be observed in order for the fixtures to properly perform their locating functions. (These fixtures are supplied as part of the optional RF-110A/MRK maintenance repair kit.)

5.7.2 Disassembly Instructions

Figure 1-1 shows the arrangement of the equipment in the dual enclosure which houses all of the equipment of the Transmitter. The RF-110A main chassis is conveniently mounted on slides. All cable connections between it and other units are made to connectors on the rear of

the unit. The only preremoval identification required consists of ensuring that all cabling and wiring to be removed is fully identified for proper replacement.

WARNING

The RF-110A weighs 95 pounds (43.1 kg). Do not attempt to remove it from the Exciter/Driver Cabinet without help.

5.7.2.1 Normal Subassembly Removal and Replacement Suggestions

The following suggestions will assist in removal and replacement of the subassemblies during maintenance.

WARNING

Before performing any disassembly, always be sure that primary power is turned off and secured at the source.

a. Tag all wires and cables for easy identification before unsoldering or disconnecting.

b. To eliminate confusing similar types of hardware, set aside all screws, washers, etc. in the order in which they are removed from the assembly.

c. When separating sections or assemblies from their gear drive assembly (such as the driver transformer assembly) make a sketch of drive shaft position and the orientation of the driven components to assist in relocation.

d. Lift assemblies straight away from chassis to avoid damage to hidden pins and spring contacts.

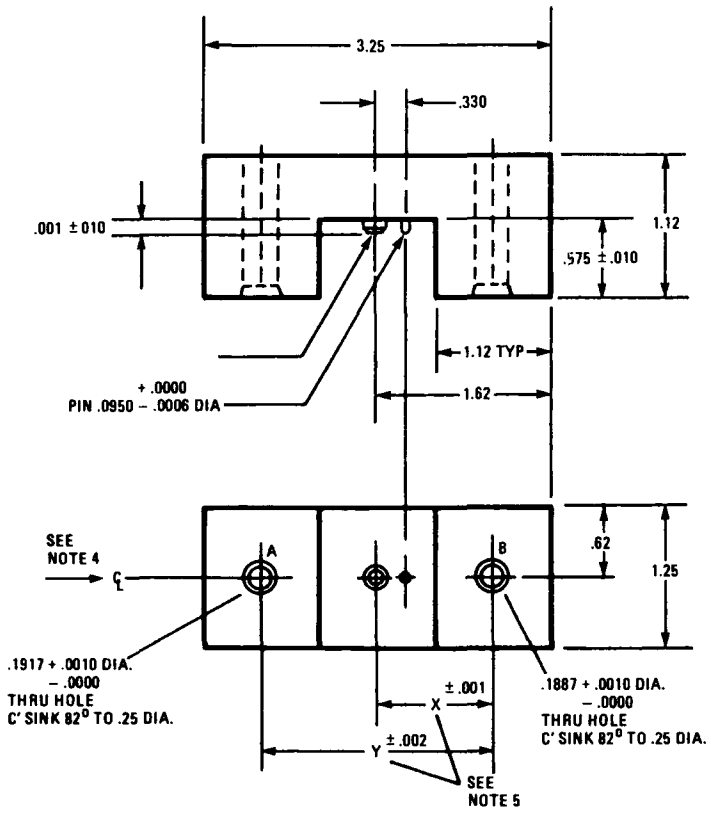
e. To prevent misalignment, do not disturb lead dress of RF leads in assemblies such as the final transformer assembly.

NOTE

During maintenance procedures, when subassemblies are removed, take advantage of the disassembly to inspect and clean normally hidden contacts and components.

5.7.2.2 Removal of the Transmission Assembly

The transmission assembly must be removed in order to replace the bandswitch motor or to repair the couplings of the transmission assembly. To remove the transmission assembly, proceed as follows:



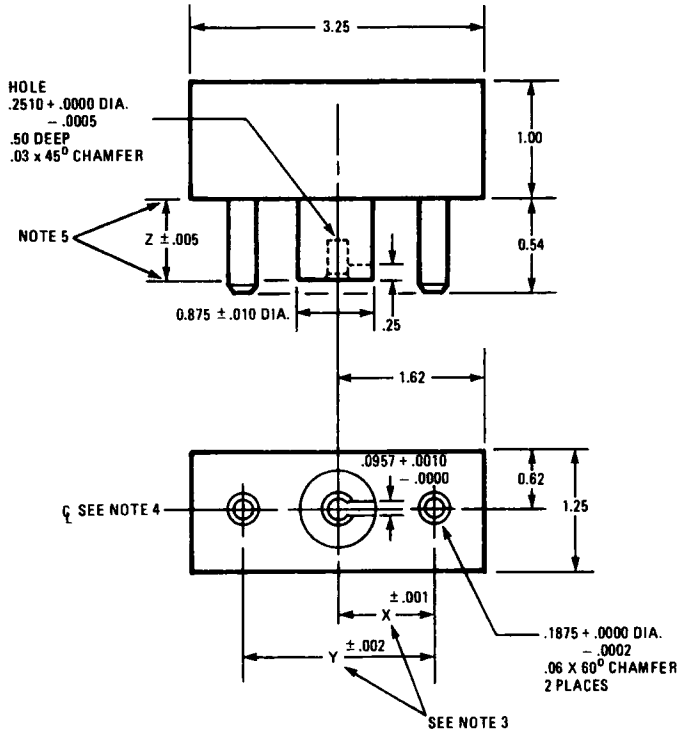
DRIVER TRANS. COUPLING	DIMENSION X	DIMENSION Y
1A1A4 COUPLING	.750	1.500
1A1A2 COUPLING	1.125	2.250

NOTES:

1. MATL: TOOL STEEL
2. FINISH: NONE
3. PRESS FIT PINS
4. ℄ OF PINS TO BE POSITIONED ON ℄ OF "A" AND "B" HOLES WITHIN .001
5. MAKE ONE FIXTURE FOR COUPLING MATING WITH 1A1A4 AND ONE FOR COUPLING MATING WITH 1A1A2. SEE TABLE ABOVE FOR X AND Y DIMENSIONS
6. ALL DIMENSIONS ARE IN INCHES. FOR CENTIMETER DIMENSIONS MULTIPLY THE NUMBERS BY 2.54
7. TOLERANCES: .XXX = ±.005
   .XX = ±.02

745-060

Figure 5-17. Driver and Final Transformer Assembly Coupling Location Fixtures Fabrication Information



ASSY	X	Y	Z
1A1A4	.750	1.500	.578
1A1A2	1.125	2.250	.523

NOTES:

1. MATL: TOOL STEEL
2. FINISH: NONE
3. MAKE TWO FIXTURES ONE FOR FINAL AND ONE FOR DRIVER TRANSFORMER ASSY. SEE TABLE ABOVE FOR X, Y, AND Z DIMENSIONS.
4. ℄ OF GUIDE PINS AND ℄ OF SLOT TO BE WITHIN .001 INCH.
5. THESE TWO SURFACES MUST BE PARALLEL + .010 IN.
6. ALL DIMENSIONS ARE IN INCHES. FOR CENTIMETER DIMENSIONS MULTIPLY THE NUMBERS BY 2.54.
7. TOLERANCE: .XXX = ± .005
   .XX = ± .02

745-137

Figure 5-18. Driver and Final Transformer Assembly Switch Shaft Coupling Fixtures Fabrication Information

NOTE

Detailed procedures for removing parts and assemblies mentioned in subsequent steps a through g are contained in the referenced paragraphs.

a. Place the PRIMARY POWER switch off.

b. Loosen the front panel screws, and pull the main chassis out from the case until the chassis slides lock.

c. Remove the top cover, and remove final tubes 1A1V1 and 1A1V2 as described in paragraph 5.5.2.5. (Mark the tubes to allow their replacement in same socket from which they were removed. This will avoid having to reset screen voltage taps.)

d. Remove Final Transformer Assembly 1A1A2 as described in paragraph 5.5.2.5.

e. Release the chassis slide tilt locks, and tip the chassis up to expose the underside.

f. Remove Driver Tubes 1A1A1V1 and 1A1A1V2 as described in paragraph 5.5.2.4.

g. Remove Driver Transformer Assembly 1A1A4 as described in paragraph 5.5.2.6.

h. Remove the three screws that secure the airseal plate over the transmission assembly and remove the plate.

i. Unsolder the two motor leads from the terminals on the chassis bracket.

j. Remove the four screws which secure the transmission assembly to the bottom of the main chassis. The four screws are inserted through from the top of the chassis. Two are located inside the compartment for Final Transformer Assembly 1A1A2, and one each is located just inside the plastic air deflector for each final tube socket. (Step c is performed to obtain access to these last two.)

k. Refer to paragraphs 5.7.3.1 and 5.7.3.2 and perform the necessary repairs and replacement procedures for the transmission assembly and bandswitch motor.

5.7.3 Repair and Replacement

The subsequent repair/replacement procedures cover the removal of component parts from the individual subassemblies. Each procedure references the paragraphs covering assembly removal, testing, and replacement.

5.7.3.1 Transmission Assembly Coupling Repair

CAUTION

Rotating the driver or final transformer bandswitch wiper backwards will damage it.

The two couplings on the transmission assembly can be easily removed for repair or replacement by removing the retaining ring securing the coupling. To remove the spring tension washers underneath, drive out the pin in the end of the shaft.

CAUTION

The transmission assembly must accurately index the driver and final transformer assembly bandswitches, or RF voltages may arc and destroy the switches. Always check switch indexing completely after any maintenance has been performed on the transmission assembly or either transformer assembly.

5.7.3.2 Bandswitch Motor 1A1B2 Replacement

CAUTION

Rotating the driver or final transformer bandswitch backwards will damage it.

The following procedure describes the replacement of bandswitch motor 1A1B2, and the checkout of the proper indexing of the transmission assembly drive couplings which must follow motor replacement.

CAUTION

The critical accuracy required for proper indexing of the driver and final transformer assemblies, to prevent RF arcing between contacts, dictates that the transmission assembly couplings be very carefully aligned. If possible, it is advisable to replace transmission and bandswitch motor as a complete assembly, rather than replace the motor on the old transmission assembly.

No electrical test equipment will be required for the bandswitch motor replacement. Two small mechanical indexing fixtures will be required to locate transmission assembly couplings for pinning. Refer to paragraph 5.7.1.2 and figure 5-17 for fabrication details.

To replace the bandswitch motor, proceed as follows (refer to figure 5-19) for parts identification:

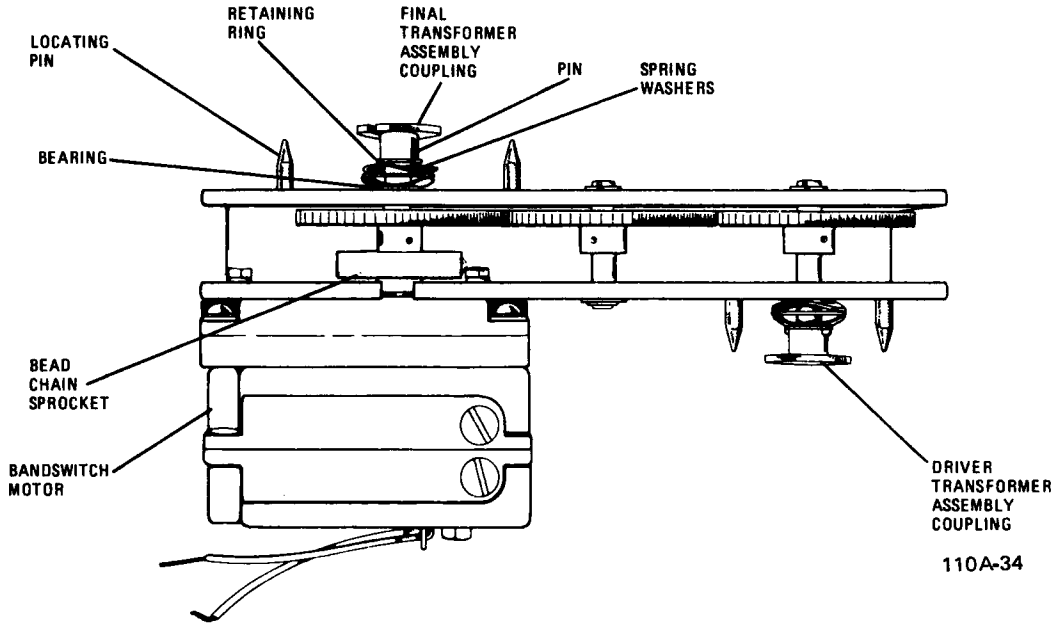


Figure 5-19. Transmission Assembly Component Details

a. Remove the transmission assembly as described in paragraph 5.7.2.2.

b. Remove the retaining ring that secures the final transformer assembly coupling to the motor shaft.

c. Remove the screws that secure the cover to the side of the transmission assembly. Remove the cover.

d. Drive out the pin on the end of the motor shaft, and remove the spring and flat washers. (Note order of removal in order to assist in later reassembly.)

e. Drive out the pins that secure the gear and bead chain sprocket to the motor shaft. If necessary, rotate the gears by hand or by inserting a screwdriver in the end of the driver transformer coupling shaft and turning it clockwise to expose the pins.

f. Remove the retaining ring that secures the bearings on the motor shaft.

g. Removes the three screws that secure the motor and lift the motor from transmission assembly. The gear and bead chain sprocket will fall out of transmission assembly when the motor shaft is withdrawn.

h. Push the bearing down and install the retaining ring on the motor shaft.

i. Reinstall the spring and flat washers removed in step d in the same order in which they were on the original motor shaft. Drive a steel pin through pinhole in end of shaft. Use coupling removed in step b as a guide to center the pin halfway through shaft.

k. Position the coupling removed in step b on end of motor shaft and over the steel pin. Secure it by installing the retaining ring.

CAUTION

Proper indexing of the transformer assemblies is dependent on correct orientation of the couplings of the transformer assembly.

k. Position the two small fixtures (fabricated as described in paragraph 5.7.1.2) over the guide pins and the couplings for the two transformer assemblies on the transmission assembly, so that the slots in the two couplings are in the same relative position.

l. Temporarily install (but not tighten) a No. 4 set screw on the large gear on the motor shaft.

m. With the gears engaged, hold the transmission assembly with its motor on the bottom, and apply pressure to rotate large gear on motor shaft counterclockwise to absorb backlash. (The indexing blocks will prevent gear from turning.) Maintain the counterclockwise pressure on gear while tightening the set screw to lock the gear in position.

n. Remove the indexing blocks.

o. Drill and pin the gear on the motor shaft, using a 1/16 inch (.16 cm) drill. (Drill the new pin hole at right angles to old hole in gear to prevent breaking drill.) When pinning is complete, remove the setscrew.

p. Hold the sprocket firmly away from the transmission assembly wall to provide clearance. Drill a 1/16 inch (.16 cm) hole through sprocket hub and shaft, and install pin.

q. Reinstall the cover on the side of the transmission assembly.

r. Reinstall the transmission assembly.

s. Reinstall the airseal plate.

t. Solder the motor leads to the terminals on the chassis plenum.

u. Follow the procedures in the referenced paragraphs and reinstall the following:

- The Driver Transformer Assembly 1A1A4 as described in paragraph 5.5.2.6
- The Driver Tube Assemblies 1A1A1V1 and 1A1A1V2 as described in paragraph 5.5.2.4
- The Final Transformer Assembly 1A1A2 as described in paragraph 5.5.2.5
- Final tubes 1A1V1 and 1A1V2, as described in paragraph 5.5.2.3 (Be sure to replace each tube in socket from which it was originally removed, or readjustment of screen voltage taps to equalize tube plate currents will be necessary.)

v. Replace the cover over the final amplifier tubes and secure it.

w. Use normal operating procedures to check out th RF-110A operation.

5.7.3.3 Driver and Final Transformer Assemblies Bandswitch and Transformer Subassembly Replacement

The type of switches used as band selection switches in the Final and Driver Transformer Assemblies are 24-position switches (only 19 positions are used for the 19 bands). These switches require accurate indexing to assure proper band selection. Also, the switches are located in the center of the assemblies surrounded by transformer assemblies. Lead dress to some of the transformer assemblies is critical, and will affect alignment of other nearby assemblies. For these reasons, the removal and replacement of the switches or any of the transformer assemblies should only be attempted by factory trained personnel. Return the transformer assemblies to the factory for repair or replacement of a switch or a transformer.

5.7.3.4 Final Transformer Assembly 1A1A2 Coupling Installation and Alignment

The following procedure is required when the band switch has been replaced, or when any other repair has been made which would affect alignment between the coupling and the band switch contacts.

NOTE

Due to critical indexing between broadband transformer switches and the code switch, repair of the switches or the transformer assemblies is not advised. Return these items to the factory for repair.

a. Place the driver coupling on the band switch shaft.

b. Place the special test fixture (figure 5-18) on the assembly, and rotate the coupling so its pin drops into the slot in the fixture.

c. With the special test fixture (indexing jig) pressed firmly against the assembly, the coupling should be snug against the jig. Increase or decrease the thickness of the brass laminated shim washers as required (laminations can be peeled off) so that the coupling resets against the jig $\pm$.010 inch. Remove the jig.

d. Manually rotate the band switch to the 2.0 to 2.5 MHz band. Adjust the position so that the rotor fingers are precisely centered on the stator contacts for this band.

e. Without disturbing the band switch, locate the coupling so that its pin is toward the 1A1A2A10 Transformer Assembly (10-12 MHz). Then orient the indexing jig in the same direction and put it in place. Be sure the coupling pin drops into the jig slot.

f. Drill a .063 + .003, -.000 inch diameter hole through the coupling hub and the shaft. (If either the coupling or shaft has a previous pinning hole, drill this hole at about a 45^{o} angle to the existing holes.) Keep the jig in position while drilling to prevent coupling or band switch rotation.

g. Install a type MS171435 spring pin in the hole.

h. Verify that the switch contacts are still precisely aligned in the 2.0 to 2.5 MHz position with the coupling positioned by the jig as described in step e.

i. Be sure that all metal clips are removed from the assembly.

5.7.3.5 Mechanical Alignment of the Driver Transformer Bandswitch 1A1A4S1 Code Decks

NOTE

Due to critical indexing between the broadband transformer switches and the code switch, repair of the driver transformer assembly in the field is not advised.

The following procedure is used to ensure that the contacts of Code Decks A and B of driver transformer band switch 1A1A4S1 position properly during band changing. This procedure is to be performed when improper driver transformer band switch positioning is observed, or when repairs make realignment necessary.

NOTE

This procedure is not to be used for ensuring proper positioning of final transformer band switch 1A1A2S1; see paragraphs 5.7.3.6 and 5.7.3.7.

a. Tune the RF-110A to the 2.0 to 2.5 MHz frequency band using the front panel FREQUENCY MEGAHERTZ.

b. Turn off the PRIMARY POWER switch.

c. Release front panel captive screws and withdraw main chassis from case assembly until its slide mount locks.

d. Release tilt locks and tilt the chassis upwards to expose its bottom (until the locks engage).

e. Remove the six wires from terminal board 1A1A4TB1.

f. Release the two captive screws and remove the assembly from the chassis.

g. Visually check Code Deck A (front) and Code Deck B (front) (switch wafers nearest the drive coupling) and notice the positioning of the rotor tabs and the switch stator contact clips.

h. If the rotor tabs are accurately centered on the stator clips for the 2 to 2.4999 MHz band, no adjustment is required.

i. If the rotor tabs are not properly centered, the positioning may be corrected by turning the bandswitch decoding deck as follows:

1. Remove the plastic dust cover plate by removing the two retaining nuts and washers securing it to the assembly top plate.

2. Remove the four screws securing the assembly top plate, and the screw securing the top plate to the input terminal plate, and tilt the top plate down to expose the rear of the switch.

3. Remove the spacer washers between the top plate and th rear deck of the switch.

4. Prior to moving decoding deck switch wafer, scribe a line across the saddle mounting and switch wafer to use as a guide for moving the decoding deck.

5. Loosen hardware on decoding decksaddle mount, using a 1/4 inch open end ignition wrench.

6. Rotate decoding deck switch wafer in its saddle mount, by the same amount and in the same direction that the rotor of Code Decks A and B would have to move for proper contact positioning. (The rotors will not actually move.)

7. Tighten hardware on decoding deck saddle mount.

j. Reassemble the spacer washers on rear of the band switch and replace assembly top plate. Be careful of component dress.

k. Replace Driver Transformer Assembly 1A1A4 in chassis. Tighten the two captive screws.

l. Reconnect the six wires to terminal board 1A1A4TB1.

m. Defeat the interlock switches on side of chassis by pulling their plungers straight out.

n. Turn on PRIMARY POWER switch.

o. Place the FREQUENCY MEGAHERTZ selector to th 2.5 to 3.0 MHz position for a few seconds, then set it to the 2.0 to 2.5 MHz position.

p. Allow a few seconds for the tuning sequence to be completed, then turn off the PRIMARY POWER switch.

q. Repeat steps e through g.

r. If necessary, repeat steps i through p until satisfactory alignment is obtained.

s. Replace the plastic dust cover plate removed in step i (1).

t. Repeat steps k and l.

u. Perform the alignment procedure described in paragraph 5.7.3.7 before returning the RF-110A to service.

5.7.3.6 Alignment of Final Transformer Assembly 1A1A2 Indicator Disc

a. Remove Final Transformer Assembly 1A1A2, as described in paragraph 5.5.2.5.

b. Using the coupling on the bottom of the assembly, manually rotate bandswitch 1A1A2S1 until the outer contact fingers of all three decks are accurately centered on the contact buttons for the 2 to 2.5 MHz band.

NOTE

Rotate switch in the direction marked on the top plate.

c. Note whether the arrow on the top plate points to the center of the band on the indicator disc.

d. Repeat steps b and c for 28 to 30 MHz band.

e. In each position, when the contacts are accurately centered, the arrow should point to the center of the band on the indicator disc, and the contacts should be properly maintained within the scribed band limits. If this is the case, proceed to step h. Otherwise, proceed to step f.

f. If adjustment is necessary, loosen the set screw on the indicator disc, reposition the disc as required, and retighten the set screw.

g. Repeat steps b through f as required to obtain correct adjustment.

h. Reinstall Final Transformer Assembly 1A1A2 as described in paragraph 5.5.2.6.

i. Perform coupling alignment as described in paragraph 5.7.3.7 before returning the RF-110A to service.

5.7.3.7 Coupling Alignment of the Final and Driver Transformer Assemblies (Tracking Adjustment)

a. The final and driver transformer assemblies must be properly aligned before performing the subsequent procedure. See paragraphs 5.7.3.4 through 5.7.3.6, if required.

b. Turn off the PRIMARY POWER switch.

c. Loosen the six captive screws that secure the main chassis to the case assembly.

d. Pull the main chassis out on its slides until it locks (detents) into service position.

e. Read, and remain aware of, the red CAUTION notices on the top cover over the output tubes.

f. Defeat the two interlock switches (1A2S1 and 1A2S2) on case assembly (1A2) by pulling their plungers straight out.

g. Turn on the PRIMARY POWER switch.

h. Place the unit in Standby Mode.

i. Place the FREQUENCY MEGAHERTZ selector at each of its frequency bands. Start with the lowest band. At each band, pause and note the position (reading) of the indicator disc on the top of Final Transformer Assembly 1A1A2.

j. At each band, the arrow should lie between the two lines scribed on the indicator disc for that band.

k. If the positioning is correct on all bands, no adjustment is required. Proceed to step w.

l. If the positioning is not correct, place the FREQUENCY MEGAHERTZ selector at 2.0 to 2.5 MHz position. When the bandswitch motor stops, place the PRIMARY POWER switch off.

m. Tilt the chassis upwards to expose the bottom components.

n. Remove the small plastic dust cover on Driver Transformer Assembly 1A1A4.

o. Loosen the switch shaft clutch nut on Driver Transformer Assembly 1A1A4 while holding the double-flattedshaft to prevent rotation.

p. Disconnect the wire and lug from terminal board 1A1A4TB1-6. Connect one end of a clip lead (approximately two feet long) to the wire and lug removed (from 1A1A4TB1-6).

NOTE

Grounding the clip lead will cause the bandswitch motor to energize.

q. Tilt chassis back to the horizontal position, being careful that neither the loose wire nor the clip lead becomes grounded.

r. Place the PRIMARY POWER switch to the on position. Ground clip lead as required to run bandswitch motor until Final Transformer Assembly 1A1A2 switch indicator disc is in the exact center of 2 to 2.49999 MHz band.

s. Place the PRIMARY POWER switch at the off position. Tilt the chassis upwards to expose the bottom components.

t. Tighten switch shaft clutch nut (while holding double-flatted shaft to prevent rotation) to 6.0 $\pm$.5 inch-pounds torque.

u. Reconnect the wire and lug (removed in step p) to 1A1A4TB1-6.

v. Tilt the chassis back to the horizontal position and place the PRIMARY POWER switch to on position. Repeat steps i through k and l through v as required.

NOTE

In steps o and t, preventing the double-flatted shaft from rotating is difficult. Several sequences of steps n through u may be necessary.

w. Place the PRIMARY POWER switch to the off position. Replace plastic dust cover removed in step n.

x. Deenergize all equipment.

y. Press the detent button on the main chassis slides and slide the unit back into the case assembly.

z. Secure the unit to the cabinet by tightening the six captive screws.

5.8 REASSEMBLY OF REPAIRED UNITS

After the repaired unit has been remounted in the case, wiring and cabling must be reconnected. Reconnect the cabling according to identification made prior to removal (paragraph 5.7.2) and by referencing applicable abling and wiring diagrams. Check the connections to make sure connectors are secure and unit is ready to operate.

5.9 PARTS LISTS

Section 6 contains a listing of all the major assemblies, subassemblies, and component parts of the RF-110A.

5.10 COMPONENT LOCATION INFORMATION

Figures 7-1 through 7-17 of section 7 show the location of all the major assemblies, subassemblies, and component parts of the RF-110A.

5.11 SCHEMATIC DIAGRAMS

Schematic diagrams of all RF-110A assemblies and subassemblies are included in figures 7-18 through 7-23 of section 7.

SECTION 6

PARTS LISTS

6.1 GENERAL INFORMATION

This section lists the major assemblies, subassemblies, and component parts of the RF-110A. Table 6-1 cross references the major assemblies and subassemblies to the component location and schematic drawings of section 7. Table 6-2 is the parts list for the Radio Frequency Amplifier.

Table 6-1. Cross References of Component Location Drawings and Schematic Drawings

Ref. Desig.	Name	Component Location Figure	Schematic Drawings Figure
1	Radio Frequency Amplifier	7-1	7-18
1A1	Main Chassis Assembly	7-1 thru 7-6	7-18
1A1A1	Driver Tube Assembly	7-7	7-18
1A1A2	Final Transformer Assembly	7-8, 7-9	7-19
1A1A3	VSWR Bridge Assembly	7-10	7-18
1A1A4	Driver Transformer Assembly	7-11	7-20
1A1A5	Dc Power Control PWB Assembly	7-12	7-21
1A1A6	APC-PPC PWB Assembly	7-13	7-22
1A1A7	Meter Resistor PWB Assembly	7-14	7-18
1A1A8	Not Used	-----	-----
1A1A9	Zener Diode Protector Assembly	7-15	7-18
1A2	Case Assembly	7-16	7-23
1A2A1	Filter Box Assembly	7-17	7-23

Table 6-2. Radio Frequency Amplifier Parts List

Ref. Desig.	Part No.	Description
1	1932-1000	Radio Frequency Amplifier, Model RF-110A
1A1	1932-3100	Main Chassis Assembly
B1	B22-0001-000	Fan, 115 Vac, 400 Hz, 1 Phase
B2	B11-0004-000	Motor, Synchronous, 115 Vac, 60 Hz, 1 Phase, 6 rpm
C1	CP53B1EF205K1	Capacitor, Fixed, 2 uF, @600 V
C2, C3	C11-0003-001	Capacitor, Fixed, .005 uF, @ 3 kV
C4	10043-0033	Capacitor, Fixed, Ceramic, .01 uF, @ 6 kV, +50%, -20%
C5 - C13	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C14		Not Used
C15 - C17	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C18		Not Used
C19 - C21	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C22		Not Used
C23, C24	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C25		Not Used
C26 - C28	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C29	CE51C970K	Capacitor, Fixed, Electrolytic, 47 uF, 200 V, +50%, -10%
C30	CE51C401F	Capacitor, Fixed, Electrolytic, 400 uF, 25 V, +75%, -10%
C31	CE51C251F	Capacitor, Fixed, Electrolytic, 250 uF, 25 V, +75%, -10%
C32 - C34	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C35	C15-0002-001	Capacitor, Fixed, Ceramic, 3 pF NPO, @ 5000 V, 5%
C36	CM06FD751J03	Capacitor, Fixed, 750 pF, @ 500 V
C37 - C48	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C49		Not Used
C50, C51	C11-0003-001	Capacitor, Fixed, .005 uF, @ 3 kV
CR1, CR2	JAN1N3611	Diode
CR3 - CR6		Not Used
CR7 - CR11	JAN1N4461	Diode, Zener, 6.8 Vdc
CR12	JAN1N3611	Diode
CR13	JAN1N4148	Diode
CR14	JAN1N3611	Diode
DS1		Not Used
DS2, DS3	MS25252-C7A	Lamp, Neon, Midget, Flanged Base, 110 V to 125 V
DS4		Not Used
DS5	MS25237-387	Lamp, Incandescent
F1	F10-0001-026	Fuse, Cartridge, 7 A Time Delay, 500 Vac (used with 440 Vac power)
	F60C500V15AS	Fuse, Cartridge, 15 A, 500 Vac (used with 208 Vac power)

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
F2	F10-0001-026	Fuse, Cartridge, 7 A Time Delay, 500 Vac (used with 440 Vac power)
	F60C500V15AS	Fuse, Cartridge, 15 A, 500 Vac (used with 208 Vac power
F3	F10-0001-026	Fuse, Cartridge, 7 A Time Delay, 500 Vac (used with 440 Vac Power)
	F60C500V15AS	Fuse, Cartridge, 15 A, 500 Vac (used with 208 Vac power)
F4	F02A250V1AS	Fuse, Cartridge, 1.0 A @ 220 V
F5, F6	F02A250V3AS	Fuse, Cartridge, 3.0 A, @ 28 V
F7	F02A250V1.5AS	Fuse, Cartridge, Slo-Blo, 1.5 A @ 250 V
J1	M39012/19-0004	Connector, Receptacle
J2, J3		Not Used
J4, J5	J10-0007-008	Connector, Receptacle, 36 Pin
J6 - J11	J60-0002-213	Connector, Receptacle, 1 Pin
J12	MS3102A-28-17P	Connector, Receptacle, Electrical
J13	MS18177-1	Insert, Insulator, Rect. Connector
J14	MS18176-1	Insert, Insulator, Rect. Connector
		NOTE Removable crimp-type replacement pins for J12, J13, and J14 are as follows: 20 Gauge Pin (socket): MS17804-16-20 16 Gauge Pin (socket): MS17804-16-16 20 Gauge Pin: MS17803-16-20 16 Gauge Pin: MS17803-16-16
K1	K30-0001-003	Relay, Operate, 4-Pole, 25 A, dc coil
K2	K32-0002-001	Relay, Solenoid
K3	M5757/23-001	Relay, Solenoid
K4	M19648/1-127	Relay, Time Delay, Thermal, SPST, 2 A
L1	8948-3307	Choke, Fixed, RF
L2, L3	MS16221-15	Choke, RF, 22 uH
L4	MS75054-5	Choke, RF, 1000 uH
L5	MS16221-15	Choke, RF, 22 uH
L6	391-3311	Coil, Fixed, RF
M1	0082-3677	Meter, Panel
M2	391-3676	Meter, Power
MP1	MS91528-1P2B	Knob (for S5)
MP2	MS91528-3F2B	Knob (for S7)
MP3	MS91528-1P2B	Knob (for S8)
MP4	MS91528-1D2B	Knob (for R13)
MP5	1932-3000	Air Filter
MP6	8948-3470	Final Tube Assembly
MP6-1	391-3474	Pan, Tube

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
MP6-2, -3	391-3490	Chimney Tube
MP6-4, -5	10044-1005	Clamp, Tube
MP6-6, -7	10044-1004	Cable Assembly, Tube
MP6-8	10043-3336	Strap, Interconnecting
MP6-9	391-3483	Suppressor Board Assembly
MP6-10	0082-3332	Shroud
MP7	391-3605	Contact Assembly Chassis
MP8	J30-0002-008	Finger, Contact
MP9	391-3250	Transmission Assembly
P1 - P4		Not Used
P5	391-3603	Jumper, Plenum Term. Board
P6	J20-0002-101	Connector, Plug
P7	J20-0002-201	Connector, Plug
Q1	JAN2N297A	Transistor, PNP
R1	RCR42G154JM	Resistor, Fixed, Composition, 150K ohms, 2 W, 10%
R2	RCR42G473JM	Resistor, Fixed, Composition, 47K ohms, 2 W, 10%
R3, R4	RL20S512G	Resistor, Fixed, Film, 5.1K ohms, 1/2 W, 2%
R5	6743-3835-001	Resistor, Fixed, Composition, 2.2K ohms, 2 W, 10%
R6	RC42GF182K	Resistor, Fixed, Composition, 1.8K ohms, 2 W, 10%
R7, R8	RC20G470K	Resistor, Fixed, Composition, 47K ohms, 1/2 W, 5%
R9 - R12	RA20LASB103A	Resistor, Variable, Drive Bias Adj., 10K ohms
R13	RA20NASD103A	Resistor, Variable, Power, 10K ohms
R14	RA20LASB103A	Resistor, Variable, 10K
R15		Not Used
R16 - R19	R11-0001-001	Resistor, Fixed, Composition, 2.2 ohms, 1/2 W, 5%
R20	RC20G472JM	Resistor, Fixed, Composition, 4.7K ohms, 1/2 W, 5%
R21	RC42GF330K	Resistor, Fixed, Composition, 33 ohms, 2 W, 5%
R22 - R24		Not Used
R25 - R28	RW79U10R0F	Resistor, Fixed, Wirewound, 10 ohms, 3 W, 1%
R29		Not Used
R30	RC42GF103K	Resistor, Fixed, Composition, 10K ohms, 2 W, 10%
S1	391-3590	Switch, Air Vane
S2		Not Used
S3	MS35059-31	Switch, Toggle, Normal/Local Key
S4	MS25100-22	Switch, Toggle
S5	391-3673	Switch, Rotary, Multifunction Selector
S6	MS35659-31	Switch, Toggle, Normal/Overload Reset
S7	0082-3660	Switch, Rotary, MEGAHERTZ
S8	391-3672	Switch, Rotary

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
S9	MS16106-4	Switch, Interlock, HV
T1	391-3562	Transformer, 47-63 Hz, Low Power
TB1, TB2	37TB-12	Terminal Board
TB3	391-3596	Terminal Board
V1, V2	JAN8660	Tube, Electron
XC1 - XC28		Not Used
XC29 - XC31	M12883/01-04	Socket, Octal
XDS1		Not Used
XDS2, XDS3	LH74/1-LC13CN	Lampholder, Clear
XDS4		Not Used
XDS5	LH73/1-LC12RT2	Lampholder
XF1 - XF3	FHL-12U	Fuseholder
XF4, XF5	J50-0004-001	Fuseholder, Indicating
XF6	J50-0004-002	Fuseholder, Amber, Indicating
XF7	1932-0114	Fuseholder, Clear, Indicating
Z1	6725-3106	Driver Parasitic Suppressor Assembly
Z1C1, Z1C2	CK60AW102M	Capacitor, Ceramic, .001 uF
Z1R1	RCR42G150JM	Resistor, Fixed, Composition, 15 ohms, 2 W, 10%
1A1A1	1932-3850	Driver Tube Assembly
C1 - C5	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C6	C11-0002-203	Capacitor, Fixed, Ceramic, .02 uF, @ 500 V
C7	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C8 - C10	C11-0002-203	Capacitor, Fixed, Ceramic, .02 uF, @ 500 V
C11 - C14	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C15		Not Used
C16	CM05FD111J03	Capacitor, Fixed, Mica, 110 pF, @ 500 V, 5%
C17, C18	CM05D391J03	Capacitor, Fixed, Mica, 390 pF, @ 500 V
C19	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
C20 - C27	C11-0002-203	Capacitor, Fixed, Ceramic, .02 uF, @ 500 V
CR1, CR2	JAN1N4148	Diode
L1	391-3860	Choke Assembly
L2	MS18130-3	Choke, RF, 3.3 uH
L3	MS91189-17	Choke, RF, 2.2 uH
L4, L5	MS75103-1	Choke, RF, 22 uH
L6	M14049-5	Choke, RF, 1000 uH
MP1, MP2	391-3869	Tube Chimney Assembly
MP3	391-3861	Plate Driver Tube
R1, R2	RWR79U10R0F	Resistor, Fixed, 10 ohms, 3 W, 2%
R3, R4	RL20S103G	Resistor, Fixed, 10 ohms, 1/2 W, 2%
R5		Not Used
R6	RCR20G560JM	Resistor, Fixed, Composition, 56 ohms, 1/2 W, 10%
R7	RCR20G103JM	Resistor, Fixed, Composition, 10K ohms, 1/2 W, 10%
R8	RWR74S1R00FM	Resistor, Fixed, Composition 1 ohm, 5 W, 1%
TB1	E31-0004-013	Terminal Board

