U.S. Department
of Transportation

**United States
Coast Guard**

Electronics Engineering Center
Wildwood, New Jersey

VOLUME I

TECHNICAL MANUAL

LORAN TRANSMITTING SET AN/FPN-44A/B

CG-273-136 (CHANGE 4)

SECTIONS 1-7

CHANGE 4 DATED: FEBRUARY 03 1992

RECORD OF CORRECTIONS MADE

1. The ORIGINAL AN/FPN-44A manual was written for ITT transmitters containing a solid state power supply and pre-LRE timing equipment. ITT CHANGE 1 was never issued, CHANGE 2 and 3 documented Coast Guard modifications to the transmitter interface, including the LRE modification.

2. **CHANGE 4 of this technical manual for the AN/FPN-44A/B Loran Transmitter includes all the field and factory changes issued through 03 February 1992.** This includes the following changes except F.C. 2, which attempted to correct erroneous ITT CHANGE 2 and 3 data deletions.

F.C. 1 - Maintenance Procedures
F.C. 2 - AN/FPN-60 LRE addendum - **NOT issued.**
F.C. 3 - Feedback Modification.
F.C. 4 - Orange Water Hoses For 1A6 PA Section.
F.C. 5 - DESLOT Modification.
F.C. 6 - 1A4 Signal Disable Removal.
F.C. 7 - 1A4A1 Cooling Fan Modification.
F.C. 8 - 1A4P6/1A4A1J1 Connector-to-Terminal Strip Mod.
F.C. 9 - 1A4A1A3 PCB Modification, 1A4A1R1 Standby Gain Adjust Relocation, and 1A4M11/1A4S2 Quiescent Current Meter Disable. (To be issued Spring 1992)
F.C. 10 - 1A53A3S1 OP-109 Solid State Knife Switch Replacement Instructions.
F.C. 11 - 1A4A1A3 V3 THRU V8 Upgrade From 6146B to 6146W.
F.C. 12 - GTU control line ground addition to 1A53A3A1TB5-7.
F.C. 13 - Replacement of EIMAC Y711 with ITT F8C25N tubes.

3. This version was written utilizing current DOD standards for Technical Manuals. As a result, the schematic section changed from section 6 to 7, and the parts section from section 7 to 6. The previous AN/FPN-44A manual (Change 3) consisted of the following volumes and corresponding sections:

Volume 1 : Section 1. General Information
Section 2. Installation
Section 3. Operator's Section
Section 4. Principals of Operation
Volume 2 : Site Selection (ORIGINAL)
Volume 3 : Installation and Field Assembly Instructions (ORIGINAL)
Volume 4 : Section 5. Troubleshooting, Service and Repair
Volume 5 : Section 6. System schematics and logic diagrams.
Volume 6 : Section 7 Maintenance Parts Lists.

4. Only Volumes 1, 4, 5 and 6 were rewritten with Change 4. Since these volumes represent the working AN/FPN-44A manual

commonly used in the field, these volumes were combined into a single Volume 1. The new format consists of:

Volume 1: Section 1. General Information
Section 2. Installation
Section 3. Operator's Section
Section 4. Principals of Operation
Section 5. Trouble Shooting, Service and Repair
Section 6. Maintenance Parts Lists
Section 7. System schematics and logic diagrams.

5. The ORIGINAL Site Selection and Field Assembly Instructions (Volumes 2 & 3) should be retained by units and will remain in the stock system.

6. This manual includes data applicable to the AN/FPN-44A and AN/FPN-44B transmitter versions. The **AN/FPN-44A** transmitters are the original solid state power supply units built for the U.S. West Coast and Alaskan Loran stations. The **AN/FPN-44B** transmitters are the older inductrol power supply AN/FPN-44 units which were modified (solid state power supply) to functionally resemble the AN/FPN-44A transmitters. The primary differences between the transmitter types are:

AN/FPN-44A	**AN/FPN-44B**
1A4A1 front panel contains three fuses.	Contains two extra unused fuseholders.
Harmonic filter 1A20 contains L1 and L2.	L2 not used, L1 is larger.
MX-9783/FPN-44A Instrument Shunt 1A53A4A2 is a transistor version.	Newer Integrated Circuit version (IC).
1B1 BLOWER FAN & 1S1 specs differ between FPN-44A/B versions.	
1A11 F7-F9 BLOWER FAN fuses specs differ between FPN-44A/B versions.	
1A11 HR4-HR9 HEATER thermal releases for 1A11 K2,3 differ between FPN-44A/B versions.	
4BL1, 4B1B1, 4B1E1 specs differ. Dummy Load blower 9 blade fan (B1E1)	Dummy Load blower 3 blade fan.
Liquid Electron Cooler 1A52 HD-1000	Liquid Electron Cooler 1A2 HD-601

7. Separate Allowance Parts Lists will be issued to the field to reflect transmitter parts differences as follows:

AN/FPN-44A	**AN/FPN-44B**
Fallon	Dana
Middletown	EECEN
Narrow Cape	Guam
Searchlight	Lampedusa
Shoal Cove	NORPAC Transmitter replacements (3)
Tok	TRACEN Petaluma
Williams Lake	

8. This manual rewrite was contracted out to an 8(a) company under contract DTCG42-90-R-TBI217. All text material consists of Word Perfect files, and all schematics reside on AUTOCAD files. This task was prosecuted under SME task XT-016 by the EECEN (N1) branch.

9. Several enhancements will follow this manual. The photos within this manual will be converted to line drawings; and a consolidated master control circuit schematic will be generated.
All field and staff personnel utilizing this manual are encouraged to submit ANY corrections directly to the Life Cycle Support Branch:

COMMANDING OFFICER
USCG EECEN (Rs)
P.O. BOX 60
WILDWOOD, N.J. 08260-0060
FTS 346-7317 Commercial (609) 523-7317

THIS PAGE INTENTIONALLY LEFT BLANK

RECORD OF CHANGES

CHANGE#	DATED	DESCRIPTION	SIGNATURE / DATE

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS - SECTION 1.

PARAGRAPH	DESCRIPTION	PAGE
	RECORD OF CORRECTIONS MADE	1-i
	RECORD OF CHANGES.	1-iii
	LIST OF ILLUSTRATIONS	1-xv
	LIST OF TABLES.	1-xxv
	NOTE: AN/FPN-44B nomenclature in []	
1.0.	GENERAL INFORMATION	1-3
1.1.	INTRODUCTION.	1-3
1.2.	FUNCTIONAL DESCRIPTION, LORAN GROUND STATION.	1-3
1.3.	FUNCTIONAL DESCRIPTION, LORAN TRANSMITTING SET.	1-3
1.3.1.	GENERAL.	1-3
1.3.2.	DESCRIPTION OF MAJOR UNITS.	1-4
1.3.2.1.	TRANSMITTING GROUP OT-96/FPN-44A **[OA-4483/FPN-44]**.	1-4
1.3.2.2.	ANTENNA COUPLER CU-2171/FPN-44A **[CU-1106/FPN-44]**.	1-4
1.3.2.3.	ELECTRICAL DUMMY LOAD DA-329A/FPN-44.	1-4
1.3.2.4.	FEEDBACK MODIFICATION.	1-4
1.3.2.4.1.	DESCRIPTION OF UNITS.	1-4
1.3.2.4.2.	DESCRIPTION OF CIRCUIT CHANGES	1-5
1.4.	FACTORY OR FIELD CHANGES.	1-5
1.5.	QUICK REFERENCE DATA.	1-5
1.5.1.	OPERATING FREQUENCY.	1-5
1.5.2.	FREQUENCY BANDWIDTH.	1-5
1.5.3.	FREQUENCY CONTROL.	1-5
1.5.4.	TYPE OF EMISSION.	1-5
1.5.5.	POWER OUTPUT.	1-5
1.5.6.	PULSE SHAPE.	1-5
1.5.6.1.	AMPLITUDE.	1-5
1.5.6.2.	PULSE BEGINNING.	1-5
1.5.6.3.	SAMPLING POINT.	1-5
1.5.6.4.	TRAILING EDGE.	1-5
1.5.7.	PULSE SPECTRUM.	1-6
1.5.8.	GROUP REPETITION INTERVALS (GRI).	1-6
1.5.9.	SPECIFIC LORAN-C RATES.	1-6
1.5.10.	MULTIPULSE GROUPS.	1-6
1.5.11.	INPUT POWER REQUIREMENTS.	1-6
1.6.	EQUIPMENT LISTS.	1-6
1.6.1.	EQUIPMENT SUPPLIED.	1-6
1.6.2.	EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.	1-6
1.6.3.	SHIPPING DATA.	1-6
1.6.4.	ELECTRON TUBE COMPLEMENT.	1-6
1.6.5.	POWER REQUIREMENTS AND HEAT CALCULATIONS	1-6

TABLE OF CONTENTS - SECTION 2

PARAGRAPH	DESCRIPTION	PAGE
2.0.	INSTALLATION	2-1
2.1.	UNPACKING AND HANDLING.	2-1
2.2.	SITE SELECTION.	2-1
2.3.	POWER REQUIREMENTS AND DISTRIBUTION.	2-1
2.4.	INSTALLATION LAYOUT.	2-2
2.5.	INSTALLATION REQUIREMENTS.	2-2
2.6.	INSPECTION AND ADJUSTMENTS.	2-2
2.6.1.	VISUAL INSPECTION.	2-2
2.6.2.	OPERATION ON 50 Hz POWER.	2-7
2.6.3.	DISCHARGE CIRCUIT.	2-7
2.6.4.	RELAY SHUNT ADJUSTMENTS.	2-7
2.6.5.	PROTECTIVE SPARK GAP SPACING.	2-8
2.6.6.	GROUNDING HOOKS.	2-8
2.6.7.	THERMOMETER SWITCH ADJUSTMENT.	2-8
2.6.8.	TEST POINT BLOCKING CAPACITOR ADJUSTMENT.	2-8
2.6.9.	FILAMENT TRANSFORMER VISUAL CHECK.	2-8
2.6.10.	UNDERVOLTAGE AND OVERVOLTAGE PROTECTION.	2-8
2.6.11.	EQUIPMENT SETUP.	2-8
2.6.12.	PHASE SEQUENCE OF 208-VOLT LINE.	2-10
2.6.13.	PRIMARY COOLING SYSTEM FILL PROCEDURE.	2-10
2.6.14.	WATER FLOW SWITCHES.	2-10
2.6.15.	VOLTAGE REGULATOR CN-1472/FPN-44A ADJUSTMENT**[1096343G1]**.	2-11
2.6.16.	THERMOMETER SWITCHES.	2-11
2.6.17.	AIR SWITCHES.	2-11
2.6.18.	DOOR INTERLOCKS.	2-12
2.6.19.	ANTENNA COUPLER-DUMMY LOAD SWITCHING TEST.	2-13
2.6.20.	TANK COIL ALIGNMENT.	2-16
2.6.21.	TUNING PROCEDURES.	2-16
2.6.22.	BIAS AND PLATE VOLTAGE CIRCUITS.	2-16
2.6.23.	OVERLOAD CIRCUITS AND 3-STRIKE RELAY.	2-19
2.6.24.	TRANSMITTER CONTROLS AND CONTROL CIRCUITS.	2-21
2.6.25.	FEEDBACK CABLE POLARITIES.	2-27
2.6.26.	PRELIMINARY INSPECTION AND ADJUSTMENT.	2-27
2.6.27.	FEEDBACK POLARITIES CHECK.	2-28
2.6.28.	TUBE SEASONING.	2-29
2.6.29.	BIAS ADJUSTMENT.	2-29
2.6.30.	NORMAL WAVESHAPES.	2-29
2.6.31.	NORMAL METER READINGS AND FUNCTIONS OF ALL METERS.	2-29
2.6.32.	AC OVERLOAD ADJUSTMENT.	2-29
2.7.	INTERFERENCE REDUCTION.	2-30
2.8.	PREPARATION FOR RESHIPMENT.	2-30

TABLE OF CONTENTS - SECTION 3

PARAGRAPH	DESCRIPTION	PAGE
3.0.	OPERATOR'S SECTION.	3-1
3.1.	FUNCTIONAL OPERATION.	3-1
3.2.	OPERATING PROCEDURES	3-1
3.2.1.	DESCRIPTION OF CONTROLS.	3-2
3.2.2.	SEQUENCE OF OPERATION.	3-2
3.2.2.1.	BEFORE USE.	3-2
3.2.2.2.	DURING USE.	3-2
3.2.2.3.	TRANSFER.	3-2
3.2.2.4.	AFTER USE	3-2
3.2.2.5.	OFF CONDITION	3-3
3.2.3.	TUNING ADJUSTMENTS	3-3
3.3.	SUMMARY OF OPERATING PROCEDURES	3-3
3.3.1.	BEFORE USE	3-3
3.3.2.	DURING USE	3-3
3.3.3.	TRANSFER	3-4
3.3.4.	AFTER USE	3-4
3.3.5.	OFF CONDITION	3-4
3.4.	EMERGENCY OPERATION	3-4
3.4.1.	SWITCHING TRANSMITTING GROUPS	3-4
3.4.2.	OPERATION WITH FAULTY POWER AMPLIFIER SECTION	3-4
3.4.3.	OPERATION IN THE OPEN LOOP CONDITION	3-17
3.4.4.	DESLOT AND NON-DESLOT	3-17
3.4.4.1.	THEORY OF OPERATION	3-17
3.4.4.1.1.	PUMPS, BLOWERS, AND FILAMENT CONTROL	3-17
3.4.4.1.2.	PLATE VOLTAGE CONTROL	3-17
3.4.4.1.3.	TAC READY CIRCUIT	3-18
3.4.4.2.	DESLOT AND NON-DESLOT TRANSMITTER OPERATING PROCEDURES	3-18
3.5.	OPERATOR'S MAINTENANCE	3-21
3.5.1.	OPERATING CHECKS AND ADJUSTMENTS	3-21
3.5.2.	ROUTINE CHECKS	3-21
3.5.3.	EMERGENCY MAINTENANCE	3-21

TABLE OF CONTENTS - SECTION 4

PARAGRAPH	DESCRIPTION	PAGE
4.0.	PRINCIPLES OF OPERATION	4-1
4.1.	OVERALL FUNCTIONAL DESCRIPTION.	4-1
4.1.1.	LIMITATIONS.	4-1
4.1.2.	LORAN-C GROUND STATION.	4-1
4.1.3.	DEFINITIONS.	4-1
4.1.3.1.	AMPLITUDE DROOP.	4-1
4.1.3.2.	BASIC REPETITION RATE.	4-2
4.1.3.3.	BLINKING.	4-2

TABLE OF CONTENTS - SECTION 4(Cont)

4.1.3.4.	DOUBLE RATING.	4-2
4.1.3.5.	CROSS-OVER EFFECT	4-2
4.1.3.6.	GROUP REPETITION INTERVAL (GRI).	4-2
4.1.3.7.	LORAN-C CHAIN.	4-2
4.1.3.8.	LORAN-C PULSE GROUP.	4-2
4.1.3.9.	LORAN PAIR.	4-4
4.1.3.10.	MASTER STATION (M).	4-4
4.1.3.11.	SECONDARY STATIONS (X, Y, Z).	4-4
4.1.3.12.	PHASE COHERENCE.	4-4
4.1.3.13.	PULSE BEGINNING.	4-4
4.1.3.14.	STANDARD SAMPLING POINT.	4-4
4.1.3.15.	STANDBY TRANSMITTER.	4-5
4.1.4.	PRINCIPLES OF FEEDBACK.	4-5
4.1.4.1.	GENERAL THEORY.	4-5
4.1.4.2.	FEEDBACK MODIFICATIONS.	4-6
4.1.4.2.1.	ADDED INPUT AMPLIFIER UNIT, 1A4A1A3,	4-6
4.1.4.2.2.	ADDED LOW VOLTAGE POWER SUPPLY ASSEMBLY,	4-6
4.1.4.2.3.	BROADBANDING	4-6
4.1.4.2.4.	CIRCUIT MODIFICATIONS TO THE BIAS PEDESTAL GENERATOR	4-6
4.1.4.2.5.	CURRENT FEEDBACK TRANSFORMER	4-6
4.1.4.2.6.	VOLTAGE FEEDBACK WINDING	4-6
4.1.4.2.7.	CHANGE IN TUBE TYPE FOR 2ND INTERMEDIATE POWER	4-6
4.1.4.3.	MODIFIED TRANSMITTER CONFIGURATION	4-6
4.1.4.3.1.	OUTPUT TRANSFORMER (PA TANK 1A5)	4-6
4.1.4.3.2.	POWER AMPLIFIER TUBE RACK (1A6).	4-6
4.1.4.3.3.	EXCITER UNIT (1A4).	4-7
4.2.	FUNCTIONAL DESCRIPTION.	4-8
4.2.1.	LORAN TRANSMITTING SET AN/FPN-44A/B.	4-8
4.2.2.	POWER SUPPLY SET 0P-109 FPN-44A (1A53)**[1096281G3]**.	4-12
4.2.2.1.	PURPOSE.	4-12
4.2.2.2.	POWER SUPPLY ASSEMBLIES	4-13
4.2.2.3.	OVERALL DESCRIPTION	4-13
4.2.3.	ANTENNA COUPLER CU-2171/FPN-44A(3)**[CU-1106/FPN-44]** AND ELECTRICAL DUMMY LOAD DA-329A/FPN-44(4)	4-18
4.3.	CIRCUIT DESCRIPTION	4-19
4.3.1.	GENERAL	4-19
4.3.2.	AMPLIFIER GROUP OG-159/FPN-44A**[OA-4482/FPN-44]** AND RADIO FREQUENCY AMPLIFIER AM-3774/FPN-44	4-19
4.3.2.1.	MAIN FRAME CIRCUITS	4-19
4.3.2.1.1.	GENERAL	4-19
4.3.2.1.2.	VOLTAGE AMPLIFIER CIRCUITS	4-20
4.3.2.1.3.	FIRST INTERMEDIATE POWER AMPLIFIER	4-20
4.3.2.1.4.	SECOND INTERMEDIATE POWER AMPLIFIER	4-21
4.3.2.1.5.	BIAS PEDESTAL GENERATOR 1A4A5	4-22

TABLE OF CONTENTS - SECTION 4(Cont)

4.3.2.1.6.	BIAS PEDESTAL POWER SUPPLY 1A4A4	4-27
4.3.2.1.7.	POWER SUPPLY ASSEMBLY 1A4A6	4-27
4.3.2.2.	POWER SUPPLY PP-7304/FPN-44A 1A4A1 **[C-4557/FPN-44]**	4-31
4.3.2.2.1.	INPUT CIRCUIT	4-32
4.3.2.2.2.	DRIVE CONTROL	4-32
4.3.2.2.3.	CURRENT AMPLIFIER	4-32
4.3.2.2.4.	BANDWIDTH CONTROL/PREAMPLIFIER	4-32
4.3.2.2.5.	AMPLIFIER	4-33
4.3.2.2.6.	CURRENT AMPLIFIER	4-33
4.3.2.2.7.	FEEDBACK SUMMING	4-33
4.3.2.2.8.	DIFFERENCING NETWORK	4-33
4.3.2.2.9.	LOOP COMPENSATION NETWORK	4-33
4.3.2.2.10.	PHASE SPLITTER AND AMPLIFIER	4-34
4.3.2.2.11.	FIRST VOLTAGE AMPLIFIER	4-34
4.3.2.2.12.	SECOND VOLTAGE AMPLIFIER	4-34
4.3.2.2.13.	CATHODE FOLLOWER	4-34
4.3.2.2.14.	+250 VOLT REGULATOR 1A4A1A1	4-35
4.3.2.3.	OSCILLOSCOPE CONTROL C-4558A/FPN-44	4-36
4.3.2.3.1.	TRIGGER SELECTOR/BIAS PEDESTAL DRIVER 1A4A3A2	4-36
4.3.2.3.2.	NEGATIVE POWER SUPPLY 1A4A3A1	4-38
4.3.2.4.	POWER AMPLIFIER	4-39
4.3.2.4.1.	FIRST INTERMEDIATE POWER AMPLIFIER	4-40
4.3.2.4.2.	SECOND INTERMEDIATE POWER AMPLIFIER	4-40
4.3.2.4.3.	POWER SUPPLY (1A4A6)	4-40
4.3.2.5.	PROTECTIVE CIRCUITS IN THE POWER AMPLIFIERS	4-41
4.3.2.6.	BIAS POWER SUPPLIES	4-42
4.3.3.	ELECTRICAL EQUIPMENT RACK MT-2929/FPN-44	4-42
4.3.4.	INDICATOR PANEL SB-1894A/FPN-44	4-48
4.3.5.	LOW PASS FILTER F-1428/FPN-44A	4-48
4.3.6.	ANTENNA COUPLER CU-2171/FPN-44A **[CU-1106/FPN-44]**	4-48
4.3.6.1.	TRANSMITTER OPERATE CONTROL	4-51
4.3.6.2.	ANTENNA SHORTING	4-51
4.3.6.3.	VACUUM RELAYS	4-51
4.3.7.	ELECTRICAL DUMMY LOAD DA-329A/FPN-44	4-51
4.3.8.	POWER SUPPLY SET OP-109/FPN-44A **[1096281G3]**	4-51
4.3.8.1.	208 VAC CIRCUITS	4-55
4.3.8.2.	460 VAC CIRCUITS	4-55
4.3.8.3.	TRANSMITTER CONTROL CIRCUITS	4-55
4.3.9.	VOLTAGE REGULATOR CN-1472/FPN-44A **[1096343G1]**	4-57
4.3.9.1.	THEORY	4-57
4.3.9.2.	AUTOMATIC OPERATION	4-58
4.3.9.3.	MANUAL OPERATION	4-62
4.3.10.	VOLTAGE REGULATOR CN-1473/FPN-44A	4-62

TABLE OF CONTENTS - SECTION 4(Cont)

4.3.10.1.	GENERAL THEORY	4-62
4.3.10.2.	FUNCTIONAL BLOCK DIAGRAM DESCRIPTION	4-65
4.3.10.2.1.	BEFORE HIGH VOLTAGE TURN ON	4-65
4.3.10.2.2.	AFTER HIGH VOLTAGE TURN ON	4-66
4.3.10.2.3.	PROTECTION CIRCUITS	4-67
4.3.10.3.	GATE TRIGGER UNIT, DETAILED DESCRIPTION	4-69
4.3.10.4.	CHOP-OFF LIMITER DETAILED DESCRIPTION	4-71
4.3.10.5.	PREAMPLIFIER DETAILED DESCRIPTION	4-72
4.3.11.	POWER SUPPLY PP-7305/FPN-44A	4-74
4.3.12.	RELAY ASSEMBLY RE-1112/FPN-44A	4-75
4.3.13.	RESISTOR ASSEMBLY (1A53A19)	4-75
4.3.14.	RESISTOR ASSEMBLY (1A53A20)	4-76
4.3.15.	RESISTOR ASSEMBLY (1A53A23)	4-76
4.3.16.	INSTRUMENT SHUNT MX-9783/FPN-44A (1A53A4)	4-76
4.3.17.	VOLTAGE DIVIDER CN-1474/FPN-44A (1A53A7)	4-77
4.3.18.	TRANSMITTER CONTROL	4-79
4.3.18.1.	TRANSMITTER CONTROL FUNCTIONAL DESCRIPTION	4-79
4.3.18.1.1.	SAFETY INTERLOCK SENSE	4-79
4.3.18.1.2.	COOLING SYSTEM SENSE	4-79
4.3.18.1.3.	VOLTAGE, CURRENT AND TEMPERATURE SENSE	4-80
4.3.18.1.4.	REMOTE INPUTS	4-105
4.3.18.1.5.	LOCAL INPUTS	4-105
4.3.18.1.6.	OUTPUTS	4-105
4.3.18.1.7.	SEQUENTIAL POWER TURN ON	4-105
4.3.18.1.8.	ANTENNA TRANSFER	4-106
4.3.18.1.9.	HIGH VOLTAGE DISCHARGE	4-106
4.3.18.1.10.	DELAY OVERLOAD SENSE	4-106
4.3.18.1.11.	INPUT SIGNAL CONTROL	4-106
4.3.18.1.12.	REMOTE STATUS INDICATIONS	4-106
4.3.18.1.13.	RESET LATCHED RELAYS	4-107
4.3.18.2.	PRIMARY POWER DISTRIBUTION	4-107
4.3.18.2.1.	208 VAC DISTRIBUTION	4-107
4.3.18.2.2.	460 VAC DISTRIBUTION	4-108
4.3.18.3.	TRANSMITTER CONTROL CIRCUIT DESCRIPTION	4-109
4.3.18.3.1.	MOTOR CONTROL	4-109
4.3.18.3.2.	START TRANSFER	4-110
4.3.18.3.3.	FILAMENT TURN ON	4-113
4.3.18.3.4.	BIAS TURN ON	4-114
4.3.18.3.5.	HIGH VOLTAGE TURN-ON	4-117
4.3.18.3.6	PROTECTION CIRCUITS	4-118
4.3.18.3.7.	SHUNT TRIP	4-122
4.3.18.3.8.	LIGHTING	4-126
4.3.19.	WATER COOLING SYSTEM	4-126
4.3.20.	COMMON CIRCUITS	4-131

4.3.20.1.	TIME DELAY RELAYS (1A5A3K28,131 1A53A3K39 and 1A53A3K40)	4-131
4.3.21.	LOCAL CONTROL UNIT (5). (Figure 7-51)	4-131
4.3.21.1.	OPERATE TRANSMITTER SELECTION	4-131
4.3.21.2.	PLATE VOLTAGE CONTROL	4-134
4.3.21.3.	OPERATE TRANSMITTER INDICATOR	4-134
4.3.21.4.	INHIBIT CIRCUITS IN LOCAL OPERATION	4-134
4.3.21.5.	STATUS SIGNALS TO THE TAC	4-134
4.3.21.6.	READY FOR REMOTE	4-135

TABLE OF CONTENTS - SECTION 5

PARAGRAPH	DESCRIPTION	PAGE
5.0.	MAINTENANCE.	5-1
5.1.	TROUBLE SHOOTING - GENERAL.	5-1
5.1.1.	SYMPTOM RECOGNITION.	5-1
5.1.2.	SYMPTOM ELABORATION.	5-8
5.1.3.	LISTING PROBABLE FAULTY FUNCTION.	5-8
5.1.4.	LOCALIZING THE FAULTY FUNCTION.	5-8
5.1.5.	LOCALIZING TROUBLE TO THE CIRCUIT.	5-8
5.1.6.	FAILURE ANALYSIS.	5-8
5.1.7.	TROUBLE SHOOTING AIDS.	5-8
5.1.8.	TEST EQUIPMENT AND SPECIAL TOOLS.	5-9
5.1.9.	OVERALL TROUBLE SHOOTING.	5-9
5.1.9.1.	PRELIMINARY CHECK.	5-9
5.1.9.2.	CONTROL SETTINGS.	5-9
5.1.9.3.	SYSTEM TROUBLE SHOOTING.	5-9
5.1.10.	FUNCTIONAL SECTION TROUBLE SHOOTING.	5-10
5.1.10.1.	TEST EQUIPMENT.	5-10
5.1.10.2.	CONTROL SETTINGS.	5-10
5.1.10.3.	SERVICE BLOCK AND SCHEMATIC DIAGRAMS.	5-10
5.1.10.4.	VOLTAGE AND RESISTANCE DIAGRAMS.	5-10
5.1.10.5.	TEST POINT AND PARTS LOCATION DIAGRAMS.	5-10
5.1.10.6.	SCHEMATIC DIAGRAMS.	5-10
5.2.	SERVICE AND REPAIR - GENERAL.	5-22
5.2.1.	MAINTENANCE STANDARDS.	5-22
5.2.1.1.	MAINTENANCE STANDARDS LIST.	5-22
5.2.1.2.	TEST EQUIPMENT REQUIRED.	5-23
5.2.1.3.	TIME NEEDED TO ESTABLISH REFERENCE STANDARDS.	5-23
5.2.1.4.	OPERATION IN DUMMY LOAD CONFIGURATION.	5-23
5.2.2.	PREVENTIVE MAINTENANCE.	5-23
5.2.2.1	CHECK-OFF LISTS.	5-23
5.2.2.2.	EQUIPMENT REQUIRED FOR PREVENTIVE MAINTENANCE.	5-107
5.2.2.3.	TIME REQUIRED FOR PREVENTIVE MAINTENANCE.	5-107

TABLE OF CONTENTS - SECTION 5(Cont)

5.2.2.4.	PREVENTIVE MAINTENANCE TABLES.	5-108
5.2.3.	FAILURE REPORT.	5-131
5.2.4.	TUNING AND ADJUSTMENTS.	5-131
5.2.4.1.	TEST EQUIPMENT AND SPECIAL TOOLS.	5-131
5.2.4.2.	RELAY ADJUSTMENTS.	5-131
5.2.4.2.1.	AMPLIFIER GROUP 1A4.	5-131
5.2.4.2.2.	POWER AMPLIFIER TUBE RACK 1A6.	5-133
5.2.4.2.3.	RELAY ASSEMBLY 1A53A3.	5-140
5.2.4.3.	PROTECTIVE SPARK GAP SPACING.	5-142
5.2.4.4.	THERMOMETER SWITCHES.	5-143
5.2.4.5.	TEST POINT BLOCKING CAPACITORS.	5-143
5.2.4.6.	UNDERVOLTAGE AND OVERVOLTAGE PROTECTION CIRCUIT.	5-143
5.2.4.7.	VOLTAGE REGULATOR CN-1472/FPN-44A **[1096285G2]**.	5-143
5.2.4.8.	VOLTAGE REGULATOR CN-1473/FPN-44A.	5-151
5.2.4.8.1.	GATE TRIGGER UNIT (GTU) 1A53A3A1A1, 1A53A3A1A2, 1A53A3A1A3 ADJUSTMENTS.	5-151
5.2.4.8.2.	CHOP-OFF LIMITER 1A53A3A1A4 ADJUSTMENT.	5-153
5.2.4.8.3.	PREAMPLIFIER 1A53A3A1A5 ADJUSTMENT.	5-154
5.2.4.9.	TUBE SEASONING.	5-154
5.2.4.10.	BIAS ADJUST	5-155
5.2.4.11.	TUNING.	5-161
5.2.4.11.1.	PRELIMINARY SET-UP.	5-161
5.4.2.11.2.	FILTER INPUT CIRCUIT TUNING.	5-163
5.4.2.11.3.	FILTER OUTPUT CIRCUIT TUNING (DUMMY LOAD).	5-163
5.4.2.11.4.	FILTER OUTPUT CIRCUIT TUNING (ANTENNA).	5-163
5.2.4.11.5.	FINAL DUMMY LOAD COIL ADJUSTMENT.	5-164
5.2.4.12.	METER CALIBRATION ADJUSTMENTS.	5-164
5.2.4.12.1	LOW VOLTAGE PLATE METER 1A53A2M9. CALIBRATION ADJUSTMENT.	5-164
5.2.4.12.2.	-5KV BIAS METER 1A53A2M4. CALIBRATION ADJUSTMENT.	5-165
5.2.4.12.3.	IPA PLATE VOLTAGE METER 1A53A2M4 CALIBRATION ADJUSTMENT.	5-165
5.2.4.12.4.	PA PLATE VOLTAGE METER 1A53A2M2 CALIBRATION ADJUSTMENT.	5-165
5.2.4.13.	OVERLOAD ADJUSTMENTS.	5-165
5.2.4.13.1.	PA PLATE OVERVOLTAGE RELAY 1A53A7K1 ADJUSTMENT.	5-168
5.2.4.14.	BIAS UNDERVOLTAGE CIRCUIT ADJUSTMENT.	5-168
5.2.4.15.	POWER AMPLIFIER TANK 1A5 AXIAL ALIGNMENT.	5-169
5.2.4.16.	OPERATING ADJUSTMENTS.	5-170
5.2.4.17.	AC OVERLOAD ADJUSTMENT.	5-170
5.2.4.18.	INSTRUMENT SHUNT ADJUSTMENTS.	5-170
5.2.4.18.1.	10.75 KVDC OVERLOAD RELAY 1A53A4K1 ADJUSTMENT.	5-170
5.2.4.18.2.	21.5 KVDC OVERLOAD RELAY 1A53A4K2 ADJUSTMENT.	5-171

TABLE OF CONTENTS - SECTION 5(Cont)

5.2.4.19.	RELAY POWER SUPPLY ADJUSTMENT.	5-172
5.2.4.20.	POWER SUPPLIES 1A4A6A1 AND 1A4A6A2.	5-172
5.2.4.20.1.	TEST EQUIPMENT.	5-172
5.2.4.20.2.	CONTROL SETTINGS.	5-173
5.2.4.20.3.	TROUBLESHOOTING.	5-173
5.2.4.20.4.	CALIBRATION.	5-173
5.2.4.20.5.	PERFORMANCE TESTING.	5-177
5.3.4.21.	POWER SUPPLIES 1A4A6A3 AND 1A4A6A4.	5-178
5.2.4.21.1.	TEST EQUIPMENT.	5-178
5.2.4.21.2.	CONTROL SETTINGS.	5-178
5.2.4.21.3.	TROUBLESHOOTING.	5-179
5.2.4.21.4.	CALIBRATION.	5-179
5.2.4.21.5.	PERFORMANCE TESTING.	5-180
5.2.4.22.	BIASING THE TRANSMITTER.	5-181
5.2.4.23.	DRIVE ADJUSTMENT.	5-181
5.2.4.24.	PERIODIC CHECKS.	5-182
5.3.	REMOVAL, ASSEMBLY, REPAIR AND ALIGNMENT.	5-183
5.3.1.	PARTS LOCATION.	5-183
5.3.2.	REMOVAL OF PARTS.	5-183
5.3.2.1.	REPLACEMENT OF POWER AMPLIFIER TUBE RACK 1A6V1 THROUGH 1A6V4 TUBES.	5-183
5.3.2.2	MAINTENANCE OF ELECTRON TUBE LIQUID COOLER 1A2/1A52.	5-183
5.3.2.2.1.	HEAT EXCHANGER PARTS REMOVAL.	5-183
5.3.2.2.2.	ELECTRON TUBE LIQUID COOLER 1A2/1A52 MAINTENANCE.	5-184
5.3.2.3.	REMOVAL OF ELECTRON TUBE LIQUID COOLER 1A2U39B1 PUMP-MOTOR ASSEMBLY.	5-191
5.3.2.4.	REMOVAL OF ELECTRON TUBE LIQUID COOLER 1A2/1A52 PUMP.	5-191
5.3.2.5.	REMOVAL AND REPLACEMENT OF 1A53A3 CONTROL RELAYS.	5-191
5.3.2.6.	REPLACEMENT OF VOLTAGE REGULATOR 1A53A3A1 SCR'S.	5-192
5.3.2.7	REMOVAL OF VOLTAGE REGULATOR 1A53A3A3 MOTOR ASSEMBLY.	5-192
5.3.2.8.	REMOVAL OF VOLTAGE REGULATOR 1A53A3A3 MOTOR ASSEMBLY AND TRANSFORMER MOUNTING PLATE.	5-192
5.3.2.9.	REMOVAL OF VOLTAGE REGULATOR 1A53A3A3 MAIN WORM ASSEMBLY.	5-192
5.3.2.10.	REPLACEMENT OF POWER SUPPLY 1A53A5 FRAME ASSEMBLY.	5-193
5.3.2.11.	REPLACEMENT OF TRANSFORMER 1A53A6 INSULATORS 1A53A6A1MP1 - MP12.	5-193
5.3.3.	REPAIR AND ALIGNMENT.	5-196
5.3.3.1.	REPLACEMENT PARTS.	5-196
5.3.3.2.	REPAIR OF TRANSISTORIZED CIRCUITS:	5-196
5.3.3.2.1	GENERAL.	5-196
5.3.3.2.2.	TESTING.	5-196
5.3.3.2.3.	REPLACEMENT.	5-196

5.3.3.3.	ALIGNMENT.	5-196
5.3.4.	OVERALL SCHEMATIC DIAGRAMS.	5-196

TABLE OF CONTENTS - SECTION 6

PARAGRAPH	DESCRIPTION	PAGE
6.0.	PARTS LISTS	6-1
6.1.	INTRODUCTION	6-1
6.2.	LIST OF MAJOR UNITS	6-1
6.3.	MAINTENANCE PARTS LIST	6-1
6.4.	STOCK NUMBER INFORMATION	6-1
6.5.	LIST OF MANUFACTURES	6-2
6.6.	NOTES	6-2

TABLE OF CONTENTS - SECTION 7

PARAGRAPH	DESCRIPTION	PAGE
7.0.	SCHEMATICS AND LOGIC DIAGRAMS	7-1

LIST OF ILLUSTRATIONS - SECTION 1

FIGURE	DESCRIPTION	PAGE
1-1.	LORAN TRANSMITTING SET AN/FPN-44A/B. RELATIONSHIP OF UNITS	1-1

LIST OF ILLUSTRATIONS - SECTION 2

FIGURE	DESCRIPTION	PAGE
2-1.	UNPACKING PROCEDURES FOR ELECTRON TUBES. . . .	2-2
2-2.	LORAN TRANSMITTING SET, AN/FPN-44A/B SYSTEM DIAGRAM	2-5/2-6

LIST OF ILLUSTRATIONS - SECTION 3

FIGURE	DESCRIPTION	PAGE
3-1.	Amplifier Group OG-159/FPN-44A (1A4) **[OA-4482/FPN-44]** Controls and indicators. . . .	3-5
3-2.	Power Supply PP-3704/FPN-44A (1A4A1) **[C-4557/FPN-44]** Controls and Indicators. . . .	3-6
3-3.	Power Supply Assembly (1A4A6) Controls and Indicators.	3-7
3-4.	Oscilloscope Control C-4558A/FPN-44A (1A4A3) Controls and Indicators.	3-8
3-5.	Indicator Panel SB-1894/FPN-44 (1A12) Controls and Indicators.	3-9
3-6.	PA Overload Indicator Panel (1A21) Controls and Indicators.	3-10
3-7.	Control-Indicator C-10034/FPN-44A (1A53A2) Controls and Indicators.	3-11
3-8.	P/O Relay Assembly RE-1113/FPN-44A (1A53A3) Controls and Indicators.	3-12
3-9.	P/O Voltage Regulator CN-1472/FPN-44A (1A53A3A4) Controls and Indicators.	3-13
3-10.	Antenna Coupler CU-2171/FPN-44A (3) **[CU-1106/FPN-44]** Controls and Indicators. . .	3-14
3-11.	Local Control Unit (5) Controls and Indicators.	3-15
3-12.	Local and Remote Operation	3-16

LIST OF ILLUSTRATIONS - SECTION 4

FIGURE	DESCRIPTION	PAGE
4-1.	Loran C Transmitting Station Equipment Configuration	4-3
4-2.	Loran Transmitting Set AN/FPN-44 Block Diagram	4-9/10
4-3.	Power Supply Set OP-109/FPN-44A (1A53) - **[1096281G3]** Simplified Functional Block Diagram.	4-15/16
4-4.	Power Supply Assembly (1A4A6) Controls and Indicators	4-24
4-5.	Supplement Page 4-4	4-25
4-6.	Amplifier Group, 2nd IPA and Radio Frequency Amplifier PA Stages, One-half of Push-Pull Circuit, Simplified Schematic Diagram (3 sheets).	4-26
4-7.	Deleted	4-43/4-45
4-8.	Power Amplifier, Typical Grid Cathode Protective Circuits, Simplified Schematic Diagram	4-46
4-9.	Left PA Bias Supply. Simplified Schematic Diagram	4-47
4-10.	Power Supply Set, OP-109/FPN-44A (1A53). **[1096281G3]** Detailed Functional Block Diagram	4-49
4-11.	Voltage Regulator CN-1472/FPN-44A (1A53A3A3) and (1A53A3A4). **[1096285G2]** Functional Block Diagram	4-53
4-12.	Voltage Regulator CN-1472/FPN -44A **[1096285G2]** Phase Relationship	4-56
4-13.	Voltage Regulator CN-1473/FPN-44A, (1A53A3A1) and (1A53A3A2). Functional Block Diagram	4-59
4-14.	Silicone Controlled Rectifier Operation	4-61
4-15.	Transmitter Control, Functional Block Diagram	4-63
4-16.	Primary Power Distribution (2 sheets)	4-83/4-86
4-17.	Transmitter Control Functional Block Diagram (9 sheets)	4-87/4-103
4-18.	Water Cooling System, Simplified Schematic Diagram	4-123/4-124
4-19.	Time Delay Relay, Schematic Diagram	4-128
4-20.	-260 Vdc and -150 Vdc Power Supplies Block Diagram	4-132
4-21.	±24 Vdc Power Supply Block Diagram	4-133

LIST OF ILLUSTRATIONS - SECTION 5

FIGURE	DESCRIPTION	PAGE
5-1.	Input Amplifier (1A4A1A3), Right Side, Parts Location Diagram.	5-2
5-2.	Reference Amplifier (1A4A1A3A1) Parts Location Diagram.	5-3
5-3.	Input Amplifier (1A4A1A3), Left Side, Parts Location Diagram.	5-4
5-4.	Pedestal Generator/Difference Preamplifier (1A4A1A3A2), Parts Location Diagram.	5-5
5-5.	Input Amplifier (1A4A1A3), Left Side, Upper and Lower Component Boards.	5-6
5-6.	Exciter (1A4TB3), Parts Location Diagram.	5-7
5-7.	Transmitting Group OT-96/FPN-44A, **[OA-4483/FPN-44]** Parts Location Diagram	5-24
5-8.	Transmitting Group OT-96/FPN-44A, **[OA-4483/FPN-44]** Inside Rear View, Parts Location Diagram	5-25
5-9.	Cooler Liquid Electron Tube HD-601/1000 FPN, Parts Location Diagram	5-26
5-10.	Amplifier Group OG-159/FPN-44A **[OA-4482/FPN-44]** Front View, Parts Location Diagram	5-27
5-11.	Amplifier Group OG-159/FPN-44A, **[OA-4482/FPN-44]** Parts Location Diagram	5-28
5-12.	Amplifier Group OG-159/FPN-44A, **[OA-4482/FPN-44]** Front View	5-29
5-13.	Deleted	
5-14.	Amplifier Group OG-159/FPN-44A.**[OA-4482/FPN-44]** Part of Lower Shelf, Parts Location Diagram	5-31
5-15.	Deleted	5-31
5-16.	Amplifier Group OG-159/FPN-44A,**[OA-4482/FPN-44]** Front Panel, Parts Location Diagram	5-32
5-17.	Amplifier Group OG-159/FPN-44A,**[OA-4482/FPN-44]** Terminal Board, Parts Location Diagram	5-32
5-18.	Amplifier Group OG-159/FPN-44A,**[OA-4482/FPN-44]** Left Rear View, Parts Location Diagram	5-33
5-19.	Amplifier Group OG-159/FPN-44A,**[OA-4482/FPN-44]** Right Rear View, Parts Location Diagram	5-34
5-20.	Power Supply PP-7304/FPN-44A Front View, Parts Location Diagram	5-35
5-21.	+250V Regulator Voltage, Top View, Parts Location Diagram	5-36
5-22.	+250v Regulator Voltage, Bottom View, Parts Location Diagram	5-37

LIST OF ILLUSTRATIONS - SECTION 5(Cont)

5-23.	Control Oscilloscope C-4558A/FPN-44A Front View, Parts Location Diagram	5-38
5-24.	Control Oscilloscope C-4558A/FPN-44A Right Side View, Parts Location Diagram	5-39
5-25.	Power Supply, Parts Location Diagram	5-40
5-26.	Trigger Selector, Edge View Test Point Location Diagram	5-41
5-27.	Deleted	
5-28.	Bias Pedestal Power Supply, Top View, Parts Location Diagram	5-43
5-29.	Deleted	
5-30.	Generator Bias Pedestal, Top View, Parts Location Diagram	5-45
5-31.	Bias Pedestal Generator, Bottom View	5-49
5-32.	Power Amplifier Tank Coil, Parts Location Diagram	5-47
5-33.	Amplifier Radio Frequency AM-3774/ FPN-44, Front View Doors Open, Parts Location Diagram (4 sheets)	5-48
5-34.	Amplifier Radio Frequency AM-3774/ FPN-44, Rear View, Parts Location Diagram	5-52
5-35.	Resistor Rack Transmitter No. 1, Parts Location Diagram	5-53
5-36.	Resistor Rack Transmitter No. 2, Parts Location Diagram	5-54
5-37.	Rack Electrical Equipment MT-2929/ FPN-44A, Parts Location Diagram	5-55
5-38.	Panel, Indicator SB-1894A/FPN-44, Front View, Parts Location Diagram	5-56
5-39.	Panel, Indicator SB-1894A/FPN-44, Chassis, Parts Location Diagram	5-57
5-40	Filter, Low Pass F-1428/FPN-44A, Parts Location Diagram.	5-58
5-41.	Indicator Panel, PA Overload, Front View, Parts Location Diagram	5-59
5-42.	Indicator Panel, PA Overload, Rear View, Parts Location Diagram	5-60
5-43.	Power Supply Set OP-109/FPN-44A,**[1096281G3]** Parts Location Diagram (2 sheets)	5-61
5-44.	Relay Assembly RE-1112/FPN-44A, Parts Location Diagram	5-63
5-45.	Control-Indicator C-10034/FPN-44A, Front View, Parts Location Diagram	5-64
5-46.	Control-Indicator C-10034/FPN-44A, Rear View, Parts Locations Diagrams	5-65
5-47.	Relay Assembly RE-1113/FPN-44A, Parts Location Diagram	5-66

LIST OF ILLUSTRATIONS - SECTION 5(Cont)

5-48.	Relay Assembly RE-1113/FPN-44A, Parts Location Diagram	5-67
5-49.	Relay Assembly P/O RE-1113/FPN-44A, Parts Location Diagram	5-68
5-50.	Relay Assembly P/O RE-1113/FPN-44A, Parts Location Diagram	5-69
5-51.	Relay Assembly P/O RE-1113/FPN-44A Parts Location Diagram	5-70
5-52.	Relay Assembly P/O RE-1113/FPN-44A, Parts Location Diagram	5-71
5-53.	Relay Assembly P/O RE-1113/FPN-44A Parts Location Diagram	5-72
5-54.	Regulator Voltage CN-1473/FPN-44A Parts Location Diagram	5-73
5-55.	Gate Trigger Unit, Underside of Cover, Parts Location Diagram	5-74
5-56.	Gate Trigger Unit, Inside Can, Parts Location Diagram	5-74
5-57.	Gate Trigger Unit, Underside of Board Parts Location Diagram	5-75
5-58.	Gate Trigger Unit, Underside of Board, Parts Location Diagram	5-76
5-59.	Gate Trigger Unit, Topside of Board, Parts Location Diagram	5-77
5-60.	Chop-Off Limiter, Parts Location Diagram (2 Sheets)	5-78
5-61.	Amplifier Voltage Regulator, Cover Dropped, Parts Location Diagram	5-80
5-62.	Preamplifier Voltage Regulator, Underside of Cover, Parts Location Diagram	5-81
5-63.	Fuse Panel, Parts Location Diagram	5-82
5-64.	Voltage Regulator, Interior View, Parts Location Diagram	5-83
5-65.	Panel Control P/O CN-1472/FPN-44A Parts Location Diagram	5-84
5-66.	Shunt, Instrument, Parts Location Diagram	5-85
5-67.	Component Board Assembly, Parts Location Diagram	5-86
5-68.	Component Board Assembly, Parts Location Diagram	5-87
5-69.	Component Board Assembly, Parts Location Diagram	5-88
5-69A.	Component Board Assembly, Parts Location Diagram	5-89
5-70.	Power Supply PP-7305/FPN-44A, Parts Location Diagram	5-90
5-71.	Power Supply, Parts Location Diagram	5-91

LIST OF ILLUSTRATIONS - SECTION 5(Cont)

5-72.	Power Supply, Parts Location Diagram	5-92
5-73.	Voltage Divider CN-1474/FPN-44A Right View, Parts Location Diagram	5-93
5-74.	Voltage Divider CN-1474/FPN-44A Left View, Parts Location Diagram	5-94
5-75.	Voltage Divider CN-1474/FPN-44A Bottom View, Parts Location Diagram	5-95
5-76.	Relay Driver, Parts Location Diagram	5-96
5-77.	Resistor Assembly, Parts Location Diagram	5-97
5-78.	Resistor Assembly, Parts Location Diagram	5-98
5-79.	Coupler Antenna CU-2171/FPN-44A, **[CU-1106/ FPN-44]** Front View, Parts Location Diagram	5-99
5-80.	Coupler Antenna CU-2171/FPN-44A, **[CU-1106/ FPN-44]** Front Panel Open, Parts Location Diagram	5-100
5-81.	Coupler Antenna CU-2171/FPN-44A, **CU-1106/ FPN-44]** Left Side View, Parts Location Diagram	5-101
5-82.	Coupler Antenna CU-2171/FPN-44A, **[CU-1106/ FPN-44]** Right Side View, Parts Location Diagram	5-102
5-83.	Dummy Load Electrical DA-329A/FPN-44, Front View, Parts Location Diagram	5-103
5-84.	Dummy Load Electrical DA-329A/FPN-44, Left Side View, Parts Location Diagram	5-104
5-85.	Dummy Load Electrical DA-329A/FPN-44, Right Side View, Parts Location Diagram	5-105
5-86.	Local Control Unit. Inside View Parts Location Diagram	5-106
5-87.	Gate Trigger Unit Positive-Negative Balance and Three Phase Balance Waveforms.	5-121
5-88.	Weekly Preventive Maintenance Routines, Step 1	5-122
5-89.	Weekly Preventive Maintenance Routines, Steps 2 and 3	5-123
5-90.	Weekly Preventive Maintenance Routines, Step 4	5-124
5-91.	Weekly Preventive Maintenance Routines, Step 5	5-125
5-92.	Weekly Preventive Maintenance Routines, Step 6	5-126
5-93.	Weekly Preventive Maintenance Routines, Step 7	5-127
5-94.	Amplifier Group OG-159/FPN-44A (1A4) **[OA-4482/FPN-44]** Front and Rear Views, Relay Adjustments	5-128

LIST OF ILLUSTRATIONS - SECTION 5(Cont)

5-95.	PA Tube Rack 1A6, Front View Relay Adjustment	5-129
5-96.	Time Delay Relay Adjustments, Test Setup	5-130
5-97.	Time Delay Relay Adjustments, Location of Components	5-134
5-98.	Amplifier Group OG-159/FPN-44A (1A4), **[OA-4482/FPN-44]** Front View Spark Gap Spacing	5-135
5-99.	PA Tube Rack 1A6, Front View, Spark Gap Spacing	5-135
5-100.	PA Tube Rack 1A6, Front View, Thermometer Switches Adjustments	5-136
5-101.	Amplifier Group OG-159/FPN-44A (1A4), **[OA-4482/FPN-44]** Front View, Blocking Capacitor	5-137
5-102.	Undervoltage and Overvoltage Protection Circuit, Adjustment Location	5-138
5-103.	Regulator Control Panel 1A53A3A4 (P/O Voltage Regulator CN-1472/FPN-44A)	5-139
5-104.	Voltage Regulator CN-1473/FPN-44A, Location of Adjustment Controls	5-144
5-105.	Gate Trigger Unit Positive-Negative Balance Adjustment Test Setup	5-145
5-106.	Gate Trigger Unit Three Phase Balance Adjustment Test Setup	5-146
5-107.	AN/FPN-44A Bias Adjustment	5-147
5-108.	Bias Adjust Control Locations	5-148
5-109.	Bias Pedestal Adjust Waveform	5-149
5-110.	Antenna Coupler CU-2171/FPN-44A **[CU-1106/FPN-44]** Tuning Test Setup.	5-157
5-111.	Axial Alignment of PA Tank Test Setup	5-166
5-112.	Deleted	5-167
5-113.	Electron Tube Liquid Cooler HD-601/1000 FPN, Removal and Maintenance	5-186
5-114.	SCR Clamp Assembly	5-187
5-115.	Control Relay Maintenance	5-188
5-116.	Voltage Regulator 1A53A3A3 End View	5-189

LIST OF ILLUSTRATIONS - SECTION 6

FIGURE	DESCRIPTION	PAGE
N/A	NONE	

LIST OF ILLUSTRATIONS - SECTION 7

FIGURE	DESCRIPTION	PAGE
7-1.	AN-FPN-44A Control Circuitry (10 Sheets)	7-3
7-2.	AN/FPN-44/TAC Interface Diagrams (10 Sheets)	7-21
7-3.	Deleted	
7-4.	+250-Volt Regulator 1A4A1A1 Servicing Block Diagram	7-41
7-5.	Oscilloscope Control C-4558A/FPN-44A Servicing Schematic Diagram	7-43
7-6.	Trigger Selector/Bias Pedestal Driver 1A4A3A2, Waveforms and Adjustments	7-45
7-7.	Voltage Regulator CN-1473/FPN-44A Servicing Diagram	7-46
7-8.	Chop-Off Limiter 1A5A3A1A4 (P/O Voltage Regulator CN-1473/FPN-44A) Servicing Schematic Diagram	7-47
7-9.	Preamplifier 1A5A3A1A5 (P/O Voltage Regulator CN-1473/FPN-44A) Servicing Schematic Diagram	7-49
7-10.	Regulator CN-1472/FPN-44A Servicing Schematic Diagram	7-51
7-11.	Voltage Divider CN-1474/FPN-44A (1A53A7), Servicing Schematic Diagram	7-53
7-12.	Antenna Coupler and Dummy Load Control Circuits, Servicing Schematic Design	7-55
7-13.	Deleted	
7-14.	+250-Volt Regulator 1A4A1A1 Voltage and Resistance Measurements	7-57
7-15.	Output Stages in Amplifier Group OG-159/FPN-44A,**[OA-4482/FPN-44]** Resistance Measurements	7-58
7-16.	PA Tube Rack 1A6, Resistance Measurements	7-59
7-17.	Loran Transmitting Set AN/FPN-44, Wiring Diagram	7-61
7-18.	Loran Transmitting Set. System Interconnection Diagram	7-63
7-19.	Transmitting Group OT-96/FPN-44**[OA-4483/FPN-44]** (1), Wiring Diagram (3 Sheets)	7-65
7-20.	Amplifier Group OG-159/FPN-44**[OA-4482/FPN-44]** (1A4) Schematic Diagram	7-71
7-21.	Power Supply PP-7304/FPN-44A (1A4A1), Schematic Diagram	7-73
7-22.	+250V Regulator 1A4A1A1, Schematic Diagram	7-75
7-23.	Oscilloscope Control C-4558A/	

	FPN-44A (1A4A3) Schematic Diagram	7-77
7-24.	Negative Power Supply 1A4A3A1, Schematic Diagram	7-79
7-25.	Trigger Selector 1 Bias Pedestal Driver 1A4A3A2, Schematic Diagram	7-81
7-26.	Bias Pedestal Power Supply 1A4A4 Schematic Diagram	7-83
7-27.	Bias Pedestal Generator 1A4A5, Schematic Diagram	7-85
7-28.	Power Supply Assembly, Schematic Diagram.	7-87
7-29.	Radio Frequency Amplifier AM-3774/ FPN-44 (1A5 thru 1A10)	7-89
7-30.	Electrical Equipment Rack MT-2929/FPN-44 (1A11), Schematic Diagram	7-91
7-31.	Indicator Panel SB-1894/FPN-44 (1A12), Schematic Diagram	7-93
7-32.	Low Pass Filter F-1428/FPN-44A (1A20), Schematic Diagram	7-95
7-33.	PA Overload Indicator Panel (1A21) Schematic Diagram	7-96
7-34.	Electron Tube Liquid Cooler HD601/1000 FPN-44 (1A2)Schematic Diagram	7-97
7-35.	Relay Assembly RE-1112/FPN-44A FPN-44A (1A53A1) Power Supply PP-7305/FPN-44A 1A53A5 and 1A53A6 and Resistor Assemblies (1A53A19, 1A53A20 and 1A53A23.	7-99
7-36.	Control Indicator C-10034/FPN-44A (1A53A2) Schematic Diagram	7-101
7-37.	460 Volt Rack Assembly P/O Relay Assembly RE-1113/ FPN-44A (1A53A3), Schematic Design	7-103
7-38.	Over Current Assembly, P/O Relay Assembly RE-1113/FPN-44A (1A53A3), Schematic Diagram	7-105
7-39.	208 Volt Rack Assembly, P/O Relay Assembly RE-1113/FPN-44A (1A53A3) Schematic Diagram (2 Sheets)	7-107
7-40.	Relay Power Supply, P/O Relay Assembly, RE-1113/FPN-44A (1A53A3) Schematic Diagram	7-111
7-41.	Voltage Regulator CN-1473/FPN-44A (1a53A3A1 AND 1A53A3A2), Schematic Diagram	7-113
7-42.	Gate Trigger Unit 1A53A3A1A1, 1A53A3A1A2, and 1A53A3A1A3, Schematic Diagram	7-115
7-43.	Chop-Off Limiter 1A53A3A1A4,	

	Schematic Diagram	7-117
7-44.	Preamplifier 1A53A3A1A5, Schematic Diagram	7-119
7-45.	Voltage Regulator P/O CN-1472/ FPN44A (1A53A3A3), Schematic Diagram	7-121
7-46.	Voltage Regulator Control Panel P/O CN-1472/FPN-44A (1A53A3A4) Schematic Diagram	7-123
7-47.	Instrument Shunt MX-9783/FPN44A (1A53A4), Schematic Diagram	7-125
7-47A.	Instrument Shunt MX-9783/FPN44A (1A53A4), Transistor Version	7-126A
7-48.	Voltage Divider CN-1474/FPN-44A (1A53A7), Schematic Diagram	7-127
7-49.	Antenna Coupler CU-2171/FPN-44A **[CU-1106/FPN-44]** (3) Schematic Diagram . . .	7-129
7-50.	Electrical Dummy Load DA-329 /FPN-44A (3)	7-131
7-51.	Local Control Unit (5) Schematic Diagram	7-133
7-52.	Input Amplifier (1A4A1A3A1) Schematic Diagram. (7 Sheets)	7-135
7-53.	-260 Vdc Power Supply 1A4A6A1 Schematic Diagram	7-145
7-54.	-150 Vdc Power Supply 1A4A6A2 Schematic Diagram	7-147
7-55.	± 24Vdc Power Supply, 1A4A6A3 and 1A4A6A3, Schematic Diagram	7-149

LIST OF TABLES - SECTION 1

TABLE	DESCRIPTION	PAGE
1-1.	EQUIPMENT SUPPLIED QUANTITY AND IDENTIFICATION	1-7
1-2.	EQUIPMENT DIMENSIONS AND WEIGHTS	1-10
1-3.	EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED	1-11
1-4.	SHIPPING DATA	1-12
1-5.	SEMICONDUCTOR AND TUBE COMPLEMENT PER TRANSMITTER	1-15
1-6.	LORAN TRANSMITTING SET, AN/FPN-44A HEAT EXCHANGER CALCULATIONS	1-17

LIST OF TABLES - SECTION 2

TABLE	DESCRIPTION	PAGE
2-1.	FILAMENT TRANSFORMER PRIMARY TAPS	2-8
2-2.	INITIAL EQUIPMENT SWITCH POSITIONS	2-9
2-3.	KEY INTERLOCKS	2-13
2-4.	TRANSMITTER CONTROL SEQUENCE OF OPERATION	2-22

LIST OF TABLES - SECTION 3

TABLE	DESCRIPTION	PAGE
3-1.	AMPLIFIER GROUP OG-159/FPN-44A (1A4) **[OA-4482/FPN-44]** CONTROLS AND INDICATORS	3-22
3-2.	POWER SUPPLY PP-7304/FPN-44A (1A4A1), **[C-4557/FPN-44]** CONTROLS INDICATORS	3-24
3-3.	POWER SUPPLY ASSEMBLY (1A4A6) CONTROLS AND INDICATORS	3-25
3-4.	OSCILLOSCOPE CONTROL C-4558A/FPN-44 (1A4A3) CONTROLS AND INDICATORS	3-26
3-5.	INDICATOR PANEL SB-1894/FPN-44 (1A12) CONTROLS AND INDICATORS	3-27
3-6.	PA OVERLOAD INDICATOR PANEL (1A21) CONTROLS AND INDICATORS	3-30
3-7.	CONTROL-INDICATOR C-10034/FPN-44A (1A53A2) CONTROLS AND INDICATORS	3-31
3-8.	P/O RELAY ASSEMBLY RE-1113/FPN-44A (1A53A3) CONTROLS AND INDICATORS	3-36
3-9.	P/O VOLTAGE REGULATOR CN-1472/FPN-44A (1A53A3A4) CONTROLS AND INDICATORS	3-37

3-10.	ANTENNA COUPLER CU-2171/FPN-44A **[CU-1106/FPN-44]** CONTROLS AND INDICATORS . .	3-38
3-11.	LOCAL CONTROL UNIT(5) CONTROLS AND INDICATORS	3-38
3-12.	BEFORE-USE SWITCH POSITION	3-40
3-13.	BEFORE-USE SEQUENCE OF OPERATION	3-41
3-14.	DURING-USE SEQUENCE OF OPERATION NON-DESLOT	3-42
3-15.	LOCAL AND REMOTE OPERATION	3-45
3-16.	BEFORE USE SWITCH POSITION (DESLOT)	3-46
3-17.	DURING USE SEQUENCE OF OPERATION (DESLOT) . .	3-47
3-18.	FUSE REPLACEMENT DATA	3-50

LIST OF TABLES - SECTION 4

TABLE	DESCRIPTION	PAGE
4-1.	POWER SUPPLY SET OP- 109/FPN-44A **[1096281G3]** (1A53) FUNCTIONS	4-17
4-2.	SENSING INPUTS AND CONTROLLED CIRCUITS	4-81
4-3.	SUMMARY OF START TRANSFER FUNCTION IN VARIOUS MODES	4-115
4-4.	FAULTS WHICH TURN OFF BIAS AND HIGH VOLTAGES	4-122
4-5.	WATER COOLING SYSTEM INDICATOR AND SENSOR FUNCTIONS	4-129

LIST OF TABLES - SECTION 5

TABLE	DESCRIPTION	PAGE
5-1.	TEST EQUIPMENT	5-11
5-2.	TRANSMITTING GROUP INITIAL CONTROL SETTINGS	5-13
5-3.	CONTROL AND POWER CIRCUITS, SYSTEM TROUBLE SHOOTING PROCEDURES	5-14
5-4.	FUNCTIONAL SECTION DIAGRAM	5-20
5-5.	LIST OF MAINTENANCE STANDARDS PROCEDURES . .	5-22
5-6.	TIME REQUIRED TO ESTABLISH REFERENCE STANDARDS	5-107
5-7.	TIME REQUIRED FOR PREVENTIVE MAINTENANCE . .	5-107
5-8	SAMPLE CHECK-OFF LISTS.	5-108
5-9.	WEEKLY PREVENTIVE MAINTENANCE ROUTINES . . .	5-109
5-10.	QUARTERLY PREVENTIVE MAINTENANCE ROUTINES	5-131

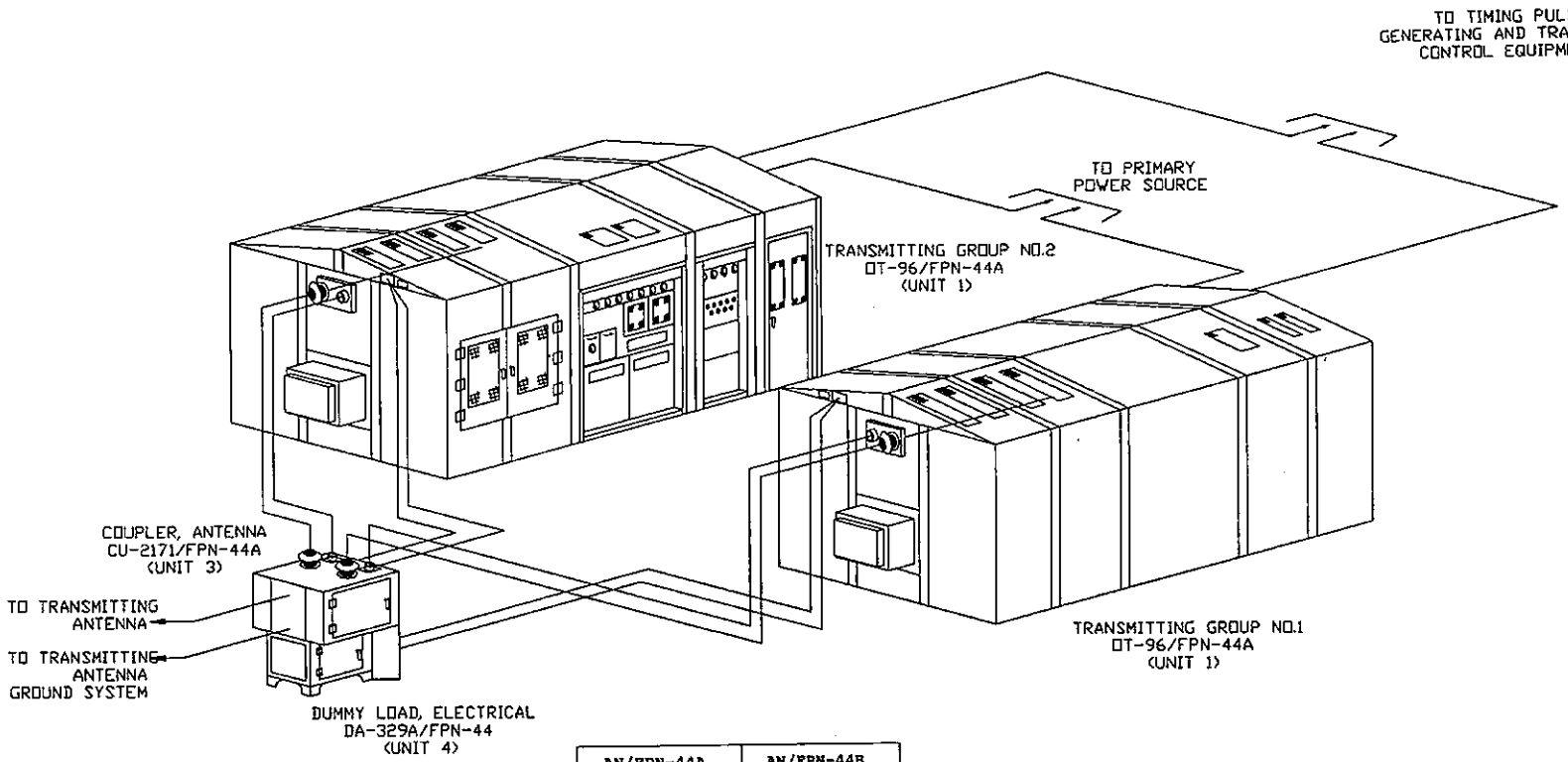
5-11.	TEST EQUIPMENT REQUIRED FOR TUNING ADJUSTMENT	5-175
5-12.	TROUBLE SHOOTING 1A4A6A1 AND 1A4A6A2	5-176
5-13.	TROUBLESHOOTING 1A4A6A3 AND 1A4A6A4	5-182

LIST OF TABLES - SECTION 6

TABLE	DESCRIPTION	PAGE
6-1.	LORAN TRANSMITTING SET, AN/FPN-44A LIST OF MAJOR UNITS	6-3
6-2.	LORAN TRANSMITTING SET, AN/FPN-44A MAINTENANCE PARTS LIST	6-5
6-3.	LORAN TRANSMITTING SET, AN/FPN-44A LIST OF MANUFACTURERS	6-172

LIST OF TABLES - SECTION 7

TABLE	DESCRIPTION	PAGE
N/A	NONE	



AN/FPN-44A	AN/FPN-44B
OT-96/FPN-44A	OA-4483/FPN-44
HD-1000/FPN	HD-601/FPN
OG-159/FPN-44A	OA-4482/FPN-44
PP-7304/FPN-44A	C-4557/FPN-44
OP-109/FPN-44A	1096281G3
CN-1472/FPN-44A	1096343G1
CN-1472/FPN-44A	1096285G2
CN-1472/FPN-44A	1096285G3
CU-2171/FPN-44A	CU-1106/FPN-44

Figure 1-1. Loran Transmitting Set AN/FPN-44A, Relationship of Units

1.0. GENERAL INFORMATION

1.1. **INTRODUCTION.** This technical manual provides the general information, principles of operation, and instructions for the installation, operation, and maintenance of Loran Transmitting Set AN/FPN-44A modified for feedback (figure 1-1). This set is used in a Loran-C ground station to transmit pulsed signals which provide a means of determining geographical position.

1.2. **FUNCTIONAL DESCRIPTION, LORAN GROUND STATION.** A Loran-C ground station consists of various configurations of equipment. A ground station that includes a Loran Transmitting Set AN/FPN-44A, is equipped with timing, pulse generating, and transmitter control equipment and an antenna. The function of the Loran-C ground station is to develop and transmit pulsed navigational signals at 100-kHz.

The station output power is 100 kilowatts at the standard sampling point. The standard sampling point occurs 25 microseconds after the start of each pulse. The peak power is approximately 400 kilowatts. The average power varies directly with the repetition rate of the pulses. Maximum output power averages 7.5 kilowatts; this occurs at a repetition rate of 180 pulses per second.

Loran-C ground stations are arranged in groups of three or more; one master station (M) and secondary stations (X, Y, Z). In each group (or chain) of stations the transmissions are timed and coordinated so that the signals form a Loran-C cycle. This cycle consists of groups of eight (or nine) phase-coded pulses which are transmitted to convey position information.

At either a master or a secondary station, the Loran Transmitting Set may be double pulsed (or single pulsed) at two different specific repetition rates. This technique is utilized to add one Loran-C system to another, and is called double rating.

1.3. **FUNCTIONAL DESCRIPTION, LORAN TRANSMITTING SET.**

1.3.1. **GENERAL.** The overall function of the Loran Transmitting Set AN/FPN-44A is to transmit Loran-C pulses. Principally, the Loran Transmitting Set performs the following basic functions:

(1) Amplifies Loran-C signal pulses, using triggers and 100-kHz excitation furnished by the associated timing, pulse generating, and transmitter control equipment.

(2) Monitors the developed signal.

(3) Transmits the signal pulses through an antenna.

(4) Incorporates features for switching its two integral transmitters between standby and operate status.

(5) Provides negative feedback in the Transmitter Amplifier Section to obtain automatic control of pulse shape and amplitude.

1.3.2. **DESCRIPTION OF MAJOR UNITS.**

1.3.2.1. **TRANSMITTING GROUP OT-96/FPN-44A (OA-4483/FPN-44B).** Two transmitting groups (figure 1-1) are contained in the Loran Transmitting Set. Since the two groups are identical, and each group is designated as unit 1, they are identified as Transmitting Group No. 1 and Transmitting Group No. 2. In practice, both transmitting groups are always in operation; one feeding the antenna, and the other on standby operation. In standby operation, only filament and bias voltages are applied to the standby group. Full operation into the dummy load is utilized only when necessary during maintenance or performance testing. If the operate transmitting group fails, the standby transmitting group can be switched to the antenna with no significant break in the transmission of the station signal.

The transmitting groups receive shaped drive pulses from the transmitter control and provide high level amplification to increase the signal level to sufficient amplitude to drive the transmitting antenna. The signal is then coupled to the antenna or dummy load. The transmitting groups also contain their own power supplies and temperature controlling devices.

The transmitting group cooling system provides water at a rate of 75 gallons-per-minute delivered by an electron tube liquid cooler.

1.3.2.2. **ANTENNA COUPLER CU-2171/FPN-44A (CU-1106/FPN-44B).** Tuned circuits in the antenna coupler (figure 1-1) match the output of the operate transmitting group to the antenna. The output the standby transmitting group is switched to the dummy load by means of vacuum relays. Operate/Standby status is controlled by transmitter control equipment.

1.3.2.3. **ELECTRICAL DUMMY LOAD DA-329A/FPN-44.** The dummy load (figure 1-1) provides an rf termination testing for the transmitting group that is in standby operation.

1.3.2.4. **FEEDBACK MODIFICATION.** The feedback modification that is implemented involves the addition of an Input Amplifier chassis and its power supply. These units are described below.

1.3.2.4.1. **DESCRIPTION OF UNITS.**

(1) The new Input Amplifier chassis, reference designation

1A4A1A3, is added to the Exciter. This subchassis contains drive conditioning and low level amplifier circuitry and provides the means of combining feedback with incident drive.

(2) A new power supply unit, reference designation 1A4A6, provides operating voltages for the Input Amplifier.

1.3.2.4.2. **DESCRIPTION OF CIRCUIT CHANGES .**

(1) The First IPA stage is modified to receive drive from the Input Amplifier.

(2) The interstage coupling between the First and Second IPA stages is modified for improved linearity.

(3) The Bias Pedestal Generator, reference designation 1A4A5, is modified for improved operation.

(4) The Power Amplifier, reference designation 1A6, is modified to provide current and voltage feedback.

1.4. **FACTORY OR FIELD CHANGES.** Field changes are modifications made to the transmitting equipments to correct deficiencies and to improve operations.

1.5. **QUICK REFERENCE DATA.**

1.5.1. **OPERATING FREQUENCY.** 100 kHz

1.5.2. **FREQUENCY BANDWIDTH.** 90 TO 110 kHZ

1.5.3. **FREQUENCY CONTROL.** 100 kHz shaped drive from transmitter control equipment. Antenna Tuning.

1.5.4. **TYPE OF EMISSION.** Pulse.

1.5.5. **POWER OUTPUT.**

1) PEAK PULSE - 400 kw (approximate)
2) SAMPLING POINT - 100 KW (minimum)
3) AVERAGE - 7.5 kw (at 180 pps)

1.5.6. **PULSE SHAPE.**

1.5.6.1. **AMPLITUDE.** Peak antenna currents reach 550 to 700 Amps depending on antenna systems used as load.

1.5.6.2. **PULSE BEGINNING.** first point at which amplitude reaches 0.5% of peak amplitude.

1.5.6.3. **SAMPLING POINT.** 30 Microseconds after pulse beginning, assuming unit transmits zero ECD Pulse.

1.5.6.4. **TRAILING EDGE.** Amplitude down 60 db from sampling point level 500 microseconds after pulse beginning.

1.5.7. **PULSE SPECTRUM.** At least 99.5 percent of radiated energy within band from 90 to 110 kHz.

1.5.8. **GROUP REPETITION INTERVALS (GRI).** GRI's available for use are 40,000 microseconds through 99,990 microseconds in ten microsecond increments. Thus, there are 5999 GRI's available. The actual GRI's used are selected to minimize mutual interference with other Loran-C chains and avoid synchronous interference from other signals in the low frequency band.

1.5.9. **SPECIFIC LORAN-C RATES.** The specific Loran-C rate is identified by a four-digit number corresponding to the GRI in tens of microseconds. For example a GRI of 99,300 microseconds is called "rate 9930."

1.5.10. **MULTIPULSE GROUPS.** One or two groups of eight pulses or nine pulses.

1.5.11. **INPUT POWER REQUIREMENTS.** Each transmitting group requires the following maximum input power, however the required 460 volt power may be significantly less for certain modes of operation:

460 vac, 50 to 60 Hz, 3 phase, 335 kva, 3 wire
208 vac, 50 to 60 Hz, 3 phase, 35 kva, 4 wire
120 vac, 50 to 60 Hz, 1 phase, 3 kva, 2 wire

1.6. **EQUIPMENT LISTS.**

1.6.1. **EQUIPMENT SUPPLIED.** The complete equipment supplied by the manufacturer is listed in Table 1-1. Table 1-2 identifies the equipment volume and size.

1.6.2. **EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.** Additional equipment required for operation but not supplied by the manufacturer under this contract is listed in Table 1-3.

1.6.3. **SHIPPING DATA.** The shipping data pertaining to the Loran Transmitting set is given in Table 1-4.

1.6.4. **ELECTRON TUBE COMPLEMENT.** The vacuum tubes and semiconductors contained in this equipment are listed in Table 1-5.

1.6.5. **POWER REQUIREMENTS AND HEAT CALCULATIONS.** Table 1-6 identifies the frequency rates at which the transmitter operates, the power requirements at that rate, and the volume of circulating air required.

TABLE 1-1. EQUIPMENT SUPPLIED QUANTITY AND IDENTIFICATION

QTY PER EQP	NOMENCLATURE NAME	DESIGNATION	UNIT NO.
2	Transmitting Group **AN/FPN-44B**	OT-96/FPN-44A OA-4483/FPN-44	1
1	Cabinet, Electrical Equipment	CY-3841/FPN-44	1A1
1	Electron Tube Liquid Cooler **AN/FPN-44B**	HD-1000/FPN HD-601/FPN	1A52 1A2
1	Amplifier Group **AN/FPN-44B** (includes)	OG-159/FPN-44A OA-4482/FPN-44	1A4 1A4
1	Power Supply **AN/FPN-44B**	PP-7304/FPN-44A C-4557/FPN-44	1A4A1 1A4A1
1	Oscilloscope Control	C-4558A/FPN-44	1A4A3
1	Power Supply	1088103G1	1A4A3A1
1	TS/BPD Board	WO725-1B/TS/BPD	1A4A3A2
1	Power Supply, Bias Pedestal	1092037G1	1A4A4
1	Generator, Bias Pedestal	1092036G1	1A4A5
1	Power Supply Assembly	1096581G1	1A4A6
1	Power Supply, -280 VDC	QSA265-.15	1A4A6A1
1	Power Supply, -150 VDC	QSA120-.5	1A4A6A2
2	Power Supply, +/-24 VDC	PTM24-2.3	1A4A6A3 1A4A6A4
2	Printed Circuit Board Assembly	588555-3	1A4A6A3A1 1A4A6A4A1
1	Radio Frequency Amplifier (includes)	AM-3774/FPN-44	
1	Power Amplifier Tank		1A5
1	Power Ampl. Tube Rack		1A6
4	Resistor Rack		1A7-1A10
1	Rack, Electrical	MT-2929/FPN-44	1A11

TABLE 1-1. EQUIPMENT SUPPLIED QUANTITY AND IDENTIFICATION (cont.)

QTY PER EQP	NOMENCLATURE NAME	DESIGNATION	UNIT NO.
1	Indicator Panel	SB-1894A/FPN-44	1A12
1	Filter,Harmonic,Low **AN/FPN-44B**	OF-1428/FPN-44A USCG F.C. 4, 18	1A20 1A20
1	PA Overload Indicator Panel	USCG F.C. 8	1A21
1	Power Supply Set **AN/FPN-44B** (includes)	OP-109/FPN-44A 1096281G3	1A53 1A53
1	Relay Assembly	RE-1112/FPN-44A	1A53A1
1	Control-Indicator	C-10034/FPN-44A	1A53A2
1	Relay Assembly (includes 460 V Rack less 1A53A3A1 and 1A53A3A2)	RE-1113/FPN-44A	1A53A3
1	Regulator,Voltage	CN-1473/FPN-44A	1A53A3A1
1	Fuse Panel **AN/FPN-44B**	CN-1472/FPN-44A 1096343G1	1A53A3A2 1A53A3A2
3	Gate Trigger Unit	304108	1A53A3A1A1-A3
1	Limiter, Chop-off	359118	1A53A3A1A4
1	Amplifier-Voltage Regulator	300413	1A53A3A1A5
1	208 V Rack including		
1	Voltage Regulator **AN/FPN-44B**	CN-1472/FPN-44A 1096285G2	1A53A3A3 1A53A3A3
1	Panel, Control **AN/FPN-44B**	CN-1472/FPN-44A 1096285G3	1A53A3A4 1A53A3A4
1	Shunt, Instrument	MX-9783/FPN-44A	1A53A4
1	Regulator, Assembly	C60-17780	1A53A4A1
1	Relay Driver, PCB	D60-17844	1A53A4A2
1	Meter Shunt Assembly	C60-17854	1A53A4A3
1	Rectifier Assembly	PP-7305/FPN-44A Power Supply	1A53A5
1	Transformer Assembly	PP-7305/FPN-44A Power Supply	1A53A6
1	Rectifier Stack	40000B1069A	1A53A5CR1

TABLE 1-1. EQUIPMENT SUPPLIED QUANTITY AND IDENTIFICATION (cont.)

QTY PER EQP	NOMENCLATURE NAME	DESIGNATION	UNIT NO.
1	Power Supply, DC	40000D592C	1A53A6A1
1	Rectifier Assembly	D30-17729	1A53A6A1A1
1	Voltage Divider	CN-1474/FPN-44A	1A53A7
1	Regulator Assembly	C60-17780	1A53A7A1
1	Relay Driver Assembly	C60-17789	1A53A7A2
1	Resistor Assembly	D30-17797	1A53A7A3
1	High Voltage Assembly	D30-18223	1A53A7A4
1	Voltage Divider Assembly	D60-17759	1A53A7A4A1
3	Resistor Assembly	1096304G2 1096304G1 1096303G1	1A53A19 1A53A20 1A53A21
1	Antenna Coupler **AN/FPN-44B**	CU-2171/FPN-44A CU-1106/FPN-44	3 3
2	Transformer Assembly	1087909G1	3A1 3A2
1	Transformer, RF	1087884	3A1T1 3A1T2
1	Electrical Dummy Load Dummy Load	DA-329A/FPN-44	4
1	Local Control Unit	GCF-W-678-LCU	5
2	Modification Instructions for Loran Transmitting sets (FEEDBACK)	1096562	
2	Unit 1A4A1 Modification Kit	1096563	
2	Bias Pedestal Generator Modification Kit	1096564	
2	Exciter Modification Kit	1096565	
2	PA Tube Tank Modification Kit	1096561	
2	PA Tank Coil Modification Kit	1096566	
2	Transmitter Group Modification Kit	1096567	

TABLE 1-2. EQUIPMENT DIMENSIONS AND WEIGHTS

UNIT No. AND NAME	DIMENSIONS HEIGHT	WIDTH	DEPTH	VOLUME (CU FT)	WEIGHT (LBS)
1 Transmitting Group					
1A1 Elect Equip Cab.	102	144	276	2,350	2,275
1A2 Elect Tube Cooler	89	58	20	60	1,150
1A4 Amplifier Group	75	67	35	102	1,534
1A5 Power Ampl. Tank	68	42	41	68	330
1A6 Pwr Ampl. Rack	78	83	47	176	2,278
1A7-1A10 Resistor Rack	10	87	5	3	22 each
1A11 Elect Equip Rack	84	24	16	19	104
1A12 Indicator Panel	15	30	14	4	17
1A20 Low Pass Filter	75	54	25	59	528
1A21 PA Overload Indicator Panel					
1A53 Pwr Supply Set					
1A53A1 Relay Assy	10	22	8	1	6
1A53A2 Cntrl/Indictr	45	32	14	12	69
1A53A3 Relay Assy includes					
460 V rack	79	31	38	54	290
1A53A3A1 V. Regul	55	30	11	11	176
1A53A3A1 V. Regul	16	30	4	1	50
208 V rack incl. 1A53A3A3 and 1A53A3A4 Regulators	79	41	38	58	600
1A53A4 Instrument Shunt	8	22	13	1	13
1A53A5 and 1A53A6 Power Supplies	78	55	55	137	6,400
1A53A7 Voltage Divider	11	35	11	2	26
1A53A19 Res. Assy	28	22	3	1	16
1A53A20	28	22	3	1	17
1A53A23	22	22	3	1	11
3 Antenna Coupler and 4 Electrical Dummy Load	81	61	51	146	1,042

TABLE 1-3. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QTY PER EQP	NAME	REQUIRED USE	REQUIRED CHARACTERISTICS
1	Variable Power Supply	Adjust Overload relays	0 to 60 VDC, 0 to 3 amps
1	Timing Pulse Genrating, and Transmitter Control Equipment	Furnish required inputs	
1	Technical Manual for Timing, Pulse Generating and Transmitter Control Equipment.		
1	Phase Sequence Indicator (Note)	Check input power phasing	107 to 625 Vac, 60 Hz.
1	Instruction Book for Phase Sequence Indicator.	Check input power	

NOTE: Phase Sequence Generator is G.E.Type 5467032G5

NOTE

Also required, but not supplied are transmitting and receiving antennas, cables, wires and tubing for interconnections between the antenna, transmitter control equipment and various other installation items.

TABLE 1-4. SHIPPING DATA

NOTE: AN/FPN-44B nomenclature in []

BOX #	NOMENCLATURE NAME	DESIGNATION	DIMENSIONS (INCHES) HGT	WID	DPT	VOLUME (CU FT)	WT LBS
W1	Antenna Coupler	CU-2171/FPN-44A **[CU-1106/FPN-44]**	96	72	68	272	1780
	Dummy Load	DA-329A/FPN-44					
W3	Electrical Installation Material		21	105	46	60	400
W5	Cables		21	26	26	8	600
W5A	Cables		16	34	34	10	250
W6	Ducts		32	22	64	31	395
	NOTE: Transmitting Group No. 1 is shipped in series X boxes, and Transmitting Group No. 2 in series Y boxes. Refer to Volume III for detailed list of materials contained in each box.						
X1, Y1	Fan and Louver		49	33	57	70	370
X2, Y2	Electron Tube	HD-1000/FPN-44A **[HD-601/FPN]**	31	67	97	116	1340
X3, Y3	Ceramic Mount'g	Packed in Boxes X21, Y21					
X4, Y4	Ceramic Mount'g	Packed in Boxes X21, Y21					
X5, Y5	Capacitors		37	21	23	10	462
X6, Y6	Capacitors		37	21	23	10	462
X7, Y7	Water Jackets	Packed in Boxes X21, Y21					
X8, Y8	PA Tube Rack (P/ORF Amplifier)	P/O AM-3774/FPN-44	96	55	94	287	2605
X9, Y9	Resistor Rack	P/O AM-3774/FPN-44	23	24	49	15	170
X10, Y10	PA Tank	P/O AM-3774/FPN-44	79	48	52	114	700
X11, Y11	Air Exhaust Housing		28	26	43	18	98
X12, Y12	Meter Light Assembly, Cable Ducts		20	26	69	21	21
X13, Y13	Indicator Panel & Misc. Parts	SB-1894A/FPN-44	26	33	72	35	310

TABLE 1-4. SHIPPING DATA (cont.)

BOX #	NOMENCLATURE NAME	DESIGNATION	DIMENSIONS (INCHES) HGT	WID	DPT	VOLUME (CU FT)	WT LBS
X14, Y14	Electrical Equipment Rack	MT-2929/FPN-44	22	28	92	33	250
X15, Y15	Enclosure Assembly, Partition		17	39	109	42	435
X16, Y16	Power Supply	PP-7304/FPN-44A **[C-4557/FPN-44]**	92	65	73	250	6222
X17, Y17	Control-Indicator	C-10034/FPN-44A	20	38	51	22	200
X18, Y18	Voltage Regulator	CN-1472/FPN-44A **[1096285G2]**	89	45	40	105	960
X19, Y19	Relay Assembly,	RE-1113/FPN-44A	89	35	45	93	640
X20, Y20	Voltage Regulator	CN-1473/FPN-44A	19	34	76	28	350
X21, Y21	Miscellaneous Parts	Includes Box X3,	25	25	49	18	297
X22, Y22	Miscellaneous Parts		12	48	86	29	230
X23, Y23	Tubes		18	26	49	13	122
X24, Y24	Tubes		21	26	36	12	100
X25, Y25	Tube F1086		55	27	34	29	111
X26, Y26	Tube F1086		55	27	34	29	111
X27, Y27	Tube F1086		55	27	34	29	111
X28, Y28	Tube F1086		55	27	34	29	111
X29, Y29	Capacitor		27	17	21	6	180
X30, Y30	Amplifier Group	OG-159/FPN-44A **[OA-4482/FPN-44]**	87	39	76	149	1950
X31, Y31	Tubes and Chimney		30	28	34	17	140
X32, Y32	Cables and Interconnection		14	38	52	16	330
X33, Y33	Floor Assembly		10	20	72	9	188
X34, Y34	Floor Assembly		15	50	94	44	430
X35, Y35	Enclosure Assembly		16	39	99	36	760

TABLE 1-4. SHIPPING DATA (cont.)

BOX #	NOMENCLATURE NAME	DESIGNATION	DIMENSIONS (INCHES) HGT	WID	DPT	VOLUME (CU FT)	WT LBS
X36, Y36	Enclosure Assembly		26	51	96	74	820
X37, Y37	Enclosure Assembly		10	30	75	26	468
X38,Y38	Enclosure Assembly		8	28	77	10	330
X39, Y39	Low Pass Filter		30	59	59	60	760
X40, Y40	P/O Power Supply Set		9	14	126	9	120

TABLE 1-5. SEMICONDUCTOR AND TUBE COMPLEMENT

TUBE TYPE	TRANSMITTING GP OT-96/FPN-44A Q'TY PER SET	Q'TY PER SYSTEM
C6A	7	14
F1086	4	8
F8C25N	2	4
JHV34H40	12	24
LM120K-15	2	4
LM340K-15	2	4
T720145504 DW	6	12
USS-15	6	12
OA2WA	1	2
1N751B	1	2
1N1199A	2	4
1N1614	4	8
1N2976B	1	2
1N4003A	87	174
1N4007	22	44
1N457	6	12
1N459	1	2
1N4733	2	4
1N4735	3	6
1N4737	4	8
1N4739	12	24
1N4744	2	4
1N5054	3	6
1N547	14	28
1087689	8	16
2N930A	24	48
2N2222A	10	20
2N2646	2	4
2N2905	1	2
2N2907A	5	10
2N3417	2	4
2N4401	17	34
2N4403	10	20
3G6	19	38
741	3	6
4PR-1000A	2	4
54121	1	2
5651WA	1	2
5751	1	2
6146W	6	12
6CL6	3	6
6336A	4	8

	90 PPS		
PO	KVA IN	KW WATER	KW AIR
	42.5	26.4	11.6
STANI	14.0	1.3	10.3
FIXEL	59.0	31.0	2.1
PULS	115.5	78.7	24.0
	5.0 KW		

NOTES

TABLE 1-6. LORAN TRANSMITTING SET, AN/FPN-44A
HEAT EXCHANGER CALCULATIONS

POWER IN	3 PH. VOLT	POWER REQUIREMENTS, LOW POWER TRANSMITTER, SINGLE PULSE - PULSE RATE											
		180 PPS			150 PPS			113 PPS			90 PPS		
		KVA IN	KW WATER	KW AIR	KVA IN	KW WATER	KW AIR	KVA IN	KW WATER	KW AIR	KVA IN	KW WATER	KW AIR
STANDBY	208	42.4	26.4	11.6	42.5	26.4	11.6	42.5	26.4	11.6	42.5	26.4	11.6
FIXED OPERATE	440	14.0	1.3	10.3	14.0	1.3	10.3	14.0	1.3	10.3	14.0	1.3	10.3
PULSED OPERATE	440	118.0	102.0	4.2	98.4	85.0	3.3	75.0	63	2.7	59.0	31.0	2.1
TOTAL		174.4	129.7	26.1	154.9	112.7	25.4	131.5	92.7	24.6	115.5	78.7	24.0
POWER OUT ANTENNA OR DUMMY LOAD		10.0 KW			8.3 KW			6.4 KW			5.0 KW		

NOTES:

1. FOR DOUBLE PULSE OPERATION -

   a. POWER IN. Determine power requirements for one of the selected rates from above table, then for the second rate, increase requirements as follows:

      1. Increase Standby KVA-IN by 2.0 KVA
      2. Increase Standby KVA AIR by 1.8 KW
      3. Increase Pulsed-Operate KW Water by the amount shown in the Pulsed-Operate KW-Water Column for the second selected rate.

   b. POWER OUT. The Double Pulse power out will be the sum of the power outputs for the selected rates.

2. AIR REQUIREMENTS, EACH TRANSMITTER, LOW POWER - 4000 CFM
3. AIR REQUIREMENTS, DUMMY LOAD - 4000 CFM

2.0. INSTALLATION.

2.1. **UNPACKING AND HANDLING.** Unpack and handle Loran Transmitting Set AN/FPN-44A with the care usually taken with precision electronic equipment. Immediately after unpacking, inspect the entire set for dents, damaged dials and indicators, etc. Check the equipment against table 1-4. Refer to Volume III for installation and assembly instructions.

The only special unpacking procedures are for boxes X25 through X28 and Y25 through Y28 containing electron tubes and are as follows (figure 2-1):

CAUTION

Keep package vertical at all times. Do not remove corrugated fiberboard container from wooden box.

Step 1. Carefully cut open top of corrugated container. Open top flaps of container, exposing top cushioning.

Step 2. Remove top cushioning from top of corrugated container, exposing spring-loaded frame which holds tube.

Step 3. Carefully lift loaded frame through the top opening of the container. Do not tilt or jar the tube.

Step 4. Gently set the spring-loaded frame containing the tube on the floor. This is done keeping the tube in a vertical position.

Step 5. Remove the tube from the frame.

NOTE

Retain special packing materials after removal of equipment. They can be used for reshipment if needed.

2.2. **SITE SELECTION.** The erection and installation of the enclosures housing the loran transmitting groups are described and illustrated in Volume II.

2.3. **POWER REQUIREMENTS AND DISTRIBUTION.** Primary power distribution is shown in Section 4. Each transmitting group requires the following maximum input power; however the required 460-volt power may be significantly less for certain modes of operation.

a. 460 vac, 50/60 Hz ±10 percent, 3-phase, 3-wire, 335 kva.

b. 208 vac, 50/60 Hz ±10 percent, 3-phase, 4-Wire, 35 kva.

c. 120 vac, 50/60 Hz ±10 percent, 1-phase, 2 wire, 3 kva.

2.4. **INSTALLATION LAYOUT.** The layout and overall relationship between units of the loran transmitting set is shown in figure 2-2.

2.5. **INSTALLATION REQUIREMENTS.** The installation and field assembly instructions for the AN/FPN-44A are described and illustrated in Volume III.

WARNING

This equipment uses voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

Interlocks are installed throughout the loran transmitting set to protect personnel from dangerous high voltages within the loran transmitting set. They are not to be tampered with or disabled in an unauthorized manner.

Before contacting any circuit shut down the equipment and then discharge all circuits in the working area with the grounding hooks.

2.6. **INSPECTION AND ADJUSTMENTS.**

WARNING

Be sure that station circuit breakers controlling 208-volt and 460-volt power to Loran transmitting set are off until procedures of paragraphs 2.6.1 through 2.6.11 have been completed.

The instructions given in paragraph 2.6.1 should be performed immediately after unpacking. Procedures given in paragraphs 2.6.2 through 2.6.29, should be performed after the equipment is completely installed and ready for normal operation. See paragraph 5.2.4.1 for required test equipment. Inspection and adjustment procedures should be executed in the sequence given.

2.6.1. **VISUAL INSPECTION.**

Step 1. Check for legibility of front panel markings.

Step 2. Check finish of all units for damage.

Step 3. Operate front panel controls to check for freedom of movement. Check front panel controls for proper alignment with panel markings. Adjust, if necessary.

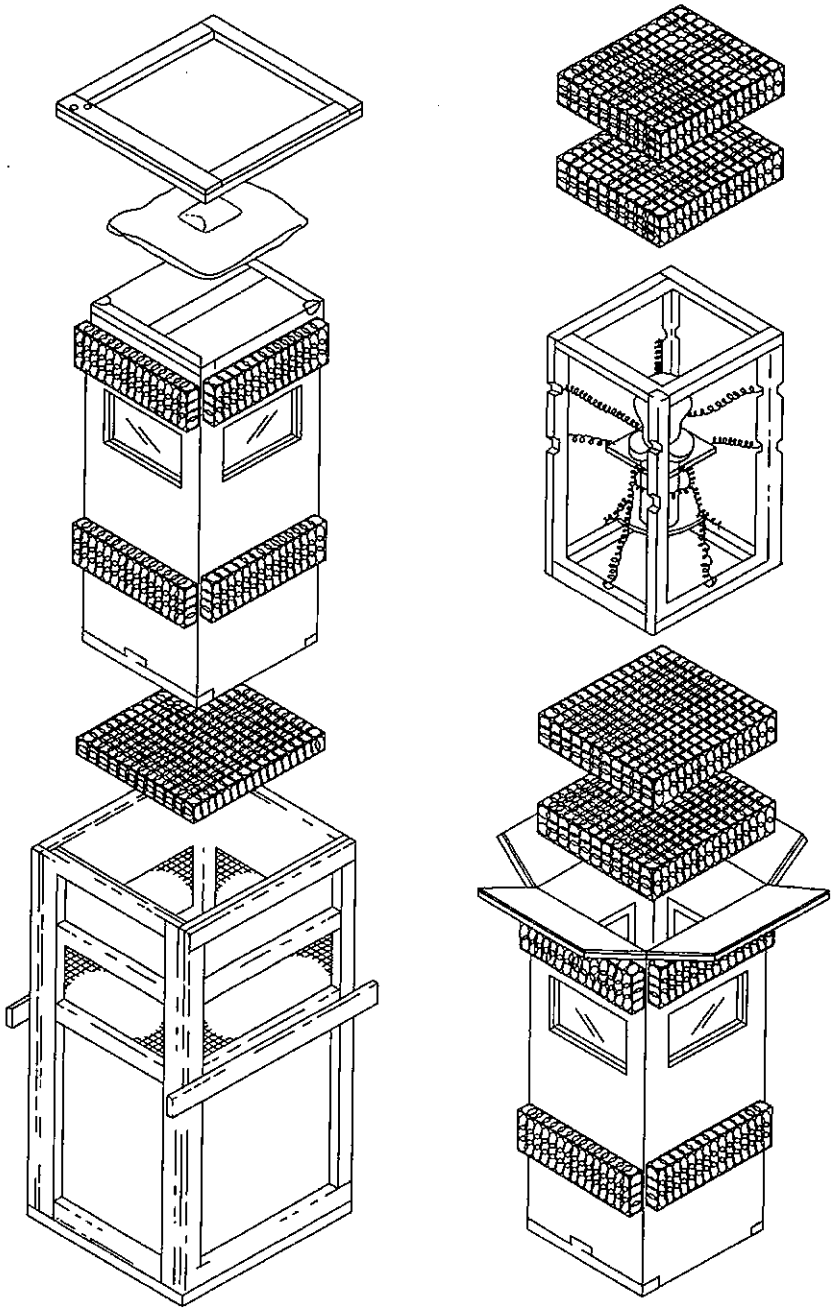
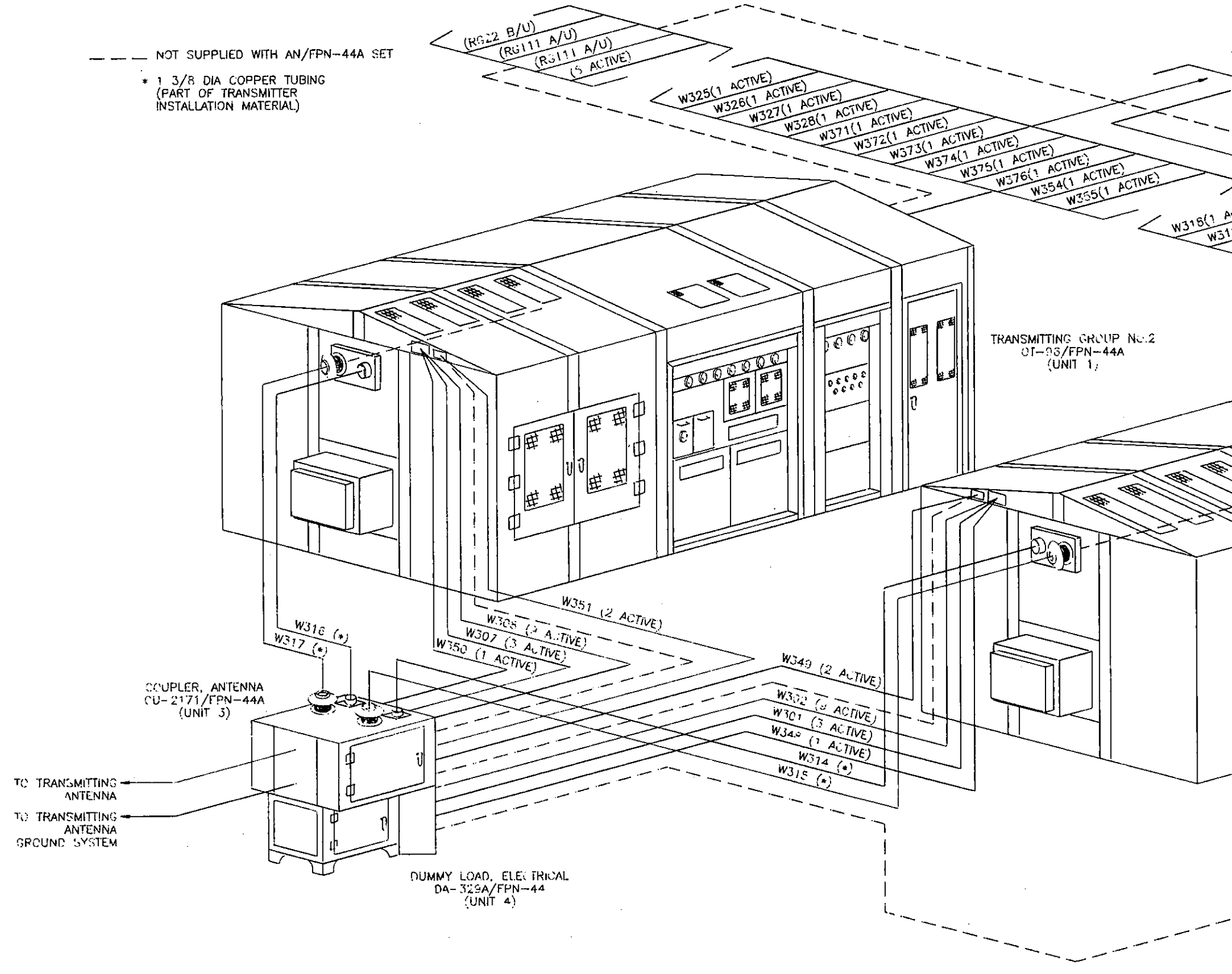
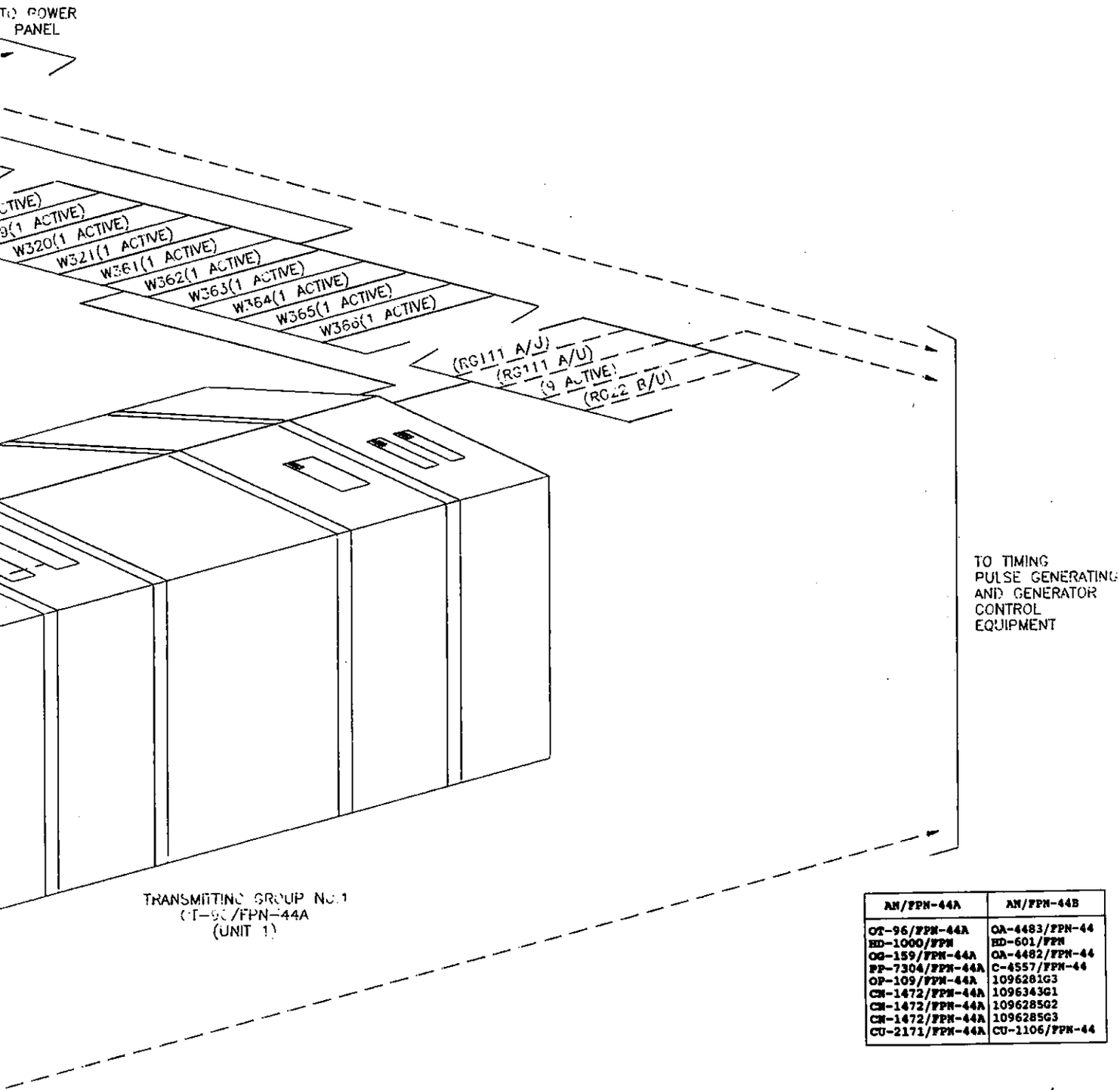


Figure 2-1. Unpacking Procedures for Electron Tubes


— — — NOT SUPPLIED WITH AN/FPN-44A SET
* 1 3/8 DIA COPPER TUBING (PART OF TRANSMITTER INSTALLATION MATERIAL)
(RG22 B/U)
(RG111 A/U)
(RG111 A/U)
(5 ACTIVE)
W325(1 ACTIVE)
W326(1 ACTIVE)
W327(1 ACTIVE)
W328(1 ACTIVE)
W371(1 ACTIVE)
W372(1 ACTIVE)
W373(1 ACTIVE)
W374(1 ACTIVE)
W375(1 ACTIVE)
W376(1 ACTIVE)
W354(1 ACTIVE)
W355(1 ACTIVE)
TRANSMITTING GROUP NO.2 OT-93/FPN-44A (UNIT 1)
W351 (2 ACTIVE)
W306 (3 ACTIVE)
W307 (3 ACTIVE)
W350 (1 ACTIVE)
W316 (*)
W317 (*)
COUPLER, ANTENNA CU-2171/FPN-44A (UNIT 3)
W349 (2 ACTIVE)
W302 (3 ACTIVE)
W301 (3 ACTIVE)
W348 (1 ACTIVE)
W314 (*)
W315 (*)
TO TRANSMITTING ANTENNA
TO TRANSMITTING ANTENNA GROUND SYSTEM
DUMMY LOAD, ELECTRICAL DA-329A/FPN-44 (UNIT 4)



AN/FPN-44A	AN/FPN-44B
OT-96/FPN-44A	OA-4483/FPN-44
HD-1000/FPN	HD-601/FPN
OG-159/FPN-44A	OA-4482/FPN-44
PP-7304/FPN-44A	C-4557/FPN-44
OP-109/FPN-44A	1096281G3
CN-1472/FPN-44A	1096343G1
CN-1472/FPN-44A	1096285G2
CN-1472/FPN-44A	1096285G3
CU-2171/FPN-44A	CU-1106/FPN-44

Figure 2-2. Loran Transmitting Set, AN/FPN-44A System Diagram

Step 4. Check all units internally for damage.

Step 5. Check that tubes and other plug in components are properly seated and have not incurred damage during transit.

Step 6. Check for loose or missing hardware.

Step 7. Check all units for broken or loose wire, and hardware.

Step 8. Check high voltage transformer 1A53A6T1 for oil leaks.

2.6.2. **OPERATION ON 50 Hz POWER.** Follow the instructions listed below if the AN/FPN-44A Transmitting Set is to be used on 50 Hz power rather than 60 Hz power:

Step 1. Remove the jumpers that connect terminal 5 to terminal 6 on the gate trigger units, 1A53A3A1A1, 1A53A3A1A2, 1A53A3A1A3.

Step 2. Note that the elapsed time readings on the PLATE HOURS and FILAMENT HOURS meters must be multiplied by 1.2 because these meters have 60-Hz motors.

2.6.3. **DISCHARGE CIRCUIT.** Check the function of the high voltage discharge resistors and relays as follows:

Step 1. Connect an ohmmeter from the 21500 volt terminal of the rectifier assembly 1A53A5 to ground. The ohmmeter should indicate 12,000 ohms (±2400 ohms).

Step 2. Open and close the contacts of the discharge relay 1A53A1K1 by hand. The ohmmeter shall indicate over one megohm when the relay is open and return to 12,000 ohms when the relay is closed.

Step 3. Connect the ohmmeter from the 10750 volt terminal of 1A53A5 to ground. The ohmmeter shall indicate 3000 ohms (±600 ohms).

Step 4. Open and close the contacts of the discharge relay 1A53A1K2 by hand. The ohmmeter should indicate over one megohm when the relay is open and return to 3000 ohms when the relay is closed.

Step 5. Remove ohmmeter.

2.6.4. **RELAY SHUNT ADJUSTMENTS.** Make relay adjustments according to paragraph 5.2.4.2.

2.6.5. **PROTECTIVE SPARK GAP SPACING.** Adjust spark gaps according to paragraph 5.2.4.3.

2.6.6. **GROUNDING HOOKS.** Check that all grounding hooks are furnished and that the lead is securely fastened to the hook and to cabinet ground. Secure the handle in the clips provided. There are two hooks each for the amplifier group 1A4 front and rear doors, two hooks on the protective partition inside the transmitter enclosure, and one hook at each door of the antenna coupler (CU-2171/FPN-44A) cabinet. There are also two hooks at the front doors and one hook at the rear of PA tube rack 1A6.

2.6.7. **THERMOMETER SWITCH ADJUSTMENT.** Adjust thermometer switches according to paragraph 5.4.2.4.

2.6.8. **TEST POINT BLOCKING CAPACITOR ADJUSTMENT.** Adjust capacitors according to paragraph 5.4.2.5.

2.6.9. **FILAMENT TRANSFORMER VISUAL CHECK.** Check each filament transformer listed in table 2-1 to ensure that the proper primary taps are used. These transformers are located in amplifier group 1A4, and PA tube rack 1A6.

TABLE 2-1. FILAMENT TRANSFORMER PRIMARY TAPS

FILAMENT TRANSFORMER DESIGNATION	PRIMARY TAPS
1A4T1	1 and 2
1A4T2	1 and 2
1A4T3	1 and 2
1A4T4	1 and 2
1A6T1	1 and 4
1A6T2	1 and 4
1A6T3	1 and 4
1A6T4	1 and 4

2.6.10. **UNDERVOLTAGE AND OVERVOLTAGE PROTECTION.** Adjust meter 1A53A3M1 as specified in paragraph 5.4.2.6.

2.6.11. **EQUIPMENT SETUP.** Set up the equipment for electrical tests as follows:

Step 1. Place all controls as shown in table 2-2.

NOTE

When performing specified operation, the indicated result may be accompanied by other results not mentioned. The reason is that they do not pertain directly to the particular function being checked. Disregard results not specifically mentioned unless they are obviously a malfunction.

Step 2. Take readings of FILAMENT HOURS and PLATE HOURS meters (figure 3-7).

TABLE 2-2. INITIAL EQUIPMENT SWITCH POSITIONS

CONTROL	REF DES	FIGURE	POSITION
208 vac circuit breaker	1A53A3CB2	3-8	OFF
460V INPUT CB1	1A53A3CB1	3-8	OFF
HIGH VOLTAGE RECTIFIER POWER	1A53A3S1	3-8	OFF
POWER	1A53A2S17	3-7	OFF/RESET
FILAMENTS	1A53A2S13	3-7	OFF
BIAS AND LOW VOLTAGE	1A53A2S7	3-7	OFF
PLATE VOLTAGE SELECTOR	1A53A2S18	3-7	OFF
EMERGENCY STOP	1A53A2S19	3-7	RUN
DESLOT/NON-DESLOT	1A53A2S20	3-7	NON-DESLOT
LOCKOUT-READY	1A12S1	3-5	LOCKOUT
All water flow valves in 1A6			open
ALL drawers and doors			closed
Transmitter control equipment Transmitter Selector			To select transmitting group under test.

2.6.12. **PHASE SEQUENCE OF 208-VOLT LINE.** Check phase sequence as follows:

Step 1. Turn off the 208 vac power at the station distribution panel.

Step 2. Set the 208-volt circuit breaker 1A53A3CB2 to OFF.

Step 3. Connect the phase sequence indicator to 208 vac regulator terminals 1A53A3TB1-1, 1A53A3TB1-2, and 1A53A3TB1-3.

Step 4. Turn on the 208 vac power at the station distribution panel.

Step 5. Check that phase sequence is as follows:

Terminal	Phase Sequence
1A53A3TB1-1	1
1A53A3TB1-2	2
1A53A3TB1-3	3

Step 6. Turn off the 208 vac power at the station distribution panel.

Step 7. Remove phase sequence indicator.

NOTE

Phase sequence check of 460-volt line is not required.

2.6.13. **PRIMARY COOLING SYSTEM FILL PROCEDURE.** Fill the primary cooling system as specified in step 30 of table 2 in the AN/FPN-44A Installation and Field Assembly Instruction Manuals.

2.6.14. **WATER FLOW SWITCHES.** Check water flow switches as follows:

Step 1. Set 208 vac circuit breaker 1A53A3CB2 to ON.

Step 2. Observe that WATER LEVEL lamp (figure 3-5) is lit.

Step 3. Set POWER switch (figure 3-7) to ON.

Step 4. Observe that water pump starts and then WATER ON lamp lights.

Step 5. Partially close the water control valve to each rf amplifier tube while observing that the WATER ON lamp goes out when the flow rate is 14 GPM or less. After each observation, reset the

valve for a flow rate of 18 GPM. The reference designations of the water flow switches are: 1A6S1, 1A6S2, 1A6S3 and 1A6S4.

Step 6. Set 208 vac circuit breaker and POWER switch to OFF.

2.6.15. **VOLTAGE REGULATOR CN-1472/FPN-44A ADJUSTMENT.** Adjust the 208-volt regulator according to paragraph 5.2.4.7.

2.6.16. THERMOMETER SWITCHES. Check thermometer switch circuits as follows:

Step 1. Set 208 vac circuit breaker 1A53A3CB2 (figure 3-8) to ON.

Step 2. Set POWER switch (figure 3-7) to ON.

Step 3. Check that each water thermometer switch operates by temporarily turning the temperature setting down until contact is made with the temperature indicator.

Step 4. Observe that the appropriate lamp on the indicator panel (figure 3-5) goes out and transmitter control equipment alarm operates.

Step 5. Reset the temperature setting to normal and depress the OVERLOAD AND 3 STRIKE RESET pushbutton (figure 3-7) after each thermometer switch is checked. These switches are located in PA tube rack 1A6.

Step 6. Turn off 208 vac circuit breaker and POWER switch.

Switch Designation	Indicator Lamp Description	Normal Setting
1A6S5	PA 1A6 OUTLET	70 Max
1A6S6	PA 1A6 OUTLET	70 Max
1A6S7	PA 1A6 OUTLET	70 Max
1A6S8	PA 1A6 OUTLET	70 Max
1A6S9	PA 1A6 INLET	60 Max

2.6.17. **AIR SWITCHES.** Check air switches as follows:

Step 1. Set 208 vac circuit breaker 1A53A3CB2 (figure 3-8) to ON.

Step 2. Set POWER and FILAMENTS switches (figure 3-7) to ON.

Step 3. Observe that the following indicator lamps are lit: AIR ON, AND FILAMENTS READY, (after a 45 second delay) (figure 3-7).

Step 4. Block the air intake of the blower 1A4B1.

Step 5. Observe that AIR ON indicator lamps (goes out immediately) and the FILAMENTS READY indicator lamp goes out in 10 seconds maximum.

Step 6. Unblock the air intake and observe that the AIR ON indicator lamp is lit immediately and the filaments light after a delay of less than 10 seconds.

Step 7. Set 208 vac circuit breaker and POWER switch to OFF.

Step 8. Remove enclosure blower fuses 1A11F7, 1A11F8, and 1A11F9.

Step 9. Set 208 vac circuit breaker and POWER switch to ON.

Step 10. Observe that the AIR ON and FILAMENTS READY indicator lamps are off and the filaments are off.

Step 11. Set 208 vac circuit breaker and POWER switch to OFF. Replace fuses removed in step 8.

Step 12. Set 208 vac circuit breaker and POWER switch to ON.

Step 13. Observe that the following indicator lamps are Lit: AIR ON, and FILAMENTS READY. There should be a 45 second delay if the POWER switch was off more than 30 seconds.

Step 14. Set 208 vac circuit breaker (1A53A3CB2), POWER, FILAMENTS switches to OFF.

2.6.18. **DOOR INTERLOCKS.** Check the door interlocks as follows:

Step 1. Close and secure all interlocked drawers and the access panels of amplifier group 1A4 (figure 3-1), antenna coupler unit 3 and dummy load unit 4.

Step 2. Lock all the key interlocks listed in table 2-3. Remove each key and place it in the appropriate lock position in the key block located on the bulkhead just inside the transmitter group access door.

Step 3. Ensure that the master key in the key block cannot be turned and removed with any other key removed.

Step 4. Turn the master key in the key block and then remove the master key. Use this key to unlock the LOCKED OFF switch (figure 3-8).

Step 5. Place the HIGH VOLTAGE RECTIFIER POWER switch (figure 3-8) ON.

TABLE 2-3. KEY INTERLOCKS

KEY	LOCATION
1	Right Fence
2	Left Fence
3	Amplifier Group 1A4 Front Door
4	Amplifier Group 1A4 Rear Door
5	PA Tube Rack 1A6 Front Door

Step 6. Lock the LOCKED ON switch (figure 3-8). The DOOR INTERLOCK lamp (figure 3-7) shall light.

Step 7. Open each amplifier group 1A4 drawer and access panel, listed below in turn, and observe that the DOOR INTERLOCK lamp (figure 3-7) goes out. After opening each interlock, momentarily depress the INTERLOCK DISABLE pushbutton (figure 3-1) and then disable the interlock. Observe that the DOOR INTERLOCK lamp lights in each case, then close and secure the drawer or panel.

Drawer or Panel	Interlock Switch
Feedback Control	1A4A1
Oscilloscope Control 1A4A3	1A4S4
Access Panel	1A4S7

Step 8. Open each door and access panel of antenna coupler, unit 3, and each door of dummy load, unit 4, in turn, and observe that the DOOR INTERLOCK lamp, (figure 3-7) goes out. Then close and secure each door and panel. The interlock switches on the antenna coupler are: 3S1 through 3S8. The interlock switches on the dummy load are 4S3 through 4S6.

2.6.19. **ANTENNA COUPLER-DUMMY LOAD SWITCHING TEST.** Check the antenna coupler and dummy load circuitry and switching functions before the application of rf power as follows:

Step 1. Set the following controls on both transmitting groups as indicated:

208 vac circuit breaker 1A53A3CB2 (figure 3-8) to OFF

460V INPUT circuit breaker 1A53A3CB1 (figure 3-8) to OFF

LOCKED ON 1A53A3S2 switch (figure 3-8) to open

HIGH VOLTAGE RECTIFIER POWER 1A53A3S1 switch (figure 3-8) to OFF and locked off

POWER switch (figure 3-7) to OFF/RESET

FILAMENTS switch (figure 3-7) to OFF

BIAS AND LOW VOLTAGE switch (figure 3-7) to OFF

PLATE VOLTAGE SELECTOR switch (figure 3-7) to OFF

EMERGENCY STOP switch (figure 3-7) to RUN

Step 2. On both transmitting groups set 208 vac circuit breaker 1A53A3CB2 (figure 3-8) and POWER switch (figure 3-7) to ON, and LOCAL-REMOTE switch (figure 3-5) to REMOTE.

Step 3. On transmitter control equipment, select transmitting group No. 1 as the operate group.

Step 4. On the antenna coupler observe that TRANSMITTER #1 OPERATE lamp (figure 3-10) is lit; OPERATE lamp (figure 3-5) is lit on transmitting group No. 1, and STANDBY lamp (figure 3-4) is lit on transmitting group No. 2.

Step 5. Open all the access doors on the antenna coupler and dummy load and disable their interlock switches. To disable an interlock switch, grasp the head of the interlock switch and pull forward until it clicks.

Step 6. Observe that the following circuits are closed by visually circuit tracing:

(1) Transmitting group No. 1 antenna terminal to high voltage contact of antenna transfer relay 3K1 to tap on antenna coupler coil 3L1.

(2) Transmitting group No. 1 ground terminal to high voltage contact of ground transfer 3K2 to ground terminal of antenna coupler

(3) Transmitting group No. 2 antenna terminal to high voltage contact of antenna transfer relay 3K11 to dummy load resistor bank.

(4) Transmitting group No. 2 ground terminal to high

voltage contact of ground transfer relay 3K10 to ground side of dummy load resistor bank.

(5) Antenna coupler antenna terminal to antenna grounding relay 3K6 to antenna coupler ground terminal.

Step 7. On both transmitting groups set PLATE VOLTAGE SELECTOR switch (figure 3-7) to OPERATE.

Step 8. Observe that circuit from antenna terminal through relay 3K6 to ground is open.

Step 9. At transmitter control equipment, select transmitting No. 2 as the operate group.

Step 10. On the antenna coupler, observe that the TRANSMITTER NO. 1 OPERATE lamp (figure 3-10) is not lit.

Step 11. On transmitting group No. 1, observe that OPERATE lamp is not lit and STANDBY lamp is lit (figure 3-5).

Step 12. Observe that dummy load blower is operating.

Step 13. Set PLATE VOLTAGE SELECTOR switch (figure 3-7) to OFF on both transmitting groups. On transmitting control equipment, select transmitting group No. 1 as the operate group.

Step 14. Switch the transmitters same as in step 3.

Step 15. On the antenna coupler, observe that TRANSMITTER #2 OPERATE lamp (figure 3-10) is lit ; OPERATE lamp (figure 3-5) is lit on transmitting 2; and STANDBY lamp (figure 3-5) is lit on transmitting group No. 1.

Step 16. Observe that the following circuits are closed by visual circuit tracing.

(1) Transmitting group No. 2 antenna terminal to high voltage contact of antenna transfer relay 3K11 to tap on antenna coupler coil 31.

(2) Transmitting group No. 2 ground terminal to high voltage contact of ground transfer relay 3K10 to ground terminal of antenna coupler.

(3) Transmitting group No. 1 antenna terminal to high voltage contact of antenna transfer relay 3K1 to dummy load resistor bank.

(4) Transmitting group No. 1 ground terminal to high voltage contact of ground transfer relay 3K2 to ground side of dummy load resistor bank.

Step 17. Set PLATE VOLTAGE SELECTOR switch to ON on both transmitting groups.

Step 18. Observe that circuit from antenna terminal through relay 3K6 to ground is open.

Step 19. Observe that dummy load blower is operating.

Step 20. Set PLATE VOLTAGE SELECTOR SWITCH to OFF on both transmitting groups.

Step 21. Close all doors of the antenna coupler and dummy load.

Step 22. Set controls to positions listed in step 1

2.6.20. **TANK COIL ALIGNMENT.** Align the P.A. tank coil 1A5, as specified in paragraph 5.4.2.15.

2.6.21. **TUNING PROCEDURES.** Tune the output circuits according to paragraph 5.4.2.11.

2.6.22. **BIAS AND PLATE VOLTAGE CIRCUITS.** Check the bias and plate voltage circuits, proceed as follows:

CAUTION

The transmitting group not being tested should be disconnected from the antenna coupler circuits by removing the copper tubing connectors that connect its vacuum switches to the large copper pipes. The output circuits of both transmitting groups are connected to the dummy load except when control power is applied to the transmitter group that is selected as the "operate" transmitter by the transmitter control equipment.

The secondary water system must be placed in operation while the following tests are being performed.

Step 1. Set BIAS PEDESTAL CCT CONTROL switch 1A4A4S8 (figure 3-1) to OFF

Step 2. Set bias pedestal generator controls 1A4AR193, 1A4AR194 and 1A4AR195 fully counter clockwise (figure 3-1).

Step 3. Set the following bias controls (figure 3-1) for maximum bias (extreme clockwise).

V7 BIAS ADJ	(1A4R149)
V8 BIAS ADJ	(1A4R150)
LEFT 2ND IPA BIAS ADJUST	(1A4R97)
RIGHT 2ND IPA BIAS ADJUST	(1A4R98)
LEFT PA BIAS ADJUST	(1A4T5)
RIGHT PA BIAS ADJUST	(1A4T6)

Step 4. Set the following controls to ON:

POWER switch (figure 3-7)

208 vac circuit breaker 1A53A3CB2 (figure 3-8)

HIGH VOLTAGE RECTIFIER POWER switch (figure 3-8)

Step 5. Turn the LOCKED ON key (figure 3-8) which locks 1A53A3S2.

Step 6. Observe that DOOR INTERLOCK indicator lamp (figure 3-7) is lit.

Step 7. Set 460V INPUT CB1 to ON. Set FILAMENTS switch to ON. Wait for FILAMENTS READY indicator lamp to light (approximately 45 seconds) Set BIAS AND LOW VOLTAGE switch (figure 3-7) to ON.

Step 8. Observe that the 5 KV BIAS voltmeter indicates -5 kv ±500v and that the LOW VOLTAGE PLATE voltmeter indicates 500 ±50v (figure 3-7).

Step 9. Observe that the BIAS AND LOW VOLTAGE ON indicator lamp (figure 3-7), LEFT PA BIAS UNDERVOLTAGE, and RIGHT PA BIAS UNDERVOLTAGE indicator lamps (figure 3-5) are lit.

Step 10. Set LOCKOUT-READY switch (figure 3-5) to READY.

Step 11. Set 208 vac circuit breaker 1A53A3CB2 to OFF and then 20 seconds later set to ON.

Step 12. Observe that 5KV BIAS voltmeter indicates -5kv ±500v immediately after circuit breaker is set to ON.

Step 13. Set 208 vac circuit breaker to OFF and then 40 seconds later set to ON.

Step 14. Observe that 5KV BIAS voltmeter indicates -5kv ±500v in 45 ±15 seconds.

Step 15. On the transmitter control equipment, set the transmitting group under test in standby mode.

Step 16. Set the LOCKOUT-READY switch to LOCKOUT.

Step 17. Adjust MAINTENANCE ADJUST control (figure 3-7) fully counter-clockwise. Set PLATE VOLTAGE SELECTOR switch (figure 3-7) to MAINT. Adjust MAINTENANCE ADJUST control so PA PLATE VOLTAGE meter indicates less than 6.5 kv.

Step 18. Observe the following:

PLATE ON indicator lamp (figure 3-7) is lit.

IPA PLATE VOLTAGE meter (figure 3-7) indicates less than 3.3 kv.

Dummy load blower is running.

Step 19. Have one man observe IPA PLATE VOLTAGE meter and one man observe discharge switching relays on 1A53A1 when the BIAS AND LOW VOLTAGE switch is set to OFF. Observe that relays 1A53A1K1 and 1A53A1K2 close and IPA PLATE VOLTAGE and PA PLATE VOLTAGE meters indicate zero volts.

Step 20. Set BIAS AND LOW VOLTAGE switch to ON.

Step 21. Observe that PA PLATE VOLTAGE meter indicates less than 6.5 kv and IPA PLATE VOLTAGE meter indicates less than 3.3 kv.

Step 22. Set PLATE VOLTAGE SELECTOR switch (figure 3-7) to OFF.

Step 23. Disable dummy load blower 4B1 by blocking air intake. Set PLATE VOLTAGE SELECTOR switch to MAINT. Observe that PLATE ON indicator lamp (figure 3-7) is not lit.

Step 24. Enable dummy load blower by unblocking air intake and observe that PLATE ON indicator lamp is lit.

Step 25. Observe that the BIAS AND LOW VOLTAGE ON and PLATE ON indicator lamps go out as each of the following operations is performed:

(1) Unlock and lock LOCKED ON switch 1A53A3S2.

(2) Open and close each 1A4 interlock.

(3) Open and close dummy load side doors.

(4) Open and close antenna coupler side doors.

(5) Open and close antenna coupler front door.

(6) Open and close antenna coupler front panel.

Step 26. Set PLATE VOLTAGE SELECTOR switch to OPERATE. Set LOCKOUT-READY switch (figure 3-5) to READY. Observe that a transmitter ready indication is displayed on transmitter control equipment.

Step 27. On the transmitter control equipment, select the transmitting group under test as the operate transmitter.

Step 28. Set controls to initial positions as listed in table 2-2.

2.6.23. **OVERLOAD CIRCUITS AND 3-STRIKE RELAY.** Check the overload and the 3-strike relay as follows:

Step 1. Set the following controls as indicated:

PLATE VOLTAGE SELECTOR switch to OFF.

208-Volt circuit breaker 1A53A3CB2 to ON.

HIGH VOLTAGE RECTIFIER POWER switch to ON.

Turn LOCKED ON key.

460V INPUT CB1 to ON.

POWER switch to ON.

FILAMENTS switch to ON.

BIAS AND LOW VOLTAGE switch to ON.

MAINTENANCE ADJUST control to 0.

PLATE VOLTAGE SELECTOR switch to MAINT.

Step 2. After the PLATE ON lamp lights, use the MAINTENANCE ADJUST control to set the P.A. plate voltage to 3 KV as indicated on the PA PLATE VOLTAGE meter.

Step 3. Turn the LOCKED ON key, lower the HIGH VOLTAGE RECTIFIER POWER switch to OFF, turn the LOCKED OFF key, and move it to the key transfer block.

Step 4. Open enclosure partition gate with interlock key. Place a grounding hook on the 21.5 kv output bus. Close enclosure inner fence gate with interlock key.

Step 5. Set HIGH VOLTAGE RECTIFIER POWER switch to ON and lock LOCKED ON switch (figure 3-8). Set 460V INPUT circuit breaker (figure 3-8) to ON.

Step 6. Observe that the 3-strike relay cycles three times and locks out. Observe that the BIAS AND LOW VOLTAGE ON, and 3 STRIKE RESET indicator lamps are not lit.

Step 7. Set HIGH VOLTAGE RECTIFIER POWER switch to OFF. Open enclosure inner fence gate with interlock key. Place the grounding hook on the 10.75 kv bus.

Step 8. Repeat step 5.

Step 9. Depress OVERLOAD AND 3 STRIKE RESET pushbutton and repeat step 6.

Step 10. Depress OVERLOAD AND 3 STRIKE RESET pushbutton but only allow the 3-strike relay to cycle once by setting PLATE VOLTAGE SELECTOR switch to OFF after the first cycle.

Step 11. After at least 90 seconds, set the PLATE VOLTAGE SELECTOR switch to MAINT. Observe that the 3-strike relay cycles three times and locks out.

Step 12. Set PLATE VOLTAGE SELECTOR, BIAS AND LOW VOLTAGE and HIGH VOLTAGE RECTIFIER POWER switches to OFF. Open enclosure inner fence gate with interlock key. Remove grounding hook.

Step 13. Open the access doors of the PA tube rack. Slowly depress each PA cathode overload relay (see figure 5-33) listed below and observe that its associated indicator lamp (figure 3-6) goes out and the 3-strike relay simultaneously cycles. After each relay operation is checked, depress the OVERLOAD AND 3 STRIKE RESET pushbutton (figure 3-7).

RELAY	**INDICATOR**
1A6K1	1A6V1 PA CATHODE OVERLOAD
1A6K2	1A6V2 PA CATHODE OVERLOAD
1A6K3	1A6V3 PA CATHODE OVERLOAD
1A6K4	1A6V4 PA CATHODE OVERLOAD

Step 14. Open the access doors on the rear of the exciter. Slowly depress each IPA cathode overload and PA bias overload relay listed below and observe that its associated indicator lamp (figure 3-5) goes out and the 3-strike relay simultaneously cycles.

After each relay operation is checked, depress the OVERLOAD AND 3 STRIKE RESET pushbutton.

RELAY	INDICATOR
1A4K1	LEFT 1ST IPA CATHODE OVERLOAD
1A4K2	RIGHT 1ST IPA CATHODE OVERLOAD
1A4K5	LEFT PA BIAS OVERLOAD
1A4K4	RIGHT PA BIAS OVERLOAD

2.6.24. **TRANSMITTER CONTROLS AND CONTROL CIRCUITS.** Check the transmitter controls and control circuits by performing the operations of table 2-4. Before performing these operations be sure that:

(1) Pulse input cable is disconnected from the transmitter input.

(2) Cooling system is connected and filled.

TABLE 2-4. TRANSMITTER CONTROL SEQUENCE OF OPERATION

STEP	OPERATION	RESULT
1	Set the following controls to position indicated.	
	CONTROL	**POSITION**
	All doors and drawers	Closed and locked
	EMERGENCY STOP (figure 3-7)	RUN
	208 vac circuit breaker (figure 3-8)	ON
	POWER (figure 3-7)	OFF/RESET
	FILAMENTS (figure 3-7)	OFF
	HIGH VOLTAGE RECTIFIER POWER (figure 3-8)	ON
	LOCKED ON (figure 3-8)	Closed
	460 V INPUT CB1 1A53A3CB1 (figure 3-8)	ON
	LOCKOUT-READY (figure 3-5)	READY
	BIAS AND LOW VOLTAGE (figure 3-7)	OFF
	PLATE VOLTAGE SELECTOR (figure 3-7)	OFF
	MAINTENANCE ADJUST (figure 3-7)	Full ccw (0.0)
	OPERATE ADJUST (figure 3-7)	Full ccw (0.0)
	All water flow valves	Open
	Transmitter control equipment. Transmitter group selector.	See NOTE at end of Step 15.

TABLE 2-4. TRANSMITTER CONTROL SEQUENCE OF OPERATION (Cont.)

STEP	OPERATION	RESULT
2	Set the AC VOLTAGE SELECTOR switch (figure 3-7) to 208V LINE. Turn VOLTAGE PHASE SELECTOR switch through its three positions and observe AC VOLTAGE meter (figure 3-7).	208± 21 vac for each phase.
3	Set AC VOLTAGE SELECTOR switch to 208 V REG. Turn VOLTAGE PHASE SELECTOR through its three positions and observe AC VOLTAGE meter.	208± 4 vac for each phase.
4	Set AC VOLTAGE SELECTOR switch to 460 V LINE. Turn VOLTAGE PHASE SELECTOR through its three positions and observe AC VOLTAGE meter.	460± 46 vac for each phase.
5	Observe the following indicator lamps (figures 3-7, 3-5 and 3-6).	All indicator lamps are lit.

IPA OVERLOAD

PA OVERLOAD

AC OVERLOAD

3 STRIKE

DOOR INTERLOCK

208V EMERGENCY STOP POWER

460V EMERGENCY STOP POWER

PLATE TRANSFORMER OVERTEMPERATURE

LEFT 1ST IPA CATHODE OVERLOAD

RIGHT 1ST IPA CATHODE OVERLOAD

LEFT PA BIAS OVERLOAD

RIGHT PA BIAS OVERLOAD

TABLE 2-4. TRANSMITTER CONTROL SEQUENCE OF OPERATION (Cont.)

STEP	OPERATION	RESULT
5 cont.	1A6V1 PA CATHODE OVERLOAD	
	1A6V2 PA CATHODE OVERLOAD	
	1A6V3 PA CATHODE OVERLOAD	
	1A6V4 PA CATHODE OVERLOAD	
	WATER LEVEL	
	PA1A6 INLET OVER TEMPERATURE	
	PA1A6 OUTLET OVER TEMPERATURE	
	STANDBY	
6	Set METER SELECTOR switch (figure 3-4) to -28V and -12V positions and observe readings on voltmeter (figure 3-4).	
	-28V position	28 ±2.0v
	-12V position	12 ±0.6v
7	Set POWER switch to ON and observe AIR ON and WATER ON indicator lamps (figure 3-7).	Both indicator lamps are lit.
8	Set FILAMENTS switch to ON. Observe FILAMENTS READY indicator lamp and FILAMENT HOURS meter (figure 3-7).	
	FILAMENTS READY indicator lamp	Lit after a 45 ±15 second delay
	FILAMENT HOURS meter	Running
9	Set BIAS AND LOW VOLTAGE switch to ON. Observe following indicator lamps and meters:	
	BIAS AND LOW VOLTAGE ON indicator lamp (figure 3-7).	Lit

TABLE 2-4. TRANSMITTER CONTROL SEQUENCE OF OPERATION (Cont.)

STEP	OPERATION	RESULT
9 cont.	LEFT PA BIAS UNDERVOLTAGE indicator lamp (figure 3-5).	Lit
	RIGHT PA BIAS UNDERVOLTAGE indicator lamp (figure 3-5).	Lit
	5 KV BIAS meter (figure 3-7)	-5 kv ±500v
	LOW VOLTAGE PLATE meter (figure 3-7)	500 ±50v
	LEFT PA BIAS meter (figure 3-1)	1.5 ±0.2 kv
	RIGHT PA BIAS meter (figure 3-1)	1.5 ±0.2 kv
	LEFT 2ND IPA BIAS meter (figure 3-1)	4 ±0.5 kv
	RIGHT 2ND IPA BIAS meter (figure 3-1)	4 ±0.5 kv
10	Set METER SELECTOR switch (figure 3-4) to +250 V position and observe voltmeter (figure 3-4).	250 ±12.5 V
11	Set PLATE VOLTAGE SELECTOR switch to MAINT. Slowly turn MAINTENANCE ADJUST control clockwise until IPA PLATE VOLTAGE meter (figure 3-7) reads approximately 5 kv. Observe the following indicator lamps and meter:	
	PLATE ON indicator lamp (figure 3-7)	Lit
	PLATE HOURS meter (figure 3-7)	Running
	Transmitter control equipment high voltage on indicator.	Lit
12	Observe the following current indicating meters (figure 3-7)	
	IPA PLATE CURRENT meter	Reads zero
	PA PLATE CURRENT meter	Reads zero
13	Observe the following plate and cathode meters on units 1A4 (figure 3-1) and 1A6.	

	LEFT 1ST IPA CATHODE meter	All meters
	(1A4M1)	Read zero

TABLE 2-4. TRANSMITTER CONTROL SEQUENCE OF OPERATION (Cont.)

STEP	OPERATION	RESULT
13 cont.	RIGHT 1ST IPA CATHODE meter (1A4M2)	
	LEFT 2ND IPA PLATE CURRENT (1A4M3)	
	RIGHT 2ND IPA PLATE CURRENT (1A4M4)	
	V1 CATHODE CURRENT (1A6M1)	
	V2 CATHODE CURRENT (1A6M2)	
	V3 CATHODE CURRENT (1A6M3)	
	V4 CATHODE CURRENT (1A6M4)	
14	Set EMERGENCY STOP switch to STOP and observe that transmitter shuts down immediately.	460V INPUT CB1 and 208 vac circuit breakers open, all meters read zero and indicator lamps are off.
15	Set EMERGENCY STOP switch to RUN.	

NOTE

Test each transmitting group in the standby mode so that it operates into dummy load. On the transmitting control equipment. Set the transmitting group selector to the "opposite" group: that is, if the transmitting group No. 1 is under test, transmitting group No. 2 should be selected as the operate transmitter.

2.6.25. **FEEDBACK CABLE POLARITIES.** It is imperative that these cables have the correct polarity. The particular inter-unit cables involved are the twinax cable from the current feedback transformer, (W191) the twinax cable from the voltage feedback winding, (W192) and the twin lead between the input amplifier and the first IPA. Refer to the appropriate parts of the installation instructions to ensure that cable polarities are correct. If it is necessary to make up new cables, an ohmmeter should be used to ensure that cable polarity is maintained.

2.6.26. **PRELIMINARY INSPECTION AND ADJUSTMENT.** The following steps comprise a systematic turn-on and check procedure a transmitter group.

Step 1. Repeat step 1 of table 2-4, except set the LOCKOUT-READY switch (1A11S1) to LOCKOUT.

Step 2. Set ON-OFF reset switch (1A53A2S17) to ON.

Step 3. Check that blower 1A4B2 is energized and that air flow is directed upward across the Input Amplifier (1A4A1A3) chassis.

Step 4. Set the FILAMENTS switch (1A53A2S13) to ON. Check that all tube filaments in the Input Amplifier are lit.

Step 5. Set BIAS PEDESTAL ON-OFF switch (1A4S8) to OFF.

Step 6. Set the 1st IPA BIAS ADJ. controls (1A4R149 and 1A4R150) fully clockwise.

Step 7. Set BIAS and LOW VOLTAGE switch (1A53A2S7) to ON. Measure the voltages on the Input Amplifier at the following terminal points.

Voltage	1A4A1A3 + TERMINAL	1A4A1A3 - TERMINAL
+ 500 VDC	TB1-5	TB1-10
+ 250 VDC	TB1-3	TB1-10
- 150 VDC	TB2-7	TB2-8
- 260 VDC*	TB2-5	TB2-8
- 260 VDC*	TB2-6	TB2-8
+ 24 VDC	TB2-9	TB2-8
+ 24 VDC	TB2-10	TB2-8

* with the 1ST IPA Bias Control in full clockwise position.

Step 8. Connect a dc voltmeter to 1A4A1A3TB2-2 and 1A4A1A3TB2-8.

(1) With the transmitter group in Standby, observe that the voltmeter reads -28V dc.

(2) With the transmitter group in Operate, observe that the voltmeter reads zero Vdc.

Step 9. With the transmitter group in Standby, set STANDBY DRIVE CONTROL (1A4A1A3R18) to zero.

Step 10. Set FEEDBACK/OPEN LOOP switch (1A4A1A3S1) to OPEN LOOP position.

Step 11. Bias the transmitter in accordance with paragraph 5.2.4.10.

Step 12. Adjust the MAINTENANCE ADJUST control so that the IPA PLATE VOLTAGE voltmeter indicates 10.75 Kv.

2.6.27. **FEEDBACK POLARITIES CHECK.** Perform the following checks in OPEN LOOP to prevent feedback distortions affecting first half cycle observations. This polarity check does NOT require removal of the Feedback current (J2) or Feedback voltage (J3) cable removal.

Step 1. Connect an oscilloscope probe at the junction of 1A4A1A3A2C19 and 1A4A1A3A2R76 (TDW).

Step 2. Apply drive to the transmitter and carefully adjust the oscilloscope to view the first half cycle of the signal. Record the polarity of the first half cycle.

Step 3. Move the oscilloscope probe to 1A4A1A3E97 (R236/R79) in the feedback combiner circuit (voltage feedback).

Step 4. Carefully adjust the oscilloscope to view the first half cycle. **The polarity of the first half cycle should be the SAME as observed in step 2.**

Step 5. If the polarity observed in step 4 is correct proceed to step 7; if incorrect the following must be checked and corrected as necessary.

(1) Check that the voltage feedback winding on 1A5 is wound in the proper direction.

(2) Check that the wiring on resistor assemblies 1A6A1 and 1A6A2 and the connections from the feedback winding are correct.

(3) Check that the 300 ohm cable is wired with no phase reversals to 1A4TB3.

(4) Check the polarity of twinax cable W192.

Step 6. Repeat steps 2 through 5 until step 4 is satisfied.

Step 7. Connect the oscilloscope probe to 1A4A1A3E98 in the feedback combiner circuit (current feedback).

Step 8. Carefully adjust the oscilloscope to view the first half cycle. **The polarity of the first half cycle should be the SAME as observed in step 2 on the C19/R76 junction.**

Step 9. If the polarity observed in step 8 is correct proceed to step 10; if incorrect the following must be checked and corrected as necessary.

(1) Check that the key on the case of the current transformer (1A6T5) is pointing toward the rear of the transmitter.

(2) Check the polarity of twinax cable W191.

Step 10. Set STANDBY DRIVE CONTROL to zero. Set FEEDBACK/OPEN LOOP switch to the FEEDBACK position.

Step 11. While observing the rf output current and all transmitter front panel indicators, slowly increase transmitter drive.

Step 12. On the transmitter control equipment build the proper pulse shape and set the output to the prescribed level.

2.6.28. **TUBE SEASONING.** Season tubes according to paragraph 5.2.4.9.

2.6.29. **BIAS ADJUSTMENT.** Adjust bias voltages as specified in paragraph 5.2.4.10.

2.6.30. **NORMAL WAVESHAPES.** Check the normal waveshapes against table 5-9 step 7.

2.6.31. **NORMAL METER READINGS AND FUNCTIONS OF ALL METERS.** Check the normal meter readings and functions of all meters against table 5-9 steps 1 through 6.

2.6.32. **AC OVERLOAD ADJUSTMENT.** Readjust the OVER-CURRENT TRIP SETTING controls as specified in paragraph 5.2.4.17 as soon as the transmitting group is operating normally into the antenna.

2.7. **INTERFERENCE REDUCTION.** Radio interference reduction has been designed into this equipment. The only area where installation may affect this interference is in the coupling of the transmitter to the antenna. The reduction of this radio interference to an absolute minimum, consistent with good engineering practice, must be accomplished by aligning the power amplifier tank according to paragraph 5.2.4.15 and tuning the output circuit according to

paragraph 5.2.4.11.

2.8. **PREPARATION FOR RESHIPMENT.** The shipping and reassembly instruction for special equipment of the AN/FPN-44A is described in Volume III. For the rest of the equipment, reverse the order of procedure for unpacking. Determine whether shipment is domestic or overseas and pack accordingly. Mark the case containing the technical manuals TECHNICAL MANUALS INSIDE.

3.0. OPERATOR'S SECTION.

3.1. **FUNCTIONAL OPERATION.** Loran Transmitting Set AN/FPN-44A is used to transmit uniform and accurately timed phase-coded pulses. The loran transmitting set is only one of several units essential to the transmission of these pulses. For this reason, operation of the loran transmitting set cannot be considered separately but must be incorporated into the operating routine for a complete station. The operation of the timing and some of the switching equipment which is not part of the loran transmitting set is covered in their respective instruction manuals.

Normal operation of the loran transmitting set includes a start-stop procedure, switching arrangements, operational adjustments, and monitoring procedures. Since a loran transmitting set is operational for extended periods of time, a time-sharing schedule for the two transmitter groups of a ground station is used. Starting and stopping procedures represent a small portion of the operating routine.

Controls located at the transmitter control equipment are used for switching transmitter groups. Indicators are provided for observing the operation of the set. Monitoring consists of observation of the transmitted pulse and observation of meter indications.

Before placing the equipment in normal operation, the transmitting set shall be completely tuned and adjusted as specified in Section 2. Only those controls listed in tables 3-1 through 3-11 should then be used by operating personnel.

3.2. **OPERATING PROCEDURES.**

The procedures used in operating the loran transmitting set consist of start-up, switching of transmitting groups, and monitoring.

WARNING

Interlocks are installed throughout the loran transmitting set to protect personnel from dangerous high voltages within the loran transmitting set. They are not to be tampered with or disabled in an unauthorized manner.

One of the two transmitting groups is placed in the operate status and the other transmitting group in standby. The controls and indicators associated with switching are located on the transmitter control equipment.

Since a loran transmitting set is operated constantly, monitoring is necessary to determine that the transmitted pulse

is normal. Any deviation from prescribed timing, power, or pulse shape is detected immediately. In addition to display lamps and meters, oscilloscopes are used to monitor the transmitted pulse and the signal supplied to the antenna or dummy load.

3.2.1. **DESCRIPTION OF CONTROLS.** The controls and indicators of the loran transmitting set with which the operator is concerned are located at the transmitting group and the antenna coupler. A description of these controls can be found in tables 3-1 through 3-17 and figures 3-1 through 3-12.

3.2.2. **SEQUENCE OF OPERATION**

NOTE

The sequence of operation is the same for both transmitter groups. Certain results (specified in tables 3-12 and 3-14) depend upon which status (operate or standby) has been selected by the transmitter control equipment.

3.2.2.1. **BEFORE USE.** Set the controls as shown in table 3-12 and perform the steps in table 3-13 before high voltage is applied to the transmitter groups.

3.2.2.2. **DURING USE.** Perform the sequence of operation in table 3-14 and observe that the specified results are obtained.

3.2.2.3. **TRANSFER.** The operate status may be transferred from one transmitter group to the other by the transmitter control equipment when both transmitter groups are turned on as specified in the two preceding paragraphs. This transfer will have the following effect:

(a) The IPA and PA plate voltages in the original operate transmitter group are cut off.

(b) The drive signal in the original operate transmitter group is cut off.

(c) The vacuum relays in the antenna coupler transfer the antenna from the original operate transmitter group to the new operate transmitter group.

(d) The IPA and PA plate voltages are applied in the new operate transmitter group.

(e) The drive signal is applied in the new operate transmitter group.

3.2.2.4. **AFTER USE.** To shut down either transmitting group set POWER switch (figure 3-7) to OFF/RESET. The same indicators

which were lit after setting 1A53A3CB2 (see table 3-12) will remain lit. In addition, the AIR ON and WATER ON (figure 3-7) indicators should remain lit for approximately five minutes. After this time, the pumps and blowers should go off and the AIR ON and WATER ON indicators should go out. After the AIR ON and WATER ON indicators go out, set 1A53A3CB1 and 1A53A3CB2 to OFF. All lamps should go off indicating that the equipment is shut down.

3.2.2.5. **OFF CONDITION.** When the AFTER USE procedures in step (4) above have been performed, the equipment is in the normal off condition. In this condition, however, there is power applied to 1A53A3CB1 and 1A53A3CB2. However, in situations where it is required to remove all power from the transmitting set completely (for repair, etc.), set the 208V and 460V circuit breakers on the station power distribution panel to OFF.

3.2.3. **TUNING ADJUSTMENTS.** See Section 5.2 for all tuning adjustments for the loran transmitting sets.

3.3. **SUMMARY OF OPERATING PROCEDURES.** The following summarizes the operating procedures described in detail in paragraph 3-2.

3.3.1. **BEFORE USE.**

Step 1. Set the controls to their before use positions (table 3-12).

Step 2. Monitor the 208 vac regulated and unregulated voltages, and the 28 vdc and -12 vdc regulated voltages.

Step 3. On control-indicator (1A53A2) check that all overload, 208V EMERGENCY STOP, POWER, DOOR INTERLOCKS, 3 STRIKE, and PLATE TRANSFORMER OVERTEMPERATURE indicator lamps are lit. On indicator panels (1A12 and 1A21), check that all overload, overtemperature and WATER LEVEL indicator lamps are lit.

3.3.2. **DURING USE.**

Step 1. Set POWER switch (figure 3-7) to ON and check that AIR ON and WATER ON indicator lamps are lit.

Step 2. Set FILAMENTS switch (figure 3-7) to ON and check that FILAMENTS READY lamp is lit after a time delay.

Step 3. Set BIAS AND LOW VOLTAGE switch (figure 3-7) to ON and check that BIAS AND LOW VOLTAGE ON indicator lamp and undervoltage indicators (figure 3-5) are lit. Check bias and low voltages for normal voltage.

Step 4. Set 460V INPUT CB1 circuit breaker (figure 3-8) to ON and observe that EMERGENCY STOP POWER 460V indicator lamp is

lit.

Step 5. Set the PLATE VOLTAGE SELECTOR SWITCH (figure 3-7) to OPERATE. Observe that PLATE ON indicator lamp is lit. Check plate voltage and current meters for normal indications as specified by Calibration Chart at each station.

3.3.3. **TRANSFER.** The operate status may be transferred by the transmitter control equipment when both transmitter groups are switched on.

3.3.4. **AFTER USE.** This procedure is used when it is desired to place the loran transmitting set in the normal shutdown mode. In this mode, primary power is applied to the transmitting set's 1A53A3CB1 and 1A53A3CB2 but is not distributed.

3.3.5. **OFF CONDITION.** This procedure is used to completely remove all power from the loran transmitting set for emergency or maintenance purposes. In this case, not even primary power is applied to the equipment.

3.4. **EMERGENCY OPERATION.** The following instructions describe alternate methods of operation when certain failures occur within the loran transmitting set.

3.4.1. **SWITCHING TRANSMITTING GROUPS.** Since uninterrupted transmission is required from a loran transmitting set, provision is made to switch the standby transmitting group to operate status in the event of failure of the transmitting group that is operating. Transmitting group switching is performed at the transmitter control equipment.

3.4.2. **OPERATION WITH FAULTY POWER AMPLIFIER SECTION.**

NOTE

This procedure should only be used as a last resort, all other means of repair should first be attempted.

If logistics prevent immediate repair of a fault in a Power Amplifier section, satisfactory reduced power operation may be possible if filament and plate power is removed from the faulty section. To maintain a balanced output, it will be necessary to remove filament power and plate voltage from one section of the opposite polarity side of the Power Amplifier, Unit 1A6. To remove filament power, take out the filament primary fuses corresponding to the defective tube section and to the selected tube of the opposite polarity. Filament fuses are F16 through F23 on unit 1A11. To remove plate voltage, take out two plate charging resistors, R7 and R8 of each of the appropriate resistor assemblies; 1A7, 1A8, 1A9 or 1A10. When full plate voltage has been applied to the two operating tubes, pulse shape and ECD MUST be checked and adjusted at the timing equipment.

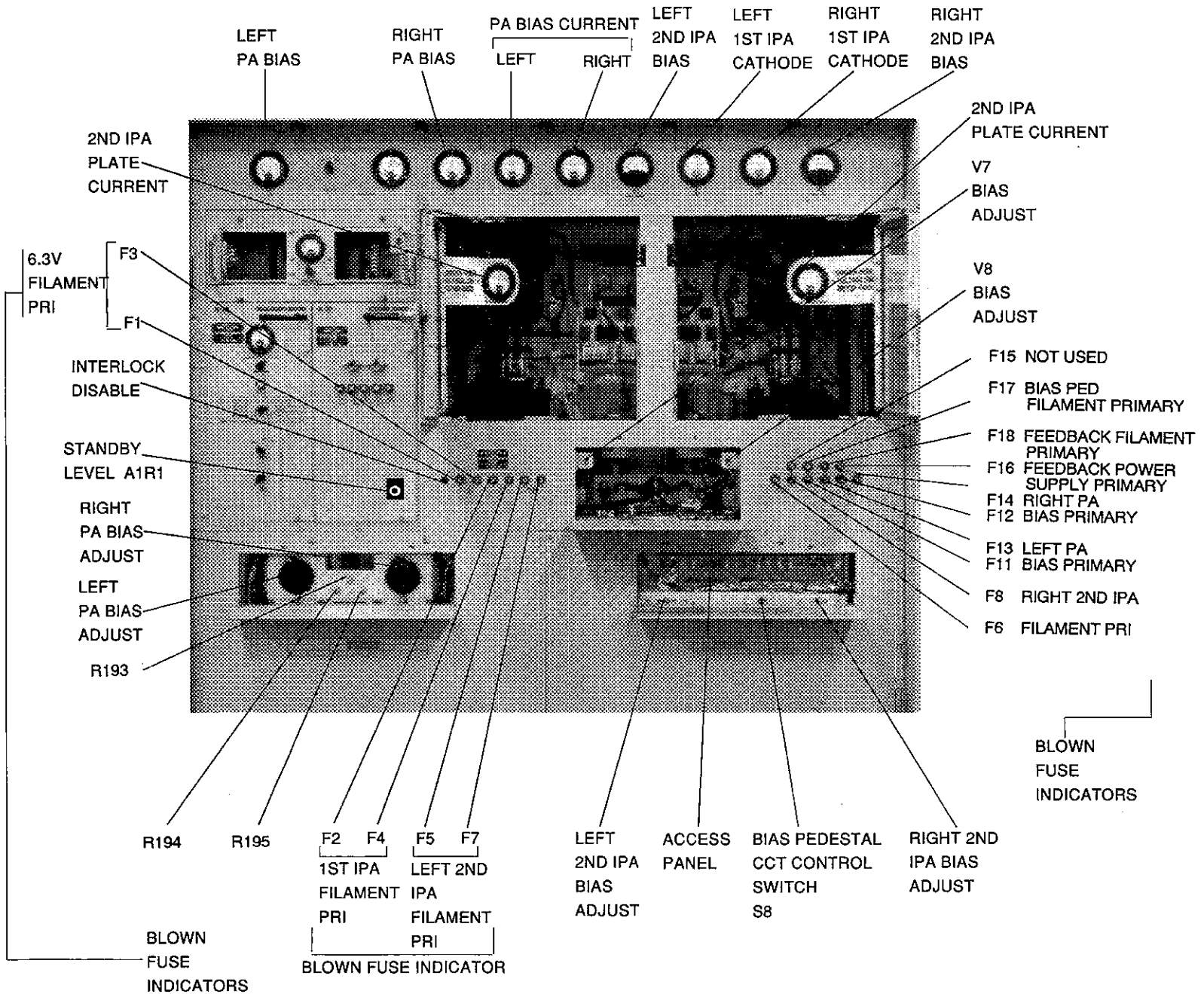
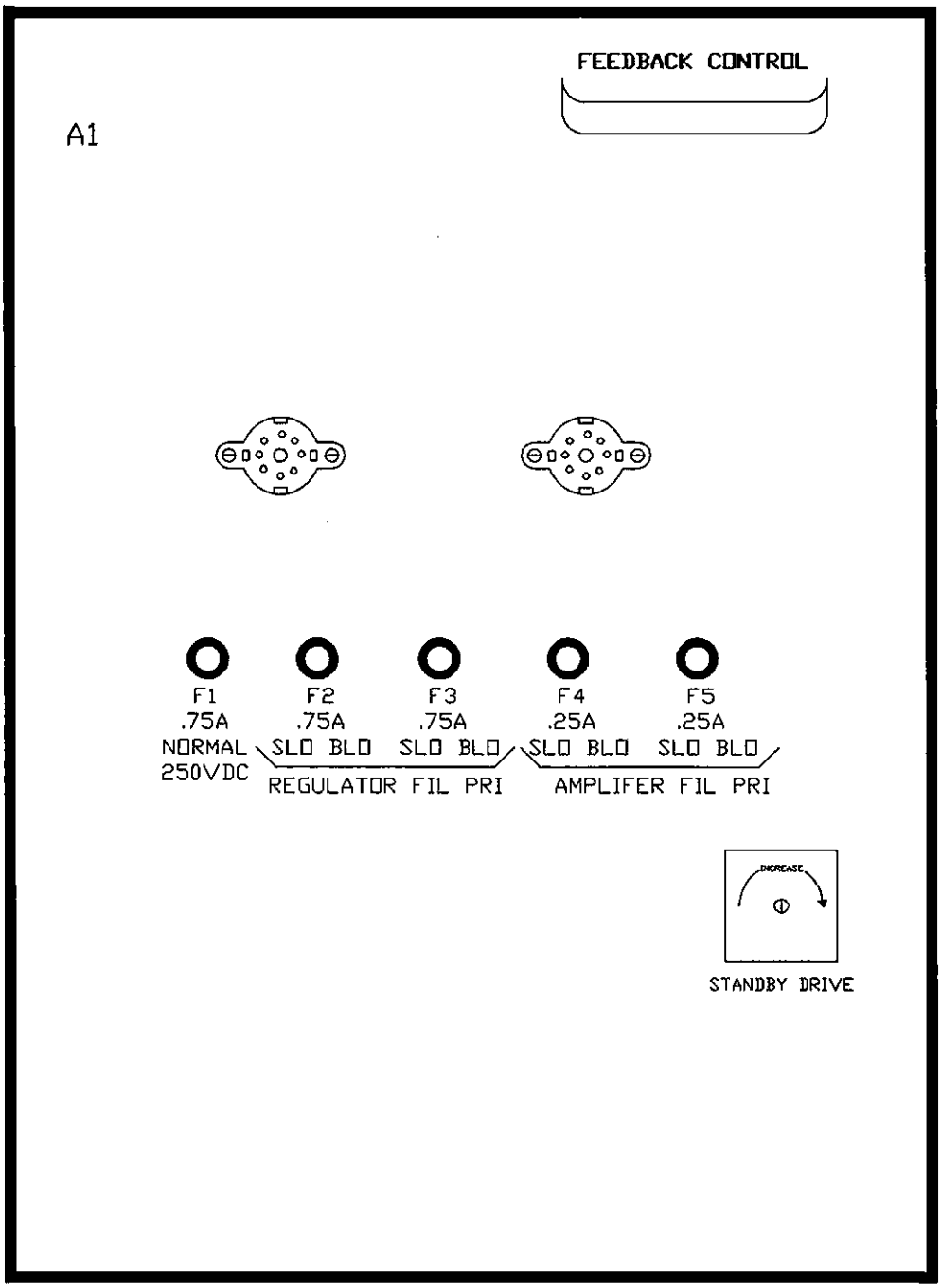
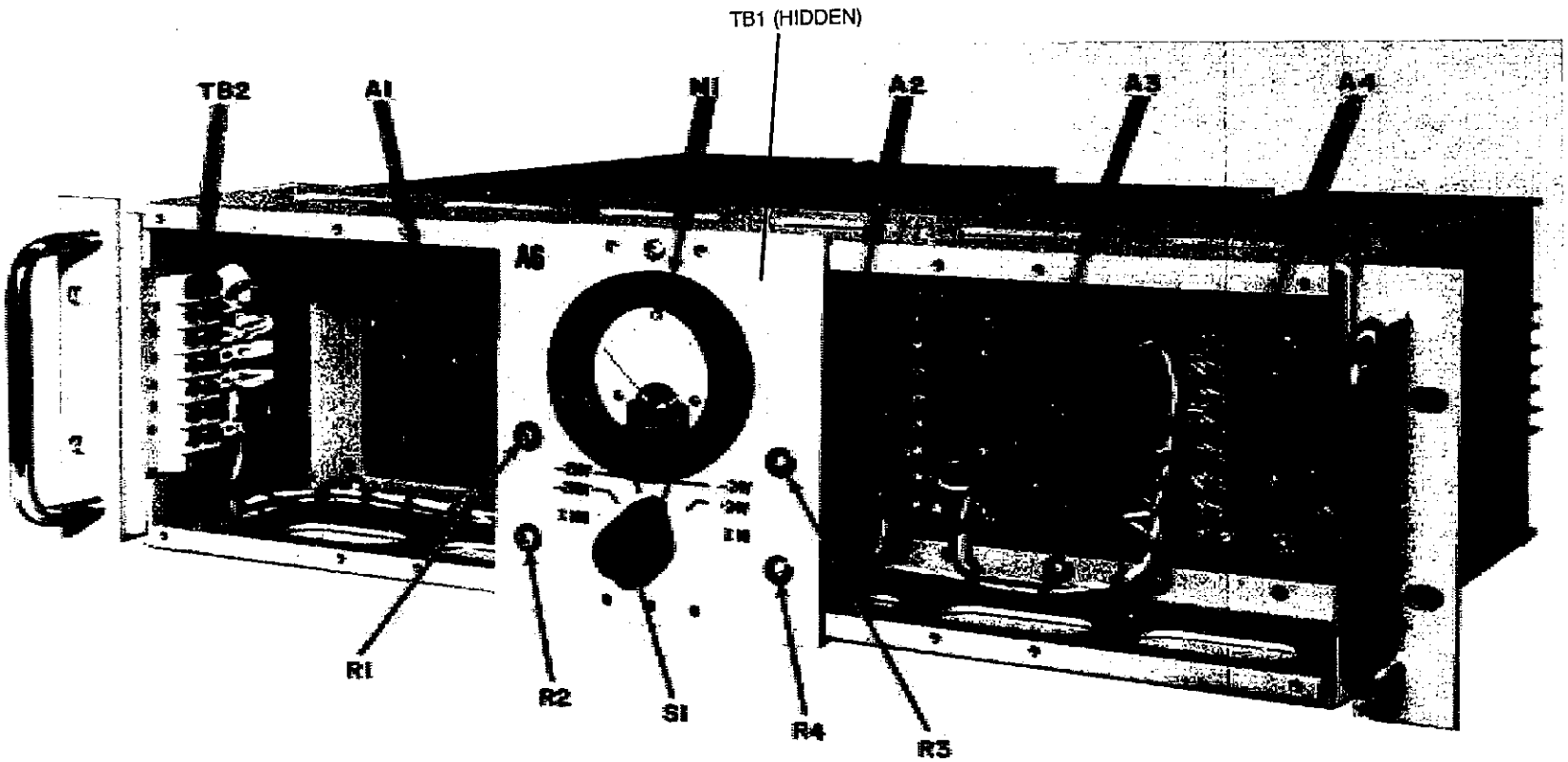


Figure 3-1. Amplifier Group OG-159/FPN-44A (1A4) Controls and Indicators



NOTE: F4 & F5 NOT IN AN/FPN-44B

Figure 3-2. Power Supply PP-3704/FPN/44A (1A4A1). Controls and Indicators



PREFIX REFERENCE DESIGNATION WITH 1A4A6

R1 – R4 IS HIDDEN

Figure 3-3. Power Supply Assembly (1A4A6) Controls and Indicators

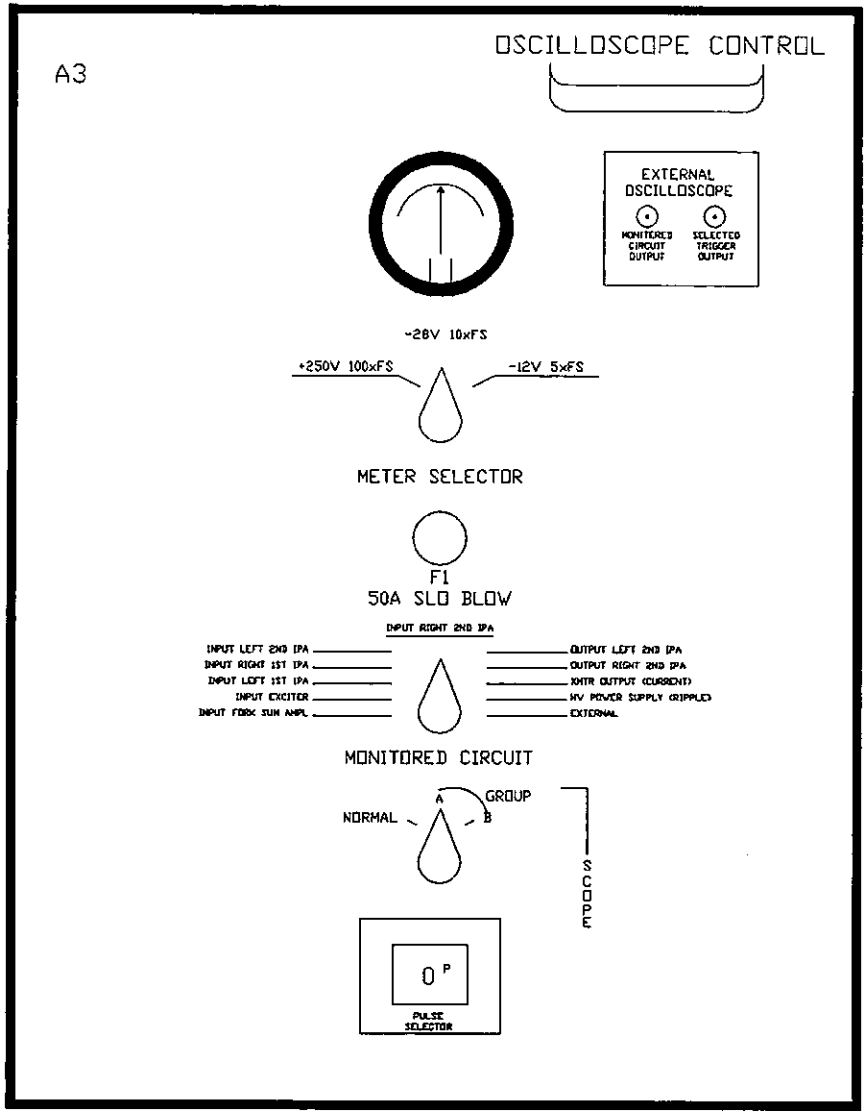


Figure 3-4. Oscilloscope Control C-4558A/FPN-44 (1A4A3). Controls and Indicators

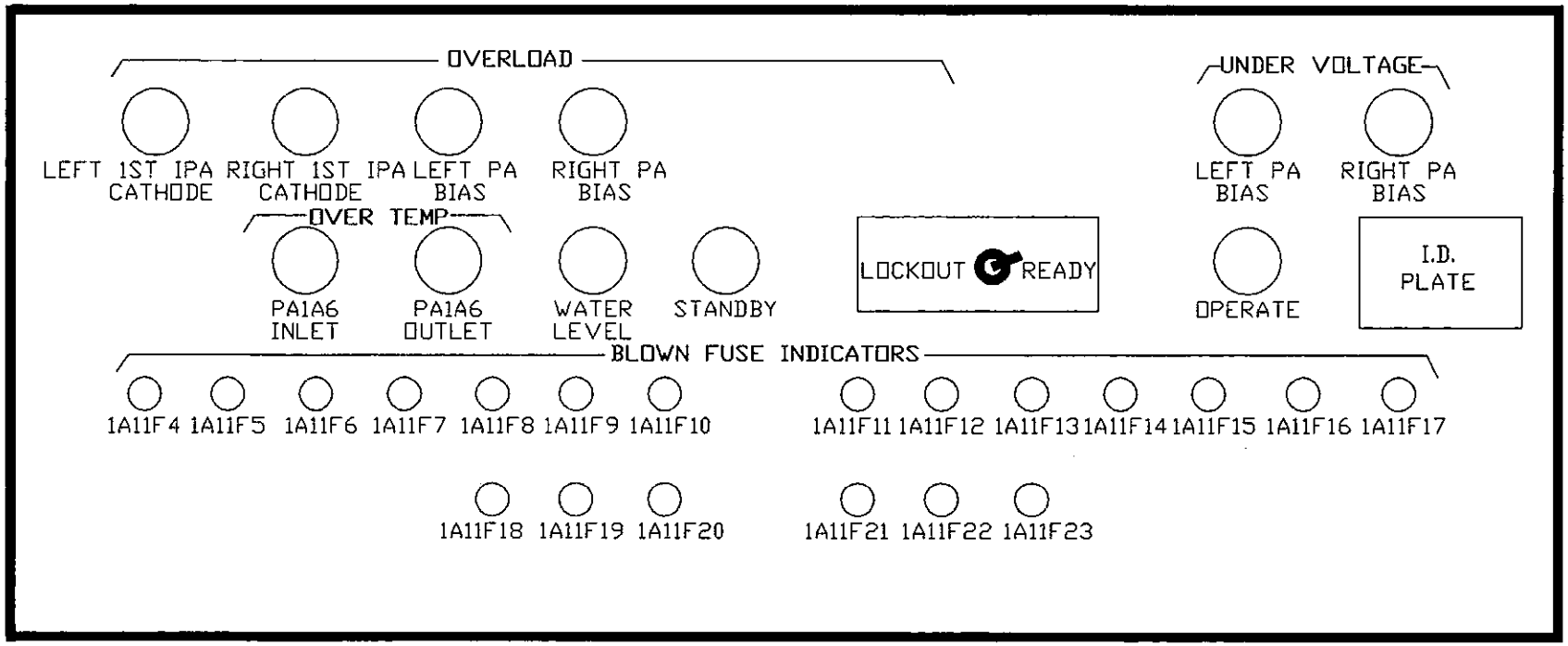


Figure 3-5. Indicator Panel SB-1894/FPN-44A (1A12)

Controls And Indicators

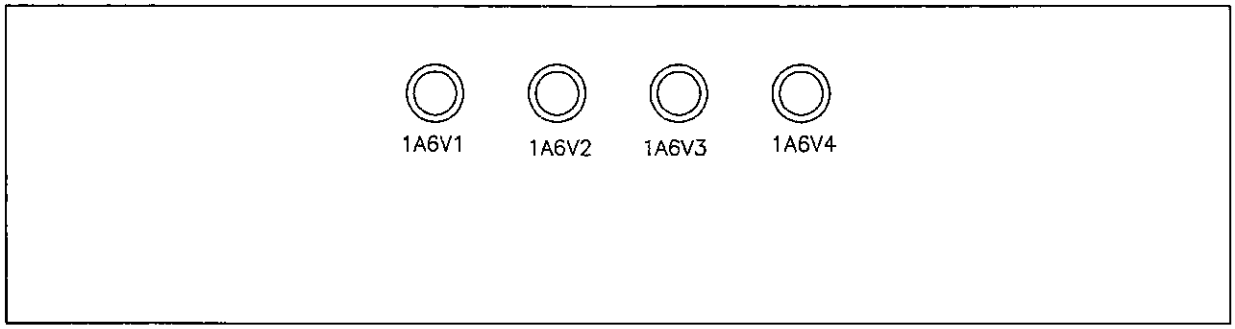


Figure 3–6. PA Overload Indicator Panel (1A21) Controls and Indicators

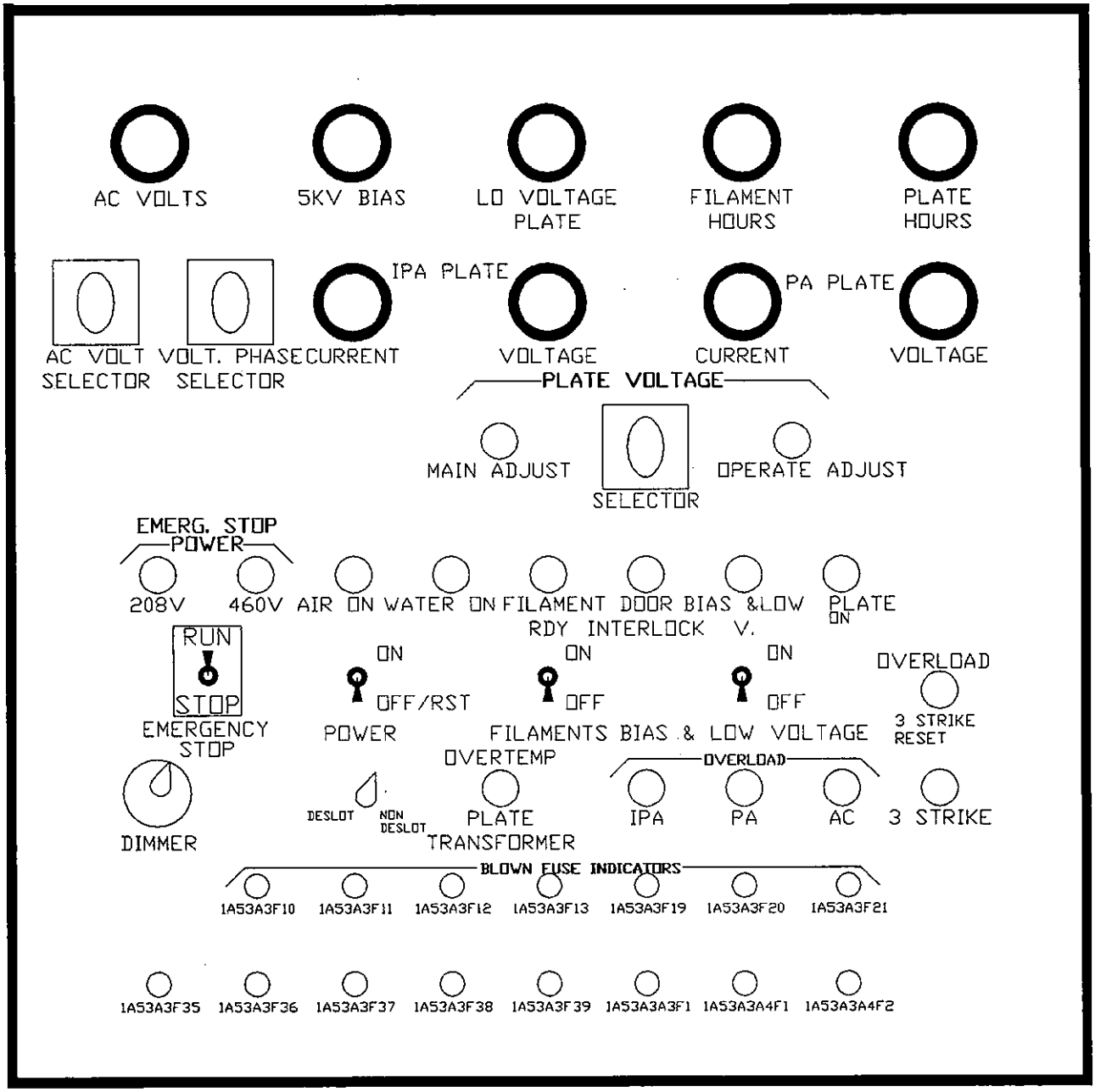


Figure 3-7. Control-Indicators C-10034/FPN-44A (1A53A2)
Controls and Indicators

SEE FIGURE 5-47 FOR ILLUSTRATION

Figure 3-8. P/O Relay Assembly RE-1113/FPN-44A(1A53A3) Controls and Indicators

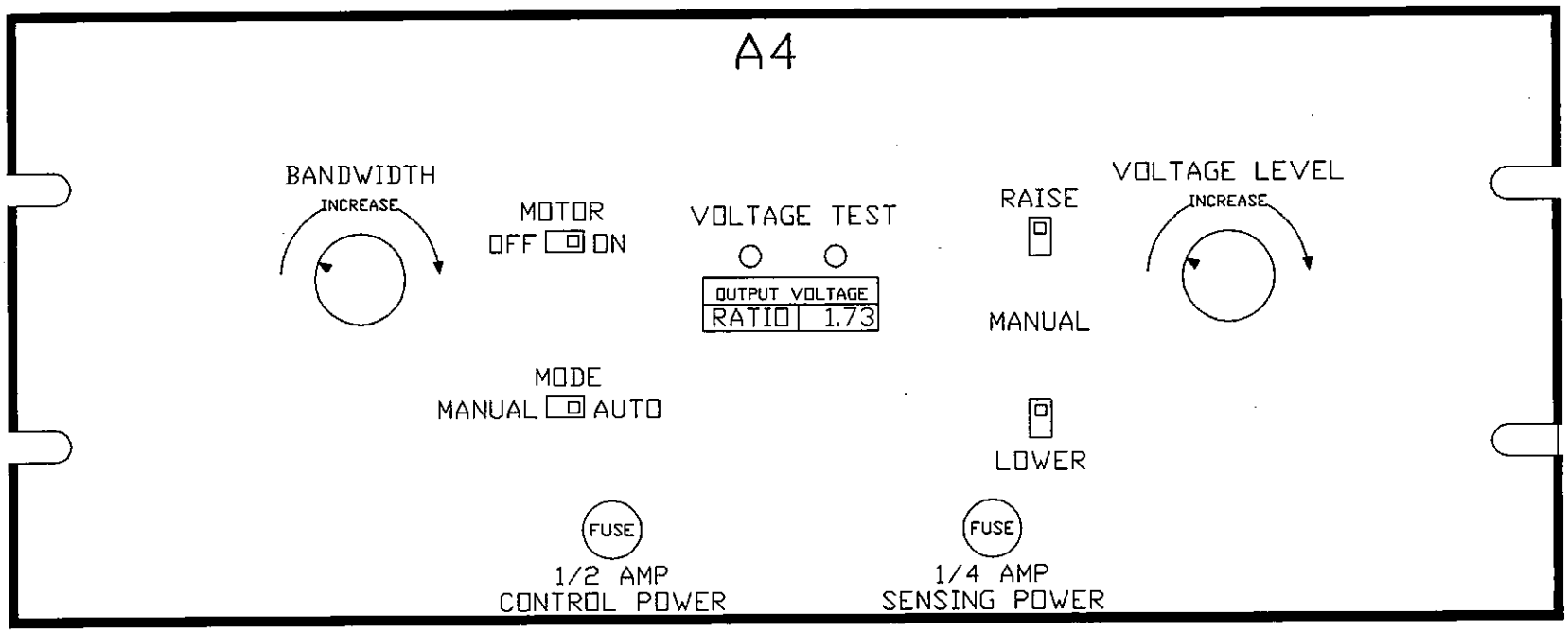


Figure 3-9. P/O Voltage Regulator CN-1472/FPN-44A (1A53A3A4)

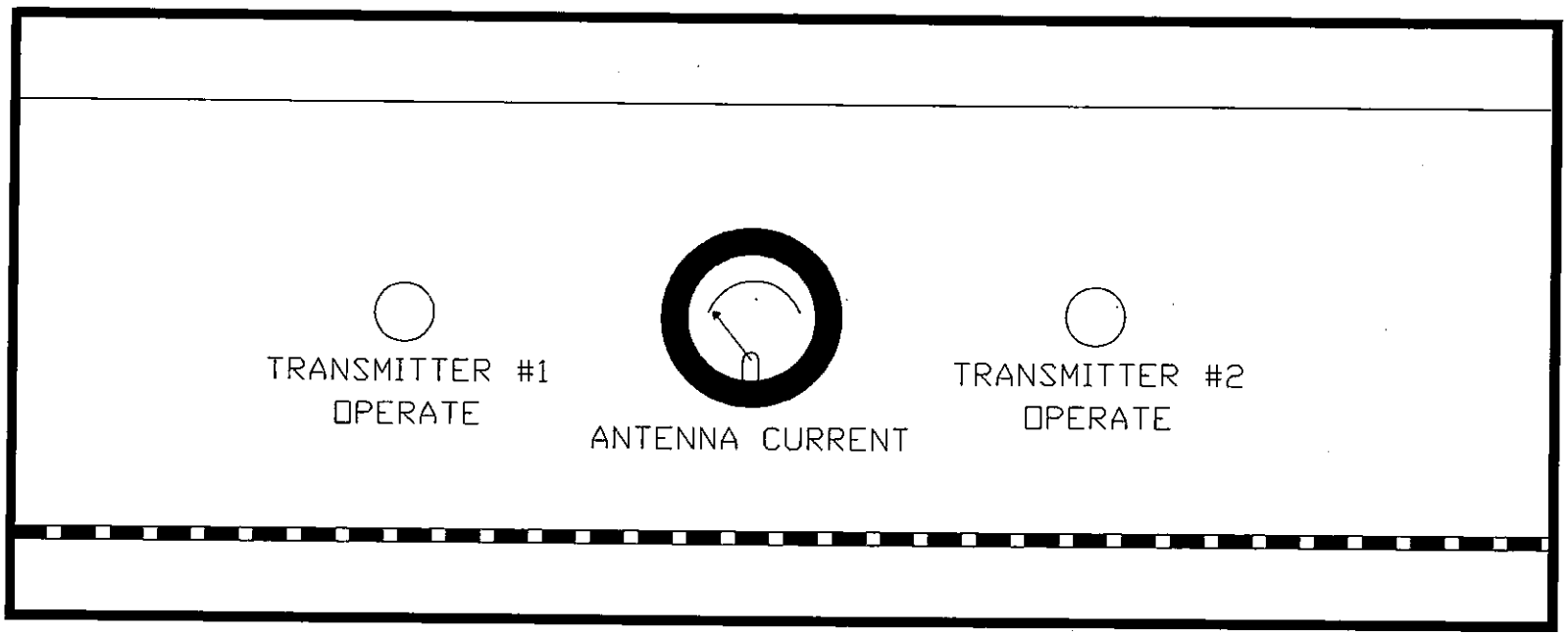


Figure 3-10. Antenna Coupler CU-2171/FPN-44A (3)
Controls and Indicators

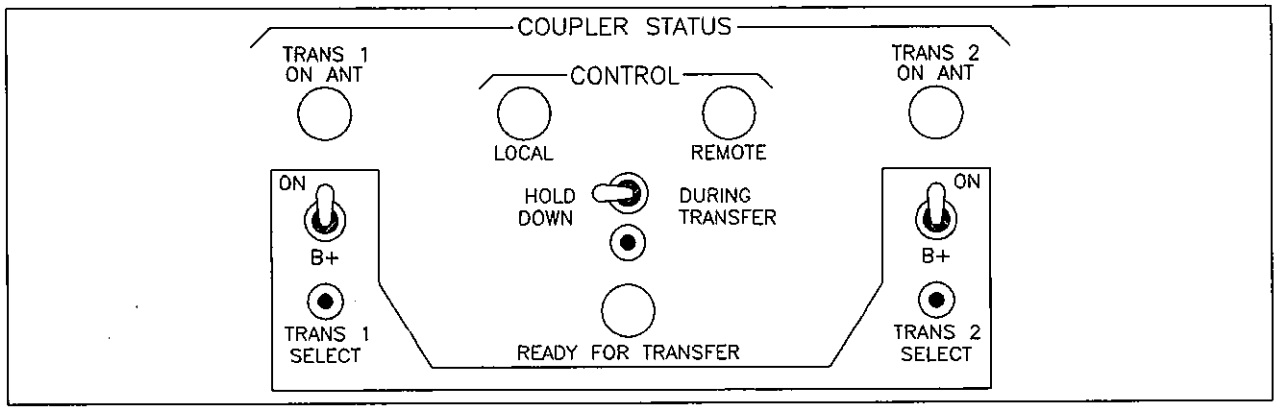
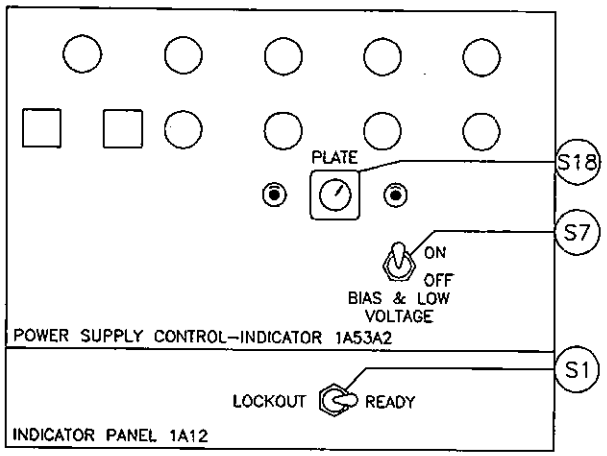


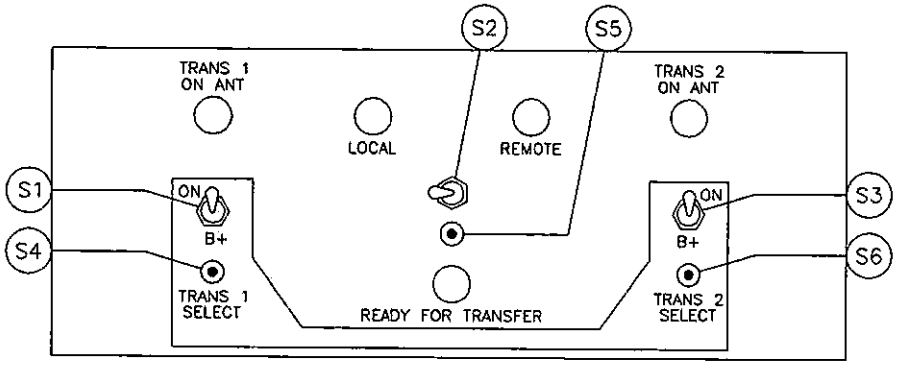
Figure 3-11. Local Control Unit (5) Controls and Indicators



TO PLACE TRANSMITTER IN "READY" STATUS:

1. WITH TRANSMITTER ENERGIZED AND FILAMENTS ON, PLACE "BIAS & LOW VOLTAGE" (1A53A2S7) "ON" AND PLACE "PLATE VOLTAGE" SWITCH (1A53A2S18) IN THE "OPERATE" POSITION.
2. PLACE "LOCKOUT–READY" SWITCH (1A12S1) IN THE "READY" POSITION.

NOTE: A TRANSMITTER CANNOT BE PLACED ON–AIR IF IT IS NOT IN READY STATUS.



TO SWITCH FROM LOCAL TO REMOTE CONTROL:

1. PLACE BOTH TRANSMITTERS IN "READY" STATUS.
2. THE "READY FOR TRANSMIT" LAMP (5DS5) SHOULD NOW BE ILLUMINATED.
3. THE DESLOT/NON DESLOT SWITCH MUST BE IN THE SAME POSITION ON BOTH TRANSMITTERS
4. PUSH THE "HOLD DOWN DURING TRANSFER" SWITCH (5S5) AND PLACE THE "LOCAL/REMOTE" SWITCH (5S2) IN THE "REMOTE" POSITION. RELEASE THE "HOLD DOWN DURING TRANSFER" SWITCH.

TO SWITCH FROM REMOTE TO LOCAL:

1. PLACE THE "B+" SWITCH (5S1) OR (5S3) FOR THE OPERATE TRANSMITTER IN THE "ON" POSITION.
2. THE "READY FOR TRANSFER" LAMP (5DS5) SHOULD NOW BE ILLUMINATED.
3. PUSH THE "HOLD DOWN DURING TRANSFER" SWITCH (5S5) AND PLACE THE "LOCAL/REMOTE" SWITCH (5S2) IN THE "LOCAL" POSITION. RELEASE THE "HOLD DOWN DURING TRANSFER" SWITCH.

TO SWITCH TRANSMITTERS WHEN OPERATING IN LOCAL CONTROL:

1. PLACE THE "B+" SWITCH (5S1) OR (5S3) FOR THE STANDBY TRANSMITTER IN THE "OFF" (i.e. DOWN) POSITION.
2. PLACE THE "BIAS & LOW VOLTAGE" SWITCH (1A53A2S7) AND THE "PLATE" SWITCH (1A53A2S18) ON THE STANDBY TRANSMITTER IN THE "OPERATE" POSITION.
3. PLACE THE "LOCKOUT–READY" SWITCH (1A12S1) ON THE STANDBY TRANSMITTER IN THE "READY" POSITION.
4. PLACE THE "B+" SWITCH (5S1) OR (5S3) FOR THE OPERATE TRANSMITTER IN THE "OFF" (i.e. DOWN) POSITION. PUSH THE LOCAL CONTROL "OPERATE SELECT" SWITCH (5S4) OR (5S6) FOR THE DESIRED TRANSMITTER. PLACE THE "B+" SWITCH (5S1) OR (5S3) FOR THE NEWLY SELECTED OPERATE TRANSMITTER IN THE "ON" POSITION.

Figure 3–12. Local and Remote Operation

CAUTION

Removal of resistors from a resistor rack leaves plate storage capacitors without high-voltage discharge circuits. Use a grounding hook on the remaining resistors before replacing resistors.

3.4.3. **OPERATION IN THE OPEN LOOP CONDITION.** The transmitter can be operated with 1A4A1A3S1 in the OPEN-LOOP position. Switching to open loop mode can be useful in trouble shooting (see section 5). Open loop operation on the antenna is to be used only as a last resort if repeated overloads are experienced. When in open-loop mode, the output pulse shape and amplitude must be continuously monitored since the automatic control provided by feedback is inoperative.

3.4.4. **DESLOT/NON-DESLOT.**

3.4.4.1 **THEORY OF OPERATION.** The AN/FPN-44A DESLOT circuitry can operate as three functional circuits as described below. When a transmitter is selected as the operate transmitter, a 24VDC 4PDT relay designated as 1A53A2K1 is energized. This relay is connected in parallel with the operate/standby relay 1A12K11. The 1A53A2K1 relay's normally open contacts control all DESLOT circuit functions via Agastat time delay relays 1A53A3K5 (for pumps and blowers) and 1A53A2K2 (for filaments). One set of normally open contacts controls plate voltage turn on/off directly via existing high voltage interlock circuitry and 1A53A3K45. A set of normally closed contacts is used to bypass the 1A11 cooling system failure alarms when in the deslot mode.

a. Pumps, Blowers, and Filament Control

b. Plate Voltage Control

c. TAC Ready Circuits

3.4.4.1.1. **PUMPS BLOWERS AND FILAMENT CONTROL.** Pumps and blowers are controlled directly via 1A53A2K2 in both the DESLOT and NON-DESLOT modes. A3K5 is energized by relay 1A53A2K1 upon selection as the operate transmitter when in the DESLOT mode. The new Agastat relay 1A53A2K2, used for filament control energizes in parallel with A3K5, by the same set of A2K1 contacts.

3.4.4.1.2. **PLATE VOLTAGE CONTROL.** The 1A53A2K2 Agastat relay normally open contacts are placed in series with the Filament Disable relay 1A12K17 contacts for Filament control. Since the Agastat is a time delay on dropout type relay, it will delay the dropout of filaments for its delay setting after plate voltage is removed by the 1A53A2K1 relay. The purpose of this delay is to allow for the high voltage control circuits to be de-energized

and stabilized prior to the removal of bias and filaments. This is to avoid possible damage to the high voltage bleeder resistors and power tubes.

Each of the normally open contacts used for DESLOT control are bypassed by the DESLOT/NON-DESLOT selector switch 1A53A2S20 to return all circuitry to the original configuration. Thus, the transmitter may be run in the standby mode for maintenance or routine transmitter switching.

3.4.4.1.3. **TAC READY CIRCUITS.** The DESLOT TAC Ready 115 VAC signal source is taken from the normally closed contacts of 1A53A3K18, the Three Strike Lockout relay. This provides assurance that the door interlocks and Kirk key interlocks are secured, and that no Three Strike Lockout exists while showing a READY Transmitter. From this point the TAC Ready 115 VAC signal is gated through 1A53A3K5 normally closed contacts wired in parallel with normally open contacts of relay 1A53A2K1. This parallel combination locks out the TAC Ready during transmitter cool down following a DESLOT transmitter switch. This is required because of the one minute required for the operate transmitter to warm up and go ON AIR. Without locking out the TAC Ready from the standby transmitter during cool down, the TAC would try to switch back to the failed transmitter after waiting 30 seconds for the new operate. This of course causes a double transmitter failure. Extra contacts on 1A53A2S7, S13 and S18 are wired in series to ensure that these switches are placed in the "Ready to Go" positions prior to obtaining the TAC Ready and leaving the transmitter in the DESLOT Ready standby. The fourth section of the DESLOT/NON-DESLOT selector switch 1A53A2S20 places the TAC Ready circuitry back in the original configuration for NON-DESLOT operation.

The 460 VAC Lockout is designed to prevent a READY indication with the 460 VAC wall breaker off. The 4PST relay 1A53A2K3 is wired in series with the wiper of the DESLOT/NON-DESLOT switch and the circuitry leading to the TAC Ready relays in the AN/FPN-60. Without this 460 VAC Lockout, it is possible to leave the transmitter in a seemingly READY state without the 460 VAC wall breaker ON.

3.4.4.2. **DESLOT AND NON-DESLOT TRANSMITTER OPERATING PROCEDURES.**

1. When both transmitters are in the DESLOT mode of operation the Local Control Unit will have its READY FOR TRANSFER indicators, the REMOTE indicator, and either the TRANSMITTER No.1 ON ANTENNA or TRANSMITTER No. 2 ON ANTENNA indicator lit.

2. If DESLOT mode is the authorized normal operating mode, switch to NON-DESLOT mode on both transmitters when the Standby transmitter is run-up into the dummy load for routine maintenance or for taking readings. Once the maintenance is completed,

return the selector switches to the DESLOT mode.

3. When performing routine transmitter switches, place both transmitters into the NON-DESLOT mode and allow the standby transmitter to achieve a Bias on condition. The purpose of this is to reduce the amount of time that the station will be off-air during the switch (approximately 15 seconds Versus 1 minute). After switching transmitters, return the mode selector to DESLOT, if this is the authorized normal operating mode. Once the previous operate transmitter has been switched to standby status, the transmitter will commence a 5-minute cool-down cycle, then secure itself. Once per month a DESLOT transmitter switch shall be performed utilizing the SWITCH TRANSMITTERS switch on the AN/FPN-60 (the purpose of this is to checkout the TAC and DESLOT circuitry for proper operation).

4. During an automatic transmitter switch, when the transmitters are in the DESLOT mode, the following indications will appear on the Status Alarm Unit (SAU): NO STDBY XMTR, XMTR FAIL ON AIR, and XMTR FAIL OFF AIR indications will appear for approximately five minutes, until the failed transmitter cools down and then secures itself. If the failure is due to a Three-Strike dropout, the XMTR FAIL ON AIR and NO STDBY XMTR indications Will remain. If an automatic switch occurs via operator intervention, the SAU will return to a HAPPY FACE condition only after the five minute cool-down period.

5. When changing from NON-DESLOT to DESLOT mode of operation, proceed as follows:

a. Ensure that the LOCAL CONTROL UNIT is in the LOCAL mode with the standby transmitter B+ switch OFF. On the standby transmitter, place the BIAS & LOW VOLTAGE, TRANS FIL, and the Power ON/OFF-RESET switches to the OFF position. Then place the DESLOT/NON-DESLOT switches on both transmitters in the position. This will permit the normal 5-minute cool-down period.

b. Place the Power ON/OFF-RESET, FILAMENT, and BIAS/LOW VOLTAGE switches on the standby transmitter to their ON positions.

c. With the DOOR INTERLOCK lamp lit and the PLATE VOLTAGE selector switch in the OPERATE position, a READY FOR TRANSFER indication will be displayed on the Local Control Unit as soon as the pumps and blowers stop.

d. The Local Control Unit may be placed in the REMOTE position.

6. When changing from DESLOT to NON-DESLOT mode of operation, proceed as follows:

a. Ensure that the standby transmitter's B+ switch on the Local Control Unit is OFF and place the Local Control Unit in LOCAL Control.

b. Place the BIAS & LOW VOLTAGE, FILAMENTS, and POWER-ON/OFF-RESET switches on the standby transmitter into their OFF positions.

c. Place the DESLOT/NON-DESLOT selector switch in the NON-DESLOT position (both transmitters).

d. Run up or test the standby transmitter as desired by placing the POWER ON/OFF-RESET, FILAMENTS-BIAS & LOW VOLTAGE switches in their ON positions.

CAUTION

Do not attempt to operate the transmitters in opposite modes while in REMOTE (i.e. one transmitter in DESLOT and the other in NON-DESLOT). Such action will result in a dual transmitter failure should the operate transmitter fail.

7. The following indicators will be illuminated with the transmitter in DESLOT ready remote:

INDICATOR	INDICATOR
208 V EMERGENCY STOP POWER	1A11F4
460 V EMERGENCY STOP POWER	1A11F5
DOOR INTERLOCKS	1A11F6

INDICATOR	INDICATOR
OVER TEMPERATURE PLATE	1A11F7
TRANSFORMER	1A11F8
IPA OVERLOAD	1A11F9
PA OVERLOAD	1A11F10
AC OVERLOAD	1A11F12
3-STRIKE	1A11F14
LEFT 1ST IPA CATHODE OVERLOAD	1A11F15
RIGHT 1ST IPA CATHODE OVERLOAD	1A11F50
LEFT PA BIAS OVERLOAD	1A11F52
RIGHT PA BIAS OVERLOAD	1A11F53
WATER LEVEL	1A11F54
STANDBY	1A11F55
PA 1A6 INLET	1A6V1 PA CATHODE
PA 1A6 OUTLET	1A6V2 PA CATHODE
	1A6V3 PA CATHODE
	1A6V4 PA CATHODE

3.5. OPERATOR'S MAINTENANCE.

3.5.1. **OPERATING CHECKS AND ADJUSTMENTS.** Operator's routine maintenance is limited to front panel controls and indicators. The operator should not perform any interior preventive maintenance procedures.

3.5.2. **ROUTINE CHECKS**. See Section 5.2 for all operator's preventive maintenance procedures.

3.5.3. **EMERGENCY MAINTENANCE.** Operator's maintenance is limited to fuse and lamp replacement. Operator's routine maintenance is limited to front. Information pertinent to fuse replacement is given in table 3-18. Each fuse holder is connected to an indicator lamp that lights when its associated fuse is blown.

TABLE 3-1. AMPLIFIER GROUP OG-159/FPN-44A (1A4) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-1)	REFERENCE SYMBOL	AN/FPN-44B: OA-4482/FPN-44 TYPE	FUNCTION
LEFT PA BIAS	M9	Meter	Measures left PA bias voltage.
RIGHT PA BIAS	M10	Meter	Measures right PA bias voltage
LEFT PA BIAS CURRENT	M7	Meter	Measures left PA bias current.
RIGHT PA BIAS CURRENT	M8	Meter	Measures right PA bias current.
LEFT 2ND IPA BIAS	M5	Meter	Measures left 2nd IPA bias voltage.
LEFT 1ST IPA CATHODE	M1	Meter	Measures left 1st IPA cathode current.
RIGHT 1ST IPA CATHODE	M2	Meter	Measures right 1st IPA cathode current.
RIGHT 2ND IPA BIAS	M6	Meter	Measures right 2nd IPA bias voltage.
2ND IPA PLATE CURRENT	M3	Meter	Measures left 2nd IPA plate current.
V7 BIAS ADJUST	R149	Potentiometer	Adjusts left 1st IPA bias voltage. Clockwise rotation increases bias voltage.
V8 BIAS ADJUST	R150	Potentiometer	Adjusts right 1st IPA bias voltage. Clockwise rotation increases bias voltage.
BIAS PEDESTAL PLATE PRI F16	DS14	Lamp	Indicates power supply 1A4A6 primary power fuse blown.

TABLE 3-1. AMPLIFIER GROUP OG-159/FPN-44A (1A4) CONTROLS AND INDICATORS (cont)

PANEL MARKING (Figure 3-1)	REFERENCE SYMBOL	AN/FPN-44B: OA-4482/FPN-44 TYPE	FUNCTION
BIAS PEDESTAL FILAMENT PRI F17 F18	DS15 and DS16	Lamps	Indicates bias pedestal filament primary power fuse blown.
RIGHT PA BIAS PRI F12 and F14	DS12 and DS10	Lamps	Indicates right PA bias primary power fuse blown.
LEFT PA BIAS PRI F11 AND F13	DS9 and DS11	Lamps	Indicates left PA bias primary power fuse blown.
RIGHT 2ND IPA FILAMENT PRI F6 AND F8	DS6 and DS8	Lamps	Indicate right second IPA filament primary power fuse blown.
RIGHT 2ND IPA BIAS	R98	Potentiometer	Adjusts right 2nd IPA bias voltage.
BIAS PEDESTAL CCT CONTROL SWITCH	S8	Switch	Controls power to bias power supply.
LEFT 2ND IPA BIAS ADJUST	R97	Potentiometer	Adjusts left 2nd IPA bias voltage.
LEFT 2ND IPA FILAMENT F5 AND F7	DS5 and DS7	Lamps	Indicate left second filament primary power fuse blown.
1ST IPA FILAMENT PRI F2 and F4	DS2 and DS4	Lamps	Indicate first IPA filament primary power fuse blown.
6.3V FILAMENT PRI F1 and F3	DS1 and DS3	Lamps	Indicate 6.3 vac filament primary power fuse blown.
R194	A5R194	Potentiometer	Adjusts bias pedestal generator positive clipping level.
R193	A5R193	Potentiometer	Adjusts bias pedestal level.

TABLE 3-1. AMPLIFIER GROUP OG-159/FPN-44A (1A4) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-1)	REFERENCE SYMBOL	AN/FPN-44B: OA-4482/FPN-44 TYPE	FUNCTION
R195	A5R195	Potentiometer	Adjusts bias generator negative clipping level.
LEFT PA BIAS ADJUST	T5	Variac	Adjusts left PA bias voltage. Clockwise rotation increases bias voltage.
RIGHT PA BIAS ADJUST	T6	Variac	Adjusts right PA bias voltage. Clockwise rotation increases bias voltage.
INTERLOCK DISABLE	S6	Switch	Disables amplifier 1A4 group drawer interlock.
2ND IPA PLATE CURRENT	M4	Meter	Measures right 2nd IPA plate current.
FEEDBACK/OPEN LOOP	1A4A1A3S1	Switch	Selects operating mode of transmitter. (FDBK/NO FDBK)
STANDBY DRIVE	A1A3R1	Potentiometer	Provides manual control of drive to voltage amplifiers when in standby.

TABLE 3-2. POWER SUPPLY PP-7304/FPN-44A (1A4A1), CONTROLS INDICATORS

PANEL MARKING (Figure 3-2)	REFERENCE SYMBOL	AN/FPN-44B: C-4557/FPN-44 TYPE	FUNCTION
+250 VDC .75A NORMAL F1	F1	Fuse/ Lamp	Indicates 250 vdc fuse blown.
REGULATOR FIL PRI .75A SLO BLOW F2 AND F3	F2 AND F3	Fuse/ Lamp	Indicate regulator filament primary power fuse blown.

TABLE 3-3. POWER SUPPLY ASSEMBLY (1A4A6) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-3)	REFERENCE SYMBOL	TYPE	FUNCTION
VOLTMETER	M1	Meter	Measures output voltages of power supplies 1A4A6A1, 1A4A6A2, 1A4A6A3, and 1A4A6A4
-260V, -150V, -24V, +24V	S1	Switch	Selects -260 Vdc, or +24 Vdc power supply output for meter 1A4A6M1.

TABLE 3-4. OSCILLOSCOPE CONTROL C-4558A/FPN-44 (1A4A3) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-4)	REFERENCE SYMBOL	TYPE	FUNCTION
VOLTMETER	M1	Meter	Measures +250, -28 and - 12 vdc lines.
METER SELECTOR	S2	Switch	Selects voltage to be read on voltmeter M1.
F1 .50A SLO BLO	F1	Fuse/ Lamp	Indicates 28 vdc power supply 120 vac fuse blown.
MONITORED CIRCUIT	S1	Switch	Selects signal to be monitored on oscilloscope via MONITORED CIRCUIT OUTPUT connector J3.
INPUT EXCITER INPUT LEFT 1ST IPA INPUT RIGHT 1ST IPA INPUT LEFT 2ND IPA INPUT RIGHT 2ND IPA OUTPUT LEFT 2ND IPA OUTPUT RIGHT 2ND IPA XMTR OUTPUT (CURRENT) HV POWER SUPPLY (RIPPLE) EXTERNAL			
SCOPE TRIGGER MODE	S4	Switch	Selects triggering mode for oscilloscope via SELECTED TRIGGER OUTPUT connector J4.
SCOPE TRIGGER PULSE SELECTOR	S3	Switch	Selects pulse for oscilloscope trigger. Allows individual pulses to be viewed via SELECTED TRIGGER OUTPUT connector J4.

TABLE 3-5. INDICATOR PANEL SB-1894/FPN-44 (1A12) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-5)	REFERENCE SYMBOL	TYPE	FUNCTION
OVERLOAD:			
LEFT 1ST IPA CATHODE	DS1	Lamp	Indicates overload in left 1st IPA cathode circuit
RIGHT 1ST IPA CATHODE	DS2	Lamp	Indicates overload in right 1st IPA circuit.
LEFT PA BIAS	DS3	Lamp	Indicates overload in left PA bias circuit.
RIGHT PA BIAS	DS4	Lamp	Indicates overload in IPA bias circuit.
OVER TEMPERATURE:			
PA1A6 INLET	DS7	Lamp	Indicates overtemperature of PA1A6 inlet water.
PA1A6 OUTLET	DS8	Lamp	Indicates overtemperature of PA1A6 outlet water.
WATER LEVEL	DS9	Lamp	Indicates adequate water level of cooling system.
STANDBY	DS12	Lamp	Indicates that transmitter is switched to the dummy load.
OPERATE	DS13	Lamp	Indicates that transmitter is switched in to the antenna.
LOCKOUT-READY	S1	Switch	Allows transmitter to be maintained independently or made ready for normal operation.

TABLE 3-5. INDICATOR PANEL SB-1894/FPN-44 (1A12) CONTROLS AND INDICATORS (cont)

PANEL MARKING (Figure 3-5)	REFERENCE SYMBOL	TYPE	FUNCTION
UNDERVOLTAGE:			
LEFT PA BIAS	DS10	Lamp	Indicates under voltage in left PA bias circuit.
RIGHT PA BIAS	DS11	Lamp	Indicates undervoltage in right PA bias circuit.
BLOWN FUSE INDICATORS:			
1A11F4	DS14	Lamp	Indicates 2nd IPA blower fuse open.
1A11F5	DS15	Lamp	Indicates 2nd IPA blower fuse open.
1A11F6	DS16	Lamp	Indicates 2nd IPA blower fuse open.
1A11F7	DS17	Lamp	Indicates enclosure fan fuse open.
1A11F8	DS18	Lamp	Indicates enclosure fan fuse open.
1A11F9	DS19	Lamp	Indicates enclosure fuse fan open.
1A11F10	DS20	Lamp	Indicates water pump open.
1A11F11	DS21	Lamp	Indicates water pump motor fuse open.
1A11F12	DS22	Lamp	Indicates water pump motor fuse open.
1A11F13	DS23	Lamp	Indicates dummy load fan fuse open.
1A11F14	DS24	Lamp	Indicates dummy load fan fuse open.

TABLE 3-5. INDICATOR PANEL SB-1894/FPN-44 (1A12) CONTROLS AND INDICATORS (cont.)

PANEL MARKING (Figure 3-5)	REFERENCE SYMBOL	TYPE	FUNCTION
1A11F15	DS25	Lamp	Indicates dummy load fan fuse open.
1A11F16	DS26	Lamp	Indicates power amplifier 1A6V1 filament fuse open.
1A11F17	DS27	Lamp	Indicates power amplifier 1A6V1 filament fuse open.
1A11F18	DS28	Lamp	Indicates power amplifier 1A6V3 filament fuse open.
1A11F19	DS29	Lamp	Indicates power amplifier 1A6V3 filament fuse open.
1A11F20	DS30	Lamp	Indicates power amplifier 1A6V2 filament fuse open.
1A11F21	DS31	Lamp	Indicates power amplifier 1A6V2 filament fuse open.
1A11F22	DS32	Lamp	Indicates power amplifier 1A6V4 filament fuse open.
1A11F23	DS33	Lamp	Indicates power amplifier 1A6V4 filament fuse open.

* Lamp not lit indicates malfunction.

TABLE 3-6. PA OVERLOAD INDICATOR PANEL (1A21) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-6)	REFERENCE SYMBOL	TYPE	FUNCTION
1A6V1	DS1	Lamp	* Indicates overload in 1A6V1 PA cathode circuit.
1A6V2	DS2	Lamp	* Indicates overload in 1A6V2 PA cathode circuit.
1A6V3	DS3	Lamp	* Indicates overload in 1A6V3 PA cathode circuit.
1A6V4	DS4	Lamp	* Indicates overload in 1A6V4 PA cathode circuit.

* Lamp not lit indicates malfunction

TABLE 3-7. CONTROL-INDICATOR C-10034/FPN-44A (1A53A2) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-7)	REFERENCE SYMBOL	TYPE	FUNCTION
AC VOLTAGE	M5	Meter	Measures each phase of 460 vac and 208 vac, 3-phase input voltage and 208 vac regulated voltage.
5KV BIAS	M4	Meter	Measures -5 kvdc bias supply voltage.
LOW VOLTAGE PLATE	M9	Meter	Measures 500 vdc supply voltage.
FILAMENT HOURS	M6	Meter	Records length of time power is applied to transmitter group filaments.
PLATE HOURS	M1	Meter	Records length of time power is applied to transmitter group plates.
AC VOLTAGE SELECTOR	S4	Switch	Selects 460v input, 208v input, or 208v regulated as input to AC VOLTAGE meter M5.
IDA PLATE:			
CURRENT	M8	Meter	Measures IPA plate current.
VOLTAGE	M3	Meter	Measure 10.75 kv IPA plate voltage.
PA PLATE:			
CURRENT	M7	Meter	Measures PA plate current.
VOLTAGE	M2	Meter	Measures 21.5 kv PA plate voltage.

TABLE 3-7. CONTROL-INDICATOR C-10034/FPN-44A (1A53A2) CONTROLS AND INDICATORS (cont)

PANEL MARKING (Figure 3-7)	REFERENCE SYMBOL	TYPE	FUNCTION
PLATE VOLTAGE:			
MAINTENANCE ADJUST	R9	Potentiometer	Adjusts plate voltage over wide range when selected by the PLATE VOLTAGE SELECTOR S18.
SELECTOR	S18	Switch	Turns plate voltage on in MAINT and OPERATE Positions. Turns plate voltage off in OFF position. In OPERATE position enables OPERATE ADJUST (R8). In MAINT position enables OPERATE ADJUST or MAINTENANCE ADJUST (R9).
OPERATE ADJUST	R8	Potentiometer	Adjusts plate voltage to normal operating value when enabled by PLATE VOLTAGE SELECTOR S18.
EMERGENCY STOP POWER:			
208 V	DS44	Lamp	When lit, indicates 208v emergency stop power is present.
460 V	DS45	Lamp	When lit indicates 460v emergency stop power, is present.
AIR ON	DS8	Lamp	* Indicates all blowers are providing cooling air.
WATER ON	DS1	Lamp	* Indicates proper water flow to PA tubes.
FILAMENTS READY	DS7	Lamp	* Indicates that filaments have been heated up.

TABLE 3-7. CONTROL-INDICATOR C-10034/FPN-44A (1A53A2) CONTROLS AND INDICATORS (cont)

PANEL MARKING (Figure 3-7)	REFERENCE SYMBOL	TYPE	FUNCTION
DOOR INTERLOCK door	DS2	Lamp	* Indicates key interlock and all and drawer interlock switches are closed.
BIAS AND LOW VOLTAGE ON	DS5	Lamp	* Indicates bias and low power supplies are at operating level.
PLATE ON	DS9	Lamp	* Indicates 460 vac voltage regulator has been enabled.
EMERGENCY STOP-RUN/STOP	S19	Switch	In STOP position, opens 460 and 208 vac circuit breakers.
POWER-ON/OFF-RESET	S17	Switch	Turns on blowers and pump. Resets control circuits following a power failure during LOCAL operation.
FILAMENTS	S13	Switch	Turns transmitting group filaments on and off.
BIAS AND LOW VOLTAGE-ON/OFF	S7	Switch	Turns bias and low voltage power supplies on and off.
OVERLOAD AND THREE STRIKE RESET	S8	Push-button	When depressed, resets overload and three-strike circuit relays.
DIMMER	T1	Variable Auto-transformer	Adjusts brightness of edge lamps.
DESLOT/NON-DESLOT	1A53A2S20	Switch	Selects DESLOT OR NON-DESLOT mode.

TABLE 3-7. CONTROL-INDICATOR C-10034/FPN-44A (1A53A2) CONTROLS AND INDICATORS (cont)

PANEL MARKING (Figure 3-7)	REFERENCE SYMBOL	TYPE	FUNCTION
OVER-TEMPERATURE PLATE TRANSFORMER	DS11	Lamp	* Indicates that temperature of 1A53A6T1 is over limit.
OVERLOAD:			
IPA	DS13	Lamp	* Indicates IPA overload.
PA	DS14	Lamp	* Indicates PA overload.
AC	DS10	Lamp	* Indicates overload in high voltage transformer input circuit.
3 STRIKE	DS12	Lamp	* Indicates three overloads in 90 seconds.
BLOWN FUSE INDICATORS:			
1A53A3F1O	DS30	Lamp	Indicates 120 vac control circuit fuse open.
1A53A3F11	DS29	Lamp	Indicates filament power fuse open.
1A3A3F12	DS28	Lamp	Indicates filament power fuse open.
1A53A3F13	DS27	Lamp	Indicates filament power fuse open.
1A53A3F19	DS39	Lamp	Indicates -5000v and +500v power supplies fuse open.
1A53A3F20	DS38	Lamp	Indicates -5000v and +500v power supplies fuse open.

TABLE 3-7. CONTROL-INDICATOR C-10034/FPN-44A (1A53A2) CONTROLS AND INDICATORS (cont)

PANEL MARKING (Figure 3-7)	REFERENCE SYMBOL	TYPE	FUNCTION
1A53A3F21	DS37	Lamp	Indicates -5000v and +500v Supplies fuse open.
1A53A3F35	DS40	Lamp	Indicates bias power supplies fuse open.
1A53A3F36	DS41	lamp	Indicates bias power supplies fuse open.
1A53A3F37	DS42	Lamp	Indicates bias power supplies fuse open.
1A53A3F38	DS43	Lamp	Indicates 460v voltage regulator control circuits fuse open.
1A53A3F39	DS46	Lamp	Indicates 460v voltage regulator control circuits fuse open.
1A53A3A3F1	DS47	Lamp	Indicates 208v voltage regulator motor circuit fuse open.
1A53A3A4F1	DS48	Lamp	Indicates 208v voltage regulator control power fuse open.
1A53A3A4F2	DS49	Lamp	Indicates 208v voltage regulator sensing power fuse open.

* Lamp not lit indicates malfunction.

TABLE 3-8. P/O RELAY ASSEMBLY RE-1113/FPN-44A (1A53A3) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-8)	REFERENCE SYMBOL	TYPE	FUNCTION
HIGH VOLTAGE RECTIFIER POWER.	S1	Switch	Applies 460 vac, 3-phase power.
LOCKED ON S2	S2	Key operated Switch Lock.	Provides safety interlocking for 460 vac application.
460V INPUT CB1	CB1	Circuit Breaker	Provides 460 vac, 3-phase application.
1A53A3CB2	CB2	Circuit breaker	Provides 208 vac, 3-phase application.
LOCKED OFF	None	Key operated lock.	Prevents bias and high voltage turn on until doors on 1A4, 1A6, and right and left partition gates are key locked.

TABLE 3-9. P/O VOLTAGE REGULATOR CN-1472/FPN-44A (1A53A3A4) CONTROLS AND INDICATORS

PANEL MARKINGS (Figure 3-9)	REFERENCE SYMBOL	TYPE	FUNCTION
BANDWIDTH	R1	Potentiometer	Adjusts deadband range of regulator output.
MOTOR	S4	Switch	Controls power to regulator motor.
MODE	S1	Switch	In MANUAL position, enables manual control of regulator motor and disables automatic circuits. In AUTO position, enables automatic circuits.
VOLTAGE TEST	VTT	Tip Jacks	Provides access to sensing Jacks input voltage to automatic mode circuits.
MANUAL RAISE	S3	Switch	When MODE switch is in MANUAL position, enables regulator motor to increase voltage output.
MANUAL LOWER	S2	Switch	When MODE switch is in MANUAL position, enables regulator to decrease voltage output.
VOLTAGE LEVEL	R2	Potentiometer	Adjusts voltage level of output.
CONTROL POWER 1/2 Amps	F1	Fuse	Protects reference circuit components.
SENSING POWER 1/4 AMP	F2	Fuse	Protects sense circuit components.

TABLE 3-10. ANTENNA COUPLER CU-2171/FPN-44A (3) CONTROLS AND INDICATORS

PANEL MARKING (Figure 3-10)	REFERENCE SYMBOL	AN/FPN-44B: CU-1106/FPN-44 TYPE	FUNCTION
TRANSMITTER #1 OPERATE	DS1	Lamp	Indicates transmitter group No. 1 is operating into antenna.
ANTENNA CURRENT	M1	Meter	No longer used.
TRANSMITTER #2 OPERATE	DS2	Lamp	Indicates transmitter group No.2 is operating into antenna.

TABLE 3-11. LOCAL CONTROL UNIT (5) CONTROLS AND INDICATORS

PANEL MARKING (figure 3-11)	REFERENCE SYMBOL	TYPE	FUNCTION
TRANS 1 ON	DS1	Lamp	Indicates transmitter group No. 1 is operating into antenna.
LOCAL	DS2	Lamp	Indicates both transmitter groups are under control of Local Control Unit.
LOCAL/ REMOTE	S2	Toggle Switch	Selects control of transmitter groups switch from either Local Control Unit (LOCAL) or remote equipment (REMOTE).
REMOTE	DS3	Lamp	Indicates both transmitter groups are under control of remote equipment.

TABLE 3-11. LOCAL CONTROL UNIT(5) CONTROLS AND INDICATORS (cont)

PANEL MARKING (figure 3-11)	REFERENCE SYMBOL	TYPE	FUNCTION
HOLD DOWN DURING TRANSFER	S5	Push-button switch	Enables continued operation of transmitter when operating LOCAL-REMOTE switch S2.
READY FOR TRANSFER	DS5	Lamp	Indicates both transmitter groups are ready for transfer by use of LOCAL-REMOTE switch.
TRANS 2 ON ANT	DS4	Lamp	Indicates transmitter group no. 2 is operating into antenna.
Transmitter 2 B+	S3	Toggle switch	Controls B+ power to transmitter group no. 2.
TRANS 2 SELECT	S6	Push-button Switch	When operating in local control, enables switching transmitter group No.2 To operate status.
TRANS 1 SELECT	S4	Push-button Switch	When operating in local control, enables switching transmitter group No.1 to operate status.
Transmitter 1 B+	S1	Toggle switch	Controls B+ power to transmitter group No. 1.

TABLE 3-12. BEFORE-USE SWITCH POSITION

CONTROL	FIGURE	SETTING
All drawers and doors		Closed
HIGH VOLTAGE RECTIFIER POWER S1	3-8	ON
LOCKED ON S2	3-8	LOCKED
1A53A3CB2	3-8	ON
LOCKOUT-READY	3-5	READY
POWER	3-7	OFF
FILAMENTS	3-7	OFF
BIAS AND LOW VOLTAGE	3-7	OFF
PLATE VOLTAGE SELECTOR	3-7	OFF
DESLOT/NON-DESLOT SELECTOR	3-7	NON-DESLOT

NOTE:

On control-indicator (figure 3-7), the following indicators should be lit: IPA, PA and AC OVERLOAD, 208V EMERGENCY STOP POWER, DOOR INTERLOCK, 3 STRIKE, and PLATE TRANSFORMER OVERTEMPERATURE.

On indicator panel (figure 3-5), the WATER LEVEL, OVERLOAD and OVER TEMPERATURE indicators should be lit. On the transmitter group in the operate status, the OPERATE indicator should be lit; on the other transmitter group, the STANDBY indicator should be lit.

On the antenna coupler indicator panel (figure 3-10) the OPERATE indicator for the transmitter group in the operate status should be lit.

TABLE 3-13. BEFORE-USE SEQUENCE OF OPERATION

STEP	OPERATION	RESULTS
1	Turn AC VOLTAGE SELECTOR switch (figure 3-7) to 208V LINE. In turn, set VOLTAGE PHASE SELECTOR switch to each position.	The 208 vac, 3-phase unregulated voltage is monitored by AC VOLTAGE meter (figure 3-7) for the correct indication.
2	Turn AC VOLTAGE SELECTOR switch (figure 3-7) to 208V REG. In turn set VOLTAGE PHASE SELECTOR switch to each position.	The 208 vac, 3-phase regulated voltage is monitored by AC VOLTAGE meter (figure 3-7) for the correct indication.
3	Turn METER SELECTOR switch (figure 3-4) on the oscilloscope control to -28V and -12V, in turn.	The -28 vdc and -12 vdc regulated voltages should be monitored by voltmeter of oscilloscope control (figure 3-4)

TABLE 3-14. DURING-USE SEQUENCE OF OPERATION NON-DESLOT

STEP	OPERATION	RESULTS (Operate Status)	RESULTS (Standby Status)
1	Set POWER Switch to ON (figure 3-7)	The water pump and blowers should become energized. the following lamps (figure 3-7) should light: AIR ON WATER ON	Same as operate status.
2	Place FILAMENT switch (figure 3-7) to ON.	All tube filaments should light and FILAMENT HOURS meter (figure 3-7) should become energized. The FILAMENTS READY lamp (figure 3-7) should light after a time delay.	Same as operate status results.
3	Place the BIAS and LOW VOLTAGE switch (figure 3-7) to ON and METER SELECTOR switch (figure 3-4) to 250V.	The -5KV BIAS and LOW VOLTAGE PLATE voltmeters (figure 3-7) show an indication. The oscilloscope control voltmeter (figure 3-4) should indicate +250. The following meters (figure 3-1) should show an indication: LEFT PA BIAS RIGHT PA BIAS LEFT 2ND IPA BIAS RIGHT 2ND IPA BIAS	Same as operate status results.

TABLE 3-14. DURING-USE SEQUENCE OF OPERATION NON-DESLOT(cont)

STEP	OPERATION	RESULTS (Operate Status)	RESULTS (Standby Status)
3 cont		The following lamps should light: BIAS AND LOW VOLTAGE ON (figure 3-7) LEFT PA BIAS UNDER VOLTAGE (figure 3-5) RIGHT PA BIAS UNDER VOLTAGE (figure 3-5).	
4	Place the 460V INPUT circuit breaker CB1 (figure 3-8) to ON.	The 460V EMERGENCY STOP POWER lamp should light.	Same as operate status results
5	Turn AC VOLTAGE SELECTOR switch (figure 3-7) to 460V LINE and, in turn, set the VOLTAGE PHASE (figure 3-7) to each position.	The AC VOLTAGE meter should provide the correct indication at each setting of the VOLTAGE SELECTOR switch.	The AC VOLTAGE meter should provide the correct indication at each setting of the VOLTAGE PHASE SELECTOR switch.
6	Turn the PLATE VOLTAGE SELECTOR (Figure 3-7) to OPERATE.	The PLATE ON lamp and the PLATE HOURS meter (figure 3-7) on the operate transmitter should become energized. After a few seconds delay the IPA PLATE VOLTAGE, PA PLATE VOLTAGE, IPA PLATE CURRENT AND PA PLATE CURRENT meters (figure 3-7) gradually increase to within 15% of normal indication. The 10.75 kv supply voltage is	No additional voltages or indicator lamps on the transmitter group go on, however the ready circuit in the transmitter control equipment is energized.

TABLE 3-14. DURING-USE SEQUENCE OF OPERATION NON-DESLOT (cont)

STEP	OPERATION	RESULTS (Operate Status)	RESULTS (Standby Status)
6 cont.		monitored by the IPA PLATE VOLTAGE meter; the 21.5 kv supply voltage is monitored by the PA PLATE VOLTAGE meter. The 10.75 kv plate current is monitored by the IPA PLATE CURRENT meter; the 21.5 kv plate current is monitored by the PA PLATE CURRENT meter. All transmitting set meters should provide typical indications specified by the calibration chart at each station.	

TABLE 3-15. BEFORE-USE SWITCH POSITIONS (DESLOT)

CONTROL	FIGURE	SETTING
All drawers and doors		Closed
HIGH VOLTAGE RECTIFIER POWER S1	3-13	ON
LOCKED ON S2	3-13	LOCKED
1A5A3CB2	3-13	ON
LOCKOUT-READY	3-8	READY
POWER	3-10	OFF
FILAMENTS	3-10	OFF
BIAS AND LOW VOLTAGE	3-10	OFF
PLATE VOLTAGE SELECTOR	3-10	OFF
DESLOT/NON-DESLOT *	3-10	DESLOT

NOTE

On control-indicator (Figure 3-6), the following indicators should be lit: IPA, PA, and AC OVERLOAD, 208V EMERGENCY STOP POWER, DOOR INTERLOCK, 3 STRIKE, and PLATE TRANSFORMER OVERTEMPERATURE.

On indicator panel (Figure 3-9), the WATER LEVEL, OVERLOAD, OVERTEMPERATURE, 1A11F11, and 1A1F12 indicators would be lit. On PA overload indicator panel (1A21) all indicators should be lit. If the transmitter group is in the operate status, the OPERATE indicator should be lit; otherwise, the STANDBY indicator should be lit.

On the antenna coupler indicator panel (Figure 3-15) the OPERATE indicator for the transmitter group should be lit if it is in the operate status.

* DESLOT/Non DESLOT switch setting must be the same on both transmitters.

TABLE 3-16. BEFORE-USE SEQUENCE OF OPERATION (DESLOT)

STEP	OPERATION	RESULTS
1.	Set AC VOLTAGE SELECTOR switch (figure 3-10) to 208V LINE. Set VOLTAGE PHASE SELECTOR switch through its three positions and observe AC VOLTAGE meter (figure 3-10).	208 ± 21 Vac for each phase.
2.	Set AC VOLTAGE SELECTOR switch to L.P. REG 208V. Set VOLTAGE PHASE SELECTOR switch through its three positions and observe AC VOLTAGE meter.	208 ± 4 Vac for each phase.
3.	Set METER SELECTOR switch (Figure 3-5) to -28V and -12V positions and observe readings on voltmeter.	28 ± 4 Vac for each phase.
	-28V position -28 ± 2.0V	
	-12V position -12 ± 0.6V	

TABLE 3-17. DURING USE SEQUENCE OF OPERATION (DESLOT)

STEP	OPERATION	RESULTS Operate Status	RESULTS STANDBY
1.	Set POWER switch to ON figure 3-10).	The water pump and blowers should become energized and following (fig 3-10) should light: AIR ON WATER ON	Same as operate status results.
2.	Place FILAMENTS switch (figure 3-10) to ON.	All tube filaments should light and FILAMENT HOURS meter (Fig 3-10) should become energized. The FILAMENTS READY lamps (figure 3-10) should light after a time delay.	Same as operate status results.
3.	Place the BIAS and LOW VOLTAGE switch (figure 3-10) to ON and METER SELECTOR switch (figure 3-5) to +250 V.	The -5 kV BIAS and LOW PLATE voltmeters (figure 3-10) should show an indication. The oscilloscope control voltmeter (figure 3-5) should indicate +250 VDC. The following meters (figure 3-2) should show an indication: LEFT PA BIAS RIGHT PA BIAS LEFT 2ND IPA BIAS RIGHT 2ND IPA BIAS The following lamps should light: BIAS AND LOW VOLTAGE ON (Fig 3-10) LEFT PA BIAS UNDER VOLTAGE (Fig 3-8) RIGHT PA BIAS UNDER VOLTAGE (Fig 3-8)	Same as operate status results.

TABLE 3-17. DURING USE SEQUENCE OF OPERATION (DESLOT) (cont)

STEP	OPERATION	RESULTS Operate Status	RESULTS STANDBY
4.	Set meter selector switch (Figure 3-7) to 260V,-150V, -24V and +24V positions and observe readings on voltmeter.		
	-260V	-260 ±13V	
	-150V	-150 ±7.5V	
	- 24V	-24 ±1.2V	
	+ 24V	+24 ±1.2V	
5.	Place the 460 VAC circuit 1A5CB1 (figure 3-8) to ON.	The 460V EMERGENCY STOP POWER lamp should light.	Same as operate status results.
6.	Turn AC VOLTAGE SELECTOR (Figure 3-10) to 460V LINE in turn, set the VOLTAGE PHASE SELECTOR SWITCH (Figure 3-10) to each position.	The AC VOLTAGE meter should provide the current indication at each setting of the VOLTAGE PHASE SELECTOR switch.	The AC VOLTAGE meter should provide the correct indication at each setting of the VOLTAGE PHASE SELECTOR switch.
7.	Turn the PLATE VOLTAGE SELECTOR (Fig.3-3-10) to OPERATE.	The PLATE ON lamp and the PLATE HOURS meter (Fig. 3-10) on the operate transmitter should become energized. After a few seconds delay the IPA PLATE VOLTAGE, IPA PLATE	No additional voltages or indicator lamps on the transmitter group go on, however,

TABLE 3-17. DURING USE SEQUENCE OF OPERATION (DESLOT) (cont)

STEP	OPERATION	RESULTS	RESULTS
		Operate Status	**STANDBY**
7 cont.		CURRENT meters (Figure 3-10) gradually increase to within ±15 percent of normal indication. The 10.75 kV supply voltages are monitored by the IPA PLATE VOLTAGE meter; the 21.5 kV supply voltages are monitored by the PA PLATE VOLTAGE meter. The 10.75 kv plate currents are monitored by the PA PLATE CURRENT meter.	the ready circuit in the transmitter control equipment is energized. The IPA PLATE VOLTAGE, PA PLATE VOLTAGE IPA PLATE CURRENT, and PLATE CURRENT meters should indicate zero.
		All transmitting set meters should provide typical indications specified by the calibration chart at each station.	

TABLE 3-18. FUSE REPLACEMENT DATA

FUSE SYMBOL	FUSE RATINGS AMPERES	VOLTS
Amplifier Group 1A4		
F1	0.2	250 (slo-blo)
F2	2.0	250 (slo-blo)
F3	0.2	250 (slo-blo)
F4	2.0	250 (slo-blo)
F5	6.0	250 (slo-blo)
F6	6.0	250 (slo-blo)
F7	6.0	250 (slo-blo)
F8	6.0	250 (slo-blo)
F11	7.0	250 (slo-blo)
F12	7.0	250 (slo-blo)
F13	7.0	250 (slo-blo)
F14	7.0	250 (slo-blo)
F15	2.0	250 (slo-blo)
F16	2.0	250 (slo-blo)
F17	1.0	250 (slo-blo)
F18	1.0	250 (slo-blo)
Power Supply 1A4A1		
F1	0.75	250
F2	0.75	250 (slo-blo)
F3	0.75	250 (slo-blo)
F4	Not used	
F5	Not used	
Oscilloscope Control 1A4A3		
F1	0.5	250 (slo-blo)
Electrical Equipment Rack 1A11		
F4	15.0	500
F5	15.0	500
F6	15.0	500
F7*	15.0	500 (slo-blo)
F8*	15.0	500 (slo-blo)
F9*	15.0	500 (slo-blo)
F10	80.0	250
F11	80.0	250
F12	80.0	250
F13	15.0	500 (slo-blo)

TABLE 3-18. FUSE REPLACEMENT DATA (cont.)

FUSE SYMBOL	FUSE RATINGS AMPERES	VOLTS
Electrical Equipment Rack 1A11 (cont.)		
F14	15.0	500 (slo-blo)
F15	15.0	500 (slo-blo)
F16	25.0	250 (slo-blo)
F17	25.0	250 (slo-blo)
F18	25.0	250 (slo-blo)
F19	25.0	250 (slo-blo)
F20	25.0	250 (slo-blo)
F21	25.0	250 (slo-blo)
F22	25.0	250 (slo-blo)
F23	25.0	250 (slo-blo)

*** NOTE: AN/FPN-44B F7,8,9 are NOT slow blow fuses.**

Relay Assembly 1A53A3		
F1	1.8	600 (slo-blo)
F2	1.8	600 (slo-blo)
F3	1.8	600 (slo-blo)
F4	1.8	600 (slo-blo)
F5	1.8	600 (slo-blo)
F6	1.8	600 (slo-blo)
F7	1.8	600 (slo-blo)
F8	1.8	600 (slo-blo)
F9	1.8	600 (slo-blo)
F10	30.0	250 (slo-blo)
F11	80.0	250 (slo-blo)
F12	80.0	250 (slo-blo)
F13	80.0	250 (slo-blo)
F19	8.0	250 (slo-blo)
F20	8.0	250 (slo-blo)
F21	8.0	250 (slo-blo)
F35	20.0	250 (slo-blo)
F36	20.0	250 (slo-blo)
F37	20.0	250 (slo-blo)
F38	2.0	250 (slo-blo)
F39	2.0	250 (slo-blo)
F40	8.0	250 (slo-blo)
F41	1.0	600 (slo-blo)
F42	1.0	600 (slo-blo)
Fuse Panel 1A53A3A2		
F1	800.0	500
F2	800.0	500
F3	800.0	500

TABLE 3-18. FUSE REPLACEMENT DATA (cont.)

FUSE SYMBOL	FUSE RATINGS AMPERES	VOLTS
208 V Voltage regulator 1A53A3A3		
F1	3.0	250
Regulator Control Panel 1A53A3A4		
F1	0.5	250
F2	0.25	250

4.0. PRINCIPALS OF OPERATION.

4.1. OVERALL FUNCTIONAL DESCRIPTION.

4.1.1. **LIMITATIONS.** The functional and operational descriptions presented in this section are limited to the AN/FPN-44A equipment and the interface signals with other equipments of a Loran-C ground station. The overall functional description of Loran-C ground station equipment that includes a Loran Transmitting Set AN/FPN-44A and the fundamental concepts of the Loran system are beyond the scope of this manual.

4.1.2. **LORAN-C GROUND STATION.** A typical equipment configuration at a Loran-C station, shown is in figure 4-1, includes: timing, pulse generation, transmitter control equipment, Loran Transmitting Set AN/FPN-44A, and an antenna. The Loran Transmitting Set consists of two functionally identical transmitting groups, an antenna coupler and a dummy load. Each transmitting group interfaces with a pulse generator, and both groups interface with a transmitter controller.

Each pulse generator develops a transmitter drive waveform (TDW) from timing signals received from the timer set. The transmitter drive waveform is shaped within the pulse generator to ensure that the radiated Loran-C pulse has proper phase code, balance, and shape characteristics. The operating transmitting group amplifies the TDW and applies the Loran-C pulse to an antenna via the antenna coupler, while the standby transmitting group, is connected to the dummy load.

The transmitter control equipment interface with the Loran Transmitting Set provides for the following functions:

- Selecting a transmitting group as the operating group.

- Monitoring the operational status of both transmitting groups.

- Monitoring the antenna current of the operating transmitting group.

- Shutting down a transmitting group in an emergency.

- Exercising the standby transmitting group into the dummy load.

4.1.3. **DEFINITIONS.** This paragraph provides the definitions of terms which pertain to the Loran-C system.

4.1.3.1. **AMPLITUDE DROOP.** This is the decrease in the peak voltage over the first eight pulses in the pulse group.

4.1.3.2. **BASIC REPETITION RATE.** This is the approximate rate at which a transmitter is single pulsed or group pulsed.

4.1.3.3. **BLINKING.** This is the method by which the transmitting stations indicate an error in system timing accuracy to system users (vessels, aircraft) and other transmitting stations.

4.1.3.4. **DOUBLE RATING.** A transmitter may be group pulsed or single pulsed at two different repetition intervals simultaneously. Double rating is utilized when it is desired to operate one station in two chains.

4.1.3.5. **CROSS-OVER EFFECT.** This is the disturbance of Loran equipment, or a Loran pulse, caused by a pulse group of one repetition interval approaching and passing through coincidence with a pulse group of another rate.

4.1.3.6. **GROUP REPETITION INTERVAL (GRI).** This is the basic timing interval in the loran chain. Each signal (M, X, Y and Z) is transmitted once each interval from the corresponding transmitter. The timing relationships of transmitting equipments are such that the master (M) signal is transmitted first, and the slave signals follow at fixed intervals in the cycle in the order X, Y, and Z.

4.1.3.7. **LORAN-C CHAIN.** This is a group of three or more Loran-C transmitting stations having a common timing reference.

4.1.3.8. **LORAN-C PULSE GROUP.** This group consists of eight phase-coded pulses (nine for a master station) transmitted by a Loran-C station.

The pulse groups are transmitted at one of six basic repetition rates. The rates and repetition periods for these pulses in microseconds are tabulated below.

RATES:

SS - 10 pulses per second

SL - 12-1/2 pulses per second

SH - 16-2/3 pulses per second

S - 20 pulses per second

L - 25 pulses per second

H - 33-1/3 pulses per second

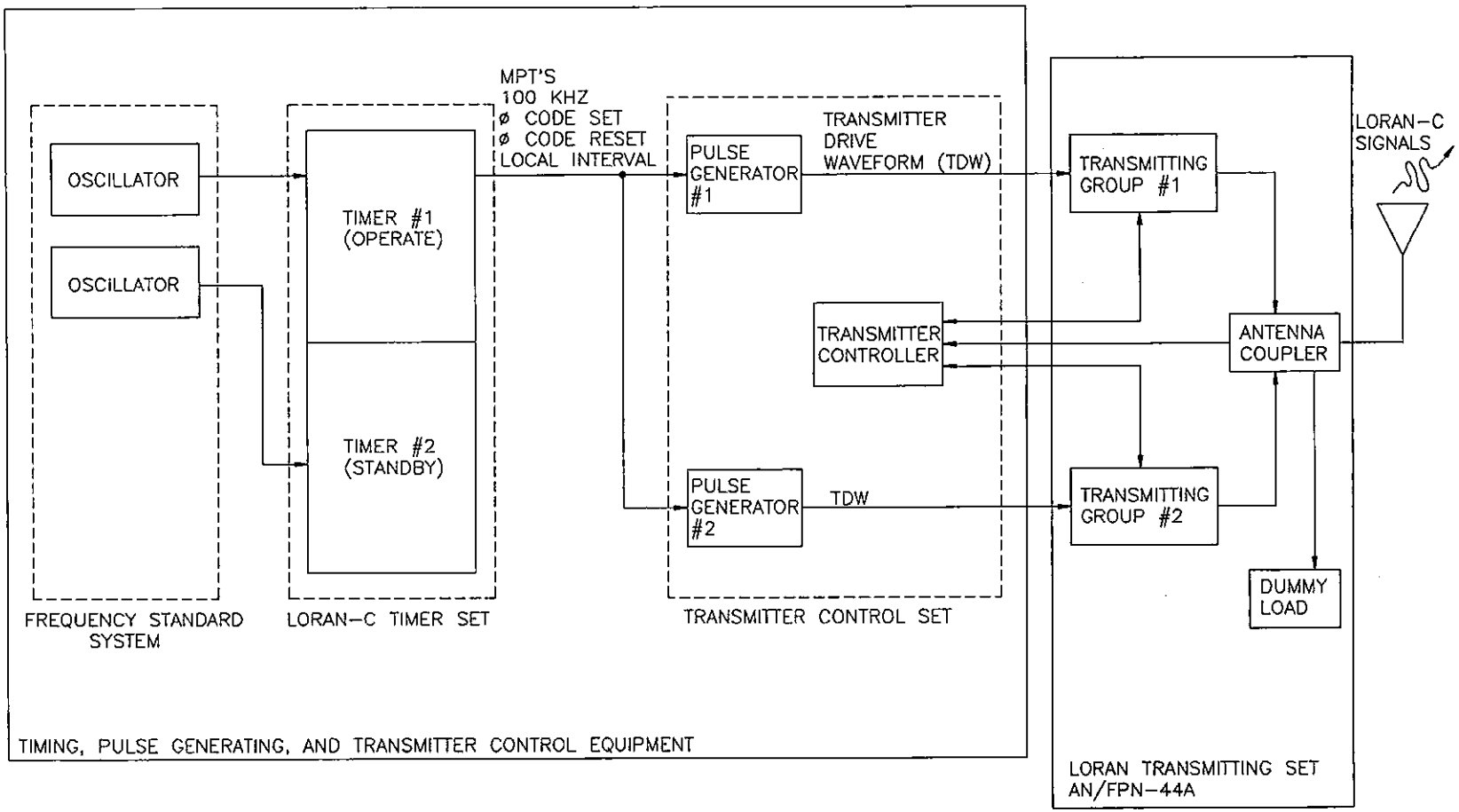


Figure 4-1. Loran C Transmitting Station Equipment Configuration

REPETITION PERIODS IN MICROSECONDS

PULSE	SS	SL	SH	S	L	H
0	100,000	80,000	60,000	50,000	40,000	30,000
1	99,900	79,900	59,900	49,900	39,900	29,900
2	99,800	79,800	59,800	49,800	39,800	29,800
3	99,700	79,700	59,700	49,700	39,700	29,700
4	99,600	79,600	59,600	49,600	39,600	29,600
5	99,500	79,500	59,500	49,500	39,500	29,500
6	99,400	79,400	59,400	49,400	39,400	29,400
7	99,300	79,300	59,300	49,300	39,300	29,300

4.1.3.9. **LORAN PAIR.** The M-X, M-Y, and M-Z signal combinations each comprise a loran pair. Time-difference measurements are made between the signals of any pair or all three pairs.

4.1.3.10. **MASTER STATION (M).** This station is one of the group of Loran-C transmitting stations operating on a predetermined pulse repetition interval. It precisely maintains its assigned repetition interval and carrier frequency.

4.1.3.11. **SECONDARY STATIONS (X, Y, Z).** These stations are the Loran-C stations whose transmissions, when individually paired with the transmission of the master station, constitute a Loran-C pair. Each secondary station maintains an accurate fixed time delay between the master station transmissions and transmission of its own signal.

4.1.3.12. **PHASE COHERENCE.** A Loran signal is phase-coherent when its r-f cycles have a direct fixed relationship to the pulsed envelope. Similarly, two 100 kHz cw signals are phase-coherent if they are maintained at a desired phase relationship with respect to each other.

4.1.3.13. **PULSE BEGINNING.** The point at which the amplitude of the r-f signal reaches one half of one percent of the peak amplitude of the pulse is considered the pulse beginning.

4.1.3.14. **STANDARD SAMPLING POINT.** All measurements in the Loran-C system are referred to a standard sampling point. It is defined as being the point 25 microseconds after the beginning of the pulse.

4.1.3.15. **STANDBY TRANSMITTER.** Normally, two transmitter groups are provided at the master and each secondary station. The transmitter group not operating is termed the standby transmitter.

4.1.4. **PRINCIPLES OF FEEDBACK.** A system of inverse (negative) feedback is employed in the modified transmitter configuration. Negative feedback improves the linearity of the r-f amplifiers to achieve faithful reproduction of the low-level drive pulse. Additional benefits are gained in the reduction of pulse droop and modulation of the transmitter output by power supply variations and cross-rate at dual rated stations.

4.1.4.1. **GENERAL THEORY.** The transmitter amplifier system can be represented by the simplified circuit in figure 4-5.

A = Voltage gain of amplifier without feedback applied.

B = Feedback factor, a fraction of the output of the amplifier, inverted in phase and applied at the amplifier input.

Actual amplifier input $= e_s + BE$

Actual amplifier output $= E = A(e_s + BE)$

Voltage amplification with feedback $= A/(1 - AB) = -1/Bx\{1/(1-1/AB)\}$

With large amounts of feedback signal, the quantity AB becomes large, and the amplification of the system is virtually independent of the characteristics of the amplifier itself.

The effect of feedback upon distortion is shown by the following:

Distortion in the output $= D = d/(1-AB)$

d = distortion in the amplifier without feedback.

This equation shows that, as the feedback hence the factor AB increases, the distortion in the output of the feedback amplifier decreases. This fact applies equally to droop in power supply output and many other factors which come under the general heading of characteristics of the amplifier.

The advantages gained by the application of feedback do not come at no cost. In order to maintain the desired output level, it is necessary to increase the level at the input terminals by an amount equal to the feedback. The feedback system in the modified AN/FPN-44A configuration uses 22 db of feedback,

therefore the overall open-loop gain of the system is increased by that amount.

4.1.4.2. **FEEDBACK MODIFICATIONS.** The transmitter modification consists of the following:

4.1.4.2.1. **ADDED INPUT AMPLIFIER UNIT, 1A4A1A3,** comprising a feed back system and additional signal conditioning and amplifier circuitry.

4.1.4.2.2. **ADDED LOW VOLTAGE POWER SUPPLY ASSEMBLY, 1A4A6,** to provide operating voltages for the Input Amplifier unit.

4.1.4.2.3. **BROADBANDING** of the interstage coupling network between the 1st and 2nd Intermediate Power Amplifier stages.

4.1.4.2.4. **CIRCUIT MODIFICATIONS TO THE BIAS PEDESTAL GENERATOR, 1A4A5,** for improved operation.

4.1.4.2.5. **CURRENT FEEDBACK TRANSFORMER** added in PA tube Rack 1A6.

4.1.4.2.6. **VOLTAGE FEEDBACK WINDING** added to PA Tank Coil, 1A5, and attenuator assembly added to PA Tube Rack, 1A6.

4.1.4.2.7. **CHANGE IN TUBE TYPE FOR 2ND INTERMEDIATE POWER** Amplifier stage for greater drive to the Power Amplifier tubes. (Applies only to the multi-tower array antenna installations where greater drive is required due to the low antenna Q.)

4.1.4.3. **MODIFIED TRANSMITTER CONFIGURATION.** (Refer to Figure 4-2)

4.1.4.3.1. **OUTPUT TRANSFORMER (PA TANK 1A5).** The PA Tank is modified by adding a tertiary winding on the primary coil form.

The winding consists of two turns of high voltage wire placed at the electrical center of the transformer primary **(E6).** This feedback voltage winding samples the plate-to-plate r-f signal voltage of the Power Amplifier stage.

4.1.4.3.2. **POWER AMPLIFIER TUBE RACK (1A6).**

The PA Tube Rack modifications consist of:

1. A resistor assembly comprising a fixed amount of attenuation of the voltage developed across the feedback winding

is installed at the rear of the PA Tube Rack. The attenuated feed back voltage is led to the rear of the Exciter unit through twinax cable.

2. A current transformer is installed at the rear of the PA Tube Rack. The high voltage leads from the PA tubes to the PA Tank Coil pass through the aperture of the current transformer. The output of the current transformer represents the composite output current from the PA stage and is led to the rear of the Exciter unit through twinax cable.

3. The PA grid resistance for the modified configuration is 300 ohms per tube. This is achieved by installing an additional 600 ohm resistor in parallel with the original 600 ohm resistor at the grid of each PA tube.

4.1.4.3.3. **EXCITER UNIT (1A4).** The modifications made in the Exciter unit consist of:

1. Bias Pedestal Generator output transformer. The output transformer is replaced with a transformer having improved pulse characteristics.

2. Bias Pedestal Clipper circuit. The clipper circuit at the output of the Bias Pedestal Generator has several changes in component values for improved controllability of the pedestal amplitude and shape.

3. Interstage coupling. The interstage transformer between the First and Second IPA, 1A4T11, is broadbanded by adding parallel resistors. Additional filter capacitors are installed at the center tap of 1A4T11 and at the cathodes of the First IPA tubes.

4. First IPA input circuit. The original Voltage Amplifier circuitry comprising 1A4V2 through 1A4V6 and associated components is de-installed. The grid circuits of the First IPA tubes are reconfigured to accept the input from the Input Amplifier assembly.

5. Input Amplifier. A new subassembly designated 1A4A1A3 is added in the modified transmitter configuration. The new unit receives transmitter drive at a level determined by the AN/FPN-60 Transmitter Control Set. In the OPERATE mode, the first stage operates at a fixed gain; in STANDBY the transmitter drive level is manually adjustable for testing into Dummy Load. The drive signal is then further amplified and applied to a bandwidth control circuit. In the feedback mode, the system requires a narrower bandwidth than when operated open loop. The output of the high gain six stage amplifier is applied to a differencing network. The other input to this network is the composite feedback derived from the current and voltage feedback signals from the output, combined in the proper ratio. The differenced output, corrected for overall frequency response in a loop compensation network, is applied to a phase splitter circuit to develop the required left and right drive signals. The outputs

of the phase splitter are applied to a vacuum tube voltage amplifier consisting of two type 6CL6 tubes in push-pull. Rectangular bias pedestals are applied to this stage to keep the amplifier cut off during the intervals between Loran-C pulse transmissions. The voltage amplifier output is applied to a single stage amplifier using type 6146W beam power tubes. The output of the low level power amplifier is applied to a push-pull parallel cathode follower stage employing four type 6146W tubes. The output of the cathode follower is directly coupled to the First IPA.

6. Power Supply Assembly. A new subassembly designated 1A4A6 is added in the modified transmitter configuration. The new unit provides various d-c voltages for the Input Amplifier, 1A4A1A3.

