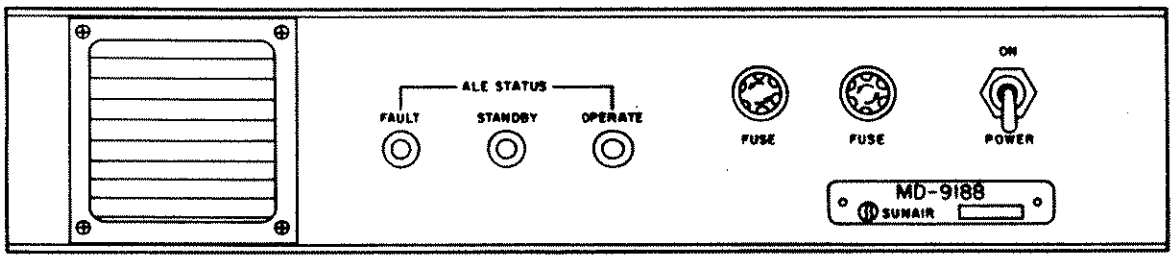
SUNAIR®



MD-9188

ALE MODEM

OPERATION AND MAINTENANCE MANUAL

FIRST EDITION JANUARY 21, 1991

PRODUCT SERVICE:

In case of difficulty please contact the Sunair Product Service Department, between the hours of 8:00 AM and 5:00 PM or write to:

Product Service Dept.
Sunair Electronics, Inc.
3101 SW Third Avenue
Ft. Lauderdale, FL 33315-3389
U.S.A.

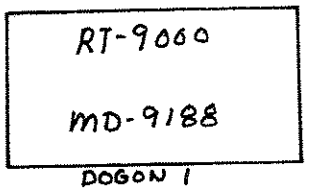
Telephone:	(305) 525-1505
Telex:	51-4443
Cable:	Sunair FTL.
Fax:	(305) 765-1322

TRAINING:

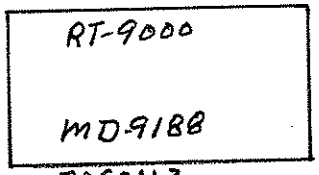
Sunair offers training programs of varying lengths covering operation, service, and maintenance of all Sunair manufactured equipment. For details please contact the Product Support Department.

SUNAIR RT-9000/MD-9188 LQA VALUE TO SINAD CONVERSION

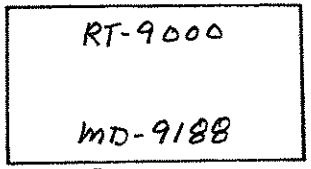
DISPLAYED VALUE	dB SINAD	DISPLAYED VALUE	dB SINAD
1	1	G	16
2	2	H	17
3	3	I	18
4	4	J	19
5	5	K	20
6	6	L	21
7	7	M	22
8	8	N	23
9	9	O	24
A	10	P	25
B	11	Q	26
C	12	R	27
D	13	S	28
E	14	T	29
F	15	U	30



Self ID. DOGON 1
Call ID. DOGON 2
Call ID. DOGON 3
Call ID. DOGON 4
Call ID. DOGON 5

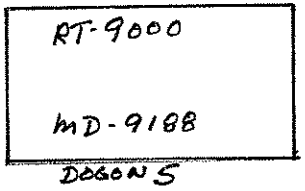


Call ID DOGON 1
Call ID DOGON 2
Self ID DOGON 3
Call ID DOGON 4
Call ID DOGON 5

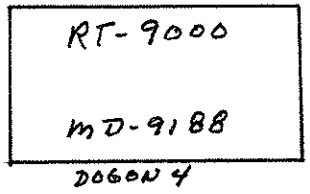


Call ID. DOGON 1
Self ID. DOGON 2
Call ID. DOGON 3
Call ID. DOGON 4
Call ID. DOGON 5

NET "BINGO"



Call ID. DOGON 1
Call ID. DOGON 2
Call ID. DOGON 3
Call ID. DOGON 4
Self ID. DOGON 5



Call ID. DOGON 1
Call ID. DOGON 2
Call ID DOGON 3
Self ID DOGON 4
Call ID DOGON 5

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LISTING of FIGURES (Cont...)

LISTING of TABLES

SECTION I

GENERAL INFORMATION

1.1 SCOPE OF MANUAL

This manual contains information necessary to install, operate, and maintain the MD-9188 'Pathfinder' ALE Modem. Installation information is located in Section II. Operating Instructions are included in Section III. Theory of Operation is in Section IV. Section V contains Maintenance and Troubleshooting guidelines. Information in this manual applies to all equipment configurations, unless otherwise stated in the text or illustrations.

1.2 PURPOSE OF EQUIPMENT

The MD-9188 is a radio modem designed to operate with the Sunair RT-9000 transceiver to provide HF radio automatic link establishment (ALE). Designed for use in fixed-station or mobile environments, the modem complies with the signaling and link establishment requirements of MIL-STD-188-141A (Interoperability and Performance Standards for Medium and High Frequency Radio Equipment) and FED-STD-1045 (Telecommunications: HF Radio Automatic Link Establishment).

1.3 GENERAL DESCRIPTION

The MD-9188 ALE Modem is a practical, flexible, easy-to-use solution for the basic requirements of automatic link establishment for HF radios.

MD-9188 features include: robust MIL-STD-188-141A waveform, operational simplicity, link quality analysis (LQA), use of digital signal processing (DSP) technology, Golay-encoded forward error correction (FEC), rapid station connectivity, and selective calling.

The MD-9188 performs real-time near optimum channel selection at the time of link establishment. Individual-call link establishment is the functional goal of the MD-9188, making it a practical solution to the needs of HF interoperability requirements.

The MD-9188 is based on state-of-the-art microcomputer and digital signal processing (DSP) technologies. DSP techniques enable the generation and detection of signals in a manner that is significantly more efficient and reliable than traditional analog processing. Maximum system flexibility is maintained by using software to implement all modem operations. This makes the MD-9188 adaptable to existing and future signaling schemes with no changes required to the hardware.

Operational simplicity is achieved by placing all modem control functions on the front panel of the RT-9000 transceiver connected to the modem. The equipment operator can program and activate ALE operations through the use of a small number of option menus, entry fields, and "soft" keys. Once activated, all transceiver and modem operations necessary for link establishment are performed automatically.

1.4 TECHNICAL SPECIFICATIONS

1.4.1 GENERAL

INPUT POWER: AC - 115/230 VAC, +/-15%, 25W, single phase 50-60 Hz.
DC - 12 -28 VDC, 40W
AUTOMATIC AC/DC CHANGEOVER

AUDIO INTERFACE IMPEDANCE: 600 ohms.

REMOTE INTERFACE: RS232 at 9600 Baud.

SIZE: (CM) 8.9H X 42.5W X 45.7L
(INCHES) 3 1/2H X 16 3/4W X 18L
(RACK MOUNTABLE).

WEIGHT: (KG): 6.7
(LBS) 14.75

1.4.2 SIGNALING

MODULATION: 8-ary FSK.

SYMBOL RATE: 125 Baud.

BIT RATE: 375 bits/sec.

CODING: Golay forward error correction (FEC) Mode;
3/4 and 2/3 majority vote.

REDUNDANT WORD LENGTH: 49 symbols (147 bits).

DATA THROUGHPUT: 61.22 bits/sec.

CALLING CYCLE: 9016 ms (3 Character ID Only).

RESPONSE/ACKNOWLEDGE CYCLE: 2,352 ms (3 Character ID Only).

SCAN RATE: 500 ms/channel.

1.4.3 SELECTIVE CALLING

ADDRESS FORMAT: 15 Characters Maximum, alphanumeric ALE basic 38-character set, excluding wildcard character.

HANDSHAKE: 3-way, station-to-station and net call, 1-way all call and sounding.

NETWORK MANAGEMENT: 1 network 99 station address, 30 29 slot positions available for net call.

1-29

ENGINEERING CHANGE NOTICE

TITLE	MODEL	DWG/NEW REV.	NUMBER 8076-116
CONNECTOR, POWER, 19 PIN MALE	9000 SERIES		DATE 04/20/92
	ASSEMBLIES AFFECTED/NEW REV.		ORIGINATOR RLS
	SEE BELOW		DATE 04/20/92

PURPOSE OF ECN:

1. CHANGE MASTER PARTS LIST AS FOLLOWS:
   A. CHANGE VENDOR PART NUMBER OF PN 1011140004 FROM "PW06F-14-19P" TO "PW06A-14-19P".

2. ADD PN 1000200001, "CABLE CLAMP MS3057-8A", TO THE FOLLOWING BILLS OF MATERIAL:
   A. PN 8107159799, "CABLE ASSY, AUDIO, IN/OUT, 3 FT", QTY 1, REV A.
   B. PN 8107110099, "CABLE ASSY, CTRL/AUDIO-Y, 1 FT", QTY 1, REV A.
   C. PN 8101003398, "CABLE ASSY, AUDIO CONTROL, 4 FT", QTY 2, REV A.
   D. PN 8107805097, "CABLE ASSY, AUDIO ADAPTOR", QTY 1, REV A.
   E. PN 8076004594, "CABLE ASSY, AUDIO INTERFACE", QTY 1, REV B.
   F. PN 8102000490, "CONNECTOR KIT, R-9200", QTY 1, REV A.
   G. PN 8078000499, "CONNECTOR KIT, RCU-9310", QTY 1, REV A.
   H. PN 8076400058/91, "PHONE PATCH, GRY/OD", QTY 1, REV C.
   I. PN 8076004390, "CABLE ASSY, AUDIO CONTROL", QTY 2, REV B.
   J, PN 8076000491, "CONNECTOR KIT, RT-9000", QTY 1, REV B.

REASON FOR CHANGE:

PRESENT CONNECTOR IS WRONG TYPE FOR USE WITH JACKETED AND SHIELDED CABLE.

NOTE: PRODUCTION CONTROL, QA.

1. REWORK ALL PN 1011140004 CONNECTORS IN-STOCK BY REMOVING FOUR "F-BACKSHELL COMPONENTS" AND ADDING ONE "A-BACKSHELL". THE "A-BACKSHELL" IS A NEW PART AND HAS BEEN ORDERED FOR THIS REWORK. REMOVED "F-BACKSHELL COMPONENTS" SHOULD BE BAGGED (SET OF FOUR PER BAG) AND RETURNED TO VENDOR FOR CREDIT. REWORK TO COMMENCE ONCE "A-BACKSHELLS" ARE RECEIVED.
2. REWORK ALL IN-PROCESS CABLE ASSEMBLIES AS PER NOTE 1 ABOVE.
3. ALL CONNECTOR KITS CONTAINING PN 1011140004 CAN BE USED AS IS.

PARTS DISPOSITION	USE AS IS	REWORK	SCRAP	NOTED ABOVE	N.A.
PARTS - ON ORDER		X		X	
PARTS - IN STOCK		X		X	
IN PROCESS ASSY'S		X		X	
COMPLETED ASSY'S	X				
COMPLETED PRODUCTS	X				
RETURNED EQUIPMENT					X

DOCUMENTATION AFFECTED BY THIS CHANGE ACTION 'A' REVISION HAS BEEN COMPLETED, 'B' FOLLOW-UP ACTION IS REQUIRED			
DESCRIPTION	A	B	RESPONSIBILITY
ENG. DWG/SPECIFICATIONS			
BILL OF MATERIAL	X		EK
TECHNICAL MANUALS			
SERVICE BULLETIN			
MASTER PARTS LIST	X		EK
PRODUCTION DRAWING		X	RLS
BUY CARD		X	FR
PRODUCTION CONTROL		X	GH
CONFIGURATION CONTROL			

APPROVALS	DATE
PROJECT MGR.	
ENG. MGR.	4/30
PROD. MGR.	4/30/92
PRODUCT SERVICES MGR.	5/1/92
Q.A. MGR.	4/30/92
CORPORATE OFFICER	4/30/92

PART NO	DESCRIPTION	VENDOR PN	REFERENCE DESIGNATION	TY CO	COM CDE	ECN NUMBER	EG RV	D C	P C	QUANTITY PER	UM
8101003398	CABLE ASSY, AUDIO CONTROL, 4FT			MFG		8076-116	A				EA
COMPONENT											
0501900004	NUT, HEX 6-32 X 5/16 AF	70207 FEDERAL NSN 5310009349761		PUR	520			Z		2.	EA
0502050004	LUG, SOLDER, IT NO. 6 3/4 L	MS35649-264 38-126 FEDERAL NSN 5940008166103		PUR	450			Z		2.	EA
0700550046	BUSHING, TELESCOPING, .44 ID	MS77066-2 NSN 5975009367377 MS3420-8		PUR	850					2.	EA
1000200001	CABLE CLAMP, MS3057-8A	9779-513-8 AMPH MS3057-8A		PUR	850	8076-116				2.	EA
1004400004	BRAID, SHIELDING 3/32 WIDE DNP	NE16336T NEMAL 1224 ALPHA 8652 BELDEN		PUR	762					.33	FT
1006900004	WIRE KIT, NO. 20 BLACK			MFG						1.	EA
1011140004	CONNECTOR, POWER, 19 PIN MALE	PW06A-14-19P ARRAY		PUR	858					2.	EA
1011200015	CABLE, 19 COND, NO. 24	NX1924SJ NATIONAL		PUR	753					4.	FT

END OF REPORT

PART NO	DESCRIPTION	VENDOR PN	REFERENCE DESIGNATION	TY CD	COM CDE	ECN NUMBER	EG RV	D C	P C	QUANTITY PER	UM
B101003291	CABLE ASSY, I/O, 4 FT			MFG			01				EA
COMPONENT											
1011120011	CONNECTOR, POWER, 9 PIN FEMALE	8309-7060 3M		PUR	858					2.	EA
1011130017	JUNCTION SHELL, DB-9	3357-9209 3M		PUR	850					2.	EA
1011150018	CABLE, RIBBON, 9 COND, 28 AWG	3659/9 3M		PUR	753					4.	FT

END OF REPORT

PART NO	DESCRIPTION	VENDOR PN	REFERENCE DESIGNATION	TY CD	COM CDE	ECN NUMBER	EG RV	D C	P C	QUANTITY PER	UM
8101002596	INTERCONNECT KIT, MD-9188A			MFG		8101-011	A				EA
COMPONENT											
1011960010	CONNECTOR, DB-9, 9 PIN FEM.	152-5109	MOUSER	PUR	858	8101-011				1.	EA
1011970015	HOOD, W/SCREW LOCK, DB-9	152-1409	MOUSER	PUR	850	8101-011				1.	EA
1012700003	CONNECTOR, DB-15, 15 PIN MALE	152-5015	MOUSER	PUR	858	8101-011				2.	EA
1012710009	CONNECTOR, DB-25, 25 PIN MALE	152-5025	MOUSER	PUR	858	8101-011				1.	EA
1012740005	HOOD, W/LOCK SCREWS, DB-15	152-1415	MOUSER	PUR	850	8101-011				2.	EA
1012750001	HOOD, W/LOCK SCREWS, DB-25	152-1425	MOUSER	PUR	850	8101-011				1.	EA
8101003291	CABLE ASSY, I/O, 4 FT			MFG				S	Y	1.	EA
8101003398	CABLE ASSY, AUDIO CONTROL, 4FT			MFG						1.	EA

END OF REPORT

1.4.4 LINK QUALITY ANALYSIS

MEASUREMENTS: S+N/N (SINAD) and Bit Error Rate (BER).

ACCEPTANCE THRESHOLD: 20dB (approximate) no inhibit function after one sounding cycle.

1.4.5 AMD PROTOCOL

CHARACTER SET: 64 character ASCII subset.

MESSAGE SIZE: 90 characters, maximum.

SUPPORTING PROTOCOL: Single station link, all call and net call (net control station acknowledge only).

1.4.6 ENVIRONMENTAL

TEMPERATURE RANGE: -10° to +55°C.

HUMIDITY: 95% at 50°C.

VIBRATION: MIL-STD-810D.

1.5 EQUIPMENT SUPPLIED

The following is a list of equipment, with appropriate Sunair part numbers, supplied with the MD-9188 ALE Modem.

SUPPLIED EQUIPMENT:	SUNAIR PART NUMBERS:
ALE Modem, MD-9188	8101001255 GRY 8101001298 O.D.
Manual	8101000500
Power Cord Assembly, 115 VAC or Power Cord Assembly, 230 VAC	8101002090 8101002197
Interconnect Kit;	8101002596

See Printouts.

Cable Assy P/N 8101003398 Audio Cable 4 ft. and 2 19 PIN MALE CONNECTORS. 9

Cable Assy P/N 8101003291 Serial Cable 4 ft. and 2 audio DB-15 with hoods (connector).

1.6 OPTIONS AVAILABLE

The following is a list of optional equipment or accessories available for use with the MD-9188 ALE MODEM.

OPTIONAL EQUIPMENT/ACCESSORIES:	SUNAIR PART NUMBERS:
Power Cord Assembly, DC	8101002294
Field Module Kit	8101905090

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SECTION II

INSTALLATION

2.1 GENERAL

This section contains all necessary instructions for unpacking, inspection, and, if required, reshipment of the equipment or parts. Information regarding location and mounting considerations, power requirements, and equipment interconnection is also provided.

2.2 UNPACKING AND INSPECTION

As soon as you have received your unit(s), unpack and inspect all components and accessories. Check the packing list to be sure you have received all items ordered, and that all items necessary for operation have been ordered.

NOTE: Be sure to retain the carton and its associated packing materials should it be necessary to reship the equipment.

Do not accept a shipment when there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage of items or any evidence of damage, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier. If concealed damage is discovered after the shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report should also be forwarded to Sunair's Product Services Department. Please be sure to include the following information for prompt service:

a) ORDER NUMBER.
b) MODEL AND SERIAL NUMBER.
c) NAME OF TRANSPORTATION AGENCY.
d) APPLICABLE DATES.

Upon receipt of this information, Sunair will make arrangements for repair or replacement.

2.3 RETURN OF EQUIPMENT TO FACTORY

The shipping carton for the MD-9188 has been designed to protect the equipment during shipment. The container and its associated packing material should be used to reship the unit.

When necessary to return equipment to Sunair for warranty or non-warranty repair, an authorization number is required. This number can be obtained from our Product Services Department:

TELEPHONE: (305) 525-1505,
TELEX: 51-4443,
CABLE: SUNAIR,
FACSIMILE: (305) 765-1322.

If the original shipping carton is not available, be sure to carefully pack each unit separately, using suitable cushioning material where necessary. Very special attention should be given to providing enough packing material around connectors and other protrusions from the unit. Rigid cardboard should be placed at the

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TELEPHONE: (305) 525-2505, 1505
TELEX: 51-4443,
CABLE: SUNAIR,
FACSIMILE: (305) 765-1322.

If the original shipping carton is not available, be sure to carefully pack each unit separately, using suitable cushioning material where necessary. Very special attention should be given to providing enough packing material around connectors and other protrusions from the unit. Rigid cardboard should be placed at the

corners of the equipment to protect against denting. DO NOT USE DUNNAGE (e.g., STYROFOAM PEANUTS) FOR PACKING PROTECTION; they may allow the unit to shift while being shipped, and, therefore, become dammaged.

When returning subassemblies or components for repair or replacement, be sure to pack each separately, using suitable cushioning material.

Shipment to be made PREPAID consigned to:

Sunair Electronics, Inc.
Product Services Department
3101 SW Third Avenue
Fort Lauderdale, Florida 33315-3389
U.S.A.

Plainly mark with indelible ink all mailing documents as follows:

US Goods Returned for Repair
Value For Customs - $ (Amt.)

Mark ALL SIDES of the package:

FRAGILE - ELECTRONIC EQUIPMENT!

NOTE: Before shipping, carefully inspect the package to be sure it is marked properly and is securely wrapped.

2.4 GENERAL INSTALLATION AND MOUNTING INFORMATION

Satisfactory operation of this equipment will depend upon the care and thoroughness taken during installation.

2.4.1 GENERAL INSTALLATION

For installation and use with the transceiver and other equipment, use this manual in conjunction with their respective operating manuals for complete installation information.

Before starting installation, carefully plan equipment locations to ensure that the operating environment is suitable and that adequate access for maintenance is provided.

If operated on DC power, check for correct polarity before applying power.

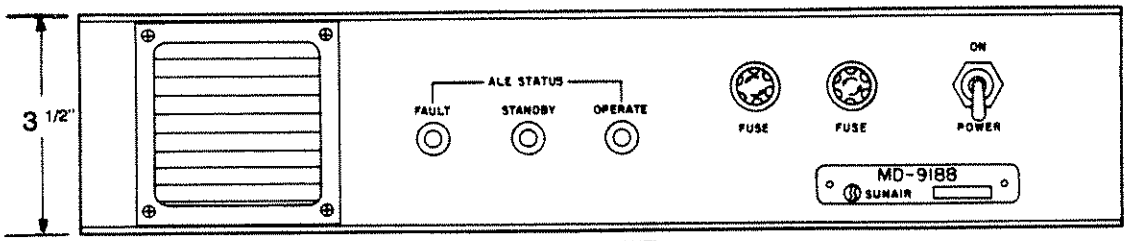
Installation of the MD-9188 ALE modem requires connecting the power line cord to the appropriate power source and two signal cables between the modem and the RT-9000 transciever. If an optional RCU-9310 Remote Control Unit and/or Auxilliary Terminal is present in the system, they must also be connected to the modem. Refer to chart below.

Refer to Figure 2.4.1.2 for the interconnection of the modem, transceiver, and optional remote control unit and appropriate power connection.

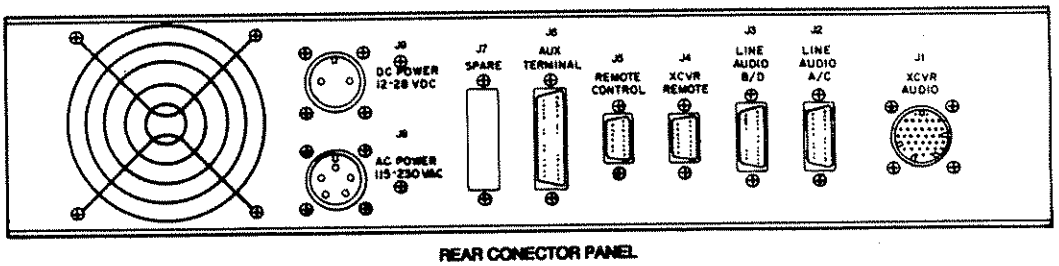
TO ADD	CONNECT	NOTE
AC Power	AC source to J8 on rear panel.	See Figure 2.4.1.1 and 2.4.1.2.
DC Power	DC source to J9 on rear panel.	See Figure 2.4.1.1 and 2.4.1.2.
RT-9000	Control lines from J8 (RT-9000) to XCVR Remote connector J4 on rear panel of MD-9188.	See Figure 2.4.1.1, 2.4.1.2, and consult RT-9000 Manual.
	Audio lines from J5 (RT-9000) to XCVR Audio connector J1 on rear panel of MD-9188.	See Figure 2.4.1.1, 2.4.1.2, and consult RT-9000 Manual.
RCU-9310	Control lines from J6 (RCU-9310) to Remote Control connector J5 on rear panel of MD-9188.	See Figure 2.4.1.1, 2.4.1.2, and consult RCU-9310 Manual.
	Audio lines from J4 (RCU-9310) to Line Audio A/C connector J2 on rear panel of MD-9188.	See Figure 2.4.1.1, 2.4.1.2, 2.4.1.3, and consult RCU-9310 Manual.
Aux Terminal	Control lines from Aux Terminal to Aux Terminal connector J6 on rear panel of MD-9188.	See Figure 2.4.1.1, 2.4.1.2, and section 3.3.

2.4.2 BASE STATION INSTALLATION

Self-adhesive rubber pads, or 'feet,' are supplied with the MD-9188 so that it can be placed directly on a table, desk, or similar flat surface. Minimum clearance of one (1) inch at the sides and two (2) inches at the rear and top should be allowed to provide for adequate air flow for cooling. Figure 2.4.1.1 shows the applicable outline dimensions of the equipment and the location of inputs and outputs for signal and power lines.



FRONT PANEL



REAR CONECTOR PANEL

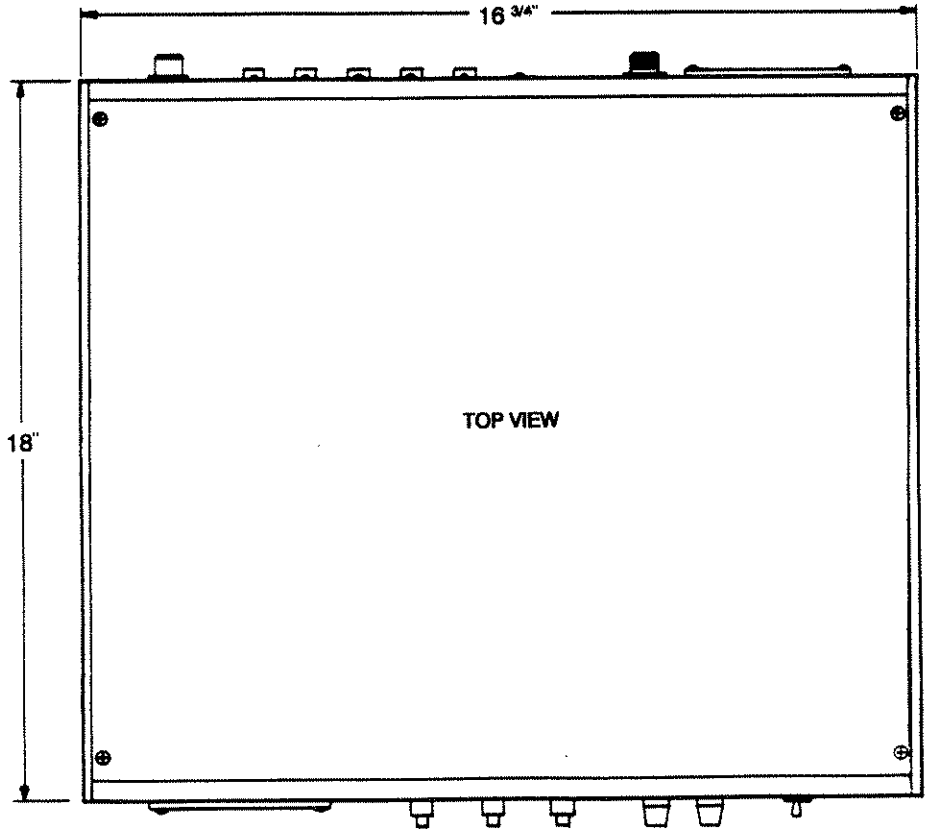
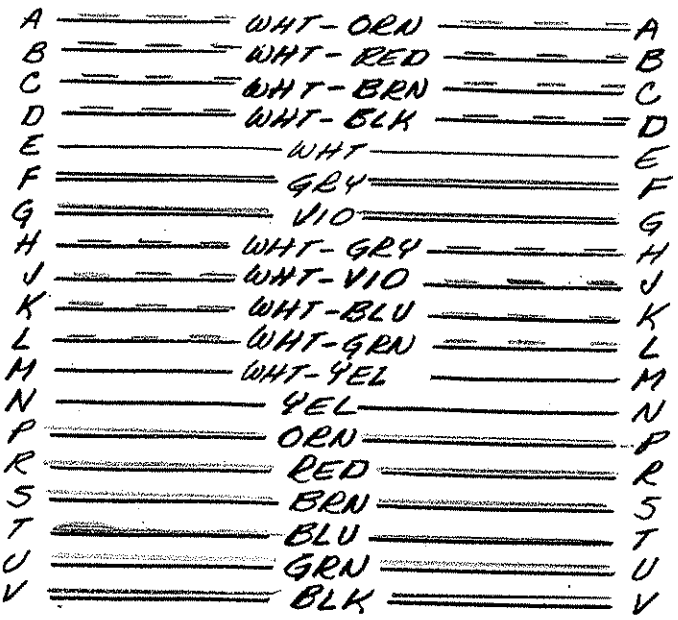


Figure 2.4.1.1 MD-9188 Outline Dimensions and Connector Locations.

Audio Cable 4foot P/N 8101003398



RT-9000
J5

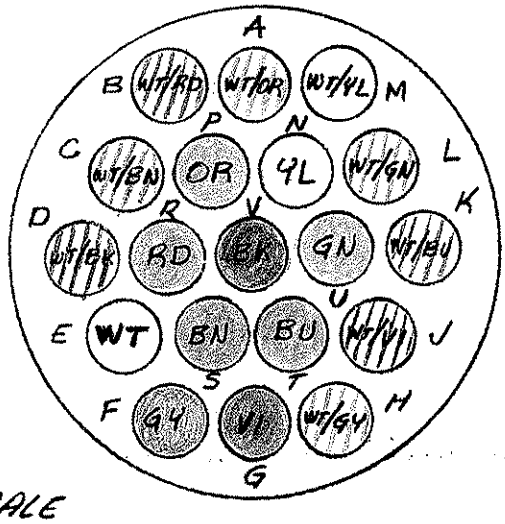
MD-9188
J1

MALE
10111140004

MALE
10111140004

SEE PD 5024450043 PAGE 3 FOR MECHANICAL ASSEMBLY DETAILS.