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
V1, V2	V12-0001-001	Tube, Electron
XV1, XV2	J30-0001-000	Socket, Electron Tube
Z1, Z2	6725-3797	Ferrite Core, Trap
1A1A2	10051-3700	Final Transformer Assembly
C1	C15-0003-001	Capacitor, Fixed, Ceramic,. HV, 25 pF, @ 7500 V, 5%
C2		Not Used
C3	C15-0003-002	Capacitor, Fixed, Ceramic, HV, 50 pF, @ 7500 V, 5%
C4, C5	C15-0003-003	Capacitor, Fixed, Ceramic, HV, 100 pF, @ 5000 V, 5%
C6		Not Used
C7	C15-0003-003	Capacitor, Fixed, Ceramic, HV, 50 pF, @ 7500 V, 5%
C8		Not Used
C9	C15-0003-003	Capacitor, Fixed, Ceramic, HV, 100 pF, @ 5000 V, 5%
C10	C15-0003-001	Capacitor, Fixed, Ceramic, HV, 25 pF, @ 7500 V, 5%
C11	C15-0003-002	Capacitor, Fixed, Ceramic, HV, 50 pF, @ 7500 V, 5%
C12	C15-0003-001	Capacitor, Fixed, Ceramic, HV, 25 pF, @ 7500 V, 5%
C13	C15-0002-006	Capacitor, Fixed, Ceramic, HV, 10 pF, @ 5000 V, 10%
C14		Not Used
C15 - C19	C15-0003-003	Capacitor, Fixed, Ceramic, HV, 100 pF, @ 5000 V, 5%
C20	C15-0003-002	Capacitor, Fixed, Ceramic, HV, 50 pF, @ 7500 V, 5%
C21 - C24		Not Used
C25	C11-0004-020	Capacitor, Feed-thru, 430 pF, @ 100 V, 5%
C26, C27	C11-0004-010	Capacitor, Feed-thru 470 pF, @ 100 V, 5%
C28, C29		Not Used
C30 - C32	C11-0004-034	Capacitor, Feed-thru, 620 pF, @ 100 V, 5%
C33, C34		Not Used
C35	C11-0004-027	Capacitor, Feed-thru, 270 pF, @ 100 V, 5%
C36, C37	C11-0004-024	Capacitor, Feed-thru, 240 pF, @ 100 V, 5%
C38, C39		Not Used
C40 - C42	C11-0004-027	Capacitor, Feed-thru, 270 pF, @ 100 V, 5%
C43, C44		Not Used
C45, C46	C11-0004-029	Capacitor, Feed-thru, 1800 pF, @ 100 V, 5%
C47	C11-0004-017	Capacitor, Feed-thru, 200 pF, @ 100 V, 5%
C48, C49		Not Used
C50, C51	C11-0004-017	Capacitor, Feed-thru, 200 pF, @ 100 V, 5%
C52	C11-0004-029	Capacitor, Feed-thru, 180 pF, @ 100 V, 5%
C53, C54		Not Used

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
C55, C56	C11-0004-015	Capacitor, Feed-thru, 110 pF, @ 100 V, 5%
C57	C11-0004-031	Capacitor, Feed-thru, 91 pF, @ 100 V, 5%
C58, C59		Not Used
C60, C61	C11-0004-015	Capacitor, Feed-thru, 110 pF, @ 100 V, 5%
C62	C11-0004-014	Capacitor, Feed-thru, 100 pF, @ 100 V, 5%
L1	6725-3713	Coil, Coupling, .2 uH
L2	6725-3714	Coil, Coupling, .1 uH
P1	M39012/16-0007	Connector, Coaxial, Mil type
S1	10051-3732	Switch Assembly, Rotary, 24 position
Z1	0082-3796	Trap Assembly
Z1C1	C50-0001-029	Capacitor, Porcelain, High Current, 150 pF, @ 500 V, 1.16 kVA, 5%
Z1R1	RCR42G820JM	Resistor, Fixed, Composition, 820 ohms
Z2 - Z7	6725-3797	Ferrite Core
Z8	10051-3737	Trap Assembly
Z8R1, R2	RCR42G222JM	Resistor, Fixed, Composition, 2.2K ohms, 2 W
1A1A2A1	10051-3711-1	Transformer Assembly, 2-3 MHz
1A1A2A2	10051-3711-2	Transformer Assembly, 2-3 MHz
1A1A2A3	10051-3711-3	Transformer Assembly, 3-4 MHz
1A1A2A4	10051-3711-4	Transformer Assembly, 3-4 MHz
1A1A2A5	10051-3711-5	Transformer Assembly, 4-6 MHz
1A1A2A6	10051-3711-6	Transformer Assembly, 6-8 MHz
1A1A2A7	10051-3711-7	Transformer Assembly, 8-12 MHz
1A1A2A8	10051-3711-8	Transformer Assembly, 12-16 MHz
1A1A2A9	10051-3711-9	Transformer Assembly, 16-20 MHz
C1	10075-0515	Capacitor, Fixed, Ceramic, 1.5 pF
1A1A2A10	10051-3711-10	Transformer Assembly, 20-22 MHz
1A1A2A11	10051-3711-11	Transformer Assembly, 22-24 MHz
1A1A2A12	10051-3711-12	Transformer Assembly, 26-30 MHz
1A1A2LPF	6725-3745	Low Pass Filter Assembly
1A1A2A20	6725-3748	Coil Assembly, Low Pass Filter
C23, C24	C11-0004-033	Capacitor, Feed-thru, 130 pF, @ 100 V, 5%
L3	6725-3746	Choke, Static Drain, 36 uH
1A1A3	0082-3420	VSWR Bridge Assembly
C1	CM05FD361J03	Capacitor, Fixed, Mica, 360 pF, 500 V, 5%
C2	MS9003/01-2043	Capacitor, Fixed, Tantalum, 2.2 uF, 20 Vdc, 10%
C3, C4	CK60AW102M	Capacitor, Fixed, Ceramic, .001 uF, Mil type
C5	MS9003/01-2043	Capacitor, Fixed, Tantalum, 2.2 uF, 20 Vdc, 10%
C6	10075-0225	Capacitor, Trimmer, .8-16 pF, Mil type
CR1 - CR6	JAN1N4148	Diode
J1	MS35180-909A	Connector, Receptacle
J2	MS27035-625B	Connector, Receptacle
L1	MS75055-3	Choke, Fixed, 2700 uH, 10%
L2	MS75008-23	Choke, Fixed, .33 uH, 20%
R1, R2	RL32S560G	Resistor, Fixed, 56 ohms, 1 W, 2%

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
R3	RL07S103J	Resistor, Fixed, Film, 10K, 1/4 W, 10%
R4	RL07S473J	Resistor, Fixed, Film, 47K ohms, 1/4 W, 5%
R5	RCR07G272JM	Resistor, Fixed, Composition, 2.72K ohms, 1/4 W, 5%
R6	RCR07G682JM	Resistor, Fixed, Composition, 6.8K ohms, 1/4 W, 5%
R7	RCR07G393JM	Resistor, Fixed, Composition, 39K, 1/4W, 5%
R8	RCR07G624JM	Resistor, Fixed, Composition, 120K ohms, 1/4 W, 5%
R9	RCR20G105JM	Resistor, Fixed, Composition, 1 Meg ohm, 1/2 W, 10%
T1	391-3426	Transformer Assembly, Toroid
1A1A4	0082-3800	Driver Transformer Assembly
C1, C2	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, @ 1000 V
R1	RC42GF102K	Resistor, Fixed, Composition, 1K ohms, 2 W, 5%
S1	0082-3833	Switch, Rotary
TB1	E31-0004-006	Terminal Board, 6-position
TP1	MS16108-2A	T.P. Jack, Red, Mil type
1A1A4A1	391-3807	Transformer Assembly 2-2.5 MHz
1A1A4A2	391-3808	Transformer Assembly, 2.5-3 MHz
1A1A4A3	391-3809	Transformer Assembly, 3-4 MHz
1A1A4A4	391-3810	Transformer Assembly, 4-6 MHz
1A1A4A5	391-3811	Transformer Assembly, 6-8 MHz
1A1A4A6	391-3812	Transformer Assembly, 8-10 MHz
C1	CC25CH390G	Capacitor, Fixed, 39 pF
R1	6743-3835-001	Resistor, Non-inductive, 2.20K ohms, 9 W, 5%
1A1A4A7	391-3813	Transformer Assembly, 10-12 MHz
C1	CC25CH330G	Capacitor, Fixed, 33 pF
R1	6743-3835-001	Resistor, Non-inductive, 2.20K ohms, 9 W, 5%
1A1A4A8	391-3814	Transformer Assembly, 12-14 MHz
C1	CC25H300G	Capacitor, Fixed, 30 pF
R1	6743-3835-001	Resistor, Non-inductive, 2.20K ohms, 9 W, 5%
1A1A4A9	391-3815	Transformer Assembly, 14-16 MHz
C1	CC25CH270G	Capacitor, Fixed, 27 pF
R1	6743-3835-001	Resistor, Non-inductive, 2.20K ohms, 9 W, 5%
1A1A4A10	391-3816	Transformer Assembly, 16-18 MHz
C1	CC25CH270G	Capacitor, Fixed, 27 pF
R1	6743-3835-002	Resistor, Non-inductive, 2.70K ohms, 9 W, 5%
1A1A4A11	391-3817	Transformer Assembly, 18-20 MHz
C1	CC25CH270G	Capacitor, Fixed, 27 pF
R1	6743-3835-002	Resistor, Non-inductive, 2.70K ohms, 9W, 5%
1A1A4A12	391-3818	Transformer Assembly, 20-22 MHz
C1	CC25CH240G	Capacitor, Fixed, 24 pF
R1	6743-3835-002	Resistor, Non-inductive, 270K ohms, 9 W, 5%
1A1A4A13	391-3819	Transformer Assembly, 22-24 MHz
C1	CC20CH240G	Capacitor, Fixed, 24 pF
R1	6743-3835-003	Resistor, Non-inductive, 4.7K ohms, 9 W, 5%

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
1A1A4A14	391-3820	Transformer Assembly, 24-26 MHz
C1	CC25CH300G	Capacitor, Fixed, 30 pF
R1	6743-3835-004	Resistor, Non-inductive, 8.2K ohms, 9 W, 5%
1A1A4A15	391-3821	Transformer Assembly, 26-28 MHz
C1	CC25CH330G	Capacitor, Fixed, 33 pF
1A1A4A16	391-3822	Transformer Assembly, 28-30 MHz
C1	10075-0507	Capacitor, Fixed, 39 pF
1A1A5	0082-3360	Dc Power Control Printed Circuit Board Assembly, 6.625 in. W, 4.065 in. H
C1	M39003/01-2055	Capacitor, Fixed, Electrolytic, 47 uF, 20 Vdc, 10%
C2	M39003/01-2052	Capacitor, Fixed, Electrolytic, 33 uF, 20 Vdc, 10%
C3	CK62AW822M	Capacitor, Fixed, Ceramic, 0.0082 uF, 500 Vdc, 20%
C4, C5	CK05BX104K	Capacitor, Fixed, Ceramic, 0.1 uF, 50 Vdc, 10%
C6	M39003/01-2116	Capacitor, Fixed, Electrolytic, 1 uF, 50 Vdc, 10%
C7	CK05BX104K	Capacitor, Fixed, Ceramic, 0.1 uF, 50 Vdc, 10%
CR1 - CR4	JAN1N3611	Semiconductor Device, Diode
CR5		Not Used
CR6, CR7	JAN1N3611	Semiconductor Device, Diode
CR8		Not Used
CR9 - CR12	JAN1N4148	Semiconductor Device, Diode
CR13		Not Used
CR14 - CR16	JAN1N3611	Semiconductor Device, Diode
CR17, CR18		Not Used
CR19	JAN1N759A	Semiconductor Device, Diode, 12 Vdc
CR20		Not Used
CR21 - CR29	JAN1N3611	Semiconductor Device, Diode
CR30, CR31	JAN1N753A	Semiconductor Device, Diode, 6.2 Vdc
CR32	JAN1N3611	Semiconductor Device, Diode
CR33	JAN1N758A	Semiconductor Device, Diode, 10 Vdc
CR34	JAN1N4148	Semiconductor Device, Diode
CR35	JAN1N3611	Semiconductor Device, Diode
CR36	JAN 1N4148	Semiconductor Device, Diode
CR37 - CR39		Not Used
CR40	JAN1N3611	Semiconductor Device, Diode
Q1		Not Used
Q2	JAN2N2905A	Transistor, PNP
Q3, Q4	JAN2N2219A	Transistor, NPN
Q5	JAN2N2905A	Transistor, PNP
Q6	JAN2N398A	Transistor, PNP
Q7	JAN2N3019	Transistor, NPN
Q8	JAN2N2905A	Transistor, PNP
Q9 - Q11	JAN2N2219A	Transistor, NPN
Q12	JAN2N2905A	Transistor, PNP

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
R1, R2		Not Used
R3	RCR07G472K	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 10%
R4	RCR07G152JM	Resistor, Fixed, Composition, 1.5K ohms, 1/4 W, 10%
R5		Not Used
R6	RL07S471G	Resistor, Fixed, Film, 470 ohms, 1/4 W, 2%
R7	RL07S271G	Resistor, Fixed, Film, 270 ohms, 1/4 W, 2%
R8	RCR07G472JM	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 10%
R9	RCR07G102JM	Resistor, Fixed, Composition, 1K ohm, 1/4 W, 10%
R10	RCR07G472JM	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 10%
R11	RCR07G152JM	Resistor, Fixed, Composition, 1.5K ohms, 1/4 W, 10%
R12	RCR07G122JM	Resistor, Fixed, Composition, 1.2K ohms, 1/4 W, 10%
R13	RCR07G151JM	Resistor, Fixed, Composition, 150 ohms, 1/4 W, 10%
R14	RCR07G471JM	Resistor, Fixed, Composition, 470 ohms, 1/4 W, 10%
R15	RCR07G221JM	Resistor, Fixed, Composition, 220 ohms, 1/4 W, 10%
R16	RCR07G821JM	Resistor, Fixed, Composition, 820 ohms, 1/4 W, 10%
R17	RCR07G102JM	Resistor, Fixed, Composition, 1K ohms, 1/4 W, 10%
R18		Not Used
R19	RCR07G102JM	Resistor, Fixed, Composition, 1K ohm, 1/2 W, 10%
R20	RCR07G103JM	Resistor, Fixed, Composition, 10K ohms, 1/4 W, 10%
R21	RCR07G102JM	Resistor, Fixed, Composition, 1K ohms, 1/4 W, 10%
R22	RCR07G103JM	Resistor, Fixed, Composition, 10K ohms, 1/4 W, 10%
R23, R24		Not Used
R25	RCR07G681JM	Resistor, Fixed, Composition, 680 ohms, 1/4 W, 10%
R26	RCR42G221JM	Resistor, Fixed, Composition, 220 ohms, 2 W, 10%
R27	RCR07G121JM	Resistor, Fixed, Composition, 120 ohms, 1/4 W, 10%
R28	RCR07G221JM	Resistor, Fixed, Composition, 220 ohms, 1/4 W, 10%
R29 - R33	RCR07G222JM	Resistor, Fixed, Composition, 2.2K ohms, 1/4 W, 10%

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
R34	RCR20G101JM	Resistor, Fixed, Composition, 100 ohms, 1/2 W, 5%
R35	RCR20G391JM	Resistor, Fixed, Composition, 390 ohms, 1/2 W, 10%
R36, R37		Not Used
R38, R39	RCR07G472K	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 10%
R40	RCR20G332JM	Resistor, Fixed, Composition, 3.3K ohms, 1/2 W, 10%
R41	RCR07G102JM	Resistor, Fixed, Composition, 10K ohms, 1/4 W, 10%
R42	RCR07G102JM	Resistor, Fixed, Composition, 1K ohms, 1/4 W, 10%
TP1	M39024/11-04	Connector, Electrical, Test-Point Type, Brown
TP2	M39024/11-02	Connector, Electrical, Test-Point Type, Red
TP3	M39024/11-06	Connector, Electrical, Test-Point Type, Orange
TP4	M39024/11-08	Connector, Electrical, Test-Point Type, Yellow
TP5	M39024/11-05	Connector, Electrical, Test-Point Type, Green
1A1A6	825-3340	APC-PPC PWB
C1	CS13BG156K	Capacitor, Fixed, Tantalum, 15 uF, 50 V
C2	CK63AY103M	Capacitor, Fixed, Ceramic, 0.01 uF
C3, C4		Not Used
C5	CK60AW102M	Capacitor, Fixed, Ceramic, 0.006 uF, 1000 V
C6		Not Used
C7	CK60AW102M	Capacitor, Fixed, Ceramic, 0.001 uF, 1000 V
C8	CM04FD101J03	Capacitor, Fixed, Tantalum, 100 pF, 10 V
CR1		Not Used
CR2	JAN1N3611	Diode
CR3, CR4	JAN1N3033B	Diode, Zener, 36 Vdc
CR5	JAN1N4148	Diode
CR6 - CR8		Not Used
CR9	JAN1N4148	Diode
CR10		Not Used
CR11, CR12	JAN1N4148	Diode
CR13		Not Used
CR14 - CR17	JAN1N3611	Diode
CR18 - CR20	JAN1N4148	Diode
CR21		Not Used
CR25	JAN1N4148	Diode
CR26		Not Used
CR27	JAN1N975B	Diode, Zener, 39 Vdc
CR28 - CR30	JAN1N4148	Diode
Q1, Q2	JAN2N1613	Transistor, NPN
Q3	JAN2N3637	Transistor, PNP
Q4 - Q6	JAN2N4123	Transistor, NPN
Q7	JAN2N4123	Transistor, NPN
Q8	JAN2N1613	Transistor, NPN

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
Q9	JAN2N1132	Transistor, PNP
Q10 - Q12	JAN2N1613	Transistor, NPN
Q13	JAN2N1132	Transistor, PNP
Q14 - Q16	JAN2N1613	Transistor, NPN
Q17	JAN2N2906A	Transistor, PNP
Q18		Not Used
Q19, Q20	JAN2N3637	Transistor, PNP
Q21	JAN2N1613	Transistor, NPN
R1	RCR07G182JM	Resistor, Fixed, Composition, 1.8K ohms, 1/4 W, 5%
R2	RCR07G473JM	Resistor, Fixed, Composition, 47K ohms, 1/4 W, 5%
R3	RCR07G682JM	Resistor, Fixed, Composition, 6.8K ohms, 1/4 W, 5%
R4	RCR07G223JM	Resistor, Fixed, Composition, 22K ohms, 1/4 W, 5%
R5, R6		Not Used
R7	RCR07G472JM	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 5%
R8	RCR07G273JM	Resistor, Fixed, Composition, 27K ohms, 1/4 W, 5%
R9	RCR07G333JM	Resistor, Fixed, Composition, 33K ohms, 1/4 W, 5%
R10	RCR07G472JM	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 5%
R11	RCR07G182JM	Resistor, Fixed, Composition, 1.8K ohms, 1/4 W, 5%
R12	RCR07G822JM	Resistor, Fixed, Composition, 8.2K ohms, 1/4 W, 5%
R13	RCR07G473JM	Resistor, Fixed, Composition, 47K ohms, 1/4 W, 5%
R14	RCR07G222JM	Resistor, Fixed, Composition, 2.2K ohms, 1/4 W, 5%
R15	RCR07G562JM	Resistor, Fixed, Composition, 5.6K ohms, 1/4 W, 5%
R16, R17		Not Used
R18	RCR07G222JM	Resistor, Fixed, Composition, 2.2K ohms, 1/4 W, 5%
R19, R20		Not Used
R21	RCR07G183JM	Resistor, Fixed, Composition, 18K ohms, 1/4 W, 5%
R22	RCR07G124JM	Resistor, Fixed, Composition, 12K ohms, 1/4 W, 5%
R23	RCR07G122JM	Resistor, Fixed, Composition, 1.2K ohms, 1/4 W, 5%
R24	RCR07G472JM	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 5%

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
R25		Not Used
R26	RCR07G272JM	Resistor, Fixed, Composition, 2.7K ohms, 1/4 W, 5%
R27	RCR07G223JM	Resistor, Fixed, Composition, 22K ohms, 1/4 W, 5%
R28	RCR07G123JM	Resistor, Fixed, Composition, 12K ohms, 1/4 W, 5%
R29	RCR07G102JM	Resistor, Fixed, Composition, 1K ohms, 1/4 W, 5%
R30		Not Used
R31	RCR07G682JM	Resistor, Fixed, Composition, 6.8K ohms, 1/4 W, 5%
R32	RCR07G123JM	Resistor, Fixed, Composition, 12K ohms, 1/4 W, 5%
R33	RCR07G652JM	Resistor, Fixed, Composition, 5.6K ohms, 1/4 W, 5%
R34	RCR07G182JM	Resistor, Fixed, Composition, 1.8K ohms, 1/4 W, 5%
R35	RCR07G272JM	Resistor, Fixed, Composition, 2.7K ohms, 1/4 W, 5%
R36	RCR20G683JM	Resistor, Fixed, Composition, 68K ohms, 1/4 W, 5%
R37	RCR07G473JM	Resistor, Fixed, Composition, 47K ohms, 1/4 W, 5%
R38	RCR07G472JM	Resistor, Fixed, Composition, 4.7K ohms, 1/4 W, 5%
R39		Not Used
R40	RCR07G223JM	Resistor, Fixed, Composition, 22K ohms, 1/4 W, 5%
R41	RCR07G102JM	Resistor, Fixed, Composition, 1K ohms, 1/4 W, 5%
R42	RCR42G682JM	Resistor, Fixed, Composition, 6.8K ohms, 1/4 W, 5%
R43 - R45	RCR07G222JM	Resistor, Fixed, Composition, 2.2K ohms, 1/4 W, 5%
R46	RCR07G102JM	Resistor, Fixed, Composition, 1K ohms, 1/4 W, 5%
R47	RCR07G103JM	Resistor, Fixed, Composition, 10K ohms, 1/4 W, 5%
R48	RCR07G333JM	Resistor, Fixed, Composition, 33K ohms, 1/4 W, 5%
R49	RCR07G103JM	Resistor, Fixed, Composition, 10K ohms, 1/4 W, 5%
R50 - R53		Not Used
R54	RCR07G222JM	Resistor, Fixed, Composition, 2.2K ohms, 1/4 W, 5%
R55	RCR07G102JM	Resistor, Fixed, Composition, 1K ohms, 1/4 W, 5%

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
TP1	J60-0001-008	Test Point, Brown
TP2	J60-0001-002	Test Point, Red
TP3	J60-0001-006	Test Point, Orange
TP4	J60-0001-007	Test Point, Yellow
1A1A7	0020-3400	Meter Resistor Assembly
R1 - R6		Not Used
R7, R8	RL42S125G	Resistor, Fixed, Film, 1.2 M, 2%
R9	RCR20G103JM	Resistor, Fixed, Composition, 10K ohms, 1/2 W, 10%
R10 - R12		Not Used
R13, R14	RL42S125G	Resistor, Fixed, Film, 1.2 M, 2 W, 2%
R15	RCR20G103JM	Resistor, Fixed, Composition, 10K ohms, 1/2 W, 10%
R16	RL32S474G	Resistor, Fixed, Film, 470K ohms, 1 W, 2%
R17 - R20	RL32S514G	Resistor, Fixed, Film, 510K ohms, 1 W, 2%
R21	RCR20G103JM	Resistor, Fixed, Composition, 10K ohms, 1/2 W, 10%
1A1A8		Not Used
1A1A9	10043-3220	Zener Diode Protector Assembly
CR1	JAN1N3611	Diode, Silicon, 1 A, 200 V
CR2 - CR4	JAN1N5552	Diode, Silicon, 5 A, 600 V
CR5 - CR7	10043-0049	Diode, Zener, 75 V, 10 W, 10%
CR8	10043-0048	Diode, Zener, 60 V, 10 W, 10%
CR9	10043-0047	Diode, Zener, 40 V, 10 W, 10%
Q1	D29-0001-001	Transistor, SCR, 7 A, 600 V
R1 - R3	RCR32G100JM	Resistor, Fixed, Composition, 10 ohms, 1 W, 5%
XQ1	10043-0050	Base Insulated Style TO5
1A1XV1/ 1A1XV	None*	Tube Socket Assembly
H1 - H12	J30-0002-003	Nut, Hex, Large Pattern, No. 4-40 UNC-2B
H13 - H24	J30-0002-006	Screw, Machine Head, Cross-Recessed, No. 4-40 UNC-2A
H25 - H36	J30-0002-007	Lockwasher, Split, Light Series, No. 4
H37 - H48	J30-0002-009	Washer, Flat, Fiber, .003 in. thick x 0.31 in. OD x 0.12 in. OD x 0.12 in. ID
MP1 - MP24	J30-0002-001	Spacer, Ceramic
MP25 - MP36	J30-0002-002	Bushing, Ceramic
MP37 - MP44	J30-0002-004	Spacer, Silver-plated
MP45, MP46	J30-0002-005	Base
MP47 - MP78	J30-0002-008	Contact, Finger
MP79 - MLP90	391-3486	Spacer

* Tube Socket Assemblies 1A1XV1 and 1A1XV2 are not purchasable as assembled units. The components that make up the assemblies are, however, and are listed here for maintenance reference.

Table 6-2. Radio Frequency Amplifier Parts List (Cont.)

Ref. Desig.	Part No.	Description
1A2	0082-2000	Case Assembly
C1, C2	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, 1000 Vdc
FL1/J5	391-2300	Filter, Power Input
J1	MS3102P-28-17S	Connector, Receptacle, Electrical
J2		Not Used
J3, J4	UG-556B/U	Connector, Coax
J5 - J8		Not Used
J9	MS39012/19-0004	Connector, Coax
K1	K80-0001-000	Relay, Coaxial, 29 Vdc, 2 W, SPDT
P1	M39012/16-0005	Connector, Plug, Coax
P2, P3		Not Used
P4 - P6	M39012/16-0007	Connector, Plug, Coax
P7	M39012/16-0001	Connector, Plug, Coax
P8 - P11		Not Used
P12	MS3106A-28-17S	Connector
P13	MS18176-1	Connector, Electrical, 20 crimp removable pin contacts
P14	MS18177-1	Connector, Electrical, 20 crimp removable socket contacts
1A2A1	391-2100	Filter Box Assembly
C1 - C21	CK70AW152M	Capacitor, Fixed, Ceramic, 1500 pF, 500 Vdc, 20%
C22	CK63AY103M	Capacitor, Fixed, Ceramic, .01 uF, 1000 Vdc working
CR1, CR2	JAN1N3611	Semiconductor Device, Diode
J2	MS3102R-28-12S	Connector, Electrical
J3 - J5		Not Used
J6	MS3102R-20-27S	Connector, Electrical
J7	MS3102R-28-21S	Connector, Electrical
J8	MS3102R-18-1S	Connector, Electrical

SECTION 7

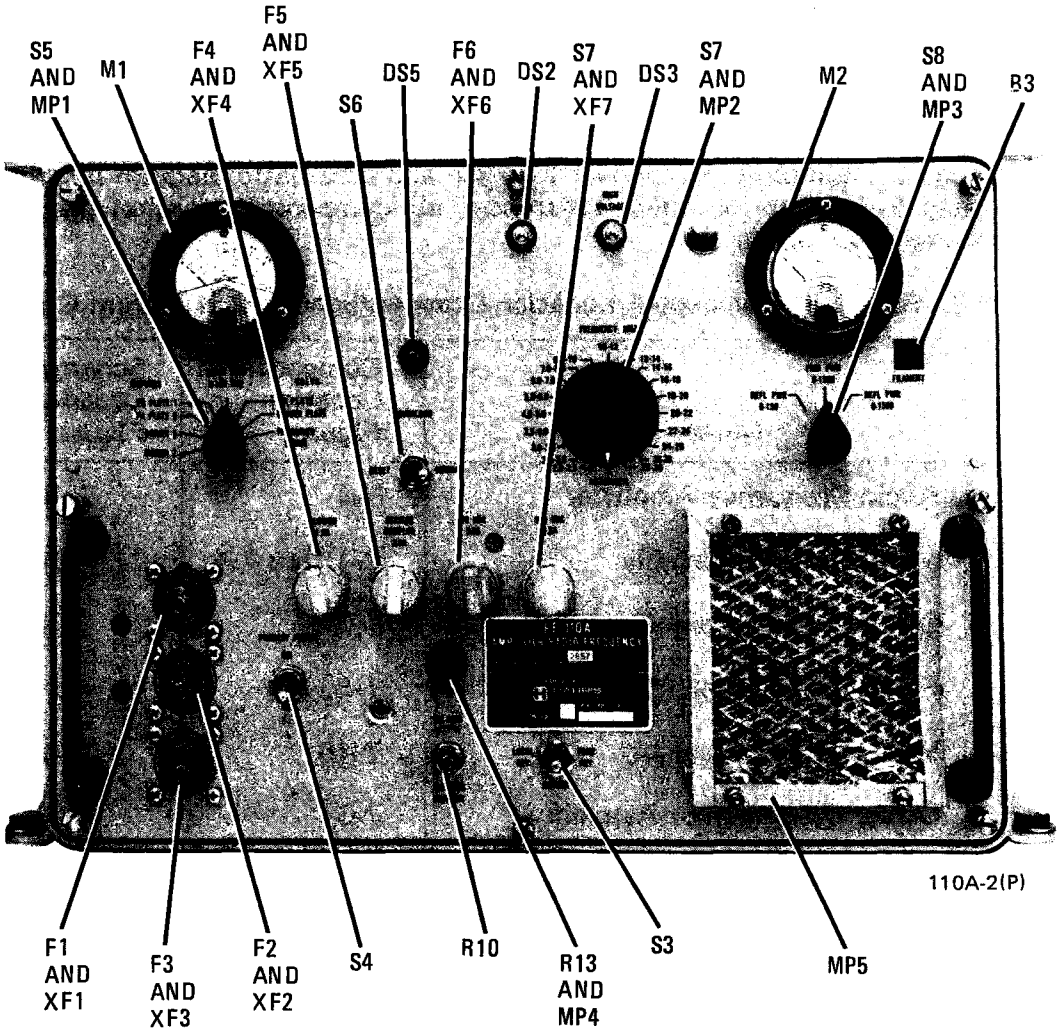
COMPONENT LOCATION AND SCHEMATIC DIAGRAM DATA

7.1 INTRODUCTION

This section contains complete component location and schematic diagram information for the RF-110A. Table 7-1 lists, for quick reference, all component location drawings and corresponding schematic diagrams.

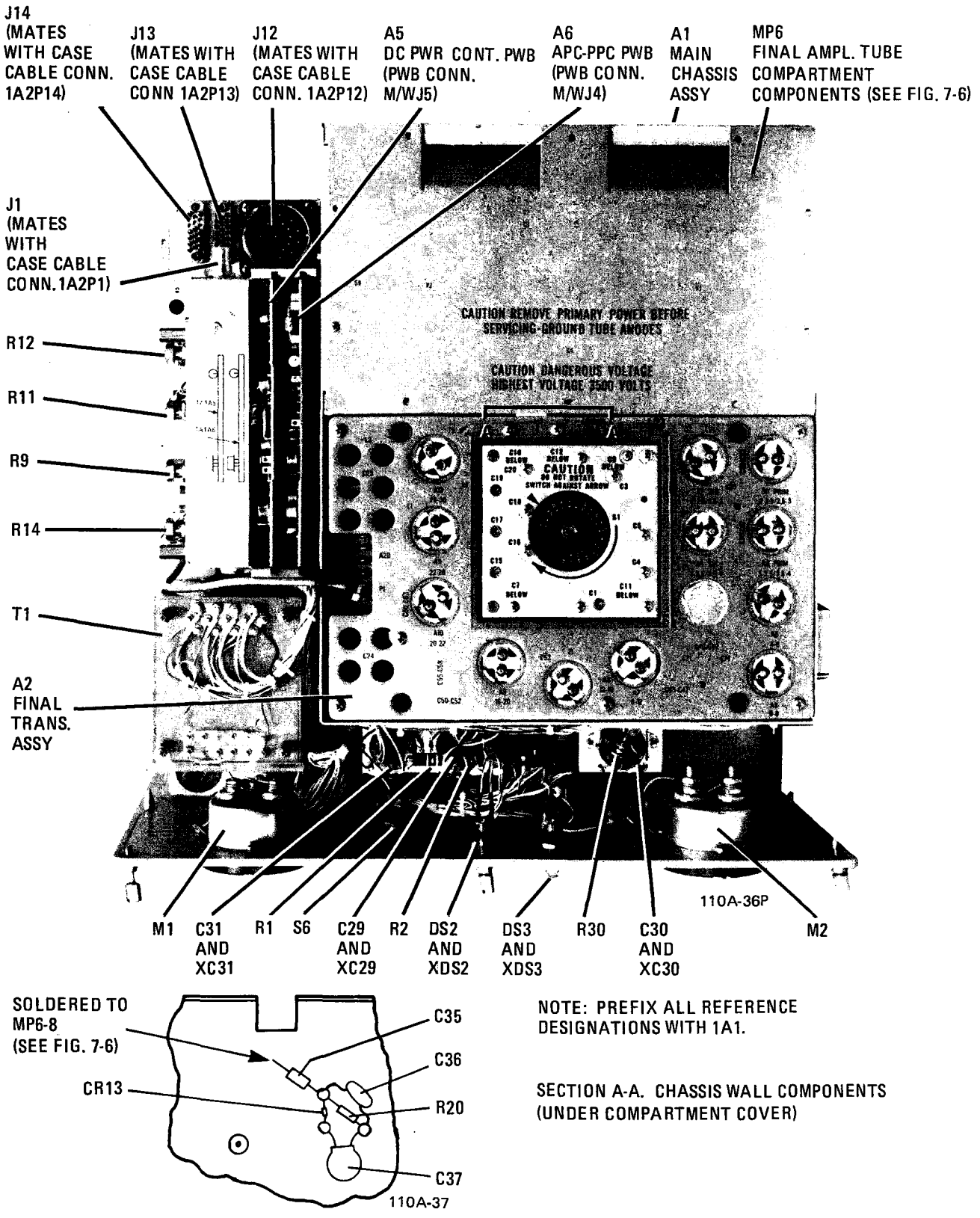
Table 7-1. RF-110A Component Location Drawing/Schematic Diagram Correlation

Ref. Desig.	Name	Component Location Figure	Schematic Drawings Figure
1	Radio Frequency Amplifier	7-1	7-18
1A1	Main Chassis Assembly	7-1 thru 7-6	7-18
1A1A1	Driver Tube Assembly	7-7	7-18
1A1A2	Final Transformer Assembly	7-8, 7-9	7-19
1A1A3	VSWR Bridge Assembly	7-10	7-18
1A1A4	Driver Transformer Assembly	7-11	7-20
1A1A5	Dc Power Control PWB Assembly	7-12	7-21
1A1A6	APC-PPC PWB Assembly	7-13	7-22
1A1A7	Meter Resistor PWB Assembly	7-14	7-18
1A1A8	Not Used	-----	-----
1A1A9	Zener Diode Protector Assembly	7-15	7-18
1A2	Case Assembly	7-16	7-23
1A2A1	Filter Box Assembly	7-17	7-23



NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1.