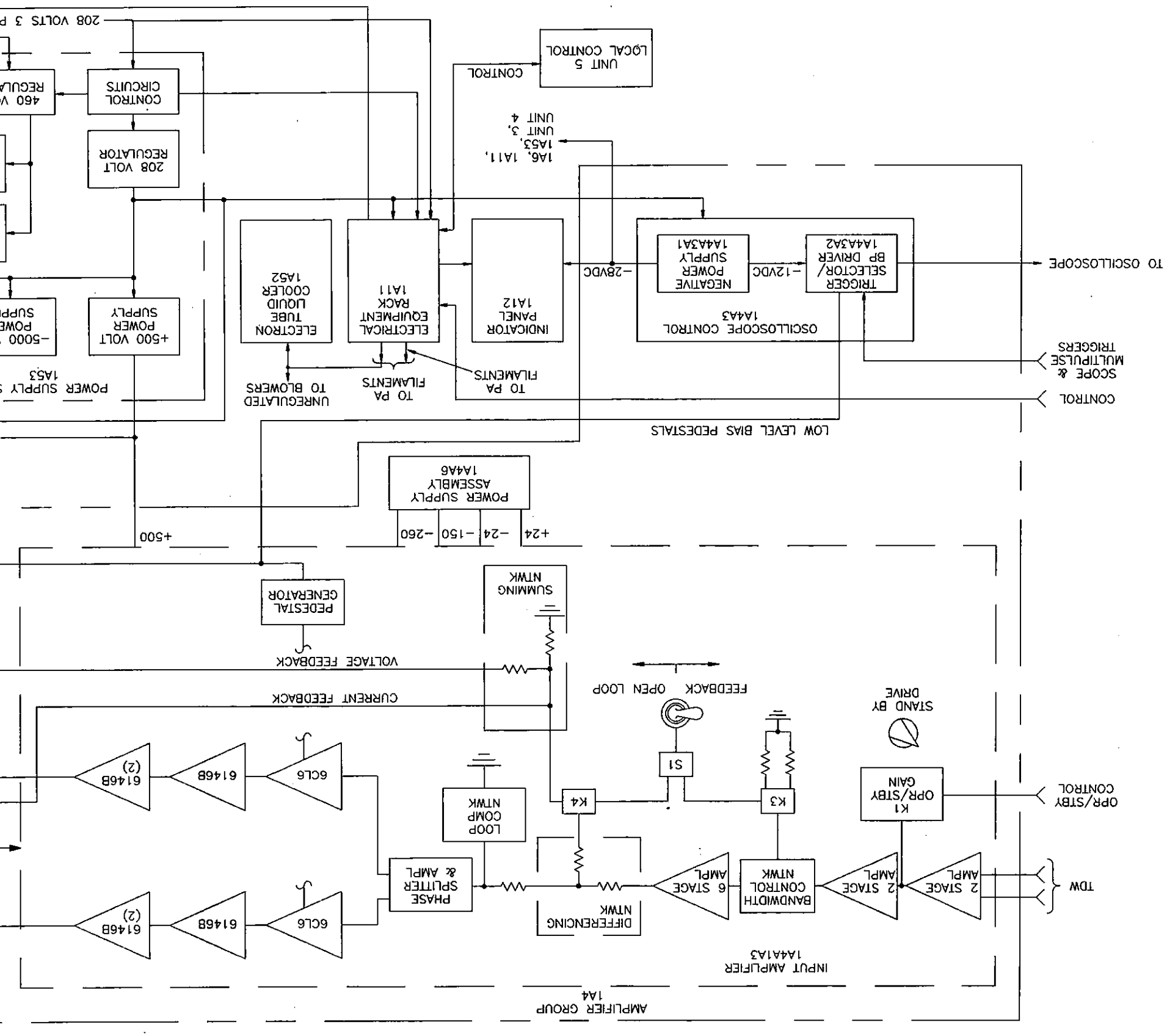
Each d-c voltage source (-260V, -150V, -24V and +24V) is obtained from a separate module, designated 1A4A6A1, 1A4A6A2, 1A4A6A3 and 1A4A6A4, respectively. The output voltage is manually adjustable over a limited range, and regulated to better than
0.05%.

4.2. FUNCTIONAL DESCRIPTION.

4.2.1. **LORAN TRANSMITTING SET AN/FPN-44A.** The basic function of the Loran Transmitting Set (figure 4-2) is to amplify transmitter drive waveform (Loran-C pulse) signals from the transmitter control equipment and couple the amplified signals to an antenna. The Loran transmitting set consists of two functionally identical Transmitting Groups OT-96/FPN-44A, an Antenna Coupler CU-2171/FPN-44A, and an Electrical Dummy Load DA-329A/FPN-44. Since both transmitting groups are functionally identical, only one is shown in figure 4-2. Each transmitting group includes the following equipment: Amplifier Group OG-159/FPN-44A (1A4), Radio Frequency Amplifier AM-3774/FPN-44 (1A5 through 1A10), Electrical Equipment Rack MT-2929/FPN44 (1A11), Indicator Panel SB-1894A/FPN-44 (1A12), Low Pass Filter F-1428/FPN-44A (1A20), Electron Tube Liquid Cooler HD-1000/FPN (1A52), and Power Supply Set OP-109/FPN-44A (1A53). **Refer to table 1-1 for nomenclature differences between the AN/FPN-44A and AN/FPN-44B transmitters.**

The Loran Transmitting Set receives transmitter drive waveforms (Loran-C pulses), trigger signals, and control signals from transmitter control equipment. The station provides 460 vac, three phase, 50/60 Hz and 208 vac, three phase, four wire, 50/60 Hz power to operate the Loran Transmitting Set. In addition, 120 vac, single phase, 50/60 Hz power is supplied for lighting and convenience outlets. The Loran transmitting set supplies the transmitter control equipment with four equipment status indications and an antenna current indication. The transmitter control equipment control signals perform the following functions:

CHANGE 4


AMPLIFIER GROUP
1A4
INPUT AMPLIFIER
1A4A1A3
DIFFERENCING NTWK
PHASE SPLITTER & AMPL
LOOP COMP NTWK
SUMMING NTWK
PEDESTAL GENERATOR
POWER SUPPLY ASSEMBLY
1A4A6
+24
-24
-150
-260
+500
208 VOLTS 3 P
CONTROL CIRCUITS
208 VOLT REGULATOR
UNIT 5 LOCAL CONTROL
CONTROL
1A6, 1A11, 1A53, UNIT 3, UNIT 4
ELECTRON TUBE LIQUID COOLER 1A52
ELECTRICAL EQUIPMENT RACK 1A11
INDICATOR PANEL 1A12
OSCILLOSCOPE CONTROL 1A4A3
NEGATIVE POWER SUPPLY 1A4A3A1
TRIGGER SELECTOR/ BP DRIVER 1A4A3A2
-28VDC
-12VDC
TO OSCILLOSCOPE
+500 VOLT POWER SUPPLY
UNREGULATED TO BLOWERS
TO PA FILAMENTS
TO PA FILAMENTS
SCOPE & MULTIPULSE TRIGGERS
CONTROL
LOW LEVEL BIAS PEDESTALS
VOLTAGE FEEDBACK
CURRENT FEEDBACK
FEEDBACK OPEN LOOP
S1
K4
K3
STAND BY DRIVE
K1 OPR/STBY GAIN
OPR/STBY CONTROL
BANDWIDTH CONTROL NTWK
6 STAGE AMPL
2 STAGE AMPL
2 STAGE AMPL
TDW
6CL6
6146B
6146B (2)
6CL6
6146B
6146B (2)

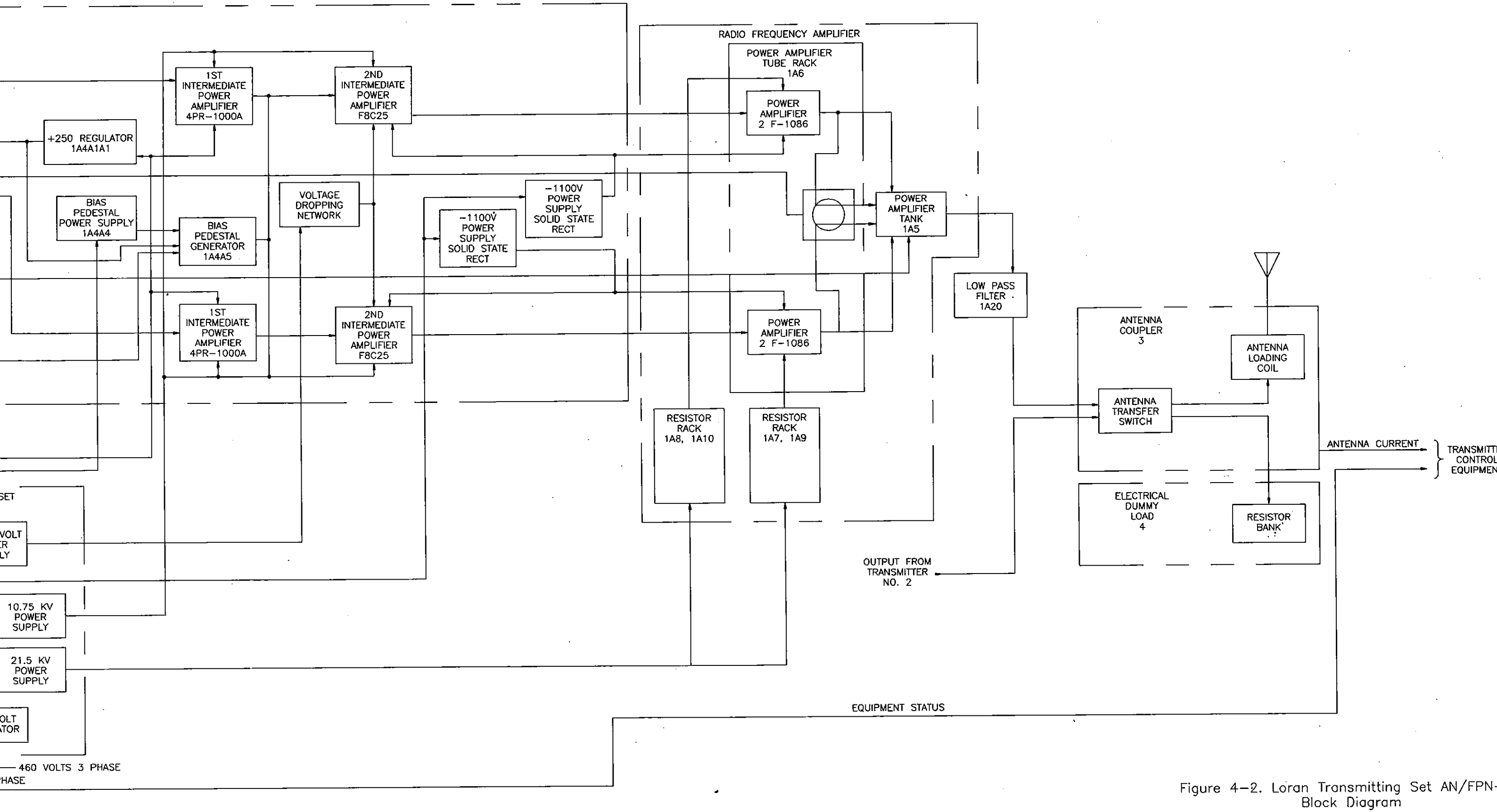


Figure 4-2. Loran Transmitting Set AN/FPN-
Block Diagram

ER
T

NOTE

The standby Transmitter in the standby mode may have cooling, filament, and bias power applied, or be essentially de-energized depending on the position of the DESLOT/NON-DESLOT selector switch
1A53A2S20 - Select one of the two transmitting groups as the operating group and the other as the standby group.

- Test the standby transmitting group using the dummy load.
- Shut down either transmitting group completely.

The four status signals sent to the transmitter control equipment from each transmitting group indicate the following conditions:

- The cooling system is operating properly; that is, the cooling equipment motors have been turned on, inlet and outlet water temperatures of PA cooling system are within limits, the water in cooling system tank is at proper level.

- The filaments are heated, bias and low voltages are normal, and transmitting group is under remote control.

- Filaments are heated, bias voltages are normal, and the 460V voltage regulator has been turned on. The transmitting group is either under local or remote control.

- Plate voltages are at their proper operating levels.

In normal operation, a transmitting set operates with one transmitting group on the air and the other group in standby mode. The transmitting group selected as the operate group performs as follows: The Loran-C pulses are connected to two dual pentode voltage amplifier stages by the operation of a signal control relay. The signal control relay selects a fixed level. The outputs of the voltage amplifiers are applied to the first intermediate power amplifier (IPA). The second IPA is a dc coupled cathode follower which drives the power amplifier (PA) grids. The PA employs water cooled type F1086 triodes. The PA plates connect to the PA tank (1A5) which provides transformer coupling to the antenna circuit. A low pass filter (1A20) in the circuit suppresses unwanted harmonics. Transfer relays in the antenna coupler switch the output of the operate transmitting group to the antenna and the output of the standby transmitting group to the dummy load. The antenna coupler houses the antenna loading coil which resonates the antenna.

The standby transmitting group can operate in three modes: standby, standby test and local. The standby mode is the normal

operating condition. In this mode, cooling, filament, and bias power is applied and the Loran-C pulse inputs are terminated. In the standby test mode all power is applied and the Loran-C pulse inputs are connected to the voltage amplifiers. However, unlike the operate mode, the PA output is connected to the dummy load. In the local mode, control is passed from the transmitter control equipment to the local controls.

The PA output is also connected to the dummy load in the local mode.

Ancillary circuits in the Loran transmitting set include the following:

- Regulated high voltage power supply.

- Standby transmitting group testing using the dummy load.

- Regulated filament and bias supplies.

- A water cooling system for the PA tubes.

- An oscilloscope control unit which can be switched to monitor waveforms in the transmitting group. Associated switching circuits can select individual pulses or an entire pulse-group for examination.

- A system of control circuits to ensure application and removal of voltages in proper sequence to prevent damage to the vacuum tubes.

- A system of control circuits to prevent component damage by removing power in the event of an overload.

- A system of interlocks to protect operating personnel from contact with high voltages.

- A system of control circuits to de-energize the Transmitter (DESLOT) while in the standby mode.

4.2.2. **POWER SUPPLY SET OP-109 FPN-44A (1A53).**

4.2.2.1. **PURPOSE.** Power supply set 1A53 (figure 4-3) provides the following voltages:

- Regulated 21.5 kvdc for power amplifier tubes.

- Regulated 10.75 kvdc for first and second intermediate power amplifiers.

- Regulated -5 kvdc for bias in second intermediate power amplifier.

- Regulated 500 volts dc for screen grid voltage in amplifier group 1A4, the 250 volt regulator (1A4A1A1), and input amplifier 1A4A1A3.

- Regulated 208 vac for filaments and PA bias power supply.

4.2.2.2. **POWER SUPPLY ASSEMBLIES.** The power supply set consists of assemblies and sub-assemblies. Table 4-1 identifies these assemblies and subassemblies and defines their functions.

4.2.2.3. **OVERALL DESCRIPTION.** The power supply set, controlled by internal and external signals, supplies regulated and unregulated power to operate a transmitting group. Figure 4-3 shows the functional relationship between the various assemblies of the power supply set as well as its interface with the other assemblies of a Loran transmitting set and the remote transmitter control equipment.

External and internal control of the power supply set is determined by the status inputs from the cooling system, interlock, voltage and current sensing circuits: mode signals: emergency stop and switch settings. The sensing circuit inputs provide personnel and equipment protection. The mode signals select one of the transmitting groups as the operate group. The local-remote input determines the control point for the plate power supply (local control at the transmitter or remote from the transmitter control equipment). Control logic sequentially enables the distribution of power to the control circuits, cooling system motors, filaments, bias, and plates.

Power supply set sequential operation is as follows:

- Circuit breaker control applies 208 vac 3 phase, 60 Hz station power to the 208 vac voltage regulator and to control circuits including antenna-dummy load switching.

- Control logic to motor control circuits enables the distribution of unregulated 208 vac, 3-phase power to cooling system motors.

- Control logic enables regulated 208 vac, 3 phase power to filament transformers in radio frequency amplifier 1A6 and amplifier group 1A4.

- Control logic enables regulated 208 vac, 3 phase power to bias power supplies in 1A53A6 and amplifier group 1A4 when interlock switches are closed. The bias power supplies provide -5 kvdc and 500 vdc to amplifier group 1A4 circuits. The regulated 208 vac, 3 phase power to 1A4 supplies power to PA bias power supplies. A resistor assembly (1A53A23) acts as a bleeder for the -5 kvdc and 500 vdc supplies.

- When the 460 vac circuit breaker is closed, control logic enables the operation of 460 vac voltage regulator which supplies phase angle control of the ac voltage to the primary of the high voltage transformer (1A53A6T1). The high voltage power supplies provide 21.5 kv and 10.75 kv to the power amplifier tubes and IPA'S. Resistor assemblies 1A53A19 and 1A53A20) discharge the high voltage circuits when bias voltages are off. Voltage divider (1A53A7) supplies a sample of the high voltage as a regulator control voltage.

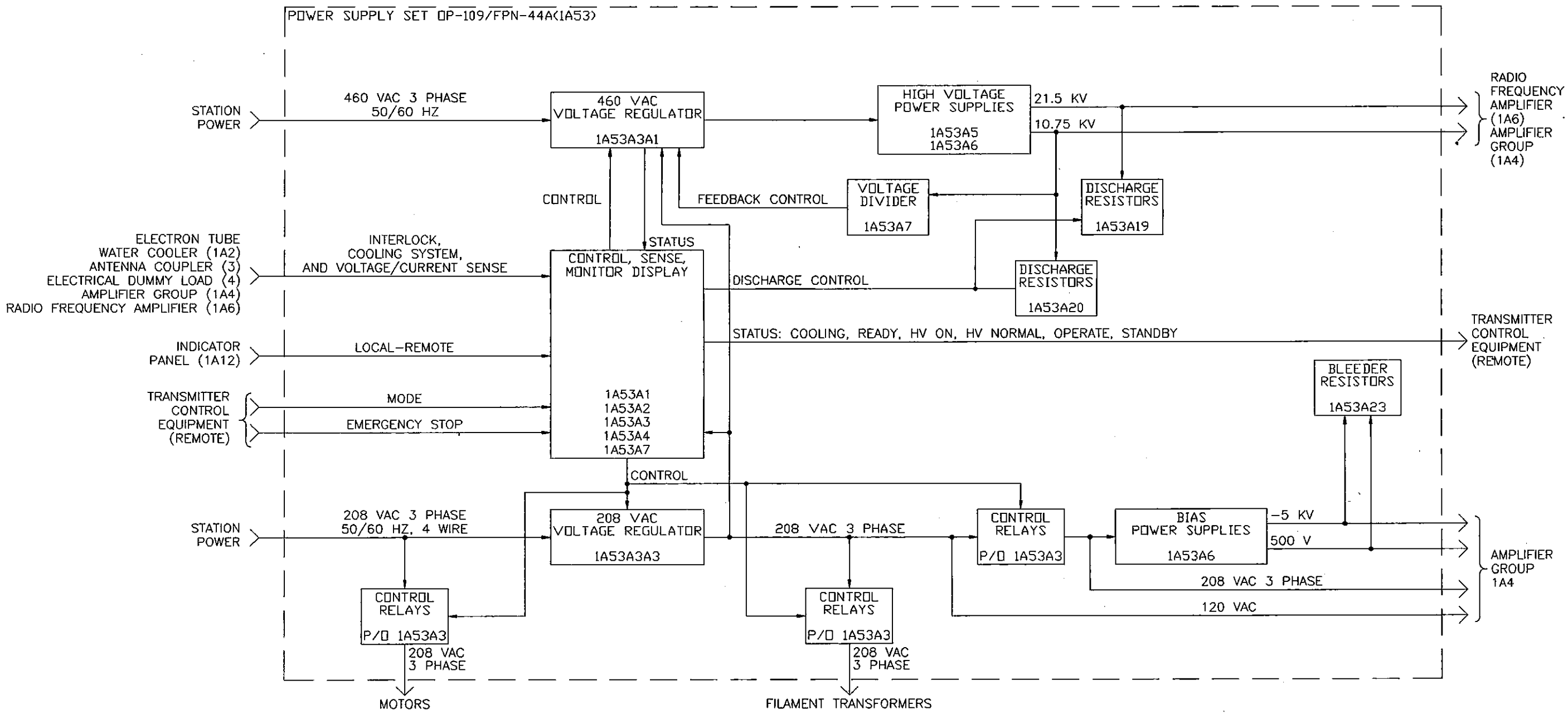


Figure 4-3. Power Supply Set OP-109/FPN-44A(1A53) Simplified Functional Block Diagram

TABLE 4-1 POWER SUPPLY SET OP- 109/FPN-44A (1A53) FUNCTIONS

REF. DES.	NOMENCLATURE	FUNCTION Note: Refer to table 1-1 for AN/FPN-44B.
1A53A1	Relay Assembly RE-1112/FPN-44A	Discharges 21.5 kv and 10.75 kv circuits when bias and low voltage voltages are off.
1A53A2	Control-Indicator C-10034/FPN-44A	Controls and monitors ac input, 21.5 kv, 10.75 kv,-5kv, 500 v, emergency stop, three strike, overload, overtemperature, filament circuits. Provides fuse status indicators for power supply set units.
1A53A3	Relay Assembly	Controls 208 and 460 vac. using relay logic, controls operation of loran transmitting set, with inputs from sensing circuits, manual controls, and remote transmitter control equipment circuits.
1A53A3A1	Voltage Regulator CN-1473/FPN-44A	Regulates 460 vac for 21.5 kv and 10.75 kv circuits
1A53A3A2	Fuse Panel	Mounts fuses for 1A53A3A1
1A53A3A3 1A53A3A4	Voltage Regulator CN-1472/FPN-44A	Regulates 208 vac
1A53A4	Instrument Shunt NEK-9783/FPN-44A	Senses 21.5 kv and 10.75 kv overloads. Samples 21.5 kv and 10.75 kv circuit currents for meters.
1A53A5 1A53A6 1A53A19 1A53A20 1A53A23	Power Supply PP-7305/FPN-44A	Supplies 21.5 kv, 10.75kv, -5kv, 500 v power. Provides discharge and bleeder resistors for power supplies.
1A53A7	Voltage divider CN-1474/FPN-44A	Samples 21.5 kv and 10.75 kv voltages for meters. Senses 21.5 kv overvoltage. Senses -5 kv circuit voltage to enable high voltage turn on. Provides control voltage to 460 vac voltage regulator.

4.2.3. **ANTENNA COUPLER CU-2171/FPN-44A(3) AND ELECTRICAL DUMMY LOAD DA-329A/FPN-44(4).** The antenna coupler receives the high level output of both transmitting groups, couples the operating transmitting group to the antenna, and the standby transmitting group to a tuned resistive load in the dummy load.

The following functions occur within the antenna coupler:

- Vacuum relays interchange the transmitter outputs between antenna and dummy load in accordance with the transmitting group selection command from the transmitter control equipment.

- An r-f current transformer provides for remote monitoring of the standby transmitting group.

- An r-f current transformer provides for monitoring antenna current.

- Front panel indicator lamps denote which transmitting group is connected to the antenna.

- Interlock circuits prevent application of power in the event doors are opened.

The following functions occur within the dummy load:

- Forced-air-cooled resistors dissipate the r-f power.

- A high power r-f capacitor and inductor series resonates the transmitter output reactance..

- Remote-controlled motor starters apply forced air when plate voltage is switched on for standby transmitting group.

- Interlock circuits prevent application of power in the event of air-failure or open doors.

4.3. CIRCUIT DESCRIPTION.

4.3.1. **GENERAL.** This section describes the Loran Transmitting Set circuits. The descriptions reference functional block diagrams, timing diagrams, simplified schematics, and detailed schematics. The detailed schematic diagrams are contained in Section 7.

4.3.2. **AMPLIFIER GROUP OG-159/FPN-44A AND RADIO FREQUENCY AMPLIFIER AM-3774/FPN-44.** Amplifier group 1A4 also called Exciter, (figure 7-20) provides voltage amplification of the input signal for excitation of the power amplifier tubes. Circuits are included for monitoring, coordination of the signal level with plate voltage control sequence and biasing provisions to prevent pulse ringing at the final output. The amplifier group, in addition to the components mounted on its frame, consists of power supply 1A4A1 (which includes a + 250 vdc regulator 1A4A1A1), oscilloscope control 1A4A3 (which includes trigger selector 1A4A3A2 and negative power supply 1A4A3A1), bias pedestal generator 1A4A5, and bias pedestal power supply 1A4A4.

The transmitter drive from the Transmitter Control Set is applied to the Input Amplifier Unit 1A4A1A3. After amplification and conditioning by applying feedback and bandwidth correction, the balanced output is applied to the input of the First Intermediate Power Amplifier stage (1st IPA). The amplified outputs from the 1st IPA stages are then fed to the 2nd IPA which provides power amplification to drive the grids of the PA tubes.

The Radio Frequency Amplifier AM-3774/FPN-44 (figure 7-29) consists of the following units: power amplifier tank (1A5), power amplifier tube rack (1A6) and four resistor racks (1A7 through 1A10).

4.3.2.1. MAIN FRAME CIRCUITS.

4.3.2.1.1. **GENERAL.** The intermediate power amplifiers increase the signal level to provide excitation of the proper level for the power amplifiers. To obtain the voltage swing required by the power amplifiers, amplifier group 1A4 is connected as a two-stage push-pull voltage amplifier and an output cathode follower.

The input pulse signal from the transmitter control equipment, connected at connector CPI, is applied to an impedance-matching phase splitting transformer T12. The transformer output provides two signals equal in amplitude, but 180 degrees out-of-phase which drive the push-pull system.

The amplified outputs from the first IPA stages are then fed to the second IPA stages which provide power amplification to drive the transmission lines between amplifier-oscillator group 1A4 and the rf amplifier.

4.3.2.1.2. **VOLTAGE AMPLIFIER CIRCUITS.** The voltage amplifier stage amplifies the outputs from the phase splitter to the level required by the first IPA. The tubes in each push-pull channel are connected in parallel pairs for lower output impedance and therefore, less loss of high frequency response due to the input capacitance of the next stage shunting this output impedance.

The input amplifier 1A4A1A3 receives transmitter drive at a level determined by the AN/FPN-60 Transmitter Control Set. In the OPERATE mode, the first stage operates at a fixed gain; in STANDBY the transmitter drive level is manually adjustable for testing into Dummy Load. The drive signal is then further amplified and applied to a bandwidth control circuit. In the feedback mode, the system requires a narrower bandwidth than when operated open loop. The output of the high gain six stage amplifier is applied to a differencing network. The other input to this network is the composite feedback derived from the current and voltage feedback signals from the output, combined in the proper ratio. The differenced output, corrected for overall frequency response in a loop compensation network, is applied to a phase splitter circuit to develop the required left and right drive signals. The outputs of the phase splitter are applied to a vacuum tube voltage amplifier consisting of two type 6CL6 tubes in push-pull. Rectangular bias pedestals are applied to this stage to keep the amplifier cut off during the intervals between Loran-C pulse transmissions. The voltage amplifier output is applied to a single stage amplifier using type 6146B beam power tubes. The output of the low level power amplifier is applied to a push-pull parallel cathode follower stage employing four type 6146B tubes. The output of the cathode follower is directly coupled to the First IPA.

4.3.2.1.3. **FIRST INTERMEDIATE POWER AMPLIFIER.** The first IPA is a tuned tetrode amplifier furnishing the principal signal voltage gain in the loran transmitting set. The plate circuit consists of transformer 1A4T11, tuned to 100 khz by the capacitor combination shown in figure 4-20. The bandwidth of the plate circuit is established by resistive loading consisting of resistors 1A4R34 through 1A4R63 in series modified by the addition of the 1A4R221 and 1A4R222 in parallel with R34 through R63. The equivalent resistor is resistance is 6200 ohms resulting in a Q greater than 1. Thus the interstage coupling is broadbanded to improve the frequency response, hence the linearity of the overall transmitter system.

The stage operates in push-pull Class B in which the plate current of both tubes in the absence of signals is biased near cut off. Negative signal swing at either grid cuts the tube completely off, while positive signal swing at the opposite grid causes an increase in plate current. This produces an increased voltage drop across the load, and thereby produces an output. A positive grid voltage swing, therefore, produces a negative

half-cycle of plate voltage swing.

The first IPA is capacitively coupled to the second IPA, which also operates Class B. Therefore, the negative going plate swing of each first IPA is not directly amplified. It is, however, inverted in polarity by Tlc which produces a positive swing at the opposite plate. This positive voltage is the effective signal applied to the grid of the following stage.

As the first IPA is a tetrode, protective facilities have been provided to prevent the screen grids from exceeding their rated dissipation. This condition can occur when the plate voltage is too low, as happens when power supply set 1A53 begins its slow start. Relay 1A4K3 delays the application of screen voltage until the plate voltage has increased to an adequate level. Resistor 1A4R66 serves as a screen grid leak to keep the screen at ground potential before voltage is applied. Resistor, 1A4R105 and capacitor 1A4C35 perform the dual function of ripple filter and pulse-current energy source for the screen circuit.

Bypass capacitors 1A4C57 and C58 are added to ensure that the center tap of 1A4T11 is at signal ground. Additional signal grounding is provided at the cathodes of the 1st IPA tubes by bypass capacitors 1A4C59 through C62.

As originally designed, the 1st IPA stage was biased for Class B push-pull operation. In the modified configuration, the 1st IPA is directly coupled to the output stage of the Input Amplifier, a cathode follower. During the interpulse interval, the 1st IPA tubes are biased into cutoff. Just prior to the arrival of the transmitter drive, a rectangular voltage is applied to the tubes, raising the bias to a linear region of the tube's operating characteristics. The rectangular bias voltage keeps the d.c. grid voltage at this operating point until after the Loran-C drive pulse has decayed to zero.

Potentiometer 1A4R149 and R150 previously were the bias adjust controls for the 1st IPA tubes, 1A4V7 and V8, respectively. These controls are now used to control the fixed bias to the cathode follower output stage of the Input amplifier which is directly coupled to the inputs of the 1st IPA. The potentiometer control the 1st IPA cathode currents in the same manner as prior to the modification.

4.3.2.1.4. **SECOND INTERMEDIATE POWER AMPLIFIER.** One stage of dc coupled current amplification is provided in the form of a dc coupled cathode follower to drive the next stage which is the final power amplifier.

The signal applied to the second IPA grid does not exceed the bias, so no grid current flows in this stage. Class B biasing produces a half-wave rectified cathode-current waveform. This

current flows in the grid-cathode resistor and develops a positive going voltage on the cathode and on the succeeding grid. When the resistor voltage drop exceeds the PA bias, grid current flows, so that the second IPA cathode current thus divides between the resistor and the PA grid.

The peak signal currents represented by the arrows in figure 4-6 are far beyond the peak current capability of the dc power supplies. The second IPA plate bypass and PA grid bypass capacitors are the energy storage sources for the heavy grid cathode circuit currents. Between loran pulses, the plate bypass is recharged by the series combination of the 10.75 kv supply and the PA bias supply. The PA grid bypass recharges from the PA bias supply alone. As this recharge cannot fully take place between pulses. The droop in voltage at these capacitors during the pulse group may be overcome by increased drive from pulse-to-pulse which is produced the droop compensation in the driver equipment.

4.3.2.1.5. **BIAS PEDESTAL GENERATOR 1A4A5.** Bias pedestal generator 1A4A5 (figure 7-27) and its associated power supply (1A4A4) are located in amplifier group 1A4. Only the 6.3 vac filament power supply is operational.

The purpose of the bias pedestal generator is to bias the 2nd IPA and PA tubes into Class B operation during the pulse and to shorten the rf output pulse of the transmitter by reducing "ringing" of the transmitter power amplifier output circuit.

Positive-going 350 microsecond pedestals from 1A4A3A2 are applied at the input of the Bias Pedestal Generator. The input signal is phase inverted by class A amplifier V1 and applied as a negative pulse to normally heavily conducting power amplifier V2. The output of V2 is a positive pulse that overcomes the blocking bias applied to power output amplifier V3, driving it into heavy conduction. The heavy V3 cathode current through the primary of output transformer T1 generates a high positive voltage pulse at the secondary of T1. Diodes CR1 through CR5, capacitor C7 and C17, resistors R23, R24, R36, R40, R41, and R42, and variable resistor 1A4A5R195 form a positive clipping network that maintains a constant output voltage level of pedestal pulses. Diodes CR6 through CR10, capacitor C8, resistors R43, R44, and R45, and variable resistor 1A4A5R194 clip the negative output voltage that is developed across the secondary of transformer T1 when the positive driving pulse applied to power amplifier V3 ends. Variable resistors 1A4A5R194 and 1A4A5R195 permit adjustment of the clipping level, while variable resistor 1A4A5R193 provides adjustment for bias pedestal amplitude. The positive bias pedestal pulse is applied to the grids of second IPA tubes 1A4V9 and 1A4V10 via capacitors 1A4C51 and 1A4C54 and the series connected resistors 1A4R34 through 1A4R63; this reduces the second IPA tube fixed bias for the duration of the bias pedestal pulse. Cathode follower action of the second IPA tubes applies

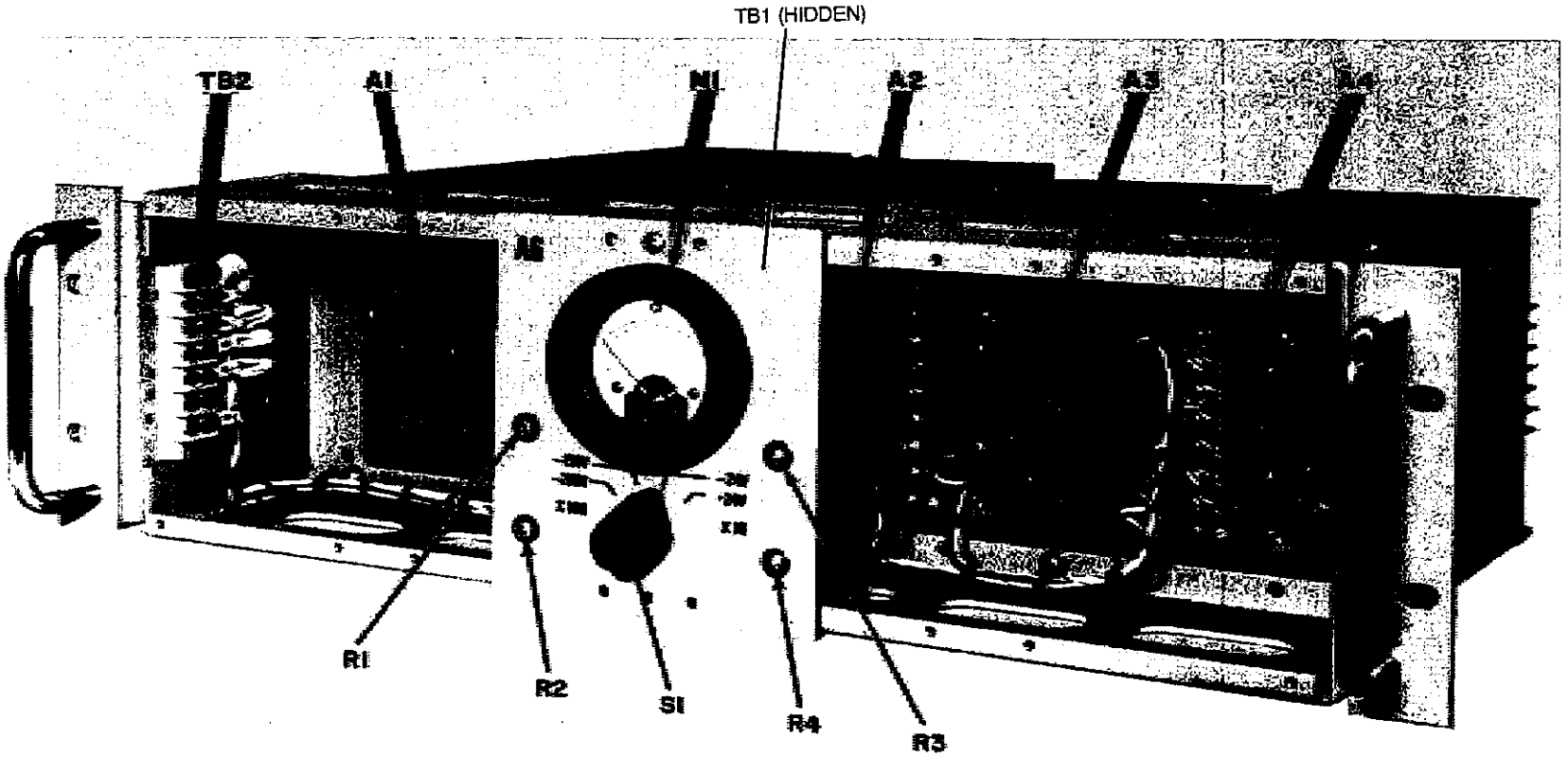
the bias pedestal voltage and superimposed r-f pulse to the grids of power amplifier tubes 1A6V1 through 1A6V4. The bias pedestal causes the power amplifier tubes to draw additional dc plate current, thus lowering their plate resistance; this plate resistance is effectively across the power amplifier output tank circuit and the resultant damping action reduces "ringing" in the circuit. The bias pedestals also reduce the droop of the r-f output pulse groups.

The bias pedestal generator 1A4A1A3A2 develops low level bias pulses for the voltage amplifier circuit. Multi-triggers are applied at J4. Q22, U1 and Q23 comprise a bias pedestal circuit which develops these low level bias pulses. Q22 is a buffer amplifier driving integrated circuit, U1, CR1, a zener diode (5.1 volts), regulates the Q22 collector voltage and U1 supply.

U1 is a TTL monostable multivibrator (one shot) which is triggered by the leading edge of the input. The rectangular output pulse width is set to approximately 550 microseconds by C79 and R214.

Q23 is a buffer amplifier to isolate the monostable multivibrator from the load. The output of Q23 is combined with the left and right signal outputs and applied to the Voltage Amplifier grids.

Jumpers across 1A4A5R36, R40, R41, and R44 provide for adapting the output networks for the various repetition rates. For single rate stations, the jumper selection is for the basic rate at which the transmitter operates. For double rate stations, the jumper selection is for the highest of the two basic rates at which the station operates (the shortest GRI). For example, a double rate station operating on both SH (16 2/3) and SS (10) basic rates, require those jumpers associated with the SH rate. The following table provides guidelines for jumper selection.



PREFIX REFERENCE DESIGNATION WITH 1A4A6

R1 – R4 IS HIDDEN

Figure 4-4. Power Supply Assembly (1A4A6) Controls and Indicators

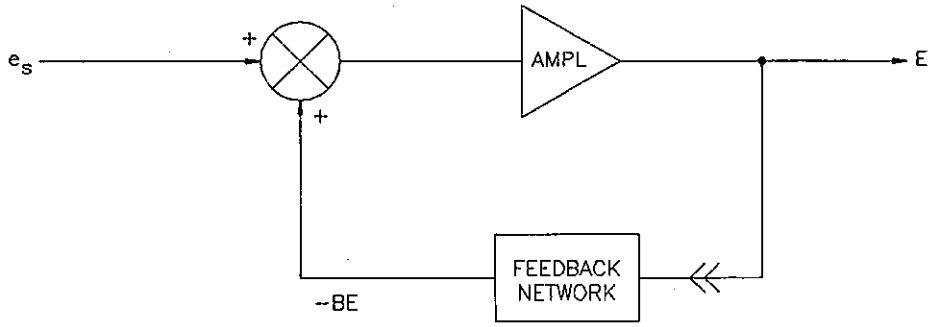


Figure 4–5. Transmitter Amplifier – Simplified Diagram

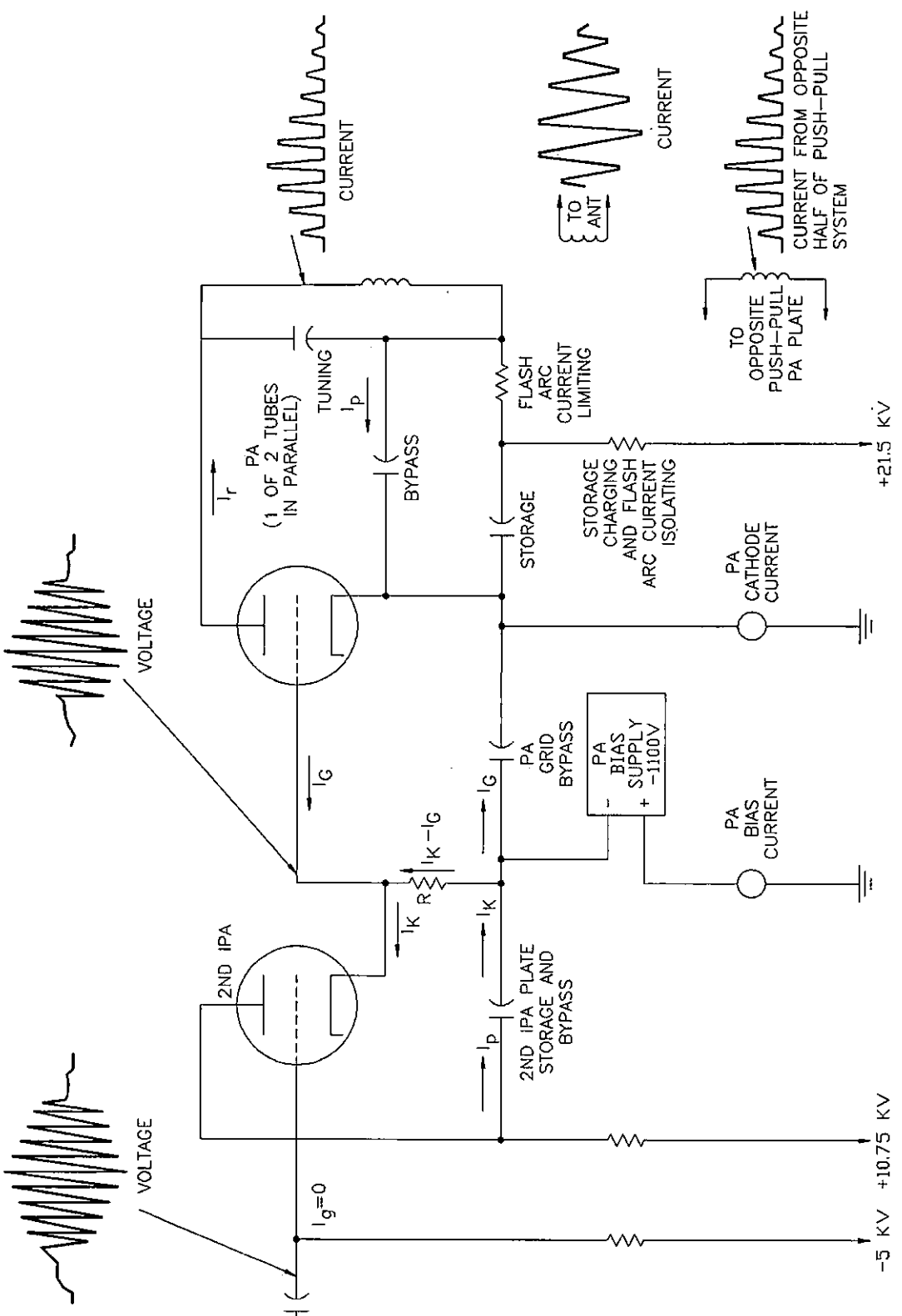


Figure 4-6. Amplifier Group, 2nd IPA and Radio Frequency Amplifier PA Stages, One-Half of Push-Pull Circuit, Simplified Schematic Diagram

JUMPER SELECTION.

Approx. Group Rep. interval	Basic Rate	Jumpers to be used		
		1	2	3
MS*	*			
100	SS			X
90				X
80	SL		X	X
70			X	X
60	SH	X		

* Shortest GRI (highest rate at a double-rate station)

4.3.2.1.6. **BIAS PEDESTAL POWER SUPPLY 1A4A4 (See figure 7-26).** The purpose of the Bias Pedestal Power Supply is to supply 6.3 vac filament voltage for the pedestal generator tubes. This voltage is provided by the step down transformer T2. Plate voltage (+250 Vdc) is no longer being supplied from this power supply, instead, +250 Vdc is supplied from 1A4A1A1 (see figure 7-21).

4.3.2.1.7. **POWER SUPPLY ASSEMBLY 1A4A6.** The power supply unit provides operating voltages for the input amplifier circuitry, and is protected by Main Frame fuses 1A4F17 and 1A4F18. Power supply assembly 1A4A6, figure 4-4 consists of four power supplies and meter circuits. The power supplies provide regulated 260 Vdc (1A4A6A1) figure 7-53, -150 Vdc (1A4A6A2) figure 7-54, -24 Vdc (1A4A6A3), and +24 Vdc (1A4A6A4) figure 7-55, to input amplifier 1A4A1A3 and +24 Vdc to signal conditioner 1A4A7. The power supplies input is regulated 120 Vac. The meter circuits provide for monitoring the output voltage of each of the four power supplies.

(1) **-260 VDC (1A4A6A1) AND -150 VDC (1A4A6A2) POWER SUPPLIES.** The -260 Vdc (1A4A6A1) and -150 Vdc (1A4A6A2) power supplies provide regulated outputs using the series passing-stage principle. The power supplies include overcurrent protection circuits. Refer to block diagram, figure 4-21 and schematic diagram figures 7-53 and 54.

Transformer T1, steps up the 120 Vac input voltage and applies the output to a full-wave bridge rectifier consisting of CR4 through CR7. The rectifier output is fed through a passing stage Q2A and Q2B to the load. The passing stage, which is the regulating device, absorbs the voltage difference between the rectifier and the desired output voltage. A feedback loop includes a voltage sensing bridge, which compares a sample of the output with a fixed reference voltage. The output of the voltage sensing bridge is amplified and varies the drive current to the passing stage. Overcurrent protection is provided by a foldback circuit, which reduces the drive on the passing stage by providing an alternate path for the current output of a constant current generator.

Output-voltage sensing and error amplification are provided by a bridge circuit, consisting of resistor R9, reference diode CR8 and potentiometer R15, sensing resistor R18 and R17 and differential amplifiers Q8, Q9 and Q6 and Q7. R10 and R11 are collector resistors; R8 and R13 are emitter resistors for their respective amplifiers. Capacitor C6 and resistor R12 are used for amplifier stabilization. Diode CR10 protects the bridge circuit from high reverse voltages developed during a short circuit condition.

Operationally, the voltage reference, developed by the zener action of CR8, is compared with a portion of the output voltage sensed across an arm of the bridge, i.e., the part of R15 across the base emitter of Q9. Error signals, resulting from variations in unit output, are applied to the bases of Q8 and Q9. The operating currents in each transistor then change as a function of signal strength and polarity. (Note that the sum of the operating currents in Q8 and Q9 is kept approximately constant by the zener-diode regulated voltage across R13). Variations in voltages across the collectors, resulting from the current changes, produce an amplified potential difference between the bases of Q6 and Q7. The operating currents through Q6 and Q7 change, causing an increase or decrease of drive on the passing stage.

The voltage across R15 and therefore across the bridge is actually the voltage being regulated. It is therefore very nearly constant. As a result, the sum of the bridge and amplifier currents is constant. This total current produces an IR drop across R18 which, when added to the 7.9 V across R15, gives the output voltage.

The conduction level of Q6 is controlled by the operation of differential amplifier (Q8 and Q9). Current through Q6 then is altered indirectly by variations in the output voltage. Q6's operating current and the drive current on Q4 are supplied by the constant-current generator. As a result any change in the operating current in Q6 is reflected as an increase or decrease in the drive on Q4. This is the key to feedback control.

The generator is comprised of two resistors (R1 and R2), two diodes (CR2 and CR3), and transistor Q5. The diodes act as voltage regulators and provide the current-limiting characteristic by holding the voltage drop across R1 constant. Input to the generator is derived from an unregulated supply consisting of a secondary winding of T1, half-wave rectifier (CR1) and filter capacitor C1.

The drivers for passing stage (Q2A and Q2B) are transistors Q3 and Q4. The constant-current generator supplies drive current to Q4 and operating current for Q6. The drive on Q4 is amplified by a high-gain circuit and applied to the base of Q2B, altering stage impedance and therefore its IR drop as a

function of unit output. The passing stages are connected in series and equally share the total voltage absorbed across the stages. The voltage sharing circuit is made up of divider R29, R39 and amplifier Q4A. As an example of circuit operation, assume that 215 Vdc output of the unregulated supply increases (either through a line or load variation). R29 and R30 divide the increase equally and a voltage signal, amplified by Q4A, is placed across the base emitter of Q2A. Q2A's impedance increases until its absorbed voltage is equal to that developed across R29. The voltage absorbed by Q2B then is equal to the voltage across the divider minus the drop across Q2A and CR11, and it is controlled by action of the sensing and amplifier section. CR11 and R3A form a reverse-bias section for Q2A.

As an example of how sensing and error amplification, the constant-current generator, and the drivers and passing stages function to regulate the output voltage, assume that the output tends to rise. The increase in voltage is sensed across R15, and therefore the base of Q9 becomes more positive with respect to the base of Q10. The operating current through Q9 increases, and the voltage drop across R11 becomes greater. The base of Q7, therefore, becomes more negative with respect to the base of Q6, Q7 conducts less current, and more current is drawn through Q6. With an increase in Q6 operating current, the drive current to Q4 is reduced since the sum of these currents is fixed by the constant-current generator. Reduction of the drive on Q4 decreases Q4's operating current. This reduces the drive on Q3 and subsequently the drive on Q2. Q2's impedance, and therefore its absorbed voltage, increases, and the output is regulated to the desired output.

The input-power section includes main transformer (T1), a full-wave bridge rectifier (CR4-CR7), and filter capacitors C3A and C3B. Capacitor C19, connected across the input terminals, is a high-frequency bypass, and capacitor C2 suppresses noise generated by rectifier commutation.

Overcurrent protection is afforded by the current-foldback section, which is comprised of voltage divider (R5 and R6), sensing resistor (R7) and transistor (Q5). During an overcurrent condition, the section operates to pull current from the constant-current generator. This effectively decreases the drive on Q4, and subsequently increases passing-stage impedance. The absorbed voltage across the stage increases and consequently the output voltage and current decrease.

More explicitly, an overcurrent condition generates a higher voltage drop across R7. When the difference between this drop and the voltage across R5 is sufficient (approximately 0.6 V), Q5 conducts and pulls current from the constant-current generator. This reduces the drive on Q2, increasing its impedance and subsequently decreasing the output voltage. As the output

voltage drops, the load current will decrease. A dropping output voltage and decreasing current reduce the voltage drops across both R7 and R5, until these voltages are nearly equal.

Inherent in the operation of any high-gain feedback amplifier is the tendency for it to become unstable under certain operating conditions. To preclude unstable operation, a number of stabilization capacitors and a resistor have been connected across appropriate points. The capacitors include C4, C5, C7, C8, C9, and C14.

(2) **-24 VDC (1A4A6A3) AND +24 VDC (1A4A6A4) POWER SUPPLIES.** Since the ±24 Vdc power supplies are identical, the following description is applicable to both. Refer to block diagram, figure 4-21 and the schematic figure 7-55.

Transformer T1 steps down the ac input and applies it to a bridge rectifier CR3 and filter C6. The dc output is fed to the load through a passing stage, Q1 and Q2, which acts to absorb the difference between the rectifier output and the desired output voltage. The feedback loop to the passing stage includes an output voltage-sensing network and a reference voltage generated in the voltage regulator U1. These two signals are compared in a differential amplifier on U1 and the amplifier error signal is used to vary the drive current to the pass stage.

Overcurrent protection is provided by the foldback section, in the event of a short circuit or overload. This circuit reduces the drive on the pass stage by providing an alternate path for the error-amplifier output. OVP is provided by a sensing network which upon excess output voltage, acts to trigger an SCR crowbar. The crowbar shorts the dc rectifier output, clearing a dc fuse.

Voltage regulator U1 acts to maintain a zero error signal across input terminals 4 and 5. The amplified error signal appears at terminal 9. This output signal is used to drive Q3, which drives the system passing stages. U1 output is passed such that an increase in output voltage acts to decrease the Q3 drive. This action restores the output voltage to its regulated value (as set by the reference voltage and sense resistors). U1 terminal 6 is the 7.15 volt reference voltage measured with respect to terminal 7. R8, R9, R20 and C2 adjust and filter the reference voltage. R10, R11, and R12 comprise the output-voltage sensing network.

Diode CR1, resistor R1, and zener VR1 supply a regulated +16 Vac voltage for voltage regulator U1. The driver for the pass stage is Q3. The pass stage consists of Q1 and Q2. Resistors R2 and R3 insure equal current-sharing by all transistors. R5 is a reverse-bias resistor for Q3.

R4 and R6 act as a voltage divider to select the reverse bias applied to the foldback amplifier (inside U1). This bias is opposed by a forward bias developed across Q2 base-emitter diode and across R3. Under excess load conditions, the R3 bias increases enough to turn on the foldback amplifier, which reduces the pass-stage drive current. R4/R6 reduce the output current even further as the excess load current pulls down the output voltage (thus, the foldback characteristic).

Resistors R13, R14, and R15 form a voltage divider which selects a portion of the output voltage. This voltage is delayed by filter R16 and C4 to eliminate short-duration pulses. In an overvoltage situation, the drop appearing across the divider increases. When approximately 8 volts appears at C4, silicon unilateral switch Q4 conducts, generating a pulse which appears across SCR gate Q5. Q5 is triggered into conduction, instantly reducing the output (C5 and load) through the Q5 short circuit.

The Feedback modifications to the Bias Pedestal Generator circuit consist of replacement of the output transformer, 1A4A5T1, and minor revisions in the output clipper circuit. The replacement transformer is essentially the same as the original component except that the replacement has better frequency response, hence produces less distortion to the desired high level bias pedestal waveform. Two of the three potentiometers used to adjust the output of the bias pedestal generator are changed in value. Other minor revisions are made in the clipper, namely four resistors and one capacitor are added, and one capacitor deleted.

Figure 7-27 shows the circuit changes made in the Bias Pedestal Generator.

4.3.2.2. **POWER SUPPLY PP-7304/FPN-44A.(1A4A1).** The Power Supply PP-7304/FPN-44A contains the 250 Vdc regulator subassembly and the Input Amplifier 1A4A1A3 subassembly. The input amplifier (see block diagram figure 4-2 and schematic diagram in Section 7) consists of the following assemblies: reference amplifier (1A4A1A3A1), bias pedestal generator/difference preamplifier (1A4A1A3A2) and chassis mounted components.

The input amplifier inputs are: Loran r-f pulses from the transmitter control equipment; multi-triggers from the remote transmitter control equipment; a current feedback signal from a current transformer sensing the power output; a voltage feedback signal from a winding of the PA tank coil (1A5); and standby/operate mode control signals from 1A4 control circuits. Two maintenance controls are provided: FEEDBACK-OPEN LOOP switch S1 and STANDBY DRIVE CONTROL potentiometer R18.

The power supply, which had been modified by the addition of an amplifier designated 1A4A1A3, is added to the equipment. Power connector 1A4A1J1, blown fuse indicators, coaxial connectors

1A4A1J3 and 1A4A1J4, and coaxial cable termination resistors 1A4A1R1 and 1A4A1R2 are mounted on power supply 1A4A1 (figure 7-21). The power connector connects 208 vac regulated and +500 vdc from the main chassis of the amplifier group to the +250 volt regulator 1A4A1A1, and +250 vdc from the regulator to amplifier group main chassis. The coaxial connectors connect the antenna current sample from r-f current transformer 1T1 to the oscilloscope control 1A4A3 and to coaxial connector 1A4J14. The circuitry of the Input Amplifier is described below. (Refer to figure 7-22).

Operation of the input amplifier circuits are described in the following paragraphs.

4.3.2.2.1. **INPUT CIRCUIT.** Transistors Q1 and Q2 function as a solid state transformer matching the balanced 95-ohm input line to a single-ended (unbalanced) signal which is applied to the base of Q3.

4.3.2.2.2. **DRIVE CONTROL.** When the transmitter is in OPERATE mode, emitter follower Q3 functions at a fixed gain with the output developed across potentiometer R1. When the transmitter is in STANDBY, -28 volts is present on TB2-2 which causes K1 to energize. In STANDBY mode, the transmitter signal drive level is manually adjustable from zero to maximum by R1.

4.3.2.2.3. **CURRENT AMPLIFIER.** Transistors Q4 and Q5 are cascaded common emitter amplifiers to provide a small power gain. Direct coupling is employed for optimum frequency response. The input to Q4 is grounded when the signal disabling relay is energized.

4.3.2.2.4. **BANDWIDTH CONTROL/PREAMPLIFIER.** Theoretically, to obtain maximum effect, a feedback system should have an infinite, or at least an extremely wide, bandwidth. In the practical situation, the complexity of the load on the transmitter could result in positive feedback at some frequencies far from 100 Khz. C6 and L1 have a resonant frequency of 100 Khz and the low resistance of R29 results in a Q of 0.26 which corresponds to a bandwidth of 385 kHz.

In the OPEN LOOP mode, the bandwidth of the system is decreased to approximately 20 kHz which is ample to pass the Loran-C pulse.

The gain of the amplifier in OPEN LOOP mode is 22 db less than that when in FEEDBACK mode, which corresponds to the amount of feedback employed.

C6, L1, R28 and R29 comprise a network to control the bandwidth of the system. When S1 is in the FEEDBACK position, R29 is in series with C6 and L1; R28 is connected by K3 contacts when S1 is in OPEN LOOP.

In the FEEDBACK position the resultant bandwidth of the

transmitter, from the difference preamplifier input to the output of the PA plates, is approximately 300 kHz. In this mode R29 in series with C6 and L1 properly pre-emphasizes the reference drive to compensate for this closed loop bandwidth.

In the OPEN LOOP position the bandwidth of the transmitter, from the difference preamplifier input to the output of the PA plates, is approximately 20 kHz. In this mode R28 is placed in series with C6 and L1 to properly pre-emphasized the drive for this open loop bandwidth.

In addition to properly changing the shape of the drive, the above switching produces 22 dB less output in the OPEN LOOP position than in FEEDBACK position; this corresponds to the amount of negative feedback employed.

4.3.2.2.5. **AMPLIFIER.** Transistors Q6 through Q11 comprise a high gain amplifier. Direct coupling is used extensively to minimize frequency dependent components. For improved linearity, negative feedback is obtained by unbypassed emitter resistors.

4.3.2.2.6. **CURRENT AMPLIFIER.** Transistors Q12 and Q13 are driven in parallel from the output of Q11. Q12 is an NPN type and amplifies the negative alternation, while Q13 is a PNP and amplifies the positive alternation of the drive signal. The output currents are combined in R121.

4.3.2.2.7. **FEEDBACK SUMMING.** Current feedback is obtained from a new current transformer in the PA Tube Rack and applied at J2. Voltage feedback is obtained from a tertiary winding on the PA Tank, via a voltage divider assembly in the PA Tube Rack and applied at J3.

The proper ratio of voltage-to-current feedback signals is determined by resistors R78 and R79. The composite feedback signal is applied to the network composed of R74, R75 and R240 which presents a 50-ohm impedance matching and approximately 4 db attenuation. R77 provides a load for the other side of the balanced feedback inputs.

4.3.2.2.8. **DIFFERENCING NETWORK.** Resistors R71 and R72 comprise resistive summing network; the output current flowing through R73 is the sum of the two input currents. Since the phase of the current and voltage feedback signals is carefully made to be out of phase with the drive signal, this network is termed a differencing network.

When switch S1 is set to the OPEN LOOP position, relay K4 is energized and the composite feedback signal is open-circuited, and R72 is grounded.

4.3.2.2.9. **LOOP COMPENSATION NETWORK.** C19 and L2 are tuned to 100 kHz and present maximum impedance to the combined input signal at

that frequency. In FEEDBACK mode, the bandwidth is controlled by R76 and R73 and the parallel resultant of R71 and R72. The three decibel bandwidth of this combination is 20 kHz. Resistor R76 provides pre-emphasis compensation for the bandwidth of 1A4T11 in the exciter; In OPEN LOOP by R76, R73 and R72.

4.3.2.2.10. **PHASE SPLITTER AND AMPLIFIER.** Transistor Q14 is a conventional emitter follower driving Q15, a phase splitter. The outputs of Q15 are two signals, equal in amplitude and 180 degrees out of phase, to drive the remainder of the amplifier circuits in the transmitter which are configured in push-pull to provide Class B linear amplification of alternate r-f cycles.

Transistors Q17, Q19 and Q21 comprise three stages of the left channel. The identical circuitry of Q16, Q18 and Q20 drives the right voltage amplifier.

4.3.2.2.11. **FIRST VOLTAGE AMPLIFIER.** Tubes V1 and V2 comprise a conventional push-pull voltage amplifier circuit which are linear for positive going input voltage swings. The tubes are biased below conduction by the application of -24 VDC via the d-c coupling from the preceding stage. The positive-going pedestals from the low level bias pedestal circuit (U1 and Q23) are applied on the grids of V1 and V2 to raise the bias level into the linear conduction region of the tube's operating characteristics prior to the arrival of the drive signal. The output of the Voltage Amplifier is applied to the next stage using R-C coupling.

4.3.2.2.12. **SECOND VOLTAGE AMPLIFIER.** Tubes V3 and V4 comprise the Second Voltage Amplifier stage employing type 6146W beam power tubes. This conventional push-pull circuit drives the Cathode Follower stage.

Each circuit is capable of supplying a linearly amplified positive-going output swing of 300 volts peak riding on top of a bias pedestal swing of +42 volts. This circuit drives the cathode follower stage.

4.3.2.2.13. **CATHODE FOLLOWER.** Beam power tubes V5, V6, V7 and V8 comprise a push-pull parallel cathode follower current amplifier for the positive going half cycles. The output of the Second Voltage Amplifier is fed to the grids using RC coupling. The grid input resistors, R166, R167, R168, and R169 are returned to a fixed bias voltage of -260 VDC furnished by the new power supply unit 1A4A6A1. Grid bias is applied through bias adjust controls 1A4R149 and 1A4R150.

The positive going output signal for each side of the push-pull circuit is developed across three 4700 ohm resistors in parallel. The signal is directly coupled to the grids of the First IPA stage. The cathode load resistors are returned to a fixed voltage of -150 VDC from the new 1A4A6A2 power supply unit.

This serves two functions; to provide grid bias for the First IPA, and to serve with the +500 VDC source as the plate supply for the Cathode Followers.

Filament voltage for the Cathode follower is derived from separate filament transformers to minimize the possibility of coupling the 60 Hz into the cathode output circuit through inter-electrode capacitance. Cancellation of a-c hum is also achieved by center tapping the filament supply circuit.

4.3.2.2.14. **+250 VOLT REGULATOR 1A4A1A1.** The +250 volt regulator (figure 7-22) supplies +250 vdc regulated to electron tube circuits in the low level amplifiers in amplifier group 1A4, and to Bias Pedestal Generator 1A4A5.

The input to the regulator is +500 vdc from the primary power supply. The +250 vdc output is controlled such that any variation of input voltage or changes in load within the specified limits of these devices does not change the output value of +250 vdc. The regulator operates on the principle of an automatic variable voltage divider. Tubes V1, V2, and V3 function as controlled variable resistive impedances.

The circuit is initially adjusted to give +250 vdc across the specified load. If for any reason the voltage of +250 vdc should increase, the impedance of tubes V1, V2, and V3 also increases, causing the voltage drop across them to equal the increase in voltage. Thus, the voltage available for the load remains at +250 vdc.

If the output voltage should tend to decrease, the impedance across these tubes also decreases, maintaining the correct voltage across the external load. Tube V4 is the voltage sensing element in the regulator. Should the output fall below +250 vdc, the voltage across voltage divider R25, R26, and R27 decreases. A proportional voltage decrease is obtained at the arm of potentiometer R26 which is connected to the cathode (pin 3) of V4.

Since the grid (pin 2) of V4 is held at a constant voltage by voltage reference tube V5, the grid-to-cathode voltage becomes less negative causing the current to increase and the plate voltage (pin 1) to fall. This voltage decrease is coupled to the grid (pin 7) of V4, causing the plate current to decrease and the plate voltage (pin 6) to rise. This rise is coupled to the grids of V1, V2, and V3 through grid resistors R6 and R11, R16 and R22, and R23 and R29, respectively. This increase of grid voltage lowers their cathode-to-plate impedance. Therefore, the voltage drop across these tubes decreases, raising the output voltage level to +250 vdc.

The reverse procedure occurs when the load voltage increases. Diode 1A4A1A1CR1 is a protective device limiting the positive grid

bias that can be applied to tubes V1, V2, and V3. Should the voltage at the plate (pin 6) of V4 attempt to rise higher than the voltage at the bottom of R12, CR1 would conduct and clamp pin 6 to R12. This would limit the grid bias of tubes V1, V2, and V3 to the voltage drop across cathode resistor R12. Since voltage reference tubes are noisy devices, a noise suppression filter consisting of resistors R17, R19 and capacitor C3 is inserted between voltage reference tube V5 and the grid (pin 2) of V4. Resistor R19 and capacitor C3 act as an RC filter which attenuates frequencies at terminal 3. Resistor R17 serves as a parasitic suppressor. To ensure that the maximum filament-to-cathode voltage rating is not exceeded on V1 through V4, a bias voltage from the voltage divider consisting of resistors R2 and R3 is applied to the center tap of filament transformer T1.

4.3.2.3. **OSCILLOSCOPE CONTROL C-4558A/FPN-44.** Oscilloscope control 1A4A3 (figure 7-23) allows for selection of pulses in different parts of the transmitting set for examination on an external oscilloscope. The control circuits also contain the selector switch and voltmeter which permits measurements of the output voltage of the +250, -12. and -28 vdc power supplies. Also contained in the oscilloscope control are negative power supply 1A4A3A1 (figure 7-24), which supplies -12 and -28 vdc to control circuits in amplifier group 1A4. PA tube rack 1A6, indicator panel 1A12, electron tube liquid cooler 1A2, power supply set 1A53, antenna coupler (Unit 3) electrical dummy load (Unit 4), and local control unit (Unit 5).

Meter Selector switch 1A4A3S2 provides for connecting voltmeter 1A4A3M1 to the +250, -12, and -28 vdc power supplies. Since one meter movement is used to measure these three voltages, three external multiplier resistors are provided, the proper value for each scale selected.

Monitored Circuit switch 1A4A3S1 is an 11 position wafer switch and connects the oscilloscope to the desired circuit for observation. Resistor 1A4A3R4 provides the required termination impedance for the external oscilloscope.

4.3.2.3.1. **TRIGGER SELECTOR/BIAS PEDESTAL DRIVER 1A4A3A2.** Oscilloscope triggers that permit observation of any loran pulse are provided by this assembly. Oscilloscope triggers are selected by means of SCOPE TRIGGER MODE selector switch 1A4A3S4 and SCOPE TRIGGER PULSE SELECTOR switch 1A4A3S3. The mode selector switch permits observation of any one of the nine pulses without a delayed oscilloscope.

The 1A4A3A2 printed circuit card **(WO725-1B)** also contains the circuitry which develops the rectangular drive pulse for the Bias Pedestal Generator (Unit 1A4A5). The Bias Pedestal Interval circuitry is not used in the AN/FPN-44A transmitter. Although the printed circuit card is not field repairable, the theory of

operation is presented below.

The circuitry of 1A4A3A2 is divided into three main functions (Refer to figure 7-25). These functions are:

- trigger splitter
- bias pedestal driver
- trigger selector

The input signal to the TS/BPD board is the sum of Early Trigger (ET) and Multipulse Triggers (MPT) developed in the timing equipment. ETs and MPTs are multiplexed by applying in opposite phase to each other and appear at the transmitter on a balanced 95-ohm transmission line.

The trigger splitter separates the multiplexed input triggers and develops two output signals, each 5 microseconds wide. These outputs are shown on figure 7-25 as $\overline{ET}$ and $\overline{MPT}$. $\overline{MPT}$ is also routed to the unused Bias Pedestal Interval circuit.

The purpose of the Trigger Selector circuit is to develop a 70 microsecond oscilloscope trigger pulse for use in transmitter testing. Inputs to the C-SEL-1 circuit are $\overline{ET}$ and $\overline{MPT}$. When the MODE switch, 1A4A3S4, is in the NORMAL position, every 70 microsecond pulse from the one-shot multivibrator, U14B, will appear at the output. When in either A or B position, every other 70 microsecond trigger will appear due to U13.

The decoder state is determined by the PULSE SELECTOR switch, 1A4A3S3, which is a Nines Complement Binary Coded Decimal switch. The following table shows the state of the four input lines from the switch for various positions.

1A4A3S3 position	**"8" Pin 31**	**"4" Pin 35**	**"2" Pin 44**	**"1" Pin 61**
0	HI	LO	LO	HI
1	HI	LO	LO	LO
2	LO	HI	HI	HI
3	LO	HI	HI	LO
4	LO	HI	LO	HI
5	LO	HI	LO	LO
6	LO	LO	HI	HI
7	LO	LO	HI	LO
8	LO	LO	LO	HI
9	LO	LO	LO	LO

HI = 0 VDC LO = -12 VDC

When 1A4A3S3 is in the "0" position, the ET is fed to the 70 microsecond one-shot. When in any other position, the appropriate

MPT causes an output from the decoder-driver.

The "0" position is generally used for viewing the entire pulse group, while the other positions are for viewing specific pulses. At secondary stations there is no oscilloscope trigger when 1A4A3S3 is in position "9".

The input to the Bias Pedestal Driver (BPD) circuit consists of $\overline{MPT}$. Two dip switches control the pedestal parameters. **S1** is a 16 position, screw driver adjust rotary switch which is used to control the position of the bias pedestal waveform with respect to the RF drive waveform. The positioning should be verified at the junction of 1A4C5/1A4C54 as with high voltage pedestal adjustment procedures listed in 5.2.4.10. S1 controls the position of the complete pedestal, which should be adjusted so that the leading edge of the pedestal coincides with or slightly proceeds the first RF cycle. **S2** is a four position DIP switch which varies the R/C time constant for U9, providing an adjustable pedestal width from 350 to 500 usec, depending which DIP position is in the closed position. Only one of the four DIP switches should be closed at any one time to provide the 350 to 500 usec pedestal width range. Closing additional DIP switches will result in pulse widths LESS than 350 usec, which will adversely affect biassing and conduction performance. S2 switch and resulting pedestal width are as follows:

S2 SECTION CLOSED	PULSE WIDTH
1	350 USEC
2	400 USEC
3	450 USEC
4	500 USEC

Figure 7-6 shows the timing relationships of the associated waveforms of the WO725-1B circuit.

4.3.2.3.2. **NEGATIVE POWER SUPPLY 1A4A3A1.** The 120-vac input (Figure 7-24) is applied through step-down transformer T1 to a full-wave bridge rectifier consisting of diodes CR1 through CR4. The full-wave rectified output from this bridge is filtered by swinging choke L1 and capacitors C1, C2, C3, connected in parallel. The -28 vdc output from the filter is applied across a voltage divider consisting of resistor R1 and Zener diode CR5. Diode CR5 clamps its voltage drop at 12 volts. Therefore, the output voltage taken at the junction of R1 and CR1 is -12 vdc. This voltage is applied as element voltages for plug-in modules of trigger selector 1A4A3A2. The -28 vdc is distributed to relay circuits in 1A4, 1A12, 1A53, 1A53, Unit 3 and Unit 4.

4.3.2.4. **POWER AMPLIFIER.** The PA stage (figures 4-6 and 7-29) is a push-pull parallel triode amplifier operating Class B. The tubes are biased below cutoff until the bias pedestals occur. The amplitude of the bias pedestals is adjusted to raise the biasing level from below cutoff to the proper operating point. Positive-going grid voltage pulses produce plate-current pulses which flow to the plates through the tuned PA tank circuit. Tight coupling from each side of the push-pull plate circuit to the output, results in the two "half-wave rectified" currents, combining to form the desired symmetrical carrier.

The PA plate-bypass capacitor is the energy source for each individual half-wave pulse of 100 kHz plate current. It recharges from the storage capacitors on opposite half cycles through the flash-arc current limiter resistor. The storage capacitor recharges between pulse groups.

The PA tank circuit is divided into separate LC sections for each tube. The series-parallel combination of all the PA tuning capacitors, together with the series-parallel combination of all the PA primary coil sections resonates at 100 kHz. These sections and the associated bypass and storage capacitors are insulated from each other for the full dc plate voltage. By this technique, the flash-arc energy to be dissipated in a single tube is limited to that available from one pair of storage capacitors. The destructive power of the arc is thereby substantially limited.

The power amplifier circuits have been modified to include additional amplification stages to increase the signal level. In addition, a power supply (1A4A6) has been added to provide the additional amplification stages. These are described in paragraphs 4.3.2.4.1 through 4.3.2.4.3 that follow.

A tertiary winding on the PA Tank coil form, consisting of two turns of high voltage wire, is the source for the voltage feedback signal. The winding is centered on the primary coil form and connected to a resistive voltage divider with a total resistance of 880 ohms. Since the load on the feedback winding is of high impedance and is purely resistive, the tuning of the output network is not significantly affected. The feedback voltage, attenuated by the resistive voltage dividers, 1A6A1 and 1A6A2, is applied at 1A4A1J6 through twinax cable W192.

A current transformer of the same type used to sample antenna current is installed at the rear of the PA Tube Rack to obtain the current feedback signal. The primary leads from the four PA tubes are passed through the aperture of the current transformer so that the voltage induced in the transformer represents the total r-f output current from the tubes. The primary leads from the left and right PA stages are passed through the transformer in opposing directions for two reasons:

(1) to perform the algebraic summation of the total output current.

(2) to avoid d-c saturation of the core.

The current feedback signal is applied at 1A4A1J5 through twinax cable W191.

4.3.2.4.1. **FIRST INTERMEDIATE POWER AMPLIFIER.** The 1st IPA is a tuned tetrode voltage amplifier furnishing the principal voltage gain in the transmitter. The plate circuit consists of transformer 1A4T11, tuned to 100 kHz by the capacitor combination shown in figure 4-2. The bandwidth of the original circuit was established by the resistive loading of 1A4R34-R63, a total shunt resistance of 45 kilo ohms. Part of the modification is the addition of 1A4R221 and R222 in parallel with the original 45 K. The equivalent resistance of the parallel combination is 6200 ohms which results in a circuit Q slightly greater than 1. Thus, the interstage coupling is broadbanded to improve the frequency response, hence the linearity, of the overall transmitter system.

In the modified equipment, bypass capacitors 1A4C57 and C58 are added to ensure that the center tap of 1A4T11 is at signal ground. Additional signal grounding is provided at the cathodes of the 1st IPA tubes by bypass capacitors 1A4C59 through C62.

As originally designed, the 1st IPA stage was biased for Class B push-pull operation. In the modified configuration, the 1st IPA is directly coupled to the output stage of the Input Amplifier, a cathode follower. During the interpulse interval, the 1st IPA tubes are biased into cutoff. Just prior to the arrival of the transmitter drive, a rectangular voltage is applied to the tubes, raising the bias to a linear region of the tube's operating characteristics. The rectangular bias voltage keeps the d.c. grid voltage at this operating point until after the Loran-C drive pulse has decayed to zero.

Potentiometer 1A4R149 and R150 previously were the bias adjust controls for the 1st IPA tubes, 1A4V7 and V8, respectively. These controls are now used to control the fixed bias to the cathode follower output stage of the Input amplifier which is directly coupled to the inputs of the 1st IPA. The potentiometer control the 1st IPA cathode currents in the same manner as prior to the modification.

4.3.2.4.2. **SECOND INTERMEDIATE POWER AMPLIFIER.** The 2nd IPA stage functions the same as the original circuit. The load on the direct-coupled cathode follower amplifier is the grid resistors of the PA stage. The value of the grid resistance was originally 600 ohms and is decreased to 300 ohms.

4.3.2.4.3. **POWER SUPPLY (1A4A6).** In the modified transmitter

configuration, a power supply assembly is added. The new power supply unit provides operating voltages for the Input Amplifier circuitry.

Main frame fuses 1A4F17 and F18 are re-wired to provide 120 V, 1 phase power for the new assembly. DC output voltages are +24 V, -24 V, -150 V, and -260 V.

4.3.2.5. **PROTECTIVE CIRCUITS IN THE POWER AMPLIFIERS.** Several stages in the AN/FPN-44 operate with plate potentials in the range of ten thousand volts. At these voltages, a short-circuit in the form of an arc may be momentarily applied between the plate and all other electrodes. This arc maintains itself until the plate voltage is removed. This phenomenon requires the use of several equipment protective devices.

First of all, the tube itself must be protected from the burning damage of the arc. This is accomplished by limiting the short-circuit current into the tube, and providing a dissipation point for the short-circuit energy that would otherwise be dissipated at the tube electrodes. See figure 4-8, which illustrates a typical circuit configuration involved in the flash-arc problem. Tracing the circuit from the arc back along the plate and filament leads, it is seen that the plate-bypass and storage capacitors are the original sources of energy to the arc. After these capacitors discharge, the plate power-supply furnishes energy up to its short-circuit capacity. The current-limiting resistor provides the necessary dissipation until the cathode overload relay can cause the removal of high voltage.

At the initial instant of the arc, the current inrush is limited to the plate voltage divided by the relatively low-value of current limiting resistance and wiring inductance. The current value can be several thousand amperes, with a very steep wavefront. Under these conditions, the small inductances of the circuit wiring can be subject to several thousand volts for a few microseconds, so that inadequate insulation can be punctured. The filament transformer leads can be particularly vulnerable to this type of damage. Varistors (thyrite discs) are provided, therefore, from each filament lead to ground. These devices decrease in resistance rapidly as the voltage across them is increased. The devise selected for the PA filament circuits limits the surge to about 50 volts when the peak short-circuit current of the storage capacitor is flowing to ground.

The flash arc to the grid can cause this electrode to approach the plate voltage, so a ball gap is provided to limit this transient to slightly more than the grid-bias-plus-peak-signal voltage normally present. Varistors cannot be used in this application due to their inability to attain the relative change in resistance required in this high-voltage circuit. For this same reason the cathode circuits of the cathode follower stages

must also be protected with ball gaps.

While ball gaps and varistors can short circuit the transient surges to the surrounding chassis structure, the fault currents still flow in these structures. A separate ground-lead is provided from each major frame in the transmitter. A single ground point is provided in the overall housing so that no fault currents flow in this enclosure to cause large voltage drops along the external surfaces. This phenomenon would otherwise be a serious personnel-safety hazard.

4.3.2.6. **BIAS POWER SUPPLIES.** PA bias is supplied from variable output power supplies in amplifier group 1A4. Separate supplies are provided for opposite sides of the push-pull circuit to facilitate balancing adjustments. Figure 4-9 is a simplified schematic diagram of a left PA bias supply which is identical with the right PA bias supply. Variable primary voltage to the rectifier transformer is provided by a buck-boost transformer operating from a variable autotransformer. A solid-state single phase bridge rectifier is used, with a choke input filter. The filter capacitors serve the additional function of PA grid bypass (see figure 4-6) and are physically located in the PA tube rack. Relays are included to open the plate interlocks in the event of bias undervoltage and to trip the 3-strike overload system, removing all rectifier primary power in the event of bias overcurrent sensing relay 1A4K5 on initial high voltage turn on.

Flash arcs in the large amplifier tubes can apply high transient voltages to the bias supplies. Resistors in series with the diodes limit the current peaks. Varistors discs across the filter choke and overload relay protect these devices from overvoltage.

4.3.3. **ELECTRICAL EQUIPMENT RACK MT-2929/FPN-44 (1A11).** This rack (figure 7-31) which consists of three relay contactors, fuses, terminal boards, and coaxial terminations, performs the following functions:

- Distributes fused unregulated 208 vac 3-phase power to the enclosure blower motor 1B1, amplifier group blower motor 1B1, and electron tube liquid cooler pump motor (1A52B1) when the three relay contractors are simultaneously energized by system control.

- Distributes fused unregulated 208 vac 3-phase power to the electrical dummy load motor relay-contactors (4K1 and 4K2).

FIGURE 4-7
THIS PAGE INTENTIONALLY LEFT BLANK
REPLACED BY TS/BPD-1B CIRCUIT

Figure 4-7
THIS PAGE INTENTIONALLY LEFT BLANK
REPLACED BY TS/BPD-1B CIRCUIT

Figure 4-7
THIS PAGE INTENTIONALLY LEFT BLANK
REPLACED BY TS/BPD CIRCUIT

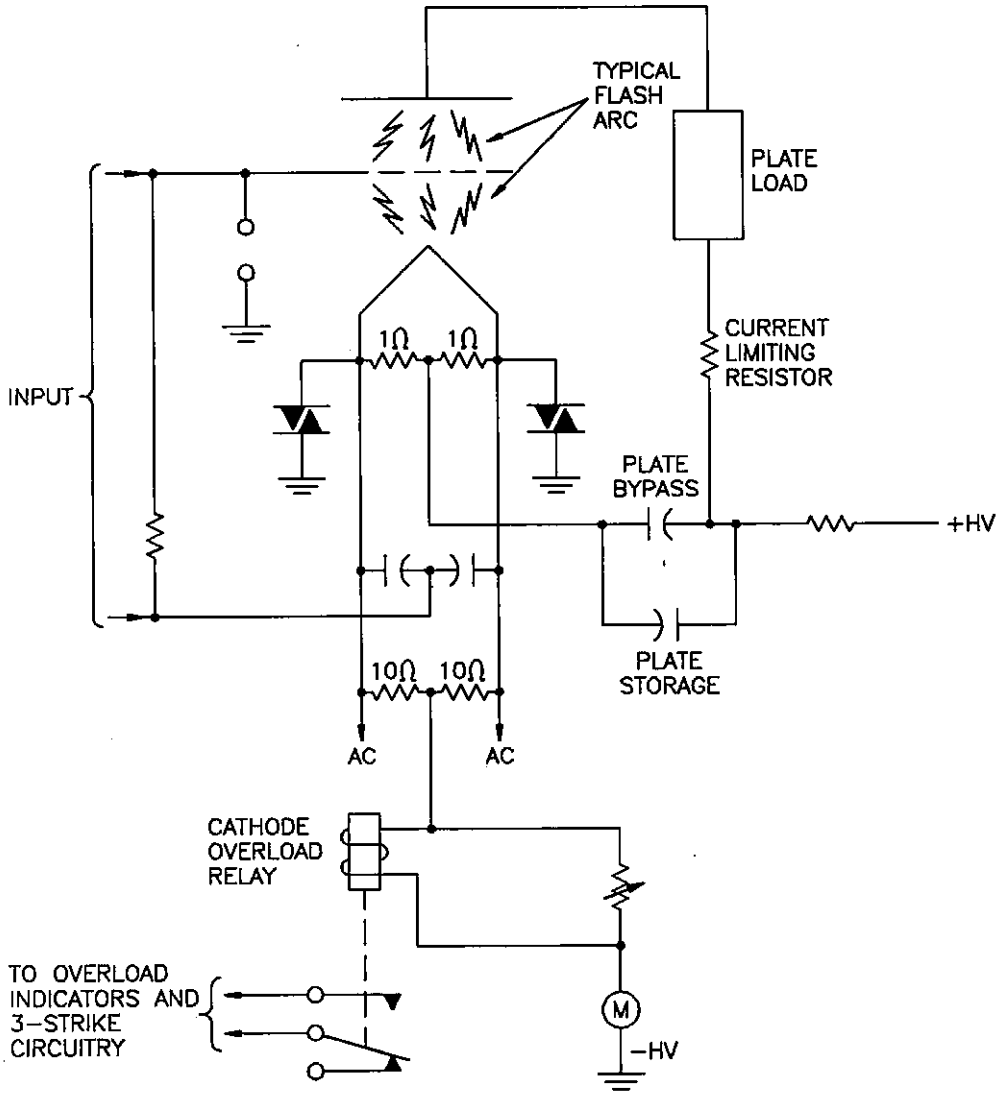


Figure 4–8. Power Amplifier Typical Grid–Cathode Protective Circuits, Simplified Schematic Diagram

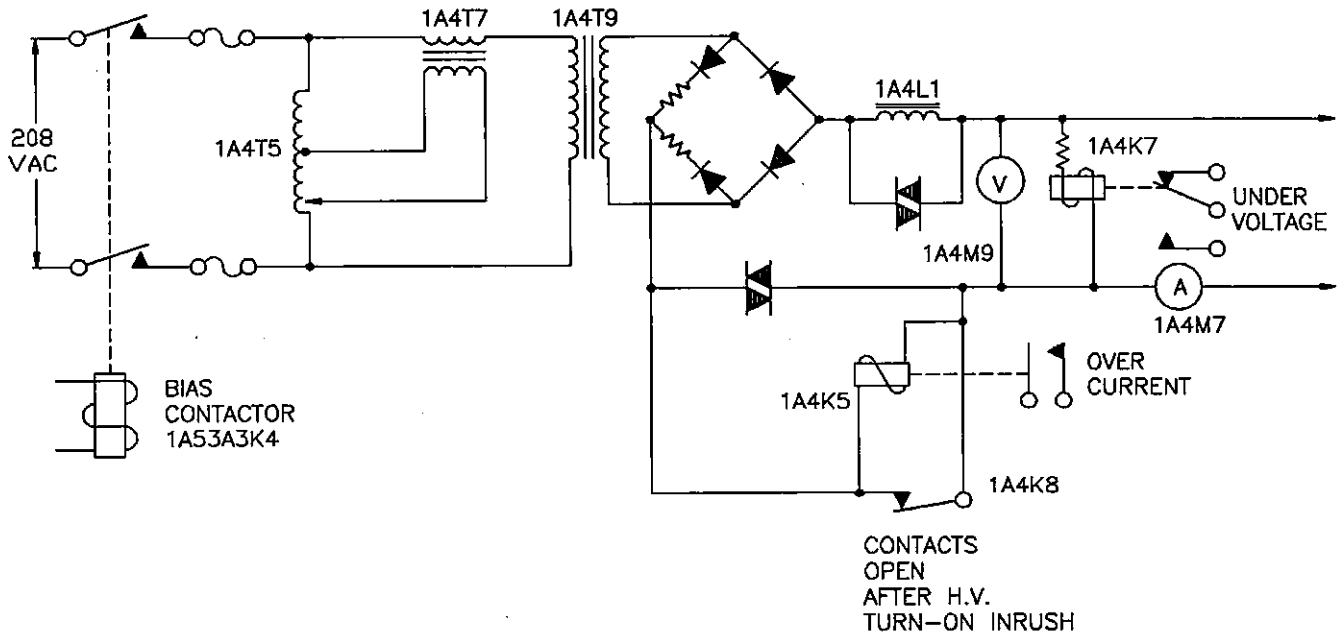


Figure 4-9. Left PA Bias Supply, Simplified Schematic Diagram

- Distributes fused regulated 208 vac 3-phase power to the filament transformers of the PA (1A6).

- Distributes regulated 208 vac 3-phase power to the filament transformers of amplifier group (1A4).

- Provides interface connections between a transmitter group, the Local Control Unit, and remote transmitter control equipment. It receives from the control equipment; Operate/standby and B-Plus command, Emergency Stop command, and triggers. It transmits status information to remote equipment.

4.3.4. **INDICATOR PANEL SB-1894A/FPN-44 (1A12).** This panel (figure 7-31) consists of a switch, indicator lamps, relays, and fuse indicator circuits. The functions of these circuits are as follows:

- The switch (LOCKOUT-READY) circuit selects the operating mode of the Transmitter Group. In normal operation, the switch is set to READY; for test or maintenance the switch may be placed in LOCKOUT which disables all controls external to the transmitter, and prevents operation on the antenna.

- The indicator lamps circuits include relays. These circuits are operated by relays and switches in the amplifier group (1A4), radio frequency amplifier (1A6) and electron tube water cooler (1A2/1A52).

- The fuse indicator circuits provide visual indications of blown fuses in the electrical equipment rack (1A11).

- The relay circuits (part of the system control logic) control filament turn-on, three strike, and emergency stop functions.

4.3.5. **LOW PASS FILTER F-1428/FPN-44A (1A20).** The low pass filter (figure 7-32) tuned to 100 kHz suppresses all harmonics of this frequency. The input circuit consists of the secondary of the PA tank coil and 1A20L1, 1A20L2, 1A20C1, 1A20C2, 1A20C3, and 1A20C4. The output circuit consists of the antenna coupler coil 3L1, and the antenna. The low pass input and output circuits are tuned to 100 kHz and together comprise a band-pass filter which suppresses harmonics of 100 kHz.

4.3.6. **ANTENNA COUPLER CU-2171/FPN-44A.** The antenna coupler (figure 7-49) switches the output of the operate transmitting group to the antenna and the output of the standby transmitting group to the dummy load. It also provides for tuning the antenna to each transmitting group.

The operational status of both transmitting groups is determined by the position of the transmitter control equipment. The TRANSMITTER #1 OPERATE lamp 3DS1 and TRANSMITTER #2 OPERATE

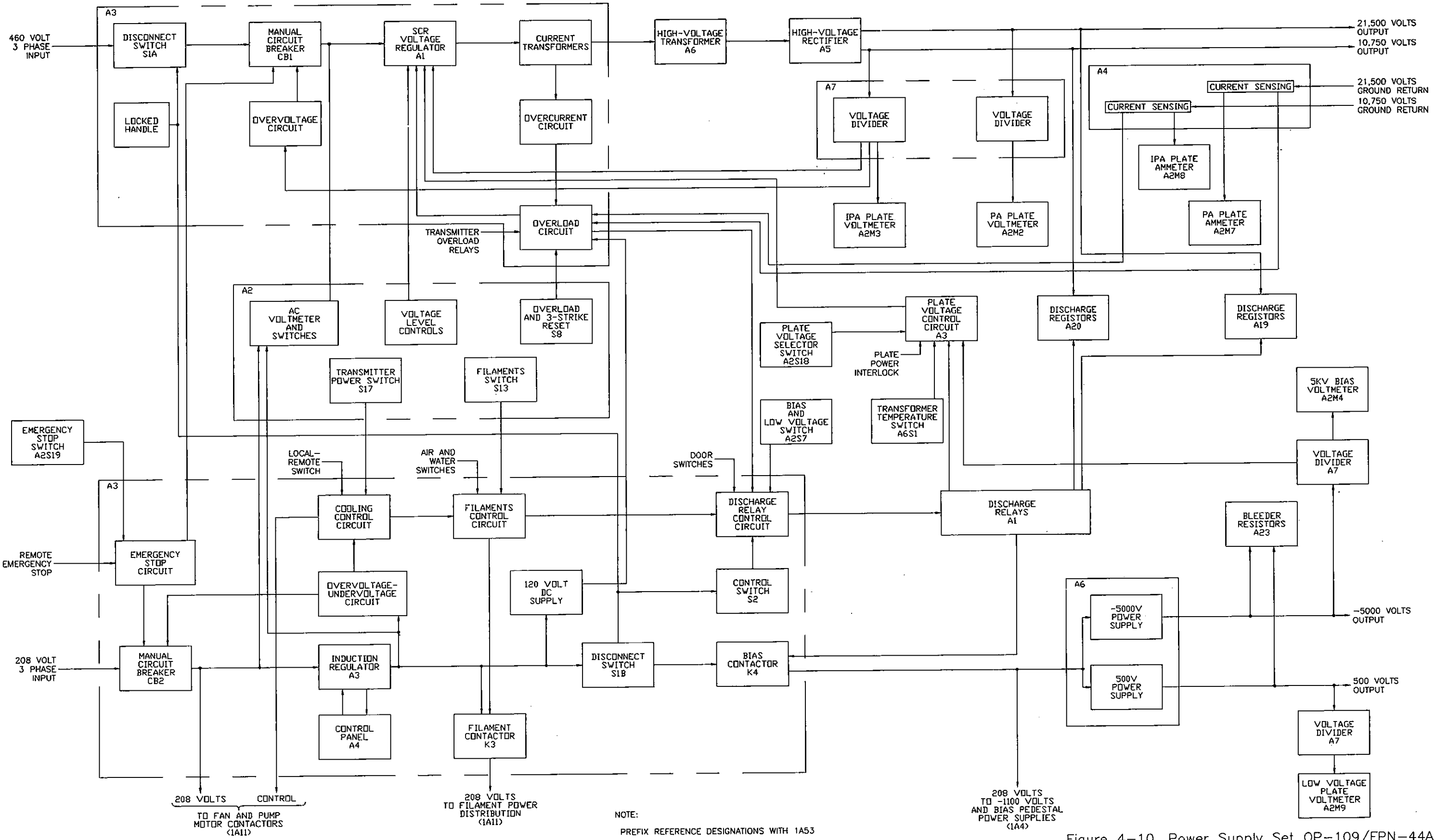


Figure 4-10. Power Supply Set OP-109/FPN-44A (1A53) Detailed Functional Block Diagra

lamp 3DS2 indicate the resultant status.

4.3.6.1. **TRANSMITTER OPERATE CONTROL.** Transmitter operate relay 3K5 or 3K7 is energized by the transmitter control equipment selector. When transmitting group No. 1 is selected, relay 3K5 is energized which, in turn, energizes relays 3K1 and 3K2. When these relays are energized, the following actions occur: The output signal from transmitting group No. 1 is connected to loading coil 3L1. The output signal from transmitting group No. 2 is connected to the dummy load. The ground circuit of transmitting group No. 1 is connected to the counterpoise, and the ground circuit from transmitting group No. 2 is connected to the dummy load. Also, TRANSMITTER #1 OPERATE lamp 3DS1 lights.

When transmitting group no. 2 is selected, relay 3K5 is de-energized and causes relays 3K1, 3K2, and 3K6 to de-energize. Relay 3K7 energizes which, in turn, energizes relays 3K10, and 3K11 and an opposite condition exists.

4.3.6.2. **ANTENNA SHORTING.** Antenna shorting relay 3K6, when not energized, connects the antenna to the grounded counterpoise. This relay is energized by closure of antenna coupler relays for the operate transmitting group; 3K5 and 3K1 for transmitting group No. 2. Furthermore, the PLATE VOLTAGE SELECTOR must be set at MAINT or OPERATE for relay 3K6 to be energized. Auxiliary contacts on relay 3K6 prevent application of plate voltages in the operate transmitting group until the antenna ground has been opened by this relay.

4.3.6.3. **VACUUM RELAYS.** The large vacuum relays, 3K1, 3K2, 3K10, 3K11 and 3K6, are ac operated to the extent that the outputs of built-in semiconductor bridge rectifiers energize the solenoids. This feature provides reliable operation over a wide control-voltage frequency range. These rectifiers are physically located within the relay coil housings.

4.3.7. **ELECTRICAL DUMMY LOAD DA-329A/FPN-44.** The dummy load (figure 7-50) provides the load for the standby transmitting group. The dummy load consists of non-inductive resistors, a coil and capacitor. The resistive load 2.5 ohms, consists of an assembly of thirty-six 2.5 ohm resistors connected in series parallel. A current transformer is provided in the ground return line for remote monitoring. Blower 4B1 is turned on when the plate voltage is on in the standby transmitting group to increase the power dissipation capability of the resistor bank.

4.3.8. **POWER SUPPLY SET OP-109/FPN-44A (1A53).** The power supply set (1A53) consists of the following units identified by nomenclature and reference designation:

- Relay Assembly RE-1112/FPN-44A (1A53A1)

- Control-Indicator C-10034/FPN-44A (1A53A2)

- Relay Assembly RE-1113/FPN-44A (1A53A3)

- Voltage Regulator CN-1473/FPN-44A (1A53A3A1 and 1A53A3A2)

- Voltage Regulator CN-1472/FPN-44A (1A53A3A3 and 1A53A3A4)

- Instrument Shunt MX-9783/FPN-44A (1A53A4)

- Power Supply PP-7305/FPN-44A (1A53A5 and 1A53A6)

- Voltage Divider CN-1474/FPN-44A (1A53A7)

- Resistor Assembly (1A53A19)

- Resistor Assembly (1A53A20)

- Resistor Assembly (1A53A23)

These assemblies supply, control, and monitor:

- Unregulated 208 vac to blower and water pump motors 1B1, 1A4B1, 4B1, and 1A52B1.

- Regulated 208 vac to filament transformers in amplifier group 1A4 and radio frequency amplifier 1A6.

- Regulated 208 vac to -1100 vdc and bias pedestal power supplies in amplifier group 1A4.

- Regulated 21.5 $\pm$ 1% kvdc to PA plate circuits.

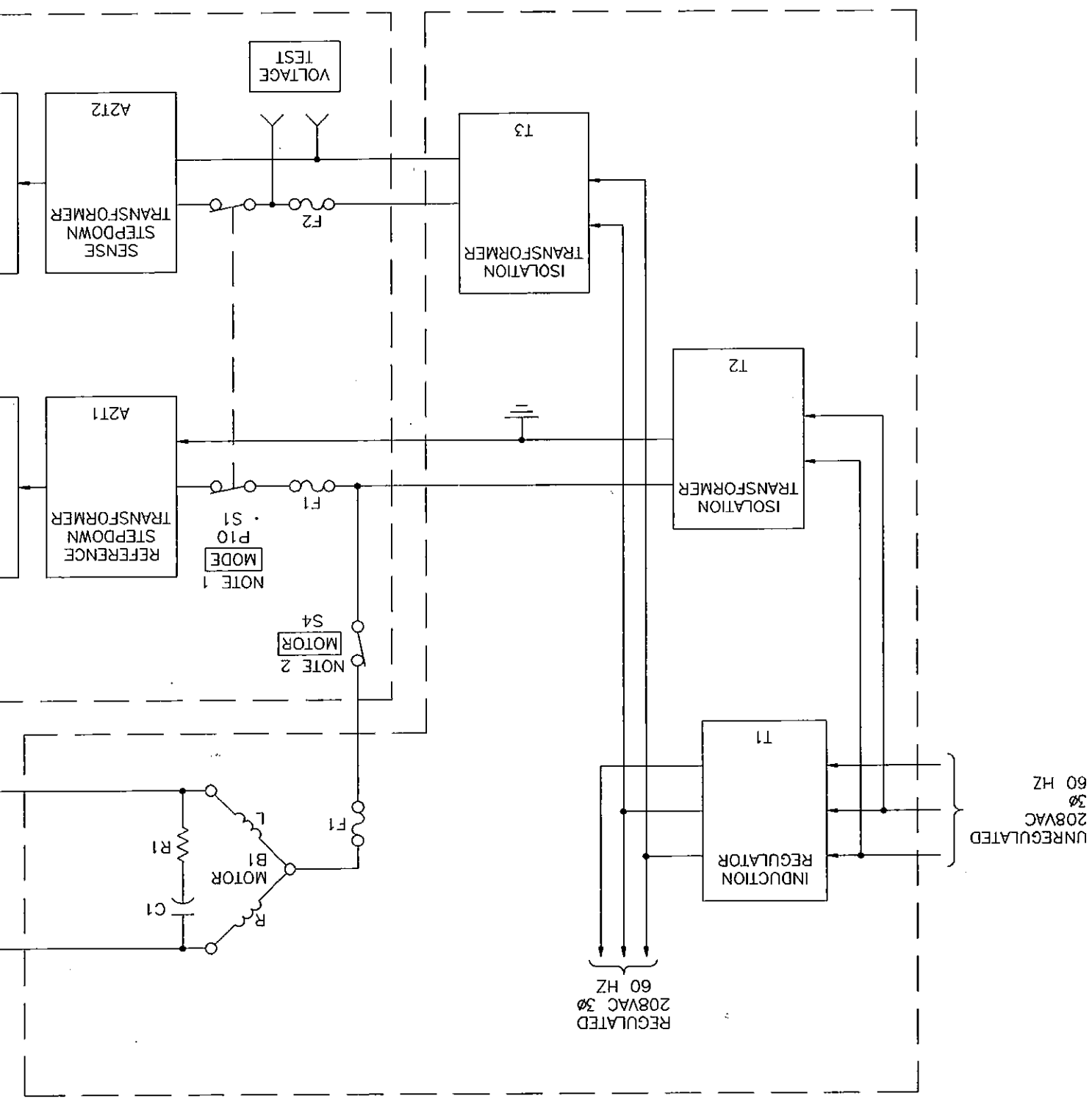
- Regulated 10.75 $\pm$ 1% kvdc to IPA plate circuits.

- Regulated -5 kvdc to second IPA bias circuits.

- Regulated 500 vdc to plate circuits of voltage amplifiers in amplifier group 1A4.

- Regulated 120 vac to transmitter control circuits.

Figure 4-10 shows the functional relationship between the various assemblies and components of the power supply set. The inputs include: 208 vac three phase 50/60 Hz 4 wire; 460 vac three phase 50/60 Hz and control signals from the remote transmitter control equipment and from other assemblies of the associated transmitting group. The outputs include not only the regulated and unregulated power listed previously but also transmitter control signals.


NOTES:
1. MODE SWITCH IN AUTO
2. MOTOR SWITCH ON
VOLTAGE TEST
A2T2
SENSE STEPDOWN TRANSFORMER
T3
ISOLATION TRANSFORMER
F2
A2T1
REFERENCE STEPDOWN TRANSFORMER
NOTE 1
MODE
P10
S1
F1
T2
ISOLATION TRANSFORMER
NOTE 2
MOTOR
S4
F1
MOTOR
B1
R1
C1
T1
INDUCTION REGULATOR
UNREGULATED
208VAC
3Ø
60 HZ
REGULATED
208VAC 3Ø
60 HZ

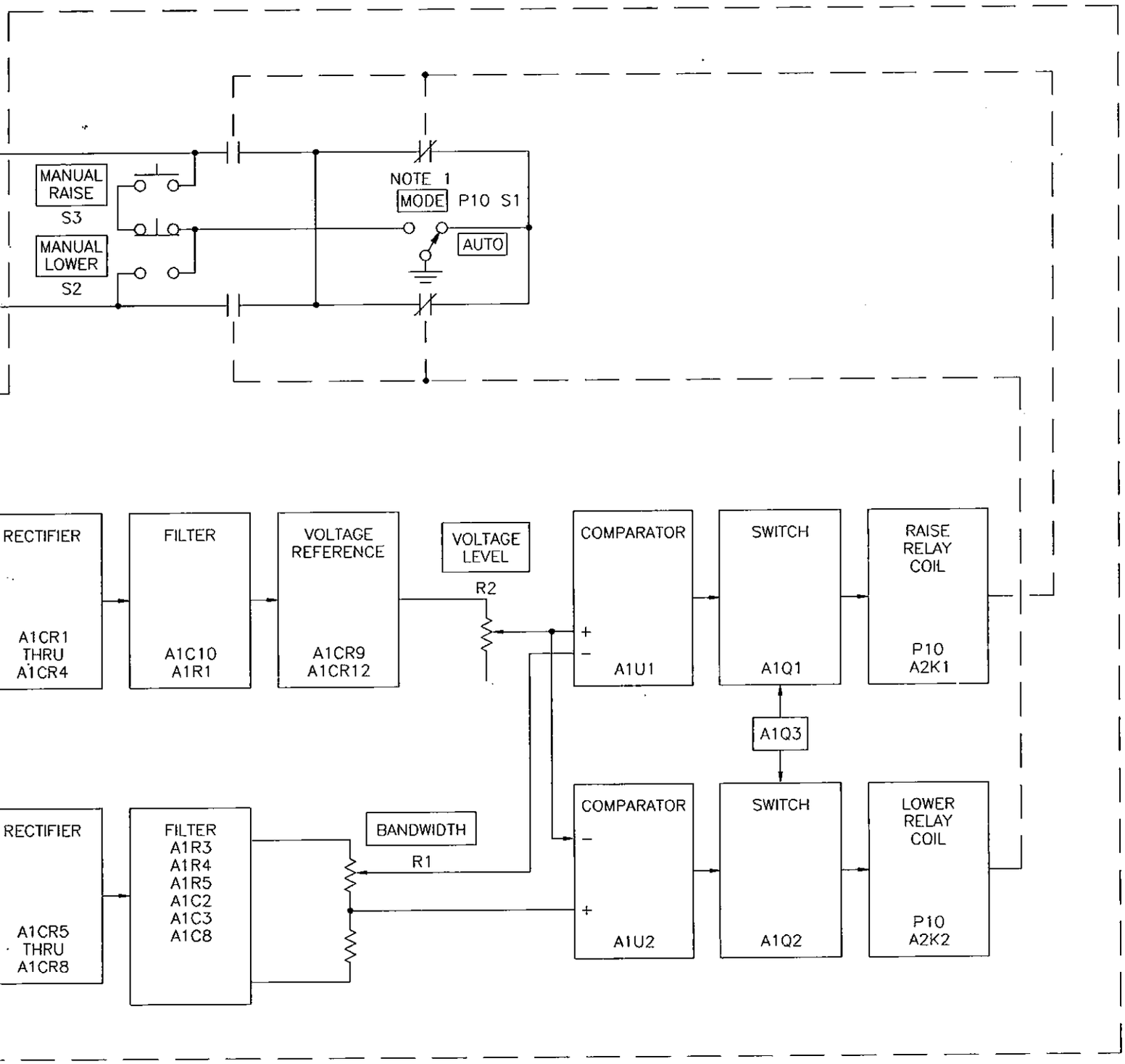


Figure 4-11. Voltage Regulator CN-1472/FPN-44A (1A53A3A3 and 1A53A3A4) Functional Block Diagram

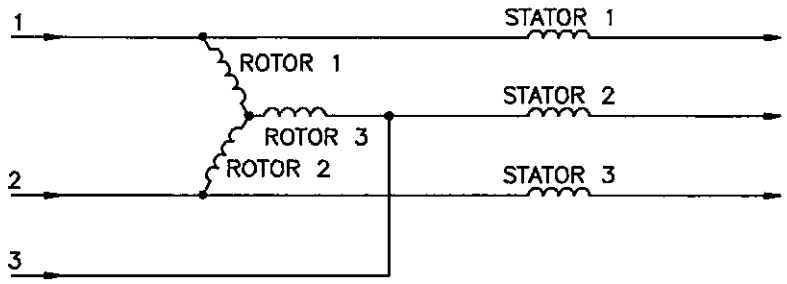
4.3.8.1. **208 VAC CIRCUITS.** Primary-208 vac power is applied to the voltage regulator (1A53A3A3 and 1A53A3A4) via a circuit breaker. The LOCKOUT-READY switch on indicator panel (1A12), water switches in electron tube water cooler (1A2) and radio frequency amplifier (1A6), door and interlock switches, and control-indicator (1A53A2) switches are inputs to the 208 vac transmitter control circuits that enable the sequential distribution of power to the motors, filament, and bias power supplies. Distribution of motor and filament power is controlled by contactors in the electrical equipment rack (1A11). The -5000 vdc and 500 vdc power supplies, part of the 1A53A6 assembly include a step up transformer, rectifier, and filters. Voltage divider networks in 1A53A7 supply sample voltages to meter

circuits on 1A53A2. A -120 vdc power supply powers the three strike circuit, part of the transmitter control circuits.

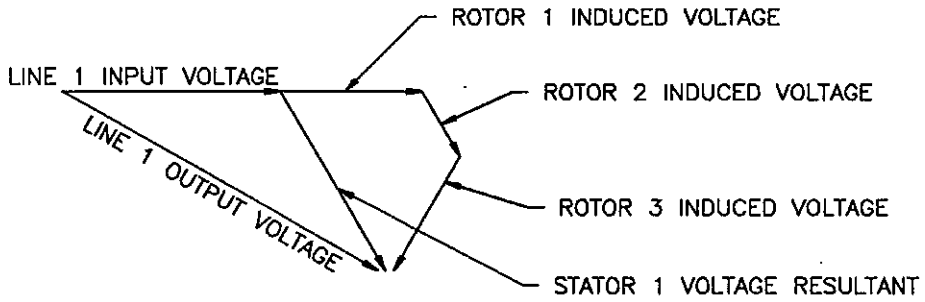
4.3.8.2. **460 VAC CIRCUITS.** Primary 460 vac power is applied to the voltage regulator 1A53A3A1) via a disconnect switch and a circuit breaker. The voltage regulator supplies regulated ac to the high voltage transformer (1A53A6T1) when enabled by the transmitter control circuits. Transformer 1A53A6T1 secondary voltages are rectified but not filtered by the 1A53A3A5 assembly. Voltage divider networks in 1A53A7 supply samples of the plate voltage output to meter circuits in 1A53A2 and to the voltage regulator voltage control circuit. Shunt resistors for the ammeter circuits of 1A53A2 are provided by the 1A53A4 assembly.

4.3.8.3. **TRANSMITTER CONTROL CIRCUITS.** Included on figure 4-10 are the following transmitter control circuits: 208 vac overvoltage/undervoltage, discharge relay control, emergency stop, and three strike overload. The 208 vac overvoltage circuit trips the 208 vac circuit breaker if an overvoltage is sensed for more than two seconds. In normal operation the 208 vac undervoltage circuit recycles the sequential turn-on of power if an undervoltage is sensed for more than two seconds. The discharge relay control circuit controls the discharge of plate voltages through discharge resistors of 1A53A19 and 1A53A20 when the bias voltages are turned off. The emergency stop circuit, which receives inputs from the transmitter control equipment and a control-indicator switch, trips both the 460 vac and 208 vac circuit breakers.

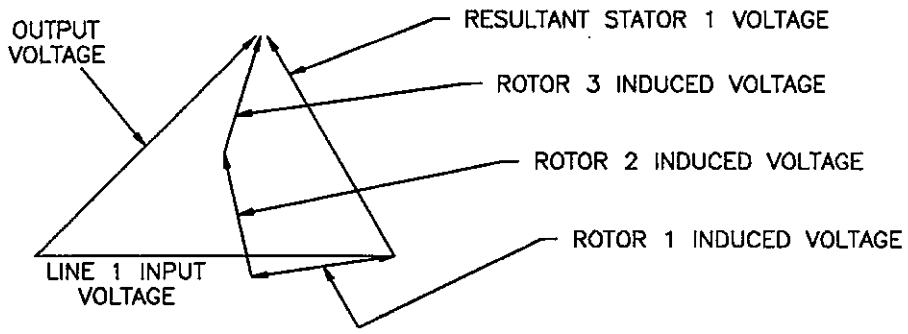
The three strike overload circuits receive inputs from various overload sensing circuits including 460 vac overcurrent 208 vac undervoltage, plate overcurrents, the -120 vdc power supply and transformer temperature switch. When an overload is sensed, the circuit turns off the 460 vac voltage regulator and the bias supplies and then automatically turns them on again after a short interval. Three overloads in 90 seconds turns off these circuits until manually reset by a pushbutton switch on 1A53A2.



A. INDUCTION VOLTAGE REGULATOR



B. SUMMATION OF INDUCED VOLTAGES FROM THREE ROTOR SECTIONS IN A STATOR



C. SUMMATION AS IN B, BUT WITH ROTOR ASSEMBLY ROTATED 180 DEGREES

Figure 4–12. Voltage Regulator CN–1472 FPN–44A, Phase Relationships

4.3.9. **VOLTAGE REGULATOR CN-1472/FPN-44A 1A53A3A3 and 1A53A3A4).** The voltage regulator provides output voltages to ±1 per cent with input line variation of ±10%. The regulated output voltage is adjustable to ±5% of the 208 vac nominal input voltage.

The voltage regulator consists of two assemblies, a regulator (1A53A3A3) and a control panel (1A53A3A4) (see figure 4-11 and schematic diagrams 7-45 and 7-46). The 1A53A3A3 assembly consists of an induction re-regulator T1, isolation transformers T2 and T3, and motor B1. Motor B1, controlled by control panel circuits rotates the rotor winding of T1 to increase or decrease the output voltage. Isolation transformers T2 and T3 supply power to operate the motor B1 and the control panel circuits. The control panel assembly 1A53A3A4 consists of circuits that automatically or manually control the induction regulator.

4.3.9.1. **THEORY.** The operation is as follows (figure 4-12). Windings are provided on both the rotor and stator. The rotor windings are wye connected to the input lines. The stator windings are each connected in series with an output line. As there is inductive coupling between rotor and stator windings, the output voltage at each line consists of the input voltage plus or minus the voltage induced in the associated stator by the rotor. This induced voltage is the vector sum of three voltages, each due to a corresponding rotor section. It should be noted that this resultant induced voltage is constant in magnitude, but at a phase which depends upon the angular position of the rotor. Each component of this induced resultant however, is constant in phase and is the same as that of the line to which the corresponding rotor section is connected.

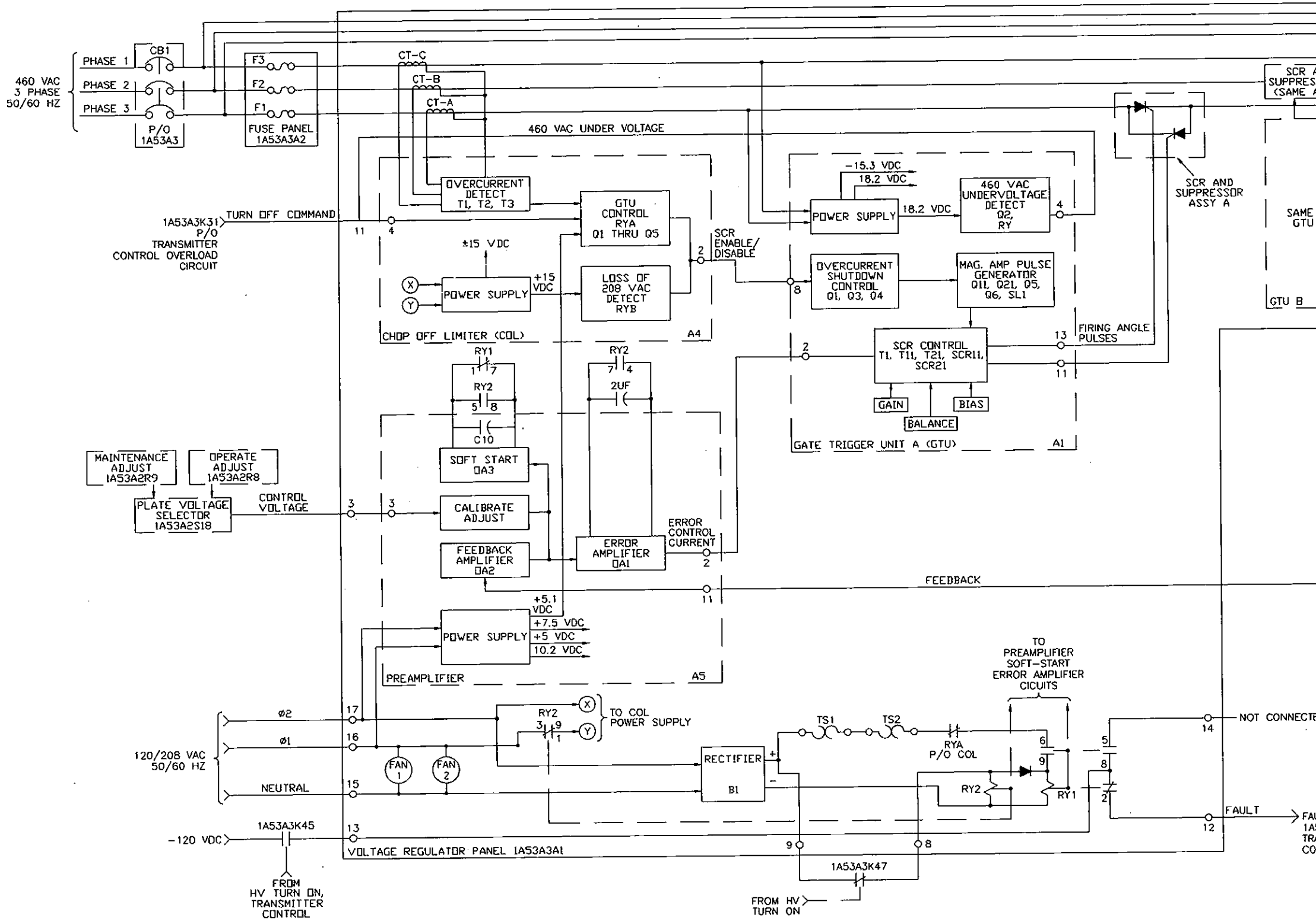
The amplitude and polarity of each induced component, on the other hand, are dependent upon the tightness of coupling and whether it is boosting or bucking the line voltage. The degree of coupling occurs symmetrically between all windings when the rotor is turned by motor 1A53A3A3B1. This coupling symmetry maintains a constant net amplitude in each stator. As the rotor is turned, coupling is reduced from one rotor to a particular stator section but is increased a compensating amount from another rotor section. Thus, the stator section receives a decreasing induced voltage of one phase and an increasing voltage of another phase. The phase of the resultant is then determined in accordance with the laws of vector addition. The induced resultant in turn, adds vectorially to the line voltage at the input of the stator section. The output voltage therefore, is increased or decreased depending upon the phase of the induced resultant stator voltage, which similarly depends upon the angular position of the rotor.

The voltage regulator operates in two modes: automatic (normal) and manual (test or maintenance) In the following description reference designations are abbreviated. Unless otherwise indicated, prefix reference designations with 1A53A3.

4.3.9.2. **AUTOMATIC OPERATION.** When the voltage regulator is in the automatic mode, MODE switch A4S1 is set to AUTO and MOTOR switch A4S4 is set to ON. The regulated output voltage from the induction regulator A3T1 is applied to step down transformer A4A2T2 via isolation transformer A3T3. The transformer output is rectified, filtered, adjusted by BANDWIDTH control A4R1 and applied to operational amplifier comparators A4A1U1 and A4A1U2. The comparators compare this voltage with a reference voltage. The reference voltage is derived from the 208V unregulated input via isolation transformer A3T2, and stepdown transformer A4A2T1. The output of A4A2T1 is rectified, filtered and then stabilized to a fixed voltage by a two stage zener diode circuit A4A1CR9 and A4A1-CR12. The reference voltage is adjusted by VOLTAGE LEVEL potentiometer A4R2 and fed to the comparators. Each comparator operates in the following manner: When the voltage at its (+) input is greater than at the (-) input the output is high (approximately +11V), otherwise it is low (approximately +1V).

When the output of regulator transformer A3T1 decreases, the sense voltage at the (-) input of comparator A4A1U1 decreases below the reference voltage at the (+) input. The high output of A4A1U1 turns on switching transistor A4A1Q1 which energizes the coil of raise relay A4A2K1, closing the raise winding circuit of motor A3B1 to raise the output voltage of A3T1. This raise circuit consists of isolation transformer A3T2, MOTOR switch A4S4, raise winding of A3B1, normally open contact of A4A2K1, normally closed contacts of A4A2K2, and MODE switch A4S1 contacts to ground. The raise winding of A3B1 remains energized until the reference and sense voltages are equal which turns off A4A1U1. The sense voltage at the (+) input of comparator A4A1U2 increases above the reference input at the (-) input. When the output of regulator transformer A3T1 increases, the high output of A4A1U2 turns on switching transistor A4A1Q2 which energizes the coil of lower relay A4A2K2, closing the lower winding circuit of motor A3B1. The lower winding of A3B1 remains energized until the reference and sense voltages are equal which turns off A4A1U2. When one motor winding is connected to A3T2, the other winding is also connected but with A3C1, and A3R1 in series. This provides the phase shift needed to make the motor run in the desired direction.

Transistor A4A1Q3 provides a positive bias voltage of 4 volts to the emitters of A4A1Q1 and A4A1Q2 to ensure that both turn off when the comparator outputs are low or when the control is balanced. Resistors A4A2R20 and A4A2R21 (see figure 7-46) are used to provide positive holding effects. Resistor A4A2R21 and capacitor A4A2C11 compensate for potential transformer regulation during motor start-up by momentarily feeding back sufficient positive voltage to the (+) terminal of comparator A4A1U2, so that A4A1U2 can be kept turned on without chattering. BANDWIDTH potentiometer A4R1 and potentiometer A4R6 provide for the adjustment of the dead band. The dead band is the voltage range around the selected voltage level set by the VOLTAGE LEVEL potentiometer A4R2 inside which the control is


460 VAC 3 PHASE 50/60 HZ
PHASE 1
PHASE 2
PHASE 3
CB1
P/O 1A53A3
F3
F2
F1
FUSE PANEL 1A53A3A2
CT-C
CT-B
CT-A
460 VAC UNDER VOLTAGE
1A53A3K31 P/O TRANSMITTER CONTROL OVERLOAD CIRCUIT
TURN OFF COMMAND
OVERCURRENT DETECT T1, T2, T3
GTU CONTROL RYA Q1 THRU Q5
±15 VDC
POWER SUPPLY
+15 VDC
LOSS OF 208 VAC DETECT RYB
SCR ENABLE/ DISABLE
CHOP OFF LIMITER (COL)
A4
RY1
RY2
C10
2UF
SOFT START DA3
CALIBRATE ADJUST
FEEDBACK AMPLIFIER DA2
ERROR AMPLIFIER DA1
ERROR CONTROL CURRENT
FEEDBACK
MAINTENANCE ADJUST 1A53A2R9
OPERATE ADJUST 1A53A2R8
PLATE VOLTAGE SELECTOR 1A53A2S18
CONTROL VOLTAGE
+5.1 VDC
POWER SUPPLY
+7.5 VDC
+5 VDC
10.2 VDC
PREAMPLIFIER
A5
-15.3 VDC
18.2 VDC
POWER SUPPLY
18.2 VDC
460 VAC UNDERVOLTAGE DETECT Q2, RY
OVERCURRENT SHUTDOWN CONTROL Q1, Q3, Q4
MAG. AMP PULSE GENERATOR Q11, Q21, Q5, Q6, SL1
SCR CONTROL T1, T11, T21, SCR11, SCR21
FIRING ANGLE PULSES
GAIN
BIAS
BALANCE
GATE TRIGGER UNIT A (GTU)
A1
SCR AND SUPPRESSOR ASSY A
SAME
GTU B
TO PREAMPLIFIER SOFT-START ERROR AMPLIFIER CICUITS
TO COL POWER SUPPLY
ø2
ø1
120/208 VAC 50/60 HZ
NEUTRAL
FAN 1
FAN 2
RECTIFIER B1
TS1
TS2
RYA P/O COL
RY2
RY1
NOT CONNECTE
FAULT
-120 VDC
1A53A3K45
FROM HV TURN ON, TRANSMITTER CONTROL
VOLTAGE REGULATOR PANEL 1A53A3A1
1A53A3K47
FROM HV TURN ON

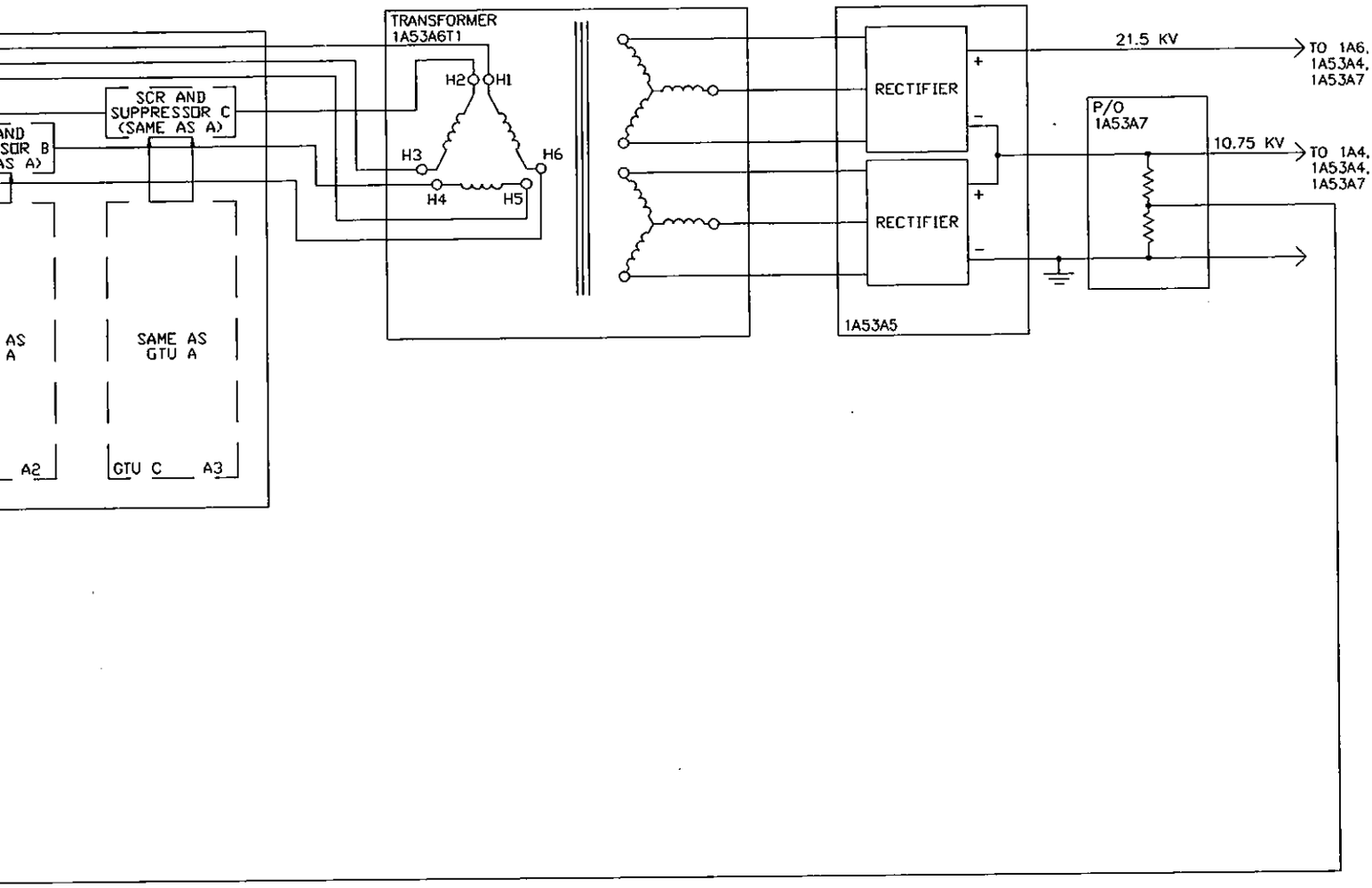
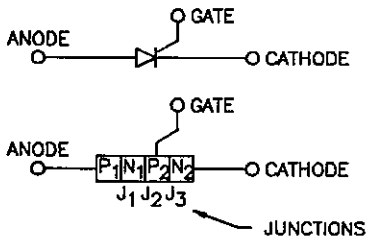
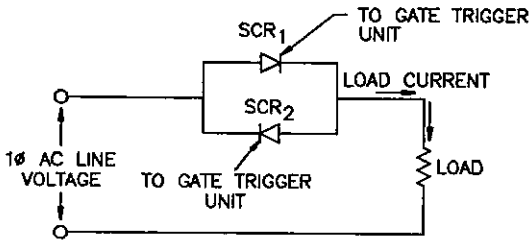


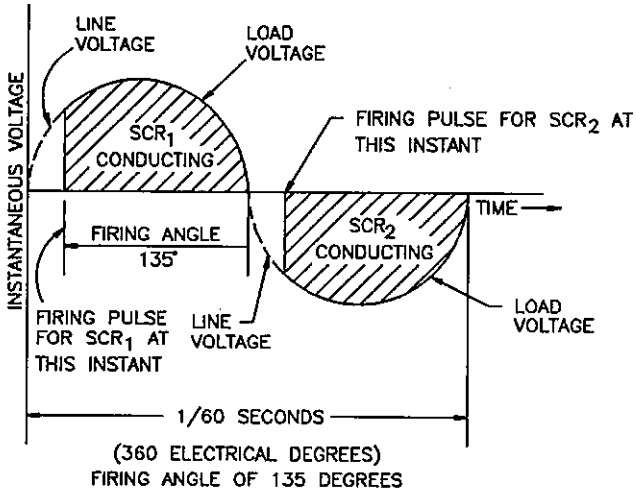
Figure 4-13. Voltage Regulator CN-1473/FPN-44A, (1A53A3A1 and 1A53A3A2) Functional Block Diagram

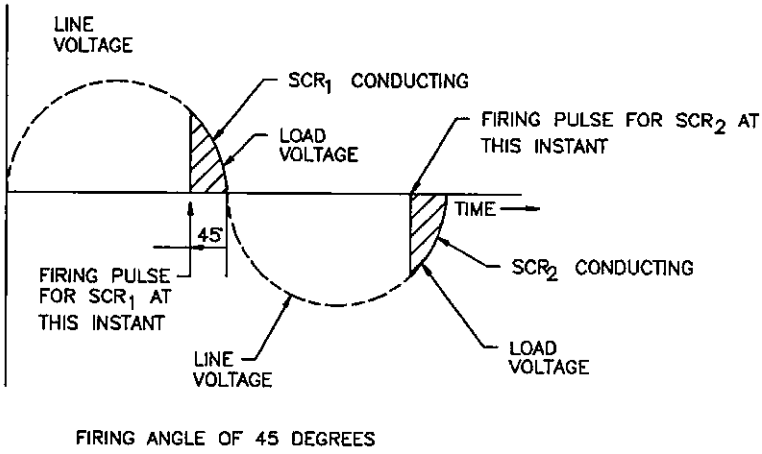


a. SCR SCHEMATIC



b. TYPICAL SCR CIRCUIT FOR SINGLE PHASE AC POWER CONTROL





c. FIRING ANGLES OF 135 AND 45 DEGREES

Figure 4–14. Silicon Controlled Rectifier Operation

at rest and does not call for corrective action raise or lower. The output voltage has to be outside of the dead band range for the control to call for corrective action.

4.3.9.3. **MANUAL OPERATION.** When the voltage regulator is in the manual mode, switch S1 is set to MANUAL, and MOTOR switch S4 is set to ON. Setting the MODE switch to MANUAL disables the sense and reference circuits, thereby disabling voltage regulation capability. Control of motor A3B1 is either by the MANUAL RAISE switch A4S3 or MANUAL LOWER switch A4S2 which increases or decreases the output voltage.

4.3.10. **VOLTAGE REGULATOR CN-1473/FPN-44A (1A53A3A1 and 1A53A3A2).** The voltage regulator (figures 4-13 and 7-41) is a line voltage regulator which regulates the dc output voltage of power supply PP-7305/FPN-44A that supplies 21. 5 kvdc and 10.75 kvdc to the power amplifier and amplifier group circuits. The high voltage is generated by the high voltage transformer whose primary windings are delta connected. The silicon controlled rectifiers (SCR's) are inserted in series with each delta leg. Regulation is accomplished by varying the firing angle of the SCR'S. The voltage regulator operates with an input of 460 vac $\pm$ 10 per cent in an ambient temperature range of 0 to 60°C (32 to 140°F). The voltage regulator incorporates protective and control circuits.

4.3.10.1. **GENERAL THEORY.** The 460 vac voltage regulator employs the silicon controlled rectifiers (SCR) to control line voltage to high voltage transformer 1A53A6T1. The SCR is a solid-state, semiconductor NPNP four-layer device, shown schematically in figure 4-14a. When the anode is negative in polarity with respect to the cathode, the device does not conduct and is in the "blocking" state. The device blocks because junctions J1 and J3 are reverse biased P-N junctions. In order to fire an SCR, a voltage pulse is applied across gate-cathode. If the anode is more positive than the cathode, junctions J1 and J3 are forward biased. The application of positive pulse voltage at the gate causes increased hole velocity in the P2 region, accelerating electrons across the J3 junction and through the P2 region causing breakdown (or firing). Once the SCR is fired, the gate loses control and the device can only be turned off by reducing the anode-to-cathode voltage to approximately zero. In summary, two conditions must be present for SCR firing.

- Anode must be positive with respect to cathode.

- A voltage pulse of sufficient magnitude must be fed to the SCR gate.

The circuit shown in figure 4-14b shows how these two conditions are utilized to fire SCR'S. In this circuit, two SCR's are connected in reverse with respect to each other. When the polarity of the applied ac line voltage of the anode of SCR_1 is

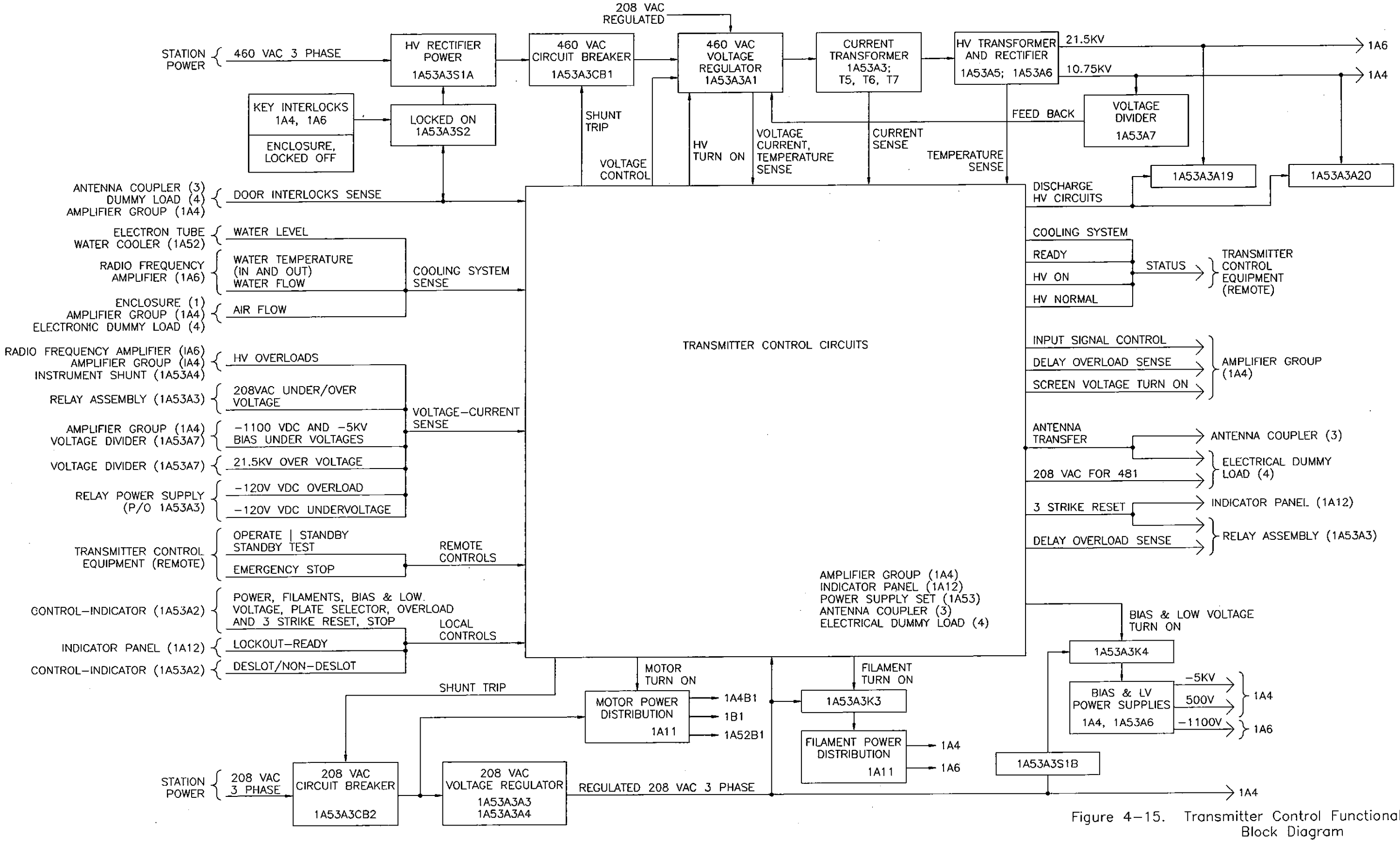


Figure 4-15. Transmitter Control Functional Block Diagram

positive with respect to its cathode, it meets one of the conditions for conduction. Note also that SCR_2 is blocking during this half cycle of line voltage. The firing gate pulse for SCR_1 can be applied at any point in the half cycle with the result that the SCR_1 conducts for the remainder of the half cycle. When the polarity of the line voltage reverses, the anode of SCR_2 is positive with respect to its cathode and causes SCR_2 to conduct for any portion of this half cycle by applying its firing pulse at the proper moment.

Figure 4-14c shows load voltage for two different firing points. Since the voltage drop across an SCR is very slight (approximately one and one half volts), nearly all of the impressed line voltage appears across the load resistance during conduction of each SCR.

Note that if the firing pulse is introduced relatively early in the half cycle, a greater RMS voltage is applied to the load than when the firing pulse is introduced relatively late in the half cycle. Thus by varying the firing pulse over any point in the half cycle, any desired power level within the limits of the voltage control unit can be achieved. The waveforms associated with three phase operation are a composite of those resulting from all three phases and are considerably more complex than those shown for the single phase example of figure 4-14.

The pulse firing circuit in the gate trigger unit of the 460 vac voltage regulator circuit is synchronized to line frequency. The pulse circuit produces symmetrical firing, that is, each SCR fires at the same point in its respective half cycle. This method of power control provides for output voltage control from minimum to maximum.

4.3.10.2. **FUNCTIONAL BLOCK DIAGRAM DESCRIPTION.** A functional block diagram of the 460 vac voltage regulator is shown in figure 4-13. The inputs are: 460 vac, 3-phase, 50/60 Hz; inductrol regulated 208 vac, 50/60 Hz; a control voltage ; a feedback voltage determine the regulated dc level at the output of the high voltage power supply. The relay 1A53A3K47 signal controls the turn on and turn off of the 460 vac voltage regulator. The 1A53A3K31 control signal turns off the regulator when an overload is sensed. The regulator supplies phase angle control of the 460 vac input to the primary of the high voltage transformer 1A53A6T1.

The voltage regulator consists of chassis mounted components and assemblies. The chassis mounted components include two fans, a rectifier (B1), three current transformers, relays RYA and RYB, and associated components. The assemblies consist of three gate trigger units, a chop-off limiter, a pre-amplifier, and three SCR assemblies and suppressor units.

4.3.10.2.1. **BEFORE HIGH VOLTAGE TURN ON.** The following functional

description is presented in the sequence of power and control signal application: 208 vac, 460 vac, and turn-on (relay 1A53A3K47 energized). Before the 208vac is applied the contact configuration of relays RY1, RY2 and 1A53A3K47 are as shown in figure 4-13. When 208 vac is applied the following actions will occur:

- Fans 1 and 2 operate.

- 208 vac power is applied to operate the preamplifier.

- DC relays RY1 and RY2 are simultaneously energized via rectifier B1 and the closed contacts of relay 1A53A3K47.

- RY2 contact 3-9 open, thereby opening the 208 vac supply to the chop-off limiter.

- The loss of 208 vac. detect relay RYB (in the chop-off limiter) contacts remain closed, inhibiting the three gate trigger units.

- Relay RY2 7-4 contacts short out the 2 uf capacitor of the error amplifier circuit in the Preamplifier.

- Relay RY2 5-8 contacts short out capacitor C10 of the soft start circuit in the preamplifier.

- Relay RY1 is latched via temperature switches TS1 and TS2, the closed contacts of relay RYA, and its own contacts 6-9.

- Relay RY1 contacts 8-2 open.

- Relay RY1 contacts 1-7 open across capacitor C10 of the slow start circuit in the preamplifier, however, the capacitor is shorted by the RY2 contacts 5-8.

- A signal from the preamplifier to the chop-off limiter disables the gate trigger units.

4.3.10.2.2. **AFTER HIGH VOLTAGE TURN ON.** When 460 vac is applied shortly after the 208 vac the three gate trigger units are energized. However, since the gate trigger units are disabled by the loss of 208 vac detect relay RYB in the chop-off limiter (see fifth item above), the gate trigger units cannot supply firing pulses to the SCR assemblies. The voltage regulator circuits remain in this state until the blowers, filament and bias voltages are supplied. When these conditions are met, relay 1A53A3K47 is energized and the following actions occur:

- Relay 1A53A3K45 contacts close, however the open (8-2) contacts of RY1 prevent energizing the fault trip relay 1A53A3K31.

- Relay 1A53A3K47 contacts open.

- Relay RY2 drops out but relay RY1 remains energized since it is latched by its contacts 6-9.

- When relay RY2 drops out, its 3-9 contacts close enabling the application of 208 vac power to the chop-off limiter. Since the chop-off limiter is now powered, the loss of 208 vac relay RYB contacts open enabling the three gate trigger units to supply firing pulses to the SCR assemblies.

- The contacts of relays RY1 and RY2 across the external capacitors of the preamplifier are opened.

The normal operation of the voltage regulator circuit is a loop consisting of a feedback signal from a voltage divider network (part of 1A53A7) that senses the 10.75 kv power supply; feedback amplifier OA2 and error amplifier OA1 in the preamplifier; SCR control circuits in gate trigger units: SCR assemblies associated with each gate trigger unit; the high voltage transformer 1A53A6T1 and its associated rectifiers and voltage divider networks.

Regulation operation begins with an initial error current signal from the preamplifier to the gate trigger units. The error current signal is a function of the difference between the control voltage manually selected by either the MAINTENANCE ADJUST control or the OPERATE ADJUST control located on the control-indicator 1A53A2 and the feedback signal from the voltage divider. Since the feedback signal from the voltage divider network of 1A53A7 is initially zero before the gate trigger units supply firing angle pulses, the error signal would be high. A high error signal would cause a high inrush of 460 vac power into the primary of 1A53A6T1 To prevent damage to circuit components due to these power surges, a soft start circuit in the preamplifier generates a ramp voltage on turn-on such that the error signal is initially small and gradually increases to the voltage level commanded by the manual controls. The error current signal is applied to the SCR control circuits of the gate trigger units. Each SCR control circuit generates firing angle pulses which are synchronized to the line and are applied to a pair of SCR's that are in the delta leg of the high voltage transformer 1A53A6T1. The firing angle pulses control the on time of each half cycle of line voltage.

4.3.10.2.3. **PROTECTION CIRCUITS.** In addition to the voltage regulation, the regulator includes circuits that provide protection against the following conditions:

- 460 vac voltage transients.

- 460 vac overcurrents.

- 460 vac undervoltage.

- Loss of 208 vac in the chop-off limiter.

- Overtemperature in the regulator.

- Transmitter overloads.

Each of these conditions, except 460 vac voltage transients, causes the shutdown of the gate trigger units. The bias and low voltage circuits are also shut down via energized relay 1A53A3K31 except for loss of 208 vac.

1. 460 VAC TRANSIENTS. The pair of SCR's in each SCR assembly is protected against 460 vac transients by a suppressor network consisting of a selenium element and a resistor-capacitor network. When a transient occurs, the suppressor network bypasses the high voltage around the SCR'S. In operation, the suppressor presents a high impedance up to a given voltage. Above this voltage its impedance falls off, providing a low impedance path for a voltage transient.

2. 460 VAC OVERCURRENT. The 460 vac overcurrent circuit consists of three current transformers CTA, CTB, CTC; the overcurrent detect, and the gate trigger unit control circuits in the chop-off limiter. The outputs of the current transformers are sensed by overcurrent detect circuits in the chop-off limiter.

When the output of any current transformer is above a preset reference, a signal is generated which is applied to the gate trigger unit control circuits. These circuits, consisting of solid-state switches Q1 through Q5 and relay RYA, generate an SCR disable signal and energize relay RYA. The following actions result:

- The SCR disable signal, applied to each gate trigger unit, inhibits the generation of firing angle pulses, thereby shutting down the input to high voltage transformer 1A53A6T1.

- When relay RYA is energized, its contacts which are in the latching circuit of relay RY1, opens de-energizing relay RY1. RY1 contacts 8-2 close, thereby supplying a fault signal to the fault trip relay 1A53A3K31. The subsequent opening of relay 1A53A3K45 permits 1A53A3K31 to drop out.

3. 460 VAC UNDERVOLTAGE. The 460 vac undervoltage circuit consists of an undervoltage detect circuit in each gate trigger unit and the gate trigger unit control circuit in the chop-off limiter. When an undervoltage detect circuit in any one of the gate trigger units detects and undervoltage, a signal is sent to the gate trigger unit control circuit in the chop-off limiter which generates the same outputs as when it receives an input from the overcurrent detect circuits.

4. LOSS OF 208 VAC. The loss of 208 vac detect relay, RYB, in the chop-off limiter keeps the gate trigger units off in the interval between the application of 208 vac and the energizing relay 1A53A3K47. Once the gate trigger units are enabled by the application of 208 vac to chop-off limiter, relay RYB monitors the +15 vdc chop-off limiter power supply. If the power supply voltage falls below RYB's drop-out voltage, the RYB closed contacts send an SCR disable signal to the gate trigger units.

5. OVERTEMPERATURE. The overtemperature circuit consists of temperature switches TS1 and TS2, relay RY1 and the gate trigger unit control circuit in the chop-off limiter. When either switch opens because of an overtemperature condition in the regulator, the relay RY1 latching circuit opens, which de-energizes relay RY1. Contacts 1-7 on relay RY1 close across the soft-start ramp capacitor A5C10 to shut down the voltage regulator. Contacts 8-2 on relay RY1 energize the fault trip relay 1A53A3K39.

6. TRANSMITTER OVERLOADS. Any Overcurrents sensed by the transmitter overload relays operate relay 1A53A3K31 resulting in the generation of a turn-off command which is applied to the gate trigger unit control circuit of the chop-off delimiter. Subsequent actions are the same as for a 460 vac overcurrent, described previously.

4.3.10.3. **GATE TRIGGER UNIT, DETAILED DESCRIPTION.** Each of the three identical gate trigger units (figures 7-42 and 4-13) provides phase shifted pulses for two SCR gates in response to the error current signal received from the preamplifier. The SCR firing angle is a function of the error current from the preamplifier. Each gate trigger unit contains the following functional circuits.

- Magnetic amplifier pulse generator and SCR control circuits.
- Overcurrent shutdown circuit.
- Undervoltage shutdown circuit.
- Zener regulated power supply.

The power supply consists of transformer, T1, rectifier diodes D7 through D10, resistors R1 and R2, capacitors C1 and C2, and zener diodes D1 through D4. The circuit provides regulated +18.2 $\pm$10% vdc and -15. 3 $\pm$10% vdc. An additional dc output is provided to the undervoltage detector from the cathodes of diode D7 and D9.

For 60 Hz operation, terminals 5 and 6 are jumpered so that factory selected resistors R3 and R100 are in parallel: for 50 Hz operation this jumper must be removed.

The magnetic amplifier and pulse generator and SCR control circuits are composed of transistors Q5, Q6, Q11, and Q21, magnetic amplifier SL1, pulse transformers T11 and T21; silicon control rectifiers SCR11 and SCR21; and two windings (6-7, and 8-9) of power transformer T1. The error current signal from the preamplifier is series connected to the SCR control circuit via terminals 1 and 2 on all three gate trigger units.

Transistor Q6, which receives the error signal, is a common base amplifier and provides full control output for a nominal input current of 3 ma dc. Potentiometer P2 sets the bias point of Q6 to obtain three phase firing angle tracking when operating the near zero transmitter output voltage. Transistor Q6 drives the base of Q5. Potentiometer P3 provides a small variation of Q6 collector load resistance for gain adjustment for three phase tracking near full output. Collector current of Q5 flows through the common 600 turn control winding on magnetic amplifier cores SL1. R72 is a factory selected biasing resistor. Control winding current establishes the reset flux level for the magnetic amplifier cores and determines the firing delay and phase of the final gate pulses.

Q11 and Q21 drive the two gate windings of magnetic amplifier SL1. The bases of Q11 and Q21 clip the SINE wave from T1 (pins 10, 12), via D14, R15, and D24, R25. The two windings receive gating voltage on opposite half cycles of the ac supply. Resistors R19, R14B, R24 and R24B are factory selected for optimum balance, tracking and freedom from spurious triggering.

During the gating half cycle, each core integrates flux (volt-seconds) until it saturates. The saturation point is determined by the amount of reset current (flux) set by the control current from Q5. The phase forward or lead of the saturation point from the end of the gating half cycle is roughly proportional to control current from the Preamplifier. When either core saturates, a current pulse flows through pulse transformer T11 or T21 primary. Resistance dividers R101, R102 and R103/R104 couple the pulse outputs to external test points at terminals 15 and 16.

Two isolated 20v secondaries on T1 provide voltage to the gating circuits. Resistor R11 is a current limiter for the voltage multiplier C11, D11, D12 and C12. This circuit functions to provide a continuing source of gating voltage near zero cross-over points in the line waveform. Capacitors C12 and C13 in combination provide a high initial current capability once a gate pulse is initiated.

Gating pulses are started by a gate signal to auxiliary SCR11 via T11 secondary when mag amp SL1 saturates. C15 and C12 provide noise immunity for SCR11. When SCR11 is fired, it delivers a high amplitude output pulse (20v, 2a) across +terminal 11 and

-terminal 12; R13 provides noise immunity for the main SCR gated from terminals 11 and 12. At the end of the half cycle SCR11 drops out of conduction. The sequence just described occurs every other half cycle of supply voltage. SCR21 and associated components comprise an identical channel for the opposite half cycles and are used to gate the companion main SCR.

The 460 vac undervoltage detector circuit includes transistor Q2 and relay RY. Transistor Q2 is biased on by current through R69 and biased off by current through R66 and R67 from the voltage across zener diode D61. Resistor R67 is selected so that Q2 is biased on for line voltage above 65 per cent of nominal consequently, relay RY is normally energized. When line voltage drops below 65 per cent of nominal RY is de-energized, which shorts terminals 3 and 4. These terminals are connected to terminals 3 and 4 of the chop-off limiter, which causes the transmitter to shut down.

A fault signal generated by the chop-off limiter closes a circuit between terminals 1 and 8. Q4 is biased on which turns on transistor Q3, which shorts the base of transistor Q1 to common. This action reduced the clipped SINE wave drive to Q11 and Q21 to zero thereby disabling the SCR control circuit.

4.3.10.4. **CHOP-OFF LIMITER DETAILED DESCRIPTION.** The chop-off limiter (figure 7-43) consists of a power supply, an overcurrent detect circuit a gate trigger unit control circuit and a loss of 208 vac detect circuit. The power supply provides ±15 vdc operating, voltage for chop off limiter circuits.

The overcurrent detect circuits sense overcurrents in the 460 vac input lines. The gate trigger unit control circuit enables and disables the gate trigger units. In addition, a signal is supplied to transmitter control circuits to turn off the bias power supplies. The loss of 208 vac detect circuit monitors the +15 vdc power supply output. When 208 vac is lost the +15 vdc drops to 0 vdc.

The power supply consists of a stepdown, center-tapped transformer T11, rectifier diodes D15 through D18, filter capacitors C2 and C3, resistors R4 and R5, and 15 volt Zener diodes Z1 and Z2. The circuit forms a pair of symmetrical positive and negative regulated power supplies. Each power supply has an output voltage of +15±% vdc.

The overcurrent detect circuit consists of current transformers T1, T2 and T3, rectifier diodes D1 through D13, resistor R1, and capacitor C1. The inputs to T1, T2 and T3 are from the 5 ampere secondaries of line current transformers CTA, CTB, CTC. Input currents are transformed to low current high voltage signals by transformers T1, T2, T3 and diodes D1 through D12 connected as bridge rectifiers. Resistor R1 is the common

load resistor for the three current detect circuits. Diode D13 and capacitor C1 form a filter that removes short duration line current transients.

The gate trigger unit control circuit consists of transistors Q1 through Q5 and their associated components, SCR1, and SPST relay RYA. The circuit receives signals from the overcurrent detect, the three gate trigger units, the external transmitter overload circuit and the preamplifier.

Input current as represented by the drop across R1 is compared to adjustable reference voltage on potentiometer P1. Resistors R2 and R3 form a voltage divider to the base of Q1. When the input current signal exceeds the reference, the base of Q1 goes positive and Q1 conducts. Q1 turns on Q5 and Q5 then turns on Q2. As the collector of Q5 goes high, current through R11 and C4 maintains Q1 in conduction until the voltage at C4 rises to the conduction threshold of Q3. This action insures a continuing signal following a momentary overload. Reset of Q3 occurs after 50 ms.

As Q5 collector goes high, C5 charges and Q4 is also driven into conduction. C5 then discharges through Q4 and R20 to gate SCR1 on and pick up RYA. SCR1 continues to conduct until the 208 vac input is turned off. Contacts of RYA are used via terminals 5-6 to open the latching circuit of relay RY1 on the main voltage regulator chassis, thereby sending a fault signal to the transmitter overload circuit. When Q2 turns on and saturates, a short is placed across terminals 1-2 which is used to inhibit gating pulses to the power SCR'S. A detected overcurrent thus results in immediate cessation of gating pulse.

The inputs from gate trigger units and the transmitter overload circuit appear as a short circuit across terminals 3 and 4. When this occurs, the current through diode D24 turns on transistor Q1.

This results in circuit operation identical to an overcurrent input, except that the input circuit is independent of the setpoint of potentiometer P1. When 208 vac input power is first applied, an input from the preamplifier appears at terminal 13. Charging current of capacitor C12 activates Q1 and inhibits the gate trigger unit.

The loss of 208 vac detect circuit consists of SPST relay RYB and current limiting resistor R24. Relay RYB, in series with resistor R24, is across the +15 vdc supply. When the +15 vdc is lost, relay RYB is de-energized, and its contacts short terminals 1 and 2. These terminals, when shorted, disable the gate trigger units.

4.3.10.5. **PREAMPLIFIER DETAILED DESCRIPTION.** The preamplifier

(figure 7-44) supplies an error signal that controls the firing angle pulses generated in the gate trigger units. The error signal is the difference between the feedback signal from the voltage divider 1A53A1 and the high voltage level selected by either the MAINTENANCE ADJUST or OPERATE ADJUST controls on the control-indicator 1A53A2. Preamplifier circuits consist of a power supply, a feedback amplifier, a reference circuit, soft start, and error amplifier.

The power supply consists of transformer T1, rectifier diodes D1 through D4, filter capacitors C1 and C2, resistors R1 and R2, and 7.5 v zener diodes D5 through D8. The circuit forms a pair of symmetrical positive and negative regulated power supplies. Each power supply has an output of 15 $\pm$10% vdc which are supplied to operational amplifiers OA1, OA2 and OA3. Another power supply circuit resistor R3 and 5.1 v zener diodes D9 and D10, provide a 10.2 $\pm$5% vdc regulated supply to the reference circuit. In addition, a 7.5 $\pm$10% vdc supply is provided for the timing circuit of the operational amplifier OA3, and 5.1 vdc $\pm$ 5 percent output from D9 is supplied to the chop-off limiter to activate it on initial turn-on.

The feedback amplifier circuit consists of operational amplifier OA2 and its associated components. The amplifier's input at terminal 11, is amplified and inverted. The amplifier's gain is unity. R-f isolation is provided by r-f choke RFC2 and capacitor C37. Capacitor C19, C20, and associated resistors reduce the feedback ripple.

The reference circuit, a voltage divider network, consists of calibration potentiometer P2 and the control voltage adjustment MAINTENANCE ADJUST or OPERATE ADJUST potentiometer. The input to terminal 3 is filtered by r-f choke RFC1 and capacitor C33. Resistor R19 terminates the circuit if the input to terminal 3 is opened and forces a zero volt output. Potentiometer P2 (calibrate) provides a means of calibrating to, compensate for zener diode and external potentiometer tolerances.

The control voltage at the junction of R17 and R18, selected by either the MAINTENANCE ADJUST or OPERATE ADJUST potentiometer, is applied to error amplifier OA1 after an interval determined by the soft start circuit. The soft start circuit consists of inverting operational amplifier OA3 and a timing circuit consisting of capacitor C10 and 3.0 megohm resistor 1A53A3A1R1 connected at terminals 12 and 13. The circuit generates a fast rising ramp voltage each time the high voltage is turned on, which occurs when relay RY1 is energized. When the high voltage is off, contacts of relay RY1 short capacitor C10, and the output of OA3 at pin 6 is held to -1.4 vdc by the voltage drop across diodes D13 and D14. The anode of diode D12 is thus held to -0.7 vdc and the command voltage at the junction of R17 and R18 is thus clamped to this level. This generates a zero current error signal. When

relay RY1 is energized, removing the short across C10, it charges from the 7.5 vdc power supply through the externally mounted 3 megohm resistor 1A53A3A1R1. As the capacitor charges, the output at terminal 6 of OA3 rises to approximately +8.4 vdc. This back biases D12 and allows the input error signal to take command. The rise time in seconds to reach the set voltage output is approximately equal to 5 x R (3.0 megohms); that is, 15 seconds.

The error amplifier, operational amplifier OA1, amplifies the voltage difference between the control voltage at the junction of resistors R17 and R18, and the amplified inverted feedback voltage at resistor R13 and produces a filtered error voltage. An external integrating 2.2 μf capacitor 1A53A3A1C1 is connected at terminals 14 and 16. This capacitor is initially shorted by relay RY2 contacts to reduce the gain of OA1 during the soft start. This capacitor determines the bandwidth of the voltage regulator. The high frequency roll-off point (3 db down) is given as approximately f/Hz = 2/c microfarads up to the upper limit of 5 Hz. The error signal also appears on terminal 15 and is connected to an external test point. Maximum transmitter high voltage output is obtained when the voltage error signal at terminal 2 is -7.5 vdc.

4.3.11. **POWER SUPPLY PP-7305/FPN-44A (1A53A5 and 1A53A6).** The power supply (1A53A5 and 1A53A6) (figure 7-35) supplies 21.5 kvdc, 10.75 kvdc, -5000 vdc, 500 vdc and $\pm$26 vdc.

The +21.5 kvdc and -10.75 kvdc outputs are produced by rectifying the outputs of the 3-phase transformer 1A53A6T1 with silicon diode assemblies 1A53A5CR1 through 1A53A5CR12 each having a peak inverse voltage rating of 34000v. The high voltage transformer has two sets of secondary windings, each set being connected to diode assemblies arranged in a three phase, full-wave bridge configuration. 1A53A5CR1 through 1A53A5CR6 comprise one bridge and 1A53A5CR7 through 1A53A5CR12 comprise the second bridge. The two bridges are connected in series with each producing a nominal 10750 vdc.

Metal oxide varistors (MOV's) 1A53A5RV1 through 1A53A5RV18 and 1A53A5RV19 through 1A53A5RV36 are placed across the outputs of both rectifier bridges to absorb any excessive transient voltages that may be developed due to switching or shorting, of the power supply. Each MOV has a conduction point of approximately 1650 volts and is capable of absorbing 80 joules of energy. Each bridge is thus protected from transients that would exceed 29700 v (18 x 1650v).

The -5000 vdc, +500 vdc and $\pm$24 vdc outputs are produced by a power supply module (1A53A6A1) which is mounted on the cover of the high voltage transformer. Both the -5000 vdc and +500 vdc supplies utilize three phase, full-wave bridge rectifiers followed by choke input filters in the conventional configuration. The $\pm$24

vdc which is used by the 1A53A4 and 1A53A7 units is produced by 1A53A6A1A1CR19 through 1A53A6A1A1CR24 in conjunction with a wye connected secondary (terminals R1O, R11, R12, and R13 of 1A53A6A1T2). The neutral of this three phase wye (terminal 13) is brought out and is the common side of both 24 vdc supplies. The positive voltage is then produced by 1A53A6A1A1CR19, CR21 and CR23, and the negative voltage produced by 1A53A6A1A1CR20, CR22, and CR24, both sets operating as a three phase, halfwave rectifier. Filtering of these 24 vdc supplies is accomplished by 1A53A6A1A1C1 and C2 acting as capacitor input filters, 1A53A6A1R1 and R2 of this assembly function as bleeder resistors.

The output of the two high voltage supplies is governed by the 460 vac voltage regulator (1A53A3A1). These supplies have nominal outputs of 21.5 kvdc and 10.75 kvdc. When the three phase input voltage to the low voltage power supplies is 208 vac line-to line the output voltages are:

Terminal E2(-)	to TB1 -4(+)	5150 vdc ± 1% at 0.2 adc
Terminal E1(+)	to TB1 -5(-)	505 vdc ± 1% at 0.5 adc
Terminal TB1-6(+)	to TB1 -7(-)	24 vdc ± 5% at 0.1 adc
Terminal TB1-8(-)	to TB1 -7(+)	24 vdc ± 5% at 0.1 adc

A thermostat (1A53A6S1), attached to the high voltage transformer (1A53A6T1), senses the temperature of the transformer. When the temperature is above a safe limit, the thermostat opens, which turns off the high voltages and OVERTEMPERATURE PLATE TRANSFORMER indicator lamp 1A53A2DS11.

4.3.12. **RELAY ASSEMBLY RE-1112/FPN-44A (1A53A1).** Relay assembly (1A53A1) (figure 7-45) consists of two high voltage relays (1A53A1K1 and K2) which are normally closed when power is removed from the relay coils. These relays are energized during normal operation of the power supply. When the power supply is de-energized, power is removed allowing them to close and complete a relatively low resistance path across the 21.5 kvdc and 10.75 kvdc supplies. Auxiliary contacts are provided on the relays to enable high voltage turn on only after the relays have been energized. Power for the relay coils is 120 vrms, 45 to 66 Hz.

4.3.13. **RESISTOR ASSEMBLY (1A53A19).** Resistor assembly (1A53A19) (figure 7-35) consists of eight (6000-ohm) non-inductive power resistors in a series parallel configuration to produce a total resistance of 12000 ohms. This resistor network is connected between the 21.5 kvdc output of the high-voltage supply and 1A53A1K1. In the normal operation of the power supply system, the relays contacts of 1A53A1K1 are open and no current flows through 1A53A1. When power is removed from the system, 1A53A19 is placed across the high voltage supply discharging the capacitors in the 21.5 kvdc circuit.

4.3.14. **RESISTOR ASSEMBLY (1A53A20).** Resistor assembly (1A53A20) (figure 7-35) consists of eight 1500-ohm non-inductive power resistors in a series parallel configuration to produce a total resistance of 3000 ohms. This resistor network is connected between the 10.75 kvdc output of the high voltage supply and 1A53A1K2. In normal operation, the relay contacts of 1A53A1K2 are open and no current flows through 1A53A20. When power is removed from the system, 1A53A20 is placed across the high voltage supply, discharging the capacitors in the 10.75 kvdc circuit.

4.3.15. **RESISTOR ASSEMBLY (1A53A23).** Resistor assembly (1A53A23) (figure 7-35) consists of two sets of four resistors in series-parallel that serve as bleeder resistors for the -5000 vdc and +500 vdc power supplies. The network contained between terminals E1 and E2 of 1A53A23 is composed of 200K ohm resistors arranged to produce a total resistance of 200K ohms. The network contained between terminals E3 and E4 is comprised of 10K ohm resistors to produce a total resistance of 10K ohms.

In operation the 200K ohm portion is connected across the -5000 vdc supply and draws approximately 0.025 adc: the 10K ohm portion is connected across the +500 vdc supply and draws approximately 0.050 adc. These resistive loads across the power supplies discharge the filter capacitors 1A53A6A1C1 and C2 when the system is deactivated and maintain the required no-load to full-load regulation of 8 per cent maximum for the -5000 vdc supply and 15 per cent maximum for the +500 vdc supply.

4.3.16. **INSTRUMENT SHUNT MX-9783/FPN-44A (1A53A4).** The Loran Transmitting Set AN/FPN-44A uses several instrument shunts all operating on the same concept. The description presented below reflect the details of one. Instrument shunt (1A53A4) (figure 7-47) provides the shunts for monitoring the current for the 21.5 kvdc and 10.75 kvdc power supplies as well as providing overcurrent sensing for these power supplies.

The unit consists of a meter shunt assembly (1A53A4A3) and transistor relay driver circuits (1A53A4A2). The transistor circuitry is powered from the output of a pair of integrated circuit voltage regulators (1A53A4A1) which are powered from the ± 26 vdc outputs of the 1A53A6A1 assembly.

The return path of the 10750 vdc load current is through 1A53A4E1 and the return path of the load current of 21500 vdc load current is through 1A53A4E2. Terminals 1A53A4E3, E4, E5, E6 and E7 provide the common ground point terminals for the entire system. Load current flowing in the 10750 vdc circuit develops a voltage across the shunt 1A53A4A3R1 and the two 0.1 ohm paralleled resistors 1A53A4A3R3 and R4. Similarly, load current flowing in the 21500 vdc circuit develops a voltage across the shunt 1A53A4A3R2, and the four 0.1 ohm paralleled resistors 1A53A4A3R5, R6, R7 and R8. The shunt 1A53A4A3R1 produces a metering signal of

100 mv for a current of 2 adc and shunt 1A53A4A3R2 produces 100 mv for a current of 10 adc.

The voltage signal produced at terminal E3 of 1A53A4A3 as a result of the current flow resistor network via terminal 1A53A4E1 (10750 vdc load current) is applied to a low pass filter network consisting of 1A53A4A2R1, C1, C2, C3, L1 and potentiometer 1A53A4R1. Because the load currents of the power supply are in the form of pulses, the low pass filter network functions to produce a dc signal proportional to the average value of the pulse current, and to eliminate any unwanted conducted radio frequencies from the following relay driver circuit.

A sample of the load current is extracted at the slider of 1A54A4R1 and applied to one input of a differential amplifier consisting of 1A53A4A2Q1 and Q2. The PNP transistor 1A53A4A2Q3 is connected to the output of the differential amplifier in such a way that a single ended output is obtained. The output signal of 1A53A4A2Q3 is then applied to the base of 1A53A4A2Q4 where it is amplified, controlling relay 1A53A4K1. Positive feedback is applied around the circuit from the base of 1A53A4A2Q4 to 1A53A4A2Q1 through 1A53A4A2R5 to provide a "snap action" to the relay driver when the input signal reaches the relay closure threshold level. A resistor network consisting of 1A53A4A2R8 and R9 together with potentiometer 1A53A4R2 is connected across the zener diode 1A53A4A2CR4: the junction of 1A53A4A2R8 and R9 being connected to the base of 1A53A4A2Q2 which is the reference input of the differential amplifier. Adjustment of 1A53A4R2 thus adjusts the reference voltage against which the sensed load current signal is compared. An identical filtering and relay driver circuit is connected to terminal 1A53A4A3E5 for sensing the load current in the 21500 vdc circuit.

4.3.17. **VOLTAGE DIVIDER CN-1474/FPN-44A (1A53A7).** Voltage divider (1A53A7) (figure 7-48) provides metering outputs for the power supply voltages, -5000 vdc and +21500 vdc voltage level sensing, and a feedback signal from the +10750 vdc supply to the 460 vac voltage regulator (1A53A3A1).

This unit consists of five sets of voltage dividers, one each for the +21500 vdc, -5000 vdc, and +500 vdc supplies, and two for the +10750 vdc supply: four sets of monitor outputs each with a calibrating potentiometer: a feedback connection point through one of the +10750 vdc voltage dividers: and transistor relay driver circuits for the +21500 vdc and -5000 vdc supplies (1A53A7A2). The transistor circuitry is powered from the output of a pair of integrated circuit voltage regulators (1A53A7A1) which are powered from the plus and minus 24 vdc outputs of the 1A53A6A1 assembly.

Terminal 1A53A7E1 is connected to the 21500 vdc power supply output, terminal 1A53A7E3 is connected to the +10750 vdc output,

terminal 1A53A7E5 is connected to the -5000 vdc output, and terminal 1A53A7E7 is connected to the +500 vdc output. Terminal 1A53A7E12 which is the common return of all circuits within the 1A53A7 unit is connected to one of the common ground terminals of 1A53A4. The high voltage portions of the divider (1A53A7A3 and 1A53A7A4) are composed of frequency compensated precision resistors. In the +21500 vdc overvoltage level sensing and monitoring circuit a portion of the +21500 vdc is extracted at the slider of potentiometer 1A53A7R1, and applied to the input of a two stage amplifier consisting of 1A53A7A2Q1 and Q2. This amplifier which is powered by the +15 vdc output of the integrated circuit regulator assembly (1A53A7A1Q1) functions as a current amplifier that activates overvoltage sensing relay 1A53A7K1 when the signal level at the input is high enough to cause conduction of 1A53A7A2Q1. The function of diode 1A53A7A2CR1 is to absorb inverse transient voltages that are developed when K1 opens.

The -5000 vdc undervoltage sensing and monitoring circuit functions exactly the same as the +21500 vdc circuit except that the polarity of the 15 vdc supply, the transistors and the transient protection diode are reversed. In this -5000 vdc sensing circuit continuity must be established between terminals 1A53A7TB1-5 and 1A53A7TB1-6 before bias-up sensing relay 1A53A7K2 can be activated. Contacts on bias-up sensing relays in the amplifier, group 1A4 are connected between these terminals, thus 1A53A7K2 is not activated until all bias voltages are adequate.

The monitor and sensing circuits are adjusted by potentiometers. The function of each potentiometer is as follows:

1A53A7R1 adjusts the trip point of K1 for overvoltage to the +21500 vdc supply.

1A53A7R3 adjusts the signal level at J1 that represents the +21500 vdc supply level to calibrate PA PLATE VOLTAGE meter 1A53A2M2.

1A53A7R4 adjusts the signal level at J3 that represents the +10750 vdc supply level to calibrate IPA PLATE VOLTAGE meter 1A53A2M3.

1A53A7R2 adjusts the trip point of K2 for -5000 vdc bias voltage.

1A53A7R5 adjusts the signal level at J7 that represents the -5000 vdc supply level to calibrate -5 KV BIAS meter 1A53A2M4.

1A53A7R6 adjusts the signal level at J5 that represents the -500 vdc supply level to calibrate LOW VOLTAGE PLATE meter 1A53A2M9.

Feedback connection to the 460 vac voltage regulator

(1A53A3A1) is via 1A53A7J9 with pin B being the feedback signal and pin A being the common side. Transient and overvoltage protection of all of the monitoring functions and the feedback signal is provided by capacitors 1A53A7A2C1 through 1A53A7A2C5 and neon lamps 1A53A7DS1 through 1A53A7DS5.

4.3.18. **TRANSMITTER CONTROL.** This section describes the transmitter control circuits of a transmitting group.

4.3.18.1. **TRANSMITTER CONTROL FUNCTIONAL DESCRIPTION.** Transmitter control circuits (figure 4-15) consisting of relay-switch logic control the operation of each transmitting group. The relays and switches are located in the amplifier group (1A4), indicator panel (1A12), power supply set (1A53), antenna coupler unit 3 and electrical dummy load unit 4. The input control signals are from sensing circuits, remote and local switches, and potentiometers.

The sensing circuits are identified in table 4-2, as interlock, cooling system, and voltage, current, and temperature circuits. The table identifies the sensing component and the associated controlled circuit.

4.3.18.1.1. **SAFETY INTERLOCK SENSE.** The interlock signals provide for protecting personnel from dangerous voltages by inhibiting the turn on of bias and high voltages until areas of high potential are secured. In order to turn on these high voltages, interlocked switches on the amplifier group (1A4), antenna coupler (unit 3), and electrical dummy load (unit 4) must be closed. Furthermore, access doors to 1A4, 1A6 and the high voltage area in the enclosure must be locked and the key interlock system used to close the HIGH VOLTAGE RECTIFIER POWER switch 1A53A3S1 and the LOCKED ON switch 1A53A3S2.

NOTE

Only the high and bias voltages are inhibited by the interlock system. All cooling and control voltages remain on.

4.3.18.1.2. **COOLING SYSTEM SENSE.** The cooling system sense inputs are received from the electron tube water cooler (1A2/1A52, the radio frequency amplifier (1A6), the electronic dummy load (unit 4), the enclosure (unit 1), and the amplifier group (1A4). These inputs provide positive indications of the status of water cooling systems and blower operation. The water level signal indicates the relative (to preset standard) level of the distilled water (primary coolant) in the tank of the electron tube water cooler (1A2/1A52). The water temperature signals indicate the relative temperature of the distilled water at the input to PA tubes and at each of the outputs of the PA tubes. The water flow signals indicate the relative water flow rate at each of the PA

tubes. The air flow signals indicate whether the blowers in the enclosure (unit 1), amplifier group (1A4) and dummy load (unit 4) are operating.

4.3.18.1.3. **VOLTAGE, CURRENT AND TEMPERATURE SENSE.** Voltage, current and temperature sensing circuits are located in amplifier group (1A4), radio frequency amplifier (1A6), and power supply set (1A53). A detected fault operates one of the following circuits as indicated in table 4-2: overload, power turn on, high voltage turn on, 208 vac and 460 vac circuit breaker trip. The overload circuit turns off the bias, low and high voltages momentarily and automatically turns them back on again. If three faults are sensed in a less than 90 seconds bias, low and high voltages remain off. A fault which controls power turn-on disables the cooling system, filament, bias, low and high voltages. Other faults turn off or inhibit the turn-on of the high voltage only. Circuit breakers are tripped by certain over voltage conditions or by the emergency stop circuit.

TABLE 4-2. SENSING INPUTS AND CONTROLLED CIRCUITS

CIRCUIT	SENSING COMPONENTS	CONTROLLED CIRCUIT
Safety Interlock	1A53A3S2 (LOCKED ON)	Bias low and high voltage turn on.
	1A4S3, 1A4S4, 1A4S5, 1A4A6, 3S1, 3S2, 3S3, 3S4 (Transmitting Group No.1) 3S5, 3S6, 3S7, 3S8 (Transmitting Group No.1)	"
	4S3, 4S6 (Transmitting Group No. 1)	"
	4S4, 4S5 (Transmitting Group No. 2)	"
Cooling System:		
Water level	1A2S1/1A52S1	Cooling system status
Water Temp. Out	1A6S5,1A6S6,1A6S7,1A6S8	Cooling system status
Water Flow	1A6S1,1A6S2,1A6S3,1A6S4	Filament turn on
Water Temp. In	1A6S9	Filament turn on
Air Flow	1S1, 1A4S1	Filament turn on
Air Flow	4S1, 4S2	High voltage turn on.
(Dummy Load)		(Standby transmitter group).
Voltage, Current, Temperature:		
1st IPA cathode overloads	1A4K1,1A4K2	Plate and Bias voltage turn off
PA bias overloads	1A4K4,1A4K5	"
PA cathode overloads	1A6K1,1A6K2,1A6K3,1A6K4	"
10. 75 kvdc overloads	1A53A4K1	"
21. 5 kvdc overloads	1A53A4K2	"
460 vac overload	1A53A3T5,1A53A3T6,1A53A3T7	"

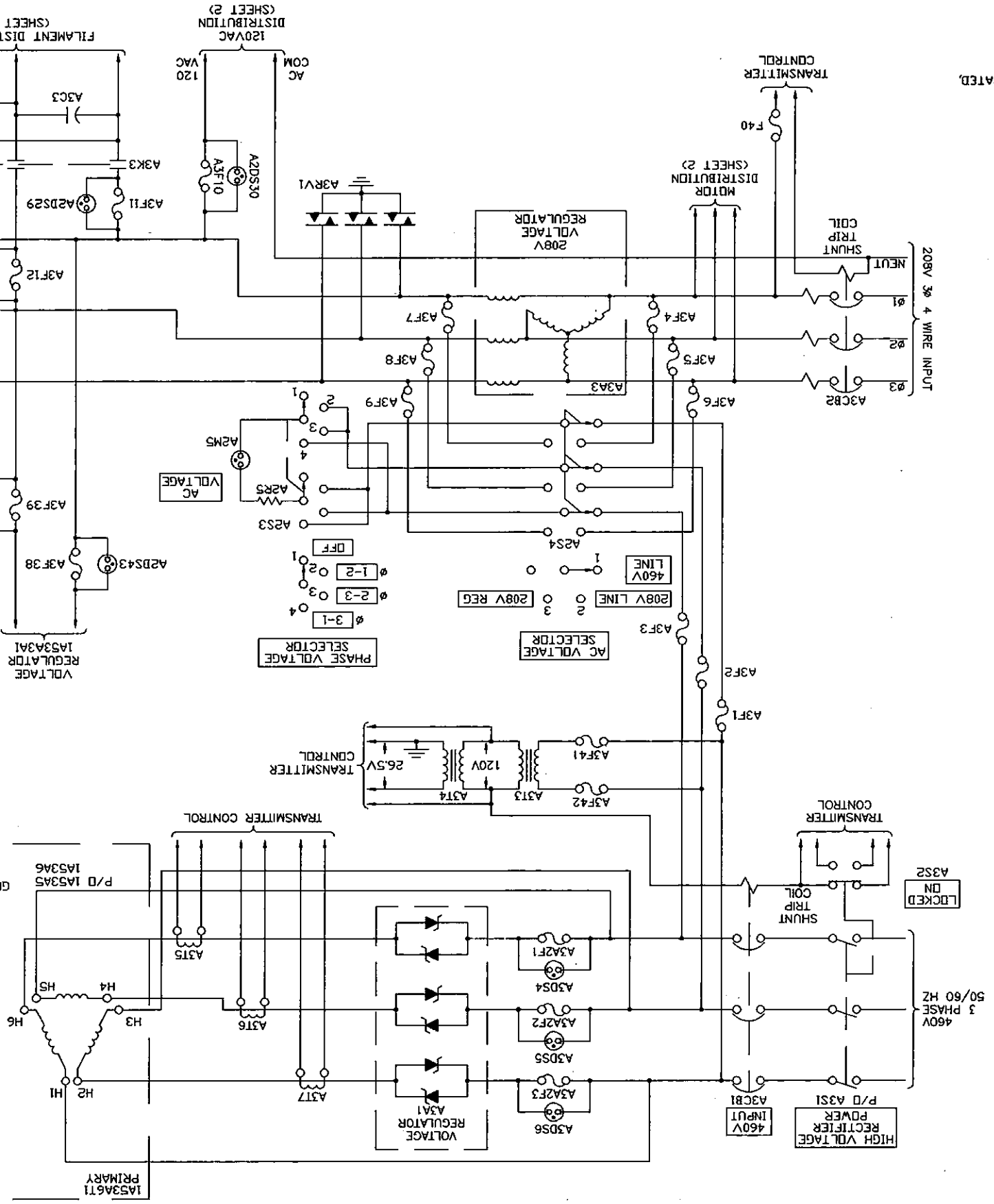
TABLE 4-2. SENSING INPUTS AND CONTROLLED CIRCUITS (cont.)

CIRCUIT	SENSING COMPONENTS	CONTROLLED CIRCUIT
460 vac voltage regulator:	1A53A3A1:	"
Overtemperature	TS1, TS2	"
460 vac under-voltage	A1, A2, A3	"
208 vac under-voltage	A4	"
460 vac overload	CTA, CTB, CTC	"
120/208 vac under-voltage	1A53A3M1	Power turn on
-120 vdc overload	1A53A3K36	Power turn on
-120 vdc under-voltage	1A53A3K37	Power turn on
-5000 vdc under-voltage	1A53A7K2	High voltage turn on.
-1100 vdc under-voltages	1A4K6,1A4K7	High voltage turn on.
High voltage transformer temperature	1A53A6S1	High voltage turn on.
208 vac overvol-tage	1A53A3M1	Trips 208 vac circuit breaker
21. 5 kv overvo-ltage	1A53A7K1	Trips 460 vac circuit breakers

CHANGE 4

NOTES:

1. UNLESS OTHERWISE INDICATED, PREFACE REFERENCE DESIGNATIONS WITH 1A53



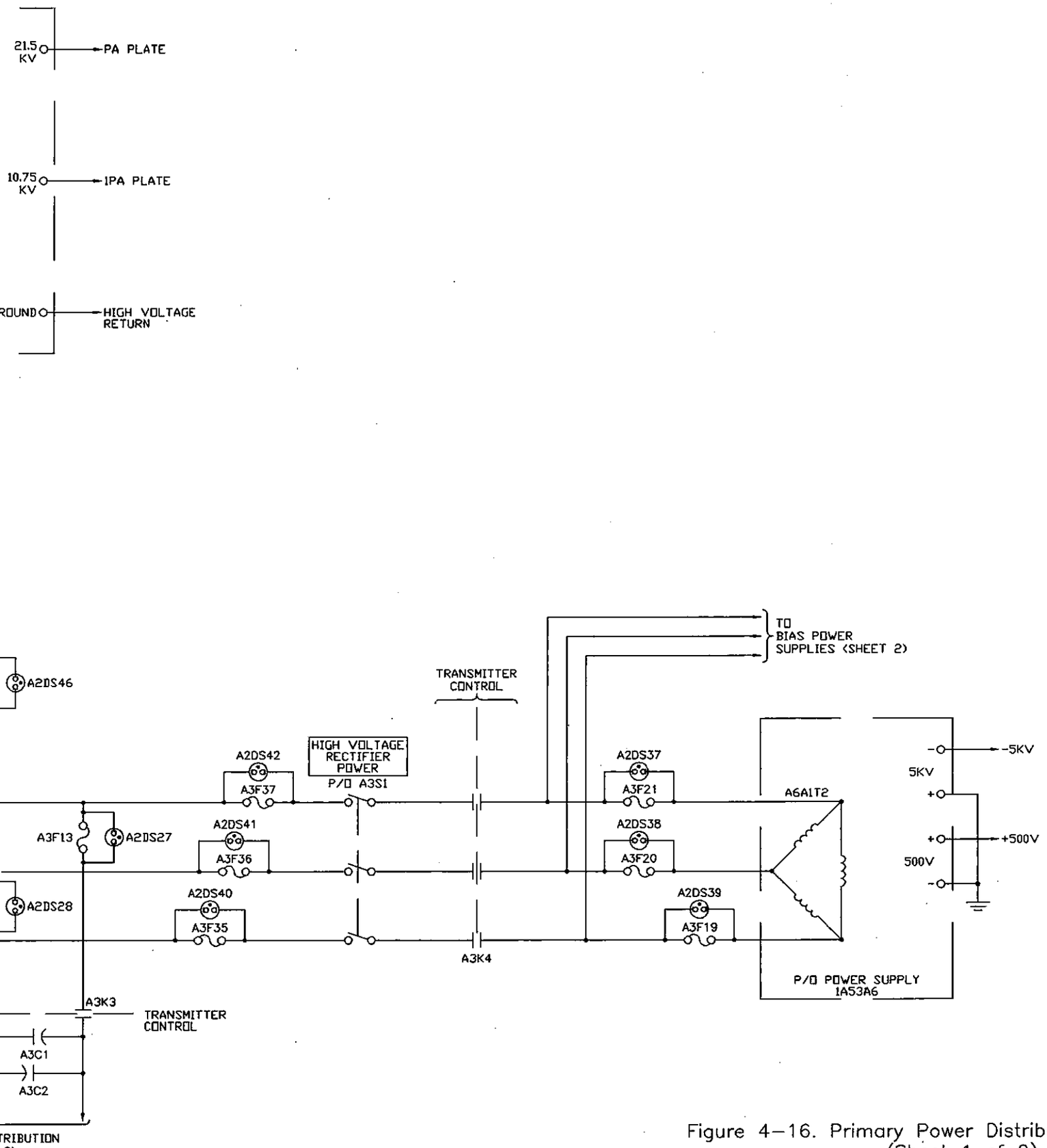
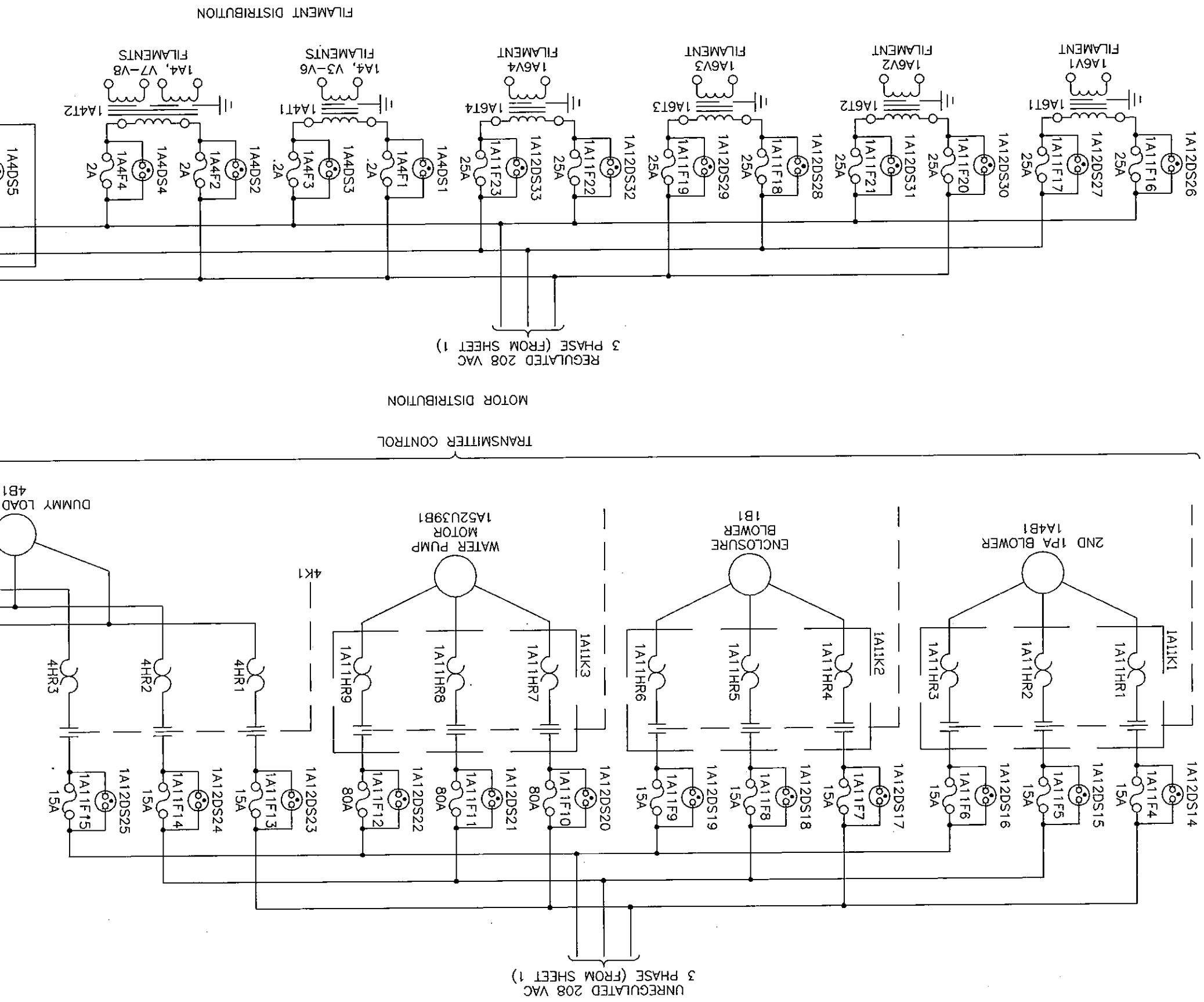
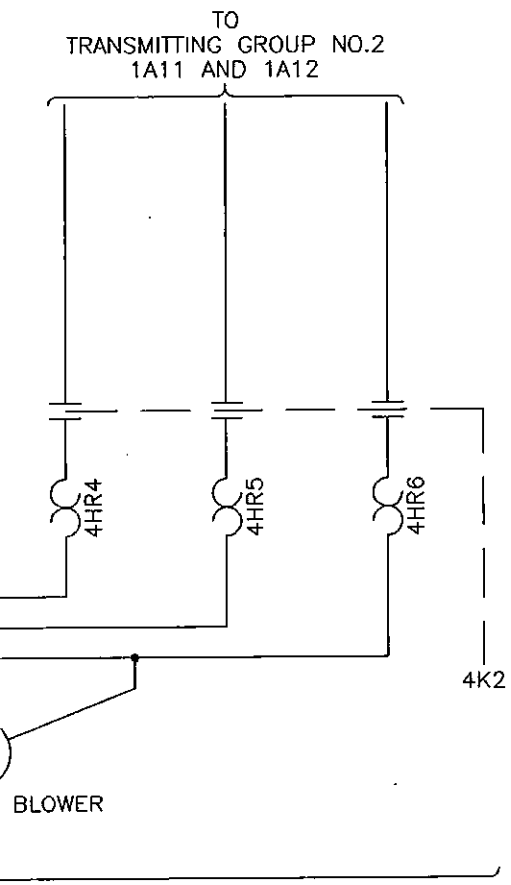
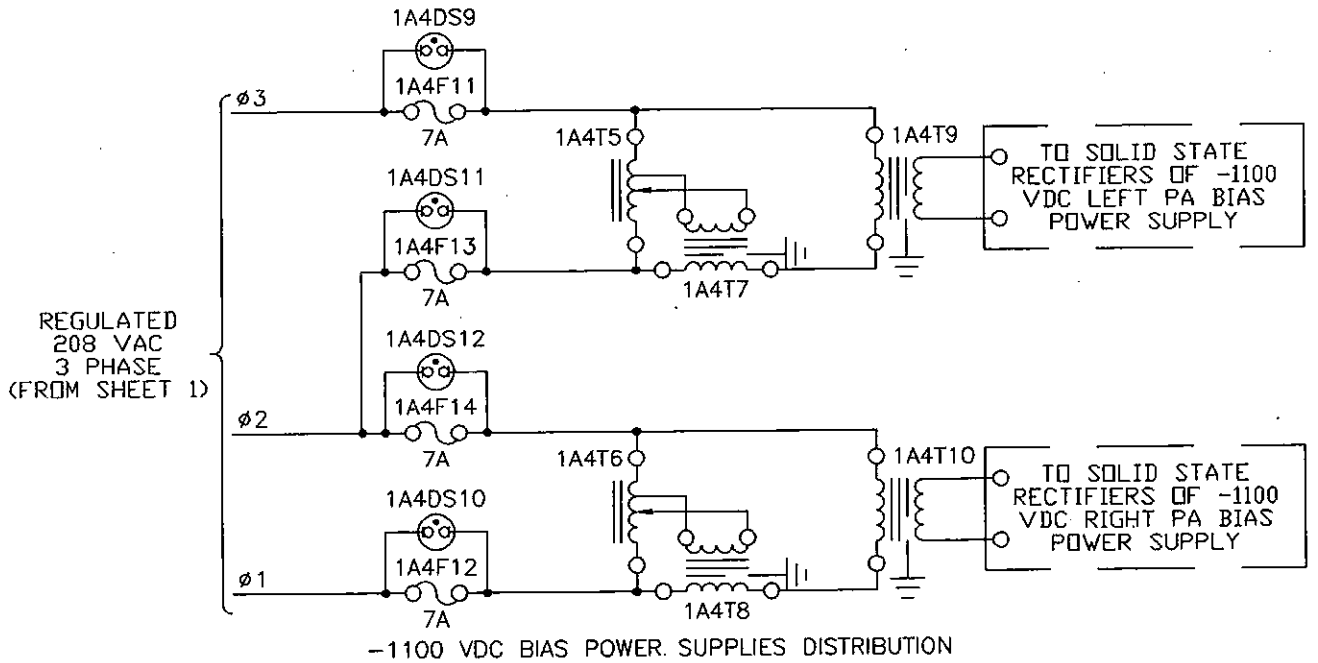


Figure 4–16. Primary Power Distribution (Sheet 1 of 2)

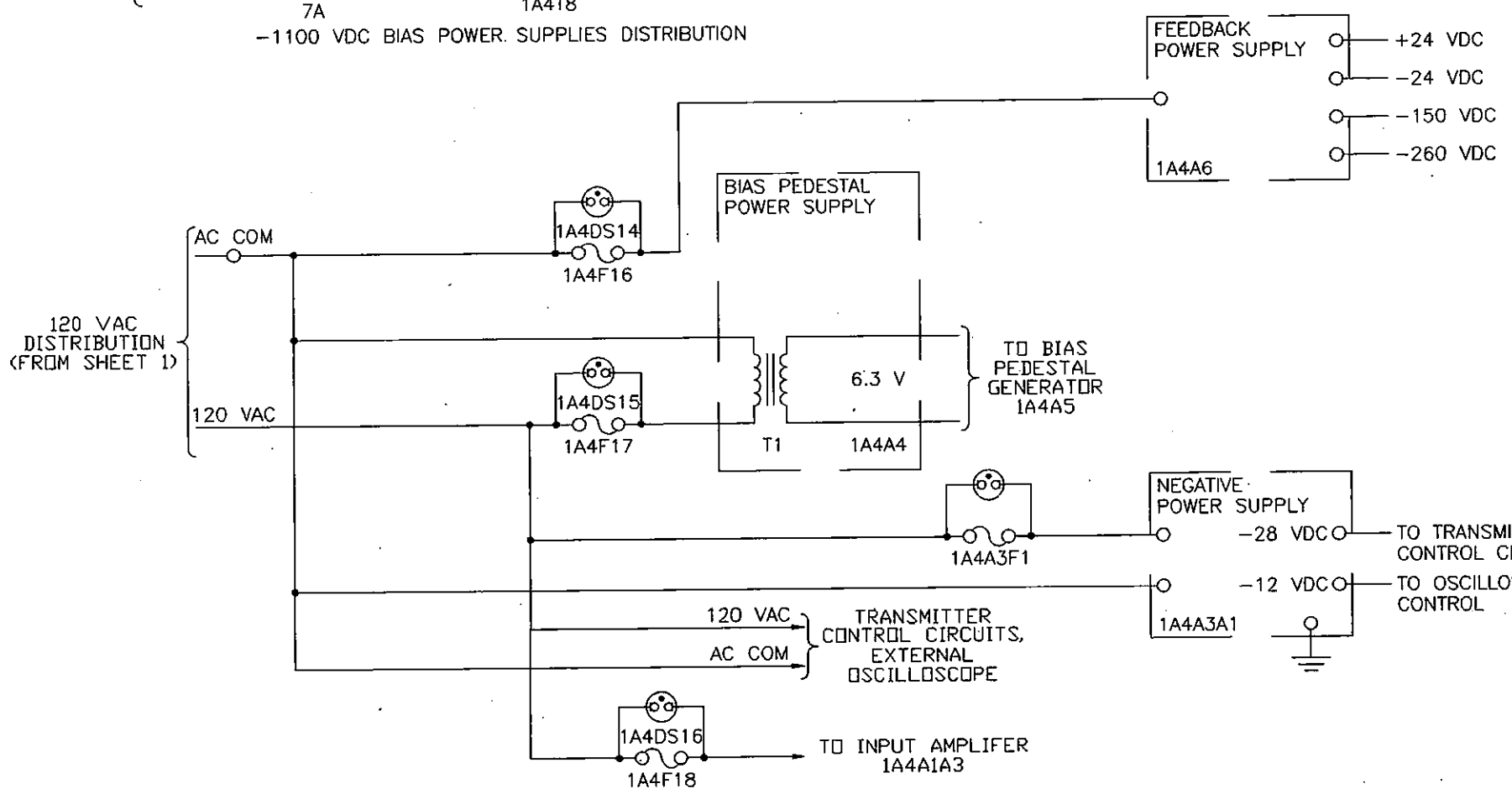
CHANGE 4


FILAMENT DISTRIBUTION
1A6V1 FILAMENT
1A6V2 FILAMENT
1A6V3 FILAMENT
1A6V4 FILAMENT
1A4, V3–V6 FILAMENTS
1A4, V7–V8 FILAMENTS
1A6T1
1A6T2
1A6T3
1A6T4
1A4T1
1A4T2
1A12DS26
1A12DS27
1A12DS28
1A12DS29
1A12DS30
1A12DS31
1A12DS32
1A12DS33
1A11F16
1A11F17
1A11F18
1A11F19
1A11F20
1A11F21
1A11F22
1A11F23
25A
1A4DS1
1A4DS2
1A4DS3
1A4DS4
1A4DS5
1A4F1
1A4F2
1A4F3
1A4F4
2A
REGULATED 208 VAC
3 PHASE (FROM SHEET 1)
MOTOR DISTRIBUTION
TRANSMITTER CONTROL
2ND 1PA BLOWER
1A4B1
ENCLOSURE BLOWER
1B1
WATER PUMP MOTOR
1A52U39B1
DUMMY LOAD
4B1
1A11K1
1A11K2
1A11K3
4K1
1A11HR1
1A11HR2
1A11HR3
1A11HR4
1A11HR5
1A11HR6
1A11HR7
1A11HR8
1A11HR9
4HR1
4HR2
4HR3
1A12DS14
1A12DS15
1A12DS16
1A12DS17
1A12DS18
1A12DS19
1A12DS20
1A12DS21
1A12DS22
1A12DS23
1A12DS24
1A12DS25
1A11F4
1A11F5
1A11F6
1A11F7
1A11F8
1A11F9
1A11F10
1A11F11
1A11F12
1A11F13
1A11F14
1A11F15
15A
80A
REGULATED 208 VAC
3 PHASE (FROM SHEET 1)





-1100 VDC BIAS POWER. SUPPLIES DISTRIBUTION



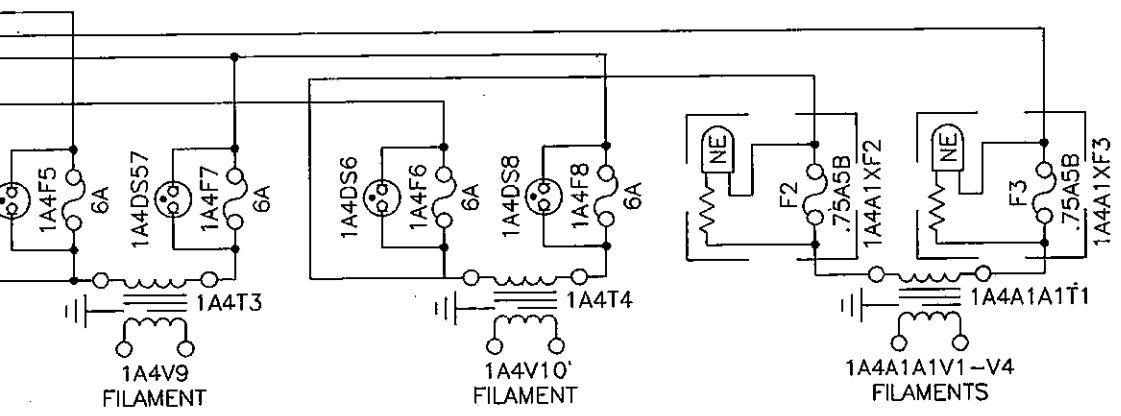
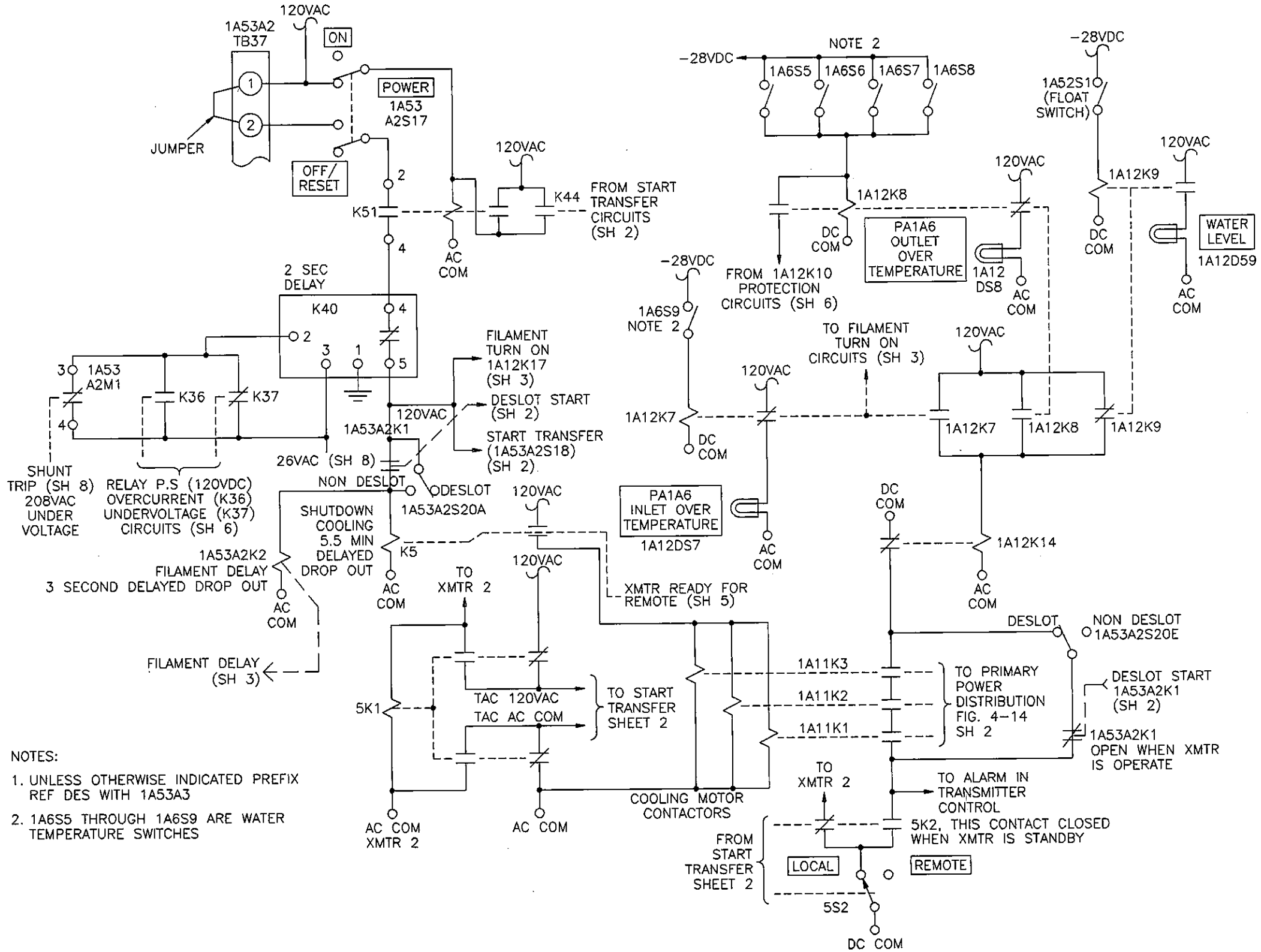


Figure 4-16. Primary Power Distribu
(Sheet 2 of 2)

ution

–86



NOTES:

1. UNLESS OTHERWISE INDICATED PREFIX REF DES WITH 1A53A3
2. 1A6S5 THROUGH 1A6S9 ARE WATER TEMPERATURE SWITCHES

Figure 4-17. Transmitter Control Functional Circuit Diagram (Sheet 1 of 9)

NOTES:

1. UNLESS OTHERWISE INDICATED PREFIX REF DES WITH 1A53A3
2. WHERE DIFFERENT PARTS ARE USED FOR TRANSMITTING GROUPS NO.1 AND NO.2, BOTH ARE SHOWN CORRESPONDING TRANSMITTING GROUP NO.2 PARTS ARE SHOWN IN PARENTHESES
3. SIMPLIFIED REPRESENTATION OF TRANSMITTER CONTROL EQUIPMENT
4. RELAY CONNECTIONS MARKED * GO TO RELAYS FOR OTHER TRANSMITTER

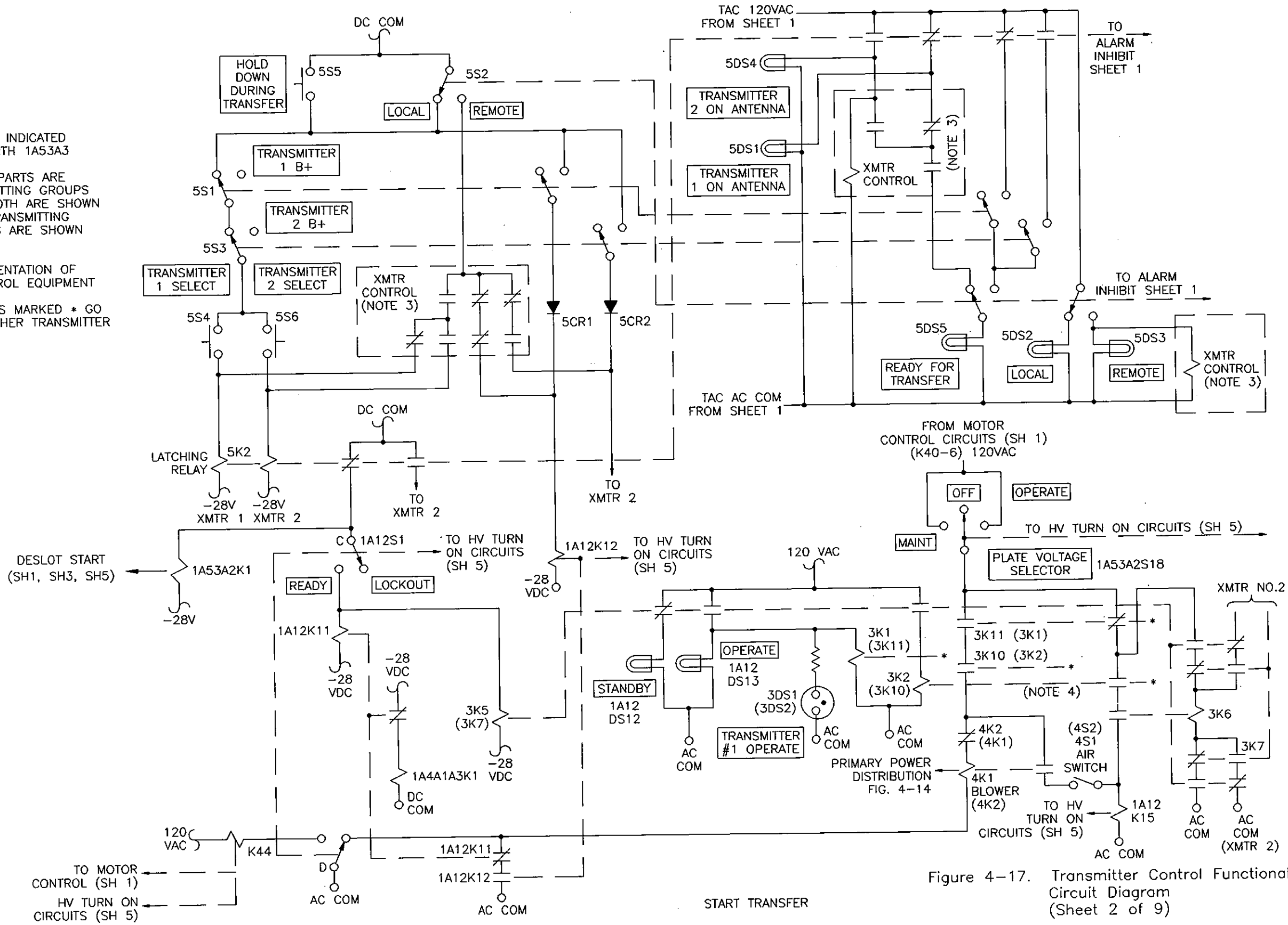
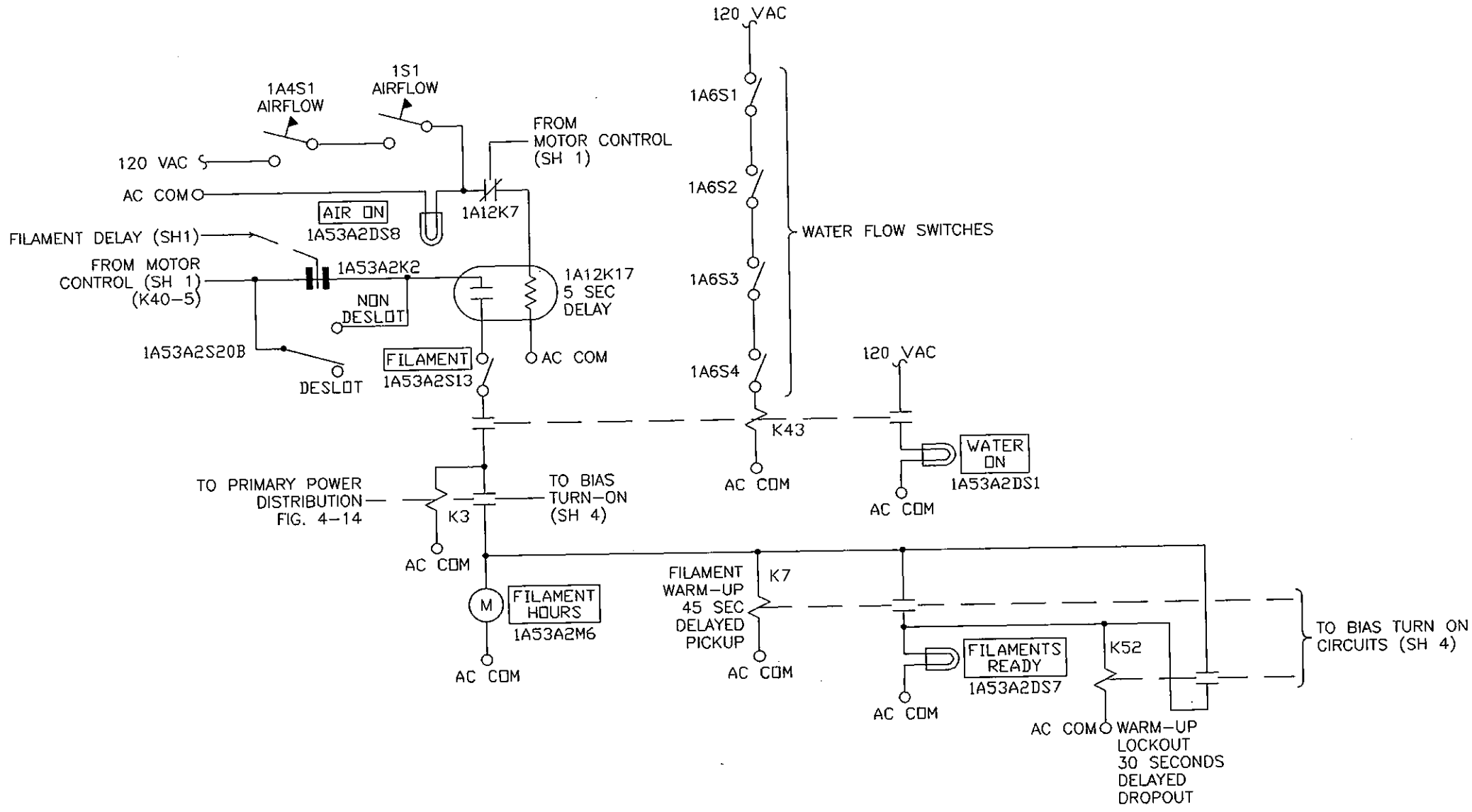
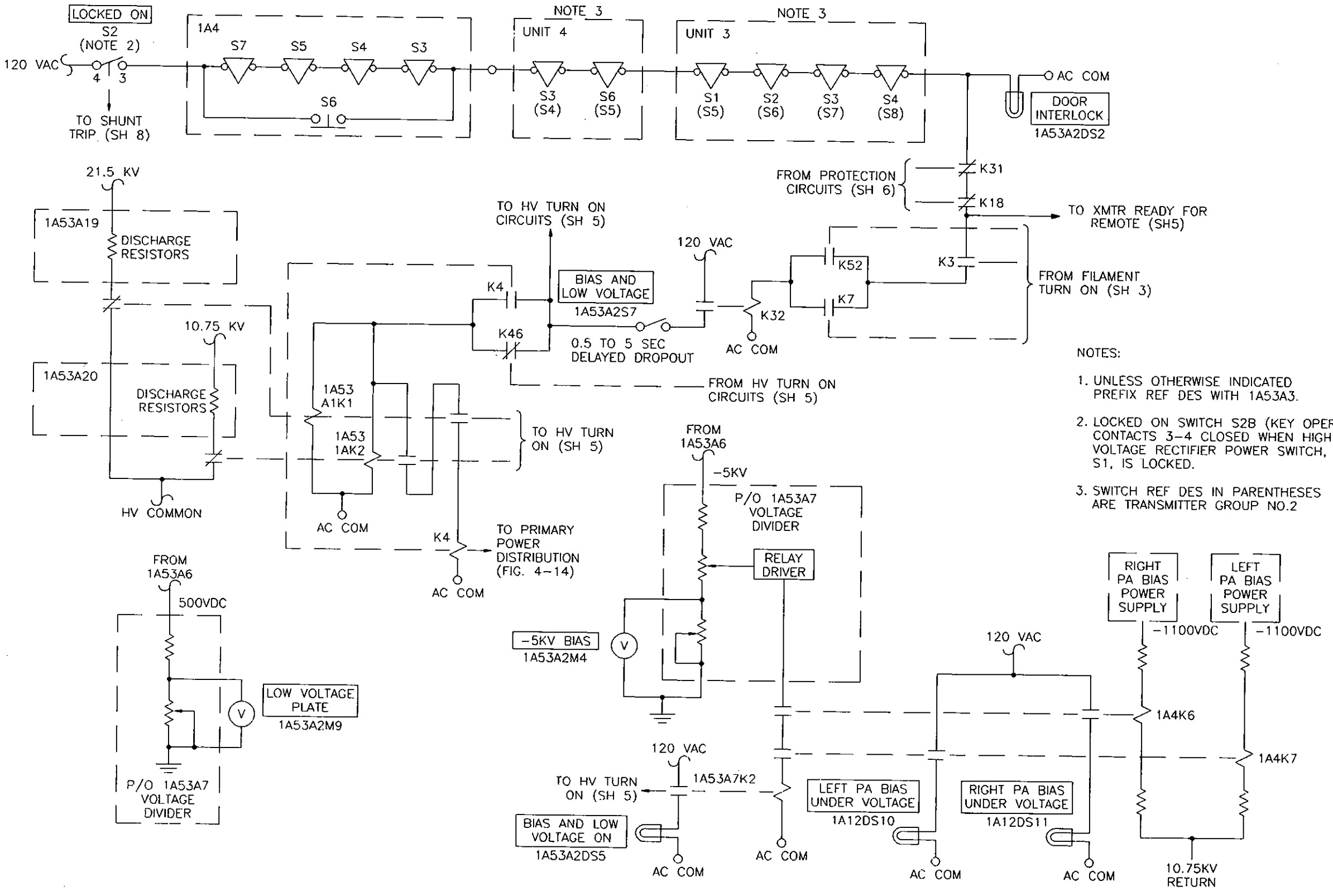


Figure 4-17. Transmitter Control Functional Circuit Diagram (Sheet 2 of 9)



FILAMENT TURN-ON

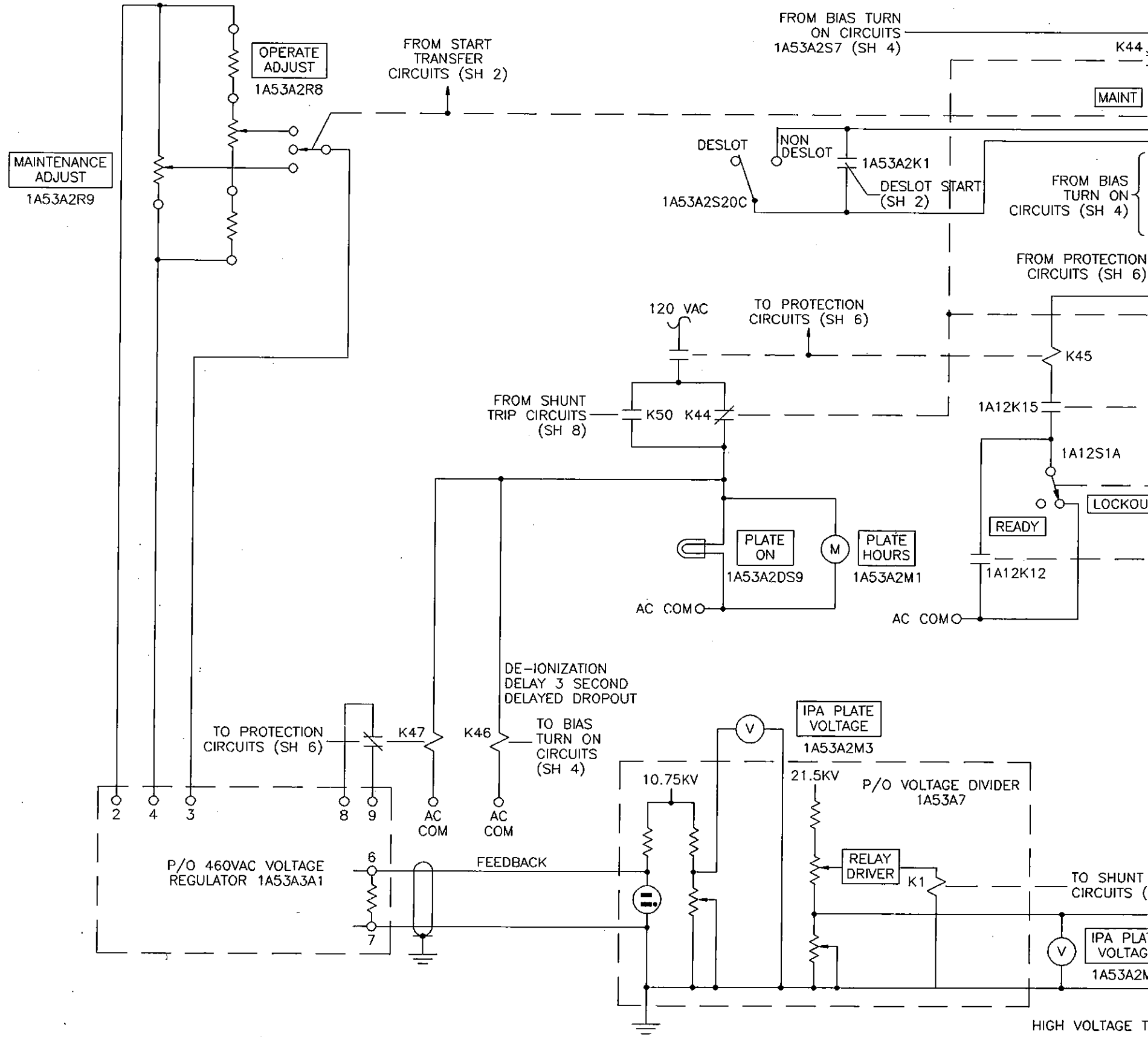
Figure 4-17. Transmitter Control Functional Circuit Diagram (Sheet 3 of 9)



NOTES:

1. UNLESS OTHERWISE INDICATED PREFIX REF DES WITH 1A53A3.
2. LOCKED ON SWITCH S2B (KEY OPERATED) CONTACTS 3–4 CLOSED WHEN HIGH VOLTAGE RECTIFIER POWER SWITCH, S1, IS LOCKED.
3. SWITCH REF DES IN PARENTHESES ARE TRANSMITTER GROUP NO.2

Figure 4–17. Transmitter Control Functiona Circuit Diagram (Sheet 4 of 9)


OPERATE ADJUST
1A53A2R8
MAINTENANCE ADJUST
1A53A2R9
FROM START TRANSFER CIRCUITS (SH 2)
FROM BIAS TURN ON CIRCUITS 1A53A2S7 (SH 4)
K44
MAINT
DESLOT
NON DESLOT
1A53A2K1
1A53A2S20C
DESLOT START (SH 2)
FROM BIAS TURN ON CIRCUITS (SH 4)
FROM PROTECTION CIRCUITS (SH 6)
120 VAC
TO PROTECTION CIRCUITS (SH 6)
K45
FROM SHUNT TRIP CIRCUITS (SH 8)
K50
K44
1A12K15
1A12S1A
LOCKOU
READY
PLATE ON
1A53A2DS9
M
PLATE HOURS
1A53A2M1
1A12K12
AC COM
AC COM
DE-IONIZATION DELAY 3 SECOND DELAYED DROPOUT
TO PROTECTION CIRCUITS (SH 6)
K47
K46
TO BIAS TURN ON CIRCUITS (SH 4)
IPA PLATE VOLTAGE
1A53A2M3
V
10.75KV
21.5KV
P/O VOLTAGE DIVIDER 1A53A7
2
4
3
8
9
AC COM
AC COM
P/O 460VAC VOLTAGE REGULATOR 1A53A3A1
6
7
FEEDBACK
RELAY DRIVER
K1
TO SHUNT CIRCUITS (
IPA PLA VOLTAG
1A53A2M
HIGH VOLTAGE T

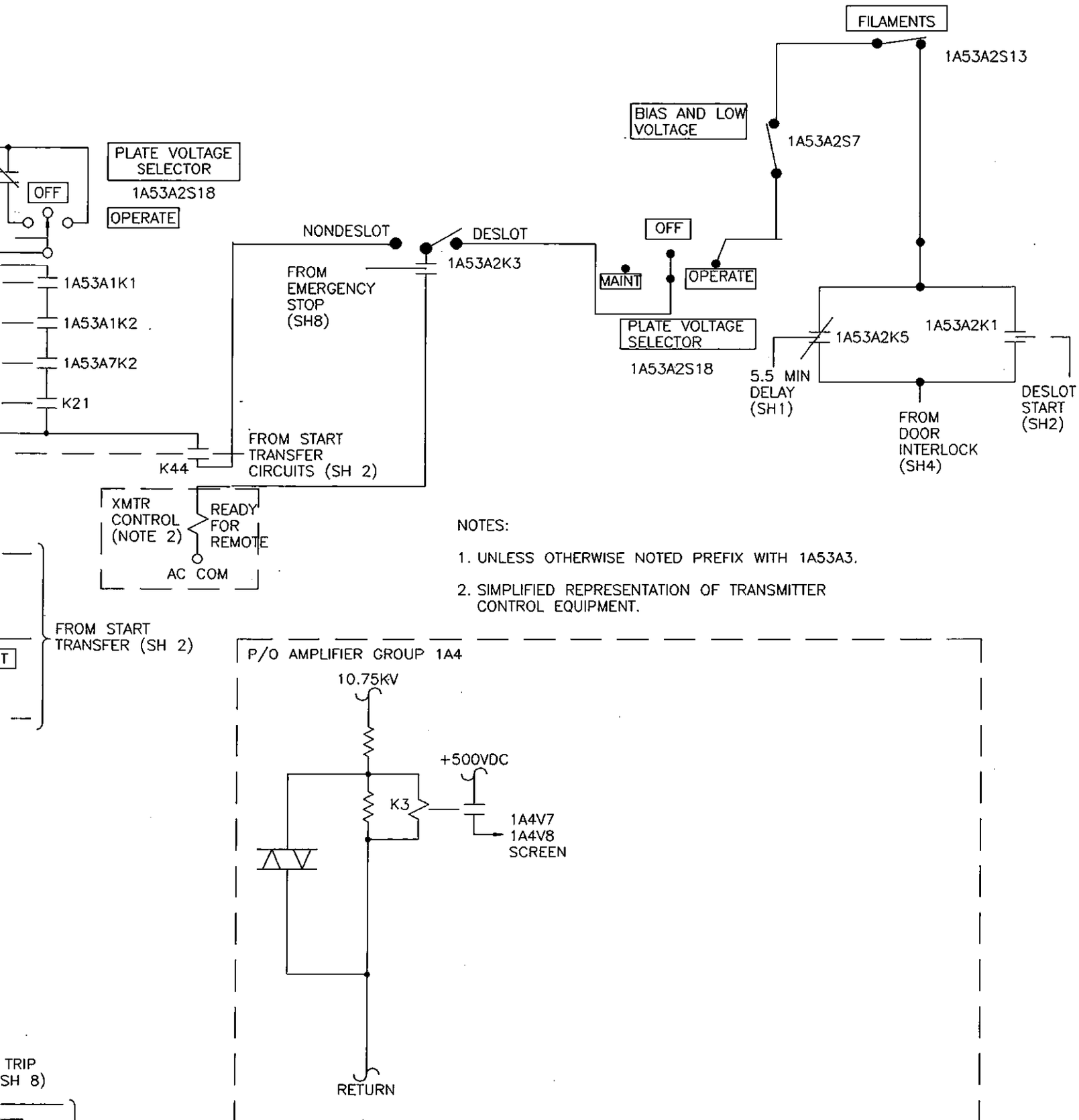
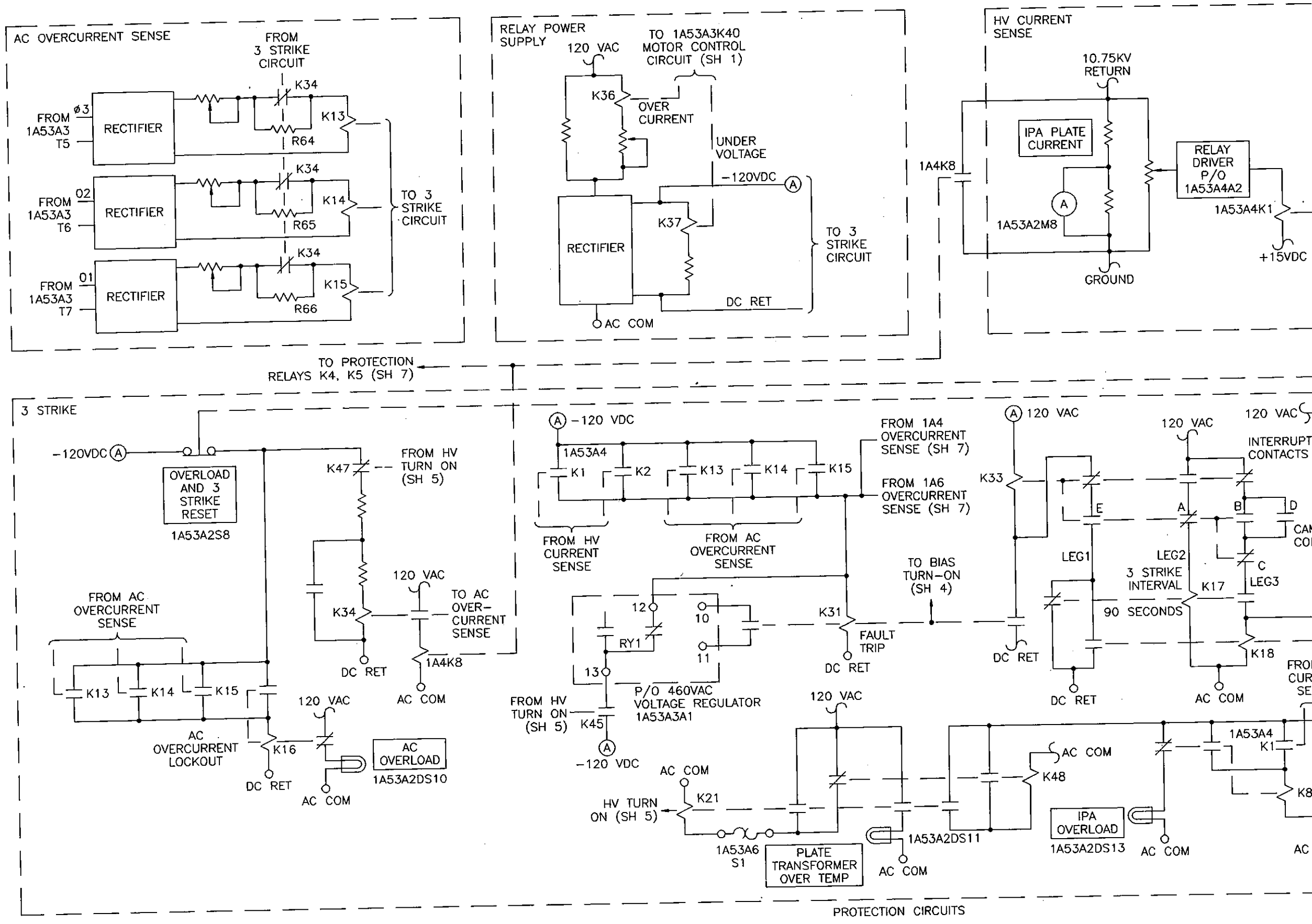
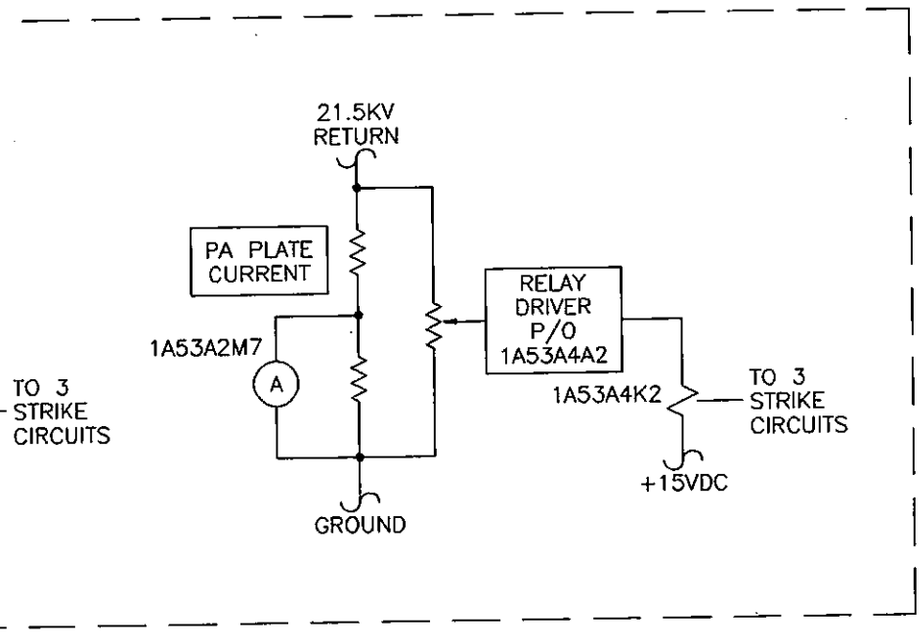
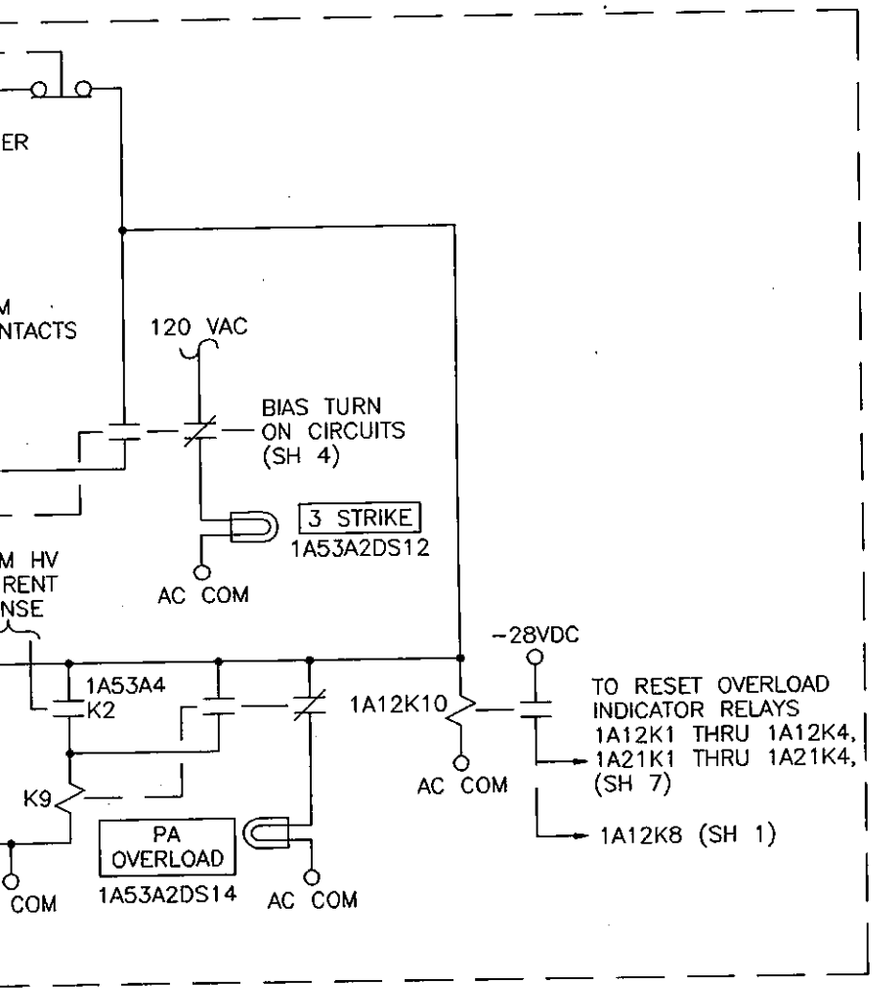


Figure 4–17. Transmitter Control Functional Circuit Diagram (Sheet 5 of 9)


AC OVERCURRENT SENSE
FROM 3 STRIKE CIRCUIT
FROM 1A53A3 T5
ø3
RECTIFIER
K34
K13
R64
FROM 1A53A3 T6
02
RECTIFIER
K34
K14
R65
FROM 1A53A3 T7
01
RECTIFIER
K34
K15
R66
TO 3 STRIKE CIRCUIT
RELAY POWER SUPPLY
120 VAC
TO 1A53A3K40 MOTOR CONTROL CIRCUIT (SH 1)
K36
OVER CURRENT
UNDER VOLTAGE
-120VDC
A
RECTIFIER
K37
DC RET
TO 3 STRIKE CIRCUIT
AC COM
HV CURRENT SENSE
10.75KV RETURN
IPA PLATE CURRENT
1A4K8
A
1A53A2M8
RELAY DRIVER P/O 1A53A4A2
1A53A4K1
+15VDC
GROUND
TO PROTECTION RELAYS K4, K5 (SH 7)
3 STRIKE
-120VDC
A
OVERLOAD AND 3 STRIKE RESET
1A53A2S8
K47
FROM HV TURN ON (SH 5)
120 VAC
K34
TO AC OVER-CURRENT SENSE
DC RET
1A4K8
AC COM
FROM AC OVERCURRENT SENSE
K13
K14
K15
AC OVERCURRENT LOCKOUT
K16
120 VAC
DC RET
AC COM
AC OVERLOAD
1A53A2DS10
A -120 VDC
1A53A4
K1
K2
K13
K14
K15
FROM 1A4 OVERCURRENT SENSE (SH 7)
FROM 1A6 OVERCURRENT SENSE (SH 7)
FROM HV CURRENT SENSE
FROM AC OVERCURRENT SENSE
TO BIAS TURN-ON (SH 4)
12
10
RY1
11
13
K31
FAULT TRIP
DC RET
P/O 460VAC VOLTAGE REGULATOR 1A53A3A1
FROM HV TURN ON (SH 5)
K45
A
-120 VDC
120 VAC
AC COM
HV TURN ON (SH 5)
K21
1A53A6 S1
PLATE TRANSFORMER OVER TEMP
1A53A2DS11
AC COM
K48
IPA OVERLOAD
1A53A2DS13
AC COM
A 120 VAC
K33
DC RET
120 VAC
LEG1
E
DC RET
120 VAC
INTERRUPT CONTACTS
A
B
D
LEG2
C
LEG3
3 STRIKE INTERVAL
K17
90 SECONDS
K18
AC COM
1A53A4
K1
PROTECTION CIRCUITS



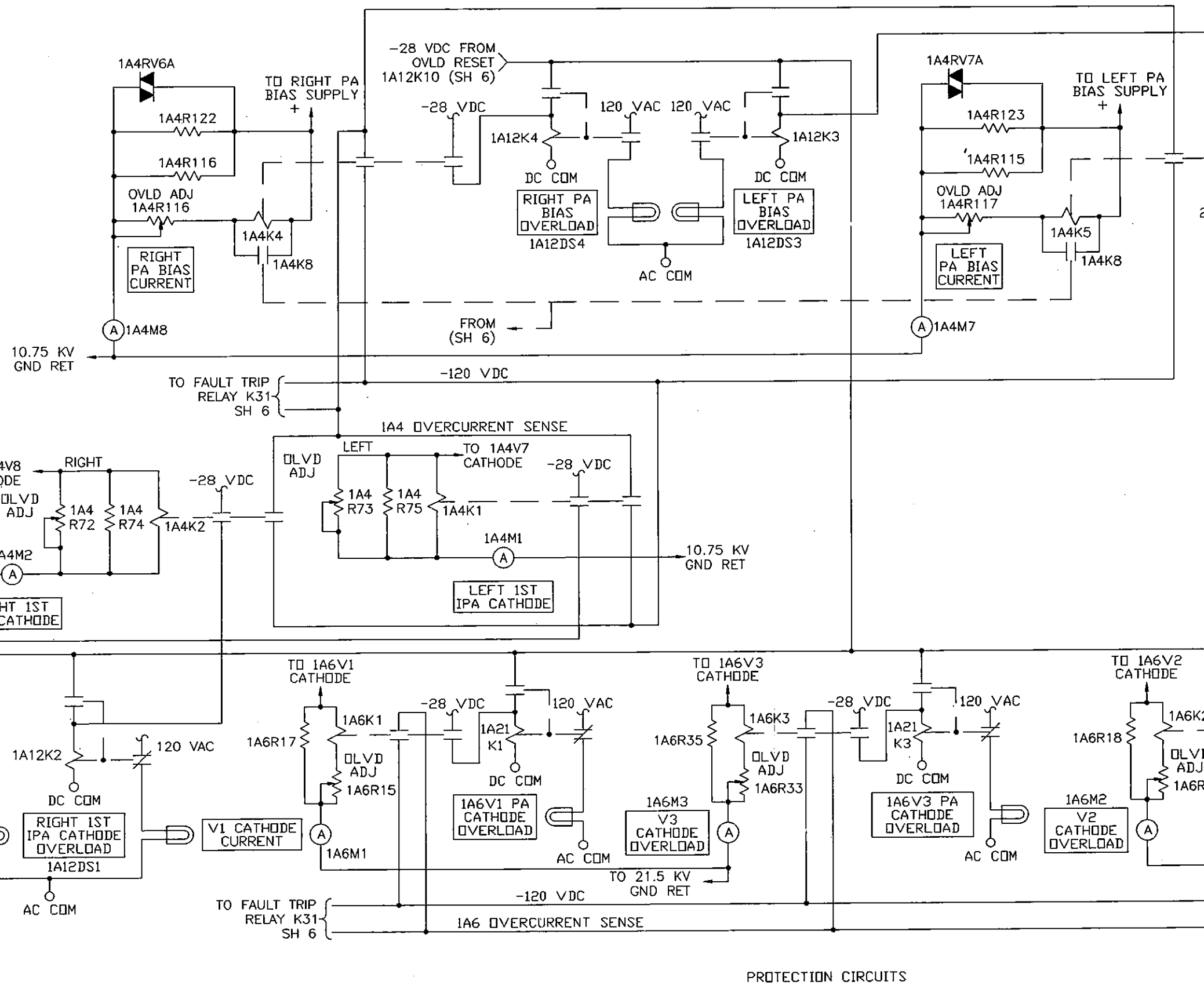


FAULT	CONTACT POSITION				
	A	B	C	D	E
0	X	O	X	O	O
1	O	X	O	O	X
2	O	O	O	X	X
3	O	X	X	O	X

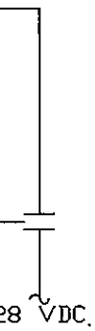
X=CLOSED
O=OPEN

NOTE:
1. UNLESS OTHERWISE NOTED PREFIX WITH 1A53A3.

Figure 4-17. Transmitter Control Functional Circuit Diagram (Sheet 6 of 9)



PROTECTION CIRCUITS



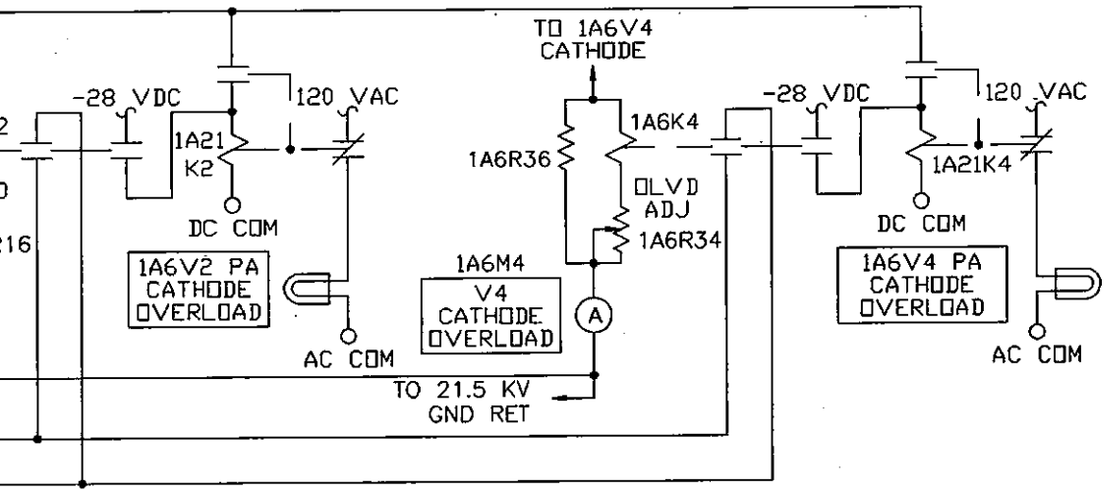
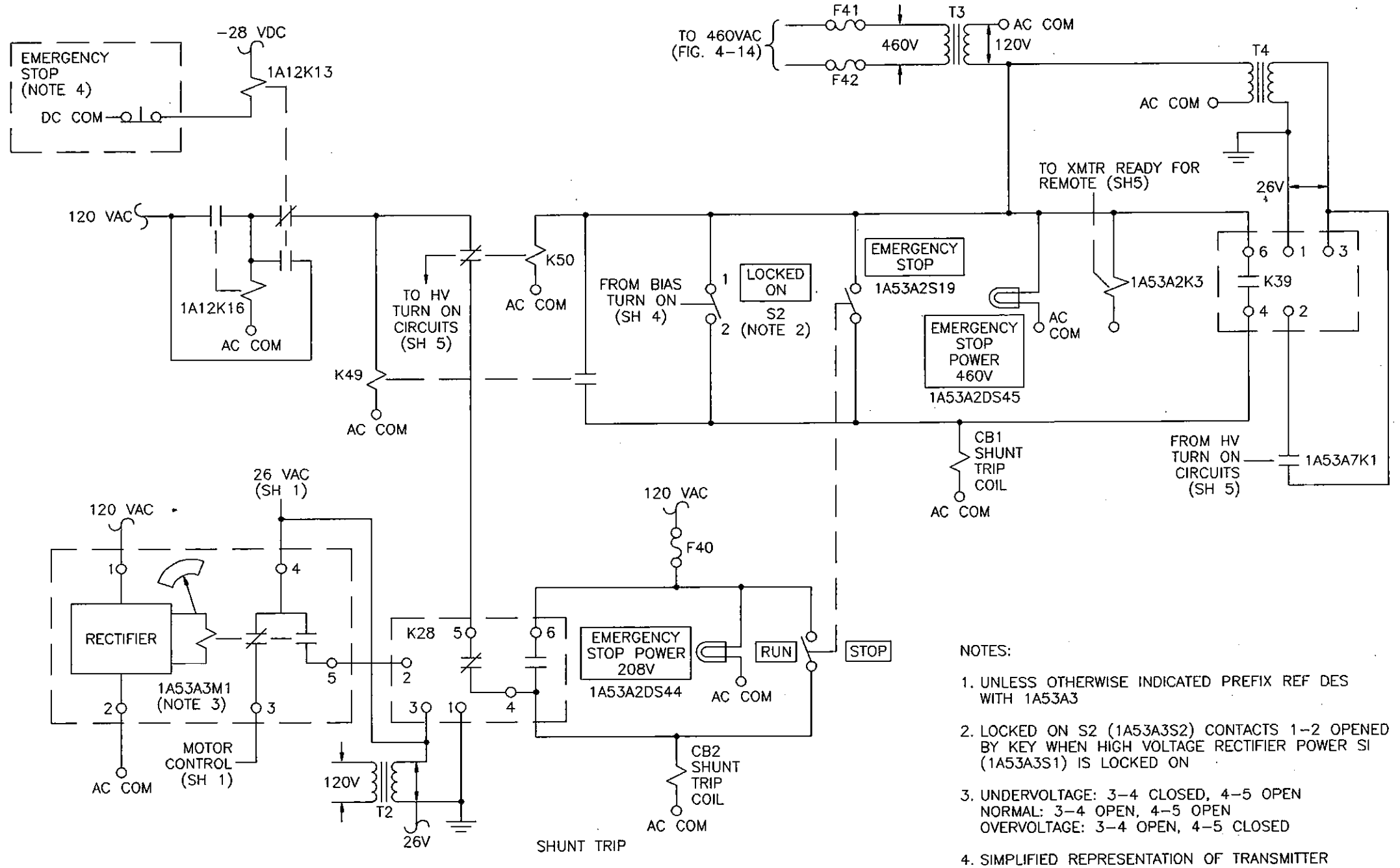


Figure 4–17. Transmitter Control Functional Circuit Diagram (Sheet 7 of 9)



NOTES:

1. UNLESS OTHERWISE INDICATED PREFIX REF DES WITH 1A53A3
2. LOCKED ON S2 (1A53A3S2) CONTACTS 1-2 OPENED BY KEY WHEN HIGH VOLTAGE RECTIFIER POWER SI (1A53A3S1) IS LOCKED ON
3. UNDERVOLTAGE: 3-4 CLOSED, 4-5 OPEN
   NORMAL: 3-4 OPEN, 4-5 OPEN
   OVERVOLTAGE: 3-4 OPEN, 4-5 CLOSED
4. SIMPLIFIED REPRESENTATION OF TRANSMITTER CONTROL EQUIPMENT

Figure 4-17. Transmitter Control Functional Circuit Diagram (Sheet 8 of 9)

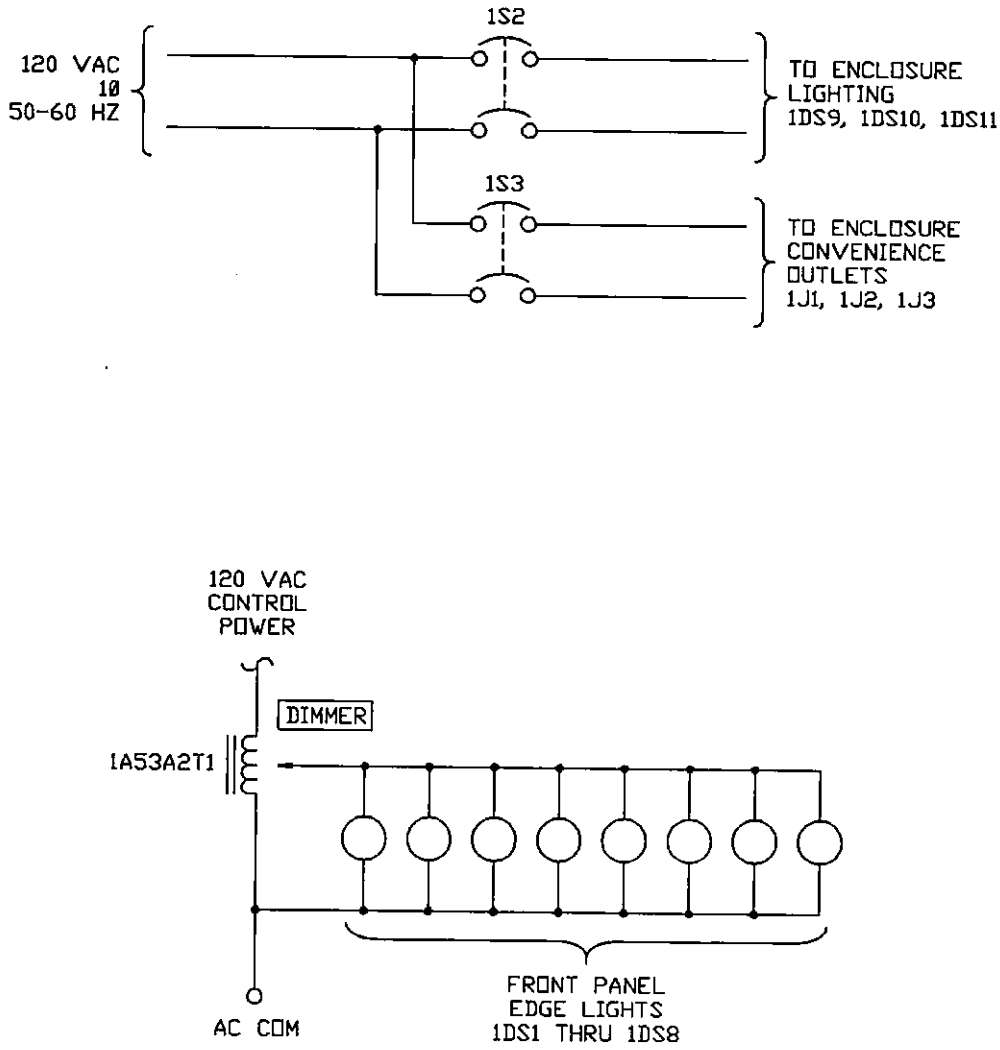


Figure 4–17. Transmitter Control Functional Circuit Diagram (Sheet 9 of 9)

4.3.18.1.4. **REMOTE INPUTS.** The transmitter control equipment sends the mode input (operate, standby, or standby test) and the emergency stop signals to control circuits in the transmitting set. The operate signal is received by one of the transmitting groups while the other is the standby. The standby test signal is used only for test purposes. The emergency stop signal trips both the 208 vac and 460 vac circuit breakers.

4.3.18.1.5. **LOCAL INPUTS.** In normal operation the controls of control-indicator (1A53A2) relay assembly (1A53A3) and indicator panel (1A12) of both transmitting groups are set to the following positions:

- POWER (1A53A2S17) to ON
- FILAMENTS (1A53A2S13) to ON
- BIAS AND LOW VOLTAGE (1A53A2S7) to ON
- PLATE SELECTOR (1A53A2S18) to OPERATE
- HV RECTIFIER POWER (1A53A3S1) to ON
- LOCKED ON (1A53A3S2) locked
- 460 V INPUT (1A53A3CB1) to ON
- 208 vac circuit breaker (1A53A3CB2) to ON
- LOCKOUT-READY (1A12S1) to READY
- EMERGENCY STOP (1A53A2S19) to RUN

4.3.18.1.6. **OUTPUTS.** The relay-switch logic of 1A4, 1A12, 1A53, unit 3, and unit 4 processes the input signals to control the following operations:

- Sequentially turns on motors, filament, bias and low voltage, and high voltage power.

- Transfers signal output from dummy load to antenna.

- Turns on dummy load blower motor when high voltage is turned on in the standby transmitting group.

- Discharges high voltage circuits when bias and low voltage are turned off.

- Delays overload sense on bias and high voltage turn on.

- Selects input signal to 1A4 first stage.

- Transmits status indications to the transmitter control equipment.

- Resets three-strike circuit.

4.3.18.1.7. **SEQUENTIAL POWER TURN ON.** See figure 4-16. The power turn on circuits ensure that the cooling system, filaments, bias and low voltage, and high voltages are turned on in that order. The cooling system motors 1A2U39B1, 1A4B1, and 1B1 receive

unregulated 208 vac, 3 phase when a motor turn on signal energizes relay-contactors in 1A11. Filament power is distributed from 1A11 when a filament turn on signal is received by relay 1A53A3K3 after the motors are running. After a delay to warm up the filaments, the bias and low voltages are supplied when a turn on signal energizes relay 1A53A3K4. Note that the HIGH VOLTAGE RECTIFIER POWER switch (1A53A3S1) must be closed and locked on with 1A53A3S2 to enable bias turn on. After the bias turn on the 460 vac voltage regulator (1A53A3A1) is turned on. The output of the regulator is stepped up, rectified, and supplied to the high voltage circuits of 1A6 and 1A4. A relay that senses the high voltage circuit, ensures that plate voltages are at the proper operating level before screen voltages are applied to the screens of the first IPA tubes 1A4V9 and 1A4V10.

4.3.18.1.8. **ANTENNA TRANSFER.** Antenna switching logic ensures that when a transmitting group is selected as the operate group, its output is connected to the antenna coupler and the standby group to the dummy load. The dummy load blower is turned on when the standby group receives the standby-test command from the transmitter control equipment or when it is under local control and high voltage is turned on.

4.3.18.1.9. **HIGH VOLTAGE DISCHARGE.** See figure 4-17, sheet 4. Normally closed contacts of relays in relay assembly (1A53A1) ground the high voltage busses through discharge resistor assemblies 1A53A19 and 1A53A20. These relays remain de-energized until the bias and low voltages are turned on, removing the ground. When the bias and low voltages are turned off the relays again ground the discharge resistor assemblies to discharge the high voltage capacitors.