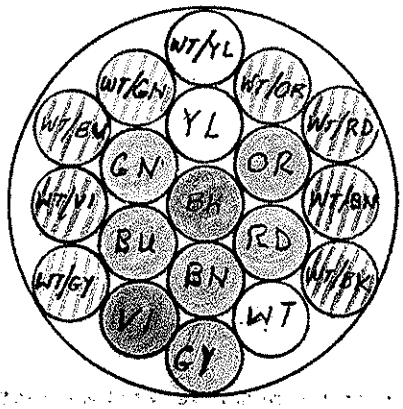
RT-9000/MD-9188



MALE

19 PIN CONNECTOR
10111140004
2 PLCS
(PW06A-14-19P)
(BOTH CONNECTORS WIRED PER ABOVE).

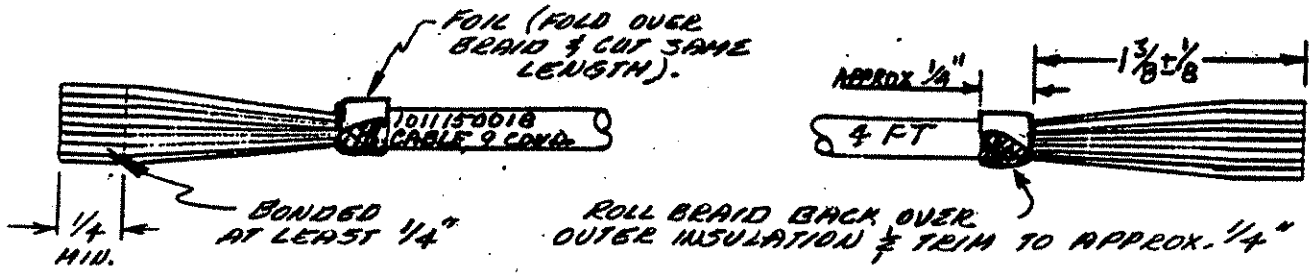
NOTE: TO PREVENT DAMAGE TO CONNECTOR, INSERT IN MATING CONNECTOR P.N 10111110008 DURING WIRING AND BUTTON UP.



CABLE 19 CONDUCTOR
10112 0015 all conductors used

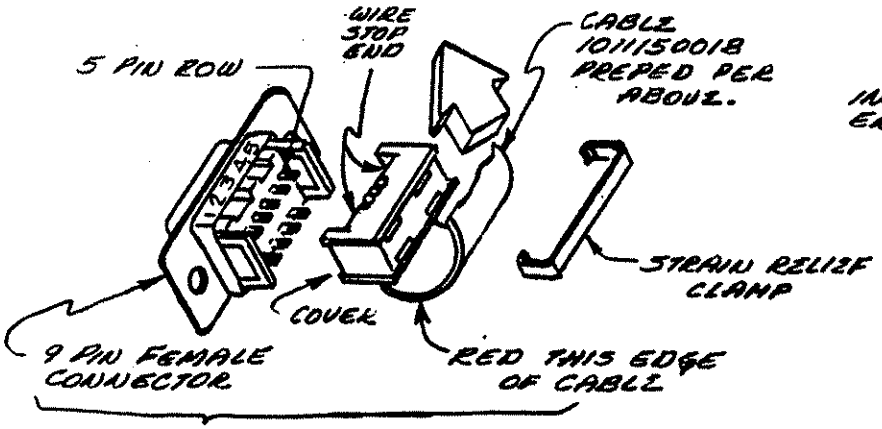
THE END OF THE CABLE WITH COLOR CODE AS PER ABOVE WILL WIRE NEATLY INTO ITS CONNECTOR. OTHER END OF CABLE ALSO GETS A MALE CONNECTOR, SO WIRING WILL NOT FALL INTO PLACE AND BE NEAT.

SUNAIR electronics inc.	ECN	26194	Title	CABLE ASSY AUDIO, RT-9000	Drawing No.	PD 8076004390	
Drawn By: RLS	Rv	C	I.E. RLS	P.E.	C.E.	Date 9.12.89	Pg. 1 of ___	Rev. Date 10-12-92



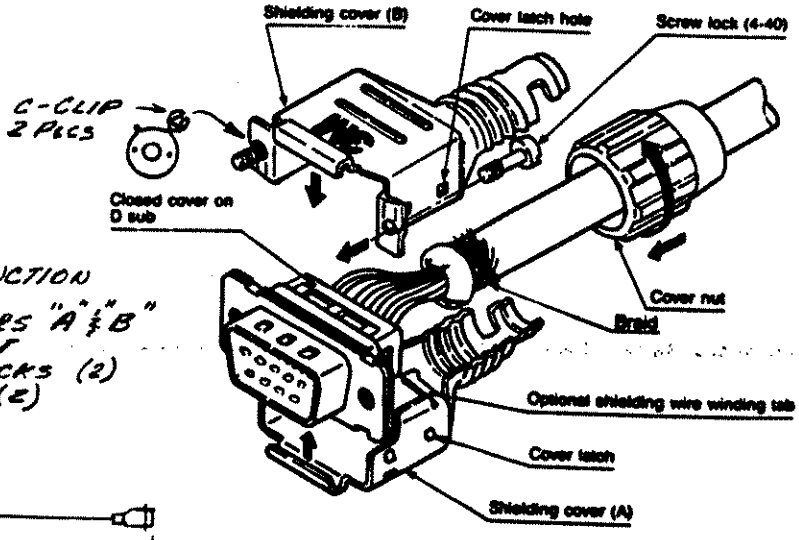
IF WIRES AT END OF CABLE ARE LOOSE (NOT BONDED TOGETHER) TRIM BACK TO BONDED PART, and RESTRIP TO ABOVE DIMENSION.

AFTER PRESSING COVER INTO PLACE PULL CABLE FIRMLY BACK OVER COVER IN DIRECTION OF ARROW, THEN STRAIN RELIEF CLAMP IN SLOTS IN METAL TABS AT BOTH ENDS OF CONNECTOR.



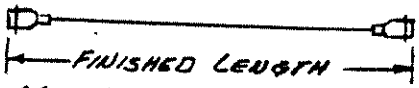
CONNECTORS ARE INSTALLED ON BOTH ENDS OF CABLE IN SAME WAY.

1011120011 CONNECTOR
(CONNECTOR + COVER + STRAIN RELIEF)
2 PCS



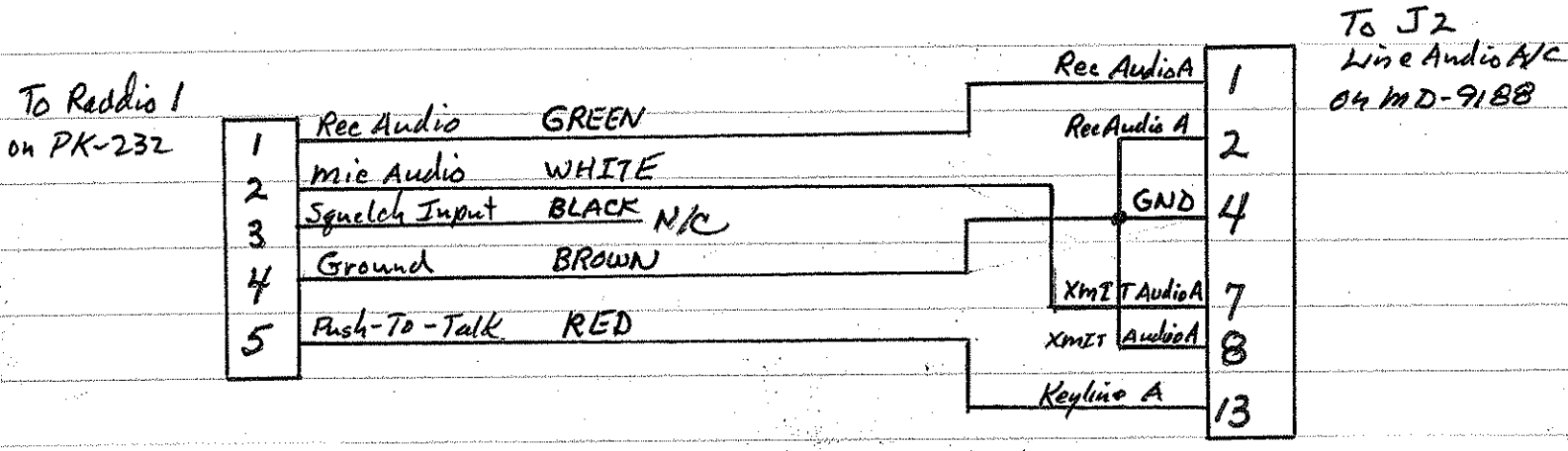
NOTE: BE SURE TO SLIDE COVER NUTS ONTO CABLE BEFORE ASSEMBLY OF CONNECTORS and SHELLS.

1011130017 JUNCTION SHELL =
SHIELDING COVERS "A" & "B"
PLUS COVER NUT
PLUS SCREW LOCKS (2)
PLUS C-CLIPS (2)
2 PCS

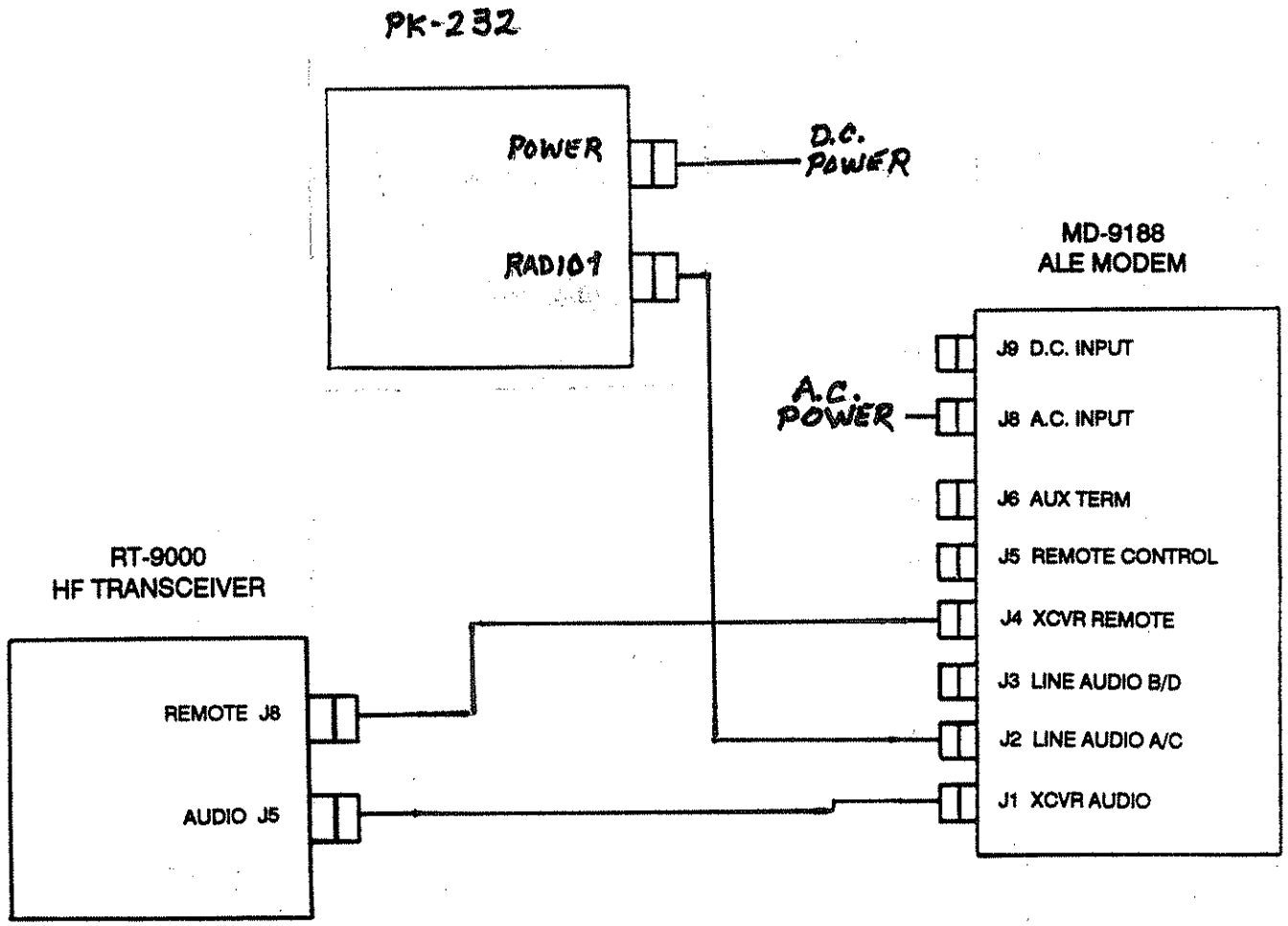


NOTE: FINISHED LENGTH OF CABLE IS ACCEPTABLE FROM THE LENGTH SPECIFIED ON THE FACTORY ORDER, DOWN TO A MINIMUM OF 5 INCHES SHORTER THAN SPECIFIED. EXAMPLE: IF 4 FT. IS SPECIFIED, ANYTHING BETWEEN 3 FT. 7 IN. and 4 FT. IS ACCEPTABLE.

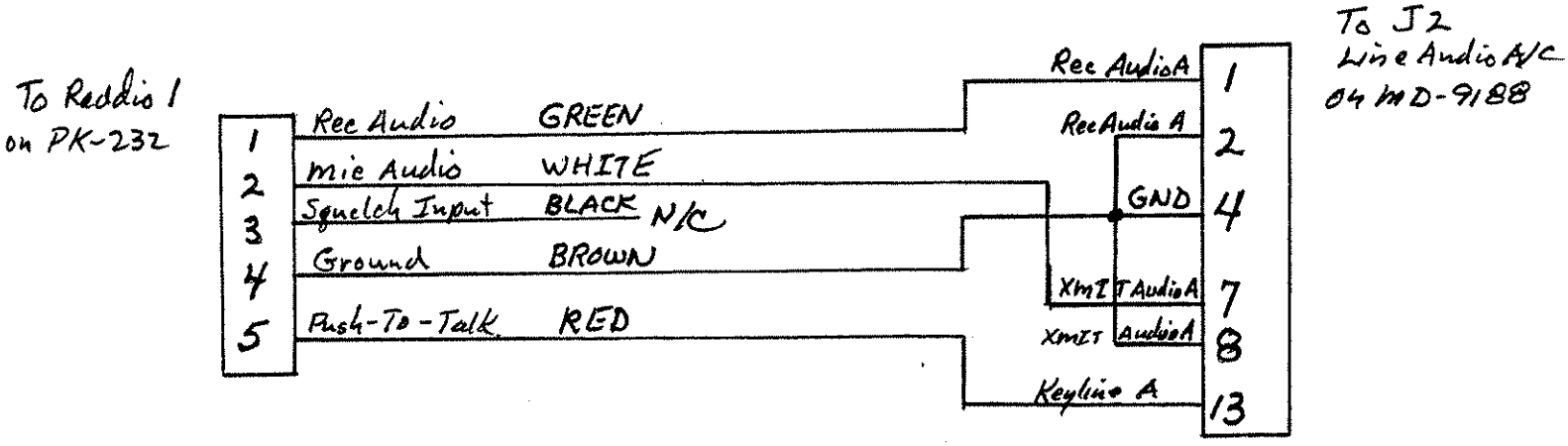
SUNAIR electronics inc.	ECN	Title CABLE ASSEMBLY I/O, 4 FT	Drawing No. P.D. 8101003291	Re C
Drawn By: RLS	Rv	I.E. STORMANN / P.E. / C.E. / Date 6-9-92	Pg. 1 of 1	Rev. Date



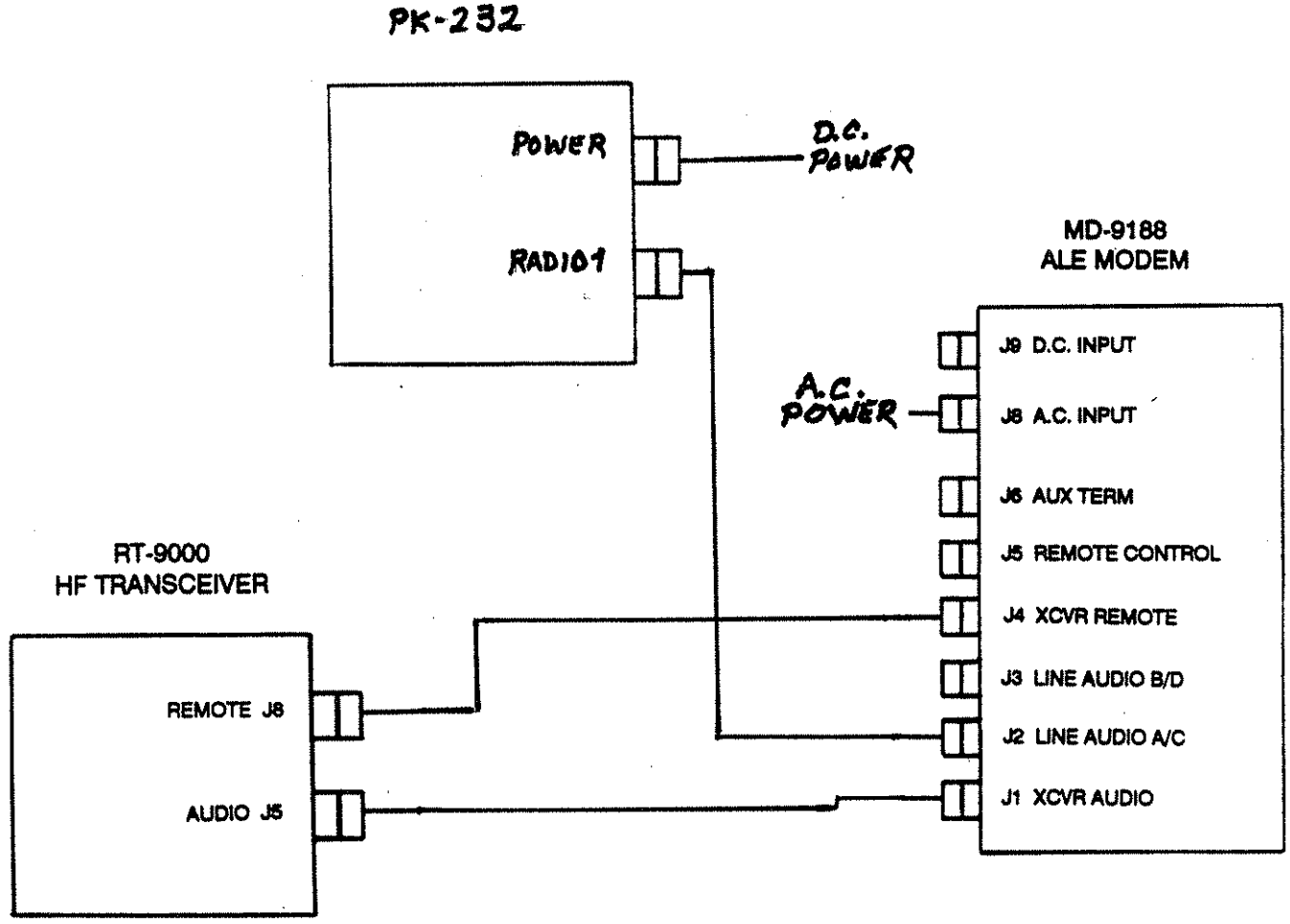
Cable Wiring Diagram



System Interconnect Diagram.

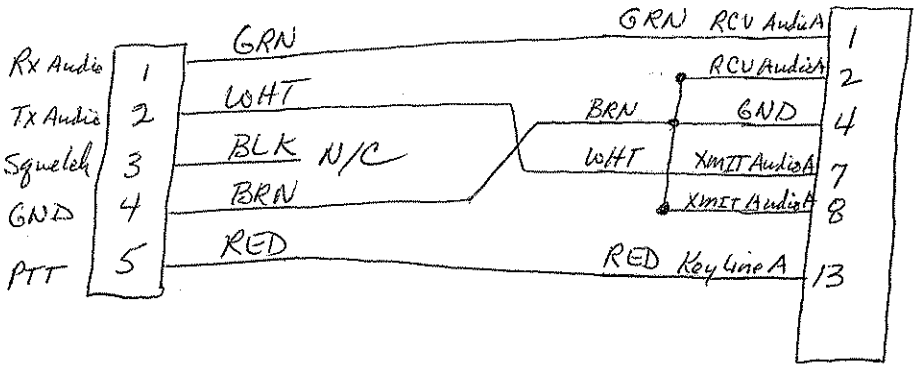


Cable Wiring Diagram



System Interconnect Diagram.

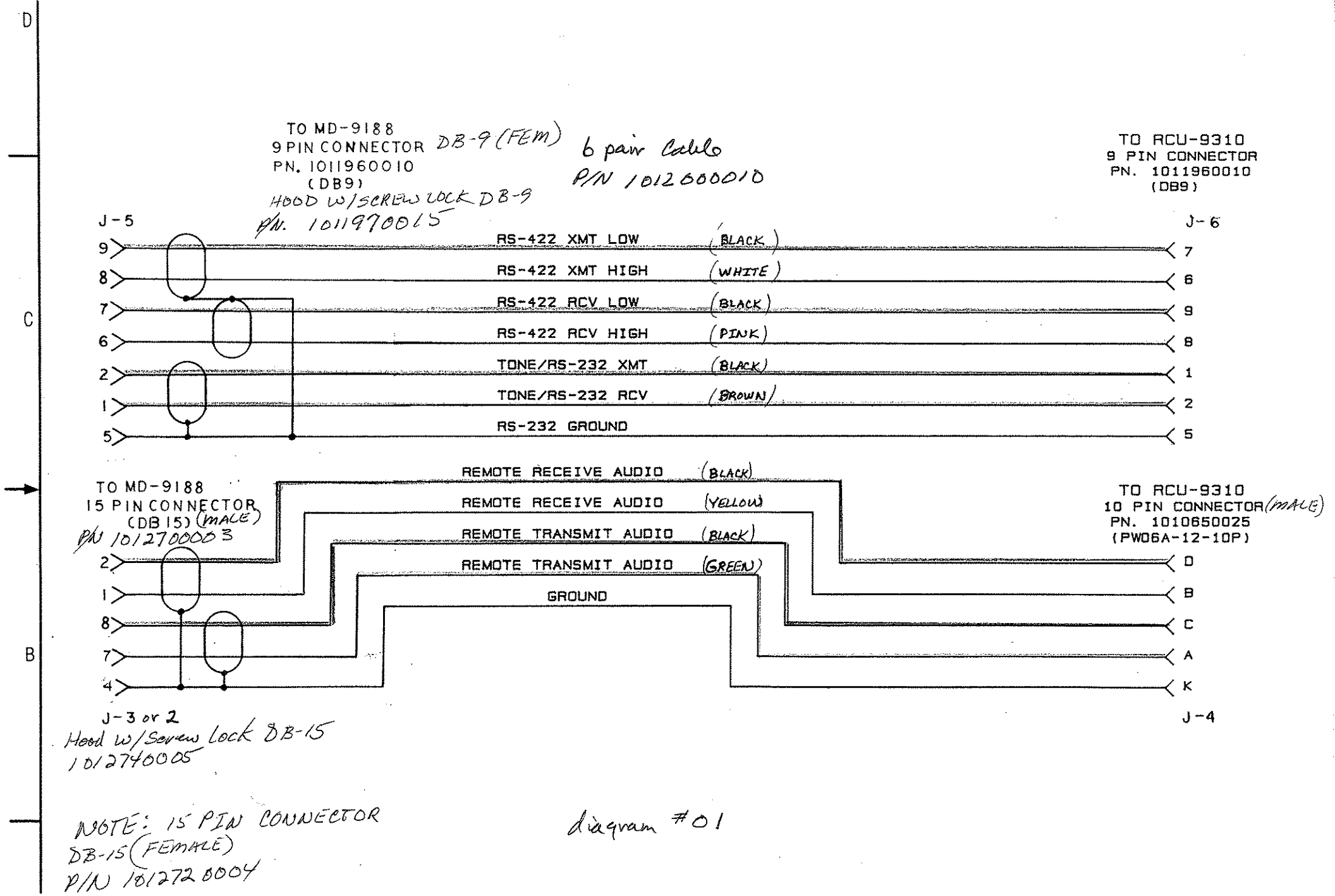
To J2 on MD-9188

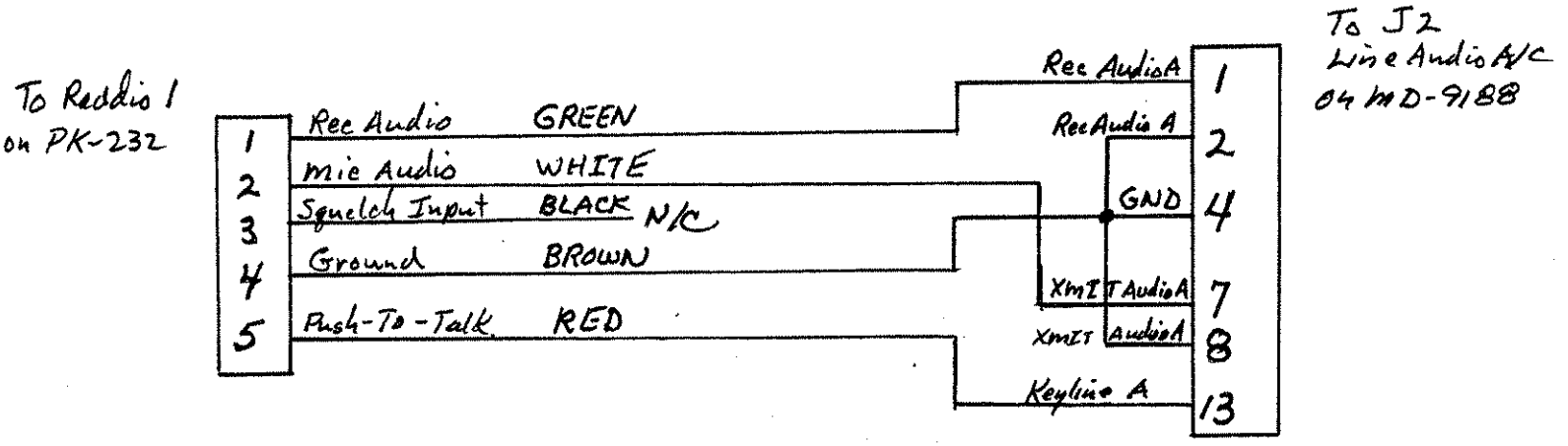


15 Pin Male.
Line A audio

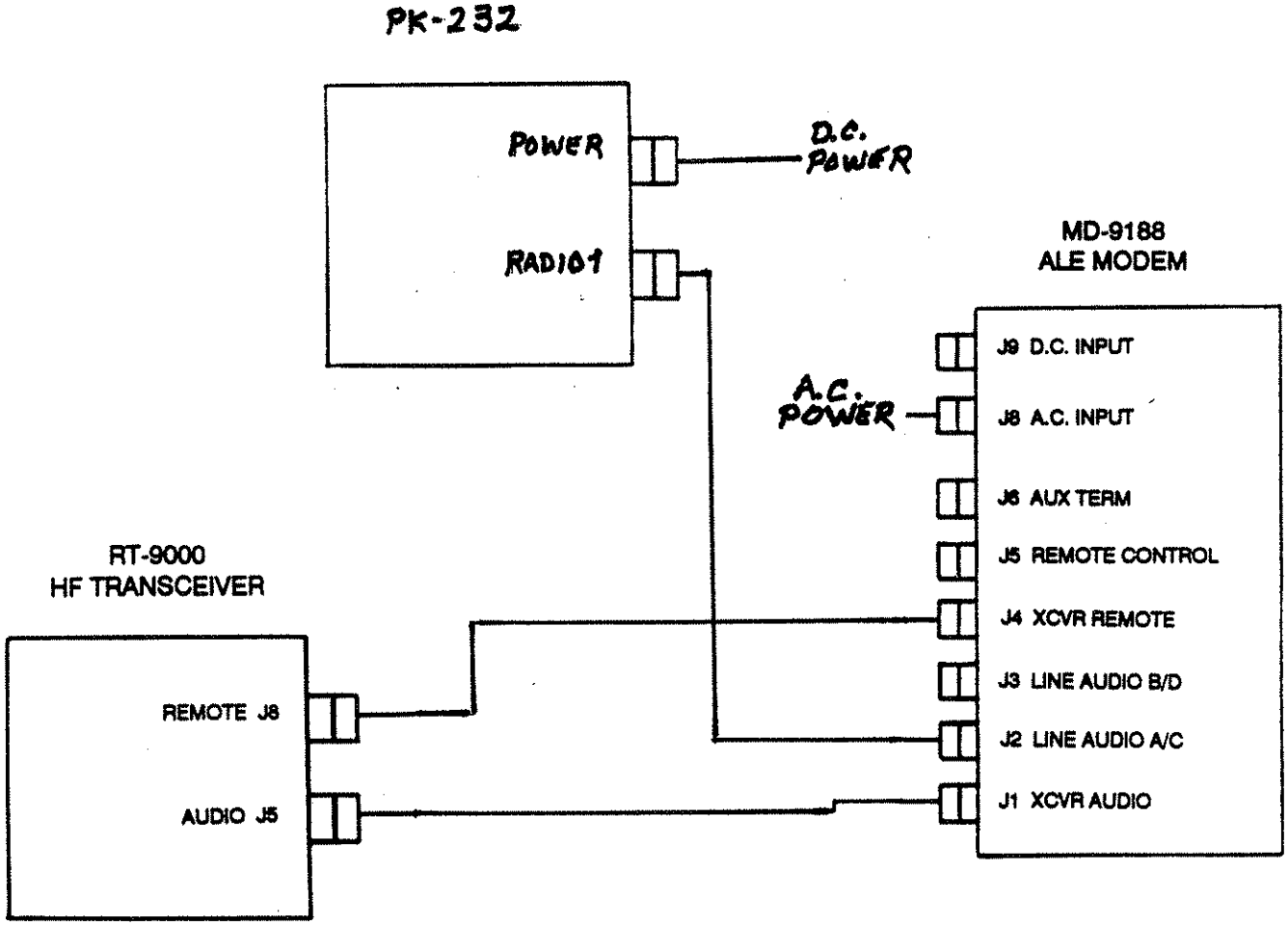
ON RT-9000 Select Line Audio A.