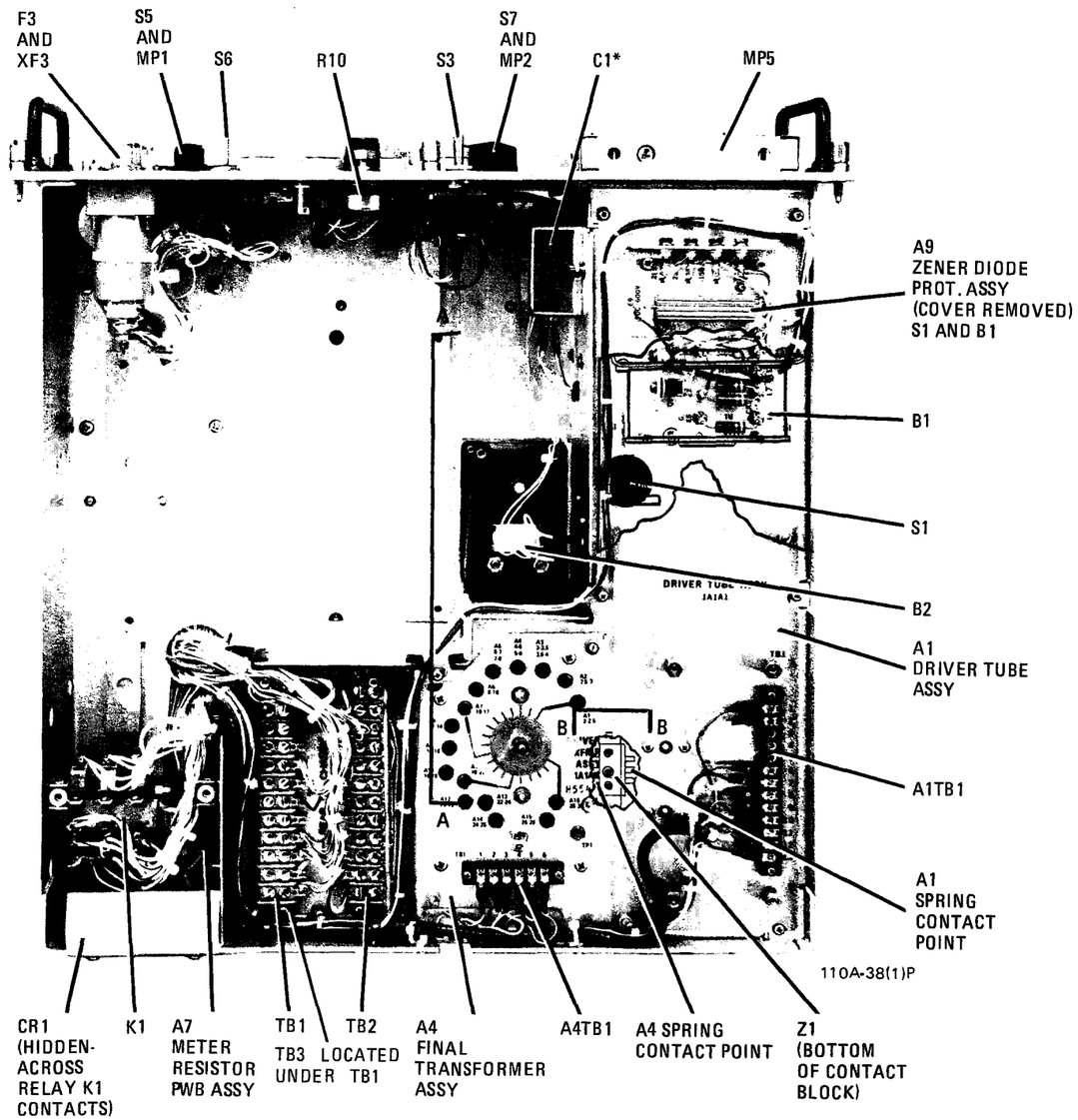
Figure 7-1. Main Chassis Assembly 1A1, Part No. 1932-3100, Component Locations - Front Panel View



NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1.

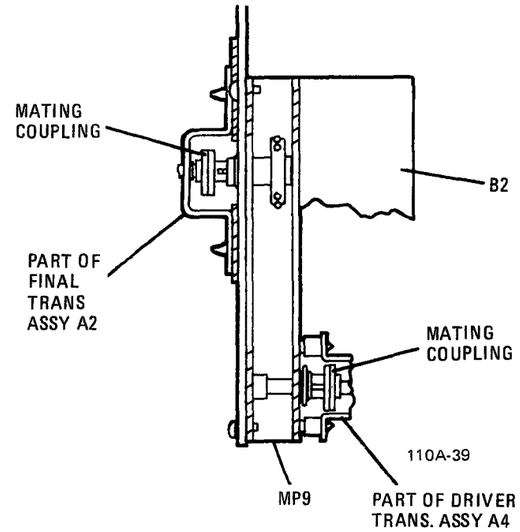
SECTION A-A. CHASSIS WALL COMPONENTS (UNDER COMPARTMENT COVER)

Figure 7-2. Main Chassis Assembly 1A1, Part No. 1932-3100, Component Locations - Top View

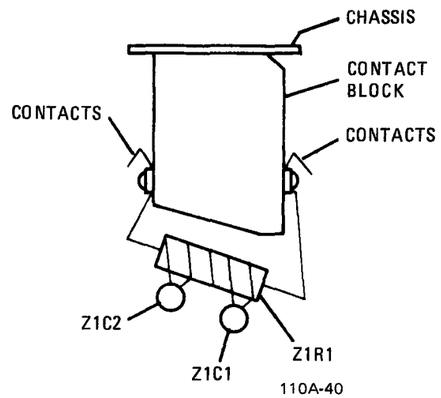


*C1 HAS BEEN MOVED TO THE FRONT PANEL ON LATER UNITS.

NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1.



SECTION A-A. TRANSMISSION ASSEMBLY COMPONENT LOCATIONS AND RELATIONSHIPS



SECTION B-B. DRIVER PARASITIC SUPPRESSOR ASSY Z1 COMPONENT LOCATIONS

Figure 7-3. Main Chassis Assembly 1A1, Part No. 1932-3100, Component Locations - Bottom View

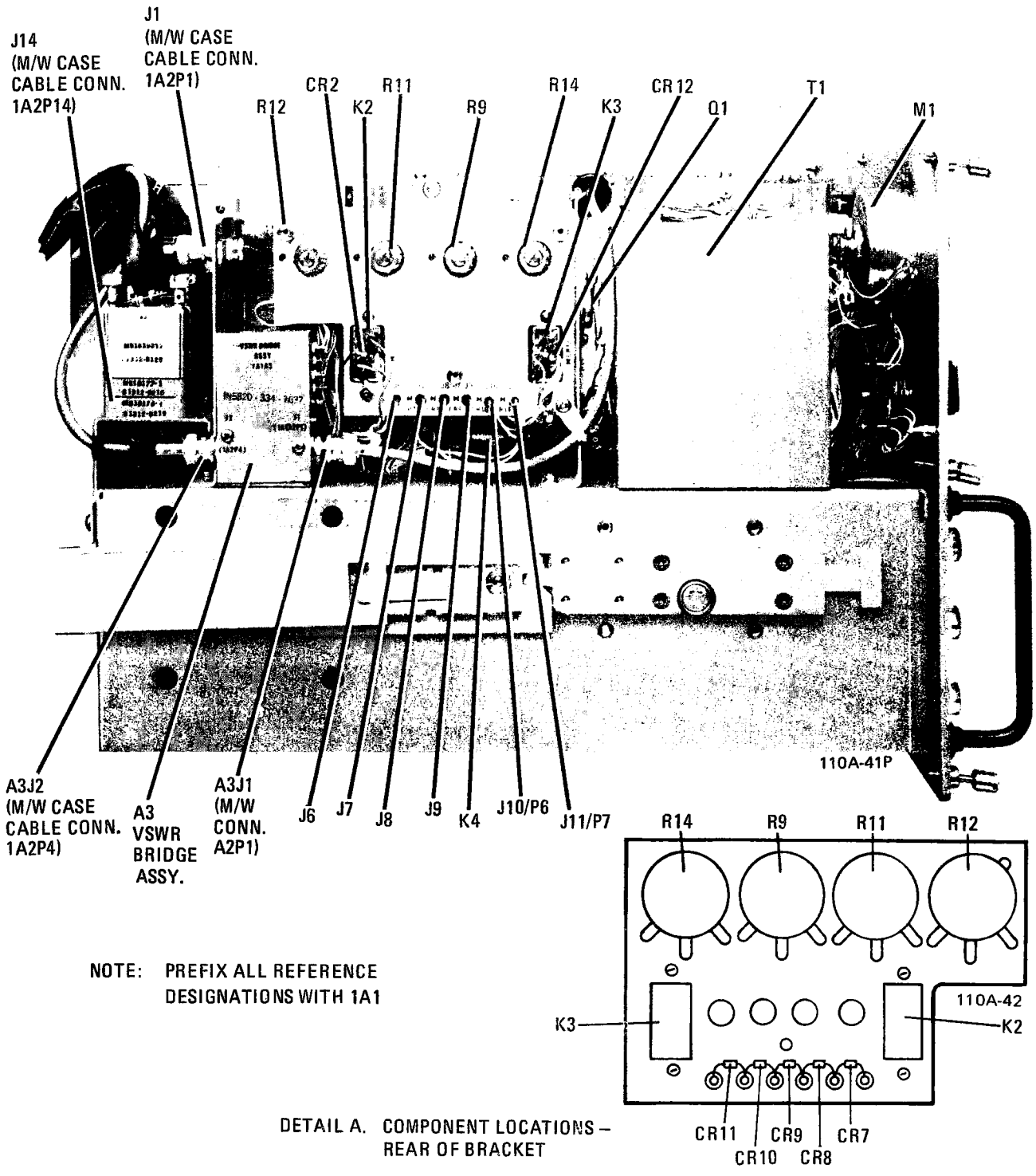


Figure 7-4. Main Chassis Assembly 1A1, Part No. 1932-3100, Component Locations - Left Side View

NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1.

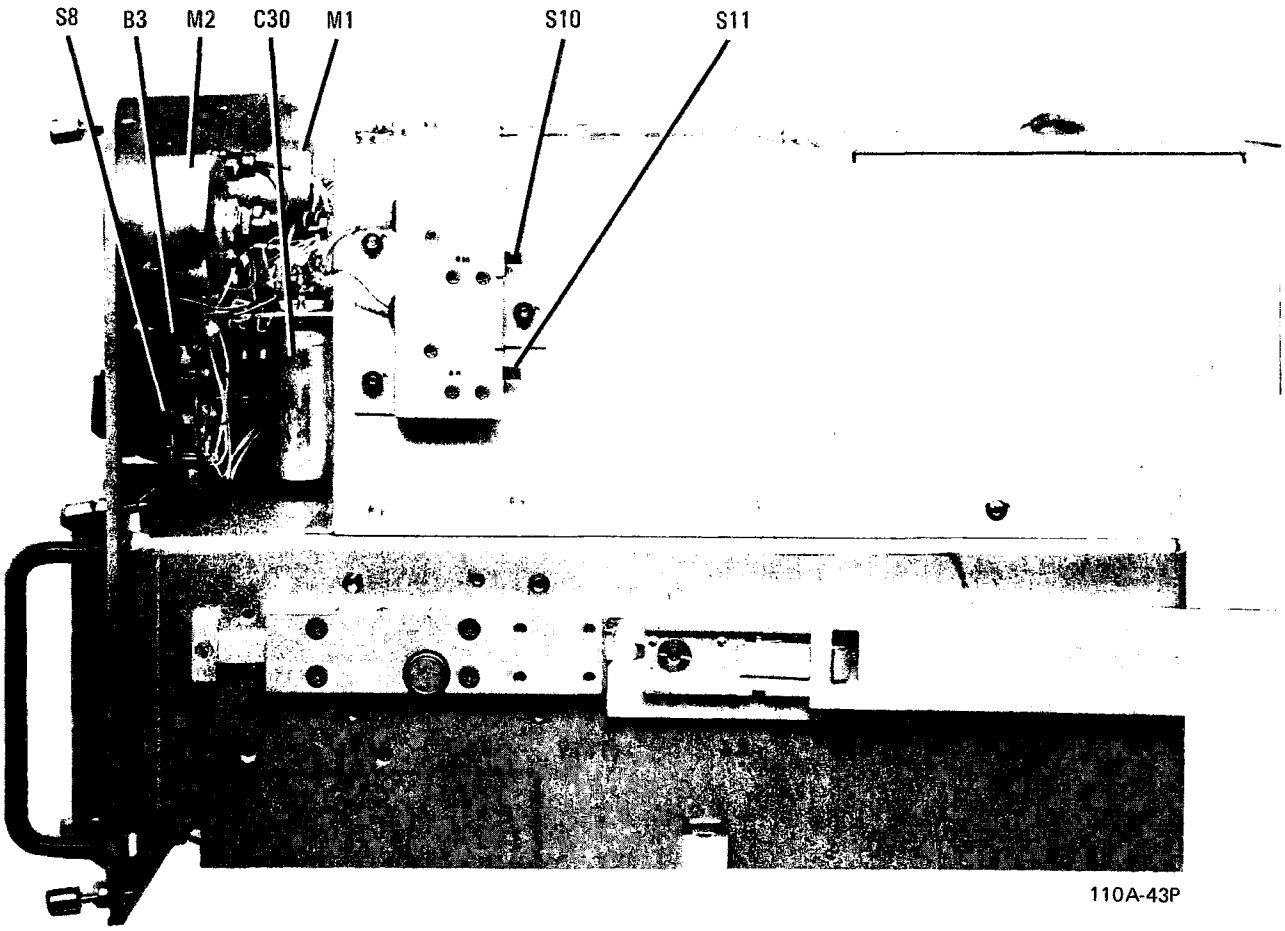
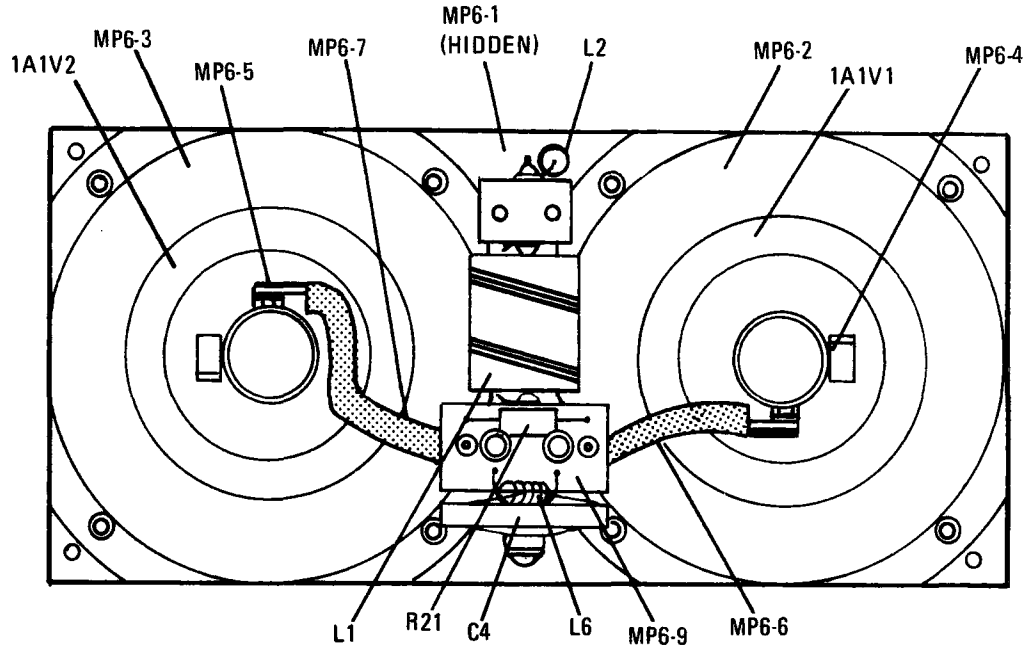
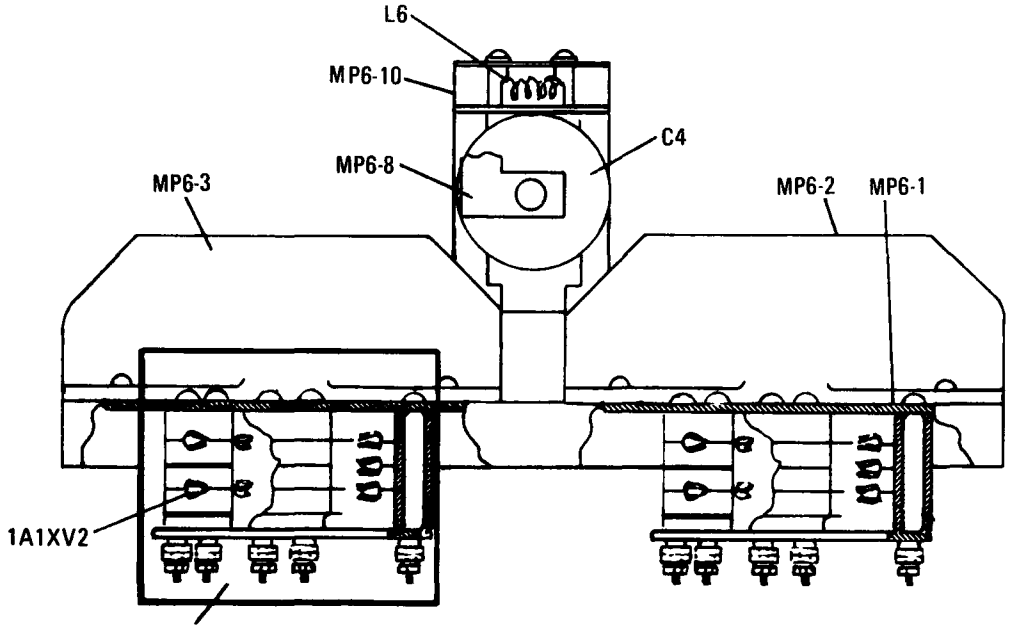


Figure 7-5. Main Chassis Assembly 1A1, Part No. 1932-3100, Component Locations - Right Side View



NOTE: SHROUD MP6-10 HAS BEEN REMOVED FOR CLARITY.

DETAIL A. TOP VIEW – FINAL TUBE ASSEMBLY



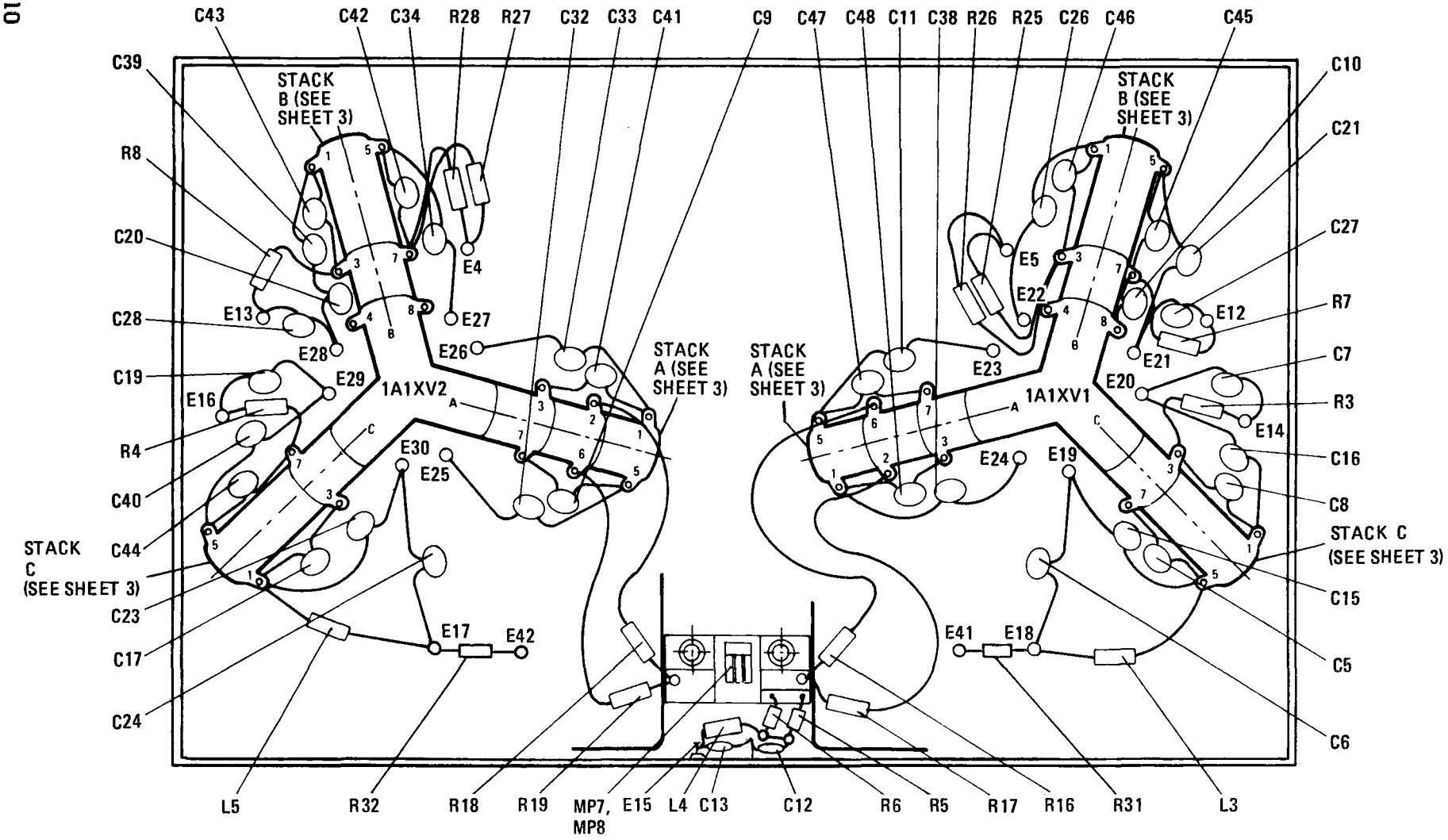
SEE SHEET 3 FOR COMPONENT LOCATION AND IDENTIFICATION INFORMATION.

DETAIL B. SIDE VIEW (AS VIEWED FROM FRONT OF UNIT)

NOTE: PREFIX ALL INCOMPLETE REFERENCE DESIGNATIONS WITH 1A1.

110A-44

Figure 7-6. Final Tube Assembly 1A1MP6, Part No. 8948-3470, Component Locations (Sheet 1 of 3)

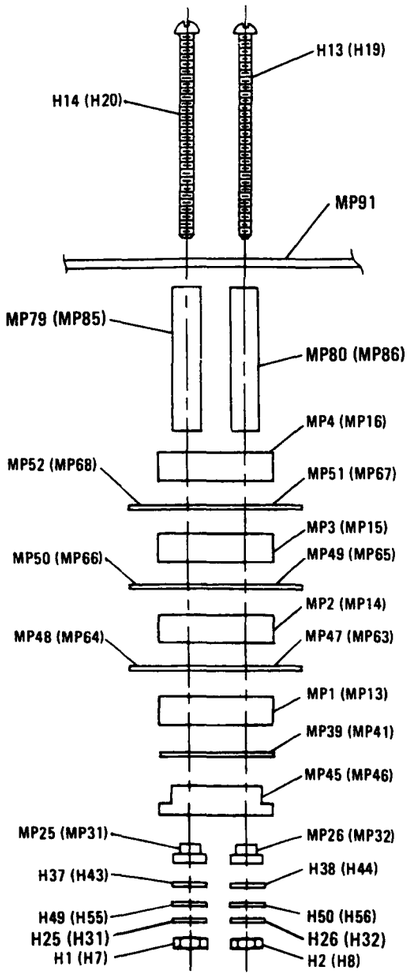


110A-45

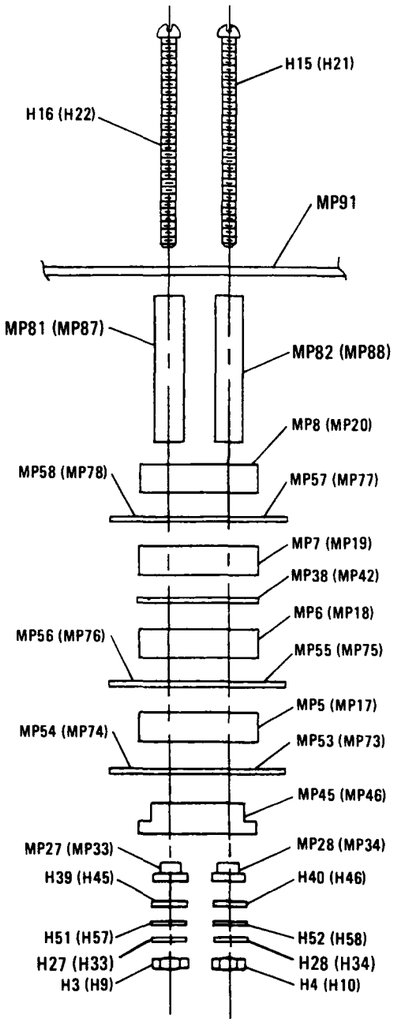
NOTES: PREFIX ALL INCOMPLETE REFERENCE DESIGNATIONS WITH 1A1

DETAIL C. BOTTOM VIEW SHOWING ELECTRONIC/MECHANICAL COMPONENTS

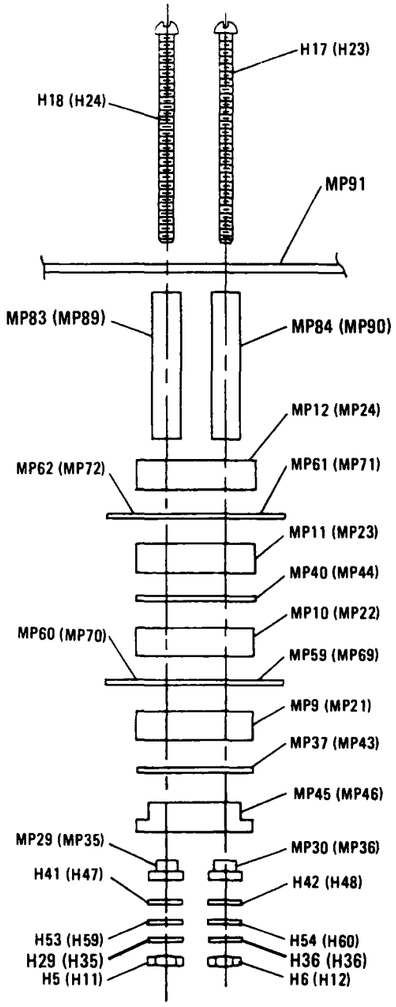
Figure 7-6. Final Tube Assembly 1A1MP6, Part No. 8948-3470, Component Locations (Sheet 2 of 3)



DETAIL D-1.
TUBE SOCKET – STACK A –
ASSEMBLY/DISASSEMBLY
COMPONENT VIEW

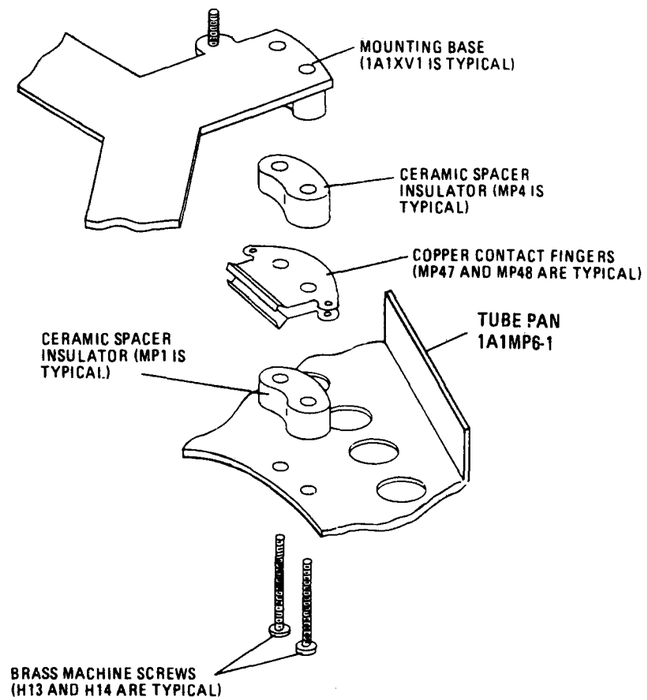


DETAIL D-2.
TUBE SOCKET – STACK B –
ASSEMBLY/DISASSEMBLY
COMPONENT VIEW



DETAIL D-3.
TUBE SOCKET – STACK C–
ASSEMBLY/DISASSEMBLY
COMPONENT VIEW

DETAIL D. TUBE SOCKET ASSEMBLIES 1A1XV1 AND 1A1XV2 COMPONENT LOCATIONS AND ALIGNMENT



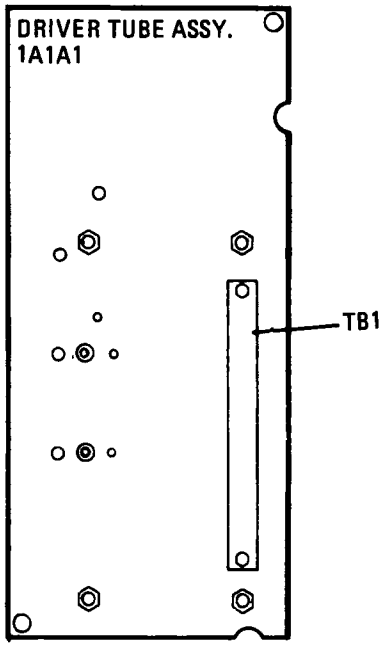
DETAIL D-4.
TUBE SOCKET – COMPONENT
ORIENTATION VIEW

NOTES (DETAIL D THROUGH G):

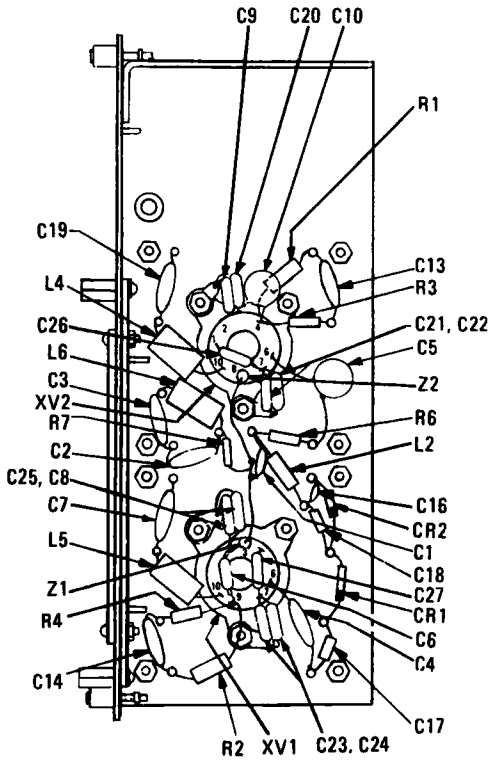
1. PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1XV1 OR 1A1XV2 UNLESS OTHERWISE INDICATED.
2. REFERENCE DESIGNATIONS OUTSIDE THE PARENTHESES REFER TO THE COMPONENTS OF TUBE SOCKET XV1. REFERENCE DESIGNATIONS WITHIN THE PARENTHESES REFER TO THE COMPONENTS OF TUBE SOCKET XV2.

110A-46

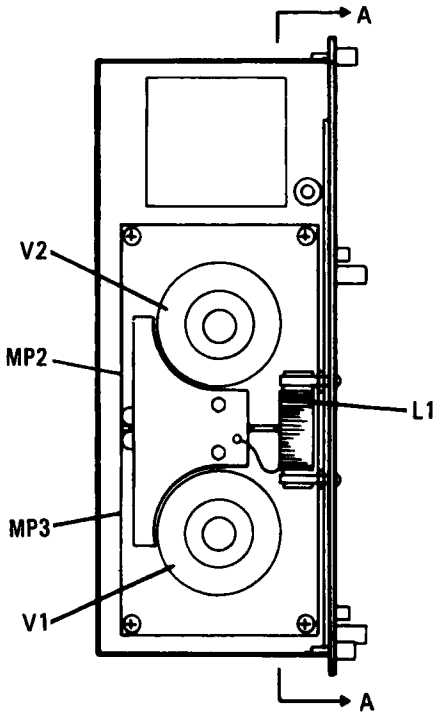
Figure 7-6. Final Tube Assembly 1A1MP6, Part No. 8948-3470, Component Locations (Sheet 3 of 3)



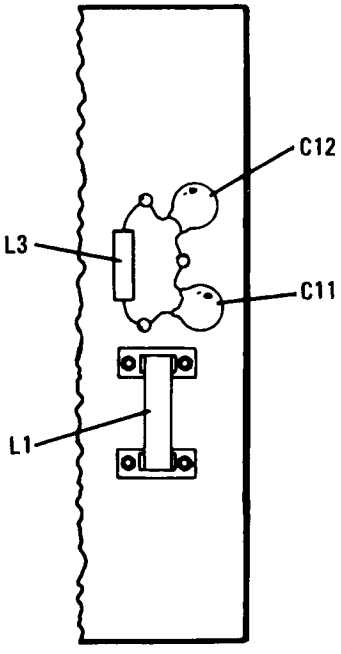
DETAIL A. TOP VIEW



DETAIL C. RIGHT SIDE VIEW (FROM BOTTOM OF UNIT)



DETAIL B. BOTTOM VIEW



SECTION A-A (PARTIAL)

NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A1.