4.3.18.1.10. **DELAY OVERLOAD SENSE.** On bias and high voltage turn on transient overload inputs would be detected by sensing circuits causing turn off of bias, low voltage, and high voltage circuits. A time delay circuit is provided to inhibit these sensing circuits in 1A4 and 1A53A3 for a short interval after initial high voltage turn on.

4.3.18.1.11. **INPUT SIGNAL CONTROL.** The input circuit to the first amplifier stage of amplifier group (1A4) is controlled by one relay. When the amplifier group is in the operate mode, this relay selects a fixed level input; in the local mode or standby test mode a variable level input is enabled.

4.3.18.1.12. **REMOTE STATUS INDICATIONS.** The remote control of the Loran Transmitting Set is governed by four status inputs sent from each transmitting group: cooling system, ready, high voltage on, and high voltage normal. These signals represent the status of the following circuits:

- Cooling system: Summation of all water and air cooling circuits.

- Ready: Cooling system operative, filament heated, bias and low voltages normal, and transmitting group is under remote control (LOCKOUTREADY switch set to READY).

- High voltage on: Cooling system operative, filament bias, low and high voltage turned on.

- High voltage normal: Same as high voltage on except high voltages are at normal operating level.

4.3.18.1.13. **RESET LATCHED RELAYS.** When three overloads have occurred in a 90 second interval bias, low and high voltage are turned off and latched relays prevent turn on until the OVERLOAD AND 3 STRIKE RESET switch is depressed. Operating this switch resets these relays as well as latched fault indicator relays and indicator lamps.

4.3.18.2. **PRIMARY POWER DISTRIBUTION.** Distribution of regulated and unregulated 208 vac three phase 50/60 Hz 4 wire and 460 vac, three-phase 50/60 Hz primary power is shown in figure 4-16. As indicated in the figure, power is controlled by switches and transmitter control circuits. The following description of primary power distribution assumes that the following switches are set to positions indicated:

- EMERGENCY STOP switch 1A53A2S19 to RUN.

- 208 vac circuit breaker 1A53A3CB2 to ON.

- POWER switch 1A53A2S17 to ON.

- FILAMENTS switch 1A53A2S13 to ON.

- BIAS PEDESTAL CONTROL SWITCH 1A4S8 to ON.

- BIAS AND LOW VOLTAGE switch 1A53A2S7 to ON.

- HIGH VOLTAGE RECTIFIER POWER switch 1A53A3S1 to ON.

- LOCKED ON switch 1A53A2S2 locked.

- 460 V INPUT circuit breaker- 1A53CB1 to ON.

- PLATE VOLTAGE SELECTOR switch 1A53A2S18 to MAINT OR OPERATE.

4.3.18.2.1. **208 VAC DISTRIBUTION.** When the EMERGENCY STOP switch is set to RUN and the 208 vac circuit breaker set to ON power is distributed as follows:

- Unregulated 120 vac is available for the 208 vac circuit breaker shunt trip circuit.

- Regulated 120 vac is supplied to the transmitter control circuits, the negative power supply 1A4A3A1, and the filament transformer of the bias pedestal power supply.

- Regulated 208 vac single-phase is supplied to operate the 460 vac voltage regulator 1A53A3A1.

- With the POWER switch set to ON and enabled by transmitter control, unregulated 208 vac three phase power is supplied to the second IPA blower 1A4B1, enclosure blower 1B1, and water pump motor 1A52U39B1.

NOTE

Unregulated 208 vac three-phase power is distributed to the dummy load blower 4B1 only when 460 vac is applied to the high voltage transformer 1A53A6T1 in standby transmitting group.

- With FILAMENTS switch set to ON and enabled by transmitter control, regulated 208 vac three phase power is supplied to the filament transformers of 1A4 and 1A6.

- With BIAS PEDESTAL CONTROL SWITCH, BIAS AND LOW VOLTAGE, and HIGH VOLTAGE RECTIFIER POWER switches set to ON; LOCKED ON switch locked, and enabled by transmitter control, distribution is as follows:

  - Regulated 208 vac three-phase is supplied to the -5000 vdc and 500 vdc power supply 1A53A6A1.

  - Regulated 208 vac single-phase is supplied to the left and right -1100 vdc PA bias power supplies in 1A4.

  - Regulated 120 vac is supplied to the bias pedestal power supply 1A4A4.

4.3.18.2.2. **460 VAC DISTRIBUTION.** When the 460 V INPUT circuit breaker is set to ON, one phase is stepped down to 120 vac to operate the 460 vac circuit breaker shunt trip circuit. The 120 vac is stepped down to 26. 5 vac to operate transmitter control relays.

With the PLATE VOLTAGE SELECTOR switch set to either MAINT or OPERATE and enabled by transmitter control, 460 vac three phase is supplied to the high voltage transformer 1A53A6T1.

4.3.18.3. **TRANSMITTER CONTROL CIRCUIT DESCRIPTION.** The following paragraphs and associated figure 4-17, describe the operation of transmitter control circuits. Circuit descriptions are presented in the following sequence:

- Motor control (Sheet 1)
- Start transfer (Sheet 2)
- Filament turn-on (Sheet 3)
- Bias and low voltage turn-on (Sheet 4)
- High voltage turn-on (Sheet 5)
- Protection (Sheets 6 and 7)
- Shunt trip (Sheet 8)
- Lighting (Sheet 9)

NOTE

Control and indicator circuits identified on figure 4-17 (transmitter control) are only shown in simplified form for reference. These circuits are part of the transmitter control equipment, not supplied with Loran Transmitting Set AN/FPN-44. Refer to the Timing, Pulse Generating, and Transmitter Control Equipment Technical Manual for circuit details.

4.3.18.3.1. **MOTOR CONTROL.** This circuit (figure 4-17, sheet 1) performs the following functions:

- Turns on motors.
- Enables antenna coupling switching to the operating transmitting group.
- Enables the sequential turn on of filament bias and high voltage power.
- Provides for automatic restart if 208 vac power is momentarily interrupted in the remote mode.
- Disables automatic restart if 208 vac power is momentarily interrupted in the local mode.
- Provides for cooling after shut-down.
- Provides status indications of cooling systems.

- Provides optional remote power-on capability.

The second 1PA blower motor 1A4B1, enclosure motor 1B1, and water pump motor 1A2U39B1 are simultaneously turned on by energizing 1A11K1, 1A11K2, and 1A11K3, respectively. The circuit consists of POWER switch 1A53A2S17, and relays 1A53A3K51, 1A53A3K40, and 1A53A3K5. When the POWER switch is in the OFF/RESET position relay 1A53A3K51 is latched on by its contacts, so that when the POWER switch is set to the ON position, it does not drop out. Relay contacts 1A53A3K40-4, -5 are normally closed and open only when meter-relay 1A53A3M1 or relays 1A53A3K36 or 1A53A3K37 have sensed malfunctions for more than two seconds. The sensed malfunctions are: 208 vac undervoltage or 120 vdc power supply overcurrent or undervoltage. Shut-down cooling relay 1A53A3K5 contacts remain closed (adjustable from 1 to 10 minutes) for 5.5 minutes after the coil is de-energized so that cooling can continue after a shutdown. An additional latching circuit is provided for relay 1A53A3K51 by the contacts of relay 1A53A3K44, when the LOCKOUT-READY switch 1A12S1 is in the READY position. This provides for automatic restart if there is an interruption of the 208 vac in remote operation mode only. To restart in the local mode, the POWER switch must be set to the OFF/ RESET position and then to the ON position.

A status signal is provided to the remote control location to indicate the operation of water and air cooling. When relays 1A11K1, 1A11K2, and 1A11K3 are not energized or 1A12K14 is energized, a circuit is closed to the remote station to indicate a cooling fault. Relay 1A12K14 is energized when relay 1A12K7 or 1A12K8 is energized or 1A12K9 is de-energized. Relay 1A12K7 is energized when thermoswitch 1A6S9 is closed, indicating that the primary cooling inlet water temperature is above a preset level. Relay 1A12K8 is energized when any one of the primary cooling outlet water thermoswitches (1A6S5 through 1A6S8) is closed indicating that the outlet water temperature for a particular power amplifier tube is above a preset level. Relay 1A12K9 is de-energized when the water float switch is open indicating that the water level of the tank in 1A2 is low. The indicator lamps associated with relays 1A12K7, 1A12K8 and 1A11K9 are normally lit and go off when a fault is sensed. Relay 1A12K8, when energized by a fault, is latched, thereby keeping its associated indicator lamp off until reset by the OVERLOAD AND 3 STRIKE RESET pushbutton, shown in the protection circuits, figure 4-17, sheet 6.

An optional turn-on circuit is provided for the remote location, if a jumper is removed from 1A53A2TB37 terminals 1 and 2. The option provides for the remote control of the motor and filament turn on circuits.

4.3.18.3.2. **START TRANSFER.** The functions performed by these circuits (figure 4-17, sheet 2 and table 4-3) depends on the mode

of operation and the selected transmitter group. Since the groups are functionally identical, to simplify presentation, the operation of transmitting group no. 1 is described in the various modes. The modes are: operate, standby, standby test and lockout. Mode selection is controlled by the following switches: Xmtr Selector, Standby Test, and LOCKOUT-READY 1A12S1. A station is normally operated with one transmitting group in the operate mode and the other transmitting group in, the standby mode. The standby test and local modes are used for test and maintenance.

1. OPERATE MODE. In the operate mode, as indicated in table 4-3, Xmtr Selector is set to Xmtr No. 1, Standby Test is off, LOCKOUT-READY is set to READY, and the PLATE VOLTAGE SELECTOR switch is set to OPERATE. With this switch configuration the following relays are energized: 1A12K11, 3K1, 3K2, 3K5, 3K6, 1A12K12, 1A12K15, and 1A53A3K44. Relays 1A4K9, 3K7 and 4K1 are not energized. Relay 1A12K11, energized only when Xmtr No. 1 and READY are selected, enables the operation of 3K5 and disables 1A4K9. Relay 3K5 enables 3K1, 3K2, OPERATE indicator lamp 1A12DS13 and TRANSMITTER NO. 1 OPERATE lamp 3DS1 and disables STANDBY indicator lamp 1A12DS12. Relay 3K6 is energized via the closed contacts of relays 3K1, 3K2, and 3K7. Relay 1A12K15 is energized via the closed contact of relays 3K1, 3K2, and 3K6. Relay 1A53A3K44 is energized by selecting, the READY position. Relay 1A12K12 is energized by selecting Xmtr No. 1. The functions performed by this relay configuration are:

- When relay 3K1 is energized, the output of transmitting group no. 1 is connected to the antenna.

- When relay 3K2 is energized, the ground circuit of transmitting group no. 1 is connected to the counterpoise.

- When relay 3K6 is energized, the ground is removed from the antenna.

- Relay 1A12K15 must be energized to enable the high voltage turn on.

- When relay 1A4K9 is not energized, the input to the amplifier group (1A4) is at a fixed drive level.

- Functions of relays 1A12K12, 1A12K15, and 1A53A3K44 are shown on figure 4-17, sheets 1 and 5.

- When relay 3K5 is energized, the OPERATE indicator lamp 1A12DS13 and TRANSMITTER NO. 1 OPERATE indicator lamp 3DS1 are lit.

2. STANDBY MODE. In the standby mode, the Xmtr Selector is set to Xmtr No. 2,LOCKOUT-READY switch 1A12S1 is set to READY, and

the PLATE VOLTAGE SELECTOR switch 1A53A2S18 is set to OPERATE. With this switch configuration only relays 1A4K9 and 1A53A3K44 are energized. The functions performed by operated and unoperated relays are as follows:

- When relay 3K1 is not energized, the output of transmitting group no. 1 is connected to the dummy load.

- When relay 3K2 is not energized. the transmitting group no. 1 ground is connected to the dummy load ground.

- When relay 4K1 is not energized dummy load blower is not turned on.

- When relay 1A12K15 is not energized, high voltage turn-on is not enabled.

- When relay 1A4K9 is energized, the input to the amplifier group (1A4) is an adjustable drive level.

- When relay 3K5 is not energized, the STANDBY indicator lamp 1A12DS12 is lit.

- Other functions of relays 1A12K12 and 1A53K44 are shown on figure 4-17, sheets 1 and 5.

3. STANDBY TEST MODE. In the standby test mode, Xmtr Selector is set to Xmtr No. 2, Standby Test switch is closed, LOCKOUT-READY switch 1A12S1 is set to READY and PLATE VOLTAGE SELECTOR switch 1A53A2S18 is set to OPERATE. With this switch configuration the following relays are energized: 1A12K12, 1A4K9, 4K1, 1A12K15, and 1A53A3K44. Relay 1A12K15 is operated by 120 vac from the start motor circuit via the Standby Xmtr B+ switch. Relay 4K1 is operated by 120 vac from the start motor circuit via 1A53A2S18, 3K1, 3K2, 4K2, 1A12K11, and 1A12K12 contacts. Relay 1A12K15 is operated by 120 vac from the start circuit via 1A53A2S18, 3K1, 3K2, 4K1, and 4S1. The function performed by operated and unoperated relays are as follows:

- When relay 3K1 is not energized, the output of transmitting Group no. 1 is connected to the dummy load.

- When 3K2 is not energized, the transmitting Group no. 1 ground is connected to the dummy load mound.

- When relay 4K1 is energized, the dummy load blower is turned on.

- Relay 1A12K15 must be energized to enable the high voltage turn on.

- When relay 1A4K9 is energized, the input to the amplifier-group (1A4) is at an adjustable drive level.

- When relay 3K5 is not energized, the STANDBY indicator lamp 1A12DS12 is lighted.

- Other functions of relays 1A12K12 and 1A53A3K44 are shown on figure 4-17, sheets 1 and 5.

4. LOCKOUT MODE. In the lockout mode, the Xmtr Selector switch is set to Xmtr No. 2 and LOCKOUT-READY switch 1A12S1 is set to LOCKOUT. The PLATE VOLTAGE SELECTOR switch 1A53A2S18 may be set MAINT or OPERATE. With this switch configuration the following relays are energized: 1A4K9, 4K1 and 1A12K15. The functions performed in the lockout mode are identical to the standby test mode, except for relay 1A12K12 and relay 1A53A3K44 functions.

5. SUMMARY OF START TRANSFER FUNCTIONS. Table 4-3 summarizes the start transfer functions performed in the various modes. For each mode, the table lists the position of each switch in the switch position columns; the status of each relay in the relay status columns: the functions performed in the function columns, and the status of the associated indicators in the lamp columns.

4.3.18.3.3. **FILAMENT TURN ON.** The filament turn-on circuits (figure 4-17, sheet 3) turn on filament transformers and enable bias and low voltage power turn on after an adjustable 20 to 200 second delay. These functions are performed only if air and water cooling status signals indicate proper operation. If air flow is proper, indicating blower operation in 1A4 and the enclosure, switches 1A4S1 and 1S1 close. When this occurs, the AIR ON indicator lamp 1A53A2DS8 lights and 120 vac is applied to the heating element in relay 1A12K17 via the closed contacts of relay 1A12K7. Relay 1A12K7 contacts are closed if the primarily cooling inlet water temperature is normal. If the water flow rate in the power amplifier (1A6) is proper water flow switches 1A6S1 through 1A6S4 close, energizing relay 1-A53A3K43. Relay 1A53A3K43 contacts close and the WATER ON indicator lamp 1A53A2DS1 lights. Filament relay 1A53A3K3 closes when FILAMENTS switch 1A53A2S13 is closed.

When relay 1A53A3K3 is energized, filament power is turned on, FILAMENT HOURS 1A53A2M6 starts timing filament on time, and filament warm-up relay 1A53A3K7 is energized. This relay, which enables bias turn on, does not pick up until 45 seconds (adjustable from 20 to 200 seconds) have elapsed. The delay prevents bias and low voltage turn on before tube filaments have warmed up. When it picks up, its contacts close the FILAMENT READY indicator lamp 1A53A2DS7 and warm-up lockout relay 1A53A3K52 coil circuits. This relay, also latched by own contacts, has a 30 second delayed drop out. The delayed dropout of relay 1A53A3K52 provides for turning on the bias supplies after a brief loss of

power without waiting for the 45 second pickup delay of 1A53A3K7.

4.3.18.3.4. **BIAS TURN ON.** The bias turn on circuits (figure 4-17 sheet 4), which are initially enabled after filament ready, perform the following functions:

- Remove grounds from the high voltage discharge resistors.

- Turn on bias and low voltage power supplies.

- Enable high voltage turn on.

- Provide meter and indicator lamp indications of bias and low voltage power supplies.

- Disable bias and low voltage turn on when an interlock is opened.

- Disable bias turn on for a short interval after a fault is sensed in the high voltage circuits.

- Disable bias turn on when three faults are sensed in 90 seconds in the high voltage circuits until reset by the OVERLOAD AND 3 STRIKE RESET switch.

The ungrounding of high voltage discharge resistors, contained in subassemblies 1A53A19 and 1A53A20, occurs when relays 1A53A1K1 and 1A53A1K2 are energized by 120 vac. The circuit consists of the closed interlock switches; closed contacts of relays 1A53A3K31, 1A53A3K3, 1A53A3K18, 1A53A3K7, or 1A53A3K52 and 1A53A3K32: closed BIAS AND LOW VOLTAGE switch 1A53A2S7; the closed contacts of relay 1A53A3K46 and LOCKED ON switch 1A53A3S2. Relay 1A53A3K31 is normally de-energized, except when a fault is detected in the high voltage circuits by the protection circuits. Relay 1A53A3K18 is normally de-energized, unless three overloads have been detected in 90 seconds, and remains energized until manually reset. Relays 1A53A3K3, 1A53A1K1 and 1A53A1K2 are energized when the filament turn on conditions are satisfied. Relay 1A53A3K46 is de-energized until the high voltage regulator 1A53A3A1 is turned on. After relays 1A53A1K1 and 1A53A1K2 are energized, the bias and low voltage supplies are turned on by the energized relay 1A53A3K4. When relay 1A53A3K4 is energized, it is latched by its contacts, so that when relay 1A53A3K46 is energized by the turn on of the high voltage, relay 1A53A3K4 remains energized.

DOOR INTERLOCK indicator lamp 1A53A2DS2 lights when all interlocks are closed or bypassed. RIGHT PA BIAS UNDERVOLTAGE indicator lamp 1A12DS11 and LEFT PA BIAS UNDERVOLTAGE indicator lamp 1A12DS10 light when -1100 vdc PA bias power supply voltages, sensed by relay 1A4K7 and 1A4K6, are normal, BIAS AND Low VOLTAGE

TABLE 4-3. SUMMARY OF START TRANSFER FUNCTION IN VARIOUS MODES

SWITCH POSITIONS											RELAY STATUS						FUNCTIONS								LAMP STATUS (NOTE 2)		
	REMOTE				(1A12S1)		(1A53A2S18) PLATE VOLTAGE SELECTOR										XMTR NO. 1 CONNECTED TO		HV TURN ON		DUMMY LOAD MOTOR		1A4 INPUT LEVEL				
XMTR NO. 1 MODE	XMTR SELECTOR		STANDBY TEST								1A12K11 3K1,3K2 3K5,3K6	1A12K2	1A12K15	4K1	1A4K9	1A53 A3 K44	ANT	D.L.	ON	OFF	ON	OFF	FIXED	ADJ.	(1A12DS13) OPERATE	(1A12DS12) STANDBY	3DS1 XMTR NO. 1 OPERATE
	NO. 1	NO. 2	ON	OFF	READY	LOCKOUT	OP	MAINT	OFF																		
OPERATE	X			X	X		X				X	X	X			X	X		X			X	X		X		X
STANDBY		X		X	X		X								X	X		X		X		X		X		X	
STANDBY TEST		X	X		X		X					X	X	X	X	X		X	X		X			X		X	
LOCKOUT		X		X		X	X OR X						X	X	X			X	X		X			X		X	

ON indicator lamp 1A53A2DS5 lights when -5000 vdc power supply voltage and both -1100 vdc PA bias power supply voltages are normal. This circuit includes a voltage divider, a relay driver, and relay 1A53A7K2, 1A4K7, and 1A4K6. The relay driver circuit is adjusted so that when the -5000 vdc power supply is above a preset level it supplies current to operate relay 1A53A7K2 if relays 1A4K7 and 1A4K6 are energized. Relay 1A53A7K2 must be energized to enable high voltage turn-on.

4.3.18.3.5. **HIGH VOLTAGE TURN ON.** The high voltage turn on circuits (figure 4-17 sheet 5) consist of the following circuits: ready, high voltage turn on, high voltage sense, and signal drive control. Turn on occurs in the operate, standby test, and local modes. The mode of operation is determined by switches as described in the start transfer circuit. The circuits perform the following functions:

- Control the operation of 460 vac voltage regulator.

- Determine deionization time after a high voltage fault.

- Provide status signals to remote and local indicators.

- Apply screen grid voltages to 1A4V7 and 1A4V8 when the high voltage is at the proper level.

- Sense 21. 5 kv overvoltage and supply signal to shunt trip circuit.

- Allow automatic recovery after a loss of 460 vac source power when control is from the remote location (operate and standby test modes).

1. OPERATE AND STANDBY TEST MODES OPERATION. Circuit operation for these modes is identical, since the PLATE VOLTAGE SELECTOR switch is set to OPERATE and the LOCKOUT-READY switch is set to READY for both modes. For this switch configuration, relays 1A53A3K44, 1A12K12, and 1A12K15 are energized. Relays 1A53A1K1, 1A53A1K2, and 1A53A7K2 are energized by the bias turn on circuits. Relay 1A53A3K21 is energized if the temperature of the high voltage transformer 1A53A6T1 is below preset limit. With this configuration of energized relays the ready signal is sent to the remote location and relay 1A53A3K45 is energized. When relay 1A53A3K45 is energized, it enables energizing relays 1A53A3K47 and 1A53A3K46 if relay 1A53A3K50 is energized. Relay 1A53A3K50, part of the shunt trip circuit, is energized when 460 vac is present.

When relay 1A53A3K47 is energized, it opens the circuit between terminals 8 and 9 of the 460 vac voltage regulator, which turns on the regulator. When the regulator is turned on, its output rises to an adjustable preset level controlled by the OPERATE ADJUST control in approximately 15 seconds. The feedback

voltage is obtained from a network of the 10. 75 kv power supply in voltage divider 1A53A7. The 10.75 kv and 21. 5 kv power supply voltages are monitored by IPA PLATE VOLTAGE and PA PLATE VOLTAGE meters from resistor networks in the voltage divider. A sample of the 21.5 kv voltage is also supplied to a connector so that the ripple can be observed on an external oscilloscope. Relay 1A53A7 senses 21.5 kv overvoltage. If the 21.5 kv supply is above a preset limit, a signal is sent to the shunt trip circuit, which trips the 460 vac circuit breaker.

When a high voltage fault is sensed, overload relay 1A53A3K31, turns off the bias and high voltage circuits. The function of deionization relay 1A53A3K46 is to disable bias turn on (and therefore disable high voltage turn on) for 3 seconds (adjustable from 0. 5 to 5 seconds) to allow for deionization before the circuits are turned on again. When the 460 vac is lost, relay 1A53A3K50 inhibits high voltage turn on: otherwise the three-strike circuit would count three faults in 90 seconds and lockout the automatic recovery circuit.

When the 10.75 kv power supply rises to 65%, of maximum (approximately 7 kv) relay 1A4K3 applies the screen grid voltage to 1A4V7 and 1A4V8.

2. LOCKOUT MODE OPERATION. In the local mode, the LOCKOUT-READY switch is set to LOCKOUT. The PLATE VOLTAGE SELECTOR switch may be set to OPERATE or MAINT. For this switch configuration, relays 1A53A3K44, and 1A12K12 are not energized, while relay 1A12K15 is energized. Except for the following differences, circuit operation is identical to the operate and standby test mode.

The MAINTENANCE ADJUST control may be used to set the high voltage level without disturbing the OPERATE ADJUST control setting.

4.3.18.3.6. **PROTECTION CIRCUITS.** The protection circuits (figure 4-17 sheets 6 and 7) consist of the relay power supply, ac overcurrent sense, high voltage current sense, and the three-strike circuits.

1. RELAY POWER SUPPLY. The relay power supply includes a rectifier that converts 120 vac to -120 vdc, overcurrent sensing relay 1A53A3K36, and undervoltage sensing relay 1A53A3K37. The power supply supplies the operating voltage for relays 1A53A3K16, 1A53A3K34, 1A53A3K31, and 1A53A3K33 in the overload circuit. If 120 vdc overcurrent or undervoltage is sensed by relays 1A53A3K36 or 1A53A3K37 for more than 2 seconds, relay 1A53A3K40 in the start motor circuit disables the turn on the sequence.

2. AC OVERCURRENT SENSE. The ac overcurrent sense circuits consists of three identical circuits which monitor each line of the 3-phase inputs to the high voltage power transformer. Each

circuit consists of a current transformer, a load resistor, a rectifier, a relay, and associated components. The voltage resulting from the current transformer secondary current passing through the load resistor is rectified and applied to a relay (1A53A3K13. 1A53A3K14, or 1A53A3K15). When the input current in any line is above a preset level, the relay closes to energize relay 1A53A3K31 and 1A53A3K16. Relay 1A53A3K16 locked up through its own contacts, extinguishes the AC OVERLOAD indicator lamp 1A53A2DS10. Relay 1A53A3K31 is the fault trip relay in the three-strike overload circuit described subsequently.

3. HV CURRENT SENSE. Relay 1A53A4K1 is energized when the sensed current in the 10.75 kv power supply return is above a preset level. Relay 1A53A4K2, is energized when the sensed current in the 21.5 kv power supply return is above a preset level. When either relay is energized, it energizes relay 1A53A3K31. Relays 1A53A4K1 and 1A53A4K2 also energize relays 1A53A3K8 and 1A53A3K9 respectively. When relays 1A53A3K8 or 1A53A3K9 are energized, they are latched and extinguish IPA OVERLOAD indicator lamp 1A53A2DS13 and PA OVERLOAD indicator lamp, respectively.

4. THREE STRIKE OVERLOAD CIRCUIT. The three strike overload circuit performs the following functions:

- Disables certain fault sensing circuits on initial high voltage turn on.

- Provides for the automatic turn off and reapplication of bias and high voltages due to a momentary fault.

- Locks out bias and high voltages if three faults are sensed in 90 seconds until manually reset.

- Inhibits the high voltage turn on if the high voltage transformer overheats until transformer returns to normal temperature and manually reset by the OVERLOAD AND 3-STRIKE RESET switch.

- Provides for the reset of latched relays.

Table 4-4 lists each fault that operates the automatic recovery circuit, and the associated sensing relay. The indicator relay latches when energized by a fault signal from the sensing relay, thereby keeping the indicator lamp off. In addition to the sensing relays, the overload circuits include: cam relay 1A53A3K33, 3-strike interval relay 1A53A3K17, 3-strike lockout relay 1A53A3K18, fault trip relay 1A53A3K31, and overload sense inhibit relay 1A53A3K34.

When any one of the faults listed in table 4-4 is sensed.

fault trip relay 1A53A3K31 is energized. This locks out the 460-vac regulator by energizing relay RYA in the chop-off limiter unit. Relay 1A53A3K31 also de-energizes the discharge relays, 1A53A1K1 and 1A53A1K2, and the bias contactor, 1A53A3K4 by opening the bias turn-on circuit. Another set of relay 1A53A3K31 contacts control stepping relay 1A53A3K33.

Relay 1A53A3K33 is comprised of three sets of interrupter contacts and 5 sets of cam contacts. The interrupter contacts open and close with the energizing and de-energizing of the relay. The cam contacts open and close in the order shown on the table on figure 4-17, sheet 6. The cam is advanced whenever 1A53A3K33 is de-energized by a mechanical ratcheting action.

When the first fault energizes 1A53A3K31, it also energizes 1A53A3K33. This energizes relay 1A53A3K17 through leg 2. The contacts of 1A53A3K17 remain in this state for approximately 90 seconds after its coil is de-energized. The removal of bias and high voltage by 1A53A3K31 contacts prevents detection of another fault until bias and high voltage return. Therefore, relay 1A53A3K31 is de-energized, which causes 1A53A3K33 to be de-energized, which in turn advances its cam to fault position 1.

While in fault position 1, further cam advancement by leg 1 is inhibited by the open contacts of relays 1A53A3K17 and

1A53A3K18. Three conditions may now change the state of this circuit.

1. One more overload within 90 seconds advances the cam to fault position 2.

2. Two more overloads advances the cam to fault position 3. if this happens, 1A53A3K18 will be energized through leg 3.

3. If 90 seconds elapses before three overloads occur, the cam advances to the "home" (0) position and the circuit is back to its original condition.

In case 2, where the third overload is detected in less than 90 seconds, 1A53A3K18 is energized. One set of its contacts provide self-latching; another set inhibits bias and high voltage turn on. In addition, another set provides continuity in leg 1 and allows 1A53A3K33 to advance to home position, at which time contact E opens. Bias and high voltage can only be reapplied by manually pressing OVERLOAD AND 3 STRIKE RESET switch, which unlatches 1A53A3K18.

In case 3, where only one or two overloads have occurred and the 90 second time delay has expired, relay 1A53A3K17 contacts provide continuity in leg 1 to energize 1A53A3K33. Relay

1A53A3K33 is enabled until the home position is reached, where contact E opens breaking the circuit.

Transformer temperature sensing relay 1A53A3K21, is energized through the normally closed contacts of thermoswitch 1A53A6S1. When energized, the relay enables high voltage turn on, latches relay 1A53A3K48, and lights PLATE TRANSFORMER OVER TEMP indicator lamp 1A53A2DS11. When thermoswitch 1A53A6S1 opens, relay 1A53A3K21 is de-energized. When this occurs, high voltage is inhibited and the lamp is extinguished. When the switch 1A53A6S1 re-closes, relay 1A53A3K21 remains de-energized because relay 1A53A3K48 is still energized through its latching contacts. The high voltage and the PLATE TRANSFORMER OVERTEMP lamp remain off until reset by pressing the OVERLOAD AND 3 STRIKE RESET switch to drop out 1A53A3K48.

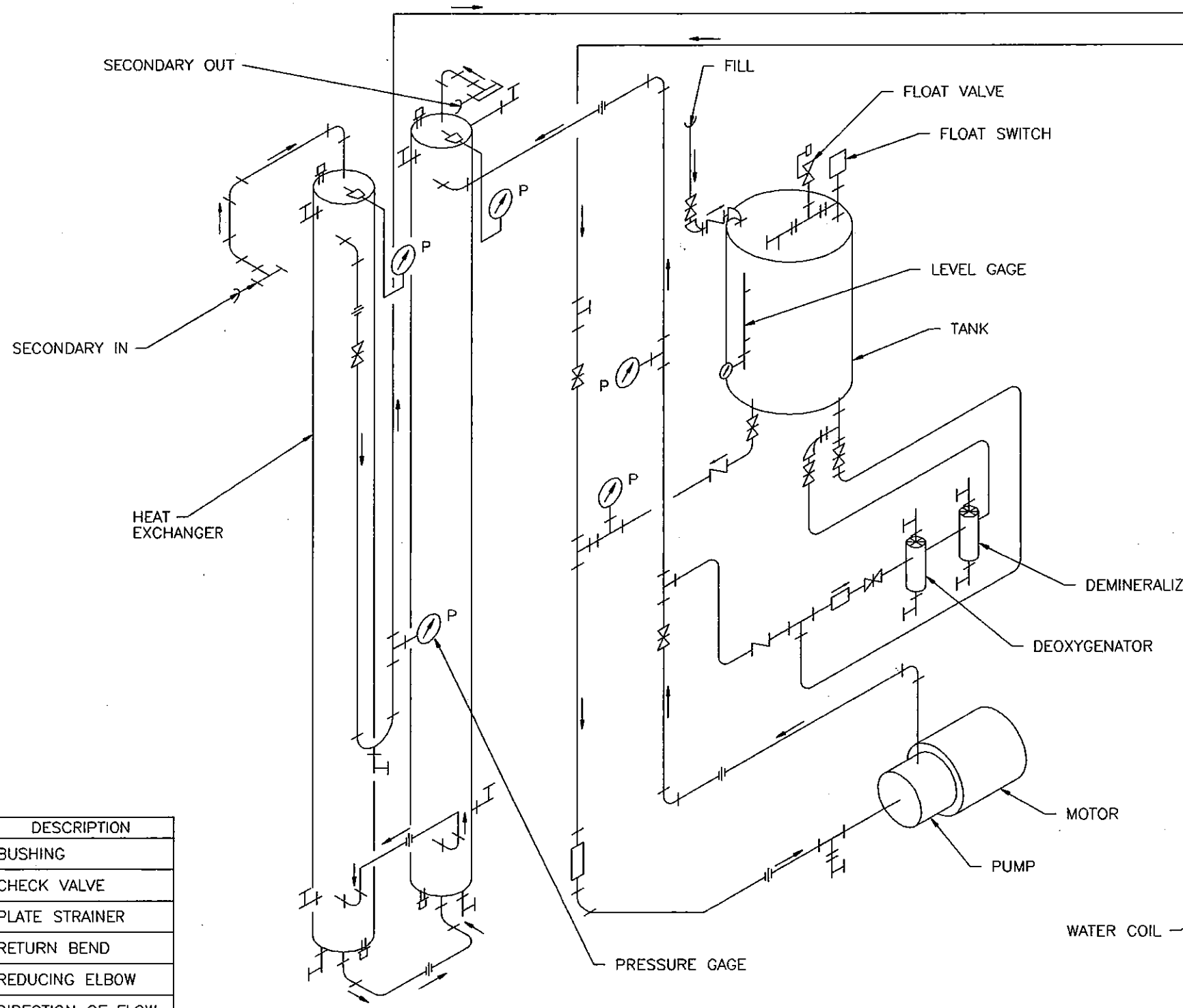
When the OVERLOAD AND 3 STRIKE RESET switch 1A53A3S8 is depressed, it releases the following latched relays: 1A53A3K18, 1A53A3K16, 1A53A3K8, 1A53A3K9, 1A53A3K48, and 1A12K1O. When relay 1A53A3K18 is released, bias and high voltage turn on are enabled and 3 STRIKE indicator lamp 1A53A2DS12 lights. When relay 1A53A3K16 is released, AC OVERLOAD indicator lamp 1A53A2DS10 lights. When relay 1A53A3K8 is released, IPA OVERLOAD indicator lamp 1A53A2DS13 lights. When relay 1A53A3K9 is released, PA OVERLOAD indicator Lamp 1A53A2DS14 lights. When relay 1A53A3K48 is released, high voltage turn on is enabled and PLATE TRANSFORMER OVER TEMP indicator lamp 1A53A2DS11 lights. When relay 1A12K10 is de-energized, it releases relays 1A12K1 through 1A12K6, 1A12K18, and 1A12K19 which lights the associated lamps shown in table 4-4. and relay 1A12K12 which lights PA1A6 OUTLET OVERTEMPERATURE.

Fault sensing circuits are disabled on high voltage turn on by relays 1A53A3K47, 1A53A3K34 and 1A4K8. Before the high voltage is turned on, relay 1A53A3K34 is energized via the de-energized relay 1A53A3K47 closed contacts and relay 1A4K8 is energized via the energized relay 1A53A3K34 closed contacts. With relay 1A53A3K34 energized, the overcurrent sensing relay 1A53A3K13, 1A53A3K14, and 1A53A3K15 are in series with resistors 1A53A3R64, 1A53A3R65, and 1A53A3R66 respectively, thereby reducing their sensitivity. With 1A4K8 energized the current sensing relay 1A4K5, 1A4K4 and 1A53A4K1 are shorted. When relay 1A53A3K47 is energized for high voltage turn-on a resistor-capacitor combination keeps relay 1A53A3K34 and 1A4KB energized for approximately one tenth of a Second. The turn off delay prevents initial surge currents on high voltage turn on from sending fault signals to the fault trip relay 1A53A3K31.

TABLE 4-4. FAULTS WHICH TURN OFF BIAS AND HIGH VOLTAGES

FAULT SENSE RELAY	FAULT INDICATOR	INDICATOR RELAY
1A4K1	LEFT 1ST IPA CATHODE OVERLOAD (1A12DS1)	1A12K1
1A4K2	RIGHT 1ST IPA CATHODE OVERLOAD (1A12DS2)	1A12K2
1A4K5	LEFT PA BIAS OVERLOAD (1A12DS3)	1A12K3
1A4K4	RIGHT PA BIAS OVERLOAD (1A12DS4)	1A12K4
1A6K1	1A6V1 CATHODE OVERLOAD (1A12DS34)	1A12K18
1A6K3	1A6V3 CATHODE OVERLOAD 1(1A12DS5)	1A12K5
1A6K2	1A6V2 CATHODE OVERLOAD (1A12056)	1A12K6
1A6K4	1A6V4 CATHODE OVERLOAD (1A12DS35)	1A12K19
1A53A4K1	IPA OVERLOAD (1A53A2DS13)	1A53A3K8
1A53A4K2	PA OVERLOAD (1A53A2DS14)	1A53A3K9
1A53A3K13 1A53A3K14 1A53A3K15	AC OVERLOAD (1A53A2DS10)	1A53A3K16
	460 vac voltage regulator detected faults:	
NONE	Overtemperature	NONE
1A53A3A1A4RYA	AC overload	
1A53A3A1A1RY 1A53A3A1A2RY 1A53A3A1A3RY	460 VAC undervoltage	NONE

4.3.18.3.7. **SHUNT TRIP.** Both the 460 vac circuit breaker 1A53A3CB1 and the 208 vac circuit breaker 1A53A3CB2 incorporate shunt trip coils (see figure 4-17, sheet 8). Each coil when energized trips its circuit breaker. To restore power after a trip, the circuit breakers must be manually reset. A separate fused power circuit and indicator lamp is provided for each shunt trip circuit. The 460 vac shunt trip circuit fused by 1A53A3F41 and 1A53A3F42 receives its 120 vac operating voltage from the 460 vac lines via step down transformer 1A53A3T3. The 120 vac is stepped down to 26 vac by transformer 1A53A3T4 to supply time delay relay 1A53A3K39. The 208 vac shunt trip circuit receives its 120 vac via fuse 1A53A3F40. The 120 vac is stepped down to 26 vac by transformer 1A53A3T2 to operate time delay relays 1A53A3K28



COOLING UNIT
UNIT 1A2

SYMBOL	DESCRIPTION
	NIPPLE
	UNION ELBOW
	90° ELBOW
	GATE VALVE
	LATERAL FITTING
	PLUG
	UNION
	COUPLING
	TEE
	REDUCER
	PET COCK

SYMBOL	DESCRIPTION
	BUSHING
	CHECK VALVE
	PLATE STRAINER
	RETURN BEND
	REDUCING ELBOW
	DIRECTION OF FLOW
	PRIMARY SYSTEM
	SECONDARY SYSTEM
	ELECTRODE PLUG
P	FLOW SWITCH

AN/FPN-44A	AN/FPN-44B
OT-96/FPN-44A	OA-4483/FPN-44
HD-1000/FPN	HD-601/FPN
OG-159/FPN-44A	OA-4482/FPN-44
PP-7304/FPN-44A	C-4557/FPN-44
OP-109/FPN-44A	1096281G3
CN-1472/FPN-44A	1096343G1
CN-1472/FPN-44A	1096285G2
CN-1472/FPN-44A	1096285G3
CU-2171/FPN-44A	CU-1106/FPN-44

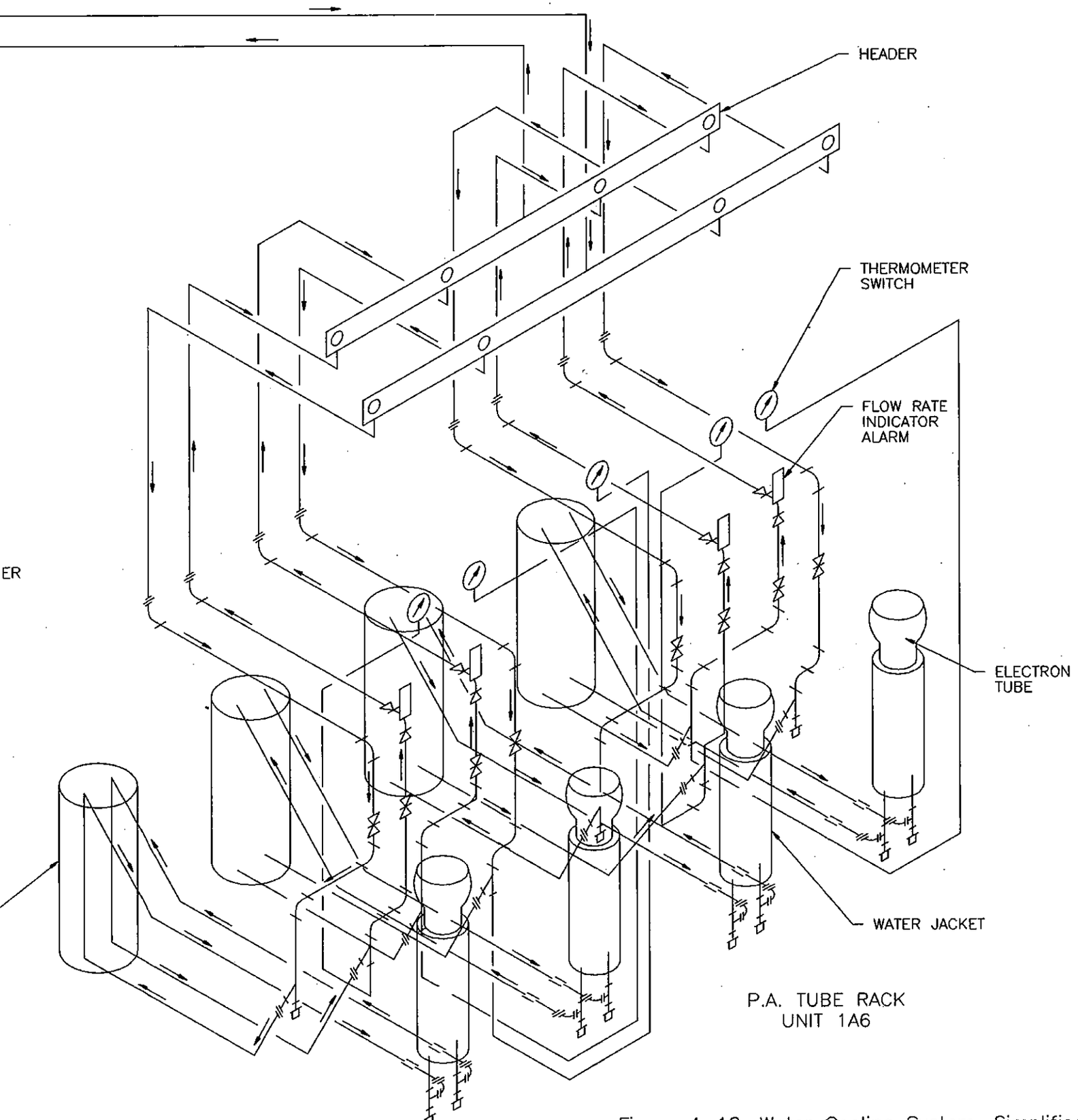


Figure 4–18. Water Cooling System, Simplified Schematic Diagram

and 1A53A3K40, shown as part of the motor turn-on circuits.

The following conditions trip the circuit breakers by energizing their shunt trip coils:

- Depress a remote emergency stop switch. (CB1 and CB2).

- Open the key operated LOCKED ON switch 1A53A3S2. (CB1 only)

- Set EMERGENCY STOP switch 1A53A2S19 to STOP. (CB1 and CB2)

- A plate overvoltage sustained for more than two seconds, sensed by relay 1A53A7K1 (CB1 only).

- A 208 vac overvoltage sustained for more than two seconds, sensed by meter-relay 1A53A3M1 (CB2 only).

1. REMOTE EMERGENCY TRIP. This circuit provides the capability of tripping both the 460vac circuit breaker 1A53A3CB1 and the 208vac circuit breaker from a remote location. When activated, the 460 vac power is turned off before the 208 vac. Circuit operation is initiated by depressing a remote emergency stop pushbutton. Note that in normal operation, relays 1A12K13, 1A12K16, and 1A53A3K50 are energized. When the pushbutton is depressed, relay 1A12K13 is de-energized, thereby providing a closed circuit to energize relay 1A53A3K49. When energized, its contacts close the 1A53A3CB1 shunt trip coil circuit, which results in the turning off of 460 vac power. Removing the 460 vac power causes relay 1A53A3K50 contacts to close, thereby applying 120 vac to the shunt trip coil of 1A53A3CB2 via the normally closed contacts of relay 1A53A3K28.

2. LOCKED ON SWITCH 1A53A3S2. When the key in LOCKED ON S2 switch 1A53A3S2 is turned to the unlocked position, contacts 1 and 2 are closed. This action applies 120 vac across the shunt coil of the 460 vac circuit breaker 1A53A3CB1, tripping the breaker, thereby turning off the high voltage circuits. At the same time contacts 3 and 4 of 1A53A3S2 (shown on sheet 4 of figure 4-17 as part of the interlock circuit) are opened, turning off the bias and low voltage circuits.

3. EMERGENCY STOP SWITCH 1A53A2S19. When this switch is set to STOP, simultaneously applies 120 vac directly to each silent trip coil tripping both the 460V INPUT circuit breaker and the 208 volt circuit breaker.

4. HIGH VOLTAGE OVERVOLTAGE. When relay 1A53A7K1 senses an overvoltage in the PA plate voltage supply, it applies 26 vac through its contacts to terminal 2 of time delay relay 1A53A3K39. If the overvoltage is sustained for more than two seconds,

contacts 4-6 of relay 1A53A3K39 close, applying 120 vac to the shunt trip coil of 1A53A3CB1, thus disconnecting the 460 vac power.

5. 208 VAC OVERVOLTAGE. When the 208 vac supply is within preset limits, contacts 3-4 and 4-5 of meter relay 1A53A2M1 are open. When the 208 vac supply is above the preset limit, contacts 4-5 close, supplying a signal to two-second time delay relay 1A53A3K28. If the overvoltage is sensed for more than two seconds, relay contacts 4-6 of 1A53A3K28 close the 120 vac circuit across the shunt trip coil of 1A53A3CB2.

4.3.18.3.8. **LIGHTING.** Power for lighting the enclosure and the panels (figure 4-17, sheet 9) is supplied from two sources. An independent 120 vac line supplies enclosure lighting and convenience outlet power, each controlled by a switch. Panel lighting power is supplied by the 120-vac control power. The brightness of the panel lights are controlled by the DIMMER control on the control indicator panel 1A53A2.

4.3.19. **WATER COOLING SYSTEM.** The water cooling system is shown in figures 4-18 and 7-34. This system removes the heat generated by power amplifier tubes 1A6V1 through 1A6V4. The entire system is capable of delivering water at a rate of 75 gallons per minute to the power amplifiers and of dissipating 250 kilowatts of heat.

The water cooling system has two heat exchangers, a motor-driven pump and an expansion tank for the supply of primary coolant.

The water cooling system contains a primary and secondary circuit. The primary circuit is the path through which distilled water coolant is pumped from electron tube liquid cooler 1A2 through the power amplifier tube water jackets and back to the liquid cooler. Part of primary coolant is circulated through oxygen and mineral removal filters. The secondary circuit is the path in which the secondary coolant is pumped from an external source through the liquid cooler and back to its source. The secondary coolant is fresh undistilled water.

Four outlets leading from the main outlet distributes water to each power amplifier tube.

Safeguard alarms against insufficient cooling are provided to prevent damage due to excessive heating in the power amplifier tubes. These safeguard alarms are activated by automatic switches.

Flow rate alarm switches 1A6S1 through 1A6S4 are located in the cooling path of each power amplifier tube. These switches are electrically in series with one another. When the water flow through the system is normal, the switches close, energizing

1A53A3K43 which closes a set of contacts in the transmitter filament interlock circuits. In addition, another set of contacts close, lighting the WATER ON lamp 1A53A2DS1. The actual rate of flow can be measured directly from the flow meters.

The thermometers are directly associated with automatic thermo-electric switches 1A6S5 through 1A6S8. These thermometers are located in the cooling path of each tube, just before the coolant re-enters the main pipe to return to the liquid cooler.

The switches are connected in parallel. When the temperature of the primary coolant is too high above 70°C (158°F) - in any of the paths, its associated switch closes and OVERTEMPERATURE PA1A6 OUTLET lamp 1A12DS8 on the indicator panel lights. The actual temperature can be read directly from the thermometer dial. These thermometers are located on the PA tube racks. A thermometer is associated with INLET TEMP. switch 1A6S9. This thermometer and switch are located in the main inlet where the coolant is about to enter the cooling path of each tube. When the temperature of the primary coolant is above 60°C (108°F) switch 1A6S9 closes, the equipment shuts down automatically, and OVERTEMPERATURE PA1A6 INLET lamp 1A12DS7 on the indicator panel goes out.

In the water cooler itself, there is a low water level switch and gauge glass water level indicator.

When the water falls below a present level, the switch closes and WATER LEVEL indicator lamp 1A12DS9 on the indicator panel lights. If the low water level alarm, a flow meter, or an outlet thermometer indicates a malfunction, an alarm signal is sent to the transmitter control equipment.

Table 4-5 provides a summary of the water cooling system sense and indicator functions.

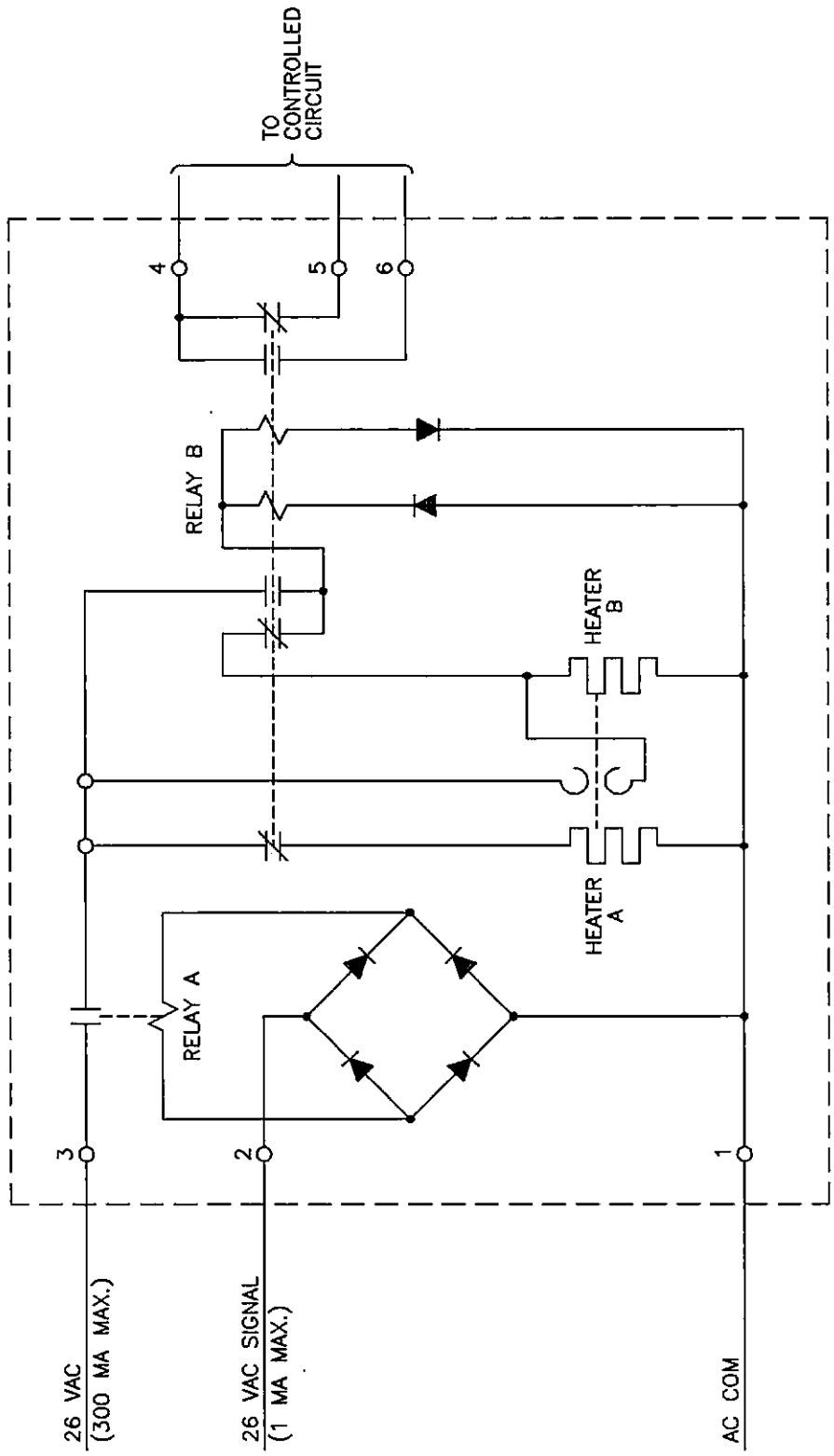


Figure 4–19. Time Delay Relay, Schematic Diagram

TABLE 4-5. WATER COOLING SYSTEM INDICATOR AND SENSOR FUNCTIONS

REF. DES.	DESCRIPTION	FUNCTION
1A6M5	Milliammeter	Provides visual indication of primary coolant conductivity.
1A6: S1, S2, S3, S4	Flow rate switches	Supplies transmitter control circuits with flow rate status for each PA tube. When rate is below limit, inhibits filament turn on and supplies alarm in remote indicator. Associated flow rate meter provides visual indication.
1A6: S5, S6, S7, S8	Thermostats	Provides transmitter control circuits with water temperature status of each PA tube. When temperature is above limit, sends alarm to remote station. Associated thermometers provide visual indications.
1A6S9	Thermostat	Provides transmitter control circuits with water temperature status tubes. When temperature is above limit, inhibits filament turn on supplies alarm indicator. Associated thermometer provides visual indication.
1A2M1	Pressure gauge	Provides visual indication of secondary coolant pressure to heat exchanger.
1A2M2	Pressure gauge	Provides visual indication of secondary coolant pressure to heat exchanger.

TABLE 4-5. WATER COOLING SYSTEM INDICATOR AND SENSOR FUNCTIONS (cont.)

REF. DES.	DESCRIPTION	FUNCTION
1A2M3	Water level gauge	Provides visual indication of water level in tank.
1A2M4	Pressure gauge	Provides a visual indication of primary coolant pressure from heat exchanger.
1A2M5	Pressure gauge	Provides visual indication of pressure or primary coolant return from PA tube rack.
1A2M6	Pressure gauge	Provides visual indication of primary coolant pressure at pump outlet.
1A52S1	Float switch	Provides transmitter control circuits with water level status of primary coolant in tank. When level is below limit, sends alarm to remote indicator.

4.3.20. **COMMON CIRCUITS.** The following paragraph describes a circuit that is used in more than one assembly.

4.3.20.1. **TIME DELAY RELAYS (1A5A3K28, 1A53A3K39 and 1A53A3K40).** This relay provides a two-second delay after closing the control circuit contacts. The control circuit requires only 1 milliampere at 26 volts ac.

The relay circuit is shown in Figure 4-19. With a 26 volts ac signal applied at terminal 2, closing the contacts in the signal circuit energizes a relay A which applies power to heater A. After two seconds the thermal contacts close and energize relay B. This relay has a center-tapped coil with two halves supplied by two diodes. When relay B closes, it transfers the output contacts and closes a maintaining contact. It also disconnects heater A. A low-level heater B is connected to keep the thermal contacts closed. When the signal circuit (or the 26 volt supply) is opened for a few seconds, the thermal contacts open and the relay returns to its normal status.

4.3.21. **LOCAL CONTROL UNIT (5). (Figure 7-51).** The Local Control Unit (LCU), reference designation 5, is the interface between the Transmitting Set and the AN/FPN-60 Transmitter Control Set (TCS). In order to be controlled by either the LCU or the TCS, the OT-96/FPN-44A Transmitter Group must be in "Ready" status. "Ready" consists of 120 VAC when the following conditions are met:

- Transmitter a-c power ON.
- Bias and Low Voltage ON.
- PLATE VOLTAGE selector in OPERATE position.
- LOCKOUT-READY switch in READY position.

When in LOCAL mode, the LCU performs the functions:

- Selects the OPERATE transmitter group.
- Controls transmitter plate voltage (HV interlock) of both transmitter groups.
- Provides control signal status information to the TCS.

When in the REMOTE mode, the controls of the LCU are ineffective.

4.3.21.1. **OPERATE TRANSMITTER SELECTION.** Relay 5K2 is the operate transmitter selector relay having two independent coils. When a 28 volt impulse is impressed across coil terminals 1 and 19, the contacts go to the "latched" position. A voltage

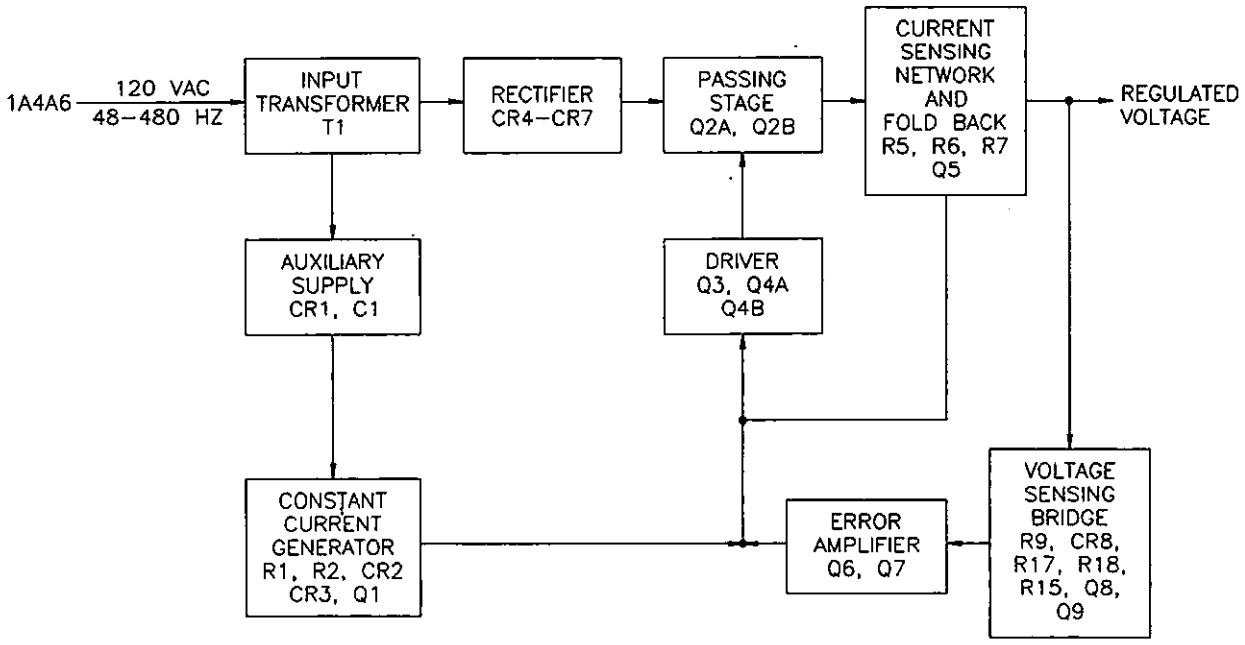


Figure 4–20. –260 VDC and –150 VDC Power Supplies Block Diagram

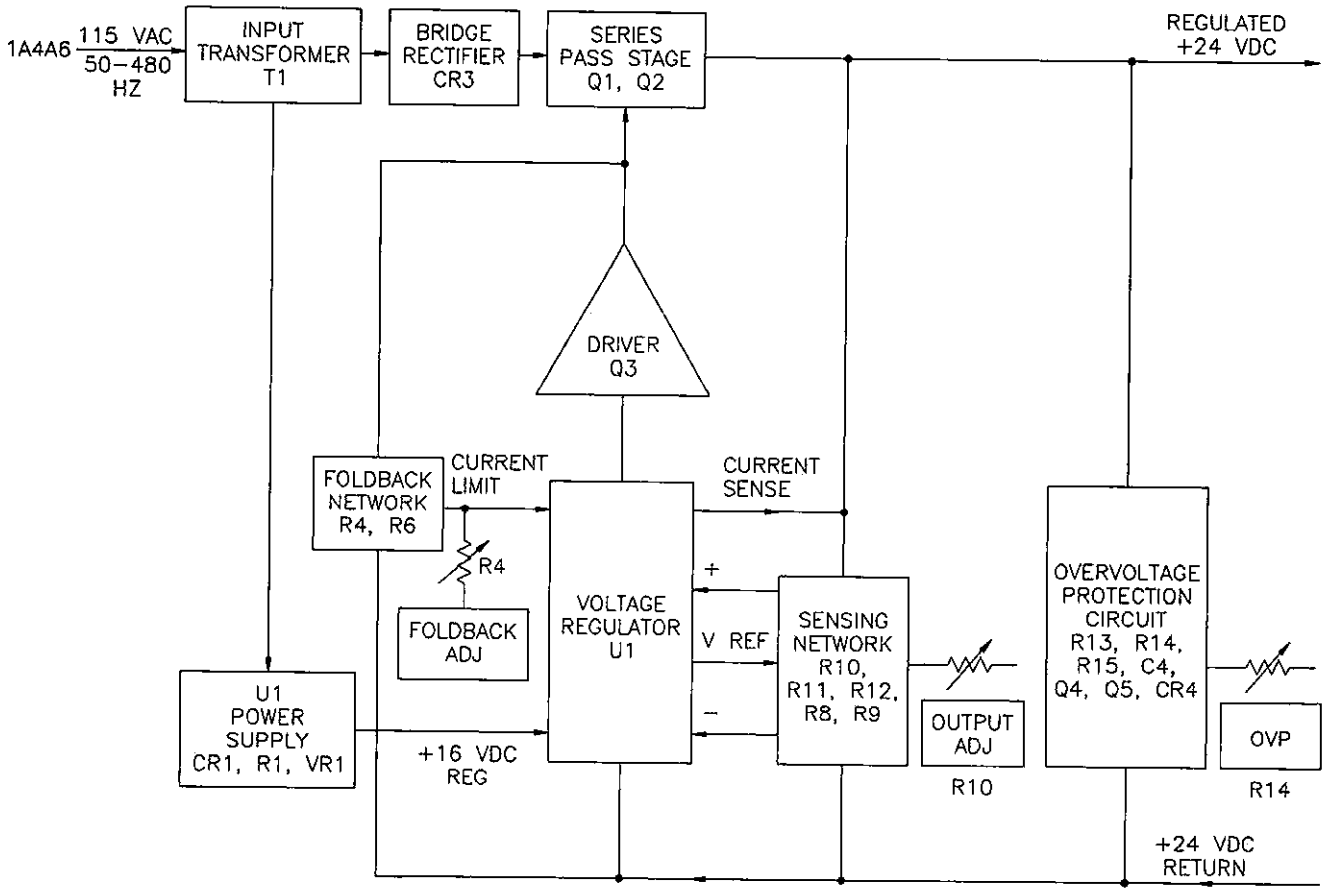


Figure 4–21. ±24 VDC Power Supply, Block Diagram

impulse impressed across coil terminals 2 and 18 place the contacts the "reset" position. Relay 5K2 will remain mechanically locked in the last selected position until the opposite coil is actuated. In figure 7-51 relay 5K2 is shown in the "latched", or transmitter 1 position. Contacts of 5K2 apply d-c common to the Indicator Panel at the selected operate transmitter, which actuates 1A12K11 and the appropriate relay (3K5 or 3K7) in the Antenna Coupler.

In LOCAL mode, transmitter changes are made by manually depressing, the appropriate selector switch, 5S4 or 5S6. The manual selector switches are interlocked through the plate switches of the LCU, 5S1 and 5S3, so that a transmitter change cannot be made unless both HV interlock circuits are open.

In REMOTE operation, the selector relay is actuated by the Transmitter Automatic Controller (TAC) of the TCS, by applying d-c common for a period of approximately eight seconds. When a transmitter change is made by the TAC, the HV interlock circuit is automatically opened prior to the change.

4.3.21.2. **PLATE VOLTAGE CONTROL.** When 1A12S1 is in the READY position the high voltage interlock relay, 1A12K12, is energized by the appropriate B-Plus switch of the LCU in LOCAL mode, or by a contact closure in the TAC when in REMOTE mode. The coil of the HV interlock relay is wired to -28 VDC and energized by applying d-c common.

4.3.21.3. **OPERATE TRANSMITTER INDICATOR.** Indicator lamps 5DS1 and 5DS4 show the position of the selector relay, i.e. Transmitter 1 or Transmitter 2, respectively. These lamps therefore indicate that the operate command has been given. The lighting of the OPERATE lamp, 1A12DS13, indicates that the Antenna Coupler has, in fact, made the proper transmitter selection.

4.3.21.4. **INHIBIT CIRCUITS IN LOCAL OPERATION.** When 5S2 is placed in LOCAL, the alarm circuit for the standby transmitter is inhibited so that it may be serviced without causing the transmitter malfunction alarm to sound.

4.3.21.5. **STATUS SIGNALS TO THE TAC.** In addition to performing transmitter selection and HV interlock by controlling d-c common, the TAC requires additional status information from the transmitters.

The status logic relays of the TAC require 120 VAC. Relay 5K1 determines the source of "TAC 120 V", which is Transmitter 2 when it has power applied. If Transmitter 2 is secured, "TAC 120 V" is derived from Transmitter 1 through normally closed contacts of 5K1. A second set of contacts are used to provide the source for "TAC AC Common".

The "TAC 120 V"/"TAC AC COM" source is used for the following functions:

- lights 5DS1 or 5DS4, "Transmitter No On Antenna" indicator lamps, through contacts of transmitter selector relay.

- provides "No. 1 Ready for Remote" and "No. 2 Ready for Remote" status signals to the TAC through contacts of the selector relay. The "No. 2 Ready for Remote" signal is also used in the TAC as No. 2 "Operate" as the means of ensuring that the positions of the TAC transmitter selector relay and 5K2 are in agreement.

- lights 5DS2 or 5DS3 to indicate the control status of the LCU as "LOCAL" or "REMOTE", respectively.

- lights 5DS5 "READY FOR TRANSFER" lamp to indicate that conditions are correct for transfer of transmitter control point from LCU to TAC or vice versa, without interruption in the output signal.

4.3.21.6. **READY FOR REMOTE.** Indicates capability of transfer of control without signal interruption. The "READY FOR TRANSFER" lamp, 5DS5, indicates that the system is properly aligned to permit a transfer of control of the transmitters without interrupting the transmitted signal. Indicator lamp 5DS5 is lighted under the following conditions:

- When in LOCAL control, READY FOR TRANSFER to the REMOTE, i. e. TAC control point is permissible (lamp is lighted) when the following conditions are satisfied:

- Both transmitters are in "READY" status.

- The B-Plus switch for the selected OPERATE transmitter (5S1 or 5S3) is ON for the OPERATE transmitter.

- 5S2 is in the LOCAL position.

- The transmitter selector relay in the TAC, K2, is in the same position as 5K2.

- When in REMOTE control, READY FOR TRANSFER to the LOCAL, i.e. LCU control point is permissible when the following conditions are satisfied.

- The B-Plus switch for the selected OPERATE transmitter is ON.

- 5S2 is in the REMOTE position.

The function of the HOLD DOWN DURING TRANSFER switch, 5S5, is to maintain continuity in the d-c common circuit when the LOCAL-REMOTE switch 5S2, is operated. This normally open pushbutton switch completes the HV interlock circuit for the selected operate transmitter permitting transfer of control without turning the plate voltage off.

5.0. MAINTENANCE.

This section encompasses the full maintenance requirements and procedures including trouble shooting, service and repairs. Paragraph 5.1 and its sub paragraphs identify the procedures used in trouble shooting, whereas paragraphs 5.2 and its sub paragraphs define the service and repair procedures. Paragraph 5.3 and its sub paragraphs, describe component removal, assembly, and repair. Paragraph 5.4 refers the reader to Section 7 for the AN/FPN-44A schematic and logic diagrams.

5.1. **TROUBLE SHOOTING - GENERAL.** Paragraphs 5.1 its sub paragraphs, describe the trouble shooting procedures to be used. To locate troubles quickly and efficiently, the technician should become thoroughly familiar with the Loran-C ground station equipments giving special attention to monitoring devices and alarm and status indicators of the loran transmitting set.

When a trouble is encountered, the cause of it may be localized to the exact assembly or component item by a systematic procedure. First the defective group must be determined and then the defective group must be determined and then the defective unit within the group. Next, the defective circuit must be determined. Finally the trouble must be isolated to the defective assembly or part.

In troubleshooting the r-f circuits of the modified transmitter, it's usually preferable to place 1A4A1A3S1 in the OPEN LOOP POSITION. This permits analyzing the function of each stage of amplification independently without being affected by feedback.

Figure 7-1 is the schematic diagram for the Input Amplifier unit, 1A4A1A3. Test waveforms are shown on the schematic diagrams in Figure 7-1, and refer to the standard waveforms at the settings listed on the drawing.

> **NOTE:** The waveforms in Figure 7-1 are taken with 1A4A1A3 in the FEEDBACK position.

Figures 5-1 through 5-5 provide parts location information for the Input Amplifier, 1A4A1A3. Figure 5-6 shows the modified component arrangement on terminal board 1A4TB3 of the Exciter mainframe.

5.1.1. **SYMPTOM RECOGNITION.** This is the first step in the trouble shooting procedure and is based on a complete knowledge and understanding of equipment operating characteristics. All equipment troubles are not the direct result of component failure. Therefore, a trouble in an equipment is not always easy to recognize, since all conditions of less than peak performance are not always apparent. This type of equipment trouble is usually discovered while accomplishing preventive maintenance procedures. It is important that the "not so apparent" troubles, as well as the apparent troubles be recognized.

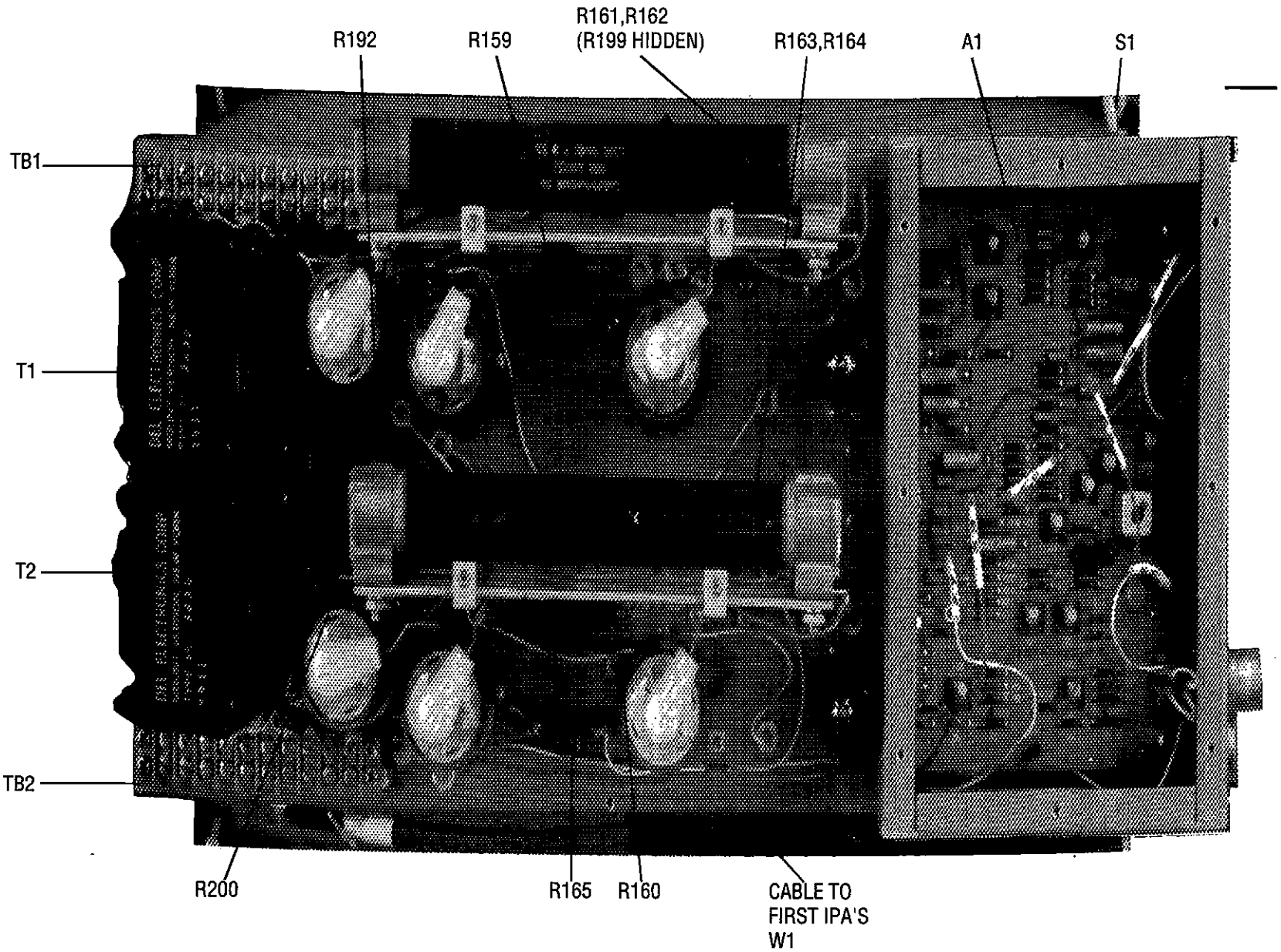


Figure 5-1. Input Amplifier (1A4A1A3), Right Side, Parts Location Diagram

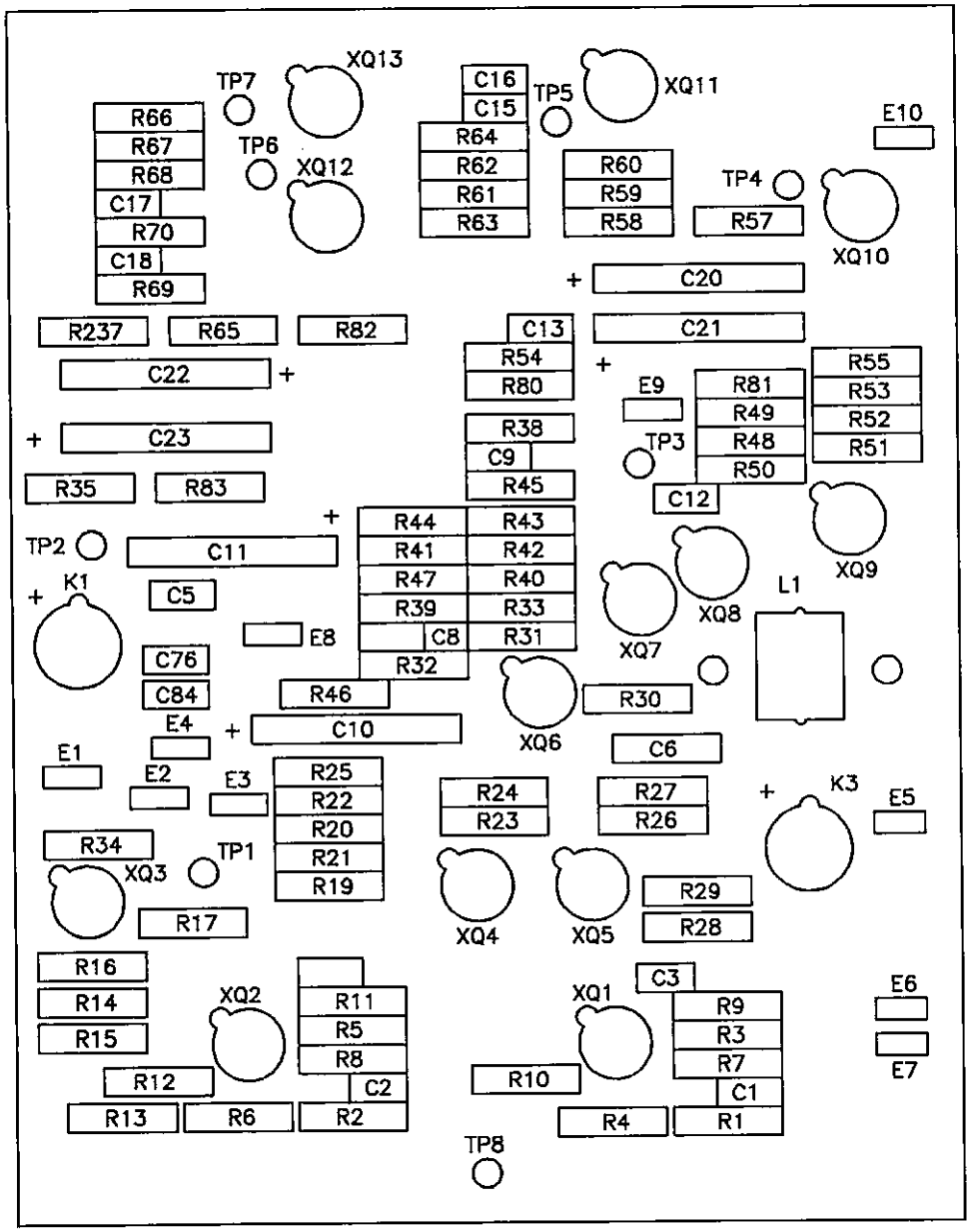


FIGURE 5–2. Reference Amplifier (1A4A1A3A1)
Parts Location Diagram

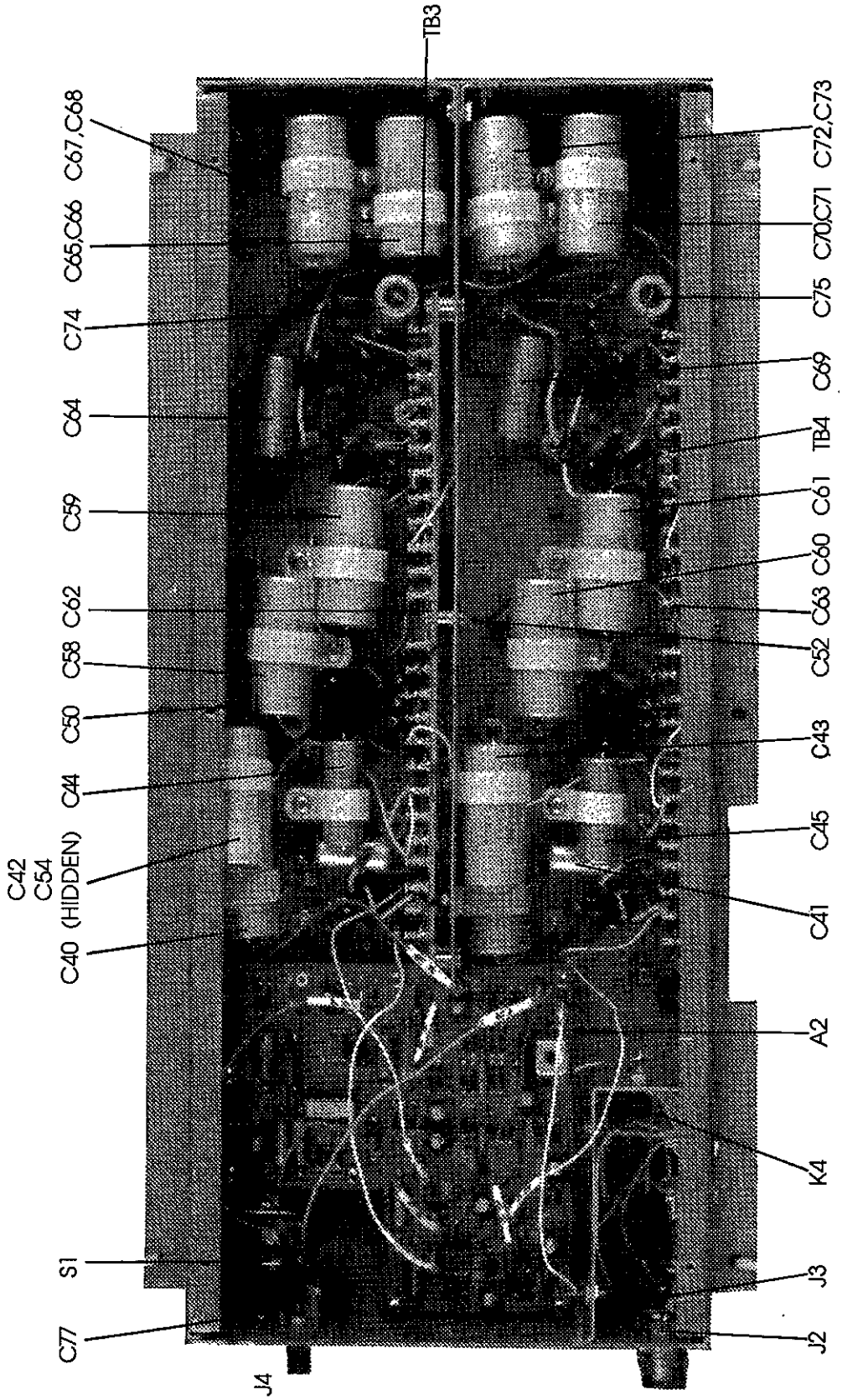


Figure 5-3. Input Amplifier (1A4A1A3), Left Side, Parts Location Diagram

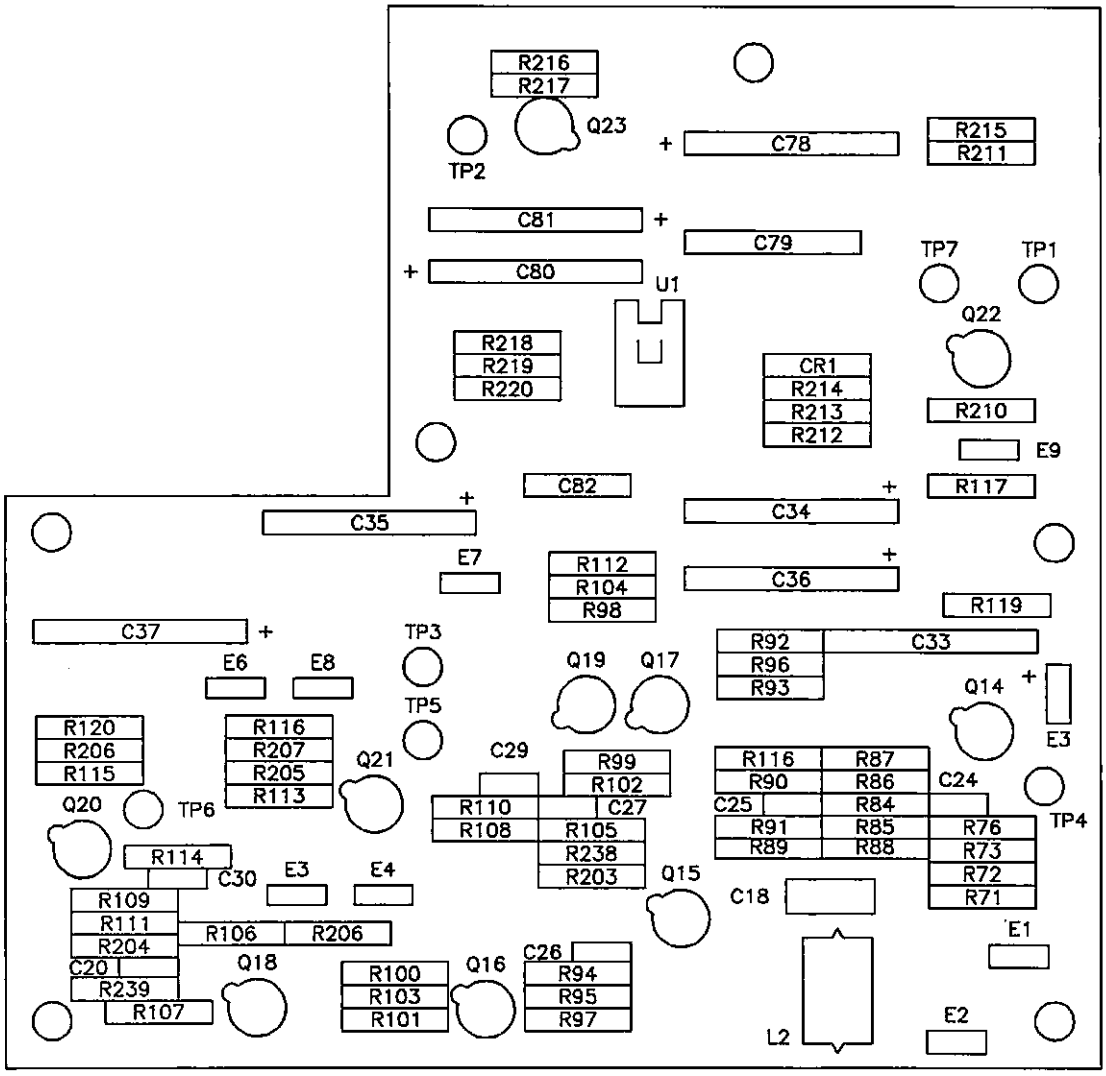


Figure 5–4. Pedestal Generator/Reference Preamplifier (1A4A1A3A2) Parts Location Diagram

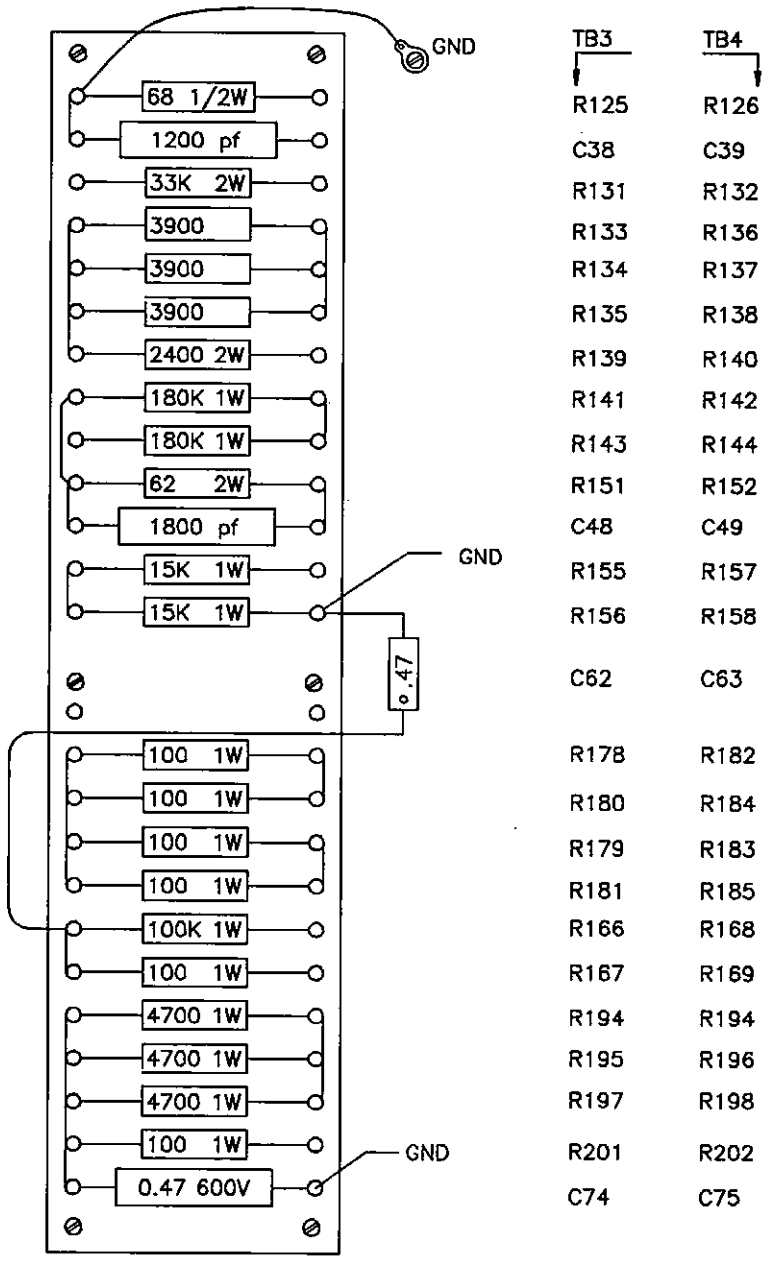


Figure 5–5. Parts Location Input Amplifier (1A4A1A3), Left Side Upper & Lower Component Boards

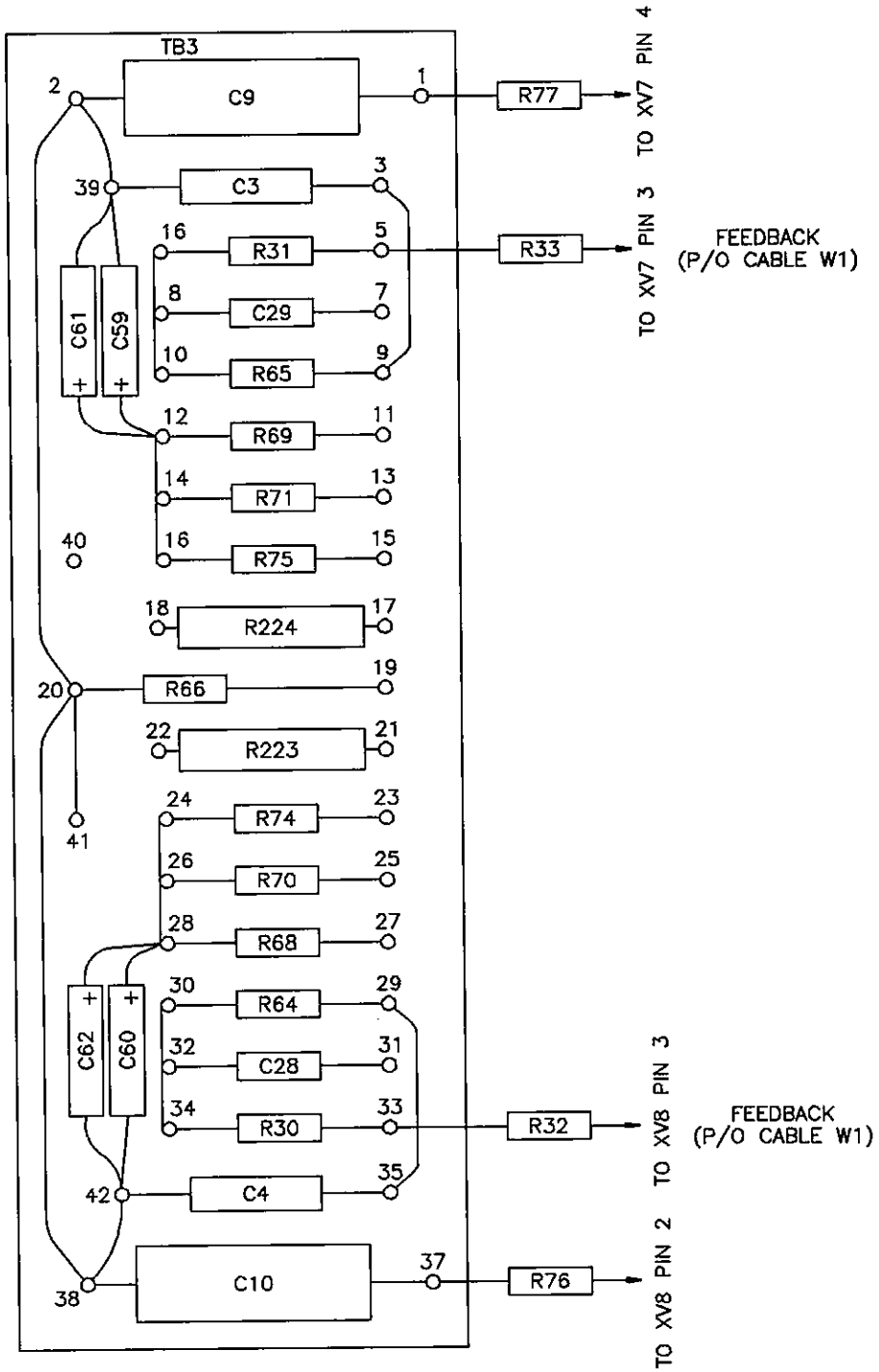


Figure 5-6. Parts Location Exciter, IA4TB3

5.1.2. **SYMPTOM ELABORATION.** After an equipment trouble has been "recognized," all the available aids designed into the equipment should be used to further elaborate on the original trouble symptom. Use of front panel controls and other built-in indicating and testing aids should provide better identification of the original trouble symptom. Also, checking or otherwise manipulating the operating controls may eliminate the trouble.

5.1.3. **LISTING PROBABLE FAULTY FUNCTION.** The next step in logical trouble shooting is to formulate a number of "logical choices" as to the cause and likely location (functional section) of the trouble. The "logical choices" are mental decisions which are based on knowledge of the equipment operation, a full identification of the trouble symptom, and information contained in this manual. The overall functional description and its associated block diagram should be referred to when selecting possible faulty functional sections.

5.1.4. **LOCALIZING THE FAULTY FUNCTION.** For the greatest efficiency in localizing trouble, the functional sections which have been selected by the "logical choice" method should be tested in an order that requires the least time. This requires a mental selection to determine which section to test first. The selection should be based on the validity of the "logical choice" and the difficulties in making the necessary tests. If the tests do not prove that functional section to be at fault, the next selection should be tested, and so on until the faulty functional section is located. As aids in this process, the manual contains a functional description and a servicing schematic or block diagram for each functional section. Waveforms (or other pertinent indications) are included as significant check points on servicing block diagrams to aid in isolating the faulty section.

5.1.5. **LOCALIZING TROUBLE TO THE CIRCUIT.** After the faulty functional section has been isolated, it is often necessary to make additional "logical choices" as to which group of circuits or circuit (within the functional section) is at fault. Servicing schematics or block diagrams for each functional section provide the signal flow and test location information needed to bracket and then isolate the faulty circuit.

5.1.6. **FAILURE ANALYSIS.** After the trouble (faulty component, misalignment, etc.) has been located, but prior to performing corrective action, the procedures followed up to this point should be reviewed to determine exactly why the fault affected the equipment in the manner it did. This review is usually necessary to make certain that the fault discovered is actually the cause of the malfunction, and not just the result of the malfunction.

5.1.7. **TROUBLE SHOOTING AIDS.** The trouble shooting information in this section is arranged to make the procedure outlined above possible. System trouble shooting procedures are provided, which

when followed, help to determine which one of the equipment groups and major components within the group contains the trouble. After the trouble is isolated to a specific unit within a group, the functional section breakdown table references a corresponding service block or schematic diagram. This diagram contains all the waveshape and voltage information necessary to completely isolate the trouble to a particular stage within the unit. Continuity checks may then be performed to localize the trouble to a defective part. To aid the technician in performing these procedures, part and test point location diagrams and voltage and resistance diagrams are provided in addition to the service block and schematic diagrams.

The service diagrams and part and test point location diagrams include tests points which are indicated by stars and circles. The starred test points (major test points) are for checking the overall functions of, and localizing troubles to, a unit or rack.

The circled test points (secondary and minor test points) are for isolating causes or abnormal performance within a unit and stage.

5.1.8. **TEST EQUIPMENT AND SPECIAL TOOLS.** The test equipment required to trouble shoot, tune and adjust the loran transmitting set is listed in Table 5-1. No special tools are required.

5.1.9. **OVERALL TROUBLE SHOOTING.**

5.1.9.1. **PRELIMINARY CHECK.** Check the equipment visually before performing trouble shooting procedures. Note the state of front panel alarms, as these may give a clue to the cause of equipment malfunction.

5.1.9.2. **CONTROL SETTINGS.** The initial control settings for commencement of overall troubleshooting procedures are given in Table 5-2. Deviations from these control settings are listed in appropriate portions of the trouble shooting procedures. Once a change in control settings has been effected in the trouble shooting procedures, the controls remain in the changed position until a note in the procedure directs that the control be placed in a new position or returned to the initial position.

5.1.9.3. **SYSTEM TROUBLE SHOOTING.** The purpose of system trouble shooting is isolation of a malfunction to a specific unit of the equipment. This is accomplished by a minimum performance type procedure which provides instructions to obtain indications of critical points within the equipment. From the indications obtained in these tests, trouble isolation to a specific unit may be surmised. Trouble isolation procedures, on a system basis, are given in Table 5-3. The procedures given in this table is arranged in sequential steps, each of which has a normal indication. The last column gives the action required in the event a normal indication is not obtained. This column normally contains

a reference to the applicable service diagram.

5.1.10. **FUNCTIONAL SECTION TROUBLE SHOOTING.** If a functional section or unit is suspected of being faulty, trouble shoot in accordance with the information provided in the applicable service diagram.

5.1.10.1. **TEST EQUIPMENT.** The test equipment required for functional section trouble shooting is the same as that for system trouble shooting (See Table 5-1).

5.1.10.2. **CONTROL SETTINGS.** The initial control settings required for functional section trouble shooting are identical to those required for system trouble shooting (Table 5-2). After any functional section trouble shooting is completed, return all controls to the positions indicated in Table 3-12.

5.1.10.3. **SERVICE BLOCK AND SCHEMATIC DIAGRAMS.** Figures 7-1 through 7-16 are the service block and schematic diagrams.

5.1.10.4. **VOLTAGE AND RESISTANCE DIAGRAMS.** After it has been determined that a malfunction exists in a particular section or unit (see Table 5-4), the trouble is then isolated to a stage and then a component. To aid the technician in isolating a trouble to a part within a stage, voltage and resistance diagrams are provided which indicate the voltage and resistance at each terminal to ground (or some other designated point.

5.1.10.5. **TEST POINT AND PARTS LOCATION DIAGRAMS.** Figures 5-7 through 5-86 show the test points and the parts that might require replacement during service life of the equipment. Table 5-4 lists the applicable diagram by functional section.

5.1.10.6. **SCHEMATIC DIAGRAMS.** The schematic diagrams are contained in Section 7 of this manual. These schematics should be referred to when isolating a malfunction to a particular component within a unit or stage.

TABLE 5-1. TEST EQUIPMENT REQUIRED FOR TUNING, TROUBLE SHOOTING AND ADJUSTMENTS

PARAGRAPH	ADJUSTMENT PROCEDURES	EQUIPMENT REQUIRED	0-26V, 2A PWR SUPPLY	THICKNESS GAUGE	HP 400D VTVM	AN-USM-281 O'SCOPE	SIG. GEN. AN/URM-25D	2.2 K RESISTOR	SIMPSON MOD. 260 METER & 25 KV PROBE	PLUGINS FOR AN/USM-281 O'SCOPE	RFL CALIB. STD.	HP 5245L FREQ. CTR.	STOPWATCH	ISOLATION XFMR	AUTOXFMR 0-140 VAC	TEST SET DRIVER ROBICON 300427	0-300 VAC WESTON MOD. 433	DIGITAL MULTI-METER
5.2.4.2.	RELAY ADJUST		X		X				X				X	X	X		X	
5.2.4.3.	PROTECTIVE SPARK GAP SPACING			X														
5.2.4.5.	TEST POINT BLOCKING CAPACITORS			X														
5.2.4.7.	VOLTAGE REG CN-1472/FPN-44A				X												X	
5.2.4.8	VOLTAGE REG CN-1473/FPN-44A					X										X	X	
5.2.4.11.	TUNING					X	X	X		X	X	X						
5.2.4.12.	METER CALIB ADJUST'S								X									
5.2.4.16.	OPERATING					X				X								
5.2.4.18.	INSTRUMENT SHUNT		X						X		X							
5.2.4.19.	RELAY PWR SUPPLY								X					X	X			
5.2.4.20	PWR SUPPLY				X	X			X	X								X

TABLE 5-2 TRANSMITTING GROUP INITIAL CONTROL SETTINGS

CONTROL	SETTING
NOTE Set transmitting control equipment to put transmitting group under test in standby.	
208 vac and 460 vac circuit breakers on power distribution panel	ON
Emergency STOP 1A53A3S19 (figure 3-5)	RUN
1A53A3CB2 (figure 3-6) All interlocked doors and drawers including antenna coupler and electrical dummy load	ON Closed
LOCKOUT-READY 1A12S1 (figure 3-4)	READY
POWER 1A53A2S17 (figure 3-5)	OFF/RESET
FILAMENTS 1A53A2S13 (figure 3-5)	OFF
BIAS AND LOW VOLTAGE 1A53A2S7 (figure 3-5)	OFF
PLATE VOLTAGE SELECTOR 1A53A2S18 (figure 3-5)	OFF
MOTOR 1A53A3A4S4 (figure 3-7)	ON
MODE 1A53A3A4S1 (figure 3-7)	AUTO
HIGH VOLTAGE RECTIFIER POWER 1A53A3S1 (figure 3-6)	ON Locked
LOCKED ON (figure 3-6)	ON
460 V INPUT 1A53A3CB1 (figure 3-6)	
DESLOT/NON-DESLOT SELECTOR	NON-DESLOT

TABLE 5-3 CONTROL AND POWER CIRCUITS, SYSTEM TROUBLE SHOOTING PROCEDURES

STEP	PRELIMINARY ACTION	NORMAL INDICATION	TEXT STEP
1	Set controls as indicated in table 5-2.	The following lamps shall be lit: 208 V EMERGENCY STOP POWER 1A53A2DS44 460 V EMERGENCY STOP POWER 1A53A2DS45 DOOR INTERLOCK 1A53A2DS2 PLATE TRANSFORMER OVER TEMPERATURE 1A53A2DS11 IPA OVERLOAD 1A53A2DS13 PA OVERLOAD 1A53A2DS14 AC OVERLOAD 1A53A2DS10 3 STRIKE 1A53A2DS12 LEFT 1ST IPA CATHODE OVERLOAD 1A12DS1 RIGHT FIRST IPA CATHODE OVERLOAD 1A12DS2 LEFT PA BIAS OVERLOAD 1A12DS3 RIGHT PA BIAS OVERLOAD 1A12DS4 1A6V1 PA CATHODE OVERLOAD 1A21DS1 1A6V2 PA CATHODE OVERLOAD 1A21DS2 1A6V3 PA CATHODE OVERLOAD 1A21DS3 1A6V4 PA CATHODE OVERLOAD 1A21DS4 OVER TEMPERATURE PA 1A6 INLET 1A12DS7 OVER TEMPERATURE PA 1A6 OUTLET 1A12DS8	If one or more of the indicator lamps do not light, check the lamps. If the malfunction is not isolated, trouble shoot the energizing circuit corresponding to the name of the lamp using Figure 5-1.

TABLE 5-3 CONTROL AND POWER CIRCUITS, SYSTEM TROUBLE SHOOTING PROCEDURES (cont.)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1 cont.		WATER LEVEL 1A12DS9 STANDBY 1A12DS12	
		No blown fuse indicators are lit	Check associated fuse. If fuse blows again, check circuit using figure 7-1
2	Turn AC VOLTAGE SELECTOR switch 1A53A2S4 to 208V LINE. Turn VOLTAGE PHASE SELECTOR switch 1A53A2S3 through its three positions.	The 208 vac 3-phase unregulated voltage is monitored by AC VOLTAGE meter 1A53A2M5 for the correct indication.	If indications are abnormal, trouble shoot using figure 7-1
3	Turn AC VOLTAGE SELECTOR switch 208V. Turn VOLTAGE PHASE SELECTOR switch 1A53A2S3 through its three positions.	The 208 vac 3-phase regulated voltage is monitored by AC VOLTAGE meter for 208v$\pm$5 vac.	If indications are abnormal, trouble to HE shoot using figure 7-1
4	Turn AC VOLTAGE SELECTOR switch 1A53A2S4 to 460 V LINE and VOLTAGE PHASE SELECTOR 1A53A2S3 switch through its three positions.	The 460 vac line voltage is monitored by AC VOLTAGE meter 1A53A2M5 for the correct indication.	If indications are abnormal, trouble shoot using figure 7-1
5	Turn METER SELECTOR 1A4A3S2 on oscilloscope control 1A4A3 to -28V and -12V.	The voltmeter 1A4A3M1 indicates 28 vdc and 12 vdc.	If indications are abnormal, trouble shoot using Figure 7-5. If still incorrect, check using Figure 7-24
6	Set POWER switch 1A53A2S17 to ON.	The water pump and blowers shall start.	If the pump or blowers do not function, check primary power circuits using Figure 7-1.

TABLE 5-3 CONTROL AND POWER CIRCUITS, SYSTEM TROUBLE SHOOTING PROCEDURES (cont.)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
6 cont.		The following lamps shall light: AIR ON 1A53A2DS8 WATER ON 1A53A2DS1	If any of the indicators fail to light, check the lamp. If the trouble is not isolated, check the corresponding energizing control circuit using Figure 7-1.
7	Place FILAMENTS switch 1A53A2S13 to ON	All tube filaments light.	If filaments do not light, check filament primary power circuits using Figures 7-1 & 4-14.
		The TRANSMITTER FILAMENT HOURS meter 1A53A2M6 is energized.	If meter is not energized, trouble shoot the energizing circuit using Figure 7-1. If fault is not found, replace the meter.
		The FILAMENTS READY lamp 1A53A2DS7 shall light after a 45 second time delay.	If lamp does not light, check lamp. If fault is not isolated, trouble shootthe corresponding energizing control circuit using Figure 7-1

TABLE 5-3 CONTROL AND POWER CIRCUITS, SYSTEM TROUBLE SHOOTING PROCEDURES (cont.)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
8	Place the BIAS and LOW VOLTAGE switch 1A53A2S7 to ON and METER SELECTOR switch 1A4A3S2 to +250V.	The -5KV BIAS voltmeter 1A532M4 indicates -5KV ±10% The low voltage plate voltmeter 1A53A2M9 indicates 0.5KV ±10%	If any of the indicators fail to light, first check the lamps. If the fault is not isolated, trouble shoot the energizing circuits indicated by the title of the lamp using Figure 7-1. If both meters 1A53A2M4 and 1A53A2M9 indicate no voltage, check the 500 vdc and -5 kv primary power supplies Figures 7-1 and 7-35
		The voltmeter 1A4A3M1 indicates +250 vdc.	If meter 1A4A3M2 does not indicate properly trouble shoot using Figures 7-4 and 7-5.
		The following meters shall show an indication: LEFT PA BIAS 1A4M9 RIGHT PA BIAS 1A4M10 LEFT 2ND IPA BIAS 1A4M5 RIGHT 2ND IPA BIAS 1A4M6	If the meters do not show an indication, check their respective biassupply circuit using Figure 7-20.
		The following lamps shall light: BIAS & LOW VOLTAGE ON 1A53A2DS5 LEFT PA BIAS UNDER VOLTAGE 1A12DS10 RIGHT PA BIAS UNDER VOLTAGE 1A12DS11	If any of the indicators fail to light, check the lamp. If lamp is normal check the corresponding energizing circuit indicated by the name of the lamp using Figure 7-1.

TABLE 5-3 CONTROL AND POWER CIRCUITS, SYSTEM TROUBLE SHOOTING PROCEDURES (cont.)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
9	Proceed to Step 10.		
10	Turn PLATE VOLTAGE SELECTOR TO OPERATE	The PLATE ON lamp 1A53A2DS9 should light.	If indication is abnormal, check lamp and associated energizing circuit using Figures 7-1 and 7-7.
		The PLATE HOURS meter 1A53A2M1 shall start.	If meter is not energized, check meter control circuit using Figure 7-1.
		PA PLATE VOLTAGE 1A53A2M2 shall indicate 21.5 kv ±5% within 15 seconds and IPA PLATE VOLTAGE meter 1A53A2M3 shall indicate 10.75 kv.	If meter readings are abnormal, trouble shoot using Figure 7-35.
		The IPA PLATE CURRENT meter 1A53A2M8 and PA PLATE CURRENT meter 1A53A2M7 shall show an indication.	If meters are not energized, check meter control circuits using Figures 7-1, 7-35, and 7-47.
		The appropriate HIGH VOLTAGE NORMAL lamp shall light.	If indicator does not light, refer to at remote locationFigure 7-1.
		The following plate and cathode current meters shall provide typical indications specified by the calibration chart at each station: LEFT 1ST IPA CATHODE 1A4M1 RIGHT 1ST IPA CATHODE 1A4M2	If meters are not energized, check meter control circuit using Figure 7-19.

TABLE 5-3 CONTROL AND POWER CIRCUITS, SYSTEM TROUBLE SHOOTING PROCEDURES (cont.)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
10 cont.		LEFT PA BIAS CURRENT 1A4M7 RIGHT PA BIAS CURRENT 1A4M8 LEFT 2ND IPA PLATE CURRENT 1A4M3 RIGHT 2ND IPA PLATE CURRENT 1A4M4 The following cathode current meters located in PA tube rack 1A6, shall shall provide typical indications specified by the calibration chart at each station. PA 1A6-V1 CATHODE CURRENT 1A6M1 PA 1A6-V2 CATHODE CURRENT 1A6M2 PA 1A6V3 CATHODE CURRENT 1A6M3 PA 1A6-V4 CATHODE CURRENT 1A6M4	If any of the cathode current meters indicate abnormal current, proceed to Step 7 of Table 5-9.

TABLE 5-4 FUNCTIONAL SECTION DIAGRAM

FUNCTIONAL SECTION	VOLTAGE AND RESISTANCE	SERVICE DIAGRAMS	SCHEMATIC DIAGRAMS	TEST POINT AND PARTS LOCATION
Transmitter control		7-1, 7-2	7-31, 7-35 thru 7-40	
Amplifier Group 1A4	7-13, 7-15	7-3	5-105	5-10 thru 5-19
Power Supply 1A4A1			7-21	5-29
+250 Regulator 1A4A1A1	7-14	7-4	7-22	5-21, 5-22
Oscilloscope Control, 1A4A3		7-5	7-23	5-23, 5-24
Negative Power Supply 1A4A3A1			7-24	5-25
Trigger Selector/ Bias Pedestal Driver 1A4A3A2		7-6	7-25	5-26, 5-27
Bias Pedestal Power Supply 1A4A4			7-26	5-28, 5-29
Bias Pedestal Generator 1A4A5			7-27	5-30, 5-31
Radio Frequency Amplifier 1A5-1A10	7-16		7-29	5-32 thru 5-36
Electrical Equipment Rack 1A11			7-30	5-37
Indicator Panel 1A12			7-32	5-38, 5-39
Low Pass Filter 1A20			7-32	5-40
Water Cooling Unit 1A2			7-35	5-41, 5-42
Relay Assembly 1A53A1				5-43, 5-44
Power Supply 1A53A5, 1A53A6			7-35	5-70, 5-71 and 5-72
Resistor Rack 1A53A19, 1A53A20 and 1A53A23				5-75, 5-77 and 5-78
Control-Indicator 1A53A2			7-36	5-45, 5-46
Relay Assembly 1A53A3			7-37 thru 7-40	5-47 thru 5-53

TABLE 5-4 FUNCTIONAL SECTION DIAGRAM (cont.)

Voltage Regulator 1A53A3A1, 1A53A3A2		7-7	7-41	5-54, 5-63
Gate Trigger Unit 1A53A3A1A1, 1A53A3A1A2, 1A53A3A1A3			7-42	5-55 thru 5-59
Chop-off Limiter 1A53A3A1A4	7-8	7-8	7-43	5-60
Pre-Amplifier 1A53A3A1A5	7-9	7-9	7-44	5-61, 5-62
Voltage Regulator 1A53A3A3			7-45	5-64
Voltage Regulator Control Panel 1A53A3A4	7-10	7-10	7-46	5-74
Instrument Shunt 1A53A4	7-11	7-11	7-47	5-66 thru 5-69
Voltage Divider 1A53A7		7-11	7-48	5-67, 5-73, 5-74, 5-76
Antenna Coupler 3		7-12	7-49	5-79 thru 5-82
Electrical Dummy Load 4		7-12	7-50	5-83 thru 5-85
Local Control Unit 5			7-51	5-86

5.2. **SERVICE AND REPAIR - GENERAL.** Paragraphs 5.2 and its sub paragraphs, establish the maintenance standards and outlines the preventive maintenance routines for Loran Transmitting Set AN/FPN-44A. Comparison of the preventive maintenance results with the maintenance standards, and proper correction of any abnormal results, helps to reduce equipment failure during operation. Also included in this section are tuning, adjustment, and repair procedures.

5.2.1. **MAINTENANCE STANDARDS.** After a loran transmitting set has been installed at a site, and before it is placed in operation, establish the maintenance standards as described in the following paragraphs. Re-establish the standards after each major overhaul. These standards should be periodically referred to while performing the preventive maintenance routines and while performing the trouble-shooting procedures in Section 5.

5.2.1.1. **MAINTENANCE STANDARDS LIST.** Table 5-5 lists the maintenance standards in a suggested sequence of performance. Any deviation from this sequence does not affect the measurements. The actual procedures for establishing the standards are indicated in the referenced tables.

TABLE 5-5. LIST OF MAINTENANCE STANDARDS PROCEDURES

STEP	ACTION REQUIRED	TABLE
1	Check line voltage	5-9
2	Check outputs of power supply in amplifier group 1A4.	5-9
3	Check for proper, indications on amplifier group 1A4 meters.	5-9
4	Check for proper indications on PA tube rack 1A6 meters.	5-9
5	Check for proper indications on power supply set 1A53 meters.	5-9
6	Check meter indications in electron tube liquid cooler 1A2.	5-9
7	Monitor waveshapes with Oscilloscope	5-9
8	Check output power	5-9
9	Clean air filters	5-10
10	Check 1A53A6T1 oil level	5-10

Before starting the procedures, make a maintenance standards chart for recording the measurements. On the first page of this

chart record the equipment nomenclature, the serial number, and the date. The REFERENCE STANDARDS column in the preventive maintenance tables (table 5-9) give the limits for each measurement. These limits should also be added to the chart. If the measurements are not within the limits, the equipment should be repaired.

5.2.1.2. **TEST EQUIPMENT REQUIRED.** The AN/USM-281 oscilloscope and plug in units are required to establish each reference standard.

5.2.1.3. **TIME NEEDED TO ESTABLISH REFERENCE STANDARDS.** The approximate time needed to establish each reference standard and the total time needed to establish all the reference standards are given in table 5-6. This time does not include the time required for setting up the test equipment.

5.2.1.4. **OPERATION IN DUMMY LOAD CONFIGURATION.** The dummy load is used for preventive maintenance and troubleshooting. The dummy load should be tuned in accordance with paragraph 5.2.4.13.

The electrical characteristics of the dummy load are somewhat different from those of the antenna, Therefore, with the pulse generator adjusted for on-air operation, the pulse shape into the dummy load will be somewhat different.

A record should be made of transmitter meter readings and waveshapes using the format of Table 5-9 with the pulse generator set for proper pulse shape into the antenna.

A second set of readings and waveshapes should be taken with the same pulse generator settings but with the FEEDBACK-OPEN LOOP switch 1A4A1A3 in OPEN LOOP position.

5.2.2. **PREVENTIVE MAINTENANCE.** Periodic preventive maintenance routines are performed On the loran transmitting sets as outlined in the following subparagraphs. Check-off lists that itemize all the routines are to be completed and initialed to indicate that the work has been done. Refer to the maintenance standards for each routine performed and record any deviation from these standards on the check-off lists.

5.2.2.1 **CHECK-OFF LISTS.** Make separate check-off lists for each period (weekly, monthly, etc.) using the step numbers of the preventive maintenance routines as a guide. As each step is completed, enter the results on the list opposite the step number. Also, enter the date and initial the step. Use the suggested column headings given in table 5-9 to standardize the preparation of check-off lists.

Compare each entry with the maintenance standards and with previous entries for that step. Large deviations that are not within the prescribed limits, or small deviations that progressively vary with each period, indicate improper operation or impending failure. In either case, corrective measures should be taken.

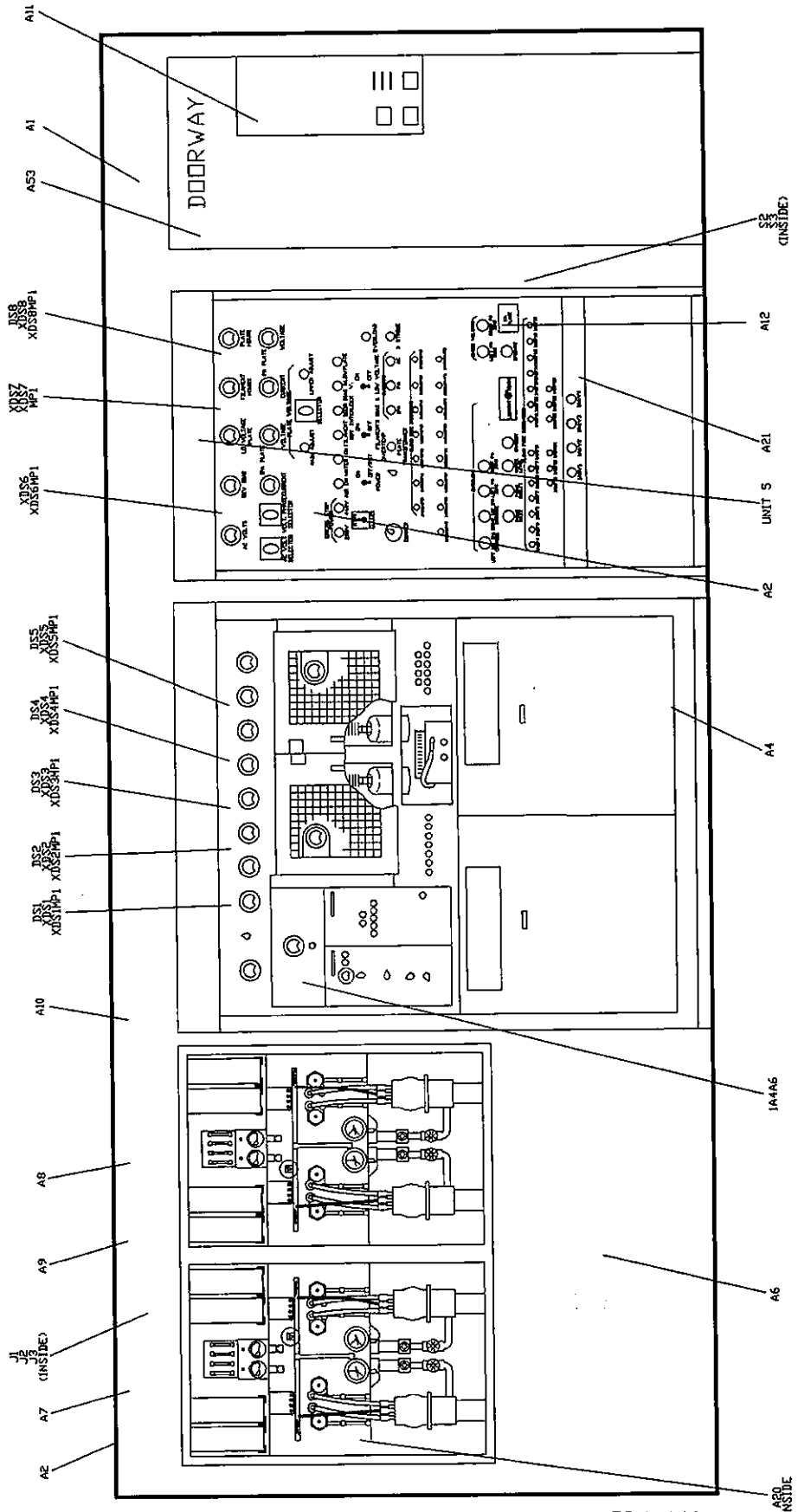
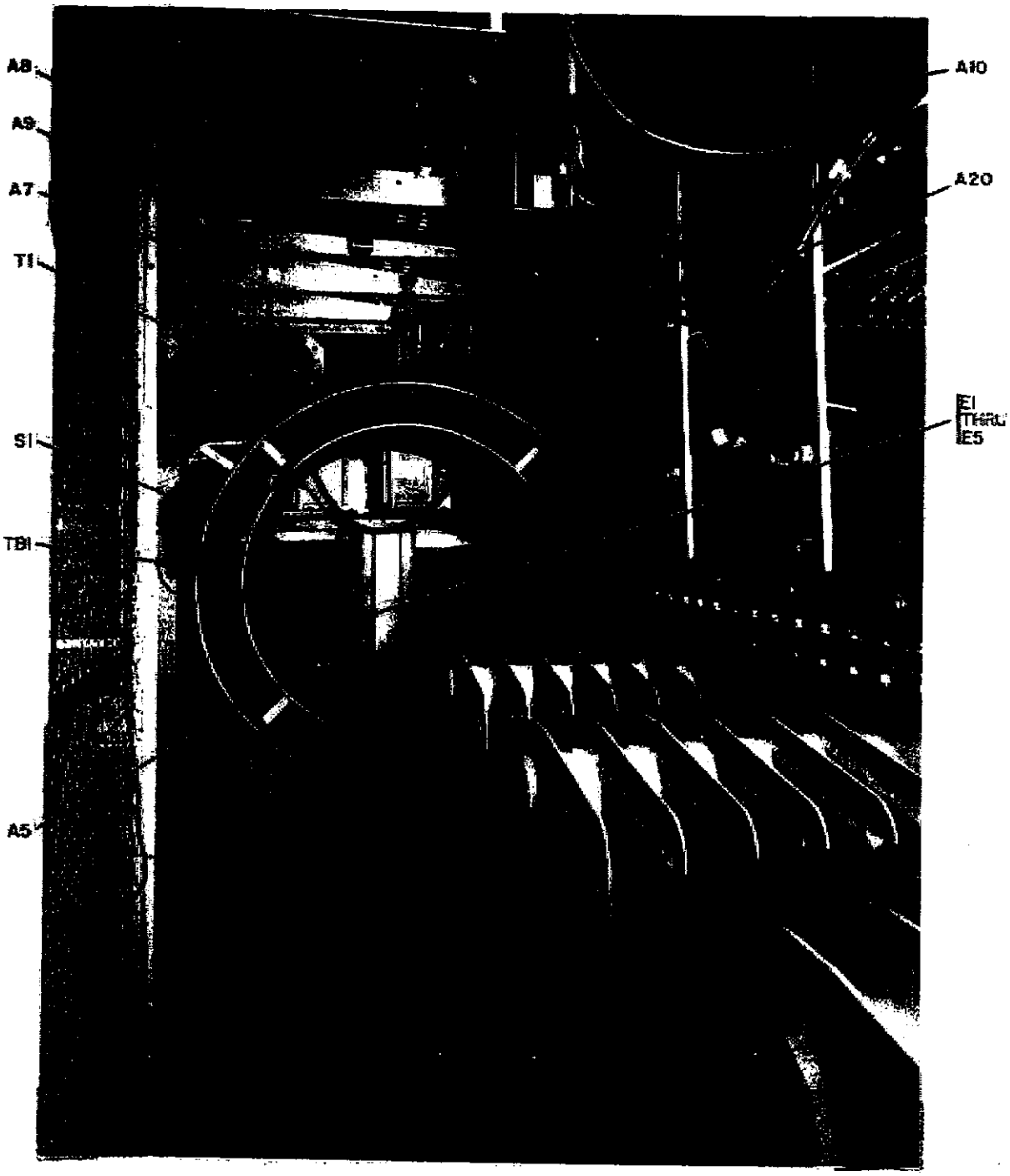
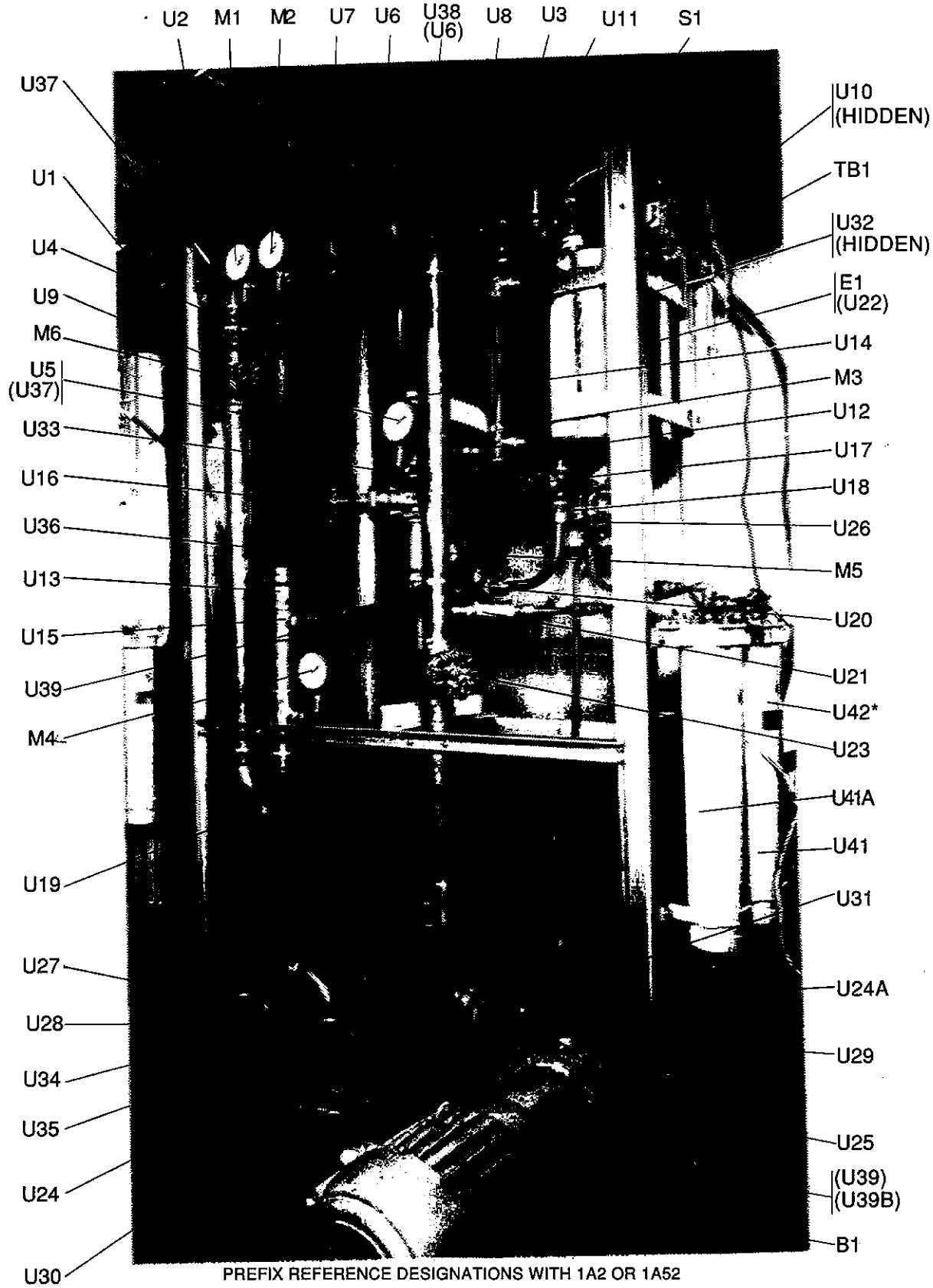


Figure 5-7. Transmitting Group OT-96/FPN-44A. Parts Location Diagram.



PREFIX REFERENCE DESIGNATION WITH 1
75-009-74150

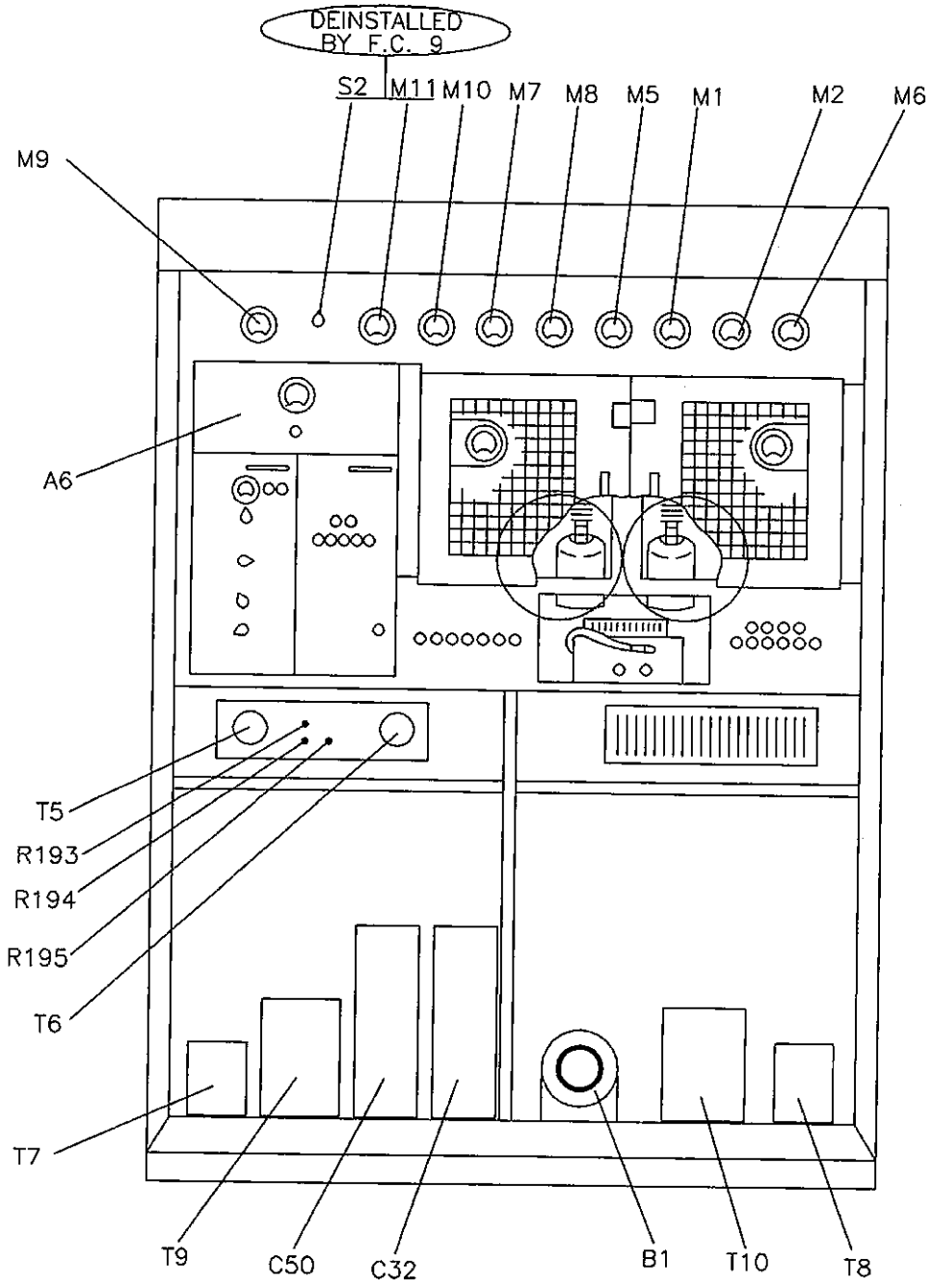
Figure 5-8. Transmitting Group OT-96/FPN-44A,Inside Rear View, Parts Location Diagram



PREFIX REFERENCE DESIGNATIONS WITH 1A2 OR 1A52

NOTE: PARTS NOTED IN ( ) ARE THE HD-1000 DESIGNATIONS

Figure 5-9. Cooler Liquid Electron Tube HD-601/FPN-44 and HD-1000/FPN-44A, Parts Location Diagram



PREFIX REFERENCE DESIGNATIONS WITH 1A4

Figure 5-10. Amplifier Group OG-159/FPN-44A, Front View, Parts Location Diagram

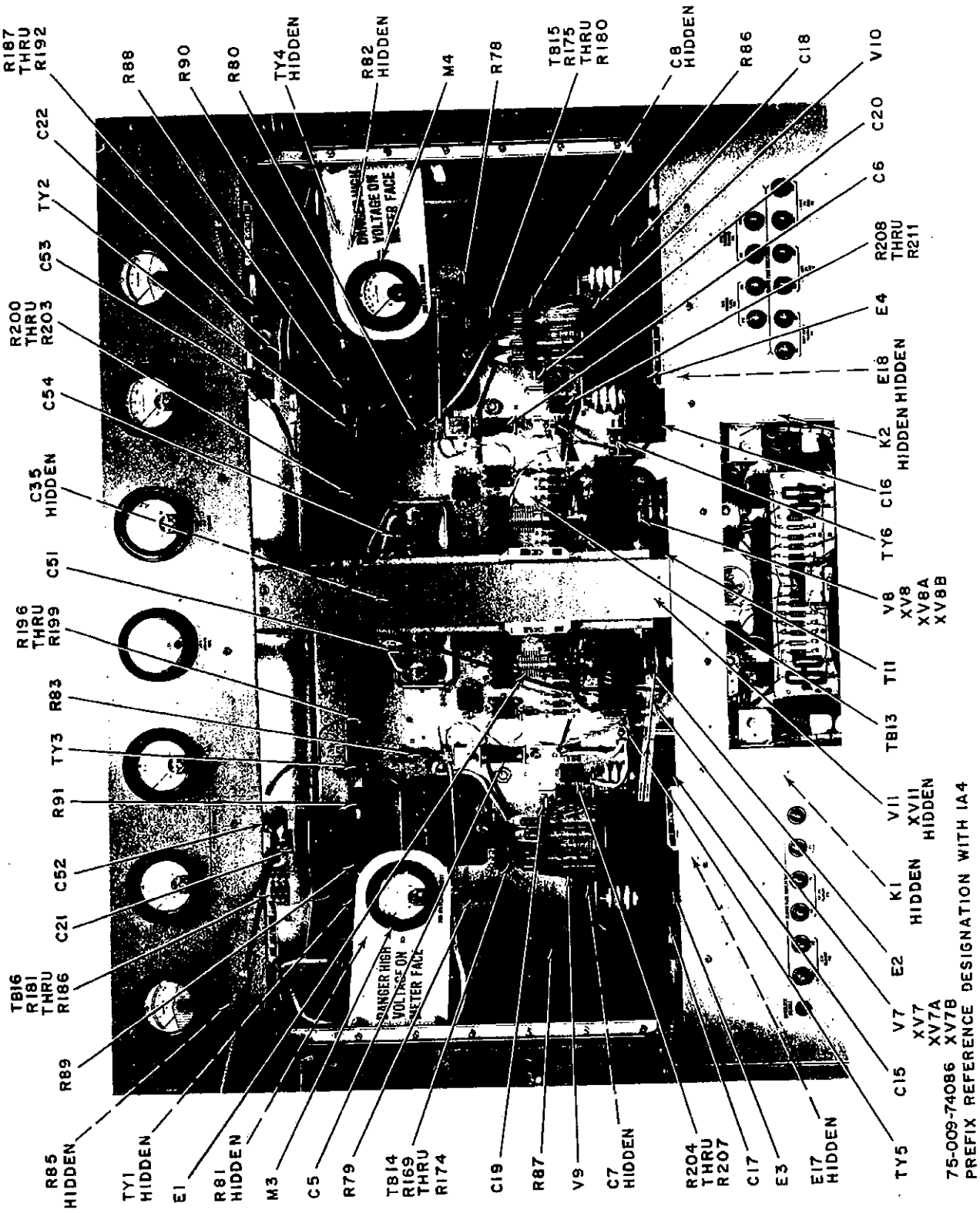


Figure 5-11. Amplifier Group OG-159/FPN-44A, Front View With Doors Open, Parts Location Diagram

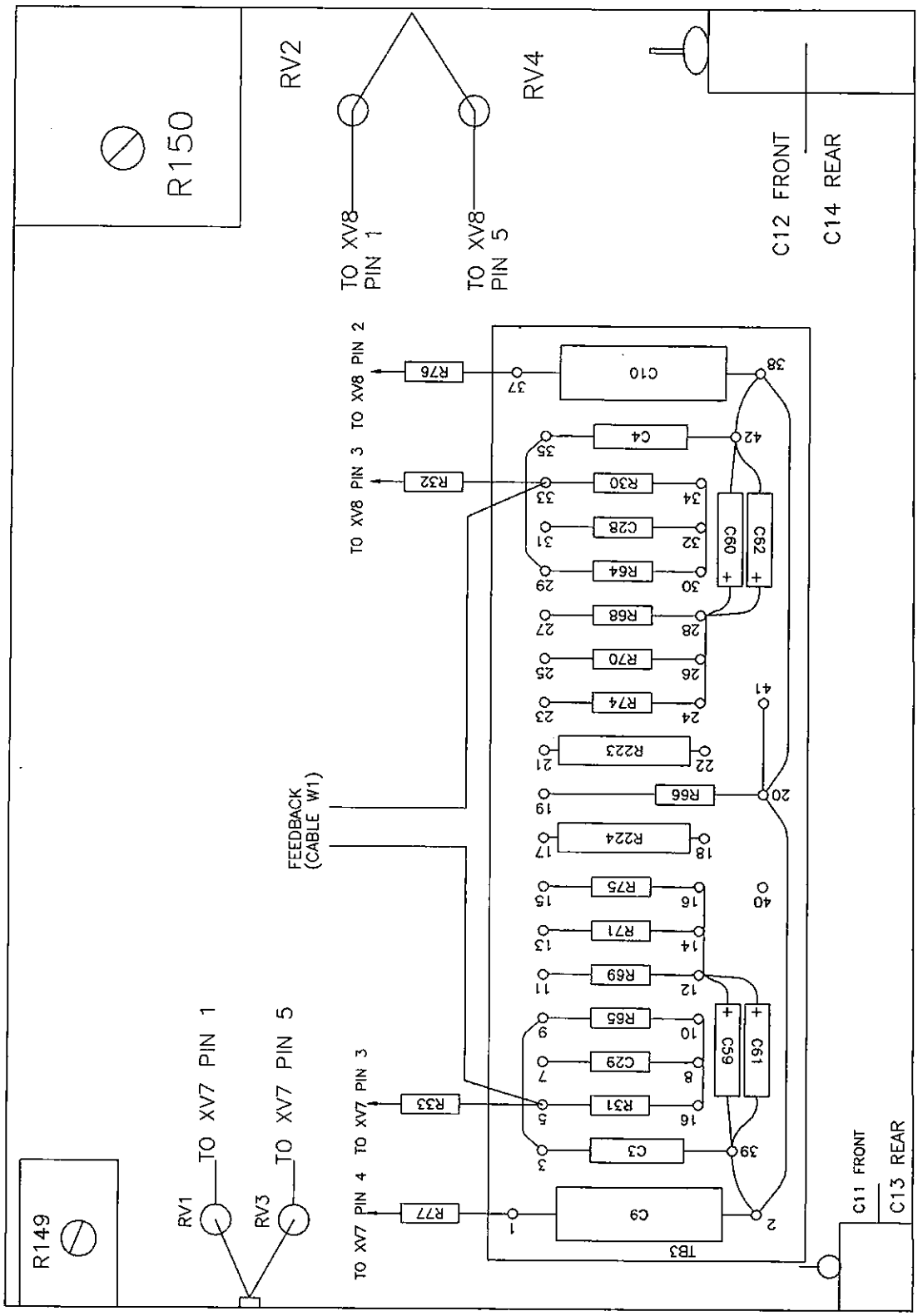
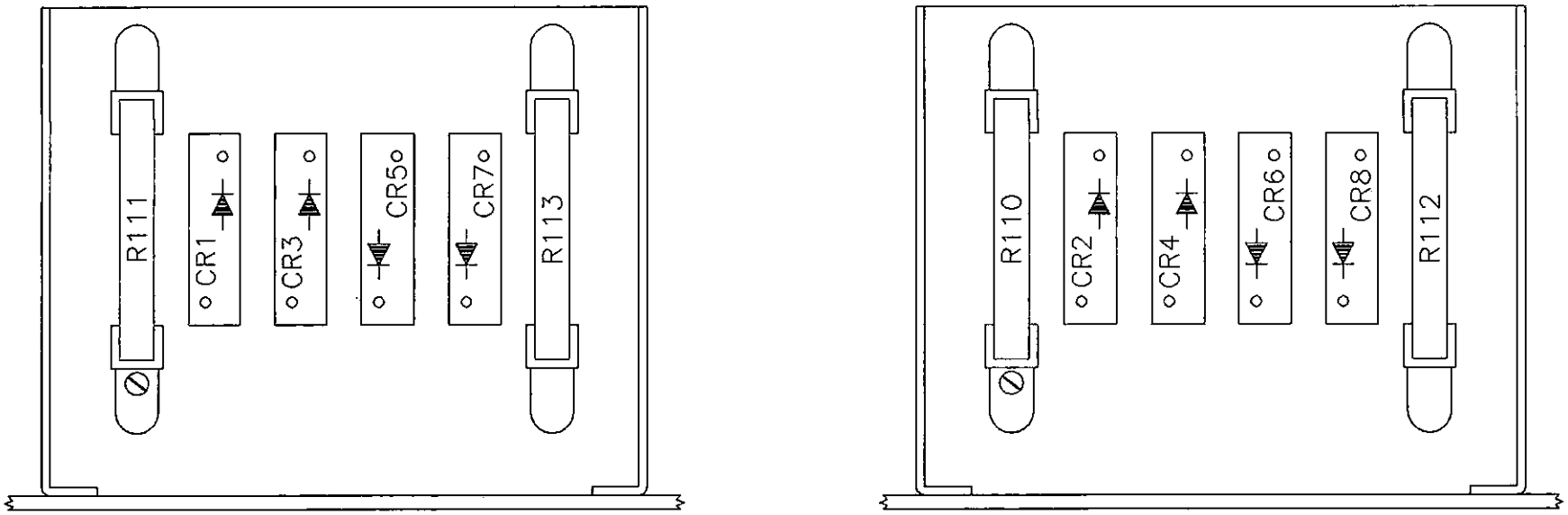


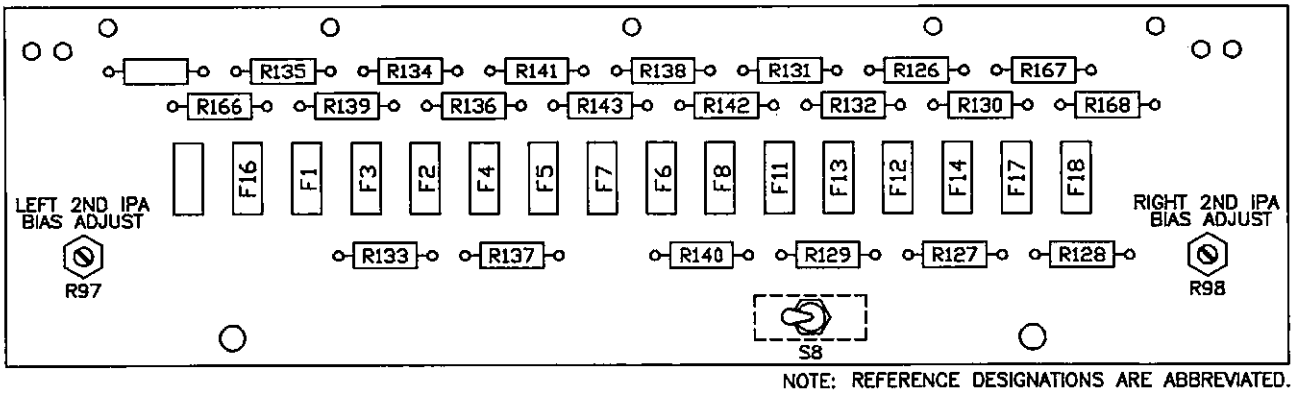
FIGURE 5–12. Amplifer Group 0G–159/FPN–44A, Front View With Doors Open, Parts Location Diagram.

FIGURE 5-13 DELETED



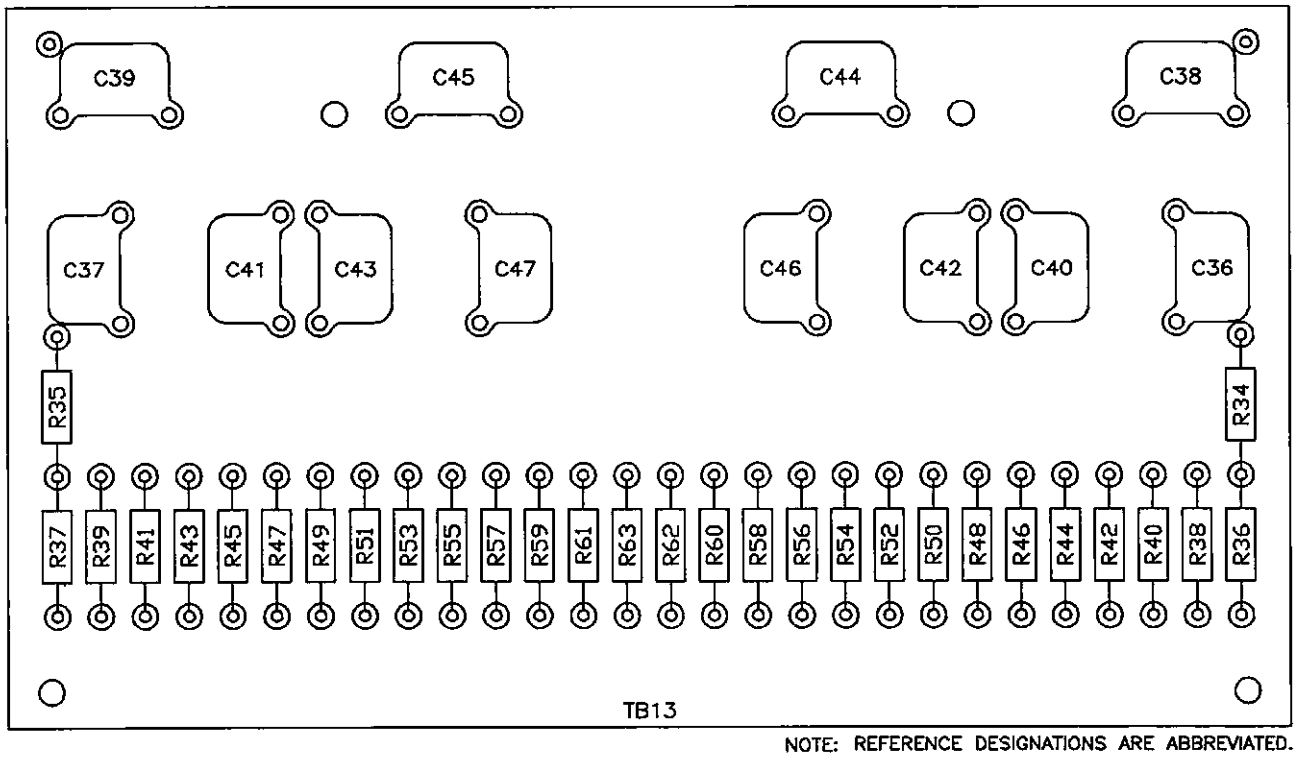
NOTE:
REFERENCE DESIGNATIONS ARE ABBREVIATED.
PREFIX REFERENCE DESIGNATIONS WITH 1A4.

Figure 5-14. Amplifier Group OG-159/FPN-44A, Part of Lower Shelf, Parts Location Diagram



NOTE: REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX REFERENCE DESIGNATIONS WITH 1A4.

Figure 5–16. Amplifier Group OG–159/FPN–44A, Front Panel, Parts Location Diagram



NOTE: REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX REFERENCE DESIGNATIONS WITH 1A4.

Figure 5–17. Amplifier Group OG–159/FPN–44A, Terminal Board, Parts Location Diagram

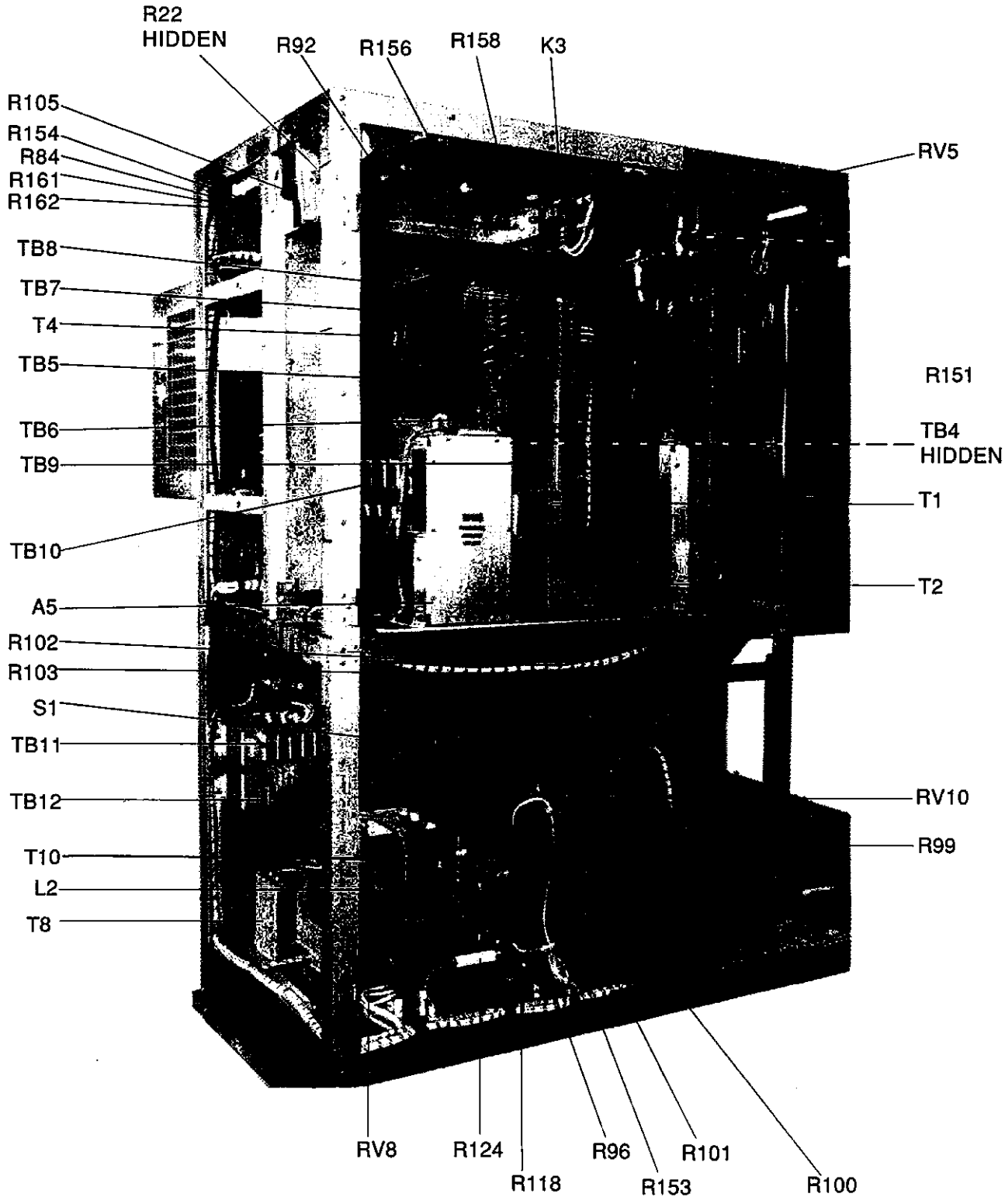


Figure 5-18. Amplifier Group OG-159/FPN-44A, Left Rear View, Parts Location Diagram

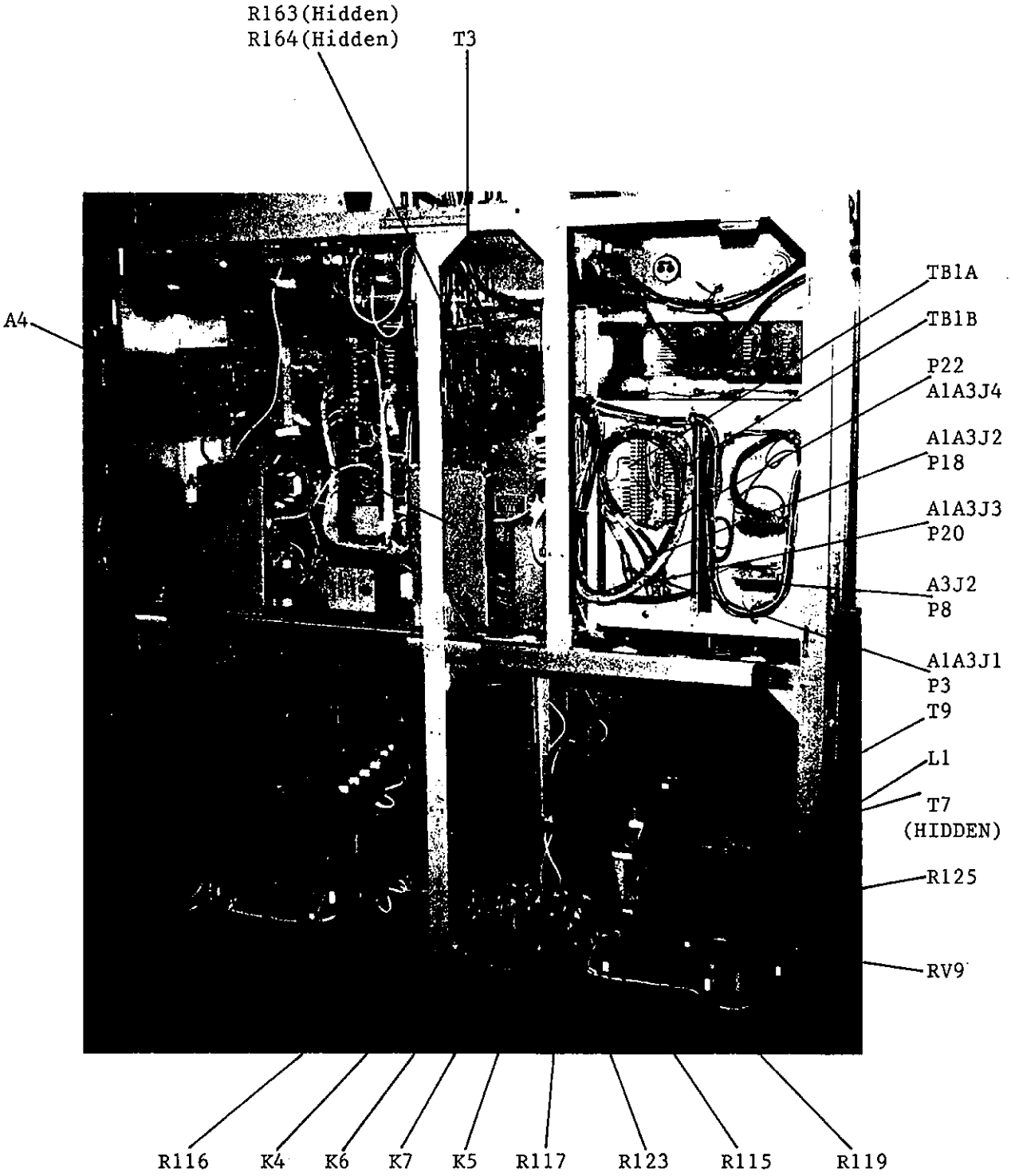


Figure 5-19. Amplifier Group OG-159/FPN-44A, Right Rear View, Parts Location Diagram

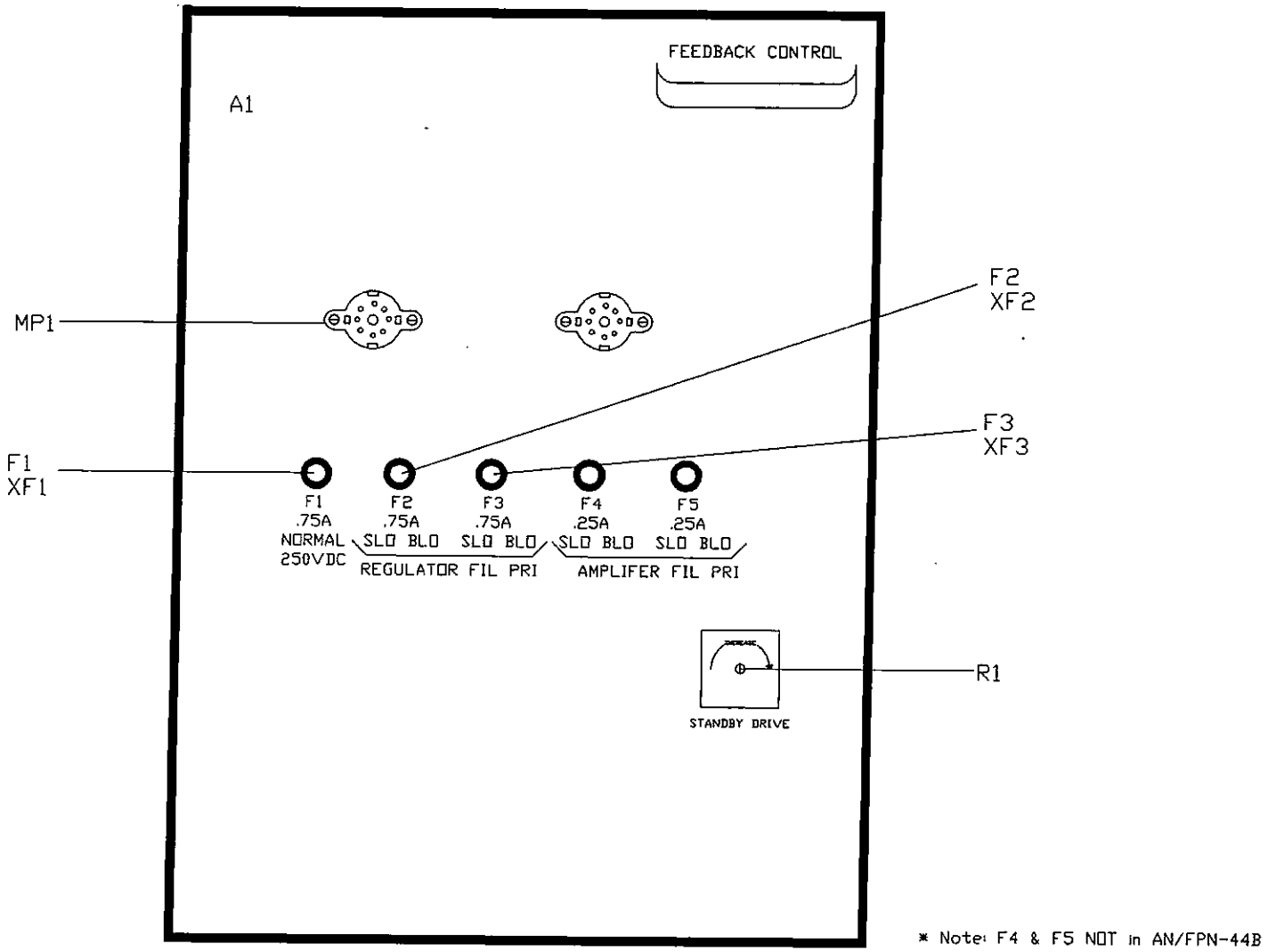


Figure 5-20. Power Supply PP-7304/FPN-44A, Front View, Parts Location Diagram

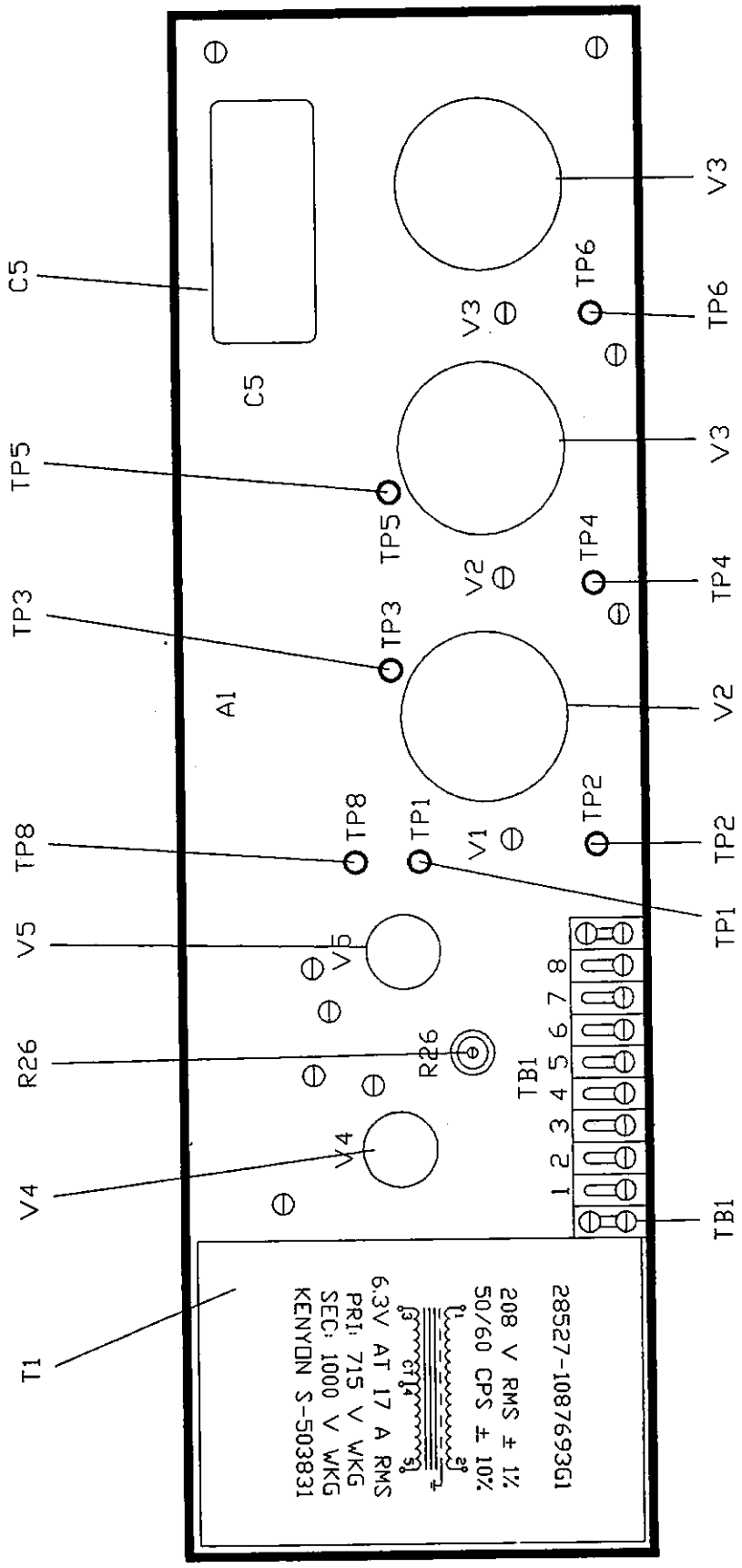
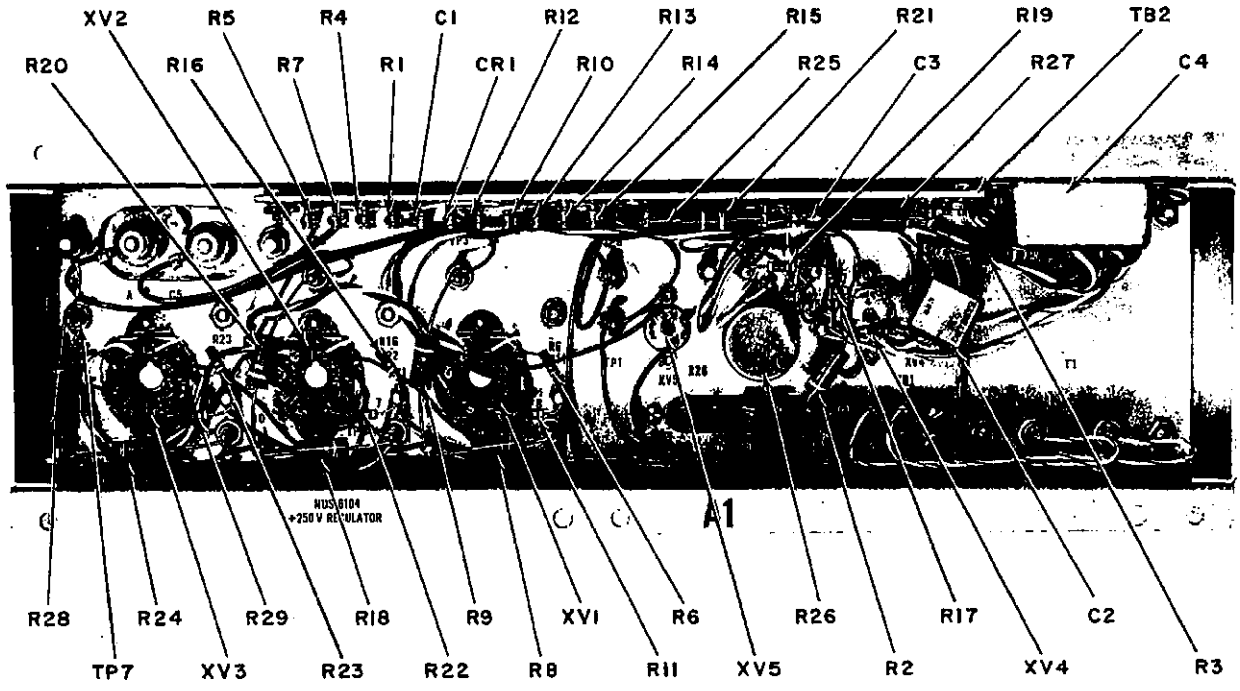


Figure 5-21. +250v Regulator Voltage, Top View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A4A1A1
75-009-74097

Figure 5-22. +250V Regulator Voltage, Bottom View, Parts Location Diagram

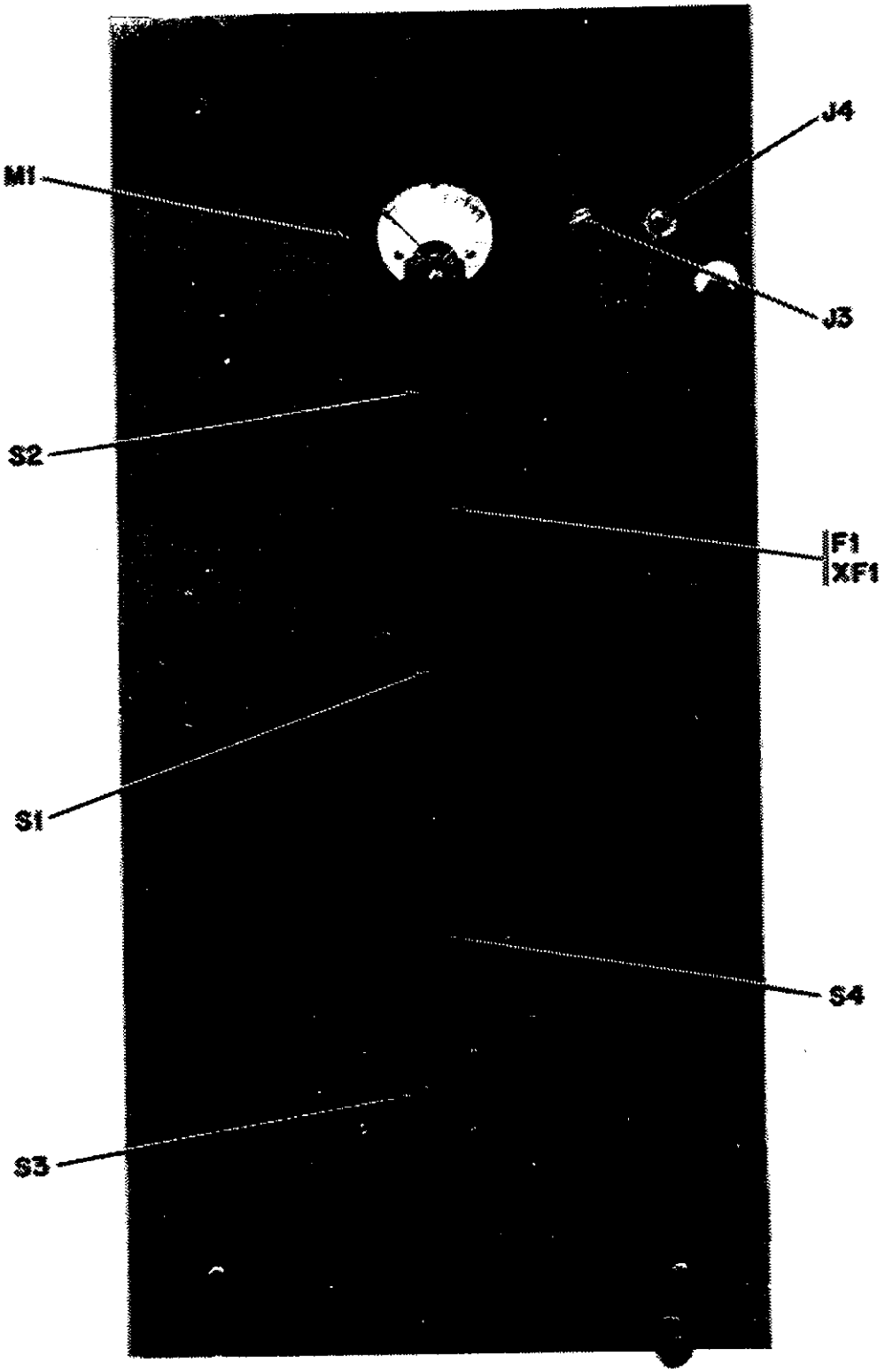


Figure 5-23. Control Oscilloscope C-4558A/FPN-44A, Front View, Parts Location Diagram

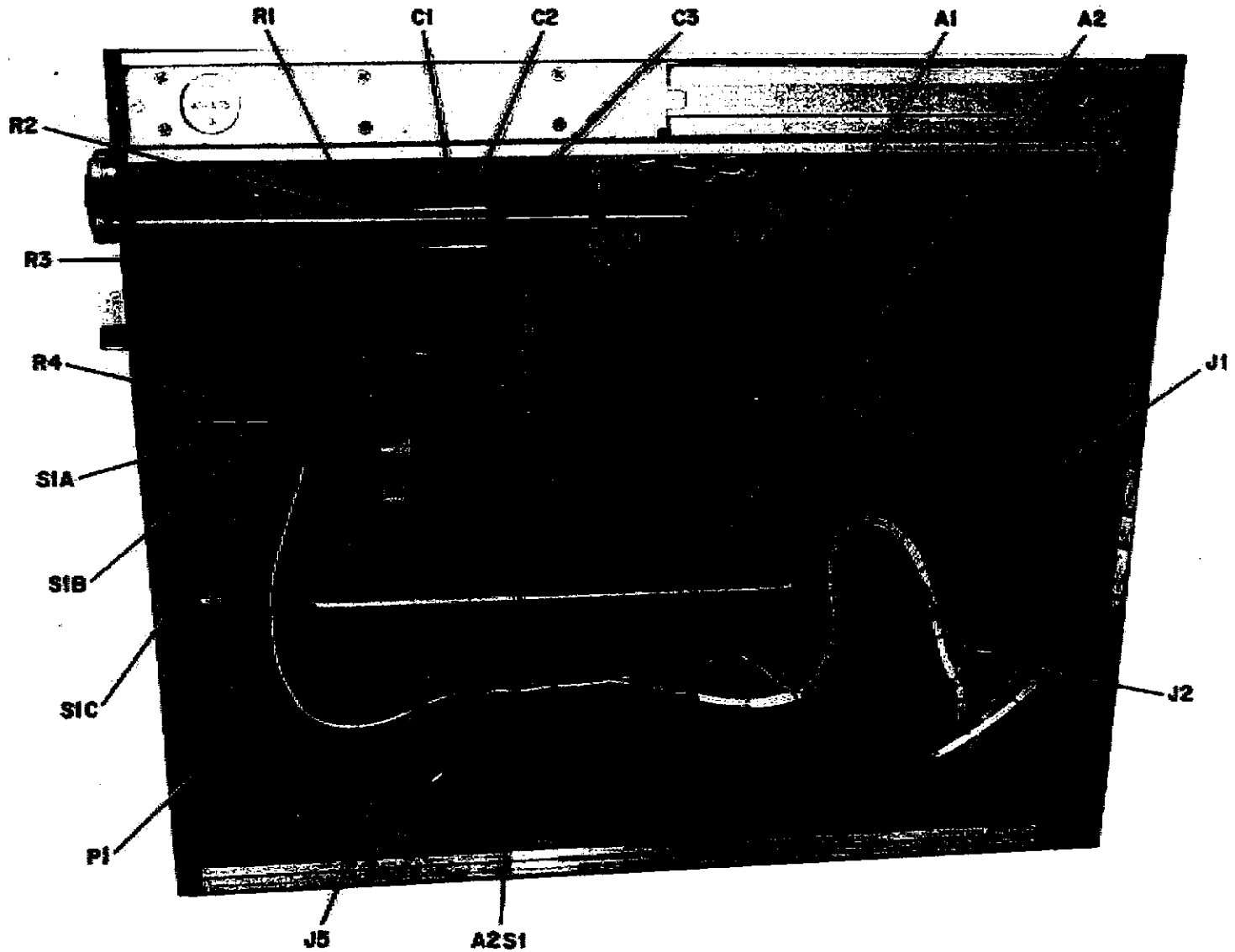


Figure 5-24. Control Oscilloscope C-4558A/FPN-44A, Right Side View, Parts Location Diagram

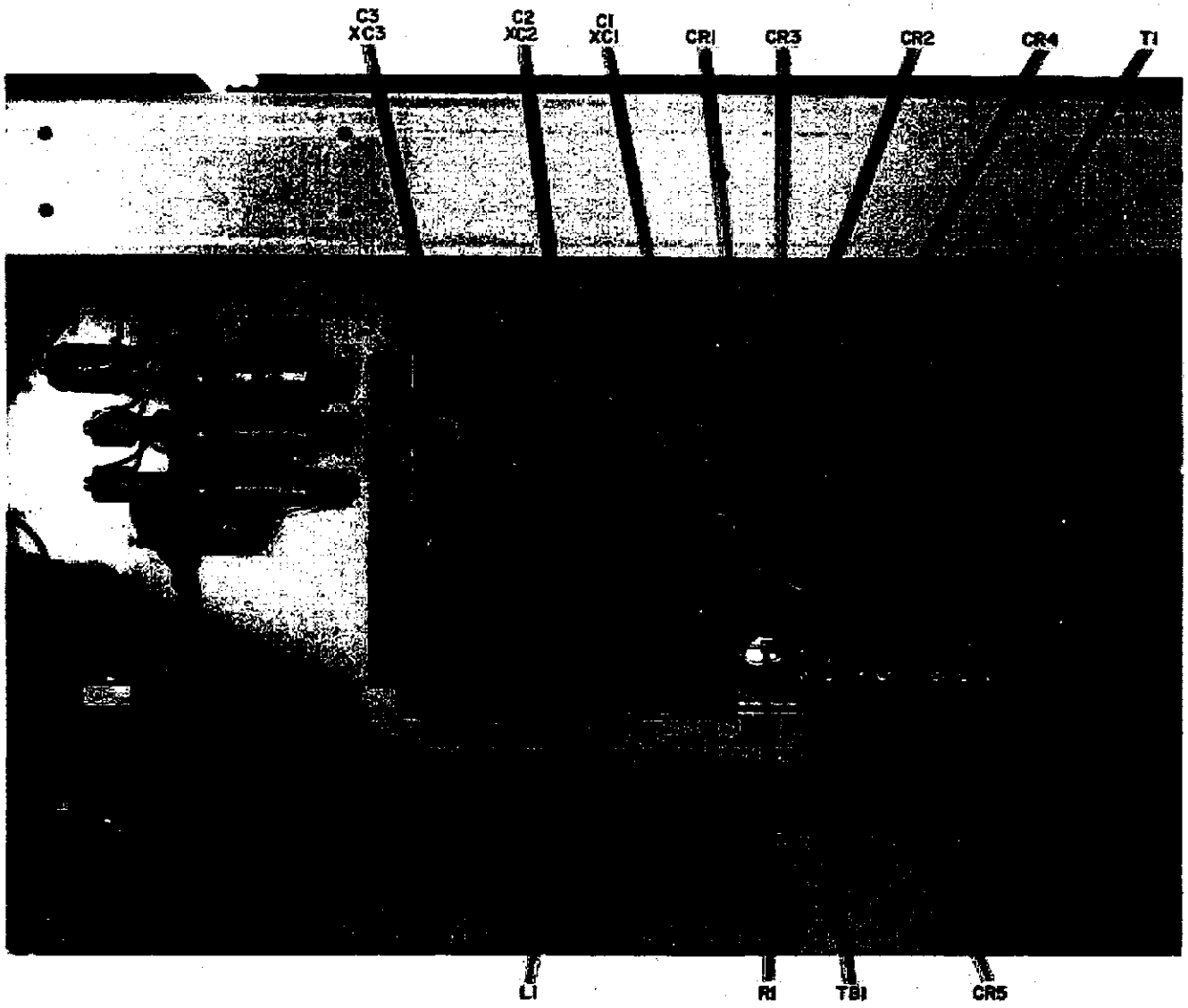
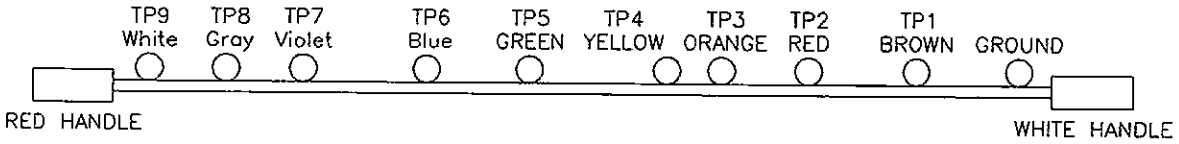


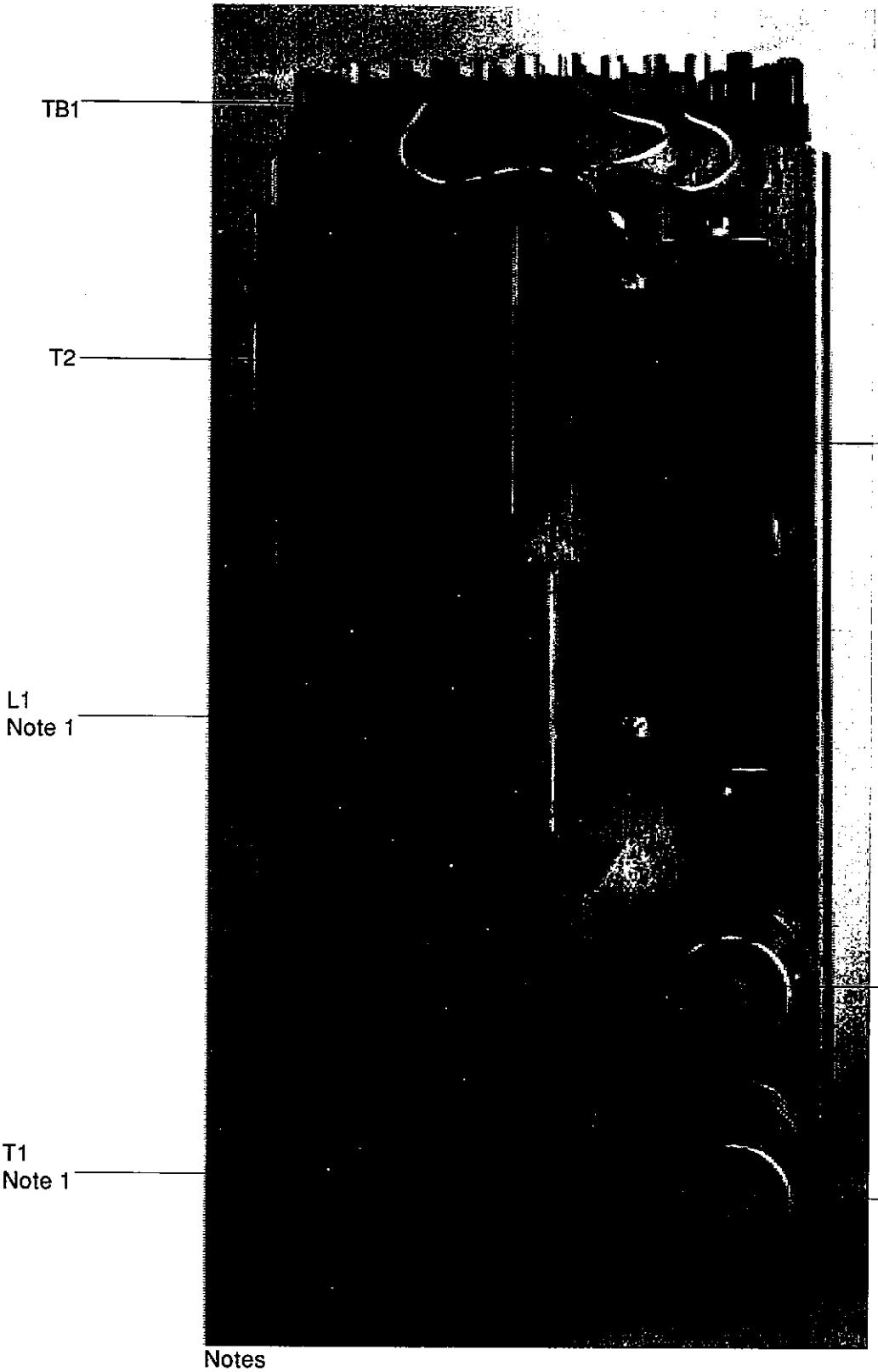
Figure 5-25. Power Supply, Parts Location Diagram



PREFIX REFERENCE DESIGNATION
WITH 1A4A3A2

Figure 5-26. Trigger Selector, Bias Pedestal Drive (W0725-1B) Edge View, Test Point Location Diagram

FIGURE 5-27 DELETED



Notes

1. Parts disconnected by F.C. 3

Figure 5-28. Bias Pedestal Power Supply, Top View, Parts Location Diagram

FIGURE 5-29 DELETED

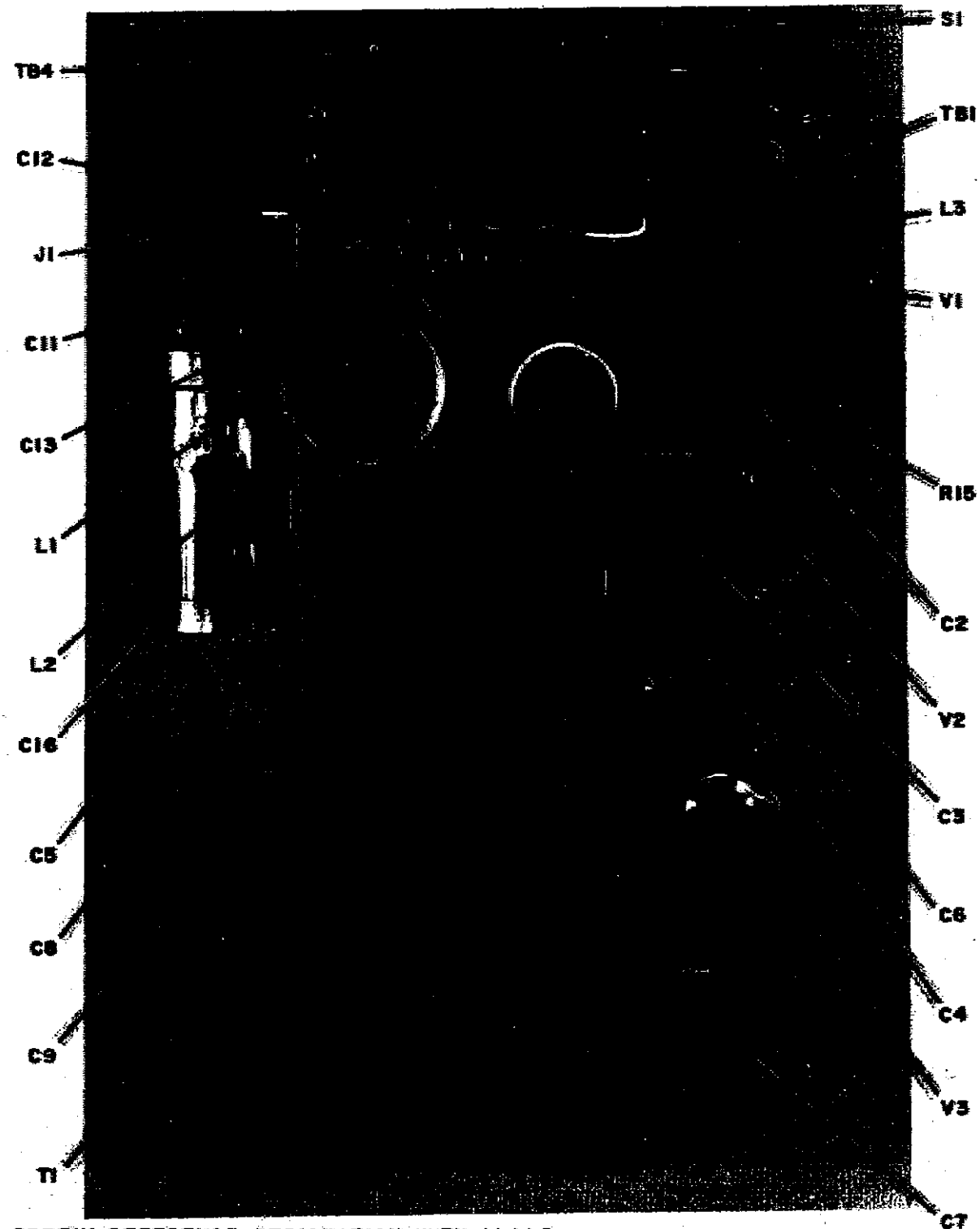
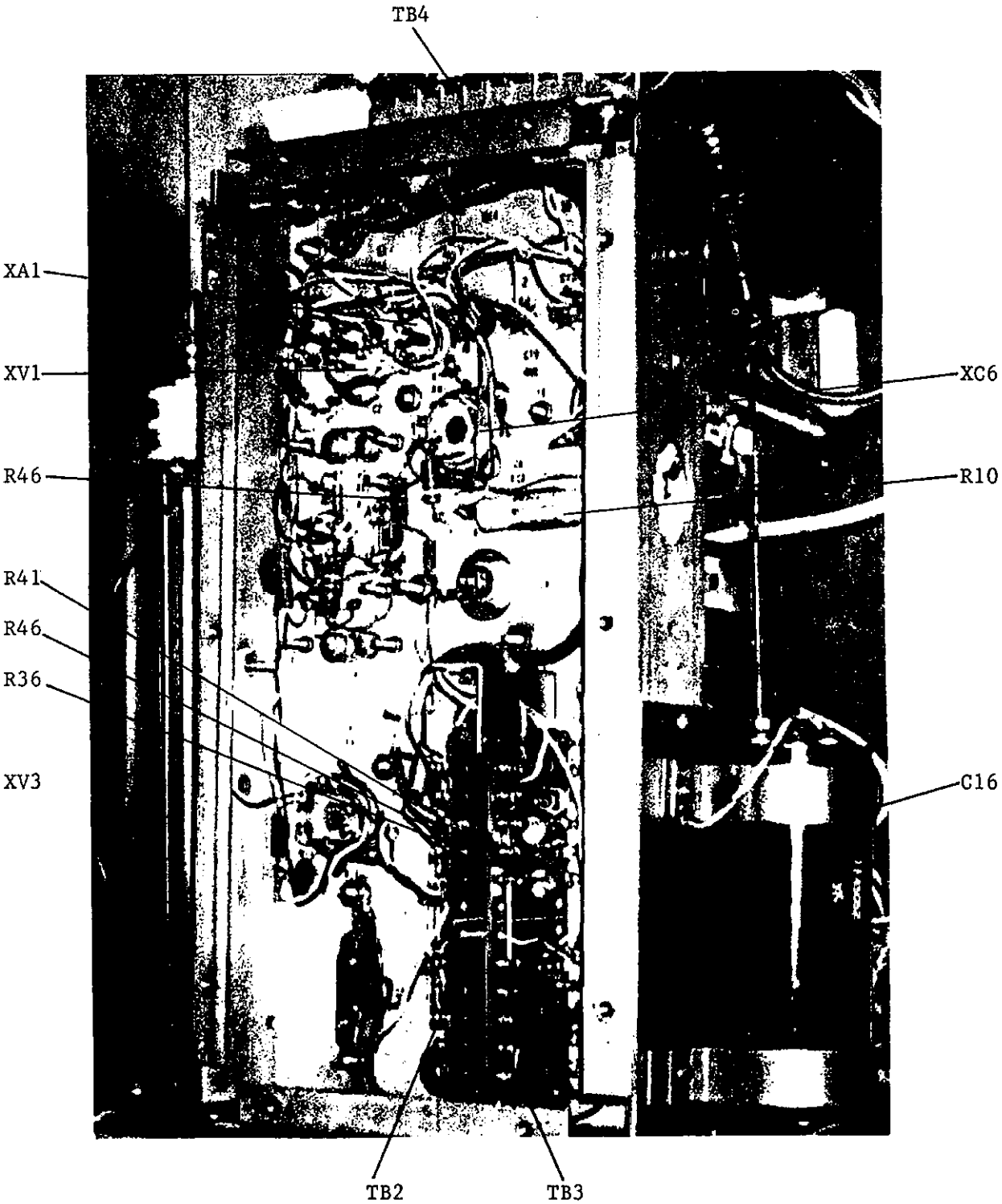
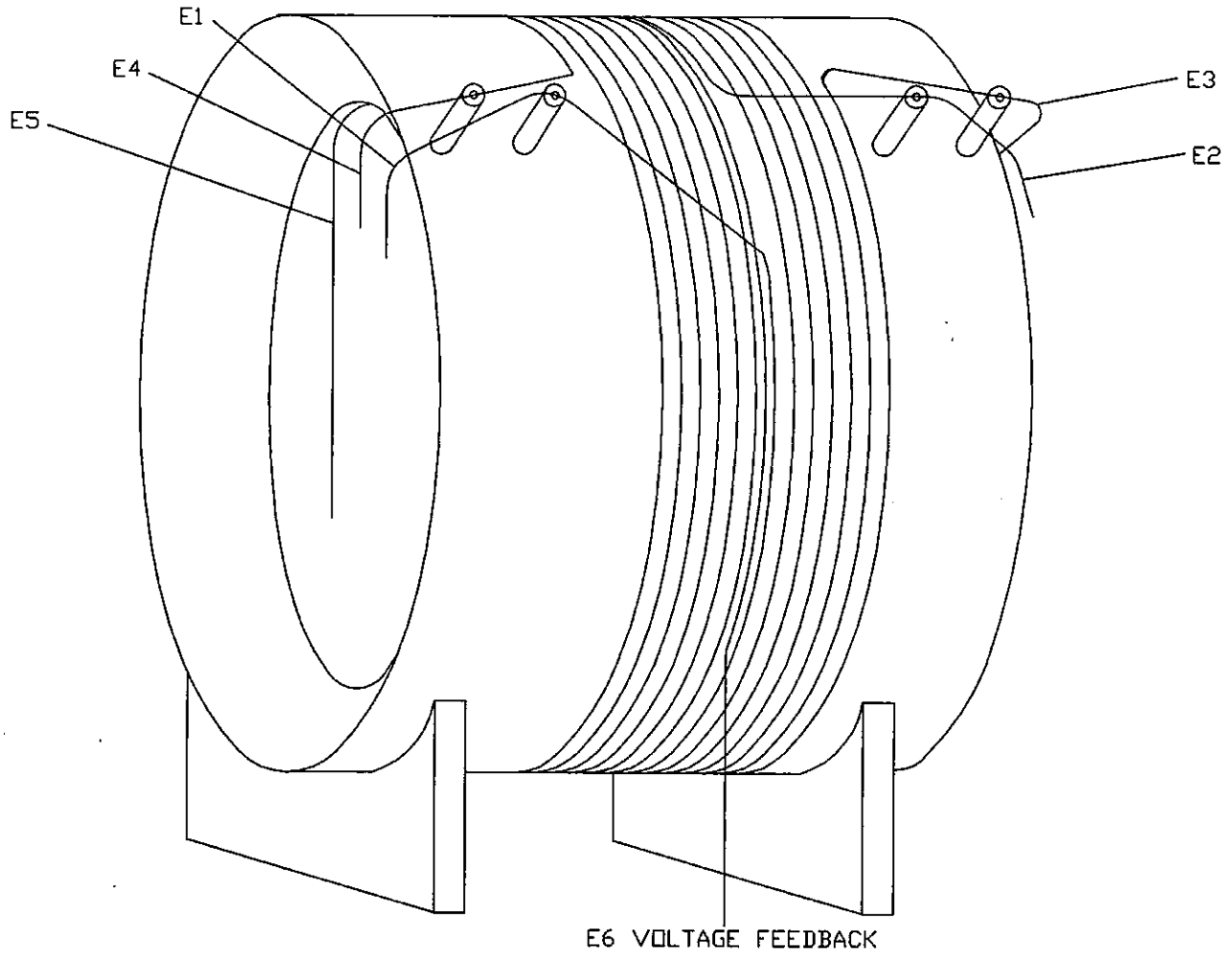


Figure 5-30. Generator Bias Pedestal, Top View, Parts Location Diagram



PREFIX REFERENCE DESIGNATIONS WITH 1A4A5

Figure 5-31. Bias Pedestal Generator, Bottom View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A5
75-009-74585

Figure 5-32. Power Amplifer Tank Coil. Parts Location Diagram

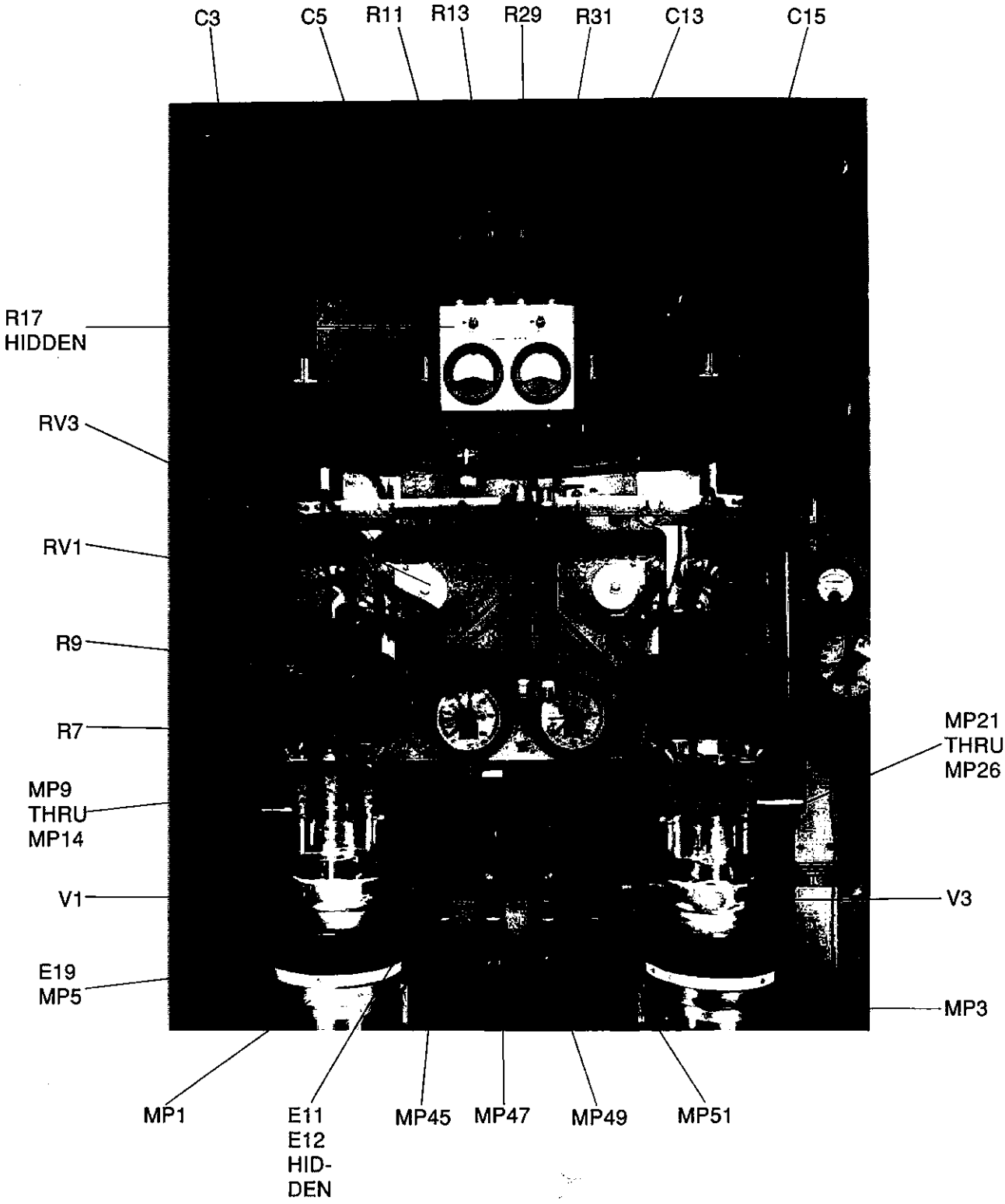


Figure 5-33. Amplifier Radio Frequency AM-3774/FPN-44, Front View, Left Side Doors Open, Parts Location Diagram (Sheet 1 of 4)

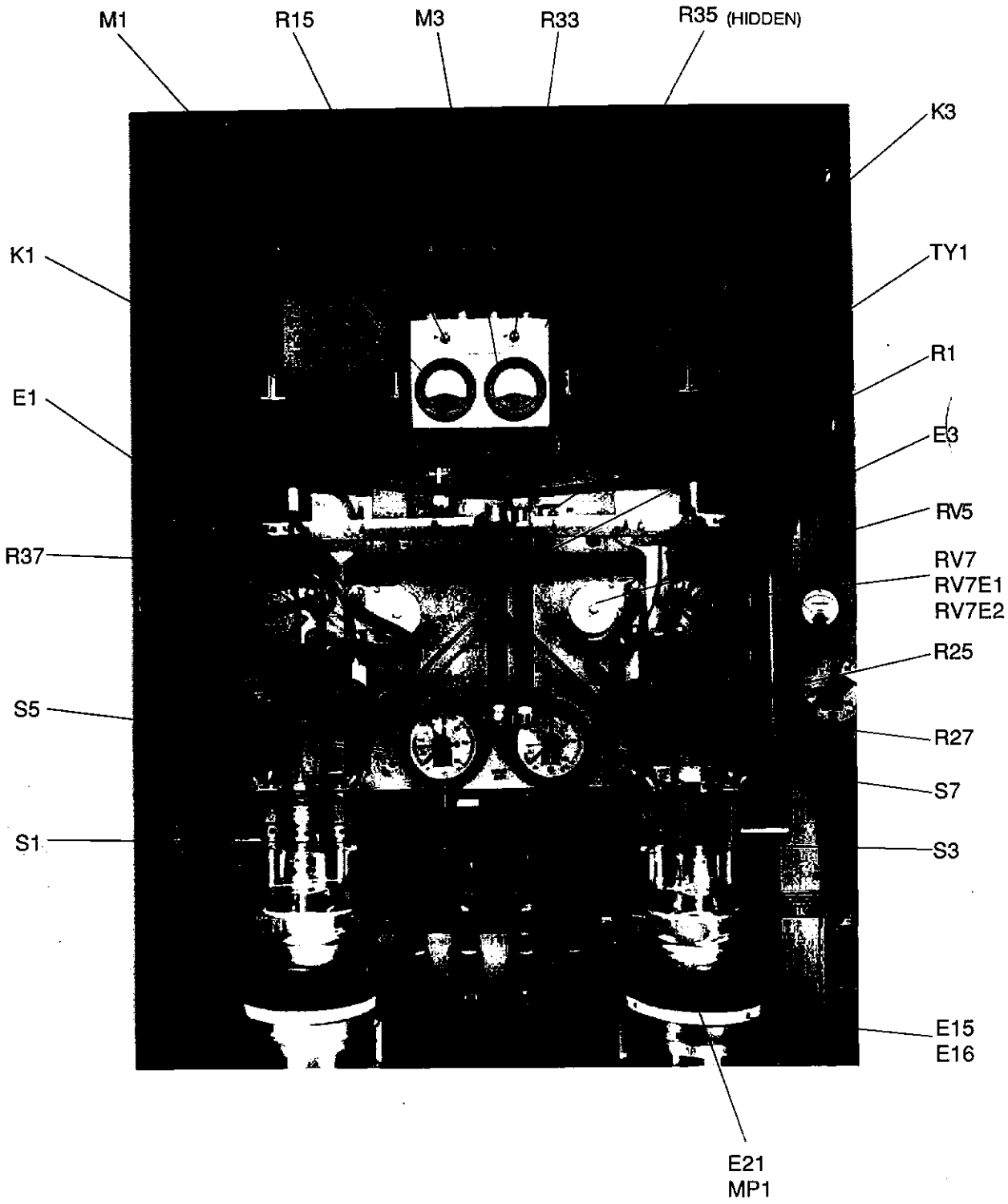


Figure 5-33. Amplifier Radio Frequency AM-3774/FPN-44, Front View, Left Side Doors Open, Parts Location Diagram (Sheet 2 of 4)

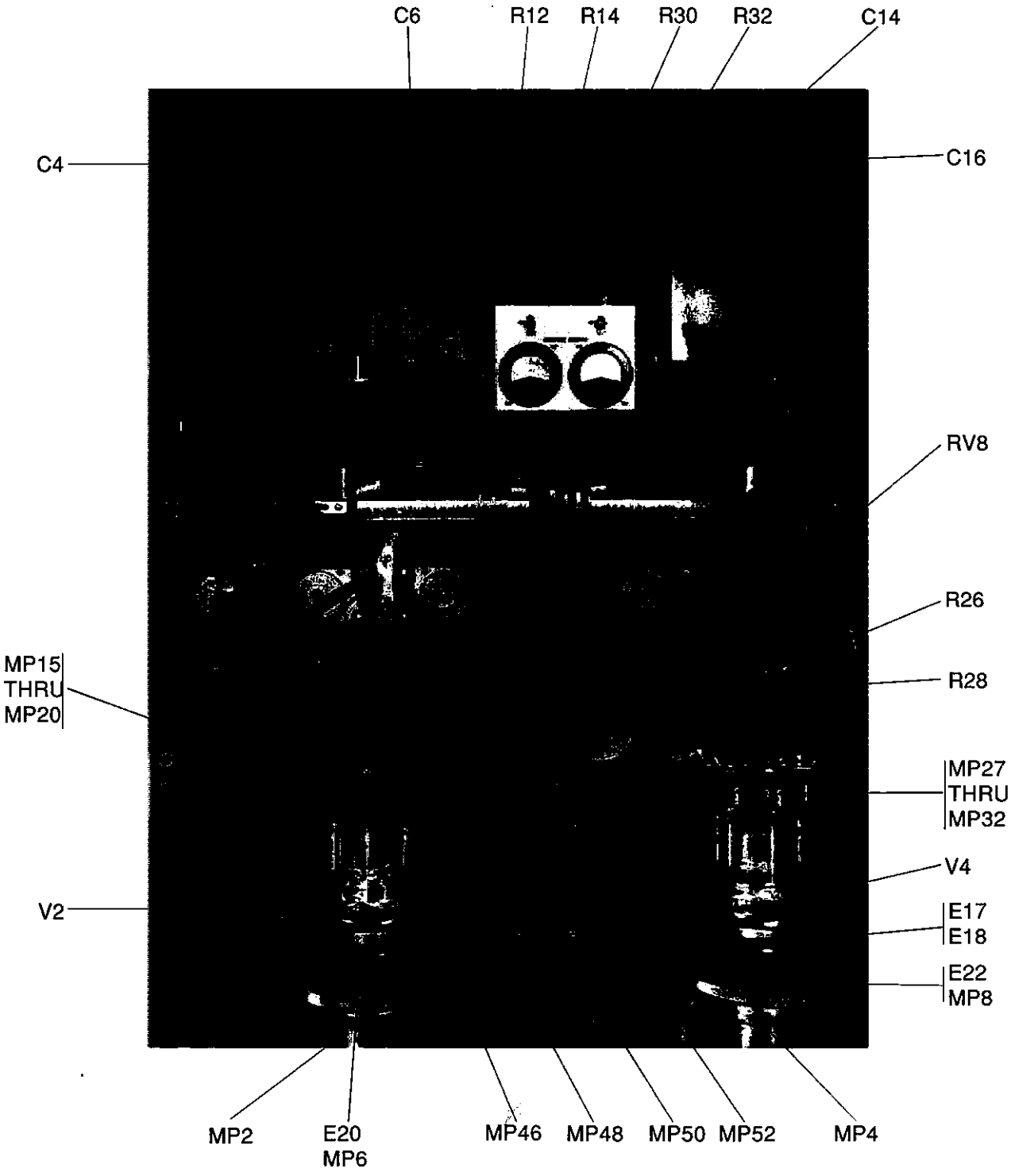


Figure 5-33. Amplifier Radio Frequency AM-3774/FPN-44, Front View ,Right Side Doors Open, Parts Location Diagram (Sheet 3 of 4)

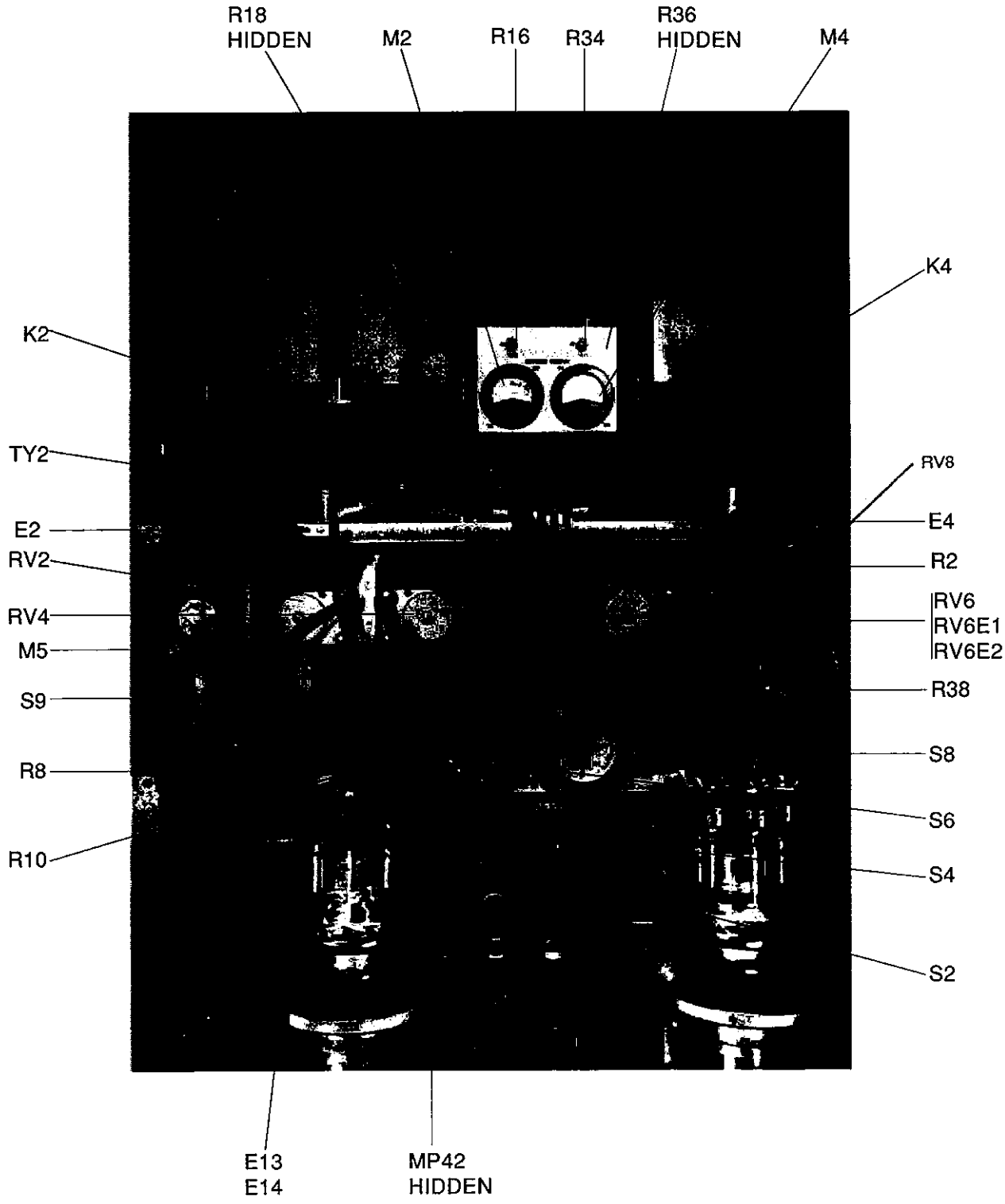


Figure 5-33. Amplifier Radio Frequency AM-3774/FPN-44, Front View ,Right Side Doors Open, Parts Location Diagram (Sheet 4 of 4)

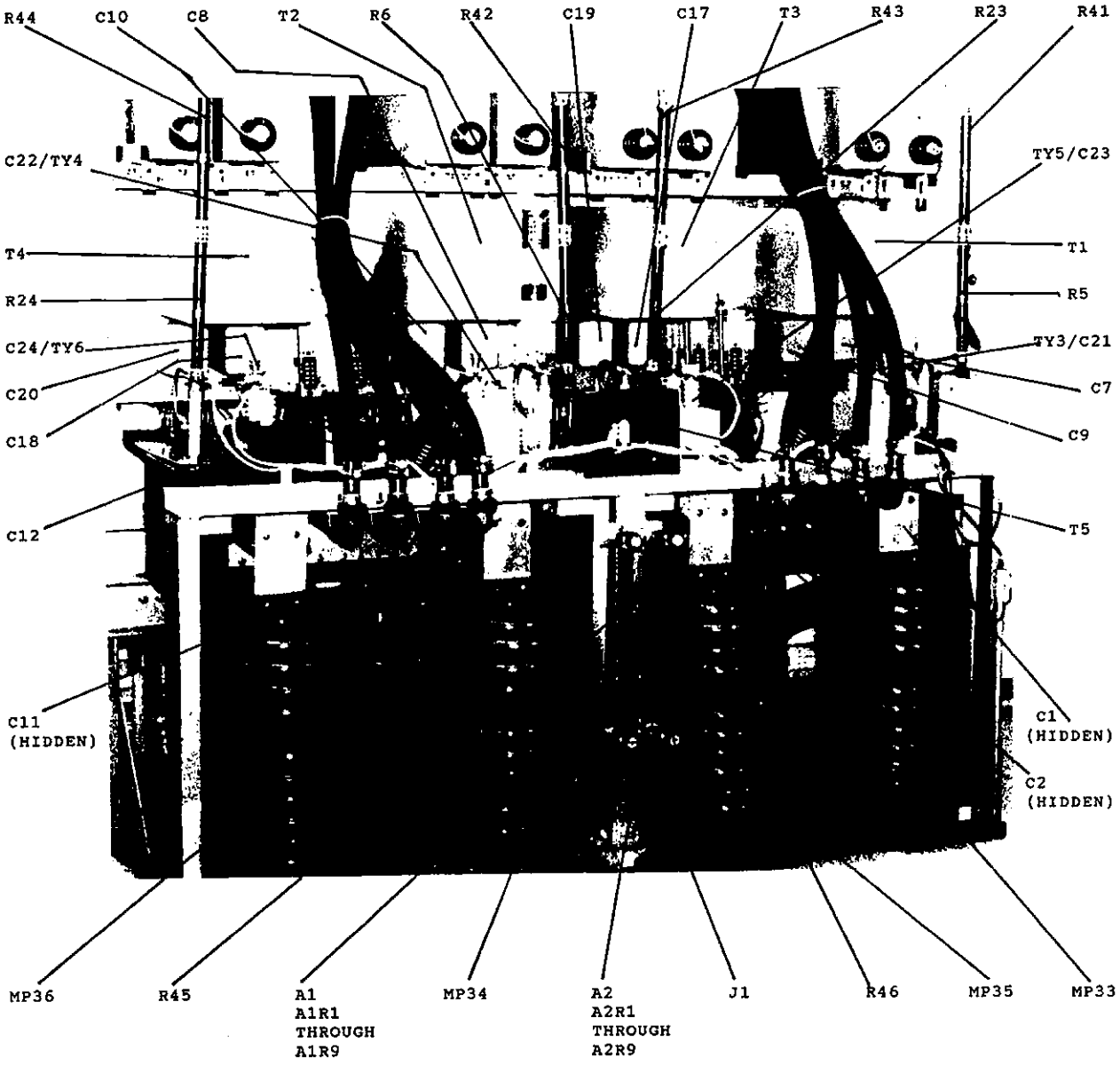
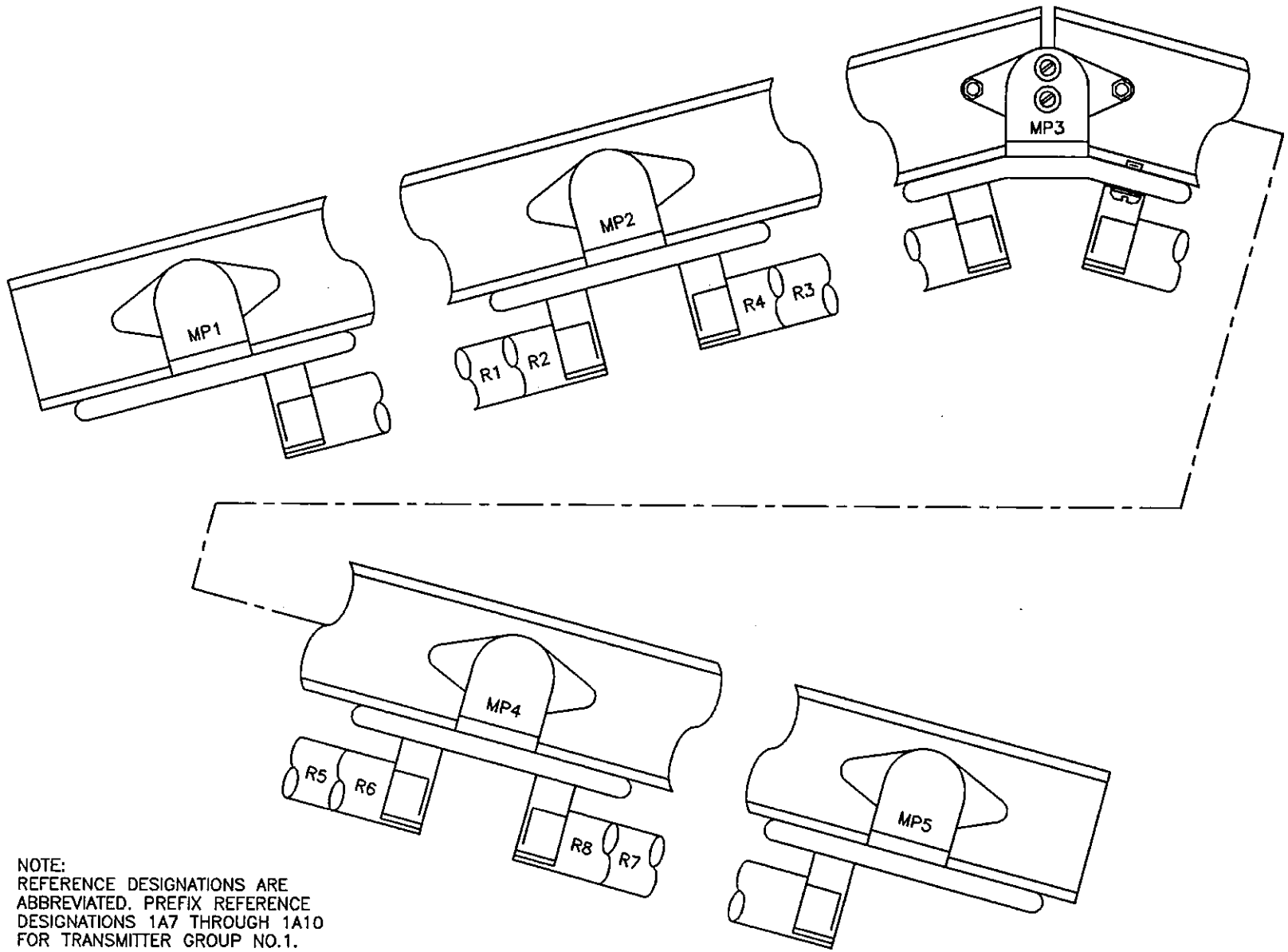
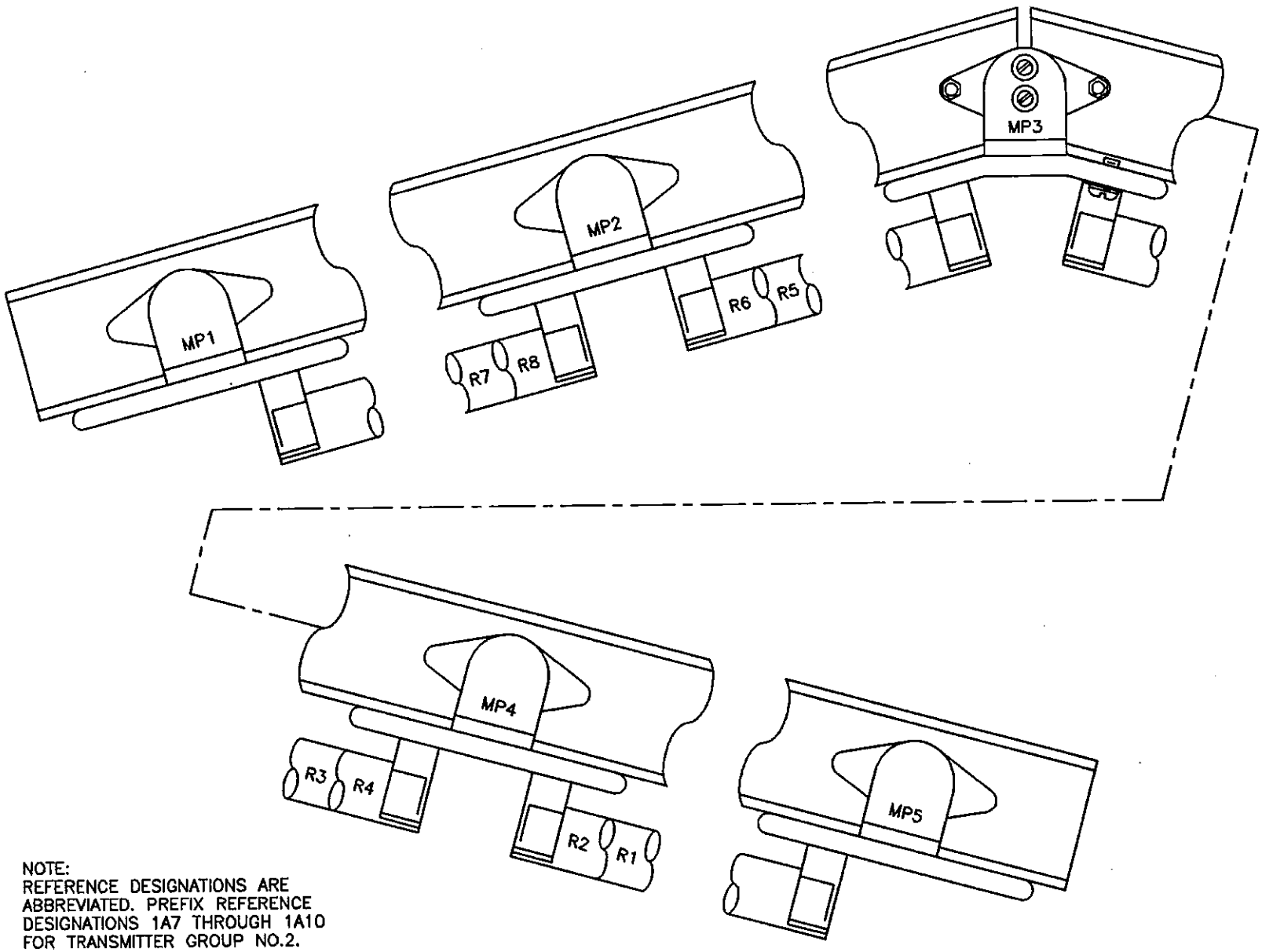


Figure 5-34. Amplifier Radio Frequency AM-3774/FPN-44A, Rear View, Parts Location Diagram



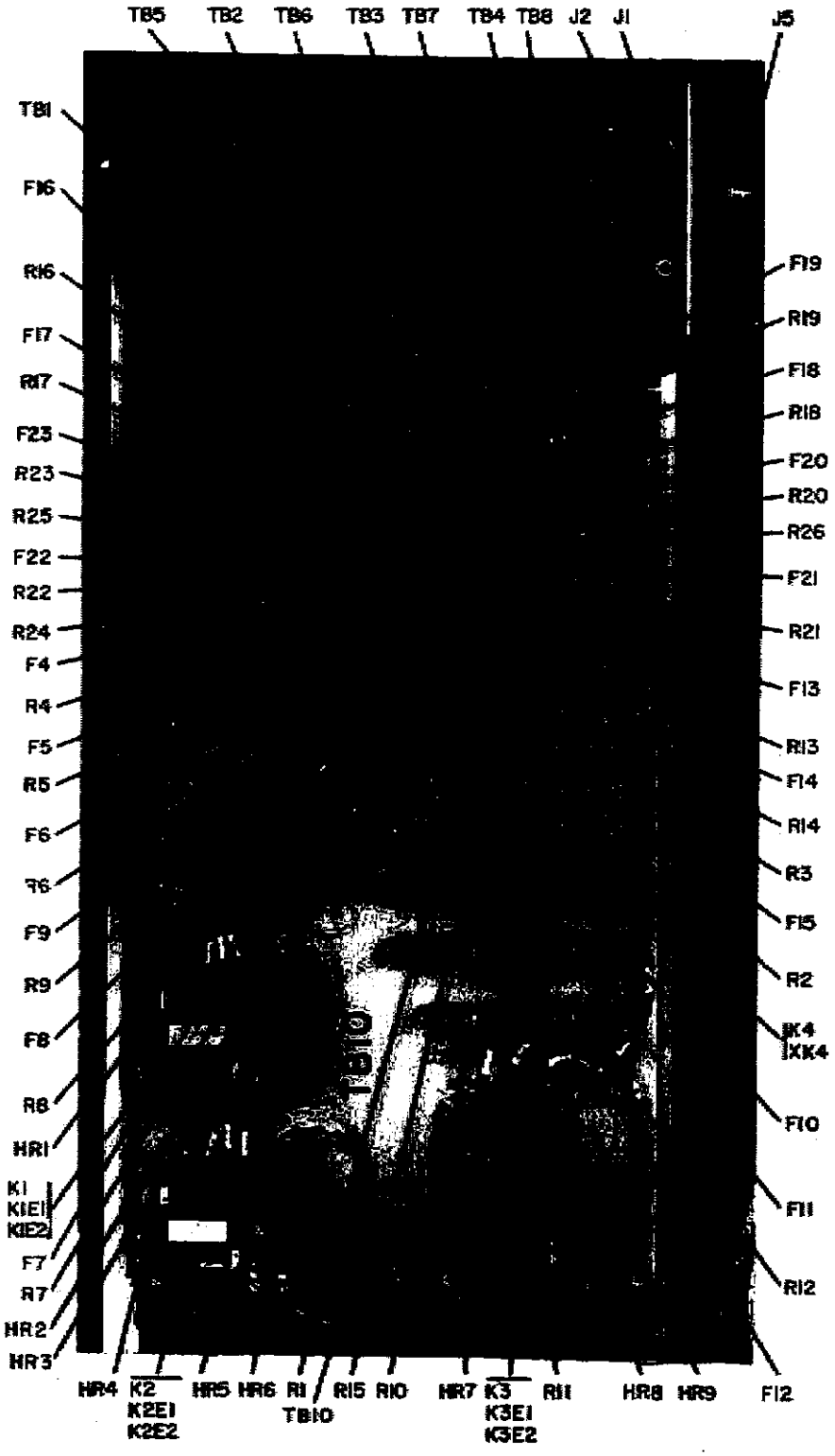
NOTE:
REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX REFERENCE DESIGNATIONS 1A7 THROUGH 1A10 FOR TRANSMITTER GROUP NO.1.

Figure 5–35. Resistor Rack Transmitter No.1, Parts Location Diagram



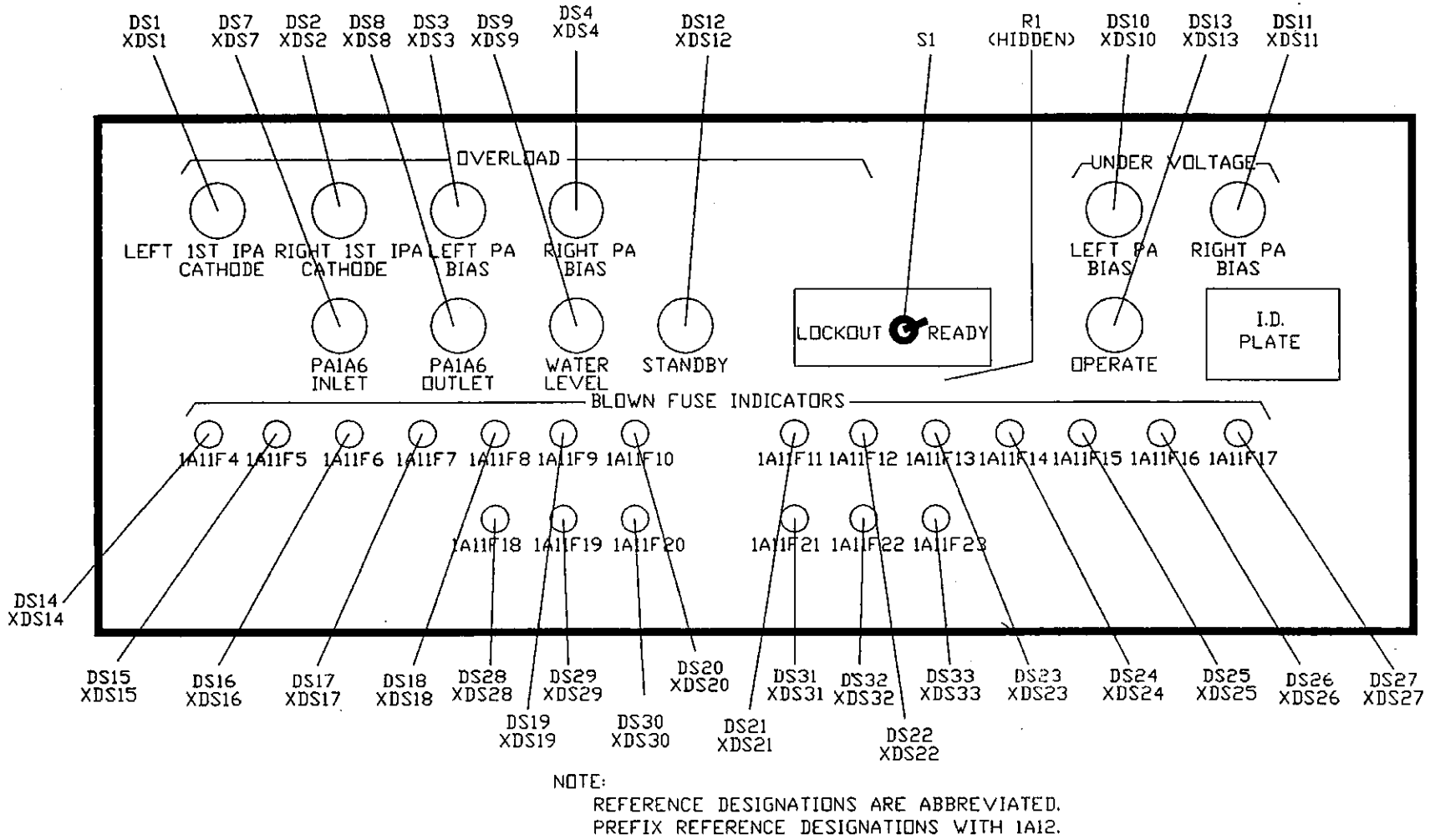
NOTE:
REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX REFERENCE DESIGNATIONS 1A7 THROUGH 1A10 FOR TRANSMITTER GROUP NO.2.

Figure 5-36. Resistor Rack Transmitter No.2, Parts Location Diagram



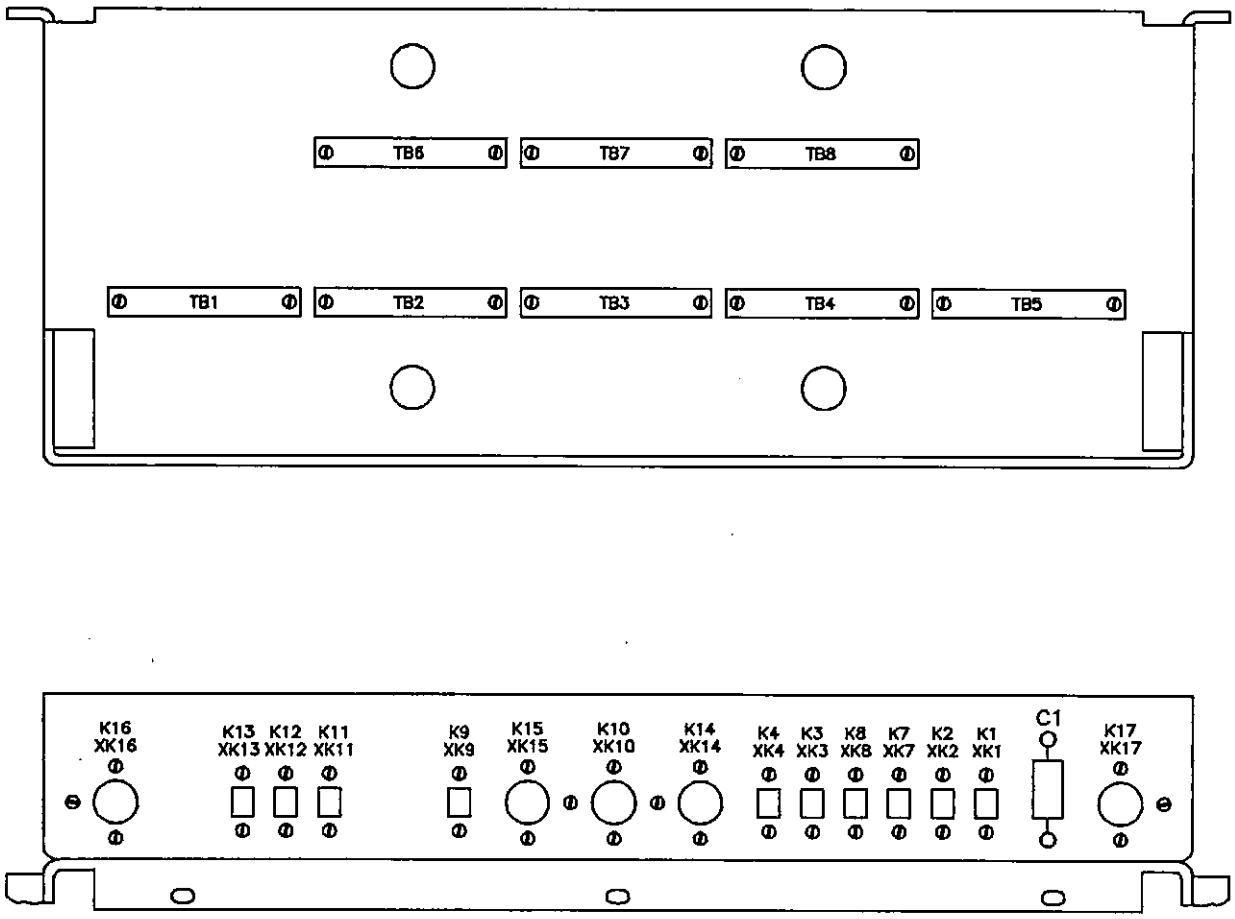
PREFIX REFERENCE DESIGNATION WITH IAII
75-009-74109

Figure 5-37. Rack, Electrical Equipment MT-2929/FPN-44A, Parts Location Diagram



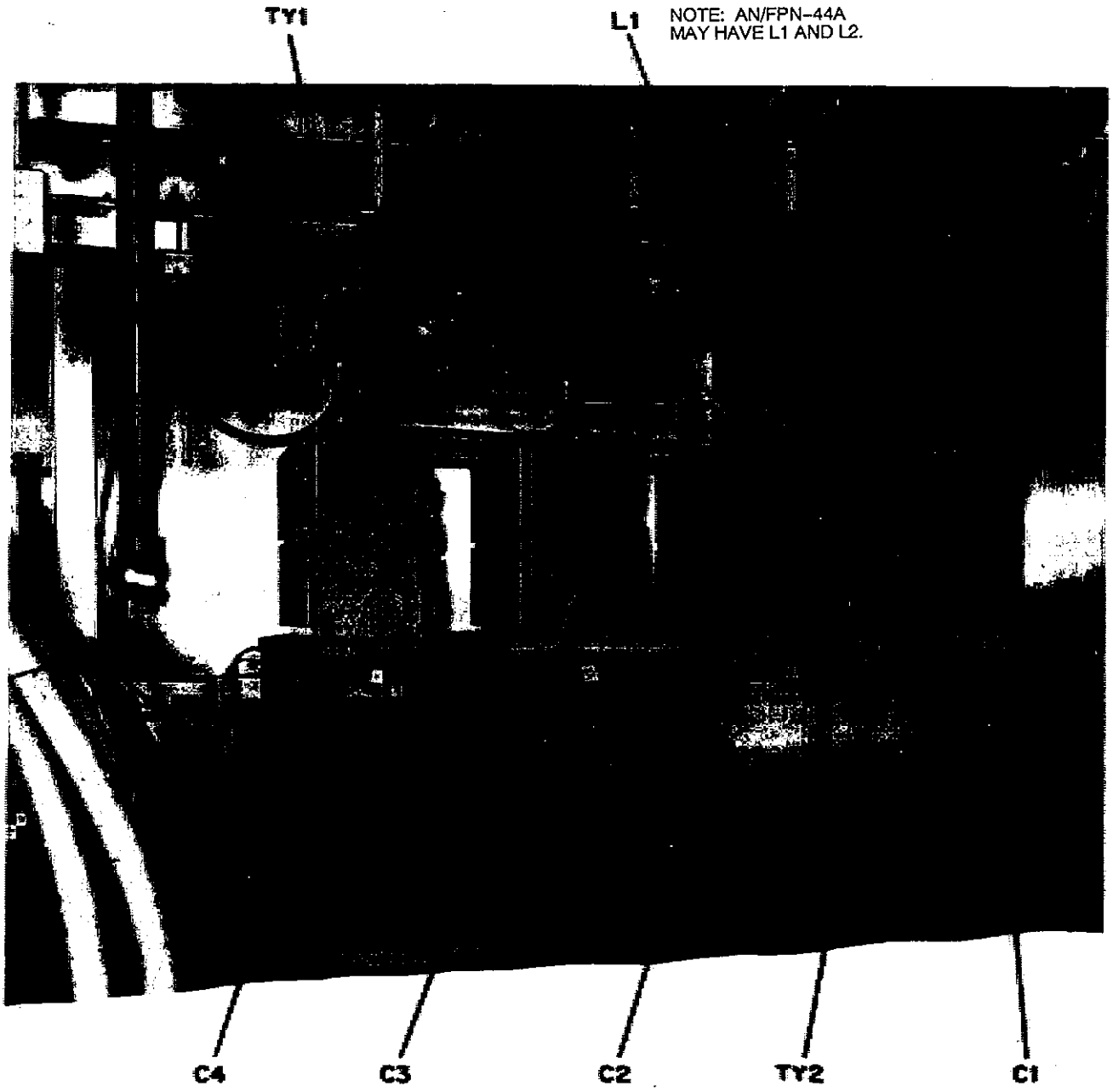
NOTE:
REFERENCE DESIGNATIONS ARE ABBREVIATED.
PREFIX REFERENCE DESIGNATIONS WITH 1A12.

Figure 5-38. Panel Indicator SB-1894/FPN-44. Front View Parts Location Diagram



NOTE:
REFERENCE DESIGNATIONS ARE ABBREVIATED.
PREFIX REFERENCE DESIGNATIONS WITH 1A12.