J-5 MD-9188


TO MD-9188
9 PIN CONNECTOR DB-9 (FEM)
PN. 1011960010
(DB9)
HOOD W/SCREW LOCK DB-9
P/N. 1011970015
6 pair Cable
P/N 1012000010
TO RCU-9310
9 PIN CONNECTOR
PN. 1011960010
(DB9)
J-5
J-6
9
8
7
6
2
1
5
RS-422 XMT LOW (BLACK)
RS-422 XMT HIGH (WHITE)
RS-422 RCV LOW (BLACK)
RS-422 RCV HIGH (PINK)
TONE/RS-232 XMT (BLACK)
TONE/RS-232 RCV (BROWN)
RS-232 GROUND
7
6
9
8
1
2
5
TO MD-9188
15 PIN CONNECTOR
(DB15) (MALE)
P/N 1012700003
REMOTE RECEIVE AUDIO (BLACK)
REMOTE RECEIVE AUDIO (YELLOW)
REMOTE TRANSMIT AUDIO (BLACK)
REMOTE TRANSMIT AUDIO (GREEN)
GROUND
2
1
8
7
4
D
B
C
A
K
TO RCU-9310
10 PIN CONNECTOR (MALE)
PN. 1010650025
(PW06A-12-10P)
J-3 or 2
Hood w/Screw Lock DB-15
1012740005
J-4
NOTE: 15 PIN CONNECTOR
DB-15 (FEMALE)
P/N 1012720004
diagram #01



Cable Wiring Diagram



System Interconnect Diagram.

6.3 OPTIONAL RCU-9310 TO MD-9188 AUDIO HARDWIRED

RCU-9310 @ J-4

10 PIN CONNECTOR

P/N 10106500025

(PWO6A-12-10P)

MD-9188

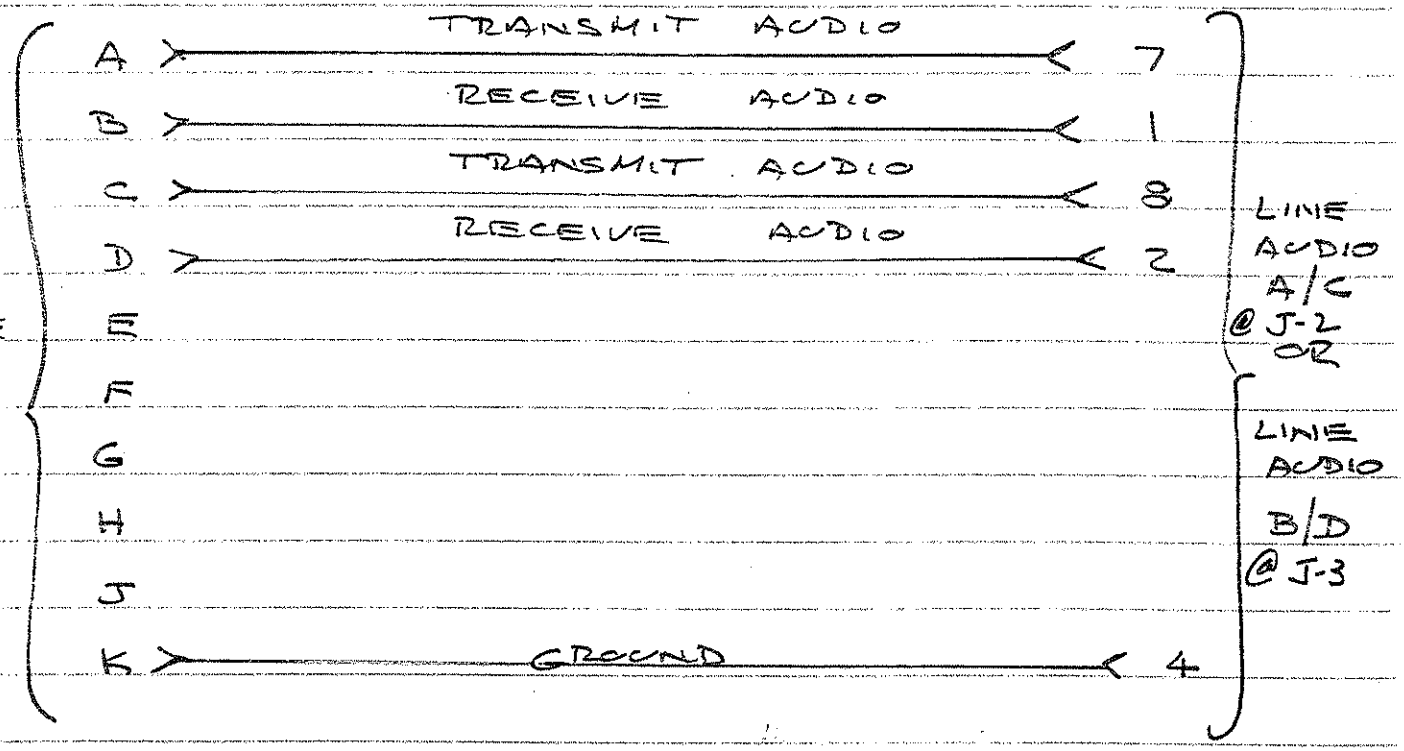
15 PIN CONNECTOR

DB-15 (MALE)

P/N 1012700003

HOOD W/SCREW LOCK

P/N 1012740005



RCU-9310/MD-9188 AUDIO CABLE

addendum WHCA

Fig 6.[redacted]

SUNAIR RT-9000/MD-9188 LQA VALUE TO SINAD CONVERSION

DISPLAYED VALUE	dB SINAD	DISPLAYED VALUE	dB SINAD
1	1	G	16
2	2	H	17
3	3	I	18
4	4	J	19
5	5	K	20
6	6	L	21
7	7	M	22
8	8	N	23
9	9	O	24
A	10	P	25
B	11	Q	26
C	12	R	27
D	13	S	28
E	14	T	29
F	15	U	30

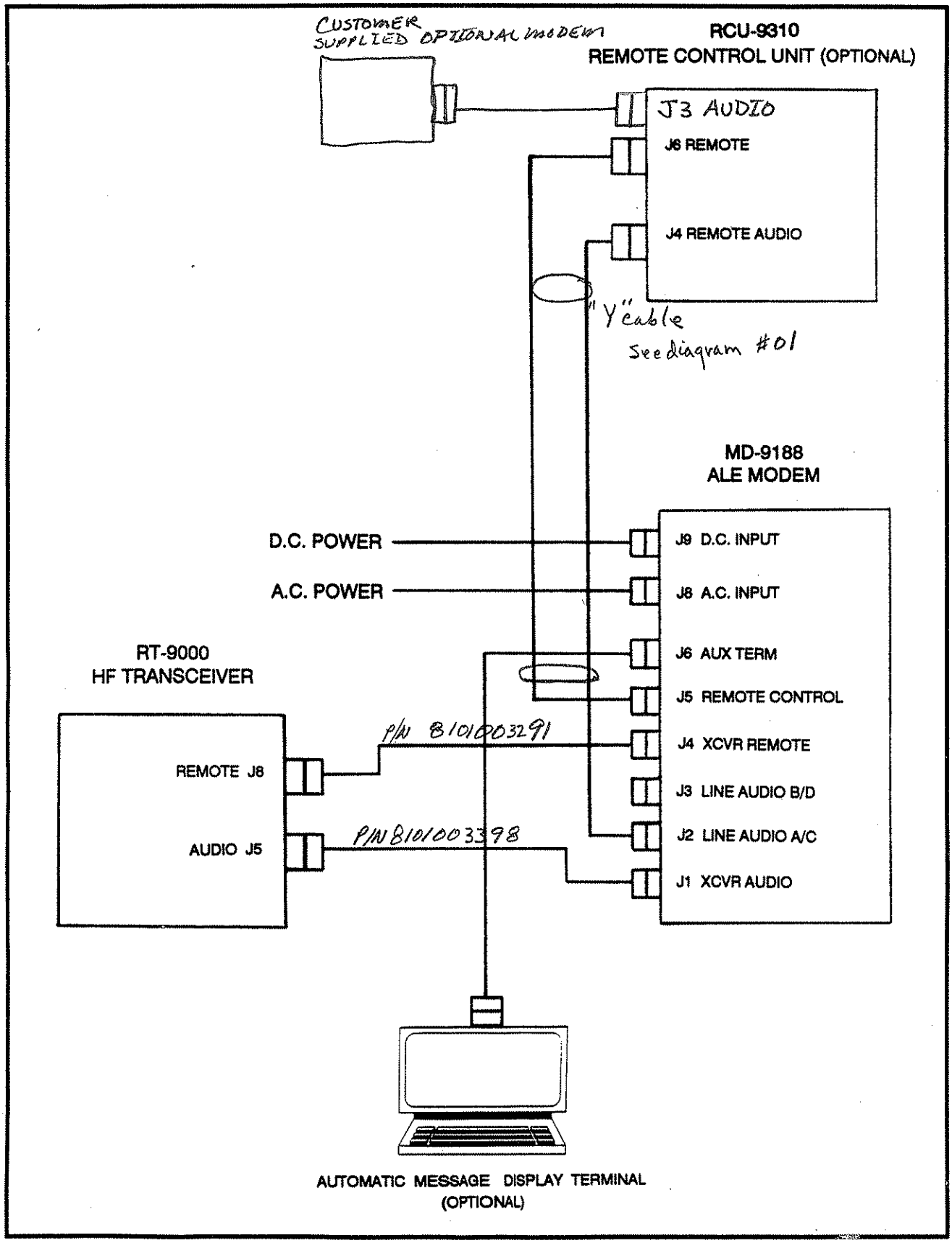


Figure 2.4.1.2 RT-9000/MD-9188 System Interconnect Diagram.

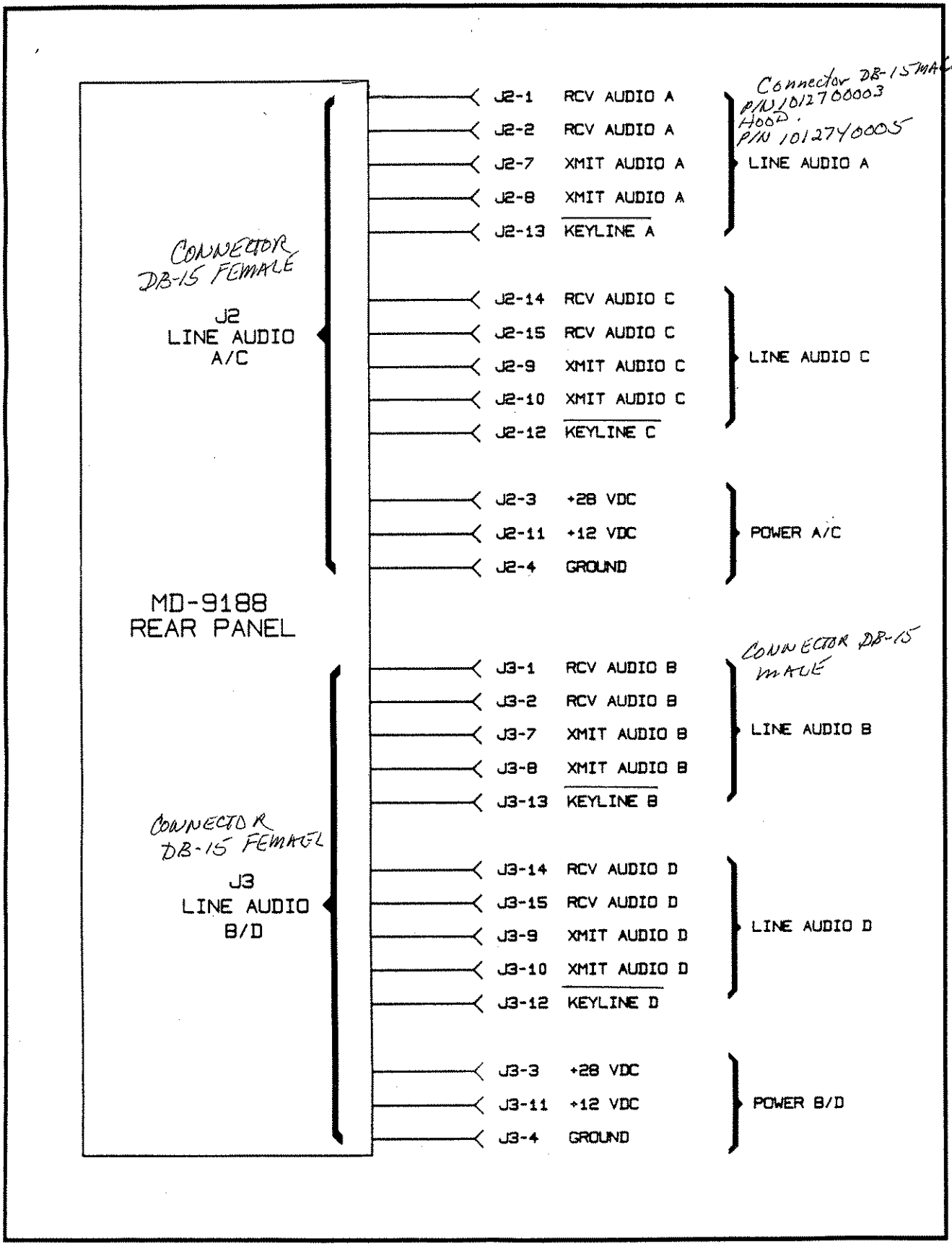
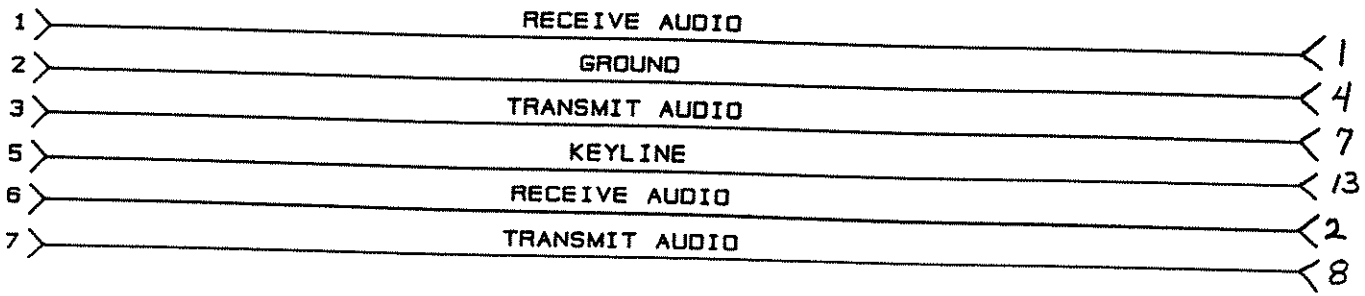


Figure 2.4.1.3 MD-9188 RCV/XMT Line Audio Interface.

RTU-200
CONTROL INTERFACE-P1/P2
9 PIN CONNECTOR
PN. 1011960010
(DB-9)

CABLE, 7 CONDUCTOR, 8 FT
PN. 0604710003

MD-9188
LINE AUDIO A/C J2
15 PIN CONNECTOR



2.4.3 RACK INSTALLATION

The modem may be conveniently mounted in a standard nineteen-inch (19") rack using the rackmount tabs, or 'ears,' attached to the sides of the front panel. In the rack-mounted configuration, the MD-9188 requires a standard panel space of three and one-half inches (3-1/2") high. Refer to Figure 2.4.3 for assembly details.

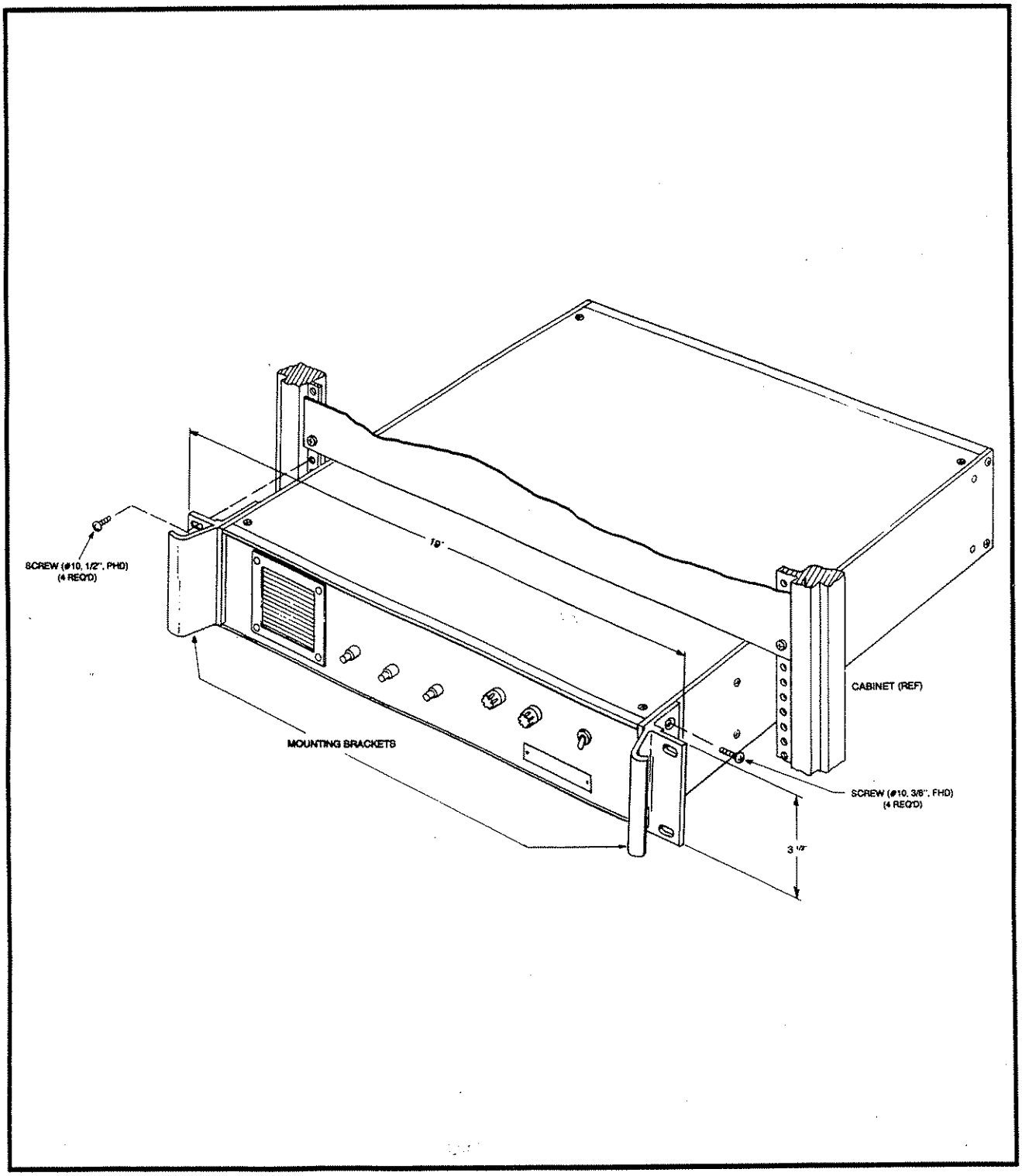


Figure 2.4.3 Installation of MD-9188 in Equipment Rack .

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SECTION III

OPERATION

3.1 GENERAL

As noted in Section I, all ALE operations are controlled through the front panel of the RT-9000 transceiver. Detailed instructions for ALE programming and operation are included in the RT-9000 Installation and Operation Manual.

This section provides the operator with the location and use of the MD-9188 front panel controls and indicators. Refer to Figure 3.1.

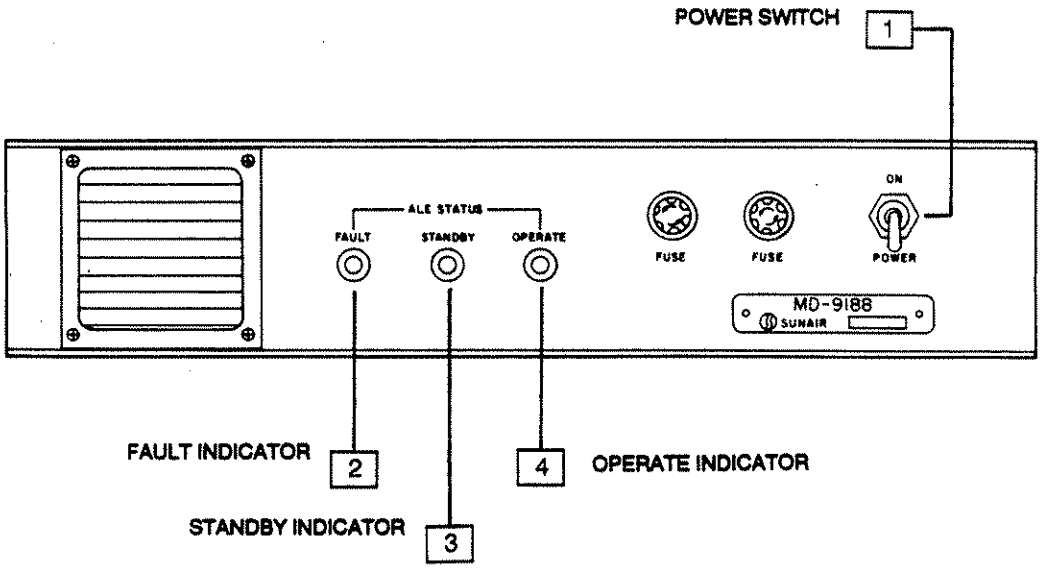

Figure 3.1 MD-9188 ALE Modem, Front Panel Controls and Indicators.

1 POWER ON/OFF SWITCH

When this switch is in the down position, the equipment is off. To apply power, simply place the switch in the 'ON' (up) position.

2 FAULT INDICATOR

When this indicator is on, there is a fault in the operation of the equipment. During the power on sequence, the FAULT indicator is turned on as a lamp test. After about 20 seconds, the FAULT indicator will turn off. If this indicator should turn on at any other time, an internal hardware or software failure has occurred. In this event, the modem will automatically perform a system reset sequence, which will subsequently turn the FAULT indicator off.

3 STANDBY INDICATOR

When this indicator is on, the modem is in the standby state, waiting for a scan command from the RT-9000 transceiver. During the power on sequence, the STANDBY indicator is turned on as a lamp test. After about 20 seconds, the power on sequence will complete, but the STANDBY indicator will remain on. If the modem switches to another state (FAULT or OPERATE) the STANDBY indicator will turn off.

4 OPERATE INDICATOR

When this indicator is on, the modem is in the operate state; i.e., the modem is performing either a transmit or a receive scan. During the power on sequence, the OPERATE indicator is turned on as a lamp test. After about 20 seconds, the OPERATE indicator will turn off. When a scan operation is requested by the RT-9000 transceiver, the OPERATE indicator will turn on. If the scan operation is halted, the OPERATE indicator will turn off.

3.2 PRIMARY OPERATIONS

Once the MD-9188 ALE modem is connected to the RT-9000 transciever and the transceiver is programmed for ALE, power up and use of the modem is relatively straightforward.

Place the front-panel 'POWER' switch in the 'ON' position. The cooling fan will start running and the three ALE status lights (FAULT, STANDBY, and OPERATE) on the front panel will turn on.

After the power is turned on, the modem will perform a power up sequence that will last about 20 seconds. During this sequence, the modem cannot be operated. When the power up sequence is completed, the FAULT and OPERATE lights will turn off and the STANDBY light will remain on. The MD-9188 ALE modem is now ready for operation.

If the preceding events fail to occur, consult the troubleshooting guide in Section V.

NOTE: Whenever the MD-9188 is commanded to begin a receive or transmit scan, the STANDBY light will turn off. The OPERATE light will turn on and will remain on until:

a) the scan is halted by an RT-9000 command;
or
b) a modem fault occurs.

If the scan is halted, the OPERATE light will turn off and the STANDBY light will turn on. If a modem fault occurs, the OPERATE light will turn off and the FAULT light will turn on. If the FAULT light turns on, consult the troubleshooting guide in Section V.

3.3 AUXILIARY TERMINAL USE

The MD-9188 supports the Automatic Message Display (AMD) protocol of FED-STD-1045 through the use of an auxiliary terminal to display, generate, and edit ALE messages. A DEC VT-102-compatible terminal, or a computer that supports VT-102 emulation, must be used.

3.3.1 TERMINAL SETUP

The terminal is connected to the 'AUX TERMINAL' connector on the rear panel of the MD-9188 (refer to Section II). Set up the terminal as follows:

Data Interface - RS-232 (without 20ma current loop)
Transmission Speed - 9600 bits/second
No Parity
Seven Data Bits
Two (2) Stop Bits

3.3.2 TERMINAL OPERATION

Turn on the terminal's power; then turn on the ALE modem. This allows the terminal to stabilze, with a refreshed screen, prior to the modem's power up sequence.

NOTE: When the modem is in the 'STANDBY' mode, the terminal screen may be refreshed by holding down the 'Ctrl' key while pressing 'R.'

Once the terminal and modem are powered up, the following heading will be displayed:

"AMD MESSAGE TRAFFIC"

The modem/terminal will be in one of four (4) AMD modes, as idicated by the display at the bottom of the screen:

[1] "MESSAGE EDIT ..... "EDITING DISABLED"
[2] "MESSAGE SEND ..... "EDITING DISABLED"
[3] "MESSAGE EDIT ..... "EDITING ENABLED"
[4] "MESSAGE SEND ..... "EDITING ENABLED"

The 'Return' ('Enter') key toggles the "MESSAGE EDIT/SEND" function, while the 'Esc' key toggles the "EDITING DISABLED/ENABLED" function.

The cursor movement (arrow) and 'Del(ete)' keys are not supported; the 'Backspace' key is used to correct errors.

NOTE: The keybord 'Caps Lock' (or 'Shift Lock') must be on during message creation or editing. FED-STD-1045 AMD protocol supports UPPER-CASE characters only.

Messages may be up to 90 alphanumeric characters in length. If the character buffer is overrun, a 'beep' will occur, signifying an error. An error beep will also be heard if the operator presses the 'Backspace' key when the cursor is in the first character position.

NOTE: Prior to sending a message, the EDITING function must be DISABLED, otherwise, the message will not be sent.

The following FED-STD-1045 ALE protocols permit the embedding of messages:

Single-Station Link
All Call
Net Call

Unless the MESSAGE EDIT function is enabled, messages will always be embedded and sent when these protocols are invoked.

Each time a message is sent, the terminal at the transmitting station will display:

"AMD MESSAGE TRANSMITTED: (MESSAGE .....)"