110A-47

Figure 7-7. Driver Tube Assembly 1A1A1, Part No. 1932-3850, Component Locations

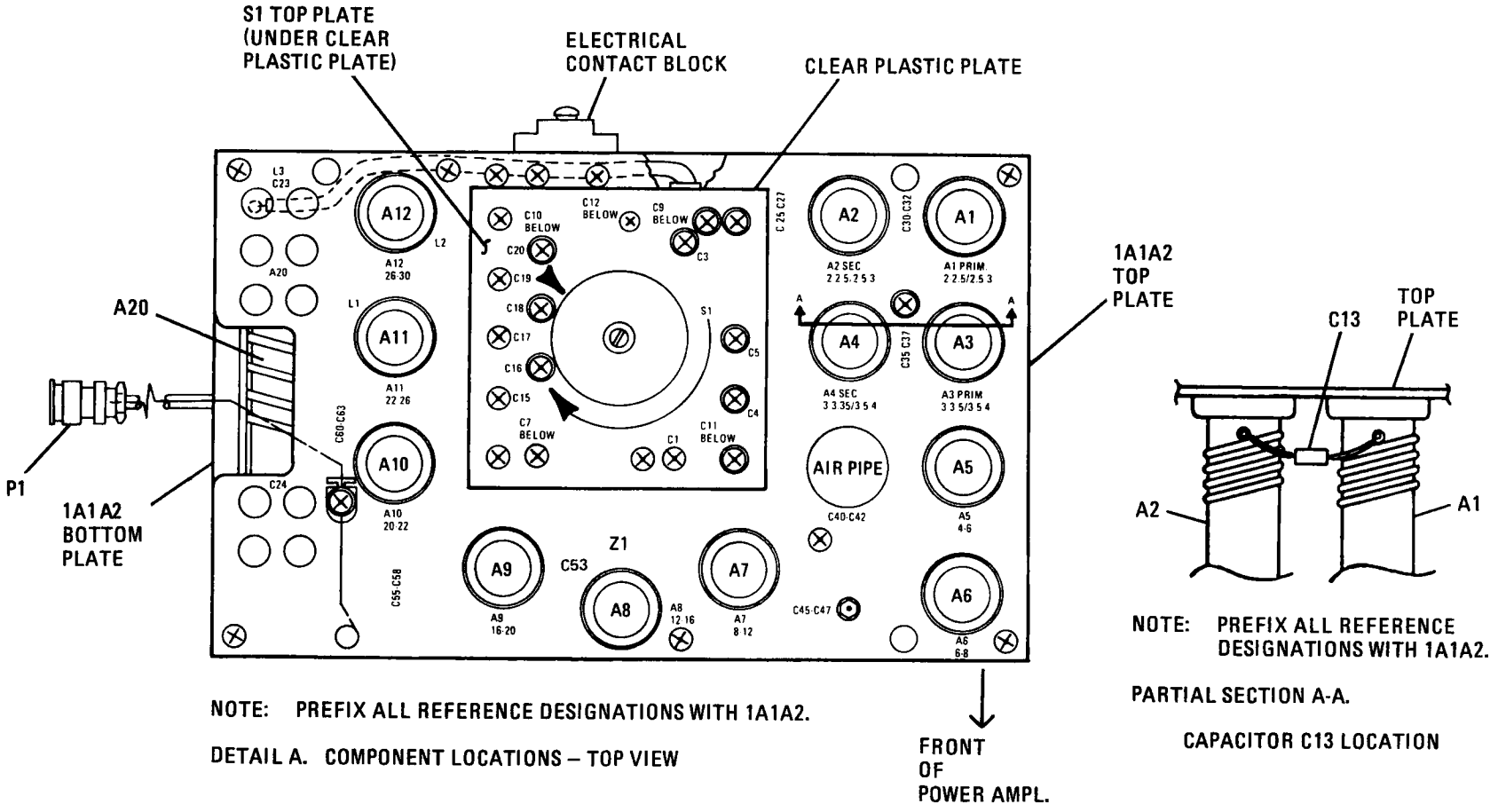
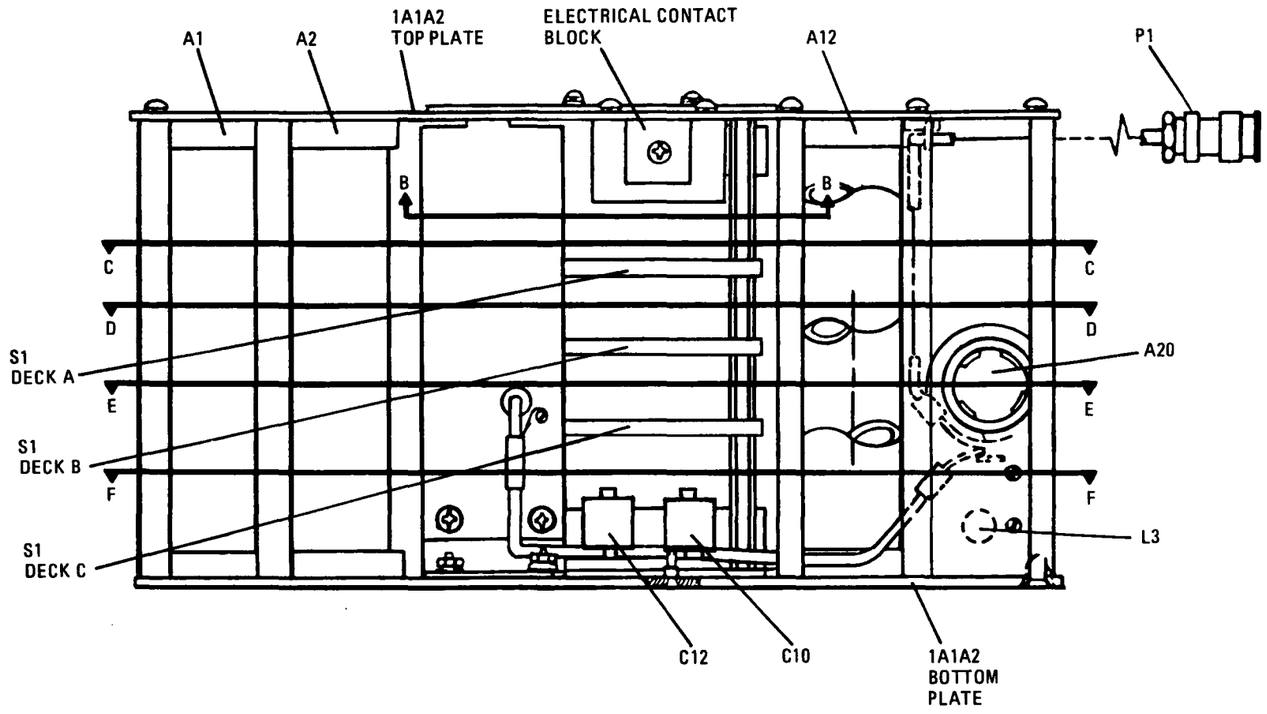
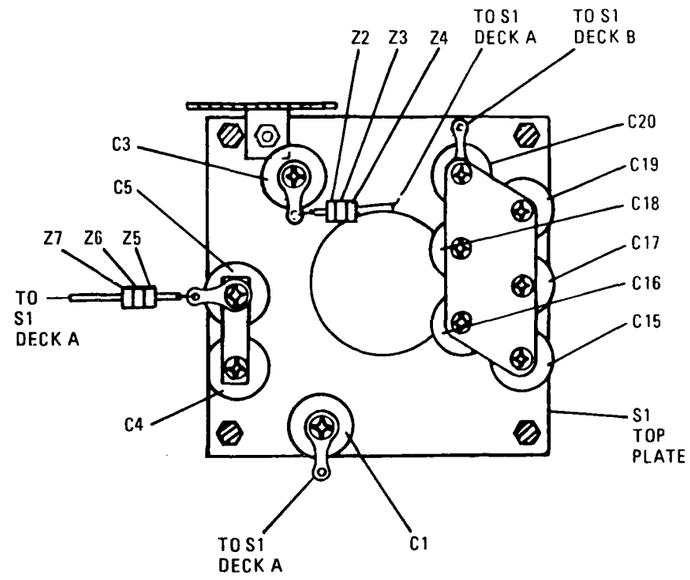


Figure 7-8. Final Transformer Assembly 1A1A2, Part No. 10051-3700, Component Locations (Sheet 1 of 5)



NOTES: 1. PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2.
2. SEE SHEETS 3 THROUGH 5 FOR SECTIONS C-C THROUGH F-F.

DETAIL B. COMPONENT LOCATIONS – REAR VIEW

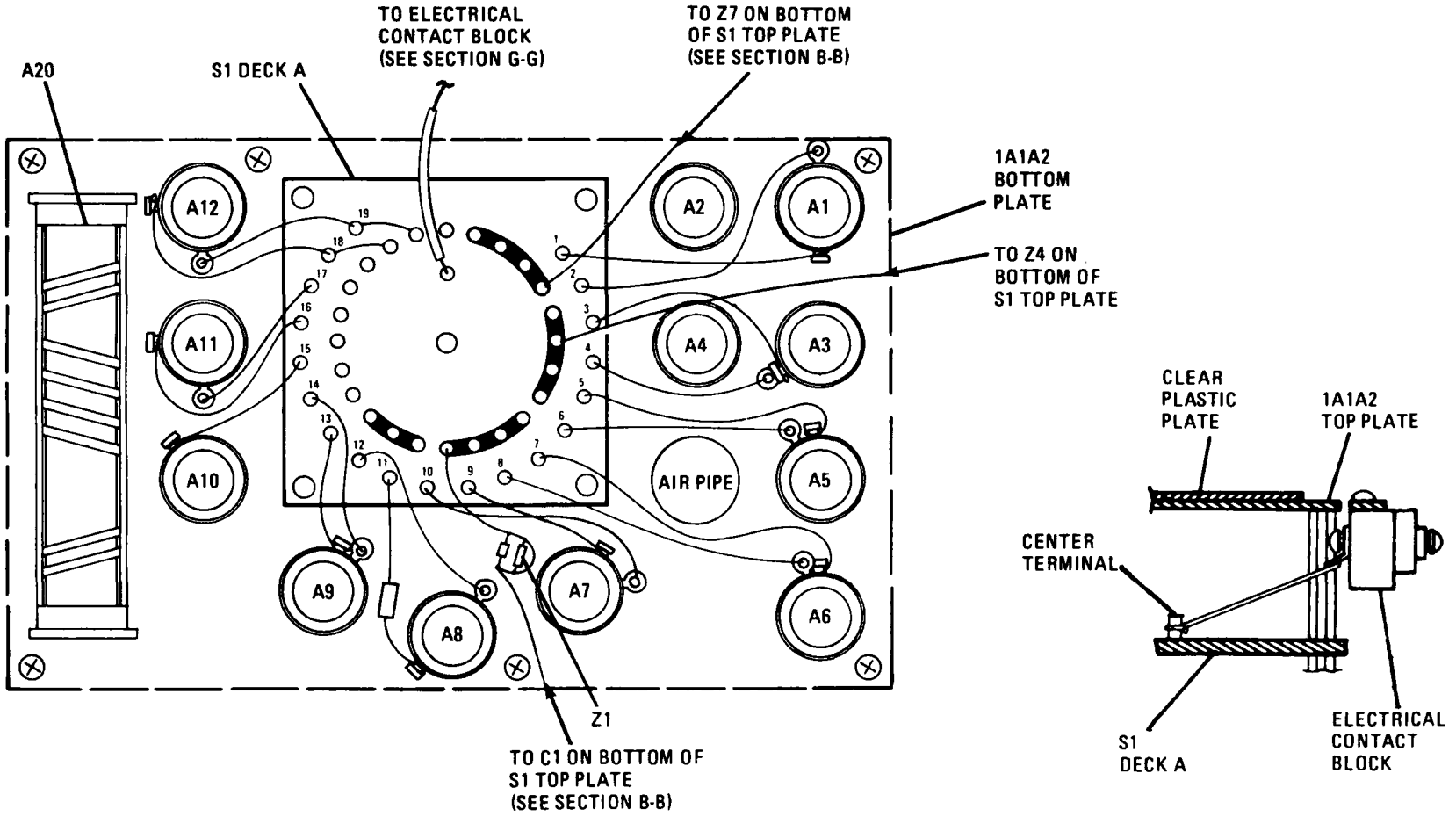


NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2.

PARTIAL SECTION B-B. COMPONENT LOCATIONS – UNDERSIDE OF S1 TOP PLATE

745-140

Figure 7-8. Final Transformer Assembly 1A1A2, Part No. 10051-3700, Component Locations (Sheet 2 of 5)



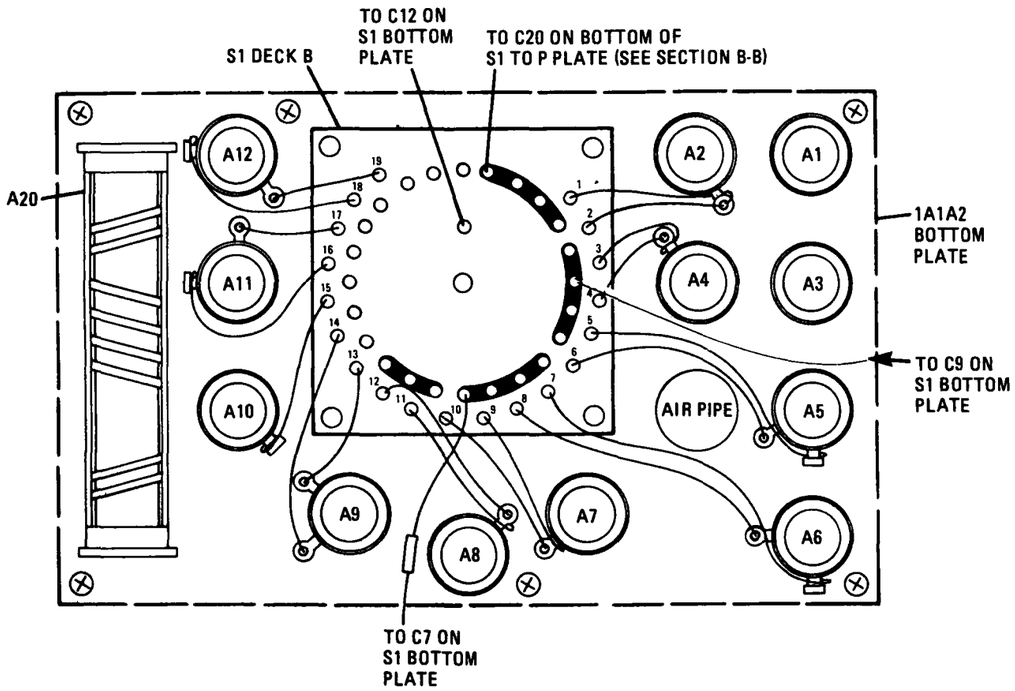
NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2.

SECTION C-C. COMPONENT LOCATIONS – S1 DECK A

SECTION G-G
S1 DECK A
ELECTRICAL
CONNECTION
DETAILS

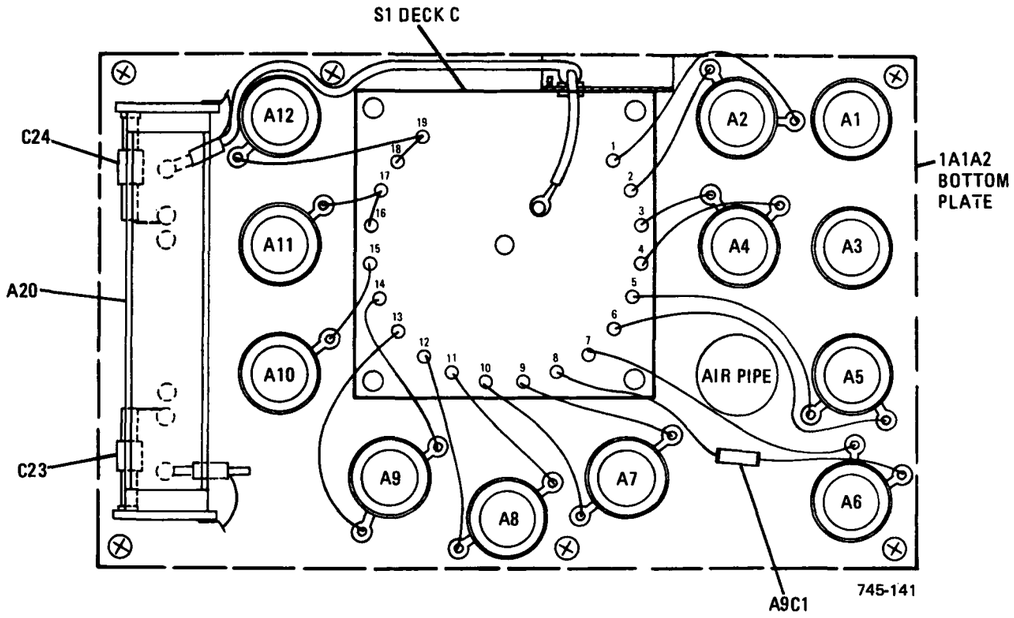
745-066

Figure 7-8. Final Transformer Assembly 1A1A2, Part No. 10051-3700, Component Locations (Sheet 3 of 5)



NOTE: PREFIX ALL REFERENCES DESIGNATIONS WITH 1A1A2.

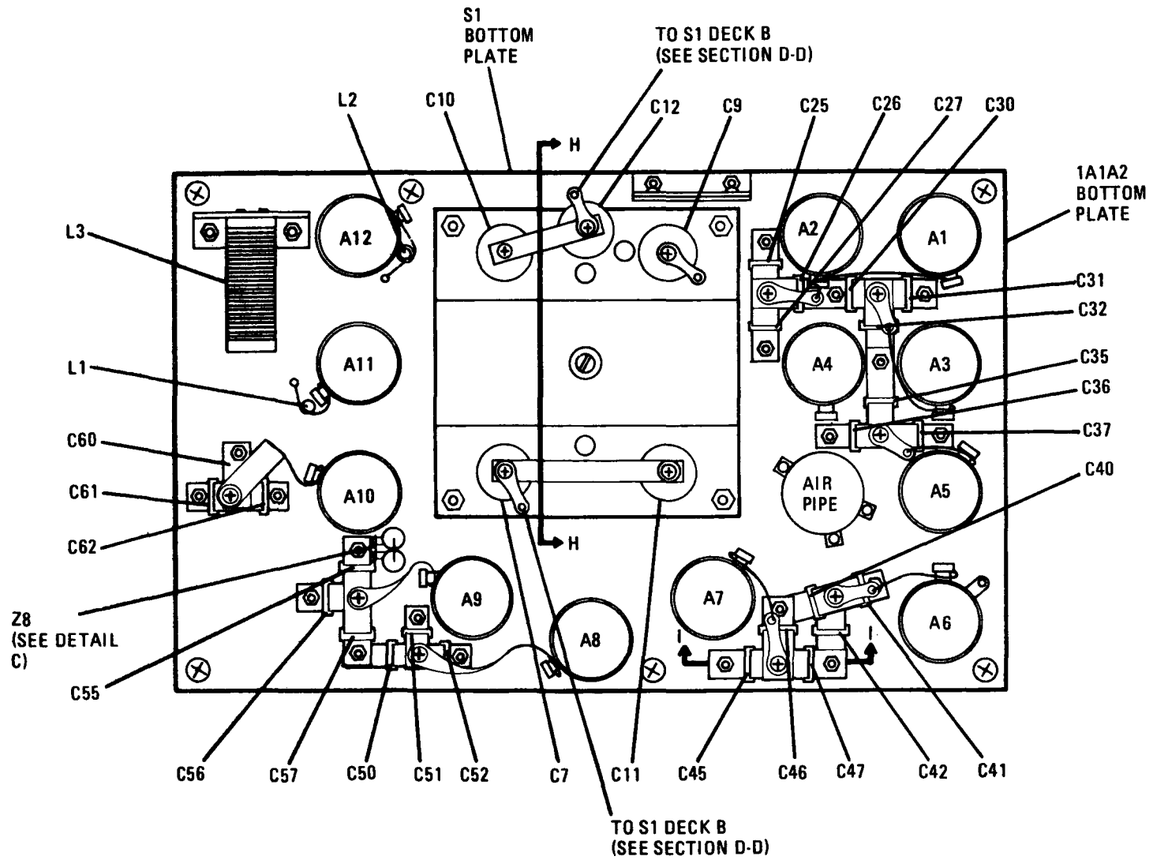
SECTION D-D. COMPONENT LOCATIONS – S1 DECK B



NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2

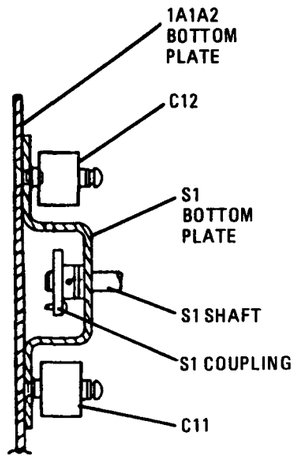
SECTION E-E. COMPONENT LOCATIONS – S1 DECK C

Figure 7-8. Final Transformer Assembly 1A1A2, Part No. 10051-3700, Component Locations (Sheet 4 of 5)



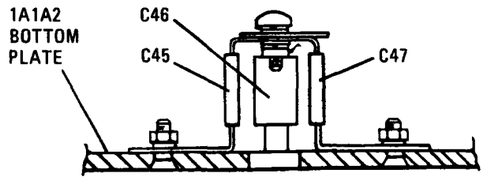
NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2

SECTION F-F. COMPONENT LOCATIONS – BOTTOM PLATE



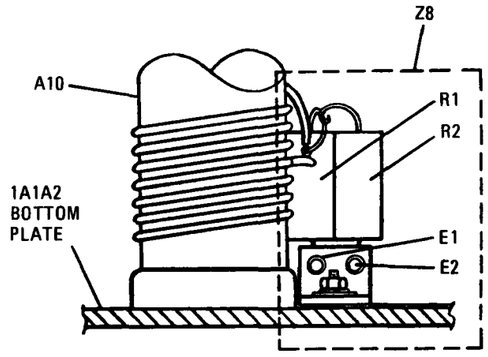
NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2

SECTION H-H. COMPONENT LOCATIONS AND DETAILS 1A1A2 BOTTOM PLATE AND S1 BOTTOM PLATE



NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2

PARTIAL SECTION I-I. CAPACITOR COMPONENT ORIENTATION ON 1A1A2 BOTTOM PLATE

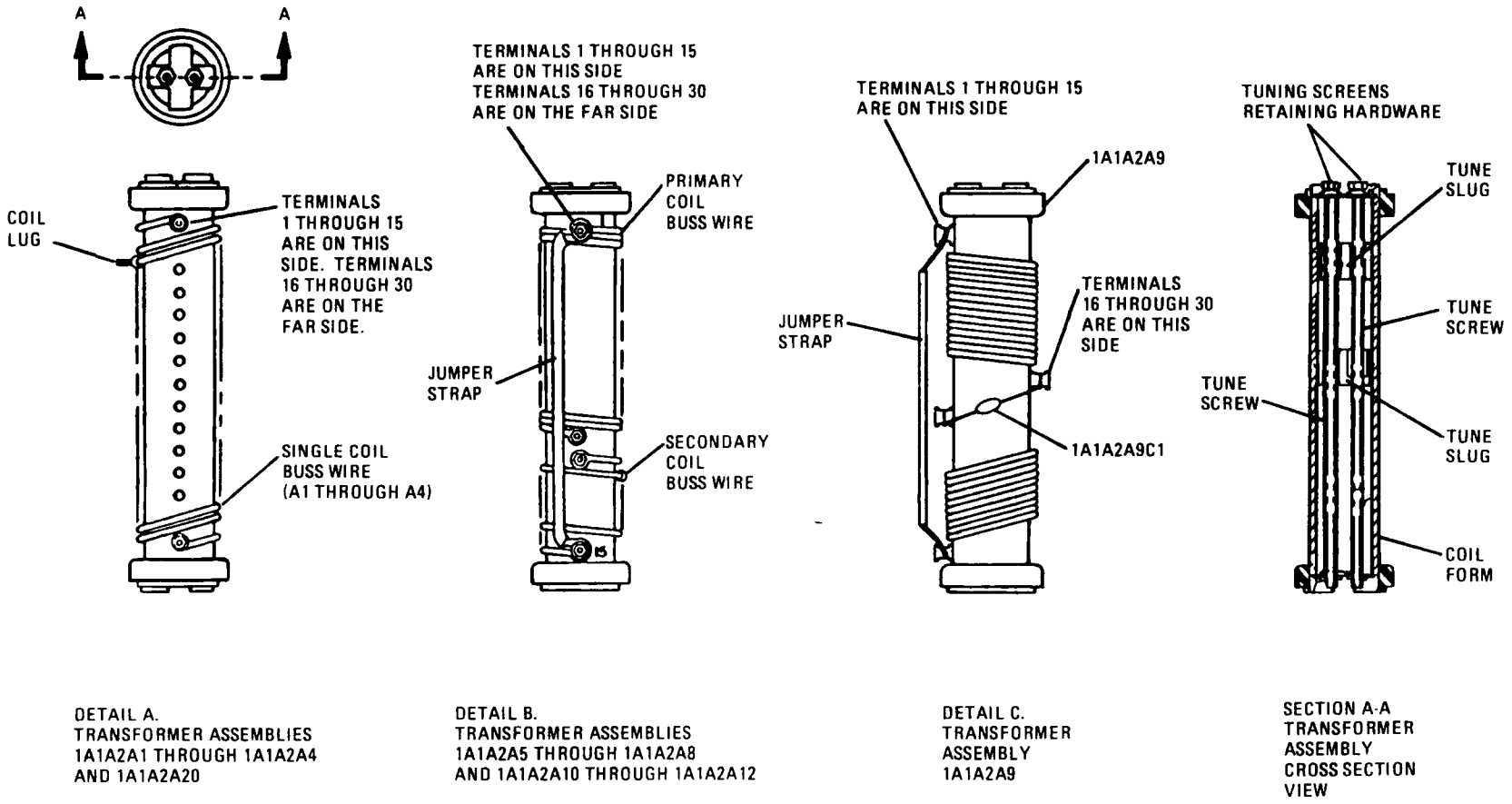


NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2 OR 1A1A2Z8 AS APPLICABLE

DETAIL C. COMPONENT LOCATIONS – Z8 TRAP ASSEMBLY

745-142(1)

Figure 7-8. Final Transformer Assembly 1A1A2, Part No. 10051-3700, Component Locations (Sheet 5 of 5)



DETAIL A.
TRANSFORMER ASSEMBLIES
1A1A2A1 THROUGH 1A1A2A4
AND 1A1A2A20

DETAIL B.
TRANSFORMER ASSEMBLIES
1A1A2A5 THROUGH 1A1A2A8
AND 1A1A2A10 THROUGH 1A1A2A12

DETAIL C.
TRANSFORMER
ASSEMBLY
1A1A2A9

SECTION A-A
TRANSFORMER
ASSEMBLY
CROSS SECTION
VIEW

NOTE: SEE PARTS LISTS FOR INDIVIDUAL TRANSFORMER ASSEMBLY PART NUMBERS

745-067

Figure 7-9. Transformer Assemblies 1A1A2A1 through 1A1A2A20 Component Locations

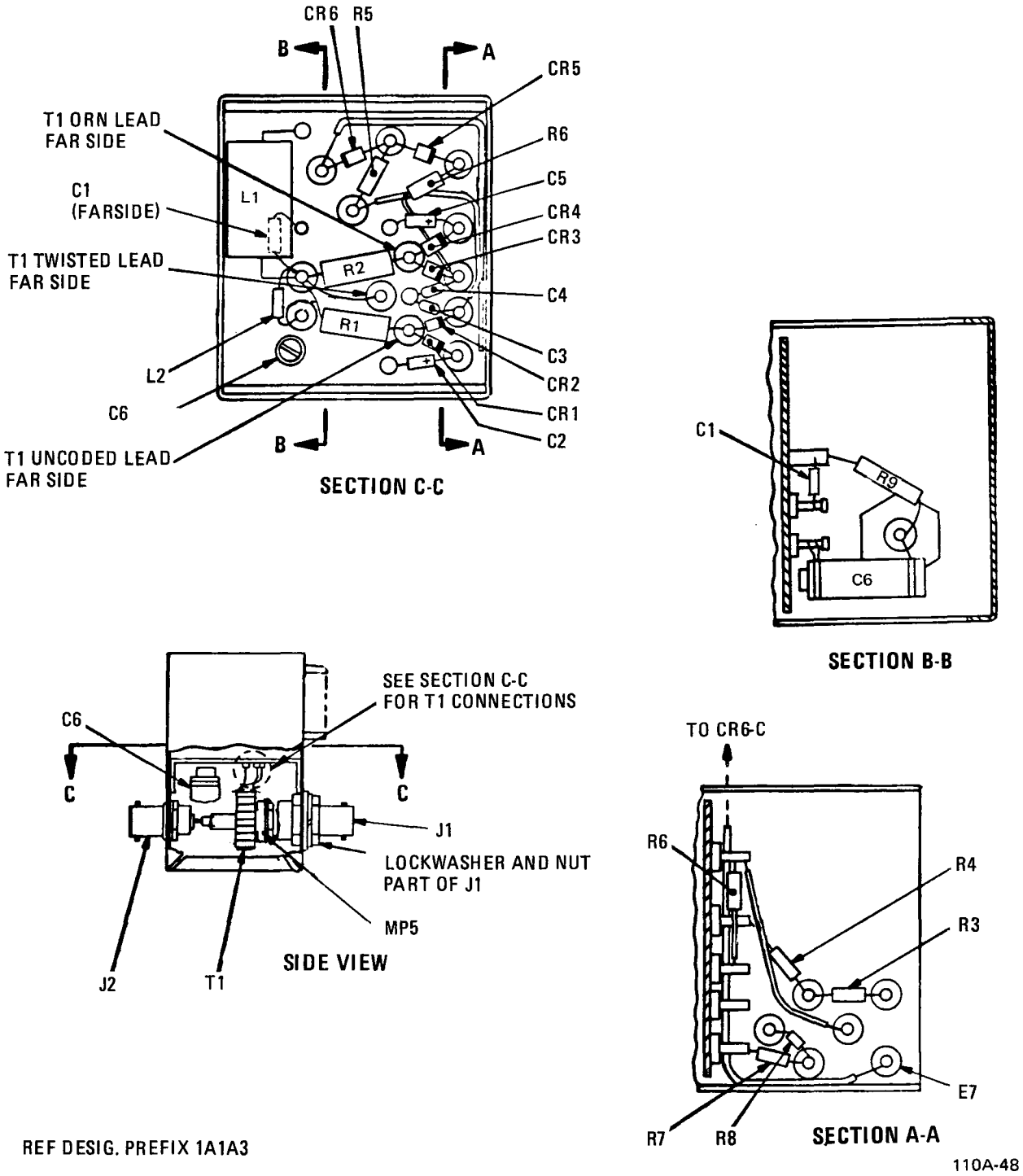
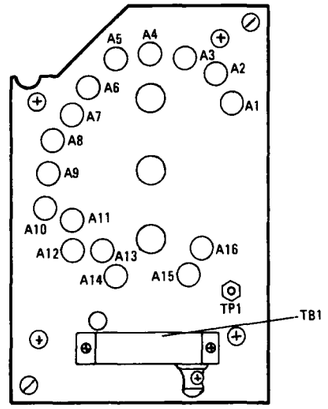
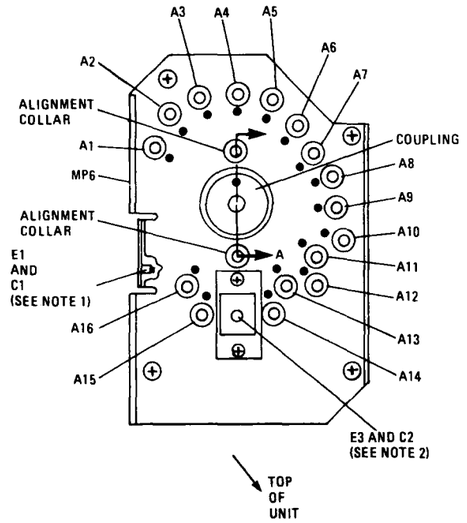


Figure 7-10. VSWR Bridge Assembly 1A1A3, Part No. 0082-3420, Component Locations



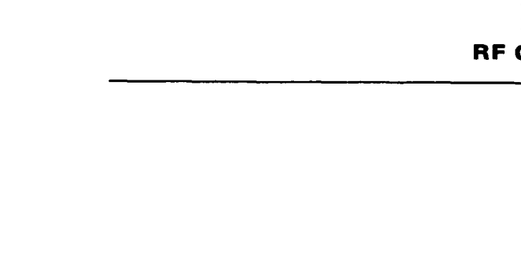
NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A4.

DETAIL A. COMPONENT LOCATIONS - AS VIEWED FROM TOP OF ASSEMBLY.



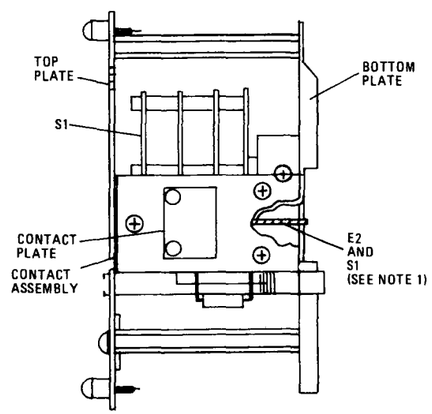
NOTES:
1. C1 IS CONNECTED BETWEEN S1B-4 AND E1.
2. C2 IS CONNECTED BETWEEN S1A-4 AND E3.
3. PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A4.

DETAIL B. COMPONENT LOCATIONS – AS VIEWED FROM BOTTOM OF ASSEMBLY



NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A4

SECTION A-A. COMPONENT LOCATIONS – SWITCH S1 NEARBY COMPONENTS



NOTES:
1. R1 IS CONNECTED BETWEEN S1-A TERMINAL 4 AND E2.
2. PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A4.