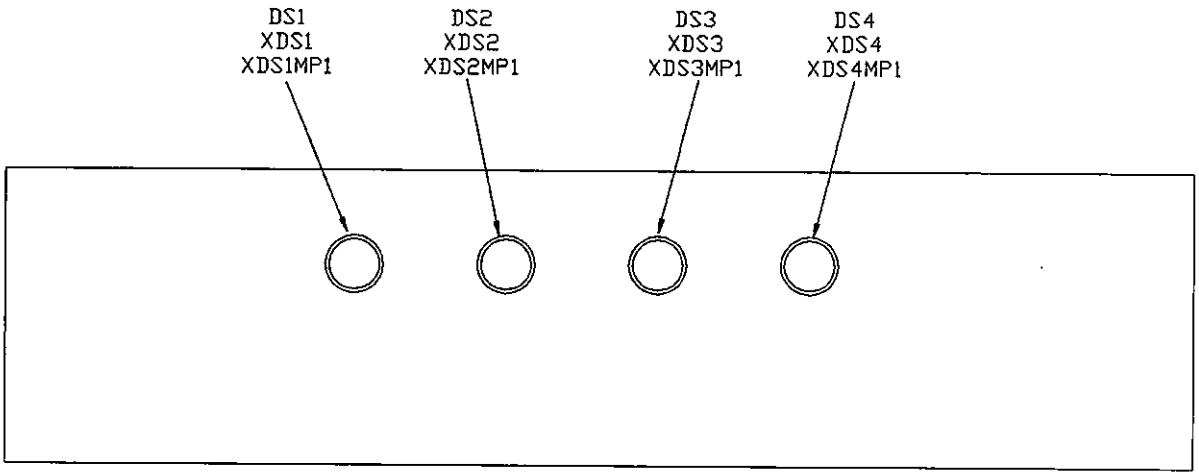
Figure 5–39. Indicator Panel SB–1894/FPN–44, Chassis, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A20

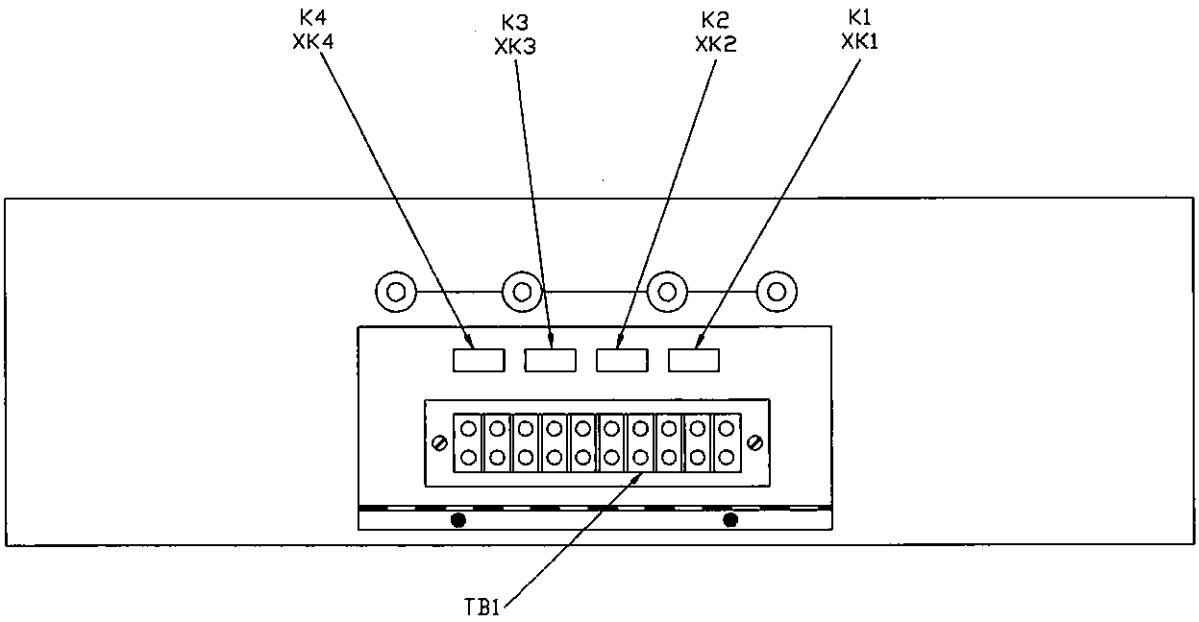
75-009-74168

Figure 5-40. Filter, Low Pass F-1428/FPN-44A, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A21

Figure 5–41. Indicator Panel, PA Overload, Front View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A21

Figure 5–42. Indicator Panel
PA Overload, Rear View,
Parts Location Diagram

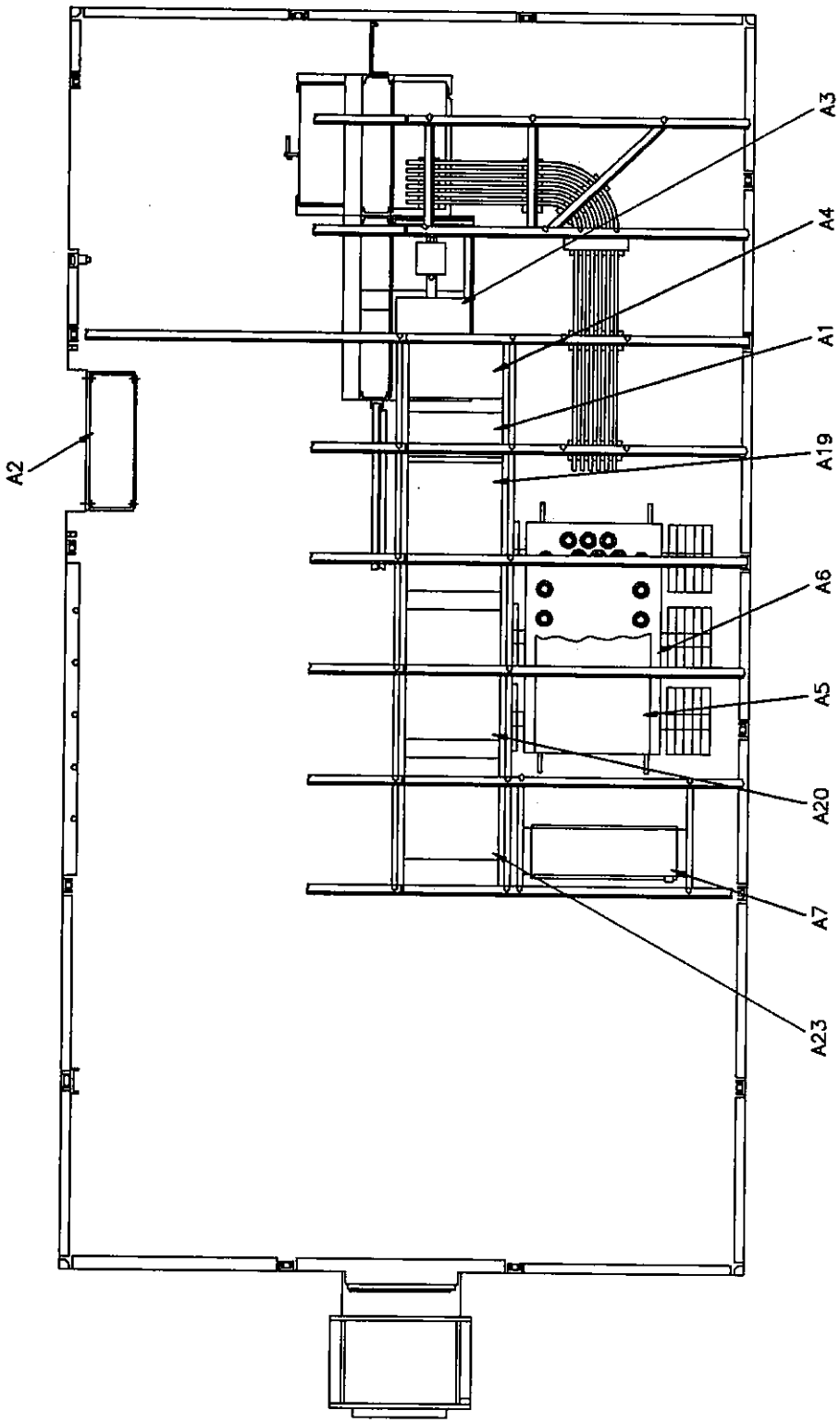
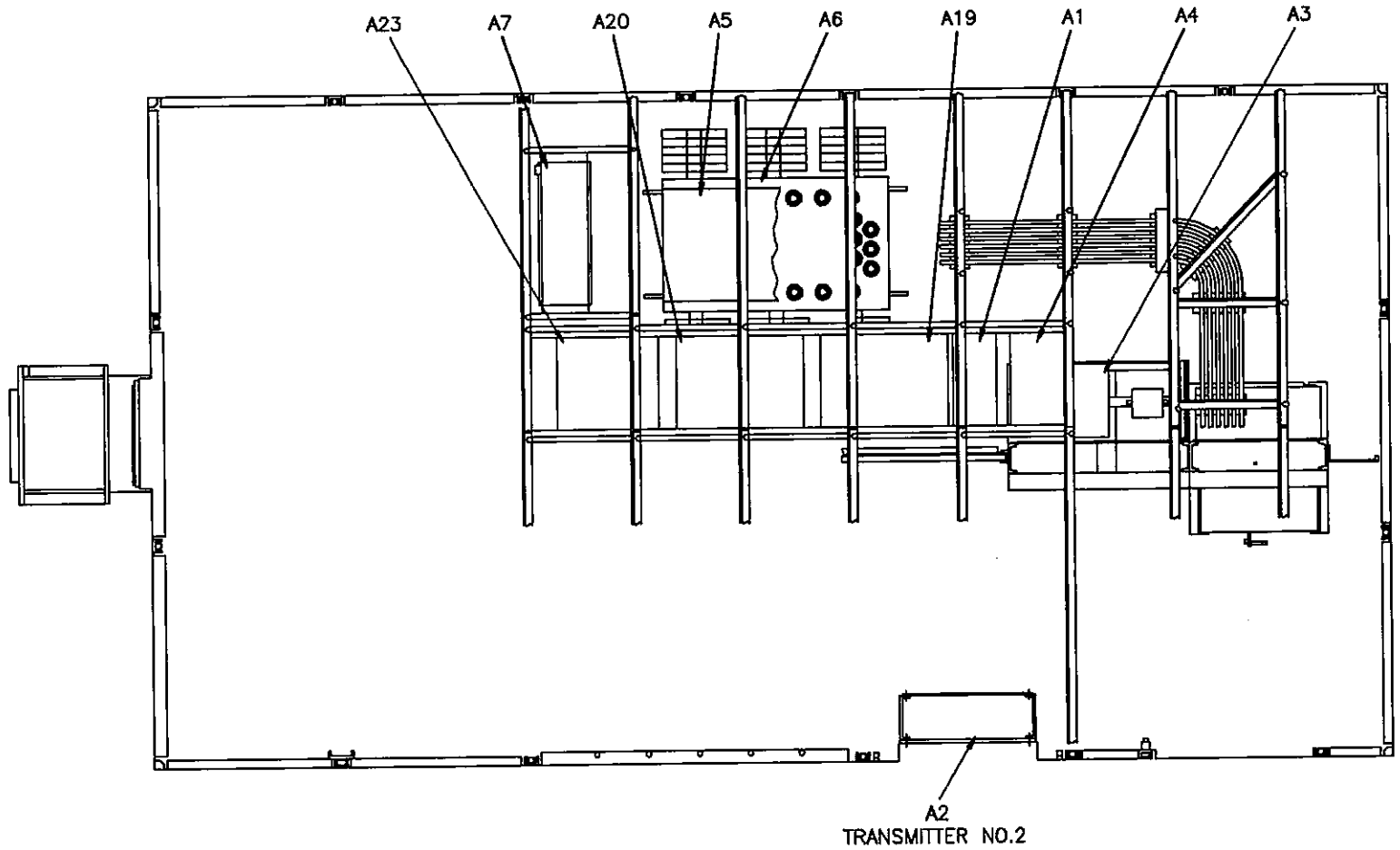
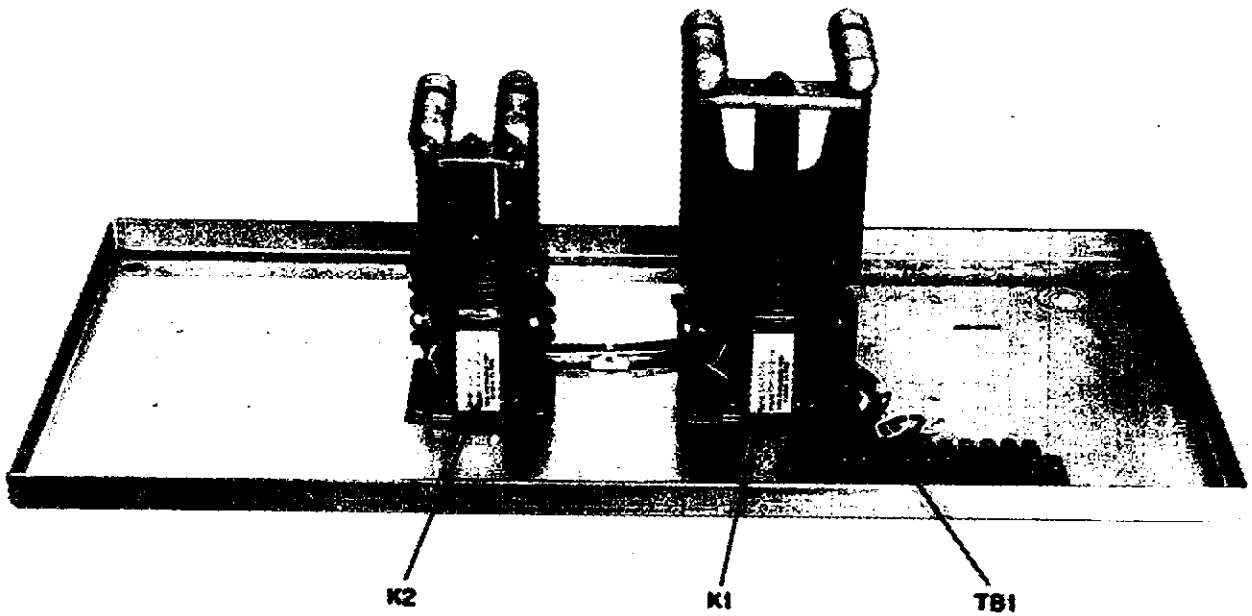


Figure 5-43. Power Supply Set OP-109/FPN-44A, Parts Location Diagram (Sheet 1 of 2)



PREFIX REFERENCE DESIGNATION WITH 1A53

Figure 5-43. Power Supply Set OP-109/FPN-44A,
Parts Location Diagram (Sheet 2 of 2)



PREFIX REFERENCE DESIGNATION WITH 1A53A1
75-009-74758

Figure 5-44. Relay Assembly RE-1112/FPN-44A, Parts Location Diagram

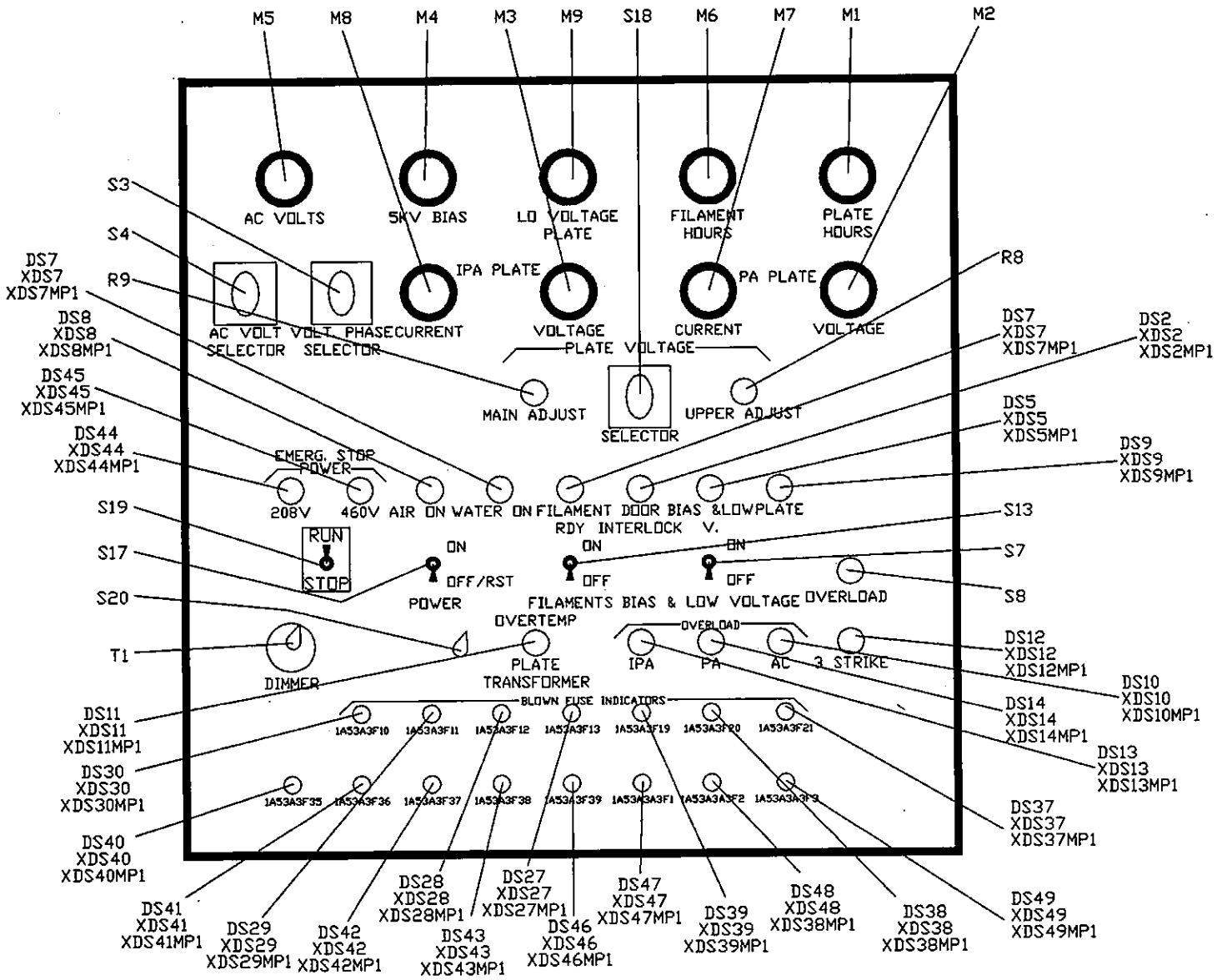


Figure 5-45. Control-Indicator C-10034/FPN-44A. Front View. Parts Location Diagram

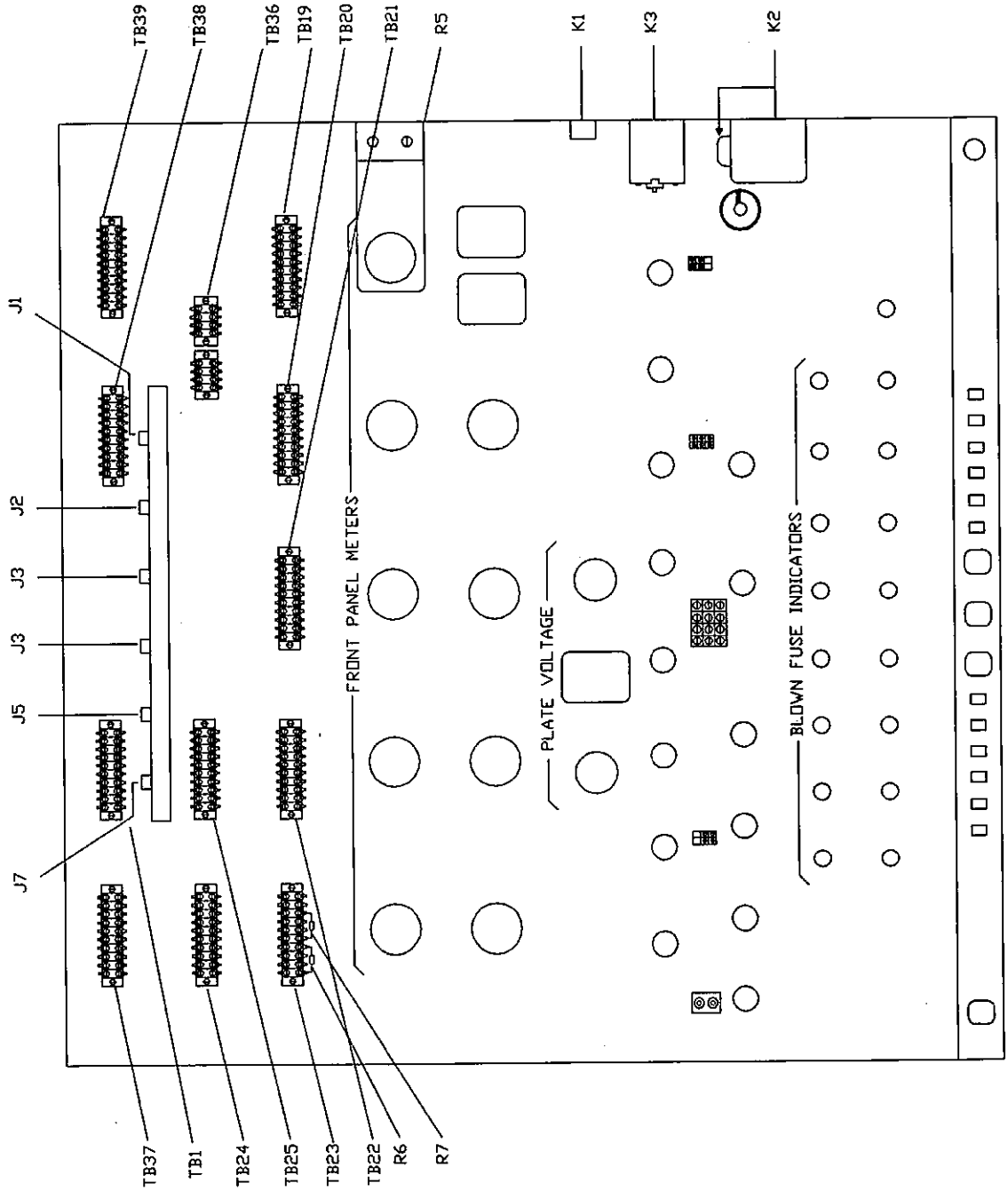
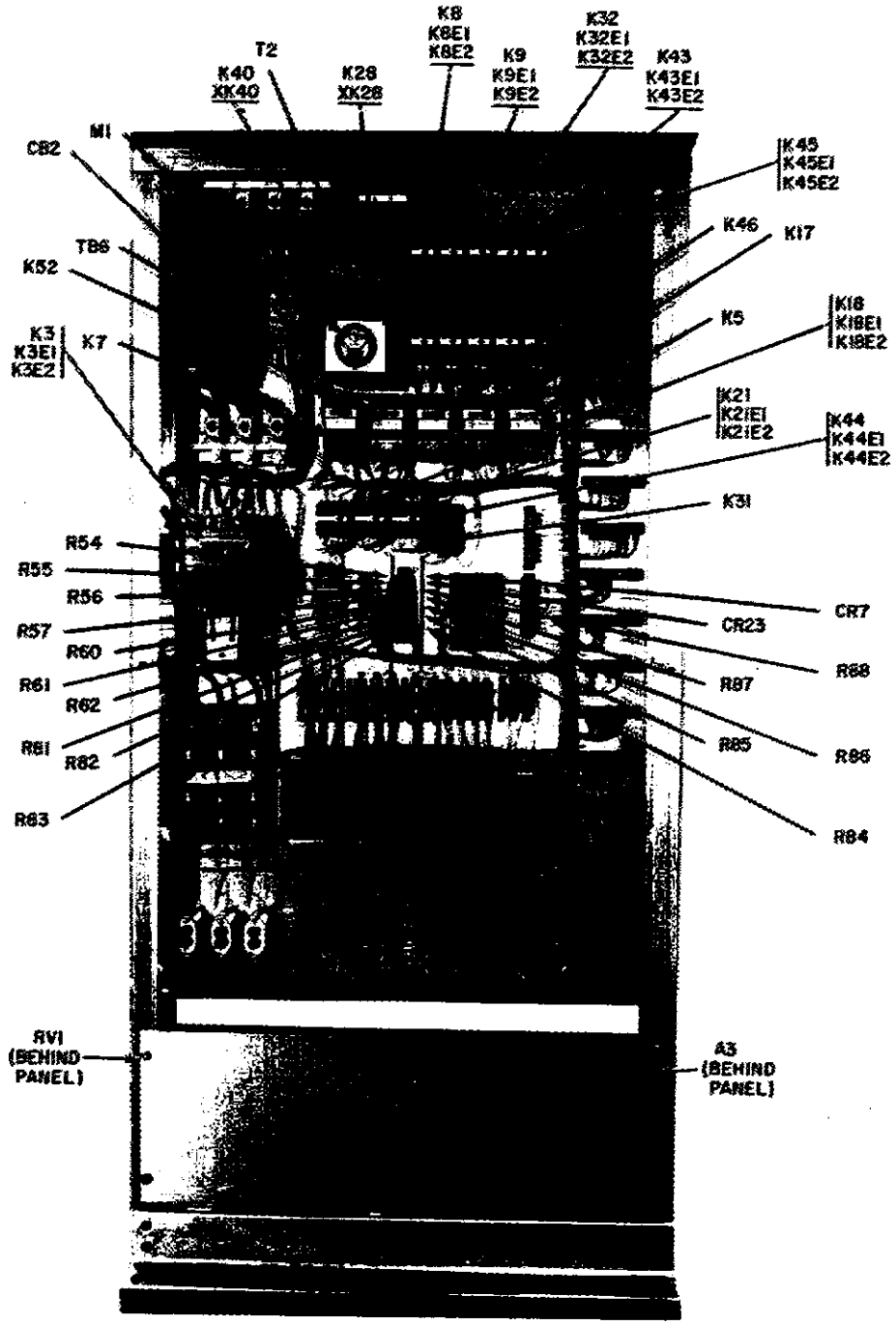
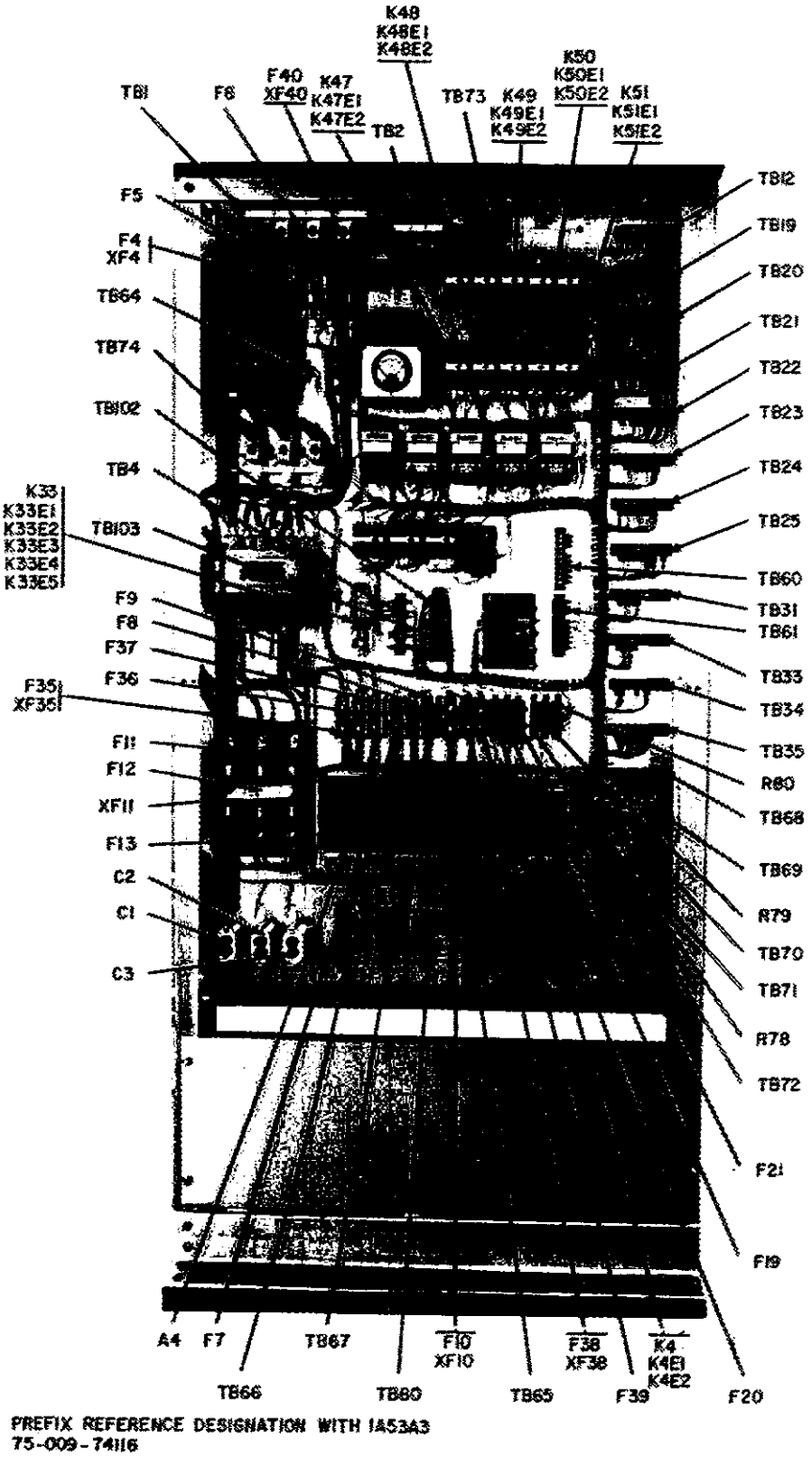


Figure 5-46. Control Indicator C-10034/FPN-44A, Rear View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH IA53A3
75-009-74116

Figure 5-47. Relay Assembly RE-1113 / FPN-44A, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH IA53A3
75-009-7411 6

Figure 5-48. Relay Assembly RE-1113 / FPN -44A, Parts Location Diagram

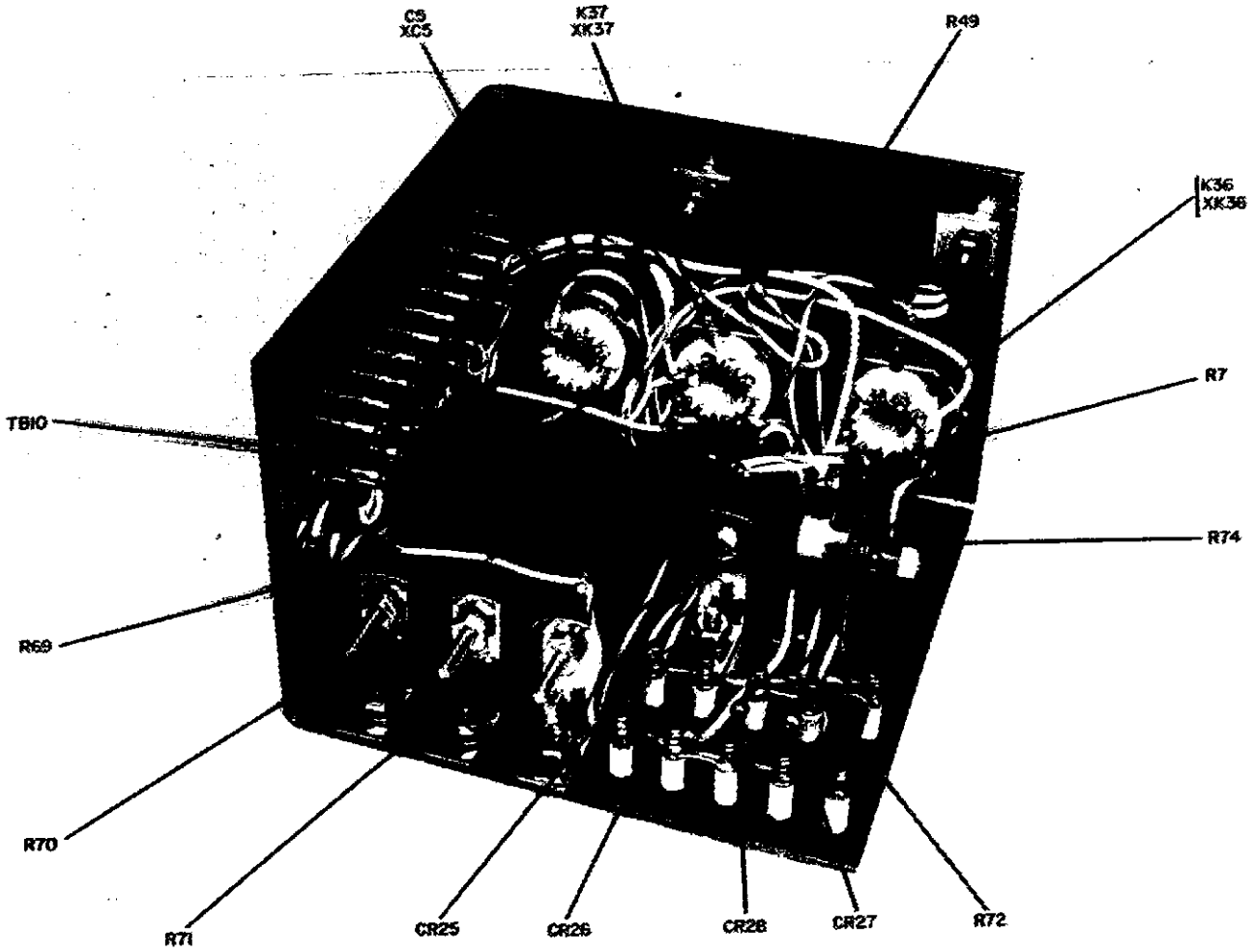


Figure 5-49. Relay Assembly P / O RE-1113 / FPN-44A, Parts Location Diagram

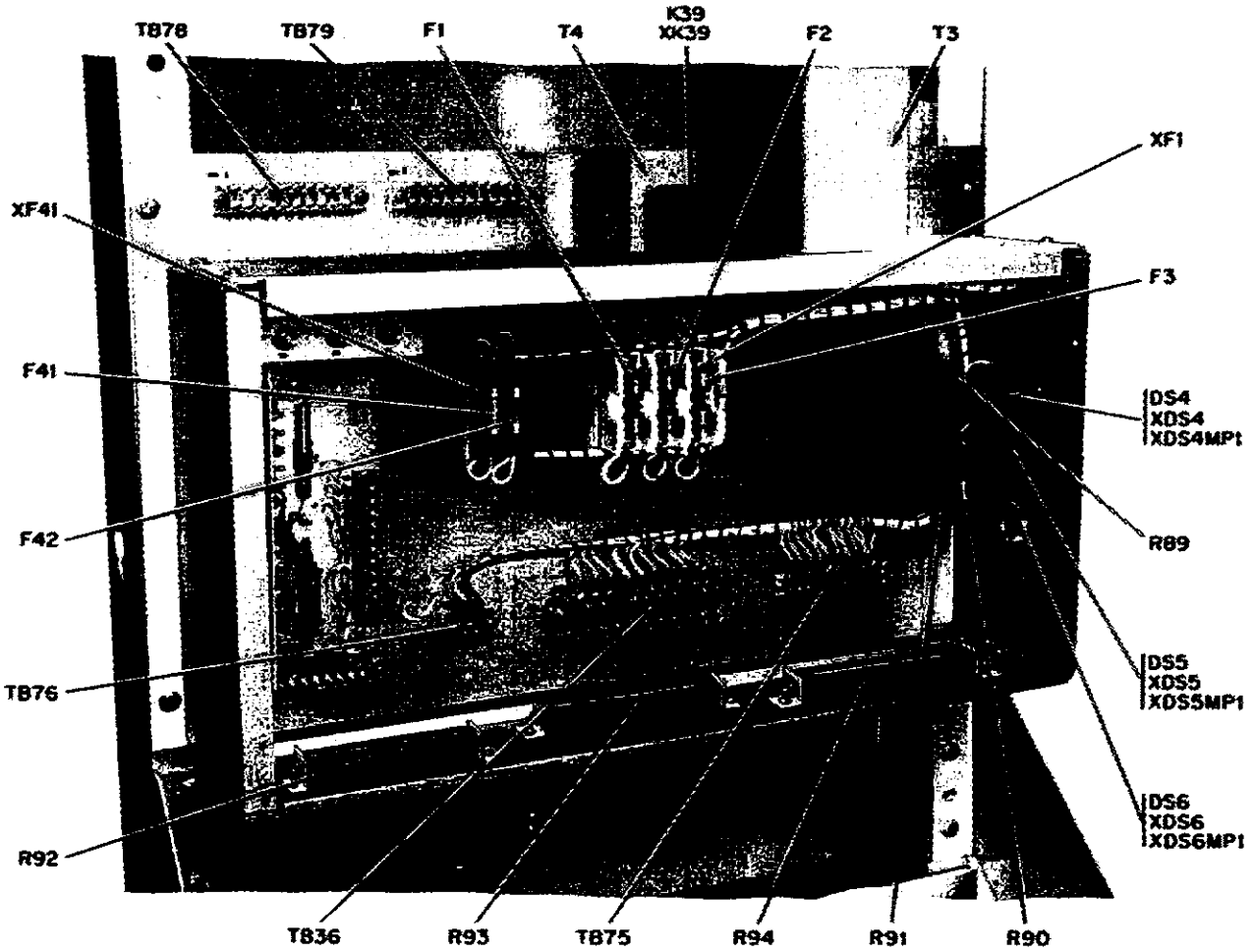


Figure 5-50. Relay Assembly P/O RE-1113/FPN-44A, Parts Location Diagram

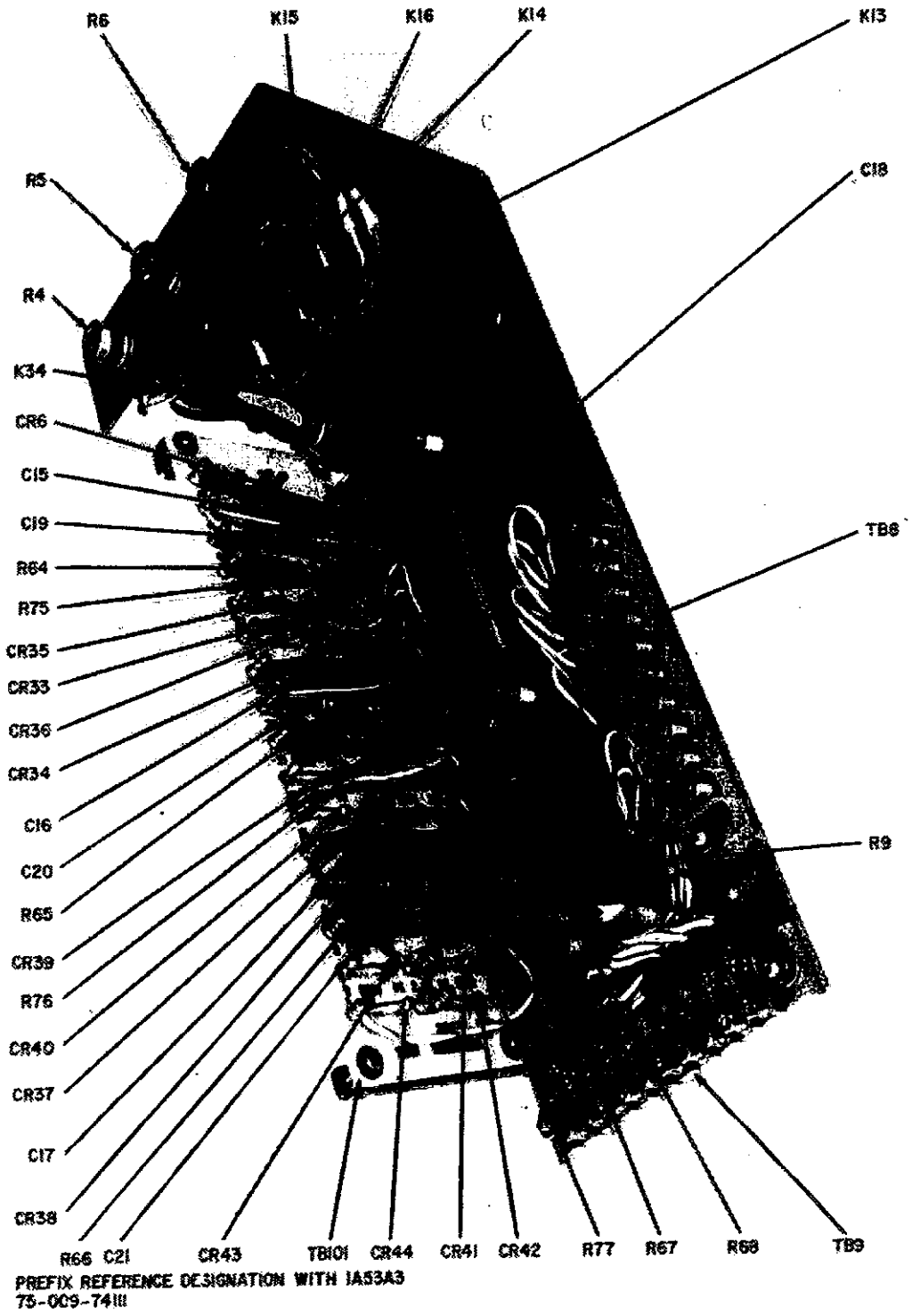
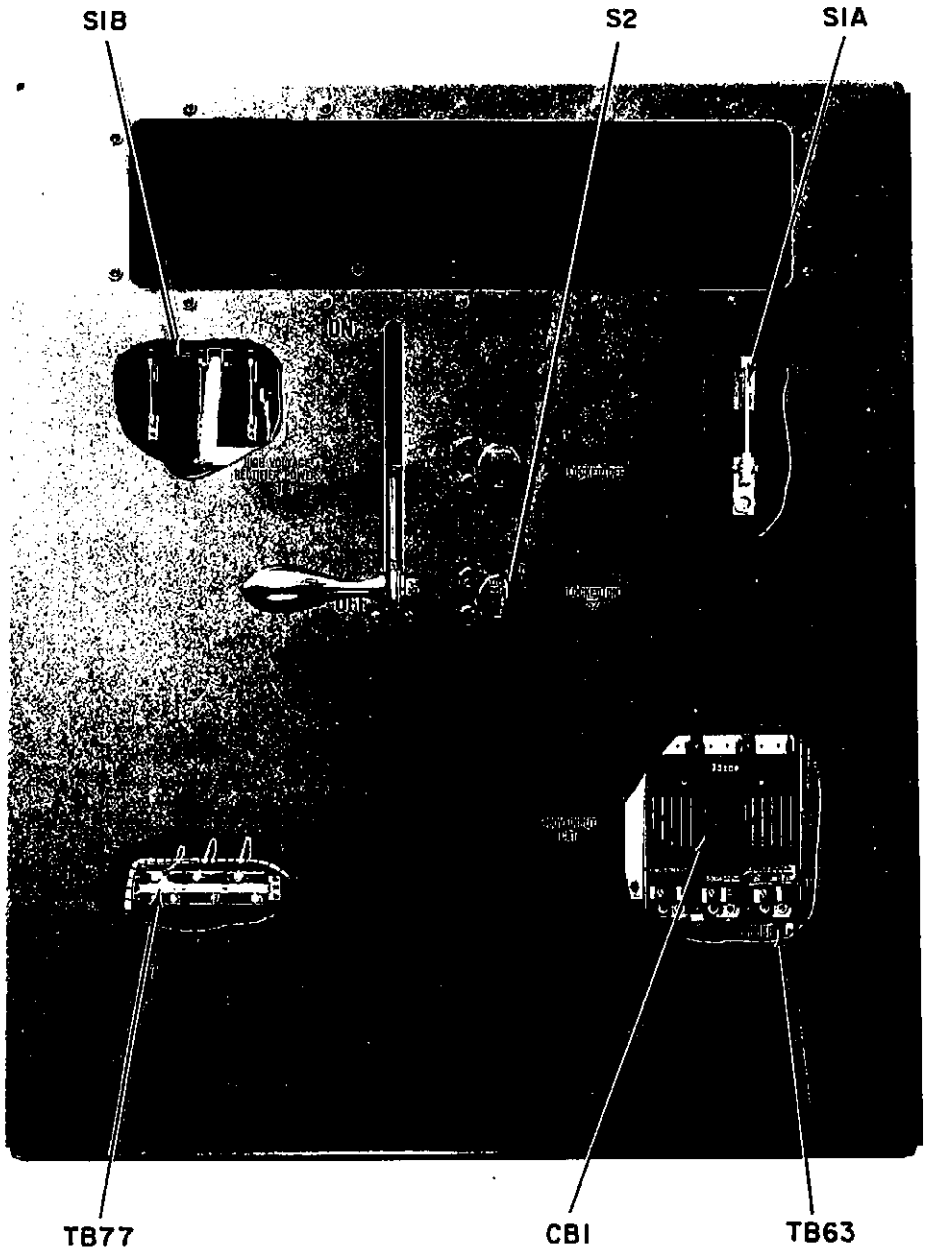


Figure 5-51. Relay Assembly P/O RE-1113/FPN-44A, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A53A3

Figure 5-52. Relay Assembly, P/O RE-1113/FPN-44A, Parts Location Diagram

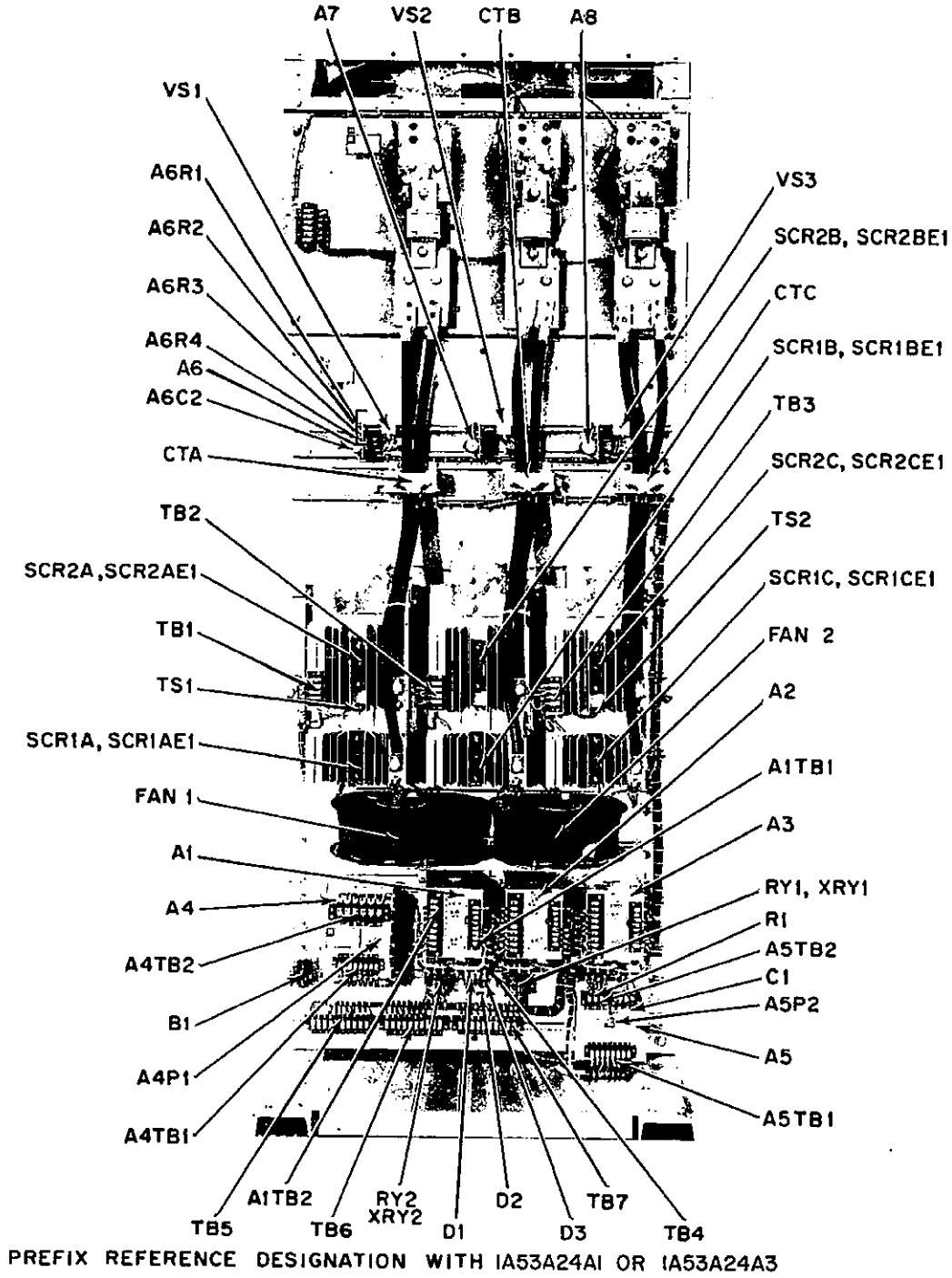


Figure 5-53. Relay Assembly P/O RE-1113/FPN-44A, Parts Location Diagram

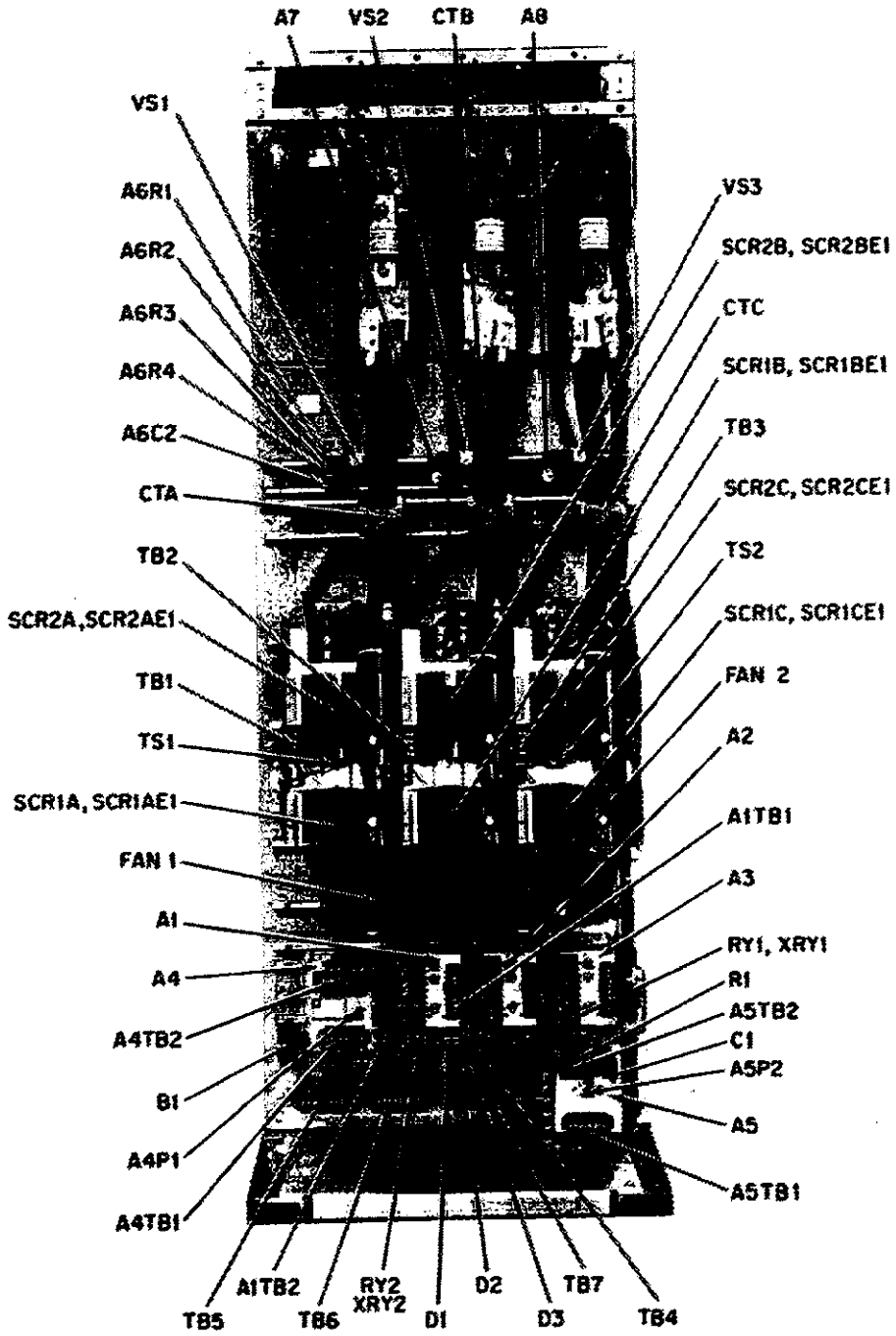


Figure 5-54. Regulator Voltage CN-1473/FPN-44A, Parts Location Diagram

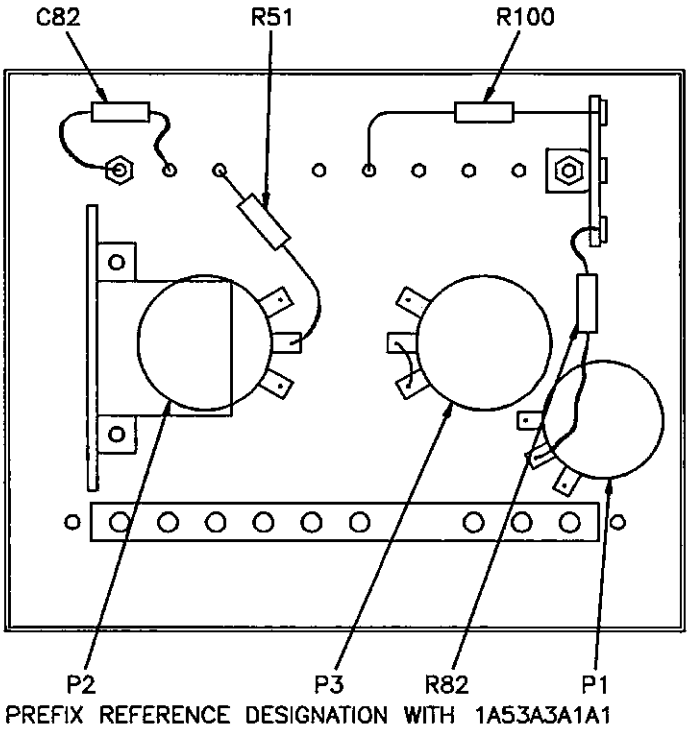


Figure 5–55. Gate Trigger Unit, Underside of Cover, Parts Location Diagram

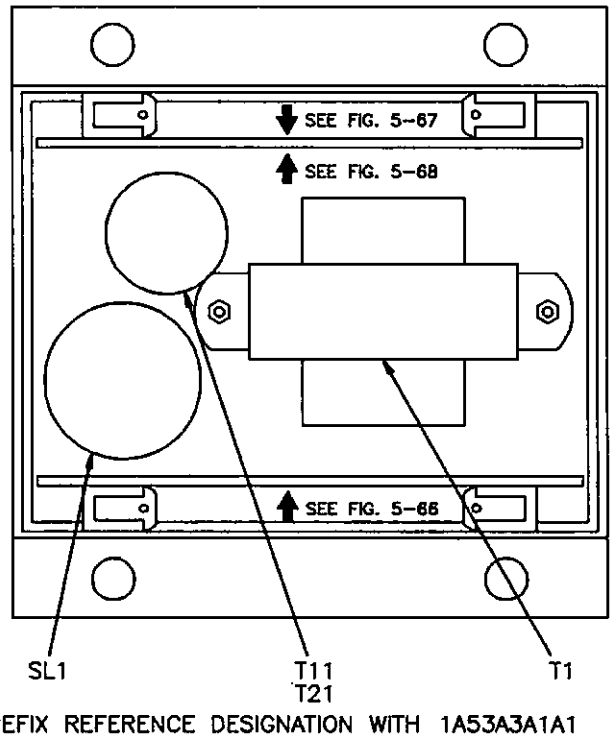
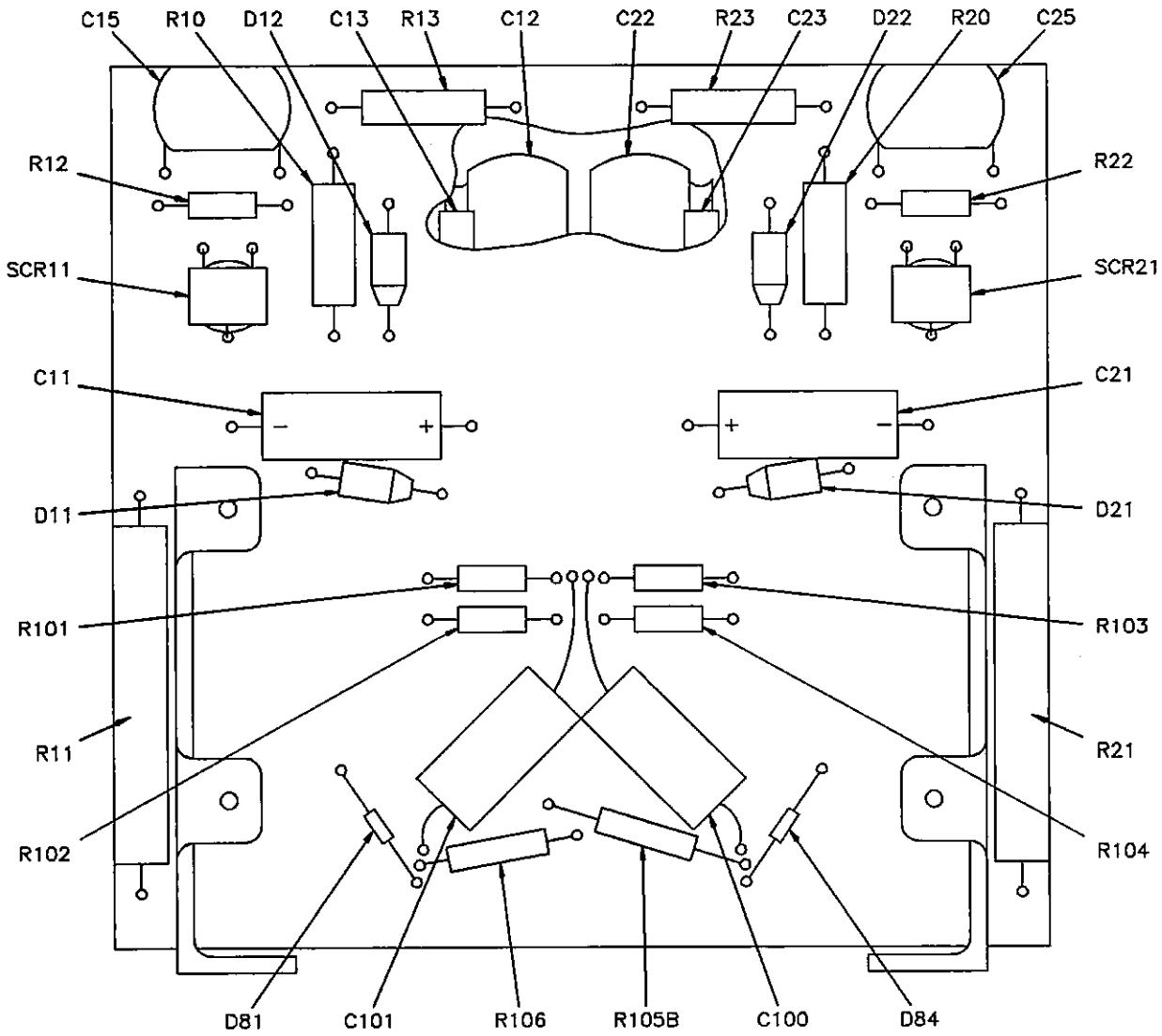


Figure 5–56. Gate Trigger Unit, Inside Can, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A53A3A1A1

Figure 5–57. Gate Trigger Unit, Underside of Board, Parts Location Diagram

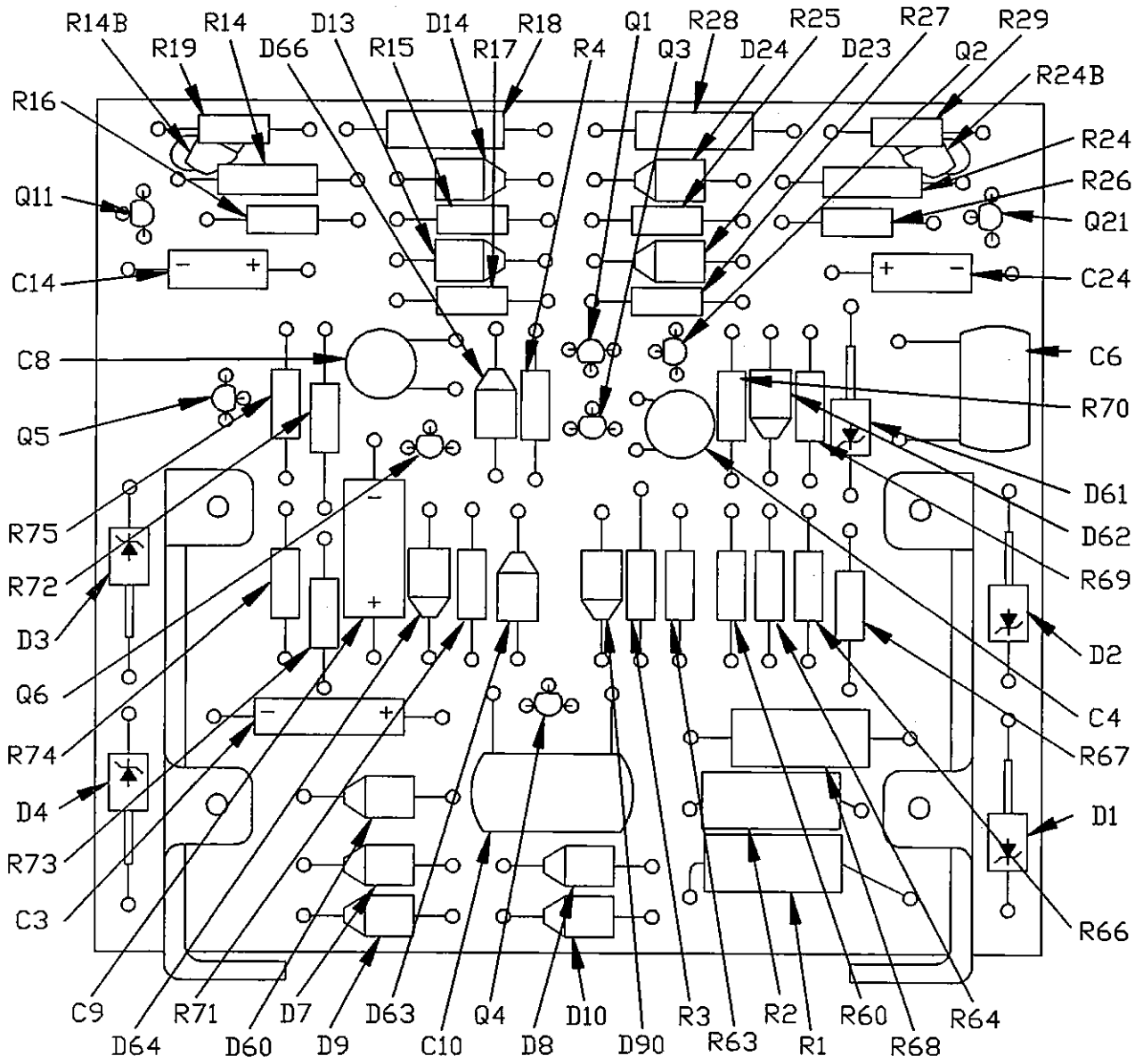
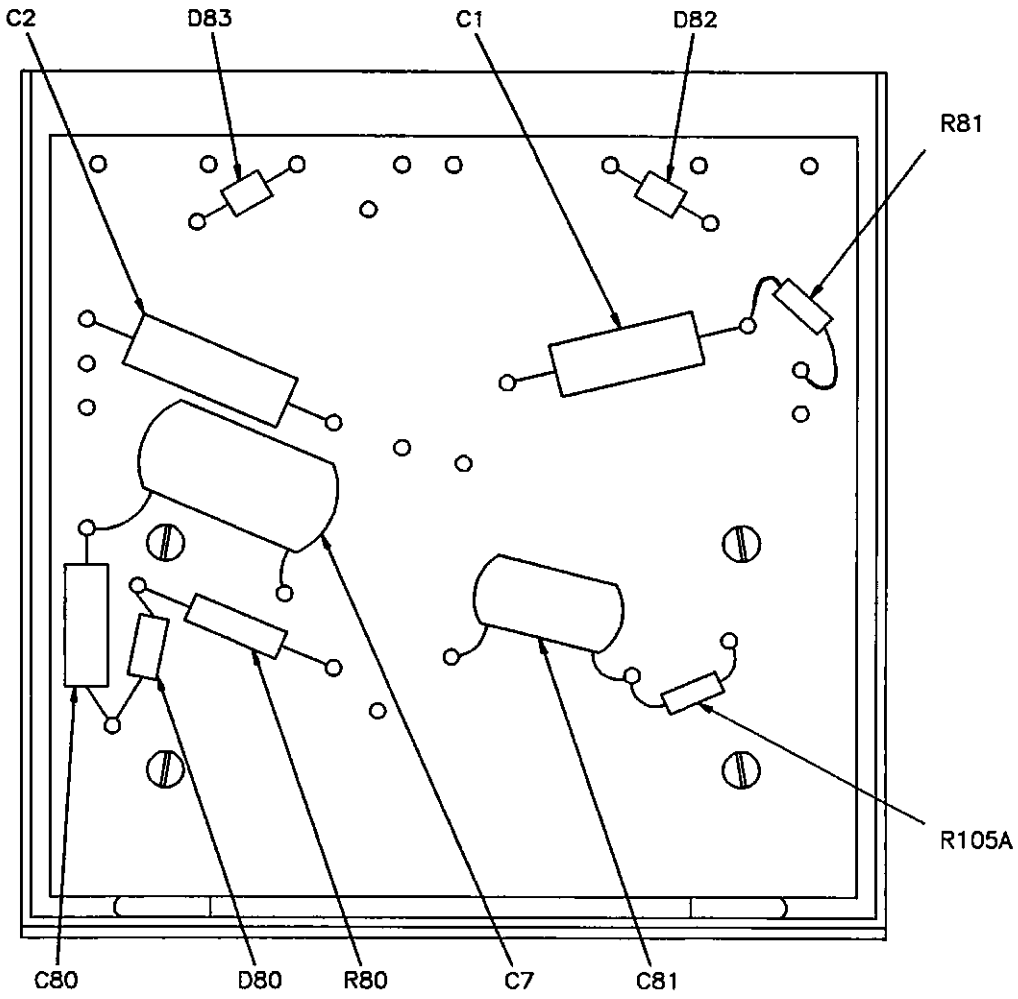


Figure 5–58. Gate Trigger Unit, Underside of Board, Parts Location Diagram



PREFIX REFERENCE DESIGNATION 1A53A3A1A1

Figure 5–59. Gate Trigger Unit, Topside of Board, Parts Location Diagram

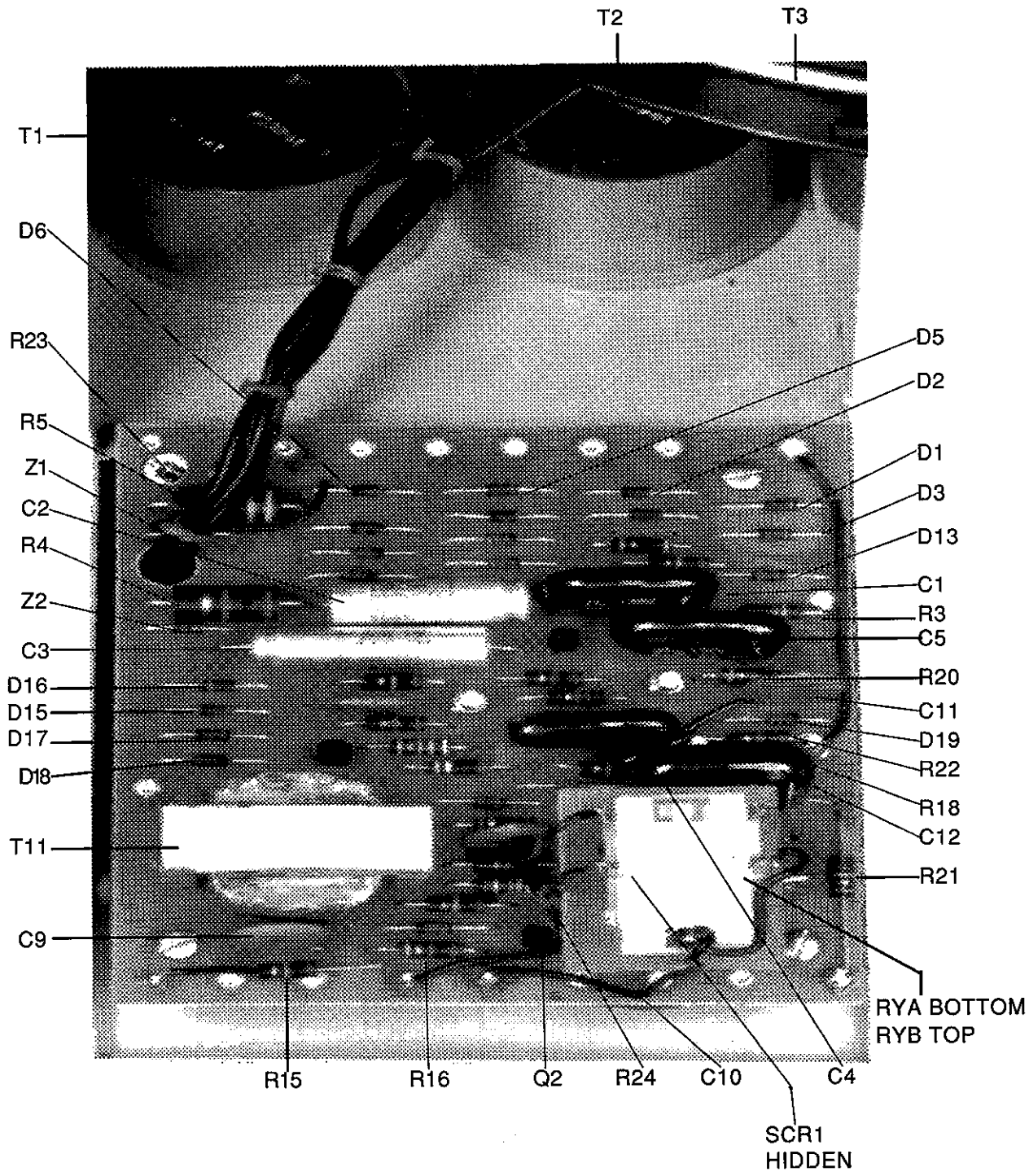


Figure 5-60. Chop-Off Limiter, Parts Location Diagram (Sheet 1 of 2)

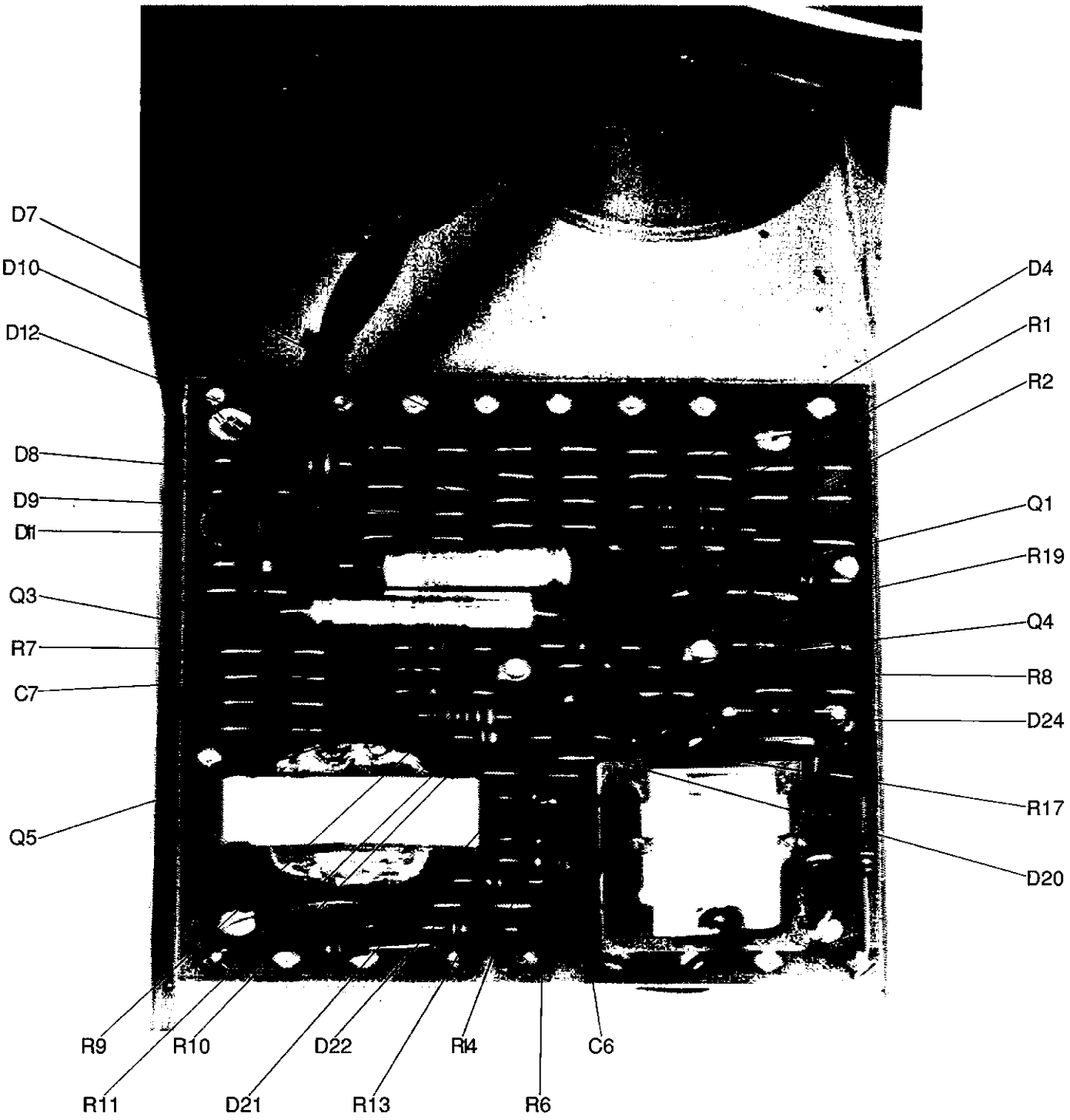
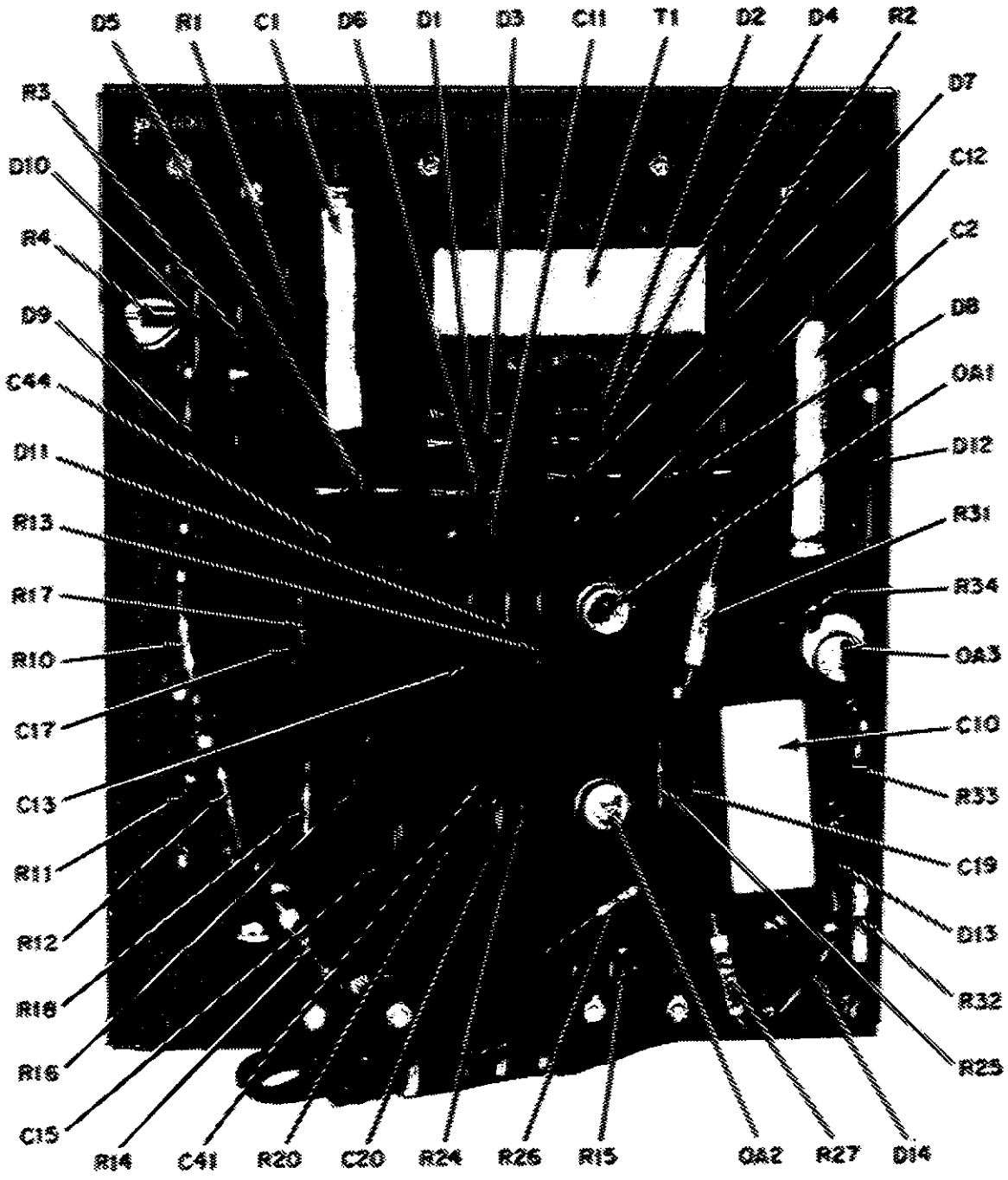


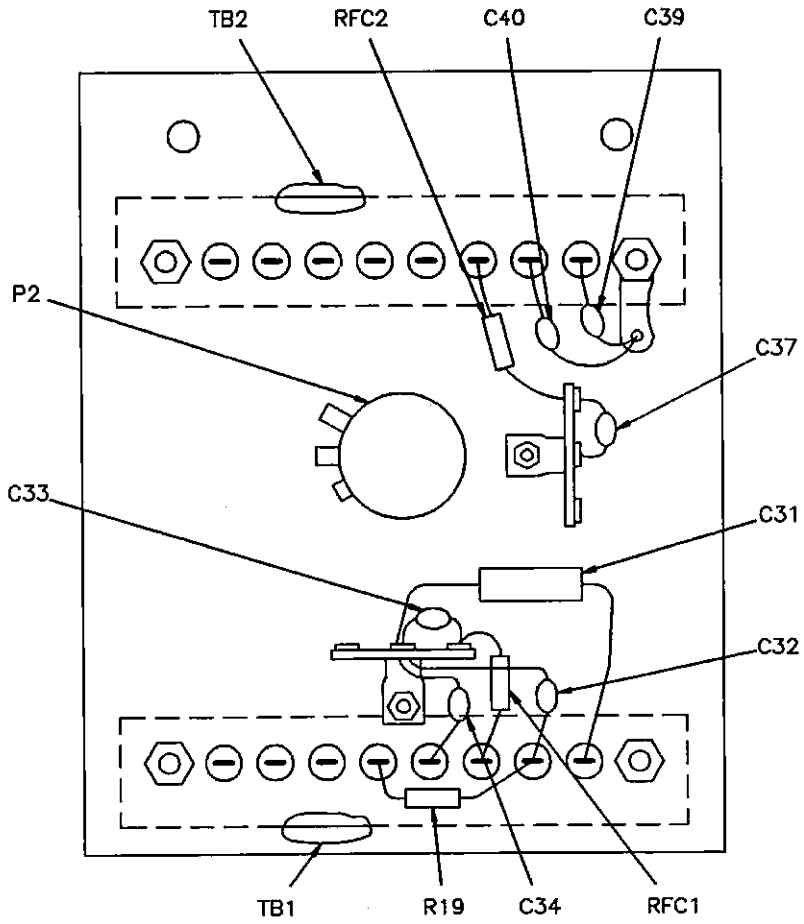
Figure 5-60. Chop-Off Limiter, Parts Location Diagram (Sheet 2 of 2)



PREFIX REFERENCE DESIGNATION WITH 1A53A3A1A5

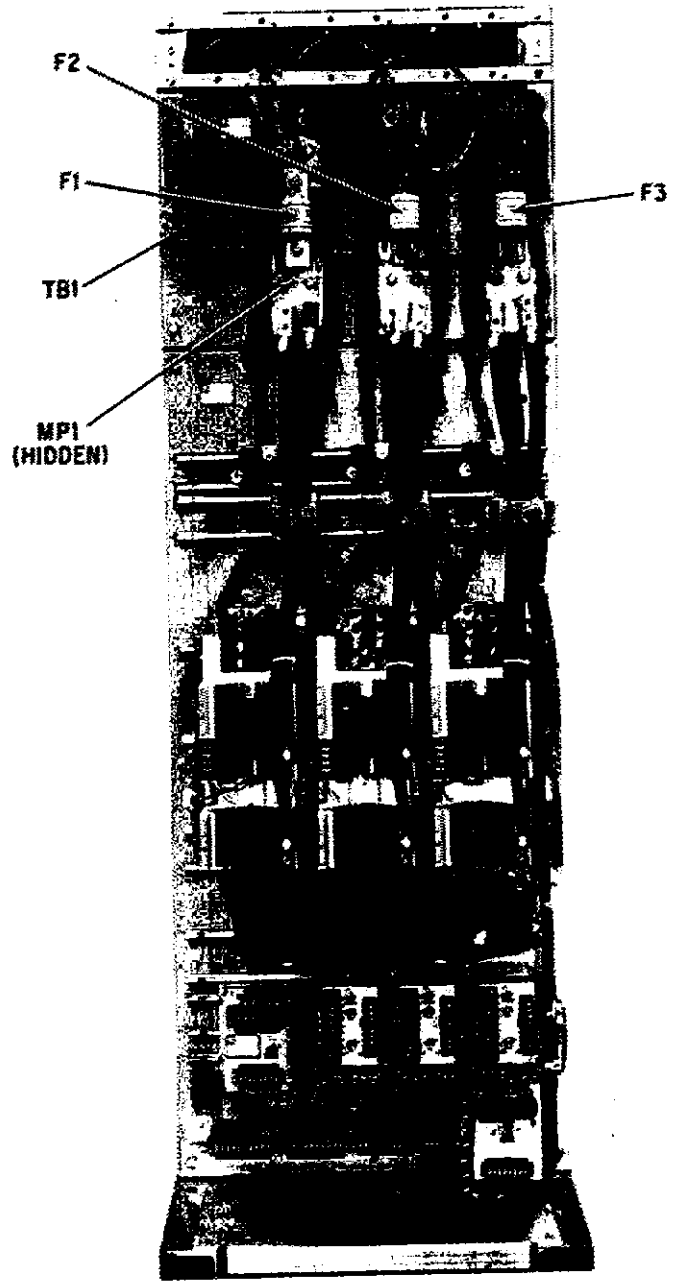
75-009-74146

Figure 5-61. Amplifier Voltage Regulator, Cover Dropped, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A53A3A11A5

Figure 5–62. Preamplifier Voltage Regulator, Underside of Cover, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH !A53A3A2
75-009-74114

Figure 5-63. Fuse Panel, Parts Location Diagram

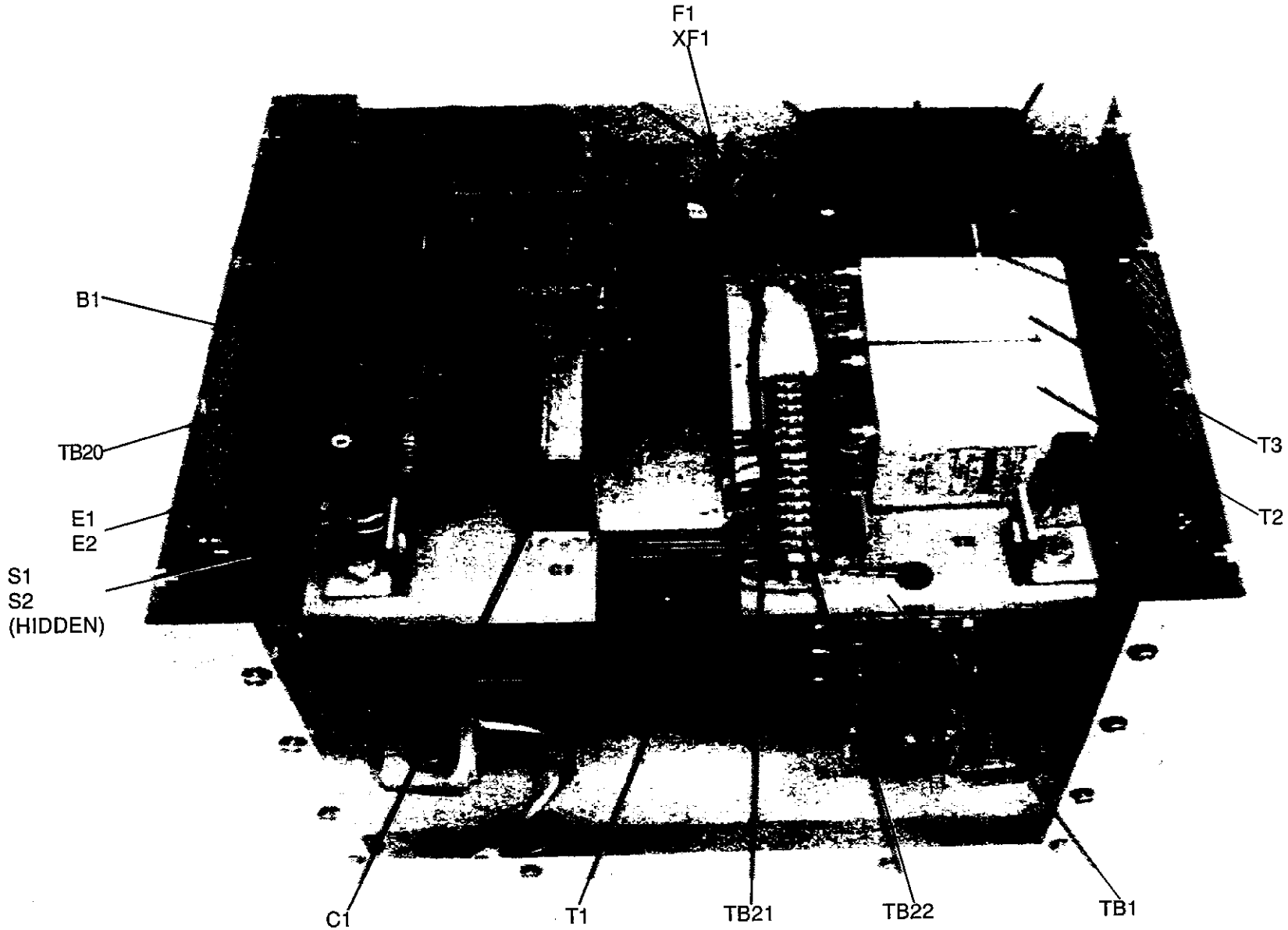


Figure 5-64. Voltage Regulator, Interior View, Parts Location Diagram

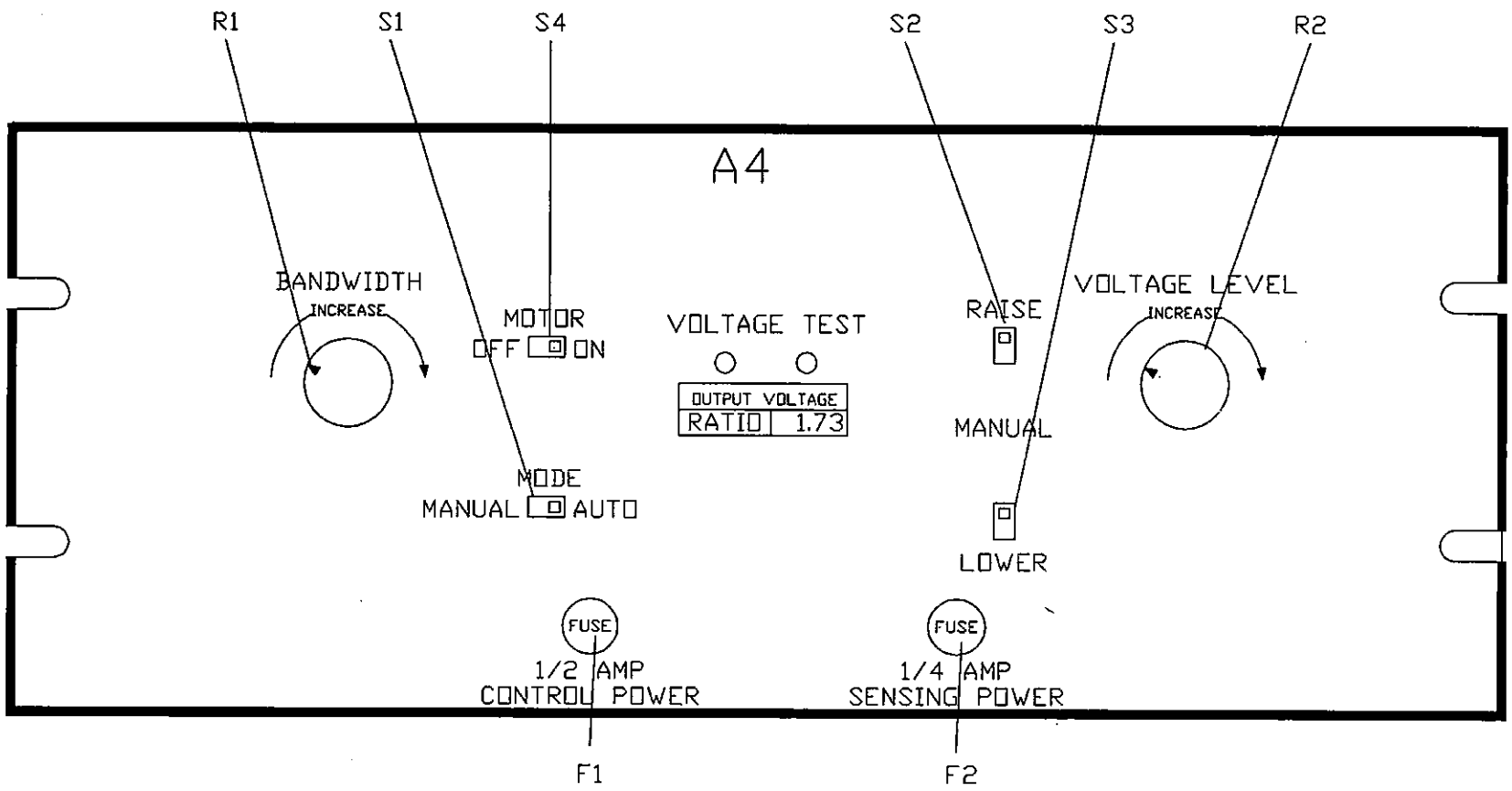
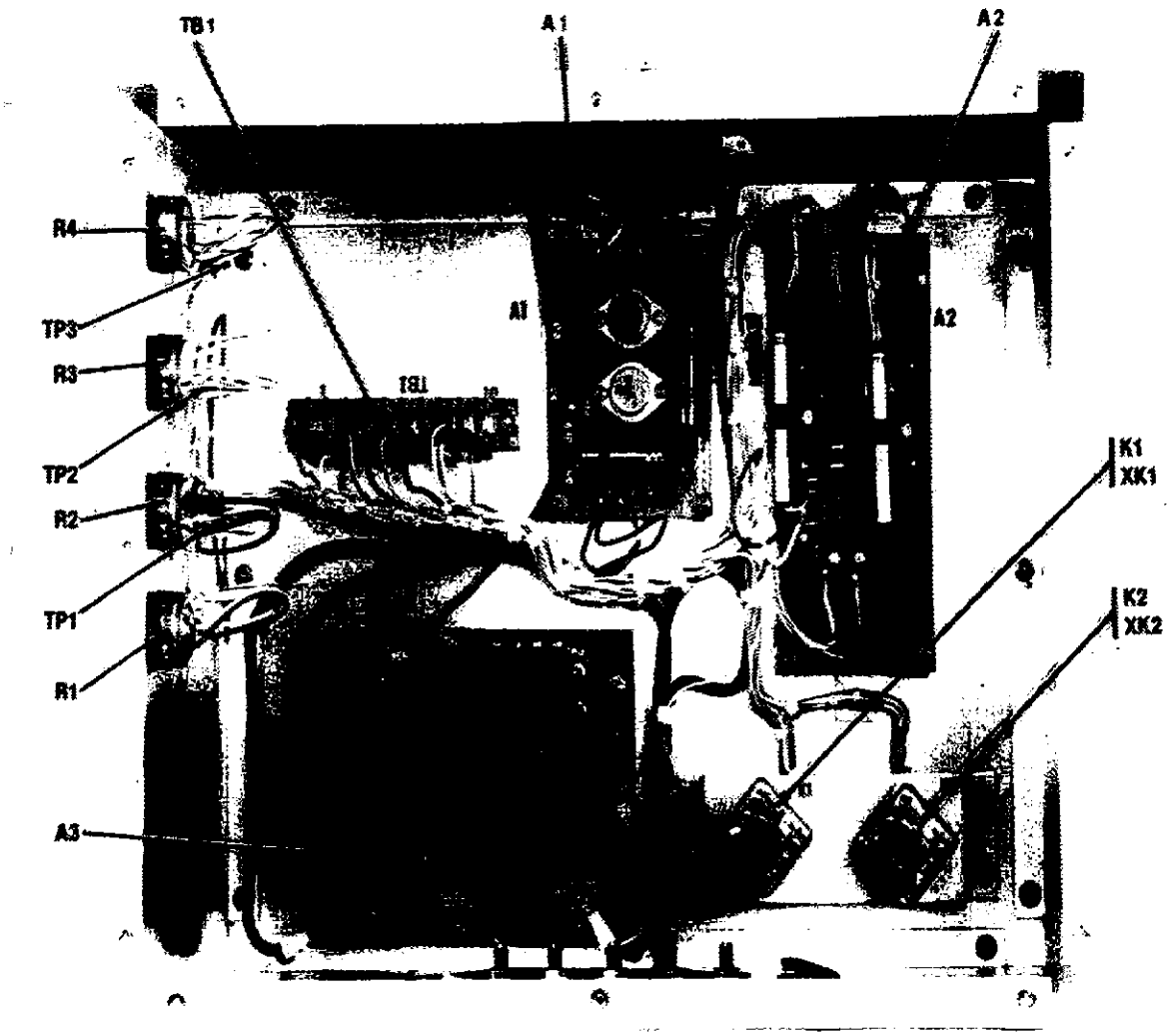


Figure 5-65. P/O Voltage Regulator CN-1472/FPN-44A (1A53A3A4)

Parts Location Diagram



PREFIX REFERENCE DESIGNATIONS WITH 1AS3A4

75-009-76583

Figure 5-66. Shunt, Instrument, Parts Location Diagram

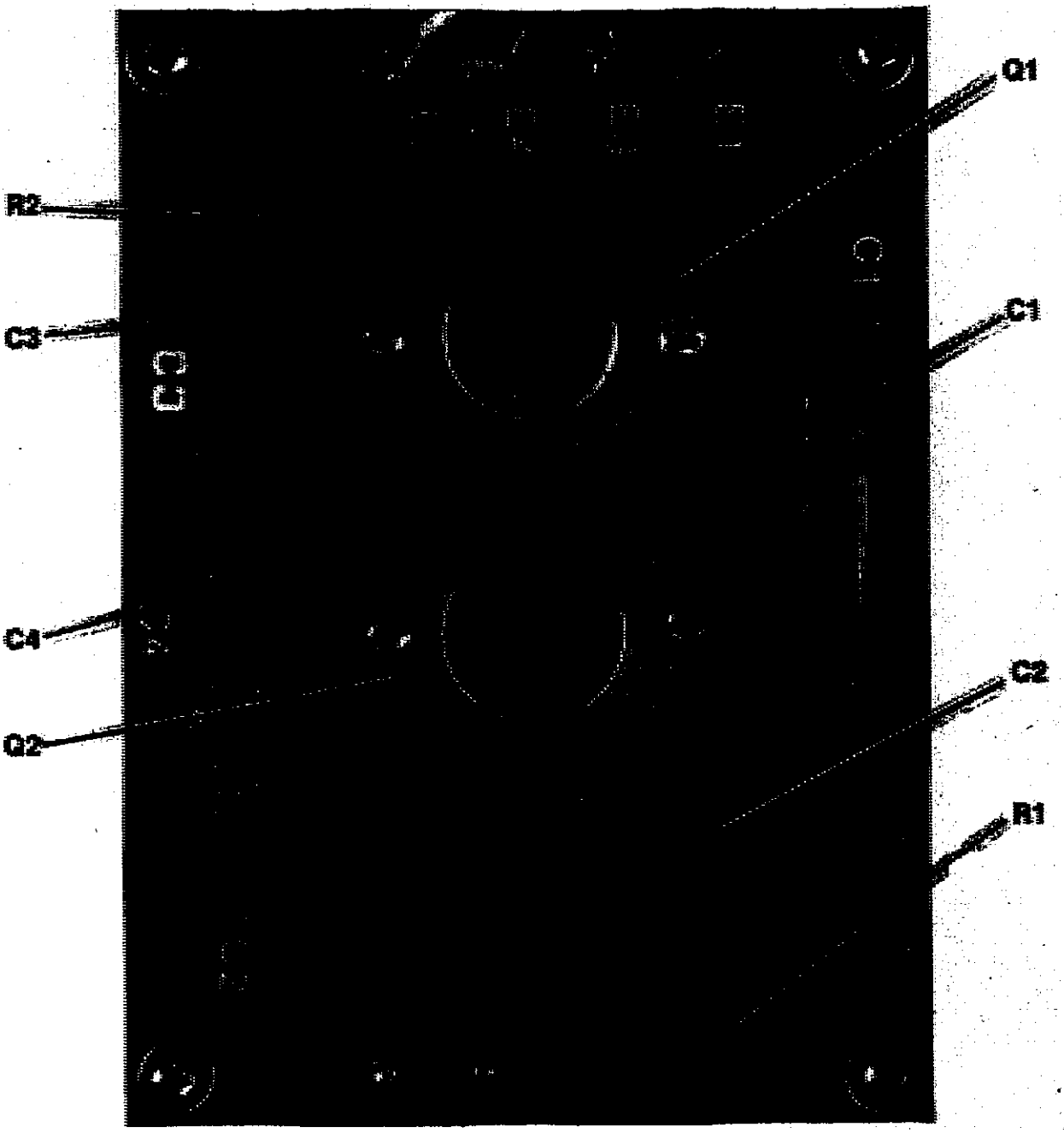


Figure 5-67. Component Board Assembly, Parts Location Diagram

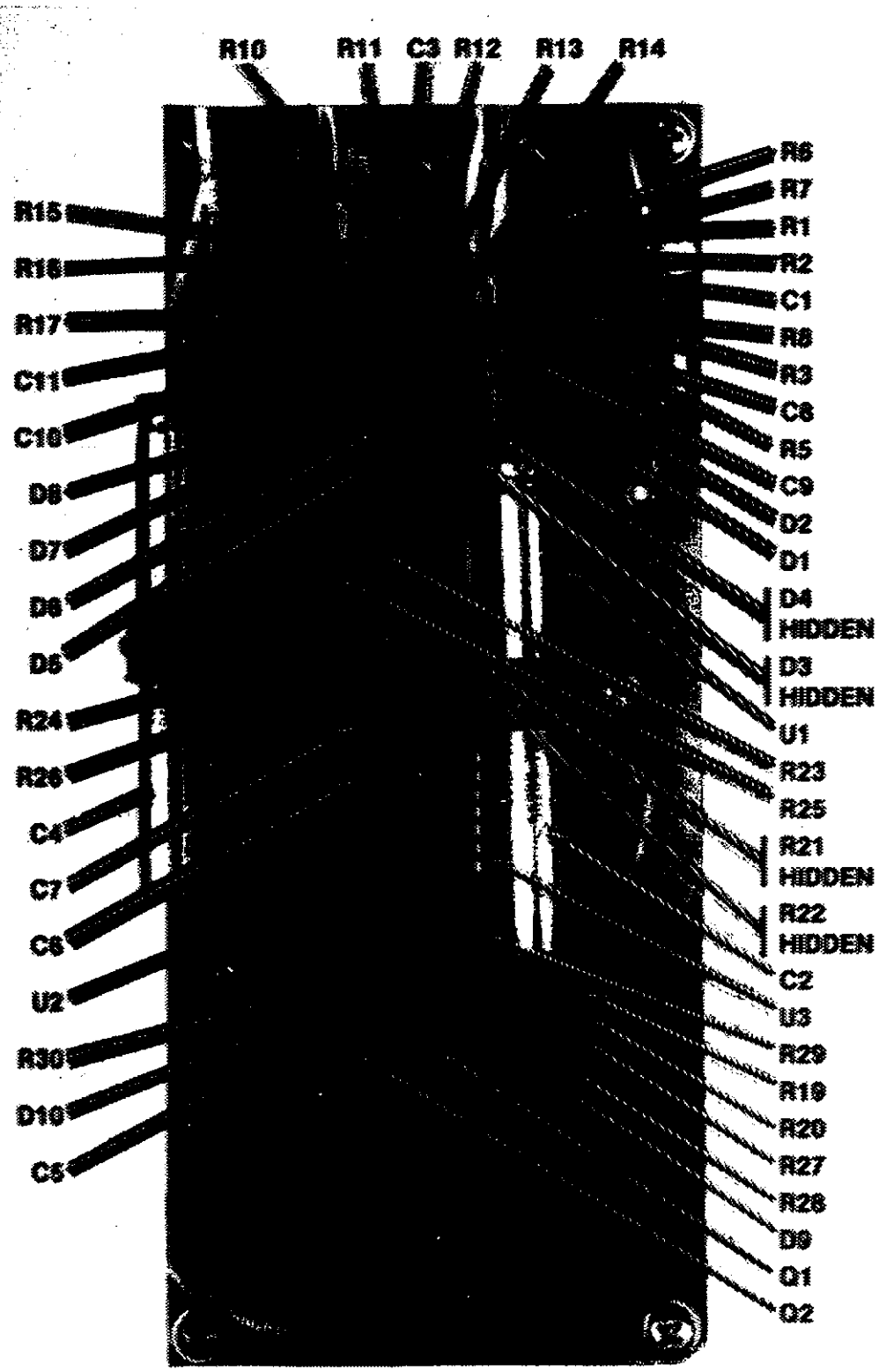


Figure 5-68. Component Board Assembly, Parts Location Diagram

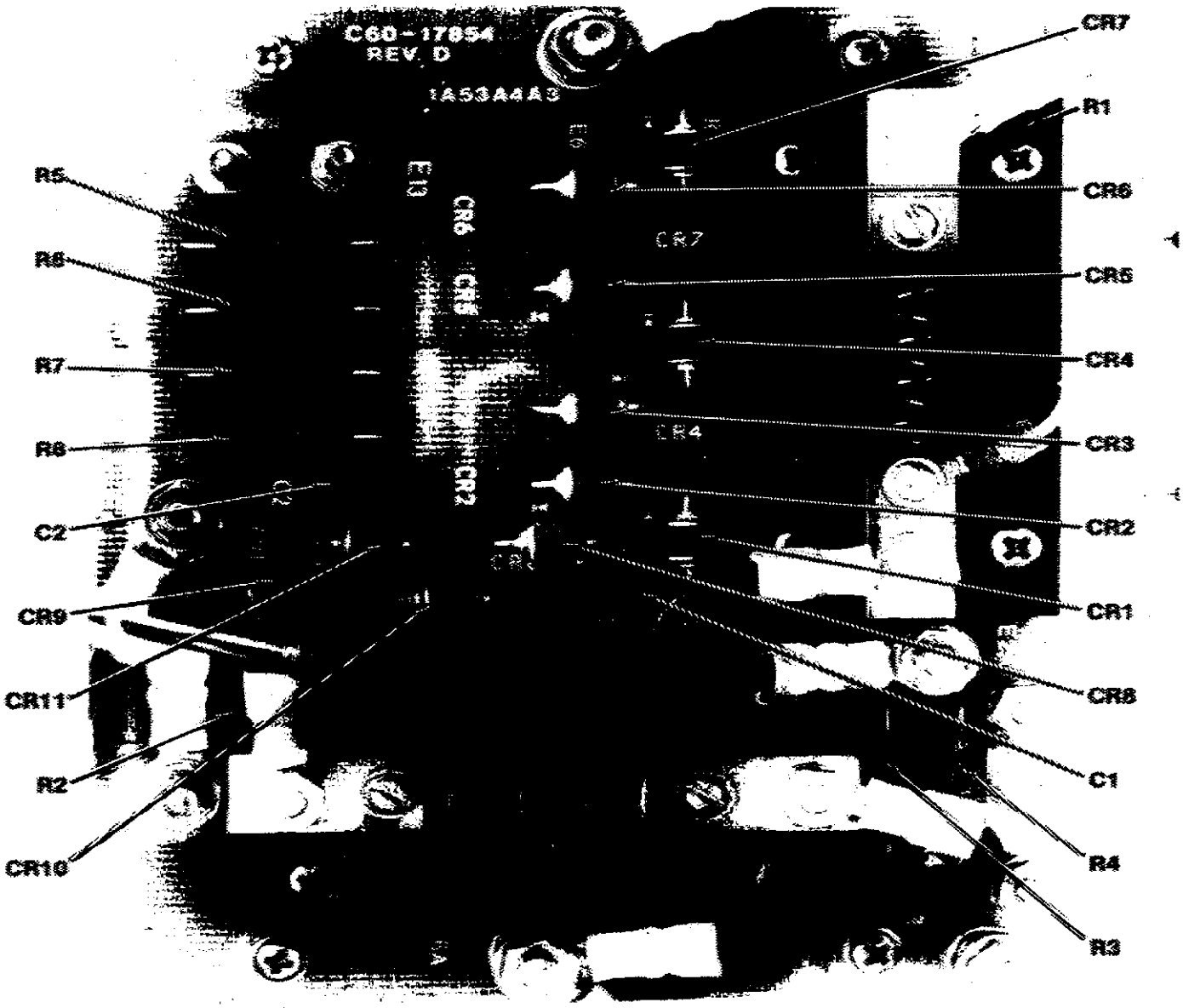


Figure 5-69. Component Board Assembly, Parts Location Diagram

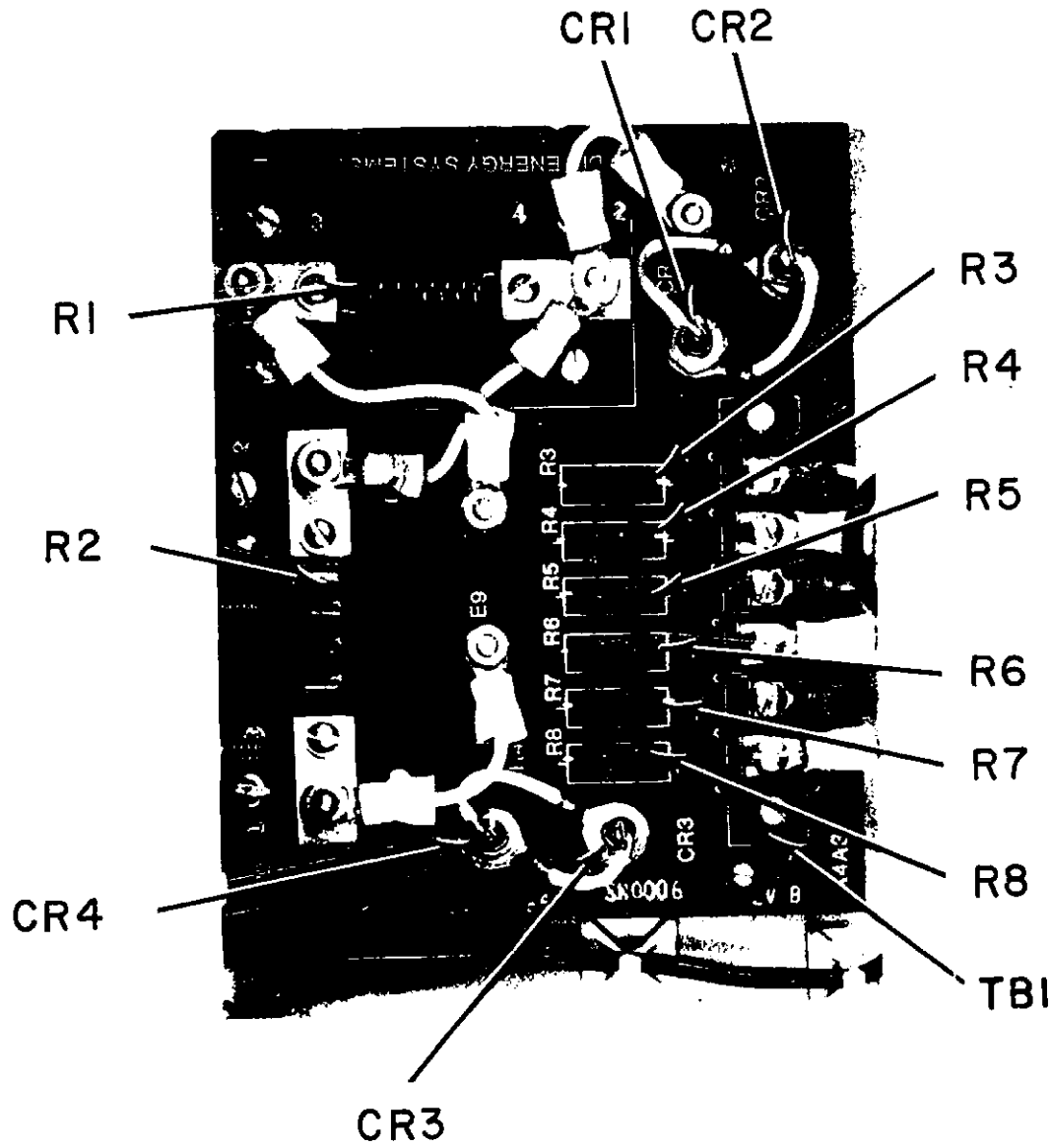


Figure 5-69A. Component Board Assembly, Parts Location Diagram

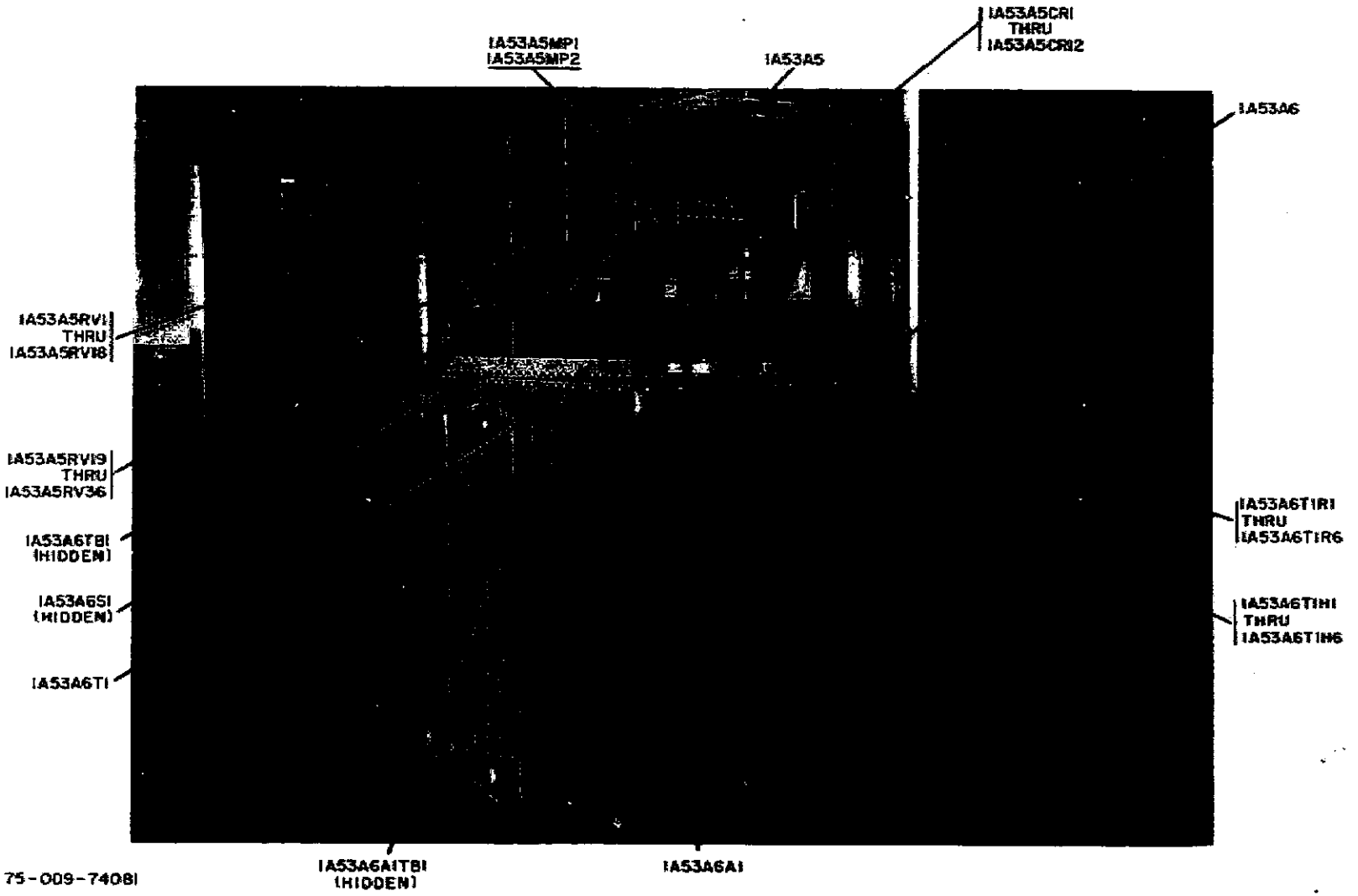


Figure 5-70. Power Supply PP-7305/FPN-44A, Parts Location Diagram

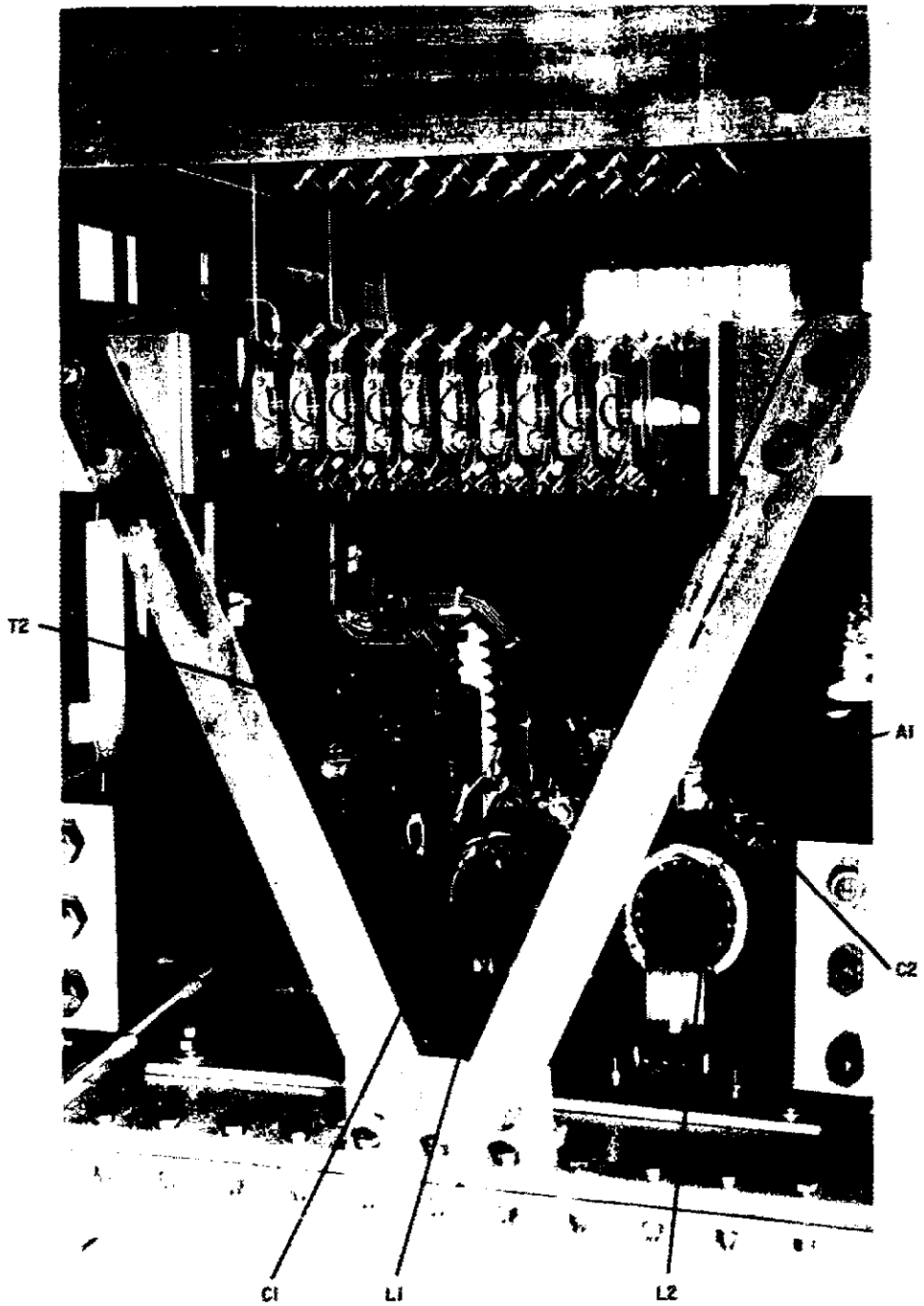


Figure 5-71. Power Supply, Parts Location Diagram

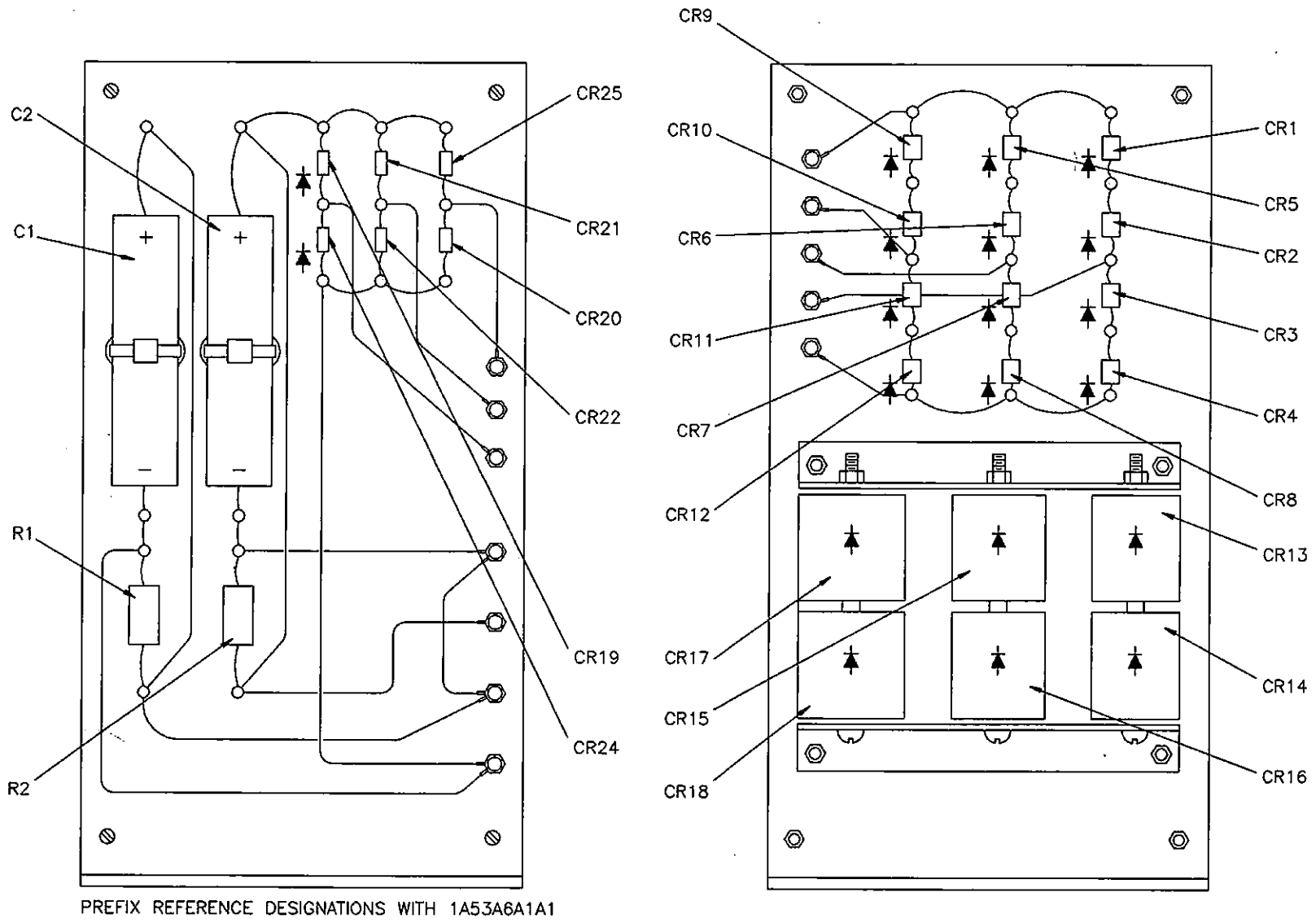


Figure 5-72. Power Supply, Parts Location Diagram

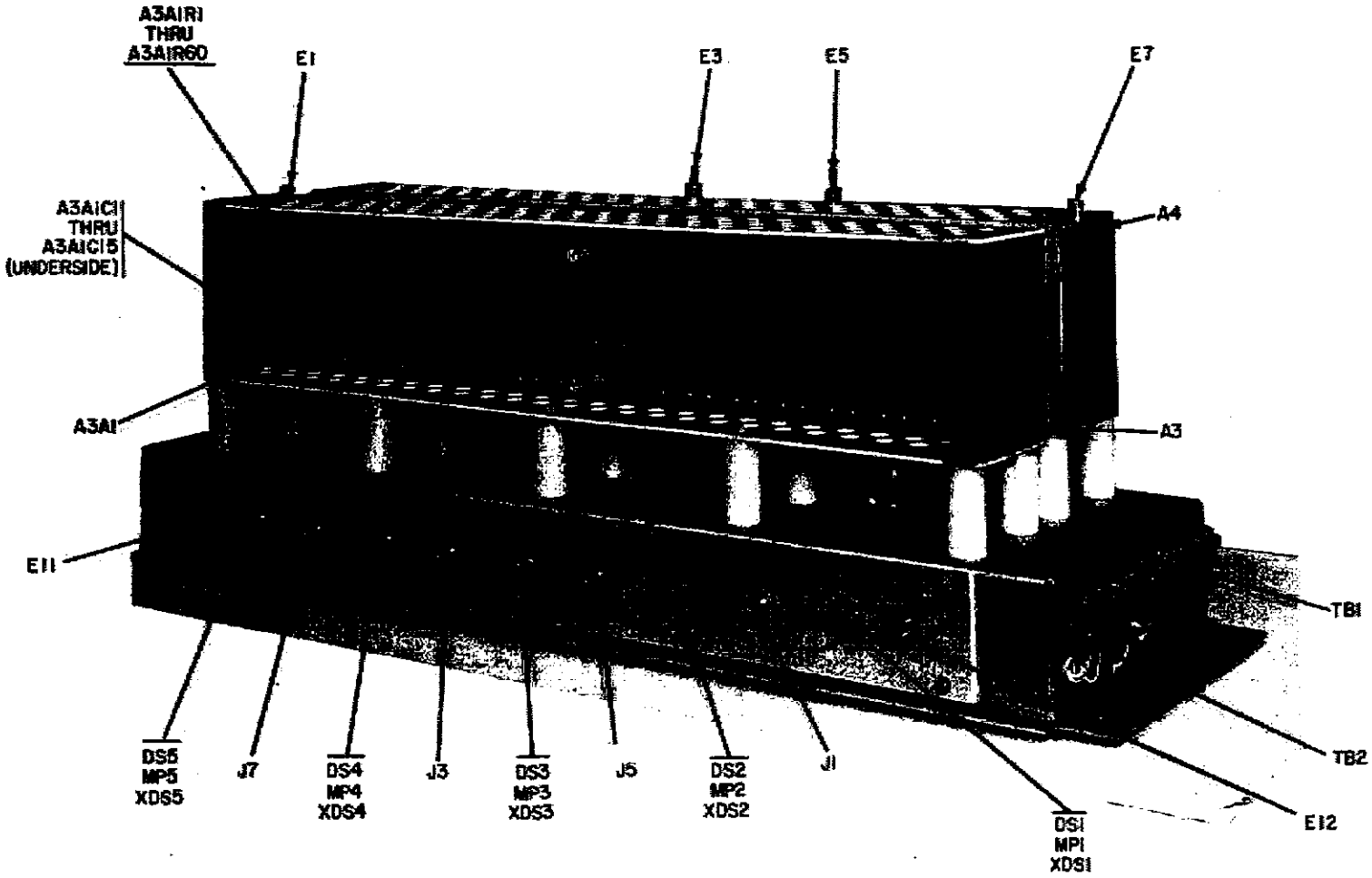


Figure 5-73. Voltage Divider CN-1474/FPN-44A, Right View, Parts Location Diagram

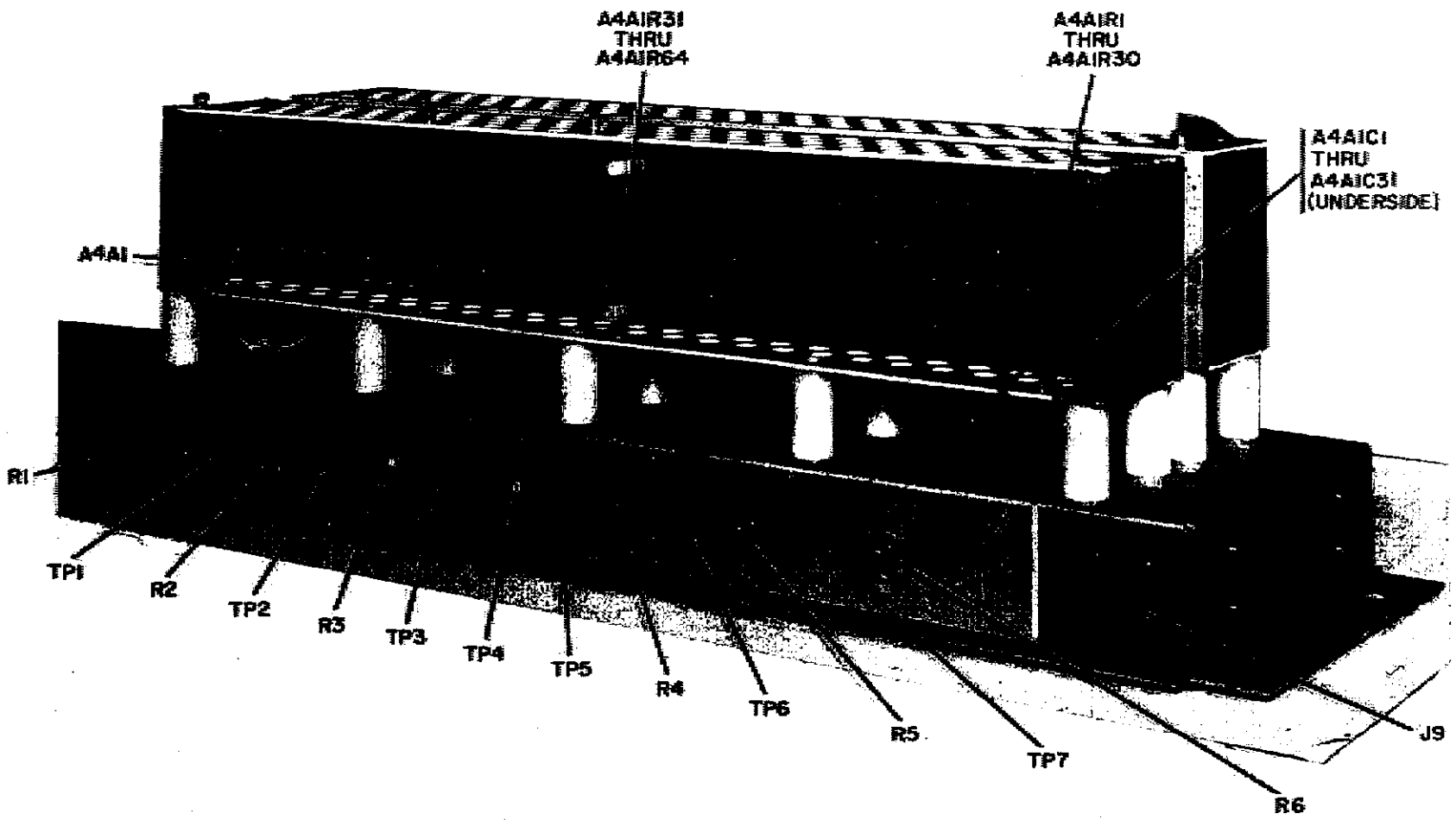
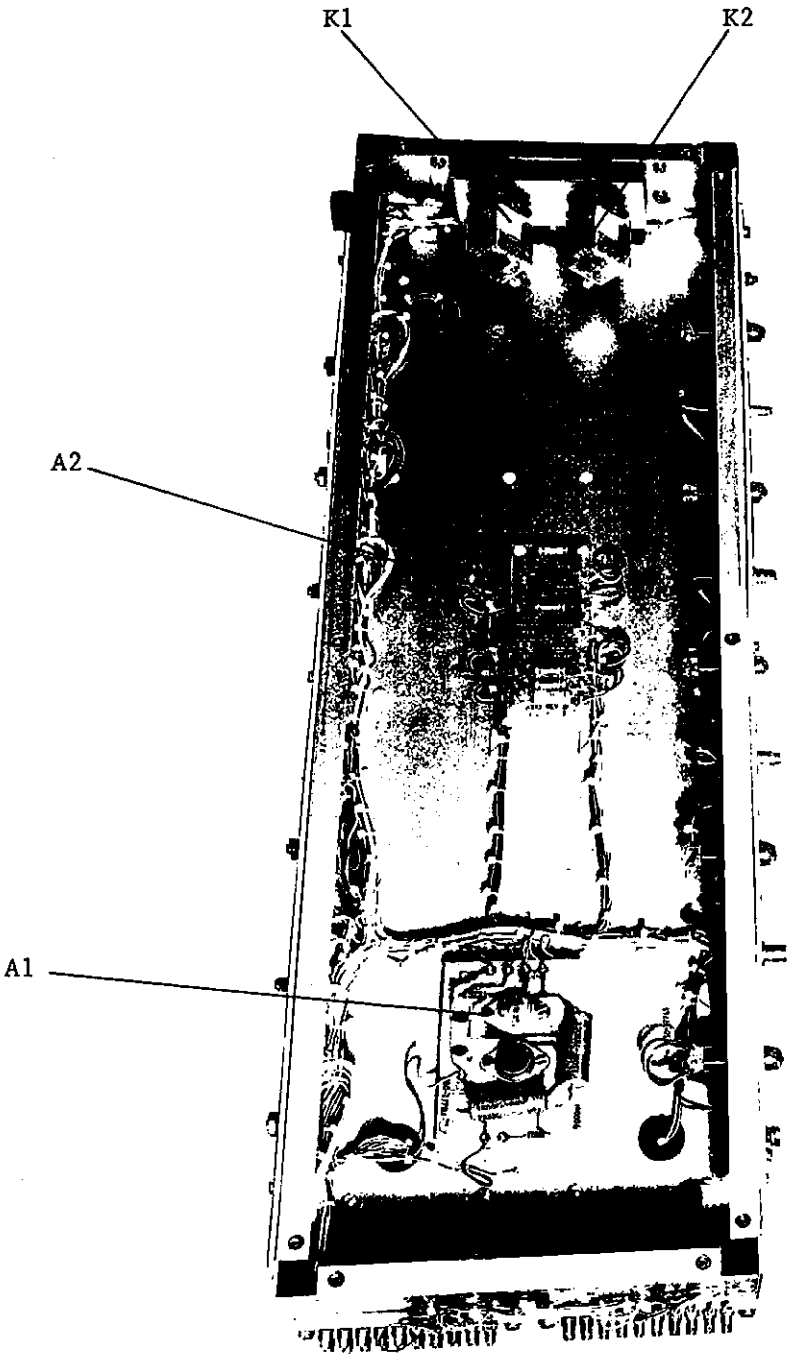


Figure 5-74. Voltage Divider CN-1474/FPN-44A, Left View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 1A53A7

Figure 5-75. Voltage Divider CN-1474/FPN-44A, Bottom View, Parts Location Diagram

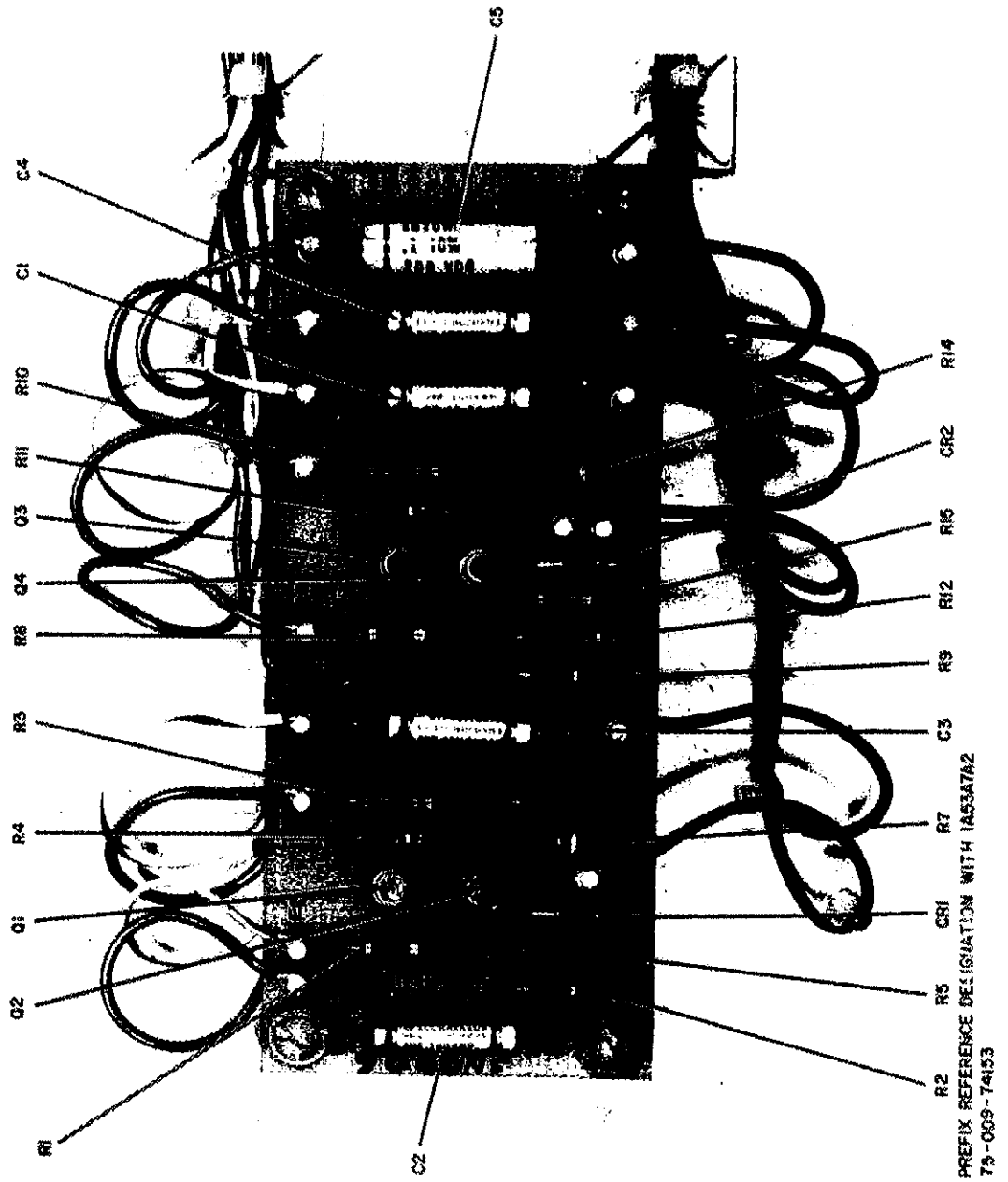


Figure 5-76. Relay Driver, Parts Location Diagram

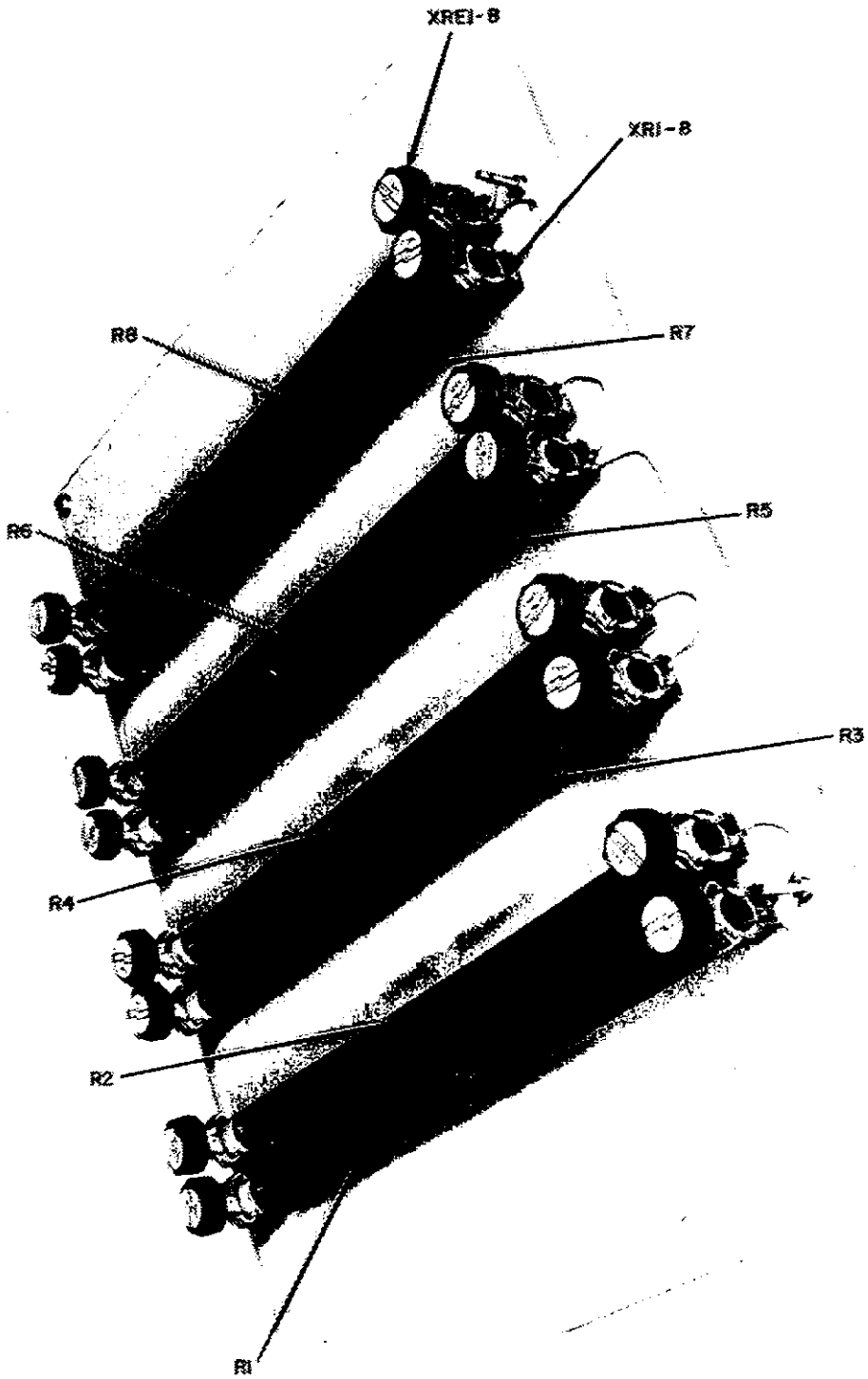


Figure 5-77. Resistor Assembly, Parts Location Diagram

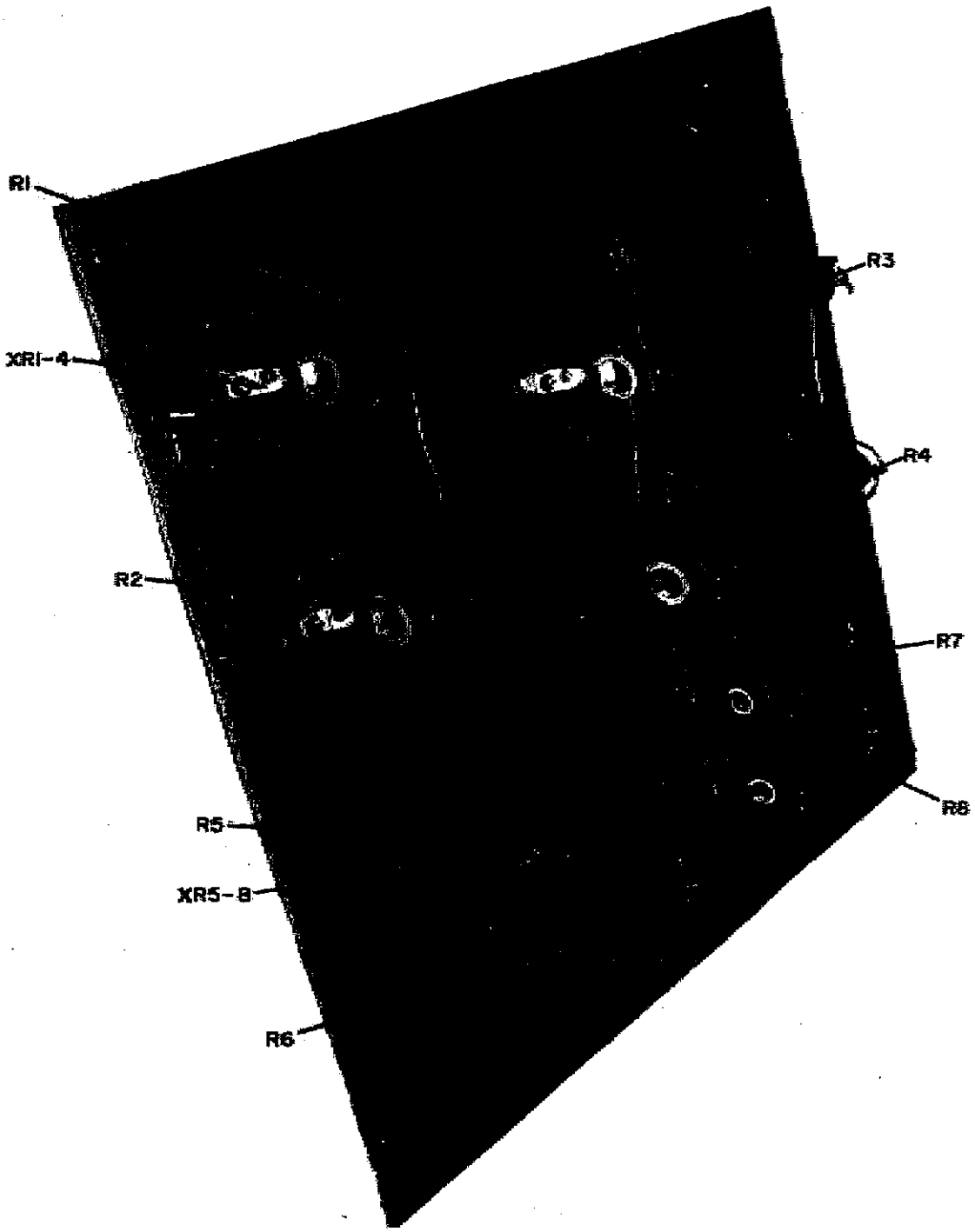


Figure 5-78. Resistor Assembly, Parts Location Diagram

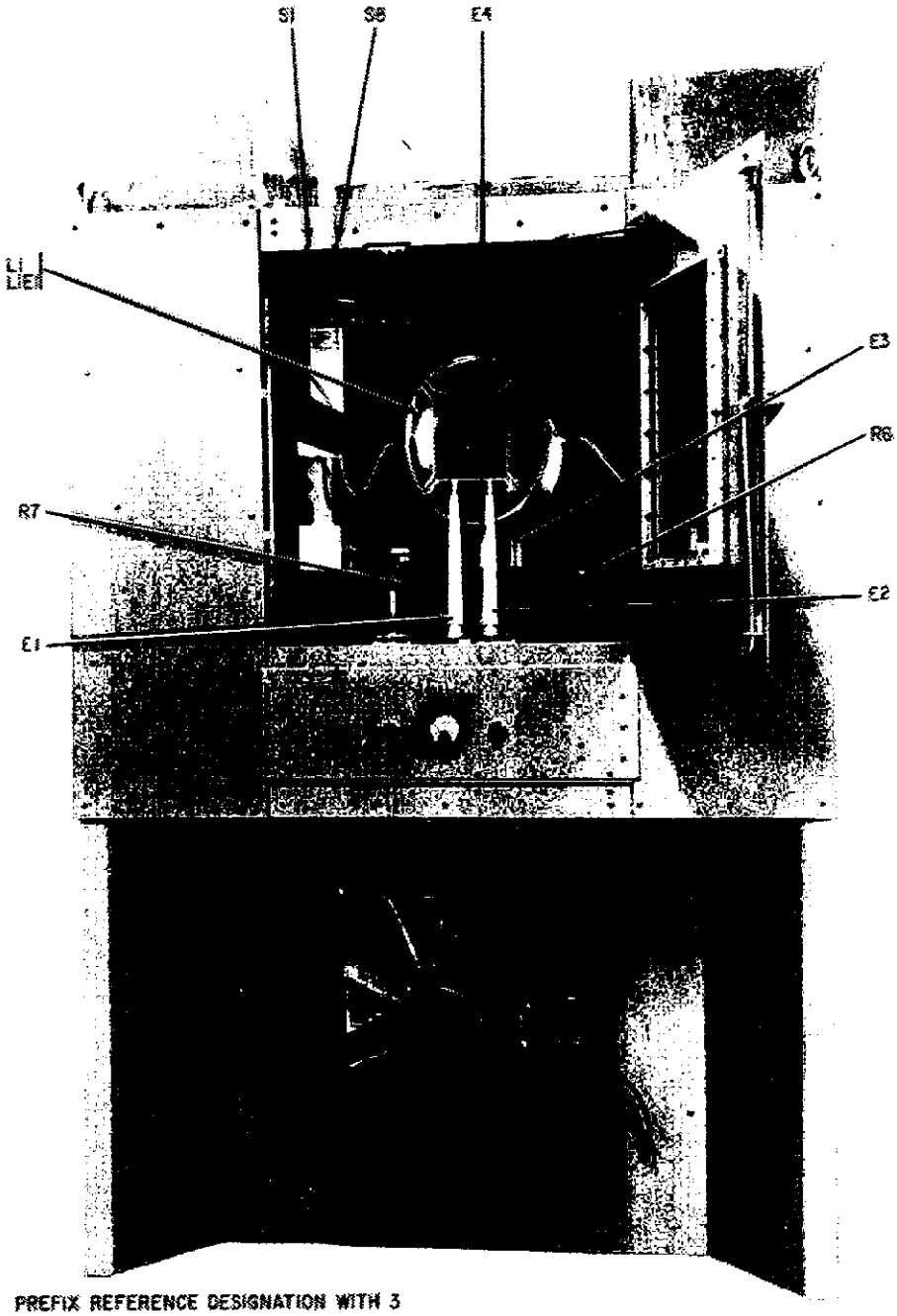
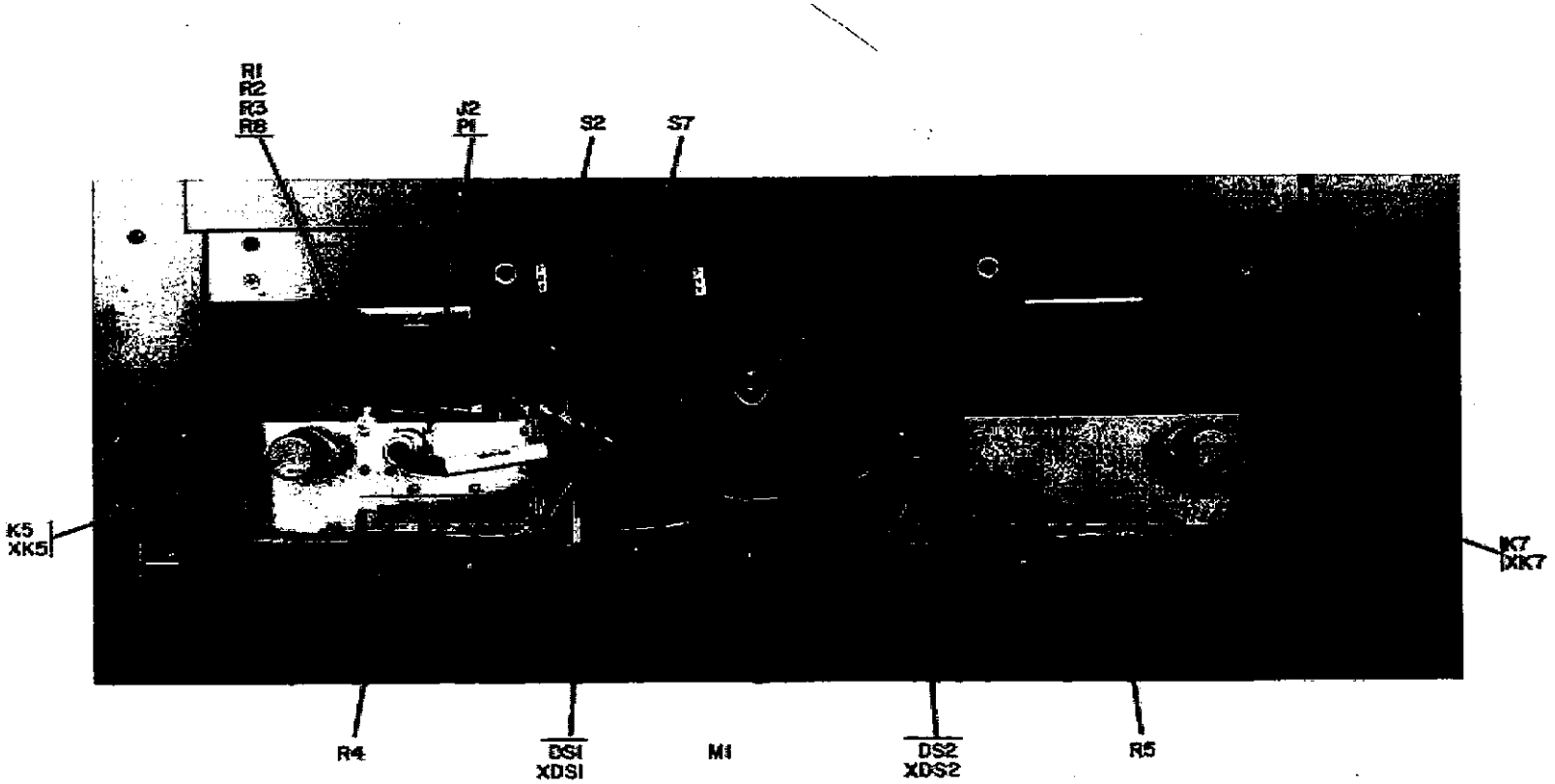


Figure 5-79. Coupler Antenna CU-2171/FPN-44A, Front View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 3
75-009-74129

Figure 5-80. Coupler Antenna CU-2171/FPN-44A, Front Panel Open, Parts Location Diagram

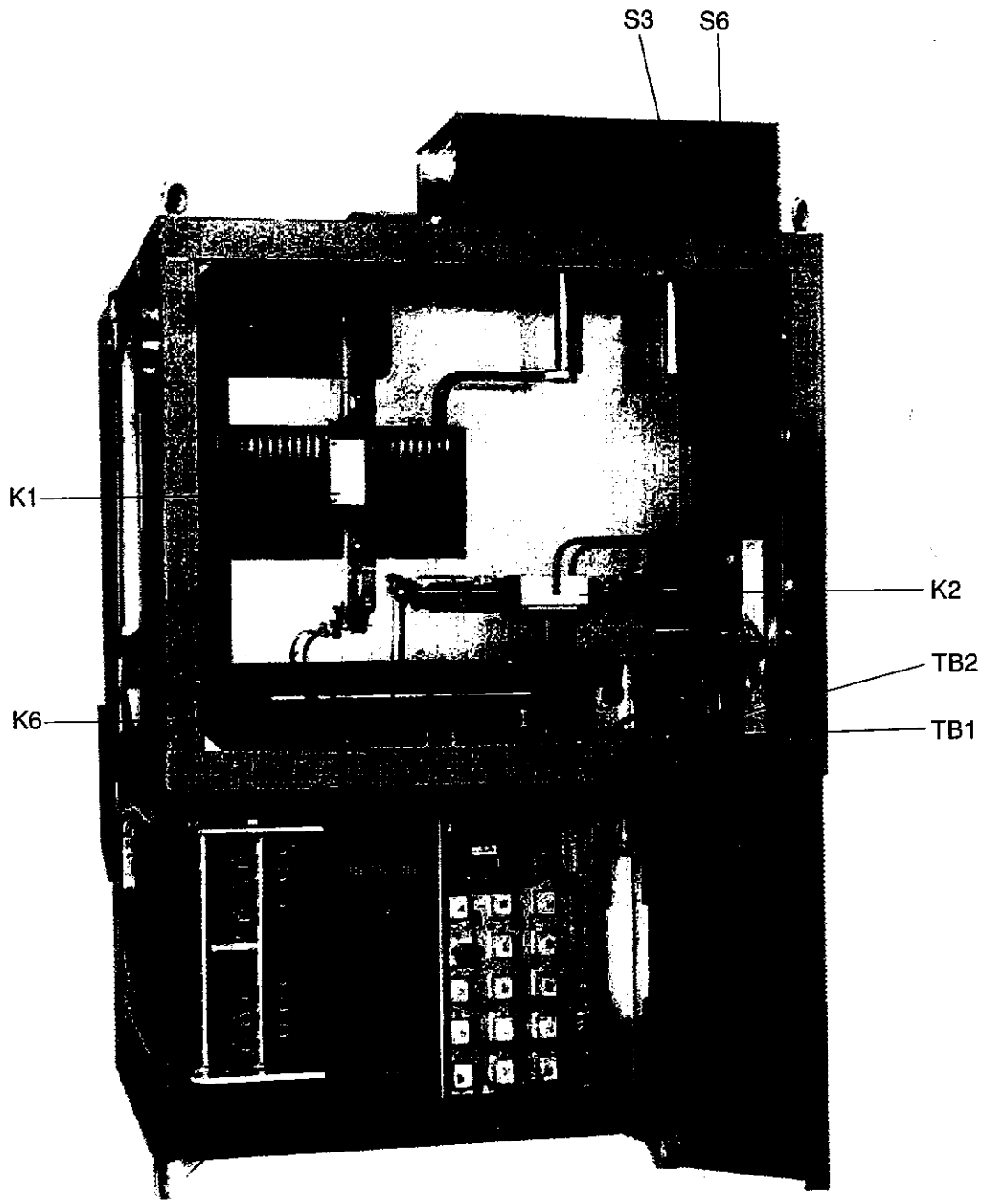


Figure 5-81. Coupler Antenna CU-2171/FPN-44A, Left Side View, Parts Location Diagram

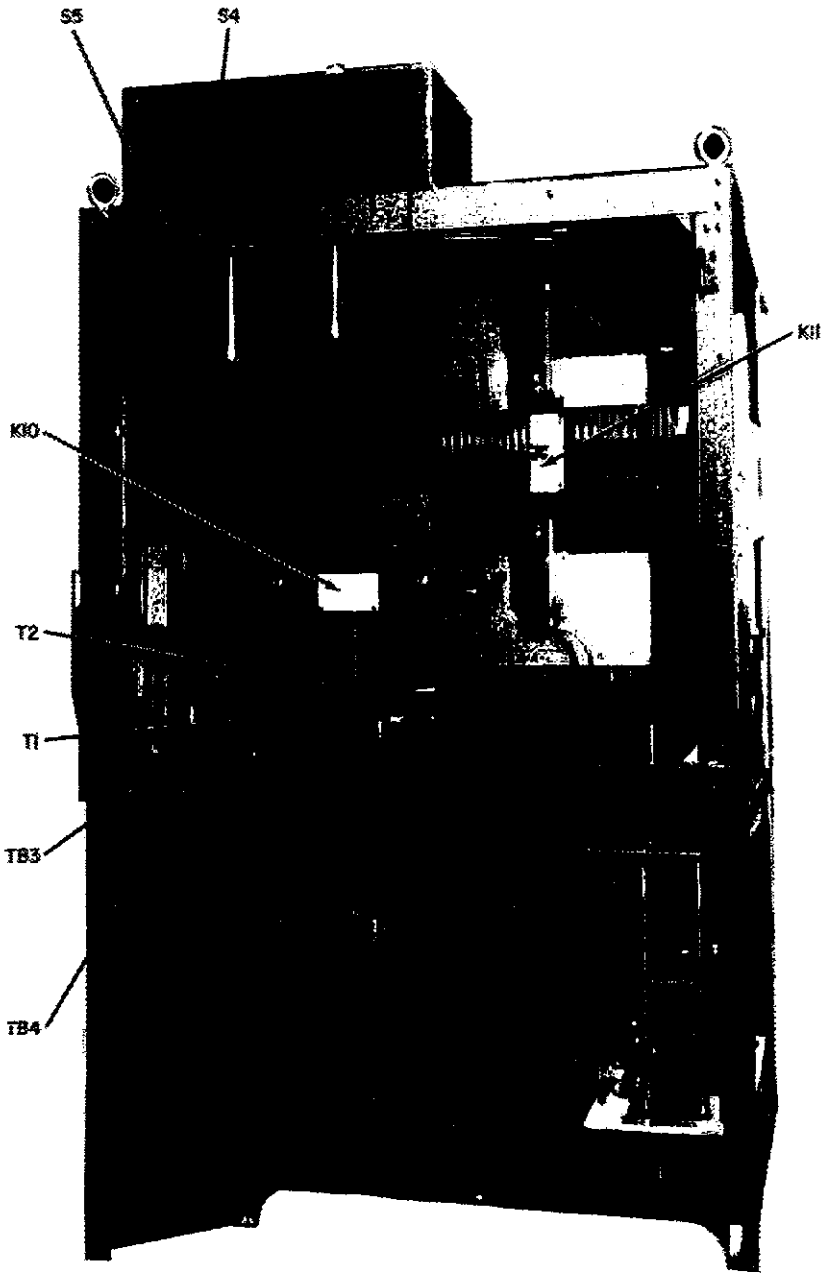
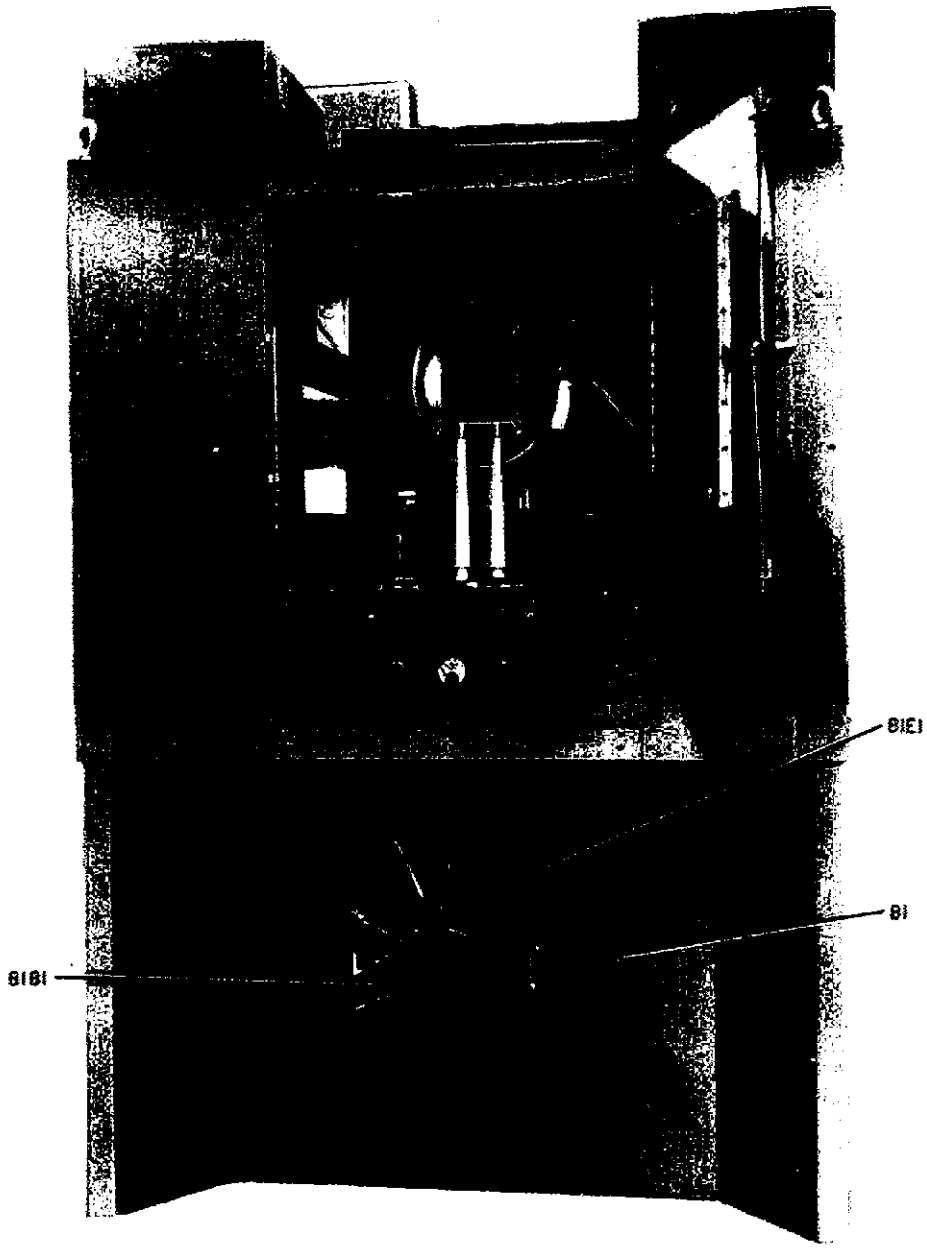


Figure 5-82. Coupler Antenna CU-2171/FPN-44A, Right Side View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 4
75-009-74165

Figure 5-83. Dummy Load Electrical DA-329A/FPN-44A, Front View, Parts Location Diagram

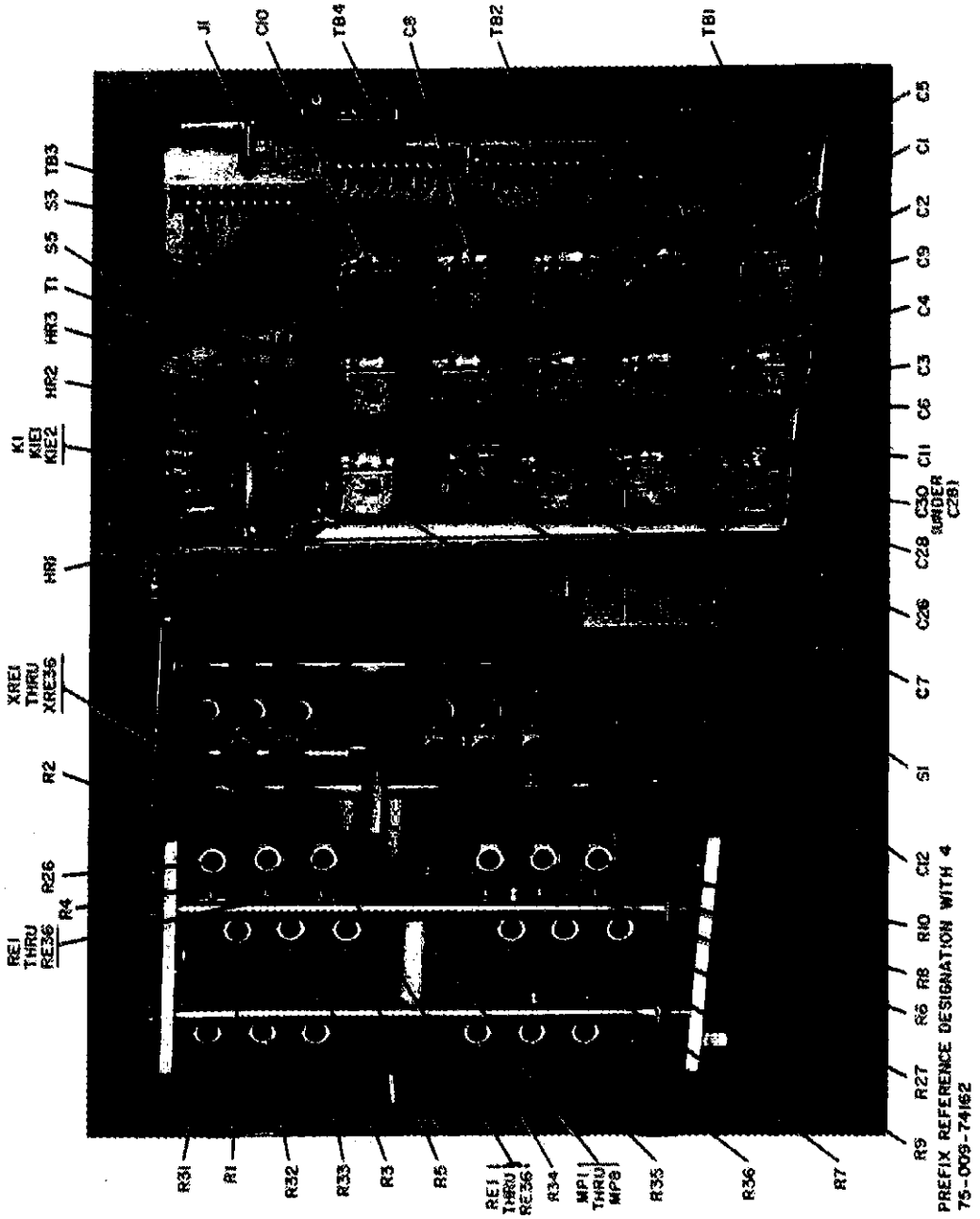


Figure 5-84. Dummy Load Electrical DA-329A/FPN-44, Left Side View, Parts Location Diagram

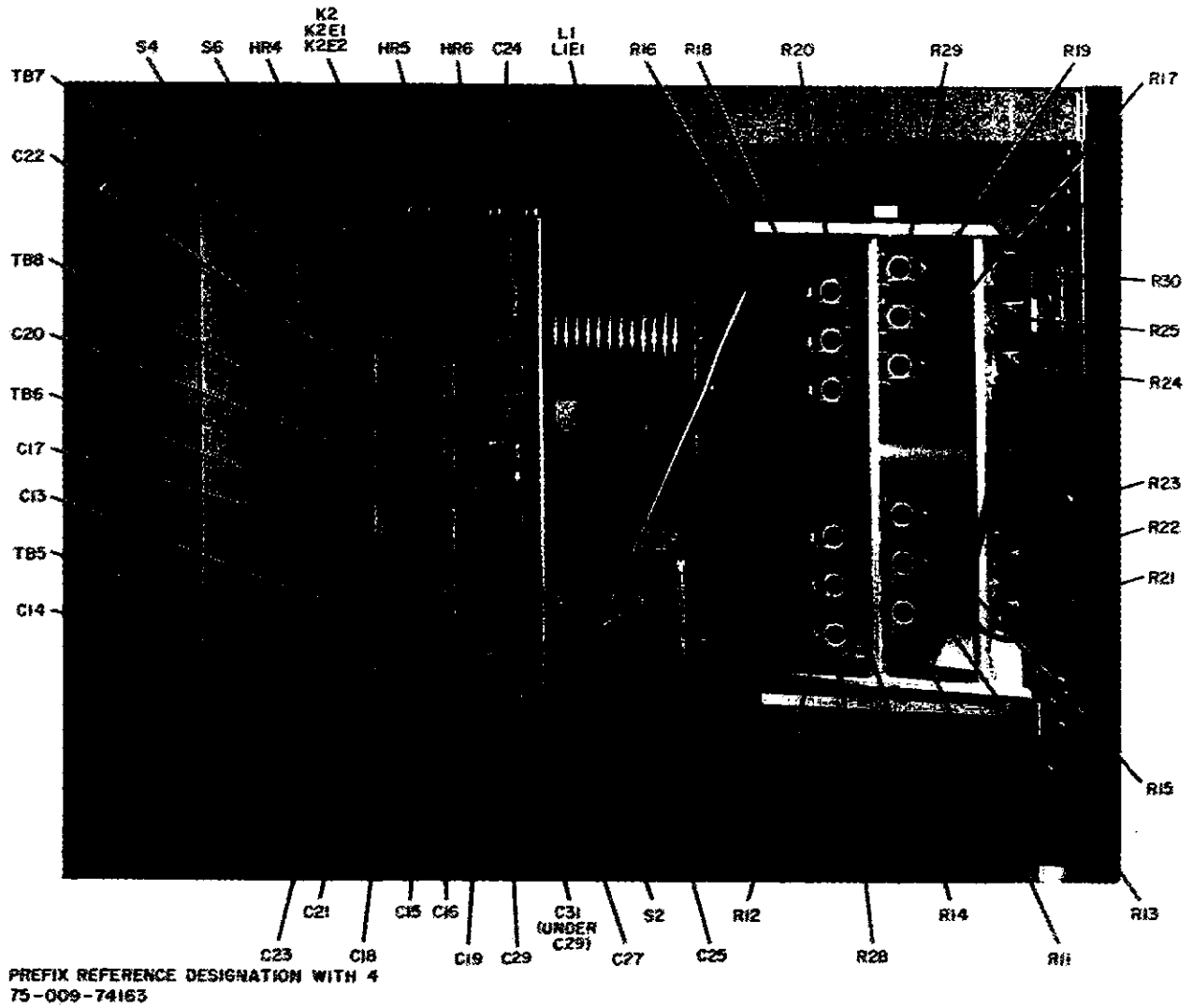
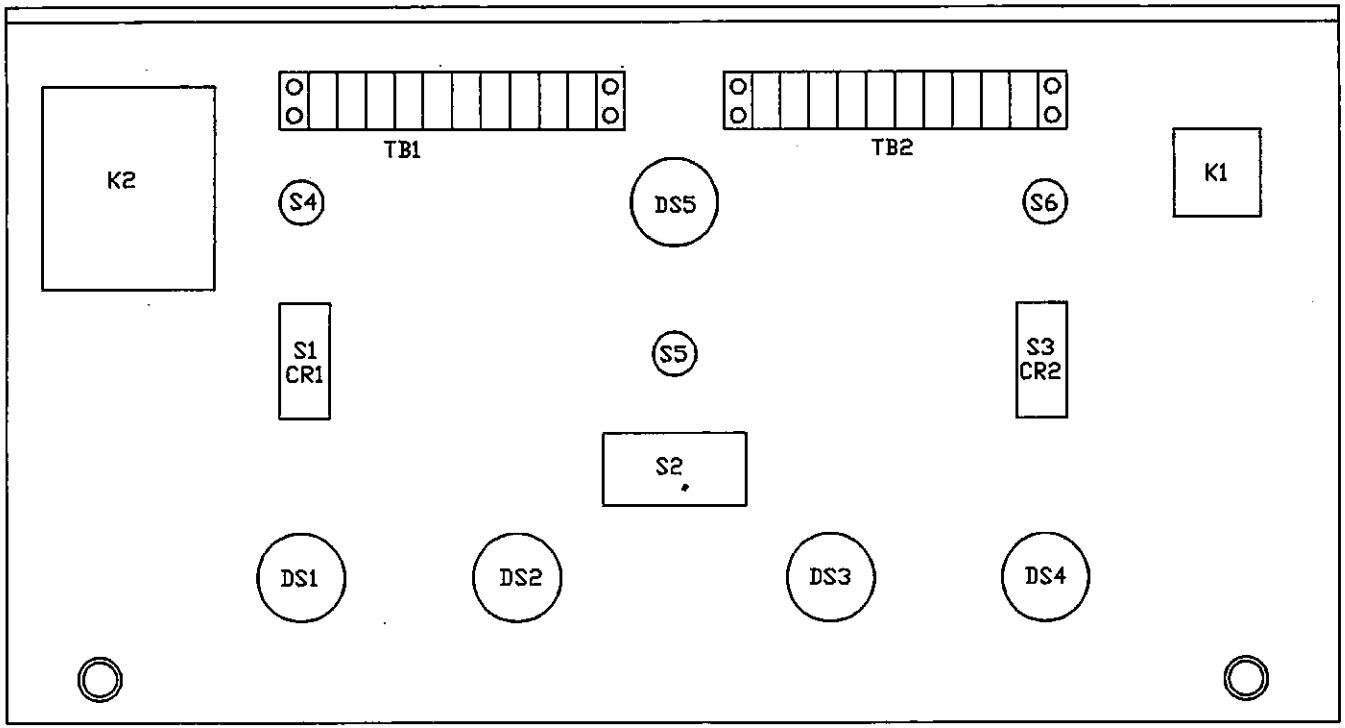


Figure 5-85. Dummy Load Electrical DA-329A/FPN-44, Right Side View, Parts Location Diagram



PREFIX REFERENCE DESIGNATION WITH 5

Figure 5-86. Local Control Unit, Inside View Parts Location Diagram

5.2.2.2. **EQUIPMENT REQUIRED FOR PREVENTIVE MAINTENANCE.** The test equipment necessary for preventive maintenance routine are the AN/USM-281 oscilloscope and plug-in units. Equivalent test equipment may be substituted if the specified equipment is not available.

5.2.2.3. **TIME REQUIRED FOR PREVENTIVE MAINTENANCE.** Table 5-7 gives the approximate times needed to do each preventive maintenance routine. This time does not include the time required to set up the test equipment.

TABLE 5-6. TIME REQUIRED TO ESTABLISH REFERENCE STANDARDS

STEP (See Table 5-5)	ESTIMATED TIME IN MINUTES
1	5
2	1
3	2
4	5
5	1
6	1
7	10
8	1
9	120
10	5
Total	151

TABLE 5-7. TIME REQUIRED FOR PREVENTIVE MAINTENANCE

PERIODIC CHECKS	ESTIMATED TIME REQUIRED
Weekly	35 Minutes
Quarterly	30 Minutes
Total Required Per Quarter	8 Hours
Average Per Day	5.3 Minutes

TABLE 5-8 Sample Check-off Lists.

1st And Second Year Of Operation (Use same form)
Weekly Check-off Form

Week	Step	19-	19-	19-	19-	19-	19-	19-	19-	19-	19-	19-	19-
1													
through													
52													

Table 5-8 a.

1st Year of Operation. (Use Same Form For Second Year)
Quarterly Check-off List

Quarter	First	Second	Third	Fourth
Step---				
Step---				
Step---				
Initial				

Table 5-8 b.

5.2.2.4. **PREVENTIVE MAINTENANCE TABLES.** Table 5-9 lists the preventive maintenance routines for each period. Set the loran transmitting set to the operating condition and control settings given at the start of each table (as required before beginning any of the routines. Then perform each routine in sequence and record any deviation on the check-off list for that period.

Associated with each table is a figure (Figure 5-88 through 5-93) that illustrates the routine steps. Refer to this figure for the location of controls, indicators. and test points used in each step.

TABLE 5-9. WEEKLY PREVENTIVE MAINTENANCE ROUTINES

STEP NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
1	Check line voltage. Turn AC VOLTAGE SELECTOR switch 1A5A2S4 to 469V LINE.	AC VOLTAGE meter 1A53A2M5	
	Turn VOLTAGE PHASE SELECTOR switch 1A53A2S3 to:		
	1-2		_____vac (460 ± 46)
	2-3		_____vac (460 ± 46)
	3-1		_____vac (460 ± 46)
	Turn AC VOLTAGE SELECTOR switch to 208V LINE.		
	Turn VOLTAGE PHASE SELECTOR switch to:		
	1-2		_____vac (208 ± 21)
	2-3		_____vac (208 ± 21)
	3-1		_____vac (208 ± 21)
	Turn AC VOLTAGE SELECTOR switch to 208V REG.		
	Turn VOLTAGE PHASE SELECTOR switch to:		
	1-2		_____vac (208 ± 10)
	2-3		_____vac (208 ± 10)
	3-1		_____vac (208 ± 10)
2	Check outputs of power supply in amplifier group 1A4.	Meter 1A4A3M1	
	Turn METER SELECTOR switch 1A4A3S2 to:		
	+250V 100XFS		_____vdc (250 ± 12.5)
	-28V 10XFS		_____vdc (-28 ± 2)
	-12V 5XFS		_____vdc (-12 ± 0.6)

TABLE 5-9. WEEKLY PREVENTIVE MAINTENANCE ROUTINES(cont.)

STEP NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
3	Check for proper indications on amplifier group 1A4 meters.	LEF PA BIAS 1A4M9 meter	_____vdc
		RIGH PA BIAS meter 1A4M10	_____vdc
		LEFT PA BIAS CURRENT meter 1A4M7	_____ma.
		RIGH PA BIAS CURRENT meter 1A4M8	_____ma.
		LEFT 2nd IPA BIAS meter 1A4M5	_____vdc.
		RIGHT 2nd IPA BIAS meter 1A4M6	_____vdc.
		LEFT 1st IPA CATHODE meter 1A4M1	_____ma.
		RIGHT 1st IPA CATHODE meter 1A4M2	_____ma.
		LEFT 2nd IPA PLATE CURRENT meter 1A4M3	_____ma.
		RIGHT 2D IPA PLATE CURRE meter 1A4M4	_____ma.
4	Check for proper indications on PA tube rack 1A6.	1A6V1 CATHODE CURRENT meter 1A6M1	_____amp.
		1A6 V2 CATHODE CURRENT meter 1A6M2	_____amp.
		1A6V3 CATHODE CURRENT meter 1A6AM3	_____amp.
		1A6V4 CATHODE CURRENT meter 1A6M4	_____amp.
		LEAKAGE CURRENT 1A6M5	Less than 1 ma.
		INLET TEMP. meter/switch 1A6S9	_____ºC (60 max)
		1A6V1 OUTLET TEMP. meter 1A6S5	_____ºC (70 max)
		1A6V2 OUTLET TEMP. meter 1A6S6	_____ºC (70 max)
		1A6V3 OUTLET TEMP. meter 1A6S7	_____ºC (70 max)

TABLE 5-9. WEEKLY PREVENTIVE MAINTENANCE ROUTINES(cont.)

STEP NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
4 cont.		1A6V4 OUTLET TEMP. meter 1A6S8	_____ºC (70 max)
		*1A6V1 WATER FLOW RATE meter	_____gpm (13, min)
		*1A6V2 WATER FLOW RATE meter	_____gpm. (13, min)
		*1A6V3 WATER FLOW RATE meter	_____gpm. (13, min)
		*1A6V4 WATER FLOW RATE meter	_____gpm. (13, min)
	* Maximum allowable variation between tubes is 2 gpm		
5	Check for proper indication on power supply set 1A53 meters.	5 Kv BIAS meter 1A53A2M4	_____kv. (-5.0 ± 0.5)
		LOW VOLTAGE PLATE meter 1A53A2M9	_____kv. (.5 ± 0.005)
		IPA PLATE CURRENT meter 1A53A2M8	_____amp.
		IPA PLATE VOLTAGE meter 1A53A2M3	_____kv. (10.7 ± 10%)
		PA PLATE CURRENT meter 1A53A2M7	_____amp.
		PA PLATE VOLTAGE meter 1A53A2M2	_____kv. (21.5 ± 10%)
6	Check the meter indications in the electron tube liquid cooler 1A2/1A52 with the water circulating pump operating.	Secondary water inlet pressure meter 1A2M1	_____psi
		Secondary water outlet pressure meter 1A2M2	_____psi
		Primary water inlet pressure meter 1A2M5	_____psi
		Primary water outlet pressure meter 1A2M4	_____psi
		Pump water outlet pressure meter 1A2M6	_____psi
7	Operate the transmitter into the dummy load. Adjust the shape and drive controls for a standard Loran pulse into the dummy load with an amplitude of 80 volts, peak-to-peak.	Oscilloscope All measurements sweep magnifier at X1	

TABLE 5-9. WEEKLY PREVENTIVE MAINTENANCE ROUTINES (Cont)

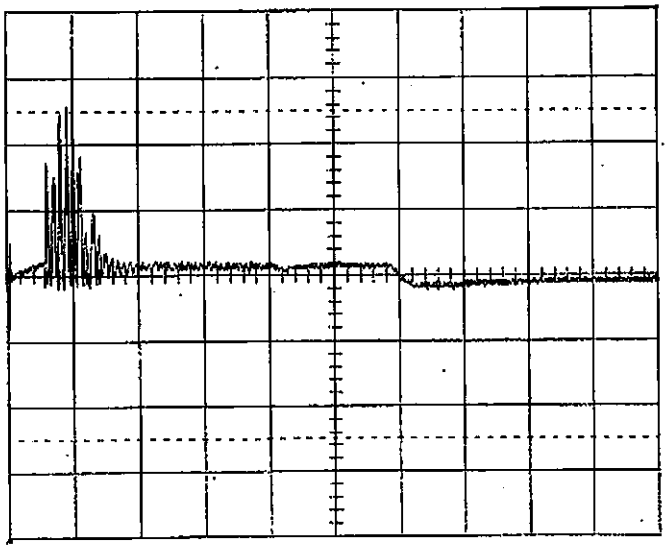
STEP NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
7 cont.	Set switches as follows:		
7A	Oscilloscope Control 1A4A3 Switch positions: MONITORED CIRCUIT - INPUT EXCITER MODE - NORMAL PULSE SELECTOR - ALL Oscilloscope Switch Positions (**This test was canceled**)	Oscilloscope	
7B	Oscilloscope Control 1A4A3 Switch positions: MONITORED CIRCUIT - INPUT EXCITER MODE - A or B PULSE SELECTOR - 8 Oscilloscope Switch Positions (**This test was canceled**)	Oscilloscope	
7C	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - INPUT LEFT 1st IPA MODE - A or B PULSE SELECTOR - 8 Oscilloscope switch positions (see waveform TP1)	Oscilloscope	

TABLE 5-9. WEEKLY PREVENTIVE MAINTENANCE ROUTINES (Cont)

STEP NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
7D	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - INPUT RIGHT 1st IPA MODE - A or B PULSE SELECTOR - 8 Oscilloscope Switch Positions (see waveform TP2)	Oscilloscope	
7E	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - INPUT LEFT 2nd IPA MODE - A or B PULSE SELECTOR - 8 Oscilloscope Switch Positions (see waveform TP3)	Oscilloscope	
7F	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - INPUT RIGHT 2nd IPA MODE - A or B PULSE SELECTOR - 8 Oscilloscope Switch Positions (see waveform TP4)	Oscilloscope	

TABLE 5-9. WEEKLY PREVENTIVE MAINTENANCE ROUTINES (Cont)

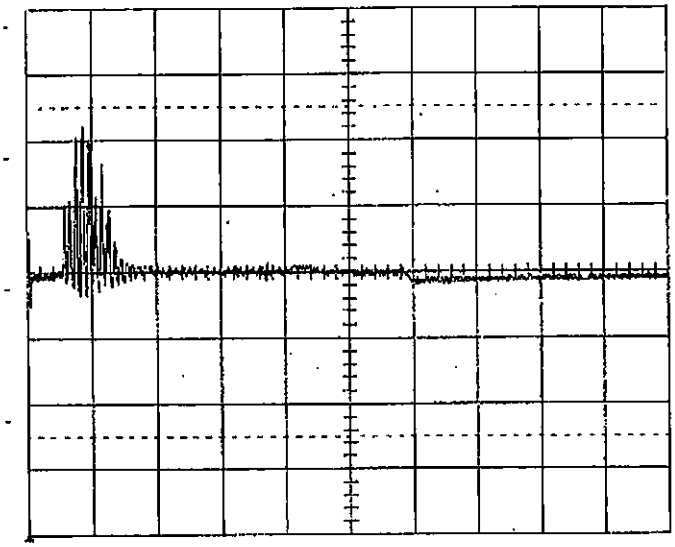
STEP NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
7G	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - INPUT LEFT/RIGHT 2nd IPA MODE - NORMAL PULSE SELECTOR - ALL Oscilloscope Switch Positions (see waveform TP5)	Oscilloscope	
7H	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - OUTPUT LEFT 2nd IPA MODE - A or B PULSE SELECTOR - 8 Oscilloscope Switch Positions (see waveform TP6)	Oscilloscope	
7I	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - OUTPUT LEFT/RIGHT 2nd IPA MODE - NORMAL PULSE SELECTOR - ALL Oscilloscope Switch Positions (see waveform TP7)	Oscilloscope	



TP-1
INPUT LEFT 1ST IPA

Channel 1
.1 ms > 1V

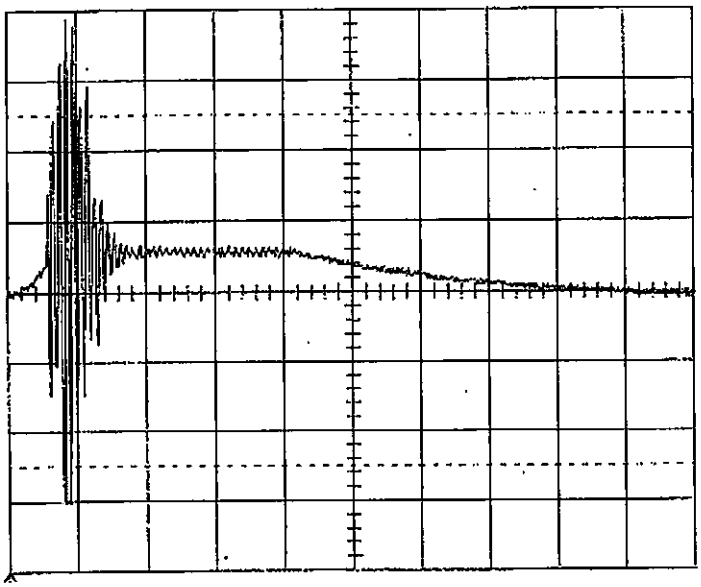
Ch1 > 1 V
T/div .1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-2
INPUT RIGHT 1ST IPA

Channel 1
.1 ms > 1V

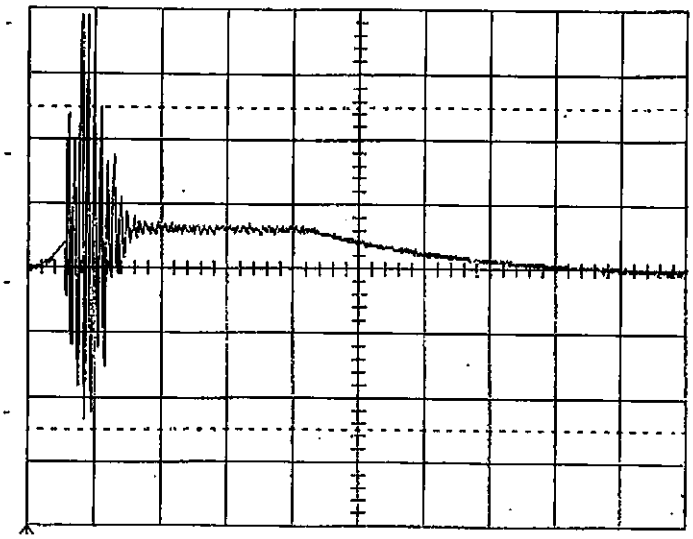
Ch1 > 1 V
T/div .1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-3
INPUT LEFT 2ND IPA

Channel 1
.1 ms > 5 V

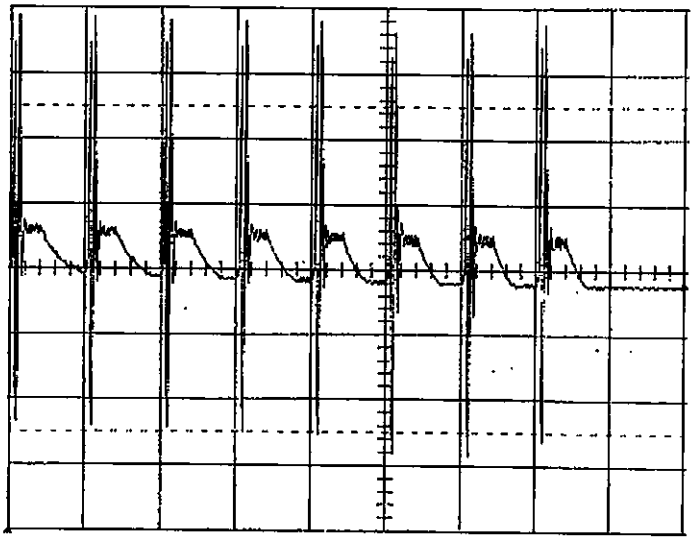
Ch1 > 5 V
T/div .1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-4
INPUT RIGHT 2ND IPA

Channel 1
.1 ms > 5 V

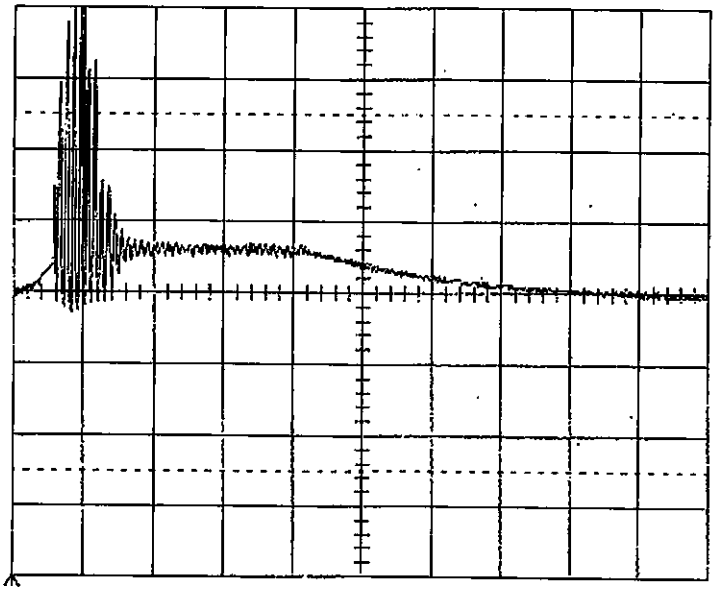
Ch1 > 5 V
T/div .1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-5
INPUT LEFT/RIGHT

Channel 1
1 ms > 5 V

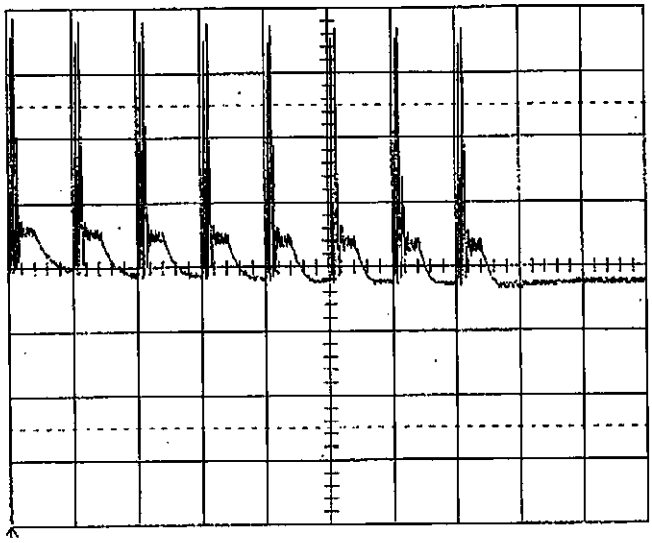
Ch1 > 5 V
T/div 1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-6
OUTPUT LEFT 2ND IPA

Channel 1
.1 ms 5 V

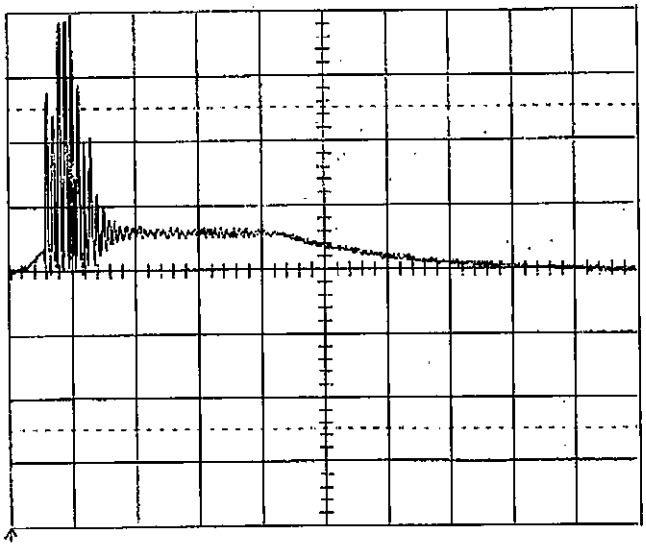
Ch1 5 V
T/div .1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-7
OUTPUT RIGHT 2ND IPA

Channel 1
1 ms 5 V

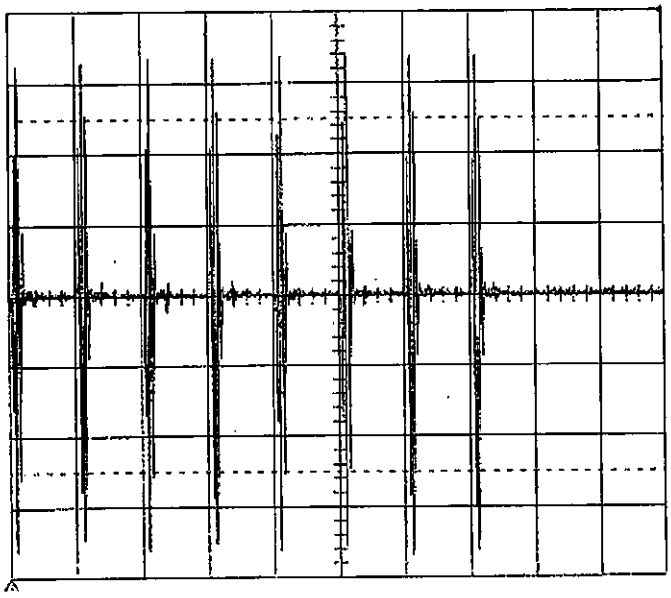
Ch1 5 V
T/div 1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-8
OUTPUT RIGHT 2ND IPA

Channel 1
.1 ms 5 V

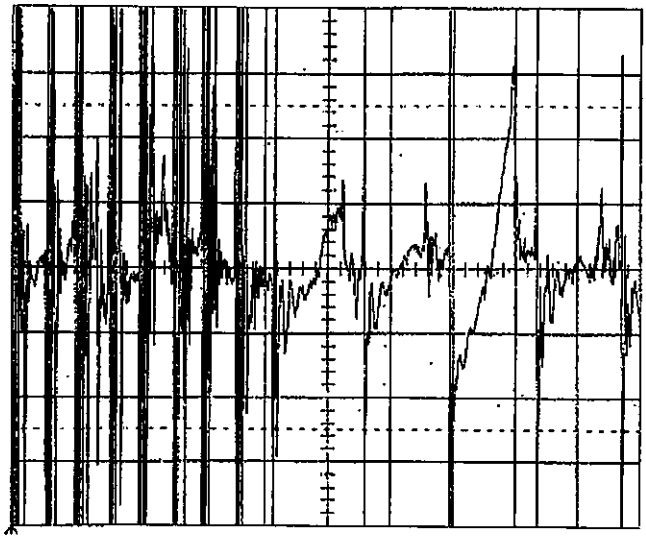
Ch1 5 V
T/div .1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-9
XMTR OUTPUT (CURRENT)

Channel 1
1 ms 1 V

Ch1 1 V
T/div 1ms Ch2 10 mV
Trig - 1.88 V + EXT



TP-10
HV POWER SUPPLY (RIPPLE)

Channel 1
2 ms 10 mV

Ch1 10 mV
T/div 2ms Ch2 10 mV
Trig .12 V + EXT

TABLE 5-9. WEEKLY PREVENTIVE MAINTENANCE ROUTINES (Cont)

STEP NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
7J	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - OUTPUT RIGHT 2nd IPA MODE - A OR B PULSE SELECTOR - 8 Oscilloscope Switch Positions (see waveform TP8)	Oscilloscope	
7K	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - TRANSMITTER OUTPUT CURRENT MODE - A OR B PULSE SELECTOR - 8 Oscilloscope Switch Positions (see waveform TP9)	Oscilloscope	
7L	Oscilloscope Control 1A4A3 Switch Positions: MONITORED CIRCUIT - H.V.POWER SUPPLY RIPPLE Oscilloscope Switch Positions (see waveform TP10)	Oscilloscope	

This page is intentionally left blank

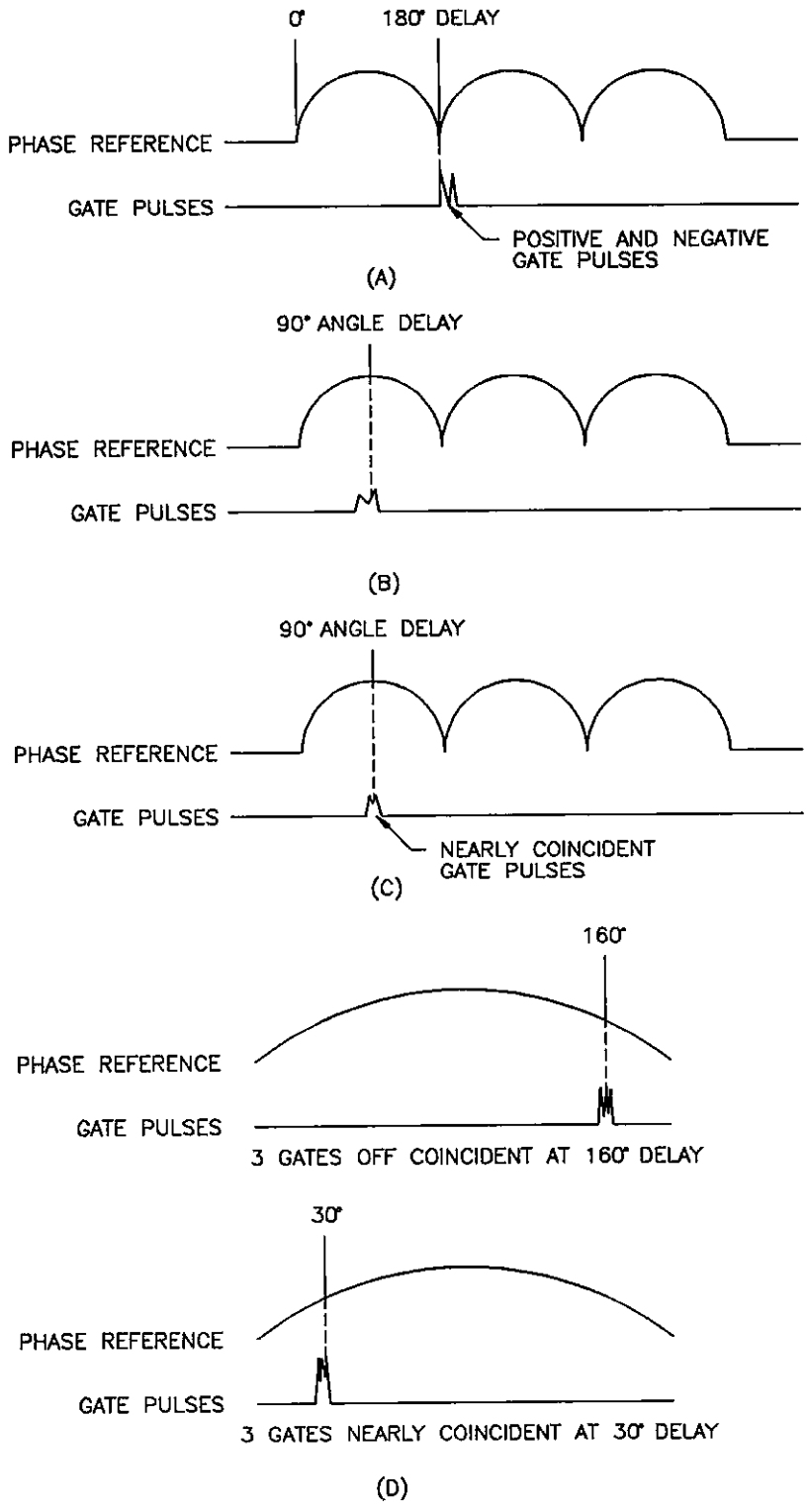


Figure 5–87. Gate Trigger Unit Positive–Negative Balance and Three Phase Balance Waveforms

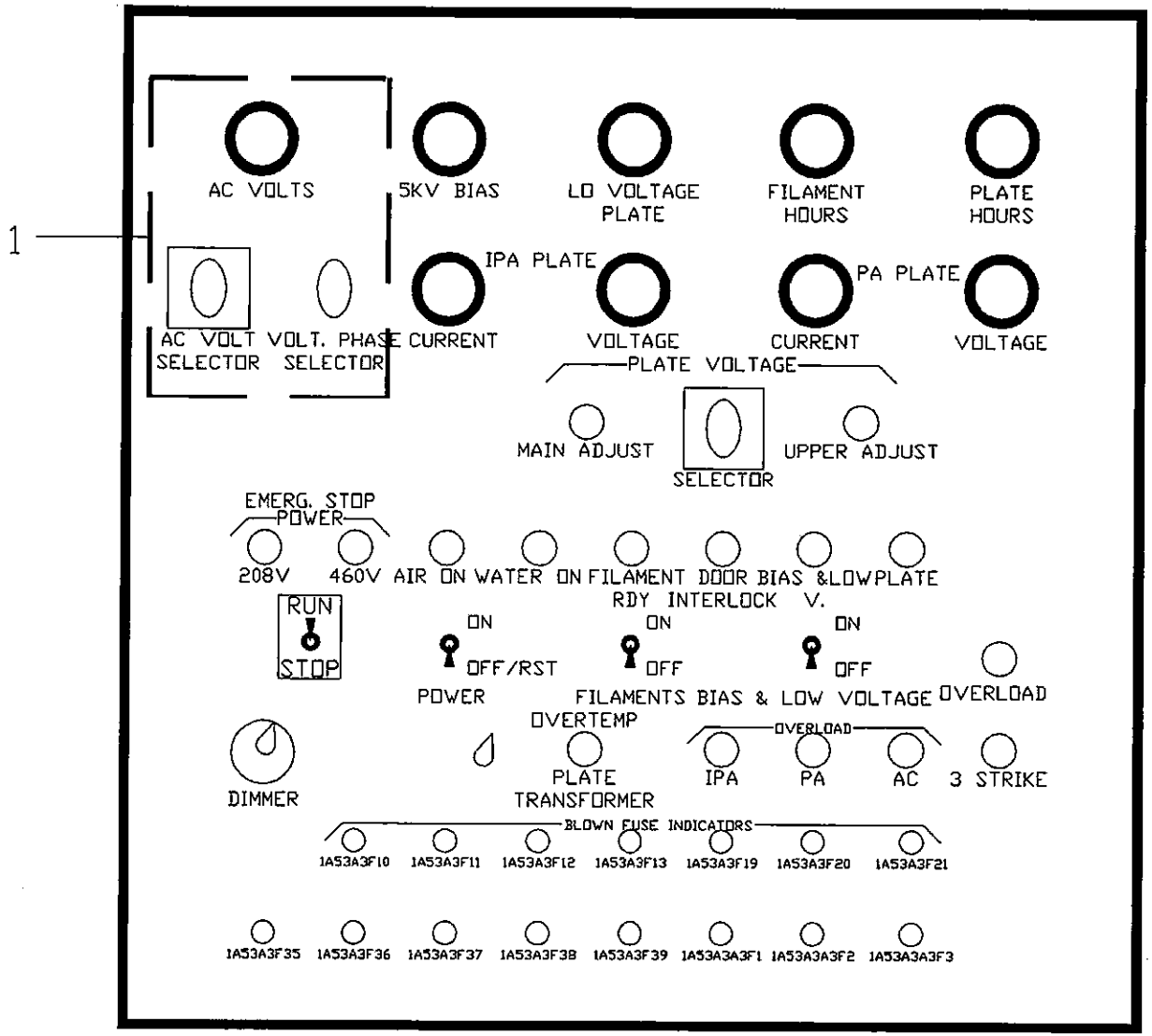


Figure 5-88. Weekly Preventive Maintenance Routines. Step 1.

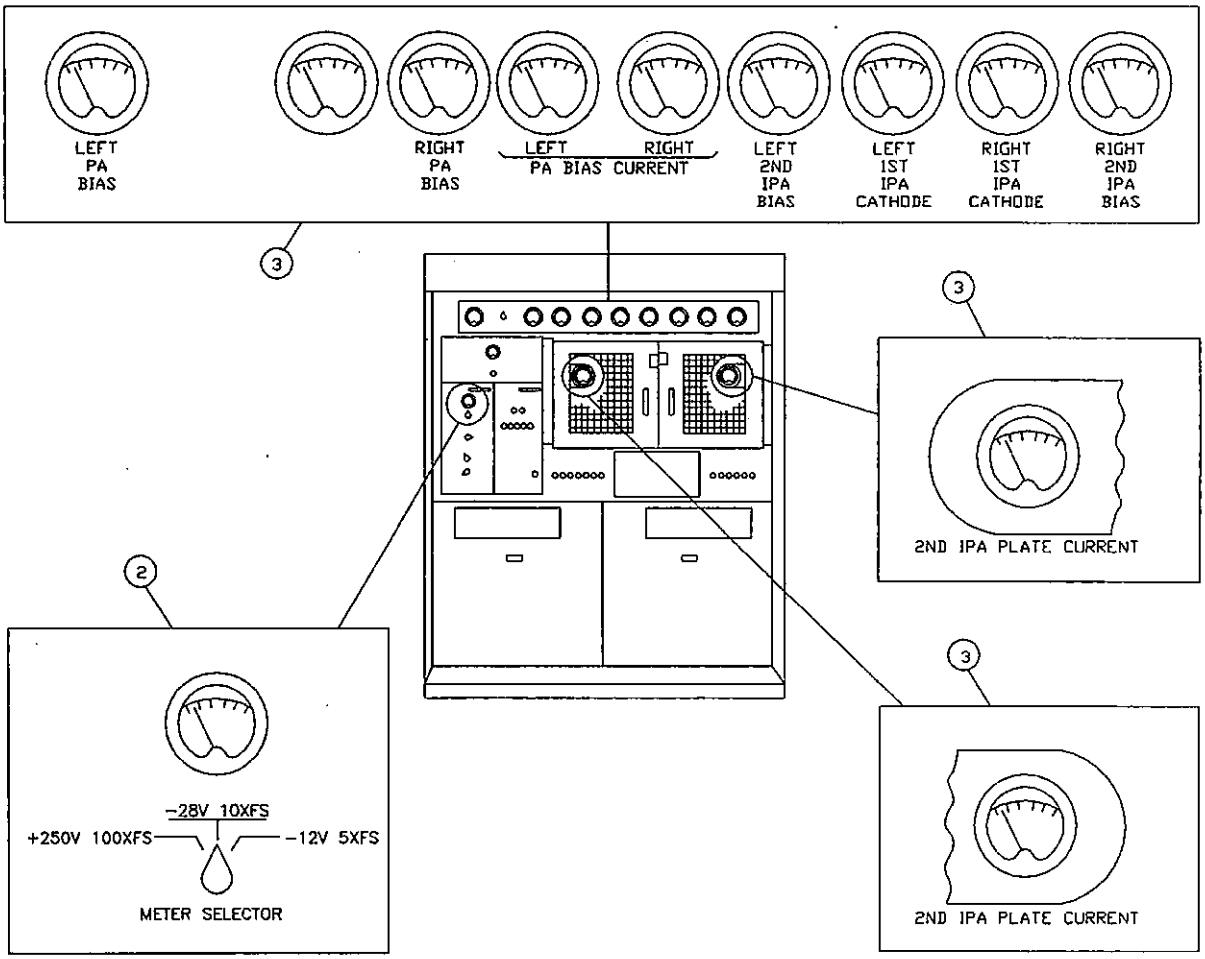


Figure 5-89. Weekly Preventive Maintenance Routines, Steps 2 and 3

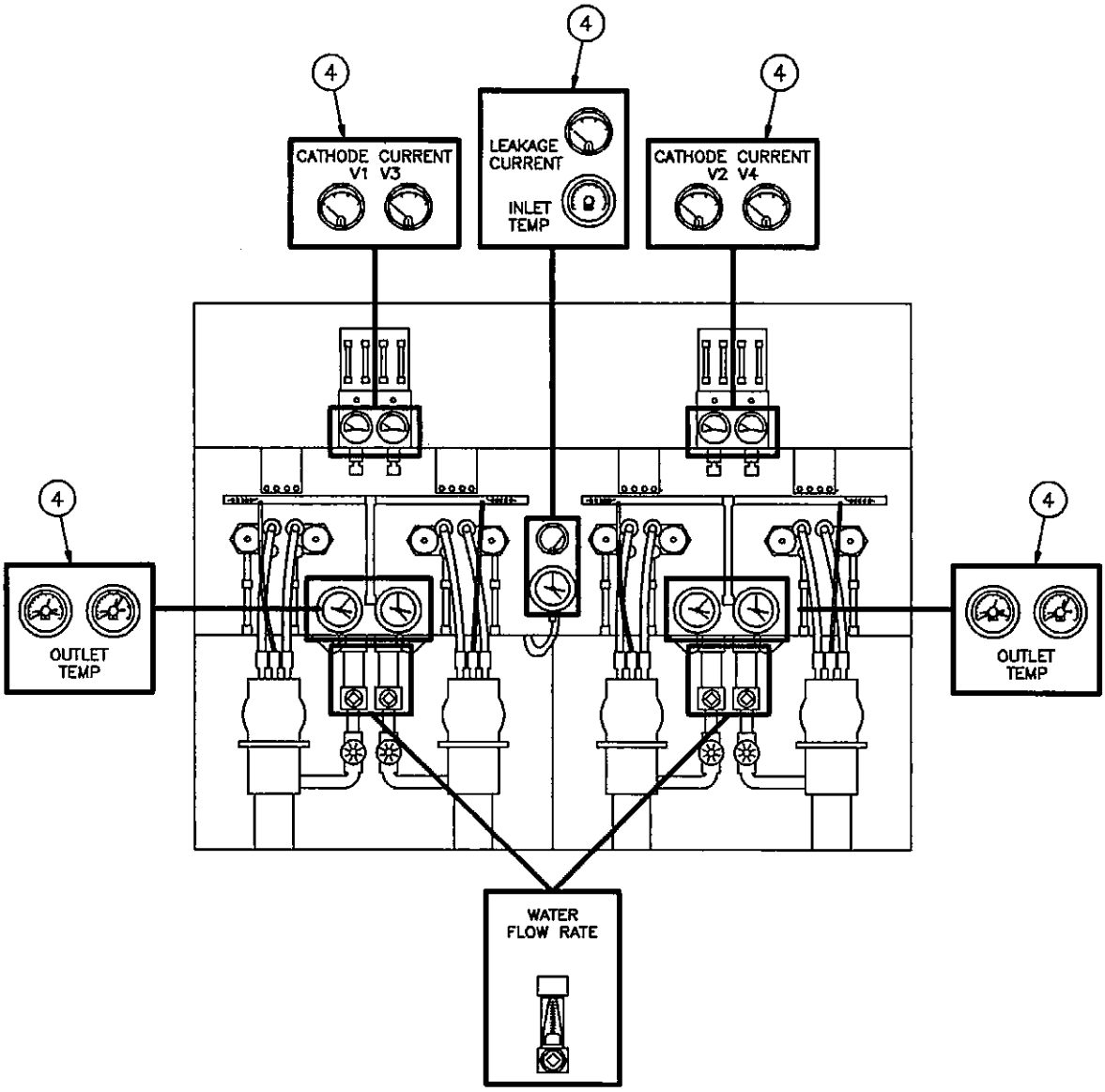


Figure 5–90. Weekly Preventive Maintenance Routines, Step 4

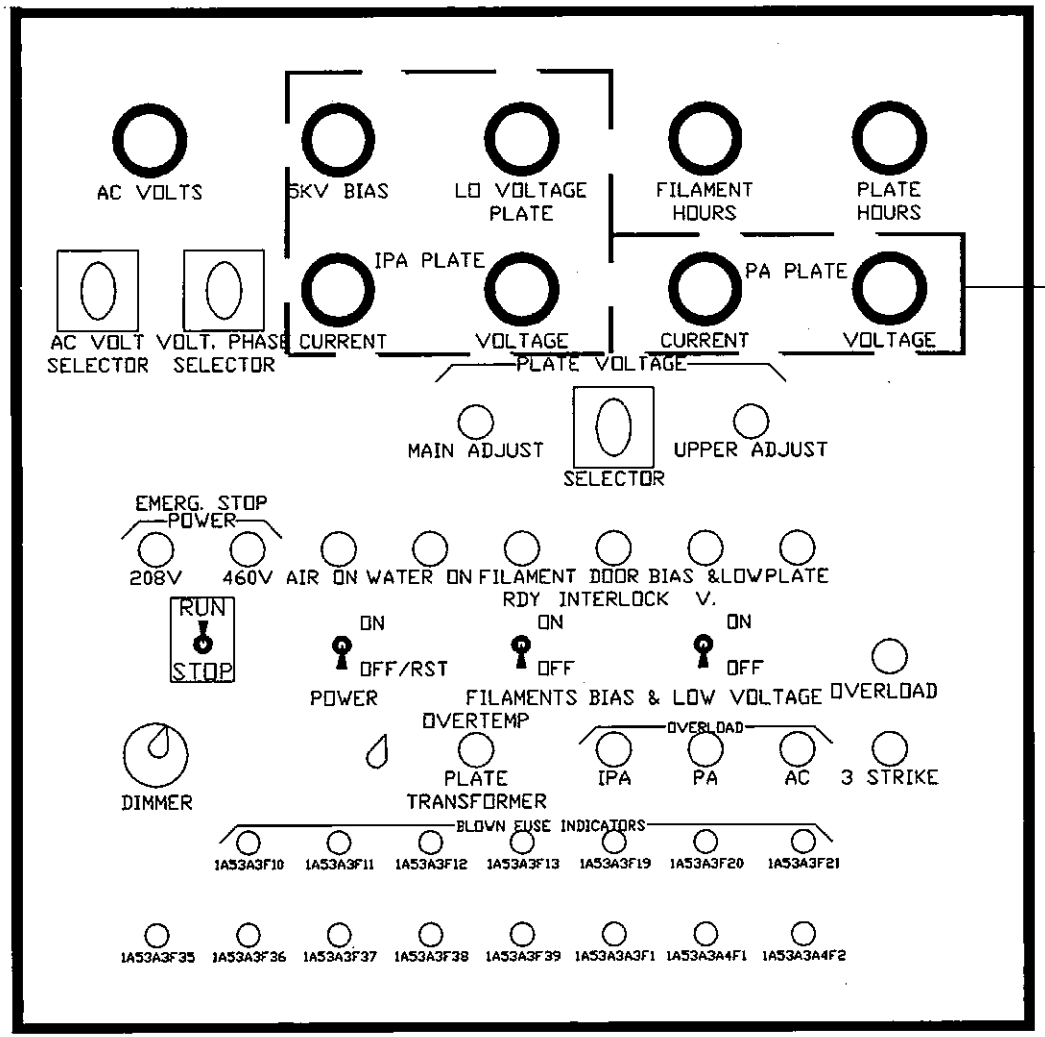


Figure 5-91. Weekly Preventive Maintenance Routines. Step 5.

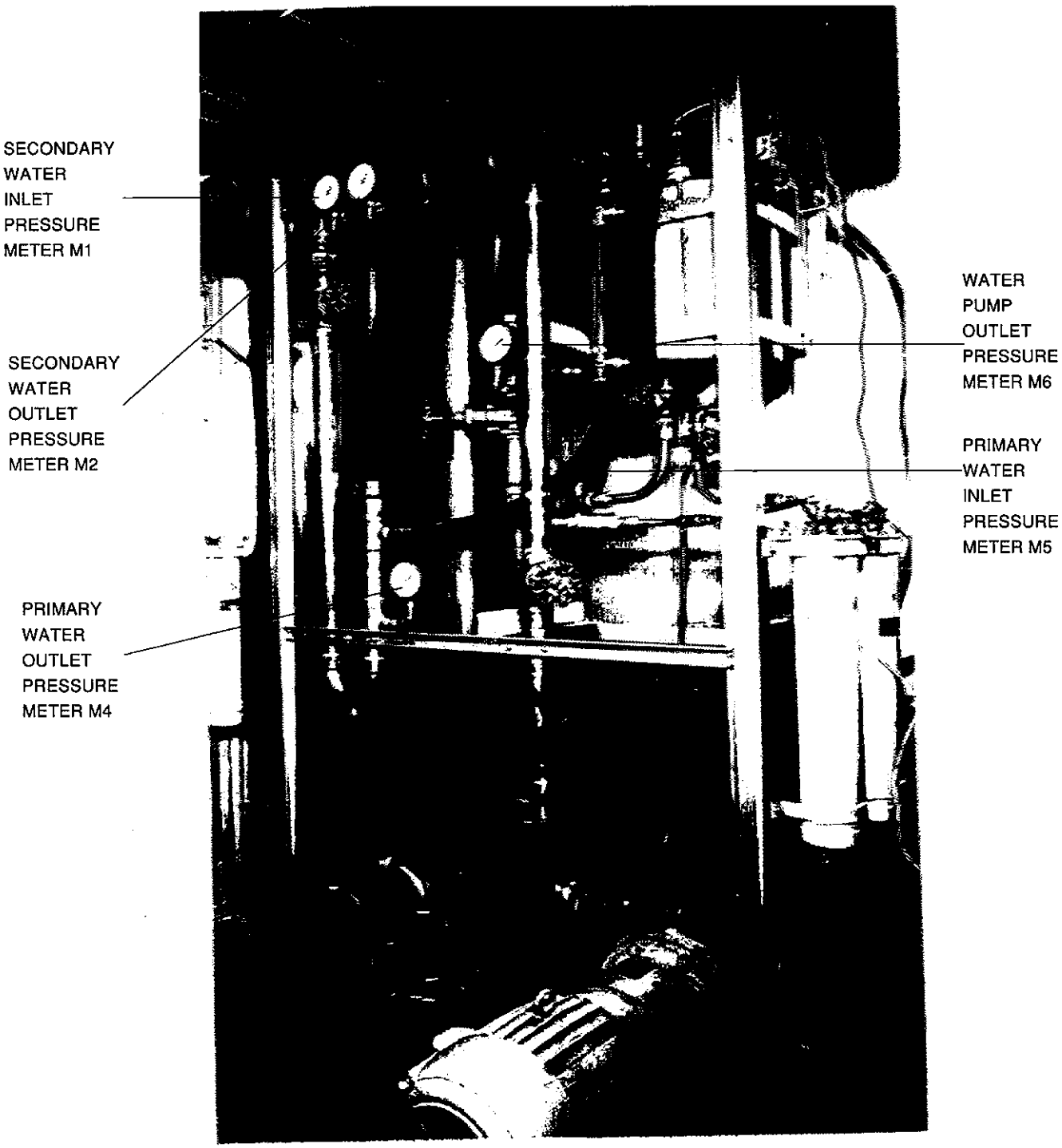


Figure 5-92. Weekly Preventive Maintenance Routines, Step 6

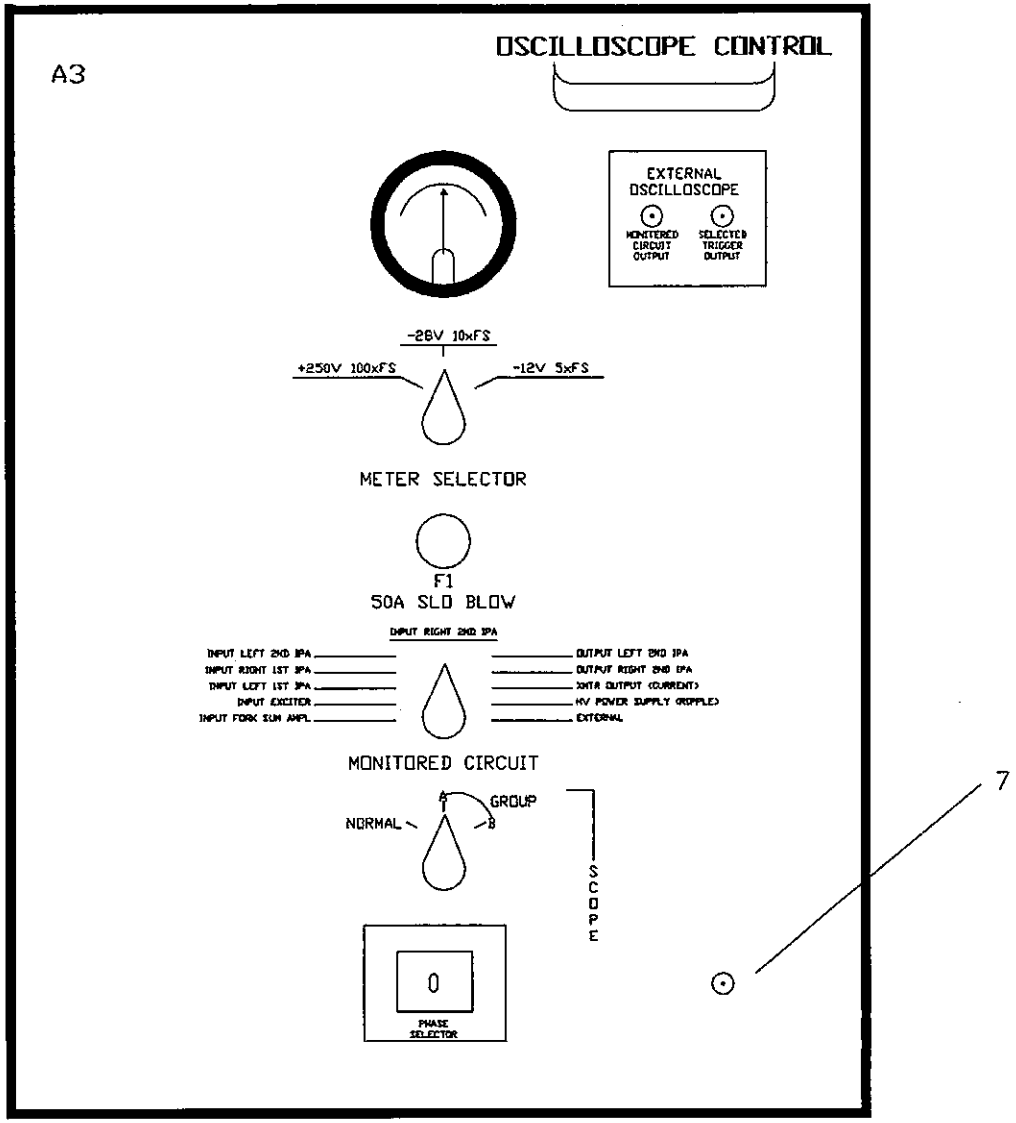
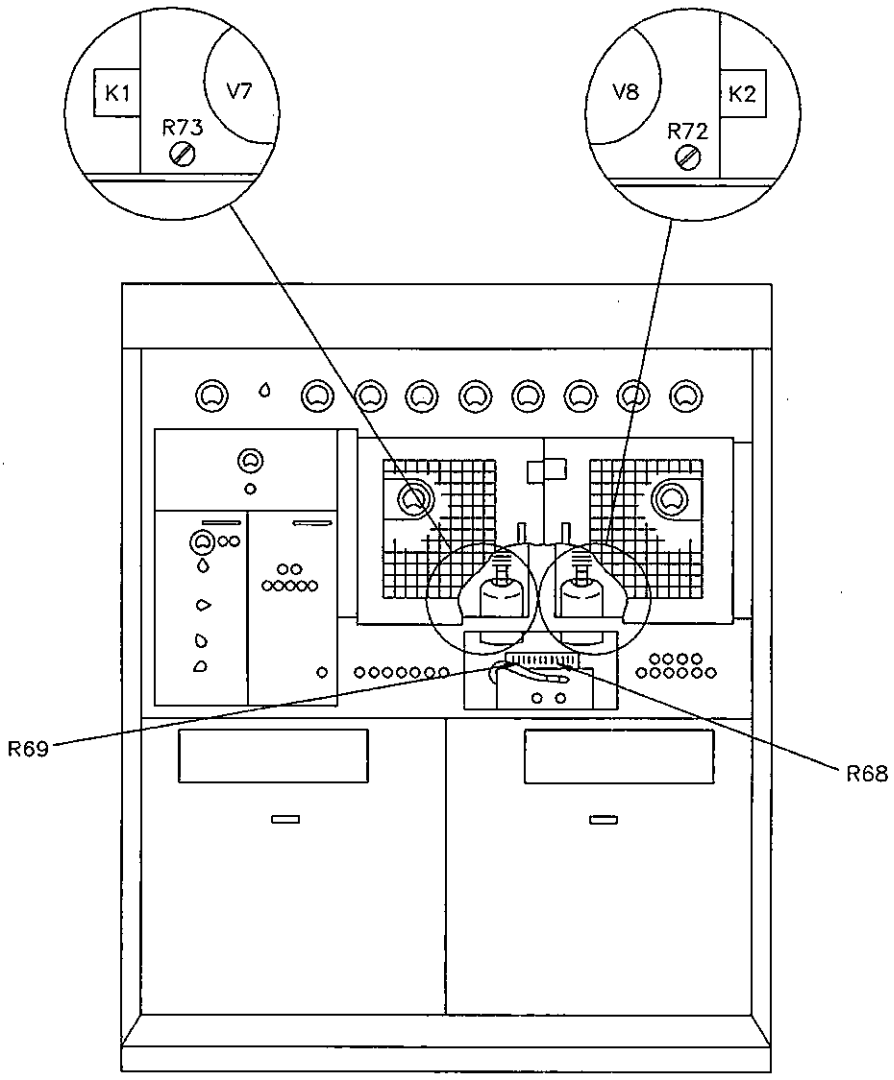
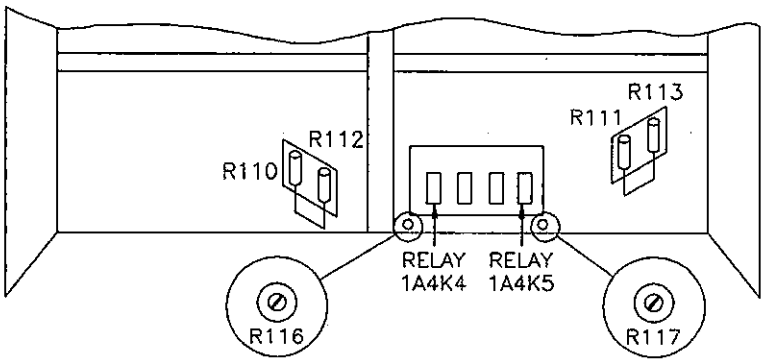


Figure 5-93. Weekly Preventive Maintenance Routines. Step 7.



FRONT VIEW



(LOWER REAR VIEW WITH DOORS OPEN)

Figure 5-94. Amplifier Group OG-159/FPN-44A (1A4), Front and Rear Views, Relay Adjustments

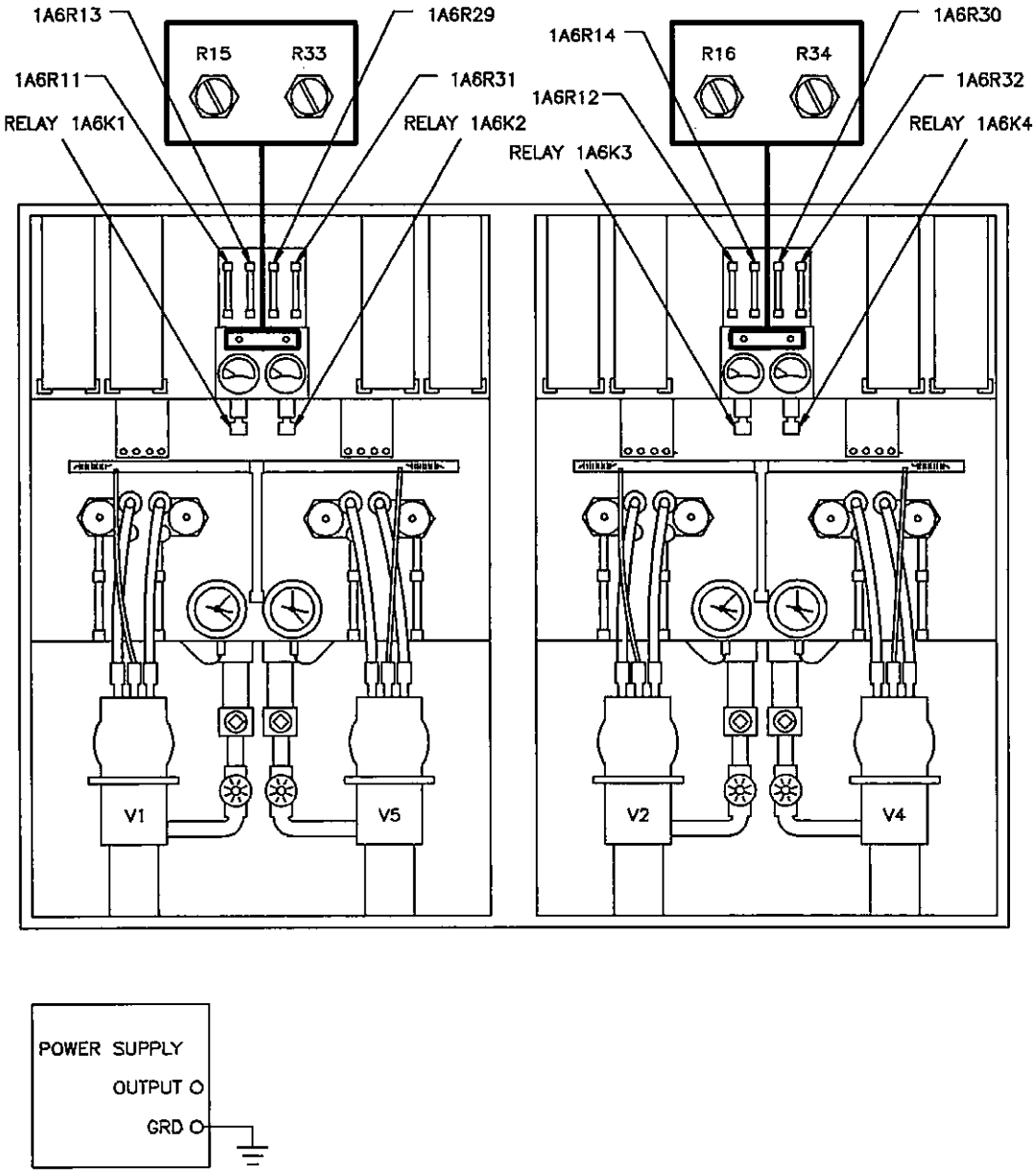


Figure 5–95. PA Tube Rack 1A6, Front View Adjustment

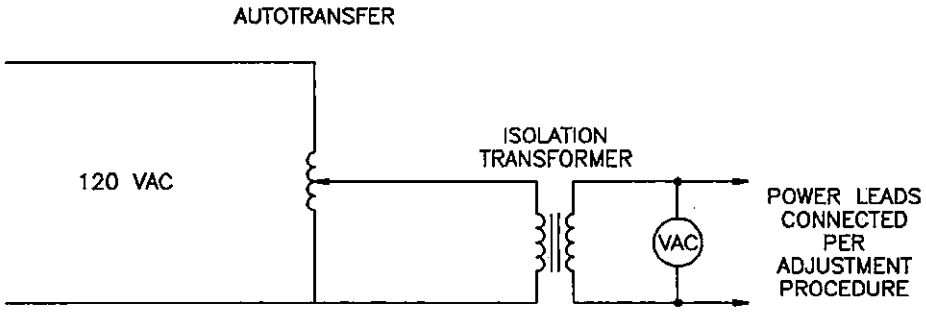


Figure 5–96. Time Delay Relay Adjustment, Test Setup

TABLE 5-10 QUARTERLY PREVENTIVE MAINTENANCE ROUTINES

STEP No.	ACTION REQUIRED
1	Clean transmitter group enclosure filters (figure 5-18). PROCEDURE: Remove air filters and clean with vacuum cleaner. If vacuum cleaner is not available, clean in a mild soap and water solution, dry thoroughly, and immerse in motor lubricating oil (SAE 20). Place in warm location to facilitate maximum drainage. Remove all dust from blower area. The fan motors contain sealed precision ball bearings which are greased for the life of the motor and require no other maintenance. Reinstall the filters after they have been drained of excess oil.
2	Maintain oil level of high voltage transformer 1A53A6T1 to level of oil fill plug. PROCEDURE: Use 3/8inch allen wrench to loosen the oil fill plug. Slowly unscrew the plug. If oil seeps out around plug threads, oil level is ok. tighten plug. If oil does not seep out, remove plug. Determine oil level by using a twisted piece of paper as dip stick. Fill until oil level is at least to bottom of oil plug hole. Replace plug.

5.2.3. **FAILURE REPORT.** Submission of electronic equipment failure reports shall be made in accordance with current instructions contained in the USCG Electronic Maintenance Manual M10550.25, and on the prescribed form indicated therein. The importance of providing complete information cannot be overemphasized. Do not substitute brevity for clarity.

5.2.4. **TUNING AND ADJUSTMENTS.** Variable adjustments in the Loran transmitting set are made only after circuitry associated with the adjustment is repaired. Adjustments to compensate for deterioration of circuits should not be made since deterioration indicates aging components and impending failure. Location and replacement of the faulty components lessens the chance of failure under operating conditions. The following subparagraphs give all the adjustment procedures for each unit in the loran transmitting set. Each procedure is independent (unless otherwise indicated) and can be performed provided the transmitting set is operating to the degree necessary to perform each particular procedure. The degree of operation is described in each procedure.

WARNING

Voltages dangerous to life are present in this equipment. Observe all safety regulations at all times.

5.2.4.1. **TEST EQUIPMENT AND SPECIAL TOOLS.** Table 5-1 lists the test equipment and special tools needed to adjust the assemblies in the loran transmitting set.

5.2.4.2. **RELAY ADJUSTMENTS.** Relay adjustments are performed as follows with NO power applied to equipment:

5.2.4.2.1. **AMPLIFIER GROUP 1A4. (See figure 5-94.)**

Step 1. Set controls to positions indicated below:

208 vac circuit breaker on power distribution panel.	OFF
460 vac circuit breaker on power distribution panel.	OFF
EMERGENCY STOP switch 1A53A2S19	STOP
208 vac circuit breaker 1A53A3CB2	OFF
460V INPUT circuit breaker 1A53A3CB1	OFF
HIGH VOLTAGE RECTIFIER SWITCH switch 1A53A3S1	OFF
POWER switch 1A53A2S7	OFF/RESET
FILAMENT switch 1A53A2S13	OFF
BIAS AND LOW VOLTAGE switch 1A53A2S7	OFF
PLATE VOLTAGE SELECTOR switch 1A53A2S18	OFF
LOCKOUT-READY switch 1A12S1	LOCKOUT

Step 2. Connect positive lead of 0-26 volts power supply to 1A4V7 cathode (top of 1A4R69) and negative lead to ground.

Step 3. Adjust potentiometer 1A4R73 so that relay 1A4K1 energizes at 100 $\pm$ 5 ma on LEFT 1ST IPA CATHODE (1A4M1).

Step 4. Tighten potentiometer lock nut.

Step 5. Connect positive lead of 0-26 volts power supply to cathode (top of 1A4R68) of 1A4V8 and negative lead to ground.

Step 6. Adjust potentiometer 1A4R72 so that relay 1A4K2 energizes at 100 $\pm$ 5 ma on RIGHT 1ST IPA CATHODE (1A4M2).

Step 7. Tighten potentiometer lock nut.

Step 8. Connect positive lead of 0-26 volts power supply to junction of resistors 1A4R110 and 1A4R112 and negative lead to ground.

Step 9. Adjust potentiometer 1A4R116 so that relay 1A4K4

energizes at 600 ± 15 ma on RIGHT PA BIAS CURRENT (1A4M8).

Step 10. Tighten potentiometer lock nut.

Step 11. Connect positive lead of 0-26 volts power supply to junction of resistors 1A4R111 and 1A4R113 and negative lead to ground.

Step 12. Adjust potentiometer 1A4R117 so that relay 1A4K5 energizes at 600 ± 15 ma on LEFT PA BIAS CURRENT (1A4M7).

Step 13. Tighten potentiometer lock nut.

5.2.4.2.2. **POWER AMPLIFIER TUBE RACK 1A6. (See figure 5-95)**

Step 1. Connect positive lead of 0-26 volt power supply to junction of 1A6R11 and 1A6R13. Connect negative lead to ground.

Step 2. Adjust potentiometer 1A6R15 so that relay 1A6K1 energizes at 1.5 ± 0.03 amperes on CATHODE CURRENT V1 (1A6M1).

Step 3. Tighten potentiometer lock nut.

Step 4. Connect positive lead of 0-26 volt power supply to junction of 1A6R12 and 1A6R14. Connect negative lead to ground.

Step 5. Adjust potentiometer 1A6R16 so that relay 1A6K2 energizes at 1.5 ± 0.03 amperes on CATHODE CURRENT V2 (1A6M2).

Step 6. Tighten potentiometer lock nut.

Step 7. Connect positive lead of 0-26 volt power supply to junction of 1A6R29 and 1A6R31. Connect negative lead to ground.

Step 8. Adjust potentiometer 1A6R33 so that relay 1A6K3 energizes at 1.5 ± 0.03 amperes on CATHODE CURRENT V3 (1A6M3).

Step 9. Tighten potentiometer lock nut.

Step 10. Connect positive lead of 0-26 volt power supply to junction of 1A6R30 and 1A6R32. Connect negative lead to ground.

Step 11. Adjust potentiometer 1A6R34 so that relay 1A6K4 energizes at 1.5 ± 0.03 amperes on CATHODE CURRENT V4 (1A6M4).

Step 12. Tighten potentiometer lock nut.

Step 13. Disconnect the power supply leads.

SEE FIGURE 5-48 FOR ILLUSTRATION

Figure 5-97. Time Delay Relay Adjustments, Location of Components

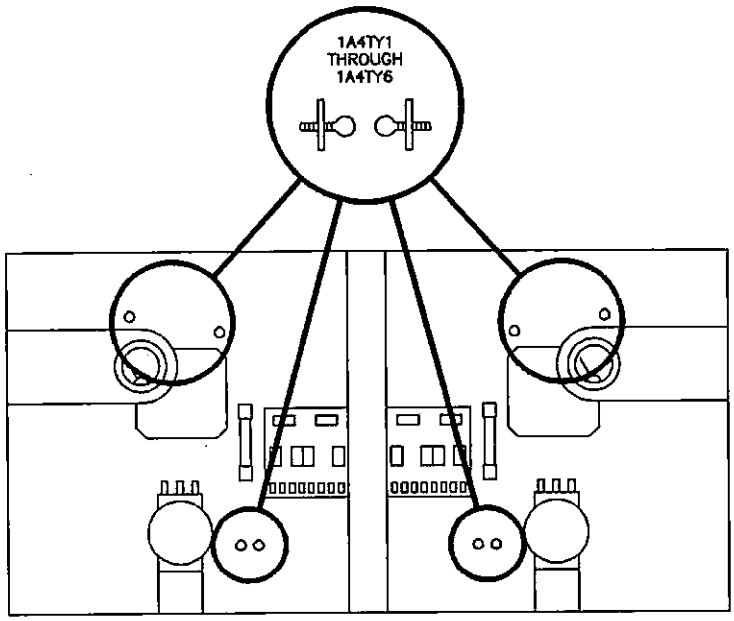


Figure 5-98. Amplifier Group OG-159/FPN-44A (1A4), Front View Spark Gap Spacing

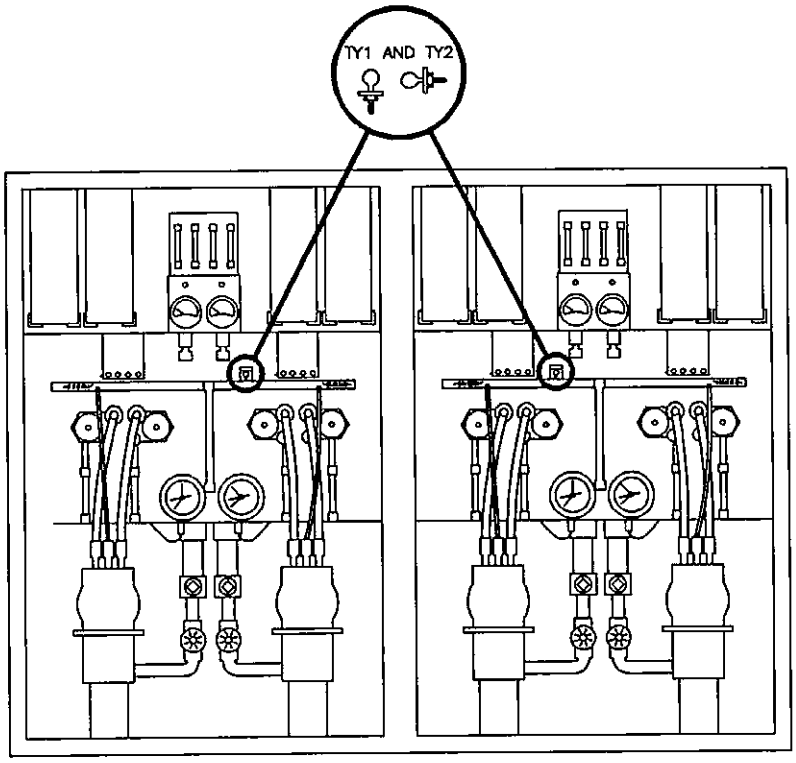


Figure 5-99 PA Tube Rack 1A6, Front View, Spark Gap Spacing

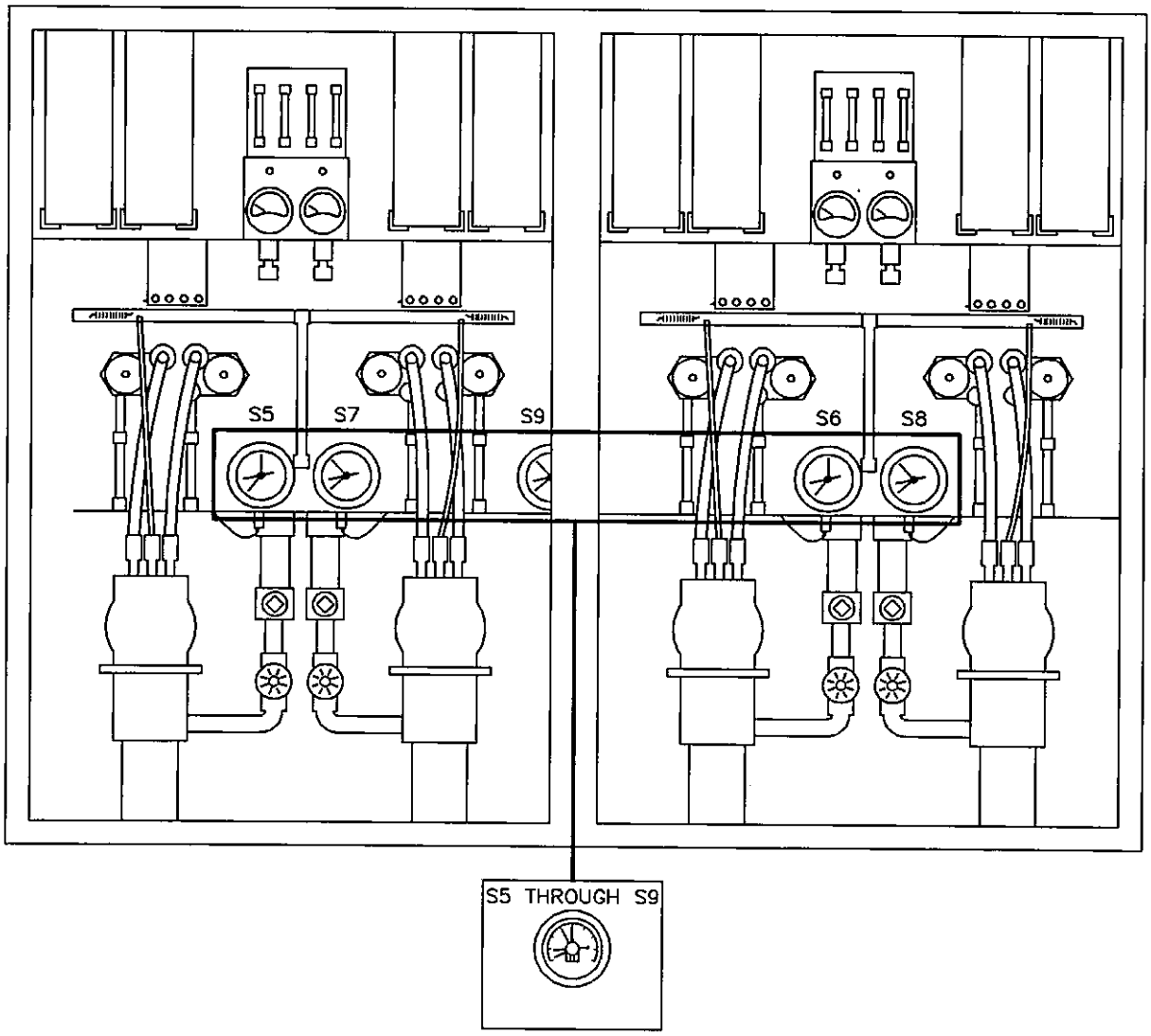


Figure 5–100. PA Tube Rack 1A6.
Front View. Thermometer Switches Adjustments

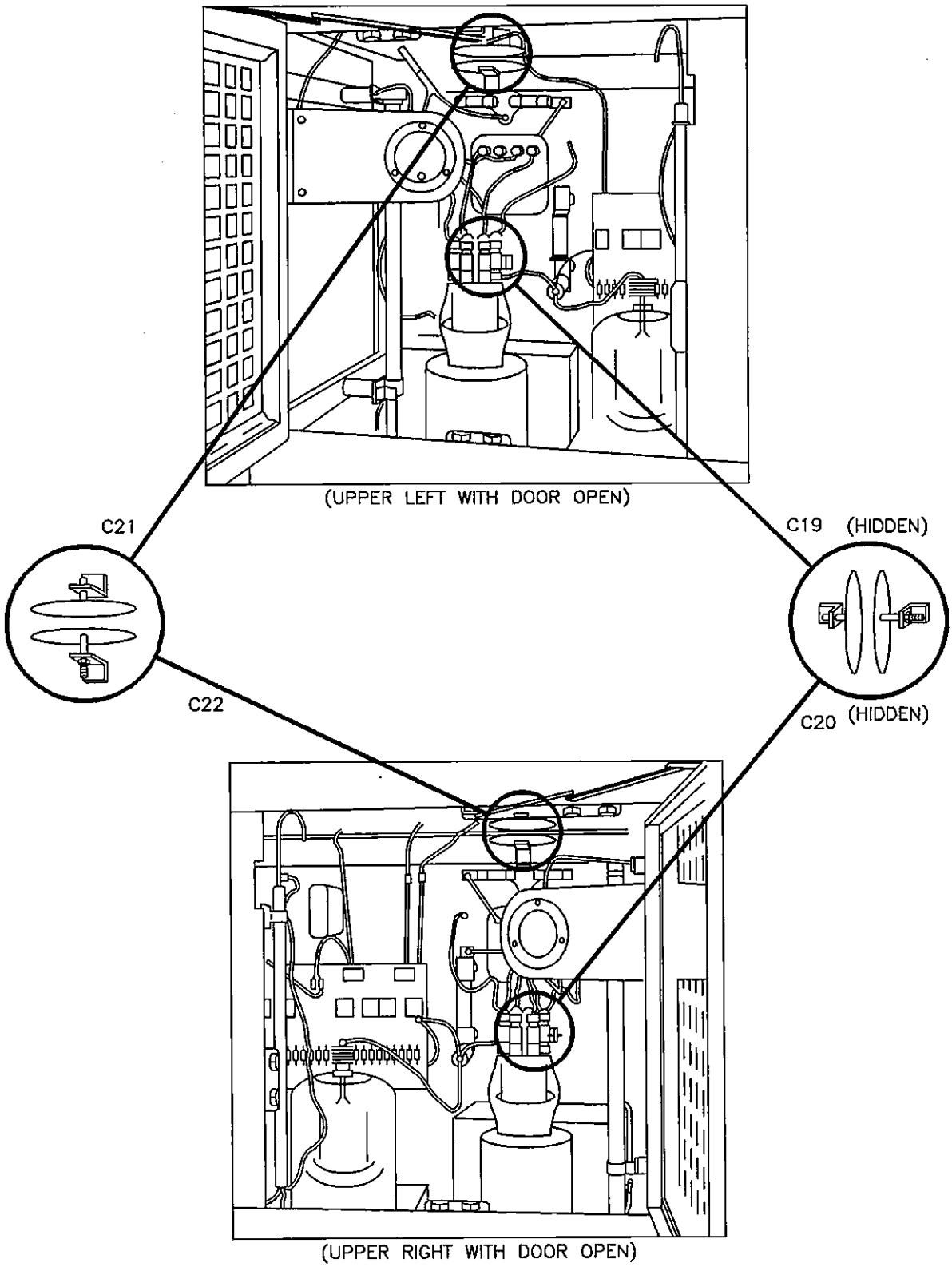


Figure 5-101. Amplifier Group OG-159/FPN-44A (1A4), Front View, Blocking Capacitor

SEE FIGURE 5-47 FOR ILLUSTRATION

Figure 5-102. Undervoltage and Overvoltage Protection Circuit, Adjustment Location

SEE FIGURE 5-74 FOR ILLUSTRATION

Figure 5-103. Regulator Control Panel 1A53A3A4 (P/O Voltage Regulator CN-1472/FPN-44A)

5.2.4.2.3. **RELAY ASSEMBLY 1A53A3.** Time delay relay adjustments on relay assembly 1A53A3 are performed with no power supplied to the transmitter. Prior to making relay adjustments, proceed as follows:

Step 1. Connect test setup as illustrated in figure 5-96.

Step 2. Turn autotransformer on and adjust output for 120 VAC on ac voltmeter.

Step 3. Turn autotransformer off without changing the setting.

(a) SHUT-DOWN COOLING DELAY RELAY 1A53A3K5.

Step 1. Adjust relay 1A53A3K5 (figure 5-97) time adjust knob to the 5.5 minute mark.

Step 2. Connect power leads across relay 1A53A3K5 coil at terminals 1A53A3TB24-5 and 1A53A3TB60-1.

Step 3. Connect the Simpson (on RX1 range) across relay 1A53A3K5 contacts at terminals 1A53A3TB61-8 and 1A53A3TB69-10.

Step 4. Turn autotransformer on. The Simpson should read zero ohms indicating that relay 1A53A3K5 is energized and its contacts closed.

Step 5. Start the stop watch and simultaneously turn autotransformer off. Record the time interval until the Simpson reads approximately 6.5 ohms indicating 1A53A3K5 is de-energized. It should be 5.5 $\pm$ .5 minutes.

Step 6. If the time is not as specified in step 5, turn time adjust knob on relay 1A53A3K5 one mark to the right or left as required and repeat steps 4 and 5 until required limits are obtained.

Step 7. Disconnect Simpson and power leads.

(b) FILAMENT WARM-UP DELAY RELAY 1A53A3K7.

Step 1. Adjust relay 1A53A3K7 (figure 5-97) time adjust knob to the 45 second mark.

Step 2. Connect power leads across relay 1A53A3K7 coil at terminals 1A53A3TB23-2 and 1A53A3TB60-1.

Step 3. Turn autotransformer on and simultaneously start stop watch. Record the time interval until the FILAMENTS READY lamp on control indicator 1A53A2 comes on. It should be within 45 $\pm$ 3 seconds.

Step 4. If the time interval is not within the limits of step 3, turn autotransformer off, turn relay 1A53A3K7 time adjust knob one mark as required and repeat step 3 until required limit is obtained.

Step 5. Disconnect autotransformer leads.

(c) THREE STRIKE INTERVAL DELAY RELAY 1A53A3K17.

Step 1. Adjust relay 1A53A3K17 (figure 5-97) time adjust knob to the 90 second mark.

Step 2. Connect power leads across relay 1A53A3K17 coil at terminals 1A53A3TB4-7 and 1A53A3TB60-1.

Step 3. Connect Simpson ohmmeter across relay 1A53A3K17 contacts at terminals 1A53A3TB66-2 and 1A53A3TB4-4. The ohmmeter should read zero ohms, indicating closed relay contacts.

Step 4. Turn autotransformer on. The ohmmeter should read infinity indicating that relay 1A53A3K17 is energized and its contacts open.

Step 5. Start the stop watch and simultaneously turn autotransformer off. Record the time interval until the ohmmeter reads zero indicating 1A53A3K17 contact closed. Time should be 90 ± 9 seconds.

Step 6. If the time is not as specified in step 5, turn time adjust knob on relay 1A53A3K17 one mark to the right or left as required and repeat steps 4 and 5 until required limits are obtained.

Step 7. Disconnect Simpson and power leads.

(d) DEIONIZATION DELAY RELAY 1A53A3K46.

Step 1. Adjust relay 1A53A3K46 (figure 5-97) time adjust knob to the 3 second mark.

Step 2. Connect power leads across relay 1A53A3K46 coil at terminals 1A53A3TB23-3 and 1A53A3TB60-1.

Step 3. Connect Simpson ohmmeter across relay 1A53A3K46 contacts at terminals 1A53A3TB24-2 and 1A53A3TB31-1.

Step 4. Turn autotransformer on. The ohmmeter should read infinity indicating that relay 1A53A3K46 is energized and its contacts open.

Step 5. Start the stop watch and simultaneously turn autotransformer off. Record the time interval until the ohmmeter indicates zero ohms indicating relay 1A53A3K46 contacts are

closed. It should be 3 ± 0.3 seconds.

Step 6. If the time is not as specified in step 5, turn time adjust knob on relay 1A53A3K46 one mark to the right or left as required and repeat steps 4 and 5 until required limits are obtained.

Step 7. Disconnect Simpson and power leads.

(e) WARM-UP LOCKOUT DELAY RELAY 1A53A3K52.

Step 1. Adjust relay 1A53A3K52 (figure 5-97) time adjust knob to the 30 second mark.

Step 2. Connect power leads across relay 1A53A3K52 coil at terminals 1A53A3TB25-4 and 1A53A3TB60-1.

Step 3. Connect the Simpson ohmmeter across relay 1A53A3K52 contacts at terminals 1A53A3TB25-4 and 1A53A3TB23-2.

Step 4. Turn autotransformer on. The ohmmeter should read zero indicating that relay 1A53A3K52 is energized and its contacts closed.

Step 5. Start the stop watch and simultaneously turn autotransformer off. Record the time interval until the ohmmeter reads approximately 120 ohms indicating 1A53A3K52 is de-energized. It should be 30 ± 3 seconds.

Step 6. If the time is not as specified in step 5, turn time adjust knob on relay 1A53A3K52 one mark to the right or left as required and repeat steps 4 and 5 until required limits are obtained.

Step 7. Disconnect Simpson and power leads.

5.2.4.3. **PROTECTIVE SPARK GAP SPACING.** The protective spark gaps (figures 5-98 and 5-99) are adjusted as follows with no power applied to the equipment.

NOTE

After setting each spark gap to its proper setting, tighten the lock nut and check the gap to ensure that it did not change.

Step 1. Using the thickness gauge, set the four filament spark gaps in amplifier group 1A4 (1A4TY1 through 1A4TY4) to 0.065 (+0.001 - 0.000) inch.

Step 2. Set the filter capacitor spark gaps in amplifier group 1A4 (1A4TY5 and 1A4TY6) to 0.030 ± 0.001 inch.

Step 3. Set the PA grid spark gaps in the PA tube racks

(1A6TY1 and 1A6TY2) to 0.065 ± 0.001 inch.

Step 4. Set the PA tank tuning capacitor spark gaps in the rear of the PA tube rack (1A6TY3-6) to 0.500 ± 0.010 inch.

Step 5. Set the low pass filter capacitor spark gaps to 0.500 ± 0.010 inch.

5.2.4.4. **THERMOMETER SWITCHES.** Determine that the contact adjustment of each of the following thermometers figure 5-100) with no power applied to the equipment is set as follows:

1A6S5	70° C Max
1A6S6	70° C Max
1A6S7	70° C Max
1A6S8	70° C Max
1A6S9	60° C Max

5.2.4.5. **TEST POINT BLOCKING CAPACITORS.** These adjustments are made with no power applied to the equipment. Refer to (figure 5-101). Set the test point blocking capacitors 1A4C19, 1A4C20, 1A4C21 and 1A4C22 to 0.875 ± 0.030 inch using the thickness gauge. Ensure that the capacitor plates are parallel after the lock units are tightened.

5.2.4.6. **UNDERVOLTAGE AND OVERVOLTAGE PROTECTION CIRCUIT.** These adjustments are normal made with all power off. The undervoltage and overvoltage protection circuits are adjusted by setting the high and low contacts on meter 1A53A3M1 to 126 and 114 vac, respectively (figure 5-102).

5.2.4.7. **VOLTAGE REGULATOR CN-1472/FPN-44A.** This procedure involves checking the operation of the 208V regulator 1A53A3A3 and adjusting the output for proper filament voltage on the 2ND IPA and PA tubes. The regulator adjustments are located on the inductrol voltage regulator control panel 1A53A3A4 (figure 5-103).