Each time a message is received, the terminal at the receiving station will display:

"AMD MESSAGE RECEIVED: (MESSAGE .....)"

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

The theory of operation of the MD-9188 Modem is presented in the following format:

	Corresponding Section #'s:
HARDWARE ASSEMBLIES	4.2
Host Processor Assembly	4.2.1
Digital Signal Processor Assembly	4.2.2
Audio/Display Assembly	4.2.3
Audio Selector Assembly	4.2.4
Power Supply Assembly	4.2.5
SOFTWARE	4.3
ALE Message Transmission Software	4.3.1
ALE Message Reception Software	4.3.2

4.2 HARDWARE ASSEMBLIES

Figure 4.2 shows a block diagram of the major subsections of the MD-9188 and how they interface to each other and the RT-9000 transceiver. The major subsections are the host processor assembly, the digital signal processor assembly, the audio/display assembly, and the power supply assembly These assemblies are described below.

4.2.1 HOST PROCESSOR ASSEMBLY

The host processor assembly performs ALE message management and process control within the modem. This includes transmit message assembly from supplied ALE IDs, ALE ID extraction from the ALE receive message, redundant word interleave/deinterleave, Golay encode/decode, and tribit symbol conversions. All command communications and ALE scan control operations between the MD-9188 and the RT-9000 transceiver are accomplished through the host processor. The host processor consists of and IBM PC/AT-compatible motherboard, a daughtercard containing two RS-232 serial data ports and a parallel data port, and a daughtercard containing a ROM (read only memory) disk drive.

4.2.2 DIGITAL SIGNAL PROCESSOR ASSEMBLY

The digital signal processor assembly performs ALE waveform generation and detection, channel signal-to-noise ratio (SNR) measurement, and channel traffic activity measurement. Symbol data and other information is passed between the host processor assembly and the digital signal processor.

Data transfer requests are interrupt-driven from the digital signal processor or polled by the host processor. The digital signal processor assembly uses an AT&T DSP32 and an AT&T T7525 high-precision PCM coder/decoder.

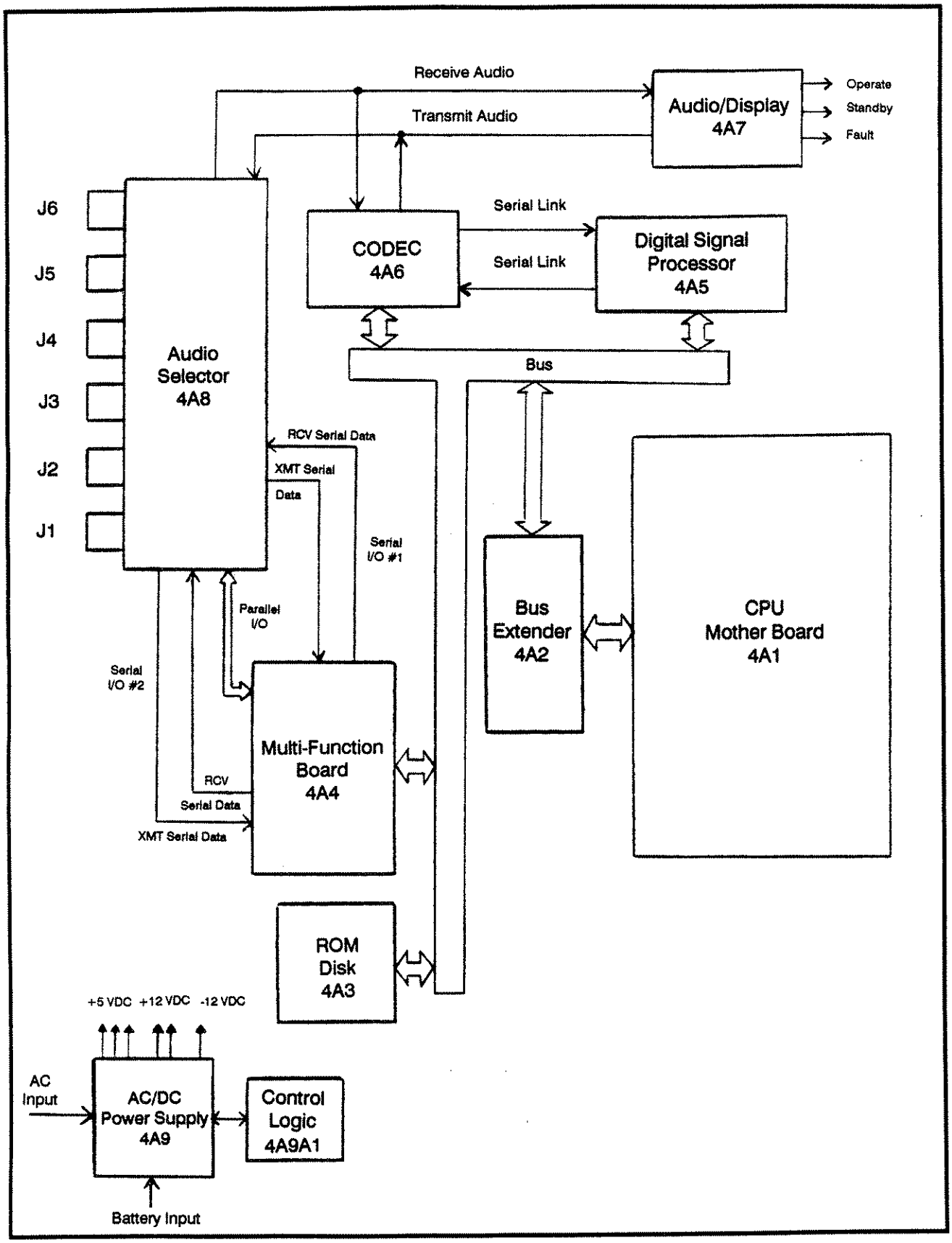

Figure 4.2. MD-9188 ALE Modem, Block Diagram.

4.2.3 AUDIO/DISPLAY ASSEMBLY

The audio/display assembly provides interface between the RT-9000 transceiver and the MD-9188 front panel, and the host processor and digital signal processor assemblies. Buffering of control lines for the keyline, scan interrupt, and front panel display indicators is provided on this assembly. In addition, circuitry is also provided for translation between doubly-balanced, 600-ohm audio signals externally and single-ended, 8-ohm audio internally.

4.2.4 AUDIO SELECTOR ASSEMBLY

The audio selector assembly provides switched access to the transmit and receive audio of the RT-9000 transceiver. Up to four audio receive and/or transmit lines can be attached to the RT-9000 through the assembly (see section 2.4.1). Each audio source may have its own keyline to control the transceiver. The operation of the audio selector assembly is performed by the RT-9000 and is transparent to the operations of the modem. When the modem keyline is active, the modem audio overrides the audio from the switched audio sources. In addition, the audio selector assembly provides interface between XCVR Audio (J1), Line Audio A/C (J2), Line Audio B/D (J3), XCVR Remote (J4), Remote Control (J5), and the Aux. Terminal (J6) connectors on the rear panel.

4.2.5 POWER SUPPLY ASSEMBLY

The power supply assembly consists of an input transformer, rectifier and filter circuits, a DC-to-DC converter, and relay-controlled changeover circiuts. With both AC and DC power connected, the supply will automatically sense AC line reductions or failure and switch to the DC backup voltage.

Supply voltages and ground are provided through standard power supply connectors to the host processor board.

Supply voltage and ground are provided to the audio/display assembly via a disk drive power supply cable and Molex connector. An additional disk drive power supply connector is provided to allow the modem to supply power to an external floppy disk drive for system testing.

A power supply partition encloses the power supply, providing EMI shielding while allowing air flow through the modem.

4.3 MODEM SOFTWARE PROCESSES

The host processor and digital signal processor assemblies provide the hardware platform for the modem software. It is the software that gives most of the performance characteristics to the MD-9188. To the operator, the software consists of two elements. These are the ALE message transmission software and the ALE message reception software. Both are described below.

4.3.1 ALE MESSAGE TRANSMISSION SOFTWARE

Figure 4.3.1 shows the processes of ALE message formation and symbol generation. First, the ALE self ID and call ID are acquired. The self ID comes from the Sunair RT-9000 transceiver when a receive or transmit scan is requested. The call ID either comes from the RT-9000 when a transmit scan is requested or from the calling station's message during a receive scan. The characters must come from the basic 38-character ASCII set, excluding the wildcard character (the question mark, '?').

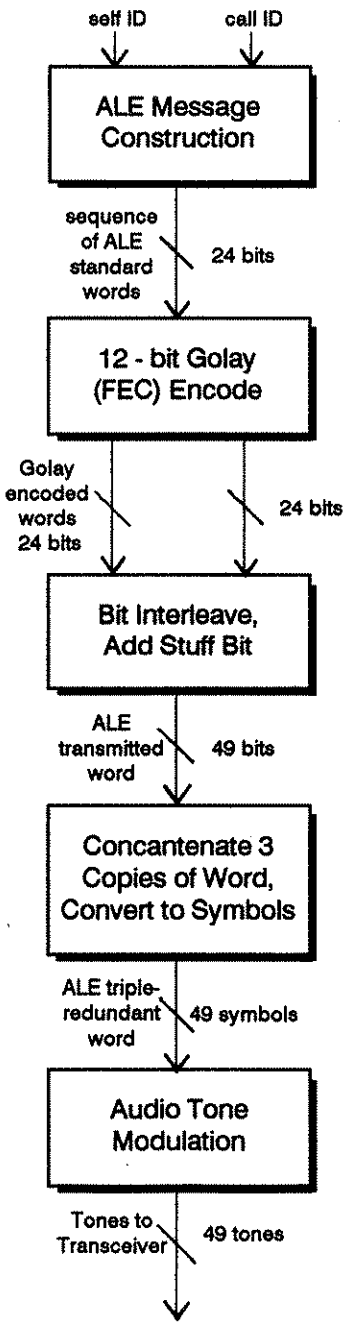

Figure 4.3.1 ALE Message Transmission Process.

IDs are broken into three-character words of 21 bits, with the 'at-sign' (@) character appended as needed to fill out the last word. Three preamble bits are then added to the beginning of each word according to the word's position in the message. These combined elements form the 24-bit ALE standard word as described in MIL-STD-188-141A and FED-STD-1045.

Next, the 24-bit standard word is broken into two 12-bit elements which are then Golay encoded for forward error correction (FEC). Mode 3/4 (up to 3 errors detected and corrected, up to 4 errors detected but not correctable) is used for the Golay encoding of both of the word elements. The two 24-bit encoded elements are then interleaved to form a 48-bit word and a 'stuff bit' added as the 49th bit of the complete transmitted word. Each transmitted word is sent three times in succession forming one ALE redundant word. The bits of the redundant word are grouped into 49 symbols of three bits each. The 49 symbols of the redundant word are then sent to the digital signal processor for modulation.

The modulation process takes each symbol and produces a corresponding tone with a duration of 8 milliseconds. The transition between each tone occurs at a zero-crossing point in the signal waveform and each tone has the same amplitude. The transmission of the 49 symbols of one ALE redundant word occurs in the digital signal processor while the next redundant word is being created by the host processor.

4.3.2 ALE MESSAGE RECEPTION SOFTWARE

Figure 4.3.2 on the following page, shows the processes of ALE symbol detection and message reception. Symbol detection is accomplished in the digital signal processor. During the ALE message receive operation, the digital signal processor monitors the audio channel for ALE tones. Any tones received must belong to the ALE tone constellation and have the proper timing. The detection algorithm synchronizes with a sequence of ALE tones as they are received. Synchronization is maintained even under suboptimal channel conditions such as multipath and broadband interference.

As each symbol is detected, a real-time estimate of the ratio of the signal- and noise-to-noise plus interference (SINAD) is calculated.

The SINAD value is passed to the host processor along with the symbol value. The host processor accumulates the SINAD values to form an average SINAD value for the ALE message. This average SINAD value is used for link quality analysis (LQA) to determine if the channel is of acceptable quality for use. The symbols are buffered until a sufficient number are acquired to form an ALE redundant word. A majority vote is taken of the three transmitted words of the redundant word and a count of the number of non-unanimous votes is made for the two 24-bit Golay encoded words and the stuff bit. The two words are then Golay decoded (using mode 3/4) and forward error corrected to yield a received 24-bit ALE standard word.

After the ALE redundant word is decoded into the ALE standard word, a number of tests are performed to determine redundant word sync, bit error rate, and proper message reception. The number of error bits detected in each Golay word is used along with non-unanimous bit count to determine ALE redundant word synchronization. The non-unanimous bit count is also used for bit error rate (BER) estimation. When redundant word sync is achieved, each standard word is checked for proper ID characters and preamble bits in the context of the word's position in the received message (i.e., message parsing). The address characters in the call ID of the message must match those of the self ID of the receiving station. The address characters in the self ID of the message must also match those of the call ID that the receiving station is listening for if the call ID is already known.

Upon successful link establishment, the self ID, call ID, and an LQA figure of merit are sent to the RT-9000 transceiver. The LQA figure of merit is an alphanumeric character that is related to the SINAD of the message in dB. This information is displayed on the message display of the RT-9000.

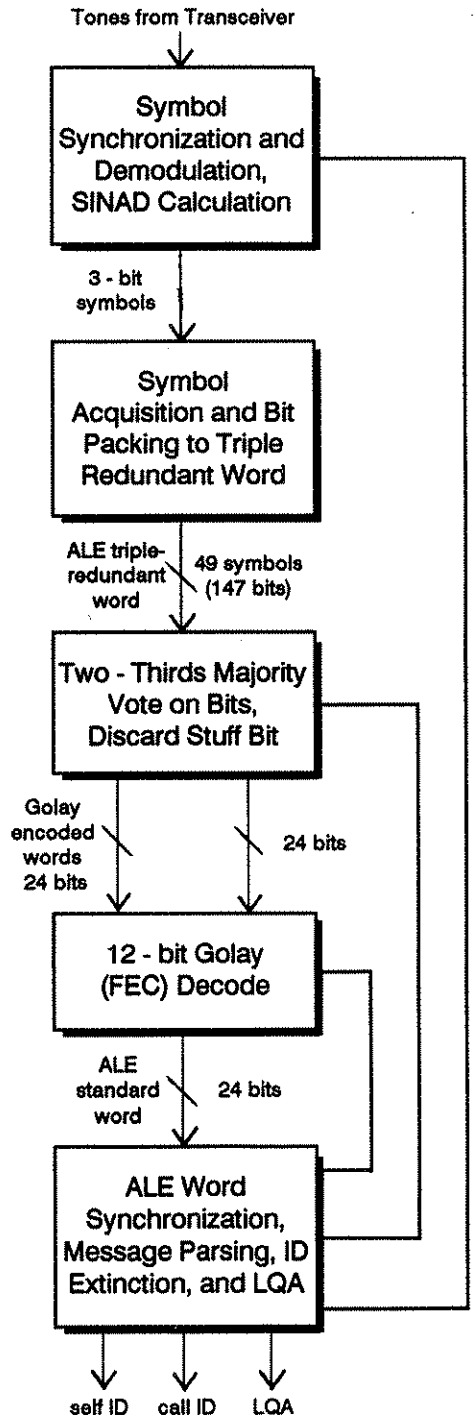

Figure 4.3.2 ALE Message Reception Process.

SECTION V

FAULT ISOLATION/MAINTENANCE AND REPAIR

5.1 GENERAL

This section provides guidelines for Fault Isolation, maintenance and repair to the Lowest Repairable Unit (LRU) level.

NOTE: There are no user adjustments in this modem. All adjustments are preset at the factory and should not be attempted in the field. Replacement PC board assemblies contain preset factory adjustments and require no further adjustments on installation.

5.2 DISASSEMBLY

Disassembly should be only to the extent necessary to accomplish the repair or replacement of the defective LRU. Procedures for disassembly of assemblies are given in the following paragraphs.

5.3 TEST EQUIPMENT REQUIRED or EQUIVALENT

Multimeter or	Simpson 260
Digital Voltmeter	Leader LDM-853A

5.4 MODEM FAULT ISOLATION GUIDE

NOTE: The following PC assemblies have factory set DIP switches and/or jumper plugs. When the POSSIBLE TROUBLE refers to these assemblies check the switch settings and/or jumpers to be sure they have not changed from the factory settings.

See the following illustrations for reference:

CPU Mother Board Assembly 4A1, see Figure 5.4.1.

ROM Disk Board Assembly 4A3, see Figure 5.4.2.

Multifunction Board Assembly 4A4, see Figure 5.4.3.

Digital Signal Processor Assembly 4A5, see Figure 5.4.4.

CODEC Board Assembly, see Figure 5.4.5.

MODEM FAULT ISOLATION GUIDE.

SYMPTOM(s)	POSSIBLE TROUBLE(s)	CORRECTIVE ACTION(s)
AC Power Only: When power switch is turned ON, the status lights fail to light and power supply fan does not run.	1. No AC power. 2. Open front panel AC fuses 4AF1 and F2. 3. Faulty AC/DC power supply 4A9.	1. Check for AC input. 2. Replace F1 and F2 as required. If fuses open again, troubleshoot power supply. See section 5.5. 3. Troubleshoot power supply. See section 5.5.
DC Power Only: When power switch is turned ON, the status lights fail to light and power supply fan does not run.	1. No DC power. 2. 4A9 F1 open. 3. Faulty AC/DC power supply 4A9.	1. Check for DC input. 2. Remove modem from rack and remove top cover by removing 4 corner screws, see Figure 2.4.1.1. Remove Power Supply Cover, see Figure 5.4.6, by removing the 6 screws. Replace F1 as required, see Figure 5.4.7. If F1 opens again, troubleshoot power supply, see section 5.5. 3. Troubleshoot power supply, see section 5.5.
AC or DC Power: When power switch is turned ON the status lights turn ON, but power supply cooling fan 4AB1 does not run.	1. 4AB1 faulty. 2. Faulty 4A9 U2 or associated circuitry.	1. Use DVM to measure 4A9J1 pins 5+ and 6- for +12 VDC. Remove and replace 4AB1 as required. 2. Use normal troubleshooting techniques and check U2 and associated circuitry. Remove and replace faulty components or Remove and replace 4A9 power supply P.C. board. Return faulty 4A9 to factory for repair. See Figures 5.4.6 and 5.4.7.
AC or DC Power: When power switch is turned ON 4AB1 runs but one or more of the status lights do not light.	1. Faulty lamps. 2. Faulty Audio/Display board assembly 4A7.	1. Remove and replace lamps as required. 2. Remove and replace 4A7. Return faulty 4A7 to factory for repair. See Figures 5.4.6 and 5.4.8.

MODEM FAULT ISOLATION GUIDE, *Continued ...*

SYMPTOM(s)	POSSIBLE TROUBLE(s)	CORRECTIVE ACTION(s)
AC or DC Power: When power switch is turned ON 4AB1 runs, but status lights fail to light.	1. Faulty Audio/Display board assembly 4A7. 2. Faulty Multifunction board assembly 4A4 **NOTE:** -12 V from power supply 4A9 is used only by 4A4 and 4A6 assemblies. To make sure fault is not caused by power supply 4A9, Use DVM and check -12 V out of power supply at J3, pin 6, before replacing 4A4. If -12 V is faulty go to section 5.5 for troubleshooting power supply 4A9. 3. Faulty power supply assembly 4A9.	1. Remove and replace 4A7. Return faulty 4A7 to factory for repair. 2. See Figures 5.4.6 and 5.4.9. Remove subassemblies 4A2 thru 4A6. Reinstall as in Figure 5.4.10. Remove and replace 4A4. Return faulty 4A4 to factory for repair. 3. Troubleshoot power supply, see section 5.5.
AC or DC Power: When power switch is turned ON, all status lights turn on and remain lit. (Modem does not go to STANDBY state).	1. Faulty CPU Mother board assembly 4A1, ROM Disk board assembly 4A3, Multifunction board assembly 4A4, or Audio/Display board assembly 4A7. **NOTE:** Before replacing 4A4 assembly use DVM to check for -12 V output at 4A9J3 pin 6. If -12 V is faulty, go to section 5.4 for troubleshooting power supply 4A9.	1. See Figure 5.4.6. Remove subassemblies 4A2 thru 4A6, Reinstall as in Figure 5.4.10. Remove and replace 4A3, 4A4, 4A7, and 4A1 assemblies one at a time to determine faulty board. Return faulty board assembly to factory for repair.
The modem performs power up sequence properly but does not go into the OPERATE state when commanded to perform a receive or transmit scan.	1. The serial data cable is not properly connected to modem or the RT-9000. 2. Faulty Multifunction board 4A4.	1. See Figure 2.4.1.2 and make sure Serial Data Cable is properly connected. 2. See Figures 5.4.6 and 5.4.10. Remove and replace 4A4 assembly. Return faulty 4A4 assembly to factory for repair.

MODEM FAULT ISOLATION GUIDE, *Continued ...*

SYMPTOM(s)	POSSIBLE TROUBLE(s)	CHECKS & CORRECTIVE ACTION(s)
	NOTE: Before replacing 4A4 assembly use DVM to check for -12 V output at 4A9J3 pin 6. If -12 V is faulty, go to section 5.5 for troubleshooting power supply 4A9.	
	3. Faulty I/O board assembly 1A2A8 in RT-9000.	3. Refer to RT-9000 manual, section 5.4.
While modem is performing a receive scan, the modem does not respond to ALE messages that are being received.	1. The audio cable is not properly connected to the MD-9188 or the RT-9000.	1. See Figure 2.4.1.2, and check cable connections.
	2. Faulty Multifunction board 4A4, Digital Signal Processor assembly 4A5, CODEC board assembly 4A6, Audio/Display assembly 4A7 or Audio Selector assembly 4A8.	2. See Figure 5.4.6, remove subassemblies 4A4 thru 4A6. Reinstall as in Figure 5.4.10. Remove and replace assemblies 4A4 thru 4A6 one at a time. If symptom still exists, see Figure 5.4.8. Remove and replace 4A7. If symptom still exists, see Figure 5.4.11. Remove and replace 4A8. Return faulty board assembly to factory for repair.
	NOTE: Before replacing 4A4 or 4A6 assemblies, use DVM to check for -12 V output at 4A9J3 pin 6. If -12 V is faulty go to section 5.5 for troubleshooting power supply 4A9.	
	3. Faulty 1A2A1 CPU or 1A2A3 Audio PC assemblies in the RT-9000 Transceiver.	3. Refer to RT-9000 manual, Section 5.4.
While performing a transmit scan, the modem does not key the transmitter and/or does not appear to be generating tones.	1. The audio cable is not properly connected to the MD-9188 or the RT-9000.	1. See Figure 2.4.1.2. Check cable connections.
	2. Faulty Multifunction board 4A4, Digital Signal Processor assembly 4A5, CODEC board assembly 4A6, Audio/Display assembly 4A7 or Audio Selector assembly 4A8.	2. See Figure 5.4.6. Remove subassemblies 4A3 thru 4A6. Reinstall as in Figure 5.4.10. Remove and replace assemblies 4A4 thru 4A6 one at a time. If symptom still exists, refer to Figure 5.4.8. Remove and replace 4A7. If symptom still exists, see Figure 5.4.11. Remove and replace 4A8. Return faulty board assembly to factory for repair.

MODEM FAULT ISOLATION GUIDE, *Continued ...*

SYMPTOM(s)	POSSIBLE TROUBLE(s)	CHECKS & CORRECTIVE ACTION(s)
	NOTE: Before replacing 4A4 or 4A6 assemblies, use DVM to check for -12 V output at 4A9J3 pin 6. If -12 V is faulty go to section 5.5 for troubleshooting power supply 4A9.	
	3. Faulty 1A2A1 CPU or 1A2A3 Audio PC assemblies in the RT-9000 Transceiver.	3. Refer to RT-9000 manual, Section 5.4.
While the modem is in operation, the FAULT state is illuminated momentarily (i.e., the FAULT status light is ON and the STANDBY and OPERATE status lights are OFF) and the modem goes to the STANDBY status.	1. Faulty Multifunction board 4A4, Digital Signal Processor assembly 4A5. NOTE: Before replacing 4A4 assembly, use DVM to check for -12 V output at 4A9J3 pin 6. If -12 V is faulty go to section 5.5 for troubleshooting power supply 4A9.	1. See Figure 5.4.6. Remove subassemblies 4A3 thru 4A6. Reinstall as in Figure 5.4.10. Remove and replace 4A4 and 4A5 one at a time. Return faulty board to factory for repair.

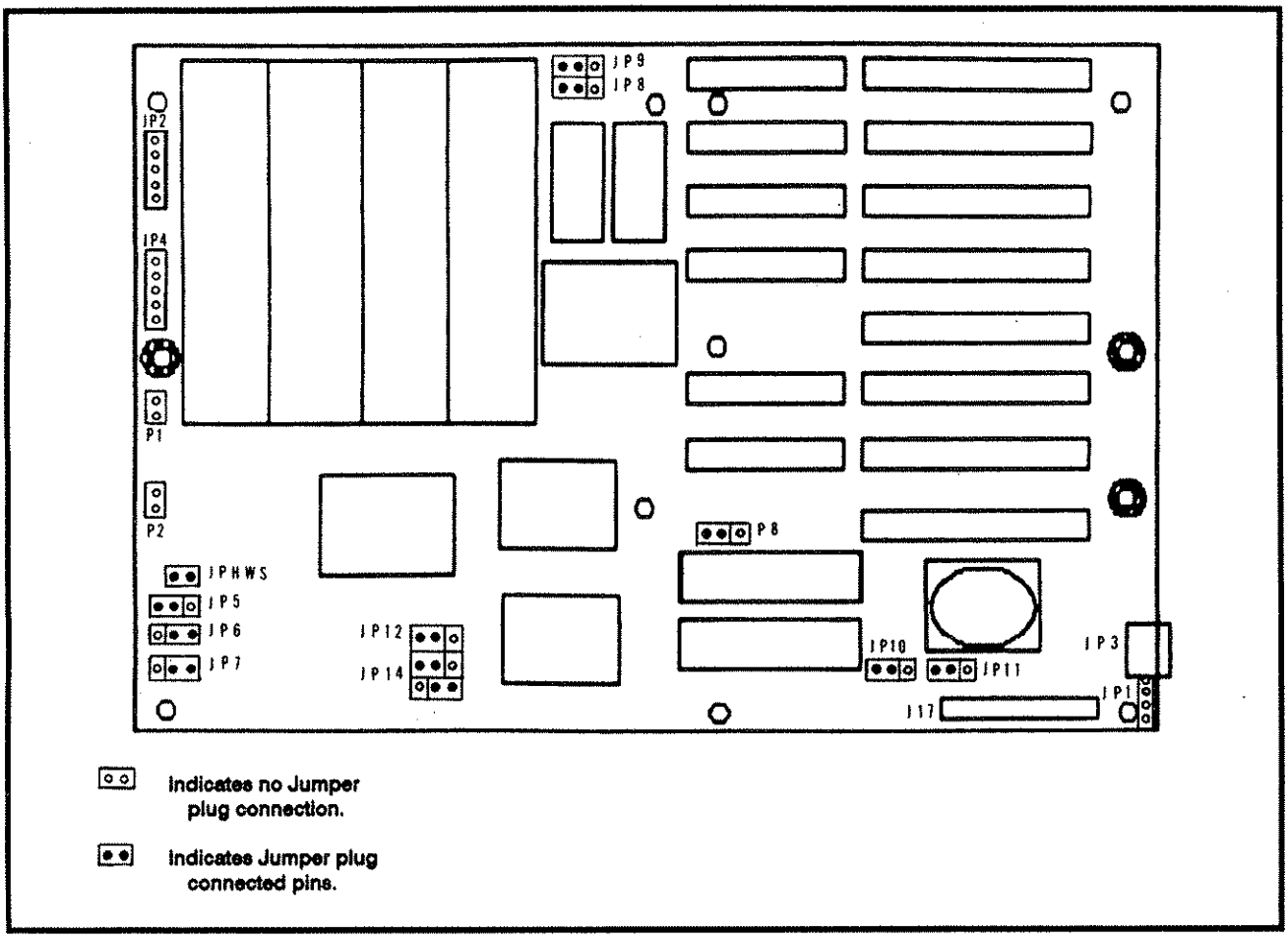

Figure 5.4.1 CPU Mother Board Assy 4A1, Jumper Plug Locations.