DETAIL C. COMPONENT LOCATIONS – ASSEMBLY SIDE VIEW

745-144

Figure 7-11. Driver Transformer Assembly 1A1A4, Part No. 0082-3800, Component Locations (Sheet 1 of 3)

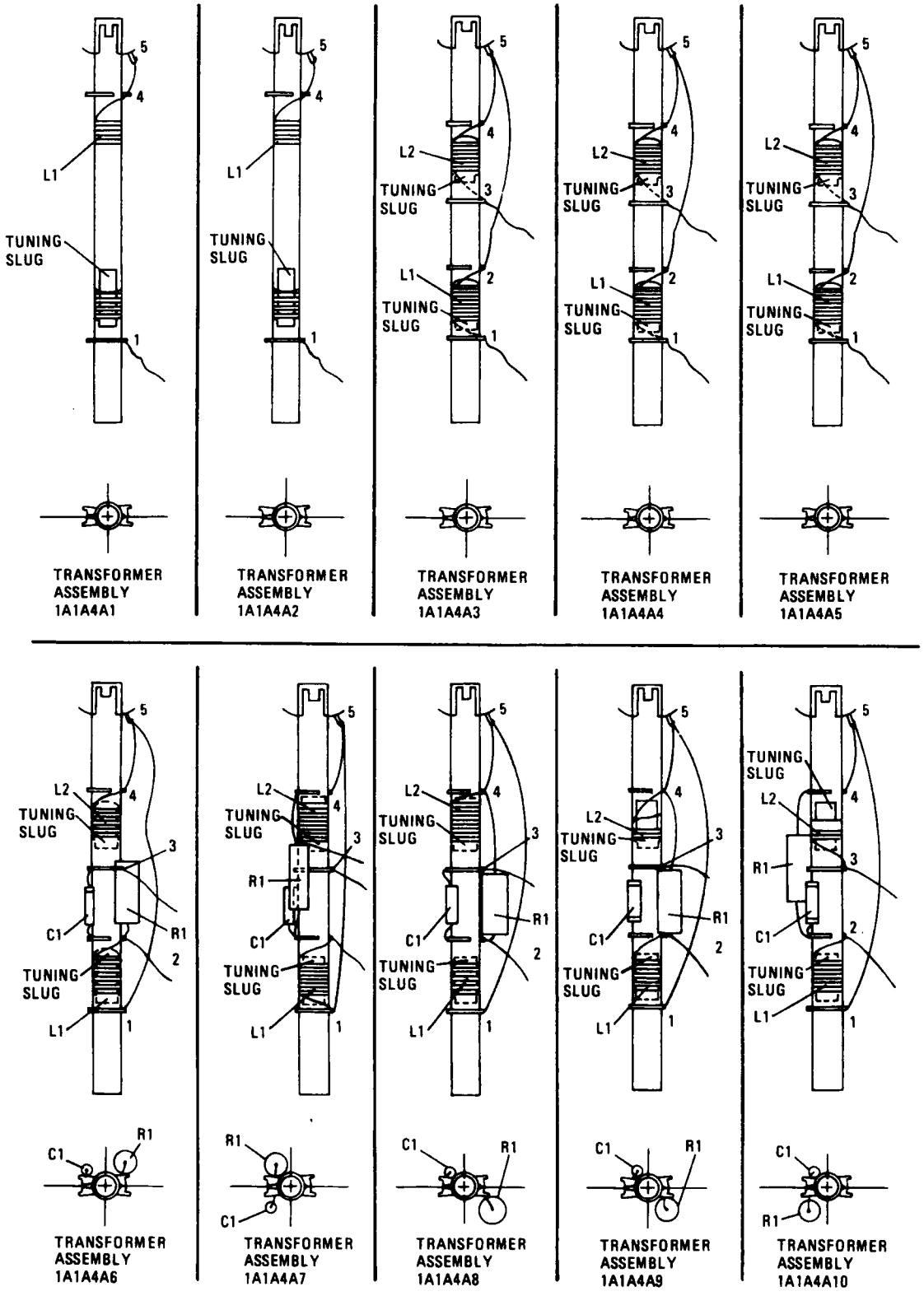


Figure 7-11. Driver Transformer Assembly 1A1A4, Part No. 0082-3800, Component Locations (Sheet 2 of 3)

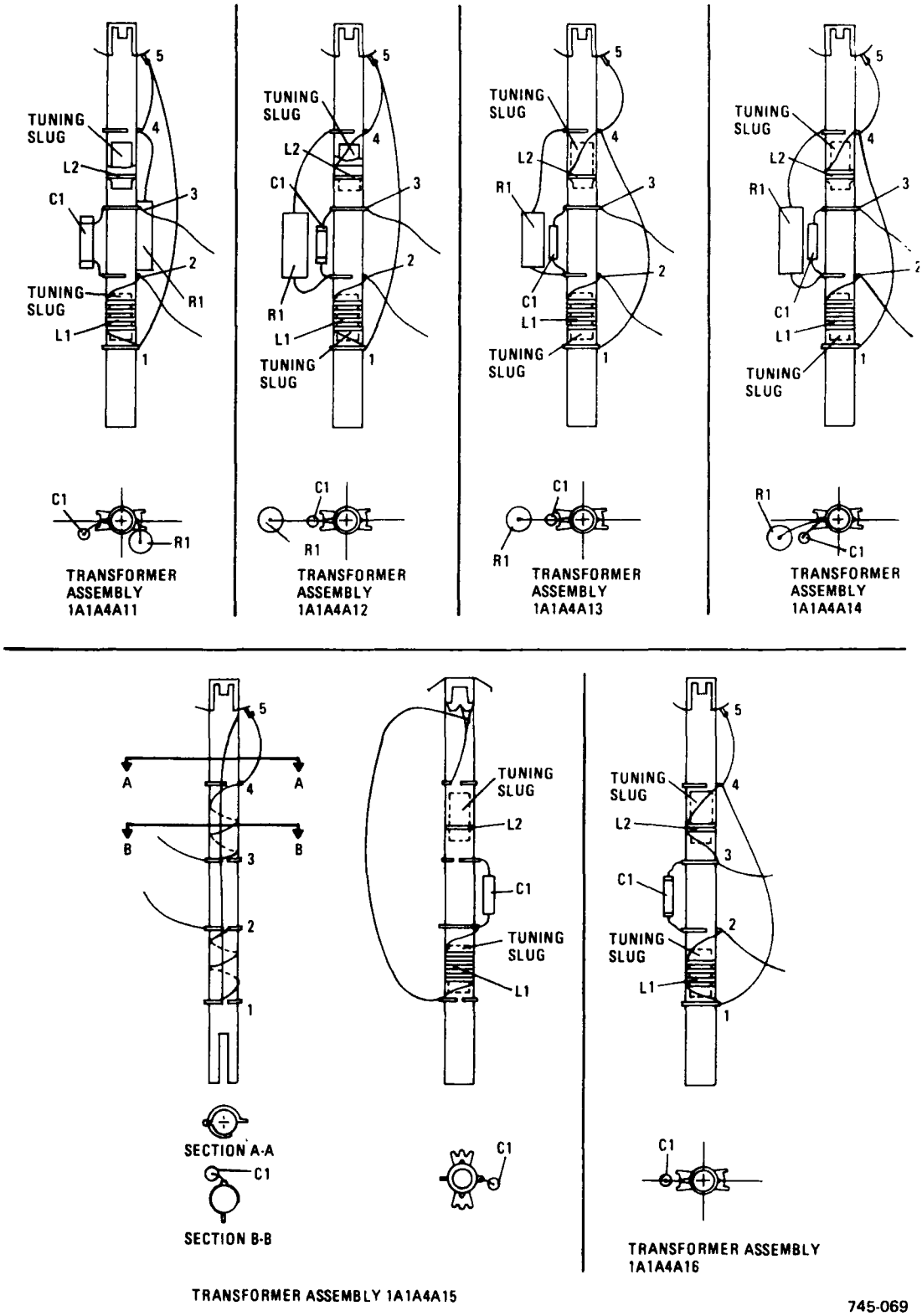
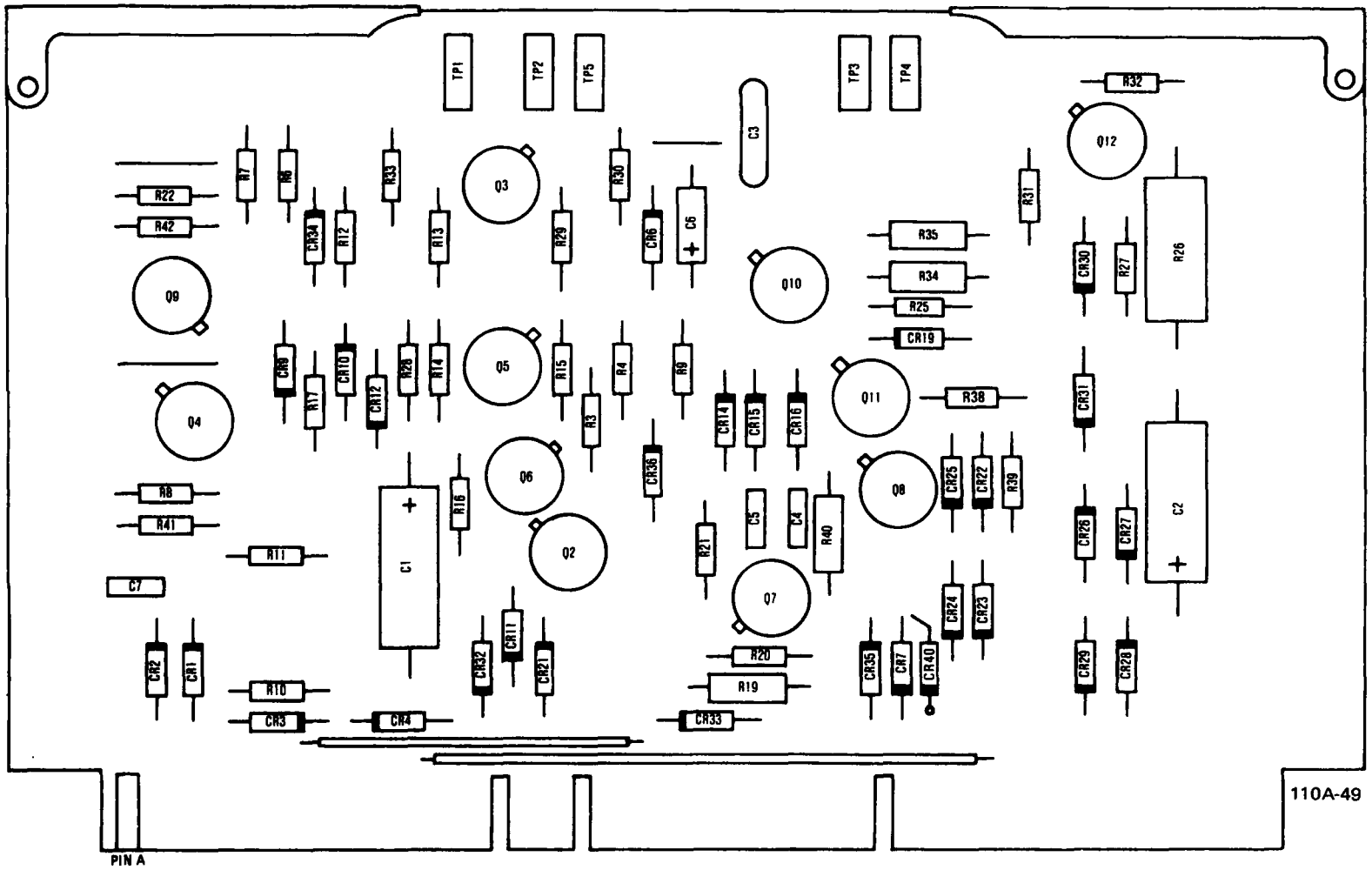
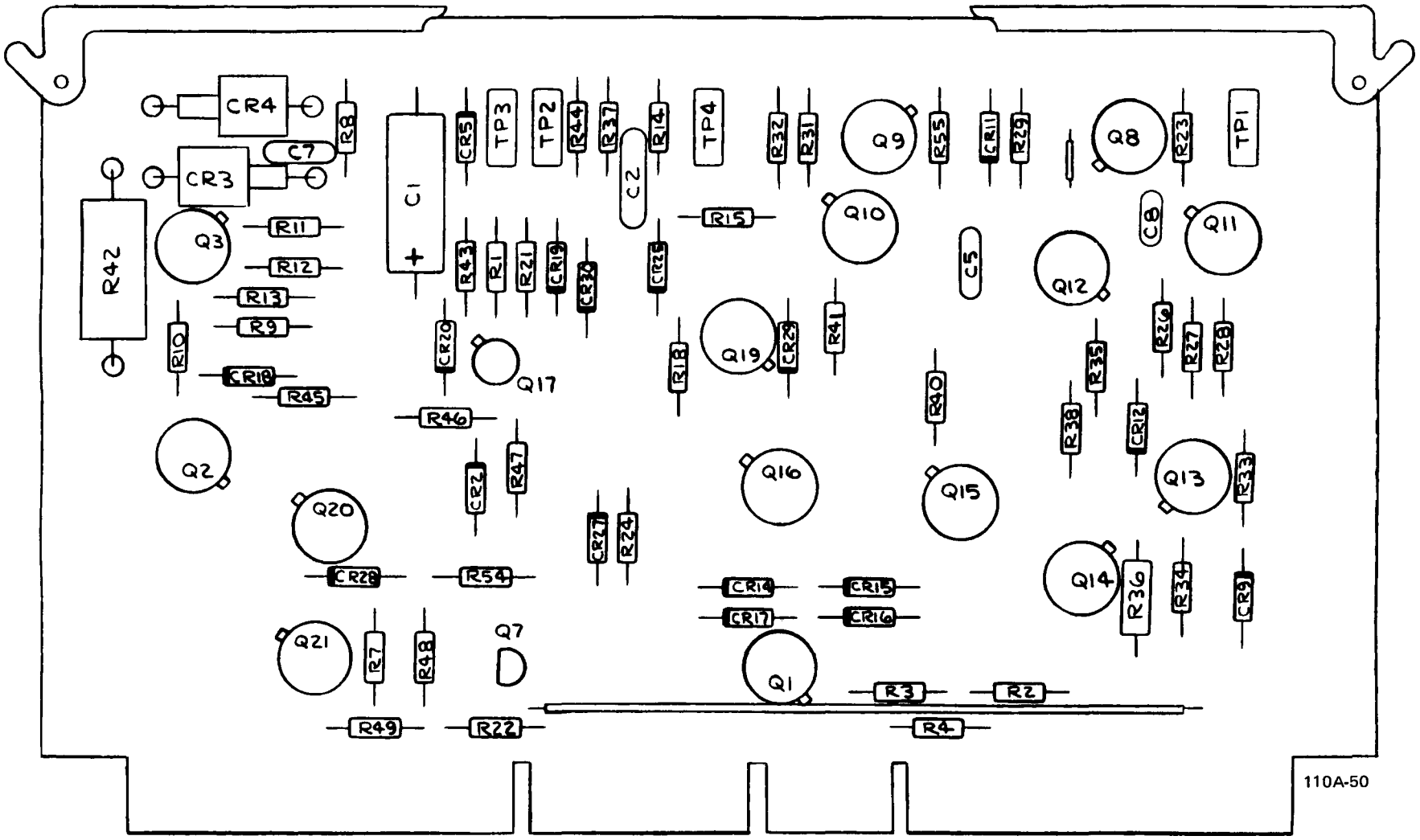


Figure 7-11. Driver Transformer Assembly 1A1A4, Part No. 0082-3800, Component Locations (Sheet 3 of 3)



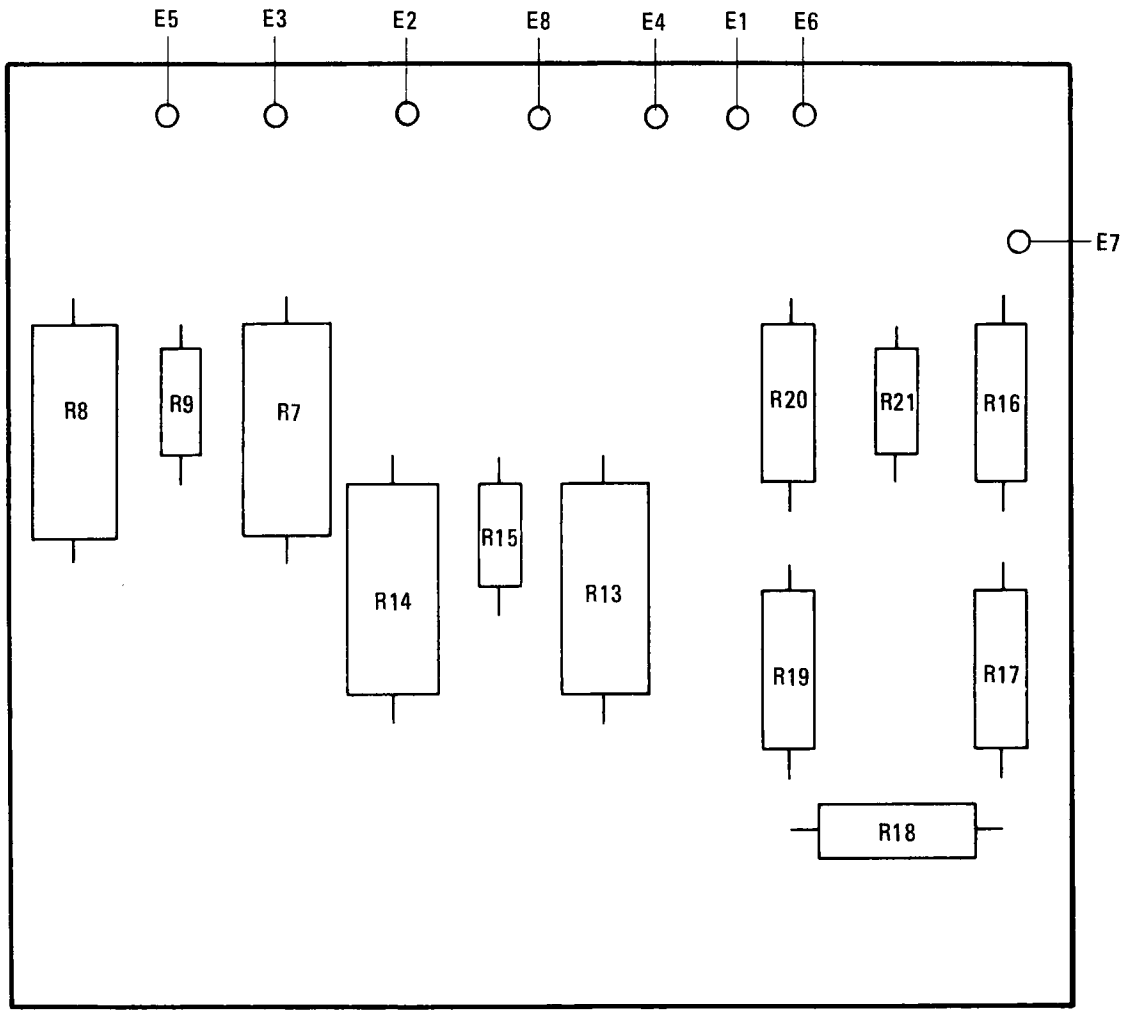
NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A5.

Figure 7-12. Dc Power Control PWB 1A1A5, Part No. 0082-3360, Component Locations



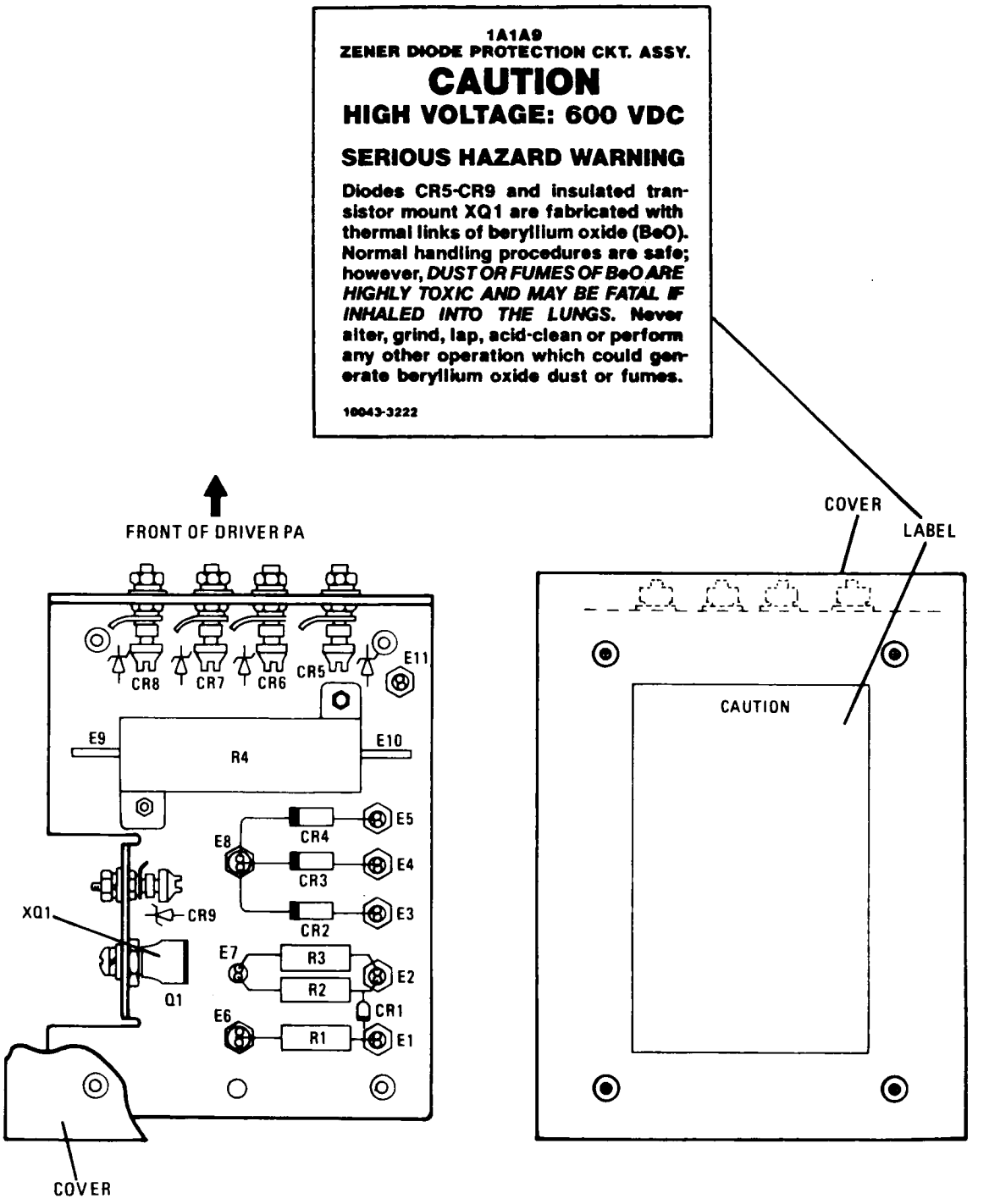
NOTE: COMPLETE REFERENCE DESIGNATION PREFIX WITH 1A1A6.

Figure 7-13. APC-PPC PWB Assembly 1A1A6, Part No. 0825-3340, Component Locations



NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A7. 110A-51(1)

Figure 7-14. Meter Resistor PWB 1A1A7, Part No. 0020-3400 Component Locations



NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A9.

DETAIL A. COMPONENT LOCATIONS – TOP VIEW

NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A9.

DETAIL B. COMPONENT LOCATIONS – TOP VIEW (COVER INSTALLED)

745-076

Figure 7-15. Zener Diode Protector Assembly 1A1A9, Part No. 10043-3220, Component Locations

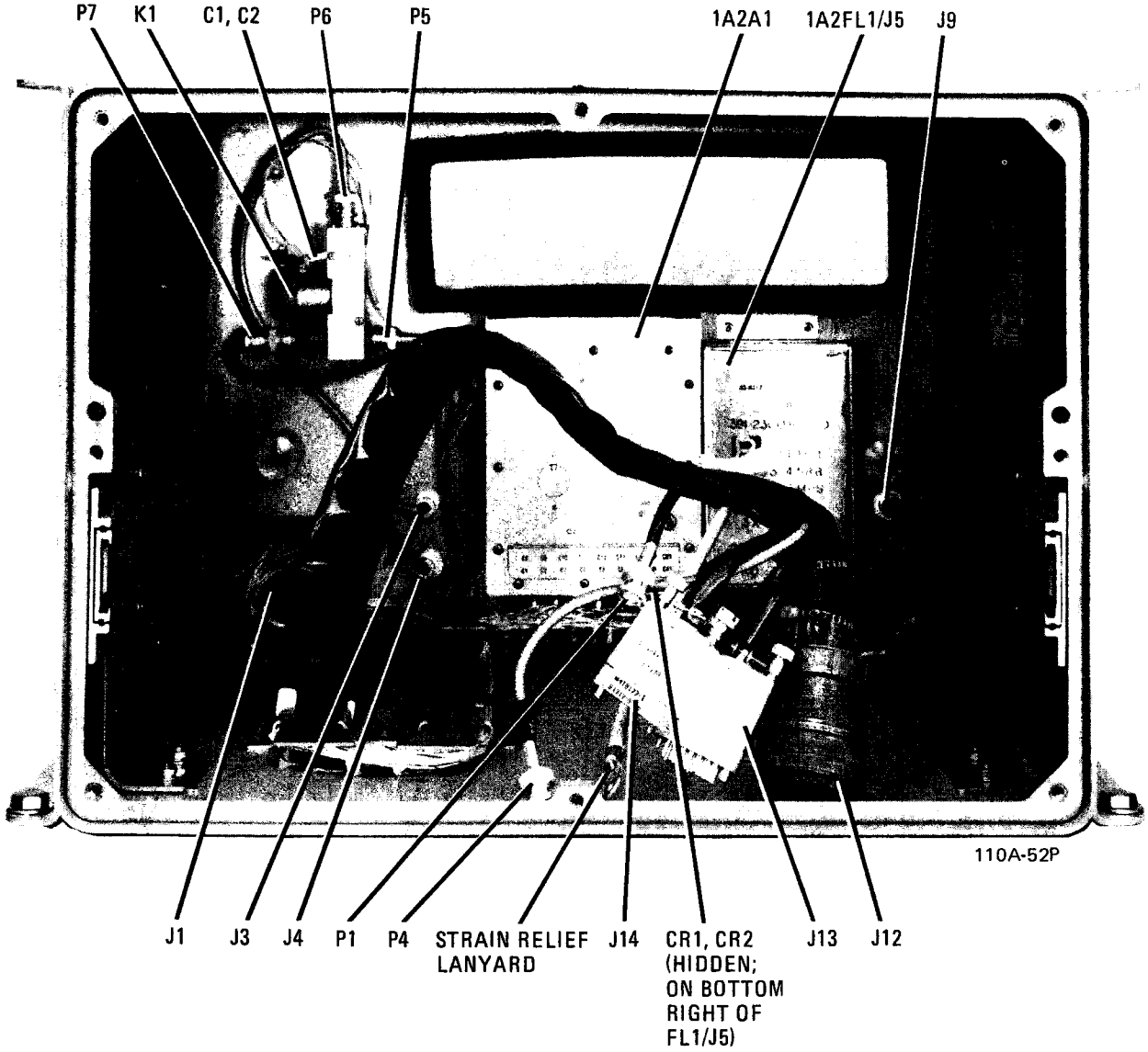
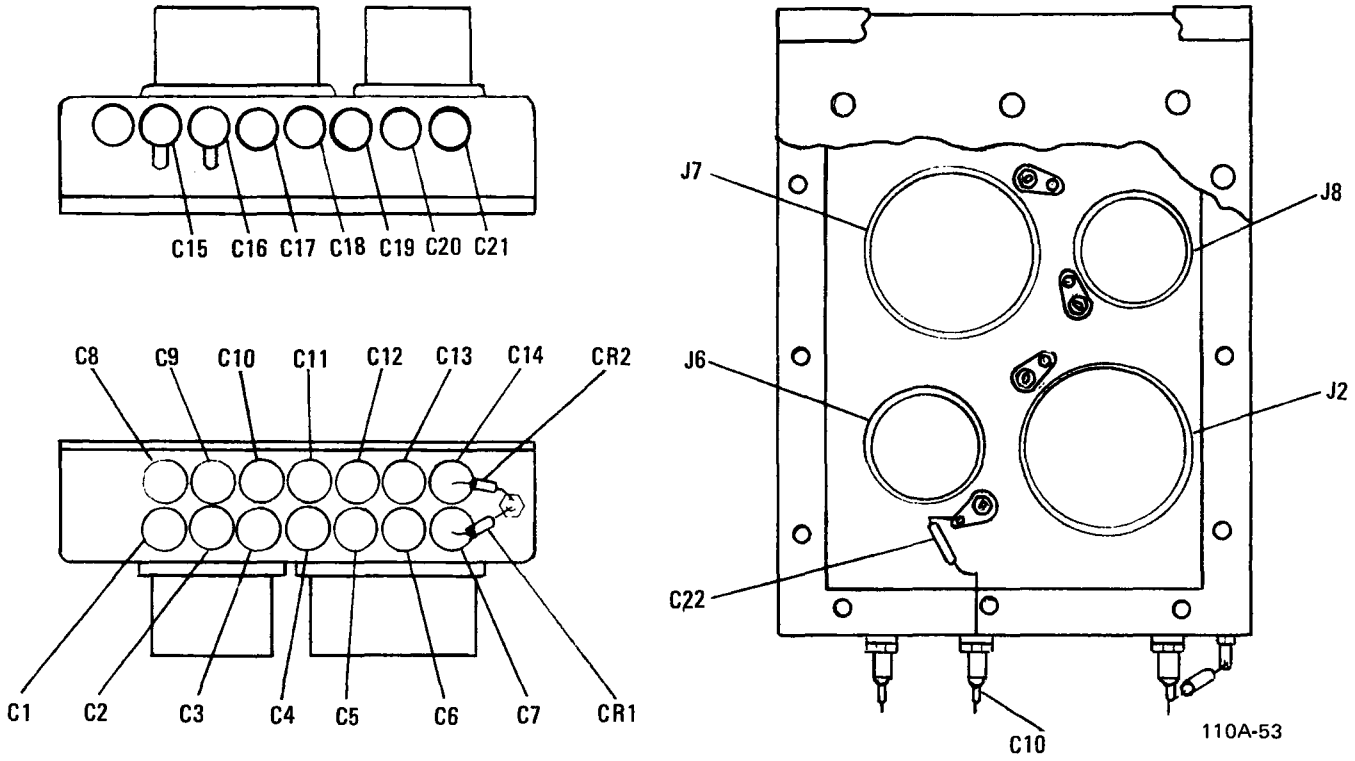


Figure 7-16. Case Assembly 1A2, Part No. 0082-2000, Component Locations

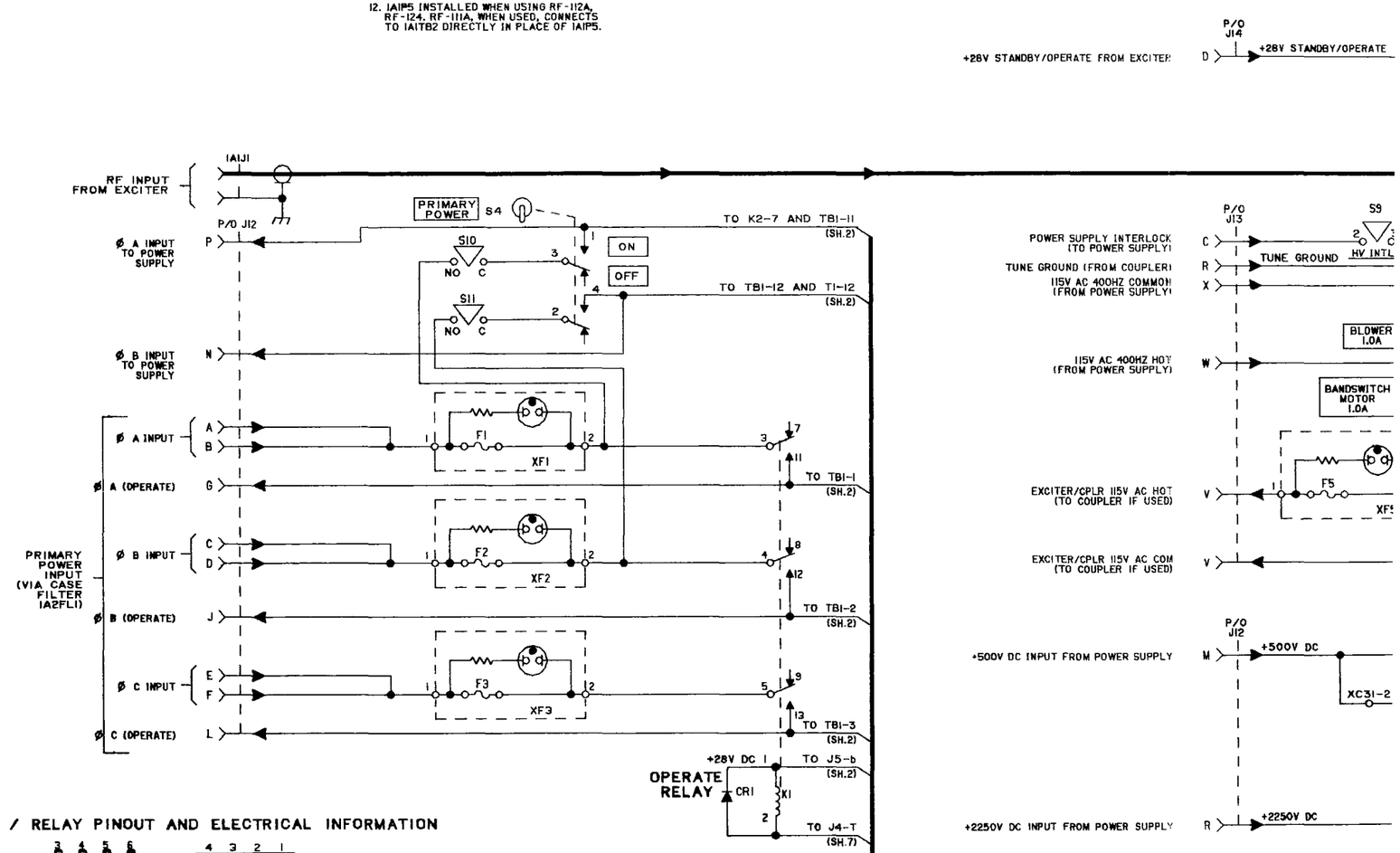


NOTE: PREFIX ALL REFERENCE DESIGNATIONS WITH 1A2A1.

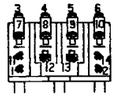
Figure 7-17. Filter Box Assembly 1A2A1, Part No. 391-2100, Component Locations

NOTE: UNLESS OTHERWISE SPECIFIED:

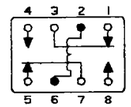
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±10%.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
4. ALL INDUCTOR VALUES ARE IN MICROHENRIES.
5. ALL DIODES ARE TYPE 1N3611.
6. ALL TRANSISTORS ARE TYPE 2N1613.
7. [ ] INDICATES MARKINGS ON FRONT OR OTHER PANELS.
8. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY. COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.
9. P6 AND P7 CONECTIONS TO J6-J11 ARE SELECTED TO BALANCE PLATE CURRENTS FOR FINAL AMPLIFIER TUBES 1A1V1 AND 1A1V2.
10. CONNECT T1 PRIMARY ACCORDING TO PRIMARY POWER:
    115V AC - CONNECT 1-4-7-10, 3-6-9-12:
    INPUT TO 1 AND 12.
    208V AC - CONNECT 1-4, 2-5-7-10, 8-11:
    INPUT TO 1 AND 11.
    230V AC - CONNECT 1-4, 3-6-7-10, 9-12:
    INPUT TO 1 AND 12
    440V AC - CONNECT 3-4, 6-7, 9-10:
    INPUT TO 1 AND 11.
11. 1A1F1-F3:
    25A FOR 115V AC PRIMARY POWER.
    25A FOR 230V AC PRIMARY POWER.
    15A FOR 208V AC PRIMARY POWER.
    7A SLO FOR 440V AC PRIMARY POWER.
12. 1A1P5 INSTALLED WHEN USING RF-112A, RF-124, RF-111A, WHEN USED, CONNECTS TO 1A1TB2 DIRECTLY IN PLACE OF 1A1P5.



CONTACTOR / RELAY PINOUT AND ELECTRICAL INFORMATION



OPERATE RELAY 1A1K1

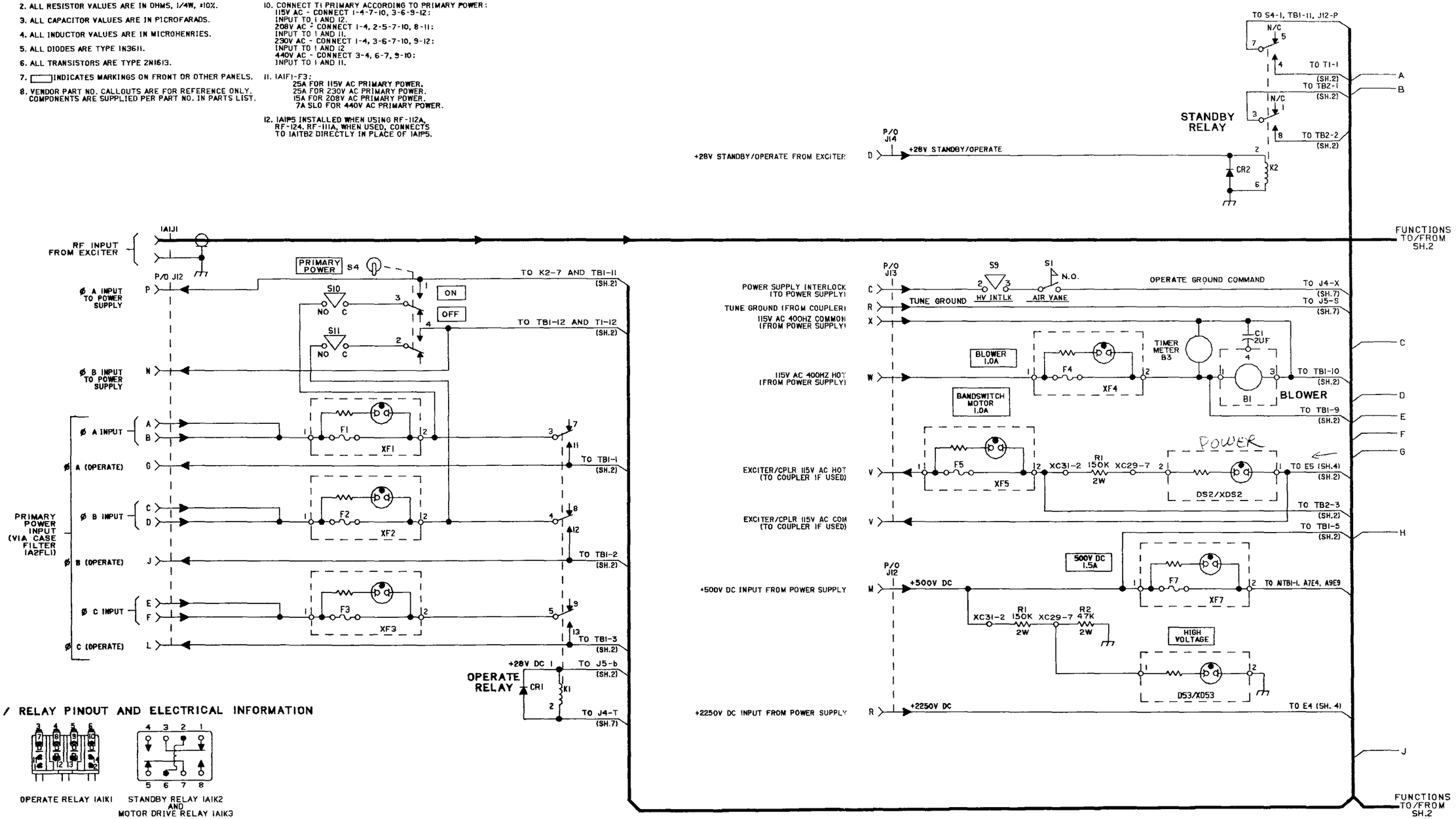


STANDBY RELAY 1A1K2 AND MOTOR DRIVE RELAY 1A1K3

RELAY COIL	RESISTANCE (OHMS)	OPER. VOLTS (VOLTS DC)	CURRENT (MILLIAMPERES)
1A1K1	132	24	182
1A1K2	300	26.5	88
1A1K3	300	26.5	88

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±10%.
3. ALL CAPACITOR VALUES ARE IN PICROFARADS.
4. ALL INDUCTOR VALUES ARE IN MICROHENRIES.
5. ALL DIODES ARE TYPE IN3611.
6. ALL TRANSISTORS ARE TYPE 2N1613.
7. [ ] INDICATES MARKINGS ON FRONT OR OTHER PANELS.
8. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY. COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.
9. P6 AND P7 CONECTIONS TO J6-J11 ARE SELECTED TO BALANCE PLATE CURRENTS FOR FINAL AMPLIFIER TUBES 1A1V1 AND 1A11V2.
10. CONNECT T1 PRIMARY ACCORDING TO PRIMARY POWER:
    115V AC - CONNECT 1-4-7-10, 3-6-9-12: INPUT TO 1 AND 12.
    208V AC - CONNECT 1-4, 2-5-7-10, 8-11: INPUT TO 1 AND 11.
    230V AC - CONNECT 1-4, 3-6-7-10, 9-12: INPUT TO 1 AND 12
    440V AC - CONNECT 3-4, 6-7, 9-10: INPUT TO 1 AND 11.
11. 1A1F1-F3:
    25A FOR 115V AC PRIMARY POWER.
    25A FOR 230V AC PRIMARY POWER.
    15A FOR 208V AC PRIMARY POWER.
    7A SLO FOR 440V AC PRIMARY POWER.
12. 1A1P5 INSTALLED WHEN USING RF-112A. RF-124, RF-111A, WHEN USED, CONNECTS TO 1A1TB2 DIRECTLY IN PLACE OF 1A1P5.