Step 1. Place the controls listed below in the position indicated:

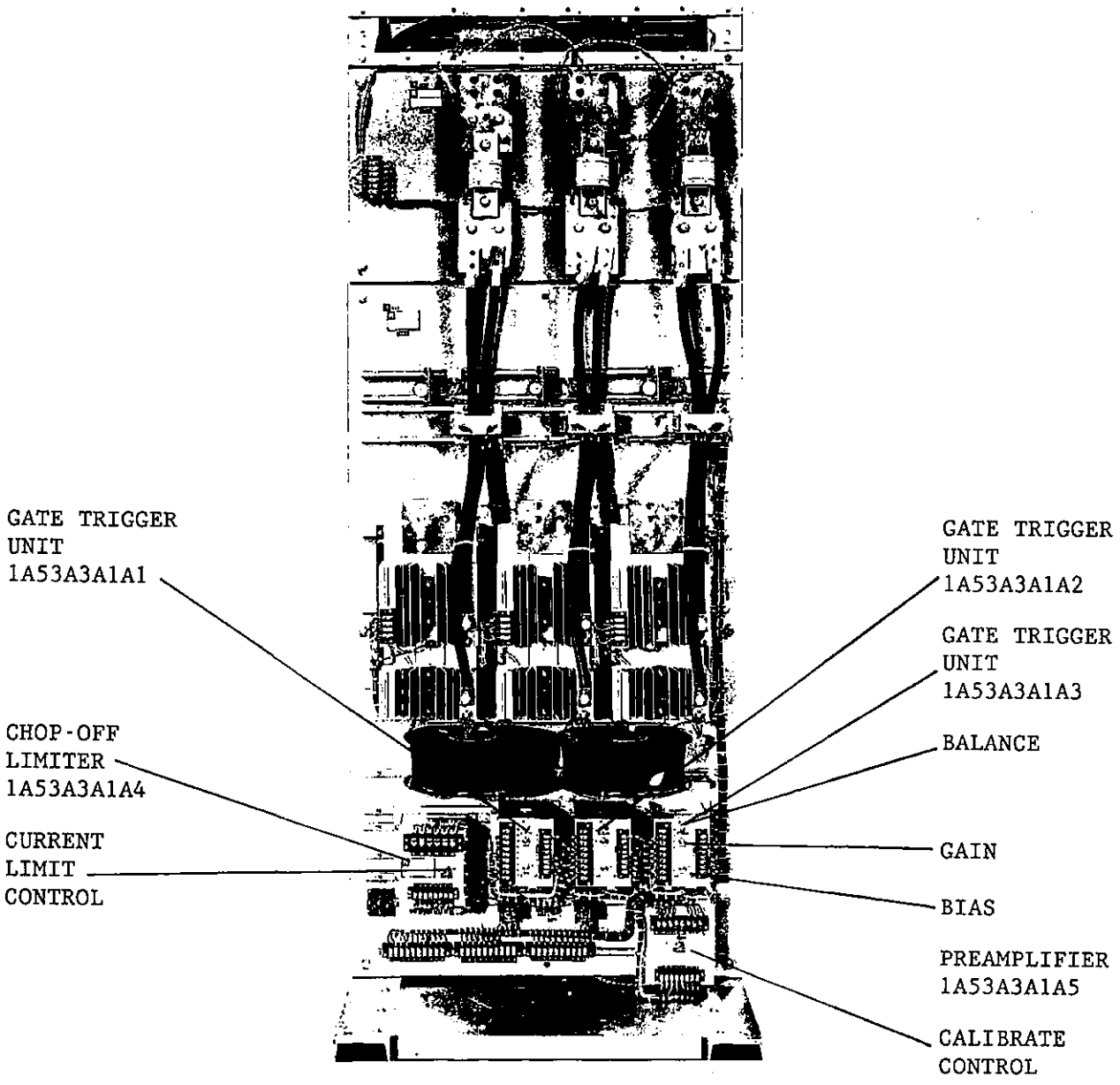


Figure 5-104. Voltage Regulator CN-1473/FPN-44A, Location of Adjustment Controls

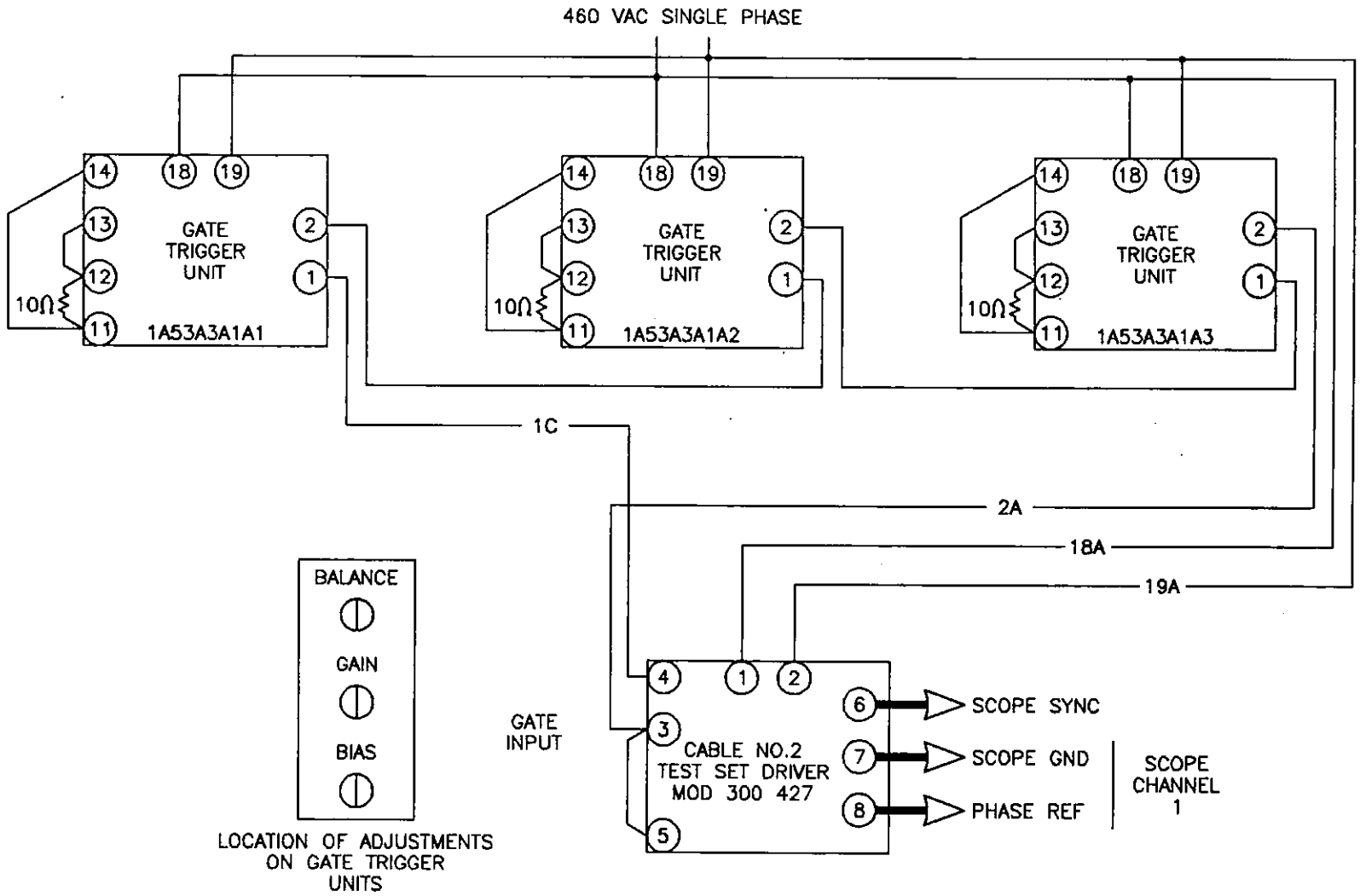


Figure 5–105. Gate Trigger Unit Positive – Negative Balance Adjustment Test Setup

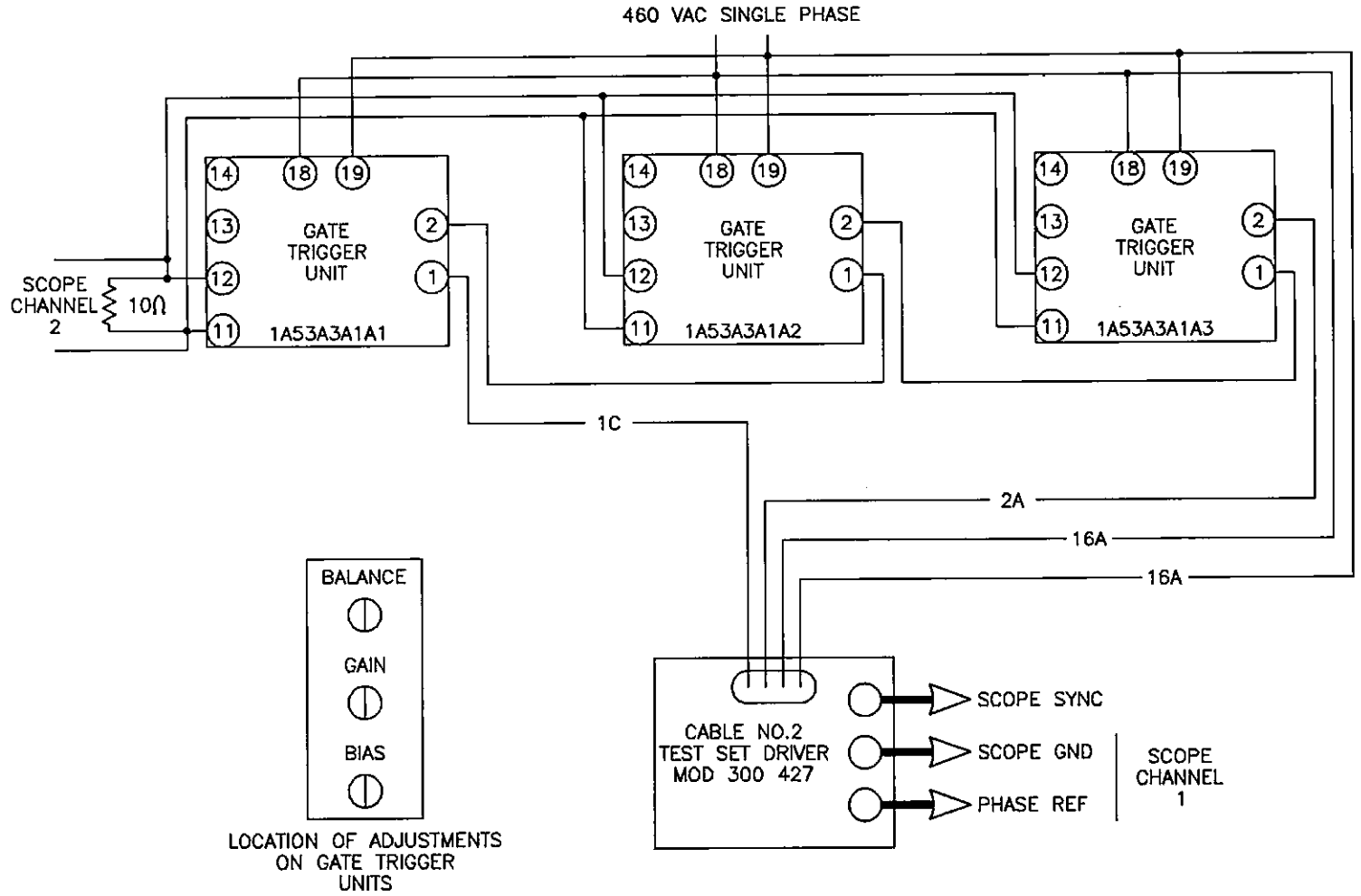


Figure 5-106. Gate Trigger Unit Three Phase Balance Adjustment Test Setup

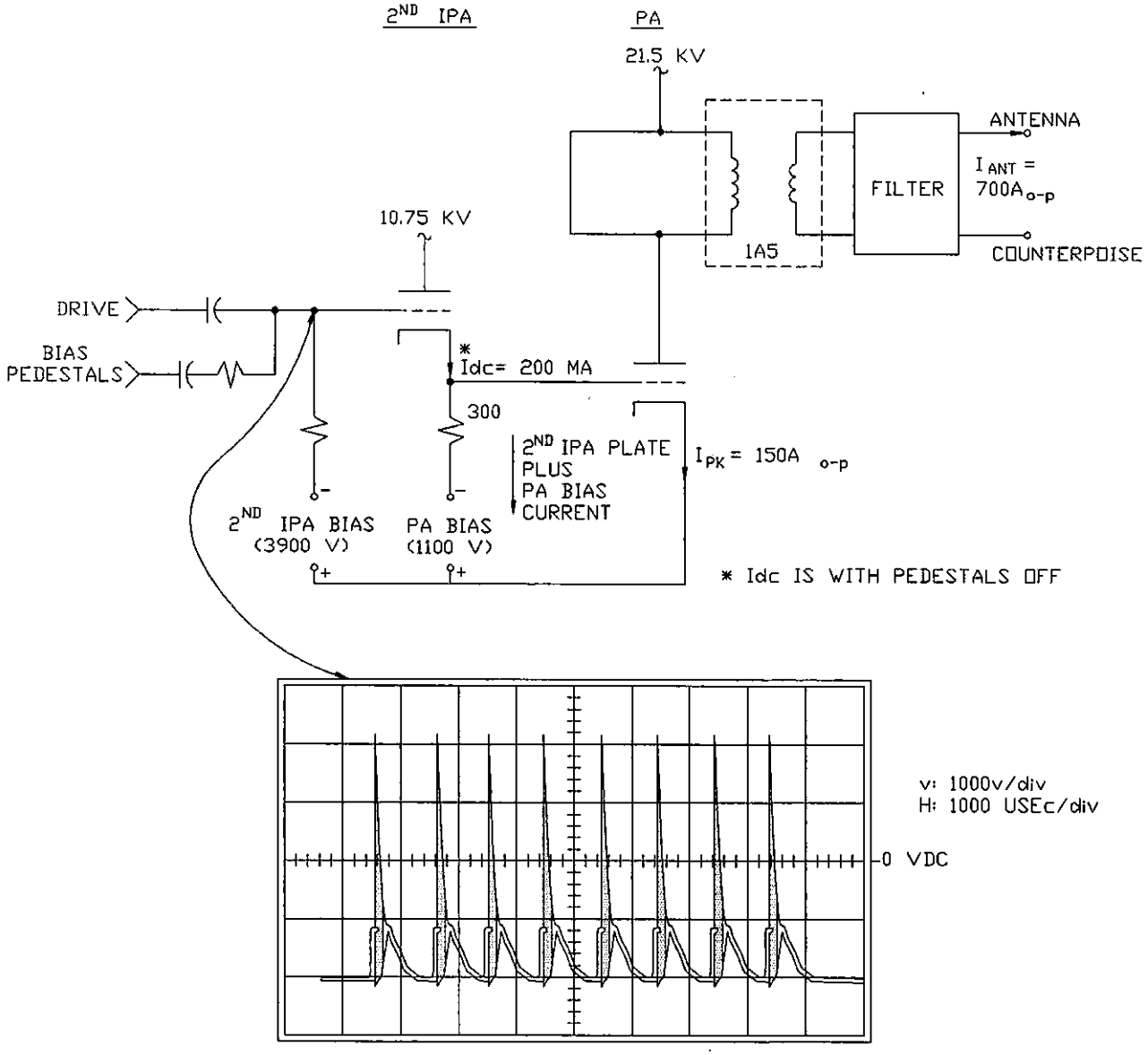


Figure 5-107. AN/FPN-44A Bias Adjustment

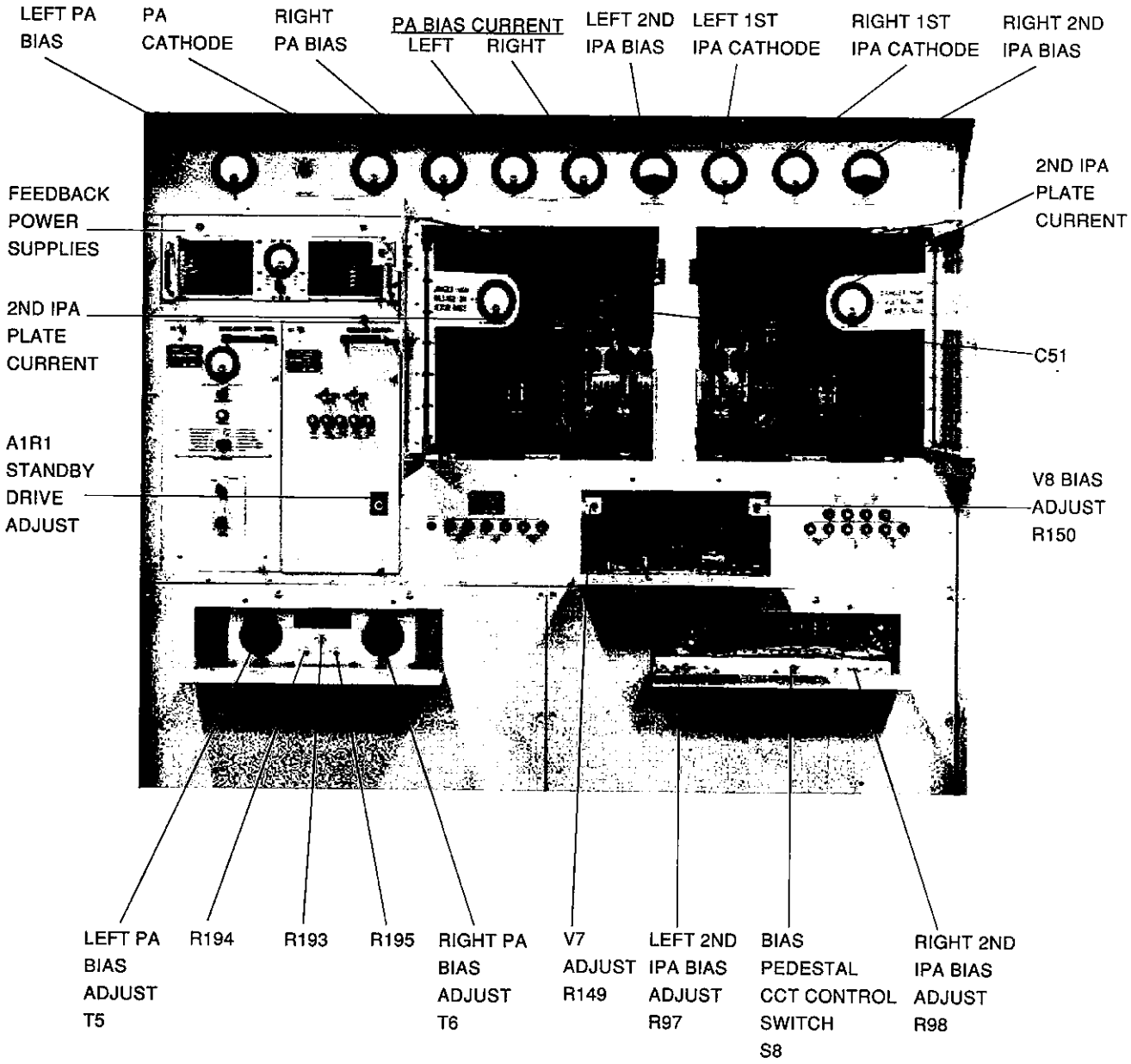


Figure 5-108. Bias Adjust Control Locations

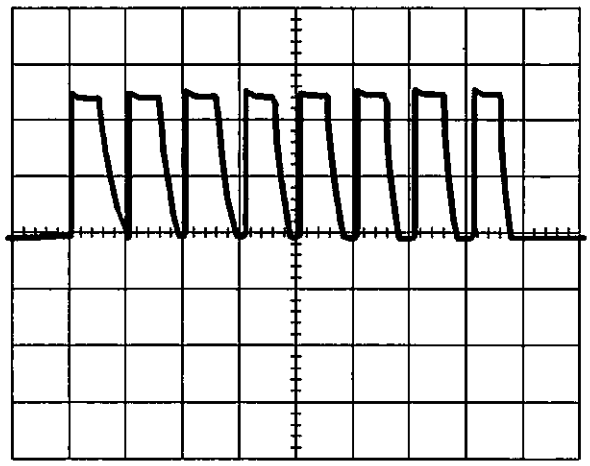


Figure 5-109. Bias Pedestal Adjustment Wave Form

CONTROL	POSITION
208V Circuit Breaker 1A53A3CB2	OFF
460V INPUT CB1	OFF
HIGH VOLTAGE RECTIFIER POWER S1	OFF
POWER	OFF/RESET
FILAMENTS	OFF
BIAS AND LOW VOLTAGE	OFF
PLATE VOLTAGE SELECTOR	OFF
LOCKOUT-READY	LOCKOUT
EMERGENCY STOP	RUN
208V Regulator Motor Switch	OFF
208V Regulator Mode Switch	MANUAL

Step 2. Remove FILAMENT power fuses 1A53A3F11, F12 and F13.

Step 3. Connect the voltmeter (0-300 vac range) across the 208V regulator output terminals L1 and L2 (bottom of fuseholders for 1A53A3F12, F13).

Step 4. Turn VOLTAGE LEVEL and BANDWIDTH controls fully counterclockwise.

Step 5. Set 208V regulator MOTOR switch ON and MODE switch to AUTO.

Step 6. Gain access to potentiometer 1A53A3A4A1R6 on back of panel (figure 5-103).

Step 7. Set circuit breaker 1A53A3CB2 to ON.

Step 8. Adjust potentiometer 1A53A3A4A1R6 until regulator control is balanced; that is, when LOWER and RAISE relays 1A53A3A4A2K1 and 1A53A3A4A2K2 are de-energized, close panel.

Step 9. Adjust the 208V regulator VOLTAGE LEVEL control for 208 vac across terminals L1 and L2, as indicated by test equipment voltmeter.

Step 10. Set the MODE switch to MANUAL.

Step 11. Actuate the 208V regulator MANUAL LOWER switch to obtain 203 vac across terminals L1 and L2.

Step 12. Set the MODE switch to AUTO. Observe that the voltage across L1 and L2 returns to 208 ± 3.5 vac without overshoot or hunting. Adjust BANDWIDTH control if necessary.

NOTE:

Increasing BANDWIDTH reduces overshoot and hunting. Decreasing BANDWIDTH narrows the dead band.

Step 13. Set the MODE switch to MANUAL.

Step 14. Actuate the MANUAL RAISE switch to obtain 212 vac across L1 and L2.

Step 15. Set the MODE switch to AUTO. Observe that the voltage across L1 and L2 returns to 208 ± 3.5 vac without overshoot or hunting.

Step 16. Set circuit breaker 1A53A3CB2 to OFF.

Step 17. Replace fuses 1A53A3F11, F12 and F13. Set circuit breaker 1A53A3CB2 to ON. Set POWER and FILAMENTS switches to ON.

Step 18. Connect the voltmeter (to measure 0-14 vac range) across the filament terminals of 1A4V9, and then across filament terminals of 1A6V1 through 1A6V4.

Step 19. Adjust the VOLTAGE LEVEL control on 1A53A3A4 to a setting which will provide filament voltages for the 2ND IPA and PA tubes within limits specified below. (The MODE switch must be in AUTO while taking the voltage measurements.)

TUBE	FILAMENT VOLTAGE (vac)
1A4V9	7.1 ± 0.2
1A4V10	7.1 ± 0.2
1A6V1	12.6 ± 0.2
1A6V2	12.6 ± 0.2
1A6V3	12.6 ± 0.2
1A6V4	12.6 ± 0.2

5.2.4.8. **VOLTAGE REGULATOR CN-1473/FPN-44A.** Perform Voltage Regulator CN-1473/FPN-44A adjustments as follows:

5.2.4.8.1. **GATE TRIGGER UNIT (GTU) 1A53A3A1A1, 1A53A3A1A2, 1A53A3A1A3 ADJUSTMENTS.**

NOTE

This procedure is applicable only if Field Test Sets for the GTU are available. If Field Test Sets are not available, adjustment of the GTU must be at a repair facility having the required test equipment.

The gate trigger unit (GTU) adjustment procedure is performed using a set of three GTU's (when a GTU malfunctions and is replaced). The three GTU's are removed from rack 1A53A3A1 and placed on a bench for adjustment purposes. Proceed as follows:

(a) **POSITIVE-NEGATIVE BALANCE.**

Step 1. Disconnect all leads from terminal boards on Gate Trigger Units 1A53A3A1A1, A2, and A3, and tag accordingly (see figure 5-104).

Step 2. Remove four screws securing each Gate Trigger Unit to panel 1A53A3A1 to remove the units from the rack.

Step 3. Connect all three Gate Trigger Units into test setup shown in figure 5-105.

Step 4. Using dual trace oscilloscope connect one oscilloscope probe to terminal 12 on Gate Trigger Unit 1A53A3A1A1, and the second oscilloscope probe to terminal 8 (phase reference) on Test Set Driver 300427.

Step 5. Turn control potentiometer on Test Set Driver 300427 fully counterclockwise. This positions the gate pulses at the maximum delay angle (zero output voltage).

Step 6. Observing the oscilloscope, adjust the BIAS control on the Gate Trigger Unit 1A53A3A1A1 until the gate pulses just appear beyond the 180° position on the phase reference (see figure 5-87 a.).

Step 7. Turn Test Set Driver 300427 control potentiometer clockwise until a 90° delay angle is observed between the gate pulses and the phase reference signal (figure 5-87 b.).

Step 8. Adjust BALANCE potentiometer on Gate Trigger Unit 1A53A3A1A1 until the two gate pulses observed are coincident or within 2.5° of each other (see figure 5-87 c.).

Step 9. Repeat steps 4 through 8 on Gate Trigger Units 1A53A3A1A2 and 1A53A3A1A3.

Step 10. Proceed to Three Phase Balance Adjustment, paragraph (b).

(b) **THREE PHASE BALANCE ADJUSTMENT.**

Step 1. Connect the three Gate Trigger Units as shown in figure 5-106.

Step 2. Connect one oscilloscope probe across the 10 ohm resistor and the second oscilloscope probe to the phase reference.

Step 3. Adjust Test Set Driver control potentiometer for a 160° delay angle between the gate pulses and the phase reference.

Step 4. Observe the three positive gate pulses at the 160° delay angle point. They should be almost coincident (within 2.5° of each other). See figure 5-87 d.). If the spacing is outside these limits, adjust the BIAS control on the Gate Trigger Unit(s) to bring the three pulses together within the required spacing.

Step 5. Adjust the Test Set Driver 300427 control potentiometer for a delay angle of 30°.

Step 6. If the phase matching is outside the required limits (pulses not coincident or more than 2.5° spacing), adjust the GAIN control on the Gate Trigger Unit(s) which appears to show the greatest deviation to obtain coincidence of the pulses within the required spacing.

Step 7. Repeat steps 3 through 6 for angle delays of 60°. 90°, and 120°, until phase balance limits are obtained between 30° and 160°.

5.2.4.8.2. **CHOP-OFF LIMITER 1A53A3A1A4 ADJUSTMENT.** To perform the current limit adjustment on Chop-Off Limiter 1A53A3A1A4 proceed as follows:

WARNING

If an extender cable is not available, it will be necessary to make these adjustments on a trial and error basis in order to prevent exposure to high voltage. Observe all safety regulations at all times.

Step 1. Turn on transmitter and set it for a full load with IPA Voltage at 10.75 KV.

Step 2. Set 460V INPUT CB1 to OFF.

Step 3. Loosen locknut on CURRENT LIMIT control P1 on Chop-Off Limiter 1A53A3A1A4, located on the back of rack 1A53A3 (see figure 5-104). Turn CURRENT LIMIT control slightly counterclockwise.

Step 4. Set 460V INPUT CB1 to ON.

Step 5. Observe that the chop-off limiter overcurrent circuit immediately turns off the bias and plate voltages. If these voltages are not turned off, repeat steps 2 through 4, observing all safety precautions, until the CURRENT LIMIT control is set to a point at which the voltages are just turned off.

Step 6. Turn the CURRENT LIMIT control clockwise one-quarter turn and tighten locknut.

5.2.4.8.3. **PREAMPLIFIER 1A53A3A1A5 ADJUSTMENT.** To perform the Preamplifier 1A53A3A1A5 adjustments, proceed as follows:

WARNING

If an extender cable is not available it will be necessary to make this adjustment on a repetitive basis in order to prevent exposure of personnel to high voltages. Observe all safety regulations at all times. Voltages up to 208 vac are present on the voltage regulator when the 460 vac power is switched off.

NOTE

The following adjustment is made to ensure that the IPA voltage does not exceed 11.25 KVDC when the OPERATE ADJUST control is fully clockwise.

Step 1. Turn on power to transmitter.

Step 2. Set OPERATE ADJUST control 1A53A2R8 fully counterclockwise.

Step 3. With PLATE VOLTAGE SELECTOR switch 1A53A2S18 in OPERATE position, observe IPA PLATE VOLTAGE meter 1A53A2M3. Reading should be approximately 9.75 KVDC. If so, proceed to step 4. If not, adjust Preamplifier CALIBRATE potentiometer slightly until 9.75 KVDC is obtained.

Step 4. Adjust OPERATE ADJUST control clockwise until IPA PLATE VOLTAGE meter 1A53A2M3 reads 11.00 to 11.25 KVDC.

If OPERATE ADJUST is at the fully clockwise position for this condition, adjustment is complete, otherwise proceed to step 5.

Step 5. Loosen locknut on Preamplifier CALIBRATE control 1A53A3A1A5-P2 and adjust control slightly counterclockwise (to decrease voltage) or clockwise (to increase voltage) as required.

Step 6. Repeat steps 4 and 5 until IPA

PLATE VOLTAGE is 11.00 to 11.25 KVDC with OPERATE ADJUST control fully clockwise.

Step 7. Tighten locknut on 1A53A3A1A5-P2.

5.2.4.9. **TUBE SEASONING.** For trouble-free on-air operation, new second IPA and PA tubes should be seasoned after installation as follows:

Step 1. Record tube serial numbers and the PLATE HOURS (1A53A2M1) meter reading.

Step 2. Set V7 BIAS ADJUST and V8 BIAS ADJUST (figure 5-108) to their clockwise limits.

Step 3. Disconnect the signal cable from 1A4J1.

Step 4. Put the transmitter group in the standby status at the transmitter control equipment.

Step 5. Start the transmitter, turning on bias voltages but not plate voltages, according to tables 3-12 and 3-13 and steps 1, 2, and 3 of table 3-14.

Step 6. Set LEFT PA BIAS ADJUST for 1.25 KV on the LEFT PA BIAS meter.

Step 7. Set RIGHT PA BIAS ADJUST for 1.25 KV on the RIGHT PA BIAS meter.

Step 8. Set the LOCKOUT-READY switch to LOCKOUT.

Step 9. Set the PLATE VOLTAGE MAINTENANCE ADJUST control to 0.

Step 10. Set the PLATE VOLTAGE SELECTOR to MAINT.

Step 11. Set the PLATE VOLTAGE MAINTENANCE ADJUST for 5 KV on the PA PLATE VOLTMETER.

Step 12. Gradually increase the PA plate voltage according to the following schedule:

Plate Voltage Range	**Maximum Rate of Increase**
5 kV to 10 kV	1 kV per minute
10 kV to 21.5 kV	0.5 kV per minute

NOTE

If PA or IPA overloads occur, reduce the PA plate voltage to a level 2 kV below that which the overload occurred and resume seasoning.

Step 13. Continue seasoning for at least two hours after 21.5 kV is reached.

Step 14. Record the PLATE HOURS meter reading when seasoning is completed.

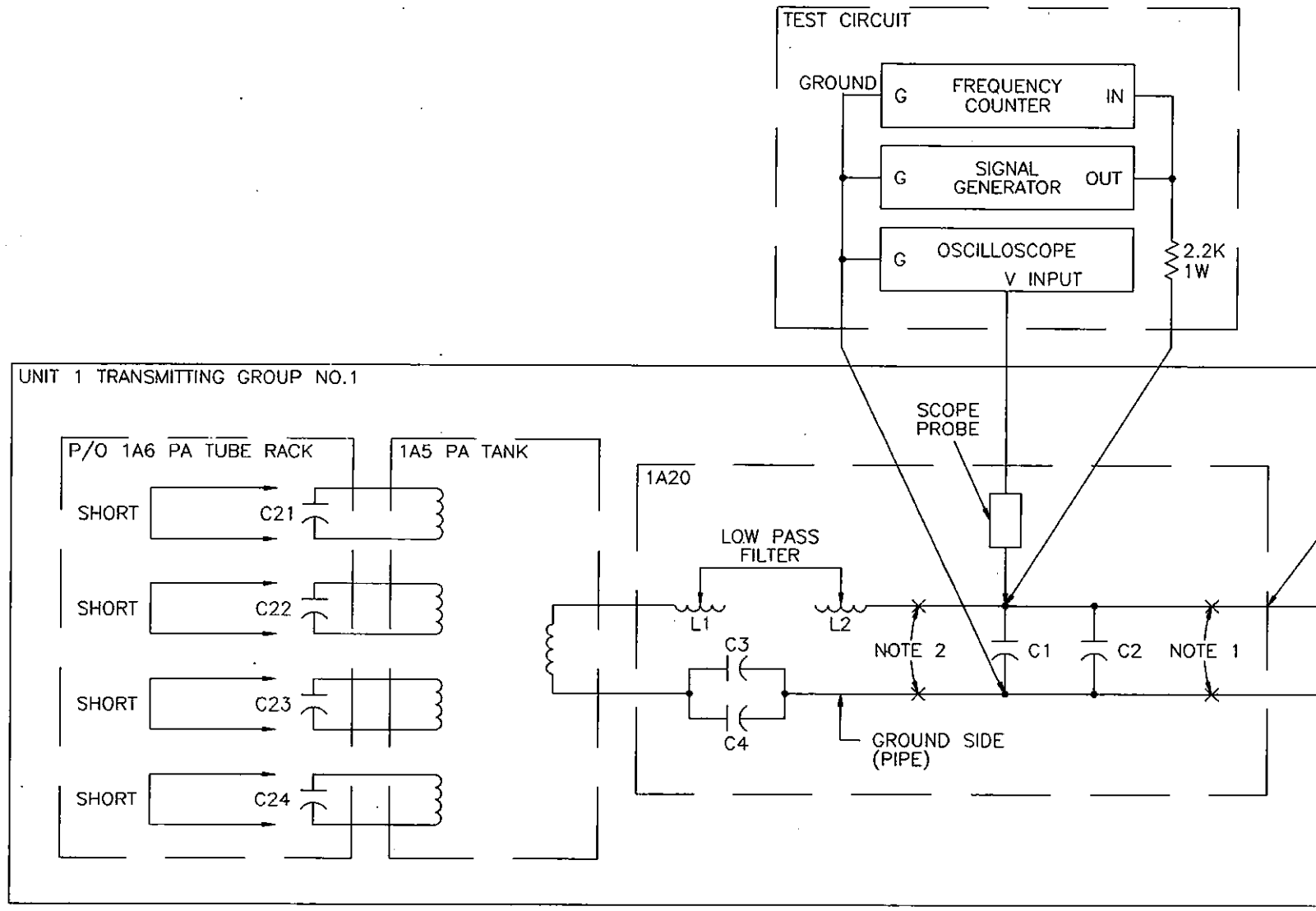
5.2.4.10. **BIAS ADJUST.** Bias voltages are adjusted as follows (figure 5-108):

Step 1. Select the transmitting group under test as the standby transmitter.

Step 2. Connect oscilloscope high voltage probe to ground and to the junction 1A4C5 and 1A4C54. Lock amplifier group front doors.

Step 3. Set the following controls to the indicated position:

CONTROL	POSITION
PLATE VOLTAGE SELECTOR 1A53A2S18	OFF
MAINTENANCE ADJUST 1A53A2R9	Fully, CCW (0.0)
LOCKOUT-READY 1A12S1	LOCKOUT
All water flow valves	Open
All interlocked doors	Closed
208 vac circuit breaker on primary power distribution panel	ON
460 vac circuit breaker on primary power distribution panel	ON
EMERGENCY STOP 1A53A2S19	RUN
208 vac circuit breaker 1A53A3CB2	ON
POWER 1A53A2S17	ON
FILAMENTS 1A53A2S13	ON
BIAS PEDESTAL CCT CONTROL 1A4S8	ON
BIAS AND LOW VOLTAGE 1A53A2S7	ON
HIGH VOLTAGE RECTIFIER POWER 1A53A3S1	ON
LOCKED ON 1A53A3S2	LOCKED



UNIT 1 TRANSMITTING GROUP NO.2

SAME AS TRANSMITTING GROUP NO.1

NOTES:

1. OPEN HERE TO TUNE FILTER INPUT CIRCUIT. INPUT CIRCUIT CONSISTS OF C1, C2, C3, C4, L1, L2 AND SECONDARY OF PA TANK.
2. OPEN HERE TO TUNE FILTER OUTPUT CIRCUIT. OUTPUT CIRCUIT FOR STATION WITH ANTENNA INSTALLED ADJACENT TO TRANSMITTERS CONSISTS OF C1, C2, 3L1 AND ANTENNA. FOR STATIONS HAVING 500 FOOT TRANSMISSION LINES, OUTPUT CIRCUIT CONSISTS OF C1, C2, 500 FOOT LINE, DOG HOUSE COIL AND ANTENNA. (ALSO SEE NOTE 4)
3. RELAYS K1, K2, K11 AND K10 ARE SHOWN DE-ENERGIZED MODE.
4. DISCONNECT K6 FROM ANTENNA WHEN TUNING OUTPUT CIRCUIT.
5. KEEP ALL TEST LEADS AS SHORT AS POSSIBLE AND WELL SHIELDED.

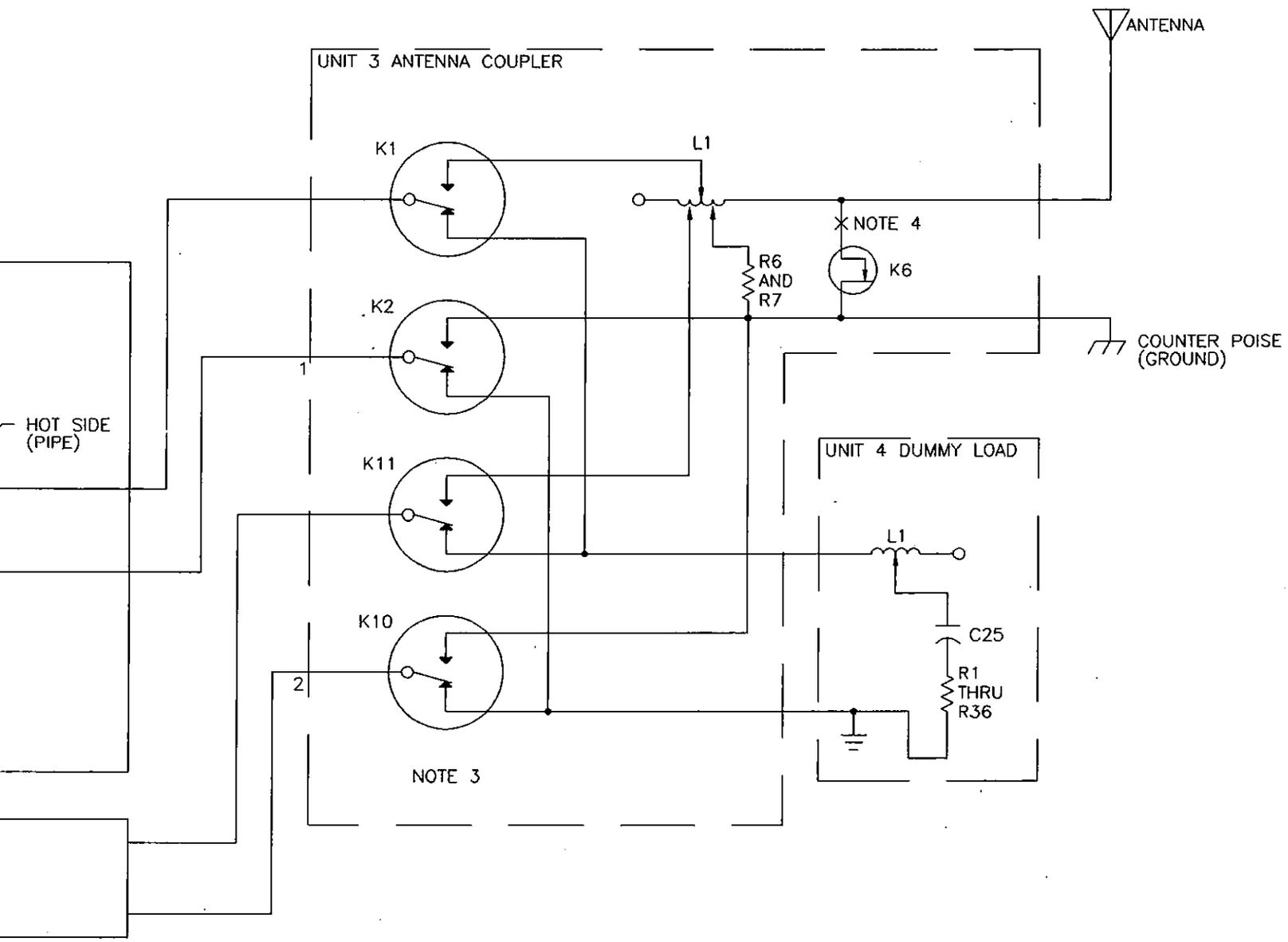


Figure 5-110. Antenna Coupler CU-2171/FPN-44A Tuning Test Setup

460V INPUT 1A53A3CB1	ON
Set STANDBY LEVEL 1A4A1R1	Fully CCW

Step 4. Turn Bias controls 1A4R149, 1A4R150, 1A4R193, 1A4R194, 1A4R195, 1A4R197, and 1A4R198 fully clockwise. Adjust 1A4T5 an 1A4T6 so that LEFT PA BIAS meter and RIGHT PA BIAS meter indicate 1.2 kv.

Step 5. Set PLATE VOLTAGE SELECTOR to MAINT.

Step 6. Adjust MAINTENANCE ADJUST so that IPA PLATE VOLTAGE meter reads 10.75 kv.

Step 7. Set BIAS PEDESTAL CCT CONTROL 1A4S8 to OFF.

Step 8. Perform the following adjustments:

(1) Adjust LEFT 1ST IPA BIAS ADJUST 1A4R149 so that LEFT 1ST IPA CURRENT meter indicates 50 mA.

(2) Adjust RIGHT 1ST IPA BIAS ADJUST 1A4R150 so that RIGHT 1ST IPA CURRENT meter indicates 50 mA.

(3) Adjust LEFT 2ND IPA BIAS ADJUST 1A4R97 so that LEFT 2ND IPA PLATE CURRENT meter indicates 200 mA.

(4) Adjust RIGHT 2ND IPA BIAS ADJUST 1A4R98 so that RIGHT 2ND IPA PLATE. CURRENT meter indicates 200 mA.

(5) Repeat step 8 (1) through (4) until indicated readings are obtained simultaneously.

Step 9. Set BIAS PEDESTAL CCT CONTROL 1A4S8 to ON.

Step 10. Observe the bias pedestal generator output on the external oscilloscope and adjust controls 1A4R193, 1A4R194 and 1A4R195 as follows:

NOTE

Original ITT specifications listed a 1200 VP-P pedestal setting. To reduce power consumption, a 750 VP-P setting is recommended. This setting may be varied from 750-1200 VP-P to produce optimal

transmitter operations.

(1) Rotate output level control R193 to provide 750 Vp-p pedestal swing.

(2) Adjust negative clipping control R194 to the point where the trailing edge of the 1st pedestal just "bottoms". It is imperative that R194 be left in the most counterclockwise position which just produces 1st pedestal "bottoming", otherwise peak output will be reduced.

(3) Adjust positive clipping control R195 counterclockwise until right hand corner of last bias pedestal "tilts". It is imperative that R195 be left in the most clockwise position which just removes last pedestal tilt, otherwise peak output will be reduced.

(4) When the above adjustments are completed, the bias pedestal group as observed on the external oscilloscope should appear as shown below and have the following characteristics (Figure 5-109):

(a) All pedestal amplitudes 750 ± 100 volts peak-to-peak.

(b) Pedestal width at 90% amplitude 450 ± 50 usec.

Step 11. Adjust STANDBY LEVEL 1A4A1R1 for normal standby drive level.

Step 12. Record the following meter indications:

(a) PA CATHODE CURRENT meter 1A6V1 _____mA
PA CATHODE CURRENT meter 1A6V3 _____mA

Total _____mA

(2) PA CATHODE CURRENT meter 1A6V2 _____mA
PA CATHODE CURRENT meter 1A6V4 _____mA

Total _____mA

Step 13. If the totals of step 12 are more then 20 mA apart, adjust STANDBY LEVEL 1A4A1R1 fully CCW and repeat steps 7 through 12. If totals remain more then 20 mA apart, tube replacement for weak tubes/cutoff voltage matching or corrective maintenance is required at the amplifier stages indicating the unbalance.

5.2.4.11. **TUNING.** This procedure covers the method used for tuning the antenna coupler (Unit 3), dummy load (Unit 4) and low pass filter (Unit 1A20). Refer to figure 5-110.

WARNING

Do not attempt to perform the following antenna coupler tuning procedures during an electrical storm.

WARNING

Before proceeding with the following steps, open the antenna coupler doors and touch the grounding hooks to the leads of inductor 3L1 and to the tubing. Then, replace the grounding hooks in their appropriate holders. Also, in both transmitter No. 1 and transmitter No. 2, use grounding hooks to ground capacitors 1A20C1, 1A20C2, 1A20C3, and 1A20C4 in the low pass filter.

Proceed with extreme care since ac control voltage is still applied to the antenna coupler and to the dummy load.

5.2.4.11.1. **PRELIMINARY SET-UP.**

Step 1. In each transmitting group, with the 208 VAC circuit breaker 1A53A3CB2 set to OFF, remove enclosure blower fuses (1A11F7, 1A11F8, and 1A11F9) and dummy load blower fuses (1A11F13, 1A11F14, and 1A11F15) to prevent high noise levels.

Step 2. Set the controls listed below in the positions indicated for each transmitting group.

CONTROL	TRANSMITTING GROUP BEING TUNED	OTHER TRANSMITTING GROUP
EMERGENCY STOP 1A53A2S19	RUN	RUN
208 VAC Circuit Breaker 1A53A3CB2	ON	ON
HIGH VOLTAGE RECTIFIER POWER 1A53A3S1	OFF (LOCKED OFF)	OFF (LOCKED OFF)
460 V INPUT CB1 1A53A3CB1	OFF	OFF
POWER Switch 1A53A2S17	ON	ON
FILAMENTS Switch 1A53A32S13	OFF	OFF
BIAS AND LOW VOLTAGE 1A53A2S7	OFF	OFF
LOCKOUT-READY 1A12S1	READY	READY
PLATE VOLTAGE	OPERATE	OPERATE
SELECTOR 1A53A2S18	OPERATE	OPERATE

Set control on Transmitter Control Equipment so that transmitter being tuned is the standby transmitter.

Step 3. Open output circuit for loop 1 (filter input circuit) tuning as indicated by note 1 in figure 5-110 as follows:

(a) Disconnect the copper tubing that connects 1A2OC4 to the 1-3/8 inch (ground) copper pipe.

(b) Disconnect the copper tubing which goes from 1A2OC2 and 1A2OL2 to the 1-3/8 inch (hot) copper pipe.

Step 4. Set coils L1 and L2 in low pass filter 1A20 for a total of (15) active turns by connecting top lead (with slide clip at each end) symmetrically between L1 and L2.

Step 5. In the PA tube rack 1A6, ground capacitors C21 through C24 with associated grounding hooks, then connect shorting (clip) leads across C21 through C24.

Step 6. Connect the test equipment, including the 2.2k non-inductive (carbon) resistor as shown in (figure 5-110):

5.2.4.11.2. **FILTER INPUT CIRCUIT TUNING.**

NOTE

It is imperative that the filter input circuit be tuned precisely. Place the test equipment on a chair or stool alongside the filter rack. Dress all leads as short as possible. Make certain that leads do not cross or come in contact with the filter elements.

Step 1. Adjust the oscillator frequency for a reading of 100 kHz on the frequency counter.

Step 2. Use a fuse puller (to isolate body from the circuit) to slide the 1A20 L1 and L2 coil taps along the coils for a peak indication on the oscilloscope.

Step 3. Check the tuning by moving away from the circuit and adjusting the oscillator for a peak on the oscilloscope. When the peak occurs the frequency counter reading should be at 100 kHz. If the frequency counter does not read 100 kHz. slide the tap slightly to a new position, then repeat this adjustment until the frequency counter reads 100 kHz.

Step 4. Mark the tuning point on coils 1A20L1 and L2.

5.2.4.11.3. **FILTER OUTPUT CIRCUIT TUNING (DUMMY LOAD).**

Step 1. Reconnect the copper tubing in the low pass filter 1A20 such that only the parallel combination of Z1 and C2 are across the output terminals going to the Antenna Coupler. Refer to figure 5-110. Note 2.

Step 2. Using the same tuning method as the filter input circuit tuning, adjust the tap on 4L1 in the dummy load until maximum deflection or a peak occurs in the oscilloscope.

Step 3. Mark the tuning point for transmitter No. 1 on the dummy load tuning coil.

5.2.4.11.4. **FILTER OUTPUT CIRCUIT TUNING (ANTENNA).**

Step 1. Switch the transmitter control equipment to put the transmitter being tuned in the operate mode.

Step 2. Using the same tuning method outlined in filter input circuit tuning, adjust the tap from K1 (K11) on 3L1 until a maximum deflection or peak occurs on the oscilloscope.

Step 3. Mark the tuning point for the transmitter being tuned on the loading coil 3L1 and tighten tap on coil.

NOTE

Transmitter tuning is complete. Proceed to tune the other transmitter by performing

paragraphs 5.2.4.11 and its subparagraphs.

5.2.4.11.5. **FINAL DUMMY LOAD COIL ADJUSTMENT.**

Step 1. Compare the tuning point on 4L1 for the first transmitter to the tuning point on 4L1 for the second transmitter.

Step 2. Split the difference and permanently install the tap on the dummy load coil.

Step 3. Reconnect circuits for normal operation as follows:

(a) Disconnect the test equipment and remove from enclosure.

(b) Reconnect the input circuits in transmitter 1 and 2 low pass filters 1A20.

(c) Disconnect shorts from capacitors C21 through C24 in PA Tube Rack 1A6.

(d) Turn power switch 1A53A2S17 OFF and replace blower fuses 1A11F7, F8, F9, F13. F14 and F15.

5.2.4.12. **METER CALIBRATION ADJUSTMENTS.** The following are normally factory adjustments and are not often required in the field. However, aging or replacement of circuit components could necessitate adjustment.

WARNING

It will be necessary to make these adjustments on a trial-and-error basis in order to prevent exposure to high voltage. Observe all safety regulations at all times. Extreme care must be exercised to make HV Probe connections in a safe and secure manner that will provide safe clearance for personnel when making measurements or resistor adjustments. After each test. use grounding hook to discharge high voltage circuit before removing connections.

5.2.4.12.1 **LOW VOLTAGE PLATE METER 1A53A2M9. CALIBRATION ADJUSTMENT.**

Step 1. Connect a Simpson Model 260 Multimeter (or equivalent) between terminals 1A53A7E7(+) and 1A53A7E6 (COMMON). Set the multimeter range switch to measure approximately 500 vdc.

Step 2. Place the transmitter in normal operation. Observe and note the reading of the multimeter connected in step 1.

Step 3. Adjust 1A53A7R6 to obtain the same reading on LOW

VOLTAGE PLATE meter 1A53A2M9 as that obtained in step 2. Then lock 1A53A7R6, taking care not to disturb the setting.

5.2.4.12.2. **-5KV BIAS METER 1A53A2M4. CALIBRATION ADJUSTMENT.**

Step 1. Connect Simpson Model 260 Multimeter (or equivalent) between terminals 1A53A7E5(-) and 1A53A7E6 (COMMON). Connect the negative probe to the multimeter DC 5000V jack. Set the multimeter range switch to measure approximately -5000 vdc.

Step 2. Place the transmitter in normal operation. Observe and note the voltage reading of the multimeter connected in step 1.

Step 3. Adjust 1A53A7R5 to obtain the same reading on 5KV BIAS meter 1A53A2M4 as that obtained in step 2. Then lock 1A53A7R5, taking care not to disturb the setting.

5.2.4.12.3. **IPA PLATE VOLTAGE METER 1A53A2M4 CALIBRATION ADJUSTMENT.**

Step 1. Connect a Simpson Model 260 Multimeter (or equivalent) using a 25 kV High Voltage Probe between 1A53A7E3(+) and 1A53A7E6 (COMMON). Set the multimeter range switch to measure approximately +10.75 vdc.

Step 2. Place the transmitter in normal operation. Observe and note the voltage reading on multimeter connected in step 1.

Step 3. Adjust 1A53A7R4 to obtain the same reading on IPA PLATE VOLTAGE METER 1A53A2M3 as that obtained in step 2. Then lock 1A53A7R4 taking care not to disturb the setting.

5.2.4.12.4. **PA PLATE VOLTAGE METER 1A53A2M2 CALIBRATION ADJUSTMENT.**

Step 1. Connect a Simpson Model 260 Multimeter (or equivalent) using a 25 kV High Voltage Probe between terminals 1A53A7E1(+) and 1A53A7E6 (COMMON). Set the multimeter range switch to measure approximately 21,500 vdc.

Step 2. Place the transmitter in normal operation. Observe and note the voltage reading on the multimeter connected in step 1.

Step 3. Adjust 1A53A7R3 to obtain the same reading on PA PLATE VOLTAGE meter 1A53A2M2 as that obtained in step 2. Then lock 1A53A7R3 taking care not to disturb the setting.

5.2.4.13. **OVERLOAD ADJUSTMENTS.** The following are normally factory adjustments and are not often required in the field. However, aging or replacement of circuit components could necessitate adjustment.

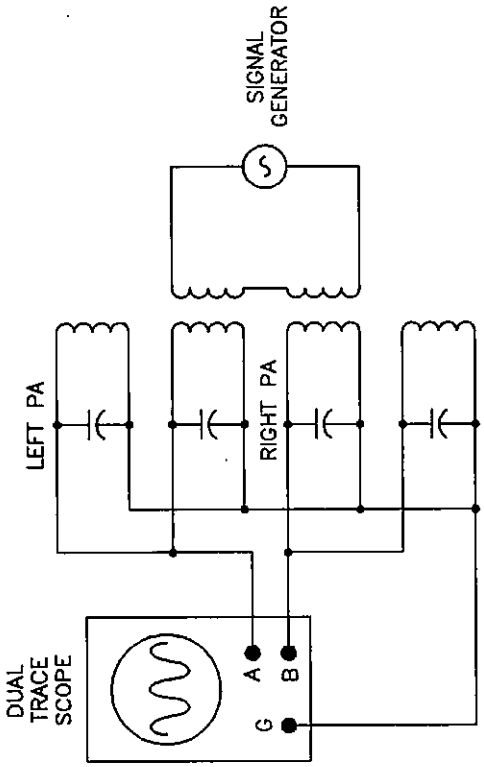


Figure 5-111. Axial Alignment of PA Tank Test Setup

FIGURE DELETED

Figure 5-112. Gain Balance Adjustment Waveforms

WARNING

It will be necessary to make these adjustments on a trial-and-error basis in order to prevent exposure to high voltage. Observe all safety regulations at all times.

5.2.4.13.1. **PA PLATE OVERVOLTAGE RELAY 1A53A7K1 ADJUSTMENT.**

Step 1. Place the transmitter into operation in the maintenance mode. (PLATE VOLTAGE SELECTOR switch in the MAINT position).

Step 2. Adjust MAINTENANCE ADJUST control 1A53A2R9, slowly until the PA PLATE VOLTAGE meter 1A53A2M2 reads 23.6 kvdc. If circuit breaker 460V INPUT CB1 trips before the PA PLATE VOLTAGE meter reaches 23.6 kvdc, set PLATE VOLTAGE SELECTOR switch to the OFF position and adjust 1A53A7R1 slightly in the clockwise direction. If circuit breaker 460V INPUT CBI does not trip at 23.6 kvdc, set PLATE VOLTAGE SELECTOR switch to OFF and adjust 1A53A7R1 slightly in the counterclockwise direction.

Step 3. Decrease the setting of MAINTENANCE ADJUST control slightly, then repeat steps 1 and 2 until 1A53A7R1 is adjusted to trip the circuit breaker within two seconds after the voltage reaches 23.6 kvdc. Then lock 1A53A7R1, taking care not to disturb the setting.

5.2.4.14. **BIAS UNDERVOLTAGE CIRCUIT ADJUSTMENT.** The following is normally a factory adjustment and is not often required in the field. However, aging or replacement of circuit components could necessitate adjustment. If this is the case, proceed as follows:

WARNING

It will be necessary to make these adjustments on a trial-and-error basis in order to prevent exposure to high voltage. Observe all safety regulations at all times.

Step 1. Place the transmitter in normal operation: but set the PLATE VOLTAGE SELECTOR switch to OFF.

Step 2. Adjust 1A53A7R2 in a counterclockwise direction until the BIAS AND LOW VOLTAGE ON indicator goes out. Then, readjust 1A53A7R2 in a counterclockwise direction just to the point at which the indicator lights and lock it, taking care not to disturb the setting.

Step 3. Set the PLATE VOLTAGE SELECTOR switch to OPERATE and observe that the PLATE ON indicator lights. If it does not, repeat steps 1 and 2 until the BIAS AND LOW VOLTAGE ON indicator lights and the PLATE ON indicator remains lit.

5.2.4.15. **POWER AMPLIFIER TANK 1A5 AXIAL ALIGNMENT.**

WARNING

Set 460 V INPUT circuit breaker 1A53A3CB1 and 208 vac circuit breaker 1A53A3CB2 to OFF.

This procedure covers the method to be used for axial alignment of the PA Tank Coil secondary for reduction of second harmonic output. Refer to figure 5-111.

Step 1. Interconnect the rear terminals of both left PA plate tuning capacitors. (Terminals toward the PA tank coil 1A5).

Step 2. Interconnect the rear terminals of both right PA plate tuning capacitors.

Step 3. Interconnect the front terminals of all right and left PA plate tuning capacitors. Disconnect the PA secondary leads (welding wire) and connect a 382/URR Signal Generator (calibrated to the Loran-C frequency standard) to the output leads. Set the oscillator to 100 kHz and maximum drive.

Step 4. Utilizing a dual trace scope set for algebraic subtraction calibrate on .05V DIV for both A and B traces by connecting trace A and B probes together on the rear terminals of the left PA tuning caps. Utilizing the vertical deflection verniers, set the scope presentation for a null. (This action ensures both A and B traces have same gain.)

Step 5. Leave the trace A probe on the rear terminal of the left PA. Place the trace B probe on the rear terminals of the right PA tuning capacitors. Place both probe grounds on the front terminals. (Do not touch or move the signal generator or scope.) The circuit should appear as shown in figure 5-111.

NOTE

Set the scope for algebraic addition for the following adjustments.

Step 6. Remove all bolts securing the secondary core.

Step 7. Move the PA tank secondary by lightly tapping the coil, first in one direction, then the other. Continually check the scope for a null. The null point is extremely critical, therefore, the coil should not be moved more than 1/16 inch at a time. When the null point is found the coil should be marked and rebolted. Remove test equipment and restore transmitter wiring.

Step 8. Make sure the coil is marked for the correct position. Later when the station is put on the air, check the output spectrum by looking at the second harmonic and noting its magnitude. Shut the transmitter down and move the secondary coil

an inch in one direction from the mark and check the spectrum again noting its magnitude at the second harmonic. Shut the transmitter down again and move the secondary coil an inch in the opposite direction from the mark and again check the spectrum to note if the mark is actually at the null point for the second harmonic output.

Step 9. If the mark is at the null point for the second harmonic output, move the secondary coil back to the correct marked position and resecure all bolts.

5.2.4.16. **OPERATING ADJUSTMENTS.** Gain balance control adjustments have been eliminated by FC3 (feedback).

5.2.4.17. **AC OVERLOAD ADJUSTMENT.** The ac overload sensing circuit is set at a high level during manufacture because the normal operating currents will depend upon the loran repetition interval and other factors. For the most effective protection, this circuit should be readjusted after installation, replacement of parts in the ac overload sensing circuit or a change in the mode of operation. The ac overload circuit includes three current transformers (1A53A3T5, 1A53A3T6, and 1A53A3T7), the overcurrent sub-assembly (figure 5-51), and the AC OVERLOAD indicator (1A53A2DS10). Adjust the circuit by using OVER-CURRENT TRIP SETTING controls 1A53A3R4, 1A53A3R5, and 1A53A3R6 (figure 5-51) as follows:

Step 1. Set 1A53A3R4, 1A53A3R5, and 1A53A3R6 at their clockwise limits for maximum ac current.

Step 2. Record the IPA PLATE CURRENT and PA PLATE CURRENT when the transmitting group is operating into the antenna at maximum power with the assigned repetition interval.

Step 3. Transfer to the standby mode and switch to LOCAL control. With the transmitting group supplying the dummy load, adjust the STANDBY LEVEL control so that the IPA PLATE CURRENT and PA PLATE CURRENT are equal to or slightly greater than they were when operating into the antenna.

Step 4. Turn 1A53A3R4 CCW until the overload circuit trips, shutting off plate and bias voltages. The AC OVERLOAD indicator will go out and remain out until it is reset by the OVERLOAD AND 3 STRIKE RESET button. Set 1A53A3R4 1/8 turn clockwise from the point at which the overload circuit is tripped.

Step 5. Repeat step 4 with 1A53A3R5 and 1A53A3R6.

5.2.4.18. **INSTRUMENT SHUNT ADJUSTMENTS.** The following adjustments are required if 10.75 kvdc overload relay 1A53A4K1 or 21.5 kvdc overload relay 1A53A4K2 circuits are repaired. Perform these adjustments with power off.

5.2.4.18.1. **10.75 KVDC OVERLOAD RELAY 1A53A4K1 ADJUSTMENT.**

Step 1. Disconnect the leads from the following terminals: 1A53A4E1, 1A53A4E2, 1A53A4TB1-10, 1A53A4TB1-8, and 1A53A4TB1-7.

Step 2. Connect ohmmeter on lowest range across 1A53A4TB1-3 and 1A53A4TB1-4.

Step 3. Connect one 26 vdc test power supply to 1A53A4TB1-10(+) and 1A53A4TB1-8(-). Connect the second 26 vdc test power supply to 1A53A4TB 1-8(+) and 1A53A4TB1-7(-).

Step 4. Connect RFL Calibration Standard 829G to 1A53A4E1(+) and 1A53A4E3(-).

Step 5. Adjust calibration standard to supply 4 amperes dc and adjust 1A53A4R1 and 1A53A4R2 as follows:

Step 6. Set 1A53A4R1 and 1A53A4R2 to their clockwise limits.

Step 7. Check that ohmmeter indicates an open current

Step 8. Slowly turn 1A53A4R2 counterclockwise until 1A53A4K1 just closes as indicated by the ohmmeter.

Step 9. Reduce the output of the calibration standard to 2 amperes and observe that relay 1A53A4K1 opens as indicated by the ohmmeter.

Step 10. Increase the output of the calibration standard until relay 1A53A4K1 just closes.

Step 11. Adjust 1A53A4R1 so that relay 1A53A4K1 closes at 10.0 ± 10% amperes when steps 9 and 10 are repeated.

Step 12. Tighten locknuts on 1A53A4R1 and 1A53A4R2.

Step 13. Disconnect ohmmeter and calibration standard.

5.2.4.18.2. **21.5 KVDC OVERLOAD RELAY 1A53A4K2 ADJUSTMENT.**

Step 1. Disconnect the leads from the following terminals: 1A53A4E1, 1A53A4E2, 1A53A4TB1-10, 1A53A4TB1-8, and 1A53A4TB1-7.

Step 2. Connect ohmmeter on lowest range across 1A53A4TB1-3 and 1A53A4TB1-5.

Step 3. Connect one 26 vdc test power supply to 1A53A4TB1-10(+) and 1A53A4TB1-8(-). Connect the second 26 vdc test power supply to 1A53A4TB1-8(+) and 1A53A4TB1-7(-).

Step 4. Connect calibration standard to 1A53A4E2(+) and 1A53A4E3(-).

Step 5. Adjust calibration standard to supply 10 amperes dc

and adjust IA53A4R3 and 1A53A4R4 as follows:

Step 6. Set 1A53A4R3 and 1A53A4R4 to their clockwise limits.

Step 7. Check that ohmmeter indicates an open circuit.

Step 8. Slowly turn 1A53A4R4 counterclockwise until 1A53A4K2 just closes as indicated by the ohmmeter.

Step 9. Reduce the output of the calibration standard to 5 amperes and observe that relay 1A53A4K2 opens as indicated by the ohmmeter.

Step 10. Increase the output of the calibration standard until relay 1A53A4K2 just closes.

Step 11. Adjust 1A53A4R3 so that relay 1A53A4K2 doses at 10.0 ± 10% amperes when steps 9 and 10 are repeated.

Step 12. Tighten locknuts on 1A53A4R3 and 1A53A4R4.

Step 13. Disconnect ohmmeter and calibration standard.

5.2.4.19. **RELAY POWER SUPPLY ADJUSTMENT.** Adjustment of relay power supply relay 1A53A3K36 circuit is performed with no power supplied to the transmitter.

Step 1. Set 1A53A3R74 fully counterclockwise.

Step 2. Connect ohmmeter on the RX1 range to 1A53A3TB10-3 and 1A53A3TB10-4.

Step 3. Connect autotransformer and isolation transformer as shown on figure 5-96. Connect autotransformer to 1A53A3TBlO-9 and 1A53A3TB10-10. Adjust autotransformer for 120 vac output.

Step 4. Slowly turn 1A53A3R74 clockwise until relay 1A53A3K36 contacts close as indicated by continuity on ohmmeter.

Step 5. Continue turning 1A53A3R74 clockwise until chatter of relay 1A53A3K36 just stops.

Step 6. Tighten relay 1A53A3R74 locknut.

5.2.4.20. **POWER SUPPLIES 1A4A6A1 AND 1A4A6A2.** If a functional section of the power supply is suspected of being faulty, trouble shoot in accordance with the information provided in the applicable service diagram.

5.2.4.20.1. **TEST EQUIPMENT.** The test equipment required for functional section troubleshooting is the same as that required for system troubleshooting and are listed in table 5-1.

5.2.4.20.2. **CONTROL SETTINGS.** The initial control settings

required for functional section trouble shooting are identical to those required for system trouble shooting, and are listed in table5-11.

The following paragraphs provide troubleshooting, calibration, and performance testing procedures for the -260 Vdc (1A4A6A1) and -150 Vdc (1A4AOA2) power supplies.

5.2.4.20.3. **TROUBLESHOOTING.** Table 5-12 lists a number of malfunction symptoms and their probable causes. The table covers symptoms which are attributable to a single component failure only. This should not be interpreted to mean that there could not be other causes for the tabulated symptoms. Footnotes in the table indicate which components may be damaged due to a chain-reaction effect. If any amplifier components are replaced, unit may require recalibration.

5.2.4.20.4. **CALIBRATION.** Calibration entails the checking and, if necessary, the adjustment of the comparison-bridge and current-foldback circuits.

(1). COMPARISON BRIDGE.- To check and, if required, adjust the comparison-bridge circuit, proceed as follows:

(a) Rotate OUTPUT ADJUST to approximately the midrange position.

(b) Remove unit nameplate and slide enclosure plate.

(c) Turn bridge-voltage potentiometer shaft (normally concealed by nameplate) to the midrange position.

(d) Connect a sensitive dc voltmeter (0 - 10V range) across terminal 2 (+ SENSE) and terminal stud E3 on component board.

(e) Assure that links are firmly in place across terminals 1 and 2, and 3 and 4.

(f) Apply a nominal 115V input to terminals 6 and 7. Voltmeter should indicate between 7.8 and 8 volts. If it does not use potentiometer R15 to adjust.

(g) Remove input power, and reconnect voltmeter across terminal 1 and 4. Select a voltmeter range compatible with unit output ratings.

(h) Apply nominal input power and rotate OUTPUT ADJUST from stop-to-stop. At left-hand stop, voltmeter should indicate no more than the minimum value of the unit's specified range, and at right-hand stop, at least the maximum value.

(i) Remove input, disconnect voltmeter, and before remounting enclosure, apply locking compound to R15.

TABLE 5-11. TRANSMITTING GROUP INITIAL CONTROL SETTINGS

CONTROL	SETTING
NOTE: Set transmitting control equipment to put transmitting group under test in standby.	
208 vac and 460 vac circuit breakers on power distribution panel	ON
EMERGENCY STOP 1A53A3S19	RUN
1A53A3CB2 AND 1A53A3CB4	ON
All interlocked doors and drawers (including antenna coupler and electrical dummy load)	Closed
LOCAL-REMOTE 1A11S1	REMOTE
POWER 1A53A2S17	OFF/RESET
FILAMENTS 1A53A2S13	OFF
BIAS AND LOW VOLTAGE 1A53A2S7	OFF
PLATE VOLTAGE SELECTOR 1A53A2S18	OFF
POWER 1A3A9A2S1 and 1A3A18A2S1	ON
SELECTOR 1A3A9A2S2 and 1A3A18A2S2	AUTO
HIGH VOLTAGE RECTIFIER POWER 1A53A3S1	ON
LOCKED ON 1A53A3S2	Locked
1A53A3CB1 and 1A53A3CB3	ON

TABLE 5-12. TROUBLE SHOOTING 1A4A6A1 AND 1A4A6A2

SYMPTOM	PROBABLE CAUSE
NO OUTPUT	a. Transistor Q1, Q2, Q3, or Q4 open. (notes 1 and 2) b. In 120 v supply transistor Q4 OPEN c. Diode CR1 open d. Transistor Q5 shorted
High Output CR3 open	a. In constant-current generator, transistor Q1 shorted, or diode CR2 or b. Driver Q3 or Q4 shorted c. Passing stage Q2 shorted (note 2) d. Potentiometer R15 or R18 defective e. Amplifier transistor Q6 or Q9 open f. Amplifier transistor Q7 or Q8 shorted g. Zener reference diode CR8 open
Low output	a. In constant current supply, CR1 shorted b. In amplifier, transistor Q6 or Q9, or zener diode CR8 shorted c. In amplifier, transistor Q7 or Q8 open d. In foldback circuit, transistor Q5 shorted
Foldback Circuit inoperative (note 3)	Transistor Q5 open
User supplied input protective device actuates	Shorted CR4, CR5, CR6, or CR7
Ripple Specifications	Open CR4, CR5, CR6, or CR7 (note 4)

Notes:

1. Parallel passing stage, if any, may be damaged as a result of an open Q2.
2. When replacing Q2, apply thermal junction compound (thermacote, Thermalloy Co. Dallas, Texas or equivalent) to both sides of wafer. Mounting screw torque is 10 lb-in.
3. Without foldback, no protection is provided for passing stage, bridge rectifiers, or input transformer. If any of these components fail, check the foldback circuit before returning unit to operation.
4. Complementary rectifier will be overloaded if one of the bridge rectifiers opens. Check before returning unit to service.

(2). CURRENT-FOLDBACK RESET.- Calibrate as follows:

NOTE

The recommended settings are:

POWER SUPPLY	FOLDBACK SETPOINT (A dc) (0 - 40 deg.C)	REGULATION (mv)
150-.5	0.69	24.0
265-.15	0.22	53.0

(a) Remove slide enclosure to expose component board.

(b) Rotate foldback adjust potentiometer (R5) fully clockwise.

(c) Connect a voltmeter across the output terminals. Apply nominal input power, and adjust output voltage to 260 Vdc (1A4A6A1) or 150 Vdc (1A4A6A2).

(d) Remove input power, and series connect an ammeter and variable load across the output terminals.

(e) Reapply input power, and adjust load so that test ammeter indicates current foldback current calculated as follows:

For ambient temperatures between 50 deg C to 71 deg C (122 deg F to 159.8 deg F)

$$I_{FB} = I_o \times 1.30 \text{ (note)} \quad 1-0.0167 \ (T-50)$$

For ambient temperatures between 40°C to 50°C (104°F to 122°F)

$$I_{FB} = I_o \times 1.25 \quad 1-.01 \ (T-50)$$

Where Io is rated current at 50 C, To is ambient temperature in degrees C.

Note: 1.30 Is based on setting being performed at room ambient. Otherwise, use 1.25.

5.2.4.20.5. **PERFORMANCE TESTING.** After repairing or adjusting a power supply, check output ripple and regulation as follows:

(1). OUTPUT RIPPLE. - To measure output ripple, proceed as follows:

(a) Connect a test setup as shown in figure 5-118. Set oscilloscope for 0.5 mV vertical and 10 ms/cm horizontal. (Oscilloscope should have at least a 30 Mhz bandwidth). Select a

150V range for ac voltmeter. Choose a 0.5 mV range for RMS meter and a range for the dc ammeter compatible with unit's rated output current. Use a resistive load with a current drawing capacity greater than unit's rated output. Use the differential voltmeter as a VTVM. Select a 15-volt range.

(b) At no load apply a 115 Vac, 60 Hz input, and adjust to the nominal output voltage.

(c) Apply load and observe oscilloscope and RMS voltmeter. Voltmeter should indicate no more than 0.3 mV; oscilloscope should display a peak-to-peak voltage no greater than 3 mV.

(2). REGULATION. - To measure output voltage dc regulation, proceed as follows:

(a) Connect unit to test setup shown in figure 4. The oscilloscope and RMS voltmeter are not necessary. Convert the voltmeter to the differential mode. Select an internal voltage equal to the unit's nominal output voltage, and set null sensitivity to the 10-mV or 20-mV range.

(b) Apply a 115 Vac, 60 Hz input, and adjust output voltage to obtain a null indication of voltmeter.

(c) With ac voltmeter indicating 115 Vac, increase load on unit until dc ammeter reads current equal the maximum rated current at 40 C (104 F). Record the deviation from voltmeter null position.

(d) Adjust voltmeter internal voltage to regain the null position. Then with full load on unit, vary input voltage at 60 Hz from 105 to 125 Vac. Note the deviation.

(e) Sum the deviations recorded in steps (c) and (d). The total should be less than the regulation voltage.

5.3.4.21. **POWER SUPPLIES 1A4A6A3 AND 1A4A6A4.** If a functional section of the power supply is suspected of being faulty, trouble shoot in accordance with the information provided in the applicable service diagram.

5.2.4.21.1. **TEST EQUIPMENT.** The test equipment required for functional section troubleshooting is the same as that required for system troubleshooting and are listed in table 5-1.

5.2.4.21.2. **CONTROL SETTINGS.** The initial control settings required for functional section trouble shooting are identical to those required for system trouble shooting, and are listed in table 5-11.

The following paragraphs provide troubleshooting, calibration, and performance testing procedures for the -24 Vdc

(1A4A6A3) and +24 Vdc (1A4A6A4) power supplies.

5.2.4.21.3 **TROUBLESHOOTING (1A4A6A3/1A4A6A4).** Table 5-13 lists a number of malfunction symptoms and probable causes. The table covers symptoms which are attributable to a single component failure only. This should not be interpreted to mean that there could not be other causes for the tabulated symptoms. Notes following the table indicate which components may be damaged due to a chain-reaction effect. If any amplifier components are replaced, unit may require recalibration.

5.2.4.21.4. **CALIBRATION.** Calibration consists of checking and/or adjusting the foldback and overvoltage protection (OVP) circuits. Perform these adjustments as follows:

(1) CURRENT-FOLDBACK RESET.-Reset current foldback as follows:

(a) Remove top cover to expose component printed-circuit board (PCB).

(b) Rotate foldback-adjust control (R4) fully clockwise.

(c) Connect a voltmeter across the output terminals. Apply nominal input power, and adjust output voltage to +24 ± 1 Vdc.

(d) Remove input Power, and connect an ammeter and variable load resistor in series across the output terminals.

(e) Reapply input power and adjust load so that the test ammeter indicates 2.875 amp. (125 percent of rated 40 C (104 F) current).

(f) Rotate R4 slowly counterclockwise until both output voltage and current begin to drop. Current foldback is then properly set.

NOTE

If the power supply is operated in other ambients, adjust foldback current reset as follows:

50°C (122°F	2.1 A
60°C (140°F)	1.7 A
71°C (159.8°F)	1.1 A

(g) Remove input power, disconnect test instruments and load. Reassemble top cover.

(2). OVERVOLTAGE TRIP POINT RESET. The OVP trip point is factory-set to 10 percent higher than the rated nominal output voltage. However, if the output voltage will be operated near its

maximum rating, it may be desired to raise the trip point. For nuisance-free OVP, the trip point should be maintained at least 10 percent above the operating voltage. To reset the OVP, proceed as follows:

(a) Rotate OVP control (R14) on panel fully clockwise.

(b) Rotate output control (R10) on panel until the output voltage is equal to the desired trip point.

(c) Rotate OVP control R14 slowly counterclockwise until the output voltage suddenly drops to zero. This indicates OVP has triggered the crowbar.

(d) Remove input power. Rotate output control fully counterclockwise (minimum voltage).

(e) Apply input power. Slowly adjust output control until desired operating voltage is obtained.

NOTE

The OVP circuit includes a time delay such that the overvoltage condition must exist for approximately 100 microseconds before the OVP fires. This delay prevents short-duration OV pulses from triggering the crowbar.

5.2.4.21.5. **PERFORMANCE TESTING.** After repairing or adjusting a power supply, check output ripple and regulations as follows:

(1). OUTPUT RIPPLE. - To measure output ripple, proceed as follows:

(a) Connect a test setup for figure 4. Set oscilloscope for 1 mv/cm vertical sensitivity and 10 ms/cm horizontal. The oscilloscope should have at least a 10 MHZ bandwidth. Select a 0-150 Vac meter. Choose a 1-mv range for the RMS voltmeter. Select a range for the dc ammeter compatible with the unit's rated output current. Use a resistive load capable of fully loading the unit to rated maximum current.

(b) At no load, apply 115 Vac, 60 HZ input. Adjust for nominal output.

(c) Apply load and observe oscilloscope rms meter. Voltmeter indication should not exceed 1mV and oscilloscope display should not exceed 5mV peak-to-peak.

(2). REGULATION. - To measure the output voltage dc regulation, proceed as follows:

(a) Connect unit to test setup per figure 5-118.

(b) Check the ripple per preceding paragraph.

(c) Use a sensitive differential dc voltmeter or dvm capable of indicating the output voltage to within 1mV.

(d) Apply 125 Vac, 60 Hz input at no load. Observe dc voltmeter indication.

(e) Increase load to maximum rating with 105 Vac input. The dc voltmeter indication should not change more than the value listed in the specifications.

5.2.4.22. **BIASSING THE TRANSMITTER.** Proper biassing of the transmitter is necessary to operation within the tube parameters. Non-linear operation causes distortion of pulse shape and out-of-band radiations.

The AN/FPN-44A transmitter should be biassed in accordance with paragraph 5.2.4.10 of the Technical Manual. Figure 5-107 gives typical voltages and currents in the Second IPA and PA.

5.2.4.23. **DRIVE ADJUSTMENT.** Drive level to the transmitter is adjusted to provide a specified value of antenna current. The antenna current available is determined by:

150 amps peak current in each PA tube.

15,000 volts swing in plate voltage on the PA tubes for the eighth pulse of the Loran-C pulse group.

TABLE 5-13 TROUBLESHOOTING 1A4A6A3 AND 1A4A6A4

SYMPTOM	PROBABLE CAUSE
1. No Output	a. Fuses F1 or F2 open b. Transistors Q1, 2 or 3 open. (notes 1 and 2) c. Diode CR1 (and CR2 if used) open. d. IC regulator U1 defective.
2. High Output	a. Regulator U1 defective. b. Transistors Q1, 2 or 3 shorted. c. Potentiometer R10 defective.
3. Low Output	a. Overload (external) causing foldback limiting. b. OV tripped. Remove Q5 anode before proceeding. c. Defective regulator U1.
4. Foldback circuit inoperative	a. Defective regulator U1. b. Shorted Q1, 2 or 3. (note 3).
5. OV circuit inoperative.	a. Q4 defective. b. Q5 defective.
6. F1 (AC) fuse blows.	CR3 or C6 shorted.
7. F2 (DC) fuse blows.	Foldback inoperative.
8. Ripple specifications degenerate	a. Open CR3 section. b. Regulator U1 defective. c. Foldback set too low.
9. Regulation specifications degenerate	a. Regulator U1 defective. b. Foldback set too low.

NOTES

1. Parallel passing stages may be damaged as a result of open Q1 and Q2.

2. When replacing Q1 and Q2, apply thermal compound (thermacote, Thermalloy Co., Dallas, Texas) or equivalent to both sides of insulating wafer. Mounting screw torque is 6 lb-in.

3. Without foldback, no protection is provided for rectifier CR3 or pass stages Q1 and Q2. If any of these components fail, check the foldback circuit before returning unit to service.

5.2.4.24. **PERIODIC CHECKS.** The feedback system will mask deteriorating transmitter condition. Periodically, the

transmitter should be operated open loop and measurements taken to determine the condition. A log should be kept of antenna current, bias voltages, tube quiescent currents and 2nd IPA and PA grid signal levels, for the eighth pulse of the Loran-C pulse group.

These parameters should be checked at least monthly. Voltages recorded by oscilloscope photographs provide an excellent record of performance and condition.

5.3. **REMOVAL, ASSEMBLY, REPAIR AND ALIGNMENT.** The following subparagraphs contain instructions for the removal, repair, and alignment of parts of the loran transmitting set. Detailed steps are provided for procedures that are not obvious.

5.3.1. **PARTS LOCATION.** The locations of all parts are shown in figures 5-7 through 5-85. These illustrations are shown in reference designation order.

5.3.2. **REMOVAL OF PARTS.** The following subparagraphs give detailed procedures for the removal of parts when warranted. The only special tool required for the removal and replacement of parts is the tube puller.

5.3.2.1. **REPLACEMENT OF POWER AMPLIFIER TUBE RACK 1A6V1 THROUGH 1A6V4 TUBES.** The F1086 tube replacement procedure is presented in Volume III, table 2, steps 28 and 29.

5.3.2.2 **MAINTENANCE OF ELECTRON TUBE LIQUID COOLER 1A2 & 1A52.** Maintenance on the primary cooling system includes cleaning the conical filter at 1A2U24. and replacing the oxygen removal U41 and demineralization mixed bed U42 cartridges when water leakage meter 1A6M5 indicates 1 ma maximum.

5.3.2.2.1. **HEAT EXCHANGER PARTS REMOVAL.** The secondary cooling system must be cleaned when the meters indicate a higher pressure than normal and the water flow meters indicate a lesser flow. Both of these indications should normally occur simultaneously. If they do, the tubes within the heat exchanger shell are dirty and must be cleaned. This is accomplished by disconnecting the secondary pipes (inlet and outlet) outside the transmitting set, connecting a pump between them, and adding hot wash oil or a detergent such as Oakite to the secondary water. The hot wash oil or detergent should then be allowed to circulate through the secondary system for approximately two hours. The secondary lines should then be connected to the water supply as before. If the secondary pressure and water flow rate have not returned to normal, the cooling tubes in the heat exchangers are clogged with hard scale and must be cleaned by mechanical means. Remove the secondary water hoses at U1 and U2 and the bottom elbow assembly of the heat exchanger (figure 5-113). Using a hard-wire brush with a flexible handle, clean the hard scale from each tube in each heat exchanger.

Scheduling of maintenance of the heat exchangers cannot be accurately determined, since it is dependent upon many unforeseen variables. These variables include secondary water purity and whether or not a closed-loop of secondary system is incorporated where a fluid-to-air exchanger is used outside the main transmitter building. It is also dependent upon the type of secondary filters used, and whether or not well water is used where he secondary outlet sewer is pumped back into the well from where the secondary inlet water is obtained. Therefore, maintenance of the secondary system, insofar as scheduling, methods, etc., can only be determined through experience at each particular site.

The primary system uses purified, distilled water. Therefore, after the first year of operation, the only maintenance required is inspection of the conical filter 1A2U24 and replacement of the oxygen removal and demineralization/mixed bed cartridges (U41 and U42) when indicated by the current leakage meter 1A6M5. During the first year of operation, the conical filter should be inspected often. When the system is first placed into operation, the filter should be cleaned once a week for the first month, twice a month for the next two months, once every two months for the next eight months, and once yearly for the life of the equipment.

If modifications are performed on the primary cooling system, the conical filter should again be cleaned often to discard the foreign particles introduced into the system as a result of the modification.

Since all foreign particles are normally trapped by the filter during the first year of operation, the only other particles that may be introduced to the system are from the inner walls of the rubber tubes.

5.3.2.2.2. **ELECTRON TUBE LIQUID COOLER 1A2 & 1A52 MAINTENANCE.** The following methods are to be used for maintaining electron tube liquid cooler 1A2:

NOTE

THE FOLLOWING MAINTENANCE AND DISASSEMBLY STEPS ARE PROVIDED FOR EMERGENCY USE ONLY. CONSTRICTED AND DEFECTIVE COOLING EXCHANGERS SHOULD BE RETURNED TO SUPCEN FOR OVERHAUL.

1. To remove sludge or other similar soft deposits, circulate hot wash oil or light distillate through tubes or shell at high velocity.

2. If the above methods do not remove all of the deposits, use a cleaning compound such as Oakite.

3. If none of the above methods are effective for the removal of hard scale, a mechanical means must be used. For

mechanically cleaning the tubes, use a hard-wire brush with a long, flexible handle.

4. As soon as a noticeable rise in water pressure and decreased water flow rate is observed, clean the tubes. If these tubes are not cleaned after these indications have been observed, the result will be the complete stoppage of flow through some tubes, with subsequent overheating. This can result in severe expansion strains and leaking tube joints.

5. Do not attempt to clean tubes by blowing steam through them. This overheats some of the tubes and results in the same severe overexpansion strains and leaks as for plugged tubes.

6. Do not open heads until all pressure is removed from equipment and the unit drained.

7. Do not handle tube bundles with hooks or other tools which might damage tubes. Bundles should be moved about on cradles or skids.

8. Do not tighten bolts until gasket is seated properly. This precaution eliminates one cause for taking down units because of leaks.

NOTE

It is recommended that when a heat exchanger is dismantled for any reason, new gaskets be used in reassembly. This tends to lessen the possibility of future leaks. Composition gaskets become brittle and dried out and they do not provide an effective seal when reused. Metal or metal-jacketed gaskets, when compressed initially, tend to match their gasket contact surfaces. In so doing, they are hardened to the point that their reuse provides an imperfect seal and possible damage to the gasket contact surfaces of the heat exchanger.

9. To tighten a loose tube joint. use a suitable roller-type tube expander. Do not roll tubes that are not leaking as it needlessly thins the tube wall.

10. A light sludge or scale coating on the tubes greatly reduces their effectiveness. Therefore, when deemed necessary, do not hesitate in cleaning the exchangers. However, the heat exchanger should first be checked for air or vapor binding.

11. If it is necessary to remove the tube bundles from the heat exchanger, great care must be exercised so as not to damage the tubes. Tube bundles are of great weight, yet the tubes are small and of relatively thin metal. The dead weight of the tube bundle, therefore, should never be supported by individual tubes, but should rest on those parts that are designed to carry it; i.e., tube sheets, support plates, or wood blocks cut to fit the periphery of the bundle.

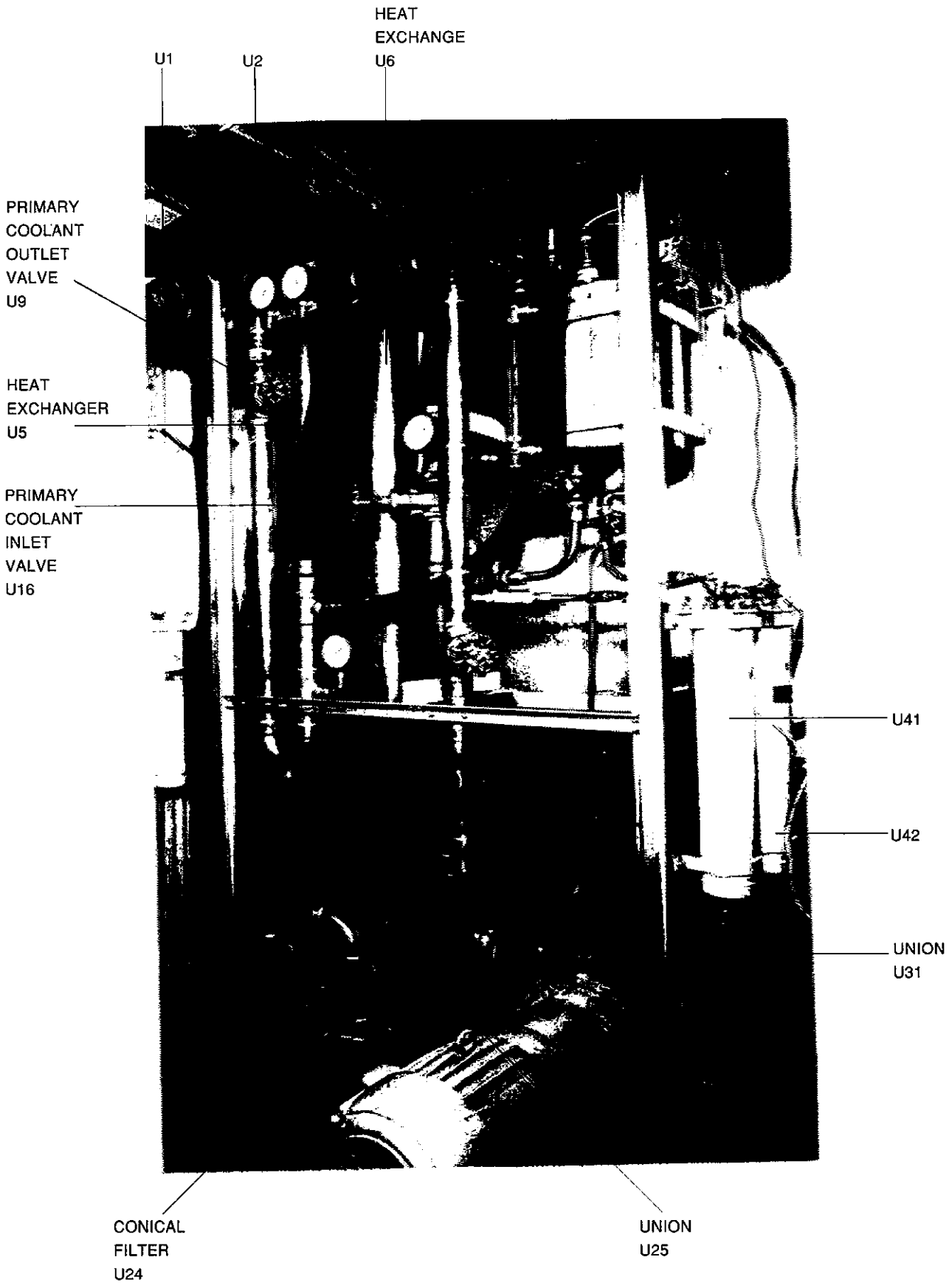


Figure 5-113. Electron Tube Liquid Cooler HD-601/FPN, Removal and Maintenance

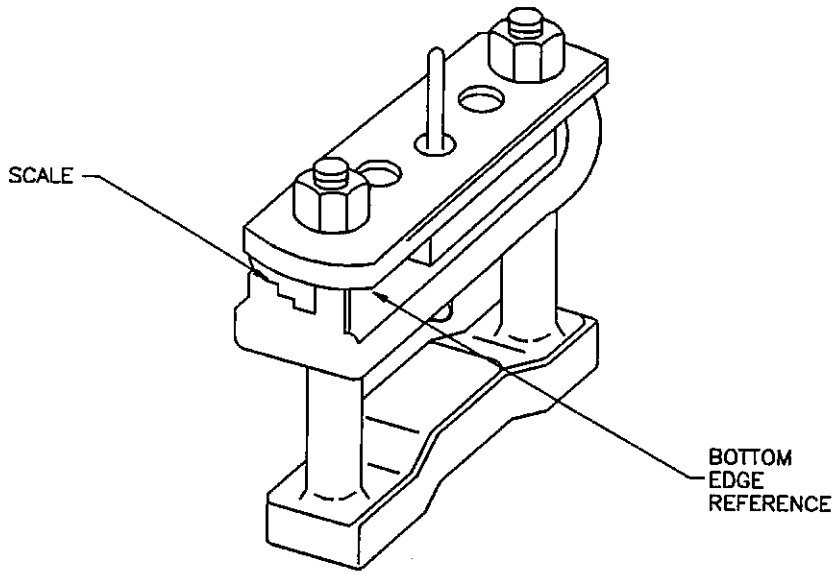


Figure 5–114. SCR Clamp Assembly

REMOVAL OF COIL

1. To remove white retainer, place thumbs against one side of the retainer and apply pressure.
2. Slide out movable contact arm. (Figure 2)

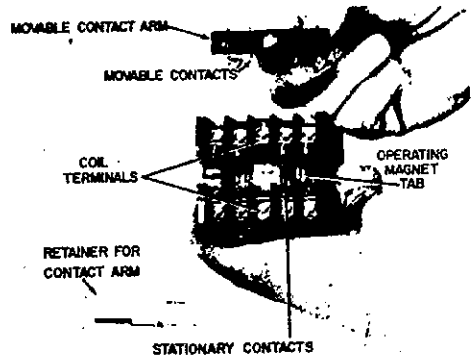


FIGURE 2

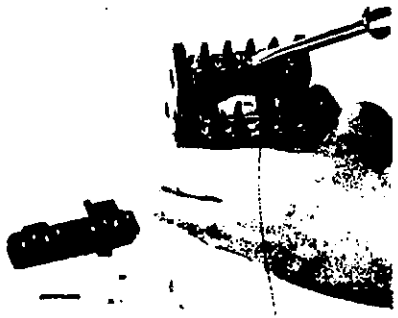


FIGURE 3

3. Loosen coil terminal screws (terminals without contacts attached) and remove wiring.
4. Place screwdriver under one coil terminal screw head, and using barrier as a fulcrum, pry coil out of relay. (Figure 3)
5. Replace coil and wiring, tighten screws and replace movable contact carrier.
6. To replace retainer, place one side of retainer in holding slots, making sure indicating tab fits through hole provided in retainer; then apply pressure to the ends of the opposite side of the retainer with your thumbs.

CHANGING OR CONVERTING OF CONTACTS

(STATIONARY CONTACTS)

1. Follow steps 1 and 2 under removal of coil.
2. Loosen both terminal screws on opposite sides of pole to be changed at least three turns. Remove wiring.
3. Grasping the screwdriver by the blade shaft, (Figure 4) place the thumb over the top (or bottom) of the terminal and the blade edge of the screwdriver against the inside of the terminal against the contact. Slide the terminal tip assembly out of relay.

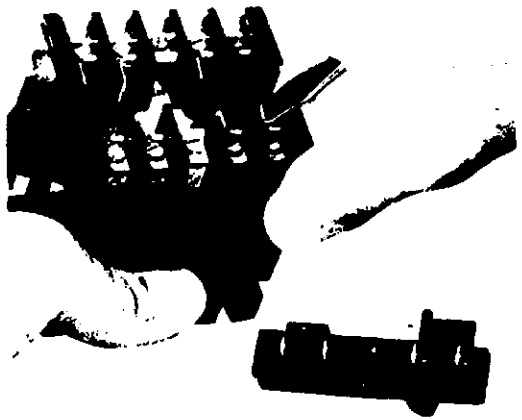


FIGURE 4

4. If contacts are to be converted – Exchange position of the two terminals removed, slide into place, replace wiring, and tighten screws.
5. If terminal tip assembly requires change, follow steps 1 through 3 above and replace with new assembly.

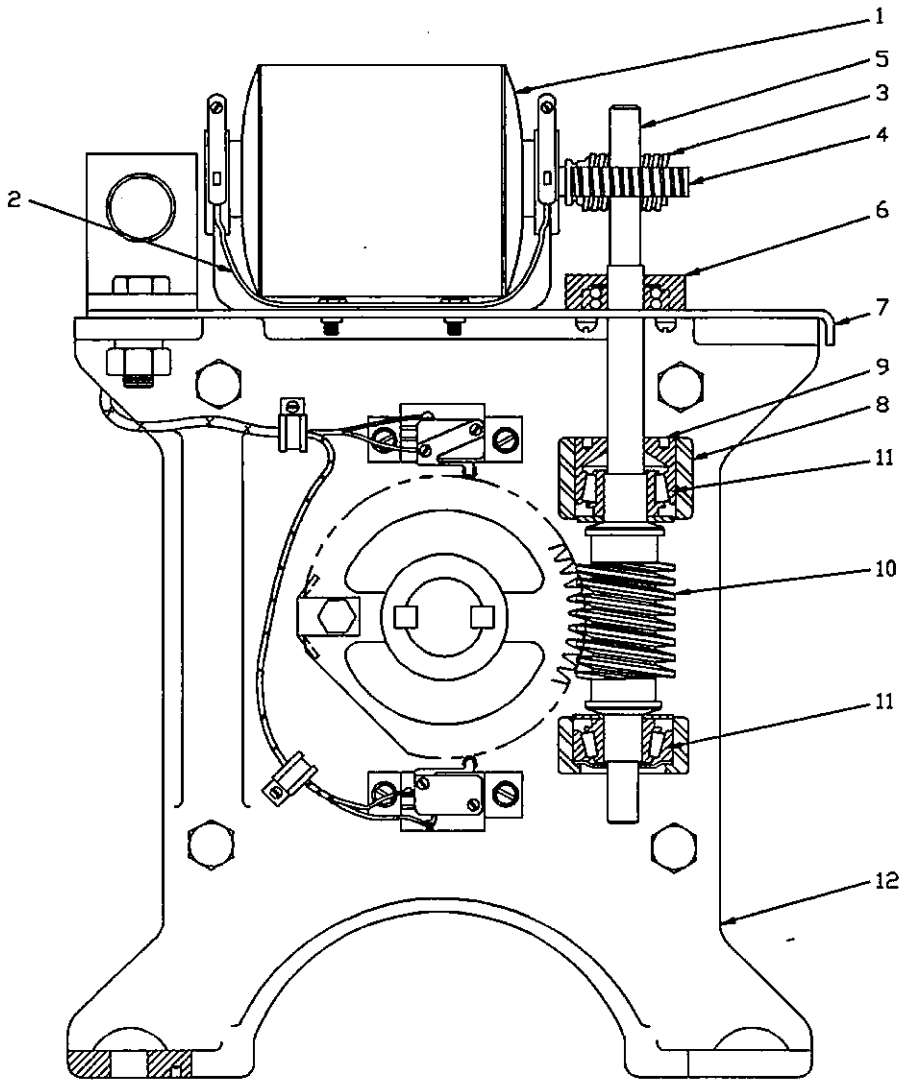
(MOVABLE CONTACTS)

6. Turn cover on movable contact arm 90° in direction of the arrow (Figure 5).

FIGURE 5

7. If contacts are to be converted lift out contact to be changed and rotate 180°. Replace contact in carrier and replace cover on carrier.
8. If contacts are to be changed, lift out existing contact and replace new contact in same position.
9. Replace contact arm in relay making sure notch in bottom of carrier fits over tab of operating magnet.
10. Replace movable contact arm retainer making sure indicating tab fits through slot provided in retainer.

Figure 5-115. Control Relay Maintenance



1. MOTOR
2. MOTOR SUPPORT
3. WORM MOUNTED ON MOTOR SHAFT
4. WORM OR SPUR GEAR TO ENGAGE WITH MOTOR WORM
5. WORM SHAFT
6. OUTBOARD BEARING, BALL-BEARING TYPE
7. MOTOR AND TRANSFORMER MOUNTING PLATE
8. SET SCREW
9. THRUST BUSHINGS, WORM SHAFT
10. MAIN WORM FOR DRIVING ROTOR
11. ROLLER BEARINGS, WORM SHAFT
12. END PLATE, DRIVE END

Figure 5–116. Voltage Regulator 1A53A3A3, End View

12. When withdrawing tube bundles it is recommended that rods or steel cables are passed through two or more of the tubes and the load taken on the floating tube sheet. Rods should be threaded and provided with nuts and should pass through a bearing plate at either end of the bundle. A soft wood filler board should be inserted between bearing plates and tube sheets, in order to prevent damage to tube ends. A forged steel eye bolt which may be screwed into either plate is used for pulling and lifting.

13. When steel cables are used for lifting, the cable is threaded through one tube and returned through another. Loops are formed in the ends of the cable by use of thimbles and wire rope clips. A hard wood spreader block is inserted between the cable and the floating tube sheet to prevent crushing of tube ends.

14. If the tube bundle has been in service for a considerable length of time without being removed, it may be necessary to use a hydraulic jack on the floating tube sheet to get it started.

15. A large steel bearing plate should be inserted between jack and tube sheet and the tube ends protected by means of a filler board.

16. Tube bundles may be raised horizontally by means of slings formed by bending light plates into a U-form and attaching lifting lugs to the ends of the sheets. Baffles can be easily bent and damaged by dragging a bundle over a rough surface. Diameter of the baffles is practically the same as the inside of the shell and the fit must be very close for the apparatus to function properly.

17. Any damage to them should, therefore, be carefully avoided.

18. In cleaning a tube bundle, tubes should not be hammered with any metallic tool. In case it is necessary to use scrapers, care should be exercised to see that the scraper is not sharp enough to cut the metal of the tubes.

19. The following are safe loads for rods and eye bolts:

Size Tubes	**Size Rods**	**SafeLoad per Rod**
5/8"	3/8	1000 lbs.
3/4"	1/2"	2000 lbs.
1" or larger	5/8"	3000 lbs.

Size Eye Bolts	Safe Load per Eye Bolt
3/4"	4,000 lbs.
1"	6,000 lbs.
1 1/4"	10,000 lbs.
1 1/2"	15,000 lbs.

5.3.2.3. **REMOVAL OF ELECTRON TUBE LIQUID COOLER 1A2U39B1 PUMP-MOTOR ASSEMBLY.** The procedure for removing the pump-motor assembly from electron tube liquid cooler 1A2 (figure 5-113) is as follows:

Step 1. Turn off all transmitting group power and disconnect wires to motor.

Step 2. Drain the primary coolant.

Step 3. Disconnect pipe union joints U31 and U25.

WARNING

Use as many men as necessary in lifting and supporting the pump-motor assembly to prevent injury to personnel.

Step 4. Remove the pump-motor assembly.

5.3.2.4. **REMOVAL OF ELECTRON TUBE LIQUID COOLER 1A2 & 1A52 PUMP.** When it is necessary to replace the pump, remove the pump-motor assembly from electron tube liquid cooler 1A2 as described in paragraph 5.3.2.2. Then disassemble as shown in figure 5-42.

5.3.2.5. **REMOVAL AND REPLACEMENT OF 1A53A3 CONTROL RELAYS.** When replacing control relays in relay assembly 1A53A3, the relay contact configuration of certain relays must be changed before installation in the equipment.

The following relay contacts must be changed from a normally-open to a normally-closed configuration. To convert relay contacts, refer to the instructions contained in figure 5-115.

RELAY REF. DESIG.	TERMINAL NUMBERS OF CONTACTS
K8	2-4
K9	2-4
K18	3-7
	4-8
K44	3-7
	4-8
K47	1-3
	2-4
K48	2-4
K50	2-4

5.3.2.6. **REPLACEMENT OF VOLTAGE REGULATOR 1A53A3A1 SCR'S.** When replacing a silicon controlled rectifier 1A53A3A1SCR1A through 1A53A3A1SCR2C (see figure 5-54), tighten the clamp assembly nuts securing the SCR and the associated heat sinks to between 1000 and 1200 pounds. The bottom edge of the clamp assembly leaf spring is the force indicating reference relative to the clamp scale (see figure 5-114).

CAUTION

If clamp assembly nuts appear to be loose, do not tighten. Instead, back off nuts to zero pounds and then retighten to recommended 1000 to 1200 pounds.

5.3.2.7 **REMOVAL OF VOLTAGE REGULATOR 1A53A3A3 MOTOR ASSEMBLY.** When it is necessary to replace the voltage regulator 1A53A3A3 motor assembly see figure 5-116 and proceed as follows:

Step 1. Disconnect the motor leads from the resistor, capacitor, and fuse and remove them from the cable clamp.

Step 2. Loosen the screws holding the motor (1) to the motor support (2). The motor can now be removed as an assembly with its worm (3), in place.

Step 3. The motor (1) should be replaced as an assembly due to the worm gear (3) mounted on the motor shaft. The motor worm gear centerline must match with the centerline of the spur gear (4).

5.3.2.8. **REMOVAL OF VOLTAGE REGULATOR 1A53A3A3 MOTOR ASSEMBLY AND TRANSFORMER MOUNTING PLATE.** If it is necessary to remove the motor assembly and transformer mounting plate, see figure 5-116 and proceed as shown.

Step 1. Remove the spur gear (4) from the knurled section of the worm shaft (5).

Step 2. Loosen the screws and remove the housing holding the outboard bearing (6) to the motor and transformer plate (7).

Step 3. Remove the outboard bearing (6). Care should be taken not to damage this bearing.

Step 4. Remove the two 0.500-13 bolts holding the motor and transformer mounting plate to the drive end plate. The motor and transformer mounting plate or drive end plate can now be removed.

5.3.2.9. **REMOVAL OF VOLTAGE REGULATOR 1A53A3A3 MAIN WORM ASSEMBLY.** If the main worm assembly of voltage regulator 1A53A3A3 must be removed for repair, see figure 5-116 and proceed as follows:

Step 1. Remove the spur gear (4), the motor and transformer

mounting plate (7), and outboard bearing (6) as previously described in paragraph (5).

Step 2. Loosen the set screw (8) that holds the thrust bushing (9) in place. Turn the thrust bushing counterclockwise to remove.

Step 3. Tap on the shaft end opposite the end from which the spur gear was removed. Pull the complete worm assembly out of the housing.

Step 4. To remove the main worm (104, remove the bearing cone (11) farthest from the knurled end of the shaft. Note the position of the Bellville washers on the shaft. The main worm can now be removed.

NOTE

If the main worm assembly was disassembled, proceed as follows before replacing:

Step 5. After the defective part has been replaced, insert the worm and shaft into the housings. Force it into place with the thrust bushing (9).

Step 6. Mount the old spur gear on the knurled section of the main worm shaft. Then preload the main worm bearing (11) in the following manner:

- Loosen thrust bushing.
- Connect torque wrench to main worm shaft.
- Tighten thrust bushing until torque wrench gives reading of approximately six inch pounds.
- Lock thrust bushing in place with set screw.

Step 7. Remove the old spur gear (4) and reassemble the motor and transformer mounting plate (7) to the drive end plate (12), and then the outboard bearing (6) to the motor and transformer plate (7). Because the spur gear is retained on the main worm shaft by the knurled section which cuts into the gear, it is recommended that this gear be replaced whenever it is removed from the shaft.

5.3.2.10. **REPLACEMENT OF POWER SUPPLY 1A53A5 FRAME ASSEMBLY.** When a rectifier assembly 1A53A5CR1 through 1A53A5CR12 (see figure 5-70) in replaced, torque the permalie nuts as follows:

Step 1. Torque nuts securing a rectifier assembly and frame to 90 inch-pounds maximum.

Step 2. Torque other permalie nuts to 120 inch-pounds maximum.

5.3.2.11. **REPLACEMENT OF TRANSFORMER 1A53A6 INSULATORS 1A53A6A1MP1 - MP12.** If it is necessary to replace any one of the secondary or

primary transformer insulators proceed as follows:

CAUTION

Any tools or loose articles that are to be taken into the transformer tank should be tied securely to one end of a 6 to 8 foot long strong cord, the other end of this cord being tied to some non-movable item outside the tank, such as a tank lift eye. With this cord, articles dropped inside the tank can be easily retrieved.

Step 1. Disconnect and tag transformer 1A53A6 primary wires connected to terminals H1 through H6.

Step 2. Remove transformer 1A53A6 hatch cover by removing 22 3/8-24 hex head bolts (9/16" wrench) which attach the hatch cover (12-1/2" x 14 1/2" x 1/4") to tank cover.

Step 3. To replace a transformer secondary insulator 1A53A6A1MP1 through MP12 perform steps 4 through 9. To replace a transformer primary insulator 1A53A6A1MP1 through MP6 perform steps 10 through 14.

Step 4. Since a large portion of the replacement work must be done "blind" you should become completely familiar with the feel of the installed and replacement insulator. Note that the retainer spring is located in the groove farthest away from the convoluted portion of the ceramic insulator. Note also the two tabs which are part of the threaded stud. These tabs fit into recesses in the top of the ceramic insulator to prevent the threaded stud from turning when the cap is screwed on or off.

Step 5. Remove the cap from the defective insulator. This can normally be done by hand without using any tools, but occasionally it may be necessary to use a 3/4" open-end or adjustable wrench. When the cap is removed, the gasket under the cap should also be removed. When the cap and gasket are removed, the wiring of the terminal will not fall back into the tank because of its rigid nature.

Step 6. Reach through the hatch opening of the transformer and loosen the three screws of the insulator clamp ring two to three turns. It is not necessary or desirable to remove the screws. These screws may be loosened with either a flat blade screwdriver or a 3/8" wrench. When the clamp ring is loose. a flat blade screwdriver should then be inserted between the ring and the retaining spring and with a prying motion. move the spring out of the groove of the insulator. When the spring is out of the groove, it is then moved down and off of the insulator, followed by the clamp ring. Although the spring and ring will be retained by the insulator wiring, it would be advantageous to pass a piece of cord through them so that they can be easily retrieved. At the same time that the ring and spring are being moved down on the

insulator, the insulator should be lifted up and off of the transformer. In this way, it will not be necessary to reach under the transformer oil surface, which is normally approximately 3 inches below the tank cover. This oil is a form of mineral oil and is in no way harmful to the skin.

Step 7. If no damage has occurred to the clamp ring, spring, top cap or cap gasket, they may be reused with the replacement insulator. The insulator gasket should be replaced when changing insulators as it probably has compressed and formed to exactly fit the preceding installation.

Step 8. The new insulator with its gasket should be carefully lowered over the insulator wiring. When the bottom portion of the insulator has just passed through the tank cover, the clamp ring and the retainer spring should be slid up as far as possible on the smooth part of the insulator. When the insulator is almost seated on the tank cover, it should be rotated until the threaded stud tabs fit into the recesses at the top of the insulator. As soon as the insulator is seated and the stud tabs are located, the cap gasket and the cap should be screwed into place.

Step 9. The retainer spring should next be slid upward on the insulator until it snaps into the lower groove. The three screws of the clamp ring are then tightened until the insulator assembly is solidly fixed to the tank cover. This completes the changing of the secondary insulator. If no further work is to be done in the tank, the hatch cover, rectifier assembly, wiring and cable clamps should be replaced by performing steps 1 and 2 in reverse order.

Step 10. Since a large portion of the replacement work must be done "blind" you should become completely familiar with the feel of the installed and replacement insulator. Note the locator tab on the cap which fits into the tab recess on the ceramic insulator: the insulator must be assembled with the cap and the insulator in the proper relationship or breakage will result. In the transformer the wiring from the transformer primary coils is brought to the insulator terminals as heavy cables fitted with lugs, two cables per each insulator. The lugs are placed between two nuts with a third nut serving as a jam nut.

Step 11. Remove defective insulator from transformer by removing the outer two nuts and primary coil wiring from terminal. Care must be taken not to drop the nuts. These nuts are loosened with a 15/16" wrench.

Step 12. Carefully remove nut the lowest using 15/16" wrench. Removing this nut allows the washer, the lower ceramic insulator and the lower gasket to drop down and be removed. Again, extreme care must be taken not to drop any of these items.

Step 13. Remove the upper ceramic insulator together with the clamp ring, the cap, and the other items by lifting them off the top of the tank.

Step 14. Replace the defective insulator and reassemble the insulator by performing steps 1, 2, 11, 12 and 13 in reverse order. Particular attention must be paid to placing the location tab of the cap into the tab recess of the insulator.

5.3.3. **REPAIR AND ALIGNMENT.**

5.3.3.1. **REPLACEMENT PARTS.** Replace faulty parts only with the replacement parts listed in Section 6. Discard all faulty parts that are not returned to the manufacturer for repair.

NOTE

Be sure to complete a failure report as outlined in paragraph 5.2.3.

5.3.3.2. **REPAIR OF TRANSISTORIZED CIRCUITS:**

5.3.3.2.1 **GENERAL.** Transistors are generally more rugged mechanically than vacuum tubes. However, they are still comparatively easy to damage by improper treatment or electrical overload. Precautions must be observed that are not normally necessary, with vacuum tube circuits.

5.3.3.2.2. **TESTING.** The most effective way of determining whether a transistor is defective is to replace it. However. this technique should be use only after it is determined that there are no other circuit defects. A transistor should first be removed from the circuit if it is necessary to check any of its associated components with an ohmmeter. Only voltage measurements should be taken at the transistor terminals.

5.3.3.2.3. **REPLACEMENT.** Take care when replacing transistors. Do not overheat transistors or their leads, since excessive heat can cause permanent damage. Use a soldering iron of the lowest wattage available. The transistor lead being soldered or unsoldered should be grasped gently with a long nose pliers between the soldering iron and the transistor to help dissipate the heat. Avoid excessive bending of the transistor leads.

5.3.3.3. **ALIGNMENT.** Alignment procedures are contained in paragraph 5.2.4.

5.3.4. **OVERALL SCHEMATIC DIAGRAMS.** All of the schematic diagrams for the loran transmitting set are shown in figures 7-17 through 7-52.

6.0. SYSTEM/EQUIPMENT PARTS LISTS.

6.1. INTRODUCTION. Reference designations (previously referred to as circuit symbols, reference symbols, etc.) have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (generic group) such as resistor (R), capacitor (C), electron tube (V), etc. The number after the letter differentiates between parts of the same generic group. The unit numbering method of identifying units and assemblies within units is used in the equipment.

The reference designations of the major units are given in table 6-1. A complete reference designation consists of the unit number, generic group and a number indicating the part within the generic group, for example, 1A1A2R5, 2A4A1V1, etc.

Sockets associated with a particular plug-in device, such as an electron tube or a fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for fuse 1A1F1 is designated 1A1XF1.

6.2. **LIST OF MAJOR UNITS.** Table 6-1 is arranged by the unit numbers of reference designations that apply to a major unit. Thus when the reference designation of a part is known, this table will furnish ready reference to the major unit in which it is used. The table also gives the following information for each major unit: quantity in one equipment; official nomenclature (Column 3); and location of its parts in table 6-2. Colloquial names are not used.

6.3. **MAINTENANCE PARTS LIST.** Table 6-2 lists all major units and their maintenance parts. The parts of each major unit are grouped together. Column 1 lists the unit number of each unit, followed by the reference designations of the various parts in alphabetical and numerical order. Column 2 gives the name and description of the various parts. Complete information is given for all key parts (parts differing from any part previously listed in this table) and sub-key parts (parts identical with a key part but appearing for the first time within a unit). The name and description are omitted for other parts. Column 3 indicates how the part is used and gives its functional location in the equipment. It also includes the figure number of the pictorial illustration on which the part is identified.

6.4. **STOCK NUMBER INFORMATION.** Allowance Parts Lists (APL) issued by the Coast Guard Supply Center include Federal Stock Numbers and Source, Maintenance and Recoverability Codes. When ordering parts, refer to the APL for this information.

6.5. **LIST OF MANUFACTURERS.** Table 6-3 lists manufacturers of parts used in the equipment. Column 1 shows the Federal Supply Code used in table 6-2 to identify manufacturers. Columns 2 and 3 show the name and address of the manufacturers.

6-6. **NOTES.**

1. These resistors are not used in all transmitting sets. (Only one AN/FPN-44 has 36 resistors.)

TABLE 6-1. LORAN TRANSMITTING SET AN/FPN-44A
LIST OF MAJOR UNITS

REF	QTY	NAME OF MAJOR UNITS AND DESIGNATION . . . . . PAGE
		TRANSMITTING SET, LORAN
		Note: AN/FPN-44B nomenclature in [ ]
		AN/FPN-44
1	2	Transmitting Group OT-96/FPN-44A **[OA-4483/FPN-44]** 6-5
1A1	2	Cabinet, Electrical Equipment CY-3841/FPN-44 6-6
1A2	2	Cooler, Liquid, Electron Tube HD-1000/FPN **[1A52 HD-601/FPN]** 6-7
1A4	2	Amplifier Group OG-159/FPN-44A **[OA-4482/FPN-44]** . . . 6-10
1A4A1	2	Power Supply PP-7304/FPN-44A **[C-4557/FPN-44]** 6-30
1A4A3	2	Control, Oscilloscope C-4558A/FPN-44 6-44
1A4A4	2	Power Supply 1092037G1 6-47
1A4A5	2	Generator, Bias Pedestal 1092036G1 6-49
1A4A6	2	Power Supply, Power Amplifier 1096581G1 6-54
1A5	2	Power Amplifier Tank Coil 1087450G1 6-66
1A6	2	Amplifier,Tubes, Radio Frequency 1087441G1 and 1087441G3 6-67
1A7 thru 1A10	1	Resistor Assembly Transmitter No. 1 1087447G1 6-79
1A7 thru 1A10	1	Resistor Assembly, Transmitter No. 2 1087447G2 6-80
1A11	2	Rack, Electrical Equipment MT-2929/FPN-44 6-81
1A12	2	Panel, Indicator SB-1894A/FPN-44 6-84
1A20	2	Filter, Low Pass OF-1428/FPN-44A 6-88
1A21	2	Indicator Panel PA Overload 6-89
1A52	2	Cooler Liquid, Electron Tube HD-1000/FPN-44A **[1A2 HD-601/FPN]** 6-90
1A53	2	Power Supply set OP-109/FPN-44A **[1096281G3]** 6-94
1A53A1	2	Relay Assembly, RE-1112/FPN-44A 6-95
1A53A2	2	Control-Indicator C-10034/FPN-44A 6-96
1A53A3	2	Relay Assembly RE-1113/FPN44A 6-106
1A53A3A1	2	Regulator, Voltage CN-1473/FPN-44A 6-122
1A53A3A2	2	Fuse Panel CN-1472/FPN-44A **[1096343G1]** 6-142
1A53A3A3	2	Regulator, Voltage CN-1472/FPN **[1096285G2]** 6-143
1A53A3A4	2	Panel, Control CN-1472/FPN-44A **[1096285G3]** 6-144
1A53A4	2	Shunt, Instrument MX-9783/FPN-44A 6-145

TABLE 6-1. LORAN TRANSMITTING SET AN/FPN-44A
LIST OF MAJOR UNITS

REF	QTY	NAME OF MAJOR UNITS AND DESIGNATION . . . . . PAGE
1A53A5 & 1A53A6	2	Power Supply PP-7305/FPN-44A 6-152
1A53A7	2	Voltage Divider CN-1474/FPN-44A 6-154
1A53A19	2	Resistor Assembly 1096304G2 6-159
1A53A20	2	Resistor Assembly 1096304G1 6-159
1A53A21	2	Resistor Assembly 1096303G1 6-159
3	1	Coupler, Antenna CU-2171/FPN-44A **[CU-1106/FPN-44]** 6-160
4	1	Dummy Load, Electrical DA-329A/FPN-44 6-163
5	1	Local Control Unit GCF-W678-LCU 6-166

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A MAINTENANCE PARTS LIST

TRANSMITTING GROUP, OT-96/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	TRANSMITTING SET, LORAN AN/FPN-44A includes 2 transmitting groups, also miscellaneous installation material; 28527 part no. 1087426G3.	Transmitting Set Figures 5-7, 5-79, 5-83
1	TRANSMITTING GROUP, OT-96/FPN-44A; amplifies a low voltage level Loran pulse to a power level above 200KW. Has facilities for controlling and monitoring its pulse shape, water cooling, power stages, and generating the required supply voltages; 28527 part no. 1087428G3 and 1087428G4	Low Power Transmitter Figure 5-7
1B1	FAN, VENTILATING: motor driven, 208V, 50-60 Hz, 3 phase, 1-1/2 hp, 4800/4000 cfm; AAAAA part no. VD19F1P1X; 28527 part no. 1087896G1	Cooling Figure 5-8
1B1 AN/FPN-44B:	**FAN, VENTILATING: motor driven, 208V, 50-60 Hz, 3 phase, 1.5 hp, 07077 part no. 5K20, model K; 90348 part no. 1087896.**	
1B1E1	IMPELLER: three blades; AAAAA part no. VP19-9	Fan Impeller Figure 5-8
1B1E1 AN/FPN-44B:	**IMPELLER: three blades; 90348 part no. 1088472G2**	
1B1E2 AN/FPN-44B:	**BEARING, BALL, ANNULAR: 90348 part no. 1088472G3**	
1B1B1	MOTOR, ALTERNATING CURRENT: 1-1/2 hp, 208V, 57-60 Hz, 1450 rpm, enclosed	Fan Motor Figure 5-8
1B1B1 AN/FPN-44B:	**MOTOR, ALTERNATING CURRENT: 1-1/2 hp, 208V, 50-60 Hz, 1750 rpm, 07077 Part no. 5K20, model K; 90348 part no. 1088472G1**	
1DS1 thru 1DS8	LAMP, INCANDESCENT: bayonet base; 96906 part no. MS15567-1	Meter Illumination Figure 5-7
1E1 thru 1E5	FILTER, AIR: metal mesh, 19-3/4 inches by 24-3/4 inches; 00736 part no. P5RR; 28527 part no. 1088231G1	Air Filtration Figure 5-8
1J1 thru 1J4	CONNECTOR, RECEPTACLE, ELECTRICAL: 15 amp, 125V; 71183 part no. 5252; 28527 part no. 1088911G1	Convenience Outlet Figure 5-7
1S1	SWITCH, AIR FLOW: actuates at 1800 ft/min max, deactuates at 1450 ft/min.	Enclosure Air Flow Detector

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST

TRANSMITTING GROUP, OT-96/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	spdt, 250Vac, 5 amps; 82877 part no.2A type 2000; 28527 part no. 1087599G5	Figure 5-8
1S1	**AN/FPN-44B: SWITCH, AIRFLOW: actuates at 2350 ft/min, spdt, 250Vac, 5 amps; 82877 part no.2A2450; 90348 part no. 1087599G2**	
1TB1	TERMINAL BOARD: 10 terminals, barrier type: MIL-T-55164 type 17TB10	Connecting Figure 5-8
1S2 thru 1S3	CIRCUIT BREAKER: 20 amp, 2 pole 120/140 vac; 52737 part no. P220; 28527 part no. 1088925G1	Enclosure lighting and Convenience Outlet Figure 5-7
1T1	TRANSFORMER, CURRENT: 65 amp current 95 ohms impedance; 05280 part no. 1705; 28527 part no. 2138264G1	Samples Antenna Current Figure 5-8
1XDS1 thru 1XDS8	LAMPHOLDER: Colorless Lens; MIL-L-3661 type LH80/ILC21CD3	1DS1 thru 1DS8 Holder Figure 5-7
1XDS1MP1 thru 1XDS8MP8	LENS: Colorless; MIL-L-3661 type	1XDS1 thru LC21CD3 Lens Figure 5-7

CABINET, ELECTRICAL EQUIPMENT, CY-3841/FPN-44

1A1	CABINET, ELECTRICAL EQUIPMENT, CY-3841/FPN-44: metal structure which houses the Loran Transmitting Set AN/FPN-44A; 28527 part no. 1087435G1	Transmitting Set Housing Figure 5-7

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE, HD-601/FPN

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A2 AN/FPN-44B:	**COOLER, LIQUID, ELECTRON TUBE, HD-601/FPN: circulates and cools a liquid for the purpose of maintaining the temperature off the electron tubes at a normal operating temperature; 90348 part no. 1087438** NOTE: For AN/FPN-44A (HD-1000) specification, see 1A52.	**Heat Exchanger Figure 5-9**
1A2B1	MOTOR AND PUMP ASSEMBLY: 208/220/440 volt, 60 Hz, 3 phase, 7.5 hp, 3600 rpm, type J, design B, Code G, class B: 16630 part no. 8950A00-0026; 28527 part no. 1088592G22	Water Circulator Figure 5-9
1A2E1	TANK, COOLER: 5 gallon capacity, stainless steel, 11.250 in. od by 13.562 in. high; 16630 part no. 8950A01-0002; 28527 part no. 1088592G1	Water Tank Figure 5-9
1A2M1	METER, PRESSURE GAUGE: 200 pound pressure, 3-1/2 inch dial; 16630 part no. 8950A00 0021-2; 28527 part no. 1088592G19	Pressure Indicator Figure 5-9
1A2M2	Same as 1A2M1	Pressure Indicator Figure 5-9
1A2M3	GAUGE, WATER LEVEL: expansion tank type; 16630 part no. 8950A00-0117; 28527 part no. 1088592G18	Water Level Indicator Figure 5-9
1A2M4	METER, PRESSURE GAUGE: 160 pound pressure, 3-1/2 inch dial; 16630 part no. 8950A00-0121-1; 28527 part no. 1088592G13	Pressure Indicator Figure 5-9
1A2M5	METER PRESSURE GAUGE: 150 pound pressure, 2-1/2 inch dial; 16630 part no. 8950A00-0122; 28527 part no. 1088592G21	Pressure Indicator Figure 5-9
1A2M6	Same as 1A2M4	Pressure Indicator Figure 5-9
1A2S1	SWITCH LEVEL: spst; snap action; hermetically sealed; 04034 part no. LS1800; 28527 part no. 1088592GS; 16630 part no. 8950A00-0116	115vac Control Circuit Figure 5-9
1A2TB1	TERMINAL BOARD: 10 terminals; 28527 part no. 356259	Inter connection Figure 5-9
1A2U1	FITTING, HOSE: 2-1/2 in. pipe size; 16630 part no. ST30B	Secondary Coolant Inlet Figure 5-9

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE, HD-601/FPN

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A2U2	Same as 1A2U1	Secondary Coolant Outlet Figure 5-9
1A2U3	FITTING, HOSE: 1 in. pipe size; 16630 part no. ST10B	Fill Figure 5-9
1A2U4	DRAIN COCK: Brass and bronze construction, 1/4 in. pipe size; 30327 part no. 303E; 28527 part no. 1088592G10; 16630 part no. 25A00-0910	Water Drain Figure 5-9
1A2U5	HEAT EXCHANGER: 07077 part no. 87M606A31; 28527 part no. 1088592G2	Reduce Primary Coolant Temperature Figure 5-9
1A2U6	Same as 1A2U5	Reduce Primary Coolant Temperature Figure 5-9
1A2U7	Same as 1A2U4	Drain Figure 5-9
1A2U8	VALVE, GATE: 1 in. with teflon packing; 16630 part no. 8950A00-0024 -2; 28527 part no. 1088592G16	Valve Figure 5-9
1A2U9	VALVE, GATE: 2 in. with teflon packing; 16630 part no.8950A00-0124-3; 28527 part no. 1088592G14	Valve Figure 5-9
1A2U10	VALVE, SWING CHECK: bronze, 1 in,; 16630 part no. 8950A00-0023-2; 28527 part no. 8950A00-0023-2; 28527 part no. 1088592G9	Check Valve Figure 5-9
1A2U11	VALVE, FLOAT: automatic air valve; 16630 part no. 8950A00-0019; 28527 part no. 1088592G11	Air Escape Figure 5-9
1A2U12	Same as 1A2U4	Drain Figure 5-9
1A2U13	TEE, REDUCING: bronze nipple, 2 in. to 1 in. 16630 part no. 3411	Pipe Reducer figure 5-9
1A2U14	FITTING: bronze nipple, 2 in. pipe size; 16630 part no. ST25B	Hose Figure 5-9
1A2U15	Same as 1A2U3	Fill Figure 5-9

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE, HD-601/FPN

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A2U16	Same as 1A2U9	Valve Figure 5-9
1A2U17	VALVE, GATE: 3/4 in. bronze, low pressure; 16630 part no. 8950A00-0124-1; 28527 part no. 1088592G15	Water Cooler Figure 5-9
1A2U18	VALVE, GLOVE: 1/2 in. bronze; 16630 part no. 895A00-0025; 28527 part no. 1088592G17	Water Cooler Figure 5-9
1A2U19	Same as 1A2U4	Drain Figure 5-9
1A2U20	VALVE, SWING CHECK: bronze 3/4 in.; 16630 part no. 8950A00-0023-1; 28527 part no. 1088592G7	Check Valve Figure 5-9
1A2U21	VALVE, CHECK: 1/2 in. pipe size, bronze; 16630 part no. 8950A00-0020, 28527 part no. 1088592G6	Check Valve Figure 5-9
1A2U22	Not used	
1A2U23	Same as 1A2U9	Figure 5-9
1A2U24	STRAINER, MESH: 16630 part no. U8767; 28527 part no. 1088592G12	Water Pump Figure 5-9
1A2U24A	STRAINER, SEDIMENT: 100 mesh, monel; 16630 U203-5A, 28527 part no. 1088592G24	Strainer Figure 5-9
1A2U25	UNION, ELBOW: 90 degree, 1-1/4 in. x 1-1/4 in., brass; 16630 part no. A11445	Fitting, Pump Figure 5-9
1A2U26	VALVE, GATE: bronze with teflon packing; 1/4 in.; 16630 part no. 5	Heat Exchanger Figure 5-9
1A2U27 thru 1A2U32	Same as 1A2U4	Drain Figure 5-9
1A2U33	Same as 1A2U3	Deionizer Figure 5-9
1A2U34	PROTECTOR ROD: zinc, 1/2 in. pipe thread, 16630 part no. Z4R101, 28527 part no. 1088592G	Deionizer Figure 5-9
1A2U35	Same as 1A2U34	Deionizer Figure 5-9
1A2U36	HOSE: 2 1/2 inch; 28527 part no. 1088455G6	Connecting Figure 5-9

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE, HD-601/FPN

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A2U37	HOSE: 3 inch; 28527 part no. 1088455G62	Connecting Figure 5-9
1A2U38	HOSE: 2 inch; 28527 part no. 1088455G60	Connecting Figure 5-9
1A2U39	HOSE: 1 inch; 28527 part no. 1088455G59	Connecting Figure 5-9
1A2U40	Not used	
1A2U41	CARTRIDGE, DEMIN.	Cartridge Oxygen Removal Figure 5-9
1A2U41A	CARTRIDGE, OXYG.	Cartridge Figure 5-9
1A2U42	FILTER, MICRON.	Cartridge Figure 5-9

REGULATOR, VOLTAGE CN-941/FPN

1A3	Not used	

AMPLIFIER GROUP, OG-159/FPN-44A FOR AN/FPN-44B: [OA-4482/FPN-44]

1A4	AMPLIFIER GROUP, OG-159/FPN-44A: this low power group contains circuitry used to amplify the low level Loran pulses to the level required to drive the power amplifier grids; 28527 part no.1087453G3	Low Power Amplifier Figure 5-7
1A4B1	FAN CENTRIFUGAL: ccw; 220 vac, 50-60 HZ; 3.3 amp; 82877 part no. A018925; 28527 part no. 1087592G1	Tube Cooling Figure 5-10
1A4B1 AN/FPN-44B:	**BLOWER: non-portable, clockwise rotation, 82877 model ARDPF, type AS608; motor series 318JS, 220 volt, 50/60 Hz, 3.3 amp; 90348 part no. 1087592G1**	
1A4B2	FAN, ROTARY; 115 V, 60 Hz, 82877 Part No. 020189	
1A4B2E1	GUARD; 82877 Part No. 476323	
1A4CP2	CONNECTOR, ELECTRICAL; Twinax double female feed-thru, type UG-493A/U	
1A4CP3	Same as 1A4CP2	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4CP4	CONNECTOR, ELECTRICAL; BNC tee, MIL type UG-274B/U	
1A4CR1 thru 1A4CR8	SEMICONDUCTOR DEVICE, DIODE: silicon, piv 4500 volts min, average dc forward current at 60 degrees C, 450 ma min, peak surge current 19 amps for 0.1 sec.; 28527 part no. 1087689G1	Rectifier Figure 5-14
1A4C1 and 1A4C2	Not used	
1A4C3	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 uf ± 10%, 400 vdc, MIL-C-25 type CP09A1KE104K3	1A4V7 Grid Figure 5-12
1A4C4	Same as 1A4C3	1A4V8 Grid Coupling Figure 5-12
1A4C5	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.001 uf ± 5%, 15000 vdc; 16727 part no. ASG102-15M; 28527 part no. 1092093G1	1A4V9 Grid Coupling Figure 5-11
1A4C6	Same as IA4C5	1A4V10 Grid Coupling Figure 5-11
1A4C7	CAPACITOR, FIXED, ELECTROLYTIC: 0.02 uf ±10%, 7500 vdc; 56289 part no. 221M319 part no. 1087614G1	1A4A9 Grid Monitor Figure 5-11
1A4C8	Same as 1A4C7	1A4V10 Grid Monitor Figure 5-11
1A4C9	CAPACITOR, FIXED PAPER DIELECTRIC: 0.1 uf ± 10%, 1000 vdc; MIL-C-25 type CP09A1KG104K1	1A4V7 Screen By-Pass Figure 5-12
1A4C10	Same as 1A4C9	1A4V8 Screen By-Pass Figure 5-12
1A4C11	CAPACITOR, FIXED, PAPER DIELECTRIC: 2.0 uf ± 10%, 600 vdc; MIL-C-25 type CP53B1EF205K1	1A4V7 Filament By-Pass Figure 5-12
1A4C12	Same as 1A4C111A4V8	Filament By-Pass Figure 5-12
1A4C13	Same as 1A4C11	1A4V7 Filament By-Pass Figure 5-12
1A4C14	Same as 1A4C11	1A4V8 Filament By-Pass

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY, PP-7304/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-12
1A4C15	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 uf, 12700 vdc; 24446 part no. 28F745; 28527 part no. 1087487G4	1A4V9 Plate By-Pass Figure 5-11
1A4C16	Same as 1A4C15	1A4V10 Plate By-Pass Figure 5-11
1A4C17	Same as 1A4C15	1A4V9 Plate Bypass Figure 5-11
1A4C18	Same as 1A4C15	1A4V10 Plate By-Pass Figure 5-11
1A4C19	CAPACITOR, VARIABLE, AIR DIELECTRIC: brass sheet, 4,500 in. dia by 0.125 in. thick with 1 center mounted stud; 28527 part no. 1088228G1	1A4V7 Plate Monitor Figure 5-11
1A4C20	Same as 1A4C19	1A4V8 Plate Monitor Figure 5-11
1A4C21	Same as 1A4C19	1A4V9 Cathode Monitor Figure 5-11
1A4C22	Same as 1A4C19	1A4V10 Cathode Monitor Figure 5-11
1A4C23 thru 1A4C27	Not used	
1A4C28	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 uf ± 10%, 400 vdc; MIL-C-25 Type CP05A1KE103K3	1A4V8 Grid Monitor Figure 5-12
1A4C29	Same as 1A4C28	1A4V7 Grid Monitor Figure 5-12
1A4C30	Not used	
1A4C31	Not used	
1A4C32	CAPACITOR, FIXED, PAPER DIELECTRIC: 13.5 uf, 12700 vdc; 28527 part no. 1087487G3	1A4V9 Plate Storage Figure 5-10

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4C33/34	Not used	
1A4C35	CAPACITOR, FIXED, PAPER DIELECTRIC: 8 uf ± 10%, 600 vdc, MIL-C-25 type CP72E1EF805K1	1A4V7 and 1A4V8 Screen Voltage Filter Figure 5-11
1A4C36	CAPACITOR, FIXED, MICA DIELECTRIC: 200 pf ± 5%, thru 2500 vdc; MIL-C-25 type CM45BK201JN3	1A4V7 and 1A4V8 Plate Tuning Figure 5-17
1A4C48 thru 1A4C49	Not used	
1A4C50	Same as 1A4C32	1A4V10 Plate Storage Figure 5-10
1A4C51	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 uf, ± 10%, 6000 vdc; 24446 part no. 23F1139G2; 28527 part no. 1092094G1	Bias Pedestal Coupling Figure 5-11
1A4C52	Same as 1A4C7	1A4V9 Cathode Monitor Figure 5-11
1A4C53	Same as 1A4C7	1A4V10 Cathode Monitor Figure 5-11
1A4C54	Same as 1A4C51	Bias Pedestal Coupling Figure 5-11
1A4C55/56	Not Used	
1A4C57	CAPACITOR, FIXED PAPER; 1.0 uF, 12.5 kV, 28527 Part No. 1087487G4	
1A4C58	Same as 1A4C57	
1A4C59	CAPACITOR, ELECTROLYTIC; 140 uF, 60 V, MIL-C-39006/9 M39006/09-8558	Figure 7-1
1A4C60	Same as 1A4C59	Figure 7-1
1A4C61	Same as 1A4C59	Figure 7-1
1A4C62	Same as 1A4C59	Figure 7-1

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4DS1 thru 1A4DS12	LAMP, GLOW: neon; MIL-L-15098 type M15098/10-002	1A4F1 TO 1A4F6 Indicator Figure 5-10
1A4DS13 thru 1A4DS16	Same as 1A4DS1	1A4F13 thru 1A4F16 Blown Fuse Indicator Figure 5-10
1A4E1	CLIP, ELECTRICAL: aluminum; 06980 Part no. HR8; 28527 part No.1069190G1	1A4V7 Plate Cap Figure 5-11
1A4E2	Same as 1A4E1	1A4V8 Plate Cap Figure 5-11
1A4E3	SUPPORT, TUBE: fiber glass, 8 inches high by 8.380 inches o.d. by 6.560 inches i.d.; 28527 part no. 1087497G1	1A4V9 Tube Support Figure 5-11
1A4E4	Same as 1A4E3	1A4V10 Tube Support Figure 5-11
1A4E5 thru 1A4E16	CONNECTOR: copper, 0.875 in. dia. by 1.168 in. lg; 28527 part no. 1087498G1	Tube Connector Figure 5-11
1A4E17	CONTACT ASSEMBLY, ELECTRICAL: consists of 4 contacts mounted on a band; 28527 part no. 1088073G1	1A4V9 Anode Connector Figure 5-11
1A4E18	Same as 1A4E18	1A4V10 Anode Connector Figure 5-11
1A4F1	FUSE, CARTRIDGE: 0.20 amps, 250 volts; MIL-F-15160 type F09B250V2/10AS	1A4T1 Overload Fuse Figure 5-16
1A4F2	FUSE, CARTRIDGE: 2.0 amps, 250 volts; MIL-F-15160 type F09B250V2AS	1A4T2 Overload Fuse Figure 5-16
1A4F3	Same as 1A4F1	1A4T1 Overload Fuse Figure 5-16
1A4F4	Same as 1A4F2	1A4T2 Overload Fuse Figure 5-16

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4F5	FUSE, CARTRIDGE: 6.0 amps, 250 volts; 71400 part no. FNM5AMPS; 28527 part no. 1089226G1	1A4T3 Overload Fuse Figure 5-16
1A4F6	Same as 1A4F5	1A4T4 Overload Fuse Figure 5-16
1A4F7	Same as 1A4F5	1A4T3 Overload Fuse Figure 5-16
1A4F8	Same as 1A4F5	1A4T4 Overload Fuse Figure 5-16
1A4F9	Not Used	
1A4F10	Not Used	
1A4F11	FUSE, CARTRIDGE: 7.0 amps, 250 volts; 71400 part no. FNM7AMPS: 28527 part no. 1089226G2	Left PA Bias Supply Figure 5-16
1A4F12	Same as 1A4F11	Right PA Bias Supply Figure 5-16
1A4F13	Same as 1A4F11	Left PA Bias Supply Figure 5-16
1A4F14	Same as 1A4F11	Right PA Bias Supply Figure 5-16
1A4F15	Not Used	
1A4F16	FUSE, CARTRIDGE; 8.0 amps, 250 volts MIL-F-15160/9 type F09B250V8AS	
1A4F17	FUSE, CARTRIDGE: 1.0 amp, 250 volts; MIL-F-15160 type F09B250V1AS	1A4A4T2 Line Figure 5-16
1A4F18	Same as 1A4F17	1A4A4T2 Line Figure 5-16
1A4J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 contacts; 74868 type 8225; 28527 part no. 2312172G1	Pulse Signal Input Figure 5-13
1A4J2 thru 1A4J3	Not Used	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4J4	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 contact; MIL-C-39012 type M39012/19-0001	Oscilloscope Monitor Input Figure 5-15
1A4J5 thru 1A4J8	Same as 1A4J4	Spare Figure 5-15
1A4J9	Same as 1A4J4	Multitrigger Input Figure 5-15
1A4J10	Same as 1A4J4	Scope Trigger Input Figure 5-15
1A4J11	Same as 1A4J4	Spare Figure 5-15
1A4J12	Not Used	
1A4J13	Same as 1A4J3	Current Transformer Figure 5-15
1A4J14	Same as 1A4J3	Spare Monitor Figure 5-15
1A4J15	Same as 1A4J3	Current Transformer Signal Figure 5-15
1A4K1	RELAY, ARMATURE: 2 spdt switches; 5 amps, 250 vdc; coil; 500 ohms, 24 vdc, 71482 part no. W2-8018, type EMS; 28527 part no. 1087589G1	1A4V7 Cathode Figure 5-11
1A4K2	Same as 1A4K1	1A4V8 Cathode Figure 5-11
1A4K3	RELAY, ARMATURE: contact rating 50 ma at 550 vdc, normally open; coil energized at 3 ma max, de-energized at 1.5 ma min; 82415 part no. 5601; 28527 part no. 1087709G1	1A4V7 and 1A4V8 screen protection Figure 5-18
1A4K4 thru 1A4K7	Same as 1A4K1	-1100 vdc Protection Figure 5-19

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4K8	RELAY, ARMATURE: 4 pdt; contact rating 5 amp at 30 vdc; 115 vac coil; plug-in type, 01526 part no. 3S279OG128A1; 28527 part no. 2311889G1	1A4V10 and 1A4V11 Overload Sensing Delay Figure 5-19
1A4L1	REACTOR: 20 henries at 150 ma min, 5 hy. at 700 ma min; 88422 part no. SBT-1243AR; 28527 part no. 1087688G1	-1100 vdc Filter Choke Figure 5-19
1A4L2	Same as 1A4L1	-1100 vdc Filter Choke Figure 5-10
1A4M1	AMMETER: dc, 0-200 ma; MIL-M-10304 type MR36W200DCMAR	1A4V7 Cathode Current Figure 5-10
1A4M2	Same as 1A4M1	1A4V8 Cathode Current Figure 5-10
1A4M3	AMMETER: dc, 0-500 ma; MIL-M-10304 type MR36W500DCMAR	1A4V9 Plate Current Figure 5-11
1A4M4	Same as 1A4M3	1A4V10 Plate Current Figure 5-11
1A4M5	VOLTMETER: dc, 0-5000 volt, full scale; MIL-M-10304 type MR36W005DCKVR	1A4V9 Bias Voltmeter Figure 5-10
1A4M6	Same as 1A4M5	1A4V10 Bias Voltmeter Figure 5-10
1A4M7	AMMETER: dc, 0-1 amp, full scale; MIL-M-10304 type MR36W001DCAAR	-1100 vdc Bias Current Ammeter Figure 5-10
1A4M8	Same as 1A4M7	-1100 vdc Bias Current Ammeter Figure 5-10
1A4M9	VOLTMETER: dc, 0-1000 volt, full scale; MIl-M-10304 type MR36W002DCKVR	-1100 vdc Bias Voltage Voltmeter Figure 5-10

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4M10	Same as 1A4M9	-1100 vdc Bias Voltage Voltmeter Figure 5-10
1A4P1 thru 1A4P2	Not Used	
1A4P3	CONNECTOR, PLUG, ELECTRICAL: 1 contact; MIL-C-3608 type UG421BU; 28527 part no. 2312139G1	Current Transformer Signal Figure 5-19
1A4P4	CONNECTOR, PLUG, ELECTRICAL: 1 contact; MIL-C-39012 type M39012/16-001	Scope Monitor Input Figure 5-19
1A4P5	Not Used	
1A4P6A	FANNING STRIP 71785 part no. 20-160-L	Exciter Drawer Input Terminals 1-20
1A4P6B	FANNING STRIP 71785 part no. 20-160-R	Exciter Drawer Input Terminals 21-40
1A4P7	CONNECTOR, PLUG, ELECTRICAL: 35 contacts; 28527 part no. 2228398G4	Oscilloscope Control Input Figure 5-19
1A4P8	CONNECTOR, PLUG, ELECTRICAL: 35 contacts; 28527 part no. 2228398G2	Oscilloscope Control Input Figure 5-19
1A4P9	Not Used	
1A4P10	Same as 1A4P4	Scope Monitor Input Figure 5-15
1A4P11	Same as 1A4P4	Scope Monitor Input Figure 5-19
1A4P12	CONNECTOR, PLUG, ELECTRICAL: 3 contacts; 74545 part no. 5269; 28527 part no. 1088606G1	Scope Power Figure 5-19
1A4P13	Same as 1A4P3	Pulse Input Figure 5-15
1A4P14	Not Used	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4P15	Same as 1A4P3	Current Transformer Signal Figure 5-18
1A4P16	Same as 1A4P4	Multipulse Trigger Figure 5-19
1A4RV1	SURGE PROTECTOR, THYRITE: 1.5 watt continuous rating, 1100 watt second discharge capacity; 50157 type 68D10000; 28527 part no. 1087739G1	1A4V7 Cathode Circuit Protector Figure 5-12
1A4RV2	Same as 1A4RV1	1A4V8 Cathode Circuit Protector Figure 5-12
1A4RV3	Same as 1A4RV1	1A4V7 Cathode Circuit Protector Figure 5-12
1A4RV4	Same as 1A4RV1	1A4V8 Cathode Circuit Protector Figure 5-12
1A4RV5	SURGE PROTECTOR, THYRITE: 1.5 watt continuous rating, 1100 watt second discharge capacity; 50157 type 66D10000; 28527 part no. 1087739G2	1A4K3 Over-voltage Protector Figure 5-18
1A4RV6	SURGE PROTECTOR, THYRITE: two discs, 3 in. dia. by 0.130 in. thick; 1/2 in. center mounting hole; 28527 part no. 1087716G1	PA Bias Relay and Meter Overload Protector Figure 5-19
1A4RV6E1	PLATE, CONNECTING: copper, irregular shape; 0.065 in. by 3.000 in. by 3.000 in. o/a dim; 28527 part no. 1087713G1	1A4RV6 Connecting Plate Figure 5-19
1A4RV6E2	SURGE PROTECTOR, THYRITE: 44 volts at 25 ma; 13 volts at 1.0 ma; 30 watts continuous power dissipation; 50157 part no. 67W30000; 28527 part no. 1087587G1	1A4RV6 DISC Figure 5-19

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4RV7	Same as 1A4RV6	PA Bias Relay and Meter Overload Protector Figure 5-19
1A4RV7E1	Same as 1A4RV6E1	1A4RV7 Connecting Plate Figure 5-19
1A4RV7E2	Same as 1A4RV6E2	1A4RV7 Disc Thyrite Figure 5-19
1A4RV8	SURGE PROTECTOR, THYRITE: 1500 vdc operating; 3.5 watt power dissipation; 10 amp[at 7500 V rating; 3.000 in. dia. by 0.780 in. thick; 50157 part no. 9RV3A51; 28527 part no. 1087729G1	Rectifier Overvoltage Protector Figure 5-18
1A4RV9	Same as 1A4RV8	Rectifier Overvoltage Protector Figure 5-19
1A4RV10	Same as 1A4RV1	-150V Circuit Protector Figure 5-18
1A4R1 thru 1A4R29	Not Used	
1A4R30	RESISTOR, FIXED, COMPOSITION: 100K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G104JS	1A4V8 Grid Return Figure 5-12
1A4R31	Same as 1A4R30	1A4V7 Grid Return Figure 5-12
1A4R32	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G101JS	1A4V8 Grid Parasitic Suppressor Figure 5-12
1A4R33	Same as 1A4R32	1A4V7 Grid Parasitic Suppressor Figure 5-12
1A4R34 thru	RESISTOR, FIXED, COMPOSITION: 1.5K ohms ± 5%, 2 watts; MIL-R-39008 type	1A4V7 and 1A4V8 Plate

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4R63	RCR42G152JS	Load Figure 5-17
1A4R64	RESISTOR, FIXED, COMPOSITION: 1.8K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G182JS	1A4V8 Grid Bias Figure 5-12
1A4R65	Same as 1A4R64	1A4V7 Grid bias Figure 5-12
1A4R66	RESISTOR, FIXED, COMPOSITION: 220K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G224JS	1A4V7 and 1A4V8 Screen Voltage Bleeder Figure 5-12
1A4R67	Not Used	
1A4R68	RESISTOR, FIXED, COMPOSITION: 47 ohms ± 10%, 2 watts; MIL-R-39008 type RCR42G470JS	1A4V8 Cathode Figure 5-12
1A4R69	Same as 1A4R68	1A4V7 Cathode Figure 5-12
1A4R70	Same as 1A4R68	1A4V8 Cathode Figure 5-12
1A4R71	Same as 1A4R68	1A4V7 Cathode Figure 5-12
1A4R72	RESISTOR, VARIABLE: composition, 250 ohms ± 10%, 2 watts; MIL-R-94 type RV4LAYSA251A	1A4V8 Overload Relay Control Figure 5-12
1A4R73	Same as 1A4R72	1A4V7 Overload Relay Control Figure 5-12
1A4R74	RESISTOR, FIXED, COMPOSITION: 10K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G103JS	1A4V8 Overload Relay Shunt Figure 5-12
1A4R75	Same as 1A4R74	1A4V7 Overload Relay Shunt Figure 5-12
1A4R76	Same as 1A4R32	1A4V8 Screen Parasitic Suppressor Figure 5-12
1A4R77	Same as 1A4R32	1A4V7 Screen Parasitic

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Suppressor Figure 5-12
1A4R78	RESISTOR, FIXED, COMPOSITION: 200K ohms ± 10%, 15 watts; 72819 part no. AS015-204K; 28527 part no. 1087591G6	1A4V10 Grid Return Figure 5-11
1A4R79	Same as 1A4R78	1A4V9 Grid Return Figure 5-11
1A4R80	RESISTOR, FIXED, COMPOSITION: 10 ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G100JS	1A4V10 Grid Parasitic Suppressor Figure 5-11
1A4R81	Same as 1A4R80	1A4V9 Grid Parasitic Suppressor Figure 5-11
1A4R82	Same as 1A4R80	1A4V10 Grid Parasitic Suppressor Figure 5-11
1A4R83	Same as 1A4R80	1A4V9 Grid Parasitic Suppressor Figure 5-11
1A4R84 1A4V10	RESISTOR, FIXED, COMPOSITION: 750 ohms ± 10%, 125 watts; 72819 part no. AS125-751K, 28527 part no. 1087591G7	1A4V9 and Plate Dropping Figure 5-18
1A4R85	RESISTOR, FIXED, COMPOSITION: 250 ohms ± 10%, 250 watts; 72819 part no. 779SP005; 28527 part no. 1087590G4	1A4V7 and 1A4V8 Plate Dropping Figure 5-11
1A4R86	RESISTOR, FIXED, COMPOSITION: 13 ohms ± 10%, 250 watts; 72819 part no. 682SP001; 28527 part no. 1087590G11	1A4V10 Plate Dropping Figure 5-11
1A4R87	Same as 1A4R86	1A4V9 Plate Dropping Figure 5-11
1A4R88	RESISTOR, FIXED, COMPOSITION: 1 ohm ± 20%, 15 watts; 72819 part no. 218SP004; 28527 part no. 1087590G7	1A4V10 Filament Centertap
1A4R89	Same as 1A4R88	1A4V9 Filament

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Centertap Figure 5-11
1A4R90	Same as 1A4R88	1A4V10 Filament Centertap Figure 5-11
1A4R91	Same as 1A4R88	1A4V9 Filament Centertap Figure 5-11
1A4R92	RESISTOR, FIXED, WIREWOUND: 330K ohms +10%, 50 watts; 10646 part no. 887A334K; 28527 part no. 1089076G1	High Voltage Relay Voltage Divider Figure 5-18
1A4R93 thru 1A4R95	Not Used	
1A4R96	RESISTOR, FIXED, WIREWOUND: 7.5K ohms ± 5%, 200 watts; MIL-R-26 type RW47V752	1A4V9 and 1A4V10 Bias Supply Figure 5-18
1A4R97	RESISTOR, VARIABLE: wirewound; 10K ohms ± 10%, 100 watts; MIL-R-22 type RP251SD103KK	1A4V9 Bias Adjustment Figure 5-16
1A4R98	Same as 1A4R97	1A4V10 Bias Adjstment Figure 5-16
1A4R99	RESISTOR, FIXED, WIREWOUND: 75K ohms ± 10%, 210 watts; MIL-R-26 type RW47V753	1A4V9 and 1A4V10 Bias Voltage Divider Figure 5-18
1A4R100	Same as 1A4R99	1A4V9 and 1A4V10 Bias Voltage Divider Figure 5-18
1A4R101	Same as 1A4R99	1A4V9 and 1A4V10 Bias Voltage Divider Figure 5-18
1A4R102	RESISTOR, FIXED, FILM: 5 megohms ± 0.5%,	1A4M6

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	5 watts; MIL-R-29 type MFA505	Multiplier Resistor Figure 5-18
1A4R103	Same as 1A4R102	1A4M5 Multiplier Resistor Figure 5-18
1A4R104	Not Used	
1A4R105	Same as 1A4R84	1A4V7 and 1A4V8 Screen Supply Figure 5-18
1A4R106 thru 1A4R109	Not Used	
1A4R110 thru 1A4R113	RESISTOR, FIXED, COMPOSITION: 5 ohms ± 10%, 60 watts; 72819 part no. 218SP008; 28527 part no. 1087590G3	-1100 Volt Balancing Figure 5-14
1A4R114	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 10%, 30 watts; 72819 part no. 218SP005; 28527 part no. 1087590G8	1A4K4 Overload Relay Shunt Figure 5-19
1A4R115	Same as 1A4R114	1A4K5 Overload Relay Shunt Figure 5-19
1A4R116	RESISTOR, VARIABLE: wirewound, 1.5K ohms ± 10%, 4 watts; MIL-R-19 type RA30LASD152A	1A4K4 Overload Relay Adjust Figure 5-19
1A4R116	**AN/FPN-44B: RESISTOR, VARIABLE: wirewound, 1.5K ohms ± 10%, 4 watts; MIL-R-19 type RA30LASB152A; 90348 PART NO. 1087691G1**	
1A4R117	Same as 1A4R116	1A4K5 Overload Relay Adjust Figure 5-19
1A4R117	**AN/FPN-44B: Same as 1A4R116**	
1A4R118	RESISTOR, FIXED, WIREWOUND: 22K ohms +1 5%, 159 watts; MIL-R-26 type RW38V223	1A4K6 Voltage Dropping Figure 5-18
1A4R119	Same as 1A4R118	1A4K7 Voltage Dropping Figure 5-19

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4R120 and 1A4R121	Not Used	
1A4R122	Same as 1A4R114	1A4K4 Overload Relay Shunt Figure 5-19
1A4R123	Same as 1A4R114	1A4K5 Overload Relay Shunt Figure 5-19
1A4R124	RESISTOR, FIXED, FILM: 2 megohms ± 0.5%, 5 watts; MIL-R-29 type MFB205	1A4M10 Multiplier Resistor Figure 5-18
1A4R125	Same as 1A4R124	1A4M9 Multiplier Resistor Figure 5-19
1A4R126	RESISTOR, FIXED, COMPOSITION: 33K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G332JS	Blown Fuse Indicator Limiter Figure 5-16
1A4R127	RESISTOR, FIXED, COMPOSITION: 15K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G153JS	Limiting Figure 5-16
1A4R127	**AN/FPN-44B: RESISTOR, FIXED, COMPOSITION: 15K ohms ± 10%, 2 watts; MIL-R-11 type RC42GF153K; 90348 part no.501255H1**	
1A4R128 thru 1A4R132	Same as 1A4R126	Limiting Figure 5-16
1A4R133	Same as 1A4R127	Limiting Figure 5-16
1A4R134 thru 1A4R136	Same as 1A4R126	Limiting Figure 5-16
1A4R137	Same as 1A4R127	Limiting Figure 5-16
1A4R138	Same as 1A4R126	Limiting Figure 5-16
1A4R139	Same as 1A4R126	Limiting Figure 5-16
1A4R140	Same as 1A4R127	Limiting

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-16
1A4R141 thru 1A4R143	Same as 1A4R126	Limiting Figure 5-16
1A4R144 thru 1A4R148	Not Used	
1A4R149	RESISTOR, VARIABLE: composition, 2.5K ohms ±10%, 2 watts; MIL-R-94 type RV4LAYSA252A	1A4V7 Bias Adjust Figure 5-12
1A4R150	Same as 1A4R149	1A4V8 Bias Adjust Figure 5-12
1A4R151	Same as 1A4R127	Limiting Figure 5-18
1A4R152	Not Used	
1A4R153	Same as 1A4R99	Voltage Divider Figure 5-18
1A4R154	Same as 1A4R84	1A4V9 and 1A4V10 Plate Dropping Figure 5-18
1A4R155	Not Used	
1A4R156	Same as 1A4R92	High Voltage Relay Voltage Divider Figure 5-18
1A4R157	Not Used	
1A4R158	Same as 1A4R92	High Voltage Relay Voltage Divider Figure 5-18
1A4R159 thru 1A4R160	Not Used	
1A4R161	Same as 1A4R84	1A4V9 and 1A4V10 Plate Dropping Figure 5-18

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4R162	Same as 1A4R84	1A4V9 and 1A4V10 Plate Dropping Figure 5-18
1A4R163	CAPACITOR, FIXED, COMPOSITION: 51 ohms ± 5%0, 2 watts MIL-R-39008 type RCR42G510JS	Termination Figure 5-18
1A4R164	Same as 1A4R163	Termination Figure 5-19
1A4R165 thru 1A4R168	Same as 1A4R126	Limiting Figure 5-16
1A4R169 thru 1A4R174	RESISTOR, FIXED, COMPOSITION: 150K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G154JS	Monitor Voltage Divider Figure 5-11
1A4R175 thru 1A4R180	Same as 1A4R169	Monitor Voltage Divider Figure 5-11
1A4R181 thru 1A4R186	Same as 1A4R169	Monitor Voltage Divider Figure 5-11
1A4R187 thru 1A4R192	Same as 1A4R169	Monitor Voltage Divider Figure 5-11
1A4R193	RESISTOR, VARIABLE; 5000 ohms, MIL-R-94/5 type RV4LAYSA502A	Pedestal Amplitude Figure 5-10
1A4R194	Same as 1A4R193	Negative Clipping
1A4R195	RESISTOR, VARIABLE; 100 kOhms; MIL-R-94/5 type RV4LAYSA104A	Positive Clipping
1A4R196 thru 1A4R199	RESISTOR, FIXED, COMPOSITION: 330K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G334JM	Discharge Resistor Figure 5-11
1A4R200 thru 1A4R203	Same as 1A4R196	Discharge Resistor Figure 5-11
1A4R204	Same as 1A4R196	Discharge

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
thru 1A4R207		Resistor Figure 5-11
1A4R208 thru 1A4R211	Same as 1A4R196	Discharge Resistor Figure 5-11
1A4R212 thru 1A4R219	Not Used	
1A4R221	RESISTOR, FIXED; 3600 ohms,175 watts, 72819 Part No. 890AS362K	
1A4R222	Same as 1A4R221	
1A4R223	RESISTOR, FIXED; 4700 ohms, 2 watts, MIL-R-26/4 type 56V472]	Figure 7-7
1A4R224	Same as 1A4R223	Figure 7-7
1A4S1	SWITCH, AIR FLOW: actuates at 2925 ft max flow deactuates 2700 ft/min, min. spdt, 250 vac, 5 amps; 82877 part no. 2A type 3000; 28527 part no. 1087599G4.	Air Flow Safety Switch Figure 5-18
1A4S1	**AN/FPN-44B: SWITCH, AIR FLOW: actuates at 4000 ft min max, deactuates 2800 ft/min, min. spdt, 250 vac, 5 amps; 82877 part no. 2A type 4000; 90348 part no. 1087599G1**	
1A4S2	Not used	
1A4S3	SWITCH, SENSITIVE: interlock type, spdt; MIL-S-8805 type MS16106-	Interlock Switch Figure 5-10
1A4S4	Same as 1A4S3	Interlock Switch Figure 5-10
1A4S5	Same as 1A4S3	Interlock Switch Figure 5-10
1A4S6	SWITCH,PUSH: spdt; MIL-S-8805 type MS25089G	Interlock Disable Switch Figure 5-10
1A4S7	Same as 1A4S3	Interlock Switch Figure 5-12
1A4S8	SWITCH, TOGGLE: dpst, MIL-S-3950	Bias Pedestal

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	type MS25100-22	On-Off Figure 5-16
1A4TB1	TERMINAL BOARD: 18 terminal, plastic sheet; 28527 part no. 1087673G1	Component Board Figure 5-13
1A4TB2	Not Used	
1A4TB3	TERMINAL BOARD: 40 terminal, plastic sheet; 28527 part no. 1087737G1	Component Board Figure 5-12
1A4TB4 thru 1A4TB6	TERMINAL BOARD: 10 terminal, barrier type; MIL-T-55164 type 8TB10	Interconnect. Figure 5-18
1A4TB7	TERMINAL BOARD: 10 terminal, barrier type; MIL-T-55164 type 17TB10	Interconnect. Figure 5-18
1A4TB8	Same as 1A4TB7	Interconnect. Figure 5-18
1A4TB9	Same as 1A4TB4	Interconnect. Figure 5-18
1A4TB10	TERMINAL BOARD: 4 terminal, barrier type; MIL-T-55164 type 8TB4	Interconnect. Figure 5-18
1A4TB11	Same as 1A4TB10	Interconnect. Figure 5-18
1A4TB12	TERMINAL BOARD: 4 terminal, barrier type; MIL-T-55164 type 17TB4	Interconnect. Figure 5-18
1A4TB13	TERMINAL BOARD: 79 terminal, plastic sheet; 28527 part no. 1088724G1	Interconnect. Figure 5-11
1A4TB14	TERMINAL BOARD: 12 terminal, plastic; 28527 part no. 1092092G1	Component Mounting Figure 5-11
1A4TB15	TERMINAL BOARD: 12 terminal, plastic; 28527 part no. 1092092G2	Component Mounting Figure 5-11
1A4TB16	TERMINAL BOARD: 12 terminal, plastic; 28527 part no. 1092092G3	Component Mounting Figure 5-10
1A4TB17	TERMINAL BOARD: 12 terminal, plastic; 28527 part no. 1092092G4	Component Mounting Figure 5-10
1A4TB23	TERMINAL BOARD: 18 terminals, plastic;	Component

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	28527 part no. 1087673G3	Mounting Figure 5-13
1A4TY1	ELECTRODE SET: protective spark gap, one 1/2 in. dia. sphere with 9/16 in. lg 8-32 mounting stud, one 1/2 in. dia. sphere with 1-1/8 in. lg mounting stud; 28527 part no. 1087623G1	1A4V9 Filament Protector Figure 5-11
1A4TY2	Same as 1A4TY1	1A4V10 Filam. Protector Figure 5-11
1A4TY3	Same as 1A4TY1	1A4V9 Filament Protector Figure 5-11
1A4TY4	Same as 1A4TY1	1A4V10 Filam. Protector Figure 5-11
1A4TY5	Same as 1A4TY1	Capacitor Protector Figure 5-11
1A4TY6	Same as 1A4TY1	Capacitor Protector Figure 5-11
1A4T1	TRANSFORMER, POWER, STEP-DOWN: input 208 vac, 50 to 60 Hz, output 6.3 vac at 5 amps; 49956 part no. 6258-012-003; 28527 part no. 1087694G1	1A4V1 to 1A4V6 Filament Figure 5-18
1A4T2	TRANSFORMER, POWER STEP-DOWN: input 208 vac, output 2 secondary windings each 7.6v at 25 amps; 28527 part no. 1087495G1	1A4V7 to 1A4V8 Filament Figure 5-18
1A4T3	TRANSFORMER, POWER, STEP-DOWN: input 208v, output 7.1v at 114 amps; 28527 part no. 1087494G1	1A4V9 Filament Transformer Figure 5-19
1A4T4	Same as 1A4T3	1A4V10 Filament Figure 5-18
1A4T5	TRANSFORMER, POWER, VARIABLE: 0-240 vac 6 amps; 58474 type 226-1012; 28527 part no. 1087618G1	Bias Voltage Variable Transformer Figure 5-10
1A4T6	Same as 1A4T5	Bias Voltage Variable

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Transformer Figure 5-10
1A4T7	TRANSFORMER, POWER, STEP-DOWN: 120 volts 45-66 Hz, output 80 vdc, 5.3 amps; 58474 type T5859; 28527 part no. 1087619G1	Buck-Boost Transformer Figure 5-10
1A4T8	Same as 1A4T7	Buck-Boost Transformer Figure 5-10
1A4T9	TRANSFORMER, POWER, STEP-UP: input 208v ± 36%, 50-60 Hz, output 1280vdc ± 2%, 0.7 amps; 33324 part no. S36970; 28527	Rectifier Power Transformer Figure 5-10
1A4T10	Same as 1A4T9	Rectifier Power Transformer Figure 5-10
1A4T11	TRANSFORMER, RADIO FREQUENCY: interstage; 1:1 turns ratio; 21878 part no. YA365; 28527 part no.1088798G1.	RF Interstage Transformer Figure 5-11
1A4V1 thru 1A4V6	Not Used	
1A4V7	ELECTRON TUBE: radial beam tetrode, air cooled; 06980 8189/4PR1000A; 28527 part no. 1096255G1	First IP Amplifier Figure 5-11
1A4V8	Same as 1A4V7	First IP Amplifier Figure 5-11
1A4V9	ELECTRON TUBE: power triode, air cooled; 20948 type F8C25N; 28527 part no. 1096284G1	Second IP Amplifier Figure 5-11
1A4V10	Same as 1A4V9	Second IP Amplifier Figure 5-11
1A4V11	Same as 1A4V2	150 Volt Regulator Figure 5-11
1A4XDS1 thru 1A4XDS16	LAMPHOLDER: clear lens; MIL-L-3661 type LH76/1LC14CD3	1A4DS1-1A4DS16 Lampholder Figure 5-10

1A4XDS1 AN/FPN-44B: LAMPHOLDER: clear lens; MIL-L-3661

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
thru 1A4XDS16	**type LH75LC14CD; 90348 part no. 1087996**	
1A4XDS1MP1 Lens for 1A4XDS1MP16	LENS: clear; MIL-L-3661 type LC14CD3 thru	1A4XDS1 thru 1A4XDS16 Figure 5-10
1A4XK1 thru 1A4XK7	Not Used	
1A4XK8	SOCKET, RELAY: 14 terminals; 71785 part no. 203-62-14-017; 28527 part no. 2311506G1	1A4K8 Relay Socket Figure 5-19
1A4XK8 AN/FPN-44B:	**SOCKET, RELAY: 14 terminals; 71785 part no. 203-62-14-026; 90348 part no. 2311506.**	
1A4XV1 thru 1A4XV6	Not Used	
1A4XV7	SOCKET, ELECTRON TUBE: 5 contacts; glass air flow chimney; saddle mounting, 06980 part no. 4-1000A socket, SK506 chimney; 28527 part no. 1022643G1	Tube Socket Figure 5-11
1A4XV7A	SOCKET, ELECTRON TUBE: 5 contacts; 06980 part no. SK500	1A4V7 Socket Figure 5-11
1A4XV7B	CHIMNEY: glass; 06980 part no. SK506	1A4V7 Chimney Figure 5-11
1A4XV8	Same as 1A4XV7	Tube Socket Figure 5-11
1A4XV8A	Same as 1A4XV7A	1A4V8 Socket Figure 5-11
1A4XV8B	Same as 1A4XV7B	1A4V8 Chimney Figure 5-11
1A4XV9	Not Used	
1A4XV10	Not Used	
1A4XV11	Same as 1A4XV2	Tube Socket Figure 5-11

POWER SUPPLY, PP-7304/FPN-44A

1A4A1	POWER SUPPLY PP-7304/FPN-44A: Part of the Amplifier Group. Includes a 250 volt regulator; 28527 part no. 1088080G3	Power Supply Figure 5-10

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER GROUP, OG-159/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A1F1	FUSE, CARTRIDGE: 0.750 amp, 250 volts; MIL-F-15160 type F02A250V3/4AS	+250 Volt Fuse Figure 5-20
1A4A1F2	FUSE, CARTRIDGE: 0.750 amp, 250 volts; MIL-F-15160 type F02B250V3/4AS	+250 Volt Regulator Filament Voltage Fuse Figure 5-20
1A4A1F3	Same as 1A4A1F2	+250 Volt Regulator Filament Voltage Fuse Figure 5-20
1A4A1F4/5	**AN/FPN-44B: NOT used.**	
1A4A1TB1A	BARRIER STRIP, Cinch part no. 20-140	Drawer Rear Connector Terminal 1-20
1A4A1TB1B	Same as 1A4A1TB1A	Drawer Rear Connector Terminals 21-40
1A4A1J2	CONNECTOR, RECEPTACLE, ELECTRICAL: twinax, 74868 part no. 4775, UG921U; 28527 part no. 2312145G1	Right Angle Twinax Adaptor Figure 5-19
1A4A1J3	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 contacts; MIL-C-3608 type UG422B/U	Current Transformer Figure 5-19
1A4A1J4	CONNECTOR, RECEPTACLE, ELECTRICAL: MIL-C-39012 type M39012/23-0002	To 1 contact; Oscilloscope Figure 5-19
1A4A1MP1	PIN STRAIGHTENER, TUBE: for 7 and 9 pin tubes; 72653 part no. 8655; 28527 part no.2138263G1	Pin Straightener Figure 5-20
1A4A1R1	RESISTOR, VARIABLE: 1K ohm, type RV4LAYSA102A	Stby Drive Level Adjust Figure 5-20
1A4A1XF1 thru 1A4A1XF3	FUSEHOLDER: MIL-F-19207 type FHL17G	1A4A1F1 to 1A4A1F3 Fuseholder Figure 5-20
1A4A1XF4 thru	**AN/FPN-44B: FUSEHOLDER: MIL-F-19207 type FHL17G; NOT USED.**	

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY, PP-7304/FPN44-A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A1XF5		
1A4A1A1	REGULATOR, VOLTAGE: provides +250 vdc in the control-feedback unit 1A4A1; 28527 part no.108748G1	Voltage Supply Figure 5-21
1A4A1A1CR1	SEMICONDUCTOR DEVICE, DIODE: zener, silicon; MIL-S-19500 type JAN1N459	Limiting Diode Figure 5-22
1A4A1A1C1	CAPACITOR, FIXES, MICA DIELECTRIC: 150 pf ± 5%, 500 vdc; MIL-C-5 type CM15ED151JN3	1A4A1A1V4 Feedback Capacitor Figure 5-22
1A4A1A1C2	CAPACITOR, FIXED, MICA DIELECTRIC: 4700 pf ± 5%, 500 vdc, MIL-C-5 type CM35CD472JN3	Filter Capacitor Figure 5-22
1A4A1A1C3	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 uf ± 10%, 400 vdc; MIL-C-25 type CP05A1KE104K3	1A4A1A1V5 Noise Filter Capacitor Figure 5-22
1A4A1A1C4	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.5 uf ± 10%, 400 vdc; MIL-C-25 type CP53B1KE504K1	Filter Capacitor Figure 5-22
1A4A1A1C5	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf ± 10%, 600 vdc; MIL-C-25 type CP72E1EF405K1	Filter Capacitor Figure 5-21
1A4A1A1R1	RESISTOR, FIXED, COMPOSITION: 110K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G114JS	1A4A1A1V4 Plate Voltage Divider Figure 5-22
1A4A1A1R1	**AN/FPN-44B: RESISTOR, FIXED, COMPOSITION: 110K ohms ± 5%, 1/2 watt; MIL-R-11 type RC22GF114J; 90348 part no. 504405H114**	
1A4A1A1R2	RESISTOR, FIXED, COMPOSITION: 82K ohms ±5%, 2 watts; MIL-R-39008 type RCR42G823JS	Filament Bias Resistor Figure 5-22
1A4A1A1R3	RESISTOR, FIXED, COMPOSITION: 33K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G333JS	Filament Bias Resistor Figure 5-22
1A4A1A1R4	RESISTOR, FIXED, COMPOSITION: 470K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G474JS	1A4A1A1V4 Plate Load Resistor Figure 5-22

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY, PP-7304/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A1A1R4	**AN/FPN-44B: RESISTOR, FIXED, COMPOSITION: 470K ohms ± 5%, 1/2 watt; MIL-R-11 type RC22GF474J; 90348 part no. 504405H474**	
1A4A1A1R5	RESISTOR, FIXED, COMPOSITION: 330K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G334JS	1A4A1A1V4 High Freq. Feedback Resistor Figure 5-22
1A4A1A1R6	RESISTOR, FIXED, COMPOSITION: 1K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G102JS	1A4A1A1V1 Parasitic Suppressor Figure 5-22
1A4A1A1R7	Same as 1A4A1A1R1	1A4A1A1V4 Plate Voltage Divider Figure 5-22
1A4A1A1R7	**AN/FPN-44B: Same as 1A4A1A1R1**	
1A4A1A1R8	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5% 2 watts; MIL-R-39008 type RCR42G101JS	1A4A1A1V1 Current Balancing Resistor Figure 5-22
1A4A1A1R9	Same as 1A4A1A1R8	1A4A1A1V1 Current Balancing Resistor Figure 5-22
1A4A1A1R10	RESISTOR, FIXED, COMPOSITION: 680K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G684JS	1A4A1A1V4 Plate Load Resistor Figure 5-22
1A4A1A1R11	Same as 1A4A1A1R6	1A4A1A1V1 Parasitic Suppressor Figure 5-22
1A4A1A1R12	RESISTOR, FIXED, COMPOSITION: 4.7K ohms ±5%, 5%, 2 watts; MIL-R-39008 type RCR42G472JS	1A4A1A1V4 Cathode Voltage Divider Figure 5-22
1A4A1A1R13	RESISTOR, FIXED, COMPOSITION: 10K ohms ±5%, 2 watts; MIL-R-39008 type RCR42G103JS	1A4A1A1V4 Cathode Voltage Divider Figure 5-22

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY, PP-7304/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A1A1R13	**AN/FPN-44B: RESISTOR, FIXED, COMPOSITION: 10K ohms ±10%, 2 watts; MIL-R-11 type RC42GF103K; 90348 part no. 501253H1**	
1A4A1A1R14	RESISTOR, FIXED, COMPOSITION: 22K ohms ±5%, 1 watt; MIL-R-39008 type RCR32G223JS	1A4A1A1V4 Cathode Voltage Divider Figure 5-22
1A4A1A1R15	Same as 1A4A1A1R14	1A4A1A1V4 Cathode Voltage Divider Figure 5-22
1A4A1A1R16	Same as 1A4A1A1R6	1A4A1A1V2 Parasitic Suppressor Figure 5-22
1A4A1A1R17	RESISTOR, FIXED, COMPOSITION: 33 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G330JS	1A4A1A1V4 Parasitic Suppressor Figure 5-31
1A4A1A1R18	Same as 1A4A1A1R8	1A4A1A1V2 Current Balancing Resistor Figure 5-31
1A4A1A1R19	RESISTOR, FIXED, COMPOSITION: 47K ohms ± 5%, 1/2 WATT; MIL-R-39008 type RCR20G473JS	1A4A1A1V4 Decoupling Resistor Figure 5-22
1A4A1A1R20	Same as 1A4A1A1R8	1A4A1A1V2 Current Balancing Resistor Figure 5-31
1A4A1A1R21	RESISTOR, FIXED, COMPOSITION: 100K ohms ± 5% 5%, 2 watts; MIL-R-39008 type RCR42G104JS	1A4A1A1V5 Current Limiting resistor Figure 5-22
1A4A1A1R22	Same as 1A4A1A1R6	1A4A1A1V2 Parasitic Suppressor Figure 5-22
1A4A1A1R23	Same as 1A4A1A1R6	1A4A1A1V3 Parasitic

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY, PP-7304/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Suppressor Figure 5-22
1A4A1A1R24	Same as 1A4A1A1R8	1A4A1A1V3 Current Balancing Resistor Figure 5-22
1A4A1A1R25	RESISTOR, FIXED, FILM: 38.3K ohms ± 1%, 1 watt; MIL-R-10509 type RN75B3832F	1A4A1A1V4 Cathode Voltage Divider Figure 5-22
1A4A1A1R26	RESISTOR, VARIABLE, COMPOSITION: 5K ohms ± 10%, 2 watts; MIL-R-94 type RV4LAYSA502A	Output Voltage Adjust Figure 5-21
1A4A1A1R27	RESISTOR, FIXED, FILM: 17.8K ohms + 1%, 1 watt; MIL-R-10509 type RN75B1782F	1A4A1A1V4 Cathode Voltage Divider Figure 5-22
1A4A1A1R28	Same as 1A4A1A1R8	1A4A1A1V4 Current Balancing Resistor Figure 5-22
1A4A1A1R29	Same as 1A4A1A1R6	1A4A1A1V3 Parasitic Suppressor Figure 5-22
1A4A1A1TB1	TERMINAL BOARD: 8 terminal; barrier type; MIL-T-55164 type 41TB8	Interconnection Figure 5-21
1A4A1A1TB1	**AN/FPN-44B: TERMINAL BOARD: 8 terminal; barrier type; 90348 part no. 356064**	
1A4A1A1TB2	TERMINAL BOARD: 32 terminals; plastic; 28527 part no. 1088002G1	Component Mounting Figure 5-22
1A4A1A1TP1	JACK TIP: low voltage, red insulator; MIL-C-39024 type M39024/10-02	+500 Volt Input Test Point Figure 5-21
1A4A1A1TP2	JACK TIP: low voltage, yellow insulator; MIL-C-39024 type M39024-10-08	1A4A1A1V1 Current Monitoring

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY, PP-7304/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-21
1A4A1A1TP3	Same as 1A4A1A1TP2	1A4A1A1V1 Current Monitoring Figure 5-21
1A4A1A1TP4	Same as 1A4A1A1TP2	1A4A1A1V2 Current Monitoring Figure 5-22
1A4A1A1TP5	Same as 1A4A1A1TP2	1A4A1A1V2 Current Monitoring Figure 5-22
1A4A1A1TP6 1A4A1A1TP7	Same as 1A4A1A1TP2	1A4A1A1V3 Current Monitoring Figure 5-21
1A4A1A1TP8	Same as 1A4A1A1TP1	+250 Volt Output Voltage test Point Figure 5-21
1A4A1A1T1	TRANSFORMER, POWER, STEP-DOWN: primary 208 volts, 50/60 Hz ± 10%, secondary 6.3v at 17 amps; 28527 part no. 1087693G1	Filament Voltage Figure 5-21
1A4A1A1V1	ELECTRON TUBE: dual power triode; MIL-E-1 type JAN6336B	Series Regulator Tube Figure 5-21
1A4A1A1V2/3	Same as 1A4A1A1V1	
1A4A1A1V4	ELECTRON TUBE: dual triode; MIL-E-1 type JAN5751	Control Tube Figure 5-22
1A4A1A1V5	ELECTRON TUBE: MIL-E-1 type JAN5651WA	Voltage Reference Tube Figure 5-22
1A4A1A1XV1 thru 1A4A1A1XV3	SOCKET, ELECTRON TUBE: octal, MIL-S-12883 type M12883/01-04	Tube Socket Figure 5-22
1A4A1A1XV4	SOCKET, ELECTRON TUBE: noval; MIL-S-12883 type M12883/03-01	Tube Socket Figure 5-22
1A4A1A1XV5	SOCKET, ELECTRON TUBE: octal MIL-S-12883 type M12883/02-01	Tube Socket Figure 5-22

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

INPUT AMPLIFIER 1A4A1A3

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
C1 thru C37	Not used	
C38	CAPACITOR, FIXED; 1200 pF, 5%, 500 V, MIL-C-5 type CM06FD122J03	Decoupling Figure 7-6
C39	Same as C38	Decoupling Figure 7-6
C40	CAPACITOR, FIXED; 0.1 uF, 10%, 400 V, MIL-C-25 type CP09A1KE104K1	Bypass Figure 7-4
C41	Same as C40	Bypass Figure 7-4
C42	CAPACITOR FIXED; 2 uF, 10%, 600 V, 56289 Part No. 118P20596S4	Decoupling Figure 7-4
C43	Same as C42	Decoupling Figure 7-4
C44	CAPACITOR, FIXED; 0.47 uF, 10%, 600 V, 56289 Part No. 118P47496S4	Coupling Figure 7-4
C45	Same as C44	Coupling Figure 7-4
C46	NOT USED	
C47	NOT USED	
C48	CAPACITOR FIXED; 1800 pF, 5%, 500 V, MIL-C-5 type CM06FD182J03	Bypass Figure 7-6
C49	Same as C48	Bypass Figure 7-6
C50	Same as C42	Bypass Figure 7-4
C51	NOT USED	
C52	Same as C42	Bypass Figure 7-4
C53	NOT USED	
C54	Same as C42	Decoupling Figure 7-4
C55	NOT USED	
C56	Same as C42	Decoupling Figure 7-4
C57	NOT USED	
C58	Same as C42	Coupling Figure 7-4

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

INPUT AMPLIFIER 1A4A1A3 (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
C59	Same as C42	Coupling Figure 7-4
C60	Same as C42	Coupling Figure 7-4
C61	Same as C42	Coupling Figure 7-4
C62	Same as C44	Decoupling Figure 7-6
C63	Same as C44	Decoupling Figure 7-6
C64	Same as C44	Decoupling Figure 7-4
C65	Same as C42	Filter Figure 7-4
C66	Same as C42	Filter Figure 7-4
C67	Same as C42	Filter Figure 7-4
C68	Same as C42	Filter Figure 7-4
C69	Same as C44	Decoupling Figure 7-4
C70	Same as C42	Filter Figure 7-4
C71	Same as C42	Filter Figure 7-4
C72	Same as C42	Filter Figure 7-4
C73	Same as C42	Filter Figure 7-4
C74	Same as C44	Decoupling Fig 7-4, and 7-6
C75	Same as C44	Decoupling Fig 7-4, and 7-6
C76	Not used	
C77	CAPACITOR, FIXED, ELECTROLYTIC; 10 uF. ±10%, 50 VDC; MIL-C-39003 type CSR13G1O6KL	Coupling Figure 7-4

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

INPUT AMPLIFIER 1A4A1A3 (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
J1	CONNECTOR, TWINAX; MIL-C-3608 type UG-422/U	Drive input Figure 7-3
J2	Same as J1	Current FDBK Figure 7-4
J3	Same as J1	Voltage FDBK Figure 7-4
J4	CONNECTOR, COAX; BNC, MIL-C- type UG-290B/U	Pedestal 39012, Drive Figure 7-4
K4	RELAY, DPDT; Coil 26.5 vdc, contacts 28 v, 2 amp, MIL-R-5757 type M5757/10-030	Feedback/ Overload 7-4
R74	RESISTOR, FIXED; 82 Ohms, 5%, 1/4 watt, MIL-R-39008 type RCR07G820JR	Figure 7-4
R75	RESISTOR, FIXED; 47 Ohms, 5%, 1/4 watt, MIL-R-39008 type RCR07G470JR	Figure 7-4
R77	RESISTOR, FIXED; 51 Ohms, 5%, 1/4 watt, MIL-R-39008 type RCR07G510JR	Figure 7-4
R78	RESISTOR, FIXED; 820 Ohms 5%, 2 watt, MIL-R-39008 type RCR07G821JR	Figure 7-4
R79	Same as R78	Figure 7-4
R80 thru R120	Not used	
R121	RESISTOR, FIXED; 100 Ohms, 5%, 1/2 watt, MIL-R-39008 type RCR20G101JR	Figure 7-4
R122	Same as R121	Figure 7-4
R123	RESISTOR, FIXED; 100 k, 5%, 1/2 watt, MIL-R-39008 type	Figure 7-4
R124	Same as R123	Figure 7-4
R125	RESISTOR, FIXED; 68 ohm 1/2 watt, MIL-R-39008 type RCR20G680JR	
R126	Same as R256	Figure 7-6
R127 to R130	RESISTOR, FIXED; 100 Ohms, 5%, 1/2 Watt, MIL-R-39008 type RCR20G101JR	Figure 7-6
R131	RESISTOR, FIXED; 33 k,watts, MIL-R-39008 type RCR42G333JR	Figure 7-6
R132	Same as R1313 RESISTOR, FIXED; 3900 Ohms, 5%, 1 watt, MIL-R-39008 type RCR32G392JR	Figure 7-6

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

INPUT AMPLIFIER 1A4A1A3 (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
R133	RESISTOR, FIXED; 3900 Ohms, 5%, 1 watt, MIL-R-39008 type RCR32G392JR	Figure 7-6
R134 thru R138	Same as 133	Figure 7-6
R139	RESISTOR, FIXED; 2400 Ohms, 5%, 2 watts, MIL-R-39008 type RCR42G242JR	Figure 7-6
R140	Same as R139	Figure 7-6
R141	RESISTOR, FIXED; 180 k, 5%, 1 watt, MIL-R-39008 type RCR32G184JR	Figure 7-6
R142	Same as R141	Figure 7-6
R143	Same as R141	Figure 7-6
R144	Same as R141	Figure 7-6
R145	Same as R121	Figure 7-6
R146	Same as R121	Figure 7-6
R147 thru R150	Not Used	
R151	RESISTOR, FIXED; 62 Ohms, 5%, 2 watts, MIL-R-39008 type RCR42G620JR	Figure 7-6
R152	Same as R151	Figure 7-6
R153	Same as R121	Figure 7-6
R154	Same as R121	Figure 7-6
R155	RESISTOR, FIXED; 15 k, 5%, 1 watt, MIL-R-39008 type RCR32G153JR	Figure 7-6
R156 thru R158	Same as R155	Figure 7-6
R159	RESISTOR, FIXED; wire wound, 3300 Ohms, 5%, 14 watts, MIL-R-26 type RW56V332	Figure 7-1
R160	Same as R159	Figure 7-1
R161	RESISTOR, FIXED; 1200 Ohms 5%, 75 watts, 72819 Part No. 888AS122J	Figure 7-1
R162 thru R164	Same as R161	Figure 7-1
R165	RESISTOR, FIXED; 27 Ohms, 5%. 2 WATTS, MIL-R-39008 type RCR42G270JR	Figure 7-1
R166	RESISTOR, FIXED; 100 k, 5%, 1 WATT, MIL-R-39008 type RCR32G104JR	Figure 7-6
R167	RESISTOR, FIXED; 100 Ohms, 5%, 1 WATT MIL-R-39008 type RCR32G101JR	Figure 7-6

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

INPUT AMPLIFIER 1A4A1A3 (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
R168	Same as R166	Figure 7-6
R169 thru R170	Same as R167	Figure 7-6
R171	Same as R121	Figure 7-4
R172	Same as R167	Figure 7-1
R173	Same as R121	Figure 7-4
R174 thru R180	Same as R167	Figure 7-4
R181 thru R185	Same as R167	Figure 7-6
R186	Same as R121	Figure 7-4
R187	Same as R167	Figure 7-4
R188	Same as R121	Figure 7-4
R189	Same as R167	Figure 7-4
R190	RESISTOR, FIXED; 10 Ohms, 5%. 1 WATT MIL-R-39008 type RCR32G1OOJR	Figure 7-4
R191	Same as R190	Figure 7-4
R192	RESISTOR, FIXED; Wirewound, 200 Ohms, 5%, 14 watts, MIL-R-26 type RW56V201	Figure 7-1
R193	RESISTOR, FIXED; 4700 Ohms, 5%, 1 watt, MIL-R-39008 type RCR32G472JR	Figure 7-6
R194 thru R198	Same as R193	Figure 7-6
R199	Same as R165	Figure 7-1
R200	Same as R192	Figure 7-1
R201 thru R202	Same as R167	Figure 7-6
R209	RESISTOR, FIXED; 10k, 5%, 1/4 watt, MIL-R-39008 type RCR07G103JR	Figure 7-4
R221 thru R235	Not used	
R236	RESISTOR, FIXED; 36 Ohms, 5%, 1/2 watt, MIL-R-39008 type RCR20G360JR	Figure 7-4
R240	Same as R74	Figure 7-4
S1	SWITCH, TOGGLE; DPDT, MIL-S-83731 type MS35059-23	Figure 7-4
TB1	TERMINAL BOARD; 10 terminal barrier, MIL-T-55164/5 type 37TB1O	Figure 7-1
TB2	Same as TB1	Figure 7-1

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

INPUT AMPLIFIER 1A4A1A3 (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
TB3	COMPONENT BOARD; Left main amplifier 28527 Part No. 1096593G1	Figure 7-4
TB4	COMPONENT BOARD; Right main amplifier, 28527 Part No. 1096595G1	Figure 7-4
T1	TRANSFORMER, FILAMENT; 115 V: 6.3V, 10 kV; Del Electronics Part No. AD3230	Figure 7-1
T2	Same as T1	Figure 7-1
V1	ELECTRON TUBE; Type 6CL6	Figure 7-1
V2	Same as V1	Figure 7-1
V3	ELECTRON TUBE; Type 6146W	Figure 7-1
V4 - V8	Same as V3	Figure 7-1
W1	CABLE 300 OHM SHIELDED, 81774 P/N C-5720-18	Figure 5-6
XV1	SOCKET, TUBE; 9-pin miniature, MIL-S-12883 type TS103P01	Figure 7-4
XV2	Same as XV1	Figure 7-4
XV3	SOCKET, TUBE; Octal, MIL-S-12883 type TS101P02	Figure 7-4
XV4 Thru XV8	Same as XV3	Figure 7-4
1A4A1A3A1	PRINTED CIRCUIT BOARD Reference Amplifier	Figure 7-3
1A4A1A3A1R1	RESISTOR, FIXED; 51 Ohms, 5%, 1/4 watt, MIL-R-39008 type RCR07G510JR	Figure 7-3
1A4A1A3A1R2	Same as 1A4A1A3A1R1	Figure 7-3
1A4A1A3A2	PRINTED CIRCUIT BOARD Pedestal-Gen/Diff PreAmp	Figure 7-4
1A4A1A3A2 R73	RESISTOR, FIXED; 390 Ohms, 5%, 1/4 watt, MIL-R-39008 type RCR07G391JR	Figure 7-5
1A4A1A3A2 R76	RESISTOR, FIXED; 120 ohms, 5%, 1/4 watt, MIL-R-39008 type RCR07G121JR	Figure 7-5

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL OSCILLOSCOPE, C-4558A/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A3	CONTROL, OSCILLOSCOPE, C-4558A/FPN-44: Oscilloscope provides Control circuitry in the Low Power Control Transmitter to select signals to be visually displayed on the associated oscilloscope; 28527 part no. 1087795G3	Oscilloscope Control Figure 5-10
1A4A3C1	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 uf ± 10%, 100 vdc; MIL-C-25 type CP11A3KB105K3	-12 Volt Bypass Figure 5-24
1A4A3C2	Same as 1A4A3C1	-28 Volt Bypass Figure 5-24
1A4A3C3	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.47 uf ± 10%, 400 vdc; MIL-C-25 type CP11A3KE474K3	250 Volt Bypass Figure 5-24
1A4A3F1	FUSE, CARTRIDGE: 0.5 amp, 250 volt; MIL-F-15160 type F02B250V1/2AS	-28 Volt Rectifier Transformer primary Figure 5-23
1A4A3J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 35 97525 type 7008-35-5-4-11; 28527 part no. 2311101G4	Drawer Contacts; Interconnect Figure 5-24
1A4A3J2	Same as 1A4A3J1	Drawer Interconnect Figure 5-24
1A4A3J3	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 contact; MIL-C-39012 type no. M39012/21-0001	Monitored Circuit O Output Figure 5-23
1A4A3J4	Same as 1A4A3J3	Selected Trigger Output Figure 5-23
1A4A3J5	CONNECTOR, RECEPTACLE, ELECTRICAL: 86 contacts; 00779 part no. 67015-6	1A4A3A2 Intercon-nection Figure 5-23
1A4A3M1	AMMETER: 0 to 5 ma; 50 equal divisions; 2.695 in. od; 28527 part no. 2311391G1	Low Voltage Indicator Figure 5-33
1A4A3P1	CONNECTOR, PLUG, ELECTRICAL: 10 contact positions; 71785 part no. 250-10-30-170	1A4A3S3 Intercon-nection

CONTROL OSCILLOSCOPE, C-4558A/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-24
1A4A3R1	RESISTOR, FIXED, WIREWOUND: 499K ohms+ + 1% 3/4 watt; MIL-R-93 type RB18CE49902F	250 Volt Multiplier Figure 5-
241A4A3R2	RESISTOR, FIXED, WIREWOUND: 24.9K ohms ± 1% 1/4 watt; MIL-R-93 type RB08CE24901F	-12 Volt Multiplier Figure 5-24
1A4A4R3	RESISTOR, FIXED, WIREWOUND; 49.9 ohms ± 1%, 1/4 watt; MIL-R-93 type RB08CE49901F	-28 Volt Multiplier Figure 5-24
1A4A3R4	RESISTOR, FIXED, COMPOSITION: 10K ohms ± 5%, 1 watt; MIL-R-39008 type RCR32G103JS	-250 Volt multiplier Figure 5-24
1A4A3R4	**AN/FPN-44B: RESISTOR, FIXED, COMPOSITION: 10K ohms ± 10%, 1 watt; MIL-R-11 type RC32GF103K; 90348 part no. 503930H1**	
1A4A3S1	SWITCH, ROTARY: 3 pole, 15 position, 3 section, non-shorting; 28527 part no. 1088044G1	Oscilloscope Circuit Selector Figure 5-23
1A4A3S1A	SWITCH SECTION, ROTARY: contacts brass, silver plated, non-shorting; 28527 part no. 1088044G2	Part of 1A4A3S1 Figure 5-24
1A4A3S1B	Same as 1A4A3S1A	Part of 1A4A3S1 Figure 5-24
1A4A3S1C	Same as 1A4A3S1A	Part of 1A4A3S1 Figure 5-24
1A4A3S2	SWITCH, ROTARY: 2 pole, 4 position, 1 section, non-shorting 76854 type 399371FC NON-SHORTING; 28527 part no. 2310966G6	Meter Selector Figure 5-23
1A4A3S2	**AN/FPN-44B: SWITCH, ROTARY: 2 pole, 4 position, 1 section, non-shorting 76854 type 399355FC; 90348 part no. 2310966G6**	
1A4A3S3	SWITCH, ROTARY: thumbwheel, 10 position, dial 0-9, nines complement binary coded decimal; 07126 part no. 19027-1	Pulse Selector Figure 5-32
1A4A3S4	SWITCH, ROTARY: 3 position, 3 pole, 1 Section, non-shorting; 76854 part no. 399375FC; 28527 part no. 2310966G10	Mode Selector Figure 5-23
1A4A3XF1	FUSEHOLDER: MIL-F-19207 type FHL17G	1A4A3F1 Holder

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL OSCILLOSCOPE, C-4558A/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-23
1A4A3A1	POWER SUPPLY: furnishes -12 and -28 volt supply to the Control Oscilloscope Unit 1A4A3; 28527 part no. 1088103G1	Power Supply Figure 5-24
1A4A3A1CR1	SEMICONDUCTOR DEVICE, DIODE: MIL-S-19500 type JAN1N1614	-28 Volt Supply Figure 5-25
1A4A3A1CR2	Same as 1A4A3A1CR1	-28 Volt Supply Figure 5-25
1A4A3A1CR3	Same as 1A4A3A1CR1	-28 Volt Supply Figure 5-25
1A4A3A1CR4	Same as 1A4A3A1CR1	-28 Volt Supply Figure 5-25
1A4A3A1CR5	SEMICONDUCTOR DEVICE, DIODE: MIL-S-19500 TYPE 1N2976B	12 Volt Regulator Figure 5-25
1A4A3A1C1	CAPACITOR, FIXED, ELECTROLYTIC: 400 uf +150% -10%, 100 vdc; MIL-C-62 type CE51C401H	-28 Volt Filter Figure 5-25
1A4A3A1C2	Same as 1A4A3A1C1	-28 Volt Filter Figure 5-25
1A4A3A1C3	Same as 1A4A3A1C1	-28 Volt Filter Figure 5-25
1A4A3A1L1	REACTOR: 0.08 hy at 2 amps and 0.82 hy at 0.2 amps, 2 ohms dc res; 28527 part no. 2311918G1	-28 Volt Filter Figure 5-25
1A4A3A1R1	RESISTOR, FIXED, WIREWOUND: 91 ohms ±5%, 14 watts; MIL-R-26 type RW56V910	-12 Volt Dropping Figure 5-25
1A4A3A1TB1	TERMINAL BOARD: 8 terminals, barrier type; MIL-T-55164 type 41TB8	Intercon-nection Figure 5-25
1A4A3A1T1	TRANSFORMER, POWER, STEP-DOWN: input 115 volts, 45/66 Hz, output 32 volts at 3 amp; 28527 part no. 2311985G1	-28 Volt Power Transformer Figure 5-25
1A4A3A1XC1 thru 1A4A3A1XC3	SOCKET, ELECTRON TUBE: octal, MIL-S-12883 type M12883/01-03	Capacitor Socket Figure 5-25

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL OSCILLOSCOPE, C-4558A/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A3A2	TRIGGER SELECTOR: provides the Control Oscilloscope Unit 1A4A3 with the proper selected signals to be visually displayed on Oscilloscope; provides drive to Bias Pedestal Generator 1A4A5: 04624 part no. W0725/IB/TB/BPD	Trigger Selector/ Bias Pedestal Driver Figure 5-24

POWER SUPPLY, 1092037G1 NOTE: * denotes components not active.

1A4A4	POWER SUPPLY: 120v input, 350 vdc at 0.5 amp output; 28527 part no. 1092037G1	Bias Pedestal Figure 5-19
* 1A4A4CR1 thru * 1A4A4CR4	SEMICONDUCTOR DEVICE, DIODE: silicon; MIL-S-19500 type JAN1N547	Rectifier Figure 5-29
* 1A4A4C1	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.015 uf ± 10%, 1000 vdc; MIL-C-25 type CP05A1KG153K3	Suppressor Figure 5-29
* 1A4A4C2 thru * 1A4A4C5	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 uf ± 10%, 600 vdc; MIL-C-25 type CP09A1KF103K3	Bypass Figure 5-29
* 1A4A4C6	CAPACITOR, FIXED, ELECTROLYTIC: 80 uf -10 +50%, 450 vdc; MIL-C-62 type CE51C800R	Filter Figure 5-28
* 1A4A4C7	Same as 1A4A4C6	Filter Figure 5-28
* 1A4A4L1	REACTOR: 1.0 hy at 0.6 amp dc, 37 ohms dc resistance, 750 peak working voltage; 28527 part no. 1088485G1	Filter Figure 5-28
* 1A4A4R1	RESISTOR, FIXED, COMPOSITION: 1K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G102JS	Suppressor Figure 5-29
* 1A4A4R2	RESISTOR, FIXED, WIREWOUND: 2000 ohms ± 5%, 113 watts; MIL-R-26 type RW37V202	Bleeder Figure 5-28
* 1A4A4T1	TRANSFORMER, POWER, STEP-UP: primary 114v, 120v, 126v, 45 to 66 Hz, secondary 375v at 0.6 amp dc; 28527 part no. 1088488G1	Plate Supply Figure 5-28
1A4A4T2	TRANSFORMER, POWER, STEPDOWN: primary 105.6v, 112.8v, 120v, 127.2v, secondary 6.3v at 10 amps; 28527 part no. 2312375G1	Filament Supply Figure 5-28
1A4A4TB1	TERMINAL BOARD: 10 terminals, barrier type;	Connecting

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL OSCILLOSCOPE, C-4558A/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	MIL-T-55164 type 17TB10	Figure 5-28
* 1A4A4TB2	TERMINAL BOARD: plastic 28527 part no. 1092041G1	Component Mounting Figure 5-29
* 1A4A4XC1 thru * 1A4A4XC5	Not Used	
* 1A4A4XC6	SOCKET, ELECTRON TUBE: octal; MIL-S-12883 type M12883/01-03	1A4A4C6 Socket Figure 5-29
* 1A4A4XC7	Same as 1A4A4XC6	1A4A4C7 Socket Figure 5-29

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

GENERATOR, BIAS PEDESTAL

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A5	GENERATOR, BIAS PEDESTAL: 350 vdc at 0.5 operating power requirement; 28527 part no. 1092036G1	Generate amp Bias for Pedestal Figure 5-18
1A4A5A1	Not Used	
1A4A5CR1 thru 1A4A5CR10	SEMICONDUCTOR DEVICE, DIODE: silicon; MIL-S-19500 type JAN1N547	Clipping Figure 5-31
1A4A5C1	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.033 uf ± 10%, 200 vdc; MIL-C-25 type CP08A1KC333K1	1A4A5A1 Time Constant Figure 5-31
1A4A5C2	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 uf ± 10%, 600 vdc; MIL-C-25 type CP91B1EF105K1	1A4A5V1 Coupling Figure 5-30
1A4A5C3	Same as 1A4A5C2	1A4A5V2 Screen Bypass Figure 5-30
1A4A5C4	Same as 1A4A5C2	1A4A5V2 Coupling Figure 5-30
1A4A5C5	CAPACITOR, FIXED, ELECTROLYTIC: 350 uf -10 +50%, 450 vdc; 24446 part no. 43F3079CA4	1A4A5V3 Plate Storage Figure 5-30
1A4A5C6	CAPACITOR, FIXED, ELECTROLYTIC: 82 uf -10 +50%, 450 vdc; MIL-C-62 type CE56C820R	Bias Decoupling Figure 5-30
1A4A5C7	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 uf ± 10%, 1500 vdc; MIL-C-25 type CP70B1EH105K1	Clipping Bias Filter Figure 5-30
1A4A5C8	CAPACITOR, FIXED, PAPER DIELECTRIC: 8.0 uf ± 10% 600 vdc; MIL-C-25 type CP70E1EF805K1	Clipping Bias Filter Figure 5-30
1A4A5C9	Not Used	
1A4A5C10	Same as 1A4A5C1	1A4A5A1 Trigger Coupling Figure 5-31
1A4A5C11	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 uf + 20%, 400 vdc; MIL-C-11693 type CZ24BKE104	+250V Filter Figure 5-30

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

GENERATOR, BIAS PEDESTAL (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A5C12	Same as 1A4A5C11	-12V Filter Figure 5-30
1A4A5C13	Same as 1A4A5C11	-150V Filter Figure 5-30
1A4A5C14	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 uf ± 10%, 400 vdc; MIL-C-25 type CP54B1KE254K1	1A4A5A1 Time Constant Figure 5-31
1A4A5C15	Same as 1A4A5C1	1A4A5A1 Time Constant Figure 5-31
1A4A5C16	CAPACITOR, FIXED, ELECTROLYTIC: 470 uf + 50% -10%, 350 vdc; MIL-C-62 type CE71C471P	Filter Figure 5-30
1A4A5C17	CAPACITOR, FIXED PAPER DIELECTRIC; 4.0 uF, ±10%, 1.5 kVDC, 56289 Sprague Part No. CQ72EIGH405K3	Filter Figure 5-30
1A4A5J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 contact; MIL-C-3608 type UG1094AU	Trigger Input Figure 5-30
1A4A5L1	CHOKE, RADIO FREQUENCY: 470 uh inductance, 17 ohms dc resistance, 170 ma current rating; MIL-C-15305 type MS21380-33	+250V Filter Figure 5-30
1A4A5L2	Same as 1A4A5L1	-12V Filter Figure 5-30
1A4A5L3	Same as 1A4A5L1	-150V Filter Figure 5-30
1A4A5R1	Not Used	
1A4A5R2	RESISTOR, FIXED, COMPOSITION: 100K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G104JS	1A4A5V1 Grid Leak Figure 5-31
1A4A5R3	RESISTOR, FIXED, COMPOSITION: 100 ohms ±5%, 1/2 watt; MIL-R-39008 type RCR20G101JS	1A4A5V1 Grid Limiting Figure 5-31
1A4A5R3	**AN/FPN-44B: RESISTOR, FIXED, COMPOSITION: 100 ohms ±5%, 1/2 watt; MIL-R-11 type RC22GF101J; 90348 part no. 504405H101**	
1A4A5R4	RESISTOR, FIXED, COMPOSITION: 6.2K ohms ± 5%, 1 watt; MIL-R-39008 type RCR32G622JS	1A4A5V1 Grid Load Figure 5-31
1A4A5R5	RESISTOR, FIXED, COMPOSITION: 10 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G100JS	1A4A5V1 Plate Suppressor Figure 5-31

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

GENERATOR, BIAS PEDESTAL (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A5R6	Same as 1A4A5R3	1A4A5V1 Cathode Figure 5-31
1A4A5R6	**AN/FPN-44B: Same as 1A4A5R3**	
1A4A5R7	RESISTOR, FIXED, COMPOSITION: 220K ohms ± 5%, 1/2 watt; MIL-39008 type RCR20G224JS	1A4A5V2 Grid Leak Figure 5-31
1A4A5R8 thru 1A4A5R9	Not Used	
1A4A5R10	RESISTOR, FIXED, WIREWOUND: 10K ohms ± 5%, 14 watts; 28527 part no. 535188H103	1A4A5V2 Plate Load Figure 5-31
1A4A5R11	RESISTOR, FIXED, COMPOSITION: 10 ohms ±5%, 1 watt, MIL-R-39008 type RCR32G100JS	1A4A5V2 Plate Suppressor Figure 5-31
1A4A5R12	Same as 1A4A5R5	Cathode Figure 5-31
1A4A5R13	RESISTOR, FIXED, COMPOSITION: 24K ohms ±5%, 2 watts; MIL-R-39008 type RCR42G243JS	1A4A5V2 Screen Dropping Figure 5-31
1A4A5R14	RESISTOR, VARIABLE: composition, 100K ohms ±10%, 2 watts; MIL-R-94 type RV4LAYSA104A	Level Adjust Figure 5-10
1A4A5R15	RESISTOR, FIXED, WIREWOUND: 330 ohms ±5%, 91 watts; MIL-R-26 type RW24V331	1A4A5V3 Plate Charging Figure 5-30
1A4A5R16	RESISTOR, FIXED, COMPOSITION: 180 ohms ±5%, 1 watt; MIL-R-39008 type RCR32G181JS	1A4A5V3 Grid Suppressor Figure 5-31
1A4A5R17	Same as 1A4A5R16	1A4A5V3 Grid Suppressor Figure 5-31
1A4A5R18 thru 1A4A5R22	RESISTOR, FIXED, COMPOSITION: 1 megohm ± 5% 1/2 watt; MIL-R-39008 type RCR20G105JS	Diode Voltage Equalizing Figure 5-31
1A4A5R23	RESISTOR, FIXED, COMPOSITION: 100K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G104JS	Diode Clipping Bias Figure 5-31

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

GENERATOR, BIAS PEDESTAL (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A5R24 Clipping	Same as 1A4A5R23	Diode Bias Figure 5-31
1A4A5R25 thru 1A4A5R29	Same as 1A4A5R18	Diode Voltage Equalizing
1A4A5R30	Not Used	
1A4A5R31	RESISTOR, VARIABLE: composition, 5K ohms ± 5%, 2 watts; MIL-R-94 type RV4LAYSA502A	Negative Clipping Adjust Figure 5-10
1A4A5R32	RESISTOR, VARIABLE: composition, 100K ohms ± 10%, 2 watts; MIL-R-94 type RV4LAYSA104A	Positive Clipping Adjust Figure 5-10
1A4A5R33	Not Used	
1A4A5R34	RESISTOR, FIXED, COMPOSITION: 39K ohms + 5% 2 watts; MIL-R-39008 type RCR42G393JR	Bias Decoupling Figure 5-31
1A4A5R35	RESISTOR, FIXED, WIREWOUND: 39K ohms ± 5%, 2 watts MIL-R-39008 type RCR426393JR	Suppressor Figure 5-31
1A4A5R36	Same as 1A4A5R23	
1A4A5R37 thru 1A4A5R39	Not used	
1A4A5R40	Same as 1A4A5R23	
1A4A5R41	Same as 1A4A5R23	
1A4A5R42	Same as 1A4A5R23	
1A4A5R43	RESISTOR, FIXED; 1500 ohms, ± 5%, 2 watts, MIL-R-39008, type RCR42G152JR	
1A4A5R44	Same as 1A4A5R43	
1A4A5R45	Same as 1A4A5R43	
1A4A5R46	RESISTOR, FIXED, COMPOSITION; 75 kOhms ±5%, 1 watt; MIL-R-39008, type RCR32G753JR	
1A4A5S1	SWITCH, TOGGLE: spdt; 96906 part no. MS35058-23	Pulse Spacing Selector Figure 5-30
1A4A5T1	TRANSFORMER, PULSE, STEP-UP; Electronic	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

GENERATOR, BIAS PEDESTAL (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	Transformer Corporation Part 150702	
1A4A5TB1	TERMINAL BOARD: 10 terminals; MIL-T-55164 type 17TB10	Connecting Figure 5-30
1A4A5TB2	TERMINAL BOARD: plastic; 28527 part no. 1092053G	Component Mounting Figure 5-31
1A4A5TB3	TERMINAL BOARD: plastic; 28527 part no. 1092054G1	Component Mounting Figure 5-31
1A4A5TB4	TERMINAL BOARD: 6 terminals; MIL-T-55164 type 40TB6	Inter connection Figure 5-30
1A4A5V1	ELECTRON TUBE: MIL-E-1 type JAN12AT7WC	Pulse Amplifier Figure 5-30
1A4A5V2	ELECTRON TUBE: MIL-E-1 type 6CL6	Pulse Amplifier Figure 5-30
1A4A5V3	ELECTRON TUBE: MIL-E-1 type JAN6336B	Cathode Follower
4A5XA1	SOCKET, ELECTRON TUBE: 9 pin; MIL-S-12883 type M12883/03-01	1A4A5A1 Socket Figure 5-31
1A4A5XC1 thru 1A4A5XC5	Not Used	
1A4A5XC6 M12883/01-03	SOCKET, ELECTRON TUBE: octal; MIL-S-12883 Socket	1A4A5C6 type Figure 5-31
1A4A5XV1	Same as 1A4A5XA1	1A4A5V1 Socket Figure 5-31
1A4A5XV2	Same as 1A4A5XA1	1A4A5V2 Socket Figure 5-31
1A4A5XV3	Same as 1A4A5XC6	1A4A5V3 Socket Figure 5-31

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6	POWER SUPPLY ASSEMBLY; Provides power for 1A4A1A3, consists of four power supplies; 28527 part no. 1096581G	Low-Voltage DC Figure 5-10
1A4A6M1	METER, PANEL; 0-5 Scale, 50 Divisions; 28527 part no. 2311391G1	Power Supply Output Figure 5-30
1A4A6R1 and 1A4A6R2	RESISTOR, FIXED, WIREWOUND: 499K ohms ± 1%, 3/4 watts; MIL-R-93 Type RB18CE49902F	1A4A6M1 Multiplier Figure 5-30
1A4A6R3 and 1A4A6R4	RESISTOR, FIXED, WIREWOUND: 49.9K ohms ± 1%, 1/4 watt; MIL-R-93 Type RB08CE49901F	1A4A6M1 Multiplier Figure 5-30
1A4A6S1	SWITCH ROTARY: 2 poles 5 positions 28527 part no. 2310966G6	Voltage Section Selector Figure 5-30
1A4A6TB1	TERMINAL BOARD: 6 terminals; MIL-T-55164 type 37TB6	Inter connection Figure 5-30
1A4A6TB2	Same as TB1	
1A4A6A1	POWER SUPPLY MODULE; 200-300 V @ .15 A, 49956 (Sorensen Div of Raytheon) part no. QSA 265-.15	-260 Vdc Figure 5-30
1A4A6A1 CR1	SEMICONDUCTOR DEVICE, DIODE: 21845 no. CER68; 49956 part no. 26-158-1	Control part Circuit Rectifier Figure 5-32
1A4A6A1 CR2 thru 1A4A6A1 CR3	SEMICONDUCTOR DEVICE, DIODE: 21845 part no. RD5637/9119; 49956 part no. 26.1017	Constant Current Generator Figure 5-32
1A4A6A1 CR4 and 1A4A6A1 CR7	SEMICONDUCTOR DEVICE, DIODE: 21845 part no. CER72; 49956 part no. 26-158-8	420 vdc Rectifier Figure 5-32
1A4A6A1 CR8	SEMICONDUCTOR DEVICE, DIODE: 04713 part no. 1N752A; 49956 part no. 26-213	Voltage Reference Figure 5-32
1A4A6A1 CR9	Not Used	
1A4A6A1 CR10	Same as 1A4A6A1CR1	Short Circuit Protection Figure 5-32

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A1 CR11	Same as 1A4A6A1CR1	Reverse Bias Figure 5-32
1A4A6A1 CR13 thru 1A4A6A1 CR14	Same as 1A4A6A1CR1	Voltage CR13 Limiting Figure 5-32
1A4A6A1 CR12	Same as 1A4A6A1CR1	Voltage Sensing Figure 5-32
1A4A6A1 C1	CAPACITOR, FIXED, ELECTROLYTIC: 250 uf-10% ± 75%, 12vdc; 56289 part no. TE1138; 49956 part no. 24-2276-18	6 vdc Filter Figure 5-31
1A4A6A1 C2	CAPACITOR, FIXED, PAPER DIELECTRIC; 0.02 uf ± 10%, 900V; 91418 part no. U.02GMV; 49956 part no. 24-026	Noise Filter Figure 5-31
1A4A6A1 C3A thru 1A4A6A1 C3B	CAPACITOR, FIXED, ELECTROLYTIC: 160uf; 49956 part no. 24-2573-1	420 vdc Filter Figure 5-31
1A4A6A1 C4	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.01 uf 10%, 200vdc; 50930 part no. V146XR-22 ± 10% 49956 part no. 24-2409-7	Stabilization Figure 5-32
1A4A6A1 C5	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.0068 uf ± 10% 200vdc; 50930 part no. V146XR-21 ± 10%; 49956 part no. 24-2409-6	Stabilization Figure 5-32
1A4A6A1 C6	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.015 uf ±10%, 200 vdc; 50930 part no. V146XR-23 ± 10%; 49956 part no. 24-2409-8	Amplifier Stabili-zation Figure 5-32
1A4A6A1 C7	CAPACITOR, FIXED, ELECTROLYTIC: 40uf ± 10%; 49956 part no 24-2576-1	Stabilization Figure 5-31
1A4A6A1C8 C8	CAPACITOR, FIXED, ELECTROLYTIC: 4 uf ± 10%; 49956 part no. 24-2575-1	Stabilization Figure 5-31
1A4A6A1 C9	± CAPACITOR, FIXED, PLASTIC: DIELECTRIC: 0.022uf ±10%, 200vdc; 50930 part no. V146XR-24 ± 10%; 49956 part no. 24-2409-9	Stabilization Figure 5-32
1A4A6A1 C10 thru 1A4A61 C13	Not used	
1A4A6A1 C14	CAPACITOR, FIXED PLASTIC DIELECTRIC: 0.01 uf ± 10%, 200vdc; 50930 part no. V146XR-22 ± 10%; 49956 part no. 24-2409-7	Stabilization Figure 5-32

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A1 C15 thru 1A4A6A1 C18	Not used	
1A4A6A1 C19	Same as 1A4A6A1C2	High Frequency By-Pass Figure 5-32
1A4A6A1 C20	Same as 1A4A6A1C4	Stabilization Figure 5-32
1A4A6A1 Q1	TRANSISTOR: 07263 part no. FSC3641; 49956 Part no. 18-144	Constant-Current Generator Figure 5-32
1A4A6A1 Q2A thru 1A4A6A1 Q2B	TRANSISTOR:21921 part no. 2N5239; 49956 18-198-2	265 vdc Regulation Figure 5-31
1A4A6A1 Q3	TRANSISTOR: 21921 part no. 40313; 49956 part no. 18-196-2	Driver Figure 5-32
1A4A6A1 Q4	TRANSISTOR: 21921 part no. 40321; 49956 Driver part no. 18-197-2	Driver Figure 5-32
1A4A6A1 Q4A	same as 1A4A6A1Q4	Voltage Sharing Figure 5-32
1A4A6A1 Q5	TRANSISTOR: 21921 part no. 2N697; 49956 part no. 18-115	Current Regulation Figure 5-32
1A4A6A1 Q6 thru 1A4A6A1 Q9	Same as 1A4A6A1Q1	Differential Amplifier Figure 5-32
1A4A6A1 R1	RESISTOR, FIXED, COMPOSITION: 390 ohms 5%, 1/2 watt; MIL-R-39008 type RCR20G391JS	Constant-Current Generator Figure 5-32
1A4A6A1 R2	RESISTOR, FIXED, COMPOSITION: 680 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G681JS	Constant-Current Generator Figure 5-32
1A4A6A1 R3	RESISTOR, FIXED, COMPOSITION: 270 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G271JS	Q4 Emitter Figure 5-32
1A4A6A1 R3A	RESISTOR, FIXED, COMPOSITION: 330 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G331JS	Reverse Bias Figure 5-32

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A1 R4	RESISTOR, FIXED, COMPOSITION: 120 ohms Q2B Base ± 5%, 2 watts; MIL-R-39008 type RCR42G124JS	Q2B Base Figure 5-32
1A4A6A1 R5	RESISTOR, VARIABLE: wirewound, 400 ohms ± 20%, 3 watts; 71450 part no. HC-110-400 ohms: 49956 part no. 29-489	Current Control Figure 5-32
1A4A6A1 R6	RESISTOR, FIXED, COMPOSITION: 82K ohms ± 5%, Current 2 watts; MIL-R-39008 type RCR42G823JS	Current Foldback Figure 5-32
1A4A6A1 R7A	RESISTOR, FIXED, WIREWOUND: 6.8 ohms ± 10%, 3 watts; 63743 part no. 3X6.8 ohms; 49956 part no. 27-395-45	Current Sensing Figure 5-32
1A4A6A1 R8	RESISTOR, FIXED, FILM: 1.21K ohms ± 1%, 1/4 watt; 75042 part no. CEB-TO-1210 OHMSPORM1: 49956 part no. 28-1339	Q6 AND Q7 Emitters Figure 5-32
1A4A6A1 R9	RESISTOR, FIXED, FILM: 88.7 ohms ± 1%, 1/2 watt; 75042 part no. CEC-T2-88.7 OHMSPORM1: 49956 part no. 28-1216	Voltage Sensing Bridge Figure 5-32
1A4A6A1 R10	RESISTOR, FIXED, FILM: 1.5k ohms ± 1%, 1/4 watt; 75042 part no. CEC-T0-1.5K OHMSPORM1; 49956 part no. 28-1340	Q8 Collector Figure 5-32
1A4A6A1 R11	Same as 1A4A61R10	Q9 Collector Figure 5-32
1A4A6A1 R12	RESISTOR, FIXED, COMPOSITION: 120 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G121JS	Amplifier Stabilization Figure 5-32
1A4A6A1 R13	RESISTOR, FIXED, FILM: 2.4K ohms ± 1%, 1/4 watt; 75042 part no. CEB-T0-2.4K OHMSPORMI; 49956 part no. 28-1341	Q8 and Q9 Emitters Figure 5-32
1A4A6A1R14	Not used	
1A4A6A1 R15	RESISTOR, VARIABLE: WIREWOUND, 4K ohms ± 10%, 4 watts; 12697 part no. TYPE45-4000OHMS; 49956 part no. 29-507	Voltage Control Figure 5-31
1A4A6A1R16	Not used	
1A4A6A1 R17	RESISTOR, FIXED, WIREWOUND: 16.2K ohms ± 5%, 3 watts; 56289 part no. 223E-16.2KOHMS; 49956 part no. 28-1343	Voltage Sensing Figure 5-32

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A1 R18	RESISTOR, VARIABLE: WIREWOUND: 8.5K ohms ± 10%, 4 watts; 12697 part no. TYPE 45-KOHMS; 49956 part no. 29-554	Voltage Sensing Figure 5-31
1A4A6A1 R19	RESISTOR, FIXED, COMPOSITION: 120K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G124JS	Bleeder Figure 5-32
1A4A6A1 R20 thru 1A4A6A1 R26	Not used	
1A4A6A1 R27	RESISTOR, FIXED, COMPOSITION: 220K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G221JS	Q2B Base Figure 5-32
1A4A6A1 R28A thru 1A4A6A1 R28B	RESISTOR, FIXED, WIREWOUND 27K ohms ± 10%, 5 watts; 63743 part no. 5XM-27K ohms; 49956 part no. 28-1344	Bleeder Figure 5-32
1A4A6A1 R29 thru 1A4A6A1 R30	RESISTOR, FIXED, COMPOSITION: 47K ohms ± 5%, 2 watts; MIL-R-39000 type RCR42G473JS	Voltage Sensing Figure 5-32
1A4A6A1 T1	TRANSFORMER, POWER, STEP-UP: 115, 220, 230 vac input, 48-480 Hz; 49956 part no. 126-3064	Power and Control Voltages Figure 5-32
1A4A6A2	POWER SUPPLY MODULE; 90-150 V @ .5 A, 49956 (Sorensen Div of Raytheon) part no. QSA 120-.5	-150 Vdc Figure 5-30
1A4A6A2 CR1	SEMICONDUCTOR DEVICE, DIODE: 21845 part no. CER68; 49956 part no. 26-158-1	Control Circuit Rectifier Figure 5-34
1A4A6A2 CR2 thru 1A4A6A2 CR3	SEMICONDUCTOR DEVICE, DIODE: 21845 part no. RD5637/9119; 49956 part no. 26-1017	Control Circuit Generation Figure 5-34
1A4A6A2 CR4 thru 1A4A6A2 CR7	SEMICONDUCTOR DEVICE, DIODE: 21845 part no. CER70; 49956 part no. 26-158-4	215 VDC Rectifier Figure 5-34
1A4A6A2 CR8	SEMICONDUCTOR DEVICE, DIODE: 04713 part no. 1N750A; 49956 part no. 588101-6	Voltage Reference Figure 5-34
1A4A6A2CR9	Not used	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A2 CR10	Same as 1A4A6A2CR1	Short-Circuit Protection Figure 5-34
1A4A6A2 CR11	Same as 1A4A6A2CR1	Reverse Bias Figure 5-34
1A4A6A2CR2	Not used	
1A4A6A2 CR13 thru 1A4A6A2 CR14	Same as 1A4A6A2CR1	Voltage Limiting Figure 5-34
1A4A6A2 C1	CAPACITOR, FIXED, ELECTROLYTIC: 250uf -10% + 75%, 12 vdc; 56289 part no. TE1138; 49956 part no. 24-2276-18	6 Vdc Filter Figure 5-34
1A4A6A2 C2	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1uf ± 10%, 400 vdc; 56289 part no. 160P10494; 49956 part no. 24-2143	Noise Filter Figure 5-34
1A4A6A2 C3	CAPACITOR, FIXED, ELECTROLYTIC: 550 uf -10%, + 50%, 300 vdc; 56289 part No. 36D551F300AF6B; 49956 part no. 24-2468-1	215 Vdc Filter Figure 5-33
1A4A6A2 C4	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.01uf ± 10%, 200 vdc 50930 part no. V146XR-22 ±10%, 49956 part No. 24-2409-7	Stabilization Figure 5-34
1A4A6A2 C5	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.0068 uf ±10%, 200 vdc; 50930 part no. V146XR-21 ± 10%, 49956 part No. 24-2409-6	Stabilization Figure 5-34
1A4A6A2 C6	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.015 uf ± 10%, 200 vdc; 50930 part no. V146XR-23 ± 10%; 49956 part No. 24-2409-8	Amplifier Stabilization Figure 5-34
1A4A6A2 C7	CAPACITOR, FIXED, ELECTROLYTIC: 14uf -10% +50%, 200 vdc; 56289 part no. 34D147F200HSO; 49956 part No. 24-2465-1	Stabilization Figure 5-33
1A4A6A2 C8	CAPACITOR, FIXED, ELECTROLYTIC: 5uf -10% + 75%, 150 vdc; 56289 part No. 34D505F150EEO; 49956 part No. 24-2464-1	Stabilization Figure 5-34
1A4A6A2 C9	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.022 uf ± 10%, 200 vdc; 50930 part No. V146XR-24 ± 10%, 49956 part No. 24-2409-9	Stabilization Figure 5-34

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A2 C10 thru 1A4A6A2 C13	Not used	
1A4A6A2 C14	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.01 uf ± 10%, 200 vdc; 50930 part no. V146XR-22 ± 10%; 49956 part no. 24-2409-7	Stabilization Figure 5-34
1A4A6A2C15 thru 1A4A6A2C18	Not used	
1A4A6A2C19	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.02 uf ± 10%, 900 vdc; 91418 part no. U026MV; 49956 part no. 24-026	High Frequency By-Pass Figure 5-34
1A4A6A2C20	Same as 1A4A6A2C4	Stabilization Figure 5-34
1A4A6A2Q1	TRANSISTOR: 07263 part no FSC3641; 49956 part no. 18-144	Constant-Current Generator Figure 5-34
1A4A6A2Q2A thru 1A4A6A2Q2B	TRANSISTOR: 21921 part no. 2N3442; 49956 part no. 18-163	150 vdc Regulation Figure 5-33
1A4A6A2 Q3	TRANSISTOR: 21921 part no. 40313; 49956 part no. 18-164	Driver Figure 5-34
1A4A6A2 Q4	TRANSISTOR: 21921 part no. 40321; 49956 part no. 18-165	Driver Figure 5-34
1A4A6A2 Q4A	Same as 1A4A6A2Q4	Voltage Sharing Figure 5-34
1A4A6A2 Q5	TRANSISTOR: 21921 part no. 2N697; 49956 part no. 18-115	Current Regulation Figure 5-34
1A4A6A2 Q6 thru 1A4A6A2 Q9	Same as 1A4A6A2Q1	Differential Amplifier Figure 5-34
1A4A6A2 R1	RESISTOR, FIXED, COMPOSITION: 390 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G391JS	Constant Current Figure 5-34
1A4A6A2 R2	RESISTOR, FIXED, COMPOSITION: 680 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G681JS	Constant Current Generator Figure 5-34

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A2 R3	RESISTOR, FIXED, COMPOSITION: 270 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G271JS	Q4 Emitter Figure 5-34
1A4A6A2 R3A	RESISTOR, FIXED, COMPOSITION: 330 ohms ± 5%, 1/2 watt; MIL-R-39008 Type RCR20G331JS	Q2A Reverse Bias Figure 5-34
1A4A6A2 R4	RESISTOR, FIXED, COMPOSITION: 22K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G223JS	Q2B Base Figure 5-34
1A4A6A2 R5	RESISTOR, VARIABLE, WIREWOUND, 400 ohms ± 20%, 3 watts; 71450 part no HC-110-400 ohms; 49956 part no. 29489	Current Control Figure 5-34
1A4A6A2 R6	Same as 1A4A6A2R4	Current Foldback Figure 5-34
1A4A6A2 R7A	RESISTOR, FIXED, WIREWOUND: 2.2 ohms ± 10%, 3 watts: 63743 part no. TYPE3X-2.2 ohms: 49956 part no. 27-397-33	Current Sensing Figure 5-34
1A4A6A2 R8	RESISTOR, FIXED, COMPOSITION: 1.2K ohms ± 5%, 1/4 watt; MIL-R-39008 type RCR07G122JS	Q6 and Q7 Emitters Figure 5-34
1A4A6A2 R9	RESISTOR, FIXED, FILM: 182 ohms ± 1%, 1/2 watt; 75042 part no. CEC-TO-182 OHMSPORM1: 49956 part no. 28-1212	Voltage Sensing Bridge Figure 5-34
1A4A6A2 R10	RESISTOR, FIXED, COMPOSITION: 1.8K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G182JS	Q8 Collector Figure 5-34
1A4A6A2 R11	Same as 1A4A6A2R10	Q9 Collector Figure 5-34
1A4A6A2 R12	RESISTOR, FIXED, COMPOSITION: 120 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G121JS	Amplifier Stabilization Figure 5-34
1A4A6A2 R13	RESISTOR, FIXED, COMPOSITION: 2.2K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G222JS	Q8 and Q9 Emitters Figure 5-34
1A4A6A2 R14	Not used	
1A4A6A2 R15	RESISTOR, VARIABLE: WIREWOUND, 2K ohms ± 10%, 4 watts; 12697 part no. TYPE45-2K OHMS: 49956 part no. 29-486	Voltage Control Figure 5-33
1A4A6A2 R16	Not used	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A2 R17	RESISTOR, FIXED, WIREWOUND: 2.7k ohms ± 3%, 5 watts; 00213 part no. 1500S-2700-3; 49956 part no. 28-1240	Voltage Sensing Figure 5-34
1A4A6A2 R18	RESISTOR, VARIABLE: WIREWOUND, 4K ohms ± 10% 4 watts; 12697 part no. TYPE 45-4KOHMS; 49956 part no. 29-507	Voltage Sensing Figure 5-33
1A4A6A2 R19	Same as 1A4A6A2R4	Bleeder Figure 5-34
1A4A6A2 R20 thru 1A4A6A2 R27	Not used	
1A4A6A2 R28	RESISTOR, FIXED, COMPOSITION: 68K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G683JS	Bleeder Figure 5-34
1A4A6A2 R29 thru 1A4A6A2R30	RESISTOR, FIXED, COMPOSITION: 10K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G103JS	Voltage Sensing Figure 5-34
1A4A6A2 T1	TRANSFORMER, POWER, STEP-DOWN: 115, 220, 230 vac input, 48-480 Hz: 49956 part No. 126-2971	Power and Control Voltages Figure 5-33
1A4A6A3	POWER SUPPLY MODULE; 23-25 V @ 2.3 A, (Sorensen Div of Raytheon) 49956 part No. PTM 24-2.3	-24 Vdc Power Supply Figure 5-30
1A4A6A3 A1	PRINTED CIRCUIT BOARD ASSEMBLY: 49956 part No. 588555-3	Voltage Control Figure 5-35
1A4A6A3	SEMICONDUCTOR DEVICE, DIODE: 14099 part No. S12; 49956 part No. 587565-2	Control CR1 Voltage Rectifier Figure 5-36
1A4A6A3 CR2	Not used	
1A4A6A3 CR3	SEMICONDUCTOR DEVICE, DIODE: 4 Vdc CR3 14099 part No. SCBA1; 49956 part No. 586050-1	24 vdc Rectifier Figure 5-35
1A4A6A3 CR4	Not used	
1A4A6A3 CR5	SEMICONDUCTOR DEVICE, DIODE: 21921 part No. 1N4148; 49956 part No. no. 322-7220P1	Blocking Figure 5-36

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A3	CAPACITOR, FIXED, ELECTROLYTIC: 150uf-10 ± 75%, 50 vdc; 90201 part no. TCG151U050D1G3P; 49956 part no. 586048-1	Control C1 Voltage Filter Figure 5-36
1A4A6A3 C2	CAPACITOR, FIXED, ELECTROLYTIC: 4.7 uf ± 10%, 10 vdc; 05397 part no. T110A475K010AS 49956 part no. 586057-2	Reference Voltage Filter Figure 5-36
1A4A6A3 C3	CAPACITOR, FIXED, MICA DIELECTRIC: 820 pf ± 10%, 300 vdc; 72136 part no. DM15FC821K04CR; 49956 part no. 235-7053P334	Stabilization Figure 5-36
1A4A6A3 C4	CAPACITOR, FIXED, ELECTROLYTIC: 0.47 uf ± 10%, 35 vdc; 05397 part no. T110A474K035AS; 49956 part no. 586058-3	Delay Filter Figure 5-36
1A4A6A3 C5	CAPACITOR, FIXED, ELECTROLYTIC: 2400uf -10 +75%, 40 vdc; 90201 part no. TCG242U040L3C3P; 49956 part no. 586047-1	Output-Voltage Filter Figure 5-35
1A4A6A3 C6	CAPACITOR, FIXED, ELECTROLYTIC: 3400uf -10 + 75%, 50 vdc; 49956 part no. 586045-1	Input Voltage Filter Figure 5-35
1A4A6A3 C7	CAPACITOR, FIXED, MICA DIELECTRIC: 220 pf ± 10%, 300 vdc; 72136 part no. DM15FC221K04CR; 49956 part no. 237-7053P120	Stabilization Figure 5-36
1A4A6A3 C8	Same as 1A4A6A3C4	Stabilization Figure 5-36
1A4A6A3 C9	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.047uf ± 10%, 200 vdc; 50930 part no. V146XR-26 ± 10%, 49956 part no. 24-2409-11	Noise Filter Figure 5-35
1A4A6A3 F1	FUSE, CARTRIDGE: 1.5 amps, 250 V; 71400 part no. MDX1.5; 49956 part no. 42-1859	AC Input Figure 5-35
1A4A6A3 F2	FUSE, CARTRIDGE: 4 amps, 250 v; 71400 part no. MTH-4; 49956 part no. 226-7176P56	DC Output Figure 5-35
1A4A6A3 Q1 thru 1A4A6A3 Q2	TRANSISTOR: 21921 part no. 2N3055; 49956 part no. 18-151	24 Vdc Regulation Figure 5-35
1A4A6A3 Q3	TRANSISTOR: 21921 part no. 40312-V1; 49956 part no. 586060-1	Driver Figure 5-36
1A4A6A3 Q4	TRANSISTOR: 2446 part no. 2N4987; 49956 part no. 586063-1	Overvoltage Trigger Figure 5-36

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A3 Q5	TRANSISTOR: 21921 part no. 2N4441; 49956 part no. 586820-1	Overvoltage Cut-off Figure 5-36
1A4A6A3 R1	RESISTOR, FIXED, COMPOSITION: 180 ohms ±5%, 2 watts; MIL-R-39008 type RCR42G181JS	Control Voltage Figure 5-36
1A4A6A3 R2	RESISTOR, FIXED, WIREWOUND: 0.68 ohms ±5%, 6.5 watts; 01686 part no. T5-0.68OHMSPORM5; 49956 part no. 586054-7	Current Sharing Figure 5-35
1A4A6A3 R3	RESISTOR, FIXED, WIREWOUND: 0.47 ohms ±5%, 6.5 watts; 01686 part no. T5-0. 47OHMSPORM5; 49956 part no. 586054-9	Current Sharing Figure 5-35
1A4A6A3 R4	RESISTOR, VARIABLE: composition, 100 ohms ± 30%, 1/4 watt; 90201 part no. MTC-4-100OHMS: 49956 part no. 240-7177P13	Current Control Figure 5-36
1A4A6A3	RESISTOR, FIXED, COMPOSITION: 12K ohms ± 5%, 2 watt; MIL-R-39008 type RCR20G123JS	Q3 Reverse R5 Bias Figure 5-36
1A4A6A3 R6	RESISTOR, FIXED, COMPOSITION: 1.2K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G122JS	Current Control Figure 5-36
1A4A6A3 R7	RESISTOR, FIXED, COMPOSITION: 1K ohms ± 5%, 1/4 watt; MIL-R-39008 type RCR06G102JS	Stabilization Figure 5-36
1A4A6A3 R8	RESISTOR, FIXED, FILM: 1.5K ohms ± 1%, 1/8 watt; 19701 part no. MF4-E-1541-F: 49956 part no. 586055-83	Reference Voltage Figure 5-36
1A4A6A3 R9	RESISTOR, FIXED, FILM: 2.15K ohms ± 1%, 1/8 watt; 19701 part no. MF4-E-2151-F; 49956 part no. 586055-90	Reference Voltage Figure 5-36
1A4A6A3 R10	RESISTOR, VARIABLE: nonwirewound, 5k ohms ± 10%, 2 watts; 32997 part no. 3859A-16-1-502A; 49956 part no. 585348-14	Voltage Control Figure 5-36
1A4A6A3 R11	RESISTOR, FIXED, FILM: 11.5K ohms ± 1%, 1/8 watt; 19701 part no. MF4-E-1152-F; 49956 part no. 586055-125	Voltage Sensing Figure 5-36
1A4A6A3 R12	Same as 1A4A6A3R8	Voltage Sensing Figure 5-36
1A4A6A3 R13	RESISTOR, FIXED, FILM 820 ohms + 2%, 1/2 watt; MIL-R-2284 type RL20S821G	Voltage Divider Figure 5-36

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY ASSEMBLY, EXCITER ADDENDUM (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A4A6A3 R14	RESISTOR, VARIABLE: WIREWOUND, 500 ohms ± 20%; 2 watts; 71450 part no. 117-500 ohms; 49956 part no. 585348-7	Overvoltage Control Figure 5-35
1A4A6A3 R15	RESISTOR, FIXED, FILM: 330 ohms ± 2%, 1/2 watt; MIL-R-22684 type RL20S331G	Voltage Divider Figure 5-36
1A4A6A3 R16	RESISTOR, FIXED, COMPOSITION: 82 ohms ± 5%, 1/4 watt; MIL-R-39008 type RCR07G820JS	Delay Filter Figure 5-36
1A4A6A3 R17	Not used	
1A4A6A3 R18	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G101JS	Overvoltage Cut-off Figure 5-36
1A4A6A3 R19	RESISTOR, FIXED, COMPOSITION: 680 ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G681JS	Bleeder Figure 5-36
1A4A6A3 R20	RESISTOR, FIXED, FILM: 237 ohms ± 1%, 1/8 watt; 19701 part no. MF4-E-2370-F; 49956 part no. 586055-44	Reference Voltage Figure 5-36
1A4A6A3R21	Not used	
1A4A6A3 R22	RESISTOR, FIXED, COMPOSITION: 10 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G100JS	Stabilization Figure 5-36
1A4A6A3 R23	RESISTOR, FIXED, COMPOSITION: 470 ohms ± 5% 1/4 watt; MIL-R-39008 type RCR07G471JS	Q3 Base Figure 5-36
1A4A6A3	TRANSFORMER, POWER, STEP-DOWN: 115, 220, 230 vac input, 50-440 Hz 49956 part no. 588556-5	Power and T1 Control Voltages Figure 5-36
1A4A6A3	INTEGRATED CIRCUIT: voltage regulator 07910 part no. 723CN or 723CL; 49956 part no. 586062-1	Voltage U1 Control Figure 5-36
1A4A6A3	SEMICONDUCTOR DEVICE, DIODE: 04713 part no.1N4745A; 49956 part no. 588102-12	Control VR1 Voltage Regulator Figure 5-36
1A4A6A4	Same as 1A4A6A3	+24 Vdc Power Supply Figure 5-30

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	AMPLIFIER RADIO FREQUENCY, AM-3774/FPN-44 Power amplifier in transmitting group. Includes Tank Coil 1A5, amplifier 1A6 and resistor assemblies 1A7 thru 1A10.	Power Amplifier Figures 5-7 and 5-8
1A5	POWER AMPLIFIER TANK COIL: 28527 part no. 1087450G1	RF Coupling Figure 5-8
1A5E1	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: 88 feet of no. 14 AWG insulated wire terminated at each end by a Corona shield; 28527 part no. 1089089G2	Primary Cable Figure 5-32
1A5E2	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: 88 feet of no. 14 AWG insulated wire terminated at each end by a Corona shield; 28527 part no. 1089089G3	Primary Cable Figure 5-32
1A5E3	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: 88.2 feet of no. 14 AWG insulated wire terminated at each end by a Corona shield; 28527 part no. 1089089G4	Primary Cable Figure 5-32
1A5E4	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: 88.2 feet of no. 14 AWG insulated wire terminated at each end by a Corona shield; 28527 part no. 1089089G5	Primary Cable Figure 5-32
1A5E5	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL 55 feet of no. 3/0 AWG insulated wire terminated at each end by a solder lug; 28527 part no. 1096261G1	Cable Secondary Figure 5-32
1A5E6	CABLE ASS'Y, SPECIAL PURPOSE, ELECTRICAL; 40 feet of AWG high voltage wire terminated at each end in a terminal lug 28527 Part no. 1089173G001	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6	AMPLIFIER, RADIO FREQUENCY: increases the power level of the Loran "C" pulse; 28527 part no. 1087441G1 and 1087441G3	RF Amplifier Figure 5-7
1A6C1	CAPACITOR, FIXED, PAPER DIELECTRIC; 2 uf ±5%, 21000 vdc; 28527 part no. 1087487G2	1A6V1 Plate By-Pass Figure 5-34
1A6C2	Same as 1A6C1	1A6V2 Plate By-Pass Figure 5-34
1A6C3 thru 1A6C4	CAPACITOR, FIXED, PAPER DIELECTRIC: 7 uf and ±5%, 21000 vdc; 28527 part no. 1087487G5	1A6V1 Plate Storage Figure 5-34
1A6C5 thru 1A6C6	CAPACITOR, FIXED, PAPER DIELECTRIC: 7 uf and ±5%, 21000 vdc; 28527 part no. 1087487G5	1A6V2 Plate Storage Figure 5-34
1A6C7 thru 1A6C8	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 uf ±10%, 2000 vdc; MIL-C-25 type CP72E1EJ106K1 and Grid Storage	1A6V1 Filament By-pass Figure 5-34
1A6C9 thru 1A6C10	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 uf ±10%, 2000 vdc; MIL-C-25 type CP72E1EJ106K1 and Grid Storage	1A6V2 Filament By-pass Figure 5-34
1A6C11	Same as 1A6C11	1A6V3 Plate By-Pass Figure 5-34
1A6C12	Same as 1A6C1	1A6V4 Plate By-Pass Figure 5-34
1A6C13	Same as 1A6C3	1A6V3 Plate Storage Figure 5-33
1A6C14	Same as 1A6C3	1A6V4 Plate Storage Figure 5-33
1A6C15	Same as 1A6C3	1A5V3 Plate Storage Figure 5-33

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6C16	Same as 1A6C3	1A6V4 Plate Storage Figure 5-33
1A6C17	Same as 1A6C7	1A6V3 Filament Bypass Figure 5-34
1A6C18	Same as 1A6C7	1A6V4 Filament Bypass Figure 5-34
1A6C19	Same as 1A6C7	1A6V3 Filament Bypass Figure 5-34
1A6C20	Same as 1A6C7	1A6V4 Filament Bypass Figure 5-34
1A6C21	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.0105uf ±5%, 21000 vdc; 28527 part no. 1087669G1	Plate Tuning Figure 5-34
1A6C22	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.0105uf ±5%, 21000 vdc; 28527 part no. 1087669G1	Plate Tuning Figure 5-34
1A6C23	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.0105uf ±5%, 21000 vdc; 28527 part no. 1087669G1	Plate Tuning Figure 5-34
1A6C24	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.0105uf ±5%, 21000 vdc; 28527 part no. 1087669G1	Plate Tuning Figure 5-34
1A6E1	SUPPRESSOR, PARASITIC: resistor coil type; three 68ohms ± 10%, 2 watt resistors in parallel around which a coil, 2 in lg by 1 in. dia. with turns of No. 12 solid bare copper wire is wound; 28527 part no. 1087567G1	1A6V1 Parasitic Suppressor Figure 5-33
1A6E2	SUPPRESSOR, PARASITIC: resistor coil type; three 68ohms ± 10%, 2 watt resistors in parallel around which a coil, 2 in lg by 1 in. dia. with turns of No. 12 solid bare copper wire is wound; 28527 part no. 1087567G1	1A6V2 Parasitic Suppressor Figure 5-33
1A6E3	SUPPRESSOR, PARASITIC: resistor coil type; three 68ohms ± 10%, 2 watt resistors in parallel around which a coil, 2 in lg by 1 in. dia. with turns of No. 12 solid bare copper wire is wound; 28527 part no. 1087567G1	1A6V3 Parasitic Suppressor Figure 5-33

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6E4	SUPPRESSOR, PARASITIC: resistor coil type; three 68ohms ± 10%, 2 watt resistors in parallel around which a coil, 2 in lg by 1 in. dia. with turns of No. 12 solid bare copper wire is wound; 28527 part no. 1087567G1	1A6V4 Parasitic Suppressor Figure 5-33
1A6E5	SUPPRESSOR, PARASITIC: resistor and coil type; resistor 13 ohms ± 10%, 140 watts; 28527 coil 6 turns 0.375 in. od tubing, cadmium plated part no. 1089179G2	Parasitic Suppressor Figure 5-34
1A6E5L1	COIL, RADIO FREQUENCY: 6 turns 0.375 in od copper tubing, cadmium 28527 part no. 1089181G1	1A6E5 Coil Figure 5-34
1A6E5R1	RESISTOR, FIXED, FILM: 13 ohms ±10%, 140 watts; 28527 part no. 1087933G2	1A6E5 Resistor Figure 5-34
1A6E6	SUPPRESSOR, PARASITIC: resistor and coil type; resistor 13 ohms ± 10%, 140 watts; 28527 coil 6 turns 0.375 in. od tubing, cadmium plated part no. 1089179G2 Same as 1A6E5	Parasitic Suppressor Figure 5-34
1A6E6L1	COIL, RADIO FREQUENCY: 6 turns 0.375 in od copper tubing, cadmium 28527 part no. 1089181G1	1A6E5 Coil Figure 5-34
1A6E6R1	Same as 1A6E5R1	1A6E6 Resistor Figure 5-34
1A6E7	Same as 1A6E5	Parasitic Suppressor Figure 5-34
1A6E7L1	Same as 1A6E5L1	1A6E7 Coil Figure 5-34
1A6E7R1	Same as 1A6E5R1	1A6E7 Resistor Figure 5-34
1A6E8	Same as 1A6E5	Parasitic Suppressor Figure 5-34
1A6E8L1	Same as 1A6E5L1	1A6E8 Coil Figure 5-34
1A6E8R1	Same as 1A6E5R1	1A6E8 Resistor Figure 5-34
1A6E9 thru 1A6E10	Not Used	

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6E11	INSULATOR, STANDOFF: 12 in. lg, 3.750 in. square base; 75539 part no. R9063H12; 28527 part no. 1087532G1	1A6V1 Water Jacket Support Figure 5-33
1A6E12	INSULATOR, STANDOFF: 12 in. lg, 3.750 in. square base; 75539 part no. R9063H12; 28527 part no. 1087532G1	1A6V1 Water Jacket Support Figure 5-33

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A
MAINTENANCE PARTS LIST (Cont)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44

REF. DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6E13 thru 1A6E14	same as 1A6E11	1A6V2 Water Jacket Support Figure 5-33
1A6E15	Same as 1A6E11	1A6V3 Water
1A6E16		Figure 5-33
1A6E17 thru 1A6E18	Same as 1A6E11	1A6V4 Water Jacket Support Figure 5-33
1A6E19	PACKING, PREFORMED: 5.375 in. od, 4.875 in. id, 0.250 in. high, neoprene; 28527 part no. 1087496G1, item 5	1A6MP1 Packing Figure 5-33
1A6E20	Same as 1A6E19	1A6MP2 Packing Figure 5-33
1A6E21	Same as 1A6E19	1A6MP3 Packing Figure 5-33
1A6E22	Same as 1A6E19	1A6MP4 Packing Figure 5-33
1A6J1	CONNECTOR, TWINAX; MIL-C-3608 type UG-422/U	
1A6K1 thru 1A6K4	RELAY, ARMATURE: two spdt sensitive; 5 amps, 250 vdc; coil 24 vdc, 500 ohms; 71482 par no. W2-8018, type EMS; 28527 part no.1087589G1	1A6V1 to 1A6V4 Overload Relay Figure 5-33
1A6MP1	WATER JACKET: 7.25 in. max od, 15.125 in. lg, 50 psi operating pressure; 28527 part no. 1087496G1	1A6V1 Water Jacket Figure 5-33
1A6MP2	Same as 1A6MP1	1A6V2 Water Jacket Figure 5-33
1A6MP3	Same as 1A6MP1	1A6V3 Water Jacket Figure 5-33
1A6MP4	Same as 1A6MP1	1A6V4 Water Jacket Figure 5-33
1A6MP5	RING, RETAINING: beveled, 6.125 id, cadmium plated; 28527 part no. 1087496G1	Retainer Ring Figure 5-33
1A6MP6	Same as 1A6MP5	Retainer Ring Figure 5-33

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6MP7	Same as 1A6MP5	Retainer Ring Figure 5-33
1A6MP8	Same as 1A6MP5	Retainer Ring Figure 5-33
1A6MP9 thru 1A6MP14	CONTACT, ELECTRICAL: 3/8-16NC2B internal thread, 1 in. knurled od, 1.125 inc. cap id, copper; 28527 part no. 1087500G1	1A6V1 Contacts Figure 5-33
1A6MP15 thru 1A6MP20	Same as 1A6MP9	1A6V2 Contacts Figure 5-33
1A6MP21 thru 1A6MP26	Same as 1A6MP9	1A6V3 Contacts Figure 5-33
1A6MP27 thru 1A6MP32	Same as 1A6MP9	1A6V4 Contacts Figure 5-33
1A6MP33	WATER HOSE ASSEMBLY: consists of two 20-foot hoses with connectors; 01609 part no. 8021180-G1 wound counterclockwise on form 28527 part number 1096238G3	1A6V1 Water Insulation Figure 5-34
1A6MP34	WATER HOSE ASSEMBLY: consists of one hose five feet long with connectors; 01609 part no. 82021180G2; connected to one hose 15-feet long with connectors; 01609 part no. 82021180G1 by 1A6MP42, and one hose 20 feet long with connectors; 01609 part number 82021180G3 wound counter-clockwise on form 28527 part no. 1096238G3	1A6V2 Water Insulation and Leakage Current Pickup Figure 5-34
1A6MP35	Same as 1A6MP33 except the hoses are wound clockwise on the form	1A6V3 Water Insulation Figure 5-34
1A6MP36	Same as 1A6MP35	1A6V4 Water Insulation Figure 5-34
1A6MP37 thru 1A6MP41	Not Used	
1A6MP42	ELBOW, HOSE: 1 5/16-12 UNF-2A thd each end; 01276 part no. FF5260-1616C; 28527 part no. 1096240G1	Leakage Current Pickup Figure 5-33/34

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6MP43 thru 1A6MP44	Not Used	
1A6MP45	VALVE, GATE: 1 in. NPT, 125 psi test pressure; 14959 part no. 438-1; 28527 part no. 1087651G1	Gate Valve Figure 5-33
1A6MP46	Same as 1A6MP45	Gate Valve Figure 5-33
1A6MP47	Same as 1A6MP45	Gate Valve Figure 5-33
1A6MP48	Same as 1A6MP45	Gate Valve Figure 5-33
1A6MP49	Same as 1A6MP45	Gate Valve Figure 5-33
1A6MP50	Same as 1A6MP45	Gate Valve Figure 5-33
1A6MP51	Same as 1A6MP45	Gate Valve Figure 5-33
1A6MP52	Same as 1A6MP45	Gate Valve Figure 5-33
1A6M1 thru 1A6M4	AMMETER: dc, 0-3 amp, full scale; MIL-M-10304 type MR36W003DCAAR	1A6V1 to 1A6V4 Cathode Current Figure 5-33
1A6M5	AMMETER: dc, 0-1 ma, full scale; MIL-M-10304 type MR36W001DCMAR	Water Conduction Indicator Figure 5-33
1A6RV1	RECTIFIER, METALLIC: four parallel discs, each disc 3 in. dia by 0.13 in. thick, 1/2 in. center mounting hole; 28527 part no. 1097568G5	1A6V1 Cathode Circuit Protector Figure 5-33
1A6RV1E1	PLATE, THYRITE: brass irregular shape, 0.125 in. by 3.500 in. by 7.250 in.; 28527 part no. 1087628G6	1A6RV1 Thyrite Plate Figure 5-33
1A6RV1E2	PLATE, CONNECTING: copper, irregular shape, 0.031 in. by 3.00 in by 3.00 in.; 28527 part no. 1087620G1	1A6RV1 Connecting Plate Figure 5-33

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6RV1E3	DISC, THYRITE: 1 ma ±15% at 20v, 25 ma ±15% at 44v, 30 watts, 50157 part no. 67W30000; 28527 part no. 1087587G1	1A6RV1 Disc Thyrite Figure 5-33
1A6RV1E4	INSULATOR, MICANITE INSULATING TUBE .500 INCH O.D. x .390 INCH I.D. x .750 INCH LONG 28527, PART NUMBER 1087630	
1A6RV2	Same as 1A6RV1	1A6V2 Cathode Circuit Protector Figure 5-33
1A6RV2E1	Same as 1A6RV1E1	1A6RV2 Thyrite Plate Figure 5-33
1A6RV2E2	Same as 1A6RV1E2	1A6RV2 Connecting Plate Figure 5-33
1A6RV2E3	Same as 1A6RV1E3	1A6RV2 Disc Thyrite Figure 5-33
1A6RV3	RECTIFIER,METALLIC:four parallel discs with one thyrite plate;28527 part no. 1087568G6	1A6V1 Cathode Circuit Figure 5-33
1A6RV3E1	PLATE, THYRITE: brass, irregular shape, 0.125 in. by 3.500 in. by 7.250 in.; 28527 part no. 10876298G5	1A6RV3 Thyrite Plate Figure 5-33
1A6RV3E2	Same as 1AA6RV1E2	1A6RV3 Connecting Plate Figure 5-33
1A6RV3E3	Same as 1A6RV1E3	1A6RV3 Disc Thyrite Figure 5-33
1A6RV4	Same as 1A6RV3	1A6V2 Cathode Circuit Protector Figure 5-33
1A6RV4E1	Same as 1A6RV3E1	1A6RV4 Thyrite Plate Figure 5-33

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6RV4E2	Same as 1A6RV1E2	1A6RV4 Connecting Plate Figure 5-33
1A6RV4E3	Same as 1A6RV1E3	1A6RV4 Disc Thyrite Figure 5-33
1A6RV5	RECTIFIER, METALLIC: four parallel discs with one thyrite plate; 28527 part no. 1087568G7	1A6V3 Cathode Circuit Protector Figure 5-33
1A6RV5E1	PLATE, THYRITE: brass, irregular shape, 0.125 in. by 3.500 in. by 7.250 in; 28527 part no. 1087628G4	1A6RV5 Thyrite Plate Figure 5-33
1A6RV5E2	Same as 1A6RV1E2	1A6RV5 Connecting Plate Figure 5-33
1A6RV5E3	Same as 1A6RV1E3	1A6RV5 Disc Thyrite Figure 5-33
1A6RV6	Same as 1A6RV5	1A6RV4 Cathode Circuit Protector Figure 5-33
1A6RV6E1	Same as 1A6RV3E1	1A6RV6 Thyrite Plate Figure 5-33
1A6RV6E2	Same as 1A6RV1E2	1A6RV6 Connecting Plate Figure 5-33
1A6RV6E3	Same as 1A6RV1E3	1A6RV6 Disc Thyrite Figure 5-33
1A6RV7	RECTIFIER, METALLIC: four parallel discs with one thyrite plate; 28527 part no. 1087568G8	1A6V3 Cathode Circuit Protector Figure 5-33
1A6RV7E1	PLATE, THYRITE: brass, irregular shape, 0.125 in. by 3.500 in. by 7.250 in; 28527 part no. 1087628G3	1A6RV7 Thyrite Plate Figure 5-33

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6RV7E2	Same as 1A6RV1E2	1A6RV7 Connecting Plate Figure 5-33
1A6RV7E3	Same as 1A6RV1E2	1A6RV7 Disc Thyrite Figure 5-33
1A6RV8	Same as 1A6RV7	1A6V4 Cathode Circuit Protector Figure 5-33
1A6RV8E1	Same as 1A6RV1E1	1A6RV8 Thyrite Plate Figure 5-33
1A6RV8E2	Same as 1A6RV1E2	1A6RV8 Connecting Plate Figure 5-33
1A6RV8E2	Same as 1A6RV1E3	1A6RV8 Disc Thyrite Figure 5-33
1A6R1	RESISTOR, FIXED, COMPOSITION: 600 ohms ±10%, 180 watts; 72819 part no. 779SP006; 28527 part no. 1087590G1	1A6V1 and 1A6V3 Grid Swamping Figure 5-33
1A6R2	Same as 1A6R1	1A6V2 and 1A6V4 Grid Swamping Figure 5-33
1A6R3	Not Used	
1A6R4	Not Used	
1A6R5	RESISTOR, FIXED, COMPOSITION: 2.5 ohms ±10%, 140 watts; 72819 part no. SP140-2R5K; 28527 part no. 1087933G1	1A6V1 Plate By-Pass Decoupling Figure 5-34
1A6R6	Same as 1A6R5	1A6V2 Plate By-Pass Decoupling Figure 5-34
1A6R7 thru 1A6R10	RESISTOR, FIXED, COMPOSITION: 1 ohm ±20%; 50 watts; 72819 part no. 778SP004; 28527 part no. 1087590G2	1A6V1 and 1A6V2 RF Balancing Figure 5-33

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6R11 thru 1A6R14	RESISTOR, FIXED, COMPOSITION: 10 ohms ±10%, 30 watts; 72819 part no. 218SP007; 28527 part no. 1087590G5	1A6V1 and 1A6V2 DC Balancing Figure 5-33
1A6R15	RESISTOR, VARIABLE: composition, 750 ohms ±10%, 2 watts; MIL-R-94 type RV4LAYSA751A	1A6V1 Overload Relay Control Figure 5-33
1A6R16	Same as 1A6R15	1A6V2 Overload Relay Control Figure 5-33
1A6R17	RESISTOR, FIXED, COMPOSITION: 14 ohms ±10%, 30 watts; 72819 part no. 218SP006;	1A6V1 Overload Relay Shunt Figure 5-33
1A6R18	Same as 1A6R17	1A6V2 Overload Relay Shunt Figure 5-33
1A6R19 thru 1A6R22	Not Used	
1A6R23	Same as 1A6R5	1A6V3 Plate By-Pass Decoupling Figure 5-34
1A6R24	Same as 1A6R5	1A6V4 Plate By-Pass Decoupling Figure 5-34
1A6R25 thru 1A6R28	Same as 1A6R7	1A6V4 RF current balancing Figure 5-33
1A6R29 thru 1A6R32	Same as 1A6R11	1A6V3 and 1A6V4 DC Balancing Figure 5-33
1A6R33	Same as 1A6R15	1A6V3 Overload Relay Control Figure 5-33
1A6R34	Same as 1A6R15	1A6V4 Overload Relay Control Figure 5-33