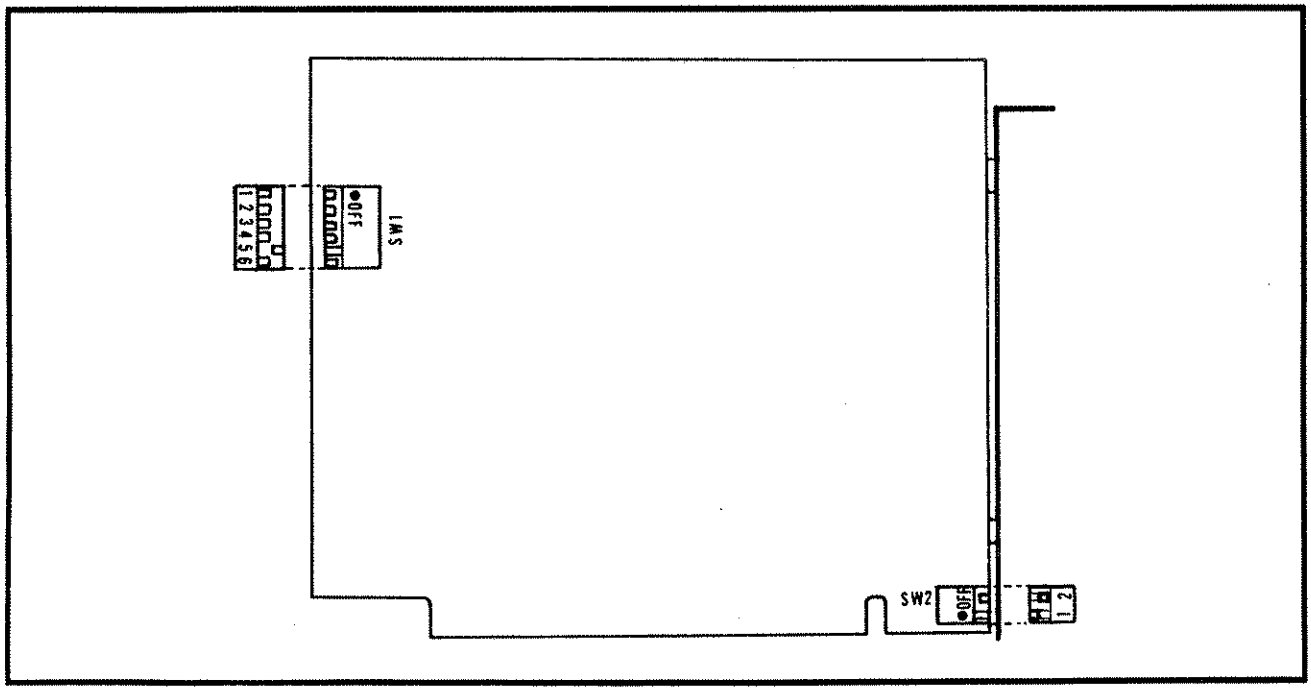

Figure 5.4.2 ROM Disk Board Assy 4A3, DIP Switch Settings.

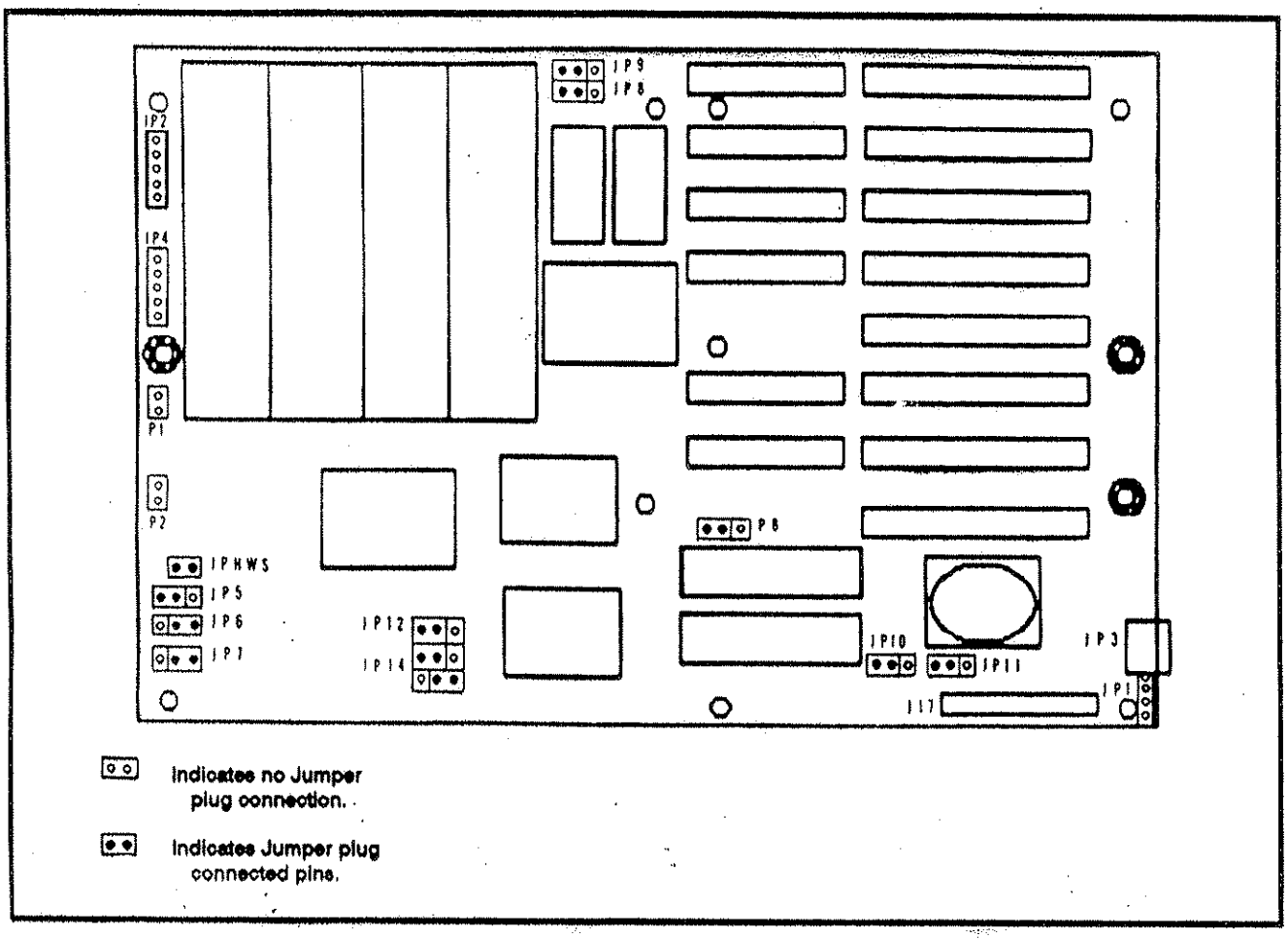

Figure 5.4.1 CPU Mother Board Assy 4A1, Jumper Plug Locations.

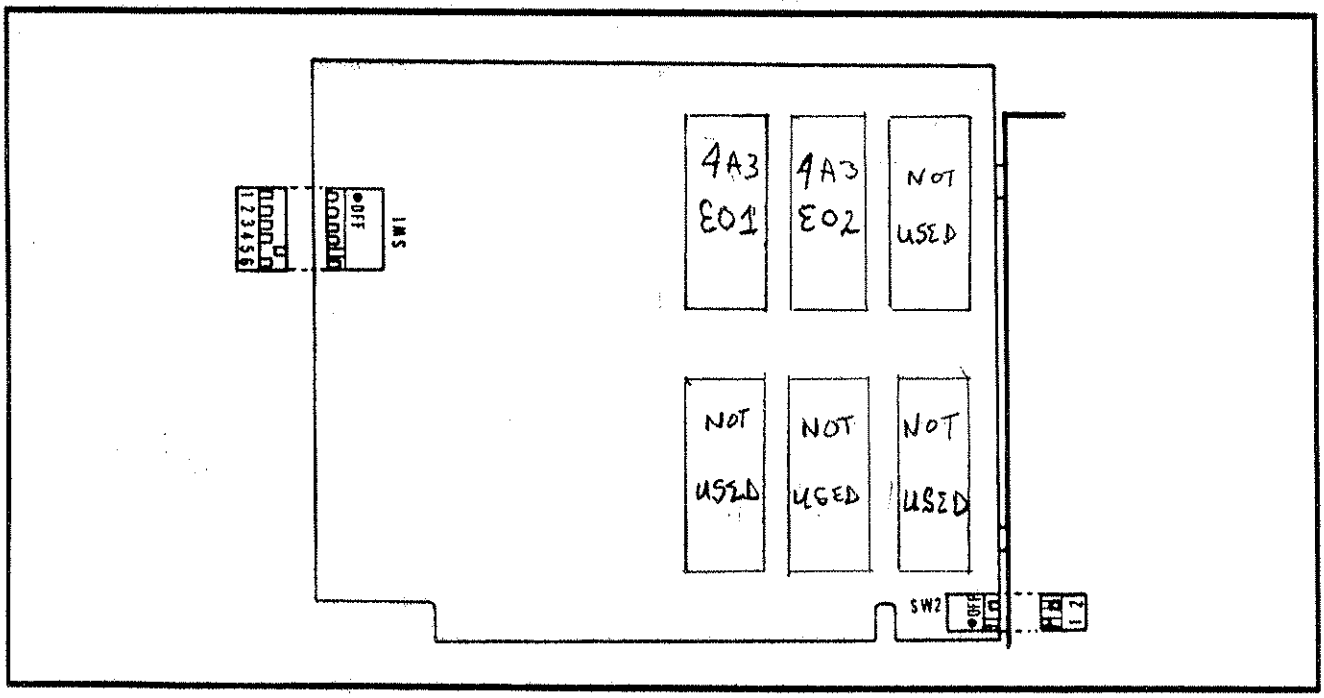

Figure 5.4.2 ROM Disk Board Assy 4A3, DIP Switch Settings.

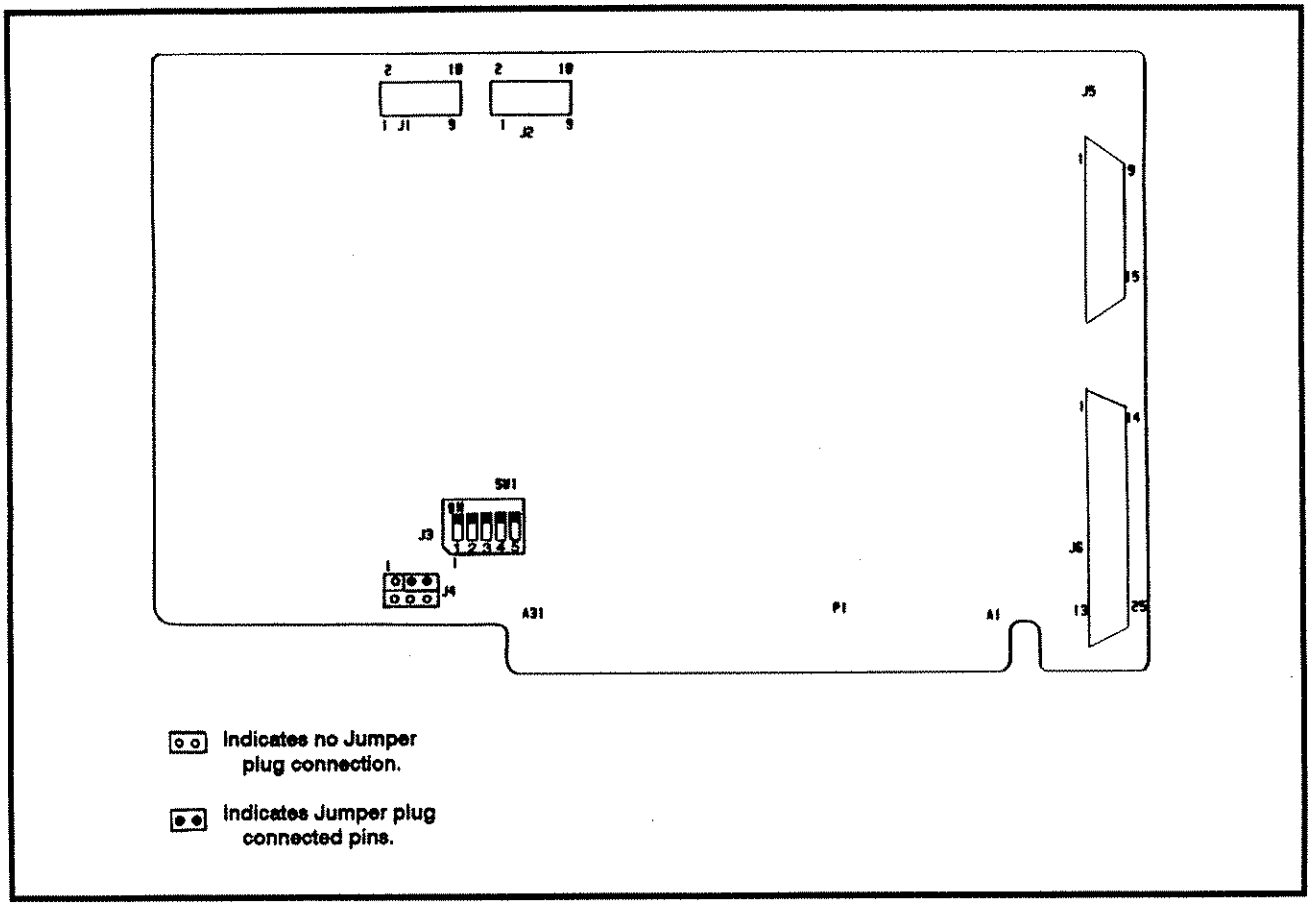

Figure 5.4.3 Multifunction Board Assy 4A4, DIP Switch Settings and Jumper Plug Locations.

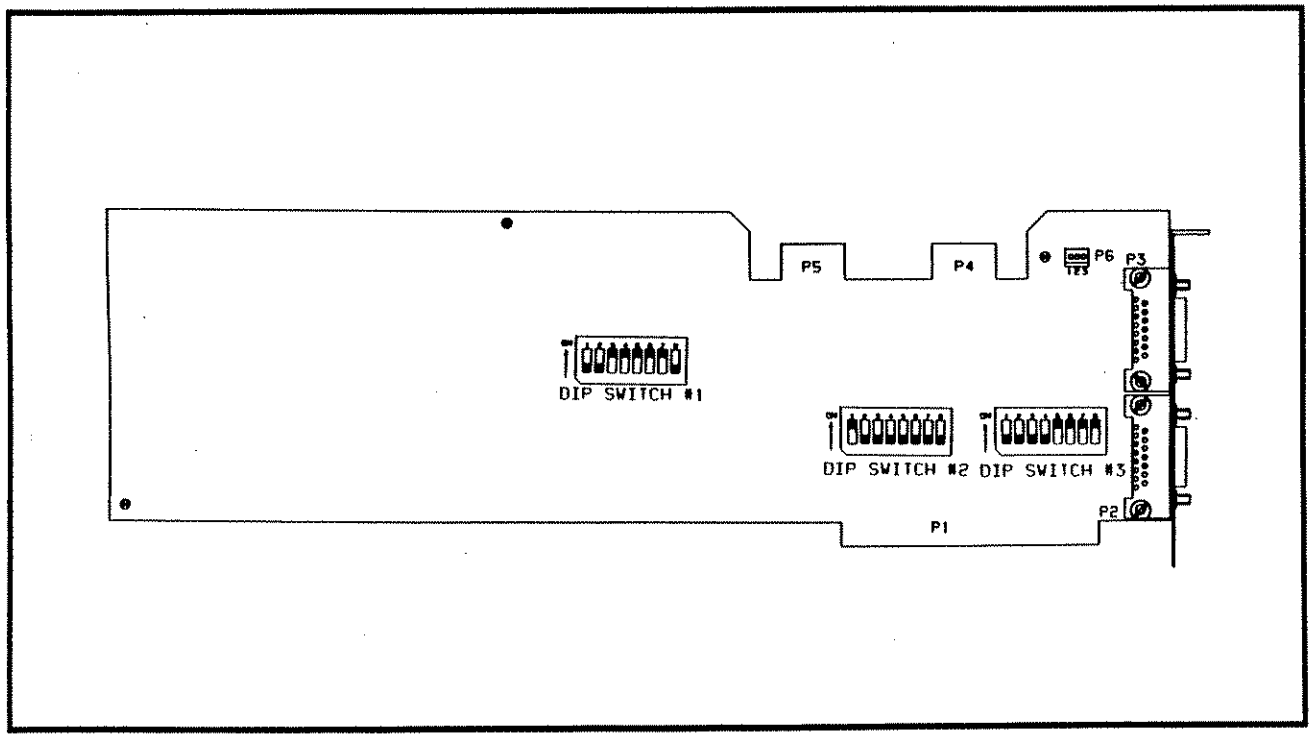

Figure 5.4.4 Digital Signal Processor Assy 4A5, DIP Switch Settings.

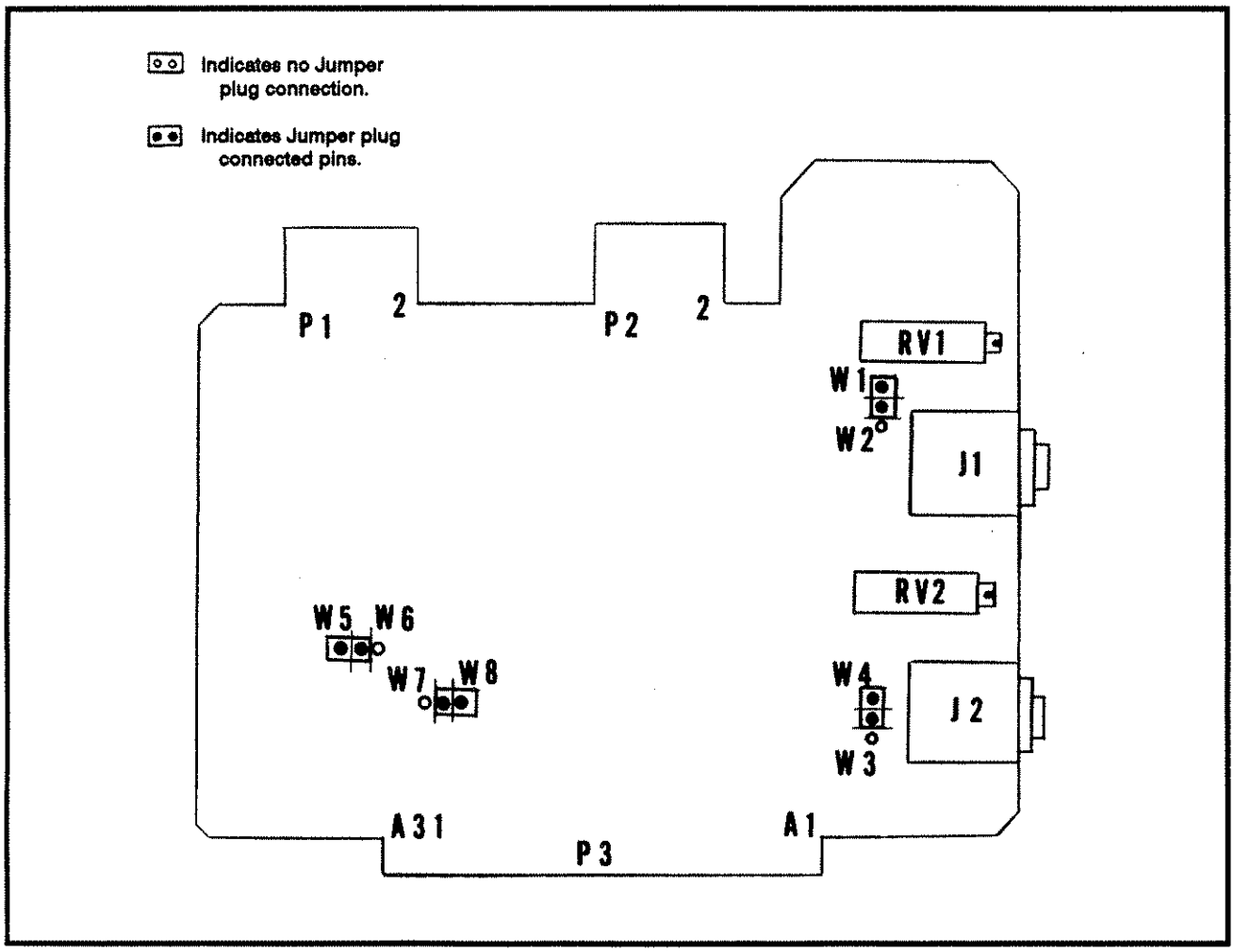

Figure 5.4.5 CODEC Board Assy 4A6, Jumper Plug Locations.

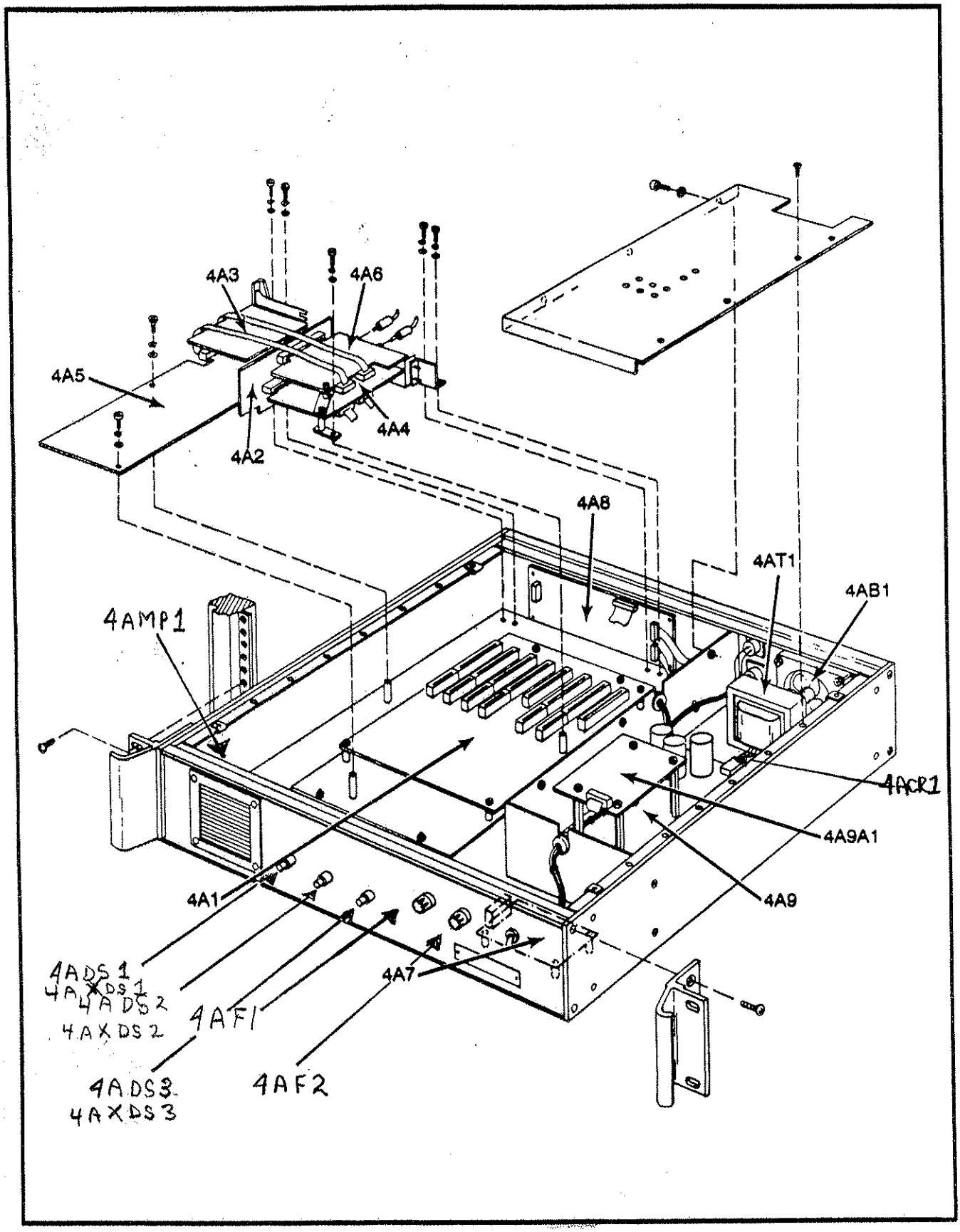

Figure 5.4.6 Removal/Installation of MD-9188 Modules.

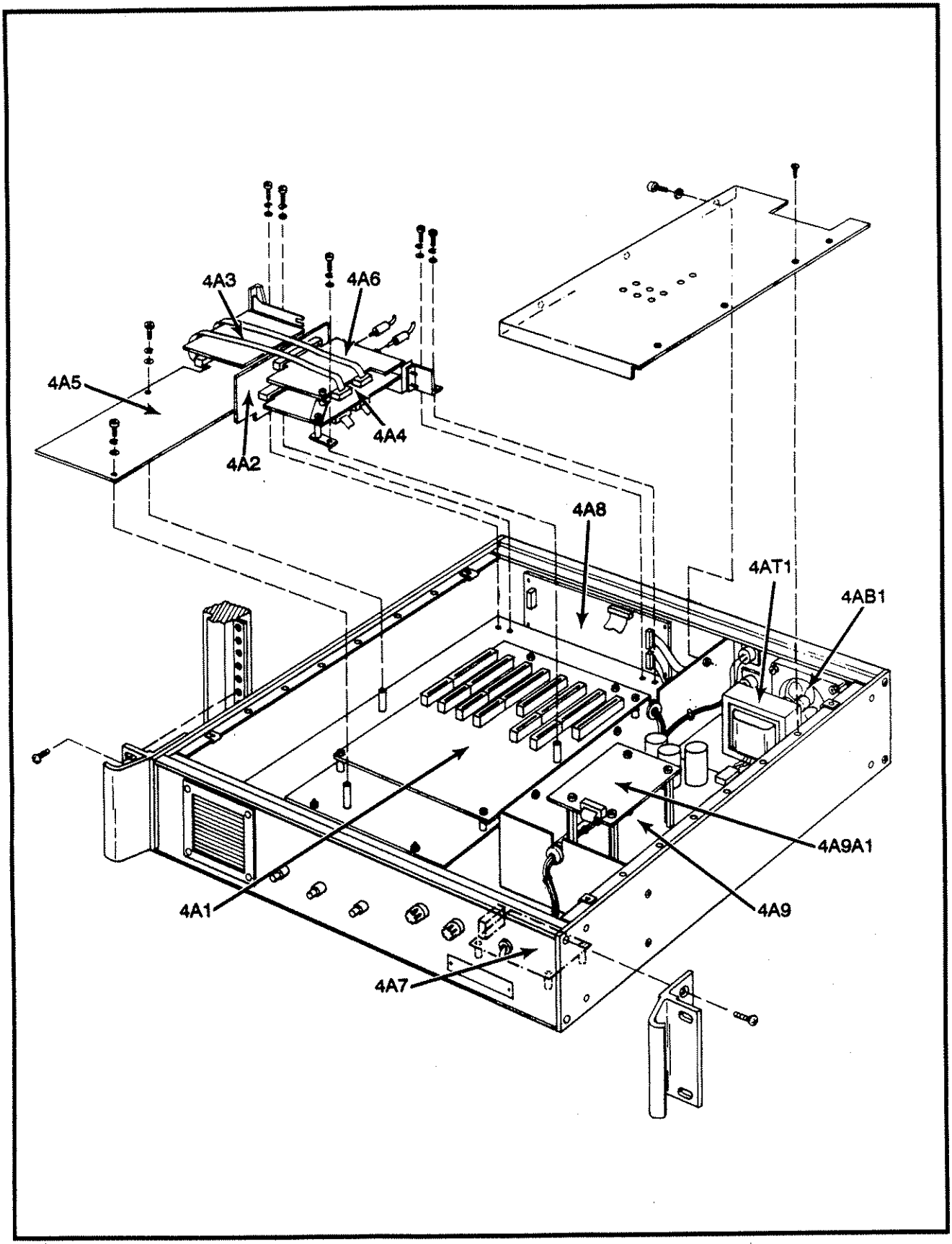

Figure 5.4.6 Removal/Installation of MD-9188 Modules.