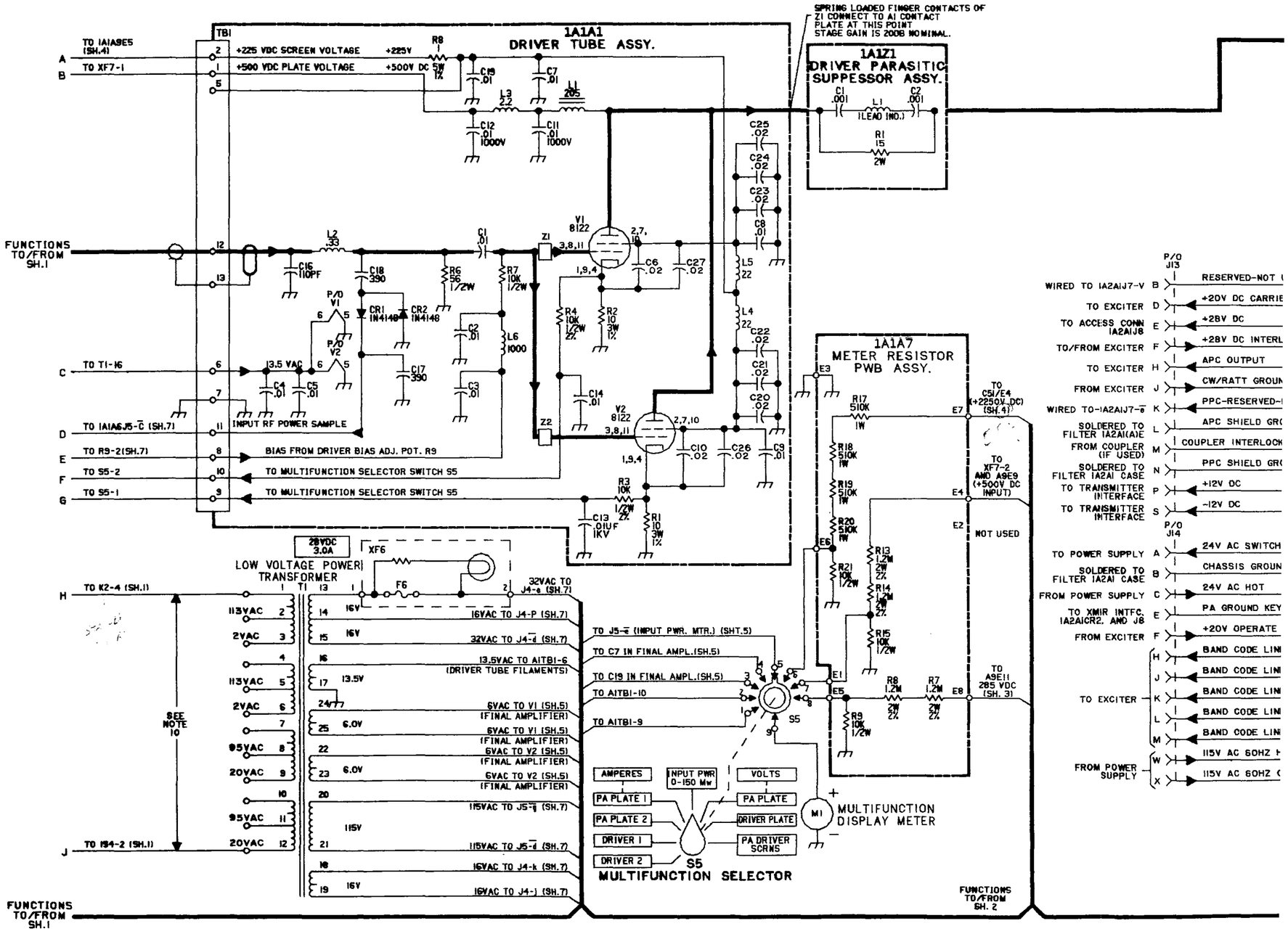
CONTACTOR / RELAY PINOUT AND ELECTRICAL INFORMATION

OPERATE RELAY 1A1K1

STANDBY RELAY 1A1K2 AND MOTOR DRIVE RELAY 1A1K3

RELAY COIL	RESISTANCE (OHMS)	OPER. VOLTS (VOLTS DC)	CURRENT (MILLIAMPERES)
1A1K1	132	24	182
1A1K2	300	26.5	88
1A1K3	300	26.5	88

Figure 7-18. Main Chassis Assembly 1A1 Schematic Diagram (1932-1001) (Sheet 1 of 7)


1A1A1
DRIVER TUBE ASSY.
TBI
TO IAIA9E5 (SH.4)
TO XF7-1
+225 VDC SCREEN VOLTAGE
+500 VDC PLATE VOLTAGE
+225V
+500V DC
R8 5W 1%
SPRING LOADED FINGER CONTACTS OF Z1 CONNECT TO A1 CONTACT PLATE AT THIS POINT STAGE GAIN IS 200B NOMINAL.
1A1Z1
DRIVER PARASITIC SUPPESSOR ASSY.
C1 .001
L1 (LEAD IND.)
C2 .001
R1 15 2W
FUNCTIONS TO/FROM SH.1
L2 .33
C16 110PF
C18 390
R6 56 1/2W
C1 .01
Z1
R7 10K 1/2W
V1 8122
3,8,11
2,7, 10
1,9,4
C6 .02
C27 .02
C25 .02
C24 .02
C23 .02
C8 .01
L5 22
L4 22
C22 .02
C21 .02
C20 .02
P/O V1
CR1 IN4148
CR2 IN4148
C2 .01
L6 1000
C3 .01
C17 390
R4 10K 1/2W 2%
R2 10 3W 1%
C14 .01
V2 8122
3,8,11
2,7,10
1,9,4
C10 .02
C26 .02
C9 .01
C4 .01
C5 .01
13.5 VAC
INPUT RF POWER SAMPLE
TO TI-16
TO IAIA6J5-C (SH.7)
TO R9-2(SH.7)
TO S5-2
TO S5-1
BIAS FROM DRIVER BIAS ADJ. POT. R9
TO MULTIFUNCTION SELECTOR SWITCH S5
TO MULTIFUNCTION SELECTOR SWITCH S5
R3 10K 1/2W 2%
C13 .01UF 1KV
R1 10 3W 1%
1A1A7
METER RESISTOR PWB ASSY.
E3
R17 510K 1W
E7
TO C5J/E4 (+225V DC) (SH.4)
R18 510K 1W
R19 510K 1W
R20 510K 1W
E4
TO XF7-2 AND A9E9 (+500V DC INPUT)
E2
NOT USED
E6
R21 10K 1/2W
R13 1.2M 2W 2%
R14 1.2M 2W 2%
R15 10K 1/2W
E1
E5
R8 1.2M 2W 2%
R7 1.2M 2W 2%
E8
R9 10K 1/2W
TO A9E11 285 VDC (SH. 3)
28VDC 3.0A
XF6
LOW VOLTAGE POWER TRANSFORMER
T1
F6
32VAC TO J4-a (SH.7)
TO K2-4 (SH.1)
SEE NOTE 10
TO I84-2 (SH.1)
115VAC
2VAC
95VAC
20VAC
16V
13.5V
6.0V
115V
16VAC TO J4-P (SH.7)
32VAC TO J4-d (SH.7)
13.5VAC TO A1TB1-6 (DRIVER TUBE FILAMENTS)
6VAC TO V1 (SH.5) (FINAL AMPLIFIER)
6VAC TO V2 (SH.5) (FINAL AMPLIFIER)
115VAC TO J5-g (SH.7)
115VAC TO J5-d (SH.7)
16VAC TO J4-k (SH.7)
16VAC TO J4-j (SH.7)
TO J5-e (INPUT PWR. MTR.) (SHT.5)
TO C7 IN FINAL AMPL.(SH.5)
TO C19 IN FINAL AMPL.(SH.5)
TO A1TB1-10
TO A1TB1-9
S5
AMPERES
INPUT PWR 0-150 Mw
VOLTS
PA PLATE 1
PA PLATE 2
DRIVER 1
DRIVER 2
PA PLATE
DRIVER PLATE
PA DRIVER SCRNS
S5 MULTIFUNCTION SELECTOR
M1
MULTIFUNCTION DISPLAY METER
FUNCTIONS TO/FROM SH. 2
FUNCTIONS TO/FROM SH.1
P/O J13
WIRED TO IA2AIJ7-V
TO EXCITER
TO ACCESS CONN IA2AIJ8
TO/FROM EXCITER
TO EXCITER
FROM EXCITER
WIRED TO-IA2AIJ7-e
SOLDERED TO FILTER IA2AI(A)E
FROM COUPLER (IF USED)
SOLDERED TO FILTER IA2AI CASE
TO TRANSMITTER INTERFACE
TO TRANSMITTER INTERFACE
RESERVED-NOT U
+20V DC CARRIE
+28V DC
+28V DC INTERL
APC OUTPUT
CW/RATT GROUN
PPC-RESERVED-I
APC SHIELD GRO
COUPLER INTERLOCK
PPC SHIELD GRO
+12V DC
-12V DC
P/O J14
TO POWER SUPPLY
SOLDERED TO FILTER IA2AI CASE
FROM POWER SUPPLY
TO XMIR INTFC. IA2AICR2, AND J8
FROM EXCITER
TO EXCITER
FROM POWER SUPPLY
24V AC SWITCH
CHASSIS GROUN
24V AC HOT
PA GROUND KEY
+20V OPERATE
BAND CODE LIN
BAND CODE LIN
BAND CODE LIN
BAND CODE LIN
BAND CODE LIN
115V AC 60HZ H
115V AC 60HZ C

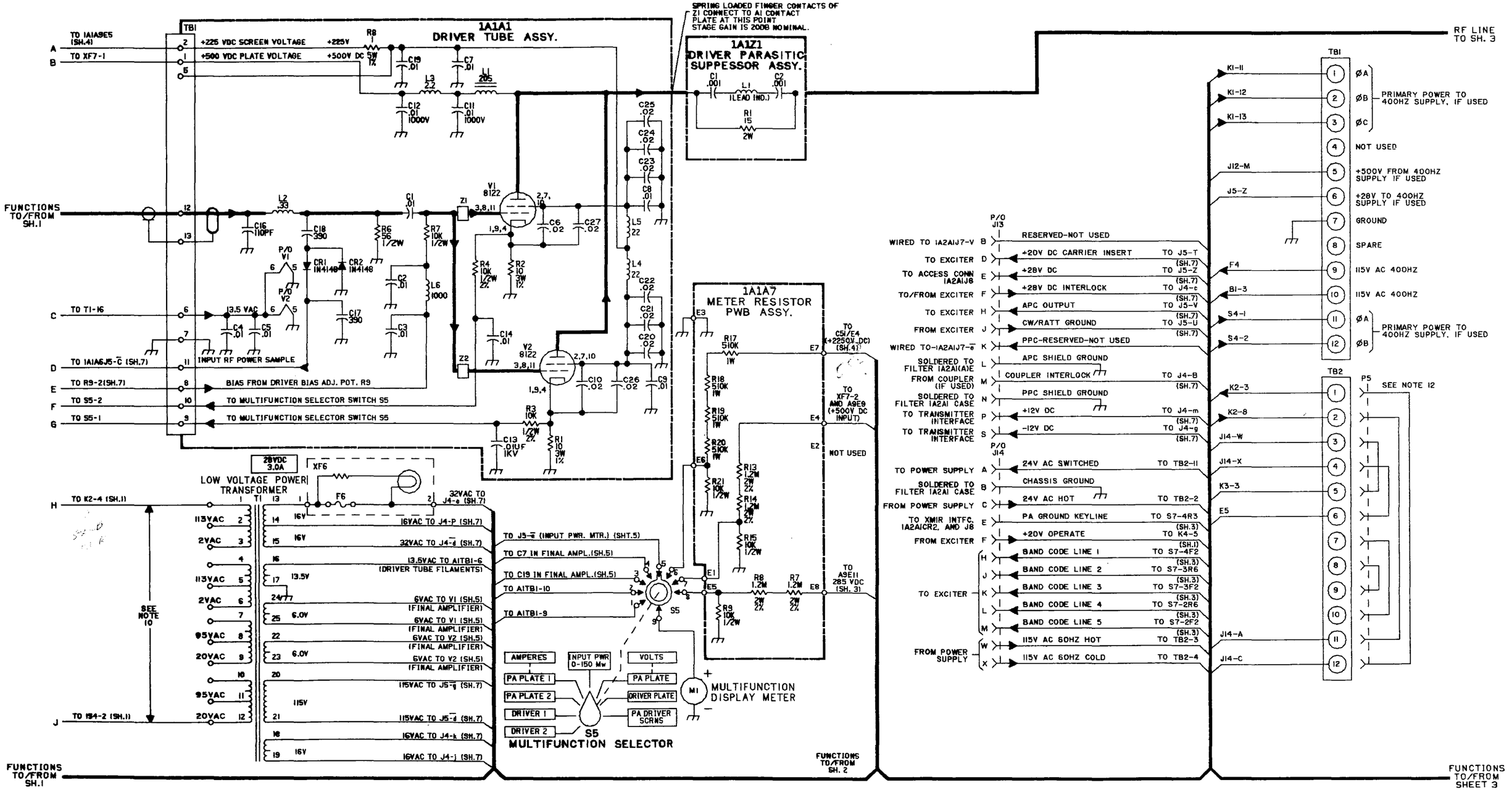


Figure 7-18. Main Chassis Assembly 1A1 Schematic Diagram (1932-1001) (Sheet 2 of 7)

RF LINE FROM SHEET 2

RF INPUT FROM A1 DRIVER TUBE ASSY VIA 1A1Z1 DRIVER PARASITIC SUPPRESSOR ASSY

E1

SPRING-LOADED FINGER CONTACTS OF 1A1Z1 CONNECT TO DRIVER TRANS. CONTACT PLATE 1A1A4E1 AT THIS POINT

C1 .01UF 1000V

1A1A4 DRIVER TRANSFORMER ASSY

TP1

FREQUENCY MEGAHERTZ

S7 (SHOWN IN AUTOMATIC POSITION)

SECTION 1 FRONT

SECTION 1 REAR

SECTION 2 FRONT

SECTION 2 REAR

SECTION 3 FRONT

SECTION 3 REAR

SECTION 4 FRONT

SECTION 4 REAR

P/O 1A1J14

BAND CODE LINE 5 (FROM EXCITER) M

BAND CODE LINE 4 (FROM EXCITER) L

BAND CODE LINE 3 (FROM EXCITER) K

BAND CODE LINE 2 (FROM EXCITER) J

BAND CODE LINE 1 (FROM EXCITER) H

PA GROUND KEYLINE E

B

CR14 1U361I

BANDSWITCH SECTION S1-B FRONT

BANDSWITCH SECTION S1-A FRONT

1A1A4A1 TRANSFORMER ASSEMBLY

L1 2.0 - 2.5MHZ

NOTE: THE TR ASSY SCHEMAT APPLIES TO 1A THERE ARE AC TRANSFORMER 1A1A4A1 THROU WHOSE CONFIG VARIES WITH T SELECTED. RI THE MAIN SCH DIAGRAM FOR INFORMATION.

TB1

1 CODE LINE 1 (LOGIC 0)

2 CODE LINE 2 (LOGIC 0)

3 CODE LINE 3 (LOGIC 0)

4 CODE LINE 4 (LOGIC 0)

5 CODE LINE 5 (LOGIC 1)

6 BAND CHANGE GROUND

NOTE: COMPONENTS SHOWN HERE ARE FOR REFER TO THE SCHEMATIC DIAGRAM SCHEMATIC REPRESENTATION OF AL

ALL CONNECTIONS TO UNITS EXTERNAL TO MAIN CHASSIS ASSY 1A1 ARE VIA CASE ASSY 1A2. REFER TO SCH. DIA. DWG. 7932-2001 FOR ADDITIONAL INFORMATION.

TO J4-E (SH.7)

FUNCTIONS FROM/TO SHEET 2

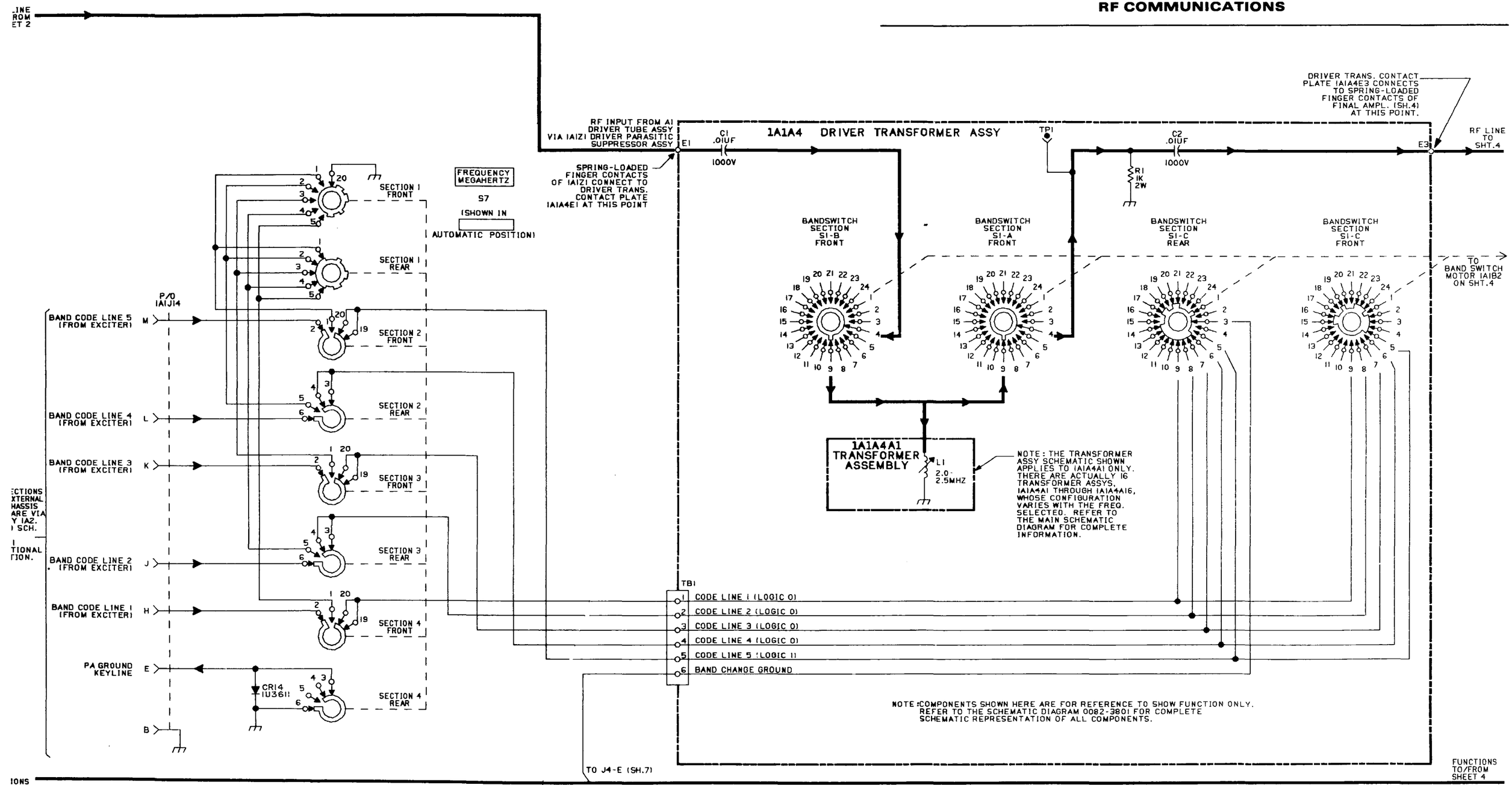


Figure 7-18. Main Chassis Assembly 1A1 Schematic Diagram (1932-1001) (Sheet 3 of 7)

RF LINE FROM SHEET 3

FROM BANDSWITCH SECTIONS S1-A FRONT, S1-B FRONT, S1-C FRONT AND REAR

TO TB2-5 (115 VAC) (SH.2)

TO J4-5 (28V DC) (SH.7)

CR12

K3

MOTOR DRIVE RELAY

TO J4-C (SH.7)
(MOTOR DRIVE GROUND-GROUND WHEN MOTOR IS RUNNING)

TO TB2-6 (SH.2)

B2

BANDSWITCH MOTOR

TO FINAL TRANSFORMER ASSEMBLY 1A1A2 (SHEET 6)

J11 319V
CR11 IN4461
J10 312V
CR10 IN4461
J9 305V
CR9 IN4461
J8 299V
CR8 IN4461
J7 292V
CR7 IN4461
J6 285V

TO A7E4 (500V DC) (SH.2)

TO A7E8 (285V DC) (SH.2)

1A1A9 ZENER DIODE PROTECTOR ASSY

CR9 UZ7840V
R4 12.1K 30W 1%
285V
CR8 UZ7860V
225V
CR7 UZ7875V
160V
CR6 UZ7875V
75V
CR5 UZ7875V
CR1 IN3611
R1 10 1W
R2 10 1W
R3 10 1W
CR2 IN5552
CR3 IN5552

NOTE: 1A1P6 AND 1A1P
TO 1A1J6 THROU
TO BALANCE TH
OF FINAL AMPL

P7
P6

FUNCTIONS FROM/TO SHEET 3

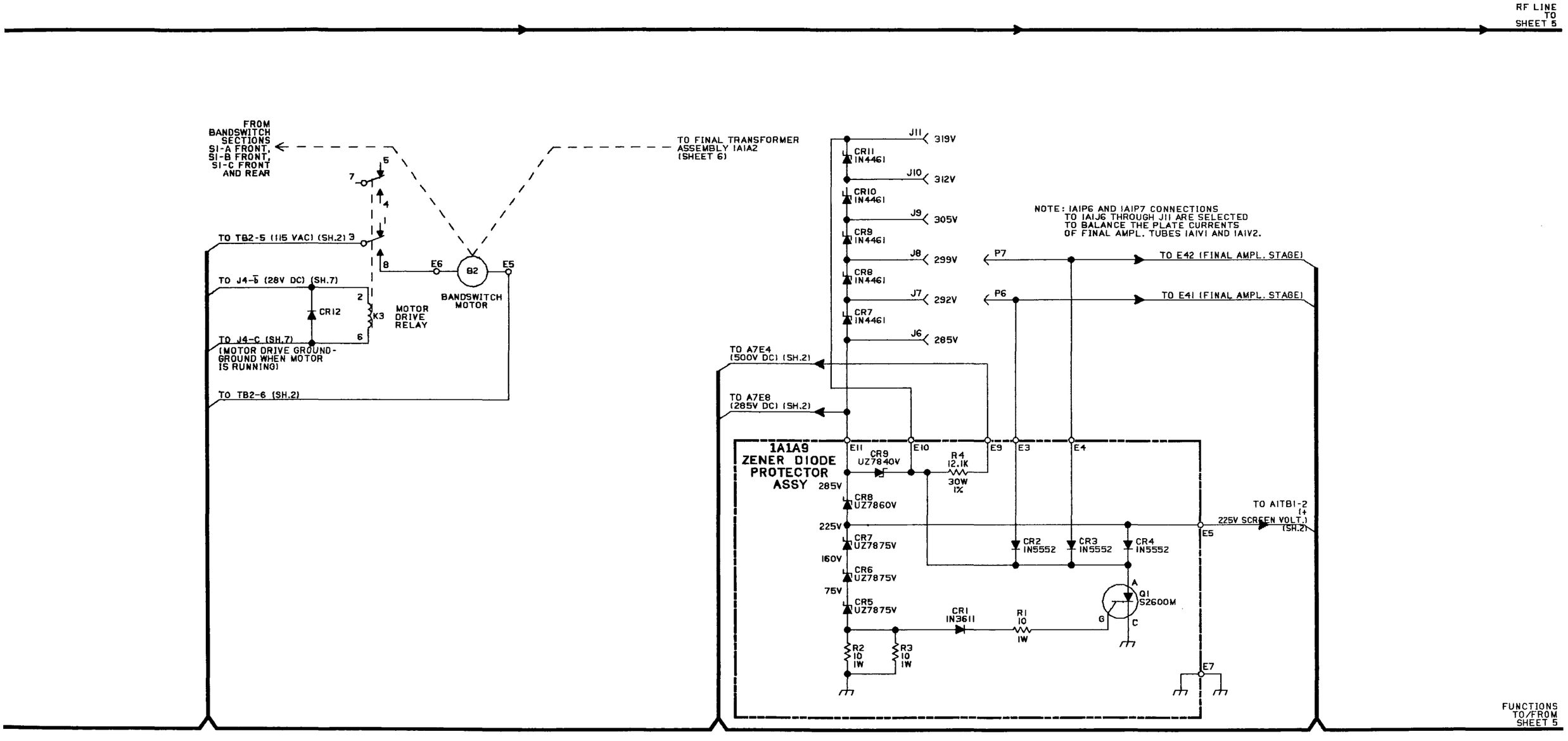
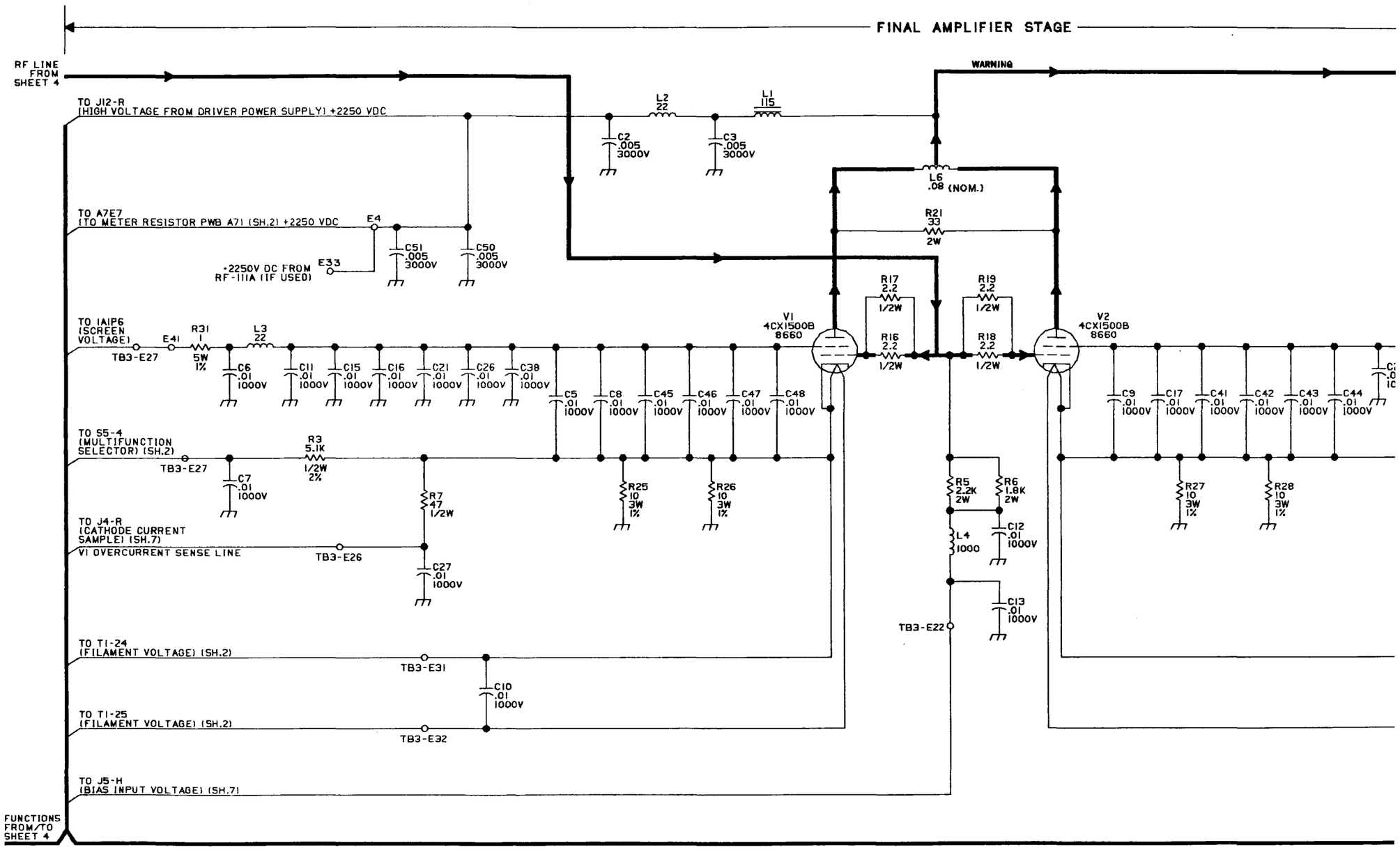


Figure 7-18. Main Chassis Assembly 1A1 Schematic Diagram (1932-1001) (Sheet 4 of 7)


FINAL AMPLIFIER STAGE
RF LINE FROM SHEET 4
WARNING
TO J12-R (HIGH VOLTAGE FROM DRIVER POWER SUPPLY) +2250 VDC
L2 22
L1 115
C2 .005 3000V
C3 .005 3000V
L6 .08 (NOM.)
TO A7E7 (TO METER RESISTOR PWB A7) (SH.2) +2250 VDC
E4
R21 33 2W
C51 .005 3000V
C50 .005 3000V
+2250V DC FROM RF-111A (IF USED)
E33
R17 2.2 1/2W
R19 2.2 1/2W
V1 4CX1500B 8660
V2 4CX1500B 8660
TO 1A1P6 (SCREEN VOLTAGE)
E41
R31 1 5W 1%
L3 22
TB3-E27
R16 2.2 1/2W
R18 2.2 1/2W
C6 .01 1000V
C11 .01 1000V
C15 .01 1000V
C16 .01 1000V
C21 .01 1000V
C26 .01 1000V
C38 .01 1000V
C5 .01 1000V
C8 .01 1000V
C45 .01 1000V
C46 .01 1000V
C47 .01 1000V
C48 .01 1000V
C9 .01 1000V
C17 .01 1000V
C41 .01 1000V
C42 .01 1000V
C43 .01 1000V
C44 .01 1000V
TO S5-4 (MULTIFUNCTION SELECTOR) (SH.2)
TB3-E27
R3 5.1K 1/2W 2%
C7 .01 1000V
R7 47 1/2W
R25 10 3W 1%
R26 10 3W 1%
R27 10 3W 1%
R28 10 3W 1%
R5 2.2K 2W
R6 1.8K 2W
TO J4-R (CATHODE CURRENT SAMPLE) (SH.7)
V1 OVERCURRENT SENSE LINE
TB3-E26
L4 1000
C12 .01 1000V
C27 .01 1000V
C13 .01 1000V
TB3-E22
TO T1-24 (FILAMENT VOLTAGE) (SH.2)
TB3-E31
C10 .01 1000V
TO T1-25 (FILAMENT VOLTAGE) (SH.2)
TB3-E32
TO J5-H (BIAS INPUT VOLTAGE) (SH.7)
FUNCTIONS FROM/TO SHEET 4

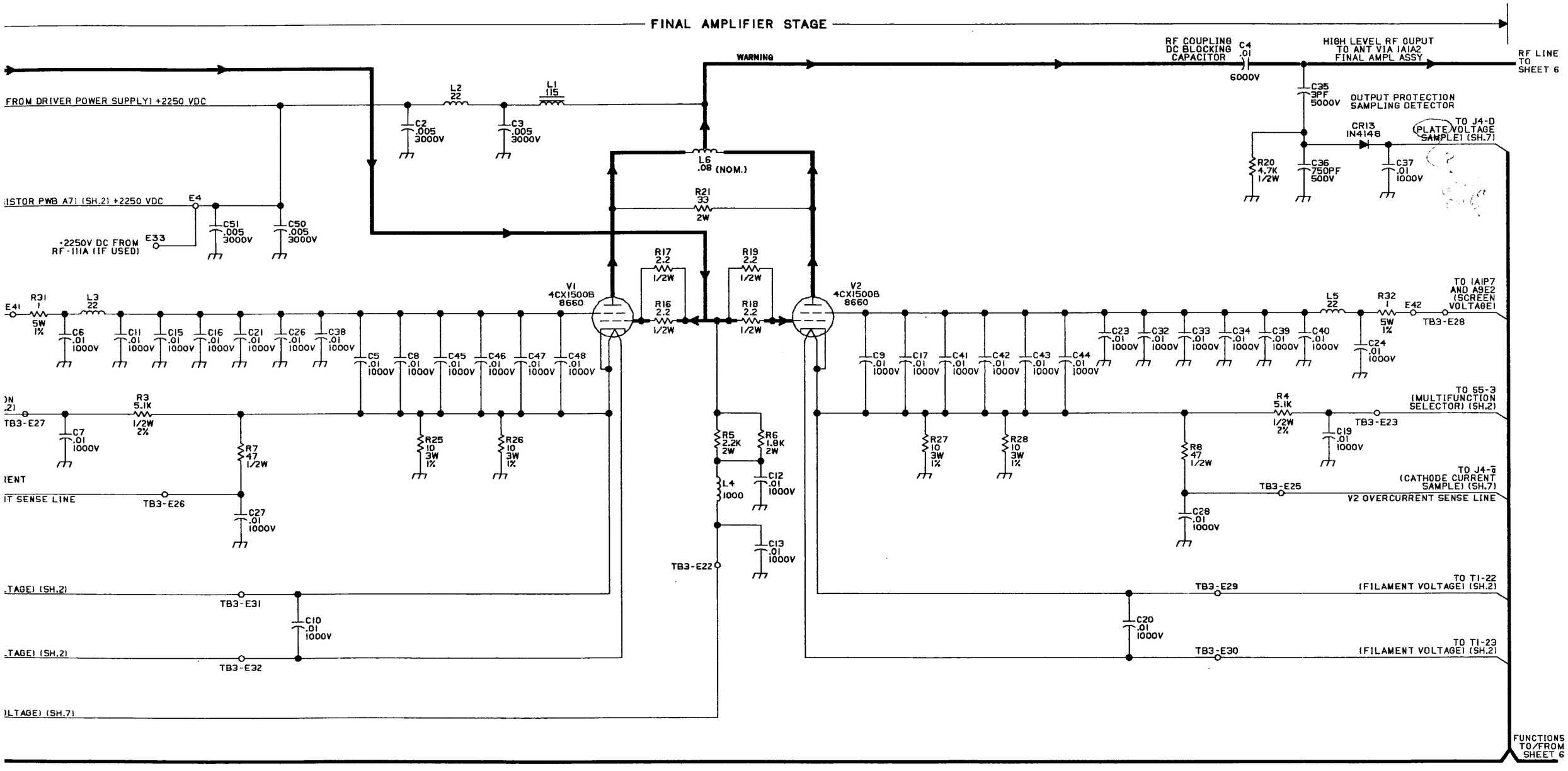


Figure 7-18. Main Chassis Assembly 1A1 Schematic Diagram (1932-1001) (Sheet 5 of 7)

1A1A2 FINAL TRANSFORMER ASSEMBLY

RF LINE FROM SHEET 5

E1

P1

TO BANDSWITCH MOTOR B2 (SHEET 4)

NOTE: BANDSWITCH S1 IS SHOWN IN THE 14-16 MHZ POSITION.

S1-A

S1-B

S1-C

C10 25

1A1A2Z1 TRAP ASSY

R1 82

C1 150

C1 25

1A1A2A12 TRANSFORMER ASSY

L1

L2

C_C = C72 (220PF) AND C73 (300PF)

NOTE: THE TRANSFORMER ASSY SCHEMATIC SHOWN APPLIES TO 1A1A2A12 ONLY, AS DOES THE VALUE OF C_C. THERE ARE ACTUALLY 12 TRANSFORMER ASSYS, 1A1A2A1 THROUGH 1A1A2A12, WHOSE VALUES AND ADDED CAPACITANCES/ INDUCTANCES VARY WITH THE FREQUENCY SELECTED. REFER TO THE MAIN SCHEMATIC DIAGRAM FOR COMPLETE INFORMATION.