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6R35	Same as 1A6R17	1A6V3 Overload Relay Shunt Figure 5-33
1A6R36	Same as 1A6R17	1A6V4 Overload Relay Shunt Figure 5-33
1A6R37 thru 1A6R38	Same as 1A6R1	Grid Swamping Figure 5-33
1A6R39 thru 1A6R40	Not Used	
1A6R41	Same as 1A6R5	1A6V1 Plate By-Pass Decoupling Figure 5-34
1A6R42	Same as 1A6R5	1A6V2 Plate By-Pass Decoupling Figure 5-34
1A6R43	Same as 1A6R5	1A6V3 Plate By-Pass Decoupling Figure 5-34
1A6R44	Same as 1A6R5	1A6V4 Plate By-Pass Decoupling Figure 5-34
1A6R45	RESISTOR, FIXED; Globar 750 Ohms, 150 watts type 890AS751K	Figure 5-34
1A6R46	Same as 1A6R45	
1A6S1 thru 1A6S4	SWITCH, FLOW: 75 psi; 20 gpm; 2 to 20 gpm scale range; 22375 part no. 10A2235-0A; 28527 part no. 1087552G1	1A6V1 to 1A6V4 Flow Rate Alarm Switch Figure 5-33
1A6S5 thru 1A6S9	SWITCH, THERMOSTATIC: 0 to 100 deg c scale; vapor actuated; 115 vac; 61349 part no. 3063; 28527 part no. 1087569G1	Temperature Switch Figure 5-33
1A6TB1	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Interconnecting Figure 5-34
1A6TB2	Same as 1A6TB1	Interconnecting Figure 5-34

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A6TB3 thru 1A6TB7	TERMINAL BOARD: 6 terminals, barrier type; MIL-T-55164 type 8TB6	Interconnecting Figure 5-34
1A6TY1	SPARK GAP: protective spark gap; one 1/2 in. dia sphere with 9/16 in. lg no. 8-32 mounting stud; one 1/2 in dia sphere with 1-1/8 in lg no. 8-32 mounting stud; 28527 part no. 1087623G1	1A6V1 and 1A6V3 Grid Protector Figure 5-33
1A6TY2	Same as 1A6TY1	1A6V2 and 1A6V4 Grid Protector Figure 5-33
1A6T1 thru 1A6T4	TRANSFORMER, POWER, STEP-DOWN: 208v input; output 12.7v, 292 amps, 13.2v, 302 amps, 13.7v, 312 amps;' 28527 part no. 1087492G1	1A6V1 and 1A6V4 Filament Transformer Figure 5-33
1A6T5	TRANSFORMER, CURRENT; 05280, part no. 1705	
1A6A1 1A6A1R1	RESISTOR ASSEMBLY, COMPOSITION; 51 ohms, 5%, 2 watts, MIL-R-39008, type RCR42G510JR	
1A6A1R2 thru 1A6A1R9	Same as 1A6A1R1	
1A6A2	RESISTOR, ASSEMBLY	
1A6A2R1 thru 1A6A2R9	Same as 1A6A1R1	
1A6V1 thru 1A6V4	ELECTRON TUBE: pulse triode; 20948 part no. F1086; 28527 part no. 1096250G1	Power Amplifier Figure 5-33

RESISTOR ASSEMBLY, TRANSMITTER NO. 1

1A7	RESISTOR ASSEMBLY, TRANSMITTER NO. 1: Resistors in banks of 8 to limit current to plate storage capacitors in Amplifier RF Unit 1A6; 28527 part no. 1087447G1	Current Limiting Figure 5-7
1A7R1 thru 1A7R8	RESISTOR, FIXED, COMPOSITION: 250 ohms + 10%, 250 watts; 72819 part no. 779SP005; 28527 part no. 1087590G4	Current Limiting Figure 5-35
1A7MP1 thru 1A7MP5	INSULATOR, STANDOFF: steatite, 7 in. lg overall; 75539 part no. 24229D7; 28527 part no. 1087632G1	Resistor Mounting Figure 5-35

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

AMPLIFIER, RADIO FREQUENCY, AM-3774/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A8	Same as 1A7	Current Limiting Figure 5-7
1A9	Same as 1A7	Current limiting Figure 5-7
1A10	Same as 1A7	Current Limiting Figure 5-7

RESISTOR ASSEMBLY, TRANSMITTER NO. 2

1A7	RESISTOR ASSEMBLY, TRANSMITTER NO. 2: resistors in banks of 8 to limit current to plate storage capacitors in Amplifier RF Unit 1A6; 28527 part no. 1087447G2	Current Limiting Figure 5-7
1A7R1 thru 1A7R8	RESISTOR, FIXED, COMPOSITION: 250 ohms ± 10%, 250 watts; 72819 part no. 779SP005; 28527 part no. 1087590G4	Current Limiting Figure 5-36
1A7MP1 thru 1A7MP5	INSULATOR, STANDOFF: steatite, 7 in 1g overall; 75539 part no. 24229D7; 28527 part no. 1087632G1	Resistor Mounting Figure 5-36
1A8	Same as 1A7	Current Limiting Figure 5-7
1A9	Same as 1A7	Current Limiting Figure 5-7
1A10	Same as 1A7	Current Limiting Figure 5-7

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RACK, ELECTRICAL EQUIPMENT, MT-2929/FPN-44

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A11	RACK, ELECTRICAL EQUIPMENT, MT-2929/FPN-44; accepts input power and distributes it through switching and relay circuitry throughout the transmitter group; 28527 part no. 1088019G1	Power Distribution Figure 5-7
1A11F1 thru 1A11F3	Not used	
1A11F4 thru 1A11F6	FUSE, CARTRIDGE: 15 amps, 500v; MIL-F-15160 type F60C500V15AS	IPA Blower Figure 5-37
1A11F7 thru 1A11F9	FUSE, CARTRIDGE: 15 amps, 250v; 71424 part no. TRM15; 28527 part no. 2138525G1	Enclosure Fan Figure 5-37
1A11F7 thru 1A11F9	**AN/FPN-44B: FUSE, CARTRIDGE: 15 amps, 500 volts; MIL-F-15160 type F60H15ROC; 90348 part no. 882290**	**Enclosure Fan Figure 5-37**
1A11F10 thru 1A11F12	FUSE, CARTRIDGE: 80 amps, 250v; MIL-F-15160 type F19A250V80A	Water Pump Figure 5-37
1A11F13 thru 1A11F15	Same as 1A11F7	Dummy Load Fan Figure 5-37
1A11F13 thru 1A11F15	**AN/FPN-44B: FUSE, CARTRIDGE: Same as 1A11F4.**	**Dummy Load Figure 5-37**
1A11F16 thru 1A11F23	FUSE, CARTRIDGE: 25 amps, 250v; MIL-F-15160 type F15A250V25AS	Tube Filaments Figure 5-37
1A11F16 thru 1A11F23	**AN/FPN-44B: FUSE, CARTRIDGE: 25 amps, 250v; MIL-F-15160 type F15G25ROB; 90348 PART NO. 882127**	
1A11HR1 thru 1A11HR3	HEATER, THERMAL RELEASE: 02295 part no. CR123C5.26A; 28527 part no. 1088278G3	Heater for 1A11K1 Thermal Cutout Figure 5-37
1A11HR4 thru 1A11HR6	HEATER, THERMAL RELEASE: 02295 part no. CR123C7.78A; 28527 part no. 1088278G5	Heater for 1A11K2 Thermal Cutout Figure 5-37
1A11HR4 thru 1A11HR6	**AN/FPN-44B: HEATER, THERMAL RELEASE: 02295 part no. CR123C5.26; 90348 part no. 1088278G2**	**Heater for 1A11K2 Thermal Cutout Figure 5-37**

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RACK, ELECTRICAL EQUIPMENT, MT-2929/FPN-44

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A11HR7 thru 1A11HR9	HEATER, THERMAL RELEASE: 02295 part no. CR123C27.3B; 28527 part no. 1088278G6	Heater for 1A11K3 Thermal Cutout Figure 5-37
1A11HR7 thru 1A11HR9	**AN/FPN-44B: HEATER, THERMAL RELEASE: 02295 part no. CR123C18.0; 90348 part no. 1088278G2**	**Heater for 1A11K3 Thermal Cutout Figure 5-37**
1A11J1	CONNECTOR, RECEPTACLE, ELECTRICAL: MIL-C-39012 type M39012/21-0001	Multipulse Input Figure 5-37
1A11J2	Same as 1A11J1	Scope Trigger Input Figure 5-37
1A11J3	Not used	
1A11J4	Not used	
1A11J5	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 contacts MIL-C-3608 type UG422BU	Multipulse Input Figure 5-37
1A11K1	RELAY, ARMATURE: 120v ± 2%, 45-66 Hz; 24446 part no. CR106B002ADDMFP	2nd IPA Blower Motor Starter Figure 5-37
1A11K1E1	CONTACT SET, ELECTRICAL: motor starter, three poles; 28527 part no. 1088433G2	1A11K1 Contact Figure 5-37
1A11K1E2	COIL, RF: 120 vac, 45-66 Hz; 28527 part no. 1088433G1	1A11K1 Coil Figure 5-37
1A11K2	Same as 1A11K1	Enclosure Fan Motor Starter Figure 5-37
1A11K2E1	Same as 1A11K1E1	1A11K2 Contact Figure 5-37
1A11K2E2	Same as 1A11K1E2	1A11K2 Coil Figure 5-37
1A11K3	RELAY, ARMATURE: 120v ± 2%, 45-66 Hz; 24446 part no. CR106D002BACMFP; 28527 part no. 1088029G1	Water Pump Motor Starter Figure 5-37
1A11K3E1	CONTACT SET, ELECTRICAL: motor starter, 120 vac ± 2%, 45-66 Hz; 28527 part no. 1088434G2	1A11K3 Contact Figure 5-37
1A11K3E2	COIL, RF: 120 vac, 45-66 Hz; 28527 part no. 1088434G1	1A11K3 Coil Figure 5-37

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RACK, ELECTRICAL EQUIPMENT, MT-2929/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A11K4	RELAY, ARMATURE: 4 pdt; contact rating coil 115v, 45-66 Hz; contacts 5 amps at 30 vdc; 115 vac coil, plug-in type; 24446 part no. 3S279OG128A1: 28527 part no. 2311889G1	Not Used Figure 5-37
1A11R1 thru 1A11R3	RESISTOR, FIXED, COMPOSITION: 15K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G153JS	Indicator Common Figure 5-37
1A11R4 thru 1A11R23	RESISTER, FIXED, COMPOSITION: 33K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G333JS	1A11F4 and 1A11F23 Limited Figure 5-37
1A11R24 thru 1A11R26	Same as 1A11R1	Indicator Common Figure 5-37
1A11R27 thru 1A11R62	Not Used	
1A11R63	Not Used	
1A11R64	Not Used	
1A11TB1 thru 1A11TB8	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Interconnection Figure 5-37
1A11TB9	Not Used	
1A11TB10	TERMINAL BOARD: plastic; 30.74 in. lg by 19.75 in. w by 0.250 in thick; 28527 part no. 1088174G1	Component Mounting Figure 5-37
1A11XK1 thru 1A11XK3	Not Used	
1A11XK4	SOCKET, RELAY: 14 terminals: 71785 part no. 203-62-14-017; 28527 part no. 2311506G1	1A11K4 Socket Figure 5-37

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

PANEL, INDICATOR, SB-1894A/FPN-44

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A12	PANEL, INDICATOR, SB-1894A/FPN-44: performs a dual function of providing control and indicating facilities. It contains switches, resistors, indicating lights and meters: 28527 part no. 1088013G3	Controls and Indicates Figure 5-7
1A12C1	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 uf ± 10%, 600 vdc; MIL-C-25 type CP09A1KF104K3	1A12K17 Spark Suppression Figure 5-39
1A12DS1	LAMP, INCANDESCENT: 120v, 6 watts; 96906 part no. MS15567-1	Left 1st IPA Cathode Overload Figure 5-38
1A12DS2	Same as 1A12DS1	Right 1st IPA Cathode Overload Figure 5-38
1A12DS3	Same as 1A12DS1	Left PA Bias Overload Figure 5-38
1A12DS4	Same as 1A12DS1	Right PA Bias Overload Figure 5-38
1A12DS5	Not Used	
1A12DS6	Not Used	
1A12DS7	Same as 1A12DS1	Hot Water Inlet Figure 5-38
1A12DS8	Same as 1A12DS1	Hot Water Outlet Figure 5-38
1A12DS9	Same as 1A12DS1	Water Level Figure 5-38
1A12DS10	Same as 1A12DS1	Left PA Bias Undervoltage Figure 5-38
1A12DS11	Same as 1A12DS10	Right PA Bias Undervoltage Figure 5-38
1A12DS12	Same as 1A12DS1	Transmitter Standby Figure 5-38

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

PANEL, INDICATOR, SB-1894A/FPN-44

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A12DS13	Same as 1A12DS1	Transmitter Operate Figure 5-38
1A12DS14 thru 1A12DS33	LAMP, GLOW: 120v, 0.04 watts; T3-1/4 bulb; MIL-L-15098 type M15098/10-002	Blown Fuse Indicator Figure 5-38
1A12DS34	Not Used	
1A12DS35	Not used	
1A12K1 thru 1A12K4	RELAY, ARMATURE: dpdt, 26.5 vdc; 2 amp contacts; 71482 part no. RP7641G196; 28527 part no. 2311296G1	1A12DS1 to 1A12DS4 Control Figure 5-39
1A12K5 thru 1A12K6	Not Used	
1A12K7 thru 1A12K9	Same as 1A12K1	1A12DS7 to 1A12DS9 Control Fig 5-39
1A12K10	RELAY, ARMATURE: 4 pdt, 115v coil, 46-66 Hz, 30v, 5 amps; plug-in type; 01526 part no. 3S279OG128A1; 28527 part no. 2311889G1	1A12K1 to 1A12K9 Reset Figure 5-39
1A12K11	Same as 1A12K1	Operate-Standby Figure 5-39
1A12K12	Same as 1A12K1	HV Interlock Figure 5-39
1A12K13	Same as 1A12K1	Transmitter Stop Relay Figure 5-39
1A12K14	Same as 1A12K10	1A12K13 Control Figure 5-39
1A12K15	Same as 1A12K10	HV Interlock Figure 5-39
1A12K16	Same as 1A12K10	Emergency Stop Figure 5-39
1A12K17	RELAY, THERMAL: spst, contacts rated 115 vac, 2 amps; coil 115v, 45 to 66 Hz; time delay 5 seconds; 70563 part no. 115N05T; 28527 part no. 1089186G1	Filament Disable Figure 5-39

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

PANEL, INDICATOR, SB-1894A/FPN-44

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A12S1	SWITCH, TOGGLE: 4 pdt; 96906 part no. MS25068-23	Local-Remote Figure 5-38
1A12TB1 thru 1A12TB8	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Interconnection Figure 5-39
1A12XDS1 thru 1A12XDS4	LAMPHOLDER: yellow lens; MIL-L-3661 type LH80/1LC21YD3	1A12DS1 to 1A12DS4 Holder Figure 5-38
1A12XDS5 thru 1A12XDS6	Not Used	
1A12XDS7 thru 1A12XDS9	Same as 1A12XDS1	1A12DS7 to 1A12DS9 Holder Figure 5-38
1A12XDS1MP1 thru 1A12XDS1MP4	LENS: yellow; MIL-L-3661 type LC21YD3	1A12XDS1 thru 1A12XDS4 Lens Figure 5-38
1A12XDS5MP1 thru 1A12XDS6MP1	Not Used	
1A12XDS7MP1 thru 1A12XDS9MP1	Same as 1A12XDS1MP1	1A12XDS7 to 1A12XDS9 Lens Figure 5-39
1A12XDS9	LAMPHOLDER, blue lens; MIL-L-3661 type LH80/1LC21BD3	1A12DS9 Holder Figure 5-38
1A12XDS9MP1	LENS: blue; MIL-L-3661 type LC21BD3	1A12XDS9 Lens Figure 5-38
1A12XDS10	LAMPHOLDER: green lens; MIL-L-3661 type LH80/1LC21GD3	1A12DS10 Holder Figure 5-38
1A12XDS10MP1	LENS: green, MIL-L-3661 type LC21GD3	1A12XDS10 Lens Figure 5-38
1A12XDS11	Same as 1A12XDS10	1A12DS11 Holder Figure 5-38
1A12XDS11PM1	Same as 1A12XDS10MP1	1A12XDS11 Lens Figure 5-38
1A12XDS12	LAMPHOLDER: red lens; MIL-L-3661 type LH80/1LC21RD3	1A12DS12 Holder Figure 5-38

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

PANEL, INDICATOR, SB-1894A/FPN-44

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A12XDS12MP1	LENS: red; MIL-L-3661 type LC21RD3	1A12XDS12 Lens Figure 5-38
1A12XDS13	Same as 1A12XDS12	1A12DS13 Holder Figure 5-38
1A12XDS13MP1	Same as 1A12XDS12MP1	1A12XDS13 Lens Figure 5-38
1A12XDS14 thru 1A12XDS33	LAMPHOLDER: translucent lens; MIL-L-3661 type LH76/1LC14CD3	1A12DS14 to 1A12DS33 Holder Figure 5-38
1A12XDS14 thru 1A12XDS33	**AN/FPN-44B: LAMPHOLDER: translucent lens; MIL-L-3661 type LH75LC14CD; 90348 part no. 1087996**	
1A12XDS14MP1 thru 1A12XDS33MP1	LENS: Clear; MIL-L-3661 type LC14CD3	1A12XDS14 thru 1A12XDS33 Lens Figure 5-38
1A12XK1 thru 1A12XK4	SOCKET, RELAY: 8 contacts; 91506 part no. 8009-1G18; 28527 part no. 2311372G1	1A12K1 to 1A12K4 Holder Fig 5-39
1A12XK5 thru 1A12XK6	Not Used	
A12XK7 thru 1A12XK9	Same as 1A12XK1	1A12K7 thru 1A12K9 Holder Figure 5-39
1A12XK10	SOCKET, RELAY: 14 contacts; 71785 part no. 203-62-14-017; 28527 part no. 2311506G1	1A12K10 Holder Figure 5-39
1A12XK11 thru 1A12XK13	Same as 1A12XK1	1A12XK11 to 1A12XK13 Holder Figure 5-39
A12XK14 thru 1A12XK16	Same as 1A12XK10	1A12XK14 thru 1A12XK16 Holder Figure 5-39
1A12XK17	SOCKET, RELAY: 9 contacts; MIL-S-12883 type M12883/03-01	1A12K17 Holder Figure 5-39

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

FILTER, LOW PASS

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A20	FILTER, LOW PASS: used to reduce the level of harmonic content in the radiated signal, U.S. Coast Guard field change no. 18	Harmonic Filter Figure 5-7
1A20C1 thru 1A20C4	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.07 uf ± 5%, 10,800 vrms; 28527 part no. 1096242G1	RF Filter Figure 5-40
1A20L1	COIL, RADIO FREQUENCY: 1 winding, two terminals, adjustable; 15249 part no. DO-157	Harmonic Filter Figure 5-40
1A20TY1 thru 1A20TY2	SPARK GAP: 0.500 in. dia brass balls with 8-32 thd stud 1.750 in. long; 28527 part no. 109623G1	Surge Protector Figure 5-40

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

INDICATOR PANEL, PA OVERLOAD

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A21	INDICATOR PANEL, PA OVERLOAD: U.S. Coast Guard field change 8	PA Overload Figure 5-7
1A21DS1 thru 1A21DS4	LAMP, INCANDESCENT: bayonet base; 96906 part no. MS15567-1	1A6V1 thru 1A6V4 Overload Indicator Figure 5-41
1A21K1 thru 1A21K4	RELAY, ARMATURE: coil 26.5 vdc, 675 ohms resistance, 2 amp resistive; 50237 part no. 560-2-1308	PA Tube dc Overload Relay Figure 5-42
1A21TB1	TERMINAL BOARD: MIL-T-55164 type 37TB10	Interconnection Figure 5-42
1A21XDS1 thru 1A21XDS4	LAMPHOLDER: yellow, Mil-L-3661 type LH/1LC21YD3	Lampholder for 1A21DS1 thru 1A21DS4 Figure 5-41
1A21XDS1MP1 thru 1A21XDS4MP1	LENS: yellow, MIL-L-3661 type LC21YD3	Lens for 1A21XDS1 thru 1A21XDS4 Figure 5-41
1A21XK1 thru 1A21XK4	SOCKET, RELAY: 8 contacts; 91506 part no. 8009-1G3	1A21K1 thru 1A21K4 Socket Figure 5-42

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE HD-1000/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A52	COOLER, LIQUID, ELECTRON TUBE HD-1000/ FPN-44A:16630 part no. 8950A00-0000; 28527 part no. 1096267G1	Heat Exchanger Figure 5-50
1A52MP1	CARTRIDGE HOLDER ASSEMBLY: c/o 1 "O' ring, 1 clamp, 1 head, 1 tube body and 1 spring; 16630 part no. 8950A00-0132	Cartridge Holder Figure 5-41
1A52MP2	Same as 1A52MP1	Cartridge Holder Figure 5-41
1A52M1	GAUGE, PRESSURE: 200 pound pressure, 3,500 in. dia; 3% accuracy; 16630 part no. 8950A00-0121-2	Pressure Indicator Figure 5-41
1A52M2	Same as 1A52M1	Pressure Indicator Figure 5-41
1A52M3	Same as 1A2M3	Water Level Indicator Figure 5-41
1A52M4	Same as 1A2M4	Pressure Indicator Figure 5-41
1A52M5	Same as 1A2M5	Pressure Indicator Figure 5-41
1A52M6	Same as 1A2M4	Pressure Indicator Figure 5-41
1A52S1	Same as 1A2S1	115 Vac Control Circuit Figure 5-41
1A52TB1	Same as 1A2TB1	Interconnection Figure 5-41
1A52TB2	TERMINAL BOARD: 2 terminals; MIL-T-55164 type 8TB2	Interconnection Figure 5-41
1A52U1	ADAPTER, STRAIGHT, PIPE TO HOSE: 2.500 in. IPS; brass; 72661 part no. BST30; 16630 part no. 8950A00-0000-13	Hose Connecting Figure 5-41
1A52U2	Same as 1A52U1	Hose Connecting Figure 5-41

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE, HD1000/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A52U3	ADAPTER, STRAIGHT, PIPE TO HOSE: 1 in. IPS; brass; 72661 part no. BST10; 16630 part no. 8950A00-0000-15	Hose Connecting Figure 5-41
1A52U4	Same as 1A2U4	Water Drain Figure 5-41
1A52U5	COCK, DRAIN: 1/2 in; 16630 part no. 8950A00-0129 REF 1-2 IN.	Bleeder Figure 5-41
1A52U6	Same as 1A52U5	Bleeder Figure 5-41
1A52U7	Same as 1A2U4	Water Drain Figure 5-41
1A52U8	VALVE, GATE: 1 in. FPT; bronze; teflon packing seal; 200 PS1G; 16630 part no. 8950A00-0124-2	Water Cooler Figure 5-41
1A52U9	Same as 1A2U9	Water Cooler Figure 5-41
1A52U10	VALVE, CHECK: swing; 1 in. FPT; bronze; 125 pounds working pressure; 16630 part no. 8950A00-0123-2	Check Valve Figure 5-41
1A52U11	Same as 1A2U11	Air Escape Figure 5-41
1A52U12	Same as 1A2U12	Drain Valve Figure 5-41
1A52U13	ADAPTER, STRAIGHT, PIPE TO HOSE: 2 in. IPS; brass; 72661 part no. BST25; 16630 part no. 8950A00-0000-14	Hose Connecting Figure 5-41
1A52U14	Same as 1A52U13	Hose Connecting Figure 5-41
1A52U15	Not Used	
1A52U16	Same as 1A2U9	Water Cooler Figure 5-41
1A52U17	Same as 1A2U17	Valve Figure 5-41
1A52U18	VALVE, GATE: 1/4 in. FPT; bronze; teflon packing seal; 200 PS1G; 16630 part no. 8950A00-0131	Valve Figure 5-41
1A52U19	Same as 1A2U4	Drain Figure 5-41

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE, HD1000/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A52U20	VALVE, CHECK: Swing; 3/4 in. FPT; bronze; 125 pounds working pressure; 16630 part no. 8950A00-0123-1	Check Valve Figure 5-41
1A52U21	Same as 1A2U21	Check Valve Figure 5-41
1A52U22	1A2E1	Reservoir Figure 5-41
1A52U23	Same as 1A2U9	Water Cooler Figure 5-41
1A52U24	Same as 1A2U24A	Strainer Figure 5-41
1A52U25	Not Used	
1A52U26	VALVE, GLOBE: 1/2 in. FPT; bronze; teflon packing seal; 200 PSIG working pressure; 16630 part no. 8950A00-0125	Water Cooler Figure 5-41
1A52U27 thru 1A52U32	Same as 1A2U4	Drain Figure 5-41
1A52U33	Not Used	
1A52U34	Same as 1A52U5	Plug Figure 5-41
1A52U35	Same as 1A52U5	Plug Figure 5-41
1A52U36	Same as 1A52U18	Valve Figure 5-41
1A52U37	HEAT EXCHANGER: brass; 16630 part no. 8950A00-0129	Heat Exchanger Figure 5-41
1A52U38	Same as 1A52U37	Heat Exchanger Figure 5-41
1A52U39	PUMP-MOTOR ASSEMBLY: 75 gallons per minute; bronze; 7.5 hp; 3500 rpm; 208v; 60 Hz; 3 phase; 16630 part no. 8950A00-0126	Water Circulator Figure 5-41
1A52U39B1	MOTOR, ALTERNATING CURRENT: 7.5 hp; 3500 rpm; 208v; 3 phase; 60 Hz; for 1531-1-1/4 AB pump	Pump Motor Figure 5-42
1A52U39MP1	PLUG, VOLUTE: 06631 part no. P39470	Volute Plug Figure 5-42

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COOLER, LIQUID, ELECTRON TUBE, HD1000/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A52U39MP2	VOLUTE: 06631 part no. P41220	Volute Figure 5-42
1A52U39MP3	CAPSCREW, IMPELLER: 06631 part no. P52530	Impeller Capscrew Figure 5-42
1A52U39MP4	GASKET, CAPSCREW: 06631 part no. P57000	Capscrew Gasket Figure 5-51

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY SET

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53	POWER SUPPLY SET: converts the 208/460 volt primary power from AC to DC at the required levels and supplies power to components of the Transmitter Group; 28527 part no. 1096281G3	Supplies Power to Transmitter Figure 5-43

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY RE-1112/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A1	RELAY ASSEMBLY RE-1112/FPN-44A: consists of two relays on panel, used to discharge high voltage capacitors in the transmitter; 01238 part no. D30-17733; 28527 part no. 1096306G1	Capacitor Discharge Figure 5-43
1A53A1K1	RELAY ARMATURE: actuator 115v 50 Hz, normally closed, 40000 volts peak test with 2 auxiliary contacts; 23598 part no. E40NC40-2-1	Capacitor Discharge Figure 5-44
1A53A1K2	RELAY ARMATURE: actuator 115v 50 Hz, normally closed, 25000 volts peak test with 2 auxiliary contacts; 23598 part no. E25NC25-2-1	Capacitor Discharge Figure 5-44
1A53A1TB1	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Interconnection Figure 5-44

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR C-10034/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A2	CONTROL-INDICATOR C-10034/FPN-44A: provides controls and indicators for the operation of the Power Supply Set; 28527 part no. 1096286G1	Controls and Indicators for Power Supply Set Figure 5-43
1A53A2DS1	LAMP, INCANDESCENT: 125, 6 watts; 96906 type MS15567-1	Water On Figure 5-45
1A53A2DS2	Same as 1A53A2DS1	Door Interlock Figure 5-45
1A53A2DS3 thru 1A53A2DS4	Not Used	
1A53A2DS5	Same as 1A53A2DS1	Bias and Low Voltage On Figure 5-45
1A53A2DS6	Not used	
1A53A2DS7	Same as 1A53A2DS1	Filaments Ready Figure 5-45
1A53A2DS8	Same as 1A53A2DS1	Air On Figure 5-45
1A53A2DS9	Same as 1A53A2DS1	Plate On Figure 5-45
1A53A2DS10	Same as 1A53A2DS1	AC Overload Figure 5-45
1A53A2DS11	Same as 1A53A2DS1	Plate Transformer Over Temperature Figure 5-45
1A53A2DS12	Same as 1A53A2DS1	3 Strike Figure 5-45
1A53A2DS13	Same as 1A53A2DS1	IPA Overload Figure 5-45
1A53A2DS14	Same as 1A53A2DS1	PA Overload Figure 5-45
1A53A2DS15 thru 1A53A2DS26	Not Used	

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A2DS27	LAMP, GLOW: 120 vac, 0.142 watts, T3-1/4 bulb; MIL-L-15098/10-002	1A53A3F13 Blown Fuse Indicator Figure 5-45
1A53A2DS28	Same as 1A53A2DS27	1A53A3F12 Blown Fuse Indicator Figure 5-45
1A53A2DS29	Same as 1A53A2DS27	1A53A3F11 Blown Fuse Indicator Figure 5-45
1A53A2DS30	Same as 1A53A2DS27	1A53A3F10 Blown Fuse Indicator Figure 5-45
1A53A2DS31 thru 1A53A2DS36	Not Used	
1A53A2DS37	Same as 1A53A2DS27	1A53A3F21 Blown Fuse Indicator Figure 5-45
1A53A2DS38	Same as 1A53A2DS27	1A53A3F20 Blown Fuse Indicator Figure 5-45
1A53A2DS39	Same as 1A53A2DS27	1A53A3F19 Blown Fuse Indicator Figure 5-45
1A53A2DS40	Same as 1A53A2DS27	1A53A3F35 Blown Fuse Indicator Figure 5-45
1A53A2DS41	Same as 1A53A2DS27	1A53A3F36 Blown Fuse Indicator Figure 5-45
1A53A2DS42	Same as 1A53A2DS27	1A53A3F37 Blown Fuse Indicator Figure 5-45

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A2DS43	Same as 1A53A2DS27	1A53A3F38 Blown Fuse Indicator Figure 5-45
1A53A2DS44	Same as 1A53A2DS1	Emergency Stop Power Figure 5-45
1A53A2DS45	Same as 1A53A2DS1	Emergency Stop Power Figure 5-45
1A53A2DS46	Same as 1A53A2DS27	1A53A3F39 Blown Fuse Indicator Figure 5-45
1A53A2DS47	Same as 1A53A2DS27	1A53A3A3F1 Blown Fuse Indicator Figure 5-45
1A53A2DS48	Same as 1A53A2DS27	1A53A3A4F1 Blown Fuse Indicator Figure 5-45
1A53A2DS49	Same as 1A53A2DS27	1A53A3A4F2 Blown Fuse Indicator Figure 5-45
1A53A2J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 contact; MIL-C-39012 type M39012/ 21-0001	Voltage Divider Output Figure 5-46
1A53A2J2	Same as 1A53A2J1	Ripple (1A4J4) Figure 5-46
1A53A2J3	Same as 1A53A2J1	Voltage Divider Output Figure 5-46
1A53A2J4	Same as 1A53A2J1	Spare Figure 5-46
1A53A2J5	Same as 1A53A2J1	Voltage Divider Output Figure 5-46
1A53A2J6	Not Used	

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A2J7	Same as 1A53A2J1	Voltage Divider Output Figure 5-46
1A53A2M1	METER, TIME TOTALIZING: 0 to 99999.9 hours; 120v, 60 Hz; 24446 part no. 50-240-731AAAE; 28527 part no. 1088418G48	Plate Hours Figure 5-45
1A53A2M2	VOLTMETER: 0 to 30 Kv dc; MIL-M-10304 type MR36W030DCKVR	PA Plate Volts Figure 5-45
1A53A2M3	VOLTMETER: 0 to 20 Kv dc; MIL-M-10304 type MR36W020DCKVR	IPA Plate Volts Figure 5-45
1A53A2M4	VOLTMETER: 0 to 10 Kv dc; MIL-M-10304 type MR26W010DCKVR	Low Voltage Plate Figure 5-45
1A53A2M5	VOLTMETER: 0 to 800 vac; MIL-M-10304 type MR36W800ACVVR W/Multiplier R5	AC Volts Figure 5-45
1A53A2M6	Same as 1A53A2M1	Filament Hours Figure 5-45
1A53A2M7	AMMETER: 0 to 10 amp dc; 15309 part no. 908-255; 28527 part no. 1088418G35	PA Plate Current Figure 5-45
1A53A2K1	RELAY, 66342 part no. KHS17011-24	Deslot/Non-Deslot Control Relay
1A53A2K2	RELAY, Time Delay, 89020 part no. 7012AB	Filament Off Delay
1A53A2K3	RELAY, 24446 part no. CR120A04002AA MFP	460 Vac Lockout Control Relay
1A53A2M8	AMMETER: 0 to 2 amps dc; 15309 part no. 908-256; 28527 part no. 1088418G36	IPA Plate Current Figure 5-45
1A53A2M9	VOLTMETER: 0 to 1K vdc; MIL-M-10304 type MR36W001DCKVR	-5 KV Bias Figure 5-45
1A53A2R1 thru 1A53A2R4	Not Used	
1A53A2R5	RESISTOR, FIXED: Meter Multiplier	1A53A2M5 Meter Multiplier Figure 5-46

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A2R6	RESISTOR, FIXED, FILM: 590 ohms ± 1%, 1/4 watt; MIL-R-10509 TYPE RN65C5900F	Plate Voltage Control Figure 5-46
1A53A2R7	RESISTOR, FIXED, FILM: 7.5K ohms ± 1%, 1/4 watt; MIL-R-10509 type RN65C7501F	Plate Voltage Control Figure 5-46
1A53A2R8	RESISTOR, VARIABLE: 2K ohms ± 3%, 5 watts; 32997 part no. 3400S1-202; 28527 part no. 2138485G5	Operate Adjust Figure 5-45
1A53A2R9	RESISTOR, VARIABLE: 10K ohms ± 3%, 5 watts; 32997 part no. 3400S1-103; 28527 part no. 2138485G7	Maintenance Adjust Figure 5-45
1A53A2S1 thru 1A53A2S2	Not Used	
1A53A2S3	SWITCH ROTARY: 600v, 20 amps; 24446 part no. 16SB1CF11X2; 28527 part no. 1088418G38	AC Voltage Phase Selector Figure 5-45
1A53A2S4	SWITCH, ROTARY: 3 position, 600v, 20 amps; 28527 part no. 2138352G1	AC Voltage Selector Figure 5-45
1A53A2S5 thru 1A53A2S6	Not used	
1A53A2S7	SWITCH, TOGGLE: dpst; 115v, 20 amps; MIL-S-83731 type MS35059-22	Bias and Low Voltage Figure 5-45
1A53A2S8	SWITCH, PUSH: dpdt, 600v, 10 amps; 24446 part no. CR2940UA203BMFP; 28527 part no. 1088782G034	Overload and 3 Strike Reset Figure 5-45
1A53A2S9 thru 1A53A2S12	Not Used	
1A53A2S13	Same as 1A53A2S7	Filaments Figure 5-45
1A53A2S14 thru 1A53A2S16	Not Used	
1A53A2S17	SWITCH, TOGGLE: dpdt, 115v, 20 amps; MIL-S-83731 type MS35059-23	Power On/Off Reset Figure 5-45

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
A153A2S18	SWITCH, ROTARY: 3 position, 600v, 20 amps; 24446 part no. 16BIEB3B8655M2V	Plate Voltage Selector Figure 5-45
1A53A2S19	SWITCH, TOGGLE: dpdt, 115 vac, 15 amps, 28 vdc, 200 amps; MIL-S-3950 type MS24659-22F	Emergency Stop Figure 5-46
1A53A2S20	SWITCH, Rotary, 5PDT, 81083 part no. 42M36-05-1-2N	DESLOT/ NON-DESLOT SWITCH
1A53A2TB1	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Interconnection Figure 5-45
1A53A2TB2 thru 1A53A2TB18	Not Used	
1A53A2TB19	Same as 1A53A2TB1	Interconnection Figure 5-46
1A53A2TB20	Same as 1A53A2TB1	Interconnection Figure 5-46
1A53A2TB21	Same as 1A53A2TB1	Interconnection Figure 5-46
1A53A2TB22	Same as 1A53A2TB1	Interconnection Figure 5-46
1A53A2TB23	Same as 1A53A2TB1	Interconnection Figure 5-46
1A53A2TB24	Same as 1A53A2TB1	Interconnection Figure 5-46
1A53A2TB25	Same as 1A53A2TB1	Interconnection Figure 5-46
1A53A2TB26	Not Used	
1A53A2TB27	TERMINAL BOARD: 4 terminals, barrier type; MIL-T-55164 type 17TB4	Interconnection Figure 5-46
1A53A2TB28 thru 1A53A2TB35	Not Used	
1A53A2TB36	Same as 1A53A2TB27	Interconnection Figure 5-46
1A53A2TB37	Same as 1A53A2TB1	Interconnection

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-46
1A53A2T1	TRANSFORMER, VARIABLE: 120 vac input, 50 to 60 Hz; 0-120v, 2.25 amps output; 24446 part no. 9T92A1; 28527 part no. 1088418G46	Dimmer Figure 5-45
1A53A2XDS1	LAMPHOLDER: blue lens; MIL-L-3661 type LH80/1LC21BD3	1A53A2DS1 Holder Figure 5-45
1A53A2S20	SWITCH ROTARY, 5 pdt, 81083 part no. 42M36-05-1-2N	Deslot/Non-Deslot switch
1A53A2XDS1 MP1	LENS: blue; MIL-L-3661 type LC21BD3	1A53A2XDS1 Lens Figure 5-45
1A53A2XDS2	LAMPHOLDER: white lens; MIL-L-3661 TYPE LH80/1LC21WT3	1A53A2DS2 Holder Figure 5-45
1A53A2XDS2 MP1	LENS: white; MIL-L-3661 type LC21WT3	1A53A2XDS2 Lens Figure 5-45
1A53A2XDS3 thru 1A53A2XDS4	Not Used	
1A53A2XDS5	Same as 1A53A2XDS2	1A53A2DS5 Holder Figure 5-45
1A53A2XDS5 MP1	Same as 1A53A2XDS2MP1	1A53A2XDS5 Lens Figure 5-45
1A53A2XDS6	Not Used	
1A53A2XDS7	LAMPHOLDER: yellow lens; MIL-L-3661 type LH80/1LC21YD3	1A53A2DS7 Holder Figure 5-45
1A53A2XDS7 MP1	LENS: yellow; MIL-L-3661 type LC21YD3	1A53A2XDS7 Lens Figure 5-45
1A53A2XDS8	Same as 1A53A2XDS2	1A53A2DS8 Holder Figure 5-45
1A53A2XDS8	Same as 1A53A2XDS2MP1	1A53A2XDS8 Lens Figure 5-45
1A53A2XDS9	LAMPHOLDER: red lens; MIL-L-3661 type	1A53A2DS9

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	LH80/1LC21RD3	Holder Figure 5-45
1A53A2XDS9 MP1	LENS: red; MIL-L-3661 type LC21RD3	1A53A2XDS9 Lens Figure 5-45
1A53A2XDS10	Same as 1A53A2XDS7	1A53A2DS10 Holder Figure 5-45
1A53A2XDS10 MP1	Same as 1A53A2XDS7MP1	1A53A2XDS10 Lens Figure 5-45
1A53A2XDS11	Same as 1A53A2XDS7	1A53A2DS11 Holder Figure 5-45
1A53A2XDS11 MP1	Same as 1A53A2XDS7MP1	1A53A2XDS11 Lens Figure 5-45
1A53A2XDS12	Same as 1A53A2XDS7	1A53A2DS12 Holder Figure 5-45
1A53A2XDS12 MP1	Same as 1A53A2XDS7MP1	1A53A2XDS12 Lens Figure 5-45
1A53A2XDS13	Same as 1A53A2XDS7	1A53A2DS13 Holder Figure 5-45
1A53A2XDS13 MP1	Same as 1A53A2XDS7MP1	1A53A2XDS13 Lens Figure 5-45
1A53A2XDS14	Same as 1A53A2XDS7	1A53A2DS14 Holder Figure 5-45
1A53A2XDS14 MP1	Same as 1A53A2XDS7MP1	1A53A2XDS14 Lens Figure 5-45
1A53A2XDS15 thru 1A53A2XDS26	Not Used	
1A53A2XDS27	LAMPHOLDER: clear lens; MIL-L-3661 type LH76/1LC14CD3	1A53A2DS27 Holder Figure 5-45

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A2XDS27 MP1	LENS: clear; MIL-L-3661 type LC14CD3	1A53A2XDS27 Lens Figure 5-45
1A53A2XDS28	Same as 1A53A2XDS27	1A53A2DS28 Holder Figure 5-45
1A53A2XDS28 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS28 Lens Figure 5-45
1A53A2XDS29	Same as 1A53A2XDS27	1A53A2DS29 Holder Figure 5-45
1A53A2XDS29 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS29 Lens Figure 5-45
1A53A2XDS30	Same as 1A53A2XDS27	1A53A2DS30 Holder Figure 5-45
1A53A2XDS30 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS30 Lens Figure 5-45
1A53A2XDS31 thru 1A53A2XDS36	Not Used	
1A53A2XDS37	Same as 1A53A2XDS27	1A53A2DS37 Holder Figure 5-45
1A53A2XDS37 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS37 Lens Figure 5-45
1A53A2XDS38	Same as 1A53A2XDS27	1A53A2DS38 Holder Figure 5-45
1A53A2XDS38 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS38 Lens Figure 5-45
1A53A2XDS39	Same as 1A53A2XDS27	1A53A2DS39 Holder Figure 5-45
1A53A2XDS39 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS39 Lens

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-45
1A53A2XDS40	Same as 1A53A2XDS27	1A53A2DS40 Holder Figure 5-45
1A53A2XDS40 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS40 Lens Figure 5-45
1A53A2XDS41	Same as 1A53A2XDS27	1A53A2DS41 Holder Figure 5-45
1A53A2XDS41 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS41 Lens Figure 5-45
1A53A2XDS42	Same as 1A53A2XDS27	1A53A2DS42 Holder Figure 5-45
1A53A2XDS42 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS42 Lens Figure 5-45
1A53A2XDS43	Same as 1A53A2XDS27	1A53A2DS43 Holder Figure 5-45
1A53A2XDS43 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS43 Lens Figure 5-45
1A53A2XDS44	Same as 1A53A2XDS7	1A53A2DS44 Holder Figure 5-45
1A53A2XDS44 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS44 Lens Figure 5-45
1A53A2XDS45	Same as 1A53A2XDS7	1A53A2DS45 Holder Figure 5-45
1A53A2XDS45 MP1	Same as 1A53A2XDS7MP1	1A53A2XDS45 Lens Figure 5-45
1A53A2XDS46	Same as 1A53A2XDS27	1A53A2DS46 Holder

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

CONTROL-INDICATOR, C-10034/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-45
1A53A2XDS46 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS46 Figure 5-45
1A53A2XDS47	Same as 1A53A2XDS27	1A53A2DS47 Holder Figure 5-45
1A53A2XDS47 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS47 Lens Figure 5-45
1A53A2XDS48	Same as 1A53A2XDS27	1A53A2DS48 Holder Figure 5-45
1A53A2XDS48 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS48 Lens Figure 5-45
1A53A2XDS49	Same as 1A53A2XDS27	1A53A2DS49 Holder Figure 5-45
1A53A2XDS49 MP1	Same as 1A53A2XDS27MP1	1A53A2XDS49 Lens Figure 5-45
1A53A2XK1	RELAY SOCKET, 77342 part no. 270E166	K1 Mounting Socket

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY RE-1113/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3	RELAY ASSEMBLY RE-1113/FPN-44A: provides overcurrent, overvoltage and undervoltage protection; performs interlocking and timing functions	Overcurrent Overvoltage and Undervoltage Protection Figure 5-43
1A53A3CB1	CIRCUIT BREAKER: 600v at 500 amps, 120 vac at 45 to 66 Hz shunt trip; 60969 part no. TJK636500WLFP W/TJKSTA12RS W/343L162G20 mtg hdwe; 28527 part no. 213835G1	460 Volt Plate Power Figure 5-52
1A53A3CB2	CIRCUIT BREAKER: 600v at 225 amps, 120 vac at 45 to 66 Hz shunt trip; 60969 part no. TFK236225WLFP W/TJKSTA12RSW/ 343L162G21 mtg hdwe; 28527 part no. 2138336G1	208 Volt Power Figure 5-47
1A53A3CR1 thru 1A53A3CR5	Not Used	
1A53A3CR6	SEMICONDUCTOR DEVICE, DIODE: rectifier; 21845 part no. 3G6; 28527 part no. 2138315G1	Relay Protection Figure 5-47
1A53A3CR7	Same as 1A53A3CR6	Relay Protection Figure 5-47
1A53A3CR8 thru 1A53A3CR22	Not Used	
1A53A3CR23	Same as 1A53A3CR6	Relay Protection Figure 5-47
1A53A3CR24	Not Used	
1A53A3CR25 thru 1A53ACR28	Same as 1A53A3CR6	Relay Power Supply Rectifier Figure 5-49
1A53A3CR29 thru 1A53A3CR32	Not Used	
1A53A3CR33 thru 1A53A3CR44	Same as 1A53A3CR6	Rectifier Figure 5-51

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3C1 thru 1A53A3C3	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 15 uf ± 10% 330 vac; 01002 part no. 21L3316; 28527 part no. 2138391G1	Filament Transformer Inrush Protection Figure 5-49
1A53A3C4	Not Used	
1A53A3C5	CAPACITOR, FIXED, ELECTROLYTIC: 39 uf, +100%-10%, 450 vdcw; MIL-C-62 type CE51C390R	Relay Power Supply Filter Figure 5-49
1A53A3C6 thru 1A53A3C14	Not Used	
1A53A3C15 thru 1A53A3C17	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf ± 20%, 100 vdcw; MIL-C-3965 type CL31BN100MPG	Filter Figure 5-51
1A53A3C18	CAPACITOR, FIXED, ELECTROLYTIC: 30 uf ± 20%, 100 vdcw; MIL-C-3965 type CL31BN300MPG	1A53A3K34 Timing Figure 5-51
1A53A3C19 thru 1A53A3C21	CAPACITOR, FIXED, ELECTROLYTIC: 20 uf +75%-15%, 25 vdcw; MIL-C-3965 type CL23BG200UNE	1A53A3K13 Timing Figure 5-51
1A53A3DS1 thru 1A53A3DS3	Not Used	
1A53A3DS4	LAMP, GLOW: 120v, 0.142 watts, T3-1/4 bulb; MIL-L-15098 type M15098/10-002	1A53A3A2F1 Blown Fuse Indicator Figure 5-50
1A53A3DS5	Same as 1A53A3DS4	1A53A3A2F2 Blown Fuse Indicator Figure 5-50
1A53A3DS6	Same as 1A53A3DS4	1A53A3A2F3 Blown Fuse Indicator Figure 5-50
1A53A3F1	FUSE CARTRIDGE: 1.8 amp, 600v; 71400 part no. BCC1-8-10; 28527 part no. 1088782G20	460V Phase 1 Meter Circuit Figure 5-50
1A53A3F2	Same as 1A53A3F1	460V Phase 2 Meter Circuit Figure 5-50

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3F3	Same as 1A53A3F1	460V Phase 3 Meter Circuit Figure 5-50
1A53A3F4	Same as 1A53A3F1	208V Phase 1 Meter Circuit Unregulated Figure 5-48
1A53A3F5	Same as 1A53A3F1	208V Phase 2 Meter Circuit Unregulated Figure 5-48
1A53A3F6	Same as 1A53A3F1	208V Phase 3 Meter Circuit Unregulated Figure 5-48
1A53A3F7	Same as 1A53A3F1	208V Phase 1 Meter Circuit Regulated Figure 5-48
1A53A3F8	Same as 1A53A3F1	208V Phase 2 Meter Circuit Regulated Figure 5-48
1A53A3F9	Same as 1A53A3F1	208V Phase 3 Meter Circuit Regulated Figure 5-48
1A53A3F10	FUSE, CARTRIDGE: 30 amps, 250v; MIL-F-15160 type F15A250V30AS	Control Power Figure 5-48
1A53A3F11 thru 1A53A3F13	FUSE, CARTRIDGE: 80 amps, 250v; MIL-F-15160 type F19A250V80AS	Transmitter Filament Figure 5-48
1A53A3F14 thru 1A53A3F18	Not Used	
1A53A3F19 thru 1A53A3F21	FUSE, CARTRIDGE: 8 amps, 250v; MIL-F-15160 type F09B250V8AS	Bias Power Figure 5-48

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3F22 thru 1A53A3F34	Not Used	
1A53A3F35 thru 1A53A3F37	FUSE, CARTRIDGE: 20 amps, 250v; MIL-F-15160 type F15A250V20AS	Bias Power Figure 5-48
1A53A3F38	FUSE, CARTRIDGE: 2 amps, 250v; MIL-F-15160 type F09B250V2AS	460v Regulator Protection Figure 5-48
1A53A3F39	Same as 1A53A3F38	460v Regulator Protection Figure 5-48
1A53A3F40	Same as 1A53A3F19	1A53A3CB2 Trip Power Figure 5-48
1A53A3F41	FUSE CARTRIDGE: 1 amp, 600v; 71400 part no. KLM1A; 28527 part no. 2138351G1	1A53A3CB1 Trip Power Figure 5-50
1A53A3F42	Same as 1A53A3F41	1A53A3CB1 Trip Power Figure 5-50
1A53A3K1 thru 1A53A3K2	Not Used	
1A53A3K3	RELAY ARMATURE: 3 pst; coil 120v; 45 to 66 Hz; contacts 100 amps; 24446 part no. CR2810E11AB1S2MFP; 28527 part no. 1088418G66	Transmitter Filaments Figure 5-47
1A53A3K3E1	COIL RELAY: 115v at 30 amps; 24446 part no. 22D153G2	1A53A3K3 Coil Figure 5-47
1A53A3K3E2	CONTACT SET, ELECTRICAL: 4 contacts; 115 vac; 100 amp current rating; 24446 part no. 6960045G77; 28527 part no. 1088418G79	1A53A3K3 Contacts Figure 5-47
1A53A3K4	RELAY, ARMATURE: 4 pst; coil 120v; 45 to 66 Hz; contacts 10 amps; 24446 part no. CR2810A11AD102MFP; 28527 part no. 1088418G68	Bias Power Figure 5-48
1A53A3K4E1	COIL, RELAY: 120v; 45 to 66 Hz; 24446 part no. 22D135G102; 28527 part no. 1088418G83	1A53A3K4 Coil Figure 5-48
1A53A3K4E2	CONTACT SET, ELECTRICAL: 5 contacts; 10 amp current rating; 24446 part no. 6960045G11; 28527 part no. 1088418G78	1A53A3K4 Contacts Figure 5-48

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3K5	RELAY, ARMATURE: dpdt; 110 to 120v, 50 to 60 Hz; 1 to 10 minute delayed drop-out; 89020 part no. 7022AF; 28527 part no. 2138314G1	Shut-down Cooling Figure 5-47
1A53A3K6	Not Used	
1A53A3K7	RELAY ARMATURE: dpdt; 110 to 120v, 50 to 60 Hz; 20 to 200 seconds delayed pick-up; 89020 part no. 7012AE; 28527 part no. 2138314G2	Filament Warm-Up Figure 5-47
1A53A3K8	RELAY, ARMATURE: dpst; 115v, 60 Hz; contacts 10 amps; 24446 part no. CR120A02002AAMFP; 28527 part no. 1088418G27	IPA Overload Indicator Figure 5-47
1A53A3K8E1	COIL, RELAY: 120v, 45 to 66 Hz, 44 va; 24446 part no. 551G2; 28527 part no. 1088475G18	1A53A3K8 Coil Figure 5-47
1A53A3K8E2	CONTACT SET, ELECTRICAL: 10 amps; 24446 part no. 55-153944G3	1A53A3K8 Contacts Figure 5-47
1A53A3K9	Same as 1A53A3K8	PA Overload Indicator Figure 5-47
1A53A3K9E1	Same as 1A53A3K8E1	1A53A3K9 Coil Figure 5-47
1A53A3K9E2	Same as 1A53A3K8E2	1A53A3K9 Contacts Figure 5-47
1A53A3K10 thru 1A53A3K12	Not Used	
1A53A3K13	RELAY, ARMATURE: dpdt, contact 2 amps at 28 vdc, 115 vac; coil 26.5 vdc nominal, 852 ohms dc resistance; 24446 part no. 3SAE2018A2; 28527 part no. 1088782G6	Phase 1 Overcurrent Figure 5-51
1A53A3K14	Same as 1A53A3K13	Phase 2 Overcurrent Figure 5-51
1A53A3K15	Same as 1A53A3K13	Phase 3 Overcurrent Figure 5-51

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3K16	Same as 1A53A3K13	AC Overcurrent Indicator Figure 5-51
1A53A3K17	Same as 1A53A3K5	3 Strike Time Delay Figure 5-47
1A53A3K18	RELAY, ARMATURE: 4 pst; coil 120v, 45 to 66 Hz; contact 10 amps; 24446 part no. CR120A04002AAMFP	3 Strike Lockout Figure 5-47
1A53A3K18E1	Same as 1A53A3K8E1	1A53A3K18 Coil Figure 5-47
1A53A3K18E2	CONTACT SET, ELECTRICAL: 1 set; 10 amp; 24446 part no. 55-153944G3; 28527 part no. 1088475G19	1A53A3K18 Contacts Figure 5-47
1A53A3K19 thru 1A53A3K20	Not Used	
1A53A3K21	Same as 1A53A3K18	Transformer Overtemperature Figure 5-47
1A53A3K21E1	Same as 1A53A3K8E1	1A53A3K21 Coil Figure 5-47
1A53A3K21E2	Same as 1A53A3K18E2	1A53A3K21 Contact Figure 5-47
1A53A3K22 thru 1A53A3K27	Not Used	
1A53A3K28	RELAY, THERMAL: 26.5 vac operating voltage, 45 to 66 Hz; 2 second time delay at 34.5 vrms; 99928 part no. MTRH7414; 28527 part no. 2311948G2	1A53A3CB2 Trip Delay Figure 5-47
1A53A3K29 thru 1A53A3K30	Not Used	
1A53A3K31	RELAY, ARMATURE: 3 pdt, coil 115 vdc, 0.024 amps, 3550 ohms dc resistance; 78290 part no. A1XCX; 28527 part no. 1088782G53	Fault Trip Figure 5-47
1A53A3K32	Same as 1A53AK8	Bias Control Figure 5-47

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3K32E1	Same as 1A53A3K8E1	1A53A3K32 Coil Figure 5-47
1A53A3K32E2	Same as 1A53A3K8E2	1A53A3K32 Contacts Figure 5-47
1A53A3K33	RELAY, ARMATURE: 5 cams; coil 110 vdc; contacts 115 vac at 4 amps; 71482 part no. B325549; 28527 part no. 1088475G49	3 Strike Counting Figure 5-48
1A53A3K33E1	SWITCH: less cam and cam pileup assemblies for 200 cam switch no. 325549	1A53A3K33 only Switch Figure 5-48
1A53A3K33E2	CAM ASSEMBLY: cam assembly only for 200 cam switch no. B325549	1A53A3K33 cam Assembly Figure 5-48
1A53A3K33E3	INTERRUPTER ASSEMBLY: interrupter pileup assembly only for 200 cam switch no. B325549	1A53A3K33 Interrupter Assembly Figure 5-48
1A53A3K33E4	CAM PILEUP: this must be ordered by giving the specific cam number that pileup is for. If complete set of pileups are required order complete pileup assembly only for 200 cam switch B325549	1A53A3K33 Cam Pileup Figure 5-48
1A53A3K33E5	COIL, RELAY: coil only for 200 cam switch no. B-325549	1A53A3K33 Coil Figure 5-48
1A53A3K34	RELAY, ARMATURE: 4 pdt, 25-41 vdc operating voltage, contacts 2 amps at 28 vdc, 1 amp at 115 vac, coil; 24446 part no. 3S2791FB100F10; 28527 part no. 1088782G7	Overload Sensing Delay Figure 5-51
1A53A3K35	Not Used	
1A53A3K36 Supply	RELAY, ARMATURE: spst, 115 vac, 28 vdc, 500 ohms dc resistance; 83851 part no. 5D1C89A; 28527 part no. 1088782G92	Relay Power Overload Figure 5-49
1A53A3K37 Supply	RELAY, ARMATURE: spst, 115 vac, 28 vdc, 500 ohms dc resistance; 83851 part no. 5D1CA37D; 28527 part no. 1088782G93	Relay Power Undervoltage Figure 5-49
1A53AK38	Not Used	
1A53A3K39	Same as 1A53A3K28	1A53A3CB1 Trip Delay Figure 5-50

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3K40	Same as 1A53A3K28	208V Undervoltage Delay Figure 5-47
1A53A3K41 thru 1A53A3K42	Not Used	
1A53A3K43	Same as 1A53A3K8	Water Flow Figure 5-47
1A53A3K43E1	Same as 1A53A3K8E1	1A53A3K43E1 Coil Figure 5-47
1A53A3K43E2	Same as 1A53A3K8E2	1A53A3K43 Contact Figure 5-47
1A53A3K44	Same as 1A53A3K18	Remote Switch Control Figure 5-47
1A53A3K44E1	Same as 1A53A3K8E1	1A53A3K44 Coil Figure 5-47
1A53A3K44E2	Same as 1A53A3K8E2	1A53A3K44 Contact Figure 5-47
1A53A3K45	Same as 1A53A3K8	Plate Control Figure 5-47
1A53A3K45E1	Same as 1A53A3K8E1	1A53A3K45 Coil Figure 5-47
1A53A3K45E2	Same as 1A53A3K8E2	1A53A3K45 Contacts Figure 5-47

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3K46	RELAY, ARMATURE: dpdt; 110 to 120v, 50 to 60 Hz; 0.5 to 5 second drop-out; 89020, part no. 7022AB; 28527 part no. 2138314G3	Deionization Time Figure 5-47
1A53A3K47	Same as 1A53A3K8	High Voltage ON Figure 5-48
1A53A3K47 E1	Same as 1A53A3K8E1	1A53A3K47 Coil Figure 5-48
1A53A3K47 E2	Same as 1A53A3K8E2	1A53A3K47 Contacts Figure 5-48
1A53A3K48	Same as 1A53A3K8	Transformer Overtem-perature Reset Figure 5-48
1A53A3K48E1	Same as 1A53A3K8E1	1A53A3K48 Coil Figure 5-48
1A53A3K48E2	Same as 1A53A3K8E2	1A53A3K48 Contacts Figure 5-48
1A53A3K49	Same as 1A53A3K8	Remote Emergency Stop Figure 5-48
1A53A3K49E1	Same as 1A53A3K8E1	1A53A3K49 Coil Figure 5-48
1A53A3K49E2	Same as 1A53A3K8E2	1A53A3K49 Contacts Figure 5-48
1A53A3K50	Same as 1A53A3K8	460V Sensing Figure 5-48
1A53A3K50E1	Same as 1A53A3K8E1	1A53A3K50 Coil Figure 5-48

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3K50E2	Same as 1A53A3K8E2	1A53A3K50 Contacts Figure 5-48
1A53A3K51	Same as 1A53A3K8	Power Failure Control Figure 5-48
1A53A3K51E1	Same as 1A53A3K8E1	1A53A3K51 Coil Figure 5-48
1A53A3K51E2	Same as 1A53A3K8E2	1A53A3K51 Contacts Figure 5-48
1A53A3K52	RELAY ARMATURE: dpdt; 110 to 120v, 50 to 60 Hz; 20 to 200 seconds delayed dropout; 89020 part no. 7022AE; 28527 part no. 2138314G4	Warm-up Lock-out Figure 5-47
1A53A3M1	METER-RELAY: 80 to 160v, 40 scale divisions, 45 to 66 Hz; 80145 part no. 28527 part no. 2311961G1	Over/Under-Voltage 255C; Contacts Figure 5-47
1A53A3RV1	SURGE PROTECTOR; 150 vdc, 208 vac, 3 phase 60 Hz; 50157 part no. 9RV6A168; 28527 part no. 1088418G85	Voltage Surge Protection Figure 5-47
1A53A3R1 thru 1A53A3R3	Not Used	
1A53A3R4	RESISTOR, VARIABLE: 250 ohms ± 10%, 2 watts; MIL-R-94 type RV4LAYSA251A	Overcurrent Adjusting Resistor Figure 5-51
1A53A3R5	Same as 1A53A3R4	Overcurrent Adjusting Resistor Figure 5-51
1A53A3R6	Same as 1A53A3R4	Overcurrent Adjusting Resistor Figure 5-51
1A53A3R7	RESISTOR, FIXED WIREWOUND: 16 ohms ± 5%, 11 watts; MIL-R-26 type RW30V160	Relay Power Supply Limiter Figure 5-49

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3R8	Not Used	
1A53A3R9	RESISTOR, FIXED, WIREWOUND: 3.1K ohms ± 5%, 14 watts; MIL-R-26 type RW31V312	1A53A3K16 Current Limiting Figure 5-51
1A53A3R10 thru 1A53A3R48	Not Used	
1A53A3R49	RESISTOR, FIXED, WIREWOUND: 2.5K ohms ± 5%, 31 watts; MIL-R-26 type RW21V252	Voltage Divider Figure 5-49
1A53A3R50 thru 1A53A3R53	Not Used	
1A53A3R54 thru 1A53A3R57	RESISTOR, FIXED, COMPOSITION: 10K ohms ±5%, 2 watts; MIL-R-39008 type RCR42G103JS	Neon Lamp Current Limiter Figure 5-47
1A53A3R58 thru 1A53A3R59	Not Used	
1A53A3R60 thru 1A53A3R62	Same as 1A53A3R54	Neon Lamp Current Limiter Figure 5-47
1A53A3R63	Not Used	
1A53A3R64	RESISTOR, FIXED, COMPOSITION: 2.7K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G272JS	1A53A3K13 Desensitizing Figure 5-51
1A53A3R65	Same as 1A53A3R64	1A53A3K15 Desensitizing Figure 5-51
1A53A3R66	Same as 1A53A3R64	1A53A3K14 Desensitizing Figure 5-51
1A53A3R67	RESISTOR, FIXED, COMPOSITION: 3.3K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G332JS	1A53A3K34 Limiter Figure 5-51

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3R68	RESISTOR, FIXED, COMPOSITION: 1.8K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G182JS	1A53A3K34 Timing Figure 5-51
1A53A3R69 thru 1A53A3R71	RESISTOR, FIXED, WIREWOUND: 56 ohms ± 5%, 26 watts; MIL-R-26 type RW33V560	1A53A3K36 Shunt Figure 5-49
1A53A3R72	RESISTOR, FIXED, COMPOSITION: 510 ohms ±5%, 2 watts; MIL-R-39008 type RCR42G511JS	1A53A3K37 Shunt Figure 5-49
1A53A3R73	Not Used	
1A53A3R74	RESISTOR, VARIABLE: 5000 ohms ± 10%, 2 watts; MIL-R-94 type RV4LAYSA502A	1A53A3K36 Adjusting Resistor Figure 5-49
1A53A3R75	RESISTOR, FIXED, COMPOSITION: 330 ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G331JS	1A53A3K13 Shunt Figure 5-51
1A53A3R76	Same as 1A53A3R75	1A53A3K14 Shunt Figure 5-51
1A53A3R77	Same as 1A53A3R75	1A53A3K15 Shunt Figure 5-51
1A53A3R78	RESISTOR, FIXED, WIREWOUND: 5.6K ohms ± 5%, 11 watts; MIL-R-26 type RW29V562	Wire Protection Blown Fuse Phase 1 Figure 5-48
1A53A3R79	Same as 1A53A3R78	Wire Protection Blown Fuse Phase 2 Figure 5-48
1A53A3R80	Same as 1A53A3R78	Wire Protection Blown Fuse Phase 3 Figure 5-48
1A53A3R81 thru 1A53A3R88	Same as 1A53A3R54	Current Limiter Figure 5-47

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3R89 thru 1A53A3R91	RESISTOR, FIXED, FILM: 220K ohms ± 5%, 2 watts; MIL-R-22684 type RL42S224J	Current Limiter Figure 5-50
1A53A3R92 thru 1A53A3R94	RESISTOR, FIXED, WIREWOUND: 2.7 ohms ± 5%, 113 watts; MIL-R-26 type RW37V2R7	Current Transformer Load Figure 5-50
1A53A3S1A	SWITCH, KNIFE: 3 pdt, 500v, 400 amp; 58308 part no. DA8035 MOD REVISION 1	High Voltage Rectifier, Power Figure 5-52
1A53A3S1B	SWITCH, KNIFE: 3 pdt, 500 vac, 60 amp; 58308 part no. DA8032 MOD REVISION 1	208v 3 Phase Bias Supply Figure 5-52
1A53A3S2	SWITCH, KEY INTERLOCK: 77662 type FS Key interlock	Locked ON Switch Figure 5-43
1A53A3TB1	TERMINAL BOARD: 600v, 225 amp; 73631 part no. S4; 28527 part no. 2138384G20	Intercon-nection Figure 5-48
1A53A3TB2	TERMINAL BOARD: 600v, 100 amp; 73631 part no. L3; 28527 part no. 2138384G3	Intercon-nection Figure 5-48
1A53A3TB3	Not Used	
1A53A3TB4	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Intercon-nection Figure 5-48
1A53A3TB5	Not Used	
1A53A3TB6	Same as 1A53A3TB4	Intercon-nection Figure 5-49
1A53A3TB7	Not Used	
1A53A3TB8	Same as 1A53A3TB4	Intercon-nection Figure 5-51
1A53A3TB9	Same as 1A53A3TB4	Intercon-nection Figure 5-51

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3TB10	Same as 1A53A3TB4	Intercon-nection Figure 5-49
1A53A2TB11	Not Used	
1A53A3TB12	Same as 1A53A2TB4	Intercon-nection Figure 5-48
1A53A3TB13 thru 1A53A3TB18	Not Used	
1A53A3TB19 thru 1A53A3TB25	Same as 1A53A3TB4	Intercon nection Figure 5-48
1A53A3TB26 thru 1A53A3TB30	Not Used	
1A53A3TB31	Same as 1A53A3TB4	Intercon-nection Figure 5-48
1A53A3TB32	Not Used	
1A53A3TB33 thru 1A53A3TB35	Same as 1A53A3TB4	Intercon-nection Figure 5-48
1A53A3TB36	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 17TB10	Intercon nection Figure 5-50
1A53A3TB37 thru 1A53A3TB59	Not Used	
1A53A3TB60 thru 1A53A3TB61	Same as 1A53A3TB4	Intercon-nectio Figure 5-48
1A53A3TB62	Not Used	
1A53A3TB63	Same as 1A53A3TB4	Intercon-nection Figure 5-52
1A53A3TB64	TERMINAL BOARD: 2 terminals, barrier type; MIL-T-55164 type 8TB2	Intercon-nection Figure 5-48

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3TB65	Same as 1A53A3TB36	Interconnection Figure 5-48
1A53A3TB66 thru 1A53A3TB72	Same as 1A53A3TB4	Interconnection Figure 5-48
1A53A3TB73	TERMINAL BOARD: 4 terminals, barrier type; MIL-T-55164 type 17TB4	Interconnection Figure 5-48
1A53A3TB74	TERMINAL BOARD: 600v, 225 amp; 73631 part no. S3; 28527 part no. 2138384G19	Interconnection Figure 5-48
1A53A3TB75	Same as 1A53A3TB4	Interconnection Figure 5-50
1A53A3TB76	Same as 1A53A3TB64	Interconnection Figure 5-50
1A53A3TB77	Same as 1A53A3TB74	Interconnection Figure 5-52
1A53A3TB78 thru 1A53A3TB79	Same as 1A53A3TB4	Interconnection Figure 5-50
1A53A3TB80	Same as 1A53A3TB4	Interconnection Figure 5-48
1A53A3TB81 thru 1A53A3TB100	Not Used	
1A53A3TB101	TERMINAL BOARD: 52 terminals, plastic; 28527 part no. 1096325G1	Component Mounting Figure 5-51
1A53A3TB102	TERMINAL BOARD: 20 terminals, plastic; 28527 part no. 1096363G1	Component Mounting Figure 5-48
1A53A3TB103	TERMINAL BOARD: 20 terminals, plastic; 28527 part no. 1096364G1	Component Mounting Figure 5-48

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3T1	Not Used	
1A53A3T2	TRANSFORMER, POWER, STEP DOWN: 120v primary, 45 to 55 Hz, 26.5v secondary, 0.5 amp current rating; 28527 part no. 2311970G1	Relay Power Figure 5-47
1A53A3T3	TRANSFORMER, POWER, STEPDOWN: 460v, 506v, 414v primary, 45 to 66 Hz, 120v secondary 2.5 amp current rating; 28527 part no. 1096296G1	1A53A3CB2 Trip Power Figure 5-50
1A53A3T4	Same as 1A53A3T2	Relay Power Figure 5-50
1A53A3T5 thru 1A53A3T7	TRANSFORMER, CURRENT: 250.5 amp current ratio, 600v, 25 to 400 Hz; 28527 part no. 1088418G88	Overcurrent Sensing Figure 5-53
1A53A3XC1 thru 1A53A3XC4	Not Used	
1A53A3XC5	SOCKET, CAPACITOR: octal; 72825 part no. 9751-10; 28527 part no. 1088475G3	1A53A3C5 Socket Figure 5-49
1A53A3XDS1 thru 1A53A2XDS3	Not Used	
1A53A3XDS4	LAMPHOLDER: clear lens; MIL-L-3661 type LH76/1LC14C03	1A53A3DS4 Lampholder Figure 5-50
1A53A3XDS4 MP1	LENS: clear; MIL-L-3661 type LC14C03	1A53A3XDS4 Lens Figure 5-50
1A53A3XDS5	Same as 1A53A3XDS4	1A53A3DS5 Lampholder Figure 5-50
1A53A3XDS5 MP1	Same as 1A53A3XDS4MP1	1A53A3XDS5 Lens Figure 5-50
1A53A3XDS6	Same as 1A53A3XDS4	1A53A3DS6 Lampholder Figure 5-50
1A53A3XDS6 MP1	Same as 1A53A3XDS4MP1	1A53A3XDS6 Lens Figure 5-50

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3XF1	FUSEHOLDER: 3 pole, 1-30 amp, 250v; 71400 part no. 2607; 28527 part no. 2138357G1	1A53A3F1 to 1A53A3F3 Fuseholder Figure 5-50
1A53A3XF2 thru 1A53A3XF3	Not Used	
1A53A3XF4	Same as 1A53A3XF1	1A53A3F4 to 1A53A3F6 Fuseholder Figure 5-48
1A53A3XF5 thru 1A53A3XF6	Not Used	
1A53A3XF7	Same as 1A53A3XF1	1A53A3F7 to 1A53A3F9 Fuseholder Figure 5-48
1A53A3XF8 thru 1A53A3XF9	Not Used	
1A53A3XF10	FUSEHOLDER: 1 pole, 30 amp, 600v; 71400 Part no. 2601; 28527 part no. 2138357G2	1A53A3F10 Fuseholder Figure 5-48
1A53A3XF11	FUSEHOLDER: 3 pole, 0.100 amp, 250v; 71400 part no. 3452; 28527 part no. 2138358G1	1A53A3F11 to 1A53A3F13 Fuseholder Figure 5-48
1A53A3XF12 thru 1A53A3XF18	Not Used	
1A53A3XF19	FUSEHOLDER: 3 pole, 2 amp, 250v; MIL-F-21346 type FH25CM	1A53A3F19 to 1A53A3F21 Fuseholder Figure 5-48
1A53A3XF20 thru 1A53A3XF34	Not Used	
1A53A3XF35	Same as 1A53A3XF1	1A53A3F35 to 1A53A3F37 Fuseholder Figure 5-48

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RELAY ASSEMBLY, RE-1113, AN/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3XF36 thru 1A53A3XF37	Not Used	
1A53A3XF38	FUSEHOLDER: 2 pole, 2 amp, 250v; MIL-F-21346 type FH25BM	1A53A3F38 to 1A53A3F39 Fuseholder Figure 5-48
1A53A3XF39	Not used	
1A53A3XF40	FUSEHOLDER: 1 pole, 2 amp, 250v; MIL-F-21346 type FH25AM	1A53A3F40 Fuseholder Figure 5-48
1A53A3XF41	FUSEHOLDER: 2 pole, 30 amp, 600v; 71400 part no. FH25AM	1A53A3F41 and 1A53A3F42 Fuseholder Figure 5-48
1A53A3XK1 thru 1A53A3XK27	Not used	
1A53A3XK28	SOCKET RELAY: 9 contacts; MIL-S-12883 type M12883-11-01	1A53A3K28 Socket Figure 5-47
1A53A3XK29 thru 1A53A3XK35	Not used	
1A53A3XK36	Same as 1A53A3XC5	1A53A3K36 Socket Figure 5-49
1A53A3XK37	Same as 1A53A3XC5	1A53A3K37 Socket Figure 5-49
1A53A3XK38	Not used	
1A53A3XK39	Same as 1A53A3XK28	1A53A3K28 Relay Socket Figure 5-50
1A53A3XK40	Same as 1A53A3XK28	1A53A3K40 Socket Figure 5-47

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1	REGULATOR, VOLTAGE CN-1473/FPN-44A; used to regulate 10,750 and 21,500 volt Power Supply Outputs 26862 part no. 418056; 28527 part no. 1096342G1.	Regulates Power Supply Outputs Figure 5-43
1A53A3A1B1 no. MDA952-6	SEMICONDUCTOR DEVICE: rectifier; 04713 Rectifier	Bridge part Figure 5-54
1A53A3A1CTA thru 1A53A3A1CTC	TRANSFORMER, CURRENT: 500-5 ratio; 25 to 400 Hz, 600v; 12670 part no. 64-501	Current Sensing Figure 5-54
1A53A3A1C1	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 2.2 uf ± 10%, 100 vdcw; 04222 part no. V146Z168	Regulator Bandwidth Figure 5-54
1A53A3A1D1	SEMICONDUCTOR DEVICE, DIODE: rectifier; 13327 part no. 1N5054	Coil Protection Figure 5-54
1A53A3A1D2	Same as 1A53A3A1D1	Gating Diode Figure 5-54
1A53A3A1D3	Same as 1A53A3A1D1	Coil Protection Figure 5-54
1A53A3A1 Fan 1	FAN, TUBEAXIAL: 115v, 50 to 60Hz, 1 phase, 52 watts, 0.76 amps, 575 cfm; 82877 part no. CL2T	Cooling FAN 1 Figure 5-54
1A53A3A1 Fan 2	Same as 1A53A3A1 FAN 1	Cooling FAN 2 Figure 5-54
1A53A3A1 RY1	RELAY, ARMATURE: dpdt, 120v coil, 50 to 60 Hz, 2250 ohms dc resistance, continuous; 77342 part no. KUP14D11-120 vac	Fault Latching Figure 5-54
1A53A3A1 RY2	Same as 1A53A3A1RY1	Control Reset Figure 5-54
1A53A3A1R1	RESISTOR, FIXED, COMPOSITION: 3 megohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G305JS	Soft-Start Timing Figure 5-54
1A53A3A1SCR 1A thru 1A53A3A1SCR 2C	SEMICONDUCTOR DEVICE, DIODE: silicon controlled rectifier; 89481 part no. T720145504DN	Line Voltage Control Figure 5-54

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1 SCR1AE1 thru 1A53A3A1 SCR2CE1	CLAMP GAUGE: stainless steel, 800 to 2000 pounds clamping force; 05820 part no. 130D-1	1A53A3A1SCR1A thru 1A53A3A1SCR2C Holder Figure 5-54
1A53A3A1TB1 thru 1A53A3A1TB4	TERMINAL BOARD: 4 terminal, barrier type; 75382 part no. 671-4	Intercon-nection Figure 5-54
1A53A3A1TB5 thru 1A53A3A1TB7	TERMINAL BOARD: 10 terminals, barrier type; 75382 part no. 671-10	Intercon-nection Figure 5-54
1A53A3A1TS1 thru 1A53A3A1TS2	SWITCH, THERMOSTATIC: opens at 75 deg C, closes at 65 deg C; 26882 part no. 161025-2	SCR Protect. Figure 5-54
1A53A3A1VS1 thru 1A53A3A1VS3	RECTIFIER, METALLIC: selenium; 89481 part no. S01AA48AC	Transient Suppressor Figure 5-54
1A53A3A1RY1	SOCKET, RELAY: screw terminals; 77342 part no. 9KU6	1A53A3A1RY1 Socket Figure 5-54
1A53A3A1RY2	Same as 1A53A3A1XRY1	
1A53A3A1A1	GATE TRIGGER UNIT: Regulate 3 phase input to the primary of the High Voltage Transformer; 26862 part no. 304108 (NOTE: Gate Trigger Units 1A53A3A1A1, 1A53A3A1A2 and 1A53A3A1A3 must be used as a matched set.)	Controls Line Voltage Input Figure 5-54
1A53A3A1A1C1 thru 1A53A3A1A1C2	CAPACITOR, FIXED ELECTROLYTIC: 50 uf +75% -10%, 50 vdcw; 56289 part no. TE1307	Filter Figure 5-59
1A53A3A1A1C3	CAPACITOR, FIXED ELECTROLYTIC: 5 uf +150% -10%, 25vdcw; 14655 part no. NLW5-25	Filter Figure 5-58
1A53A3A1A1C4	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.001 uf +100% -0% vdcw; 71590 part no. DD102	Transistor Protection Figure 5-48
1A53A3A1A1C5	Not used	
1A53A3A1A1C6	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.01 uf ± 10%, 200 vdcw; 90201 part no. PVC211	Decoupling Figure 5-58

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1C7	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.22 uf ± 10%, 100 vdcw; 90201 part no. PVC1022	Filter Figure 5-59
1A53A3A1A1C8	Same as 1A53A3A1A1C4	Filter Figure 5-58
1A53A3A1A1C9	CAPACITOR, FIXED, ELECTROLYTIC: 3 uf +150% -10%, 25 vdcw; 14655 part no. NLW3-25	Filter Figure 5-58
1A53A3A1A1C10	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.1 uf ± 10%, 100 vdcw; 90201 part no. PVC101	Coupling Figure 5-58
1A53A3A1A1C11	CAPACITOR, FIXED, ELECTROLYTIC: 20 uf +150% -10%, 50 vdcw; 14655 part no. NLW20-50	Filter Figure 5-57
1A53A3A1A1C12	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.47 uf ± 10%, 100 vdcw; 90201 part no. PVC1047	Filter Figure 5-57
1A53A3A1A1C13	CAPACITOR, FIXED, ELECTROLYTIC: 3 uf +50% -10%, 100 vdcw; 56289 part no. TE1402	Filter Figure 5-57
1A53A3A1A1C14	CAPACITOR, FIXED, ELECTROLYTIC: 1 uf +150% -10%, 50vdcw; 14655 part no. NLW1-50	Filter Figure 5-58
1A53A3A1A1C15	Same as 1A53A3A1A1C10	Filter Figure 5-57
1A53A3A1A1C16 thru 1A53A3A1A1C20	Not used	
1A53A3A1A1C21	Same as 1A53A3A1A1C11	Filter Figure 5-57
1A53A3A1A1C22	Same as 1A53A3A1A1C12	Filter Figure 5-57
1A53A3A1A1C23	Same as 1A53A3A1A1C13	Filter Figure 5-57
1A53A3A1A1C24	Same as 1A53A3A1A1C14	Filter Figure 5-58
1A53A3A1A1C25	Same as 1A53A3A1A1C10	Filter Figure 5-57
1A53A3A1A1C26 thru 1A53A3A1A1C79	Not used	
1A53A3A1A1C80	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.02 uf ± 10%, 200 vdcw; 90201 part no. PVC212	Filter Figure 5-59

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1C81	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.01 uf ± 10% 400 vdcw; 90201 part no. PVC411	Filter Figure 5-59
1A53A3A1A1C82	Same as 1A53A3A1A1C10	Filter Figure 5-55
1A53A3A1A1C83 thru 1A53A3A1A1C99	Not used	
1A53A3A1A1C100 thru 1A53A3A1A1C101	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 1 uf ± 10%, 100 vdcw; 90201 part no. PVC11	Filter Figure 5-57
1A53A3A1A1D1 thru 1A53A3A1A1D2	SEMICONDUCTOR DEVICE, DIODE: silicon reference diode; 04713 part no. 1N4739	Voltage Regulator Figure 5-58
1A53A3A1A1D3	SEMICONDUCTOR DEVICE, DIODE: silicon reference diode; 04713 part no. 1N4735	Voltage Regulator Figure 5-58
1A53A3A1A1D4	Same as 1A53A3A1A1D1	Voltage Regulator Figure 5-58
1A53A3A1A1D5 thru 1A53A3A1A1D6	Not used	
1A53A3A1A1D7 thru 1A53A3A1A1D10	SEMICONDUCTOR DEVICE, DIODE: rectifier; 04713 part no. 1N4003	Rectifier Figure 5-58
1A53A3A1A1D11 thru 1A53A3A1A1D12	Same as 1A53A3A1A1D7	Rectifier Figure 5-59
1A53A3A1A1D13 thru 1A53A3A1A1D14	Same as 1A53A3A1A1D7	Pulse Shaper Figure 5-59
1A53A3A1A1D15 thru 1A53A3A1A1D20	Not used	
1A53A3A1A1D21 thru 1A53A3A1A1D22	Same as 1A53A3A1A1D7	Rectifier Figure 5-59

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1D23 thru 1A53A3A1A1D24	Same as 1A53A3A1A1D7	Pulse Shaper Figure 5-59
1A53A3A1A1D25 thru 1A53A3A1A1D59	Not used	
1A53A3A1A1D60 thru 1A53A3A1A1D61	Same as 1A53A3A1A1D7	Regulator Figure 5-58
1A53A3A1A1D62	Same as 1A53A3A1A1D7	Clamping Figure 5-58
1A53A3A1A1D63 thru 1A53A3A1A1D64	Same as 1A53A3A1A1D7	Rectifier Figure 5-58
1A53A3A1A1D65	Not used	
1A53A3A1A1D66	Same as 1A53A3A1A1D7	Clamping Figure 5-58
1A53A3A1A1D67 thru 1A53A3A1A1D79	Not used	
1A53A3A1A1D80	Same as 1A53A3A1A1D7	Rectifier Figure 5-59
1A53A3A1A1D81	SEMICONDUCTOR DEVICE, DIODE: silicon; MIL-S-19500 type 1N4148	Limiter Figure 5-57
1A53A3A1A1D82	Same as 1A53A3A1A1D81	Limiter Figure 5-59
1A53A3A1A1D83	Same as 1A53A3A1A1D81	Limiter Figure 5-59
1A53A3A1A1D84	Same as 1A53A3A1A1D81	Limiter Figure 5-57
1A53A3A1A1D85 thru 1A53A3A1A1D89	Not used	
1A53A3A1A1D90	Same as 1A53A3A1A1D7	Relay Protection Figure 5-58

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1P1	RESISTOR, VARIABLE: 100K ohms ± 10%, 2 watts; 80294 part no. 3852B202-104A	Balance Control Figure 5-55
1A53A3A1A1P2	RESISTOR, VARIABLE: 10K ohms ± 10%, 2 watts; 71450 part no. WPRL10000	Bias Control Figure 5-55
1A53A3A1A1P3	RESISTOR, VARIABLE: 50K ohms ± 10%, 2 watts; 71450 part no. WPRL50000	Gain Control Figure 5-55
1A53A3A1A1Q1	TRANSISTOR: silicon NPN; 04713 part no. 2N4403	Square Wave Generator Figure 5-58
1A53A3A1A1Q2	TRANSISTOR: silicon NPN; 04713 part no. 2N4401	Relay Control Figure 5-58
1A53A3A1A1Q3	Same as 1A53A3A1A1Q2	Gate Control Figure 5-58
1A53A3A1A1Q4	Same as 1A53A3A1A1Q1	Gate Control Figure 5-58
1A53A3A1A1Q5	Same as 1A53A3A1A1Q1	Amplifier Figure 5-58
1A53A3A1A1Q6	Same as 1A53A3A1A1Q2	Amplifier Figure 5-58
1A53A3A1A1Q7 thru 1A53A3A1A1Q10	Not used	
1A53A3A1A1Q11	Same as 1A53A3A1A1Q2	Emitter Follower Figure 5-58
1A53A3A1A1Q12 thru 1A53A3A1A1Q20	Not used	
1A53A3A1A1Q21	Same as 1A53A3A1A1Q2	Emitter Follower Figure 5-58
1A53A3A1A1RY	RELAY, ARMATURE: spdt, coil 12vdc at 1640 ohms dc resistance, 90 mw; 78277 part no. 65F1A12DC	Undervoltage Control Figure 5-55
1A53A3A1A1R1 thru 1A53A3A1A1R2	RESISTOR, FIXED, COMPOSITION: 270 ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G271JS	Current Limiter Figure 5-58

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1R3	RESISTOR, FIXED, FILM: selected at test; 91637 type MFF 1/2; 4 to 18K ohms range	Bias Control Figure 5-58
1A53A3A1A1R4	RESISTOR, FIXED, COMPOSITION: 3.9K ohms ± 5% ± 5%, 1/2 watt; MIL-R-39008 type RCR20G392JS	Bias Control Figure 5-58
1A53A3A1A1R5 thru 1A53A3A1A1R9	Not used	
1A53A3A1A1R10	RESISTOR, FIXED, COMPOSITION: 10 ohms ± 5%, 2 watts; MIL-R-34008 type RCR42G100JS	Current Limiter Figure 5-57
1A53A3A1A1R11	RESISTOR, FIXED, WIREWOUND: 75 ohms ± 5%, 10 watts; 63743 part no. 10XM75OHMS10 Watt	Current Limiter Figure 5-57
1A53A3A1A1R12	RESISTOR, FIXED, COMPOSITION: 47 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G470JS	Gate Control Figure 5-57
1A53A3A1A1R13	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5%, 1 watt; MIL-R-39008 type RCR32G101JS	Bleeder Figure 5-57
1A53A3A1A1R14	RESISTOR, FIXED, FILM: 80.6K ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-80600OHMSPORM1	Pulse Shaper Figure 5-58
1A53A3A1A1R14A	Not used	
1A53A3A1A1R14B	RESISTOR, FIXED, FILM: selected at test; 91637 type MFF 1/2; 100K to open range	Pulse Shaper Figure 5-59
1A53A3A1A1R15	RESISTOR, FIXED, COMPOSITION: 4.7K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G472JS	Pulse Shaper Figure 5-58
1A53A3A1A1R16	Same as 1A53A3A1A1R15	Pulse Shaper Figure 5-58
1A53A3A1A1R17	RESISTOR, FIXED, COMPOSITION: 3.3K ohms ± ± 5%, 1/2 watt; MIL-R-39008 type RCR20G332JS	Collector Figure 5-58
1A53A3A1A1R18	RESISTOR, FIXED, COMPOSITION: 4.7K ohms ± 5%, 1 watt; MIL-R-39008 type RCR32G472JS	Current Control Figure 5-58
1A53A3A1A1R19	RESISTOR, FIXED, FILM: selected at test; 91637 type MFF1/2; 1 to 15K ohms range	Current Control Figure 5-58
1A53A3A1A1R20	Same as 1A53A3A1A1R10	Current Limiter Figure 5-57

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1R21	Same as 1A53A3A1A1R11	Current Limiter Figure 5-57
1A53A3A1A1R22	Same as 1A53A3A1A1R12	Gate Control Figure 5-57
1A53A3A1A1R23	Same as 1A53A3A1A1R13	Bleeder Figure 5-57
1A53A3A1A1R24	Same as 1A53A3A1A1R14	Pulse Shaper Figure 5-58
1A53A3A1A1R24A	Not used	
1A53A3A1A1R24B	RESISTOR, FIXED, FILM: selected at test; 91637 type MFF1/2; 100K to open range	Pulse Shaper Figure 5-59
1A53A3A1A1R25	Same as 1A53A3A1A1R15	Pulse Shaper Figure 5-58
1A53A3A1A1R26	Same as 1A53A3A1A1R15	Pulse Shaper Figure 5-58
1A53A3A1A1R27	Same as 1A53A3A1A1R17	Collector Figure 5-58
1A53A3A1A1R28	Same as 1A53A3A1AR18	Current Control Figure 5-58
1A53A3A1A1R29	RESISTOR, FIXED, FILM: selected at test; 91637 type MFF1/2; 1 to 15K ohms range	Current Control Figure 5-58
1A53A3A1A1R30 thru 1A53A3A1A1R50	Not used	
1A53A3A1A1R51	RESISTOR, FIXED, FILM: 3010 ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-3010OHMSPORM1	Bias Figure 5-55
1A53A3A1A1R52 thru 1A53A3A1A1R59	Not used	
1A53A3A1A1R60	RESISTOR, FIXED, COMPOSITION: 240K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G244JS	Bias Figure 5-58
1A53A3A1A1R61 thru 1A53A3A1A1R62	Not used	

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1R63	RESISTOR, FIXED, COMPOSITION: 10K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G103JS	Bias Figure 5-58
1A53A3A1A1R64	RESISTOR, FIXED, COMPOSITION: 51K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G513JS	Bias Figure 5-58
1A53A3A1A1R65	Not used	
1A53A3A1A1R66	RESISTOR, FIXED, COMPOSITION: 24K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G243JS	Voltage Divider Figure 5-58
1A53A3A1A1R67	RESISTOR, FIXED, COMPOSITION: selected at test; MIL-R-39008 type RCR20G: 10 to 60K ohms range	Voltage Divider Figure 5-58
1A53A3A1A1R68	RESISTOR, FIXED, COMPOSITION: 1.5K ohms ± 5%; 2 watts; MIL-R-39008 type RCR42G152JS	Voltage Divider Figure 5-58
1A53A3A1A1R69	RESISTOR, FIXED, COMPOSITION: 100K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G104JS	Voltage Divider Figure 5-58
1A53A3A1A1R70	Same as 1A53A3A1A1R63	Collector Figure 5-58
1A53A3A1A1R71	RESISTOR, FIXED, FILM: 2000 ohms ± 1%; 1/2 watt; 91637 type MFF1-2-2000OHMSPORM1	Collector Figure 5-58
1A53A3A1A1R72	RESISTOR, FIXED, FILM: selected at test; 91637 type MFF1/2; 1.5 to 4K ohms range	Voltage Divider Figure 5-58
1A53A3A1A1R73	RESISTOR, FIXED, FILM: 64.9K ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-64900OHMSPORM1	Voltage Divider Figure 5-58
1A53A3A1A1R74	RESISTOR, FIXED, FILM: 1910 ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-1910OHMSPORM1	Emitter Figure 5-58
1A53A3A1A1R75	RESISTOR, FIXED, FILM: 22.1K ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-22100OHMSPORM1	Bias Control Figure 5-58
1A53A3A1A1R76 thru 1A53A3A1A1R79	Not used	
1A53A3A1A1R80	RESISTOR, FIXED, COMPOSITION: 15K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G153JS	Coupling Figure 5-59

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1R81	RESISTOR, FIXED, COMPOSITION: 332 ohms ± 1%, watt; 91637 part no MFF1-2-332OHMSPORM1	Current 1/2 Control Figure 5-59
1A53A3A1A1R82	Same as 1A53A3A1A1R69	Isolation Figure 5-55
1A53A3A1A1R83 thru 1A53A3A1AR99	Not used	
1A53A3A1A1R100	RESISTOR, FIXED, FILM: to be selected; 91637 type MFF1/2; 20 to 60K ohms range	Bias Control Figure 5-55
1A53A3A1A1R101	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G101JS	Voltage Divider Figure 5-57
1A53A3A1A1R102	RESISTOR, FIXED, COMPOSITION: 1K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G102JS	Voltage Divider Figure 5-57
1A53A3A1A1R103	Same as 1A53A3A1A1R101	Voltage Divider Figure 5-57
1A53A3A1A1R104	Same as 1A53A3A1A1R102	Voltage Divider Figure 5-57
1A53A3A1A1 R105A	RESISTOR, FIXED, FILM: 4.49K ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-4490OHMSPORM1	Gain Control Figure 5-59
1A53A3A1A1 R105B	RESISTOR, FIXED, FILM: 1K ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-1KOHMSPORM1	Current Limiter Figure 5-59
1A53A3A1A1 R106	Same as 1A53A3A1A1R105B	Current Limiter Figure 5-59
1A53A3A1A1 R107 thru 1A53A3A1A1R199	Not used	
1A53A3A1A1 R200	RESISTOR, FIXED, COMPOSITION: 330 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G331JS	Collector Figure 5-55

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A1 SCR1 thru 1A53A3A1A1SCR10	Not used	
1A53A3A1A1 SCR11	SEMICONDUCTOR DEVICE, DIODE: silicon controlled rectifier; 03508 part no. C6A	Gate Trigger Figure 5-57
1A53A3A1A1 SCR12 thru 1A53A3A1A1SCR20	Not used	
1A53A3A1A1 SCR21	Same as 1A53A3A1A1SCR11	Gate Trigger Figure 5-57
1A53A3A1A1 SL1	AMPLIFIER, MAGNETIC: 26862 part no. 190140	Gate Control Figure 5-56
1A53A3A1A1	TERMINAL BOARD: 8 terminals, barrier type; 75382 part no 670Y8	Intercon-nection Figure 5-54
1A53A3A1A1 TB2	TERMINAL BOARD: 9 terminals, barrier type; 75382 part no. 671Y9	Intercon-nection Figure 5-54
1A53A3A1A1T1	TRANSFORMER, POWER, STEPDOWN: primary 120v, 208v, 240v, 480v, secondary 20v, 20v, 60v, 50-60Hz; 26862 part no. 161004	Power Transformer Figure 5-56
1A53A3A1A1T2 thru 1A53A3A1A1T10	Not used	
1A53A3A1A1T11	TRANSFORMER, PULSE: 2 windings, 200 turns of no. 36 awg wire; 26862 part no. 190048	Gate Coupler Figure 5-56
1A53A3A1A1T12 thru 1A53A3A1A1T20	Not used	
1A53A3A1A1T21	Same as 1A53A3A1A1T11	Gate Coupler Figure 5-56
1A53A3A1A2	Same as 1A53A3A1A1	Controls Line Voltage Input Figure 5-54
1A53A3A1A3	Same as 1A53A3A1A1	Controls Line Voltage Input Figure 5-54

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A4	CHOP-OFF LIMITER: overcurrent and loss of voltage control for high voltage power supply; 26862 part no. 359118	SCR Cut-Off Control Figure 5-54
1A53A3A1A4C1	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.5 uf ± 10%, 100 vdcw; 90201 part no. PVC105	Filter Figure 5-60
1A53A3A1A4C2	CAPACITOR, FIXED, ELECTROLYTIC: 100 uf ± 150% -10%, 50vdcw; 14655 part no. NLW100-50	Filter Figure 5-60
1A53A3A1A4C3	CAPACITOR, FIXED, ELECTROLYTIC: 125 uf ± 150% -10%, 50 vdcw; 14655 part no. NLW125-50	Filter Figure 5-60
1A53A3A1A4C4 thru 1A53A3A1A4C5	Same as 1A53A3A1A4C1	Timing Network Figure 5-60
1A53A3A1A4C6 thru 1A53A3A1A4C7	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.1 uf +80% -30%, 75 vdcw; 71590 part no. DDA104	Filter Figure 5-60
1A53A3A1A4C8	Not used	
1A53A3A1A4C9	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.01 uf +100% -0%, 1000 vdcw; 71590 part no. DD103	Filter Figure 5-60
1A53A3A1A4C10	Same as 1A53A3A1A4C9	Arc Suppressor Figure 5-60
1A53A3A1A4C11	Same as 1A53A3A1A4C6	Filter Figure 5-60
1A53A3A1A4C12	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.47 uf ± 10%, 100 vdcw; 90201 part no. PVC1047	Coupling Figure 5-60
1A53A3A1A4D1 thru 1A53A3A1A4D13	SEMICONDUCTOR DEVICE, DIODE: rectifier; 04713 part no 1N4003	Rectifier Figure 5-60
1A53A3A1A4D14	Not used	
1A53A3A1A4D15 thru 1A53A3A1A4D18	Same as 1A53A3A1A4D1	Rectifier Figure 5-60
1A53A3A1A4D19	Same as 1A53A3A1A4D1	Coupling Figure 5-60
1A53A3A1A4D20	Same as 1A53A3A1A4D1	Clamping Figure 5-60

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A4D21	Same as 1A53A3A1A4D1	Coupling Figure 5-60
1A53A3A1A4D22	Same as 1A53A3A1A4D1	Clamping Figure 5-60
1A53A3A1A4D23	Not used	
1A53A3A1A4D24	Same as 1A53A3A1A4D1	Coupling Figure 5-60
1A53A3A1A4P1	RESISTOR, VARIABLE: 10K ohms ± 5%, 2 watts; 12697 part no. 43C2-10K	Limit Adjust Figure 5-54
1A53A3A1A4Q1	TRANSISTOR: silicon NPN; 04713 part no. 2N4401	Fault Amplifier Control Figure 5-60
1A53A3A1A4Q2	Same as 1A53A3A1A4Q1	Gate Trigger Unit Control Figure 5-60
1A53A3A1A4Q3	TRANSISTOR: unijunction; 04713 part no. 2N2646	Fault Amplifier Control Figure 5-60
1A53A3A1A4Q4	Same as 1A53A3A1A4Q3	Fault Control Figure 5-60
1A53A3A1A4Q5	TRANSISTOR: silicon NPN; 04713 part no. 2N4403	Fault Control Figure 5-60
1A53A3A1A4RYA	RELAY, ARMATURE: spdt, coil 12 vdc, 1640 ohms dc resistance, 90 mw; 78277 part no. 65 FP1A12DC	Fault Control Figure 5-60
1A53A3A1A4RYB	RELAY, ARMATURE: spdt, coil, 12 vdc, 164 ohms dc resistance, 90 mw; 78277 part no. 65F1A12DC	Loss of Voltage Control Figure 5-60
1A53A3A1A4R1	RESISTOR, FIXED, COMPOSITION: 75 ohms ± 5%, 1/2 watt; MIL-R-39008 type RC20G750JS	Overcurrent Load Figure 5-60
1A53A3A1A4R2	RESISTOR, FIXED, COMPOSITION: 15K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G153JS	Current Limiter Figure 5-60

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A4R3	RESISTOR, FIXED, COMPOSITION: 12K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G123JS	Reference Voltage Divider Figure 5-60
1A53A3A1A4R4	RESISTOR, FIXED, COMPOSITION: 1K ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G102JS	Current Limiting Figure 5-60
1A53A3A1A4R5	RESISTOR, FIXED, COMPOSITION: 330 ohms ± 5%, 2 watts; MIL-R-39008 type RCR42G331JS	Current Limiting Figure 5-60
1A53A3A1A4R6	RESISTOR, FIXED, COMPOSITION: 2.2 meg ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G225JS	Bias Figure 5-60
1A53A3A1A4R7	RESISTOR, FIXED, COMPOSITION: 10K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G103JS	Collector Figure 5-60
1A53A3A1A4R8	RESISTOR, FIXED, COMPOSITION: 5.1K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G512JS	Collector Figure 5-60
1A53A3A1A4R9	RESISTOR, FIXED, COMPOSITION: 1K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G102JS	Q3 Base Resistor Figure 5-60
1A53A3A1A4R10	RESISTOR, FIXED, COMPOSITION: 10 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G100JS	Q3 Bases Resistor Figure 5-60
1A53A3A1A4R11	RESISTOR, FIXED, COMPOSITION: 48K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G483JS	Timing Network Figure 5-60
1A53A3A1A4R12	Same as 1A53A3A1A4R8	Collector Figure 5-60
1A53A3A1A4R13	Same as 1A53A3A1A4R7	Bias Figure 5-60
1A53A3A1A4R14	RESISTOR, FIXED, COMPOSITION: 47K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G473JS	Collector Figure 5-60
1A53A3A1A4R15	Same as 1A53A3A1A4R7	Coupling Figure 5-60
1A53A3A1A4R16	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G101JS	Collector Figure 5-60
1A53A3A1A4R17	Same as 1A53A3A1A4R7	Timing Network Figure 5-60

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A4R18	RESISTOR, FIXED, COMPOSITION: 2K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G202JS	Current Limiter Figure 5-60
1A53A3A1A4R19	Same as 1A53A3A1A4R9	Q4 Base Resistor Figure 5-60
1A53A3A1A4R20	RESISTOR, FIXED, COMPOSITION: 47 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G470JS	Q4 Base Resistor Figure 5-60
1A53A3A1A4R21	RESISTOR, FIXED, COMPOSITION: 220K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G224JS	Coupling Figure 5-60
1A53A3A1A4R22 thru 1A53A3A1A4R23	Same as 1A53A3A1A4R9	Current Limiter Figure 5-60
1A53A3A1A4R24	RESISTOR, FIXED, COMPOSITION: 30 ohms ± 5%, 1/2 watt; MIL-R039008 type RCR20G391JS	Current Limiter Figure 5-60
1A53A3A1A4SCR1	SEMICONDUCTOR DEVICE, DIODE: silicon controlled rectifier; 03508 part no. C6A	Relay Control Figure 5-60
1A53A3A1A4TB1	TERMINAL BOARD: 8 terminals, barrier type; 75382 part no. 670 Y8	Inter-Connection Figure 5-54
1A53A3A1A4TB2	TERMINAL BOARD: 6 terminals, barrier type; 75382 part no. 672Y6	Inter-Connection Figure 5-54
1A53A3A1A4T1 thru 1A53A3A1A4T3	TRANSFORMER, CURRENT: 2 windings, 1000 turns no. 30 awg, 10 turns no. 16 awg; 26862 part no. 190012	Current Sensing Figure 5-60
1A53A3A1A4T4 thru 1A53A3A1A4T10	Not used	
1A53A3A1A4T11	TRANSFORMER, POWER, STEPDOWN: primary 208v, 240v, 277v, secondary 60v CT at 4 va; 26862 part no. 161003-8	Power Transformer Figure 5-60
1A53A3A1A4Z1 thru 1A53A3A1A4Z2	SEMICONDUCTOR DEVICE, DIODE: silicon reference; 04713 part no. 1N4744	Voltage Regulator Figure 5-60

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A5	AMPLIFIER-VOLTAGE REGULATOR: provides control signal to the Gate Trigger Unit; 26862 part no. 300413	Provides Control Signal Figure 5-54
1A53A3A1A5C1 thru 1A53A3A1A5C2	CAPACITOR, FIXED, ELECTROLYTIC: 125 uf +150% -10%, 50vdcw; 14655 part no. NLW125-50	Filter Figure 5-61
1A53A3A1A5C3 thru 1A53A3A1A5C9	Not used	
1A53A3A1A5C10	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 6.8 uf ± 10%, 100 vdcw; 80031 part no. C280MCHA6M8	Soft Start Timing Figure 5-61
1A53A3A1A5C11 thru 1A53A3A1A5C12	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.1 uf ± 10%, 100 vdcw; 90201 part no. PVC101	Filter Figure 5-61
1A53A3A1A5C13	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.1 uf +80% -30%, 75 vdcw; 71590 part no. DDA104	Filter Figure 5-61
1A53A3A1A5C14	Not used	
1A53A3A1A5C15	Same as 1A53A3A1A5C11	Coupling Figure 5-61
1A53A3A1A5C16	Not used	
1A53A3A1A5C17	Same as 1A53A3A1A5C13	Filter Figure 5-61
1A53A3A1A5C18	Not used	
1A53A3A1A5C19	Same as 1A53A3A1A5C13	Filter Figure 5-61
1A53A3A1A5C20	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.022 uf ± 10%, 100 vdcw; 90201 part no. PVC1122	Feedback Figure 5-61
1A53A3A1A5C21 thru 1A53A3A1A5C30	Not used	
1A53A3A1A5C31	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 2 uf ± 20%, 200vdcw; 04222 part no. V146ZR127	Filter Figure 5-62
1A53A3A1A5C32 thru 1A53A3A1A5C34	Same as 1A53A3A1A5C13	Filter Figure 5-62

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A5C35 thru 1A53A3A1A5C36	Not used	
1A53A3A1A5C37	Same as 1A53A3A1A5C13	Filter Figure 5-62
1A53A3A1A5C38	Not used	
1A53A3A1A5C39 thru 1A53A3A1A5C40	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.005 uf +100% -0%, 3000 vdcw; 71590 part no. DD30-502	Filter Figure 5-62
1A53A3A1A5C41	Same as 1A53A3A1A5C13	Filter Figure 5-61
1A53A3A1A5C42 thru 1A53A3A1A5C43	Not used	
1A53A3A1A5C44	Same as 1A53A3A1A5C13	Filter Figure 5-61
1A53A3A1A5D1 thru 1A53A3A1A5D4	SEMICONDUCTOR DEVICE, DIODE: rectifier; 04713 part no. 1N4003	Rectifier Figure 5-61
1A53A3A1A5D5 thru 1A53A3A1A5D8	SEMICONDUCTOR DEVICE, DIODE: silicon reference; 04713 part no. 1N4737	Voltage Regulator Figure 5-61
1A53A3A1A5D9	SEMICONDUCTOR DEVICE, DIODE: silicon reference; 04713 part no. 1N4733A	Voltage Regulator Figure 5-61
1A53A3A1A5D10	Same as 1A53A3A1A5D9	Voltage Regulator Figure 5-61
1A53A3A1A5D11 thru 1A53A3A1A5D12	Same as 1A53A3A1A5D1	Clamping Figure 5-61
1A53A3A1A5D13 thru 1A53A3A1A5D14	Same as 1A53A3A1A5D1	Reference Level Figure 5-61
1A53A3A1A5OA1 thru 1A53A3A1A5OA3	AMPLIFIER, OPERATIONAL: linear; 33789 part no. UA741CH	Operational Amplifier Figure 5-61
1A53A3A1A5P1	Not used	

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A5P2	RESISTOR, VARIABLE: 3K ohms ± 1%, 2 watts; 12697 part no. CM36663	Calibrate Control Figure 5-54
1A53A3A1A5 RFC1 thru 1A53A3A1A5 RFC2	CHOKE, RADIO FREQUENCY: 2.5 mh, 41 ohms dc resistance, 125 ma current rating, 4 pies; 42498 part no. R50-2.5	Filter Figure 5-62
1A53A3A1A5R1 thru 1A53A3A1A5R2	RESISTOR, FIXED, WIREWOUND: 200 ohms ± 5%, 5 watts; MIL-R-26 type RW57G201	Current Limiter Figure 5-61
1A53A3A1A5R3	RESISTOR, FIXED, COMPOSITION: 200 ohms ± 5% 2 watts; MIL-R-39008 type RCR42G201JS	Current Limiter Figure 5-61
1A53A3A1A5R4	RESISTOR, FIXED, FILM: 1000 ohms ± 1%, 1/2 watt; part no. MFF1-2-1000OHMSPORM1	Voltage Divider Figure 5-61
1A53A3A1A5R5 thru 1A53A3A1A5R9	Not used	
1A53A3A1A5R10	RESISTOR, FIXED, FILM: 100 ohms ± 1%, 1/8 watt; 91637 part no. MFF1-8-100OHMSPORM1	Bandwidth Control Figure 5-61
1A53A3A1A5R11	RESISTOR, FIXED, FILM: 10K ohms ± 1%, 1/8 watt; 91637 part no. MFF1-8-10KOHMSPORM1	Isolation Figure 5-61
1A53A3A1A5R12	Same as 1A53A3A1A5R10	Bandpass Figure 5-61
1A53A3A1A5R13 thru 1A53A3A1A5R14	RESISTOR, FIXED, FILM: 5110 ohms ± 1%, 1/8 watt; 91637 part no. MFF1-8-5110OOHMSPORM1	Gain Control Figure 5-61
1A53A3A1A5R15	RESISTOR, FIXED, COMPOSITION: 2.2 meg ohms ± 50%, 1/2 watt; MIL-R-39008 type RCR20G225JS	Gain Control Figure 5-61
1A53A3A1A5R16	RESISTOR, FIXED, FILM: 2K ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2-2000OHMSPORM1	Coupling Figure 5-61
1A53A3A1A5R17 thru 1A53A3A1A5R18	Same as 1A53A3A1A5R13	Voltage Divider Figure 5-61
1A53A3A1A5R19	RESISTOR, FIXED, FILM: 100K ohms ± 1%, 1/2 watt; 91637 part no. MFF1-8-100KOHMSPORM1	Voltage Divider Figure 5-62

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A5R20	Same as 1A53A3A1A5R11	Operational Amplifier Output Figure 5-61
1A53A3A1A5R21 thru 1A53A3A1A5R23	Not used	
1A53A3A1A5R24	Same as 1A53A3A1A5R19	Operational Amplifier Gain Control Figure 5-61
1A53A3A1A5R25	Same as 1A53A3A1A5R13	Operational Amplifier Gain Control Figure 5-61
1A53A3A1A5R26	RESISTOR, FIXED, FILM: 56.2K ohms ± 1%, 1/8 watt; 91637 part no. MFF1-2-56200OHMSPORM1	Operational Amplifier Gain Control Figure 5-61
1A53A3A1A5R27	RESISTOR, FIXED, FILM: 2550 ohms ± 1%, 1/2 watt; 91637 part no. MFF1-2 2550OHMSPORM1	Input Load Figure 5-61
1A53A3A1A5R28 thru 1A53A3A1A5R30	Not used	
1A53A3A1A5R31 thru 1A53A3A1A5R32	Same as 1A53A3A1A5R4	Operational Amplifier Slow Start Figure 5-61
1A53A3A1A5R33	Same as 1A53A3A1A5R11	Operational Amplifier Slow Start Figure 5-61
1A53A3A1A5R34 Output	RESISTOR, FIXED, FILM: 47.5K ohms ± 1%, 1/2 watt; 91637 part no. MFF-1-2-47500OHMSPORM1	Operational Amplifier Figure 5-61
1A53A3A1A5TB1	TERMINAL BOARD: 8 terminals, barrier type; 75382 part no. 670Y8	Intercon-nection Figure 5-54
1A53A3A1A5TB2	TERMINAL BOARD: 8 terminals, barrier type; 75382 part no. 671Y8	Intercon nection Figure 5-54

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, CN-1473/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A1A5T1	TRANSFORMER, POWER, STEPDOWN: primary 208v, 240v, 272v, secondary 60 vct at 4 va; 26862 part no. 161003-8	Power Transformer Figure 5-61
1A53A3A1A6	SUPPRESSOR ASSEMBLY: 26862 part no. 169597	Line Transient Protection Figure 5-54
1A53A3A1A6C1	Not used	
1A53A3A1A6C2	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.1 uf ± 10%, 1000 vdcw; 56289 part no 10TMP10	Filter Figure 5-54
1A53A3A1A6R1 thru 1A53A3A1A6R4	RESISTOR, FIXED, COMPOSITION: 10 ohms ± 5% 2 watts; MIL-R-39008 type RCR42G100JS	Filter Figure 5-54
1A53A3A1A7 thru 1A53A3A1A8	Same as 1A53A3A1A6	Line Transient Protection Figure 5-54

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

FUSE PANEL, 109634G1

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A2	FUSE PANEL: contains fuses; 26862 part no. 300412; 28527 part no. 1096343G1	Fuse Mounting Figure 5-53
1A53A3A2F1 thru 1A53A3A2F3	FUSE, CARTRIDGE: 800 amps, 500v; 71424 part no. A50P800 type 4	Circuit Protection Figure 5-63
1A53A3A2MP1	INSULATOR, STANDOFF: 600v, plastic; 02329 part no. PL1603B	Fuse Plate Mounting Figure 5-63
1A53A3A2TB1	TERMINAL BOARD: 6 terminals, barrier type; 75382 part no. 671-6	Interconnection Figure 5-63

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

VOLTAGE REGULATOR, NO NUMBER

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A3	VOLTAGE REGULATOR: subassembly, consisting of transformers, relays and associated components, no part number assigned to this assembly	Voltage Regulator Figure 5-47
1A53A3A3B1	MOTOR, REGULATOR: 115 volts, 60 Hz, single phase, 1/20 hp, 1600 rpm; 15413 part no. 699A240; 28527 part no. 1088475G61	Regulates Voltage Figure 5-64
1A53A3A3C1	CAPACITOR, FIXED, PAPER DIELECTRIC: 15 uf ± 10%, 600 vdc; 24446 part no. CP701D1F156K1; 28527 part no. 1088475G47	Motor Capacitor Figure 5-64
1A43A3A3E1	GEAR, SPUR: phenolic, 30 teeth, 1.875 pitch dia; 24446 part no. 699A212; 28527 part no. 1088475G9	Regulator Motor Drive Mechanism Figure 5-64
1A53A3A3E2	GEAR, SPUR: 24446 part no. PO-973B397G1	Regulator Motor Drive Mechanism Figure 5-64
1A53A3A3F1	FUSE, CARTRIDGE: 3 amps, 250 v; MIL-F-15160 type FO3A250V3AS	Motor Protection Figure 5-64
1A53A3A3S1 thru 1A53A3A3S2	SWITCH, LIMIT: spst, 125/250 volt, 15 amp; 91929 part no. V3-1; 28527 part no. 1088475G39	Raise and Lower Limit Switch Figure 5-64
1A53A3A3TB1	TERMINAL BOARD: seven .312-18 terminals, .375 in thick by 3.500 in wide by 8.500 in long	Interconnection Figure 5-64
1A53A3A3TB2 thru 1A53A3A3TB19	Not used	
1A53A3A3TB20 thru 1A53A3A3TB22	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Interconnection Figure 5-64
1A53A3A3T1	REGULATOR, INDUCTROL: 120/208 volts, 55/66 Hz 3.34 amps to 83.3 amps	Inductrol Regulator Figure 5-64
1A53A3A3T2	TRANSFORMER, POWER, STEP-DOWN: 575/460/230 volts, 50/60 Hz, 100 volt amps; 133/115 volts secondary; 24446 part no. 9T35Y1162G2; 28527 part no. 1088475G62	Control Potential Figure 5-64

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

REGULATOR, VOLTAGE, NO NUMBER (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A3A3T3	Same as 1A53A3A3T2	Motor Supply Figure 5-64
1A53A3A3XF1	FUSEHOLDER: indicating, 20 amp 250 v; MIL-F-19207 type FHL17G1	1A53A3A3F1 Holder Figure 5-64

REGULATOR, VOLTAGE, CN-1472/FPN-44A

1A53A3A4	PANEL, CONTROL: contains fuses, switches and controls for Regulator Voltage; 28527 part no. 1096285G3	Regulator Control Panel Figure 5-49
1A53A3A4F1	FUSE, CARTRIDGE: 1/2 amp; 15413 part no. W8DDP012	Control Power Fuse Figure 5-65
1A53A3A4F2	FUSE, CARTRIDGE: 1/4 amp; 15413 part no. W8DDP002	Sensing Power Fuse Figure 5-65
1A53A3A4R1	RESISTOR, VARIABLE: 15413 part no. 3917A111AAP84	Bandwidth Increase Figure 5-65
1A53A3A4R2	RESISTOR, VARIABLE: 15413 part no. 3917A111AAP31	Voltage Level Increase Figure 5-65
1A53A3A4S1	SWITCH, PUSH: 15413 part no. 3917A223AAP25	Mode Selector Switch Figure 5-65
1A53A3A4S2	SWITCH, PUSH: 15413 part no. 3917A223AAP23	Manual Raise Switch Figure 5-65
1A53A3A4S3	Same as 1A53A3A4S2	Manual Lower Switch Figure 5-65
1A53A3A4S4	SWITCH, PUSH: 15413 part no. 3917A223AAP24	Motor Switch Figure 5-65

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

SHUNT, INSTRUMENT MX-9783/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A4	SHUNT, INSTRUMENT MX-9783/FPN-44A: includes Two instrument shunts; 01238 part no. 1096307G1	Meter and Control Circuit Shunt Figure 5-43
1A53A4K1 thru 1A53A4K2	RELAY, ARMATURE: dpdt, coil 1000 ohms dc resistance, 10 ma dc, 2 amp contact rating; 78277 part no. 42R01000SSIL	Overcurrent Control Figure 5-66
1A53A4R1	RESISTOR, VARIABLE: 200 ohms ± 10%, 2 watts; MIL-R-94 type RV4LAYSA201A	Average IPA Current Reference Figure 5-66
1A53A4R2	Same as 1A53A4R1	Peak IPA Current Reference Figure 5-66
1A53A4R3	RESISTOR, VARIABLE: 100 ohms ± 10%, 2 watts; MIL-R-94 type RV4LAYSA101A	Average PA Current Reference Figure 5-66
1A53A4R4	Same as 1A53A4R1	Peak PA Current Reference Figure 5-66
1A53A4TB1	TERMINAL BOARD: 10 terminal, barrier type; MIL-T-55164 type 8TB10	Interconnection Figure 5-66
1A53A4TP1	JACK, TIP: brown; MIL-C-39024/10-04	+15v Regulator Output Figure 5-66
1A53A4TP2	JACK, TIP: red; MIL-C-39024 type M39024/10-02	-15v Regulator Output Figure 5-66
1A53A4TP3	JACK, TIP: orange: MIL-C-39024 type M39024/10-06	Common Test Point Figure 5-66
1A53A4XK1 thru 1A53A4XK2	SOCKET, RELAY: octal; 71785 part no. 8AB	1A53A4K1 and 1A53A4K2 Relay Figure 5-66

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

SHUNT, INSTRUMENT, MX-9783/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A4A1	REGULATOR ASSEMBLY: 15v regulator; 01238 part no. C60-17780	±15v Regulator Figure 5-66
1A53A4A1C1 thru 1A53A4A1C2	CAPACITOR, FIXED, ELECTROLYTIC: 150 uf +50% -10%, 75 vdcw; 56289 part no. 39D157G075FJ4	Filter Figure 5-67
1A53A4A1C3 thru 1A53A4A1C4	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1.0 uf ± 10% 50 vdc; 56289 part no. 5C023105X0500C5	Filter Figure 5-67
1A53A4A1Q1	INTEGRATED CIRCUIT: regulator, +15 vdc; 27014 part no. LM340K-15	+15 vdc Regulator Figure 5-67
1A53A4A1Q2	INTEGRATED CIRCUIT: regulator, -15 vdc; 27014 part no. LM120K-15	-15 vdc Regulator Figure 5-67
1A53A4A1R1 thru 1A53A4A1R2	RESISTOR, FIXED, COMPOSITION: 2.2K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G222JS	Current Limiter Figure 5-67
1A53A4A2	CIRCUIT CARD ASSEMBLY: provide overcurrent sensing for the power supply; 01238 part no. D60-17844	Relay Driver Figure 5-66
1A53A4A2C1 Sample	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.47 uf ± 10%, 50 vdc; MIL-C-11015 type CK06BX474K	Current Filter Figure 5-68
1A53A4A2C2 Sample	CAPACITOR, FIXED, ELECTROLYTIC: 1000 uf -10 +75%, 5 vdc; 56289 part no. 600D108G007DL4	Current Smoothing Figure 5-68
1A53A4A2C3	Same as 1A53A4A2C1	Current Sample Filter Figure 5-68
1A53A4A2C4	Same as 1A53A4A2C2	Current Sample Smoothing Figure 5-68
1A53A4A2C5	Same as 1A53A4A2C1	Filter Figure 5-68

SHUNT, INSTRUMENT, MX-9783/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A4A2C6	CAPACITOR, FIXED, ELECTROLYTIC: 1 uf ± 10% 135 vdc; 56289 part no. 150 D105X9035A	Overcurrent Delay Figure 5-68
1A53A4A2C7	Same as 1A53A4A2C6	Overcurrent Delay Figure 5-68
1A53A4A2C8 thru 1A53A4A2C11	Same as 1A53A4A2C1	Filter Figure 5-68
1A53A4A2D1 thru 1A53A4A2D8	SEMICONDUCTOR DEVICE, DIODE: MIL-S-19500 type JAN1N914B	Overvoltage Protection Figure 5-68
1A53A4A2D9	SEMICONDUCTOR DEVICE, DIODE: 04713 part no. 1N4002	Transient Suppression Figure 5-68
1A53A4A2D10	Same as 1A53A4A2D9	Transient Suppression Figure 5-68
1A53A4A2Q1	TRANSISTOR: MIL-S-19500 type JAN2N2222A	Relay Driver Figure 5-68
1A53A4A2Q2	Same as 1A53A4A2Q1	Relay Driver Figure 5-68
1A53A4A2R1 thru 1A53A4A2R2	RESISTOR, FIXED, FILM: 100 ohms ± 10%, 1/8 w; MIL-R-55182 type RN60D1000F	Current Sample Divider Figure 5-68
1A53A4A2R3	RESISTOR, FIXED, FILM: 1.3K ohms ± 1%, 1/8 watt; MIL-R-55182 type RN60D1301F	Reference Voltage Figure 5-68
1A53A4A2R4	Not used	
1A53A4A2R5	Same as 1A53A4A2R1	Current Sample Divider Figure 5-68
1A53A4A2R6 thru 1A53A4A2R7	RESISTOR, FIXED, FILM: 1000 ohms ± 1%, 1/8 watt; MIL-R-55182 type RN60D1001F	Current Sample Divider Figure 5-68

SHUNT, INSTRUMENT, MX-9783/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A4A2R8	RESISTOR, FIXED, FILM: 10K ohms ± 1%, 1/8 watt; MIL-R-55182 type RN60D1002F	Reference Voltage Figure 5-68
1A53A4A2R9	Not used	
1A53A4A2R10 thru 1A53A4A2R11	Same as 1A53A4A2R1	Current Sample Divider Figure 5-68
1A53A4A2R12	RESISTOR, FIXED, FILM: 15K ohms ± 1%, 1/8 watt; MIL-R-55182 type RN60D1502F	Reference Voltage Figure 5-68
1A53A4A2R13	Not used	
1A53A4A2R14	RESISTOR, FIXED, FILM: 200 ohms ± 1%, 1/8 watt; MIL-R-55182 type RN60D2000F	Reference Voltage Figure 5-68
1A53A4A2R15 thru 1A53A4A2R16	Same as 1A53A4A2R6	Current Sample Divider Figure 5-68
1A53A4A2R17	Same as 1A53A4A2R8	Reference Voltage Figure 5-68
1A53A4A2R18	Not used	
1A53A4A2R19	RESISTOR, FIXED, COMPOSITION: 10K ohms ± 5%, 1/4 watt; MIL-R-39008 type RCR07G103JS	U1-A Output Figure 5-68
1A53A4A2R20	Same as 1A53A4A2R19	U1-B Output Figure 5-68
1A53A4A2R21	Same as 1A53A4A2R19	U1-C Output Figure 5-68
1A53A4A2R22	Same as 1A53A4A2R19	U1-D Output Figure 5-68
1A53A4A2R23	RESISTOR, VARIABLE: Wirewound, 200K ohms ± 10%, 1/2 watt; 80294 part no. 3299W-1-204	Overcurrent Delay Figure 5-68
1A53A4A2R24	RESISTOR, FIXED, COMPOSITION: 100K ohms ± 5%, 1/4 watt; MIL-R-39008 type RCR07G104JS	Overcurrent Delay Figure 5-68

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

SHUNT, INSTRUMENT, MX-9783/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A4A2R25	Same as 1A53A4A2R23	Overcurrent Delay Figure 5-68
1A53A4A2R26	Same as 1A53A4A2R24	Overcurrent Delay Figure 5-68
1A53A4A2R27	Same as 1A53A4A2R19	Q1 Base Figure 5-68
1A53A4A2R28	RESISTOR, FIXED, COMPOSITION: 5.1K ohms ± 5%, 1/4 watt; MIL-R- 39008 type RCR07G512JS	Q1 Base Figure 5-68
1A53A4A2R29	Same as 1A53A4A2R19	Q2 Base Figure 5-68
1A53A4A2R30	Same as 1A53A4A2R28	Q2 Base Figure 5-68
1A53A4A2U1	INTEGRATED CIRCUIT: quad comparator; 27014 part no. LM139D	Overload Signal Amplifiers Figure 5-68
1A53A4A2U2	INTEGRATED CIRCUIT: low power; 27014 part no. MC14528BAL	Overload Delay Figure 5-68
1A53A4A2U3	INTEGRATED CIRCUIT: low power; 27014 part no. MC14011BAL	Gates Figure 5-68
1A53A4A3	METER SHUNT ASSEMBLY: 01238 part no. C60-17854	Meter Shunt Figure 5-69
1A53A4A3CR1 thru 1A53A4A3CR11	SEMICONDUCTOR DEVICE, DIODE: 04713 part no. MR751	Overvoltage Protection Figure 5-69
1A53A4A3C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.47 uf ± 20%, 50 vdc, 56289 part no. 5CZU4740050CA5	Filter Figure 5-69
1A53A4A3C2	Same as 1A53A4A3C1	Filter Figure 5-69
1A53A4A3R1	SHUNT, INSTRUMENT: 2 amp, 100 mv; 25497 part no. PR0002-A	Meter Shunt Figure 5-69
1A53A4A3R2	SHUNT, INSTRUMENT: 10 amp, 100 mv; 25497 part no. PR0010-A	Meter Shunt Figure 5-69

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

SHUNT, INSTRUMENT, MX-9783/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A4A3R3 thru 1A53A4A3R6	RESISTOR, FIXED, WIREWOUND: 0.1 ohms ± 3%, 6 watts; 91637 part no. GN6-.1 ohms 3 pct	Current Limiting Figure 5-69
1A53A4A3R7	RESISTOR, FIXED, COMPOSITION: 2.2K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G222JS	Collector Figure 5-68
1A53A4A3R8	RESISTOR, FIXED, COMPOSITION: 1.8K ohms ± 5% 1/2 watt; MIL-R-39008 type RCR20G182JS	Base Bias Figure 5-68
1A53A4A3R9	RESISTOR, FIXED, COMPOSITION: 3.9K ohms ± 5% 1/2 watt; MIL-R-39008 type RCR20G392JS	Base Bias Figure 5-68
1A53A4A3R10	RESISTOR, FIXED, COMPOSITION: 22K ohms ± 5% 1/2 watt; MIL-R-39008 type RCR20G223JS	Base Bias Figure 5-68
1A53A4A3R11	Same as 1A53A4A2R10	Collector Figure 5-68
1A53A4A3R12	Not used	
1A53A4A3R13	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5% 1/2 watt; MIL-R-39008 type RCR20G101JS	Emitter Figure 5-68
1A53A4A3R14	Same as 1A53A4A2R1	Filter Figure 5-68
1A53A4A3R15 thru 1A53A4A3R16	Same as 1A53A4A2R2	Bias Figure 5-68
1A53A4A3R17	Same as 1A53A4A2R4	Collector Figure 5-68
1A53A4A3R18	Same as 1A53A4A2R5	Feedback Figure 5-68
1A53A4A3R19	Same as 1A53A4A2R6	Emitter Figure 5-68
1A53A4A3R20	Same as 2A53A4A2R7	Collector Figure 5-68
1A53A4A3R21	Same as 1A53A4A2R8	Base Bias Figure 5-68
1A53A4A3R22	Same as 1A53A4A2R9	Base Bias Figure 5-68
1A53A4A3R23	Same as 1A53A4A2R10	Base Bias Figure 5-68

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

SHUNT, INSTRUMENT, MX-9783/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A4A3R24	Same as 1A53A4A2R10	Collector Figure 5-68
1A53A4A3R25	Not used	
1A53A4A3R26	Same as 1A53A4A2R13	Emitter Figure 5-68
1A53A4A3R27 Limiter	RESISTOR, FIXED, COMPOSITION: 1K ohms ± 5%, 1 watt; MIL-R-39008 type RCR32G102JS	Current Figure 5-68
1A53A4A3R28	Same as 1A53A4A2R27	Current Limiter Figure 5-68
1A53A4A4	METER SHUNT ASSEMBLY: provide current meter shunts for monitoring power supply current; 01238 part no. C60-17854	Meter Shunt Figure 5-66
1A53A4A4CR1 thru 1A53A4A4CR4	SEMICONDUCTOR DEVICE, DIODE: rectifier; 04713 part no. 1N1199A	Clamping Figure 5-69
1A53A4A4R1	SHUNT, INSTRUMENT: 2 amp, 100 mv; 25497 part no. PR0002A	Meter Shunt Figure 5-69
1A53A4A4R2	SHUNT, INSTRUMENT: 10 amp, 100 mv; 25497 part no. PR0010A	Meter Shunt Figure 5-69
1A53A4A4R3 thru 1A53A4A4R8	RESISTOR, FIXED, WIREWOUND: 0.1 ohms ± 3% 6 watts; 91637 part no. GN6R1PORM3PCT	Meter Shunt Figure 5-69
1A53A4A4TB1	TERMINAL BOARD: 6 terminals; 73631 part no. GBP6	Interconnection Figure 5-69

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN 44-A, MAINTENANCE PARTS LIST (cont.)

POWER SUPPLY PP-7305/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
	POWER SUPPLY, PP-7305/FPN-44A: Trans formers and rectifiers to supply dc power. Consists of Rectifier Assembly 1A53A5 and Power Supply and Transformer Assembly 1A53A6; 01238 part no. 40000D603C.	DC Power Figure 5-70
1A53A5	RECTIFIER ASSEMBLY: 01238 part no. 40000D1006E; 28527 part no. 1096301G1	High Voltage Rectification Assembly Figure 5-70
1A53A5CR1 thru 1A53A5CR12	RECTIFIER ASSEMBLY: rectifier; 58849 part no. JHV34H40	High Voltage Rectifier Figure 5-70
1A53A5MP1	ROD, THREADED: plastic, 1/2 in dia. by 48 in. long; 15395 part no. EH.55MI-2-48 inch	High Voltage Rectifier Holder Figure 5-70
1A53A5MP2	NUT, HEX: 1/2 inch; 15395 part no. 1-2 hex nut	Nut for 1A53A5MP1 Figure 5-70
1A53A5MP3	PLASTIC SHEET: High strength phenolic laminate, 15395 type EH 4 feet wide by 8 feet long by 0.375 inch thick	High Voltage Rectifier Holder Figure 5-70
1A53A5RV1 thru 1A53A5RV36	RESISTOR, VOLTAGE SENSITIVE: metal oxide; 24446 part no. V1000LB80A	Transient Voltage Absorber Figure 5-70
1A53A6	POWER SUPPLY AND TRANSFORMER ASSEMBLY: 01238 part no. 40000D597C; 28527 part No. 1096300G1	High Voltage AC and DC Supply Figure 5-43
1A53A6S1	SWITCH, THERMOSTATIC: spst, normally closed; 14604 part no. 3100-3-60SL96C	Overtemperature Protection Figure 5-70
1A53A6TB1	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Interconnection Figure 5-70
1A53A6T1	TRANSFORMER, POWER, SET-UP: input 390v, 3 phase, 56 to 60 Hz, output 9353v at 11.424 amps, 9376v at15.504 amps; 01238 Part no. 40000A1052C	Power Transformer Figure 5-70
1A53A6T1H1 thru 1A53A6T1H6	INSULATOR ASSEMBLY: 74178 part no. 24071	Primary Terminals Figure 5-70
1A53A6T1MP1	OIL: 54527 type DIALA AX: 01238 part no. 940-11239-000	Transformer oil Figure 5-70
1A53A6T1R1 thru 1A53A6T1R6	INSULATOR ASSEMBLY: 23 kv, 55 amp, 17.6 in. h, o/a 71478 part no. 32334	Secondary Terminals Figure 5-70

POWER SUPPLY, PP7305/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A6A1	POWER SUPPLY: Outputs 5000V, 500V, ± 26v C01238 part no. 40000D592	DC Power Supplies Figure 5-70
1A53A6A1C1	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 uf ± 10%, 8000 vdcw; 16727 part no. AOC8M1	Filter Figure 5-71
1A53A6A1C2	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 uf ± 10%, 1000 vdcw; 53021 part no. CP70E1FG106K1	Filter Figure 5-71
1A53A6A1L1	REACTOR: 15 hy inductance, 0.23 amps dc, 60 Hz, 260 ohms dc resistance; 01238 part no. 4F110	Choke Figure 5-71
1A53A6A1L2	REACTOR: 2 hy inductance, 0.56 amps dc, 60 Hz, 43 ohms dc resistance; 01238 part no. 4F111	Choke Figure 5-71
1A53A6A1TB1	TERMINAL BOARD: 6 terminals; 71785 part no. 3-141	Interconnection Figure 5-71
1A53A6A1T1	Not used	
1A53A6A1T2	TRANSFORMER, POWER, STEPDOWN AND STEPUP: primary 208v, 45 to 66 Hz, 3 phase, secondary 34.6v at 0.5 amps, 407v at 0.46 amps, 4088v at 0.19 amps; 01238 part no. 4B256	Power Transformer Figure 5-71
1A53A6A1A1	POWER SUPPLY: 01238 part no. D30-17729	Rectifier Assembly Figure 5-71
1A53A6A1A1CR1 thru 1A53A6A1A1 CR12	SEMICONDUCTOR DEVICE, DIODE: rectifier; 04713 part no. IN4007	Rectifier Figure 5-72
1A53A6A1A1 CR13 thru 1A53A6A1A1 CR18	SEMICONDUCTOR DEVICE, DIODE: rectifier; 12969 part no. USS15	Rectifier Figure 5-72
1A53A6A1A1 CR19 thru 1A53A6A1A1 CR24	Same as 1A53A6A1CR1	Rectifier Figure 5-72
1A53A6A1A1C1 thru 1A53A6A1A1C2	CAPACITOR, FIXED, ELECTROLYTIC: 150 uf + 50%, -10%, 75 vdcw; 56289 part no. 39D157G075FJ4	Filter Figure 5-72
1A53A6A1A1MP1	TERMINAL BOARD: plastic, 15 terminals; 01238 part no. C50-17723	Component Mounting Figure 5-72
1A53A6A1A1MP2	TERMINAL BOARD: plastic, 15 terminals; 01238 part no. D50-17726	Component Mounting
1A53A6A1A1R1 thru 1A53A6A1A1R2	RESISTOR, FIXED, COMPOSITION: 4.7K ohms ± 5%, 1 watt; MIL-R-39008 type RCR32G472JS	Bleeder Figure 5-72

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

VOLTAGE DIVIDER CN-1474/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A7	VOLTAGE DIVIDER CN-1474/FPN-44A: contains the voltage divider, resistors etc. used to divide voltage outputs for instrumentation purposes; 01238 part no. E30-17796; 28527 part no. 1096302G1	Voltage Divider Figure 5-43
1A53A7DS1	LAMP, GLOW: 110 to 125 vac, T 3-1/4 bulb; 72619 part no. NE51H	Voltage Limiter Figure 5-73
1A53A7DS2	Same as 1A53A7DS1	Voltage Limiter Figure 5-73
1A53A7DS3	Same as 1A53A7DS1	Voltage Limiter Figure 5-73
1A53A7DS4	Same as 1A53A7DS1	Voltage Limiter Figure 5-73
1A53A7DS5	Same as 1A53A7DS1	Voltage Limiter Figure 5-73
1A53A7J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 contact; 81349 part no. UG657/U	PA Plate Voltage Monitor Jack Figure 5-73
1A53A7J2	Not used	
1A53A7J3	Same as 1A53A7J1	10 kv Monitor Jack Figure 5-73
1A53A7J4	Not used	
1A53A7J5	Same as 1A53A7J1	500v Monitor Jack Figure 5-73
1A53A7J6	Not used	
1A53A7J7	Same as 1A53A7J1	5 kv Monitor Jack Figure 5-73
1A53A7J8	Not used	
1A53A7J9	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 contacts; 96906 part no. MS3102A18-3P	10 kv Feedback Connector Figure 5-73
1A53A7K1	RELAY, ARMATURE: dpdt, coil 1000 ohms dc resistance, 2 amps contact rating; 78277 part no. 42R01000SS1L	Overvoltage Sensing 21 kv Figure 5-75
1A53A7K2	Same as 1A53A7K1	Bias-up Sensing Figure 5-75
1A53A7MP1 thru 1A53A7MP5	LENS, LIGHT: clear; 72619 part no. 95-0937	1A53A7XDS1 thru 1A53A7XDS5 Lens Figure 5-73

VOLTAGE DIVIDER, CN-1474/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A7R1	RESISTOR, VARIABLE: 5K ohms ± 10%; 2 watts; MIL-R-94 type RV4LAYSA502A	21 kv Over-voltage Trip Pot Figure 5-74
1A53A7R2	Same as 1A53A7R1	5000v Bias-up Setting Pot Figure 5-74
1A53A7R3	RESISTOR, VARIABLE: 35 ohms ± 10%, 2 watts; MIL-R-19 type RA20LASB350A	21 kv Monitor Level Adjust Figure 5-74
1A53A7R4	Same as 1A53A7R3	10 kv Monitor Level Adjust Figure 5-74
1A53A7R5	Same As 1A53A7R3	5 kv Monitor Adjust Figure 5-74
1A53A7R6	Same as 1A53A7R3	500v Monitor Level Adjust Figure 5-74
1A53A7TB1 thru 1A53A7TB2	TERMINAL BOARD: 10 terminals, barrier type; MIL-T-55164 type 8TB10	Inter-Connection Figure 5-73
1A53A7TP1	JACK, TIP: brown; 74970 part no. MS16108-4A	+15v Supply Monitor Figure 5-74
1A53A7TP2	JACK, TIP: red; 74970 part no. MS16108-2A	-15v Supply Monitor Figure 5-74
1A53A7TP3	JACK, TIP: orange; 74970 part no. MS16108-6A	Common Figure 5-74
1A53A7TP4	JACK, TIP: yellow; 74970 part no. MS16108-8A	21 kv Monitor Test Point Figure 5-74
1A53A7TP5	JACK, TIP: green; 74970 part no. MS16108-5A	10 kv Monitor Test Point Figure 5-74
1A53A7TP6	JACK, TIP: blue; 74970 part no. MS16108-7A	500v Monitor Test Point Figure 5-74
1A53A7TP7	JACK, TIP: purple; MIL-C-39024 type M39024/10-10	5 kv Monitor Test Point Figure 5-74

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

VOLTAGE DIVIDER, CN-1474/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A7XDS1 thru 1A53A7XDS5	LAMPHOLDER: clear lens; 72619 part no. 95-0410-09-301	1A53A7DS1 thru 1A53A7DS5 Holder Figure 5-73
1A53A7XDS1MP1 thru 1A53A7XDS5MP5	LENS, LIGHT: clear, 76219 part no. 95-0437	1A53A7XDS1 thru 1A53A7XDS5 Lens Figure 5-73
1A53A7XK1	SOCKET, RELAY: octal; 71785 part no. 8AB	1A53A7K1 Socket Figure 5-75
1A53A7XK2	Same as 1A53A7XK1	1A53A7K2 Socket Figure 5-75
1A53A7A1	REGULATOR ASSEMBLY: 15v regulator; 01238 part no. C60-17780	±15v Regulator Figure 5-75
1A53A7A1C1 thru 1A53A7A1C2	CAPACITOR, FIXED, ELECTROLYTIC: 150 uf + 50% -10%, 75 vdcw; 56289 part no. 39D157G075FJ4	Filter Figure 5-67
1A53A7A1C3 thru 1A53A7A1C4	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1.0 uf ± 20%, 50 vdcw: 56289 part no. 5C023105X0500C5	Filter Figure 5-67
1A53A7A1Q1	INTEGRATED CIRCUIT: regulator, ±15 vdc; 27014 part no. LM340K15	±15 vdc Regulator Figure 5-67
1A53A7A1Q2	INTEGRATED CIRCUIT: regulator, -15 vdc; 27014 part no. LM120K15	-15 vdc Regulator Figure 5-67
1A53A7A1R1 thru 1A53A7A1R2	RESISTOR, FIXED, COMPOSITION: 2.2K ohms ± 5%, 1/2 watt MIL-R-39008 type RCR20G222JS	Current Limiter Figure 5-67
1A53A7A2	CIRCUIT CARD ASSEMBLY: drives overvoltage relays; 01238 part no. C60-17789	Relay Driver Figure 5-75
1A53A7A2CR1 thru 1A53A7A2CR2	SEMICONDUCTOR DEVICE, DIODE; rectifier; 04713 part no. 1N4007	Protection Figure 5-76
1A53A7A2C1 thru 1A53A7A2C4	CAPACITOR, FIXED, ELECTROLYTIC: 2 uf +50% -15%, 100 vdcw; MIL-C-3965 type CL23CN205TN3	Filter Figure 5-76
1A53A7A2C5	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.1 uf ± 10%, 100 vdcw; 84411 part no. 663UW10491W2	Filter Figure 5-76
1A53A7A2Q1	TRANSISTOR: silicon NPN; MIL-S-19500 type 2N2222A	Amplifier Figure 5-76
1A53A7A2Q2	TRANSISTOR: silicon NPN; MIL-S-19500 type 2N2907A	Relay Driver Figure 5-76

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

VOLTAGE DIVIDER, CN-1474/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A7A2Q3	Same as 1A53A7A2Q2	Amplifier Figure 5-76
1A53A7A2Q4	Same as 1A53A7A2Q1	Relay Driver Figure 5-76
1A53A7A2R1	RESISTOR, FIXED, COMPOSITION: 47K ohms ± 5% 1/2 watt; MIL-R-39008 type RCR20G473JS	Voltage Divider Figure 5-76
1A53A7A2R2	RESISTOR, FIXED, COMPOSITION: 12K ohms ± 5% 1/2 watt; MIL-R-39008 type RCR20G123JS	Voltage Divider Figure 5-76
1A53A7A2R3	RESISTOR, FIXED, COMPOSITION: 3.3K ohms ± 5% 1/2 watt; MIL-R-39008 type RCR20G332JS	Voltage Divider Figure 5-76
1A53A7A2R4	Same as 1A53A7A2R2	Voltage Divider Figure 5-76
1A53A7A2R5	RESISTOR, FIXED, COMPOSITION: 1.5K ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G152JS	Collector Figure 5-76
1A53A7A2R6	Not used	
1A53A7A2R7	RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5%, 1/2 watt; MIL-R-39008 type RCR20G101JS	Emitter Figure 5-76
1A53A7A2R8	Same as 1A53A7A2R1	Voltage Divider Figure 5-76
1A53A7A2R9	Same as 1A53A7A2R2	Voltage Divider Figure 5-76
1A53A7A2R2	Same as 1A53A7A2R3	Voltage Divider Figure 5-76
1A53A7A2R11	Same as 1A53A7A2R2	Voltage Divider Figure 5-76
1A53A7A2R12	Same as 1A53A7A2R5	Emitter Figure 5-76
1A53A7A2R13	Not used	
21A53A7A2R14	Same as 1A53A7A2R7	Emitter Figure 5-76
1A53A7A2R15	Same as 1A53A7A2R1	Collector Figure 5-76
1A53A7A3	RESISTOR ASSEMBLY: houses the 21500 volt resistor assembly; 01238 part no. D30-17797	Assembly Housing Figure 5-73
1A53A7A3A1	COMPONENT BOARD ASSEMBLY: voltage divider; 01238 part no. D60-17751	Component Mounting Figure 5-73
1A53A7A3A1C1 thru 1A53A7A3A1C15	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 pf ± 10%, 6000 vdcw; 72982 part no. 818V5U500PF	Filter Figure 5-73

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

VOLTAGE DIVIDER, CN-1474/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A7A3A1R1 thru 1A53A7A3A1R60	RESISTOR, FIXED, FILM: 400K ohms ± 1%, 10 watts; 19647 part no. MS310-400KOHMSPORM1	Voltage Divider Figure 5-73
1A53A7A4	HIGH VOLTAGE ASSEMBLY: voltage divider; 01238 part no. D30-18223	Voltage Divider Figure 5-73
1A53A7A4A1	COMPONENT BOARD ASSEMBLY: voltage divider; 01238 part no. D60-17759	Voltage Divider Figure 5-74
1A53A7A4A1C1 thru 1A53A7A4A1C31	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 pf ± 10%, 6000 vdcw; 72982 part no. 818V5U500PF	Filter Figure 5-74
1A53A7A4A1R1 thru 1A53A7A4A1R26	RESISTOR, FIXED, FILM: 137.8K ohms ± 1%, 10 watts; 19647 part no. MS310-137.8KOHMSPORM1	Voltage Divider Figure 5-74
1A53A7A4A1R27 thru 1A53A7A4A1R50	RESISTOR, FIXED, FILM: 167K ohms ±1%, 10 watts; 19647 part no. MS310-167KOHMSPORM1	Voltage Divider Figure 5-74
1A53A7A4A1R51 thru 1A53A7A4A1R52	RESISTOR, FIXED, FILM: 400K ohms ± 1%, 10 watts; 19647 part no. MS310-400KOHMSPORM1	Voltage Divider Figure 5-74
1A53A7A4A1R53 thru 1A53A7A4A1R64	Same as 1A53A7A4A1R27	Voltage Divider Figure 5-74

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

RESISTOR ASSEMBLY 1096304G2

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
1A53A19	RESISTOR ASSEMBLY: consists of eight resistors; 01238 part no. D30-17724-01; part no. 1096304G2	Capacitor Discharge Figure 5-43
1A53A19R1 thru 1A53A19R8	RESISTOR, FIXED, COMPOSITION: 6000 ohms ± 10, 150 watts; 72819 part no. 890AS6000OHMS	Capacitor Discharge Figure 5-77
1A53A19XR1 thru 1A53A19XR8	CLIP, ELECTRICAL: 600v, 60 amps; 74829 part no. C23	Resistor Clip Figure 5-77
1A53A19XRE1 thru 1A53A19XRE8	CLIP, CLAMP: 250v, 35-60 amps; 71400 part no. 4	Resistor Clamp Figure 5-77

RESISTOR ASSEMBLY 1096304G1

1A53A20	RESISTOR ASSEMBLY: consists of eight resistors; 01238 part no. D30-17724-02; 28527 part no. 1096304G1	Capacitor Discharge Figure 5-43
1A53A20R1 thru 1A53A20R8	RESISTOR, FIXED, COMPOSITION: 1500 ohms ± 10%, 150 watts; 72819 part no. 890AS1500OHMS	Capacitor Discharge Figure 5-77
1A53A20XR1 thru 1A53A20XR8	CLIP, ELECTRICAL: 600v, 60 amps; 74829 part no. C23	Resistor Clip Figure 5-77
1A53A20XRE1 thru 1A53A20XRE8	CLIP, CLAMP: 250v, 35-60 amps; 71400 part no. 4	Resistor Clamp Figure 5-77

RESISTOR ASSEMBLY 1096303G1

1A53A23	RESISTOR, ASSEMBLY: consists of eight resistors; 01238 part no. D30-17725; 28527 part no. 1096303G1	Bleeder Figure 5-43
1A53A23R1 thru 1A53A23R4	RESISTOR, FIXED, WIREWOUND: 200K ohms ± 5% 160 watts; 91637 part no. HL160-04Z200K5PCT	Bleeder Figure 5-78
1A53A23R5 thru 1A53A23R8	RESISTOR, FIXED, WIREWOUND: 10K ohms ± 5% 55 watts; MIL-R-26 type RW35V103	Bleeder Figure 5-78
1A53A23XR1 thru 1A53A23XR4	CLIP, ELECTRICAL: steel; 44655 part no. 12BN	Resistor Holder Figure 5-78
1A53A23XR5 thru 1A53A23XR8	CLIP, ELECTRICAL: steel; 91637 part no. 202	Resistor Holder Figure 5-78

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A
MAINTENANCE PARTS LIST

COUPLER, ANTENNA, CU-2171/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
3	COUPLER, ANTENNA CU-2171/FPN-44A: provides impedance matching between the antenna and attenuates harmonics of the 100 kc output signal; 28527 part no. 1087429G4	Antenna Coupler Figure 5-79
3DS1 thru 3DS2	LAMP, GLOW: neon; 72619 part no. NE16; 28527 part no. 71503	Transmitter On Indicator Figure 5-80
3E1 thru 3E4	INSULATOR, STANDOFF: steatite, 2.250 in. w by 4.625 in lg by 12.000 in. h o/a; 75539 part no. 10084; 28527 part no. 1089225G1	3L1 Support Figure 5-79
3J1	CONNECTOR, RECEPTACLE, ELECTRICAL: MIL-C-3608 type UG422BU	Dummy Load Current Figure 5-80
3J2	CONNECTOR, RECEPTACLE, ELECTRICAL: MIL-C-3608 type UG422BU	Antenna Current Figure 5-80
3K1 thru 3K2	RELAY, VACUUM: dpdt; 60 kv, 85 amps; 73905 part no. R88401E27B10; 28527 part no. 1087959G1	Transmitter and Antenna Ground Transfer Figure 5-81
3K3	Not used	
3K4	Not used	
3K5	RELAY, ARMATURE: 6 pdt; contacts 2 amps at 26.5 vdc, coil 26.5 vdc, 400 ohms; 61775 part no. R35PLP6A; 28527 part no. 3411413G1	Transmitter No. 1 Operate Control Figure 5-80
3K6	RELAY, VACUUM: spst, 60kv, two spst auxiliary contacts, 115 vac, 3 amps; 73905 part no. R8G4304A27B00; 28527 part no. 1087958G1	Antenna Grounding Relay Figure 5-79
3K7	Same as 3K5	Transmitter No. 2 Operate Control Figure 5-80
3K8 and 3K9	Not used	
3K10	Same as 3K1	Transmitter No. 2 Ground Transfer Figure 5-82
3K11	Same as 3K1	Transmitter No. 2 Antenna Transfer Figure 5-82
3L1	COIL, RF: 88 uh, 24 turns, copper tubing, silver plated; 15249 part no. 202-509; 28527 part no. 1089222G1	Antenna Loading Figure 5-79

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A MAINTENANCE PARTS LIST

COUPLER, ANTENNA, CU-2171/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
3L1E1	CONTACT, ELECTRICAL: 0.375 in. dia tubing; 15249 part no. C30A; 28527 part no. 1089241G1	3L1 Contact Figure 5-79
3M1	Not used	
3P1	CONNECTOR, PLUG, ELECTRICAL: polarized, 2 contact; 81349 type UG421BU	Connector Figure 5-80
3P2	CONNECTOR, PLUG, ELECTRICAL: polarized, 2 contact; 81349 type UG421BU	Connector Figure 5-80
3R4 thru 3R5	RESISTOR, FIXED, COMPOSITION: 33K ohms ± 5% 2 watts; MIL-R-39008 type RCR42G333JS	Limiting Resistors Figure 5-80
3R6	RESISTOR, FIXED, COMPOSITION: 7K ohms ± 5% 125 watts; 10646 part no. AS125-702K; 28527 part no. 1087591G4	Static Drain Figure 5-79
3R7	Same as 3R6	Static Drain Figure 5-79
3S1	SWITCH, SENSITIVE: spdt; interlock type; 96906 part no. MS16106-1	Interlock Switch Figure 5-79
3S2	Same as 3S1	Interlock Switch Figure 5-79
3S3	Same as 3S1	Interlock Switch Figure 5-81
3S4	Same as 3S1	Interlock Switch Figure 5-82
3S5	Same as 3S1	Interlock Switch Figure 5-82
3S6	Same as 3S1	Interlock Switch Figure 5-81
3S7	Same as 3S1	Interlock Switch Figure 5-79
3S8	Same as 3S1	Interlock Switch Figure 5-79
3TB1 thru 3TB2	TERMINAL BOARD: 10 terminals; MIL-T-55164 type 8TB10	Input Figure 5-81
3TB3 thru 3TB4	Same as 3TB1	Input Figure 5-82
3T1	TRANSFORMER, CURRENT: 65 amps current rating; 95 ohms impedance; 05280 part no. 1705; 28527 part no. 2138264G1	Current Sensing Figure 5-82

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

COUPLER, ANTENNA, CV-2171/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
3T2	Same as 3T1	Current Sensing Figure 5-82
3XDS1 thru 3XDS2	LAMPHOLDER: red lens; 72619 part no. 72-6206-1231-301; 28527 part no. 2311666G1	3DS1 and 3DS2 Holder Figure 5-80
3XK1 thru 3XK4		Not used
3XK5	SOCKET, RELAY: 20 contacts; 61775 part no. S6C3; 28527 part no. 2311414G1	Retains 3K5 Figure 5-80
3XK6	Not used	
3XK7	Same as 3XK5	Retains 3K7 Figure 5-80
3XK8	Not used	

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

DUMMY LOAD, ELECTRICAL, DA-329A/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
4	DUMMY LOAD, ELECTRICAL DA-329A/FPN-44: simulates the lumped electrical characteristics of transmitting antenna; 28527 part no. 1087432G3	Energy Dissipation Figure 5-83
4B1	FAN, VENTILATING: motor driven, 208v, 50-60 Hz, 3 phase, 1-1/2 hp, 4800/4000 cfm; AAAAA part no. VD19F1P1X; 28527 part no. 1087896G1	Cooling Figure 5-83
4B1	**AN/FPN-44B: FAN, VENTILATING: clockwise rotation, direct drive, 208 volts, 3 phase, 45-66 Hz, 4800/4000 cfm; 1.5 hp, 1750/1450 rpm; 07077 model K, cat. no. 5K20; 90348 part no. 1087896G1**	
4B1B1	MOTOR ALTERNATING CURRENT: 208v, 50-60 Hz, 1-1/2 hp, enclosed	Fan Motor Figure 5-84
4B1B1	**AN/FPN-44B: MOTOR ALTERNATING CURRENT: 208v, 50-60 Hz, 3 phase, 1750/1450 rpm; 07077 part no. 5K20, model K; 90348 part no. 1088472G1**	
4B1E1	IMPELLER, FAN, CENTRIFUGAL: nine blades; AAAAA part no. VP19-9	Fan Impeller Figure 5-84
4B1E1	**AN/FPN-44B: IMPELLER: three blades; 90348 part no. 1088472G2**	
4B1E2	**AN/FPN-44B: BEARING, BALL, ANNULAR: 90348 part no. 1088472G3**	
4C1 thru 4C12	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 uf ± 10%, 400 vdcw; MIL-C-25 type CP53B1KE105K1	Interconnect Bypass Figure 5-84
4C13 thru 4C24	Same as 4C1	Interconnect Bypass Figure 5-85
4C25	CAPACITOR, FIXED, DIELECTRIC: 0.08 uf ± 5%, 15 kv peak at 100 kc; 21810 part no. SK11554, type TKB162; 28527 part no. 1088881G1	RF Tuning Figure 5-85
4C26	Same as 4C1	Interconnect Bypass Figure 5-84
4C27	Same as 4C1	Interconnect Bypass Figure 5-85
4C28	Same as 4C1	Interconnect bypass Figure 5-84
4C29	Same as 4C1	Interconnect Bypass Figure 5-85
4C30	Same as 4C1	Interconnect

DUMMY LOAD, ELECTRICAL, DA-329A/FPN-44A

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Bypass Figure 5-84
4C31	Same as 4C1	Interconnect Bypass Figure 5-85
4HR1 thru 4HR6	HEATER: 02295 part no. CR123C-7.78A; 28527 part no. 1088278G5	Overload Sensing Figure 5-84/85
4HR1 thru 4HR6	**AN/FPN-44B: HEATER: 02295 part no. CR123C-5.26A; 90348 PART NO. 1088278G3**	
4J1	CONNECTOR, RECEPTACLE, ELECTRICAL: straight adapter, twinax: MIL-C-3655 type UG493U; 74868 type 7925; 28527 part no. 2312358G1	Antenna Current Monitor Connector Figure 5-84
4K1	RELAY, MAGNETIC STARTER: 3 poles, 3 overloads less heaters, one normally closed auxiliary contact in addition to holding interlock; coil 120 volts ± 2%, 45-66 Hz; 24446 part no. CR106B002ADDMFP, size 0; 28527 part no. 1088028G1	Trans 1 Blower Starter Figure 5-84
4K1E1	CONTACT, ELECTRICAL: motor starter, three poles; 28527 part no. 1088433G2	4K1 Contact Figure 5-84
4K1E2	COIL, RELAY: motor starter, 120 vac ± 2%, 45 to 66 Hz; 28527 part no. 1088433G1	4K1 Coil Figure 5-84
4K2	Same as 4K1	Trans 2 Blower Starter Figure 5-8
4K2E1	Same as 4K1E1	4K2 Contact Figure 5-85
4K2E2	Same as 4K1E2	4K2 Coil Figure 5-85
4L1	COIL, RADIO FREQUENCY: 31-1/2 turns 0.250 in. copper tubing; silver plated; 15249 part no. D0158; 28527 part no. 1096520G1	Antenna Simulation Figure 5-85
4L1E1	CLIP, ELECTRICAL: brass, nickel plated; 15249 part no. 235-824; 28527 part no. 2138526G1	4L1 Clip Figure 5-85
4MP1 thru 4MP8	INSULATOR, STANDOFF: 1 in. dia. by 4 in. lg; MIL-I-23264 type 422W04-032	Resistor Assembly Support Figure 5-84
4RE1 thru 4RE36	CLIP, LOCKING: 60 amps; 250 volts; 28527 part no. 2311941G4	4R1 thru 4R36 Holder Figure 5-84
4R1	RESISTOR, FIXED, COMPOSITION: 2.5 ohms	Dummy Load

DUMMY LOAD, ELECTRICAL, DA-329A/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
thru 4R10	± 10%, 140 watts; 24546 type HL; part no. 1087933G1	Figure 5-84
4R11 thru 4R25	Same as 4R1	Dummy Load Figure 5-85
4R26 thru 4R27	Same as 4R1	Dummy Load Figure 5-84
4R28 thru 4R30	Same as 4R1	Dummy Load Figure 5-85
4R31 thru 4R36	Same as 4R1	Dummy Load Figure 5-84
4S1 thru 4S2	SWITCH, AIR FLOW: actuates at 1550 ft/min max, deactuates at 1450 ft/min, spdt, 250 vac, 5 amps; 82877 part no. 2A, type 1800; 28527 part no. 1087599G6	Air Flow Safety Switch Figures 5-84 and 5-85
4S1 thru 4S2	**AN/FPN-44B: SWITCH, AIR FLOW: actuates at 2350 ft/min max, deactuates at 1550 ft/min, spdt, 250 vac, 5 amps; 82877 part no. 2A, type 2450; 90348 part no. 1087599G2**	
4S3	SWITCH, SENSITIVE: spdt; interlock type; 90906 part no. MS16106-1	Door Interlock Figure 5-84
4S4	Same as 4S3	Door Interlock Figure 5-85
4S5	Same as 4S3	Door Interlock Figure 5-84
4S6	Same as 4S3	Door Interlock Figure 5-85
4TB1	TERMINAL BOARD: 10 terminal; MIL-T-55164 type 17TB10	Incoming Power Figure 5-84
4TB2	TERMINAL BOARD: 10 terminal; MIL-T-55164 type 8TB10	Incoming Signal Figure 5-84
4TB3	Same as 4TB2	Outgoing Signal Figure 5-84
4TB4	Same as 4TB2	Outgoing Signal Figure 5-84
4TB5	Same as 4TB1	Incoming Power Figure 5-85
4TB6	Same as 4TB2	Incoming Signal Figure 5-85
4TB7	Same as 4TB2	Outgoing Power

TABLE 6-2. LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

DUMMY LOAD, ELECTRICAL, DA-329A/FPN-44A (cont.)

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
		Figure 5-85
4TB8	Same as 4TB2	Outgoing Power Figure 5-85
4T1	TRANSFORMER, CURRENT: 65 amps current rating; 95 ohms impedance; 05280 part no. 1705; 28527 part no. 2138264G1 **(NOTE: 4T1 NO LONGER INSTALLED)**	Monitoring Dummy Load Current Figure 5-84
4XRE1 thru 4XRE36	CLIP, CLAMP: 35-60 amps, 250 volts; 71400 part no. 4; 28527 part no. 1089008G1	4R1 thru 4R36 Clamp Figure 5-84

TABLE 6-2. LORAN TRANSMITTING SET AN/FPN-44A MAINTENANCE PARTS LIST

LOCAL CONTROL UNIT

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
5	LOCAL CONTROL UNIT: provides local control of transmitting set; interface to AN/FPN -60 Transmitter Control Set	System Control Figure 5-7
5K1	RELAY, 4PDT: 120V coil; 77342 part no. KH517A11	A-C Power Selector Figure 5-86
5K2	RELAY, LATCHING, 4PDT: two 28.5 vdc coils 77342 part no. KBP20DC-24	Transmitter Selector Figure 5-86
5S1	SWITCH: Toggle	Transmitter 1 B-Plus Figure 5-86
5S2	Same as 5S1	Local Remote Control Selector Figure 5-86
5S3	Same as 5S1	Transmitter 2 B-Plus Figure 5-86
5S4	SWITCH: Pushbutton, type MS25088-4G	Transmitter 1 Operate Selector Figure 5-86
5S5	Same as 5S4	HV Interlock during Control Transfer Figure 5-86
5S6	Same as 5S4	Transmitter 2 Operate Selector Figure 5-86
5CR1	SEMICONDUCTOR, DIODE: type IN538	Sneak Circuit Prevention Figure 5-86
5CR2	Same as 5CR1	Sneak Circuit Prevention Figure 5-86
5DS1 thru 5DS5	LAMP, INCANDESCENT: 120V, 6 watts; 96906 part no. MS15567-1	Indicator Lamps Figure 5-86
5TB1	TERMINAL BOARD: 12 terminal, barrier; 75382 type 5TB12	Transmitter 1 Interconnection Figure 5-86
5TB2	Same as 5TB1	Transmitter 2 Interconnection Figure 5-86

TABLE 6-2, LORAN TRANSMITTING SET, AN/FPN-44A
MAINTENANCE PARTS LIST (cont.)

LOCAL CONTROL UNIT.

REF DESIG.	NAME AND DESCRIPTION	LOCATING FUNCTION
5XDS1	FRO RECORDS	Transmitter 1 Selected Indicator Figure 5-86
5XDS1A	LAMPHOLDER	
5XDS1B	LENS, RED	Local Control Indicator Figure 5-86
5XDS2	FRO RECORDS	
5XDS2A	Same as 5XDS1A	
5XDS2B	LENS, YELLOW	Remote Control Indicator Figure 5-86
5XDS3	FRO RECORDS	
5XDS3A	Same as 5XDS1A	
5XDS3B	Lens, Green	Transmitter 2 Selected Indicator Figure 5-86
5XDS4	FRO RECORDS	
5XDS4A	Same as 5XDS1A	Ready for transfer Indicator Figure 5-86
5XDS4B	Same as 5XDS1B	
5XDS5	FRO RECORDS	
5XDS5A	Same as 5XDS1A	
5XDS5B	LENS, WHITE	

TABLE 6-3. LORAN TRANSMITTING SET AN/FPN-44A
LIST OF MANUFACTURERS

CODE	NAME	ADDRESS
AAAAA	Strobic Air Corp.	200 Bunting Avenue Trenton N.J. 08611
00736	Filter Products Div. of North American Rockwell Corp.	2500 Miles Road Cleveland, Ohio
AAAAA	Strobic Air Corp.	200 Bunting Avenue Trenton N.J. 08611
00736	Filter Products Div. of North American Rockwell Corp. Air-Maze Plant	2500 Miles Road Cleveland, Ohi 44128
01002	General Electric Co. Industrial and Power Capacitor Products Department	John Street Hudson Valley, NY 12839
01238	Energy Systems An Aldin Co.	3180 Hanover Palo Alto, Calif. 94303
01276	Aeroquip Corp. Industrial Division	1225 W. Main St. Van Wert, Ohio 45891
01526	General Electric Co. Data Communication Product Dept.	General Electric Drive Waynesboro, Va. 22980
02295	General Electric Co. General Purpose Control Products Dept.	P.O. Box 913 Bloomington, Ill. 61701
02329	Glastic Corp, The	4321 Glenridge At Green Cleveland, Ohio 44121
03508	General Electric Co. Semi-Conductor Products Dept.	Electronics Park Syracuse, N.Y. 13201
04072	Bell Industries, Inc., Miller J.W. Div., Components Div.	P.O. Box 5825 19070 Reyes Ave. Compton, Calif. 90224
04222	AVX Ceramics Corp.	P.O. Box 867 Aerovox Road Myrtle Beach, S.C. 29577
04713	Motorola Inc. Semiconductor Products Div.	5005 E McDowell Rd Phoenix, Ariz. 85008
05280	Pearson Electronics Inc.	4007 Transport St. Palo Alto, Calif. 94303

TABLE 6-3, LORAN TRANSMITTING SET, AN/FPN-44A
LIST F MANUFACTURERS (cont.)

CODE	NAME	ADDRESS
05820	Wakefield Engineering Inc.	Audobon Road Wakefield, MA. 01880
06631	ITT Bell and Gossett-Hydronics A Unit of ITT Fluid Handling Div.	8200 Austin Morton Grove, Ill. 60053
06980	Varian Associates Eimac Division	301 Industrial Way San Carlos, CA. 94070
07077	American Industrial Standards Div.	Detroit, Mich.
10646	Carborundum Co., The	P.O. Box 337 Niagara Falls, N.Y. 14302
12670	Electromagnetic Industries, Inc.	2005 Calumet Street Clearwater, Fl. 33515
12697	Clarostat Mfg. Co., Inc.	Lower Washington Street Dover, N.H. 03820
12969	Unitrode Corp.	580 Pleasant Street Watertown, Ma. 02172
13327	Solitron Devices, Inc.	256 Oak Tree Road Tappan, N.Y. 10983
14604	Elmwood Sensors, Inc.	1655 Elmwood Avenue Cranston, R.I. 14604
14655	Cornell-Dubilier Electronics Div. of Federal Pacific Electric Co. Government Contracts Dept.	150 Avenue L Newark, N.J. 07101
14959	Crane Co.	4100 S. Kedzie Ave Chicago, Ill. 60632
15249	Multronics Inc.	12307 Washington Avenue Rockville, Md. 20852
15309	A and M Instrument	5 Nassau Street Rockville Ctr, NY 11571
15395	Permal, Inc.	P.O. Box 718 Mount Pleasant, PA. 15666

TABLE 6-3, LORAN TRANSMITTING SET, AN/FPN-44A
LIST F MANUFACTURERS (cont.)

CODE	NAME	ADDRESS
15413	General Electric Co. Commercial Distribution Transformer Products Dept. Voltage Regulator Business Sect.	100 Woodlawn Ave Pittsfield, MA. 01201
16630	LI Metals Inc.	Garvies Point Rd. Glen Cove, N.Y. 11542
16727	Condenser Products Corp.	P.O. Box 997 Brooksville, Fl. 33512
19647	Caddock Electronics, Inc.	3127 Chicago Avenue Riverside, Calif. 92507
20948	ITT Electron Tube Div. International Telephone and Telegraph Corp.	P.O. Box 100 3100 Charlotte Ave Easton, Pa. 18042
21810	Federal Pacific Electric Co.	150 Avenue L Newark, N.J. 07105
21845	Solitron Devices Inc. Transistor Division	1177 Blue Heron Boulevard Riviera Beach, Fl. 33404
22375	Fisher and Porter Co.	County Line Rd. Warminster, Pa. 18974
23598	Ross Engineering Corp.	559 Westchester Dr Campbell, CA. 95008
24446	General Electric Co.	1 River Road Schenectady, N.Y. 12305
24546	Corning Glass Works Electronic Components Div.	550 High St. Bradford, PA. 16701
25497	Metermaster	5646 Jillson St. Los Angeles, CA. 90040
26862	Robicon Corp.	100 Sagamore Hill Road Plum Industrial Pk Pittsburgh, Pa. 15239
27014	National Semiconductor Corp.	2900 San Ysidro Way Santa Clara, CA. 95051

TABLE 6-3, LORAN TRANSMITTING SET, AN/FPN-44A
LIST F MANUFACTURERS (cont.)

CODE	NAME	ADDRESS
27434	Bell Fasteners Corp.	P.O. Box 567 352 Evelyn Street Paramus, N.J. 07652
28432	General Electric Co. Circuit Protective Devices Product Dept.	41 Woodford Ave Plainville, CT. 06062
28527	ITT Avionics Division	390 Washington Ave Nutley, N.J. 07110
30327	Imperial-Eastman Corp. Imperial Div.	6300 W. Howard St. Chicago, Ill. 60648
32997	Bourns Inc. Trimpot Products Division	1200 Columbia Ave Riverside, CA. 92507
33324	Kenyon Electronics Inc.	1057 Summit Avenue Jersey City, N.J. 07307
33789	Fairchild Defense Products A Div. of Fairchild Camera and Instrument Corp.	13 East Edison St. Amityville, NY 11701
42498	National Radio Co., Inc.	78 Stone Place Melrose, Ma. 02176
44655	Ohmite Manufacturing Co.	3601 W. Howard St. Skokie, Ill. 60076
49956	Raytheon Co.	141 Spring St. Lexington, Ma. 02173
50157	N L Industries Inc Electronics Dept	P.O. Box 787 Muskegon, MI. 49443
52737	ITE Imperial Corp. Distribution and Controls Group Ohio Operations	811 N. Main St. Bellefontaine, Oh. 43311
53021	Sangamo Electric Co.	P.O. Box 3347 1301 N. 11th Springfield, Ill. 62708
54527	Shell Oil Co.	50 W. 50th St. New York, N.Y. 10020
56289	Sprague Electric Co.	North Adams, MA. 01247
58308	Filmor Inc. Knife Switch Div.	Alliance, OH. 44601

TABLE 6-3, LORAN TRANSMITTING SET, AN/FPN-44A
LIST F MANUFACTURERS (cont.)

CODE	NAME	ADDRESS
58474	Superior Electric Co., The	383 Middle Street Bristol, Ct. 06010
58849	FMC Corp. Syntron Division	1003 Lexington Avenue Homer City, Pa. 15748
60969	General Electric Co. Distribution Assemblies Products Dept.	41 Woodford Ave. Plainville, Ct. 06062
61349	Ametek Inc. United States Gauge Div.	909 Clymer Ave. Sellersburg, Pa. 18960
61775	Westinghouse Air Brake Co. Signal and Communications Div.	1789 Braddock Ave. Swissville, Pa. 15218
63743	Ward Leonard Electric Co., Inc.	31 South Street Mount Vernon, N.Y. 10550
70563	Amperite Co.	600 Palisades Ave Union City, N.J. 07087
71183	Bryant Electric Co.	1421 State Street Bridgeport, Ct. 06602
71400	Bussman Manufacturing Div. Mc Graw-Edison Co.	2536 W. Univ. St. St. Louis, Mo. 63107
71424	Chase Shawmut Co., The	374 Merrimac St. Newburgport, Ma. 01950
71450	CTS Corp.	1142 W Beardsley Avenue Elkhart, In. 46514
71482	Clare, C. P. and Co.	3101 Pratt Blvd Chicago, Ill. 60645
71590	Centralab Electronics Div. of Globe-Union Inc.	5757 GreenBay Ave Milwaukee, Wis. 53201
71785	TRW Electronics Components Cinch Connector Operations	1501 Morse Ave. ElkGrove Vlg. Ill. 60007
72619	Dialight Corp. Sub. of Digitronics Corp.	60 Stewart Ave Brooklyn, N.Y. 11237

TABLE 6-3, LORAN TRANSMITTING SET, AN/FPN-44A
LIST F MANUFACTURERS (cont.)

CODE	NAME	ADDRESS
72653	GC Electronics A Division of Hydrometals Inc.	400 S. Wyman St. Rockford, Ill. 61101
72661	Dixon Valve and Coupling Co.	2nd St&Columbia Av Philadelphia, Pa. 19122
72819	Carborundum Co., The Refractories and Electronics Div. Globar Plant	P.O. Box 339 Niagara Falls, NY 14302
72825	Eby Hugh H. Inc.	4701 Germantown Avenue Philadelphia, Pa. 19144
72982	Erie Technological Products Inc.	644 W. 12th Street Erie, PA. 16512
73386	Freed Transformer Co., Inc.	1736 Weirfield St Brooklyn, N.Y. 11227
73631	Curtis Development and Mfg. Co.	3266 N. 33rd St Milwaukee, Wis. 53216
73905	ITT Jennings	970 McLoughlin Ave San Jose, Calif. 95116
74178	Porcelain Products Co. Div.	225 N. Patterson Street Carey, Ohio 43316
74545	Hubbell Harvey Inc.	State Street and Bostwick Ave Bridgeport, Ct. 06602
74829	Ilsco Corp	4730 Madison Road Cincinnati, Ohio 45227
74868	Bunker Ramo Corp. Amphenol RF Div.	33 E. Franklin Danbury, Ct. 06810
74970	Johnson, E.F. Co.	Church Road Bridgeport, Ct. 19405
75382	Kulka Electric Corp.	633-643 S Fulton Avenue Mount Vernon, N.Y. 10550
75539	Lapp Insulator Div. Interpace Corp.	Gilbert Street Leroy, N.Y. 14482

TABLE 6-3, LORAN TRANSMITTING SET, AN/FPN-44A
LIST F MANUFACTURERS (cont.)

CODE	NAME	ADDRESS
76487	Millem James Mfg. Co., Inc.	150 Exchange St. Malden, Ma. 02148
76854	Oak Industries, Inc. Switch Division	S. Main Street Crystal Lake, Ill. 60014
77342	AMF Inc. Potter and Brumfield Div.	P.O. Box 522 1200 E. Broadway Princeton, In. 47570
77662	ITE Imperial Corporation Power Equipment Group Greensburg Division	P.O. Box 98 Greensburg, PA. 77662
78277	Sigma Industries, Inc.	170 Pearl Street South Braintree, Ma. 02185
78290	Struthers-Dunn Inc.	Lambs Road Pitman, N.J. 08071
80031	Mepco/Electra Inc., A North American Phillips Co.	Columbia Road Morristown, N.J. 07960
80145	LFE Corp. Process Control Division	7100 Wilson Mills Road Chesterland, Ohio 44026
80294	Bourns Inc. Instrument Div.	6135 Magnolia Ave Riverside, CA. 92506
81349	Military Specifications Promulgated by Military Departments/Agencies under Authority of Defense Standardization Manual 4120 3-M	
82415	North American Phillips Controls Corp.	E Church & 2nd Ave Frederick, Md. 21701
82877	Rotron Inc.	7-9 Hasbrouck Lane Woodstock, N.Y. 12498
83851	Kurman Instruments, Inc.	15 Burke Lane Syosset, N.Y. 11791
84411	TRW Electronic Components TRW Capacitors	112 W. First St. Ogallala, Ne. 69153
88245	Litton Systems, Inc. Useco Division	13536 Saticoy St. Van Nuys, CA. 91409

TABLE 6-3, LORAN TRANSMITTING SET, AN/FPN-44A
LIST F MANUFACTURERS (cont.)

CODE	NAME	ADDRESS
88422	General Electric Co. General Purpose Motor Business Dept.	2000 Taylor St. Fort Wayne, In. 46804
89020	Control Products Div. Amerace Corp.	1065 Floral Ave Union, N.J. 07083
89481	Westinghouse Electric Supply Co.	Westinghouse Bldg Gateway Center P.O. Box 448 Pittsburgh, Pa. 15222
90201	Mallory Capacitor Co. Division of P.R. Mallory & Co., Inc.	3029 E Washington Street P.O. Box 372 Indianapolis, In. 46206
90348	ITT Laboratories, Division ofITT Corp.	Nutley, N.J.
90800	Haynes Manufacturing Co. Division Zurn Industries Inc.	801 W 12th St Erie, Pa. 16512
91506	Augat Inc.	33 Perry Avenue Attleboro, Ma. 02703
91637	Dale Electronics Inc.	P.O. Box 609 Columbus, Ne. 68601
91662	Elco Corp.	Maryland Rd & Computer Avenue Willow Grove, Pa. 19090
96906	Military Standards Promulgated by Military Departments under Authority of Defense Standardization Manual 4120 3-M	
97182	Sterling Transformer Corp.	510 Driggs Avenue Brooklyn, N.Y. 11211
97525	Electronic Engineering Co. of California/EECO	1441 E. Chestnut Ave. Santa Ana, CA. 92702
99928	Branson Corp.	P.O. Box 147 Newton, N.J. 07860

7.0 **SCHEMATIC AND LOGIC DIAGRAMS.** This section includes all the logic and schematic diagrams that fully define the Loran Transmitting Set AN/FPN-44A. It also includes details of connectivity diagrams for certain tubes. Figures 7-1 through 7-16 are logic and wiring diagrams that are mostly used for trouble shooting. Figures 7-17 through 7-52 are detailed schematic diagrams used mostly for the service and repair of the transmitting set.

This page is intentionally left blank

INDICATOR CROSS-REFERENCE INDEX

INDICATOR	REF DESIG	SHT No.
LEFT PA BIAS CURRENT meter	1A4M7	8
RIGHT PA BIAS CURRENT metER	1A4M8	8
VOLT meter	1A4A3M1	9
1A6V1 CATHODE CURRENT meter	1A6M1	8
1A6V2 CATHODE CURRENT meter	1A6M2	8
1A6V3 CATHODE CURRENT meter	1A6M3	8
1A6V4 CATHODE CURRENT meter	1A6M4	8
LEFT 1st IPA CATHODE OVERLOAD	1A12DS1	8
RIGHT 1st IPA CATHODE OVERLOAD	1A12DS2	8
LEFT PA BIAS OVERLOAD	1A12DS3	8
RIGHT PA BIAS OVERLOAD	1A12DS4	8
1A6V3 CATHODE OVERLOAD	1A12DS5	8
1A6V2 CATHODE OVERLOAD	1A12DS6	8
PA 1A6 INLET OVERTEMPERATURE	1A12DS7	8
PA 1A6 OUTLET OVERTEMPERATURE	1A12DS8	8
WATER LEVEL	1A12DS9	8
LEFT PA BIAS UNDERVOLTAGE	1A12DS10	8
RIGHT PA BIAS UNDERVOLTAGE	1A12DS11	8
STANDBY	1A12DS12	5
OPERATE	1A12DS13	5
1A6V1 PA CATHODE OVERLOAD	1A12DS34	8
1A6V4 PA CATHODE OVERLOAD	1A12DS35	8
WATER ON	1A53A2DS1	4
DOOR INTERLOCK	1A53A2DS2	4
BIAS AND LOW VOLTAGE ON	1A53A2DS5	5
FILAMENTS READY	1A53A2DS7	4
AIR ON	1A53A2DS8	4
PLATE ON	1A53A2DS9	5
AC OVERLOAD	1A53A2DS10	7
PLATE TRANSFORMER OVERTEMPERATURE	1A53A2DS11	7
3 STRIKE	1A53A2DS12	7
IPA OVERLOAD	1A53A2DS13	7
PA OVERLOAD	1A53A2DS14	7
208 V EMERGENCY STOP POWER	1A53A2DS44	3
460 V EMERGENCY STOP POWER	1A53A2DS45	3
PLATE HOURS meter	1A53A2M1	5
PA PLATE VOLTAGE meter	1A53A2M2	6
IPA PLATE VOLTAGE meter	1A53A2M3	6
5 KV BIAS meter	1A53A2M4	5
AC VOLTAGE meter	1A53A2M5	6
FILAMENTS HOURS meter	1A53A2M6	4
PA PLATE CURRENT meter	1A53A2M7	6
IPA PLATE CURRENT meter	1A53A2M8	6
LOW VOLTAGE PLATE meter	1A53A2M9	6

Figure 7-1 AN/FPN-44A Control Circuitry (sheet 1 of 9)

INDICATOR CROSS-REFERENCE INDEX (cont.)

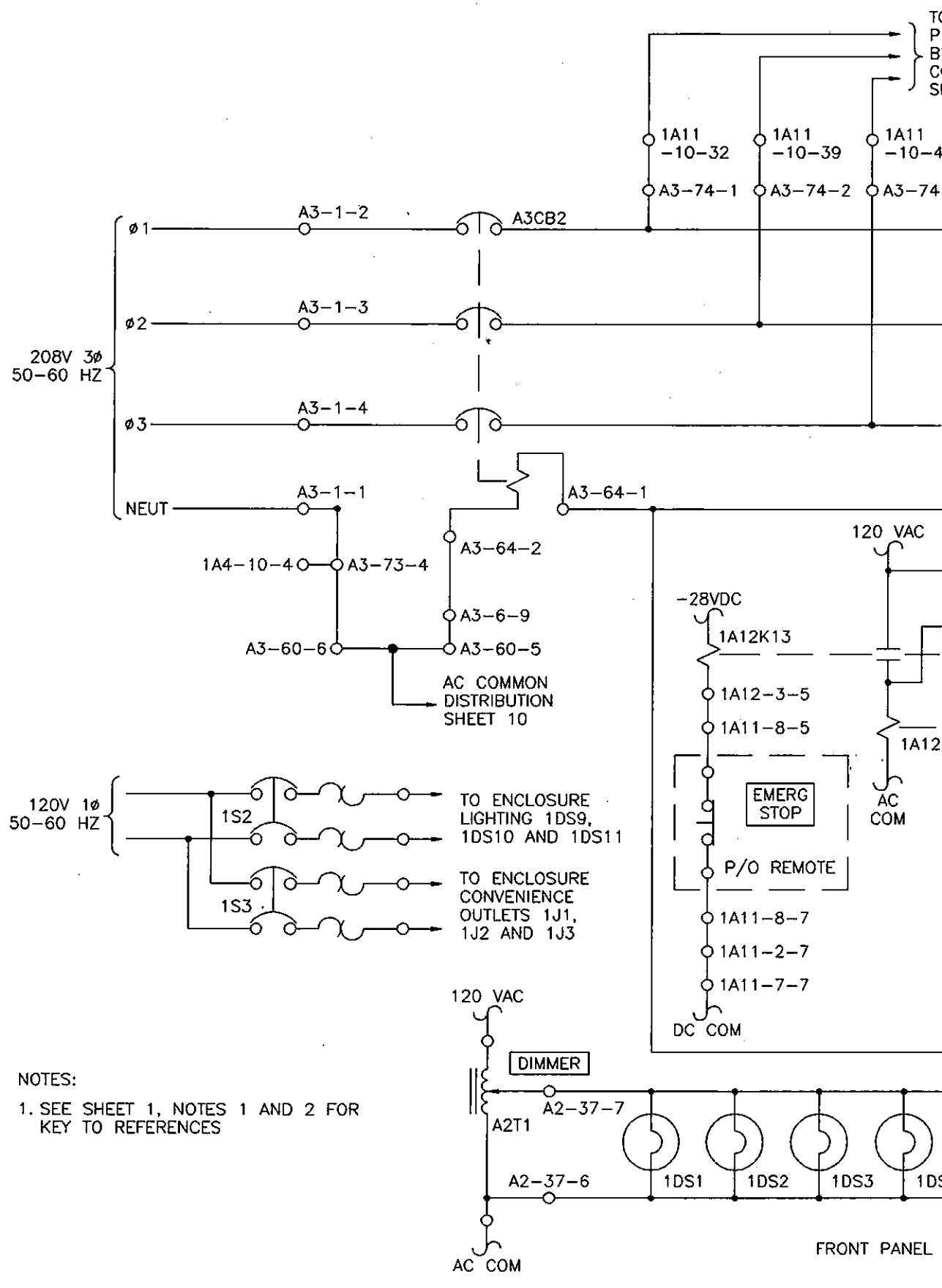
INDICATOR	REF DESIG	SHT No.
AC VOLTAGE meter	1A53A3M1	3
TRANSMITTER #1 OPERATE	3DS1	5
TRANSMITTER #2 OPERATE	3DS2	5

NOTES:

1. TERMINAL BOARD CONNECTIONS ARE INDICATED USING AN ABBREVIATED CODE CONSISTING OF THE ASSEMBLY REFERENCE DESIGNATION, TERMINAL BOARD NUMBER AND PIN NUMBER. FOR EXAMPLE, 1A4-1-7 MEANS CONNECTIONS IS MADE TO PIN 7 OF TERMINAL BOARD TB1 ON ASSEMBLY 1A4.

2. RELAYS, INDICATORS, AND TERMINAL BOARDS ON ALL ASSEMBLIES EXCEPT 1A53 ARE PREFIXED WITH COMPLETE ASSEMBLY REFERENCE DESIGNATION. ON POWER SUPPLY 1A53, RELAYS, INDICATORS, AND TERMINAL BOARDS ARE PREFIXED WITH SUBASSEMBLY REFERENCE DESIGNATION. (I.E., A3-1-4 MEANS CONNECTION IS MADE TO PIN 4 OF TERMINAL BOARD TB1 ON ASSEMBLY 1A53A3).

Figure 7-1 AN/FPN-44A Control Circuitry (sheet 2 of 9)



NOTES:

1. SEE SHEET 1, NOTES 1 AND 2 FOR KEY TO REFERENCES

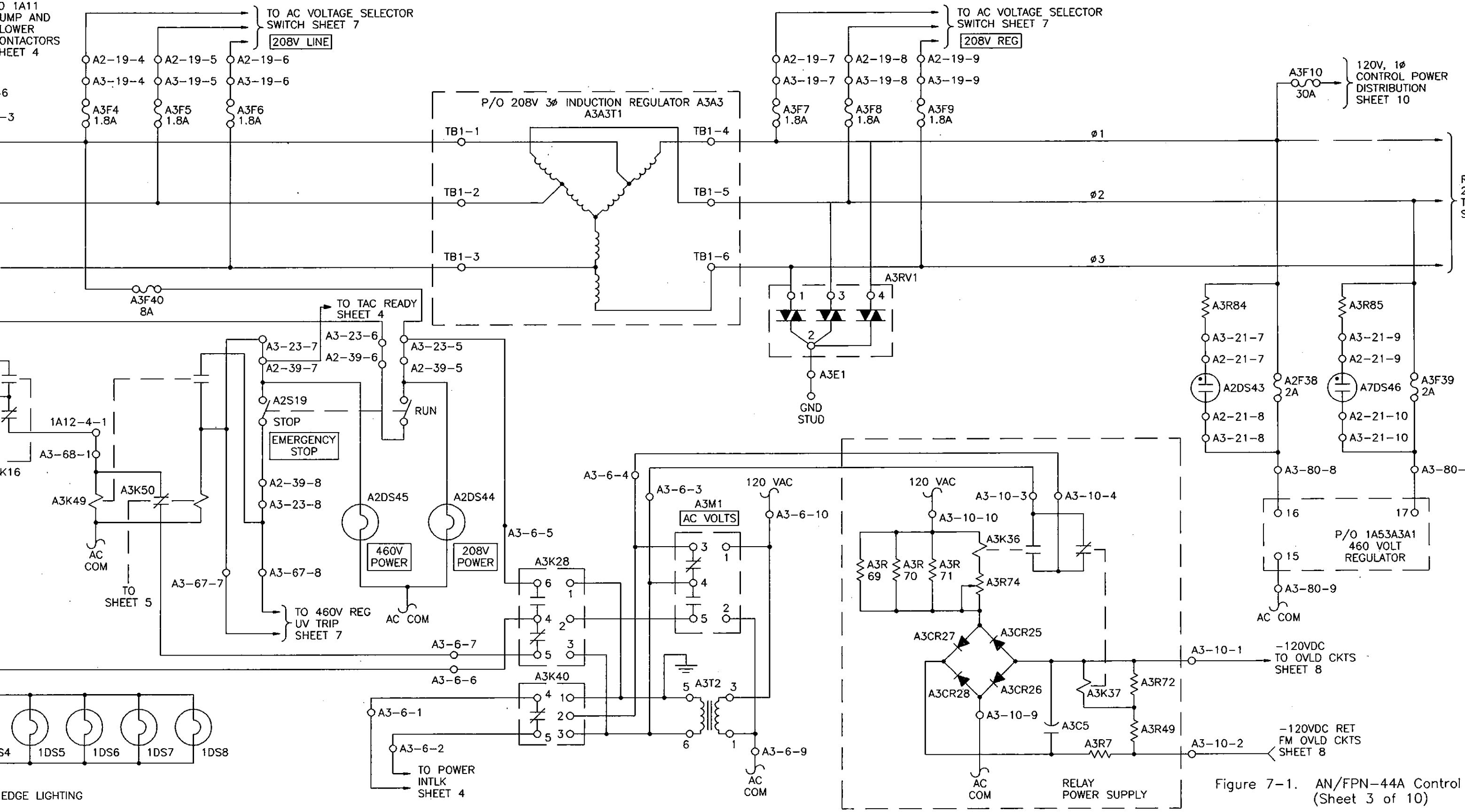


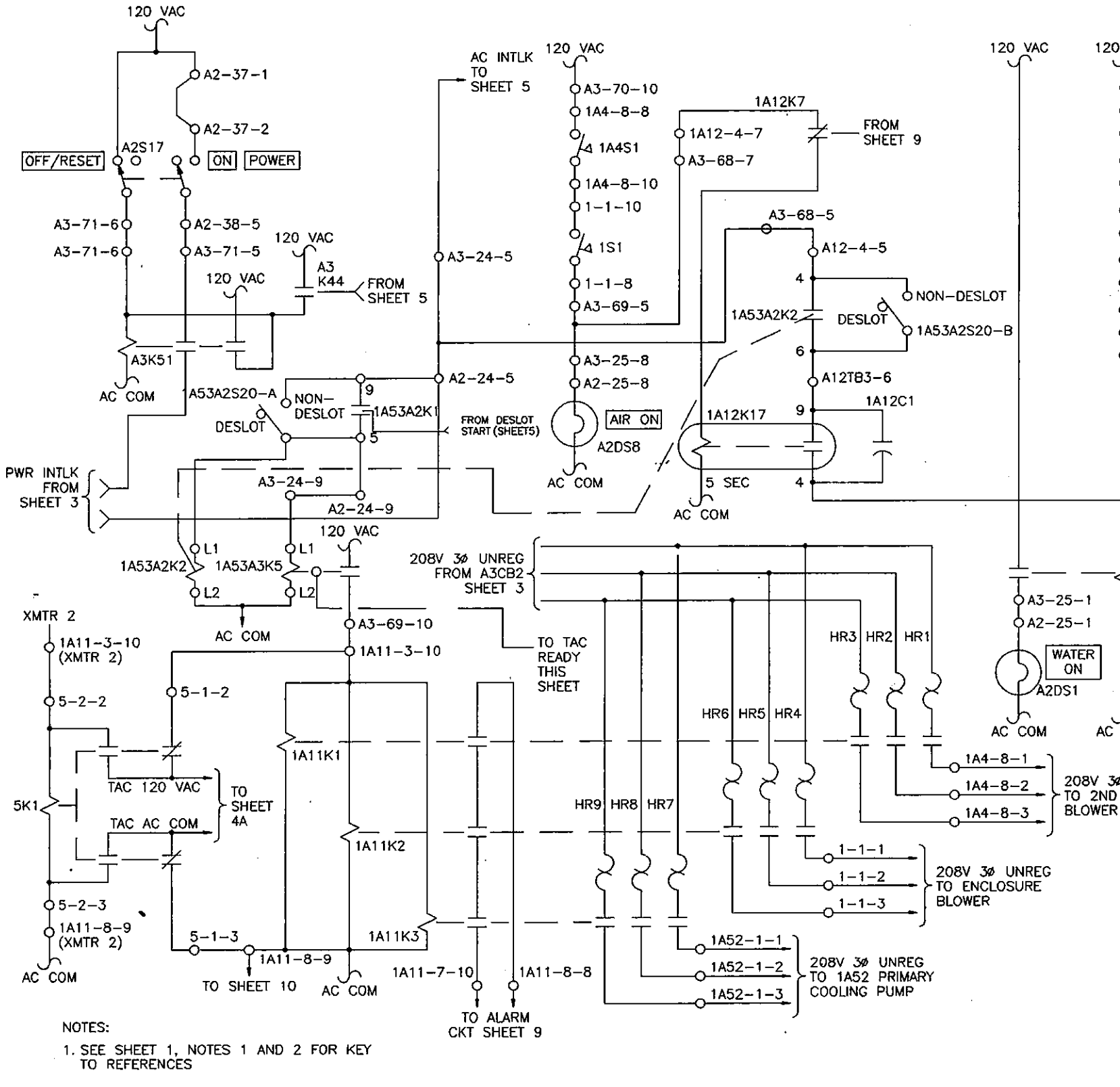
Figure 7-1. AN/FPN-44A Control Circ
(Sheet 3 of 10)

ATED
3ø

4

cuitry

/7-6



NOTES:

1. SEE SHEET 1, NOTES 1 AND 2 FOR KEY TO REFERENCES

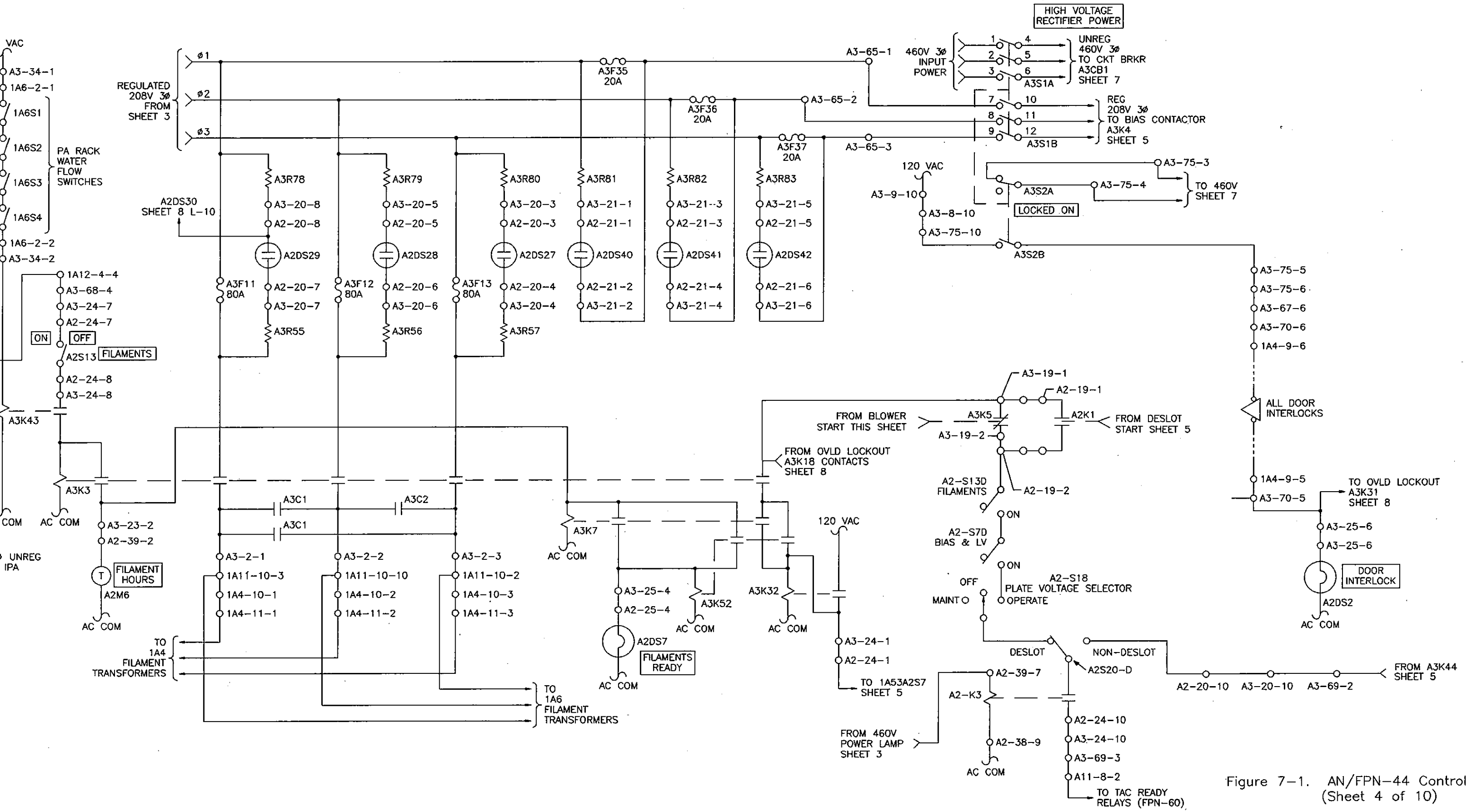
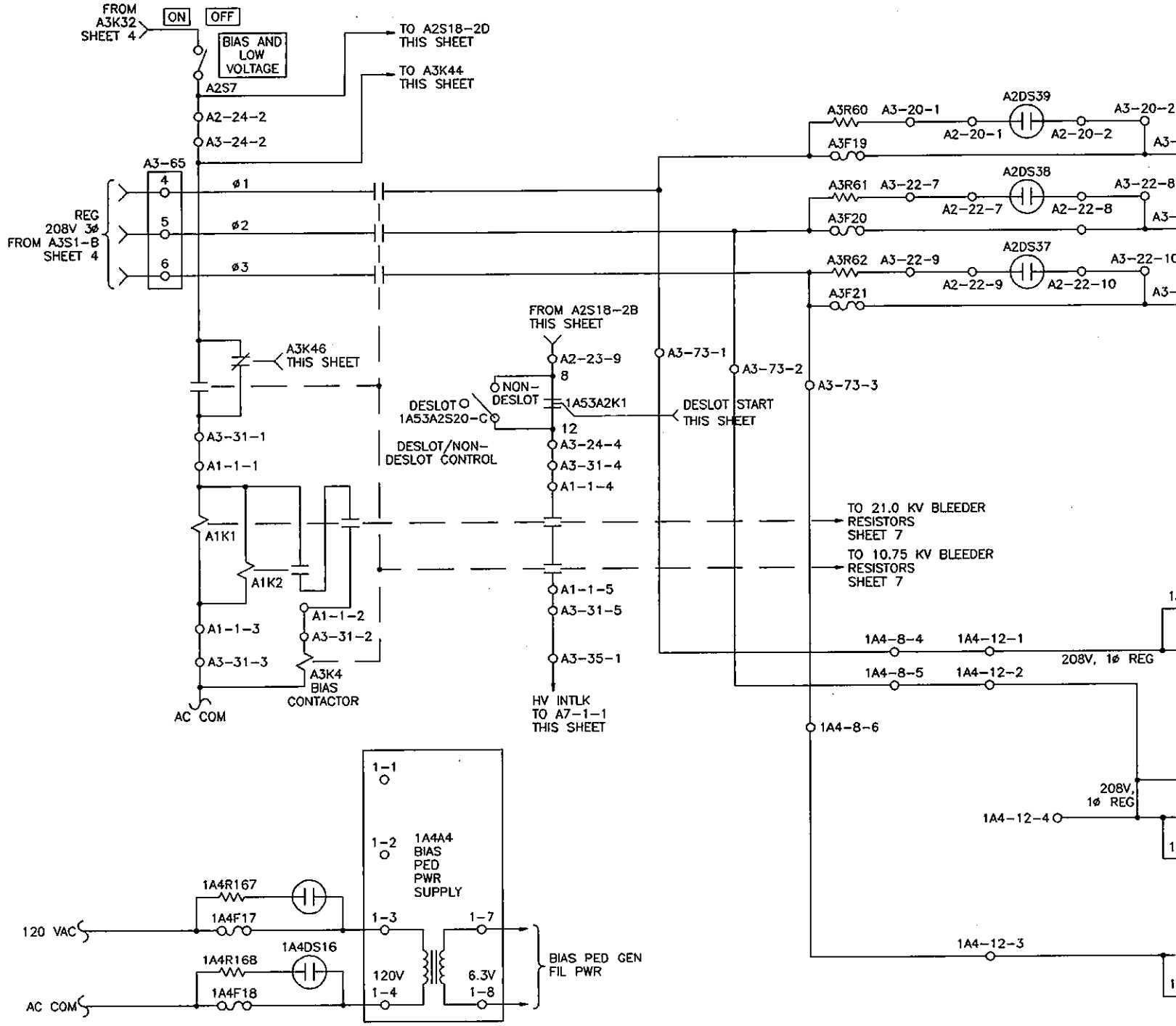


Figure 7-1. AN/FPN-44 Control Circ
(Sheet 4 of 10)

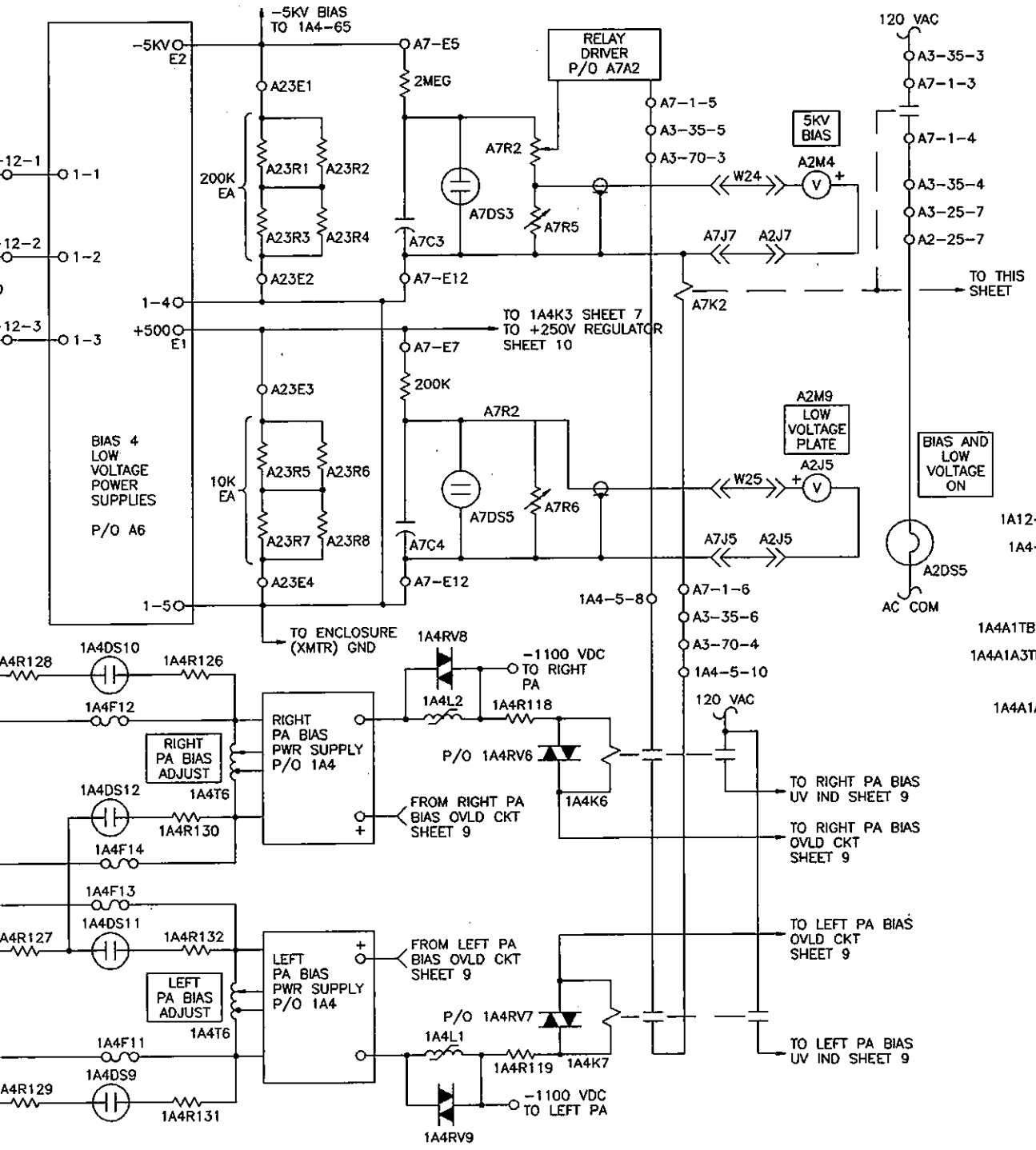
uitry

7–8



NOTES:

1. TO OPPOSITE TRANSMITTER GROUP.
2. SEE SHEET 1, NOTES 1 AND 2 FOR KEY TO REFERENCES.



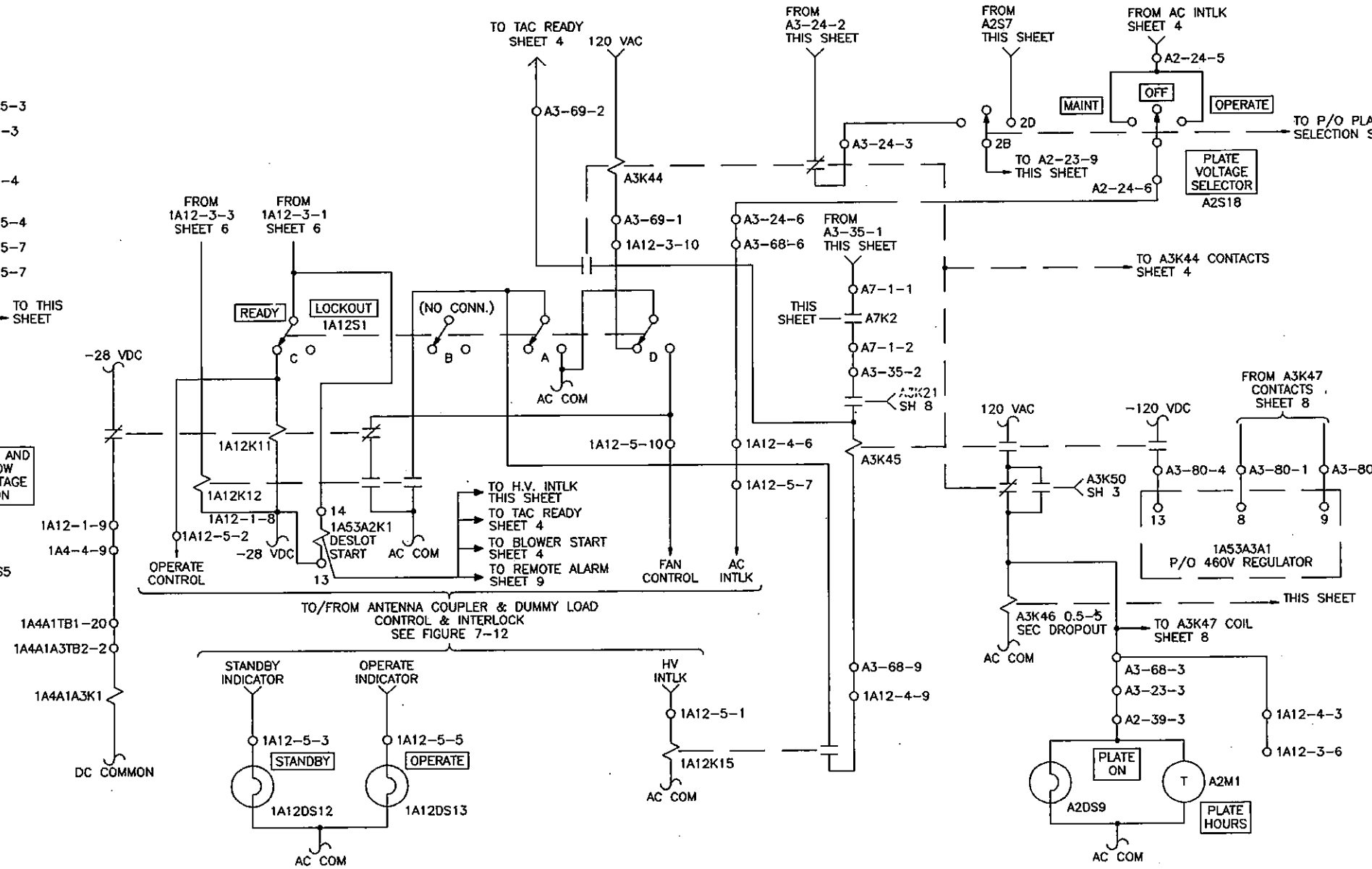


Figure 7-1. AN/FPN-44 Control Circui
(Sheet 5 of 10)

GE
7

try

10

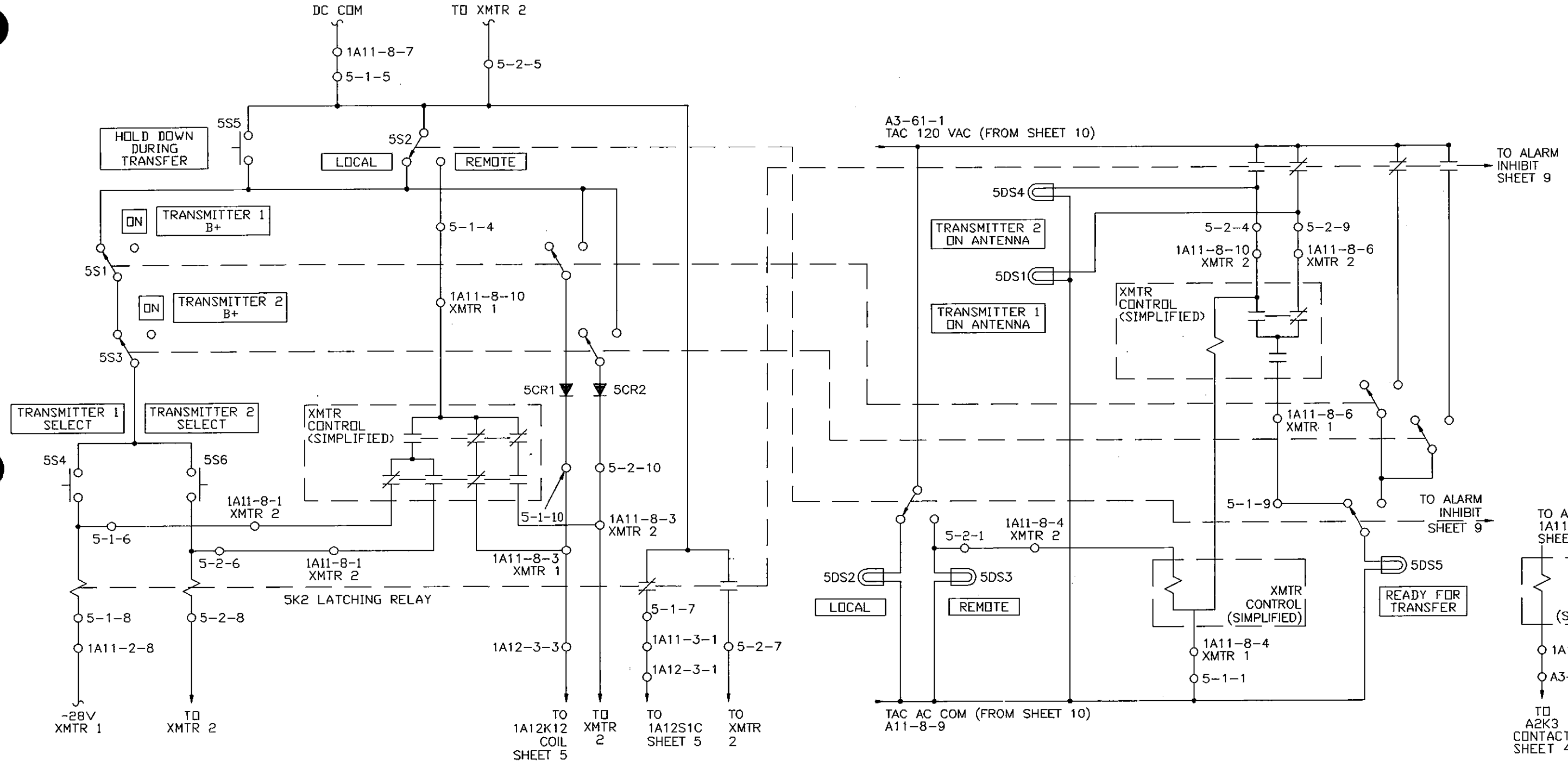
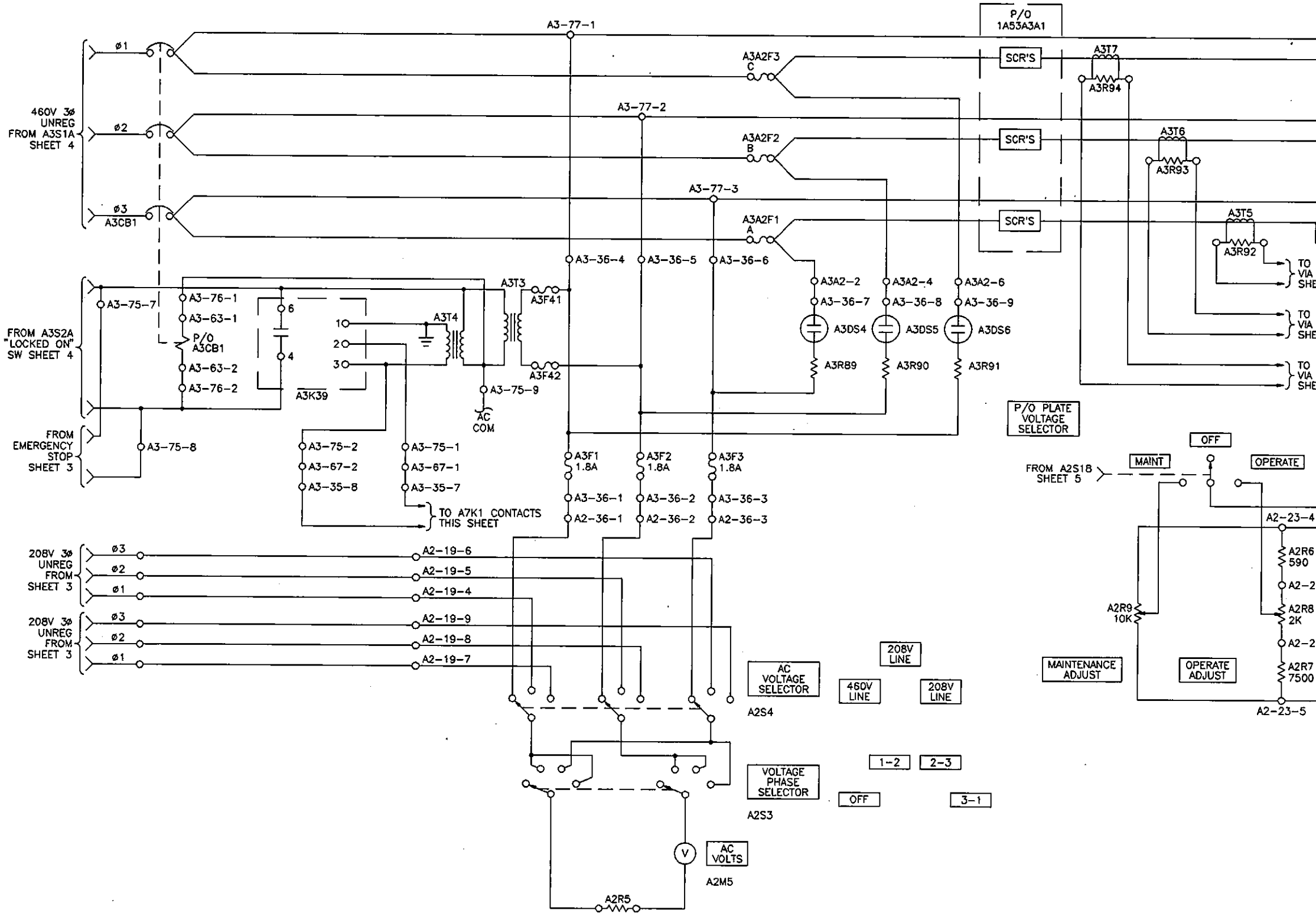


Figure 7-1. AN/FPN-44 Control Circuitry (Sheet 6 of 10)



NOTES:

1. SEE SHEET 1 NOTES 1 AND 2 FOR KEY TO REFERENCES.

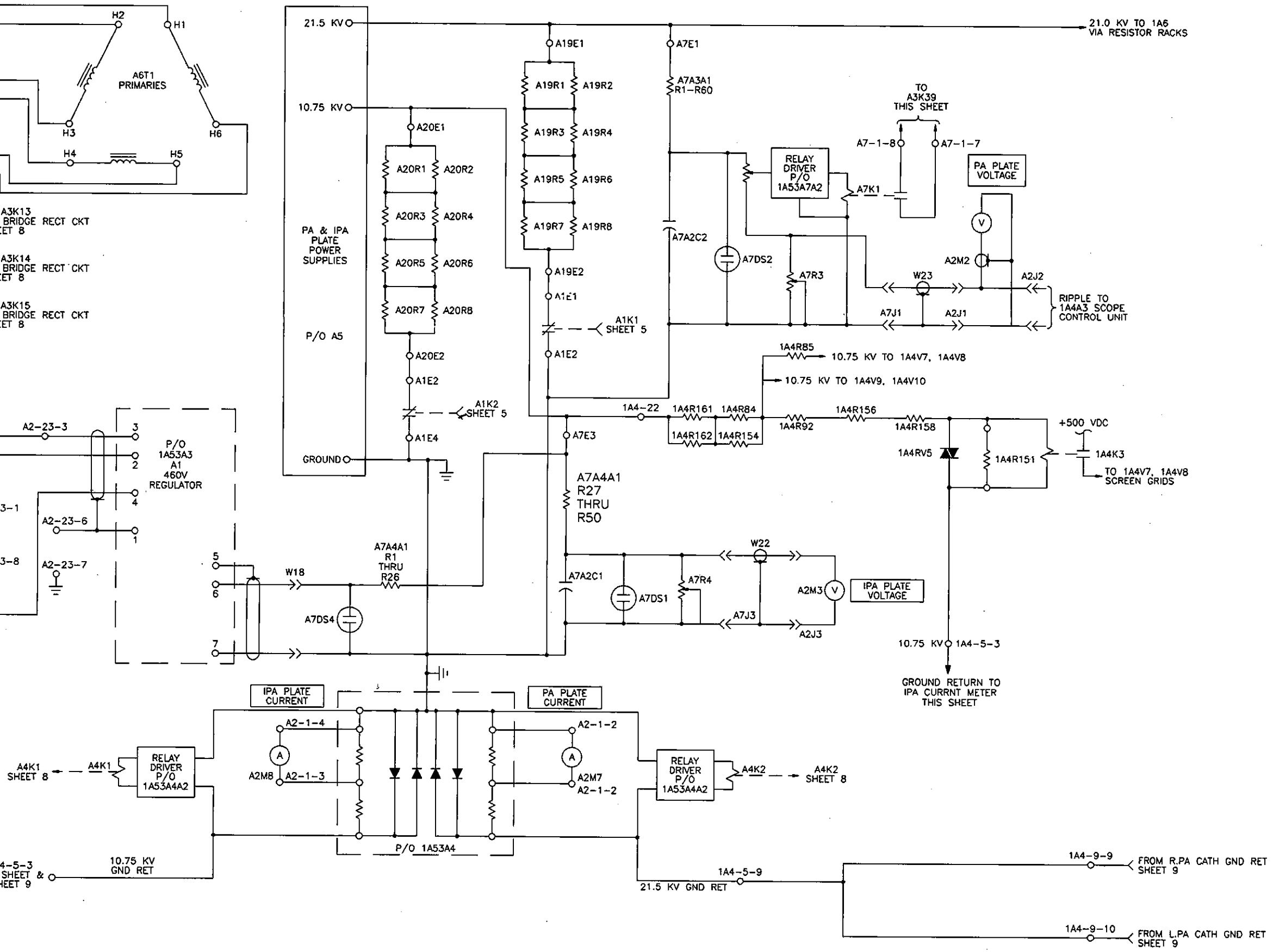


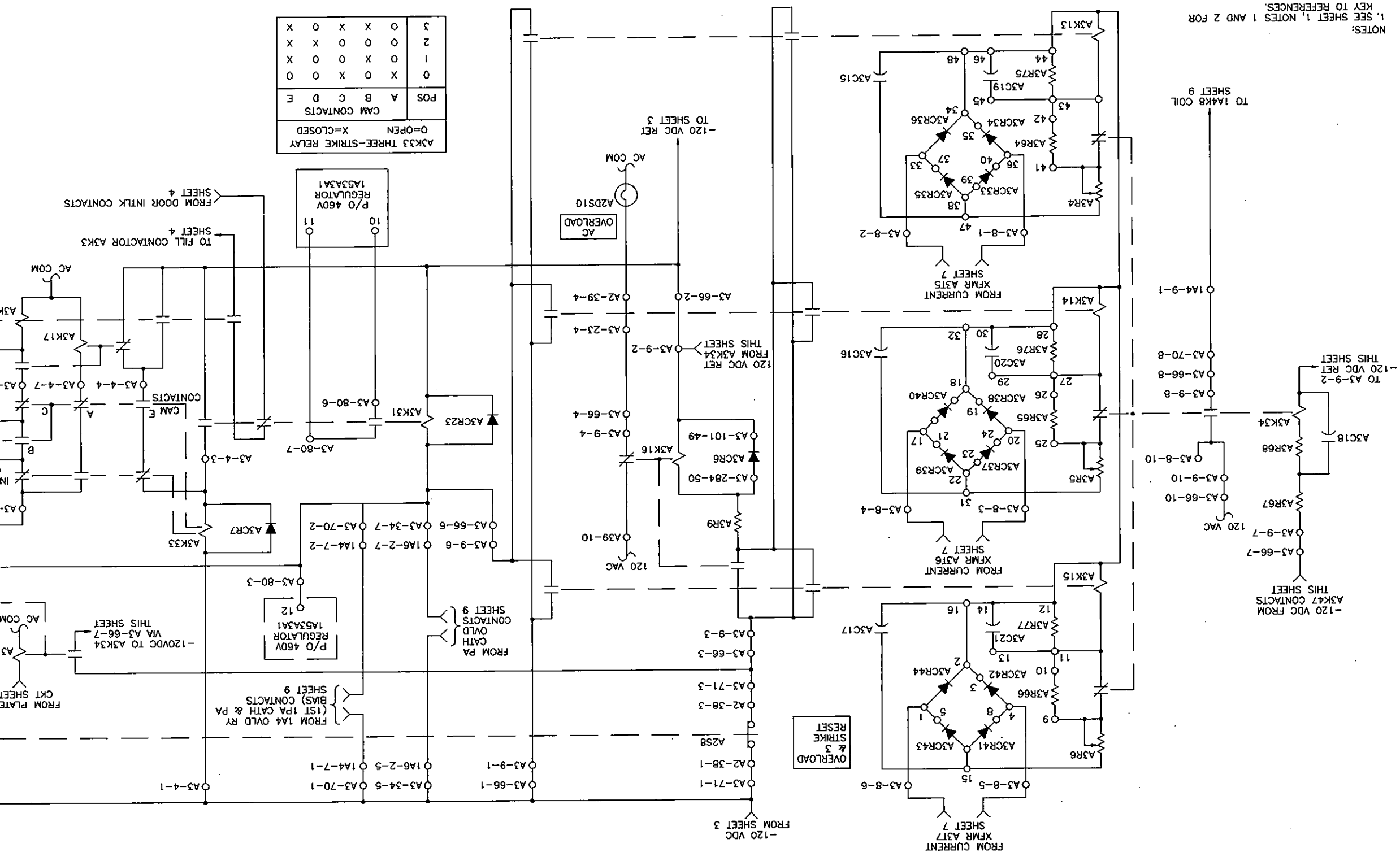
Figure 7–1. AN/FPN–44 Control Circui
(Sheet 7 of 10)

try

4

CHANGE 4

NOTES:
1. SEE SHEET 1, NOTES 1 AND 2 FOR KEY TO REFERENCES.



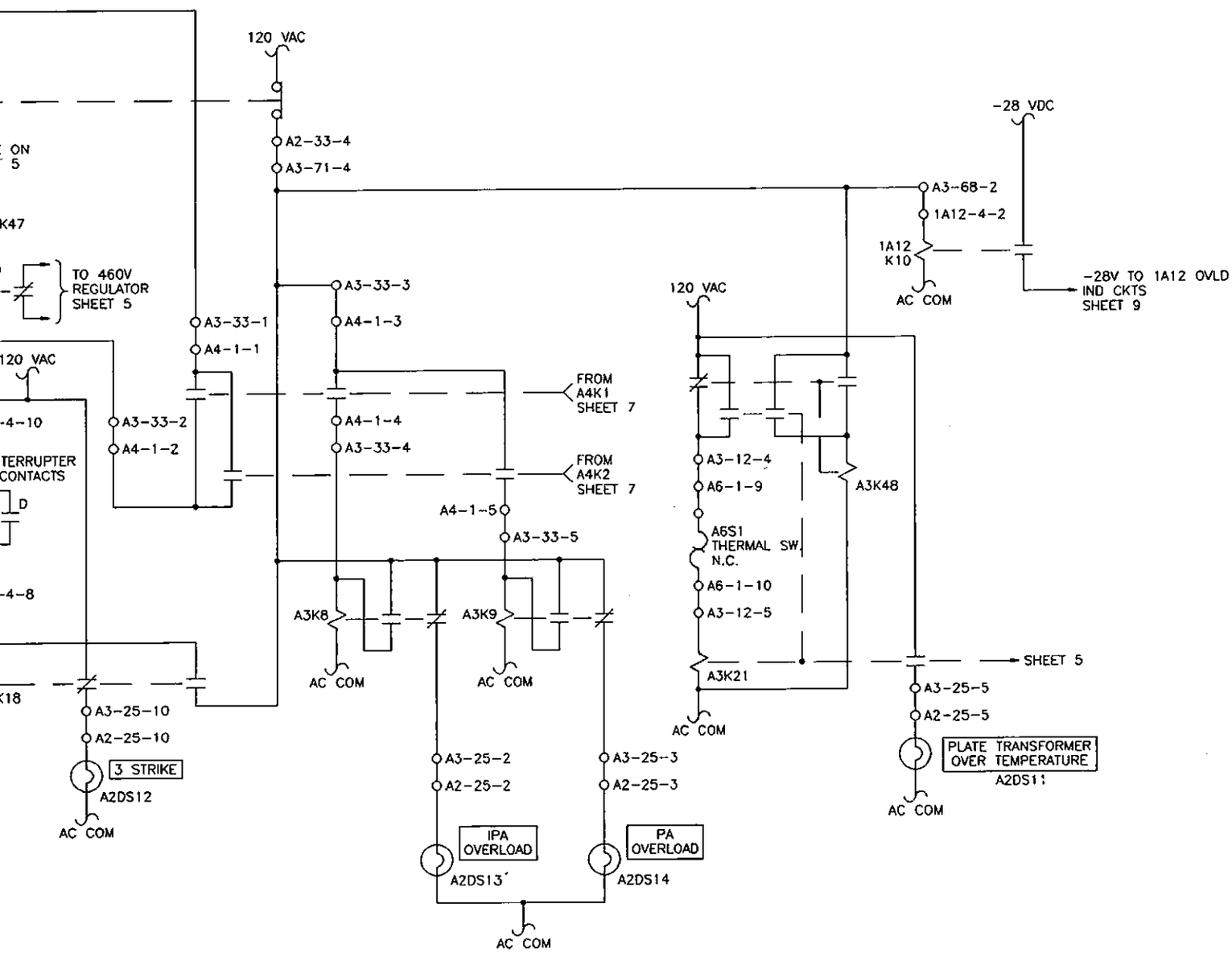
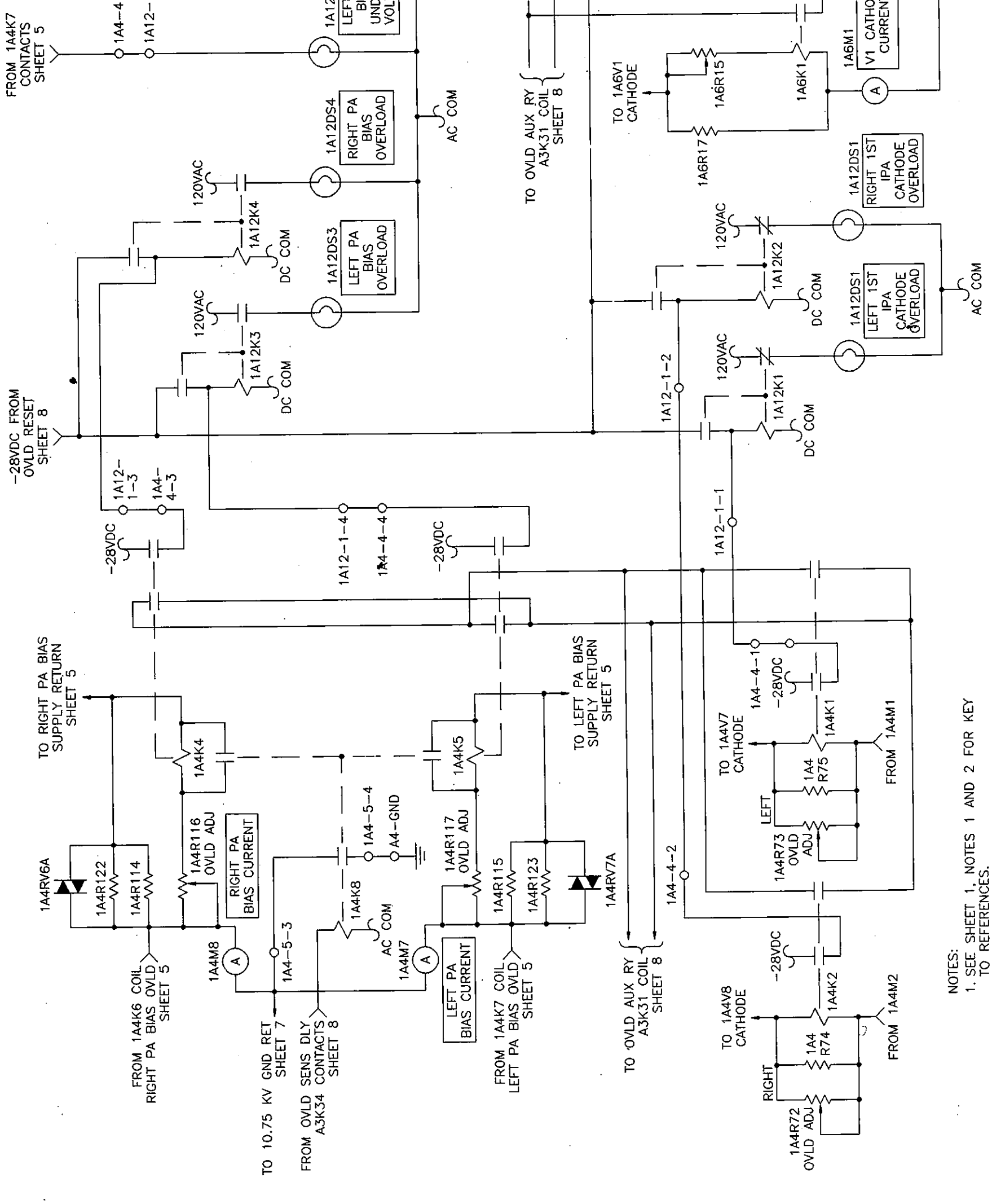


Figure 7-1. AN/FPN-44A Control Circuitry
(Sheet 8 of 10)



NOTES:
1. SEE SHEET 1, NOTES 1 AND 2 FOR KEY TO REFERENCES.

CHANGE 4

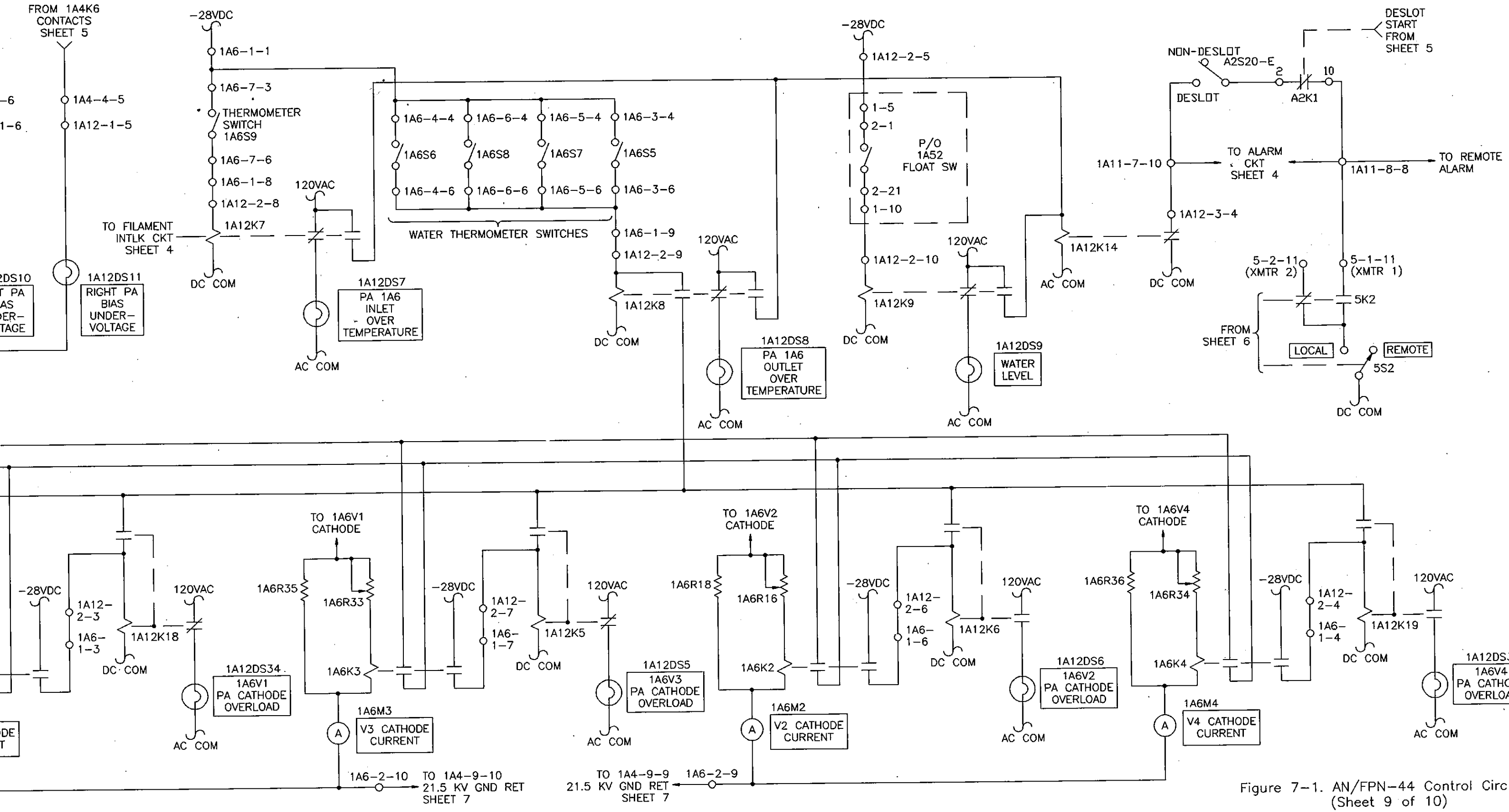


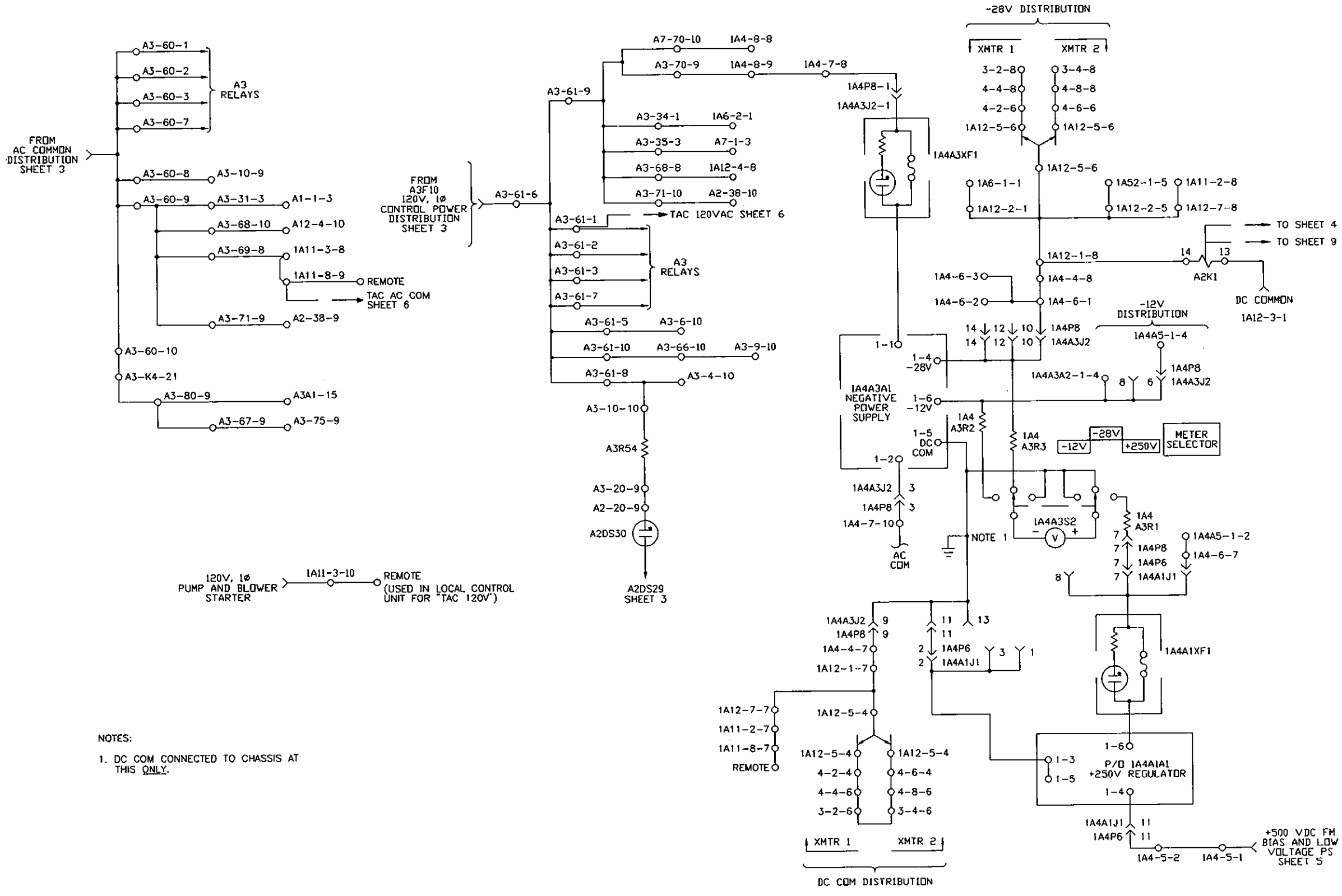
Figure 7-1. AN/FPN-44 Control Circ
(Sheet 9 of 10)

35

ODE
AD

uitry

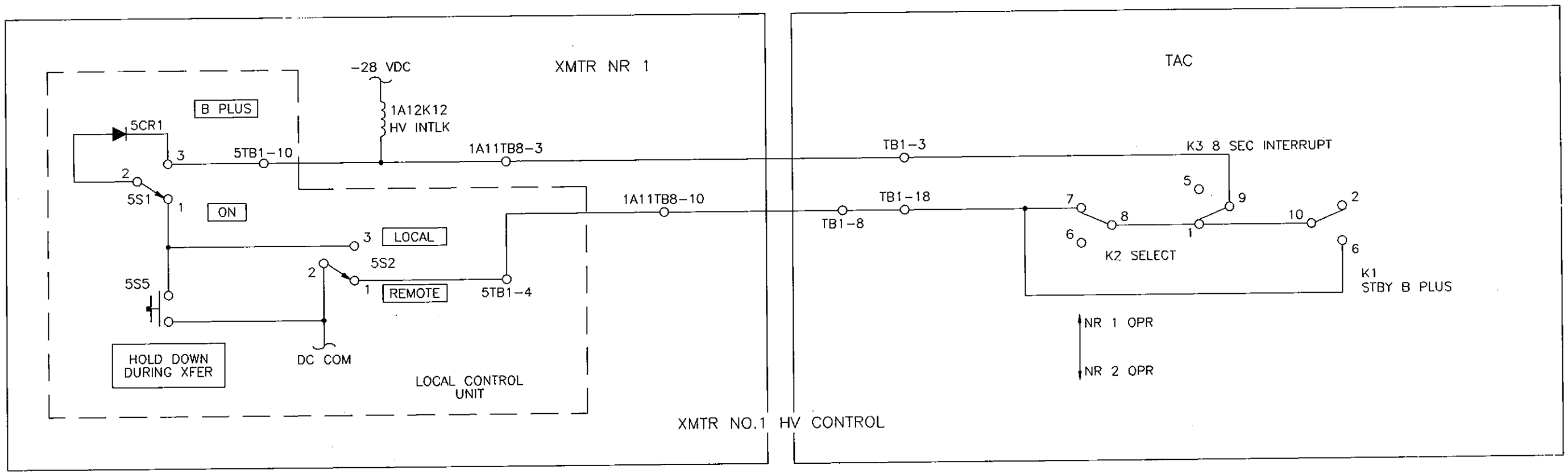
-18



NOTES:

1. DC COM CONNECTED TO CHASSIS AT THIS ONLY.

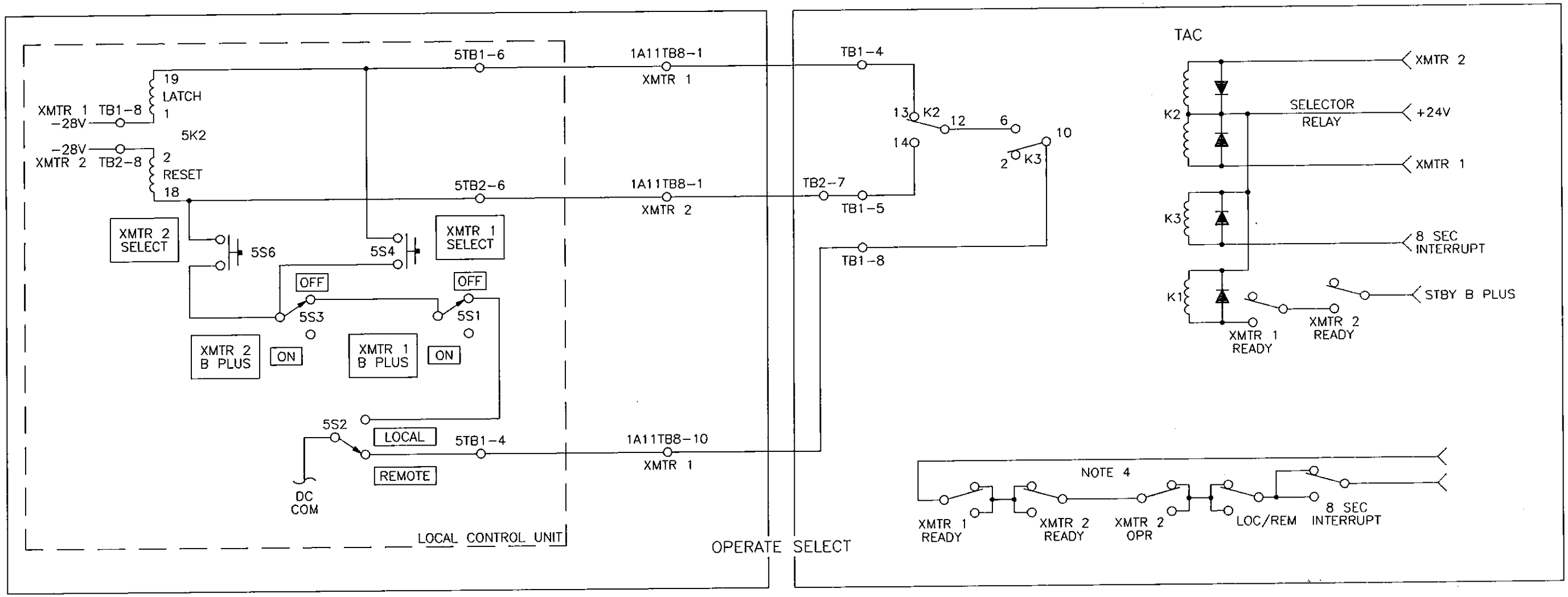
Figure 7-1. AN/FPN-44 Control Circuitry (Sheet 10 of 10)



NOTES:

1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.
2. RELAY (TAC)K3 IS ENERGIZED FOR 8 SECONDS UPON TAC COMMAND FOR TRANSMITTER CHANGE.
3. LOGIC CIRCUITRY IN TAC CAUSES RELAY (TAC)K2 TO FOLLOW POSITION OF 5K2, CALLED "RE-INITIALIZE".
4. CHANGE IN STATE OF ANY OF THESE RELAYS CAUSES THE TAC TO RE-INITIALIZE.

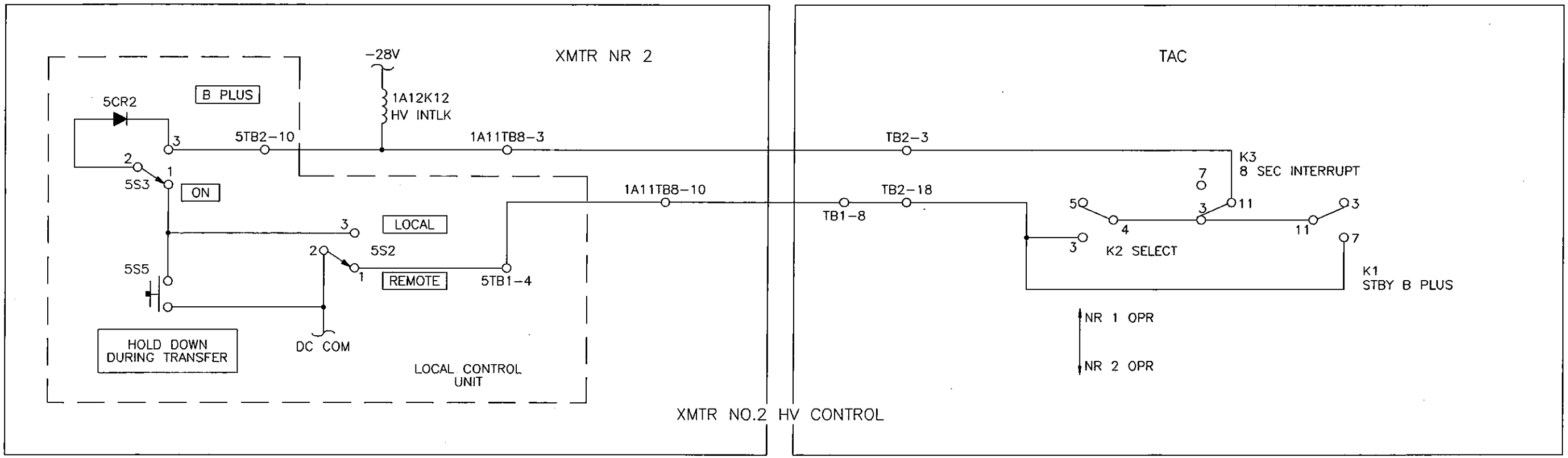
Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 1 of 10)



NOTES:

1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.
2. RELAY (TAC)K3 IS ENERGIZED FOR 8 SECONDS UPON TAC COMMAND FOR TRANSMITTER CHANGE.
3. LOGIC CIRCUITRY IN TAC CAUSES RELAY (TAC)K2 TO FOLLOW POSITION OF 5K2, CALLED "RE-INITIALIZE".
4. CHANGE IN STATE OF ANY OF THESE RELAYS CAUSES THE TAC TO RE-INITIALIZE.

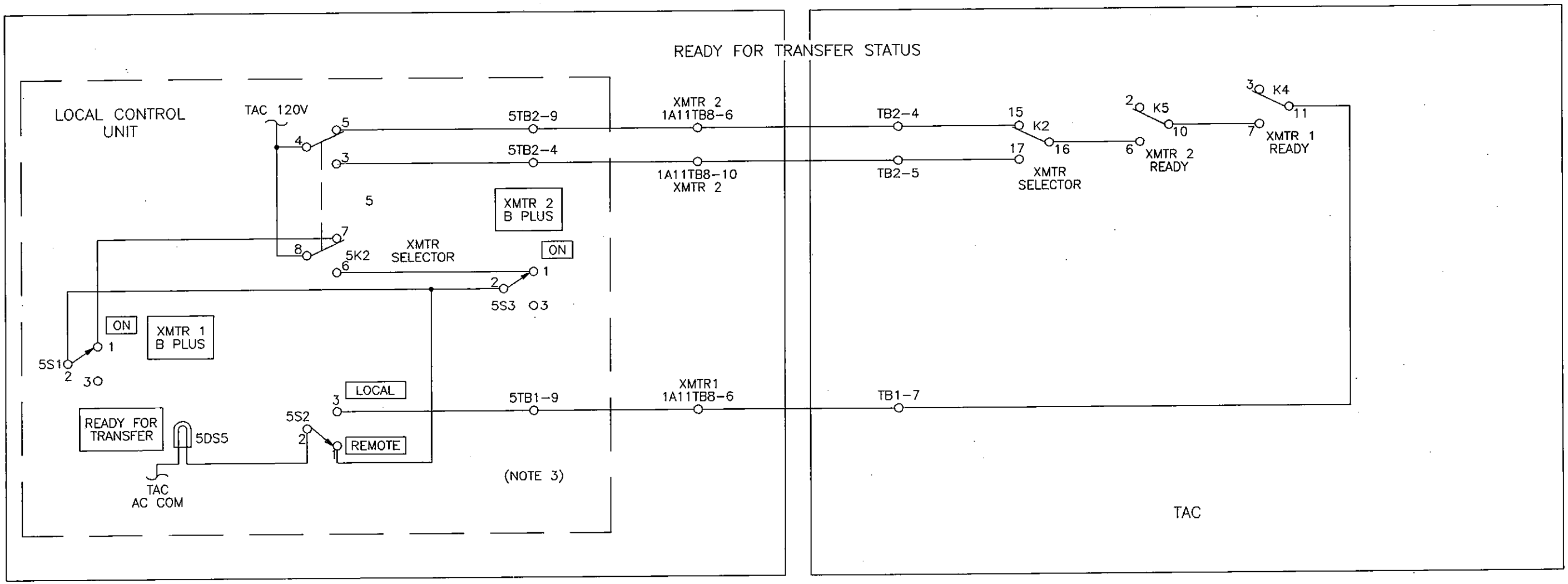
Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 2 of 10)



NOTES:

1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.
2. RELAY (TAC)K3 IS ENERGIZED FOR 8 SECONDS UPON TAC COMMAND FOR TRANSMITTER CHANGE.
3. LOGIC CIRCUITRY IN TAC CAUSES RELAY (TAC)K2 TO FOLLOW POSITION OF 5K2, CALLED "RE-INITIALIZE".
4. CHANGE IN STATE OF ANY OF THESE RELAYS CAUSES THE TAC TO RE-INITIALIZE.

Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 3 of 10)



NOTES:

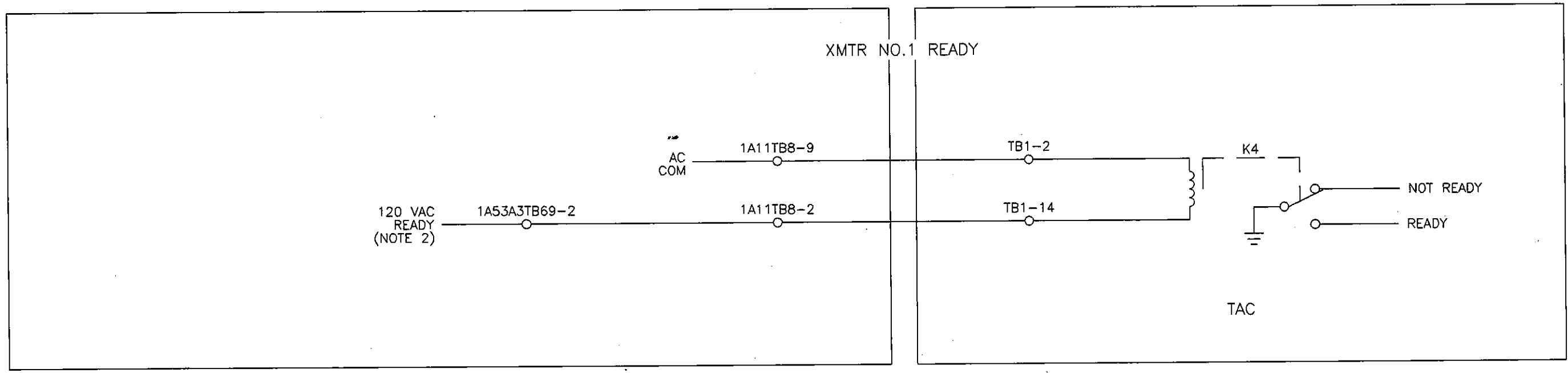
1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.