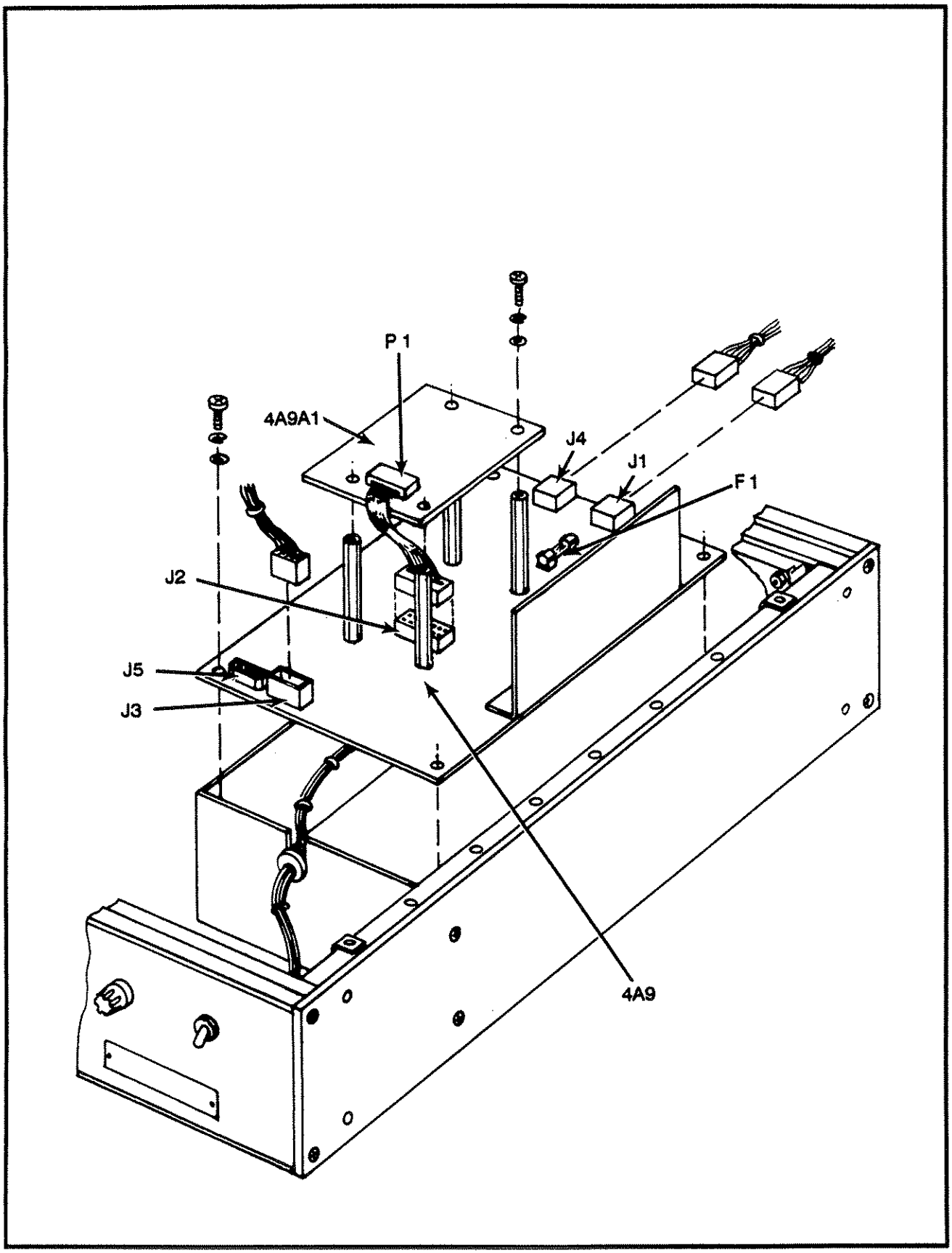

Figure 5.4.7 Removal/Installation of Power Supply 4A9.

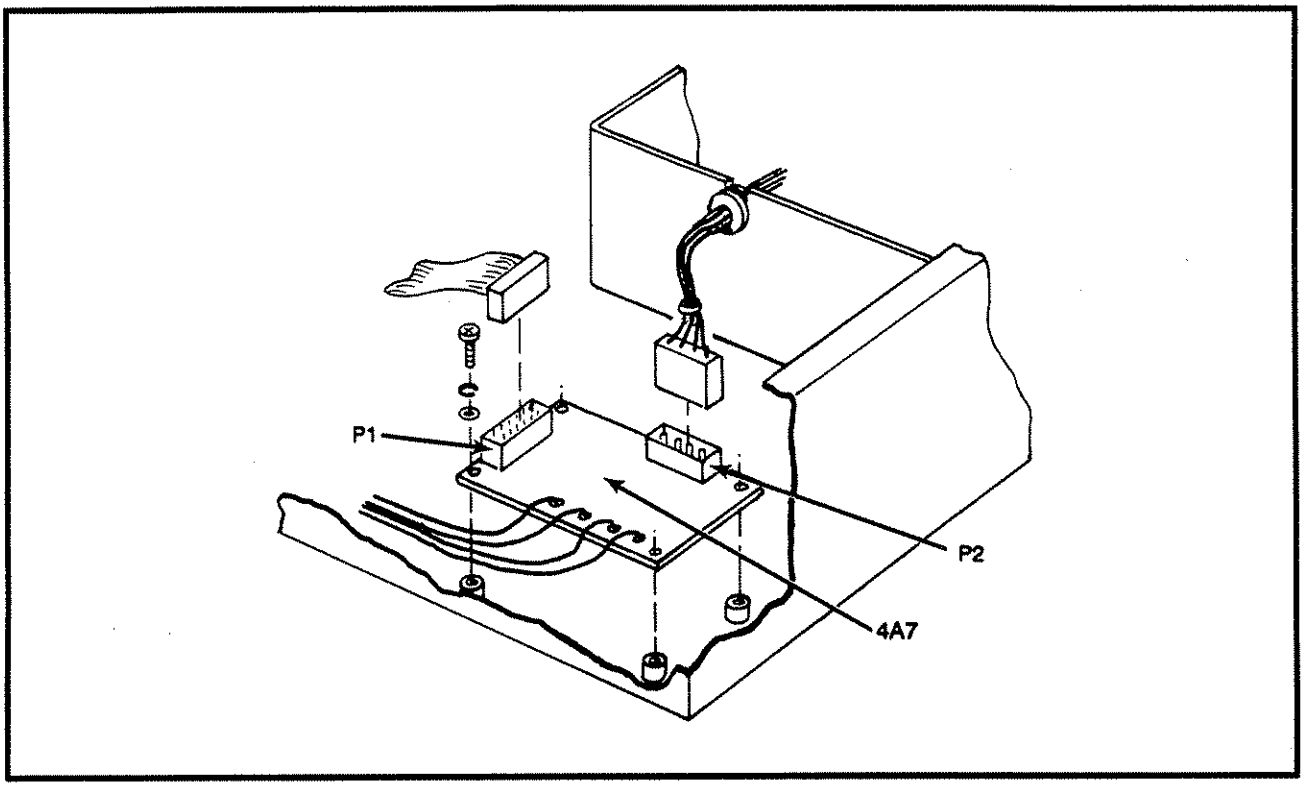

Figure 5.4.8 Removal/Installation of Audio/Display Board 4A7.

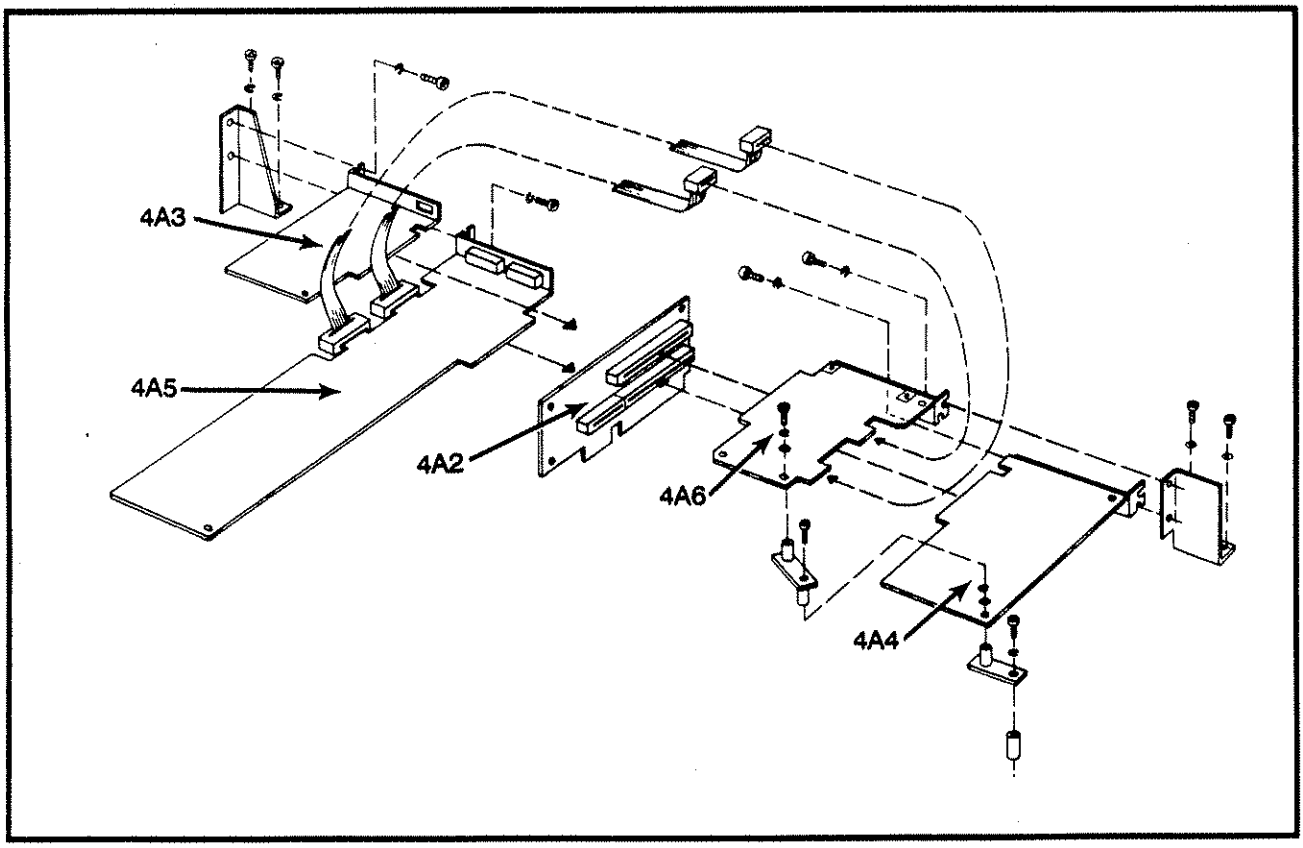

Figure 5.4.9 Removal/Installation of Subassemblies.

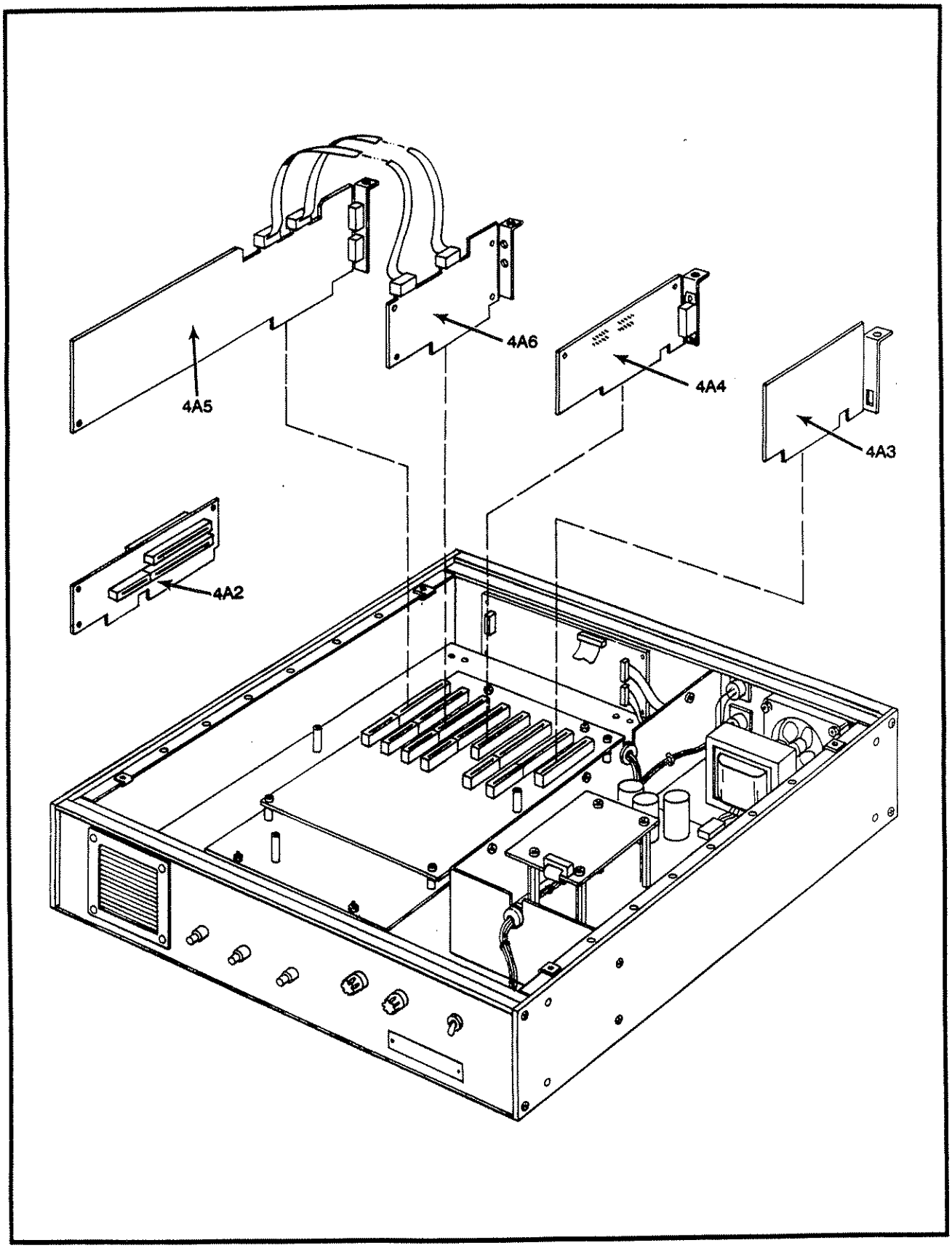

Figure 5.4.10 Alternate Plug-In for ease of substitution of PC Assemblies during Fault Isolation.

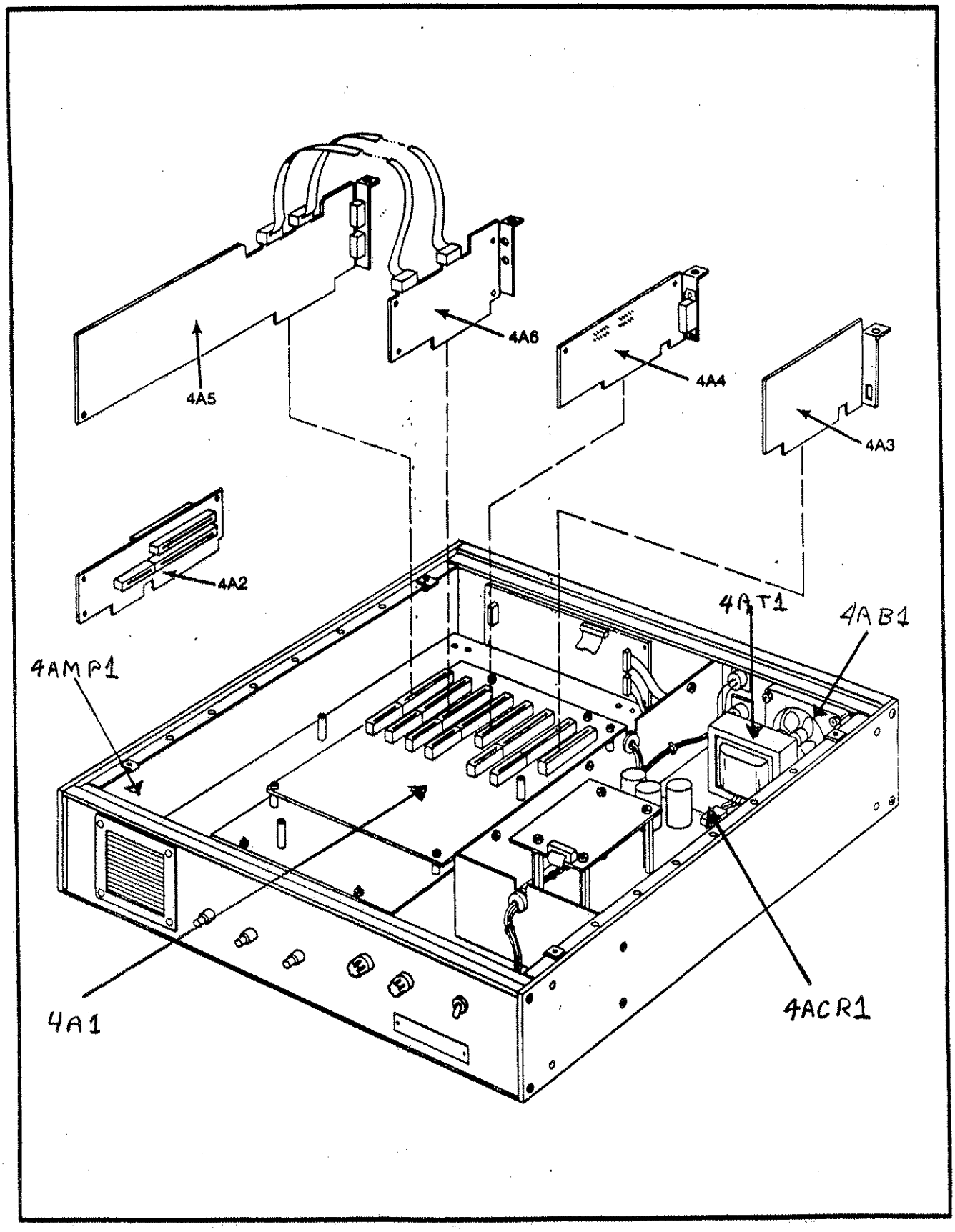

Figure 5.4.10 Alternate Plug-In for ease of substitution of PC Assemblies during Fault Isolation.

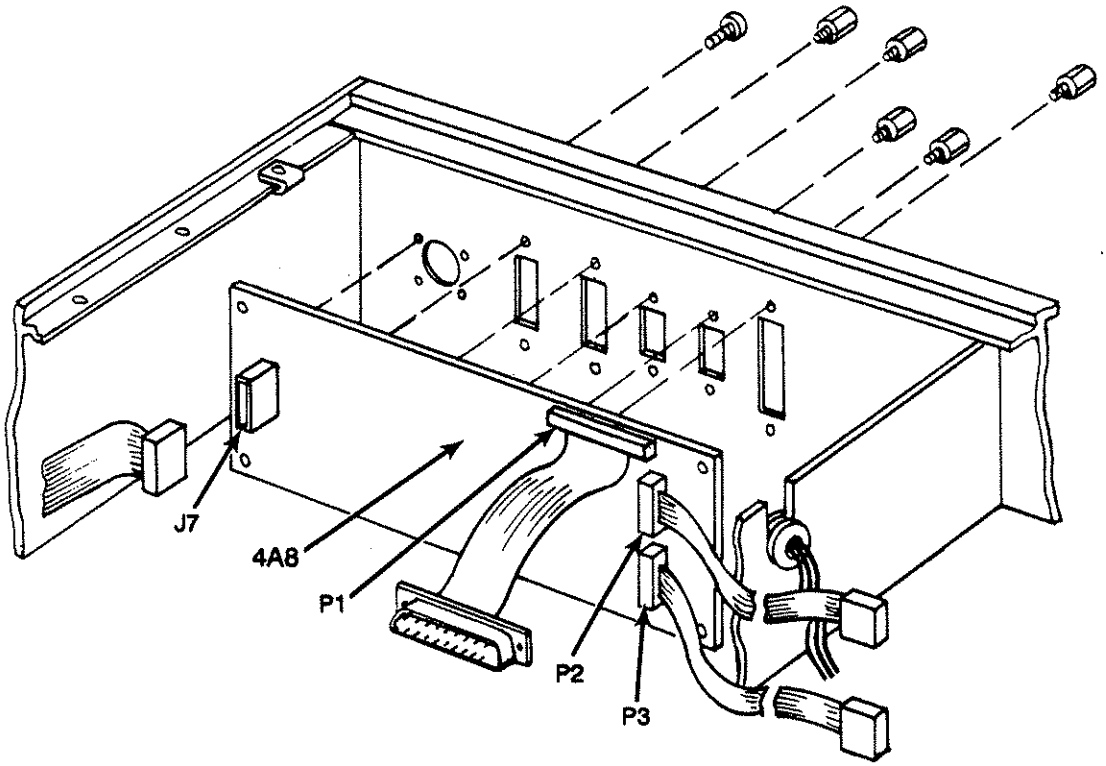

Figure 5.4.11 Removal/Installation of Audio Selector Board 4A8.

5.5 POWER SUPPLY 4A9 FAULT ISOLATION GUIDE

NOTE: Refer to Figure 5.5.1 for LED indicators, Figure 5.4.6 for location, Figure 5.4.7 for Power Supply removal and Figures 5.6.5 thru 5.6.7 for schematics.

POWER SUPPLY 4A9 FAULT ISOLATION GUIDE

LED's X=ON BLANK=OFF	AC/DC POWER APPLIED								POSSIBLE TROUBLE	CORRECTIVE ACTION
	READY	FAULT	INPUT		5 V		12 V			
			OVER	UNDER	OVER	UNDER	OVER	UNDER		
1	X								No trouble, normal indication.	No action required.
2									1. No AC input power. 2. Open AC fuses 4A F1 and F2.	1. Check AC input. 2. Replace as required. If fuses open again, use standard troubleshooting techniques and repair or replace 4A9 power supply.
3									1. No DC input power. 2. Open 4A9 F1.	1. Check DC input. 2. Replace as required. If fuses open again, use standard troubleshooting techniques and repair or replace 4A9 power supply.
4		X		X					Input voltage below 10 VDC at 4A9 J4 pin 1 for AC input or J1 pin 3 for DC input.	Use standard Troubleshooting techniques to correct input voltage.
5		X	X						Input voltage above 33 VDC at 4A9J4 pin 1 for AC input or 4A9J1 pin 3 for DC input.	Use standard Troubleshooting techniques to correct input voltage.

LED's X=ON BLANK=OFF	AC/DC POWER APPLIED								POSSIBLE TROUBLE	CORRECTIVE ACTION
	READY	FAULT	INPUT		5 V		12 V			
			OVER	UNDER	OVER	UNDER	OVER	UNDER		
6		X				X		X	1. Failure in U3/U4 or associated circuitry. 2. Short on the 5 VDC line in modem.	Remove P3 from 4A9J3. If GREEN READY LED comes ON, there is a short on the 5 VDC line in modem. Use standard troubleshooting techniques to repair. If symptom was not corrected with P3 removed, troubleshoot U3/U4 and associated circuitry. Repair or replace as required or remove and replace 4A9 assembly.
7		X			X				Failure in U3/U4 or associated circuitry.	Troubleshoot U3/U4 and associated circuitry. Repair or replace as required or remove and replace 4A9 assembly.
8		X						X	1. Failure in U5/U8 or associated circuitry. 2. Short on +12 or -12 VDC lines in modem.	Remove P3 from 4A9J3. If GREEN READY LED comes ON, there is a short on the +12 or -12 VDC line in modem. Use standard

LED's X=ON BLANK=OFF	AC/DC POWER APPLIED								POSSIBLE TROUBLE	CORRECTIVE ACTION
	READY	FAULT	INPUT		5 V		12 V			
			OVER	UNDER	OVER	UNDER	OVER	UNDER		
										troubleshooting techniques to repair. If symptom was not corrected with P3 removed, troubleshoot U5/U8 and associated circuitry. Repair or replace as required or remove and replace 4A9 assembly.
9		X					X		Failure in U5/U8 or associated circuitry.	Troubleshoot U5/U8 and associated circuitry. Repair or replace as required or remove and replace 4A9 assembly.

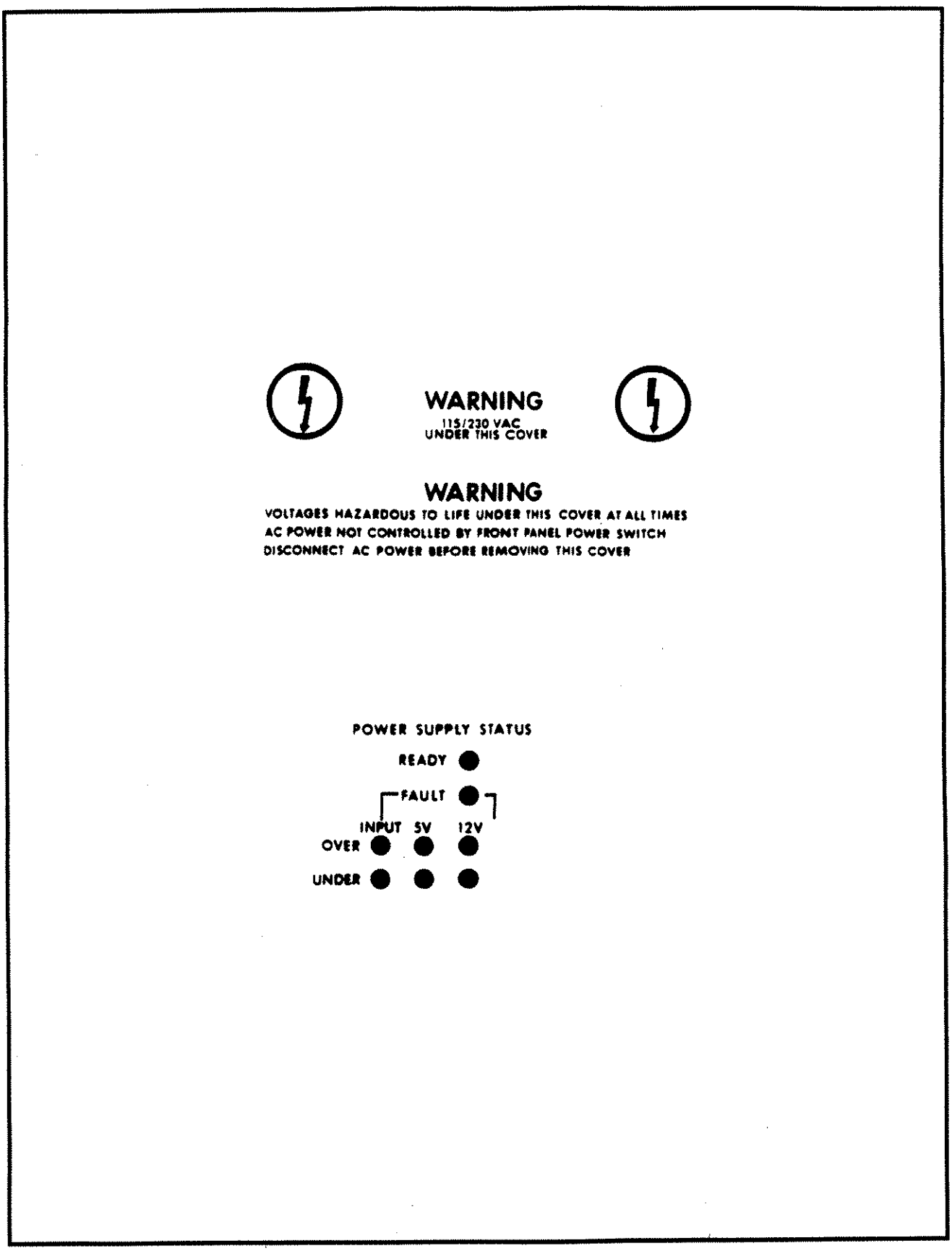

Figure 5.5.1 Top View of MD-9188 Power Supply (4A9) Fault Indicators.

5.6 SCHEMATICS and PARTS LISTS

The following pages contain schematics and parts lists for the MD-9188, see table 5.6 below:

DESIGNATOR		DESCRIPTION	SUNAIR PART NUMBER
ASSEMBLY	SUBASSEMBLY		
4A		CHASSIS	81010100XX
	4A1	CPU MOTHER BOARD ASSY	8101030093
	4A2	BUS EXTENDER BOARD	8101080091
	4A3	ROM DISK BOARD ASSY	8101050094
	4A4	MULTIFUNCTION BOARD ASSY	8101060090
	4A5	DIGITAL SIGNAL PROCESSOR ASSY	8101045007
	4A6	CODEC BOARD ASSEMBLY	8101046003
	4A7	AUDIO/DISPLAY ASSEMBLY	8101070095
	4A8	AUDIO SELECTOR ASSEMBLY	8101090096
	4A9	AC/DC POWER SUPPLY ASSY	8101025090
	4A9A1	AC/DC POWER SUPPLY CONTROL ASSY	8101028099

ECN 2645

Table 5.6 MD-9188 Table of Assemblies.