NOTE: COMPONENTS SHOWN HERE ARE FOR REFERENCE TO SHOW FUNCTION AT A PARTICULAR FREQUENCY ONLY. REFER TO THE SCHEMATIC DIAGRAM 10051-3701 FOR COMPLETE SCHEMATIC REPRESENTATION OF ALL COMPONENTS.

1A1A3 VSWR

J1

C6 .8-16

L2 .33

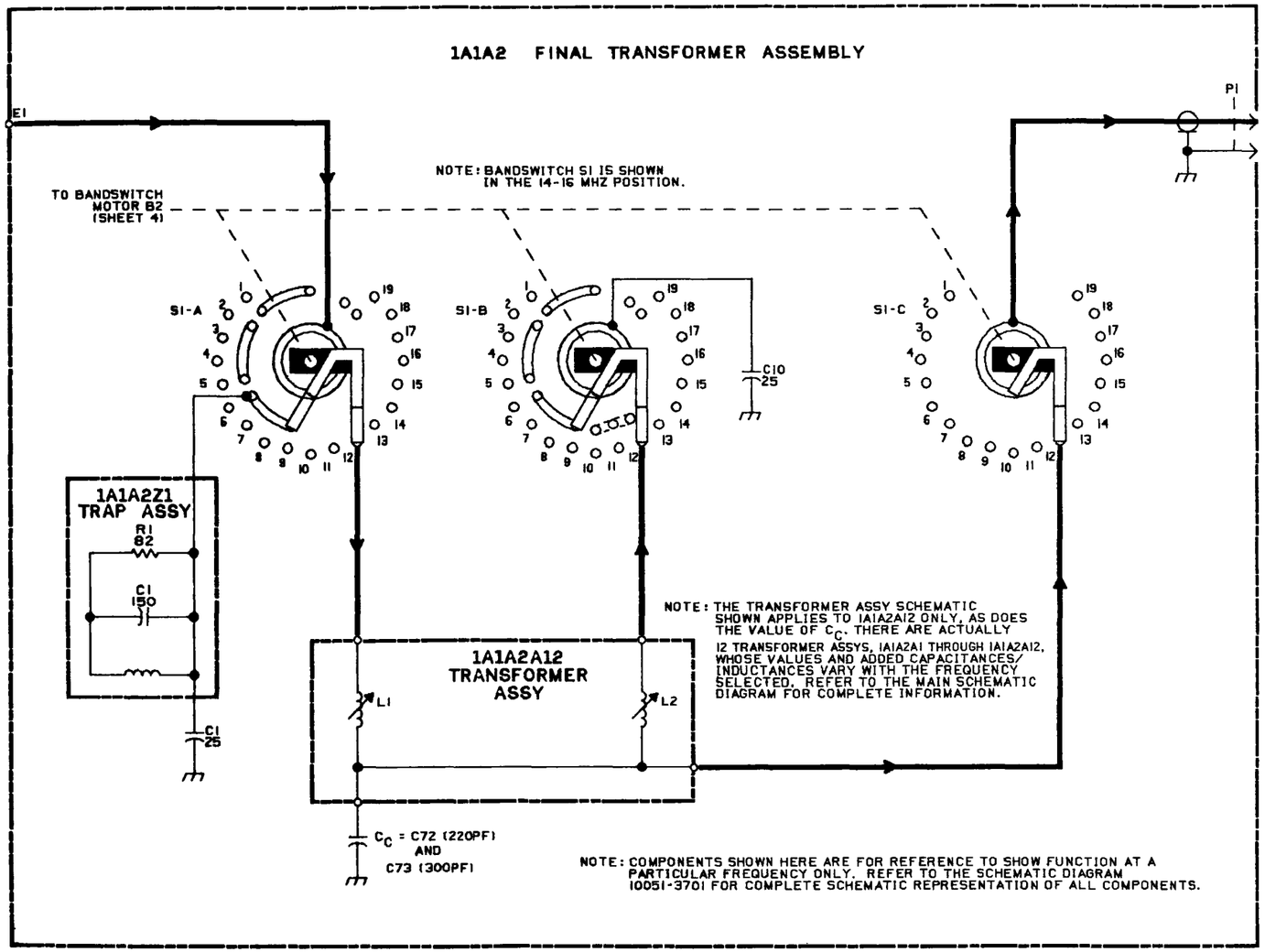
C1 360

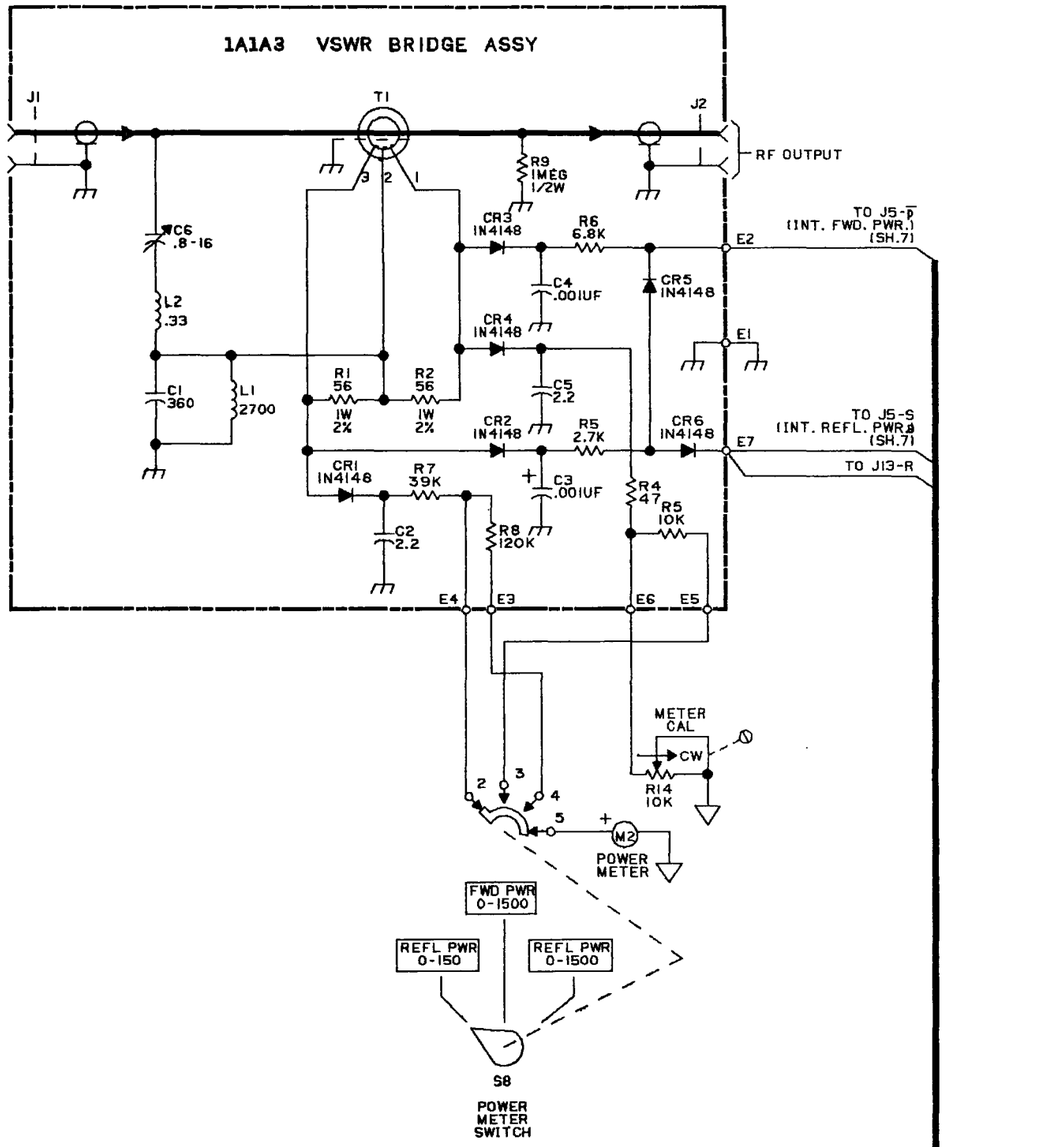
L1 2700

R1 56 1W 2%

CR1 1N4148

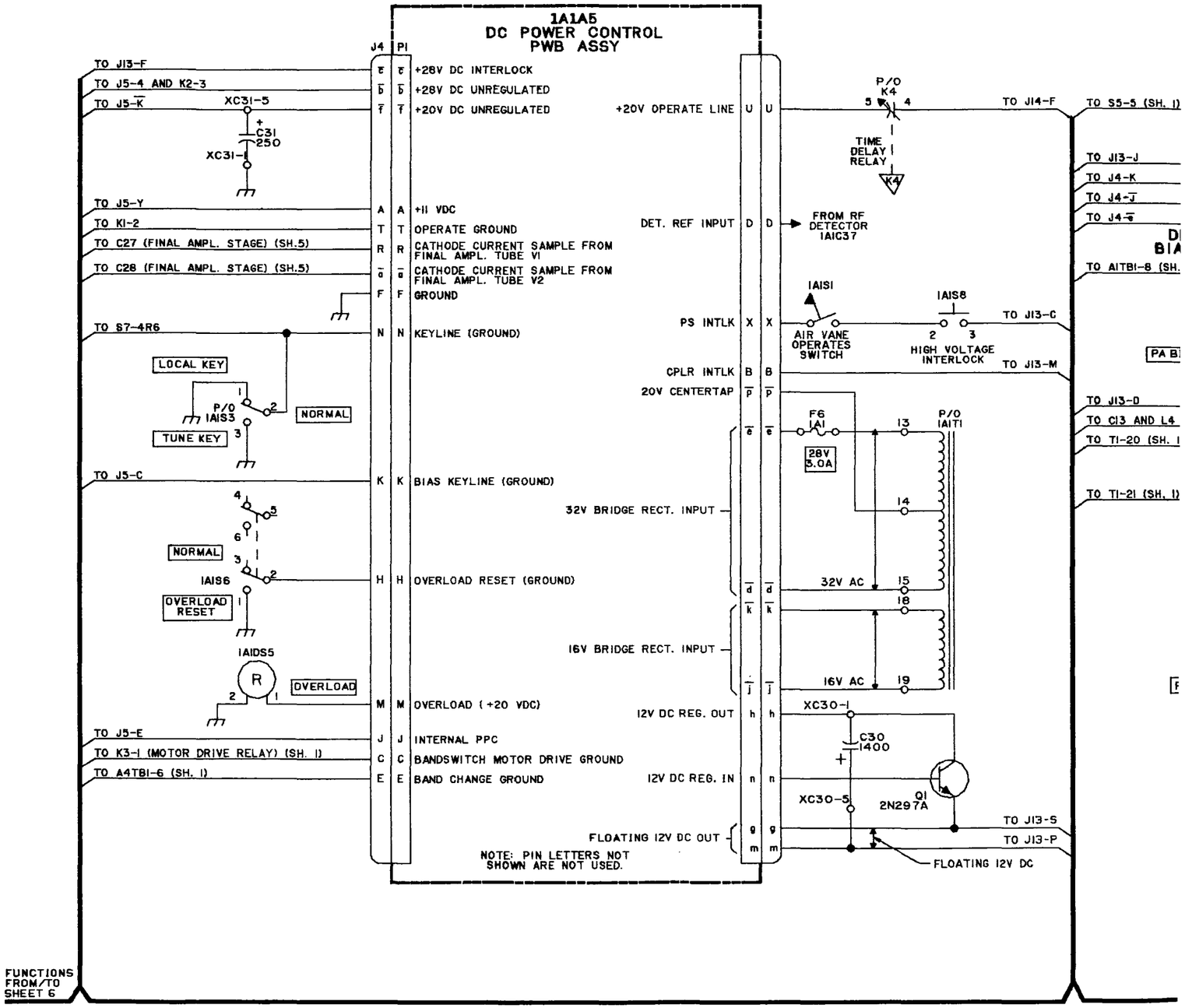
FUNCTIONS FROM/TO SHEET 5





FUNCTIONS TO/FROM SHEET 7

Figure 7-18. Main Chassis Assembly 1A1 Schematic Diagram (1932-1001) (Sheet 6 of 7)


1A1A5
DC POWER CONTROL
PWB ASSY
J4
P1
TO J13-F
TO J5-4 AND K2-3
TO J5-K
XC31-5
C31
250
XC31-1
TO J5-Y
TO K1-2
TO C27 (FINAL AMPL. STAGE) (SH.5)
TO C28 (FINAL AMPL. STAGE) (SH.5)
TO S7-4R6
LOCAL KEY
P/O 1AIS3
NORMAL
TUNE KEY
TO J5-C
NORMAL
1AIS6
OVERLOAD RESET
1AIDS5
R
OVERLOAD
TO J5-E
TO K3-1 (MOTOR DRIVE RELAY) (SH. 1)
TO A4TB1-6 (SH. 1)
+28V DC INTERLOCK
+28V DC UNREGULATED
+20V DC UNREGULATED
+11 VDC
OPERATE GROUND
CATHODE CURRENT SAMPLE FROM FINAL AMPL. TUBE V1
CATHODE CURRENT SAMPLE FROM FINAL AMPL. TUBE V2
GROUND
KEYLINE (GROUND)
BIAS KEYLINE (GROUND)
OVERLOAD RESET (GROUND)
OVERLOAD (+20 VDC)
INTERNAL PPC
BANDSWITCH MOTOR DRIVE GROUND
BAND CHANGE GROUND
+20V OPERATE LINE
DET. REF INPUT
PS INTLK
CPLR INTLK
20V CENTERTAP
32V BRIDGE RECT. INPUT
16V BRIDGE RECT. INPUT
12V DC REG. OUT
12V DC REG. IN
FLOATING 12V DC OUT
NOTE: PIN LETTERS NOT SHOWN ARE NOT USED.
P/O K4
TIME DELAY RELAY
K4
TO J14-F
FROM RF DETECTOR 1AIC37
1AIS1
AIR VANE OPERATES SWITCH
1AIS8
HIGH VOLTAGE INTERLOCK
TO J13-C
TO J13-M
F6 1A1
28V 5.0A
P/O 1AIT1
32V AC
16V AC
XC30-1
C30
1400
XC30-5
Q1
2N297A
TO J13-5
TO J13-P
FLOATING 12V DC
TO S5-5 (SH. 1)
TO J13-J
TO J4-K
TO J4-J
TO J4-G
TO A1TB1-8 (SH.
TO J13-D
TO C13 AND L4
TO T1-20 (SH. 1
TO T1-21 (SH. 1)
FUNCTIONS FROM/TO SHEET 6

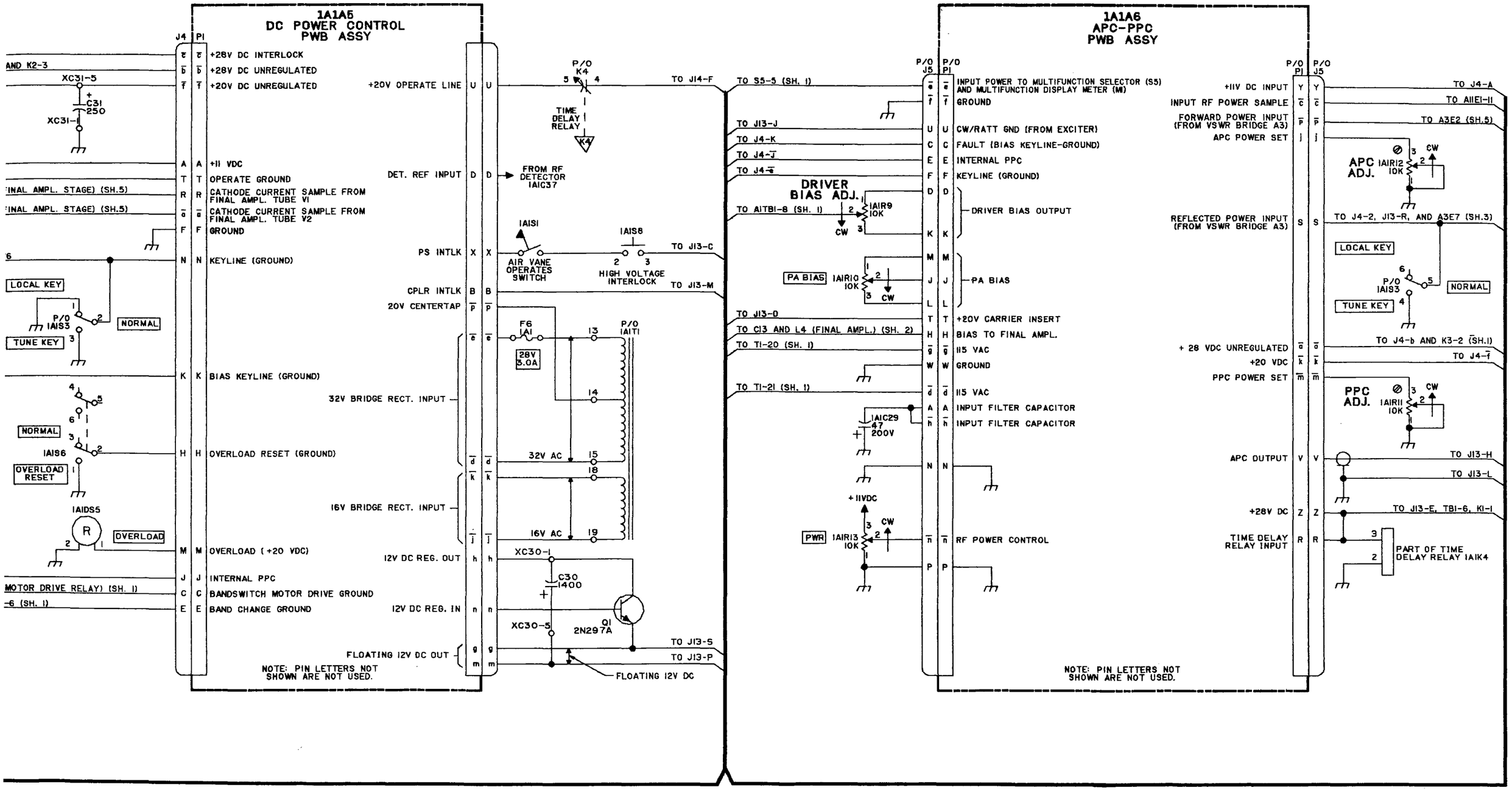


Figure 7-18. Main Chassis Assembly 1A1 Schematic Diagram (1932-1001) (Sheet 7 of 7)

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.

2. ALL RESISTANCE VALUES ARE IN OHMS.

3. ALL CAPACITANCE VALUES ARE IN PICOFARADS.

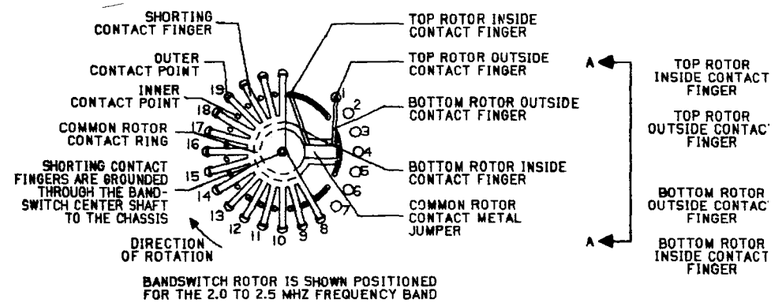
4. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY. COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.

5. BANDSWITCH S1 IS SHOWN IN THE 2.0 TO 2.5 MHZ POSITION.

6. ▲ INDICATES DARK COLOR CODED TUNING NUT SCREW, OR "P" LABELED TUNING NUT. START TUNING WITH THIS AT CLOCKWISE END. (PRIMARY SLUG IS 1/4" TO 1-1/2" FROM TOP OF COIL.)

   ▲ INDICATES UNCODED SCREW. START TUNING WITH THIS AT COUNTERCLOCKWISE END. (SECONDARY SLUG IS 1/4" TO 1-1/2" FROM BOTTOM OF COIL.)

   TURN SLOWLY AND CAREFULLY TO NOT JAM THE SLUGS AGAINST EACH OTHER OR THEIR ENDSTOPS.



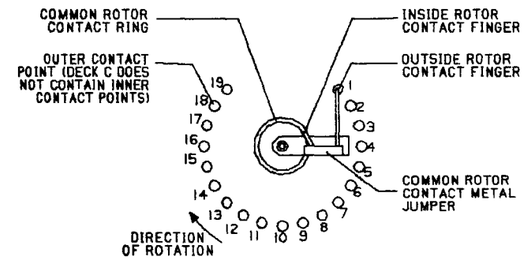
BANDSWITCH ROTOR IS SHOWN POSITIONED FOR THE 2.0 TO 2.5 MHZ FREQUENCY BAND

DETAIL A. BANDSWITCH ELECTROMECHANICAL INFORMATION

DETAIL A NOTES:

1. THERE ARE 15 SHORTING CONTACT FINGERS AND 19 OUTER CONTACT POINTS. THEIR POSTION IS DETERMINED BY THE FREQUENCY BAND SELECTED. THE FINGERS GROUND OUT INACTIVE COMPONENTS CONNECTED TO THE CONTACT POINTS, AS DICTATED BY THE FREQUENCY BAND SELECTED. THE GROUNDING ACTION PREVENTS EXTRANEOUS RESONANCES, WHICH CAN CAUSE DANGEROUSLY HIGH VOLTAGES TO BE BUILT UP, FROM OCCURING.

2. THE TOP AND BOTTOM OUTSIDE AND INSIDE ROTOR CONTACT FINGERS ALLOW THE PROPER CIRCUIT COMPONENTS TO BE CONNECTED FOR THE FREQUENCY BAND SELECTED.



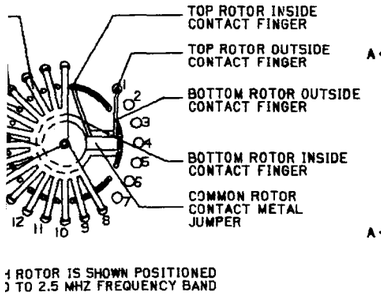
BANDSWITCH ROTOR IS SHOWN POSITIONED FOR THE 2.0 TO 2.5 MHZ FREQUENCY BAND

RF INPUT FROM (A1E2) (MAIN CHASSIS FINAL AMPL.)

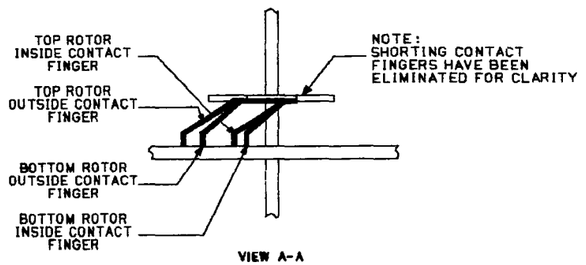
DETAIL B. BANDSWITCH ELECTROMECHANICAL INFORMATION - DECK C

DETAIL B NOTES:

1. ON DECK C, THE OUTER ROTOR CONTACT FINGER ROUTES THE SELECTED TRANSFORMER ASSEMBLY OUTPUT (OF DECKS A AND B) VIA THE OUTSIDE AND INSIDE ROTOR CONTACT FINGERS TO THE LOW PASS FILTER ASSEMBLY. THE OUTPUT OF LOW PASS FILTER ASSEMBLY (P1) IS THE RF OUTPUT OF THE FINAL TRANSFORMER ASSEMBLY.



ROTOR IS SHOWN POSITIONED
TO 2.5 MHZ FREQUENCY BAND

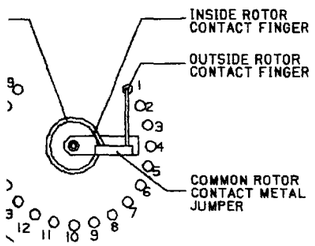


VIEW A-A

DETAIL A. BANDSWITCH ELECTROMECHANICAL INFORMATION - DECKS A AND B

CONTACT FINGERS AND 19 OUTER CONTACT POINTS.
RMINED BY THE FREQUENCY BAND SELECTED. THE
ACTIVE COMPONENTS CONNECTED TO THE CONTACT
THE FREQUENCY BAND SELECTED. THE GROUNDING
ANEOUS RESONANCES, WHICH CAN CAUSE
TAGES TO BE BUILT UP, FROM OCCURING.

UTSIDE AND INSIDE ROTOR CONTACT FINGERS ALLOW
OMPONENTS TO BE CONNECTED FOR THE FREQUENCY

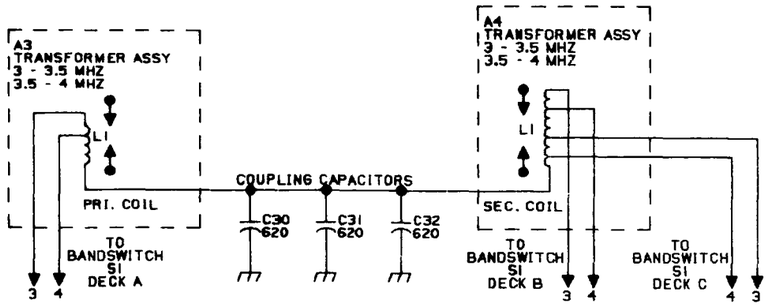


CH ROTOR IS SHOWN POSITIONED
:0 TO 2.5 MHZ FREQUENCY BAND

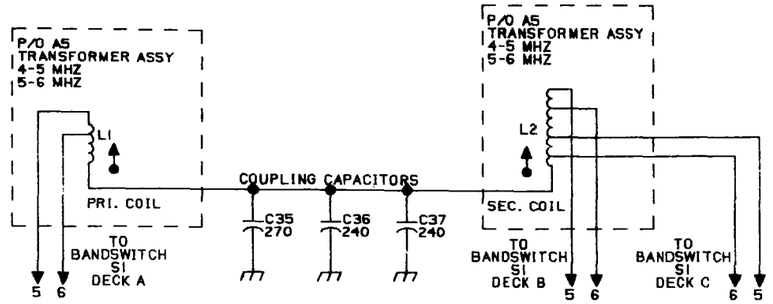
H ELECTROMECHANICAL INFORMATION - DECK C

ROTOR CONTACT FINGER ROUTES THE SELECTED
LY OUTPUT (OF DECKS A AND B) VIA THE OUTSIDE
ITACT FINGERS TO THE LOW PASS FILTER ASSEMBLY.
ASS FILTER ASSEMBLY (P1) IS THE RF OUTPUT
ORMER ASSEMBLY.

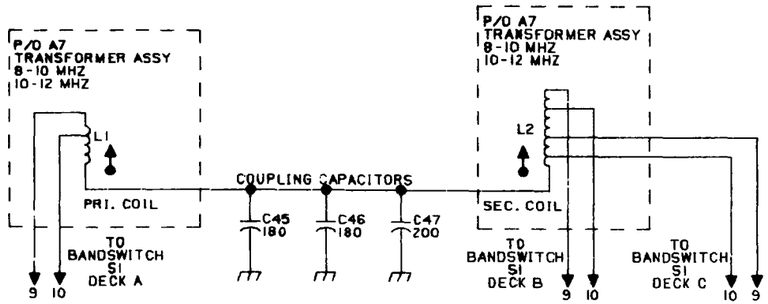
Figure 7-19. Final Transformer Assembly 1A1A2 Schematic Diagram (10051-3701) (Sheet 1 of 2)



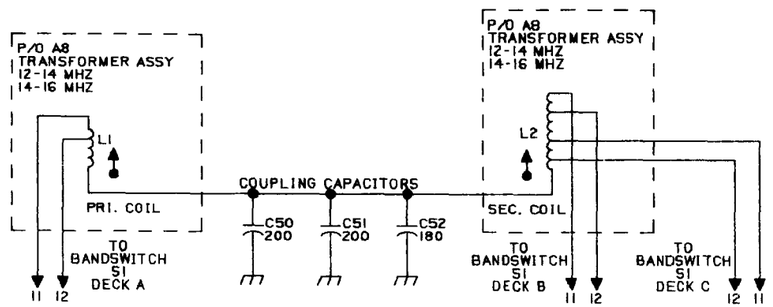
TRANSFORMER ASSEMBLIES A3 AND A4
3.0 TO 4.0 MHZ



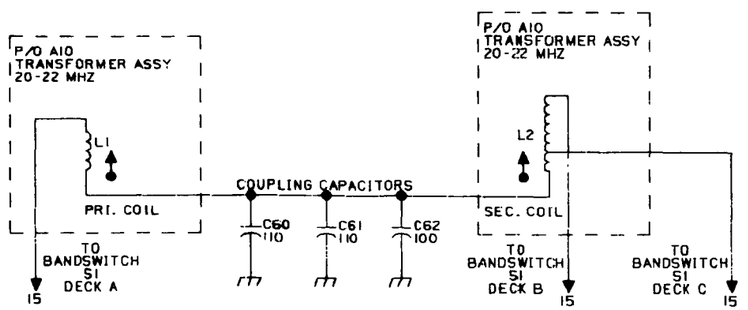
TRANSFORMER ASSEMBLY A5
4.0 TO 6.0 MHZ



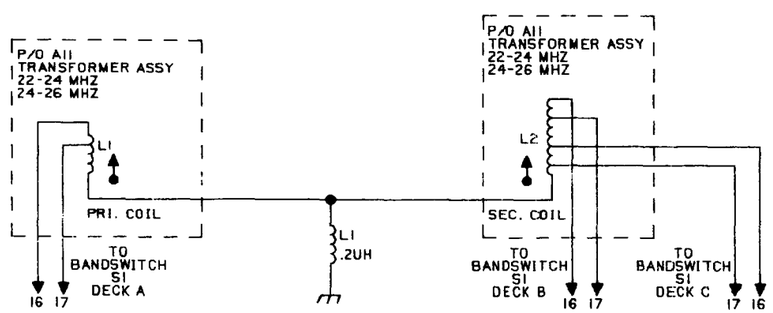
TRANSFORMER ASSEMBLY A7
8.0 TO 12.0 MHZ



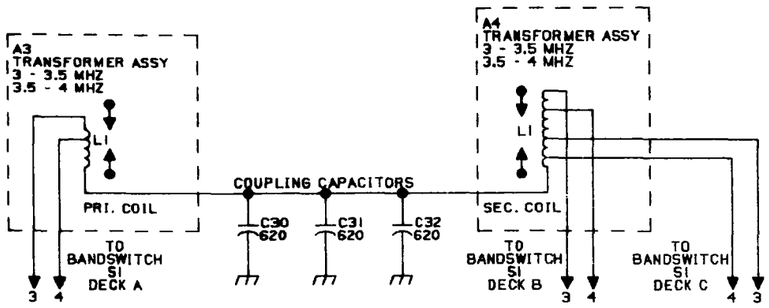
TRANSFORMER ASSEMBLY A8
12.0 TO 16.0 MHZ



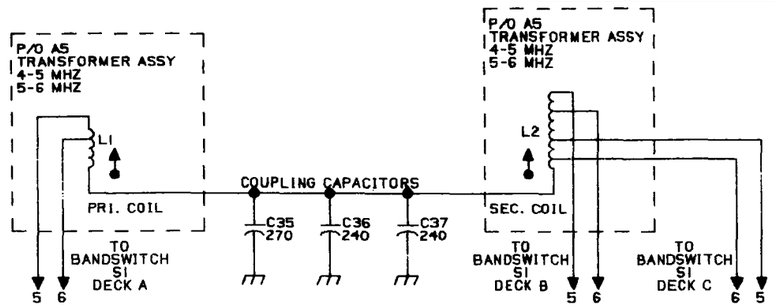
TRANSFORMER ASSEMBLY A10
20.0 TO 22.0 MHZ



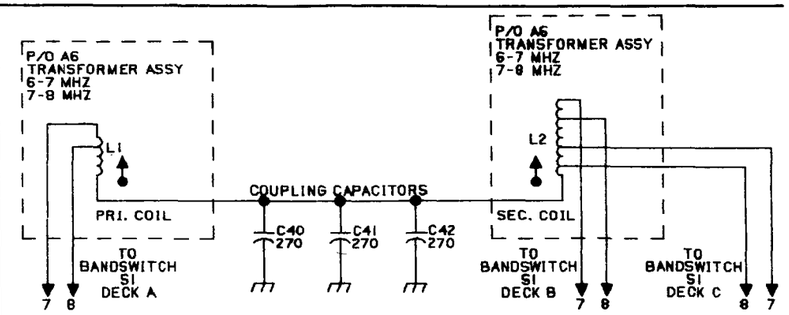
TRANSFORMER ASSEMBLY A11
22.0 TO 26.0 MHZ



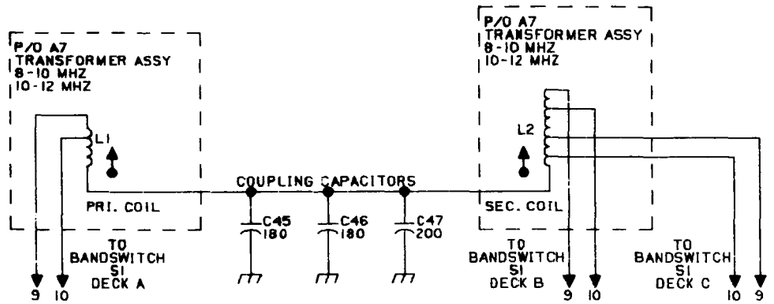
TRANSFORMER ASSEMBLIES A3 AND A4
3.0 TO 4.0 MHZ



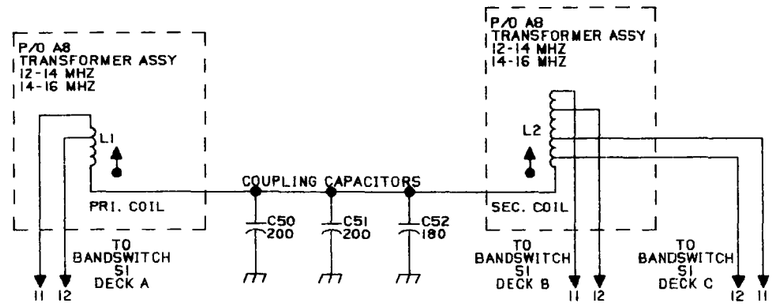
TRANSFORMER ASSEMBLY A5
4.0 TO 6.0 MHZ



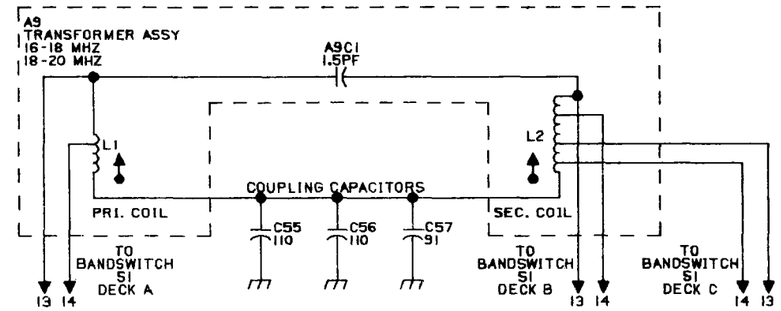
TRANSFORMER ASSEMBLY A6
6.0 TO 8.0 MHZ



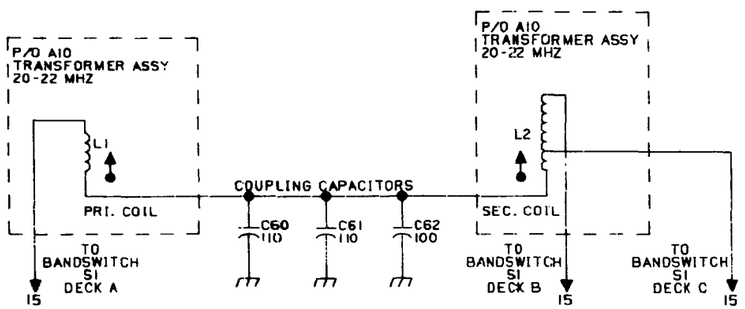
TRANSFORMER ASSEMBLY A7
8.0 TO 12.0 MHZ



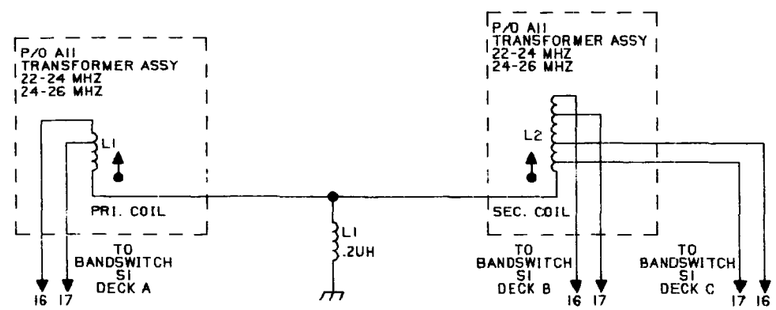
TRANSFORMER ASSEMBLY A8
12.0 TO 16.0 MHZ



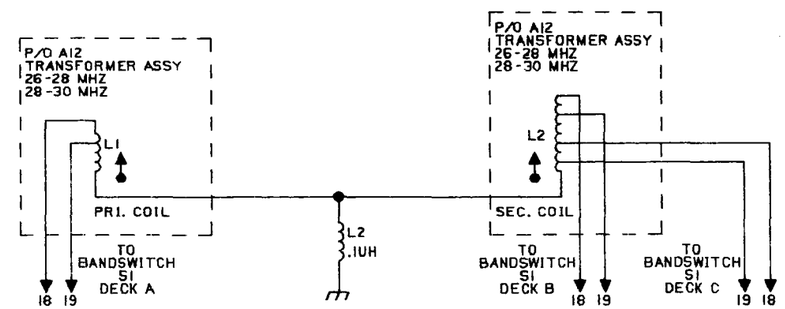
TRANSFORMER ASSEMBLY A9
18.0 TO 20.0 MHZ



TRANSFORMER ASSEMBLY A10
20.0 TO 22.0 MHZ



TRANSFORMER ASSEMBLY A11
22.0 TO 26.0 MHZ



TRANSFORMER ASSEMBLY A12
26.0 TO 30.0 MHZ

Figure 7-19. Final Transformer Assembly 1A1A2 Schematic Diagram (10051-3701) (Sheet 2 of 2)

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTANCE VALUES ARE IN OHMS, 2W, ±5%.
3. ALL CAPACITANCE VALUES ARE IN PICOFARADS.
4. BANDSWITCH SHOWN AS VIEWED FROM THE PANEL, CLOCKWISE ROTATION, IN 2.0 - 2.5 MHZ POSITION.