2. TRANSMITTER "READY" IS 120 VAC WHEN:
   - "BIAS & LOW VOLTAGE" 1A53A2S7 IS ON.
   - DISCHARGE CONTACTORS 1A53A1K1 & K2 ARE ENERGIZED.
   - BIAS ON RELAY 1A53A7K2 IS ENERGIZED.
   - HVPS TRANSFORMER TEMPERATURE IS NORMAL.
   - "PLATE VOLTAGE" 1A53A2S18 IN OPERATE POSITION.
   - "LOCKOUT-READY" SWITCH 1A12S1 IN READY POSITION.

3. "TAC AC HOT" (120 VAC) AND "TAC AC COM" NORMALLY FROM XMTR NO.2; IF XMTR NO.2 IS OFF, TAC AC IS FROM XMTR NO.1.

4. WHEN 5S2 IS IN LOCAL, THE ALARM CIRCUIT FOR THE STANDBY TRANSMITTER IS INHIBITED.

Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 4 of 10)



NOTES:

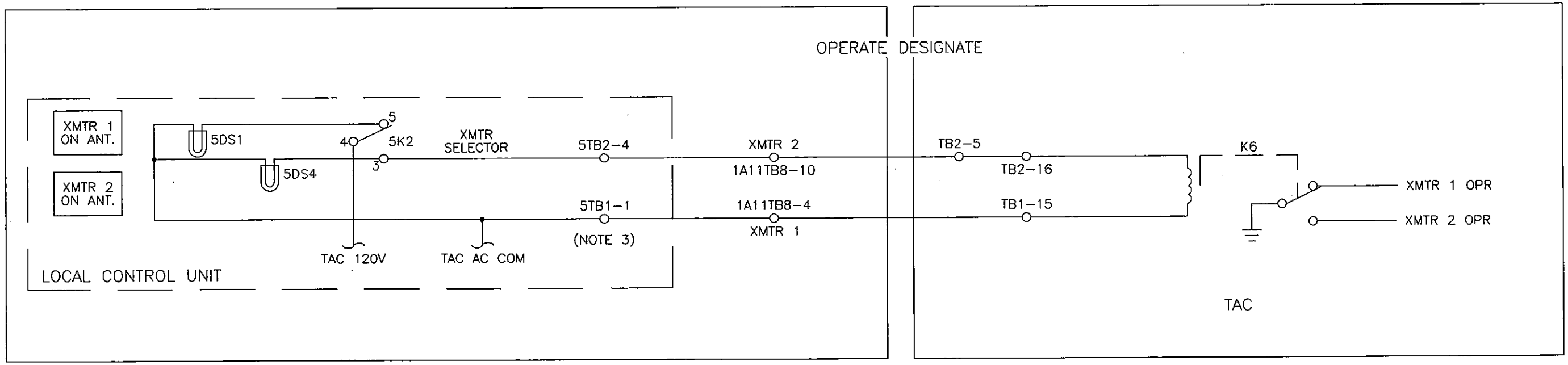
1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.

2. TRANSMITTER "READY" IS 120 VAC WHEN:
   - "BIAS & LOW VOLTAGE" 1A53A2S7 IS ON.
   - DISCHARGE CONTACTORS 1A53A1K1 & K2 ARE ENERGIZED.
   - BIAS ON RELAY 1A53A7K2 IS ENERGIZED.
   - HVPS TRANSFORMER TEMPERATURE IS NORMAL.
   - "PLATE VOLTAGE" 1A53A2S18 IN OPERATE POSITION.
   - "LOCKOUT-READY" SWITCH 1A12S1 IN READY POSITION.

3. "TAC AC HOT" (120 VAC) AND "TAC AC COM" NORMALLY FROM XMTR NO.2; IF XMTR NO.2 IS OFF, TAC AC IS FROM XMTR NO.1.

4. WHEN 5S2 IS IN LOCAL, THE ALARM CIRCUIT FOR THE STANDBY TRANSMITTER IS INHIBITED.

Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 5 of 10)



NOTES:

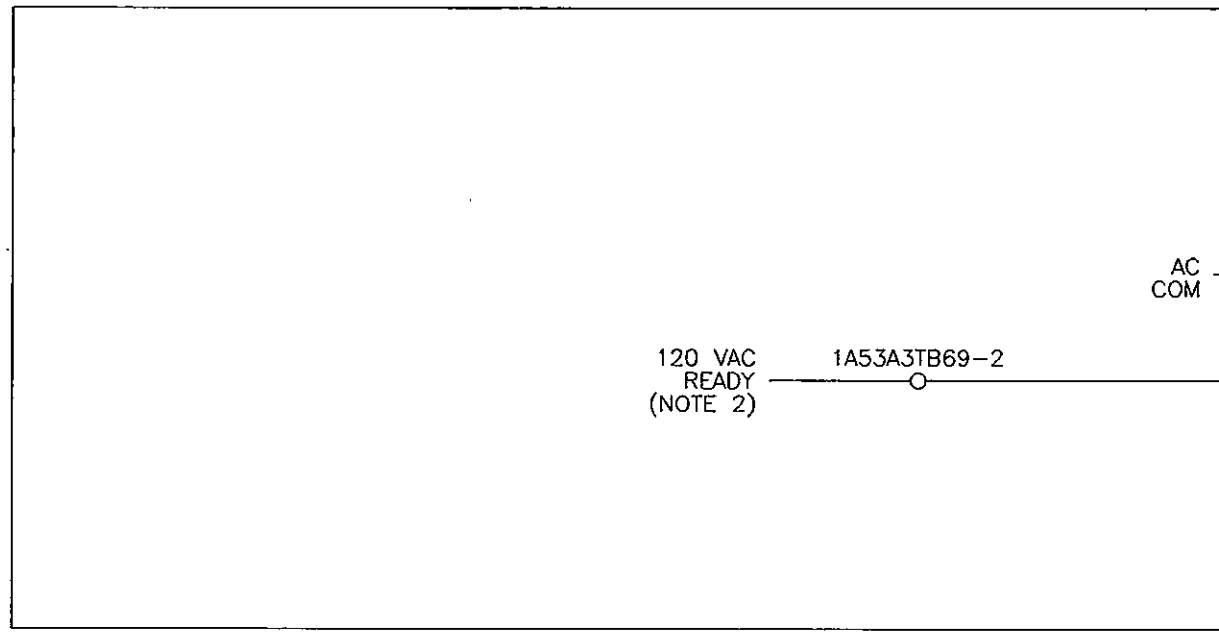
1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE–ENERGIZED.

2. TRANSMITTER "READY" IS 120 VAC WHEN:
   - "BIAS & LOW VOLTAGE" 1A53A2S7 IS ON.
   - DISCHARGE CONTACTORS 1A53A1K1 & K2 ARE ENERGIZED.
   - BIAS ON RELAY 1A53A7K2 IS ENERGIZED.
   - HVPS TRANSFORMER TEMPERATURE IS NORMAL.
   - "PLATE VOLTAGE" 1A53A2S18 IN OPERATE POSITION.
   - "LOCKOUT–READY" SWITCH 1A12S1 IN READY POSITION.

3. "TAC AC HOT" (120 VAC) AND "TAC AC COM" NORMALLY FROM XMTR NO.2; IF XMTR NO.2 IS OFF, TAC AC IS FROM XMTR NO.1.

4. WHEN 5S2 IS IN LOCAL, THE ALARM CIRCUIT FOR THE STANDBY TRANSMITTER IS INHIBITED.

Figure 7–2. AN/FPN–44/TAC Interface Diagram (Sheet 6 of 10)



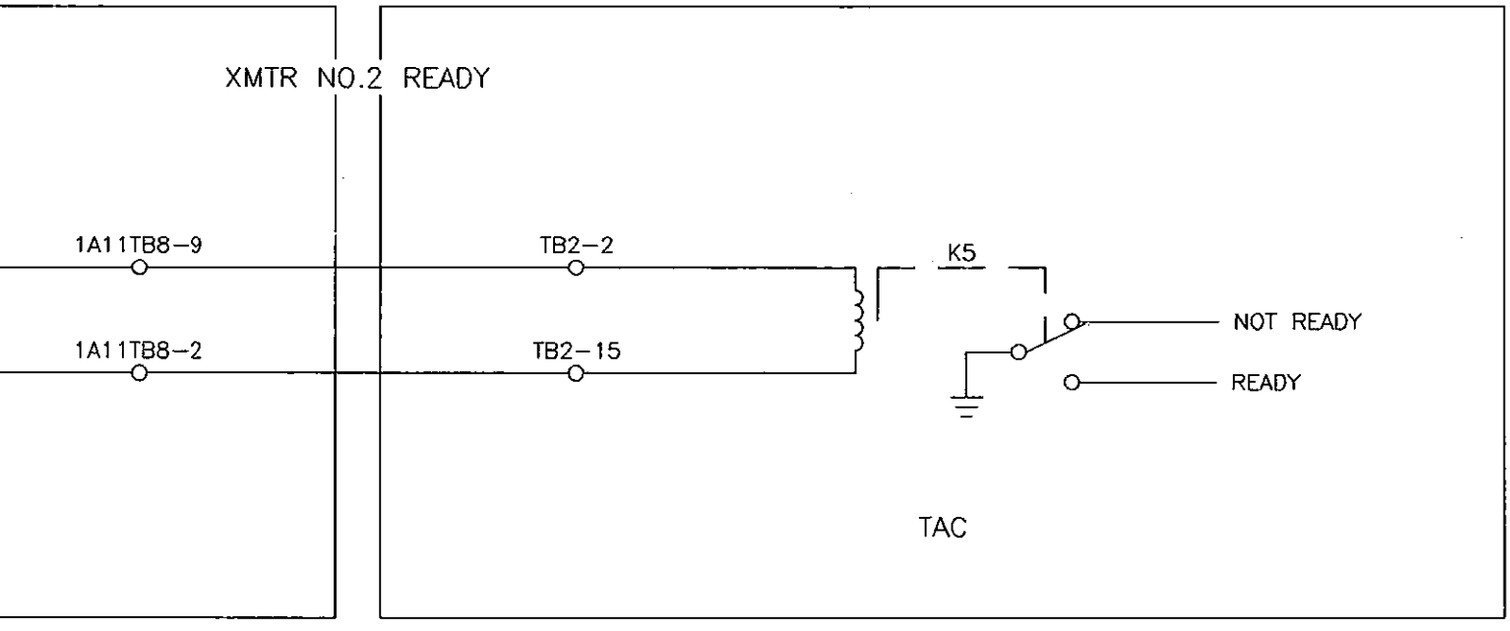
NOTES:

1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.

2. TRANSMITTER "READY" IS 120 VAC WHEN:
   - "BIAS & LOW VOLTAGE" 1A53A2S7 IS ON.
   - DISCHARGE CONTACTORS 1A53A1K1 & K2 ARE ENERGIZED.
   - BIAS ON RELAY 1A53A7K2 IS ENERGIZED.
   - HVPS TRANSFORMER TEMPERATURE IS NORMAL.
   - "PLATE VOLTAGE" 1A53A2S18 IN OPERATE POSITION.
   - "LOCKOUT-READY" SWITCH 1A12S1 IN READY POSITION.

3. "TAC AC HOT"
   FROM XMTR N
   XMTR NO.1.

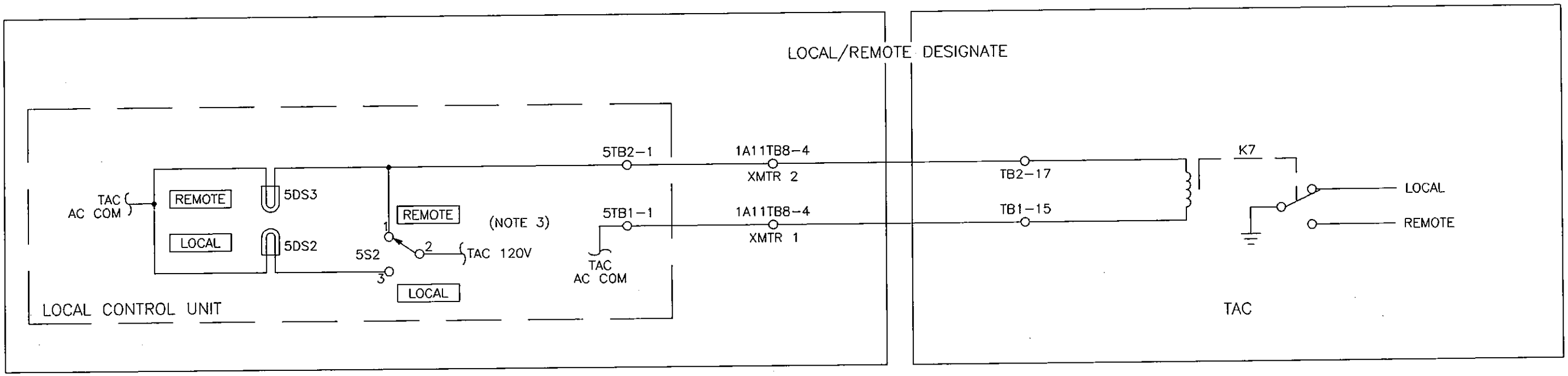
4. WHEN 5S2 IS
   STANDBY TRAN



(120 VAC) AND "TAC AC COM" NORMALLY
O.2; IF XMTR NO.2 IS OFF, TAC AC IS FROM

N LOCAL, THE ALARM CIRCUIT FOR THE
SMITTER IS INHIBITED.

Figure 7–2. AN/FPN–44/TAC Interface Diagram
(Sheet 7 of 10)



NOTES:

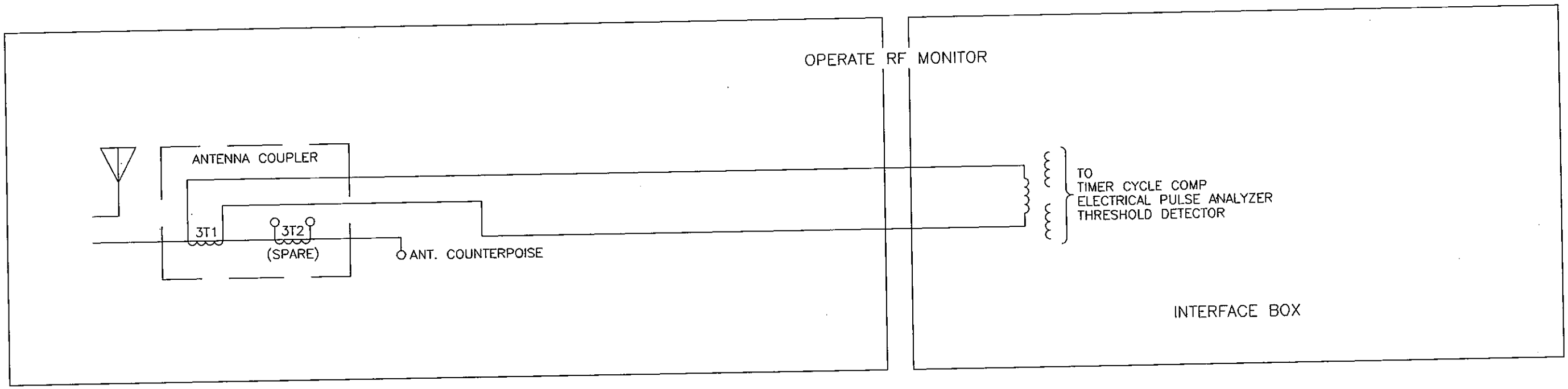
1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.

2. TRANSMITTER "READY" IS 120 VAC WHEN:
   - "BIAS & LOW VOLTAGE" 1A53A2S7 IS ON.
   - DISCHARGE CONTACTORS 1A53A1K1 & K2 ARE ENERGIZED.
   - BIAS ON RELAY 1A53A7K2 IS ENERGIZED.
   - HVPS TRANSFORMER TEMPERATURE IS NORMAL.
   - "PLATE VOLTAGE" 1A53A2S18 IN OPERATE POSITION.
   - "LOCKOUT-READY" SWITCH 1A12S1 IN READY POSITION.

3. "TAC AC HOT" (120 VAC) AND "TAC AC COM" NORMALLY FROM XMTR NO.2; IF XMTR NO.2 IS OFF, TAC AC IS FROM XMTR NO.1.

4. WHEN 5S2 IS IN LOCAL, THE ALARM CIRCUIT FOR THE STANDBY TRANSMITTER IS INHIBITED.

Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 8 of 10)



NOTES:

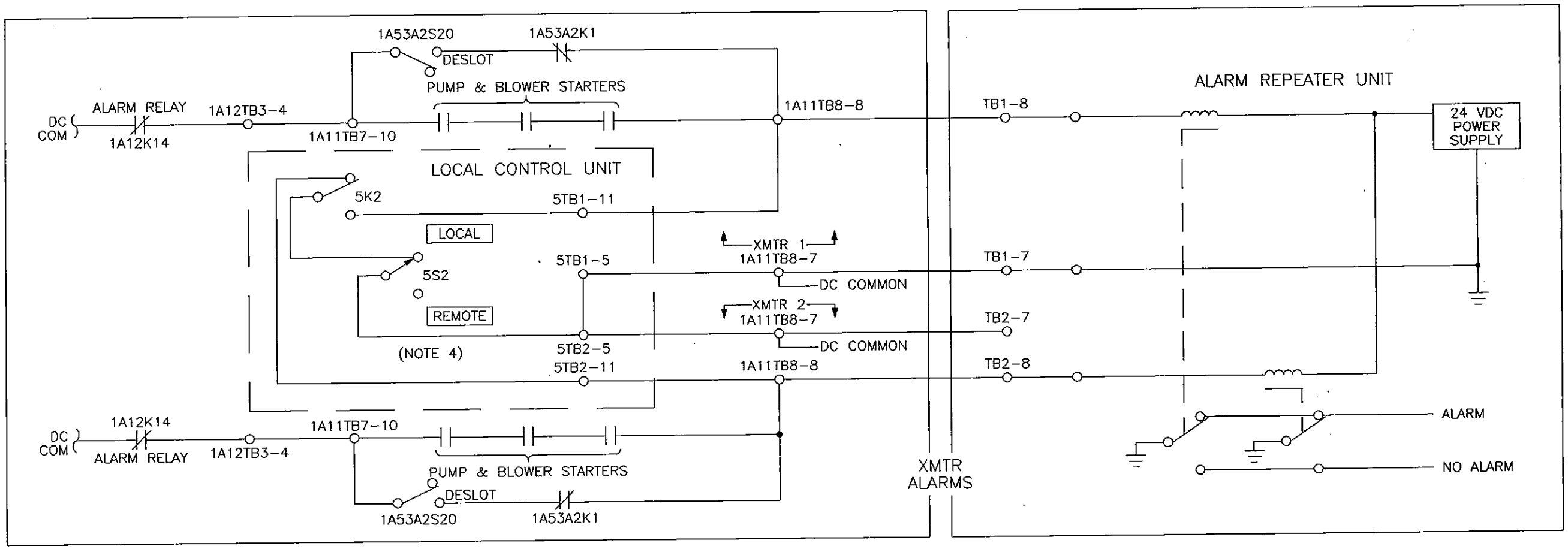
1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.

2. TRANSMITTER "READY" IS 120 VAC WHEN:
   - "BIAS & LOW VOLTAGE" 1A53A2S7 IS ON.
   - DISCHARGE CONTACTORS 1A53A1K1 & K2 ARE ENERGIZED.
   - BIAS ON RELAY 1A53A7K2 IS ENERGIZED.
   - HVPS TRANSFORMER TEMPERATURE IS NORMAL.
   - "PLATE VOLTAGE" 1A53A2S18 IN OPERATE POSITION.
   - "LOCKOUT-READY" SWITCH 1A12S1 IN READY POSITION.

3. "TAC AC HOT" (120 VAC) AND "TAC AC COM" NORMALLY FROM XMTR NO.2; IF XMTR NO.2 IS OFF, TAC AC IS FROM XMTR NO.1.

4. WHEN 5S2 IS IN LOCAL, THE ALARM CIRCUIT FOR THE STANDBY TRANSMITTER IS INHIBITED.

Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 9 of 10)



NOTES:

1. LATCHING RELAYS 5K2 & (TAC)K2 ARE SHOWN IN "XMTR NO.1" POSITION. ALL OTHER RELAYS ARE SHOWN DE-ENERGIZED.

2. TRANSMITTER "READY" IS 120 VAC WHEN:
   - "BIAS & LOW VOLTAGE" 1A53A2S7 IS ON.
   - DISCHARGE CONTACTORS 1A53A1K1 & K2 ARE ENERGIZED.
   - BIAS ON RELAY 1A53A7K2 IS ENERGIZED.
   - HVPS TRANSFORMER TEMPERATURE IS NORMAL.
   - "PLATE VOLTAGE" 1A53A2S18 IN OPERATE POSITION.
   - "LOCKOUT-READY" SWITCH 1A12S1 IN READY POSITION.

3. "TAC AC HOT" (120 VAC) AND "TAC AC COM" NORMALLY FROM XMTR NO.2; IF XMTR NO.2 IS OFF, TAC AC IS FROM XMTR NO.1.

4. WHEN 5S2 IS IN LOCAL, THE ALARM CIRCUIT FOR THE STANDBY TRANSMITTER IS INHIBITED.

Figure 7-2. AN/FPN-44/TAC Interface Diagram (Sheet 10 of 10)

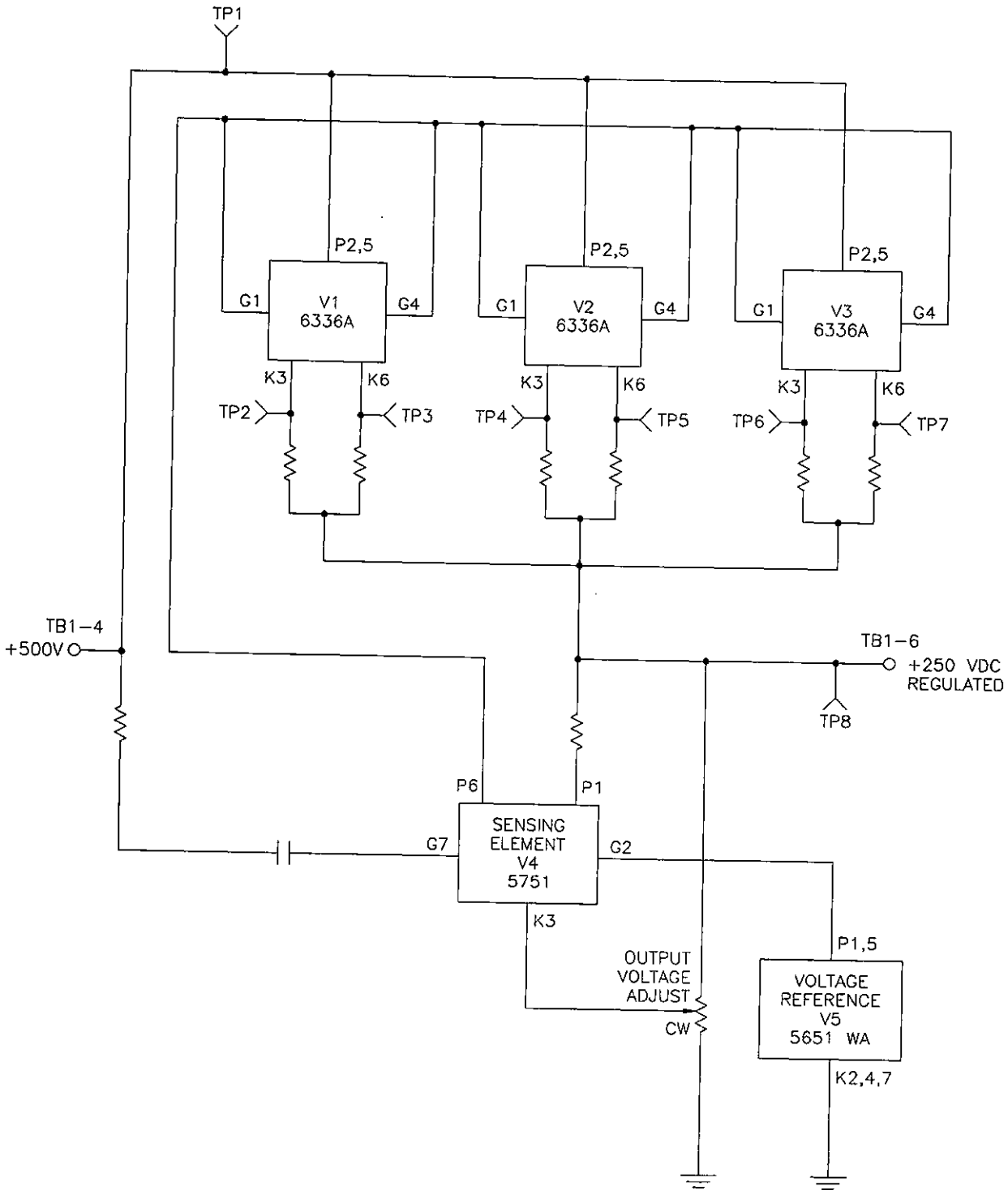
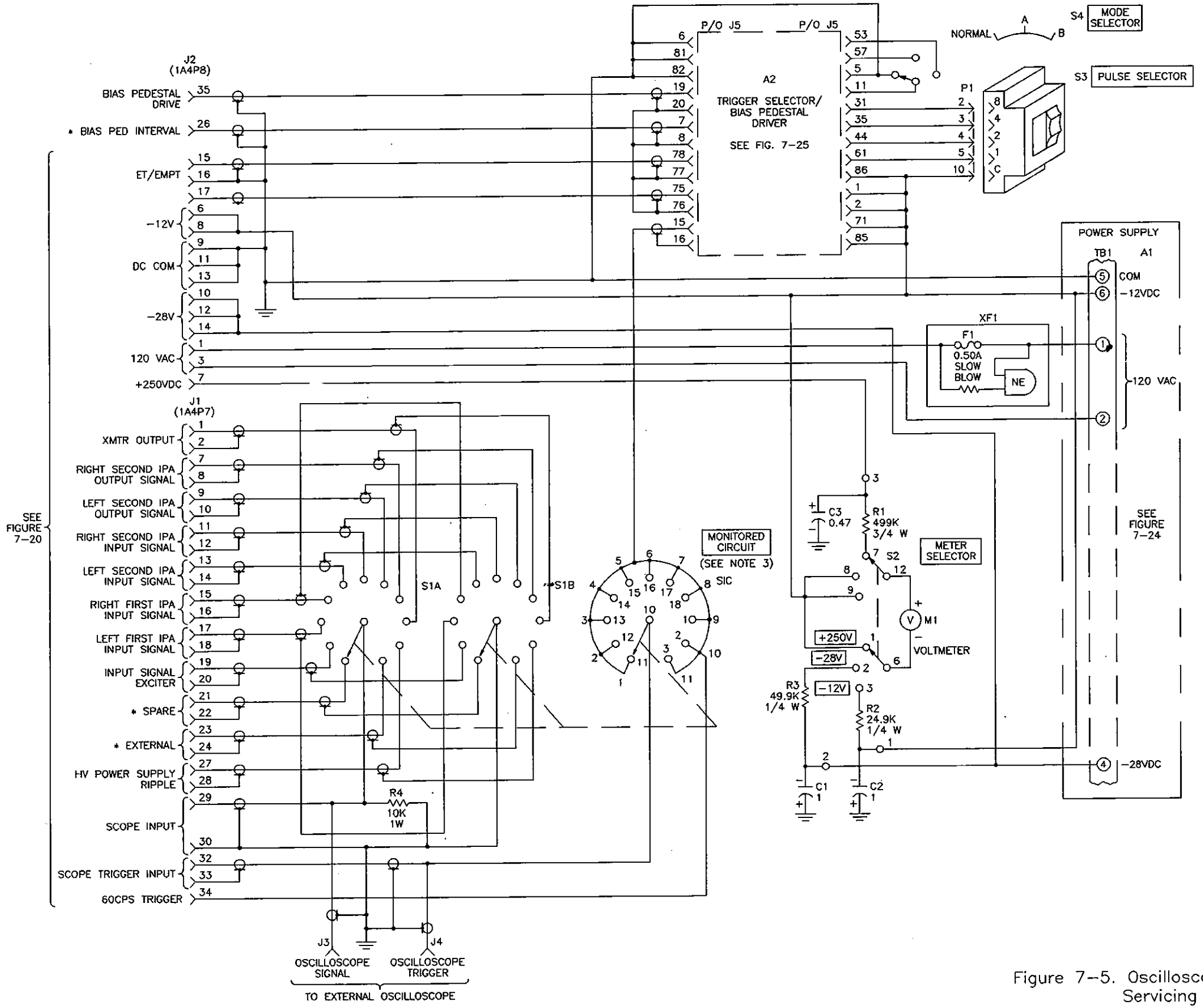


Figure 7–4. +250 Volt–Regulator 1A4A1A1, Servicing Block Diagram



S1

POS	FUNCTION
1	SPARE
2	INPUT EXCITER
3	INPUT LEFT FIRST IPA
4	INPUT RIGHT FIRST IPA
5	INPUT LEFT SECOND IPA
6	INPUT RIGHT SECOND IPA
7	OUTPUT LEFT SECOND IPA
8	OUTPUT RIGHT SECOND IPA
9	XMTR OUTPUT (CURRENT)
10	HV POWER SUPPLY (RIPPLE)
11	EXTERNAL
12	

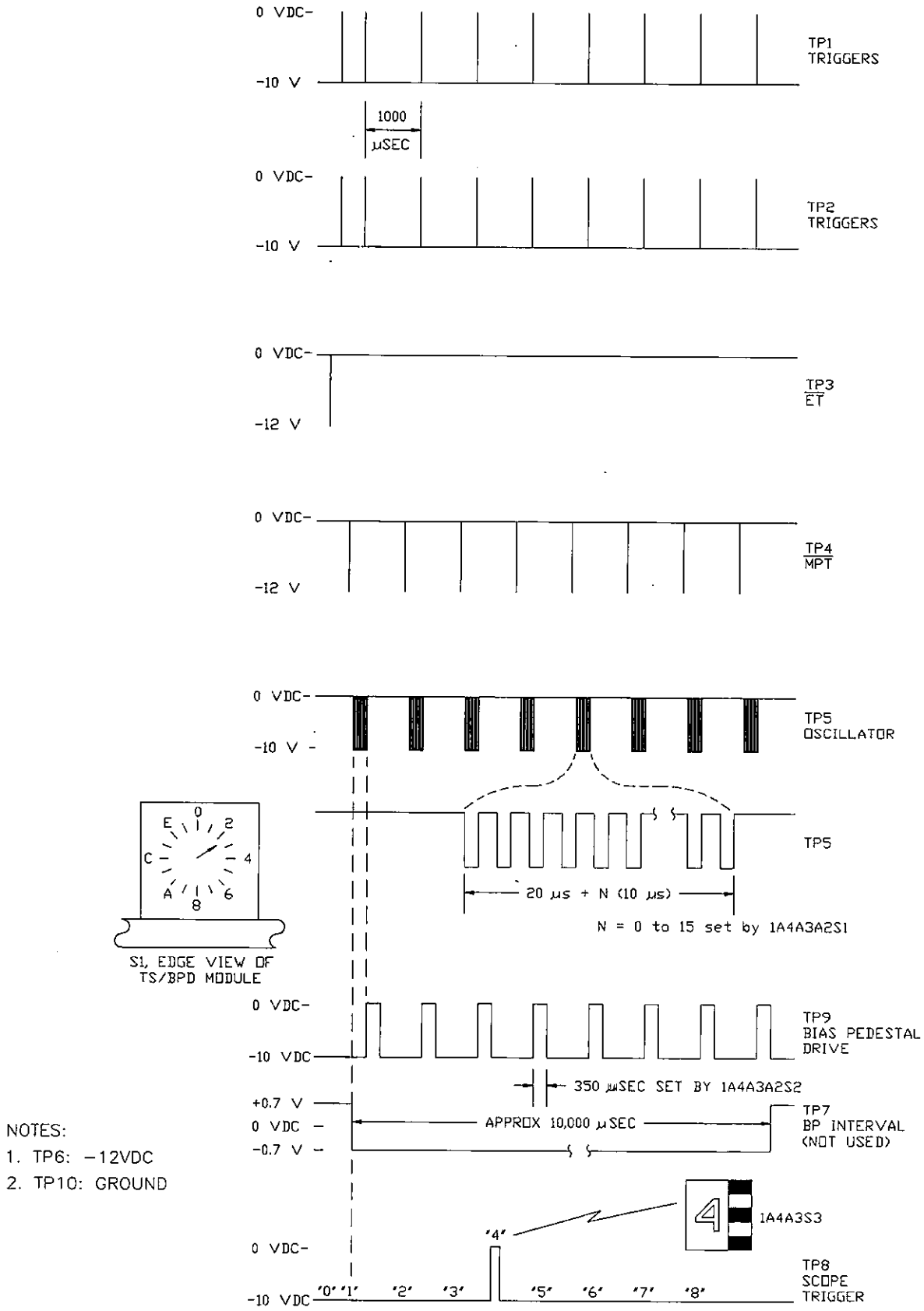
S3

POS	CONTACT CLOSURES X=CLOSED O=OPEN			
	8−C	4−C	2−C	1−C
0	X	O	O	X
1	X	O	O	O
2	O	X	X	X
3	O	X	X	O
4	O	X	O	X
5	O	X	O	O
6	O	O	X	X
7	O	O	X	O
8	O	O	O	X
9	O	O	O	O

NOTES:
1. O INDICATES INSULATED STANDOFF.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS.
3. NUMBERS ON THE OUTSIDE ARE SWITCH POSITION NUMBERS. NUMBERS ON THE INSIDE ARE SWITCH TERMINAL NUMBERS.
4. PREFIX REF DESIG WITH 1A4A3.

* NOT USED

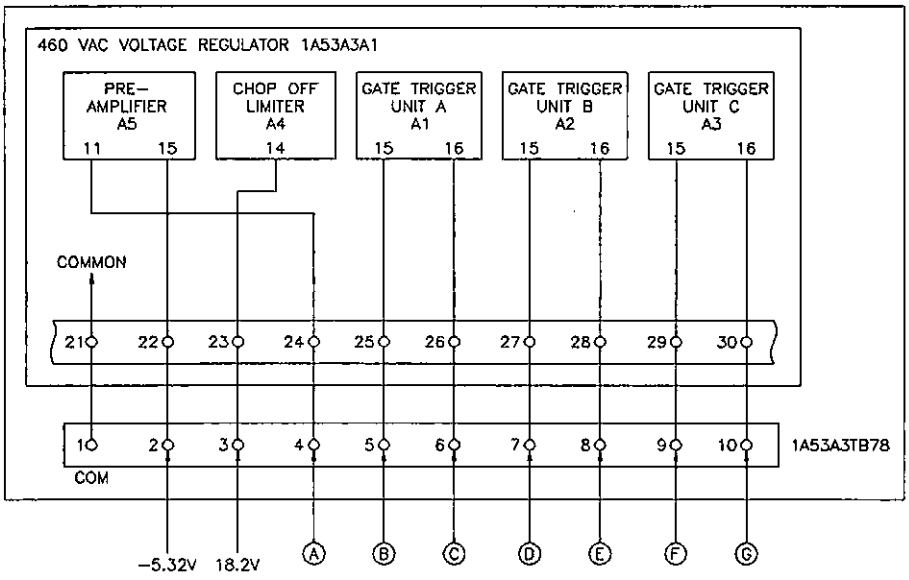
Figure 7−5. Oscilloscope Control C−4558A/FPN−44A, Servicing Schematic Diagram



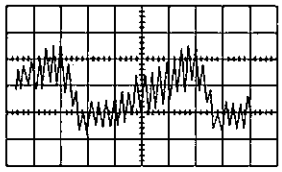
NOTES:

1. TP6: −12VDC
2. TP10: GROUND

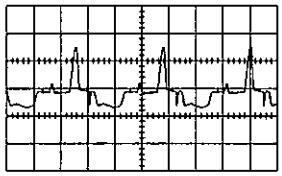
Figure 7−6. Trigger Selector/Bias Pedestal Driver 1A4A3A2, (W0725−1B) Waveforms and Adjustments



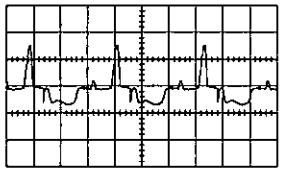
Ⓐ TB78-4
HORIZONTAL SWEEP: 10MS/DIV
VERTICAL SENSITIVITY: 0.2V/DIV
TRIGGER: LINE



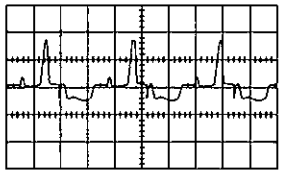
Ⓑ TB78-5
HORIZONTAL SWEEP: 5MS/DIV
VERTICAL SENSITIVITY: 50MV/DIV
TRIGGER: LINE



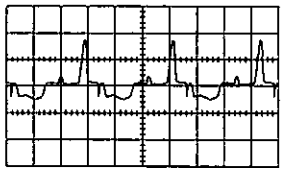
Ⓒ TB78-6
HORIZONTAL SWEEP: 5MS/DIV
VERTICAL SENSITIVITY: 50MV/DIV
TRIGGER: LINE



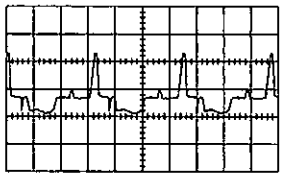
Ⓓ TB78-7
HORIZONTAL SWEEP: 5MS/DIV
VERTICAL SENSITIVITY: 50MV/DIV
TRIGGER: LINE



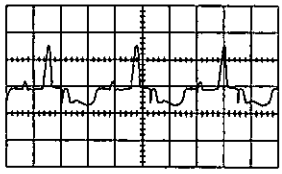
Ⓔ TB78-8
HORIZONTAL SWEEP: 5MS/DIV
VERTICAL SENSITIVITY: 50MV/DIV
TRIGGER: LINE



Ⓕ TB78-9
HORIZONTAL SWEEP: 5MS/DIV
VERTICAL SENSITIVITY: 50MS/DIV
TRIGGER: LINE



Ⓖ TB78-10
HORIZONTAL SWEEP: 5MS/DIV
VERTICAL SENSITIVITY: 50MS/DIV
TRIGGER: LINE



NOTE:
1. CONDITIONS
   A. MEASUREMENTS REFERENCED TO TB78-1.
   B. PLATE VOLTAGE SELECTOR SET TO OPERATE.
   C. DRIVE PULSE INPUT.

Figure 7-7. Voltage Regulator CN-1473/FPN-44A, Servicing Diagram

CHOP–OFF LIMITER TEST PROCEDURE

STEP 1. REMOVE CHOP–OFF LIMITER 1A53A3A1A4 FROM VOLTAGE REGULATOR 1A53A3A1 AND PLACE ON TEST BENCH.

STEP 2. CONNECT TEST SETUP IN ACCORDANCE WITH FIGURE.

STEP 3. SET SPST SWITCH ACROSS TERMINALS 3 AND 4 TO CLOSED POSITION. THE DIGITAL VOLTMETER SHOULD INDICATE LESS THAN +5 VDC AND THE OHMETER ACROSS TERMINALS 5 AND 6 SHOULD INDICATE INFINITY.

STEP 4. CONNECT OSCILLOSCOPE TO JUNCTION OF EMITTER OF Q4, RESISTOR R17 AND CAPACITOR C5.

STEP 5. MOMENTARILY SET SWITCH ACROSS 3 AND 4 TO OPEN POSITION AND THEN CLOSE. OBSERVE WAVEFORM ON OSCILLOSCOPE.

STEP 6. CONNECT OSCILLOSCOPE TO JUNCTION OF EMITTER OF Q3, RESISTOR R11, AND CAPACITOR C4.

STEP 7. REPEAT STEP 5.

STEP 8. OPEN SWITCH ACROSS TERMINALS 3 AND 4 AND OBSERVE THAT DIGITAL VOLTMETER INDICATE 15 VDC.

STEP 9. USING DPDT SWITCH DISCONNECT TERMINALS 7 AND 8 FROM THE 208 VAC SOURCE AND CONNECT TO A 120 VAC SOURCE. OBSERVE THAT THE DIGITAL VOLTMETER READS 0 VDC.

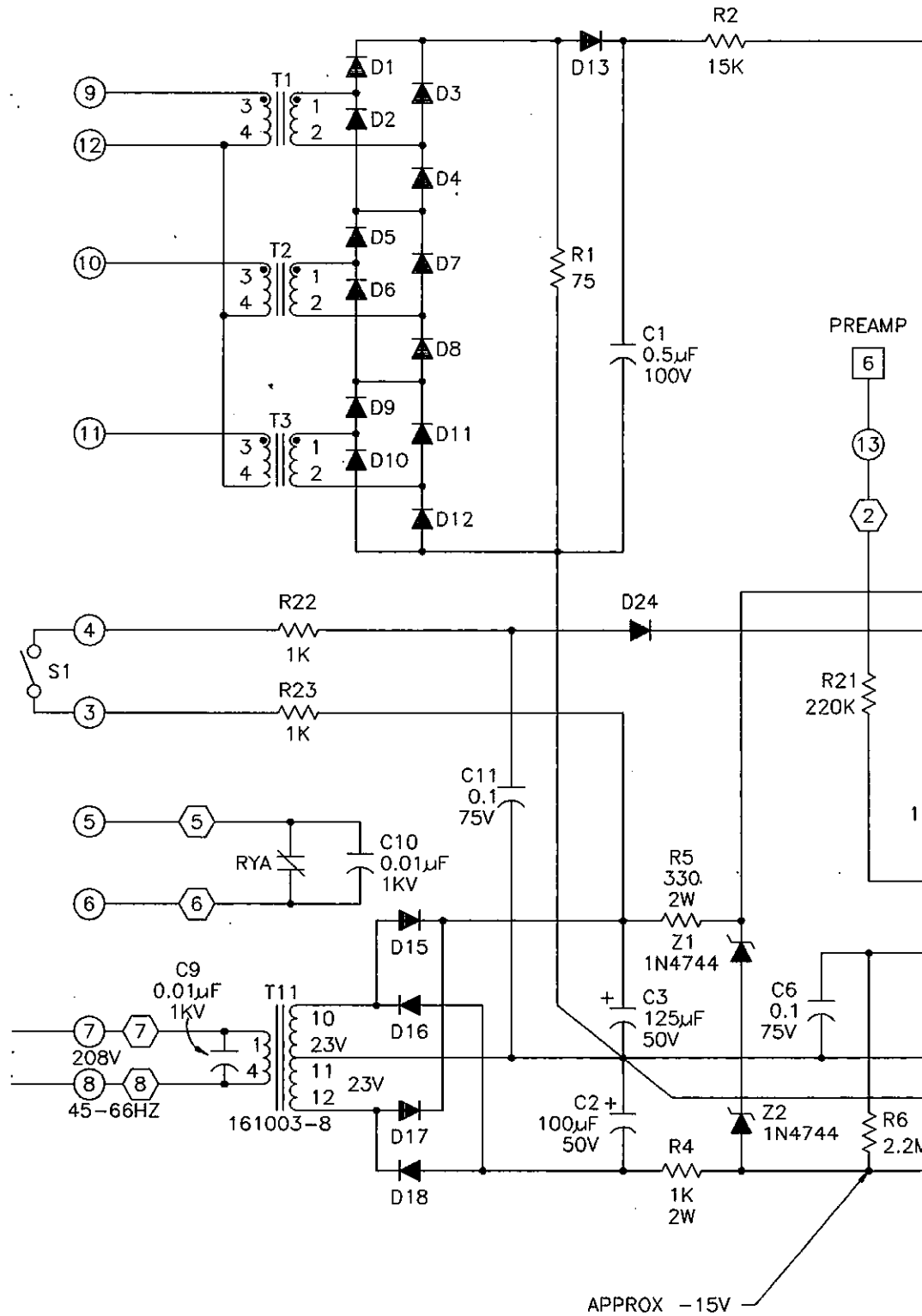
STEP 10. DISCONNECT ALL TEST EQUIPMENT FROM CHOP–OFF LIMITER.

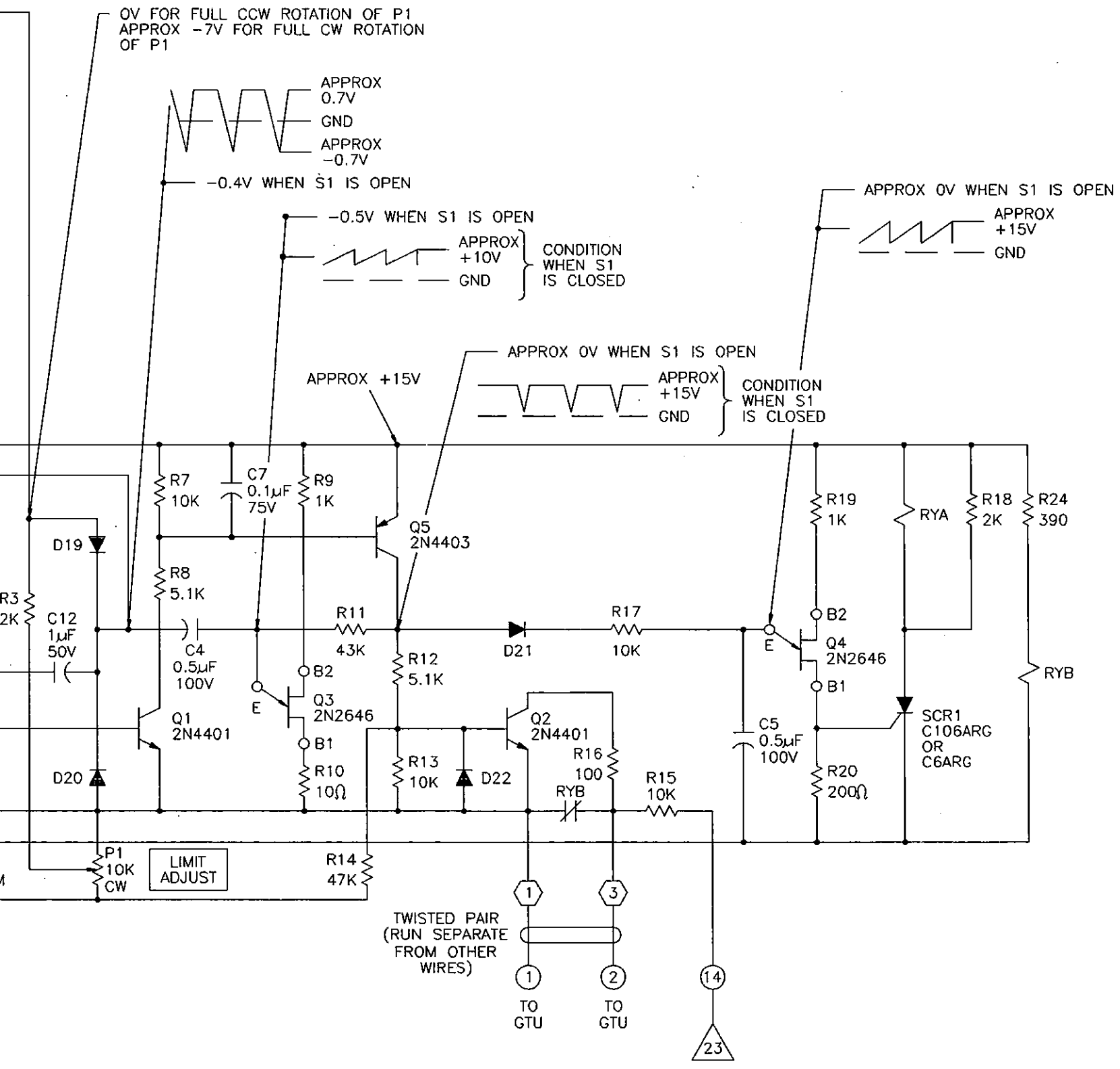
STEP 11. WITH CHOP–OFF LIMITER ON TEST BENCH, USE EXTENDER CABLE TO CONNECT SYSTEM INPUTS.

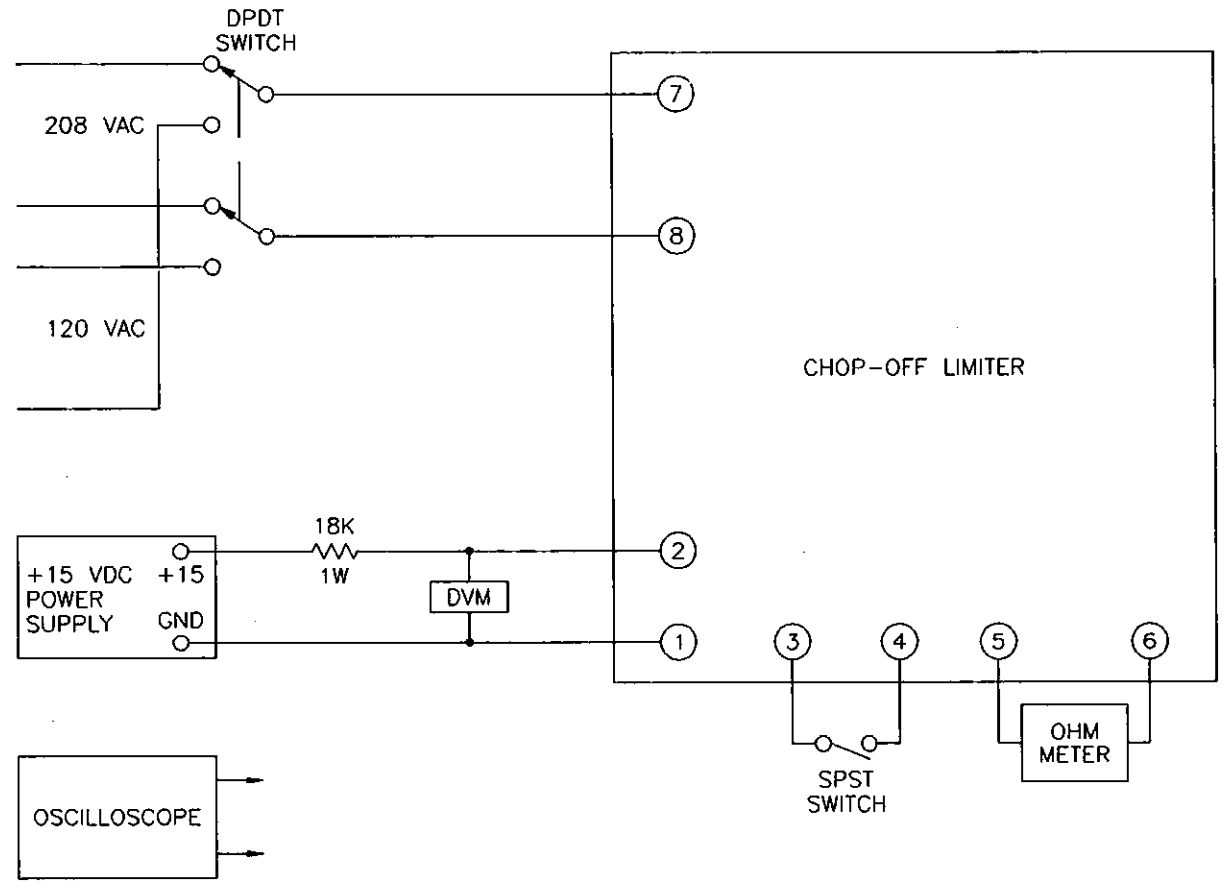
STEP 12. MEASURE VOLTAGES AT JUNCTION OF R2 AND R3 WITH DIGITAL VOLTMETER. IT SHOULD BE –7 VDC WITH P1 FULLY CLOCKWISE AND 0 VDC WITH P1 FULLY COUNTERCLOCKWISE.

NOTES:

1. UNLESS NOTED, ALL DIODES ARE 1N4003.
2. ⬡ TERMINAL ON PC BOARD.
3. ◯ TERMINAL STRIP ON COVER.
4. □ CUSTOMER TEST POINT. (SEE FIGURE 7–7)







TEST SETUP DIAGRAM

Figure 7−8. Chop−Off Limiter 1A53A3A
(P/O Voltage Regulator CN−1473/FPN−
Servicing Schematic Diagram

1A4
44A)

PREAMPLIFIER TEST PROCEDURE

STEP 1. REMOVE PREAMPLIFIER 1A53A3A1A5 FROM VOLTAGE REGULATOR 1A53A3A1 AND PLACE ON TEST BENCH.

STEP 2. CONNECT TEST SETUP IN ACCORDANCE WITH FIGURE.

STEP 3. SET SPST SWITCH ACROSS TERMINALS 7 AND 8 TO CLOSED POSITION.

STEP 4. ADJUST 1K POTENTIOMETER ACROSS POWER SUPPLY OUTPUT FOR A 1 VDC INDICATION ON DIGITAL VOLTMETER.

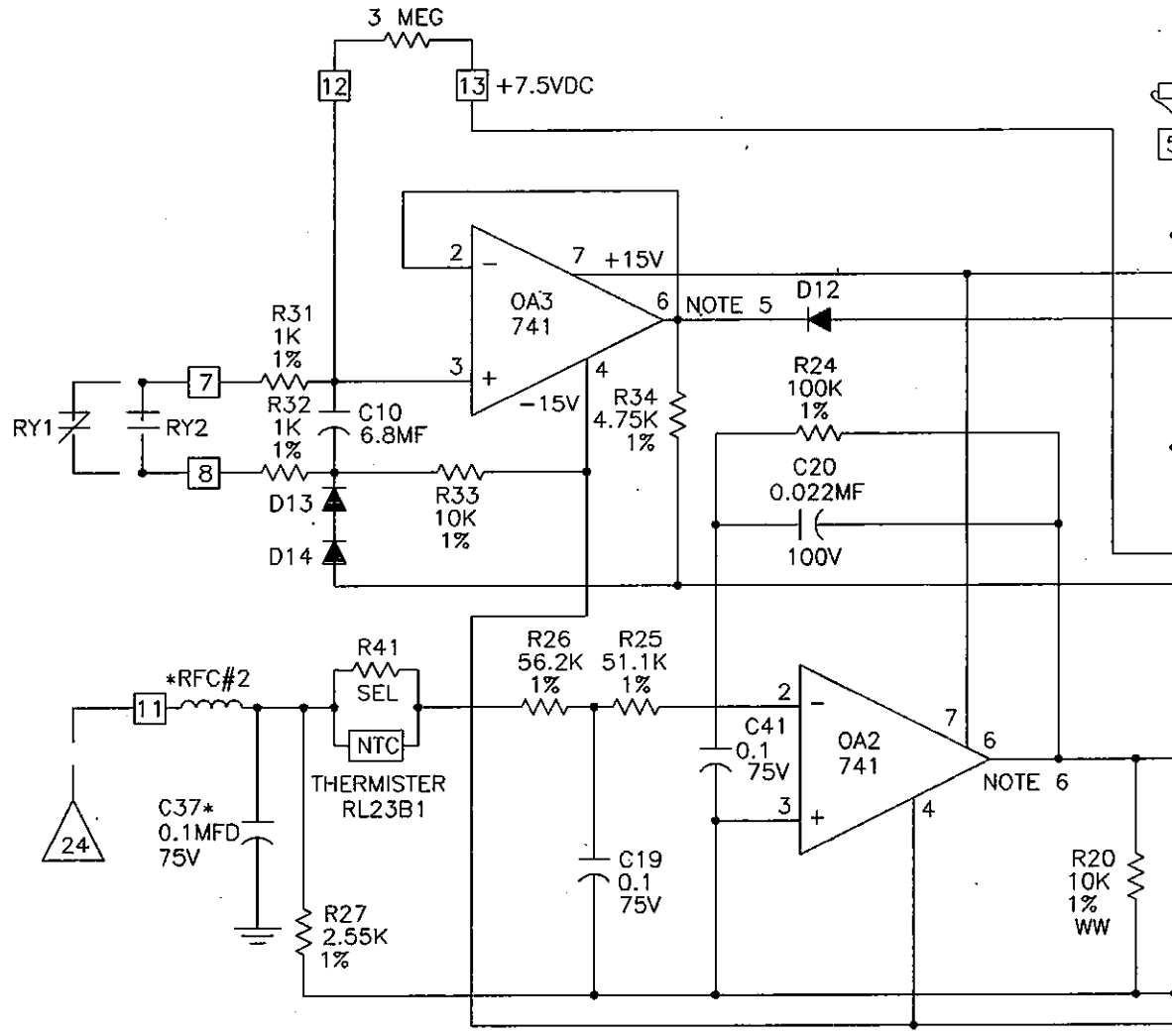
STEP 5. TURN 5K POTENTIOMETER ACROSS TERMINALS 3, 4, 5 FULLY CLOCKWISE AND OBSERVE MILLIAMETER FOR A 5 MA INDICATION.

STEP 6. TURN 5K POTENTIOMETER FULLY COUNTERCLOCKWISE. THE MILLIAMETER SHOULD READ 0 MA.

STEP 7. ADJUST 1K POTENTIOMETER FOR 0 VDC ON DIGITAL VOLTMETER.

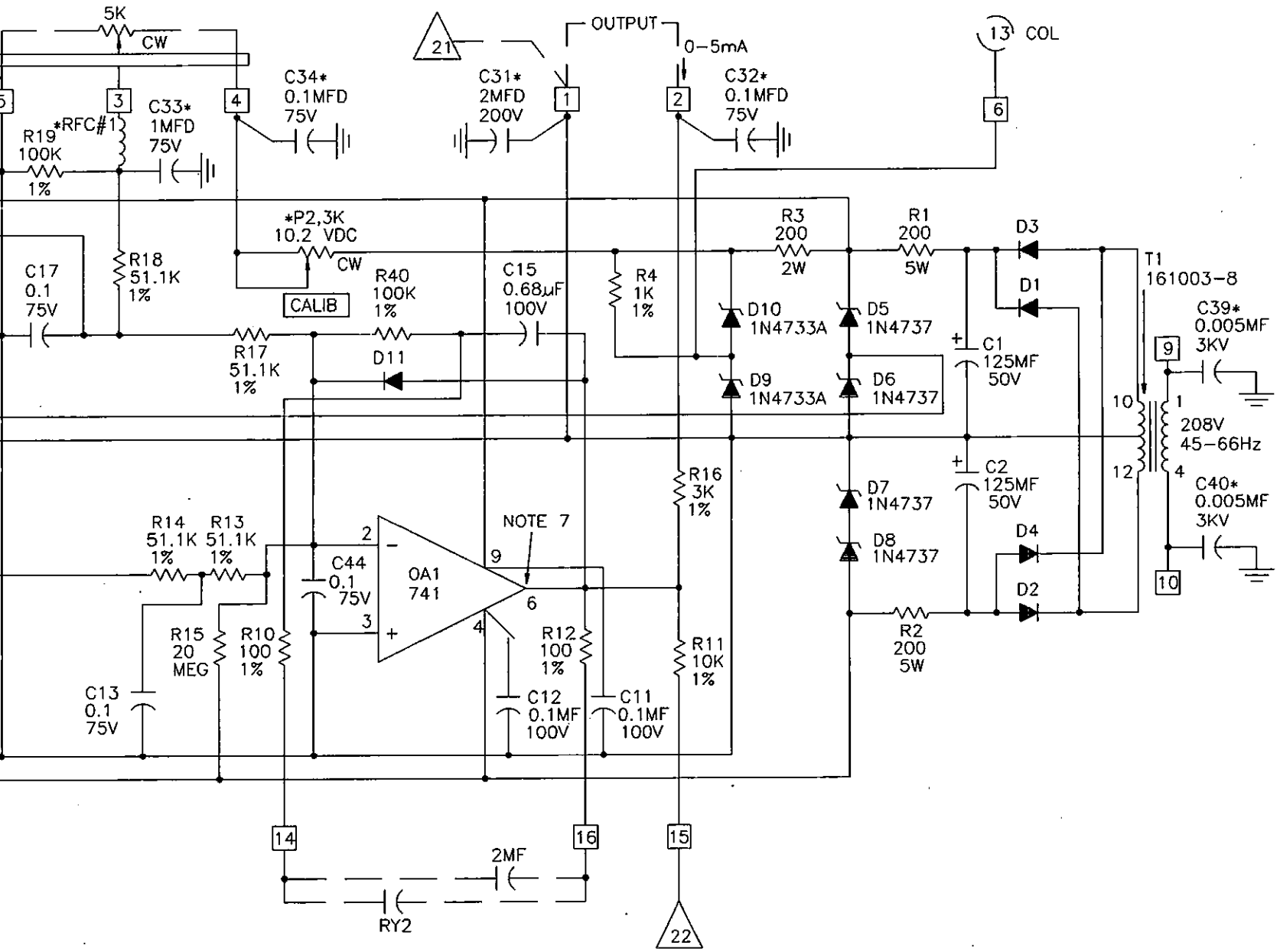
STEP 8. CONNECT DIGITAL VOLTMETER TO PIN 6 OF 0A3 AND TERMINAL 1 (COMMON).

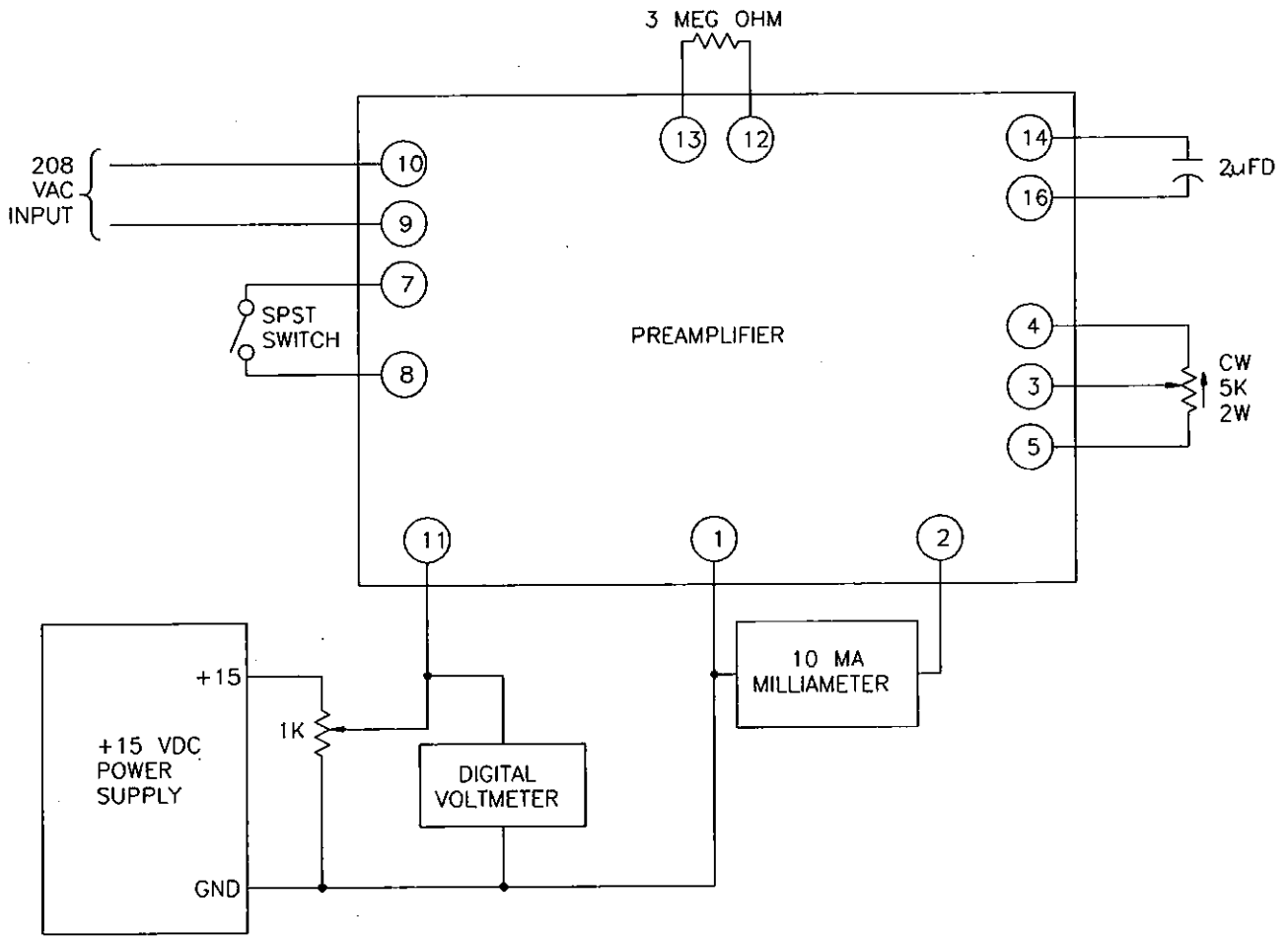
STEP 9. SET SPST SWITCH ACROSS TERMINALS 7 AND 8 TO OPEN POSITION WHILE OBSERVING DIGITAL VOLTMETER. THE VOLTAGE AT 0A3, TERMINAL 6 SHOULD RISE FROM −0.7 VDC TO APPROXIMATELY 8.4 VDC.



NOTES:
1. * COMPS. ARE LOCATED ON COVER (FIGURE 5−71).
2. RUN LEADS 9 & 10 SEPARATE FROM OTHER BUNDLE (LEADS 1−8).
3. RUN−UP TIME ≅ 4.5 X $R_{(MEG)}$ SECONDS (0−100%).
4. BANDWIDTH ≅ $\frac{2}{C_{(MF)}}$ Hz UP TO 5Hz.
5. TERMINAL 7 & 8 SHORTED APPROX −1.4V TERMINALS 7 & 8 OPEN, RAMP UP TO +15V
6. A NEGATIVE VOLTAGE APPROX EQUAL IN MAGNITUDE TO ANY DC VOLTAGE (UP TO APPROX 12V) PLACED ON TERMINAL 11 WITH RESPECT TO TERMINAL 1.
7. AN OUTPUT VOLTAGE RAMPING DOWN TO −15V. SPEED OF RAMP DEPENDENT UPON SETTING OF 5K POT ON TERMINALS 3, 4 AND 5.

△ TEST POINTS (SEE FIGURE 7−7)



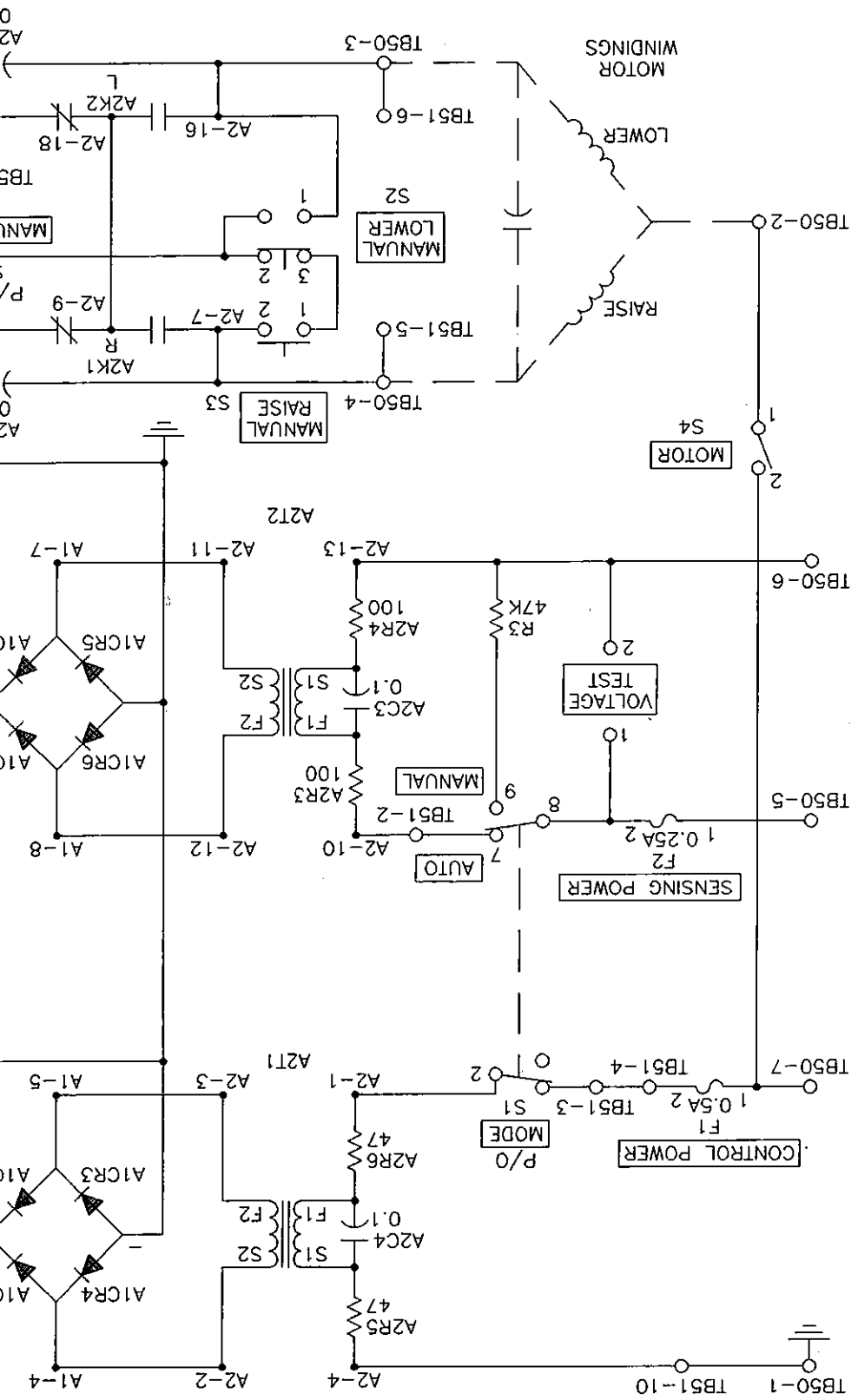


TEST SETUP DIAGRAM

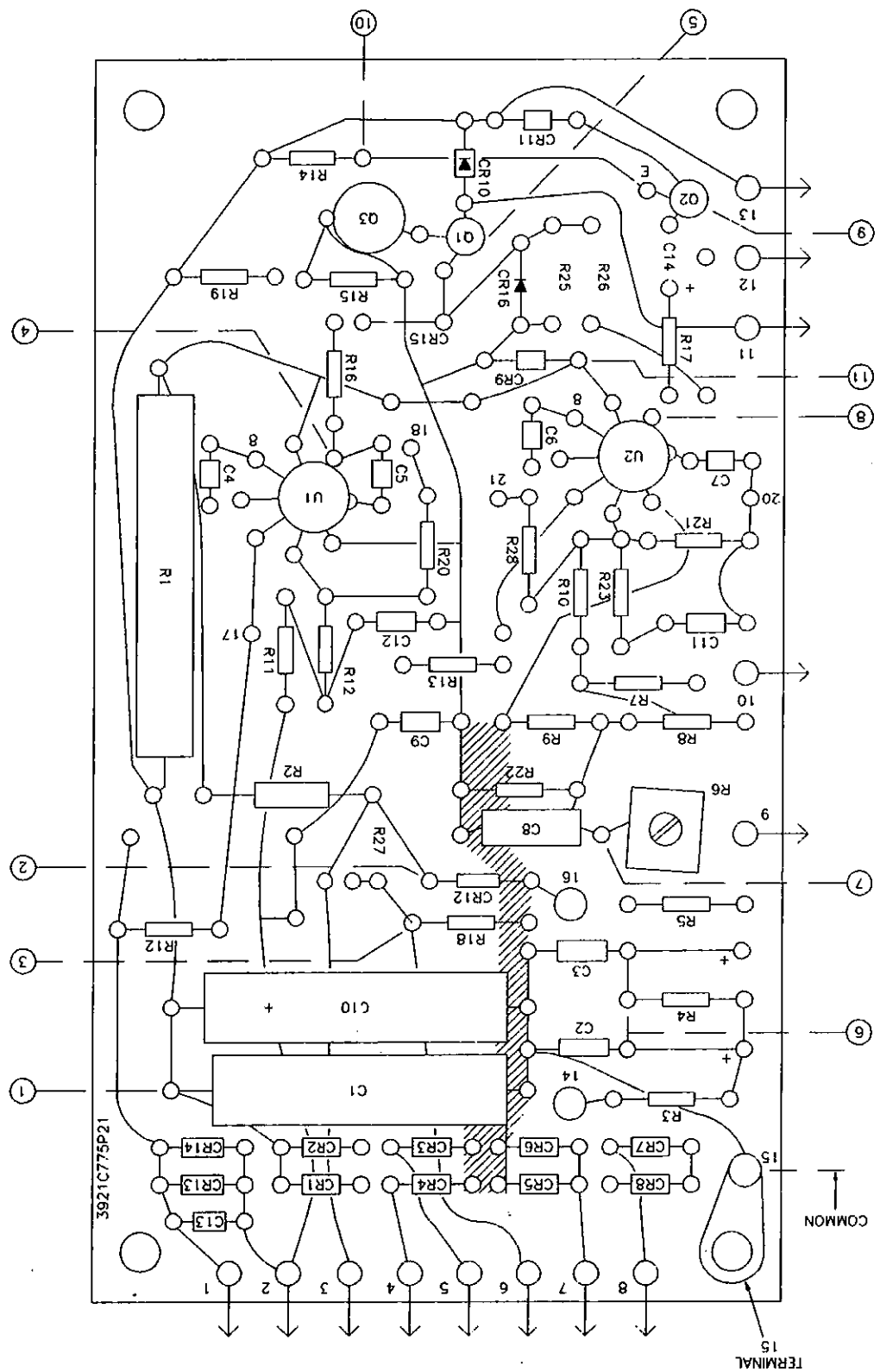
Figure 7-9. Preamplifier 1A53A3A1A5 (P/O Voltage Regulator CN-1473/FPN-44A) Servicing Schematic Diag

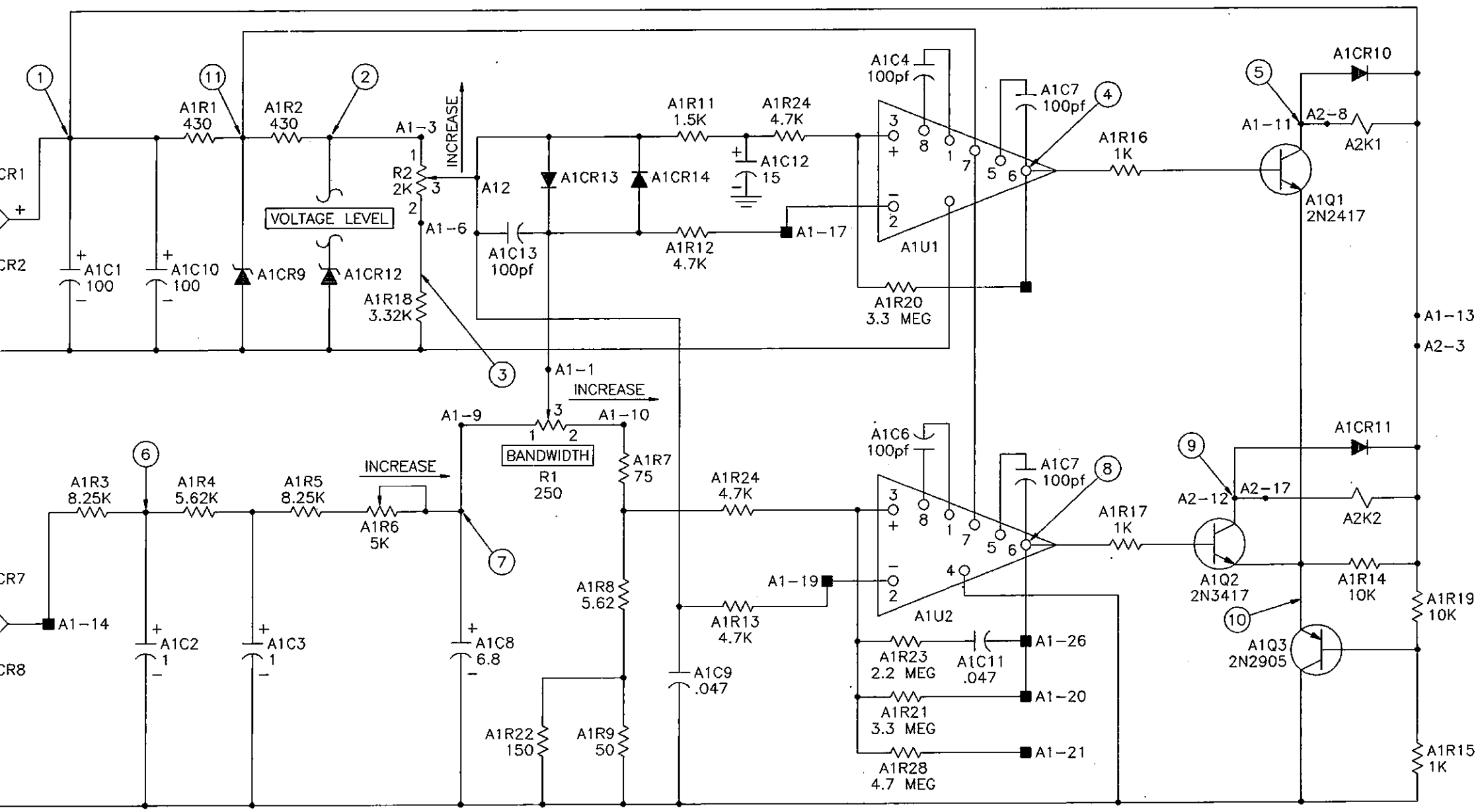
ram

–50



SENSING COMPONENT
BOARD A1
TEST POINT LOCATIONS





VOLTAGE MEASUREMENT PROCURE

1. GAIN ACCESS TO SENSING CIRCUIT COMPONENT BOARD A1.
2. ADJUST VOLTAGE LEVEL CONTROL SO THAT RAISE AND LOWER RELAYS ARE NOT ENERGIZED.
3. MEASURE VOLTAGES WITH 10,000 OHMS/VOLT METER, METER COMMON LEAD AT NEGATIVE TERMINAL OF A1C1 (TERMINAL 15) AND POSITIVE LEAD AT POINTS LISTED IN VOLTAGE TABLE.

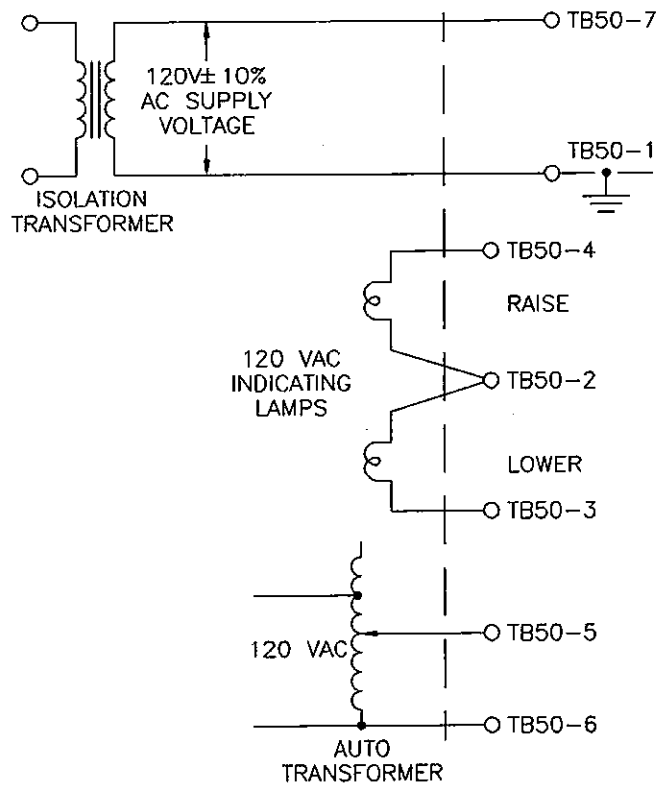
OPTIONAL BENCH TEST PROCEDURE

1. REMOVE PANEL FROM CASE AS FOLLOWS:
   A. REMOVE SCREWS FASTENING PANEL TO CASE.
   B. DISCONNECT EXTERNAL LEADS AT TERMINAL BOARDS TB50 AND TB51.
2. CONNECT AS SHOWN IN OPTIONAL BENCH TEST SET-UP.
3. ADJUST AUTO TRANSFORMER SO THAT RAISE AND LOWER LAMPS ARE NOT LIT.

VOLTAGE TABLE

TEST POINT NO.	COMPONENT	DC± 10%
1	C1	28
2	CR12	6
3	R18	4
4	U1-6	0.8 *10.7
5	Q1-C	28 *3
6	C2	19
7	C8	5
8	U2-6	0.8 *10.7
9	Q2-C	28 *3
10	Q3-E	3
11	CR9	12

*THE VOLTAGE READINGS WHEN RAISE OR LOWER RELAY IS ENERGIZED



OPTIONAL BENCH TEST SET-UP

Figure 7-10. Regulator CN-1472/FPN-44A Servi
Schematic Diagram

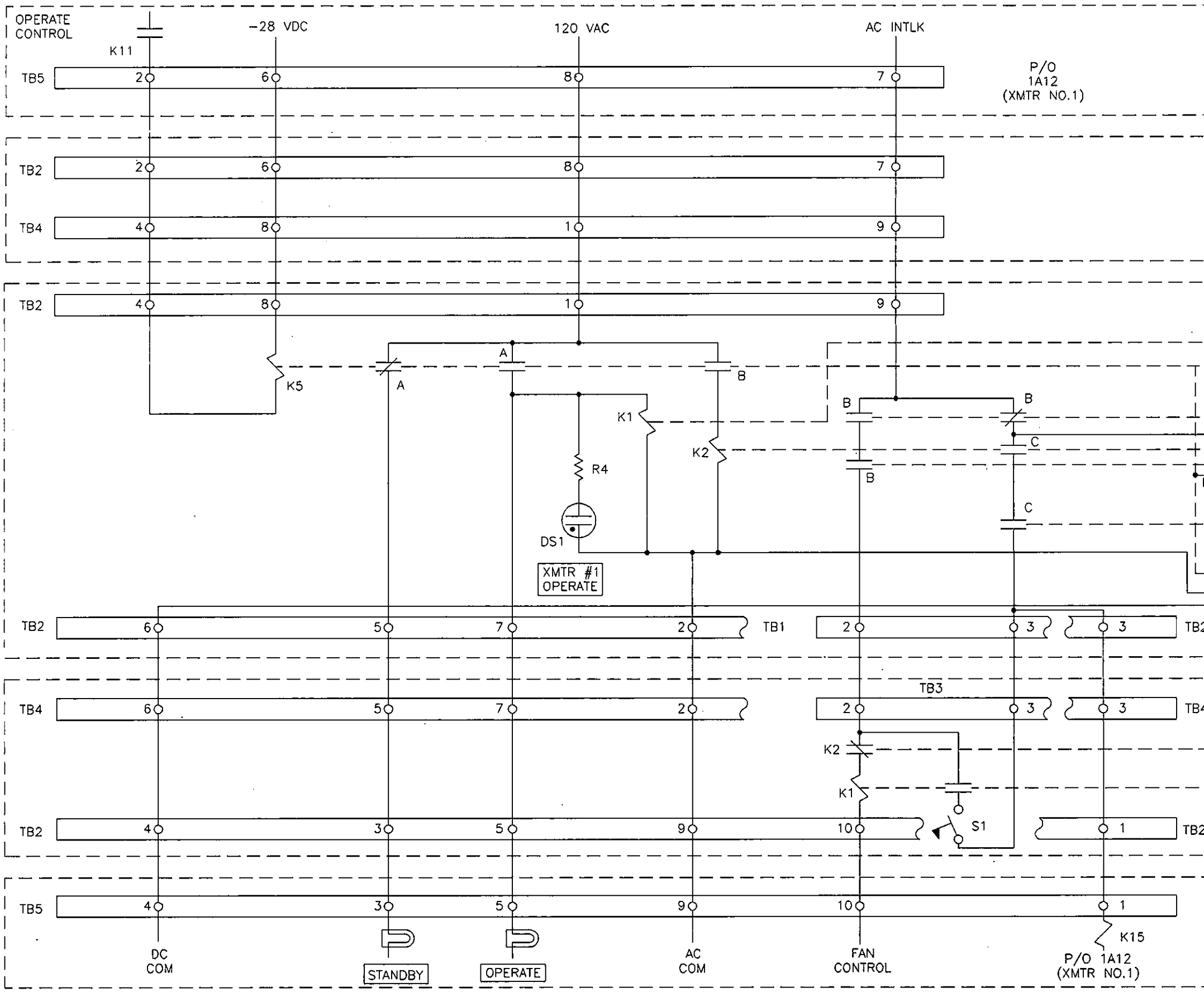
o.

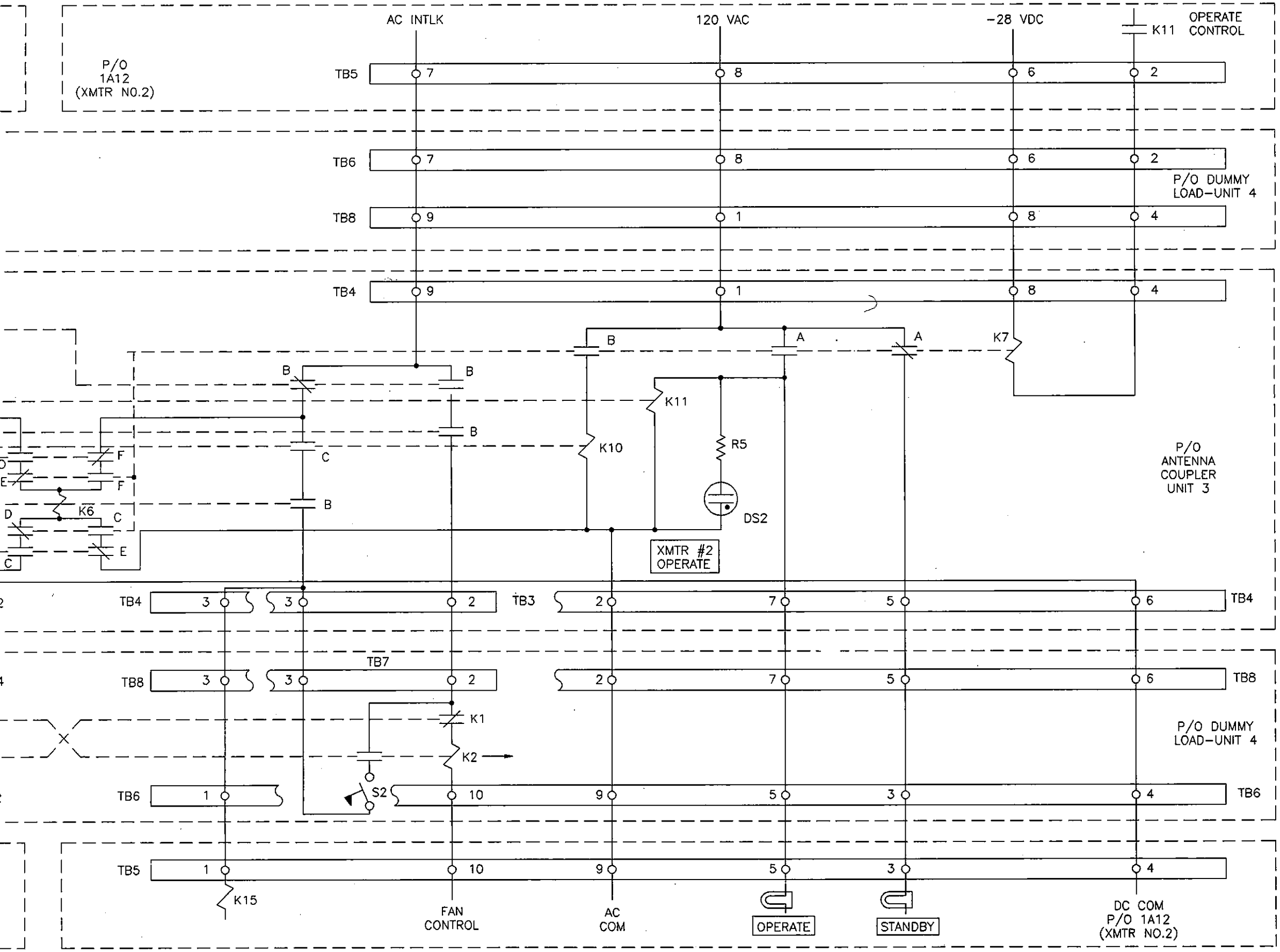
cing

–52

SEE FIGURE 7-48

Figure 7-11. Voltage Divider CN-1474/PPN-44A (1A53A7), Servicing Schematic Diagram


OPERATE CONTROL
K11
-28 VDC
120 VAC
AC INTLK
TB5
2
6
8
7
P/O 1A12 (XMTR NO.1)
TB2
2
6
8
7
TB4
4
8
1
9
TB2
4
8
1
9
K5
A
A
B
K1
K2
R4
DS1
XMTR #1 OPERATE
B
B
C
B
C
TB2
6
5
7
2
TB1
2
3
3
TB2
TB3
TB4
6
5
7
2
2
3
3
TB4
K2
K1
S1
TB2
4
3
5
9
10
1
TB2
TB5
4
3
5
9
10
1
K15
DC COM
STANDBY
OPERATE
AC COM
FAN CONTROL
P/O 1A12 (XMTR NO.1)



RELAY FUNCTION	
3K1	XMTR #1 ANTENNA TRANSFER
3K2	XMTR #1 GROUND TRANSFER
3K3	NOT USED
3K4	NOT USED
3K5	XMTR #1 OPERATE CONTROL
3K6	ANTENNA GROUNDING
3K7	XMTR #2 OPERATE CONTROL
3K8	NOT USED
3K9	NOT USED
3K10	XMTR #2 GROUND TRANSFER
3K11	XMTR #2 ANTENNA TRANSER
4K1	XMTR #1 DUMMY LOAD FAN
4K2	XMTR #2 DUMMY LOAD FAN

Figure 7-12. Antenna Coupler and Dummy Control Circuits, Servicing Schematic Diag

Load,
gram

/7–56

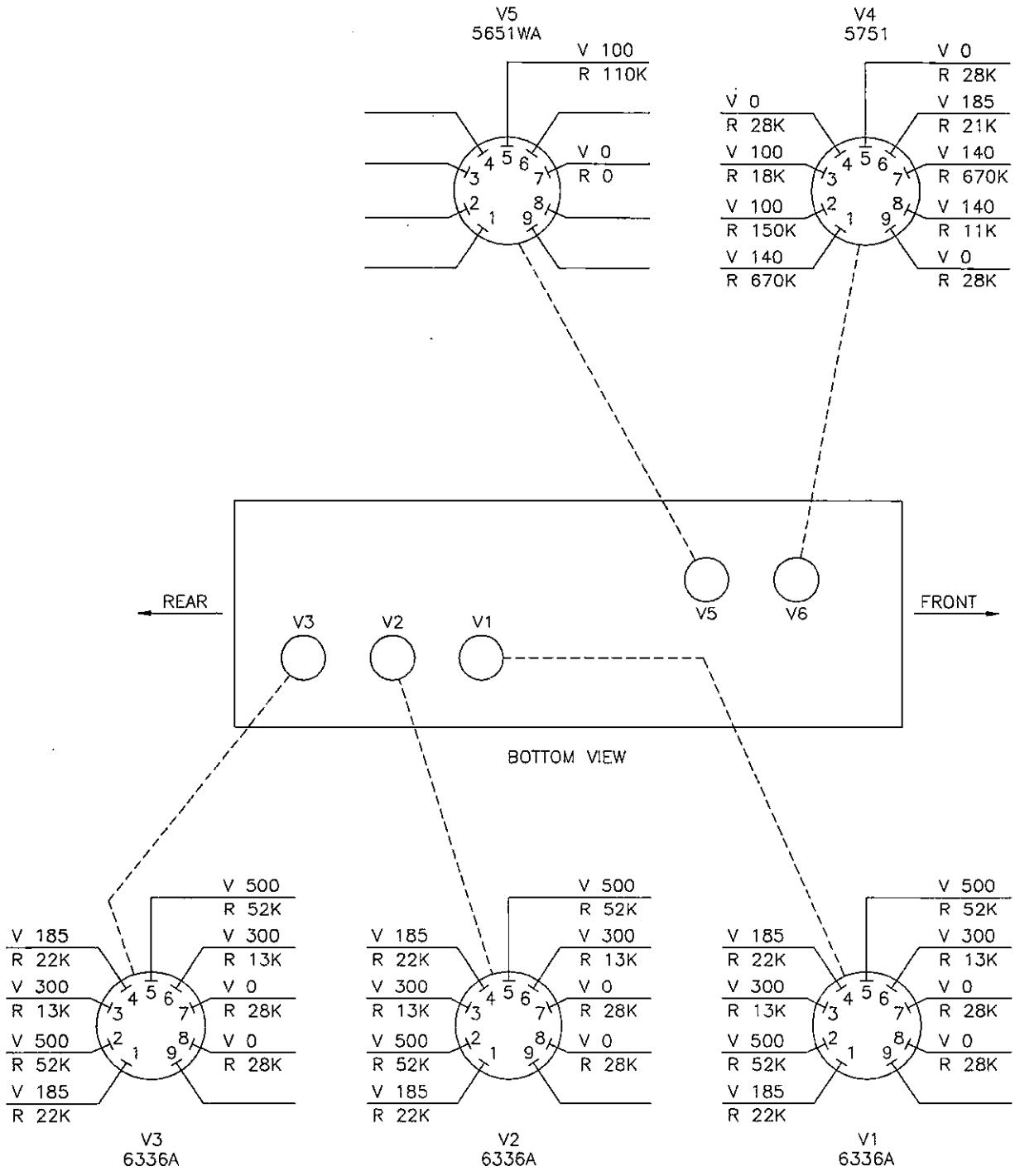


Figure 7-14. +250-Volt Regulator 1A4A1A1, Voltage and Resistance Measurements

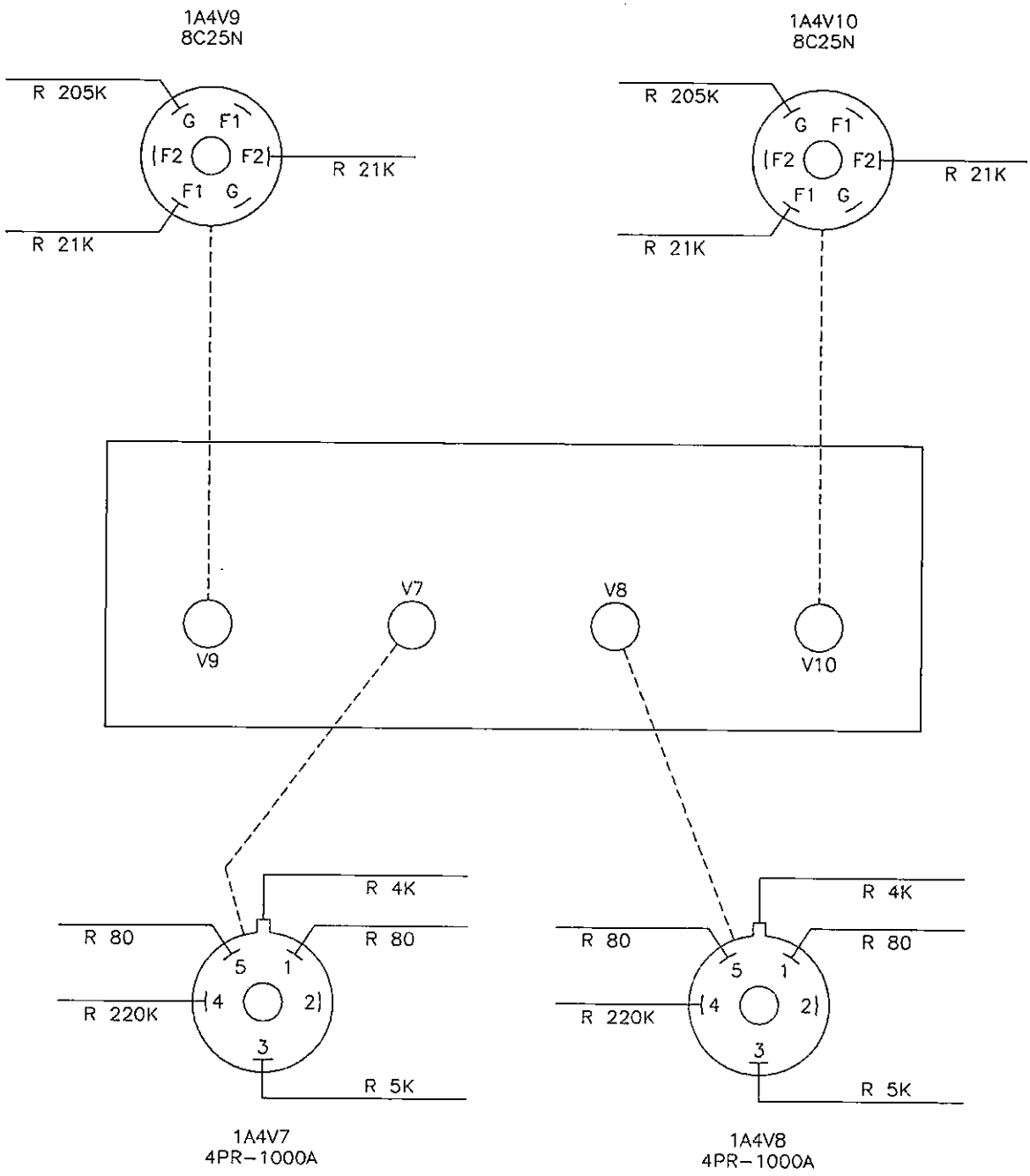


Figure 7-15. Output Stages in Amplifier Group OG-159/FPN-44A, Resistance Measurements

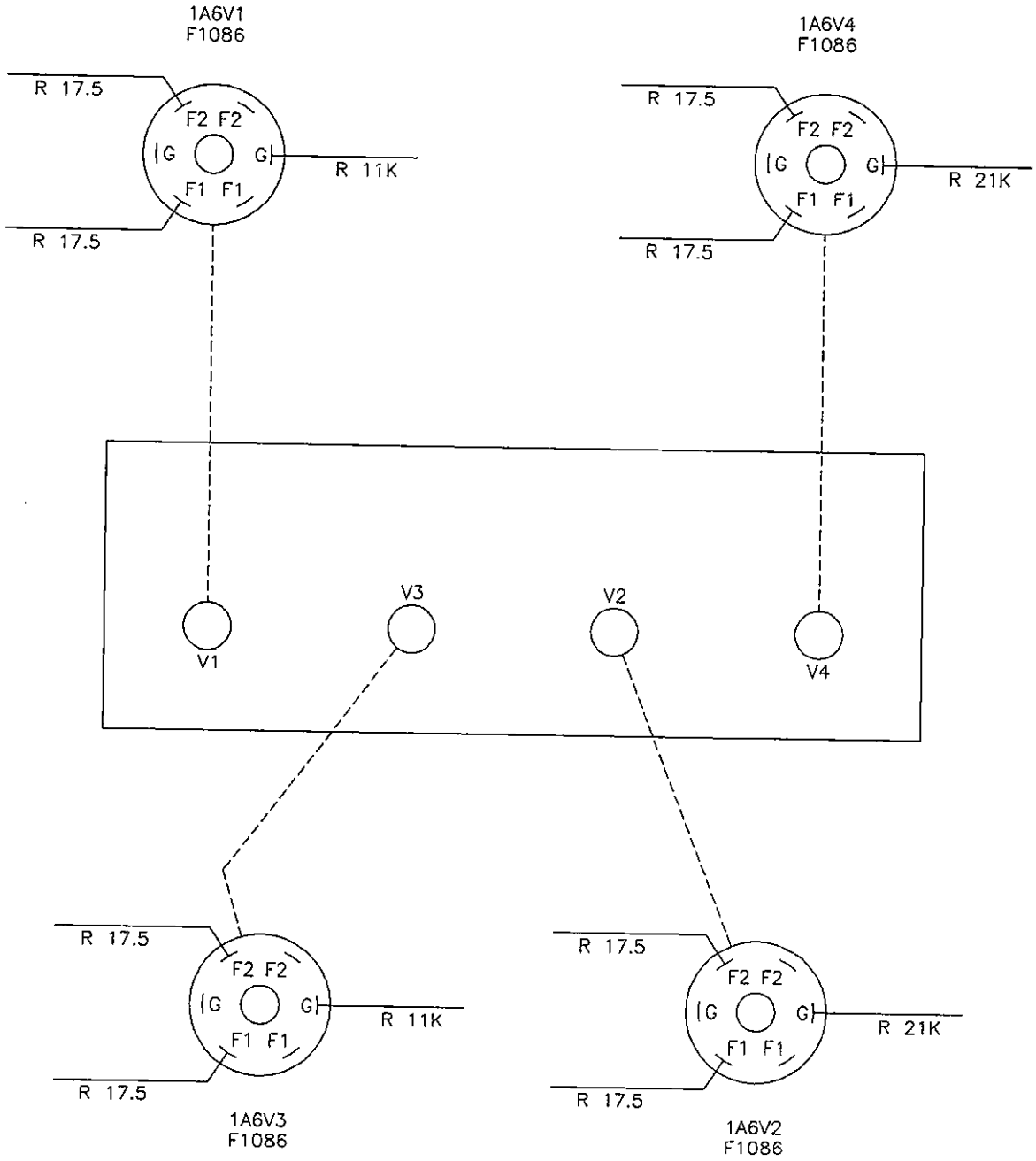
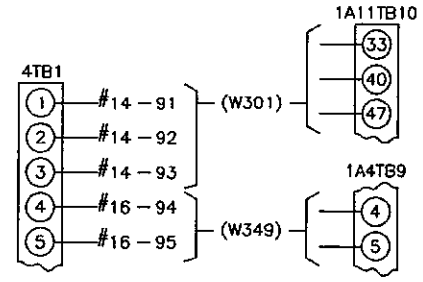
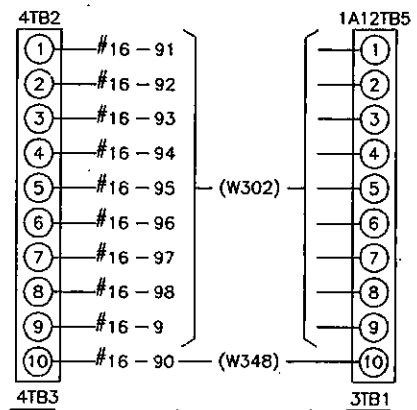
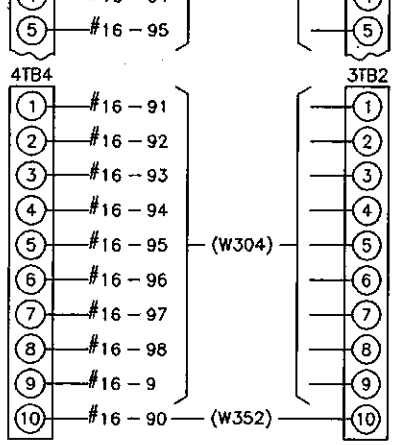


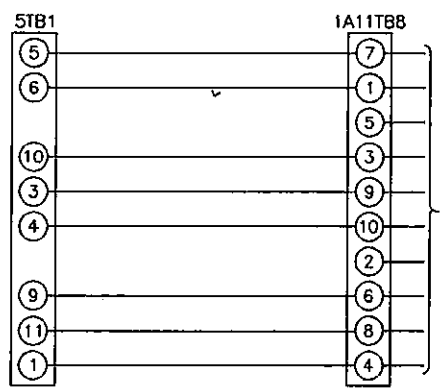
Figure 7–16. PA Tube Rack 1A6, Resistance Measurements

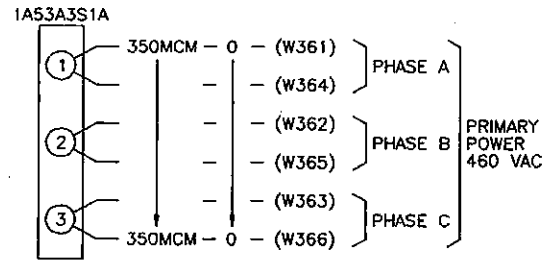
TRANSMITTER #1

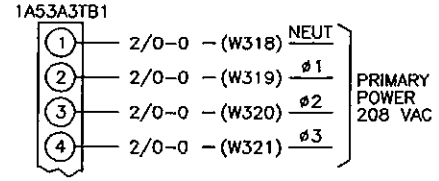


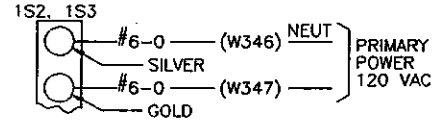


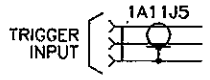


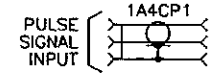


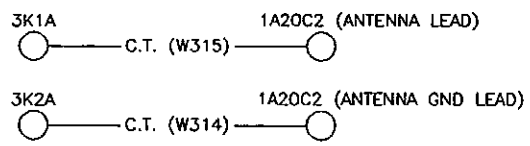




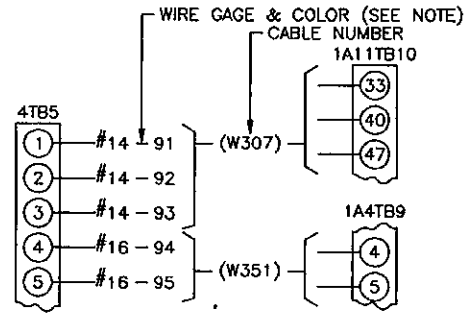


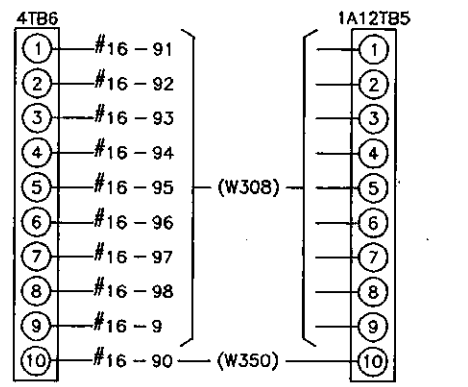


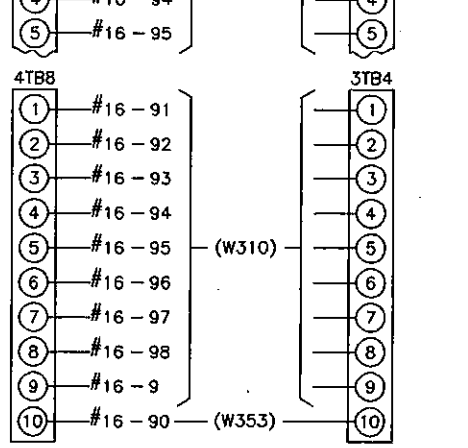


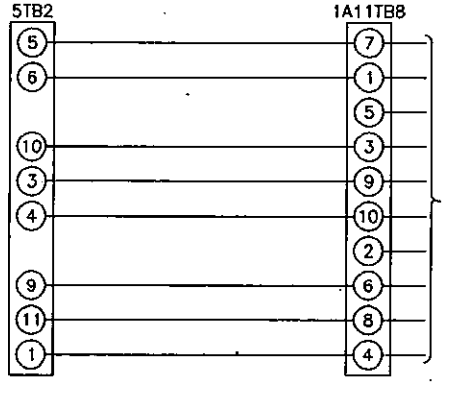


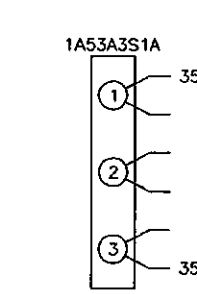
TRANSMITTER

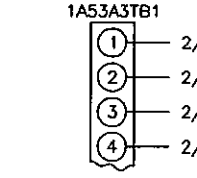


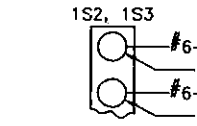


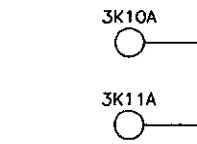


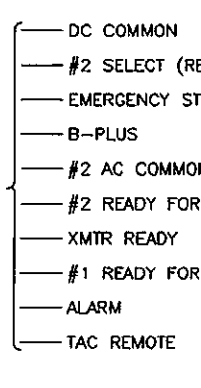






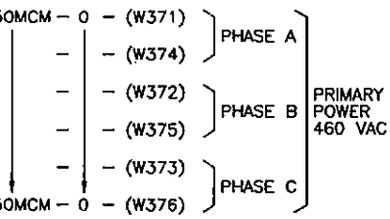


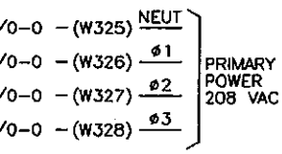


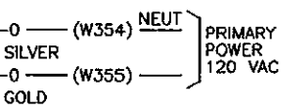


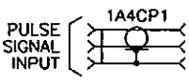
CHANGE 4

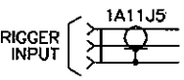
#2

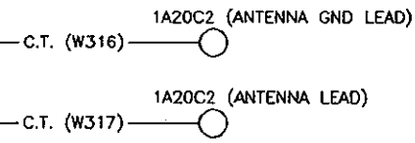


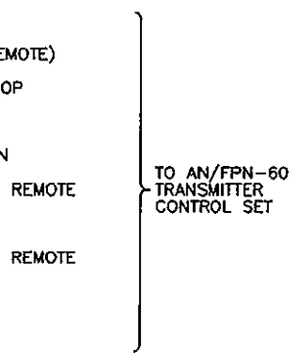


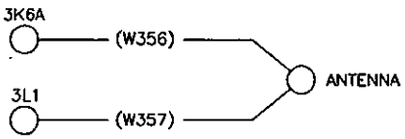


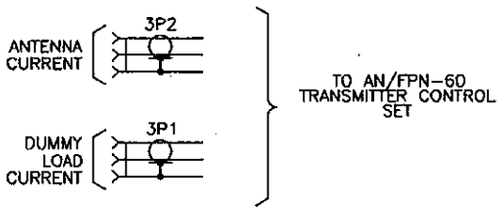












NOTE:

WIRE COLOR CODE

0	– BLACK
09	– BLACK WHITE
2	– RED
20	– RED BLACK
30	– ORANGE BLACK
5	– GREEN
50	– GREEN BLACK
6	– BLUE
9	– WHITE
91	– WHITE BROWN
92	– WHITE RED
93	– WHITE ORANGE
94	– WHITE YELLOW
95	– WHITE GREEN
96	– WHITE BLUE
97	– WHITE VIOLET
98	– WHITE GRAY
C.T.	– COPPER TUBING
90	– WHITE BLACK

Figure 7–17. Loran Transmitting Set AN/FPN–44, Wiring Diagram

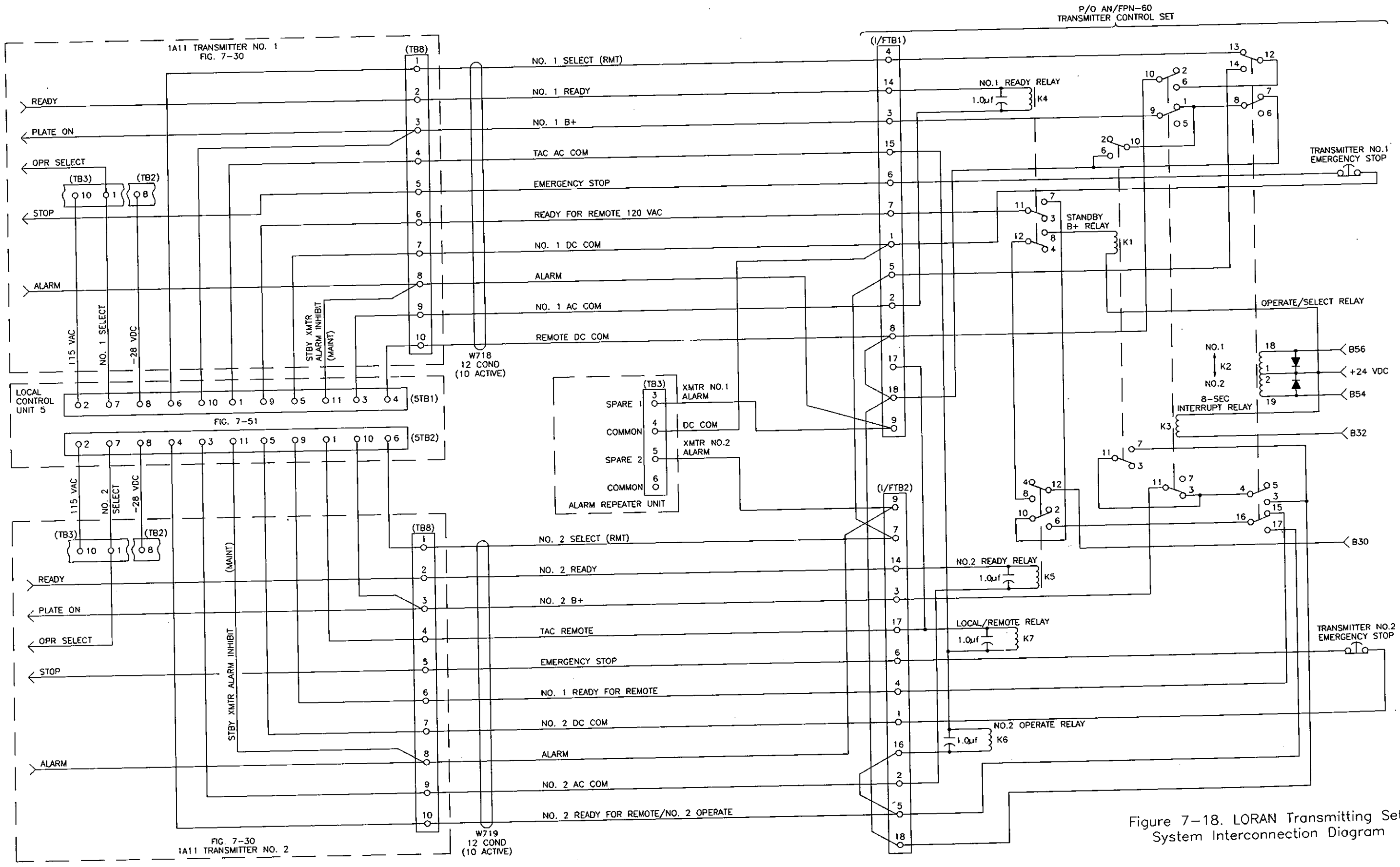
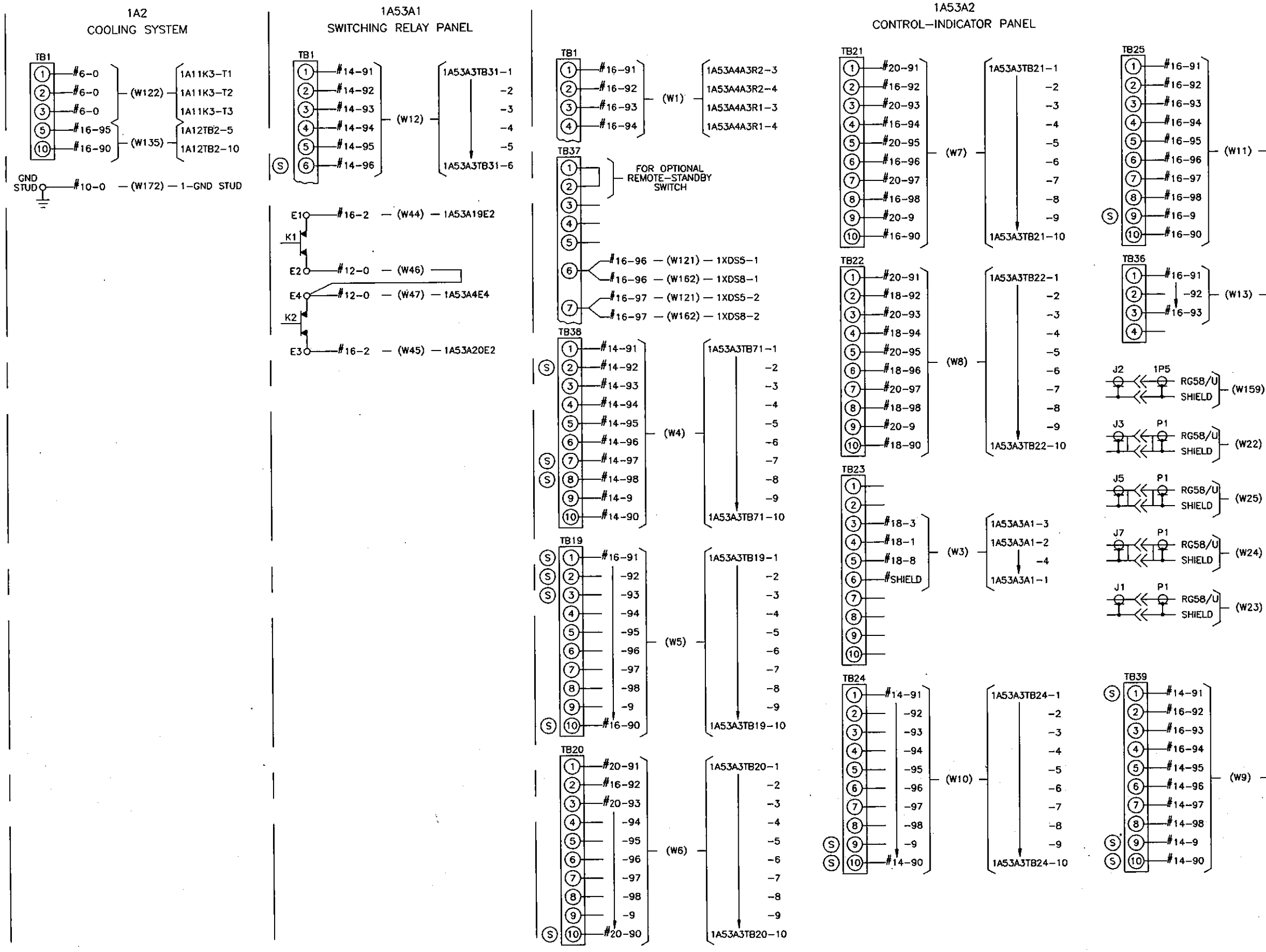
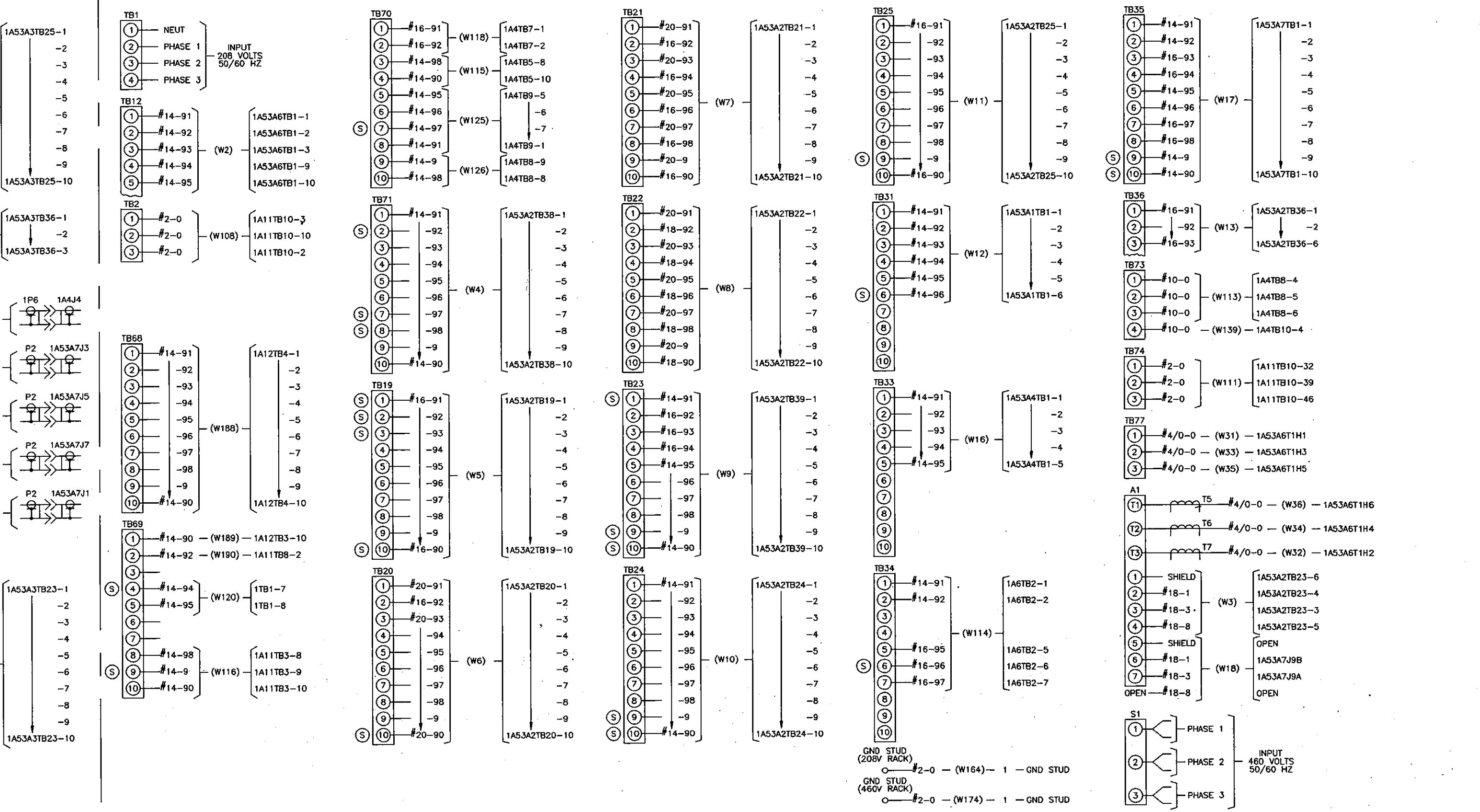


Figure 7-18. LORAN Transmitting Set, System Interconnection Diagram

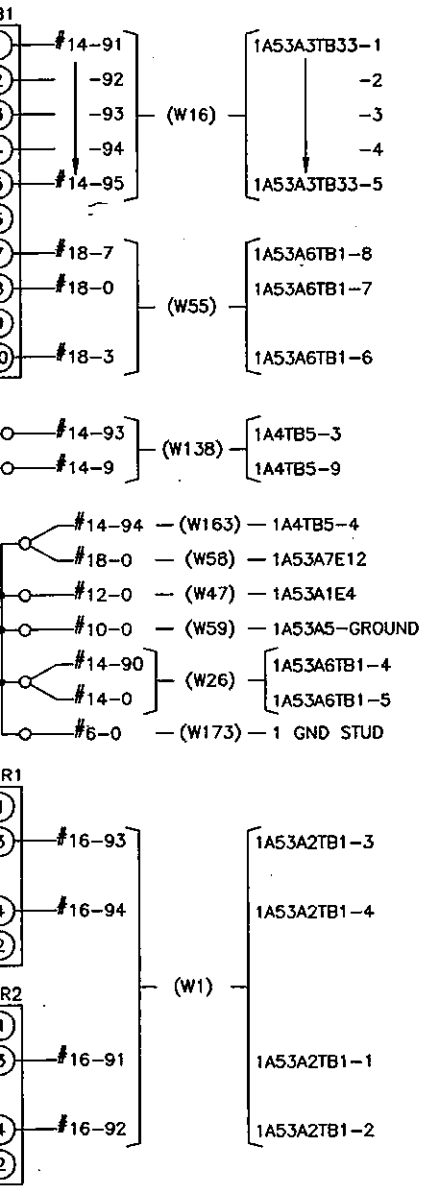

1A2
COOLING SYSTEM
TB1
#6-0
#6-0
#6-0
#16-95
#16-90
(W122)
(W135)
1A11K3-T1
1A11K3-T2
1A11K3-T3
1A12TB2-5
1A12TB2-10
GND STUD
#10-0 — (W172) — 1-GND STUD
1A53A1
SWITCHING RELAY PANEL
TB1
#14-91
#14-92
#14-93
#14-94
#14-95
#14-96
(W12)
1A53A3TB31-1
-2
-3
-4
-5
1A53A3TB31-6
E1 #16-2 — (W44) — 1A53A19E2
K1
E2 #12-0 — (W46)
E4 #12-0 — (W47) — 1A53A4E4
K2
E3 #16-2 — (W45) — 1A53A20E2
TB1
#16-91
#16-92
#16-93
#16-94
(W1)
1A53A4A3R2-3
1A53A4A3R2-4
1A53A4A3R1-3
1A53A4A3R1-4
TB37
FOR OPTIONAL REMOTE-STANDBY SWITCH
#16-96 — (W121) — 1XDS5-1
#16-96 — (W162) — 1XDS8-1
#16-97 — (W121) — 1XDS5-2
#16-97 — (W162) — 1XDS8-2
TB38
#14-91
#14-92
#14-93
#14-94
#14-95
#14-96
#14-97
#14-98
#14-9
#14-90
(W4)
1A53A3TB71-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB71-10
TB19
#16-91
-92
-93
-94
-95
-96
-97
-98
-9
#16-90
(W5)
1A53A3TB19-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB19-10
TB20
#20-91
#16-92
#20-93
-94
-95
-96
-97
-98
-9
#20-90
(W6)
1A53A3TB20-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB20-10
1A53A2
CONTROL-INDICATOR PANEL
TB21
#20-91
#16-92
#20-93
#16-94
#20-95
#16-96
#20-97
#16-98
#20-9
#16-90
(W7)
1A53A3TB21-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB21-10
TB22
#20-91
#18-92
#20-93
#18-94
#20-95
#18-96
#20-97
#18-98
#20-9
#18-90
(W8)
1A53A3TB22-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB22-10
TB23
#18-3
#18-1
#18-8
#SHIELD
(W3)
1A53A3A1-3
1A53A3A1-2
-4
1A53A3A1-1
TB24
#14-91
-92
-93
-94
-95
-96
-97
-98
-9
#14-90
(W10)
1A53A3TB24-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB24-10
TB25
#16-91
#16-92
#16-93
#16-94
#16-95
#16-96
#16-97
#16-98
#16-9
#16-90
(W11)
TB36
#16-91
-92
#16-93
(W13)
J2 1P5 RG58/U SHIELD (W159)
J3 P1 RG58/U SHIELD (W22)
J5 P1 RG58/U SHIELD (W25)
J7 P1 RG58/U SHIELD (W24)
J1 P1 RG58/U SHIELD (W23)
TB39
#14-91
#16-92
#16-93
#16-94
#14-95
#14-96
#14-97
#14-98
#14-9
#14-90
(W9)

1A53A3
RELAY ASSEMBLY

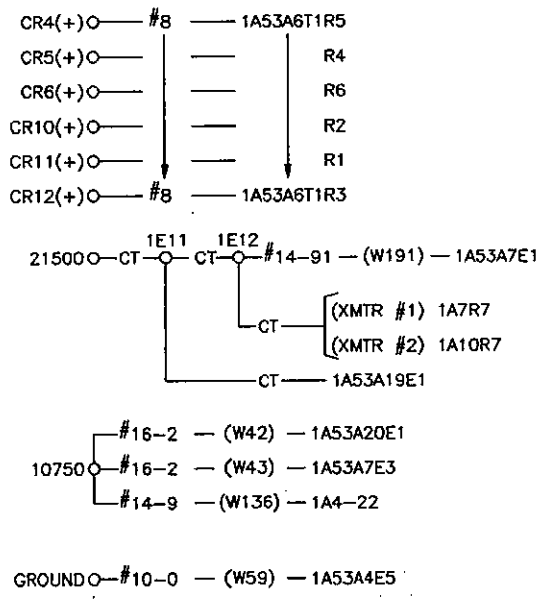
1A53
POWER SUPPLY



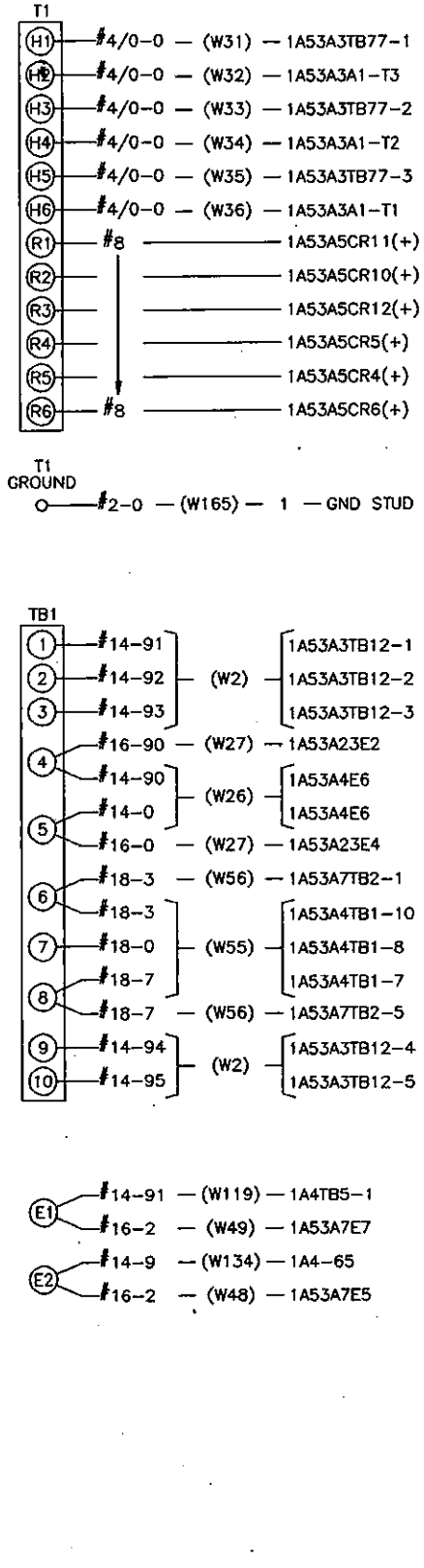
1A53A4
INSTRUMENT SHUNT



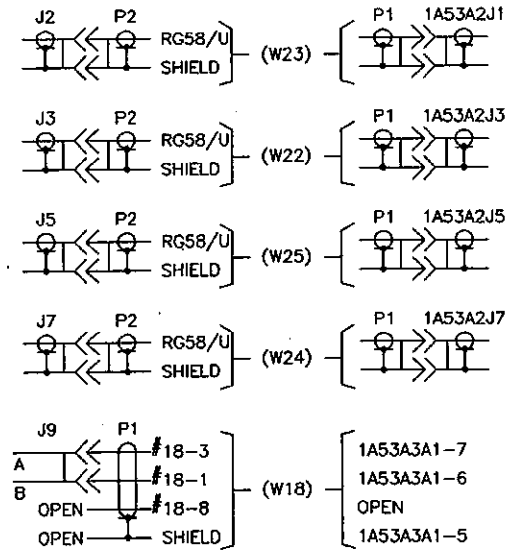
1A53A5
RECTIFIER ASSEMBLY

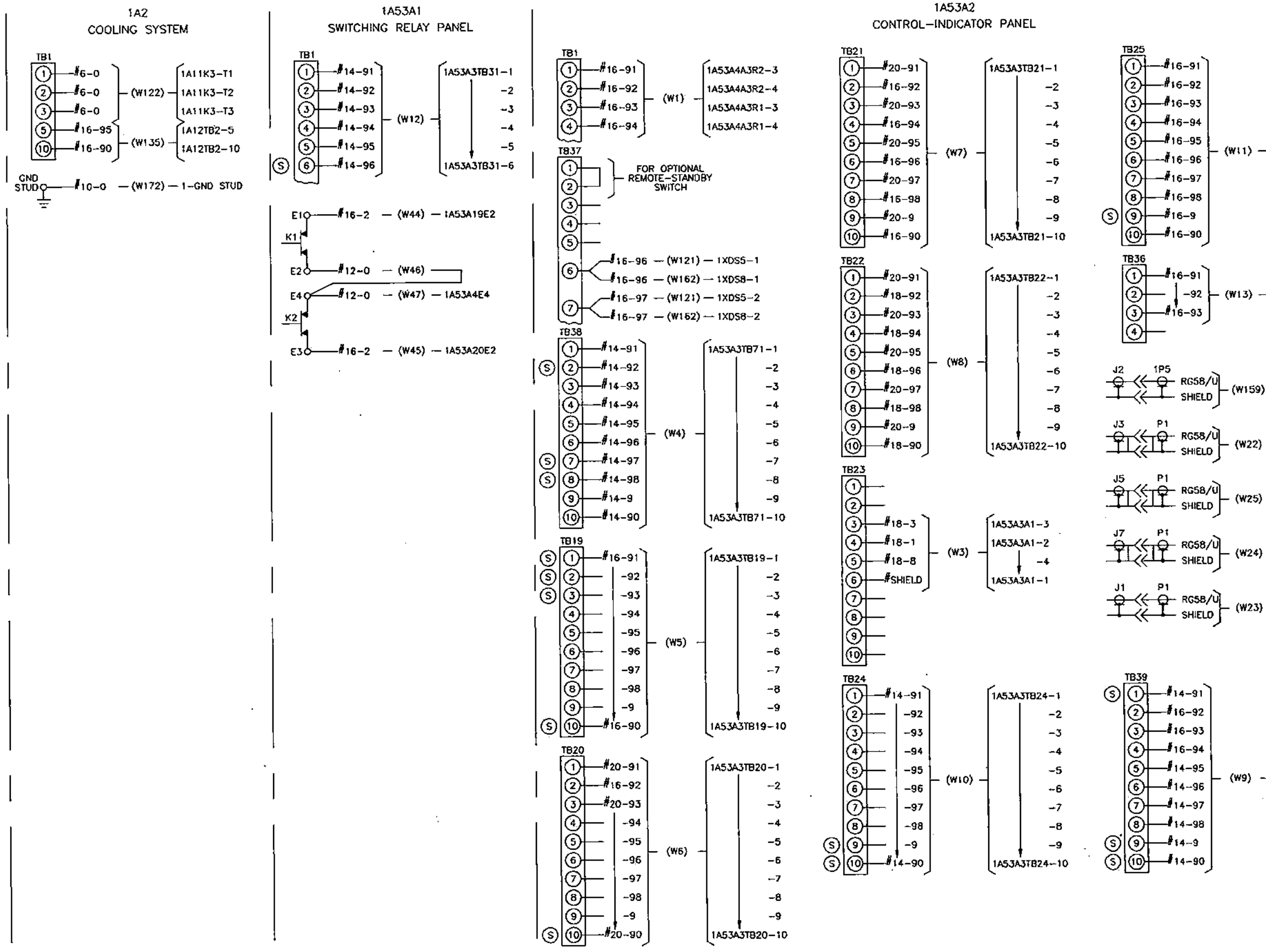


1A53A6
TRANSFORMER



1A53A7
VOLTAGE DIVIDER




1A2
COOLING SYSTEM
TB1
#6-0
#6-0
#6-0
#16-95
#16-90
(W122)
(W135)
1A11K3-T1
1A11K3-T2
1A11K3-T3
1A12TB2-5
1A12TB2-10
GND STUD
#10-0
(W172)
1-GND STUD
1A53A1
SWITCHING RELAY PANEL
TB1
#14-91
#14-92
#14-93
#14-94
#14-95
#14-96
(W12)
1A53A3TB31-1
-2
-3
-4
-5
1A53A3TB31-6
E1
#16-2
(W44)
1A53A19E2
K1
E2
#12-0
(W46)
E4
#12-0
(W47)
1A53A4E4
K2
E3
#16-2
(W45)
1A53A20E2
TB1
#16-91
#16-92
#16-93
#16-94
(W1)
1A53A4A3R2-3
1A53A4A3R2-4
1A53A4A3R1-3
1A53A4A3R1-4
TB37
FOR OPTIONAL REMOTE-STANDBY SWITCH
#16-96
(W121)
1XDS5-1
#16-96
(W162)
1XDS8-1
#16-97
(W121)
1XDS5-2
#16-97
(W162)
1XDS8-2
TB38
#14-91
#14-92
#14-93
#14-94
#14-95
#14-96
#14-97
#14-98
#14-9
#14-90
(W4)
1A53A3TB71-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB71-10
TB19
#16-91
-92
-93
-94
-95
-96
-97
-98
-9
#16-90
(W5)
1A53A3TB19-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB19-10
TB20
#20-91
#16-92
#20-93
-94
-95
-96
-97
-98
-9
#20-90
(W6)
1A53A3TB20-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB20-10
1A53A2
CONTROL-INDICATOR PANEL
TB21
#20-91
#16-92
#20-93
#16-94
#20-95
#16-96
#20-97
#16-98
#20-9
#16-90
(W7)
1A53A3TB21-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB21-10
TB22
#20-91
#18-92
#20-93
#18-94
#20-95
#18-96
#20-97
#18-98
#20-9
#18-90
(W8)
1A53A3TB22-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB22-10
TB23
#18-3
#18-1
#18-8
#SHIELD
(W3)
1A53A3A1-3
1A53A3A1-2
-4
1A53A3A1-1
TB24
#14-91
-92
-93
-94
-95
-96
-97
-98
-9
#14-90
(W10)
1A53A3TB24-1
-2
-3
-4
-5
-6
-7
-8
-9
1A53A3TB24-10
TB25
#16-91
#16-92
#16-93
#16-94
#16-95
#16-96
#16-97
#16-98
#16-9
#16-90
(W11)
TB36
#16-91
-92
#16-93
(W13)
J2
1P5
RG58/U
SHIELD
(W159)
J3
P1
RG58/U
SHIELD
(W22)
J5
P1
RG58/U
SHIELD
(W25)
J7
P1
RG58/U
SHIELD
(W24)
J1
P1
RG58/U
SHIELD
(W23)
TB39
#14-91
#16-92
#16-93
#16-94
#14-95
#14-96
#14-97
#14-98
#14-9
#14-90
(W9)

1A53A3
RELAY ASSEMBLY

1A53
POWER SUPPLY

1A53A3TB25-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A3TB25-10

1A53A3TB36-1 -2 1A53A3TB36-3

1P6 1A4J4

P2 1A53A7J3

P2 1A53A7J5

P2 1A53A7J7

P2 1A53A7J1

1A53A3TB23-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A3TB23-10

TB1
1 NEUT
2 PHASE 1
3 PHASE 2
4 PHASE 3
INPUT 208 VOLTS 50/60 HZ

TB12
1 #14-91
2 #14-92
3 #14-93
4 #14-94
5 #14-95
(W2)
1A53A6TB1-1
1A53A6TB1-2
1A53A6TB1-3
1A53A6TB1-9
1A53A6TB1-10

TB2
1 #2-0
2 #2-0
3 #2-0
(W108)
1A11TB10-3
1A11TB10-10
1A11TB10-2

TB68
1 #14-91
2 -92
3 -93
4 -94
5 -95
6 -96
7 -97
8 -98
9 -9
10 #14-90
(W188)
1A12TB4-1 -2 -3 -4 -5 -6 -7 -8 -9 1A12TB4-10

TB69
1 #14-90 — (W189) — 1A12TB3-10
2 #14-92 — (W190) — 1A11TB8-2
3
S 4 #14-94
5 #14-95
(W120)
1TB1-7
1TB1-8
6
7
8 #14-98
S 9 #14-9
10 #14-90
(W116)
1A11TB3-8
1A11TB3-9
1A11TB3-10

TB70
1 #16-91
2 #16-92
(W118)
1A4TB7-1
1A4TB7-2
3 #14-98
4 #14-90
(W115)
1A4TB5-8
1A4TB5-10
S 5 #14-95
6 #14-96
7 #14-97
8 #14-91
(W125)
1A4TB9-5 -6 -7 1A4TB9-1
9 #14-9
10 #14-98
(W126)
1A4TB8-9
1A4TB8-8

TB71
1 #14-91
S 2 -92
3 -93
4 -94
5 -95
6 -96
S 7 -97
S 8 -98
9 -9
10 #14-90
(W4)
1A53A2TB38-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB38-10

TB19
S 1 #16-91
S 2 -92
S 3 -93
4 -94
5 -95
6 -96
7 -97
8 -98
9 -9
S 10 #16-90
(W5)
1A53A2TB19-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB19-10

TB20
1 #20-91
2 #16-92
3 #20-93
4 -94
5 -95
6 -96
7 -97
8 -98
9 -9
S 10 #20-90
(W6)
1A53A2TB20-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB20-10

TB21
1 #20-91
2 #16-92
3 #20-93
4 #16-94
5 #20-95
6 #16-96
7 #20-97
8 #16-98
9 #20-9
10 #16-90
(W7)
1A53A2TB21-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB21-10

TB22
1 #20-91
2 #18-92
3 #20-93
4 #18-94
5 #20-95
6 #18-96
7 #20-97
8 #18-98
9 #20-9
10 #18-90
(W8)
1A53A2TB22-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB22-10

TB23
S 1 #14-91
2 #16-92
3 #16-93
4 #16-94
5 #14-95
6 -96
7 -97
8 -98
S 9 -9
S 10 #14-90
(W9)
1A53A2TB39-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB39-10

TB24
1 #14-91
2 -92
3 -93
4 -94
5 -95
6 -96
7 -97
8 -98
S 9 -9
S 10 #14-90
(W10)
1A53A2TB24-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB24-10

TB25
1 #16-91
2 -92
3 -93
4 -94
5 -95
6 -96
7 -97
8 -98
S 9 -9
10 #16-90
(W11)
1A53A2TB25-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A2TB25-10

TB31
1 #14-91
2 #14-92
3 #14-93
4 #14-94
5 #14-95
S 6 #14-96
7
8
9
10
(W12)
1A53A1TB1-1 -2 -3 -4 -5 1A53A1TB1-6

TB33
1 #14-91
2 -92
3 -93
4 -94
5 #14-95
6
7
8
9
10
(W16)
1A53A4TB1-1 -2 -3 -4 1A53A4TB1-5

TB34
1 #14-91
2 #14-92
3
4
5 #16-95
S 6 #16-96
7 #16-97
8
9
10
(W114)
1A6TB2-1
1A6TB2-2
1A6TB2-5
1A6TB2-6
1A6TB2-7

GND STUD (208V RACK) — #2-0 — (W164) — 1 — GND STUD

GND STUD (460V RACK) — #2-0 — (W174) — 1 — GND STUD

TB35
1 #14-91
2 #14-92
3 #16-93
4 #16-94
5 #14-95
6 #14-96
7 #16-97
8 #16-98
S 9 #14-9
S 10 #14-90
(W17)
1A53A7TB1-1 -2 -3 -4 -5 -6 -7 -8 -9 1A53A7TB1-10

TB36
1 #16-91
2 -92
3 #16-93
(W13)
1A53A2TB36-1 -2 1A53A2TB36-6

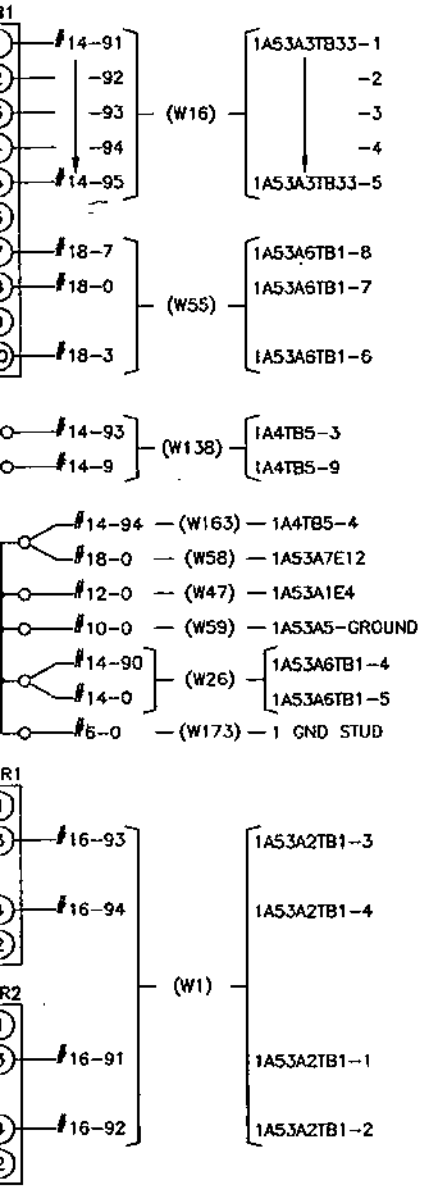
TB73
1 #10-0
2 #10-0
3 #10-0
(W113)
1A4TB8-4
1A4TB8-5
1A4TB8-6
4 #10-0 — (W139) — 1A4TB10-4

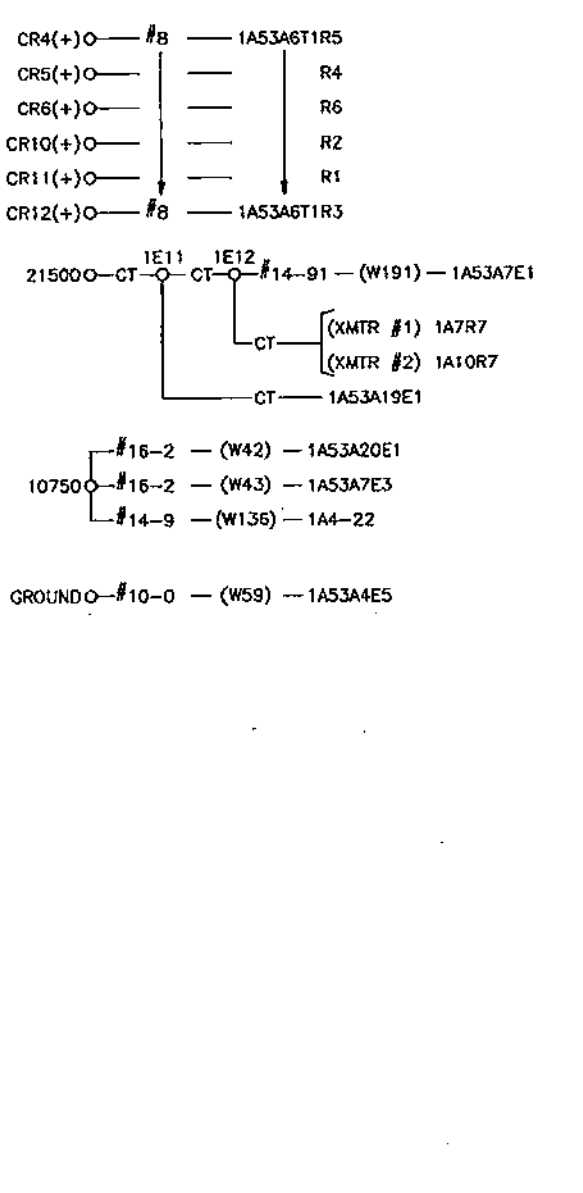
TB74
1 #2-0
2 #2-0
3 #2-0
(W111)
1A11TB10-32
1A11TB10-39
1A11TB10-46

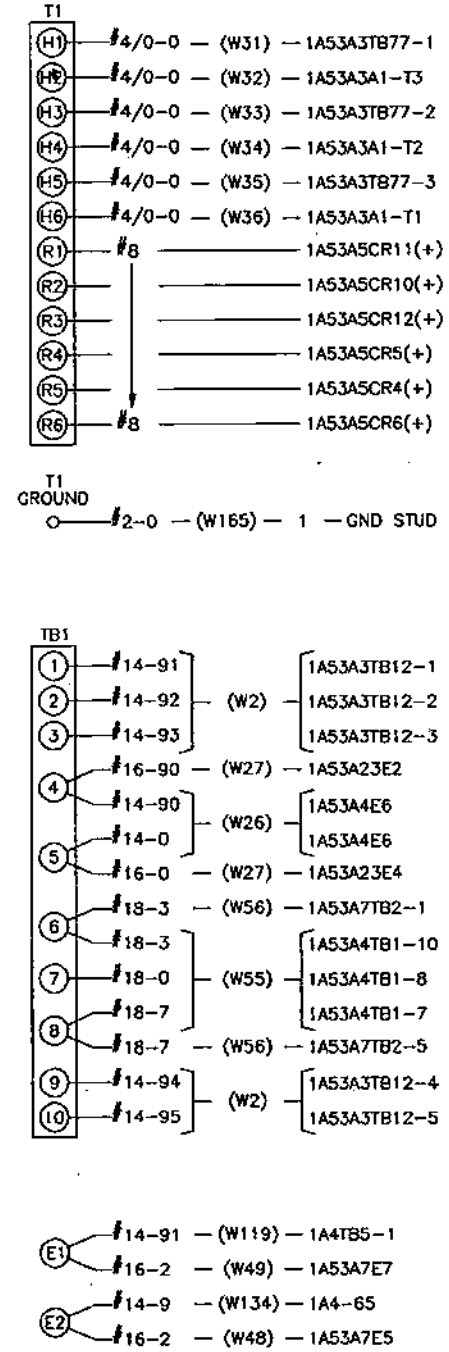
TB77
1 #4/0-0 — (W31) — 1A53A6T1H1
2 #4/0-0 — (W33) — 1A53A6T1H3
3 #4/0-0 — (W35) — 1A53A6T1H5

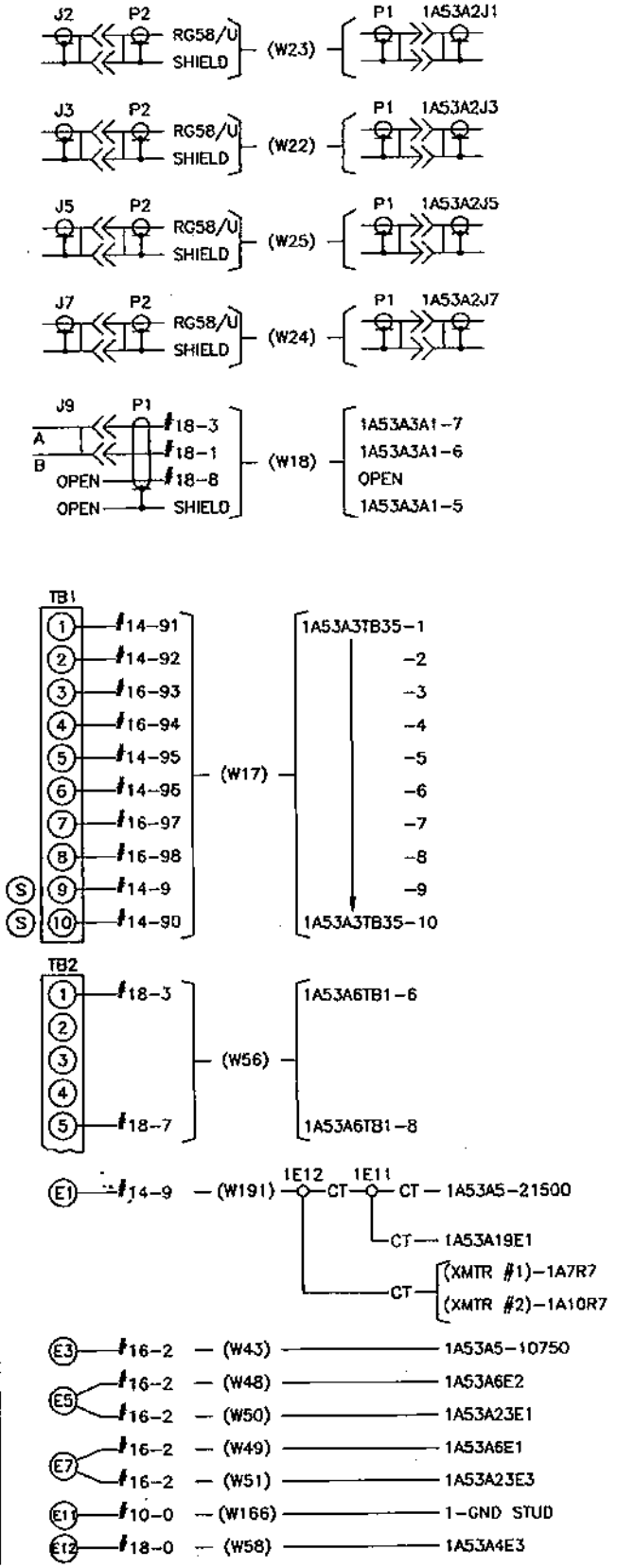
A1
T1 T5 #4/0-0 — (W36) — 1A53A6T1H6
T2 T6 #4/0-0 — (W34) — 1A53A6T1H4
T3 T7 #4/0-0 — (W32) — 1A53A6T1H2
1 SHIELD
2 #18-1
3 #18-3
4 #18-8
(W3)
1A53A2TB23-6
1A53A2TB23-4
1A53A2TB23-3
1A53A2TB23-5
5 SHIELD
6 #18-1
7 #18-3
OPEN — #18-8
(W18)
OPEN
1A53A7J9B
1A53A7J9A
OPEN

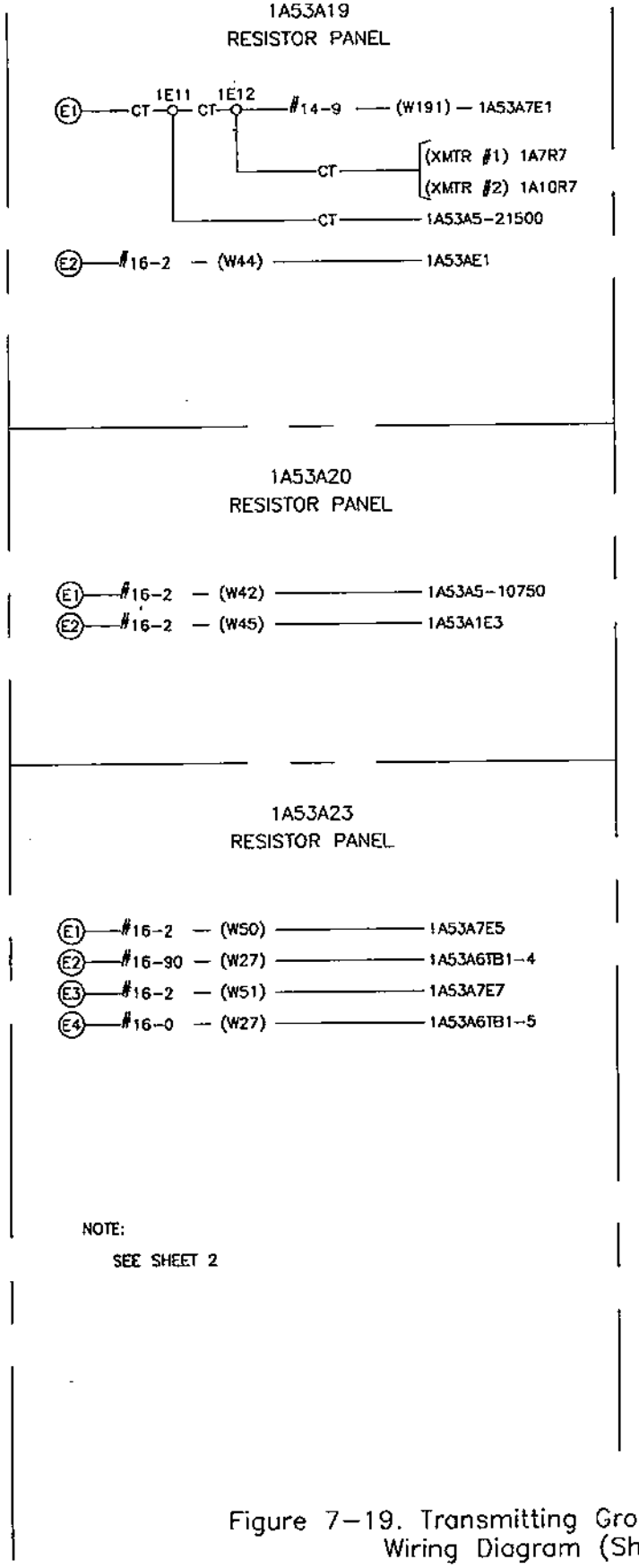
S1
1 PHASE 1
2 PHASE 2
3 PHASE 3
INPUT 460 VOLTS 50/60 HZ











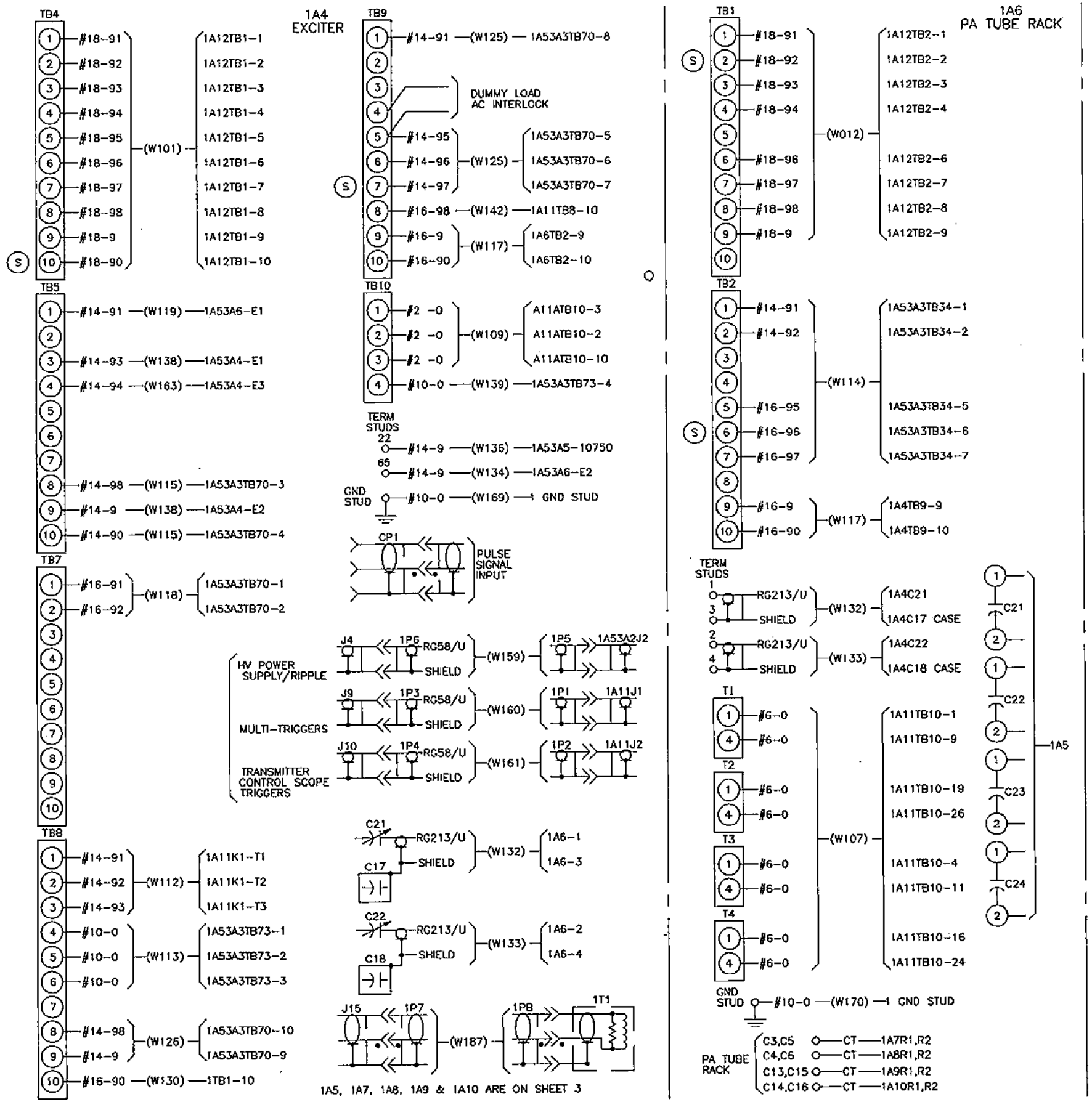
NOTE:

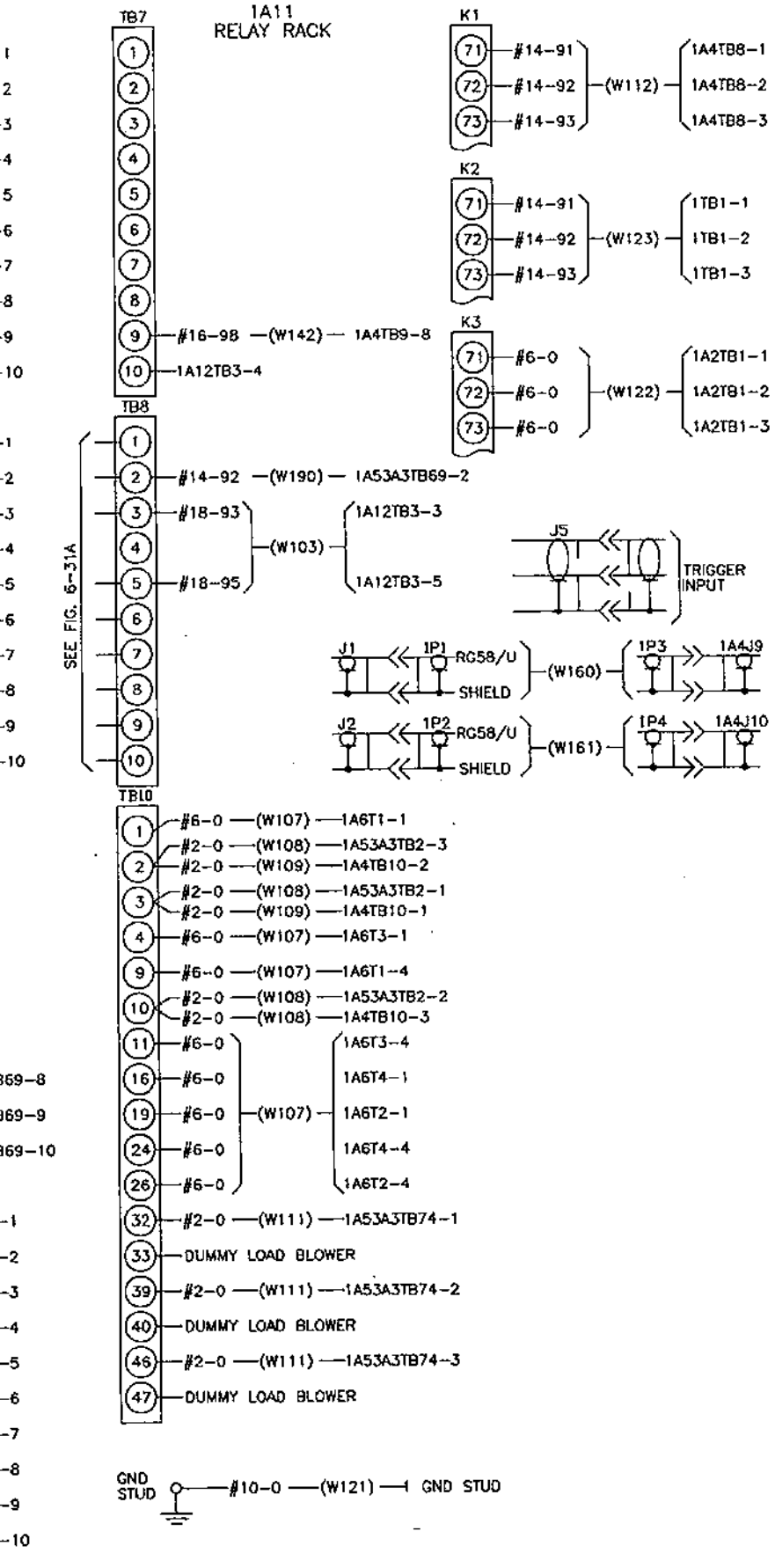
SEE SHEET 2

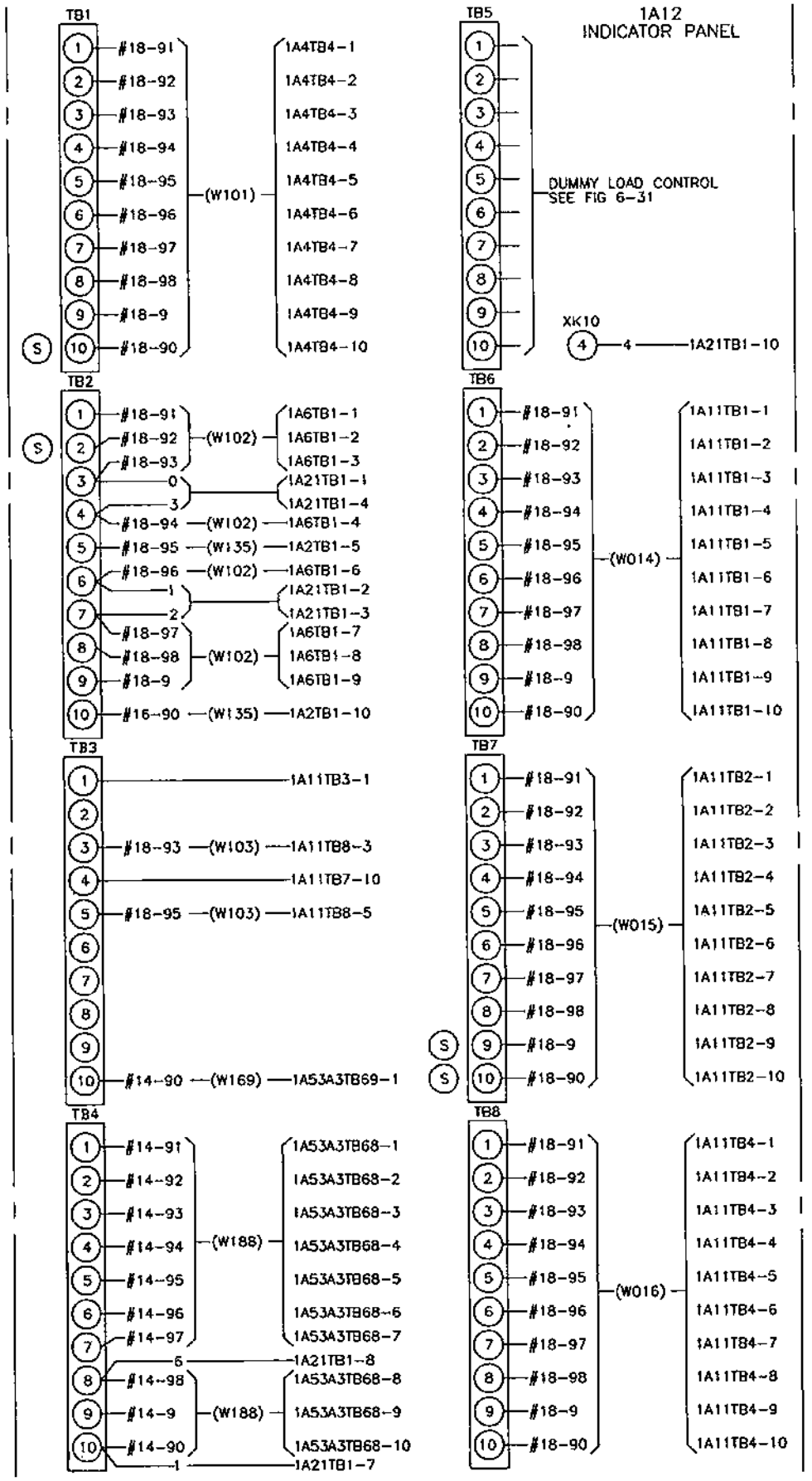
Figure 7-19. Transmitting Group OT-96/FPN Wiring Diagram (Sheet 1 of 3)

1–44A(1),

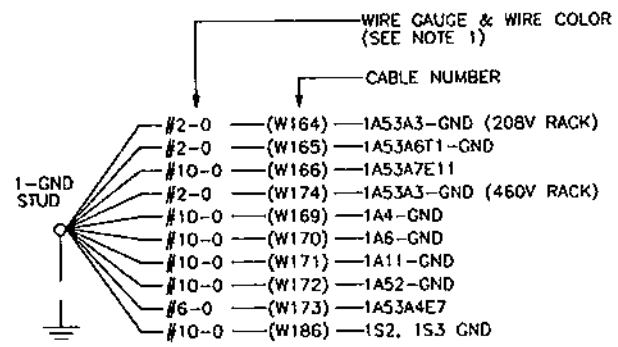
65/7–66


1A4 EXCITER
TB4
#18-91 (1) 1A12TB1-1
#18-92 (2) 1A12TB1-2
#18-93 (3) 1A12TB1-3
#18-94 (4) 1A12TB1-4
#18-95 (5) 1A12TB1-5
#18-96 (6) 1A12TB1-6
#18-97 (7) 1A12TB1-7
#18-98 (8) 1A12TB1-8
#18-9 (9) 1A12TB1-9
(S) #18-90 (10) 1A12TB1-10
(W101)
TB5
#14-91 (1) (W119) 1A53A6-E1
#14-93 (3) (W138) 1A53A4-E1
#14-94 (4) (W163) 1A53A4-E3
#14-98 (8) (W115) 1A53A3TB70-3
#14-9 (9) (W138) 1A53A4-E2
#14-90 (10) (W115) 1A53A3TB70-4
TB7
#16-91 (1) (W118) 1A53A3TB70-1
#16-92 (2) 1A53A3TB70-2
TB8
#14-91 (1) 1A11K1-T1
#14-92 (2) 1A11K1-T2
#14-93 (3) 1A11K1-T3
(W112)
#10-0 (4)
#10-0 (5)
#10-0 (6)
(W113)
1A53A3TB73-1
1A53A3TB73-2
1A53A3TB73-3
#14-98 (8) (W126) 1A53A3TB70-10
#14-9 (9) 1A53A3TB70-9
#16-90 (10) (W130) 1TB1-10
TB9
#14-91 (1) (W125) 1A53A3TB70-8
DUMMY LOAD AC INTERLOCK
#14-95 (5)
#14-96 (6) (W125) 1A53A3TB70-5, 1A53A3TB70-6
(S) #14-97 (7) 1A53A3TB70-7
#16-98 (8) (W142) 1A11TB8-10
#16-9 (9)
#16-90 (10) (W117) 1A6TB2-9, 1A6TB2-10
TB10
#2 -0 (1)
#2 -0 (2) (W109) A11ATB10-3, A11ATB10-2
#2 -0 (3) A11ATB10-10
#10-0 (4) (W139) 1A53A3TB73-4
TERM STUDS
22 #14-9 (W136) 1A53A5-10750
65 #14-9 (W134) 1A53A6-E2
GND STUD #10-0 (W169) 1 GND STUD
CP1
PULSE SIGNAL INPUT
J4 1P6 RG58/U SHIELD (W159) 1P5 1A53A2J2
HV POWER SUPPLY/RIPPLE
J9 1P3 RG58/U SHIELD (W160) 1P1 1A11J1
MULTI-TRIGGERS
J10 1P4 RG58/U SHIELD (W161) 1P2 1A11J2
TRANSMITTER CONTROL SCOPE TRIGGERS
C21 RG213/U SHIELD C17 (W132) 1A6-1, 1A6-3
C22 RG213/U SHIELD C18 (W133) 1A6-2, 1A6-4
J15 1P7 (W187) 1P8 1T1
1A5, 1A7, 1A8, 1A9 & 1A10 ARE ON SHEET 3
1A6 PA TUBE RACK
TB1
(S) #18-91 (1) 1A12TB2-1
#18-92 (2) 1A12TB2-2
#18-93 (3) 1A12TB2-3
#18-94 (4) 1A12TB2-4
#18-96 (6) 1A12TB2-6
#18-97 (7) 1A12TB2-7
#18-98 (8) 1A12TB2-8
#18-9 (9) 1A12TB2-9
(W012)
TB2
#14-91 (1) 1A53A3TB34-1
#14-92 (2) 1A53A3TB34-2
(S) #16-95 (5) 1A53A3TB34-5
#16-96 (6) 1A53A3TB34-6
#16-97 (7) 1A53A3TB34-7
(W114)
#16-9 (9)
#16-90 (10) (W117) 1A4TB9-9, 1A4TB9-10
TERM STUDS
1 RG213/U SHIELD 3 (W132) 1A4C21, 1A4C17 CASE
2 RG213/U SHIELD 4 (W133) 1A4C22, 1A4C18 CASE
T1 #6-0 (1) #6-0 (4) 1A11TB10-1, 1A11TB10-9
T2 #6-0 (1) #6-0 (4) 1A11TB10-19, 1A11TB10-26
T3 #6-0 (1) #6-0 (4) 1A11TB10-4, 1A11TB10-11
T4 #6-0 (1) #6-0 (4) 1A11TB10-16, 1A11TB10-24
(W107)
GND STUD #10-0 (W170) 1 GND STUD
PA TUBE RACK
C3,C5 CT 1A7R1,R2
C4,C6 CT 1A8R1,R2
C13,C15 CT 1A9R1,R2
C14,C16 CT 1A10R1,R2
C21 C22 C23 C24
1A5
TB1
SEE FIG. 6-31A
#18-91 (1)
#18-92 (2)
#18-93 (3)
#18-94 (4)
#18-95 (5)
#18-96 (6)
#18-97 (7)
#18-98 (8)
(S) #18-9 (9)
(S) #18-90 (10)
(W104)
TB2
(W105)
TB3
SEE FIG 7-18
1A12TB3-1
#14-98 (8)
(S) #14-9 (9)
#14-90 (10)
(W116)
TB4
#18-91 (1)
#18-92 (2)
#18-93 (3)
#18-94 (4)
#18-95 (5)
#18-96 (6)
#18-97 (7)
#18-98 (8)
#18-9 (9)
#18-90 (10)
(W106)



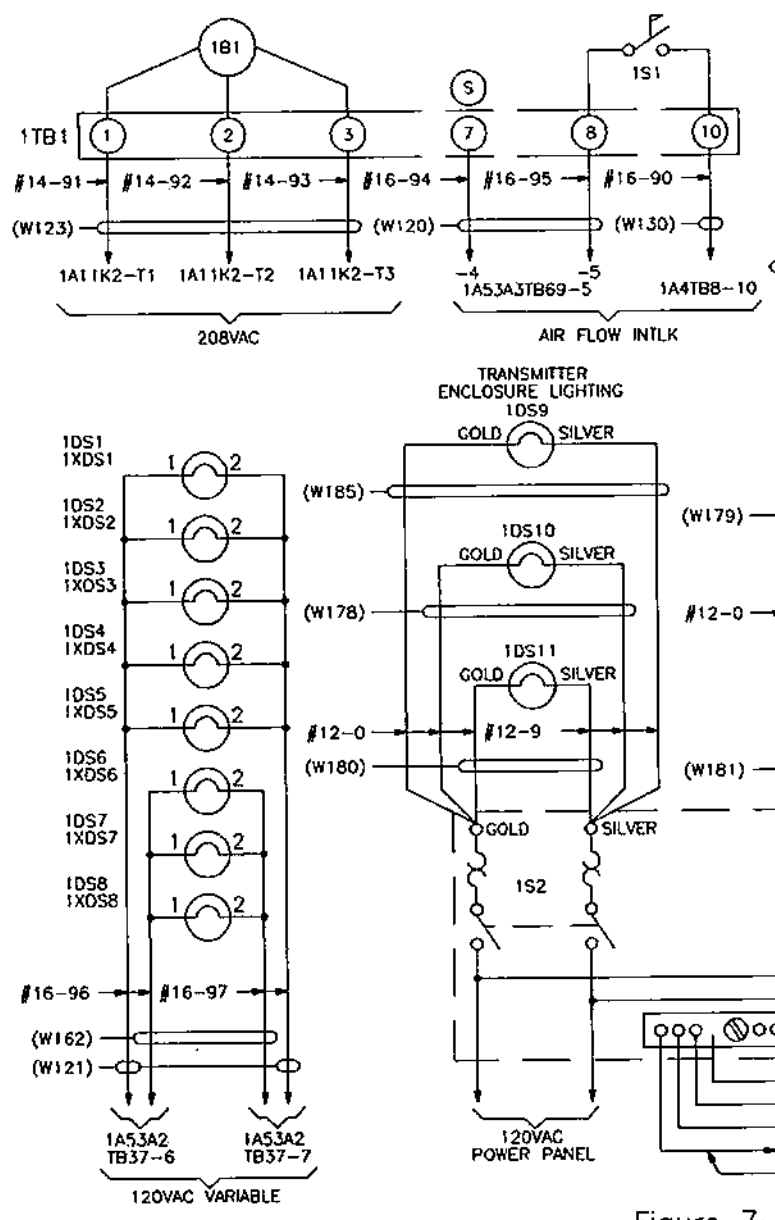


GROUND STUD CABLES:



NOTES:

1. WIRE COLOR CODE
   0 - BLACK
   91 - WHITE BROWN
   92 - WHITE RED
   93 - WHITE ORANGE
   94 - WHITE YELLOW
   95 - WHITE GREEN
   96 - WHITE BLUE
   97 - WHITE VIOLET
   98 - WHITE GRAY
   9 - WHITE
   90 - WHITE BLACK
   CT - COPPER TUBING
2. UNLESS OTHERWISE SPECIFIED T AS INDICATED ARE FOR BOTH T IN THE STATION SET.
3. (S) INDICATES SPARE WIRE.



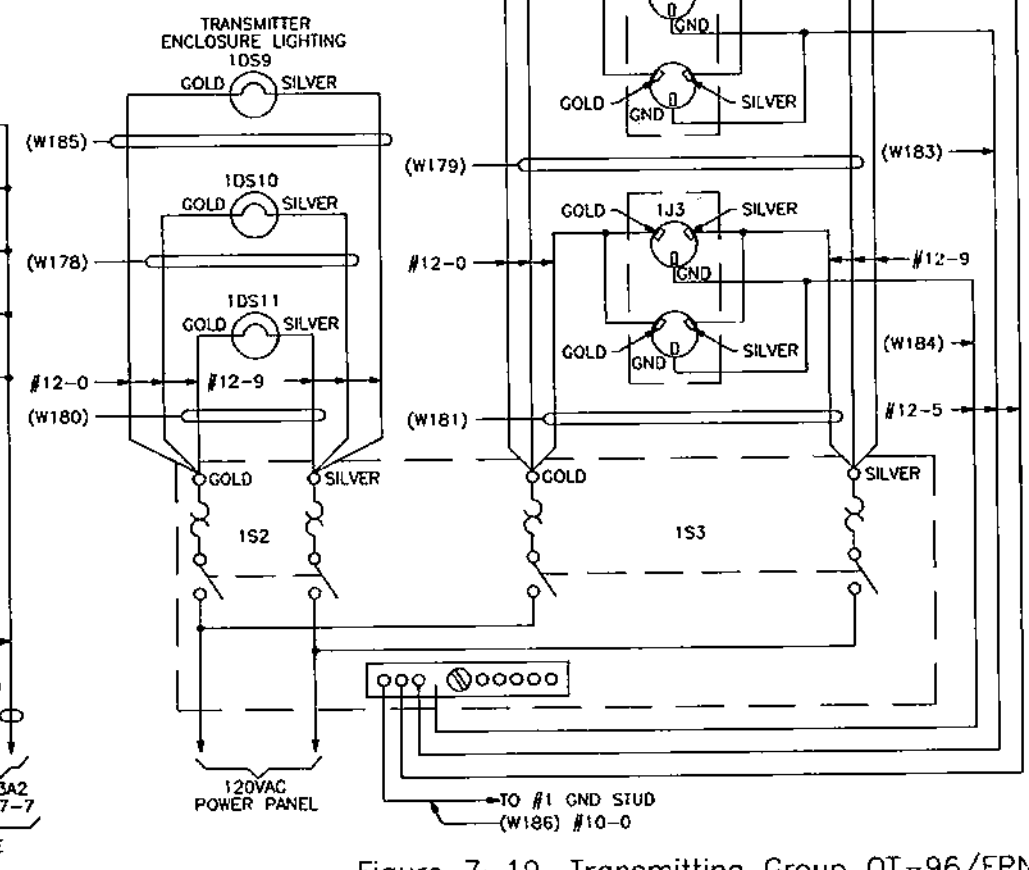


Figure 7-19. Transmitting Group OT-96/FPN Wiring Diagram (Sheet 2 of 3)

ERMINATIONS
RANSMITTERS

N–44A(1),

N–68

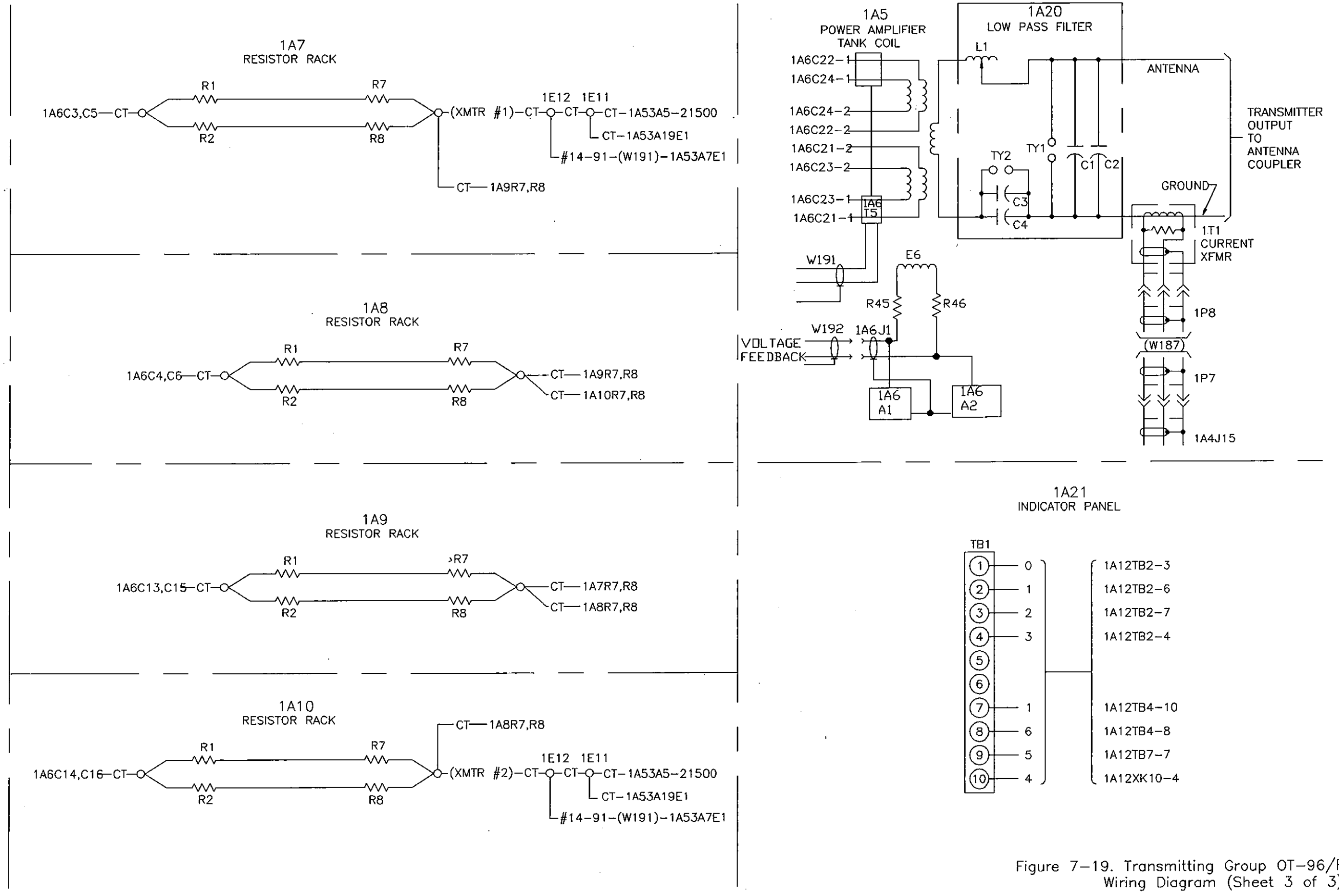
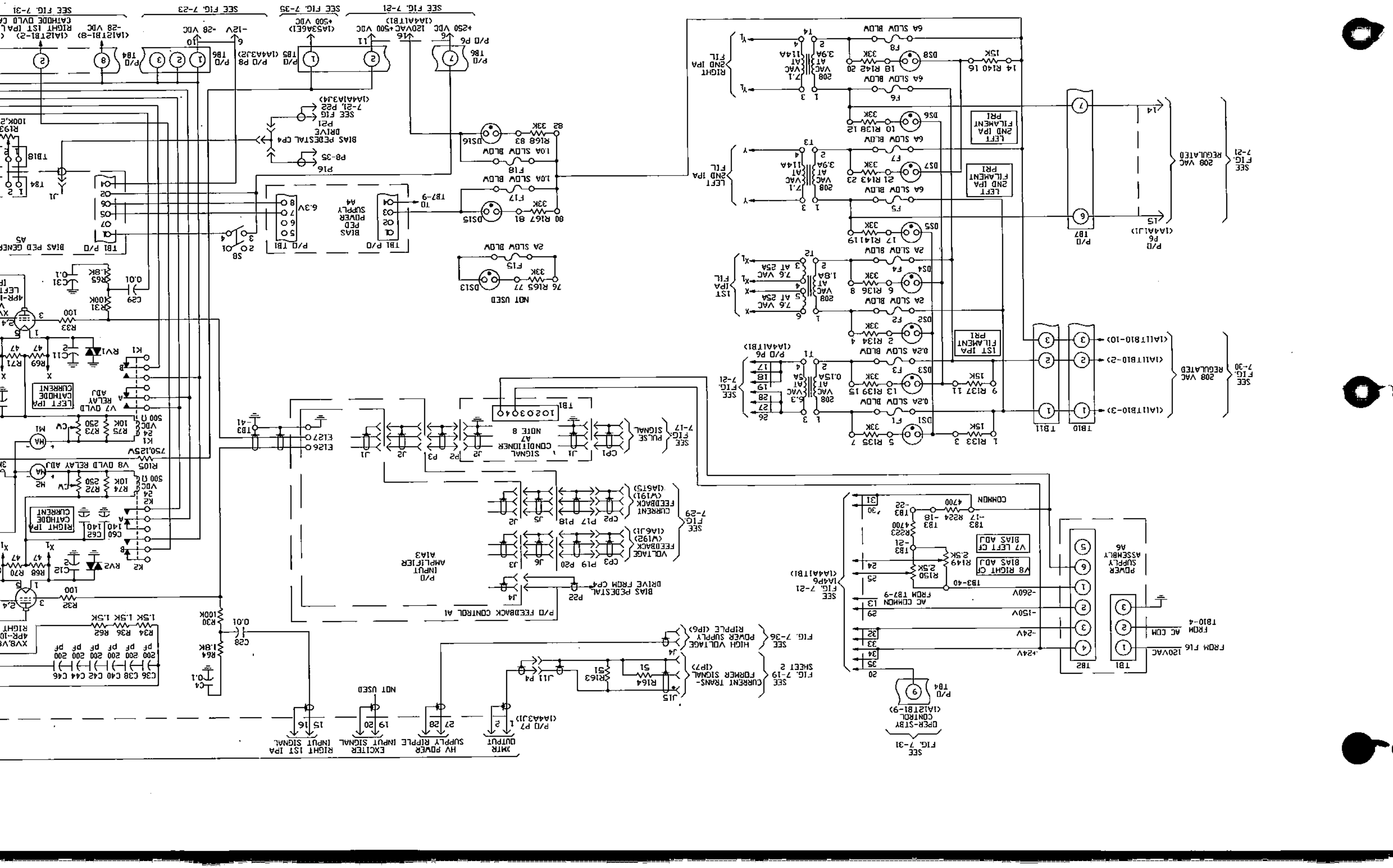
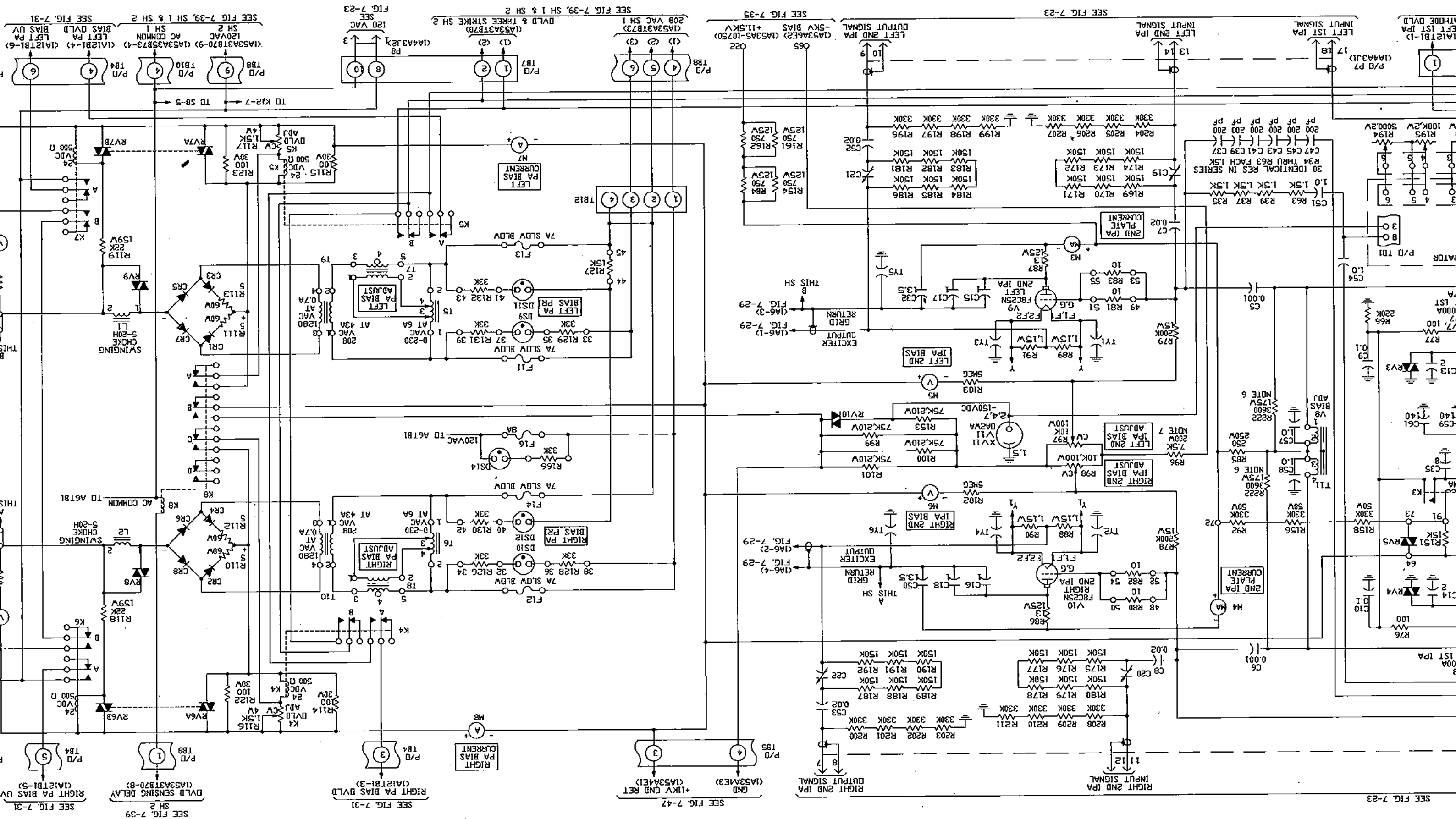
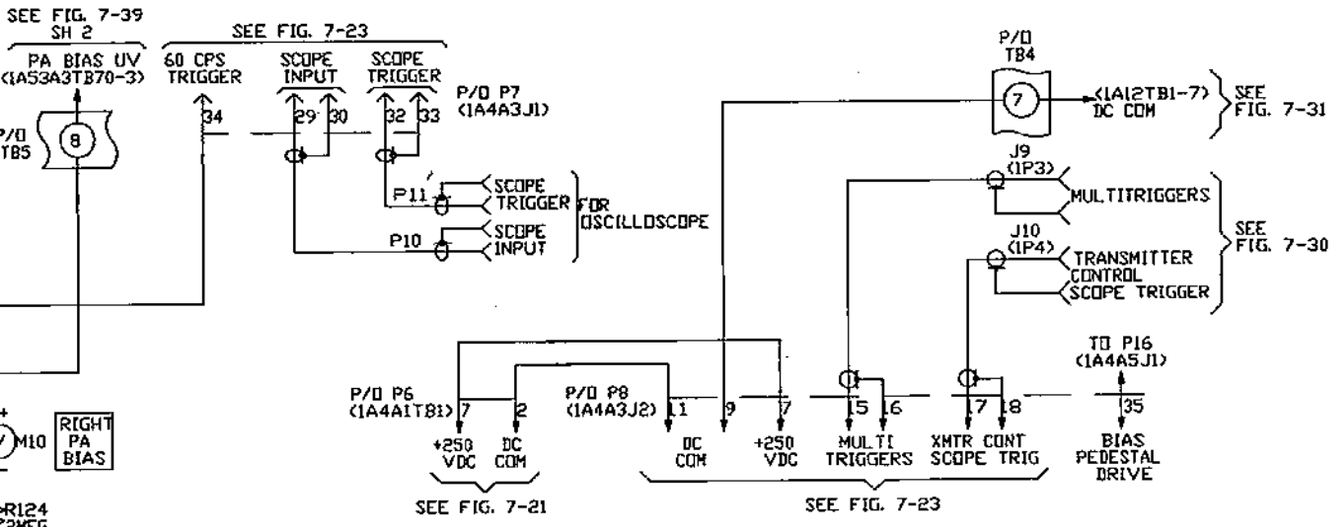


Figure 7—19. Transmitting Group OT—96/FPN—44A(1), Wiring Diagram (Sheet 3 of 3)


SEE FIG. 7-31
SEE FIG. 7-23
SEE FIG. 7-35
SEE FIG. 7-21
-28 VDC
-12V
+250 VDC
120VAC +500 VDC
+500 VDC
P/D P6
P/D P8
P/D TB1
P/D TB4
P/D TB5
P/D TB6
BIAS PEDESTAL CP4 DRIVE
BIAS PED GENER A5
6.3V
10A SLOW BLOW
6A SLOW BLOW
2A SLOW BLOW
0.25A SLOW BLOW
NOT USED
LEFT 2ND IPA FILAMENT PRI
RIGHT 2ND IPA FIL
LEFT 2ND IPA FIL
1ST IPA FILAMENT PRI
208 VAC REGULATED
SEE FIG. 7-21
SEE FIG. 7-30
SEE FIG. 7-17
SEE FIG. 7-29
SEE FIG. 7-36
SEE FIG. 7-19 SHEET 2
SEE FIG. 7-31
SEE FIG. 7-21
FROM F16 120VAC
FROM TB10-4 AC COM
COMMON
-260V
-150V
-24V
+24V
POWER SUPPLY ASSEMBLY A6
OPER-STBY CONTROL
RIGHT 1ST IPA INPUT SIGNAL
EXCITER INPUT SIGNAL
HV POWER SUPPLY RIPPLE
XMTR OUTPUT
P/D FEEDBACK CONTROL A1
P/D INPUT AMPLIFIER A1A3
BIAS PEDESTAL FROM CP4
CURRENT FEEDBACK (W19)
VOLTAGE FEEDBACK (W19)
PULSE SIGNAL
CONDITIONER A7 NOTE 8
HIGH VOLTAGE POWER SUPPLY RIPPLE (IP6)
CURRENT TRANS-FORMER SIGNAL (IP7)
LEFT IPA CATHODE CURRENT
RIGHT IPA CATHODE CURRENT
V7 OVLD RELAY ADJ
V8 OVLD RELAY ADJ
V7 LEFT CF BIAS ADJ
V8 RIGHT CF BIAS ADJ


SEE FIG. 7-23
SEE FIG. 7-39, SH 1 & SH 2
SEE FIG. 7-31
SEE FIG. 7-47
SEE FIG. 7-39 SH 2
SEE FIG. 7-31
SEE FIG. 7-31
TO K12-7
TO S8-5
TO A6T8I
AC COMMON
LEFT 1ST IPA INPUT SIGNAL
LEFT 2ND IPA INPUT SIGNAL
LEFT 2ND IPA OUTPUT SIGNAL
RIGHT 2ND IPA INPUT SIGNAL
RIGHT 2ND IPA OUTPUT SIGNAL
2ND IPA PLATE CURRENT
LEFT PA BIAS CURRENT
RIGHT PA BIAS CURRENT
LEFT PA BIAS PR
RIGHT PA BIAS PR
LEFT PA BIAS ADJUST
RIGHT PA BIAS ADJUST
LEFT 2ND IPA BIAS ADJUST
RIGHT 2ND IPA BIAS ADJUST
DVLD SENSING DELAY
SWINGING CHOKE
EXCITER OUTPUT
GRID RETURN
7A SLOW BLOW
208 VAC
120 VAC
120VAC
-11.5KV BIAS
+11.5KV
-150VDC
+11KV GND RET
GND
NOTE 6
NOTE 7



NOTES:

1. O INDICATES INSULATED STANDOFF.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS.
3. UNLESS OTHERWISE SPECIFIED RESISTORS ARE 2 WATT.
4. REFERENCE DESIGNATIONS NOT IN PARENTHESES ARE ABBREVIATED. PREFACE THE DESIGNATIONS WITH 1A4.
5. REFERENCE DESIGNATIONS AND TERMINAL NUMBERS IN PARENTHESES IDENTIFY ITEMS THAT ARE CONNECTED TO THIS ASSEMBLY.
6. FOR AN/FPN-45, R221 AND R222 ARE 7000 OHMS, 175 WATTS.
7. FOR AN/FPN-45, R96 IS 3.5 kOHM, 210 WATTS.
8. SIGNAL CONDITIONER USED WITH N-3 OUTPUT NET ONLY.

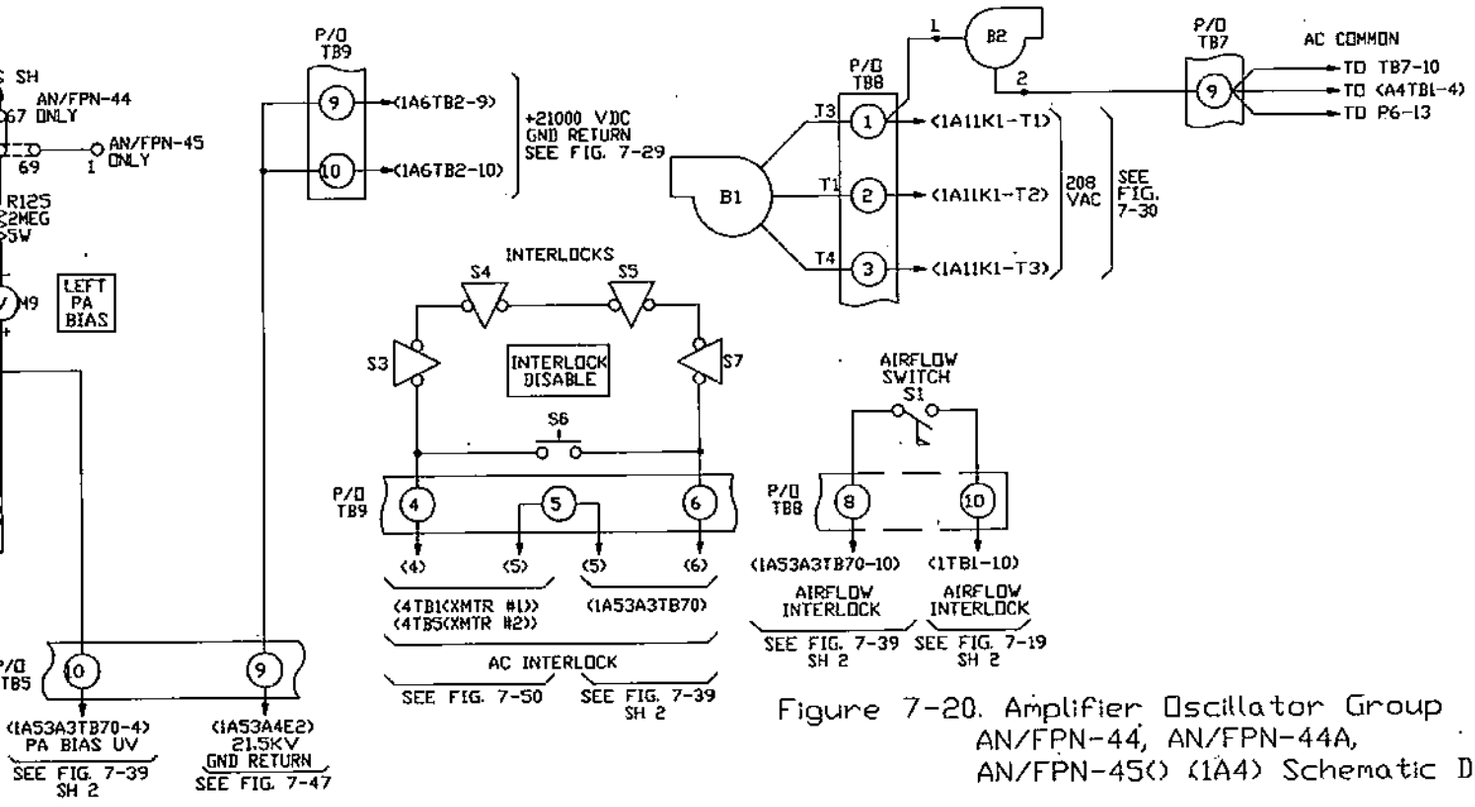
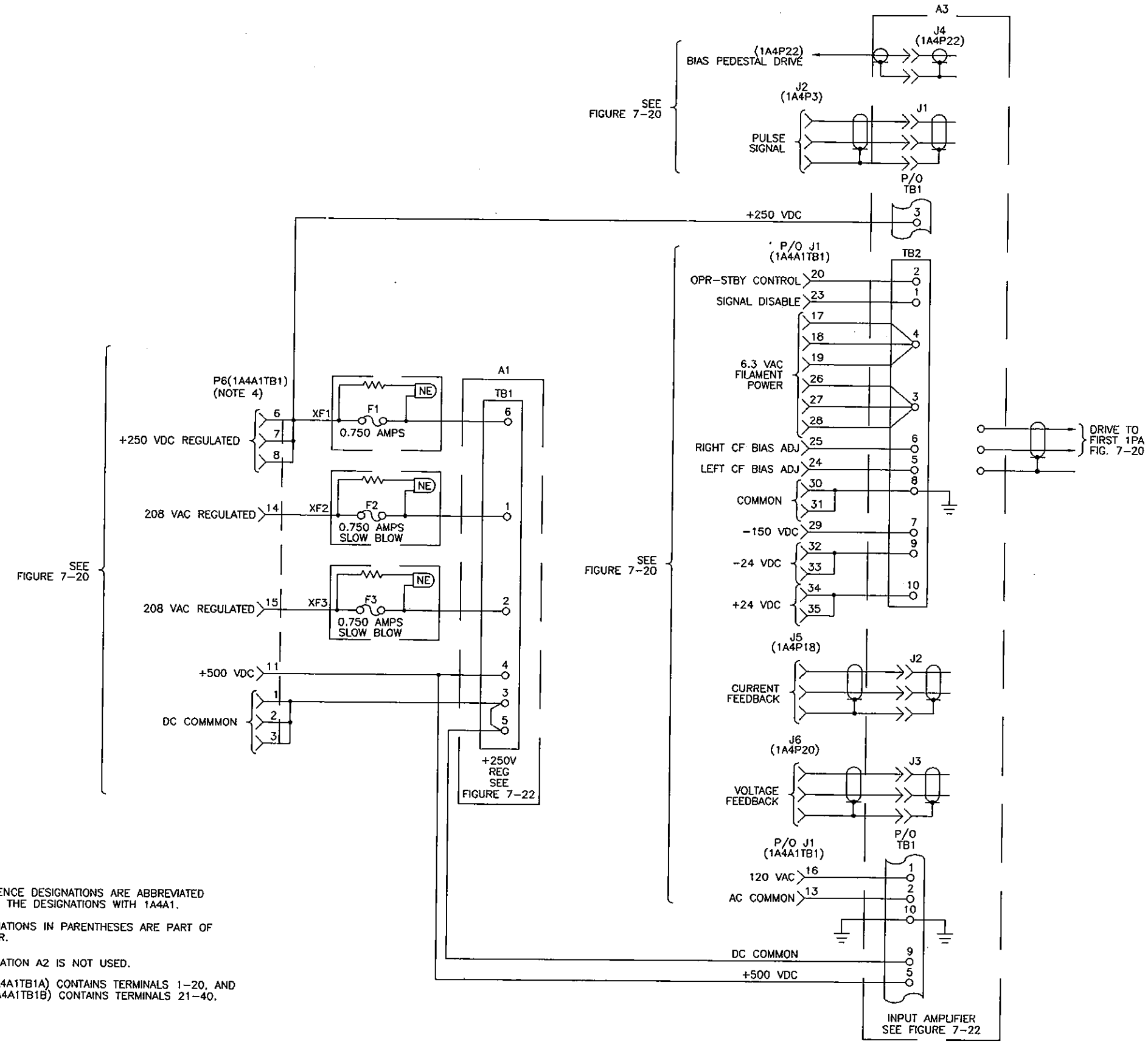


Figure 7-20. Amplifier Oscillator Group AN/FPN-44, AN/FPN-44A, AN/FPN-45() (1A4) Schematic Diagram



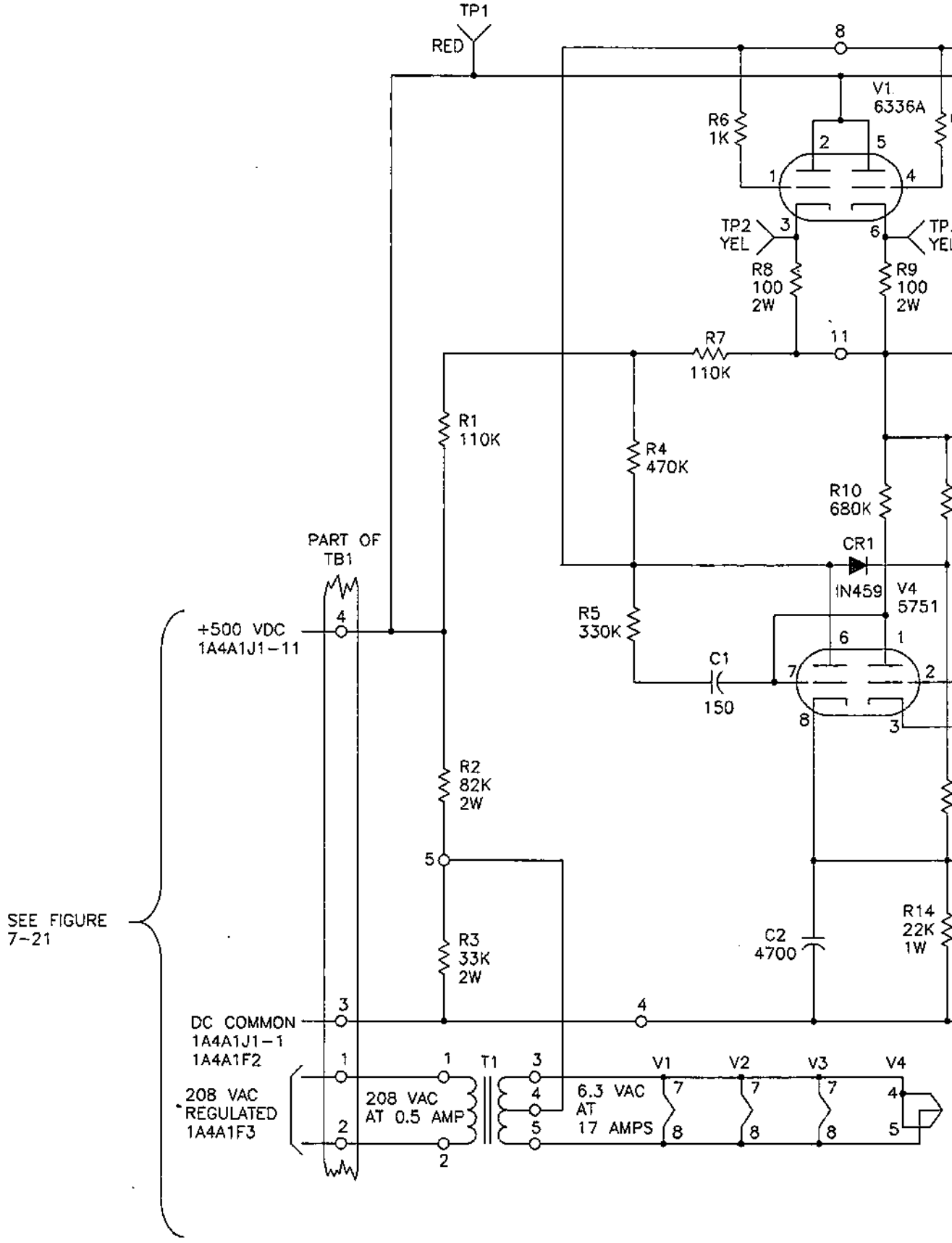
NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX THE DESIGNATIONS WITH 1A4A1.
2. DESIGNATIONS IN PARENTHESES ARE PART OF EXCITER.
3. DESIGNATION A2 IS NOT USED.
4. P6A(1A4A1TB1A) CONTAINS TERMINALS 1-20, AND P6B(1A4A1TB1B) CONTAINS TERMINALS 21-40.

Figure 7-21. Power Supply PP-7304/FPN-44A (1A4A1), Schematic Diagram

NOTE:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS, RESISTORS ARE 1/2 WATT.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH 1A4A1A1.
3. —O— DEFINES INSULATED STANDOFF DESIGNATION.
4. TRANSFORMER RATINGS ARE MAXIMUM VALUES.



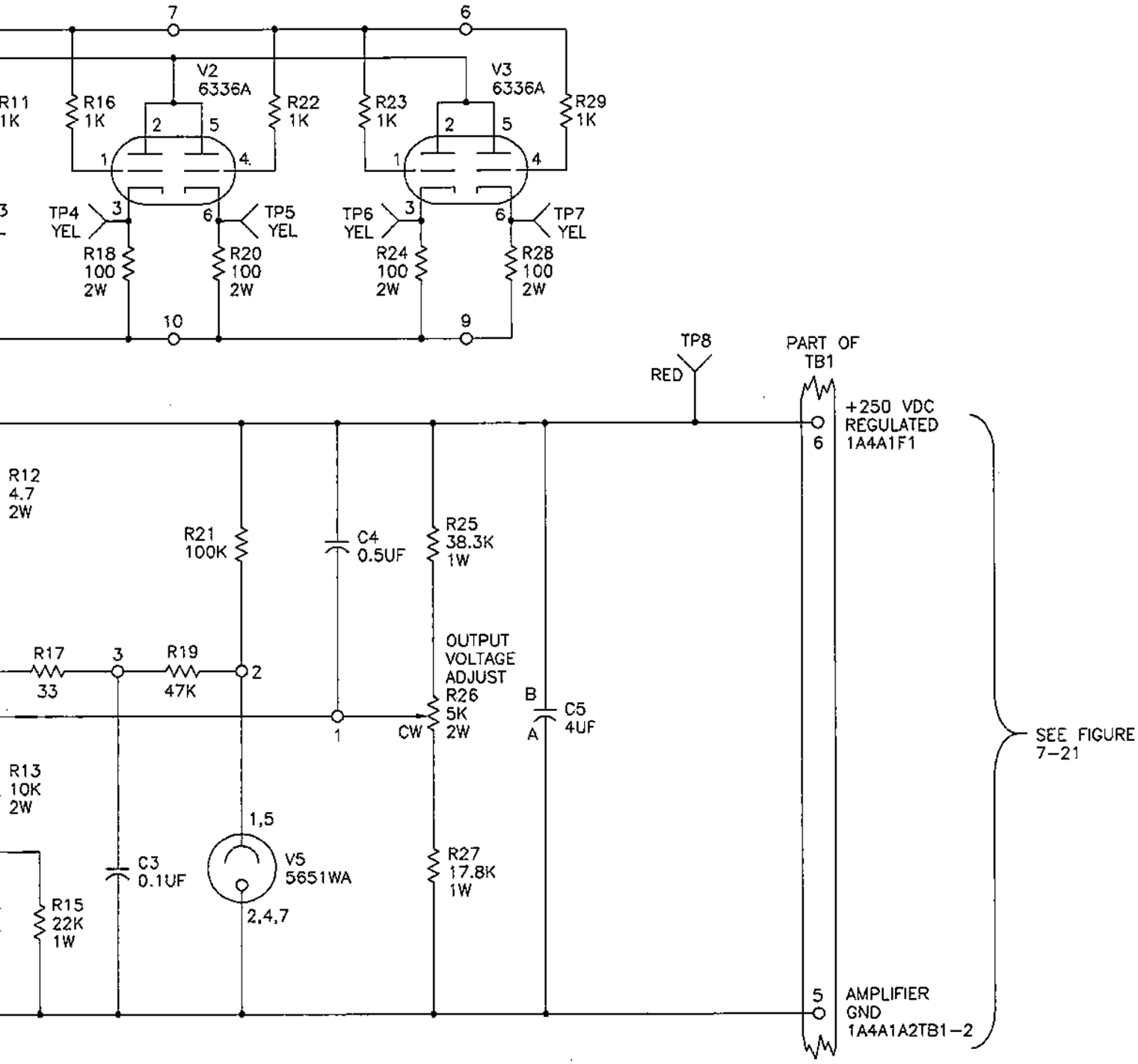
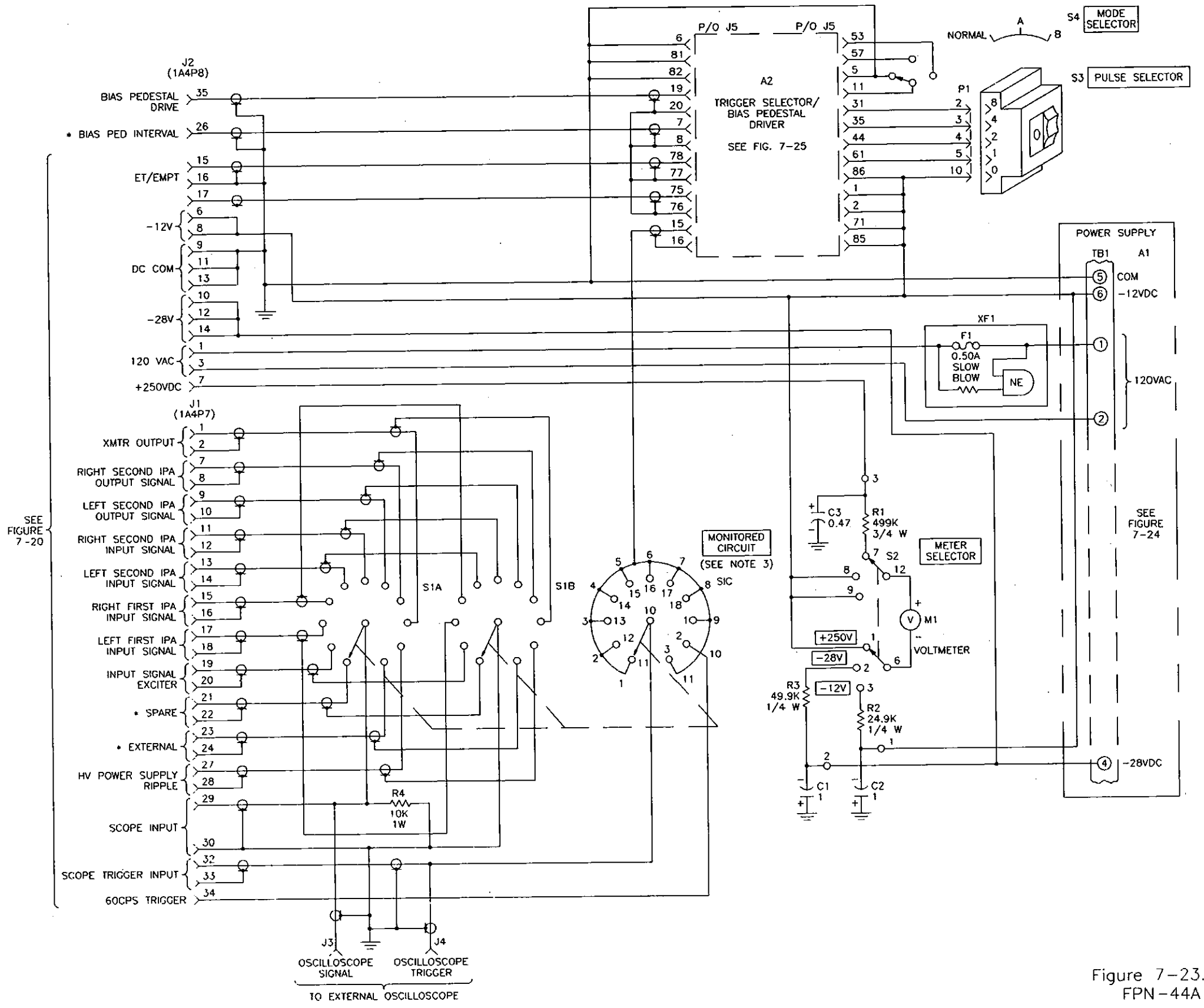


Figure 7-22. +250V Regulator 1A4A1A1, Schematic Diagram



S1

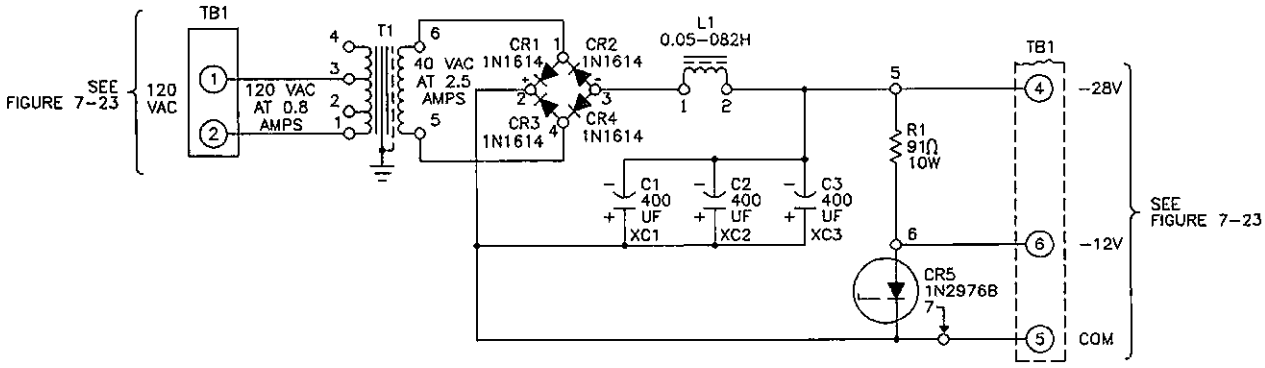
POS	FUNCTION
1	SPARE
2	INPUT EXCITER
3	INPUT LEFT FIRST IPA
4	INPUT RIGHT FIRST IPA
5	INPUT LEFT SECOND IPA
6	INPUT RIGHT SECOND IPA
7	OUTPUT LEFT SECOND IPA
8	OUTPUT RIGHT SECOND IPA
9	XMTR OUTPUT (CURRENT)
10	HV POWER SUPPLY (RIPPLE)
11	EXTERNAL
12	

S3

POS	CONTACT CLOSURES X=CLOSED O=OPEN			
	8-C	4-C	2-C	1-C
0	X	O	O	X
1	X	O	O	O
2	O	X	X	X
3	O	X	X	O
4	O	X	O	X
5	O	X	O	O
6	O	O	X	X
7	O	O	X	O
8	O	O	O	X
9	O	O	O	O

NOTES:
1. O INDICATES INSULATED STANDOFF.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS.
3. NUMBERS ON THE OUTSIDE ARE SWITCH POSITION NUMBERS. NUMBERS ON THE INSIDE ARE SWITCH TERMINAL NUMBERS.
4. PREFIX REF DESIG WITH 1A4A3.
* NOT USED

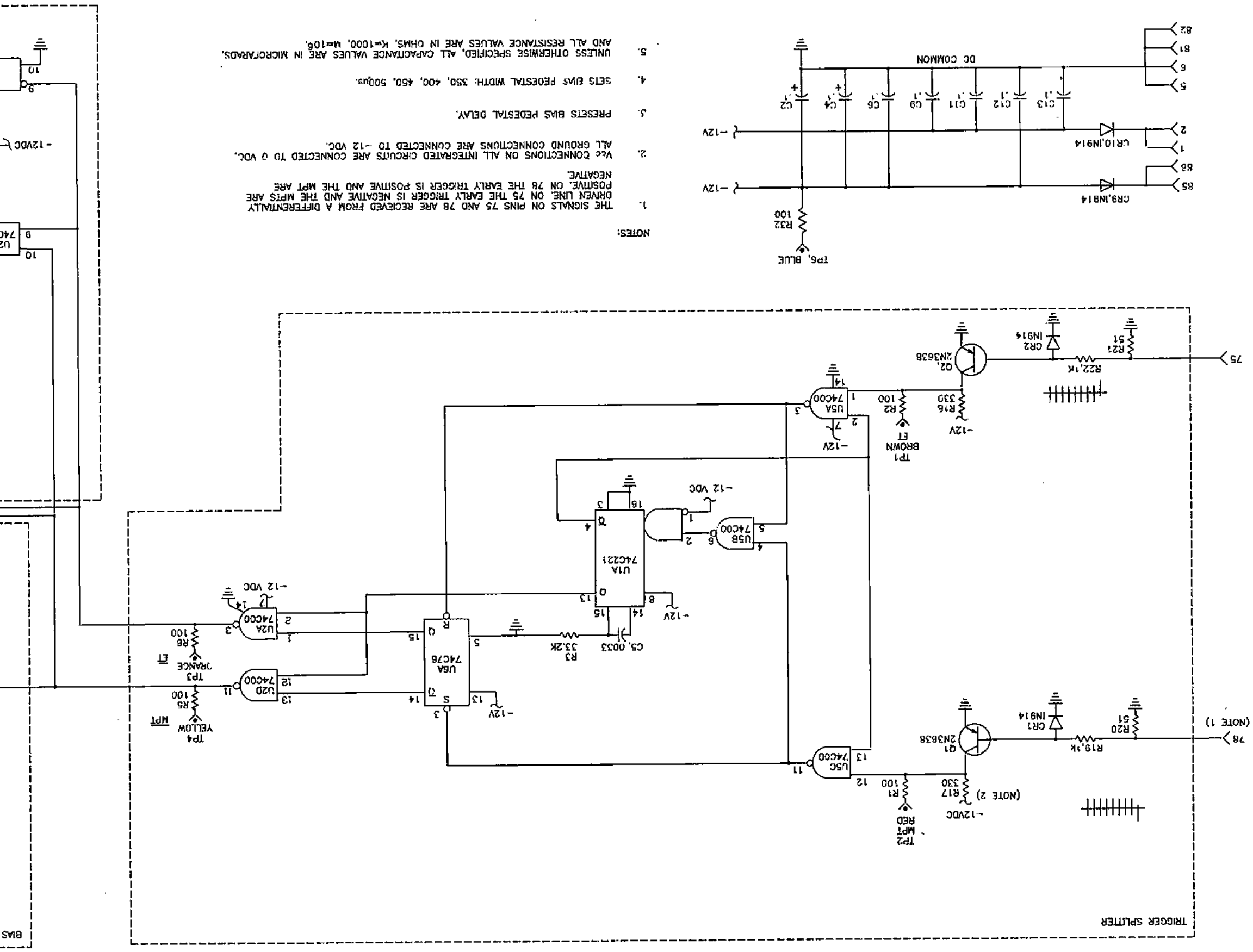
Figure 7-23. Oscilloscope Control C-4558A/ FPN-44A (1A4A3), Schematic Diagram



NOTES:

1. O INDICATES INSULATED STANDOFF.
2. REFERENCE DESIGNATIONS ARE ABREVIATED. PREFIX THE DESIGNATIONS WITH 1A4A3A1.
3. TRANSFORM RATINGS ARE MAXIMUM VALUES.

Figure 7-24. Negative Power Supply 1A4A3A1, Schematic Diagram



NOTES:

1. THE SIGNALS ON PINS 75 AND 78 ARE RECIEVED FROM A DIFFERENTIALLY DRIVEN LINE. ON 75 THE EARLY TRIGGER IS NEGATIVE AND THE MPTS ARE POSITIVE. ON 78 THE EARLY TRIGGER IS POSITIVE AND THE MPT ARE NEGATIVE.
2. Vcc CONNECTIONS ON ALL INTEGRATED CIRCUITS ARE CONNECTED TO 0 VDC. ALL GROUND CONNECTIONS ARE CONNECTED TO -12 VDC.
3. PRESETS BIAS PEDESTAL DELAY.
4. SETS BIAS PEDESTAL WIDTH: 350, 400, 450, 500μs.
5. UNLESS OTHERWISE SPECIFIED, ALL CAPACITANCE VALUES ARE IN MICROFARADS, AND ALL RESISTANCE VALUES ARE IN OHMS, K=1000, M=10^6.

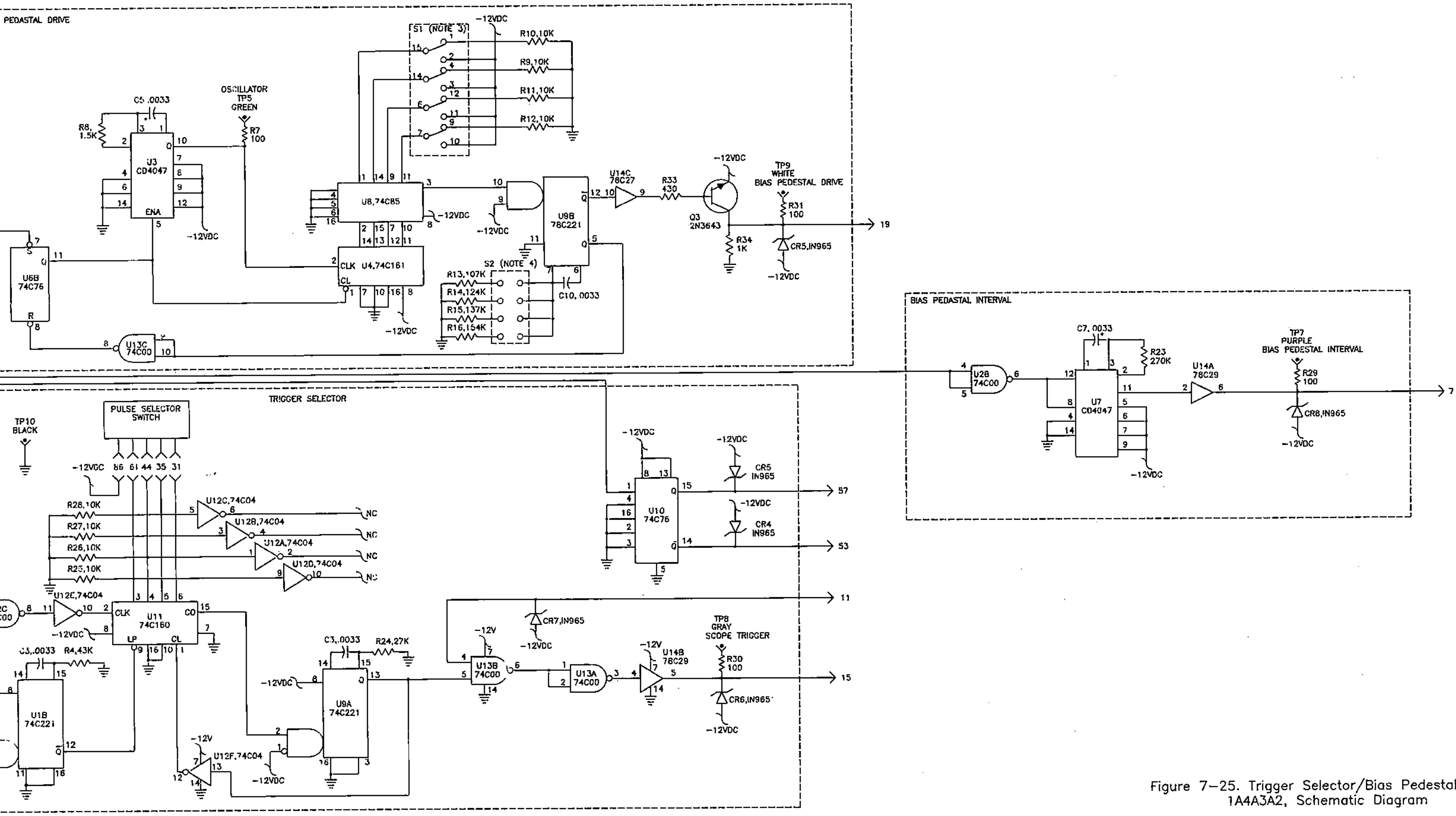


Figure 7–25. Trigger Selector/Bias Pedestal D
1A4A3A2, Schematic Diagram

Driver

7-82

NOTES: ALL OTHER INSTALLED
COMPONENTS ARE
NOT USED.

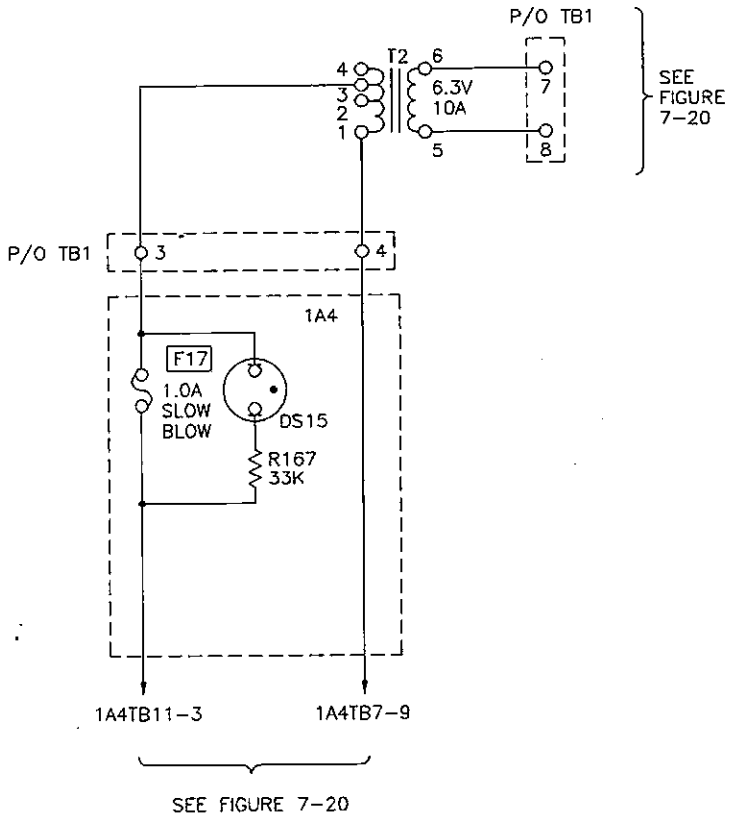
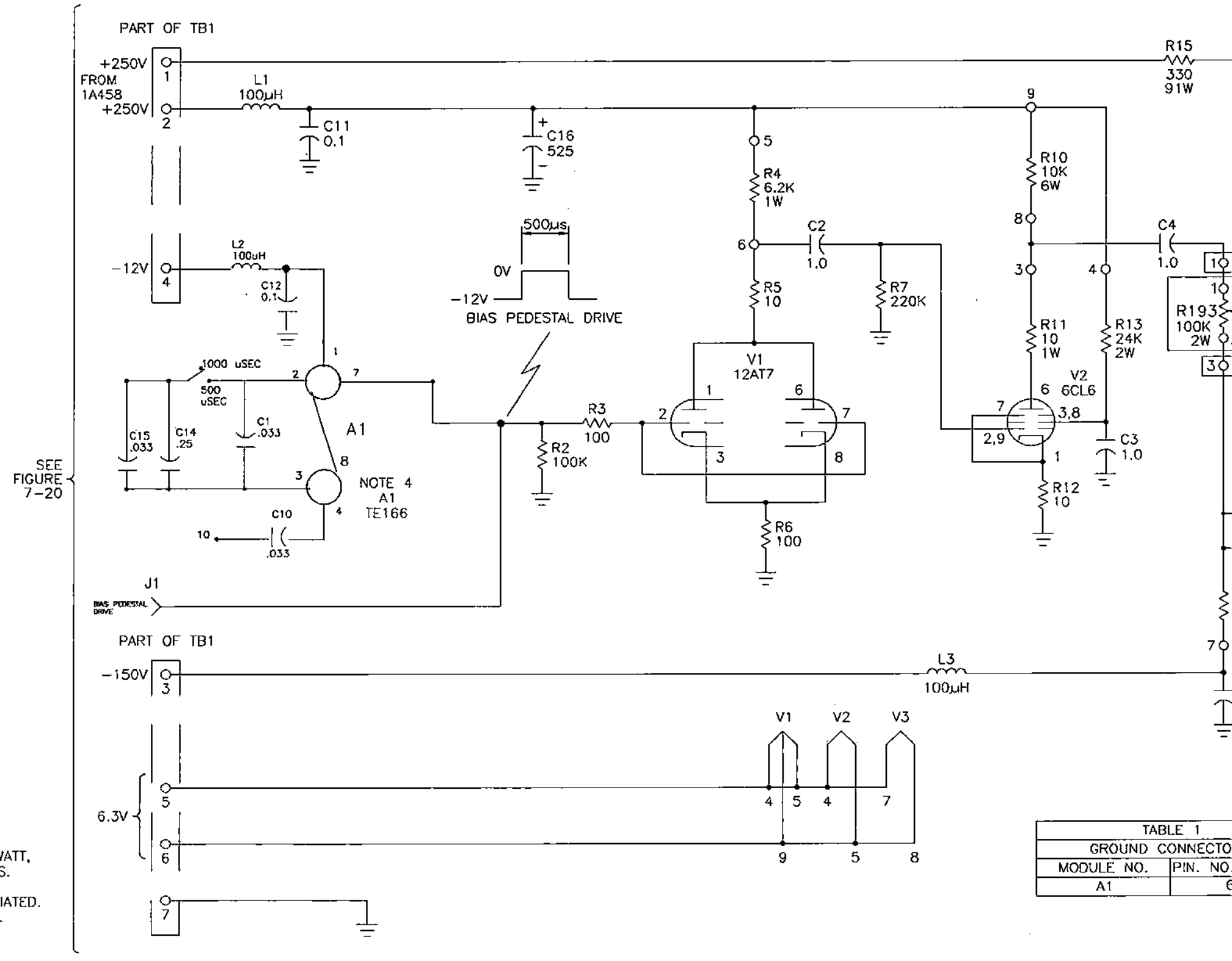


Figure 7-26. Bias Pedestal Power Supply 1A4A4, Schematic Diagram

NOTES:
1. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE OHMS, 1/2 WATT. CAPACITANCE VALUES ARE IN MICROFARADS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH 1A4A4 UNLESS OTHERWISE SPECIFIED.
3. DIODES ARE 1N547.



NOTES:

1. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE OHMS, 1/2 WATT, CAPACITANCE VALUES ARE MICROFARADS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH 1A4A5.
3. DIODES ARE 1N547.
4. MODULE A1 NOT INSTALLED.

TABLE 1	
GROUND CONNECTO	
MODULE NO.	PIN. NO.
A1	6

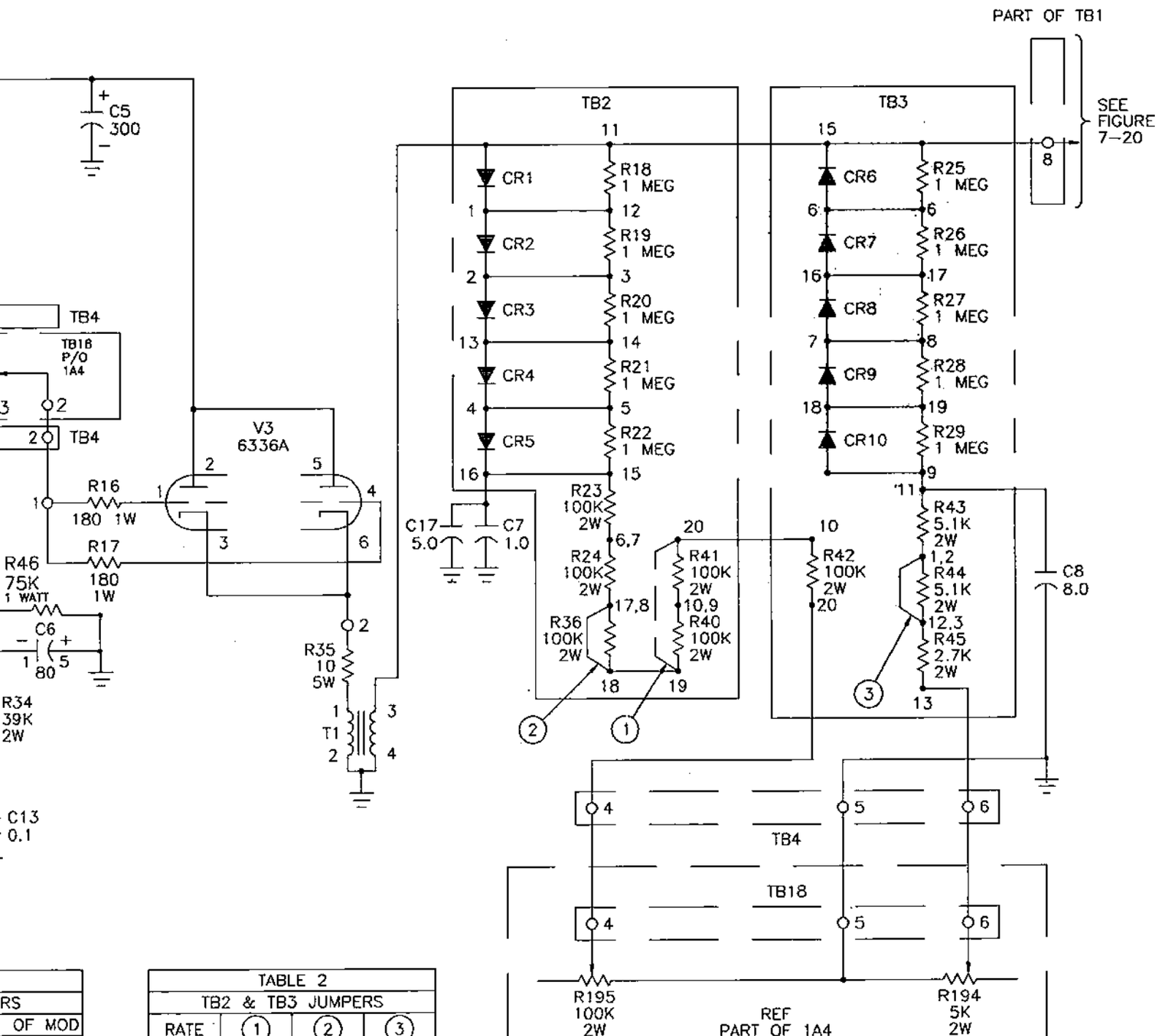


TABLE 2			
TB2 & TB3 JUMPERS			
RATE	①	②	③
9990	OUT	OUT	IN
7990	OUT	IN	IN
5990	IN	OUT	OUT

Figure 7-27. Bias Pedestal Generator 1A4A5, Schematic Diagram

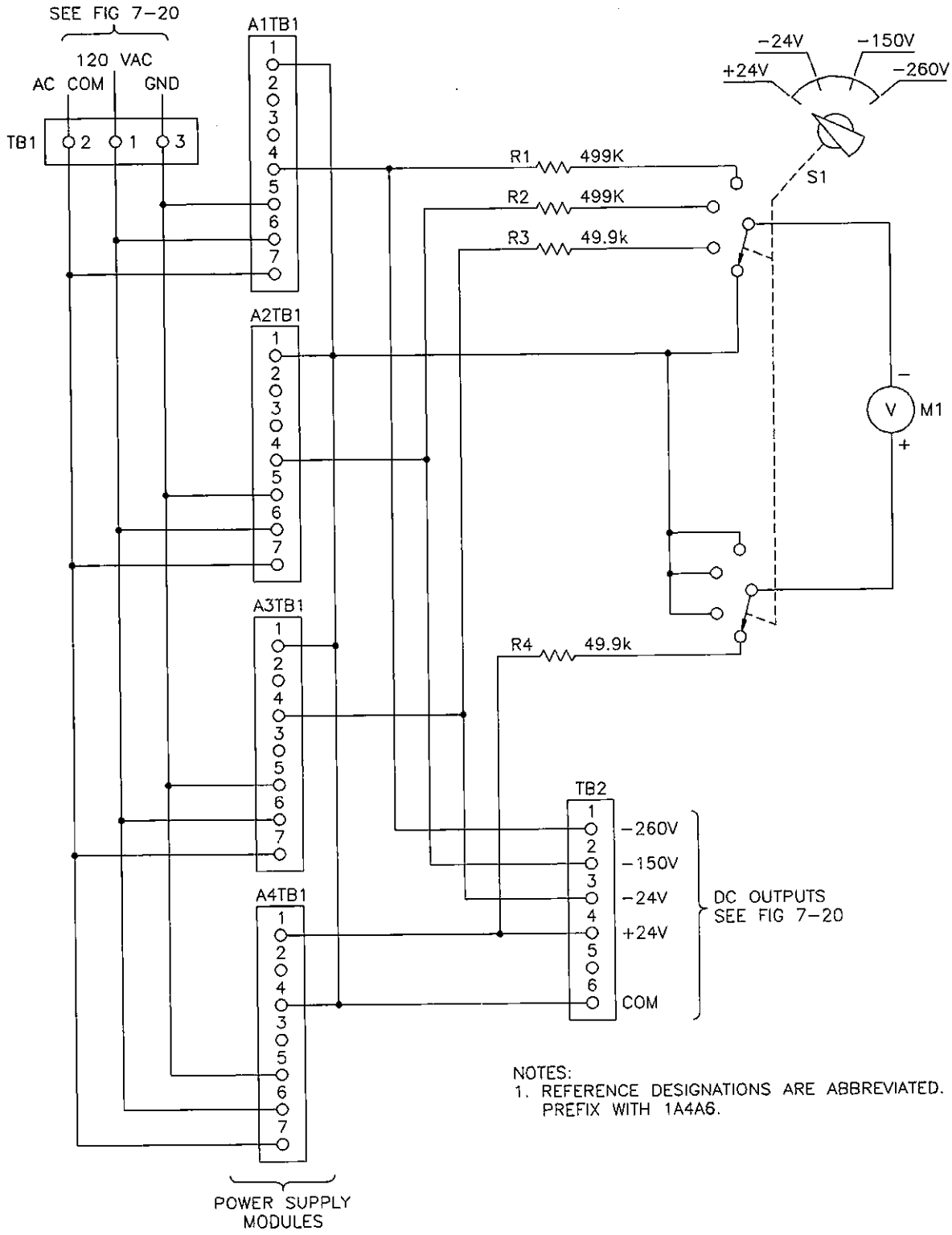
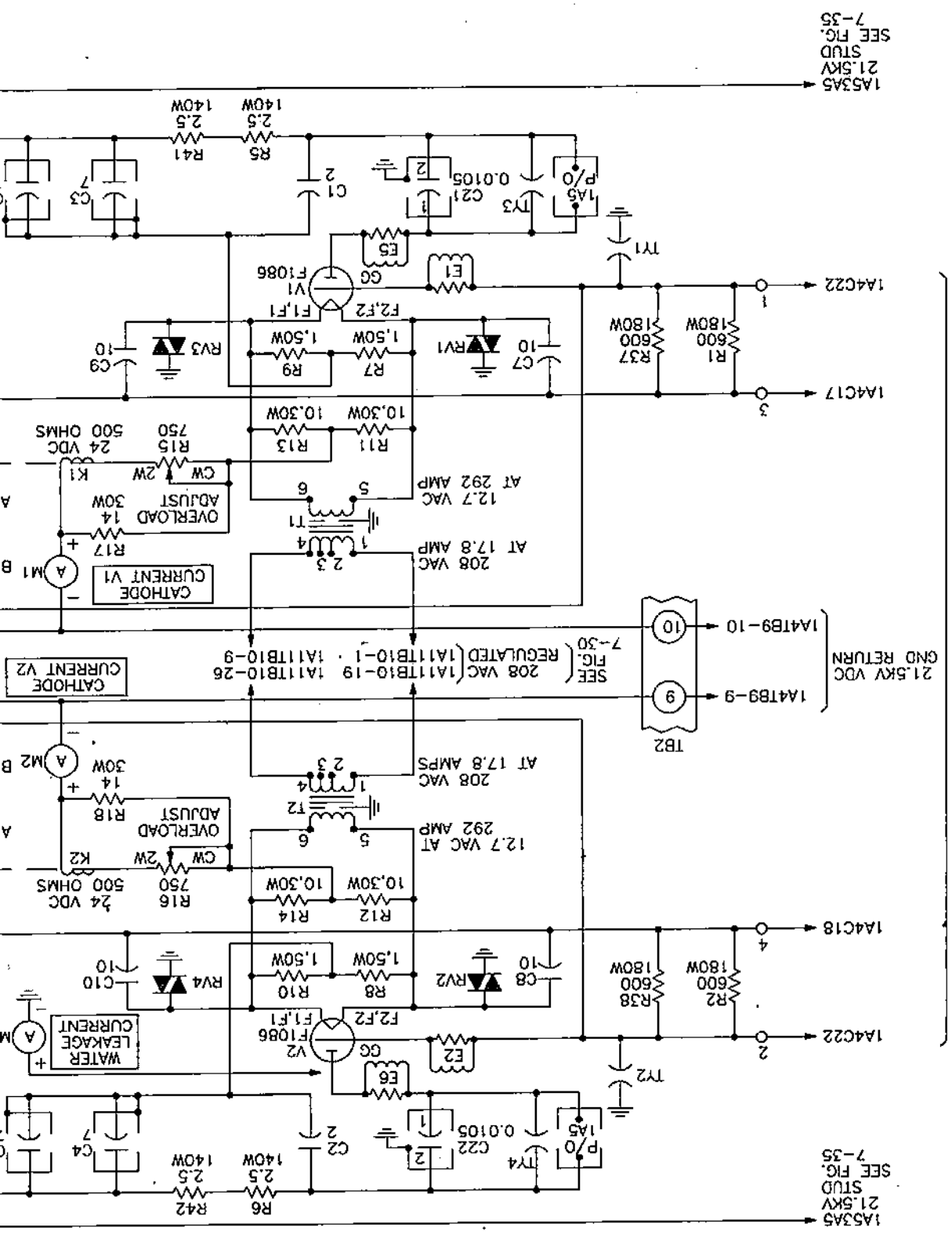


Figure 7-28. Power Supply Assembly, Schematic Diagram


1A53A5
21.5KV
STUD
SEE FIG.
7-35
1A4C22
1A4C17
1A4C18
1A4C22
1A4TB9-10
1A4TB9-9
TB2
SEE FIG. 7-20
21.5KV VDC
GND RETURN
208 VAC (1A11TB10-19 1A11TB10-26 REGULATED (1A11TB10-1 · 1A11TB10-9
SEE FIG. 7-30
CATHODE CURRENT V1
CATHODE CURRENT V2
WATER LEAKAGE CURRENT
OVERLOAD ADJUST 30W
OVERLOAD ADJUST 14 30W
CW 2W
R15 750 24 VDC 500 OHMS
R16 750 24 VDC 500 OHMS
R17
R18
K1
K2
M1
M2
AT 17.8 AMP
AT 17.8 AMPS
208 VAC
12.7 VAC AT 292 AMP
R11 R13 R12 R14 R7 R9 R8 R10
10.3OW 1.5OW
R1 R37 R2 R38
600 180W
RV1 RV3 RV2 RV4
C7 C9 C8 C10
10
V1 V2
F1086
G6
F1,F1 F2,F2
E1 E2 E5 E6
TY1 TY2 TY3 TY4
C1 C2 C3 C4
C21 C22
0.0105
1A5 P/O
R41 R5 R42 R6
2.5 140W
1 2 3 4 5 6 7 9 10

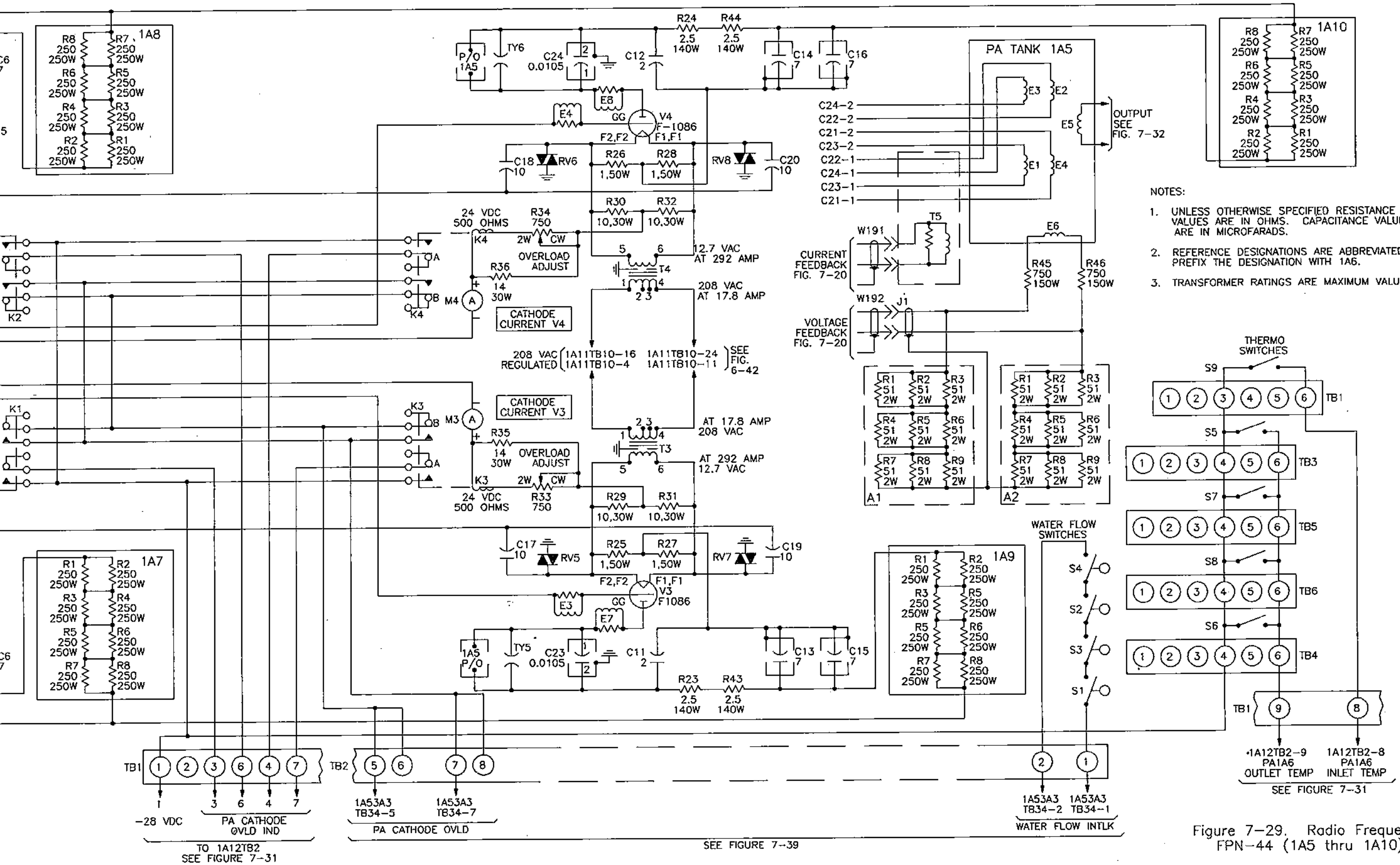
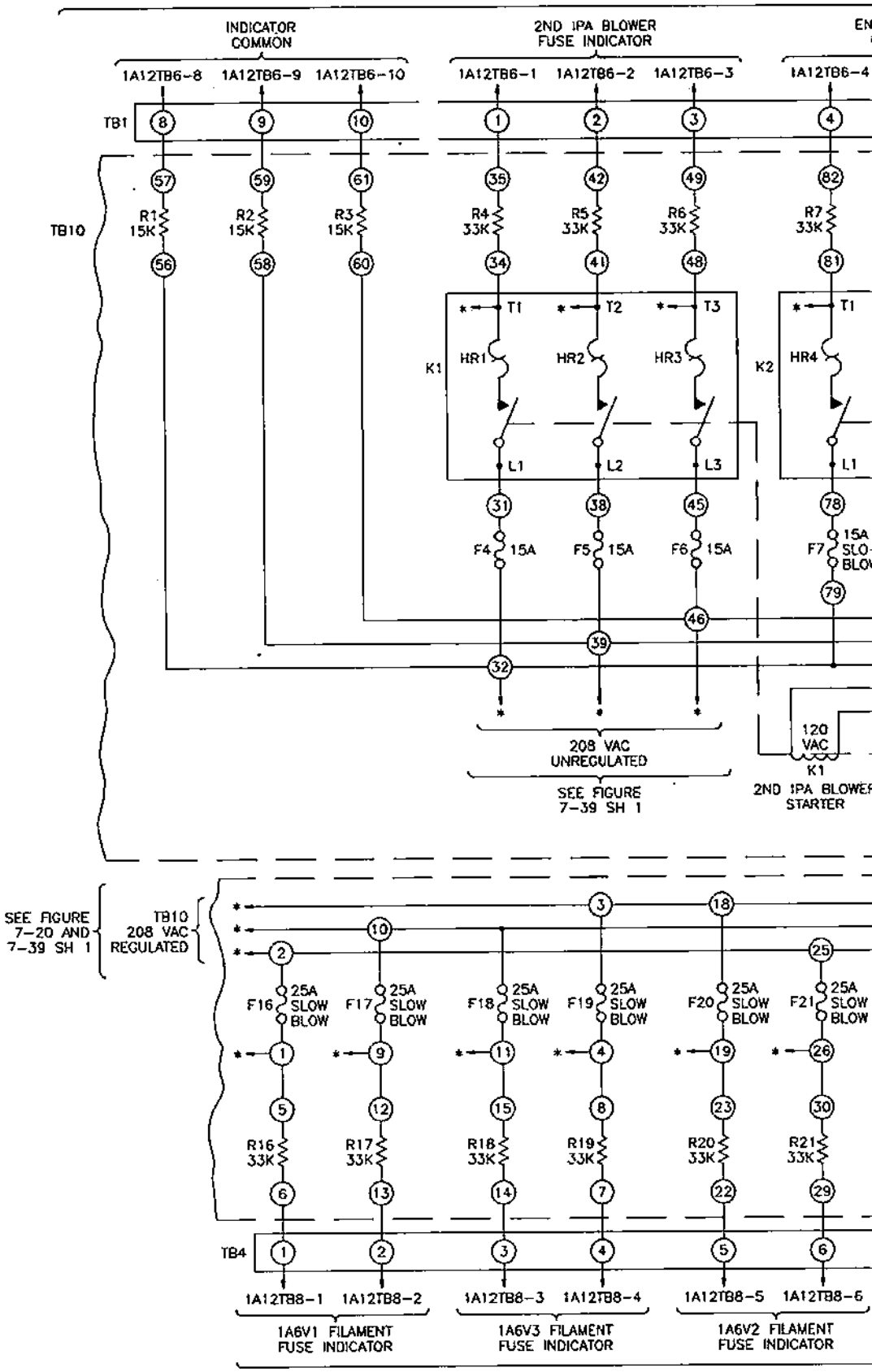


Figure 7-29. Radio Frequency Amplifier AM-377 FPN-44 (1A5 thru 1A10), Schematic Diagram

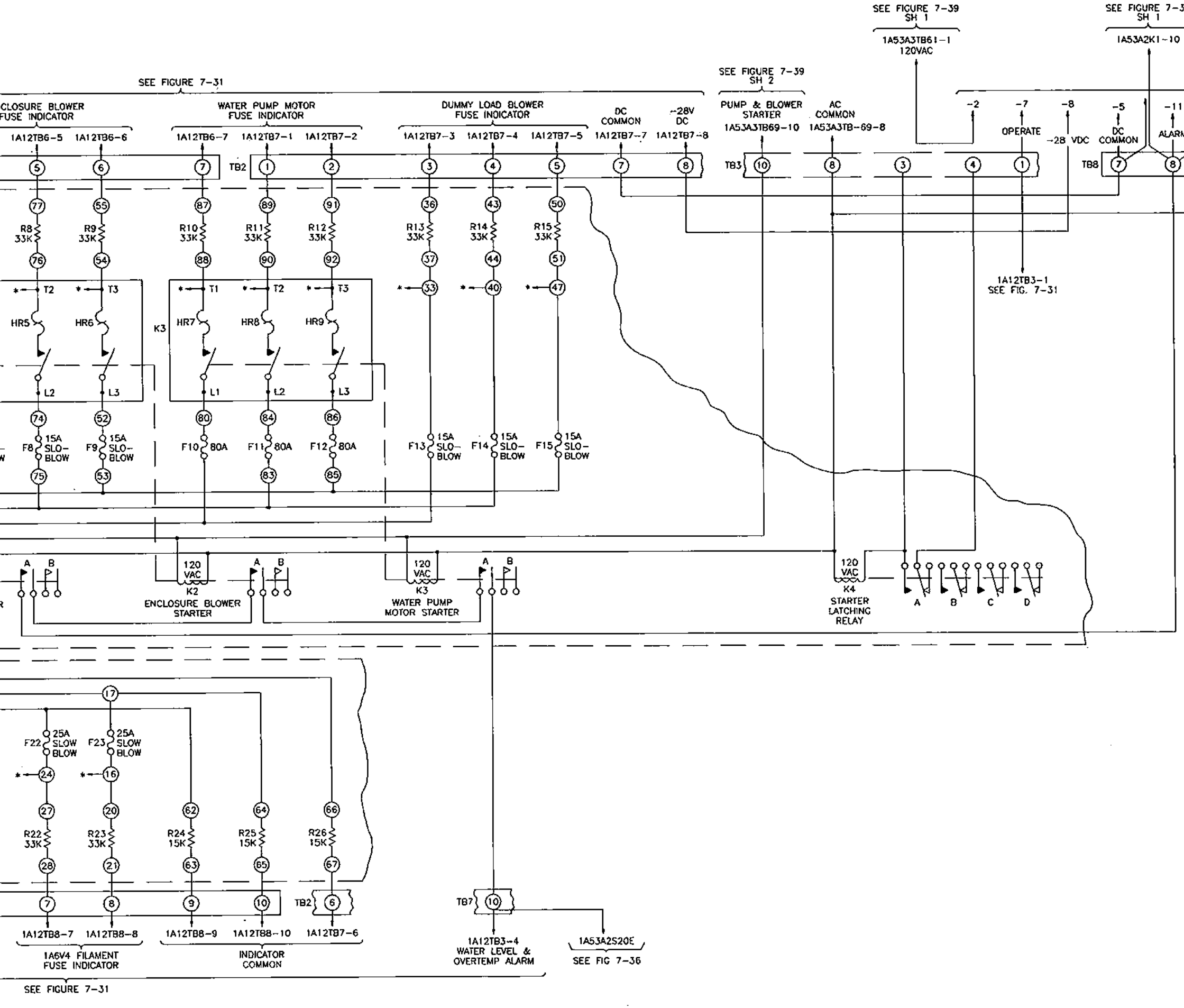
06-90

/74/



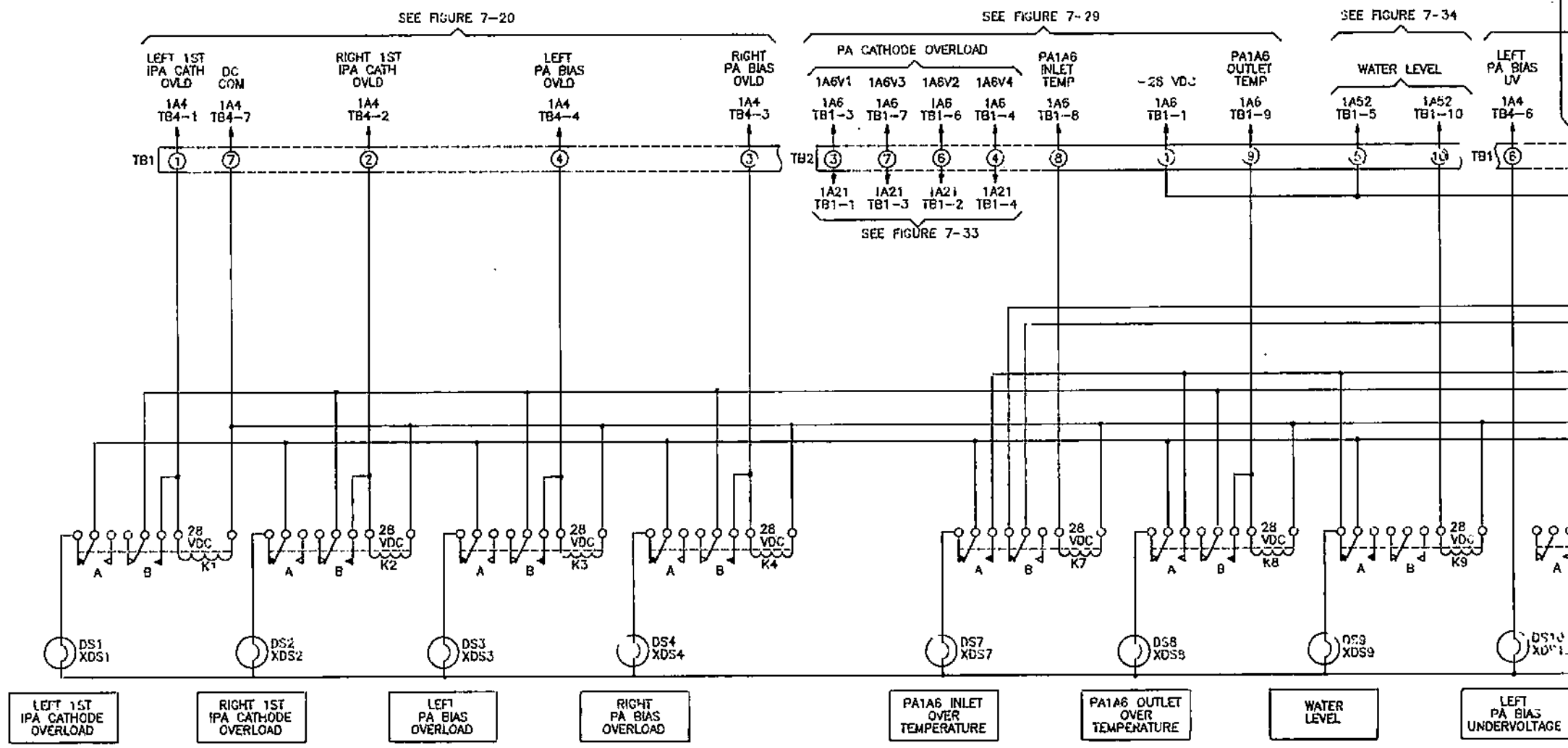
NOTES:

1. * SEE CONNECTION TABLE.
2. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS.
3. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE 2 WATT.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX THE DESIGNATION WITH 1A11.
5. NC DESIGNATES NO CONNECTION.
6. CONNECTIONS TO AN/FPN-60 TRANSMITTER CONTROL SET. SEE FIGURE 7-17.
7. CONNECTIONS TO INDICATED TERMINALS OF LOCAL CONTROL UNIT, 5TB1 FOR TRANS #1, 5TB2 FOR #2. SEE FIGURE 7-18.