ENGINEERING CHANGE NOTICE

TITLE	MODEL	DWG/NEW REV.	NUMBER 2645
PART MASTER MAINTENANCE			DATE 06/20/90
	ASSEMBLIES AFFECTED/NEW REV.		ORIGINATOR FR/SB
			DATE 06/11/90

PURPOSE OF ECN:

1. REVISE MASTER PARTS BOOK AS FOLLOWS:

   A. CHANGE DESCRIPTION PN 1011050013 FROM "TRANSISTOR, N-CHANNEL, FET, MPF8000" TO "TRANSISTOR, N-CHANNEL, FET, 2N7000".

REASON FOR CHANGE:

MOTOROLA HAS DISCONTINUED THE MPF8000 AND REPLACED IT WITH 2N7000.

USED IN:

8102090090 AUDIO PC R-9200 ??
8103022698 SWITCHING REGULATORS PC ??
8103017094 PC MOTHERBOARD ✓ T-9400
8076900093 SPARES KIT RT-9000 MD 9188?
8101090096 AUDIO SELECTOR PC ALE MODEM.
8101028099 PC ASSY AC/DC PS CONTROL ALE
8101025090 PC ASSY AC/DC Power Supply ALE ✓
8105085097 PC ASSY PERIPHERAL LPA-9600 ✓
8103080098 PC ASSY IF T-9400 ✓
8102080094 PC ASSY IF R-9200 ✓
8101070095 PC ASSY AUDIO/DISPLAY ALE MODEM
8076080096 PC ASSY IF RT-9000 ✓

Q21, Q22 Q23,

RELEASED

SEP 26 1990

PARTS DISPOSITION	USE AS IS	REWORK	SCRAP	NOTED ABOVE	N.A.
...ART... N ORDER					X
... N STOCK	X				
... ASSY'S					X
... ASSY'S					X
...MPLETED PRODUCTS					X
...TURNED EQUIPMENT					X

DOCUMENTATION AFFECTED BY THIS CHANGE ACTION
'A' REVISION HAS BEEN COMPLETED. 'B' FOLLOW-UP ACTION IS REQUIRED

DESCRIPTION	A	B	RESPONSIBILITY
ENG. DWG/SPECIFICATIONS			
BILL OF MATERIAL			
TECHNICAL MANUALS			
SERVICE BULLETIN			
MASTER PARTS LIST	X		EK
PRODUCTION DRAWING		X	RLS
BUY CARD		X	FR
PRODUCTION CONTROL			
CONFIGURATION CONTROL			

APPROVALS	DA...
PROJECT MGR.	
ENG. MGR. [signature]	9/2...
PROD. MGR. [signature]	6/20/...
PRODUCT SERVICES MGR [signature]	8/2...
Q.A. MGR. [signature]	8/22
CORPORATE OFFICER [signature]	

1010780034 Connector Power, 15 pin Female

FINAL TESTED MD-9188

	FINAL TESTED MD-9188	81010012XX
4A	CHASSIS ASSY, ALE MODEM	81010100XX
4A2	PC ASSY, BUS EXTENDER	8101080091
4A3	ROM DISK BOARD ASSY, ALE	8101050094
4A4	MULTIFUNCTION BOARD ASSY, ALE	8101060090
4A5	DSP BOARD ASSY	8101045007
4A6	CODEC BOARD ASSY	8101046003
	BRACKET, RACKMOUNT	81010043XX
	BRACKET, DSP ASSY	8101010408
	BRACKET, ROM DISK ASSY, REAR	8101010505
	BRACKET, PC SUPPORT, UPPER	8101016104
	BRACKET, PC SUPPORT, LOWER	8101016309
	BRACKET, SUPPORT, ROM DISK	8101016503
	BUMP-ONS, SELF ADHESIVE	9187040239
	CABLE, FLAT, 14 COND. 28AWG	1011170001
	CAP. .47UF, 50V, X7R 20%	0283777771
	COVER, TOP/BOTTOM	81010123XX
	COVER, POWER SUPPLY	8101020900

CHASSIS ASSEMBLY 4A

	CHASSIS ASSEMBLY 4A	81010100XX
4A1	MOTHER BOARD ASSY, ALE MODEM	8101030093
4A7	PC ASSY, AUDIO/DISPLAY	8101070095
4A8	PC ASSY, AUDIO SELECTOR	8101090096
4A9	PC ASSY, AC/DC POWER SUPPLY	8101025090
4A9A1	PC ASSY, AC/DC PS CONTROL	8101028099
	BOOT, TOGGLE SWITCH 15/32-32	0346450004
	BRACKET, PS PARTITION	8101021302
	CABLE, FLAT, 20 COND. 28AWG	1008080004
	CLAMP, CABLE, FLAT 1 1/16 WIDE	1008650005
	CONNECTOR, RIBBON, 20 PIN FEM	1008120031
	CONNECTOR, POWER, 5 PIN ROUND	1010510029
	CONNECTOR, POWER, 2 PIN ROUND	1010510037
	CONNECTOR, HOUSING, 6PIN, FEM	1010840011
	CONNECTOR, HOUSING, 10 PIN,FEM	1010850016
	CONNECTOR, HOUSING, 6 PIN FEM	1010900030
	CONNECTOR, HOUSING, 4 PIN FEM	1010920031
	COVER, SPARE CONNECTOR	8101015400
	DIODE, BRIDGE MDA2504	1010630024
	FAN, DC, 12V, 30CFM	1010870033
	FILTER SCREEN, 3.2 IN FAN	1010890034
	FILTER, AIR	8066002301
	FINGER GUARD, 3.2 IN FAN	1010860039
	FUSE, MDL, 1/2 AMP, 250V	0841310009
	FUSEHOLDER, PANEL MOUNT	0849030005
	JACK SOCKET KIT, D SUB	1011140012
	LAMP ASSY. GREEN	0841480001
	LAMP ASSY. RED	0841490007
	LAMP ASSY. AMBER	0841500002
	NAMEPLATE MD-9188	8101014900
	PANEL, RH SIDE	81010133XX
	PANEL, LH SIDE	81010137XX
	PANEL, FRONT	81010140XX
	PANEL, REAR	8101015001
	PLATE, BASE, ALE MODEM	8101010700
	SOCKET, CARTRIDGE LAMP	1003322000
	SWITCH, TOGGLE, DPST	0346430003
	TRANSFORMER, AC, 16VCT, 56W	1010670034
	VARISTOR, MOV V140LA5	1011300010

NOTE: Is same size filter as in the LPA-9600 have to cut a 3" x 3" piece.

Figure 5.6.1 Final Tested MD-9188 and Chassis Assembly 4A.

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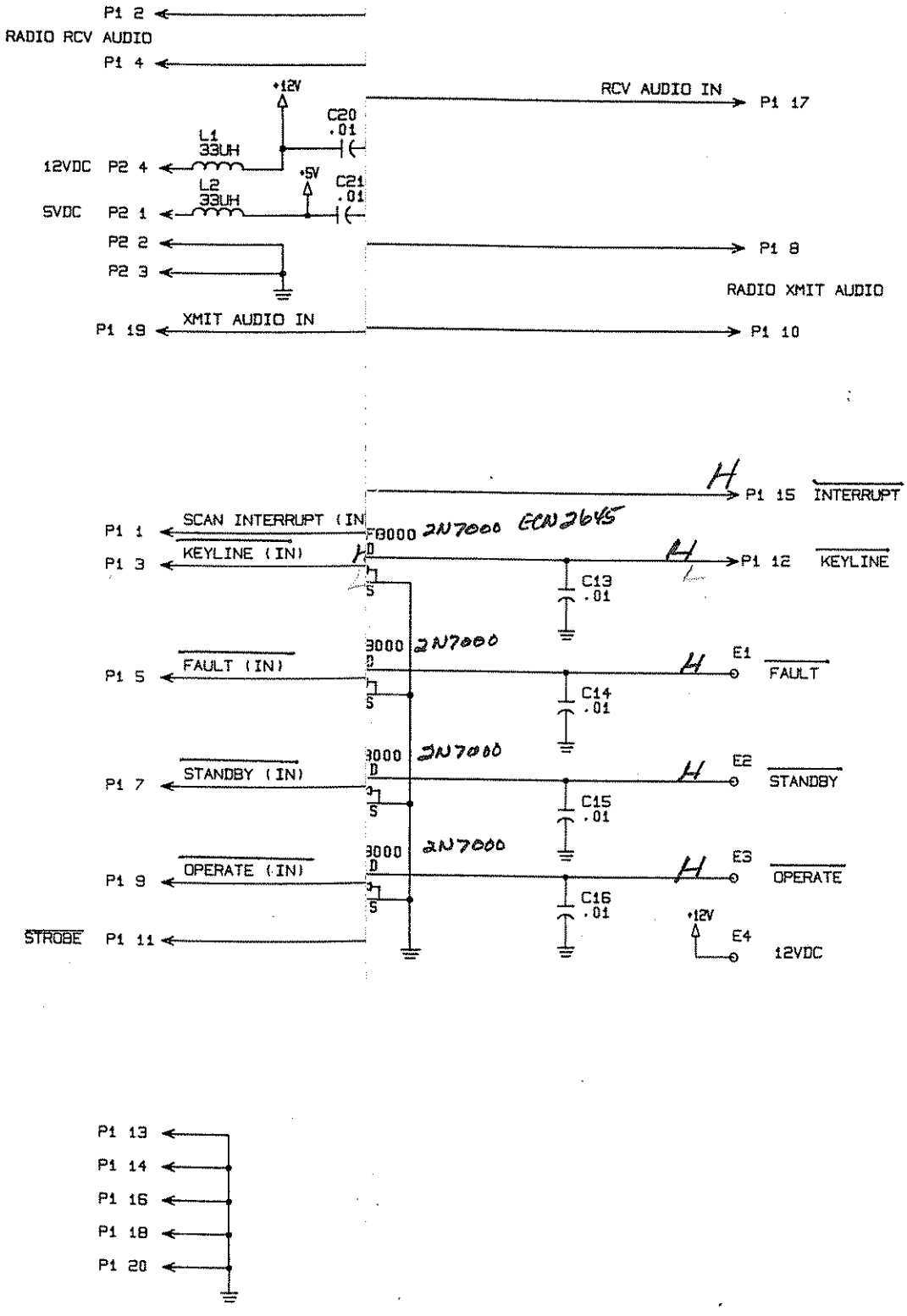


No Parts List
for 4A7 9/22/92

Figure 5.6.2 Audio/Display Assembly 4A7.

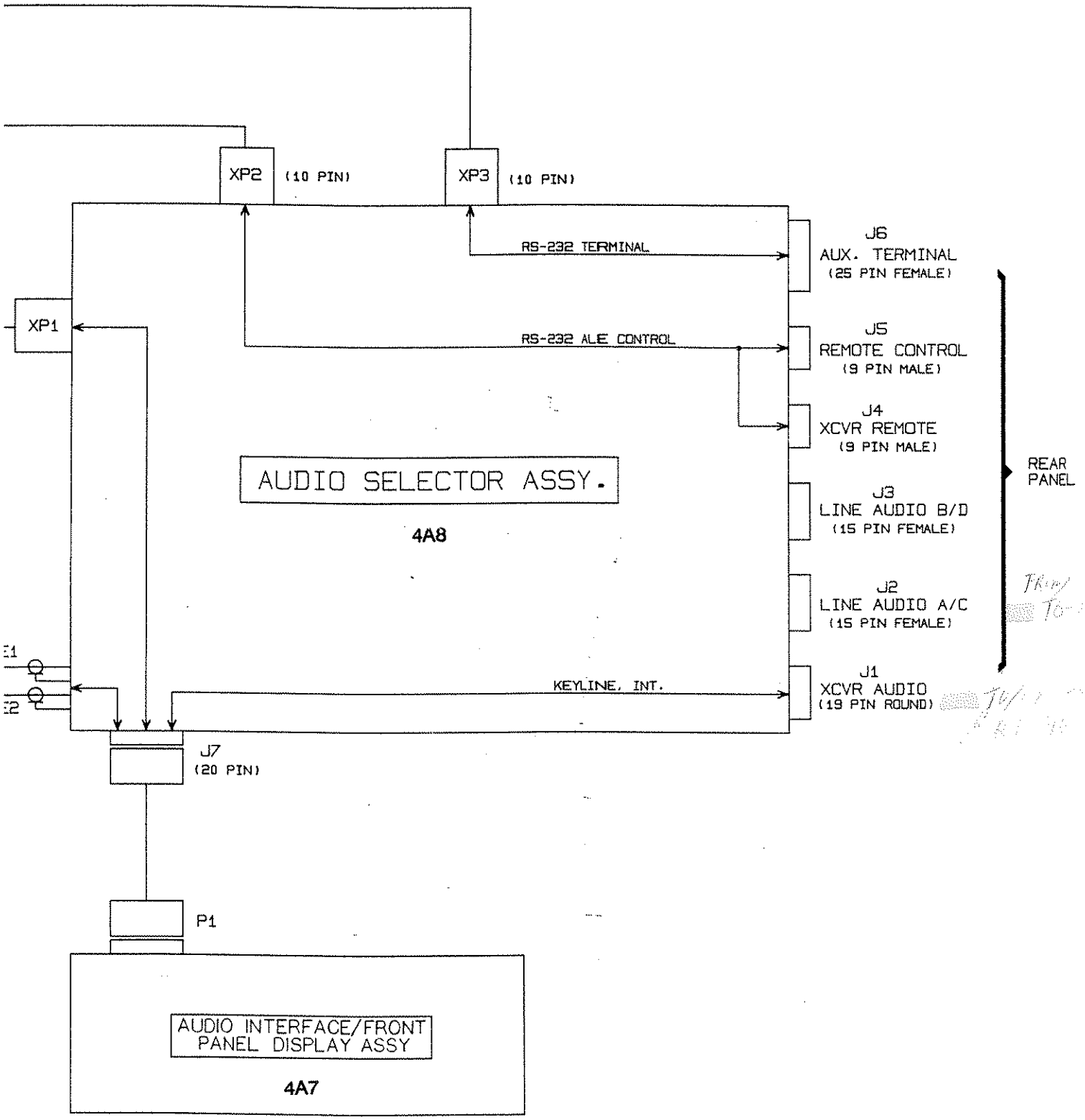
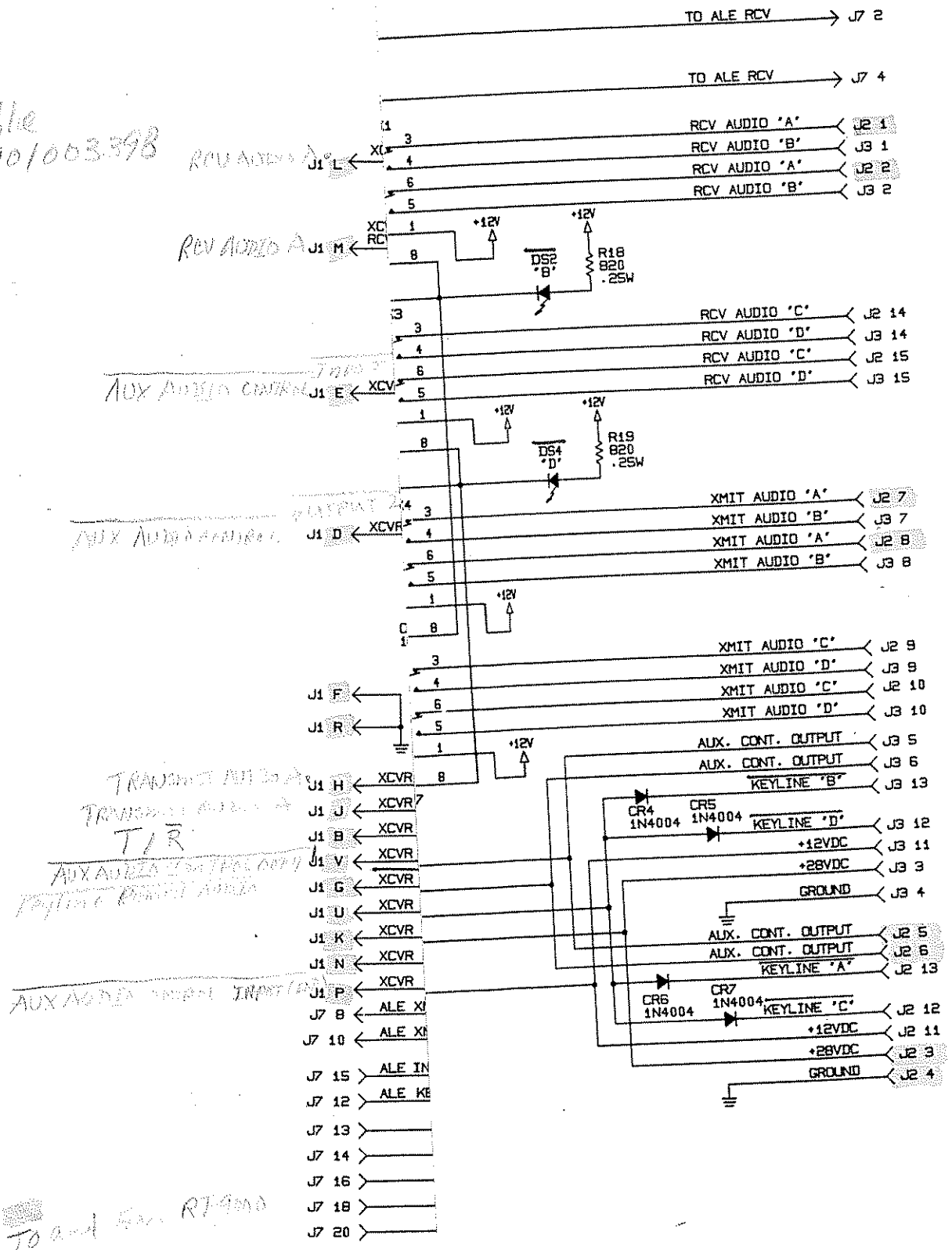


Figure 5.6.3 Audio Selector Interconnect Cable Diagram.



No Parts List
for 4A8 9/22/92

Figure 5.6.4 Audio Selector Assembly 4A8, page 1 of 2.

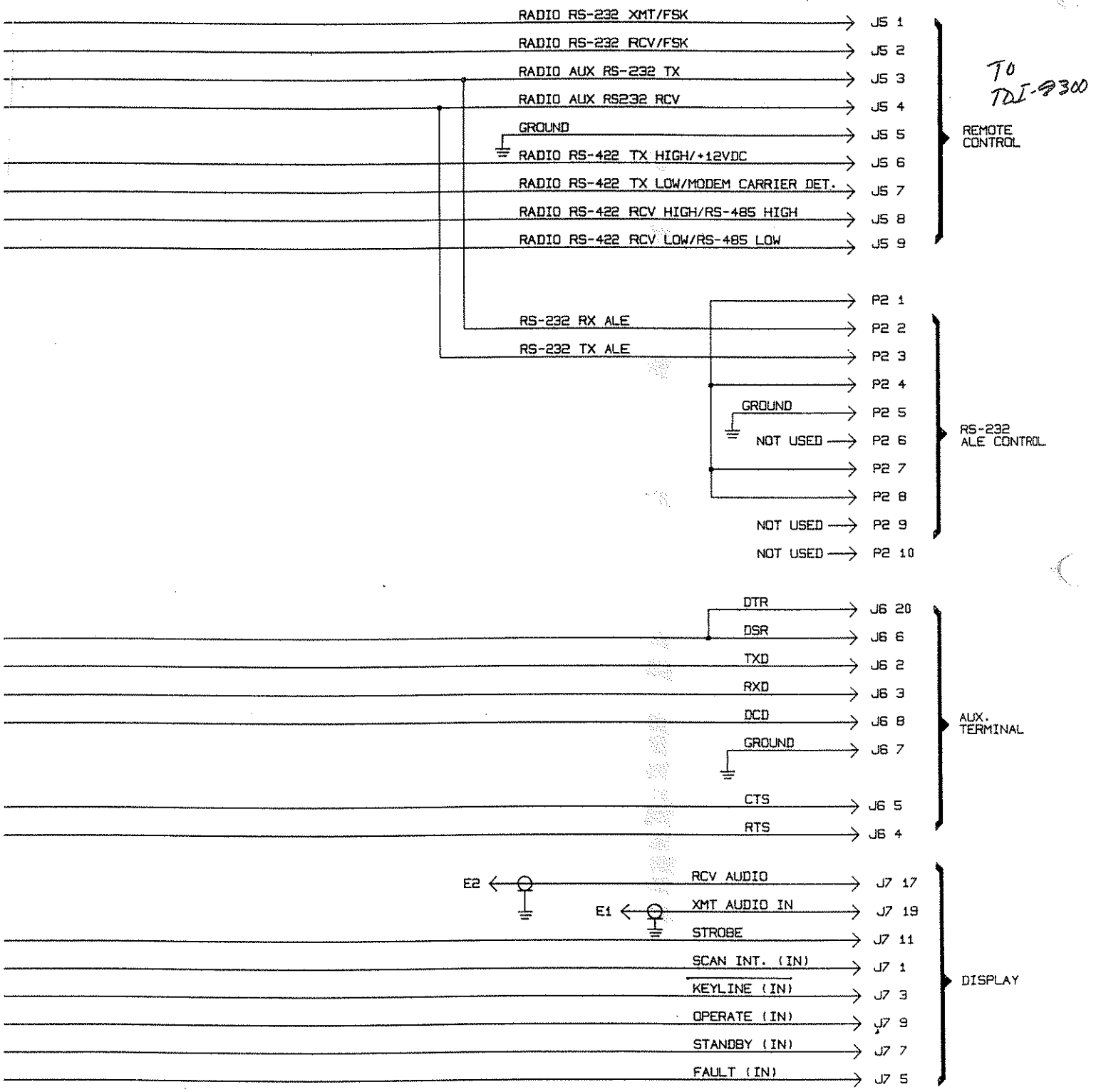
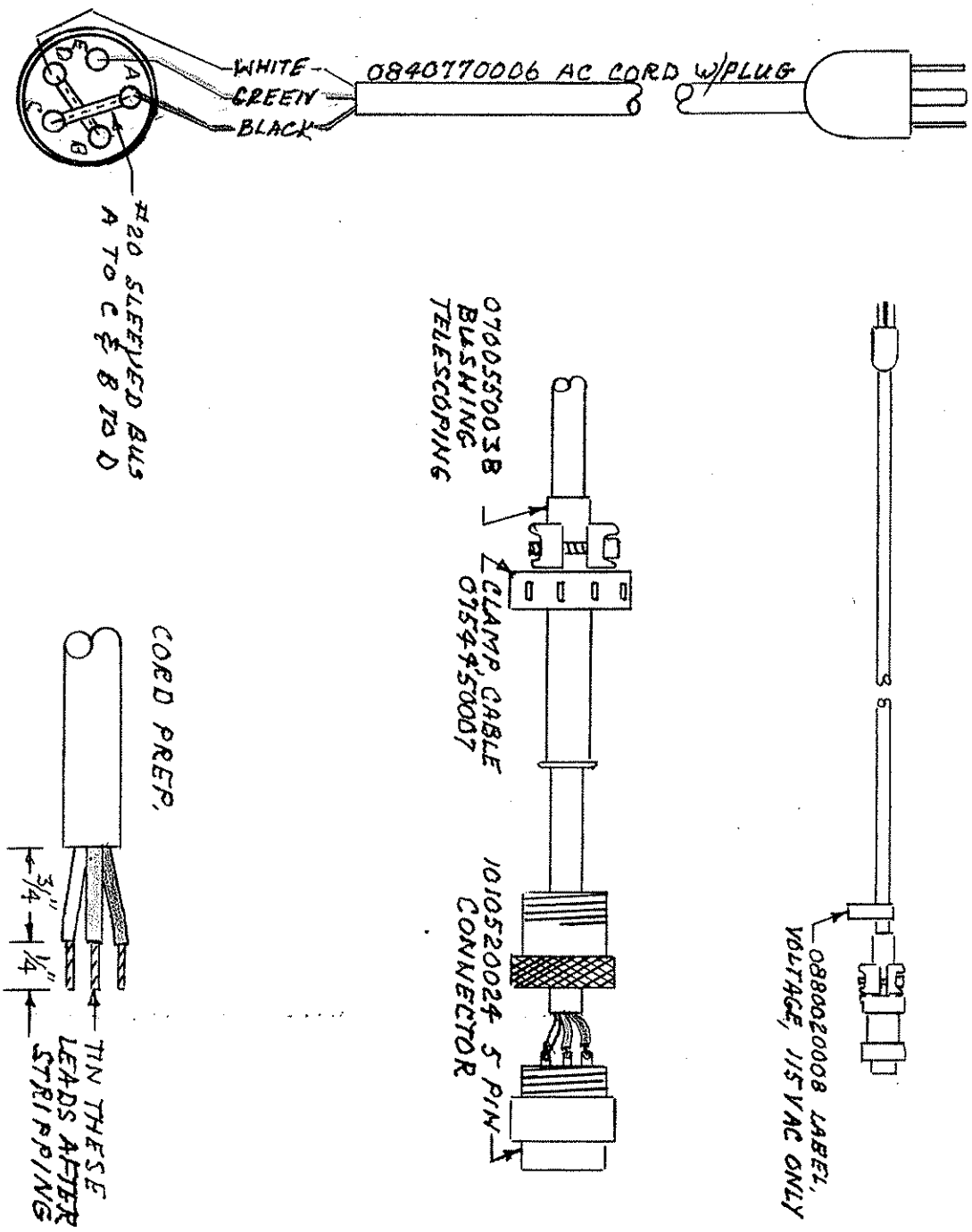
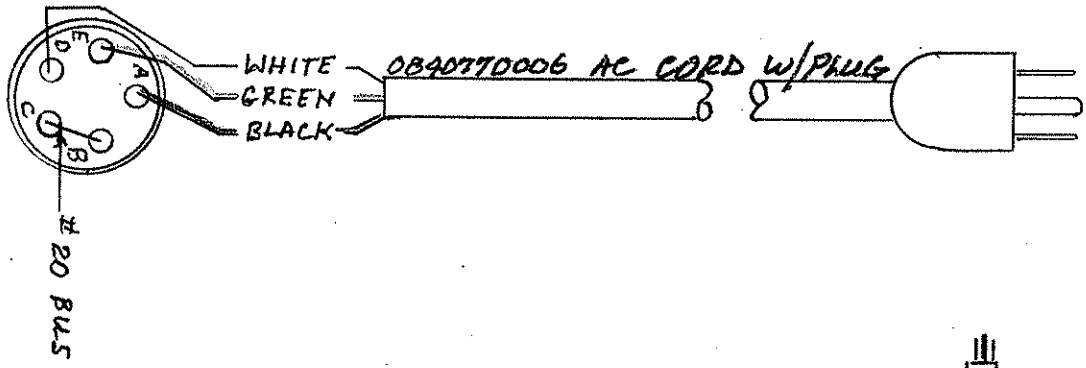
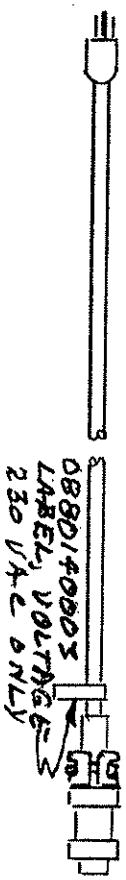


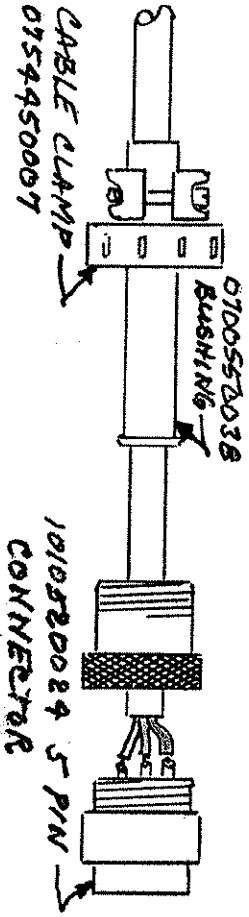
Figure 5.6.4 Audio Selector Assembly 4A8, page 2 of 2.