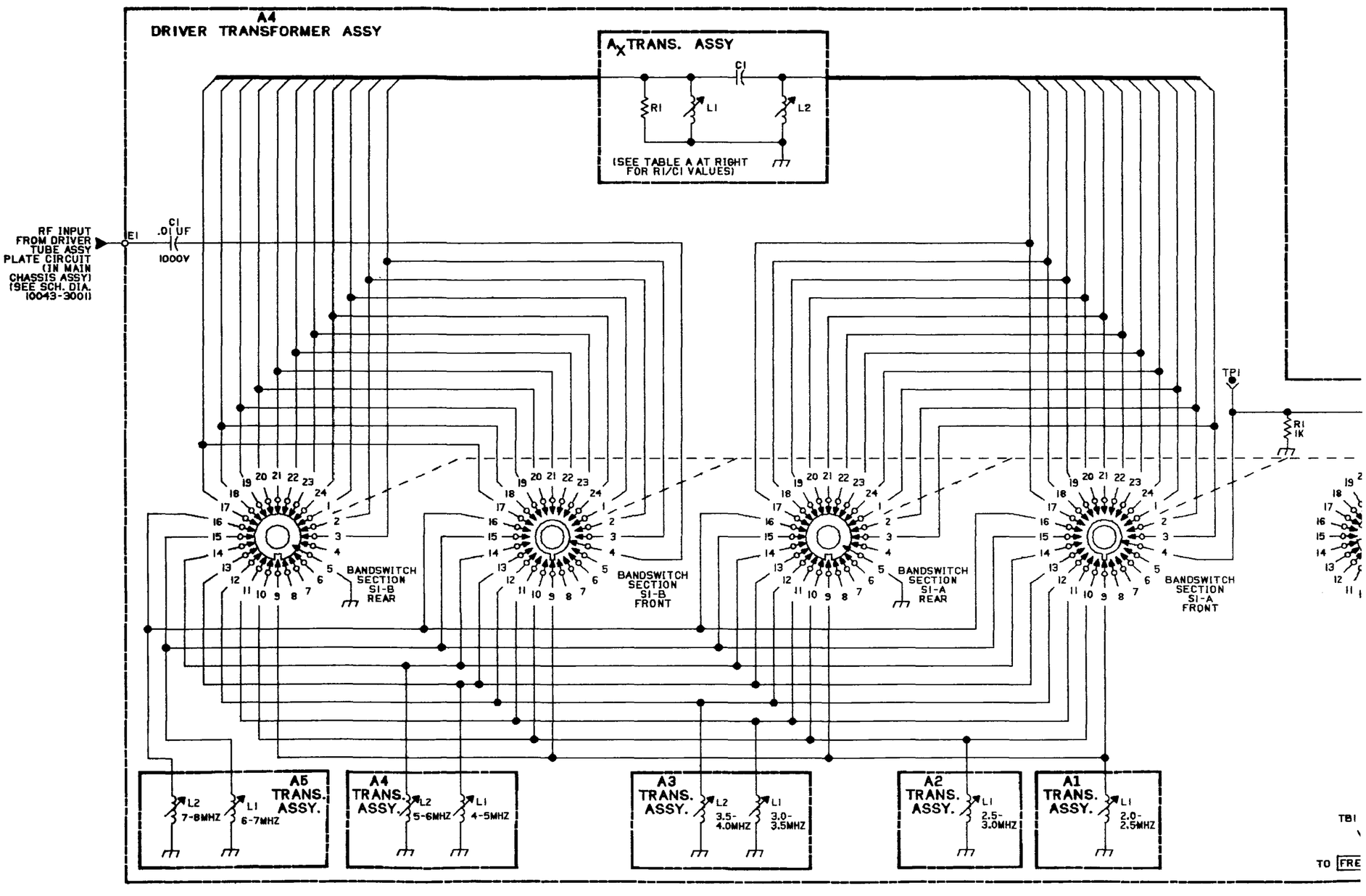


TABLE A

DRIVER TRANSFORMER ASSEMBLY A_X COMPONENT VALUE/ BANDSWITCH TERMINAL/FREQ. SELECTED CORRELATION

APPLICABLE BANDSWITCH S1-A, -B TERM. NO.	SELECTED A_X TRANS. ASSY	$A_X C1$ (pF)	VALUE OF $A_X R1$ (OHMS-9W-±5%)	SEL. FREQ. (MHZ)
9	A1	N/A	N/A	2.0 - 2.5
10	A2	N/A	N/A	2.5 - 3.0
11	A3	N/A	N/A	3.0 - 3.5
12	A3	N/A	N/A	3.5 - 4.0
13	A4	N/A	N/A	4-5
14	A4	N/A	N/A	5-6
15	A5	N/A	N/A	6-7
16	A5	N/A	N/A	7-8
17	A6	39	2.2K	8-10
18	A7	33	2.2K	10-12
19	A8	30	2.2K	12-14
20	A9	27	2.2K	14-16
21	A10	27	2.7K	16-18
22	A11	27	2.7K	18-20
23	A12	24	2.7K	20-22
24	A13	24	4.7K	22-24
1	A14	30	8.2K	24-26
2	A15	33	N/A	26-28
3	A16	39	N/A	28-30

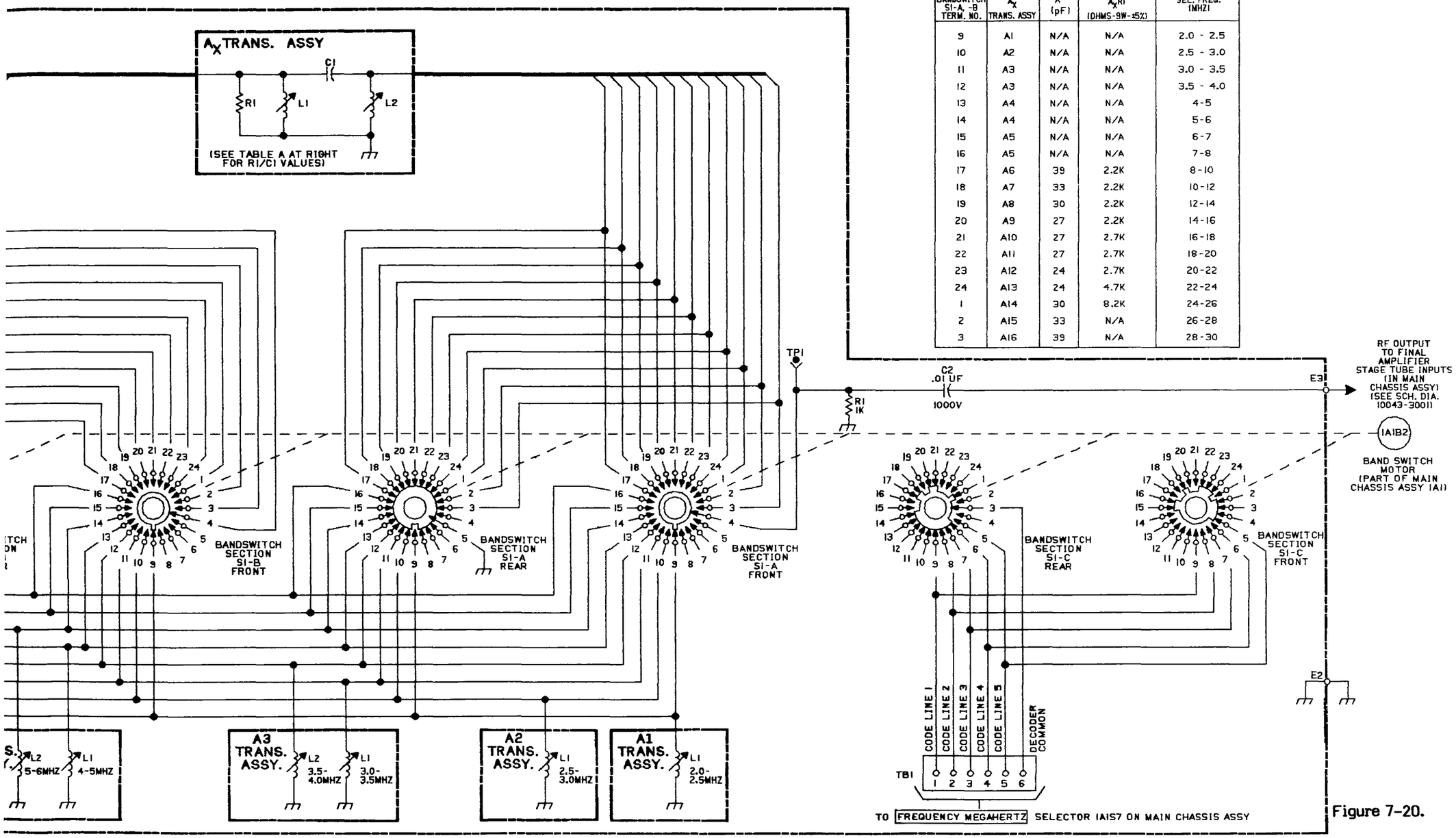
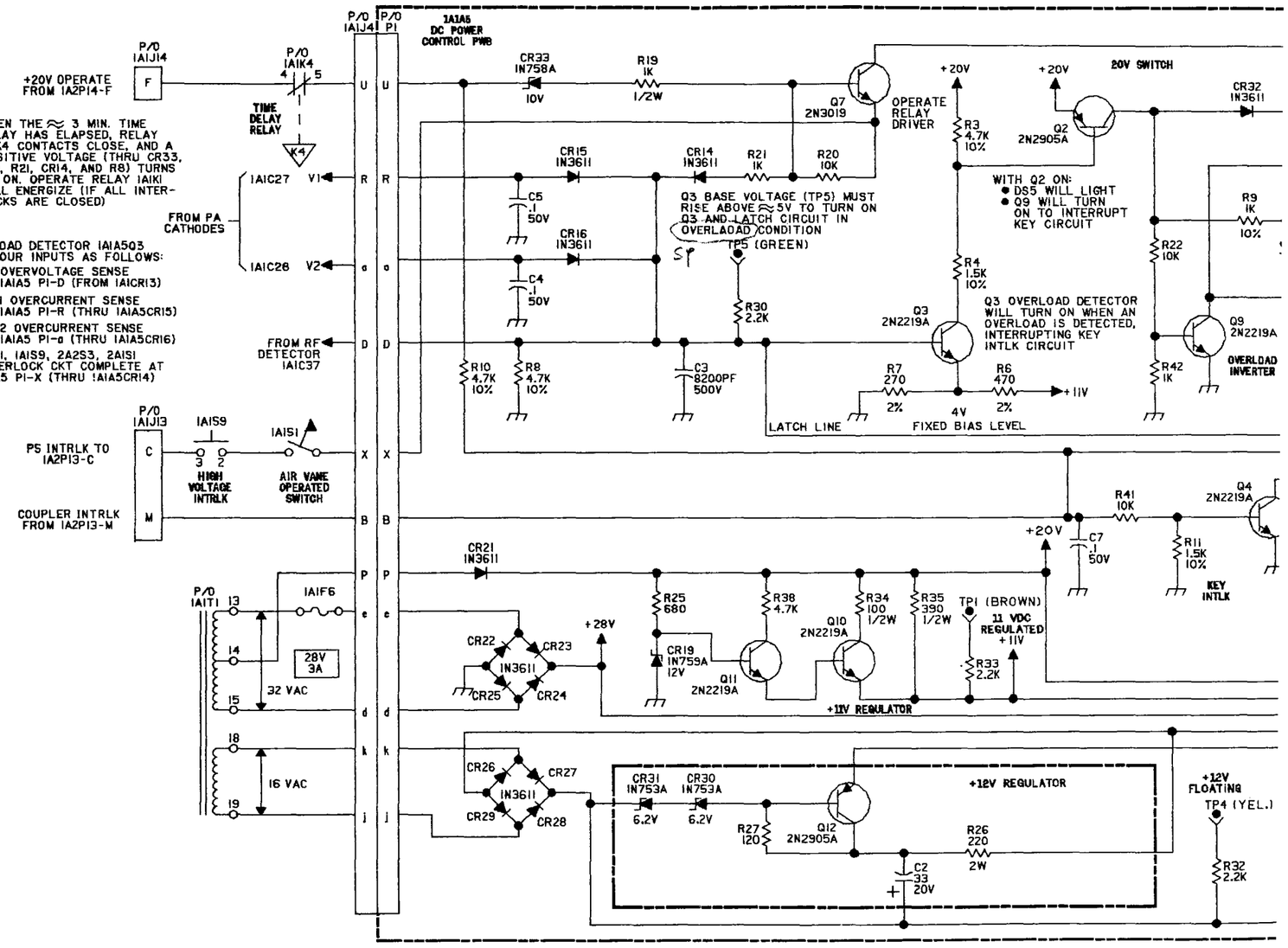


Figure 7-20. Driver Transformer Assembly 1A1A4 Schematic Diagram (0082-3801)

GENERAL NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±5%.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
4. ▭ INDICATES FRONT PANEL MARKING.
5. Q6 IS ORIGINALLY SUPPLIED WITH GERMANIUM TYPE JAN 2N-398A. LATER VERSIONS USE TYPE JAN 2N-5415, JAN 2N-3635, OR JAN 2N-3637, ANY OF WHICH IS SUITABLE FOR REPLACEMENT IN THIS CIRCUIT.
6. FLOATING 12V POWER SUPPLY MUST BE LOADED AT LEAST 10 MA (10K OHM, 1/2W RESISTOR LOAD) BEFORE MEASURING VOLTAGE.



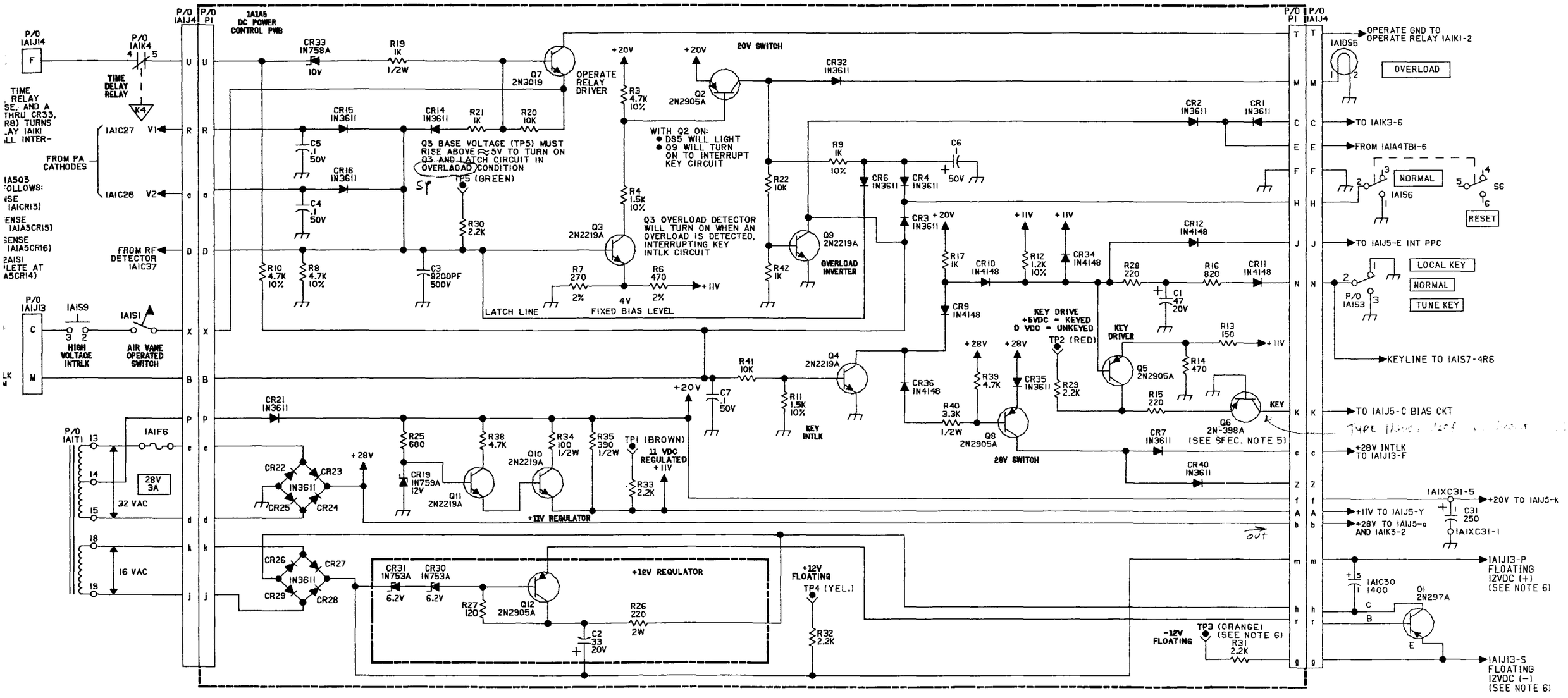
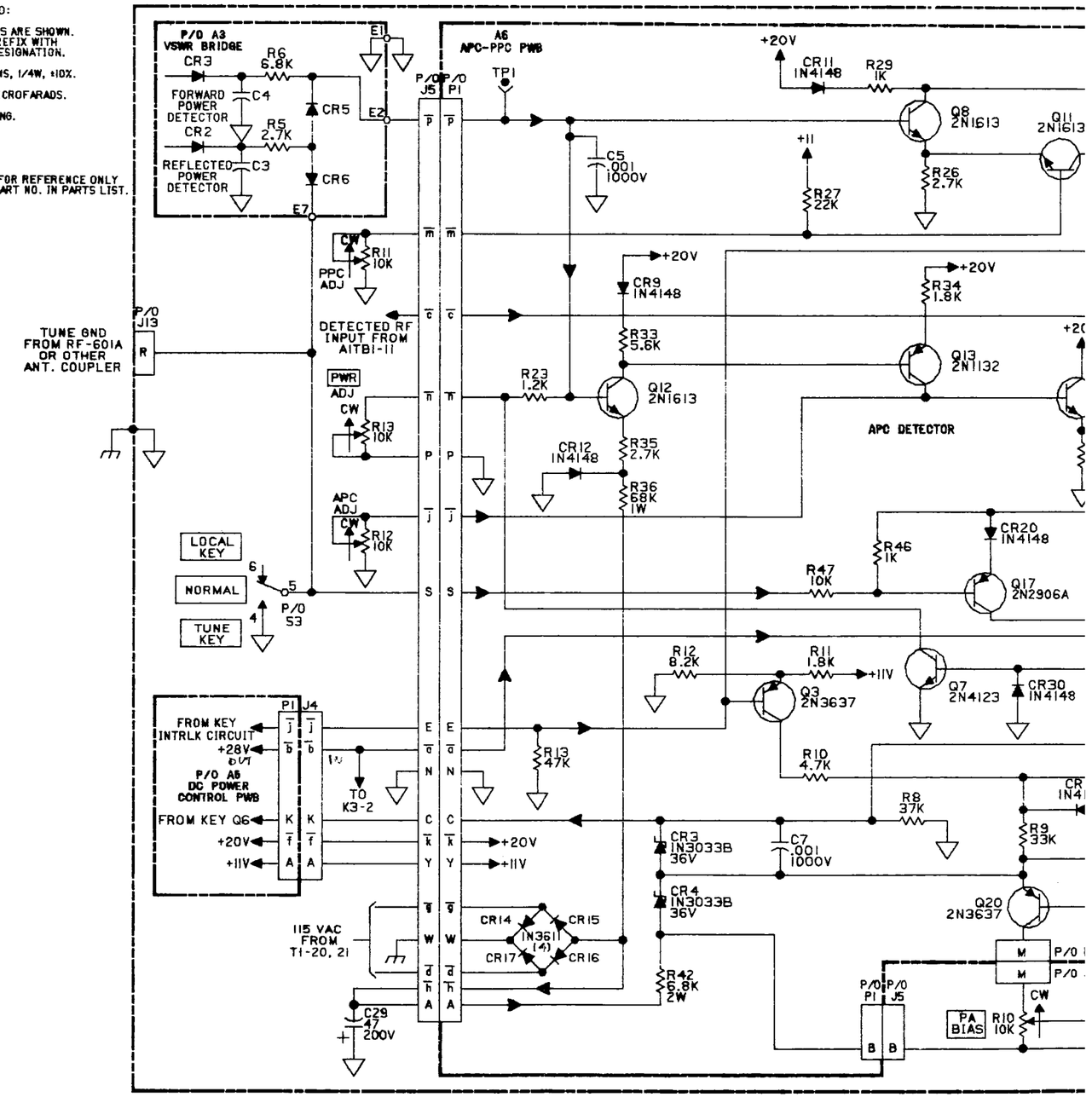


Figure 7-21. Dc Power Control PWB 1A1A5 Schematic Diagram (0082-3361)

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±10%.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
4. ▭ INDICATES EQUIPMENT MARKING.
5. ⏚ INDICATES CHASSIS GROUND.
6. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.



ECIFIED:

NATIONS ARE SHOWN.
ION, PREFIX WITH
' NO. DESIGNATION.

IN OHMS, 1/4W, ±10%.

E IN MICROFARADS.

MARKING.

OUND.

S ARE FOR REFERENCE ONLY
I PER PART NO. IN PARTS LIST.

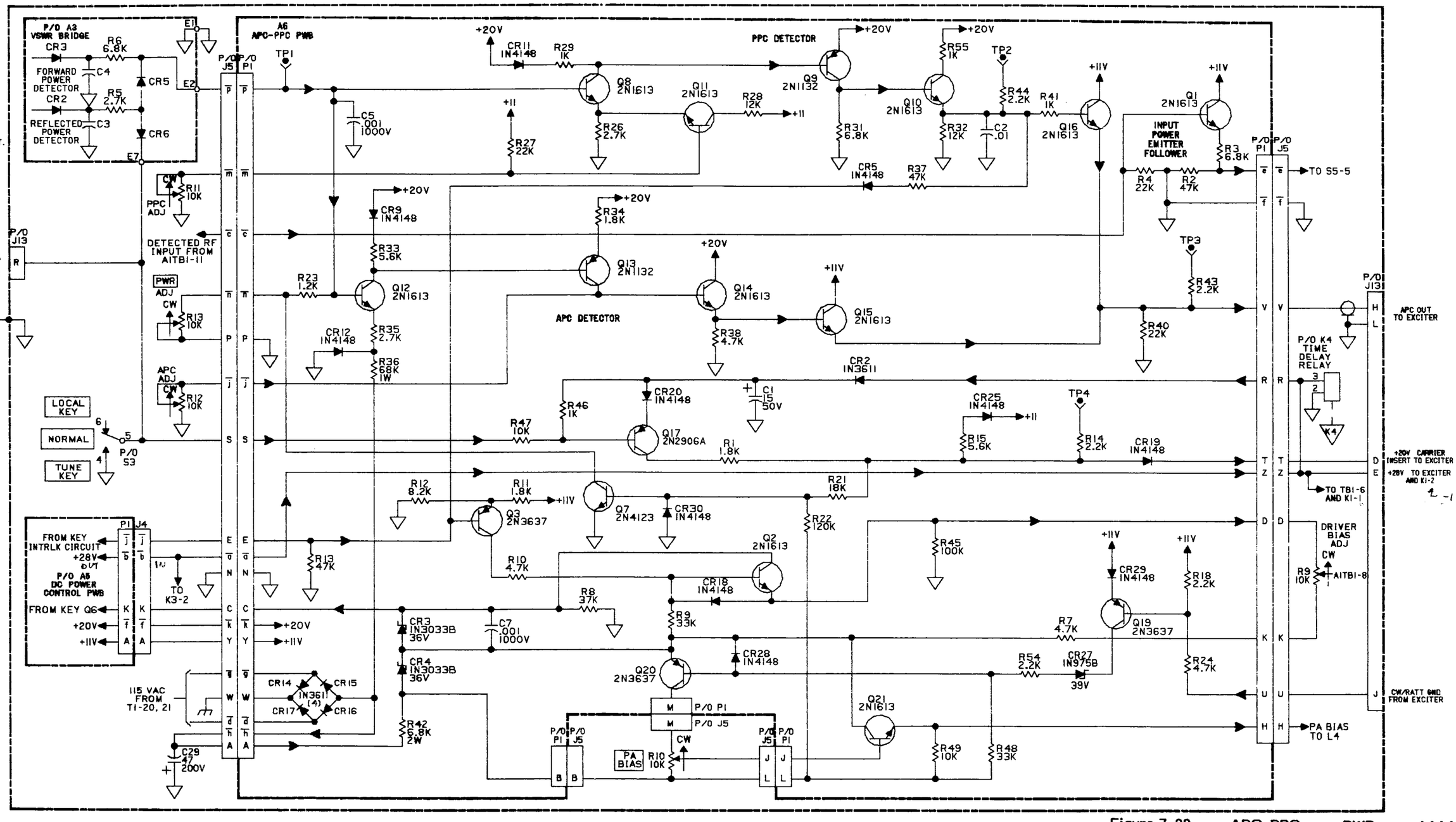
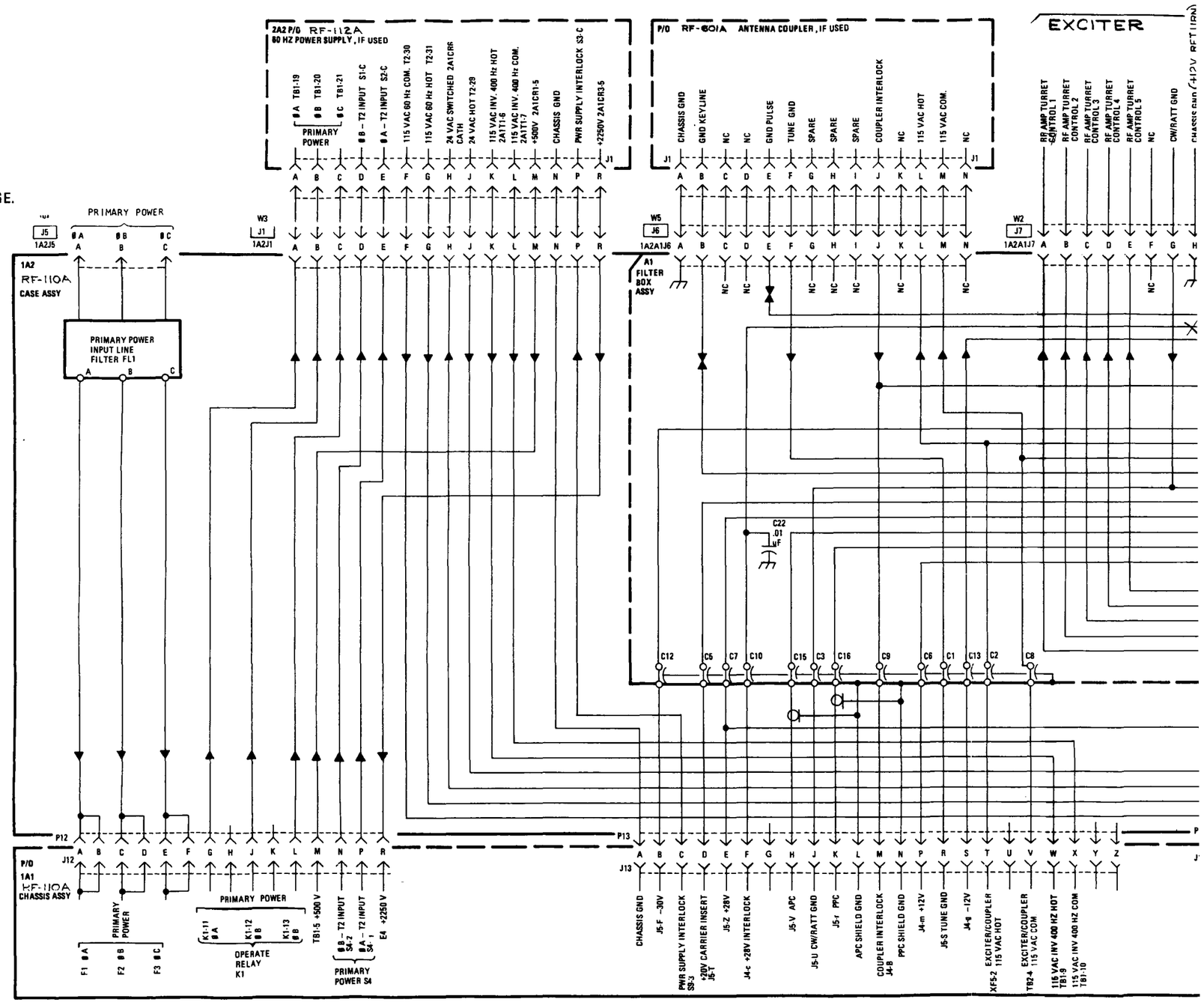


Figure 7-22. APC-PPC PWB 1A1A6
Schematic Diagram (0825-3341)

NOTES:

UNLESS OTHERWISE SPECIFIED

1. PREFIX PARTIAL REFERENCE DESIGNATORS WITH APPLICABLE UNIT, ASSEMBLY AND/OR SUBASSEMBLY DESIGNATORS
2. INDICATES EQUIPMENT MARKING
3. CAPACITORS ARE 1500 PF, 500 V
4. FLOATING 12 V POWER SUPPLY MUST BE LOADED AT LEAST 10 MA (10 K OHMS, 1/2 W RESISTOR LOAD) BEFORE MEASURING VOLTAGE.



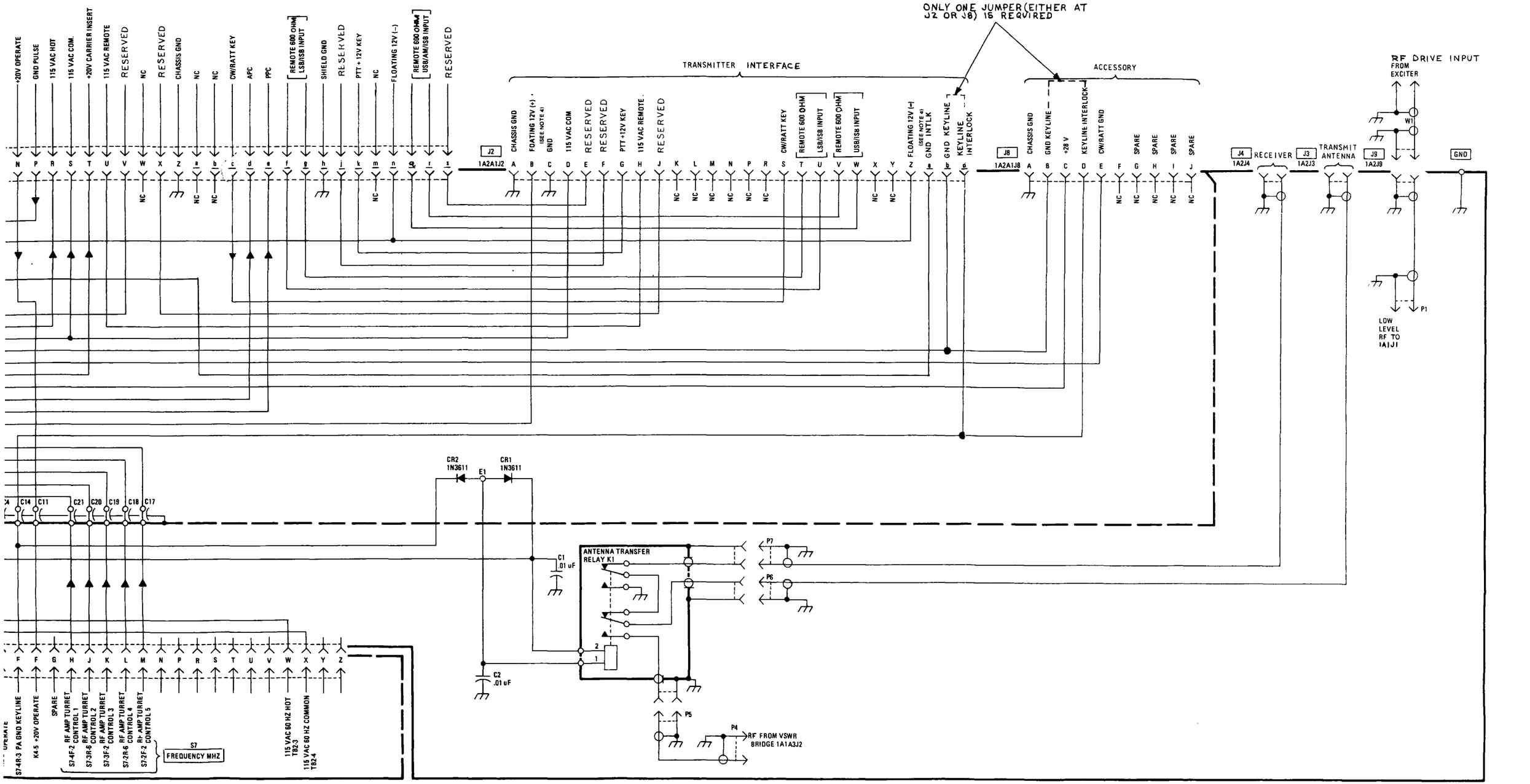


Figure 7-23. Case Assembly 1A2 Schematic Diagram (1932-2001

We welcome your comments:

HARRIS CORPORATION/RF Communications Group constantly reviews and updates equipment and system manuals. We would appreciate any information that you feel will help improve our manuals. If you have any comments on this or any of our other manuals, please take a moment to write them down.

After writing down your comments, remove this page along the perforation, fold, staple, and mail at your earliest convenience. No postage is required unless mailed from outside the U.S.A.

We will be grateful for your response.

Comments: _____

TEAR HERE

_____

(Name)

_____

(Title)

TEAR HERE

FOLD HERE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 4033 ROCHESTER, N.Y.

POSTAGE WILL BE PAID BY ADDRESSEE

HARRIS CORPORATION
RF Communications Group
1680 University Avenue
Rochester, New York 14610 U.S.A.

ATTN: Publications Department

STAPLE HERE

HARRIS

HARRIS CORPORATION RF COMMUNICATIONS DIVISION
1680 University Avenue Rochester, New York 14610 U.S.A.
Tel: 716-244-5830 Cable: RFCOM; Rochester, N.Y. TELEX 978464