CONNECTION TABLE		SEE FIGURE
FROM	TO	
TB10-1	1A6T1-1	7-29
TB10-2	1A53A3TB2-3	7-39
	1A4TB10-2	7-20
TB10-3	1A53A3TB2-1	7-40
	1A4TB10-1	7-20
TB10-4	1A6T3-1	7-29
TB10-9	1A6T1-4	
TB10-10	1A53A3TB2-2	7-39
	1A4TB10-3	7-20
TB10-11	1A6T3-4	7-29
TB10-16	1A6T4-1	
TB10-19	1A6T2-1	
TB10-24	1A6T4-4	
TB10-26	1A6T2-4	
TB10-32	1A53A3TB74-1	7-39
TB10-33	4TB1-1 OR 4TB5-1	7-50
TB10-39	1A53A3TB74-2	7-39
TB10-40	4TB1-2 OR 4TB5-2	7-50
TB10-46	1A53A3TB74-3	7-39
TB10-47	4TB1-3 OR 4TB5-3	7-50
K1-T1	1A4TB8-1	7-20
K1-T2	1A4TB8-2	
K1-T3	1A4TB8-3	
K2-T3	1TB1-3	7-19
K2-T2	1TB1-2	
K2-T1	1TB1-1	
K3-T1	1A52TB1-1	7-34
K3-T2	1A52TB1-2	
K3-T3	1A52TB1-3	

Figure 7-30. Electrical Equipment Ra
MT-2929/FPN-44(1A11),
Schematic Diagram



NOTES:

1. ◯ INDICATES INSULATED STANDOFF.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS
3. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX THE DESIGNATION WITH 1A12.
4. UNLESS OTHERWISE SPECIFIED CAPACITANCE VALUES ARE IN MICROFARADS.

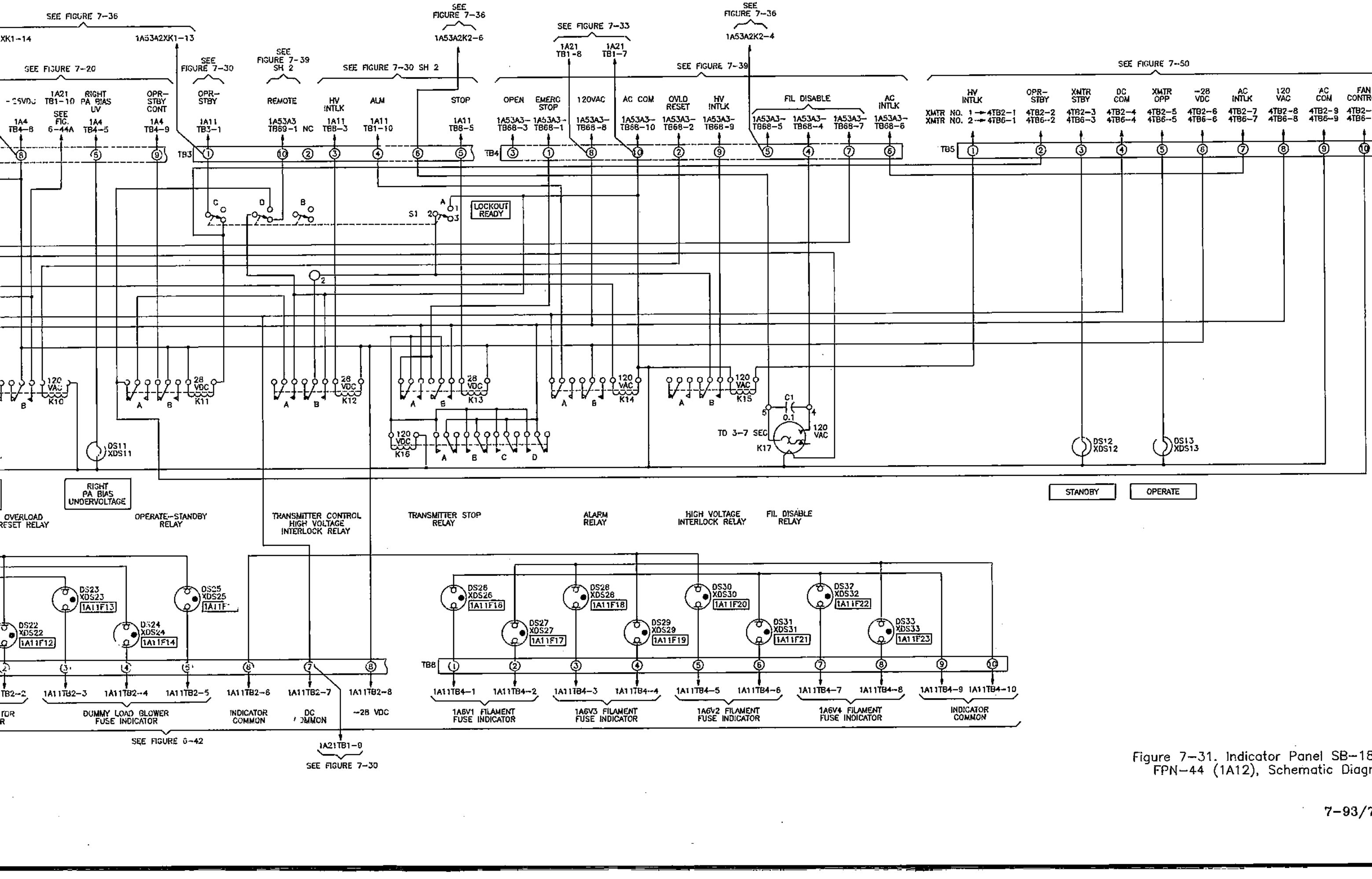


Figure 7-31. Indicator Panel SB-1894/
FPN-44 (1A12), Schematic Diagram

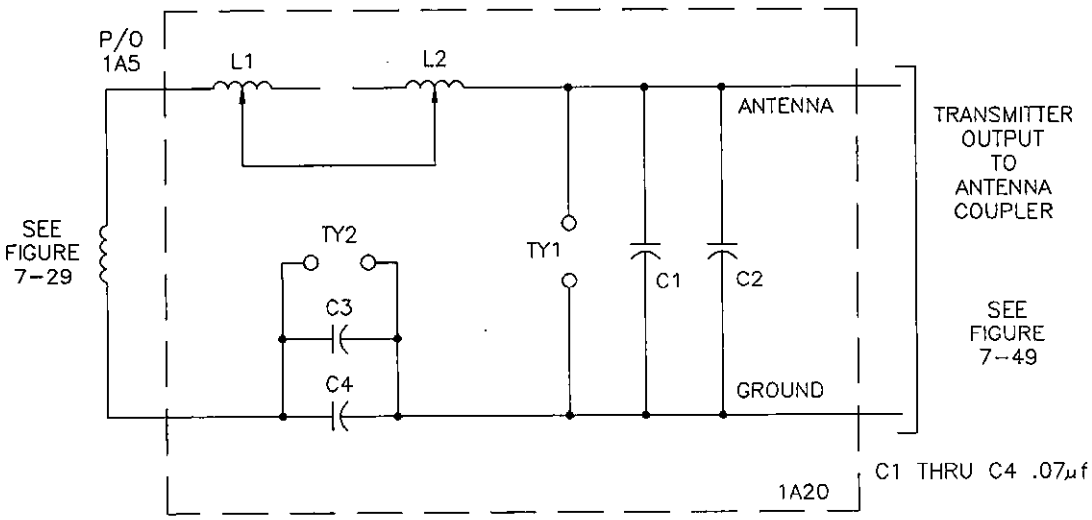


Figure 7-32. Low Pass Filter F-1428/
FPN-44A (1A20), Schematic Diagram

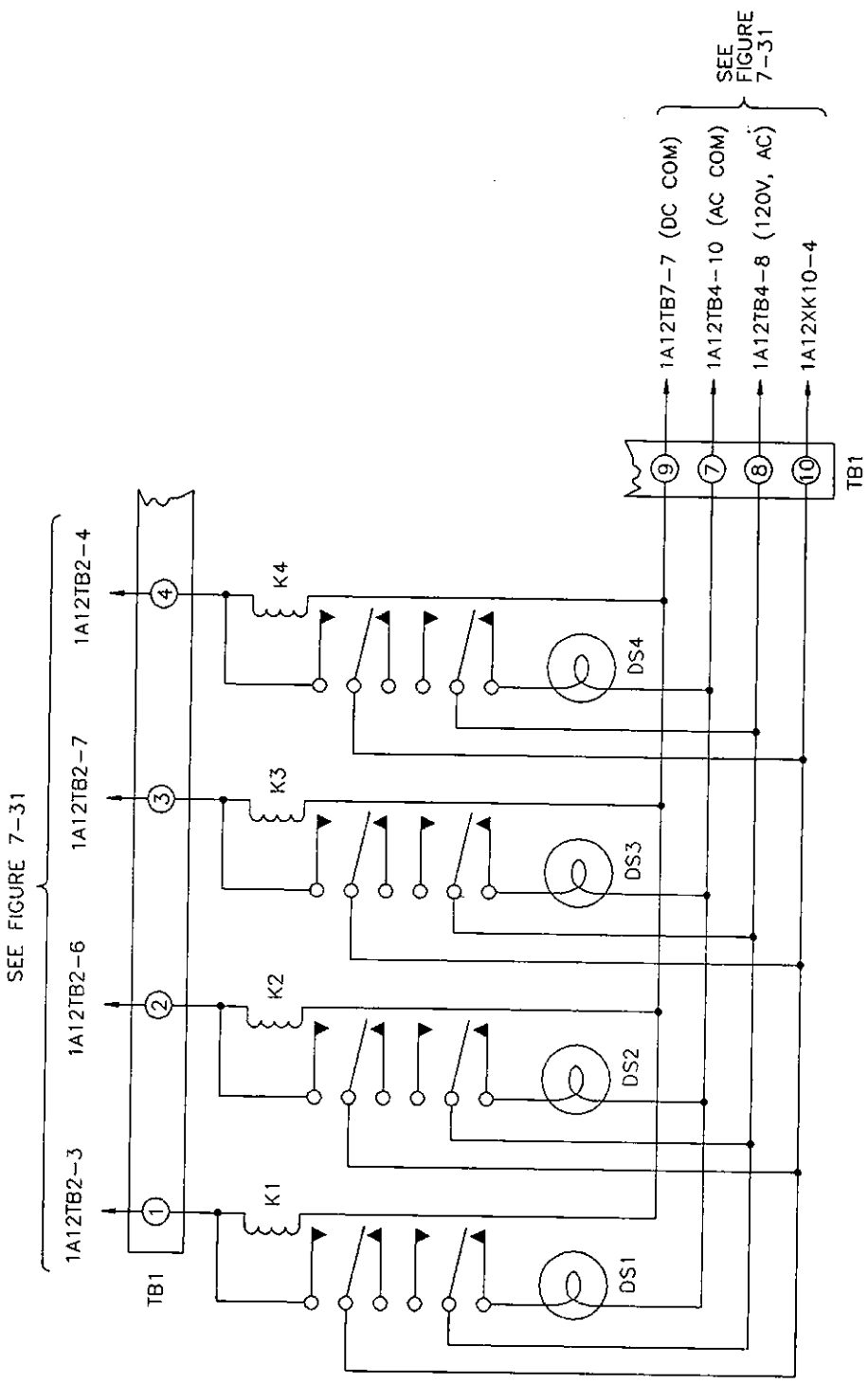
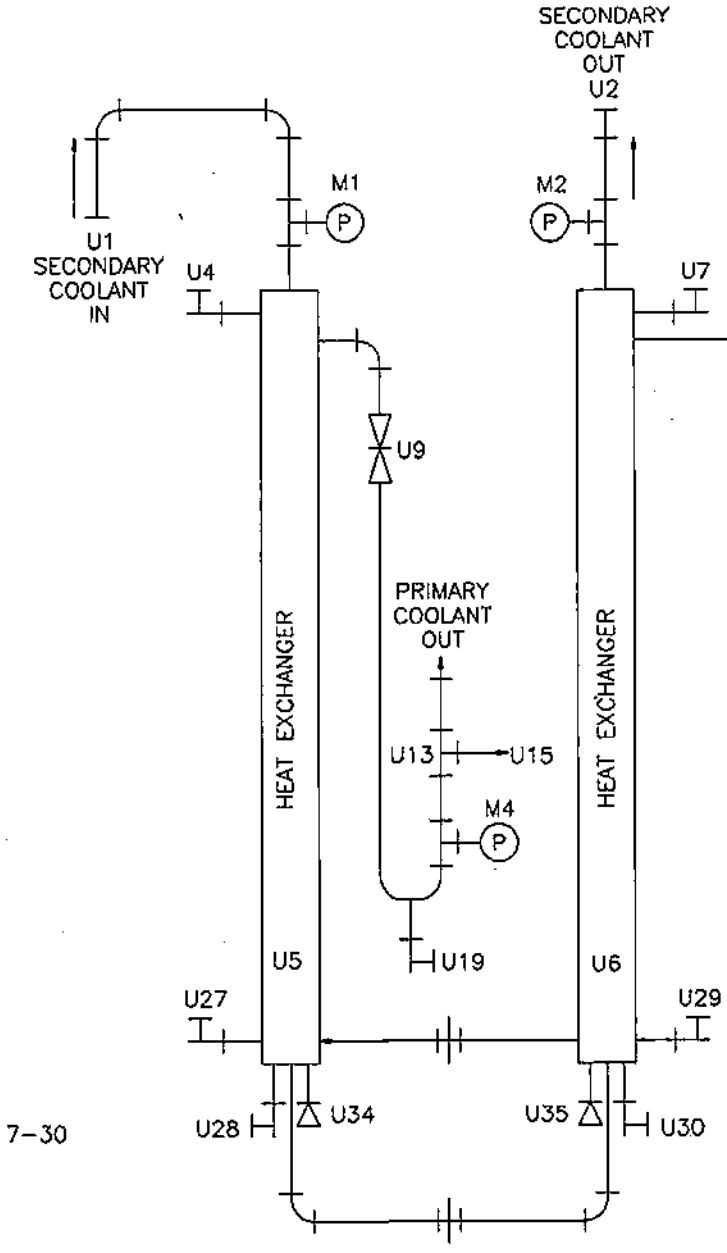
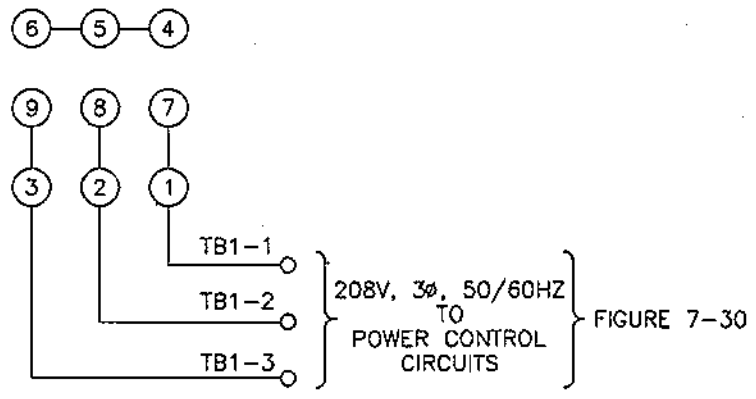


Figure 7-33. PA Overload Indicator Panel 1A21. Schematic Diagram





DETAIL A
MOTOR CONNECTION

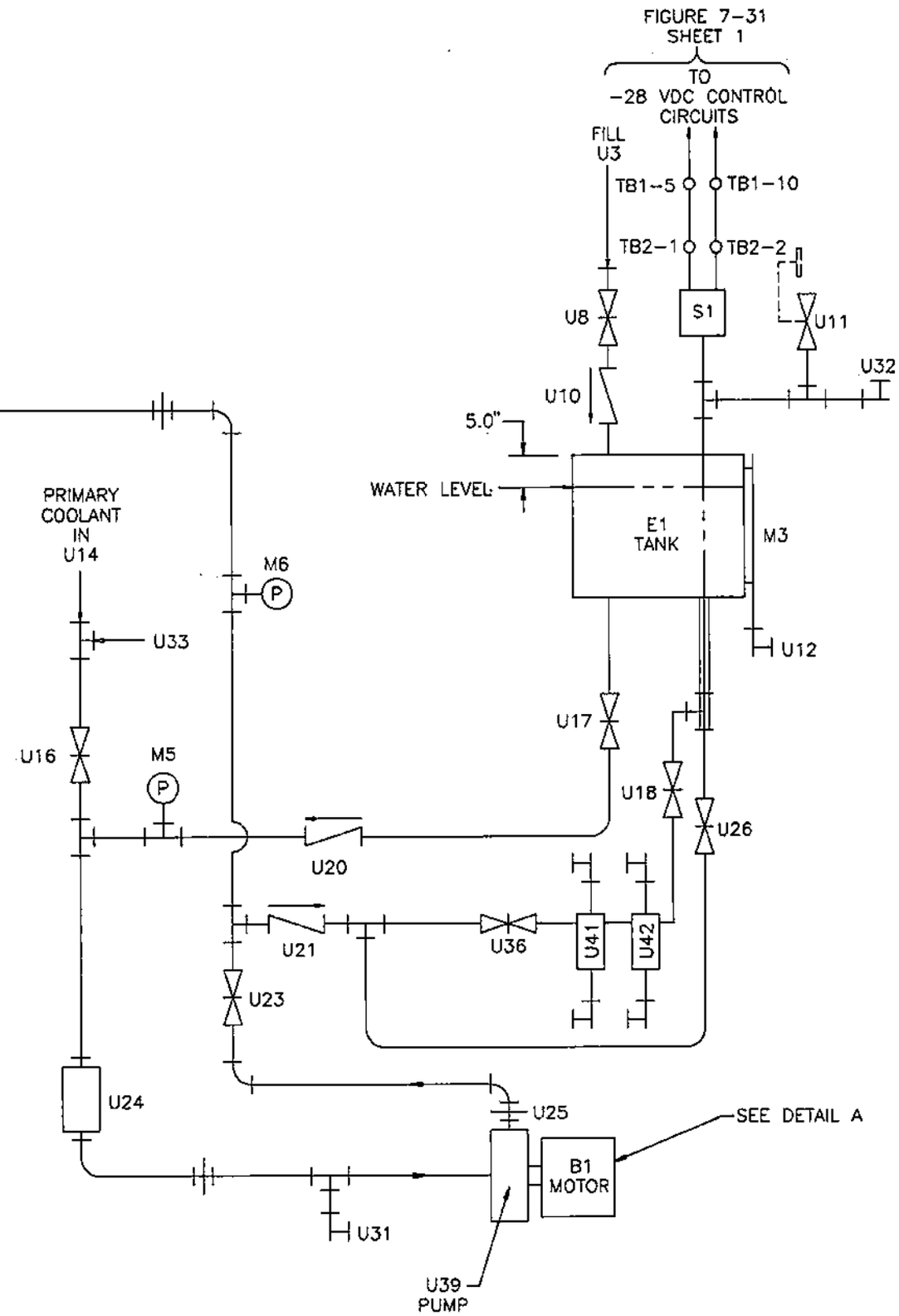
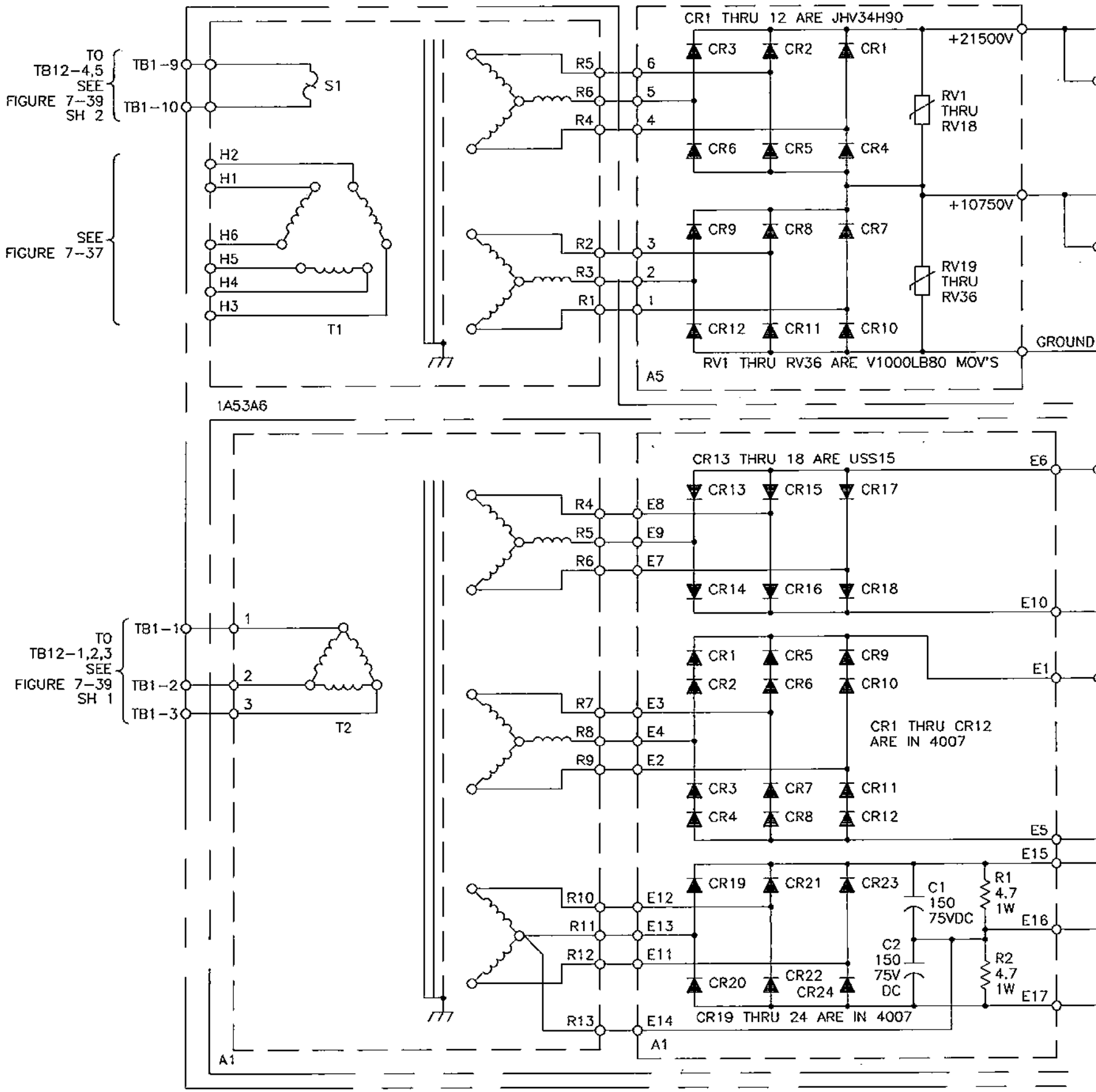


Figure 7-34. Electron Tube Liquid Cooler HD-1000/FPN (1A52) Schematic Diagram


CR1 THRU 12 ARE JHV34H90
+21500V
+10750V
GROUND
RV1 THRU RV36 ARE V1000LB80 MOV'S
A5
1A53A6
CR13 THRU 18 ARE USS15
E6
E10
E1
E5
E15
E16
E17
CR1 THRU CR12 ARE IN 4007
CR19 THRU 24 ARE IN 4007
A1
TO TB12-4,5 SEE FIGURE 7-39 SH 2
TB1-9
TB1-10
S1
SEE FIGURE 7-37
H2
H1
H6
H5
H4
H3
T1
TO TB12-1,2,3 SEE FIGURE 7-39 SH 1
TB1-1
TB1-2
TB1-3
T2
R5
R6
R4
R2
R3
R1
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
CR3
CR2
CR1
CR6
CR5
CR4
CR9
CR8
CR7
CR12
CR11
CR10
CR14
CR16
CR18
CR1
CR5
CR9
CR2
CR6
CR10
CR3
CR7
CR11
CR4
CR8
CR12
CR19
CR21
CR23
CR20
CR22
CR24
RV1 THRU RV18
RV19 THRU RV36
C1 150 75VDC
C2 150 75V DC
R1 4.7 1W
R2 4.7 1W

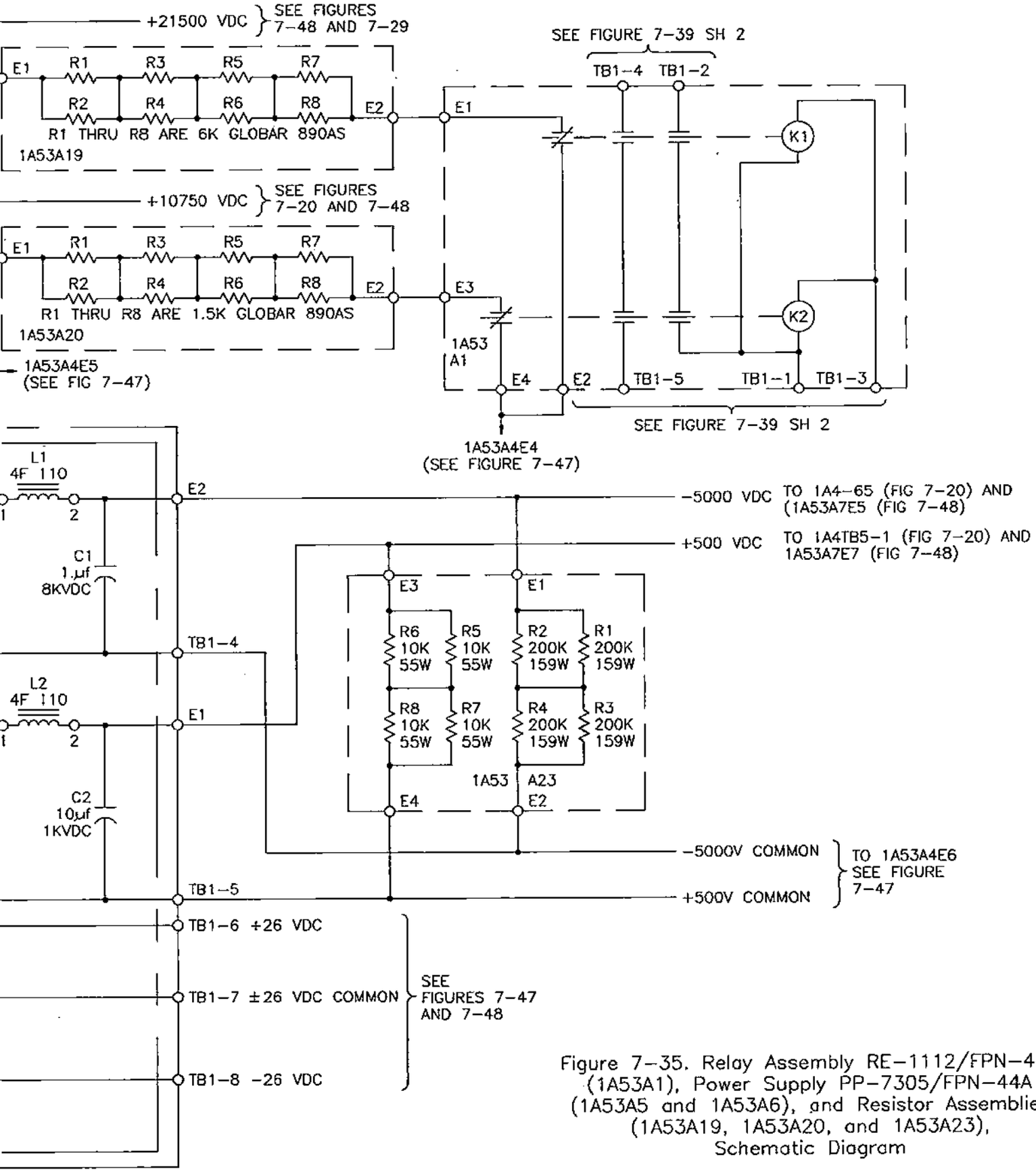
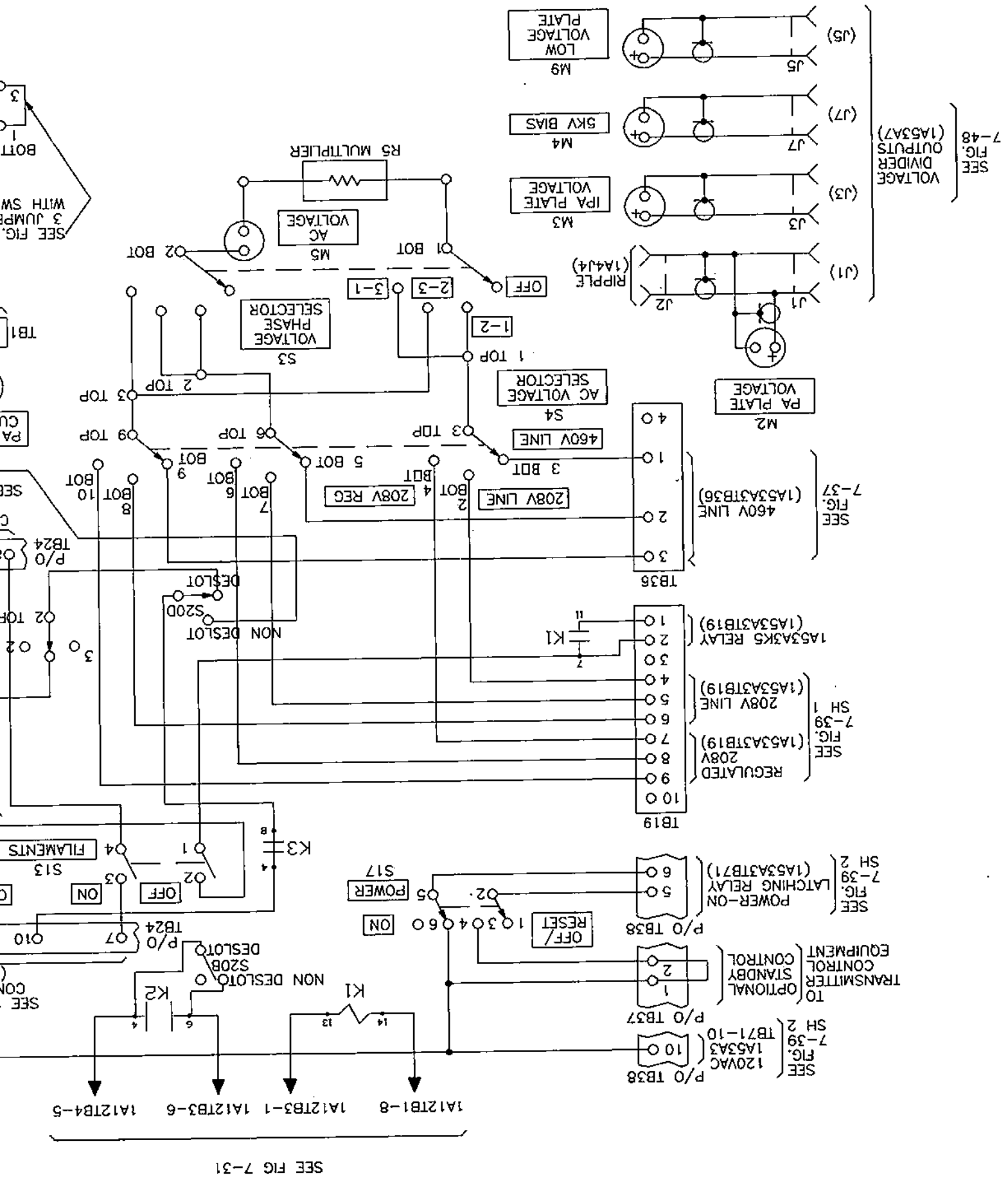
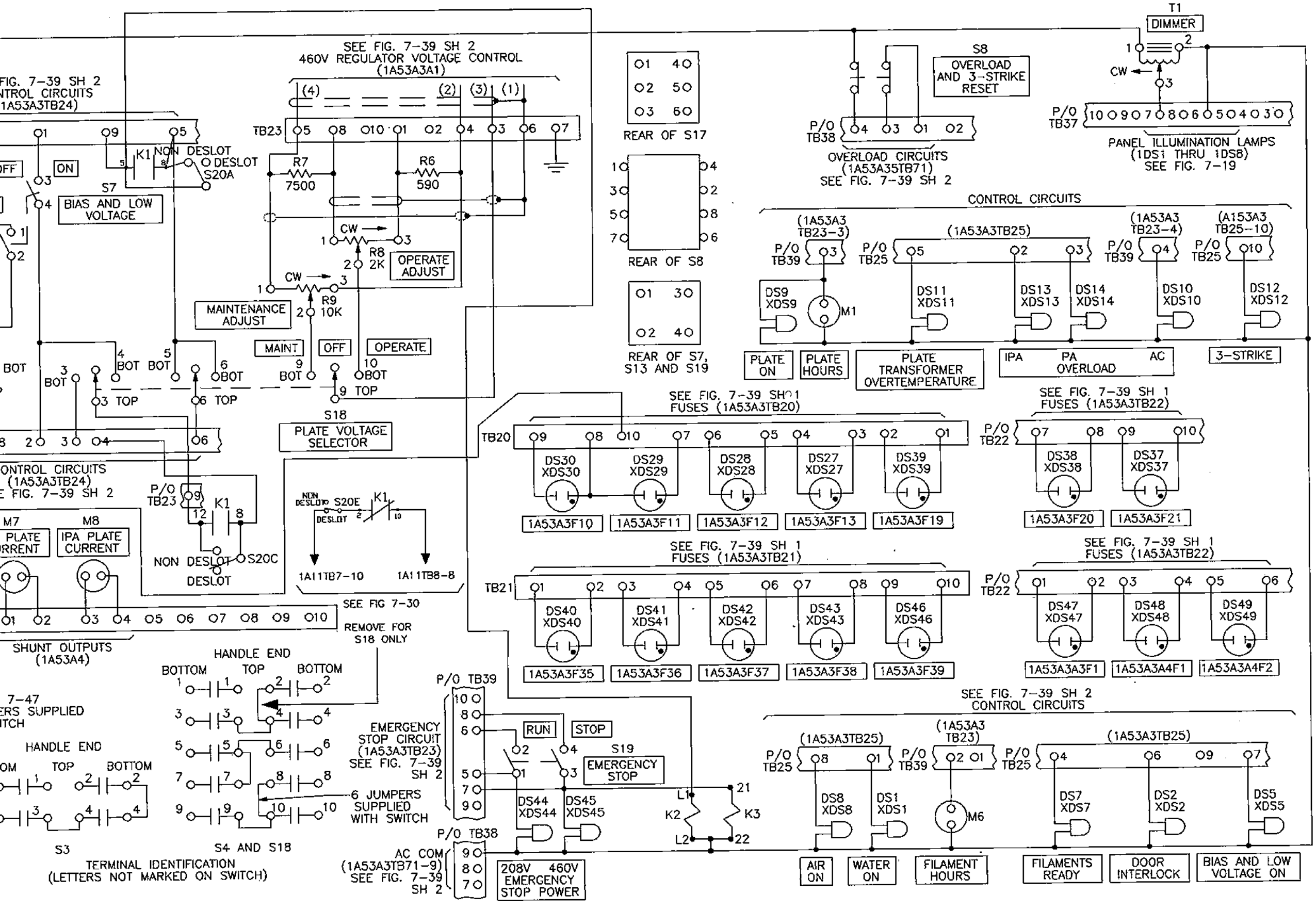


Figure 7-35. Relay Assembly RE-1112/FPN-44A (1A53A1), Power Supply PP-7305/FPN-44A (1A53A5 and 1A53A6), and Resistor Assemblies (1A53A19, 1A53A20, and 1A53A23), Schematic Diagram


M2
PA PLATE VOLTAGE
RIPPLE (1A4J4)
J1
J2
(J1)
M3
IPA PLATE VOLTAGE
J3
(J3)
M4
5KV BIAS
J7
(J7)
M9
LOW VOLTAGE PLATE
J5
(J5)
SEE FIG. 7-48
VOLTAGE DIVIDER OUTPUTS (1A53A7)
R5 MULTIPLIER
M5
AC VOLTAGE
S3
VOLTAGE PHASE SELECTOR
S4
AC VOLTAGE SELECTOR
OFF
1-2
2-3
3-1
1 TOP
2 TOP
3 TOP
1 BOT
2 BOT
3 BOT
460V LINE
208V REG
208V LINE
4 BDT
5 BOT
6 TOP
7 BOT
8 BOT
9 BOT
9 TOP
10 BOT
TB36
SEE FIG. 7-37
(1A53A3TB36)
460V LINE
TB19
(1A53A3TB19)
1A53A3K5 RELAY
K1
SEE FIG. 7-39 SH 1
(1A53A3TB19)
208V LINE
(1A53A3TB19)
REGULATED 208V
P/O TB38
SEE FIG. 7-39 SH 2
(1A53A3TB71)
POWER-ON LATCHING RELAY
POWER
S17
OFF/ RESET
ON
P/O TB37
TRANSMITTER CONTROL EQUIPMENT
OPTIONAL STANDBY CONTROL
P/O TB38
SEE FIG. 7-39 SH 2
120VAC 1A53A3
TB71-10
DESLOT
S20D
NON DESLOT
S20B
K2
K3
S13
FILAMENTS
ON
OFF
P/O TB24
SEE FIG. 7-31
1A12TB1-8
1A12TB3-1
1A12TB3-6
1A12TB4-5



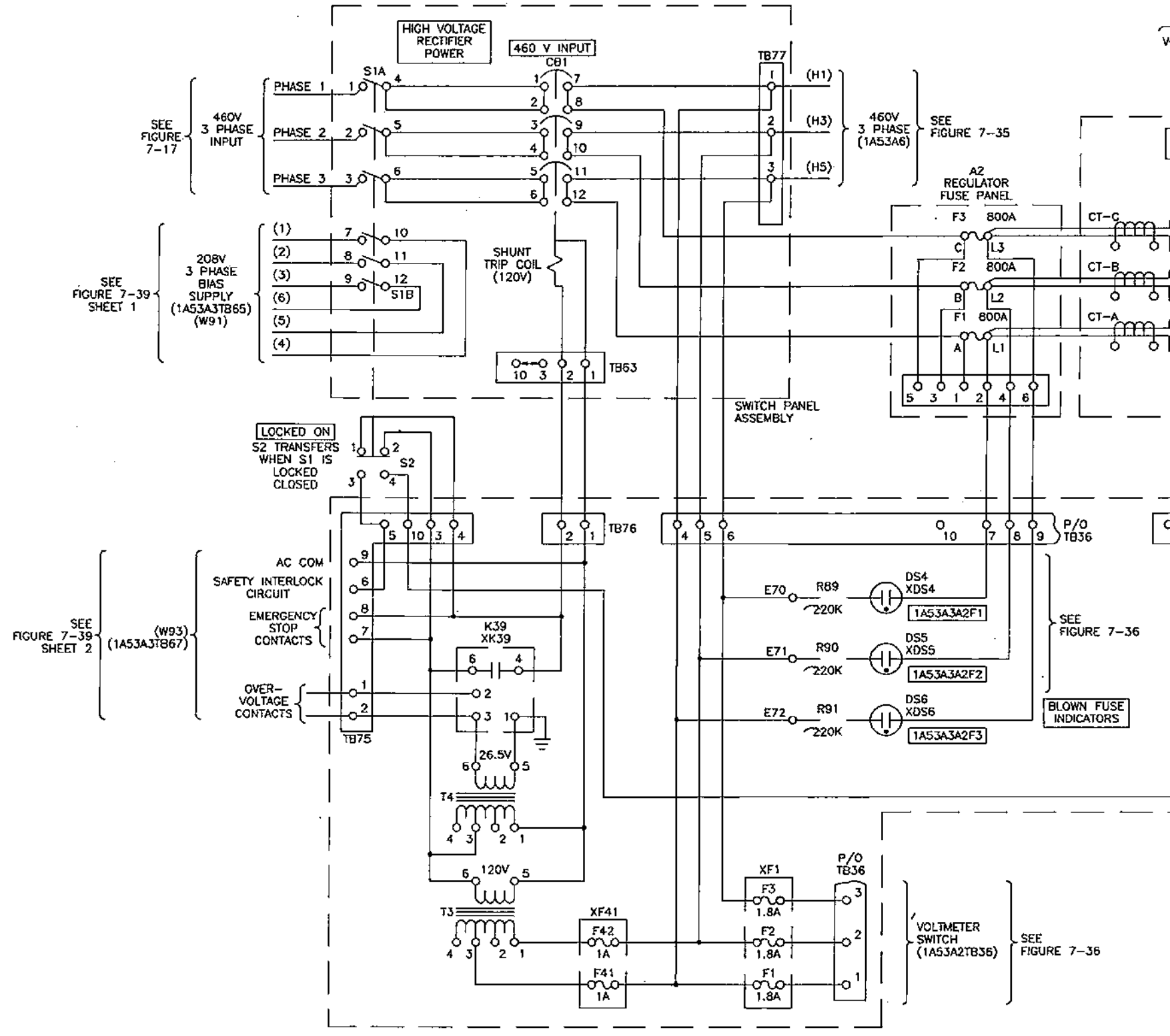
NOTES:

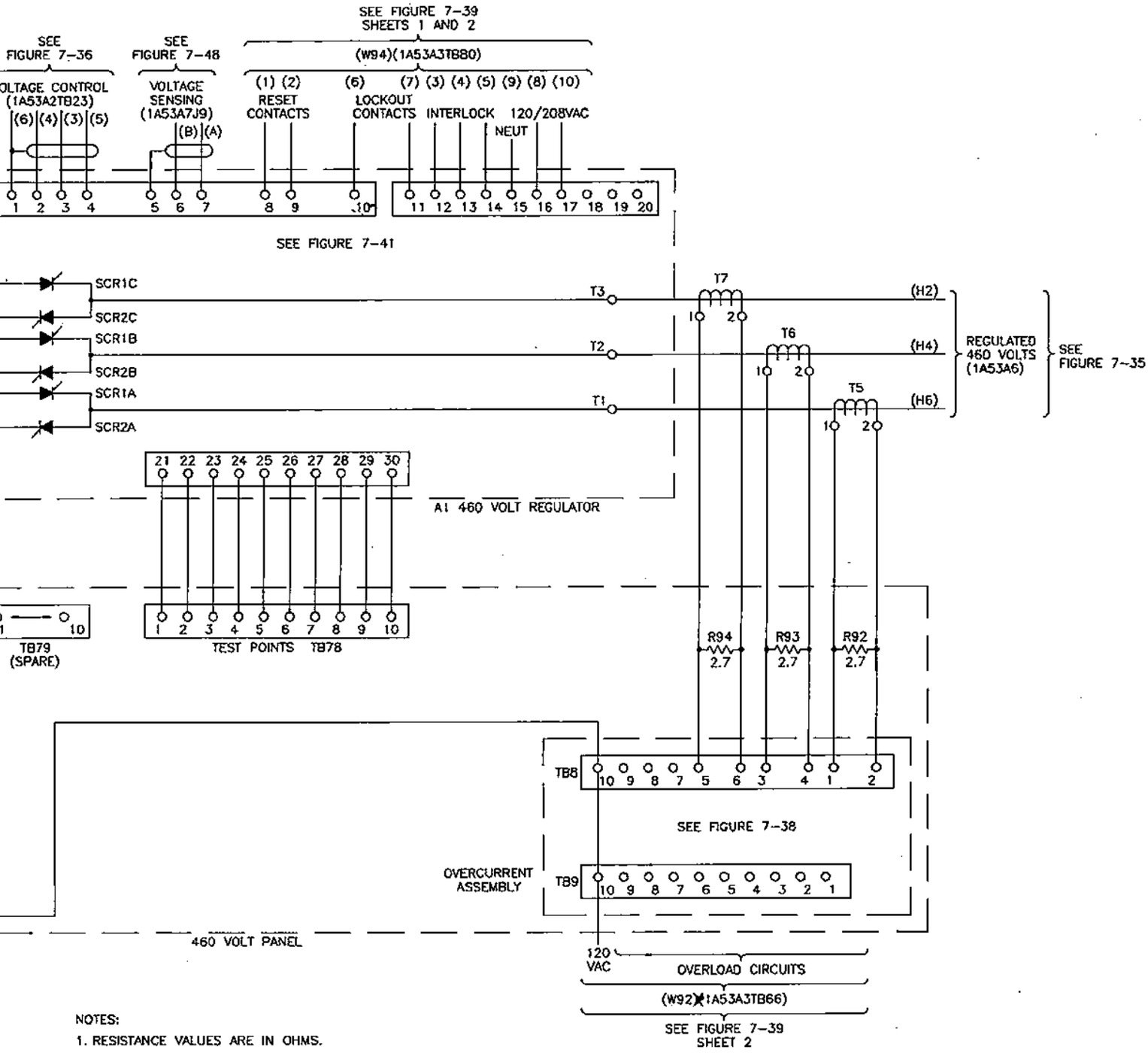
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS.
2. REFERENCE DESIGNATIONS NOT IN PARENTHESES ARE ABBREVIATED. PREFACE THE DESIGNATIONS WITH 1A53A2.
3. REFERENCE DESIGNATIONS AND TERMINAL NUMBERS IN PARENTHESES IDENTIFY ITEMS THAT ARE CONNECTED TO THIS ASSEMBLY.
4. REFERENCE DESIGNATIONS ARE NOT IN SEQUENCE.

Figure 7-36. Control-Indicator C-1003 FPN-44A (1A53A2), Schematic Diagra

34/
m

102

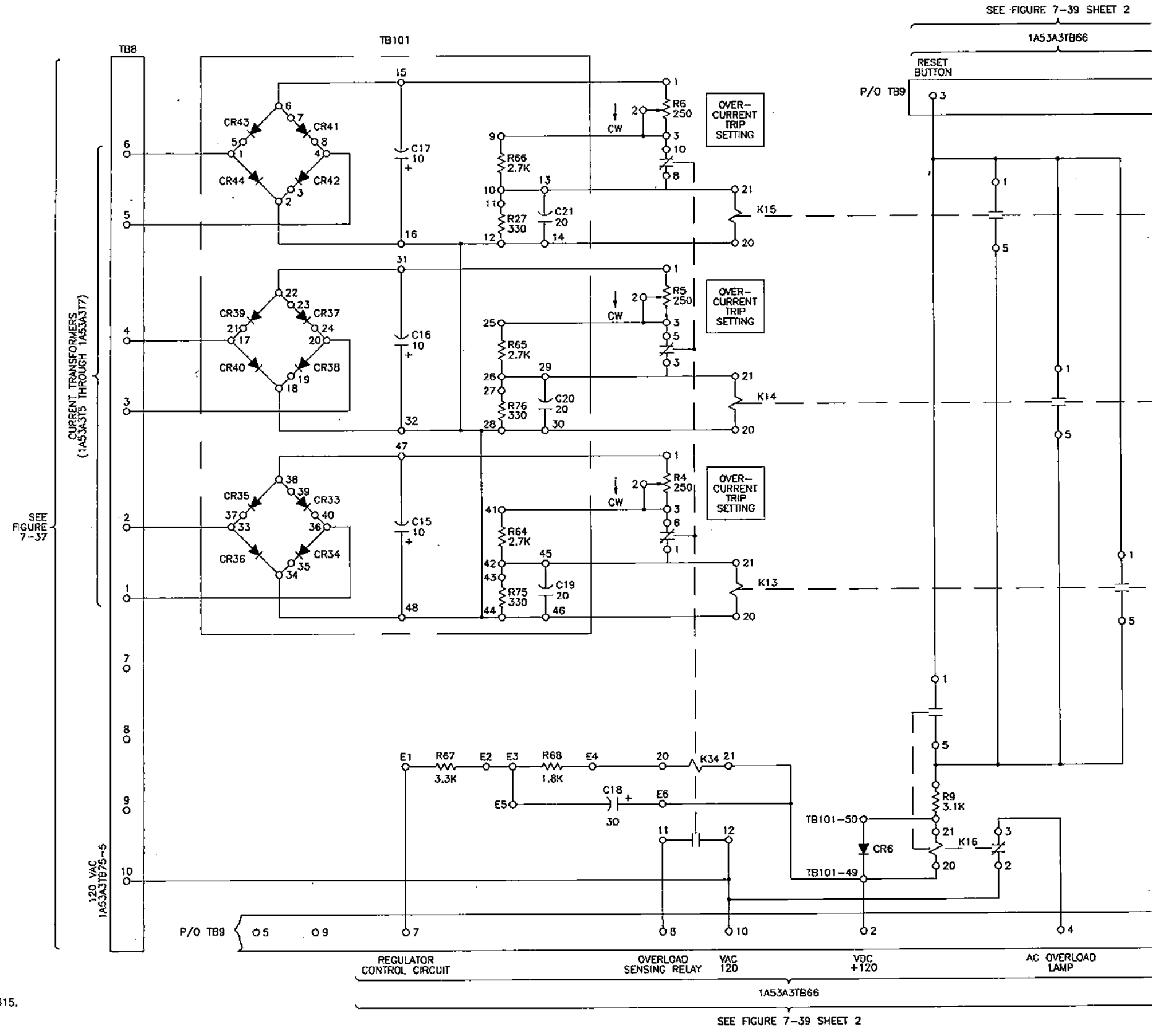

HIGH VOLTAGE RECTIFIER POWER
460 V INPUT
CB1
TB77
S1A
PHASE 1
PHASE 2
PHASE 3
SEE FIGURE 7-17
460V 3 PHASE INPUT
(H1)
(H3)
(H5)
460V 3 PHASE (1A53A6)
SEE FIGURE 7-35
A2 REGULATOR FUSE PANEL
F3 800A
F2 800A
F1 800A
CT-C
CT-B
CT-A
SEE FIGURE 7-39 SHEET 1
208V 3 PHASE BIAS SUPPLY (1A53A3TB65) (W91)
S1B
SHUNT TRIP COIL (120V)
TB63
SWITCH PANEL ASSEMBLY
LOCKED ON
S2 TRANSFERS WHEN S1 IS LOCKED CLOSED
S2
TB76
P/O TB36
SEE FIGURE 7-39 SHEET 2
(W93) (1A53A3TB67)
AC COM
SAFETY INTERLOCK CIRCUIT
EMERGENCY STOP CONTACTS
OVER-VOLTAGE CONTACTS
TB75
K39
XK39
26.5V
T4
120V
T3
XF41
F42 1A
F41 1A
XF1
F3 1.8A
F2 1.8A
F1 1.8A
VOLTMETER SWITCH (1A53A2TB36)
SEE FIGURE 7-36
E70
R89
220K
DS4
XDS4
1A53A3A2F1
E71
R90
DS5
XDS5
1A53A3A2F2
E72
R91
DS6
XDS6
1A53A3A2F3
SEE FIGURE 7-36
BLOWN FUSE INDICATORS



NOTES:

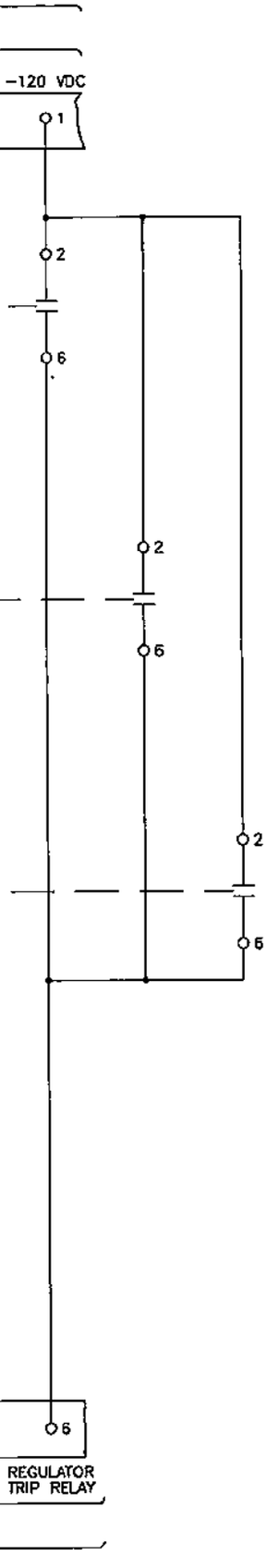
1. RESISTANCE VALUES ARE IN OHMS.
2. REFERENCE DESIGNATIONS NOT IN PARENTHESIS ARE ABBREVIATED. PREFACE THE DESIGNATIONS WITH 1A53A3.
3. REFERENCE DESIGNATIONS AND TERMINAL NUMBERS IN PARENTHESIS IDENTIFY ITEMS THAT ARE CONNECTED TO THIS ASSEMBLY.
4. REFERENCE DESIGNATIONS ARE NOT IN SEQUENCE.

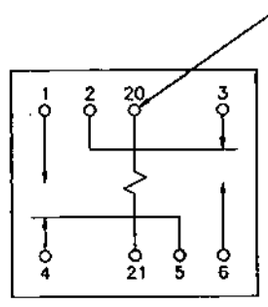
Figure 7-37. 460-Volt Rack Assembly, P/O Relay Assembly RE-1113/FPN-44A (1A53A3), Schematic Diagram



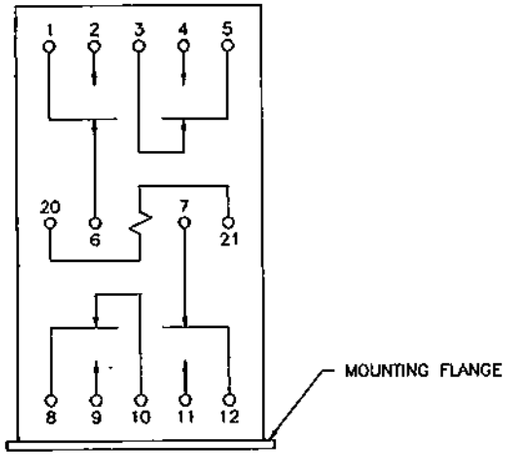
NOTES:

1. RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. REFERENCE DESIGNATIONS NOT IN PARENTHESES ARE ABBREVIATED. PREFACE THE DESIGNATIONS WITH 1A53A3.
3. REFERENCE DESIGNATIONS AND TERMINAL NUMBERS IN PARENTHESES IDENTIFY ITEMS THAT ARE CONNECTED TO THIS ASSEMBLY.
4. REFERENCE DESIGNATIONS ARE NOT IN SEQUENCE.
5. DIODES CR6 AND CR33 THRU CR44 ARE PART OF NO. 2138315.





K13,K14,K15,K16
TERMINAL IDENTIFICATION



K34
TERMINAL IDENTIFICATION
(NUMBERS ARE NOT MARKED ON RELAYS)

Figure 7-38. Over-Current Assembly P/O Relay Assembly RE-1113/FPN-44 (1A53A3), Schematic Diagram

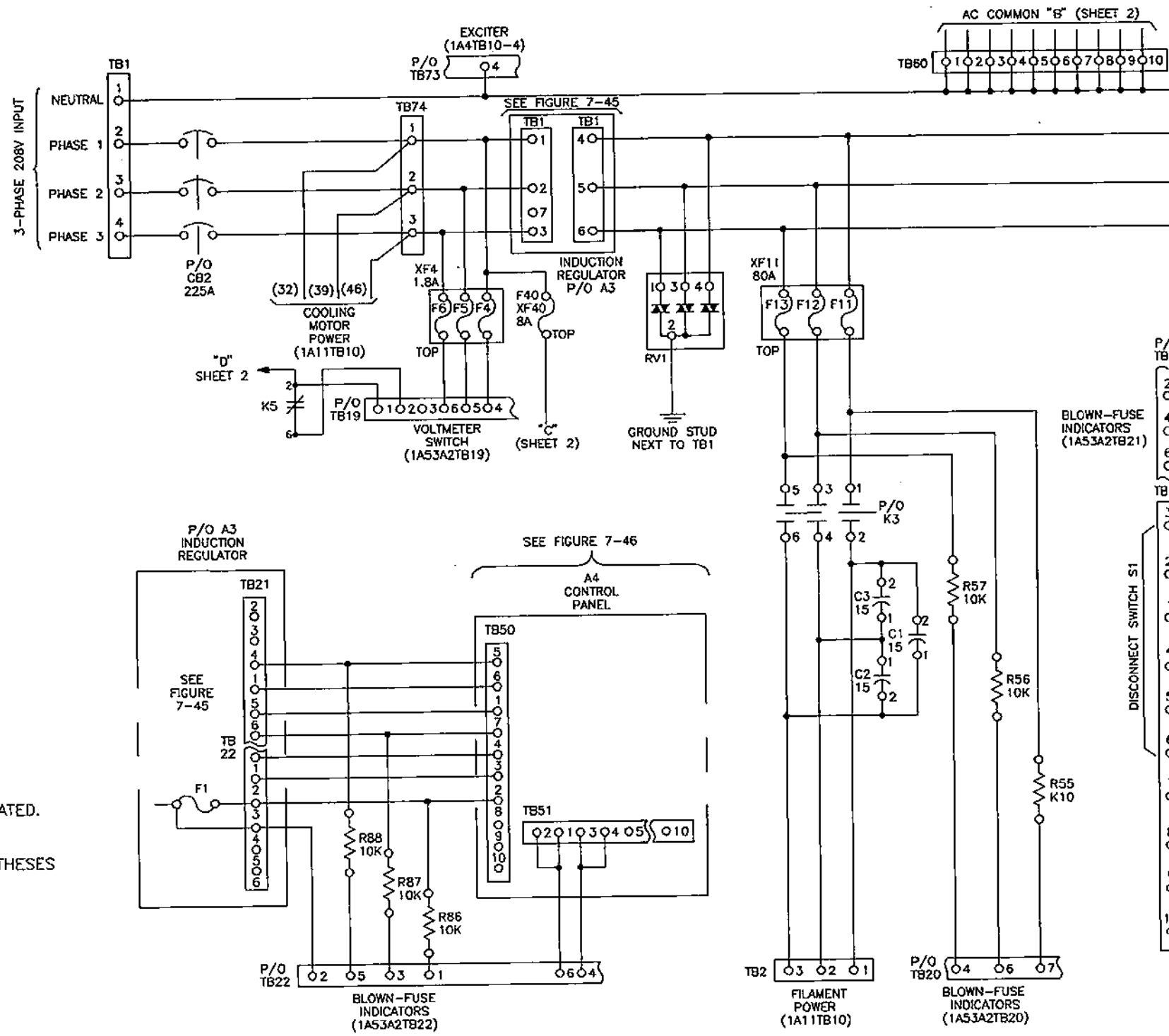
NOTES:

1. RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

2. REFERENCE DESIGNATIONS NOT IN PARENTHESES ARE ABBREVIATED. PREFACE THE DESIGNATIONS WITH 1A53A3.

3. REFERENCE DESIGNATIONS AND TERMINAL NUMBERS IN PARENTHESES INDENTIFY ITEMS THAT ARE CONNECTED TO THIS ASSEMBLY. SEE INTERCONNECTION CROSS REFERENCE TABLE FOR CONNECTING FIGURE.

4. THE NUMBER OF CONTACTS ON EACH RELAY IS GIVEN IN PARENTHESES AFTER THE REFERENCE DESIGNATION.



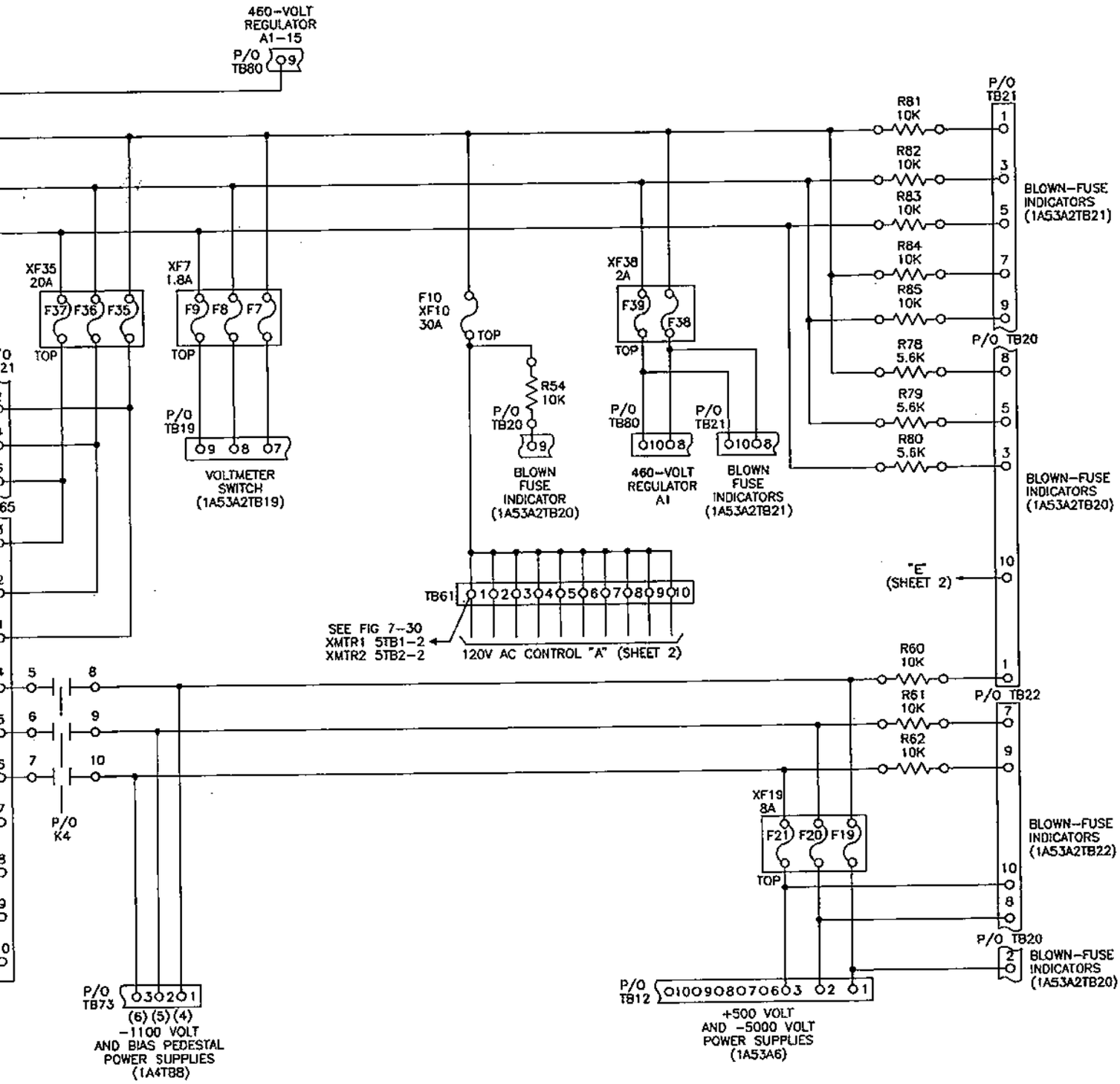
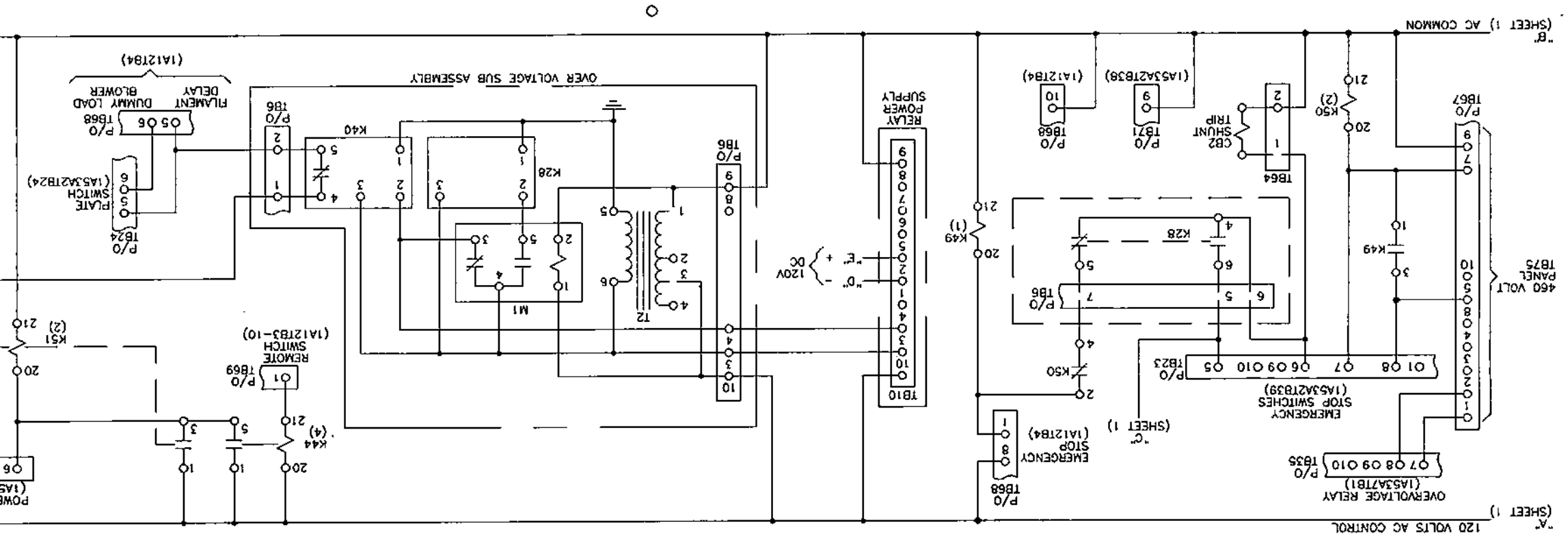


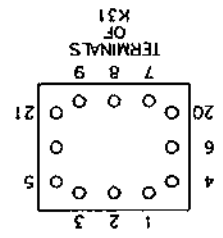
Figure 7-39. 208-Volt Rack Assembly, P/O Relay Assembly RE-1113/FPN-44A (1A53A3), Schematic Diagram (Sheet 1of 2)

CHANGE 4



SEE NOTES ON SHEET 1

TERMINALS OF K31



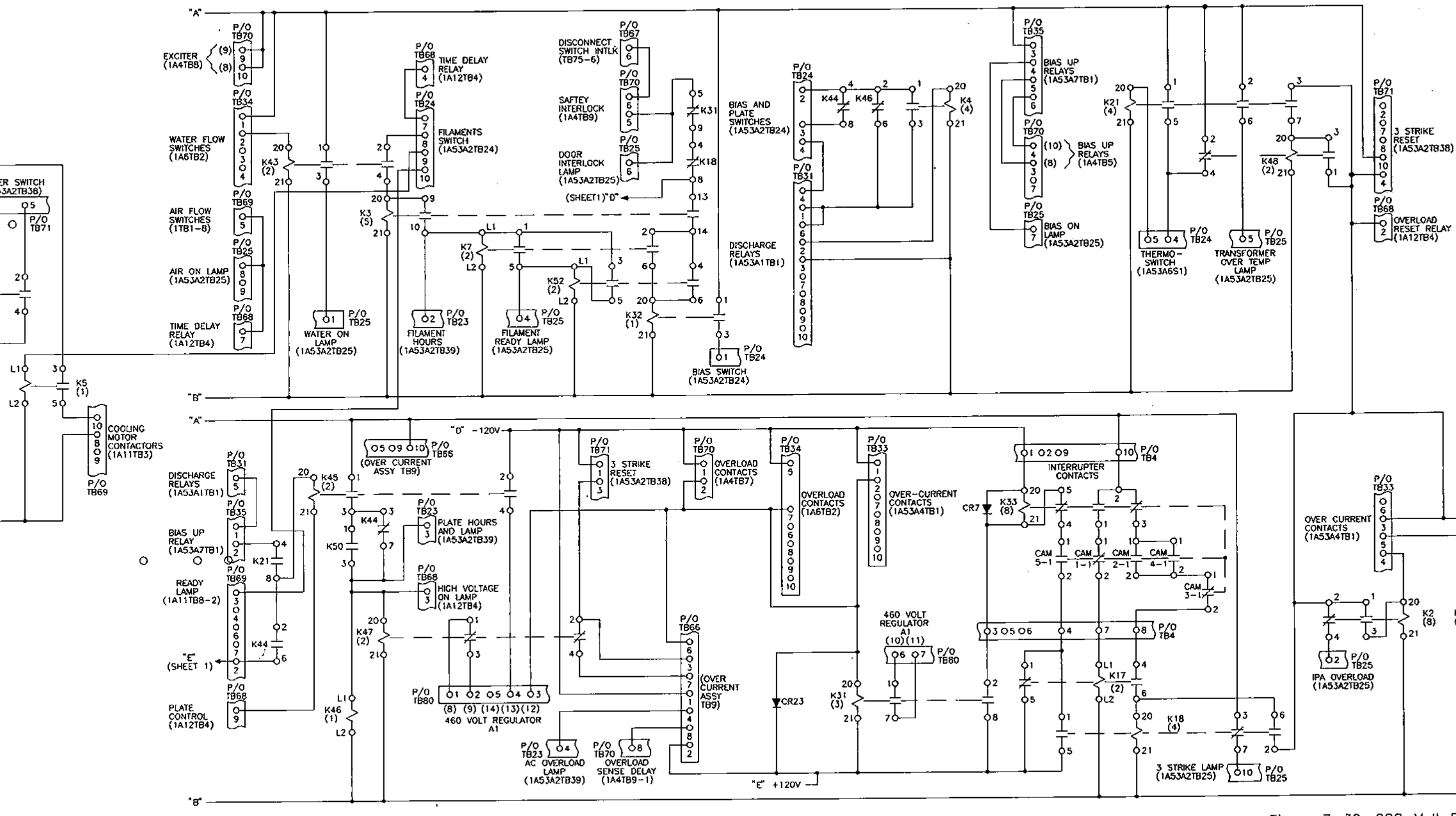
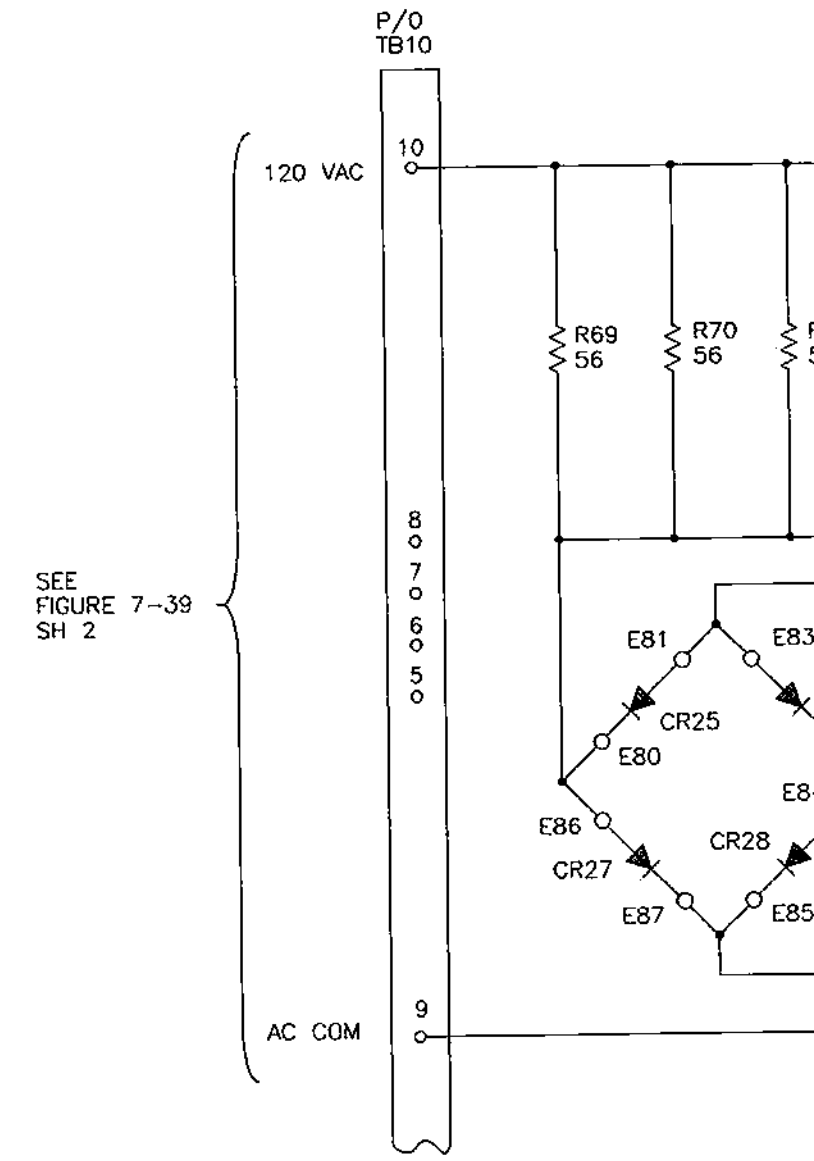


Figure 7-39. 208-Volt Rack Assembly, P/
Relay Assembly RE-1113/FPN-44A(1A53A
Schematic Diagram (Sheet 2 of 2)

/0
3),

110



NOTES:

1. RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. REFERENCE DESIGNATIONS NOT IN PARENTHESES ARE ABBREVIATED. PREFACE THE DESIGNATIONS WITH 1A53A3.
3. REFERENCE DESIGNATIONS AND TERMINAL NUMBERS IN PARENTHESES IDENTIFY ITEMS THAT ARE CONNECTED TO THIS ASSEMBLY.
4. REFERENCE DESIGNATIONS ARE NOT IN SEQUENCE.
5. DIODES CR25 THRU CR28 ARE PART NO. 2138315.

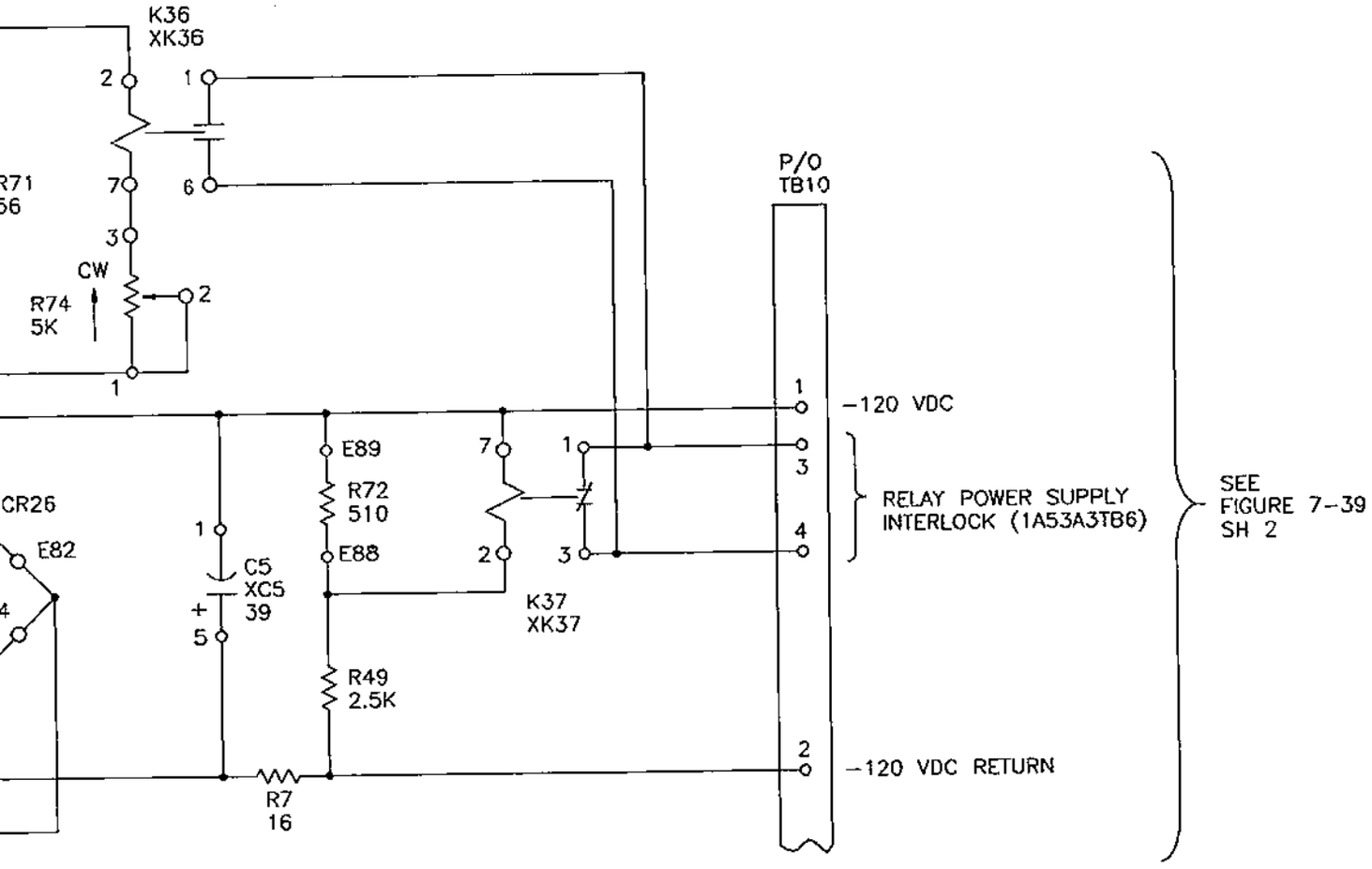
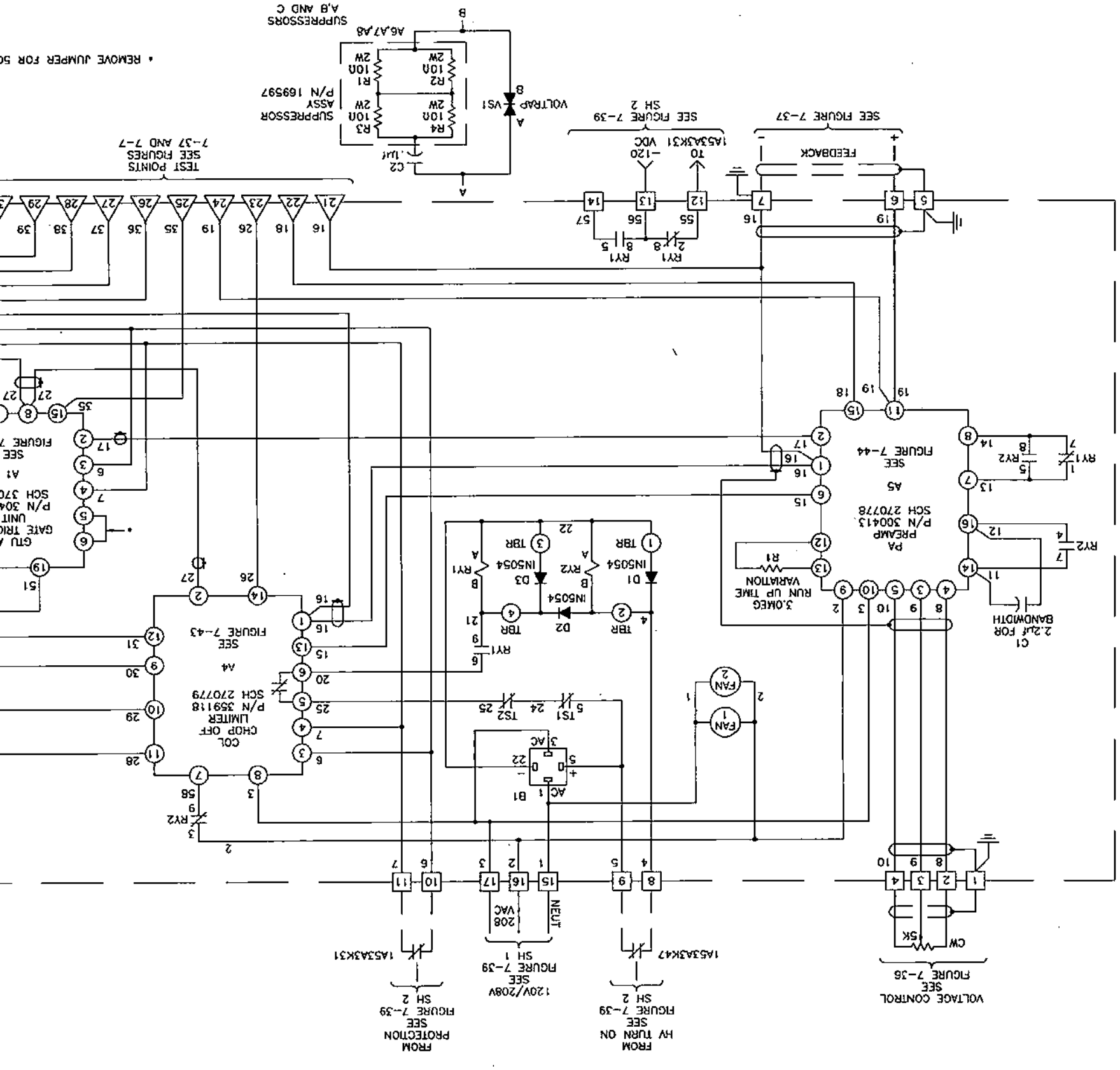
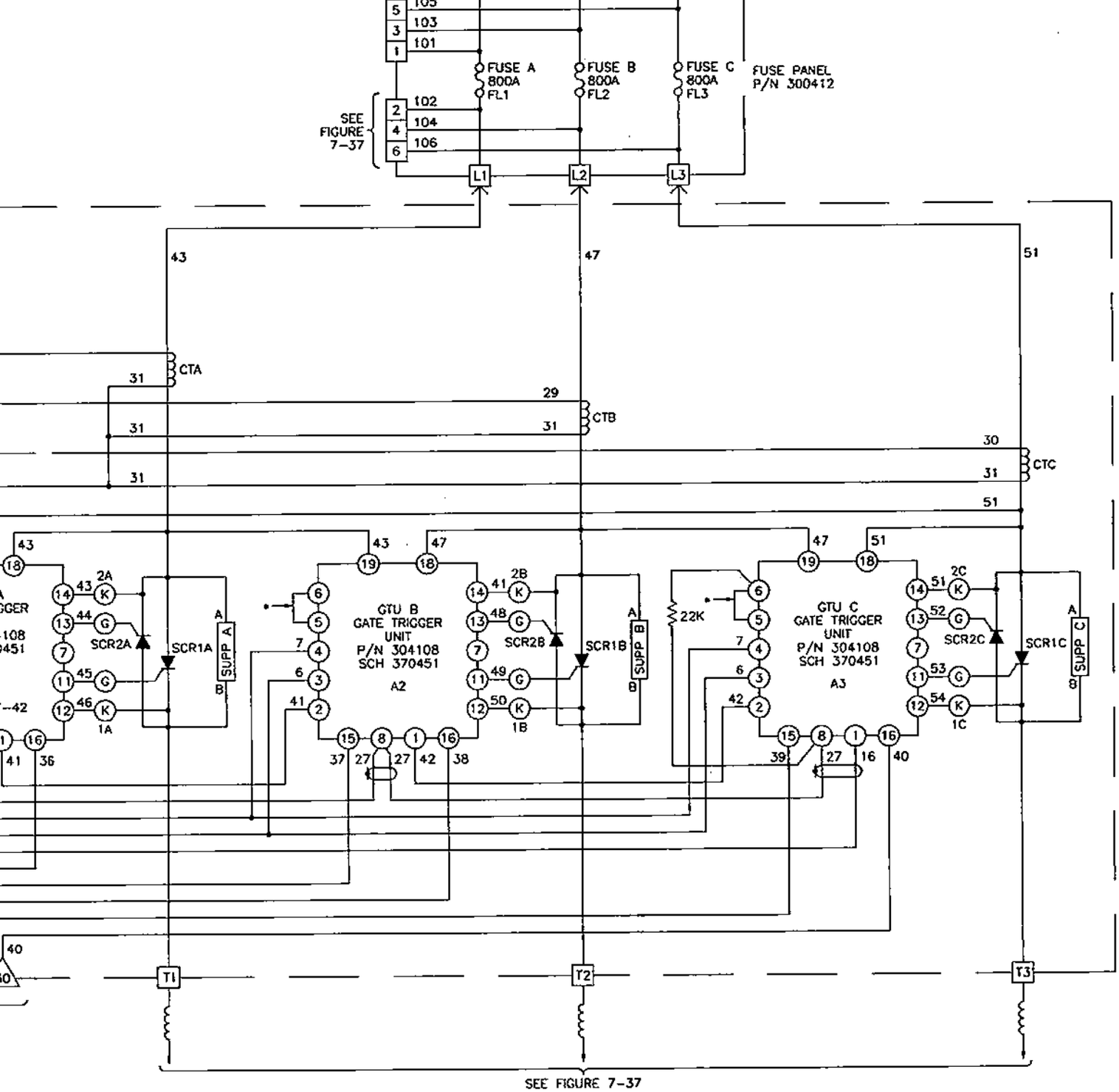


Figure 7−40. Relay Power Supply, P/O Relay Assembly, RE−1113/FPN−44A (1A53A3), Schematic Diagram


TEST POINTS
SEE FIGURES
7-37 AND 7-7
SEE FIGURE 7-37
SEE FIGURE 7-39
SH 2
FEEDBACK
1A53A3K31 VDC
-120
10
VOLTRAP
VS1
SUPPRESSOR
ASSY
P/N 169397
R1 10A 2W
R2 10A 2W
R3 10A 2W
R4 10A 2W
C2 .1μf
A6,A7,A8
SUPPRESSORS
A,B AND C
REMOVE JUMPER FOR 50
RY1
2 X 8
B 5
55
56
57
12
13
14
7
16
19
5
6
1
SEE
FIGURE 7-44
A5
PREAMP
P/N 300413
SCH 270778
PA
PREAMP
P/N 300413
SCH 270778
RY1
RY2
R1
3.0MEG
RUN UP TIME
VARIATION
C1
2.2μF FOR
BANDWIDTH
VOLTAGE CONTROL
SEE
FIGURE 7-36
5K
CW
1A53A3K47
FROM
HV TURN ON
SEE
FIGURE 7-39
SH 2
208
VAC
NEUT
120V/208V
SEE
FIGURE 7-39
SH 1
1A53A3K31
FROM
PROTECTION
SEE
FIGURE 7-39
SH 2
TBR
D1
IN5054
D2
IN5054
D3
IN5054
RY1
TS1
TS2
FAN
1
FAN
2
B1
AC
DC
22
5
3
AC
COL
CHOP OFF
LIMITER
P/N 359118
SCH 270779
A4
SEE
FIGURE 7-43
SEE
FIGURE 7
A1
GTU
GATE TRIG
UNIT
P/N 304
SCH 270
S1
RY2

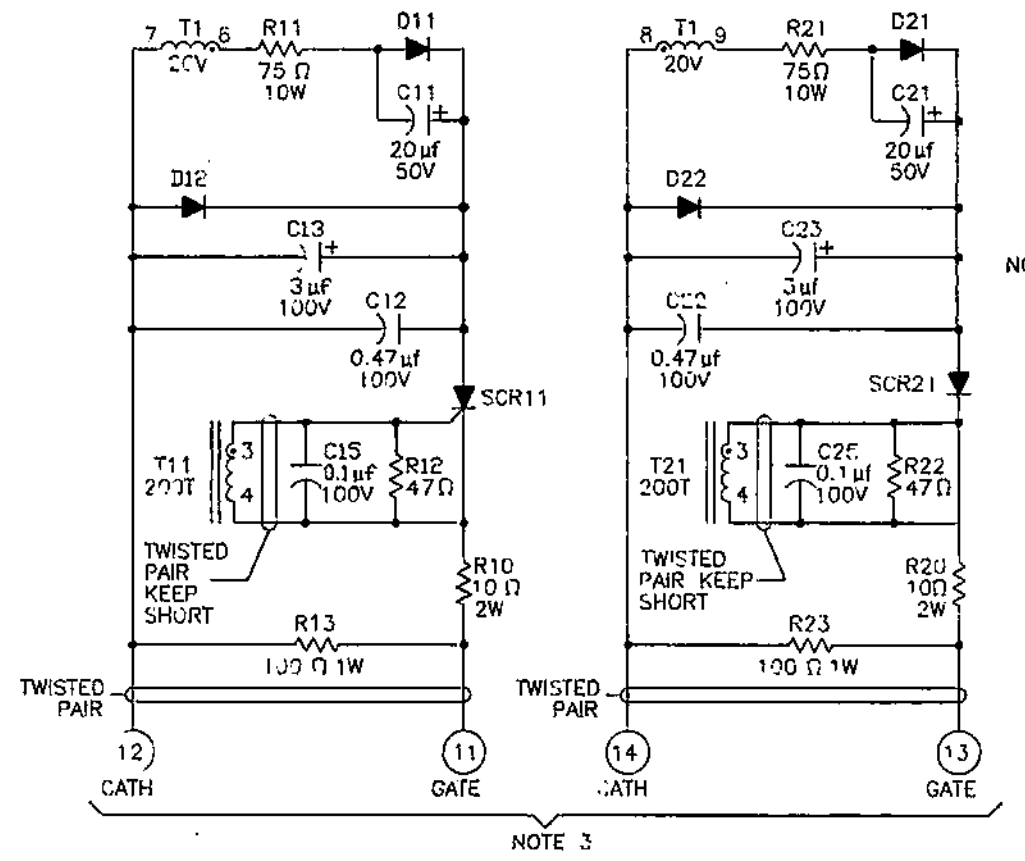


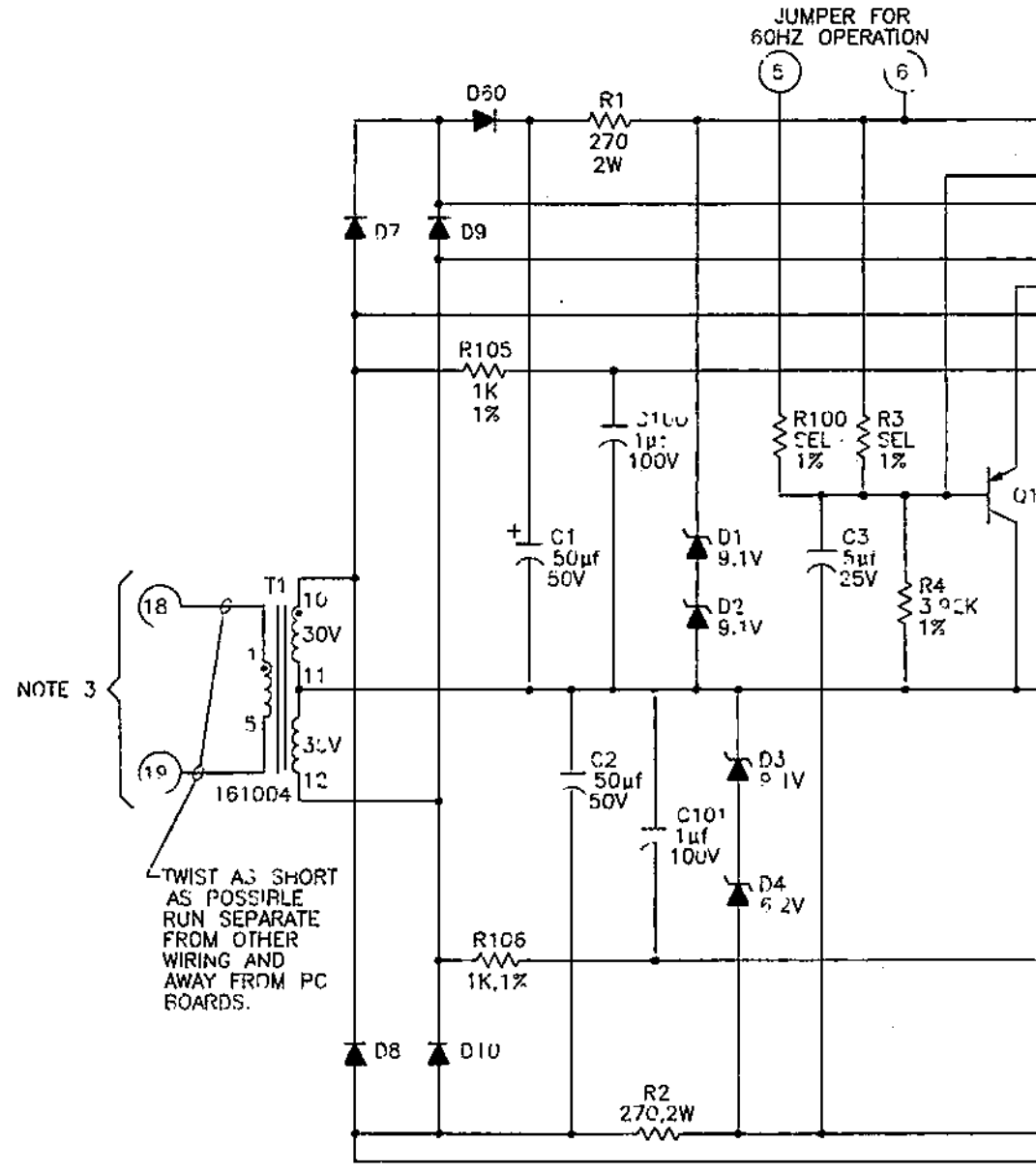
0Hz OPERATION

Figure 7-41. Voltage Regulator CN-1473/FPN-44A (1A53A3A1 and 1A53A3A2), Schematic Diagram

NOTES:

1. TRANSISTORS Q1, Q4, Q5 ARE 2N4403
   Q2, Q3, Q6, Q11, Q21 ARE 2N4401.
2. DIODES D1, D2, D4, D61 ARE 1N4739;
   DIODE D3 IS 1N4735;
   DIODES D81 THRU D84 ARE 1N4148;
   ALL OTHER DIODES ARE 1N4003
3. SEE FIGURE 7-41 FOR INTERFACE.





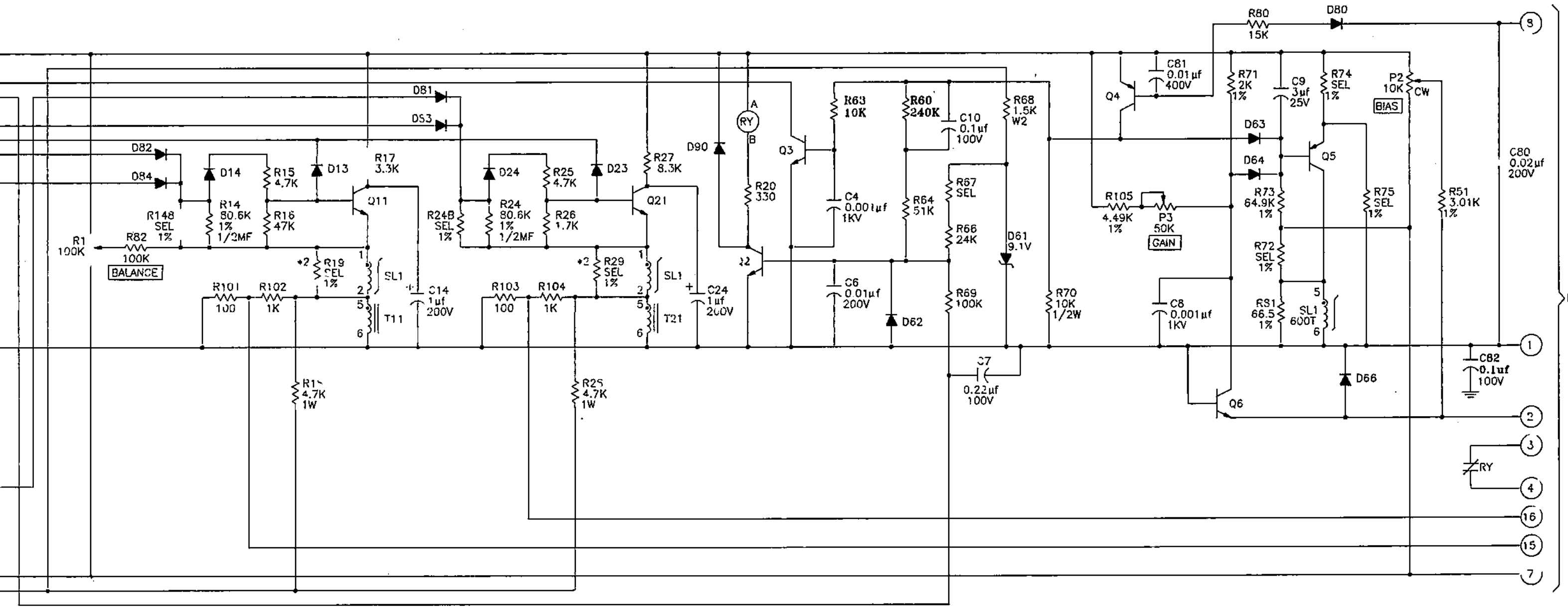
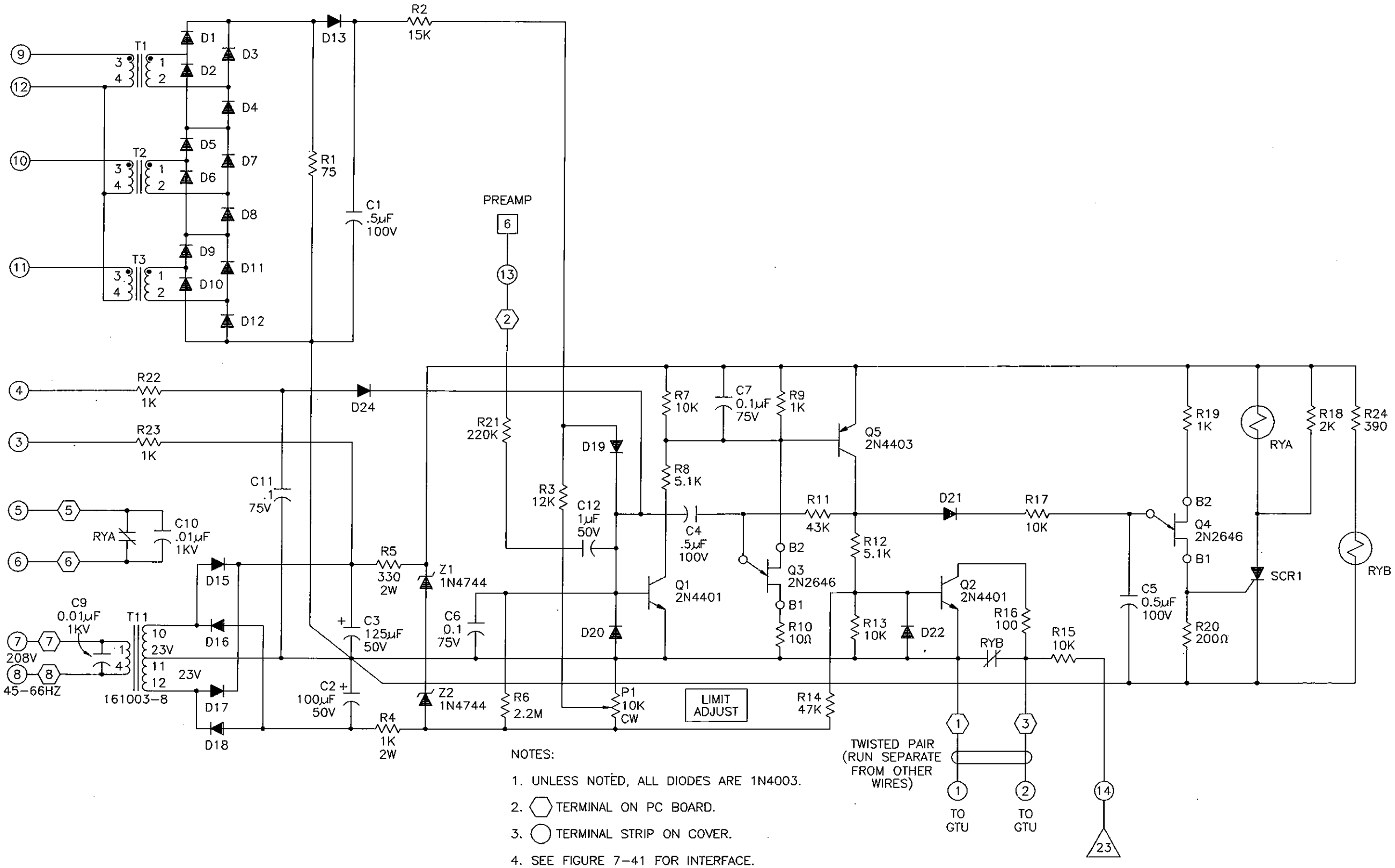


Figure 7–42. Gate Trigger Unit 1A53A3A1A1, 1A53A3A1A2, and 1A53A3A1A3, Schematic Diagram

TE 3

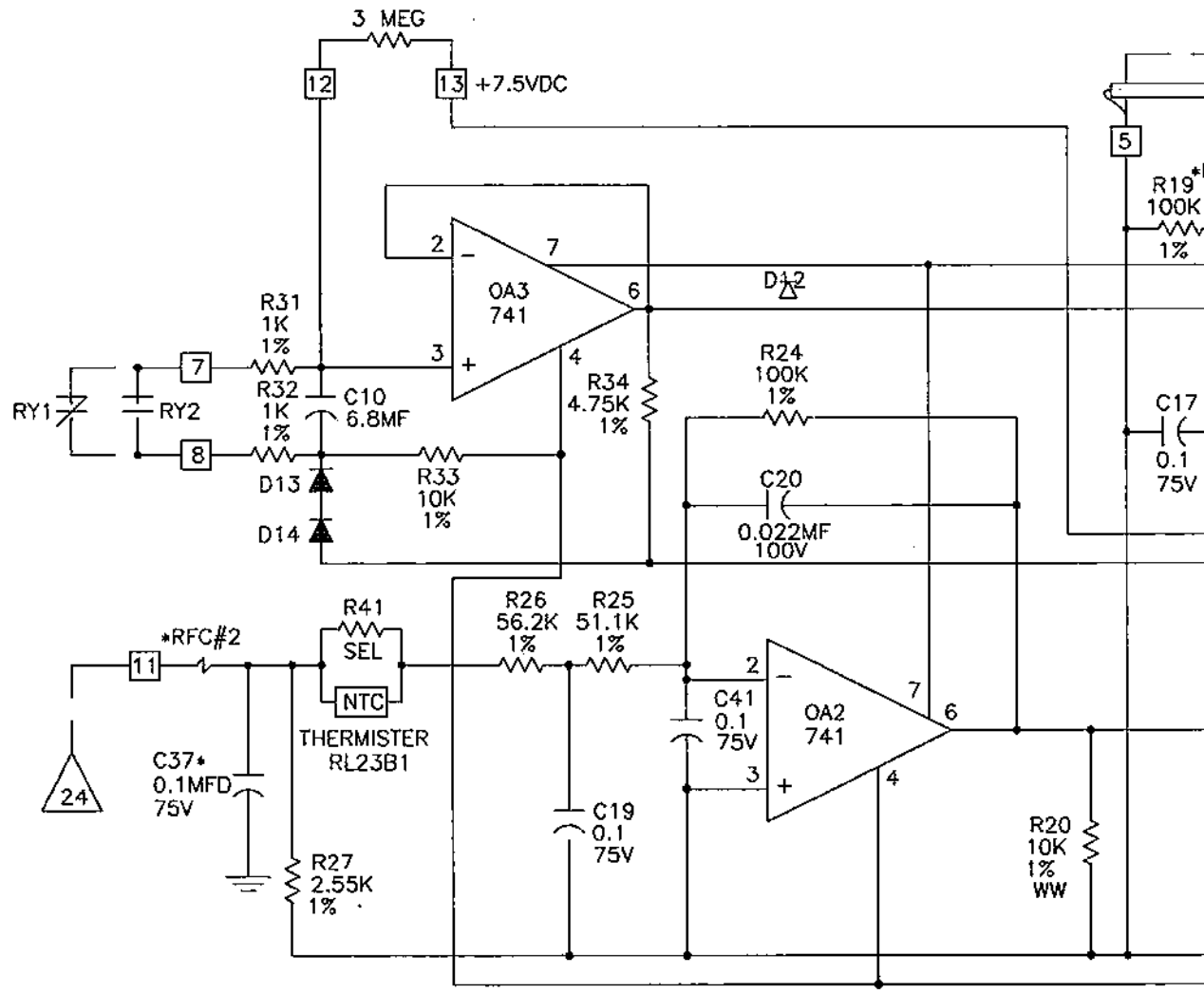
116



NOTES:

1. UNLESS NOTED, ALL DIODES ARE 1N4003.
2. ⬡ TERMINAL ON PC BOARD.
3. ◯ TERMINAL STRIP ON COVER.
4. SEE FIGURE 7-41 FOR INTERFACE.

Figure 7-43. Chop-Off Limiter 1A53A3A1A4, Schematic Diagram



NOTES:

1. * PARTS ARE LOCATED ON COVER. (FIGURE 5–62).
2. RUN LEADS 9 & 10 SEPARATE FROM OTHER BUNDLE (LEADS 1–8).
3. RUN–UP TIME $\cong$ 4.5 X $R_{(MEG)}$SECONDS (0–100%).
4. BANDWIDTH $\cong \frac{2}{C_{(MF)}}$HZ UP TO 5HZ.
5. SEE FIGURE 7–41 FOR INTERFACE.
6. ALL DIODES ARE TYPE 1N4003 EXCEPT AS NOTED.

△ TEST POINT

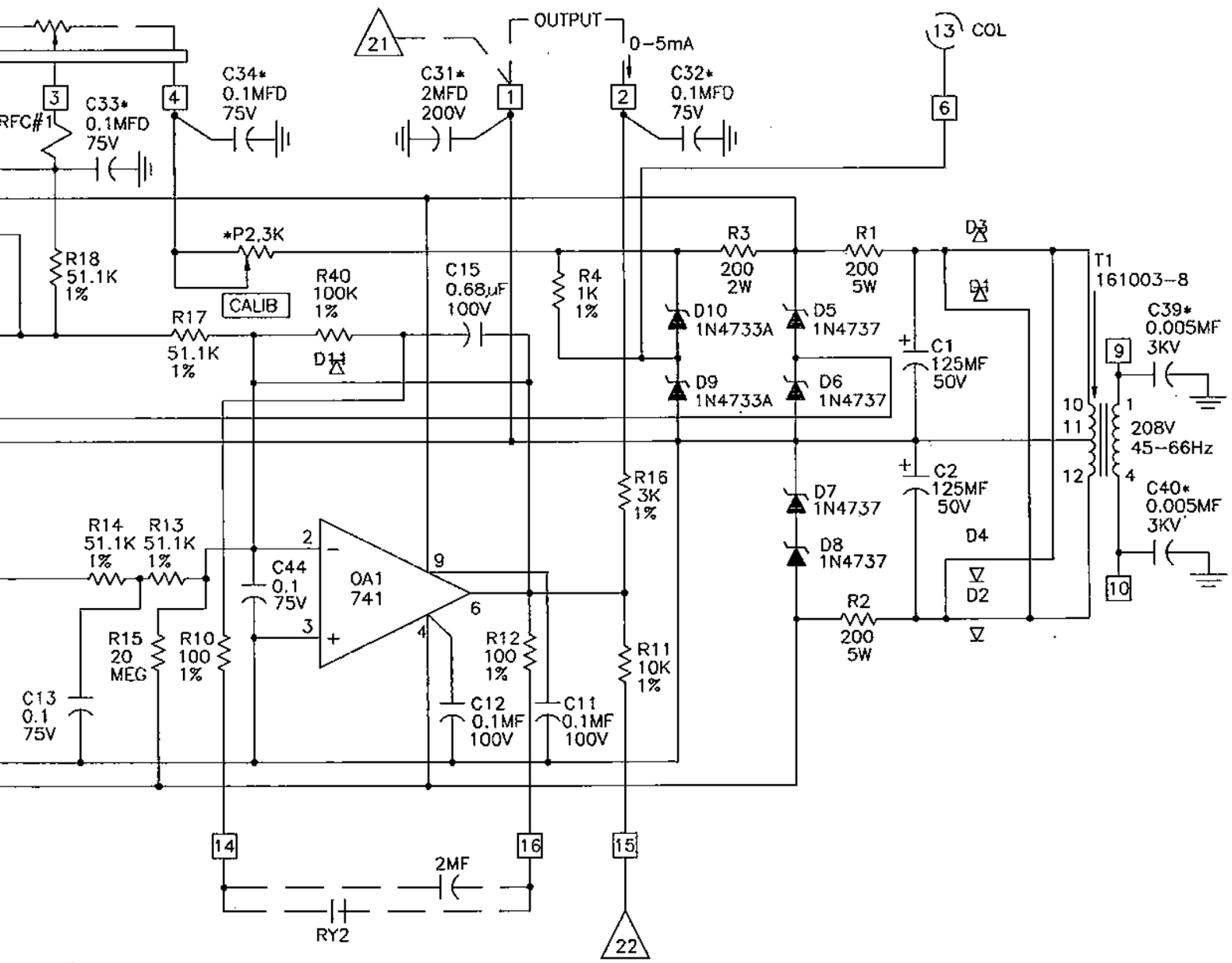


Figure 7-44. Preampplifier 1A53A3A1A5, Schematic Diagram

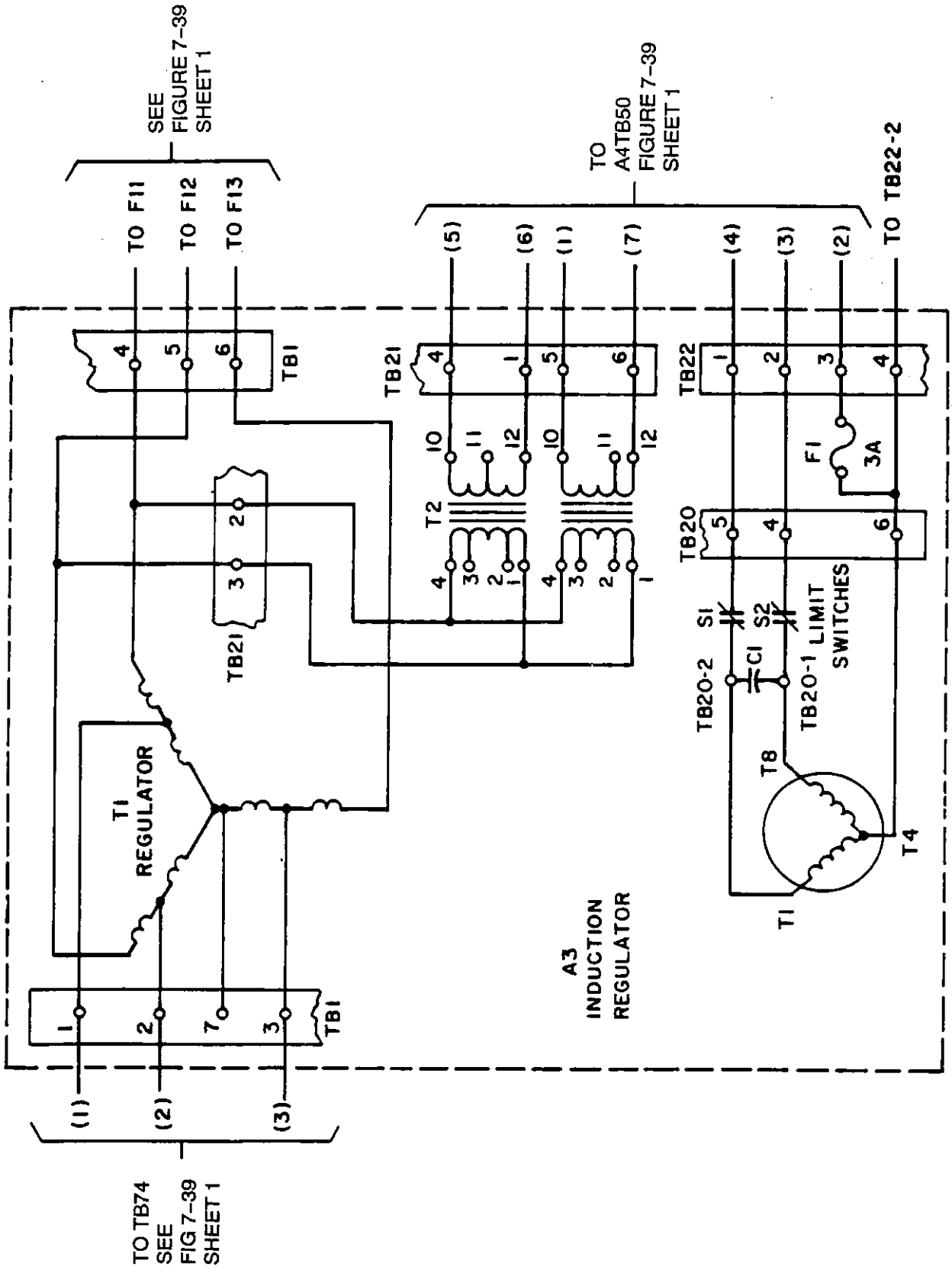
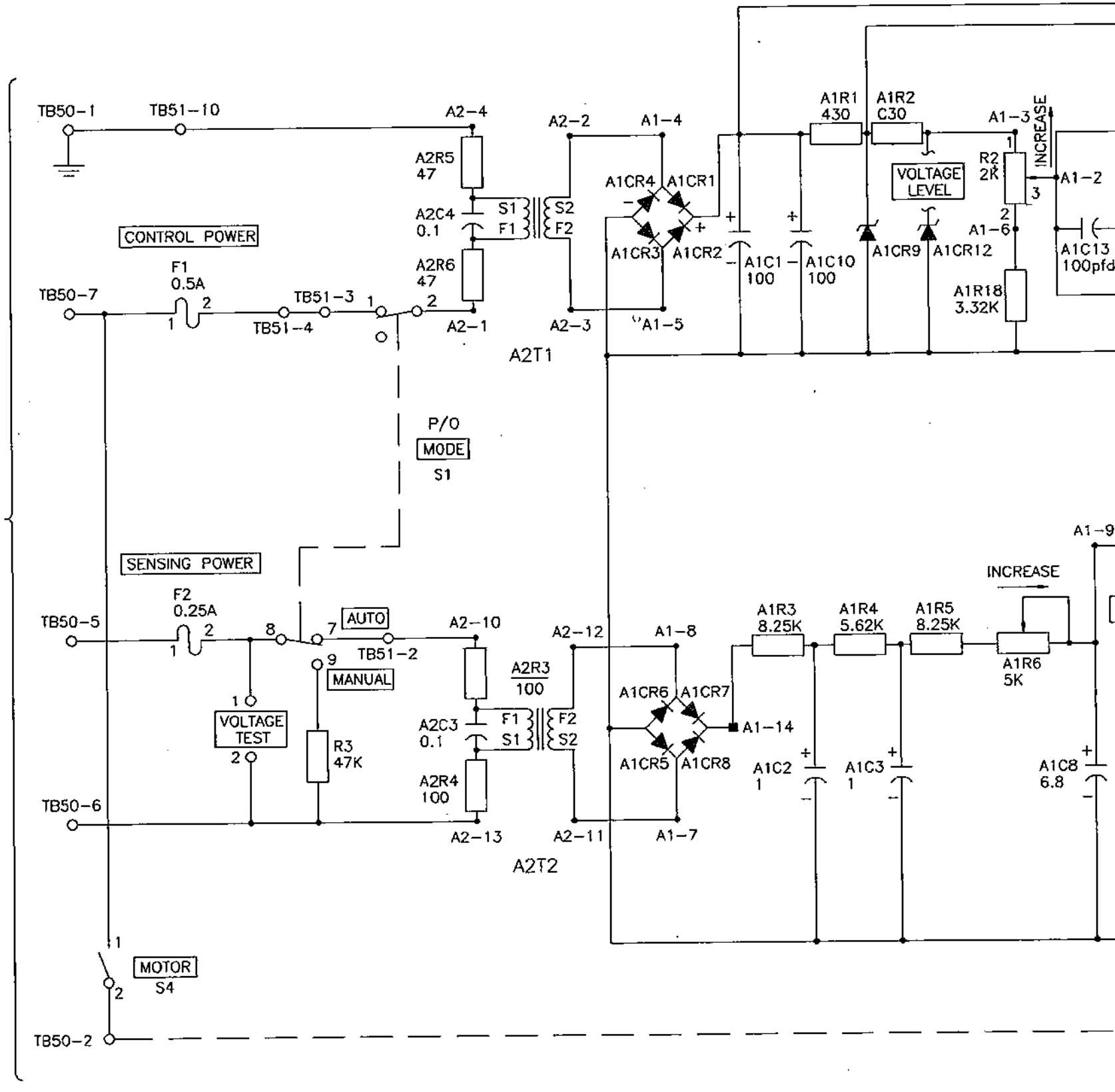


Figure 7-45. Voltage Regulator P/O CN-1472/FPN-44A (1A53A3A3) Schematic Diagram.



NOTES:

1. CAPACITANCE VALUES ARE IN MICROFARADS.
2. RESISTANCE VALUES ARE IN OHMS.

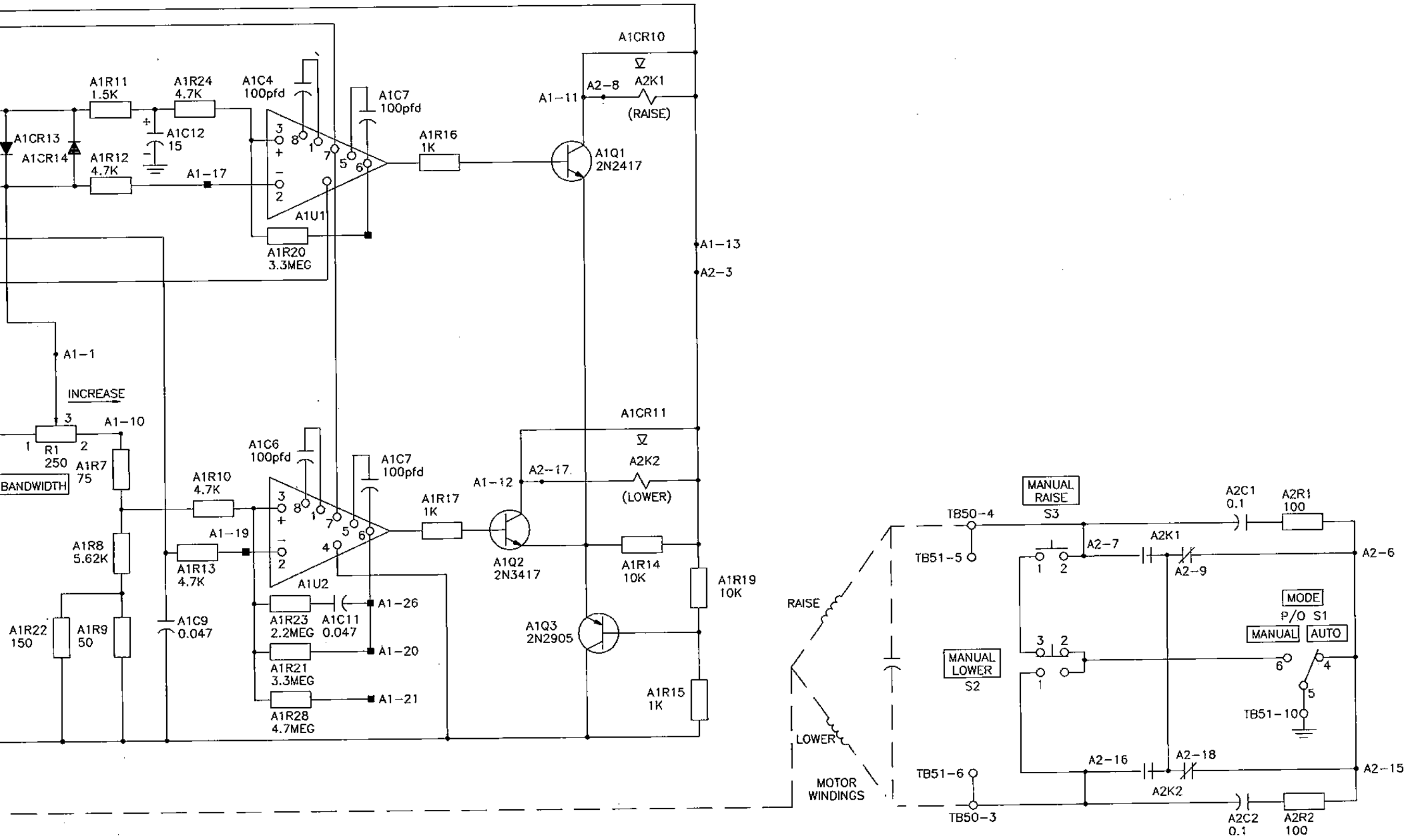
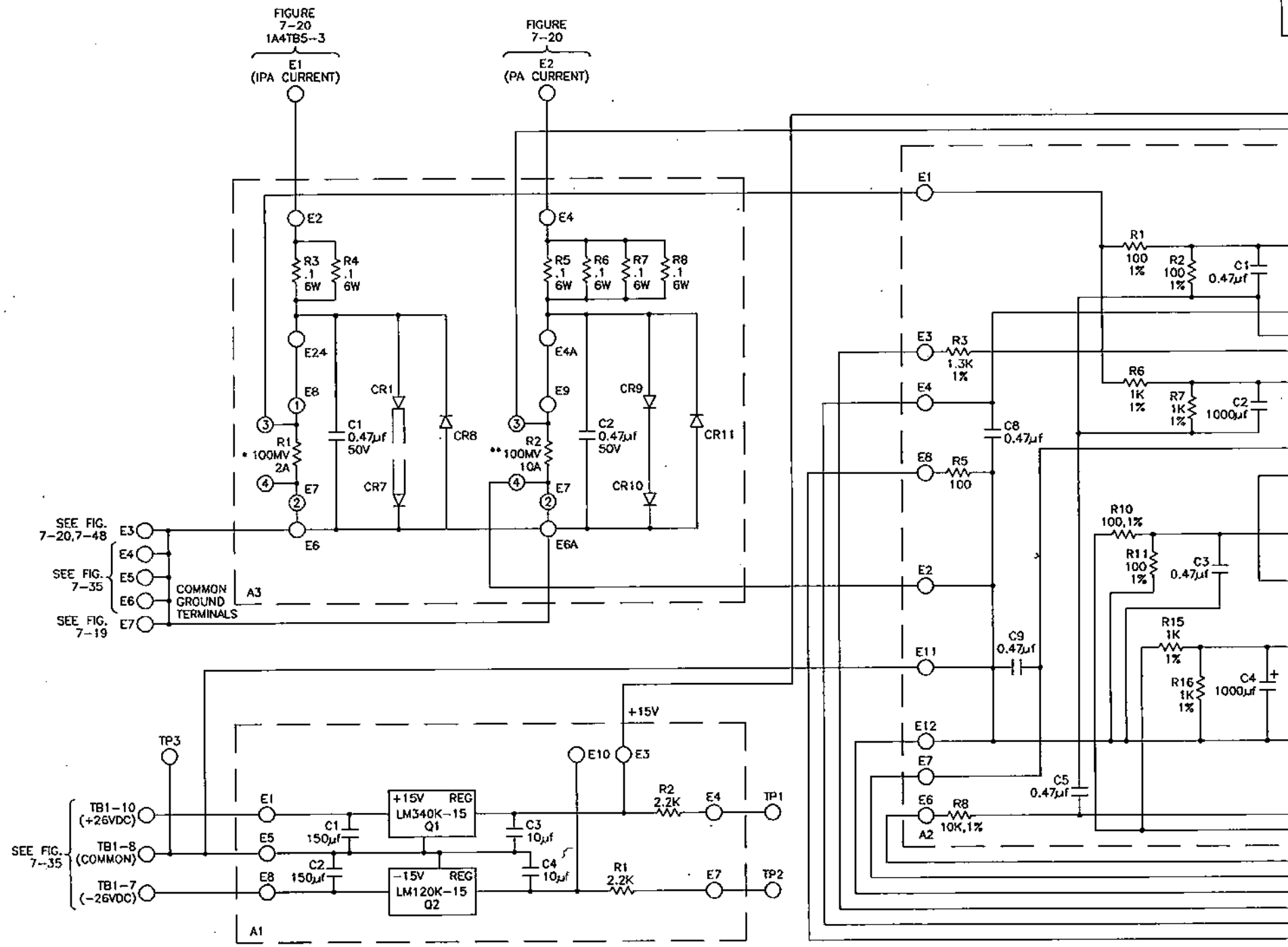


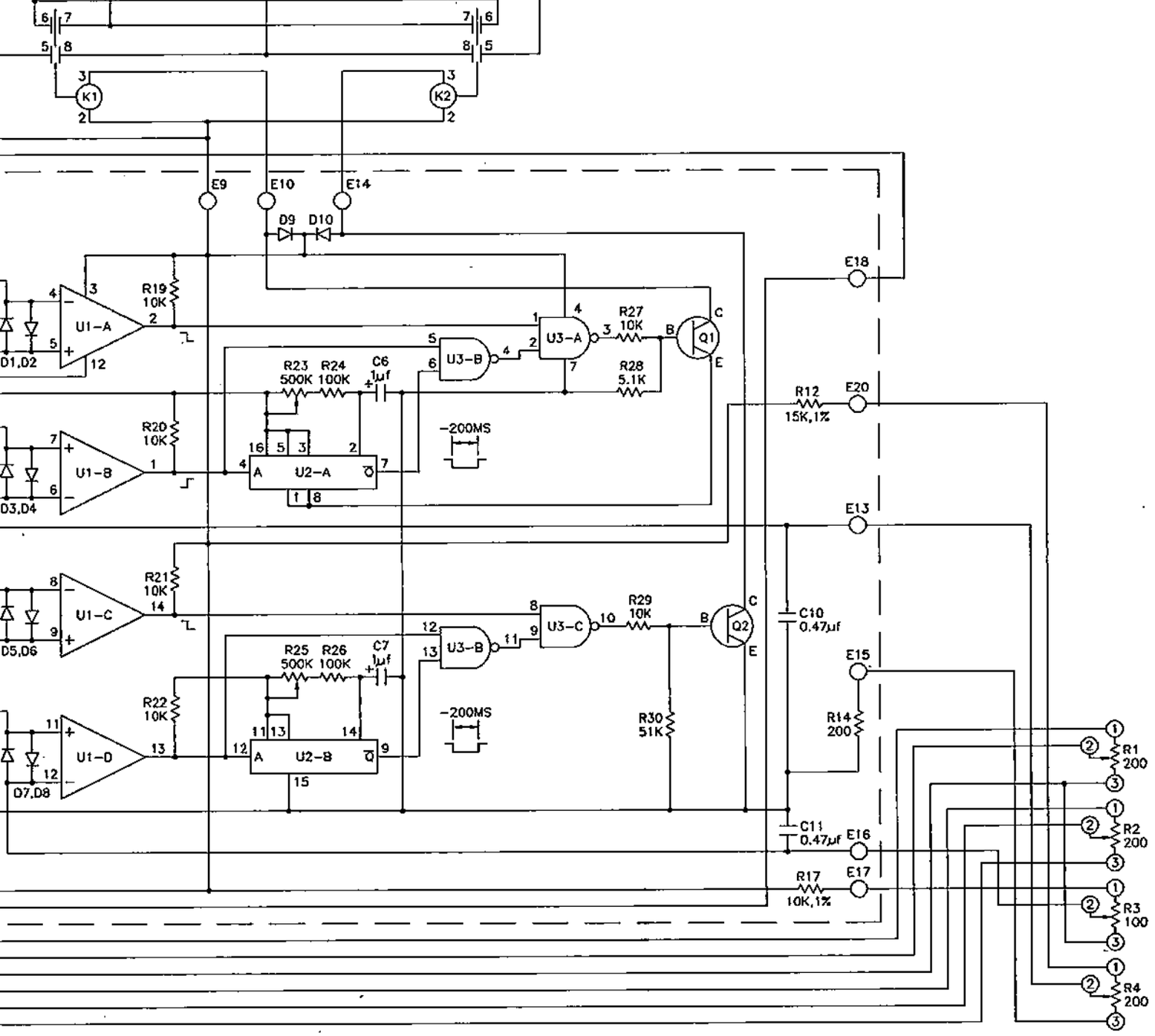
Figure 7-46. Voltage Regulator Cont
Panel P/O CN-1472/FPN-44A
(1A53A3A4). Schematic Diagram

rol

24



* A3R1-3,4 FIGURE 7-36
** A3R2-3,4 FIGURE 7-36



NOTE=(1) -A2 BOARD-

U1-LM139D
U2-MC14528BAL
U3-MC14011BAL
D1-8-IN9148
D9,10-IN4002
Q1,2-2N2222A

Figure 7-47. Instrument Shunt MX9783/FPN-44A(1A53A4), Schematic Diagram

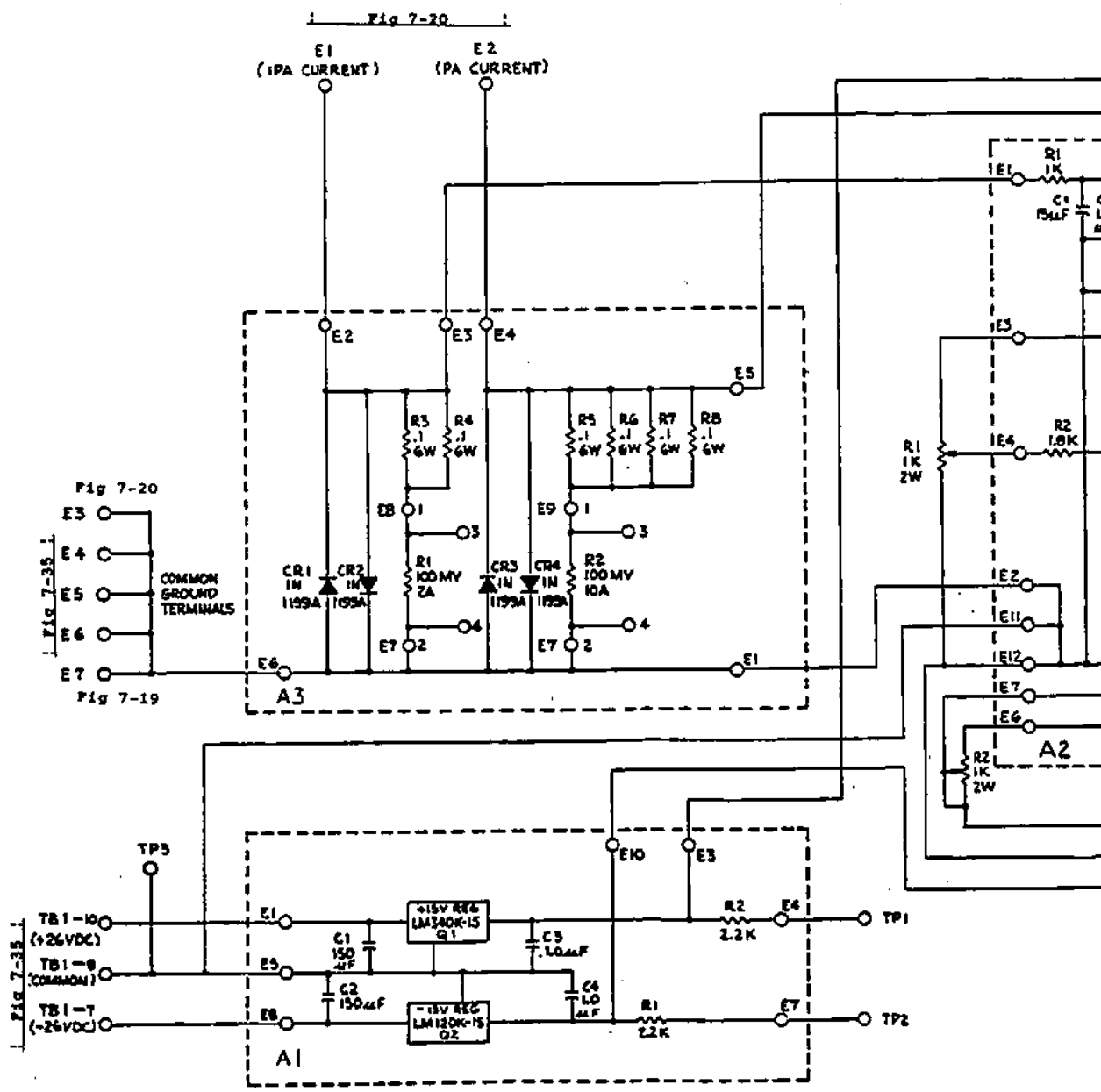
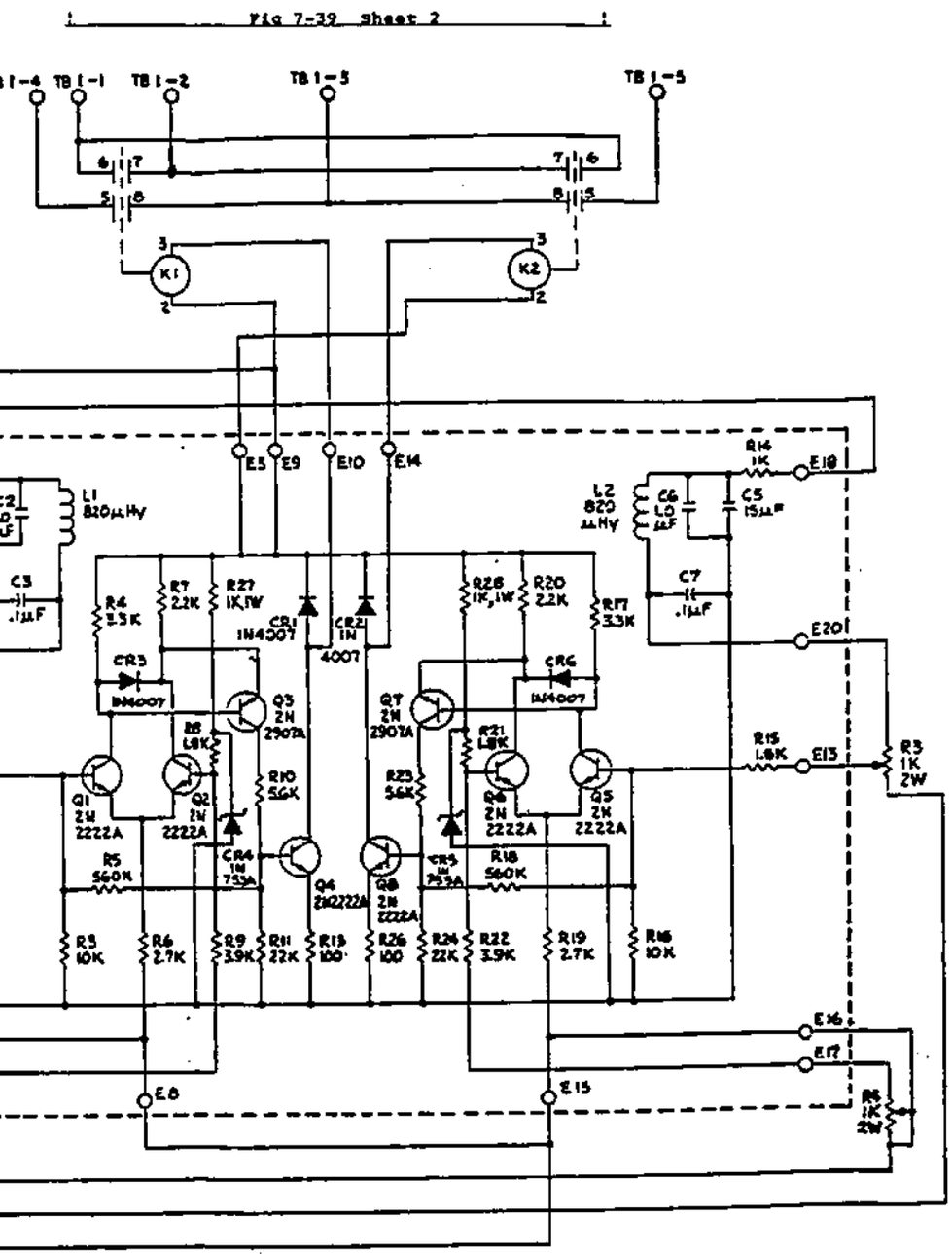


Fig 7-20
E1
(IPA CURRENT)
E2
(PA CURRENT)
R1
1K
C1
15μF
E1
E2
E3
E4
E5
R3
.1
6W
R4
.1
6W
R5
.1
6W
R6
.1
6W
R7
.1
6W
R8
.1
6W
E8
E9
CR1
IN
1199A
CR2
IN
1199A
R1
100 MV
2A
CR3
IN
1199A
CR4
IN
1199A
R2
100 MV
10A
E7
E6
A3
Fig 7-20
E3
E4
E5
E6
E7
COMMON
GROUND
TERMINALS
Fig 7-35
Fig 7-19
R1
1K
2W
R2
1.8K
E4
E2
E11
E12
E7
E6
A2
R2
1K
2W
TP3
E10
E3
TB1-10
(+26VDC)
TB1-8
(COMMON)
TB1-7
(-26VDC)
Fig 7-35
E1
E5
E8
C1
150
μF
C2
150μF
+15V REG
LM340K-15
Q1
-15V REG
LM120K-15
Q2
C3
1.0μF
C4
1.0
μF
R2
2.2K
R1
2.2K
E4
E7
TP1
TP2
A1

CHANGE 4



TP 1	+15.0 Vdc ±0.5 Vdc
TP 2	-15.0 Vdc ±0.5 Vdc
Q1E, (Q5E)	-0.52 Vdc ±-0.05 Vdc relay open, -0.48 Vdc ±-0.05 Vdc relay closed.
Q1B, (Q5B)	0 Vdc ±0.1 Vdc relay open, +0.10 Vdc ±0.05 Vdc relay closed.
Q1C, (Q5C)	+8.0 Vdc ±1.0 Vdc relay open, +7.0 Vdc ±1.0 Vdc relay closed.
Q2E, (Q6E)	-0.52 Vdc ±-0.05 Vdc relay open, -0.48 Vdc ±-0.05 Vdc relay closed.
Q2B, (Q6B)	+0.10 Vdc ±0.1 Vdc relay open, +0.10 Vdc ±0.1 Vdc relay closed.
Q2C, (Q6C)	+7.0 Vdc ±1.0 Vdc relay open, +8.0 Vdc ±1.0 Vdc relay closed.
Q3E, (Q7E)	+7.0 Vdc ±1.0 Vdc relay open, +8.0 Vdc ±1.0 Vdc relay closed.
Q3B, (Q7B)	+8.0 Vdc ±1.0 Vdc relay open, +7.0 Vdc ±1.0 Vdc relay closed.
Q3C, (Q7C)	0 Vdc ±0.1 Vdc, relay open, +2.5 Vdc ±0.5 Vdc relay closed.
Q4E, (Q8E)	0 Vdc ±0.1 Vdc relay open, +0.6 Vdc ±0.1 Vdc relay closed.
Q4B, (Q8B)	0 Vdc ±0.1 Vdc relay open, +1.2 Vdc ±0.5 Vdc relay closed.
Q4C, (Q8C)	+15.0 Vdc ±0.5 Vdc relay open, +5.0 Vdc ±4.0 Vdc relay closed.
CR4, (CR5)	+6.2 Vdc ±0.3 Vdc

1. Voltage Measurements made from 1A53R4TP3 to indicated test point using 20,000 ohm/volt voltmeter.

2. All resistances in ohms, 1/2 W unless stated otherwise.

FIGURE 7-47A. Instrument Shunt MX9783/FPN-44A(1A53A4), A2 Schematic, Transistor Version

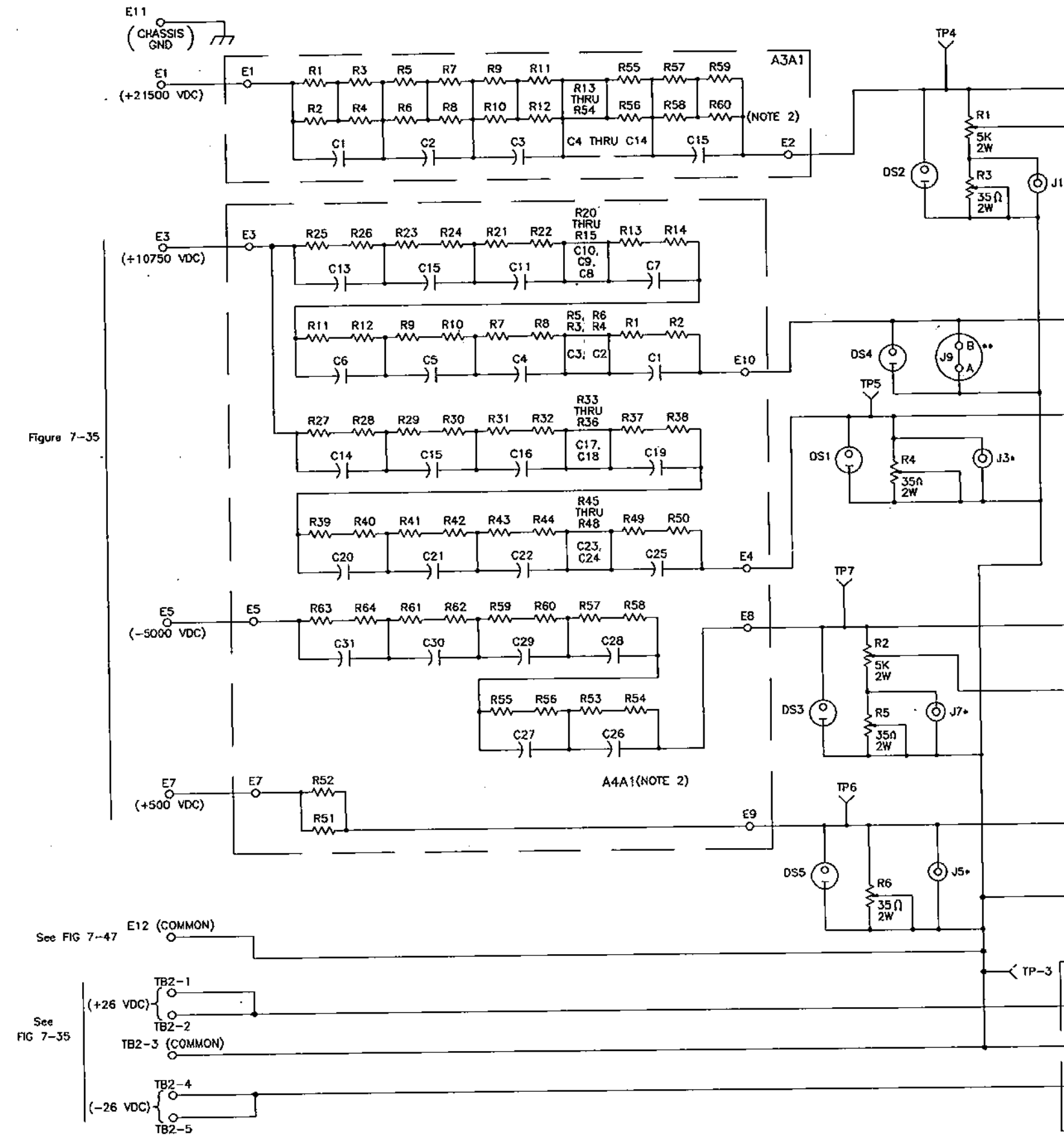
TP1	+15.0 VDC ±0.5 VDC
TP2	−15.0 VDC ±0.5 VDC
Q1 E	0 (0V AT 1A53A7E1), +0.07 VDC ±0.15 VDC (K1 CLOSED)
Q1 B	0 (0V AT 1A53A7E1), +1.30 VDC ±0.2 VDC (K1 CLOSED)
Q1 C	+15.0 VDC ±0.5 VDC (0V AT 1A53A7E1), +5.0 VDC ±3.0 VDC (K1 CLOSED)
Q2 E	+15.0 VDC ±0.5 VDC (0V AT 1A53A7E1), +14.0 VDC ±1.0 VDC (K1 CLOSED)
Q2 B	+15.0 VDC ±0.5 VDC (0V AT 1A53A7E1), +13.2 VDC ±1.0 VDC (K1 CLOSED)
Q2 C	0 (0V AT 1A53A7E1), +10.0 VDC ±3 VDC (K1 CLOSED)
Q3 E	0 (0V AT 1A53A7E5), −0.70 VDC ±0.15 VDC (K2 CLOSED)
Q3 B	0 (0V AT 1A53A7E5), −1.30 VDC ±0.2 VDC (K2 CLOSED)
Q3 C	−15.0 VDC ±0.5 VDC (0V AT 1A53A7E5), −5.0 VDC ±3.0 VDC (K2 CLOSED)
Q4 E	−15.0 VDC ±0.5 VDC (0V AT 1A53A7E5), −14.0 VDC ±1.0 VDC (K2 CLOSED)
Q4 B	−15.0 VDC ±0.5 VDC (0V AT 1A53A7E5), −13.2 VDC ±1.0 VDC (K2 CLOSED)
Q4 C	0 (0V AT 1A53A7E5), −10.0 VDC ±3 VDC (K2 CLOSED)

NOTES: UNLESS OTHERWISE SPECIFIED

1. IN UNITS A1 AND A2, ALL RESISTORS ARE IN OHMS, ±5% 1/2 W.
2. IN UNITS A3 AND A4, ALL RESISTORS ARE ±1%, 1OW; A3R1 THRU A3R60 ARE 400K OHM, A4R1 THRU A4R26 ARE 137.8K OHM, A4R50 AND A4R53 THRU A4R64 ARE 167K OHM, A4R51 AND A4R52 ARE 400K OHM.
3. VOLTAGE MEASUREMENTS MADE FROM 1A53A7TP3 TO INDICATED TEST POINT USING 20,000 OHM/VOLT VOLTMETER.

* See Figure 7−35
** See Figure 7−37

Figure 7−35



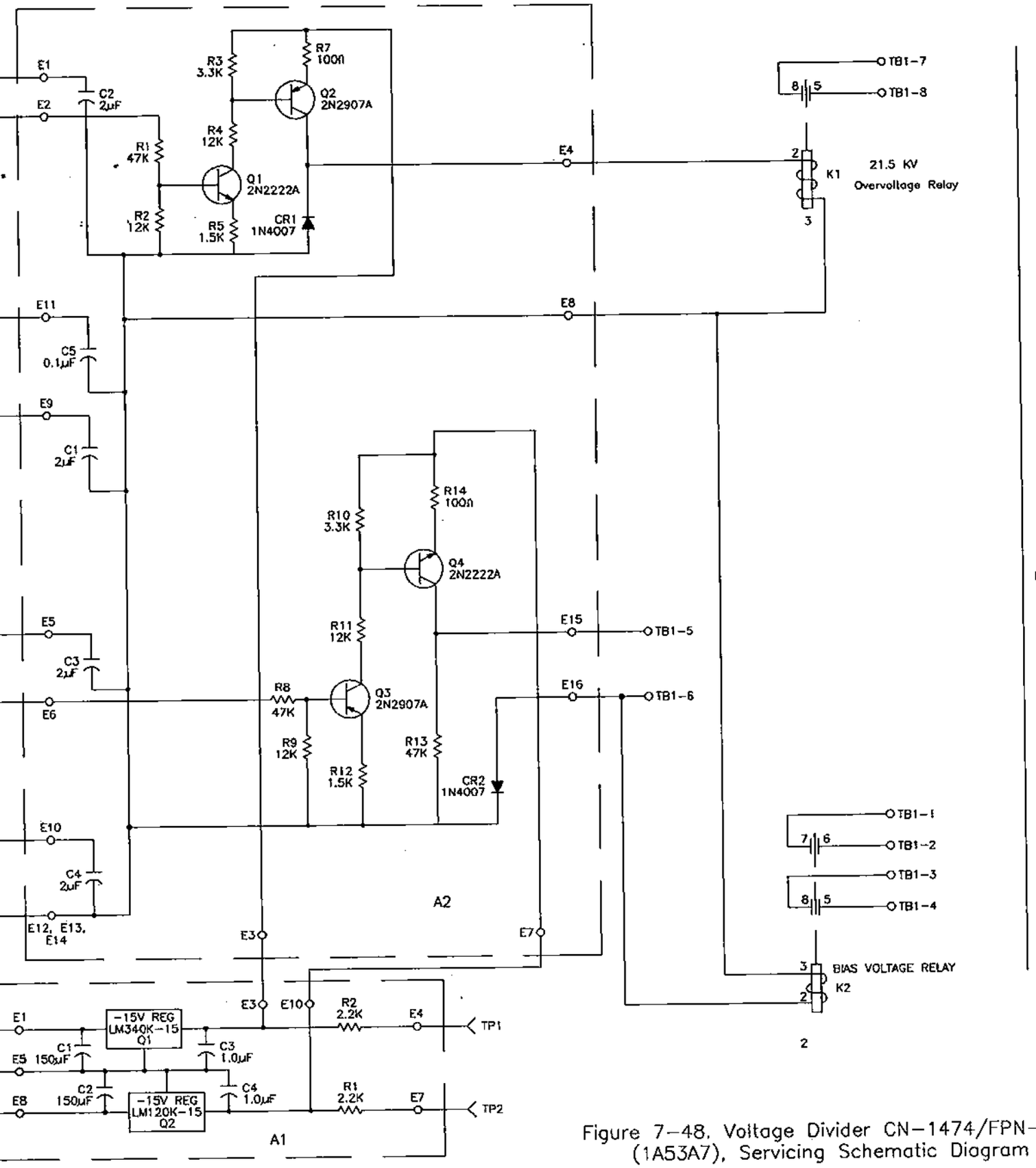


Figure 7-39

Figure 7-48. Voltage Divider CN-1474/FPN-44A (1A53A7), Servicing Schematic Diagram

RELAY FUNCTION	
K1	XMTR #1 ANTENNA TRANSFER
K2	XMTR #1 GROUND TRANSFER
K3	NOT USED
K4	NOT USED
K5	XMTR #1 OPERATE CONTROL
K6	ANTENNA GROUNDING
K7	XMTR #2 OPERATE CONTROL
K8	NOT USED
K9	NOT USED
K10	XMTR #2 GROUND TRANSFER
K11	XMTR #2 ANTENNA TRANSFER

NOTES:

1. ◯ INDICATES INSULATED STANDOFF.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX THE DESIGNATION WITH 3

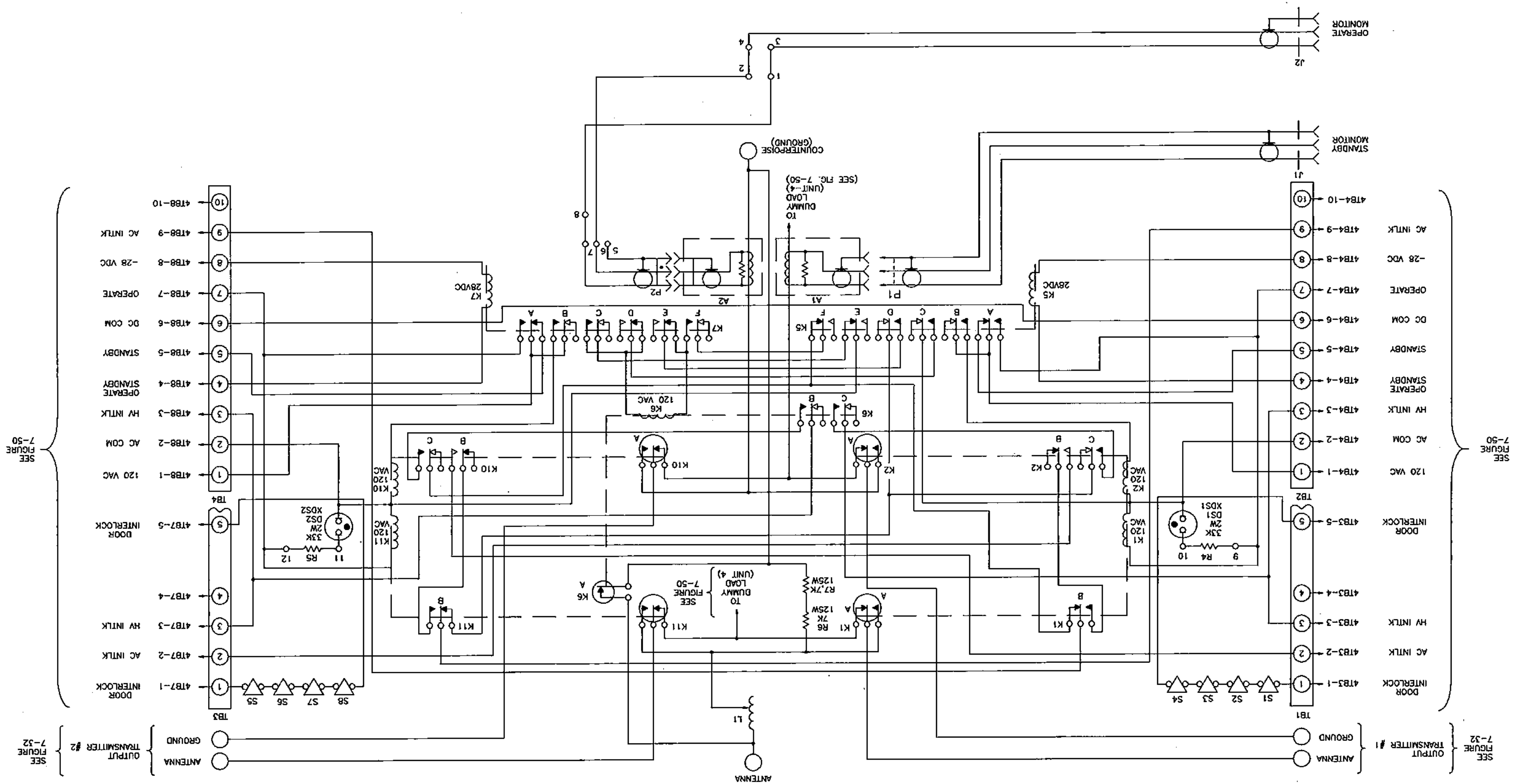
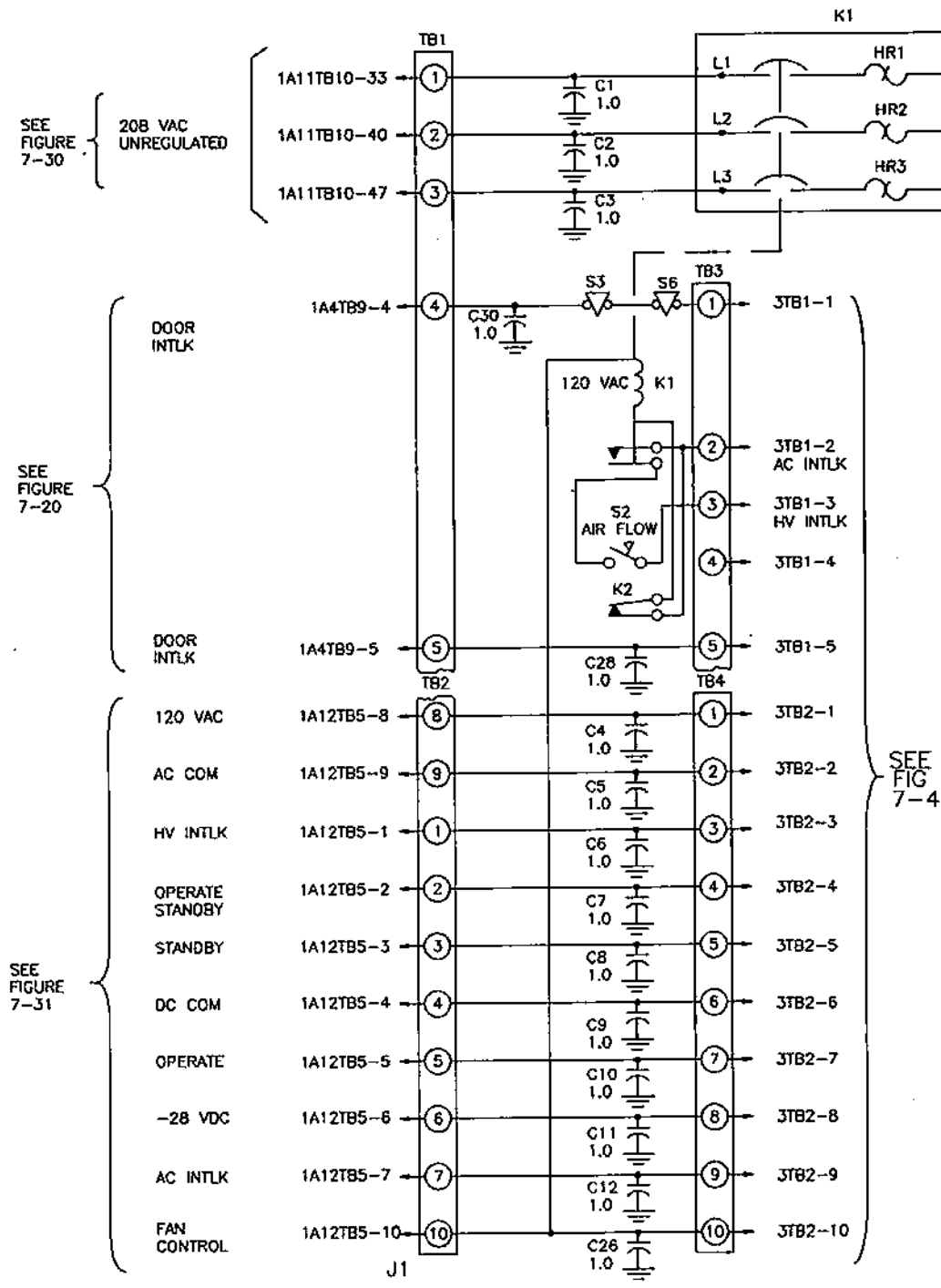


Figure 7-49. Antenna Coupler CV-2
FPN-44 (3), Schematic Diagram

174/
n

—130



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS; CAPACITANCE VALUES ARE IN MICROFARADS.
2. UNLESS OTHERWISE SPECIFIED RESISTORS ARE 140W.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH 4

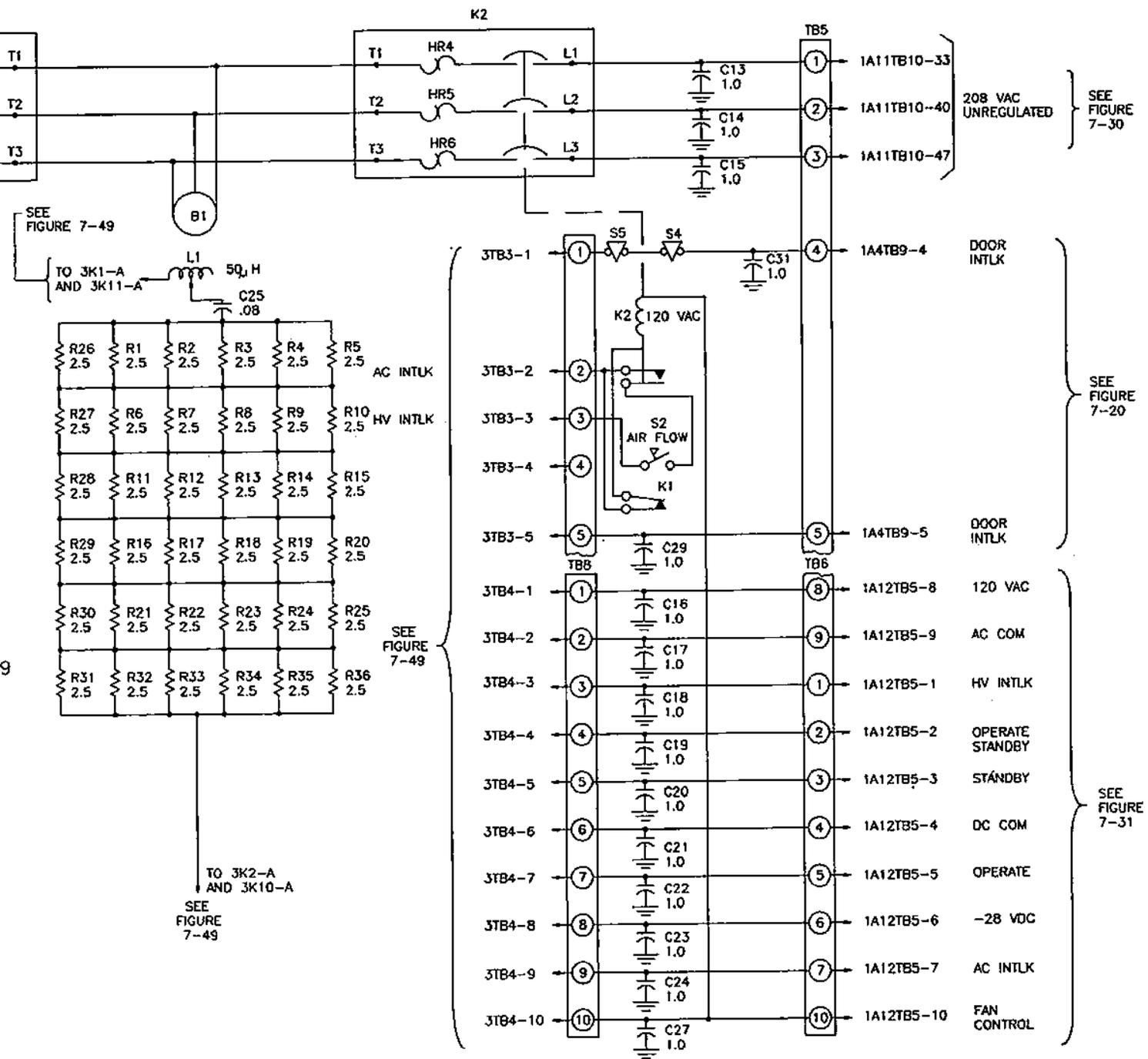
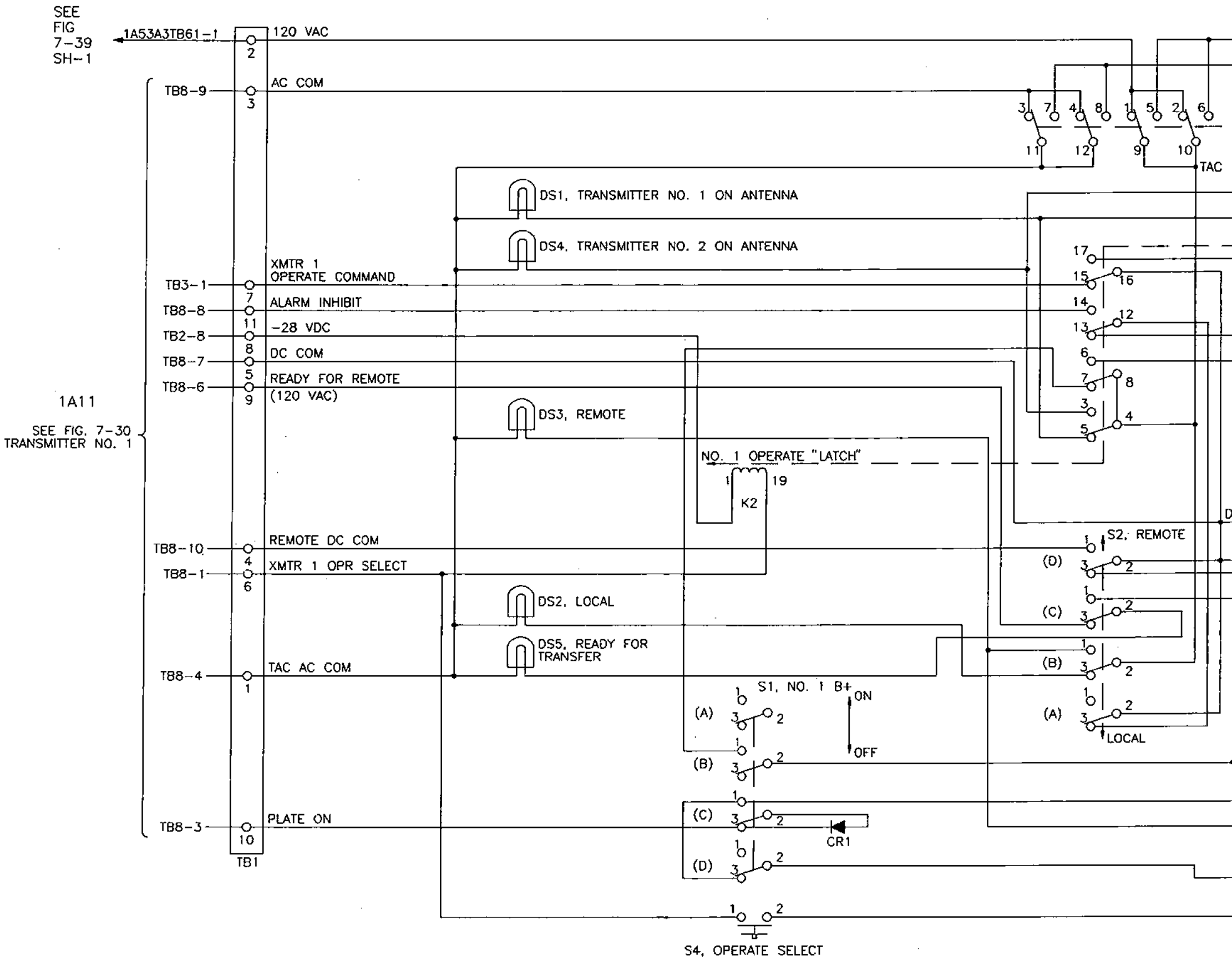


Figure 7-50. Electrical Dummy Load DA-329/FPN-44(4), Schematic Diagram


SEE FIG 7-39 SH-1
1A53A3TB61-1
120 VAC
TB8-9
AC COM
TAC
DS1, TRANSMITTER NO. 1 ON ANTENNA
DS4, TRANSMITTER NO. 2 ON ANTENNA
XMTR 1 OPERATE COMMAND
TB3-1
ALARM INHIBIT
TB8-8
-28 VDC
TB2-8
DC COM
TB8-7
READY FOR REMOTE (120 VAC)
TB8-6
1A11
SEE FIG. 7-30 TRANSMITTER NO. 1
DS3, REMOTE
NO. 1 OPERATE "LATCH"
K2
S2, REMOTE
REMOTE DC COM
TB8-10
XMTR 1 OPR SELECT
TB8-1
DS2, LOCAL
DS5, READY FOR TRANSFER
TAC AC COM
TB8-4
S1, NO. 1 B+
ON
OFF
LOCAL
PLATE ON
TB8-3
CR1
TB1
S4, OPERATE SELECT

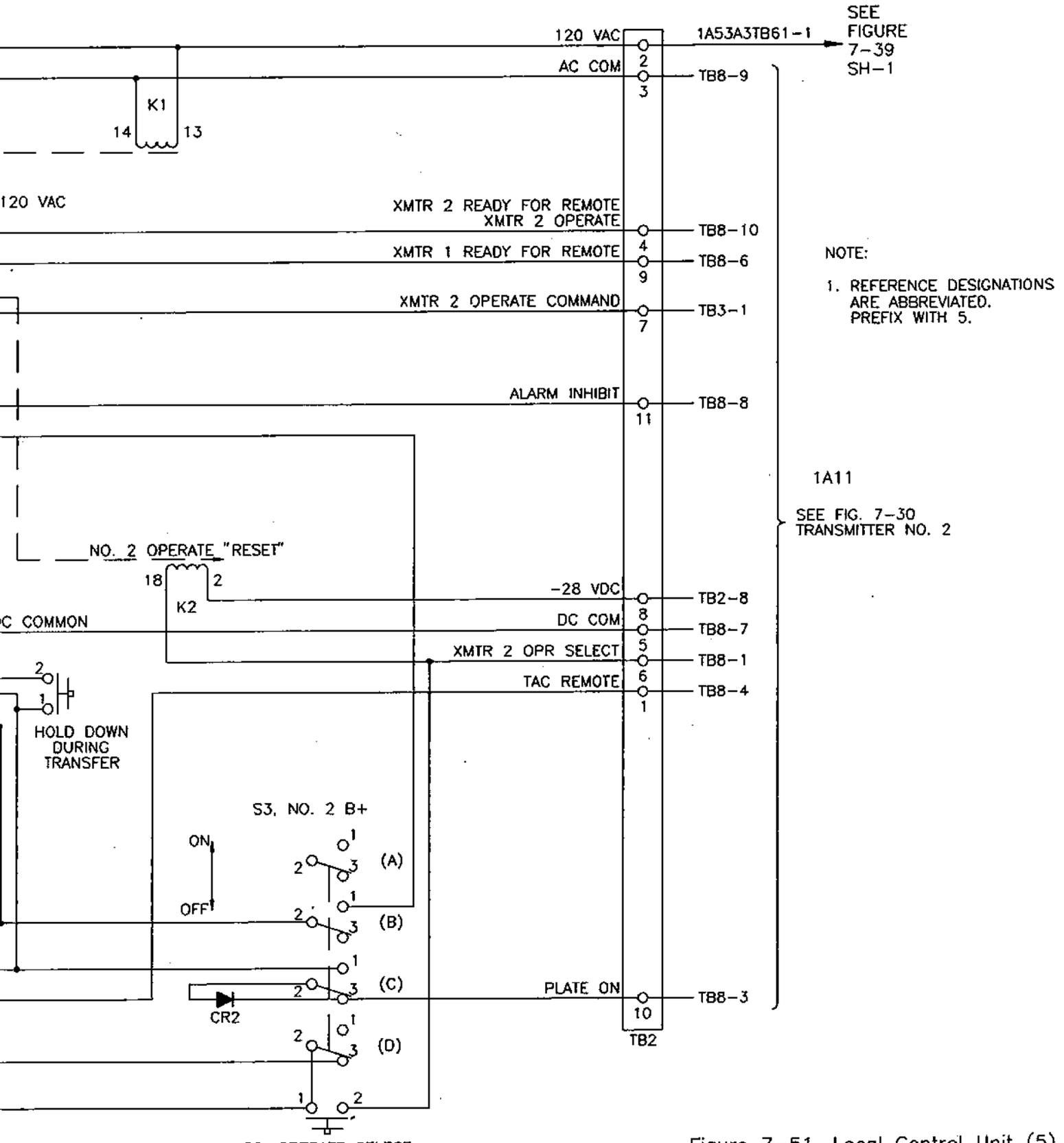
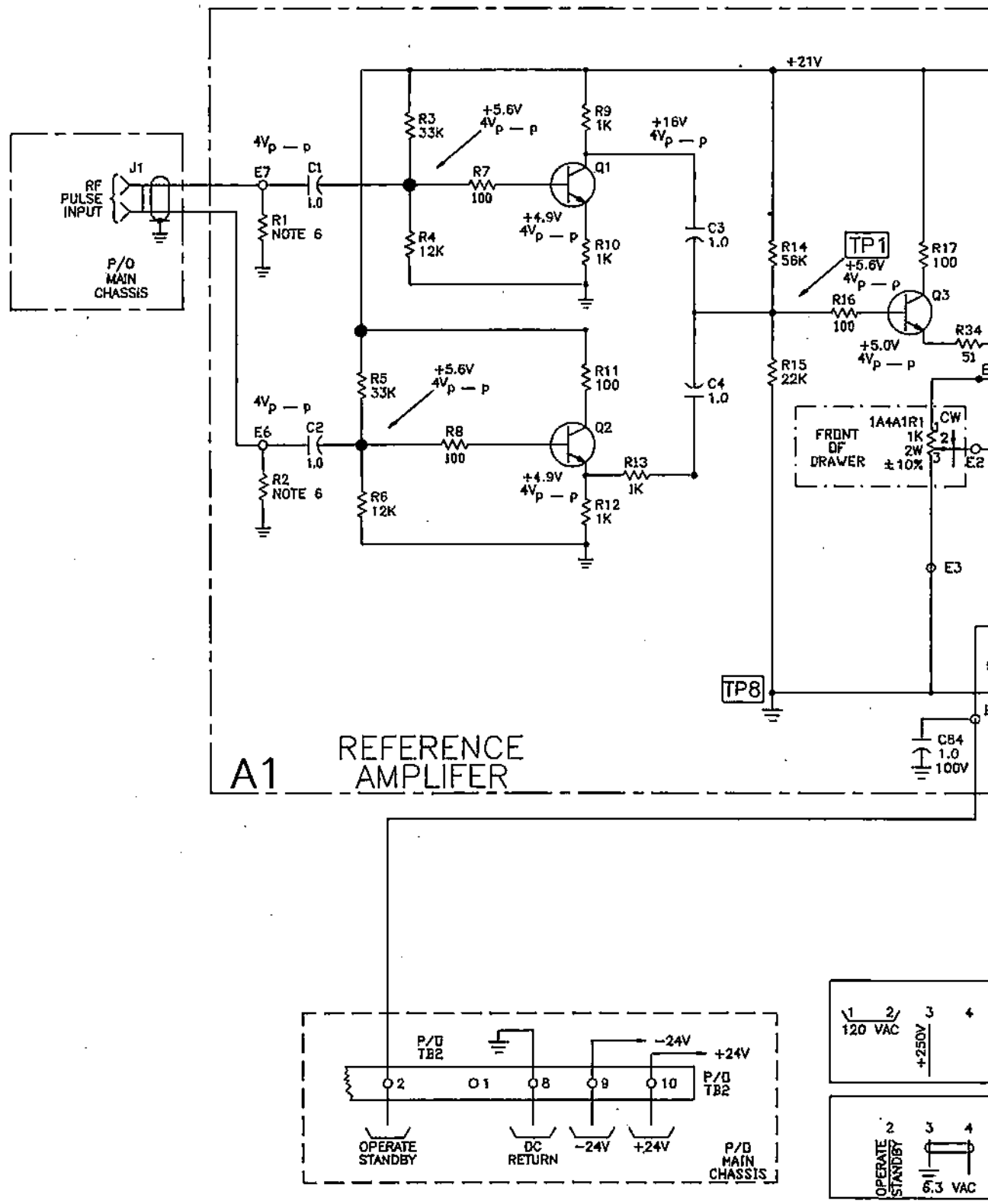


Figure 7-51. Local Control Unit (5), Schematic Diagram


A1
REFERENCE AMPLIFER
J1
RF PULSE INPUT
P/O MAIN CHASSIS
E7
E6
C1 1.0
C2 1.0
R1 NOTE 6
R2 NOTE 6
4Vp — p
R3 33K
R4 12K
R5 33K
R6 12K
+5.6V 4Vp — p
R7 100
R8 100
Q1
Q2
+4.9V 4Vp — p
R9 1K
R10 1K
R11 100
R12 1K
R13 1K
+16V 4Vp — p
C3 1.0
C4 1.0
+21V
R14 56K
R15 22K
TP1
+5.6V 4Vp — p
R16 100
Q3
R17 100
R34 51
+5.0V 4Vp — p
FRONT OF DRAWER
1A4A1R1 1K 2W ±10%
CW
E2
E3
TP8
C84 1.0 100V
P/O TB2
-24V
+24V
2
1
8
9
10
OPERATE STANDBY
DC RETURN
P/O MAIN CHASSIS
120 VAC
+250V
6.3 VAC

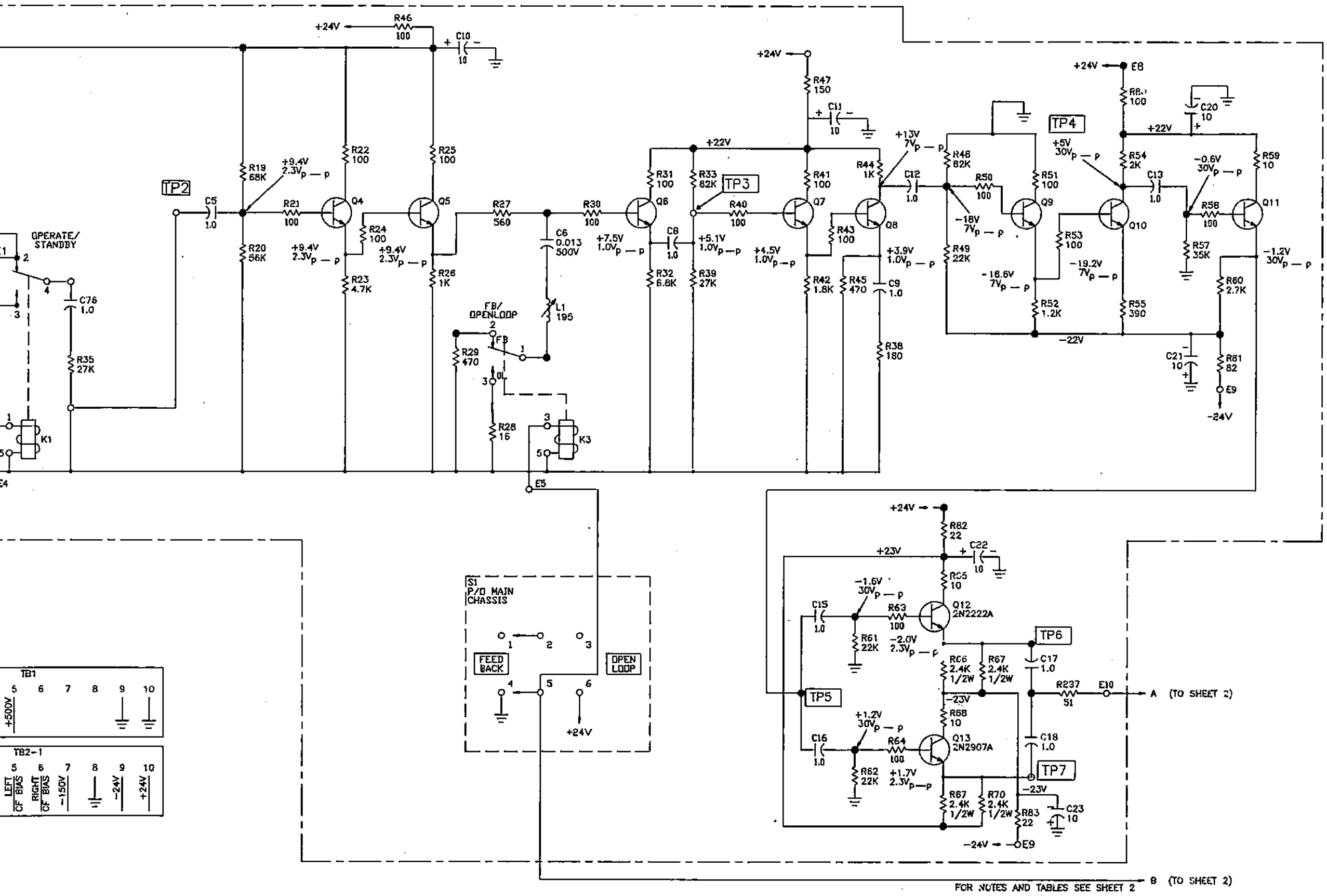


Figure 7-52. Input Amplifier (1A4A1A
Schematic Diagram (Sheet 1 of 7

A3),
')

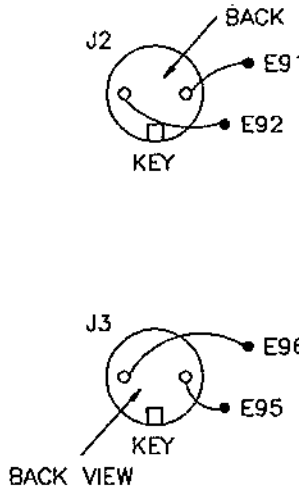
136

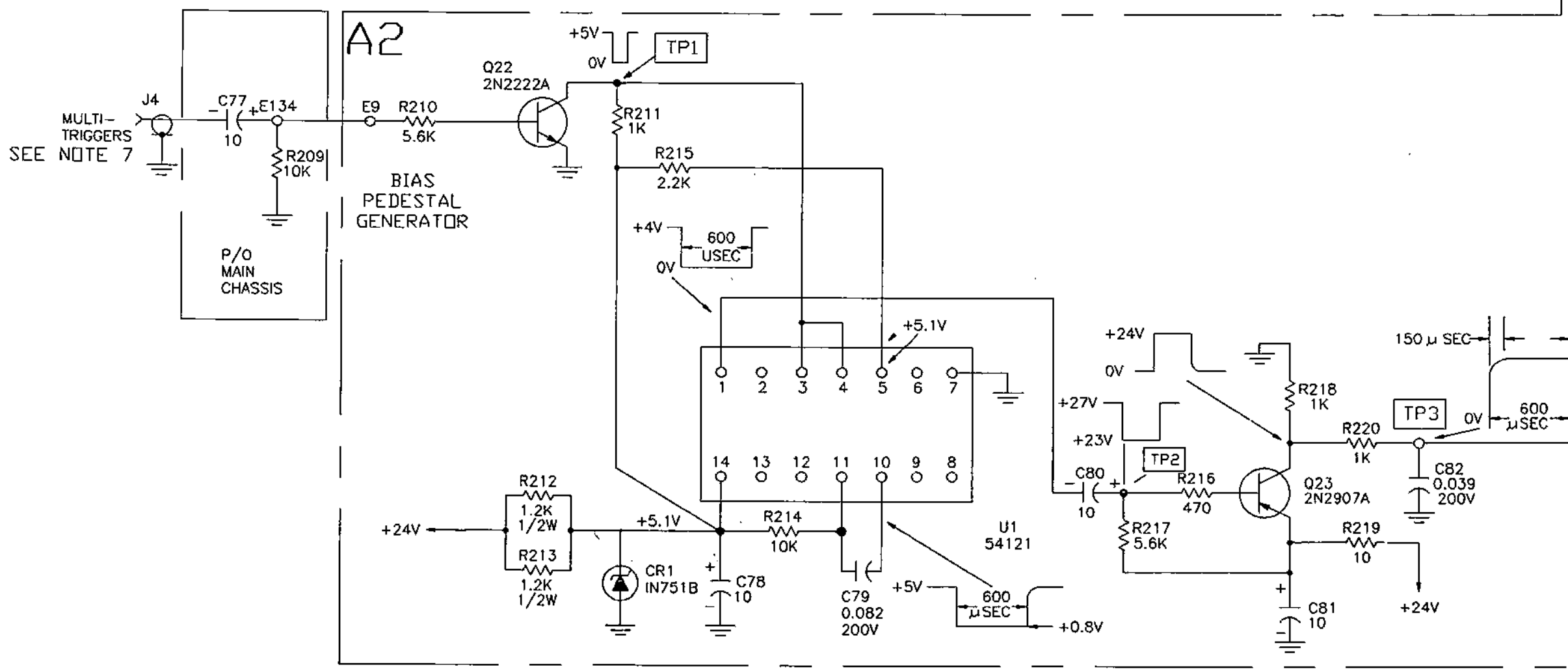
NOTES:

1. UNLESS OTHERWISE SPECIFIED—
   ALL RESISTOR VALUES ARE IN OHMS, 1/4 WATT, ± 5% TOL.
   ALL CAPACITOR VALUES ARE IN MICROFARADS, 50 VOLTS.
   INDUCTOR VALUES ARE IN MICROHENRIES.
   ALL TRANSISTORS ARE TYPE 2N930A.
2. E NOS SHOWN WITH AN ASTERISK (*) APPEAR TWO OR MORE TIMES.
3. PREFIX ALL REFERENCE DESIGNATIONS WITH 1A4A1A3.
4. [TP] DESIGNATES WAVEFORM ON SHEETS 4–7.
5. SIGNAL DATA ON SHEETS 2 AND 3 IS FOR THE SPECIFIED SIGNAL LEVEL AT TEST POINT 4 (SHEET 2).
6. THE VALUES OF THE FOLLOWING PARTS DEPEND UPON THE APPLICATION.

ASSEMBLY	G0001	G0002	G0003	G0004	G0005
R73	390	270	270	390	270
R76	120	220	220	120	220
R78	820	680	910	820	
R79	820	680	910	820	
R1	51	51	OPEN	OPEN	51
R2	51	51	OPEN	OPEN	51

   G0001 FOR AN/FPN-44/44A WITH NO SIGNAL CONDITIONER.
   G0002 FOR AN/FPN-45 WITH SLT ANTENNA(LORSTA GEORGE)
   G0003 FOR AN/FPN-45 WITH SIGNAL CONDITIONER(625 FT ANTENNA)
   G0004 FOR AN/FPN-44 WITH SIGNAL CONDITIONER
   G0005 FOR AN/FPN-45 WITH NO SIGNAL CONDITIONER
7. BIAS PEDASTAL DRIVE FROM TS/BPD CARD (1A4A3CP4) VIA 1A4CP4 (1A4A5 "T") CONNECTOR.





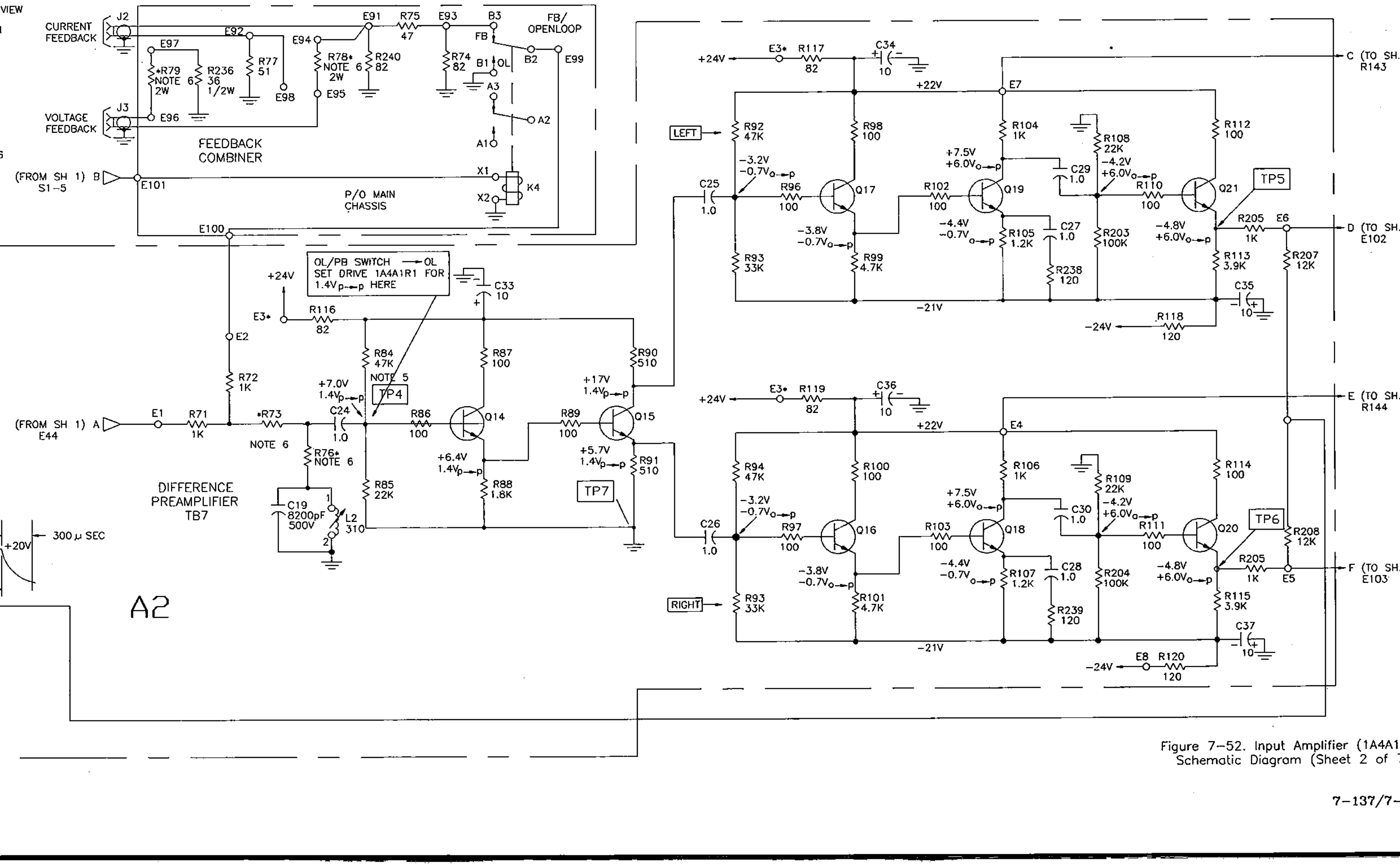


Figure 7-52. Input Amplifier (1A4A1
Schematic Diagram (Sheet 2 of

3)

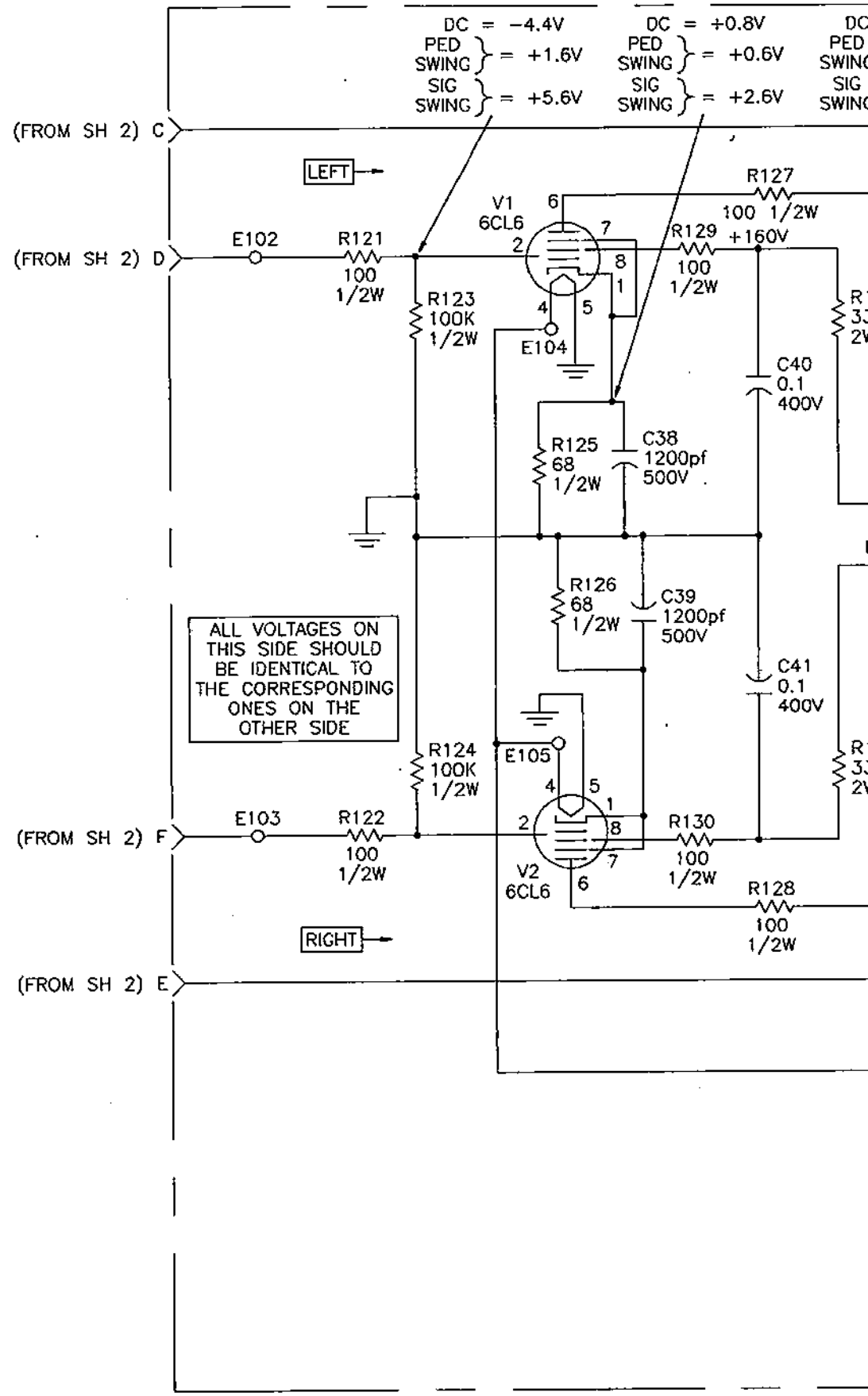
3)

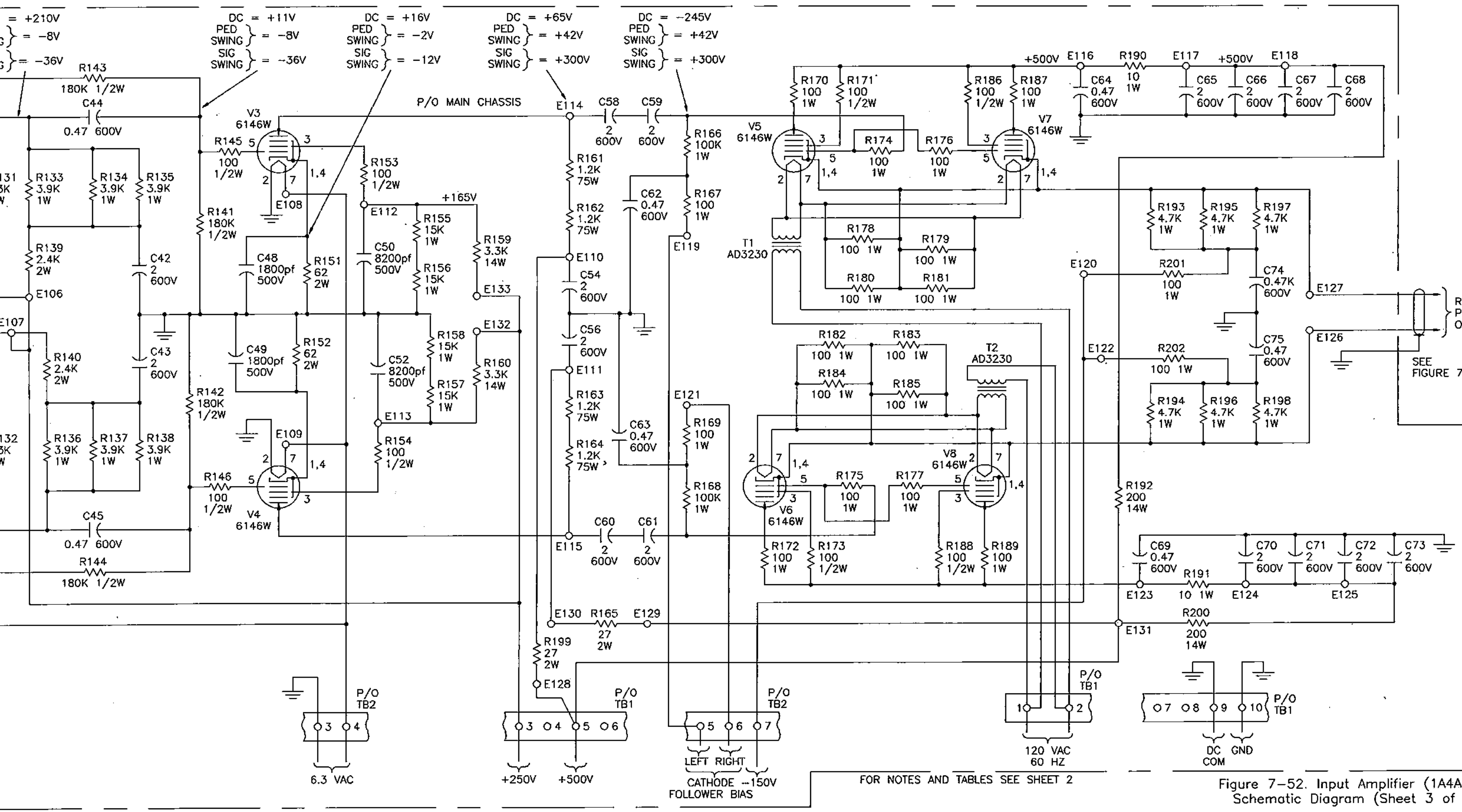
3)

3)

A3),
7)

138


DC = −4.4V
PED SWING = +1.6V
SIG SWING = +5.6V
DC = +0.8V
PED SWING = +0.6V
SIG SWING = +2.6V
(FROM SH 2) C
LEFT
V1
6CL6
R127
100 1/2W
R129
100
1/2W
+160V
(FROM SH 2) D
E102
R121
100
1/2W
R123
100K
1/2W
E104
C40
0.1
400V
R125
68
1/2W
C38
1200pf
500V
R126
68
1/2W
C39
1200pf
500V
C41
0.1
400V
ALL VOLTAGES ON THIS SIDE SHOULD BE IDENTICAL TO THE CORRESPONDING ONES ON THE OTHER SIDE
R124
100K
1/2W
E105
E103
R122
100
1/2W
R130
100
1/2W
V2
6CL6
R128
100
1/2W
RIGHT
(FROM SH 2) F
(FROM SH 2) E



FOR NOTES AND TABLES SEE SHEET 2

Figure 7−52. Input Amplifier (1A4A
Schematic Diagram (Sheet 3 of

F
ULSE
UTPUT

–20

1A3),
7)

'–140

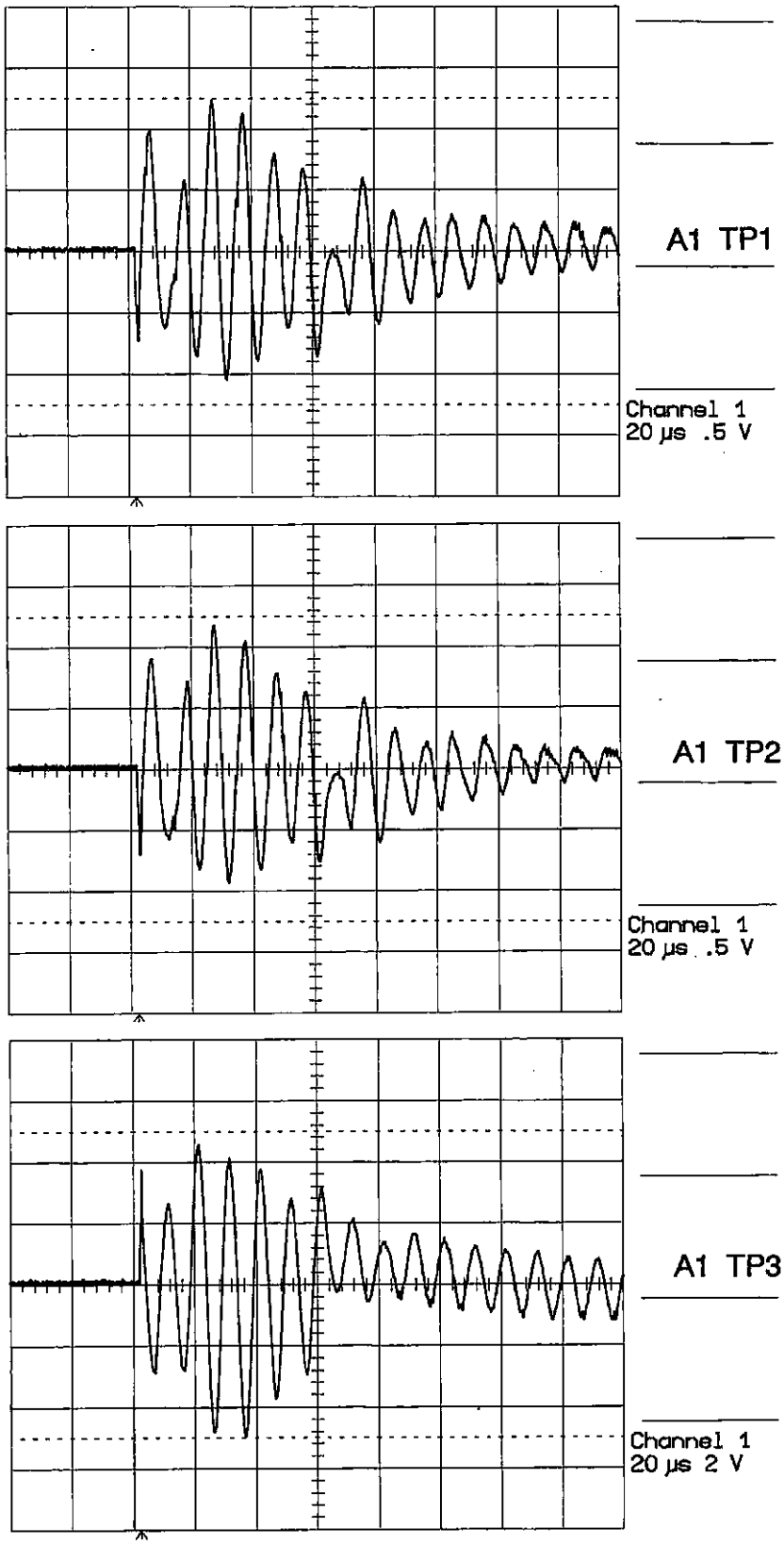


Figure 7-52. Input Amplifier (1A4A1A3)
(Sheet 4 of 7)

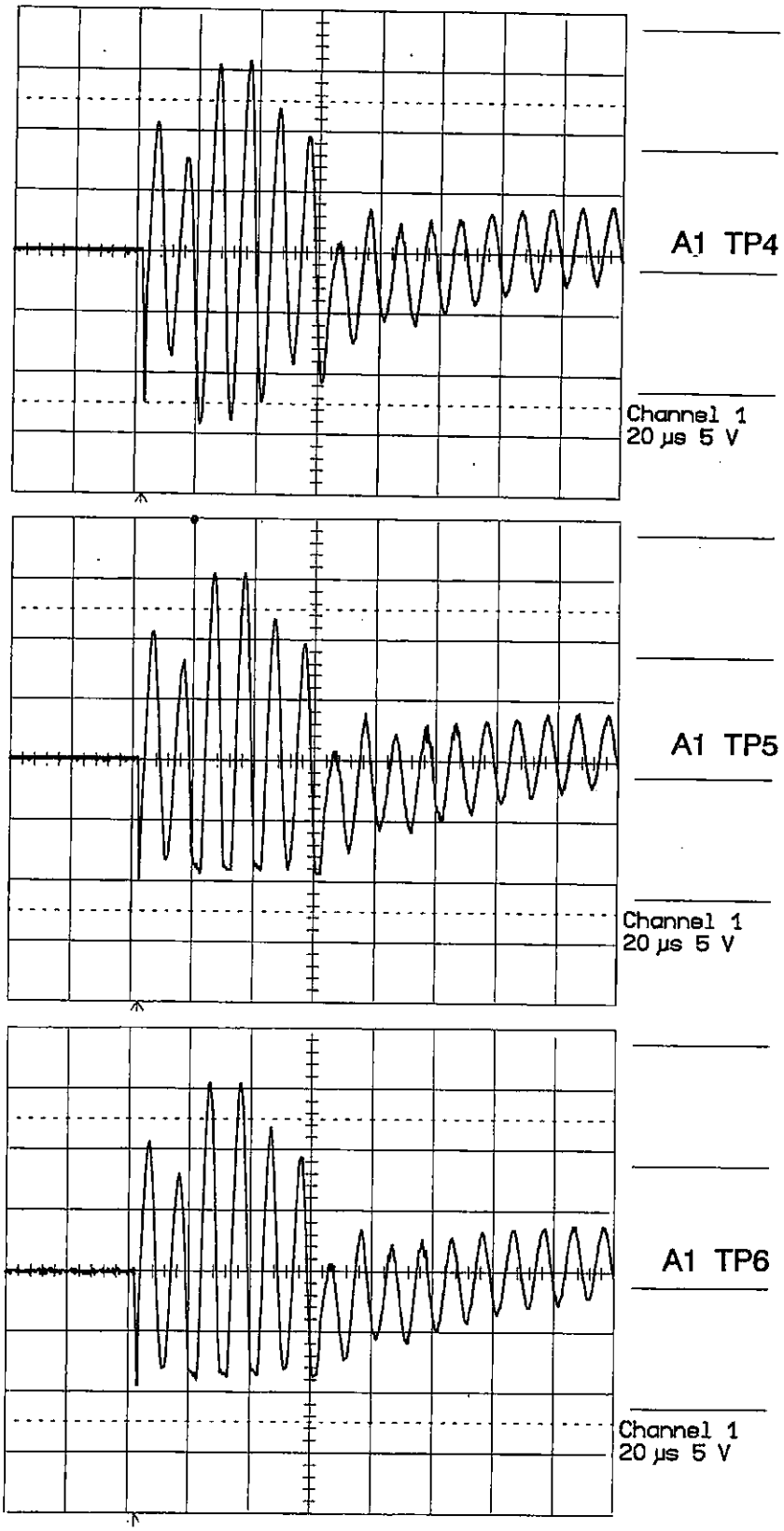


Figure 7-52. Input Amplifier (1A4A1A3)
(Sheet 5 of 7)

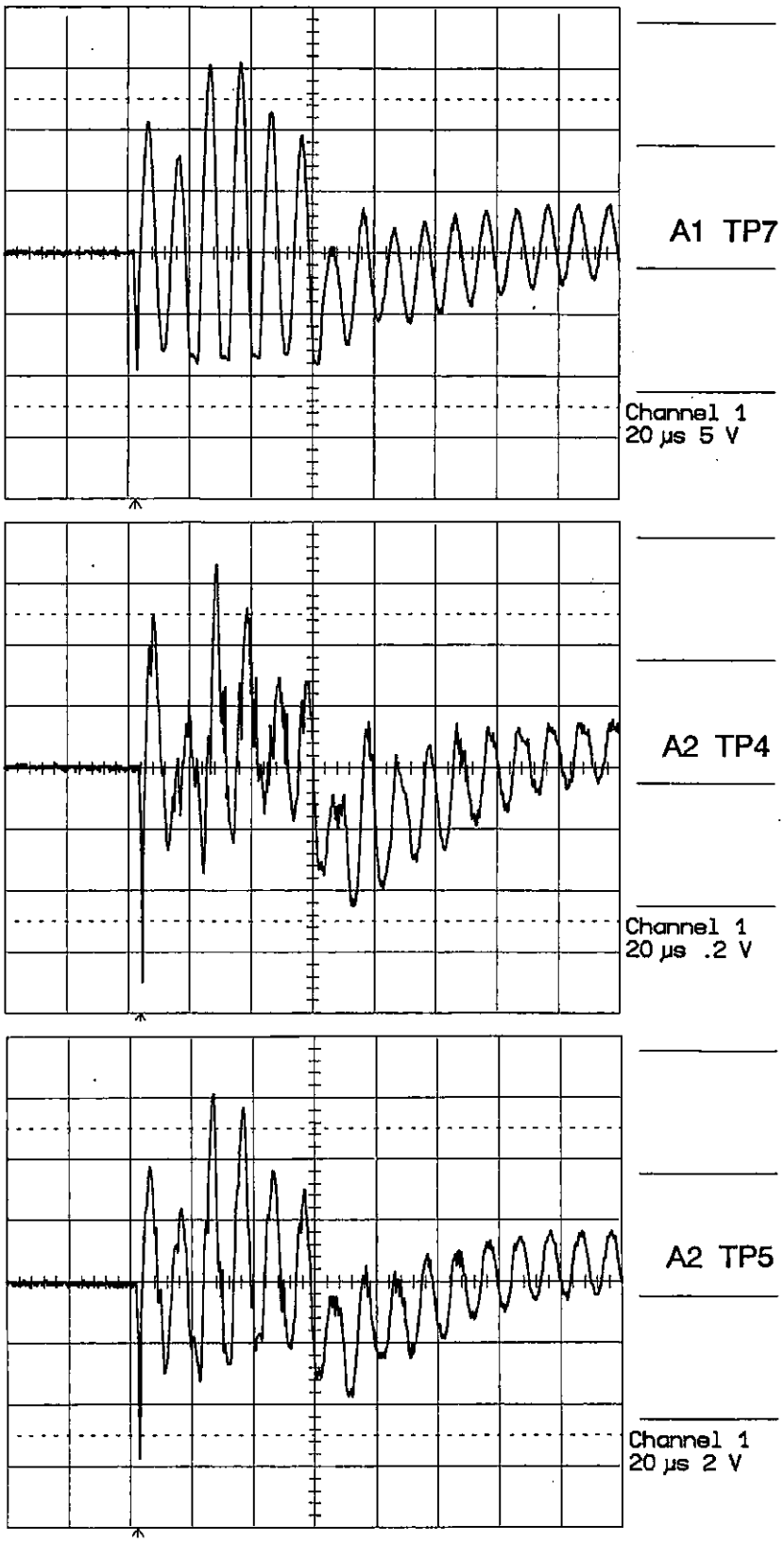


Figure 7-52. Input Amplifier (1A4A1A3)
(Sheet 6 of 7)

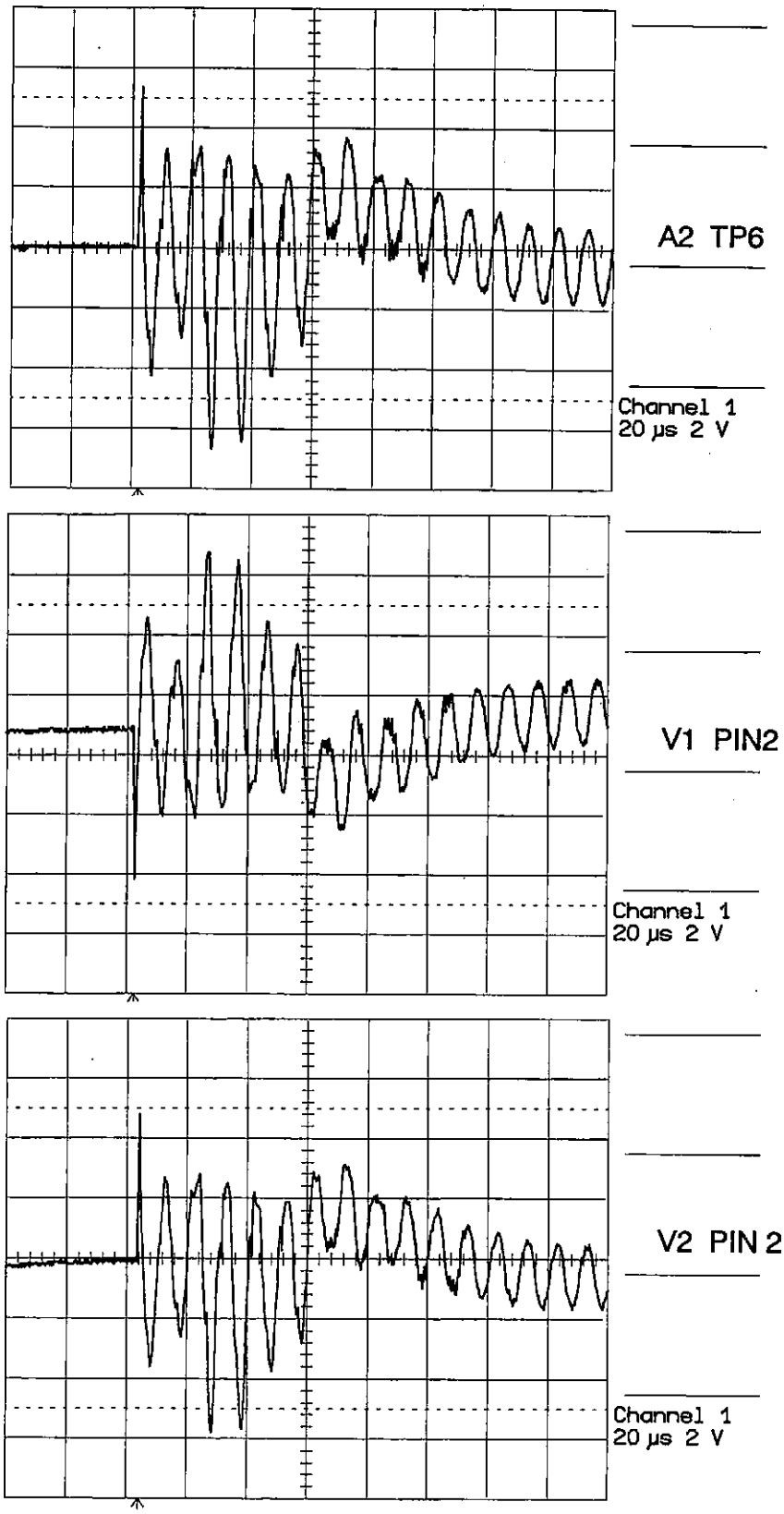
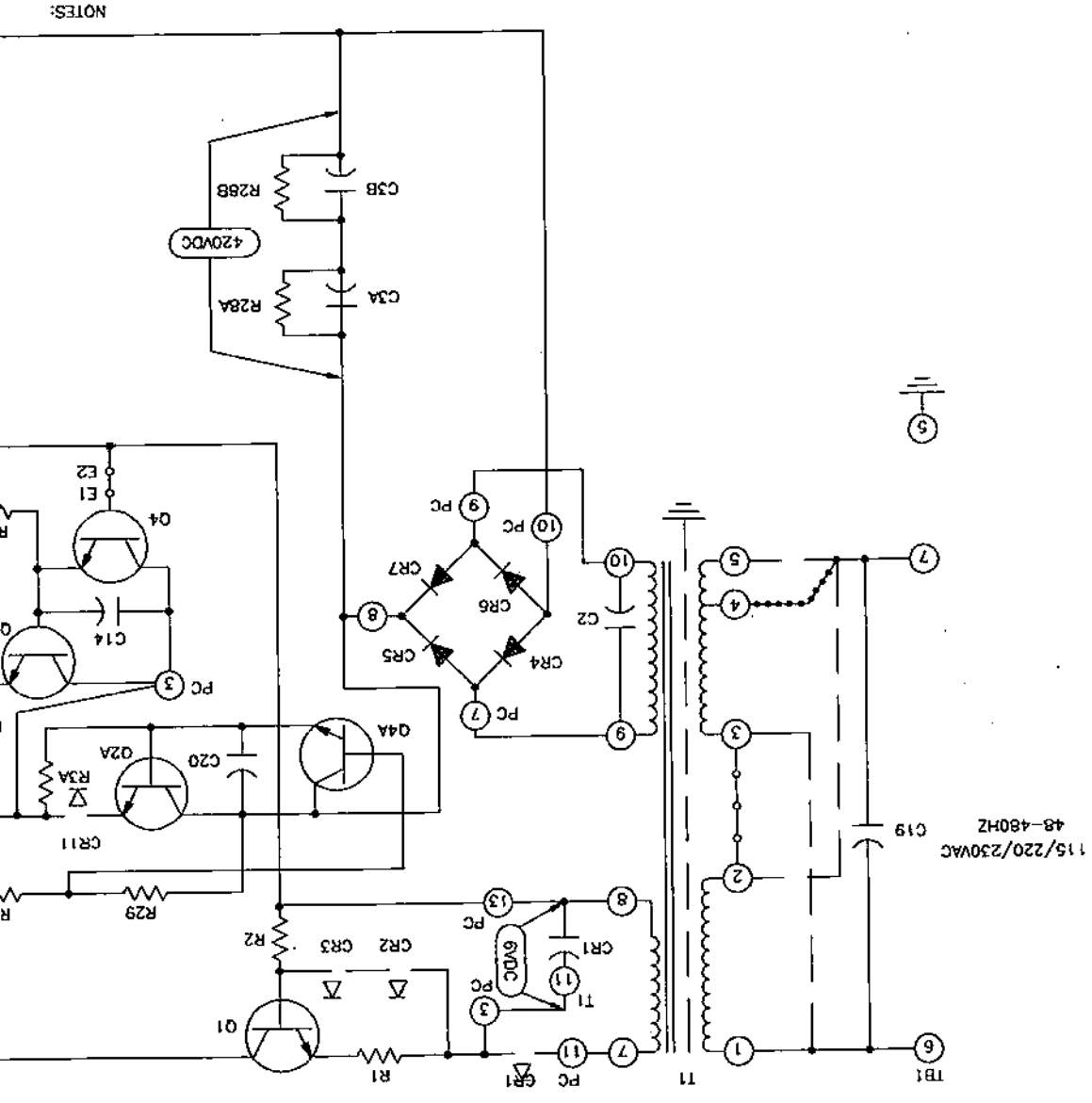
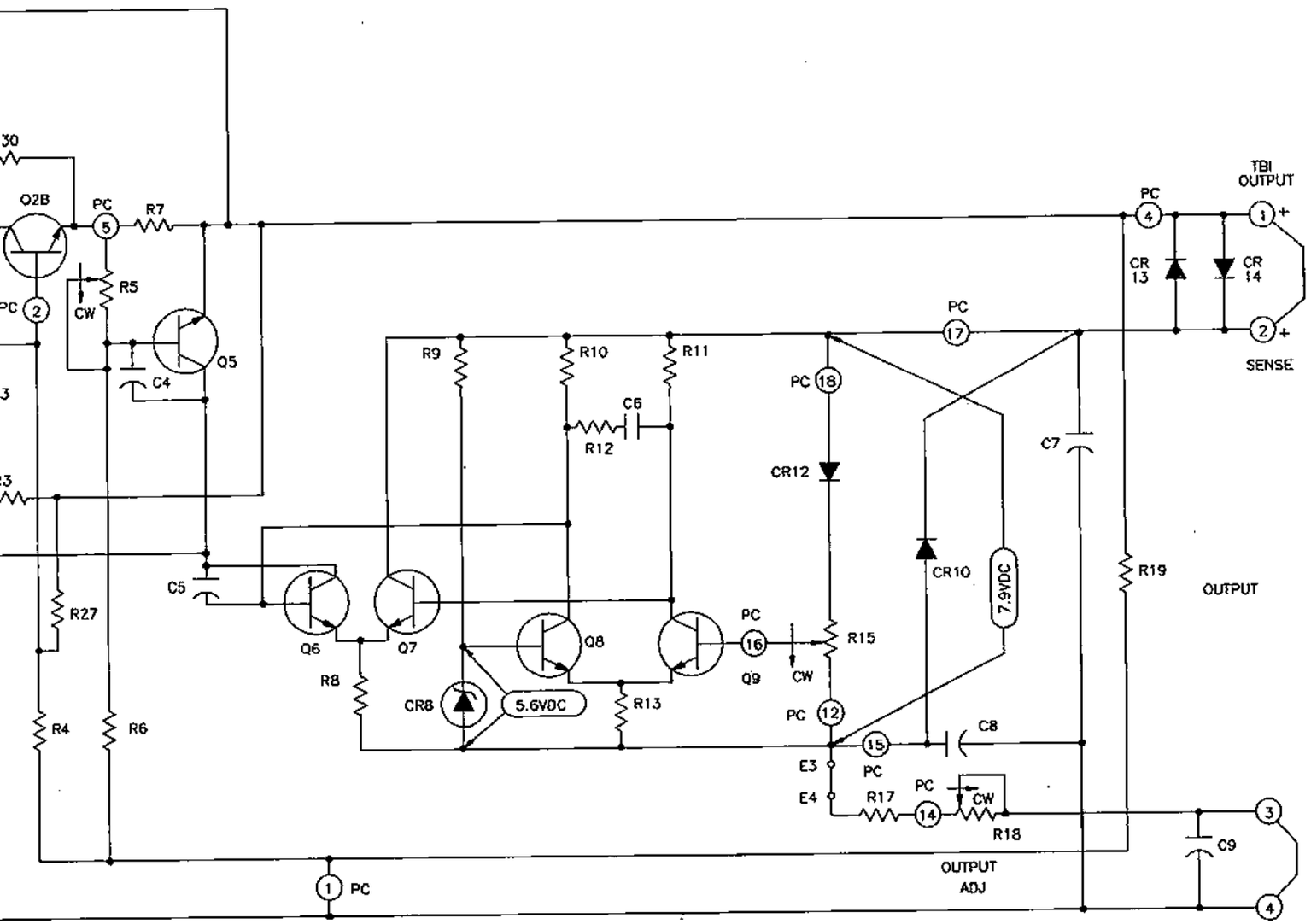


Figure 7-52. Input Amplifier (1A4A1A3)
(Sheet 7 of 7)

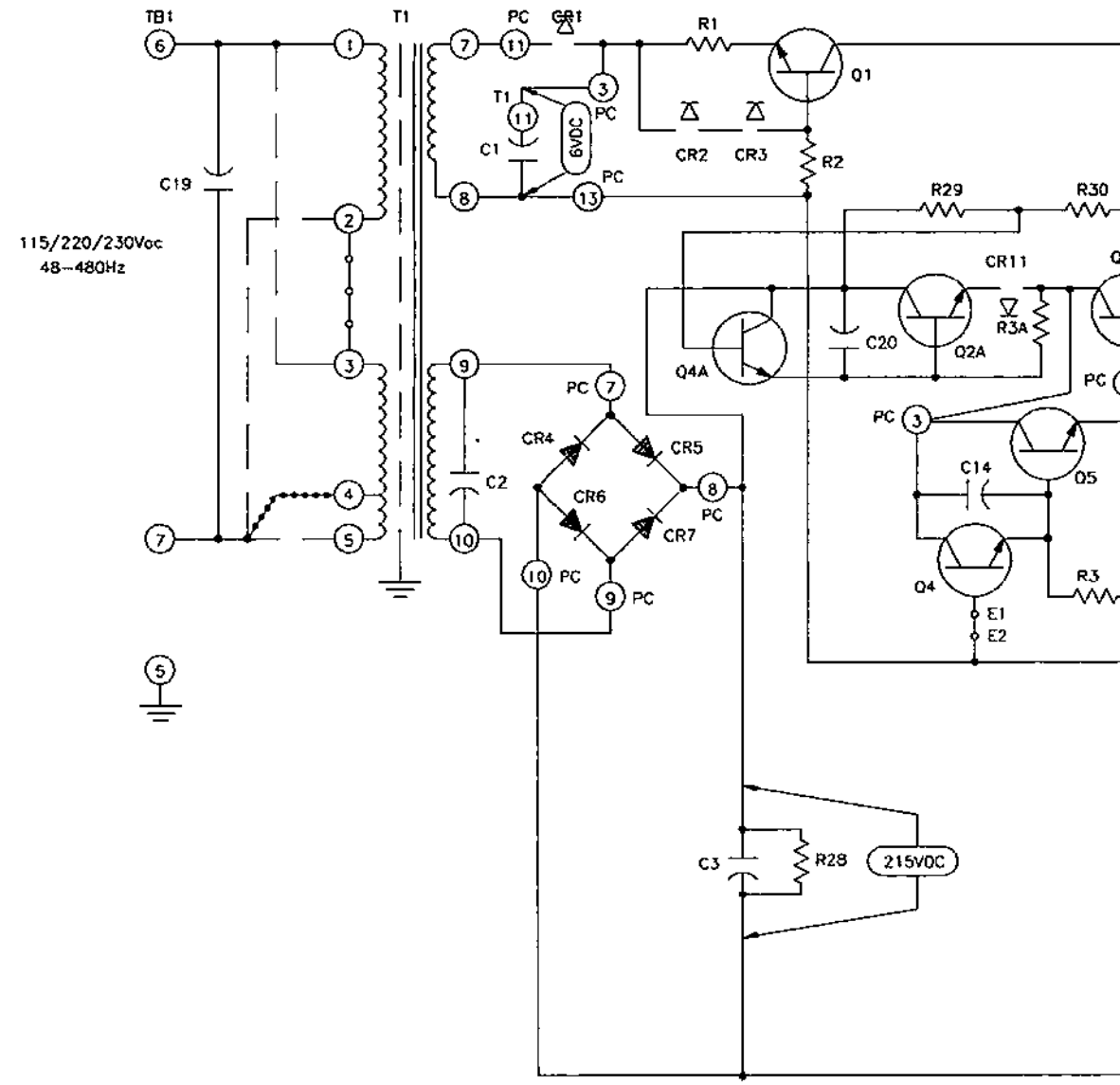
CHANGE 4

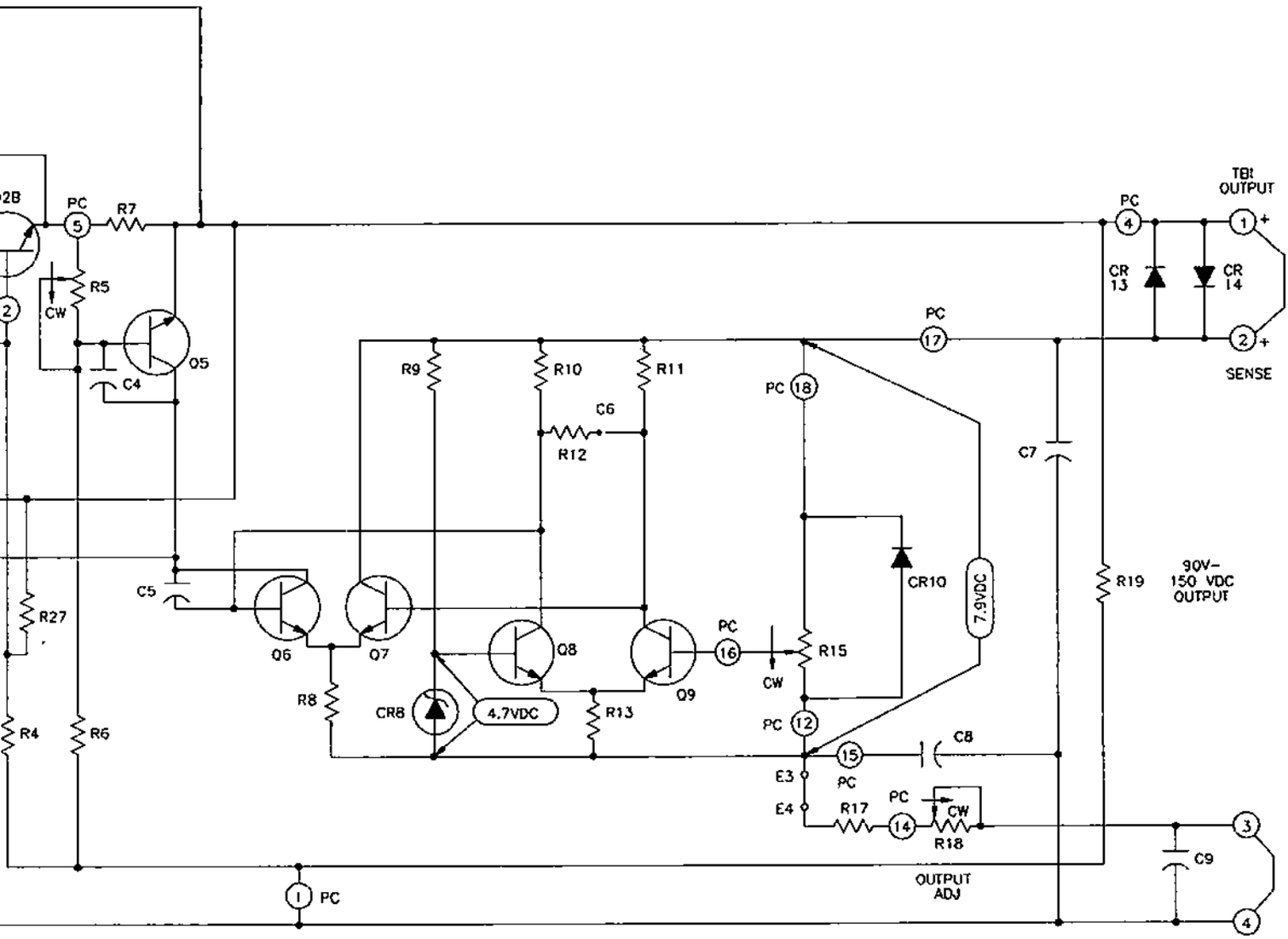

NOTES:
1. ALL VOLT
2. SEE 144
C3B
R28B
420VDC
C3A
R28A
E1
E2
Q4
C14
PC
Q4A
Q2A
C20
R34
CR11
R29
R2
CR2
CR3
Q1
R1
PC
GR1
6VDC
CR1
T1
C2
CR4
CR5
CR6
CR7
PC
C19
115/220/230VAC
48-480HZ
TB1



TAGES MEASURED AT NOMINAL INPUT, NOMINAL OUTPUT, NO LOAD.
A6 FOR INTERFACE.

Figure 7-53. -260 Vdc Power Supply 1A4A6A1, Schematic Diagram


TB1
T1
PC
CR1
R1
Q1
T1
C1
6VDC
CR2
CR3
R2
C19
115/220/230Vac
48--480Hz
R29
R30
CR11
R3A
C20
Q2A
Q4A
PC
CR4
CR5
CR6
CR7
C2
C14
Q5
Q4
R3
E1
E2
C3
R28
215VDC
NOTES:
1. ALL VOLTAGES
2 SEE 1A4A6 F

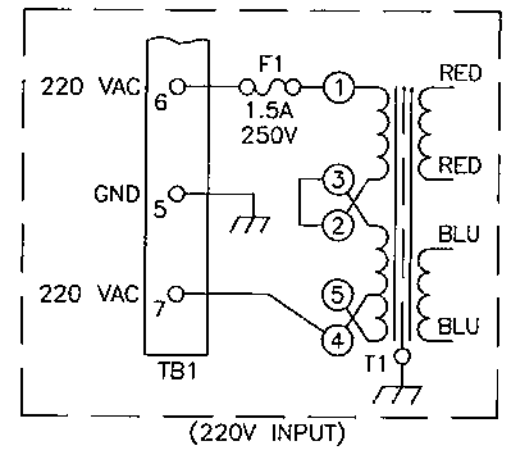


S MEASURED AT NOMINAL INPUT, NOMINAL OUTPUT, NO LOAD.
OR INTERFACE.

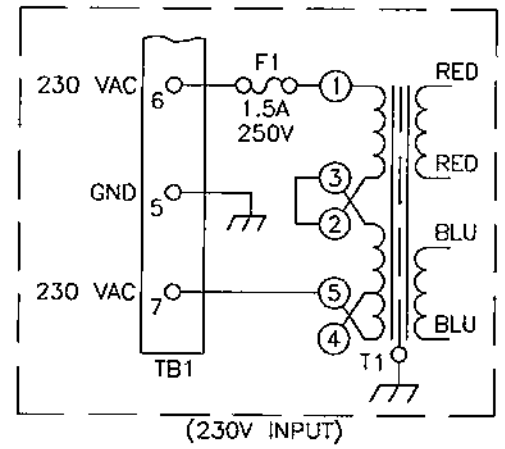
Figure 7-54. -150 Vdc Power Supply 1A4A6A2, Schematic Diagram

NOTES:

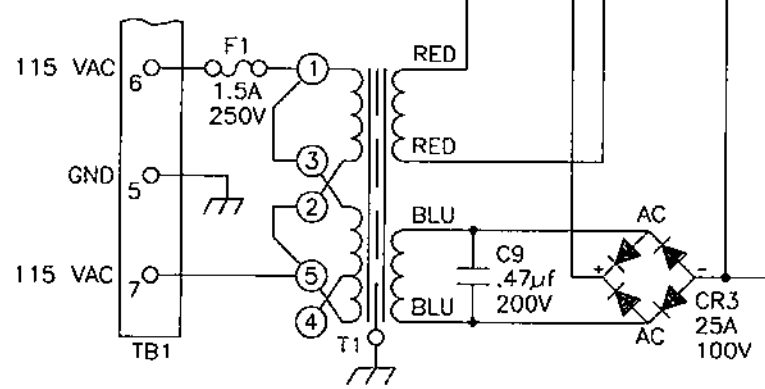
1. ALL RESISTANCE IN OHMS & 1/2W UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITANCE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. R10 & R14 NOT PART OF A1000.
4. SEE 1A4A6 FOR INTERFACE.



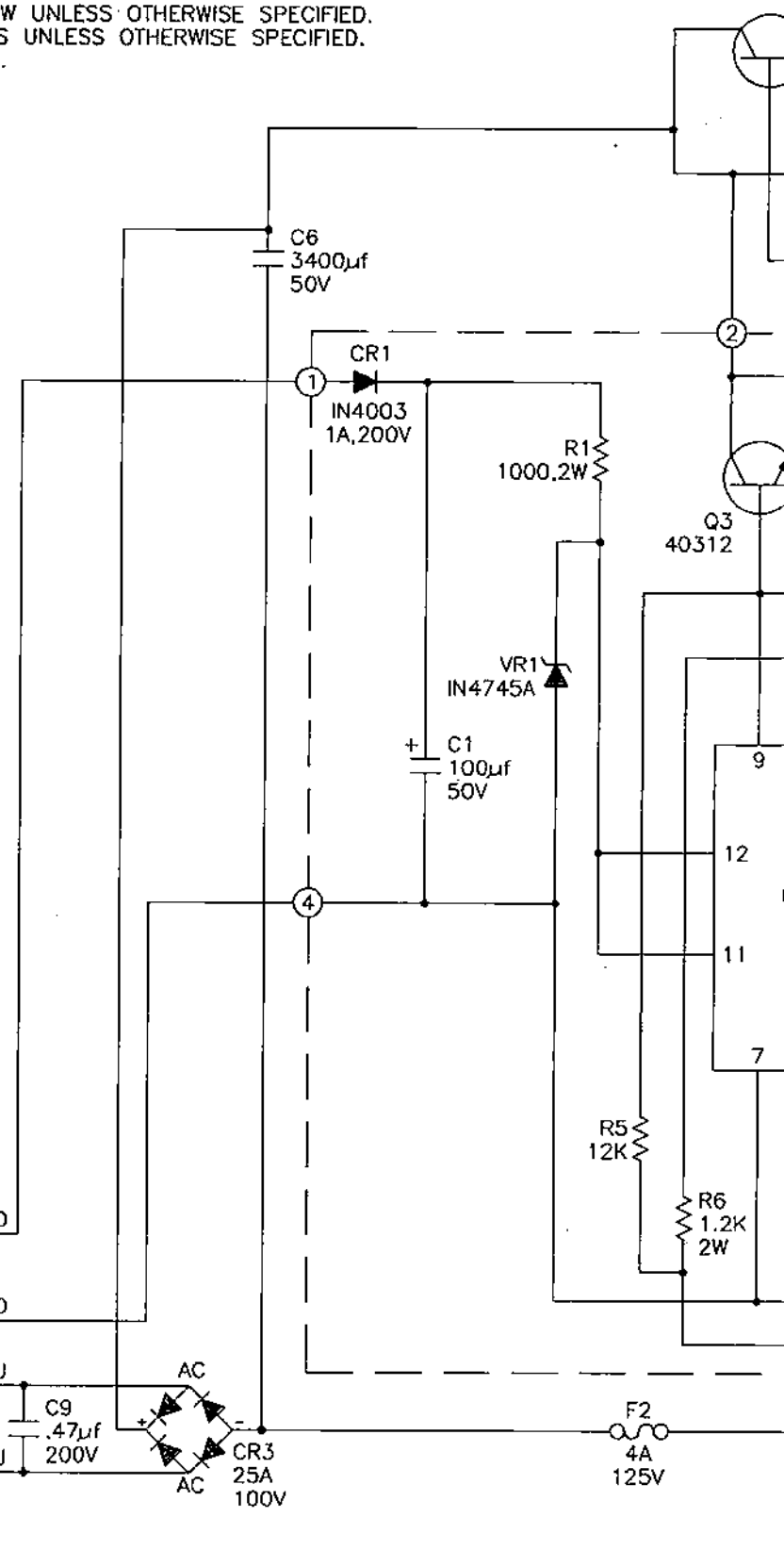
(220V INPUT)



(230V INPUT)



(115V INPUT)



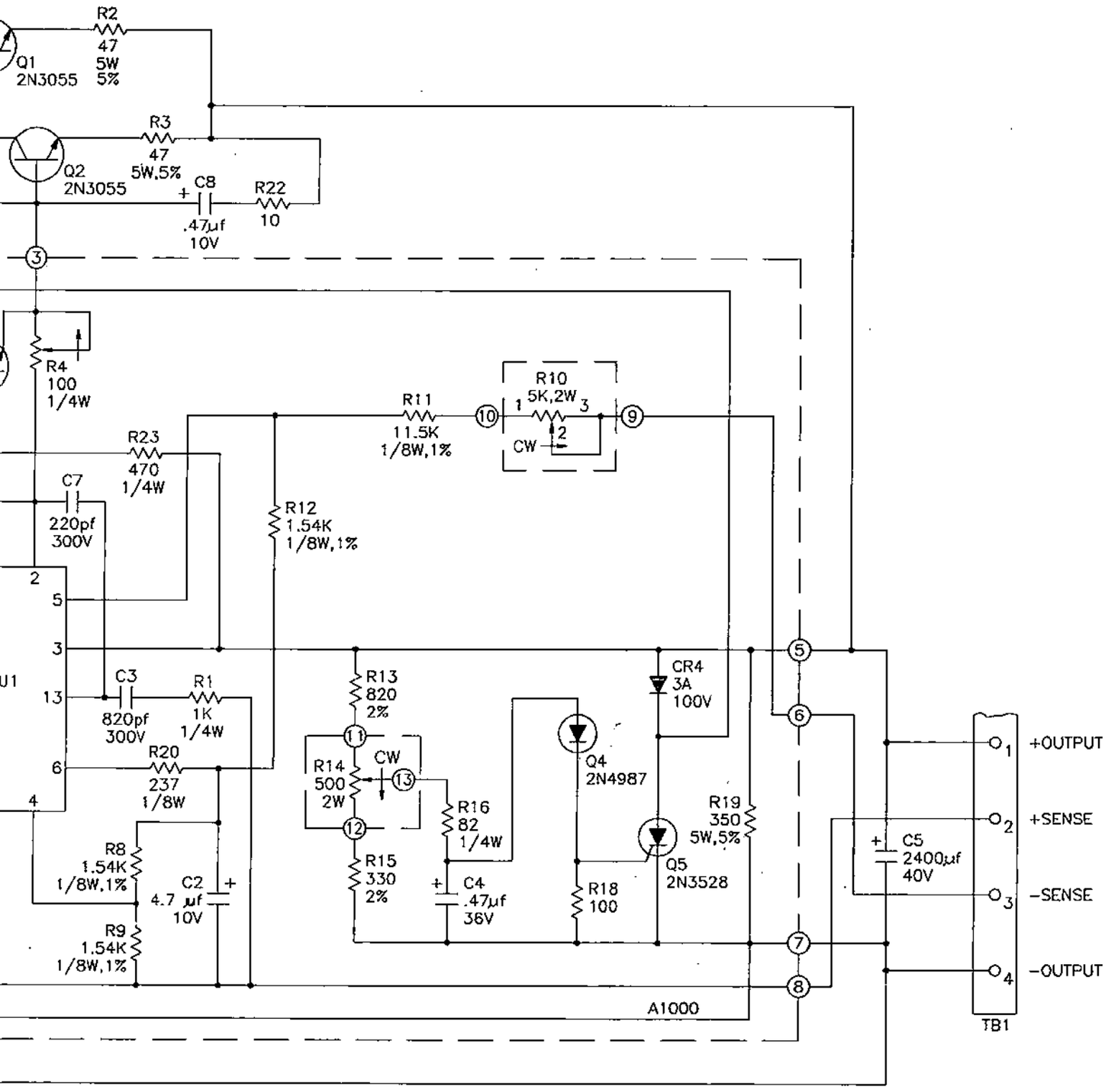


Figure 7-55. ±24 Vdc Power Supplies (1A4A6A3 and 1A4A6A4), Schematic Diagram