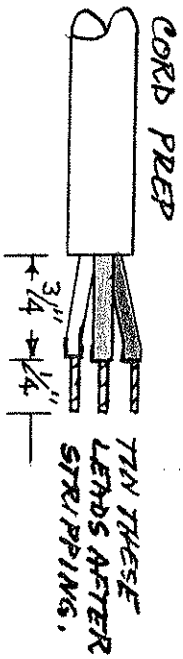


SUNAIR electronics inc.	ECN		Title POWER CORD, A.C. 115V MD-9188				Drawing No. PD 8101002090		Rev. (B/A)
Drawn By: G.D.L.	Rv		I.E. Y.D.Lowry	P.E.	C.E.	Date 6-1-90	Pg. 1 of 1	Rev. Date	

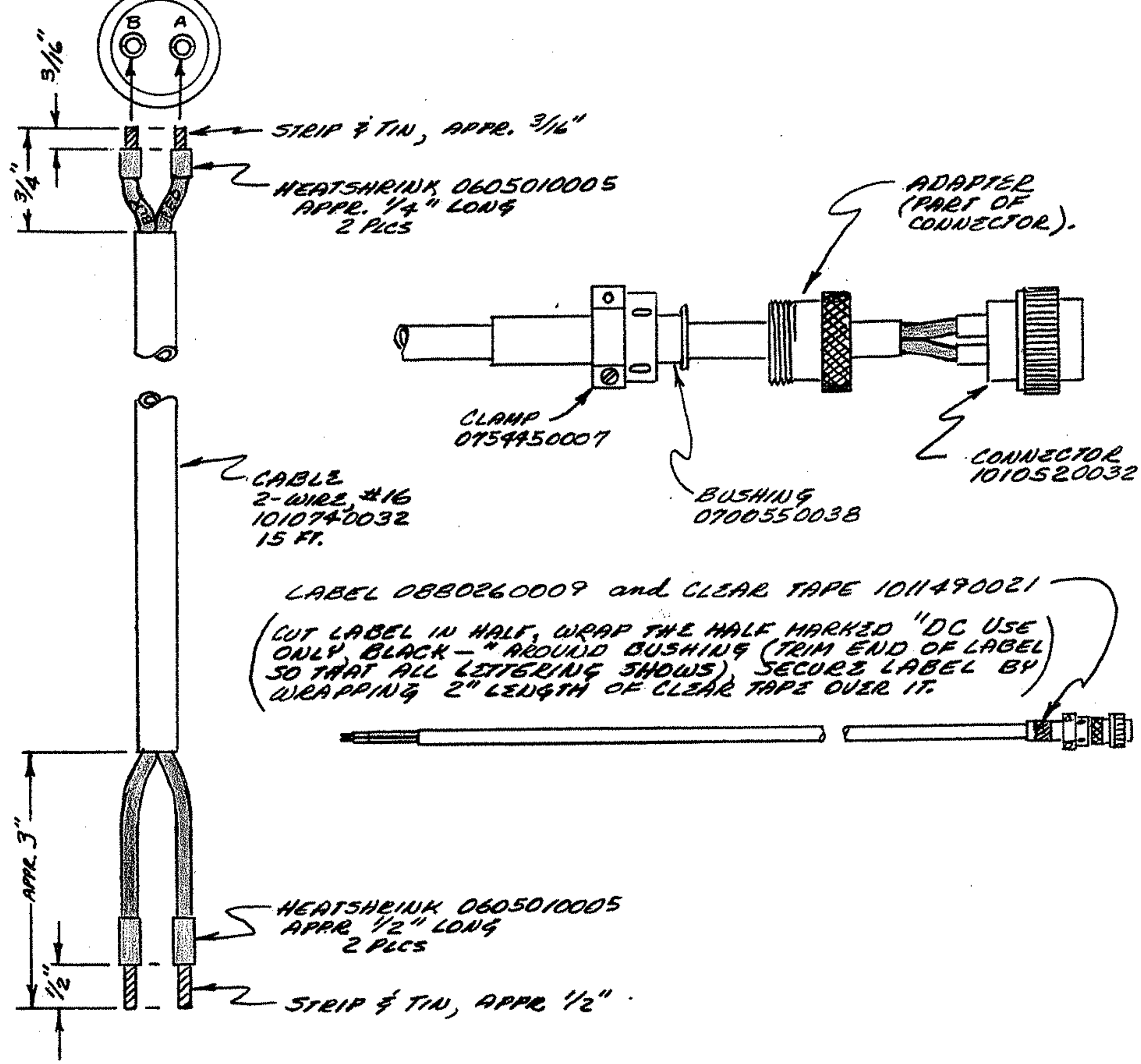




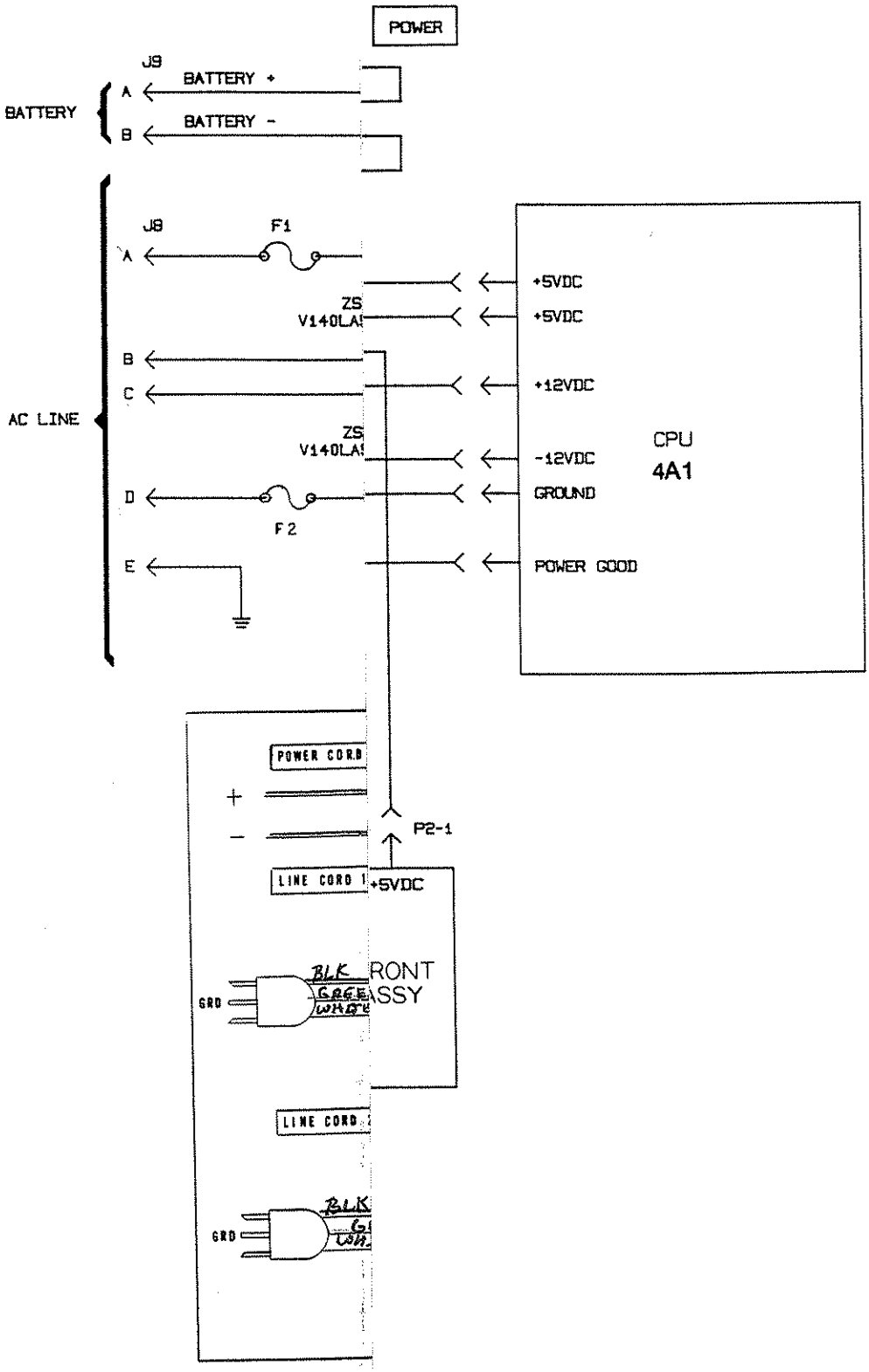




SUNAIR electronics inc.	ECN		Title POWER CORD, A.C 230 V, ALE MODEM MD-9188				Drawing No. MA&E PDB101002197		Rev (B/I) A
Drawn By: G.D.L.	Rv		I.E.	P.E.	C.E.	Date 9-28-90	Pg. 1 of 1	Rev. Date	



SUNAIR electronics inc.	ECN	5960	5960A	Title: POWER CORD, DC ALE and RCU-9310				Drawing No. PD8101002294	
Drawn By: RLS	Rv	A 1	03	I.E. RLS	P.E.	C.E.	Date 9-12-90	Pg. 1 of 1	Rev. Date



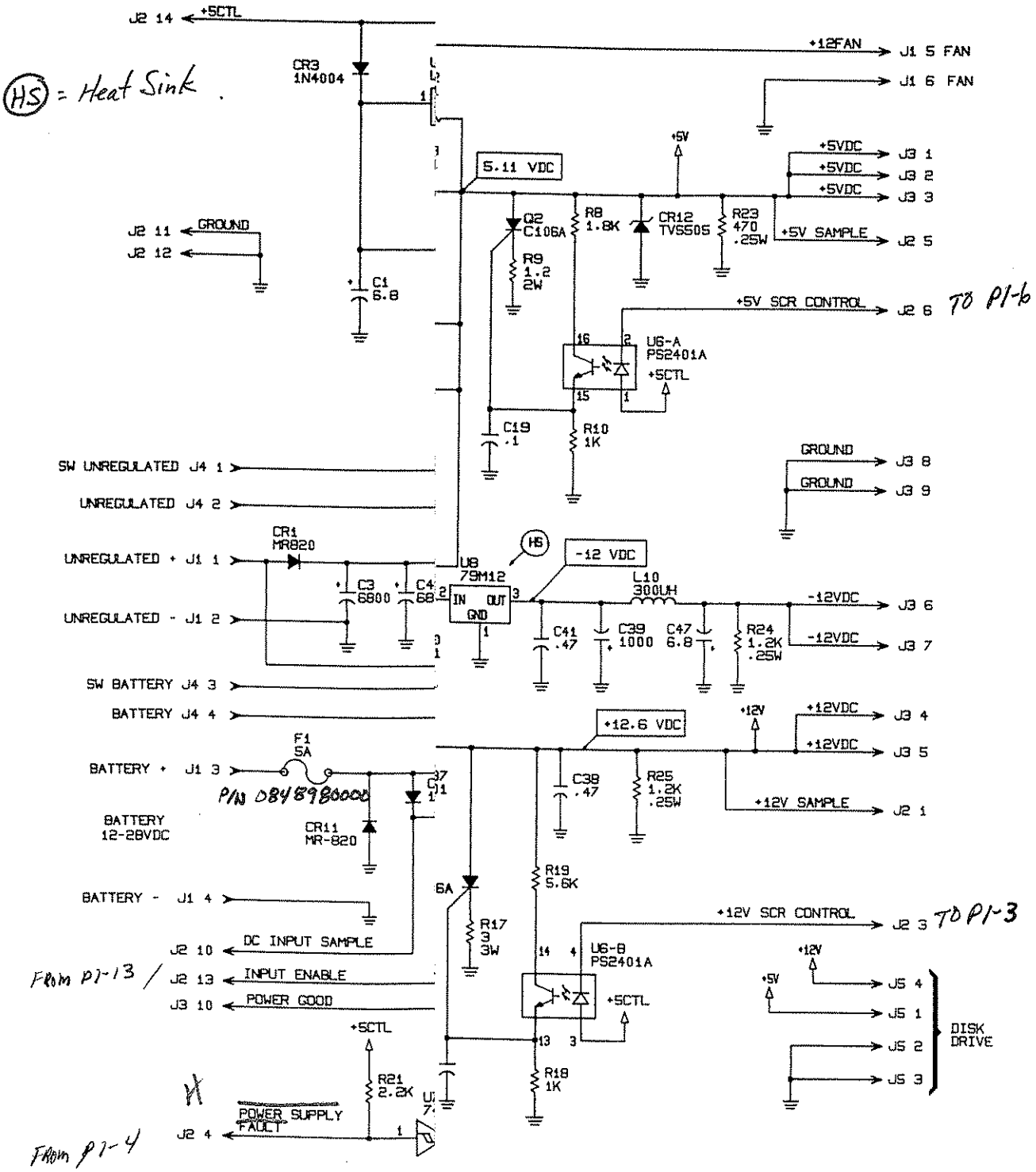
5.6.5 AC/DC Power Supply Chassis and Interconnect.

AC/DC POWER SUPPLY ASSY 4A9

	AC/DC POWER SUPPLY ASSY 4A9	8101025090
C1	CAP. 6.8µF, 50V, T350	1008980013
C2	CAP. .47µF, 50V, X7R 20%	0283377771
C3	CAP. 6800 µF, 63V, 20%, 105C	1010800019
C4	CAP. 6800 µF, 63V, 20%, 105C	1010800019
C5	CAP. 6800 µF, 63V, 20%, 105C	1010800019
C6	CAP. 3.3µF, 35V, 196D	0281680001
C7	CAP. .01µF, 50V, X7R 20%	0281730008
C8	CAP. 6.8µF, 50V, T350	1008980013
C9	CAP. 6.8µF, 50V, T350	1008980013
C10	CAP. .01µF, 50V, X7R 20%	0281730008
C11	CAP. .47µF, 50V, X7R 20%	0283377771
C13	CAP. 1000µF, 63V, 20%, 105C	1011350009
C14	CAP. 6.8µF, 50V, T350	1008980013
C15	CAP. 1000µF, 63V, 20%, 105C	1011350009
C16	CAP. 1000µF, 63V, 20%, 105C	1011350009
C17	CAP. .01µF, 50V, X7R 20%	0281730008
C18	CAP. .47µF, 50V, X7R 20%	0283377771
C19	CAPACITOR 0.1µF, 50V, X7R	1011180014
C20	CAP. .01µF, 50V, X7R 20%	0281730008
C21	CAP. .47µF, 50V, X7R 20%	0283377771
C23	CAP. 1000µF, 63V, 20%, 105C	1011350009
C24	CAP. 6.8µF, 50V, T350	1008980013
C25	CAP. 1000µF, 63V, 20%, 105C	1011350009
C26	CAP. 1000µF, 63V, 20%, 105C	1011350009
C27	CAP. .01µF, 50V, X7R 20%	0281730008
C28	CAP. .47µF, 50V, X7R 20%	0283377771
C29	CAP. .47µF, 50V, X7R 20%	0283377771
C30	CAP. 1000µF, 63V, 20%, 105C	1011350009
C31	CAP. 1000µF, 63V, 20%, 105C	1011350009
C32	CAP. 6.8µF, 50V, T350	1008980013
C33	CAP. .47µF, 50V, X7R 20%	0283377771
C34	CAP. 1000µF, 63V, 20%, 105C	1011350009
C35	CAP. 1000µF, 63V, 20%, 105C	1011350009
C36	CAP. 1000µF, 63V, 20%, 105C	1011350009
C37	CAP. .01µF, 50V, X7R 20%	0281730008
C38	CAP. .47µF, 50V, X7R 20%	0283377771
C39	CAP. 1000µF, 63V, 20%, 105C	1011350009
C40	CAP. .01µF, 50V, X7R 20%	0281730008
C41	CAP. .47µF, 50V, X7R 20%	0283377771
C42	CAPACITOR 0.1µF, 50V, X7R	1011180014
C43	CAPACITOR 0.1µF, 50V, X7R	1011180014
C44	CAPACITOR 0.1µF, 50V, X7R	1011180014
C45	CAP. 6.8µF, 50V, T350	1008980013
C46	CAP. .01µF, 50V, X7R 20%	0281730008
C47	CAP. 6.8µF, 50V, T350	1008980013
CR1	DIODE, RECTIFIER MR-820	0405620004
CR2	DIODE, RECTIFIER 1N4004	0405180004
CR3	DIODE, RECTIFIER 1N4004	0405180004
CR4	DIODE, RECTIFIER 1N4004	0405180004
CR5	DIODE, RECTIFIER 1N5822	1010630032
CR6	DIODE, RECTIFIER 1N5822	1010630032
CR7	DIODE, RECTIFIER 1N5822	1010630032
CR8	DIODE, RECTIFIER 1N5822	1010630032
CR9	DIODE, RECTIFIER 1N4004	0405180004
CR10	DIODE, TRANSZORB 1N6423A	1011260000
CR11	DIODE, RECTIFIER MR-820	0405620004
CR12	DIODE, TRANSIENT SUPR.TVS505	1010720007
CR13	DIODE, RECTIFIER 1N4004	0405180004
CR14	DIODE, RECTIFIER 1N4004	0405180004
F1	FUSE, AGC, 5 AMP, 32V	0848980000
J1	CONNECTOR, PC, 6 PIN HEADER	1010830015
J2	CONNECTOR, HEADER 14 PIN MALE	1011200147
J3	CONNECTOR, PC, 10 PIN HEADER	1010680030
J4	CONNECTOR, PC, 6 PIN HEADER	1010830015
J5	CONNECTOR, 4PIN, DISK DRIVE	1011310015
K1	RELAY, SPDT, 24VDC, 10 AMP	1008290009
L1	FERRITE BEAD, .400L	1010900013
L2	INDUCTOR, TOROID, 150 µH	1010650033
L3	FERRITE BEAD, .400L	1010900013
L4	FERRITE BEAD, .400L	1010900013
L5	INDUCTOR, TOROID, 150 µH	1010650033
L6	FERRITE BEAD, .400L	1010900013
L7	FERRITE BEAD, .400L	1010900013
L8	CHOKE, POWER, 300 µH	8101024701
L9	CHOKE, POWER, 300 µH	8101024701
L10	CHOKE, POWER, 300 µH	8101024701
Q1	TRANSISTOR, P-CH FET MTP20P06	1010960008
Q2	DIODE, SCR C106A2	0447070002
Q3	DIODE, SCR C106A2	0447070002
Q4	TRANSISTOR, N-CH, FET 2N7000	1011050013 ECN 2645
R3	RESISTOR 68K, 10%, 1/4W	0173520006
R4	RESISTOR, 0.11, 5%, 2W	0197570003
R5	RESISTOR, 0.11, 5%, 2W	0197570003
R6	RESISTOR 3320, 1%, 1/8W	1003050000
R7	RESISTOR, 1K, 1%, 1/8W	1011380005
R8	RESISTOR 1.8K, 10%, 1/4W	0178190004
R9	RESISTOR 1.2, 10%, 2W	0186290004
R10	RESISTOR 1K, 10%, 1/4W	0171560001
R11	RESISTOR 3320, 1%, 1/8W	1003050000
R12	RESISTOR, 1K, 1%, 1/8W	1011380005
R13	RESISTOR, 0.11, 5%, 2W	0197570003
R14	RESISTOR 2.2K, 5%, 1/4W	0178070009
R15	RESISTOR, 56.2K, 1%, 1/8W	1008910015
R16	RESISTOR, 6040, 1%, 1/8W	1010580019
R17	RESISTOR 3, 5% 3W	1004600003
R18	RESISTOR 1K, 10%, 1/4W	0171560001
R19	RESISTOR 5.6K, 10%, 1/4W	0183060008
R20	RESISTOR 100K, 10%, 1/4W	0170390004
R21	RESISTOR 2.2K, 5%, 1/4W	0178070009
R22	RESISTOR, 0.11, 5%, 2W	0197570003
R23	RESISTOR 470, 5%, 1/4W	0184110009
R24	RESISTOR 1.2K, 10%, 1/4W	0181860007
R25	RESISTOR 1.2K, 10%, 1/4W	0181860007
R26	RESISTOR 56, 10%, 1/2W	0168890003
T1	TRANSFORMER, -12V SUPPLY	1010660039
U1	IC. LINEAR LM340T5	0448600005
U2	IC. LINEAR LM340/7812	1003410022
U3	IC. LINEAR LM2576-ADJ	1010610031
U4	IC. LINEAR LM2576-ADJ	1010610031
U5	IC. LINEAR LM2577-ADJ	1010620037
U6	IC. DIGITAL 2501-4	1010630008
U7	IC. DIGITAL 74HC14	1006490027
U8	IC. LINEAR 79M12	1010700031
XF1	FUSECLIP, PC MOUNT	0534610005
	BRACKET, HEATSINK, PS	8101025707
	BRACKET, HEATSINK, POWER FET	8101025901
	KEY, POLARIZING	1008070033

C48 Cap. 150F, 35V 0282240004 ECN 8101-013

Figure 5.6.6 AC/DC Power Supply Assembly 4A9, page 1 of 2.



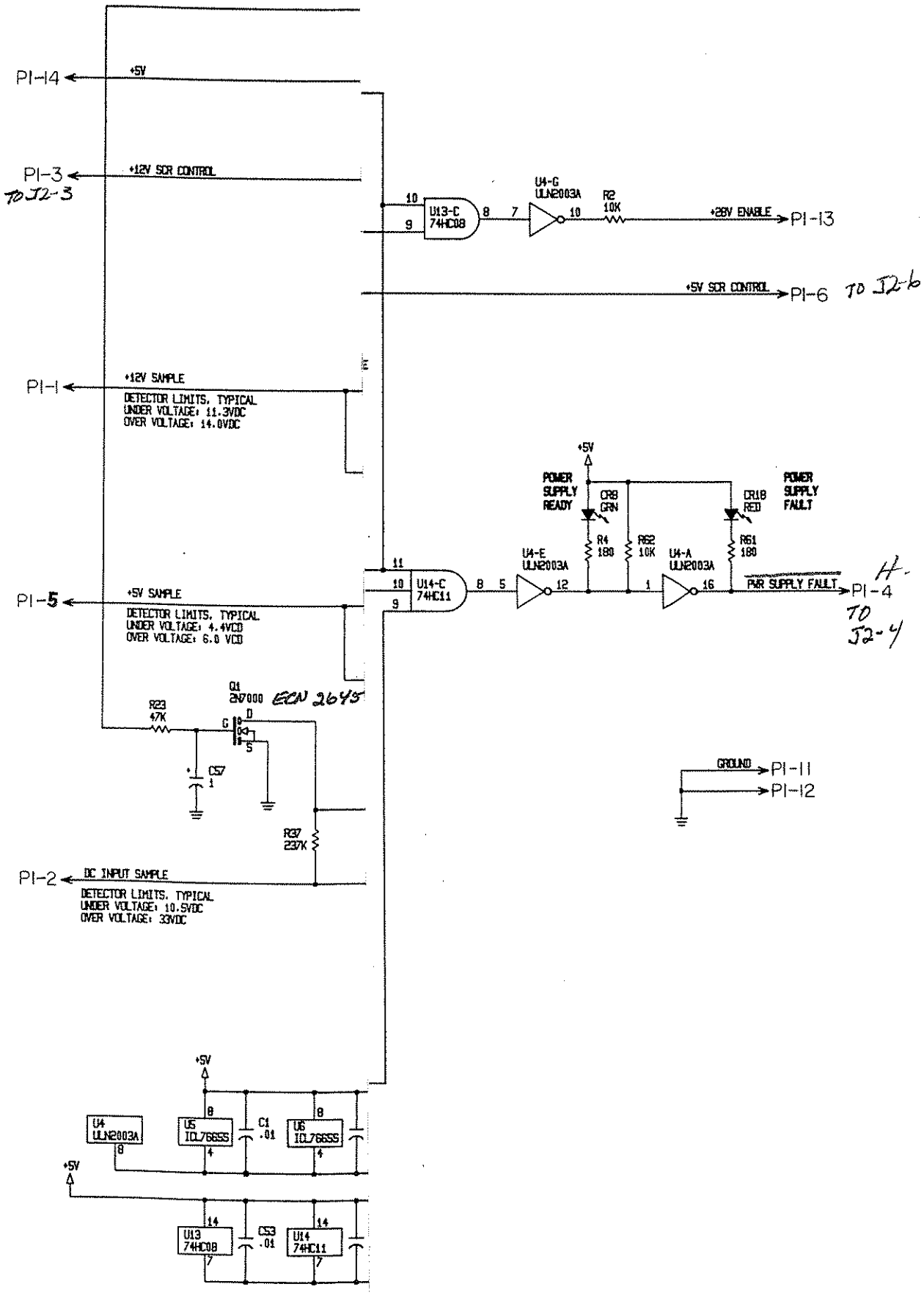
6.6 AC/DC Power Supply Assembly 4A9, page 2 of 2.

AC/DC POWER SUPPLY CONTROL ASSEMBLY 4A9A1

	AC/DC PWR SUPPLY CTRL ASSY 4A9A1	8101028099
C1	CAP. .01µF, 50V, X7R 20%	0281730008
C2	CAP. .01µF, 50V, X7R 20%	0281730008
C14	CAP. 15µF, 15V, 196D	0281720002
C37	CAP. .01µF, 50V, X7R 20%	0281730008
C38	CAP. .01µF, 50V, X7R 20%	0281730008
C39	CAP. .01µF, 50V, X7R 20%	0281730008
C51	CAP. .01µF, 50V, X7R 20%	0281730008
C53	CAP. .01µF, 50V, X7R 20%	0281730008
C54	CAP. .01µF, 50V, X7R 20%	0281730008
C55	CAP. .01µF, 50V, X7R 20%	0281730008
C57	CAP. 1µF, 35V, 196D	0281660000
CR1	DIODE, RECTIFIER 1N4004	0405180004
CR2	DIODE, LED, RED	1004350023
CR3	DIODE, LED, RED	1004350023
CR4	DIODE, LED, RED	1004350023
CR5	DIODE, LED, RED	1004350023
CR6	DIODE, LED, RED	1004350023
CR7	DIODE, LED, RED	1004350023
CR8	DIODE, LED, GREEN	1004350015
CR11	DIODE, ZENER IN5228B	1004320027
CR18	DIODE, LED, RED	1004350023
P1	CONNECTOR, RIBBON, 14 PIN FEM	1008350001
Q1	TRANSISTOR, N-CH, FET 2N7000	1011050013 EQV 2645
R2	RESISTOR 10K, 10%, 1/4W	0170410005
R4	RESISTOR 180, 10%, 1/4W	0175220000
R9	RESISTOR, 100K, 1/8W, 1%	1001030036
R10	RESISTOR, 1.8M, 10%, 1/4W	1011300001
R11	RESISTOR 10K, 1%, 1/8W	1003050026
R12	RESISTOR, 80.6K, 1%, 1/8W	1011290006
R13	RESISTOR 1.2M, 10%, 1/4W	0174930003
R14	RESISTOR 10K, 1%, 1/8W	1003050026
R15	RESISTOR 270, 10%, 1/4W	0178450006
R16	RESISTOR 390, 10%, 1/4W	0178330001
R17	RESISTOR 100K, 10%, 1/4W	0170390004
R18	RESISTOR 180, 10%, 1/4W	0175220000
R20	RESISTOR 180, 10%, 1/4W	0175220000
R22	RESISTOR 180, 10%, 1/4W	0175220000
R23	RESISTOR 47K, 10%, 1/4W	0171060008
R24	RESISTOR 270, 10%, 1/4W	0178450006
R26	RESISTOR 680K, 10%, 1/4W	0181480000
R27	RESISTOR 36.5K, 1%, 1/8W	1004050011
R28	RESISTOR 10K, 1%, 1/8W	1003050026
R29	RESISTOR 470K, 10%, 1/4W	0180570005
R30	RESISTOR, 26.1K, 1%, 1/8W	1011280001
R31	RESISTOR 10K, 1%, 1/8W	1003050026
R35	RESISTOR 270, 10%, 1/4W	0178450006
R36	RESISTOR, 4.7M, 10 %, 1/4W	1011330008
R37	RESISTOR, 237K, 1%, 1/8W	1011310007
R38	RESISTOR 10K, 1%, 1/8W	1003050026
R39	RESISTOR 1.2M, 10%, 1/4W	0174930003
R40	RESISTOR, 45.3K, 1%, 1/8W	1008200000
R41	RESISTOR 10K, 1%, 1/8W	1003050026
R51	RESISTOR 10K, 10%, 1/4W	0170410005
R52	RESISTOR 10K, 10%, 1/4W	0170410005
R61	RESISTOR 180, 10%, 1/4W	0175220000
R62	RESISTOR 10K, 10%, 1/4W	0170410005
R64	RESISTOR 390, 10%, 1/4W	0178330001

RP1	RES NTWK 8 PIN SIP 10K COM	1005200009
U4	IC. DIGITAL ULN2003A	1005630038
U5	IC. DIGITAL ICL7665S	1010940007
U6	IC. DIGITAL ICL7665S	1010940007
U7	IC. DIGITAL ICL7665S	1010940007
U8	IC, DIGITAL 74HC74	1008000019
U9	IC, DIGITAL 74HC74	1008000019
U10	IC. DIGITAL 74HC14	1006490027
U13	IC. DIGITAL 74HC08	1006490019
U14	IC. DIGITAL 74HC11	1010950002
U16	IC. DIGITAL UDN5703A	1011030004
XP1	CONNECTOR,PCB,TRANSITION,14PIN	1011090147
	CABLE, FLAT, 14 COND. 28AWG	1011170001

Figure 5.6.7 AC/DC Power Supply Control Assembly 4A9A1, page 1 of 2.



Power Supply Control Assembly 4A9A1, page 2 of 2.

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